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Description of document: Guidance on Style for NTSB Written Products, 2014 and "Writing Guide" that provides guidance on the content and structure of accident reports, safety recommendations, and similar NTSB products. 2000

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Freedom of Information Act (FOIA) Public Access Link

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National Transportation Safety Board
Washington, DC 20594 | www.ntsb.gov
OFFICE OF THE MANAGING DIRECTOR

January 4, 2018

Re: National Transportation Safety Board (NTSB)
Freedom of Information Act (FOIA)
Appeal No. 2017-00016-A
Request No. 2014-00389

On June 20, 2014, you requested an electronic copy of the NTSB "Style Manual." On December 15, 2016, the FOIA Office denied the request, citing FOIA Exemption 2, 5 U.S.C. § 552(b)(2), which exempts records "related solely to the internal personnel rules and practices of an agency." On December 23, 2016 you appealed, asserting that exemption 2 does not apply to the manual.

In response to your FOIA appeal, and in light of the Supreme Court decision in *Milner v. Dep't of the Navy*, 562 U.S. 562 (2011), the agency is releasing two documents in response to your FOIA request for the "NTSB Style Manual."

Two documents can reasonably be interpreted as style manuals used by the NTSB. For context, the NTSB previously used a "Style Guide" that provided standards for grammar and prose. The NTSB no longer uses the Style Guide; it was discontinued in 2013, before you submitted your FOIA request. The NTSB currently utilizes the Chicago Manual of Style. In 2014, the NTSB produced a Style Guide Transition document providing guidance on the transition from the Style Guide to the Chicago Manual of Style. Additionally, the NTSB uses a "Writing Guide" that provides guidance on the content and structure of accident reports, safety recommendations, and similar NTSB products. Pursuant to your preference for electronic copies of responsive documents, the agency encloses .pdf copies of both documents.

Sincerely,

Dennis Jones

Dennis Jones
Managing Director

Enclosures

Guidance on Style for NTSB Written Products

May 2014

During the first quarter of FY2013, the NTSB began transitioning to *The Chicago Manual of Style* (*Chicago*), 16th Edition, as its official style guide. *Chicago* is one of the most widely used style guides in the United States, and as such, supports the federal government's mandate under the Plain Writing Act of 2010 (Public Law 111-274) to prepare its written products with a focus on readers' needs. Because it is in such widespread use, *Chicago* best supports readers' expectations for writing style and format. NTSB users have subscription online access to *Chicago* at http://www.chicagomanualofstyle.org/16/contents.html (accessible via the NTSB network, either in-office or VPN).

To assist NTSB employees in the transition to *Chicago*, MD-3 has developed this resource. The following guidance highlights differences between the former *NTSB Style Guide* and *Chicago* and offers some clarifications and examples. The first column provides the former *NTSB Style Guide* section and the section content or a short topic phrase. The second column provides the *Chicago* section(s) and page number(s) (of the hard copy edition) that represent a style change. The third column offers clarifications and exceptions. The fourth column offers some examples beyond those provided in *Chicago*.
If an *NTSB Style Guide* section is not listed in the table, the guidance remains unchanged—so simply follow *Chicago*. Questions concerning omissions, ambiguity, or other challenges in applying *Chicago* to written NTSB products should be sent to md-3execsec@ntsb.gov. We encourage you to send specific examples (and if you'd like to suggest a way of handling it, please do!) Your input will be used to further develop and refine this guidance, and will be posted and continuously updated at the NTSB Portal.

NTSB	CMOS	Clarification or Exception	Example
Capitalization			
1.2 a person's title or designator when it precedes his or her name	8.18–8.32, 393–399	Focus on 8.18 and 8.19	
1.4 particles such as d', da, de, della, den, du, van, and von in foreign names and company names	8.5, 388. Also see the references to other sections within 8.5: 8.7–8.11, 8.14, 8.33, 388–891, 400; 8.67–8.68, 416–417		
1.5 name of a marine vessel	8.115–8.117, 436–437		

NTSB	CMOS	Clarification or Exception	Example
1.6 trademark names	8.152–8.153, 446–447 8.68, 417		
1.7 names of specific documents	8.154–8.160, 8.162–8.184, 447–457	Focus on 8.154 and 8.155	
1.8 center or side heading and titles of documents	8.155–8.160, 8.162–8.184, 447–457		
1.10 geographic locations, geographic terms, directional terms, transportation routes, and planets	8.44–8.49, 8.52–8.54, 403–408		
1.12 governmental terms	8.111, 433–434 (Military-related terms) 8.61–8.64, 412–414 8.50, 406–407		
1.13 terms that refer to nationwide transportation-related programs	8.68, 417		
Punctuation			
2.1.h use of apostrophes in forming plurals	7.14, 353; 7.61, 367		
2.3 use of uppercase letter following a colon within running text	6.59, 326–327 6.61, 327		

NTSB	CMOS	Clarification or Exception	Example
2.4.h use of a comma before “Jr.” or “Sr.”	6.47, 322–323		
2.4.i use of a comma before and after such abbreviations as “Inc.” and “Ltd.”	6.48, 323		
2.8.b use of parentheses to enclose sentences	6.96, 337		
2.9.a use of periods in captions and table titles	6.14, 311		
2.10 use of quotation marks to highlight unfamiliar term	7.54, 365		
2.10.c use of quotation marks after certain terms	7.58, 366–367		
2.10.e use of quotation marks with “so called”	7.56, 366		
Abbreviations, Acronyms, and Initialisms			
3.1 first time & subsequent times an abbreviation or acronym appears	10.3, 488–489	New Always spell out the abbreviation/acronym/initialism the 1st time it appears, even if the 1st time is a footnote or figure caption. In addition, always spell it out the 1st time it appears in the body of the document.	*Code of Federal Regulations* (CFR) *Federal Register* (FR) *United States Code* (USC)

NTSB	CMOS	Clarification or Exception	Example
3.2 use of an abbreviation or acronym in a report title or safety recommendation	NULL	Do not use abbreviations, acronyms, or initialisms in report titles. In the list of safety recommendations at the end of a report, spell out terms and include the related abbreviation, acronym, or initialism in parentheses in every safety recommendation. Allow the abbreviations, acronyms, or initialisms in the report text to appear according to first and later use rules. The safety recommendations in the report text do not have to match those at the back of the report in regard to abbreviations, acronyms, or initialisms; usage should flow with the surrounding text.	
3.3 abbreviations for terms not normally abbreviated or terms mentioned only a few times within the text	NULL	Do not use abbreviations that have other common definitions. Refer to the NTSB glossary for common abbreviations.	
3.5 National Transportation Safety Board on first reference	NULL (Similar to 10.3)	Spell out National Transportation Safety Board (and introduce the acronym NTSB if needed) in a report executive summary, the first place it appears in the report text, the probable cause, and the lead-in sentence for the safety recommendations list at the end of a report.	
3.6 United States when used as a noun and adjective	10.33, 500		United States (noun) US (adjective) US Army *United States Code* (USC)

NTSB	CMOS	Clarification or Exception	Example
3.7 US Coast Guard and US Army Corps of Engineers	NULL Closest reference is 8.111, 433–434	Use US Coast Guard on first reference and the Coast Guard thereafter (treat as an abbreviation). Use USCG only in combination with a designated station or vessel name. Use US Army Corps of Engineers on first reference and the Corps thereafter.	US Coast Guard (the Coast Guard) US Army US Navy US Air Force US Army Corps of Engineers (the Corps)
3.8 periods after each letter in most abbreviations	10.4, 489	In report and correspondence text, use District of Columbia instead of Washington, DC. Use Washington, DC, in address blocks, footnotes, or reference list citations. Disregard 4 of 10.4, 489. Do not use Latin abbreviations. For 2 of 10.4, 489, when using initials for names do not insert a space between the period and the next initial.	US USC Washington, DC PhD NY PO Box ac a.m. p.m. ft. in. kW m cm yd. lb. mi. Dr. Ms. Deborah A.P. Hersman
3.10 directional abbreviations in addresses and compass directions	10.36, 501		
3.11 geographic names abbreviations	10.31, 499		

NTSB	CMOS	Clarification or Exception	Example
3.12 name of a highway	10.34, 500–501	Use the 10.34 second column for reference in mailing addresses. Maintain current guidance for report text.	
3.13 Latin abbreviations	10.7, 490	Per plain language guidelines, do not use Latin abbreviations.	replace “e.g.” with “for example” replace “i.e.” with “that is” replace “et al.” with “and others” replace “etc.” with “and so on”
3.15 a company‘s legal or corporate status	10.22, 496		
3.16 abbreviation or acronym more generally used than the full term		Likely retaining examples from NTSB Style Guide.	
3.18 post office abbreviations for states, commonwealths, territories, and the District of Columbia in tables, charts, figures, maps, or briefs of accidents where space is limited	10.28, 498–499	Spell out state names in text. Use postal codes (without periods) for address blocks, footnote citations, and reference list citations. Use first column of 10.28, 498–499.	

Numbers

NTSB	CMOS	Clarification or Exception	Example
4.1, 4.2 use of words for numbers of nine or less; use of numerals for numbers of 10 or more	9.3, 464–465 9.14–9.15, 469	Disregard CMOS 9.2, 464, and 9.13, 468–469. Use words for numbers of one through nine in all instances except for measurements, money, with symbols, or with a related number of 10 or more in the sentence.	five cars 5 cars and 15 trucks eight helicopters 5 inches 5 hours 5 days 5 minutes $5 $5 million $55.5 million 5° course change 9°F five percent (or 5% if many percentages used, see exception in symbols)
4.5 Note method of writing years	9.31, 475 9.34, 476	Use 4-digit format for dates, as in NTSB 4.5 Note.	1980s
4.8 spelling out fractions	9.14, 469	Use numerals with measurements (see rules and exceptions above at CMOS 9.3) Use decimals or “word fractions”	Decimal fractions are preferred, when possible.
manner of writing dates	9.31, 475 9.32, 475–476	Follow first example in CMOS for all dates in text; disregard other styles. When referring to dates, always use both the month and the day and always use a numeral for the day.	June 25 and June 26
Footnotes			
5.1.b footnote numbering	14.20, 666	Number footnotes consecutively throughout a report, restarting only for each appendix.	
5.1.c footnotes in tables	3.74–3.77, 146–148	Use superscript lowercase letters when inserting notes to specific parts of a table.	

NTSB	CMOS	Clarification or Exception	Example
5.1.d footnote location on page and breaks between pages	14.36, 671	Let Word determine breaks and separator length during draft and publishing stages.	
5.1.f footnotes in headings	1.48, 26–27; 14.22, 666–667	Do not use unnumbered notes pertaining to a whole chapter. Do not use footnotes in any heading.	
Spelling			
6 spelling, general	chapter 7, 349–384 *Spelling, Distinctive Treatment of Words, and Compounds*	Generally follow Merriam-Webster (m-w.com); if more than one form given for spelling or plural, CMOS "normally opts for first" listed spelling for consistency.	
6.2 plurals	7.5 and 7.6, 351 regarding standard plural forms	7.6, 351 Alternative plural forms—"In some cases, however, different forms of the plural are used for different purposes. A book may have two indexes and a mathematical expression two indices, as indicated in the Webster's entry for index."	Following Merriam-Webster (m-w.com) (first listed form if more than one) for plurals of nonstandard words, words with Latin or Greek origin, and so on: antennae, appendixes, criteria, curricula, indexes, memorandums, minutiae, phenomena, symposia, 351.
data always plural	5.220, 276 *Good usage versus common usage*—see entry for "data"	Follow CMOS rule for "formal writing (and always in the sciences)," that is, plural.	these data are
6.3 awkward language in transportation disciplines (use of "main" as plural)		Keep "main" (plural) in NTSB addendum and glossary.	
6.8 transportation community combinations		Keep in NTSB addendum and glossary.	

NTSB	CMOS	Clarification or Exception	Example
6.9 hyphenating compounds	5.91, 227–228; chapter 7, 350–384, particularly 7.31–7.43, 358–361, and 7.77–7.85, 372–384 (7.85 includes compounding and hyphenation table); see also 6.80, 332–333		
Hyphenated and Compound Words			
Refers user to CMOS and NTSB Glossary	7.85, 374–384, including reference table of compounds by category, 375		
7.4 two or more hyphenated compounds with common basic element which is omitted with one term	7.84, 374		
7.6 hyphenating single letter with word	7.85, 380	x-ray: Do not capitalize x, as in some Merriam-Webster (m-w.com) entries and examples.	e-mail x-ray
7.9 and 7.10 certain hyphenation guides/specific terms	7.85, 374–384		
7.15 hyphenation before specific **suffixes** (wide, wise, less, like)	7.85, 374–384		
7.16 and 7.17 hyphenation with specific **prefixes**	7.85, 382		

NTSB	CMOS	Clarification or Exception	Example
Symbols			
8.1.a use of $ sign	9.21, 472; 9.25, 473	Use $ and numerals for all US monetary amounts, except at the start of sentence.	$0.50 $5 $50 $5 million
8.2 degree symbol use symbol after figure/measurement	9.13, 468; 9.16, 469–470; 10.37, 501–502; 10.52, 514; 10.61, 522; 10.64, 522	Use the degree symbol after a figure indicating a specific measurement. Always use a numeral with the degree symbol. Do no insert a space between the symbol and Fahrenheit or Celsius. Do not spell out Fahrenheit or Celsius upon first use; use the abbreviation only.	4° course change 9°F 36°C 115°F
8.3 percent symbol	9.18, 470–471	Spell out percent, except in tables, figures, or equations. (If percentages appear many times (for example, six or more times) in the same paragraph in a report, an exception to the exception will be considered. Contact MD-3.) Always use numerals with the percent symbol.	
8.4 compass symbols	10.37, 501–502; 10.64, 522; 10.69, 525–526	Use prime and double prime only to refer to minutes and seconds.	
8.5.a mathematical expressions	12.5, 581	Use symbols in place of words mainly in tables, figures, and equations. See exceptions for degree and percent symbols above.	
8.5.b equations in relation to text	12.21, 591		

NTSB	CMOS	Clarification or Exception	Example
8.5.c breaking equations before symbols	12.23, 593		
8.5.d number equations flush with right margin	12.24, 594		
8.5.e en space before and after symbols	12.16, 587; A.22		
8.5.g align short equations on equals sign	12.21, 591–592		
8.6 magnification, use of x	3.27, 126–127		x400
Tables			
9.1 basic elements of a table	consistency: 3.48, 134 parts: 3.49–3.50, 134 cell alignment and formatting: 3.68–3.73, 144–146		
9.3 Titles	3.52–3.53,135–136	Use sentence style without the period. Follow example provided in 3.52, 136.	
9.4 headings	3.54–3.62, 136–140		
9.5 table body	3.63–3.65, 140–141 cell alignment and formatting: 3.68–3.73, 144–146		

NTSB	CMOS	Clarification or Exception	Example
Documentation **The CMOS offers two options for citing sources: (1) footnotes and bibliography and (2) author-date and reference list. We will use CMOS chapter 14 when inserting substantive footnotes in report text and for all footnotes (substantive, source citation, and so on) in all correspondence. We will use CMOS chapter 15, the author-date and reference list option, when citing sources and creating a reference list in a report. Do not use the bibliography methods described in chapter 14 for reports or correspondence. The author-date citation and reference list methods are very different from the previous NTSB Style Guide methods. See CMOS chapter 15 for specifics; below we have highlighted the basic method elements and then suggested some simplifications and exceptions.** **The CMOS provides many examples of the author-date citation and reference list formats. However, the CMOS does not address all document types. If no example exactly fits your needs, please follow the basic form as closely as possible and be consistent throughout your document. Please also provide your method to MD-3 so it can be assessed and added to this list.**			
10.1.a author's name	14.72–14.92, 694–701 15.5, 787; 15.9, 789–792; 15.12, 793; 15.28, 799; 15.35–15.36, 803	Include all relevant information in footnotes, even if repetitive of nearby text. Exception to 14.73, 694: Do not insert space between initials in Deborah A.P. Hersman's name. (D'Onofrio e-mail, 7/30/2009)	**Footnote in correspondence:** 3. National Transportation Safety Board, *Motorcoach Roadway Departure and Overturn on Interstate 95 Near Doswell, Virginia, May 31, 2011,* HAR-12/02 (Washington, DC: National Transportation Safety Board, 2012). **In report text cite:** (NTSB 2012) **Report References:** NTSB (National Transportation Safety Board). 2012. *Motorcoach Roadway Departure and Overturn on Interstate 95 Near Doswell, Virginia, May 31, 2011.* HAR-12/02. Washington, DC: NTSB. (Indent lines by 0.5 under author's name.)

NTSB	CMOS	Clarification or Exception	Example
10.1.a one author	14.75, 695 15.9, 790		**Footnote in correspondence:** 1. David Shields, *The Thing about Life Is That One Day You'll Be Dead* (New York: Alfred A. Knopf, 2008). **In report text cite:** (Shields 2008) **Report References:** Shields, David. 2008. *The Thing about Life Is That One Day You'll Be Dead.* New York: Alfred A. Knopf. (Indent lines by 0.5 under author's name.)
10.1.a three or fewer authors	14.76, 695–696 15.9, 790		**Footnote in correspondence:** 6. Steven D. Levitt and Stephen J. Dubner, *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything* (New York: William Morrow, 2005), 20–21. **In report text cite:** (Levitt and Dubner 2005, 20–21) **Report References:** Levitt, Steven D., and Stephen J. Dubner. 2005. *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything.* New York: William Morrow. (Indent lines by 0.5 under author's name.)

NTSB	CMOS	Clarification or Exception	Example
10.1.a more than three authors	14.76, 696 15.9, 790–791; 15.28, 799–800	Include all names in a footnote for correspondence (because there will not be an associated bibliography).	**Footnote in correspondence:** 6. Name, Name, Name, Name, and Name, *Title in Italics* (Place of Publication: Publisher, Year). List up to seven names followed by and others, see page 696. **In report text cite:** (Last Name of First Author and others Year) **Report References:** Name, Name, Name, Name, and Name. Year. *Title in Italics.* Place of Publication: Publisher. List up to seven names followed by and others, see page 696.
10.1.a editor or compiler	14.76–14.77, 695–696 15.9, 790		**Footnote in correspondence:** 5. Sue-Ellen Jacobs, Wesley Thomas, and Sabine Lang, eds., *Two-Spirit People: Native American Gender Identity, Sexuality, and Spirituality* (Urbana: University of Illinois Press, 1997), 32. **In report text cite:** (Jacobs, Thomas, and Lang 1997, 32) **Report References:** Jacobs, Sue-Ellen, Wesley Thomas, and Sabine Lang, eds. 1997. *Two-Spirit People: Native American Gender Identity, Sexuality, and Spirituality.* Urbana: University of Illinois Press. (Indent lines by 0.5 under author’s name.)

NTSB	CMOS	Clarification or Exception	Example
10.1.a author and editor or translator	14.88, 700 15.9, 791		**Footnote in correspondence:** 10. Theodor W. Adorno and Walter Benjamin, *The Complete Correspondence*, *1928–1940*, ed. Henri Lonitz, trans. Nicholas Walker (Cambridge, MA: Harvard University Press, 1999). **In report text cite:** (Adorno and Benjamin 1999) **Report References:** Adorno,Theodor W., and Walter Benjamin. *The Complete Correspondence*, *1928–1940*. Edited by Henri Lonitz. Translated by Nicholas Walker. Cambridge, MA: Harvard University Press. (Indent lines by 0.5 under author's name.)
10.1.a no author	14.79, 697 15.32, 801		**Footnote in correspondence:** 8. *A True and Sincere Declaration of the Purpose and Ends of the Plantation Begun in Virginia, of the Degrees Which It Hath Received, and Means by Which It Hath Been Advanced* (London, 1610). **In report text cite:** (*True and Sincere Declaration* 1610) **Report References:** *A True and Sincere Declaration of the Purpose and Ends of the Plantation Begun in Virginia, of the Degrees Which It Hath Received, and Means by Which It Hath Been Advanced.* 1610*.* London. (Indent lines by 0.5 under author's name.)
10.1.b changing section titles to initial capitals non-English titles	8.163, 451; 8.156, 448; 11.3, 532–533; 14.107, 706	8.163 seems to allow for the NTSB style guidance about permissible changes to titles, however, it is not specific to the CFR.	
10.1.c. publisher's location and name	14.133, 716		

NTSB	CMOS	Clarification or Exception	Example
10.1.d. publication date	14.149, 721		
10.1.e. page numbers p. and pp. ranges	14.121, 712; 14.158, 724; 9.60, 483; 9.61, 484 15.8, 789	We recognize the variations allowed, please just be as consistent as possible with use or nonuse of p. or pp. Consider use of vol. and no. in decision. Use the full form of numbers in inclusive page ranges. (9.61)	
10.1.f volume and issue numbers	14.121–14.127, 712–714; 14.157, 724; 14.159, 724	We recognize the variations allowed, please just be as consistent as possible with use or nonuse of vol. or no. Consider use of p. and pp. in decision.	
10.2.a shortened citation form	14.24–14.31, 667–670	Do not use ibid in any citation form. Do not use Latin abbreviations.	
10.2.b shortened form if full cite does not contain author's name	14.28, 668–669		
10.3 citing multiple references	14.23, 667; 14.52, 682–683 15.29, 800		
reports by government agencies if both author and publisher	14.92, 701		See NTSB and FHA examples below.

NTSB	CMOS	Clarification or Exception	Example
10.4 NTSB reports	14.68–14.69, 693–694; 14.92, 701 15.36, 802–803	Use NTSB for in-text references and reference list, but spell out National Transportation Safety Board in parentheses in the reference list. See 15.36 in particular.	**Footnote in correspondence:** 3. National Transportation Safety Board, *Motorcoach Roadway Departure and Overturn on Interstate 95 Near Doswell, Virginia, May 31, 2011,* HAR-12/02 (Washington, DC: National Transportation Safety Board, 2012). **In report text cite:** (NTSB 2012) **Report References:** NTSB (National Transportation Safety Board). 2012. *Motorcoach Roadway Departure and Overturn on Interstate 95 Near Doswell, Virginia, May 31, 2011.* HAR-12/02. Washington, DC: NTSB. (Indent lines by 0.5 under author's name.)
10.4 reports published by other federal agencies	14.68–14.69, 693–694; 14.92, 701 (secondary sources see 14.303, 777–778)		Trying to translate some examples from the old style guide, do you think the highlighted parts below can be deleted? **Footnote in correspondence:** Federal Highway Administration, *Manual on Uniform Traffic Control Devices* (Washington, DC: US Department of Transportation, Federal Highway Administration, 1988). **In report text cite:** (FHA 1988) **Report References:** FHA (Federal Highway Administration). 1988. *Manual on Uniform Traffic Control Devices.* Washington, DC: US Department of Transportation, FHA.

NTSB	CMOS	Clarification or Exception	Example
10.4 federal regulations and directives *Code of Federal Regulations*	14.301, 776	Use *Code of Federal Regulations* (CFR), without periods.	CMOS is not prescriptive. Maintain current practice which refrains from footnoting and circumvents author-date issues too. No need to include in the reference list. First reference: Title 14 *Code of Federal Regulations* (CFR) Part 135 Later references: 14 CFR Part 135 At the beginning of a sentence: Title 14 CFR Part 135 When decimal point indicates a section: 14 CFR 135.65(a) Later references, if appropriate: section 135.63(b) When referring to specific parts or sections of regulations related to transportation agencies, it is best to relate them to the *Code of Federal Regulations* rather than to their individual part titles. Federal Aviation Regulations: 14 CFR Part 319 (not 14 FAR Part 319) Federal Motor Carrier Safety Regulations: 49 CFR Part 395
10.4 federal regulations and directives *Federal Register*	14.301, 776	Use *Federal Register* (FR).	**Footnote in correspondence:** *Federal Register* 60, no. 97 (May 19, 1995): 26899. **In report text cite:** (*Federal Register* 1995, 26899) **Report References:** *Federal Register*. 1995. Vol. 60, no. 97 (May 19).
10.4 federal regulations and directives *United States Code*	14.294, 774; 14.301, 776	Use *United States Code* (USC).	CMOS is not prescriptive. Maintain current practice which refrains from footnoting and circumvents author-date issues too. No need to include in the reference list.

NTSB	CMOS	Clarification or Exception	Example
10.4 legal documents	14.283–14.291, 770–773; 14.293–14.297, 774–775 15.54–15.55, 809–810		
10.4 handbooks, directives, and certain other administrative documents	14.75, 695 15.9, 790	Include author and publication location information, whenever available.	
10.4 books	14.15, 661; 14.18, 662–664 15.7, 789; 15.9, 789–791		**Footnote in correspondence:** 1. Michael Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals* (New York: Penguin, 2006), 99–100. **In report text cite:** (Pollan 2006, 99–100) **Report References:** Pollan, Michale. 2006. *The Omnivore's Dilemma: A Natural History of Four Meals.* New York: Penguin.
10.4 proceedings and articles in proceedings	14.226, 747 15.9, 791–792		
10.4 investigative hearings, forums, and symposia	14.226, 747 and 15.9, 791–792	Use format for lectures and papers presented at meetings.	
10.4 journal articles	14.170–14.198, 728–738 15.9, 791–792		
10.4 circulars and pamphlets	14.249, 756		

NTSB	CMOS	Clarification or Exception	Example
10.4 memorandums and letters	14.222, 745–746	Incorporate relevant agency or company information for sender and recipient.	
10.4 theses and dissertations	14.224, 746–747; 14.120, 711; 8.184, 457		
10.4 oral presentations	14.226, 747		**Footnote in correspondence:** Linda A. Teplin, Gary M. McClelland, Karen M. Abram, and Jason J. Washburn, "Early Violent Death in Delinquent Youth: A Prospective Longitudinal Study" (paper presented at the Annual Meeting of the American Psychology-Law Society, La Jolla, CA, March 2005). **In report text cite:** (Teplin and others 2005) **Report References:** Teplin, Linda A., Gary M. McClelland, Karen M. Abram, and Jason J. Washburn. March 2005. "Early Violent Death in Delinquent Youth: A Prospective Longitudinal Study." Paper presented at the Annual Meeting of the American Psychology-Law Society, La Jolla, CA.
10.4 maps and charts	14.165, 726		
10.4 interviews	14.219, 744; 14.221, 745		

NTSB	CMOS	Clarification or Exception	Example
10.4 press releases	14.213, 742		**Footnote in correspondence:** 3. National Transportation Safety Board, “NTSB Chairman Commends FAA on Major Advancement in Aviation Safety,” news release, July 16, 2008, http://www.ntsb.gov/Pressrel/2008/080716.html. **In report text cite:** (NTSB 2008) **Report References:** NTSB (National Transportation Safety Board). 2008. “NTSB Chairman Commends FAA on Major Advancement in Aviation Safety.” News release. Washington, DC: NTSB. (Indent lines by 0.5 under author’s name.)
10.4 online sources World Wide Web	14.4, 656; 14.6, 657; 14.7, 657–658; 14.18, 664–665	Use URLs in online source citations.	
10.4 online sources e-mail	14.222, 745–746	Incorporate relevant agency or company information for sender and recipient.	
	See all of chapter 15.		Sources are cited in the text, usually in parentheses, by the author’s last (family) name (or the organization), the publication date of the work cited, and a page number if needed. -(Last Name Year) no punctuation between -(Last Name Year, Page Number) insert comma after year if page number is needed Full cite details appear in the reference list in which the year of publication appears immediately after the author’s name.

NTSB	CMOS	Clarification or Exception	Example
	15.10, 792–794 reference list	Insert one main reference list at the end of a report (after any appendixes). Use “References” as the header. Indent lines by .5 under author’s name when creating list.	
	15.29, 800 order of multiple text references	When citing multiple references in text, use the following sequence: (1) order the citations to reflect the text when possible, (2) rely on relative importance of the citations next, and (3) use alphabetical ordering last, which would most closely match the reference list order.	
	15.38, 803–804 reprint and modern editions	Do not include original date of publication in in-text citations or the reference list.	
Miscellaneous			
12.1 captions	3.21, 3.23–3.27, 122–127		
12.2 time	time zone info: 10.42, 503–504 and 8.89, 426	Marine and aviation modes use 24-hour time clock.	

CHAPTER 1

ACCIDENT REPORTS

ACCIDENT REPORTS

Overview

What is a Safety Board accident report? What is its purpose? Why is it formatted the way it is? Who reads it? Why is it reviewed so carefully? How do I write one? These questions come naturally to new Board employees. And even some long-time employees may not know the answers to all of these questions.

A Safety Board accident report is the culmination of an investigation that has often lasted more than a year and involved many employees and staff hours. All of this effort should result in a complete, readable, and accurate discussion of the accident that satisfies the reader’s questions about the cause and prompts the reader to act on the safety issues raised by the report. Readers rely on the Safety Board to discuss all pertinent information relating to its accident investigation and determination of probable cause.

Accident reports are written according to a basic formula:

- List the facts.
- Analyze the facts.
- Draw conclusions based on the analysis.
- State the probable cause.
- Make recommendations.

To follow this formula, a report writer must:

- Write simple declarative sentences.
- Write well-structured, logical paragraphs.
- Arrange the material in a logical sequence.

- Analyze the significance of the information developed by the investigation.

- Write convincing conclusions and recommendations that persuade readers to correct safety problems.

Finally, a report writer needs to know when enough has been said and it is time to stop writing.

A Safety Board accident report *is not*:

- a data dump of all the facts gathered during the investigation,

- a technical dissertation,

- a compilation of excerpts from Federal regulations,

- an apology for the actions of the principals, or

- a forum for presenting every safety issue remotely related to the accident.

Each Safety Board accident report has a specific purpose and audience and is written with a scope, content, and style that communicates its purpose to that audience.

Purpose

The general purpose of an accident report is to fulfill the Safety Board's mandate (49 *Code of Federal Regulations* 801.35 and 801.36) to provide the "facts, conditions, and circumstances, and the Board's determination of cause or probable cause of the accident."

In addition to this general purpose, each accident report has a specific purpose that focuses on the report's key safety issues and audience. To determine the specific purpose, the writer should answer these questions:

- Why did we investigate the accident?

- What are the safety issues that make the accident unique?

- What changes do we want to achieve?

Audience

The general audience of an accident report is anyone who can effect change to improve transportation safety. This group includes, among others, the Congress, Government transportation agencies (such as the Federal Aviation Administration, Federal Railroad Administration, and Federal Highway Administration), industry officials, and the news media. Because it may be impractical, if not impossible, to write a report that satisfies the information needs of such a large, diverse group, a specific audience must be determined for each accident report. To determine the specific audience, the writer should answer these questions:

- Who can correct the specific safety problems identified in the report?

- Who can influence others to correct the safety problems?

- Who should be made aware of the safety problems to help prevent a similar accident?

Scope

Generally, the scope of an accident report encompasses only those “facts, conditions, and circumstances” that are analyzed and result in the Board’s statement of probable cause. In some cases, that is all a report needs to do. However, in many cases, the accident report is used as a forum for the discussion of factors that “contributed” to the accident. And at times, an accident report discusses an issue, such as the emergency response, that is not a causal or contributing factor in the accident, but is important to safety.

To determine the specific scope, the writer should answer these questions:

- What is the purpose of this report?

- Who is the audience?
- How much does the audience know or need to know about the subject?
- What are the safety issues, and how thoroughly will the issues be analyzed?

The participants at the report planning meeting (see Board Order 300, *Report Preparation Process*) should determine the purpose, audience, and scope of a report through discussion. The writer should write a statement that explains the purpose, audience, and scope of the report, as determined at the meeting, and refer to it frequently while writing the report.

Content

The content of an accident report is determined by its purpose, audience, and scope. The writer considers these three factors and selects the "facts, conditions, and circumstances" that are essential to communicating the safety message to the reader.

Because of format requirements, accident reports do contain some nonessential information. For example, "Meteorological Information" is a standard section that discusses the role the weather played in the accident. Often the weather is not an important factor. In such a case, a writer should limit the amount of information included about the weather, even though such information could be considered essential to conveying the complete "facts, conditions, and circumstances" of the accident.

Style

Style is the manner in which a document is written, as distinguished from its content. The style of a document can range from informal to formal. Audience is the primary consideration in determining the style of a document.

Safety Board accident reports have a specific style that has developed over the years. The reports should be simple, clear, and direct. **FACTUAL INFORMATION**, the factual section, should be objective. **ANALYSIS**, the analysis section, should be analytical and persuasive. A report should appeal to a reader's reason rather than emotion. A report should be purposeful and result-oriented, rather than merely informative and educational. (For further information on the Safety Board's editorial policy, see attachment 1 of Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings,* which is also in the introduction of the *Writing Guide*.)

Format

Format is the physical arrangement and general appearance of a document. Good format enhances the content and helps the writer communicate to the reader. In most publications, the content dictates the format. However, because the Safety Board has established standard accident report formats for all transportation modes, the format controls the content to a large degree.

The format of Safety Board aircraft accident reports is based on a format published by the International Civil Aviation Organization (ICAO) as the appendix to *International Standards and Recommended Practices, Aircraft Accident Investigation, Annex 13 to the Convention on International Civil Aviation*. In "Chapter 6—Reporting," it states:

> The final report may be prepared in the format considered to be the most appropriate in the circumstances. However, the format presented in the appendix [to Annex 13] may be used to good advantage.

When standard formats for surface accident reports were developed, it was logical to use the ICAO format as a model. Although the surface report formats have changed little over the years, presentation methods have improved, and the Board has not adhered as strictly to the ICAO format for surface reports as for aircraft reports. For example, the headings “Events Preceding the Accident” and “Training” have been used often in surface reports, although they are not considered to be “standard” headings. The most recent format change was the replacement of the “Synopsis” section with **Executive Summary**. In addition, we now use an abstract on the inside front cover that is more useful to abstract users, such as the National Technical Information Service.

Use the formats shown in the following sections for accident reports. The headings shown are required for all reports. Other headings may be used when both the writer and editor consider them necessary. These optional headings are used if more detailed factual information is needed to support the analysis of a safety issue. Optional headings may also be used to emphasize certain information.

Final Decision on Report Presentation

Staff views on a report’s purpose, audience, scope, content, style, and format often differ. The final decision on how the results of an accident investigation will be presented to our readers is made by the Safety Board Members after their review of the report. Remember, your first (and maybe toughest) audience is the Board Members.

How to incorporate and reference Board Member statements in reports and safety recommendation letters

Reports:

- Include the standard statement: "BY THE NATIONAL TRANSPORTATION SAFETY BOARD" with the names of all Members typed below, followed by "Adopted: [date]"

- The paragraph immediately below should state: "Member XXX filed the following concurring [or dissenting] statement on [date]." If another member joins the statement, add the additional phrase "…and was joined by Member XX." If more than one member filed a statement, write a similar sentence for each statement.

- Start statements on a new page with the following heading: "Member XXX, concurring [or dissenting]:" **Note**: there is no need to include the notation number, even if it was included in the Board Member's original statement. If any other Member[s] joined the statement there is no need to restate it here.

- Insert text of Member statement. There is no need to include any signature or signature block at the end.

- Any subsequent Board Member statements should start on a new page, again with the heading "Member XXX, concurring [or dissenting].

- **Examples** (these examples may reflect slight variations from the guidance above):
  http://www.ntsb.gov/publictn/2007/AAR0705.pdf
  http://www.ntsb.gov/publictn/2007/HAR0701.pdf

Safety Recommendation Letters:

- Footnote at the beginning should reference the full report and include a link to the report on our website. **Example:**

  > [1] For more information, see *In-flight Separation of Right Wing, Flying Boat, Inc., doing business as Chalk's Ocean Airways Flight 101,Grumman G-73T, N2969, Port of Miami, Florida, December 19, 2005,* Aviation Accident Report NTSB/AAR-07/04 (Washington, DC: NTSB, 2007), available on the National Transportation Safety Board's website at <http://www.ntsb.gov/publictn/2007/AAR0704.pdf>.

- Closing paragraph should reference any statements that were filed and who they were filed by and note that they are attached to the report. For example: "Chairman XX, Vice Chairman XX, and Members XX, XX, and XX, concurred in these recommendations. Member XX filed a concurring statement, which is attached to the [mode] accident report."

- The statements themselves should not be attached to the recommendation letter.

- **Examples**:
  http://www.ntsb.gov/Recs/letters/2007/R07_9_12.pdf
  http://www.ntsb.gov/Recs/letters/2008/M08_1_2.pdf

CHAPTER 2

AIRCRAFT
ACCIDENT REPORT

CONTENTS

Paragraph

FORMAT AND CONTENT

Draft Report Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header showing the date of the report version and the label “draft.”

Include a table of contents. Figures should be numbered consecutively, tables should be numbered consecutively, and charts should be numbered consecutively. The appendixes should be lettered consecutively.

Published Report Elements

For the format of the elements that only the published report has, such as the front and back covers, the abstract and the mission statement on the inside front cover, and the title page, see ***Published Format***, which is at the end of this chapter. Following ***Published Format*** are ***examples A*** through ***E*** of the front cover, the inside front cover, the title page, the table of contents, and the executive summary.

Table of Contents

In most cases, the editor develops the table of contents for the notation and final versions of the report. Report writers should include a table of contents with earlier report versions. (For a table of contents, see ***example D***.)

Report Title

The report title includes the following elements:

- type of accident;
- name of the operator of the aircraft;
- type, model, nationality, and registration number of the aircraft;

- location of accident, including airport name (if applicable), city, and State; and
- date of accident.

Use consistent language for citing accident locations in different parts of the report, such as the cover, title page, **Executive Summary**, and **1.1 History of Flight**. Follow modal office criteria for citing accident locations in report titles. On the cover and on the title page, do not use "in" before the accident location or "on" before the accident date. Do not use such imprecise designations as "near" unless unavoidable. (See ***examples A*** and ***C***.)

Executive Summary

Include the following information in **Executive Summary** (see ***example E***):

- a brief description of the accident (usually the first paragraph of **1.1 History of Flight**),
- probable cause of the accident,
- list of safety issues discussed, and
- list of recommendation recipients (see ***example E***).

Body of the Report

Provide only the information that is appropriate and necessary to support the Safety Board's conclusions, recommendations, and probable cause. Eliminate unnecessary details that detract from the safety message that you are communicating.

Paragraph 1. describes the sections that belong under **FACTUAL INFORMATION**. Subheadings may be used as necessary. For example:

1.16 Tests and Research

1.16.1 Simulator Experiments

1.16.2 Simulator Flight #1

Use all of the headings and specific numbering shown. Insert “None” or “Not applicable” as appropriate. Section **1.19 Useful or Effective Investigation Techniques** is the only optional heading.

Paragraph 2. describes the sections that belong under **ANALYSIS**. In **ANALYSIS**, do not analyze facts about the accident unless the information has already been mentioned in **FACTUAL INFORMATION**. Do not introduce new factual information.

All facts in the report must be supported by documentation in the Board’s public docket. The only exceptions are documents readily accessible to the public, such as the *Code of Federal Regulations* (CFR) and past Safety Board reports.

In **ANALYSIS**, a conclusion is normally preceded by the words “the Safety Board concludes,” and a safety recommendation is preceded by the words “the Safety Board believes.” Remember:

- Every safety recommendation must have a corresponding conclusion.
- Every conclusion must be supported by analysis.
- All analysis must be supported by fact.

1. FACTUAL INFORMATION

1.1 History of Flight

Write a brief narrative giving the following information, as appropriate, in a logical order:

- time of departure (use 24-hour clock);
- date of departure;
- manufacturer and model of aircraft;
- registration number;
- operator;
- flight number;
- type of operation;
- location of departure;
- number of people on board (broken down in the following categories: flight crew, cabin crew, and passengers);
- destination;
- type of flight plan filed;
- flight preparation, including time flight crew reported for duty, weather briefing, preflight check, and flight plan;
- airport operations, if they affected the flight;
- earlier portions of the flight;
- description of the flight, including air traffic control transmissions and cockpit voice recorder conversation, if appropriate, and events leading up to the accident, including a reconstruction of the significant portion of the flightpath. State who was flying the aircraft;
- location (latitude, longitude, and elevation), time of the accident, and lighting conditions;
- weather at time of accident; and
- witness accounts of the accident.

This section is often the most difficult section to write. Here are some tips:

- Eliminate unnecessary details.

- Choose a logical starting point from which to begin the description of the events leading up to the accident.

- Describe the events in chronological order. If two events occurred simultaneously, explain one event thoroughly and then backtrack to the other event, using such transitions as “meanwhile” and “while.”

Remember that you have 17 other sections in which to be more specific.

Also remember that this is the history of the flight, not a place to discuss the highlights of the report or the significant issues. Sometimes the substance of the report is not logically connected to the flight itself. (For example, an engine fails because of a fatigue crack due to a manufacturing defect.) Although much of the report may focus on the manufacturing process of the engine part, resist the urge to discuss manufacturing in **1.1 History of Flight**.

1.2 Injuries

The survival factors investigator provides the report writer with an injury table in the following format:

Injury Type	Flight Crew	Cabin Crew	Passengers	Others	Total
Fatal	2	2	3	0	7
Serious	1	1	0	0	2
Minor	0	0	0	0	0
None	0	0	0	0	0
Total	3	3	3	0	9

49 *Code of Federal Regulations* (CFR) 830.2 defines *fatal injury* as “any injury which results in death within 30 days of the accident” and *serious injury* as “an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface.”

1.2 Injuries contains only the table. Injuries are discussed in **1.13 Medical and Pathological Information**.

1.3 Damage to Airplane

Briefly describe the accident damage (destroyed, substantial damage, minor damage, and no damage) to the aircraft and to other objects, such as the runway field. Give the estimated dollar value of the aircraft, and state who made the estimate. Include a tabulated listing of all other documented dollar damages.

1.4 Other Damage

Briefly describe other property damage.

1.5 Personnel Information

This section is usually limited to the flight crew but may contain information on any person, such as an air traffic controller, whose duties or actions directly affected the accident.

When more than one flight crew is involved in an accident, discuss each flight crew under a separate subheading. The information covered in this section can include:

- job title (captain, first officer, and flight engineer),
- date of birth,
- certification,
- experience,
- training,
- duty time,
- pertinent preaccident activities,
- medical factors,
- human factors, and
- record of previous accidents or Federal Aviation Administration (FAA) enforcement actions.

Give only the details necessary for the reader to understand a person's qualifications. Unless someone's performance will be analyzed in depth because of his or her role in the accident, save your time and the reader's time by eliminating nonessential details.

1.6 Airplane Information

This section may contain the following information:

- aircraft type, model, registration number, manufacturer, number of seats, certification, and operator (for midair collisions, include information on paint, markings, and lights);
- engines;
- airworthiness and maintenance of the aircraft, including deficiencies known before and during the flight;
- performance;
- weight and balance; and
- equipment systems, such as a stall avoidance system or flap and slat systems, if their operation will be analyzed in depth.

When more than one aircraft is involved, discuss each aircraft under a separate subheading.

1.7 Meteorological Information

Briefly describe the weather at the time of the accident. If weather was a factor in the accident, include more details, such as the forecast, the actual conditions, and availability of meteorological information to the flight crew and air traffic controllers.

1.8 Aids to Navigation

If relevant to the accident, briefly describe the navigational aids available, including landing aids, and their effectiveness at the time. If aids to navigation were not involved, write “Not applicable.”

1.9 Communications

Briefly describe aeronautical mobile and fixed service communications and their effectiveness. Cover cockpit/cabin crew communications, if relevant. If communications were not a factor in the accident, write either “Not applicable” or “There were no known communication difficulties.”

1.10 Airport Information (not Aerodrome Information)

Briefly describe the airport, its facilities, and their conditions, including:

- location,
- elevation,
- navigational aids, and
- Air Traffic Control (ATC) services.

If the aircraft took off from or landed somewhere other than an airport, briefly describe the area. If the accident did not involve an airport, write “Not applicable.”

1.11 Flight Recorders

Briefly describe the manufacturer, mode, and location of the flight data recorder (FDR) and cockpit voice recorder (CVR) in the aircraft, the numbers of FDR parameters, their condition on recovery, and the quality of the CVR recording. If the aircraft was not equipped with recorders and not required to be, so state.

1.12 Wreckage and Impact Information

Briefly describe the accident site and the distribution of the wreckage. Details about the location and the state of the different pieces of the wreckage are not normally required unless it is necessary to indicate a breakup of the aircraft or a collision with another aircraft or object before impact. Include diagrams, charts, and photographs in this section. Discuss pertinent data from the CVR under **1.1 History of Flight** and pertinent data from the FDR under **1.16 Tests and Research**.

1.13 Medical and Pathological Information

Briefly describe the results of toxicological tests and medical examinations or autopsies of the flight crew and other crewmembers and, if relevant, of such other personnel as air traffic controllers. (Medical information related to flight crew certificates should be included in either **1.5 Personnel Information** or in an appendix.)

Describe, in general, the types of injuries or causes of death of passengers or other people involved in the accident.

Follow the ICAO (International Civil Aviation Organization) criteria at 49 CFR 830.2[1] to determine fatalities and injuries.

Do not discuss survival aspects in this section. (See ***1.15 Survival Aspects***.)

[1] 49 CFR 830.2 defines fatal injury as "any injury which results in death within 30 days of the accident" and serious injury as "an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface."

1.14 Fire

If a fire occurred, tell how it happened, and note the firefighting equipment used and its effectiveness. If no fire occurred, write "There was no in-flight or postimpact fire."

1.15 Survival Aspects

Briefly describe, if applicable:

- search, evacuation, and rescue;
- location of crew and passengers in relation to injuries sustained;
- failure of such structures as seats and seatbelt attachments;
- problems with emergency exits;
- passenger injuries and;
- resistance of seat materials and other materials to fire.

If the accident was not survivable, so state.

(Note the differences between **1.13 Medical and Pathological Information** and **1.15 Survival Aspects**.)

1.16 Tests and Research

This section briefly explains tests and research done by the Safety Board or another organization to determine facts regarding the accident. Discuss each test or research topic under a separate subheading (for instance, "metallurgical examination" or "aircraft performance"). If no tests or research were conducted, write "Not applicable."

This section relates the results and evaluations of the tests and research. Subsequently, this is the only section under **FACTUAL INFORMATION** that has analytical language. Do not confuse the analysis of test results, which establishes facts, with the analysis of the accident in **ANALYSIS**.

1.17 Organizational and Management Information

This section discusses relevant organizational and management information, such as the company’s structure or internal oversight. Also describe the FAA’s oversight.

1.18 Additional Information

This section contains relevant information not already included in previous sections. Use a separate subheading for each topic discussed. This section often contains two or more subheadings.

The following examples from past reports show topics that have appeared in this section:

- airspace;
- ATC facilities;
- ATC procedures, requirements, and training;
- operations;
- human performance (general information and research);
- checklist procedures; and
- action taken since the accident.

1.19 Useful or Effective Investigation Techniques

This heading is optional. When useful or effective investigation techniques have been used during the investigation, briefly discuss the reason for using the techniques and refer to the main features. Describe the results of the techniques, as appropriate, in other sections.

Use this heading *only* when necessary. This is the *only* optional heading in **FACTUAL INFORMATION**. (See NTSB/AAR-88/08 [Detroit-CASA] for an example.)

2. ANALYSIS

Every issue discussed in **ANALYSIS** should result in a conclusion about the accident that supports the Safety Board's statement of probable cause. These conclusions result in recommendations of what the Board believes should be done to correct, prevent, or mitigate the identified deficiency.

2.1 General

This section usually eliminates factors that were not causal to the accident. Discuss the safety issues that are addressed by the report in subsequent sections. Use a logical order, such as the one that follows:

- Begin with a brief statement of the certification, maintenance, and airworthiness of the aircraft.

- Follow with a brief statement on the flight crew's certifications and qualifications.

- If appropriate, continue with a brief statement on the training, certification, and qualifications of other people involved, such as air traffic controllers.

- Conclude with a brief statement on other factors, such as weather, airframe, powerplants, system malfunction, or the physiological condition of the crew.

Dismiss factors that were not causal. Conclude by listing the factors that the investigation revealed as significant. These factors are the focus of the sections that follow.

Obviously, the order suggested above would not be logical for an accident in which maintenance was found to be a problem. In such a case, aircraft maintenance factor would be discussed last and lead into a discussion of maintenance under **2.2 The Accident**.

2.2 The Accident

In this section, the cause-and-effect relationship among the events leading up to the accident is analyzed by drawing conclusions based on the information in **FACTUAL INFORMATION**. Begin with a very brief overview of major findings of the investigation. Then explain why the accident happened.

This is the most important section of **ANALYSIS** and usually is the most difficult to write. Except for **2.1 General**, other sections of the report should be tailored to the issues discussed. Use appropriate headings. Some commonly used headings follow:

- The Accident or The Accident Scenario,
- Flight Crew Decisions and Actions,
- Survival Factors or Emergency Evacuation, and
- Emergency Response.

2.3 Other Sections

After explaining the accident, use the remainder of **ANALYSIS** to deal with the safety issues raised by the accident. Use whatever headings and subheadings are appropriate and necessary. Some frequently used headings follow:

- Flight Crew,
- Aircraft,
- Weather,
- Air Traffic Control,
- Human Performance,
- Operations,
- Survivability,
- FAA Surveillance,
- Maintenance,
- Airworthiness,
- Training, and
- Equipment Systems.

Arrange the sections in descending order of significance to the accident. Begin with the issues contributing to the cause of the accident, follow with the issues contributing to the severity of the accident, and end with the issues that were developed during the investigation but not related to cause.

In writing each section, follow this general formula:

- Briefly summarize the facts of the accident pertaining to the section's topic.

- Explain the safety issue to which the facts pertain.

- Provide other information that supports the Board's belief that the safety issue is a valid one. Include data from previous accidents and past safety recommendations, including responses and Board action. (Note that outstanding safety recommendations can be closed or superseded in **ANALYSIS**.)

- Analyze the issue, developing a logical argument for action.

- Conclude each section with a firm statement of the Safety Board's position on the issue.

- Recommend action, if appropriate.

Avoid using the passive voice and such indefinite and awkward language, as:

> "It is apparent that…."
> "It is clear that…."
> "It could be concluded that…."
> "It is the Safety Board's opinion that…." and
> "This has led us to the belief that…."

3. CONCLUSIONS

3.1 Findings

Findings are conclusions taken from **ANALYSIS**, not factual statements taken from **FACTUAL INFORMATION**. Findings are brief, to the point, and cover the causal factors and safety issues analyzed. Avoid using abbreviations in findings.

An easy way to develop this section is copy the conclusions from **ANALYSIS.** Make minor revisions for clarity, if necessary.

3.2 Probable Cause

This paragraph briefly summarizes the conclusions reached in **ANALYSIS** that explain why the accident happened. The probable cause can be a series of events or a listing of separate causal factors. Either way, the probable cause describes the conditions that made the accident inevitable.

The probable cause may also describe factors that contributed to the:

- cause of the accident,
- severity of the accident, and
- survivability of the accident.

4. RECOMMENDATIONS

To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action rather than a series of actions, even if the resulting series leads to one result or covers one subject. In addition, do not write “throwaway” recommendations, which are recommendations that ask an organization to do what it is already doing or is required to do.

Writing Tips

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (A-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as “ensure that.”

- Use consistent language.

Previous and Reiterated Recommendations

Recommendations made during the investigation or as the result of a past investigation (related or reiterated recommendations) should be discussed in **ANALYSIS**. When discussing such a recommendation, restate the recommendation, describe the recipient’s reply, describe the Safety Board’s response to the reply, and give the recommendation’s status. Format and presentation are determined on a case-by-case basis. An editor can help.

Order of Recommendations and Approval Information

The normal order for recipients of safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or governor,
- companies and organizations.

Any reiterated recommendations are listed after the new ones are listed.

Approval information comes immediately after the recommendations, followed by any dissenting or concurring statements. (For more information on dissenting or concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

5. APPENDIXES

APPENDIX A
INVESTIGATION

Investigation

Provide the following information:

- date and time the Safety Board was notified of the accident,
- time the investigators arrived on scene,
- organization of the investigation, and
- parties to the investigation.

Hearing/Deposition

This section contains information about any public hearing or depositions related to the investigation. If none occurred, say so.

OTHER APPENDIXES

Other appendixes can include, but are not limited to, the following:

- air traffic control transcript,
- cockpit voice recorder transcript,
- letters and memorandums, and
- checklists.

PUBLISHED FORMAT

Front and Back Covers

The front cover contains the following information:

- The National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order number).

- Report number (provided by MD-5). Format the number as follows: NTSB/AAR-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the AAR series for that year).

- Report title. (For required elements, see ***Report Title*** under ***Format and Content*** at the beginning of this chapter.)

See ***example A*** for a front cover. The back cover is blank except for the Safety Board's mailing frank.

Abstract (Inside Front Cover)

The editor writes the abstract for the final report from information in **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. The abstract appears on the inside front cover. (See ***example B***.)

Mission Statement (Inside Front Cover)

The Safety Board mission statement and publication information appear on the inside front cover. (See ***example B***.)

Title Page

The title from the cover is repeated on the title page. In addition, include the adoption date and the notation number. (See ***example C***.)

Table of Contents and Executive Summary

The table of contents and **Executive Summary** are discussed in the first section of this chapter. (See ***examples D*** and ***E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

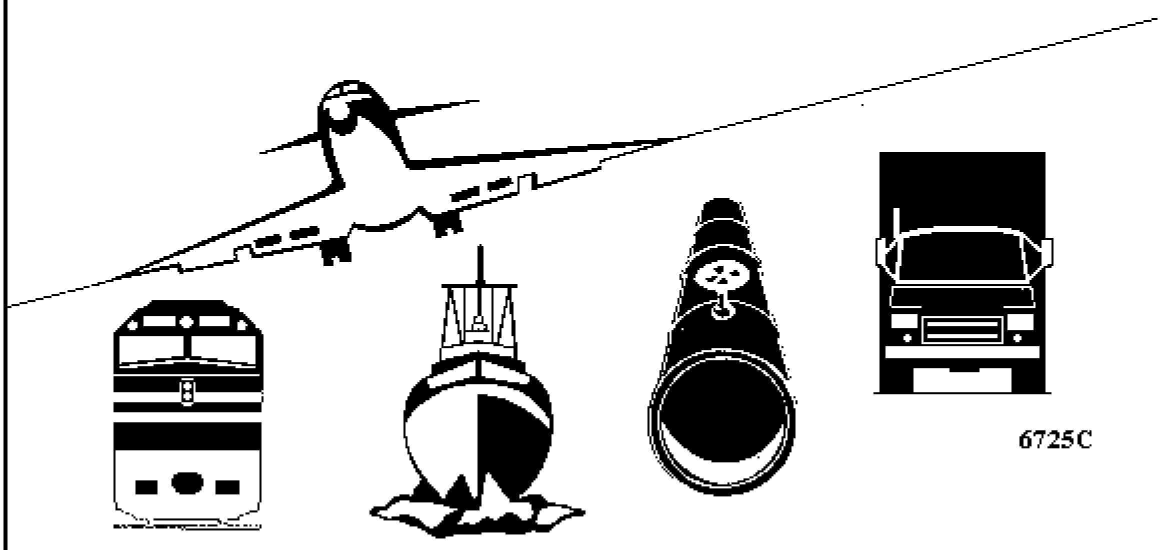
PB98-910401
NTSB/AAR-98/01
DCA96MA068

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

UNCONTAINED ENGINE FAILURE
DELTA AIR LINES FLIGHT 1288
MCDONNELL DOUGLAS, MD-88, N927DA
PENSACOLA, FLORIDA
JULY 6, 1996



6725C

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. *Uncontained Engine Failure, Delta Air Lines Flight 1288, McDonnell Douglas, MD-88, N97DA, Pensacola, Florida, July 6, 1996.* Aircraft Accident Report NTSB/AAR-98/01. Washington, D.C.: NTSB, 1998.

Abstract: This report explains the accident involving Delta Air Lines flight 1288, an MD-88, which experienced uncontained engine failure during the initial part of its takeoff roll at Pensacola Regional Airport in Pensacola, Florida, on July 6, 1996.

Safety issues in the report include the limitations of the blue etch anodize process, manufacturing defects, standards for the fluorescent penetrant inspection process, the performance of nondestructive testing, the use of alarm systems for emergency situations, and instructions regarding emergency exits. Safety recommendations concerning these issues were made to the Federal Aviation Administration.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

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National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Aircraft Accident Report

Uncontained Engine Failure
Delta Air Lines Flight 1288
McDonnell Douglas MD-88, N927DA
Pensacola, Florida
July 6, 1996

NTSB/AAR-98/01
PB98-910401
Notation 6725C
Adopted January 13, 1998

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

Executive Summary

On July 6, 1996, at 1424 central daylight time, a McDonnell Douglas MD-88, N927DA, operated by Delta Air Lines, Inc., as flight 1288, experienced an engine failure during the initial part of its takeoff roll on runway 17 at Pensacola Regional Airport in Pensacola, Florida. Uncontained engine debris from the front compressor front hub (fan hub) of the No. 1 (left) engine penetrated the left aft fuselage. Two passengers were killed and two others were seriously injured. The takeoff was rejected, and the airplane was stopped on the runway. The airplane, which was being operated by Delta as a scheduled domestic passenger flight under the provisions of 14 *Code of Federal Regulations* Part 121, with 137 passengers and 5 crew on board, was destined for Hartsfield Atlanta International Airport in Atlanta, Georgia.

The National Transportation Safety Board determines that the probable cause of this accident was the fracture of the left engine's front compressor fan hub, which resulted from the failure of Delta Air Lines' fluorescent penetrant inspection process to detect a detectable fatigue crack initiating from an area of altered microstructure that was created during the drilling process by Volvo for Pratt & Whitney and that went undetected at the time of manufacture. Contributing to the accident was the lack of sufficient redundancy in the in-service inspection program.

Safety issues discussed in this report include the limitations of the blue etch anodize process, manufacturing defects, standards for the fluorescent penetrant inspection process, the performance of nondestructive testing, the use of alarm systems for emergency situations, and instructions regarding emergency exits. Recommendations concerning these issues were made to the Federal Aviation Administration.

CHAPTER 3

HIGHWAY
ACCIDENT REPORT

CONTENTS

3.1 FORMAT AND CONTENT

3.1.1 Draft Report Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label "draft."

Include a table of contents. Figures should be numbered consecutively, tables should be numbered consecutively, and charts should be numbered consecutively. The appendixes should be lettered consecutively.

3.1.2 Published Report Elements

For the format of the elements that only the published report has, such as the front and back covers, the abstract and the mission statement on the inside front cover, and the title page, see ***paragraph 3.9***, followed by ***examples A*** through ***E*** of the front cover, the inside front cover, the title page, the table of contents, and the executive summary.

3.1.3 Table of Contents

In most cases, the editor develops the table of contents for the notation and final versions of the report. Report writers should include a table of contents with earlier versions. (For a table of contents, see ***example D.***)

3.1.4 Report Title

The title includes the following elements:

- type of accident,
- type of vehicle,
- location of accident, and
- date of accident.

