

The US National Civil Aviation Review Commission (NCARC), chaired by then Senator Norman Mineta, currently the US Secretary of Transportation, prepared a report entitled, "Avoiding Aviation Gridlock & Reducing the Accident Rate," dated December 1997. The following is excerpted from the final report, Part III "Safety Report", Section III. The full final report can be viewed at <http://www.faa.gov/NCARC/>.

**NCARC FINAL REPORT
Avoiding Aviation Gridlock & Reducing the Accident Rate
December 1997**

EXCERPT

**PART III
SAFETY REPORT**

SECTION III. ENCOURAGE THE IMPROVEMENT OF AVIATION SAFETY PROGRAMS IN INDUSTRY AND GOVERNMENT

As described in the introduction to this report, the accident rate has leveled over the past three decades. If accident rates are to be lowered to meet the national goal of reducing the fatal accident rate five fold within 10 years, fundamental change must take place in how safety is provided. The aviation community must look deeper than accidents and incidents to identify latent and emerging problems and fix them before a mishap occurs.

Today, technology, safety reporting, and risk management concepts are emerging that could literally identify most aviation safety problems before they become accidents. If used in combination, safety could be dramatically improved. These concepts require the collection, analysis, and sharing of types of data and information that are just now beginning to be routinely studied in the U.S. aviation industry. Among these are programs in which pilots, mechanics and other safety-related personnel are encouraged to report problems without penalty; safety self-audit and analysis programs within airlines; and programs that analyze digitally recorded flight operations data from actual flights.

Each of these approaches uses information and data in new and different ways as a means to take corrective actions before problems turn into accidents. These programs also require that the traditional FAA/industry regulatory relationship be changed so that the intended broad safety benefits (prevention of accidents) can be realized.

Regarding the analysis of flight operations data, an important means to improve safety risk management programs is now in its infancy in the United States. It involves utilizing digitally recorded flight operations data in a program known as Flight Operations Quality Assurance (FOQA). To bring FOQA and other self-reporting programs into full fruition and realize their potential safety

benefits, impediments to the collection and analysis of flight, air traffic, and other safety data need to be removed. There also needs to be a willingness in government and industry to invest in new ways of doing business.

A. Safety Risk Management Programs Should Exist Throughout Industry and Government.

Historically, air carriers and unions have used reports from flight and maintenance crews as a means of identifying potential safety problems within companies. Within the past few years, the FAA has required each airline to have a senior safety executive and encouraged airline self-audit and self-disclosure programs. The FAA has also encouraged partnerships between unions, air carrier safety departments, and the FAA itself to jointly identify safety problems and take constructive action, such as in the USAirways program that was created to address altitude deviations.

The American Airlines' Airline Safety Action Partnership (ASAP) is a prime example of such efforts. ASAP consists of an agreement between pilots, their union, American and the FAA whereby pilots are encouraged to report safety problems and the other parties agree to work to address the problems in a way that is not threatening to the person who does the reporting. Each pilot report is submitted to the NASA Aviation Safety Reporting System (ASRS) to feed a national safety database for broader analysis and to guarantee immunity from FAA certificate action or civil penalties. A committee of all the parties then meets and works to resolve each safety issue as effectively and expeditiously as possible.

The Commission finds that an effective means to quickly reduce the accident rate is to implement a safety risk management program in each company across the aviation community. The risk management program should include a combination of a company self-audit and an ASAP-like self-disclosure program. Such programs should include the analysis and sharing of reports from aviation professionals among industry members and between the industry and the FAA. A similar but more aggregated program should be administered at the national level to ensure that the government is focusing its aviation safety resources according to the results of such programs.

