NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

January 13, 2000

Group Chairman's Factual Report

AIR TRAFFIC CONTROL GROUP

DCA00MA006

A. ACCIDENT

Operator:	EgyptAir, Flight 990 (MSR990)
Location:	60 nm Southeast of Nantucket Island, Mass. (N40.20, W69.45)
Date:	October 31, 1999
Time:	About 0648 Coordinated Universal Time[1] (UTC)
Airplane:	Boeing 767-366ER, SU-GAP

B. AIR TRAFFIC CONTROL GROUP

Chairman:	William English, National Transportation Safety Board
Member:	Allen Lebo, National Transportation Safety Board
Member:	Peter F. Hruz, Federal Aviation Administration
Member:	Christopher Sutherland, National Air Traffic Controllers Association

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, MA. 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. Floating debris from the aircraft was recovered on the morning of October 31, 1999.

[1] All times are Coordinated Universal Time (UTC) based on a 24-hour clock, unless otherwise noted.

D. DETAILS OF THE INVESTIGATION

1.0 GROUP ACTIVITIES

The Air Traffic Control (ATC) Group convened at New York Air Route Traffic Control Center (ZNY) on November 3, 1999, to begin the field phase of accident investigation. ZNY personnel provided a SATORI[2] replay of the ATC display. The ATC Group interviewed the Federal Aviation Administration (FAA) Air Traffic Control Specialists (ATCS) who worked EgyptAir 990 until the loss of communication and radar contact. The Group interviewed FAA Traffic Management and Supervisory personnel who coordinated Search and Rescue (SAR) operations. Personnel training records were reviewed. The Group interviewed technical personnel with expertise on the operation of FAA radar, display, and communication equipment. Applicable documents, charts, and radar data were requested and/or obtained from the FAA. The ATC Group concluded activities at ZNY on November 4, 1999.

2.0 ATC ENVIRONMENT

Between 0430 and 0615 UTC (0030 EDT to 0115 EST)[3] on October 31, 1999 New York Air Route Traffic Control Center (ZNY) was operating in a backup mode called Direct Access Radar Channel (DARC). The primary Host/NAS (National Airspace System) computer and software were out of service while technicians performed routine maintenance. Maintenance of the primary systems is commonly performed during midnight shifts to minimize the impact on air traffic. The DARC system does not have the capability to process flight plan database information as the Host/NAS does. Controllers must transfer flight plan data either verbally or via paper flight strips, per standard FAA procedures. As part of the transition to DARC, all flight plans stored in the Host/NAS, including MSR990, were printed out at the appropriate sectors in a procedure called "flush". This procedure gives the controllers a printed flight strip of the flight plan, although altitude and time references need to be manually written on the strip. While operating in DARC controllers must pass flight plan information to other facilities verbally via telephone landlines. After returning to Host/NAS operation flight plan data must be reentered into the computer.

ZNY operates five manual departure positions in a centralized departure complex, commonly known as the "Pit". The departure complex is responsible for the instrument flight rules (IFR) clearances to traffic departing all New York City and Philadelphia, Pennsylvania metropolitan area airports. Controllers staffing the departure complex review the proposed flight plans and make necessary changes which are then relayed back to ZNY sectors or adjacent facilities. "Pit" controllers do not normally communicate directly with aircraft. During midnight shift operations at ZNY all five positions are combined at sector 57.

New York Center Area F encompasses sectors which provide oceanic ATC service in the western North Atlantic. Oceanic control is largely performed using non-radar procedures. Traffic primarily travels via a system of routes called North Atlantic Tracks, which are routes plotted on a daily basis

[2] Systematic Air Traffic Operational Research Initiative, a computer system which uses enroute center computer data records to create a display approximating the depiction observed by the controller for a certain event.
[3] At 0600 UTC local time changed from Eastern Daylight Time to Eastern Standard Time.

in order to take advantage of upper wind flows. A notice called Track Advisory Message is published daily by the FAA to advise operators of the structure of the day's North Atlantic tracks. Aircraft operating in the oceanic system seldom have direct pilot-to-controller radio communication. ATC instructions and pilot position reports are relayed via High Frequency radio through the ARINC[4] equipment. Sectors 65 and 86 are responsible for transitioning aircraft from the domestic US radar ATC system to the Oceanic track system. Offshore military operating zones called Warning Areas are included in these sectors. ZNY logs indicates the Warning Areas were not in use on the night of the accident. These sectors have direct radar and radio coverage out to approximately 200 miles offshore. The Oceanic Display and Planning System (ODAPS) is used by oceanic controllers to aid in non-radar separation. Using time estimates and pilot position reports a video display of the approximate position of aircraft in oceanic airspace is created. The system also aids the controllers in computing projected aircraft positions and navigational fix crossing times.