Use consistent language for citing accident locations in different parts of the report, such as the cover, title page, **Executive Summary**, and **Accident Narrative**. Follow modal office criteria for citing accident locations in report titles. On the cover and on the title page, do not use "in" before the accident location or "on" before the accident date. Do not use such imprecise designations as "near" unless unavoidable. (See ***examples A*** and ***C***.)

3.1.5 Executive Summary

Include the following information in **Executive Summary** (see ***example E***):

- brief description of the accident, eliminating unnecessary details;
- probable cause of the accident;
- list of safety issues discussed; and
- list of recommendation recipients.

3.1.6 Body of Report

Provide only the information that is appropriate and necessary to support the Safety Board's conclusions, recommendations, and probable cause. Eliminate unnecessary details that detract from the safety message that you are communicating.

Paragraph 3.2 describes the sections that belong under **FACTUAL INFORMATION**. Subheadings may be used as necessary. Note that sections are not numbered as they are in aviation reports. For example:

Tests and Research

Visibility

Surface Friction

Paragraph 3.3 describes the sections that belong under **ANALYSIS**. In **ANALYSIS**, do not analyze facts about the accident unless the facts have already been mentioned in **FACTUAL INFORMATION**. Do not introduce new factual information.

All facts in the report must be supported by documentation in the Board's public docket. The only exceptions are documents readily accessible to the public, such as the *Code of Federal Regulations* (CFR) and past Safety Board reports.

In **ANALYSIS**, a conclusion is normally preceded by the words "the Safety Board concludes," and a safety recommendation is preceded by the words "the Safety Board believes." Remember:

- Every safety recommendation must have a corresponding conclusion.
- Every conclusion must be supported by analysis.
- All analysis must be supported by fact.

3.2 FACTUAL INFORMATION

3.2.1 Accident Narrative

Write a brief narrative giving the following information, as appropriate, in a logical order:

- carrier name;
- type of vehicle;
- cargo information;
- point of origin;
- destination;
- last point of departure;
- departure time;
- number of passengers;
- trip preparation;
- pretrip inspections;
- description of trip;
- description of driver's activities;
- significant events en route;
- significant operations-related conversations en route;
- inspections en route;
- events leading up to accident, including a reconstruction of the significant portion of the accident sequence;
- location and time of accident;
- activities of driver after accident;
- witness accounts of accident; and
- brief summary of survival, fire, and wreckage clearing after the accident.

This section is often the most difficult section to write. Here are some tips:

- Eliminate unnecessary details.

- Choose a logical starting point from which to begin the description of the events leading up to the accident.

- Describe the events in chronological order. If some events occurred simultaneously, explain one event thoroughly, and then backtrack to the other event, using such transitions as "meanwhile" and "while."

- When more than one vehicle is involved, discuss each vehicle separately, if appropriate.

- Remember that you have 12 other sections in which to be more specific.

3.2.2 Injuries

The survival factors investigator provides the report writer with an injury table in the following format:

Injury Type	Drivers	Passengers	Others	Total
Fatal	2	3	0	5
Serious	1	0	0	1
Minor	0	0	1	1
None	0	0	0	0
Total	3	3	1	7
49 *Code of Federal Regulations* (CFR) 830.2 defines *fatal injury* as "any injury which results in death within 30 days of the accident" and *serious injury* as "an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface."				

The column headings may vary if more than two vehicles were involved or if bystanders were injured.

Include the following explanatory paragraph with the table:

> The table above is based on the injury criteria (49 CFR 830.2) of the International Civil Aviation Organization (ICAO), which the Safety Board uses in accident reports for all transportation modes. See appendix B for an injury table based on the Abbreviated Injury Scale (AIS) of the American Association for Automotive Medicine.

Follow the 49 CFR 830.2 definition of fatality and injury.

Injuries contains the table and explanatory paragraph only. Details of injuries are discussed in **Medical and Pathological Information**.

3.2.3 Damage

Briefly describe the accident damage (destroyed, minor damage, or no damage) sustained by the vehicle and other objects, such as the roadway. Discuss details of the damage in **Vehicle and Wreckage Information**. Give the estimated dollar value of the vehicle damage, and state who made the estimate. Include a tabulated listing of all other documented dollar damages.

3.2.4 Personnel Information (or Driver Information)

This section is usually limited to the driver but may contain information on any person, such as a loading supervisor or bridge inspector, whose duties or actions directly affected the accident. When more than one person is involved in an accident, discuss each person under a separate subheading. Information covered in this section can include:

- job title;
- date of birth;
- certification;
- experience;
- training, including a discussion of Federal, State, and local requirements, carrier requirements, classroom instruction, on-the-job training, and examinations;

- duty time;
- pertinent preaccident activities;
- medical factors;
- human factors; and
- record of previous traffic violations.

Give only the details necessary for the reader to understand a person's qualifications. Unless someone's performance will be analyzed in depth because of his or her role in the accident, save your time and the reader's time by eliminating the nonessential details.

3.2.5 Vehicle and Wreckage Information

This section contains the following:

- a brief description of the vehicle, emphasizing information related to the accident or needed to explain the damage. (Any other information about the vehicle belongs in an appendix.)

- a brief description of pretrip inspections of the vehicle, including any indication of deficiencies that were known before and during the trip and had a bearing on the accident. After the vehicle information, describe the postaccident condition of the vehicle and other structures damaged by the accident, using appropriate subheadings.

3.2.6 Highway Information

Briefly describe the accident location, roadway conditions, signing, and road scars and marks attributed to the accident.

3.2.7 Operational Information

Briefly describe the operations of the carrier that owned the vehicle. If the vehicle was a school bus, briefly describe school district policies and procedures for school bus operations.

3.2.8 Management Information

Briefly describe relevant organizational and management information, such as the company's structure and quality control oversight. Also describe Federal or State oversight policies, procedures, and actions.

3.2.9 Meteorological Information

Briefly describe the weather at the time of the accident. If weather was a factor in the accident, include more details, such as the forecast, the actual conditions, and the driver's access to meteorological information.

3.2.10 Medical and Pathological Information

Briefly describe the results of toxicological tests and postaccident medical examinations or autopsies of the driver and, if relevant, of other people. (Medical information related to required physical examinations should be included under **Personnel Information**.)

Include a general description of the types of injuries and causes of death that the accident inflicted on passengers or other people.

Do not discuss survival aspects in this section. (See ***paragraph 3.2.11***.)

3.2.11 Survival Aspects

Briefly describe, if applicable:

- emergency response;
- search, evacuation, and rescue;
- location of driver and passengers in relation to injuries sustained;
- vehicle design factors that contributed to or prevented occupant survival;
- failure of such structures as seats and seatbelt attachments;
- problems with emergency exits; and
- resistance of seat materials and other materials to fire.

If the accident was not survivable, say so.

(Note the differences between **Medical and Pathological Information** and **Survival Aspects**.)

3.2.12 Tests and Research

This section briefly explains tests and research done by the Safety Board or another organization to determine facts about the accident. Discuss each test or research topic under a separate subheading (for instance, "metallurgical examination"). If no tests and research were conducted, write "Not applicable."

This section relates the results and evaluations of the tests and research. Consequently, this is the only section under **FACTUAL INFORMATION** that has analytical language. Do not confuse the analysis of test results, which establishes facts, with the analysis of the accident.

3.2.13 Other Information

This section contains relevant information not already included in previous sections. Use a separate subheading for each topic discussed. This section often contains two or more subheadings.

The following examples from past reports show topics that have appeared in this section:

- human performance (general information and research);

- excerpts from *Federal Motor Carrier Safety Regulations*;
- Highway Safety Program Standards;
- State laws;
- accident statistics;
- excerpts from carrier rule books;
- rulemaking activities;
- research (meaning general research on specific topics, not research pertaining solely to this accident, which would be in **Tests and Research**);
- Federal and State oversight programs; and
- actions taken since the accident.

3.3 ANALYSIS

Every issue discussed in **ANALYSIS** should result in a conclusion about the accident that supports the Safety Board's statement of probable cause. These conclusions result in recommendations about what the Board believes should be done to correct, prevent, or mitigate the identified deficiency.

3.3.1 Exclusions

This section usually eliminates factors that were not causal to the accident. Discuss the safety issues that are addressed by the report in subsequent sections. Use a logical order, such as the one that follows:

- Begin with a brief statement on the condition of the vehicle for the trip.

- Follow with a brief statement on the driver's condition and qualifications for operating the vehicle.

- If appropriate, continue with a brief statement on the training, certification, and qualifications of other people involved, such as mechanics.

- Conclude with a brief statement on other factors, such as weather, vehicle maintenance, highway factors, signal malfunction, or the driver's physiological condition.

Dismiss factors that were not causal. Close by listing the factors the investigation revealed as significant. These factors are the focus of the sections that follow.

Obviously, the order suggested above would not be logical for an accident in which vehicle maintenance was found to be a problem. In such a case, vehicle maintenance would be discussed last and lead into a discussion of maintenance under **Accident Discussion**.

3.3.2 Accident Discussion

In this section, the cause-and-effect relationship among the events leading up to the accident is analyzed by drawing conclusions based on the information in **FACTUAL INFORMATION**. Begin with a very brief overview of the major findings of the investigation; then explain why the accident happened.

This is the most important section of **ANALYSIS** and usually is the most difficult to write.

3.3.3 Other Sections

After explaining the accident, discuss the safety issues raised by the accident. Use appropriate headings. Some frequently used headings follow:

- Training,
- Vehicle Factors,
- Weather,
- Driver Performance and Qualifications,
- Human Performance,
- Operational Factors,
- Survivability,
- Crashworthiness, and
- Emergency Response.

Arrange the sections in descending order of significance to the accident. Begin with issues contributing to the cause of the accident, follow with issues contributing to the severity of the accident, and end with issues that were developed during the investigation but are not related to the cause.

In writing each section, follow this general formula:

- Briefly summarize the facts of the accident that pertain to the section's topic.

- Explain the safety issue to which the facts pertain.

- Provide other information that supports the Board's belief that the safety issue is a valid one. Include data from previous accidents and past safety recommendations, including responses and Board action.

(Note that outstanding safety recommendations can be closed or superseded here.)

- Analyze the issue, developing a logical argument for action.

- Conclude each section with a firm statement of the Safety Board’s position on the issue.

- Recommend action, if appropriate. (A recommendation is the culmination of the discussion in **ANALYSIS** of a safety issue. Each recommendation must have a corresponding conclusion.)

Avoid using the passive voice and such indefinite and awkward language as:

“It is apparent that….”
“It is clear that….”
“It could be concluded that….”
“It is the Safety Board’s opinion that….” and
“This has led us to the belief that….”

3.4 CONCLUSIONS

3.4.1 Findings

Findings are conclusions taken from **ANALYSIS**, not factual statements taken from **FACTUAL INFORMATION**. Findings are brief, to the point, and cover the causal factors and safety issues analyzed. Avoid using abbreviations in the findings.

An easy way to develop this section is to copy the conclusions from **ANALYSIS**. Make minor revisions for clarity, if necessary.

3.4.2 Probable Cause

This paragraph summarizes why the accident happened. The probable cause can be a series of events or a listing of separate causal factors. Either way, the probable cause describes the conditions that made the accident inevitable.

The probable cause may also describe factors that contributed to the:

- cause of the accident,
- severity of the accident, and
- survivability of the accident.

3.5 RECOMMENDATIONS

To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action, rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. Do not write “throwaway” recommendations that ask an organization to do what it is already doing or is required to do.

3.5.1 Writing Tips

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (H-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as “ensure that.”

- Use consistent language.

3.5.2 Previous and Reiterated Recommendations

Recommendations made during the investigation or as the result of a past investigation (related or reiterated recommendations) should be discussed in **ANALYSIS**. When discussing such a recommendation, restate the recommendation, describe the recipient’s reply, describe the Safety Board’s response to the reply, and give the recommendation’s status. Format and presentation are determined on a case-by-case basis. An editor can help.

3.5.3 Order of Recommendations and Approval Information

The normal order for recipients of safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or governor,
- companies and organizations.

Any reiterated recommendations are listed after the new ones are listed.

Approval information comes immediately after the recommendations, followed by any dissenting or concurring statements. (For more on dissenting and concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

3.6 APPENDIX A—INVESTIGATION

3.6.1 Investigation

Provide the following information:

- date and time Safety Board was notified of the accident,
- time investigators arrived on scene,
- organization of the investigation, and
- parties to the investigation.

3.6.2 Hearing/Deposition

This section contains information about any public hearings or depositions related to the investigation. If none occurred, so state.

3.7 APPENDIX B—INJURY INFORMATION

This section contains the injury table based on the Abbreviated Injury Scale (AIS) of the American Association for Automotive Medicine version. It is not the same as the injury table in **FACTUAL INFORMATION**. (See ***paragraph 3.2.2***.) The AIS table shown below, which is also provided by the survival factors investigator, appears only in highway products.

Injuries	**Drivers(s)**	**Passenger(s)**	**Other**	**Total**
AIS-0 None	0	4	0	4
AIS-1 Minor	1	14	0	15
AIS-2 Moderate	0	4	0	4
AIS-3 Serious	0	3	0	3
AIS-4 Severe	0	5	1	6
AIS-5 Critical	0	7	0	7
AIS-6 Unsurvivable	0	0	0	0
TOTAL	1	37	1	39

3.8 OTHER APPENDIXES

Other appendixes can include, but are not limited to, the following:

- summary of driver's activities before the accident;
- copies of letters, memorandums, or forms;
- responses to notices of proposed rulemaking;
- test results;
- research results; and
- excerpts from regulations.

3.9 PUBLISHED FORMAT

3.9.1 Front and Back Covers

The front cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order number).

- Report number (provided by MD-5). Format the number as follows: NTSB/HAR-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the HAR series for that year).

- Report title. (For required elements, see ***paragraph 3.1.4***.)

See ***example A*** for a front cover. The back cover is blank, except for the Safety Board's mailing frank.

3.9.2 Abstract (Inside Front Cover)

The editor writes the abstract from information in **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. The abstract appears on the inside front cover. (See ***example B***.)

3.9.3 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover. (See ***example B***.)

3.9.4 Title Page

The title is repeated on the title page. In addition, include the adoption date and the notation number. (See ***example C***.)

3.9.5 Table of Contents and Executive Summary

The table of contents and **Executive Summary** are discussed in ***paragraphs 3.1.3*** and ***3.15***. (Also, see ***examples D*** and ***E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

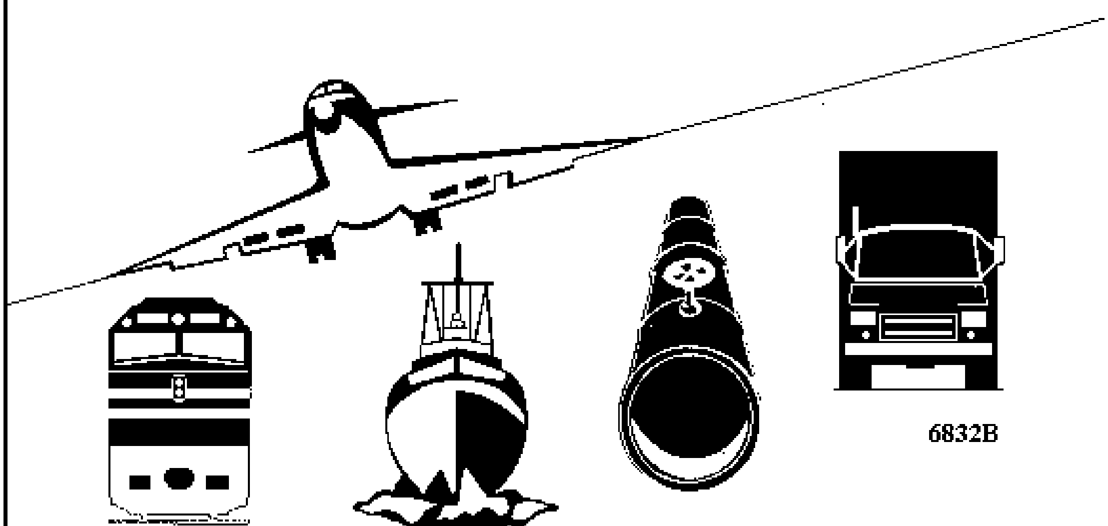
PB 98-916202
NTSB/HAR- 98/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

HIGHWAY ACCIDENT REPORT

MULTIPLE VEHICLE CROSSOVER
CROSSOVER ACCIDENT
SLINGER, WISCONSIN
FEBRUARY 12, 1997



6832B

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. ***Multiple Vehicle Crossover Accident, Slinger, Wisconsin, February, 12, 1997.*** **Highway Accident Report NTSB/HAR-98/01. Washington, D.C.: NTSB, 1998.**

Abstract: About 5:52 a.m. on February 12, 1997, a doubles truck that was traveling northbound on U.S. Route 41 near Slinger, Wisconsin, lost control and crossed over the median into the southbound lanes. A Flatbed truck traveling southbound on U.S. Route 41 collided with the doubles truck, lost control, and crossed over the median into the northbound lanes. A northbound passenger van struck and underrode the right front side of the flatbed truck. A refrigerator truck struck the right rear side of the flatbed truck. Eight persons suffered fatal injuries.

The safety issues discussed in this report are: judgement and experience of the doubles truckdriver; stability of doubles truck; effectiveness of snow and ice removal; adequacy of the American Association of State Highway and Transportation Officials divided freeway median barrier warrants; adequacy of the States' accident report forms to capture cross-median accident data; and availability and use of restraints.

As a result of its investigation, the National Transportation Safety Board issued safety recommendations to the Federal Highway Administration, the National Highway Traffic Safety Administration, the National Association of Governors' Highway Safety Representatives, the American Trucking Association, the Motor Freight Carrier Association, the International Brotherhood Teamsters, the American Association of State Highway Transportation Officials, the Wisconsin Department of Transportation, the Independent Truckers and Drivers Association, the National Private Truck Council, and the Owner-Operator Independent Drivers Association, Inc. The Safety Board reiterated one recommendation to the State of Wisconsin.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at <http://www.ntsb.gov/>. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB98-916202** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Highway Accident Report

Multiple Vehicle Crossover Accident
Slinger, Wisconsin
February 12, 1997

NTSB/HAR-98/01
PB98-916202
Notation 6832B
July 24, 1998

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

vii **Highway Accident Report**

Executive Summary

About 5:52 a.m. on February 12, 1997, a doubles truck with empty trailers, operated by Consolidated Freightways, Inc., that was traveling northbound on U.S. Route 41, a four-lane divided limited access highway near Slinger, Wisconsin, lost control and crossed over the 50-foot depressed median into the southbound lanes. A flatbed truck loaded with lumber, operated by McFaul Transport, Inc., that was traveling southbound on U.S. Route 41 collided with the doubles truck, lost control, and crossed over the median into the northbound lanes. A northbound passenger van with nine adult occupants struck and underrode the right front side of the flatbed truck at the landing gear. A refrigerator truck loaded with produce, operated by Glandt/Dahlke, Inc., that was also traveling northbound, struck the right rear side of the flatbed truck. Although it had snowed from about 8 p.m. to 3 a.m. the night before, it was clear at the time of the accident. Other motorists and the emergency responders to the accident scene reported icy patches in the roadway. Eight of the nine van occupants suffered fatal injuries, and the remaining occupant suffered serious injuries. Two of the three commercial truckdrivers were treated for minor injuries and released; the third refused treatment.

The National Transportation Safety Board determines that the probable cause of the accident was the doubles truckdriver's lack of judgement in driving too fast for the configuration of his truck under the hazardous highway weather conditions. Contributing to the severity of the injuries and the reduced potentiality for survival was the lack of restraint use by the unrestrained occupants of the passenger van.

- Judgement and experience of the doubles truckdriver;
- Stability of doubles trucks;
- Effectiveness of snow and ice removal.
- Adequacy of the American Association of State Highway and Transportation Officials divided freeway median barrier accounts.
- Adequacy of the State's accident report forms to capture cross-median accident data.
- Availability and use of restraints.

As a result of this accident investigation, the Safety Board makes recommendations to the Federal Highway Administration, the National Highway Administration, the National Highway Traffic Safety Administration, the National Association of Governors' Highway Safety Representatives, the American Trucking Association, the International Brotherhood of Teamsters, the American Association of State Highway and Transportation Officials, the Wisconsin Department of Transportation, the Independent Truckers and Drivers Association, the National Private Truck Council, and the Owner-Operators Independent Drivers Association, Inc. Also, the Safety Board reiterates on recommendation to the State of Wisconsin.

CHAPTER 4

MARINE
ACCIDENT REPORT

CONTENTS

4.1 FORMAT AND CONTENT

4.1.1 Draft Report Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header showing the date of the report version and the label “draft.”

Include a table of contents. Figures should be numbered consecutively, tables should be numbered consecutively, and charts should be numbered consecutively. The appendixes should be lettered consecutively.

4.1.2 Published Report Elements

For the format of the elements that only the published report has, such as the front and back covers, the abstract and the mission statement on the inside front cover, and the title page, see ***paragraph 4.8***, followed by ***examples A*** through ***E*** of the front cover, the inside front cover, the title page, the table of contents, and the executive summary

4.1.3 Table of Contents

In most cases, the editor develops the table of contents for the notation and final versions of the report. Report writers should include a table of contents with earlier report versions. (For a table of contents, see ***example D***.)

4.1.4 Report Title

The title includes the following elements:

- type of accident,
- country of vessel’s registration,
- type of vessel,
- name of vessel,
- location of accident, and

- date of accident.

Use consistent language for citing accident locations in different parts of the report, such as the cover, title page, **Executive Summary**, and **Accident Narrative**. Follow modal office criteria for citing accident locations in report titles. On the cover and title page, do not use “in” before the accident location or “on” before the accident date. Do not use such imprecise designations as “near” unless unavoidable. (See ***examples A*** and ***C***.)

4.1.5 Executive Summary

Include the following information in **Executive Summary** (see ***example E***):

- brief description of the accident, eliminating unnecessary details;
- probable cause of the accident;
- list of safety issues discussed; and
- list of recommendation recipients.

4.1.6 Body of the Report

Provide only the information that is appropriate and necessary to support the Safety Board’s conclusions, recommendations, and probable cause. Eliminate unnecessary details that detract from the safety message that you are communicating.

Paragraph 4.2. describes the sections that belong under **FACTUAL INFORMATION**. Subheadings may be used as necessary. Note that sections are not numbered as they are in aviation reports. For example:

Tests and Research

Stability

Maneuvering

Paragraph 4.3 describe the sections that belong under **ANALYSIS**. In **ANALYSIS**, do not analyze factual information about the accident unless the information has already been mentioned in **FACTUAL INFORMATION**. Do not introduce new factual information in **ANALYSIS**.

All facts in the report must be supported by documentation in the Board's public docket. The only exceptions are documents readily accessible to the public, such as the *Code of Federal Regulations* (CFR) and past Safety Board reports.

In **ANALYSIS**, a conclusion is normally preceded by the words "the Safety Board concludes," and a safety recommendation is preceded by the words "the Safety Board believes." Remember:

- Every safety recommendation must have a corresponding conclusion.
- Every conclusion must be supported by analysis.
- All analysis must be supported by fact.

4.2 FACTUAL INFORMATION

4.2.1 Accident Narrative

Write a brief narrative giving the following information, as appropriate, in a logical order:

- owner or operator;
- vessel name;
- flag state;
- type of operation;
- cargo information;
- point of origin;
- destination;
- last point of departure;
- departure time;
- number of crewmembers;
- crew positions and duties;
- number of passengers;
- trip preparation;
- pretrip inspections;
- description of trip;
- description of crew activities;
- significant events en route;
- significant operations-related conversations en route;
- inspections en route;
- events leading up to the accident, including a reconstruction of the significant portion of the accident sequence;
- location and time of accident;
- activities of the crew after accident;
- witness accounts of accident; and
- brief summary of survival, fire, and towing or salvage operations after accident.

This section is often the most difficult section to write. Here are some tips:

- Eliminate unnecessary details.

- Choose a logical starting point from which to begin the description of the events leading up to the accident.

- Describe the events in chronological order. If some events occurred simultaneously, explain one event thoroughly and then backtrack to the other event, using such transitions as “meanwhile” and “while.”

- When more than one vessel is involved, discuss each vessel separately if more appropriate.

- Remember that you have 13 other sections in which to be more specific.

4.2.2 Injuries

The survival factors investigator provides the report writer with an injury table in the following format:

Injury Type	Crew	Passengers	Others	Total
Fatal	2	3	0	5
Serious	1	0	0	1
Minor	0	0	1	1
None	0	0	0	0
Total	3	3	1	7
49 *Code of Federal Regulations* (CFR) 830.2 defines *fatal injury* as “any injury which results in death within 30 days of the accident” and *serious injury* as “an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface.”				

The column headings may vary if more than two vessels were involved or bystanders were injured.

Follow the 49 CFR 830.2 definition of fatality and injury.

Injuries contains only the table. Details of injuries are discussed in **Medical and Pathological Information**.

4.2.3 Damage

Briefly describe the accident damage (destroyed, substantial damage, minor damage, or no damage) sustained by the vessel and such other objects as the docks. Discuss details of the damage in **Wreckage**. Give the estimated dollar value of the vessel, and state who made the estimate. Include a tabulated listing of all documented dollar damages.

4.2.4 Personnel Information (or Crew Information)

This section is usually limited to the operator of the vessel (but may contain information on any person, such as a pilot, whose duties or actions directly affected the accident. When more than one person is involved in an accident, discuss each person under a separate subheading. Information covered in this section can include:

- job title;
- date of birth;
- certification;
- experience;
- training, including Federal and State requirements, operator and owner requirements, classroom instruction, on-the-job training, and examinations;
- duty time;
- pertinent preaccident activities;
- medical factors;
- human factors; and
- record of any previous accidents.

Give only the details necessary for the reader to understand a person's qualifications. Unless someone's performance will be analyzed in depth because of his or her role in the accident, save your time and the reader's time by eliminating the nonessential details.

4.2.5 Vessel Information

This section contains the following:

- a brief description of the vessel, emphasizing information related to the accident or needed to explain the damage. (Any other information concerning the vessel belongs in an appendix.)

- a brief description of pretrip inspections of the vessel; the statement should explain the vessel's seaworthiness, maintenance, and any indication of deficiencies that were known before and during the trip and had a bearing on the accident.

- a brief description of other structures the reader needs to know about in order to understanding the accident.

- a brief statement on the performance of the vessel en route.

4.2.6 Wreckage

Describe the postaccident condition of the vessel or other structures damaged in the accident. If a fire occurred, tell how it happened, and note the firefighting equipment used and its effectiveness.

4.2.7 Waterway Information

Briefly describe the accident location, waterway conditions, and navigational aids.

4.2.8 Operational Information

Briefly describe the vessel operating procedures. Describe the operations of the company that owned the vessel, if appropriate.

4.2.9 Management Information

Briefly describe the company's policy for managing its operations.

4.2.10 Meteorological Information

Briefly describe the weather at the time of the accident. If weather was a factor in the accident, include more details, such as the forecast, the actual conditions, and the operator's access to meteorological information.

4.2.11 Medical and Pathological Information

Briefly describe the results of toxicological tests and postaccident medical examinations or autopsies of the pertinent crewmembers and, if relevant, of other people, such as pilots. (Medical information related to required physical examinations should be included under **Personnel Information**.)

Include a general description of the types of injuries and causes of death that the accident inflicted on passengers or other people.

Do not discuss survival aspects in this section. (See ***paragraph 4.2.12***.)

4.2.12 Survival Aspects

Briefly describe, if applicable:

- emergency response;
- search, evacuation, and rescue;
- location of crewmembers and passengers in relation to injuries sustained;
- vessel design factors that contributed to or prevented occupant survival;
- failure of equipment, such as lifeboats and personal flotation devices;
- problems with emergency exits; and
- resistance of construction materials and other materials to fire.

If the accident was not survivable, say so.

(Note the differences between **Medical and Pathological Information** and **Survival Aspects**.)

4.2.13 Tests and Research

This section briefly explains tests and research done by the Safety Board or another organization to determine facts regarding the accident. Discuss each test or research topic under a separate subheading (for instance, "metallurgical examination"). If no tests and research were conducted, write "not applicable."

This section relates the results and evaluations of the tests and research. Consequently, this is the only section under **FACTUAL INFORMATION** that has analytical language. Do not confuse the analysis of test results, which establishes facts, with the analysis of the accident in **ANALYSIS**.

4.2.14 Other Information

This section contains relevant information not already included in previous sections. Use a separate subheading for each topic discussed. The following examples from past reports show topics that have appeared in this section:

- human performance (general information and research),
- inland navigation rules,
- radar use by small passenger vessels,
- Coast Guard oversight,
- operator licensing,
- vessel turning characteristics (general information and research),
- Coast Guard maneuvering regulations,
- Coast Guard towing policy,
- fishing vessel safety program,
- Navigation and Vessel Inspection Circulars,
- vessel safety manual,
- Commercial Fishing Industry Vessel Safety Act of 1988,
- safety and survival training programs,
- vessel traffic service,
- tank vessel safety standards, and
- actions taken since the accident.

4.3 ANALYSIS

Every issue discussed in **ANALYSIS** should result in a conclusion about the accident that supports the Safety Board's statement of probable cause. These conclusions result in recommendations about what the Board believes should be done to correct, prevent, or mitigate the identified deficiency.

4.3.1 Exclusions

This section usually eliminates factors that were not causal to the accident. Discuss the safety issues that are addressed by the report in subsequent sections. Use a logical order, such as the one that follows:

- Begin with a brief statement on the condition of the vessel for the trip.
- Follow with a brief statement on the crew's condition and qualifications for operating the vessel.
- If appropriate, continue with a brief statement on the training, certification, and qualifications of other people involved.
- Conclude with a brief statement on other factors, such as weather, vessel maintenance, waterway conditions, or the physiological problems of the crewmembers.

Dismiss factors that were not causal. Close by listing the factors the investigation revealed as significant. These factors are the focus of the sections that follow.

Obviously, the order suggested above would not be logical for an accident in which vessel maintenance was a problem. In such a case, vessel maintenance would be discussed last and lead into a discussion of maintenance under **Accident Discussion**.

4.3.2 Accident Discussion

In this section, the cause-and-effect relationship among the events leading up to the accident is analyzed by drawing conclusions based on the information in **FACTUAL INFORMATION**. Begin with a very brief overview of the major findings of the investigation; then explain why the accident happened.

This is the most important section of **ANALYSIS** and usually is the most difficult to write.

4.3.3 Other Sections

After explaining the accident, discuss the safety issues raised by the accident. Use appropriate headings. Some frequently used headings follow:

- Training,
- Vessel Factors,
- Weather,
- Crew Performance and Qualifications,
- Pilot Performance and Qualifications,
- Human Performance,
- Operational Factors,
- Survivability,
- Vessel Stability, and
- Search and Rescue.

Arrange the sections in descending order of significance to the accident. Begin with issues contributing to the cause of the accident, follow with issues contributing to the severity of the accident, and end with issues that were developed during the investigation but are not related to the cause.

In writing each section, follow this general formula:

- Briefly summarize the facts of the accident that pertain to the section's topic.

- Explain the safety issue to which the facts pertain.

- Provide other information that supports the Board's belief that the safety issue is a valid one. Include data from previous accidents and past recommendations, including responses and Board action. (Note that outstanding safety recommendations can be closed or superseded here.)

- Analyze the issue, developing a logical argument for action.

- Conclude each section with a firm statement of the Safety Board's position on the issue.

- Recommend action, if appropriate.

Avoid the passive voice and such indefinite and awkward language as:

> "It is apparent that…."
> "It is clear that…."
> "It could be concluded that…."
> "It is the Safety Board's opinion that…."
> "This has led us to the belief that…."

4.4 CONCLUSIONS

4.4.1 Findings

Findings are conclusions taken from **ANALYSIS**, not factual statements taken from **FACTUAL INFORMATION**. Findings are brief, to the point, and cover the causal factors and safety issues analyzed. Avoid using abbreviations in findings.

An easy way to develop this section is to copy the conclusions from **ANALYSIS**. Make minor revisions for clarity, if necessary.

4.4.2 Probable Cause

This paragraph summarizes why the accident happened. The probable cause can be a series of events or a listing of separate causal factors. Either way, the probable cause describes the conditions that made the accident inevitable.

The probable cause may also describe factors that contributed to the:

- cause of the accident,
- severity of the accident, and
- survivability of the accident.

4.5 RECOMMENDATIONS

To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. Do not write “throwaway” recommendations, which are recommendations that require an organization to do what it is already doing or is required to do.

4.5.1 Writing Tips

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (M-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as “ensure that.”

- Use consistent language.

4.5.2 Previous and Reiterated Recommendations

Recommendations made during the investigation or as the result of a past investigation (related or reiterated recommendations) should be discussed in **ANALYSIS**. When discussing such a recommendation, restate the recommendation, describe the recipient’s reply, describe the Safety Board’s response to the reply, and give the recommendation’s status. Format and presentation are determined on a case-by-case basis. An editor can help.

4.5.3 Order of Recommendations and Approval Information

The normal order for recipients of safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or governor,
- companies and organizations.

Any reiterated recommendations are listed after the new ones are listed.

Approval information comes immediately after the recommendations, followed by any dissenting or concurring statements. (For more on dissenting and concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

4.6 APPENDIX A—INVESTIGATION

4.6.1 Investigation

Provide the following information:

- date and time Safety Board was notified of the accident,
- time investigators arrived on scene,
- organization of the investigation, and
- parties to the investigation.

4.6.2 Hearing/Deposition

This section contains information about any public hearings or depositions related to the investigation. If none occurred, say so.

4.7 OTHER APPENDIXES

Other appendixes can include, but are not limited to, the following:

- chronology of Coast Guard search;
- weather forecasts;
- laws, rules, and regulations;
- emergency plans;
- ferry schedule; and
- certificate of inspection.

4.8 PUBLISHED FORMAT

4.8.1 Front and Back Covers

The front cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order number).

- Report number (provided by MD-5). Format the number as follows: NTSB/MAR-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the MAR series for that year).

- Title. (For required elements, see ***paragraph 4.1.4***.)

See ***example A*** for a front cover. The back cover is blank except for the Safety Board's mailing frank.

4.8.2 Abstract (Inside Front Cover)

The editor writes the abstract from information in **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. The abstract appears on the inside front cover. (See ***example B***.)

4.8.3 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover. (See ***example B***.)

4.8.4 Title Page

The title is repeated on the title page. In addition, include the adoption date and the notation number. (See ***example C***.)

4.8.5 Table of Contents and Executive Summary

The table of contents and **Executive Summary** are discussed in ***paragraphs 4.1.3*** and ***4.1.5***. (See ***examples D*** and ***E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

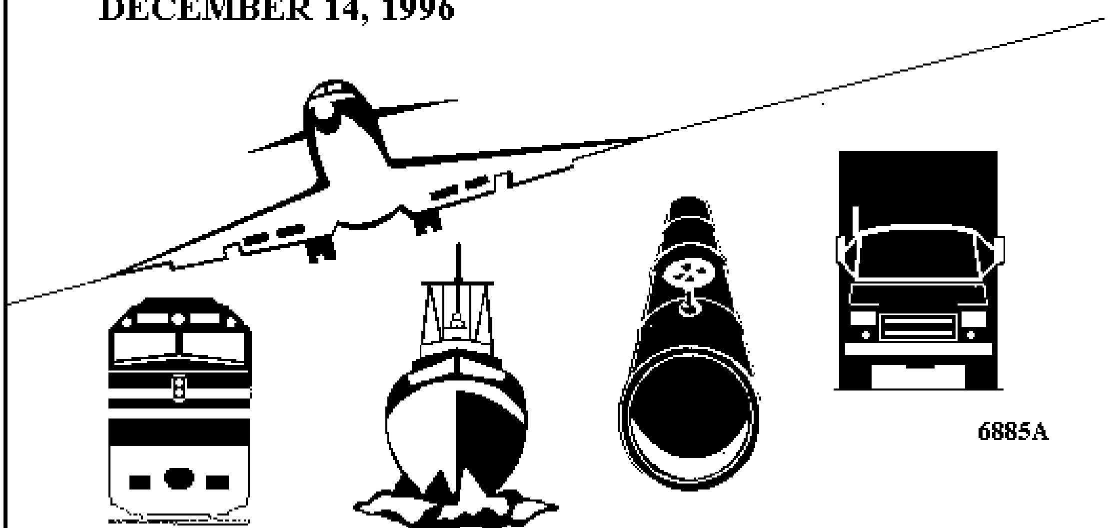
PB98-916401
NTSB/MAR-98/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

MARINE ACCIDENT REPORT

ALLISON OF THE LIBERIAN FREIGHTER
BRIGHT FIELD WITH THE POYDRAS STREET
WHARF, RIVERWALK MARKETPLACE, AND
NEW ORLEANS HILTON HOTEL
NEW ORLEANS, LOUISIANA
DECEMBER 14, 1996



6885A

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. ***Allision of the Liberian Freighter Bright Field With the Poydras Street Wharf, Riverwalk Marketplace, and New Orleans Hilton Hotel, New Orleans, Louisiana, December 14, 1996.*** **Marine Accident Report NTSB/MAR-98/01. Washington, D.C.: NTSB, 1998.**

Abstract: On December 14, 1996, the fully loaded Liberian bulk carrier *Bright Field* temporarily lost propulsion power as the vessel was navigating outbound in the Lower Mississippi River at New Orleans, Louisiana. The vessel struck a wharf adjacent to a populated commercial area that included a shopping mall, a condominium parking garage, and a hotel. No fatalities resulted from the accident, and no one aboard the *Bright Field* was injured; however, 4 serious injuries and 58 minor injuries were sustained during evacuations of shore facilities, a gaming vessel, and an excursion vessel near the impact area. Total property damages to the *Bright Field* and to shoreside facilities were estimated at $20 million.

The safety issues discussed in this report are adequacy of the ship's main engine and automation systems, the adequacy of emergency preparedness and evacuation plans of vessels moored in the Poydras Street Wharf area, and the adequacy of port risk assessment for activities within the Port of New Orleans. This report also addresses three other issues: the actions of the pilot and crew during the emergency, the lack of effective communication (as it relates to the actions of the pilot and crew aboard the *Bright Field* on the day of the accident), and the delay in administering toxicological tests to the vessel crew.

As a result of its investigation, the National Transportation Safety Board issued recommendations to the U.S. Coast Guard, the U.S. Army Corps of Engineers, the State of Louisiana, the Board of Commissioners of the Port of New Orleans, International RiverCenter, Clearsky Shipping Company, New Orleans Paddlewheels, Inc., the New Orleans Baton Rouge Steamship Pilots Association, the Crescent River Port Pilots Association, and Associated Federal Pilots and Docking Masters of Louisiana, Inc.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at http://www.ntsb.gov/. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB98-916401** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Marine Accident Report

Allison of the Liberian Freighter *Bright Field* With the Poydras Street Wharf, Riverwalk Marketplace, and New Orleans Hilton Hotel New Orleans, Louisiana December 14, 1996

NTSB/MAR-98/01
PB98-916401
Notation 6885A
January 13, 1998

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

Executive Summary

Shortly after 1400 on December 14, 1996, the fully loaded Liberian bulk carrier *Bright Field* temporarily lost propulsion power as the vessel was navigating outbound in the Lower Mississippi River at New Orleans, Louisiana. The vessel struck a wharf adjacent to a populated commercial area that included a shopping mall, a condominium parking garage, and a hotel. No fatalities resulted from the accident, and no one aboard the *Bright Field* was injured; however, 4 serious injuries and 58 minor injuries were sustained during evacuations of shore facilities, a gaming vessel, and an excursion vessel near the impact area. Total property damages to the *Bright Field* and to shoreside facilities were estimated at $20 million.

The National Transportation Safety Board determines that the probable cause of this accident was the failure of Clearsky Shipping Company to adequately manage and oversee the maintenance of the engineering plant aboard the *Bright Field*, with the result that the vessel temporarily lost power while navigating a high-risk area of the Mississippi River. Contributing to the amount of property damage and the number and types of injuries sustained during the accident was the failure of the U.S. Coast Guard, the Board of Commissioners of the Port of New Orleans, and International RiverCenter to adequately assess, manage, or mitigate the risks associated with locating unprotected commercial enterprises in areas vulnerable to vessel strikes.

The major safety issues identified in this investigation are the adequacy of the ship's main engine and automation systems, the adequacy of emergency preparedness and evacuation plans of vessels moored in the Poydras Street Wharf area, and the adequacy of port risk assessment for activities within the Port of New Orleans. This report also addresses three other issues: the actions of the pilot and crew during the emergency, the lack of effective communication (as it relates to the actions of the pilot and crew aboard the *Bright Field* on the day of the accident), and the delay in administering toxicological tests to the vessel crew.

As a result of its investigation of this accident, the Safety Board issued safety recommendations to the U.S. Coast Guard, the U.S. Army Corps of Engineers, the State of Louisiana, the Board of Commissioners of the Port of New Orleans, International RiverCenter, Clearsky Shipping Company, New Orleans Paddlewheels, Inc., the New Orleans Baton Rouge Steamship Pilots Association, the Crescent River Port Pilots Association, and Associated Federal Pilots and Docking Masters of Louisiana, Inc.

CHAPTER 5

PIPELINE
ACCIDENT REPORT

CONTENTS

5.1 FORMAT AND CONTENT

5.1.1 Draft Report Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label "draft."

Include a table of contents. Figures should be numbered consecutively, tables should be numbered consecutively, and charts should be numbered consecutively. The appendixes should be lettered consecutively.

5.1.2 Published Report Elements

For the format of the elements that only the published report has, such as the front and back covers, the abstract and the mission statement on the inside front cover, and the title page, see ***paragraph 5.8***, followed by ***examples A*** through ***E*** of the front cover, the inside front cover, the title page, the table of contents, and the executive summary.

5.1.3 Table of Contents

In most cases, the editor develops the table of contents for the notation and final versions of the report. Report writers should include a table of contents with earlier report versions. (For a table of contents, see ***example D***.)

5.1.4 Report Title

The title includes the following elements:

- name of the pipeline operator,
- type of pipeline,
- type of accident,
- location of accident, and
- date of accident.

Use consistent language for citing accident locations in different parts of the report, such as the cover, title page, **Executive Summary**, and **Accident Narrative**. Follow modal office criteria for citing accident locations in report titles. On the cover and on the title page, do not use “in” before the accident location or “on” before the accident date. Do not use imprecise designations, such as “near,” in the title unless unavoidable. (See ***examples A*** and ***C***.)

5.1.5 Executive Summary

Include the following information in **Executive Summary** (see ***example E*****)**:

- brief description of the accident, eliminating unnecessary details;
- probable cause of the accident;
- list of safety issues discussed; and
- list of recommendation recipients.

5.1.6 Body of the Report

Provide only the information that is appropriate and necessary to support the Safety Board’s conclusions, recommendations, and probable cause. Eliminate unnecessary details that detract from the safety message that you are communicating.

Paragraph 5.2 describes the sections that belong under **FACTUAL INFORMATION**. Subheadings may be used as necessary. Note that sections are not numbered as they are in aviation reports. For example:

Tests and Research

Metallurgical Analysis

Relief Valve

Paragraph 5.3 describes the sections that belong under **ANALYSIS**. In **ANALYSIS**, do not analyze factual information about the accident unless that information has already been mentioned in **FACTUAL INFORMATION**. Do not introduce new factual information.

All facts in the report must be supported by documentation in the Board's public docket. The only exceptions are documents readily accessible to the public, such as the *Code of Federal Regulations* (CFR) and past Safety Board reports.

In **ANALYSIS**, a conclusion is normally preceded by the words "the Safety Board concludes," and a safety recommendation is preceded by the words "the Safety Board believes." Remember:

- Every safety recommendation must have a corresponding conclusion.
- Every conclusion must be supported by analysis.
- All analysis must be supported by facts.

5.2 FACTUAL INFORMATION

5.2.1 Accident Narrative

Write a brief narrative giving the following information, as appropriate, in a logical order:

- pipeline company/operator, type, description, location, and operating pressure;

- if the accident involved the operation of the pipeline by pipeline company/operator employees:
  - employee positions and duties,
  - employee activities before the accident,
  - significant events before the accident,
  - significant operations-related conversations before the accident,
  - description of the accident, and
  - employee actions after the accident;

- if the accident involved work on the pipeline by pipeline company/operator employees:
  - crew positions and duties,
  - work preparation,
  - prework inspections,
  - description of the work,
  - crew activities,
  - significant events during the work,
  - significant operations-related conversations during the work,
  - inspections during the work,
  - equipment used at the site, and
  - description of the accident;

- if the accident involved work (such as construction) near the pipeline done by people other than pipeline company/operator employees:
  - crew positions and duties,
  - work preparation,
  - prework inspections,
  - description of the work,
  - crew activities,
  - significant events during the work,
  - significant operations-related conversations during the work,
  - inspections during the work,
  - equipment used at the site, and
  - description of the accident;

- if the accident involved a problem with the pipeline not caused by pipeline company/operator employees or others:
  - employee positions and duties,
  - status of the pipeline before the problem,
  - how the problem became known to the employees,
  - employee actions when the problem occurred, and
  - description of the accident;

- location and time of the accident;

- reports made to the gas company/operator on gas odors, including caller and time;

- meteorological conditions at the time of the accident;

- description of on-scene crew and bystander activities after the accident;

- description of company's emergency response to the accident;

- description of public emergency response to the accident; and

- description of fire.

This section is often the most difficult to write, especially about accidents in which many events occurred simultaneously and at different locations. Here are some tips:

- Eliminate unnecessary details.

- Choose a logical starting point from which to begin describing the events leading up to the accident.

- Describe the events in chronological order. If some events occurred simultaneously, explain one event thoroughly, and then backtrack to the other event, using such transitions as "meanwhile" and "while."

Remember that you have 12 other sections in which to be more specific.

5.2.2 Injuries

The survival factors investigator provides the report writer with an injury table in the following format:

Injury Type	Employees	Occupants	Others	Total
Fatal	2	3	0	5
Serious	1	0	0	1
Minor	0	0	1	1
None	0	0	0	0
Total	3	3	1	7

49 *Code of Federal Regulations* (CFR) 830.2 defines *fatal injury* as "any injury which results in death within 30 days of the accident" and *serious injury* as "an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface."

The column headings may vary depending on the circumstances of the accident and the classification of the people who were injured.

Follow the 49 CFR 830.2 definition of fatality and injury.

Injuries contains only the table. Details of injuries are discussed in **Medical and Pathological Information**.

5.2.3 Damage

Briefly describe the accident damage (destroyed, substantial damage, minor damage, or no damage) sustained by the pipeline and other objects. Discuss details of the damage in **Wreckage**. Give the estimated dollar value of the pipeline, and state who made the estimate. Include a tabulated listing of all other documented dollar damages.

5.2.4 Personnel Information

This section contains information on any person whose duties or actions directly affected the accident. When more than one person is involved in an accident, discuss each person under a separate subheading. Information covered in this section may include:

- job title,
- date of birth,
- experience,
- training,
- duty time,
- pertinent preaccident activities,
- medical factors, and
- human factors.

Give only the details necessary for the reader to understand a person's qualifications. Unless someone's performance will be analyzed in depth, because of his or her role in the accident, save your time and the reader's time by eliminating the nonessential details.

Discuss training in this section, including:

- Federal, State, and local requirements,
- company/operator requirements,
- contractor requirements,

- classroom instruction,
- on-the-job training, and
- examinations.

5.2.5 Pipeline Information

This section may contain the following:

- detailed information on the pipeline's diameter, length, wall thickness, material, coating, manufacturer, manufacturing process, date of installation, installed depth, location, operating pressure, and testing;

- a brief statement on preaccident inspections, including any indication of deficiencies that were known before the accident or during the work and had a bearing on the accident;

- valve information and location;

- markers; and

- description of other structures as necessary to the reader's understanding the accident.

5.2.6 Wreckage

Briefly describe the postaccident condition of the pipeline or other structures damaged in the accident. If a fire occurred, tell how it happened, and note the firefighting equipment used and its effectiveness.

5.2.7 Pipeline Operations

This section may contain the following:

- pipeline company/operator’s name, products, service area, number of customers, supervision, and management;
- pipeline length, route, capacity, markers, and maps;
- border, district regulator, monitoring, and pump stations;
- customer service and dispatching offices;
- pressure recording charts; and
- maintenance, inspection, and surveillance of main lines, service lines, and valves.

5.2.8 Management Information

Briefly describe relevant organizational and management information, such as the company’s structure or internal quality control oversight. Also describe Federal or State oversight policies, procedures, and actions.

5.2.9 Meteorological Information

Briefly describe the weather at the time of the accident. If weather was a factor in the accident, include more details, such as the forecast, the actual conditions, and the availability of meteorological information to the people involved.

5.2.10 Medical and Pathological Information

Briefly describe the results of toxicological and postaccident medical examinations or autopsies of pertinent pipeline company/operator employees or of other personnel, such as dispatchers or construction workers, if relevant. (Medical information related to required physical examinations should be included under **Personnel Information**.)

Include a general description of the types of injuries and causes of death that the accident inflicted on bystanders, building occupants, or other people involved in the accident.

Do not discuss survival aspects in this section (see ***paragraph 5.2.11***).

5.2.11 Survival Aspects

Briefly describe, if applicable:

- emergency response;
- search, evacuation, and rescue;
- location of employees, workers, building occupants, and bystanders in relation to injuries sustained;
- failure of structures;
- problems with emergency exits; and
- resistance of pipeline workers' clothing to fire.

If the accident was not survivable, say so.

(Note the differences between **Medical and Pathological Information** and **Survival Aspects**.)

5.2.12 Tests and Research

This section briefly explains tests and research done by the Safety Board or another organization to determine facts about the accident. Discuss each test or research topic under a separate subheading (for instance, "metallurgical examination”). If no tests or research were conducted, write “not applicable.”

This section relates the results and evaluations of tests and research. Consequently, this is the only section under **FACTUAL INFORMATION** containing analytical language. Do not confuse the analysis of test results, which establishes facts, with the analysis of the accident.

5.2.13 Other Information

This section contains relevant information not already included in the previous sections. Use a separate subheading for each topic discussed. This section often contains two or more subheadings.

The following examples show topics that have appeared in this section:

- customer education about gas hazards;
- emergency personnel training in gas hazards;
- one-call system (excavation notification);
- public service commission information;
- drilling operations;
- similar accidents;
- survey information;
- construction information;
- Federal, State, and local regulations;
- human performance (general information and research); and
- actions taken since the accident (urgent safety recommendations).

5.3 ANALYSIS

Every issue discussed in **ANALYSIS** should result in a conclusion about the accident that supports the Safety Board's statement of probable cause. The conclusions result in recommendations of what the Board believes should be done to correct, prevent, or mitigate the identified deficiency.

5.3.1 Exclusions

This section usually eliminates factors that were not causal to the accident. Discuss the safety issues to be addressed by the report in subsequent sections. Use a logical order, such as the one that follows:

- Begin with a brief statement on the condition of the pipeline.

- Follow with a brief statement on the condition and qualifications of the people operating or working on the pipeline or in the area.

- Conclude with a brief statement on other factors, such as construction activities, employee actions, equipment failure, weather, or the physiological condition of an employee or a crewmember.

Dismiss factors that were not causal. Close by listing the factors the investigation revealed as significant. These factors are the focus of the sections that follow.

Obviously, the order suggested above would not be logical for an accident in which the condition of the pipeline was found to be a problem. In such a case, that factor would be discussed last and lead into a discussion of maintenance under **Accident Discussion**.

5.3.2 Accident Discussion

This section analyzes the cause-and-effect relationship among the events leading up to the accident by drawing conclusions based on the information in **FACTUAL INFORMATION**. Begin with a very brief overview of major findings of the investigation; then, explain why the accident happened.

This is the most important section of **ANALYSIS** and usually is the most difficult to write.

5.3.3 Other Sections

After explaining the accident, use the remainder of **ANALYSIS** to deal with the various safety issues raised by the accident. Use whatever headings and subheadings are appropriate and necessary. Some frequently used headings follow:

- Maintenance,
- Corrosion,
- Cracking,
- Inspection,
- Surveillance,
- Operations,
- Excavation Damage Prevention,
- Training,
- Human Performance,
- Survivability,
- Company/Operator Emergency Response,
- Public Emergency Response,
- Communications,
- Maps, and
- Public Education of Pipeline Hazards.

Arrange the sections in descending order of significance to the accident. Begin with issues contributing to the cause of the accident, follow with issues contributing to the severity of the accident, and end with issues that were developed during the investigation but are not related to the cause.

In writing each section, follow this general formula:

- Briefly summarize the facts of the accident that pertain to the section's topic.

- Explain the safety issue to which the facts pertain.

- Provide other information that supports the Board’s belief that the safety issue is a valid one. Include data from previous accidents and past safety recommendations, including responses and Board action. (Note that outstanding safety recommendations can be closed or superseded here.)

- Analyze the issue, developing a logical argument for action.

- Conclude each section with a firm statement of the Safety Board’s position on the issue.

- Recommend action, if appropriate. (A recommendation is the culmination of the discussion in **ANALYSIS** of a safety issue. Each recommendation must have a corresponding conclusion.)

Avoid the passive voice and such indefinite and awkward language as:

> “It is apparent that….”
> “It is clear that….”
> “It could be concluded that….”
> “It is the Safety Board’s opinion that….” and
> “This has led us to the belief that….”

5.4 CONCLUSIONS

5.4.1 Findings

Findings are conclusions taken from **ANALYSIS**, not factual statements taken from **FACTUAL INFORMATION**. Findings are brief, to the point, and cover the causal factors and safety issues analyzed. Avoid using abbreviations in findings.

An easy way to develop this section is to copy the conclusions from **ANALYSIS**. Make minor revisions for clarity, if necessary.

5.4.2 Probable Cause

This paragraph summarizes why the accident happened. The probable cause can be a series of events or a listing of separate causal factors. Either way, the probable cause describes the conditions that made the accident inevitable.

The probable cause may also describe factors that contributed to the:

- cause of the accident,
- severity of the accident, and
- survivability of the accident.

5.5 RECOMMENDATIONS

To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action, rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. In addition, do not write "throwaway" recommendations, which ask an organization to do what it is already doing or is required to do.

5.5.1 Writing Tips

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more about safety recommendations.)

- Follow each recommendation with (P-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as "ensure that."

- Use consistent language.

5.5.2 Previous and Reiterated Recommendations

Recommendations made during the investigation or as the result of a past investigation (related or reiterated recommendations) should be discussed in **ANALYSIS**. When discussing such a recommendation, restate the recommendation, describe the recipient's reply, describe the Safety Board's response to the reply, and give the recommendation's status. Format and presentation are determined on a case-by-case basis. An editor can help.

5.5.3 Order of Recommendations and Approval Information

The normal order for recipients of safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or governor,
- companies and organizations.

Any reiterated recommendations are listed after the new ones are listed.

Approval information comes immediately after the recommendations, followed by dissenting or concurring statements, if necessary. (For more information on dissenting or concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL
Chairman

ROBERT T. FRANCIS II
Vice Chairman

JOHN A. HAMMERSCHMIDT
Member

JOHN J. GOGLIA
Member

GEORGE W. BLACK, JR.
Member

Adopted: [insert date]

5.6 APPENDIX A—INVESTIGATION

5.6.1 Investigation

Provide the following information:

- date and time Safety Board was notified of the accident,
- time investigators arrived on scene,
- organization of the investigation, and
- parties to the investigation.

5.6.2 Hearing/Deposition

This section contains information about any public hearings or depositions related to the investigation. If none occurred, say so.

5.7 OTHER APPENDIXES

Other appendixes can include, but are not limited to, the following:

- pressure recording charts;
- test results;
- inspection information;
- public education material;
- reports, letters, or memos;
- procedures; and
- regulations.

5.8 PUBLISHED FORMAT

5.8.1 Front and Back Covers

The cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order sequence number).

- Report number (provided by MD-5). Format the number as follows: NTSB/PAR-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the PAR series for that year).

- Report title. (For required elements, see ***paragraph 5.1.4***.)

See ***example A*** for a front cover. The back cover is blank except for the Safety Board mailing frank.

5.8.2 Abstract (Inside Front Cover)

The editor writes the abstract for the final report from information in **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. The abstract appears on the inside front cover of the report. (See ***example B***.)

5.8.3 Mission Statement (Inside Front Cover)

The Safety Board mission statement and publication information appears on the inside front cover. (See ***example B***.)

5.8.4 Title Page

The title is repeated on the title page. In addition, include the adoption date and the notation number. (See ***example C***.)

5.8.5 Table of Contents and Executive Summary

The table of contents and **Executive Summary** are discussed in ***paragraphs 5.1.3*** and ***5.1.5***. (For published format, see ***examples D*** and ***E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

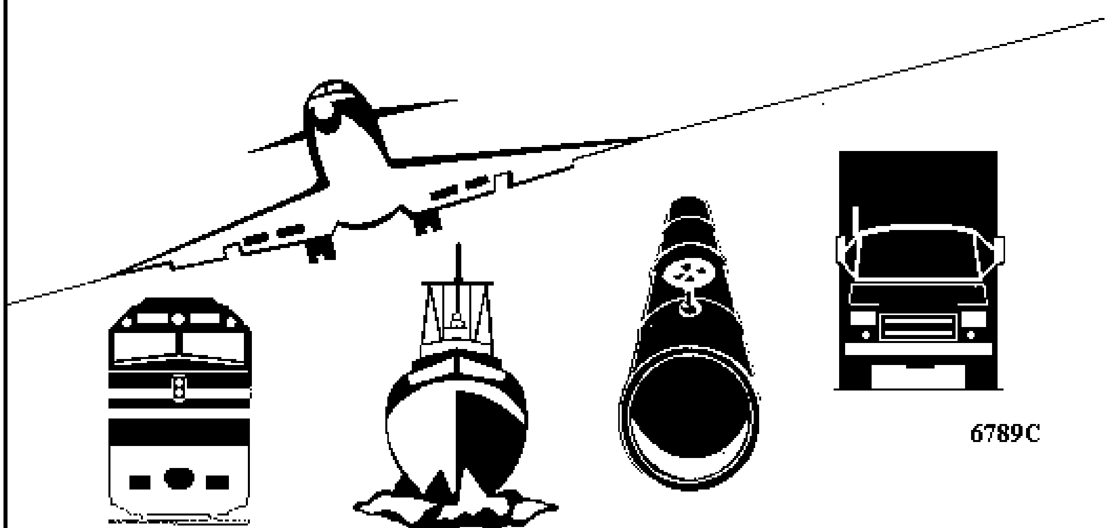
PB97-916501
NTSB/PAR-97/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

PIPELINE ACCIDENT REPORT

SAN JUAN GAS COMPANY, INC./ENRON CORP.
PROPANE GAS EXPLOSION
SAN JUAN, PUERTO RICO
NOVEMBER 21, 1996



B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. ***San Juan Gas Company, Inc./Enron Corp. Propane Gas Explosion, San Juan, Puerto Rico, November 21, 1996.*** **Pipeline Accident Report NTSB/PAR-97/01. Washington, D.C.: NTSB, 1997.**

Abstract: About 8:30 a.m. on November 21, 1996, because of a propane gas leak, a commercial building in San Juan, Puerto Rico, exploded. Thirty-three people were killed; at least 69 were injured.