B. Whenever Possible, FOQA Should Become Part of Safety Risk Management Programs

Programs similar to the American Airlines ASAP program should be pursued across the aviation community as the foundation of any safety risk management program. There is additional information now available which many companies may also use to improve their safety program. Aviation is one industry where almost every activity can be digitally recorded. It will be possible in the future to monitor, analyze, model, and simulate the aviation system using digital flight

and air traffic management data. This could become a new method for the aviation community (crew members, airlines, manufacturers, airport operators, maintenance facilities, air traffic services, etc.) to identify and fix problems before they become accidents and for the FAA to oversee and improve the aviation system at a fraction of today's costs.

In the United States, recorded flight data has been used in support of maintenance programs and for accident investigations. In other countries, however, these data are also beginning to be used to detect flight safety problems before accidents occur. Flight Operations Quality Assurance (FOQA) programs have been providing critical safety information to non-U.S. airlines for over two decades. The Flight Safety Foundation has described a FOQA system as "a program for obtaining and analyzing data recorded in flight to improve flight crew performance, air-carrier training programs and operating procedures, air traffic control procedures, airport maintenance and design, and aircraft operations and design." Currently, more than 25 non-U.S. airlines screen flight data for deviations from prescribed operations. Some airlines perform these analyses on data from all flights. While three U.S. airlines (United, Alaska, and USAirways) have established flight data analysis programs, most U.S. airlines have not done so largely because of concerns about data protection and the expense of conducting such programs. The Commission finds it regrettable that more airlines have not been able to institute these types of programs.

Today's FOQA concepts were derived from the flight-data efforts of foreign air carriers such as British Airways, SAS, KLM, and TAP Air Portugal over the past several decades. These systems share two common features. First, they are primarily concerned with identifying and counting unwanted events. These include, for example, approach speeds being too high at specified altitudes, vertical acceleration at landing being too high, an abandoned take-off, a go-around, etc. Second, the systems are as much, or more, concerned with detecting trends in the frequencies of these events as they are with individual event occurrences. The event detection and tracking systems developed by these airlines would, if implemented, provide valuable safety information to U.S. carriers.

FOQA programs basically involve converting digitally recorded flight data into useful safety information. Early aircraft flight data recorders (FDRs) had relatively few basic parameters, such as speed, time, altitude, pitch, compass heading and vertical acceleration. Newer aircraft can record up to 200 parameters, several times per second. The Boeing 777 records up to 700 parameters every eighth of a second. Ongoing research by the FAA, NASA, and the aviation industry, and the revolution in information technology, are now beginning to make it possible to use this data in ways not dreamed possible before. FOQA systems have the potential of becoming the basis for making aviation safety decisions at three levels: the company, the air crew, and the air transport system as a whole.

At the company level, a FOQA program could be used to evaluate the safety and efficacy of flight operations within each airline. It could help identify operational problems specific to the airports served by that air carrier or to the aircraft fleets it employs. These data could be used to shape and evaluate air-carrier procedures and training. In this regard, FOQA could become an essential ingredient in streamlining air carrier training procedures, and serve as a performance-measurement tool for company risk management programs and for assessing the effectiveness of training. Special-event identification and the statistical analysis of all flight data could be complementary and synergistic activities. Together, these analyses could provide a fuller picture of air-carrier operational performance.

At the air-crew level, FOQA data could be used for crew member self-assessment and training. Computer animation of flight data could allow flight crews to review their own performance, as well as that of other flights depicting both optimal and unacceptable performances. The ability to replay events is an important feedback element that could result in improved piloting, and crew coordination skills and could also assist in understanding the context of an event.

At the air transport system level, bringing together FOQA information with pilot, dispatcher, and mechanic reports across companies and with air traffic controller reports could assist in evaluating the overall safety and efficacy of the aviation system. For example, FOQA data could be used in models of air traffic operations to evaluate airspace allocation and to develop improved measures of practical traffic capacity, or to monitor the consequences of introducing new traffic control concepts such as "Free Flight". FOQA data could also be used to validate new training practices in ground-training devices, and to provide operational data pertinent to ongoing research.

