NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594
December 9, 2009

ADDENDUM 2

STRUCTURES GROUP CHAIRMANS FACTUAL REPORT

DCA09MA026

A. ACCIDENT

Location:	Hudson River, Weehawken, New Jersey
Date:	January 15, 2009
Time:	1527 (EST)
Aircraft:	Airbus A320-214, N106US, S/N 1044

B. STRUCTURES GROUP

Chairman:	**Brian Murphy** National Transportation Safety Board Office of Aviation Safety (AS-40) Washington, DC 20594
Member:	**Frederic Brocard** Airbus A320/A380 Structures Technical advisor Toulouse / France
Member	**Alexander Martin** Airbus Cargo door specialist

C. SUMMARY

On January 15, 2009, about 1527 Eastern Standard Time, US Airways flight 1549, an Airbus A320-214, registration N106US, suffered bird ingestion into both engines, lost engine thrust, and landed in the Hudson River following take off from New York City's La Guardia Airport (LGA). The scheduled, domestic passenger flight, operated under the provisions of Title 14 CFRAME Part 121, was en route to Charlotte Douglas International Airport (CLT) in Charlotte, North Carolina. The 150 passengers and 5 crewmembers evacuated the aircraft successfully. One flight attendant and four passengers were seriously injured.

This addendum to the factual report details the follow-up examination of the aft cargo door and was completed on September 23, 2009. The group during the follow-on investigation was comprised of members from the NTSB and Airbus.

D. DETAILS OF THE INVESTIGATION

1.0 Aircraft Description

N-number:	N106US
Aircraft Serial Number:	1044
Aircraft Manufacturer:	Airbus
Model:	A320-214
Engine Manufacturer:	CFM
Model:	CFM56-5B4/P
Aircraft Year:	1999
Airworthiness Certificate:	Standard
Approved Operations:	121
Aircraft Type:	Fixed Wing Multi-Engine
Engine Type:	Turbo-fan
Aircraft Category:	Transport
Number of Engines:	2
Number Seats:	150
Max. T/O Weight:	169,785 lbs (Weight Variant 010)
Total Time:	25,241 hours
Total Cycles:	16,299 cycles
Type Certificate	A28NM

2.0 Airworthiness

Following the bird strike and subsequent loss of power the airplane performed an unplanned water landing on the Hudson River. Following the unplanned water landing the aircraft settled to a wings level attitude and the passengers and crew evacuated onto the wings and into the forward door slides/rafts. The airplane was later towed by tug boat to the Battery Park Wharf just north of the North Cove Ferry Terminal. The airplane was moored with left wing and portions of the forward fuselage and the vertical stabilizer visible above the surface of the river. The right wing submerged below the Battery Park Esplanade. Two days after the event prior to the airplane's recovery from the river it had become completely submerged with none of the airplane structure being visible from the esplanade

The airplane was recovered using a barge mounted crane and placed on the deck of another barge. The airplane was subsequently relocated to Weeks Marine facility, in Jersey City for examination and documentation.

The right engine remained attached to the wing and the left engine separated from the wing during the unplanned water landing. The horizontal and vertical stabilizers and portions of the movable control surfaces remained attached to the airplane. The nose and main landing gear remained retracted and attached to the airplane. The fuselage and wings sustained damage during the bird strike event, the unplanned water landing and recovery phase.

Finally, the wings along with the horizontal and vertical stabilizers were removed and the airplane wreckage was relocated to a secure location in Harrison, New Jersey.

3.0 Accident Site

The airplane departed from New York's La Guardia Airport (LGA).and made unplanned water landing on the Hudson River.