The safety issues discussed in this report are the adequacy of employee training, the need for an excavation-damage prevention program, the adequacy of maps and records of buried facilities, the adequacy of public education on what to do when the odor of gas is detected, and the adequacy of the oversight of the San Juan Gas Company, Inc. by the Enron Corp., the Puerto Rico Public Service Commission, and the Office of Pipeline Safety.

As a result of its investigation, the National Transportation Safety Board issued recommendations to the Secretary of the U.S. Department of Transportation, the Research and Special Services Administration, the Puerto Rico Public Service Commission, Enron Corp., and Health Consultants, Inc.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at http://www.ntsb.gov/. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB97-916501** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Pipeline Accident Report

San Juan Gas Company, Inc./Enron Corp.
Propane Gas Explosion
San Juan, Puerto Rico
November 21, 1996

NTSB/PAR-97/01
PB97-916501
Notation 6789C
December 23, 1997

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

iii **Pipeline Accident Report**

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

Executive Summary

About 8:30 a.m. on November 21, 1996, because of a propane gas leak, a commercial building in San Juan, Puerto Rico, exploded. Thirty-three people were killed, and at least 69 were injured.

The building was in Rio Piedras, a shopping district in San Juan. The structure was a six-story mixture of offices and stores owned by Humberto Vidal, Inc. The company's administrative offices occupied the third, fourth, fifth, and sixth floors, and the first and second floors housed a jewelry store, a record store, and a shoe store.

The National Transportation Safety Board determines that the probable cause of the propane gas explosion, fueled by an excavation-caused gas leak, in the basement of the Humberto Vidal, Inc., office building was the failure of San Juan Gas Company, Inc., (1) to oversee its employees' actions to ensure timely identification and correction of unsafe conditions and strict adherence to operating practices and (2) to provide adequate training to employees. Also contributing to the explosion was (1) the failure of the Research and Special Programs Administrative/Office of Pipeline Safety to oversee effectively the pipeline safety program in Puerto Rico, (2) the failure of the Puerto Rico Public Service Commission to require San Juan Gas Company, Inc., to correct identified safety deficiencies, and (3) the failure of Enron Corp. to oversee adequately the operation of San Juan Gas Company, Inc.

Contributing to the loss of life was the failure of San Juan Gas Company, Inc., to inform adequately citizens and businesses of the dangers of propane gas and the safety steps to take when a gas leak is suspected or detected.

In its investigation of this accident, the Safety Board addressed the following safety issues:

- Adequacy of employee training.

- Need for an excavation-damage prevention program.

- Adequacy of public education on what to do when the odor of gas is detected.

- Adequacy of the oversight of the San Juan Gas Company, Inc., from Enron Corp., the Puerto Rico Public Service Commission, and the Office of Pipeline Safety.

As a result of its investigation, the Safety Board issues one safety recommendation to the Secretary of the U.S. Department of Transportation, three to the Research and Special Programs Administration, two to the Puerto Rico Public Service Commission, two to Enron Corp., and one to Health Consultants, Inc.

CHAPTER 6

RAILROAD
ACCIDENT REPORT

CONTENTS

6.1 FORMAT AND CONTENT

6.1.1 Draft Report Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label “draft.”

Include a table of contents. Figures should be numbered consecutively, tables should be numbered consecutively, and charts should be numbered consecutively. The appendixes should be lettered consecutively.

6.1.2 Published Report Elements

For the format of the elements that only the published report has, such as the front and back covers, the abstract and the mission statement on the inside front cover, and the title page, see ***paragraph 6.8***, followed by ***examples A*** through ***E*** of the front cover, the inside front cover, the title page, the table of contents, and the executive summary.

6.1.3 Table of Contents

In most cases, the editor develops the table of contents for the notation and final versions of the report. Report writers should include a table of contents with earlier report versions. (For an example of a table of contents, see ***example D***.)

6.1.4 Report Title

The report title includes the following elements:

- type of accident;
- name of the railroad company, commuter agency, or transit operator;
- train designation;
- operating railroad (if an Amtrak train); and

- location of accident (avoid the use of “near”).

Use consistent language for citing accident locations in different parts of the report, such as the cover, title page, **Executive Summary**, and **Accident Narrative**. Follow modal office criteria for citing accident locations in report titles. On the cover and on the title page, do not use “in” before the accident location or “on” before the accident date. Do not use such imprecise designations as “near” unless unavoidable. (See ***examples A*** and ***C***.)

6.1.5 Executive Summary

Include the following information in **Executive Summary** (see ***example E***):

- brief description of the accident, eliminating unnecessary details;
- probable cause of the accident;
- list of safety issues discussed; and
- list of recommendation recipients.

6.1.6 Body of the Report

Provide only the information that is appropriate and necessary to support the Safety Board’s conclusions, recommendations, and probable cause. Eliminate unnecessary details that detract from the safety message that you are communicating.

Paragraph 6.2 describes the sections that belong under **FACTUAL INFORMATION**. Subheadings may be used as necessary. Note that sections are not numbered as in aviation reports. For example:

Tests and Research

Signal Equipment

Train Brakes

Paragraph 6.3 describes the sections that belong under **ANALYSIS**. In **ANALYSIS**, do not analyze factual information about the accident unless that information has already been mentioned in **FACTUAL INFORMATION**. Do not introduce new factual information.

All facts in the report must be supported by documentation in the Board's public docket. The only exceptions are documents readily accessible to the public, such as the *Code of Federal Regulations* (CFR) and past Safety Board reports.

In **ANALYSIS**, a conclusion is normally preceded by the words "the Safety Board concludes," and a safety recommendation is preceded by the words "the Safety Board believes." Remember:

- Every safety recommendation must have a corresponding conclusion.

- Every conclusion must be supported by analysis.

- All analysis must be supported by fact.

6.2 FACTUAL INFORMATION

6.2.1 Accident Narrative

Write a brief narrative giving the following information, as appropriate, in a logical order:

- train designation;
- type of operation;
- point of origin;
- destination;
- last point of departure;
- departure time;
- number of crewmembers;
- crew positions and duties;
- number of passengers;
- trip preparation;
- pretrip inspections;
- description of the trip;
- description of crew activities;
- significant events en route;
- significant operations-related conversations en route;
- inspections en route;
- events leading up to the accident, including reconstruction of the significant portion of the derailment or collision;
- location and time of the accident;
- description of crew activities following the accident;
- witness accounts of the accident; and
- brief summary of survival, fire, and wreckage clearing events following after the accident.

This section is often the most difficult section to write. Here are some tips:

- Eliminate unnecessary details.

- Choose a logical starting point from which to begin the description of the events leading up to the accident.

- Describe the events in chronological order. If some events occurred simultaneously, explain one event thoroughly and then backtrack to the other event, using transitions, such as “meanwhile” and “while.”

- When more than one train is involved, discuss each train separately.

Remember that you have 13 other sections in which to be more specific.

6.2.2. Injuries

The survival factors investigator provides the report writer with an injury table in the following format:

Injury Type	**Train Crew**	**Passengers**	**Others**	**Total**
Fatal	2	3	0	5
Serious	1	0	0	1
Minor	0	0	1	1
None	0	0	0	0
Total	3	3	1	7

49 *Code of Federal Regulations* (CFR) 830.2 defines *fatal injury* as “any injury which results in death within 30 days of the accident” and *serious injury* as “an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface.”

The column headings may vary depending on the circumstances of the accident and the people involved.

Follow the 49 CFR 830.2 definition of fatality and injury.

Injuries contains only the table. Details about injuries are discussed in **Medical and Pathological Information**.

6.2.3 Damage

Briefly describe the accident damage (destroyed, substantial damage, minor damage, or no damage) sustained by the train and other objects, such as the track, signal system, or grade crossing protection system. Discuss details of the damage in **Wreckage**. Give the estimated dollar value of the train, and state who made the estimate. Include a tabulated listing of all documented dollar damages.

6.2.4 Personnel Information (or Train Crew Information)

This section contains information on any person whose duties or actions directly affected the accident circumstances. When more than one person is involved in an accident, discuss each person under a separate heading. Information covered in this section can include:

- job title,
- date of birth,
- experience,
- training,
- duty time,
- pertinent preaccident activities,
- medical factors,
- human factors, and
- record of any previous disciplinary action.

Give only the basic details necessary for the reader to understand a person's qualifications. Unless someone's performance will be analyzed in depth because of his or her role in the accident, save your time and the reader's time by eliminating the nonessential details.

Discuss training in this section, including:

- Federal, State, and local requirements;
- railroad requirements;
- classroom instruction;
- on-the-job training; and

- examinations.

6.2.5 Train and Mechanical Information

This section contains the following:

- brief description of the locomotive and consist (other information concerning the train belongs in an appendix);

- brief statement on pretrip inspections of the locomotive and consist, including any indication of deficiencies that were known before and during the trip and had a bearing on the accident;

- brief statement on performance of the train en route; and

- brief description of other structures that the reader needs to know about to understand the accident.

6.2.6 Wreckage

Briefly describe the postaccident condition of the train or other structures damaged in the accident. If a fire occurred, tell how it happened, and note the firefighting equipment used and its effectiveness.

6.2.7 Track and Signal Information

Briefly describe the accident site, including the number of tracks, signals, communications, and structure crossover switches or other equipment in the area. Also discuss the inspections and maintenance of the track.

6.2.8 Operational Information

Briefly describe pertinent railroad operating procedures affecting train movement, including the areas in which the train operated, track signage, signals, train orders, timetables, and schedules.

6.2.9 Management Information

Briefly describe relevant organizational and management information, such as the company's structure, or internal oversight. Also describe Federal or State oversight policies, procedures, and actions.

6.2.10 Meteorological Information

Briefly describe the weather at the time of the accident. If weather was a factor in the accident, include more details, such as the forecast, the actual conditions, and the access that the train crew and dispatcher had to meteorological information.

6.2.11 Medical and Pathological Information

Briefly describe the results of toxicological tests and postaccident medical examinations or autopsies for the driver and train crew and for other people, if relevant. (Medical information related to required physical examinations should be included under **Personnel Information**.)

Describe, in general, the types of injuries or causes of death that the accident inflicted on passengers or other people.

Do not discuss survival aspects in this section. (See ***paragraph 6.2.12***.)

6.2.12 Survival Aspects

Briefly describe, if applicable:

- emergency response;
- search, evacuation, and rescue;
- location of crew and passengers in relation to injuries sustained;
- failure of such vehicle structures as seats and seatbelt attachments;
- failure of such structures as seats and windows;

- problems with emergency exits; and
- resistance of seat materials and other materials to fire;

If the accident was not survivable, say so.

(Note the differences between the **Medical and Pathological Information** and **Survival Aspects**.)

6.2.13 Tests and Research

This section briefly explains tests and research done by the Safety Board or another organization to determine facts about the accident. Discuss each test or research topic under a separate subheading (for instance, "metallurgical examination"). If no tests or research were conducted, state "not applicable."

This section relates the results and evaluations of the tests and research. Consequently, this is the only section under **FACTUAL INFORMATION** that has analytical language. Do not confuse the analysis of test results, which establishes facts, with the analysis of the accident.

6.2.14 Other Information

This section contains relevant information not already included in previous sections. Use a separate subheading for each topic discussed. This section often contains two or more subheadings.

The following examples from past reports show topics that have appeared in this section:

- event recorders,
- tank car fittings,
- shelf couplers,
- hours of service regulations,
- efficiency test results,
- end-of-train telemetry devices,
- alerter devices,
- hot box detector research,

- safety oversight authority,
- hazardous materials,
- training,
- communications, and
- actions taken since the accident.

6.3 ANALYSIS

Every issue discussed in **ANALYSIS** should result in a conclusion about the accident that supports the Safety Board's statement of probable cause. These conclusions subsequently result in recommendations about what the Board believes should be done to correct, prevent, or mitigate the identified safety issue or deficiency.

6.3.1 Exclusions

This section usually eliminates factors that were not causal to the accident. Discuss safety issues that are addressed by the report in subsequent sections. Use a logical order, such as the one that follows:

- Begin with a brief statement on the condition of the train for the trip.

- Continue with a brief statement on the train crewmembers' condition and qualifications.

- Conclude with a brief statement on other factors, such as track work, construction activities, employee actions, equipment failure, track failure, signal malfunction, weather, or the physiological condition of an employee or crewmember.

Dismiss factors that were not causal. Close by listing the factors the investigation revealed as significant, these factors are the focus of the sections that follow.

Obviously, the order suggested above would not be logical for an accident in which the condition of the train equipment was found to be a problem. In such a case, that factor would be discussed last and lead into a discussion of maintenance under **Accident Discussion**.

6.3.2 Accident Discussion

This section analyzes the cause-and-effect relationship among the events leading up to the accident by drawing conclusions based on the information in **FACTUAL INFORMATION**. Begin with a very brief overview of major findings of the investigation; then, explain why the accident happened.

This is the most important section of **ANALYSIS** and usually is the most difficult to write.

6.3.3 Other Sections

After explaining the accident, discuss the safety issues raised by the accident. Use appropriate headings. Some frequently used headings follow:

- Training,
- Train Equipment,
- Weather,
- Train Dispatching,
- Human Performance,
- Operational Factors,
- Survivability,
- Crashworthiness, and
- Emergency Response.

Arrange the sections in descending order of significance to the accident. Begin with issues contributing to the cause of the accident, follow with issues contributing to the severity of the accident, and end with issues that were developed during the investigation but are not related to cause.

In writing each section, follow this general formula:

- Briefly summarize the facts of the accident that pertain to the section's topic.

- Explain the safety issue to which the facts pertain.

- Provide other information that supports the Board's belief that the safety issue is a valid one. Include data from previous accidents and past safety recommendations, including responses and Board action. (Note that outstanding safety recommendations can be closed or superseded here.)

- Analyze the issue, developing a logical argument for action.

- Conclude each section with a firm statement of the Safety Board's position on the issue.

- Recommend action, if appropriate.

Avoid the use of passive voice and such indefinite and awkward language, as:

> "It is apparent that…."
> "It is clear that…."
> "It could be concluded that…."
> "It is the Safety Board's opinion that…."
> "This has led us to the belief that…."

6.4 CONCLUSIONS

6.4.1 Findings

Findings are conclusions taken from **ANALYSIS**, not factual statements taken from **FACTUAL INFORMATION**. Findings are brief, to the point, and cover the causal factors and safety issues analyzed. Avoid using abbreviations in the findings.

An easy way to develop this section is to copy the conclusions from **ANALYSIS**. Make minor revisions for clarity, if necessary.

6.4.2 Probable Cause

This paragraph summarizes the conclusions reached in the **ANALYSIS** that explain why the accident happened. The probable cause can be a series of events or a listing of separate causal factors. Either way, the probable cause describes the conditions that made the accident inevitable.

The probable cause may also describe factors that contributed to the:

- cause of the accident,
- severity of the accident, and
- survivability of the accident.

6.5 RECOMMENDATIONS

To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. In addition, do not write "throwaway" recommendations, which ask an organization to do what it is already doing or is required to do.

6.5.1 Writing Tips

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (R-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted and is ready for final typing.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as "ensure that."

- Use consistent language.

6.5.2 Previous and Reiterated Recommendations

Recommendations made during the investigation or as the result of a past investigation (related or reiterated recommendations) should be discussed in **ANALYSIS**. When discussing such a recommendation, restate the recommendation, describe the recipient's reply, describe the Safety Board's response to the reply, and give the recommendation's status. Format and presentation are determined on a case-by-case basis. An editor can help.

6.5.3 Order of Recommendations and Approval Information

The normal order for recipients of safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or governor,
- companies and organizations.

Any reiterated recommendations are listed after the new ones are listed.

Approval information comes immediately after the recommendations, followed by dissenting or concurring statements, if necessary. (For more information on dissenting or concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

6.6 APPENDIX A—INVESTIGATION

6.6.1 Investigation

Provide the following information:

- date and time Safety Board was notified of the accident,
- time investigators arrived on scene,
- organization of the investigation, and
- parties to the investigation.

6.6.2 Hearing/Deposition

This section contains information about any public hearings or depositions related to the investigation. If none occurred, say so.

6.7 OTHER APPENDIXES

Other appendixes can include, but are not limited to, the following:

- summary of crew's preaccident activities before the accident;
- copies of letters, memorandums, or forms;
- responses to notices of proposed rulemaking;
- test results;
- research results; and
- excerpts from regulations.

6.8 PUBLISHED FORMAT

6.8.1 Front and Back Covers

The front cover contains the following information:

- The National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year and the 000000 indicates the NTIS order sequence number).

- Report number (provided by MD-5). Format the number as follows: NTSB/RAR-**/00 (the ** indicates the last two digits of the calendar year and the 00 indicates the report's sequence in the RAR series for that year).

- Report title. (For required elements, see ***paragraph 6.1.4***.)

See ***example A*** for a front cover. The back cover of the final report is blank except for the Safety Board's mailing frank.

6.8.2 Abstract (Inside Front Cover)

The editor writes the abstract for the final report from information in **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. The abstract appears on the inside front cover. (See ***example B***.)

6.8.3 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover. (See ***example B***.)

6.8.4 Title Page

The title from is repeated on the title page. In addition, include the adoption date and the notation number. (See ***example C***.)

6.8.5 Table of Contents and Executive Summary

The table of contents and **Executive Summary** are discussed in ***paragraphs 6.1.3*** and ***6.1.5***. (Also, see ***examples D*** and ***E*** at the end of this chapter.)

A. EXAMPLE OF FRONT COVER

(not actual size)

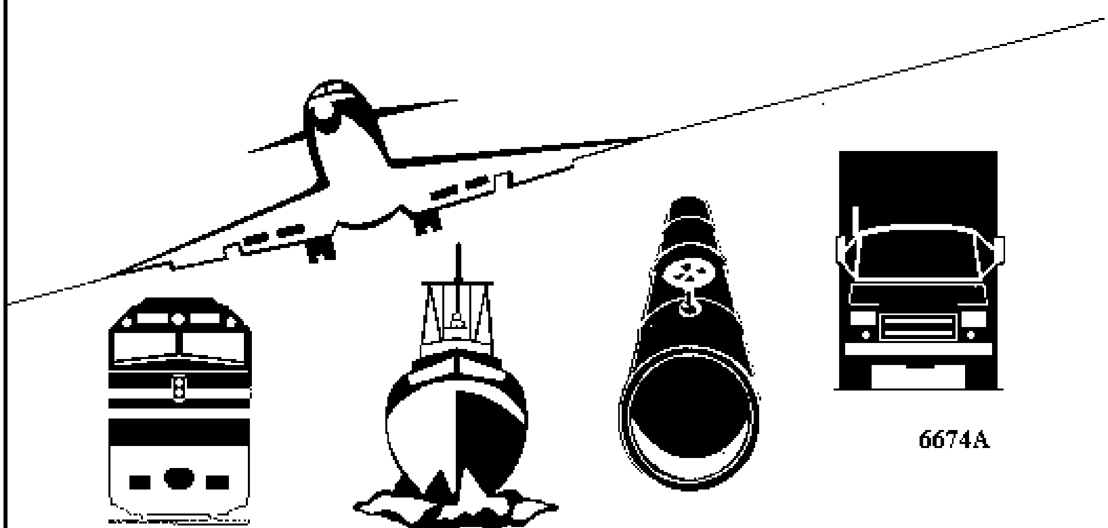
PB97-916301
NTSB/RAR-97/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

NEAR HEAD-ON COLLISION AND DERAILMENT OF TWO NEW JERSEY TRANSIT COMMUTER TRAINS SECAUCUS, NEW JERSEY FEBRUARY 9, 1996



6674A

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. ***Near Head-On Collision and Derailment of Two New Jersey Transit Commuter Trains, Secaucus, New Jersey, February 9, 1996.*** **Railroad Accident Report NTSB/RAR-97/01. Washington, D.C.: NTSB, 1997.**

Abstract: This report explains the collision of two New Jersey Transit trains in Secaucus, New Jersey, on February 9, 1996. Three people were killed and 69 people were treated at area hospitals for minor to serious injuries sustained in this accident. The total estimated damage exceeded $3.3 million.

From its investigation of this accident, the Safety Board identified the following safety issues: the medical condition of the engineer of train 1254, the adequacy of medical standards for locomotive engineers, and the adequacy of the response to the accident by New Jersey Transit train crewmembers. Based on its findings, the Safety Board made recommendations to the Federal Railroad Administration, the New Jersey Transit, the Association of American Railroads, the American Public Transit Association, the Brotherhood of Locomotive Engineers, and the United Transportation Union.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at http://www.ntsb.gov/. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB97-916301** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE
(not actual size)

Railroad Accident Report

Near Head-On Collision and Derailment of Two New Jersey Transit Commuter Trains Secaucus, New Jersey February 9, 1996

NTSB/RAR-97/01
PB97-916301
Notation 6674A
March 25, 1997

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

iii **Railroad Accident Report**

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

Executive Summary

On February 9, 1996, about 8:40 a.m., east-bound New Jersey Transit (NJT) commuter train 1254 collided nearly head-on with westbound NJT commuter train 1107 in Secaucus, New Jersey. About 400 passengers were on the two trains. The engineers on both trains and one passenger riding on train 1254 were killed in the collision.

The National Transportation Safety Board determines that the probable cause of NJT train 1254 proceeding through a stop indication and striking another NJT commuter train was the failure of the train 1254 engineer to perceive correctly a red signal aspect because of his diabetic eye disease and resulting color vision deficiency, which he failed to report to NJT during annual medical examinations. Contributing to the accident was the contract physician's use of an eye examination not intended to measure color discrimination.

The major safety issues discussed in this report are the medical condition of the engineer of train 1254, the adequacy of medical standards for locomotive engineers, and the adequacy of the NJT train crewmembers' response to the accident. In addition, the Safety Board examines the crashworthiness of the trains and the response effort of emergency personnel.

As a result of its investigation of this accident, the Safety Board makes recommendations to the Federal Railroad Administration, the New Jersey Transit, the Association of American Railroads, the American Public Transit Association, the Brotherhood of Locomotive Engineers, and the United Transportation Union.

CHAPTER 7

HAZARDOUS MATERIALS ACCIDENT REPORT

FORMAT AND CONTENT

A hazardous materials accident report can be about an accident in any transportation mode. This category was developed because of the need to report on accidents in which the safety issue of hazardous materials transportation outweighs modal considerations. Hazardous materials reports have covered such topics as the transportation of torpedoes, butadiene, and waste acid. Although the majority of reports have been about railroad or highway accidents, the reports occasionally discuss accidents in other modes, such as the report about an in-flight fire caused by a hazardous materials spill in the airplane's cargo bay and the report about an underwater pipeline ruptured by a vessel.

Some reports issued under the hazardous materials category in the past would now be classified as special investigation reports. Remember that an accident report must be about one specific accident (in rare cases, more than one) and must contain a probable cause.

Because the hazardous materials accident report may be about an accident in one of several modes, it is difficult to provide an exact format. Therefore, writers should use the required headings established for major accident reports in the relevant mode (see ***chapters 2*** through ***6***) and add additional headings as necessary to emphasize the hazardous materials aspects of the accident. Additional headings should be used sparingly and with regard for organization. An editor can help you evaluate the report's organization to determine the best way to explain the accident.

See the pages that follow for examples from a hazardous materials accident report of the:

- front cover,
- inside front cover,
- title page,
- table of contents, and
- executive summary.

A. EXAMPLE OF FRONT COVER

(not actual size)

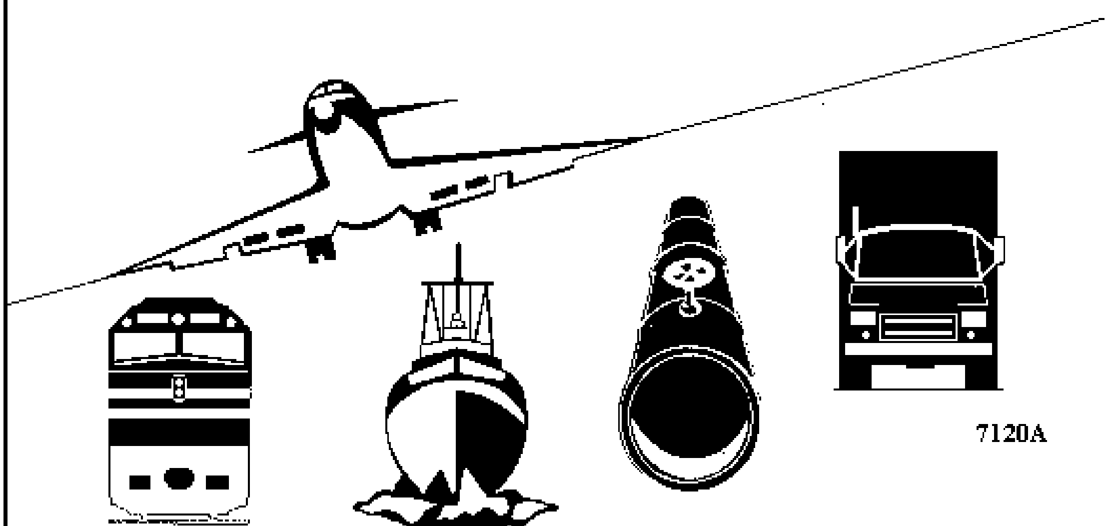
PB99-917007
NTSB/HZM-99/02

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

HAZARDOUS MATERIALS ACCIDENT REPORT

OVERFLOW OF GASOLINE AND FIRE AT A SERVICE STATION-CONVENIENCE STORE BILOXI, MISSISSIPPI AUGUST 9, 1998



7120A

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. ***Overflow of Gasoline and Fire at a Service Station-Convenience Store, Biloxi, Mississippi, August 9, 1998.*** **Hazardous Materials Accident Report NTSB/HZM-99/02. Washington, D.C.: NTSB, 1999.**

Abstract: On August 9, 1998, about 12:53 a.m., a Premium Tank Lines, Inc., truckdriver was transferring gasoline from a cargo tank to underground storage tanks at a Fast Lane gasoline station-convenience store in Biloxi, Mississippi, when an underground storage tank containing gasoline overflowed. An estimated 550 gallons of gasoline flowed from the storage tank, across the station lot into the adjacent highway, through an intersection, and into a storm drain. The gasoline ignited, and fire engulfed three vehicles near the intersection, which ultimately resulted in the deaths of five occupants and the serious injury of one. Damages were estimated at $55,000. The following safety issues are discussed in this report: Premium Tank Line, Inc.'s management oversight; R.R. Morrison and Son, Inc.'s procedures for accepting petroleum product deliveries to underground storage tanks; and Federal requirements and oversight.

As a result of its investigation of this accident, the Safety Board makes recommendations to the Federal Highway Administration, the Research and Special Programs Administration, the Environmental Protection Agency, Premium Tank Lines, Inc., R.R. Morrison and Son, Inc., the American Petroleum Institute, the National Tank Truck Carriers Association, the National Association of Convenience Stores, the National Association of Truck Stop Operators, the Petroleum Marketers Association of America, the Service Station Dealers of America, and the Society of Independent Gasoline Marketers of America.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE
(not actual size)

Hazardous Materials Accident Report

Overflow of Gasoline and Fire at a Service Station-Convenience Store Biloxi, Mississippi August 9, 1998

NTSB/HZM-99/02
PB98-917007
Notation 7010A
September 21, 1999

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

iii Hazardous Materials Accident Report

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

Executive Summary

On August 9, 1998, about 12:53 a.m., a Premium Tank Lines, Inc., truckdriver was transferring gasoline from a cargo tank to underground storage tanks at a Fast Lane gasoline station-convenience store in Biloxi, Mississippi, when an underground storage tank containing gasoline overflowed. An estimated 550 gallons of gasoline flowed from he storage tank, across the station lot into the adjacent highway, through an intersection, and into a storm drain. The gasoline ignited, and fire engulfed three vehicles near the intersection, which ultimately resulted in the deaths of five occupants and the serious injury of one. Damages were estimated at $55,000.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of Premium Tank Line, Inc.'s officials to follow established company procedures in the hiring and training of new drivers and the company's lack of adequate procedures for dispatching drivers and delivering cargo to customer facilities, and the failure of R.R. Morrison and Son, Inc., to have adequate safety procedures for accepting product offered for delivery at its Fast Lane stations. Contributing to the accident was the truckdriver's various and numerous operating errors during the gasoline transfer process that led to the underground storage tank overfill.

The following safety issues are discussed in this report:

- Premium Tank Line, Inc.'s management oversight;
- R.R. Morrison and Son, Inc.'s procedures for accepting petroleum product deliveries to underground storage tanks; and;
- Federal requirements and oversight.

As a result of its investigation of this accident, the Safety Board makes recommendations to the Federal Highway Administration, the Research and Special Programs Administration, the Environmental Protection Agency, Premium Tank Lines, Inc., R.R. Morrison and Son, Inc., the American Petroleum Institute, the National Tank Truck Carriers Association, the National Association of Convenience Stores, the National Association of Truck Stop Operators, the Petroleum Marketers Association of America, the Service Station Dealers of America, and the Society of Independent Gasoline Marketers of America.

CHAPTER 8

HIGHWAY/RAILROAD ACCIDENT REPORT

CONTENTS

8.1 FORMAT AND CONTENT

8.1.1 Draft Report Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label “draft.”

Include a table of contents. Figures should be numbered consecutively, tables should be numbered consecutively, and charts should be numbered consecutively. The appendixes should be lettered consecutively.

8.1.2 Published Report Elements

For the format of the elements that only the published report has, such as the front and back covers, the abstract and the mission statement on the inside front cover, and the title page, see ***paragraph 8.9***, followed by ***examples A*** through ***E*** of the front cover, the inside front cover, the title page, the table of contents, and the executive summary.

8.1.3 Table of Contents

In most cases, the editor develops the table of contents for the notation and final versions of the report. Report writers should include a table of contents with earlier report versions. (For a table of contents, see ***example D***.)

8.1.4 Report Title

The title includes the following elements:

- type of accident,
- name of the railroad company,
- train designation,
- name of the vehicle owner (if a company),

- type of vehicle, and
- location of accident.

Use consistent language for citing accident locations in different parts of the report, such as the cover, title page, **Executive Summary**, and **Accident Narrative**. Follow modal office criteria for citing accident locations in titles. On the cover and on the title page, do not use “in” before the accident location or “on” before the accident date. Do not use such imprecise designations as “near” unless unavoidable. (See ***examples A*** and ***C***.)

8.1.5 Executive Summary

Include the following information in **Executive Summary** (see ***example E***):

- brief description of the accident, eliminating unnecessary details;
- probable cause of the accident;
- list of safety issues discussed; and
- list of recommendation recipients

8.1.6 Body of the Report

Provide only the information that is appropriate and necessary to support the Safety Board’s conclusions, recommendations, and probable cause. Eliminate unnecessary details that detract from the safety message that you are communicating.

Paragraph 8.2 describes the sections that belong under **FACTUAL INFORMATION**. Subheadings may be used as necessary. Note that sections are not numbered as in aviation reports. For example:

Tests and Research

Train Stopping Distance

Sight Distance

Paragraph 8.3 describes the sections that belong under **ANALYSIS**. In **ANALYSIS**, do not analyze facts about the accident unless the facts have already been mentioned in **FACTUAL INFORMATION**. Do not introduce new factual information in **ANALYSIS**.

All facts in the report must be supported by documentation in the Board's public docket. The only exceptions are documents readily accessible to the public, such as the *Code of Federal Regulations* (CFR) and past Safety Board reports.

In **ANALYSIS**, a conclusion is normally preceded by the words "the Safety Board concludes," and a safety recommendation is preceded by the words "the Safety Board believes." Remember:

- Every safety recommendation must have a corresponding conclusion.
- Every conclusion must be supported by analysis.
- All analysis must be supported by fact.

8.2 FACTUAL INFORMATION

8.2.1 Accident Narrative

Write a brief narrative giving the following information, as appropriate, in a logical order:

For the train:

- train designation,
- type of operation,
- point of origin,
- destination,
- last point of departure,
- departure time,
- number of crewmembers,
- crew positions and duties,
- number of passengers,
- trip preparation,
- pretrip inspections,
- description of the trip,
- description of crew activities,
- significant events en route,
- significant operations-related conversations en route, and
- inspections en route.

For the highway vehicle:

- carrier name,
- type of vehicle,
- cargo information,
- point of origin,
- destination,
- last point of departure,
- departure time,
- number of passengers,
- trip preparation,
- pretrip inspections,
- description of the trip,

- description of driver activities,
- significant events en route,
- significant operations-related conversations en route, and
- inspections en route.

Then:

- events leading up to the accident, including reconstruction of the significant portion of the accident sequence;
- location and time of the accident;
- activities of the driver or crew after the accident; and
- witness accounts of the accident.

This section is often the most difficult section to write. Here are some tips:

- Eliminate unnecessary details.

- Choose a logical starting point from which to begin the description of the events leading up to the accident.

- Describe the events in chronological order. If some events occurred simultaneously, explain one event thoroughly and then backtrack to the other event, using such transitions as “meanwhile” and “while.”

- Discuss the vehicle and the train separately.

Remember that you have 14 other sections in which to be more specific.

8.2.2 Injuries

The survival factors investigator provides the report writer with an injury table in the following format:

Injury Type	Busdriver	Bus Passengers	Train Crew	Train Passengers	Total
Fatal	0	4	3	0	7
Serious	1	1	0	0	2
Minor	0	0	0	0	0
None	0	0	0	0	0
Total	1	5	3	0	9

49 *Code of Federal Regulations* (CFR) 830.2 defines *fatal injury* as "any injury which results in death within 30 days of the accident" and *serious injury* as "an injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface."

The column headings may vary depending on the circumstances of the accident and the people involved.

Include the following explanatory paragraph with the table:

> The table above is based on the injury criteria (49 CFR 830.2) of the International Civil Aviation Organization (ICAO), which the Safety Board uses in accident reports for all transportation modes. See appendix B for an injury table based on the Abbreviated Injury Scale (AIS) of the American Association for Automotive Medicine.

Follow the 49 CFR 830.2 definition of fatality and injury.

Injuries contains the table and explanatory paragraph only. Details of injuries are discussed in **Medical and Pathological Information**.

8.2.3 Damage

Briefly describe the accident damage to vehicle, train, and other objects, such as crossing protection. Give the estimated dollar value of the vehicle damage, and state who made the estimate. Include a tabulated listing of all documented dollar damages. (Discuss details of the damage in **Vehicle and Wreckage Information** or in **Train, Track, Signal, and Wreckage Information** as appropriate.)

8.2.4 Personnel Information

Use subheadings, such as “Train Crew” and “Driver,” as necessary.

This section is usually limited to the vehicle driver and train crew, but may contain information on any person, such as a supervisor or mechanic, whose duties or actions directly affected the accident. This information may include:

- job title;
- date of birth;
- certification;
- experience;
- training, including a discussion of Federal, State, and local requirements, company or carrier requirements, classroom instruction, on-the-job training, and examinations;
- duty time;
- pertinent preaccident activities;
- medical factors;
- human factors; and
- record of previous traffic or disciplinary actions.

If more than one train is involved, discuss the personnel of the first train before discussing the personnel of the second train.

Give only the basic details necessary for the reader to understand a person’s qualifications. Unless someone’s performance will be analyzed in depth because of his or her role in the accident, save your time and the reader’s time by eliminating nonessential details.

8.2.5 Vehicle and Wreckage Information

This section contains the following:

- a brief description of the vehicle, emphasizing any information causal to the accident or necessary to explain the damage after the accident. (Other vehicle information belongs in an appendix.)

- a brief description of pretrip inspections of the vehicle, including any indication of deficiencies that were known before and during the trip and had a bearing on the accident.

- a brief description of the performance of the vehicle en route.

Briefly describe the damage (destroyed, substantial damage, minor damage, or no damage) sustained by the vehicle and by objects other than the vehicle, such as the roadway.

8.2.6 Train, Track, Signal, and Wreckage Information

This section contains the following:

- a brief description of the locomotive and consist (other information concerning the train belongs in an appendix);

- a brief description of pretrip inspections of the locomotive and consist, including any indication of deficiencies that were known before and during the trip and had a bearing on the accident;

- a brief description of the performance of the train en route; and

- a brief description of other structures that the reader needs to know about to understand the accident.

If there was a fire, describe it and the firefighting equipment used and its effectiveness.

8.2.7 Crossing Information

Briefly describe the accident site, including roadway conditions, signing, crossing protection, number of tracks, inspections and maintenance of the crossing protection, and road scars and marks attributed to the accident.

8.2.8 Operational Information

Briefly describe pertinent railroad operating procedures affecting train movement, including the areas in which the train operated, track signage, signals, train orders, timetables, and schedules.

Briefly describe pertinent carrier or school district policies and procedures.

8.2.9 Management Information

Briefly describe relevant organizational and management information, such as the company's structure or internal oversight. Also describe Federal or State oversight policies, procedures, and actions.

8.2.10 Meteorological Information

Briefly describe the weather at the time of the accident. If weather was a factor in the accident, include more details, such as the forecast, the actual conditions, and the access the driver and train crew had to meteorological information.

8.2.11 Medical and Pathological Information

Briefly describe the results of toxicological tests and postaccident medical examinations or autopsies for the driver, train crew, and other people, if relevant. (Medical information related to required physical examinations should be included under **Personnel Information**.)

Describe, in general, the types of injuries or causes of death that the accident caused.

Do not discuss survival aspects in this section. (See ***paragraph 8.2.12***.)

8.2.12 Survival Aspects

Briefly describe, if applicable:

- emergency response;
- search, evacuation, and rescue;
- location of driver, train crew, and passengers in relation to injuries sustained;
- vehicle design factors that contributed to or prevented occupant survival;
- locomotive and train car design factors that contributed to or prevented occupant survival;
- failure of vehicle structures, such as seats and seatbelt attachments;
- failure of train car structures, such as seats and windows;
- problems with emergency exits; and
- resistance of seat materials and other materials to fire.

If the accident was not survivable, say so.

(Note the differences between **Medical and Pathological Information** and **Survival Aspects**.)

8.2.13 Tests and Research

This section briefly explains tests and research done by the Safety Board or another organization to determine facts about the accident. Discuss each test or research topic under a separate subheading (for instance, “metallurgical examination”). If no tests or research were conducted, write “not applicable.”

This section relates the results and evaluations of the tests and research. Subsequently, this is the only section under **FACTUAL INFORMATION** that has analytical language. Do not confuse the analysis of test results, which establishes facts, with the analysis of the accident.

8.2.14 Other Information

This section contains relevant information not already included in previous sections. Use a separate subheading for each topic discussed. This section often contains two or more subheadings.

The following examples from past reports show topics that have appeared in this section:

- human performance (general information and research),
- data on grade crossings in the State,
- Operation Lifesaver,
- pupil transportation safety,
- high-speed train corridors,
- Federal and State regulations, and
- actions taken since the accident.

8.3 ANALYSIS

Every issue discussed in **ANALYSIS** should result in a conclusion about the accident that supports the Safety Board's statement of probable cause. These conclusions result in recommendations about what the Board believes should be done to correct, prevent, or mitigate the identified safety issue or deficiency.

8.3.1 Exclusions

This section usually eliminates factors that were not causal to the accident. Discuss safety issues to be addressed by the report in subsequent sections. Use a logical order, such as the one that follows:

- Begin with a brief statement of the condition of the train for the trip.
- Follow with a brief statement on the condition of the vehicle for the trip.
- Continue with a brief statement on the train crew's condition and qualifications for operating the train.
- Follow with a brief statement on the driver's condition and qualifications for operating the vehicle.
- Continue with a brief statement on the training, certification, and qualifications of other people involved, such as mechanics, if appropriate.
- Conclude with a brief statement on other factors, such as weather, equipment failure, track failure, highway factors, signal malfunction, or driver- or train crew-related physiological conditions.

Dismiss factors that were not causal. Close by stating the factors the investigation revealed as significant. These factors are the focus of the sections that follow.

Obviously, the order suggested above would not be logical for an accident caused by equipment problems. In such a case, that factor would be discussed last and lead into a discussion of maintenance under **Accident Discussion**.

8.3.2 Accident Discussion

This section analyzes the cause-and-effect relationship among the events leading up to the accident by drawing conclusions based on **FACTUAL INFORMATION**. Begin with a very brief overview of major findings of the investigation; then, explain why the accident happened.

This is the most important section of **ANALYSIS** and usually is the most difficult to write.

8.3.3 Other Sections

After explaining the accident, discuss the safety issues raised by the accident. Use appropriate headings. Some frequently used headings follow:

- Training,
- Vehicle Factors,
- Train Equipment,
- Weather,
- Driver Performance and Qualifications,
- Train Crew Performance and Qualifications,
- Human Performance,
- Operational Factors,
- Survivability,
- Crashworthiness, and
- Emergency Response.

Arrange the sections in descending order of significance to the accident. Begin with issues contributing to the cause of the accident, follow with issues contributing to the severity of the accident, and end with issues that were developed during the investigation but are not related to the cause.

In writing each section, follow this general formula:

- Briefly summarize the facts of the accident that pertain to the section's topic.

- Explain the safety issue to which the facts pertain.

- Provide other information that supports the Board's belief that the safety issue is a valid one. Include data from previous accidents and past safety recommendations, including responses and Board action. (Note that outstanding safety recommendations can be closed or superseded here.)

- Analyze the issue, developing a logical argument for action.

- Conclude each section with a firm statement of the Safety Board's position on the issue.

- Recommend action, if appropriate.

Avoid using the passive voice and such indefinite and awkward language, as:

> "It is apparent that…."
> "It is clear that…."
> "It could be concluded that…."
> "It is the Safety Board's opinion that…."
> "This has led us to the belief that…."

8.4 CONCLUSIONS

8.4.1 Findings

Findings are conclusions taken from **ANALYSIS**, not factual statements taken from **FACTUAL INFORMATION**. Findings are brief, to the point, and cover the causal factors and safety issues analyzed. Avoid using abbreviations in the findings.

An easy way to develop this section is to copy the conclusions from **ANALYSIS**. Make minor revisions for clarity, if necessary.

8.4.2 Probable Cause

This paragraph summarizes why the accident happened. The probable cause can be a series of events or a listing of separate causal factors. Either way, the probable cause describes the conditions that made the accident inevitable.

The probable cause may also describe factors that contributed to the:

- cause of the accident,
- severity of the accident, and
- survivability of the accident.

8.5 RECOMMENDATIONS

To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. Do not write "throwaway" recommendations, which ask an organization to do what it is already doing or is required to do.

8.5.1 Writing Tips

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (H-**-00) or (R-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted and is ready for final typing.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as "ensure that."

- Use consistent language.

8.5.2 Previous and Reiterated Recommendations

Recommendations made during the investigation or as the result of a past investigation (related or reiterated recommendations) should be discussed in **ANALYSIS**. When discussing such a recommendation, restate the recommendation, describe the recipient's reply, describe the Safety Board's response to the reply, and give the recommendation's status. Format and presentation are determined on a case-by-case basis. An editor can help.

8.5.3 Order of Recommendations and Approval Information

The normal order for recipients of safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or governor,
- companies and organizations.

Any reiterated recommendations are listed after the new ones are listed.

Approval information comes immediately after the recommendations, followed by dissenting or concurring statements, if necessary. (For more information on dissenting or concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

8.6 APPENDIX A—INVESTIGATION

8.6.1 Investigation

Provide the following information:

- date and time Safety Board was notified of the accident,
- time investigators arrived on scene,
- organization of the investigation, and
- parties to the investigation.

8.6.2 Hearing/Deposition

This section contains information about any public hearings or depositions related to the investigation. If none occurred, say so.

8.7 APPENDIX B—INJURY INFORMATION

This section contains the Abbreviated Injury Scale (AIS) of the American Association for Automotive Medicine version of the injury table provided in **FACTUAL INFORMATION**. (See ***paragraph 8.2.2***.) The AIS table shown below, which is also provided by the survival factors investigator, appears only in highway products.

Injuries	**Drivers(s)**	**Passenger(s)**	**Other**	**Total**
AIS-0 None	0	4	0	4
AIS-1 Minor	1	14	0	15
AIS-2 Moderate	0	4	0	4
AIS-3 Serious	0	3	0	3
AIS-4 Severe	0	5	1	6
AIS-5 Critical	0	7	0	7
AIS-6 Unsurvivable	0	0	0	0
TOTAL	1	37	1	39

8.8 OTHER APPENDIXES

Other appendixes can include, but are not limited to, the following:

- summary of driver's activities before the accident;
- copies of letters, memorandums, or forms;
- responses to notices of proposed rulemaking;
- test results;
- research results; and
- excerpts from regulations.

8.9 PUBLISHED FORMAT

8.9.1 Front and Back Covers

The front cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year and the 000000 indicates the NTIS order sequence number).

- Report number (provided by MD-5). Format the number as follows: NTSB/HAR-**/00 or NTSB/RAR-**/00 (the ** indicates the last two digits of the calendar year and the 00 indicates the report's sequence in the HAR or RAR series for that year). Note that the designation "RHR" is no longer used. Designate reports "HAR" or "RAR," depending upon the lead office in the accident investigation.

- Report title. (For required elements, see ***paragraph 8.1.4***.)

See ***example A*** for a front cover. The back cover of the final report is blank except for the Safety Board mailing frank.

8.9.2 Abstract (Inside Front Cover)

The editor writes the abstract for the final report from information in **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. The abstract appears on the inside front cover of the report. (See ***example B***.)

8.9.3 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover of the final report. (See ***example B***.)

8.9.4 Title Page

The title is repeated on the title page. In addition, include the adoption date and the notation number. (See ***example C***.)

8.9.5 Table of Contents and Executive Summary

The table of contents and **Executive Summary** are discussed in ***paragraphs 8.1.3*** and ***8.15***. (Also, see ***examples D*** and ***E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

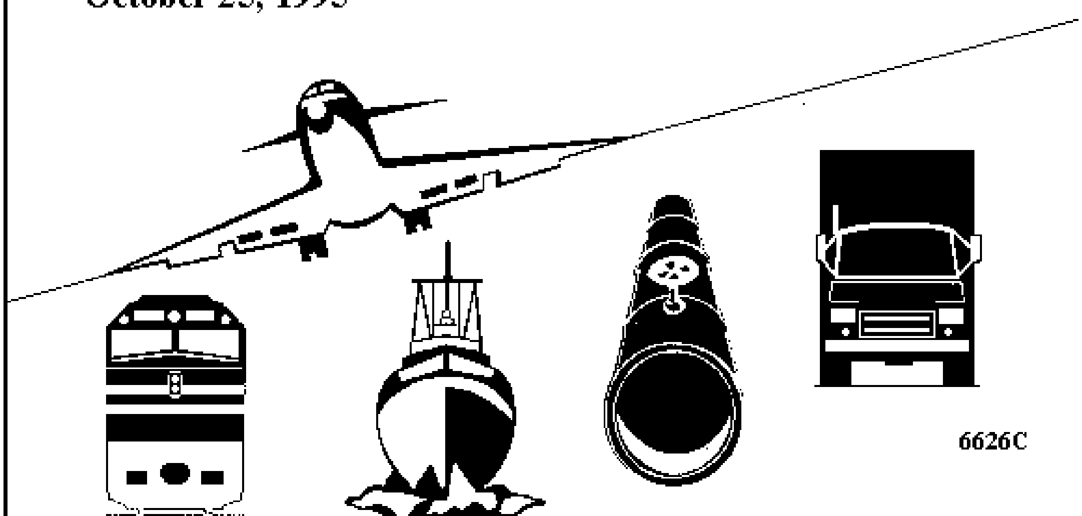
PB96-916202
NTSB/HAR-96/02

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

HIGHWAY/RAILROAD ACCIDENT REPORT

Collision of Northeast Illinois Regional Commuter Railroad Corporation (METRA) Train and Transportation Joint Agreement School District 47/155 School Bus at Railroad/Highway Grade Crossing Fox River Grove, Illinois October 25, 1995



6626C

B. *EXAMPLE OF INSIDE FRONT COVER*

(not actual size)

National Transportation Safety Board. ***Collision of the Northeast Illinois Regional Commuter Railroad Corporation (METRA) Train and Transportation Joint Agreement School District 47/155 School Bus at Railroad/Highway Grade Crossing Fox River Grove, Illinois.*** **Highway/Railroad Accident Report NTSB/HAR-96/02. Washington, D.C.: NTSB, 1998.**

Abstract: This report explains the collision of a Northeast Illinois Regional Commuter Railroad Corporation commuter train with a Transportation Joint Agreement School District 47/155 school bus that was stopped at a railroad/highway grade crossing in Fox River Grove, Illinois, on October 25, 1995. Seven school bus passengers were killed, and the busdriver and 24 bus passengers were injured. From its investigation of this accident, the Safety Board identified the following safety issues: the appropriateness of the busdriver's performance; the adequacy of the school district bus routing and busdriver monitoring and evaluating procedures; the road design; the railroad/highway signal interaction; the coordination and communication between the Illinois Department of Transportation and the Union Pacific Railroad Company and their oversight of the signal system integration; and the injury and survival factors in the school bus.

As a result of its investigation of this accident, the Safety Board made recommendations to the Secretary of Transportation, the Federal Highway Administration, the Federal Railroad Administration, the National Highway Traffic Safety Administration, the State of Illinois, the Illinois Department of Transportation, the Transportation Joint Agreement School District 47/155, the National Association of State Directors of Pupil Transportation Services, the American Association of State Highway and Transportation Officials, the National Association of County Engineers, the American Public Works Association, the Institute of Transportation Engineers, the Association of American Railroads, the American Short Line Railroad Association, the American Public Transit Association, and Operation Lifesaver, Inc. The Safety Board also issued urgent action recommendations following this accident to the Federal Highway Administration, the Federal Railroad Administration, and the State Directors of Transportation.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at http://www.ntsb.gov/. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB96-916202** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Highway/Railroad Accident Report

Collision of the Northeast Illinois Regional Commuter Railroad Corporation (METRA) Train and Transportation Joint Agreement School District 47/155 School Bus at Railroad/Highway Grade Crossing Fox River Grove, Illinois October 25, 1995

NTSB/HAR-96/02
PB96-916202
Notation 6626C
October 29, 1996

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

vii Highway/Railroad Accident Report

Executive Summary

On October 25, 1995, at 7:10 a.m., the Northeast Illinois Regional Commuter Railroad Corporation (d/b/a Metropolitan Rail) express commuter train 624 struck the rear left side of a stopped Transportation Joint Agreement School District 47/155 school bus at a railroad/highway grade crossing in Fox River Grove, Illinois. The accident occurred after the school bus had crossed the railroad tracks and stopped for a red traffic signal, with its rear extended about 3 feet into the path of the train. Of the 35 school bus passengers, 7 sustained fatal injuries, 24 sustained serious injuries, and 4 were not injured. The school busdriver received minor injuries. The 3 crewmembers and the estimated 120 passengers on the train were uninjured.

The National Transportation Safety Board determines that the probable cause of the collision was that the busdriver had positioned the school bus so it encroached upon the railroad tracks because of the failure of: 1) the Illinois Department of Transportation to recognize the short queuing area on northbound Algonquin Road and to take corrective action; 2) the Illinois Department of Transportation to recognize the insufficient time of the green signal indication for vehicles on northbound Algonquin Road before the arrival of a train at the crossing; and 3) the Transportation Joint Agreement School District 47/155 to identify route hazards and to provide its drivers with alternative instructions for such situations. Contributing to the accident was the failure of the Illinois Department of Transportation and its contractors, the Illinois Commerce Commission, and the railroads to have a communication system that ensures understanding of the integration and working relationship of the railroad and highway signal systems.

The major safety issues discussed in this report are: the appropriateness of the busdriver's performance; the adequacy of the school district bus routing and busdriver monitoring and evaluating procedures; the road design; the railroad/highway signal interaction; the coordination and communication between the Illinois Department of Transportation and the Union Pacific Railroad Company and their oversight of the signal system integration; and the injury and survival factors in the school bus.

As a result of its investigation of this accident, the Safety Board makes recommendations to the Secretary of Transportation, the Federal Highway

Administration, the Federal Railroad Administration, the National Highway Traffic Safety Administration, the State of Illinois, the Illinois Department of Transportation, the Transportation Joint Agreement School District 47/155, the National Association of State Directors of Pupil Transportation Services, the American Association of State Highway and Transportation Officials, the National Association of County Engineers, the American Public Works Association, the American Public Transit Association, and Operation Lifesaver, Inc. The Safety Board also issued urgent action recommendations following this accident to the Federal Highway Administration, the Federal Railroad Administration, and the State Directors of Transportation.

CHAPTER 9

ACCIDENT REPORT
(SUMMARY FORMAT)

CONTENTS

9.1 OVERVIEW

The surface modes developed the "accident/incident summary report" format in 1981 to address one-issue accidents. Preparing a major accident report for such investigations was considered time-consuming and of limited value. This report format has since evolved into a report that differs from a major report in these distinct ways:

- It usually covers no more than three issues.
- It usually addresses issues of limited national public interest in terms of media coverage and congressional attention.
- It can but normally does not contain recommendations of national public interest and generally contains fewer recommendations overall.

9.1.1 Organization

Summary-format reports contain a probable cause and should have the same format and major divisions as a major accident report: **FACTUAL INFORMATION, ANALYSIS, CONCLUSIONS,** and **RECOMMENDATIONS**. However, unlike major accident reports, such reports may include relatively few of the standard headings required in the **FACTUAL INFORMATION** and **ANALYSIS** sections of major accident reports, owing to the report's limited focus. (For further information on required headings in major accident reports, refer to the appropriate modal guidance in chapters 3 through 8.)

Reports containing one or two simple issues may lend themselves to an alternative format in which issue-oriented sections combine facts and analysis. However, such reports can be difficult to write and make party review of factual information more cumbersome. For further guidance, consult an editor. In addition, for frequently asked questions about the summary format, see ***paragraph 9.2.*** For a list of reports considered to be useful examples of format and content, including a few examples of alternative-format reports that combine facts and analysis, see ***paragraph 9.3***.

9.1.2 Draft and Published Format

See the appropriate modal chapters (3 through 8) for draft and published report standards and for examples of published report elements such as the front and back covers, the abstract and mission statements on the inside front cover, and the title page.

9.2 FREQUENTLY ASKED QUESTIONS

Who determines a report's format?

The Office Director and, ultimately, the Board members.

How long should the report be?

Summary-format reports should have relatively few simple–but significant–safety issues. If numerous issues exist or their discussion would be complex, you probably should be writing a major or special investigation report. Limit the facts to the minimum needed to explain the accident and the safety issues. If the report is short and has few subheadings, the table of contents may be omitted.

How are these reports written?

Write the report as you would a major accident report:

- List the facts.
- Analyze the facts.
- Draw conclusions based on the analysis.

Remember to:

- Make recommendations, if appropriate.
- Write simple, declarative sentences.
- Write well-structured paragraphs in a logical sequence.
- Omit unnecessary details.

Are photographs, tables, diagrams, and appendixes allowed?

Yes, if necessary to effectively convey the report's safety issues.

Are recommendation letters issued?

Yes. Prepare letters transmitting the recommendations after the report is adopted by the Board in the manner that you would for a major accident report.

How are these reports processed, published, numbered, and distributed?

These reports are processed, published, numbered, and distributed the same way as major accident reports.

The Executive Secretariat (MD-5) calendars them for discussion at a Board Meeting. After adoption, MD-5 notifies the originating office, which coordinates production and distribution of the final copy in the same manner as a final major accident report.

Note: When summary-format reports were formally designated "summary reports," they were numbered separately from major accident reports, with the report numbers containing the suffix "/SUM." These reports now use the same numbering system as major accident reports.

9.3 SELECTIVE LIST OF REPORTS

The following list includes only reports that are considered to be useful examples of summary-format reports. Reports published after 1995 can be found on the Safety Board's Web site under *Publications*.

Highway

NTSB/HAR-98/01[1]
Bus Collision With Pedestrians, Normandy, Missouri, June 11, 1997

NTSB/HAR-97/01[1]
Collision With a Pedestrian by a Utility Truck Near Cosmopolis, Washington, November 26, 1996

Marine

NTSB/MAR-97/01[1]
Near Grounding of the Liberian Tank Ship Patriot Bay *of Campeche, Mexico, October 15, 1995*

NTSB/MAR-96/01[1]
Capsizing of Questar Motorboat and Drowning of Operator South of Shelter Island Near Juneau, Alaska, August 21, 1994

Pipeline and Hazardous Materials

NTSB/PAR-98/02[1]
Pipeline Rupture, Liquid Butane Release, and Fire, Lively, Texas, August 24, 1996

NTSB/PAR-98/01[1]
Natural Gas Pipeline Rupture and Fire During Dredging of Tiger Pass, Louisiana, October 23, 1996

NTSB/HZM-98/01[1, 2]
Failure of Tank Car TEAX 3417 and Subsequent Release of Liquefied Petroleum Gas, Pasadena, Texas, November 22, 1997

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[1] Published with report number containing the suffix "/SUM."
[2] Sample of report combining facts and analysis in issue-oriented sections.

Railroad

NTSB/RAR-99/01[1]
Derailment of CSX Freight Train Q316 and Subsequent Hazardous Material Release at Cox Landing, West Virginia, June 20, 1998

NTSB/RAR-93/02[1, 2]
Derailment of Amtrak Train 87, Silver Meteor, in Palatka, Florida, December 17, 1991

NTSB/RAR-93/01[1, 2]
Rear-End Collision Involving Two Greater Cleveland Regional Transit Trains Near the West 98th Street Station, Cleveland, Ohio, July 2, 1991

CHAPTER 10

SPECIAL INVESTIGATION REPORT

CONTENTS

10.1 OVERVIEW

A special investigation report usually focuses on a particular safety issue by examining an incident, an accident, or a group of accidents. Often, these accidents do not meet the Safety Board's criteria for major accidents, yet they have issues of concern to the Safety Board.

A special investigation report is similar to an accident report in that it reports and analyzes facts, draws conclusions, and makes recommendations. *A special investigation report differs from an accident report* in the following ways:

- It usually involves more than one accident investigation.
- It normally does not but can contain a determination of probable cause for any of the accidents discussed.
- It usually addresses issues of limited national public interest in terms of media coverage and congressional attention and has fewer recommendations.
- It may concentrate entirely on a safety issue without the need for factual data from specific accidents.

A special investigation report is similar to a safety study in that it focuses on a safety issue rather than a determination of probable cause. *A special investigation report differs from a safety study* in the following ways:

- It usually is written by a technical specialist in one of the modal offices rather than a transportation safety specialist in the Office of Research and Engineering.
- It usually addresses issues of limited national public interest and has fewer recommendations.
- It usually does not involve as much research.
- It usually is completed in less time than a safety study.
- It does not need the approval of the Board Members before beginning.

Because a variety of approaches are used to carry out a special investigation, no standard organization exists for these reports. For your guidance, we have listed several special investigation reports in ***paragraph 10.5*** that are considered to be useful examples of format and content.