3.0 HISTORY OF FLIGHT

At 0553 UTC (0153 EDT) the pilot of EgyptAir 990 (MSR990) called the JFK Tower Clearance Delivery position for clearance. JFK Tower Clearance Delivery (CD), Ground Control (GC), and Local Control (LC) positions were all combined at the LC position. LC called the ZNY Departure Complex (D57) to confirm that the flight plan and computer generated transponder code were still usable. D57 confirmed that the flight plan and code were usable. ZNY had been operating in the DARC backup system since 0430 and flight strips were printed during the flush procedure.

At 0559:43 MSR990 advised "we are ready for our clearance". At 0600:29 LC issued the IFR clearance to MSR990 to Cairo airport "via the Kennedy seven departure, gateway climb, vectors shipp then as filed. maintain five thousand expect flight level three three zero, one zero minutes after. squawk one seven one two, Oscar the current atis[5], departure frequency one two five point seven." The pilot of MSR990 read back the clearance.

At 0611:56 MSR990 requested taxi clearance. LC instructed MSR990 to taxi via taxiway B and hold short of runway 31R at taxiway ZA. The pilot acknowledged. At 0615:42 MSR990 reported approaching the hold short position for runway 31R. At the same time the ZNY Host/NAS system returned to service. Flight plans purged from the Host/NAS database during the earlier flush procedure were no longer stored in the computer. LC cleared MSR990 to cross runway 31R and to hold short of runway 22R. The pilot acknowledged, then at 0617:56 reported holding short of runway 22R. LC instructed MSR990 to taxi into position and hold on runway 22R, then notified the NY TRACON controller (N90) that ZNY had confirmed the flight plan was "still good". LC told MSR990 the wind was from 240 degrees at 10 knots and the runway visual range was greater than six thousand feet. At 0619:22 LC cleared MSR990 for takeoff. MSR990 acknowledged the take off clearance and said "confirm climb to six thousand". LC stated that the runway 22R visual range was six thousand feet, the altitude clearance was to five thousand feet. MSR990 acknowledged. At 0621:07 LC instructed MSR990 to contact N90 on frequency 125.7.

[4] ARINC (Aeronautical Radio Inc.) is a private company which provides long-range communications service between ATC and aircraft in oceanic airspace.
[5] Automatic terminal information system

At 0621:20 he N90 departure controller established radar contact with MSR990 and issued a climb to 13,000 feet. At 0621:57 N90 cleared MSR990 direct to SHIPP intersection. At 0624:46 N90 initiated a manual handoff of MSR990 to ZNY, Manta sector (R66). R66 said he did not have flight plan data on MSR990. R66 authorized N90 to issue a climb to Flight Level 230 (FL230) for MSR990. N90 read R66 the flight plan route. At 0625:48 R66 accepted the handoff and placed a data tag on the aircraft's transponder return. At 0626:04 N90 issued the climb clearance to FL230 and instructed MSR990 to contact ZNY on frequency 134.55.

The R66 controller then looked for, and found, the flush strip with MSR990's flight plan. At 0629:57 he entered a flight plan with an abbreviated route and verbally confirmed the mode C[6] altitude of MSR990. At 0631:26 R66 completed a handoff and frequency change to ZNY Atlantic/Joboc sector (R86).

MSR990 reported on R86's frequency climbing to Flight Level 230. At the same time R86 was on the landline with ZNY sector 89 accepting flight data on ARISE57, a military aircraft that would be entering R86's airspace from the south. At 0631:40 R86 interrupted the landline call to acknowledge MSR990. The call terminated at 0632:43. R86 entered the data on ARISE57. At 0632:53 ATC radar indicated MSR990 leveled at FL230, approximately 62 miles southeast of JFK. At 0635:52 (0135:52 EST) MSR990 passed an airspace boundary with Boston ARTCC, approximately 90 miles southeast of JFK. R86 instructed MSR990 to climb to FL330 and to proceed direct to the DOVEY intersection. At 0641:59 R86 issued the Oceanic clearance via North Atlantic Track Zulu. MSR990 read back the clearance. At 0644:27 ATC radar displays indicate MSR990 leveled at FL330. At 0647:18 R86 instructed MSR990 to change radio frequencies to 125.9 for better communication coverage. The pilot acknowledged and reported on frequency 125.9 to R86 at 0647:39. There were no further transmissions from MSR990. No deviations from the air traffic clearance were observed on the ATC displays through this time.

