Aviation Safety Incident Reporting
NASA’s Aviation Safety Reporting System

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Safety is a top priority for all participants in aviation operations. Historically, significant safety issues have been identified with a variety of sources, and attempts have been made to actively address problems that occur within the aviation environment. To the credit of all participants, the aviation accident rate in the United States is one of the lowest in the world. But a new era has been initiated in aviation safety through several national safety efforts, notably the White House Commission on Aviation Safety and Security (1997).

Pertinent and timely safety information is necessary to make the constructive changes that are required to reach these safety goals. Some of this safety information is obtained from accident investigations, such as those done by the National Transportation Safety Board (NTSB). However, because of the crew member fatalities that commonly occur in tragic accidents, crucial information that is needed to assist accident prevention efforts may never be known.

Aviation incident reporting can provide this information. The information gap often involved in accident investigation—specifically, the events leading up to the accident, factors that increased risk, how problems were detected, and attempts made to successfully resolve the problems—can be provided by individuals who are involved in incidents that did not end in accidents. Incident reporting is a rich source of safety information as well as descriptions of human factor variables involved in the timeline of the event.

The Aviation Safety Reporting System (ASRS) was created in 1976 by the FAA and the National Aeronautics and Space Administration (NASA) to receive, process, and analyze voluntarily submitted aviation safety reports. The ASRS operates under two mandated purposes:

1. Identify deficiencies and discrepancies in the National Aviation System,
2. Provide data for planning and improvements to the National Aviation System by enhancing the basis for human factors research and making recommendations for future aviation procedures, operations, facilities, and equipment.

The aviation industry has learned valuable lessons from incidents that have occurred in the dynamic environment in which aircraft and their crew members fly. These lessons provide compelling motivation and encouragement for participants in the national aviation system to submit incident reports to the ASRS. Evaluation of specific incident descriptions can be used to more accurately determine major safety issues, identify potential problem areas, and create solutions before accidents occur.

GUIDELINES FOR INCIDENT REPORTING

The ASRS is governed by the Federal Air Regulations (FAR 91.25) and an Advisory Circular (AC No. 00-46D) as well as by an advisory subcommittee composed of representatives from the aviation industry. This government/industry collaboration was created to establish a forum for constructive discussion concerning aviation safety incidents. Although the FAA is the
major benefactor of the ASRS, NASA, a nonregulatory government research organization known for its aviation human factors programs, was chosen as the institution that would protect these often sensitive data. NASA is therefore regarded as the honest broker of ASRS incident data. Throughout the 23 years of ASRS operations and more than 470,000 report submissions, there has never been a breach of any reporter's confidentiality. This is a record of great pride to the ASRS. A significant event may attract the interest of FAA enforcement action, news media, legal interests, and industry operators, but there is no compromise on the confidentiality principles that have been established within ASRS functions.

As with any system that maintains a delicate balance among numerous parties, the ASRS has guidelines under which it performs the mandates of the program. A special form was created to gather consistent information on all incidents reported to the ASRS. The top of the form, called the ID strip, is returned to reporters as proof of receipt after a report is processed. Currently, there are four ASRS reporting forms. The original reporting form (NASA ARC 277B) is generally used by pilots. There are specific reporting forms for air traffic controllers (NASA ARC 277A), cabin crew members (NASA ARC 277C), and maintenance/ground crew personnel (NASA ARC 277D).

In addition to confidentiality, another important aspect of ASRS program provisions is immunity. The FAA has endorsed incident reporting as a valuable accident prevention tool by providing limited immunity from disciplinary action to any reporter who files a NASA/ASRS report in the event of a real or suspected regulatory violation. The main guidelines addressing immunity provisions are explained in detail in the Advisory Circular (AC No. 00-46D). Copies of AC No. 00-46D may be obtained from NASA/ASRS, the FAA, or the ASRS Home Page at http://olas.arc.nasa.gov/ASRS.

Briefly, the requirements for filing are as follows:

- The violation was inadvertent and not deliberate.
- The violation did not involve a criminal offense, accident, or action under 49 U.S.C. Section 44709, which discloses a lack of qualification or competency, wholly excluded from this policy.
- The person has not been found in any prior FAA enforcement action to have committed a violation of the 49 U.S.C. Subtitle VII or any regulation promulgated there for a period of 5 years before the date of the occurrence.
- The person proves that, within 10 days after the violation, he or she completed and delivered or mailed a written report of the incident or occurrence to NASA under ASRS. Proof of timely submission is provided to the reporter by the returned ID strip from the top of the NASA form. A date/time stamp appears in the upper right corner, which indicates receipt at NASA/ASRS.