FOQA information at a national level could identify faults in system procedures, airport operations, airspace structures, aircraft certification, and human-automation interface. Manufacturers, airlines, air crews, and regulators are held accountable by the flying public for the effective risk management of aviation operations. Most accidents stem from the interaction of the pilot, other crew members, the aircraft, the company flight operations center, and the air traffic system. This suggests the need for a national and perhaps international system-wide FOQA program. But data to conduct FOQA programs are not being collected at the national level today, and most airlines are not prepared to implement FOQA programs. The main reason is data protection.

C. Safety Information Should Be Protected and Shared

FOQA and other safety risk management programs are based on trust. Accident prevention depends on the ability to identify variance from normal operations,

adverse trends, and incidents that may be precursors to accidents. In each case, recorded data and incident reporting is essential to identifying these precursors. Keeping this data confidential is the key to acquiring the information. Military safety programs have effectively used confidential/privileged information for over 40 years to identify and correct safety problems that would not have been otherwise detected. Since companies only have information from their own operations, it is to their benefit to obtain information from other companies to put their operations into perspective and to have enough data when measuring rare events to ensure statistical validity. This is the objective of the FAA initiative to encourage data exchange titled Global Analysis Information Network (GAIN). The FAA's GAIN proposal involves establishing a voluntary, privately owned and operated worldwide infrastructure to collect, analyze, and disseminate aviation safety information (including FOQA data).

It appears that the only way to obtain in-depth safety information within a company, between companies, or involving the FAA, is for people who operate in the system (pilots, mechanics, controllers, dispatchers, airlines, manufacturers, airport operators, etc.) to agree to disclose this information and to allow it to be consolidated and analyzed for accident prevention purposes. Individuals and companies will not agree to assemble or disclose safety data if it can be used punitively, be misinterpreted by non-experts, reveal trade secrets, or expose them to undue liability.

The central fear is that the data could be badly misunderstood by the press or public, or even be knowingly misrepresented. Safety risk management programs must include assurances to protect aviation professionals and companies from punitive action as a result of sharing such data with each other or the FAA. Similarly, each carrier, pilot, mechanic, etc., must have assurances against the risk of public humiliation from either innocent or malevolent misrepresentation. The system must not be threatening in any way to the sources of the data or the insights from such disclosure will be lost. If the system is perceived to be punitive or threatening at any level, it will be doomed to fail.

The Flight Safety Foundation has studied this issue and concluded that data protection over time is critical to building the trust necessary for people to reveal problems in the aviation system. The joint industry/labor/government Aviation Safety Plan cites data protection as a key to achieving "zero accidents".

D. Sharing of Safety Information among the Aviation Community and the FAA Should Not Result in Punitive Actions

At the 1995 Aviation Safety Summit hosted by Transportation Secretary Peña, the FAA acknowledged the importance of sharing safety information and promised to initiate a rulemaking to make it clear that FAA will not take punitive action

against individuals or companies who self-disclose information for safety improvement purposes. To date, the agency has failed to do so. In 1996, legislation was enacted permitting voluntarily submitted information given to the FAA and NTSB to be exempt from the Freedom of Information Act (FOIA). The FAA must issue implementing regulations for the legislation to apply, but it has yet to do so.

There are several notable problems with the type of information sharing associated with safety risk management programs. As already mentioned, information might be used for punitive or enforcement purposes by a company or the FAA. A pilot or other employee might be reluctant to report a problem or mistake if there was the possibility of punishment. An otherwise harmless mistake that goes unreported could be repeated by others enough times until it becomes a link in a chain of events leading to an accident. The Commission notes that while company retaliation against employees who call attention to safety problems is rare, aviation safety would be advanced if there were "whistleblower" protections for all aviation employees who report safety problems. Aviation employees should be afforded the same protection that exists for virtually all other safety-related occupations.

The FAA has determined that airline-operated FOQA programs have been demonstrated to provide significant potential for the enhancement of both safety and efficiency. It is in the public interest for the FAA to encourage voluntary implementation of such programs by assuring that information obtained would not be used in punitive enforcement actions. An FAA rulemaking process on this issue needs to move forward to ensure the protection of such information unless there is an indication of deliberate or willful action.

