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Preoccupation and Distraction of Pilot Identified in Delayed Recognition of Lost-communication Events

Approach and landing phases of flight accounted for the largest percentage of incidents, and low time in type correlated with a higher number of occurrences.

Capt. Charles R. Drew, Andrew D. Scott, Robert D. Matchette

Battelle Memorial Institute, using data from the U.S. National Aeronautics and Space Administration (NASA) Aviation Safety Reporting System (ASRS), launched a study about how loss of communication (also called lost communication), between aircrews and air traffic control or other ground-based stations, could be detected and could be corrected. Moreover, the early detection of lost communication would likely reduce the associated risks.

The report, *Delayed Pilot Recognition in Lost-communication Events*, was based on data from an earlier Battelle study report, *Inability to Communicate on Frequency*, which examined the causes and the effects of lost communication. The earlier report defined lost communication as "stuck mikes," aircraft/facility radio problems and misset radio equipment.

Of the 200 ASRS incident reports that were reviewed for the earlier study, all contained some degreee of information about the relative length of the communication interruption and the associated human factors issues. Nevertheless, examination of the human factors involved in the lost communication was beyond the scope of the earlier study.

The more recent study aimed to:

- Relate the causes and results of lost-communication events to the flight phases in which these events occur;
- Examine how the individual pilot causes or contributes to lost-communication incidents;
- Identify the environmental factors influencing human performance in these events;
- Examine how the individual pilot can detect and resolve these problems; and,
- Suggest how event recognition and correction can be facilitated.

The study was limited to ASRS reports that provided evidence of some delay in pilot recognition of lost communication. There was no restriction on type of operation or aircraft, so records included a range from light single-engine general aviation aircraft to the largest widebody air carrier types.

The 200 records that comprised the earlier study were extracted from a review set of approximately 450 ASRS reports. These 200 records were subjected to additional analysis for the latest study. Of the 200 original reports, 128 records contained evidence of delayed pilot recognition in lost-communication events.

A coding instrument was developed to extract required information from the available reports, and data from the original study were also available for cross-tabulation. The coding form, in addition to recording previously extracted and analyzed information, asked the following questions:

- What were the pilot's/flight crew's qualifications and flight times?
- In what phase of flight did the loss of communication occur?
- Was there an apparent delay in pilot/flight crew recognition of the lost communication?
- How did the pilot/flight crew indicate that they had recognized the loss of communication?

Development of the coding form required two iterations; a trial coding effort was undertaken to validate the coding instrument. Because the study used previously analyzed reports and there were few new questions, a single inter-rater reliability test was conducted to ensure coder accuracy.

Table 1 shows that the primary reporters in the 128 records were about evenly divided between air carrier pilots and general aviation pilots. Of the three reports by air traffic controllers, two contained sufficient information for coding, while one record included secondary reports from air carrier pilots. The type of operation was also about evenly split between air carrier and general aviation. The two military reports referred to transport-type operations, and are therefore most similar to air carrier reports.

Figure 1 (page 3) correlates operational phase with type of operation. The phase of flight in which incidents occurred was examined separately for air carrier operations and general aviation operations. For air carrier operations, the largest number of incidents occurred in the cruise phase (27 of 66 citations,[1] 41 percent). For general aviation operations, the largest number of events occurred in the combined approach (18 of 60 citations) and landing phase (14 of 60 citations), more than 50 percent of all events.

When all operational types were considered (air carrier, general aviation and military), delay in lost-communication recognition while in the cruise phase was evidenced in 45 of 128 records (35 percent). The approach phase accounted for 36 occurrences (28 percent), and the landing phase was cited in 17 (13 percent) of reports. The combined approach and landing phase accounted for 53 of 128 citations (41 percent).

Table 2 (page 3) illustrates the range of human factors associated with delay in lost-communication recognition. Preoccupation or distraction in high-workload situations was cited as a behavioral factor in 94 of 160 citations (59 percent). Preoccupation or distraction was cited in 73 percent of records in the data set. At the opposite end of the attention spectrum, loss of awareness or lowered levels of awareness was noted in 50 of 160 citations (31 percent).

