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Aircraft: Registration: N965SW, MSN 7871

Flight No.: United Flight UA-5069

Landing: The aircraft landed in George Bush Intercontinental/Houston Airport (IAH) at 19:19 GMT on runway 08R (per Fig A).

Conditions up to event: All primary parameters appeared to be normal up to the reported event.

Event: Date - 11 May 2022

FDR Analysis (refer to figures 1 through 4):

- FDR Time Stamp: rel time 48:06:02 (19:19:00 GMT) – Aircraft landing (3 points landing, WOW =1 at same time). Speed 109 kts.
- FDR Time Stamp: rel time 48:06:07 (19:19:04 GMT) – simultaneous TR deployed. N1 on both engines went from approx. 27 N1%rpm to 50 N1%rpm with a max differential at 48:06:10 (19:19:07 GMT) of 11.59 N1%rpm favoring right thrust reverser.
- FDR Time Stamp: rel time between 48:06:09 (19:19:06 GMT) and 48:06:16 (19:19:13 GMT) – L inbd brake application with peak at approx. 750 psi and R inbd brake application at approx. 500 psi (outboard brakes follow trend). Inboard differential favoring left at approx. 250 psi.
- FDR Time Stamp: rel time 48:06:13 (19:19:10 GMT) – Mag heading starts to change from approx. 89 degrees (final heading recorded below, at aircraft stop). Speed 71 kts.
- FDR Time Stamp: rel time between 48:06:14 (19:19:11 GMT) and 48:06:19 (19:19:17 GMT) – Higher Acceleration to the right (from 0.186g to 0.223g)
- FDR Time Stamp: rel time between 48:06:17 (19:19:14 GMT) and 48:06:29 (19:19:26 GMT) – Full left rudder application (at 58 kts) and stays at 25 degrees until aircraft stop.
- FDR Time Stamp: rel time 48:06:20 (19:19:17 GMT) – RUNWAY EXCURSION (indicated by erratic Norm Accel 8hz). Gnd speed at 50 kts at this time.
- FDR Time Stamp: rel time between 48:06:20 (19:19:17 GMT) and 48:06:29 (19:19:26 GMT) – Lower Acceleration to the right (from 0.180g to -0.041g)
- FDR Time Stamp: rel time between 48:06:20 (19:19:17 GMT) and 48:06:21 (19:19:18 GMT) and again at 48:06:22 (19:19:19 GMT) to Aircraft Stop – significant deceleration (as indicated on figure 1)
- FDR Time Stamp: rel time 48:06:25 (19:19:22 GMT) – NWS FAIL Caution
- FDR Time Stamp: rel time 48:06:29 (19:19:26 GMT) – Aircraft stop, heading 134 deg
- AC rolls follow lateral acceleration as expected throughout.
- Hydraulic pressures (1, 2 and 3) normal (between 2935 and 3150 psi) throughout.
- Wind direction between 126 and 127 deg at 11-13 kts throughout.
- Note that elevator position did not significantly change after landing, until runway excursion.



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FDR analysis narrative:

The aircraft had 3 points landing touching down at 109kts at 19:19:00 GMT.

TR deployed at 19:19:04 GMT. Maximum thrust differential of over 10% applied for only one second (limited impact but contributes to deviation to the right).

The aircraft started to deviate to the right from runway heading at about 71 kts at 19:19:10 GMT.

Differential braking resulted from applying more pressure to the LH brakes between 19:19:06 GMT and 19:19:13 GMT, however it was not maximized since 500 psi of brake pressure remained on the RH brakes (resulting in only max 250 psi differential) to counter the momentum towards the runway edge. Brakes were released 4 seconds before the aircraft exited the runway. Hydraulic pressures (1, 2 and 3) normal throughout.

Left Rudder (25 degrees, positive indicating left) was applied at 19:19:14 GMT. Aircraft was at 58 kts.

Runway excursion at 19:19:17 GMT at 50 kts.

NWS FAIL Caution first announced by NWS ECU at 19:19:22 GMT (EICAS message 1 to 2 second delay after this).

Aircraft stop at 19:19:26 GMT (heading 134 deg from runway heading of 89 deg).

NWS ECU NVM analysis:

The following codes were reported (shown in 1st appearance order per the NVM download file). Note that there is no timestamp on the NVM. "Potential cause" per FIM32-50-01-01. NOTE that these codes are NOT timestamped. Correlation with MDC data did not help determine if these codes are all relevant to the event as the MDC fault history will not capture any NWS faults from the NWS ECU on ground, it will only capture faults in flight (as confirmed by the MDC spec document). These codes may not be all relevant.

033: PILOT_HANDWHEEL_RATE_FAULT. Potential cause: N/A

191: WARM_BOOT_OCCURED. Potential cause: ECU

015: AIR_TO_GROUND_MODE_CMD_FAULT. Potential cause: N/A

109: SSV_STUCK_CLOSED_PS1. Potential cause: SSV or PS1 or NLG Priority Valve or NLG Selector Valve or NWS System Check Valve Blockage or wiring

170: PILOT_HANDWHEEL_RVDT_FAULT. Potential cause: Pilot's HCU

036: FEEDBACK_TRACKING_FAULT. Potential cause: R Feedback RVDT or L Feedback RVDT or grease contamination or Steering Collar Wear



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105: SSV_COIL_BIT_FAULT. Potential cause: SSV or ECU or wiring or NWS System Check Valve blockage

Load sheet:

Flight 5069 VCT-IAH 11AY

GTOW 38127 CG 17.1
ZFW 34927 CG 19.4
TO FUEL 3200

A 2 /0 B 0 /0 C 0 /0
D 3 /0 E 6 /0 F 1 /0
AFT 378

REMARKS ACM

(ACM = the flight deck jump seat was occupied.)

RTS MX actions (as reported by Skywest):

- Comply with FIM 32-50-02 Figure 101 due to runway lateral deviation event.
✓ Completed with no findings
- Prior to replacing NWS Handwheel (P/N 16650-101 S/N DCL029/92/00/06) comply with return time check. Record CW and CCW times on CAMP. Reference FIM 32-50-02 Figure 101 Block 5.
✓ Prior to replacing handwheel (P/N 16650-101 S/N DCL029/92/00/06) Left to center #1. 00:03.67 #2. 00:03.54, Right to center 00:03.29 , #2. 00:03.35. New handwheel (16650-101 S/N DCL1169/04) Left to center #1. 00:02.45 , #2. 00:02.43, Right to center #1. 00:02.63, #2. 00:02.54. in ref to CRJ200 FIM 32-50-02-figure 101 item 5. REQUIREMENT is to return to null position within 2-4 seconds. Results here are within parameter.
- Replace NWS Handwheel (P/N 16650-101 S/N DCL029/92/00/06) with known good unit due to runway lateral deviation event.
✓ Removed and replaced NWS handwheel in ref to CRJ200 AMM 32-51-01.Ops check good. Serial DCL1169/04 Installed
- Replace NWS ECU (P/N 16900-107 S/N 03-988) with known good unit due to runway lateral deviation event.
✓ Removed and replaced NWS ECU in ref to CRJ200 AMM 32-51-10. Ops check good. Serial 99402 Installed
- Check LH and RH Feedback RVDTs are within optimal range of (plus/minus) 0.020VDC. Please record values on CAMP.
✓ Complied with RVDT Limit check . LH RVDT -1.787 RH, RVDT +1.779 within optimal limits in ref to CRJ200 AMM 32-51-20. Ops check good.
- Check Rudder Pedal Input RVDT is within correct limits per AMM TASK 32-51-05-820-801. Please record values on CAMP