National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594

DCA22FA132

OPERATIONAL FACTORS / HUMAN PERFORMANCE

Group Chair's Factual Report

June15, 2023

TABLE OF CONTENTS

A. ACCIDENT

Location: Miami, Florida
Date: June 21, 2022
Time: 1738 eastern daylight time (EDT)
2138 universal coordinated time (UTC[1])
Airplane: Boeing (McDonnell Douglas) DC-9-82, HI-1064, RED Air flight 203

B. OPERATIONAL FACTORS / HUMAN PERFORMANCE GROUP

Group Chair	Warren Abrams NTSB, Operational Factors Washington, DC
Group Chair	Katherine Wilson NTSB, Survival Factors and Human Performance Washington, DC
Group Member	Jim VanDerKamp NTSB, Operational Factors Washington, DC
Group Member	Sam Goodwill The Boeing Company Seattle, WA
Group Member	Mitch Mitchell Federal Aviation Administration (FAA) Washington, DC

C. SUMMARY

On June 21, 2022, about 1738 EDT, RED Air flight 203, a Boeing MD-82, HI-1064[2], experienced a left main landing gear failure shortly after landing on runway 09 at Miami International Airport (MIA), Miami, Florida. The airplane landed on runway 09 and came to a stop in the grassy area between runways 09 and 30. A post-crash fire occurred and was extinguished by ARFF[3]. The airplane was evacuated, and 4 passengers[4] received minor injuries. The flight was a 14 *Code of Federal Regulations*

[1] Eastern daylight time. All times within this report are EDT unless otherwise noted. At the time of the accident UTC time was EDT + 4 hours.
[2] Dominican Republic registration.
[3] Airport Rescue and Fire Fighting.
[4] There were 130 passengers onboard the airplane (126 passengers and four lapheld infants). There were two pilots, two flight mechanics (seated in passenger seats in the aft cabin), four flight attendants,

(CFR) part 129 scheduled international passenger flight from Las Américas International Airport (SDQ), Santa Domingo, Dominican Republic.

D. DETAILS OF THE INVESTIGATION

1.0 Operational Factors/Human Performance Group Activities

1.1 Day 1, June 21, 2022

On Tuesday, June 21, 2022, the Operational Factors and Human Performance investigators were notified of the accident. The Operational Factors investigators as well as the Human Performance investigator participated in a pre-launch meeting with the team.

1.2 Day 2, June 22, 2022

The Operational Factors and Human Performance investigators traveled to MIA via commercial flights. The Operational Factors investigators documented the cockpit of the accident airplane. The Human Performance investigator contacted the RED Air MIA station manager and CEO to gather crew contact information, the passenger manifest and RED Air manuals. After arriving at the accident site, the Human Performance investigator conducted a walkaround of the wreckage and a walkthrough of the cabin and cockpit. The maintenance logbook was recovered from the airplane; entries were in Spanish and required translation. At the organizational meeting, the Operational Factors/Human Performance (Ops/HP) Group was formed with party members from Boeing and the FAA. Finally, the Ops/HP investigators arranged for crew and company personnel interviews to be conducted for the next day and documented the crew bags.

1.3 Day 3, June 23, 2022

On Thursday, June 23, the Ops/HP Group conducted interviews with the accident first officer (FO), accident captain, RED Air CEO[5] and MIA station manager. The first three interviews were recorded and were transcribed; the final interview was summarized due to technical issues with the recording equipment. The transcripts and summary are in the docket associated with this accident. The following was a list of key takeaways from the crew and CEO interviews to be transcribed:

- Both pilots said all was normal on the approach; they used a flap setting of 28; there was between 12,500-13,000 pounds of fuel at landing.

---

and two training/observing flight attendants (both seated in a passenger seat, one in the aft and one toward the front to mid cabin) onboard the airplane. There were 140 total occupants onboard.
[55] Chief Executive Officer.

- The touchdown was smooth – right main first, although a little right of centerline, then the left came down. A few seconds after touchdown, the thrust reversers were deployed. Then there was a vibration on the left side of the airplane, "explosion" (as recalled by the FO), and subsequent sinking of the airplane to the left; the thrust reversers were stowed soon after the vibration began. The nose gear also collapsed during the accident sequence.
- According to the captain, just before the vibration (which the FO described as a hammering), the FO stated to captain that the "throttles are moving forward"; the captain thought they were maybe split a couple inches.
- After the vibration, the captain said he took over the controls but didn't announce it; both crew members were trying to maintain centerline.
- The airplane departed the runway and hit a "yellow house" with an antenna.
- After the airplane came to a stop, the captain told cabin to remain seated; the crew began shutting down the airplane.
- The lead FA knocked on door to say there was smoke in the cabin and the captain called for an evacuation.
- The captain walked the cabin to make sure all passengers and crew had evacuated then the lead FA, FO and captain evacuated through the L1 door.
- Good crew resource management during the flight; there were no issues with workload.
- No schedule/sleep issues.
- Morale seems high among pilots.
- Per the CEO, the company had an SMS and flight data monitoring program.
- IDAC had done a few audits of the company.

1.4 Day 4, June 24, 2022

The Ops/HP group chairmen reviewed the flight crew's training records. The Group also completed field notes and were released to return home on June 25, 2022.

