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

ERA22FA004

OPERATIONAL FACTORS FACTUAL REPORT

TABLE OF CONTENTS

A. ACCIDENT

Location:	Thomson, Georgia
Date:	October 5, 2021
Time:	0544 Eastern daylight time[1]
	0944 Coordinated Universal Time
Airplane:	Dassault Fanjet Falcon

B. OPERATIONAL FACTORS GROUP

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National Transportation Safety Board

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Director of Operations, PIC Type-Rated DA20
Sierra West Airlines

C. SUMMARY OF ACCIDENT

On October 5, 2021, at 0544 eastern daylight time, a Dassault Fanjet Falcon airplane, N283SA, was destroyed when it impacted terrain near the Thomson-McDuffie County Airport (HQU), Thomson, Georgia. The captain and first officer were fatally injured. The airplane was operated as Pak West Airlines Flight 887 dba Sierra West Airlines, as an on-demand cargo flight under the provisions of Title 14 Code of Federal Regulations Part 135.

D. DETAILS OF THE OPERATIONS INVESTIGATION

National Transportation Safety Board (NTSB) investigators, representatives from the Federal Aviation Administration (FAA), and Technical Advisors with Dassault Aviation examined the wreckage and documented the accident site October 5-7, 2021. The wreckage was recovered to Atlanta Air Salvage in Griffin, GA, where the on-site portion of the investigation closed out on October 8, 2021. The operations investigation was conducted primarily after the close out of the on-scene investigative work. On November 3rd and 4th, 2021, the NTSB, FAA, and the Director of Operations with Sierra West Airlines completed the Cockpit Voice Recorder (CVR) group transcription.

E. FACTUAL INFORMATION

1.0 The Operator

[1] All times are Eastern Daylight Time (EDT) unless otherwise noted.

The operator, Pak West Airlines, dba Sierra West Airlines (SWA), held a Title 14 CFR Part 135 air operator certificate with the FAA. Their corporate office was in Oakdale, California and a crew and maintenance base was located in El Paso, Texas. SWA had about 30 airplanes on their air operations certificate at the time of the accident, ranging from the SA-227, LR60, and LR55. The operator had one Dassault Falcon 20 which was destroyed in the accident. They employed about 30 pilots.

2.0 **Airplane Information**

The airplane was a Dassault Falcon 20 manufactured in 1967. It was powered by two General Electric CF700-2D-2 turbine engines. The airplane required two type-rated flight crew members and was equipped with the cargo conversion cabin.

Photo 1: Accident airplane photographed on August 6, 2010 (Credit TarmacPhotos.com)

3.0 **Flight Crew Information**

The flight crew consisted of a Captain and First Officer. The pilot seated in the left seat was designated[2] as the pilot-in-command (PIC) and was the pilot monitoring for the accident flight. The pilot seated in the right seat was designated as the second-in-command (SIC) or First Officer and was designated as the pilot flying for the accident flight.

[2] Source: Aircraft Flight and Maintenance Log

3.1 **The Captain**

According to FAA airman and operator records, the captain held an Airline Transport Pilot Certificate, airplane multi-engine land, with type ratings for the DA20 (accident make and model), B-737, BA 3100, DC-3, DC-8, and EMB-110. He also held a commercial pilot certificate with an airplane single-engine land and glider rating. His most recent first-class medical certificate was issued on January 5, 2021.

According to the captain's resume and records from his former employer Ameristar Jetcharter Inc. (Ameristar), he was employed by the operator as a pilot from June 2017 through August 2019. The captain's resignation letter to Ameristar stated that he was resigning due to family circumstances.

According to SWA operator training and employment records, the captain was hired into the position as pilot in command on the DA20 in September 2019. He flew no other make and model aircraft at SWA. The operator reported the following flight experience for the captain:

Flight Time:	**Hours:**
Total Flight Time:	11,955
Total PIC Time:	8,177
Total Time in Accident Make and Model:	1,665
Total PIC Time in Make and Model:	1,325
Total time in Past 90/30 days:	167/56

3.2 **The Captain's Past Employer Training and Proficiency Checks**

According to Ameristar training records, the captain was assigned as SIC in the DA20 in June 2017 where he satisfactorily completed indoctrination training, ground training, and simulator and flight training for the DA20[3].

On December 22, 2017, an airman competency/ proficiency check *(14 CFR 135.293, and 135.297 checks)* in a DA20 simulator was marked as disapproved. The remarks from the check airman stated in part:

> *"Area Arrival unsatisfactory [in accordance with] ATP PTS Section 2. Area of Operation V. Instrument Procedures, Task A: Standard Terminal Arrival/ Flight Management System Procedures, Objectives 6 and 11. Cleared for right turn by ATC, mis-set hdg bug resulting in left turn. Distraction resulted in loss of airspeed*

[3] Airman competency checks to include the initial pilot and instrument proficiency checks (14 CFR 135.293, and 135.297 checks) were completed satisfactorily.

to full stall condition. Notice of disapproval issued for DA-20 type rating certification test."

On December 29, 2017, the airman competency/ proficiency check was attempted again with an approval/ satisfactory result. The captain served as SIC through mid-January 2018.

On January 17, 2018, an airman competency/ proficiency check, *14 CFR 135.299 Pilot in command line check* was completed satisfactorily. Subsequently, on February 4, 2018, while serving as pilot in command, a pilot evaluation (line observation) was completed. All areas of the evaluation were marked as superior or proficient with exception to ATC communications. The evaluating pilot comments stated in part:

"Ray has trouble hearing crew and ATC while in flight, this leads to [occasional] missed or miss heard ATC radio calls and requires the second pilot to speak loudly. Ray needs to improve his organization of the tasks to be completed prior to departure, this is leading to inefficient use of time on the ground."

On January 28, 2019, an airman competency/ proficiency check, *14 CFR 135.299 Pilot in command line check* was completed satisfactorily. No further training event records were produced before the captain's resignation on August 15, 2019.

3.3 **The Captain's Training and Proficiency Checks with SWA**

According to SWA operator training and employment records, in September 2019 the captain satisfactorily completed indoctrination training and ground training and was subsequently assigned to the DA20 as a pilot in command.

On September 24, 2019, an airman competency/ proficiency check *(14 CFR 135.293, 135.297, and 135.299 check)* was completed satisfactorily, however areas of maneuvers/ procedures which included steep turns and circling approaches and landing were marked unsatisfactory. The check airman remarks stated that the areas were retraining and retested satisfactory.