10.1.1 Organization

The **INTRODUCTION** is the only required section (***example E***). Write a brief narrative giving the following information, *as appropriate*, in a logical order:

- purpose of the special investigation,
- background, and
- pertinent information about accidents investigated, such as location, date, and time.

Remember that the purpose of the **INTRODUCTION** is to focus the reader's attention on the safety issue to be discussed, not necessarily the accident that caused the investigation.

It is rarely necessary to follow the **INTRODUCTION** section with a **BACKGROUND** section. Use a **BACKGROUND** section only when the reader needs extensive historical information to understand the issues discussed in the report. Present the information chronologically and give only essential details. Do not attempt to present a complete history of a subject.

No standard organization exists for special investigation reports, so making a report outline is essential. Discuss the outline with your division chief and an editor. Have them review your work frequently during the writing process to ensure that the report's organization is effective.

Choose section headings with care, and follow a logical organization. Subheadings are allowed under section headings. For example:

ATC Facility Survey

Procedures

Workload

Provide only the information that is appropriate and necessary for the report. Eliminate unnecessary details that detract from the safety message that you are communicating.

10.1.2 Format

In appearance, special investigation reports are similar to accident reports and safety studies. For format examples of published report elements, such as the front and back covers, the inside front cover, the title page, the table of contents, and **Introduction**, see ***paragraphs 10.4.2 through 10.4.6***, followed by ***examples A through E***.

10.2 CONCLUSIONS

10.2.1 Findings

As you analyze the special investigation's issues, develop a logical argument for action. Conclude each section with a firm statement (finding) of the Safety Board's position on the issue and recommend action.

An easy way to develop the conclusions section is by reading through the report and copying its conclusionary statements. Make minor revisions for clarity, if necessary.

10.2.2 Probable Cause

Some special investigation reports contain a determination of probable cause. This paragraph, which summarizes the conclusions reached about the special investigation, may be freestanding, as in a major accident report, or be integral to the analysis leading to report's conclusions.

10.3 RECOMMENDATIONS

10.3.1 Writing Tips

~~A recommendation is the culmination of the discussion in **ANALYSIS** of a safety issue Each recommendation must have a corresponding conclusion.~~ To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action, rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. Do not write "throwaway" recommendations~~, which are recommendations~~ that ask an organization to do what it is already doing or is required to do. In addition:

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (X-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as “ensure that.”

- Use consistent language.

10.3.2 Previous and Reiterated Recommendations

R~~The decision on how and where to discuss earlier r~~ecommendations made during a special investigation’s development or as the result of a past investigation (related or reiterated recommendations) should be discussed in the report. When discussing such recommendations, restate the recommendation, describe the recipients’ reply, describe the Safety Board’s response to the reply, and give the recommendation’s status. Format and presentation are~~is~~ determined~~made~~ on a case-by-case basis. An editor can help. ~~If recommendations were issued during the investigation, you have two options:~~

- ~~If the earlier recommendations were discussed thoroughly in **ANALYSIS,** restate them at the beginning of this section. Although restating the recommendations is repetitive, it is more convenient for readers to have all recommendations listed in one section.~~

- ~~If the earlier recommendations were not discussed in **ANALYSIS**, restate them, describe the recipients’ replies, describe the Safety Board’s response to the replies, and give the status of the recommendations.~~

10.3.3 Order of Recommendations and Approval Information

The normal order for safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or Governor,
- companies and organizations, and
- reiterated recommendations.

A

pproval information usually comes immediately after the recommendations, followed by any dissenting or concurring statements. (For more on dissenting and concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

10.4 DRAFT AND PUBLISHED REPORT FORMAT

10.4.1 Manuscript Standards

Type documents in Microsoft Word using 12-point Times New Roman font. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label "draft."

To facilitate review, also include a table of contents. The figures, tables, and charts should be numbered consecutively, and the appendixes should be lettered consecutively.

For the format of published report elements, such as the front and back covers, the abstract and the mission statement on the inside front cover, the title page, the table of contents, and **Introduction**, see ***paragraphs 10.4.2 through 10.4.6***, followed by ***examples A through E***.

10.4.2 Front and Back Covers

Covers for special investigation reports should follow the standard format for accident reports and safety studies.

The front cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order number).

- Report number (provided by RE-50). Format the number as follows: NTSB/SIR-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the SIR series for that year).

- Report title.

See ***example A*** for a front cover from a safety report. The back cover is blank, except for the Safety Board's mailing frank.

10.4.3 Abstract (Inside Front Cover)

The editor writes the abstract from information in the Introduction. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. (See ***example B***.) The abstract appears on the inside front cover.

10.4.4 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover. (See ***example B***.)

10.4.5 Title Page

In addition to the report title, include the adoption date and the notation number. (See ***example C***.)

10.4.6 Table of Contents and Introduction

As mentioned at the beginning of this chapter, follow the format for accident reports and safety studies. (See ***examples D and E***.)

10.5 SELECTIVE LIST OF SPECIAL INVESTIGATION REPORTS

The following list includes only special investigation reports that are considered to be useful examples of format and content. Special investigation reports published after 1995 can be found on the Safety Board's Web site under *Publications*.

Aviation

NTSB/SIR-96/03
Robinson Helicopter Company R22 Loss of Main Rotor Control Accidents

Highway

NTSB/SIR-99/04
Bus Crashworthiness Issues

NTSB/SIR-98/03
Transit Bus Safety Oversight

Marine

NTSB/SIR-93/01
Accidents Involving Foreign Passenger Ships Operating From U.S. Ports 1990-1991

Pipeline and Hazardous Materials

NTSB/SIR-98/01
Brittle-Like Cracking in Plastic Pipe for Gas Service

NTSB/SIR-96/04
Evaluation of Pipeline Failures During Flooding and of Spill Response Actions, San Jacinto River, Near Houston, Texas, October 1994

Railroad

NTSB/SIR-99/03
Northern Indiana Commuter Transportation District Railroad Safety Assessment

NTSB/SIR-96/05
Steam Locomotive Firebox Explosion on the Gettysburg Railroad Near Gardners, Pennsylvania, June 16, 1995

A. EXAMPLE OF FRONT COVER

(not actual size)

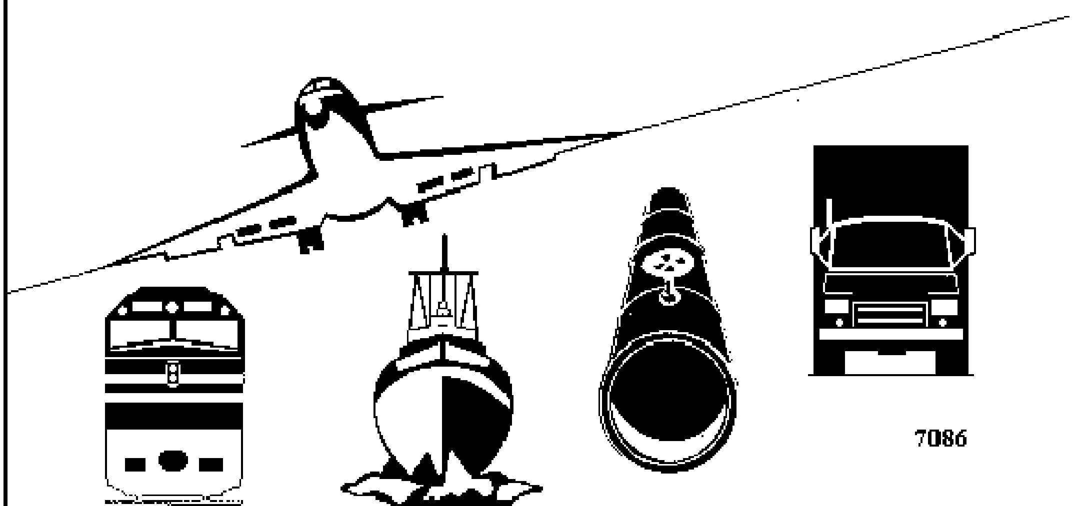
PB98-917006
NTSB/SIR-98/03

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

HIGHWAY SPECIAL INVESTIGATION REPORT

TRANSIT BUS SAFETY OVERSIGHT



7086

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. 1999. *Transit Bus Safety Oversight.* Special Investigation Report NTSB/SIR-98/03. Washington, DC.

After the National Transportation Safety Board conducted several accident investigations involving transit buses (Normandy, Missouri; Cosmopolis, Washington; New York, New York; and Nashville, Tennessee) and held a public hearing on transit bus safety in March 1998, it found that substantial safety deficiencies and little Federal or State government safety oversight existed within the transit bus industry. During the public hearing, participants discussed transit agency self-regulation, the extent of Federal and State safety oversight, accident data, pupil transportation, and driver selection and qualification.

The findings from the public hearing and from the four accident investigations formed the basis for this special investigation report. The safety issues discussed in this report are the Federal and State safety oversight of transit bus operations, adequacy of transit bus accident data to identify potential safety issues, and safety program guidelines for transit operators.

As a result of its investigation, the National Transportation Safety Board issued recommendations to the U.S. Department of Transportation, American Public Transit Association, Community Transportation Association of America, and American Association of State Highway and Transportation Officials.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at <http://www.ntsb.gov/>. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB98-917006** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Highway Special Investigation Report

Transit Bus Safety Oversight

NTSB/SIR-98/03
PB98-917006
Notation 7086
Adopted: November 17, 1998

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

E. EXAMPLE OF INTRODUCTION

(not actual size)

Introduction

Recently, the National Transportation Safety Board has investigated transit bus[1] accidents in Normandy, Missouri; Cosmopolis, Washington; New York, New York; and Nashville, Tennessee.[2] The Normandy, New York, and Nashville accidents exposed various operational deficiencies such as unqualified drivers, drivers with hazardous medical conditions, inadequate maintenance practices, and the operation of buses with mechanical defects. The Cosmopolis accident revealed that certain laws and school transportation safety operational practices are not applicable to transit operations.[3] Had these deficiencies been found during other types of bus operations,[4] which fall under Federal and State government safety regulations, sanctions could have been imposed, such as assessing fines, taking the buses out of service, or suspending the company operations. However, no such Federal regulations are in place for transit buses. Of the four accident locations, only New York conducts some type of oversight of transit bus operations.

As a result of the Normandy, Missouri, accident in which four pedestrians were killed and three injured, the Safety Board held a public hearing on March 3 and 4, 1998, to determine the extent of transit bus safety oversight. During the public hearing, witnesses representing State and Federal government agencies testified, as well as representatives from several transit agencies, member service organizations, and State associations. The participants in the hearing discussed transit agency self-regulation, the extent of Federal

[1]Defined as a vehicle that operates primarily in local scheduled route service at lower speeds and frequently loads and unloads passengers. These buses are manufactured with space and accommodations, such as support bars or straps to use as hand-holds, for standing passengers. Transit bus operations are generally publicly funded.

[2]Highway Accident Summary Report – *Transit Bus Collision with Pedestrians, Normandy, Missouri, June 11, 1997* (NTSB/HAR-98/01/SUM); Highway Accident/Incident Summary Report – *Collision with a Pedestrian by a Utility Truck near Cosmopolis, Washington, November 26, 1996* (NTSB/HAR-97/01/SUM); and National Transportation Safety Board Accident Investigations – *Transit Bus Collision with Pedestrian in New York City, New York, October 2, 1997* (HWY98FH019) and *Transit Bus Collision with Multiple Vehicles in Nashville, Tennessee, August 31, 1998* (HWY98FH042).

[3]Laws that require traffic to stop for school buses that are loading or discharging students are not in effect for transit buses. A transit bus is neither painted yellow, equipped with stop arms or bars, nor required to have its driver ensure that children are safely out of the roadway after exiting the bus.

[4]Interstate motor coach or charter buses.

and State oversight, accident data, pupil transportation, and driver selection and qualification.

The findings from the public hearing and from the accident investigations form the basis for this special investigation report, which addresses the following safety issues:

- Federal and State safety oversight of transit bus operations,
- adequacy of transit bus accident data to identify potential safety issues, and
- safety program guidelines for transit operators.

As a result of its investigation, the Safety Board makes safety recommendations to the U.S. Department of Transportation (DOT), the American Public Transit Association (APTA),[5] the Community Transportation Association of America (CTAA),[6] and the American Association of State Highway and Transportation Officials (AASHTO).[7]

[5]A nonprofit organization that serves members of transit systems, rail systems, manufacturers, universities, and State departments of transportation. APTA has over 1,100 members, 400 of which are transit agencies that serve over 90 percent of the people who use public transportation in the United States and Canada. These transit agencies make approximately 13.5 million passenger trips per day on the bus system alone.
[6]A national organization that represents rural transit agencies.
[7]An advocate organization of multimodal and intermodal transportation that serves State departments of transportation, the DOT, and Congress to ensure safe transportation, mobility, and economic prosperity.

CHAPTER 11

SAFETY STUDY

CONTENTS

11.1 OVERVIEW

A safety study usually examines safety issues that require the investigation of a number of related accidents to determine the extent and severity of the safety issues. Safety studies are often published in two volumes, with the first volume containing facts, analysis, conclusions, and recommendations and the second volume containing briefs or case summaries of the accidents investigated. Each year, the Board approves a safety study plan that summarizes ongoing and proposed safety studies for the next fiscal year.

A safety study is similar to an accident report in that it reports and analyzes facts, draws conclusions, and makes recommendations. *A safety study differs from an accident report* in the following ways:

- It usually involves more than one accident investigation.
- It does not contain a determination of probable cause.[1]
- It is jointly written by technical specialists in the Office of Research and Engineering and relevant modal offices.

A safety study is similar to a special investigation report in that it focuses on a safety issue rather than a determination of probable cause. *A safety study differs from a special investigation report* in the following ways:

- It usually addresses major issues of national public interest in terms of media coverage and congressional attention and has more safety recommendations overall.
- It must be approved by the Board Members before beginning.

[1] Note that briefs or case summaries supporting a study can have probable causes. A case summary containing a probable cause is considered to be similar to an accident brief. For further guidance on briefs of accident and case summaries, see chapters 13 and 14.

11.1.1 Organization

Because of the variety of approaches used in carrying out a safety study, no standard format exists. However, some general guidelines are practiced. Safety studies are normally written in chapters, with each chapter devoted to an issue and containing both facts and analysis. In addition, safety studies generally include the **INTRODUCTION** and **METHODOLOGY** as the first two chapters and the **CONCLUSIONS** and **RECOMMENDATIONS** as the last two chapters.

The **INTRODUCTION** normally:

- summarizes one or more typical accidents to illustrate some of the safety issues,
- provides an overview of the transportation system being discussed in the report,
- summarizes previous Board reports on this subject, and
- states the purpose of the report.

The **METHODOLOGY** normally:

- contains selection and notification criteria,
- discusses investigative procedures, and
- provides an overview of study sample.

Before writing the rest of the report, make a report outline. Choose chapter and section headings with care and follow a logical organization. Discuss the outline with an editor or report writer and with your division chief. Have them review your work frequently during the writing process to ensure that the organization is effective. Provide only the information that is appropriate and necessary for the report. Eliminate unnecessary details that detract from the safety message that you are communicating.

11.1.2 Format

Whenever possible, safety studies should be similar in appearance to accident reports, special investigation reports, and safety reports. Safety reports normally include standard elements such as the front and inside front covers, title page, table of contents, and **Executive Summary**. (For more detailed information, see ***paragraphs 11.4.2 through 11.4.6***, followed by ***examples A through E.***)

11.2 CONCLUSIONS

In general, write conclusions for a safety study as you would for any other type of report. As you analyze the report's issues, develop a logical argument for action. Conclude each section with a firm statement (finding) of the Safety Board's position on the issue and recommend action, if appropriate.

However, safety reports can differ from other types of accident reports in their approach to conclusions. For instance, unlike other Board reports, safety studies often contain factual statements as conclusions. For example:

> Securing a child restraint system properly in the vehicle is complicated by several incompatibilities related to the design of child restraint systems and vehicles and vehicle seatbelts.

11.3 RECOMMENDATIONS

11.3.1 Writing Tips

~~A recommendation is the culmination of the discussion in **ANALYSIS** of a safety issue Each recommendation must have a corresponding conclusion.~~ To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action, rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. Do not write "throwaway" recommendations~~, which are recommendations~~ that ask an organization to do what it is already doing or is required to do. In addition:

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (X-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as "ensure that."

- Use consistent language.

11.3.2 Previous and Reiterated Recommendations

R~~The decision on how and where to discuss earlier r~~ecommendations made during a safety report's development or as the result of a past investigation (related or reiterated recommendations) should be discussed in the report. When discussing such a recommendation, restate the recommendation, describe the recipient's reply, describe the Safety Board's response to the reply, and give the recommendation's status. Format and presentation are~~is~~ determined~~made~~ on a case-by-case basis. An editor can help. ~~If recommendations were issued during the investigation, you have two options:~~

- ~~If the earlier recommendations were discussed thoroughly in **ANALYSIS,** restate them at the beginning of this section. Although restating the recommendations is repetitive, it is more convenient for readers to have all recommendations listed in one section.~~

- ~~If the earlier recommendations were not discussed in **ANALYSIS**, restate them, describe the recipients' replies, describe the Safety Board's response to the replies, and give the status of the recommendations.~~

11.3.3 Order of Recommendations and Approval Information

The normal order for safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or Governor,
- companies and organizations, and
- reiterated recommendations.

The signature block generally follows the format used for other reports; however, some reports such as *We Are All Safer* and *National Transportation Safety Board: 30 Years of Transportation Safety*, place the Members' names in the front of the publication, eliminating the need for a signature block.

A

pproval information usually comes immediately after the recommendations, followed by any dissenting or concurring statements. (For more on dissenting and concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

11.4 DRAFT AND PUBLISHED REPORT FORMAT

11.4.1 Manuscript Standards

Type documents in Microsoft Word using 12-point Times New Roman. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label "draft."

To facilitate review, also include a table of contents. The figures, tables, and charts should be numbered consecutively, and the appendixes should be lettered consecutively.

For the format of published report elements, such as the front and back covers, the abstract and the mission statement on the inside front cover, the title page, the table of contents, and the Executive Summary, see ***paragraphs 11.4.2 through 11.4.6***, followed by ***examples A through E***.

11.4.2 Front and Back Covers

Covers for safety reports should follow the standard format for accident reports, special investigation reports, and safety studies. However, a safety report may use special artwork or an appropriate photo where the modal artwork appears on the cover of the other reports. Such artwork accommodates the report's individuality while ensuring that it conforms to an overall standard.

The front cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order number).

- Report number (provided by RE-50). Format the number as follows: NTSB/SS-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the HAR series for that year).

- Report title.

See ***example A*** for a front cover from a safety report. The back cover is blank, except for the Safety Board's mailing frank.

11.4.3 Abstract (Inside Front Cover)

The editor writes the abstract from information in the **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. (See ***example B***.) The abstract appears on the inside front cover.

11.4.4 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover. (See ***example B***.)

11.4.5 Title Page

In addition to the report title, include the adoption date and the notation number. (See ***example C***.)

11.4.6 Table of Contents and Executive Summary

As mentioned at the beginning of this chapter, follow the format for accident reports, special investigation reports, and safety studies. (See ***examples D and E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

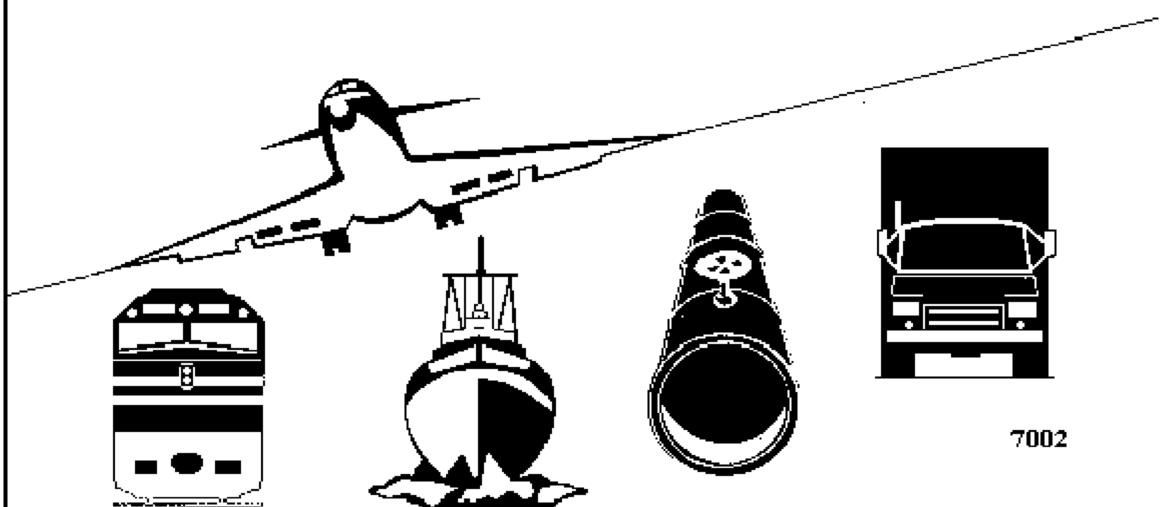
PB98-917002
NTSB/SS-98/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

SAFETY STUDY

PERSONAL WATERCRAFT SAFETY



7002

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. 1998. *Personal Watercraft Safety*. Safety Study NTSB/SS-98/01. Washington, DC.

Personal watercraft (PWC) are a type of recreational boat that has become increasingly popular in recent years. Manufacturers estimate that about 200,000 PWC are sold each year and that more than 1 million are in current operation. Although the overall number of recreational boating fatalities has been declining in recent years, the number of personal watercraft-related fatalities has been increasing. PWC are the only type of recreational vessel for which the leading cause of fatalities is not drowning; in PWC fatalities, more persons die from blunt force trauma than from drowning. The National Transportation Safety Board initiated this study to more closely examine fatalities and injury in addition to accident characteristics associated with PWC accidents. The study was not designed to estimate how often PWC accidents occur, nor are the results of the study necessarily representative of all PWC accidents. The Safety Board analyzed 814 (one-third) of the 1997 reported accidents and examined all of the data for the 1996 reported accidents, which the Board believes provided a substantial number of accidents to identify the most important safety issues associated with PWC accidents. The safety issues discussed in the report include (a) protecting PWC riders from injury; (b) PWC operator experience and training; and (c) boating safety standards. The study also addressed the need for recreational boating exposure data. Safety recommendations concerning these issues were made to the manufacturers of PWC, the U.S. Coast Guard, the Coast Guard Auxiliary, the U.S. Power Squadrons, BOAT/U.S., the National Association of State Boating Law Administrators, the Personal Watercraft Industry Association, and the States and Territories.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at <http://www.ntsb.gov/>. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB98-917002** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Safety Study

Personal Watercraft Safety

NTSB/SR-98/01
PB98-917002
Notation 7002
May 19, 1998

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

Conversion Factors for International System of Units (SI)

To convert from	*to*	*multiply by*
centimeter (cm)	inch (in)	0.3937
cubic centimeter (cc or cm^3)	cubic inch (in^3)	0.06102374
foot (ft)	meter (m)	0.3048
horsepower (550 ft · lbs/s) (hp)	watt (W)	745.6999
inch (in)	centimeter (cm)	2.54
knot (nautical mile per hour)	meter per second (m/s)	0.5144444
mile (nautical)	meter (m)	1852.0
mile (U.S. statute)	kilometer (km)	1.609344
pound (lb)	kilogram (kg)	0.4535924
yard (yd)	meter (m)	0.9144

Acronyms Used in the Report

ANPRM	advance notice of proposed rulemaking
CFR	*Code of Federal Regulations*
DOT	U.S. Department of Transportation
NASBLA	National Association of State Boating Law Administrators
NPRM	notice of proposed rulemaking
PWC	personal watercraft
PWIA	Personal Watercraft Industry Association
U.S.C.	*United States Code*
USCG	U.S. Coast Guard

Executive Summary

Personal watercraft (PWC) are a type of recreational boat that has become increasingly popular in recent years. Manufacturers estimate that about 200,000 PWC are sold each year and that more than 1 million are in current operation. PWC now account for more than one-third of the new recreational boat sales in the United States.

Although the overall number of recreational boating fatalities has been declining in recent years, the number of personal watercraft-related fatalities has been increasing. At the time of the National Transportation Safety Board's 1993 recreational boating safety study, there were only 26 personal watercraft fatalities a year, and the Safety Board did not believe that separate consideration of PWC was warranted. However, in 1994, the number of PWC fatalities began to increase noticeably because the number of PWC in operation increased. Preliminary numbers for 1997 indicate 83 PWC fatalities. PWC are the only type of recreational vessel for which the leading cause of fatalities is not drowning; in PWC fatalities, more persons die from blunt force trauma than from drowning. The increase in fatalities and the distinctive way in which fatalities occur prompted the Safety Board to examine the nature of PWC accidents.

The Safety Board initiated the current study to more closely examine fatalities and injury in addition to accident characteristics associated with PWC accidents. The study was not designed to estimate how often PWC accidents occur. For PWC accidents that occurred between January and June 1997, the Safety Board requested that State marine accident investigators provide the Safety Board with copies of their accident reports and complete a supplemental questionnaire prepared by the Safety Board specifically for this study. The goal of the supplemental questionnaire was to obtain additional information concerning the accident characteristics and details concerning personal injury that have not previously been available from State boating accident reports. State accident reports and supplemental information were the sources of the Safety Board's accident information.

The Safety Board also reviewed State reports of PWC accidents that occurred in 1996. A total of 49 States and Territories provided either copies of their boating accident report forms, automated boating accident report database files, or summary information for 1996 and/or 1997.

Because the States voluntarily provided the Safety Board with accident reports and supplemental questionnaire information, and because of the incomplete nature of much of the information, the Safety Board does not claim that the results of the study are representative of all PWC accidents. The Safety Board analyzed 814 (one-third) of the 1997 reported accidents and examined all of the data for the 1996 reported accidents. Consequently, the Board believes that a substantial number of accidents was available to identify the most important safety issues associated with PWC accidents. Further, the Safety Board's analysis did not show any biases in the types of accidents in the half-year of 1997 accidents compared to the full year of 1996 accidents. The Safety Board's interest in truncating the 1997 data collection period to 6 months was based on a goal of providing the results of this study prior to the 1998 summer boating season.

Based on the analysis of the data reviewed, the safety issues discussed in this report include the following:

- protecting personal watercraft riders from injury,
- operator experience and training, and
- boating safety standards.

The study also addressed the need for recreational boating exposure data.

As a result of this study, recommendations were issued to the manufacturers of personal watercraft, the U.S. Coast Guard, the U.S. Coast Guard Auxiliary, the U.S. Power Squadrons, BOAT/U.S., the National Association of State Boating Law Administrators, the Personal Watercraft Industry Association, and the States and Territories. The recommendations focus on the safe operation of personal watercraft.

CHAPTER 12

SAFETY REPORT

CONTENTS

12.1 OVERVIEW

Safety reports are safety issue-related publications with content or format that may not be appropriate for an accident report, a special investigation report, or a safety study. To address a particular issue, a safety report could synthesize information from various sources, summarize safety recommendations, update relevant Government and industry activity, or perhaps all of these, depending on the report's purpose. Although not all safety reports have new recommendations, most normally have findings. Some recent examples of safety reports are:

- *We Are All Safer*;
- *National Transportation Safety Board: 30 Years of Transportation Safety*; and
- *Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue*.

Whenever possible, safety reports should be similar in appearance to accident reports, special investigation reports, and safety studies and include standard elements such as the front and inside front covers, title page, table of contents, and **Executive Summary**. (See ***paragraph 12.4***, followed by ***examples A through E***.) Some flexibility is permitted, however, to accommodate a particular report's special needs. For example, a safety report could have a divider page before each major section to help unify disparate parts.

12.2 CONCLUSIONS

In general, write conclusions for a safety report as you would for any other type of report. As you analyze the report's issues, develop a logical argument for action. Conclude each section with a firm statement (finding) of the Safety Board's position on the issue and recommend action, if appropriate.

However, safety reports can differ from other types of accident reports in their approach to conclusions. For example:

- Like safety studies, a safety report may have factual statements as conclusions.

- A safety report that is a compilation of numerous issues, such as *We Are All Safer*, may have a general summary conclusion or no conclusions.

12.3 RECOMMENDATIONS

If recommendations are included in a safety report, they should follow the guidelines for recommendations in other types of reports, as noted below.

12.3.1 Writing Tips

~~A recommendation is the culmination of the discussion in **ANALYSIS** of a safety issue Each recommendation must have a corresponding conclusion.~~ To determine whether you have an effective recommendation, ask yourself these questions: How would I respond to this recommendation? Is the requested action clear? Is it realistic?

Each recommendation should deal with a single action, rather than a series of actions, even if the resulting series of recommendations leads to one result or covers one subject. Do not write "throwaway" recommendations~~, which are recommendations~~ that ask an organization to do what it is already doing or is required to do. In addition:

- Begin recommendations with an active verb. (See Board Order 70, *NTSB Safety Recommendations Program*, for more information on safety recommendations.)

- Follow each recommendation with (H-**-00), which indicates the mode, calendar year, and number of the recommendation. (The year and number will be provided by the Executive Secretariat, MD-5, after the report is adopted.)

- Do not use abbreviations.

- Be brief and specific, avoiding such vague phrases as "ensure that."

- Use consistent language.

12.3.2 Previous and Reiterated Recommendations

R~~The decision on how and where to discuss earlier r~~ecommendations made during a safety report's development or as the result of a past investigation (related or reiterated recommendations) should be discussed in the report. When discussing such recommendations, restate the recommendation, describe the recipients' reply, describe the Safety Board's response to the reply, and give the recommendation's status. Format and presentation are~~is~~ determined~~made~~ on a case-by-case basis. An editor can help. ~~If recommendations were issued during the investigation, you have two options:~~

- ~~If the earlier recommendations were discussed thoroughly in **ANALYSIS,** restate them at the beginning of this section. Although restating the recommendations is repetitive, it is more convenient for readers to have all recommendations listed in one section.~~

- ~~If the earlier recommendations were not discussed in **ANALYSIS**, restate them, describe the recipients' replies, describe the Safety Board's response to the replies, and give the status of the recommendations.~~

12.3.3 Order of Recommendations and Approval Information

The normal order for safety recommendations follows:

- Secretary of Transportation,
- Federal agency,
- State agency or Governor,
- companies and organizations, and
- reiterated recommendations.

The signature block generally follows the format used for other reports; however, some reports such as *We Are All Safer* and *National Transportation Safety Board: 30 Years of Transportation Safety*, place the Members' names in the front of the publication, eliminating the need for a signature block.

A

pproval information usually comes immediately after the recommendations, followed by any dissenting or concurring statements. (For more on dissenting and concurring statements, see Board Order 4, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.) Format the approval block as follows:

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JAMES E. HALL **Chairman**	**JOHN A. HAMMERSCHMIDT** **Member**
ROBERT T. FRANCIS II **Vice Chairman**	**JOHN J. GOGLIA** **Member**
	GEORGE W. BLACK, JR. **Member**

Adopted: [insert date]

12.4 DRAFT AND PUBLISHED REPORT FORMAT

12.4.1 Manuscript Standards

Type documents in Microsoft Word using 12-point Times New Roman font. All drafts should be double spaced and have line and page numbers. Until the report is adopted by the Board, each page of the draft should have a header containing the date of the report version and the label "draft."

To facilitate review, also include a table of contents. The figures, tables, and charts should be numbered consecutively, and the appendixes should be lettered consecutively.

For the format of published report elements, such as the front and back covers, the abstract and the mission statement on the inside front cover, the title page, the table of contents, and the Executive Summary, see ***paragraphs 12.4.2 through 12.4.6***, followed by ***examples A through E***.

12.4.2 Front and Back Covers

Covers for safety reports should follow the standard format for accident reports, special investigation reports, and safety studies. However, a safety report may use special artwork or an appropriate photo where the modal artwork appears on the cover of the other reports. Such artwork accommodates the report's individuality while ensuring that it conforms to an overall standard.

The front cover contains the following information:

- National Technical Information Service (NTIS) order number (provided by the MD-20 printing specialist after adoption). Format the number as follows: PB**- 000000 (the ** indicates the last two digits of the calendar year, and the 000000 indicates the NTIS order number).

- Report number (provided by RE-50). Format the number as follows: NTSB/SR-**/00 (the ** indicates the last two digits of the calendar year, and the 00 indicates the report's sequence in the SR series for that year).

- Report title.

See ***example A*** for a front cover from a safety report. The back cover is blank, except for the Safety Board's mailing frank.

12.4.3 Abstract (Inside Front Cover)

The editor writes the abstract from information in the **Executive Summary**. The NTIS suggests, for data input reasons, that the abstract not exceed 15 lines. (See ***example B***.) The abstract appears on the inside front cover.

12.4.4 Mission Statement (Inside Front Cover)

The Safety Board's mission statement and publication information appear on the inside front cover. (See ***example B***.)

12.4.5 Title Page

In addition to the report title, include the adoption date and the notation number. (See ***example C***.)

12.4.6 Table of Contents and Executive Summary

As mentioned at the beginning of this chapter, follow the format for accident reports, special investigation reports, and safety studies. (See ***examples D and E***.)

A. EXAMPLE OF FRONT COVER

(not actual size)

Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue

Safety Report
NTSB/SR-99/01

May 1999
PB99-917002
Notation 7155

National Transportation Safety Board
Washington, D.C.

B. EXAMPLE OF INSIDE FRONT COVER

(not actual size)

National Transportation Safety Board. 1999. *Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue.* Safety Report NTSB/SR-99/01. Washington, DC.

During the 1980s, the National Transportation Safety Board investigated several aviation, highway, and marine accidents that involved operator fatigue. Following completion of these investigations, the Safety Board in 1989 issued three recommendations to the U.S. Department of Transportation (DOT) addressing needed research, education, and revisions to hours-of-service regulations. In the 10 years that have passed, the Safety Board has issued more than 70 additional recommendations to the DOT, States, industry, and industry associations to reduce the incidence of fatigue-related accidents. In response to the three 1989 recommendations, the DOT and the modal administrations have, in general, acted and responded positively to those addressing research and education; little action, however, has occurred with respect to revising the hours-of-service regulations. Nevertheless, the Safety Board believes that support has grown in recent years to make substantive changes to these regulations. This report provides an update on the activities and efforts by the DOT and the modal administrations to address operator fatigue and, consequently, the progress that has been made in the past 10 years to implement the actions called for in the three intermodal recommendations and other fatigue-related recommendations. The report also provides some background information on current hours-of-service regulations, fatigue, and the effects of fatigue on transportation safety. As a result of this safety report, the National Transportation Safety Board issued new safety recommendations to the U.S. Department of Transportation, the Federal Aviation Administration, the Federal Highway Administration, the Federal Railroad Administration, the Research and Special Programs Administration, and the U.S. Coast Guard. The Safety Board also reiterated two recommendations to the Federal Aviation Administration.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at <http://www.ntsb.gov/>. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB99-917002** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

C. EXAMPLE OF TITLE PAGE

(not actual size)

Safety Report

Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue

NTSB/SR-99/01
PB98-917002
Notation 7155
Adopted: May 17, 1999

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

Acronyms Used in the Report

AAA	American Automobile Association
ANPRM	advance notice of proposed rulemaking
ARAC	Aviation Rulemaking Advisory Committee
ASRS	Aviation Safety Reporting System
CFR	*Code of Federal Regulations*
DOT	U.S. Department of Transportation
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GT	gross ton
NASA	National Aeronautics and Space Administration
NHTSA	National Highway Traffic Safety Administration
NPRM	notice of proposed rulemaking
RSPA	Research and Special Programs Administration
U.S.C.	*United States Code*
USCG	U.S. Coast Guard

E. EXAMPLE OF EXECUTIVE SUMMARY

(not actual size)

Executive Summary

During the 1980s, the National Transportation Safety Board investigated several aviation, highway, and marine accidents that involved operator fatigue. Following completion of these accident investigations, the Safety Board in 1989 issued three recommendations to the U.S. Department of Transportation (DOT) addressing needed research, education, and revisions to hours-of-service regulations.

Ten years have passed since these safety recommendations were issued. In the interim, the Safety Board has issued more than 70 additional recommendations to the DOT, States, industry, and industry associations to reduce the incidence of fatigue-related accidents. In response to the three 1989 recommendations, the DOT and the modal administrations have, in general, acted and responded positively to the recommendations addressing research and education; little action, however, has occurred with respect to revising the hours-of-service regulations. Nevertheless, the Safety Board believes that support has grown in recent years to make substantive changes to these regulations.

This report provides an update on the activities and efforts by the DOT and the modal administrations to address operator fatigue and, consequently, the progress that has been made in the past 10 years to implement the actions called for in the three intermodal recommendations and other fatigue-related recommendations. The report also provides some background information on current hours-of-service regulations, fatigue, and the effects of fatigue on transportation safety.

As a result of this safety report, the National Transportation Safety Board issued new safety recommendations to the U.S. Department of Transportation, the Federal Aviation Administration, the Federal Highway Administration, the Federal Railroad Administration, the Research and Special Programs Administration, and the U.S. Coast Guard. The Safety Board also reiterated two recommendations to the Federal Aviation Administration.

CHAPTER 13

ACCIDENT BRIEF

CONTENTS

13.1 OVERVIEW

An accident brief is a short narrative of an accident investigation. The following table shows at a glance how the briefs are handled in each mode:

Mode	Prepared by	Approved by[1]	Published?
Aviation	AS-10	AS-1	yes[2]
Highway	HS-1	HS-1	yes[3]
Marine	MS-1	MS-1	yes[3]
Railroad/Pipeline/ Hazardous Materials	RPH-1	RPH-1	yes[3]

[1]Approved by office directors except as noted in 49 *Code of Federal Regulations* (CFR) 800.25.

[2]Contained in the Safety Board's aviation database, and availability noted on the Safety Board's Web site.

[3]Placed on the Safety Board's Web site.

Although the brief format may be used to report on any accident, it is generally used only for accidents that do not generate a major accident report.

The office director may determine the probable cause for briefs of accident except when, as noted in 49 CFR 800.25(c):

> …(1) any Board Member so requests, (2) it appears to the Office Director that, because of significant public interest, a policy issue, or a safety issue of other matter, the determination of the probable cause(s) should be made by the Board, or (3) the accident investigation will be used to support findings in a special investigation or study.

Briefs to go before the Safety Board in accordance with 49 CFR 800.25(c) are normally approved by voting record in the Board Members' offices. However, in certain cases, briefs can be voted upon at a Board meeting, such as when the briefs are generated by high-profile aviation accidents or published with a special investigation report or a safety study.

Whenever possible, a brief in support of a stand-alone recommendation letter, regardless of who approves the brief, should be presented for the Board Member's consideration when the letter goes on notation.

13.2 MODAL FORMAT AND CONTENT

13.2.1 Aviation

Aviation briefs are published (periodically) by the Office of Aviation Safety in coordination with the Office of Managing Director. They are generated by computer in a format specific to the Office of Aviation Safety with standard data entries. Aviation briefs list causal elements and have a probable cause. They do not contain safety recommendations. See ***example A*** for an aviation mode accident brief.

13.2.2 Highway

Highway accident briefs can be used to support a stand-alone safety recommendation letter, safety study, or special investigation report. However, in recent years, the Office of Highway Safety has produced case summaries instead of briefs, which can contain a probable cause, making them similar to briefs. Case summaries have been published recently in special investigation reports and safety studies. (For more information on case summaries, see ***chapter 14***.)

Highway accident briefs should follow the format of other surface mode accident briefs, which usually consist of a short narrative of the accident followed by a probable cause and a list of safety recommendations. The narrative is normally limited to factual information but may contain some analytical statements so that the reader can understand the probable cause and recommendations. All briefs are numbered according to mode (for instance, HAB/99-01) and contain an "Adopted: (date)" line after the probable cause.

See ***example B*** for a surface mode accident brief. For other examples of accident briefs published after 1995, see the *Publications* section of the Safety Board's Web site.

13.2.3 Marine

Marine briefs can be used to support a stand-alone safety recommendation letter, safety study, or special investigation report. A brief usually consists of a short narrative of the accident followed by a probable cause and a list of safety recommendations. The narrative is normally limited to factual information but may contain some analytical statements so that the reader can understand the probable cause and recommendations. All briefs are numbered according to mode (for instance, MAB/99-01) and contain an "Adopted: (date)" line after the probable cause.

See ***example B*** for a surface mode accident brief. For other examples of accident briefs published after 1995, see the *Publications* section of the Safety Board's Web site.

13.2.4 Pipeline and Hazardous Materials

Pipeline briefs and hazardous materials briefs can be used to support a stand-alone safety recommendation letter, safety study, or special investigation report. A brief usually consists of a short narrative of the accident followed by a probable cause and a list of safety recommendations. The narrative is normally limited to factual information but may contain some analytical statements so that the reader can understand the probable cause and recommendations. All briefs are numbered according to mode (for instance, PAB/99-01 or HZB/99-01) and contain an "Adopted: (date)" line after the probable cause.

See ***example B*** for a surface mode accident brief. For other examples of accident briefs published after 1995, see the *Publications* section of the Safety Board's Web site.

13.2.5 Railroad

Railroad briefs can be used to support a stand-alone safety recommendation letter, safety study, or special investigation report. A brief usually consists of a short narrative of the accident followed by a probable cause and a list of safety recommendations. The narrative is normally limited to factual information but may contain some analytical statements so that the reader can understand the probable cause and recommendations. All briefs are numbered according to mode (for instance, RAB/99-01) and contain an "Adopted: (date)" line after the probable cause.

See ***example B*** for a surface mode accident brief. For other examples of accident briefs published after 1995, see the *Publications* section of the Safety Board's Web site.

A. EXAMPLE OF AVIATION BRIEF

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

BRIEF OF ACCIDENT

ADOPTED 09/27/1994

NYC93FA118

FILE NO. 1804	06/18/93	MARTHAS VINEYARD, MA	AIRCRAFT REG. NO. N73CE	TIME (LOCAL) - 15:50 EDT

MAKE/MODEL	- CESSNA P210		FATAL	SERIOUS	MINOR/NONE
ENGINE MAKE/MODEL	- CONTINENTAL TSIO-520-P	CREW	1	0	0
AIRCRAFT DAMAGE	- DESTROYED				
NUMBER OF ENGINES	- 1	PASS	2	0	0
OPERATING CERTIFICATES	- NONE				
TYPE OF FLIGHT OPERATION	- PERSONAL				
REGULATION FLIGHT CONDUCTED UNDER	- 14 CFR 91				

LAST DEPARTURE POINT	- SAME AS ACCIDENT	CONDITION OF LIGHT	- DAYLIGHT
DESTINATION	- BEDFORD, MA		
		WATER INFO SOURCE	- WEATHER OBSERVATION FACILITY
AIRPORT PROXIMITY	- OFF AIRPORT/AIRSTRIP		
AIRPORT NAME	-VINEYARD HAVEN	BASIC WEATHER	- INSTRUMENT (IMC)
RUNWAY IDENTIFICATION	- 24	LOWEST CEILING	- 300 FT OBSCURED
RUNWAY LENGTH/WIDTH (Feet)	- 5499/ 150	VISIBILITY	- 0001.500.SM
RUNWAY SURFACE	- MACADAM	WIND DIR/SPEED	-230/012 KTS
RUNWAY SURFACE CONDITION	- DRY	TEMPERATURE (F)	- 67
		OBSTR TO VISION	- FOG
		PRECIPITATION	- UNK/NR

PILOT-IN-COMMAND	AGE - 62	FLIGHT TIME (HOURS)	
CERTIFICATES/RATINGS		TOTAL ALL AIRCRAFT	- 690
PRIVATE		LAST 90 DAYS	- UNK/NR
SINGLE-ENGINE LAND		TOTAL MAKE/MODEL	- UNK/NR
INSTRUMENT RATINGS		TOTAL INSTRUMENT TIME	- 200
AIRPLANE			

SHORTLY AFTER TAKEOFF THE PILOT CONTACTED ATC AND REPORTED HE WAS AT 400 FT. AFTER THE PILOT RECEIVED AND ACKNOWLEDGED A FURTHER CLEARANCE, RADIO AND RADAR CONTACT WAS LOST. SEVERAL WITNESSES IN THE AREA SAW THE AIRPLANE DESCEND BELOW THE CLOUDS, FLYING AT A LOW ALTITUDE, HEADING IN THE DIRECTION OF THE AIRPORT, TURN TO THE RIGHT AND IMPACT THE GROUND. EXAMINATION OF THE AIRPLANE AND ENGINE REVEALED NO DISCREPANCIES. TOXICOLOGICAL TESTS CONDUCTED ON THE PILOT REVEALED POSITIVE CONCENTRATION OF ETHANOL, AND THE DRUGS CHLORDIAZEPOXIDE, ZEPHPOXIDE AND NORDIAZEPAM. ACCORDING TO THE BOARD'S TOXICOLOGIST, THE USE OF DEPRESSANTS (ALCOHOL) IS LIKELY TO EXACERBATE THE IMPAIRMENT EFFECTS OF CHLORDIAZEPOXIDE, ZEPHPOXIDE, AND NORDIAZEPAM.

OCCURRENCE# 1 IN FLIGHT COLLISION WITH TERRAIN/WATER

PHASE OF OPERATION MANEUVERING

FINDINGS

1. - AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
2. - IMPAIRMENT (ALCOHOL) - PILOT IN COMMAND
3. - IMPAIRMENT (DRUGS) - PILOT IN COMMAND

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINES THAT THE PROBABLE CAUSE(S) OF THIS ACCIDENT WAS:

THE PILOT'S FAILURE TO MAINTAIN CONTROL OF THE AIRPLANE. FACTOR(S) IN THE ACCIDENT WAS THE PILOT'S IMPAIRMENT DUE TO DRUGS AND ALCOHOL.

B. EXAMPLE OF SURFACE MODE ACCIDENT BRIEF

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Marine Accident Brief

Vessel No. 1:	Panamanian Container Ship *Ever Grade,* Lloyds Register No. 1392784, 757 feet long, 37,042 gross tons, built in 1984
Vessel No. 2:	U.S. Coast Guard buoy tender *Cowslip* (WLB–277), 180 feet long, 790 gross tons, built in 1942
Accident Type:	Collision
Location:	Columbia River near Astoria, Oregon
Date:	May 14, 1997
Time:	2125 (local)
Owner/Operator:	*Ever Grade*: Evergreen International S.A., Panama *Cowslip*: U.S. Coast Guard, Washington, D.C.
Property Damage:	$1.2 million
Injuries:	*Ever Grade* - 0 *Cowslip* - 1
Complement:	*Ever Grade* - 18 *Cowslip* - 51

The Accident

About 1900 on May 14, 1997, the U.S. Coast Guard buoy tender *Cowslip* completed routine maintenance work on the buoy marking the entrance to the Columbia River. The commanding officer (CO) set a special sea detail[1] in preparation for proceeding up the Columbia River to the *Cowslip*'s home port of Astoria, Oregon.

[1] The special sea detail was composed of an Officer of the Deck (OOD), a shipping officer, a navigation team, lookouts, and a phone talker. The OOD was responsible for conning the vessel during the inbound transit, issuing all rudder orders, and controlling the vessel's engine. The shipping officer was responsible for plotting all contacts on radar and making periodic reports to the OOD regarding collision avoidance. The navigation team was responsible for periodically taking navigation fixes and reporting navigation information and recommendations to the OOD. The lookouts were posted on the bow and on the bridge. The bow lookout was in radio contact with the OOD. The phone talker was in continuous communication with personnel in the engineroom and the after-steering station, so that he could immediately report any propulsion or steering problem.

MAB/99-01

The weather was calm with visibility severely reduced by fog to about 200 yards. The current in the river was ebbing at 1 to 1.5 knots.

About 1920, the *Cowslip*'s shipping officer obtained a report of the vessel traffic in the river by radio from the pilot boat *Columbia*, which was outbound in the river. She wrote on the conning board[2] the names of the vessels in the order in which the *Cowslip* would encounter them and briefed both the CO and the OOD concerning the vessel traffic. The shipping officer reported that, in addition to the *Columbia*, traffic in the river consisted of two outbound tows and three deep draft ships, the third of which was the Panamanian container ship *Ever Grade*. The CO instructed the OOD to keep the *Cowslip* on the inbound right-hand side[3] of the channel at a safe speed during the inbound transit.

The OOD kept the vessel along the inbound right-hand edge of the channel as it proceeded up the river. The *Cowslip* was so far to the right that the navigation team members were able to see each red buoy as they passed it.

As the *Cowslip* continued inbound, it met and passed the pilot boat *Columbia* and the first two deep draft vessels without incident. Two fishing vessels, which had not been cited by the *Columbia*, were also underway in the river at the time. One fishing vessel was directly ahead of the second deep draft ship and was passed without difficulty. The other fishing vessel was operating outside the channel and was never close enough to the *Cowslip* to require a passing agreement.

About 2055 at the pilot station east of the Astoria Bridge, a Columbia Bar Pilots Association pilot boarded the Panamanian container ship *Ever Grade* to relieve the two river pilots who had conducted the vessel downriver from Portland, Oregon. The bar pilot had a brief exchange of information with the Columbia River Pilots Association pilots before their departure. According to the bar pilot, the river pilots told him that the vessel had 1° of gyro error, that the port radar was "better" to use than the starboard, and that the ship's radios were set to VHF–FM channels 13 and 16. The bar pilot, who had never before piloted the *Ever Grade*, had no other discussion with the off-going river pilots. At 2100, the bar pilot assumed responsibility to pilot the *Ever Grade*.

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[2] A piece of Plexiglas covering a copy of the navigation chart placed on the bridge wings for the reference of the OOD. The chart already had the courses to steer for each leg of the inbound transit marked on it. The conning board had a column in which vessel names could be written in grease pencil.
[3] The inbound right-hand side of the channel is marked with red buoys, and the inbound left-hand side of the channel is marked with green buoys. The sides are referred to as the "red side" and the "green side," respectively.

The *Ever Grade* master spoke briefly with the bar pilot, explaining the speed relationships for the various maneuvering engine orders[4] for the vessel. He also expressed his opinion that, with the fog, a slow speed would be preferable. The master told investigators that the pilot made no response; the pilot did not discuss the river traffic with the master, nor did he discuss any intended maneuvers. When interviewed, the pilot stated that "There wasn't sufficient time to discuss much of anything."

The pilot took his station at the port-side radar on the *Ever Grade* and remained there up to the time of the collision. Also on duty in the pilothouse with the master and the pilot were a helmsman and the third officer. The third officer's duties were to check the vessel's position on the navigation chart, monitor the performance of the helmsman, and execute engine orders from the pilot.

The severely limited visibility obscured visual reference points, forcing the pilot to rely entirely on the radar to pilot the *Ever Grade*. The pilot did not plot contacts on the radar, nor did he plot the *Ever Grade*'s position as it proceeded outbound. He said he made estimates of the *Ever Grade*'s position and progress by looking at and mentally assessing the visual radar image. He did not ask the master, who was stationed at the other radar, to make any radar plots for him. He told investigators that piloting was a "seat of the pants" operation.

At 2101, the pilot ordered the *Ever Grade*'s engine first to "slow ahead," and then, in the same minute, to "half ahead," as he maneuvered the ship toward the Astoria Bridge. At 2107, the *Ever Grade* passed beneath the Astoria Bridge, and the pilot transmitted a security call[5] on VHF–FM channel 13 announcing, "This is the container ship *Ever Grade* passing under the Astoria Bridge outbound with a draft of 36 1/2 feet. The container ship *Ever Grade* outbound."

As the *Ever Grade* passed under the Astoria Bridge, the pilot ordered the helmsman to steer a course of 265° or 266°,[6] and he maintained the vessel at an engine order of "half ahead." The pilot told investigators that he had not been satisfied with the radar image's clarity and that once the *Ever Grade* was clear of the Astoria Bridge, he had occupied himself for a few moments in adjusting the radar picture.

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[4] He informed the pilot that an engine order for "dead slow ahead" produced a speed of 6 knots, an engine order for "slow ahead" produced a speed of 9 knots, and an engine order for "half ahead" produced a speed of 12 knots.

[5] A security call is an informational message of a safety nature issued to all area vessels.

[6] All headings cited in the report are True headings.

On the *Cowslip*, as the vessel approached buoy 22, the CO and the OOD heard the pilot of the *Ever Grade* make the security call. Both the CO and the OOD on the *Cowslip* noted the draft information, which signified to them that the *Ever Grade* was a very large vessel that would need most of the channel in which to navigate.

The CO stated that, after discussing the situation with the OOD, he radioed the pilot of the *Ever Grade* and, at the pilot's insistence, agreed to a port-to-port meeting. According to the *Ever Grade* pilot, in agreeing to meet port to port, the *Cowslip* CO stated, "Okay, port to port. I will give you all the room possible." At this time, based on the relative distance between the two vessels, the CO estimated that the inbound *Cowslip* and the outbound *Ever Grade* would meet near Tansy Point, where an outbound ship must turn sharply to the right to remain in the channel. At the turn, the outbound course of the channel changes 48°, from 264° to 312°.

The *Cowslip* continued inbound in Upper Desdemona Shoal Channel on a course of 132° at a speed of 9.2 knots.[7] At 2122, the CO suggested that the OOD change course 10° to the right; the OOD ordered the course changed to 142° and reduced the vessel's speed to 4 knots. This course change took the *Cowslip* out of the buoyed channel.

About this time, the *Cowslip*'s shipping officer was able to acquire the *Ever Grade* on the automatic radar plotting aid (ARPA) radar, which began to track the container ship, automatically providing course, speed, and closest point of approach (CPA) information. When it was acquired on ARPA radar, the *Ever Grade* was located between buoys 31 and 29 and was moving at 10 knots. The shipping officer told the CO that she had acquired the *Ever Grade* on the ARPA radar and that the ship was outbound on Tansy Point Range, the first leg of the channel outbound from the Astoria Bridge.

The pilot on the *Ever Grade* ordered 10° right rudder to begin the outbound Tansy Point turn about the time the vessel passed abeam of buoy 29, which is about 1 mile from Tansy Point. The pilot stated that the *Ever Grade* was in the center of the channel when he began the turn and that he knew it would be a slow turn because of the *Ever Grade*'s slow speed and the effects of the 1-knot ebb current. He also stated that he delayed starting the turn longer than he would have in good visibility because he wanted to be sure that the *Ever Grade* was clear of navigation aids during its turn. After holding 10° right rudder for about 1 minute, the pilot said he ordered 15° right rudder to increase the rate of turn.

The *Cowslip*'s shipping officer continued to monitor the progress of the *Ever Grade* on the ARPA radar. After the *Ever Grade* passed buoy 29, the CO came to the

[7] Taking into account the 1- to 1.5-knot ebb current, the *Cowslip* was making good a speed of about 7.7 knots.

ARPA radar and looked at the radar presentation. The shipping officer noted that the *Ever Grade* was then swinging to its right, away from the *Cowslip*. the pilot of the *Ever Grade* told investigators that about this time, he became apprehensive about the position of the *Cowslip* on the radar, as it seemed that the *Cowslip* was very close to the channel centerline. The pilot called the *Cowslip* and said, “Do you know that there is a great amount of water over to your right, and you can actually go over and kiss the shore without getting into trouble.” According to the *Ever Grade* pilot, the *Cowslip* radio operator responded with words to the effect that the *Cowslip* would come right and give all the room possible to the *Ever Grade*. The *Cowslip* CO stated that he did not respond to the transmission.

After receiving the *Ever Grade*’s transmission, the CO checked the *Cowslip*’s position and heading. He looked at the chart viewer and walked to the bridge’s port wing and instructed the OOD to bring the ship 5° farther to the right. At 2124, the OOD ordered the helmsman to change course to the right from 142° to 147°. Shortly thereafter, the *Cowslip*’s bow lookout reported to the OOD that he heard the *Ever Grade*’s fog signal about 5° off the port bow. Meanwhile, the shipping officer noticed that the ARPA radar heading flasher for the *Ever Grade* appeared to be swinging back toward the *Cowslip*. She also noted that the CPA for the *Ever Grade* was closing from 100 yards to 60 yards. She called loudly, “CPA .03 miles in 2 minutes.” About the same time, the CO and the OOD saw the bow of the *Ever Grade* emerge from the fog ahead of the *Cowslip*. Concurrent with her own sighting of the *Ever Grade*, the OOD received a report from the bow lookout that he had sighted the vessel ahead. The OOD immediately placed the engine throttle in the “full astern” position. Moments later, the CO called out for the helmsman to apply “right full rudder” and moved the throttle to the “full ahead” position in an attempt to move away from the oncoming *Ever Grade*. He also ordered the danger signal[8] sounded on the ship’s whistle. A navigation team member standing near the whistle sounded the signal.

The *Cowslip* CO continued to watch the *Ever Grade* as it approached the *Cowslip*, and when he judged that its bow was past the *Cowslip*’s pivot point, he ordered “left full rudder” in an attempt to swing the *Cowslip*’s stern away from the approaching ship. At 2125, about the same time that the CO ordered “left full rudder,” the bow of the *Ever Grade* struck the port bridge wing of the *Cowslip*, crushing it inward and pinning the throttle control in the “full ahead” position. (See figure 2.) The impact heeled the *Cowslip* to starboard and knocked the CO to the deck, injuring him slightly.

According to the pilot on the *Ever Grade*, about the time of his last radio transmission, the *Cowslip* entered a blind spot in front of the *Ever Grade*, and he could no

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[8] At least five rapid blasts on the ship’s whistle.

longer see it on his radar. After holding 20° for about a minute, the pilot said, he became concerned that the *Ever Grade* might swing so far to the right that it would run aground on the shoal on the "green side" of the channel, so he ordered "rudder amidships." He said that he might even have ordered the rudder 10° left at this time, but that before the rudder could have reached the amidships position, the *Ever Grade* master yelled, "It is right ahead of us." Hearing this, the pilot looked up and sighted the *Cowslip* dead ahead. He stated that both he and the master then simultaneously ordered "hard right rudder." Seconds later, the pilot heard the *Cowslip*'s danger signal, and he knew that a collision was inevitable. Moments later, the two ships collided. The pilot said that immediately after impact, he and the master both ordered the rudder hard to port, intending to swing the *Ever Grade*'s stern away from the *Cowslip*.

According to the *Ever Grade* master's recollection of events, he had been continuing to monitor the progress of the *Cowslip* on the ARPA radar. When he noted that the *Cowslip* was directly ahead of the *Ever Grade* at a range of 0.2 mile, he looked up and sighted the *Cowslip*'s range lights in line, dead ahead. At the same time, the chief officer on the bow radioed the master, reporting that he sighted the lights dead ahead. The master stated that he immediately shouted, "The range lights! Hard starboard!" The master said that when he shouted this order to the *Ever Grade* helmsman, the pilot looked up from the radar and said, "What?" The master told investigators that the pilot had seemed very surprised and did not appear to know what to do. The master said that when the two vessels collided, he, and not the pilot, ordered the rudder hard to port, to swing the *Ever Grade*'s stern away from the *Cowslip*.