2.0 History of Flight

The crew departed the hotel about 0800 and arrived at MIA about 0830. The first officer conducted a walkaround of the airplane and found no anomalies. The crew flew one leg (REA202), departing MIA at 1028 and arrived at SDQ at 1115. The crew ate lunch on the airplane in SDQ. The accident flight departed SDQ at 1435 EST after a 36-minute delay and arrived at MIA at 1738. Prior to their arrival at MIA, the flight was cleared for the ILS[6] approach to runway 09 and the crew stated the approach was "normal." The FO disconnected the autopilot between 400 and 200 feet agl[7] and hand flew the airplane to touchdown. He recalled touching down smoothly on the right main

[6] Instrument Landing System.
[7] Above ground level.

then the left main slightly right of centerline which he corrected after touching down. Soon after the crew felt a vibration on the left side of the airplane. The vibration increased and the airplane settled to the left. The crew tried to maintain centerline, but the airplane veered to the left and eventually departed the paved surface striking the glide slop equipment building. After contact with the runway 30 glide slope equipment building and antenna, the nose landing gear and the right main landing gear collapsed. A post-crash fire began on the right wing after a breach of the wings fuel tank at the impact point of the glide slope antenna. The crew told the passengers to remain seated and began the engine shutdown checklist. The lead flight attendant alerted the crew to smoke in the cabin and the captain commanded a passenger evacuation and the crew conducted the evacuation checklist. Prior to evacuating the airplane, the captain walked to the back of the cabin to ensure all passengers and crew were off the airplane. He returned to the front of the cabin and evacuated following the lead flight attendant and FO through the L1[8] door.

3.0 Flight Crew

3.1 Captain

The captain was 59 years old and held a DC-9 Type rating issued on his Venezuelan pilot's license. The captain was the pilot monitoring on the accident flight. He stated he was wearing contact lenses at the time of the accident. At the time of the accident, he was based in Santo Domingo, Dominican Republic.

He held a pilot's license issued by Venezuela and a pilot's license issued by the Dominican Republic.

CFR § 129.15, Flightcrew member certificates states,

Each person acting as a flightcrew member must hold a certificate or license that shows the person's ability to perform duties in connection with the operation of the aircraft. The certificate or license must have been issued or rendered valid by:

(a) The State in which the aircraft is registered; or

(b) The State of the Operator, provided that the State of the Operator and the State of Registry have entered into an agreement under Article 83*bis* of the Convention on International Civil Aviation that covers the aircraft.

3.1.1 Flight Hours

The captain's approximate flight hours were based on information provided to the NTSB by Red Air.

[8] The L1 door is the most forward door in the cabin and located on the left, or captain's side, of the aircraft.

Approximate Flight Hours of the Captain

Previous 24 hours	unknown
Total Flight Experience	~14,555
Total Flight Experience – MD-80	~7,250

3.1.2 Training

The captain's training record was provided by Red Air and the following table shows a summary of some of his most recent training events:

Completion of Initial Simulator Training	March 1, 2022
Completion of IOE[9]	May 17, 2022
Most Recent Line Check	May 17, 2022

3.2 First Officer

The first officer was 28 years old and held a commercial, instrument, and airplane multiengine land and single-engine land ratings. His pilot's license was issued by the FAA. He was the pilot flying on the accident flight. At the time of the accident, he was based in Santo Domingo, Dominican Republic.

The first officer's pilot certificate was most recently issued on July 29, 2019, which included the addition of commercial pilot's certificate.

3.2.1 Flight Hours

The first officer's approximate flight hours were based on information provided by RED Air.

Preceding 24 hours	unknown
Total Flight Experience	~689
Total Flight Experience – MD-80	~250

3.2.2 Training

Completion of Initial Simulator Training	December 12, 2021
Completion of IOE	May 20, 2022
Most Recent Line Check	May 19-20, 2022

[9] Initial Operating Experience.

4.0 Medical and Pathological Information

Both pilots were drug and alcohol tested post-accident, as required by FAA regulations/company policy with negative results.

5.0 Airplane Information

Photo 1: Picture of the accident aircraft; courtesy of Jetphotos.

The accident airplane was a McDonnell Douglas DC-9 (MD-82), Serial number 53027, and was manufactured in 1990. At the time of the accident, it was registered to Aviation Leasing, INC., and was configured with 12 first class seats and 137 coach seats. It was a fixed wing multiengine aircraft powered by 2 Pratt & Whitney JT8D-219 engines each capable of producing 21,700 pounds of thrust.

