Chapter 16: Operational Safety in Aviation

16.0   Operational Safety in Aviation

This chapter summarizes recent initiatives and other related activities appropriate to operational safety in aviation. The Global Aviation Information Network (GAIN) program is discussed. Special safety studies and data analyses directed to aircraft performance risk assessment are presented, and the Operator's Flight Safety Handbook (OFSH is summarized and discussed.

Many years ago Heinrich conducted a statistical study of accidents and determined that out of 300 incidents, one fatal accident may occur. This provided a general analogy of a ratio of 1 to 300. Years later, Frank Byrd conducted a similar study and noted that out of 600 incidents, one fatal accident occurred, indicating a ratio of 1 to 600. Figure 16-1 illustrates the concept that for every accident or incident that is reported, there may be a much larger number that are not reported.

It is important to identify incidents that could have resulted in accidents. An incident is any occurrence that could have resulted in an accident, i.e., fatal harm. But since the harm did not occur, it is considered an incident. The point is that all incidents that could have resulted in an accident should be reported to determine the relevant factors associated with that incident.
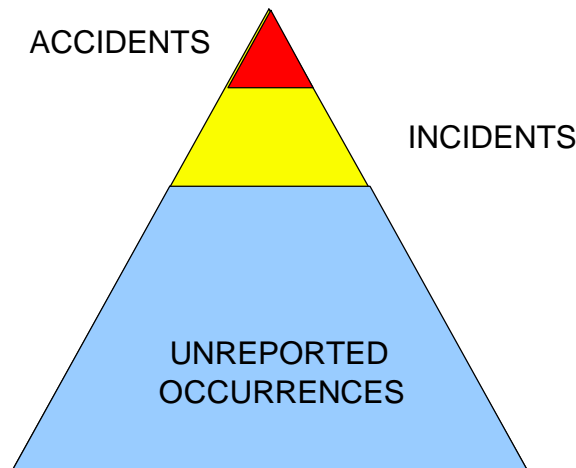
Heinrich Pyramid

Figure 16-1

16.1 Global Aviation Information Network (GAIN)

The Federal Aviation Administration (FAA) first proposed a Global Analysis and Information Network (GAIN) in May 1996 for the worldwide collection, analysis, and dissemination of safety information to help the aviation community reach the goal of zero accidents. GAIN was envisioned by the FAA as a

privately owned and operated international information infrastructure that would use a broad variety of worldwide aviation data sources together with comprehensive analytical techniques to assist in identifying emerging safety concerns.

As the aviation community exchanged ideas on the GAIN concept over the first 2 ½ years after its announcement, a variety of descriptions were applied to GAIN by various segments of the aviation community. The GAIN Steering Committee considered various comments and recommendations on GAIN and agreed upon the following description of GAIN in January 1999:

"GAIN promotes and facilitates the voluntary collection and sharing of safety information by and among users in the international aviation community to improve safety."

The Steering Committee also changed the meaning of the GAIN acronym to " Global Aviation Information Network" to better define the program.

The GAIN organization consists of the Steering Committee, Working Groups, Program Office, and a planned Government Support Team.

The **Steering Committee** consists of industry stakeholders (airlines, manufacturers, employee groups and their trade associations) that set high-level GAIN policy, issue charters to direct the Working Groups, and guide the Program Office. Represented on the GAIN Steering Committee are Airbus Industrie, Air France, Air Line Pilots Association (ALPA), Air Transport Association (ATA), Boeing Commercial Airplane Group, British Airways, Continental Airlines, Flight Safety Foundation, International Association of Machinists (IAM), Japan Airlines, National Air Traffic Controller Association (NATCA), National Business Aviation Association (NBAA), Northwest Airlines, and the U.S. military. The Steering Committee meets on a quarterly basis.

The **Executive Committee** is comprised of several Steering Committee members and acts on behalf of the whole Steering Committee on administrative matters or as directed.

