ASRS: The Case for Confidential Incident Reporting Systems

In April 2001, the world's largest confidential voluntary aviation reporting system, the NASA Aviation Safety Reporting System (ASRS), celebrated its 25th anniversary of operation. Just prior to this event, the ASRS reach another milestone – the processing of its 500,000th incident report. Scarcely one year later, report intake has now exceeded 558,000. The longevity and success of this government program is a remarkable example of how interagency cooperation can create a stable, effective agent for system safety improvements against the backdrop of changing political climates and times.

The ASRS was founded in 1976 through a Memorandum of Agreement between the Federal Aviation Administration (FAA) and National Aeronautics and Space Administration (NASA). The program was designed primarily to support the FAA in its mission to eliminate unsafe conditions in the national aviation system, and prevent avoidable accidents. The first step was to design a system in which the aviation community, both individually, and collectively, could place a high degree of trust.

The FAA quickly recognized that its regulatory and enforcement roles would discourage the aviation community from trusting and using the new program if the FAA were to operate the system. It therefore asked NASA to act as the highly respected, independent third party that would administer the program and fulfill the role of an honest broker attending to the interests of both sides. NASA, a research organization with no regulatory or enforcement role, saw a unique opportunity to enhance its research capability through access to the human factors data generated by the new system.

NASA accepted the FAA's proposal, and the ASRS began operation on April 15, 1976. This mutually beneficial interagency partnership has endured for a quarter of a century. The data collection and analysis operations of the ASRS are funded by the FAA with in kind contributions from NASA. NASA administers the program's details, oversees its products and services, guarantees confidentiality, and ensures that de-identified incident data and the results of special studies are communicated to those responsible for aviation safety, and other interested parties.

The ASRS Model

The idea behind the ASRS has been emulated by aviation systems worldwide, and is now being modeled in industries outside aviation. That idea is fairly simple and straightforward:

- When organizations and industries want to learn more about safety incidents and why people did what they did, the best approach seems to be to simply ask the participants.
- People are generally willing to share their knowledge if they are assured their identities will remain confidential, and ultimately, anonymous and the

information they provide will be protected from disciplinary and legal consequences.

- A properly structured *confidential*, *voluntary*, *non-punitive* incident reporting system can be used by any person to share this information.
- Such a system has the means to ask, and frequently answer, the question of *why*. There is no substitute for knowing why a system failed or why a human erred.
- A voluntary incident reporting system cannot succeed without the cooperation, oversight, and guidance of the community that will use it. It must be viewed as a safety information resource accessible and responsive to all.
- A voluntary reporting system usually must *exclude* from its protections some types of incidents, such as criminal acts and intentional unsafe acts. In certain systems, such as the ASRS, this exclusion extends to legally defined accidents.
- The safety data gathered from incident reporting can be used to identify system vulnerabilities and gain a better understanding of the root causes of human error. Incident reporting data is complementary to the data generated by mandatory, statistical, and monitoring systems.
- The ultimate achievement of an incident reporting system is that it can prevent accidents and fatalities.

In the United States, recent proponents of the ASRS incident reporting model include the maritime, rail, and highway transportation industries, as well as the Veterans Health Administration and medical care providers. There is a growing recognition that the ASRS model of safety incident reporting is a proven and effective way to "fill in the gaps" left by accident investigations, mandatory event reporting, and other information gathering systems. The ASRS model has also demonstrated that incident reporting can be an accurate early warning system that identifies problems related to emerging technologies and global economic trends.

The Role of an Industry Oversight Group

A major factor in the success of the ASRS has been the involvement of the entire community of aviation stakeholders in the form of an industry Advisory Committee. At the very beginning of the program, Committee representatives were actively involved in program development and oversight, and became strong advocates for the ASRS with their professional unions and memberships. The widespread acceptance and use of the ASRS program in aviation circles is due largely to their efforts.