The advice often given to reporters involved in incidents is "When in doubt, fill it out." Often a reporter is involved in an event where final determination of whether it is an incident or an accident cannot be made by the FAA or the NTSB before the 10-day time limit for filing the ASRS report has elapsed. However, if the reporter is aware that the event is determined to be an accident by NTSB criteria, a criminal offense as determined by the Department of Justice, or a deliberate act, there is no immunity advantage in submitting a report to NASA/ASRS. These types of events are ineligible for consideration within the provisions of the program.

One of the primary reasons ASRS exists is to identify and constructively address safety issues in a timely way. The immunity provisions, although a strong motivation for submission, are not the sole reason for reporting to ASRS. Even if an event or incident is not a violation or does not qualify for the program's immunity provisions, it still may contain information of safety value to aviation personnel, operators, regulators, and researchers. The ASRS is receptive to reporting on any unsafe conditions that are observed or directly experienced. The program encompasses a wide range of safety issues.

**ASRS INCIDENT REPORT DATABASE**

More than 470,000 incident reports from a variety of aviation personnel and operations have been submitted voluntarily to ASRS since the program's beginning in 1976. More than 2,600 of these reports are processed through the system every month. ASRS maintains an active database of 80,000 of these reports. This database is used to detect current problems and to provide relevant information for aviation safety efforts involving human factors research, evaluation of current policy, and improvements to aviation procedures.

ASRS staff and human factors researchers are particularly concerned about the quality of human performance in the aviation system. Areas of special interest include problems involving human interface with various elements of the aviation system, including highly automated equipment, barriers to effective human performance, communication problems, and decision-making errors. The ASRS reporting form is designed to capture information about these areas of interest as well as a broad spectrum of incident particulars.

When an incident occurs, the reporter submits an ASRS reporting form, which provides a detailed summary of the conditions and situation variables involved in the incident. The form requests information about the type of operation, type of aircraft, qualifications of the reporter, weather, type of airspace, and many other event-specific details. The most vivid portion of the reported event, however, is provided in the narrative section, in which the reporter recounts the actual events before,
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during, and after the incident. This combined information is the single, largest advantage of incident reporting to the ongoing efforts of accident prevention. The reporters involved in the event are able to relate the conditions surrounding the incident, and they are also able to relate how they detected and resolved the problem. Incident analyses can and do provide information that is useful for targeting potential areas for safety improvements.

Because of the richness of the data provided to the ASRS, much effort and attention to quality are put into the analysis of each incident report. Each incident report is reviewed and analyzed by a team of experienced aviation safety analysts. This team is composed of retired pilots, air traffic controllers, mechanics, flight attendants, and other experts in specific subject areas. The analyst team has varied experience in all types of operations and environments, such as commercial Part 121 and Part 135, corporate, general aviation, and air traffic controller operations at all levels. ASRS analysts evaluate each incident report, make selections for full format (database) processing, initiate telephone callbacks to selective reporters for needed clarifications, and process each report into a selection of categories describing the incident event characteristics.

Figure 1 presents the reports received from a variety of different aviation environments. As indicated, several categories of aviation personnel (air traffic controllers, cabin crew, maintenance/ground personnel) report in lower numbers than those in the pilot (air carrier and general aviation) reporter categories.

There are several reasons for differential reporting. Air traffic controllers historically have reported in lower numbers because they are subject to different disciplinary measures than are pilots, and they have less incentive to take advantage of the immunity provisions offered by the FAA for ASRS report submission. The ASRS program did not introduce customized reporting forms for the maintenance and cabin crew communities until 1997. The numbers of reports received from these members of the aviation community have increased since then.

DATABASE REPORTER DISTRIBUTIONS AND INCIDENT TYPES

The ASRS database contains more than 80,000 records with reporters' narratives of incidents that took place and their assessment of the factors that contributed to unwanted events. The database has the capability to sort information on many variables, including the annual numbers of reports in each of the major reporter cate-

![Annual percentage distribution](image)

**FIGURE 1** Annual ASRS report receipts, 1988–98. (Data for 1999 are incomplete and are not included.)
gories. Table 1 shows this breakdown for a 10-year period, 1988–98, as well as comparisons of each reporter category with the annual total database incidents.

Further inspection of Table 1 shows that the proportion of reports in most categories has remained remarkably constant over the years, even though the annual number of database reports has nearly doubled. Air carrier pilot reports represent about 60 percent of database records, and general aviation pilot reports represent another 20 percent of the records. The most striking exception to this general pattern of stability is found in the air traffic controller category. Air traffic controller reports dropped dramatically in 1991, after a national controllers’ strike and never regained their pre-1991 levels. In 1998, the numbers of reports submitted by maintenance personnel and cabin crew jumped dramatically because ASRS introduced a customized form for them the preceding year.

