CALLBACK

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Monitoring and Flying — A Balancing Act

On the back page of this CALLBACK issue, we summarize several ASRS research papers recently presented at the Ohio State University's Ninth International Aviation Psychology Symposium. One of these, a study of ASRS reports related to inadequate flight crew monitoring, showed that Flight Management System programming was the task most often being performed when a monitoring error occurred. A First Officer's report points out the difficulty that pilots of "glass cockpit" aircraft may have balancing monitoring and programming duties.

■ *Problem arose when the autopilot didn't level off at FL240. It was discovered when the 'ALT' warning sounded passing FL236. Switched to manual control and returned aircraft to FL240. Contributing factors: Vectored off-course for spacing on arrival, and after Flight Management Annunciator (FMA) displayed 'ALT CAP,' I diverted my attention to constructing a new descent profile into FMS...It is very easy to put too much confidence in aircraft automation, resulting in lack of proper monitoring during events such as level-offs and course intercepts. It is important to always find the proper balance for using/not using automation and programming it.*

Another report from the ASRS study shows that pilots can still fall into monitoring "traps" in spite of extensive experience and thorough knowledge of the FMC.

■ *We were descending on the arrival into ABC airport with a clearance to cross fix at 13,000 feet. The FMS was properly programmed with the arrival and altitude over fix. LNAV and VNAV were engaged, and the aircraft was descending properly. (The altitude crossing restriction was projected to be 13,000 feet by the computer.) As a line check airman doing Initial Operating Experience (IOE) with a new Captain, we began to discuss the LDA 'A' approach (we were at FL240 at the time) because it is very important for new Captains to know the FMC thoroughly...During this discussion neither of us was watching the aircraft very well because of our interest in the approach and because the aircraft was engaged in VNAV. Just past the fix, our discussion ended and our attention went back to the aircraft situation as we anticipated flight below 10,000 feet and the checklists. Much to our amazement, we were descending to 13,000 feet from 17,000 feet. We had missed the crossing restriction by over 4,000 feet! The computer was still in VNAV and LNAV with appropriate annunciations on the FMA.*

I immediately knew what had happened. The [aircraft] FMC deletes crossing altitudes on Standard Terminal Arrival Routes (STARs) whenever a runway is changed or a different approach is selected at destination. We had given the computer a hard crossing altitude, but...during our discussion we had reselected the Runway 22 ILS and the computer automatically deselected and disregarded our hard crossing altitude ...I constantly warn new pilots about this trap in the FMC. It had now caught me.

Our reporter concludes, "*This incident reinforces the requirement that someone must be flying the plane!*"

"CRM Strikes Again"

Two reports address the more general topic of Crew Resource Management (CRM). An air carrier Captain describes how CRM skills came into play while the aircraft was still on the ground.

■ *I noticed a strong [fuel] odor down the jetway and throughout the aircraft cabin. Explanation from ground personnel ranged from conditioned air to bug spray. Since I could not substantiate the bug-spray theory, I elected not to accept the aircraft. We had a [write-up] on the auxiliary fuel tank, which on investigation had an internal fuel leak. Apparently the fueler pumped fuel into the tank by mistake without telling anyone. The strongly-voiced concern from the cabin crew significantly contributed to the safe conclusion of this incident. CRM strikes again.*

Another Captain, faced with what appeared to be an in-flight engine fire, applied CRM skills to make use of all on-board personnel to cope with the emergency.

■ *During cruise, we got a #1 engine overheat light...then it went out. [Later], the light came back on, followed by a fire loop fault light. We got clearance to divert to the nearest airport. While completing the emergency checklists, we got a #1 engine fire light and bell. We declared an emergency and fired both extinguisher bottles. We landed without further problems. The fire trucks reported no evidence of smoke or fire, and [later] the mechanics confirmed a short-circuit in the #1 engine fire detection system.*

I had the co-pilot fly while I got hold of company. We had a jumpseat pilot...who made an announcement to the passengers, after which he handled ATC communications. I completed checklists, kept an eye on aircraft position, and talked to the lead flight attendant. CRM can take full credit for the uneventful completion of this flight.

