

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ENG25LA009

SYSTEMS

Group Chair's Factual Report

November 3, 2025

TABLE OF CONTENTS

A	INCIDENT	3
B	SYSTEMS GROUP	3
C	SUMMARY	3
D	SYSTEM DESCRIPTION	4
E	DETAILS OF THE INVESTIGATION	6
1.0	INCIDENT REPORT	6
2.0	FLIGHT DATA RECORDER.....	6
3.0	MAINTENANCE FINDINGS	6
4.0	SERVO AND SERVO MOUNTS EXAMINATIONS.....	7
5.0	ADDITIONAL REPORTED CABLE FAILURES AND REPLACEMENTS	9
6.0	HISTORICAL EVENTS	12

A INCIDENT

Location: Dulles, VA
Date: November 19, 2024
Time: 2020 eastern standard time (EST)
0320 coordinated universal time (UTC)
Airplane: CL-600-2C11 (CRJ-550)
Serial Number 10005

B SYSTEMS GROUP

Group Chair	Adam Huray National Transportation Safety Board Washington, DC
Accredited Representative	Beverley Harvey Transportation Safety Board of Canada Ottawa, Ontario, Canada
Advisor to the Accredited Representative	Yoshiaki Asako MHI RJ Aviation Group (MHIRJ) Dallas, TX
Group Member	Matt Rigsby Federal Aviation Administration Fort Worth, TX
Group Member	Gregory Pochapsky GoJet Airlines St Louis, MO

C SUMMARY

On November 19, 2024, about 2020 eastern standard time (EST), GoJet Airlines flight 3375, an MHIRJ Aviation Group CRJ-550, serial number 10005, registration N501GJ, reported pitch control stiffness and reduced column movement during the flare while landing at Dulles International Airport (KIAD), Dulles, Virginia. The airplane touched down and taxied to the gate with no further issues. The flight was operated as a Title 14 Code of Federal Regulations Part 91 repositioning flight from Richmond International Airport (KRIC), Richmond, VA to KIAD. There were no injuries to the two crew members and there was no damage to the aircraft.

D SYSTEM DESCRIPTION

The pilot's and copilot's control columns in the flight deck are connected to the elevators through a system of control rods, cables, and control quadrants. The left (pilot's) control column is connected to the left elevator control quadrant, which is then connected to the left elevator. Similarly, the right (copilot's) control column is connected to the right elevator control quadrant, which is then connected to the right elevator. The left and right control columns are interconnected by a torque tube. The torque tube incorporates a disconnect mechanism which allows for the separation of the left control column from the right control column when necessary (see Figure 1). In the event of a control restriction in either the left or right elevator control systems, this disconnect mechanism can be operated by the flight crew allowing the unaffected side to continue controlling its respective elevator surface.

