National Transportation Safety Board
Washington, DC 20594

Brief of Accident

Adopted 12/04/2000

NYC99FA110

File No. 1563 | 05/08/1999 | JAMAICA, NY | Aircraft Reg No. N232AE | Time (Local): 07:01 EDT

Make/Model:	Saab-scania Ab (saab) / 340B
Engine Make/Model:	Ge / GECT7-9B
Aircraft Damage:	Substantial
Number of Engines:	2
Operating Certificate(s):	Flag Carrier/Domestic
Name of Carrier:	AMERICAN EAGLE AIRLINES, INC.
Type of Flight Operation:	Scheduled; Domestic; Passenger Only
Reg. Flight Conducted Under:	Part 121: Air Carrier

	Fatal	Serious	Minor/None
Crew	0	0	3
Pass	0	1	26

Last Depart. Point:	BALTIMORE, MD
Destination:	Same as Accident/Incident Location
Airport Proximity:	On Airport/Airstrip
Airport Name:	JOHN F. KENNEDY INTL APT
Runway Identification:	4R
Runway Length/Width (Ft):	8400 / 150
Runway Surface:	Asphalt
Runway Surface Condition:	Wet

Condition of Light:	Day
Weather Info Src:	Weather Observation Facility
Basic Weather:	Instrument Conditions
Lowest Ceiling:	100 Ft. AGL, Overcast
Visibility:	.25 SM
Wind Dir/Speed:	090 / 011 Kts
Temperature (°C):	58
Precip/Obscuration:	

Pilot-in-Command Age: 41

Certificate(s)/Rating(s)
Airline Transport; Multi-engine Land

Instrument Rating
Airplane

Flight Time (Hours)

Total All Aircraft:	6000
Last 90 Days:	100
Total Make/Model:	2800
Total Instrument Time:	350

NYC99FA110

HISTORY OF FLIGHT

On May 8, 1999, at 0701:39 Eastern Daylight Time, a Saab 340B, N232AE, sustained substantial damage during landing at John F. Kennedy International Airport (JFK), Jamaica, New York. The airplane was owned by AMR Leasing Corporation, and operated by American Eagle Airlines Inc. as flight 4925. There were no injuries to 3 crewmembers and 26 passengers, while 1 passenger sustained a serious injury. Instrument meteorological conditions prevailed for the flight that originated from Baltimore-Washington International Airport (BWI), Baltimore, Maryland. An instrument flight rules flight plan was filed for the air carrier flight conducted under 14 CFR part 121.

According to pilot interviews, Air Traffic Control (ATC) data, and the cockpit voice recorder (CVR), the departure from BWI, and cruise flight to JFK was uneventful. The captain completed an approach checklist and briefing, and ATC gave the flightcrew a vector for the instrument landing system (ILS) approach to Runway 4R. Later, ATC advised the flightcrew that the runway visibility range (RVR) was 1,600 feet. The controller asked if the flightcrew could proceed

with the approach, or if they were going to have to hold until the RVR was at 1,800 feet. The captain stated that they needed 1,800 feet RVR to initiate the approach. ATC then cleared the flight to turn to 010 degrees and intercept the Runway 4R localizer, and hold southwest of the EBBEE intersection, on the localizer, at 4,000 feet.

The airplane had not reached EBBEE, but was on the localizer course, when the controller stated, "Eagle flight nine twenty five, runway four right RVR is eighteen hundred if, if you want to make it from there, or you might be too high. Just let me know..." The captain replied "we can take it." The controller then cleared flight 4925 for the ILS approach to Runway 4R. At that time, the airplane was approximately 4,000 feet mean sea level (MSL), and 6.6 miles from the approach end of the runway. The first officer began the approach descent, but the captain extended the landing gear and took control of the airplane.

Approximately 24 seconds after issuing the approach clearance, the controller stated, "Eagle flight nine twenty five, you good for the approach from there?" The captain replied, "We're gonna give it our best."

During the descent, the flightcrew received four audible warnings, including one "sink rate", and three "too low terrain" warnings. According to a Saab 340 manual, a "too low terrain" warning would cancel a flap warning. At 0701:12, the first officer stated "okay, there's three hundred feet." Approximately 7 seconds later, the captain stated "okay, before landing checklist is." The first officer replied "three green, flaps zero." During the approach, the first officer made no other callouts. The flaps remained retracted during the approach. However, after the accident, the captain extended the flaps to 20 degrees.

