

ALERT BULLETIN

AB 2015:20/3-7

5/29/2015

1251357

TO: Boeing Commercial Airplane Company, FAA (AFS-300)

INFO: FAA (AVP-1, AVP-200, AFS-200, AFS-800, AFS-280, ANM-100, SEA-ACO, SEA-AEG, AQS-230), A4A, ALPA, AMFA, ASAP, ATSG, CAPA, IAM, IATA, ICAO, ICASS, IFALPA, NTSB, PAMA, SWAPA, TWU, USAPA

FROM: Linda J. Connell, Director
NASA Aviation Safety Reporting System

SUBJ: B737-700 Autoflight, IRS, and Flight Instrument Anomalies

We recently received an ASRS report describing a safety concern which may involve your area of operational responsibility. We do not have sufficient details to assess either the factual accuracy or possible gravity of the report. It is our policy to relay the reported information to the appropriate authority for evaluation and any necessary follow-up. We feel you should be aware of the following:

ASRS received a report from a B737-700 flight crew describing anomalies with their autoflight systems. Reporters stated the anomalies were initially noted as erratic indications on the Captain's PFD along with aural alerts. Several other issues arose as the flight progressed, including IRS faults, RNP alerts, and uncommanded rudder inputs. Flight crew returned to departure airport. Post flight feedback from Maintenance Personnel indicated a possible IRS Transfer Switch fault.

To properly assess the usefulness of our alert message service, we would appreciate it if you would take the time to give us your feedback on the value of the information that we have provided. Please contact Dennis Doyle at (408) 541-2831 or email at dennis.j.doyle@nasa.gov



Aviation Safety Reporting System
P.O. Box 189 | Moffett Field, CA | 94035-0189



ACN: 1251357

Time

Date: 201503

Local Time Of Day: 1801-2400

Place

Locale Reference.ATC Facility: ZZZ.ARTCC

State Reference: US

Altitude.MSL.Single Value: 37500

Environment

Flight Conditions: Mixed

Aircraft 1

ATC / Advisory.Center: ZZZ

Make Model Name: B737-700

Person 1

Function.Flight Crew: Captain

Function.Flight Crew: Pilot Flying

ASRS Report Number: 1251357

Person 2

Function.Flight Crew: First Officer

Function.Flight Crew: Pilot Not Flying

ASRS Report Number: 1251596

Events

Anomaly.Aircraft Equipment Problem: Critical

Detector.Automation: Aircraft Other Automation

Detector.Person: Flight Crew

Result.General: Maintenance Action

Result.Flight Crew: FLC Overrode Automation

Result.Flight Crew: Returned To Departure Airport

Result.Flight Crew: Took Evasive Action

Result.Flight Crew: Landed in Emergency Condition

Result.Flight Crew: FLC complied w / Automation / Advisory

Result.Aircraft: Automation Overrode Flight Crew

Narrative 1

Passing through 37,500 for a cruise at flight level 380 the autopilot went into control wheel steering pitch mode. It appeared that the autopilot was not going to level off at the assigned altitude. Both the First Officer (FO) and myself reached for the controls and disconnected both the autopilot and autothrottles.

At about the same time the Captain's primary flight display (PFD) started showing multiple erratic indications on both airspeed and altimeter. These were accompanied by multiple aural alerts. I switched the flying duties to the FO's side while getting out the QRH. Nothing could be found, at first, in the QRH that matched our situation. I went to the airspeed unreliable checklist first but other items were failing so we weren't sure if that was the correct check list to follow.

We notified ATC that we had some navigational problems and inquired about our course. They

said our altitude was erratic and showing quick changes from 38,000 feet. We switched to our number 2 transponder to see if that would solve the problem. Center then showed us level at 38,000 feet. Then I got a unable required Nav Perf-RNP. Both the RNP and ANP were amber. I went to the POS page 2 and saw that our IRS were drifting apart. Left side showed 13 miles while the right side showed 5 miles and drifting even more apart. We inquired about our track and was told it appeared we were drifting off course. We requested a vector to a nearby vortac. This was given and told to proceed when able.

About that time I got an IRS fault and again checking the POS page 2 saw that I had lost the left IRS. Followed the QRH I switched the IRS to both on the right side. Nothing happened to my PFD and the FO's PFD started to drift off making his side worse. I switched the IRS back to the normal position and for a short time that fixed the FO's instruments.

I called both Dispatch and Maintenance Control advising them of the situation. By this time we had been hand flying and the navigational instruments were in question. I informed both that we were going to return to the departure airport. Dispatch re-dispatched us for our return via ACARS. We advised ATC of our intentions and were given a heading back. We noticed that our standby heading indicator was showing us on a 120 heading while we were still flying a 300 heading. It also had a flag showing it was inop.

As soon as the FO started his turn we received two uncommanded rudder inputs causing a sharp roll to the left. The captain's instruments were showing both pitch and bank angle in excess and was getting both aural alerts to each. Then my PFD went blank since I still had the overhead switch in the normal position on the IRS.

After the uncommanded rudder input I advised ATC that we were no longer RVSM qualified. We requested a lower altitude and was assigned flight level 280. As we started the descent we realized that 28,000 would put us in IMC. Not wanting to go IMC with our faulty navigational instruments I requested to stop at 34,000 to stay VMC and that was approved.

We checked weather at several different locations but none had the weather we felt comfortable flying in considering our current problems. We flew back to our departure airport via radar vectors and using our whiskey compass. Weather at our departure airport was VMC and we knew a visual approach could be made easily. Both the FO and myself took turns doing the flying. We elected not to trim or change the configuration of the aircraft since we weren't sure exactly what was wrong with the jet and what caused the rudder input to roll the plane. We talked about our approach and how we would configure the plane for landing.

Since we had uncommanded input to the rudder we elected not to arm the speed brake for fear of early deployment. Flaps would be at 15 for a higher approach speed in case of a hard rudder throw. The ground prox flap inhibit switch was turned off used the single engine check list since that covered our abnormal landing configuration. Autobrakes 3 were selected but they had failed too. Autobrakes were turned off and normal braking was to be used.

While descending through 12,000 feet on our approach we experienced a third and more violent roll to the left, again caused by a uncommanded rudder input. At this point I instructed the FO to turn off the yaw damper. While on approach we still were receiving many false warnings concerning airspeed and windshear. The Captain's barber pole and yellow stall indicator were touching during the approach. After touch down the Captain's stick shaker went off throughout the roll out. After clearing the runway we taxied to the gate. The taxi in was uneventful.

All decisions made were based on the interest of safety. At no time did we deviate from any altitude, clearance, or FARs.

Callback 1

The reporter stated that the Captain's PFD was ultimately blank. The only heading source

available was the wet compass which the crew was not certain they could trust. After the flight, passengers and flight attendants reported several significant rudder "kicks", several more than the crew experienced. Maintenance reported an IRS transfer switch anomaly was apparently the cause. That component was replaced and the aircraft returned to service.

Narrative 2

[Report narrative contained no additional information].

Synopsis

A B737-700 autopilot transitioned to Control Wheel Steering uncommanded, followed by the loss of both IRS, erratic airspeed, altimeter, pitch and bank indications as well as intermittent uncommanded rudder inputs. The flight returned to the departure airport where Maintenance suspected an IRS Transfer Switch Fault.