5.1 Airplane Dimensions[10]

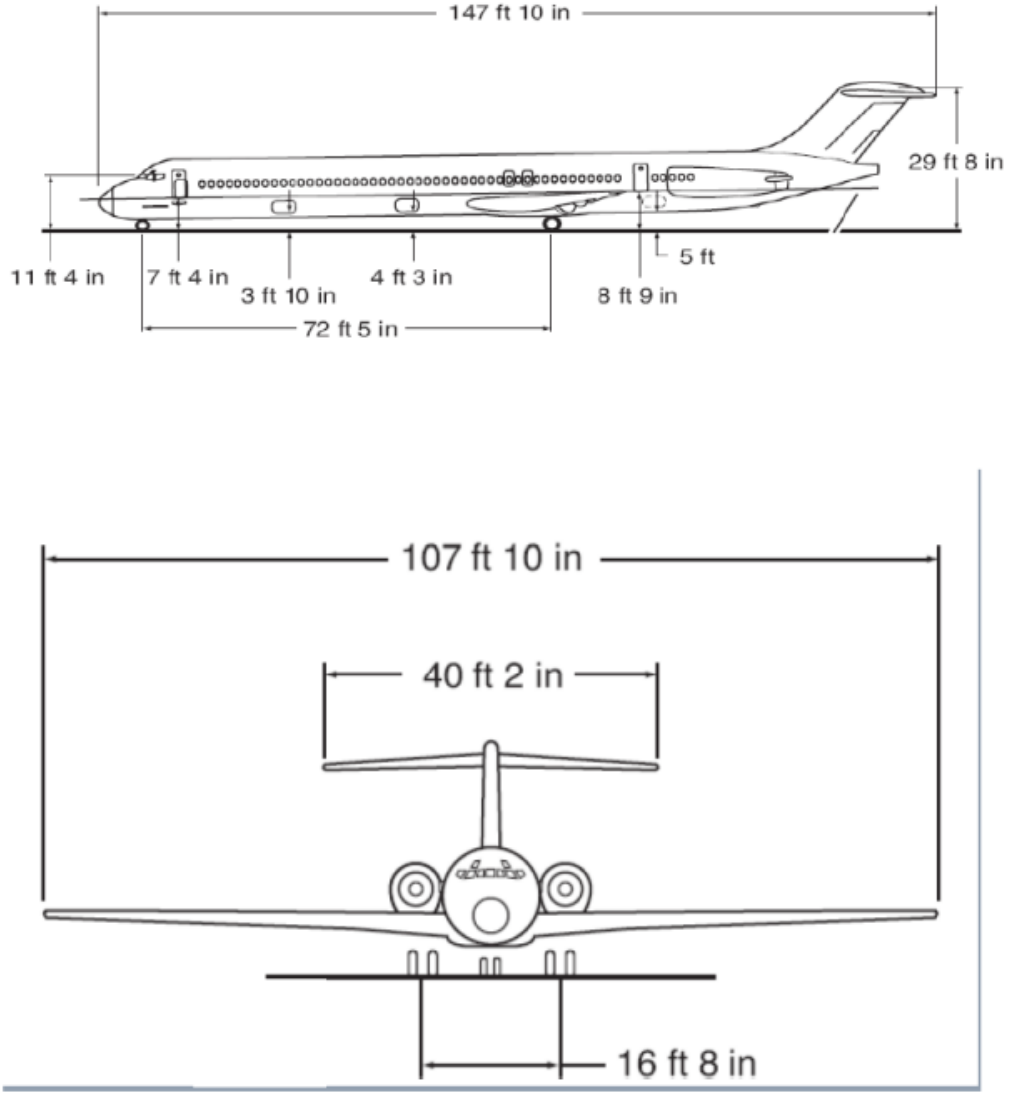

Photo 2: MD-82 dimensions; Source, Boeing , is copyright @ Boeing and is reprinted with permission of the Boeing Company

[10] Source: Boeing , is copyright @ Boeing and is reprinted with permission of the Boeing Company.

6.0 Weight and Balance

The following information, unless otherwise noted, was based on the Weight and Balance Sheet paperwork found in the cockpit of the accident airplane. All weights listed are in lbs.:

	Weight
Aircraft Empty Weight	84,234
Payload	24,500
Zero Fuel Weight	108,734
Fuel	27,500
Ramp Weight	136,234
Taxi fuel	600
Takeoff Weight[11]	135,634
Enroute Fuel Burn	15,184
Projected Landing Weight[12]	120,450
%MAC	16.92

7.0 Airport Information

Miami International Airport (MIA) was located on 3,230 acres of land near downtown Miami, Florida. It was operated by the Miami-Dade Aviation Department and was the property of Miami-Dade County government. MIA had a surveyed field elevation on November 2012 of 9 feet msl[13] and was located at a latitude/longitude of 25°47.7 N 080°17.4W. The airport was serviced by an Air Traffic Control tower that provided weather and other air traffic control services. The airport had four paved landing surfaces designated 9/27, 8R/26L, 12/30 and 8L/26R. The accident flight landed on runway 9 which was an asphalt and grooved runway 13,016 feet long by 150 feet wide and was listed to be in "good condition."

[11] MD-82 Max takeoff weight is 140,000 lbs. based on the MD-80 Aircraft Flight Manual, AFM
[12] MD-82 Max landing weight is 130,000 lbs. based on the MD-80 Aircraft Flight Manual, AFM
[13] Mean sea level.

