Cross-Industry Applications of a Confidential Reporting Model

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A strong emphasis on public safety in the U.S. is apparent throughout many arenas of public life. The efforts and support for the prevention of accidents is especially prominent in critical outcome environments, where if a mistake is made, there can be tragic results. The loss of life and substantial injury that may result from accidents is especially tragic if it is discovered in the process of an investigation that the event could have been prevented. In large, complex, and dynamic environments like aviation, nuclear power, medicine, and other industries where sometimes minor errors or flaws in systems can lead to severe incidents or accidents, the challenge of maintaining safety is significant. Therefore, effective risk management, which includes risk assessment and risk mitigation, becomes crucial in the creation of solutions necessary to assure safety.

Aviation Safety Reporting System – A Confidential Reporting Model

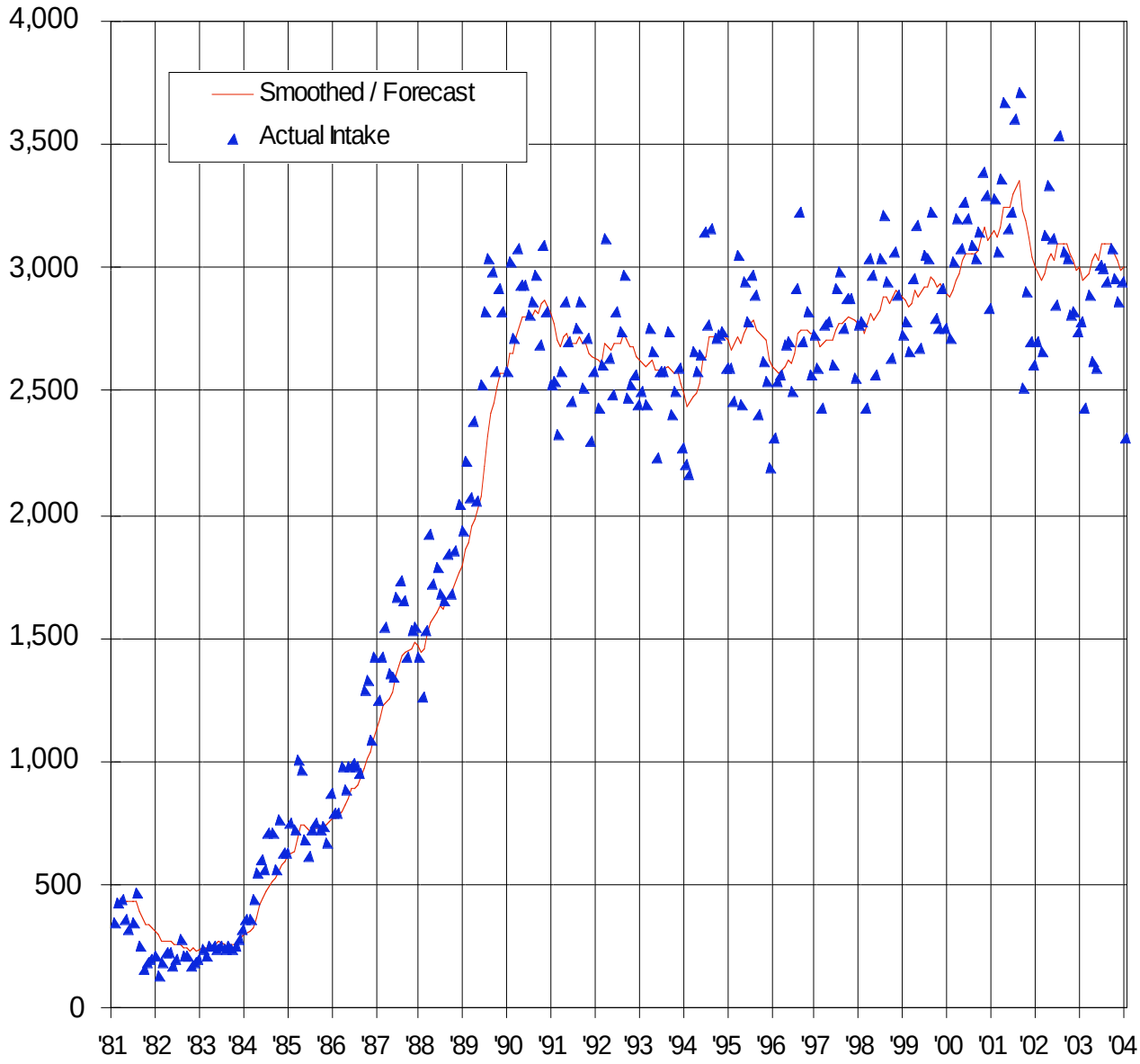
The U.S. aviation community and the public have benefited from a historic Interagency Agreement that was signed in 1976 between the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA). This cooperative agreement was in part a response to an aircraft accident in 1974 that was the result of an ambiguous and misunderstood communication between air traffic control and a flight crew. The flight crew descended too soon and hit a mountain in what is called a controlled flight into terrain accident. In the accident investigation by the National

