Writing in the Presence of Disaster
A Case Study of an Aviation Investigation Report

John Thurston

The investigation of fatal aircraft incidents has gained in importance and in the attention of the public. This paper presents the experience of one documentation company in working on a major aircraft accident investigation report. The paper covers the general approach the company took, the challenges it encountered, the standards it applied, the strategies it developed, and the lessons it learned.

BACKGROUND

In the autumn of 1998, Swissair Flight 111 crashed off the east coast of Canada, killing all 214 passengers and 14 crewmembers. As with all aviation incidents in developed countries, an investigation had to be undertaken and a report written. This task fell to the investigators at the Transportation Safety Board of Canada (TSB), an independent agency tasked with investigating transportation accidents and reporting its findings.

The Swissair investigation proved to be the largest and most complex aviation safety investigation ever undertaken by the TSB. In addition to the millions of material artifacts of the crash, tens of thousands of paper documents were generated, as well as over 200,000 photographs.

Two and a half years into their work, TSB investigators had compiled so much information that they were at a loss as to how to present it. They had reached conclusions about the accident and issued numerous safety recommendations, but they could not come up with a way to deliver their report in a manner that would do justice to the massive amount of data they had gathered.

At this point, NIVA Inc. began what would be an 18-month journey, accompanying the TSB through the last laps of its investigative marathon. NIVA came to admire and learn from the competence, compassion, and commitment of the investigators, but more relevant to the current forum, NIVA learned a great deal about how to shape an enormous collection of highly detailed data into something that could explain to experts and laypeople alike the technical contributing factors of a disaster.

APPROACH

NIVA and the TSB investigators had to adjust their approaches to suit the specific requirements for the production of this report.

Organizational Structure

At the beginning of the project, NIVA had to negotiate political and procedural complexities that derived from the organizational structure of the TSB. The investigation team answered to the communications group, and both had to answer to the TSB board of directors. The TSB as a whole had to satisfy external parties, such as the companies implicated in the incident and the families who had lost loved ones.

The report had to go through multiple stages of commentary, review, and revision before it could be released. It seemed at times that the text would never stabilize. That the text also had to be in both English and French only added to NIVA's difficulties in pushing it to its final version.

Writing Process

TSB investigation teams usually produce their reports and then hand them off to the TSB communications group for editing. For the SR 111 report, the TSB could not follow this model, given the size and complexity of the investigation, the limits on resources available for the project, the intention to publish a greater amount of information than ever before, the profound and broad interest in the incident, and the complexity of simultaneous delivery in both hard-copy and online formats.

Approximately 15 TSB investigators wrote various parts of the report. All of these parts were coordinated and compiled by two TSB investigators. They were the primary contacts for the two main NIVA editors. We had to insert ourselves into an established set of expectations, coming between the investigation team and the communications group, and to handle work that had never been done on this scale before.

Project Scheduling

To establish and maintain the confidence of the investigation team, the NIVA editors and project manager joined them at weekly meetings to discuss the schedule. These meetings were aimed at establishing rolling dates for completing the scores of text components that would go into the report.

The investigators were assigned dates for the completion of their text and NIVA staff were assigned dates for turning around edited text. Because so much of the text relied on investigations yet to be finalized and on overworked investigators, these dates seemed to continually roll farther away, while the final delivery of the report, as publicly announced, refused to budge. NIVA's maintenance of a master schedule in project management software became a major task in itself, yet the schedule proved invaluable for tracking all of the parts of the report.

Project Reporting

NIVA produced a bi-weekly project status report for the TSB's Manager of Communications. The project status reports proved particularly useful when it was necessary to justify project delays.

Bi-monthly Coordinating Committee meetings were held to update the TSB Board of Directors. On several occasions, NIVA had to use these meetings to explain that delays with the investigation required a change in the planned release date of the final investigation report. We were not responsible for these delays, but we had to justify them to the Board.

Challenges

Past TSB investigations did not recognize the documentation effort as a separate and significant task. Convincing the investigators of the necessity to organize the documentation and to recognize the volume of work it required was itself a challenge. The sheer volume, technicality, and sensitivity of the information to be delivered in the report also presented challenges.

