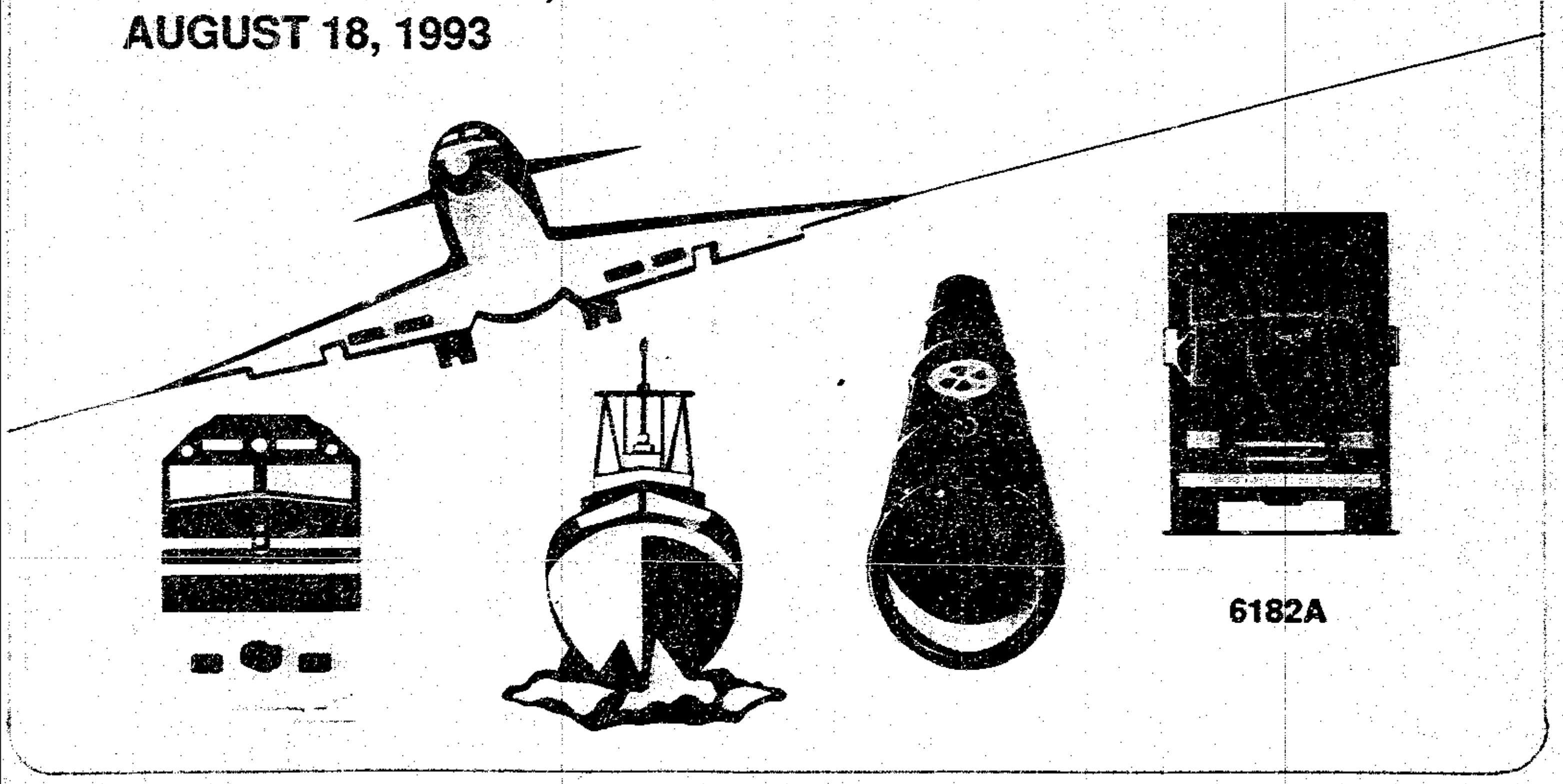
PB94-910406
NTSB/AAR-94/04

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

UNCONTROLLED COLLISION WITH TERRAIN
AMERICAN INTERNATIONAL AIRWAYS FLIGHT 808
DOUGLAS DC-8-61, N814CK
U.S. NAVAL AIR STATION
GUANTANAMO BAY, CUBA
AUGUST 18, 1993



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Adopted: May 10, 1994
Notation 6182A

Abstract: This report explains the crash of American International Airways Flight 808, a DC-8-61, about 1/4 mile from the approach end of runway 10 at Leeward Point Airfield, U.S. Naval Air Station, Guantanamo Bay, Cuba, on August 18, 1993. The safety issues discussed in the report include flightcrew scheduling, the effects of fatigue on flightcrew performance, training on special airports, and the dissemination of information about special airports. Safety recommendations concerning these issues were made to the Federal Aviation Administration, American International Airways, Inc., and the Department of Defense.

CONTENTS

EXECUTIVE SUMMARY

On August 18, 1993, at 1656 eastern daylight time, a Douglas DC-8-61 freighter, N814CK, registered to American International Airways, Inc., doing business as Connie Kalitta Services, Inc., and operating as AIA flight 808, collided with level terrain approximately 1/4 mile from the approach end of runway 10, after the captain lost control of the airplane while approaching the Leeward Point Airfield at the U.S. Naval Air Station, Guantanamo Bay, Cuba. The airplane was destroyed by impact forces and a postaccident fire, and the three flight crewmembers sustained serious injuries. Visual meteorological conditions prevailed, and an instrument flight rules flight plan had been filed. The flight was conducted under 14 Code of Federal Regulations, Part 121, Supplemental Air Carriers, as an international, nonscheduled, military contract flight.

The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision-making, and flying abilities of the captain and flightcrew due to the effects of fatigue; the captain's failure to properly assess the conditions for landing and maintaining vigilant situational awareness of the airplane while maneuvering onto final approach; his failure to prevent the loss of airspeed and avoid a stall while in the steep bank turn; and his failure to execute immediate action to recover from a stall.

Additional factors contributing to the cause were the inadequacy of the flight and duty time regulations applied to 14 CFR, Part 121, Supplemental Air Carrier, international operations, and the circumstances that resulted in the extended flight/duty hours and fatigue of the flightcrew members. Also contributing were the inadequate crew resource management training and the inadequate training and guidance by American International Airways, Inc., to the flightcrew for operations at special airports, such as Guantanamo Bay; and the Navy's failure to provide a system that would assure that the local tower controller was aware of the inoperative strobe light so as to provide the flightcrew with such information.

Safety issues discussed in the report focused on crew scheduling by American International Airways, Inc., the effects of fatigue on flightcrew performance, training on special airports by American International Airways, Inc., and the lack of dissemination of information about special airports by the Department of Defense. Safety recommendations concerning these issues were made to the Federal Aviation Administration, American International Airways, Inc., and the Department of Defense.

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1. FACTUAL INFORMATION

1.1 History of Flight

On August 18, 1993, at 1656 eastern daylight time (EDT), a Douglas DC-8-61 freighter, N814CK, registered to American International Airways (AIA), Inc., d/b/a Connie Kalitta Services, Inc., and operating as AIA flight 808, collided with level terrain approximately 1/4 mile from the approach end of runway 10, after the captain lost control of the airplane while approaching the Leeward Point Airfield at the U.S. Naval Air Station (NAS), Guantanamo Bay, Cuba. The airplane was destroyed by impact forces and a postaccident fire, and the three flight crewmembers sustained serious injuries. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan had been filed. The flight was conducted under 14 Code of Federal Regulations (CFR), Part 121, Supplemental Air Carriers, as an international, nonscheduled, military contract flight.

The captain and first officer had originated their 4-day sequence[1] of flights in Atlanta, Georgia (ATL), at 2300 (start of duty day) on August 16. Flight 860, a DC-8-61, N814CK, had departed Atlanta at 0006, on August 17, destined for Ypsilanti, Michigan (YIP), after an intermediate stop in Charlotte, North Carolina (CLT). The flight arrived in Ypsilanti at 0408, whereby the flight engineer concluded his sequence and was replaced by the flight engineer involved in the accident.

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[1] Preassigned schedule of destinations to be flown for the 4-day period.

The flight sequence continued with a change of airplane and the departure of flight 841, a DC-8-54, N802CK, from Ypsilanti to St. Louis, Missouri (STL), at 0746, and terminated at Dallas-Ft. Worth International Airport (DFW), Texas, whereby the flightcrew ended their duty day at 1200. The captain and first officer had been on duty for 13 hours, of which 5.6 hours was flight time; and the flight engineer had been on duty for 7 hours, of which 3 hours was flight time. The company provided a hotel room at the DFW Airport and the crew was relieved of flight duty for a rest period of 11 hours.

The flightcrew met in the hotel lobby in the evening hours of August 17, and arrived at the airport to begin their duty day at 2300. The scheduled flight sequence began with the departure of flight 840 from DFW at 2400, and proceeded to YIP, with an intermediate stop in STL. Flight 840 arrived at YIP at 0325 on August 18. The flightcrew changed airplanes to N814CK, and, after the "freight sort" had been completed, flight 861 departed YIP at 0620 for ATL. Upon arrival in Atlanta at 0752, the flightcrew was relieved of flight duty until their next scheduled sequence was to begin at 2300.

Shortly after 0800, the captain, domiciled in Atlanta, departed for his residence, while the first officer remained at the airport to visit with his family. The company provided the flight engineer with hotel accommodations for his scheduled rest period. The captain stated that he had telephoned his wife at their home when he stopped en route at an automotive store and was told that the "company" needed him back at the airport immediately to fly an unexpected trip. The first officer and flight engineer were also notified by the company and rejoined the captain at the Atlanta airport.

According to the chief crew scheduler for AIA, the original airplane and flightcrew, N808CK, which was to operate as flight 808, from Miami, Florida, to the Naval Air Station, Norfolk, Virginia, and on to Guantanamo Bay, had been canceled due to mechanical problems. The accident crew was reassigned to fly N814CK to Norfolk, load freight, deliver the freight to Guantanamo, and then ferry the empty airplane back to Atlanta. According to the crew scheduler, during his testimony at the Safety Board's public hearing on this accident, the revised flight assignment would have resulted in an accumulated flight time of 12 hours, and would have been accomplished within the company's "24-hour crew duty day policy."

N814CK departed Atlanta at 1010 that same day and arrived at Norfolk at 1140. Upon arrival, the captain exchanged greetings with the freight handler and then proceeded to the station office to obtain a revised flight plan from the company flight follower. The airplane remained on the ground for approximately 2 1/2 hours while the freight was loaded. During this time, the freight handler offered the flightcrew his vehicle to use while the airplane was being loaded. He accompanied the crew in the vehicle and observed them reviewing the flight plan, weight and balance information, and the weather. Additionally, the flightcrew reviewed the arrival and landing procedures for Guantanamo Bay, including the approach to runway 10, since none of the crewmembers had ever landed a DC-8 at Leeward Point Airfield.

Upon completion of the freight loading and the incidental duties associated with the dispatch of the airplane, the captain assumed the duties of the flying pilot while the first officer performed the radio communications. Flight 808 taxied from the cargo ramp at 1405 and departed Norfolk at 1413. The captain stated that the airplane had performed satisfactorily during the en route portion of the flight and that the arrival into the terminal area at Guantanamo Bay was uneventful.

According to information derived from the recorded air traffic control communications and the cockpit voice recorder (CVR),[2] the first officer established radio contact with the Guantanamo radar controller at 1634:49, while the flight was descending out of 32,000 feet (flight level (FL) 320). Several radio transmissions were exchanged between the first officer and the controller during a 3-minute period. The controller radioed, "Connie 808 heavy, Guantanamo radar, maintain VFR [visual flight rules] one two miles off the Cuban coast; no reported traffic in the area; report East Point; Leeward Field landing runway one zero; wind, one eight zero at eight; altimeter is two niner niner seven." The first officer acknowledged the transmission and stated, "...we'd like to land [runway] two eight." The controller responded and issued further landing instructions, which included a report of crossing the East Point[3] fix. However, the flightcrew was confused about the identification and location of the East Point fix, and the first officer requested clarification. Flight 808 crossed the East Point fix at approximately 1638, while at FL220.

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[2]A full transcript of the CVR is contained in appendix B.

[3]East Point is the first of three position fixes identified by radials from the Guantanamo Very High Frequency Omni Directional Radio Range (VOR).

At 1641:53, the CVR recorded the captain stating to the other crewmembers, "otta make that one zero approach just for the heck of it to see how it is; why don't we do that let's tell 'em we'll take [runway] one zero; if we miss we'll just come back around and land on two eight." This was followed by the first officer contacting the Guantanamo radar controller and requesting the approach to runway one zero. At 1642:48, the controller acknowledged the request and asked, "...you want uh, left entry or right entry." The first officer responded, "make a right entry...." The captain and first officer engaged in a discussion concerning the authorized entry pattern for the approach to runway one zero. The captain said, "it does say right traffic in the, in that uh, training clip that's all it says." The first officer followed with the comment, "right, I know for sure uh, 'cause I just went through recurrent.---- besides there's a big hill over there; it might give you some -- depth perception problems."

At 1645:51, the control of flight 808 was transferred from the radar controller to the Guantanamo tower controller. The first officer made initial contact with the tower several seconds later, and, at 1646:07, the controller stated, "...runway one zero, wind two zero zero at seven, altimeter two niner niner seven, report Point Alpha." The first officer acknowledged the transmission and requested "clarification" of the location of Point Alpha. The controller provided the crew with the information and followed this transmission several seconds later with, "eight zero eight, would you like runway two eight." The first officer responded, "we're gonna try ten first...."

At 1646:41, the captain began the approach sequence, calling for the flaps to be set at 15 degrees and the approach checklist items to be performed. The flight continued toward Guantanamo Bay, and, at 1651:37, the first officer remarked to the captain, "you wanna get all dirty and slowed down and everything." The captain acknowledged the comment. At 1652:03, the tower controller transmitted, "Connie eight oh eight, Cuban airspace begins three quarters of a mile west of the runway. You are required to remain with this, within the airspace designated by a strobe light."[4] The first officer responded, "roger, we'll look for the strobe light...." Several seconds later, the first officer again remarked to the captain, "I'd give myself plenty of time to get straight...maintain a little water off because you're gonna have

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[4]The strobe is a high intensity flashing light mounted on the Marine Corps guard tower, located at the corner of the Cuban border and the shoreline. There is only one strobe and it is used as a visual aide to identify the location of the fence. On the day of the accident, the strobe light was not operational and was in the process of repair.

to turn...I think you're gettin' in close before you start your turn." The captain responded, "yeah, I got it, I got it...going to have to really honk it, let's get the gear down."

During the next several seconds, the CVR recorded the captain stating to the other crewmembers that he was having difficulty identifying the runway environment as they approached the airport and as the wing flaps were being lowered to the 50-degree down position. The captain then said, "now we gotta stay on uh one side of this road here, right." The first officer responded, "yeah, we gotta stay on this side, on this side over here, you can see the strobe lights."

At 1652:22, the flight engineer remarked to the captain, "slow airspeed." This was followed by, "check the turn," from the first officer.

The following exchange of conversation was recorded by the CVR:

1653:28	Captain	where's the strobe
1653:29	Flight Engineer	right over there
1653:31	Captain	where
1653:33	First Officer	right inside there, right inside there
1653:35	Flight Engineer	you know, we're not getting our airspeed back there
1653:37	Captain	where's the strobe
1653:37	First Officer	right down there
1653:41	Captain	I still don't see it
1653:42	Flight Engineer	# we're never goin' to make this
1653:45	Captain	where do you see a strobe light
1653:48	First Officer	right over here
1653:57	Captain	where's the strobe
1653:58	First Officer	do you think you're gonna make this
1653:58	Captain	yeah...if I can catch the strobe light
1654:01	First Officer	five hundred, you're in good shape
1654:06	Flight Engineer	watch the, keep your airspeed up
1654:09	Sound similar to stall warning	

1654:10	Unidentified crew (don't) stall warning	
1654:11	Captain	I got it
1654:12	First Officer	stall warning
1654:12	Flight Engineer	stall warning
1654:13	Captain	I got it, back off

The CVR then recorded an unidentified crewmember say, "max power," followed by a second remark, "there it goes, there it goes."

1.1.1 Statements of Witnesses

More than 20 witness statements were received that described the events of the accident. These witnesses were located at various positions, either on the airport or in the vicinity, when they observed flight 808 on August 18, 1993.

A crew of four U.S. Navy pilots, who were located in the cockpit of a Lockheed C-130 that was on the airport ramp, observed the approach and subsequent crash of flight 808. One of the pilots stated:

> ...I saw the DC-8 on a wide right base for runway 10. It appeared to be at approximately 1,000 feet agl [above ground level]. I was interested in watching such a large airplane shoot the approach...It looked to me as if he was turning to final rather late so it surprised me to see him at 30 to 40 degrees AOB [angle of bank] trying to make final. At 400 feet agl, he increased angle of bank to at least 60 degrees in an effort to make the runway and was still overshooting. At this time the aircraft's nose turned right and it appeared he was trying to use bottom rudder to make the runway. At this point, he appeared to be 200 to 300 feet agl. He was still overshooting and my copilot remarked he was going to land on the ramp. His wings started to rock towards wings level and the nose pitched up. At this point the right wing appeared to stall, the aircraft rolled to 90 degrees AOB and the nose pitched down....

The other three crewmembers corroborated the aforementioned description of events.

The statements of many of the other witnesses who observed the DC-8 provided descriptions of the approach and crash sequence that were similar to those of the Navy pilots. Included in some of those statements were descriptions of the attitude of the airplane as it struck the ground and the explosion that occurred during the impact sequence. One witness, stated, in part:

> ...Just in front of the runway the jet tried to turn...to the right while it was very low to the ground. The nose and right wing hit almost simultaneously and the jet burst into flames sending up black smoke. Prior to the crash there were no flames or anything unusual about the aircraft.

The airplane struck the level terrain approximately 1400 feet west of the approach end of runway 10. The accident occurred during the hours of daylight at 19 degrees 54 minutes North latitude; and 75 degrees 13 minutes West Longitude. Figure 1 depicts the ground track of flight 808 derived from flight data recorder (FDR) information.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other	Total
Fatal	0	0	0	0
Serious	3	0	0	3
Minor/None	0	0	0	0
Total	3	0	0	3

1.3 Damage to Aircraft

The airplane was destroyed by ground impact forces and a postaccident fire. The value of the airplane was estimated by AIA at $5,000,000.

1.4 Other Damage

A concertina razor wire fence near the approach end of runway 10 was damaged by fire and several crash/fire/rescue vehicles that overran the fence during the fire-fighting operation.

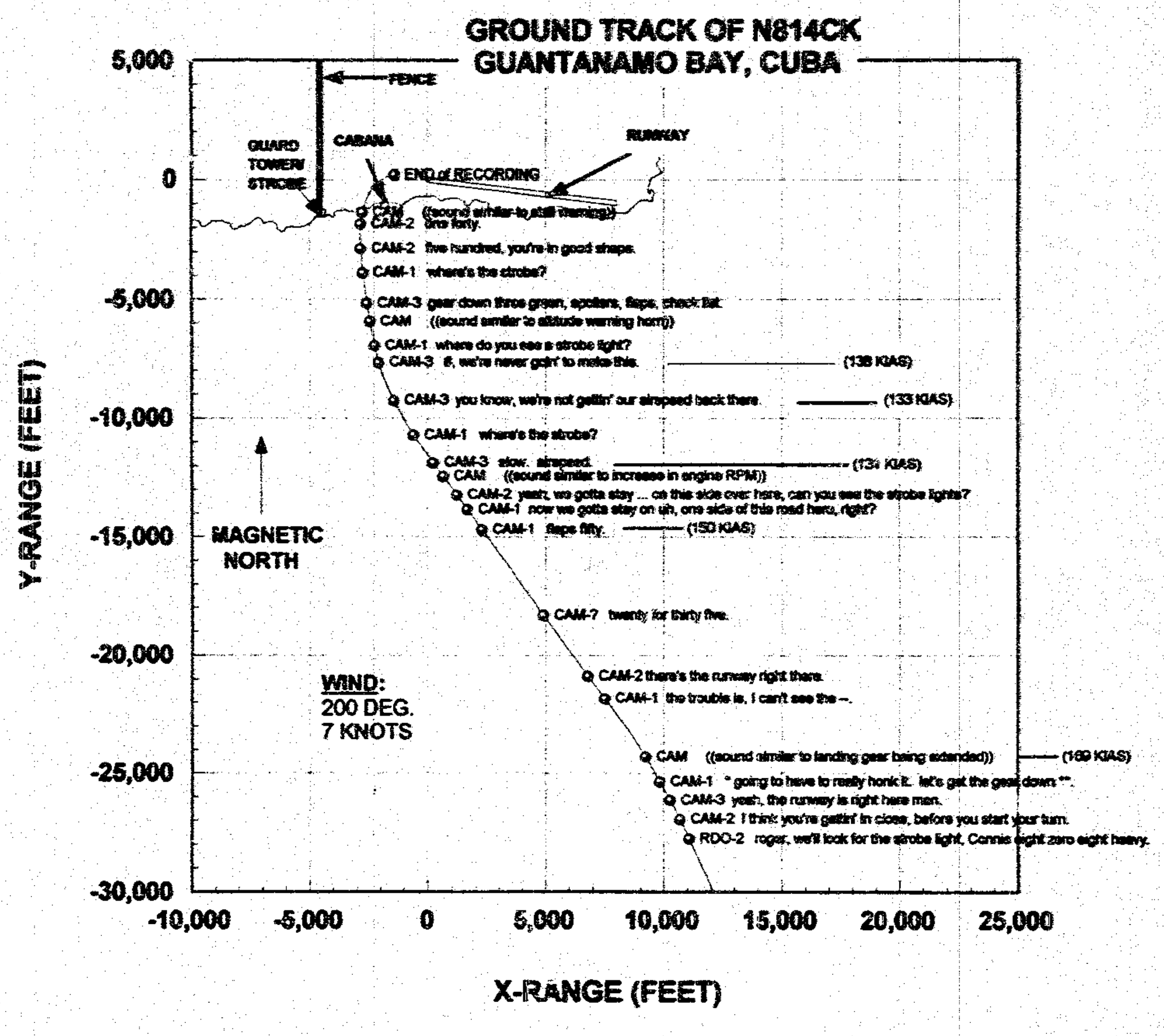

Figure 1.--Ground track of flight 808.

1.5 Personnel Information

1.5.1 The Captain

The captain, age 54, was hired by AIA on February 11, 1991, as a captain in the DC-8. He holds an Airline Transport Pilot (ATP) certificate with multiengine land airplane privileges and type ratings in the following airplanes: the DC-8, DC-9, and B-727. He also holds a commercial pilot certificate with a single engine land airplane rating, a flight engineer certificate with a turbopropeller rating, and a mechanic certificate with ratings for airframe and powerplant. The captain's first class airman medical certificate was issued on May 11, 1993, with a limitation that, "Holder shall possess correcting glasses for near vision while exercising the privileges of this airman's certificate."

Prior to being hired by AIA, he had been employed by Eastern Airlines, Inc., from 1966 until it ceased operations in 1991. During his employment with Eastern, he had flown as a flight engineer on the Lockheed L-188, and then upgraded to first officer on the Convair 440, Douglas DC-9, Boeing 727, and the Lockheed L-1011. He also flew as captain on the DC-9 and B-727.

According to company records, at the time of the accident the captain had accumulated approximately 20,727 hours of total flight time, of which about 16,200 hours had been accrued at Eastern. Since his employment at AIA, he had 1,527 hours as captain in the DC-8. A query of the Federal Aviation Administration (FAA) airman records in Oklahoma City, Oklahoma, revealed no previous enforcement action or accident history.

The captain successfully completed recurrent training and DC-8 ground school on February 12, 1993, and received international flight operations, hazardous material, and emergency procedures training, and special airports qualification. He also completed a pilot-in-command (PIC) proficiency check on February 20, 1993, a line check on April 8, 1993, and his last simulator recurrent training on August 4, 1993. The captain had no previous operational experience at Guantanamo Bay.

Interviews with pilots who have flown with the captain described him favorably and commented that he was very conscientious and good at managing the crew. A company flight instructor who had given the captain several checkrides described him as a good pilot who was "middle of the pack" in ability and who displayed good judgment when dealing with emergencies.

The captain had received a 2-day crew resource management (CRM) training while he was employed at Eastern Airlines. AIA does not have a formal CRM program; however, the company did attempt, on a limited basis, to instruct CRM principles informally during initial and recurrent training.

1.5.2 The First Officer

The first officer, age 49, was hired by AIA on November 3, 1992, as a DC-8 first officer. He holds an ATP certificate with multiengine land airplane privileges and type ratings for the Learjet, DC-8 and DC-9. He also holds a commercial pilot certificate with single-engine land airplane privileges and a flight engineer certificate with turbopropeller and turbojet ratings. His first class airman medical certificate was issued on April 6, 1993, with no limitations.

The first officer was also previously employed by Eastern Airlines from 1968 until 1991, and had flown as a flight engineer, first officer, and captain on a variety of airplanes. After leaving Eastern Airlines, he completed the DC-8 ATP program at Arrow Air Training Center that qualified him to exercise the privileges of PIC on the airplane. He held the position of co-captain on a twin engine turbopropeller airplane, operated by Eastern Foods and the Hooters Restaurant chain, until being hired by AIA.

According to AIA company records, at the time of the accident the first officer had accumulated approximately 15,350 hours of total flight time, of which about 492 hours were flown at AIA as both a first officer and captain on the DC-8. A query of the FAA airman records revealed no previous enforcement action or accident history.

The first officer completed company DC-8 recurrent ground training on August 13, 1993, and received international flight operations, hazardous material, and emergency procedures training; and special airports qualification. Interviews revealed that his peers regarded him as a "very competent" and "excellent" pilot.

Between the period of 1963 and 1968, the first officer served in the U.S. Navy as a pilot on an aircraft carrier. One of his assignments during that period was to monitor the activity in Cuba which was conducted with a Grumman S2E aircraft from the Leeward Airfield at Guantanamo Bay. However, he had not flown into the airport since that time.

The first officer had completed a 2-day CRM class while employed at Eastern Airlines; however, during his employment with AIA he had received "informal" CRM training.

1.5.3 The Flight Engineer

The flight engineer, age 35, was hired by AIA on February 11, 1991, as a DC-8 flight engineer. He holds a commercial pilot certificate with single and multiengine land and instrument airplane ratings. He also holds a flight engineer certificate with reciprocating and turbojet powered aircraft ratings, and a mechanic certificate with airframe and engine ratings. His first class airman medical certificate was issued on April 8, 1993, with no limitations.

According to company records, the flight engineer had been furloughed on May 1, 1991, and returned to AIA on October 31, 1991. During the furlough, he was employed by Trans Continental Airlines as a first officer on DC-6 airplanes. Upon his return to AIA, he resumed the duties of a flight engineer on the DC-8. On August 31, 1992, the flight engineer was again furloughed for approximately 1 month, and he has been continuously employed since his return.

At the time of the accident, the flight engineer had accumulated approximately 5,085 hours of total flight time, of which 1,500 hours were accrued as either a PIC or second-in-command (SIC), and 3,585 hours were as a flight engineer. His total flight engineer experience on the DC-8 was 1,085 hours, and he had accrued about 60 hours in the previous 30-day period. A query of the FAA airman records revealed no record of previous enforcement action or accident history.

The flight engineer successfully completed his last DC-8 flight engineer line check on June 26, 1992, and proficiency check on September 6, 1992. Company records indicate that during his last DC-8 ground school and recurrent training, he received international flight operations, hazardous material and emergency procedures training; and special airports qualification. The flight engineer had not received any CRM training from AIA.

The flight engineer was described by peers as "competent and conscientious," and that he did an effective job and spoke when he observed an unusual or abnormal situation.

1.5.4 Flightcrew Activities and Flight/Duty Times

According to interviews and AIA records, the captain and first officer were paired together on the 4-day trip sequence that began in Atlanta at 2300 on August 16, 1993, the start of their day. The flight engineer joined the pilots the following day during a layover in Ypsilanti, when he replaced the original flight engineer who had completed his sequence. The captain and flight engineer had flown together previously; however, the first officer was flying with the other crewmembers for the first time.

The captain had been off duty from August 1 through 5, and then flew a 4-day international sequence, August 6 through 9. He was again off duty until August 16. The captain stated that his activities immediately before the normally scheduled trip were routine and that in the 2 days before the trip, he typically went to bed about 2330 and awoke between 0700 and 0730.

The captain described himself as a "day person" who had some difficulty adjusting to night flying schedules. He also stated that his sleep pattern was normal during night hours when he was off-duty; however, he "was not a good sleeper" and his sleep was "not restful" when he was taking naps during the day.

On Monday, August 16 (the first day of the scheduled 4-day sequence), the captain jogged in the afternoon, took a nap between about 1700 and 1900, and then had dinner at home before reporting for duty.

The first officer was off duty from August 1 through 9, and then he attended a DC-8 recurrent training classes between August 10 and 13. He was again off duty from August 14 through 16, and spent that time at home with his family. He said that he slept his normal night time hours during the days off, going to bed about 2300 and receiving a "good" 8 hours sleep each night. He said that he also took a short nap on the afternoon of August 16, in preparation for reporting to duty.

The flight engineer had been off duty from August 1 until he joined the other crewmembers on August 17. He spent the days before the accident at home involved in routine activities while waiting for crew scheduling to provide a trip assignment. He said that he typically went to bed between 2100 and 2300, and awoke between 0800 and 0900 every day.

The flight engineer went to bed on the night of August 16 at between 2230 and 2300 and was awakened by the AIA crew scheduler at 0500 on August 17, assigning him the trip sequence with the accident captain and first officer.

1.5.5 Events Leading to the Accident

The first day of the trip sequence began at 2300 at ATL and terminated at DFW at 1200, following 13 hours on duty and 5.6 hours of actual flight time. The crew was provided a layover hotel at DFW and given a reporting time of 2300 for the next trip.

