

ANALYSIS OF GENERAL AVIATION SINGLE-PILOT IFR
INCIDENT DATA OBTAINED FROM THE NASA AVIATION
SAFETY REPORTING SYSTEM

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An analysis of incident data obtained from the NASA Aviation Safety Reporting System (ASRS) has been made to determine the problem areas in general aviation single-pilot IFR (SPIFR) operations. The Aviation Safety Reporting System data base is a compilation of voluntary reports of incidents from any person who has observed or been involved in an occurrence which was believed to have posed a threat to flight safety. This paper examines only those reported incidents specifically related to general aviation single-pilot IFR operations. The frequency of occurrence of factors related to the incidents was the criterion used to define significant problem areas and, hence, to suggest where research is needed. The data was cataloged into one of five major problem areas: (1) controller judgment and response problems, (2) pilot judgment and response problems, (3) air traffic control (ATC) intrafacility and interfacility conflicts, (4) ATC and pilot communication problems, and (5) IFR-VFR conflicts. The relative significance of each of these problem areas was determined by the number of citations corresponding to each area. In addition, several points common to all or most of the problems were observed and reported. These included human error, communications, procedures and rules, and work load.

The ASRS incident data analyzed in this report is limited to the general aviation operations typically involved in SPIFR. Since no specific category in the ASRS data base relates directly to general aviation SPIFR, the following criteria were chosen in interrogating the data base. All fixed-wing operations under air taxi, charter operations, utility operations, corporate aviation, personal business, pleasure flights, and training flights were selected for the analysis. All rotary wing operations were deleted. Also, only those flights on either an IFR or SVFR flight plan were used. These criteria produced 79 reports out of the total 2174 reports collected during the period from May 1, 1978 (the beginning of ASRS report reformatting) to January 1, 1979. Based on their sources, these 79 reports included pilot reports of flight crew errors (14 reports), ATC reports of flight crew errors (15 reports), pilot reports of ATC errors (16 reports), and ATC reports of ATC errors (34 reports).

FORMULATION OF INCIDENT DATA

ALL FIXED-WING OPERATIONS UNDER AIR TAXI, CHARTER OPERATIONS, UTILITY OPERATIONS, CORPORATE AVIATION, PERSONAL BUSINESS, PLEASURE FLIGHTS, AND TRAINING FLIGHTS ON EITHER AN IFR OR SVFR FLIGHT PLAN

The incident data reports consisted of a synopsis and several categories of factors related to the incidents. These categories included enabling factors, associated factors, descriptors, recovery factors, and supplemental key words. Only two of these, enabling factors and associated factors, were considered relevant to this study and were used in the analysis. An enabling factor is an element that is present in the history of an occurrence and without which the occurrence probably would not have happened. An associated factor is an element that is present in the history of an occurrence and is pertinent to the occurrence under study, but which does not fulfill the requirements of an enabling factor. Examples of both enabling and associated factors are controller perception, intrafacility coordination, pilot discretion, and pilot vigilance.

There were 40 different enabling factors and 58 associated factors listed in the 79 incident reports. The 40 enabling factors were cited a total of 99 times; the 58 associated factors were cited 82 times. (A factor citing is a listing of that factor in the incident report.) These data imply that more than one factor was cited in some of the incident reports.

DATA ANALYSIS CRITERIA

ENABLING FACTOR (40):

AN ELEMENT THAT IS PRESENT IN THE HISTORY OF AN OCCURRENCE AND WITHOUT WHICH THE OCCURRENCE PROBABLY WOULD NOT HAVE HAPPENED.

ASSOCIATED FACTOR (58):

AN ELEMENT THAT IS PRESENT IN HISTORY OF AN OCCURRENCE AND IS PERTINENT TO THE OCCURRENCE UNDER STUDY, BUT WHICH DOES NOT FULFILL THE REQUIREMENTS OF AN ENABLING FACTOR.

EXAMPLES:

- o CONTROLLER PERCEPTION
- o INTRAFACILITY COORDINATION
- o PILOT DISCRETION
- o PILOT VIGILANCE

The ASRS synopsis and various categories assigned to each reported incident were examined by the author to determine the types of problems suggested by the data. This review of the incident reports revealed five major problem areas that were considered to be general aviation SPIFR specific. These problem areas are (1) controller judgment and response problems, (2) pilot judgment and response problems, (3) ATC intrafacility and interfacility conflicts, (4) ATC and pilot communication problems, and (5) IFR-VFR conflicts.

- o CONTROLLER JUDGMENT AND RESPONSE PROBLEMS
- o PILOT JUDGMENT AND RESPONSE PROBLEMS
- o ATC INTRAFACILITY AND INTERFACILITY CONFLICTS
- o ATC AND PILOT COMMUNICATION PROBLEMS
- o IFR-VFR CONFLICTS

The analysis of the data showed that the problem areas could be described by more specific subelements. The "controller judgment and response problems", for example, can be primarily attributed to three elements: (1) excessive/impeding procedural requirements, (2) training/proficiency/experience related mistakes, and (3) equipment operational problems. Similarly, "pilot judgment and response problems" can be attributed primarily to three elements: (1) excessive/impeding procedural requirements, (2) training/proficiency flight infractions, and (3) limitations due to limited avionics. These problem elements can be used to determine the areas that need further research.

- o CONTROLLER JUDGMENT AND RESPONSE PROBLEMS
 - EXCESSIVE/IMPEDING PROCEDURAL REQUIREMENTS
 - TRAINING/PROFICIENCY/EXPERIENCE RELATED MISTAKES
 - EQUIPMENT OPERATIONAL PROBLEMS

- o PILOT JUDGMENT AND RESPONSE PROBLEMS
 - EXCESSIVE/IMPEDING PROCEDURAL REQUIREMENTS
 - TRAINING/PROFICIENCY FLIGHT INFRACTIONS
 - LIMITATIONS DUE TO LIMITED AVIONICS

- o ATC INTRAFACILITY AND INTERFACILITY CONFLICTS
 - INTERNAL COMMUNICATION PROBLEMS
 - HAND-OFF PROBLEMS
 - MIXED DEPARTURE AND ARRIVAL CONFLICTS
 - EQUIPMENT OPERATIONAL PROBLEMS

- o ATC AND PILOT COMMUNICATION PROBLEMS
 - MISUNDERSTANDING OF INSTRUCTIONS
 - FREQUENCY CONGESTION
 - EXCESSIVE FREQUENCY CHANGES
 - EXCESSIVE/IMPEDING PROCEDURAL REQUIREMENTS

- o IFR-VFR CONFLICTS
 - AIRCRAFT PROXIMITY AT BREAKOUT
 - IFR FLIGHT IN VFR AND MVFR CONDITIONS

A review of the problem areas pinpointed several points common to all or most of the problems. These included human error, communications, procedures and rules, and work load.

COMMON DENOMINATOR TO ALL PROBLEM AREAS

- o HUMAN ERROR
- o COMMUNICATIONS
- o PROCEDURES AND RULES
- o WORK LOAD

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