Transportation Safety Board (NTSB), it was discovered that another airline, six weeks prior to the accident under investigation, had also misunderstood the ATC instruction, began their descent, and barely missed the mountain. Although the flight crews in that airline were quickly warned of the problem, not all airlines were informed. It was "an accident waiting to happen". It was during this investigation that the aviation industry and the government agreed that the country required a system for near-miss incident reporting. The FAA and NASA established the voluntary, confidential, and non-punitive reporting program entitled the Aviation Safety Reporting System (ASRS) (Reynard, Billings, Cheaney, & Hardy, 1986). The FAA provided immunity protections to those aviation personnel who agreed to report to NASA under the new program (FAA, AC 00-46D).

Since that time, the ASRS has accepted over 610,000 reports from pilots, air traffic controllers, flight attendants, maintenance technicians, and others describing aviation safety events that they experienced or witnessed (Figure 1). The ASRS has processed this information and contributed to the enhancement and improvement of aviation safety throughout the U.S. and internationally (Reynard, 1991). In aviation, the ASRS has been recognized, both domestically and internationally, as a very successful model to collect unique safety data from front-line personnel in the system.

Currently, there are seven other countries operating an aviation safety reporting system modeled after the original ASRS and many other countries are working to establish these systems. The value of confidential reporting, its contribution to aviation safety, and its ability to gather information often not reported through other avenues, was quickly recognized by the United Kingdom and soon after by Canada and Australia

Figure 1. Report Intake by month (1981 to 2004). Current average/mo is 2,900.



aviation systems. The ASRS meets annually with these countries to coordinate and compare information concerning worldwide aviation safety through a group formed in 1988 entitled the International Confidential Aviation Safety Systems (ICASS) which now has been recognized by the International Civil Aviation Organization (ICAO). In the ICAO Annex 13 documents, member countries throughout the world are encouraged to initiate and operate a similar system to those in the ICASS group of countries. These new countries are referred to ICASS for assistance in the design and implementation stages of new systems.

Cross-Industry Applications

The confidential reporting model has been developed and matured for more than 28 years through the collaboration between NASA Ames Research Center, ASRS and the FAA, Office of System Safety. It has been recognized for providing unique safety information not available through any other means (Connell, 2000 & 2002). Other disciplines and industries have recognized the advantage of the ASRS and have consulted with the ASRS to assess the model's relevance and potential contribution to their own safety efforts. Nuclear power has adopted a similar approach to gathering safety information to complement their traditional data collection methods. Maritime operations are currently considering the best application of the confidential reporting model to their own environment (Connell & Mellone, 1999).

Medical Reporting. The medical community has begun a strong initiative to establish this model to collect safety information from front-line medical personnel. The Institute of Medicine (IOM) report directly addresses the ASRS model in Chapter 5 of

their book, To Err is Human: Building a Safer Healthcare System (Kohn, Corrigan, & Donaldson Eds., 2000).