According to radar data, and the flight data recorder (FDR), the airplane's descent rate reached a maximum vertical velocity of approximately 2,950 feet per minute. The airplane crossed the runway threshold about 180 knots. It touched down approximately 7,000 feet beyond the approach end of the runway, at 157 knots. The flightcrew applied reverse thrust and maximum braking, but the airplane departed the end of the runway about 75 knots. Approximately 300 feet of skid marks were observed, by a Federal Aviation Administration (FAA) Inspector, at the end of the runway.

The airplane traveled off the end of the runway, over a deflector, and onto an Engineered Materials Arresting System (EMAS). The airplane traveled approximately 248 feet across the 400 foot long EMAS, and the landing gear sank approximately 30 inches into the EMAS, at its final resting place. During the overrun, the nose gear, fuselage, and propellers sustained damage.

The accident occurred during the hours of daylight; located approximately 40 degrees, 38 minutes north longitude, and 73 degrees, 46 minutes west latitude.

FLIGHTCREW INFORMATION

Captain

The captain held an Airline Transport Pilot Certificate with a rating for airplane multiengine land, and was type rated in the Saab 340. His most recent FAA First Class Medical Certificate was issued on February 19, 1999. The captain was hired by American Eagle Airlines on July 6, 1992, and flew as a first officer on the Saab 340. He was upgraded to captain in October, 1998. He received his six-month simulator training in April, 1999. In March 1999, he completed academic training for initial operating experience check-airman qualifications.

According to company records, the captain's total flight experience was approximately 5,577 hours, of which, approximately 2,376 hours were in the Saab 340. Of the 2,376 hours, about 230 were pilot-in-command experience. The captain's base of operation with American Eagle Airlines was JFK.

The captain was interviewed by the Safety Board's Operations Group on July 20, 1999. He stated that, when he was cleared for the approach, he thought he was

further from EBBEE. He saw "8" displayed on the distance measuring equipment (DME) and thought it was from EBBEE. He added that calling for the Before Landing Checklist was the pilot-flying (PF) responsibility, but should be challenged if not called for appropriately. He further stated, prior to the approach, he might have known in the back of his mind that the flaps were not down, but it did not register.

The captain added that the first officer did not make the required approach call-outs, including; OM/FAF, 1,000 feet, approach deviations, 500 feet, and approaching minimums. The captain said his scan should have included the altimeter, but he was focused on the glide slope. He remembered the first officer saying "300 feet, runway in sight."; but did not remember the first officer saying "flaps zero."

The captain felt that he was adequately trained for the stabilized approach. The stabilized approach criteria was taught in ground school and the simulator.

He recalled a ground proximity warning system (GPWS) alert at the initiation of descent. He added that he could later hear the GPWS alerts, but they did not register. He did not recall canceling the GPWS alerts.

The captain stated that a go-around did not enter his mind at 300 feet because he was still trying to process information.

First Officer

The first officer held an Airline Transport Pilot Certificate with a rating for airplane multiengine land. His most recent FAA First Class Medical Certificate was issued on December 14, 1998. He was hired by the company on February 8, 1999, and received his qualification as a Saab 340 first officer in March, 1999.

According to company records, the first officer had a total flight experience of approximately 2,010 hours, of which, approximately 45 hours were in the Saab 340. His base of operation with the company was JFK.

The first officer was interviewed by the Safety Board's Operations Group on July 20, 1999. He stated:

"We were at 4,000 feet being vectored for the ILS 4R approach. The visibility was below minimums and we were given holding instructions by ATC. Two miles prior to EBBEE the visibility came up and ATC asked if the weather was good enough for us and could we make the approach. Captain Powers answered yes. He put the landing gear down and pushed the condition levers to Max. I was flying with the autopilot engaged and I initiated a 2,000 foot per minute descent. The captain took the aircraft. At that point I fell behind the aircraft. My scan was not 100%. I missed the call at the Outer Marker and the 1,000 foot call. Something prompted me to do the Before Landing Checklist. At around 500 feet, I thought I saw glide slope and called it, gear down, three green, flaps zero, runway in sight."