Today, the ASRS Advisory Committee continues to offer its guidance, aviation expertise, criticism, and advocacy when the latter is required. NASA holds semiannual meetings with the Advisory Committee and reviews proposed policy and programmatic changes with the group prior to implementation. This ensures that the major ASRS stakeholder elements are informed about program developments, and that NASA, in turn, is aware of stakeholder views and important industry trends.

Recent Variations on the ASRS Model

The principles of confidential reporting can be applied directly to the operational environment of a company or organization, as well as to a national setting. Within the aviation community, for example, there has been a movement in recent years toward Aviation Safety Action Partnership (ASAP) programs administered by individual airlines. The FAA provides limited immunity from disciplinary action to pilots who report any incidents, problems, or mistakes to their company's ASAP program. ASAP programs generally function through a Letter or Agreement between the pilots' union, airline, and the FAA.

ASAP and similar "closed" voluntary incident reporting systems (so-called because they are closed to participation by those outside the organization) permit the gathering of organization-specific safety and trend data that might not be reported in volume to a national system. A closed incident reporting system also lends itself to tailored safety solutions that are cost-effective and benefit the organization's bottom line.

But closed reporting systems have known weaknesses, as well. The concepts of legal and financial liability can effectively distort and hinder the investigation process within an organization, even with limited immunity protections in place. Reporters may not be completely forthcoming about their mistakes and those of others. Organizations may be tempted to suppress useful safety information if it puts them in an unfavorable light or at a competitive disadvantage. Most importantly, unless a company or organization shares its incident data with a national system like the ASRS, the safety information gathered by the closed system is lost to users throughout that industry.[1]

Under the ASRS model of incident reporting, NASA as an independent administrator is not tempted to filter the data collected to the advantage or disadvantage of any organization or individual. NASA does not have a regulatory or enforcement interest, and so can be an objective custodian of the data. As a federal agency, NASA is also well positioned to disseminate safety alerts and the results of data analyses to key organizations and stakeholders throughout the national aviation system.

[1] It was this very circumstance – the loss of important safety information available to one company but not to others – that became a precipitating factor in the founding of the ASRS. On December 1, 1974, TWA Flight 514, inbound through cloudy and turbulent skies to Dulles Airport in Washington, DC, descended below the minimum safe altitude for the area they were flying through and collided with a Virginia mountain top. All passengers and the flight crew were killed. The accident investigation revealed that the flight crew had misunderstood an ATC clearance and descended prematurely to the final approach altitude, in the process also misinterpreting an approach chart. Another disturbing and provocative finding emerged: six weeks earlier, a United Airlines flight crew had narrowly escaped the same fate during a nighttime approach at the same location, but discovered their mistake after landing. The United pilots reported the incident to their company's new internal reporting program, and a cautionary notice was issued to all United pilots. Unfortunately, at the time there existed no method to share this knowledge with other operators. It was determined that such safety information *must* in the future be shared with the aviation community. Thus was born the idea of a national aviation incident reporting system.

The value of a national system for the dissemination of aviation incident data has not been lost on airline ASAP programs, the majority of which support the sharing of their data with the ASRS.