Figure 1- USAirways N106US After the passenger evacuation.
(photo taken 3 hours after the accident)

4.0 Main Wreckage

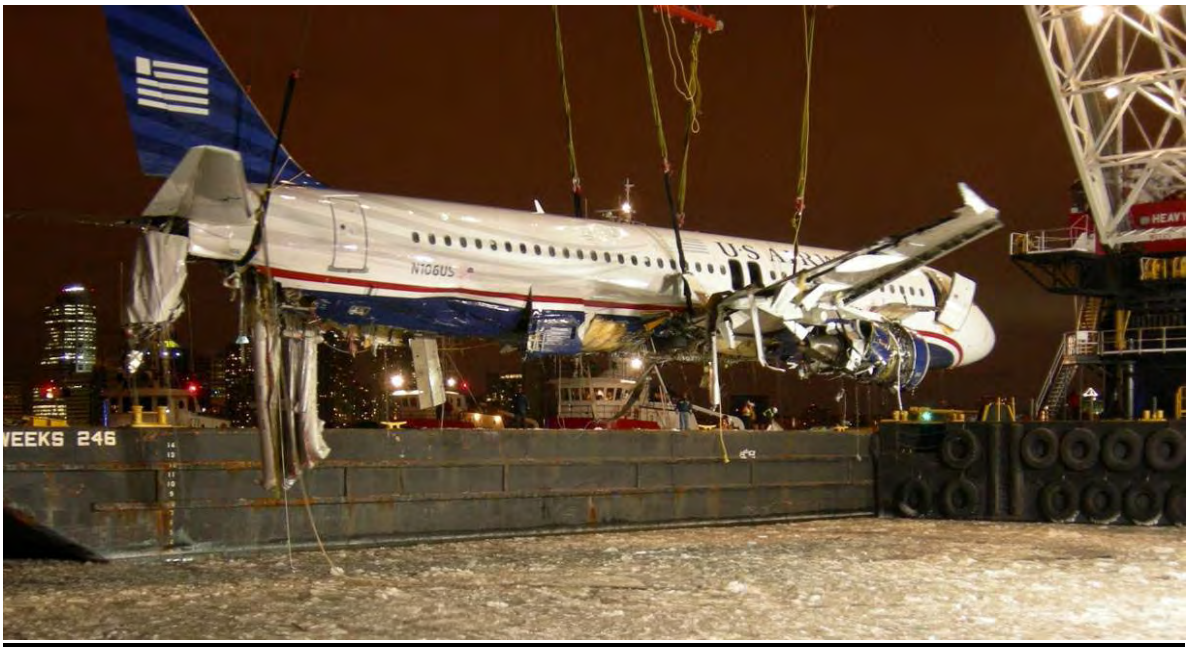


Figure 2 – US Airways N106US being placed on the recovery barge.

Following the original damage assessment performed just after the event, the wings were cut off outboard of wing rib 1 (including the main landing gear) and the vertical tail (VTP) and horizontal tail (HTP) planes were removed to allow for wreckage transportation. To facilitate the removal of the HTP, the fuselage structure below the HTP was cut between frame stations 74 and 75. The wreckage was then transferred from Weeks Marine in Jersey City, New Jersey to Harrison, New Jersey by truck. The airplane wreckage was again inspected at Joe Supor & Son facility located in Harrison, New Jersey.