When asked if he felt uncomfortable with the approach, the first officer stated "No, I relied on the captain to know what he was doing and know where he was."

INJURIES TO PERSONS

According to crew statements, passenger statements, and medical records, one passenger was seriously injured. She suffered a fractured fibula while exiting the airplane. All other occupants were not injured.

AIRCRAFT INFORMATION

The airplane was equipped with two General Electric, GECT7-9B, engines. Before the accident, the airplane underwent a maintenance inspection on May 7, 1999. After the accident, Examination of the airplane by a Federal Aviation Administration Inspector, and company personnel, did not reveal any pre-impact mechanical malfunctions, nor did the pilots report any.

METEOROLOGICAL INFORMATION

At 0705, the reported weather at JFK was: winds from 090 degrees at 11 knots; visibility less than 1/4 mile; Runway 4R visibility range 1,600 feet, variable 2,000 feet; fog; vertical visibility 100 feet; temperature and dewpoint 55 degrees Fahrenheit; altimeter 29.96 inches of mercury.

The flight plan, dispatch release, and weather documents were examined. No deficiencies were found.

AERODROME INFORMATION

John F. Kennedy International Airport (JFK), Jamaica, New York, was owned by the City of New York, and operated by the Port Authority of New York and New Jersey (PANY&NJ). JFK was served by four runways: 4L/22R, 4R/22L, 13L/31R, and 13R/31L. Runway 4R was asphalt, transverse grooved full length, 8,400 feet long, and 150 feet wide. It was configured for category II/III instrument landings, equipped with high intensity runway edge lights, and centerline lights.

Runway 4R was also equipped with an Engineered Materials Arrestor System (EMAS). The EMAS was located approximately 102 feet beyond the end of the runway. It was constructed of cellular cement, and measured approximately 400 feet long, by 150 feet wide. It progressed from approximately 9 to 30 inches in depth.

The Thurston Basin was located about 25 feet beyond the EMAS. It was a shallow, mud-based estuary with its bottom about 10 to 15 feet below runway level, and it was subject to tidal changes. At high tide, the shorelines of the basin began about 560 feet beyond the departure end of the runway. Additionally, the Thurston Basin was the site of a previous accident involving Scandinavian Airlines System flight 910 on February 28, 1984. In that accident, the airplane overran Runway 4R and came to rest in the basin. Twelve people were injured, and the airplane sustained substantial damage. Information about the accident was available from NTSB report DCA84AA018.

The Safety Board issued Safety Recommendation A-87-37, as a result of Safety Board Safety Study SS-84-02, "Airport Certification and Operations." The Safety Board recommended that the FAA: "Initiate research and development activities to establish the feasibility of soft-ground aircraft arresting systems and promulgate a design standard, if the systems are found to be practical."

The FAA and the United States Air Force (USAF) agreed to determine the feasibility of, and develop criteria for, the design of soft-ground arresting systems on December 21, 1984. In 1989, the FAA initiated an experimental program with the U.S. Naval Air Engineering Center, Lakehurst, New Jersey, to conduct experiments on soft-ground materials. The purpose of the experiments was to verify the theoretical calculations of stopping distances. Tests were conducted using a FAA Boeing 727 in July-August 1990, using phenolic foam and cellular cement. The FAA's Technical Center conducted two successful full-scale arrestments using the instrumented FAA Boeing 727 aircraft between June and July, 1993. A phenolic foam bed; 680 feet long, 48 feet wide; and 18 inches deep, was used. During the first arrestment, the instrumented Boeing 727 traveled at 50 knots, and stopped safely, 420 feet into the bed. During the second test, the Boeing 727 traveled at 60 knots, and stopped safely, 540 feet into the bed.

From 1994-1996, the FAA and PANY&NJ developed the prototype arrestor bed for runway 4R at JFK. In September 1994, the FAA and Engineered Systems

Company of Aston, Pennsylvania, entered into a cooperative research and development agreement to test new materials and methods related to the practical aspects of soft-ground arresting systems. By November 1994, a cast-in-place arrestor bed, comprised of cellular cements, was constructed and tested at the FAA William J. Hughes Technical Center. A second test bed, built with pre-cast cellular cement block, was tested in June 1995.

