Aviation Safety Reporting System

Safety Management Seminar

ATEC
January 2011 • Tokyo Japan

Overview

Linda Connell,
NASA ASRS Director
Home of ASRS

ASRS

Ames Research Center

Dryden Flight Research Center

Jet Propulsion Laboratory

Glenn Research Center

Goddard Space Flight Center

Langley Research Center

Marshall Space Flight Center

Johnson Space Center

Kennedy Space Center
Moffett Field - Hangar One
1932
ASRS Background
Aviation Tragedy Leads to Genesis of ASRS

TWA 514, December 1, 1974
ASRS History

• The ensuing investigation revealed that six weeks prior, a United Airlines crew had experienced an identical ATC misunderstanding and narrowly missed the same mountain.

• At the time there was no method of sharing the United pilot’s experience with TWA and other airline operators.

• This gave birth to the idea of a national aviation reporting program that would enable information sharing.

• In April 1976, NASA and FAA implemented the Aviation Safety Reporting System (ASRS)

NTSB Identification: DCA75AZ005
Event Occurrences

ASRS is Complementary to Other Systems of Reporting

ASRS

FAA &
NTSB

{ Fatal Accidents

Precursors

Injury
Accidents

Incidents

Normal Operations

{
FAA and NASA Partnership

MOA signed by Administrators for FAA and NASA

... To provide information to the FAA and the aviation community to assist them in reaching the goal of identifying and eliminating unsafe conditions to prevent accidents.
GUIDING PRINCIPLES

VOLUNTARY PARTICIPATION
Aviation personnel voluntarily submit reports concerning events related to safety for the purpose of system alerting, understanding and learning.

CONFIDENTIALITY PROTECTION
Protection of identity is provided by NASA through de-identification of persons, companies, and any other information.

NON-PUNITIVE
FAA will not use, nor will NASA provide, any report submitted for inclusion under ASRS guidelines or information derived therein for use in any disciplinary or other adverse action.

(14CFR91.25 & Advisory Circular 00-46D)
ASRS Beneficiaries & Providers

**Intergovernmental Partnership**
- NASA
  - Human Factors Data Studies
  - Administrative, Goodwill & Funding
- FAA
  - Funds & Immunity
  - Alerts, SRs, QRs, Studies

**Public/Private Partnership**
- ASRS
  - CALLBACK, SRs, Alerts, Studies
  - Reports & Public Support
- Advisory Subcommittee
- Aviation Community
Governing Documents

- Federal Register Notices 1975 & 1976
- Federal Aviation Regulation - 14 CFR 91.25
- FAA Advisory Circular (00-46A, B, C, & D)
  - Defines immunity provisions for pilots and others
- FAA Facility Operation and Administration Handbook, 7210.3T (Air Traffic Controllers) and new ATSAP MOU
  - Defines immunity provision for Air Traffic Controllers
- FAA Order 8020.10: Aviation Safety Reporting Program
  - Establishes program responsibilities & ASRP Study Group
- Interagency Agreement (signed in 1999 and renewed in 2004 for an additional 5 years)
  - IA details such factors as duration, products, expected funding level, termination clause, points of contact, etc.
U.S. Aviation Statistics *

- FAA Certificated Professionals
  - Pilots: 613,746
    - Air Carrier: 124,746
  - Air Traffic Controllers: 14,305
  - Mechanics: 116,310
    - Air Carrier: 27,020

- Airline
  - Flight Attendants: 98,700

- Potential Aviation Reporters
  - TOTAL(Est.): 850,000

- Flight Volume
  - 60,000 Flights/Day (Air Carrier, Cargo, Military)
  - 27,178 Flights/Day (General Aviation)

ASRS Program Overview and Use of Voluntary Reports
• Averaging 4,082 reports per month, 189 per working day

• Total Report intake for 2009 was 48,986

• 60,000 to 62,000 Reports in 2010
INCIDENT REPORTER DISTRIBUTION
Percentage of Total Intake

January 1993 – December 2009

Air Carrier Reporting  68%
General Aviation      23%

Other  Maintenance  Cabin Crew  Gen Av  Air Carrier  Controller
Report Intake 2001 - 2009
Reporter Groups

20% of all reports are matched to unique events

Decreases evident following September 11, 2001 are showing return to pre-9/11 levels
SEND REPORT ELECTRONICALLY

The Aviation Safety Reporting System (ASRS) has developed a new feature which enables you to securely send an Aviation Safety report via the internet. All ASRS Reporting Forms (General, Air Traffic Control, Maintenance, and Cabin) can be sent electronically. If electronic report submission is unavailable and there is a time issue you may want to download and print the reporting form.