After the collision, the *Cowslip* bounced off the *Ever Grade* and, moments later, it was hit a second time on the port quarter, near the motor room. The two vessels then separated and moved away from each other. Both vessels were subsequently anchored, and damage assessments were conducted.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the collision between the Panamanian container ship *Ever Grade* and the U.S. Coast Guard buoy tender *Cowslip* was the failure of the pilot of the *Ever Grade* to gauge the turn at Tansy Point properly due to imprecise radar estimations of his vessel's position and late application of rudder, which combined to cause the ship to swing excessively wide in the turn and to strike the *Cowslip*. Contributing to the accident was the joint decision of the pilot of the *Ever Grade* and the commanding officer of the *Cowslip* to attempt a meeting at a sharp bend in the channel during a period of severely reduced visibility.

Adopted: December 30, 1999

Robert T. Francis II, Vice Chairman, filed the following additional statement with his concurrence on December 30, 1999:

> I believe that the probable cause statement is sufficient as far as it goes, but it does not go far enough. Bridge resource management techniques and effective ship-to-ship communications are enormously important tools to enhance safety in maritime operations. Our failure to note breakdowns in communication on and between the vessels as a contributing factor in the collision does not, in my opinion, enhance either the safety of marine operations or the advancement of these issues in the maritime pilot community.

Recommendations

As a result of this accident, the National Transportation Safety Board makes the following recommendations:

To the U.S. Coast Guard:

> Issue instructions to U.S. Coast Guard commanding officers to avoid, whenever operational imperatives permit, meeting deep draft vessels at sharp bends or turns in channels, especially during periods of reduced visibility. (M-93-23)

To the Oregon Board of Maritime Pilots:

> Review and require revision as necessary to pilot transfer procedures used by river and bar pilots in the Columbia River to bring them into compliance with the American Pilots' Association resolution of October 8, 1997, concerning pilot transfer procedures. (M-99-24)

> Require all State pilots under your jurisdiction to complete periodic bridge resource management training, in accordance with the October 5, 1993, resolution of the American Pilots' Association concerning bridge resource management training. (M-99-25)

CHAPTER 14

CASE SUMMARY

CASE SUMMARY

Case summaries summarize accident investigations carried out in support of a particular safety study or special investigation. They are a useful method of organizing information, particularly when the data needed could not be gathered during a typical investigation or when data must come from outside sources, such as from accident investigation forms supplied by State law enforcement personnel.

Case summaries are usually prepared by regional investigators under the direction and guidance of the writer's division chief and office director. Case summaries used in safety studies, in addition to meeting modal office requirements, must meet preparation guidelines agreed to by the modal office and by the Safety Studies Division.

Case summaries have been used most recently in the following special investigations and safety studies:

NTSB/SIR-99/04: Bus Crashworthiness Issues

NTSB/SS-98/02:   Safety at Passive Grade Crossings (Volume 2)

Case summary formats may differ depending on the information collected, the needs of the study, and word processing considerations. For example, some case summaries have contained probable cause statements, making them similar to briefs (see ***chapter 13*** for more information on accident briefs), and some case summaries have included graphics.

EXAMPLES OF CASE SUMMARIES

(not actual size)

Case No. 1

Investigation No:	SRH-96-F-HX01
Location:	Childersburg, Alabama
Date and Time:	January 10, 1996, about 8:45 a.m.
Light Conditions:	Daytime
Accident Type:	Train struck vehicle
Highway Vehicle Involved:	1979 Toyota Corolla
Train Action Reported:	
Horn Sounded:	Yes
Auxiliary Lights On:	Yes
Signs Present:	
Crossbuck:	Yes
Advance Warning:	No
Multiple Track:	N/A
Stop:	Yes
Physical Characteristics:	
Limited Sight Distance:	Yes
Intersection Angle not 90 Degrees:	No
Road or Track Curve:	No
Nearby Intersections:	Yes
Injuries:	
Highway:	One fatal
Railroad:	None

Accident Description

On January 10, 1996, about 8:45 a.m., a westbound freight train struck a northbound car near Childersburg, Alabama. The vehicle was halfway over the single track when it was struck. Witnesses stated that the Toyota driver was familiar with the crossing and did not stop at the crossing stop sign.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the driver's disregard of the stop sign.

CASE 13

Date and Time	March 7, 1968, 3:47 p.m.
Date Report Adopted	December 18, 1968
Accident No.	NTSB/SS-H-3
Location	Near Baker, California
Operator	Greyhound Lines, Inc.
Motorcoach Passenger Injuries	19 Fatal, 12 Nonfatal
Type of Crash	Head-On Collision with Automobile and Subsequent Overturn

A 1966 MCI Challenger Model MC-5A motorcoach on a regularly scheduled run was traveling in the eastbound median lane of Interstate Highway 15 when it collided nearly head on with an automobile being driven westbound in the same lane by an intoxicated driver. The force of the collision drove the automobile about 45 feet east of the point of impact, killing the automobile driver instantly and ejecting his body from the automobile.

After impact, the motorcoach swerved left into the median and overturned onto its right side. The motorcoach had four windows on each side; the windows were hinged at the top, latched at the bottom, and designed as emergency exits. During the collision and subsequent overturn, the motorcoach was twisted, causing some of the side windows to spring open. Portions of passengers' bodies, such as legs, arms, and hands, were ejected and protruded through the windows; and as the overturned motorcoach came to rest, at least three passengers were pinned under it.

Fire, fed by leaking power steering fluid and diesel fuel from the breached fuel tank, spread immediately throughout the motorcoach. The driver and 6 of the 14 passengers seated in the first four rows escaped through the windshield. Five passengers seated in the last three rows at the left rear of the motorcoach smashed the rear window and escaped through it.

The 19 passengers who did not escape died in the fire. A pathologist who partially examined 12 of the dead passengers reported that, although he observed fractured extremities, he observed no injuries which, of themselves, would have been fatal. As a result of its investigation of this crash, the Safety Board recommended that the Federal Highway Administration (FHWA):

> <u>H-68-18</u>
>
> Expedite the proceeding initiated under Part II of the Interstate Commerce Act, docket Ex Parte No. MC-69, dated May 27, 1966, to inquire into the operations of motor carriers of passengers in order to determine whether it is necessary or desirable to adopt regulations and establish standards

which would require carriers to install, provide, and maintain seat belts for the use of passengers and drivers.

The Safety Board said:

The experience in this case indicates definitely that restraint of drivers and occupants in their seats during rollover conditions is necessary to reduce initial injury, disorientation, and thus insure more likelihood of timely postcrash escape from the vehicle. The FHWA Administrator in reaching his decision concerning a requirement that seat belts be available in buses should seriously consider this report and the Safety Board's conclusion. The Safety Board urges that a decision be made on this important matter which has been under consideration for more than 22 months at the time this accident occurred, and more than 30 months prior to the date of this report.

The Safety Board also recommended that the FHWA:

<u>H-68-25</u>

As soon as possible, change the basis of its regulatory requirements intended to ensure escape from buses so that they are based upon tests of performance of occupants in escaping from buses standing or lying in all basic attitudes. In the development of test criteria, it is suggested that consideration be given to test procedures presently employed by the Federal Aviation Administration for the regulation of the adequacy of escape techniques and systems. Further, consideration should be given to adopting for buses, the airline practice of placing emergency escape instructions at each passenger location. It is further recommended that necessary regulations be expedited to insure that no new types of buses go into service which have not been tested to insure that all occupants can escape rapidly when the bus is in any of its basic attitudes after a crash. This Recommendation refers to Docket 2-10 of the National Highway Safety Bureau[1] as well as the Motor Carrier Safety Regulations.

[1] At the time this recommendation was issued, the National Highway Safety Bureau, predecessor of NHTSA, was part of the FHWA.

CHAPTER 15

SAFETY RECOMMENDATION LETTER

CONTENTS

SAFETY RECOMMENDATION LETTER

The Independent Safety Board Act of 1974 states that the Safety Board was established "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations." Accident investigations result in the Safety Board issuing a probable cause statement and, in almost all cases, recommendations for action to prevent a similar accident. (See Board Order 70, *NTSB Safety Recommendations Program*.)

The Safety Board formally issues its safety recommendations in the form of a letter to the person, agency, or group that should take the recommended action. The letters are often referred to as "green sheets" because the file copies and the copies made for distribution are printed on green paper. Required elements for safety recommendation letters are discussed in ***paragraph 15.1***.

Safety recommendations may be issued independently or as the result of an accident report containing recommendations being adopted. For further information, see ***paragraphs 15.2 through 15.3*** and ***examples A*** through ***G***. Also see the *Policies and Procedures* section of the Safety Board's intranet site for administrative procedures related to preparing and distributing recommendation letters and for recommendation-letter templates.

15.1 REQUIRED ELEMENTS

Regardless whether the letter is issued independently or as the result of a report, a safety recommendation letter generally contains the following elements:

- Issue date. MD-5 dates the letter after the Chairman signs it.

- Recommendation numbers. MD-5 assigns the numbers after the recommendations are adopted.

- Addressee(s). When the letter is prepared in final, the originating office must check the accuracy of the recommendation recipient's name, title, organization, and address. Between the time that a letter is drafted and the time it is issued in final, the recipient may have died or changed jobs or addresses. Beware of using names and addresses from old safety recommendation letters, from business cards exchanged during the accident investigation, or from any type of directory.

No more than four addressees can appear on the first page. For letters containing more than four addressees, attach an address list to the letter and insert explanatory information in place of the address on the first page, such as the following:

Agencies, Associations, or Institutes
interested in [*subject of the letter*]
(See attached list.)

Governors of the 50 States
and the Mayor of the District of Columbia
(See attached list.)

- Lead paragraph(s) explaining the Board's purpose and intent and summarizing the safety issues and recommendations discussed in the letter. (Letters to U.S. Department of Transportation agencies should omit these paragraphs.) Use this or similar wording:

  The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

  These recommendations address [*safety issues*]. The recommendations are derived from the Safety Board's investigation of the [*date, location, and mode of accident or report title*] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued [*number of recommendations to all recipients*], [*number*] of which are addressed to [*name of recommendation recipient*]. Information supporting the

> recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation(s).

- One or two paragraphs explaining accidents that prompted the investigation.

- Discussion of facts leading up to safety issue(s).

- Analysis of safety issue(s). If the analysis discusses a previous Safety Board recommendation on the safety issue, include the number and status of the previous recommendation. If the previous recommendation is in an "Open" status, the discussion must include the latest response from the recipient and indicate whether the Safety Board is reiterating the recommendation or changing its classification status.

- Conclusions about safety issue(s).

- New recommendation(s). Block-indent recommendations introduced by the following paragraph, including the recommendation numbers in parentheses:

> Therefore, the National Transportation Safety Board recommends that the [*full name of the organization, company, or agency*]:

- As applicable, recommendations issued during the course of the investigation or study (such as urgent recommendations), reiterated recommendations,[1] and recommendations for which the classification status is changed as the result of the current Board product.

- Paragraph naming other recommendation recipients (if necessary) and providing reply information:

---

[1] When no new recommendations are being issued to a party to whom recommendations must be reiterated, issue a separate reiteration later. (See ***chapter 16*** for further information.)

The Safety Board also issued safety recommendations to the Federal Aviation Administration and to the American Association of Airport Executives. In your response to the recommendation in this letter, please refer to Safety Recommendation A-98-113.

- Contact information for the Office of Safety Recommendations and Accomplishments. Unless the letter is going to a Department of Transportation agency or other organization that the Safety Board deals with on a regular basis, add the following sentence to the end of the penultimate paragraph:

  If you need additional information, you may call (202) 314-6170.

- Members' concurrences. Obtain the concurrence information from the Board Action Report. (For more information on the Board Action Report and on notation procedures, see Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board, and the Convening of Board Meetings*.) Format the concurrence information the same way as any other paragraph in the text—use regular margins and indent the first line five spaces. Wording will vary depending upon Board Member concurrences and participation; some examples are provided below:

  Chairman HALL and Members HAMMERSCHMIDT, BLACK, and CARMODY concurred in this/these recommendation(s). Member GOGLIA did not participate.

  Chairman HALL and Members GOGLIA, BLACK, and CARMODY concurred in this/these recommendation(s). Member HAMMERSCHMIDT disapproved.

  Members HAMMERSCHMIDT, GOGLIA, and CARMODY concurred in this/these recommendation(s). Chairman HALL disapproved. Member BLACK did not participate.

- Chairman's signature. Appears at the center of the last page as follows:

By: Jim Hall
Chairman

- Proofreading certification. Documents forwarded to the offices of the Managing Director and the Chairman for review or signature, including safety recommendation letters, must include a proofreading certification. This certification can be accomplished by signing off on the Board Action Report, which includes a space for the date and proofreader's initials. However, if no Board Action Report has been issued (as in the case of a notation draft for a stand-alone recommendation letter) or if required by your office, provide the proofreading certification (part of the *legend*) as follows:

  - At the end of the file-copy legend, which appears a few lines below the signature block. (See ***example B***.) Note that when the letter is converted to final for the Chairman's signature, the legend moves to a separate page after the end of the letter.

  - As a separate page after the end of the letter. (See ***example C***.)

15.2 STAND-ALONE LETTERS

A stand-alone safety recommendation letter may be issued:

- As a result of a safety proposal (see ***chapter 17***),
- As the result of an accident for which a major report or study is not planned, or
- Because of a recommendation's urgency, before the planned report or study is completed.

The letter may be written by the accident's investigator-in-charge, a technical specialist, or a program specialist and may originate in any office. (For stand-alone recommendation letters, see ***examples B*** and ***C***. For other examples of letters published from 1988 onward, see the *Recommendations and Accomplishments* section of the Safety Board's Web site.)

To produce a stand-alone safety recommendation letter, follow these steps:

- Discuss the recommendation(s) with appropriate staff and supervisor before writing.

- Write the letter, incorporating the elements discussed earlier in this section. Also, write the notation memorandum, and circulate it with all drafts. The notation memorandum should contain the names and fax numbers of persons to receive an advance copy of the safety recommendation letter. The fax recipient is normally the individual who has day-to-day contact with the Safety Board, not the agency or company head to whom the recommendation letter is addressed. (See ***examples D and E*** for notation memorandums. For additional information on notation memorandums, see Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board, and the Convening of Board Meetings*.)

- Circulate the initial draft to appropriate staff and supervisors for review. Give reviewers a specific deadline for comment.

- Review comments, mark changes on a master copy of the draft, and input changes to produce the editor's draft.

- Input agreed-upon editing changes to produce the Directors draft.

- Submit the Directors draft to appropriate staff and supervisors for review.

- Review comments, mark changes on a master copy of the draft, and input changes to produce the notation draft.

- Deliver the notation draft to your office director, who will have the notation draft circulated to the appropriate offices for signatures.

- Deliver the complete original double-spaced signed-off notation draft to the Managing Director for further processing. The Managing Director may return the notation draft to the originating office with a request for changes or clarification. Answer such requests as soon as possible and return the draft to the Managing Director's office. MD-5 makes and distributes copies of the notation draft to the Board Members with voting records for their concurrence. Board Members consider the notation draft according to procedures established by Board Order 4A. Read these procedures if you are not already familiar with them.

- Respond to any Board Member's request for additional information. Their requests may come by telephone, in a meeting in the Member's office, or by written memorandum. If the Member wants changes to the draft, the Member will note the changes on the voting record or in a memorandum attached to the voting record and deliver these documents to MD-5. MD-5 will forward a copy of the voting record and memorandum to the originating office for a response. The originating office will return its response to MD-5 for further processing. (This process is explained in Board Order 4A.)

- Monitor the progress of your safety recommendation letter through the notation process. After the Board Members adopt the letter, MD-5 will return the letter to the originating office attached to a Board Action Report that gives the adoption date, recommendation numbers, information on Members' concurrences, and a deadline for preparing the safety recommendation letter in final. (For further information on Board Action reports, refer to Board Order 4A.)

- Make the final corrections to the letter. Assemble the final recommendation-letter package, following MD-5's instructions on the

Board Action Report regarding mailing envelopes, fax cover sheets, and document conversion.

- Deliver the two copies of the final recommendation letter with the Board Action Report and materials noted above to your office director. The editor, proofreader, investigator-in-charge or modal staff member, and office director should have initialed the Board Action Report to indicate that the letter is ready for the Chairman's signature.

- Return the Board Action Report with the materials noted above and two originals of the final safety recommendation letter to MD-5 for final processing. MD-5 staff double-checks the accuracy of the recommendation numbers, Members' concurrences, and letter's format. MD-5 staff does not proofread the letters but will return a letter for correction if an error is noticed. MD-5 then forwards the letter to the Chairman's office for signature.

- Ask MD-5 staff to notify you when the letter is signed, if necessary. Be aware that letters are often signed and delivered after 5 p.m. MD-5 will fax advance copies of the signed letters to the recipients noted on the fax cover sheets and forward hard copy or the pdf diskette to the appropriate offices for traditional printing and distribution, e-mail distribution, and posting on the Safety Board's Web site.

When writing a stand-alone safety recommendation letter:

- Do not include unnecessary details about the accident. The letter should focus on informing the reader about the *safety issues*.

- Determine whether an accident brief has been issued or has been drafted for any accident mentioned in the letter. (See ***chapter 13*** for additional information on briefs of accident). If so, include the brief in the notation draft for the Board Members' consideration.

- Note the status of the investigation of all accidents discussed in the letter.

15.3 REPORT-ISSUED LETTERS

When a report or study concludes with recommendations, the recommendations are formally issued to the recipient(s) through a safety recommendation letter. A report-issued safety recommendation letter is identical in appearance to a stand-alone safety recommendation letter. The only difference is the way in which the letter is created and processed. (See ***example A*** the end of this section for condensed instructions for preparing report-issued recommendation letters. For examples of such letters, see ***examples F*** and ***G***, as well as the *Recommendations and Accomplishments* section of the Safety Board's Web site.)

Because a report-issued safety recommendation letter consists almost entirely of text from the adopted report, the writing and editing process discussed earlier for a stand-alone safety recommendation letter does not apply. A report-issued recommendation letter does not have to accompany the notation draft of an accident report, safety study, or special investigation report, unless specifically requested by the Managing Director.

The report writer is responsible for creating a report-issued safety recommendation letter, but this responsibility may be delegated to the report editor. To produce a report-issued safety recommendation letter follow these steps:

- Determine what information should be copied from the report to create the letter.

  - In most cases, you will need a paragraph (following the introductory matter discussed in ***paragraph 15.1***) that provides background about the accident or study. Usually, the first paragraph of the report's executive summary is sufficient.

  - Next, include paragraphs from the report that explain why the Safety Board is making a recommendation. The paragraphs may be from either the **FACTUAL INFORMATION** or the **ANALYSIS** sections.

  - Repeat this process for each of the recommendations directed to the letter's recipient.

- Proofread the letter. Read the letter not only for typographical errors, but also for cohesion and clarity. Sometimes the "building block" approach to constructing a recommendation letter needs fine-tuning.

    - Delete information that is not essential to the recommendation letter. The letter can contain fewer details than the report.

    - Delete references to figures or tables that appear in the report but not in the recommendation letter.

    - Make sure that abbreviations are spelled out at their first reference, if appropriate.

    - Verify the accuracy of all information in the addressee block.

    - Verify the recommendation numbers cited against the recommendation numbers in the adopted report and in the Board Action Report. (For more information on the Board Action Report and notation procedures, see Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board, and the Convening of Board Meetings*.)

    - If you find typographical errors in the letter, remember that these same errors are probably in the report text. Alert the editor or writer who is responsible for preparing the final report text for printing.

- Assemble the final recommendation-letter package, following MD-5's instructions on the Board Action Report regarding mailing envelopes, fax cover sheets, and document conversion. Deliver a copy of the final letter to the office director for a technical review.

- After the final corrections have been made to the letter, deliver the two copies of the final recommendation letter with the Board Action Report and materials noted above to the office director. The editor, proofreader, investigator-in-charge or modal staff member, and office direction should initial the Board Action Report to indicate that the letter is ready for the Chairman's signature.

- When writing a report-issued safety recommendation letter:

- Ensure that the letter text closely follows the report text. Brief transitional phrases or sentences may be added for clarity.

- Include only the information necessary to support the recommendation(s) in the letter. The letter is not intended to take the place of the report, so it does not have all of the details of the report. However, the letter should not be so brief that the report must be read to understand the letter.

- Delete references to figures, tables, or appendixes. These items are rarely included in the recommendation letter.

- Some letters, especially those emanating from a safety study or special investigation report, may need additional introductory and transitional language.

A. CONDENSED INSTRUCTIONS FOR DEVELOPING REPORT-ISSUED LETTERS

National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation

Date: [*Leave blank until signature*]
In reply refer to:
[*Insert recommendation numbers*]

[*Insert addressee block with a new element on each line*]

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1. As necessary, insert the boilerplate paragraph concerning the Board's interests and purpose, followed by a paragraph describing the accident, safety issues, and requested response date.

2. Insert a paragraph that provides background about the accident or study, usually the first paragraph of the executive summary.

3. From the final report, copy the paragraphs that directly support the recommendations.

4. Add the appropriate lead-in statements or transitions to the recommendations.

5. Copy the recommendations specifically directed to the organization shown in the addressee block of this letter.

6. Note other recommendation recipients, as necessary.

7. Insert reply and point-of-contact information.

8. Insert the concurrence information.

9. Insert the Chairman's signature block.

B. EXAMPLE OF STAND-ALONE LETTER (AVIATION)

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date:
In reply to refer to: A-98-13 through -18

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On June 18, 1998, a Swearingen SA226-TC Metroliner II airplane,[1] Canadian registry C-GQAL, operated by PropAir, Inc., crashed after the left wing separated during an attempted emergency landing at Mirabel Airport, Montreal, Quebec, Canada. The flight was operating as a charter from Montreal to Peterborough, Ontario, Canada. The airplane had departed from Montreal's Dorval Airport and was climbing through 12,500 feet when the flightcrew reported a loss of hydraulic pressure and a fire on the left side of the airplane. The pilot then shut down the left engine and declared an emergency. The flightcrew lost control of the airplane at low altitude during the final approach for landing. The airplane was destroyed, and the two flightcrew members and all nine passengers were killed.

The National Transportation Safety Board is participating in the Transportation Safety Board (TSB) of Canada's ongoing investigation under the provisions of Annex 13 to the Convention on International Civil Aviation. On the basis of the preliminary findings of the investigation, the Safety Board has concluded that the Federal Aviation Administration (FAA) should address several safety issues.

[1] Swearingen Aviation Corporation was the original manufacturer of SA226 and SA227 series airplanes. Fairchild Aircraft, Inc., subsequently acquired Swearingen and continued the production of these airplanes.

7079

The airplane involved in the Montreal accident was equipped with B.F. Goodrich part number (P/N) 2-1203 wheel brake assemblies (see figure 1).[2] The left wheel well included the hydraulic power pack, a main landing gear (MLG) assembly, aluminum fuel and hydraulic lines and fittings, an overheat sensor, and a rubber fuel crossover line. The overheat sensor illuminates the L WING OVHT (left wing overheat) warning light on the pilot's annunciator panel when temperatures in the wheel well reach 350°F.[3] Although the heavier Fairchild/Swearingen model SA227 airplanes (and other commuter and corporate airplanes of the approximate weight) incorporate in the MLG wheels fuse plugs that melt when hot, causing a gradual release of nitrogen pressure and preventing a tire burst, the SA226 does not incorporate such fuse plugs.

The preliminary results of the investigation revealed that, during the takeoff roll, the flightcrew applied the right rudder because the airplane was apparently veering toward the left side of the runway. Approximately 13 minutes after takeoff, the flightcrew noted a loss of hydraulic pressure and the illumination of multiple warning lights, including the left wing overheat warning light. Meanwhile, a passenger reported that the left engine was on fire. The captain later reported that the fire was extinguished and that the back of the engine appeared to have exploded. However, while executing the instrument approach, approximately 1 minute before impact, the flightcrew reported that the fire had resumed. The flightcrew manually extended the landing gear after descending through 1,000 feet, shortly before the left wing failed.

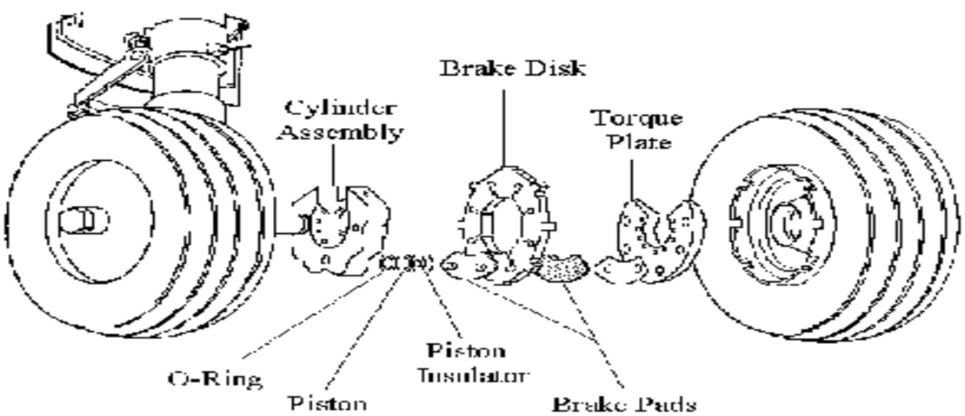

Figure 1. B.F. Goodrich 2-1203 Disk Brake Assembly

[2] The B.F. Goodrich P/N 2-1203 series brake assembly is a floating-type, single-disk assembly. The steel disk has smooth sides, expansion slots, and tangs around the outer diameter. The tangs are keyed into the wheel so that both rotate together. The disk floats in and out of the wheel to prevent binding during brake application. The cast-aluminum alloy housing, which is bolted to the landing gear strut, has six cylinders, aluminum alloy pistons, and O-rings to prevent leakage. Each piston is protected from the brake pad by an asbestos piston insulator to minimize heat transfer from the disk to the piston. During brake application, hydraulic fluid is forced into the cylinder, and the piston pushes against the insulator, movable brake pad, disk, and opposing brake pad and torque plate to clamp the rotating disk. The airplane involved in the Montreal accident had the original design P/N 2-1203 wheel brake assembly. Subsequent P/N 2-1203 brake assemblies have suffixes of -1 through -4.

[3] A similar sensor is installed in the right wheel well.

Examination of the wreckage at TSB's facility in Ottawa revealed extensive fire damage to the left MLG wheel well, overheated left MLG brake assemblies, burned tires, melted aluminum hydraulic and fuel lines and fittings, and a burned rubber fuel crossover line. Witness marks on the inside of the brake cylinders and on the outside of the piston insulators indicated that the pistons were cocked within their respective cylinders. Most of the brake pads were worn unevenly, exposing the base metal. The piston insulators and brake disks were also worn unevenly; however, the wear on the disks was within the minimum thickness requirements specified in the airplane's maintenance manual. Although the airplane's main and brake hydraulic systems had a placard specifying MIL-H-83282, analysis of the fluid in both systems revealed a mixture of MIL-H-83282 and MIL-H-5606 hydraulic fluids.[4] The mixed fluids had a flash point of approximately 237°F.

The investigation thus far indicates that the flightcrew applied the right rudder during the takeoff roll probably to compensate for a dragging left wheel brake and then raised the landing gear, with overheated brakes, into the left wheel well. Although the precise cause of the wheel well fire has not yet been determined, the investigative findings indicate that the ensuing fire in the left wheel well may have been caused by either (1) leaking low flash point brake system hydraulic fluid from a brake cylinder or (2) leaking fluid from damaged lines in the wheel well from an exploding tire coming in contact with and being ignited by the hot brake disk. The fire became hotter as additional flammable liquids from the brake, hydraulic, and fuel systems were introduced. This fire likely led to the wing failure. Leaking brake cylinders could have been caused by the cocked pistons, which appear to have resulted from the combined effects of excessive and uneven brake pad wear, uneven disk wear, and unevenly worn piston insulators on the outboard brake.

Use of Lower Flash Point Hydraulic Fluid

The accident and incident history of Fairchild/Swearingen SA226 and SA227 series airplanes revealed two previous cockpit fire accidents that involved the lower flash point MIL-H-5606 hydraulic fluid. On October 15, 1982, a Sun Aire Swearingen SA226-TC Metroliner II caught fire in Palm Springs, California, when an electrical arc from the copilot's panel light rheostat ignited wires, contaminated with hydraulic fluid from the right brake line, underneath the side panel. Additionally, on August 27, 1983, a Scheduled Skyways Swearingen SA226-TC Metroliner II caught fire in Hot Springs, Arkansas, when an electrical arc ignited wires, contaminated with hydraulic fluid, underneath the instrument panel.[5]

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[4] According to Air Force Aero Propulsion Laboratory Report AFAPL-TR-85-2057, MIL-H-5606 is a mineral oil product with a flash point of approximately 194°F, and MIL-H-83282 is a synthetic hydrocarbon with a flash point of approximately 390°F. Although the fluids are chemically compatible, mixing MIL-H-83282 with as little as 5 percent of MIL-H-5606 can render the first fluid's fire-retardant feature ineffective.

[5] For more detailed information on these two accidents, see Briefs of Accident DCA83AA037 and LAX83FA002 (enclosed).

After the investigations of these two accidents, the Safety Board issued Safety Recommendation A-83-59, which asked the FAA to require operators to comply with Fairchild Service Bulletin (SB) 32-018 and use fire-retardant hydraulic fluid. As a result, the FAA issued Airworthiness Directive (AD) 83-19-02 on September 29, 1983,[6] which required operators of certain Swearingen SA226 series airplanes, including the airplane involved in the accident in Montreal, to drain and purge the main hydraulic and brake system reservoirs and refill them with MIL-H-83282 hydraulic fluid. [7] The AD also required that operators change the placards on both reservoirs to specify that only MIL-H-83282 fluid be used. On February 21, 1984, the Safety Board classified this recommendation "Closed—Acceptable Action."

Although AD 83-19-02 and Fairchild's airplane maintenance manual required the use of MIL-H-83282 hydraulic fluid in the main and brake hydraulic systems in Swearingen SA226 and SA227 series airplanes, respectively, the Safety Board is concerned that the use of the lower flash point MIL-H-5606 or the mixing of MIL-H-5606 with MIL-H-83282 may be occurring. Therefore, the Safety Board believes that the FAA should require principal maintenance inspectors to notify operators of Fairchild/Swearingen SA226 and SA227 series airplanes of the Montreal accident and the requirement to use only the higher flash point MIL-H-83282 hydraulic fluid in all B.F. Goodrich P/N 2-1203 series brake systems.

Brake Assembly Overheating

The accident and incident history of Fairchild/Swearingen SA226 and SA227 series airplanes also revealed two previous wheel well fire accidents. On July 27, 1988, a Peninsula Airways Fairchild SA227-AC Metroliner III experienced a loss of hydraulic pressure, wheel well and wing overheat indications, exploded tires, and substantial fire damage in the left wheel well.[8] The flightcrew made a successful emergency landing at Anchorage International Airport in Alaska. Additionally, on February 10, 1990, a Perimeter Airlines Swearingen SA226-TC Metroliner II similarly experienced a loss of hydraulic pressure, wheel well and wing overheat indications, exploded tires, and substantial fire damage to the left wheel well. The flightcrew shut down the left engine and made a successful emergency landing at Winnipeg International Airport in Canada.[9]

As a result of its investigation into the Anchorage incident, the Safety Board issued Safety Recommendation A-89-101, asking the FAA to conduct a directed safety investigation of the Fairchild SA226 and SA227 wheel braking systems that utilize the B.F. Goodrich P/N 2-1203-3 wheel brake assembly to (1) determine the potential for brake lockups or overheating as a result of piston insulator cocking and (2) evaluate the current wear limits for proper brake operation at the maximum wear allowed. The FAA

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[6] A similar directive was issued by the Canadian government's aviation regulatory authority, Transport Canada.
[7] The Fairchild/Swearingen SA227 series airplane maintenance manual already specified the use of MIL-H-83282 in the main and brake hydraulic systems.
[8] For more detailed information, see Brief of Accident ANC88FA100 (enclosed).
[9] For more detailed information, see Aviation Occurrence Report synopsis A90C0024 (enclosed).

reviewed the 5-year history of service difficulty reports regarding B.F. Goodrich brake malfunctions and discovered that 75 reports, including 9 incidents of MLG brake or wheel well fires, had been filed. On October 26, 1989, B.F. Goodrich issued Service Letter (SL) 1498 to clarify the proper location to take wear measurements for all P/N 2-1203 series brake assemblies and revise the maximum allowable clearance for brake assembly P/N 2-1203-3 to reduce the brake lining wear allowed before required overhaul. The FAA issued a special notice to FAA inspectors to alert them that SL 1498 revised the method of determining brake wear and the brake wear limit for P/N 2-1203 brake assemblies, and Fairchild revised its maintenance manual accordingly. On June 18, 1990, the Safety Board classified this recommendation "Closed—Acceptable Action."

Also, the Safety Board issued Safety Recommendation A-89-102, asking the FAA to take appropriate action to prevent brake binding and overheating of B.F. Goodrich P/N 2-1203-3 brake assemblies. On January 16, 1992, the FAA issued AD 92-01-02, which required that operators of SA226 and SA227 airplanes equipped with B.F. Goodrich P/N 2-1203-3 brakes inspect and conduct wear measurements in accordance with SL 1498 and that operators of certain SA226 and SA227 airplanes modify the parking brake system in accordance with Fairchild SBs 227-32-017 and 226-32-049.[10] On March 24, 1992, the Safety Board classified this recommendation "Closed—Acceptable Action."

The wear measurement techniques specified in the component maintenance manual, SL 1498, and AD 92-01-02 were intended to measure the amount of brake wear. However, the techniques were not designed to measure or detect the degree of uneven wear, which could lead to cocked pistons and result in dragging brakes, hydraulic fluid leakage, and wheel well fires. Therefore, the Safety Board believes that the FAA should require B.F. Goodrich to develop and implement a process for identifying and eliminating excessive uneven wear on all B.F. Goodrich P/N 2-1203 series wheel brake assemblies used on Fairchild/Swearingen SA226 and SA227 series airplanes.

Need for Improved Emergency Procedures to Address Wheel Well Fires

The SA226-TC airplane flight manual (AFM) states that, after the illumination of a wing overheat warning light, the flightcrew should secure the bleed air from the affected engine and extend the landing gear. The flightcrew involved in the Montreal accident apparently noticed a loss of hydraulic pressure and the left wheel well and wing overheat warning light but did not extend the landing gear until just before impact. In this accident, immediate extension of the landing gear might have prevented failure of the left wing.

The AFM emergency procedure to address the illumination of the wheel well and wing overheat warning light assumes that the cause is an air conditioning duct overheat and does not consider the consequences of a wheel well fire and the loss of hydraulic pressure or other airplane systems. For example, the procedure calls for shutting down

[10] The requirement for the parking brake system is not relevant to the issues discussed in this safety recommendation letter.

the engine on the affected side of the airplane, which would be appropriate for an air conditioning duct overheat or a bleed air leak but unnecessary for a brake fire. Therefore, the Safety Board believes that the FAA should require Fairchild to (1) expand the description of the wing and wheel well overheat annunciator panel warning light in all Fairchild/Swearingen SA226 and SA227 series AFMs to note that a L or R WING OVHT annunciation may indicate a brake or wheel well fire and (2) expand the emergency procedure for a wheel well and wing overheat warning annunciation to address a wheel well fire and the consequences of other airplane system failures as a result of the fire.

The Safety Board is also concerned about the vulnerability of the MLG wheel well in all Fairchild/Swearingen SA226 and SA227 series airplanes to the consequences of overheated brakes and wheel well fires. In the Montreal accident, the heat from the wheel well fire consumed the rubber fuel crossover line, melted aluminum fuel and hydraulic system lines and fittings, and allowed flammable fluid to be introduced to the wheel well fire. In addition, the wheel well might have incurred damage from bursting tires. A brake temperature monitoring or overheat detection system could have provided the pilots with an earlier warning of an overheating brake. Also, the introduction of flammable fluids may have been prevented had the airplane been equipped with stainless steel, rather than aluminum, hydraulic and fuel lines; a heat-resistant fuel crossover line; or fuse plugs such as those already installed in the higher gross weight SA227 series airplanes. Therefore, the Safety Board believes that FAA should require the modification of Fairchild/Swearingen SA226 and SA227 series airplanes to (1) include the installation of a brake temperature monitoring or overheat detection system; (2) provide protection to keep tires from exploding; and (3) protect the lines, fittings, and tubing installed in the wheel wells from hazards associated with exploded tires and fire.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require principal maintenance inspectors to notify operators of Fairchild/Swearingen SA226 and SA227 series airplanes of the Montreal accident and the requirement to use only the higher flash point MIL-H-83282 hydraulic fluid in all B.F. Goodrich part number 2-1203 series brake systems. (A-98-113)
>
> Require B.F. Goodrich to develop and implement a process for identifying and eliminating excessive uneven wear on all B.F. Goodrich part number 2-1203 series wheel brake assemblies used on Fairchild/Swearingen SA226 and SA227 series airplanes. (A-98-114)
>
> Require Fairchild to (1) expand the description of the wing and wheel well overheat annunciator panel warning light in all Fairchild/Swearingen SA226 and SA227 series airplane flight manuals to note that a L or R WING OVHT annunciation may indicate a brake or wheel well fire and (2) expand the emergency procedure for a wheel well and wing overheat

warning annunciation to address a wheel well fire and the consequences of other airplane system failures as a result of the fire. (A-98-115)

Require the modification of Fairchild/Swearingen SA226 and SA227 series airplanes to

(1) include the installation of a brake temperature monitoring or overheat detection system; (A-98-116)

(2) provide protection to keep tires from exploding; (A-98-117) and

(3) protect the lines, fittings, and tubing installed in the wheel wells from hazards associated with exploded tires and fire. (A-98-118)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall
Chairman

Enclosures

98 Recs SA226 wheel well fire rec VERSION2.doc
JFrechette:AS-40:drafted:9/10/98;JDeLisi:9/18/98;Kblum:10/16/98; final 10/22/98 sjh
Log 2707
cc: C(2), GA, PA, MD-1, -5, SR-1, AS-1, -2, -10, -40, RE-1, Editor
final proofread by: _______

C. EXAMPLE OF STAND-ALONE LETTER (SURFACE)

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date:
In reply refer to: M-98-125 and -126

To Cruise Vessel Owners and Operators
(address list attached)

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address fire risks in cruise ship laundry ventilation systems. The recommendations are derived from the Safety Board's investigation of the marine accident involving a fire on board the Liberian-registered passenger vessel *Ecstasy* at Port of Miami on July 20, 1988, and are consistent with the evidence we found and the analysis we performed. As a result of these investigations, the Safety Board has issued two safety recommendations to cruise vessel owners and operators. Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

On July 20, 1998, a fire occurred on board the Liberian-registered passenger vessel *Ecstasy*, operated by Carnival Cruise Lines. The vessel had just departed Port of Miami, Florida, bound for Key West, Florida, with 2,557 passengers and 920 crewmembers aboard. At 1710, the ship's fire alarm system on the bridge sounded, indicating that a manual alarm had been activated in the laundry room. Fire spread

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through the laundry ventilation system, and flames and large volumes of smoke were seen issuing from the stern of the vessel. The vessel lost propulsion and steering as a result of the fire, which was brought under control and extinguished about 2109. The ship was returned to its berth at Port of Miami at 0220 on July 21. All passengers safely disembarked before 0600. No fatalities occurred; the injured included 14 crewmembers and 6 passengers.

The fire investigated by the National Transportation Safety Board aboard the *Ecstasy* occurred within the ship's laundry ventilation system. The investigation continues, and the Safety Board expects to issue its final report next year. Within the last 2 years, the Safety Board has investigated two other fires aboard foreign-registered passenger ships operating from U.S. ports.[1] The fires on board the Panamanian *Universe Explorer* and the Bahamian *Vistafjord* were in the vicinity of the ships' laundry and involved minor damage; however, the smoke from the fires caused multiple injuries and deaths. The fire aboard the *Ecstasy* resulted in only minor injuries but caused major damage to the vessel. Preliminary property damage is estimated at $30 million.

During the current investigation of the *Ecstasy* fire, it was determined that lint, which accumulated in the vessel's exhaust ducting and plenums from the laundry, was a fuel source that enabled the fire to spread in the ducting. As a result of the fire, the aft mooring station deck received extensive structural damage. Based on observations of similar vessels, lint from the exhaust ducting likely had also accumulated on the aft mooring deck, which was the exit point of the exhaust plenum.

Safety Board investigators arranged with Carnival Cruise Lines to examine the ventilation system, the laundry room, and the aft mooring deck of two of its vessels, the *Imagination* and the *Fantasy*, which are similar to the *Ecstasy*. The *Imagination* was fitted with a different exhaust filter arrangement on the laundry dryers; its main ship ventilation in the laundry was the same as found on the *Ecstasy*. The dryers on the *Imagination* had been fitted with a "centrifugal" filter. The air from the dryers is vented through the lint traps into this filter and then sent out the exhaust vent. The filter removes a large amount of lint; however, it does not completely remove lint from the laundry exhaust, and lint accumulation was evident on the aft mooring deck. After the removal of the louvers on the exhaust plenum on the mooring deck, lint accumulation was noted in the plenum chamber. The filters on the intake ventilation system for the thruster room, located on the mooring deck, were also coated with lint. In addition, lint was noted on stored mooring line on the deck and on the spooled line on the winches. When Safety Board investigators inspected the laundry room on board the *Fantasy*, which has the same mainship ventilation in the laundry as that on the *Ecstasy*, they found several inches of lint in the dryer ventilation ducts and in the plenum chamber.

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[1] National Transportation Safety Board, *Fire On Board the Panamanian Passenger Ship* Universe Explorer *in the Lynn Canal Near Juneau, Alaska, July 27, 1996*, Marine Accident Report NTSB/MAR-98/02 (Washington, DC: NTSB, 1998) and National Transportation Safety Board, *Fire On Board the Bahamian Passenger Ship* Vistafjord *in the Atlantic Ocean Near Grand Bahama Island, Bahamas, April 6, 1997*, Marine Accident Brief DCA97MM028 (Washington, DC: NTSB, 1997).

Since the *Ecstasy* fire and after the Safety Board inspections on the other similar ships, Carnival Cruise Lines has voluntarily instituted an inspection of the laundry ventilation duct and the plenum system on all its vessels.

The Safety Board believes that cruise vessel owners and operators should immediately inspect, within their fleet of ships, the laundry ventilation systems, including ducts, plenums, and exhaust terminuses, for any combustible material, such as lint, and clean the systems, as necessary, to reduce the risk of fire. The Safety Board also believes these owners and operators should institute a program to verify on a continuing basis that the laundry ventilation systems, including ducts and plenums, remain clean and clear of any combustible material that poses a fire hazard on their vessels.

Therefore, the National Transportation Safety Board recommends that the (cruise vessel owner and operator):

> Immediately inspect, within your fleet of ships, the laundry ventilation systems, including ducts, plenums, and exhaust terminuses, for any combustible material, such as lint, and clean the systems, as necessary, to reduce the risk of fire. (Urgent) (M-98-125)
>
> Institute a program to verify on a continuing basis that the laundry ventilation systems, including ducts and plenums, remain clean and clear of any combustible material that poses a fire hazard on your vessels. (M-98-126)

Please refer to Safety Recommendations M-98-125 and -126 in your reply. If you need additional information, you may call (202) 314-6170.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall
Chairman

J. Scheffer: MS-10 drafted 09/17/98; M.A. Ferencz: edited 9/25/98
L. Waldren: MS-1 finalized
proofread__________________

FIRE ABOARD THE LIBERIAN PASSENGER SHIP *ECSTASY,* MIAMI, FLORIDA, JULY 20,1998.

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Delta Queen Steamboat Company
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Commodore Cruise Lines
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President
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Cunard Lines, Ltd., and
Seabourn Cruise Lines
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President and Chief Executive Officer
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(305) 463-3031 Fax

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Westour and Windstar Cruises
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Renaissance Cruises, Inc.
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(954) 463-8121 Fax
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Senior Director Cruise Operations

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D. EXAMPLE OF NOTATION MEMORANDUM FOR STAND-ALONE LETTER (AVIATION)

(not actual size)

FOR OFFICIAL USE ONLY

NATIONAL TRANSPORTATION SAFETY BOARD

NOTATION

NOTATION MEMORANDUM

DATE:

TO: The Board

THROUGH: Managing Director

FROM: Director, Office of Aviation Safety

SUBJECT: **Safety Recommendations** to the Federal Aviation Administration (FAA) regarding Fairchild/Swearingen SA226 and SA227 series airplane wheel well fires (Log 2707)

Background Discussion

These recommendations were prompted by the participation of National Transportation Safety Board staff in an investigation, led by the Transportation Safety Board (TSB) of Canada, of a June 18, 1998, Swearingen SA226-TC airplane accident that involved a wheel well fire and subsequent wing failure. The accident appears to have been precipitated by an overheated wheel brake that retracted into the wheel well after takeoff from Montreal's Dorval Airport. The airplane was equipped with B.F. Goodrich part number (P/N) 2-1203 wheel brake assemblies. The cockpit voice recorder (CVR) was retrieved from the accident site. The CVR contained comments from the flightcrew; however, the attached draft safety recommendation letter does not identify the source for this information because of the TSB's prohibition against discussing CVR contents.

The Safety Board is aware of two previous SA226 overheated brake fire accidents, one of which was investigated by the Safety Board and resulted in safety recommendations to improve brake inspections. The Safety Board has also investigated two SA226 cockpit fire incidents related to the use of lower flash point hydraulic fluid and issued safety recommendations that resulted in an airworthiness directive requiring the use of higher flash point (fire-retardant) hydraulic fluid. However, because of information learned during this accident investigation, Safety Board staff believes that the Federal Aviation Administration (FAA) needs to take additional action.

Safety Issues

Brake-induced wheel well fires and subsequent loss of aircraft.

Previous Board Actions

Safety Recommendations A-83-59 and A-89-101 and -102.

Recommendations

Six new safety recommendations are proposed to the FAA. Safety Board staff believes that the FAA needs to require the (1) notification by principal maintenance inspectors for operators of Fairchild/Swearingen SA226 and SA227 series airplanes to use only higher flash point MIL-H-83282 hydraulic fluid, (2) modification of the wear measurement procedures for B.F. Goodrich P/N 2-1203 brake assemblies on Fairchild/Swearingen model SA226 and SA227 airplanes, (3) revision of emergency procedures for the wing overheat annunciator panel warning light in airplane flight manuals, (4) modification of Fairchild/Swearingen airplanes to detect overheated brakes, (5) protection of lines and fittings in the wheel well from fire and exploded tires, and (6) reduction of the potential for tire explosions by the installation of fuse plugs. Safety Board staff has coordinated with and obtained comments from TSB investigators regarding these proposed recommendations. TSB staff supports these recommendations and encourages their issuance by the Safety Board.

Staff

Jerome Frechette (AS-40, 314-6345) - U.S. Accredited Representative/writer
Kevin Pudwill (AS-40, 314-6395) - Engineer/investigator
Jeffery Guzzetti (AS-40, 314-6396) - Engineer/investigator
Nancy McAtee (RE-3, 314-6509) - Fire investigator
Kristen Sears (AS-70, 314-6376) - Editor
Karen Blum (AS-70, 314-6040) - Editor

Typing Information

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i:\as40\98rec\SA226 wheel fire Rec VERSION2.doc

Recommendation FAX Distribution

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FAA
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Bernard S. Loeb

Attachments
Letter to FAA
Briefs of Accidents (4)

I concur:

_______________________________________ _______________
Director, Office of Research and Engineering — Date

_______________________________________ _______________
Director, Office of Safety Recommendations and Accomplishments — Date

_______________________________________ _______________
General Counsel — Date

E. EXAMPLE OF NOTATION MEMORANDUM FOR STAND-ALONE LETTER (SURFACE)

(not actual size)

FOR OFFICIAL USE ONLY

NATIONAL TRANSPORTATION SAFETY BOARD

NOTATION

NOTATION MEMORANDUM

DATE:

TO: The Board

THRU: The Managing Director

FROM: Director, Office of Marine Safety

SUBJECT: Urgent Safety Recommendations Related to Fire On Board the Liberian Registered Passenger Vessel *Ecstasy* on July 20, 1998. (DCA98MM035)

Background

On July 20, 1998, a fire occurred on board the Liberian *Ecstasy*, which had just departed Port of Miami, Florida, bound for Key West, Florida, with 2,557 passengers and 920 crewmembers aboard. At 1710, the ship's fire alarm system on the bridge sounded indicating that a manual alarm had been activated in the laundry room. Fire spread through the laundry ventilation system, and flames and large volumes of smoke were seen issuing from the stern of the vessel. The vessel lost propulsion and steering as a result of the fire, which was brought under control and extinguished about 2109. The ship was returned to its berth at Port of Miami at 0220 on July 21. All passengers safely disembarked before 0600. No fatalities occurred; the injured included 14 crewmembers and 6 passengers. Preliminary property damage is estimated at $30 million.

The fire aboard the *Ecstasy*, operated by Carnival Cruise Lines, received extensive national media coverage between July 20 and 24, 1998.

The fire investigated by the National Transportation Safety Board aboard the *Ecstasy* occurred within the ship's laundry ventilation system. The investigation is ongoing, and a public hearing is planned for February 1999. Within the last 2 years, the Safety Board has investigated two other fires aboard foreign-registered passenger ships operating from U.S. ports.[1] The fires on board the Panamanian *Universe Explorer* and the Bahamian *Vistafjord* were in the vicinity of the ships' laundry and involved minor damage; however, the smoke from the fires caused multiple injuries and deaths.

<u>Safety Issue/Previous Board Action</u>

The attached recommendation letter addresses the need to inspect and clean, as necessary, the ventilation systems, especially the exhaust ducts, from the laundry rooms. Passenger ship laundries generate large amounts of lint, which can accumulate in the ducts and in the plenums, where the ventilation systems exit. The lint deposited in the ducts can be a potential fuel source for a fire. The accumulation of combustible material in laundry exhaust systems is considered to be a fire risk aboard cruise ships, as seen in the *Ecstasy* fire. Information gathered in the examination of laundry exhaust ventilation systems on other Carnival Cruise Lines ships indicated that lint accumulation is a universal problem, not limited to one ship.

No previous Board action regarding fire safety of passenger ship laundry ventilation exhaust systems has been taken. However, after the Safety Board investigated the fire on board the Italian *Angelina Lauro*,[2] it asked the U.S. Coast Guard in Safety Recommendation M-80-104 to "require vessel operators to provide proof of periodic cleaning of the interior of grease vapor exhaust ducts on passenger vessels operating under its control verification program." In April 1982, the Coast Guard reported that it had included in the *Marine Safety Manual* (CG-495) detailed guidelines for the inspection of galley vents and grease vapor exhaust ducts for Coast Guard inspectors. Safety Recommendation M-80-104 was classified "Closed—Acceptable Response."

<u>Recommendations</u>

The attached letter proposes two recommendations to each of 22 passenger vessel owners and operators. These cruise lines represent over 90 percent of the passenger-cruise industry that operates out of U.S. ports.

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[1] National Transportation Safety Board, *Fire On Board the Panamanian Passenger Ship* Universe Explorer *in the Lynn Canal Near Juneau, Alaska, July 27, 1996*, Marine Accident Report NTSB/MAR-98/02 (Washington, DC: NTSB, 1998) and National Transportation Safety Board, *Fire On Board the Bahamian Passenger Ship* Vistafjord *in the Atlantic Ocean near Grand Bahama Island, Bahamas, April 6, 1997,* Marine Accident Brief DCA-97-MM-028 (Washington, DC: NTSB, 1997).
[2] National Transportation Safety Board, *Fire On Board the Italian Passenger Ship* Angelina Lauro, *Charlotte Amalie Harbor, St. Thomas, U.S. Virgin Islands, March 30, 1979,* Marine Accident Report NTSB/MAR-80/16 (Washington, DC: NTSB, 1980).

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Donald Tyrrell, MS-10	Operations Group Chairman (Deck)
Thomas Roth-Roffy, MS-30	Operations Group Chairman (Engineering)
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Merritt Birky, RE-3	Fire Group
Mary Ann Ferencz, MD-42	Writer/Editor

Recommendation FAX Distribution

See address list with draft letter.

____
Majorie M. Murtaugh, Director
Office of Marine Safety

Attachments

I concur:

Director, Office of Research and Engineering (RE-1)	Date
Director, Office of Safety Recommendations and Accomplishments (SR-1)	Date
General Counsel (GC-1)	Date
Office of Government, Public, and Family Affairs (GAPAFA-1)	Date

J. Scheffer: MS-10 drafted 09/17/98; M.A. Ferencz: MD-42 edited 09/25/98
M.A. Ferencz: MD-42 finalized 09/25/98; G. O'Reagan: MD-42 proofread 09/25/98

F. REPORT-ISSUED LETTER TO A DEPARTMENT OF TRANSPORTATION AGENCY

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date:
In reply refer to: R-00-9 through -11

Honorable Jolene M. Molitoris
Administrator
Federal Railroad Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

About 6:10 a.m., central daylight time, on September 2, 1998, the 17th through 19th cars and the first two platforms of the five-platform 20th car of westbound Burlington Northern and Santa Fe Railway Company (BNSF) intermodal freight train S-CHILAC1-31 derailed at Crisfield, Kansas.[1] The accident occurred when the 18th car from the locomotive, DTTX 72318, an articulated, five-platform, 125-ton double-stack car, experienced a separation between the floor shear plate and bulkhead bottom angle at the leading end of the car's B platform. The separation allowed the car to sag below the rails, catch a part of a switch, and derail.

The train was traveling 68 mph through the east siding switch at Crisfield, milepost 291.7, on the Panhandle Subdivision of the railroad's Amarillo Division, when it began to derail. The train then went into emergency braking and stopped after traveling about 1/2 mile. The derailment resulted in a pileup involving four articulated multiplatform cars carrying intermodal shipping containers. Some of the containers were breached, resulting in the release of hazardous materials and fires. About 200 people were evacuated within a 5-mile radius. No injuries resulted from either the derailment or the hazardous materials releases. Estimated damage was $1.3 million.

[1] National Transportation Safety Board, *Derailment of Burlington Northern and Santa Fe Railway Company Intermodal Freight Train S-CHILAC1-31, Crisfield, Kansas, September 2, 1998,* Railroad Accident Report NTSB/RAR-00/01 (Washington, DC: NTSB, 2000).

The National Transportation Safety Board determines that the probable cause of this accident was the structural failure of intermodal car DTTX 72318 due to fatigue cracking initiated when a container was misloaded onto a foreign object. The misloading of the container occurred because of the railroad industry's inadequate preloading inspection procedures for double-stack well cars. Contributing to the accident was the improper and undocumented repair of the car.

All of the parties to the investigation of this accident, including the accident car manufacturer (Thrall Car Manufacturing Company—Thrall), the car owner (TTX Company), the Federal Railroad Administration (FRA), the Association of American Railroads (AAR), the BNSF, and the Union Pacific Railroad (UP), have found that all previous weld failures between the floor shear plate and the bulkhead bottom angle on Thrall 125-ton deep-well double-stack cars resulted from the placement of a loaded container on top of a hard foreign object. All agree and have concluded that these weld failures were the direct result of such misloadings. Investigators found that the cracks discovered in Thrall cars were not related to car age, mileage, service pattern, maintenance, or previous repairs but to stress forces caused by the presence of a foreign object on the floor of these cars.

The UP inspections of Thrall cars that ultimately prompted Early Warning Letter 161 (EW-161) provide additional evidence of this phenomenon. Further, inspections of 1,653 cars still in service since EW-161 was issued, in December 1997, have resulted in the repairs of 27 Thrall double-stack container cars, all of which had damage due to foreign objects. No evidence suggests that any of the weld failures found by the FRA or during the EW-161 inspections were the result of any other condition or phenomenon. Therefore, the Safety Board concluded that a direct causal relationship exists between the misloading of a loaded container on top of a hard foreign object and the weld failures at the floor shear plate to bulkhead bottom angle on Thrall 125-ton deep-well double-stack cars.

Since the accident car displayed all of the characteristics inherent in a weld failure due to such misloading, the parties to the investigation were convinced that the initial weld failure occurred as a result of the placement of a loaded container on a hard foreign object. No empirical evidence or evidence from the metallurgical examination supports any other conclusion. Therefore, given the nature and location (bulkhead to bottom angle) of the crack and the similar problems caused by foreign objects in the wells of Thrall cars, the Safety Board concluded that DTTX 72318's original 20-inch lateral fatigue crack was most likely caused by the misloading of a container onto a foreign object.

The postaccident examination revealed that an improper and undocumented repair of the original 20-inch floor crack had been attempted. An 8-inch-long bolt had been improperly welded between the floor shear plate and bulkhead bottom angle as filler metal to bridge the original crack. The repaired area had been painted over. However, a portion of the repaired crack at the bottom of the floor shear plate had not been covered with weld. Under the stress of service, this area became a stress raiser, which caused secondary cracking to extend outside the original 20-inch lateral fatigue crack. The repair area separated during service because of this stress raiser and because of the reduced thickness of the weld repair (0.2 inch), compared to the wall thickness of the shear plate (0.5 inch). Thus, the repair was strictly cosmetic and merely covered, rather than repaired, the cracking.

Safety Board investigators, TTX Company, Thrall, and the AAR attempted to discover the history of the improper repair to DTTX 72318. The Safety Board reviewed Thrall car repair records and histories of cars experiencing cracking or structural failure to determine why the improper repair may have been made to DTTX 72318. However, the absence of records for this repair and the conflicting records on the car's location provided by TTX Company, the AAR, and the BNSF made it impossible to realistically determine who made the repair or when the repair was made. The lack of documentation for the repair made to DTTX 72318 prevented the Safety Board from determining definitively the cause of the original 20-inch lateral fatigue crack.

Loading a container onto a foreign object, such as a track spike, brake shoe, or interbox connector (IBC), is the only type of "improper securement" noted in AAR container loading and securement standards and inspection forms that is undetectable once the container is loaded. This is particularly true for longer containers, on which it is difficult to see whether one end of the container is higher than the other and possibly resting on a foreign object. If the end of a 40- or 48-foot-long container is raised no more than 6 inches, it may still appear level and pass any overhead clearance restrictions. Thus, the only effective way to ensure that foreign objects have been removed or that the car is "clean" is to inspect the car well when it is empty. However, current methods of loading do not ensure that this occurs.

The emphasis placed on postloading and predeparture inspections is illustrated by the descriptions given to Safety Board investigators of inbound and outbound inspection procedures by the Conrail carman at Croxton Yard and the two BNSF carmen at Corwith Yard and by the AAR's *Standard Operating Procedure [SOP] for Intermodal Securement*, inspection forms, and related training videos. Such an emphasis on postloading and predeparture inspections belies the importance of preloading inspections to ensure that car wells contain no foreign objects.

The procedures outlined by the Croxton and Corwith carmen illustrate actual operating conditions for many intermodal ramp operations, under which it is difficult to perform preloading inspections. At Croxton, the carman and the contractor personnel were allowed to work the train simultaneously. The Croxton carman stated that the container cars were not always empty when he inspected them because the contractor crew routinely unloaded containers from the inbound train and immediately loaded the train for the outbound movement. The carman said that most of the time he followed the contractor crew while conducting his inspections to avoid injury and to avoid getting in the way of the loaders. Therefore, the carman could not perform a consistent, comprehensive inspection of the car wells for foreign objects.