In 1997, prior to the release of the IOM report, the Department of Veterans Affair (VA) asked NASA ASRS to join an Expert Advisory Panel being convened in Washington DC to advise the VA as they began a new focus on patient safety. The VA invited numerous cross-industry participants to describe how their industries addressed safety and what methods were successful in their experience. It was at those meetings that the VA asked NASA's ASRS Director if assistance could be provided to the VA to create a medical reporting system modeled after the ASRS. As a result of significant enthusiasm in both agencies, NASA entered into an Interagency Agreement with the VA in May, 2000 which established a collaboration between the ASRS at NASA Ames Research Center at Moffett Field, California and the VA National Center for Patient Safety (NCPS) in Ann Arbor, Michigan. The new system is entitled the Patient Safety Reporting System (PSRS). This system is a replication of the ASRS and is the beginning proof-of-concept for medicine as the model is evolved to meet the safety needs of this complex environment (McDonald & Connell, 2001). The PSRS is active and receiving reports that are providing constructive safety information. The VA and NCPS has established numerous medical safety innovations in recent years and the PSRS is to be complementary to those efforts (Weeks & Bagian, 2000). The PSRS is expected to provide similar benefits to healthcare delivery as the ASRS has to aviation.

The resources of both NASA and the Department of Veterans Affairs and the strong VA protections of data from legal discovery under 38 U.S.C. 5705 are providing maximal

opportunity for the confidential reporting model to flourish and grow in medicine. The NASA Ames Research Center is the Center of Excellence in Information Technology development for the NASA agency and has a world-renowned group of researchers in Human Factors. All technology development and human factor knowledge that have been a resource to the ASRS are available to the NASA/VA PSRS project. Additionally, the progressive developments in automated report processing, data mining, textual analysis, and data visualization tools have been substantial. These software and hardware tools are human-centered; that is, they support the human expert analysts who are the centerpiece of the success of the ASRS model. These developments and evolution of the aviation model toward the adaptation to the medical environment are progressing and have begun contributing to patient safety and the knowledge needed to foster proactive safety change.

Security Reporting. A new project is being initiated to create a separate avenue of reporting for security events. The ASRS has received increased numbers of reports describing aviation security incidents since September 11. But following a gap analysis and study of these reports, it was recognized that these reports were extremely sensitive and would require different methods of analyses and evaluation. Also, although the ASRS hears from pilots, air traffic controllers, flight attendants, and mechanics, other groups of personnel involved directly with assuring the integrity of the security processes in this country have not been exposed to or educated about the confidential reporting model of the ASRS. Therefore, NASA is proposing a Security Incident Reporting System (SIRS) as part of new work being performed under a NASA program called the Aviation Safety and Security Program (AvSSP). The SIRS project is being proposed as a replication of

the ASRS model with all of the essential success criteria of the original model. However, due to the unique nature of this type of reporting, this system will likely incorporate alternative processing features to include more extensive protections. A consortium of industry and government stakeholders will be created to advise NASA during the SIRS development on the appropriate conditions surrounding these reporting processes.

Risk Management

The importance of risk management in high reliability systems and industries cannot be overstated. In the literature, there are many concepts and methods proposed to accomplish effective risk management. Risk management can be defined as "the organized process of identifying and assessing risks, then establishing a comprehensive plan to prevent or minimize harmful effects from those risks being asserted" (NASA, NPG 2810.1). One method offered to NASA projects proposes that risk management needs to be performed during all of the life cycle phases in the development of new technology. In this NASA guidance to research and development efforts, risk management encompasses risk assessment, risk mitigation, evaluation of residual risk, and risk acceptance. The definition of risk used in this guidance is "a function of the probability of a given threat source exercising a particular vulnerability and the resulting impact of that adverse event on the organization" (NASA, NPG 2810.1). In the high reliability industries discussed earlier, it is relevant to discuss risk in relation to "threat sources" that capitalize on a system's "vulnerability" because the impact of such an event can have catastrophic results.

The voluntary, confidential, and non-punitive model for the reporting of safety events becomes a significant tool to assist in these risk management efforts. One of NASA's approaches to total risk management includes nine steps in a risk assessment process. These nine process steps are presented in Table 1.