On January 13, 2021, an airman competency/ proficiency check *(14 CFR 135.293, 135.297, and 135.299 check)* was completed satisfactorily, however areas of maneuvers/ procedures of steep turns was marked unsatisfactory and subsequently retraining and retested satisfactory.

On July 29, 2021, an airman competency/ proficiency check *(14 CFR 135.297 check)* was completed satisfactorily, however areas of maneuvers/ procedures of circling approaches and landing were marked unsatisfactory. The check airman remarks stated that the area was trained to satisfactory performance.

3.4 **The Captain's 72-Hour History**

The captain's spouse reported that that he departed their residence in Fountain Hills, Arizona in his truck on September 26, 2021, at 0430 local time for ELP Airport[4]. The operator reported that the captains 10-day on-call rotation began September 27, 2021. The captain was off-call for 16 days preceding the on-call start date. The captain would stay at a hotel near the ELP Airport while completing multi-day on-call rotation assignments.

The captain conducted flights in the evening and overnight hours on September 28, 29 and again on October 1, 2.[5] Each of these trips were with the first officer involved in the accident. He did not have any flight activity on October 3.

According to maintenance personnel at SWA, the captain was not present at the maintenance hangar, nor was he contacted by maintenance personnel throughout the day on October 4. Dispatch personnel reported that there was no record of calls between the captain and the operations center prior to the trip assignment call which occurred about 1750 mountain daylight time.

The captain's spouse reported in general that her husband was an early riser and that every day he would go on a 3-mile walk. She reported that she did speak with her husband and text with him throughout the day on October 4. She reported that throughout the day, due to maintenance issues with the airplane, he informed her that he did not expect to be flying later in the evening. She reported about 1900 mountain daylight time (the captains time zone), she received a text from him that stated, "all nighter to Georgia."

She reported that she asked him if he got enough sleep, to which he responded that he had. She reported that her husband is very conscientious about getting proper rest and exercise. The captain did not express to her that he was fatigued prior to the accident.

She reported that overnight she received a text from her husband that she believed was sent during the accident flight that commented that they were close to their destination, and that they had to fly through thunderstorms, and icing conditions while enroute.

The investigation was unable to establish a local area contact that would have had a better understanding of how the captain spent his day on Monday October 4, 2021.

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[4] According to Google Maps, the drive time was about 6 hours and 45 minutes (408 miles)
[5] Refer to assigned trip section below for specific trip itineraries.

3.5 **The First Officer**

According to FAA airman and operator records, the first officer held a commercial pilot certificate, airplane single and multi-engine land, with type ratings for the DA20 (accident make and model), LR-60, LR-JET, and SA-227. His most recent second-class medical certificate was issued on March 10, 2021.

According to SWA operator training and employment records, on August 20, 2009, the first officer was assigned to the DA20 as an SIC after satisfactorily completing indoctrination training and ground and flight training. The operator reported that for 5 years the pilot flew for another airline, and in 2019, he returned to SWA again as an SIC DA20 flight crewmember. His crew base was ELP, and he was not assigned to any other aircraft at the time of the accident. His residence listed on operator records indicated that he lived in the local area. The operator reported the following flight experience for the SIC:

Flight Time:	**Hours:**
Total Flight Time:	4,748
Total PIC Time:	2,219
Total Time in Accident Make and Model:	858
Total PIC Time in Make and Model:	736
Total time in Past 90/30 days:	99/27

3.6 **The First Officer's Recent Training and Proficiency Checks Completed**

On December 30, 2020, an airman competency/ proficiency check *(14 CFR 135.293)* was completed satisfactorily with remarks that stated, "SIC Only."

On July 20, 2019, an airman competency/ proficiency check *(14 CFR 135.293)* was completed satisfactorily with remarks that stated, unusual attitudes were trained from unsatisfactorily to satisfactorily.

The operator reported that the first officer was designated as a SIC only, due to pilot performance and a lack of aeronautical decision making and airmanship necessary to become a captain.

3.7 **The First Officer's 72-Hour History**

The operator reported that the first officer's 10-day on-call rotation began September 26, 2021. The first officer was off-call for 15 days preceding the on-call start date. The first officer conducted flights in the evening and overnight hours on

September 28, 29 and again on October 1, 2 as previously stated, with the captain.[6] However, the first officer conducted one additional trip on September 30 into the overnight hours of October 1 where he was paired with a different SWA captain. He did not have any flight activity on October 3.

According to maintenance personnel at SWA, the first officer was not present at the maintenance hangar, nor was he contacted by maintenance personnel throughout the day on October 4. Dispatch personnel reported that there was no record of calls between the first officer and the operations center prior to the trip assignment call which occurred about 1750 mountain daylight time.

According to a long-time friend of the first officer on Monday October 4 and 5, she reported that she had texted and talked with him over the phone at various times. The first officer informed her that he would be flying to Lubbock, Texas and then onto Georgia overnight. She was in Georgia at the time. She reported that prior to takeoff from Lubbock, the first officer stated, "Please pray for me," which she reported was something he routinely asked of her. She reported that later overnight she received a text from him during the accident flight that said they were "going into a storm" and he also texted "please pray for me." She reported that during the phone conversations and text messages on October 4, 5, the first officer never mentioned that he was tired.

Two family members of the first officer who lived in Canada reported that they had brief text message conversations on October 3 and one brief phone call in the evening of October 4. They reported that he did not mention his upcoming flying. The investigation was unable to establish a local area contact that would have had a better understanding of how the first officer spent his day on Monday October 4, 2021.

4.0 **Previous Trip Assignments**

The operator reported that the flight crew had been paired together for several months and review of operator records[7] found that they had conducted numerous flights together in the preceding weeks prior to the accident trip.

On the evening of September 28, 2021, and into the early morning of September 29, 2021, the flight crew conducted a three-leg trip together. They reported on-duty at 2130 UTC for the below trip schedule. The date and times are reported in UTC due to the flights crossing several time zones.

[7] Source: Aircraft Flight and Maintenance Log

N283SA, Trip# 0928213					
Date (UTC)	Route	Time Out	Time In	Total Block	Notes
SEPT 28	ELP-SDF	2228	0130 *(Sept29)*	3.0	*Part 135 flight, Captain recorded landing*
SEPT 29	SDF-LBB	0303	0535	2.5	*Part 91*
SEPT 29	LBB-ELP	0645	0745	1.0	*Part 91, Captain recorded landing*

Table 1: September 28-29 trip conducted by the accident flight crew.