ASRS Recently Issued Alerts On...
In-flight engine cowling separation on a PA-31
Communications blind spot at a North Carolina airport
B-757 EFIS failure attributed to a generator malfunction
Unclear "hold short" lines on a taxiway at an Ohio airport
Static electricity causing power outages at an ATC Tower

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July 1997 Report Intake	
Air Carrier Pilots	2051
General Aviation Pilots	762
Controllers	113
Cabin/Mechanics/Military/Other	64
TOTAL	**2990**

ASRS Research Snapshots

Editor's Note: **In May 1997 ASRS presented several research papers at The Ohio State University's Ninth International Aviation Psychology Symposium. Brief summaries of two of the papers are presented below.**

❶ What ASRS Data Tell About Inadequate Flight Crew Monitoring

Inadequate flight crew monitoring has been recognized as a safety problem by a number of aviation organizations. In independent accident studies conducted in 1994, both the International Civil Aviation Organization (ICAO) and the National Transportation Safety Board (NTSB) found that monitoring failures contributed to a large number of the accidents under review. Monitoring is also a relatively neglected subject in Crew Resource Management (CRM) courses, which usually offer few procedures or guidelines to enhance flight crew monitoring.

This study analyzed 200 ASRS air carrier reports to identify factors that contribute to monitoring errors, and to offer operationally-oriented approaches aimed at improving crew monitoring. Several patterns emerged.

Three-fourths of the monitoring errors were initiated when the aircraft was in some "vertical" flight mode—climb, cruise-descent transition, descent, or approach. FMS programming was most frequently the task being performed when the monitoring error occurred. Flight crews and ATC were far more likely to detect the monitoring errors than were onboard alerting systems, such as altitude alerters and Ground Proximity Warning Systems (GPWS).

The paper translates research findings into operational approaches that may help prevent monitoring errors. The authors note that an air carrier's automation philosophy can either support, or conflict with, the monitoring function. As an example of the latter, some air carriers require that one pilot be exclusively dedicated to monitoring *and* controlling the aircraft, regardless of the level of automation. Several alternatives to this common practice are discussed, and suggestions are also offered for enhancing crews' monitoring effectiveness on long-range flights.

❷ Communications-Related Incidents in General Aviation Dual Flight Training

A recent survey of the ASRS database revealed that one third of all incidents involving General Aviation (GA) aircraft also involved a reported communications-related difficulty, such as failure to comply with an ATC clearance or a communications equipment malfunction. Other research based on accident data and pilot interviews has raised the question of whether communications deficiencies contribute to incidents, accidents, and fatalities during dual instruction.

An analysis was undertaken of 200 ASRS reports that involved GA dual instruction and contained explicit evidence of verbal communications between the instructor and trainee. The main purposes of this research were to identify the operational context in which communications-related incidents occurred during GA dual instruction, as well as the types of problematic communications between instructors and trainees.

The authors found that half or more of the communications-related GA incidents occurred within the airport environs or airspace, within 10 nautical miles of the airport, at altitudes less than 1,000 feet AGL. Ongoing communications with control towers were a prominent element of both surface and airborne incidents. Analysis of instructor/trainee communications revealed that trainees delayed actions or acted inappropriately because instructors made confusing or misleading comments, misinterpreted trainees' comments, or delayed feedback. More than three-fourths of all the study incidents resulted in an ATC clearance violation or a related infraction, such as a runway incursion or ground conflict.

Drawing from study findings, the authors offer practical suggestions to enhance safety and prevent ATC clearance violations during dual flight instruction.

ASRS Request Form

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Please send me the following ASRS papers (Check selection below):

◯ ***What ASRS Data Tell About Inadequate Flight Crew Monitoring***

◯ ***Communications-Related Incidents in GA Dual Flight Training***