The captain said that he went to bed immediately after the trip and slept from about 1300 until 1800, then awoke, jogged, showered, and ate supper before reporting for duty.

The first officer did not go to bed immediately, but said he ate a large breakfast and read the newspapers for about 1 hour before going to sleep. He slept until about 1 hour before reporting time, and he exercised in the hotel room and had a meal before reporting for duty.

The flight engineer went to bed after breakfast and slept about six hours. He telephoned his wife in the evening from the hotel shortly before reporting for work and they spoke for 20 to 30 minutes. His wife said that when she talked with her husband he "sounded well rested."

The crew reported for duty at 2300, departed DFW, and arrived at the company base at YIP at 0325. They remained there for 3 hours while the freight was being sorted and loaded onto a second airplane. During the three-hour period, the captain and the first officer had coffee and doughnuts with another AIA captain in the company break room. The other captain described both crewmembers as cheerful, saying that the first officer was happy to be going back to his family. He said that both pilots seemed rested, at least "as much as you are at that time in the morning." The other AIA captain and the captain of the accident flight continued to converse for about 1 hour while the first officer "closed his eyes and relaxed in his seat in the airplane" for 30 to 60 minutes. The captain said that he did not rest during any of the layovers before the accident.

The crew departed YIP at 0620, and terminated the scheduled day in ATL at 0752. The flight engineer was provided a crew layover hotel room while the captain and first officer planned to return home during the scheduled layover.

About 0830, the chief AIA crew scheduler learned that flight 808 would need to be reassigned to fly to Guantanamo. The crew scheduler said that he was advised by the flight follower that the crew would finish within 24 hours duty time and that there were no legal problems with duty time because the flight to Guantanamo was considered to be "international." The scheduler said that it was company policy to avoid assigning crews to more than 24 hours continuous duty time, and with the revised schedule, the reassigned flight would have departed for Norfolk Naval Air Station, Virginia, (NGU) to load the contract freight, then fly to Guantanamo Bay, and return (ferrying the airplane under 14 CFR Part 91) to ATL within the 24-hour duty time limitation. The accumulated flight hours for the revised schedule were calculated to be about 11 hours and 45 minutes.

The crew scheduler was familiar with the three flight crewmembers and said that he had called on them numerous times in the past year for overtime assignments, which they typically accepted.

Upon notification of the reassignment, the crewmembers discussed the trip and decided it was legal, although they believed it to be a long duty day that was "pushing the edge." The captain stated in his postaccident interview that he did not feel particularly fatigued but would have rather gone to bed. The first officer stated in his interview that considering the legality of the trip and his knowledge of previous company actions, "you better really be tired" to refuse the trip.

The flight follower stated in an interview after the accident that during his conversation with the captain about the reassignment, the captain sounded normal and did not state that he was tired or fatigued.

The flight follower also said that according to the DOD contract for service to Guantanamo Bay, AIA would be penalized if too many flights in a 3-month period departed late from Norfolk. Because of the reassignment of airplanes, flight 808 was departing late. The flight follower said that she had telephoned personnel at the Leeward Point Airfield to advise them of the late arrival of flight 808. Because she believed that a curfew[5] was in effect, she requested that the airport remain open.

The captain stated in the post accident interview that during the approach briefing of Guantanamo Bay, he remarked that "if anyone [of the crewmembers] sees anything they don't like, call go-around."

The first officer said the crew had discussed the approach (referencing the approach plate) to Guantanamo Bay when they were about 50 miles from the airport. He also stated that he was satisfied that each of the crewmembers had a common understanding of what was necessary for a safe landing. The first officer said that he would have been "willing" to initiate a go-around even as the non-flying pilot. However, he also said that he would be hesitant to initiate the go-around in close proximity to the ground because it might create a dangerous situation if he took control of the airplane.

The first officer said that as they approached the airport he felt fully alert and exhilarated, as though he were making an aircraft carrier landing. The captain stated that he had felt tired and "lethargic" during the period when they were approaching the airport, and he also believed that the other two crewmembers were fatigued.

During the final portion of the approach, the CVR recorded both the first officer and flight engineer indicating their concern about the approach to the captain; however, neither crewmember called for a "go-around."

1.6 Airplane Information

1.6.1 General

N814CK, serial number 46127, was registered to American International Airways, Incorporated, d/b/a Connie Kalitta Services, of Morristown, Tennessee. The airplane was manufactured in December 1969 and was originally configured for passenger service. It had accumulated a total time of 43,947.4 hours and 18,829 cycles on the airframe.

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[5] Leeward Point Airport is open and operational 24 hours a day. The airport is not restricted by a curfew; however, flight operations after dark are not recommended.

The airplane was equipped with four Pratt & Whitney JT3D-3B engines that were modified with the stage-2 hush kit. The engines had accumulated the following total time and cycles as of August 18, 1993:

Engine 1	SN 644595	48,470.3 hours	18,084 cycles
Engine 2	SN 645518	46,386.4 hours	26,164 cycles
Engine 3	SN 644487	54,285.4 hours	26,274 cycles
Engine 4	SN 644952	43,955.3 hours	17,663 cycles

1.6.2 Aircraft Weight and Balance Information

The following airplane information was derived from the AIA (FAA-approved) flight manual:

Maximum ramp weight (MRW):	323,300 pounds
Maximum takeoff weight (MTW):	320,300 pounds
Maximum landing weight(MLW):	240,000 pounds
Maximum payload:	80,360 pounds
Basic operating weight:	143,640 pounds
Fuel capacity:	150,400 pounds
Maximum zero fuel weight(MZFW):	224,000 pounds
Landing flaps	35 degrees[6]

The takeoff weight for flight 808 was calculated by the flightcrew and determined to be 280,499 pounds (airplane basic operating weight of 143,640 pounds, 87,000 pounds of fuel and 52,859 pounds of cargo in the cabin). The maximum allowable takeoff weight was 284,300 pounds, which was based on the maximum landing weight plus the estimated fuel burn of 44,300 pounds. The required fuel for the accident trip was 75,100 pounds. The captain initially requested 86,000 pounds of fuel and later added an additional 1,000 pounds, for a total ramp departure fuel load of 87,000 pounds.

Based on the projected fuel burn of 44,300 pounds, the weight of the airplane upon landing at Guantanamo Bay would have been 237,199. The runway

[6]See section 1.6.3 for further details of authorized flap positions.

analysis provided to the flightcrew by the company flight followers determined the maximum allowable landing weights[7] for flight 808 at Leeward Airfield to be:

RUNWAY 10

10 knot headwind	274,300 pounds
0 knot headwind	260,700 pounds
10 knot tailwind	237,800 pounds

RUNWAY 28

10 knot headwind	274,300 pounds
0 knot headwind	260,700 pounds
10 knot tailwind	237,800 pounds

At the time of the accident, the wind was reported to be from 200 degrees at 7 knots. At the projected landing weight of 237,199 pounds, flight 808 would not have exceeded the limitation for landing on runway 10.

The landing "V" speeds for the airplane configured for a 50-degree flap landing at a gross landing weight of approximately 236,000 pounds would have been 170 knots maneuvering speed,[8] 147 knots (approach speed)[9] and 142 knots (threshold speed).[10]

1.6.3 Supplemental Type Certificate Information

The flight manual for N814CK contained the following Supplemental Type Certificates (STC):

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[7]The maximum allowable landing weight is predicated on operational antiskid and autospoiler systems, a dry runway, and landing flaps at 35 degrees.

[8]The maneuvering speed, which is the minimum speed for an aircraft configuration at which a 30-degree bank may be used. It is calculated at 1.5 times the stalling speed for the particular configuration or flap setting. This will normally be 15 degrees for QNC airplanes and 23/25 degrees for all others, as defined in the AIA DC-8 flight operating manual.

[9]The approach speed, which is threshold speed plus 5 knots. This speed is established after the aircraft is on final and the bank angle is limited to 15 degrees, as defined in the AIA DC-8 flight operating manual.

[10]The threshold speed, which is calculated at 1.3 times stall speed for the weight and landing flap setting, as defined in the AIA DC-8 flight operating manual.

1. STC No. SA1802SO, issued to Rosenbaum Aviation, Inc., was an airframe design change to permit the installation of a cargo door, cargo restraint bulkhead, heavy duty cabin floor, Class "E" cargo compartments, cargo pallet restraint system and provisions for two additional crewmembers.

2. STC No. SA5670NM, issued to Shannon Engineering, provided the specifications to install a cockpit warning system for 25-degree landing flaps. The aforementioned STC also required either the previous or concurrent installation of STC Nos. SA5510NM and 2411SO, which increased the airplane landing and zero fuel weights, and required the installation of the Quiet Nacelle Corporation Plus (QNC+) acoustically treated engine nacelles (stage 2 hush kit for noise reduction).

According to the supplement to the AIA airplane flight manual for the DC-8-61 equipped with the QNC+ conversion, the "Certificate Limitations, Procedures and Performance Information" authorizes 35 degrees of flaps as the normal landing flap configuration. It also states, "...flaps 50 is no longer an authorized landing flap (except for emergency purposes), and the 50-degree performance data in the Basic AFM is considered to be a part of Emergency Procedures for the purpose of this AFM Supplement."

The DC-8 was originally certified for 50-degree flap landing configurations. However, in 1985, the FAA adopted regulations limiting the noise produced by aircraft weighing more than 75,000 pounds. The DC-8 was one of many aircraft models that were equipped with engines that could not meet the noise limitations without modification. The QNC+ conversion was one such modification that "quieted" the engines with the use of acoustic insulated engine nacelles. The STC also modified the operating procedures of the airplane by reducing the "authorized" landing flap configuration from 50 degrees to 35 degrees of flaps to reduce engine thrust (reduced noise output) to comply with the noise regulations. The 50-degree flap restriction was not an aircraft performance limitation because of the conversion.

1.6.4 AIA DC-8 Maintenance and Inspection Program

Part D of the FAA-approved AIA Operations Specifications defines the approved maintenance program. The AIA General Maintenance Manual establishes the procedures and requirements for accomplishing maintenance and inspections. The program also includes a Continuing Analysis and Surveillance Program, which is defined in a Reliability Analysis Maintenance Planning Program (RAMP) manual.

AIA initiated a "C" check on N814CK in July, 1993. The inspection was completed, and the airplane returned to service on August 2, 1993. The maintenance records indicate that during the C check, three major nonroutine tasks were performed; the right elevator was replaced because of corrosion and cracking on the upper and lower skins; both control columns were replaced, and both sets of pilot rudder pedal bracket assemblies were inspected to comply with Airworthiness Directive (AD) 90-16-05 and Douglas Service Bulletin (SB) 27-273R1. The elevator and aileron control cable systems were rigged following the completion of the inspection.

At the time of the accident, the airplane had accumulated 31 hours of flight time since the completion of the C check.

1.6.5 Maintenance Records Review

In addition to the Deferred Maintenance Items (DMI) list, AD and SB compliance records, the aircraft logbook entries from June 2, 1993, through August 18, 1993, were reviewed. This review revealed that all applicable ADs and SBs had been accomplished, and that the four DMIs had been closed.

The DMI page from the aircraft papers indicated four discrepancies, two of which pertained to the No. 3 engine. One of the written items reported that the No. 3 THRUST BRAKE light had illuminated on August 4 and August 6, 1993. In the August 6 discrepancy, the reverser cascade door light was described as being "on." The same mechanic had signed the corrective action for both August occurrences and closed out the logbook entry with "removed and replaced," or "repaired" the cascade door assembly and "performed an operational check." Maintenance personnel had also documented that the reverser cascade door light was normal, per maintenance manual chapter 78. The additional deferred items referred to the No. 4 engine N2 indicator being "inop" and the No. 3 main fuel quantity indicator reading differently than the drip stick.

1.7 Meteorological Information

The 1700 reported surface weather conditions were:

Clouds 30,000 feet thin overcast, visibility 6 miles, temperature 88 degrees Fahrenheit, dew point 66 degrees Fahrenheit, wind 200 degrees at 7 knots, altimeter 30.02 inches Hg.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

The airport traffic area for the Leeward Point Airfield is defined as the Guantanamo reservation and the area to seaward, within a five statute mile radius of the airfield, up to, but not including 3,000 feet above the ground. All aircraft within this area are required to maintain radio contact with air traffic controllers. The air traffic control facility is operational 24 hours a day and is staffed continuously by military personnel.

The Guantanamo radar control facility provides VFR advisory services only, with no IFR separation for aircraft transitioning to VFR and landing at Leeward Airfield. The arrival procedures indicate that if IFR conditions prevail at the airport, the controller will issue clearance to execute the published instrument approach. However, the approach terminates with circling (VFR) minimums.

The tower supervisor/local controller assumed the air traffic control duties about 1455 on the day of the accident. Upon assuming those duties, the controller determined that the high-intensity strobe was inoperative, and this information was immediately reported to the Marine Barracks.[11]

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[11]The Marine Barracks is notified of the inoperative strobe because it is mounted on a Marine guard tower. The operation of the strobe is then verified to determine if the light has been manually extinguished or has sustained a mechanical malfunction. Once its been determined that a mechanical malfunction exists, a work order is then initiated for the Public Works Department to conduct the repairs.

At the time of the accident, training of a new air traffic controller was being conducted in the control tower. The trainee was performing the duties of local control and had provided flight 808 with landing instructions, which included the standard phraseology, "caution prohibited Cuban airspace begins three-quarters of a mile west of the runway. You are required to remain within the first fence line designated by a high intensity strobe." The trainee was not aware that the strobe light was inoperative; and the supervisory controller, who was monitoring the communications, did not alert the flightcrew that the high-intensity strobe was inoperative.

1.10 Aerodrome Information

The Leeward Point Airfield of the U.S. Naval Station is located at the western end of the Guantanamo Bay Reservation. The airfield is approximately 56 feet above mean sea level (msl) and has a single runway, oriented east-west, and designated 10-28. The runway is constructed of reinforced concrete and is 8,000 feet long and 200 feet wide.

The airfield is equipped with a lighted 30-knot wind sock near the approach end of each runway and a free-swinging wind tee, located midfield, on the south side of the runway. Runway 10 is equipped with a portable fresnel lens that is 750 feet from the approach end and is positioned to provide a 3.25-degree glideslope angle.

Runway 28 is typically the "preferred" runway to land because of the unobstructed approach from the IFR/VFR transition points. Landing on runway 10 requires a standard right traffic pattern to be flown within 3/4 nautical mile of the approach end of the runway, due to prohibited airspace beyond that point. The VFR arrival/departure route chart published in the Naval Station Guantanamo Bay, Cuba, Air Department, Airfield Brief, states, in part:

> Exercise EXTREME CAUTION when landing Runway 10 due to short final approach and prevailing crosswind.

To assist pilots performing this visual approach, the Naval reservation fence line is used as an identifying landing mark for planning the approach because it is located 3/4 of a nautical mile from the runway. Also located along the fence line are several Marine guard towers, a series of four flashing red lights, three steady illuminated red lights, and one high intensity white strobe light.

The strobe light, mounted on top of the Marine Outpost No. 1, located at the western boundary shoreline, is used only as a visual reference to identify the fence line readily (during day or night operations). It is neither a mandatory reporting point, nor is it necessary to identify its location to execute the approach to runway 10.

A second prominent visual reference point is a beach cabana located on the coastline, approximately 2,000 feet west of the runway 10 threshold, midway between the runway and the border fence on the coastline. Witnesses stated that flight 808 overflew the cabana while on the base leg of the approach.

1.11 Flight Recorders

1.11.1 Flight Data Recorder

The airplane was equipped with a Fairchild model F800 (serial number 5156) digital flight data recorder (DFDR). It records Aeronautical Radio Incorporated (ARINC) 542 expanded configuration data as a function of elapsed time in digital format. The DFDR recorded indicated airspeed, magnetic heading, pressure altitude, vertical acceleration, microphone keying and time. It was transported to the Safety Board laboratories for readout and evaluation.

The data indicated that approximately 52 seconds before the accident, the airplane was in a right turn from an initial magnetic heading of 321 degrees and was descending through a pressure altitude of 829 feet. Approximately 38 seconds later, the normal acceleration[12] values increased while pressure altitude values decreased. Concurrently, the magnetic heading passed through 360 degrees, and the indicated airspeed value was 136 knots. The magnetic heading values continued to change in a manner that was consistent with a right turn, while the indicated airspeed value decreased to 113.12 knots, and the pressure altitude decreased to 327 feet. These values continued in their respective decreasing trends until the termination of the flight.

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[12]Normal acceleration is the acceleration along the airplane's normal (vertical) axis, and the values are measured in units of "G" forces. "G" refers to a measure of the force on a body undergoing acceleration as a multiple of the force imposed by the acceleration of the Earth's gravity.

1.11.2 Cockpit Voice Recorder

The airplane was also equipped with a Sundstrand model AV-557B cockpit voice recorder (CVR), (serial number 510), that was removed from the accident airplane and transported to the Safety Board's laboratories in Washington, D.C., for transcript preparation. The CVR transcript was derived from the 4-channel recording of the audio control panels for the captain, the first officer, the flight engineer, and the audio signal input from the cockpit area microphone.

The exterior of the recorder exhibited "minor" structural damage and exposure to heat and fire. The magnetic audio tape was found undamaged, and the playback quality of the audio information was good.

1.12 Wreckage and Impact Information

1.12.1 General

The airplane initially struck the ground 200 feet north of the extended runway centerline and 1,400 feet west of the runway 10 threshold (see figure 2). The wreckage debris was oriented on a magnetic heading of approximately 100 degrees and extended for a distance of about 1,000 feet from the initial impact point. The debris found at the farthest point from the runway consisted primarily of right wing structure and skin, as well as parts from the Nos. 3 and 4 engines.

The initial impact mark was a thin, shallow trough that fanned outward to about 25 feet wide and extended 150 feet in the direction of flight. The right wing tip, found 200 feet north of the first impact point, exhibited compression damage and scratch marks that were consistent with the airplane in a roll attitude of 51 degrees at the point of initial ground impact.

All major portions of the airplane and flight control systems were accounted for at the accident site. There was no evidence of an in-flight fire, nor was there evidence of structural anomalies that would indicate a preimpact structural failure. Examination of the wreckage also revealed that the landing gear was in the down and locked position; the elevator pitch trim was in the 7 degree-nose-up position; the leading edge slots were in the open position; and the wing flaps were in the 50-degree down position at the time of ground impact.

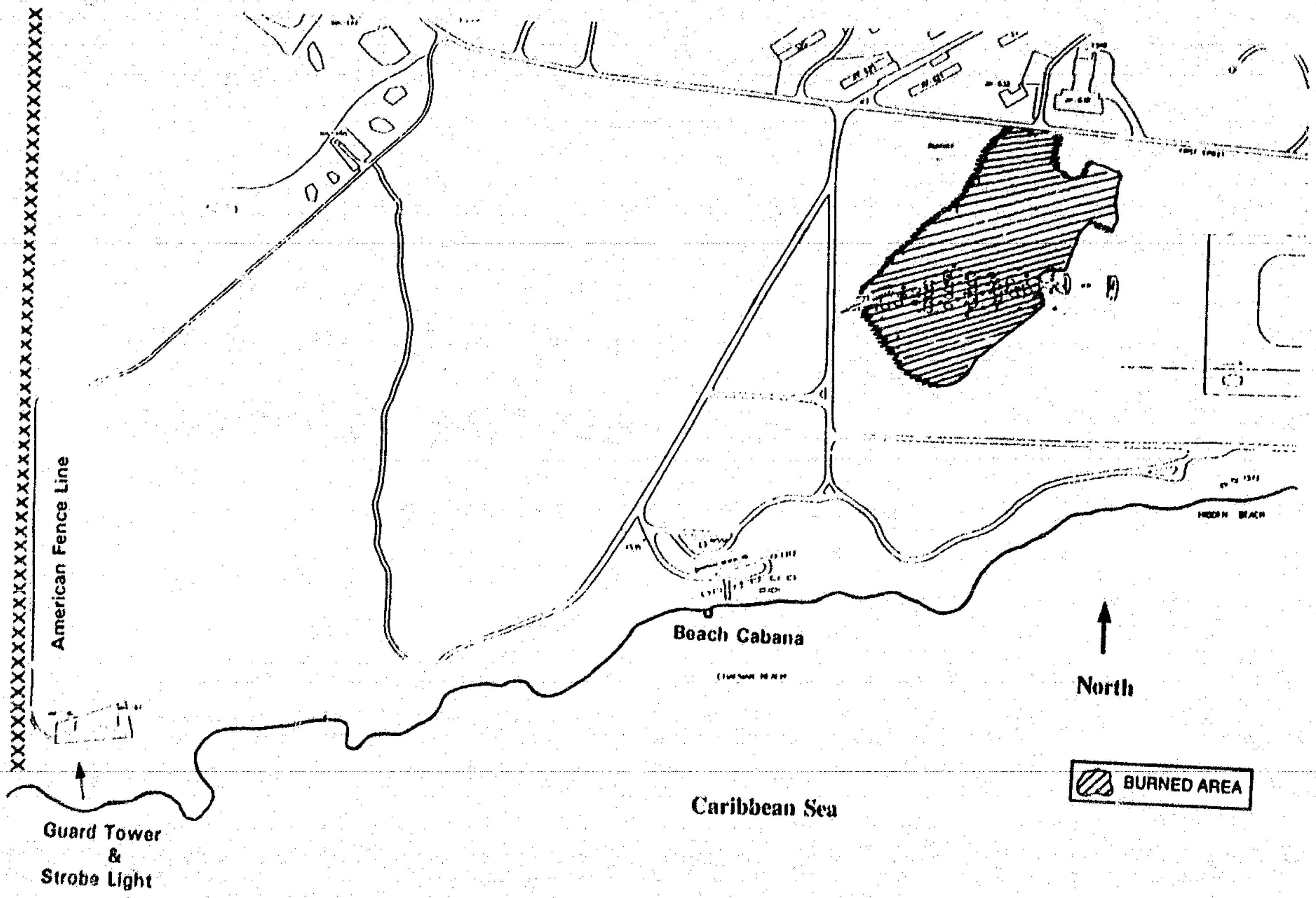

Figure 2.--Location of airplane wreckage.

1.12.2 Cockpit Documentation

The airspeed indicators in the DC-8-61 are pneumatically driven with electrical compensation for pressure measurement errors and other factors. The right pitot tube was bent toward the fuselage and had soil packed into the tip. The pitot static system was breached at numerous fuselage separations. Fiber optics were used to internally examine the airspeed indicators. Each had a burred rack gear that aligned with the pinion gear at a displayed indication of 115 - 120 knots.

The captain and first officer's airspeed indicators are equipped with internal and external "bugs" that are used to identify reference airspeeds. The bug settings found on the captain's airspeed indicator were: 78, 147, and 151 knots. The external bug settings found on the first officer's airspeed indicator were: 100, 138, 146, and 176 knots. The internal bug was set at 148 knots.

1.12.3 Flight Controls

All flight control surfaces were accounted for in the wreckage and along the debris path. However, the fire consumed the majority of the wing flaps and spoiler panels on both the left and right wings. The flight control system paths in the wings and fuselage were destroyed either by fire or impact, and flight control system continuity could not be established. Examination of the control cables did not reveal evidence of preimpact defects.

The cockpit gust lock control handle was found in the OFF/UNLOCKED position.

The rudder trim tab trailing edge was found deflected 4 inches to the left of the rudder trailing edge, when the rudder was centered. The cockpit pedestal knob was found at 6 1/2 units left rudder trim. The system control cables had tension-type failures at fuselage separation points. The cables had evidence of rust near the power pack in the base of the vertical stabilizer. Also, fresh grease was found on the manual reversion mechanism in this same area.

1.12.4 Engines

The four engines were found in areas that had been blackened in the postaccident fire. All four exhibited evidence of rotation at the time of impact, although speed of rotation was not determined on-site.

The thrust reversers for each of the four engines were separated from their respective turbine sections and the thrust deflectors, and three of the four reverser cascade doors were found in stowed positions. Examination of the cascade door with the extended actuator revealed an impact mark on the shaft that corresponded with the door being in the stowed position at impact.

1.13 Medical and Pathological Information

Toxicological tests were performed by the Jackson Memorial Hospital laboratory, Miami, Florida, on blood and urine samples obtained from the three crewmembers shortly after they were admitted to the hospital. The captain's samples were obtained between 0212 and 0220 on August 19, the first officer's at 2233 on August 18 (urine sample only), and the flight engineer's between 0418 and 0444 on August 19. The blood samples were tested for alcohol; and the urine samples were screened for drugs, which included cocaine metabolite, cannabinoids, opiates, benzodiazepines, and amphetamines.

The first officer tested positive for codeine, which is a pain suppressant. According to personnel in the hospital trauma center, this drug was most probably administered after the accident. All other toxicology tests performed on the samples from the three crewmembers were negative.

1.14 Fire

Several fires erupted after the airplane impacted the ground. These fires either self-extinguished or were extinguished by the Guantanamo Bay Naval Air Station airport rescue and fire fighting (ARFF) personnel. According to base personnel, all major fire fighting apparatus responded within approximately one minute of the accident and were used to extinguish the fire that engulfed the airplane wreckage and the approximate 30 acres of vegetation surrounding a portion of the accident site.

The ARFF vehicles expended 275 gallons of AFFF (foam), 907 pounds of Halon 1211, and approximately 37,500 gallons of water. One of the vehicles sustained damage during the fire fighting operation when the crew left the vehicle to extricate the flightcrew from the wreckage. The vehicle was damaged by the brush fire that advanced across the field and under the truck.

1.15 Survival Aspects

The forward portion of the fuselage, including the cockpit, separated from the remainder of the airplane and came to rest partially inverted outside the fire burn area.

Except for a hole in the right side wall between the first officer's seat base and the rudder pedals, the cockpit remained intact. The forward seat supports failed on both the captain's and first officer's seats, and although the cockpit floor was inverted, the flight engineer seat was found attached in its normal mounted position. The safety belts were found frayed but were not broken.

The cockpit bulkhead wall that supports the cockpit door was found to be partially separated. The cargo straps in the forward fuselage were found secured to their respective tied down rings, and the cargo was still restrained under the cargo netting.

The impact conditions and movement of the airplane were omnidirectional after ground contact. The dynamic forces of the airplane's movement on the ground did not exceed the levels of human tolerance.[13]

1.16 Test and Research

1.16.1 Flightpath Study

The Safety Board completed a flight simulation study that compared the FDR data and motion calculations to reconstruct a probable flight profile for flight 808. Information on the airplane's performance is in appendix C.

The study revealed that the load factor data recorded by the FDR, combined with turning performance calculations, indicate that the airplane's roll angles were less than 30 degrees at the approximate point where the turn from base leg to final approach was initiated. Based on the airplane's gross weight of approximately 236,000 pounds and a flap setting of 50 degrees, the approach

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[13]The level of human tolerance is defined in the U.S. Army *Aircraft Crash Survival Design Guide*, Volume II, as the "tolerable levels [G forces] of the decelerative loads [including the loads imposed by seat and restraint systems], depending on the direction of the load, the orientation of the body and the means of applying the load...."

reference speed should have been 147 knots. The FDR revealed that the airplane was at a speed of 140 knots when the turn was initiated.

A ground track generated from the FDR and meteorological data indicated that the airplane was approximately 3,000 feet west and 2,000 feet south of the runway 10 threshold (approximately 1,000 feet from the shoreline) when the turn was initiated. The fence line is located 4,560 feet west of the runway threshold.

The study was able to replicate the motion of the airplane from the positions defined by the FDR data and witness information. It revealed that the airplane had rolled to a 60-degree, right-wing-down attitude prior to impact; the stick shaker (stall warning) had activated 7 seconds prior to impact and at a speed of 136 knots, and that the ground impact occurred at an airspeed of approximately 120 knots.

1.17 Additional Information

1.17.1 Company History

The company began in 1968 as Kalitta Flying Services, Inc., with one Cessna 310 airplane, followed by the acquisition of a Beech 18 in 1971.

Several additional airplanes of varying makes and models were added, including three Learjets and five turbine-powered Beech airplanes. In 1983, Kalitta Flying Services, Inc., acquired the operating certificate of Jetway Aviation, a Part 121 air carrier, and added one DC-8-21 and three Learjets to the operation.

In 1984, the company leased one DC-9-15 and three DC-8s from United Air Lines, Inc., and conducted joint operations under Part 135 and Part 121 supplemental. In December 1984, the Federal Aviation Administration (FAA) revoked Kalitta Flying Services' certificate after an investigation revealed Federal Aviation Regulation (FAR) violations in the Part 135 operation.

In May 1985, the company separated the Part 121 supplemental and Part 135 operations; and the Part 121 supplemental division began operating as American International Airways, Inc. (AIA). The Part 121 regulations pertained to not only cargo but to chartered passenger operations. AIA conducted business as Connie Kalitta Services, Inc., an ad hoc air carrier, using two leased B-727 airplanes from Flying Tigers, Inc. In 1986, the company purchased a B-727, followed in

1987, with the purchase of two DC-8-50 airplanes. In 1988, the two leased B-727s were returned to Flying Tigers, Inc., and AIA began to specialize and concentrate on the DC-8 operations.

In anticipation of a postal contract, AIA acquired two DC-9s and a second B-727. During the following years, additional airplanes were added to the fleet, including two B-747s configured for freight and two B-747s configured for passengers.

The B-747 operation was conducted under the company name, American International Cargo, Inc., providing cargo service from Los Angeles, California (LAX), to Honolulu, Hawaii (HNL), 4 nights per week. On Saturdays, the flight continued from HNL to Pago Pago, Melbourne, Australia, and Hong Kong and returned via Chitose, Japan, and Fairbanks, Alaska, to Lockbourne, Ohio. The second B-747 freighter was used on an ad hoc basis.

The two passenger configured B-747s were wet leased to Saudi Arabian Airlines based in Jeddah, Saudi Arabia. The airplanes were used to fly Saudi Arabian Airlines' routes using AIA flightcrews.

AIA's operations specifications indicated that at the time of the accident, the fleet consisted of 3 B-727s, 4 B-747s, 2 DC-9s, and 19 DC-8s, excluding the accident airplane. Additionally, seven of the DC-8s were leased, including four from Burlington Express, Inc.

