

CALLBACK

From NASA's Aviation Safety Reporting System



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Awareness and Actions a' La Mode

Webster's definition of "mode" as "a particular functioning arrangement or condition" is useful and descriptive in an aviation sense. A specified operating mode in an aircraft system is generally characterized by a unique list of active functions for a named condition, or "mode." Most aircraft systems employ multiple modes of operation, each with distinct functions, to accommodate the wide range of needs that exist in the current operating environment.

Ever-increasing mode complexities dictate that pilots be intimately familiar with a multitude of operating modes and functions. Regardless of which systems are operated, and especially while operating automation that directly controls an aircraft, mode awareness, mode selection, and mode expectation can all present hazards that must be managed. These hazards may be clearly evident, but they are often complex and difficult to perceive.

ASRS has received reports suggesting that pilots may be unaware of a current operating mode or may be unaware of what functions are available in a particular mode. Many pilots have experienced the "What is it doing now?" syndrome at some time or other. Typically, the aircraft is in, or transitions to, a mode that the pilot has not selected. Additionally, the pilot may not have recognized that a transition has occurred. The aircraft then does something autonomously that the pilot does not expect, which usually causes confusion and increases hazard potential.

This month *CALLBACK* shares reports that reveal some mode awareness, mode selection, and mode expectation problems involving aircraft automation that are frequently experienced by the Mode Monitors and Managers in today's aviation environment.

Fast and Furious

On departure, an Air Carrier Captain selected the required navigation mode, but it did not engage. He immediately attempted to correct the condition and subsequently experienced how fast a situation can deteriorate when navigating in the wrong mode.

■ *I was the Captain of the flight from Ronald Reagan Washington National Airport (DCA). During our departure briefing at the gate, we specifically noted that the winds were 170 at 6, and traffic was departing Runway 1. Although the winds favored Runway 19, we acknowledged that they*

were within our limits for a tailwind takeoff on Runway 1. We also noted that windshear advisories were in effect, and we followed required procedure using a no-flex, maximum thrust takeoff. We also briefed the special single engine procedure and the location of [prohibited airspace] P-56. Given the visual [meteorological] conditions of 10 miles visibility, few clouds at 2,000 feet, and scattered clouds at 16,000 feet, our method of compliance was visual reference, and we briefed, "to stay over the river, and at no time cross east of the river."

Taxi out was normal, and we were issued a takeoff clearance [that included the JDUBB One Departure] from Runway 1. At 400 feet AGL, the FO was the Pilot Flying and incorrectly called for HEADING MODE. I was the Pilot Monitoring and responded correctly with "NAV MODE" and selected NAV MODE on the Flight Control Panel. The two lights adjacent to the NAV MODE button illuminated. I referenced my PFD and noticed that the airplane was still in HEADING MODE and that NAV MODE was not armed. Our ground speed was higher than normal due to the tailwind, and we were rapidly approaching the departure course. Again, I reached up and selected NAV MODE, with the same result. I referenced our location on the Multi-Function Display (MFD), and we were exactly over the intended departure course; however, we were still following the flight director incorrectly on runway heading. I said, "Turn left," and shouted, "IMMEDIATELY!" The FO banked into a left turn. I observed the river from the Captain's side window, and we were directly over the river and clear of P-56. I spun the heading bug directly to the first fix, ADAXE, and we proceeded toward ADAXE.

Upon reaching ADAXE, we incorrectly overflew it, and I insisted the FO turn right to rejoin the departure. He turned right, and I said, "You have to follow the white needle," specifically referencing our FMS/GPS navigation. He responded, "I don't have a white needle." He then reached down and turned the Navigation Selector Knob to FMS 2, which gave him proper FMS/GPS navigation. We were able to engage the autopilot at this point and complete the remainder of the JDUBB One Departure. I missed the hand-off to Departure Control, and Tower asked me again to call them, which I did. Before the hand-off to Center, the Departure Controller gave me a phone number to call because of a possible entry into P-56.

Back to Basics

An ERJ-145 Crew failed to detect a change in their vertical navigation mode during descent. When it was eventually discovered, corrective action was taken, but large deviations from the desired flight path may have already compromised safety.