The PANY&NJ installed the prototype aircraft arrestor bed at JFK in 1996. The $2.6 million bed was fully funded by the PANY&NJ. Another EMAS was installed at the departure end of Runway 13 at LaGuardia Airport (LGA), and five other EMAS were being considered for New York City area airports, by the PANY&NJ.

While the FAA tested the feasibility of EMAS with a Boeing 727; no test was ever completed with a Saab 340, or an aircraft of similar weight. The accident was the first operational use of the EMAS. Additional information pertaining to the EMAS was found in FAA Advisory Circular AC 150/5220-22 - Engineered Materials Arresting Systems for Aircraft Overruns.

After the overrun, repairs to the system took 15 days, and cost approximately $900,000. Repairs to the airplane cost approximately $ 984,000.

While the EMAS at JFK was successful, the system at LGA experienced a breakup due to the proximity of the system to the runway end. In August, 1999, PANY&NJ removed the EMAS at LGA. PANY&NJ suspected that vibration may have been involved, and that the foam panels had to be strengthened. Additional testing was being performed at the FAA Technical Center.

FLIGHT RECORDERS

Cockpit Voice Recorder

The airplane was equipped with a Fairchild model A-100A cockpit voice recorder. The CVR was transported to the NTSB, Office of Research and Engineering, on May 13, 1999. The CVR committee convened on May 20, 1999, and a transcript was prepared of 9:56 minutes of the 31:04 minute recording.

According to the CVR Group Chairman's report, the exterior of the CVR showed no evidence of structural damage. The interior of the recorder and the tape sustained no apparent heat or impact damage. The recording consisted of four channels of good quality audio information.

Flight Data Recorder

The airplane was equipped with a Loral F800 model (S/N 4307) Digital Flight Data Recorder (DFDR). The DFDR was transported to the NTSB Office of Research and Engineering on May 13, 1999. A DFDR readout was performed.

The DFDR recorded data in a digital format on six separate tracks contained on a 1/4 inch Mylar based magnetic tape. The recording process consisted of tape being drawn from one reel to another, through a set of read/write heads, as well as erase heads.

The DFDR was examined upon receipt, and during tape removal, was found to be in good condition. The DFDR data were transcribed from the DFDR magnetic tape medium to hard disk for further analysis using the NTSB laboratory readout equipment.

The DFDR tape was a continuous loop. In order to maintain the loop, the ends of the tape were physically spliced together. Immediately following the splice in the tape, was a transparent section called a "window". The window let the recorder know to switch to the next track to continue the recording.

The timing of the incident was such that the final approach and landing of the flight in question occurred at that point physically on the tape. The result was a very "messy" readout with many data dropouts and blank spots. A good portion of the data was irretrievable because of the set of circumstances. The spots were noticeable upon analysis of the graphical and tabular data. In addition to the loss of data associated with the normal track change and splice, the recording was subjected to a random track change. The F800 recorder model had a tendency to randomly change tracks.

Additionally, American Eagle had experienced problems with the make and model DFDR in the past. According to a letter from the Manager of Flight Safety at American Eagle:

"...In the past we have downloaded the information from several FDR's following minor incidents. In most of the incidents, the downloads had several gaps. The missing information was primarily from the beginning of the takeoff roll (around 40-50 kts) till the aircraft reached 120-130 kts. The avionics engineers believe the missing data is caused by tape jitter due to the mounting configuration of the FDR in the aircraft. American Eagle is working [with] Saab and Loral to find a solution to the problem..."

According to a NTSB Mechanical Engineer at the Vehicle Recorders Division, those types of problems (i.e. problems concerning the physical nature of the tape) could be alleviated with the use of solid state flight recorders.

In August, 1999, the FAA was notified about the problems with the Loral F800 DFDR. During September, 1999, the FAA received information from Saab indicating that the company sent a letter to AMR; offering the replacement of the model F800 DFDR with a solid state unit. According to Saab, AMR corporation never responded to the letter. In January, 2000, the FAA was working with SAAB and AMR to determine the best possible way to resolve the situation.