In May 1993, AIA acquired the assets of the Zantop Airlines freight hub system in Ypsilanti, Michigan, which operates three DC-8s, and one DC-9 leased from AIA, and six L-188 Electras owned by Zantop. The new company currently operates as American International Freight, Inc.

The conglomeration of Kalitta companies consists of the following entities:

> American International Airways, Inc. d/b/a Connie Kalitta Services, Inc., the Part 121 supplemental operation; Kalitta Flying Services, Inc., a Part 135 operation; Bounty Aviation, Inc., an FAA-approved repair station for aircraft accessories; Bounty Engine Services, Inc., an FAA-approved repair station for JT3-3B engines; Connie Kalitta Enterprises, an FAA-approved repair station for

Garrett engines; Airline Deicing Inc., which provides deicing operations at Ypsilanti; Aerodata Aircraft Instrument Service, an FAA-approved repair station for airplane instruments; and American International Services, Inc., a management company set up to manage bidding and contract operations of FAR Part 135 airplanes.

The Kalitta companies also include:

American International Freight, Inc., the cargo company (Zantop) operated at Ypsilanti, and American International Cargo, Inc., the air cargo company with scheduled LAX to HNL freight operations.

Trans Continental Airlines, Inc., a Part 121 air carrier purchased out of bankruptcy, was acquired; however, this operation is maintained independently of the Kalitta companies. The FAA operating certificate had not been issued as of the date of the accident, and the request was still pending before the Department of Transportation (DOT).

1.17.2 Management Hierarchy

The President/Chief Executive Officer (CEO) of AIA is also the founder and principal stock holder. He is directly responsible for the management of the company; however, the day-to-day operations are normally administered by the Vice President (General Manager) and/or the Director of Operations (D/O), with oversight by the President.

In an interview with Safety Board investigators, the CEO described the operating philosophy of the company and indicated that flight and duty time schedules were an important issue in air freight service. He said that in order to remain competitive, the company must often assign long duty times and "work everything right to the edge" of what was allowed by federal regulations. He indicated that this practice was "common" in the air freight industry.

The CEO also characterized the pilots' salaries as being slightly higher than the industry average for the overnight freight business. He described pilot morale as "fairly decent," although the pilot group had recently voted to unionize. According to the CEO, a major factor in the pilots acquiring union representation was due, in part, to the company's practice of upgrading pilots by performance rather than seniority. The CEO also said that "good" pilots were recognized for their professionalism and "pulling for the company" through support of company requirements and practices, thus they were upgraded "out of seniority."

The CEO also stated that the company was structured and operated using a "lean management" philosophy rather than overstaffing at the management level like some competitors. He said that this type of management structure requires management personnel to be responsible for, and perform multiple roles in the company, thus reducing the number of individual managers. This situation is characterized by the position of D/O, who, in addition to his duties to dispatch aircraft, is also responsible for crew training, crew scheduling, and fleet management.

The CEO described the local FAA office personnel as helpful and better than other FAA offices overseeing similar companies. The CEO also stated that AIA's relationship with the FAA was "sometimes difficult," but that the company and the FAA had always managed to work out any issues and differences.

The Vice President and General Manager (VP/GM) of AIA had been employed by the company since 1983. He held several different positions with the company prior to his current position, including flight engineer, check flight engineer, and director of maintenance. As VP/GM, he was directly accountable to the President/CEO and was responsible for ensuring that all company, state, and federal regulations governing air transportation were in compliance, as well as overseeing the day-to-day operations. There are no FARs that specify the minimum qualifications for an individual to hold the position of VP/GM. At the time of the accident, although rated as a flight engineer, he was not type rated in any of the model airplanes flown by Connie Kalitta Services, Inc.

The D/O at the time of the accident had been employed by Kalitta Companies since 1988. He was hired initially as the chief pilot and D/O for Kalitta Flying Services, Inc., the FAR Part 135 Division, and later became the D/O for AIA in 1989. 14 CFR Part 121 specifies qualifications for the position of D/O, and require that a person will:

> ...hold or has held an airline transport pilot certificate, and has had at least three years of experience as pilot in command of a large aircraft; or has had at least three years of experience as D/O....

Although the D/O did meet the regulatory requirements of the position, he was not type rated in any of the large turbojet airplanes flown by Connie Kalitta Services, Inc.

The D/O was responsible for the FAR Part 121 flight operations, such as crew training; crew scheduling; flight following/dispatch; fleet management, sales; operating manual composition, control, and revision; Airlift Mobility Command (AMC) contract negotiations; liaison with all governmental agencies, including the FAA, U. S. Customs, airport authorities; and the day-to-day corporate functions and resolution of issues. The D/O also maintained the minimum equipment list (MEL) for all the airplanes and the Operations Specifications for Part 121 operations.

In his capacity as D/O, he was responsible for all phases of the dispatching of aircraft. This responsibility was shared jointly with the PIC, and, in accordance with the FARs, the D/O could delegate the authority to other persons (company flight followers) to dispatch a flight; however, he still maintained responsibility and accountability. The practices with regard to this portion of the operation were shared by the Vice President, the D/O, and the flight followers on duty.

The Chief Pilot was accountable to the Director of Operations for all activities which pertained to general supervision of flight crewmembers and flight operations. He was also responsible for ensuring that pilots maintain their proficiency and that all levels of flight operations are safe. According to the D/O, the company hired four different pilots to fulfill the duties of the Chief Pilot during the previous 8 years.

1.17.3 Flight Following System

The control office for flight operations at AIA is located at the company's main base in YIP. The operations control center/flight following department provides operational control for all company airplanes anywhere in the world. The only persons authorized to release the airplanes for flight are the President, Vice President/General Manager, Director of Operations, and the Chief Pilot.

Under the provisions of Part 121 supplemental, an air carrier can use either an established flight dispatch system or a flight following system. The flight dispatch system requires that the dispatch personnel be qualified and trained in accordance with 14 CFR Section 121.463. These requirements include possessing an FAA-issued aircraft dispatcher certificate, receiving operational and differences training for each aircraft in operation, and observing at least five hours of flight deck operations. This system also establishes daily duty limits and incorporates the dispatcher into the chain of responsibility, along with the D/O and the PIC, to ensure the proper operational control of each flight.

The flight following system is intended as a means to monitor the disposition of an airplane when it is released to conduct flight operations. The FARs do not require the company flight followers to have any formal training nor hold an FAA-issued aircraft dispatcher certificate. Additionally, the flight followers are not required to be knowledgeable about aircraft operations or limited to a daily duty period.

In an interview with AIA's chief dispatcher, approximately one-half of the company flight followers held an FAA-issued dispatcher certificate, and they did receive limited "formal" training in the dispatching of aircraft. The Director of Operations stated that it is company policy that a newly hired flight follower obtain an FAA dispatcher certificate within 1 year of employment and that the company provides both financial assistance and reduced workload while the employee is in training for the dispatch certificate.

According to the company Flight Following Procedures Manual, the flight following department was comprised of a "chief dispatcher" and a supervisor of flight followers/dispatchers, three shift supervisors, seven flight followers/dispatchers, and three positions occupied by personnel in training.

The VP/GM stated that AIA has neither a formal safety department (flight safety office), nor an individual to address safety issues, concerns, and problems. However, he said the company practice for the resolution of safety matters or the communication of information was accomplished by the issuance of "operations memos or operations bulletins" by the appropriate management personnel.

1.17.4 Special Airport Pilot Training and Qualifications

The "special airports" video tape presentation used by AIA for training consisted of 11 different short segments depicting the visual approaches to these airports. Each segment was narrated to provide a verbal description of the approach procedure, obstacles, and hazards associated with these particular airports.

The video segment for Guantanamo Bay depicted the approaches to both runway 28 and runway 10. The approach to runway 10 was viewed from the cockpit of the camera airplane and showed the approach being flown from both the right and left downwind positions. The narrator described landmarks that are visible to the pilot, including the fence line, the guard towers located on the fence line, and the flashing strobe light identifying the boundary. Also emphasized was the wind considerations affecting the approach and the need to initiate the turn to final approach prior to crossing the shoreline.

According to documents supplied by the Air Mobility Command (AMC), there are 12 airports, including Guantanamo Bay, that are designated "certification airfields." These airports have been identified by the military to have unique hazards or operating procedures which require a heightened awareness or familiarity on the part of the crewmembers. Thus, an airport that is designated as a certification airfield requires military flightcrew members, specifically the aircraft commander, to have operated into that airfield within the past 2 years as either a pilot, copilot, or observer who has actively monitored the approach.

In contrast, the AMC procedures for civilian crews flying into Guantanamo Bay require the contract company and flightcrews to be knowledgeable in the operation into the military airfields. The contract administrator at Norfolk Naval Air Station, who had retired from the U. S. Air Force, used his own briefing for Guantanamo Bay that he developed for the Air Force while on active duty. The airfield briefing form contained a photograph of the airfield showing the approach end of runway 10 and describing the procedures for execution of the approach.

The AMC contract representative from Norfolk (NGU) was interviewed about the procedures and events involving flight 808 on the day of the accident. He stated that he recognized the accident captain and believed that he [the captain] had been to NGU several times in the recent past. The contract representative also stated that, since he believed the accident captain had been to Guantanamo Bay previously, he did not provide him with the briefing form.

14 CFR Section 121.445 states that the PIC will be qualified to operate an aircraft into certain airports determined to be special (due to items, such as surrounding terrain, obstructions, complex approach or departure procedures). The

regulation requires that the PIC may not operate into a special airport unless within the preceding 12 months:

> (b) except as provided in paragraph (c) of this section...(1) The pilot-in-command or second in command has made an entry to that airport (including a takeoff and landing) while serving as a pilot flight crewmember; or
>
> (2) The pilot-in-command has qualified by using pictorial means acceptable to the administrator for the airport.

Subparagraph (c) of the regulation states that the aforementioned qualifications do not apply when "entry to that airport (including takeoff or a landing) is being made if the ceiling at that airport is at least 1,000 feet above the lowest MEA or MOCA, or initial approach altitude prescribed for the instrument approach procedure for that airport and the visibility at that airport is at least 3 miles."

1.17.5 Military Contracts

AIA entered into a military contract with the AMC, effective January 1, 1993, in a "team" arrangement with several airlines, including United Parcel Service Company, United Air Lines, Inc., Tower Air Inc., and Burlington Air Express, Inc. The purpose of the contract was to provide on-demand, international long and/or short range airlift services for the military. These services included passenger, cargo and/or aeromedical transportation as required by the AMC. AIA had committed 16 airplanes to the Civil Reserve Air Fleet (CRAF): 13 DC-8s and three B-747s, all configured for freight. The total number of airplanes committed to the CRAF determined the percentage of the amount of military contract flying received.

Under the "team" concept, the contracted airline had a pool of other carriers available that could fulfill the AMC's particular request to either supply airplanes or crews for the particular mission. An example of this process would be as follows: if AIA was tasked for a passenger operation, the mission would be reassigned to one of the team contractors who operated passenger-configured airplanes; conversely, if a passenger-carrying airline was contracted to move freight, it could reassign the trip to AIA or one of the other similar operators available to complete the mission.

The accident flight from NGU to Guantanamo Bay was contracted by AMC for the purpose of transporting cargo, mail, and food products to the Naval facility. As part of the written contract between civilian carriers and the AMC, the airline was required to coordinate the flight activities with a contract administrator representative. The contract representative at the origination airport was responsible for the unloading/loading of the airplane, flight plan filing, fueling, briefings, and liaison with the Air Terminal Operations Center.

1.17.6 FAA Oversight and Surveillance

The FAA surveillance of AIA was the responsibility of the Flight Standards District Office (DTW-FSDO) located at Willow Run Airport in Belleville, Michigan. The DTW-FSDO is located across the airfield from the AIA main base headquarters and maintenance facility. The staffing in the DTW-FSDO was characterized by the Principal Operations Inspector (POI) as "minimum," with 57 positions allocated, but only 42 occupied. The POI for AIA stated that the management of the certificate was accomplished by himself, two assistant POIs, a Principal Maintenance Inspector (PMI), a PMI assistant, a Principal Avionics Inspector (PAI), and a PAI assistant. The assistants were not assigned to the AIA operation on a full-time basis, but rather, they would assist when needed. The POI stated that he and the PMI spent 100 percent of their time on the management of the AIA certificate, while the PAI spent about 50 percent because he was responsible for four other carriers.

The POI had served in that capacity since 1989. He was responsible for the management of the AIA certificate and, because of the size and complexity of the carrier, this was his only assigned operator. He described his responsibilities as the POI of AIA in part as "keeping an eye on the carrier and the carrier's operation to ensure that they complied with the regulations in all aspects in their day to day operation and any proposed new operations...." The POI also stated that "99.9 percent" of his workload is dedicated to the oversight of the AIA operation, and that although there were two other FAA inspectors designated to assist in the oversight process, they were also assigned to assist another POI responsible for a similar freight operator.

The POI stated that because AIA conducts flight operations at various locations around the world, he was dependent upon the support from the geographical section of various FAA offices to monitor and oversee the AIA operations in Oskoda, Michigan; Miami, Florida; Saudi Arabia; and South America.

This type of surveillance support was also necessary in other locations due to flightcrew training being conducted in Denver, Colorado, and Minneapolis, Minnesota. Regarding pilot training conducted in Denver, the POI said that, "... I would have personally liked to have gotten out there three or four times a year for myself to see what's going on...but the funds weren't always there to provide for the travel."

Accordingly, due to fiscal restraints, the POI was unable to perform international surveillance; and was therefore dependent upon geographic support at these remote locations. However, he stated that this support was "virtually zero" in the Saudi Arabian operation and that he was "never able to get any help" with the South American operation.

In a memorandum dated August 2, 1993, and addressed to the assistant manager of the DTW-FSDO, the POI, PMI and PAI expressed their concerns regarding the inability to perform their necessary surveillance due to lack of funds (See appendix D). The memorandum also stated that the geographic support that had been requested has resulted in "limited feedback," and that as the AIA "geographical sphere expands, so do their problems, and our limited surveillance consistently reveals the same negative trends." The memorandum further stated that, "for this reason we have grave concerns regarding the quality of the CKSA [Connie Kalitta Services] (AIA) operations in these remote locations in the past and the future. Please consider this notice that we can no longer accept full responsibility for the CKSA certificate management, particularly those portions requiring extended travel...."

The POI characterized AIA as a company that meets the "minimum standards; and no more," because "they operate close to the cuff." He also said that the president tried to run the airline like a "mom and pop operation," with minimum numbers of personnel, many of whom were "overworked." He also stated that it was difficult to get the company to respond to changes he felt were necessary. He said that when he found problems, AIA would fix them by "decree;" however, upon his return, the problems still existed and it took more than one letter to the carrier to "get things accomplished."

The POI said that he often had to resort to unorthodox methods to make AIA take corrective actions on the negative findings. One example that he cited was his refusal to issue the operating certificate for the B-747 operations until the company complied with corrective actions to findings in the January 1993 main base inspection.

The POI also described the company attitude as a "we versus them" mentality between flightcrews and management and that it was his belief this was reflected in the recent vote by the pilots favoring representation by a union. Additionally, he cited three examples to describe this type of attitude in the AIA operation which involved either the D/O or the Supervisor of Flight Following. First, the D/O, in addition to all his normal activities, was responsible for all the MELs on all the airplanes in the fleet because there was no one else assigned to perform the job. This type of activity can be time consuming and labor intensive, and required the MELs to be current for each airplane. Several FAA-conducted inspections, including routine checks and the main base inspection conducted by the POI, revealed that MELs for various model airplanes had not been maintained in a current status. The POI stated in the main base inspection report:

> For the past 2 years CKSA has had a continuing problem in maintaining the required Operations manuals in current status.... When deficiencies in manuals become apparent and revisions are required, response has been very slow from operator.
>
> Once revisions are made, the system for ensuring distribution to each location and manual holder doesn't seem to work, as when manuals are checked, they are often found in uncurrent condition....

Second, the POI stated that the Supervisor of Flight Following appeared to be tied to a routine dispatch slot well in excess of 40 hours per week, and that there was minimal time spent supervising the other members of the department.

Third, he said that the rapid expansion of the airline had exceeded the capabilities of the organization's structure and that the profit motive was "strong and hard to turn around." His characterization of the management attitude was that it was lacking "sensitivity training," and that he had observed management being abusive and intimidating to company personnel.

The POI stated he had been contacted many times by crewmembers via telephone and letters regarding long duty days, flight hours, and safety violations. Most of the individuals wanted to remain anonymous for fear of company reprisals.

He said that he never processed an enforcement action against the company for flight/duty time violations; however, he stated that "...if ten percent of the calls were true, why can't I find something?"[14] A review by the Safety Board of the FAA inspections performed on AIA revealed that since 1989, the following major inspections were performed:

National Aviation Safety Inspection Program (NASIP)
Performed February 21 - March 16, 1989.

Annual Main Base Inspection conducted by the local FSDO
Performed January 19 - January 22, 1993.

The inspection found numerous discrepancies in both operations and airworthiness areas that initiated enforcement actions by the POI and PMI:

Regional Aviation Safety Inspection Report (RASIP)
Performed August 9 - August 16, 1993.

The inspection found a total of 14 findings that included 11 in operations and 3 in airworthiness:

Special Inspection conducted by a select national team that commenced on October 25, 1993, and lasted approximately 10 days.

A Work Accomplishment Summary indicated that 100 percent of the FAA's NASIP requirements were met by the FSDO in fiscal year (FY) 1993. However, a waiver had been granted regarding the surveillance of the Saudi Arabian operations by the manager of the FAA Safety Analysis Branch. A review of the Detroit FSDO records revealed that all of the planned program requirements for surveillance of AIA in FY 93 were not met. According to the POI, the completion percentage rates (ranging from 55.5 to 91.2) were so varied because of the lack of geographical support, which was necessary to accomplish the program requirements.

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[14]During the course of the investigation, the Safety Board received numerous unsolicited telephone calls from former AIA employees citing the alleged conduct and safety violations of the company. These allegations were forwarded to the FAA for further investigation and validation.

During the period January 13, 1991, to August 16, 1993, 22 enforcement actions were initiated against AIA. Of those, 8 were closed and 14 remained open.

1.17.7 Department of Defense Surveillance

The Department of Defense (DOD) performs a biennial air carrier survey of all participating contract carriers in service with the DOD. In August 1991, a survey was performed at AIA, and both maintenance and operational deficiencies were found. A subsequent evaluation was conducted in March 1992, and negative operational and maintenance deficiencies were again found, some of which were recurring items. A Special DOD Air Carrier Review Committee directed a survey of AIA to be conducted in July 1992 to determine if the company had made progress in correcting the deficient areas. Accordingly, the DOD found that the operational concerns had been "adequately" addressed, however, maintenance deficiencies still remained. The areas of concern were maintenance training, reliability, manuals, and quality assurance. According to the Deputy Director, DOD Air Carrier Survey and Analysis Office, AIA was placed on an annual survey schedule rather than the normal biennial schedule because of the previous findings (primarily in maintenance). AIA made a presentation to the AMC regarding the integration of B-747s to the contract operations and responded to the DOD concerns at that time. The DOD approved the addition of the B-747 airplanes to the freight operation of the military contract. The addition of these airplanes also required the company to be surveyed annually.

1.17.8 Northwest Airlines Incident at Guantanamo Bay

On October 10, 1993, a DC-10, operated by Northwest Airlines as flight 9412, a DOD contract charter flight from Cherry Point, North Carolina, to Guantanamo Bay, had an incident while landing on runway 10. The captain stated after the incident that the crew had been given "short notice" about the flight and that because of the "limited time available for proper planning," he was not "aware of the hazards associated with an approach to runway 10...especially for a heavy aircraft such as the DC-10." He described the events of the incident in a written statement and indicated that:

> "... making a right turn to final [for runway 10]. The winds although light were from right to left, requiring a tighter turn to line up with the runway. I was anticipating the problem but probably

overcompensated for the amount of wind and as I was in the flare for landing, the heading of the aircraft caused me to drift toward the upwind side of the runway. The touchdown was normal but the right main gear touchdown was just to the right of the runway edge.... The right main landing gear struck one runway edge light...."

The captain also stated that he was notified by crew scheduling of the charter flight at 2330, on October 17, and that the reporting time for the flight was 0210, October 18. The captain said that he "only managed to receive about one hour rest before leaving for the airport after being awake all day."

Additionally, the Safety Board found that the Northwest Airlines flightcrew had not received any supplemental special airport information from the DOD or the airfield operations office at Cherry Point Naval Air Station, regarding procedures at Leeward Point Airfield, even after the accident involving AIA.

1.17.9 Crewmember Flight and Duty Time Limitations

AIA is certificated under the supplemental regulations of Part 121. Subpart S, of the Code of Federal Aviation Regulations, entitled, "Flight Time Limitations and Rest Requirements: Supplemental Air Carriers and Commercial Operators" addresses the requirements for crew flight and duty time. Paragraph 121.503, Flight time limitations: Pilots; Airplanes, states:

> (a) A supplemental air carrier or commercial operator may schedule a pilot to fly in an airplane for eight hours or less during any 24 consecutive hours without a rest period during those eight hours.
>
> (b) Each pilot who has flown more than eight hours during any 24 consecutive hours must be given at least 16 hours of rest before being assigned to any duty with the air carrier or commercial operator.
>
> (c) Each supplemental air carrier and commercial operator shall relieve each pilot from all duty for at least 24 consecutive hours at least once during any seven consecutive days.

(d) No pilot may fly as a crewmember in air carrier service more than 100 hours during any 30 consecutive days.

(e) No pilot may fly as a crewmember in air carrier service more than 1,000 hours during any calendar year.

(f) Notwithstanding paragraph (a) of this section, an air carrier may, in conducting a transcontinental nonstop flight, schedule a flight crewmember for more than eight but not more than 10 hours of continuous duty aloft without an intervening rest period, if

(1) The flight is in an airplane with a pressurization system that is operative at the beginning of the flight;

(2) The flightcrew consists of at least two pilots and a flight engineer; and

(3) The air carrier uses, in conducting the operation, an air/ground communication service that is independent of systems operated by the United States, and a dispatch organization, both of which are approved by the Administrator as adequate to serve the terminal points concerned.

Paragraph 121.507, Flight time limitations: three pilot crews: airplanes, states:

(a) No supplemental air carrier or commercial operator may schedule a pilot

(1) For flight deck duty in an airplane that has a crew of three pilots for more than eight hours in any 24 consecutive hours; or

(2) To be aloft in an airplane that has a crew of three pilots for more than 12 hours in any 24 consecutive hours.

(b) No pilot of an airplane that has a crew of three pilots may be on duty for more than 18 hours in any 24 consecutive hours.

Paragraph 121.513, Flight time limitations overseas and international operations airplanes states:

> In place of the flight time limitations paragraphs 121.503 through 121.511, a supplemental air carrier or commercial operator may elect to comply with the flight time limitations of paragraphs 121.515 and 121.521 through 121.525 for operations conducted
>
> (a) Between a place in the 48 contiguous States and the District of Columbia, or Alaska, and any place outside thereof,
>
> (b) Between any two places outside the 48 contiguous States, the District of Columbia, and Alaska; or
>
> (c) Between two places within the State of Alaska or the State of Hawaii.

Additionally, paragraph 121.517, Flight time limitations: other commercial flying: airplanes, states:

> No airman who is employed by a supplemental air carrier or commercial operator may do any other commercial flying, if that commercial flying plus his flying in operations under this part will exceed any flight time limitation in this part.

Paragraph 121.521, Flight time limitations: Crew of two pilots and one additional airman as required, states:

> (a) No supplemental air carrier or commercial operator may schedule an airman to be aloft as a member of the flightcrew in an airplane that has a crew of two pilots and at least one additional flight crewmember for more than 12 hours during any 24 consecutive hours.
>
> (b) If an airman has been aloft as a member of a flightcrew for 20 or more hours during any 48 consecutive hours or 24 or more hours during any 72 consecutive hours, he must be given at least 18 hours of rest before being assigned to any duty with the air carrier or

commercial operator. In any case, he must be relieved of all duty for at least 24 consecutive hours during any seven consecutive days.

(c) No airman may be aloft as a flight crewmember more than:

(1) 120 hours during any 30 consecutive days; or

(2) 300 hours during any 90 consecutive days.

Paragraph 121.525, Flight time limitations: Pilots serving in more than one kind of flightcrew, states:

(a) This section applies to each pilot assigned during any 30 consecutive days to more than one type of flightcrew.

(b) The flight time limitations for a pilot who is scheduled for duty aloft for more than 20 hours in two-pilot crews in 30 consecutive days, or whose assignment in such a crew is interrupted more than once in any 30 consecutive days by assignment to a crew of two or more pilots and an additional flight crewmember, are those listed in paragraphs 121.503 through 121.509, as appropriate.

(c) Except for a pilot covered by paragraph (b) of this section, the flight time limitations for a pilot scheduled for duty aloft for more than 20 hours in two-pilot and additional flight crewmember crews in 30 consecutive days or whose assignment in such a crew is interrupted more than once in any 30 consecutive days by an assignment to a crew consisting of three pilots and an additional flight crewmember, are those set forth in paragraph 121. 521.

(d) The flight time limitations for a pilot to whom paragraphs (b) and (c) of this section do not apply, and who is scheduled for duty aloft for a total of not more than 20 hours within 30 consecutive days in two-pilot crews (with or without additional flight crewmembers) are those set forth in paragraph 121.523.

(e) The flight time limitations for a pilot assigned to each of two-pilot, two-pilot and additional flight crewmember, and three-pilot and additional flight crewmember crews in 30 consecutive days, and who is not subject to paragraph (b), (c), or (d) of this section, are those listed in paragraph 121.523.

The supervisory crew scheduler for AIA stated that it is the company's policy to permit scheduling of a crewmember to perform "not more than 24 hours of duty time," at any one time. Accordingly, the scheduler also stated that this type of scheduling is determined by the company and not by the FARs.

Additionally, the AIA General Operating Manual (GOM) identifies a company practice that involves the ferrying of an airplane on a non revenue flight under 14 CFR Part 91. This practice is also known as "tail end ferry," because the ferry flight may occur at the completion of a revenue flight, and is a means of repositioning the airplane for either the next revenue flight or return to the base of operation. The FAA determined that the flight time limitations contained in 14 CFR Part 121 no longer apply after completion of the Part 121 segment of the trip. Because there are no limitations specified in 14 CFR Part 91, a Part 91 flight can be initiated even though the time that would be accrued before completion of that flight would exceed that permitted under Part 121.[15]

The manager of the FAA Air Carrier Branch provided testimony at the Safety Board public hearing regarding ferry flights being conducted under 14 CFR Part 91. He stated:

> ...the most immediate concern [of the FAA] is the other commercial flying loophole that exists in the supplemental rules that permits these post Part 121 ferry flights to be conducted under Part 91. We need to close that loophole.... We are also concerned about the clarity and the possible ambiguity of certain requirements in the supplemental rules.

1.17.10 Flightcrew Fatigue

An evaluation of the flightcrew fatigue factors and their relationship to the operation of flight 808 was conducted at the request of the Safety Board by members of the NASA-Ames Research Center Fatigue Countermeasures Program,

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[15]Federal Aviation Decisions, Chief Counsel Interpretations, 1992-1, pertaining to 14 CFR Part 121.521(a) and 121.523(a).

one of the leading research programs on fatigue in the United States. The results of this report are included as appendix E.

In their examination of the fatigue factors, which included studying the sleep/wake histories of the three flightcrew members of flight 808, the researchers discussed the effects of sleep and circadian rhythms on a person's performance abilities and capabilities. The following information is excerpted from the researchers report:

> Flight operations can engender sleep loss and circadian disruption that can affect flightcrew performance, vigilance, and mood. Scientific information on sleep and circadian rhythms acquired over the past 40 years has clearly established human requirements for sleep and the detrimental effects of sleep loss and circadian disruption....
>
> Historically, sleep has been viewed as a state when the human organism is turned off. Scientific findings have clearly established that sleep is a complex, active physiological state that is vital to human survival. Like human requirements for food and water, sleep is a vital physiological need. When an individual is deprived of food and water, the brain provides specific signals - hunger and thirst.... Similarly, when deprived of sleep, the physiological response is sleepiness.... At the onset of sleep, an individual disengages perceptually from the external environment, essentially ceasing to integrate outside information...a microsleep [a spontaneous sleep episode lasting only seconds] can be associated with a significant performance lapse when an individual does not receive or respond to external information. With sleep loss, these uncontrolled sleep episodes can occur while standing, operating machinery, and even in situations that would put an individual at risk, such as driving a car....
>
> Sleep loss creates sleepiness and often is dismissed as a minimal nuisance or easily overcome. However, sleepiness can potentially degrade most aspects of human capability.... Sleepiness can be associated with decrements in decision-making, vigilance, reaction time, memory, psychomotor coordination, and information processing (e.g. fixation on certain material to the detriment of other

information).... Research has demonstrated that with increased sleepiness, individuals demonstrate poorer performance despite increased effort, and may report indifference regarding the outcome of their performance. Individuals report fewer positive emotions, more negative emotions, and an overall worsened mood with sleep loss and sleepiness....

Generally, sleepiness can degrade most aspects of human waking performance, vigilance and mood.... However, in many other situations, while the individual may not actually fall asleep, the level of sleepiness can still significantly degrade the human performance. For example, the individual may react slowly to information, may incorrectly process the importance of the information, may find decision making difficult, may make poor decisions, may have to check and recheck information or activities because of memory difficulties. This performance degradation can be a direct result of sleep loss and the associated sleepiness and can play an insidious role in the occurrence of an operational incident or accident....