Adobe® Reader® is required for submission and must be configured to open within the browser window. Configuration settings are listed here.

If you experience a certificate warning message, refer to our FAQ for further instructions.

If you want to keep a copy of your report for your own records, be sure to print it BEFORE clicking submit. For your security, the form is designed to clear after submission.

After you submit a report to ASRS online you will be taken to a web page with a verification code concerning your submission. Please retain this verification code for future reference. If you submit a report but do not receive a verification code, contact us immediately.

Download below to fill out & securely submit a form electronically:

- General
  Pilots, Dispatchers, & Airport Personnel
- Air Traffic Control
  Air Traffic Controllers
- Maintenance
  Mechanics
- Cabin
  Cabin Crew
**Reporting Methods**

**Direct-to-ASRS**
- Electronic Submission (ERS) from website
- From website
  - Fill out on computer, print, mail
  - Print, fill out by hand, mail
- Paper Forms
  - Remains a continuing source of reporting
  - Diminishing volume of paper

**ASAP*-to-ASRS**
- Electronic *(secure electronic transfer protocols)*
  - Direct from Airline Program
  - WBAT System or other software
- Paper Forms
  - Continue to be used but being replaced by electronic transfer

*Aviation Safety Action Program at airlines*
ASAP Reporting to ASRS (September 10, 2010)

- **Overall ASAP Intake**
  - 149 Total Programs
  - 59 Air Carriers

- **Reporting Groups**
  - 58 Pilot
  - 37 Mechanic
  - 33 Dispatch
  - 17 Flight Attendant
  - 4 Ground Crew

- **Secure Electronic Data connection protocols between airline and ASRS**
  - 142 Programs
  - 57 Airlines

**ASRS Electronic Transmission Methodology compatible with numerous software platforms**

**More airline programs being added continuously**

**20% of all reports are matched to unique events**
Report Processing Flow

- Mail Pickup
- Date/Time Stamp
- Screening
- Alerting Messages
- Analyst Coding
- Match Multiples
- Telephone Callback
- De-identification
- Quality Check
- Data Entry
- Destruction of Originals

[Diagram showing the steps of report processing flow]
The ASRS Staff is composed of highly experienced pilots, air traffic controllers and mechanics, as well as a management team that possess aviation and human factors experience.

ASRS Analysts' average 35 years of aviation experience is comprised of

• ATC experience: Towers, TRACONs, Centers, and Military Facilities; or
• Over 200 cumulative years of pilot expertise covering the full spectrum of aviation activity: air carrier, corporate, military, and general aviation
  ▪ Analyst cumulative flight time exceeds 100,000 hours in over 50 different aircraft
  ▪ B727, B737, B747, B757, B767, B777, MD-80 series, A320 series, A330 series, L-88, Gulfstream II, III, IV, DH/HS/BAe 125-3A, 600, 700, 800, and other civilian and military aircraft

In addition, the ASRS Staff has human factors and psychology research experience in areas such as crew resource management, training, fatigue, user interface design, usability evaluations, and research methodology.
Incident Reporting Model

Corrective Action

Alerting Messages

Primary Analysis: Special Studies

Input Process

Secondary Analysis: Indexing

Input Data: acquires data

Analysis by Experts

Search Requests

Study & Synthesis

Secondary Analysis: looking for patients

Human Factors

Reporters

Risk Identification

DATABASE

Industry (potential reporters)