Where preoccupation or distraction was evident in high-workload situations, flawed operational procedure occurred in 52 of 94 citations (27 percent), a high-workload flight phase was noted in 45 citations (23 percent) and preoccupation with normal operational procedure was found in 29 citations (15 percent).

In the "loss of awareness or lowered levels of awareness" classification, a low-workload flight phase was cited as contributory in 31 of 59 citations (53 percent). Fatigue or boredom was cited by a reporter in only four citations.

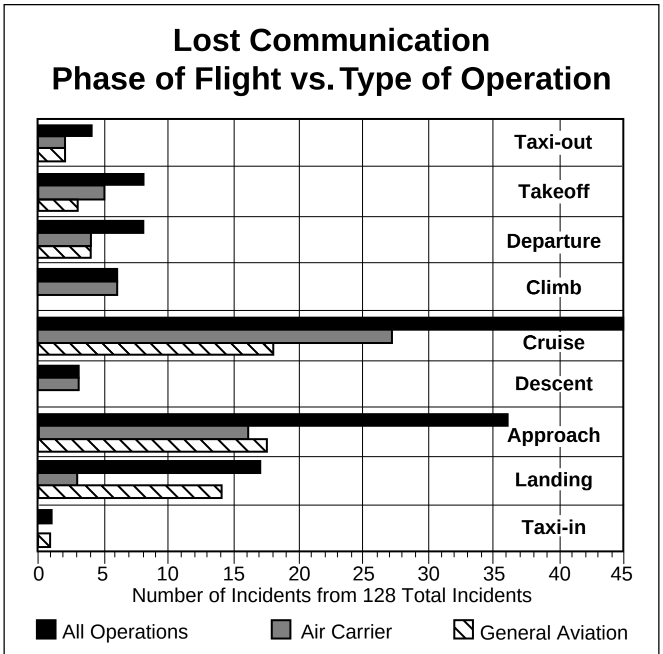
Table 3 (page 4) provides a breakdown of reasons for communication-loss detection. The most common reason for discovery by pilots of a communications interruption was a subsequent normal attempt to communicate (53 of 196 citations, 27 percent). An unexpected event, such as an unanticipated call from air traffic control (ATC) on another frequency or through company frequencies, was cited as the occasion for recovery of communications in 29 citations.

That air carrier pilots should experience the majority of events in the cruise phase is not surprising. An air carrier aircraft spends more time in cruise than in other flight phases, perhaps more than all other flight phases combined. In addition, on long distance routes, it is generally accepted that air carrier flight crews' attention is significantly lowered because of reduced ATC communication and less stimulation from cockpit management duties. General aviation pilots generally spend less time in cruise than do air carrier flight crews. With significantly less cockpit automation and usually engaged in a single-pilot operation, a general aviation pilot may devote greater attention to positional situational awareness.

Table 1
Reporter and Type of Operation for Lost-communication Study
(Based on 128 Reports)

Reporter	Number of Reports	Percentage of Data Set	Operation	Number of Reports	Percentage of Data Set
Air Carrier	64	50.0%	Air Carrier	66	51.5%
General Aviation	59	46.1	General Aviation	60	46.9
Military	2	1.6	Military	2	1.6
Air Traffic Controller	3	2.3			
Totals	**128**	**100.0%**	**Totals**	**128**	**100.0%**

Source: Battelle Memorial Institute/National Aeronautics and Space Adminstration, Aviation Safety Reporting System



Source: Battelle Memorial Institute/National Aeronautics and Space Adminstration, Aviation Safety Reporting System

Figure 1

Event occurrence in the combined approach and landing phase illustrates other differences between general aviation and air carrier operations. Air carrier operations, with two or more pilots, provide for task sharing and division of labor. A single general aviation pilot on an instrument approach and landing, with fewer and less sophisticated system and navigational devices, and often less experience, has a typically higher workload than his airline counterpart. It is no suprise that general aviation operations show higher event frequency in approach and landing phase than in other flight regimes, and greater event frequency than for air carrier flight crews.

The approach and landing phase demonstrates different human factors in delayed event recognition than does the cruise phase. In the approach and landing phase, preoccupation or distraction in high-workload situations is cited in 48 of 53 events. In contrast, the predominant behavior noted in cruise phase incidents is loss of awareness or lowered levels of awareness.