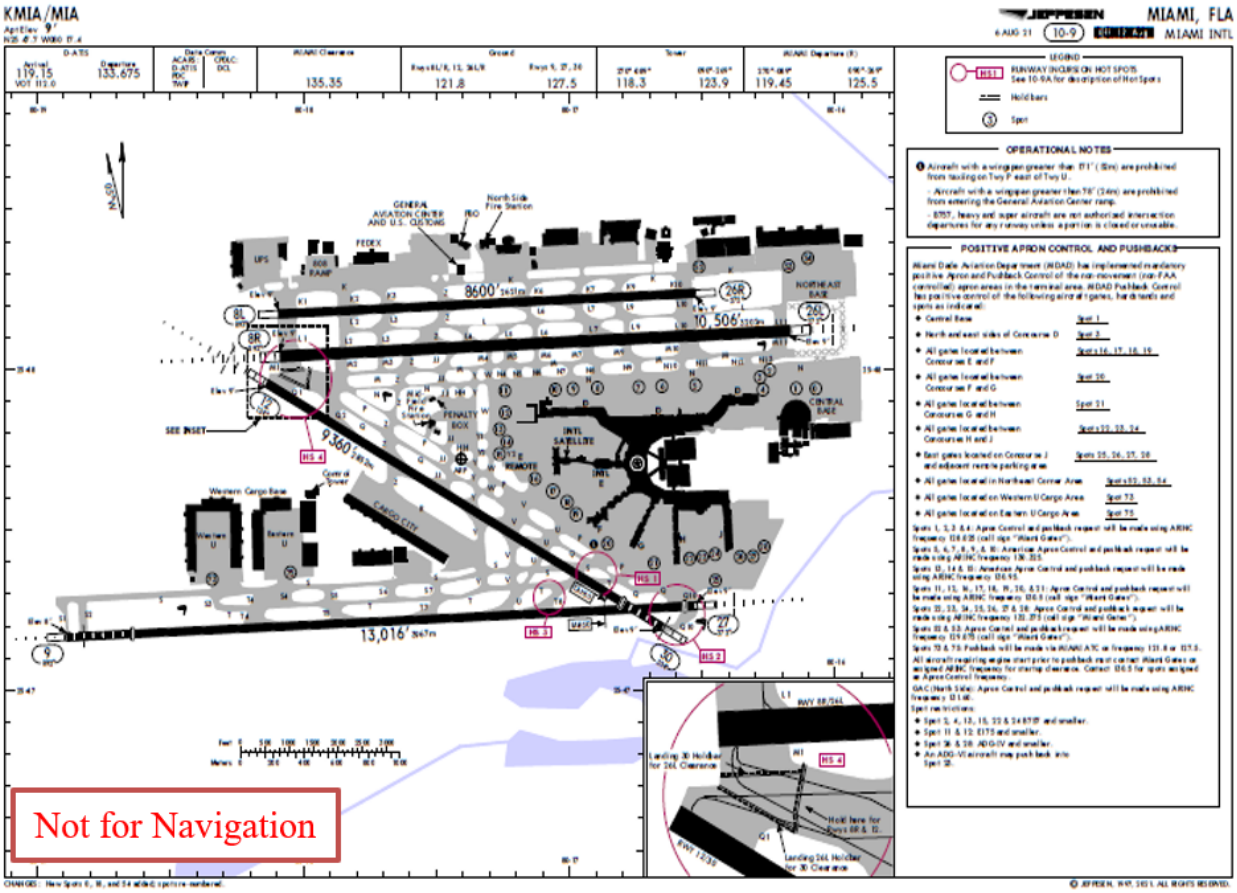

Photo 3: Miami 10-9 Airport Diagram chart. Courtesy of Jeppesen.

8.0 Meteorological Information

KMIA weather observation at 1738, automated, wind 050 degrees at 10 knots gusting to 18 knots. visibility 10 miles, a few clouds at 3,000 feet, broken clouds at 25,000 feet. Temperature 30° C, Due point 21° C, Altimeter 30.12 inches of mercury. Remarks: automated station with a precipitation discriminator.

The raw observations surrounding the period was as follows.

202206211953 METAR KMIA 211953Z 05013G18KT 10SM FEW030 BKN250 30/21 A3010

202206212053 METAR KMIA 212053Z 05010G18KT 10SM FEW030 BKN250 30/19 A3008

202206212153 METAR KMIA 212153Z 05009G16KT 10SM FEW030 FEW045 BKN250 30/16 A3008

202206212253 METAR KMIA 212253Z VRB04KT 10SM FEW030 BKN250 29/19 A3008

202206212353 METAR KMIA 212353Z 03008KT 10SM FEW030 SCT250 28/21 A3007

For further weather information see the Meteorologist Group Chairman Specialist report located in the docket for this accident.

9.0 Operator

Red Air was an air transport company, based out of Santo Domingo, Dominican Republic, which began its commercial and scheduled air passenger transport operations in November 2021. According to the company website, its mission was to "Provide air transport services for passengers and cargo, committed to the highest standards of safety and efficiency in our processes, contributing to the growth of Dominican tourism and maximizing the profitability of the company[14]." RED Air operated four McDonnell Douglas MD-80 series airplanes (including the accident airplane) between SDQ and MIA, as well as charter services. It had approximately 106 employees, of which approximately 25 were pilots.

10.0 Relevant Systems

According to The Boeing Company MD-80 Flight Crew Operations Manual, Volume III – Airplane General – Description and Operation, the following information was provided about the hydraulic system:

10.1 Hydraulic System[15]

The airplane has two independent hydraulic systems utilizing fire-resistant hydraulic fluid. Each system has a reservoir and is pressurized by a single engine-driven pump. Ground service provisions for each system are in the main gear wheel wells. These include a ground service connection panel, a hand pump for building pressure for ground maintenance operations, and a spoiler shutoff and system depressurization valve.

[14] Source: RED AIR

[15] The hydraulic information, as presented, is copyright @ Boeing and is reprinted with permission of the Boeing Company.

Hydraulic Reservoirs

The left and right hydraulic system reservoirs are located in left and right main gear wheel wells, respectively. Each reservoir exclusively supplies fluid to its own system. A manifold on the bottom of the reservoir ports fluid to supply lines for the engine-driven hydraulic pump, the electrically driven auxiliary hydraulic pump, and a ground service hydraulic hand pump. Internally, the reservoir uses a system pressure of 3,000 psi or 1,500 psi to maintain a pressure head of approximately 30 psi or 15 psi. The pressure head ensures positive transfer of fluid to the pumps. The reservoir is protected against over-pressurization by a relief valve set for 47 psi.

When the hydraulic fluid temperature is above normal, a temperature pickup in the reservoir causes the applicable L/R HYD TEMP HIGH annunciation to be displayed.

An instruction plate indicates filling instructions and direct fluid levels for both system pressurized and unpressurized conditions. A fluid quantity transmitter, located at each reservoir, transmits fluid quantity information to the applicable hydraulic quantity indicator on the First Officer's instrument panel.

Hydraulic Pumps

The left hydraulic system is pressurized by a system pump mounted on the left engine. A system pump mounted on the right engine powers the right system. Each pump is capable of providing pressure up to 3,000 psi during all flight modes; 1,500 psi can be selected for cruise flight operation.