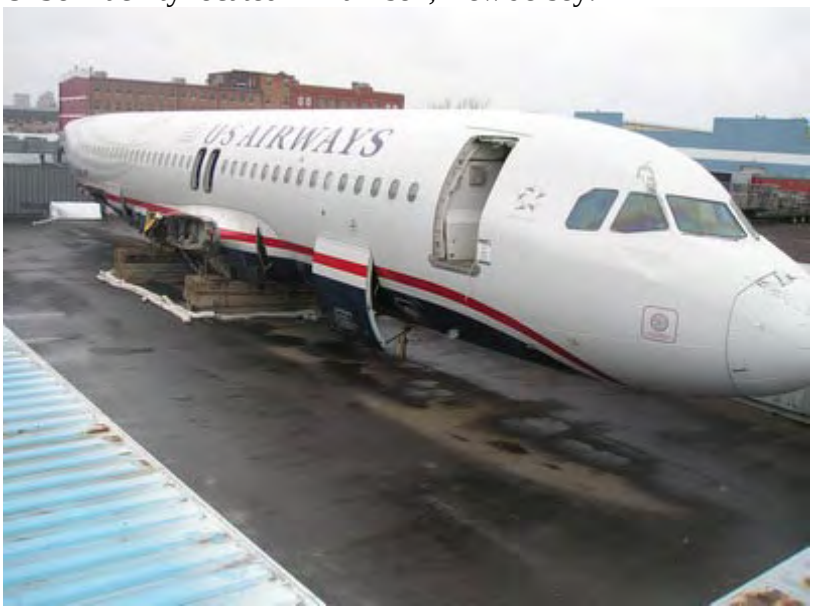


Figure 3 – US Airways N106US After removal of the wing and stabilizers.

5.0 Fire Damage

There was no evidence of a post crash fire and no evidence or any patterns like those typically associated with a moving or in-flight fire. No soot patterns were identified and no melted or splattered aluminum was observed on any of the structure.

6.0 Aft Cargo Door (refer to Figures 2 and 4)

6.1 Door hinge

The aft cargo door hinge was intact with no evidence of damage to the fasteners or sealant. The door was able to rotate normally about the upper hinge pins and the hinge teeth were in good condition (refer to Figure 5).

6.2 Actuator connections

There was no visible damage to the fasteners or sealant on the fuselage side of the actuator connections or the cargo door attachment points (refer to Figures 6 and 7).

6.3 Seal striker on fuselage

In the area of the damaged aft fuselage structure surrounding frame 56 between stringers 32RH and 38RH the seal striker was missing (refer to Figure 9). Above stringer 32LH the seal striker was present and deformed in the inboard direction. The remaining areas of the seal striker around door were undamaged and in good condition (refer to Figure 8).

6.4 Door stops

The door stops prevent the inward movement of the door caused by negative pressure loads encountered during flight and at closure of the cargo door. Four door stops are installed, two at frame 53 (the forward side of the cargo door) and two at frame 55A (the aft side of the cargo door). At frame 53, the two door stops on the fuselage and their mating parts on the door were intact and undamaged. Both door stops on the door side of frame 55A were intact and undamaged. On the fuselage side the forward stop was fractured and the aft was bent (refer to Figures 10 and 11).

6.5 Door sill and latching spools

The aft portion of the door sill between frames 55A and 56 was deformed upward. The six latching spools and associated fork fittings were undamaged (refer to Figure 12).

6.6 Aft cargo door structure

Aft of frame 55A the skin peeled aft and fractured (refer to Figures 13 and 14). Beam 3B was disconnected from frame 55A, and the door fork fitting at frame 55A was cracked on the outboard side in multiple locations.

6.7 Door latching mechanism (refer to Figures 16, 17,18 and 19)

The locking shaft and connecting rods were undeformed and intact (refer to Figure 19 for schematic). No damage was visible to the link between the locking shaft and the drift pin mechanism. The forward and aft drift pins extended about 12 millimeters (mm) and 5.5 mm respectively from the edge of the forward and aft cargo door frames. The measured extensions exceed the normally expected tolerances for the cargo door when it is in the open and unlatched position. The vent door link to locking shaft via sequence shaft was undamaged and in good condition and the vent door was in open position. The latching shaft was bent between frames 55 and 55A, and the latching mechanism was seized in the fully unlatched position. Accordingly the six latching hooks were unlatched from the six latching spools. The cargo door handle was fractured into multiple pieces. Only the handle structure directly attached to the linkage mechanism remained attached to the door structure (refer to Figure 18). The handle body is attached to the handle mechanism using three shear fasteners on each side of the handle. One of the aft three fasteners exhibited features consistent with a ductile tension failure and the fastener was deformed in the aft direction (refer to Figures 17&18). A piece of carbon fiber reinforced plastic (CFRP) was wedged between the door handle and the door handle housing (refer to Figure. 17). The interlock mechanism did not show any signs of damage and functioned properly.

