CALLBACK

From NASA's Aviation Safety Reporting System

ASRS

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As more General Aviation aircraft are equipped with autopilots, GPS, and glass cockpit displays, ASRS is also hearing more about pilots' "learning curve" with technology that has long been standard in air carrier cockpits. GA pilots increasingly experience equipment-related altitude busts, track deviations, and other incidents. This month we present both GA and air carrier reports that demonstrate the need for pilots to:

- Understand how advanced systems execute commands before using these systems in flight
- Monitor the airplane's flight path when ATC issues clearance changes that require re-programming
- Resist the urge to extensively troubleshoot automation that is not working as expected.

Surprises in the STARS

A GA pilot learned that a GPS had a different plan than ATC for beginning a STAR procedure (Standard Terminal Arrival Route).

■ *After handoff to Approach, I was asked if I could fly the MARCS EIGHT Arrival. I said that I was somewhat new to STARs though I believed I could do it. I programmed the STAR into the GPS and asked the controller what transition I should use. It took a bit of time though he said to use the CWK (Centex VOR). I noticed that I was past that point (approximately 3 nm) though I went ahead and started the STAR. The airplane then began to turn back towards CWK so I could begin the STAR as published...After 30 seconds or so, the controller [asked] why I was turning and that he had other traffic in the area and not to make turns without authorization. I told him that he wanted me to use the MARCS EIGHT with an CWK transition and I was going back to begin the arrival. He then cancelled the STAR and gave radar vectors until handoff to Approach. At no time was I aware that I was doing anything wrong….*

Here's ATC's version of the same incident, from a report submitted to ASRS by an involved controller.

■ *I was working the Radar West sector at Approach Control. There was a Cessna…that needed to be assigned the MARCS EIGHT Arrival. After determining that the pilot could indeed do the arrival, the Cessna was told to proceed with the MARCS EIGHT Arrival…at 6,000 feet from about 3 to 4 miles southwest of the Centex (CWK) VOR. The Cessna was observed to make a turn towards the southwest. At this time I was to be relieved from position and the new controller was plugged into and monitoring the position for the relief briefing. The new controller heard the instruction given but assumed the Cessna was given direct MARCS intersection for the MARCS EIGHT Arrival. I was then relieved from my position. The Radar East controller had just assumed the position and was told about the Cessna… but also assumed the Cessna was going direct to MARCS intersection. The Cessna was not assigned a heading to join the MARCS EIGHT Arrival but was expected to make a southwesterly heading…The Cessna made a southeasterly turn of more than 90 degrees to join and possibly conflicted with a* [corporate jet]*…I feel an assigned heading to join the Arrival would have ensured… separation.*

The pilots of an air carrier Embraer 190 jet experienced a similar track deviation in Canadian airspace when their FMC responded in an unanticipated fashion to a close-in runway change:

■ *…We were originally planning on a Runway 6R approach based on recent experience, even thought ATIS was advertising Runway 5. Both of us agreed to leave Runway 6R programmed until we had a final determination on the runway assignment from the Arrival Controller. Immediately after we switched to Arrival, Runway 5 was assigned and we began setting up for that approach…When I entered the Runway 5 approach into the MCDU* [Multifunction Control Display Unit]*, the aircraft began a right turn as if to return all the way to BUF and re-begin the arrival procedure. At this point, both of us were heads down setting up the approach and didn't notice the undesired turn until queried by the controller. I began an immediate left turn back toward the intended arrival route and we continued on for the Runway 5 approach with radar vectors.* [We] *neglected to verify inputs to the FMC for the new runway (might have remembered that the aircraft would want to return to BUF) and should have put the autopilot in a different lateral mode to keep it on the arrival route. No one was watching the aircraft…While this navigation system's quirk of wanting to go all the way back to the beginning of an arrival procedure because of a runway change is well known, it is still a very illogical and counterintuitive one….*

A B737-800 flight crew missed an altitude constraint on a STAR when the FMC experienced a mode reversion.