Risk Assessment
1. System Characterization
2. Threat Identification
3. Vulnerability Identification
4. Control Analysis
5. Probability determination
6. Impact Analysis
7. Risk Determination
8. Control Recommendations
9. Results Documentation

TABLE 1. Nine steps of risk assessment model in NASA NPG 2810.1.

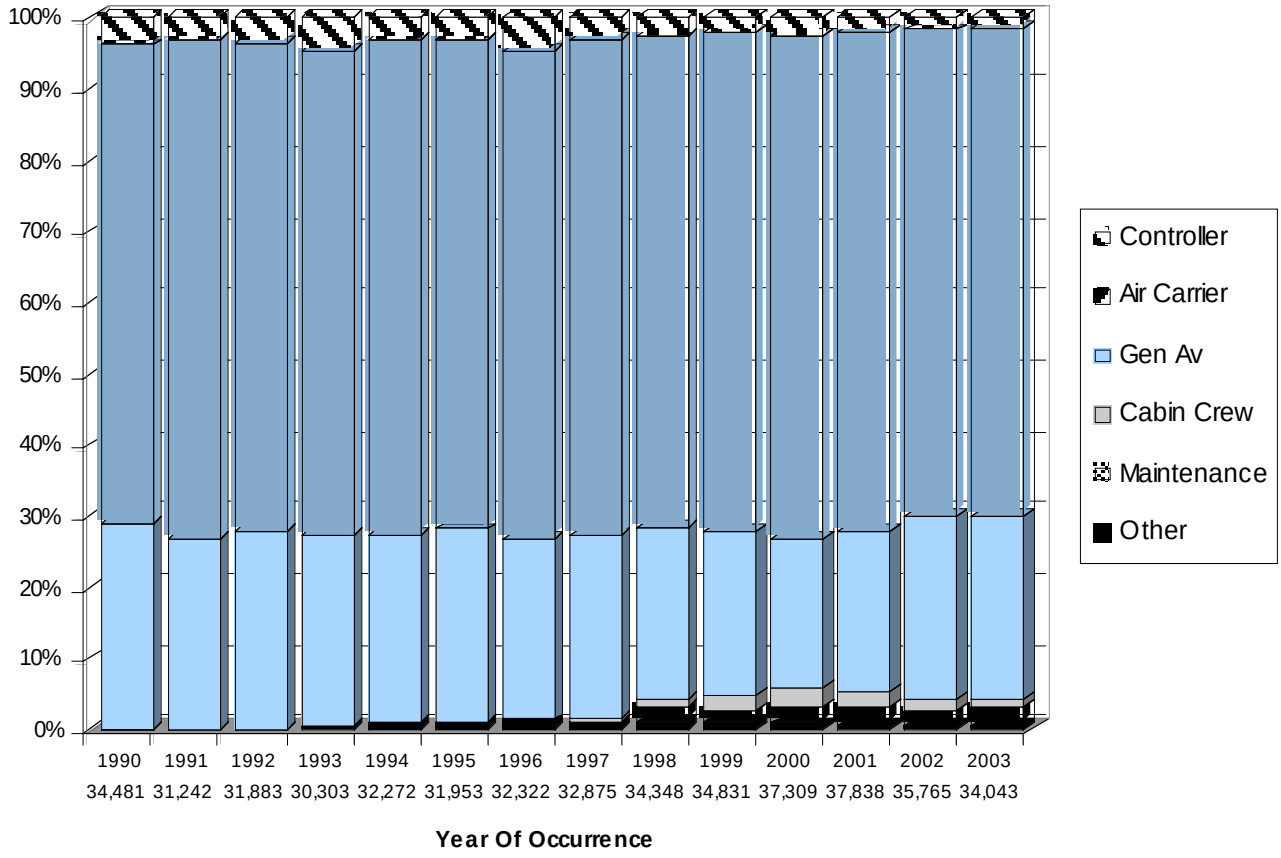
The confidential reporting model is most useful in its contribution to Step 2 - Threat Identification and Step 3 - Vulnerability Identification. This paper will discuss the ASRS program in relation to these risk management goals. The stated program purposes of the ASRS are to 1) identify deficiencies and discrepancies within the aviation system and 2) provide data and information for system planning and improvement (Reynard, 1991,