■ *This event occurred while being vectored for a visual approach.... The First Officer (FO) was the Pilot Flying and I was Pilot Monitoring. ATC had given us a heading to fly and a clearance to descend to 3,000 feet. 3,000 was entered into the altitude preselect, was confirmed by both pilots, and a descent was initiated. At about this time, we were also instructed to maintain 180 knots. Sometime later, I noticed that our speed had begun to bleed off considerably, approximately 20 knots, and was still decaying. I immediately grabbed the thrust levers and increased power attempting to regain our airspeed. At about this time, it was noticed that the preselected altitude had never captured and that the Flight Mode Annunciator (FMA) had entered into PITCH MODE at some point. It became apparent that after the aircraft had started its descent,... the altitude preselect (ASEL) mode had changed to pitch and was never noticed by either pilot. Instead of descending, the aircraft had entered a climb at some point, and this was not noticed until an appreciable amount of airspeed decay had occurred. At the time that this event was noticed, the aircraft was approximately 900 feet above its assigned altitude. Shortly after corrective action was begun, ATC queried us about our climbing instead of descending. We replied that we were reversing the climb. The aircraft returned to its assigned altitude, and a visual approach was completed without any further issues.*

[We experienced a] large decrease in indicated airspeed. The event occurred because neither pilot noticed the Flight Mode Annunciator (FMA) entering PITCH MODE. Thrust was added, and then the climb was reversed in order to descend back to our assigned altitude. Both pilots need to reaffirm that their primary duty is to fly and monitor the aircraft at all times, starting with the basics of heading, altitude, airspeed and performance.

“We Must Watch it...Like a Hawk”

A B737 crew was caught off-guard during descent. The threat was real and had been previously known. The crew did not realize that the aircraft’s vertical navigation had reverted to a mode less capable than VNAV PATH.

From the Captain’s Report:

■ *While descending on the DANDD arrival into Denver, we were told to descend via. We re-cruised the current altitude while setting the bottom altitude in the altitude window.*

Somewhere close to DANDD intersection, the aircraft dropped out of its vertical mode, and before we realized it, we descended below the 17,000 foot assigned altitude at DANDD intersection to an altitude of nearly 16,000 feet. At once I kicked off the autopilot and began to climb back to 17,000 feet, which we did before crossing the DANDD intersection. Reviewing the incident, we still don’t know what happened. We had it dialed in, and the vertical mode reverted to CWS PITCH (CWS P).

Since our software is not the best and we have no aural warnings of VNAV SPD or CWS P, alas, we must watch it ever more closely—like a hawk.

From the First Officer’s Report:

■ *It would be nice to have better software—the aircraft constantly goes out of VNAV PATH and into VNAV SPEED for no reason, and sometimes the VNAV disconnects for no reason, like it did to us today.*

“Mode Changes are Insidious”

A B737-800 Captain became distracted while searching for traffic during his approach. Both he and the First Officer missed the FMA mode change indication, which resulted in an altitude deviation in a terminal environment.

From the Captain’s Report:

■ *Arrival into JFK, weather was CAVU. Captain was Pilot Flying, First Officer was Pilot Monitoring. Planned and briefed the visual Runway 13L with the RNAV (RNP) Rwy 13L approach as backup. Approach cleared us direct to ASALT, cross ASALT at 3,000, cleared approach. During the descent we received several calls for a VFR target at our 10 to 12 o’clock position. We never acquired the traffic visually, but we had him on TCAS. Eventually Approach advised, “Traffic no factor, contact Tower.” On contact with Tower, we were cleared to land. Approaching ASALT, I noticed we were approximately 500 feet below the 3,000 foot crossing altitude. Somewhere during the descent while our attention was on the VFR traffic, the plane dropped out of VNAV PATH, and I didn’t catch it. I disconnected the autopilot and returned to 3,000 feet. Once level, I reengaged VNAV and completed the approach with no further problems.*

From the First Officer’s Report:

■ *FMA mode changes are insidious. In clear weather, with your head out of the cockpit clearing for traffic in a high density environment, especially at your home field on a familiar approach, it is easy to miss a mode change. This is a good reminder to keep instruments in your cross check on those relatively few great weather days.*

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November 2017 Report Intake

Air Carrier/Air Taxi Pilots	4,928
General Aviation Pilots	1,174
Controllers	469
Flight Attendants	401
Military/Other	284
Dispatchers	199
Mechanics	144
TOTAL	7,599