CALLBACK ASRS

From NASA's Aviation Safety Reporting System

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Fuelish Thoughts for Weather-Wise Pilots

As summer drifts into fall, weather patterns become unsettled in many areas of the country, and unforecast storms may suddenly appear. Pilots may be required to deviate well off intended routes, and this in turn may cause carefully planned fuel reserves to vanish. Add an additional delay for holding, and a pilot's options can become limited, as this commuter Captain reports:

■ *The forecast for ABC indicated no alternate was needed. As we approached the area, [we received vectors for] deviating around thunderstorms. ABC Approach advised that no one was getting into ABC due to the thunderstorm activity...[but] hopefully in 15 minutes, Approach would be able to accommodate arrivals. I told Approach that we had "Minimum Fuel" and could only accept a short delay...and needed to land as soon as conditions improved.*

After about 10 minutes, I told the controller that we needed [a circling approach] for runway 20. As we were being vectored, the right low fuel warning light illuminated. On final approach, the controller stated that visibility was going down rapidly and it would be difficult to land on runway 20. I told the First Officer to declare an emergency because we had to land...due to low visibility [for runway 20], regardless of the tailwind component... We landed with about 450 lbs. total fuel.

Both the Air Traffic Control Handbook and the AIM explain that a minimum fuel advisory is just that: *an advisory*. It does not indicate an emergency situation or imply a need for traffic priority. In order to receive traffic priority, pilots should declare an emergency.

Even when an alternate has been determined, plans may still have to be changed, creating an additional demand on fuel supplies. An air carrier crew thought they had planned for all contingencies, but still were caught short.

■ *We departed…allowing 3,500 lbs fuel for our alternate and 2,500 lbs for holding. Upon our arrival at the XYZ area, a line of thunderstorms had moved directly over the area, including over XYZ airport. We deviated around the weather… We decided to divert to ABC instead of our original alternate, because weather at the original had deteriorated also. [As we neared ABC], Approach Control told us to get in line with other aircraft, requiring us to go about 80 miles around ABC and back through some storms, and thus leaving us no other options because of low fuel. The Captain said we were fuel critical. So an emergency was declared, and we were vectored for the ILS. We landed with our minimum reserve fuel.*

"Dawn Patrol"

Fast-moving fog—and the well-known "sucker hole" that often accompanies it— surprised another reporter, a helicopter pilot en route to an early morning construction job. Fuel was not a critical issue in this incident, but this is certainly the sort of situation that can lead to fuel exhaustion.

■ *Takeoff was to be at [dawn]. Although I saw there was fog immediately around the airport, it was clear with unrestricted visibility along the route of flight. Knowing my route was clear, I elected a Special VFR departure. As soon as I took off and climbed through a large hole in the clouds, I saw that the weather had changed dramatically and that I was on top of an overcast layer which went for miles in all directions. I also realized that I could no longer return to my departure airport—my hole had disappeared. I had to ask Tower for a radar fix to be certain I didn't violate the nearby Class B airspace, and because I had lost contact with the ground. After deviating several miles out of my way, I found the earth again approximately 10 minutes later.*

I knew better. The marine layer around here has dramatic changes at dawn and dusk. I had seen this before, but never this dramatically. I have made a personal promise to myself…to think twice on "dawn patrol" takeoffs.

"Hands Across the Water"

■ *Our flight was called upon to contact another air carrier that was reported lost. We made contact with the aircraft, and confirmed that they were geographically disoriented and had less than 20 minutes of fuel remaining. Through a radio relay with the controlling agency, the aircraft's position was determined and a vector heading was given to the nearest airport.*

The modest reporting crew can be credited with averting a disaster. Here's the rest of the story obtained from an ASRS callback conversation to the reporters: The crew of a foreign air carrier with over 100 passengers on board, became disoriented on the over-water flight. Since the aircraft was out of radar and communications range of the foreign ATC Center, the reporting crew relayed information between the foreign aircraft and the Center. En route to land, the errant aircraft did run out of fuel, but had enough altitude to glide to a landing just short of the airport. Only minor injuries were reported.

Kudos to the reporting flight crew for a job well done!