Connell, 2002). Additionally, the ASRS is described as a national resource which provides information needed in three areas: 1) identifying aviation system problems and issues, 2) generating hypotheses for further research, and 3) providing unique human factors and operational insights. These features of the ASRS allows it to be well situated to provide information on risk from both the threat and vulnerability perspective.

The conduct of the ASRS as an independent, external body, the guaranteed protection of reporter confidentiality, and the non-punitive nature of the reporting allows the people on the frontline of aviation to report within a protected mechanism. Thus, the people who work in the system everyday freely provide candid and introspective reports about how they have performed well, or not so well, in the complex system of aviation. The information they have traditionally volunteered describes the activities and events preceding the more serious events. It is in reading and analyzing these reports that human experts specialized in aviation transform the report data into information to be utilized to assess risk in the system.

Due to the conditions of reporting and limited immunity protections that have been established between NASA and the FAA, the ASRS is a robust source of information for both threat and vulnerability identification. This is its main contribution to risk assessment and thus, risk management. By employing successful de-identifying policies and procedures over more than 28 years of successful operation, the confidentiality of the reporter has not been compromised. This reputation has lead to a trust that is necessary to obtain honest, open reporting. Currently, the ASRS is receiving approximately 38,000 reports per year (Figure 2). The trust and confidence built over time with these frontline

Figure 2. Incident Reporter Distribution (January, 1990 to December, 2003)



personnel has provided high volume, high quality, and candid reporting. It is through this opportunity to hear from the people who work in the system everyday that many threats and vulnerabilities have been identified. Not only have these reports illuminated system weaknesses that could, combined with other factors, potentially trigger serious incidents or accidents, but also the reports include clues to some of the strengths in the system. Reporting to the ASRS has created a capability to discover how people detect anomalies in the system and how they recover from a potentially dangerous event. Because no fatal accident occurred, the people are available to discuss thoroughly the event from the beginning. These individuals, in the trusted and protected environment of the ASRS, will explain their role in the occurrence. It is these insights and human factors content that has made the ASRS data valuable to improving aviation safety.

The ASRS attempts to maintain a neutral, unbiased position between the numerous elements within aviation. The information generated by the system and distributed through a variety of products is provided to the government and industry aviation safety community to act on and create the system safety solutions. ASRS often states that "it works through the good offices of others". The contribution of ASRS information to risk management is largely focused on threat and vulnerability identification and description of the context in which the incident occurred. The ASRS does not monitor or demand corrective action in the aviation system in relation to the information it provides. To preserve its role as an independent, external, and neutral contributor to safety improvement, the ASRS remains outside the ongoing process. Any perceptions of bias, however subtle, can adversely affect people's willingness to report. The trust and the

voluntary nature of the ASRS are unequivocally protected. The solutions to the threats and vulnerabilities identified by ASRS require evaluation and development of corrective actions and risk management through mechanisms outside of the ASRS, although the ASRS can participate as a neutral forum for the continuing discussions needed to decrease these threats and vulnerabilities.

In summary, the ASRS as a proven, effective system for confidential reporting is an exemplary model for application across industries interested in safety improvements. This model, where the "devil is in the details", can be replicated, adapted, and evolved to be an intuitive, productive information collection mechanism for safety improvement in any system. Its largest contribution is in the information provided for threat and vulnerability identification. The model's characteristics and features make it unique to other manners of gathering information, but it requires constant nurturing, support, and advocacy. When one is asking people to report what actually happened and happens in a system, the building of trust and confidence can never be sacrificed to other interests. When the front-line personnel in a system believe and trust that they are protected, even if they are the bearers of bad news about system flaws or they expose their own errors in the interest of system integrity, then truly rich and illuminating data will be provided for safety improvements.

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