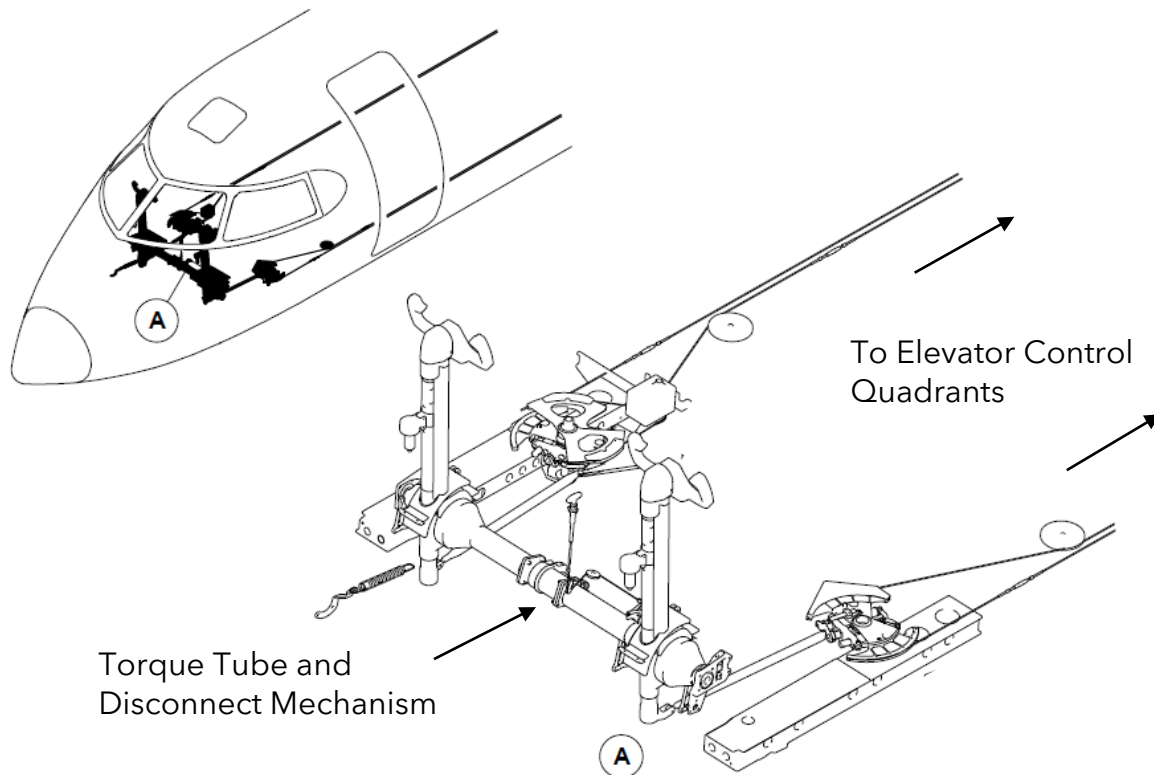


Figure 1. Elevator control column torque tube and disconnect mechanism. (Courtesy of MHIRJ)

The elevator autopilot servo rotates a servo mount in response to electrical input commands from the autopilot. The servo system includes an electrically controlled clutch that is disengaged when the autopilot is switched off. In addition, there is a secondary mechanical override slip clutch with an adjustable breakout torque that is set between 130 and 142 in-lb for this aircraft type that provides pilot

override capability. The servo mount is connected to the left elevator control quadrant by cables (see Figure 2). The forward end of the elevator control quadrant is connected to the servo mount by a single cable (Figure 2, item 8, part number BA670-93710-13). The aft end of the elevator control quadrant is connected to the servo mount by two cables (Figure 2, items 1 and 6, part numbers BA670-93710-19 and BA670-93710-17 respectively) which are joined by a turnbuckle (Figure 2, item 3, cutout B). Rotational movement of the servo mount moves the cables, which in turn rotate the left elevator control quadrant about its pivot. Per the Maintenance Review Board (MRB) Task 273000-201A (Detailed Inspection of the Elevator Mechanical Control Path and Control Cables) these cables are required to be inspected for condition and wear at intervals not exceeding 16,000 flight hours.