Brian K Murphy
Aircraft Structures
Group Chairman

Accident #: DCA09MA026	N106US

Description: General overview of aft cargo door and fuselage surround structure, during the recovery and at the storage facility.

Figure 4

Accident #: DCA09MA026	N106US
Description: Aft cargo door hinge	

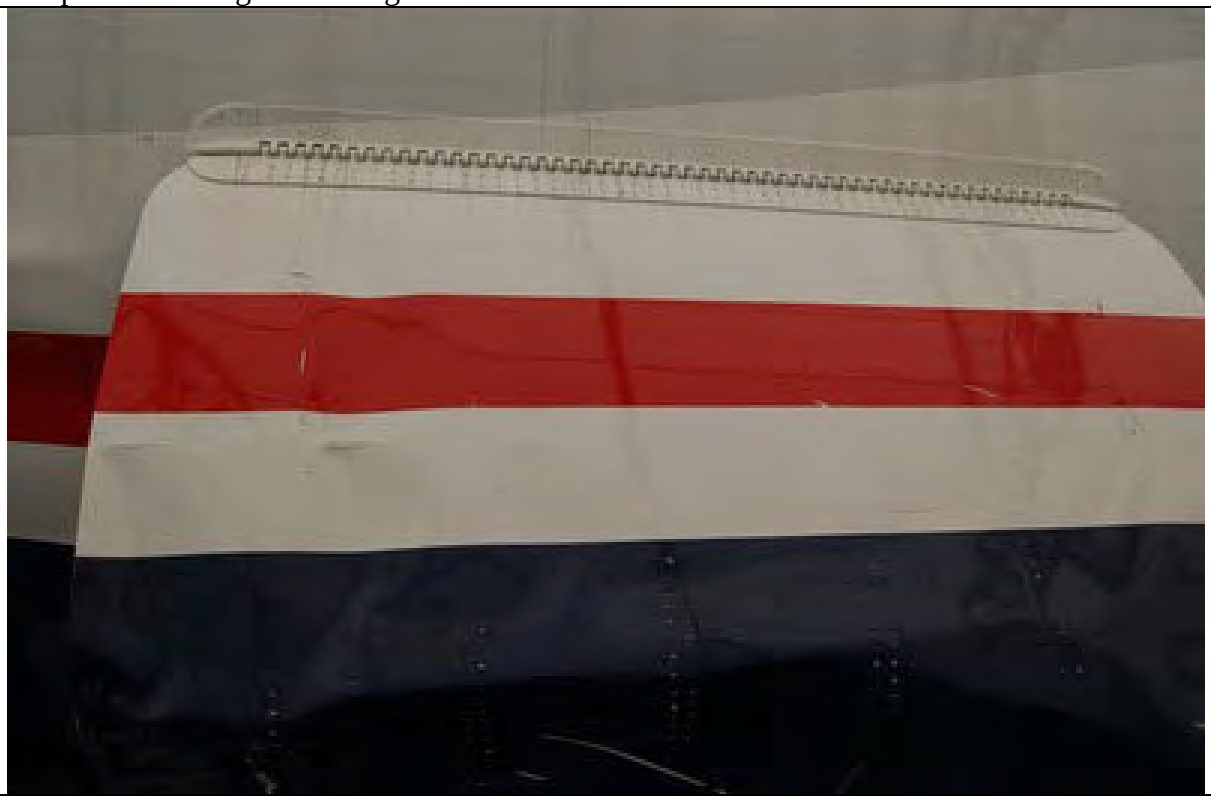
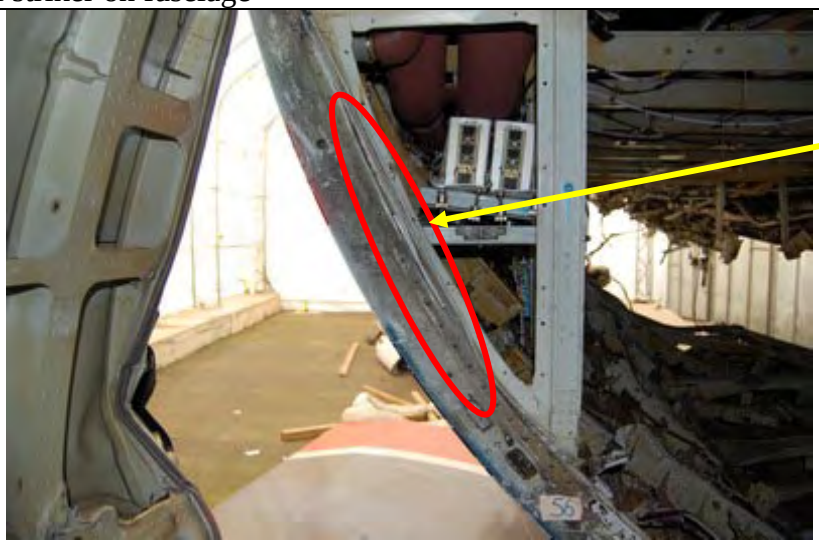