In addition, the Croxton carman stated that he conducted his night inspections from a repair truck with a search light. He said that although he was positioned to observe both the car's condition and the container's position, he would have been unable to completely see the floor of an empty car. Therefore, at each point, the carman's inspection was focused on ensuring the securement of the loads and the operation of car safety appliances before departure and not on inspecting the car wells for foreign objects. When the car was placed in the accident train, the only opportunity to inspect the cars was the predeparture inspection conducted by the Corwith carmen. Since DTTX 72318 was already loaded at that time, the carman could not have determined whether the car was structurally sound (beyond the obvious sagging or structural failure) or have seen whether a container was loaded on top of an object. The Corwith carmen's inspection was limited to postloading, predeparture securement items emphasized in the AAR training and inspection forms. This situation is typical of many intermodal facilities, where postloading securement, not preloading inspection, is emphasized. The Safety Board, therefore, concluded that current preloading inspection procedures are inadequate to ensure that foreign objects are detected on the floors of well cars, particularly Thrall 125-ton double-stack cars.

Despite the fact that the AAR SOP requires that foreign objects be removed from rail car wells or surfaces, inspecting the wells of intermodal cars before loading is not included as a safety check on the AAR *Intermodal Securement Safety Audit Form*, nor is it listed as a securement failure on the *Internal and Inter-road Securement Failure Report*. Although these forms cover postloading and predeparture securement and inspection comprehensively, the only preloading consideration is to ensure that containers and trailers are structurally sound with closed and locked doors and that trailer hitches, IBCs, and other loading equipment are in safe working order. In short, the primary emphasis is on the importance of load securement and postloading inspection.

In the latest AAR video, the removal of foreign objects is briefly mentioned by a narrator, standing next to an intermodal flatcar, who says, "Ice and snow can build up and prevent a container from making proper contact. Brake shoes, IBCs, and rocks can also prevent a container from seating properly, so remember to remove these items before loading a container." This segment takes about 30 seconds of the 17-minute video and could be easily missed. The topic of removing foreign objects before loading intermodal cars is mentioned in passing without emphasis or example, and the only reason cited for its importance is the need to ensure the container is seated correctly. The FRA has no inspection standards and procedures for intermodal cars.

The Safety Board concluded that had the railroad industry or the FRA placed sufficient emphasis on ensuring a complete preloading inspection of all well cars, the structural failure of DTTX 72318 may not have happened. The Safety Board also concluded that the EW-161 inspections did not address the root cause of the resulting structural failures: loaded containers placed on foreign objects on the floors of double-stack container cars. The Safety Board further concluded that to prevent the structural failure of double-stack container cars, all such cars must be inspected while empty to ensure that foreign objects are eliminated from the wells and platforms. This inspection can best be done at the intermodal facilities as part of a comprehensive program that focuses not only on postloading securement but also on preloading conditions when the car is empty.

To address long-term solutions to intermodal equipment problems, the FRA is conducting a nationwide intermodal securement safety audit focusing on topics such as loading practices and the removal of foreign objects from car wells. The 18-month safety audit begun in October 1999 should be completed in April 2001. One result of the FRA audit will be to determine whether new regulations regarding intermodal industry practices are needed.

Railroad intermodal traffic has increased an average of about 15 percent per year, from 3 million trailers and containers in 1980 to over 8.7 million in 1997. Intermodal traffic accounts for more than 17 percent of railroad industry revenue, second only to coal, at 22 percent. The BNSF's Director of Hazardous Materials estimated that, in 1999, roughly half of the BNSF's hazardous materials were transported intermodally. In addition, according to 1998 AAR statistics, 486,300, or 5.6 percent, of the 8,772,663 total intermodal shipments in the United States consisted of hazardous materials. These statistics prompt the Safety Board to recommend that more immediate action be taken to develop comprehensive safety inspection standards and procedures for all intermodal cars. Such procedures must include inspections of those areas of cars that have been identified as subject to misloading and catastrophic structural failure. In addition, the procedures should address other issues ultimately identified in the FRA's audit.

Therefore, the Safety Board recommends that the Federal Railroad Administration:

> Audit the Association of American Railroads and individual railroad equipment repair databases to determine whether adequate quality control procedures have been incorporated to ensure that database information is complete, accurate, and secure. Direct the Association of American Railroads and the individual railroads to correct all identified deficiencies. (R-00-9)
>
> Require that double-stack well car floors be inspected and that all foreign objects be removed before loading. (R-00-10)
>
> Revise 49 *Code of Federal Regulations* Part 215 to include comprehensive safety inspection standards and procedures for all intermodal cars. (R-00-11)

The Safety Board also issued safety recommendations to the Class I Railroads and the American Association of Railroads. Please refer to Safety Recommendations R-00-9 through -11 in your reply. If you need additional information, you may call (202) 314-6170.

Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, BLACK, and CARMODY concurred in these recommendations.

By: Jim Hall
Chairman

G. REPORT-ISSUED LETTER TO AN ORGANIZATION OTHER THAN A DEPARTMENT OF TRANSPORTATION AGENCY

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date:
In reply refer to: R-00-13 through -17

Mr. Edward R. Hamberger
President and Chief Executive Officer
Association of American Railroads
50 F Street N.W.
Washington, DC 20001

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the adequacy of the Association of American Railroads' (AAR's) intermodal container and securement standards for the preloading inspection of double-stack cars and the appropriateness of remedial actions for cars similar in design to Thrall 125-ton double-stack cars. The recommendations are derived from the Safety Board's investigation of the derailment of Burlington Northern and Santa Fe Railway Company (BNSF) intermodal freight train S-CHILAC1-31, at Crisfield, Kansas, on September 2, 1998,[1] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued nine safety recommendations, five of which are addressed to the AAR. Information supporting the recommendations is discussed below. The Safety Board would appreciate a response

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[1] National Transportation Safety Board, *Derailment of Burlington Northern and Santa Fe Railway Company Intermodal Freight Train S-CHILAC1-31, Crisfield, Kansas, September 2, 1998,* Railroad Accident Report NTSB/RAR-00/01 (Washington, DC: NTSB, 2000).

from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

About 6:10 a.m., central daylight time, on September 2, 1998, the 17th through 19th cars and the first two platforms of the five-platform 20th car of westbound BNSF intermodal freight train S-CHILAC1-31 derailed at Crisfield, Kansas. The accident occurred when the 18th car from the locomotive, DTTX 72318, an articulated, five-platform, 125-ton double-stack car, experienced a separation between the floor shear plate and bulkhead bottom angle at the leading end of the car's B platform. The separation allowed the car to sag below the rails, catch a part of a switch, and derail.

The train was traveling 68 mph through the east siding switch at Crisfield, milepost 291.7, on the Panhandle Subdivision of the railroad's Amarillo Division, when it began to derail. The train then went into emergency braking and stopped after traveling about 1/2 mile. The derailment resulted in a pileup involving four articulated multiplatform cars carrying intermodal shipping containers. Some of the containers were breached, resulting in the release of hazardous materials and fires. About 200 people were evacuated within a 5-mile radius. No injuries resulted from either the derailment or the hazardous materials releases. Estimated damage was $1.3 million.

The National Transportation Safety Board determined that the probable cause of this accident was the structural failure of intermodal car DTTX 72318 due to fatigue cracking initiated when a container was misloaded onto a foreign object. The misloading of the container occurred because of the railroad industry's inadequate preloading inspection procedures for double-stack well cars. Contributing to the accident was the improper and undocumented repair of the car.

All of the parties to the investigation of this accident, including the accident car manufacturer (Thrall Car Manufacturing Company—Thrall), the car owner (TTX Company), the Federal Railroad Administration (FRA), the AAR, the BNSF, and the Union Pacific Railroad (UP), have found that all previous weld failures between the floor shear plate and the bulkhead bottom angle on Thrall 125-ton deep-well double-stack cars resulted from the placement of a loaded container on top of a hard foreign object. All agree and have concluded that these weld failures were the direct result of such misloadings. Investigators found that the cracks discovered in Thrall cars were not related to car age, mileage, service pattern, maintenance, or previous repairs but to stress forces caused by the presence of a foreign object on the floor of these cars.

The UP inspections of Thrall cars that ultimately prompted Early Warning Letter 161 (EW-161) provide additional evidence of this phenomenon. Further, inspections of 1,653 cars still in service since EW-161 was issued, in December 1997, have resulted in the repairs of 27 Thrall double-stack container cars, all of which had damage due to foreign objects. No evidence suggests that any of the weld failures found by the FRA or during the EW-161 inspections were the result of any other condition or phenomenon. Therefore, the Safety Board concluded that a direct causal relationship exists between the misloading of a loaded container on top of a hard foreign object and the weld failures at the floor shear plate to bulkhead bottom angle on Thrall 125-ton deep-well double-stack cars.

Loading a container onto a foreign object, such as a track spike, brake shoe, or interbox connector (IBC), is the only type of "improper securement" noted in AAR container loading and securement standards and inspection forms that is undetectable once the container is loaded. This is particularly true for longer containers, on which it is difficult to see whether one end of the container is higher than the other and possibly resting on a foreign object. If the end of a 40- or 48-foot-long container is raised no more than 6 inches, it may still appear level and pass any overhead clearance restrictions. Thus, the only effective way to ensure that foreign objects have been removed or that the car is "clean" is to inspect the car well when it is empty. However, current methods of loading do not ensure that this occurs.

The emphasis placed on postloading and predeparture inspections is illustrated by the descriptions given to Safety Board investigators of inbound and outbound inspection procedures by the Conrail carman at Croxton Yard and the two BNSF carmen at Corwith Yard and by the AAR's *Standard Operating Procedure [SOP] for Intermodal Securement*, inspection forms, and related training videos. Such an emphasis on postloading and predeparture inspections belies the importance of preloading inspections to ensure that car wells contain no foreign objects.

The procedures outlined by the Croxton and Corwith carmen illustrate actual operating conditions for many intermodal ramp operations, under which it is difficult to perform preloading inspections. At Croxton, the carman and the contractor personnel were allowed to work the train simultaneously. The Croxton carman stated that the container cars were not always empty when he inspected them because the contractor crew routinely unloaded containers from the inbound train and immediately loaded the train for the outbound movement. The carman said that most of the time he followed the contractor crew while conducting his inspections to avoid injury and to avoid getting in the way of the loaders. Therefore, the carman could not perform a consistent, comprehensive inspection of the car wells for foreign objects.

In addition, the Croxton carman stated that he conducted his night inspections from a repair truck with a search light. He said that although he was positioned to observe both the car's condition and the container's position, he would have been unable to completely see the floor of an empty car. Therefore, at each point, the carman's inspection was focused on ensuring the securement of the loads and the operation of car safety appliances before departure and not on inspecting the car wells for foreign objects.
When the car was placed in the accident train, the only opportunity to inspect the cars was the predeparture inspection conducted by the Corwith carmen. Since DTTX 72318 was already loaded at that time, the carman could not have determined whether the car was structurally sound (beyond the obvious sagging or structural failure) or have seen whether a container was loaded on top of an object. The Corwith carmen's inspection was limited to postloading, predeparture securement items emphasized in the AAR training and inspection forms. This situation is typical of many intermodal facilities,

where postloading securement, not preloading inspection, is emphasized. The Safety Board, therefore, concluded that current preloading inspection procedures are inadequate to ensure that foreign objects are detected on the floors of well cars, particularly Thrall 125-ton double-stack cars.

Despite the fact that the AAR SOP requires that foreign objects be removed from rail car wells or surfaces, inspecting the wells of intermodal cars before loading is not included as a safety check on the AAR *Intermodal Securement Safety Audit Form*, nor is it listed as a securement failure on the *Internal and Inter-road Securement Failure Report*. Although these forms cover postloading and predeparture securement and inspection comprehensively, the only preloading consideration is to ensure that containers and trailers are structurally sound with closed and locked doors and that trailer hitches, IBCs, and other loading equipment are in safe working order. In short, the primary emphasis is on the importance of load securement and postloading inspection.

In the latest AAR video, the removal of foreign objects is briefly mentioned by a narrator, standing next to an intermodal flatcar, who says, "Ice and snow can build up and prevent a container from making proper contact. Brake shoes, IBCs, and rocks can also prevent a container from seating properly, so remember to remove these items before loading a container." This segment takes about 30 seconds of the 17-minute video and could be easily missed. The topic of removing foreign objects before loading intermodal cars is mentioned in passing without emphasis or example, and the only reason cited for its importance is the need to ensure the container is seated correctly.

The Safety Board concluded that had the railroad industry or the FRA placed sufficient emphasis on ensuring a complete preloading inspection of all well cars, the structural failure of DTTX 72318 may not have happened. The Safety Board also concluded that the EW-161 inspections did not address the root cause of the resulting structural failures: loaded containers placed on foreign objects on the floors of double-stack container cars. The Safety Board further concluded that to prevent the structural failure of double-stack container cars, all such cars must be inspected while empty to ensure that foreign objects are eliminated from the wells and platforms. This inspection can best be done at the intermodal facilities as part of a comprehensive program that focuses not only on postloading securement but also on preloading conditions when the car is empty.

Therefore, the Safety Board recommends that the Association of American Railroads:

> Revise training and instructional materials to emphasize the necessity of conducting a thorough preloading inspection of container cars while empty, particularly double-stack cars, to ensure the removal of foreign objects before loading. The training should also discuss the consequences of not conducting such inspections. (R-00-13)
>
> Revise intermodal container loading and securement standards, including *Standard Operating Procedures for Intermodal Securement*, to emphasize

> the necessity of conducting a thorough preloading inspection of intermodal cars while empty, particularly double-stack cars, to ensure the removal of foreign objects before loading. (R-00-14)
>
> Revise the *Intermodal Securement Safety Audit Form* to include, as a safety check item, the removal of all foreign objects from double-stack cars before loading. (R-00-15)
>
> Revise the *Internal and Inter-road Securement Failure Report* to include, as a reportable failure, the misloading of a container onto a foreign object. (R-00-16)
>
> Conduct a study to determine whether other double-stack cars similar in design to the Thrall 125-ton model are also susceptible to misloading and whether remedial actions would be appropriate. (R-00-17)

The Safety Board also issued safety recommendations to the Federal Railroad Administration and the Class I Railroads. In your response to the recommendations in this letter, please refer to Safety Recommendations R-00-13 through -17. If you need additional information, you may call (202) 314-6170.

Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, BLACK, and CARMODY concurred in this recommendation.

By: Jim Hall
Chairman

Closing language for safety recommendation letters

New boilerplate language for penultimate paragraph of safety recommendation letters:

> In response to the recommendation(s) in this letter, please refer to Safety Recommendation(s) X-XX-XX. If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our Tumbleweed secure mailbox procedures. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

How to incorporate and reference Board Member statements in reports and safety recommendation letters

Reports:

- Include the standard statement: "BY THE NATIONAL TRANSPORTATION SAFETY BOARD" with the names of all Members typed below, followed by "Adopted: [date]"

- The paragraph immediately below should state: "Member XXX filed the following concurring [or dissenting] statement on [date]." If another member joins the statement, add the additional phrase "…and was joined by Member XX." If more than one member filed a statement, write a similar sentence for each statement.

- Start statements on a new page with the following heading: "Member XXX, concurring [or dissenting]:" **Note**: there is no need to include the notation number, even if it was included in the Board Member's original statement. If any other Member[s] joined the statement there is no need to restate it here.

- Insert text of Member statement. There is no need to include any signature or signature block at the end.

- Any subsequent Board Member statements should start on a new page, again with the heading "Member XXX, concurring [or dissenting].

- **Examples** (these examples may reflect slight variations from the guidance above):
  http://www.ntsb.gov/publictn/2007/AAR0705.pdf
  http://www.ntsb.gov/publictn/2007/HAR0701.pdf

Safety Recommendation Letters:

- Footnote at the beginning should reference the full report and include a link to the report on our website. **Example:**

  [1] For more information, see *In-flight Separation of Right Wing, Flying Boat, Inc., doing business as Chalk's Ocean Airways Flight 101,Grumman G-73T, N2969, Port of Miami, Florida, December 19, 2005,* Aviation Accident Report NTSB/AAR-07/04 (Washington, DC: NTSB, 2007), available on the National Transportation Safety Board's website at <http://www.ntsb.gov/publictn/2007/AAR0704.pdf>.

- Closing paragraph should reference any statements that were filed and who they were filed by and note that they are attached to the report. For example: "Chairman XX, Vice Chairman XX, and Members XX, XX, and XX, concurred in these recommendations. Member XX filed a concurring statement, which is attached to the [mode] accident report."

- The statements themselves should not be attached to the recommendation letter.

- **Examples**:
  http://www.ntsb.gov/Recs/letters/2007/R07_9_12.pdf
  http://www.ntsb.gov/Recs/letters/2008/M08_1_2.pdf

CHAPTER 16

SAFETY RECOMMENDATION REITERATION LETTER

REITERATION LETTER

Sometimes, the Safety Board revisits a safety issue that it has addressed in a previous recommendation. If the recommendation is still in an "Open" status, the Safety Board may decide to reiterate the previous recommendation and draw the recipient's attention to the recent accident report, safety study, or investigation. The recipient of the previous recommendation must be notified of the Safety Board's most recent action, either by a recommendation letter that transmits new recommendations to the recipient (see ***chapter 15***) or by a reiteration letter. Use a reiteration letter only when no new recommendations are being made to the recipient of the previous recommendation.

Reiteration letters are processed and reviewed differently from routine outgoing letters. A reiteration letter associated with a stand-alone recommendation letter should be included in the notation package presented to the Board Members. If the stand-alone letter is adopted, MD-5 will notify the originating office to prepare the final reiteration letter for signature. A reiteration letter resulting from an accident report or safety study is reviewed and created like a report-issued safety recommendation letter. (For more information on stand-alone and report-issued recommendation letters, see ***chapter 15***.)

Format reiteration letters as you would routine outgoing letters to be signed by the Chairman. (For more information on the Safety Board's correspondence practices, see Board Order 5A, *Correspondence Procedures*. Also see the example that follows this section.) Print the letter on Chairman's letterhead, and instead of showing the Members' concurrences as in a standard safety recommendation letter, use the standard Chairman's signature block. Structure the text similarly to a standard safety recommendation letter, and include the following elements:

- Lead paragraph(s) explaining the Board's purpose and intent and summarizing the safety issues and recommendations discussed in the letter. (U.S. Department of Transportation Agencies should omit these paragraphs.) Use this or similar wording:

  > The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in

this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address [*list safety issues*]. The recommendations are derived from the Safety Board's investigation of the [*list date, location, and mode of accident or report title*] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board issued [*number of recommendations to all recipients*], [*number of recommendations to letter recipient*] of which to are addressed to [*name of recommendation recipient*]. Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation(s).

- One or two paragraphs explaining accidents that prompted the investigation.

- Discussion of facts leading up to safety issue(s).

- Analysis of safety issue(s). If the analysis discusses a previous Safety Board recommendation on the safety issue, include the number and status of the previous recommendation. If the previous recommendation is in an "Open" status, the discussion must include the latest response from the recipient and indicate whether the Safety Board is reiterating the recommendation or changing its classification status.

- Conclusions about safety issue(s).

- History of reiterated recommendation(s), followed by text of reiterated recommendation(s).

- Paragraph naming other recommendation recipients (if necessary) and providing reply information:

The Safety Board also issued safety recommendations to the Federal Aviation Administration and to the American Association of Airport Executives. In your response to the recommendation in this letter, please refer to Safety Recommendation A-98-113.

- Contact information for the Office of Safety Recommendations and Accomplishments. Unless the letter is going to a Department of Transportation agency or other organization that the Safety Board deals with on a regular basis, add the following sentence to the end of the last paragraph:

  If you need additional information, you may call (202) 314-6170.

A. EXAMPLE OF A REITERATION LETTER

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Honorable Tommy G. Thompson
Governor of Wisconsin
State Capitol
Post Office Box 7863
Madison, Wisconsin 53707-7863

Dear Governor Thompson:

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the adequacy of the State of Wisconsin's enforcement of mandatory seat belt use laws. The recommendations are derived from the Safety Board's investigation of the multiple vehicle crossover accident in Slinger, Wisconsin, on February 12, 1997,[1] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued 20 safety recommendations, 1 of which is addressed to the State of Wisconsin. Information supporting the recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

About 5:52 a.m. on February 12, 1997, a doubles truck with empty trailers, operated by Consolidated Freightways, Inc., that was traveling northbound on U.S. Route 41, a four-lane divided limited access highway, near Slinger, Wisconsin, lost control and crossed over the 50-foot depressed median into the southbound lanes. A flatbed truck loaded with lumber, operated by McFaul Transport, Inc., that was traveling southbound on U.S. Route 41 collided with the doubles truck, lost control, and crossed over the median into the northbound lanes. A northbound passenger van with nine adult occupants struck and underrode the right front side of the flatbed truck at the landing gear. A

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[1]National Transportation Safety Board, *Multiple Vehicle Crossover Accident, Slinger, Wisconsin, February 12, 1997,* Highway Accident Report NTSB/HAR-98/01 (Washington, DC: NTSB, 1998).

refrigerator truck loaded with produce, operated by Glandt/Dahlke, Inc., that was also traveling northbound, struck the right rear side of the flatbed truck. Although it had snowed from about 8 p.m. to 3 a.m. the night before, it was clear at the time of the accident. Other motorists and the emergency responders to the accident scene reported icy patches in the roadway. Eight of the nine van occupants suffered fatal injuries, and the remaining occupant suffered serious injuries. Two of the three commercial truckdrivers were treated for minor injuries and released; the third refused treatment.

The National Transportation Safety Board determined that the probable cause of the accident was the doubles truckdriver's lack of judgment in driving too fast for the configuration of his truck under the hazardous highway weather conditions. Contributing to the severity of the injuries and the reduced potentiality for survival was the lack of restraint use by the unrestrained occupants of the passenger van.

One of the most troubling issues raised by this accident was the lack of restraint use by some passenger van occupants. The van was a rental vehicle, designed to seat 15 passengers through 5 rows of seats. The first row had bucket seats for the driver and the right front passenger; both seats were equipped with lap/shoulder belts. The driver-side restraint system was equipped with a supplemental airbag and a pre-tensioner for the belt. The second through fourth rows were bench seats with three seating positions each. These seats were designed so they could be removed. The left outboard seating position in each of these bench seats was equipped with a lap/shoulder belt, while the center and right outboard seating positions were equipped with lap belts only. The fifth row, also a bench seat, differed from the other rear rows in that it was not designed for easy removal and that it had four seating positions. The left and right outboard seating positions were equipped with lap/shoulder belts. The two inboard positions were equipped with lap belts only.

In accordance with a request that appeared in the van rental agreement, the seats in the second and third rows of the van had been removed by the rental company. The rented configuration had nine seating positions, five with lap/shoulder belts and four with lap belts only.

Following the accident, the Safety Board examined the passenger van damage, the autopsy reports, and the medical records of the passenger van occupants. The Board found evidence of injury patterns consistent with seat belt use for the driver of the van. In addition, rescue personnel stated that the driver and the right front passenger were belted when the accident occurred. However, the flatbed truck's intrusion into the van precluded their survival. The fatal injuries sustained by the driver and right front passenger resulted either from the loss of occupant space because of the intrusion into the van, from the secondary collisions within the vehicle, or from the impact with the flatbed trailer as it intruded into the vehicle.

The Safety Board found no evidence of restraint use by the passengers in the rear of the van. The surviving passenger stated that none of the back seat passengers had been using seat belts. The survivor, who had been seated in the middle of the fourth row, sustained injuries to his legs and his arm. He told the Safety Board that the cargo in the van had been stored several feet in front of him. The interaction between the survivor and the cargo and the interaction of his legs with the interior of the van probably slowed him gradually, allowing him to “ride down” the collision. As a result, the injuries to his head and chest were significantly less severe than those of the other occupants of the van.

The Safety Board’s evaluation of autopsy reports and medical records indicated that the fatal injuries sustained by the passengers in the rear of the van resulted from secondary collisions with the interior of the van. The short distances over which these secondary collisions occurred resulted in greater forces and decelerations being experienced by these passengers than by the vehicle itself. The Safety Board considers that the use of the available lap/shoulder restraint systems would have reduced such secondary impact forces.

During a collision, a vehicle experiences crushing deformation that lengthens the duration of the impact and substantially decreases the peak and average forces experienced by the underformed portions of the vehicle. Unrestrained occupants do not benefit from this deformation, as they continue moving until they contact interior vehicle surfaces. Unless some cushion is provided by the vehicle interior, unrestrained occupants can experience deceleration forces many times greater than those experienced by the vehicle. On the other hand, restrained occupants, particularly those properly using lap/shoulder restraint systems, do not move significantly in relation to the vehicle interior; they experience deceleration forces similar to those experienced by the vehicle itself.

In this collision, the forward van structure experienced several feet of deformation during the underride of the van beneath the flatbed trailer. Because the occupants in the rear of the van did not use their restraint systems, they did not benefit from the reduction in peak forces associated with such deformation. A number of other variables influenced the probability of survival for a belted occupant. These variables include occupant age, health, and position relative to the belt system before the collision; occupant impact with loose objects within the vehicle; and occupant motion relative to the restraint systems. However, the fact that one individual survived this accident demonstrates that the crash forces the vehicle experienced were not inherently fatal. Although it could not conclude with certainty that the passengers would have survived had they worn the lap/shoulder belt restraint systems, the Safety Board concluded that the use of the available lap/shoulder belt restraint systems by the occupants of the passenger van would have significantly decreased the severity of their injuries and thereby increased the probability of their survival.

The Safety Board could not determine why the occupants of the rear of the van were not wearing the available restraints. Although he said he knew Wisconsin had a mandatory use law (MUL) for seat belts, the survivor did not tell the Safety Board why he and the other passengers in the rear of the van were not wearing the available restraints.

The Wisconsin seat belt MUL is a secondary enforcement law that is enforceable for seating positions with lap/shoulder belts only. Although Wisconsin is one of the few States that allows a court to consider evidence of failure to wear a seat belt, it permits mitigation of only 15 percent of the damages that may be recovered by a plaintiff who failed to wear a seat belt. The Wisconsin seat belt use rate is 61.7 percent, approximately 6 percent lower than the current national average of 68 percent. Research has shown that States and countries with stricter seat belt use laws have higher seat belt use rates. Consequently, the Safety Board considers that Wisconsin should enact stronger seat belt use laws to increase its seat belt use rate. The Board has previously recommended that Wisconsin and other States enact strong legislation regarding child restraint and seat belt use. In fact, stricter MULs have been on the Safety Board's 1995, 1996, and 1997 "Most Wanted" lists.

On June 20, 1995, the Board issued Safety Recommendation H-95-13 to the States (and the District of Columbia) that had secondary enforcement of mandatory seat belt laws and the States without MULs. It recommended that these jurisdictions:

H-95-13

> Enact legislation that provides for primary enforcement of mandatory safety belt laws. Consider provisions such as adequate fine levels and the imposition of driver license penalty points.

Wisconsin did not respond to Safety Recommendation H-95-13. Following the Air Bag Forum held on July 1, 1997,[2] the Safety Board reclassified Safety Recommendation H-95-13 "Closed—Acceptable Action/Superseded" and issued the following recommendation to the Governors and legislative leaders of the 50 States and U.S. Territories, and the mayor and chairman of the council of the District of Columbia:

H-97-2

> Enact legislation that provides for primary enforcement of mandatory seat belt use laws, including provisions such as the imposition of driver license penalty points and appropriate fines. Existing legal provisions that insulate people from the financial consequences of not wearing a seat belt should be repealed. (Supersedes H-95-13.)

Wisconsin has not responded to Safety Recommendation H-97-2. Consequently, the Safety Board reiterates Safety Recommendation H-97-2 to the State of Wisconsin.

The Safety Board also issued safety recommendations to the Federal Highway Administration, National Highway Traffic Safety Administration, National Association of Governors' Highway Safety Representatives, American Trucking Associations,

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[2]National Transportation Safety Board, *Proceedings of the National Transportation Safety Board Public Forum on Air Bags and Child Passenger Safety, March 17-20, 1997,* Report of Proceedings NTSB/RP-97/01 (Washington, DC: NTSB, 1997).

International Brotherhood of Teamsters, Motor Freight Carrier Association, American Association of State Highway and Transportation Officials, Wisconsin Department of Transportation, Independent Truckers and Drivers Association, National Private Truck Council, and Owner-Operators Independent Drivers Association, Inc. In your response to the recommendations in this letter, please refer to Safety Recommendation H-97-2. If you need additional information, you may call (202) 314-6170.

Sincerely,

Jim Hall
Chairman

CHAPTER 17

SAFETY PROPOSAL

SAFETY PROPOSAL

Board Order 70, *NTSB Safety Recommendations Program*, defines safety proposals as safety recommendations that are not processed with a major accident investigation, special investigation, or safety study. Safety proposals may be submitted by any employee, subject to the procedures set by individual Office Directors.

Upon receipt of a safety proposal, the Office of Safety Recommendations and Accomplishments gives the proposal a tracking number and acknowledges receipt via fax. The Safety Proposal Review Board (SPRB), which consists of the Directors or Deputy Directors of the operating and technical offices, reviews the safety proposals at its periodic meetings and determines whether further analysis will be performed. If the SPRB determines that the proposal will support a safety recommendation, headquarters staff will work with the person who submitted the proposal to develop a notation memorandum and a proposed safety recommendation letter (see ***chapter 15***). The notation memorandum and the recommendation letter will be developed and circulated for review in accordance with Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board and Convening of Board Meetings*.

Include the following elements in a safety proposal:

- Accident information (accident number, date, location, type of aircraft or vehicle, and whether injuries or deaths occurred).
- Nature and circumstances of the accident (a brief factual description of the accident, including facts that support the proposed recommendation(s)).
- Discussion (an analysis of how the accident occurred).
- Proposed safety recommendation(s) (including a discussion of how the proposed recommendation could have prevented the accident, minimized the injuries, or prevented the deaths).
- Previous Board actions (a discussion of previous safety recommendations or reports addressing this issue).
- Supporting documentation.

Two examples of safety proposals follow this paragraph.

EXAMPLES OF SAFETY PROPOSALS

(not actual size)

NATIONAL TRANSPORTATION SAFETY BOARD
NORTHWEST FIELD OFFICE

SAFETY RECOMMENDATION/PROPOSAL

A. **ACCIDENT** ANC-97-F-A092

Location: Nome, Alaska

Date/Time: 6/27/97 1633 ADT

Aircraft: Cessna 207A, N207SP

Injuries: 2 Fatal

B. NATURE AND CIRCUMSTANCES OF ACCIDENT

On June 27, 1997, about 1633 Alaska daylight time, a Cessna 207A, N207SP, collided with a commercial radio antenna tower, about 3.85 miles east of Nome, Alaska. The airplane was being operated as a visual flight rules (VFR) scheduled passenger flight under Title 14 CFR Part 135 when the accident occurred. The airplane was destroyed. The certificated commercial pilot and the sole passenger received fatal injuries. Instrument meteorological conditions prevailed. The pilot had been issued a special VFR clearance for operations in the Nome surface area.

The airplane departed Nome for a flight to Brevig Mission at 1448. At that time, cloud cover at the Nome airport was 400 feet broken, 1,200 feet overcast, and the visibility was 10 miles. About 1603, the pilot contacted the Nome Automated Flight Service Station (AFSS), and reported 10 miles north of the airport. The pilot requested a Special Visual Flight Rules (SVFR) clearance into the Class E airspace for landing. Numerous VFR traffic and instrument flight rules (IFR) traffic were operating in and around the Nome airport. The pilot was advised to maintain VFR conditions and remain clear of the surface area. He was provided with an airport advisory that included cloud cover conditions of 300 feet overcast and 4 miles visibility in mist.

About 1609, the Nome AFSS specialist contacted the accident airplane and requested a position report. The pilot indicated he was 6 miles north of the Nome VOR, over the Nome River. About 1616, the pilot requested the current weather conditions, and was told the cloud conditions were 300 feet overcast, visibility was down from 4 miles to 3 miles in mist.

About 1629, the AFSS specialist cleared the accident airplane to enter the Nome surface area. About 1631, the pilot contacted the AFSS and requested the current weather conditions. The AFSS specialist provided the 1630 special observation that included a visibility of 1 mile in mist, and the ceiling was 300 feet overcast. The pilot acknowledged the information, and no further communication was received from the pilot.

A witness reported he was traveling in the area east of the radio tower and observed an airplane flying about 150 to 200 feet above the ground. He described thick fog in the area. A second witness, located on the roadway just south of the tower, reported he did not initially see the accident airplane. He heard an airplane engine suddenly increase and then the sound of an impact. The witness then observed the accident airplane descending, and rolling inverted before colliding with the ground. The witness reported that low clouds obscured the tops of nearby power poles.

A weather forecast for the area included an AIRMET for IFR conditions and mountain obscuration. The AIRMET included temporary ceilings below 1,000 feet, and visibility below 3 statute miles in mist, light drizzle and mist.

The weather conditions at Nome were decreasing as the pilot was approaching, and holding outside the Class E surface area. At 1555, a METAR was reporting 300 feet overcast, and the visibility was 4 statute miles in mist. At 1612, the weather was 300 feet overcast, and the visibility was 3 statute miles in mist. At 1626, the weather was 300 feet overcast with a visibility of 2 statute miles in mist. At 1630, the weather had decreased to 300 feet overcast and a visibility of 1 statute mile in mist. At 1634, the weather conditions again decreased to 200 feet overcast and a visibility of 5/8 statute mile in mist. At 1650, the weather conditions were 100 feet overcast with a visibility of 1/4 statute mile in fog.

The pilot was initially hired by the operator 24 days before the accident, and had accrued 69 hours of flight operations with the company. The operator’s airplanes are equipped for instrument flight. The pilot had passed a Part 135 check ride, including an instrument proficiency check flight. The pilot had utilized a SVFR clearance during an earlier flight on the day of the accident. On the accident flight, the pilot remained outside the Nome Class E surface area for 26 minutes until he was given a SVFR clearance.

C. DISCUSSION

Special VFR

Title 14 CFR Part 135 rules require pilots to maintain at least 500 feet above the ground and 500 feet from obstacles. In uncontrolled airspace, when the ceiling is less than 1,000 feet, pilots must have at least 2 miles of visibility.

Title 14 CFR Part 91 allows SVFR operations within the airspace contained by the upward extension of the lateral boundaries of the controlled airspace designated to the surface for an airport. SVFR requirements, for airplanes, include an ATC clearance, clear of clouds, and flight visibility of at least 1 statue mile. In addition, no person may take off or land an airplane unless ground visibility is at least 1 statute mile.

The Safety Board has previously examined VFR into IMC, low altitude IFR operations, and weather reporting capabilities, in its Alaska Aviation Safety Study. The study identified VFR into IMC accidents as a significant safety issue. Several areas of the State of Alaska have a high concentration of single engine Part 135 operations from airports to remote villages. Operators routinely utilize SVFR clearances to depart for, and arrive from, these remote villages. Most remote villages have few, if any, weather reporting stations.

Poor weather conditions around an airport, when SVFR is utilized, are not necessarily confined to the boundaries of Class E surface areas as noted above. Once clear of the Class E airspace, the regulations require Part 135 operators to maintain 2 miles of visibility, and at least 500 feet above the ground, so pilots must depart toward improving weather conditions; however, many remote areas have few weather reporting capabilities. Part 91 operations, including SVFR, only require 1 mile visibility, and clear of clouds. Part 135 arrivals into SVFR conditions allow operations into an airport environment where decreasing visibility conditions are occurring.

The Nome Class E surface area extends about 7 nautical miles east of the Nome VORTAC (12 miles east of the Nome Airport); about 3 miles north of the Nome VORTAC, about 4 miles north of the Nome Airport; about 6.5 miles west of the Nome Airport; and about 5.5 miles south of the Nome Airport. Weather observations for the Nome area are conducted by the National Weather Service office located on the airport.

IFR operations in the airspace around the Nome airport are coordinated by the Anchorage Air Route Traffic Control Center (ARTCC). When no IFR traffic is utilizing the airspace, the Nome AFSS issues traffic advisories to VFR traffic. Under a letter of agreement, and after the ARTCC releases the surface area, the Nome AFSS issues SVFR clearances to local traffic to provide a means of takeoff and landings without an IFR clearance. Once an airplane has been granted a SVFR clearance, no other airplane may operate in the surface area until the airplane has landed or has traveled outside of the surface area boundary. An exception to the procedure may allow more than one airplane to operate in the surface area, if all participating air traffic agree to maintain visual separation from each other.

The accident airplane has a cruise speed of about 120 knots. An airplane traveling at 120 knots covers 202.5 feet per second. An airplane will travel 1 nautical mile in about 30 seconds.

In addition to the referenced accident in Nome, a review of SVFR accidents in Alaska, from 1983 to 1996, revealed 8 other accidents, all of which involved air carrier

(Part 135) airplane operations. The accidents involving a loss of control, due to a loss of visibility, included an accident in Ketchikan, Alaska, where one airplane crashed after losing sight of another airplane. The passenger received fatal injuries. Both airplanes were operating in SVFR and attempting to maintain visual separation from each other. Two other accidents involved loss of visual reference while in SVFR, one in Bethel, Alaska, and another in Kotzebue, Alaska.

A review of SVFR accidents in the Continental U.S., from 1983 to 1996, revealed 82 accidents, of which 38 were fatal, resulting in 71 fatalities. Most of the accidents were conducted under Part 91. Part 135 airplane operations, involving a loss of visual reference, included an in-flight collision with trees while the crew was obtaining an IFR clearance, and a loss of control (1 fatal), during a SVFR departure into light snow.

The Safety Board has made recommendations to the FAA in the past concerning VFR. On October 4, 1988, a Beechcraft B-99 collided with trees during a Part 135 flight in conditions that were less than basic VFR. In recommendation A-89-091, the Safety Board recommended that VFR Part 135 air carrier flights be restricted from operating in uncontrolled airspace, in less than basic VFR weather minimums of 1,000 feet ceiling and 3 miles visibility. The FAA disagreed with the recommendation, believing that the weather conditions were lower than prescribed by regulation. The FAA deemed the existing regulations established safe operating guidance when observed by an operator. The recommendation was initially “Closed - Unacceptable Action,” on October 23, 1989. Recommendation A-89-091 was superseded, and changed to “Closed - Unacceptable Action/Superseded,” by A-90-137, from an Aloha Islandair accident of October 28, 1989.

The Aloha Islandair accident involved a deHavilland DHC-6 that collided with terrain during a VFR passenger flight. In recommendation A-90-137, the Safety Board recommended that Part 135 operations of turbine-powered or multiengine airplanes be conducted under IFR rules during hours of darkness, or whenever visibilities are less than 3 miles, or when ceilings are less than 1,000 feet. The FAA responded by issuing the “Commuter Rule,” which required scheduled passenger operations in non-transport category turboprop airplanes of 10 or more seats, transport category turboprops with more than 20 seats, and turbojet airplanes with 1 to 30 seats, to meet Part 121 VFR and IFR rules. Based on the adoption of the Commuter Rule, the Safety Board closed recommendation A-90-137 as “Closed - Acceptable Action,” on July 15, 1996.

The Commuter Rule, however, did not address single-engine, or multiengine airplanes with less than 10 seats, or SVFR considerations.

The FAA has proposed single-engine IFR rules for commercial passenger aircraft. The proposed rules do not change SVFR operations for aircraft that do not meet the new requirements for equipment, trend monitoring, or pilot training.

Antenna Tower Marking

The radio antenna tower struck by the airplane rose 259.5 feet above ground level, which was 283.5 feet above sea level. The tower was installed in 1959 and was depicted as an obstruction on the VFR aviation sectional map covering the area around Nome. The airplane collided with the antenna about 222 feet above the ground.

The tower operator reported that the antenna was last painted in the summer of 1994. It was painted in an alternating aviation orange/aviation white pattern. During hours of darkness, the tower was illuminated by two steady light fixtures, mounted about half-way up from the bottom, and a flashing light, mounted at the top of the tower. Following the collision, the tower operator re-erected the antenna tower and proposed to add 2 additional towers east of the original site.

The authorization to operate a communications tower is governed by the FCC. The FCC's rules and regulations regarding marking and lighting of antennas is governed under Title 47 CFR Part 17. Under Part 17, each owner of a proposed construction must obtain a valid FAA determination of "no hazard." The owner of an antenna structure is responsible for maintaining the painting and lighting, and shall clean or repaint a structure as often as necessary to maintain good visibility. For the purposes of Part 17, the specifications, standards, and general requirements contained in FAA Advisory Circulars AC 70/7460-1H and AC 150/5345-43D are mandatory.

The placement of objects that may interfere with aviation safety is governed by Title 14 CFR Part 77, "Objects Affecting Navigable Airspace," of the FAA's FARs. Part 77's definition of obstructions to navigation includes objects that are over 500 feet high, and those that are 200 feet high, within 3 nautical miles of an airport's reference point, and the height of the object increases in the proportion of 100 feet for each nautical mile of distance from the airport, up to a maximum of 500 feet.

The FAA's aeronautical study of the tower operator's proposed construction states, in part: "The proposed construction would not exceed FAA obstruction standards, and would not be a hazard to air navigation. However, the following applies to the construction proposed: The structure should be obstruction marked and lighted per FAA Advisory Circular AC 70/7460-1H, 'Obstruction Marking and Lighting.' Chapters: 4, 5, and 13."

Advisory Circular, AC 70/7460-1H, includes marking and lighting guidelines for objects over 200 feet above the ground. These include painting objects in particular patterns to provide visibility during daylight hours; lighting of objects by the use of aviation red obstruction lights during nighttime; flashing white lights utilized for marking during daylight and nighttime; or dual lighting with red lights during nighttime, and flashing white lights utilized for marking during daylight. AC 70/7460-1H establishes paint standards but no specific maintenance schedule for repainting. It states that surfaces should be repainted when the color of the paint changes noticeably or its effectiveness is reduced by scaling, oxidation, chipping, or layers of industrial contamination. Color tolerance charts may be purchased from a supplier. AC 70/7460-1H states, in the conclusion section of the circular, that pilots of aircraft traveling at 165 knots or less should be able to see obstruction lights in sufficient time to avoid the structure by at least 2,000 feet horizontally, under all conditions of operations under CFR Part 91. The circular does not provide any visibility expectations when an obstruction is not illuminated. The circular provides for voluntary marking and lighting by a sponsor and also provides for higher standards of marking if an object presents an extraordinary hazard potential to aircraft.

A review of in-flight collisions, specifically concentrated on collisions with antenna towers, electrical towers, and guy wires, from 1983 to 1996, revealed 28 accidents. The 28 accidents resulted in 37 fatalities, 4 serious injuries, and 4 minor injuries. Most accidents (22) occurred during daylight hours when towers must rely on their pattern of marking for conspicuity. Five accidents happened at night, and 1 occurred at dusk. A little over half of the accidents (17) involved a collision with the supporting guy wires of towers. Eleven accidents involved a collision with a tower. The ratio of IMC versus VMC accidents was evenly distributed at 14 each.

D. RECOMMENDATIONS

Commercial operators, in uncontrolled airspace, conducted under Title 14 CFR Part 135, are required to maintain at least 500 feet above the surface and have a visibility that is at least 2 miles, yet operations under special VFR are allowed with 1 mile visibility and clear of clouds. At 120 knots, a mile will be covered in 30 seconds. Under some letters of agreement, operators of airplanes, including commercial operations, may operate simultaneously in special VFR conditions as long as everyone agrees to maintain visual separation from each other. The amount of separation is not specified. The possibility of numerous airplanes operating in conditions where only 1 mile of visibility is required increases the collision potential.

The Safety Board is concerned that commercial passenger-carrying airplanes are permitted to operate in special VFR conditions in Class E surface areas where increased collision hazards from obstacles and other aircraft exist. Therefore, the Safety Board recommends to the Federal Aviation Administration:

> An increase in the minimum visibility requirements for commercial passenger-carrying airplanes (Part 135), when operated in special VFR conditions, to maintain the minimum 2 miles of visibility as mandated for operations in uncontrolled airspace. In addition, the Safety Board urges the FAA to reconsider the practice of allowing simultaneous commercial operations during SVFR conditions.

The accident airplane collided with a radio antenna during daylight hours when it was not required to have any illumination. The weather conditions at an airport, 3.85 miles away, were reported as 1 mile of visibility in mist, with a decreasing visibility to 5/8 mile, 4 minutes after the accident. The tower’s conspicuity relied on its painted pattern. Even though the FAA determined the tower was not a “hazard to navigation,” it was required to conform to marking and lighting standards contained in AC 70/7460-1H, which includes the option of higher marking standards. The FCC relies on the operators of towers to maintain good conspicuity and is the agency charged with tower compliance. Following the accident, the FCC did not inspect the damaged tower nor does the FCC inspect every tower construction request. The FAA recommends repainting when the color changes noticeably and specifies a paint tolerance chart but does not inspect towers on a recurring basis. The area of the accident, Nome, Alaska, has extended hours of daylight during the summer months. The meteorological conditions of daylight (no tower illumination), low ceilings, and mist provided a decreased opportunity to see the tower. The Safety Board is aware the tower operator is planning to add two additional towers near the re-erected accident tower and is concerned about the potential for another in-flight collision. Therefore, the Safety Board recommends to the owner of the tower, Arctic Broadcasting Association, and the Federal Communications Commission (FCC):

> Ensure an increased level of daylight conspicuity by adding dual lighting, specified in Chapter 9 of AC 70/7460-1H, to provide pilots more opportunity to see and avoid the tower during decreased daylight visibility conditions.

The Safety Board is aware the FCC relies on tower operators to comply with marking and lighting standards and also that numerous other antenna towers exist near airports; therefore, the Safety Board recommends to the FCC:

> Provide for a physical inspection of obstructions recommended for marking and lighting by AC 70/7460-1H, during initial construction or alteration, and on a recurring basis, to ensure compliance with the marking and lighting standards.

Scott Erickson
Air Safety Investigator
February 27, 1998

Attachments:
Copy of FCC Part 17
Copy of FAA Part 77
Copy of AC 70/7460
Recommendation A-89-091
and A-90-137

NATIONAL TRANSPORTATION SAFETY BOARD
NORTH CENTRAL REGIONAL OFFICE

APRIL 28, 1998

SAFETY RECOMMENDATION

ACCIDENT: CHI98FA070

LOCATION: Hampshire, Illinois

DATE: December 22, 1997

FATALITIES: Four

Nature and Circumstances Surrounding the Accident

On December 22, 1997, at 1851 central standard time (cst), a Piper PA-32-301, N2586Y, operated by a private pilot, was destroyed when, while maneuvering south of Casa De Aero Airport, Hampshire, Illinois, the airplane departed controlled flight and subsequently impacted the terrain. Instrument meteorological conditions prevailed at the time of the accident. The personal flight was being conducted under 14 CFR Part 91. An IFR flight plan was on file. The pilot-in-command, second pilot, and two passengers on board were fatally injured. However, examination of the wreckage revealed evidence that at least one individual on board the airplane managed to egress the airplane and move a short distance from the airplane. Autopsy results (attached) support evidence that both pilots could have survived the impact. The emergency locator transmitter (ELT) beacon on board the airplane was activated on impact with the terrain. The cross-country flight originated at Muscle Shoals, Alabama, at 1508 cst.

At 1824:21 cst, the pilot checked in with the Chicago Terminal Radar Approach Control (TRACON) Sector 2 controller, and reported that he was level at 4,000 feet mean sea level (msl). The Sector 2 controller told the pilot to maintain 4,000 feet msl, confirmed that the Casa De Aero Airport was the pilot's destination, and told the pilot to make sure he had DuPage Airport weather information "hotel." The pilot responded, "We'll pick up hotel and maintain four thousand."

At 1835:14 cst, the Sector 2 controller directed the pilot to descend to 3,000 feet msl.

At 1838:04 cst, the Sector 2 controller cleared the pilot for the VOR alpha approach into Casa De Aero Airport and told the pilot to "report cancellation of IFR with me in the air if at all practical. If unable in the air, [then] immediately after landing through flight service. No traffic observed." The pilot read back the clearance.

At 1838:26 cst, the Sector 2 controller told the pilot, "frequency change is approved, and be sure you get to me to cancel [the IFR flight plan] please. I'm protecting the airspace." The pilot responded, "We'll probably be back with you to exercise our alternate."

At 1848:48, the airplane, at an altitude of 1,700 feet msl, dropped below Chicago TRACON's radar coverage. The Sector 2 controller said that at 1849 cst, he placed the airplane's data block on his radar screen in "overflight handoff status," generating a flashing "O" symbol, representing the airplane. The controller said that he suspected that the airplane had landed.

Between 1854 and 1856 cst, the Sector 2 controller was relieved by another controller. The off-going controller briefed the on-coming controller of two airplanes going into Midway Airport. He made no mention of N2586Y.

Between the time of the accident and 2200 cst, the U.S. Mission Control Center (MCC) at Suitland, Maryland, began picking up the airplane's emergency locator transmitter (ELT) signal through one of the several Search and Rescue Satellite Aided Tracking (SARSAT) satellites in near-polar orbit over the Earth. This signal was relayed to the Air Force Rescue Coordination Center (AFRCC), at Langley, Virginia, at approximately 2200 cst. At 2345 cst, the AFRCC notified the Illinois Wing of the Civil Air Patrol (CAP) of an ELT distress signal in the Walker Road area, between Allen and Helms Roads, in northern Kane County, Illinois. The Wing Commander of the Illinois CAP said that his ground teams were assembled and began a search of the area at 0100 cst, on December 23, 1997. They did not engage in an air search due to the poor weather conditions at the time. He said that they were called out based on the ELT signal only. There were no reports from the Chicago Air Route Traffic Control Center (ARTCC) or Flight Service of an overdue or missing airplane. At approximately 0230 cst, a CAP ground team, using handheld direction finders (DFs), narrowed the location of the ELT signal to a field behind a rural residence at 17N540 Walker Road. The CAP elected to wait until daylight to search the area. The weather conditions were foggy and the team had a difficult time seeing the terrain. The Kane County Sheriff's department was contacted at 0730 cst to assist in the search. The airplane was located at 0813 cst.

At approximately 0830 cst, the Federal Aviation Administrations' Great Lakes Region operations center, Des Plaines, Illinois, notified Chicago TRACON that N2586Y had been involved in a fatal accident and inquired about events leading up to the accident. No inquiries were made of the TRACON following the Sector 2 controller clearing the pilot for the approach, prior to the inquiry made by Great Lakes Region. It was at that time, Chicago TRACON realized they had lost the airplane. The flight progress strip, a tool used by air traffic controllers to track the traffic status of airplanes, was found closed out.

During the night, the weather in the area of the accident site included freezing drizzle and temperatures well below freezing. No airplanes flying in the area were monitoring 121.5 megahertz, the frequency which most current general aviation airplane

ELTs transmit over. The total time interval from when the accident occurred until search and rescue efforts were initiated was approximately 5 hours. Emergency responders reached the airplane crash site 13 1/2 hours after the accident occurred.

Discussion

In a memorandum to the NTSB on February 13, 1998, the Interagency Committee on Search and Rescue (ICSAR); a working group made up of representatives from the Coast Guard, Air Force, Departments of Interior, Commerce, and Transportation, the National Aeronautics and Space Administration, and the Federal Emergency Management Agency, and based in Washington, DC, stated that each year more than 130 lives are lost in aviation accidents where ELT performance is relied upon as the only indicator that an airplane has gone down.

Satellite-Aided Search and Rescue

The use of satellites to identify and locate ELT signals from downed airplanes was conceived in the 1970s through a joint effort by the United States, Canada, and France. The system was called SARSAT (Search and Rescue Satellite Aided Tracking). A similar system was developed by the then-Soviet Union, known as COSPAS (Cosmicheskaya Systyema Poiska Avariynich Sudov—translated “space systems for the detection of vessels in distress”). These four nations banded together in 1979 to form COSPAS-SARSAT. The COSPAS-SARSAT Secretariat is headquartered in London, England (U.K.). The current system consists of four active satellites (two U.S. and two Russian) operating in low Earth orbit (LEO), 38 ground receiving stations, 15 national mission control centers, and respective rescue coordination centers, worldwide.

The first satellite was launched in 1982, and the system was declared fully operational in 1984. Since the memorandum of understanding was signed, 25 other nations have joined the original four signees. These nations operate many of the ground receiving stations, mission control centers, the rescue coordination centers around the world.

The U.S.-Canadian-French system consists of two National Oceanographic and Atmospheric Administration (NOAA) Meteorological Satellites placed in sun-synchronous, near-polar (inclined 99 degrees from the equator) orbits at an altitude of 850 kilometers (528 miles). These satellites carry a repeater which receives and retransmits 121.5 MHz and 243.0 MHz signals anytime the satellite is in view of a ground station. They also carry a processor which receives 406 MHz transmissions, provides measurements of frequency and time, and then retransmits this data in real-time, if the satellite is in view of a ground station, or stores the data for later downloading when the satellite comes in view of a ground station. The satellites orbit the earth approximately every 100 minutes.

The Russians supply two Nadezhda navigation satellites placed in near-polar orbits (inclination of 83 degrees) at an altitude of 1,000 kilometers (620 miles). These satellites complete their orbits of the earth in 105 minutes. The COSPAS instrumentation is similar to that carried aboard the NOAA satellites with the exception that COSPAS cannot receive distress signals over 243.0 MHz.

System Concept

Over time, a single satellite, circling the Earth around the poles, will eventually view the entire Earth surface. The satellite's orbital plane remains fixed, while the Earth rotates beneath it. At most, it takes approximately 12 hours for any location to pass beneath the orbital plane. With a second satellite, having an orbital plane at right angles to the first, only one quarter of a rotation is required, or 6 hours maximum. With 4 satellites in orbit, the waiting time is further reduced. The current COSPAS-SARSAT system can theoretically view locations on the Earth at the mid-latitudes in just under 1 hour.

Doppler location; that is, using the relative motion between the satellite and the ELT, is the means used to generally locate an accident site. The Doppler location provides two positions for each ELT; the true position, and its mirror image relative to the satellite's ground track. The ambiguity is resolved by calculations that take into account the Earth's rotation. With appropriate frequency stability, as specified for 406 MHz transmitters, the solution can often be determined in a single satellite pass. Transmitters using 121.5 MHz require a second pass to resolve the ambiguity.

To optimize Doppler performance, satellites placed in a low altitude, near-polar orbit are used. The low altitude allows for a low uplink power requirement, a pronounced Doppler shift and short intervals between successive satellite passes. The near-polar orbit also results in full global coverage.

Future Developments Under Consideration

The COSPAS-SARSAT Secretariat continues to experiment with technological improvements to the satellite system. One such improvement is the possible use of 406 MHz repeaters on a geostationary earth orbiting (GEO) satellite. The proposed platform is the NOAA GOES 8 weather satellite. Geostationary satellites orbit the Earth on the equatorial plane and are powered to match the Earth's rotational speed; hence the satellite remains over the same fixed position over the Earth's equator. Because GEO satellites orbit at a greater distance from the Earth's surface, their field of view can cover almost an entire hemisphere. Emergency beacons would be received immediately after they activate. This information would be immediately transmitted back to a ground receiving station, giving near-instantaneous notification of an ELT signal. The GEO satellites are not able to use Doppler location processing since they have no relative motion between them and the ELT. Therefore, they cannot determine a location for the beacon. This task would still fall to the satellites in low earth orbit. Because the current proposal is to operate GEOSAR (Geostationary Earth Orbiting Search and Rescue) using the 406 MHz repeaters, this would not give any improvement to SAR capability of an ELT with an operating frequency of 121.5 MHz, which is found on the majority of general aviation airplanes currently operating in the United States.

Following the evolvement of GEOSAR's immediate detection of an ELT signal, the next logical step would be to give the satellite the capability to locate the position of the signal. To accomplish this, specially made emergency transmitters would include Global Positioning System (GPS) position location capability. This information would be encoded and transmitted to the GEOSAR, and then transmitted to a ground receiver station; hence providing near-instant position reporting as well as notification. This capability would require the development of new ELTs which not only operate on 406 MHz, but also receive GPS signals, and the capability to transmit the ELT position. Airplane owners using the current 121.0 MHz technology would have to replace their ELTs with the new technology for this system to work.

GPS Background and Specifications

The GPS was developed by the Department of Defense for the purpose of providing pin-point navigation to U.S. military forces, using a constellation of 24 medium Earth orbiting satellites, in six different orbital planes (four satellites in each plane). The satellites operate in circular orbits at altitudes of 20,200 kilometers (10,900 nautical miles), and at inclination angles of 55 degrees. Each satellite circles the Earth every 12 hours. The satellites transmit on two L-band frequencies of 1575.42 MHz and 1227.6 MHz. Each satellite transmits a navigation message containing its orbital elements, clock behavior, system time, and status. Five monitor stations, three ground antennas, and a master control station, make up the ground control component of the GPS. The user segment of the system consists of receiver-processors which can be utilized by any individual (hand-held or vehicle mounted receivers) on the ground. The GPS provides two levels of service, Standard Positioning and Precise Positioning. Precise Positioning Service is reserved for U.S. military forces. Standard Positioning Service (SPS) has been available to all civil users since the GPS was declared "Initial Operations Capable" in December of 1993. SPS provides a predictable positioning accuracy of 100 meters horizontally, and 156 meters vertically, and a time transfer accuracy to Greenwich Mean Time within 340 nanoseconds.

Since the first launch of a GPS satellite in 1978, the program manager, the U.S. Air Force, has placed 11 block I satellites, 9 block II satellites, and 21 block IIA satellites in medium Earth orbit. Because the average life span of a GPS satellite is 7.3 years (U.S. Space Command, 1998), the block I satellites and some of the block II satellites are no longer in service. The Air Force is currently placing the next generation of GPS satellites in orbit, the Block IIRs.

GPS Block IIF

Discussions held at the recent National Space Symposium, Colorado Springs, Colorado, April 6-10, 1998, revealed that the next series of satellites designed to replace the previously mentioned block satellites, on the end of their service life, is the GPS

Block IIFs. These satellites will be manufactured by the Boeing Company's Aerospace Division. They are tentatively scheduled to begin launch sometime in the year 2004.

In a conversation with Boeing's GPS Block IIR program manager, it was learned that the Air Force has made allowance for carrying an additional 70 pounds of payload in a bay aboard each satellite. At this time, the dimensions of this payload bay are unknown. No requests for use of the space, or any portion of the space have been made to the Air Force or the Boeing Company. Inquiry of the possibility of placing repeater/processors, similar to those on the current NOAA and Nadezhda satellites was received with interest and enthusiasm by Boeing and representatives of U.S. Space Command. They expressed that they would like to explore the possibility of this idea further.