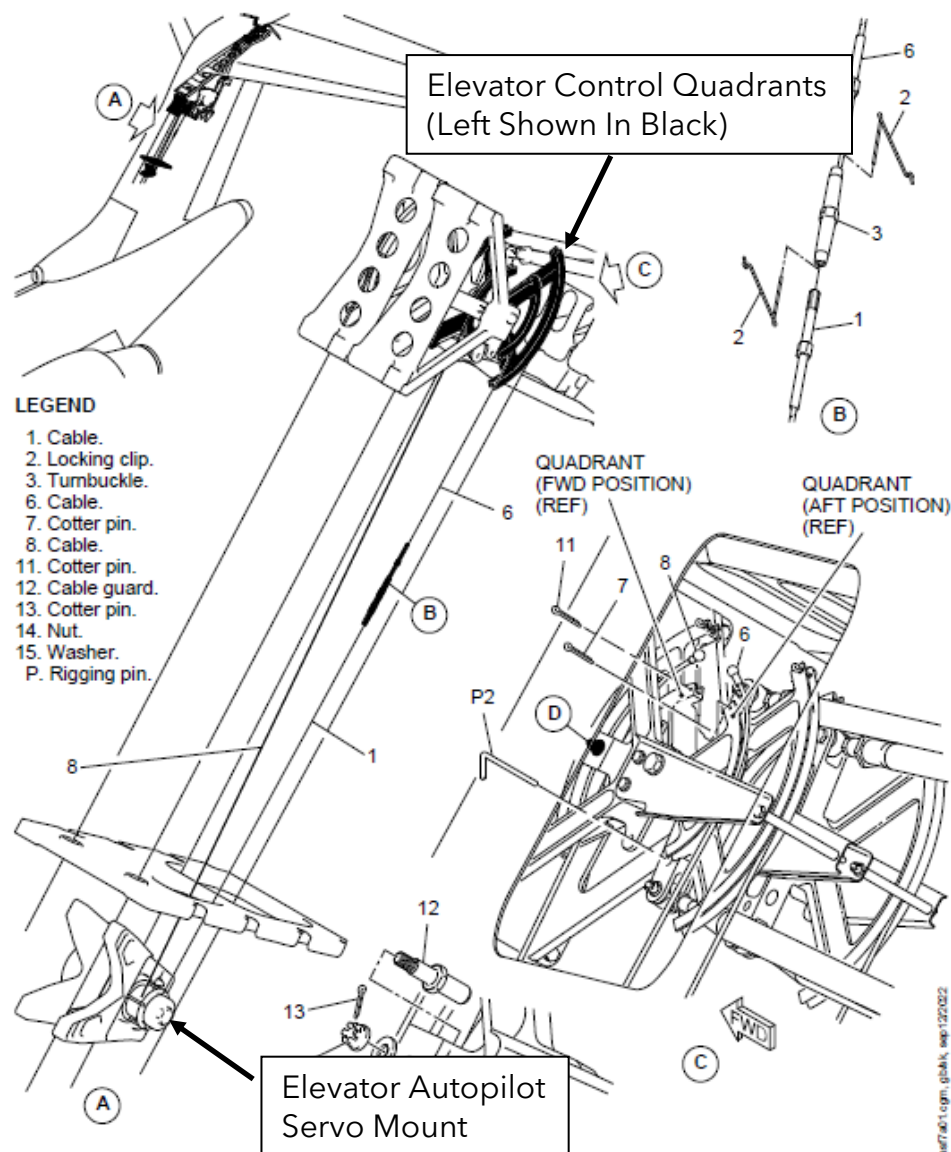


Figure 2: Elevator autopilot servo to left elevator control quadrant cables. (Courtesy of MHIRJ)

E DETAILS OF THE INVESTIGATION

1.0 Incident Report

The airline reported that “The flight was unremarkable until the descent phase. During the descent the autopilot failed to capture a preselected altitude of 3000' MSL [mean sea level]. The pilot flying intervened at approximately 2700' MSL by disconnecting the autopilot, re-trimming the stabilizer, and re-engaging the autopilot. As the aircraft approached the KIAD airspace it was cleared to 2000' MSL. Descent was initiated on the autopilot, however the crew received the EICAS [engine indicating and crew alerting system] message "AP TRIM IS NU" [autopilot trim is nose up] at approximately 2500' MSL. The crew completed the Quick Reference Handbook (QRH) checklist and re-engaged the autopilot. The captain subsequently disengaged the autopilot when cleared for a visual approach to runway 19L.” The crew reported that the aircraft flew normally by hand until the landing flare when the captain (pilot flying) noted that the left control column felt abnormally stiff and exhibited minimal movement when pulled. The aircraft touched down without further issues.