Figure 5

Accident #: DCA09MA026	N106US
Description: Aft cargo door actuator connections.	

Figures 6 and 7

Accident #: DCA09MA026	N106US
Description: Seal striker on fuselage	



Figures 8 and 9

Accident #: DCA09AM026	N106US
Description: Aft cargo door stops.	

Forward, frame 53

Aft, frame 55A

Figures 10 and 11

Accident #: DCA09MA026	N106US
Description: Aft cargo door sill and latching spool.	

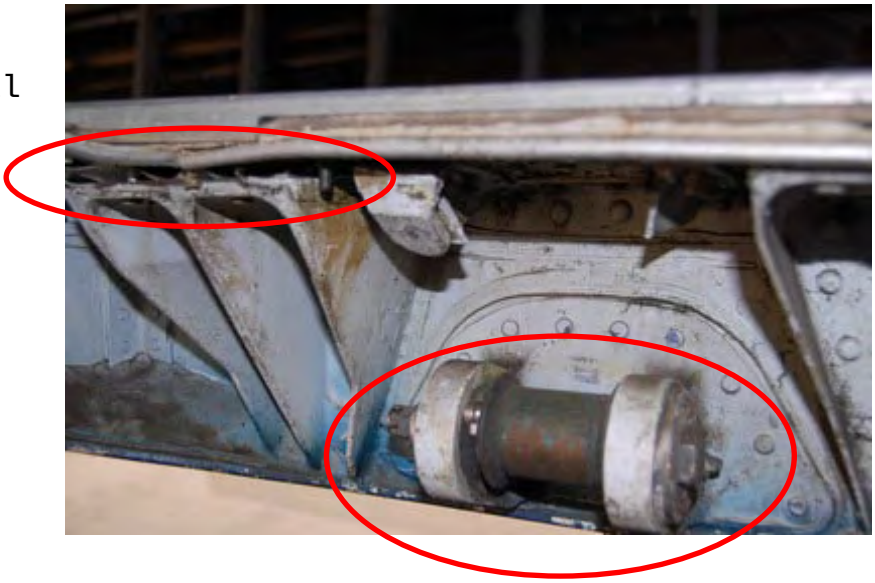
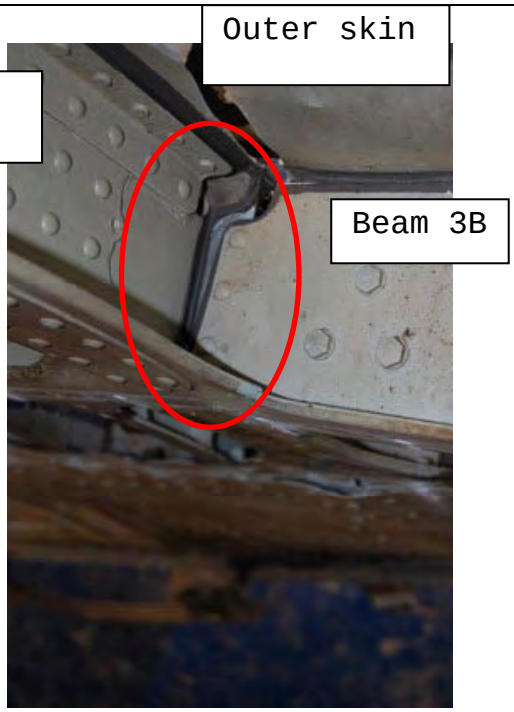