On September 30, 2021, the first officer conducted a two-leg trip that did not involve the accident flight captain.

N283SA, **First Officer Only*					
Date (UTC)	Route	Time Out	Time In	Total Block	Notes
SEPT 30	ELP-MCI	2142	2346	2.1	*First officer pilot flying indicated*
OCT 01	YIP-OKC	0101	0307	2.3	*First officer pilot monitoring*

Table 2: September 30, October 1 trip conducted by the first officer with another SWA Captain

On the evening of October 1st, 2021, and into the early morning of October 2nd, 2021, the flight crew conducted another three-leg trip together. They reported on-duty at 2130 UTC for the below trip schedule.

N283SA, Trip# 1001212					
Date (UTC)	Route	Time Out	Time In	Total Block	Notes
OCT 01	ELP-YIP	2215	0140 *(OCT02)*	3.6	*Part 135 flight, Captain recorded landing*
OCT 02	YIP-OKC	0323	0530	2.2	*Part 91*
OCT 02	OKC-ELP	0628	0810	1.7	*Part 91, Captain recorded landing*

Table 3: October 1-2 trip conducted by the accident flight crew.

The off-duty time recorded from this trip was on October 2 at 0900 for a total duty time of 11.5 hours.

5.0 **Accident Trip Assignment**

On the evening of October 4 about 2350 UTC (1950 EDT) the flight crew was assigned to a four-leg trip from their home base of El Paso Airport (ELP), El Paso, Texas. The flight crew 'on-duty' time was recorded as 0100 UTC (2100 EDT) and an actual show time was recorded about 0150UTC (2150 EDT) for both pilots.

At the accident site, an Aircraft Flight/ Maintenance Log was located. The log showed that the crew completed the first leg of their trip as a Part 91 positioning flight to LBB to pick up the freight. Due to a delay in the freight arrival at LBB, the crew remained at the LBB fixed based operator (FBO) for 2 hours and 21 minutes.

N283SA, Trip# 1005214					
Date (UTC)	Route	Time Out	Off Ground	Time In	Notes
OCT 05	ELP-LBB	0332 UTC *(2332 EDT)*	0340 UTC *(2340 EDT)*	0445 UTC *(0045 EDT)*	*On Duty: 0100 UTC (2100 EDT)* *Ground delay at LBB of 2 hours, 21 minutes*
OCT 05	*LBB-HQU*	*0706 UTC (0306 EDT)*	*0710 UTC (0310 EDT)*	-----	**Accident time: 0944UTC (0544EDT)*
----	HQU-FTW	----	----		**Hotel rest planned in the Thomson, GA area*
-----	FTW-ELP	----	----		

Table 4: The accident trip assignment.

The log referenced that the first leg of the trip was flown by the captain. The second leg, which was the accident flight, according to the log was to be flown by the first officer. The operator's director of operations reported that the flight crew intended for them to rest in the Thomson, Georgia area at a hotel prior to their return to the home base.

The estimated total duty time for the trip was 9 hours and 15 minutes with an anticipated off-duty time of about 1015 UTC (0615 EDT).

The flight crew's trip assignment was consistent with flight time and rest requirements as stated in 14 CFR 135.267, which requires that each crewmember must have had at least 10 consecutive hours of an opportunity for rest during the 24-hour period that preceded the planned completion time of the assignment and not exceed 14 hours of on-call duty or 10 hours of flight time.

5.1 **Flight Follower and SWA Dispatch**

Two flight followers at SWA interacted with the flight crew before and during the trip assignment.

The flight follower that assigned the flight crew to the trip characterized the communications as "normal". She called both pilots near 2350Z on October 4, and gave them their trip itinerary, which included the flight from El Paso to Lubbock, and then onto Thomson, Georgia. Her shift was from October 4 about 7:00AM local Pacific Daylight Time (PDT) to 11:00PM PDT. She explained that the dispatch office is short staffed and some of her shift can be performed at her residence.

Her call with the first officer included standard information. She informed him of the aircraft to be flown, the trip details, and who the captain would be.

Her call with the captain was also standard. She informed the captain of the aircraft and routes to be flown. She had further discussions with the captain that the weather in Thomson (HQU Airport) was possibly "wet". She informed the captain to divert to Augusta, Georgia if needed.

She was specifically asked if they discussed Notices to Air Mission (NOTAMs) for the HQU (Thomson, GA) airport. She stated, "I kind of do recall" a discussion where she informed the captain that he should "check weather and NOTAMs". She reported that she explained to the captain that it was her understanding that the runway was too short if it was "wet" at HQU. If it was wet, then they were to go to Augusta Airport. They also discussed the weather enroute. She oversaw the reposition flight to Lubbock Airport (LBB), but her shift ended prior to the accident leg (LBB-HQU).

She stated that neither pilot mentioned anything about being tired nor fatigued to her. The second flight follower to have contact with the flight crew started his shift at 11:00PM PDT, while the crew was already in Lubbock, Texas (LBB Airport) waiting for the freight to arrive.

He reported that the flight crew never mentioned that they were tired or fatigued to him. He stated that if a pilot reports' being fatigued, in his experience, they are immediately afforded the opportunity for rest prior to being asked to move any freight.

He reported that he discussed with the captain that he would list Augusta, GA airport as an alternate, but he planned Thomson Airport (HQU) due to its somewhat closer proximity for the freight customer.

He told the captain that Augusta was "safer", so if the "runway is soaked" or if the weather is bad, or "for any reason" divert to Augusta.

He was asked whether he was aware of any NOTAMs for HQU. He stated, "there were no NOTAMs for HQU". He reported that after the accident he saw several NOTAMs for the ILS, but he was not aware of any NOTAMs for HQU prior to flight. He told the captain that for "any reason", they should go to Augusta.

Neither flight followers were FAA certificated dispatchers, nor was there a requirement to hold such certificate.

5.2 **Lubbock FBO Line Personnel Statements**

Two-line crew personnel at the Lubbock Airport fixed-base operator (FBO) provided statements regarding their fueling of the accident airplane and interaction and observation with the flight crew while they were delayed at the airport. One line crewmember reported that his interaction with the crew was limited to the refueling. He reported that one pilot remained with the airplane to provide instruction on the

refueling, while the other pilot went inside the FBO and got some coffee. This line crewmembers shift ended, and he had no further interactions with the pilots.