■ *Approach cleared us to descend via the SEAVU1 for the ILS to Runway 24R. I was the non-flying pilot and changed the approach in the FMC from the ILS Runway 25L to the ILS Runway 24R. At the time of the change, the aircraft was on autopilot descending VNAV PATH, when the airplane reverted to VNAV SPEED during the runway change. The Captain and I were clarifying the runway change with each other and I was verifying the legs for the transition and approach when I noticed the airplane reverted to VNAV SPEED and descended below the CATAW restriction of 14,000 feet or more. Aircraft descended and crossed CATAW at 13,500 feet. There was no inquiry from ATC nor was there any TA advisory or resolution. VNAV PATH was reengaged and the flight continued without further incident. Automation, when it works well, is a great thing, but it has its pitfalls as well…Both pilots need to monitor any changes to route and verify that the modification has not changed the path as well.*

ASRS Alerts Issued in June 2009

Subject of Alert	No. of Alerts
Aircraft or aircraft equipment	8
Airport facility or procedure	12
ATC equipment or procedures	6
Maintenance procedure	1
TOTAL	**27**

A Monthly Safety Bulletin from

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http://asrs.arc.nasa.gov/

June 2009 Report Intake

Air Carrier/Air Taxi Pilots	2808
General Aviation Pilots	1019
Controllers	45
Cabin/Mechanics/Military/Other	507
TOTAL	**4379**

Programming Distractions

Several GA reports describe how loss of situational awareness can occur when pilots fixate on equipment programming. A GA pilot practicing ILS approaches had a big scare shortly after trying to program an autopilot.

■ *Flying from Airport 1 eastward to rejoin extended localizer to Airport 1, intending to turn north and intercept localizer well before vicinity of Airport 2. Meant to set 2,800 as minimum descent altitude as insurance to avoid Airport 2 Class D ceiling (2,600 feet). Mistakenly set 1,800. Shouldn't have mattered if were paying proper attention since I didn't intend to fly that close to Airport 2 (or that close to the ceiling).*

[I was] *head down in cockpit trying to figure out why a button-pushing sequence was not working per the manual. The manual for this autopilot and associated gear is 530 pages and not exhaustive, at that.*

At some point I realized I was taking too long over this. Turned westward and then noticed:

1. *Almost over Airport 2 airport. Altitude 1,800 feet.*
2. *Sky divers above and to north, lowest maybe 2,300 feet. Closest laterally was perhaps ½ to 1 mile.*

This is the most frightening thing that's ever happened to me in flying. The airspace incursion was the least of it. Had my turn been different, I could have been among the divers with potentially catastrophic results for a diver.

The cause is obvious – task fixation [and] *lack of situational awareness resulted in being where I shouldn't be, and not guarding the local frequency for any potential warning of the skydiving activity.*

It's not that priorities need reordering – we all agree on what they are. It's actually making my behavior match my mental priorities. Not as easy – but a scare like this is awfully effective.

In another incident, a C-172 pilot was unable to complete a practice GPS approach due to an autopilot functionality issue.

■ *I was in contact with Approach Control requesting a practice GPS-B approach. Approach cleared me for the approach and upon established,* [I] *descended to 2,300 feet per the chart…At DECOT intersection, I commanded the autopilot to descend to 1,500. The autopilot descended to 2,000 feet and did not descend any further. I then was looking at my other instruments and then* [was] *asked to contact Tower. At 2.0 miles from MAPVV intersection, I commanded the autopilot to descend to the minimum decision altitude and noticed that the altitude was still 2,000 feet. I re-attempted to command the autopilot to descend, but it did not respond and the autopilot continued to hold 2,000 feet over the field. After approaching MAPVV, Tower issued a descent to 1,500 feet and continue southbound then re-establish contact with Approach.*

I believe there was too much reliance on the autopilot and not recognizing that it may not have been in the right mode (vertical speed) when issuing the descend command. Situational awareness was lost when I was trying to figure out what was wrong with the autopilot.