Figure 12

Accident #: DCA09AM026	N106US

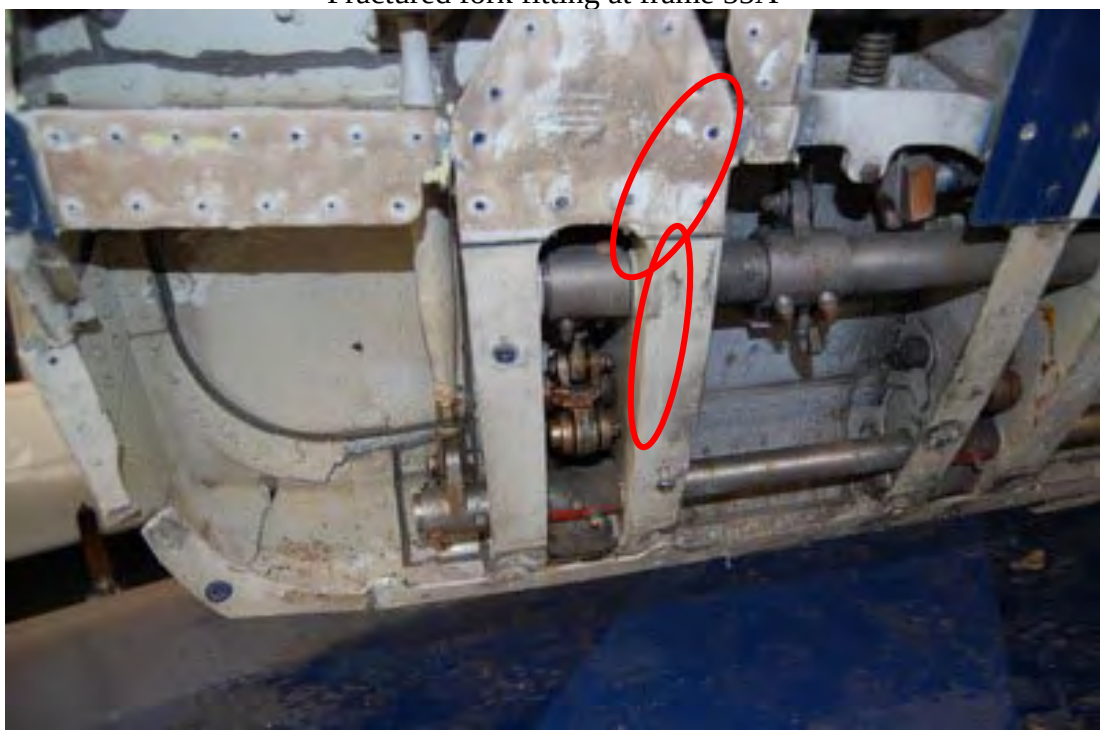
Description: Aft cargo door structure.