A Safety Board Performance Engineer compared the DFDR data with radar data, cockpit voice recorder information, and weather information. All available data indicated that EGF4925 was above the full-scale deflection on the glide slope; from the beginning of the descent at 4,000 feet, until after crossing the runway threshold. According to a Jeppesen Approach Chart for the ILS Runway 4R at JFK, the glide slope intercept altitude at EBBEE was 1,500 feet MSL. According to the data, the airplane was approximately 3,500 feet MSL when it passed EBBEE. The "on glide slope" altitude at CONDA, the final approach fix, was 921 feet. The airplane was approximately 2,050 feet MSL as it passed CONDA. The "on glide slope" altitude at the middle marker was 202 feet. EGF4925 passed the middle marker at approximately 600 feet MSL. The airplane was more than 4,000 feet beyond the approach end of Runway 4R when it descended below 100 feet MSL. The data also indicated that the airplane was within "1 dot" deflection on the localizer; from receiving the approach clearance, through touchdown.

The airplane's rate of descent was approximately 2,950 feet per minute at an altitude of 2,700 feet MSL; approximately 2,500 feet per minute at 1,200 feet MSL; approximately 1,700 feet per minute at 600 feet MSL; and approximately 1,000 feet per minute at 250 feet MSL.

OPERATIONS

Stabilized approach criteria were referenced in the American Eagle Saab-340 Aircraft Operating Manual (AOM) Volume 1, and in the American Eagle Flight Manual Part 1.

The Profiles Section, page 3 of the AOM stated that:

"Stabilized approach concept requires that, before descending below the specified minimum stabilized approach altitude, the airplane should be: In the final landing configuration (gear down and landing flaps),

On approach speed, Vapp for ILS approaches,

Vmm for non-precision approaches.

On the proper flight path and the proper sink rate,

At a stabilized power setting.

These conditions should then be maintained throughout the rest of the approach.

The minimum recommended stabilized approach altitudes are:

VFR - 500 FT AFL

IFR - 1000 FT AFL "

The American Eagle Flight Manual Part 1 (page 10-10) defined the stabilized approach criteria in part as follows:

"When any approach fails to meet the following stabilized approach criteria, an immediate missed approach (or go around as appropriate) is mandatory.

When reference is made to "course deviation" it will apply to both localizer and glide slope when executing an ILS approach.

Phase 1 2,000 feet above field level (AFL) to 1,000 feet AFL Maximum Descent Rate: 2,000 feet per minute (FPM)

Maximum Course Deflection Once Established: +/- 1.5 dots or 5 degrees on RMI

Phase 2 1,000 feet AFL to 300 feet AFL

Maximum Descent Rate: 1,200 FPM

Maximum Course Deflection: +/- 1 dot or 5 degrees on RMI

Minimum Speed briefed approach speed as appropriate

Phase 3

300 feet to 50 feet AFL

Maximum Descent Rate: 900 FPM

Maximum Course Deflection: (ILS/LOC only) +/- 1 dot

Maximum Speed Deviation: Deceleration, as required, to cross end of runway at a speed difference not in excess of + 10/- 0 of appropriate threshold speed."

According to The American Eagle Flight Manual Part 1 (10-11):

"The appropriate callouts will be made during all approaches, regardless of meteorological conditions. All callouts will be made by the Pilot Not Flying (PNF) unless otherwise noted.

1) Altitude Awareness Callouts - The callouts defined below are made during all approaches and landings. Awareness callouts are referenced to altitudes Above Field Level (AFL) and are made by the PNF.

a) "1,000 feet AFL"

b) "500 feet" - in addition, the PNF will also callout any airspeed deviation and the aircraft's sink rate.

c) "100 Feet" (Based on Radar altitude, if so equipped, otherwise barometric altimeter.).

2) Approach Callouts - The callouts defined below are made whenever the aircraft has been cleared for an approach other than a visual approach, and are made by the PNF.

a) "Localizer/Course Alive, Cross Checked, No Flags"

b) "Glide Slope Alive"

c) "Outer Marked/Final Approach Fix, Altitude Checked"

d) At DH: "DH"

e) At MDA: "MDA"

f) At the Missed Approach Point for non-precision approaches: "Missed Approach""

The American Eagle Flight Manual Part 1, page 10-14 stated in part:

"A missed approach is required when:

The aircraft is not continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and that the descent rate will allow the pilot to touchdown in the touchdown zone of the intended runway, ..."