The other line crewmember reported that he had seen the two pilots previously in the past weeks and his interaction with them seemed typical to previous nights they had arrived. He discussed with the pilots on why they were delayed, and they discussed the delayed freight was the reason. He reported that the captain moved between the airplane and the FBO during the delay and was on his tablet. He reported that he saw the first officer take a nap in an office during a portion of the delayed time at the FBO.

5.3 **Weight and Balance**

SWA maintained a digital copy of the load manifest and weight and balance for the accident flight. The landing weight was planned to be 20,280 lbs, which was below the 27,320 lbs allowable.

6.0 **Airport Information**

The HQU airport had one runway (10-28) that was 5,514 in total length and 100 ft wide. The usable length when landing runway 10 from the glide slope was 4,433 ft.

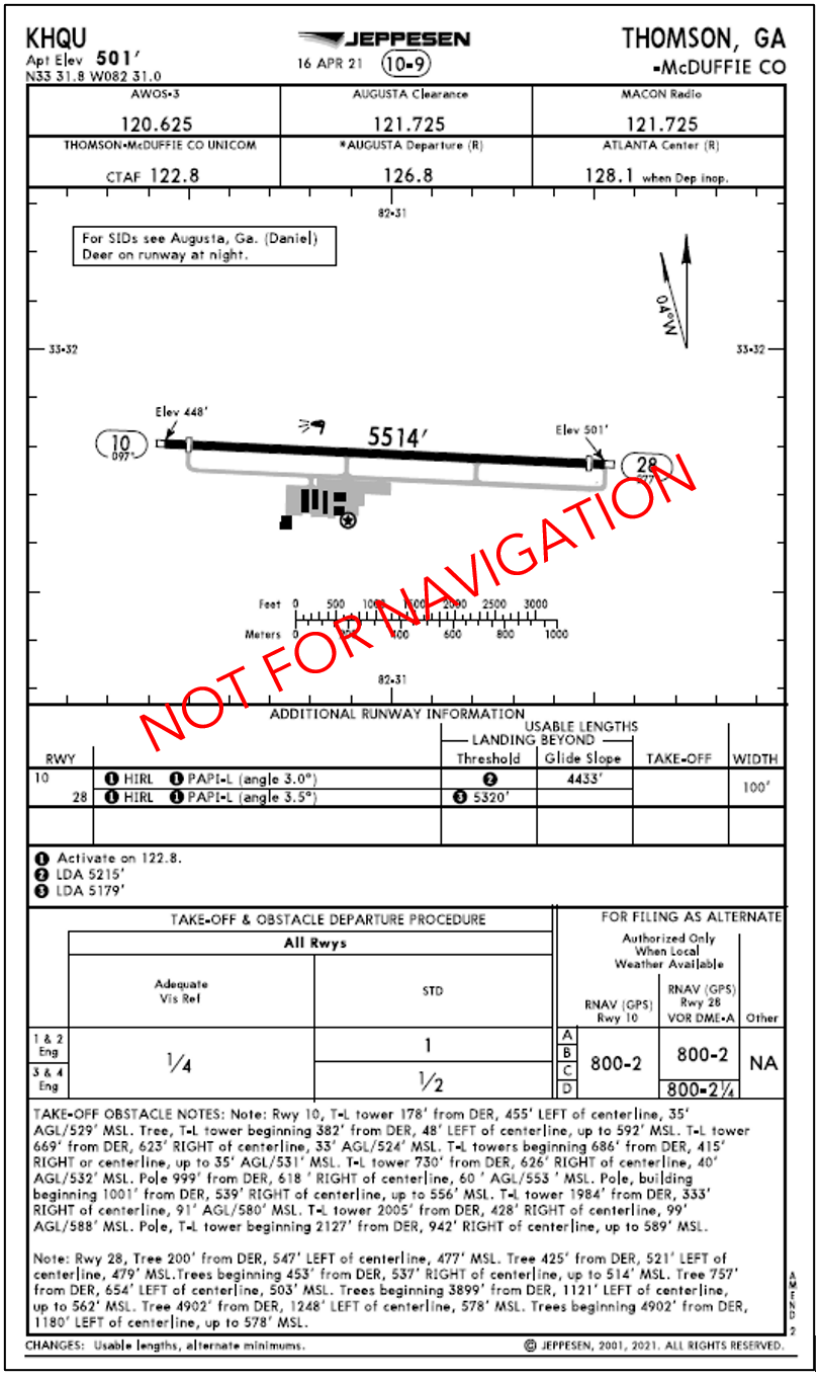


Figure 1: Jeppesen Airport Diagram

6.1 **Instrument Approach Procedure ILS or Localizer Runway 10**

The only ILS or localizer approach to HQU was to runway 10. The approach required automatic direction finding (ADF) equipment for the procedure entry. The approach plate stated that a precision approach path indicator (PAPI) was available on the left side of the runway.