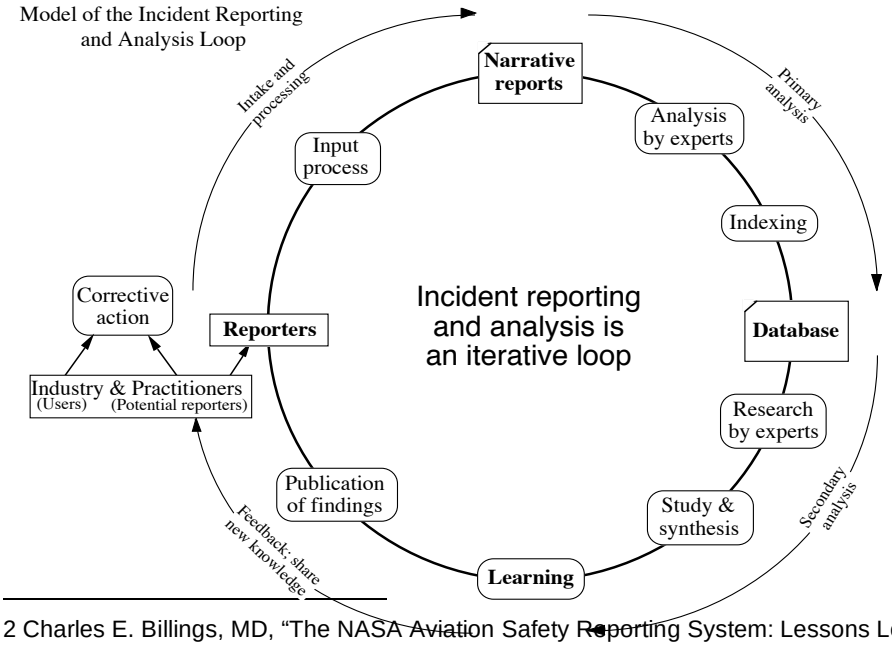
The Incident Reporting Feedback Loop

The efficiency with which a program like ASRS collects and stores data is only part of the incident reporting story. Far more crucial is the strength of the reporting system's feedback loop to the reporters and industry it serves. Feedback nurtures the analytic process of "truth-seeking," of developing new knowledge and understanding about operational problems in a complex system, and enables the users of an incident reporting system to *learn*. A reporting system's feedback mechanisms directly reach the system's users, enable this learning process to take place, and help ensure that corrective actions will be appropriate and effective.

Dr. Charles Billings, one of the NASA founders of the ASRS system, has characterized the relationship between knowledge acquisition and a reporting system's stakeholders:

> *The use of this knowledge must be the responsibility of the system stakeholders, because actions taken to improve the system inevitably raise questions of benefits and costs, feasibility and other sociological issues. The reporting system itself must remain objective and dispassionate if it is to be credible.*[2]

Figure 1 depicts the incident reporting and analysis feedback loop. The loop consists of four indispensable elements: *Reporters* – their *narratives* – the *database* of incident records – and the *learning* that takes place from the information disseminated.[3]



2 Charles E. Billings, MD, "The NASA Aviation Safety Reporting System: Lessons Learned From Voluntary Incident Reporting," In Proceedings of Conference, *Enhancing Patient Safety and Reducing Errors in Health Care* (November, 1998). Chicago: The National Patient Safety Foundation, pp. 97-100.

3 Billings, pp. 97-100.

Strong feedback mechanisms encourage individuals to continue reporting, and offer assurance that the information they provide is being well used. In the case of the ASRS, many feedback methods to the program's user community have been developed over the years. These include:

- **Alert Bulletins and For Your Information Notices** – One of most important ASRS missions is to serve as a "front line" for alerting on safety issues that affect many aviation users, or pose a significant hazard. The ASRS has issued approximately 4,000 alerting messages of all types to the FAA and aviation community authorities since the program's inception. Alert messages are issued on subjects that include airport facilities, airspace design, aircraft make/model issues, navigation aids, charting, procedures, and other conditions and situations that might compromise safe flight. Twice a month the ASRS has teleconferences with the FAA Office of Safety on the most important alerting items seen in its recent report flow.
- **Quick Response Studies** – Another central ASRS mission is to support government organizations such as the FAA, NSTB, and Congress during rule-makings, procedure and airspace design efforts, accident investigations, and other *ad hoc* circumstances. In response to government requests, ASRS analyzes relevant incident data and provides a data synopsis within a brief period (1-2 weeks). Recent Quick Response efforts include a study of passenger misconduct incidents and runway incursion events involving pilots.
- **Operational Research** – ASRS has conducted and published 57 research studies since the program's inception. ASRS research has always been designed to examine human performance issues in real-world operations. The goal of ASRS research is to return information to stakeholders so that incremental improvements in aviation safety can occur. **Figure 2** presents a sample of ASRS research subjects over the last decade.