According to ZNY computer data extractions, at 0649:53 the mode C return from MSR990 indicated FL329. The full datablock associated with the aircraft indicated "330C". The "C" in the datablock specifies the mode C is within 300 feet of the assigned altitude. Mode C altitude indicated FL315 at 0650:05. Mode C altitude indicated FL254 at 0650:17. Mode C altitude indicated FL183 at 0650:29. This was the last transponder return indicated in the ZNY computer. ZNY computer records indicate that none of the last three transponder mode C altitude returns were visible on the R86 controller's display. The mode C field in MSR990's datablock indicated XXXX.[7] At 0650:41 a primary radar return from MSR990 was received at ZNY. At 0650:45 R86 received a landline call from an adjacent facility initiating a point-out on Air France 439. The call was completed at 0650:59. At 0651:33 MSR990's datablock indicated the Host/NAS could no longer associate MSR990's flight plan with a radar target and had gone into coast status. At 0652:05 the last primary

[6] A feature of the ATC Radar Beacon System which transmits altitude from an aircraft for display on ATC equipment.

[7] The NAS software includes an adapted maximum vertical speed parameter for each type of aircraft likely to be encountered in order to aid conflict prediction programs. If the observed vertical speed of a tracked aircraft exceeds this parameter the mode C value is assumed to be invalid and the altitude on the controller's display is replaced with "XXXX". The controller can override the XXXX and display the received mode C data, however it may take up to 30 seconds to clear the XXXX symbol. The maximum descent rate adapted in ZNY's Host computer for a B767-300 is 6000 feet per minute.

target from MSR990 was received at ZNY. At 0652:41 the last primary target history[8] symbol was displayed at the R86 position. No distress transponder code[9] was received.

At 0653:28 ARISE57 initiated contact with R86. R86 responded to ARISE57 and issued a transponder code. At 0654:00 (0154:00 EST) R86 transmitted to MSR990 that radar contact was lost. There was no reply.

4.0 POST ACCIDENT ATC ACTIONS

At 0656:37 R86 contacted ARINC to determine if MSR990 had switched to oceanic frequencies early. ARINC checked radio frequencies and SELCAL[10] equipment and was unable to contact the aircraft. R86 informed the sector 81 controller (R81), who was also serving as controller-in-charge for the area, that she had lost radar and radio contact with MSR990. R81 informed the Area Manager in Charge (AMIC). At 0704:46 R86 requested Boston ARTCC have a nearby aircraft, Lufthansa 499 (DLH499) attempt radio calls to MSR990. DLH499 reported that there was no response and no ELT[11] signal. The Boston ARTCC controller advised that he had seen MSR990's radar target approximately ten to fifteen minutes earlier, but did not observe anything now.

At 0709 the AMIC notified the Air Force Rescue Coordination Center and the Coast Guard of the missing aircraft. The R81 controller called the Northeast Air Defense Sector (Huntress) to determine if they had a radar target on MSR990, they responded that they did not. He asked Huntress to relay the same request to the Canadian military radar units. Huntress did, and relayed that the Canadian military could not see any target either.

R86 advised the ZNY Oceanic area that MSR990 was out of radar and radio contact and that they should block airspace using lost communications procedures. At 0716 AMIC notified the Eastern Region Operations Center (AEAROC) and asked for a telephone contact at EgyptAir. AEAROC connected AMIC with JFK Tower who had a phone number listing that indicated Alitalia Operations provided dispatch service for EgyptAir at JFK. Numerous phone calls to the Alitalia number were unanswered.

At 0731:50 R86 coordinated with Boston ARTCC to reroute a nearby aircraft, Air France 439 (AFR439) to overfly the last known position of MSR990. The pilot agreed and was vectored to the area. The pilot reported overcast conditions in the area, but he could "see the ground lightly". He reported seeing nothing unusual in the area. At 0740 an Alert Notice was sent to all ATC facilities along MSR990's intended route that included the aircraft's flight plan and last known position. At 0800 AMIC notified Airways Facilities to make a record of ATC equipment certification.

[8] The Host/NAS system has the capability to display a "trail" of previous positions of a radar target. Up to five updates can be displayed. The number of history targets displayed is selected by the individual controller. Computer extractions from ZNY indicate the R86 history was set at 3. ARTCC radar displays update every 12 seconds.