ASRS Recently Issued Alerts On...
Gear door hinge failure on a Socata TBM-700
In-flight discharge of a passenger oxygen generator
Recurring ASR-9 radar failures at a Florida TRACON
Cabin smoke from an SA-227's ruptured hydraulic line
False localizer signals on approach to a Mexican airport

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June 1996 Report Intake	
Air Carrier Pilots	1650
General Aviation Pilots	666
Controllers	159
Cabin/Mechanics/Military/Other	27
TOTAL	**2502**

Aircraft à la Modes

Modes represent the different behaviors, or functions, of a given machine system. The more functions a system has, the more modes it has. Many everyday products have multiple modes. For example, an electronic wrist watch has modes for time, alarm, timer, and chronometer, each accessed by a different combination of control inputs. Other examples of multi-modal systems include television remote controls, telephone answering machines, automobile cruise controls, and, of course–the aircraft Flight Management System (FMS).

In both highly automated aircraft systems and simpler consumer products, multiple modes are increasingly "mapped" to fewer controls and displays–sometimes to a single control device. This is one reason that working with an FMS system requires flight crews to have a thorough understanding of the various mode interactions. Control inputs to the FMS must bring about the desired result in the lateral and vertical modes—or mode errors and confusion will result.

An air carrier crew's experience reported to ASRS provides an example:

■ *We were cleared direct to ABC fix and the remainder of the arrival. I started the airplane direct to ABC with the FMS, then inserted the crossing restriction of 10,000 feet on the "legs" page…and selected the arrival for use by the FMS. What I failed to notice was that when I inserted the arrival, the computer dumped the crossing restriction I had inserted just a few moments earlier. Descending through 17,500 feet, Approach Control asked if we would make the crossing restriction, and it was immediately obvious that we would not, as the descent line we were on was no longer using the ABC crossing restriction for computation. The Controller stated that it was not a problem, and…the landing was accomplished without further incident.*

The cause of this incident was…overconfidence in the FMS to present valid descent profile information. Correction: Always double-check the FMS data against other available navigation data to insure that your programming is correct and that the aircraft is following accurate FMS guidance.

A preventive measure for this type of mode error is a line-by-line review of the "legs" page against the clearance and the charts, after any change has been made to the FMS. The reporter also makes a good point about over-dependence on automation. Many other pilots who have reported their "automation woes" to ASRS echo this advice.

***Editor's Note*: Several research papers on the subject of human interaction with automation and modes are available free on written request from the NASA Ames Aviation Operations Branch. Requests should be directed to: AFO Publications Coordinator, Mail Stop 262-4, NASA Ames Research Center, Moffett Field, CA, 94035-1000, and should reference the specific paper numbers and titles of interest, listed below:**

#1 - *"Do You Know What Mode You're In?"* (Anthony Andre and Asaf Degani)

#2 - *"Modes in Automated Cockpits"* (Asaf Degani, Mike Shafto, and Alex Kirlik)

#3 - *"Modes in Human-Automation Interaction"* (Asaf Degani and Alex Kirlik)

Omega: (The Beginning of) The End

The OMEGA navigation system, which uses the VLF (Very Low Frequency) communications band, is operated and maintained by the U.S. Navy. At one time VLF was state-of-the-art technology for long-distance underwater communication with submarines, and many aviators are still using the VLF communication signals in combination with OMEGA navigation signals.

The entire OMEGA system is scheduled for shutdown by the Navy in September 1997. Some airborne OMEGA users were taken by surprise when the Navy recently shut down one VLF station and reassigned its frequency to another station. A charter pilot provides an example of how navigation was affected:

■ *We were below the altitude where we could receive the VOR, so we were navigating solely by OMEGA/VLF. Center informed us we were about 20 degrees off our heading. The next sector informed us we were 20 miles west of our intended course and gave us a heading for our destination. The navigation unit is being sent off to maintenance, because we have had problems of this sort once before.*

The reporter found out later that the problem was not the equipment, but resulted from the Annapolis VLF station being taken off the air and its frequency assigned to the Hawaii VLF. The FAA has recently published a NOTAM regarding deviations associated with VLF navigation.

OMEGA/VLF users should consult the manufacturers of their OMEGA equipment for information on how to avoid navigation errors due to frequency reassignments. In addition, the AIM refers OMEGA/VLF users to the U.S. Coast Guard for a taped status report on OMEGA stations at the following telephone number: 703-313-5906. Additional OMEGA status information can be obtained "live" on a 24-hour basis from Coast Guard Navigation Information Service briefers at 703-313-5900.