An auxiliary pump in the right system provides hydraulic pressure for landing gear operation, flight backup, preflight operations, and maintenance operations. The pump is electrically powered and is designed for continuous operation at 3,000 psi.

A power transfer unit mechanically connects left and right hydraulic systems and enables hydraulic pressure to be transferred from the highest to the lowest side (the high-pressure side operates as a motor and the low-pressure side operates as a pump). The unit is controlled by a single motor operating two shutoff valves, one in each hydraulic system. Operation is controlled by the TRANS HYD PUMPS switch on the First Officer's instrument panel. The shutoff valves automatically close if either system reservoir quantity falls below a safe level.

Airplane systems that normally receive pressure from both hydraulic systems operate at a reduced rate if one system is inoperative. Complete fluid supply to a system can be stopped by pulling the ENG FIRE handle on the upper instrument

panel (appropriate engine). Pump operation is controlled by the L/R ENG HYD PUMPS switch on the First Officer's instrument panel.

L/R HYD PRESS LOW annunciation will be displayed when respective system pressure is low.

A hand pump in the main gear well is installed on each main hydraulic system to supplement standard power sources for ground actuation of the various subsystems. The quick disconnect fittings in the inlet suction line of each hand pump and/or auxiliary pump connect to a ground source of hydraulic fluid to manually fill the reservoirs. The hand pumps make the hydraulic systems completely self-sufficient. Hydraulic ground connections are provided in the forward end of each main gear well for servicing and testing each main hydraulic system.

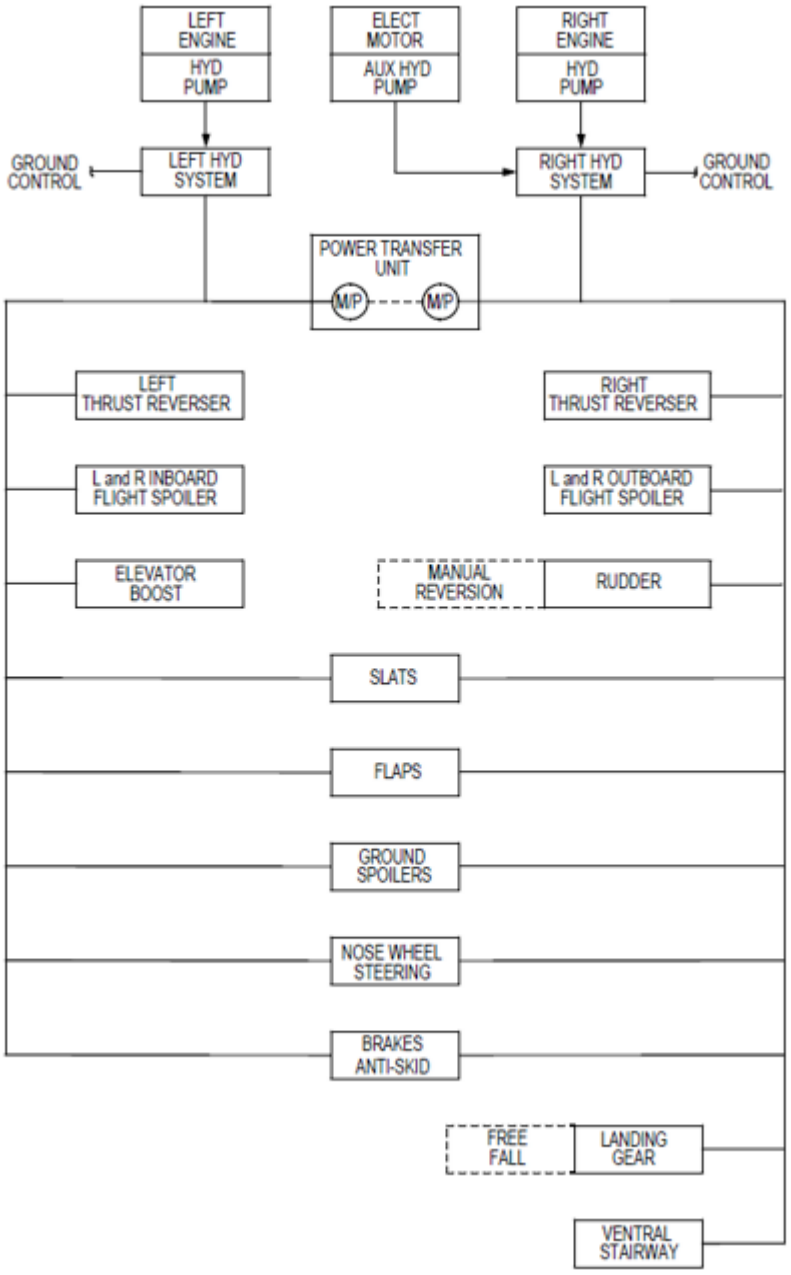

Figure 2: Hydraulic Block Diagram (Source: Boeing MD-80 Flight Crew Operations Manual)[16]

[16] The hydraulic information, as presented, is copyright @ Boeing and is reprinted with permission of the Boeing Company.

10.2 Landing Gear[17]

The Boeing Company MD-80 Flight Crew Operations Manual, Volume III - Landing Gear – Description and Operation provided, in part, the following information about the landing gear:

The MD80 has a landing gear that is mechanically actuated and hydraulically operated. Normally actuated by a landing gear handle, the gear may be raised or lowered by pressure from the right hydraulic system or by pressure transferred from the left hydraulic system through the power transfer unit. If the right hydraulic system fails, the gear can be mechanically released to free-fall to the extended and locked position. Dual hydraulic powered multi-disc wheel brakes with anti-skid control systems are provided to the main gear. An electrical visual/aural indicating and warning system provides gear and brake system status.