- **Rejected Takeoffs: Causes, Problems and Consequences**
- **Impact of TCAS II Incidents on the National Airspace System**
- **Airport Ramp Safety Incidents**
- **Flight Crew Performance During Aircraft Malfunctions**
- **Use of ASRS data in the FAA's Advanced Qualification Program (AQP)**
- **Flight Crew Monitoring Issues Identified in ASRS Data**
- **The Effects of Passenger Misconduct Incidents on Flight Crews**
- **Analysis of Pilot-Reported Runway Incursion Incidents**

Figure 2. ASRS Operational Research Topics (1990-2000)

- **Database Search Requests** – Information in the ASRS database is available to interested parties at no cost under the program's Freedom of Information Act (FOIA) provisions. Individuals and organizations

wishing to request ASRS data on a specific aviation safety subject may contact the ASRS by e-mail, phone call, fax, or letter with a statement of need. The ASRS will search its database for relevant reports and will send a report package to the requestor in an electronic format (or hard copy if requested). To date more than 6,000 database searches have been performed in support of government, industry, media, academic and other requestors.

- **Publications** – The ASRS has developed two publications, *CALLBACK* and *Directline*, to provide feedback to its constituencies. *CALLBACK* is a monthly safety bulletin whose purpose is to educate a broad aviation audience in safety issues by using a "lessons learned by others" approach. It is mailed to more than 80,000 pilots, air traffic controllers, and others. An additional 1,200-plus readers per month download issues from the ASRS web site (http://asrs.arc.nasa.gov). In addition to excerpts from ASRS incident reports, issues contain occasional summaries of ASRS research efforts and related aviation safety information.

  ASRS Directline is published periodically to meet the needs of the operators and flight crews of complex aircraft, such as commercial carriers and corporate fleets. Articles focus on subjects of special interest to this stakeholder group, such as pilot-ATC issues, factors associated with altitude deviations, similar call sign problems, and other issues deemed important by ASRS analysts. Distribution is directed to operational managers, safety officers, training organizations, and publications departments.
- **Program Outreach** – NASA and ASRS staff members also participate in important aviation industry meetings and conferences to interact directly with stakeholders across the system and stay in touch with current aviation issues and concerns. In recent years ASRS outreach efforts have included such organizations as the Air Line Pilots Association (ALPA), National Business Aircraft Association (NBAA), National Air Traffic Controllers Association (NATCA), Experimental Aircraft Association (EAA), Helicopter Association International (HAI), National Transportation Safety Board (NTSB), and International Confidential Aviation Safety Systems (ICASS).

Incident Reporting and The Human Error Problem

Across the major transportation modalities and in many other fields, human error looms as the leading cause of both accidents and incidents. In recent years, human factors practitioners have broadened their definition of human error to include concepts such as unsafe supervision and organizational influences (resource management, organizational climate, and operational processes, to name a few).

In the maritime industry, for example, approximately 80 percent of commercial and recreational waterborne accidents can be traced to human error despite regulatory, quality management, and education initiatives. The same trend applies for commercial maritime

accidents.[4] Past analyses of aviation accident and incident data, including ASRS data, have identified almost identical human error patterns.

As aviation, marine, and other systems become "smarter" and more heavily used in response to global economic demands, there is an ever-present risk that human operators will fall behind in their training and ability to safely operate the new technology. Many systems, for example, are converting from paper-based documentation and older forms of communication to integrated real-time digital systems. These and other technology changes, coupled with greatly increased numbers of operations, increase the risk that incidents and accidents will occur. The feedback from incident reporting systems is becoming a vital early-warning tool for decision makers and planners tasked with improving safety margins in the face of doubled or quadrupled operations.

Summary

Confidential incident reporting systems based on the ASRS model are not a foolproof method of data acquisition. They are subject to the biases and fears of the humans who use them. Voluntary incident reports also cannot be considered a representative sample of the underlying population of events they describe, although they are sometimes treated as such. But as the ASRS model has demonstrated for many years, if a system's users – the people at the "sharp end" of day-to-day operations – are encouraged to report the safety problems they encounter to a program they can trust, safety goals will be reached much sooner than if we never hear the stories of those lessons learned.

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