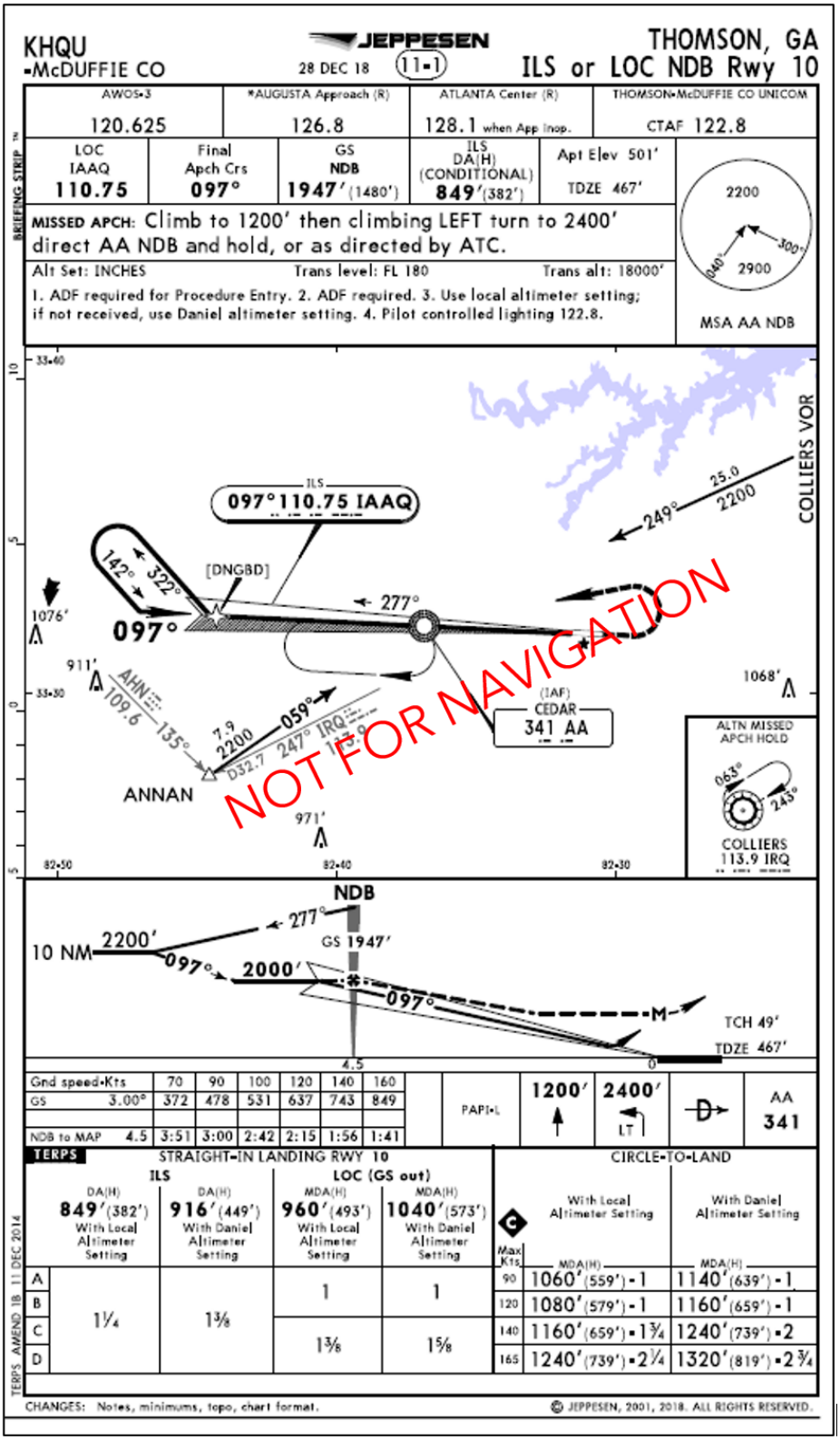


Figure 2: Jeppesen approach plate ILS or LOC NDB RWY 10 KHQU

6.2 **Airport Notice to Air Mission Information**

According to FAA NOTAM Search, several NOTAMs were published for HQU at the time of the accident.

A NOTAM was issued for the ILS runway 10 glidepath, noting it was unserviceable (out of service) from September 27, 2021, 1104 UTC, to October 11, 2021, 2000 UTC estimated. This NOTAM was in effect at the time of the accident. According to FAA Technical Operations, the glideslope was turned off and not radiating at the time of the accident and was scheduled for maintenance later in the month.

!MCN 09/752 HQU NAV ILS RWY 10 GP U/S 2109271104-2110112000EST

A NOTAM was issued for the Precision Approach Path Indicator (PAPI) denoting it was unserviceable (out of service) from October 5, 2021, 1418 UTC to October 12, 2021, 2000 UTC estimated. This NOTAM was published; however, it was not in effect at the time of the accident.

!MCN 10/113 HQU RWY 10 PAPI U/S 2110051418-2110122000EST

An operational ground test of the PAPI for runway 10 was performed after the accident and no anomalies were discovered.

A NOTAM was issued for the ILS runway 10 localizer, noting it was unserviceable (out of service) from October 5, 2021, 1200 UTC to October 5, 2021, 1800 UTC estimated. This NOTAM was published; however, it was not in effect at the time of the accident.

!MCN 10/084 HQU NAV ILS RWY 10 LOC U/S 2110051200-2110051800

There were several additional obstruction related NOTAMs also published for HQU. Refer to the FAA NOTAM Search results located in the docket for the full listing.

7.0 **Landing Performance**

According to a SWA takeoff and landing data chart located in the cockpit, the landing Vref[8] speed was about 113 kts and the minimum field length was 3,975 ft. Review of the aircraft performance landing distance charts found that the estimated landing weight did not exceed the maximum weights for a wet or dry runway at HQU.

[8] According the DA20 Airplane Flight Manual, Section 5, VREF, reference speed, was defined as the speed equal to or higher than 1.3 times the stalling speed in the normal landing configuration.