Spray deflectors on both main gear and nose gear assemblies' direct water and debris away for the engines during takeoff and landing.

A tail bumper assembly, mounted on the bottom of the aft fuselage, prevents structural damage if the fuselage contacts the runway. A compression indicator provides evidence of contact by means of a visual inspection.

10.2.1 Nose Gear

The nose gear assembly consist of dual wheels mounted on a steerable shock strut. The nose gear assembly is locked in both the extended and retracted positions by an over center linkage. During normal operation, the over center linkage is released hydraulically to permit gear extension and retraction. If hydraulic pressure is not available, the over center links can be released mechanically by the emergency gear extension lever. See photo 4 for a picture of the Emergency Gear Lever in the extended position on the accident aircraft.

A ground shift mechanism, mounted on the nose gear strut, is operated by the compression and extension of the nose gear strut. When the strut is not compressed, the ground shift mechanism disengages the rudder pedal nosewheel steering mechanism, centers the nosewheel for retraction, and retracts the landing gear handle release button. The ground shift mechanism also actuates the two-ground control relays and establishes the ground or flight modes of operation.

[17] The Landing Gear information, as presented, is Copy@ Boeing and is reprinted with permission of the Boeing Company.

10.2.2 Nose Gear Doors

The nose gear wheel well enclosure consist of two forward doors and two aft doors. The doors are mechanically operated by movement of the nose gear during extension and retraction. The forward doors are closed when the gear is extended and can be opened for ground maintenance operations.

10.2.3 Nosewheel Steering

Nosewheel steering is hydraulically operated and mechanically activated by a steering wheel or rudder pedals.

The steering wheel is the primary control used to maneuver the airplane on the ground.

The nosewheel steering system consist of two independent control valves and two actuating cylinders (left and right), that are supplied hydraulic pressure from separate systems. Each steering cylinders receive pressure from its respective hydraulic system. Nosewheel steering, with only one hydraulic system operating, will function normally except for a restriction in the maximum steering angle and rate of turn on the side towards the operating system.

While the steering system is in a natural position, the cylinders function as shimmy dampers. For towing, a manually operated bypass valve is provided to deactivate the steering system permitting manual turning of the nose gear.

10.2.4 Main Gear

The airplane has two main gear assemblies consisting of dual wheels mounted on a shock strut. When extended, each main gear assembly is locked in the extended position by over center linkage. When retracted, the main gear assemblies are held up by hydraulic pressure providing the engine driven hydraulic pumps are selected to provide 3,000 psi. If the pumps are selected to provide 1,500 psi, the main gear will rest upon the doors. If hydraulic pressure is not available for gear extension, the main gear door latches can be released by the emergency gear extension lever. See phots 4.

10.2.5 Main Gear Doors

Each main gear well enclosure consist of a hydraulically operated main gear door and a mechanically operated outboard door. The main gear doors are mechanically latched when closed and are designed to support the main gear during flight. The main gear doors cycle to the closed position after the main gear is extended. The main gear doors can also be mechanically released and opened on the ground.

10.3 Braking System[18]

The Boeing Company MD-80 Flight Crew Operations Manual, Volume III - Landing Gear – Description and Operation provided, in part, the following information about the brake system:

> *Airplane wheel brakes may be applied by depressing the brake pedals. When either set of brake pedals are depressed, hydraulic pressure from both the left and right hydraulic brake system will be applied to the main gear wheel brakes. A fully automatic brake pressure modulating anti-skid system is installed. The anti-skid system will reduce applied wheel brake pressure to the individual brakes when needed, so as to prevent tire skidding, and it will modulate brake pressure in order to provide maximum braking capability for the existing runway conditions.*
>
> *Touchdown locked wheel protection is provided by the anti-skid system to prevent brake pressure application to the inboard wheel brakes until wheel spin-up is sensed, or until 3 seconds after nose gear strut compression. It is possible to apply pressure to the outboard brakes immediately upon touchdown, but pressure to those wheels will be released as soon as the inboard wheels spin-up.*
>
> *When landing on extremely slippery surface, it may be possible that both the inboard and outboard main gear tires will not spin up within 3 seconds after nose strut compression. In such a case it is possible to apply brake pressure to all main gear wheel brakes. This could cause the tires to be locked resulting in a reduction of directional control and stopping capability. If wheel brakes are not released, the tires could blow when they come in contact with surfaces with a higher coefficient of friction further degrading stopping capability and directional control. Brake application should be judiciously applied if hydroplaning is suspected, or if the landing was initially made on icy surfaces.*
>
> *The anti-skid system is deactivated when any of the following conditions exist: the landing gear handle is not in the DOWN detent, the parking brakes are set, the*

[18] The Braking System information, as presented, is copyright @ Boeing and is reprinted with permission of the Boeing Company.

ANTI-SKID switch is OFF, or airplane is at low taxi speeds. When the system is deactivated, pilot brake pedal input controls braking action.

Each main gear wheel is equipped with disc type power brakes actuated by two independent sets of pistons (4 in each set); each set is powered by one of the hydraulic systems. In addition, each system has an accumulator that will supply reserve brake pressure in the event of normal hydraulic pressure failure. A brake pressure (BRAKE PRESS) gage provides visual indication of hydraulic pressure in each system.

A brake temperature (BRAKE TEMP) gage and an overheat (OVHT) light provide visual indications of brake temperature. If the wheels become too hot, fuse plugs in the wheel will melt releasing the tire pressure. Each brake assembly is equipped with wear indicators so that visual checks can be made of brake wear.