A conversation was held via telephone with members of the COSPAS-SARSAT Secretariat, on April 15, 1998, to discuss the idea of placing their repeater/processors on GPS satellites. The idea was met with great interest and enthusiasm. In the conversation it was learned that the processors used on the Russian Nadezhda satellites were manufactured by CNES of France. The repeater-processors used on the NOAA satellites were manufactured by SPAR of Canada. The weight and dimensions of these units are still being determined. The National Aeronautics and Space Administration's Robert F. Goddard Space Flight Center is responsible for integration of the repeater/processor packages to the current satellites. NOAA was responsible for launching the current U.S. satellites and is responsible for their operation. On April 17, 1998, an electronic mail message from COSPAS-SARSAT indicated that the Head of the Secretariat expressed great interest in pursuing the idea and provided further points of contact to pursue.

Recent discussions with representatives from NASA's Goddard Space Flight Center, NOAA, and ICSAR, have shown great interest and a desire to explore the advantages and disadvantages of a GPS SARSAT satellite system. These agencies all expressed a desire to move forward on discussions of this concept. An upcoming meeting of the COSPAS-SARSAT Research and Development Working Group is scheduled for May 19, 1998. The innovator of the current COSPAS-SARSAT system has requested a briefing on this concept. Representatives from NOAA's U.S. Mission Control Center at Suitland, Maryland, expressed on behalf of ICSAR, a desire to discuss this concept at their upcoming meeting scheduled sometime in early June 1998.

Placing COSPAS-SARSAT Repeater/Processors on GPS Block IIF Satellites

Because the GPS constellation is global in scope, it provides continual coverage of the Earth's surface. Placing a repeater/processor package on each GPS IIF satellite would ensure the same instantaneous global receiving of an ELT signal as the proposed GEOSAT. Because GPS satellites are not geostationary but move in medium altitude orbital planes, Doppler shift, currently used by the COSPAR-SARSAT system, can still be used to determine an ELT's location. Position location of an ELT should be almost instantaneous (save processing time for Earth rotation speed ambiguity) because several satellites will receive the ELT signal at the same instant. The results of this proposal are significantly improved alerting and locating of ELTs, as well as personal locator beacons and distress beacons used on ships and boats. This proposal also makes use of current technology, saving time in research and development. Improvements in solid-state technology should reduce the weight and size of current repeater/processors, providing compatible integration into the GPS IIF satellite. The repeater/processors would be designed to continue to utilize the 121.5 MHz frequency, as well as 406 MHz; requiring no technology changes by operators (especially airplane owners and operators) on the ground, and eliminating any delay in mandating all operators to use 406 MHZ.

Future Technology Improvements of the Concept

The next step, following the installation of repeater/processors on the GPS satellites, would be to develop an onboard satellite system that can integrate the GPS position location of a transmitter and relay that information to a ground station; a type of reverse application of the current method by which GPS works. This idea would enable instant notification of an emergency transmitter, and at the same time, its precise geographical location. The advantage of this would be in evaluating whether an emergency transmitter has been inadvertently activated, or is indeed an actual accident. This would step up the process of determining if an airport ramp is the source of the signal, versus a mountain ravine. The results are faster notification of emergency rescue response, determination of the type of rescue response (i.e., helicopters in mountain rescues), and providing precise location for those responders.

Steps to GPS SAR Satellite-Aided Tracking (GPS-SARSAT)

A partnership will have to be established between the U.S Air Force, the Boeing Company, the COSPAS-SARSAT Secretariat, the National Transportation Safety Board, NASA, ICAO, and COSPAS-SARSAT international participants (current and future). Specifications on the size and weight of the repeater/processors will have to be obtained. Integration of systems to satellite power sources will have to be examined. Initial funding for procurement and integration of the systems will have to be determined for not only the initial Block IIF buy, but for succeeding GPS Block satellites that will have to be launched to eventually replace GPS Block IIF. Integration of the current COSPAS-SARSAT receiver network with Air Force GPS satellite command and control will have to be examined. These are just a few of many steps that will have to be climbed as the concept evolves, should it be pursued. Representatives of the National Transportation Safety Board, the U.S. Air Force, and the COSPAS-SARSAT Secretariat should arrange a time and place to discuss the process and the steps to be taken to make GPS-SAT a reality. A decision to press ahead on this endeavor should be made as soon as possible, as the deadline marked by the integration of the first GPS Block IIF satellite with a launch vehicle approaches.

Conclusion

The COSPAS-SARSAT system has been in use for over 16 years. It is a good system and has been responsible for safely rescuing thousands of people. But it has proved to have weaknesses. The realization of a GPS-SARSAT satellite system in medium Earth orbit will provide for immediate notification, pin-point location, assessment of signal, determination of the type of resources needed to effect rescue, and emergency response; thus saving lives that would otherwise be lost.

Recommendations

To: The Federal Aviation Administration/Department of Transportation
The United States Air Force
The Boeing Company
The COSPAS-SARSAT Secretariat
The National Aeronautics and Space Administration
The National Oceanographic and Atmospheric Administration
The Interagency Committee on Search and Rescue (ICSAR)

1.) Establish an international partnership amongst the above-listed participants to examine current and future repeater/processor technology and its potential integration with GPS Block IIF satellites.

2.) Examine the integration of a GPS-SARSAT satellite constellation into the existing ground infrastructure established under the current COSPAS-SARSAT system.

3.) Integrate repeaters and processors with the GPS Block IIF satellite system.

4.) Following medium Earth orbit insertion of the GPS Block IIF constellation, activate and utilize GPS-SARSAT for real-time notification and location of vehicles (aircraft, ships, land-use) and persons (personal locator beacons) in distress.

Staff

David C. Bowling, IIC (NCR-A, 427-07-7653)

CHAPTER 18

SAFETY ACCOMPLISHMENT

SAFETY ACCOMPLISHMENT

Board Order 70, *NTSB Safety Recommendations Program*, defines a safety accomplishment as a positive change within the transportation environment that is brought about through the direct action of a Safety Board employee. Safety accomplishments may be submitted by any employee subject to the procedures set by individual Office Directors.

Upon receipt of a safety accomplishment, the Office of Safety Recommendations and Accomplishments gives the accomplishment a tracking number and acknowledges receipt via fax. The Safety Proposal Review Board (SPRB), which consists of the Directors or Deputy Directors of the operating and technical offices, reviews submitted safety accomplishments at its periodic meetings.

In general, a safety accomplishment differs from a safety recommendation in that the safety enhancement proposed is usually site-specific and can be implemented by local officials or one of the parties to the investigation. The word "recommendation" or any variation of it must not be used in either spoken or written communication concerning the suggested improvements.

Include the following elements when describing a safety accomplishment:

- The circumstances under which the problem was identified.
- The date when the suggestion for improvement was made.
- The name and title of the individual to whom the improvement was suggested.
- The exact nature of the suggested improvement.
- Documentation showing that the suggestion was actually implemented, such as photographs of the change or letters from the entity making the change.

Examples of safety accomplishment descriptions and letters suggesting safety improvements follow this paragraph.

EXAMPLES OF
SAFETY ACCOMPLISHMENT DESCRIPTIONS

(not actual size)

National Transportation Safety Board

Memorandum

DATE: January 23, 1998

TO: Chief, Safety Accomplishments Division

FROM: Michael P. O'Neill, SR-10

THRU: Chief, Safety Recommendations Division

SUBJECT: Safety Accomplishment

At about 7:48 a.m., on Tuesday, August 27, 1996, an Amtrak passenger train (No. 55, Vermonter) consisting of 1 locomotive and 6 cars struck an empty 1996 Western Star logging truck equipped with a Prentice log loader and coupled to a 1980 Evans pup trailer in the right side as it was crossing a public passive grade crossing near the south limits of Roxbury, Vermont. Amtrak diesel locomotive No. 258 impacted the vehicle between the tractor and the trailer at the coupling. The entire train consists derailed, remaining upright end in line. The train proceeded approximately 561 feet before stopping. The Western Star logging truck was occupied by the driver, who sustained minor injuries. There were no passengers in the vehicle. The driver, 4 train passengers, and 2 Amtrak crew personnel were treated and released at Central Vermont Hospital near Montpelier, Vermont.

I was dispatched as the Investigator-in-Charge for this accident and I worked alone. During the course of the accident investigation, it was my responsibility to interview the driver of the vehicle and his employer, the owner of the trucking company (Dennis Demers). During my interview with Mr. Demers, I asked him if he subscribed to any publications or logging journals. His response was: "I read ***The Northern Logger*** magazine, it's great." Following the events of the day, I proceeded back to my hotel in Northfield, Vermont, and then made a visit to the local library, which was open late that night on Wednesday, August 28, 1996. The Northfield librarian was kind enough to look up the home office address of ***The Northern Logger*** magazine. Copies of Mr. Demers' business card and the librarian's index card are enclosed.

When I returned to Washington, I contacted Mr. George Mitchell and Mr. Eric Johnson of ***The Northern Logger*** about the possibility of publishing an article on grade crossing safety. A copy of Mr. Johnson's January 21, 1997, letter is enclosed. After following the procedures spelled out in Board Order No. 7, a safety news article was published in their April 1997 edition (see page 8).

NATIONAL TRANSPORTATION SAFETY BOARD
SOUTH CENTRAL REGIONAL OFFICE
ARLINGTON, TEXAS

MARCH 5, 1998

SAFETY ACCOMPLISHMENT

A.	**ACCIDENTS:**	FTW97LA219	&	FTW97IA362
	Location:	Biggers, Arkansas		Munday, Texas
	Date:	June 13, 1997		May 8, 1997
	Aircraft:	Ayres S2R-G10 N6133X		Ayres S2R-G10 N3298Y
	Injuries:	None		None

B. NATURE AND CIRCUMSTANCES OF THE ACCIDENTS:

On June 13, 1997, at 1140 central daylight time, an Ayres S2R-G10 agricultural airplane, N6133X, was destroyed when it impacted trees during a forced landing following a loss of engine power near Biggers, Arkansas. The commercial pilot, the sole occupant of the airplane, was not injured. The airplane was registered to and operated by C & C Flying Service of Pocahontas, Arkansas. A flight plan was not filed, and visual meteorological conditions prevailed for the Title 14 CFR Part 137 local aerial application flight which was originating when the accident occurred.

During the initial takeoff climb, the agricultural airplane's turboprop engine lost power, and the pilot executed a forced landing in a cornfield. There was insufficient space available to bring the airplane to a complete stop before it reached the edge of the field and collided with trees. Examination of the airplane revealed that a foreign object had completely blocked the fuel line leading from the forward left wing tank outlet to the fuselage header tank. Chemical analysis indicated that the object was composed of silicone rubber. The 1996 model airplane had accumulated 696 hours total time. Visual inspection of the left and right wing fuel tanks disclosed no evidence that silicone rubber had been used as a tank sealant or as gasket material during manufacture of the airplane. No mention was made in the maintenance records of any maintenance, repairs, or modifications to the airplane's fuel system. The source of the silicone rubber contamination could not be determined.

During the course of the investigation into the Biggers, Arkansas, accident, this investigator learned of a similar incident involving another Ayres S2R-G10 that occurred in Munday, Texas. The incident was assigned an NTSB number, FTW97IA362, and an investigation was conducted.

On May 8, 1997, approximately 1310 central daylight time, an Ayres S2R-G10 agricultural airplane, N3298Y, registered to and operated by Bridwell Spraying Service, Inc., of Haskell, Texas, sustained minor damage during a forced landing following a loss of engine power on takeoff near Munday, Texas. The commercial pilot, the sole occupant, was not injured. Visual meteorological conditions prevailed, and no flight plan was filed for the Title 14 CFR Part 91 positioning flight which was departing the Munday Municipal Airport with an intended destination of Haskell when the incident occurred.

During the initial takeoff climb, the agricultural airplane's turboprop engine lost power, and the pilot executed a forced landing in a plowed field. The airplane nosed down in the soft ground. Examination of the airplane by the operator revealed that the right wing fuel tank was empty, and the left tank contained approximately 80 gallons of fuel. Both fuel lines leading from the left wing tank to the fuselage header tank were blocked by pellets of what appeared to be silicone rubber. Chemical analysis confirmed that the pellets were composed of silicone rubber. The 1995 model airplane had accumulated 612 hours total time. The operator expressed the opinion that the silicone rubber might have been applied to the gaskets of the wing fuel tank access panels during manufacture of the airplane; however, a representative of the manufacturer stated that the company did not use silicone rubber to seal fuel tanks. An inspection of the manufacturer's production line by FAA personnel revealed no evidence that silicone rubber was being used to seal fuel tanks. The source of the silicone rubber contamination could not be determined.

C. DISCUSSION:

Although the source of the silicone rubber contamination could not be conclusively determined in either case, a possible scenario is that silicone rubber was used to seal refueling equipment, such as hoses, nozzles, and storage tank fittings, and excess material broke loose during refueling and was carried with the fuel into the airplane fuel tanks. Silicone rubber enlarges to several times its original size when immersed in jet fuel. In both mishaps, globules of silicone rubber in a wing tank enlarged, were swept into, and blocked one or more of the fuel lines from the wing tank to the header tank, thereby restricting fuel flow to the engine.

On October 30, 1997, the Ayres Corporation issued Service Bulletin No. SB-AG-40, entitled "Fuel Tank Inspection," applicable to all turbine-powered S2R airplanes. The bulletin stated that "as a result of contamination, several aircraft have experienced fuel flow problems between the wing fuel tanks and the header tanks." It provided instructions for a one-time inspection of wing fuel tanks, the header tank, and the fuel lines from the wing tanks to the header tank for contamination and obstruction.

This investigator believed that all operators of turbine-powered Ayres S2R airplanes should be made aware of the findings of these accident investigations and should be urged to comply with the instructions in SB-AG-40. Therefore, in early October 1997, this investigator contacted by telephone Mr. Jerry Robinette, with the FAA Aircraft Certification Office in Atlanta, Georgia, and Mr. Steve Miller, with the FAA Flight Standards District Office in Lubbock, Texas, and briefed them on the findings of the investigations. Additionally, on October 8, 1997, this investigator mailed draft copies of the factual reports on the two mishaps to both of the above-mentioned individuals.

D. ACCOMPLISHMENT:

As a direct result of this investigator's conversations and correspondence with personnel of the FAA's Atlanta Aircraft Certification Office and Lubbock Flight Standards District Office, the FAA took the following action:

On December 16, 1997, the FAA issued Special Airworthiness Information Bulletin (SAIB) No. ACE-98-17, to advise owners/operators of turbine-powered Ayres S2R airplanes of the safety information contained in Ayres Service Bulletin No. SB-AG-40, entitled "Fuel Tank Inspection." The SAIB stated that "issuance of SB No. SB-AG-40 was prompted by reports of silicone rubber clogging fuel lines," then described the findings of both NTSB investigations, and concluded by recommending accomplishment of SB-AG-40.

Georgia R. Snyder
Air Safety Investigator

Attachments:
Special Airworthiness Information Bulletin No. ACE-98-17
Ayres Service Bulletin No. SB-AG-40

EXAMPLE OF LETTER SUGGESTING SAFETY IMPROVEMENTS

(not actual size)

Central Rail Region
31 W 775 North Avenue
West Chicago, Illinois 60185
(630) 377-8177

June 16, 1997

Mr. Victor H. Burke
Executive Vice President and General Manager
Dallas Area Rapid Transit
P.O. Box 660163
1401 Pacific Avenue
Dallas, Texas 75266-7202

Dear Sir:

The National Transportation Safety Board is conducting an investigation of the accident that involved the grade crossing collision between DART train #114 and a front-end loader-type construction machine on June 3, 1997.

The Independent Safety Board Act of 1974 assigns the Safety Board the responsibility to investigate transportation accidents and propose corrective steps to make transportation as safe and risk-free as possible, and to reduce the likelihood of recurrence of similar accidents. This letter contains five (5) safety suggestions that I developed during the on-scene portion of my investigation and discussed with you and your staff during our meeting on June 6, 1997.

The first three suggestions, which deal specifically with this accident, are: 1) Survey all the grade crossings along Lancaster Street to determine if there is a time delay between the time the left turn signals turn red and the time the train signals turn to proceed. As I mentioned at our meeting, my observations of the signals at the crossing where the accident occurred indicated that there was no delay. 2) Redesign the signal operations at these crossings with an appropriate delay to allow highway traffic turning left a margin of safety to clear the intersection before the train signal changes to proceed. 3) Install some type of visual warning signal for highway vehicles that would only activate when trains approach the crossing. This is desirable because the train traffic approaches the crossings from behind some vehicles turning left over the crossings, making it difficult, if not impossible, for the driver to see the approaching train.

The other two (2) suggestions I made did not deal with issues involved in this accident but were developed from observations I made of your rail operations in general. The first suggestion is that you institute an efficiency test program to randomly test your train operators on their compliance with operating rules and procedures. This type of program is required on the Nation's freight railroads, and several transit agencies have developed such programs voluntarily. I feel this would be a very beneficial program for DART because the rail operations are so new. Not only would an efficiency test program monitor compliance with your rules and procedures, but it may point out areas where your rules or procedures may need to be modified.

My final suggestion was also related to monitoring compliance with operating procedures. I understand that all DART rail equipment is equipped with event recording devices. These devices can be very helpful in monitoring employee compliance with operating rules and procedures and can also be useful in pointing out problem areas that need to be addressed. I suggest that DART develop and implement a program to systematically review and analyze event recorder data to ensure compliance with its operating rules and procedures.

I would appreciate if you would advise me of your response to these suggestions, in writing, within 30 days. If you have any questions, or want to discuss these suggestions, please feel free to contact me.

Finally, I would like to emphasize that it is your responsibility to implement whatever safety improvements are necessary. The above are my suggestions on possible ways to improve the safety of your operations and should not be construed as formal Safety Recommendations from the Members of the Safety Board. Thank you for your cooperation in this matter and your interest in transportation safety.

Sincerely,

Russell L. Seipler
Supervisory Railroad Accident Investigator

cc: Frank Jennings
Gerald Francis
Henry Hartberg

EXAMPLE OF FOLLOWUP LETTER REGARDING SUGGESTED IMPROVEMENTS

(not actual size)

Central Rail Region
31 W 775 North Avenue
West Chicago, Illinois 60185
(630) 377-8177

November 13, 1997

Mr. Victor H. Burke
Executive Vice President and General Manager
Dallas Area Rapid Transit
P.O. Box 660163
1401 Pacific Avenue
Dallas, Texas 75266-7202

Dear Sir:

The National Transportation Safety Board is conducting an investigation of the accident that involved the grade crossing collision between DART train #114 and a front-end loader-type construction machine on June 3, 1997. Subsequent to this accident, I wrote a letter (copy attached) to you on June 16, 1997, and offered five (5) suggestions to enhance safety.

You responded to my suggestions in a letter dated July 14, 1997 (copy attached). Your response to both of the general suggestions was that DART planned to implement new programs within 90 days. You also said that DART planned to initiate action to install "Train Coming" signs, and to initiate a thorough review of time and motion studies and then consider, in coordination with the city of Dallas, whether or not the design of the delay feature on traffic signals should be changed.

The purpose of this letter is to follow up with you in order to learn if the new programs you mentioned are in effect, and to learn if the other actions you indicated DART would take have been accomplished. I would appreciate if you could respond to this inquiry in writing and provide any documentation you have on the new programs.

I would like to take this opportunity to again express my thanks for the cooperation of you and your staff in this investigation and for your interest in transportation safety. I look forward to your reply.

Sincerely,

Russell L. Seipler
Supervisory Railroad Accident Investigator

CHAPTER 19

RESPONSE TO PETITION FOR RECONSIDERATION

RESPONSE TO
PETITION FOR RECONSIDERATION

Background

After the Safety Board issues its determination of probable cause in an accident investigation, a party to the investigation or other person having a direct interest in the investigation may petition the Board to reconsider its findings and determination of probable cause (49 *Code of Federal Regulations* 845.41). If the petitioner can provide new evidence or show that the Board's findings are erroneous, the Safety Board will consider the petitioner's request and issue a response.

Format

Use standard Safety Board letterhead, setting the same margins as for a routine letter. (See the first example at the end of this chapter.) In general, write the response following the guidelines below:

- Insert a petition identification block containing the following information:

    - Name of petitioner (person, company, Government agency, or attorney representing one of the parties).
    - Type of accident/incident.
    - Date of accident/incident.
    - Identifying number (NTSB report number, file number of the brief of accident, or accident number).

- Follow the petition identification block with the title—centered, all caps, and bold.

- Insert the first paragraph of the reconsideration letter, using the text below or similar wording:

  > In accordance with its rules (Title 49 *Code of Federal Regulations* Part 845), the National Transportation Safety Board has reviewed the petition for reconsideration and modification of probable cause of the [*accident, location, and date*]. Based on its review of the petition filed on [*date*], the Safety Board hereby [*denies/grants*] the petition in [*its entirety/part*].

- Include a brief synopsis of the accident, followed by the original probable cause (if the probable cause is one of the disputed items in the petition).

- Continue the response with new evidence or information provided by the petitioner citing reasons why the Safety Board should reconsider and modify the report. The text should include details on what the petitioner claims and why the petitioner disputes the evidence or facts as presented by the Safety Board.

- After each claim, either defend or recant the Safety Board's position with evidence from the investigator, hearing, depositions, accident brief, or accident report.

- Close the response with a final paragraph addressing the petitioner's request and the Safety Board's decision on the petition. Some models of this language are:

  > Accordingly, the petition for reconsideration of the analysis, findings, and probable cause in the [*accident, location, and date*] is denied in its entirety.
  >
  > Accordingly, the petition for reconsideration of the probable cause in the [*accident, location, and date*] is granted in part. The factual report of the investigation has been revised; the probable cause will remain as originally reported. A revised brief of the accident is attached.
  >
  > Accordingly, the petition for reconsideration of the probable cause in the [*accident, location, and date*] is granted in its entirety. The Safety Board has amended pages 23 and 62 of the accident report in response to the

petition. Errata sheets reflecting these changes are attached.

- Following the response, provide a concurrence statement on how the Members voted on the response to the petition for reconsideration. Some examples of this language are:

  Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, BLACK, and CARMODY concurred in the disposition of this petition for reconsideration.

  Chairman HALL and Members HAMMERSCHMIDT, BLACK, and CARMODY concurred in the disposition of this petition for reconsideration. Member GOGLIA did not concur.

  Chairman HALL and Members HAMMERSCHMIDT, BLACK, and CARMODY concurred in the disposition of this petition for reconsideration. Member GOGLIA filed the following dissenting statement: [*Member's statement*]

- If a Member wants to include a concurring and/or dissenting statement in the response, insert it after the concurrence statement.

- If corrections are to be made as a result of the petition, enclose the corrected report or errata sheet with the response. (For guidance on preparing corrected reports and errata sheets, consult an editor.)

Processing

Keep the following points in mind when preparing a response to a petition for reconsideration:

- While not repeating the petition verbatim, the response should provide enough information so that a reader can understand the response without having to read the petition. Remember that the response may be read by someone who did not receive or cannot obtain a copy of the petition.

- The original copy of the response is not signed by the Chairman.

- The response is public information.

Responses to petitions are approved through the notation process in accordance with Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board, and Convening of Board Meetings*. After the Board approves a response, MD-5 sends the original to the address shown in the notation memorandum and makes information copies for internal distribution. Ask MD-5 staff to notify you when the response is mailed, if necessary. *The originating office, not MD-5, is responsible for notifying parties to the investigation that a response is being issued.*

EXAMPLE OF A RESPONSE TO PETITION FOR RECONSIDERATION

(not actual size)

National Transportation Safety Board

Washington, D.C. 20594

Mr. Richard H. Brown, Jr.
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Petition for Reconsideration
Marine Accident Report
Grounding of the United Kingdom
Passenger Vessel RMS QUEEN ELIZABETH 2
Near Cuttyhunk Island, Vineyard Sound,
Massachusetts, August 7, 1992
(NTSB/MAR-93/01)

RESPONSE TO PETITION FOR RECONSIDERATION

In accordance with its rules (Title 49, *U.S. Code of Federal Regulations*, Part 845), the National Transportation Safety Board has reviewed the Cunard Line Limited's petition that the Board reconsider report number NTSB/MAR-93/01, including the findings and determination of probable cause, issued as a result of the Safety Board's investigation of the grounding of the RMS QUEEN ELIZABETH 2 near Cuttyhunk Island, Vineyard Sound, Massachusetts, August 7, 1992. Based on its review of the petition filed on July 21, 1993, the National Transportation Safety Board hereby denies the petition for reconsideration in its entirety.

The Safety Board issued the report of its investigation of the accident on May 25, 1993. The executive summary stated:

> On August 7, 1992, the United Kingdom passenger vessel RMS (Royal Mail Ship) QUEEN ELIZABETH 2 was outbound in Vineyard Sound, Massachusetts, when the vessel grounded about 2½ miles south of Cuttyhunk Island. No injuries or deaths resulted from this accident. However, damage was significant; temporary and permanent repairs cost about $13.2 million. In addition, the total revenue lost for the period before the vessel returned to service on October 2, 1992, was estimated at $50 million.

As a result of its investigation, the Safety Board determined:

The probable cause of the grounding of the QUEEN ELIZABETH 2 was the failure by the pilot, master, and watch officers to discuss and agree on a navigation plan for departing Vineyard Sound and to maintain situational awareness after an unplanned course change. Contributing to the accident was the lack of adequate information aboard the QUEEN ELIZABETH 2 (QE2) about how speed and water depth affected the ship's underkeel clearance.

1. The petitioner argues:

> The report's discussion of the 1939 survey is inadequate and omits any description of the hydrographic manual's explicitly stated requirement for a very careful and complete examination of the area where the 39-foot depth was found and other evidence reinforcing that requirement. Had such an examination been properly carried out, depths of 31 to 36 feet would very probably have been found and charted and, duly warned, the QE2 would have avoided the grounding area
>
> It is clear that the C&GS [Coast and Geodetic Survey] did not carry out a proper survey and, therefore, the true depths were not found and charted. This misled the QE2's navigators, who reasonably relied on the accuracy of the charts for depth information. The significant difference between the charted and actual depths of the boulders struck of at least 4 feet was a factor necessary to cause the damage and, even more certainly, to increase its severity tremendously.

The Safety Board responds:

In support of his assertions, the petitioner quotes from the Safety Board report; presents information about the 1939 survey, instructions from the 1939 Hydrographic Manual, and charting standards from the American Practical Navigator (Bowditch); and reviews the 1940 Descriptive Report of the 1939 survey. The petitioner had presented all this information, sometimes in greater detail, during the investigation (petitioner's letters of January 7, 1993, February 4, 1993, and March 24, 1993). In addition, the National Oceanic Atmospheric Administration (NOAA) discussed many of the petitioner's contentions in its March 8, 1993, letter and in its October 6, 1993, letter commenting on this petition. The Safety Board considered all information contained in the letters received before May 1, 1993, together with the other evidence, in preparing its marine accident report.

The petitioner and the other parties had an opportunity to review the Board's draft factual report in March 1993. The petitioner commented on many sections of the report but not on the one then titled “NOAA Chart and Survey Information” (“Chart and Survey Information” in the published report). Nevertheless, after the review by the parties, the Board did add to the report a statement that the 1939 survey recommended additional field work in the area of the 39-foot sounding, and the Board incorporated additional background information. This section is now the focus of the petitioner’s allegation that the report omits so much material evidence that it presents an inaccurate version of the facts. The Board believes that the section contains sufficient information to support its findings and that the Board did consider all the evidence collected in arriving at its determinations.

The petitioner states that “if reasonably correct depths in the area had been found and charted by NOAA, the QE2 would have avoided that area and no grounding would have occurred.” The ship’s navigator had previously highlighted shoal areas near the planned course lines by circling and hatchmarking them on some of the NOAA and British Admiralty charts available on the bridge. The 39-foot shoal area where the QE2 grounded was within a 60-foot contour that the navigator hatchmarked on chart BA 2456, which was used during the transit through Vineyard Sound. After the course change near buoy NA, the second officer, who had been plotting the navigational fixes, shifted to chart BA 2890. This chart did not have the hatchmarking that highlighted the 39-foot shoal area on the chart BA 2456. After the pilot changed course to 255°, the second officer noticed that the ship was headed toward a 34- to 37-foot shoal area that the navigator had highlighted with hatchmarks. Following the second officer’s warning that the ship was headed for the hatchmarked shoal area north of Brown’s Ledge, the pilot responded to the master’s request to go further south and came left to course 240°. The second officer then plotted the 2154 position on the chart and, having drawn the 240° projected course line, he noted that his new course crossed the vicinity of the 39-foot shoal, which was not hatchmarked on this chart.

The second officer testified that he was not concerned about passing over the 39-foot shoal. While the Safety Board agrees that the second officer probably would have warned the pilot about this shoal if the water depths had been charted in the 34- to 37-foot range, as he had done earlier, the Board believes that neither he, nor the pilot, nor the master would have permitted the ship to approach the 39-foot shoal if they had known that the ship’s squat at 24½ knots was 3 to 5 times greater than what they assumed. The master testified that he believed that squat would be on the order of “a foot to 18 inches” and the squat would eliminate the trim, which was initially about 1 foot down by the bow. The Safety Board believes that the navigation watch’s ignorance about the actual squat behavior of the QE2 was the predominant factor that led them to accept an unsafe margin of underkeel clearance and thereby enter a shoal area charted with a 39-foot depth. The Safety Board does not believe that the accuracy of the 1939 survey was a causal factor in this accident.

2. The petitioner argues:

> The report's estimation that actual squat possibly was as much as 8 feet is based on undisclosed "calculations" and (subject to an opportunity to examine those calculations) that estimation appears erroneous. The report also ignores new matter (unavoidably submitted only on May 19, 1993) persuasively refuting certain mistaken theoretical predictions of the David Taylor Research Center, which were material to the report's squat estimation.
>
> The damage, which the report describes as 4 to 5 feet above the keel, was relatively superficial damage and demonstrably not attributable to the grounding incident.
>
> Significantly also, squat was probably increased beyond expectations because the water was shallower than the chart indicated and, as thus increased, on the basis of the incomplete information now available, actual squat probably was approximately 5 feet.

The Safety Board responds:

The Board's squat calculations were placed in the public docket, and, together with other investigative evidence, were available to the public before the Board began its deliberation of the proposed report. Safety Board staff mailed a copy of the calculations to the petitioner on March 27, 1995.

The David Taylor Model Basin (DTMB) report of April 15, 1993, (referred to in the Board's report as DTRC) gave computer program predictions of sinkage and trim based on theoretical analysis of flow past a hull in shallow water. The application of these predictions to the QE2 yielded results that the Safety Board believes were unrealistic for depth Froude numbers ($FH=v/\sqrt{gh}$) approaching 1. Accordingly, the only figures quoted in the Safety Board's report were those at lower Froude numbers, which yielded results that were considered more realistic. Because the QE2 was operating in the transcritical range close to depth Froude 1, the Safety Board considered the DTMB results in light of all the other evidence available and did not select the large squat values predicted by the DTMB computer results as its estimated squat of the QE2.

On May 19, 1993, the petitioner mailed to the Safety Board a critique of the DTMB report by the BMT Group LTD. This critique, which reinforced the Board's conclusions about the limited value of the DTMB results for values of depth Froude numbers near 1, did not warrant any revision of the Board's report.

The petitioner states that the "BMT May 1993" report demonstrates that the Board's upper-limit estimate of 8 feet of actual squat is erroneous. However, the BMT report addresses only the DTMB report and does not suggest any upper-limit estimate of squat for the QE2. As mentioned in the Safety Board's report, at the BMT attempted to determine the QE2's squat by conducting model tests the results were not credible because, unlike the QE2, the model grounded by the stern at 16 knots and its bow rose considerably above its still water draft.

The Safety Board used three different methods in its computations for squat. The computations were based on speeds of 19, 20, and 21 knots in lieu of the QE2's reported speed of 24½ knots to avoid large errors associated with the critical region near Froude 1. A calculation at 24 knots resulted in the unrealistic squat value of 14.25 feet and was therefore not given much credence. The calculation utilizing the data from *Principles of Naval Architecture*, Volume III, figure 119, did not incorporate the data showing a bow-up trim angle because the physical hull damage indicated that the QE2 grounded with a bow-down trim angle.

The petitioner alleges that the Safety Board's report errs in suggesting that Cunard's estimate of 3½ feet of squat could have been increased to 5½ to 6½ feet if the damage noted at 4 to 5 feet above the keel was inflicted by Red Rock I (RR I). The petitioner submits a sketch showing an outline of RR I superimposed on the body plan and points out that such a scenario would also result in damage below the 4- to 5-foot height as the vessel moved over the rock. The petitioner states that because the damage can be traced from a location above the keel near the port bow at frame 324 aft to frame 228 without evidence of damage beneath that level, the damage could not have been caused by RR I or any other rock. The petitioner also states that the nature of port side "rectangle" damage proves that the grounding could not have caused the damage.

The Safety Board agrees that any rock that caused damage beginning above the offset from the keel normally would also cause damage at a lower level as the vessel passed over it. Damage above and parallel to the keel without lower damage could have been caused by rocks that were forced outward latterly as the vessel moved forward. Some rocks were moved during the QE2 grounding, and scraping damage can result in "rectangle" appearances as the damage highlights the adjacent parallel hull frame and longitudinal reinforcements. In any event, because the petitioner now believes that the QE2's squat was "approximately 5 feet," this differing viewpoint is less important.

In summary, in determining the squat of the QE2 at the grounding site, the Safety Board found no single, reliable methodology that yielded a credible single value. Because the Board believed that a range of values best described this uncertainty and recognized that computations in the region of critical speed values produced unrealistic results, the Safety Board used slightly lower speed values to determine approximate values and trends. Coupled with the fact that the hull damage indicated that the vessel grounded with the bow still in the down trim condition, a squat of 8 feet seemed reasonable for the upper limit. The Board still believes that its characterization of the squat as 4½ to 8 feet is consistent with the best information accumulated to date, and the Board does not adopt the petitioner's preferred description of "approximately 5 feet."

The petitioner states that the squat was greater than expected because the water was shallower than the chart indicated. While squat generally increases as the water becomes more shallow, none of the testimony by the QE2's bridge crew indicated that they were so sensitive to and knowledgeable about the influence of water depth on squat that they would have distinguished between the squat at 39 feet and the squat at 34 feet. They quoted squat figures of about 2 feet or less even after they knew the vessel had grounded. Given the dearth of information about squat available to most bridge crews, the QE2's bridge crew is unlikely to have distinguished the change in squat due to a 5-foot change in water depth.

The petitioner also requests that two new findings be added to the Safety Board's report and that three existing findings be modified. All but one of these changes relate to the matters discussed above, and the Safety Board declines to make the changes for the reasons stated above. The change requested to the Board's third finding concerns the ship's speed. The petitioner states, "The record supports a selected speed of 24 knots, not 25." The report quotes the master asking the pilot whether he objected to increasing the speed and "run[ning] at something of 24 knots outbound." This communication is vague concerning what he actually selected, although the master indicated he wanted to average a speed of 25 knots for the remainder of the voyage to New York City. The Safety Board calculated the QE2's average speed from 2136 until the grounding at 24.6 knots, and used 25 knots, which we believe is more accurate than 24 knots, for the rest of the report.

The petitioner also asks that the probable cause be modified to reflect the petitioner's views discussed above. Again, the Safety Board declines to do so for the reasons stated above. However, the petitioner's comments on the last sentence of the probable cause warrant further reply. That sentence reads: "Contributing to the accident was the lack of adequate information aboard the QUEEN ELIZABETH 2 about how speed and water depth affected the ship's underkeel clearance."

The petitioner points out that this statement could be interpreted to mean that information should have been available to the crew that could have enabled them to predict accurately the anticipated squat even at the critical hydrodynamic values at which the QE2 was operating. That this was not the intent of the sentence is evidenced by the report's discussion of the uncertainties in determining the squat. The petitioner requests that the sentence be modified, beginning after "lack of," to read "adequate information aboard the QUEEN ELIZABETH 2 about how speed and water depth <u>might</u> affect[ed] the ship's underkeel clearance." While the Board agrees that this revision could avoid a possible misinterpretation by someone who does not read the corresponding sections of the report, anyone who reads the sections that discuss squat is unlikely to misunderstand the sentence as written. Therefore, the suggested revision to the last sentence of the probable cause was not deemed necessary.

Accordingly, the Safety Board denies the petition in its entirety.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT and GOGLIA concurred in the disposition of this petition for reconsideration.

EXAMPLE OF A RESPONSE TO A PETITION FOR RECONSIDERATION (NOTATION MEMORANDUM AND DRAFT)

(not actual size)

FOR OFFICIAL USE ONLY

NATIONAL TRANSPORTATION SAFETY BOARD

NOTATION

NOTATION MEMORANDUM

Date:

To: The Board

Through: Managing Director

From: Director, Office of Aviation Safety

Subject: Response to Petition for Reconsideration regarding an aviation turbulence accident that occurred over the Atlantic Ocean near Cat Island, Bahamas, on January 17, 1996, involving an Airbus A300B4-605R, N7076A

Action

The staff recommends that the National Transportation Safety Board deny the petition to amend Brief of Accident MIA96FA064 finding numbers 2, 3, and 4. However, the staff recommends that the Safety Board amend the Brief of Accident narrative and probable cause narrative to reflect the concerns of the petitioner.

Petitioner and Date of Petition

The petitioner is Mr. Tommy McFall, Managing Director, Safety and Environmental, American Airlines, Inc. Mr. McFall's letter to the Safety Board requesting reconsideration of the accident and modification of the Board's findings and determination of probable cause is dated May 21, 1998. The petitioner provided copies of the petition to the parties to the investigation. No comments were received.

Issues Presented by the Petitioner

The petitioner makes several assertions that some findings and part of the probable cause included in the Brief of Accident (adopted on April 3, 1997) are not supported by the Meteorological Group Chairman's factual report or by the facts, conditions, and circumstances of the accident. Regarding the findings, the petitioner points out that (1) turbulence was not specifically forecasted in the National Weather Service's (NWS's) hazardous weather advisory and (2) American Airlines' Operations Specifications allow for the substitution of operator meteorological data for NWS data. Regarding the probable cause, the petitioner believes that American Airlines' failure to specifically advise the flightcrew of forecast severe turbulence was not a factor relating to the accident because the weather information that the company provided to the flightcrew did contain a forecast for isolated thunderstorms.

Evidence Presented by the Petitioner

The petitioner indicated that neither the Brief of Accident narrative nor the factual report made any specific reference to any forecast of turbulence by the NWS or American Airlines.

Pertinent Issues in Original Investigation and Analysis

The accident airplane departed Miami, Florida, about 1401 eastern standard time as flight 869 to San Juan, Puerto Rico. The airplane encountered severe turbulence about 1438 during an en route descent from 35,000 to 33,000 feet over the Atlantic Ocean near Cat Island, Bahamas. A NWS SIGMET [Significant Meteorological Information] for an area of active, intensifying thunderstorms was in effect for the time and location of the accident. The NWS refers to active thunderstorms as the occurrence or expected occurrence of an area (3,000 square miles or more) of widespread cumulonimbus clouds, with little or no space between individual clouds. A forecast of thunderstorms also implies severe or greater turbulence. American Airlines did not provide the flightcrew with this SIGMET. Even though American Airlines' Operations Specifications allow substitution of operator meteorological data for NWS data, American Airlines' meteorological staff did not issue a SIGMEC [Significant Meteorological Condition] advisory for thunderstorms to the flightcrew.

The probable cause adopted for the accident was "the turbulence and failure of the passengers to have their seatbelts fastened." A factor relating to the accident was "failure of the aircraft operator to advise the flightcrew of forecast severe turbulence conditions in the area of the accident."

Conclusions

After review of the original case material and evidence submitted by the petitioner, the staff finds no basis to grant the petition to amend Brief of Accident finding numbers 2, 3, and 4. The review does, however, indicate a need to amend the Brief of Accident narrative to reflect that the NWS forecasted active intensifying thunderstorms rather than an area of thunderstorms and that American Airlines issued a company forecast for isolated thunderstorms, as indicated in the flight release. The review also indicates a need to amend the probable cause narrative to reflect that a factor relating to the accident was the failure of the aircraft operator to advise the flightcrew of forecast widespread thunderstorm, rather than turbulence, conditions in the area of the accident.

Staff

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Attachments

Petition for Reconsideration
Response to Petitioner
Original Brief
Revised Brief

I concur:

Director, Office of Research and Engineering	Date
Director, Office of Safety Recommendations and Accomplishments	Date
General Counsel	Date

Mr. Tommy McFall, Petitioner
Managing Director, American Airlines
Safety and Environmental
Aircraft Accident
Over the Atlantic Ocean Near Cat Island, Bahamas
January 17, 1996
File No. 1092, Accident No. MIA96FA064

RESPONSE TO PETITION FOR RECONSIDERATION

In accordance with its rules (Title 49, *U.S. Code of Federal Regulations*, Part 845), the National Transportation Safety Board has reviewed the May 21, 1998, petition for reconsideration and modification of its findings and probable cause in the aircraft turbulence accident involving an Airbus A300B4-605R, N7076A, over the Atlantic Ocean near Cat Island, Bahamas, on January 17, 1996. On the basis of this review, the Safety Board denies the petition to amend the Brief of Accident finding numbers 2, 3, and 4. The Safety Board, however, amends the last two sentences of the Brief of Accident narrative and the last sentence of the probable cause narrative to reflect the concerns of the petitioner.

The above-referenced accident airplane was registered to and operated by American Airlines, Inc., as flight 869. The flight departed Miami, Florida, about 1401 eastern standard time to San Juan, Puerto Rico, and encountered severe turbulence about 1438 during an en route descent from 35,000 feet (flight level 350) to 33,000 feet (flight level 330). During the turbulence encounter, 3 passengers received serious injuries, and 17 passengers received minor injuries.

The petitioner believes that some information in the Brief of Accident (adopted on April 3, 1997) is not supported by the facts, conditions, and circumstances of the accident. Regarding finding numbers 2, 3, and 4, the petitioner points out that (1) turbulence was not specifically forecasted in the National Weather Service's (NWS's) hazardous weather advisory and (2) American Airlines' Operations Specifications allow for the substitution of operator meteorological data for NWS data. Regarding the probable cause, the petitioner indicated that American Airlines' failure to specifically advise the flightcrew of forecast severe turbulence was not a factor relating to the accident because neither the NWS nor the company specifically forecasted turbulence. In addition, the petitioner believes that the Brief of Accident narrative should reflect that the NWS issued a forecast for active thunderstorms[1] rather than an area of thunderstorms.

NWS International Significant Meteorological Information (SIGMET) Echo 1 was issued at 1236 and was valid until 1640. The SIGMET noted active thunderstorms observed by satellite within 70 nautical miles of latitude 24.8 degrees north and longitude 76.3 degrees west; the tops of the thunderstorms were to flight level 380 and were intensifying. The location of the severe turbulence event was contained in the area outlined by this SIGMET. Although the SIGMET did not specifically include a warning for severe turbulence, it is generally accepted and understood throughout the aviation

[1]The NWS refers to active thunderstorms as the occurrence or expected occurrence of an area (3,000 square miles or more) of widespread cumulonimbus clouds, with little or no space between individual clouds.

community that a forecast of thunderstorms implies severe or greater turbulence. For example, the Federal Aviation Administration's Advisory Circular (AC) 00-24B, "Thunderstorms," states that "outside the cloud, shear turbulence has been encountered several thousand feet above and 20 miles laterally from a severe storm." The AC also states that "hazardous turbulence may extend to as much as 20 miles from the [weather radar] echo edge." In addition, NWS forecasts contain the notation that thunderstorms imply severe turbulence.

American Airlines did not provide the flightcrew with the information on thunderstorms contained in NWS SIGMET Echo 1. In addition, American Airlines did not issue a Significant Meteorological Condition (SIGMEC) advisory for thunderstorms. Although the flight release contained information under the heading "Map Features Caribbean" indicating "isolated thunderstorms possible within showers," the widespread and significant aspects of the convection in the area of the accident should have required the issuance of an American Airlines SIGMEC. American Airlines' indication of possible isolated thunderstorms did not adequately convey to the flightcrew the extent and significance of the convective hazard and related turbulence potential.

After review of the original case material and evidence submitted by the petitioner, the Safety Board finds no basis to grant any modification to the Brief of Accident findings. The Safety Board, however, does agree that the Brief of Accident narrative and the Brief of Accident probable cause narrative should be modified as follows:

Narrative

In lines 6 and 7, replace "A SIGMET had been issued by the National Weather Service for AN AREA OF thunderstorms at the point of the turbulence encounter" with "A SIGMET had been issued by the National Weather Service for ACTIVE INTENSIFYING thunderstorms at the point of the turbulence encounter."

In lines 7 and 8, replace "The weather information supplied to the pilots by the operator did not contain this SIGMET OR WARNINGS ABOUT THE THUNDERSTORMS" with "The weather information supplied to the pilots by the operator did not contain this SIGMET; HOWEVER, IT DID CONTAIN A COMPANY FORECAST FOR POSSIBLE ISOLATED THUNDERSTORMS WITHIN SHOWERS, AS INDICATED IN THE FLIGHT RELEASE."

Probable Cause

In the last sentence, replace "A factor relating to this accident was: failure of the aircraft operator to advise the flightcrew of forecast SEVERE TURBULENCE conditions in the area of the accident" with "A factor relating to this accident was: the failure of the aircraft operator to advise the flightcrew of forecast ACTIVE INTENSIFYING THUNDERSTORM conditions in the area of the accident."

A revised Brief of Accident is enclosed.

Members’ concurrences to follow.

By: Jim Hall

Chairman

Enclosures

GSalottolo, AS-30: draft 11/5/98; revised 1/20/99; final 2/2/99 kmj
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cc: C(2), GA, PA, SR(2), AS-1, AS-30, RE-1, Editor
Draft proofread by: ______________________

Routing	AS-30	Editor	AS-2	AS-1	RE-1	SR-1	MD-5	M3	M2	M1	VC	C
Date												
Initials												

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

BRIEF OF ACCIDENT

ADOPTED 04/03/1997

MIA96FA064

FILE NO. 1092	01/17/96	ATLANTIC OCEAN, OF	AIRCRAFT REG. NO. N7076A	TIME (LOCAL) – 14:38 EST

MAKE/MODEL	- Airbus A300B4-605R				
ENGINE MAKE/MODEL	- GE CF6-80C2A5		FATAL	SERIOUS	MINOR/NONE
AIRCRAFT DAMAGE	- Minor	CREW	0	0	9
NUMBER OF ENGINES	- 2	PASS	0	3	256

OPERATING CERTIFICATES - Flag carrier/domestic
NAME OF CARRIER - AMERICAN AIRLINES
TYPE OF FLIGHT OPERATION - Scheduled
- Domestic
- Passenger

REGULATION FLIGHT CONDUCTED UNDER - 14 CFR 121

LAST DEPARTURE POINT - MIAMI, FL
DESTINATION - SAN JUAN, PR

AIRPORT PROXIMITY - Off airport/airstrip

CONDITION OF LIGHT - Daylight

WEATHER INFO SOURCE - Weather Observation Facility

BASIC WEATHER - Instrument (IMC)
LOWEST CEILING - None
VISIBILITY - 0010.000 SM
WIND DIR/SPEED -100/010 KTS
TEMPERATURE (F) - 81
OBSTR TO VISION - None
PRECIPITATION - None

PILOT-IN-COMMAND AGE - 55

CERTIFICATES/RATINGS
Airline transport
Single-engine land, Multiengine land
INSTRUMENT RATINGS
Airplane

FLIGHT TIME (HOURS)

TOTAL ALL AIRCRAFT - 4113
LAST 90 DAYS - UNK/NR
TOTAL MAKE/MODEL - 2359
TOTAL INSTRUMENT TIME - UNK/NR

The flight climbed to 33,000 feet after departure, where it encountered turbulence. The captain turned on the seat belt sign and announcements were made to the passengers to remain seated with their seat belts fastened. ATC informed the pilots that other pilots reported 27,000 and 35,000 feet had smoother air. They descended to 27,000 feet, encountered turbulence and then requested 35,000 feet. After reaching 35,000 feet, they encountered greater turbulence and requested and received clearance to 33,000 feet. During descent, they encountered severe turbulence which resulted in injuries to passengers. A SIGMET had been issued by the National Weather Service for an area of thunderstorms at the point of the turbulence encounter. The weather information supplied to the pilots by the operator did not contain this SIGMET or warnings about the thunderstorms.

Original Brief

MIA96FA064

FILE NO. 1092	01/17/96	ATLANTIC OCEAN, OF	AIRCRAFT REG. NO. N7076A	TIME (LOCAL) – 14:38 EST

OCCURRENCE# 1	IN FLIGHT ENCOUNTER WITH WEATHER
PHASE OF OPEARATION	DESCENT - NORMAL

FINDINGS

1. - WEATHER CONDITION–TURBULENCE (THUNDERSTORMS)
2. - HAZARDOUS WEATHER ADVISORY–ISSUED–NWS PERSONNEL
3. - HAZARDOUS WEATHER ADVISORY–NOT ISSUED-COMPANY/OPERATOR MANAGEMENT
4. - HAZARDOUS WEATHER ADVISORY–NOT RECEIVED–FLIGHTCREW
5. - SEAT BELT SIGN–NOT COMPILED WITH–PASSENGER

The National Transportation Safety Board determines that the probable cause(s) of this accident was:
the turbulence and failure of the passengers to have their seat belts fastened. A factor relating to the accident was:
failure of the aircraft operator to advise the flight crew of forecast severe turbulence conditions in the area of the accident.

Format Revision 4/97

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

BRIEF OF ACCIDENT

MIA96FA064

FILE NO. 1092	01/17/96	ATLANTIC OCEAN, OF	AIRCRAFT REG. NO. N7076A	TIME (LOCAL) – 14:38 EST

MAKE/MODEL - Airbus A300B4-605R
ENGINE MAKE/MODEL - GE CF6-80C2A5
AIRCRAFT DAMAGE - Minor
NUMBER OF ENGINES - 2

	FATAL	SERIOUS	MINOR/NONE
CREW	0	0	9
PASS	0	3	256

OPERATING CERTIFICATES - Flag carrier/domestic
NAME OF CARRIER - AMERICAN AIRLINES
TYPE OF FLIGHT OPERATION - Scheduled
- Domestic
- Passenger
REGULATION FLIGHT CONDUCTED UNDER - 14 CFR 121

LAST DEPARTURE POINT - MIAMI, FL
DESTINATION - SAN JUAN, PR

AIRPORT PROXIMITY - Off airport/airstrip

CONDITION OF LIGHT - Daylight

WEATHER INFO SOURCE - Weather Observation Facility

BASIC WEATHER - Instrument (IMC)
LOWEST CEILING - None
VISIBILITY - 10.000 SM
WIND DIR/SPEED -100/010 KTS
TEMPERATURE (F) - 81
OBSTR TO VISION - None
PRECIPITATION - None

PILOT-IN-COMMAND AGE - 55

CERTIFICATES/RATINGS
Airline transport
Single-engine land, Multiengine land
INSTRUMENT RATINGS
Airplane

FLIGHT TIME (HOURS)

TOTAL ALL AIRCRAFT - 4113
LAST 90 DAYS - UNK/NR
TOTAL MAKE/MODEL - 2359
TOTAL INSTRUMENT TIME - UNK/NR

The flight climbed to 33,000 feet after departure, where it encountered turbulence. The captain turned on the seat belt sign and announcements were made to the passengers to remain seated with their seat belts fastened. ATC informed the pilots that other pilots reported 27,000 and 35,000 feet had smoother air. They descended to 27,000 feet, encountered turbulence and then requested 35,000 feet. After reaching 35,000 feet, they encountered greater turbulence and requested and received clearance to 33,000 feet. During descent, they encountered severe turbulence which resulted in injuries to passengers. A SIGMET had been issued by the National Weather Service for active intensifying thunderstorms at the point of the turbulence encounter. The weather information supplied to the pilots by the operator did not contain this SIGMET; however, it did contain a company forecast for possible isolated thunderstorms within showers as indicated in the fight release.

Revised Brief

BRIEF OF ACCIDENT (Continued)

MIA96FA064

FILE NO. 1092	01/17/96	ATLANTIC OCEAN, OF	AIRCRAFT REG. NO. N7076A	TIME (LOCAL) – 14:38 EST

OCCURRENCE# 1 IN-FLIGHT ENCOUNTER WITH WEATHER
PHASE OF OPEARATION DESCENT - NORMAL

FINDINGS

1. - WEATHER CONDITION–TURBULENCE (THUNDERSTORMS)
2. - HAZARDOUS WEATHER ADVISORY–ISSUED–NWS PERSONNEL
3. - HAZARDOUS WEATHER ADVISORY–NOT ISSUED–COMPANY/OPERATOR MANAGEMENT
4. - HAZARDOUS WEATHER ADVISORY–NOT RECEIVED–FLIGHTCREW
5. - SEAT BELT SIGN–NOT COMPILED WITH–PASSENGER

--- Probable Cause--

CAUSE (S)	1	5
FACTORS (S)	3	

The National Transportation Safety Board determines that the probable cause(s) of this accident was:
the turbulence and failure of the passengers to have their seat belts fastened. A factor relating to this accident was:
the failure of the aircraft operator to advise the flight crew of forecast active intensifying thunderstorm conditions in the area of the accident.

Format Revision 2/96

*****SAMPLE*****

Issue Date: September 6, 2006

Effective immediately, please use the attached sample as a template when preparing responses to petitions for reconsideration. The new format includes several changes aimed at clarifying and standardize the Board's format for petition responses.   If you have any questions please contact me or Vicky D'Onofrio.

Summary of changes:

- The header has been revised so it looks similar to the one that is used for safety recommendation letters - the old standard format was more ambiguous in that it was not clear whether the document was a Board-adopted product or simply correspondence;

- In light of the new header, which identifies the document as a **Response to Petition for Reconsideration**, this title is no longer needed at the beginning of the document;

- The petitioner's name and address now appear at the beginning of the document - the old standard format included only the petitioner's name, followed by the accident information;

- All relevant accident information (such as date and place of accident, and NTSB accident number) is included in the first paragraph - this is important, since it will no longer be listed above; and

- The document concludes with a summary paragraph that states whether the Board is granting or denying the petition, in full or in part, and (if changes are being made as a result) that a revised brief (or report, if appropriate) is attached.

- Remember to include the notation number in the lower right hand corner of the first page when the item is put in final.

- Please note: this guidance supercedes the the formatting guidance (including the sample) in chapter 19 of the *Writing Guide*, which deals with petitions for reconsideration.

Karen Lanier
Associate Managing Director for Quality Assurance

National Transportation Safety Board
Washington, D.C. 20594

Response to Petition for Reconsideration

Date:

Lieutenant Jeff Floyd, Petitioner
Santa Rosa County Sheriff's Department
Post Office Box 7129
Milton, Florida 32572

In accordance with 49 *Code of Federal Regulations* (CFR) Section 845.41, the National Transportation Safety Board has reviewed the October 20, 2004, petition for reconsideration and modification of the findings and probable cause in the aircraft accident involving a Cessna 172P, N52615, at Jay, Florida, on September 3, 2003 (MIA03TA175).[1] On the basis of this review, the Safety Board hereby grants the petition in its entirety.

On September 3, 2003, about 1340 central daylight time, a Cessna 172P, N52615, owned and operated by the Santa Rosa County Sheriff's Department, impacted trees while maneuvering near Jay, Florida. The airline transport pilot-rated pilot and the passenger/observer were seriously injured. The airplane was substantially damaged. Visual meteorological conditions prevailed and no flight plan was filed for the public-use flight. The flight originated from Milton Airport at 1015, with a stop at the airport at Jay to pick up the passenger/observer.

The findings and probable cause adopted on September 29, 2004, were as follows:

<u>Findings</u>

Occurrence #1 Loss of Engine Power (Total) – Nonmechanical
Phase of Operation Maneuvering

Findings

1. (C) Aircraft Preflight – Inadequate – Pilot-in-command
2. Fuel Supply – Inadequate – Pilot-in-command
3. (C) Refueling – Not Performed – Pilot-in-command
4. Fluid, Fuel – Exhaustion

[1] See *[If the petition relates to an accident report, the report citation would go here.]*

Occurrence #2 In-flight Collision with Object
Phase of Operation: Emergency Descent/Landing

Findings

5. Object – Tree(s)

Probable Cause

The Safety Board determined that the probable cause of the accident was the "pilot's inadequate preflight/preparation which failed to assure an adequate fuel supply for the flight and his inadequate planning/decision to conduct flight to the point of fuel exhaustion."

The petitioner claims that the Safety Board's probable cause and the causal findings of fuel exhaustion and inadequate preflight preparation are incorrect. Specifically, the petitioner asserts that "convincing evidence" indicates that the Safety Board's findings were based on a "misinterpretation of the flight hours that were applied to the fuel rate consumption equation." The petitioner asserts that the error "involves flight hours recorded for August 29, 2003, the last day prior to the crash" in flight records provided to the Safety Board during the initial investigation. According to the petitioner, one of the two flight record entries for that day (a log entry for 3 hours), reflected time "spent at the hangar investigating the source of an oil leak that required the removal/installation of the cowling, etc." The petitioner asserts that the 3-hour entry "served only to document additional compensable, non-flight hours" worked by another contract pilot. The petitioner states that only 2 hours of flight time was logged for that day, not 5, as stated in the original investigation report. The petitioner provided a copy of the airplane's Hobbs time reading for August 29 to support this claim. Based on these facts, the petitioner concludes that "using the average fuel consumption rate for our airplane as indicated in the NTSB report (7.98 gallons per hour), the 3 hours in question puts almost 24 gallons of fuel in the plane at the time of the crash." The petitioner notes that this fuel capacity lends credence to statements from the pilot and passenger/observer that they smelled fuel while trapped in the wreckage. The petitioner submitted photographs depicting a blue fuel stain below the vented right wing tank filler cap taken several hours after the accident and noted that the airplane "remained in the nose down position for 42 hours before the remaining fuel was extracted by on-site engineers (Cessna and Lycoming)." The petitioner suggests that mechanical issues may have been involved in the airplane's loss of power.

Based on these claims, the petitioner asks that the factual report and brief of accident, including the findings and the probable cause, be modified to reflect the conclusion that the accident was not caused by fuel exhaustion and inadequate flight planning.

The original investigation concluded that the airplane had flown for about 7 hours with only one refueling of 15.93 gallons since its last fuel top off of 32.71 gallons on August 29. The calculations were based on a total of 5 hours flown on August 29 before the last recorded refueling. The airplane flew about 2.2 hours on September 3 before the accident. The airplane's fuel capacity was 40 gallons of useable fuel, and the average fuel burn of 7.98 gallons per hour was calculated based on the airplane's flight logs. The on-site investigation, conducted the day after the accident, drained small amounts of fuel from the fuel system. Fuel system integrity was found to be intact; the tanks were not breached and the fuel lines were not severed.

After review of the original case material, the Safety Board concludes that the petitioner's claims are persuasive. The Hobbs meter times, fuel records, and flight entries from the accident pilot and another contract pilot clearly support the petitioner's claims. The documents also support the pilot's statement to first responders that he believed he had "20 to 25 gallons of fuel" on board. Although several first responders reported that they did not see any fuel leaks or smell fuel at the scene, this is not uncommon when the fuel system is not breached. Moreover, one first responder reported that he smelled fuel but could not locate its source.