Humans, like other living organisms, have a circadian clock in the brain that regulates physiological and behavioral functions on a 24 hour basis ... When the circadian clock is moved to a new work/rest (or sleep/wake) schedule or put in a new environmental time zone, it does not adjust immediately. This is the basis for the circadian disruption associated with jet lag. Once the circadian clock is moved to a new schedule or time zone, it can begin to adjust and may take from several days up to several weeks to physiologically adapt.... There are some specific factors that can affect the circadian clock's adaptation. Day/night reversion can confuse the clock so that the cues that help it adjust and maintain its usual physiological pattern are disrupted. Moving from a day to night schedule and back to days can keep the clock in a continuous state of readjustment, depending on the time between schedule changes....

Scientific studies have revealed that there are two periods of maximal sleepiness during a usual 24-hour day. One occurs at night roughly between 3 and 5 AM, and the other in midday roughly between 3 and 5 PM. Individuals on a regular day/night schedule

> will typically sleep through the 3-5 AM window of sleepiness. The afternoon sleepiness period can be masked by factors described previously....
>
> Based on the previous scientific information regarding sleep and circadian rhythms, there are at least three core physiological factors to examine when investigating the role of fatigue in an incident or accident. The first is cumulative sleep loss. An individual's usual sleep amount is established based on the reported total sleep time at home.... The second factor is the continuous hours of wakefulness prior to the incident or accident. A general sleep/wake pattern will have an individual awake for about 16 hours and sleep for about 8 hours. However, operational requirements can involve extended duty periods that require continuous hours of wakefulness beyond this usual pattern. The third factor is time of day. This involves the time of operations and the time at which the incident or accident occurred....
>
> The greatest decrement would be expected when an individual carrying a substantial sleep debt is required to operate for an extended period of continuous wakefulness, and the time of the operation passes through a period of increased sleepiness....

The researchers found in their study of the crewmembers' sleep/wake periods that in the 28.5 hour period prior to the accident, the cumulative totals for sleep and wakefulness for the captain, first officer, and flight engineer were: 23.5 hours awake with 5 hours of sleep, 19 hours awake with 8 hours of sleep, and 21 hours awake with 6 hours of sleep, respectively. (See figures 3 and 4).

The crew had been on duty for about 18 hours at the time of the accident, having flown all night before accepting the new flight segment to Guantanamo. The captain stated that he felt tired on the morning when he accepted the trip to Guantanamo, after having flown all night on his scheduled trip, but said that he was not so tired that he considered it unsafe for him to fly.

In his testimony at the Safety Board's public hearing, the captain described his memory of the last period before the accident in terms that suggested fatigue:

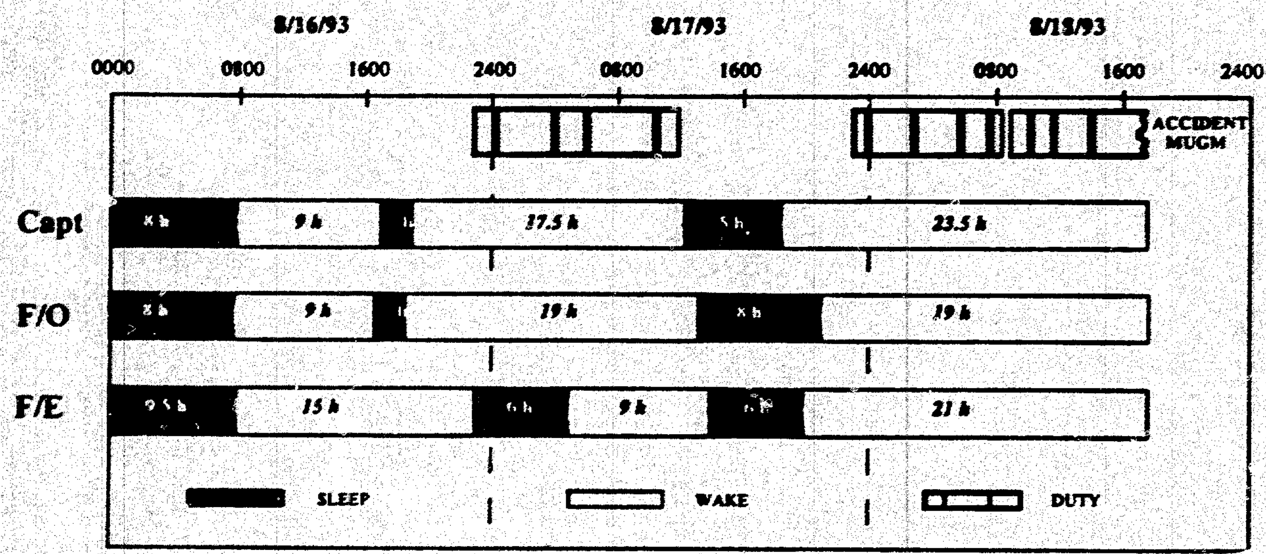

Figure 3.--Flightcrew sleep/wake histories.

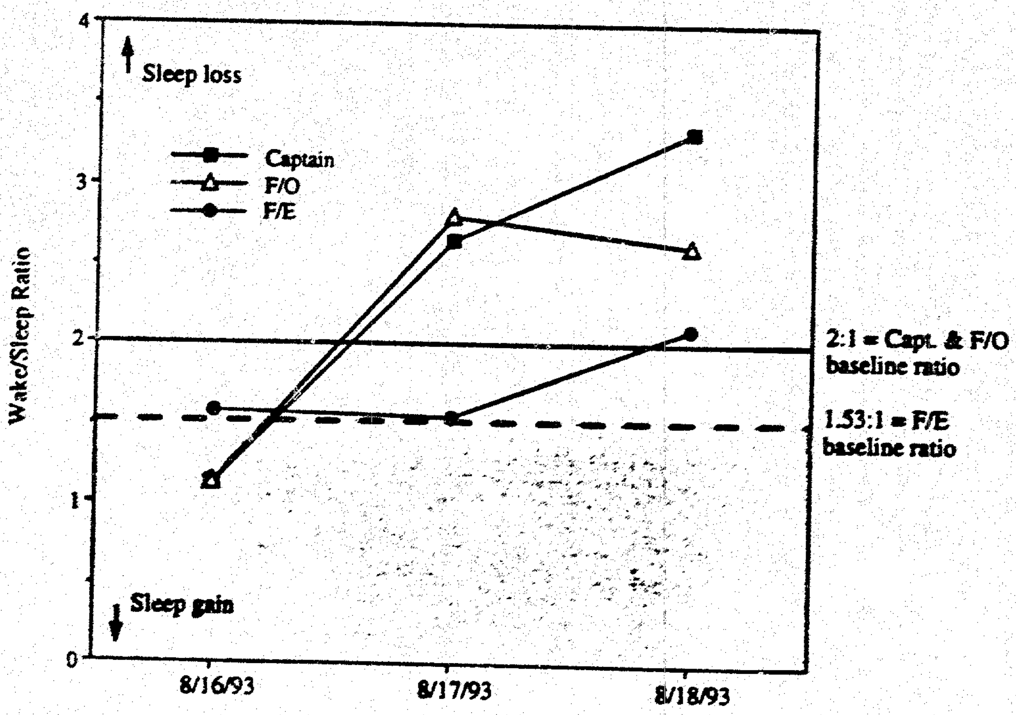

Figure 4.--Flightcrew cumulative sleep/wake debt.

> All I can say is that I was -- I felt very lethargic or indifferent. I remember making the turn from the base to the final, but I don't remember trying to look for the airport or adding power or decreasing power.
>
> On final -- I had mentioned...that I had heard Tom say something about he didn't like the looks of the approach. And looking at the voice recorder, it was along the lines of, are we going to make this?
>
> I remember looking over at him, and there again, I remember -- being very lethargic about it or indifferent. I don't recall asking him or questioning anybody. I don't recall the engineer talking about the air speeds at all. So it's very frustrating and disconcerting at night to try to lay there and think of how this -- you know -- how you could be so lethargic when so many things were going on, but that's just the way it was.

One of the NASA researchers performing the fatigue study of the crew of flight 808, stated in his testimony at the Safety Board's public hearing:

> The third important point I think is that we don't usually take sleepiness seriously, but sleepiness during our waking hours can essentially affect every aspect of human capability and performance.... A few of those things like decision making. So with sleep loss, people would have problems making decisions. People who otherwise would make fine decisions deciding among three alternatives, could go with the worst one. They don't process critical information very well.
>
> Reaction time can be degraded. Again, it's not an extreme case when you're asleep.... People get tunnel vision. They can literally focus on one piece of information to the exclusion of other kinds of information....

In his testimony, the NASA expert provided the following characterization of the captain's performance, as it related to fatigue:

> ...The second is the fixation on the strobe light. I counted seven comments in the [CVR] transcript about the strobe.... I think what's

really critical about that is that...in sleep loss situations, you get people with tunnel vision. They get fixated on a piece of information to the exclusion of other things.... The other thing is right in the middle of that, he [the captain] disregards a critical piece of information...the first officer or flight engineer -- someone saying, "I don't know if we're going to make this"... So besides just fixating, you've got disregard for a critical piece of information....

A second piece of evidence, as I said was the captain...his being "lethargic and indifferent." I think that lethargic just tells you he was tired, fatigued.... One of the findings in sleep deprivation studies is that people will put in more effort, in spite of the fact that their performance goes down, but they don't care what happens. That's indifference....

2. ANALYSIS

2.1 General

The three flightcrew members were certificated and qualified for their respective positions in accordance with company standards and FARs. Information derived during the course of the investigation revealed that the captain was controlling the airplane and the first officer was performing the duties of the nonflying pilot during the approach. Although the crew had no adverse medical histories or life events that would have physically impaired their abilities, fatigue and its relationship to the crew's performance is considered in this analysis.

The airplane was certificated, equipped and maintained in accordance with FAA regulations and company procedures. The weight and balance were within prescribed limits for landing; however, the evidence from the wreckage examination revealed that the flaps were at 50 degrees, a position that is not an "authorized" configuration for normal landings. This is further discussed in the analysis. The investigation disclosed no evidence of preexisting faults in the airplane's structure, systems, or engines that would have contributed to the cause of the accident.

Meteorological information, as reported at the time of the accident, did not reveal significant environmental conditions at Guantanamo Bay. The reported surface winds at the airport were 200 degrees at 7 knots. This wind condition would have favored a landing on runway 28; however, the captain chose to land on runway 10 from a right base turn, an approach that is recognizably difficult for the pilots of large airplanes because of the proximity of the runway touchdown zone to the Cuban border.

In analyzing the circumstances and factors of this accident, the Safety Board evaluated the conduct of the approach to runway 10 with regard to the flight characteristics of the DC-8 airplane, the performance of the flightcrew, the adequacy of the guidance provided to the flightcrew by AIA and DOD, the special airports training provided by AIA, the flightcrew's decision to use runway 10, and the probable effects of fatigue on the flightcrew's performance. The analysis of this accident also addresses the issues of crew flight and duty time policy and regulations as related to flightcrew fatigue, AIA management philosophy with regard to flight operations and training, and FAA oversight and surveillance of AIA.

2.2 The Approach to Runway 10

The proximity of the runway 10 threshold to the boundary fence between U.S. and Cuban territory (and airspace), and the associated restrictions for U.S. aircraft overflying Cuban territory, places a burden upon pilots of aircraft landing on runway 10. This burden is increased with larger aircraft, i.e. DC-8, DC-10, etc. The approach must be conducted so that the airplane remains within the 3/4 mile distance from the runway threshold (as measured along the extended runway centerline) during the turn from base leg to final runway alignment. For pilots of large aircraft, the approach presents challenges that are not normally encountered during routine air carrier line operations. In nearly all other approaches, whether conducted in instrument or visual conditions, the air carrier pilot will ensure that the aircraft is aligned with the runway centerline a minimum of 2 miles from the threshold, and at a height of greater than 500 feet above the threshold. In fact, all air carrier training programs emphasize the safety significance of a stabilized approach where changes to the airplane configuration, descent rate, airspeed and magnetic heading are minimized during the final approach segment. In contrast, the approach to runway 10 at Guantanamo Bay requires the pilot to accomplish a tight radius turn from base leg to final approach using a steeper than normal angle of bank and rolling out on runway heading over or nearly over the runway threshold. The roll out to a wings level attitude is completed at low altitude with minimum distance to correct for runway misalignment.

The difficulty of conducting the runway 10 approach from the right traffic pattern is further increased by a prevailing southerly wind. The effect of the wind on the airplane results in an increased ground speed while on base leg and an increased (inertial) radius of turn to the runway heading at a given angle of bank. To compensate for the southerly wind, the pilot must commence the turn to final sooner and/or use a steeper than normal angle of bank to maintain the proper track over the ground.

The Safety Board determined that the approach to runway 10 was within the theoretical performance limits of the accident airplane using a maximum bank angle of 30 degrees. The DC-8 at the landing gross weight of 236,000 pounds with the flaps extended to 50 degrees would have a wings level stall speed (Vso) of about 109 knots indicated airspeed (KIAS), and a nominal approach speed of 147 KIAS (1.3 Vso + 5). At this approach speed, the radius of turn with 30 degrees of bank is approximately 3,325 feet. Thus, the airplane approaching from the south and aligned precisely with the Cuban border fence should have been able to complete a turn to the east and return to a wings level attitude on final for runway 10 with about 1,300 feet remaining to the runway threshold. Assuming a touchdown aim point 1,000 feet beyond the runway threshold, and a constant 3-degree-per-second descent path, the airplane would have been approximately 120 feet above the ground as it rolled to a wings level attitude on final approach.

While this approach theoretically could have been negotiated by a DC-8, there are several factors which could compromise the success of the approach and landing on runway 10. First, in order to limit the bank angle to 30 degrees, the turn must be initiated at a precise point as the airplane proceeds north on the base leg. This precise point is located along the extended Cuban boundary line, at a distance south of the runway 10 centerline, established by the radius of the turn and the effects of the prevailing wind. Second, the transition from wings level flight to 30 degrees of bank must be accomplished immediately within 2 seconds of crossing the turn reference point in order to achieve the theoretical turn radius. A variance in either of these factors will affect both the bank angle required throughout the turn to achieve proper runway alignment and distance from the runway threshold, and the height above the ground when the turn to final is completed. If the turn to final is delayed for only 6 seconds, a 45 degree angle of bank would be necessary to complete the turn and be aligned with the runway centerline on roll out. Finally, as the turn is established, the pilot must consider the airplane's load factor associated with the bank angle and the resultant increase in aerodynamic drag and decrease in the airspeed stall margin. This can be accomplished by modulating the engine thrust to maintain the proper airspeed and descent path.

The Safety Board believes that it is unlikely that the pilot of a heavy transport airplane, having a relatively high approach speed, would be capable of adhering to all of the U.S. airspace restrictions associated with the approach to runway 10 at Leeward Point Airfield, Guantanamo Bay, without exceeding safe maneuvering bank angles at low altitude. The downwind leg for the right hand approach is flown over water; thus, there are no visual landmarks to aid the pilot in determining the proper position to initiate the turns to base leg and final approach. During normal operations, a high intensity strobe light located atop of the Marine guard tower on the U.S./Cuban boundary fence line is used to establish the downwind to base leg flight track. However, on the day of the accident and unbeknownst to the crew of flight 808, the strobe light was inoperative.

In addition, the approach to runway 10 is increasingly difficult when the right hand pattern is flown by the captain positioned in the left seat. As the airplane approaches the coastline on the base leg, the captain's visibility from the cockpit becomes progressively restricted. The captain's ability to maintain visual orientation with the runway threshold eventually degrades to the point that he can no longer see the runway. Thus, it is understandable that the captain of flight 808, unfamiliar with the approach, would have had difficulty establishing the proper position to initiate the turn to final, and maintain a reasonable angle of bank and roll out on the heading that would have provided proper alignment with the runway centerline.

2.3 The Performance of the Flightcrew

The flightcrew properly planned the unexpected flight to Guantanamo Bay, but their lack of knowledge or previous flight experience at Guantanamo (except the first officer who had conducted flight operations there many years before and in airplanes much smaller than a DC-8), specifically the runway 10 approach, created confusion upon their arrival.

The three crewmembers had been on duty for nearly 18 hours upon their arrival at Guantanamo Bay, which included being awake all night. Nonetheless, the captain's decision to land on runway 10 was made almost casually and was not questioned by the other crewmembers, although all three knew that Guantanamo Bay was a special airport because the approach to runway 10 involved an unusually short and challenging turn to final approach. This is further emphasized by the discussion in the cockpit at 1641:53, in which the captain proposed landing on runway 10 "just for the heck of it to see how it is." The first officer responded "OK," while the flight engineer said nothing. There was no further discussion of this decision, except for a comment by the flight engineer at 1644:50, "just don't do no rolls on final." The crew did not discuss the airplane's weight or the prevailing winds (which favored landing on runway 28), factors that may have prompted the first officer and flight engineer to advise against this approach.

The captain did not initiate, nor did the other crewmembers request, a briefing of the procedures to be followed in the event that the approach would be discontinued and the missed approach executed. Also, the flightcrew did not discuss the realistic challenges of the runway 10 approach, given the factors such as their unfamiliarity with the approach and their fatigued condition. With almost no interaction among the flightcrew during the latter portions of the approach, they abandoned what would have been a straightforward approach to runway 28 and set themselves up for a dangerous situation with the approach to runway 10.

As the flight turned northbound toward the coastline, the captain attempted to find the strobe light that would have provided alignment with the Cuban boundary fence line. Having not been advised by the controller that the strobe was inoperative, he continued to look for the light and allowed his attention to be diverted from the tasks necessary to execute the approach. Instead of looking for airport features and attaining/maintaining visual contact with the runway, he fixated on finding the strobe light that the controller had referenced. The success of the approach was dependent upon the proper execution of the turn from downwind to final. However, the captain's fixation led to unstabilized airspeed control for the approach, a lack of situational awareness of the airplane in relation to the runway, and the premature turn to base leg. This resulted in a failure to use all of the available airspace between the runway threshold and the fence line; thus, the distance remaining after the turn to final would not be sufficient for any necessary corrections for runway alignment.

The tower supervisor/local controller assumed the air traffic control duties about 2 hours before the accident. At that time, she notified the Marine Barracks of the inoperative strobe light. In addition, the supervisor was in the process of training a new controller. At the time of flight 808's arrival, the controller trainee was performing all of the radio communications. The trainee provided landing instructions to the flightcrew which included a reference to "...remain within the first fence line designated by the high-intensity strobe."

The strobe is a visual aid for pilots. However, it not a required reporting point nor is its identification mandatory by the flightcrew to execute the approach to runway 10. The Safety Board believes that the failure by both the controller trainee and the supervisor to inform the crew of the inoperative strobe light resulted in the captain concentrating his attention on finding the strobe rather than flying the airplane. Also, the Safety Board believes that the captain's continued focus on locating the strobe and the first officer falsely identifying the strobe were most likely enhanced by their fatigued state. Had the controllers provided the crew with the proper information about the strobe light, it is most probable that the captain would have concentrated his efforts on flying the aircraft, as well as recognized the dangerous situation of slow airspeed, steep bank and low altitude.

A ground track generated from FDR and meteorological data indicated that flight 808 was approximately 3,000 feet west and 2,000 feet south of the runway 10 threshold (approximately 1,000 feet from the shoreline) when the turn from base leg to final approach was initiated. From this position it is probable that the captain, being in the left seat, did not have the runway threshold in sight. However, there is no evidence that he requested assistance from his first officer who was in a better position to view the runway, nor is there any evidence that the first officer volunteered the essential information regarding the position and proximity of the airplane to runway 10. In addition to being too close to the runway threshold on the base leg, the FDR indicated that the captain permitted the airspeed to decrease to 140 KIAS, about 7 knots below the target airspeed. Based on the actual point where the turn was initiated, the required radius to complete the turn and be in a position to cross the runway threshold, aligned with the centerline would have been 2,700 feet. At 147 KIAS, a constant bank angle of 55 degrees would have been required to achieve this turn, an inappropriate maneuver for a DC-8. Additionally, a load factor of 1.7 would have to be developed to maintain such a turn and the stall speed would have increased to 143 KIAS.

The load factor, airspeed, and heading data from the FDR were used to calculate the actual turning maneuver, stall margins and roll angles. The roll angles were determined to be less than 30 degrees at the initiation of the turn from base to final, but increased during the last 7 seconds of flight to beyond 50 degrees right wing down. The increasing bank angles effectively reduced the turn radius but increased the required load factor in order to maintain the turn and a constant rate of descent. The increasing load factor resulted in an additional loss of airspeed. Both the decreasing airspeed and greater load factors required the airplane to be operated at greater angles-of-attack, to the point that the airplane eventually stalled. The Safety Board found no indications that engine thrust was increased nor that the bank angle was reduced during this maneuver. Based on the position of flight 808 when the turn from base leg to final was initiated, the probability of successfully completing the approach was nil. However, the accident was not inevitable until the captain steepened the bank and permitted the airplane to stall. When the captain realized that an abnormally steep bank angle was required to align the airplane with the runway, he should have acted immediately to discontinue the approach by reducing the bank angle, increasing the engine thrust, and performing a go-around.

The Safety Board believes that the lack of communication between the captain and the other crewmembers was a major factor in the accident. The flight engineer's repeated concerns about the deteriorating airspeed did not sufficiently communicate the urgency of the situation to the captain. Moreover, when the stall warning activated, neither crewmember was successful in re-directing the captain to take positive corrective action to recover to controlled flight.

According to Douglas Aircraft Company (DAC), the loss of roll authority is "minimal" on the DC-8 at the onset of wing stall because the aerodynamic effectiveness of the ailerons is preserved during the flight in the stall regime. Based on the FDR and CVR data, and the performance characteristics of the DC-8, upon activation of the stall warning stick shaker, the captain would have had about 5 seconds to initiate corrective action and eliminate the stall hazard. The data also suggests that conventional stall recovery techniques (maximum thrust and wings level) and the execution of a go-around could have prevented ground impact.

On balance, the three experienced crewmembers failed to respond properly in both their decision-making and the execution of this approach. The performance of this crew on the accident leg was especially surprising considering their extensive experience and the positive evaluations regarding the crewmembers by other pilots. The captain of the accident flight had been described as a good crew manager with better than average skills, including the ability to anticipate and avoid trouble situations. Also, the first officer was characterized as an excellent pilot, while the flight engineer was described as someone who spoke up when there were problems. Considering these commendable qualities, the Safety Board believes that one of the primary issues in this accident was the crew's failure to adhere to the professional standards characteristic of their prior performance in the final moments before the accident.

2.4 Effect of Scheduling and Flightcrew Fatigue

The crew had been on duty approximately 18 hours at the time of the accident, having flown all night before accepting the new flight segment to Guantanamo. In reviewing the performance of the crew, the Safety Board attempted to determine the extent to which this extended duty schedule may have affected the actions observed in the accident.

The evaluation of the captain's performance revealed that he initiated and continued to fly the approach to runway 10 in a manner that placed the airplane in a dangerous flight regime despite warnings from the other crewmembers and the stall warning stick shaker. The Safety Board believes that the substandard performance by an experienced pilot may have reflected the debilitating influences from fatigue.

In his testimony before the Safety Board at its public hearing, the captain described his memory of the last period before the accident in terms that suggested fatigue:

> All I can say is that I was -- I felt very lethargic or indifferent. I remember making the turn from the base to the final, but I don't remember trying to look for the airport or adding power or decreasing power.
>
> On the final -- I had mentioned...that I had heard Tom say something about he didn't like the looks of the approach. And looking at the voice recorder, it was along the lines of, are we going to make this?
>
> I remember looking over at him, and there again, I remember -- being very lethargic about it or indifferent. I don't recall asking him or questioning anybody. I don't recall the engineer talking about the airspeeds at all. So it's very frustrating and disconcerting at night to try to lay there and think of how this -- you know -- how you could be so lethargic when so many things were going on, but that's just the way it was.

The first officer told Safety Board investigators that he felt somewhat fatigued when he accepted the trip to fly to Guantanamo, but that he felt fully alert and exhilarated just before the accident as they approached the airport. He supported the captain's decision to land on runway 10, but failed to adequately monitor and initiate a go-around as the approach escalated to a critically dangerous level. Additionally, there was also an uncertainty in his [the first officer] actions throughout the approach, evidenced by the CVR transcript indicating his confusion between Guantanamo Radar and Havana Center. According to the captain, the first officer reviewed the tower transcript after the accident and "thought he might be more fatigued than he thought he was because of the way he answered some of the transmissions and the way he stuttered in some of the transmissions."

According to his wife, the flight engineer sounded well rested when they talked by telephone just before he reported for duty (about 21 hours before the accident). Interviews with several persons, including a captain who had flown with him recently, said the flight engineer always verbalized his concerns when he saw something that did not look right. This trait was evident just before the accident, when the flight engineer made several references to the airspeed and expressions of concerns about the approach. However, like the first officer, he was not sufficiently assertive to redirect the captain and stop the deteriorating situation.

2.4.1 Scientific Examination of Fatigue

In the laboratory, it is possible to measure fatigue through the monitoring of brain wave activity and other physiological evidence. Outside the laboratory, however, there is no direct measurement or testing that can be applied, thus fatigue must be inferred from background information and actions.

In accident investigations, three background factors are commonly examined for evidence related to fatigue. They are cumulative sleep loss, continuous hours of wakefulness, and time of day. These areas were examined as follows:

1) Cumulative sleep loss: Scientific literature has established that people require a certain number of hours of sleep each day to be fully alert, typically between 6 to 10 hours depending on the individual. As reflected in the recent Special Investigative Report by the Safety Board on the Pegasus Launch procedure anomaly (NTSB/SIR-93/02), there is evidence that only 2 hours less sleep than is usually required by an individual can create major degradation's in alertness and performance (p. 71). Issues of sleep loss have been cited by the Safety Board as issues in previous accidents. For example, fatigue of the third mate was cited as a factor in the probable cause of the grounding of the U.S. tank ship Exxon Valdez (NTSB/MAR-90/04). The report noted that the third mate's total sleep time in the previous 24 hours could have been as few as 5 or 6 hours, and that "impaired task performance could normally be anticipated as a result of these conditions of partial sleep loss" (p. 128).

2) Continuous hours of wakefulness: In the recent Safety Study in which the Board reviewed 37 major aviation accidents in which flightcrew performance was determined to be either a causal or contributing factor to the accident, it was found that one factor related to performance and judgment errors was the time that a pilot(s) had been awake. A review of flightcrew-involved, major accidents of U.S. Air Carriers, 1978 through 1990, NTSB/SS-94/01, revealed that flightcrews comprised of captains and first officers whose time since awakening were determined to be elevated substantially higher than average, made more errors overall, and specifically more procedural and tactical decision errors. The study adds to scientific evidence that fatigue problems can increase simply with lack of sleep.

3) Circadian disruption (Time of Day): Scientific literature has established that there are two periods of maximal sleepiness in a person's usual 24 hour day. These are determined by physiological fluctuations regulated by the brain, and occur between roughly 3-5 every morning and 3-5 every afternoon. During these periods, the body is primed to sleep. Individuals can remain awake during these periods, but the physiological pressure to sleep is maintained and may affect waking levels of performance and alertness. Failure to sleep during these periods, or efforts to sleep when the body is physiologically primed to be active, are labeled circadian disruption.

The Safety Board received a detailed analysis of the sleep history of the three crewmembers involved in this accident from an expert in the study of fatigue. The sleep histories are summarized in this study and the cumulative sleep debt is explained in appendix E. Based on the information revealed in the expert's analysis, it can be seen that none of the three crewmembers had received his normal level of sleep in the days before the accident. Both the captain and the first officer reported they normally slept about 8 hours per night, but in the 48 hours before the accident, they slept only about 8 hours and 10 hours respectively. The flight engineer reported he normally slept about 9 1/2 hours each night; however, in the same 48 hour period he only slept about 12 hours.

The Safety Board's examination of the flight and duty time revealed the captain had been awake for 23.5 hours at the time of the accident, the first officer for 19 hours, and the flight engineer for 21 hours. In comparison to those pilots sampled in the Safety Board's Air Carrier Study, these values of time since awakening would have put the crew of flight 808 in the top percentile for crewmembers lacking sleep. The accident crewmembers had been awake as long or longer than any other crewmember involved in the special study sample.

The accident occurred at 1656, at the end of the afternoon physiological low period. The crewmembers had been awake for the preceding two nights and had attempted to sleep during the day, further complicating their circadian sleep disorders.

Therefore, the evidence in this accident shows that the flight crewmembers met all three of the scientific criteria for susceptibility to the debilitating affects of fatigue. This is further supported by the comparison of evidence from this accident with that of other accidents and studies conducted by the Safety Board.

The effects of fatigue are particularly prevalent when all three factors overlap, as in the present case, where the flightcrew had received limited sleep in the previous 48 hours, then been awake more than 19 hours during both day and night periods, and then were required to be at a high level of alertness during a period of time (3 to 5 p.m.) associated with sleepiness. In summary, the three "experienced" crewmembers, especially the captain, failed to respond appropriately and effectively to a situation that deteriorated to the level of a stall during the approach, which, although demanding, could have been performed successfully provided the proper techniques and procedures were employed. The academic studies and scientific data are consistent with the flightcrew statements and testimony describing their reduced alertness and decision-making impairment. Based on these data the Safety Board concludes that fatigue was a factor directly leading to this accident.

2.4.2 Company Practices Related to Fatigue

The Chief Executive Officer (CEO) of AIA was interviewed to determine the nature of the company policies and procedures with regard to crew scheduling. He stated that, to remain competitive, the company must often assign long duty times and "work everything right to the edge" of what was allowed by FARs. He also indicated that this was a common practice in the industry.

According to the AIA chief crew scheduler, there was an unwritten company procedure to avoid assigning crews to more than 24 hours continuous duty time. However, the captain from flight 808 stated that he had been assigned trips with 24-hour duty periods several times previously. The FAA POI said that during his association with AIA, he had observed flightcrews who had been on duty 20 to 24 hours in situations that were "legal." The length of the accident trip therefore was not unique.