2.0 Flight Data Recorder

The airline downloaded the Flight Data Recorder (FDR), and MHIRJ provided plots of the requested parameters (see Attachment 1 in the public docket for this incident). The data showed that during the time around the flare and touchdown, the maximum captain's control column deflection was 7.1 degrees aft, and the maximum first officer's control column deflection was 6.2 degrees aft. The FDR data also showed that during the same time period the incident aircraft's maximum left elevator deflection was 7.4 degrees trailing edge up, and the maximum right elevator deflection was 10.6 degrees trailing edge up. Column force was not a recorded parameter because it was not required at the time the aircraft's Certificate of Airworthiness was issued.

3.0 Maintenance Findings

The NTSB did not travel to the incident airplane. The following information was provided by GoJet Airlines.

After the airplane landed maintenance requested that the flight crew pull the pitch disconnect handle to troubleshoot where the flight control bind was. After the disconnect only the captain's side (left side) was restricted in the aircraft nose-up (control column aft) direction. A maintenance inspection found that the elevator autopilot servo control cable (Figure 2, item 8, part number BA670-93710-13) had fractured into two sections. The lower section had backlashed around the servo mount, binding the cable between the elevator autopilot servo mount and the cable guide pins (see Section E.5, Figures 4-6, for similar examples). The bound cable

interfered with the rotation of the servo mount, which remained connected to the aft side of the elevator control quadrant by the intact aft cables (Figure 2, items 1 and 6). This condition resulted in the limited rotation of the elevator control quadrant in one direction. According to GoJet Airlines maintenance personnel, the elevator appeared to move normally in the downward direction but only about three quarters of its full range in the upward direction.

The broken cable was sent to the NTSB Materials Laboratory for further examination (see the Materials Laboratory Factual Report in the public docket for this investigation). The construction of the cable was 7x7 (seven strands, seven wires per strand) and made from carbon steel. The fracture occurred 14 inches from the elevator autopilot servo mount end. Examination revealed that the individual wires near the fracture were worn and exhibited features consistent with cyclic fatigue. Additional areas of wear were observed on the cable approximately 3.5 inches from the elevator control quadrant end, as well as on the other two cables that connected the elevator autopilot servo to the elevator control quadrant. GoJet Airlines reported that the airplane had accrued 47,106 flight hours and 37,439 flight cycles at the time of the cable failure. The cable was last inspected per MRB Task 273000-201A in May of 2016, 12,024 flight hours prior to the failure. GoJet Airlines stated that the cable had not been replaced since they acquired the airplane in October of 2019.

4.0 Servo and Servo Mounts Examinations

The elevator autopilot servo (part number 622-5027-101, serial number 2XB6J) and the associated servo mount (part number 822-0260-001, serial number 1512) from airplane N501GJ, as well as the servo mount (part number 822-0260-001, serial number 18PU) from airplane N502GJ (see Section E.5 of this report for additional reported cable failures), were submitted to the component manufacturer for examination. Testing was conducted on February 4, 2025 at the Collins Aerospace facility in Cedar Rapids, Iowa. The testing was remotely witnessed by the NTSB, the Transportation Safety Board of Canada, MHIRJ, and GoJet Airlines. All tests were performed with the units in their as-received condition (no adjustments were made when called out in the test steps).

The elevator autopilot servo was visually inspected and no significant damage was observed. The unit was subjected to the tests detailed in Rockwell Collins Instruction Book 523-0772563, Table 5-4, titled "SVO-85 Primary Servo Detailed Test Procedures". Step 9 "Ground Resistance" was not performed. The unit passed all performed tests.