The question of whether self-disclosed information should be used for remedial enforcement action is a more difficult issue. The FAA has engaged in an internal debate over whether pilots or airlines can or should be given immunity if self-disclosed information reveals deficiencies in the fundamental qualifications of an individual or company. For example, if shared information reveals that a pilot is unqualified from a certification standpoint, the FAA arguably should not allow that pilot to continue flying. In fact, some argue that the FAA has an unwaivable legal duty to ground such a pilot regardless of how or where the information was obtained. Safety programs involving self-disclosure are designed to identify safety problems and to take action to correct them. FAA action would only be required if company-based programs fail to take action. The question then is whether it is better to accept the small risk of a problem not being addressed by the company in a timely way in exchange for the large volumes of valuable safety information that would otherwise not be available without the assurance of immunity. Furthermore, the FAA is expecting to receive de-identified and aggregate data from airlines with FOQA programs, so it would be very difficult for the agency to even have a basis upon which to take remedial enforcement.

In essence, there are two competing concerns at issue here. One is the duty of the FAA to ensure that only qualified individuals and companies and airworthy aircraft are being operated. The other is the duty to ensure that the overall aviation system is as safe as possible by preventing accidents before they occur. While both policies have the same ultimate goal of a safe system, they can come into conflict in the particular area of information sharing. Given the rather small chance that there are truly unqualified persons operating in the system and that information sharing would be the means of discovering such persons, the Commission believes that the FAA should favor the policy of protecting the information to bring down the overall accident rate.

As already mentioned, the FAA currently is working on two proposed regulations related to information sharing. One has to do with the withholding from public disclosure of voluntarily submitted information, and the other specifically addresses the agency's use of information provided through FOQA-type programs. Regarding the latter, the FAA has reportedly resolved its internal debate on the question of whether and how to use FOQA information for remedial enforcement action against unqualified certificate holders. Despite claims to making progress on development of both rules, the FAA must move these matters forward into the next phase of issuing Notices of Proposed Rulemaking (NPRMs). Given the potential benefits of information and data sharing and increasing industry interest, the Commission believes that further delay is unacceptable. It appears from recent announcements by the FAA Administrator that the FAA is prepared to take the necessary actions.

E. FAA Must Take Action on Safety Risk Management Initiatives

The Commission believes that the establishment of company safety risk management programs, which include both the American Airlines ASAP-type self-disclosure program and company self-audit programs, are among the most important actions the aviation community can take to achieve a major reduction in accident rates. These types of programs should become routine and ubiquitous throughout the industry.

The ultimate success of these programs will depend on building trust, developing an experience base to understand the benefits, and identifying the tools and technologies needed to efficiently and effectively share and analyze safety related information. Therefore, the Commission recommends encouraging the aviation industry to move as rapidly as possible to incorporate FOQA-type programs into a comprehensive aviation risk management program in each company in the aviation system. The Commission also believes FOQA-type programs could have applicability in improving the safety and performance of the air traffic control system. If each airline, airport, maintenance facility, manufacturer, en route center, etc., had such a program to assist them in identifying problems before they contributed to accidents, aviation safety management would be

transformed.

F. Encourage R&D to Develop Analytical Tools That Make Data Analysis Affordable and Effective for All Aviation Users Large and Small

Apart from data protection, costs are a significant constraint to the implementation of FOQA programs. Today, data analysis tools are available to implement such programs, but many are labor intensive. Costs, especially for small operators, can discourage implementation. The FAA and NASA are collaborating with United and Alaska Airlines to develop tools that will make data analysis more affordable and effective. These tools are also important because they will make it possible both to document normal operations, in order to be able to determine variance from the norm, and to identify other unwanted events that are not apparent without such analysis. Without accurately knowing what is normal, it is impossible to take optimal action to prevent accidents or to validate that actions have the appropriate effect. The Commission applauds and encourages these research efforts.