Another factor that was examined was the action/reaction of both AIA and the flightcrew members with regard to the refusal to conduct a trip because of fatigue. According to the AIA chief crew scheduler, when a crewmember refused a trip because of fatigue, it was company policy to establish how long a rest period was required by the crewmember, followed by the company providing that crewmember with a hotel room. He indicated that it was very seldom that such refusals happened. The captain of flight 808 stated that he had "felt tired" upon notification of the unscheduled trip to Guantanamo, but accepted the trip because it was "legal." He also said that he never refused a trip because of fatigue and was not aware of any other crewmember that had done so. The first officer of the accident flight said the crewmembers had discussed the trip to Guantanamo and decided that although it was "legal," it seemed like a long day and might be "pushing the edge." He added that based on his previous experience regarding the company's attitude, "if the trip was legal, you better really be tired" to refuse the trip. Several former AIA pilots expressed to the Safety Board their concerns about the scheduling practices at the airline. One pilot stated that he was with a crew that refused to fly a Part 91 ferry flight at the end of a long duty and that he felt the crew was subjected to intimidation by the company.

In reviewing this evidence, the Safety Board was unable to determine the actual company reactions to pilots who refused trips because of fatigue. At the same time, the Safety Board did recognize that the current policy relies heavily on the judgment and integrity of individual pilots. As noted in the fatigue expert's report, individuals are normally poor at recognizing their own fatigue state and tend to strongly underestimate it. Given the pressures of the actual commercial environment, it does not seem realistic to rely on the crews' self assessment and willingness to confront company pressures as a safety mechanism to prevent the assignment of tired crews. The FARs set the baseline of what is permitted legally in hours of service, and competitive pressures make it likely that air carriers will operate at or near the baseline to maximize crew utilization and company profits. The Safety Board is concerned that companies are unlikely to voluntarily change their policies, or that individual crewmembers will take an aggressive position in the determination of fatigue limits; rather, it will require regulation to enact change to prevent the recurrence of this type of accident.

The Safety Board believes that AIA's scheduling of this crew contributed to their fatigue and substandard performance.

2.5 Flight and Duty Time Regulations

The significance of crewmember fatigue in this accident prompted the Safety Board to examine the FARs that govern flight and duty time for flightcrew members.

The Safety Board's examination revealed that several different crew flight and duty time regulations were applicable to the accident trip. The first portion of the trip, which involved the crew's scheduled domestic flights, were conducted under 14 CFR Section 121.505 for supplemental air carriers and commercial operators. This rule states that a pilot may not be scheduled to fly more than 8 hours, or be on duty more than 16 hours, in 24 consecutive hours. Guantanamo Bay was considered an "international" destination, thus, the flight to Guantanamo would be conducted under 14 CFR Section 121.521 rule applicable to supplemental air carriers on international flights. This regulation provides that a pilot may be scheduled to fly up to 12 hours in 24 consecutive hours; thus, because the pilots of flight 808 would have accumulated about 9.0 hours of flight time and 21 hours of duty time when they arrived at Guantanamo Bay, the time that would have accumulated during this trip would have exceeded the limits of 14 CFR Section 121.505, but not the limits of 14 CFR Section 121.521. Further, once the airplane was offloaded in Guantanamo Bay, the return portion of the scheduled trip would have been flown under 14 CFR Part 91, as a "non-commercial" ferry flight to reposition the airplane back in Atlanta. Currently, there are no flight or duty limits applicable to commercial operators when the airplane is flown under 14 CFR Part 91, to ferry the airplane. The FAA has addressed this issue and provided a legal interpretation that flight and duty time accrued during company required flights conducted under 14 CFR Part 91 must be counted against the flight and duty time accumulated in revenue operation for determining the eligibility to initiate a 14 CFR Part 121 flight. However, because there are no limits applicable to 14 CFR Part 91, flight and duty time accrued during flights conducted under 14 CFR Part 121 do not prohibit a pilot from initiating a flight under 14 CFR Part 91 at the end of a Part 121 line operation. Therefore, the accident trip was under the provisions of a combination of separate regulations that allowed extended flight and duty times to be scheduled, contrary to safe operating practices.

According to testimony before the Safety Board at its public hearing, the United States and France are the only countries in the world that base their aviation hours of service regulations on flight time while most other countries base it on duty time. The Manager of the FAA Air Carrier Branch, testified that flight and rest requirements in aviation were first established in the 1930s. The FAA has since had continuing interest in updating these regulations and several attempts had been made to revise the regulations in the 1970s but, according to the manager, these failed because the FAA was unable to obtain a consensus from industry and labor groups on new standards. The FAA established an advisory committee in 1983 which resulted in the issuance of new domestic 14 CFR Part 121 rules in 1985. A new advisory group was established in 1992, with participation from a wide segment of the aviation community, to review flight/duty time issues and, if appropriate, develop recommendations for regulatory revision. This group is currently meeting and has not provided feedback to the agency; however, the group's manager indicated that he felt there was a need for revision in the flight/duty time regulations, especially to close the option of 14 CFR Part 91 ferry flights in 14 CFR Part 121 operations. He also indicated that the FAA's present strategy is to develop regulatory change on the basis of input from an outside advisory committee rather than on the basis of new rulemaking initiated by the agency itself. The Safety Board is concerned that this process may not result in a satisfactory solution to this issue and believes that efforts to change existing regulations by means of the committee negotiating process are ineffective.

Issues of fatigue in transportation have been of special concern to the Safety Board in all modes of transportation. In 1989, the Safety Board made three recommendations to the DOT to encourage an aggressive Federal program to address the problems of fatigue and sleep issues in transportation safety:

I-89-1

Expedite a coordinated research program on the effects of fatigue, sleepiness, sleep disorders, and circadian factors on transportation system safety.

I-89-2

Develop and disseminate educational material for transportation industry personnel and management regarding shift work; work and rest schedules; and proper regimens of health, diet, and rest.

I-89-3

Review and upgrade regulations governing hours of service for all transportation modes to assure that they are consistent and that they incorporate the results of the latest research on fatigue and sleep issues

The DOT has initiated programs in each transportation mode to respond to the need for a better understanding of fatigue, and regularly briefs the Safety Board on these activities. These recommendations remain classified "Open--Acceptable Response" pending the completion of these programs.

It is apparent from the accident involving AIA flight 808 that further efforts are needed in aviation to address the third recommendation (I-89-3), which may eliminate some of the problems that continue to plague the industry.

Fatigue issues have been addressed in several major aviation accident reports. In the accident involving a Continental Express Embraer-120 RT on April 29, 1993, Pine Bluff, Arkansas, the Safety Board cited fatigue as a contributing factor in the probable cause of the accident.[16]

In January 1994, the Safety Board published a study of 37 major aviation accidents from the period 1978 through 1990, in which human performance issues were cited in the probable cause determinations.[17] Many human performance background variables were compared to the types of errors observed in the accident sequences in an effort to identify factors that might be useful in accident prevention. Several fatigue-related variables were examined, such as time

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[16]See Aircraft Accident/Incident Summary Report--"In-Flight Loss of Control Leading to Forced Landing and Runway Overrun, Continental Express, Inc., N24706, Embraer EMB-120 RT, Pine Bluff, Arkansas, April 29, 1993" (NTSB/AAR-94/02/SUM)

[17]See Safety Study--"A Review of Flightcrew-Involved Major Accidents of U. S. Air Carriers, 1978 Through 1990" (NTSB/SS-94/01)

since awakening, time of day, time zone crossings, and changing work schedules. It was found that the time since awakening for each pilot related to significant differences in performance, in terms of the number and types of errors made by pilots.

As a result of this safety study, on February 3, 1994, the Safety Board issued the following recommendation to the FAA:

A-94-5

Require U. S. air carriers operating under 14 CFR Part 121 to include, as part of pilot training, a program to educate pilots about the detrimental effects of fatigue, and strategies for avoiding fatigue and countering its effects.

The implementation by the FAA of such a program should assist pilots to better recognize their own symptoms of fatigue and to develop personal strategies to help lower its effects in the demanding work schedules to which they are subjected.

In reviewing the evidence, the Safety Board notes with concern the length of time without revision of the current flight/duty time regulations and the continuing slowness and difficulty of the current regulatory review process. New evidence has become available in the past 20 years on fatigue, and it increasingly substantiates that fatigue is a more pervasive and debilitating factor in transportation safety than was previously realized. The Safety Board believes that the FAA should revise the regulations pertaining to permitted flight and duty time. The FAA should also clarify the regulation to prohibit a flight crewmember from initiating a 14 CFR Part 91 ferry flight if before the completion of the revenue flight, the total flight and duty time will exceed that permitted during the 14 CFR Part 121 operations. Currently, the industry practice of ferry flights at the conclusion of revenue operations can lead to excessively long duty days and induce debilitating effects of fatigue on crewmembers.

2.6 The Company

The Safety Board also examined the underlying safety issues developed during the investigation, including the corporate philosophy, operational, and maintenance aspects of AIA.

Since separating the Part 121 supplemental operations from the Part 135 operations in 1985, AIA expanded its fleet of airplanes to provide ad hoc operations worldwide and had also increased the responsibilities of the current management. The individual managers/supervisors could not keep pace with the added responsibilities placed on them because of the increasing rate of expansion of the airline. This situation was evident whenever a problem area arose because either management, the airline operation, or both, were constantly "behind the power curve" in planning or foresight. This was observed on a regular basis by the FAA POI and PMI, and was documented in the various inspection reports prepared by not only the local FAA inspectors, but by the inspectors involved in the FAA RASIP, NASIP, and special inspections, as well as the DOD inspections. AIA's underlying company philosophy with regard to taking corrective action on negative findings determined by these inspections was to solve the problem by "decree." And although changes were made or actions were performed to "correct" the discrepancies, the corrections were not always long term and became repetitive on follow-up inspections. The company's attempts to comply with FARs were described as "minimal," with an attitude of disregard to elevating the level of operation above the minimum standards set forth by the regulations.

The information and concerns expressed by AIA employees to the Safety Board during the investigation suggested that a corporate attitude existed that placed more significance on economic factors than safety. This attitude was cited by the pilots in their concerns about excessive crew flight and duty time; and was expressed as only one of the many causal issues used to support the Teamsters Union being voted to represent the pilots. However, AIA management stated to the Safety Board in general terms that the "lack of communications between management and the pilots" was the reason behind the solicitation of union representation.

Other examples of management anomalies were reflected in the AIA flight operations. The oversight and responsibilities of the diverse airplane fleet (DC-9s, B-727s, B-747s, and DC-8s), were handled by the D/O and the Chief Pilot. AIA did not have fleet managers, nor were there persons assigned to the individual airplane models that could oversee that particular portion of the fleet, and resolve problems, establish or change procedures, maintain all pertinent airplane manuals, or answer questions. Additionally, the D/O was responsible for maintaining the currency of all airplane manuals for the entire fleet of airplanes. This type of work is both time consuming and labor intensive.

FAA inspections found repetitive discrepancies in required paperwork, as well as airplane and flight operations manuals, that reflected either the lack of attention, a reduced priority, or the inability to perform the task because of other work priorities. Because of the repetition of discrepancies in these specific areas, and the lack of urgency on the part of the AIA management to take corrective actions, the POI sometimes resorted to unorthodox means to achieve change. One such action related to the out-dated aircraft operations and maintenance manuals. To effect a change by AIA, the POI threatened to delay the approval of the B-747 operation, pending AIA's establishment of a "manuals office" with a supervisor and staff to monitor revisions and update the manuals. Only then did AIA management initiate efforts to bring the manuals up to acceptable standards.

The Safety Board believes that AIA's management structure and philosophy of "lean management" was insufficient to maintain vigilant oversight and control of the rapidly expanding airline operation. The lack of personnel in key positions (both operations and maintenance) that were capable of reducing the workload of the management staff, and the inability of supervisory staff to make and implement decisions without involving the highest levels of management, are just two of many examples that contributed to the management problems that compromised the safety of this operation.

2.6.1 Special Airport Information and Training

The Safety Board was concerned by the lack of available printed information, and the limited knowledge of the crewmembers regarding the Guantanamo Bay, Leeward Point Airfield. This airport is one of 11 such airports described in the "special airports" qualification video tape used by AIA crewmembers during either initial or recurrent training. The Safety Board found that this training was self-monitored and that no additional or supporting information was provided by the company or the DOD during these training sessions. Although, it was AIA's policy that flight engineers were not required to view the tape on special airports, the evidence in this accident showed that the flight engineer was more knowledgeable and aware of flight 808's position during the approach to Guantanamo Bay than the other two crewmembers.

The Safety Board believes that the lack of a requirement for flight engineers to receive this type of training limits their knowledge about special airports. It further serves to eliminate a critical element of safety when such an element is needed the most. It is vital that all members of a crew be fully aware of the possible dangers associated with airports that are considered to be special.

In addition, AIA flight crewmembers are at a disadvantage when operating at the special airports because of the randomness of their particular schedules and the time that may have elapsed between their viewing of the videotape and the actual flight into the special airport. The Safety Board also believes that the video tape prepared by DOD does not adequately convey the difficulty and potential hazards involved in the approach to runway 10 at Guantanamo Bay. The tape is a pictorial of the airport, including the coastline and Cuban boundary, as viewed from the cockpit of an airplane during the turn from downwind and base leg on to final. The tape accurately shows that the final alignment with the runway occurs at low altitude and nearly over the runway threshold. However, there is no discussion about the factors that make the approach particularly challenging to the pilots of airplanes with high approach speeds. These factors include steep bank angles and increased approach speeds necessary to compensate for the load factors associated with the bank angle, the adverse effect of a southerly wind, and the criticality of the turn initiation point in achieving proper runway alignment without excessive maneuvering. The Safety Board believes that the video tape should be revised to emphasize these factors.

The video presentation alone does not ensure that the flightcrew members retain all the information necessary to conduct a safe approach or departure from these airports. This was evidenced by the fact that the captain and first officer had viewed the special airports video tape approximately 5 months and 5 days, respectively, before the accident flight and there was still confusion among the crew while preparing for the approach. The Safety Board believes that in addition to the video presentation, it is incumbent upon AIA and DOD to provide crewmembers with up-to-date printed training and reference material for use at Guantanamo Bay.

The Safety Board conducted a survey of other air carriers operating into Guantanamo and it revealed that nearly all use a video tape supplemented by a special airports manual, and require a company briefing before departure, and/or access to the information in a Leeward Point Airfield briefing package. Additionally, several air carriers also require a check airman to accompany an unqualified crew or captain into a special airport. Unlike AIA, several airlines that had dispatch operations kept records of special airports qualifications and currency for crewmembers.

2.7 Crew Resource Management (CRM)

The crew coordination issues were examined by the Safety Board because of the events that occurred in the final minutes of the flight. The Safety Board found that the lack of crew coordination, was probably due, in part, to fatigue, rather than to the more conventional crew coordination problems attributed to personal interactions.

The breakdown in crew coordination was evidenced by the fact that the captain did not include the remainder of the crew in the initial decision-making process to land on runway 10, nor did he solicit the assistance of the first officer during the latter portion of the approach when he was unable to maintain visual contact with the runway. The Safety Board also believes that even though the captain followed his decision with an invitation to the other crewmembers to express their concerns if they did not feel comfortable with any aspect of the approach, coordination continued to deteriorate further when both the first officer and flight engineer expressed concerns that they did not believe they were "going to make it." The captain failed to comprehend and act on the information from the other crewmembers, as subtle as it may have been, to initiate a go-around.

The lack of crew coordination is further evidenced by the fact that the captain failed to recognize and take corrective action to regain the lost airspeed despite the flight engineer's repeated warnings and the activation of the stick shaker. In addition, while it is believed the captain's attention was drawn to finding the strobe light, the first officer failed to assist the captain by providing critical information concerning their proximity to the runway and their steep angle of bank, or by strongly supporting the flight engineer's warnings regarding the slow airspeed. The Safety Board believes that had the first officer and flight engineer been more assertive in volunteering vital information or redirecting the captain's attention to take the appropriate corrective action, the accident may have been prevented.

The Safety Board has advocated training in CRM as a means of enhancing the use of all crewmembers as a coordinated team to improve flight safety. The FAA has provided guidelines on CRM training in FAA AC 120-51A. This circular describes a CRM program consisting of three phases. The first phase consists of definition and discussion of basic CRM concepts in initial class work. The second phase consists of practice and feedback through line-oriented flight training (LOFT). The third phase includes continuous reinforcement as part of an airline's operational philosophy.

Both pilots from the accident trip had completed a 2-day CRM class at Eastern Airlines, and the first officer indicated that he had received some additional informal CRM training at AIA. These classes appear to correspond to the first phase described in the FAA guidelines, and suggest that AIA made an informal attempt to address CRM issues in the company training. The Safety Board believes that further development of this program along the guidelines of FAA AC 120-51A could assist the flight crewmembers and prevent some of the crew coordination deficiencies evident in this accident.

Also, the Safety Board believes that had the crewmembers discussed, as a group, the difficulties of the approach to runway 10 before the execution, they would all have been aware of the criteria necessary to not only complete the approach, but also would have agreed on the criteria to abandon the approach. This probably would have served to assist the crew in recognizing the trouble signs before the approach deteriorated to the point that safety was irreparably compromised. In addition, had the flightcrew been thoroughly indoctrinated in and practiced the principles advocated by AC-120-51A, this knowledge might have offset the debilitating effects of fatigue and helped them to sustain team performance sufficiently to avoid or recover from the hazardous situation. This accident illustrates one more example of the potential safety benefits of CRM and further supports the need to require CRM for all crews in Part 121 operations.

2.8 FAA and DOD Oversight and Surveillance

The Safety Board reviewed the FAA and DOD inspection programs for AIA. The investigation revealed that the FAA had conducted several major inspections of the company, integrated with the normal inspection and surveillance by the POI, PMI, and PAI. The various inspections revealed operational and maintenance-related discrepancies, some of which were repetitive and required only minor changes or modifications. AIA always acknowledged the findings and corresponded with the FAA citing the proposed corrective actions; however, the "fixes" were more temporary than permanent. This situation reinforced the belief of the POI that the company was performing corrective actions at the minimum levels, so as to remain "legal." The enforcement actions and recommended monetary fines against AIA were attempts by the POI and PMI to affect permanent rather than temporary corrections to problems. Similarly, the action by the POI to "withhold" approval of AIA's planned B-747 operation was an effort to force compliance with previously repeated negative findings regarding manual currency.

Many of the flight safety issues brought to the attention of the FAA and the Safety Board were problems that had occurred away from the home base. Due in part to budget constraints, the FAA was dependent upon geographic support for oversight and surveillance of the worldwide operation, especially the B-747 operation in Saudi Arabia. In terms of AIA's ad hoc operations, the geographic surveillance was vital to the POI's oversight responsibility and should have carried a high priority, considering the fact that the foreign operations involved the carriage of passengers, which, unlike cargo, requires different operational rules and regulations.

The Safety Board is concerned that the lack of FAA geographical support required to fulfill the surveillance requirements of the operations, are detrimental to the overall ability of the individual inspectors (POIs, PMIs, PAIs) to ensure that the operations are conducted in accordance with the FARs.

The DOD is recognized as having authority regarding the bidding and awarding of military contracts. However, as a DOD representative testified at the Safety Board's public hearing, the DOD does not have the authority to impose operational or FAR requirements on contract carriers. Any additional needs or requests from the contract airline would come through the contract administrator, who is required at the field of operations.

The DOD does not require civilian flightcrew briefings for flight operations to Guantanamo Bay, but does recognize that information passed on to civilian crews is done at the discretion of the individual base operations. However, the Norfolk NAS Air Transportation Operations Center (ATOC) did have a policy to brief civilian flight crews on operational procedures for flights to Guantanamo Bay from Norfolk. The contract administrator at Norfolk, who was retired from the Air Force, used a briefing package that he developed for the Air Force while on active duty. He stated that he did not provide the crew of flight 808 with the briefing package because he believed that the captain had flown into Guantanamo Bay on previous occasions.

The Safety Board found that the flightcrew of another civilian contract air carrier (Northwest Airlines) had an incident involving a DC-10 airplane landing on runway 10 at Guantanamo Bay. The Safety Board found that the flightcrew had not received any supplemental special airport information from the DOD or the airfield operations office at Cherry Point Naval Air Station, regarding procedures at Leeward Field, even after the accident involving AIA.

Based on these two occurrences, the Safety Board is concerned with the lack of standardization among the many military airfield operations offices regarding the information provided to civilian flightcrews. The Board believes that in an effort to promote safe operations by civilian DOD contract operators at military airports that may be considered as "special," the DOD should make every effort to afford civilian flightcrews with any and all available information about the unique and/or hazardous conditions which may exist at such airports.

2.9 Postaccident DOD Restrictions

As the result of recent aircraft incidents and accidents that have occurred at Guantanamo Bay, on January 5, 1994, the Air Mobility Command issued the following memorandum to all civilian air carriers:

> Until further notice, any civil air mission operating under the AMC international airlift contract is prohibited from using runway 10 at Guantanamo Bay. This restriction is placed on our contract operations solely due to safety.

This prohibition against landing on runway 10 is currently reiterated in the written contracts between DOD and civilian air carriers.

3. CONCLUSIONS

3.1 Findings

1. The flightcrew was properly certificated and operationally qualified for the flight in accordance with company procedures and the Federal regulations.

2. The airplane was properly certificated and maintained, and there was no evidence of preexisting airplane structural, flight control systems, or engine faults that contributed to the accident.

3. In view of all the circumstances, the captain's decision to land on runway 10 was inappropriate.

4. The flightcrew members had experienced a disruption of circadian rhythms and sleep loss, which resulted in fatigue that had adversely affected their performance during a critical phase of flight.

5. The flightcrew had been on duty about 18 hours and had flown approximately 9 hours at the time of the accident. The company had intended for the crew to ferry the airplane back to Atlanta after the airplane was offloaded in Guantanamo Bay. This would have resulted in a total duty time of about 24 hours and 12 hours of flight time, the maximum permitted under 14 CFR Section 121.521, supplemental rules for overseas and international flights.

6. If the flightcrew had been scheduled to conduct a flight within the United States, similar to that of flight 808, the flightcrew would have exceeded the flight and duty time requirements of 14 CFR Section 121.505.

7. The Department of Defense/Navy did not have a procedure in place at Guantanamo Bay to ensure that all air traffic controllers were made aware of the inoperative strobe light and to ensure

that the controllers communicated the operational status to flightcrews.

8. The captain did not recognize the deteriorating flightpath and airspeed conditions due to preoccupation with locating the strobe light on the ground. This lack of recognition was despite the conflicting remarks made by the first officer and the flight engineer questioning the success of the approach. Repeated callouts by the flight engineer stating slow airspeed conditions went unheeded by the captain.

9. The captain initiated the turn from base leg to final approach at an airspeed that was below the calculated reference speed of 147 KIAS, and less than 1,000 feet from the shoreline, and he allowed bank angles in excess of 50 degrees to develop.

10. The stall warning stick shaker had activated 7 seconds prior to impact, 5 seconds before the airplane reached stall speed.

11. There was no loss of roll authority at the onset of the artificial stall warning (stick shaker) and no evidence to indicate that the captain attempted to take proper corrective action at the onset of stick shaker.

12. AIA's management structure and philosophy were insufficient to maintain vigilant oversight and control of the rapidly expanding airline operation. This was substantiated by the inability of the Director of Operations to maintain aircraft flight manuals, crew training records, and various other required paperwork in an up-to-date and current status.

13. The surveillance and oversight of AIA by the FAA POI, PMI, and PAI were not totally effective because of the minimal to nonexistent FAA geographical support for oversight of the remote operations.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision-making, and flying abilities of the captain and flightcrew due to the effects of fatigue; the captain's failure to properly assess the conditions for landing and maintaining vigilant situational awareness of the airplane while maneuvering onto final approach; his failure to prevent the loss of airspeed and avoid a stall while in the steep bank turn; and his failure to execute immediate action to recover from a stall.

Additional fa[illegible] contributing to the cause were the inadequacy of the flight and duty time regulations applied to 14 CFR, Part 121, Supplemental Air Carrier, international operations, and the circumstances that resulted in the extended flight/duty hours and fatigue of the flightcrew members. Also contributing were the inadequate crew resource management training and the inadequate training and guidance by American International Airways, Inc., to the flightcrew for operations at special airports, such as Guantanamo Bay; and the Navy's failure to provide a system that would assure that the local tower controller was aware of the inoperative strobe light so as to provide the flightcrew with such information.

4. RECOMMENDATIONS

As a result of the investigation of this accident, the National Transportation Safety Board makes the following recommendations:

--to the Federal Aviation Administration:

Revise the applicable subpart of 14 CFR, Part 121, to require that flight time accumulated in noncommercial "tail end" ferry flights conducted under 14 CFR, Part 91, as a result of 14 CFR, Part 121, revenue flights, be included in the flight crewmember's total flight and duty time accrued during those revenue operations. (Class II, Priority Action) (A-94-105)

Expedite the review and upgrade of Flight/Duty Time Limitations of the Federal Aviation Regulations to ensure that they incorporate the results of the latest research on fatigue and sleep issues. (Class II, Priority Action) (A-94-106)

Revise 14 CFR, Section 121.445, to eliminate subparagraph (c), and require that all flight crewmembers meet the requirements for operation to or from a special airport, either by operating experience or pictorial means. (Class II, Priority Action) (A-94-107)

--to American International Airways, Inc. (AIA):

Revise the AIA training program to ensure that all pilots receive crew resource management (CRM) training that conforms to the guidelines set forth in FAA Advisory Circular 120-51A. (Class II, Priority Action) (A-94-108)

Review and revise the AIA special airports training program to require, in addition to flightcrew members, flight engineers to participate in the AIA special airports training program. The revised program should ensure that all flightcrew members who operate airplanes with high approach speeds are aware and understand the effects of high bank angles and increased load factors, adverse wind conditions, and required flightpath profiles necessary to perform the approach. (Class II, Priority Action) (A-94-109)

--to the Department of Defense:

Provide to all civilian contract operators and flightcrew members either verbal and/or written airfield briefing information regarding normal and emergency operations and flight restrictions pertaining to those airfields classified as "special airports." The briefing information would contain special considerations for airplanes with high approach speeds and emphasize the effects of high bank angles and increased load factors, adverse wind conditions, and required flightpath profiles necessary to perform the approach. This information would be provided in addition to the regularly published notices to airmen (NOTAMs). (Class II, Priority Action) (A-94-110)

In addition, the Safety Board reiterates the following safety recommendations to the Federal Aviation Administration:

A-94-2

Require U.S. air carriers operating under 14 CFR, Part 121, to provide for flightcrews not covered by the Advanced Qualifications Program, a comprehensive crew resource management (CRM) program as described in Advisory Circular 120-51A.

A-94-5

Require U.S. air carriers operating under 14 CFR, Part 121, to include, as part of pilot training, a program to educate pilots about the detrimental effects of fatigue, and strategies for avoiding fatigue and countering its effects.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

Carl W. Vogt
Chairman

James E. Hall
Vice Chairman

John K. Lauber
Member

John Hammerschmidt
Member

May 10, 1994

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Safety Board's duty officer was notified by a representative of the Navy Safety Center, through the Federal Aviation Administration Communications Center in Washington, D.C., at approximately 1800 eastern daylight time on August 18, 1993.

Upon receiving additional information and a formal request from the Department of Defense and the Navy Safety Center to conduct the investigation, the Safety Board dispatched a partial investigative team from its Washington, D.C. Headquarters on August 19, 1993. The team was composed of an Investigator-in-Charge and the following group specialists: Systems, Powerplants, Survival Factors and Structures. In addition, specialist reports were prepared to summarize the findings relevant to Operations, Human Performance, Maintenance Records, FDR/Aircraft Performance and CVR. Chairman Carl Vogt accompanied the investigative team to Guantanamo Bay, Cuba.

Parties to the investigation were the FAA, American International Airways, the Teamsters Union, Douglas Aircraft Company, and the Department of Defense (DOD).

2. Public Hearing

A public hearing regarding this accident was held in Ypsilanti, Michigan, from January 5 through January 7, 1994. Member John Hammerschmidt was the presiding officer of that hearing.

APPENDIX B

COCKPIT VOICE RECORDER

Transcript of a Sundstrand AV-557B cockpit voice recorder (CVR), s/n 510, installed on a Douglas DC-8-61, N814CK, which was involved in a landing accident at Guantanamo Bay, NAS, Cuba, on August 18, 1993.