The servo mount (serial number 1512) was visually inspected and no significant damage was observed. It was noted that only one cable guide pin was present; however, GoJet Airlines confirmed that they had removed the other guide pins to facilitate component removal. The unit was subjected to the tests detailed in Rockwell

Collins Instruction Book 523-0772563, Table 5-6, titled "SMT-87() Servo Mount Detailed Test Procedures". Step 3, "Maximum Breakaway Torque Test", was not performed because the actual breakaway torque was measured per Step 7.1, "Nominal Breakaway Torque Test", without performing adjustments. The nominal breakaway torque was found to be 121.6 in-lb. The MHIRJ CRJ700/900/1000 Aircraft Maintenance Manual (AMM) specified the breakaway torque to be between 130 and 142 in-lb and provided instructions for adjustment if it was found to be outside of this range. According to Collins the lower breakaway torque would result in the mount slip clutch releasing at a lower applied force in the event of undesired servo movement or a jam condition. For Step 4.2, (Ensure clutch teeth engage with a supply voltage of 21V), the test passed three times but the voltage level at which the teeth first engaged could not be determined due to test bench limitations. In addition, Step 4.3, (With a supply voltage of 21 V apply various torques and verify the two clutch halves do not ratchet), was not performed due to test bench limitations. Step 7.1.1 measured the clutch half spacing on a test rig, which was required to be between 0.004 and 0.007 inch. The actual measurement was between 0.007 and 0.008 inch. According to Collins, the larger gap indicates that the clearance between the mount and servo could be greater than designed, potentially resulting in premature clutch ratcheting at lower torques and increased clutch tooth wear. The unit passed all other performed tests.

The servo mount (serial number 18PU) was visually inspected and no significant damage was observed. It was noted that no guide pins were present; however, GoJet Airlines confirmed that they had removed the guide pins to facilitate component removal. Wear marks were observed outside of the typical cable operating area (see Figure 3). The unit was subjected to the tests detailed in Rockwell Collins Instruction Book 523-0772563, Table 5-6, titled "SMT-87() Servo Mount Detailed Test Procedures". Step 3, "Maximum Breakaway Torque Test", was not performed because the actual breakaway torque was measured per Step 7.1, "Nominal Breakaway Torque Test", without performing adjustments. The nominal breakaway torque was found to be 121.1 in-lb. The MHIRJ CRJ700/900/1000 AMM specified the breakaway torque to be between 130 and 142 in-lb and provided instructions for adjustment if it was found out of this range. According to Collins the lower breakaway torque would result in the mount slip clutch releasing at a lower applied force in the event of undesired servo movement or a jam condition. For Step 4.2, (Ensure clutch teeth engage with a supply voltage of 21V), the test passed three times but the voltage level at which the teeth first engaged could not be determined due to test bench limitations. In addition, Step 4.3, (With a supply voltage of 21 V apply various torques and verify the two clutch halves do not ratchet), was not performed due to test bench limitations. The unit passed all other performed tests.