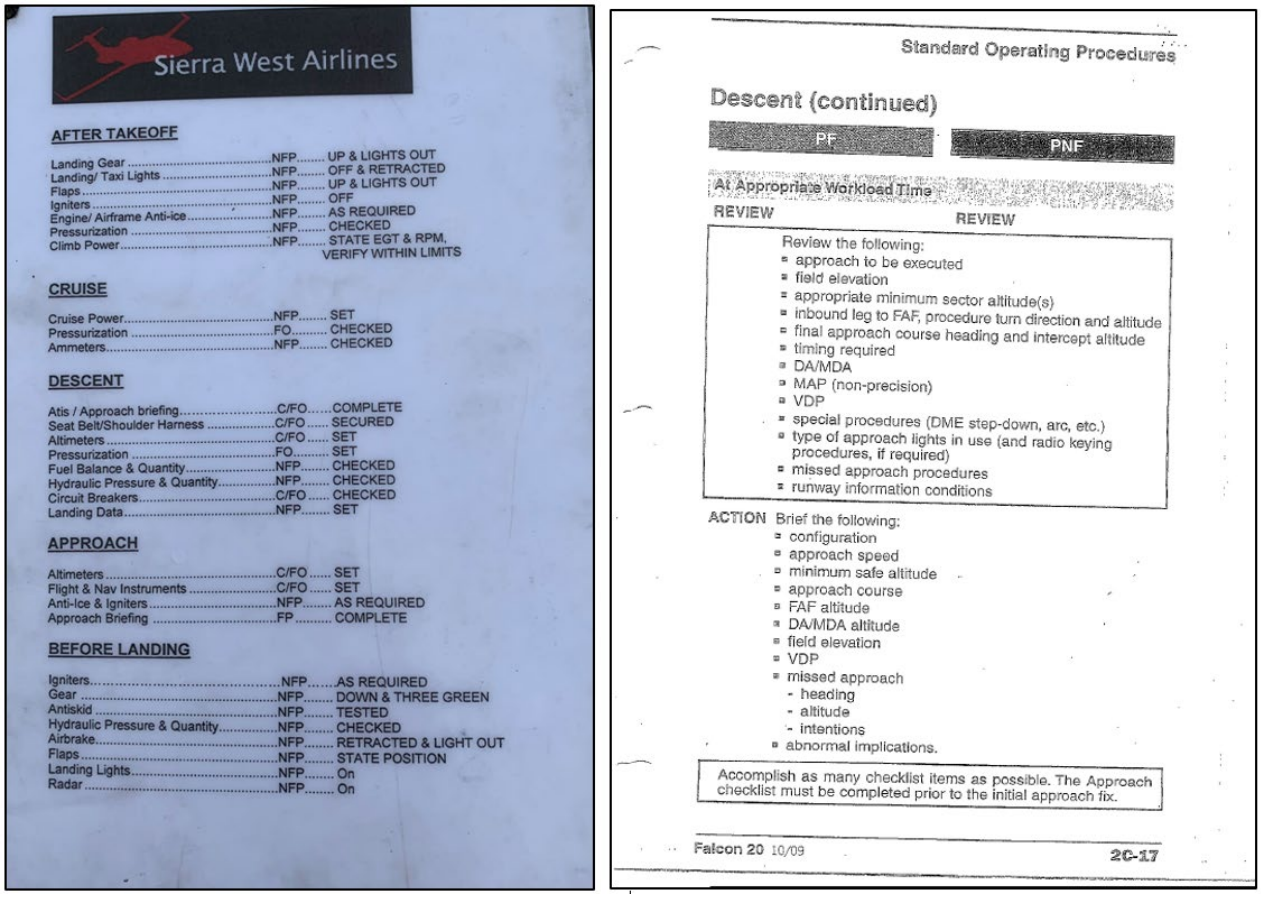
8.0 **Relevant Standard Operating Procedures**

8.1 **Checklist Procedures**

According to the SWA FA20 standard operating procedures, a challenge-response method was to be used to complete all checklists and the pilot flying was to initiate all checklists. After the completion of each checklist, the pilot monitoring (Pilot Not Flying (PNF)) was to state "_____ checklist is complete." If a checklist was not initiated by the pilot flying, it was expected that the PNF would ask whether such checklist was completed or desired to be initiated.

8.2 **Descent and Approach Briefing Procedures**

The SWA FA20 standard operating procedures (SOPs) and checklists mentioned an approach briefing in the descent and approach checklist. The Cockpit Voice Recorder (CVR) transcription did not record an approach briefing; however, the descent checklist was announced as complete. It is not known whether the briefing occurred prior to the commencement of the 30-minute CVR recording.



Sierra West Airlines

AFTER TAKEOFF

Landing Gear	NFP	UP & LIGHTS OUT
Landing/ Taxi Lights	NFP	OFF & RETRACTED
Flaps	NFP	UP & LIGHTS OUT
Igniters	NFP	OFF
Engine/ Airframe Anti-ice	NFP	AS REQUIRED
Pressurization	NFP	CHECKED
Climb Power	NFP	STATE EGT & RPM, VERIFY WITHIN LIMITS

CRUISE

Cruise Power	NFP	SET
Pressurization	FO	CHECKED
Ammeters	NFP	CHECKED

DESCENT

Atis / Approach briefing	C/FO	COMPLETE
Seat Belt/Shoulder Harness	C/FO	SECURED
Altimeters	C/FO	SET
Pressurization	FO	SET
Fuel Balance & Quantity	NFP	CHECKED
Hydraulic Pressure & Quantity	NFP	CHECKED
Circuit Breakers	C/FO	CHECKED
Landing Data	NFP	SET

APPROACH

Altimeters	C/FO	SET
Flight & Nav Instruments	C/FO	SET
Anti-Ice & Igniters	NFP	AS REQUIRED
Approach Briefing	FP	COMPLETE

BEFORE LANDING

Igniters	NFP	AS REQUIRED
Gear	NFP	DOWN & THREE GREEN
Antiskid	NFP	TESTED
Hydraulic Pressure & Quantity	NFP	CHECKED
Airbrake	NFP	RETRACTED & LIGHT OUT
Flaps	NFP	STATE POSITION
Landing Lights	NFP	On
Radar	NFP	On

Standard Operating Procedures

Descent (continued)

PF	PNF
At Appropriate Workload Time	
REVIEW	REVIEW

Review the following:
- approach to be executed
- field elevation
- appropriate minimum sector altitude(s)
- inbound leg to FAF, procedure turn direction and altitude
- final approach course heading and intercept altitude
- timing required
- DA/MDA
- MAP (non-precision)
- VDP
- special procedures (DME step-down, arc, etc.)
- type of approach lights in use (and radio keying procedures, if required)
- missed approach procedures
- runway information conditions

ACTION Brief the following:
- configuration
- approach speed
- minimum safe altitude
- approach course
- FAF altitude
- DA/MDA altitude
- field elevation
- VDP
- missed approach
  - heading
  - altitude
  - intentions
- abnormal implications.

Accomplish as many checklist items as possible. The Approach checklist must be completed prior to the initial approach fix.

Falcon 20 10/09 20-17

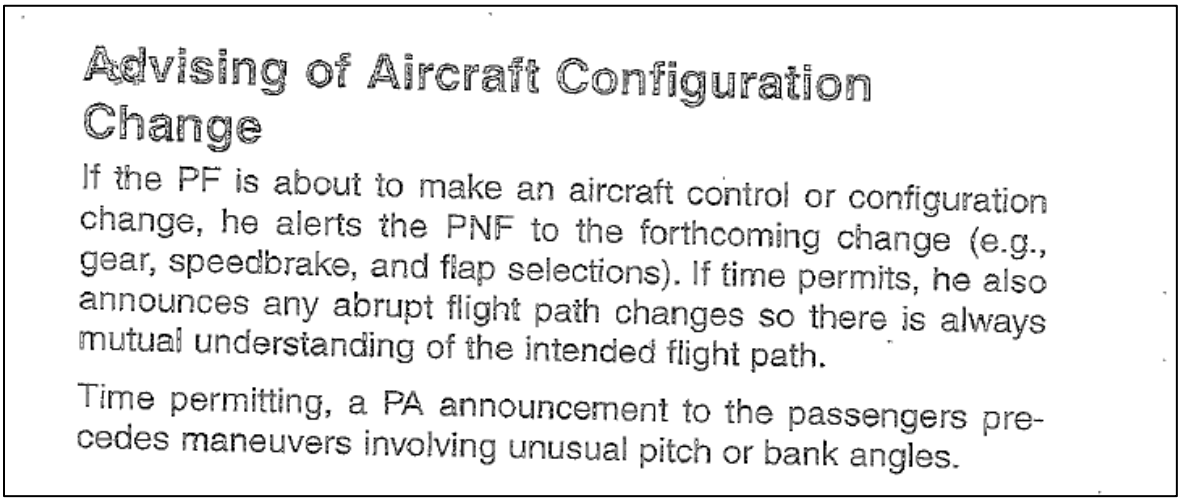
Figure 3: View of the checklist located in the wreckage and an excerpt of the Operator's Descent SOPs