Skin peeled aft and fractured



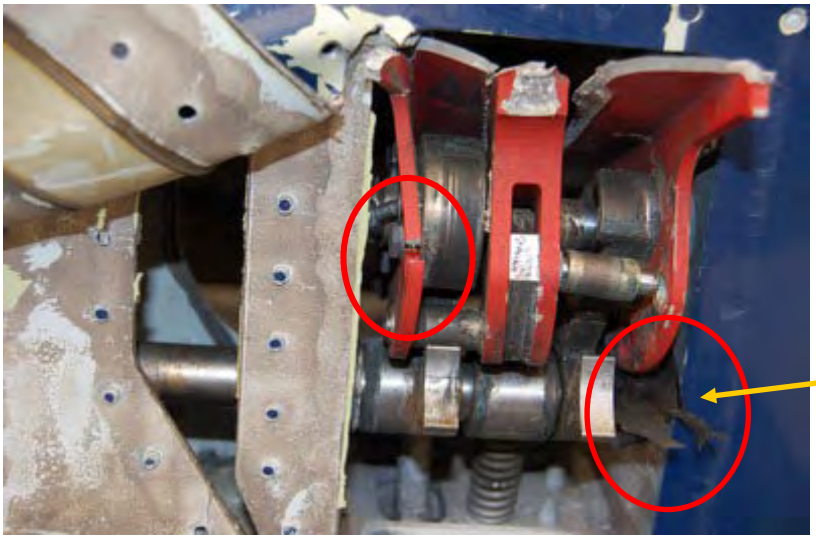
Beam 3B disconnected from frame 55A

Fractured fork fitting at frame 55A



Figures 13, 14 and 15

Accident #: DCA09MA026	N106US
Description: Aft cargo door handle and latching mechanism.	



Figures 16 and 17

Accident #: DCA09MA026	N106US
Description: Fractured aft cargo door handle (red) and mechanism.	

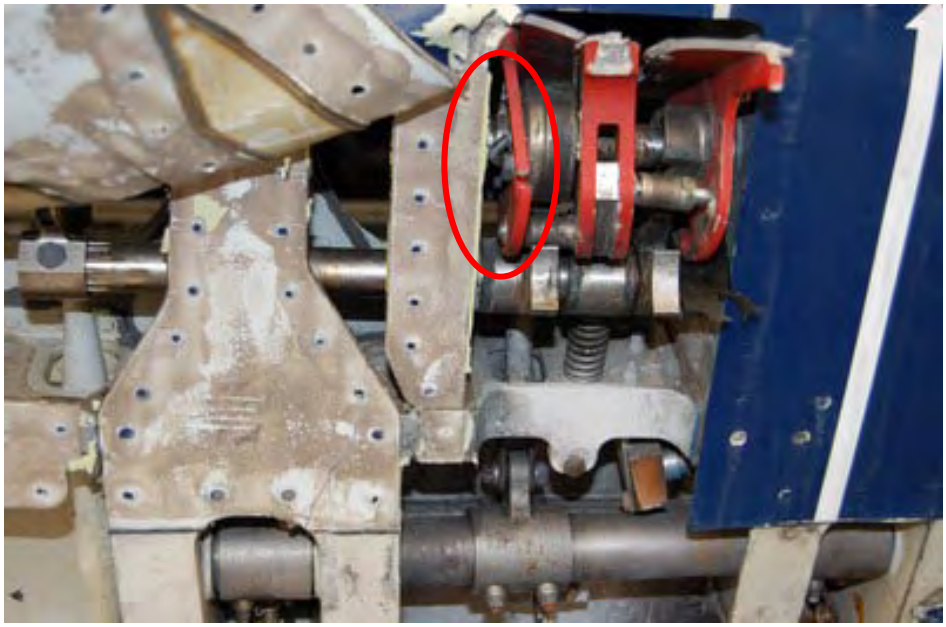


Figure 18

Accident #: DCA09MA026	N106US
Description: Cargo door schematics.	

