In modern day aircraft, automation is a reality that facilitates procedures and allows precision never before achieved in flight operations. Thorough systems knowledge and keen management skills are required to operate the automation effectively. To that end, the aviation community has proactively educated itself, honed its skills, and created new paradigms. Many improvements have been made, but pilots are human and automation is complex. Automation can clearly improve flight safety, but may also spawn new opportunities to err.

Automation errors may occur in almost any flight regime. Operational programming errors are common. Errors suggesting a lack of knowledge or understanding are less frequently reported. ASRS often receives reports suggesting that aircrews believe their automation is accomplishing a desired task when, in actuality, it is not. As aircrews rely more exclusively on automation, a tendency can arise to place more trust in it than may be prudent. Perhaps the most interesting of the complex automation phenomena reported are of the human factors type. They are central to the complicated relationships existing between situational awareness, judgment, and automation management that quicken the human vulnerability to become lulled into a false sense of security and think that, “the automation has it.”

This month, CALLBACK looks at a small sample of incidents that describe reduced awareness, dependency, overreliance, and management errors that occur with automation. You can see how the incidents developed and can project how they may have concluded had the errors not been discovered.

How Low Should You Go?
This B737 aircrew programmed their automation correctly, but they deviated from standard operating procedure in one important detail that was not of “immediate concern.” Soon thereafter, the distraction of a beautiful day and overreliance on their automation resulted in a significant altitude error.

From the Captain’s report:

- We were cleared to descend via the arrival landing south. As the Pilot Monitoring (PM), I set the lowest altitude on that STAR, which was 6,000 feet, and...then accidentally abrogated my PM duties by not stating, “I’ll set the next lowest altitude of FL220,” as we approached [the altitude restricted fix] in Level Change pitch mode. Already high on the profile and well above crossing restrictions, it wasn’t of immediate concern, but [it was] completely improper procedure on my part. Instead of correcting that, I passed the radios to the First Officer as I took to the [public address (PA) system] to offer a good-bye to our customers.

[After I finished] with the PA, I reported, “Back on number 1 radio,” to the First Officer, who had switched us to Approach but had not yet checked in. I...checked in and reported, “Descending via the...arrival.” I did not refer to the Primary Flight Display (PFD) to check what pitch mode we were in, but the Controller said, “Climb and maintain 10,000 feet.”

We were on a STAR, and this was such an unusual call,... I said, “Say again,” and the Controller unemotionally repeated, “Climb and maintain 10,000 feet.” We complied immediately. By that time I saw that the bottom [altitude] window of the next fix showed 10,000. The Controller then asked, “Why were you down at 6,000 feet?” I said, “My bust,” as there was no excuse for this performance.

I had been relying on the VNAV automation instead of the old fashioned, “Set the next lowest altitude,” which forces both pilots [to be] situationally aware with respect to the profile. I was allured by the pure beauty of a clear Spring day and was obviously much less aware than I needed to be. From the First Officer’s report:

- The Captain set 6,000 feet into the MCP altitude window, and we both verified it against the bottom altitude of the arrival.... The Captain [reported to Approach Control] that we were descending via the arrival. At this point I simply was not looking at our displays and a very short time later, we were told to climb to 10,000 feet from our current altitude of 6,000 feet.... I knew right away that we never got back into VNAV path for protection.

Teetering on the Approach
A Gulfstream Captain, experiencing strong winds during an approach, became fixated on the automation’s correction. He then lost sight of his own situation and the airport.

- During the arrival into Teterboro, we were cleared for the ILS to Runway 6. The Pilot in Command (PIC) let the autopilot drift left of the center line and [I told him] that the airport was in sight at one o’clock. The PIC’s comment was, “Look at how much correction this thing is putting in.”
A Descending STAR

A Gulfstream aircrew was given two runway changes during the arrival, and the automation did not quite lead them down the correct vertical path.

The FMS was programmed with the arrival, and VNAV was selected. All seemed well as we descended to, and crossed, HOMRR at 16,000 feet and 250 knots. However, the next fix, VNNOM, required crossing between 11,000 feet and 10,000 feet. VNNOM is 4.1 nautical miles from HOMRR. Crossing HOMRR at 16,000 feet, we realized that it was almost impossible to lose 5,000 to 6,000 feet in 4.1 nautical miles. At this point I clicked off the automation and pointed the nose down, achieving a descent rate of better than 6,000 feet per minute. Our airspeed increased to 280 knots, and we crossed VNNOM high and fast.

The STAR called for crossing HOMRR at or below 16,000 feet, and the FMS should have been in a position to make the next subsequent fix. Obviously we could have done a better job monitoring the situation. We made, programmed, and verified two runway and approach changes during this descent prior to HOMRR. In fact, the first change went from a landing east flow to a landing west flow. This could actually explain why the FMS logic chose 16,000 feet at HOMRR instead of lower. Landing east on the EAGUL actually explain why the FMS logic chose 16,000 feet at HOMRR instead of lower. From the First Officer’s report:

More Than Meets the Eye

This B737 aircrew trusted their automation to calculate the descent point, but they did not consider the winds. The situation was compounded as a second problem resulted from the action they took to solve the first.

From the First Officer’s report:

Our mistake was overreliance on the automation for planning the descent. We should have double checked that it makes sense with the winds and should have been more aware of speed control when using vertical speed to try to comply with a crossing restriction.