Federal Aviation Regulation 91.175 {c} stated:

"Operation below DH or MDA. Where a DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport, below the authorized MDA or continue an approach below the authorized DH unless - (1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under part 121 or part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;..."

Continuous duty overnights (CDO) at American Eagle Airlines, referred to a trip sequence that was flown during the late night hours, extending into the early morning hours. In addition, it referred to a significant elapsed time period between the arrival of one flight and the departure of the subsequent flight on a trip sequence. Since the break between flights was not sufficient to qualify as a free from duty rest period, the crewmembers remained continuously on duty, even though they may have been provided with a hotel room for rest.

On May 6, 1999, the captain went off duty about 2030, drove home, and was asleep about 2300. On May 7, 1999, he awoke about 0700. He attempted to nap about 1200, but was unsuccessful. He reported for duty about 2200.

The first officer was off duty on May 6, 1999. He departed Las Vegas, Nevada (commuting on a jumpseat) at 1230, and arrived at JFK about 1730. He ate, then rested in the pilot's crew room, but did not sleep. There was a 3 hour time difference between Las Vegas and JFK.

The trip sequence scheduled the pilots to depart JFK at 2246, arrive at BWI at 2359, on May 7, 1999; and depart BWI for JFK at 0610 on May 8, 1999. They were provided with individual rooms at a local hotel, approximately 10 minutes from the airport.

Due to a takeoff delay at JFK, the flightcrew did not arrive at BWI until 0025. They arrived at the hotel about 0100. The captain stated that he was asleep by 0130. He awoke at 0445 for the scheduled 0530 van ride back to the airport. The first officer stated that he was asleep between 0130 and 0200. He received a wake-up call at 0445.

The American Eagle Vice-President of Safety stated that pilots had complained about the fatigue issues associated with CDO's. However, he also stated that some pilots preferred the CDO schedules. He added that CDO's were necessary because of the role of the regional airlines. Since regionals primarily feed the major airlines, it was necessary to offer flights at early or late hours in order to make connections with the major airlines.

He stated that alternatives to CDO's have been studied. Essentially there were three possible choices:

1. Continue operating CDO's to offer connection with major airlines.

2. "Staging or "Double Crewing." Crews terminate at the out stations to layover, and another crew who has laid over from the previous night operates the return flight.

3. Discontinue the flight, thereby eliminating the CDO.

The Vice-President of Safety stated that the three alternatives were listed in the airline's order of preference. The choices to "double crew" or discontinue the flight were cost prohibitive and it was a business decision to use CDO's. He added that the company operated CDO's in agreement with the Air Line Pilots

Association (ALPA).

A representative from ALPA stated that the union advised the company on scheduling issues, but the final schedule was the responsibility of American Eagle. He stated that after the accident, American Eagle began eliminating some of the CDO schedules.

ALPA provided a report from the National Aeronautics and Space Administration (NASA). The Principles and Guidelines for Duty and Rest Scheduling in Commercial Aviation stated:

"Recovery from an acute sleep deficit, cumulative sleep debt, prolonged performance requirement, or extended hours of continuous wakefulness is another important consideration. Operation requirements can engender each of these factors and it is important that a recovery period provide an opportunity to acquire recovery sleep and to re-establish normal level of performance and alertness.

Required sleep and appropriate awake time off promote performance and alertness. These are specially critical when challenged with extended periods of wakefulness (i.e., duty) and circadian disruption (i.e., altered work/rest schedule). Recovery is important to reduce cumulative effects and to return an individual to usual levels of performance and alertness."

During post accident interviews, both pilots stated that they were fatigued.

WRECKAGE INFORMATION

The airplane was examined by Federal Aviation Administration Inspectors. The Inspectors observed damage to the nose gear, including the webbing that extended into the fuselage. Additionally, the right side of the fuselage, near the propeller, contained several punctures. Both propellers were damaged, and debris from the right propeller was found in some of the puncture holes.