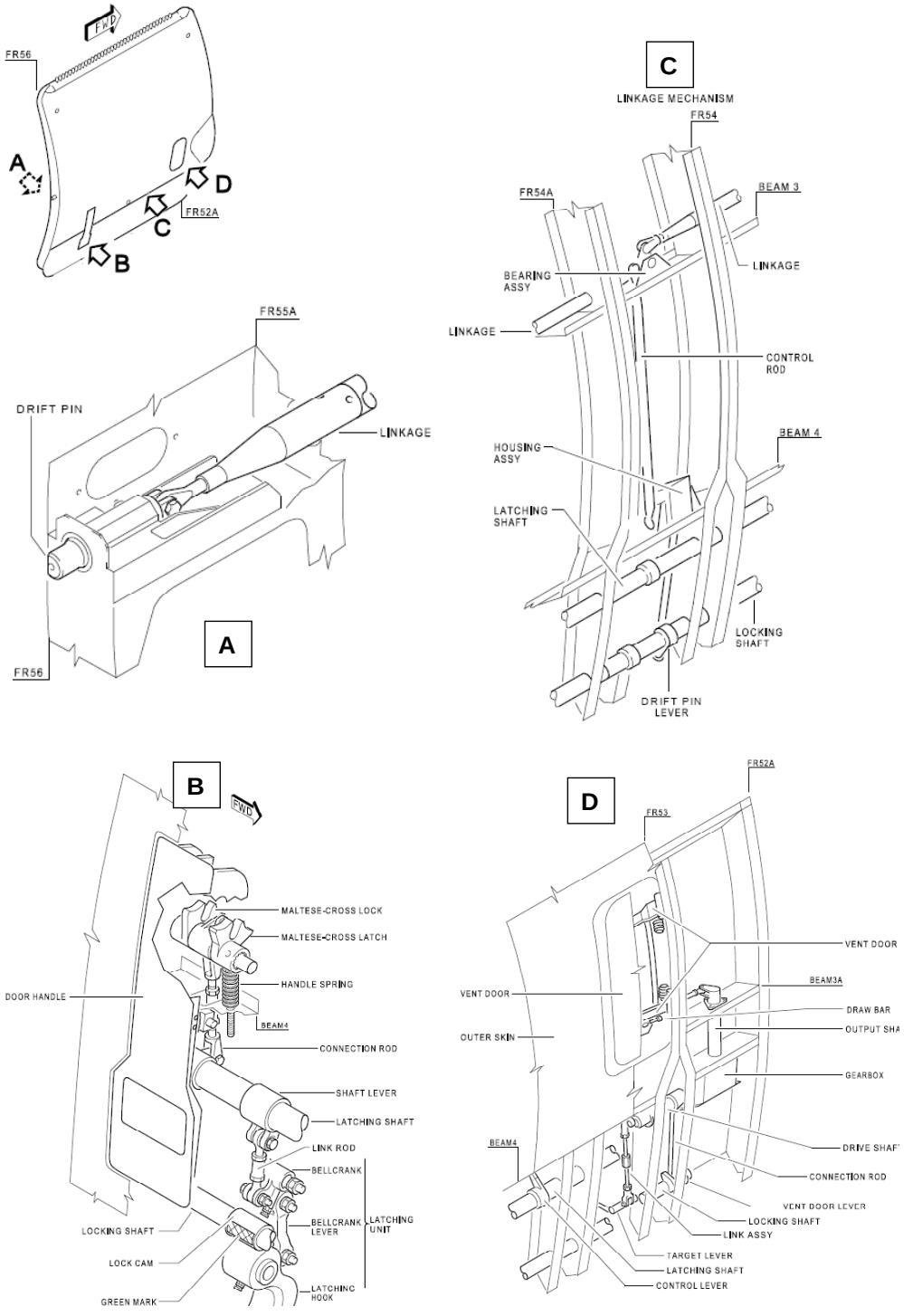


Figure 19