Publication of Findings

Research by Experts

LEARNING

Human Factors

Risk Identification

Secondary Analysis: Insights

DATABASE

Feedback: sharing new knowledge

Analysis by Experts

Indexing
WHY CONFIDENTIAL REPORTING WORKS

• When organizations want to learn more about the occurrence of events, the best approach is simply to ask those involved

• People are generally willing to share their knowledge if they are assured:
  ✓ Their identities will remain protected
  ✓ There is no disciplinary or legal consequences

• A properly constructed **confidential, voluntary, non-punitive** reporting system can be used by any person to safely share information
# ASRS Metrics

## April 1976 – December 2009

<table>
<thead>
<tr>
<th>Significant Items</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident Reports Received</td>
<td>Over 868,421</td>
</tr>
<tr>
<td>Safety Alert Messages Issued</td>
<td>5,024</td>
</tr>
<tr>
<td>Search Requests</td>
<td>7,317</td>
</tr>
<tr>
<td><strong>CALLBACK</strong> Safety Bulletins</td>
<td>360</td>
</tr>
<tr>
<td><strong>ASRS Directline</strong> Issues</td>
<td>10</td>
</tr>
<tr>
<td>Major Research Studies</td>
<td>63</td>
</tr>
</tbody>
</table>
Total ASRS Intake

- Direct: 24%
- ASAP: 76%

ASRS Intake – Jan 2010 through Aug 2010
ASRS Intake – Jan 2010 through Aug 2010

ASRS Direct Intake

- Paper: 25%
- Electronic: 75%

ASRS/ASAP Intake

- Paper: 17%
- Electronic: 83%

Currently 86% of reports are received electronically
ASRS Purpose

ALERTS

- Identify Deficiencies and Discrepancies

PRODUCTS

- Provide Data for Planning and Improvements
ASRS Web Site

- Completed Fall 2006
  - Over 7 million hits in 2009
- File an ASRS Report
  - Electronic
  - Print and Mail
- Database Online
- ASRS Publications
- Program Information
- Immunity Policies

http://asrs.arc.nasa.gov
Alert Messages and Monthly Telecons
Safety Alerts

• Types of Safety Alerts
  - Alert Bulletin (AB)
  - For Your Information Notice (FYI)

• Identifying Safety Alert Candidates
  - Expert Analyst review during screening
    - SME knowledge base
  - Downstream identification
    - Occurs after initial screening during regular report processing
    - May result from information obtained in a callback to reporter
• Expert Analysis

- Analysts assigned to sets of reports on basis of expertise

- Analyst contact reporter for more information (attempt 100% contact)

- Analyst reviews pertinent sources of information
  - Aircraft and other manuals, publications, cooperative review with other analysts, etc.
• **Timeliness of Safety Alerts**
  - Relevant reports may be grouped to provide more comprehensive picture
  - Issue may be identified subsequent to screening process by:
    - An emerging industry issue or concern
    - Downstream recognition of pertinent information
    - Information obtained during normal processing of a report
  - Can be accomplished quickly following NASA assessment of confidentiality concerns
    - Recent MD80 flight control issued in 24 hours
Safety Alerts – Alerting Subjects

Messages Issued 2006 – Present

- Aircraft Systems: 421
- Airport Facility Status and Maintenance: 270
- Other: 175
- ATC Procedures: 111
- Airport Lighting and Approach Aids: 86
- ATC Equipment: 63
- ATC Operations: 52
- Hazards to Flight: 35
- Aircraft Powerplants: 24
- Navigation: 22
- Aircraft Avionics: 22
- Security: 4

* 2010 data current through November 16.
Safety Alerts – Addressee Distribution
Messages Issued 2006 – Present

