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

April 18, 2000

Structures Group Chairperson's Factual Addendum of Investigation

DCA00MA006

A. ACCIDENT

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| Location: | 60 miles south of Nantucket, Massachusetts |
| Date: | October 31, 1999 |
| Time: | 0150 Eastern Standard Time (EST) |
| Airplane: | Boeing 767-366ER, SU-GAP<br>Operated by EgyptAir |

B. STRUCTURES GROUP

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| Chairperson: | Lorenda Ward<br>National Transportation Safety Board<br>Washington, D.C. |
| Member: | Robert L. Whittington<br>Boeing Company<br>Seattle, Washington |

C. SUMMARY

About 0150 eastern standard time (EST), on October 31, 1999, a Boeing 767-366ER, SU-GAP, operated by EgyptAir, as flight 990, crashed into the Atlantic Ocean about 60 miles south of Nantucket, Massachusetts. EgyptAir flight 990 was being operated under the provisions of Egyptian Civil Aviation Regulations Part 121 and United States Title 14 Code of Federal Regulations Part 129 as a scheduled, international flight from John F. Kennedy Airport (JFK), New York, New York to Cairo International Airport in Cairo, Egypt. The flight departed JFK about 0122 EST, with 4 flightcrew members, 10 flight attendants,

and 203 passengers on board. There were no survivors. The airplane was destroyed by impact forces.

## D. DETAILS OF THE INVESTIGATION

### 1.0 Additional Wreckage Recovery

The decision was made to make a second pass over the East and West debris fields to recover the #1 engine and any flight control parts/pieces that were still on the ocean floor. This was accomplished on 29 March through 03 April 2000. There were representatives from the NTSB, FBI and the Egyptian Civil Aviation Authority on board the U. S. Navy's *MV Carolyn Chouest* where a remote operated vehicle (ROV) surgically loaded the desired parts into a basket for retrieval. There were two baskets of wreckage recovered during this operation, along with the #1 engine. The recovered parts were then unloaded at Quonset Point, Rhode Island.

### 2.0 Structures Examination

The structures group reconvened on April 17, 2000 at Quonset Point, Rhode Island to examine the wreckage that was recovered. Due to the small amount of wreckage recovered only two group members were in attendance.

In general there were two wing panels, four fuselage skins, a section of horizontal stabilizer skin, a portion of the inboard main flap, four pieces from the engine pylon, and the majority of the nose landing gear assembly recovered. Photographs of the recovered wreckage are attached (Appendix A).

There was no evidence of any pre or post impact fire damage and all fractures were consistent with failures generated by a high-speed impact. There was no prevailing directionality to the failures. None of the fracture surfaces examined exhibited any sign of pre-existing fatigue and there was some light corrosion damage on a few parts where the primer and paint were missing. There was no evidence of "pillowing" distortion. There was no evidence of foreign impact damage. There was no evidence of pre-existing corrosion.

#### 2.1 Wing Panels

The first wing panel was from the lower left wing. The leading edge of the panel was fractured though the access holes. The aft edge of the panel was the rear spar. This wing panel was 20 feet by 4 ½ feet. From the splice stringer moving aft, the inboard edge was fractured due to

overload. From the splice stringer moving forward, the #6 and #7 stringers skin panel continues to the production break of the body.

This wing panel was bowed up in the middle. The outboard edge of the panel was where the engine fairing attached to the skate angle. The outboard fractures were due to overload. Four shear tie ribs were gone. The stringers were still with the panel from the outboard edge continuing inboard to the outboard landing gear support rib. The rest of the inboard stringers were detached (#3 and #5) or gone (#1, #2 and #4).

The second wing panel was from the upper wing surface but could not be identified as to which side (right or left). This panel included the upper skin splice (U-17) and continued aft to include ten stringers (U-7 was the bottom). There was one shear tie rib which was detached. This panel was 14 feet by 55 inches to 16 inches. There was sealant for a fuel baffle rib at the left end. The right edge was curled down 90 degrees, 3 ½ feet from the edge. On the left side, the #13 stringer rivet line was where the wing panel was fractured for 18 inches.

## 2.2 Fuselage Skins

Three of the four fuselage skins recovered were from the upper area of the fuselage. The fourth piece was from the lower area. The first piece of fuselage skin was a 3 feet by 3 feet upper left crown skin with the letter "R" painted on the exterior surface. This piece was identified as being in section 43 and was buckled inward. The second fuselage skin was identified as a section of the 41/43 joining splice and was an 8 feet by 3 feet section that was crushed accordion style to 3 feet by 3 feet in an up and down and a fore and aft direction. The third piece of fuselage skin was found in the West debris field and was from the upper fuselage. This piece was 5 ½ feet by 3 ½ feet and was folded back on itself in the fore and aft direction. The skin was thin and was located above the window belt line. Two stringers were still attached for 2 ½ feet. Three stringers were missing. The majority of the fractures were at the rivet line. The fourth fuselage piece was from the lower area and was 5 ½ feet by 2 ½ feet. The frame was bent aft and there was a saw tooth fracture line along the frame splice. The floor stanchion was attached to the frame. The leading edge right skin was bent aft.

## 2.3 Horizontal Stabilizer

The horizontal stabilizer skin panel that was recovered was 7 feet by 15 inches. There were three stringers attached. The panel was bent/bowed out. The fractures were due to overload.

## 2.4 Inboard Main Flap Box

The inboard main flap box portion was 4 ½ feet by 3 ½ feet. This piece was identified as being from the right side. The outboard upper surface was pushed up and forward, but the lower surface was pushed down 90 degrees. Inboard between the mid spar and rear spar, the upper surface was pushed down but there was no impact or witness marks (2238 rib). There were 9 inches of the pushrod remaining on the inboard side.

## 2.5 Engine Pylon

From the engine pylon, the drag brace, the mid spar, the engine post for the front engine mount and the upper link fitting were recovered. The drag brace was intact. The engine fitting was deformed up and outboard, with the outboard side torn out. The wing fitting curved inboard 10 degrees. The fuse pin was still attached but the remaining bolts were missing. The mid spar fitting for the engine was recovered with the inboard fitting intact along with the side load fitting. The fitting is bent outboard 30 degrees, 27 ½ inches from the lug. Another 18 inches out, the fitting is bent outboard an additional 30 degrees. The engine post for the front engine mount fitting was still attached to the #1 engine. The outboard upper attach fitting was torn off. The upper link fitting engine side was bent up 90 degrees, 31 inches from the lug. The upper link fitting wing side was fractured near the lug. The lugs failed. The upper end of the upper link was curled outboard 30 degrees.

## 2.6 Landing Gear

The nose landing gear was recovered as one assembly except for the tires, wheels, right hand axle, right hand trunnion and the drag brace which were broken off or separated. The retract actuator was showing 17 inches of the inner cylinder. The trunnion pins (3) were still attached. Recovered separately were a main landing gear retract actuator, main landing gear pin, main landing gear side brace and the rear spar of the wing fitting for the main landing gear drag brace with the pin intact.

[redacted]

Lorenda Ward
Aerospace Engineer

[redacted] 4/27/00