NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 15, 2000

GROUP CHAIRMAN'S FACTUAL REPORT

Addendum # 3

OPERATIONAL FACTORS

DCA00MA006

A. ACCIDENT

Operator: EgyptAir
Location: 60-Miles South of Nantucket Island
(N40.20, W69.45)
Date: October 31, 1999
Time: 0148 EST[1]
Airplane: Boeing 767-366ER, Registration: SU-GAP

[1] Unless otherwise noted all times are expressed in terms of the 24-hour clock, Eastern Standard Time (EST).

B. Addenda

1. Trip report from the March 27-31, 2000, simulator and airplane demonstrations in Seattle, Washington.

Submitted by: [redacted]

Capt. P. D. Weston
Aviation Safety Investigator
May 15, 2000

Attachments:

Trip report Memo

National Transportation Safety Board
Washington, D.C. 20594

Office of Aviation Safety

Operational Factors Division
AS-30

To: Paul Misencik, Acting Chief Operational Factors Division
From: "PD" Weston, Sr. Aviation Safety Investigator
Subject: EgyptAir 990 Simulator Demonstrations, Seattle, Washington, March 28-31,2000
Date: May 15, 2000

The agreed mission for this trip was to observe and participate in the simulator demonstrations and ground tests that were being conducted in support of the EgyptAir flight 990 investigation. Additionally, I was to act as a technical advisor to the Human Performance Group during the playing of the synchronized CVR and FDR back drive in the "E" cab simulator. This activity was not an Operations Group activity and the Operations group was not notified of this activity. Capt. Bill Tafs, Operations Group member, was in attendance as the Boeing Company representative for the activities and did not act in the capacity of an Operations Group member.

March 28, 2000

In the morning I assisted in the synchronizing of the CVR and FDR for the back drive of the "E" cab with the Human Performance group and the Boeing engineers. During the afternoon I attended the briefing given by Bob Nelson and Pete VanLeynseele of Boeing.

March 29, 2000

In the morning there was a demonstration of a single and dual elevator PCA linkage disconnects. Five Boeing and NTSB pilots and the EgyptAir Engineering staff experienced the left and right column forces.

During the afternoon, we reviewed four back drive scenarios that were prepared for the split elevator simulation set for the "E-Cab" on Friday, March 31, 2000. As each back drive scenario was flown, a video animation of the airplane was displayed on a monitor for those who were not in the cab. This animation was from a chase plane point-of-view and included some basic flight instrument and control surface positions[1].

[1] See attachment # 1

March 30, 2000

The day was devoted to back drive simulations for the Human Performance Group. The simulations were divided into two separate sessions, (1) the "Open Session" where the CVR was NOT played in synchronization with the back drive (2) the "Closed Session" where the CVR was played in synchronization with the back drive. The NTSB had previously approved all parties that attended the "Closed Session".

Captain El Missiry of the Egyptian CAA, and Egyptian Captain Kelada of EgyptAir joined the activities on Thursday morning.

Simulations were started with the "Open Session" so members could familiarize themselves with the simulator and the backdrive scenarios. The Human Performance Group time motion studies were conducted at this session using Boeing, NTSB and Egyptian pilots.

For the "Closed Session", pilots were selected by the NTSB Human Performance Group to represent the accident's flight crew based on their height/weight proportions. These pilots flew the split elevator simulations and experienced the heavier column forces associated with column breakout. The breakout column forces for the pilot and copilot were displayed on the windscreen by means of computer generated instrumentation[2].

As a result of the "Closed session" demonstration it became clear that all the cockpit movements which would have controlled the fuel shutoff switches, the speedbrake deployment and the movement of the throttles as recorded by the FDR could have been accomplished by one pilot.

An additional ground test was conducted using external jam devices to demonstrate a dual elevator PCA jam. The ground test was aborted when it was determined that the devices (wooden blocks) were inadequate to bias the elevator PCA control valve on each PCA during the test.

March 31, 2000

Prior to the simulation sessions, the performance and system teams-reconvened in a conference room to discuss the issues raised the previous day. The primary question expressed by the Egyptian representatives involved the column and wheel motion they experienced during the split elevator back drives flown on Thursday morning.