The **Working Groups** are interdisciplinary industry/government teams that work GAIN issues in a largely autonomous fashion, within the charters established for them by the Steering Committee. Working Groups are listed below in paragraph 16.1.2.

The **Program Office** administers GAIN and supports the Steering Committee, Working Groups, and the Government Support Team by communicating with GAIN participants, planning meetings and conferences, preparing meeting minutes, and other tasks.

  A **Government Support Team** (GST) is planned, which will include representatives of government regulatory authorities from various countries plus related international groups. The GST will provide assistance to airlines and air traffic organizations in developing or improving safety reporting systems and sharing safety information.

16.1.1 The 1999 GAIN Action Plan

Acknowledging that the groundwork had been laid at the Long Beach conference, the GAIN Steering Committee unanimously agreed at their January 1999 meeting that the time had come to begin implementing the global sharing of safety information. After reviewing a compilation of comments and recommendations made by GAIN participants, the Steering Committee developed a 1999 GAIN Action Plan addressing the following areas:

- Increase global awareness of and support for GAIN
- Increase participation from the international aviation community to continue the expansion of GAIN
- Influence the reduction of organizational, regulatory, civil litigation, criminal sanction, and public disclosure impediments to voluntary, non-punitive collecting and sharing of safety information

- Promote the initiation of additional internal safety data collection and analysis programs, with the help of GAIN partners
- Support expansion of existing sharing among users
- Promote development and use of analytical methods and tools
- Plan next GAIN conference to continue development and assess progress.

16.1.2 GAIN Working Groups

The Steering Committee established four GAIN Working Groups (WGs) to assist the Steering Committee in implementing the 1999 GAIN Action Plan, and developed charters to define the responsibilities of each working group. Brief descriptions of the Working Groups are provided below.

WG A: Aviation Operator Safety Practices - This group will develop products to help operators obtain information on starting, improving, or expanding their internal aviation safety programs. The products should include commonly accepted standards and best operating practices, methods, procedures, tools and guidelines for use by safety managers. The group will identify currently available materials that support the development of these products. These materials could include sample safety reporting forms, computer programs for tracking safety reports, suggested procedures, manuals, and other information to help operators start or improve programs without "reinventing the wheel." The working group will then develop products that safety officers can use to implement programs to collect, analyze, and share aviation safety information.

WG B: Analytical Methods and Tools - The group will: (a) identify and increase awareness of existing analytical methods and tools; (b) solicit requirements for additional analytical methods and tools from the aviation community; and (c) promote the use of existing methods and tools as well as the development of new ones. The group will endeavor to address various types of safety data and information (including voluntary reports and digitally derived aircraft and ATC system safety performance data). They will also benchmark or validate to the extent possible the usefulness and usability of the tools and level of proficiency needed as a guide for potential users, identify data needs where required for use of tools, and transfer knowledge about methods and tools to users.

WG C: Global Information Sharing Prototypes - This group will develop prototypes to begin global sharing of aviation safety information. These prototypes could include (a) a sharing system capability for automated sharing of safety incident/event reports derived from existing and new safety reporting systems to enhance current sharing activities among airline safety managers; (b) a sharing library containing safety

information "published" by airlines and other aviation organizations; (c) an aviation safety Internet site to encourage use of existing "public" information/data sources.

WG D: Reducing Impediments (Organizational, Regulatory, Civil Litigation, Criminal Sanction, and Risk of Public Disclosure) - This working group will identify and evaluate barriers that prevent the collection and sharing of aviation safety information among various organizations and propose solutions that are reasonable and effective. They will pursue changes in ICAO Annexes to appropriately protect information from accident/incident prevention programs. They will propose means to obtain legislation to protect reporters and providers of safety information. They will promote "jeopardy-free" reporting procedures and create methods to obtain organizational commitment to sharing safety information.