Other challenges included the use of the TSB LAN as an information repository and communication tool, the decision to publish the report in more than one format, the decentralized nature of the writing and review process, and the absence of TSB standards to accommodate the size and complexity of the report.

STANDARDS

Aviation investigation reports come with their own set of standards. Other standards had to be developed to accommodate the requirements of this particular report.

ICAO Standards

The standard International Civil Aviation Organization (ICAO) structure for investigative reports could not accommodate the mass of SR 111 investigation data. NIVA proposed supplementing the ICAO structure with a category of information called "supporting technical information" (STI). The STI documents provided a layer of information outside of the ICAO structure into which we could pile all the material that the investigators felt was essential, but that did not have a place in the ICAO standards.

The editing and formatting work, which included layering the information, creating new subsections, developing headings, and determining and implementing the best visual presentation, imposed additional work on the investigators that was outside their area of expertise. They were very sophisticated avionics engineers, but not sophisticated desktop publishers.

Editorial Standards

NIVA developed a comprehensive style guide that addressed every aspect of the SR 111 report. We consolidated guidelines from existing documents, as well as input from the editorial and investigation teams. The guide was essential in attempting to impose consistency on over a thousand pages of documentation coming from 15 writers and funneled through two editors.

We could not, however, complete the style guide until midway through the project. Because of the lag, the writers and editors were unable to apply consistent style decisions at the outset and had to continually revisit material produced prior to the introduction of the guide.

Terminology Standards

Terminology decisions were made based on information culled from various sources, including lists on the Internet, and lists in use at the TSB and by the investigation team. In an effort to standardize the terminology and provide a tool for readers, a lengthy glossary was built and revised on an ongoing basis.

The absence of a single, approved glossary at the outset meant that as spelling or capitalization changes were made throughout the editorial process, global changes had to be made to the report and the supporting technical information on an ongoing basis, even up to the last minute, which increased the risk of inconsistency. Editors made extensive use of their word processor's Find and Replace feature in order to search across the entire file set to replace words whose accepted standard spellings had been changed.

Monitoring and Maintaining Quality

Because of the size of the report (330 pages with 32 full-color graphics) and the limitations of the TSB's desktop publishing tool to manage a document of this size, the report had to be broken down into 19 separate files (one for each section of the document). The STI documents added another 48 files that amounted to approximately 800 pages.

Tight time constraints meant that investigators necessarily continued adding new content to, or revising existing content of, older versions while newer working drafts were being edited. New content had to be simultaneously input and edited later by editors once the investigators relinquished control of the older files. As a result, a series of checks had to be implemented at every stage to monitor and maintain quality and consistency.

File Tracking

A strict file naming convention was established to identify the date a file was worked on and by whom to help editors and investigators keep track of which files were working drafts and which were past versions. A file transfer protocol was also developed to track a file's progress between investigators and editors. To keep track of, input, and edit new content, investigators and editors used their word processor's cumbersome tracking and compare features.

Color codes assigned to each person identified who had made each change and, therefore, whom to query in the event that further changes were required. All changes made to a working draft by editors were subsequently verified for accuracy by the investigators and then returned to the editors for editing and consistency verification. This cycle of verification took place for each file throughout the editorial process until no further changes were required. A similar methodical QA process was developed for both print and online versions of the report to ensure that all proposed changes were identified and then verified until no changes remained to be verified.

WEB DEVELOPMENT

The requirement to publish the SR 111 report both in hard-copy and online formats presented another set of challenges.

Government Standards

From the beginning, the TSB intended to present the report on its web site, along with all the investigation reports that the TSB had produced for the past dozen or so years. As the structure of the report evolved, it became clear that the STI documents could only be made available in electronic format, either on the web or on a CD-ROM. The web version would, in fact, be the most complete version of the report.