[9] Certain four digit transponder codes are used to indicate an aircraft in difficulty. An aircraft emergency is indicated by 7700, radio failure by 7600.

[10] Selective Calling, an aircraft-specific radio addressing system.

[11] Emergency Locator Transmitter

5.0 INTERVIEWS

Ann Brennan **Sector 86 Radar Controller**

The ATC Group interviewed Ms. Brennan on November 3, 1999. She has been an air traffic controller in the FAA for 8 years. She began as an Air Traffic Assistant at Philadelphia, Pennsylvania Tower and is currently fully certified in ZNY Area F. She holds a Bachelor of Science degree in Aeronautical Science from Dowling College, and is an FAA certified Private Pilot.

On October 31, 1999, Ms. Brennan was scheduled to work a midnight shift. She reported to ZNY at 0330 (2330 EDT, October 30, 1999). She stated that she usually works only day shifts and that it is rare for her to work an evening or midnight shift. She characterized the traffic that evening as slow, with no activity in the offshore Warning Areas. There had been a scheduled outage of the Host computer, and ZNY had been using the Direct Access Radar Channel (DARC) backup equipment until approximately 0615 UTC. Sector 86 was combined with sector 65. She said this configuration is responsible for a large geographical area, and her display was set to a 200 nautical mile range. She had no radar or communication equipment problems.

Just after accepting the radar handoff on MSR990, Ms. Brennan was entering a flight plan on another aircraft, ARISE57, which was transitioning from Oceanic airspace. The Sector 87 controller physically brought her the flight strip from the ODAPS system to use as reference. MSR990 checked on frequency climbing to Flight Level 230. After completing the data entry on ARISE57 and observing MSR990 passing an airspace boundary with Boston ARTCC, she cleared MSR990 to the requested final altitude of FL330 and instructed the flight to proceed direct to the DOVEY intersection. She issued the oceanic clearance to the pilot and recalled being impressed that the pilot knew the track message identification number without her prompting. She later instructed MSR990 to change to one of her other radio frequencies for better coverage, which the pilot did. She stated MSR990 was the only aircraft using the southerly oceanic track (North Atlantic Track Zulu) during her session.

Ms. Brennan estimated the aircraft was approximately 15 minutes from DOVEY intersection, the transfer point to the oceanic controller, so she went to the flight strip printer to sort strips. She estimated she was sorting strips for approximately 30 to 45 seconds. The physical location of the printer and strip bays is approximately six feet to the left of the DSR[12] radar display. When she looked back at the display she noticed MSR990 was in coast track status which indicates that the ATC computer is no longer tracking a radar return.

Ms. Brennan advised MSR990 “radar contact lost” and instructed the pilot to recycle the transponder[13]. No reply was received. She did not see a transponder or primary target where she expected MSR990 should be. She checked the DARC system for a radar target on MSR990, none was displayed. She continued to attempt to contact the aircraft on normal ATC frequencies and the emergency frequency (121.5) with no response. Ms. Brennan told the sector 81

[12] Display System Replacement, a color video display of ATC radar and flight data, aeronautical mapping and other information. An upgrade of the Plan View Display “scope”.
[13] Turn the transponder off then on again.

(Bermuda) controller (Ray Redhead) that "something's wrong" and he notified the supervisor. She would not have expected the loss of both transponder and primary radar targets in this area.

Ms. Brennan continued attempts to contact the aircraft, including relays through ARINC communications service. She called the bordering Canadian civil and military facilities to determine if they had any radar targets on the aircraft, they reported that they did not. She called the controller at the adjacent Boston ARTCC (ZBW) sector to have an aircraft, Lufthansa 499 (DLH499), call out on her frequency and the emergency frequency. There was no reply from MSR990, and DLH499 reported they were not receiving any ELT signals. She aided Mr. Redhead in coordinating with Northeast Air Defense (Huntress) to determine if they could see any targets. She advised the ZNY Oceanic area that MSR990 was out of radar and radio contact and that they should block airspace using lost communications procedures. She coordinated with ZBW to reroute a nearby aircraft, Air France 439 (AFR439), to overfly the last known position of MSR990. The pilot of AFR439 had limited English ability. He reported "overcast" but that he could "see the ground lightly" and that he did not see anything unusual in the area.

At approximately 0800 Ms. Brennan was relieved from the position by Mr. Redhead who had earlier relinquished the Bermuda sector to another controller. She wanted someone who "knew the story" to take over while search and rescue efforts were under way.