Manufacturer 38%

FAA 37%

Airport 25%

n = 1,285

* 2010 data current through November 16.
## Alerting Metrics

**January 1999 – December 2009**

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
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<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
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<tbody>
<tr>
<td>Alert Messages Issued</td>
<td>78</td>
<td>87</td>
<td>88</td>
<td>61</td>
<td>115</td>
<td>157</td>
<td>79</td>
<td>75</td>
<td>63</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>FYI Notices Issue</td>
<td>75</td>
<td>168</td>
<td>190</td>
<td>151</td>
<td>99</td>
<td>147</td>
<td>129</td>
<td>117</td>
<td>279</td>
<td>235</td>
<td>206</td>
</tr>
<tr>
<td>Response Rate to AB/FYI</td>
<td>35%</td>
<td>26%</td>
<td>24%</td>
<td>25%</td>
<td>28%</td>
<td>36%</td>
<td>32%</td>
<td>35%</td>
<td>49%</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>Response Rate Non-Manufacturer</td>
<td>75%</td>
<td>42%</td>
<td>32%</td>
<td>32%</td>
<td>38%</td>
<td>82%</td>
<td>45%</td>
<td>55%</td>
<td>64%</td>
<td>55%</td>
<td>26%</td>
</tr>
</tbody>
</table>
Alert Responses
1999 – Present

- Action Taken as a Result of AB/FYI: 285
- Action Initiated in Response to AB/FYI; Not Completed: 116
- Action Initiated Before AB/FYI Received: 109
- Issued Raised by AB/FYI Under Investigation: 61
- Addressee in Factual Agreement but Sees No Problem: 57
- For Information Only; No Response Expected: 43
- Addressee Agrees with AB/FYI, but Unable to Resolve: 28

- Addressee Disputes Factual Accuracy of AB/FYI: 175
- Information in AB/FYI Insufficient for Action: 78
- Action not within Addressee's Jurisdiction: 37
Database Search Requests
ASRS Database Search Requests

January 2009 – December 2009

- Database search requests from...
  - Government (FAA, NASA, NTSB, etc)
  - Industry (ALPA, FSF, Manufacturers, etc)
  - Academia

- Automatically conducted for accidents
  - Disseminated to NTSB, FAA, etc.
  - Recent examples
    - A330 Accident at Tripoli International Airport, Libya
    - DHC-8-400 Accident in BUF, NY
    - A320 Hudson River Ditching Accident
    - MD10 and MD11 Autothrottle Incidents – Shanghai, China Accident
ASRS Database Online (DBOL)

- System launched August 23, 2006
  - Over 70,000 total online queries completed to date
  - Over 20,966 queries completed in 2009
- Fixed field and text search capability
- Data formats (export)
  - MS Word, Excel, CSV HTML
- Experts version (DBOL II) being proposed

http://asrs.arc.nasa.gov
ASRS Research and Special Projects
ASRS Research Focused on Operations and Human Factors

- 63 Research Studies and Special Papers Published
  - **Operations**: Deviations, De-Icing/Anti-Icing, Rejected Takeoffs, Clearances, Weather Encounters, Landing Incidents, Runway Transgressions, TCAS II, Crossing Restrictions, etc.
  - **Human Factors**: Communication, Memory, Confusion, Time Pressure, Judgment, Training, Crew Performance, Flight Crew Monitoring, etc.
  - **Confidential Reporting**: ASRS Reporting Model, Case for Confidential Reporting, Development of ASRS, Cross-Industry Applications, etc.

- Research agendas are developed in collaboration with government and industry safety organizations.

- There are over 30 ASRS research papers available for download on the ASRS website, dating from 1985 to date. Activity is ~ 3,300 downloads/month.
ASRS Genesis of Human Factors Research at NASA Ames

1975
- Aviation Safety Reporting System
- Full Mission Sim Study
- Congressional Request

1980
- Crew Factors and Resource Management
- Jetlag Research
- Fatigue Countermeasures Program
- Workload
- Strategic Behavior
- Decision Making

1985
- Vision Science & Technology Enhanced/Synthetic
- Army-NASA Aircrew Aircraft Int (MIDAS)

1990
- FAA, ATA Requests
- ATA HF Task Force
- NASA Focused Tech

1995
- TCAS
- Av. Safety/Auto.
- Datalink
- TAP
- HSR
- AATT
- NASA Focused Tech
- AEB, GAO, ATA
- White House Comp
- Safety
Voluntary, Confidential, Non-Punitive and Independent Safety Reporting Model is Growing in International Aviation
International Civil Aviation Organization (ICAO) has revised Annex 13 - Accident Prevention to be implemented in November 2010. The previous Recommendation for member nations to establish a confidential safety reporting system has been elevated to a Standard.
Safety Management Systems (SMS)
• SMS is a management system for integrating safety activities into normal day-to-day business practices. SMS is assigned to help organizations integrate a systematic risk-based and process-oriented approach to managing safety.
  - SMS requires a proactive approach to discovering and correctly problems before they exhibit safety consequences.
    - SMS is not a substitute for compliance nor oversight.
ICAO Integrated SMS