TABLE 1 Reporter Groups in the ASRS Database, 1988–98

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<tr>
<td>Air Carrier Operators</td>
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<td>693</td>
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<td>722</td>
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<td>744</td>
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<td>6</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>4</td>
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<td>1980</td>
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<td>Ground Crew Personnel</td>
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<td>84</td>
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<td>8402</td>
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NOTE: Incidents may be reported by more than one person or reporter group (e.g., a pilot and air traffic controller may report the same incident); thus reporter categories are not mutually exclusive. Column totals represent number of discrete incidents.

TYPES OF DATABASE UNSAFE EVENTS (ANOMALIES)

A collection of several incidents that share common characteristics can also illustrate safety issues. To further explore the group of incidents submitted by different reporter groups, we analyzed the “Anomaly” category. This category is evaluated by ASRS analysts during report processing. After analyzing an incident report, the analyst classifies the major types of unsafe events (“anomalies”) that occurred in the incident. Most incidents involve more than one anomaly (i.e., anomalies are not mutually exclusive). The top six anomaly categories in the ASRS database are presented in Figure 2.

The anomaly categories presented in order of frequency in Figure 2 show that more than one-third of all anomaly citations involved a nonadherence violation—nonadherence to an air traffic controller clearance, to a FAR, or to a published procedure. These incidents exemplify how even professional, well-trained pilots, controllers, and others can find themselves in a nonadherence situation to a regulation or procedure. They can be very instructive about the compatibility of a FAR or published procedure with the human’s ability to comply in a unique situation. The last three categories deal with severe aircraft equipment problems, airborne loss of separation incidents, and navigation deviations.

It is important to note that all the anomaly categories may interrelate with each other and therefore are not mutually exclusive. For example, one incident may involve an “Aircraft Equipment Problem/Critical,” which contributed to “Nonadherence/Clearance” and “Conflict/Airborne Less Severe.” This type of flexible classification system allows each incident to be evaluated in some depth. Analysis of the actual report narratives contributes to an understanding of these types of incidents.

ASRS PRODUCTS AND SERVICES

From its large database of information, the ASRS has a commitment to distribute pertinent safety information to the aviation community. This feedback is accomplished in various formats. There are a wide variety of products and services produced from the incident data submitted to the ASRS. One of these products that has become a very familiar ASRS publication is the safety bulletin Callback.

This publication, produced monthly since 1979, provides a quick review of many timely issues that have been submitted through incident reporting. A more recent publication, Directline, is now being produced for the aviation management and training audience. This publication also deals with recent topics of interest being presented to the ASRS. These articles are longer analyses usually involving presentation of several incident reports on the same subject, with interpretive commentary by ASRS analysts and research consultants.
In response to its obligation to “identify deficiencies and discrepancies in the National Aviation System,” ASRS has several options available to alert the aviation community. When ASRS receives a report describing a hazardous situation (e.g., a defective navigation aid, mischarting, a confusing procedure, or any other circumstance that might compromise safety), a series of alerting functions are in place to relay this safety information. This information is prepared in a deidentified form and sent to individuals who are in a position of authority so they can investigate the allegation and take needed corrective actions. ASRS has no direct operational authority of its own. It acts through and with the cooperation of others (ASRS Program Summary, 1998).

The alerting function involves three mechanisms: (a) Alert Bulletins (a well-documented safety problem involving a serious safety concern), (b) For Your Information Notices (information on a safety issue or a safety problem of lesser severity), and (c) FAA Telecons/Safety Communications. Depending on the severity of the incident, one or all of these mechanisms may be used. Severity is determined by a team of ASRS expert analysts. As with any product of the ASRS, these alerting messages are deidentified and remain confidential. Another ASRS service provided to the aviation community is database search requests. Information in the ASRS database is available to all interested parties. Individuals and organizations who need specific ASRS data will be provided with relevant reports retrieved during a search of the database. The current ASRS database includes reports submitted from 1988 to 1999. The search request reports can be provided in printed form or in Macintosh or IBM disk format. There is also a CD-ROM commercial product available on the market that has a copy of the ASRS database with annual updates available.

NEW REPORTING COMMUNITIES AND ASRS

Reporting of maintenance and cabin crew incidents is being strongly encouraged so that this information will be available in greater quantities for the ASRS database. The current database has about 695 incidents submitted by maintenance personnel and 672 cabin crew reports.

The next challenges for the ASRS are to promote distribution of the newer reporting forms, educate potential users, analyze the data received, and disseminate the resulting safety information to the industry. Through this tailored system of reporting, many current efforts in aircraft safety and human factors will be enhanced. This information is crucial to support ongoing airline, industry, and government activities and research. Summaries,
research projects, and data searches of these reports will be instructive for education, training, and accident prevention efforts.

The bottom line of "reduced accidents" is saving lives. All efforts toward gathering information on a national level for use by all interested organizations, unions, airlines, and others are imperative for improving safety. NASA/ASRS is looking forward to broadened participation by members of the aviation community in the program and is available to assist with any aviation safety efforts.

REFERENCES