A central agency of the Canadian federal government has for several years had the mandate to ensure that all government web sites comply with "common look and feel" guidelines. These guidelines create severe limitations in what can be done on Canadian government web sites. Given the amount of work and resources required to comply with the guidelines, many government departments and agencies, including the TSB, had postponed this work for as long as possible. With the SR 111 report, the TSB could delay no longer.

TSB Web Site

The TSB continued to maintain its own evolving standards for the hundreds of reports it had produced in the past decade. Because of the profile that the SR 111 report would have, however, it was decided that it would have to comply with the federal government standards.

Halfway through the project, officials at the TSB realized that the prominence of the SR 111 report and its compliance with government standards would make the rest of the TSB site look odd. NIVA was subsequently given the task of bringing the entire site into compliance with the standards—a major undertaking that required the conversion of approximately 4,000 files to the new standards. This work was done concurrently with the SR 111 report and with the same staff.

Network Context

NIVA also had to work within another challenging organizational structure, that of the information technology division at the TSB. Again, NIVA had to learn protocols and the correct lines of reporting and communicating. These issues were not always clearly articulated because they had always been handled internally by the TSB.

The investigators had developed a collection of multimedia files in a wide range of formats to assist them in their investigation. They felt that these files, since they supported their conclusions, should be supplied with the report. This would have required users to download and install at least three plug-ins beyond the common ones. The network administrators cancelled this idea, largely due to security concerns. This decision actually lightened our burden in preparing the files for the online version.

PROCESS

The development of the SR 111 report had to accommodate a number of other processes that were not always conducive to the orderly editorial process the editors would have liked to follow.

Concurrent Processes

The investigation deadlines required report authoring and editing to take place concurrently throughout the reviews of the Confidential Draft Report (CDR) and the Final Draft Report (FDR). The CDR review was a peer review conducted by manufacturers and companies that had equipment on the SR 111 flight, as well as other industry representatives and regulators. These were organizations that might be exposed to liabilities by the report's findings and that had the right to comment on any aspect of the report, once its conclusions, if not its form, had become final. The TSB Board of Directors reviewed the FDR.

The reviews were performed on versions of the report that had already been edited. The reviewers requested substantial content changes, which resulted in considerable duplication in the editorial effort. NIVA had to edit the report in fragments, by section and STI document, and not necessarily in order, which made identifying duplication and maintaining consistency more difficult.

"Final" Version

Subject-matter experts are often reluctant to finalize the results of their work and to freeze in time what they have become familiar with as an evolving, fluid process of researching, analyzing, writing, revising, and editing. For the SR 111 investigation team, relinquishing control over content that had taken them over three years to develop was especially difficult. The difficulties arose partly because the investigation itself had extended beyond editorial deadlines, and the final results of specific parts of the investigation were expected to affect multiple sections of text.

Beyond the ongoing investigation, however, was the team's personal commitment to accuracy and to developing the best possible report for a number of audiences, including those who had lost family members on board SR 111. In the context of such critical accountability, managing the ripple effect of content changes on editing, translation, and proofreading across multiple document formats was a comparatively insignificant priority for investigators. To ensure an appropriate balance between editorial integrity and client accommodation, NIVA went to great lengths to accept the steady trickle of revisions up to the last possible minute. There was virtually no final version until the report was taken to the printer.

Translation Issues

Because of the volume of information and the fact that the English and French versions of the report had to be released at the same time, translation had to begin as soon as possible. We sent the text for translation at the start of the CDR review process, long before the text was stable. The plan called for the federal government's Translation Bureau to submit the translated report and STI documents in stages (three separate deliveries for both the report and the STI documents). As each stage was completed, the translated text underwent a concordance editing exercise, performed by an independent third party, which was aimed at ensuring that the French and English texts were consistent and complete.

The "concordance edited" text, which at that stage was still a translation of the CDR, was passed back to the Translation Bureau in order to update the French version to reflect changes that had been made to the English text in preparation for the FDR. Once the French text had been updated to reflect FDR changes, the document was ready for proofreading and quality assurance.