The photographs provided by the petitioner offer similarly persuasive evidence that fuel was on board the airplane at the time of the crash. The photographs clearly show a large, blue fuel stain from the vented right tank filler cap that becomes progressively wider toward the leading edge of the wing. Because the filler cap is located in the middle of the wing, halfway along the chord, the tank would have to be at least half full for fuel to leak from the filler cap vent at the angle the airplane came to rest. Although investigators from Cessna and Lycoming reported that minimal fuel was drained from the wing tanks and fuel system, these observations are not conclusive based on the time between the accident and the on-scene investigation. With the airplane in an extreme tail-high position, it is also possible that fuel leaked through the carburetor or out the left tank vent, located under the left tank near the wing root. However, there was no photographic documentation of this area. Nevertheless, based on the fueling records, the revised flight hour information, physical evidence, and the position and duration of the airplane at the accident site, it is unlikely that fuel exhaustion was causal in the accident. In addition, the pilot stated that he visually and tactilely checked each tank before departure and determined that each tank was full ("filled to the ring"). There is no evidence that disputes these claims.

The Safety Board notes that the airplane was engaged in circling, low-level surveillance, requiring increased vigilance to avoid a stall during turns at reduced airspeeds. Although some details in the pilot's description (turbulence attributed to prop wash) and airspeeds of 55 knots to 58 knots during consecutive turns at 500 feet altitude suggest the possibility of an inadvertent stall scenario, this possibility does not comport with the pilot's statement about the accident. The passenger/observer's statement is also not sufficiently specific to support such a conclusion. Fuel unporting was also considered but is unlikely if the turns were coordinated and because, if the turn were uncoordinated, the amount of fuel now believed to be onboard would be sufficient to preclude unporting. Although the on-site engine investigation and a subsequent ignition system examination found no anomalies, a postaccident engine run and teardown were not conducted because of the initial on-scene evidence and fuel endurance documentation that determined that the airplane had exhausted its fuel. The engine has since been stored in an unsecured area and in uncontrolled conditions, rendering subsequent examination unreliable. Therefore, it is not possible to determine conclusively what caused the airplane to lose power.

Based on the review, the petition for reconsideration of the Safety Board's findings in connection with the aviation accident involving a Cessna 172P, N52615, at Jay, Florida, on September 3, 2003, is granted in its entirety.

The identified parts of the factual report and brief of accident have been modified as follows:

Factual Report

On page 1a, in the first paragraph, after the second sentence ending with "system lines or hoses," insert the following sentence:

> Photographs of the wreckage taken by the Santa Rosa County Sheriff's Department about 3 hours after the accident showed a large blue fuel stain on the right-wing surface beginning at the vented fuel tank filler cap and extending to the wing leading edge.

On page 1a, in the first paragraph, delete the third sentence beginning "After removing the engine from the airplane," and replace with the following:

> After removing the engine from the airplane during the on-scene examination the next day, 1.5 gallons of fuel was drained through the fuel gascolator with the fuel selector in the left position, according to the airplane manufacturer's report. Some debris was observed in the fuel drained from the left wing, the airplane manufacturer's report stated. A small amount of fuel was observed in the right tank, but no significant amount was drained from the right tank. The airplane had been in an extreme nose-low position for approximately 42 hours before investigators drained the fuel tanks.

On page 1a, delete the second and final paragraph and replace with the following:

> The airplane was flown for 4.1 hours on August 25, 2003, and not refueled. Records indicated that the airplane's fuel tanks were topped off with 32.71 gallons on August 29. The airplane was flown a total of 2 hours on August 29 and was refueled with 15.93 gallons the same day. This was the last recorded fueling. On September 3, the airplane was flown a total of 2.2 hours before the accident. According to the Cessna 172 Pilot Information Manual, the airplane has a fuel capacity of 43 gallons, of which 40 gallons are usable. A review of the airplane's flight indicated that the airplane had an average fuel burn of 7.98 gallons per hour.

Brief of Accident

Narrative

Replace the original narrative with the following:

The pilot stated that he was flying an aerial observation mission in a left-hand circular pattern about 500 feet above ground level with a passenger/observer in the backseat when the engine lost power when he attempted to climb out of turbulence. He stated that he thought the turbulence was caused by prop wash from a previous turn. He rolled wings level and added full power to climb out of it, but the engine did not respond to the power setting. The airplane "settled" and went down in an area of pine trees. The passenger/observer stated that he looked up front to see the pilot "fighting with the controls" before impact. The passenger/observer and the pilot stated that they could smell fuel leaking from the airplane. Several responders stated that they did not smell the odor of fuel at the crash site and saw no fuel leaks. One first responder stated that he did smell fuel but could not locate its origin. An examination conducted by the engine and airplane manufacturers determined that the fuel tanks were intact with no breaches. Inspection of the fuel system determined fuel line continuity. Small amounts of fuel were drained from the tanks. However, photographs taken by sheriff's department detectives showed a large blue fuel stain on the right wing from the tank filler cap to the wing leading edge. The airplane had been in an extreme nose-low position for approximately 42 hours before investigators drained the fuel tanks. The Pilot's Information Manual states that the airplane has a usable fuel capacity of 40 gallons. Airplane flight logs indicated that the airplane's fuel endurance was about 7.98 gallons per hour. Fueling and flight records indicated the airplane had flown 2.2 hours before the accident and after being topped off with 15.93 gallons on August 29, which was the last time it was flown before the accident flight.

Findings

Occurrence #1 Loss of Engine Power (Total) Non-Mechanical
Phase of Operation Maneuvering

1. (C) Reason for Occurrence Undetermined

Occurrence #2 In-flight Collision with Object
Phase of Operation: Emergency Descent/Landing

Findings

2. Object – Tree(s)

Probable Cause

Loss of engine power for undetermined reasons.

Accordingly, the Safety Board grants the petition in its entirety. A revised brief of accident and factual report are attached.

Acting Chairman ROSENKER and Members HERSMAN and HIGGINS concurred in the disposition of this petition for reconsideration.

Attachments

Typing Information

AS20co/Petitions1/Jay, FL-Floyd/Jay, FL-FloydResponse.doc

final proofread by:______________

CHAPTER 20

RESPONSE TO NOTICE OF PROPOSED RULEMAKING

RESPONSE TO
NOTICE OF PROPOSED RULEMAKING

Background

Every day, the *Federal Register* publishes notices of proposed rulemaking (NPRMs) and advance notices of proposed rulemaking (ANPRMs), some of which the Safety Board will formally comment on. If a modal office believes that an NPRM or ANPRM requires a response, the office should notify the Executive Secretariat so that the item cannot be misplaced as a mail control.

After the appropriate reviews, as determined by the modal director, the response is forwarded to the Managing Director's office as a notation item. (See Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board, and Convening of Board Meetings* for notation procedures.) Modal offices should submit responses in sufficient time to allow for Board review and to meet the due date of the notice.

Format

When preparing a response to an NPRM or ANPRM for notation, include the following:

- A notation memorandum (see Board Order 4A, *Preparation, Consideration, and Adoption of Documents by the Safety Board, and Convening of Board Meetings*) with the following information:
    - Why the Board is responding to this particular NPRM or ANPRM.
    - How the NPRM or ANPRM addresses safety recommendations or accident investigations.

    - Whether the Board supports the item, supports it in part, or believes that the item does not adequately address the safety issue.
    - When comments are due.

- A double-spaced draft letter addressed to the appropriate rulemaking function within the issuing agency (not the Administrator) stating the Board's position on the item. After approval by the Board, the draft letter will be signed only by the Chairman.

- The proposed NPRM or ANPRM from the *Federal Register*.

Two examples of responses to NPRMs and two examples of notation packages for responses to NPRMs follow.

EXAMPLE OF RESPONSE TO NOTICE OF PROPOSED RULEMAKING

(not actual size)

Federal Aviation Administration
Transport Airplane Directorate, ANM-114
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Attention: Rules Docket No. 98-NM-33-AD

Dear Sir:

The National Transportation Safety Board has reviewed your notice of proposed rulemaking, "Airworthiness Directives; Empresa Brasileira de Aeronautica S.A. (EMBRAER) Model EMB-120 Series Airplanes," which was published in 63 *Federal Register* 14855 on March 27, 1998. The notice proposes an airworthiness directive to require a one-time inspection on all Embraer Model EMB-120 series airplanes for delamination, erosion, and condition of fillet sealant and conductive edge sealer of the wing and empennage leading edge area behind the deice boots.

The proposed rule was prompted by an in-flight incident involving a foreign-operated EMB-120 in which the top layer of composite material, just aft of the deice boot upper edge, had delaminated and was lifted by the slipstream as much as 2 inches. The flightcrew experienced roll control difficulties but were able to land the airplane safely. Following this incident, Embraer issued Alert Service Bulletin No. 120-51-A004, which recommended a visual inspection of the wing and empennage leading edge area behind the deice boots for erosion, delamination, and condition of sealant. The proposed rule would make compliance with this service bulletin mandatory.

The Safety Board is investigating the January 9, 1997, accident in Monroe, Michigan, involving a Comair EMB-120. The airplane crashed while on approach to Detroit Metropolitan Airport and all 29 people on board were killed. One of the investigative findings revealed that the A-56-B conductive edge sealant, which is applied where the deice boot fits into the leading edge, was missing from five of the six deice boot segments available for examination. The Safety Board is attempting to determine if the absence of this conductive edge sealer might have been a factor in the accident. The proposed action will mandate an inspection of this sealer and provide the proper corrective action if warranted.

The Safety Board fully supports the proposed rule and believes that the action is necessary to ensure that the leading edge deice boots of all EMB-120s are installed properly.

The Safety Board appreciates the opportunity to comment on this proposed rule.

Sincerely,

Jim Hall
Chairman

Routing	AS-40	Editor	AS-2	MD			
Initials							
Date							

EXAMPLE OF RESPONSE TO NOTICE OF PROPOSED RULEMAKING

(not actual size)

Docket Clerk, Office of the Chief Counsel
RCC-10
Federal Railroad Administration
400 Seventh Street, S.W., Stop 10
Washington, D.C. 20590

FRA Docket No. PB-9; Notice No. 13
Written comments about notice of proposed rulemaking (NPRM) for 49 *Code of Federal Regulations* (CFR) Parts 229, 231, and 232, "Brake System Safety Standards for Freight and Other Non-Passenger Trains and Equipment"

Dear Sir:

The National Transportation Safety Board has reviewed the NPRM "Brake System Safety Standards for Freight and Other Non-Passenger Trains and Equipment." The NPRM was published in the *Federal Register* on September 9, 1998, and represents a positive response from the Federal Railroad Administration (FRA) to a number of Safety Board air brake-related recommendations about cold weather air brake testing, retainer valve training and use, securing standing freight cars, and controlling train speed in mountain-grade territory. The Safety Board offers the following comments.

As a result of the investigation of an accident that occurred at San Bernardino, California, in May 1989,[1] the Safety Board recommended that the FRA:

> Revise regulations to require that if a locomotive unit is equipped with dynamic brakes, the dynamic brakes function. (R-90-24)

On November 30, 1990, the FRA responded that it chose not to make a "definitive response" to the recommendation because the agency was developing the NPRM. On February 21, 1991, the Safety Board classified Safety Recommendation R-90-24 "Open—Awaiting Response."

Seven years later, because the FRA had not made any progress on Safety Recommendation R-90-24, the Safety Board concluded that the FRA should separate the recommendation from the power brake NPRM and act on the recommendation independently. Therefore, the Safety Board classified Safety

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[1] Derailment of Southern Pacific Transportation Company Freight Train on May 12, 1989, and Subsequent Rupture of Calnev Pipeline on May 25, 1989, at San Bernardino, California, Railroad Accident Report NTSB/RAR-90/02 (Washington, DC: 1990).

Recommendation R-90-24 “Closed—Superseded” and replaced it with Safety Recommendation R-98-5, which the Safety Board issued as a result of its investigation of the 1997 derailment of a freight train near Kelso, California.[2] The Safety Board issued the following recommendations in February 1998 to the FRA:

> Separate the dynamic brake requirements from the Power Brake Law rulemaking and immediately conclude rulemaking to require that railroads verify that the dynamic braking systems on all locomotives equipped with dynamic brakes are functioning properly before trains are dispatched. (R-98-5)
>
> Require railroads to ensure that all locomotives with dynamic braking be equipped with a device in the cab of the controlling locomotive unit to indicate to the operating engineer the real-time condition of the dynamic brakes on each trailing unit. (R-98-6)

Now that the power brake NPRM has been issued, however, it appears that any separate action the FRA takes on Safety Recommendation R-98-5 may take longer than the power brake rulemaking itself.

Proposed Section 232.109 of the NPRM is responsive to Safety Recommendation R-98-5. It is the Safety Board’s understanding that the NPRM requires that:

- The engineer be informed in writing of the status of the dynamic brakes on all locomotive units in the consist,
- Inoperative dynamic brakes be conspicuously tagged and repaired within 30 days,
- Railroads operating trains using dynamic brakes have operating rules that ensure trains can be stopped safely should the dynamic brakes fail, and
- Engineers be trained and certified on how to stop a train if or when dynamic brakes fail.

However, the NPRM does not fulfill the intent of Safety Recommendation R-98-6. The railroads assert that no such dynamic brake indicator device exists, although the PULSE company has shown that such a device is feasible and economical and could easily be manufactured by a number of event recorder manufacturers. Therefore, the Safety Board encourages the FRA to amend the NPRM so that it meets Safety Recommendation R-98-6.

[2] *Derailment of Union Pacific Railroad Freight Train 6205 West near Kelso, California, on January 12, 1997,* Railroad Accident Report NTSB/RAR-98/01 (Washington, DC: 1998).

Also as a result of the Kelso accident, the Safety Board issued the following recommendation to the FRA:

> Require railroads to implement formal training on correct retainer setting and using procedures for train crewmembers who may set or use air brake retainer valves. (R-98-7)

The NPRM does not specifically address training in the use of retainers,[3] particularly by operating crewmembers. It does address training in the inspection, testing, and maintenance of all brake equipment, functions traditionally performed by mechanical personnel. The NPRM seems to imply that anyone who is involved with air brake equipment should be trained. The section on "Training Requirements" (49 CFR Part 232.203) proposes a comprehensive training program for each employee or contractor employee who performs brake system inspections, tests, or maintenance. Since traincrews may inspect and test the air brake systems of trains, the NPRM suggests that the FRA interprets the proposed regulation as including those, such as train crewmembers, who may also use air brake equipment "as part of their duties on the equipment to which they are assigned." If the FRA interprets retainer use as included under the proposed required training program, the Safety Board fully supports the regulation. If not, the Safety Board would like to see the regulation expanded to include, under an air brake equipment training program, specific instruction on the use of retainers by train crewmembers who use and operate such equipment.

Again as a result of the Kelso accident, the Safety Board issued the following recommendations to the FRA:

> Require railroads to review steep-grade train handling practices and, if necessary, make changes that will preserve a margin of stopping ability should a dynamic brake system fail. (R-98-3)

> Carry out research, investigation, and analysis to determine maximum authorized train speed for safe operation of trains of all weights, using speed-based margins of safety that can be easily measured by traincrews. (R-98-4)

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[3] The setting of air brake pressure retaining valves determines how much, if any, brake cylinder pressure is retained and, therefore, how much braking force can be created. By setting retainers, traincrews retain air capacity in the air brake system.

The section of the NPRM on "General Requirements for All Train Brake Systems" states:

> A train's primary brake system shall be capable of stopping the train with a service application from its maximum authorized speed within the signal spacing existing on the track over which the train is operating.

Safety Recommendation R-98-3 could be met if the train's air brake system was always capable of stopping the train regardless of the dynamic brake status. However, the proposed regulation is insufficient to fulfill the intent of Safety Recommendation R-98-4.

Theoretically, Safety Recommendation R-98-4 could be met if the maximum authorized train speed could be precisely read from an exact speedometer and if the engineer immediately made a sufficient level of service application at the right moment to stop the train at exactly the maximum authorized speed. By the FRA's own regulations, at 49 CFR Part 229.117, however, speedometers only have to be accurate within 3 mph of the train's speed if the speed is between 10 and 30 mph and within 5 mph of the train's speed if the speed is more than 30 mph. Railroad management recognizes that controlling the speed of a freight train is not an exact science, so engineers are generally allowed to vary speed between 3 and 5 mph over the maximum authorized speed. Also, because of the large number of variables that go into determining a safe maximum authorized speed with an inherent safety margin, railroads are reluctant to establish a guideline that may sacrifice efficiency.

Several railroads, however, have already adopted a "5-mph rule" in mountain-grade territory, which seems to have been effective in reducing the number of runaway trains. Under the rule, when a train's speed exceeds the maximum authorized speed by more than 5 mph, the train must immediately be stopped with a full service air brake application or, if necessary, an emergency application. The rule provides an easily recognizable and measurable speed-based safety margin that can be quickly employed should the train speed become excessive. Therefore, the Safety Board urges the FRA to support Safety Recommendation R-98-4 by requiring railroads to determine maximum safe train speeds for trains of all weights and to set authorized speeds that incorporate speed-based margins of safety that are clear and easily understood and that can be quickly employed by traincrews.

Air brake testing is one of the most important ways of ensuring the safe operation of trains, particularly in cold weather and in mountain-grade territory. The Safety Board believes that a system should be tested under the conditions under which it will be operated. Otherwise, the test will not reveal the current status and future reliability of the system as accurately as possible.

The setting of the regulating valve (feed valve) dictates the brake pipe, or trainline, pressure at which a train will be operated. Neither current regulations nor the NPRM requires that air brakes be tested at the regulating valve setting at which the train will be operated. The Safety Board believes trains should be tested at the pressure at which they are operated. Such testing precludes crewmembers and supervisors from attempting (particularly in cold weather) to conduct brake tests and qualify trains with excessive leakage. In such an attempt, a crewmember or supervisor minimizes the leakage by testing the air brakes while the trainline pressure is lower than it will be when the train is being operated. The FRA should take advantage of the opportunity that the NPRM provides to close the loophole in the regulations and require railroads to test air brakes under the conditions under which they will be operated.

The Safety Board is also concerned that the NPRM does not adequately address the issues involved in determining the capability of the brake system. The NPRM section on "Computation of Percent Operative Power Brakes" states:

> The percentage of operative power brakes in a train shall be based on the number of control valves in the train. The percentage shall be determined by dividing the number of control valves that are cut in by the total number of control valves.

In the NPRM discussion of this section, the FRA says:

> Today, many types of freight equipment can have the brakes cut out on a per truck basis and the FRA expects this tend [*sic*] to increase as the technology is applied to new equipment. Consequently, the FRA merely proposes a method of calculating the percentage of operative brakes based on the design of equipment used today, and thus, a means to more accurately reflect the true braking ability of the train as a whole.

With modern freight equipment, a control valve can be cut in and operating while the brakes of one of the two trucks controlled by that valve are cut out and not operating. Thus, under the worst case conditions, half the brakes in the train could be nonfunctioning and yet the brakes would be considered 100-percent operational since all of the control valves would still be cut in and operational. Therefore, the Safety Board does not think that the regulation as written is adequate. Requirements should be added that preclude the railroads cutting out the brakes on one truck of a car and still considering the brakes to be 100-percent effective.

The Safety Board appreciates the opportunity to comment on this proposed rule.

Sincerely,

Jim Hall
Chairman

cc: C(2), GAPA, SR

EXAMPLE OF NOTATION PACKAGE FOR RESPONSE TO NOTICE OF PROPOSED RULEMAKING

(not actual size)

FOR OFFICIAL USE ONLY

NATIONAL TRANSPORTATION SAFETY BOARD

NOTATION

NOTATION MEMORANDUM

Date:

To: The Board

Through: Managing Director

From: Director, Office of Aviation Safety

Subject: Federal Aviation Administration (FAA) Final Rule, "Airworthiness Directives; Aerospatiale Model ATR-42 and ATR-72 Series Airplanes"

The final rule adopts a new airworthiness directive (AD) that revises the airplane flight manual (AFM) to add specific flightcrew instructions to be followed if an electrical generator fails. The AD was prompted by the Safety Board's investigation of a March 10, 1998, Flagship Airlines ATR-42 dual generator failure in Fort Myers, Florida. The investigation revealed that resetting a failed generator caused the second generator to fail. The AFM revisions will restrict flightcrews from attempting to reset a failed generator in flight.

Staff fully supports the final rule as an interim measure while the Safety Board's investigation into the incident continues.

Comments regarding this final rule are due to the FAA by May 26, 1998.

Bernard S. Loeb

Staff

Jeff Kennedy (SERA, 305-597-4610) - IIC
Kevin Pudwill (AS-40, 314-6395) - Electrical Systems Investigator
John DeLisi (AS-40, 314-6344) - Writer
Lisa Royden (AS-1, 314-6306) - Editor

Attachments

Letter to FAA
Final Rule

Federal Aviation Administration

Transport Airplane Directorate, ANM-114

1601 Lind Avenue, S.W.

Renton, Washington 98055-4056

Attention: Rules Docket No. 98-NM-124-AD

Dear Sir:

The National Transportation Safety Board has reviewed your final rule "Airworthiness Directives; Aerospatiale Model ATR-42 and ATR-72 Series Airplanes," which was published in 63 *Federal Register* 20064 on April 23, 1998. The final rule adopts a new airworthiness directive (AD) that requires revising the airplane flight manual (AFM) to add specific flightcrew instructions to be followed if one or both of the direct current generators fail.

The AD was prompted by an incident involving a Flagship Airlines ATR-42 in Fort Myers, Florida, on March 10, 1998. The Safety Board's investigation of this incident revealed that the left generator failed while the airplane was in cruise flight. The flightcrew followed the emergency procedures section of the AFM and attempted to reset the left generator; however, the right generator failed and the left generator did not reset. After declaring an emergency, the flight crew was able to land safely under dual generator failure conditions.

The action specified in this final rule will require modification of the procedures in the AFM that specify that flightcrews should not attempt to reset a failed generator in flight. The Safety Board fully supports the final rule and believes that it is an appropriate interim measure to help ensure that one generator continues to operate after the in-flight failure of the other generator. The Safety Board will continue to investigate the cause of the dual generator failure and will seek to identify appropriate permanent corrective actions.

The Safety Board appreciates the opportunity to comment on this final rule.

Sincerely,

Jim Hall
Chairman

Routing	AS-40	Editor	AS-2	MD			
Initials							
Date							

[4910-13-U]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39 [63 FR 20064 NO. 78 04/23/98]

[Docket No. 98-NM-124-AD; Amendment 39-10497; AD 98-09-16]

RIN 2120-AA64

Airworthiness Directives; Aerospatiale Model ATR-42 and ATR-72 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule; request for comments.

SUMMARY: This amendment adopts a new airworthiness directive (AD) that is applicable to all Aerospatiale Model ATR-42 and ATR-72 series airplanes. This action requires revising the Airplane Flight Manual (AFM) to add specific flightcrew instructions to be followed in the event of failure of one or both of the direct current (DC) generators. This amendment is prompted by issuance of mandatory continuing airworthiness information by a foreign civil airworthiness authority. The actions specified in this AD are intended to prevent failure of the second of two DC generators after the failure of the first generator, which could lead to the loss of main battery power and result in the loss of all electrical power, except the emergency battery supply, during flight.

DATES: Effective May 8, 1998.

Comments for inclusion in the Rules Docket must be received on or before May 26, 1998.

ADDRESSES: Submit comments in triplicate to the Federal

Aviation Administration (FAA), Transport Airplane Directorate, ANM-114, Attention: Rules Docket No. 98-NM-124-AD, 1601 Lind Avenue, SW., Renton, Washington 98055-4056.

Information pertaining to this amendment may be obtained from or examined at the FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington.

FOR FURTHER INFORMATION CONTACT: Norman B. Martenson, Manager, International Branch, ANM-116, FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (425) 227-2110; fax (425) 227-1149.

SUPPLEMENTARY INFORMATION: The Direction Générale de l'Aviation Civile (DGAC), which is the airworthiness authority for France, recently notified the FAA that an unsafe condition may exist on all Aerospatiale Model ATR-42 and ATR-72 series airplanes. The DGAC advises that an ATR airplane experienced the loss of the number one direct current (DC) generator, followed by the loss of the number two DC generator, during flight. The loss of the second generator occurred following an attempt by the flightcrew to reset the number one generator, in accordance with approved procedures. After a few minutes, the airplane experienced the loss of main battery power. The cause of the failure of the second generator is currently under investigation. Such failures, if not corrected, could result in the loss of all electrical power, except the emergency battery supply, during flight.

French Airworthiness Directives

The DGAC issued French telegraphic airworthiness directives T98-148-076(B) and T98-149-038(B), both dated March 20, 1998, in order to assure the continued airworthiness of these airplanes in France. These French airworthiness directives require adherence to instructions specified in ATR AFM Chapter 5_04 in the event of one DC generator failure, and specify that no attempt should be made to reset the affected DC generator. Additionally, the French airworthiness directives note that, in the event of failure of both DC generators, resetting the generators should be attempted.

Explanation of FAA’s Findings

The current version of the FAA-approved ATR Airplane Flight Manual (AFM) specifies that a single failed generator is to be left in the “OFF” position; however, the AFM does not explicitly prohibit an attempted reset of a failed generator. Moreover, for some operators, Flight Crew Operating Manuals may contain instructions for one attempt to reset a failed generator. Therefore, the FAA has determined that explicit instructions must be provided in the Limitations section of the AFM to specify that flight crews should not attempt to reset a single failed generator. However, in the event of dual DC generator failure, reset of the generators should be attempted.

FAA's Conclusions

These airplane models are manufactured in France and are type certificated for operation in the United States under the provisions of section 21.29 of the Federal Aviation Regulations (14 CFR 21.29) and the applicable bilateral airworthiness agreement. Pursuant to this bilateral airworthiness agreement, the DGAC has kept the FAA informed of the situation described above. The FAA has examined the findings of the DGAC, reviewed all available information, and determined that AD action is necessary for products of this type design that are certificated for operation in the United States.

Explanation of Requirements of Rule

Since an unsafe condition has been identified that is likely to exist or develop on other airplanes of the same type design registered in the United States, this AD is being issued to prevent failure of the second of two DC generators after the failure of the first generator, which could lead to the loss of main battery power and result in the loss of all electrical power, except the emergency battery supply, during flight. This AD requires revising the Limitations Section of the AFM to add specific flightcrew instructions to be followed in the event of failure of one or both of DC generators.

Interim Action

This is considered to be interim action. The manufacturer has advised the FAA that it is currently investigating the cause of the dual generator failure and may develop a modification that will positively address the unsafe condition in this AD. Once the investigation is concluded, the FAA may consider further rulemaking.

Determination of Rule's Effective Date

Since a situation exists that requires the immediate adoption of this regulation, it is found that notice and opportunity for prior public comment hereon are impracticable, and that good cause exists for making this amendment effective in less than 30 days.

Comments Invited

Although this action is in the form of a final rule that involves requirements affecting flight safety and, thus, was not preceded by notice and an opportunity for public comment, comments are invited on this rule. Interested persons are invited to comment on this rule by submitting such written data, views, or arguments as they may desire. Communications shall identify the Rules Docket number and be submitted in triplicate to the address specified under the caption “ADDRESSES.” All communications received on or before the closing date for comments will be considered, and this rule may be amended in light of the comments received.

Factual information that supports the commenter's ideas and suggestions is extremely helpful in evaluating the effectiveness of the AD action and determining whether additional rulemaking action would be needed.

Comments are specifically invited on the overall regulatory, economic, environmental, and energy aspects of the rule that might suggest a need to modify the rule. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report that summarizes each FAA-public contact concerned with the substance of this AD will be filed in the Rules Docket.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this rule must submit a self-addressed, stamped postcard on which the following statement is made: “Comments to Docket Number 98-NM-124-AD.” The postcard will be date stamped and returned to the commenter.

Regulatory Impact

The regulations adopted herein will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

The FAA has determined that this regulation is an emergency regulation that must be issued immediately to correct an unsafe condition in aircraft, and that it is not a “significant regulatory action” under Executive Order 12866. It has been determined further that this action involves an emergency regulation under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979).

If it is determined that this emergency regulation otherwise would be significant under DOT Regulatory Policies and Procedures, a final regulatory evaluation will be prepared and placed in the Rules Docket. A copy of it, if filed, may be obtained from the Rules Docket at the location provided under the caption “ADDRESSES.”

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

Adoption of the Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration amends part 39 of the Federal Aviation Regulations (14 CFR part 39) as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701. § 39.13 [Amended]

2. Section 39.13 is amended by adding the following new airworthiness directive:

98-09-16 AEROSPATIALE: Amendment 39-10497. Docket 98-NM-124-AD.

Applicability: All Model ATR-42 and ATR-72 series airplanes, certificated in any category.

NOTE 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For airplanes that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (b) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated, unless accomplished previously.

To prevent failure of the second of two direct current (DC) generators after the failure of the first generator, which could lead to the loss of main battery power and result in the loss of all electrical power, except the emergency battery supply, during flight, accomplish the following:

(a) Within 10 flight hours after the effective date of this AD, revise the Limitations Section of the FAA-approved Airplane Flight Manual (AFM) to include the following statements. This action may be accomplished by inserting a copy of this AD into the AFM.

- In the event of failure of either DC generator during flight, do not attempt to reset the affected DC generator.
- In the event of failure of both DC generators during flight, one attempt to reset each of the generators may be made, as follows:
- If the first attempt to reset a generator is successful, do not attempt to reset the other generator.
- If the first attempt to reset a generator is not successful, one attempt to reset the other generator may be made.
- If neither attempt to reset the generators is successful, land at the nearest suitable airport."

(b) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, International Branch, ANM-116, FAA, Transport Airplane Directorate. Operators shall submit their requests through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, International Branch, ANM-116.

NOTE 2: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the International Branch, ANM-116.

(c) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

NOTE 3: The subject of this AD is addressed in French telegraphic airworthiness directives T98-148-076(B) and T98-149-038(B), both dated March 20, 1998.

(d) This amendment becomes effective on May 8, 1998.

FOR FURTHER INFORMATION CONTACT:

Norman B. Martenson, Manager, International Branch, ANM-116, FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (425) 227-2110; fax (425) 227-1149.

EXAMPLE OF NOTATION PACKAGE
FOR RESPONSE TO NOTICE OF PROPOSED RULEMAKING
(not actual size)

FOR OFFICIAL USE ONLY

NATIONAL TRANSPORTATION SAFETY BOARD

NOTATION

NOTATION MEMORANDUM

Date:

To: The Board

Through: Managing Director

From: Director, Office of Aviation Safety

Subject: Federal Aviation Administration (FAA) Notice of Proposed Rulemaking (NPRM), "Airworthiness Directives; de Havilland Model DHC-8-100, -200, and –300 Series Airplanes"

The proposed rule would require the modifications described in Bombardier Service Bulletin (SB) 8-27-79, Revision 'A,' which were intended to prevent uncommanded roll system disconnects. The NPRM is responsive to Safety Recommendation A-97-28, which was issued following the Safety Board's investigation of a February 21, 1997, incident in which a de Havilland DHC-8, operated by Piedmont Airlines, experienced an uncommanded roll system disconnect. The captain reported that the disconnect resulted in a "firm" landing and that he was not able to maintain runway centerline during rollout without the assistance of the first officer.

Staff fully supports the proposed rule and believes the action is necessary to prevent uncommanded roll system disconnects.

Comments regarding this proposed rule are due to the FAA by May 27, 1998.

Bernard S. Loeb

Staff

John DeLisi (AS-40, 314-6344) - Writer
Lisa Royden (AS-1, 314-6306) - Editor

Attachments

Letter to FAA
Proposed Rule

Federal Aviation Administration
Transport Airplane Directorate, ANM-114
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Attention: Rules Docket No. 97-NM-336-AD

Dear Sir:

The National Transportation Safety Board has reviewed your notice of proposed rulemaking, "Airworthiness Directives; de Havilland Model DHC-8-100, -200, and -300 Series Airplanes," which was published in 63 *Federal Register* 20552 on April 27, 1998. The notice proposes an airworthiness directive to require the modifications described in Bombardier Service Bulletin (SB) 8-27-79, Revision 'A,' which are intended to prevent uncommanded roll system disconnects.

The Safety Board investigated a February 21, 1997, incident in which a de Havilland DHC-8 (Dash 8), operated by Piedmont Airlines, experienced an uncommanded roll system disconnect just before touchdown at Pittsburgh International Airport, Pittsburgh, Pennsylvania. The captain reported that the disconnect resulted in a "firm" landing and that he was unable to maintain runway centerline during rollout without assistance from the first officer.

During the investigation, the Safety Board learned that there had been three previous roll system disconnect incidents on these airplanes. These disconnects occurred when turbulence caused the spring-loaded disconnect handle cable to disconnect the clutch mechanism without the roll disconnect handle moving. To reduce the possibility of additional occurrences, the manufacturer issued SB 8-27-79, “Subject: Flight Controls - Roll Disconnect System - Relocation of Lever Return Spring - Modification 8/2376,” on August 9, 1996. Although de Havilland strongly recommended that operators perform this modification at their earliest convenience, the investigation revealed that the modification had not been performed on the incident airplane.

As a result of its investigation, on April 23, 1997, the Safety Board issued the following recommendation to the FAA:

> Issue an airworthiness directive to make compliance with de Havilland Dash 8 Service Bulletin 8-27-79 mandatory to reduce the possibility of uncommanded roll system disconnects. (A-97-28)

Because it is responsive to this recommendation, the Safety Board fully supports the proposed rule. The Safety Board appreciates the opportunity to comment on this proposed rule.

Sincerely,

Jim Hall

Chairman

Routing	AS-40	Editor	AS-1	MD			
Initials							
Date							

[4910-13-U]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 97-NM-336-AD]

RIN 2120-AA64

Airworthiness Directives; de Havilland Model DHC-8-100, -200, and -300 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This document proposes the adoption of a new airworthiness directive (AD) that is applicable to certain de Havilland Model DHC-8-100, -200, and -300 series airplanes. This proposal would require modification of the lever assembly of the roll disconnect system. This proposal is prompted by issuance of mandatory continuing airworthiness information by a foreign civil airworthiness authority. The actions specified by the proposed AD are intended to prevent uncommanded disconnects of the roll control system, which could result in a limited degree of roll control and consequent reduced controllability of the airplane.

DATES: Comments must be received by [insert date 30 days after date of publication in the Federal Register].

ADDRESSES: Submit comments in triplicate to the Federal Aviation Administration (FAA), Transport Airplane Directorate, ANM-114, Attention: Rules Docket No. 97-NM-336-AD, 1601 Lind Avenue, SW., Renton, Washington 98055-4056. Comments may be inspected at this location between 9:00 a.m. and 3:00 p.m., Monday through Friday, except Federal holidays.

The service information referenced in the proposed rule may be obtained from Bombardier, Inc., Bombardier Regional Aircraft Division, Garratt Boulevard, Downsview, Ontario M3K 1Y5, Canada. This information may be examined at the FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington; or at the FAA, Engine and Propeller

Directorate, New York Aircraft Certification Office, 10 Fifth Street, Third Floor, Valley Stream, New York.

FOR FURTHER INFORMATION CONTACT: Anthony E. Gallo, Aerospace Engineer, Systems and Flight Test Branch, ANE-172, FAA, Engine and Propeller Directorate, New York Aircraft Certification Office, 10 Fifth Street, Third Floor, Valley Stream, New York 11581; telephone (516) 256-7510; fax (516) 568-2716.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments, as they may desire. Communications shall identify the Rules Docket number and be submitted in triplicate to the address specified above. All communications received on or before the closing date for comments, specified above, will be considered before taking action on the proposed rule. The proposals contained in this notice may be changed in light of the comments received.

Comments are specifically invited on the overall regulatory, economic, environmental, and energy aspects of the proposed rule. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report summarizing each FAA-public contact concerned with the substance of this proposal will be filed in the Rules Docket.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must submit a self-addressed, stamped postcard on which the following statement is made: “Comments to Docket Number 97-NM-336-AD.” The postcard will be date stamped and returned to the commenter.

Availability of NPRMs

Any person may obtain a copy of this NPRM by submitting a request to the FAA, Transport Airplane Directorate, ANM-114, Attention: Rules Docket No. 97-NM-336-AD, 1601 Lind Avenue, SW., Renton, Washington 98055-4056.

Discussion

Transport Canada Aviation (TCA), which is the airworthiness authority for Canada, notified the FAA that an unsafe condition may exist on certain de Havilland Model DHC-8-100, -200, and -300 series airplanes. TCA advises that it has received several reports of uncommanded disconnects of the roll control system during landing, while the airplane was flying in turbulent conditions. Such uncommanded disconnects have been attributed to a problem with the design of the lever assembly of the roll disconnect system, in which turbulence may cause the roll control system to disconnect without a member of the flightcrew moving the cockpit disconnect handle. Uncommanded disconnects of the roll control system may be especially hazardous if the flightcrew is unaware that a disconnect has occurred. Such uncommanded disconnects of the roll control system, if not corrected, could result in a limited degree of roll control and consequent reduced controllability of the airplane.

This airplane model is equipped with a roll control system, which provides roll control by interconnecting the ailerons (which are controlled by inputs from the copilot's control wheel) and the roll spoilers (which are controlled by inputs from the pilot's control wheel), thus moving the pilot's and copilot's control wheels in tandem. If the roll control system jams, pulling the disconnect handle of the roll disconnect system (which is located in the cockpit) disengages the roll control system. Disengaging the roll control system causes the pilot's and copilot's control wheels to stop moving in tandem, and allows the ailerons and roll spoilers to be operated separately. Such separate operation limits the degree of roll control available through any one of the control wheels and results in reduced controllability of the airplane.

Explanation of Relevant Service Information

The manufacturer has issued Bombardier Service Bulletin 8-27-79, Revision 'A', dated March 20, 1998, which describes procedures for modifying the lever assembly of the roll disconnect system. The modification involves inspecting the existing lever return spring and replacing it with a new spring, if necessary; drilling a new hole in the lever assembly; filling the original hole with sealant; and installing the new spring with the lever end of the spring connected to a new attachment point for the lever return spring. Accomplishment of the actions specified in the service bulletin is intended to adequately address the identified unsafe condition. TCA classified this service bulletin as mandatory and issued Canadian airworthiness directive CF-98-04, dated February 27, 1998, in order to assure the continued airworthiness of these airplanes in Canada.

FAA's Conclusions

This airplane model is manufactured in Canada and is type certificated for operation in the United States under the provisions of section 21.29 of the Federal Aviation Regulations (14 CFR 21.29) and the applicable bilateral airworthiness agreement. Pursuant to this bilateral airworthiness agreement, TCA has kept the FAA informed of the situation described above. The FAA has examined the findings of the TCA, reviewed all available information, and determined that AD action is necessary for products of this type design that are certificated for operation in the United States.

Explanation of Requirements of Proposed Rule

Since an unsafe condition has been identified that is likely to exist or develop on other airplanes of the same type design registered in the United States, the proposed AD would require accomplishment of the actions specified in the service bulletin described previously, except as discussed below.

Difference Between This Proposed AD and the Parallel Canadian AD and the Service Bulletin

Operators should note that the service bulletin recommends accomplishing the action at “operators’ earliest convenience,” and the parallel Canadian airworthiness directive requires compliance within 6 months. In light of the criticality of the unsafe condition (uncommanded disconnects of the roll control system, which could result in a limited degree of roll control and consequent reduced controllability of the airplane), the FAA finds a 3-month compliance time for accomplishing the proposed actions to be warranted, in that it represents an appropriate interval of time allowable for affected airplanes to continue to operate without compromising safety.

Cost Impact

The FAA estimates that 180 airplanes of U.S. registry would be affected by this proposed AD, that it would take approximately 2 work hours per airplane to accomplish the proposed modification, and that the average labor rate is $60 per work hour. Based on these figures, the cost impact of the proposed AD on U.S. operators is estimated to be $21,600, or $120 per airplane.

The cost impact figure discussed above is based on assumptions that no operator has yet accomplished any of the proposed requirements of this AD action, and that no operator would accomplish those actions in the future if this AD were not adopted.

Regulatory Impact

The regulations proposed herein would not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

For the reasons discussed above, I certify that this proposed regulation (1) is not a "significant regulatory action" under Executive Order 12866; (2) is not a "significant rule" under the DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979); and (3) if promulgated, will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. A copy of the draft regulatory evaluation prepared for this action is contained in the Rules Docket. A copy of it may be obtained by contacting the Rules Docket at the location provided under the caption "ADDRESSES."

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

The Proposed Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration proposes to amend part 39 of the Federal Aviation

Regulations (14 CFR part 39) as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701. § 39.13 [Amended]

2. Section 39.13 is amended by adding the following new airworthiness directive:

DE HAVILLAND, INC.: Docket 97-NM-336-AD.

Applicability: Model DHC-8-100, -200, and -300 series airplanes on which Bombardier Modification 8/2376 was not accomplished during production; serial numbers 003 through 294 inclusive, and 296 through 433 inclusive; certificated in any category.

NOTE 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been otherwise modified, altered, or repaired in the area subject to the requirements of this AD. For airplanes that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (c) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated, unless accomplished previously.

To prevent uncommanded disconnects of the roll control system, which could result in a limited degree of roll control and consequent reduced controllability of the airplane; accomplish the following:

(a) Within 3 months after the effective date of this AD, modify the lever assembly of the roll disconnect system, in accordance with Bombardier Service Bulletin 8-27-79, Revision ‘A’, dated March 20, 1998.

(b) As of the effective date of this AD, no person shall install on the roll disconnect system of any airplane a lever assembly having part number 82710200-001.

(c) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, New York Aircraft Certification Office (ACO), FAA, Engine and Propeller Directorate. Operators shall submit their requests through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, New York ACO.

NOTE 2: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the New York ACO.

(d) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

NOTE 3: The subject of this AD is addressed in Canadian airworthiness directive CF-98-04, dated February 27, 1998.

Issued in Renton, Washington, on April 21, 1998.

Original Signed By:
Darrell M. Pederson, Acting Manager,
Transport Airplane Directorate,
Aircraft Certification Service.

CHAPTER 21

MEMORANDUM ON DECISION REGARDING PUBLIC HEARING

MEMORANDUM ON DECISION REGARDING PUBLIC HEARING

Background

As soon as possible after a major accident (normally within 20 working days), modal directors should forward a memorandum through the Managing Director to the Board Members indicating whether the office recommends holding a public hearing. In addition, the Director, Office of Research and Engineering, may recommend conducting a public hearing in connection with a safety study. (For further information, see Board Order 400, *Public Hearings and Depositions*.)

Format

Examples of memorandums for and memorandums against holding a public hearing follow this section. Include the following information in the memorandum:

- Reasons for the office's position.
- Differing views, if substantial disagreement exists within the office.
- Opinion of the Board Member who accompanied the go-team to the accident site.
- Views of the parties or other interested groups regarding the need for a public hearing in response to the office's written request that parties submit this information. Specify the medium (e-mail, telephone call, or letter) by which the parties expressed their positions.
- If a hearing is recommended, include:
    - Proposed location.
    - Earliest date staff could conduct a hearing.
    - Significant safety issues or investigative aspects of the accident or incident that would be emphasized.
    - Anticipated media and public interest, based upon information provided by the Office of Public Affairs.

The views of the Director, Office of Research and Engineering; the Director, Office of Safety Recommendations; the Director, Office of Government, Public, and Family Affairs; and the General Counsel will be attached to the memorandum before it is forwarded to the Executive Secretariat for circulation as a notation item. Each person should include a recommendation for or against a public hearing with supporting rationale.

EXAMPLE OF RECOMMENDATION FOR PUBLIC HEARING

(not actual size)

National Transportation Safety Board

Memorandum

Date:

To: The Board

Thru: The Managing Director

From: Director, Office of Highway Safety

Subject: **ACTION MEMORANDUM** - Recommendation to hold a public hearing in connection with the special investigation of bus crashworthiness and survivability.

The Office of Highway Safety is investigating the following bus accidents that have a combined total of 9 fatalities and 121 injuries:

1996	Flagstaff, AZ	School Bus High-Speed Rollover	32 injured
1997	Monticello, MN	Tractor-Semitrailer/School Bus Collision	4 dead, 11 injured
1997	Easton, MD	Tractor-Semitrailer/School Bus Collision	1 dead, 36 injured
1997	Lancaster, OH	School Bus/Truck Collision	11 injured
1998	Sinton, TX	School Bus/Train Collision	13 injured
1998	Buffalo, MT	School Bus/Train Collision	2 dead, 4 injured
1998	Lenoir City, TN	Truck/Bus Collision	2 dead, 4 injured

All of these accidents involved the transportation of school children to or from a school or a field trip. Because bus crashworthiness and occupant survivability are central issues in all seven accidents, the Office of Highway Safety plans to write a special investigation report.

Additionally, staff proposes that the report addressing motor coach crashworthiness be incorporated in this special investigation because of the overlapping areas of concern, including occupant fatalities, injuries, and ejections; bus standards and definitions; accident data and statistics; and comparisons of standards and restraints in the

United States with other countries. Between 1969 and 1997, the Safety Board investigated 44 motorcoach accidents involving 181 fatalities and several hundred injuries. The Office of Highway Safety and the Office of Research and Engineering have discussed this project and agree that a public hearing would offer a timely and appropriate forum for further exploration of those issues.

In recent months, both CNN and Dateline NBC have aired shows addressing school bus safety. These shows implied that school buses, vans, and other types of buses are not safe. The CNN show reported a 94-percent increase in injuries to students riding school buses over a 12-year period. Because different entities have different definitions for school buses, injuries, and accidents and because CNN obtained its data from the National Safety Council, not the States or National Highway Traffic Safety Administration (NHTSA), the industry is claiming that the data used were invalid. CNN's message to the public was that school buses and other buses are not equipped with seatbelts; therefore, they are not safe.

Small school buses are equipped with lapbelts; larger school buses (10,000 pounds or more) are not. School buses are specially constructed and stronger than other types of vehicles and are built to "compartmentalize" the children. However, recent investigations of accidents involving bus collisions with large trucks and trains have revealed that some of the children killed and injured were not in the impact zone. Additionally, compartmentalization does not protect passengers during rollovers or ejection from the bus.

The Snyder, Oklahoma, school bus crash prompted the Safety Board to propose a study to evaluate the effectiveness of seatbelts on large school buses in New York and New Jersey. Because of the lack of accidents involving seatbelted occupants, the study did not get underway. Due to several recent accidents in which buses were carrying school children and due to the public and media interest in the school bus safety and the seatbelt issues, staff proposes a public hearing to discuss these issues.

Potential topics to be addressed at the proposed public hearing are 1) types of possible restraints, 2) other types of injury-reducing mechanisms, 3) sources of accident data, and 4) bus standards and restraints used in other countries. The information and different perspectives gained from a public hearing would assist staff in writing the special investigation report.

A public hearing would be timely because of several factors:

1) NHTSA is in the process of issuing its final rule for universal child restraint devices and issuing guidelines for restraining preschool children in child safety seats on school buses.
2) The U.S. Congress and several State legislatures are considering school bus seatbelt legislation. Florida and California have called the Safety Board for assistance with testimony.

3) A public hearing would generate media attention and would result in dissemination of more accurate and responsive information to the public by the Federal and State agencies and industry associations responsible for school bus transportation safety.
4) CNN will air another school bus show at the end of June focusing on the Flagstaff school bus rollover which involved serious injuries.
5) The STN (*School Transportation News* is a major industry magazine) Western Regional Conference is being held August 9-12, 1998, at the Riviera Resort and Casino Hotel in Las Vegas, Nevada. It will provide a ready-made audience of 500 to 700 people who would be very interested in attending this public hearing. Additionally, the air fare is inexpensive for others who are interested in attending a Safety Board public hearing on this matter.

In accordance with Board Order No. 400, the undersigned heads of offices are requested to append comments to aid the Board in this matter.

Joseph Osterman, Director
Office of Highway Safety

cc: Managing Director
Deputy Managing Director
Director, Office of Safety Recommendations & Accomplishments
Director, Office of Research and Engineering
Director, Office of Government, Public, and Family Affairs
General Counsel
Notations

Comments:

Director, Office of Safety Recommendations
& Accomplishments (SR-1) Date

Director, Office of Research and Engineering (RE-1) Date

Director, Office of Government, Public,
and Family Affairs (GAPAFA-1) Date

General Counsel (GC-1) Date

EXAMPLE OF RECOMMENDATION AGAINST PUBLIC HEARING

(not actual size)

National Transportation Safety Board

Memorandum

DATE:

TO: The Board

THRU: Managing Director

FROM: Director, Office of Railroad, Pipeline, and Hazardous Materials Investigations

SUBJECT: Action Memorandum - Recommendation that a public hearing not be convened in connection with the failure of a Colonial Pipeline Company pipeline and the release of approximately 42,000 gallons of unleaded gasoline in the vicinity of Atlanta, Georgia, on March 30, 1998, (DCA98MP002).

At approximately 4:00 p.m. on March 30, 1998, an employee at a recycling operation on the property of the Fulton County, Georgia, landfill arrived on site and detected the odor of gasoline. He then went to investigate and found gasoline coming out of the ground in the area over a 40-inch-diameter Colonial pipeline. The individual called Colonial on their "800" emergency telephone number to report the problem, but the call was mishandled by Colonial and the caller was directed to call to a local field office of Colonial. Upon receipt of the call at the field office, an employee immediately went to the scene to verify the reported leak. He arrived on the scene approximately 20 minutes after receiving the call, verified the leak, and had the pipeline shut down immediately.

The 40-inch-diameter welded steel pipeline was constructed through the landfill in 1978. A recycling operation manufacturing compost and mulch was operating at the landfill, and, although they knew that they were to stay off the pipeline right of way, they had recently been working on the right of way and had placed a pile of mulch approximately 23 feet high on top of the pipeline and its easement in the area of the failure. This amount of material over the pipeline contributed to a delay in uncovering the pipeline and determining the characteristics of the failure.

A postaccident examination of the damaged pipe revealed that the pipeline buckled and cracked resulting in the gasoline spill. As a result of the accident, no fire, explosion, or employee injuries took place. As of April 29, 1998, 23,895 tons of contaminated soil have been removed from the site, and 17,350 gallons of gasoline have been recovered. Colonial has calculated the total amount of gasoline spilled at greater than 42,000 gallons.

The investigation team will focus on the following safety issues: construction of a pipeline through an unstable area without any special engineering design considerations, aerial patrol inspections of the pipeline right of way, and the handling of telephone calls to the emergency telephone number posted on pipeline markers.

This accident received moderate local news attention, which has diminished. The staff believes that the issues can be fully developed without a public hearing. Parties to the investigation agree that a public hearing is not necessary to develop the issues. Therefore, staff's consensus is that a public hearing should not be convened in connection with the subject incident.

In accordance with Board Order No. 400, the undersigned heads of offices are requested to append comments to aid the Board in this matter.

Robert J. Chipkevich

cc: Managing Director
Deputy Managing Director
Director, Office of Safety Recommendations & Accomplishments
Director, Office of Research and Engineering
Director, Office of Government, Public, and Family Affairs
General Counsel
Notations

Comments:

Director, Office of Safety Recommendations
& Accomplishments (SR-1) Date

Director, Office of Research and Engineering (RE-1) Date

Director, Office of Government, Public,
and Family Affairs (GAPAFA-1) Date

General Counsel (GC-1) Date

CHAPTER 22

REPORT OF PROCEEDINGS

REPORT OF PROCEEDINGS

Background

To gather information on accident investigations or safety issues, the National Transportation Safety Board conducts public forums and symposia. Two recent examples are the *Public Forum on Air Bags and Child Passenger Safety* and the *International Symposium on Transportation Recorders.* The Safety Board publishes information generated by forums and symposia (such as papers submitted by participants or transcriptions of the proceedings) in a *Report of Proceedings*, either when the Board adopts the related report on the accident or safety issue or as a separate document.

Because information presented during these forums and symposia are not adopted by the Safety Board and are only published as information, a *Report of Proceedings* receives only minimum copyediting.

Format

The cover, title page, table of contents, and acronyms and abbreviations list, if appropriate, generally follow normal accident report format, as shown in the examples that follow.

A. EXAMPLE OF FRONT COVER

(not actual size)

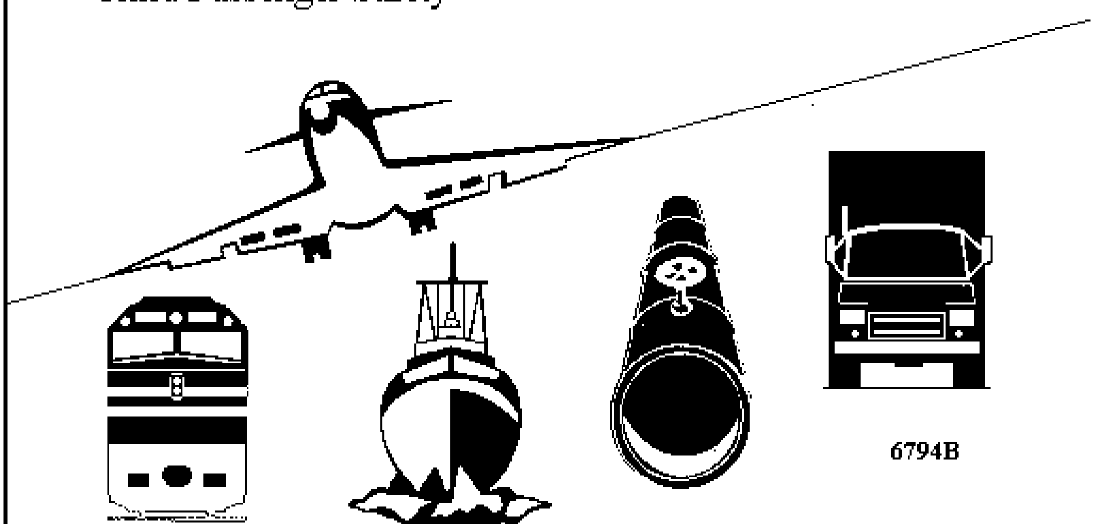
PB97-917001
NTSB/RP-97/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

Report of Proceedings

Proceedings of the
National Transportation Safety Board
Public Forum on Air Bags and
Child Passenger Safety



6794B

B. EXAMPLE OF TITLE PAGE

(not actual size)

Proceedings of the National Transportation Safety Board Public Forum on Air Bags and Child Passenger Safety

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March 17-20, 1997
Washington, D.C.

Report of Proceedings
NTSB/RP-97/01
PB97-917001
Notation 6794B

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594
October 1997

C. EXAMPLE OF ABSTRACT

(not actual size)

National Transportation Safety Board. 1997. *Proceedings of the National Transportation Safety Board Forum on Air Bags and Child Passenger Safety, March 17-20, 1997.* Report of Proceedings NTSB/RP-97/01. Washington, DC. 500 p.

Abstract: The National Transportation Safety Board convened a 4-day public forum from March 17 to March 20, 1997, to discuss concerns related to the effectiveness of air bags, passenger vulnerability to injuries from air bag deployment, other countries' experience with air bags, and ways to increase seatbelt and child restraint use. The forum identified the need for safety improvements in four areas: (a) changing societal attitudes about buckling up, (b) better evaluation of seatbelt use rates, (c) better air bag design, and (d) better evaluation of changes to air bags. Safety recommendations addressing these areas were made to the Governors and legislative leaders of the 50 States and U.S. Territories, the Mayor and Council of the District of Columbia, the U.S. Conference of Mayors, the National League of Cities, the National Association of Counties, the National Association of Towns and Townships, members of the International Association of Chiefs of Police, the State Association of Chiefs of Police, the National Sheriff's Association, the National Highway Traffic Safety Administration, the domestic and international automobile manufacturers, the Centers for Disease Control and Prevention, the Motion Picture Association of America, the Entertainment Industries Council, the Academy of Television Arts and Sciences, the National Cartoonists Society, the Newspaper Association of America, the American Society of Newspaper Editors, and the National Newspaper Association. The proceedings includes the transcript of the public forum and information about related safety issues that the Safety Board addressed in its 1996 study, *The Performance and Use of Child Restraint Systems, Seatbelts, and Air Bags for Children in Passenger Vehicles*, Volume 1 (NTSB/SS-96/01; PB96-917005).

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

Recent publications are available in their entirety on the Web at <http://www.ntsb.gov/>. Other information about available publications also may be obtained from the Web site or by contacting:

National Transportation Safety Board
Public Inquiries Section, RE-51
490 L'Enfant Plaza East, S.W.
Washington, D.C. 20594
(800) 877-6799 or (202) 314-6551

Safety Board publications may be purchased, by individual copy or by subscription, from the National Technical Information Service. To purchase this publication, order report number **PB97-917001** from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(800) 553-6847 or (703) 605-6000

D. EXAMPLE OF CONTENTS

(not actual size)

Contents

E. EXAMPLE OF INTRODUCTION

(not actual size)

Introduction

The National Transportation Safety Board convened a 4-day forum in mid-March 1997 to discuss concerns related to the effectiveness of air bags, passenger vulnerability to injuries from air bag deployment, other countries' experience with air bags, and ways to increase seatbelt and child restraint use. The agenda for the public forum is shown in part 6 of these proceedings. The National Highway Transportation Safety Administration (NHTSA) participated in the forum, along with representatives from Australia, Canada, and Europe; the automobile industry; air bag suppliers; insurance, safety, and consumer groups; and family members involved in crashes in which air bags deployed. The list of organizations that participated as parties to the public forum is also shown in part 6.

Certain points became clear during the forum:

- There is no quick or simple solution to improving air bag performance.
- Air bags need to be designed to protect all people.
- With regard to cars on the road today, children need to be in the back seat, and everyone needs to be buckled up and seated away from the air bag.
- Children should be foremost in the design of automobile safety equipment.
- More reliable data on the consequences of air bag deployment are needed. Better and quicker methods of collecting these vital data are needed.
- Societal attitudes must change with respect to seatbelt use. Elected officials need to take responsibility for tough enforcement programs and to consider financial incentives to increase seatbelt use.

In September 1996, the Safety Board issued its report of a safety study on the performance and use of child restraints, seatbelts, and air bags for children in passenger vehicles.[1] At that time, the Board recommended that various agencies and manufacturers

[1] National Transportation Safety Board, Analysis, Vol. 1 of The Performance and Use of Child Restraint Systems, Seatbelts, and Air Bags for Children in Passenger Vehicles, Safety Study NTSB/SS-96/01 (Washington, DC: NTSB, 1997) 255.

take action to improve the design of air bags, child restraint systems, and vehicle seatbacks for children; the Board also recommended that the States strengthen their child passenger protection laws. The executive summary of the report, conclusions of the study, and the Board's safety recommendations resulting from the study are presented in part 4 of these proceedings. In November 1995, while conducting the study, the Safety Board issued several urgent recommendations related to air bags; those recommendations are presented in part 5. On June 10, 1997, the Safety Board issued additional recommendations based on the outcome of the public forum; these recommendations are presented in part 3.