To correct this situation, I should have disengaged the autopilot and hand-flown the approach upon realizing that I was too high at the 2.0 nm to MAPVV….

Unfamiliar with Aircraft Instrumentation

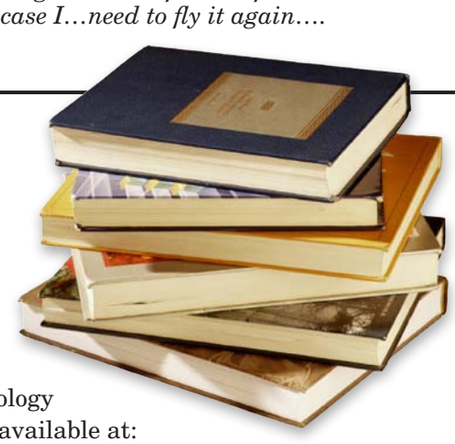
A Cessna 210 pilot felt like a "rank amateur" after borrowing a friend's Beech Debonair – with different navigation instrumentation – for an IFR cross-country flight.

■ *My airplane, a Cessna 210, was in Airport 1 having its engine overhauled. I needed to get to Airport 2. A friend urged me take his impeccably maintained Beech Debonair, in which I had checked out a couple of years prior. It has the same engine and performance as mine, and I was confident I could fly it safely. The weather was beautiful VFR with unlimited ceilings and excellent visibility. It was pretty much a last-minute decision to take the plane, and although I reviewed the manual before the flight, I didn't take much time to re-familiarize with the navigation instruments, including the HSI* [Horizontal Situation Indicator], *VOR nav, GPS, and autopilot. I filed an IFR flight plan to Airport 2. From soon after takeoff, however, I started having difficulty following the Victor airways, and frequently wandered off-course. I realized I wasn't sure which nav radio matched the HSI and the VOR head, couldn't program the GPS en route, and the autopilot didn't help because it would veer off-course upon activation. I was completely comfortable flying the plane – power management, engine management, etc. – but I felt like and flew my course like a rank amateur. I've never had an HSI and it's been too long since I trained on one. In any event, I wandered off-course, overshot a VOR, and possibly busted my altitudes a couple of times…As I got closer to Airport 2 and realized that I just wasn't comfortable enough with the instruments to go into Class B airspace, I tried to find an airport on my charts that would likely have a rental car. None appeared close, and I wandered more while searching my charts. Approach was wonderful and, at my request, called around until they found an airport that could get me a rental car, and diverted me about 40 miles east to Airport 3, where I landed….*

That night, I called an instructor pilot familiar with the plane, and talked about the navigation instruments about 20 minutes. The next morning, after much agonizing, I decided to file an IFR flight plan to Airport 4 rather than to go VFR, and my performance was as day is to night: I followed the Victor airways, successfully utilized the HSI and the VOR/Nav 2, was able to program the GPS successfully and thereby cross-check the accuracy of my course, and made good use of the autopilot, having found that it nav'ed or headed off the HSI, at my election….

My C210 is about ready again, and I look forward to getting back into a plane that I am intimately familiar with. However, the instructor (familiar with the Debonair) and I are going to go out soon for a re-familiarization session, just in case I…need to fly it again….

ASRS Research Studies on the Web!



Did you know…that ASRS has over 30 Research Studies on our website? Topics include: De-Icing/Anti-Icing, Rejected Takeoffs, Clearances, General Aviation Weather Encounters, Landing Incidents, Runway Transgressions, Crossing Restrictions, Communication, Memory, Confusion, Time Pressure, Judgment, Training, Crew Performance, Flight Crew Monitoring, ASRS Cross Industry Applications, etc. A recent study looked at General Aviation Weather Encounters and includes technology related events that are relevant to this *CALLBACK* issue. All studies are available at: **http://asrs.arc.nasa.gov/publications/research.html**