The benefits of cockpit automation in the operation of complex aircraft have been well established. However, incidents continue to occur in which flight crew management of one or more aspects of the automated system is implicated. NASA/ASRS receives several reports each day on anomalies associated with the Flight Management Computer (FMC). The majority of these involve flight crew programming errors or a lack of familiarity with FMC response to certain inputs. In an effort to increase awareness of these errors, all of the reports discussed in this issue of CallBack are related to the most common FMC problems reported to ASRS.

First, Make Comparisons

This B737-800 crew detailed the consequences of failing to compare the flight plan route with the FMC Legs Page(s) data. Their experience was typical of many incidents reported to ASRS in which fixes either were not entered, or were “dropped” by the computer.

When a runway entered in the FMC is changed, the computer may drop out previous altitude restrictions. Changing any portion of a route in the FMC requires that the Legs Page(s) be checked to ensure that each waypoint appears somewhere in the departure. When it was closed, some waypoints were dropped. This is how we got off course... I should have done a more complete check of the First Officer’s programming.

Frequently Missed Crossings

When a runway entered in the FMC is changed, the computer may drop out previous altitude restrictions. Changing any portion of a route in the FMC requires that the Legs Page(s) be checked to ensure that each waypoint and crossing restriction is correct. Two A320 crews and a B757 crew related their experiences to ASRS.

...The crossing restriction for the arrival was inserted into the FMC. The First Officer was flying. I left the ATC frequency to get the ATIS while we were still at cruise altitude... I informed the First Officer of the runway in use. He inserted the new runway in the FMC. Soon thereafter he received the anticipated crossing restriction and started to descend not realizing that the crossing restriction had dropped out of the FMC. The FMC vertical descent path would now be about 2000 feet high. When I came back from getting the ATIS, gate assignment, etc., I saw that we were high, brought it to the First Officer’s attention, and told him to descend as quickly as possible. I believe we were about 600 feet high crossing the fix...

The First Officer had set the bottom altitude of the Alpha Arrival and Runway 25L as the landing runway. The descent profile is built into the Arrival. There was a change in runways to 24R. When the new runway was selected, the descent profile altitude dropped out. We did not catch this. The aircraft was on descent and had reached 12,700 feet MSL when Approach Control called to ask our altitude. This was approximately two miles short of BRAVO Intersection. The BRAVO restriction is at or above 14,000 feet MSL. We stopped at 12,000 feet MSL to meet the next restriction.

On the Alpha Arrival into XXX, we crossed INTXN-1 at 17,000 feet and then got a runway change and a frequency change. We put the new runway in the FMC and it dumped all the arrival waypoints causing us to miss the crossing restriction of 16,000 feet at INTXN-2. [We were] preoccupied with the FMC, the runway assignment and frequency changes, and the FMC dump simultaneously. We did not have good CRM, and we needed to have VOR back up...

ASRS Recently Issued Alerts On...

A Monthly Safety Bulletin from

The Office of the NASA Aviation Safety Reporting System
P.O. Box 189
Moffett Field, CA 94035-0189
http://asrs.arc.nasa.gov/

January 2003 Report Intake

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Failure to Maintain Course

This MD90 crew learned that a runway change on departure can also cause the FMC to drop previously programmed routing.

Our flight was assigned the Alpha 5 Instrument Departure, Bravo Transition. The route was loaded into the FMC and checked...Ground Control changed the assigned runway and the new runway was put into the FMC. Approximately 10 NM south of ABC, Center asked where we were going. The FMC showed us proceeding directly to BRAVO instead of the SID routing. We turned left and intercepted the SID. I am not certain when the departure routing got dropped out of the FMC, but I suspect it was when the assigned runway was changed.

Flight Management Confusion

In this report to ASRS, a B737-300 Captain demonstrated how good airmanship, which includes situational awareness, should be used in conjunction with automation.

A few quotes from the speech-enabled HAL 9000 onboard computer, featured in the Stanley Kubrick film 2001: A Space Odyssey, have been added as a reminder that human monitoring of automated flight systems is still required.

FL250: A Descent Odyssey

HAL: “Good evening... Everything is running smoothly.”

We were at FL250 when Center cleared us to cross 30 miles west of ABC VOR at 17,000 feet. The First Officer was flying on autopilot and dialed in 17,000 feet in the altitude alerter then started programming the FMC for the crossing restriction. I dialed in ABC on my VOR. Realizing that we were fairly close to the idle power descent profile, I mentioned this and selected Level Change. There was no intersection for the crossing point so the First Officer had to build it, which takes time.

HAL: “I feel much better now.”

While all of these reports deal with Airline Crew or ATC Controller issues, the need to maintain situational awareness applies to all pilots. Overreliance on any technology can lead to complacency. As with all aids to flight and navigation, from coupled autopilots to hand-held GPS units, system knowledge and situational awareness are key factors in safe airmanship.