AIR TRAFFIC CONTROL

The Terminal Radar Approach Control (TRACON) Air Traffic Control Specialist was interviewed by the Safety Board's Air Traffic Control Group on June 8, 1999. He stated that, on the day of the accident, he came into the facility at approximately 0630 local time and signed on the J106 radar position. He added that the weather was "low IFR", meaning at or below minimums. Flightcrews were able to make approaches based on aircraft equipment; however, the majority of the traffic, at least two aircraft, were holding on the localizer.

The controller stated that he discussed the weather with the flightcrew of Eagle flight 4925 (EGF4925). The weather was below minimums, so he issued EGF4925 holding instructions. When the visibility improved, he asked the flightcrew if they wanted to make the approach. He stated that, at the time, two other aircraft were holding on the localizer and were not a factor, so he issued the approach clearance. He conversed with another flightcrew then confirmed with the EGF4925 flightcrew that they were okay for the approach. The flightcrew advised that the were, so he issued a frequency change to the tower controller.

When asked about holding, the controller stated that the EBBEE intersection was not a standard holding point. He chose to hold aircraft there to keep the aircraft close to the airport because the RVR was fluctuating. He classified EGF4925 as holding because the flight was on the inbound leg to EBBEE intersection. He added that two other airplanes were also holding.

The controller added that he did not try to force EGF4925 into executing the approach, he provided the flightcrew information to allow them the opportunity

for the approach. He was not in a rush to "get rid of him" based on other traffic.

The Air Traffic Control Group, with the assistance of the Aircraft Performance Study, determined that at the time EGF4925 received an approach clearance; the TRACON controller had no airplanes holding in his area of responsibility. Information regarding holding and instrument approach procedures was found in: FAA Order 7110.65, "Air Traffic Control".

Additionally, the Instrument Flying Handbook; and the Airman's Information Manual contained information about holding and instrument approach procedures.

AIRCRAFT PERFORMANCE

A review of the radar plots, contained in the performance study, revealed the position of EGF4925 relative to two other American Eagle flights; EGF4982 and EGF4846. At the issuance of the approach clearance, EGF4925 was about 4,000 feet MSL, EGF4982 was about 3,000 feet, and EGF4846 was about 2,000 feet. While EGF4925 was inbound to JFK, the other two flights were heading in an outbound direction. Although none of the three airplanes were in holding during the arrival; according to the data, EGF4925 was never closer than 7 nautical miles to either of the two other airplanes.

The performance study contained information about the effect of the EMAS during the overrun. The following is an excerpt from the study:

"Finally, Figure 7 shows the effect of the EMAS on the deceleration and stopping distance of the airplane. The Figure plots ground speed vs. distance from the runway end for three different average deceleration levels. The first average deceleration level is that actually sustained in the EMAS, corresponding to about 1.0 g's, which brings the airplane to rest from 75 kts. in 248 ft. (the measured penetration of the airplane into the EMAS). The second average deceleration level corresponds to that sustained by the airplane after touchdown but before penetrating the EMAS. This deceleration is provided by reverse thrust and braking on the runway surface, and averages about 0.5 g's. If this deceleration were maintained from 75 kts to zero knots, the airplane would travel about 500 ft., or 100 ft. beyond the end of the EMAS. However, it is unlikely that the airplane could sustain the same deceleration off the runway as on the runway, because the friction surface would not be as effective and because the brakes would fade over time. The actual braking performance is hard to estimate, but a conservative assumption would be that the resulting deceleration is half that sustained before departing the runway, or about .25 g's. The third line in Figure 7 shows speed vs. Distance while decelerating from 75 kts. At an average of .25 g's. In this case the airplane would travel about 1,000 ft. before stopping. Given these results, it is reasonable to assume that without the EMAS, the airplane would have traveled 500 to 1,000 feet beyond the end of runway 4R before coming to rest."

TOXICOLOGY

Post accident drug and alcohol tests were administered to the pilots and the results were unremarkable.

PROBABLE CAUSE(S)

The National Transportation Safety Board determines the probable cause(s) of this accident as follows.

The pilot-in-command's failure to perform a missed approach as required by his company procedures. Factors were the pilot-in-command's improper in-flight decisions, the pilot-in-command's failure to comply with FAA regulations and company procedures, inadequate crew coordination, and fatigue.