8.3 **Visual Approach Procedures**

The SWA FA20 standard operating procedures stated that during visual approaches the PNF was to announce 1,000 ft, 500 ft, 100 ft, and 50 ft above ground level (agl) altitude callouts. The CVR transcript revealed that none of these altitude callouts were made by the captain who was the PNF.

8.4 **Change in Airplane Configuration**

The SWA FA20 standard operating procedures stated the following regarding configuration changes, such as air brakes or flaps.



Advising of Aircraft Configuration Change

If the PF is about to make an aircraft control or configuration change, he alerts the PNF to the forthcoming change (e.g., gear, speedbrake, and flap selections). If time permits, he also announces any abrupt flight path changes so there is always mutual understanding of the intended flight path.

Time permitting, a PA announcement to the passengers precedes maneuvers involving unusual pitch or bank angles.

Figure 4: Excerpt of the operator's SOPs, Advising of Aircraft Configuration Change

8.5 **Stabilized Approaches and Go-Arounds**

The SWA General Operations Manual (GOM) defined "stabilizing approach concept" as the procedure by which the crew maintains a stable speed, configuration, descent rate, vertical flight path, and engines spooled.

Both pilots were responsible for ensuring the approach was stabilized prior to continuing below minimum altitudes that varied dependent upon the type of approach being flow. The minimum altitude for visual approaches was 500 ft agl and for non-precision approaches the minimum altitude was the minimum descent altitude (MDA) or 500 ft agl, whichever is lower. The GOM further provided a warning that that the flight crew was responsible for taking "immediate action" of a go-around or missed approach if "stabilized conditions" are not met.

The GOM further stated that it was critical to flight safety that either pilot had the ability to call for a go-around if they believe an unsafe condition exists. The go-around action was required to be associated with immediate action of executing a missed approach, without question, because of the immediacy of the situation.

8.6 **Electronic Flight Bags**

The GOM stated that the operation was authorized for Class 1, type A & B electronic flight bags[9] (EFBs).

9.0 **Relevant Airplane Systems, Flight, and Operations Manuals**

9.1 **Airspeed Limitations**

The DA20 Airplane Flight Manual (AFM) provided the following limitation regarding minimum controllable airspeed.

Based upon an expected landing weight of 20,280 lbs, the aerodynamic stall speed was likely about 91 KIAS (Flaps 40°) and 95 KIAS (Flaps 25°). The airspeed indicator displayed indicated airspeed. The calibrated airspeeds were 89 KCAS (Flaps 40°) and 93 KCAS (Flaps 25°). The AFM airspeed limitations stated:

> CAUTION: DO NOT INENTIONALLY FLY THE AIRPLANE SLOWER THAN INITIAL STALL WARNING ONSET

According to Dassault Aviation representatives, there was no data that existed as to what flight characteristics the airplane would demonstrate in an idle power, full landing flaps, landing gear down, and air brakes deployed configuration.

9.2 **Stall Warning System**

The airplane was equipped with a multi-faceted stall warning system. According to the operations manual, the stall warning system was designed to inform the pilot of a forthcoming stall, by sounding of an aural warning. Moreover, the system will energize and relight automatically the engines at a certain angle-of-attack. The "GIANNINI" stall warning system receives angle-of-attack data from a vane located on the right side of the fuselage.

When the airplane is approaching stalling conditions a modulated medium pitch will sound 2/3 seconds on, 1/3 seconds off.

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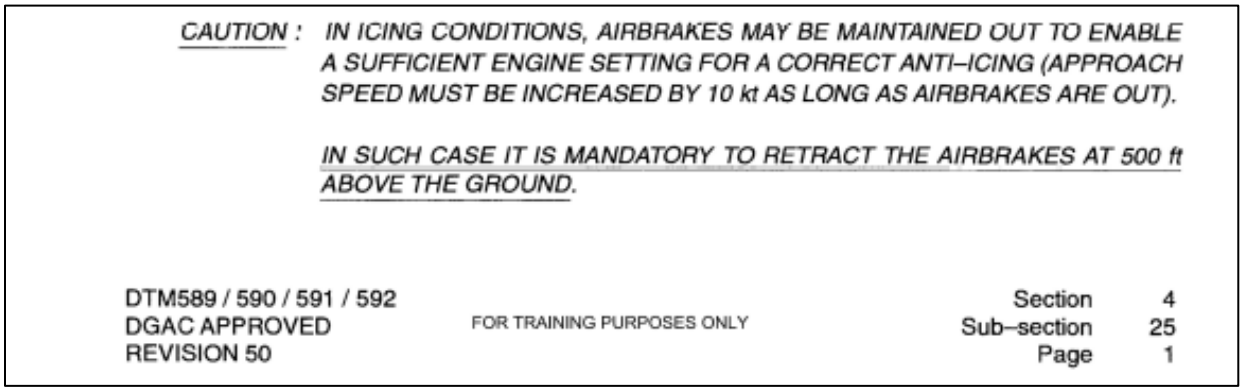
[9] FAA Advisory Circular 120-76 generally defines Class 1 EFBs as portable, rather than equipment installed on the flight deck reliant upon the airplane's power. Type A and B general means applications that can display a variety of operational and aeronautical information to the flight crew digitally (e.g., instrument approach procedure charts, flight manuals, Notices to Airman).

9.3 **Normal Procedures, Approach and Landing**

The DA20 Airplane Flight Manual provided the following normal procedures for approach and landing. The manual stated in part that the airbrakes were to be checked IN during the approach. An additional note states that when anti-ice is being utilized, the airbrakes must be retracted at 500 ft agl.