16.2 Flight Operations Quality Assurance Program (FOQA)

The FAA Administrator has announced that the FAA will soon issue a notice of proposed rulemaking on Flight Operations Quality Assurance Programs (FOQA).

"This rule is intended to encourage the voluntary implementation of FOQA by providing assurance that information obtained from such programs cannot be used by the FAA for punitive enforcement purposes,"

FOQA is the voluntary collection, analysis, and sharing of routine flight operation data, obtained by analysis of flight data recorder information. The FOQA program is one of several where the FAA is working in partnership with industry and labor to enhance aviation safety.

The FAA also has a new program where the FAA is working in partnership with industry to use improved methods and technology to detect potential defects in aircraft engines

16.3 Special Safety Studies and Data Analysis

Figure 16.1-1 Example Histogram for Illustrative Purposes Only

AVERAGE VERTICAL SPEED 2000 TO 1000 FT
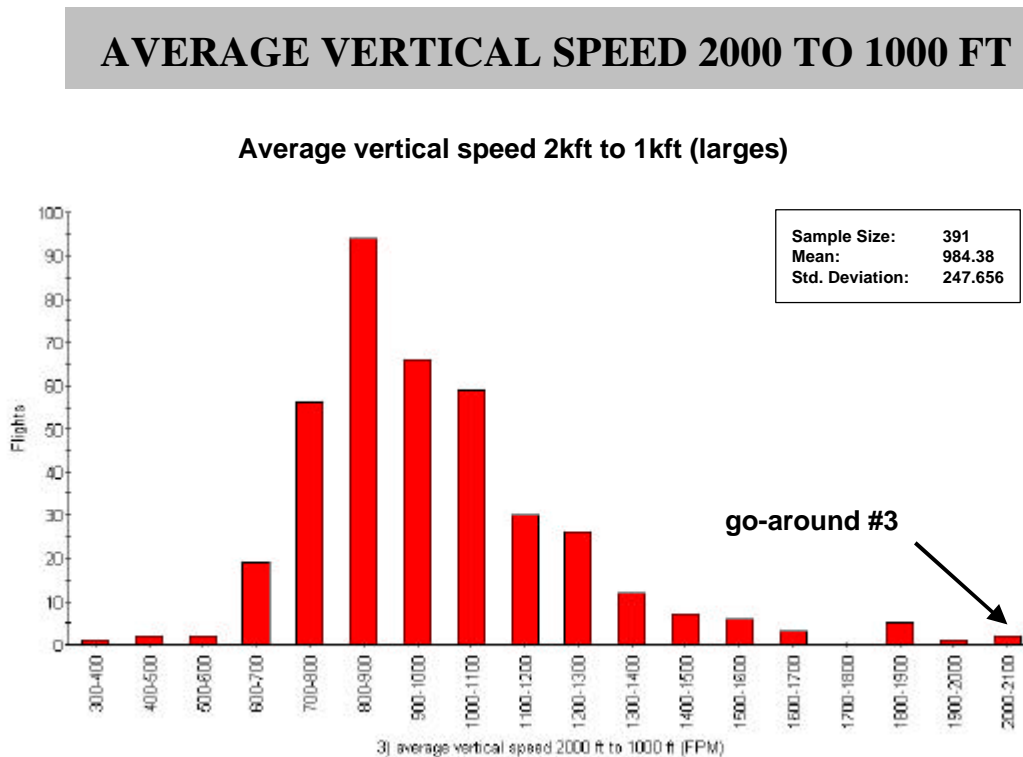
16.3.1 Model Development

FAA, in cooperation with NASA and general industry, is developing models to evaluate aviation data from routine flights in order to identify precursor events that indicate a risk of incidents and accidents. Models are under development by the Office of System Safety, working in conjunction with the System Data and Modeling activity of the NASA Aviation Safety Program (AvSP). The modeling effort is closely related to the Aviation Performance Measurement System (APMS) program, Global Aviation Information Network (GAIN), and Flight Operations Quality Assurance (FOQA) programs. APMS is being developed by NASA to provide technical tools to ease the large-scale implementation of flight data analyses in support of airline FOQA. The GAIN program is designed to promote the sharing of safety information including aircraft flight data, to proactively improve safety.