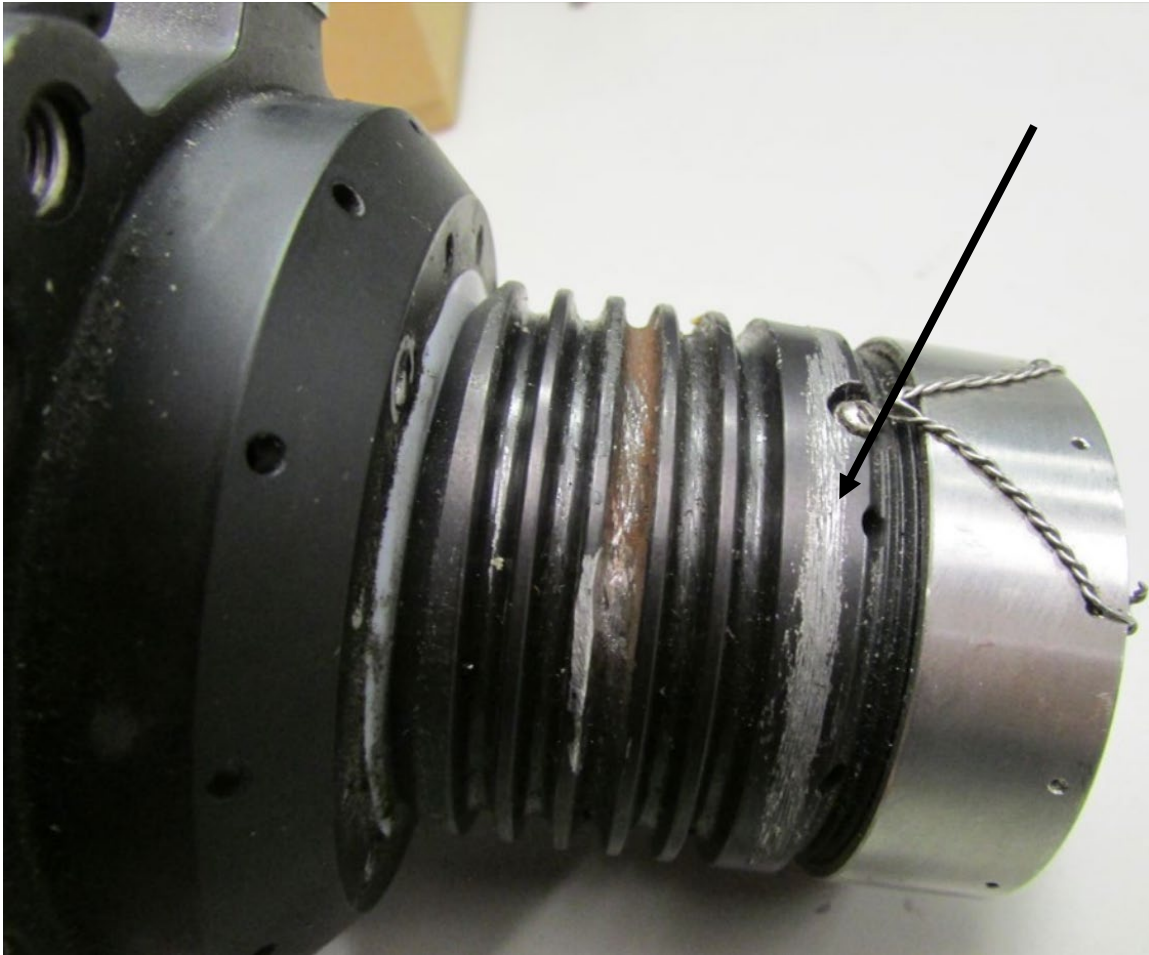


Figure 3: Servo mount serial number 18PU. Arrow points to wear marks outside of the typical cable operating area. (Courtesy of Collins Aerospace)

5.0 Additional Reported Cable Failures and Replacements

On November 24, 2024, GoJet Airlines maintenance personnel found the elevator autopilot control cable (Figure 2, item 1, part number BA670-93710-19) broken on a different CRJ-550 (registration number N502GJ, serial number 10011). The pilot report that prompted maintenance to troubleshoot the autopilot system stated "Autopilot Vertical Speed Mode not actuating flight controls. Will not climb or descend." This failure resulted in the cable backlashing around the servo mount but did not cause any reported restrictions to manual elevator control (see Figure 4). Laboratory analysis revealed that the cable failed approximately 14.75 inches from the servo mount end. Most of the wires exhibited flat fracture surfaces, and individual wires showed wear adjacent to the fracture locations (see Materials Laboratory Factual Report in the public docket for this investigation). The airplane had accrued 48,386 flight hours and 38,137 flight cycles at the time of the cable failure. The cable was last inspected per MRB Task 273000-201A in December 2020, 5,579 flight hours before the failure occurred. GoJet Airlines stated that the cable had not been replaced since they acquired the airplane in December of 2019.