Concordance Editing

The concordance editing exercise, while resulting in a better quality of translation, was premature, as it took place long before the content of the text was finalized, at the FDR stage. Because the text, in many cases, underwent considerable revision *after* the concordance editing exercise, the concordance editors could not provide any assurance of the quality of the final product.

Translation and concordance editing had to be added into the logistics of the entire editing process. We were tracking fragments of text and changes in French terminology through a network with four main nodes: the investigation team, the NIVA editors, the Translation Bureau, and the concordance editors. All of this exchange of text had to be done through a secure FTP site and through CD-ROMs physically carried back and forth to the offices of the concordance editors.

PRODUCTION

As with any major publishing project, all of the delays and difficulties experienced by the investigators, writers, editors, reviewers, translators, and so on were passed down to the final link in the chain: the production staff.

Multiple Formats

The project deadlines required that, as with so many other tasks, content development and production efforts had to occur concurrently rather than consecutively. Working drafts were maintained in several formats, which resulted in much duplication of work and the ever-present danger of introducing inconsistencies between the different formats. It was not possible to maintain the documents in true single source fashion because the investigators had to work in the files with the TSB standard word processor and lacked the training to produce the type of markup that would enable single sourcing.

HTML and PDF were the formats for final delivery. We were working in the word-processed files and converting them to the delivery formats. Every wave of review, revision, and editing resulted in the need to produce a completely new single PDF file for the entire report and changes to one or more of the 220 odd HTML files into which the report had been divided. The STI documents were somewhat easier to manage because, after a certain point, they were maintained in HTML format only.

Publication

The last days before we sent the PDF file of the report to the printer and HTML files of the report and STI documents to the TSB web administrator were full of tension, anxiety, and hard work. Everyone knew that we were about to make public an extremely sensitive and significant document. The investigators had been working on it for over four years, and NIVA had been working on it for a year and a half. We were all very conscious of the stakes involved. Many of us had been working weekends and evenings for weeks, some for months.

We had settled all of the issues and had arrived at a version that seemed to satisfy everyone. Any changes at this point in the process risked corrupting the text in unforeseen ways. The investigators had stopped examining the implications of their every word. For the two days before final delivery, the investigators and the editors had the text spread over our boardroom table and collectively went over it with a fine-toothed comb. A few final changes were passed on to production. We sent the report off to the printer. No one breathed a sigh of relief: we were waiting to see the published version.

LESSONS

The report was released to the public at simultaneous press conferences in Halifax and Zurich in March 2003. There was a lot of emotional reaction, particularly from the relatives of casualties. The findings from the report are still being digested. From our perspective, however, comments on the editing and production of the report have been unanimous in their praise.

We learned a great deal, both as a firm and as individuals, from our involvement in the production of the SR 111 report. Not all of what we learned can be codified or generalized to apply to other projects. Some things can, however:

- With a project of this magnitude, there is no such thing as too much planning, even when you know that your plans are likely to be changed every day by circumstances beyond your control.
- Approach a project of this sensitivity with humility, ready to grant that others are closer to the material and may have an emotional, as well as an intellectual connection, with it.
- With a report as significant as this, accept from the outset that other priorities are going to take precedence over your priorities as an editor, and may interfere with all of your plans.

John Thurston, PhD
Director, Online Products
NIVA Inc.
300–30 Murray Street
Ottawa, ON, K1N 5M4
Canada
(613) 737-6000 x 334

John Thurston received his Ph.D. in English Literature from Queen's University in 1989, after which he held a post-doctoral fellowship for two years, and taught at Queen's University and the University of Ottawa. He has published a book on the nineteenth-century Canadian author, Susanna Moodie (McGill-Queen's University Press, 1992), and many articles in scholarly journals and popular periodicals. In 1993, he began writing on contract for several consulting firms, addressing the documentation needs of both government and private industry. He has delivered presentations on a broad range of subjects to a variety of international conferences. In 1997, he joined NIVA and has specialized in large-scale web repositories since 1998. John managed the development of the SR 111 web repository, which can be found at the following URL: http://www.tsb.gc.ca/en/reports/air/1998/a98h0003/a98h0003.asp.