The parking brakes are set by depressing the brake pedals, pulling up on the parking brake (PARK BRAKE) control knob (located in the center of the nose gear steering wheel), and releasing the brake pedals. This mechanically opens the brake control valves and closes the anti-skid return lines in both hydraulic systems, trapping pressure in the wheel brake system. When the PARK BRAKE knob is raised, it actuates a switch and the PARKING BRAKES ON annunciation is displayed on the EOAP. If throttles are advanced to a takeoff setting with the parking brake set, the aural/vocal warning system will be activated.

Automatic Brake System (ABS)

When armed, ABS automatically applies brakes during landing and takeoff modes of flight. The ABS' landing mode is armed prior to landing, after the landing gear handle is down, by selecting MIN, MED, or MAX on the AUTO BRAKE selector and placing the AUTO BRAKE ARM/DISARM switch to ARM. The anti-skid system must be armed and operational as a condition for ABS operation. ABS landing mode is activated when spoilers are deployed either automatically or manually with throttles retarded and brake pedals released. Automatic braking is delayed after spoiler deployment for approximately 1 second in MAX position and approximately 3 seconds in MIN or MED positions to allow for normal nosewheel touchdown. ABS landing mode is inhibited if throttles are not retarded below 22 degrees. Disarm can be initiated at any time by manually placing the AUTO BRAKE ARM/DISARM switch into the DISARM position or by depressing either or both brake pedals, after spoiler deployment, by approximately 25 percent of full travel. ABS automatically disarms (during landing or takeoff) when either or both throttles are advanced beyond +22 degrees. When the system is disarmed, the ABS disarm lights located on the glareshield will illuminate. During landing, the ABS will also disarm, and the ABS disarm lights will illuminate if flaps are raised to less than 26 degrees with airplane speed above 70 knots. Stowing the ground

spoilers will release brake pressure without disarming the ABS. The ABS disarm light will remain extinguished and automatic braking will again be available if spoilers are re-deployed.
The ABS takeoff mode is armed by selecting T.O. on the AUTO BRAKE selector switch and placing the AUTO BRAKE ARM/DISARM switch in the ARM position. The spoiler/speedbrake lever must be retracted and flaps must be selected to less than 26 degrees. The takeoff aural warning will sound if either spoilers or ABS is armed, and the other system is disarmed. The ABS takeoff mode is activated during a rejected takeoff upon deployment of ground spoilers.

> *NOTE: If spoilers fail to deploy automatically, manual spoiler deployment will activate ABS.*

If a rejected takeoff is initiated below 70 knots, the ABS reverts to landing mode operation and MIN braking is provided. At speeds greater than 70 knots, maximum dual-system automatic braking is applied immediately without any time delay. Disarm can be initiated by advancing either throttle beyond +22 degrees of travel or by depressing either or both brake pedals, after spoiler deployment, by approximately 25 percent of full travel. Either condition will cause the ABS to disarm, the AUTO BRAKE ARM/DISARM switch will revert to the DISARM position and the ABS disarm lights will illuminate.

An ABS malfunction will cause the system to automatically disarm. The AUTO BRAKE ARM/DISARM switch will revert to the DISARM position, AUTO BRAKE FAIL annunciation will be displayed on the EOAP, and the ABS and MASTER CAUTION lights will illuminate. To rearm the ABS system after it has automatically disarmed, the AUTO BRAKE selector must be placed to the OFF position and then back to the appropriate setting and the AUTO BRAKE ARM/DISARM switch must be placed to the ARM position. If the fault has cleared, the system will rearm.

10.4 Thrust Reversers[19]

The Boeing Company MD-80 Flight Crew Operations Manual, Volume III – Engines- Descriptions and Operation provided , in part, the following information about the thrust reverser system:

The thrust reversers are used on the ground only. The reversers are hydraulically powered, target type, and actuation time is about 2 seconds.

[19]The Thrust Reverser information, as presented, is copyright @ Boeing and is reprinted with permission of the Boeing Company.

The thrust reverser on each engine consists of two doors (deflectors), which form the aft nacelle fairing when stowed. The door linkage system overcenters to provide positive locking in the stowed position. When extended, the doors direct exhaust gases over and under the nacelle. To prevent accidental extension, separate hydraulically actuated latches prevent the reversers from moving out of the stowed position until the thrust reversers lever is moved towered the reverse thrust position.

As the thrust reverser unlatches, a latch switch causes an amber REVERSE UNLOCK light on the center instrument panel to illuminate. When the reversers are extended, a reverse extended switch causes a blue REVERSE THRUST light on the center instrument panel to illuminate.

Aft movement of the L/R thrust reverser levers on the throttles actuates deployment of the thrust reverser on each engine. During thrust reverser deployment, an idle reverse thrust interlock stops movement of the levers, allowing the thrust reversers to unlatch (amber REVERSE UNLOCK lights illuminate) and fully extend (blue REVERSE THRUST lights illuminate) to the idle reverse thrust position. Following full extension of the thrust reversers, reverse thrust EPR may be increased. An intermediate reverse thrust detent, if installed, assists the pilot in identifying reverse thrust at approximately 1.3 EPR.

Following reverser extension, movement of the reverser levers controls the amount of reverse thrust EPR available. Up and aft movement of the levers increases reverse thrust EPR. Forward and down movement of the lever's deceases reverse thrust EPR. With the levers held at idle reverse thrust (a detent is felt on the levers) the engines are allowed to decelerate (EPR decreases) prior to selection of forward thrust. Movement of the levers full forward and down selects forward idle and deactivates reverse thrust. Reversers will stow (blue REVERSE THRUST lights extinguish) and latch (amber REVERSE UNLOCK lights extinguish).

