

CALLBACK

From NASA's Aviation Safety Reporting System



Issue 412

May 2014

Flight Management Errors à la Mode

Autoflight control modes generally involve interrelated functions of the Flight Management System (FMS), the flight director, the autopilot and autothrottles. The mode logic controlling the combined input of these systems can be very complex. Despite focus on design improvements and training emphasis on flight management modes, ASRS continues to receive a significant number of incident reports on mode related errors. While they usually result in minor “altitude busts” or crossing restrictions not met, mode errors can also lead to more serious outcomes including Controlled Flight Toward Terrain (CFTT).

Some of the more common mode errors seen in ASRS reports include:

- Selection of the wrong mode
- Inadequate knowledge of mode functions
- Undetected automatic mode sequencing
- Failure to monitor for activation of selected mode

The following reports all deal with one or more of these mode errors, but may reference terms and procedures that are unfamiliar. There are system variances among manufacturers and procedural differences among companies. Some aircraft were designed around autoflight systems and others have been retrofitted with various levels of automation. What is common to all of these scenarios, however, is that by using a procedure such as suggested by the acronym CAMI (Confirm, Activate, Monitor, Intervene) and by maintaining situational awareness, mode errors can be recognized before they adversely affect flight safety.

Myth Versus Truth

Failure to notice that the autoflight system has not sequenced to the Approach mode can have serious consequences if the crew is not monitoring other critical information such as altitude above the ground and distance from the runway. In the following report, an ERJ-145 First Officer was quick to recognize a mode discrepancy and prevent a possible “low altitude” event.

■ *Inside the Final Approach Fix... the First Officer noticed that we were below the glideslope. The autopilot was engaged and Approach mode was selected and tracking the localizer, however, unbeknownst to us, the VNAV was in Pitch mode. The First Officer brought this fact to my attention and I added power and began to climb to*

re-intercept the glideslope. At approximately the time I intercepted the glideslope, we broke out in VMC and... performed a visual landing.

Believing the autopilot had captured the ILS correctly, I relied too heavily on automation and failed to keep my scan going.

I must keep in mind that the buttons on the Flight Guidance Controller are myth and what displays on the PFD (Primary Flight Display) is truth. In other words, I can't rely on the aircraft to do what I command by simply pressing a button. I must verify that the plane is doing what I command by seeing what is displayed on the PFD. I must also keep my scan going and not get complacent.

From the First Officer's account of the same incident:

■ *This reemphasized to me to never assume that when you press a button/mode on the Flight Guidance Controller that the airplane will accept that function. You must always verify what the automation is doing on the PFD.*

Wipe Out

By “cleaning up” the FMS after localizer capture, an MD-11 Captain inadvertently wiped out the NAV/LOC mode.

■ *While being vectored to final, ATC gave us a heading with clearance to intercept the localizer course.... The Pilot Flying instructed me to arm the localizer. I responded that we needed to be in NAV before arming the localizer because of the strong overshooting winds (42 knots at 4,000 feet MSL). The Pilot Flying selected NAV and then I armed the localizer for him as he requested a cleanup of the FMS. I saw that NAV/LOC had both armed and went heads down to clean up the FMS. I looked up to see the airplane starting a left-hand turn away from the runway and immediately instructed the Pilot Flying to turn back towards the runway. I also glanced at the PFD and noticed we were now in Heading mode (no NAV or LOC armed/selected). The result was an overshoot of the final approach course. I instructed the Pilot Flying to be aggressive in getting back over to final as we received a follow-on intercept heading from ATC.*

Selecting NAV and then LOC was needed, but the FMS should have been cleaned up prior to selecting these modes. By selecting them first and then cleaning up the FMS, I may have inadvertently put us in Heading mode. Also, the First Officer needed to monitor our lateral mode and be ready

for any reversions or changes to that mode. When the plane attempts to do something we don't want it to do, the Pilot Flying needs to turn the autopilot off immediately and put the airplane in the correct position.

FMS clean up should take place well before the intercept to final and as Pilot Monitoring, I should have been more aggressive in making that happen earlier.

Mismanaged Mode

After an inquiry from ATC, an A320 Captain realized that the Airbus FMC's Managed Descent mode requires proper management in order to start a descent.