One of the models under development is the Aircraft Performance Risk Assessment Model (ASPRAM). It has the objective of using empirical data and expert judgment to quantify the risk of incidents and accidents. The general approach is to develop an automated means of analyzing commercial aircraft flight

recorder data from non-accident precursors and their causes. Expert opinion is incorporated into the automated model through the use of knowledge-based rules, which are used to identify precursor events and assess the risk of incidents and accidents.

16.4 Operator's Flight Safety Handbook (OFSH)

The GAIN "Aviation Operator's Safety Practices" Working Group has developed the "Operator's Flight Safety Handbook" (OFSH). Specifically, the international aviation safety community, in coordination with industry and government, worked together to modify the Airbus "Flight Safety Manager's Handbook" to a generic, worldwide product. It is intended to serve as a guide for the creation and operation of a flight safety function within an operator's organization. The operator is encouraged to tailor the document as necessary to be compatible with the philosophy, practices, and procedures of the organization.[1]

Section 1 of the OFSH[2] lists the important elements of an effective safety program:

– Senior management commitment to the company safety program
– Appointment of a Flight Safety Offices reporting directly to the CEO
– Encouragement of a positive safety culture
– Hazard identification and risk management
– Ongoing hazard reporting system
– Safety audits and assessment of quality or compliance
– Accident and incident reporting and investigation
– Documentation
– Immunity-based reporting systems
– Implementation of a Digital Flight Data Recorder information collection agreement with the pilots
– The exchange of valuable "Lessons Learned" with manufacturers and other airlines
– Safety training integration into the organization's training syllabi
– Human Factors training for all personnel
– Emergency response planning
– Regular evaluation and ongoing fine tuning of the program.

Section 2 of the OFSH discusses Organization and Administration. "*A safety programme is essentially a coordinated set of procedures for effectively managing the safety of an operation.*" [3] Management should: specify the company's standards, ensure the everyone knows the standard and accepts them, make sure there is a system in place so that deviations from the standard are recognized, reported, and corrected.

The Company's Policy Manual should contain a signed statement the Chief Executive Officer which specifies the safety culture and commitment in order to give credence and validation.

Section 3 outlines the elements of a Safety Program:

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[1] GAIN Working Group A, "Aviation Operator's Safety Handbook", 3rd Draft Review, March 13-14, 2000.
[2] IBID, GAIN Working Group A.
[3] IBID, GAIN Working Group A

- Safety Objectives
- Flight Safety Committee
- Hazard Reporting
- Immunity-based Reporting
- Compliance and Verification
- Safety Trends Analysis
- FOQA Collection/Analysis
- Dissemination of Flight Safety Information
- Liaison with other Departments

Section 4 is a review of Human Factors issues in aviation. The key points touched on in this section include:

- Human Error
- Ergonomics
- The SHEL Model
- Aim of Human Factors in Aviation
- Safety & Efficiency
- Personality vs. Attitude
- Crew Resource Management

Section 5 discusses the concepts of Incident/Accident Investigation and Reports. Specific definitions of concepts associated with incident/accident investigation is presented. Accident investigation and reporting is also addressed.

Section 6 discusses Emergency Response and Crisis Management. A detailed checklist is provided which provides requirements for a Crisis Management Center.

Section 7 of the AOS handbook discusses Risk Management. The true cost of risk is highlighted as well as risk profiles, decision making and cost/benefit considerations.

Section 8 provides information on external program interfaces, safety practices of contractors, sub-contractors, and other third parties.

The appendices provide additional detailed information, including sample report forms, references, organization and manufacturer information, reviews of analytical methods and tools, sample safety surveys and audits, an overview of the risk management process, and corporate accident response team guidelines.