10.5 Spoilers[20]

The Boeing Company MD-80 Flight Crew Operations Manual, Volume III-Flight Controls – Description and Operation provided, in part, the following information about the spoilers:

Each wing has two flight spoilers that are operational during all phases of flight and a ground spoiler that is operable on the ground only. The spoiler system provides the following operational modes:

[20] The Spoiler information, as presented, is copyright @ Boeing and is reprinted with permission of the Boeing Company.

• Lateral control augmentation in all modes of flight spoiler operation.

• Automatic ground and flight spoiler extension upon touchdown main wheel spin up to spoil lift, thereby increasing braking efficiency.

• Manual extension of ground and flight spoilers during landing or a rejected takeoff.

• Selectable extension of flight spoilers to serve as speed brakes.

Ground Spoilers

After landing, all spoilers (flight and ground) may be extended to a maximum of 60 degrees to serve as ground spoilers.

The system may be armed for automatic operation by pulling up on the speed brake/spoiler lever until a red armed placard is exposed and the lever latches in the up position.

When the system is armed and throttles are at idle, the spoilers automatically extend after wheel spin-up on ground contact, or after nosegear oleo actuates ground shift. The spoilers will retract, and the speed brake/spoiler lever will be disarmed if left throttle is advanced for a go-around.

The SPOILER DEPLOYED annunciation is displayed to indicate either ground spoiler extended in flight, or any spoiler is deployed more than 10 ± 2 degrees on the ground with spoiler/speedbrake lever stowed.

11.0 Relevant Procedures

11.1 Evacuation Checklist

The RED Air MD-80 QRH[21] dated October 15, 2013, section, Airplane General, Page 10.1 Cockpit Preparation for Passenger Evacuation checklist, stated:

Cabin Attendants *ALERT*
If time permits, alert ATC and ground crew.
Phase of Flight
In Flight
Just Prior to landing,
Pressurization System *DEPRESSURIZE*
On Ground
After stopping,
EMER LTS Switch *ON*

[21] Quick Reference Handbook

Parking Brakes	*SET*
SPD BRK Lever	*RET*
FLAP/SLAT	*28/LAND*

Note: *Flap position is for unobstructed egress from airplane. If airplane is at gate and ramp is congested with service vehicles, use good judgement to ensure maximum safety of passengers.*

EMER PWR Switch (For VHF-1 Comm and PA)	*ON*
FUEL Levers	*OFF*
ENG FIRE Handles	*PULL*
Note: *If required, discharge fire agent.*	
Evacuation Command	*INITATE*
All passengers and crew confirmed evacuated.	
Time and conditions permitting,	
BATT Switch	*OFF*

[END]

12.0 Foreign Air Carriers Regulations and Oversight, FAR Part 129

"Foreign air carriers or operators who would like to conduct passenger or cargo operations to, from, and transiting the United States, must obtain a permit issued by the Department of Transportation (DOT) under Title 49 of the United States Code (49 U.S.C.). The Federal Aviation Administration (FAA), International Field Offices (IFO) are responsible for issuance and amendment of foreign air carrier operation specifications. (OpSpecs). Operating standards governing foreign operators are contained in 14 Code of Federal Regulations (CFR) Part129."[22]

The Miami, FL International Field Office (IFO) was the field office responsible for overseeing the RED Air OpSpecs and operation. Prior to the accident, the IFO showed one surveillance activity on 12/31/2021 of PTRS[23] number 1326, or Technical / Administrative / Operations / OpSpec inspection. There was no indication where this surveillance took place.

After the accident, the IFO recorded six additional surveillance activities, but nothing related to the Miami accident.

For Flight Operations, the RED Air OpSpecs were approved by the FAA. RED Air OpSpecs subsection A covered the administrative issues:

[22] Source: Foreign Air Carriers (Part 129) | Federal Aviation Administration (faa.gov)
[23] Program Tracking and Reporting Subsystem.

- A001 covers the Issuance and Applicability.
- A002 covers Definitions and Abbreviations.
- A003 covers Authorization for Operations into the United States.
- A004 covers Special Authorizations, Limitations and Restrictions.
- A005 covers Foreign Air Carrie's Personnel, Designated Agent, and HQ Control.

Additionally, RED Air had OpSpecs subsection C which covered the following:

- C051 covers Terminal Instrument Procedures
- C052 covers Straight in Non-Precision APV, and Category 1 Precision Approaches.
- C055 covers Alternate Airport IFR weather Minimums.
- C056 IFR Takeoff Minimums- Airplane
- C063 covers IFR RNAV 1 Departure Procedures (DP) and Standard Terminal Arrivals (STAR)
- C068 covers Noise Abatement Departure Profiles
- C075 covers Circling Maneuvers and/or Contact Approaches at U.S. Airports.
- C077 covers Terminal Visual Flight Rules, Limitations and Provisions.

See Attachment 4 for a complete listing of the RED Air, A and C, OpSpecs.

13.0 NASA ASRS[24] Reports

A review of NASA ASRS provided reports beginning July 1988 until the date of the accident revealed there were 29 reports of the MD-80 series landing gear issues. The reports included, for example, landing gear indications, whether red or green indications lights not indicating the desired gear position, landing gear doors not in the correct position, and the crew having to manually extend the landing gear; there were no reports of the landing gear collapsing on landing.

[24] Aviation Safety Reporting System.

E. LIST OF ATTACHMENTS

Attachment 1	Flight Crew Interviews
Attachment 2	Crew Training
Attachment 3	Weight and Balance
Attachment 4	RED Air OpSpecs
Attachment 5	RED Air Personnel Interviews

Submitted by:

Warren Abrams
Aviation Accident Investigator

Katherine Wilson, Ph.D.
Human Performance Investigator

Intentionally Left Blank