LEGEND

RDO	Radio transmission from accident aircraft
CAM	Cockpit area microphone voice or sound source
-1	Voice identified as Pilot-in-Command (PIC)
-2	Voice identified as Co-Pilot
-3	Voice identified as Flight Engineer
-?	Voice unidentified
MIA-1	Radio transmission from Miami ARTCC
MIA-2	Radio transmission from second controller at Miami ARTCC
GAPR	Radio transmission from Guantanamo NAS Approach Control
TWR	Radio transmission from Guantanamo NAS Control Tower
HEL	Radio transmission from helicopter six five six nine
*	Unintelligible word
@	Non pertinent word
#	Expletive
%	Break in continuity
( )	Questionable insertion
(( ))	Editorial insertion
- - -	Pause

Note: Times are expressed in eastern daylight time (EDT).
Times shown in brackets { } are computer reference times.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
START OF RECORDING			
START OF TRANSCRIPT			
1623:23 CAM-1	{02:56} get a fuel check over this next station here uh, fifty nine minutes by seven minutes. ---- ten and a half minutes.		
1628:27 CAM-1	{08:00} **** do it. comin' down this way. around?		
1628:31 CAM-2	{08:04} around the coast.		
1628:31 CAM-2	{08:04} you're coming down like this.		
1628:33 CAM-1	{08:06} ya. ** Guantanamo ***.		
1628:37 CAM-?	{08:10} oh, OK. ***.		
1628:41 CAM-2	{08:14} direct, direct, direct. we also get another direct.		
1629:25 CAM-1	{08:58} did you ever land it the other way, on two eight?		
1629:30 CAM-3	{09:03} suppose to be a tail wind.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1629:30 **CAM-1**	{09:03} huh?		
1629:31 **CAM-3**	{09:04} suppose to be a tail wind.		
1629:35 **CAM-1**	{09:08} (we've) always flown hard deck.		
1629:37 **CAM-2**	{09:10} not always. I mean if the wind's not blowing our way, we'll just request uh, two eight.		
1629:56 **CAM-1**	{09:29} you get a fuel check out of there Dave. if you want to.		
1630:26 **CAM-3**	{09:59} thirty eight two.		
1630:28 **CAM-?**	{10:01} ***.		
1630:30 **CAM-1**	{10:03} before you write that down, look and see how ***.		
1630:34 **CAM-3**	{10:07} that's right.		
1630:36 **CAM-2**	{10:09} thirty eight.		
1630:36 **CAM-1**	{10:09} let's put thirty nine.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1630:38 **CAM-3**	{10:11} thirty eight two, confirmed.		
1630:39 **CAM-?**	{10:12} ya.		
1630:40 **CAM-?**	{10:13} OK.		
1630:48 **CAM-2**	{10:21} OK uh, we're just went over uh, Great Inagua?		
1630:52 **CAM-1**	{10:25} ya.		
1630:59 **CAM-2**	{10:32} BYGON. -- we're now, hundred and forty three miles from destination.		
1631:06 **CAM-1**	{10:39} how far?		
1631:07 **CAM-2**	{10:40} hundred forty three miles. --- start down in about twenty miles, probably?		
1631:25 **CAM-?**	{10:58} I don't believe that radar is right, is it?		
1631:28 **CAM-1**	{11:01} go to a closer range.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1631:29 CAM-2	{11:02} # even at close range it's still.		
1631:31 CAM-1	{11:04} you got it in map mode, huh?		
1631:42 CAM-2	{11:15} no, **** map mode.		
1631:45 CAM-?	{11:18} here you go see.		
1631:46 CAM-1	{11:19} showin' the same, same thing on map as it is uh, didn't switch over.		
1631:54 CAM-?	{11:27} OK, let's uh, go to uh, waypoint. BYGON *****.		
1632:02 CAM-2	{11:35} there's BYGON.		
1632:17 CAM-1	{11:50} wonder if we talk to Cuba at all? we talk to Cuban uh, approach at all?		
1632:22 CAM-2	{11:55} should be.		
1632:26 CAM-1	{11:59} we're goin to be at their airspace here in a little bit.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1632:30 CAM-2	(12:03) I'll, I'll get a word in edgewise here.		
		1632:39 RDO-2	(12:12) Miami, Connie eight oh eight heavy, over, -- break, Connie eight zero eight uh, we'd like to have uh, information on a switch over for, Guantanamo.
		1632:49 MIA-1	(12:22) Connie eight zero eight roger, you mean uh, the procedures for that?
		1632:53 RDO-2	(12:26) yes, we'd like have anticipate, we're not gonna have room from the descent and switch over.
		1632:59 MIA-1	(12:32) Connie eight zero eight Roger, right now your clearance limit is BYGON intersection uh, I'll need a cancellation prior to that, I can't clear you past BYGON. That's in Havana's airspace. and then uh, you cancel and you talk to Guantanamo radar.
		1633:12 RDO-2	(12:45) do you have their frequency you gonna give to us?
1633:17 CAM-1	(12:50) she can clear us start clearing us down now.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		1633:19 **MIA-2**	{12:52} ya the, frequency is one two six point two. one three four point one, one three four point one is the frequency.
		1633:28 **RDO-2**	{13:01} roger, one three four point one and uh confirm we have to cancel before we can get lower.
		1633:33 **MIA-1**	{13:06} Connie eight zero eight, I can descend you but I cannot let you go past BYGON unless you cancel with me.
		1633:38 **RDO-2**	{13:11} OK, we'd like to descend and uh, we'll uh, stand by for cancel, eight zero eight.
		1633:47 **MIA-1**	{13:20} Connie eight zero eight roger, descend and maintain flight level one eight zero.
1633:53 **CAM**	{13:26} ((sound similar to landing gear warning horn))		
		1633:55 **RDO-2**	{13:28} OK, to one eight zero, Connie uh, eight zero eight heavy.
1633:59 **CAM-1**	{13:32} * BYGON, what number did you put BYGON on?		
1634:02 **CAM-2**	{13:35} uh, BYGON is on uh,		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1634:03 CAM-1	{13:36} five?		
1634:03 CAM-2	{13:36} four.		
1634:04 CAM-1	{13:37} four?		
1634:05 CAM-2	{13:38} we just passed it.		
1634:09 CAM-1	{13:42} coming up on it right now.		
1634:10 CAM-2	{13:43} ya.		
1634:11 CAM-1	{13:44} ** cancel.		
1634:12 CAM-2	{13:45} ya.		
		1634:13 RDO-2	{13:46} Connie eight zero eight heavy like to cancel.
1634:16 CAM-1	{13:49} ask him if we need to call **.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		1634:17 **MIA-1**	{13:50} Connie eight zero eight heavy, cancellation received. squawk one two zero zero, and uh, frequency change approved.
1634:23 **CAM-?**	{13:56} * * *.		
1634:23 **CAM-1**	{13:56} ** if we need to call Cuba at all? --- wonder if we need to call Cuba at all?		
		1634:26 **RDO-2**	{13:59} One thirty four point one and uh, we'll switch over there right now.
		1634:33 **RDO-2**	{14:06} Havana center, Connie eight zero eight heavy uh, checking in, and we're descending out of three uh, two zero for one eight zero.
1634:48 **CAM-?**	{14:21} * * * *.		
1634:48 **CAM-?**	{14:21} BYGON here.		
		1634:49 **GAPR**	{14:22} and uh, Connie eight zero eight heavy, Guantanamo radar.
		1634:55 **RDO-2**	{14:28} roger, we receive you Connie uh, eight zero eight heavy, go ahead Havana.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1635:00 CAM-1	{14:33} Guantanamo radar, not Havana.		
		1635:02 GAPR	{14:35} Connie eight zero eight heavy this is Guantanamo radar. understand you're comin' to Guantanamo Bay?
		1635:06 RDO-2	{14:39} that's affirmative Connie eight zero eight heavy uh, we're goin' to Guantanamo uh, Guantanamo Bay.
		1635:17 GAPR	{14:50} uh, Connie eight zero eight heavy, understand you're just uh, five miles south of BYGON at this time.
		1635:24 RDO-1	{14:57} affirmative uh, comin' up on BYGON now.
		1635:28 GAPR	{15:01} Connie eight zero eight heavy, Guantanamo radar, maintain the VFR one two miles off the Cuban coast. no reported traffic in the area. report East Point. Leeward field landing one zero, wind one, eight zero at eight. altimeter's two niner niner seven.
		1635:45 RDO-2	{15:18} one eight zero at eight two niner niner seven and uh, like to land two eight.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	**CONTENT**	**TIME & SOURCE**	**CONTENT**
		1635:52 GAPR	{15:25} Connie eight zero eight heavy, Guantanamo roger, two eight is available.
		1635:57 RDO-2	{15:30} roger, two eight is available and uh, when do you want us to report off uh, of the approach.
		1636:03 GAPR	{15:36} Connie eight zero eight heavy, report East Point. zero nine five at zero seven zero.
1636:11 CAM-1	{15:44} zero nine five zero seven zero, I don't know what he meant by that.		
		1636:13 RDO-2	{15:46} ((concurrent with previous statement)) what do you mean by that, uh, uh, clarify?
		1636:18 GAPR	{15:51} Connie eight zero eight heavy. report uh, East Point.
1636:23 CAM-1	{15:56} right here ** East Point.		
		1636:24 GAPR	{15:57} East Point is the NBW zero nine zero uh, radial at zero seven zero DME.
		1636:29 RDO-2	{16:02} OK, E Point, roger Connie eight zero eight heavy.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1636:34 CAM-1	{16:07} the zero nine zero radial of what? Guantanamo?		
		1636:37 RDO-2	{16:10} and confirm that zero nine zero radial seventy miles of uh, Guantanamo?
		1636:45 GAPR	{16:18} and zero eight zero that's affirmative, affirmative, do you have a fuel request?
		1636:49 RDO-2	{16:22} * fourteen six, we'll dial it in
1636:54 CAM-1	{16:27} ask him if we need to contact at Cuba at all.		
		1636:58 RDO-2	{16:31} and uh, confirm uh, uh, no requirements for Connie eight zero eight heavy to uh, contact uh, Havana.
		1637:07 GAPR	{16:40} Connie eight zero eight heavy Guantanamo radar, say again.
		1637:11 RDO-2	{16:44} uh, Connie eight zero eight heavy uh, will remain uh, off shore and uh, is there any requirements us to contact Guan-, uh, Havana center?

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	**CONTENT**	**TIME & SOURCE**	**CONTENT**
		1637:22 **GAPR**	{16:55} Connie eight zero eight, negative.
		1637:24 **RDO-2**	{16:57} roger.
1637:29 **CAM-1**	{17:02} what's Guantanamo's frequency?		
1637:30 **CAM-2**	{17:03} Guantanamo's twelve, it's uh, fourteen six.		
1637:37 **CAM-1**	{17:10} uh, *** it's number five isn't it?. it's number five.		
1637:42 **CAM-2**	{17:15} correct, affirmative.		
1637:50 **CAM-1**	{17:23} OK, we wanna go to (E Point).		
1637:54 **CAM-?**	{17:27} everybody listen up.		
1637:55 **CAM-1**	{17:28} no, we're gonna be at (E Point) now, and then we're gonna go to Delta.		
1637:59 **CAM-2**	{17:32} (we're comin') up on it now.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1638:07 **CAM-1**	{17:40} we're crossing it right now, seventy degrees at nine miles. zero nine zero *****.		
		1638:11 **RDO-2**	{17:44} Connie eight zero eight heavy is uh, crossing East Point at the present time and we're out of twenty two uh, point three descending to one eight oh.
		1638:22 **GAPR**	{17:55} and eight zero eight heavy roger. maintain VFR six miles off the Cuban coast, no observed traffic, report two five DME.
		1638:28 **RDO-2**	{18:01} roger, report two five DME and uh, twelve miles off the coast uh, Connie eight zero eight heavy.
		1638:33 **GAPR**	{18:06} Connie eight zero eight heavy, that is six miles off the coast. understand you had no fuel request?
		1638:39 **RDO-2**	{18:12} we're gonna need refueling. uh, we'll give that to you on the ground.
		1638:44 **GAPR**	{18:17} eight zero eight heavy, roger.
1638:50 **CAM-?**	{18:23} it's still approach control.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1639:08 CAM-2	{18:41} give yourself some slack on this uh, **** the coast.		
1639:22 CAM-?	{18:55} *** (wanna get) too close.		
1639:28 CAM-?	{19:01} DELTA ** off the coast. south southeast of uh, the airport.		
1639:36 CAM-1	{19:09} looks like twelve miles?		
1639:38 CAM-2	{19:11} easily, yes easily, and ---.		
1639:44 CAM	{19:17} ((sound of warning horn similar to altitude alert))		
1639:45 CAM-2	{19:18} ****** bring it right down here uh, ** safe vector altitude is uh, twenty five hundred feet. *** bring it right down to twenty five hundred feet.		
1640:00 CAM-3	{19:33} are they giving us two eight?		
1640:02 CAM-1	{19:35} ya. if it's available.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1640:07 CAM-2	{19:40} transition alt -, level is fifty five hundred feet.		
1640:15 CAM-1	{19:48} descent checks.		
1640:16 CAM-3	{19:49} PTC?		
1640:17 CAM-1	{19:50} retracted override.		
1640:19 CAM-3	{19:52} altimeters.		
1640:22 CAM-?	{19:55} two nine nine **.		
1640:24 CAM-?	{19:57} that's it.		
1640:29 CAM-1	{20:02} set on the left, one forty uh, seven.		
1641:00 CAM-2	{20:33} you're almost due east of Delta, you're in good shape. you're right about here. abeam the Delta. right about here. abeam of the Delta. ** forty two miles.		
1641:41 CAM-?	{21:14} lookin' good.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1641:53 **CAM-1**	{21:26} otta make that one zero approach just for the heck of it to see how it is. why don't we do that let's, tell 'em we'll take one zero. if we miss it we'll just come back around and land on two eight.		
1642:04 **CAM-2**	{21:37} OK.		
		1642:05 **RDO-2**	{21:38} uh, Guantanamo uh, this is Connie eight zero eight heavy.
		1642:16 **GAPR**	{21:49} Connie eight zero eight heavy, Guantanamo go ahead.
		1642:18 **RDO-2**	{21:51} uh, Co -, eight zero eight heavy. requesting uh, land uh, east and uh, if we uh, need to, we'll uh, make another approach uh, but we'd like to make the first uh, approach anyway uh, to uh, the east th -, this afternoon.
		1642:40 **GAPR**	{22:13} and Connie eight zero eight, understand you'd like to make your first approach to runway one zero.
		1642:44 **RDO-2**	{22:17} that's affirmative, Connie eight zero eight heavy, runway one zero.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		1642:48 **GAPR**	(22:21) roger, you want uh, left entry or right entry.
1642:52 **CAM-1**	(22:25) * we have a left?		
1642:53 **CAM-?**	(22:26) we're not authorized for it.		
		1642:54 **RDO-2**	(22:27) make a right entry, Connie eight zero eight heavy.
		1642:56 **GAPR**	(22:29) eight zero eight heavy roger.
1642:58 **CAM-2**	(22:31) *** we're not authorized to do it.		
1643:00 **CAM-1**	(22:33) not authorized?		
1643:01 **CAM-1**	(22:34) he's not, he's not -- aware of that, Tom.		
1643:04 **CAM-1**	(22:37) no notes or nothing.		
1643:06 **CAM-1**	(22:39) it does say right hand traffic in the, in that uh, training clip that's all it says.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATICN	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1643:12 **CAM-2**	{22:45} right, I know for sure uh, 'cause I, I just went through recurrent. ---- besides there's a big hill over there. it might give you some -- some depth perception problems.		
1643:30 **CAM-3**	{23:03} is there weather down there at all?		
1643:32 **CAM-1**	{23:05} ah, no.		
		1643:33 **RDO-2**	{23:06} and Connie eight zero eight heavy uh, request uh, weather conditions, sky conditions, and visibility.
		1643:41 **GAPR**	{23:14} Connie eight zero eight heavy uh, standby. ---- and uh, correction, Connie eight zero eight heavy, sky conditions last reported at * thousand scattered, one zero thousand scattered, two zero thousand overcast, visibility was seven.
		1644:08 **RDO-2**	{23:41} roger ah, Connie eight zero eight heavy, thank you.
1644:11 **CAM-1**	{23:44} what was his first, comment?		
1644:12 **CAM-2**	{23:45} scattered, scattered.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	**CONTENT**	**TIME & SOURCE**	**CONTENT**
1644:13 **CAM-?**	(23:46) one thousand.		
1644:14 **CAM-?**	(23:47) ten thousand scattered, seven miles visibility.		
1644:17 **CAM-?**	(23:50) right.		
		1644:22 **RDO-2**	(23:55) and what is the local altimeter approach uh, Connie eight zero eight heavy?
		1644:26 **GAPR**	(23:59) two niner niner seven.
		1644:27 **RDO-2**	(24:00) thank you.
1644:32 **CAM-1**	(24:05) we got the descent check, didn't we?		
1644:33 **CAM-3**	(24:06) complete. well, I got the new altimeter here.		
1644:38 **CAM-2**	(24:11) this uh, transition level is fifty five hundred * * *.		
1644:41 **CAM-1**	(24:14) that's alright. it ain't going to matter.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATIO	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1644:50 CAM-3	{24:23} just don't do no rolls on final.		
1644:53 CAM-2	{24:26} ***** --- wanna make sure you're wings level and you're on center line because you have those uh, VASIs there, for catching.		
1645:12 CAM-2	{24:45} wants a call twenty five out.		
1645:14 CAM-1	{24:47} twenty five out, ya.		
1645:20 CAM-?	{24:53} *** there.		
1645:21 CAM-1	{24:54} huh?		
1645:23 CAM-?	{24:56} ****.		
1645:27 CAM	{25:00} ((sound similar to trim-in-motion horn))		
		1645:38 RDO-2	{25:11} and Connie eight zero eight heavy is comin' up on uh, twenty six out, out of uh, eighty five hundred.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	**CONTENT**	**TIME & SOURCE**	**CONTENT**
		1645:44 **GAPR**	{25:17} Connie eight zero eight roger, maintain VFR, no traffic observed, go contact tower.
		1645:51 **RDO-2**	{25:24} roger, contact tower, Connie eight zero eight heavy.
1645:54 **CAM-?**	{25:27} tower is twenty six two.		
		1646:01 **RDO-2**	{25:34} Guantanamo uh, tower this is Connie eight zero eight heavy uh, we're twenty five miles out.
		1646:07 **TWR**	{25:40} Connie, eight oh eight heavy, Leeward tower, runway one zero, wind two zero zero at seven, altimeter two niner niner seven. report Point Alpha.
		1646:18 **RDO-2**	{25:51} OK, report uh, --
1646:19 **CAM-1**	{25:52} Point Alpha.		
		1646:20 **RDO-2**	{25:53} point ALPHA, uh, we need a clarification where that point Alpha is.
		1646:26 **TWR**	{25:59} ALPHA is one two five at one zero DME.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		1646:29 **RDO-2**	{26:02} one two five at one zero, Connie eight uh, zero eight heavy.
1646:31 **CAM-1**	{26:04} ((concurrent with previous statement)) one two five radial?		
		1646:32 **TWR**	{26:05} eight zero eight, would you uh, like runway two eight?
1646:36 **CAM-1**	{26:09} we're gonna try ten first.		
		1646:39 **RDO-2**	{26:12} we're gonna try ten first uh, Connie eight zero eight heavy.
1646:41 **CAM-1**	{26:14} flaps twenty uh, fifteen approach check.		
		1646:43 **TWR**	{26:16} eight zero eight roger.
1646:44 **CAM**	{26:17} ((sound similar to landing gear warning horn))		
1646:46 **CAM-3**	{26:19} an what did he say them winds were?		
1646:49 **CAM-1**	{26:22} zero, one zero, either one eight zero or one zero zero.		

INTRA-COCKPIT COMMUNICATION TIME & SOURCE	CONTENT	AIR-GROUND COMMUNICATION TIME & SOURCE	CONTENT
		1646:50 **HEL**	(26:23) Leeward tower, Coast Guard six five six nine, holding short of runway one zero, (for some) VFR southeast bound, negative return to mother.
		1646:54 **TWR**	(26:27) Coast Guard six five six nine Leeward tower, make a right turn out and proceed on course. winds one nine zero at eight cleared for takeoff, caution men and equipment, left hand side midfield.
1646:59 **CAM-2**	(26:32) what's that fix she gave us again ***?		
1647:00 **CAM-1**	(26:33) I thought she said one twenty five.		
1647:02 **CAM-3**	(26:35) one ninety.		
1647:03 **CAM-1**	(26:36) huh?		
1647:03 **CAM-3**	(26:36) at twelve.		
1647:04 **CAM-3**	(26:37) one twenty five at twelve DME. that what you got?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	**CONTENT**	**TIME & SOURCE**	**CONTENT**
1647:08 **CAM-1**	{26:41} I don't know.		
		1647:09 **RDO-2**	{26:42} and uh, Connie eight zero eight heavy is that one twenty five degrees at ten DME at point ALPHA.
		1647:14 **TWR**	{26:47} affirmative, understand you're at point ALPHA?
1647:16 **CAM-1**	{26:49} no.		
		1647:17 **RDO-2**	{26:50} not, not quite. uh, we're still a few miles out.
		1647:19 **TWR**	{26:52} ((simultaneous with next statement)) eight oh eight, roger.
1647:20 **CAM-?**	{26:53} * *		
1647:22 **CAM-1**	{26:55} well I'm past that radial.		
1647:22 **CAM-2**	{26:55} we, got the, the route coordinates.		
1647:24 **CAM-1**	{26:57} as soon as I pass that point ALPHA. I'll ---		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1647:32 CAM-2	{27:05} OK one twenty five radial --- makes that the three oh five inbound.		
1647:38 CAM-1	{27:11} three oh five inbound, huh?		
1647:43 CAM	{27:16} ((sound similar to course selector being turned))		
1647:53 CAM-3	{27:26} it's hazy over there.		
1647:54 CAM-2	{27:27} sure as # is.		
1648:05 CAM-1	{27:38} twenty five degrees.		
1648:06 CAM-2	{27:39} set.		
1648:07 CAM	{27:40} ((sound similar to flap handle being moved))		
1648:19 CAM-3	{27:52} visibility should pick up the closer to the surface.		
1648:21 CAM-1	{27:54} yeah.		
1648:22 CAM-?	{27:55} yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1648:24 CAM-?	(27:57) not much. ((sound of chuckle))		
1648:40 CAM-1	(28:13) go back to that intersection we're going to.		
1648:43 CAM-2	(28:16) we just, flipped over.		
1648:45 CAM-1	(28:18) alright. put the airport in there then?		
1648:46 CAM-3	(28:19) there's the airport straight ahead.		
1648:48 CAM-1	(28:21) huh?		
1648:49 CAM-2	(28:22) MUGM is right here.		
1648:50 CAM-3	(28:23) fourteen miles, --- straight off the nose.		
1649:01 CAM-1	(28:34) OK, three nineteen.		
1649:07 CAM-?	(28:40) oh I got my * land.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1649:08 **CAM-2**	{28:41} there's the, there's the uh, right side of the uh, land mass and the bay that goes through. we're going to be shootin' off to the left of it.		
1649:19 **CAM-2**	{28:52} and we're goin' to be comin' in uh, inbound about fourteen miles out. the airport on this uh,		
1649:23 **CAM-1**	{28:56} the airport's gonna to be on that side of the bay.		
1649:26 **CAM-3**	{28:59} we're gonna come back around and hang a right.		
1649:27 **CAM-?**	{29:00} ya, that's right.		
		1649:28 **TWR**	{29:01} Coast Guard six five six niner, report leaving the ATA.
		1649:31 **HEL**	{29:04} six five six nine, wilco.
1649:31 **CAM-3**	{29:04} we're on downwind pretty much right now, aren't we?		
1649:33 **CAM-1**	{29:06} yeah.		
1649:33 **CAM-2**	{29:06} yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1649:34 **CAM-?**	{29:07} we're gonna have to get ***.		
1649:35 **CAM-?**	{29:08} ** over. ** get back over.		
1649:35 **CAM-?**	{29:08} I'm like ***		
1649:36 **CAM**	{29:09} ((sound similar to altitude warning horn))		
1649:38 **CAM-?**	{29:11} three for twenty five.		
1649:40 **CAM-?**	{29:13} let's go down to fifteen.		
		1649:41 **RDO-2**	{29:14} Connie eight zero eight heavy is at twelve miles out uh, anda' we're on the uh, one uh, four zero radial.
		1649:49 **TWR**	{29:22} Connie eight zero eight heavy roger, report abeam the tower.
		1649:54 **RDO-2**	{29:27} OK, report abeam the tower, Connie eight zero eight heavy.
1649:58 **CAM-1**	{29:31} report abeam the .ower?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
		1649:59 TWR	{29:32} Coast Guard six five six niner remain at or below five hundred feet until departing the ATA.
1650:00 CAM-?	{29:33} yeah.		
1650:01 CAM-?	{29:34} abeam the tower.		
1650:03 CAM-3	{29:36} yeah that's affirm.		
		1650:03 HEL	{29:36} ((simultaneous with previous two statements)) six five six nine wilco, we're level at five hundred at this time and we'll be looking for the heavy.
1650:05 CAM-1	{29:38} you say the airport's on the other side?		
1650:06 CAM-2	{29:39} yes.		
1650:07 CAM-3	{29:40} it's on that side there, yes.		
1650:08 CAM-?	{29:41} here's that bay. you gotta come over here, and lead in.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1650:10 **CAM-?**	{29:43} OK, I see that.		
		1650:10 **TWR**	{29:43} six five six niner roger, and Connie eight oh eight, traffic is H65 cutbound for the southeast at or below five hundred feet.
1650:14 **CAM-2**	{29:47} so what I'm gonna do is set this up to about uh,		
1650:17 **CAM-3**	{29:50} that's for us.		
		1650:18 **RDO-1**	{29:51} say again where the traffic was for Connie eight oh eight.
		1650:21 **TWR**	{29:54} he's about three miles to the southeast off departure end outbound, at or below five hundred feet.
1650:27 **CAM**	{30:00} ((sound similar to altitude warning horn))		
1650:28 **CAM-3**	{30:01} at or below five hundred, huh.		
1650:29 **CAM**	{30:02} ((sound similar to course selector being turned))		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1650:36 CAM-2	(30:09) use this. this will tell you when you're due south of the airport.		
1650:39 CAM-1	(30:12) I'm just gonna follow that right to the airport regardless.		
1650:43 CAM-2	(30:16) just swing over, then make sorta', square it off.		
1650:46 CAM-?	(30:19) yeah.		
1650:48 CAM-2	(30:21) but when this says three six zero you know, you're south, due south of the airport.		
		1650:55 TWR	(30:28) Connie eight oh eight, the H65 has you in sight.
		1650:57 RDO-2	(30:30) Connie eight zero eight heavy, roger.
1651:02 CAM-3	(30:35) what is it, a helicopter?		
1651:02 CAM-?	(30:35) yeah, it must be.		
1651:03 CAM-3	(30:36) there's a big hill over there man.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SCURCE	CONTENT	TIME & SOURCE	CONTENT
1651:05 **CAM-?**	(30:38) yeah, it sure is. look at that ###.		
1651:07 **CAM-1**	(30:40) wonder if that's the airport right there straight ahead of us?		
1651:10 **CAM-2**	(30:43) that is the airport straight ahead of us. see the lake on the other side.		
1651:15 **CAM-3**	(30:48) ** six miles, that's gotta be it.		
1651:17 **CAM-2**	(30:50) that's the lake on the other side of the airport.		
1651:18 **CAM-1**	(30:51) this thing here is just about dead nuts.		
1651:20 **CAM-?**	(30:53) yeah.		
1651:20 **CAM-?**	(30:53) yeah.		
1651:21 **CAM-3**	(30:54) *** little right of course.		
1651:22 **CAM-1**	(30:55) huh.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1651:23 **CAM-3**	{30:56} just a little right of course.		
1651:24 **CAM-1**	{30:57} yeah.		
1651:27 **CAM-2**	{31:00} you're uh, fourteen hundred feet. turbojet circling minimum situation.		
1651:37 **CAM-2**	{31:10} you wanna get all dirty and slowed down and everything?		
1651:39 **CAM-1**	{31:12} oh I will, yeah.		
1651:40 **CAM-?**	{31:13} OK.		
1651:45 **CAM-1**	{31:18} OK there, that's the end of the runway, right there.		
1651:47 **CAM-?**	{31:20} yeah, it's two eight.		
1651:50 **CAM-2**	{31:23} I'd give myself plenty of time to get straight *.		
1651:54 **CAM-3**	{31:27} nice **, huh?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	**CONTENT**	**TIME & SOURCE**	**CONTENT**
1651:54 **CAM-1**	(31:27) huh?		
1651:56 **CAM-2**	(31:29) maintain a little water off because you're gonna have to turn.		
		1652:03 **TWR**	(31:36) Connie eight oh eight, *, Cuban airspace begins three quarters of a mile west of the runway. you are required to remain within this, within the airspace designated by a strobe light.
		1652:14 **RDO-2**	(31:47) roger, we'll look for the strobe light, Connie eight zero eight heavy.
1652:17 **CAM-2**	(31:50) I think you're gettin' in close, before you start your turn.		
1652:20 **CAM-3**	(31:53) yeah, the runway's right here man.		
1652:21 **CAM-1**	(31:54) yeah, I got it. yeah, I got it.		
1652:22 **CAM-3**	(31:55) you're right on it.		
1652:23 **CAM-1**	(31:56) * going to have to really honk it. let's get the gear down **.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1652:25 **CAM-2**	{31:58} alright.		
1652:27 **CAM**	{32:00} ((sound similar to landing gear being extended))		
1652:36 **CAM-3**	{32:09} gear's down.		
1652:37 **CAM-1**	{32:10} the trouble is, I can't see the --		
1652:41 **CAM-2**	{32:14} there's the runway right there.		
1652:43 **CAM-3**	{32:16} see that black strip right there.		
		1652:43 **TWR**	{32:16} eight zero eight, we have a crane off to the left side, midfield 'bout thirty five feet. can you land with it raised or do we need to lower it?
1652:49 **CAM-1**	{32:22} can't understand her.		
		1652:49 **RDO-2**	{32:22} can't understand, you're garbled.
1652:52 **CAM-?**	{32:25} twenty for thirty five.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1652:53 **CAM**	(32:26) ((sound of click similar to flap handle being moved))		
		1652:55 **TWR**	(32:28) eight zero eight we have a crane off to the left side of the runway midf --, correction off the left side of the runway midfield, lowering, at from thirty five feet. can you land from there or do you need him to move?
1653:04 **CAM-1**	(32:37) ah, he'll be alright. ((simultaneous with following statement))		
		1653:05 **RDO-2**	(32:38) ah, how clo -, close is he to your runway? he should be OK.
1653:08 **CAM-1**	(32:41) flaps fifty.		
1653:08 **CAM-2**	(32:41) OK.		
1653:09 **CAM-?**	(32:42) K, uh.		
		1653:10 **TWR**	(32:43) he's cleared of runway. he's about couple of feet off the runway.
1653:11 **CAM**	(32:44) ((sound similar to trim-in-motion horn))		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1653:12 **CAM-1**	{32:45} now we gotta stay on uh, one side of this road here, right?		
1653 15 **CAM-2**	{32:48} yeah, we gotta stay on this side, on this side over here. you can see the strobe lights.		
1653:19 **CAM**	{32:52} ((sound similar to increase in engine RPM))		
		1653:20 **TWR**	{32:53} eight zero eight, check wheels down wind at two zero zero ((balance of this transmission overridden by next transmission))
		1653:21 **RDO-2**	{32:54} we're abeam the airport, Connie eight zero eight heavy.
1653:22 **CAM-3**	{32:55} slow. airspeed.		
1653:25 **CAM-2**	{32:58} check the turn.		
1653:28 **CAM-1**	{33:01} where's the strobe?		
1653:29 **CAM-3**	{33:02} right over there.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1653:31 **CAM-1**	{33:04} where?		
1653:33 **CAM-2**	{33:06} right inside there, right inside there.		
1653:35 **CAM-3**	{33:08} you know, we're not gettin' our airspeed back there.		
1653:36 **CAM-?**	{33:09} *		
1653:37 **CAM-1**	{33:10} where's the strobe.		
1653:37 **CAM-2**	{33:10} right down there.		
1653:41 **CAM-1**	{33:14} I still don't see it.		
1653:42 **CAM-3**	{33:15} #, we're never goin' to make this.		
1653:43 **CAM-1**	{33:16} huh.		
1653:45 **CAM-1**	{33:18} where do you see a strobe light?		
1653:48 **CAM**	{33:20} ((sound similar to decrease in engine RPM))		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1653:48 CAM-2	{33:21} right over here.		
1653:49 CAM	{33:22} ((sound similar to altitude warning horn))		
1653:50 CAM-?	{33:23} ** alright.		
1653:51 CAM-1	{33:24} gear, gear down, spoilers armed.		
1653:52 CAM-3	{33:25} gear down three green, spoilers, flaps, check list.		
1653:55 CAM-?	{33:28} there you go, right there lookin' good.		
1653:57 CAM-1	{33:30} where's the strobe?		
1653:58 CAM-2	{33:31} do you think you're gonna make this?		
1653:58 CAM-1	{33:31} yeah.		
1654:00 CAM-1	{33:33} if I can catch the strobe light.		
1654:01 CAM-2	{33:34} five hundred, you're in good shape.		