Paul Thumser **ZNY Area Manager In Charge**

The ATC Group interviewed Mr. Thumser on November 3, 1999. He has been an Operations Supervisor at ZNY Area C since 1989. He entered on duty with the FAA on February 7, 1982. He worked as an Air Traffic Controller at NY TRACON from then until his promotion to supervisor at ZNY. Mr. Thumser is also an FAA certificated Airline Transport Pilot and Flight Instructor. He had worked as a commuter airline pilot prior to becoming an Air Traffic Controller.

Mr. Thumser was scheduled to work a midnight shift on October 31, 1999. He reported to ZNY at 0300 (2300 EDT, October 30, 1999). He was responsible for the Area Manager in Charge (AMIC) position, which supervises the overall operation of the control room. He characterized the traffic that night as routine and quiet. He authorized a shutdown of the Host/NAS computer system for routine maintenance at 0430, scheduled to return to service at 0630. The technicians completed the maintenance early and returned the Host/NAS system at 0615. Between 0625 and 0640 he authorized a maintenance release on the DARC system, followed by a release of the ODAPS system from 0650 to 1000. He termed the maintenance releases as normal and routine procedures on a midnight shift. He said no controllers reported any difficulty in transitioning to and from the DARC system that night.

At 0700 the Area F Controller in Charge, Ray Redhead, reported a missing aircraft. Mr. Thumser took a cordless telephone from the AMIC desk and proceeded to sector 86. He spoke with Ms. Brennan who reported the loss of radar and radio contact with MSR990. He had the controllers attempt contact on all frequencies and called ARINC and the Canadian ATC. He observed a coast track display of MSR990 and asked Ms. Brennan to obtain the coordinates of the last observed target. At 0709 he notified the Air Force Rescue Coordination Center. At 0711

he notified the Coast Guard District 1 in Boston and provided the last known location, route, and aircraft information. At 0716 he notified the FAA Eastern Region Operations Center (AEAROC) and attempted to obtain a phone number for EgyptAir Operations. AEAROC did not have a contact for EgyptAir but they were able to connect him to JFK Tower who had a contact phone number at Alitalia Operations. However, no one answered.

Mr. Thumser called the Air Traffic Control System Command Center (ATCSCC) for aid in contacting the airline operations. Mr. Thumser and controller Dennis Yesenowski entered an Alert Notice to notify subsequent facilities of a possible aircraft in distress. Mr. Thumser and Mr. Yesenowski attempted to locate a satellite phone number for the aircraft but it was not listed in ZNY's directory.

At 0730 Mr. Thumser saw AFR439 on Ms. Brennan's display and got ATCSCC permission to reroute the aircraft over MSR990's last known position. He stated the Air France pilot had limited English ability. He observed Ms. Brennan vector the aircraft and overheard the pilot's response that he was in "overcast" but could "see the ground". He aided in coordinating a new routing for AFR439 and in the coordinating to have DLH499 attempt radio contact.

Mr. Thumser called the ZNY Quality Assurance Manager and advised of the missing aircraft. He then notified Airways Facilities personnel to check the status of radio and radar equipment and begin extracting radar and voice tape data. He interviewed the controllers who worked MSR990 both on this flight and the inbound flight into JFK, all reported normal operations.

Ray Redhead Sector 81 Radar Controller/Area F Controller in Charge

The ATC Group interviewed Mr. Redhead by telephone on November 3, 1999. He entered on duty with the FAA in 1979 at Cleveland Air Route Traffic Control Center and transferred to ZNY in 1992. He is fully rated in ZNY Area F. He is an FAA certificated commercial pilot.

Mr. Redhead reported to work at ZNY at 0130 on October 31, 1999 (2130 EDT, October 30, 1999). Just prior to the accident he was working the Bermuda sector (R81) and serving as the Controller-in-Charge (CIC) for Area F. He stated the CIC duty is rotated through qualified controllers during the course of a midnight shift. CICs serve as a contact point for the area of specialty during the shift.

Mr. Redhead characterized the traffic that night as routine. At approximately 0650 he was having a conversation with Ms. Brennan when she noticed a coast track on her display. He said he could see the datablock on her display from where he was sitting, but it was too far away for him to read any details. He heard her call to the aircraft several times. She told him the aircraft was not responding and there was no radar target. He alerted the AMIC. He called both Boston ARTCC and the US Navy Fleet Air Control and Surveillance Facility (FACSFAC) at Oceana Naval Air Station to determine if they saw any target, which they did not. He looked through flight plans and other documents to try to find a SELCAL code for the aircraft. He called the adjacent Canadian ATC sectors to notify them that ZNY would use lost communication procedures for MSR990 and begin blocking airspace.