Figure 4. Cable backlashed in elevator autopilot servo mount from the N502GJ event. (Courtesy of GoJet Airlines)

On August 3, 2025, GoJet Airlines maintenance found elevator autopilot control cable (Figure 2, item 8, part number BA670-93710-13) broken on a third CRJ-550 (registration number N506GJ, serial number 10041). The crew reported that they felt a pitch restriction in the aircraft nose up direction when pulling back on the column during flare, but the airplane landed without incident. The failed cable and the adjacent cable (Figure 2, item 1, part number BA670-93710-19) were found backlashed around the servo mount, binding the cables between the elevator autopilot servo mount and the cable guide pins (see Figures 5 and 6). The break occurred approximately 14 inches from the servo mount end. The fracture surface was similar to the other failed cables in that many of the wires had flat fracture surfaces and individual wires exhibited wear adjacent to the fracture surfaces. This failure region also had a relatively high number of wires (when compared to the other examples examined by the NTSB laboratory) that demonstrated necking and non-flat fracture surfaces consistent with overload. In addition, the fracture area had some rust, but not as much as the other examples. The airplane had accrued 46,833 flight hours and 37,217 flight cycles at the time of the cable failure. The cable was last inspected per MRB Task 273000-201A in March of 2025, 656 flight hours before the failure occurred. GoJet Airlines stated they did not replace the cable since they acquired the airplane in October of 2019.



Figure 5. Cables backlashed in the elevator autopilot servo mount from the N506GJ reported event. (Courtesy of GoJet Airlines)



Figure 6. Cables backlashed in the elevator autopilot servo mount from the N506GJ reported event. The arrow points to a cable guide pin. (Courtesy of GoJet Airlines)

The airline downloaded the FDR data for the N506GJ incident and MHIRJ provided plots of the requested parameters (see Attachment 2 in the public docket for this incident). The data showed that during the time around flare and touchdown, the maximum captain's control column deflection was 5.6 degrees aft, and the maximum first officer's control column deflection was 4.3 degrees aft. The FDR data also showed that during this same time, the incident aircraft's maximum left elevator deflection was 3.9 degrees trailing edge up, and the maximum right elevator deflection was 6.6 degrees trailing edge up. Column force was not a recorded parameter because it was not required at the time the aircraft's Certificate of Airworthiness was issued.

GoJet Airlines submitted Service Difficulty Reports to MHIRJ for the failed cables identified on airplanes N501GJ, N502GJ, and N506GJ.

6.0 Historical Events

Canadian Service Difficulty Report 20100813016 was filed in July of 2010 by a different operator for a CRJ-700. The crew reported an "AP Pitch Trim" message during the flight. The report stated: "At landing, at altitude 10ft, with engines at idle power, when crew ordered nose up to compensate the aircraft deceleration, as high effort to be exerted on the elevator control, nevertheless the touch down was normal. During taxiing, the elevator control is not found fully operative, which jammed at the middle range when ordered nose up." According to MHIRJ, the cable (available information did not specify the cable part number) was found broken at its end fitting near the elevator control quadrant with the side attached to the servo mount wrapped around the mount in a way that caused the mount to bind. The root cause of the failure was suspected to be the incorrect installation of the cable.

MHIRJ was also aware of a Technical Occurrence Notification reported for airplane serial number 10083 (a CRJ-700) with an occurrence date of November 1, 2017. The report stated: "Pilot reported that during final approach a control column strange movement occurred and after that the aircraft started to descend [below] Glide Slope path and pilot was also capable to move the control column in pitch still with autopilot engaged." While maintenance was troubleshooting the autopilot defect, it was observed that the left-hand elevator was not able to fully deflect to the up position, and the left control column was difficult to bring all the way back (column movement was limited to about three-quarters aft travel and described as having a spring effect). The elevator servo cable (available information did not specify the cable part number) was found broken with "a lot" of corrosion. The report further stated that it was "a jammed cable on the capstan that most likely caused the elevator not reaching it[s] full up position."

Submitted by:
Adam Huray (Aircraft Systems Investigator)