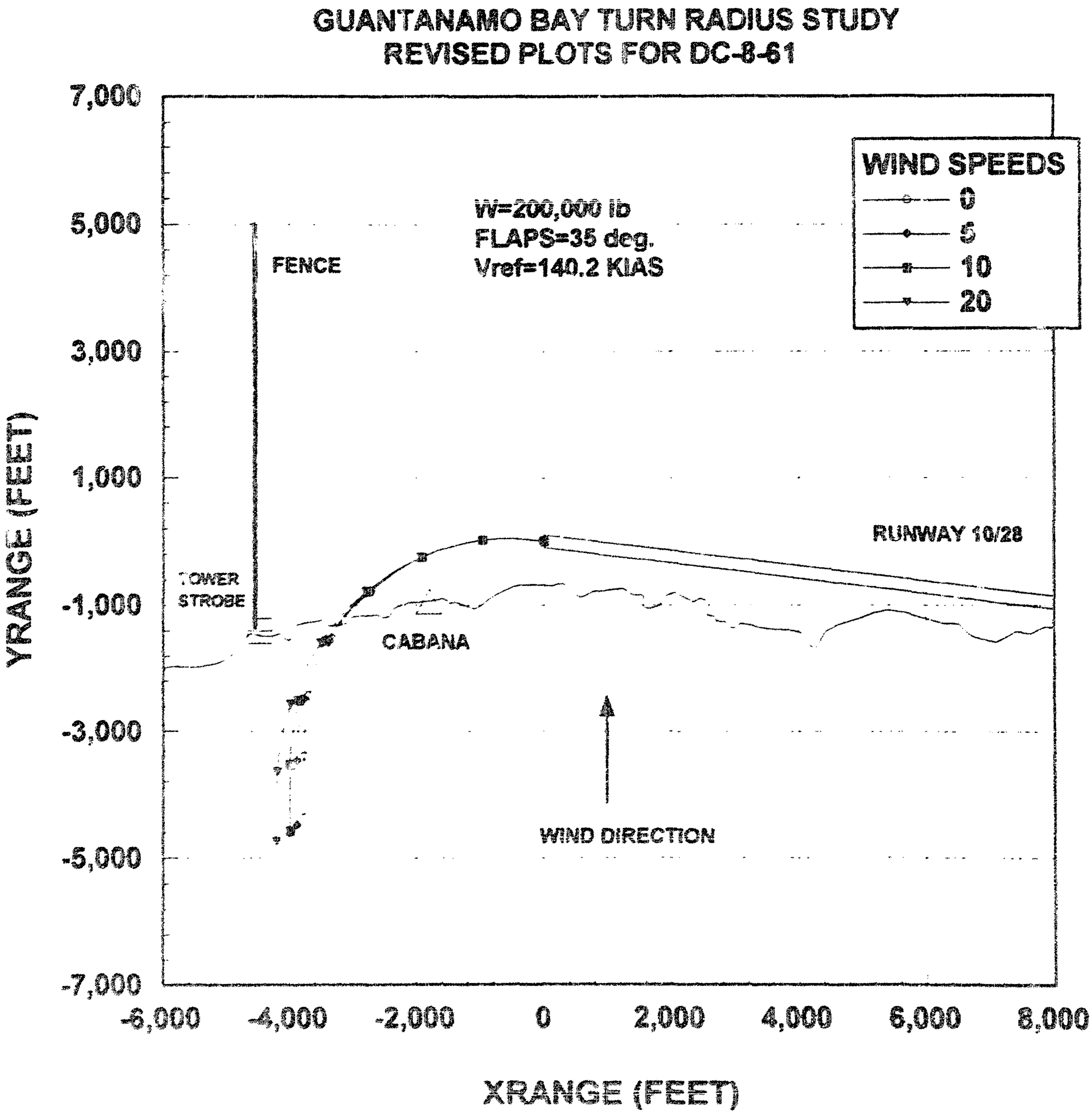
INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1654:06 CAM-3	{33:39} watch the, keep your airspeed up.		
1654:07 CAM-2	{33:40} one forty.		
1654:08 CAM	{33:40} ((sound similar to engine power being increased))		
1654:09 CAM	{33:42} ((sound similar to stall warning))		
1654:10 CAM-?	{33:43} (don't), stall warning.		
1654:11 CAM-1	{33:44} I got it.		
1654:12 CAM-2	{33:45} stall warning.		
1654:12 CAM-3	{33:45} stall warning.		
1654:13 CAM-1	{33:46} I got it. back off.		
1654:13 CAM-?	{33:46} max power. ((concurrent with previous statement))		
1654:15 CAM-?	{33:48} there it goes. there it goes.		

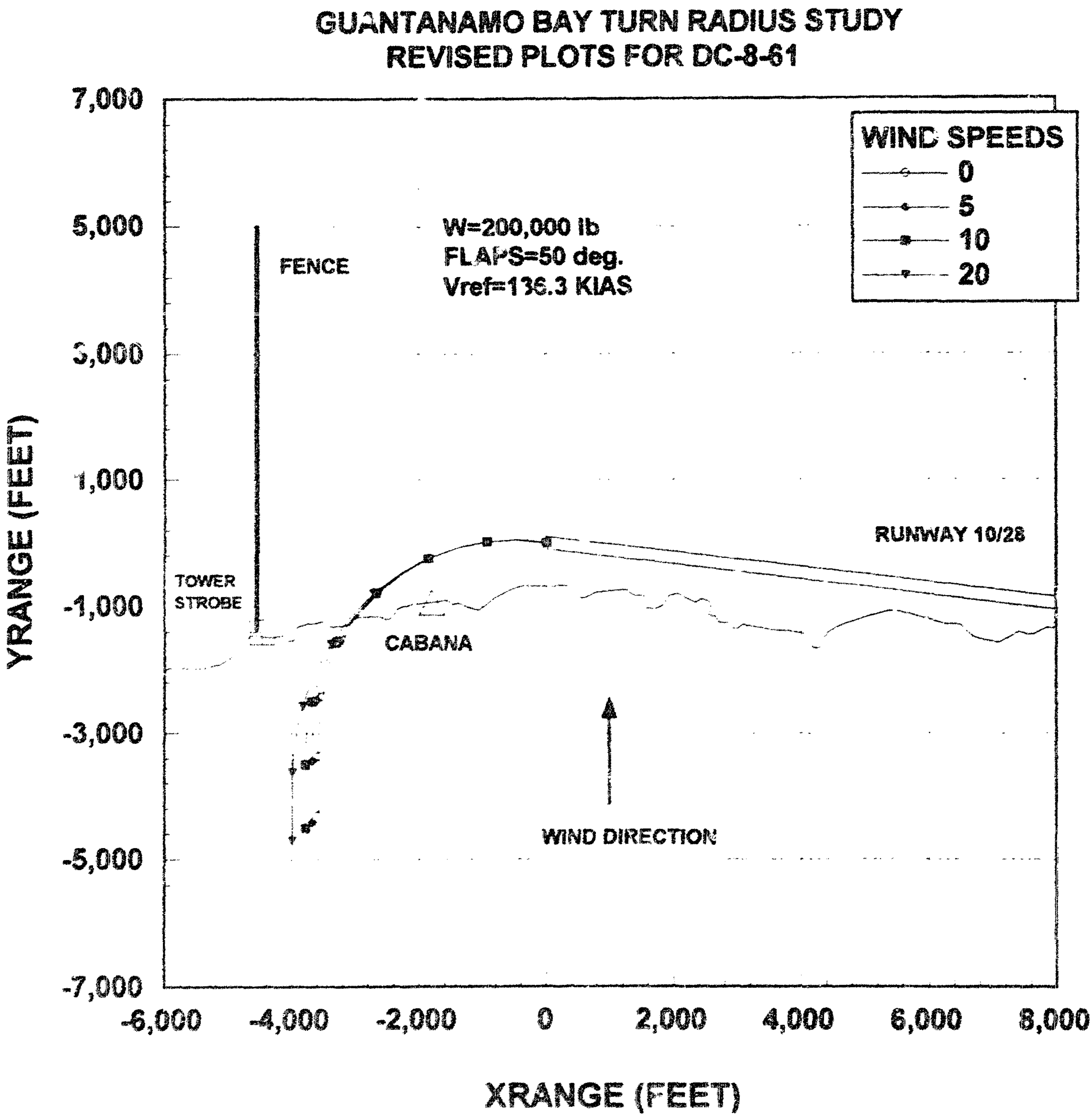
INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1654:16 CAM-?	(33:49) oh no.		
1654:17 CAM	(33:50) ((sounds of several screams))		
1654:20 END of RECORDING	(33:53)		

END of TRANSCRIPT

APPENDIX C

AIRPLANE PERFORMANCE INFORMATION




GUANTANAMO BAY TURN RADIUS STUDY
REVISED PLOTS FOR DC-8-61
WIND SPEEDS
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5
10
20
W=200,000 lb
FLAPS=50 deg.
Vref=136.3 KIAS
FENCE
TOWER
STROBE
CABANA
RUNWAY 10/28
WIND DIRECTION
YRANGE (FEET)
XRANGE (FEET)
7,000
5,000
3,000
1,000
-1,000
-3,000
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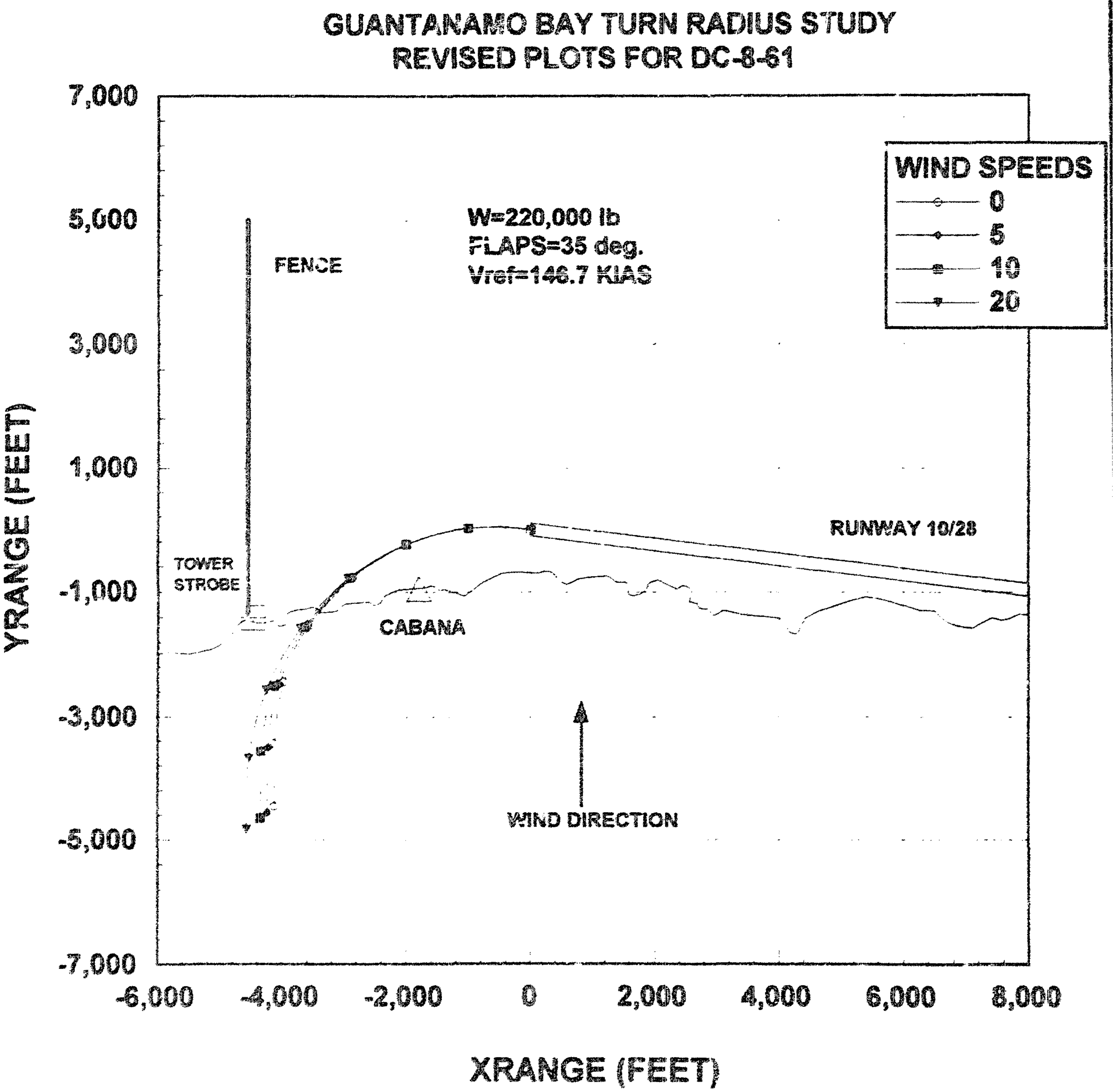
4,000
6,000
8,000


GUANTANAMO BAY TURN RADIUS STUDY
REVISED PLOTS FOR DC-8-61
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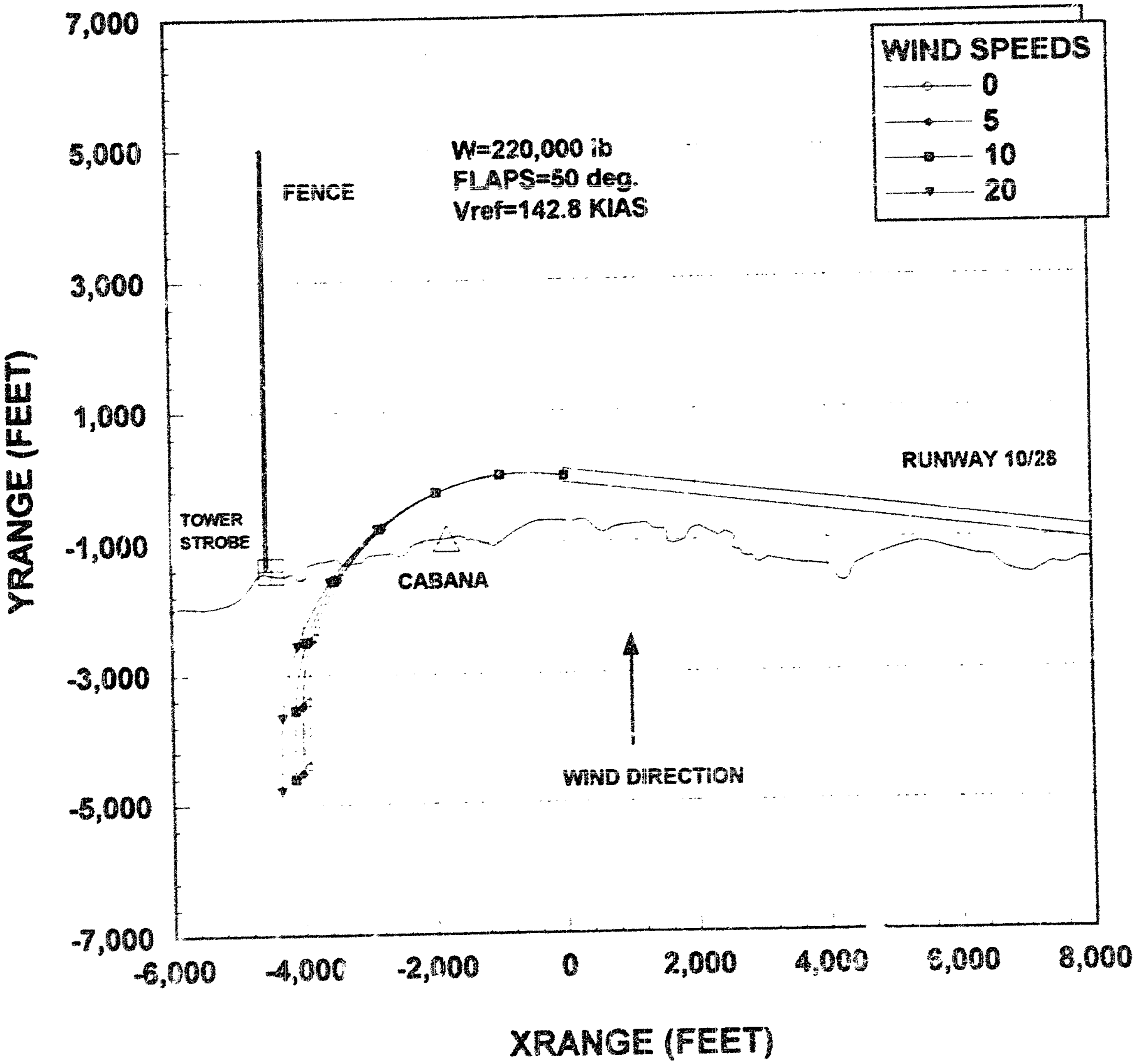
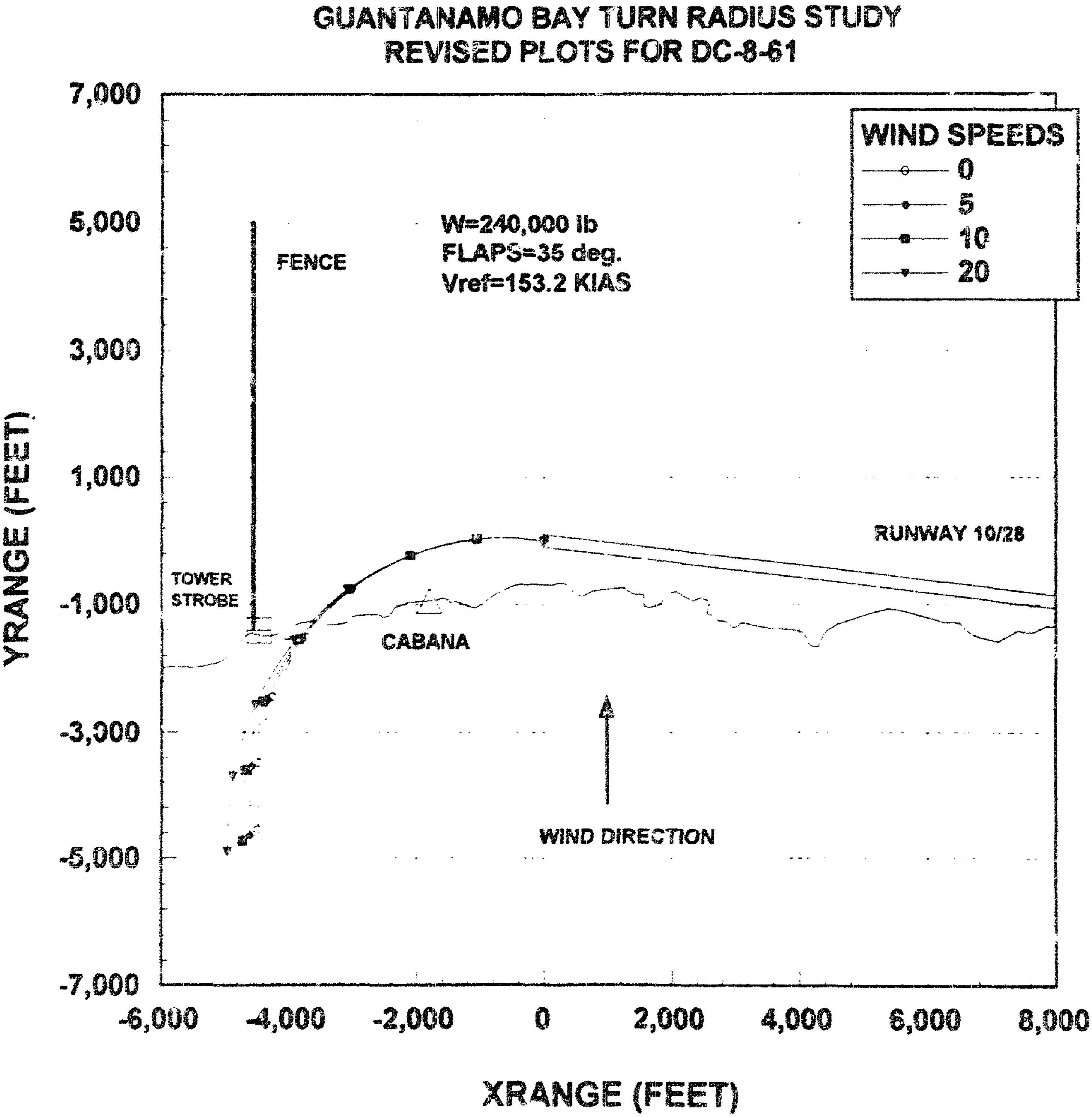
5
10
20
W=220,000 lb
FLAPS=35 deg.
Vref=146.7 KIAS
FENCE
TOWER
STROBE
CABANA
RUNWAY 10/28
WIND DIRECTION
YRANGE (FEET)
XRANGE (FEET)
7,000
5,000
3,000
1,000
-1,000
-3,000
-5,000
-7,000
-6,000
-4,000
-2,000
0
2,000
4,000
6,000
8,000

GUANTANAMO BAY TURN RADIUS STUDY
REVISED PLOTS FOR DC-8-61




GUANTANAMO BAY TURN RADIUS STUDY
REVISED PLOTS FOR DC-8-61
WIND SPEEDS
0
5
10
20
W=240,000 lb
FLAPS=35 deg.
Vref=153.2 KIAS
FENCE
RUNWAY 10/28
TOWER STROBE
CABANA
WIND DIRECTION
YRANGE (FEET)
XRANGE (FEET)
7,000
5,000
3,000
1,000
-1,000
-3,000
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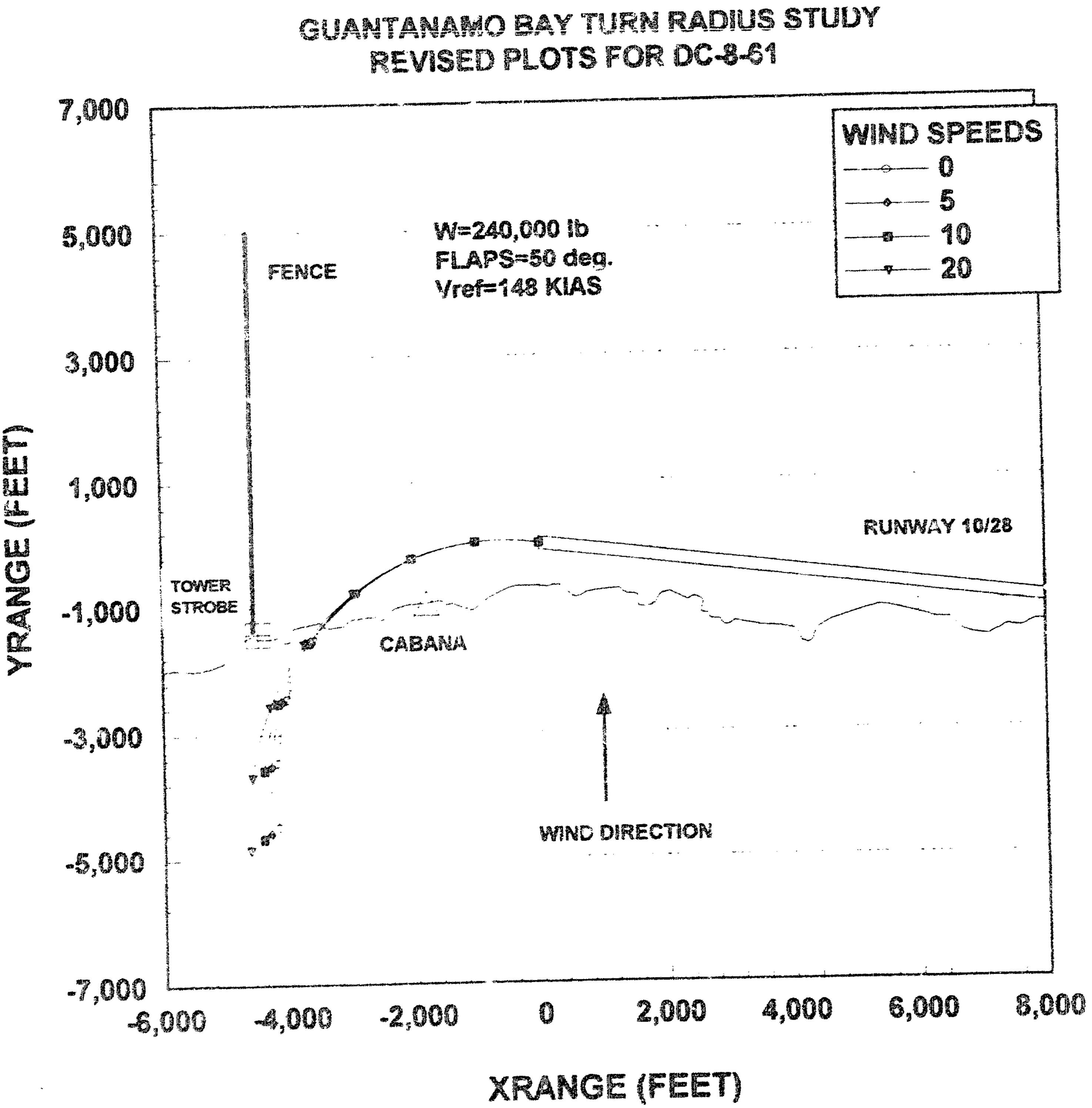
6,000
8,000


GUANTANAMO BAY TURN RADIUS STUDY
REVISED PLOTS FOR DC-8-61
WIND SPEEDS
0
5
10
20
W=240,000 lb
FLAPS=50 deg.
Vref=148 KIAS
FENCE
TOWER STROBE
CABANA
RUNWAY 10/28
WIND DIRECTION
YRANGE (FEET)
XRANGE (FEET)
7,000
5,000
3,000
1,000
-1,000
-3,000
-5,000
-7,000
-6,000
-4,000
-2,000
0
2,000
4,000
6,000
8,000

APPENDIX D

FAA MEMORANDUM ON AIA OVERSIGHT

SUBJECT: American International Airways Surveillance 8/2/93

From: CKSA Principal Inspectors

To: Assistant Manager, DTW-FSDO

In May of this year American International Airways (CKSA) began passenger operations with Boeing B747 aircraft, their principal area of operations being the Middle East. In July of this year CKSA completed negotiations with the Department of Defense to lease facilities at the former Wurtsmith AFB located in Oscoda, Michigan. Their primary goal is to establish an airline subbase at that location to perform major aircraft alterations and inspections. Currently two aircraft are undergoing cargo door installations at the facility. In addition CKSA continues to operate a "pseudo" subbase at Miami International Airport to support their South American airline operations.

In the past six months we have tried to perform the necessary surveillance functions that the above operations require with little success. Paramount to this lack of success is the lack of budget to adequately perform our tasks. Requests to the various geographic entities has resulted in limited feedback (one trip to Oscoda by GRR FSDO for a total of 4 hours of surveillance and several ramp checks at MIA by MIA FSDO).

As the CKSA geographical sphere expands so do their problems, and our limited surveillance consistently reveals the same negative trends. For this reason we have grave concerns regarding the quality of CKSA operations at these "remote" locations in the past and in the future.

Please consider this notice that we can no longer accept full responsibility for CKSA Certificate Management, particularly those portions requiring extended travel. With your assistance we are willing to attempt Certificate Management, however our employer must accept responsibility for the limitations imposed upon us.

The thrust of this memo is intended to be positive in that we are informing you of our problems and concerns.

Randal H. Drew   Marcel I. Loosbrock   David K. Johns

cc: . McCartney
 . Stanley

APPENDIX E

ANALYSIS OF CREW FATIGUE FACTORS

Analysis of Crew Fatigue Factors in AIA Guantanamo Bay Aviation Accident

Mark R. Rosekind, Kevin B. Gregory[1], Donna L. Miller[1],
Elizabeth L. Co[2], and J. Victor Lebacqz

Fatigue Countermeasures Program
Flight Human Factors Branch
NASA Ames Research Center

Introduction

Flight operations can engender sleep loss and circadian disruption that can affect flight crew performance, vigilance, and mood. Scientific information on sleep and circadian rhythms acquired over the past 40 years has clearly established human requirements for sleep and the detrimental effects of sleep loss and circadian disruption. The application of this scientific information to the 24-hour requirements of flight operations has been underway for over 12 years. A variety of sources clearly indicates that fatigue, as a result of sleep loss and circadian disruption, is an aviation safety issue that warrants attention.