■ Center gave us a clearance to descend to FL330 and fly direct to a fix. I pushed the ALT (Altitude) button to descend in Managed Descent mode then typed in the clearance to fly directly to the fix. I then checked the crossing altitude in the FMC for the arrival. Four minutes later ATC called and asked if we were descending.

While on a heading, the A320 will not descend in Managed mode, so the aircraft stayed at FL350. If I would have programmed the FMC first, then pushed the ALT button, the aircraft would have descended in the Managed Descent mode. I also could have pulled the ALT button and descended in Open Descent mode or in the Vertical Speed mode. Our procedure is to check the FMA's once you have made an input to the auto flight system. I did not do this.

"This One Scared Me"

Mode selection is not limited to the Flight Management Computer. In the following report, an air carrier Flight Crew demonstrated why selection of the proper Nav Display mode was a critical item in their localizer approach procedure.

■ Cleared to descend to 2,000 feet, we were turned towards final by Approach Control. [We were] then given another turn to intercept and cleared for LOC 31 approach, maintain 2,000 until QUENE. The final intercept vector was going to bring us well inside QUENE, so I extended off FABRY (FAF), armed the LOC, and switched to ARC mode on my NAV Display to monitor DME in order to identify abeam QUENE, and to monitor LOC capture.

After passing abeam QUENE at 10.3 DME, with LOC capturing and FABRY (FAF) next, I called for the First Officer to set and arm 600 feet which was our MDA, and I initiated descent out of 2,000 feet. It was a busy time now completing final configuration for landing, slowing down, and completing the Landing checklist. I had left ARC mode on my NAV Display. I was not aware that the First Officer was also in ARC

mode, thus neither of us were watching the "football" on the NAV Display which was now our only protection for crossing FABRY at 1,700 feet, the published altitude at the FAF.

On the LOC and descending, we were told to contact Tower. Before Tower contact was made, the First Officer figured it out and said "Hey, we're really low. We need to climb." The altitude was approximately 1100 feet, or 600 feet low, a couple of miles outside FABRY. I realized what I had done and climbed back to 1,700 feet just as we reached FABRY. Tower... issued a low altitude alert. After FABRY a normal descent to landing was made. We were IMC until about 1,100 feet.... We did not get a GPWS warning.

This one scared me. I fully grasp that being that far (600 feet) below a hard altitude on an approach will get you killed in many places. I honestly don't think complacency was our issue. I was not cavalier about this approach and neither was the First Officer. The approach was thoroughly briefed. One thing I did not specify though was who would have what (ARC or MAP) displayed on the NAV Display. We needed both for at least a short while, in order to see DME.

As pilot flying, it was my responsibility to see that I had displayed what I needed to shoot this approach in accordance with our procedures. I made a mistake when I did not go back to MAP mode after passing abeam QUENE. If MAP mode had not been available, then I would have had to set 1,700 feet for FABRY, followed by 600 feet for the MDA after passing FABRY. If MDA is set outside the FAF, then I MUST be in MAP prior to the FAF. I am fortunate to have had a good First Officer who regained situational awareness before I did.

Early Descent

Luckily this MD-11 Flight Crew was in visual conditions when "the airplane" tried to descend early.

■ After being cleared for the ILS...under visual conditions, at some point the aircraft came out of Profile Descent mode or it was deselected. The aircraft descended below the Profile Descent path. At about 12 miles from the field, we elected to level off at approximately 1,500 feet AGL. We had the field visually and...the rest of the approach was flown without issue.

The altitude that was set in the Altitude Select window was the Decision Height. The airplane was trying to descend early to the Decision Height because Profile Descent was not engaged. A better check of the Profile mode would have stopped this from happening. We also should have left the last assigned altitude in the Altitude Select window. This also would have stopped the plane from descending early.

ASRS Alerts Issued in March 2014	
Subject of Alert	No. of Alerts
Aircraft or Aircraft Equipment	7
Airport Facility or Procedure	3
ATC Equipment or Procedure	2
TOTAL	12

412
A Monthly Safety Bulletin from
**The NASA
Aviation Safety
Reporting System**
P.O. Box 189
Moffett Field, CA
94035-0189
<http://asrs.arc.nasa.gov>

March 2014 Report Intake	
Air Carrier/Air Taxi Pilots	4,892
General Aviation Pilots	1,077
Controllers	705
Flight Attendants	318
Mechanics	239
Dispatchers	149
Military/Other	124
TOTAL	7,504