The following conclusions and recommendations can be drawn from this study:

- **Time in type.** Opportunity for delayed recognition of lost-communication increases when pilot experience in the aircraft type is low. Continued emphasis on the value of situational awareness and adequate instruction in aircraft systems and performance are important, but this study's statistics on air carrier incidents emphasize that high numbers of pilot flight hours are no guarantee of perfection.

- **Controller intervention.** Controller intervention through use of company or Aeronautical Radio Inc. (ARINC) frequencies is effective.

- **Intervention strategies in approach and landing.** Where high cockpit workloads contribute to loss of communication such as during approach and landing, adherence to cockpit disciplines (such as the sterile cockpit) and maintenance of positional awareness should reduce delays in lost-communication recognition.

- **Intervention strategies in cruise.** Review of pertinent records indicates that in the cruise phase, notable for a low-workload environment and where ATC communication is minimal, pilot recognition of interrupted communication may be facilitated by constant situational and positional awareness. For high-altitude flight, noting the location of air route traffic control center facility boundaries marked on charts should alert pilots to required hand-offs.

- **General considerations for incident avoidance.** In some instances, regardless of the type of operation or aircraft, pilots had difficulty returning to an original frequency if there was an error in selection or clearance to a new frequency. A simple and effective aid for pilots is to write down assigned frequencies; should a loss of communication occur at the point of a frequency change, the pilot may easily return to the previous frequency. ♦

Table 2

Human Factors Associated with Delay in Recognition of Lost Communication

(Based on 160 Citations from 128 Reports)

Behavior	Number of Citations	Percentage of Citations	Percentage of Data Set
Preoccupation or distraction in high-workload situations	94	58.8%	73.4%
Loss of awareness or lowered levels of awareness	50	31.3	39.1
Other miscellaneous factors	14	8.8	10.9
Subtle incapacitation	1	0.6	0.8
Not stated	1	0.6	0.8
Totals	**160**	**100.0%**	**125.0%**

Source: Battelle Memorial Institute/National Aeronautics and Space Adminstration, Aviation Safety Reporting System

Table 3
Detection of Lost Communication
(Based on 196 Citations from 128 Reports)

Reason for Detection	Number of Citations	Percentage of Citations	Percentage of Data Set
Subsequent normal attempt to communicate	53	27.0%	41.4%
Contact on another frequency by controlling ATC facility, ARINC, company	29	14.8	22.7
Expected communication from ATC did not occur	20	10.2	15.6
Post-event discussion with ATC, another pilot, or other such as FSS	20	10.2	15.6
Became aware of passage of time with no communication	17	8.7	13.3
"Quiet" on the frequency—Lack of radio chatter where expected	17	8.7	13.3
External intervention by another ATC facility or aircraft	16	8.2	12.5
Cockpit monitoring duties and/or scan revealed misset radio equipment	9	4.6	7.0
Other, not stated, ambiguous	15	7.7	11.7
Totals	**196**	**100.0%**	**153.1%**

Source: Battelle Memorial Institute/National Aeronautics and Space Adminstration, Aviation Safety Reporting System

Editorial note: This article was adapted from *Delayed Pilot Recognition in Lost-communication Events*, Battelle Memorial Institute, U.S. National Aeronautics and Space Administration, Aviation Safety Reporting System, May 1993.

Reference

1. Many categories allow for multiple responses (citations), thus there may be more citations than records in the data set.

About the Authors

Capt. Charles R. Drew's 18 years of aviation experience includes more than 8,000 flight hours, with about 4,000 hours in domestic, international and overwater corporate operations.

Capt. Drew is an aviation safety research scientist with Trans Air Safety Systems Inc. and editor of ASRS Directline, *a safety digest.*

Andrew D. Scott administers the ASRS data base and analyzes computer hardware and software needs for the program. He has provided analytical support for several major ASRS research investigations besides the one described here, including a study of advanced cockpit training issues and a study of minimum equipment list safety issues.

Robert D. Matchette is an aviation safety analyst for Aerobase Research Inc. His more than 4,000 flight hours includes time as second officer on Boeing 727-200s for USAir and as first officer on Metroliner IIIs for Wings West/American Eagle.

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