The NASA Aviation Safety Reporting System (ASRS) is a confidential reporting system for flight crews and others to report difficulties and incidents in the National Airspace System. Approximately 21% of the incidents reported to ASRS are fatigue-related (ref. 1). Since its inception, ASRS has accumulated over 261,000 incident reports with about 52,000 of these reporting a fatigue-related occurrence. Since 1980, the NASA Ames Fatigue Countermeasures Program has examined the extent and effects of fatigue, sleep loss, and circadian disruption in a variety of flight environments (refs. 2, 3). This Program has collected anecdotal, subjective, physiological, and performance data documenting fatigue issues in flight operations (e.g., see refs. 4-8). The FAA has identified fatigue research as an important aviation safety issue in its National Plan for Aviation Human Factors. The National Transportation Safety Board (NTSB) has, on several occasions, called for specific actions regarding fatigue, including coordination of federal research activities, review and revision of hours of service regulations, and the dissemination of educational materials. Scientific data has clearly indicated that fatigue can be a factor in 24-hour operational environments, including aviation. This has been recognized at the Federal level by the FAA, the NTSB, other Federal agencies (e.g., Office of Technology Assessment, Federal Highway Administration), and ongoing NASA activities.

Basic Human Physiology: Sleep and Circadian Rhythms

The era of modern sleep research began in the mid-1950's with the discovery of two distinct states of sleep (ref. 9). Over the past 40 years, there has been extensive scientific research on sleep, sleepiness, circadian rhythms, sleep disorders, dreams, and the effects of these factors on waking alertness and human performance (e.g., see refs. 10, 11). Some of this basic information regarding human sleep, sleepiness, and circadian rhythms is presented as a foundation for examining the specifics of the AIA aviation accident at Guantanamo Bay.

1. Sleep is a vital human physiological function.

Historically, sleep has been viewed as a state when the human organism is turned off. Scientific findings have clearly established that sleep is a complex, active physiological state that is

[1]Sterling Software, Inc.
[2]San Jose State University Foundation

vital to human survival. Like human requirements for food and water, sleep is a vital physiological need. When an individual is deprived of food and water, the brain provides specific signals—hunger and thirst—to drive the individual to meet these basic physiological needs. Similarly, when deprived of sleep, the physiological response is sleepiness. Sleepiness is the brain's signal to prompt an individual to obtain sleep. Sleepiness is a signal that a specific physiological requirement has not been met. Eventually, when deprived of sleep (acutely or chronically), the human brain can spontaneously, in an uncontrolled fashion, shift from wakefulness to sleep in order to meet its physiological need for sleep. The sleepier the person, the more rapid and frequent are these intrusions of sleep into wakefulness. These spontaneous sleep episodes can be very short (i.e., microsleeps lasting only seconds) or extended (i.e., lasting minutes). At the onset of sleep, an individual disengages perceptually from the external environment, essentially ceasing to integrate outside information. In a sleepy person, performance can begin to slow even before actual sleep intrusions into waking. A microsleep can be associated with a significant performance lapse when an individual does not receive or respond to external information. With sleep loss, these uncontrolled sleep episodes can occur while standing, operating machinery, and even in situations that would put an individual at risk, such as driving a car (refs. 12-14).

How much sleep does an individual need? Basically, an individual requires the amount of sleep necessary to achieve full alertness and their highest level of functioning during their waking hours. There is a range of individual sleep needs and, though most adults will require about 8 hours of sleep, some people need 6 hours while others require 10 hours to feel wide awake and function at their peak level during wakefulness.

2. Sleepiness affects waking performance, vigilance, and mood.

Sleep loss creates sleepiness and often this sleepiness is dismissed as a minimal nuisance or easily overcome. However, sleepiness can potentially degrade most aspects of human capability. Controlled laboratory experiments have demonstrated decrements in most components of human performance, vigilance, and mood as a result of sleep loss. Sleepiness can be associated with decrements in decision-making, vigilance, reaction time, memory, psychomotor coordination, and information processing (e.g., fixation on certain material to the neglect of other information). Research has demonstrated that with increasing sleepiness, individuals demonstrate poorer performance despite increased effort, and may report indifference regarding the outcome of their performance. Individuals report fewer positive emotions, more negative emotions, and an overall worsened mood with sleep loss and sleepiness (for scientific reviews of this area, see ref. 15-18).

Generally, sleepiness can degrade most aspects of human waking performance, vigilance, and mood. In the most severe instances, an individual may experience an uncontrolled sleep episode and obviously be unable to perform. However, in many other situations, while the individual may not actually fall asleep, the level of sleepiness can still significantly degrade human performance. For example, the individual may react slowly to information, may incorrectly process the importance of the information, may find decision making difficult, may make poor decisions, may have to check and recheck information or activities because of memory difficulties. This performance degradation can be a direct result of sleep loss and the associated sleepiness and can play an insidious role in the occurrence of an operational incident or accident (ref. 19-21).

3. Sleep loss accumulates into a sleep debt.

An individual who requires 8 hours of sleep and obtains only 6 hours is essentially sleep deprived by 2 hours. If the individual sleeps only 6 hours over 4 nights, then the 2 hours of sleep loss per night would accumulate into an 8-hour sleep debt. Estimates suggest that in the United States today, most adults obtain 1 to 1.5 hours less sleep per night than they actually need (ref. 22). During a regular work week this would translate into the accumulation of a 5 to 7.5-hour sleep debt going into the weekend; hence, the common phenomenon of sleeping late on weekends to compensate for the sleep debt accumulated during the week. Generally, recuperation from a sleep debt involves obtaining deeper sleep over 2 to 3 nights. Obtaining deeper sleep appears to be a physiological priority over a significant increase in the total hours of sleep (i.e., sleeping 7.5 hours longer on the weekend to "make-up" for the sleep debt accumulated during the week).

4. Physiological vs. Subjective Sleepiness

Sleepiness can be differentiated into two distinct components: physiological and subjective. Physiological sleepiness is the result of sleep loss: lose sleep, get sleepy. An accumulated sleep debt will be accompanied by physiological sleepiness that will drive an individual to sleep in order to meet the individual's physiological need. Subjective sleepiness is an individual's introspective self-report regarding the individual's level of sleepiness (refs. 12, 23). An individual's subjective report of sleepiness can be affected by many factors. For example, caffeine, physical activity, and a particularly stimulating environment (e.g., an interesting conversation) can all affect an individual's subjective rating of sleepiness. However, an individual will typically report being more alert because of these factors. These factors can affect the subjective report of sleepiness and mask or conceal an individual's level of physiological sleepiness. Therefore, the tendency will be for individuals to subjectively rate themselves as more alert than they may be physiologically. This discrepancy between subjective sleepiness and physiological sleepiness can be operationally significant. An individual might report a low level of sleepiness (i.e., that they are alert) but be carrying an accumulated sleep debt with a high level of physiological sleepiness. This individual, in an environment stripped of factors that conceal the underlying physiological sleepiness, would be susceptible to the occurrence of spontaneous, uncontrolled sleep and the performance decrements associated with sleep loss (refs. 24-26).

5. The Circadian Clock.

Humans, like other living organisms, have a circadian (circa=around, dia=a day) clock in the brain that regulates physiological and behavioral functions on a 24-hour basis. In a 24-hour period this clock will regulate our sleep/wake pattern, body temperature, hormones, performance, mood, digestion, and many other human functions. For example, on a regular 24-hour schedule we are programmed for periods of wakefulness and sleep, high and low body temperature, high and low digestive activity, increased and decreased performance capability, etc. An individual's circadian clock might be programmed to sleep at midnight, awaken at 8 AM, and maintain wakefulness during the day (with an afternoon sleepiness period), and then the 24-hour pattern repeats itself. The circadian rhythm of body temperature is programmed for the lowest temperature between 3 and 5 AM on a daily basis (ref. 27).

When the circadian clock is moved to a new work/rest (or sleep/wake) schedule or put in a new environmental time zone, it does not adjust immediately. This is the basis for the circadian disruption associated with jet lag. Once the circadian clock is moved to a new schedule or time zone, it can begin to adjust and may take from several days up to several weeks to physiologically adapt to the new environmental time. Also, the body's internal physiological rhythms do not all adjust at the same rate and therefore, may be out of synch with each other for an extended period of time. Again, it can take from days to weeks for all of the internal rhythms to come together in a synchronous 24-hour rhythm on the new schedule or time zone. There are some specific factors that can affect the circadian clock's adaptation. Day/night reversal can confuse the clock so that the cues that help it adjust and maintain its usual physiological pattern are disrupted. Moving from a day to night schedule and back to days can keep the clock in a continuous state of readjustment, depending on the time between schedule changes. For example, severe effects would accompany a 12-hour day to night to day schedule alteration. Another factor is crossing multiple time zones. While there is some flexibility for adjustment, putting the circadian clock in a time zone three or more hours off home time will require a reasonable amount of physiological adaptation. Another factor can be the direction the clock is moved. Shortening the period (e.g., moving to a 21-hour cycle or day) is generally more difficult to achieve than is lengthening the period (e.g., moving to 25 or longer hours), which is the natural rhythm of the circadian clock. Therefore, it can be more difficult to cross time zones in an eastward direction compared to westward movement. It can also be more difficult to move a work/rest schedule backwards over the 24-hour day compared to moving it forward (e.g., forward from day to swing to night shift). All of the associated difficulties of moving the clock, such as poor sleep, sleepiness, effects on performance, etc., will be affected until the circadian clock physiologically adapts to the new schedule or time zone (refs. 28, 29).

Scientific studies have revealed that there are two periods of maximal sleepiness during a usual 24-hour day. One occurs at night roughly between 3 and 5 AM, and the other in midday roughly between 3 and 5 PM. However, performance and alertness can be affected throughout a 12 AM to 8 AM window. Individuals on a regular day/night schedule will typically sleep through the 3-5 AM window of sleepiness. The afternoon sleepiness period can be masked by factors described previously, or present a window when individuals are particularly vulnerable to the effects of sleepiness. This also means that individuals working through the night are maintaining wakefulness from 3-5 AM when their circadian clock is programmed for sleep. Conversely, individuals sleeping during the day are attempting to sleep when the circadian clock is programmed for wakefulness. However, individuals searching for specific windows when they are physiologically prepared to sleep, either for an extended sleep period or a strategic nap, can use these periods to their advantage (ref. 12).

Specific Fatigue Factors to Examine in Investigations

Based on the previous scientific information regarding sleep and circadian rhythms, there are at least three core physiological factors to examine when investigating the role of fatigue in an incident or accident. The first is cumulative sleep loss. An individual's usual sleep amount is established based on their reported total sleep time at home. Using this figure as an individual's baseline sleep need, the amount of actual sleep obtained over a period of time can be used to calculate the cumulative sleep loss (i.e., sleep debt) or potentially, the sleep gained. Unless physiological or behavioral data is available, the reported amounts of sleep usually rely on subjective estimates of total sleep time. It is important to note that there is often a discrepancy between subjective sleep estimates and physiologically the amount of sleep obtained. Therefore, an important caveat is the self-report nature of the data, often obtained (i.e., recreated) after an incident or accident. The second factor is the continuous hours of wakefulness prior to the incident or accident. A general sleep/wake pattern will have an individual awake for about 16 hours and sleep for about 8 hours. However, operational requirements can involve extended duty periods that require continuous hours of wakefulness beyond this usual pattern. The third factor is time of day. This involves the time of operations and the time at which the incident or accident occurred. The time of day can also be a factor when examining when sleep periods occurred and the potential disruption of a usual circadian pattern.

The relationship of these factors can be especially informative. For example, an individual requiring 8 hours of sleep, who obtains 8 hours and is then awake for 20 hours will show less performance decrement than the same individual with 6 hours of sleep awake for 20 hours. With 8 hours of sleep, the individual is better prepared for the longer-than-usual period of continuous wakefulness than they would be with the combination of a sleep debt and the extended wake period. All three factors can come together to create the highest vulnerability for a performance decrement. The greatest decrement would be expected when an individual carrying a substantial sleep debt is required to operate for an extended period of continuous wakefulness, and the time of the operation passes through a period of increased sleepiness. Time of day could also affect the cumulative sleep loss if sleep periods were scheduled at less than optimal circadian times.

Analysis of Sleep/Wake Histories for AIA Flight Crew

The three factors described above were analyzed for the AIA Flight Crew involved in the Guantanamo Bay aviation accident. The data analyzed were taken from the NTSB Human Performance Investigator's Factual Report, the Operations Group Chairman's Factual Report, and the Flight 808 Crew Statements. When there were discrepancies among the sources, conservative estimates and averages were used. The sleep/wake histories for the Flight Crew of AIA Flight 808 prior to the accident at Guantanamo Bay on August 18, 1993 at about 1656 EDT are presented in Figure 1. This figure provides an opportunity to examine the temporal organization and amount of sleep and wakefulness over the three days leading up to the accident. The days 8/16/93, 8/17/93, and 8/18/93 are identified at the top of the figure along with a 24-hour clock. The white bars indicate the duty periods and individual black lines show specific takeoff and landing activities during the duty periods. A single horizontal bar for each flight crewmember shows the sleep (black) and wakefulness (shaded) over the period leading up to the accident at about 1656 on 8/18/93.

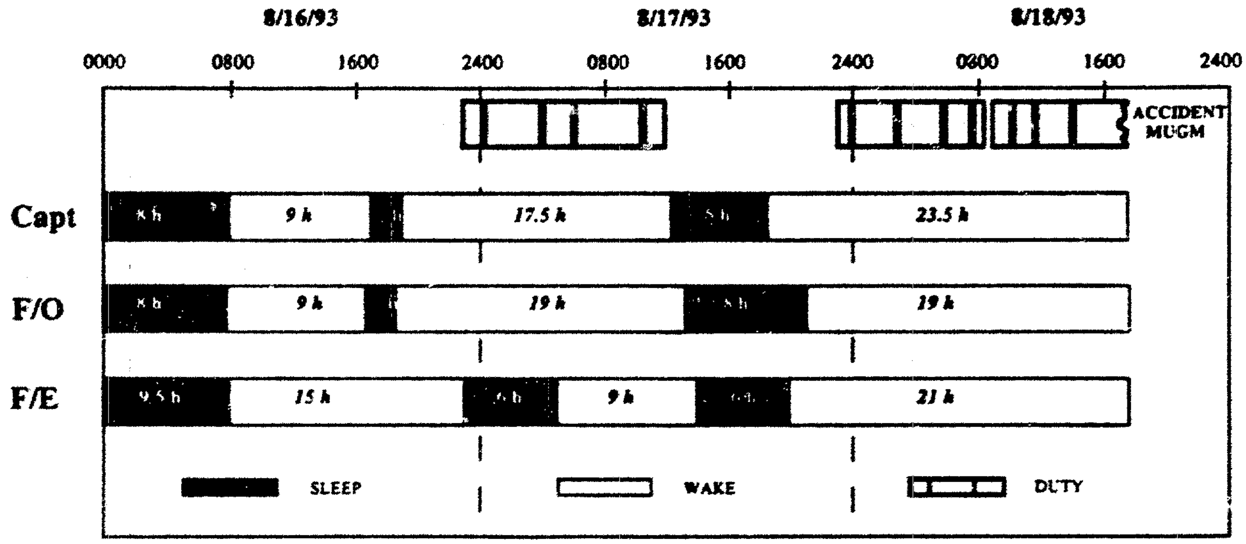


Figure 1. AIA Flight 808 Crew Sleep/Wake Histories

The first horizontal bar in Figure 1 displays the sleep/wake history of the Captain. He reported a typical sleep requirement of 8 hours. The Captain awakened on 8/16/93 after 8 hours of sleep and was awake for 9 hours before taking a 2-hour nap prior to his all-night duty period. Following his nap, the Captain was awake for 17.5 hours. He reported a 5-hour sleep period during a daytime sleep opportunity in a Dallas-Ft. Worth Airport hotel during layover. The Captain was then awake for 23.5 hours until the accident occurred at Guantanamo Bay. This 23.5 hour period included an all-night duty period after which the Captain was released from duty. However, he was called back to operate Flight 808 prior to his return home, and therefore was continuously awake until the accident.

The second bar in Figure 1 displays the sleep/wake history of the First Officer. He also reported a usual sleep requirement of 8 hours. The First Officer awakened on 8/16/93 after 8 hours of sleep and was awake for 9 hours before taking a 2-hour nap prior to his all-night duty period. Following his nap, the First Officer was awake for 19 hours. He reported an 8-hour sleep period during a daytime sleep opportunity in a Dallas-Ft. Worth Airport hotel during layover. The First Officer was then awake for 19 hours until the accident occurred at Guantanamo Bay. This 19-hour period included an all-night duty period after which the First Officer was released from duty. However, he was called back to operate Flight 808 prior to his leaving the airport, and therefore was continuously awake until the accident.

The third bar in Figure 1 displays the sleep/wake history of the Second Officer. He reported a usual sleep requirement of 9.5 hours. The Second Officer awakened on 8/16/93 after 9.5 hours of sleep and was awake for a usual 15-hour day before going to sleep at 2300 for a usual night of sleep. The Second Officer was then called at home after 6 hours of sleep and reported for duty at the airport, joining the Captain and First Officer. The Second Officer was then awake for 9 hours. He reported a 6-hour sleep period during a daytime sleep opportunity in a Dallas-Ft. Worth Airport hotel during layover. The Second Officer was then awake for 21 hours until the accident occurred at Guantanamo Bay.

An examination of the cumulative totals for sleep and continuous wakefulness is informative. For the entire 65-hour period portrayed in Figure 1, which includes the last full 8-hour sleep period at home, the Captain was awake for 50 hours with 15 hours of sleep. Including the 2-hour nap, in the last 48 hours, the Captain was awake for 41 hours with 7 hours of sleep. For the 46 hours after the nap, the Captain was awake for 41 hours with 5 hours of sleep. In the last 28.5 hours prior to the accident, the Captain was awake for 23.5 hours with 5 hours of sleep.

For the entire 65-hour period portrayed in Figure 1, which includes the last full 8-hour sleep period at home, the First Officer was awake for 47 hours with 18 hours of sleep. Including the 2-hour nap, in the last 48 hours, the First Officer was awake for 38 hours with 10 hours of sleep. For the 46 hours after the nap, the First Officer was awake for 38 hours with 8 hours of sleep. In the last 27 hours prior to the accident, the First Officer was awake for 19 hours with 8 hours of sleep.

For the entire 66.5-hour period portrayed in Figure 1, which includes the last full 9.5-hour sleep period at home, the Second Officer was awake for 45 hours with 21.5 hours of sleep. In the last 42 hours, the Second Officer was awake for 30 hours with 12 hours of sleep. In the last 27 hours prior to the accident, the First Officer was awake for 21 hours with 6 hours of sleep.

Overall, this information demonstrates that the entire crew displayed cumulative sleep loss and extended periods of continuous wakefulness. It should be noted that the cumulative sleep loss can be partially attributed to the reversal of the circadian pattern, with nighttime sleep periods at home followed by daytime sleep periods due to all-night duty periods. Sleep obtained in opposition to the body's circadian rhythms is more disturbed than sleep that coincides with times when the body is programmed for sleep. The time of day factor also played a role. Also, the accident occurred at about 4:56 PM in the 3-5 PM window of sleepiness.

In a typical 24-hour period, most individuals would be awake about 16 hours and sleep about 8 hours. This represents a 2:1 wake/sleep ratio. Based on this general pattern, a calculation of the cumulative sleep/wake debt is portrayed in Figure 2. The wake/sleep ratio is displayed along the left axis. A ratio of 2:1 or 2 represents a usual baseline pattern (shown by the solid line) with a wake/sleep ratio less than 2 representing a sleep gain. A wake/sleep ratio greater than 2:1 or 2 would represent a sleep loss. The three days prior to the trip are portrayed on the horizontal axis.

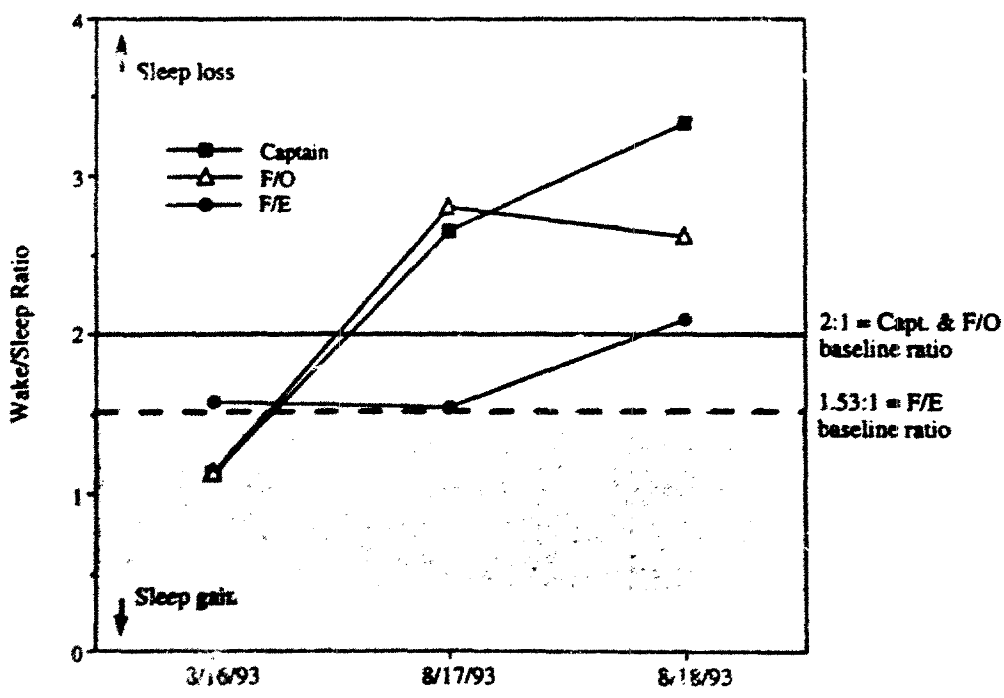


Figure 2. Cumulative Sleep/Wake Debt

The Captain and First Officer reported a usual sleep requirement of 8 hours and therefore, a wake/sleep ratio of 2 would be their appropriate self-defined norm. As evidenced in Figure 2, the wake/sleep ratio for both the Captain and First Officer is greater than 2 (indicated by the solid line) over the two days prior to the accident, reaching greater than 3 for the Captain. The Second Officer reported a usual sleep requirement of 9.5 hours. This represents a wake/sleep ratio of 1.53 as his self-defined norm (indicated by the dashed line). He approximates this on 8/16 and 8/17 and exceeds a ratio of 2 prior to the accident.

Taken together these data demonstrate that the entire flight crew displayed cumulative sleep loss, operated during an extended period of continuous wakefulness, and obtained sleep at times in opposition to the circadian clock time for sleep, and that the accident occurred in the afternoon window of physiological sleepiness. In consideration of the previous scientific information and the specific factors examined in this accident, the data clearly support the finding that fatigue was a physiological factor for the entire crew.

Evidence that Fatigue Factors Affected Performance

The data presented in the previous section demonstrated that the entire crew had experienced sleep loss, extended periods of continuous wakefulness, and circadian disruption (both the timing of sleep periods and time of accident). However, unlike alcohol, there is no chemical test for fatigue. Therefore, it is extremely difficult in an accident investigation, after the fact, to specifically demonstrate that fatigue was causal or contributory. However, as noted earlier, pilots cite fatigue as a common reason for incidents they report to ASRS. Over the past 10 years, the majority of aviation accidents were attributed to flight crew or human error. It is critical to more fully understand the specific sources of those errors if the current incident and accident rate is to be reduced further. Given the sleep/wake and circadian history of the entire flight crew, it is clear fatigue was present. However, to determine how fatigue may have contributed, one would have to determine from other sources whether performance and behavioral changes associated with fatigue were evident before the accident.

Two sources of data available for examination provide specific information regarding flight crew performance and behavior before the accident. The transcript of the cockpit voice recorder (CVR) was made available at the NTSB hearing on this accident, and the Captain provided testimony at the hearing.

1. Information from the CVR prior to the accident.

The CVR transcript provides information about flight crew performance, decisions, and responses leading up to the accident at Guantanamo Bay. There are four specific pieces of information that are relevant to the analysis of fatigue factors. The first piece of information is the decision to use runway 10. Two of the crewmembers, including the Captain (the pilot flying), had never flown into Guantanamo Bay; the First Officer had only flown into Guantanamo Bay years before in small military jets. The crew acknowledged that it was a difficult airport with special considerations. The plan had been to use the straightforward approach available on runway 28. With essentially no discussion, the Captain decided to change plans and use runway 10, which requires a more severe maneuver to complete the landing. By all reports, the Captain was lauded for his airmanship and good judgment, especially in emergency and landing procedures. Therefore, for an experienced Captain to make a sudden decision to change runways, with no prior experience at a special airport and with minimal crew discussion, suggests a degraded decision-making process. Fatigue can affect an individual's decision-making. In this situation, fatigue may have affected the crew's decision-making in the following ways: a) they did not consider important information (i.e., their unfamiliarity with the airport, their level of fatigue), b) their lack of discussion about the decision to change runways, and c) misreading of potential outcomes. In this case, the decision-making process was shared by the entire flight crew, all of whom were affected by the fatigue factors outlined.

A second piece of information from the CVR was the Captain's fixation on the strobe light. In the transcript, the Captain makes seven (possibly eight) references to the strobe light. During the critical period leading up to the accident, the Captain displayed an overwhelming focus and concern to locate the strobe light. This fixation on the strobe light, to the exclusion of other critical information, could also be an expression of the effect of fatigue on performance. It would fit laboratory research that demonstrates that this effect can result from sleep loss (ref. 15-21).

A third piece of information from the CVR was the Captain's disregard of critical information just prior to the accident. While the Captain was fixated on locating the strobe light and was making multiple references to its location, another crewmember questioned whether they were going to make the landing. The Captain did not acknowledge the question, certainly did not process the potential implications of the question, and finally disregarded the critical information to continue his search for the strobe light.

A fourth piece of information from the CVR was the response to the stall warning when the operation was clearly in trouble. Several pilots reviewed the CVR transcript and spontaneously commented on how slowly the Captain and crew responded to the stall warning prior to the accident. The warning is intended to provide a window for immediate response and an opportunity to recover the aircraft. An experienced pilot will have been trained to immediately respond to the stall warning with an automatic response. However, fatigue can degrade reaction time and psychomotor responses. Therefore, the Captain and crew may have been slow to respond to the stall warning as a consequence of the prior sleep loss, circadian disruption, and extended period of continuous wakefulness.

There are also several other instances from the CVR that suggest elements of fatigue but are more subtle. For example, there appears to have been excessive checking of information (e.g., were waypoints entered, radio frequencies). These more subtle occurrences may also reflect decreased memory and mental functioning but are less clearly defined than the previous four examples from the CVR.

The level of performance demonstrated by the Captain is below that normally expected of a Captain with his level of experience. However, the Captain's aviation record does not suggest that he was a substandard pilot. The Captain's airmanship was lauded from several sources. Therefore, some factor must have interfered with his performance on this flight. Also note that the CVR performance decrements identified above were all CRM failures. This further supports the previously presented data that the entire crew, not just the Captain, were affected by fatigue.

The examples identified above were summary points available from an initial examination of the CVR transcript made available at the NTSB accident hearing. A more detailed analysis of the CVR transcript could provide more specific information and data regarding the expression of fatigue-related performance and behavioral changes before the accident.

2. Captain's testimony.

The other piece of information available at the NTSB hearing was the Captain's testimony. Perhaps the most telling statement was in response to the question about how he felt just prior to the accident and he said, "lethargic and indifferent." Individuals use a variety of words to express their state associated with sleep loss and circadian disruption, for example, 'fatigued,' 'tired,' 'sleepy,' and 'lethargic.' Also, as previously mentioned, controlled laboratory studies of sleep deprivation have shown that individuals will increase their effort to perform, though their performance is degraded, and they become indifferent to the outcome. The Captain's report of being "lethargic and indifferent" in the period leading up to the accident is quite consistent with the typical pattern of sleep and circadian disruption.

Conclusions

Over the past 40 years, there has been tremendous progress in our scientific understanding of sleep and circadian rhythms. Over the past 12 years, this information has been specifically applied to the operational requirements of the aviation industry. The human need for sleep and the effects of sleep loss and circadian disruption on waking performance are of particular importance in the current aviation accident investigation. The subjective sleep/wake data provided by flight crewmembers was analyzed for cumulative sleep loss, extended periods of continuous wakefulness, and time of day effects. The results demonstrated that these three fatigue factors affected all three flight crewmembers. Based on the known effects of fatigue, sleep loss, and circadian disruption on human performance, other sources of information were examined to determine whether fatigue-related performance decrements occurred prior to the accident. Four examples from the CVR transcript and the Captain's testimony provide information of specific performance and behavioral occurrences that fit the expected effects of fatigue on human functioning. The hypothesis that fatigue affected the crewmembers' performance is supported by the amount of cumulative sleep loss, continuous wakefulness, and circadian disruption experienced by the entire crew. The examples from the CVR and Captain's testimony support the hypothesis that fatigue had an effect on flight crew performance that was related to specific actions involved in the occurrence of the accident at Guantanamo Bay.

Two final notes. First, it is important to acknowledge the limitations of human physiology regarding sleep, circadian rhythms, and fatigue. The flight crewmembers involved in this accident were clearly professional, well-trained, experienced, and highly motivated to perform their best. As humans, there are limitations to our performance that are purely a reflection of our physiological capabilities and are independent of training, motivation, and experience. Second, there is no simple, easy "cure" to fatigue issues in aviation operations. Individuals are different, what they do is different, and the operational demands of the aviation industry are diverse. Therefore, no one approach or "solution" will address the fatigue engendered by some flight operations. An examination of every aspect of the aviation system, including regulatory, scheduling, personal strategies, and the design of technology, is critical in addressing fatigue in flight operations. The task is to apply our scientific understanding of human physiological needs for sleep and circadian rhythms to the 24-hour operational requirements of the aviation industry. Whenever possible, this information should be applied to maintain and improve the safety margin and promote maximal alertness and performance during operations.

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