Mr. Redhead observed Ms. Brennan vectoring AFR439 to the vicinity of MSR990's last known position. By this point he concluded they "were looking for a downed aircraft". At 0800 he relinquished R81 to another controller and relieved Ms. Brennan from R86 since he had knowledge of the situation. He instructed the oceanic sectors to continue to block airspace using lost communication procedures, but assumed there was "definitely a problem" since there was no radio contact, transponder, or primary target. He provided vectors to the last known position of MSR990 to Coast Guard rescue aircraft.

Dennis Yesenowski **Sector 66 Radar Controller**

The ATC Group interviewed Mr. Yesenowski on November 3, 1999. He entered on duty with the FAA in 1981 and has been assigned to ZNY the entire time. He became fully certified in 1984 in the Oceanic area.

Mr. Yesenowski arrived at ZNY at 0230 (2230 EDT, October 30, 1999) for a scheduled midnight shift. He was working the Manta Sector (R66) at the time of the accident. He characterized the traffic as slow and routine. He said there had been some delays at JFK earlier in the shift, but that there was "no volume problem" by the time the Host/NAS was released.

Mr. Yesenowski recalled MSR990 departed JFK just after the Host/NAS had returned to service. He had to look up the flight plan on the aircraft and found the "flush" strip, which he used as a guide to manually enter a new flight plan. He initiated a track on the aircraft after accepting the manual handoff from NY TRACON. He verbally verified MSR990's mode C altitude because his sector's track was the first in the ZNY system on MSR990. After entering a flight plan with abbreviated oceanic route he hand-carried the flush strip with the full route to Ms. Brennan.

Mr. Yesenowski did not notice anything unusual about MSR990. He stated that the pilot's English was "pretty good" and the flight path and climb appeared normal. He found out about the accident at approximately 0705. Since he had many years of oceanic ATC experience he "gave his two cents" for attempts to contact the aircraft and begin search and rescue. He aided Mr. Thumser in formulating and sending an Alert Notice.

Ted Jean **ZNY National Airspace System (NAS) Operations Manager**

On November 4, 1999 the ATC group requested an explanation of the operation of the NAS software in regards to aircraft with a high vertical speed. Mr. Jean explained that the NAS software includes an adapted maximum vertical speed parameter for each type of aircraft likely to be encountered in order to aid conflict prediction programs. If the observed vertical speed of a tracked aircraft exceeds this parameter, the mode C value is assumed to be invalid and the altitude on the controller's display is replaced with "XXXX". The adapted value for a B763 in ZNY's NAS is 5000 feet per minute climb, 6000 feet per minute descent. The controller can override the XXXX and display the received mode C data, however it may take up to 30 seconds to clear the XXXX symbol. The NAS software marks mode C values that are outside the specified parameter with a preceding minus sign (-). A mode C value preceded by the minus sign will not be displayed on NTAP[14] printouts and the SATORI playback. DART[15] extractions

[14] National Track Analysis Program, a program which extracts the records of radar targets stored in the ATC host

will show the received mode C value and the preceding minus sign.

Michael Miglietta **ZNY Automation/Display Supervisor**

The ATC Group requested the status of ATC radar and computer equipment on the night of the accident. Mr. Miglietta stated that there were no open discrepancy reports on any ATC radar equipment at ZNY. He provided certification logs for the radar sites, Host computer, NAS software, and associated equipment.

6.0 ATTACHMENTS

A. ATC Voice Transcripts 50pp
B. North Atlantic Track Advisory Message 3pp
C. Copies of ZNY Flight Progress Strips on MSR990 2pp
D. Kennedy Seven Departure Chart 2pp
E. Excerpts from ZNY Standard Operating Procedures Manual 1lpp
F. ZNY Control Room Layout Diagram 1p
G. Enroute Aeronautical Chart 1p
H. North Atlantic Route Chart, Tracks Drawn by Group Member Hruz 1p
I. ZNY Accident/Incident Notification Record, Form 8020-3 1p
J. ZNY Daily Record of Facility Operation 3pp
K. ZNY DART and NTAP extraction printouts 5pp
L. FAA Order 7110.65 Chapter 10, Sections 3 and 4 6pp

[redacted]
William English
ATC Group Chairman

[redacted]
Allen Lebo
ATC Group Member

computer.
[15] Data Analysis and Reduction, a program which extracts internal recorded data from the ATC Host computer.