The Egyptians were then briefed on the simulations of the dual elevator PCU failures. All the pilots and engineers were able to fly the 3 failure types starting from the initial trim condition. The examined each failure beginning with an open loop response,

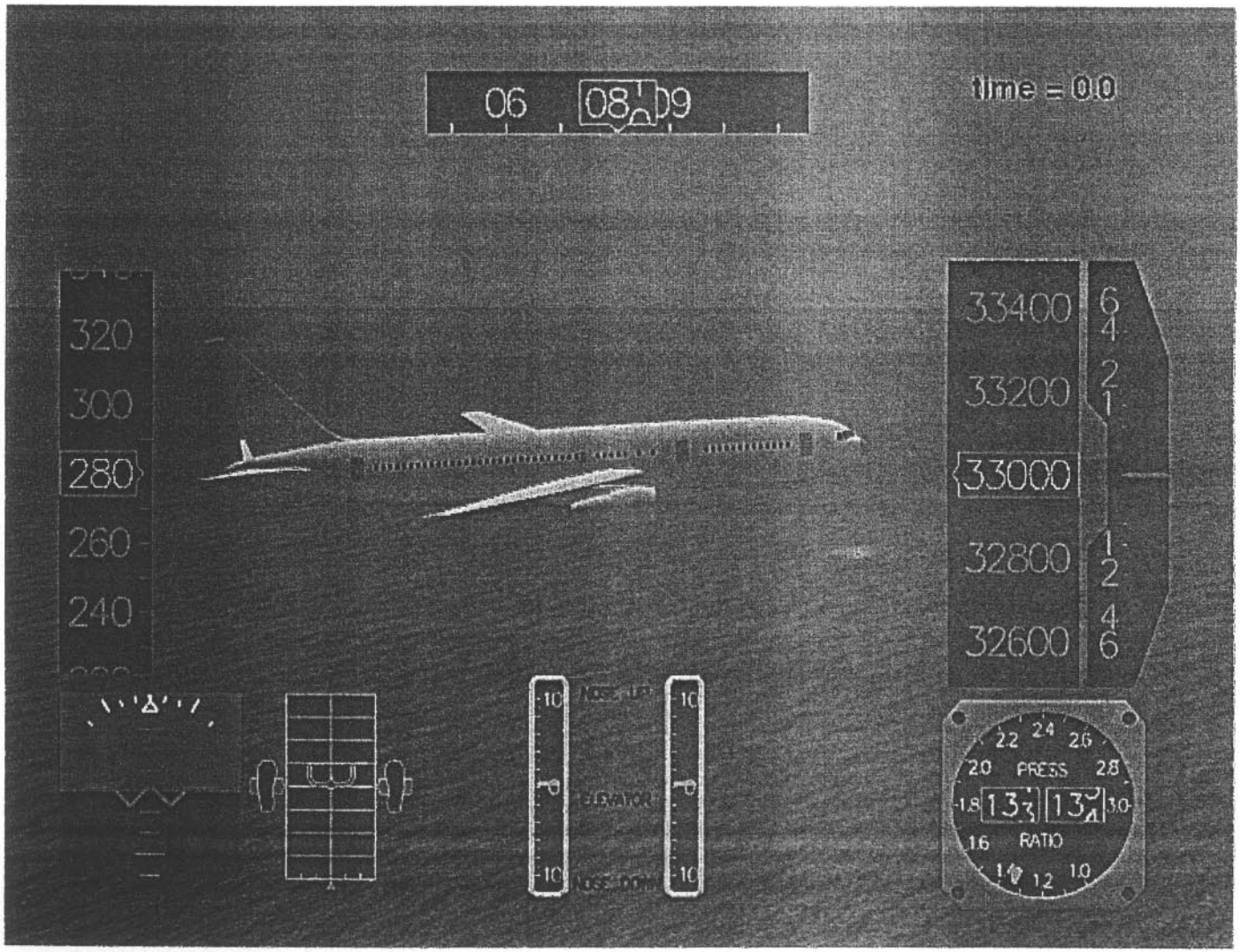
[2] See attachment # 2

followed by timed recoveries that waited 0, 5, 10, and 20 seconds before initiating recovery. During all these recovery scenarios, all of the participants were able to safely return the airplane to a stable flight condition. After these simulations were completed, the NTSB and the Egyptians requested an opportunity to examine a nose down jam of one elevator panel. A jam at the cruise [three hydraulic system] blowdown angle was considered too extreme, so one elevator panel was jammed at a deflection of 6 degrees airplane nose down. Again the pilots used the remaining elevator panel and stabilizer trim to safely recover the airplane to a stable flight condition.

Attachments:

#1 Chase plane view
#2 Windscreen display

Attachment #1



Attachment # 2