Mandate

• The development and administration of safety management standards and recommended practices (SARPs)
• Development and administration of safety management training and facilitation activities
• Development and administration of safety management guidance materials
• **Development and administration of an integrated safety trend analysis and reporting system** (iSTAR)
Other Domains
Establishing Safety Improvement Programs Using Confidential Reporting
Confidential Reporting in the U.S Railroad Industry

NASA ASRS and Federal Railroad Administration Interagency Agreement signed on May 21, 2010
Lessons LEARNED, Lessons SHARED:
Near-miss reporting, one year later
We come to the National Fire Fighter Near-Miss Reporting System. The National Fire Fighter Near-Miss Reporting System is a voluntary, confidential, non-punitive and secure reporting system with the goal of improving fire fighter safety.

Submitted reports will be reviewed by fire service professionals. Identifying descriptions are removed to protect your identity. The report is then posted on this website for other fire fighters to use as a learning tool.

Submit a Report

Photos by Jason R. Henske/Fyrfoto.com
SUMMARY
Recent article praises system

- FAA credited for a positive, proactive approach to safety

Proof that government agencies don’t have to act like big-footed oafs. The FAA (and NASA) has a system that allows pilots and air traffic controllers to report problems anonymously. It’s a “Let’s learn, let’s fix it” sort of culture. The goal is to find systemic problems and solve them rather than assign blame. Most errors and mistakes are caught early, and accidents are rare.
Encompasses:

- Risk Assessment
- Risk Mitigation
- Evaluation of Residual Risk
- Risk Acceptance

Confidential Reporting Model Has Specific Contributions to:

Risk Assessment
Nine Steps of Risk Assessment

1) System Characteristics
2) Threat Identification
3) Vulnerability Identification
4) Control Analysis
5) Probability Determination
6) Impact Analysis
7) Risk Determination
8) Control Recommendations
9) Results Documentation
Confidential reporting systems have the means to answer the question *why?* –

why a system failed

why a human erred
Unique Aspects of ASRS

**System-Wide Perspective** - capability to identify hazards identified by aviation personnel and match reports from all segments of aviation community

- ASRS was catalyst for recent FAA focus on Teterboro Departures

**System-Wide Alerting** - both national and international capability to provide ASRS Alert Messages to industry and government

- 2009 Alert Messages concerning 236 safety issues

**Data Processing through Aviation Expert Analysts**

- ASRS Office staff include Aviation Expert Analysts with a combined total of 200 years of experience in aviation (air carrier pilots, corporate pilots, general aviation pilots, air traffic control, and maintenance)

- Experts read and review 100% of reports and reliably code information to databases

**Comprehensive and Time Tested Coding Taxonomy**

- Fixed Field Codes combined with Narrative Text yields qualitative data for further secondary analysis techniques (Perilogan, special studies, focused analytic techniques, etc)
Unique Aspects of ASRS

Strong Immunity and Legal Provisions
- Federal Law specifically addressing ASRS (14 CFR 91.25)
- FAA Advisory Circular 00-46D
- ASRS Mandated by Congress in 1980’s

Information Sharing on Safety/Security
- Database Search Requests, Database Shared with FAA NASDAC, Topical Studies, Structured Telephone Callback Studies, Collaborations with Industry and Gov’t (FAA, NTSB, NASA, TSA, etc.)
- Largest source of ASAP data collected in central location

National and International Reputation
- ASRS Recognized Model for Proactive Contribution to Safety Process
- Int’l Confidential Aviation Safety Systems (ICASS)
- ASRS Model Being Utilized by Other Domains for Safety Improvements
Contact Information

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