CAUTION : IN ICING CONDITIONS, AIRBRAKES MAY BE MAINTAINED OUT TO ENABLE A SUFFICIENT ENGINE SETTING FOR A CORRECT ANTI–ICING (APPROACH SPEED MUST BE INCREASED BY 10 kt AS LONG AS AIRBRAKES ARE OUT).

IN SUCH CASE IT IS MANDATORY TO RETRACT THE AIRBRAKES AT 500 ft ABOVE THE GROUND.

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Section 4
Sub–section 25
Page 1

Figure 5: Excerpt of Airplane Flight Manual Airbrakes Caution

9.4 **Airbrakes**

According to the DA20 maintenance manual and operating manual, the air brakes are electro-hydraulic devices on both wings situated on the upper surface that permits aerodynamic braking of the airplane in flight. The maximum deflection is 70° and they are held in place by hydraulic pressure. According to operator documentation, Service Bulletin SB F20-376 was complied with, which resulted in the airbrake position being held into position by hydraulic pressure only rather than a mechanical locking mechanism.

The airbrakes are deployed through the use of a handle located in the center console of the cockpit, aft of the thrust levers on the captain side, as circled in red below. The air brakes operate in a deployed or stowed configuration. The time to extend the air brakes is 2 to 3 seconds and retraction is 3 to 4 seconds.

Figure 6: Photographs of the accident airplane cockpit taken at an unknown date prior to the accident (Photos Courtesy of The Operator)

There are two annunciator lights associated with the deployment of the airbrakes. The AIR BRAKES alarm indicator red light will illuminate if any of the below conditions are met:

**Flaps extended or retracted*
**Throttles at over 85%*
**Down locked landing gear*
**Airbrakes extended*

The second annunciator located near the center console of the cockpit, labeled as "A.B." illuminates as soon as the airbrakes begin to extend, showing that either or both airbrakes are not in a retracted position.

Figure 7: View of the airbrake annunciators

9.5 **Airbrake Limitations**

The DA20 Airplane Flight Manual provided the following limitation regarding airbrake operating limitations:

AIRBRAKE OPERATING LIMITATIONS

In approach with flaps extended, the airbrakes must be retracted. If the approach is made with the anti–icing on, the airbrakes may be extended down to 500 ft above the ground.

D –Airbrakes

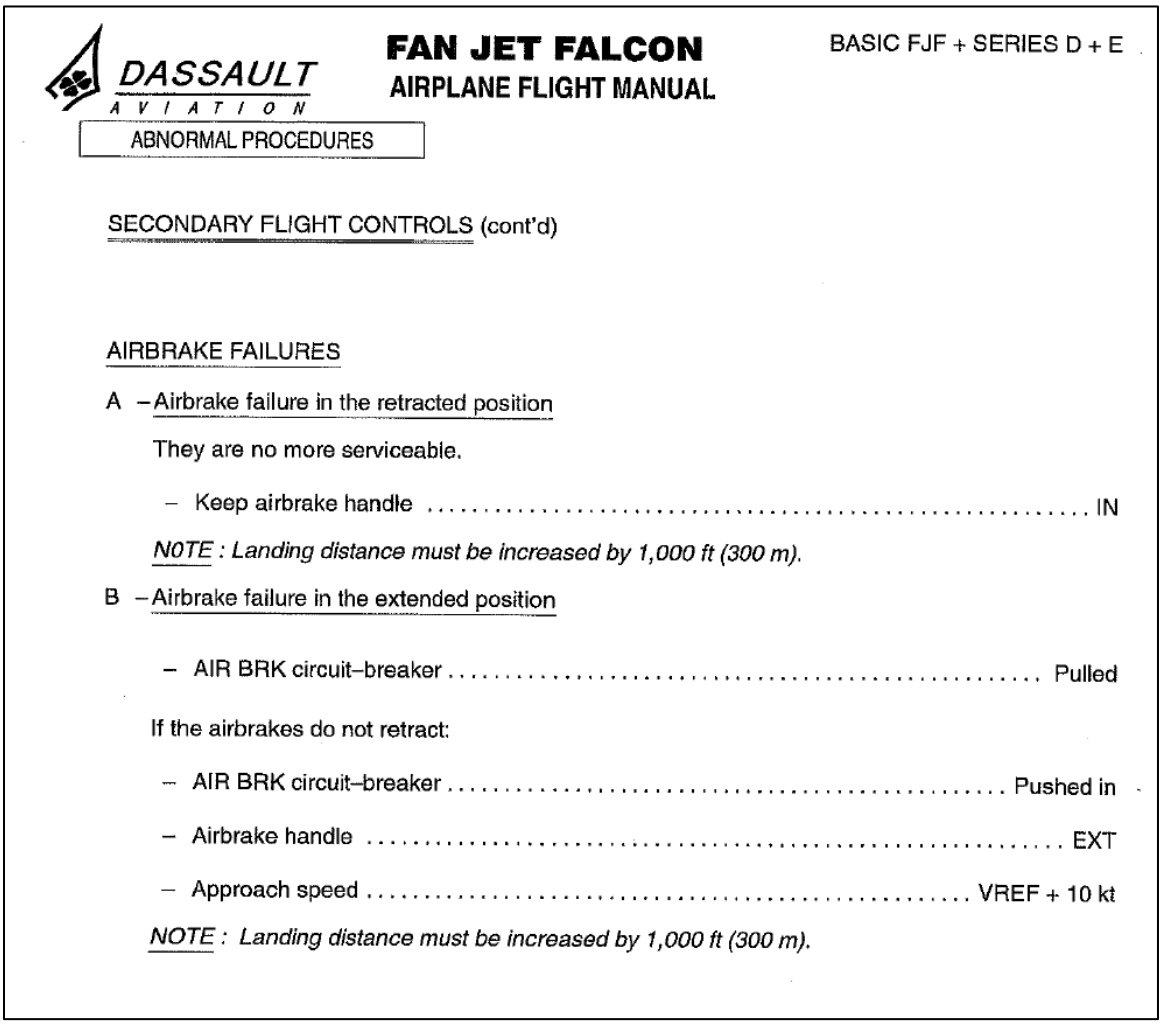
The pilot must keep his hand on the airbrake control throughout the extension or retraction maneuver.

Figure 8: AFM airbrakes operating limitations

According to the CVR transcript, there was no indication that the flight crew had activated the anti-ice system nor was there any indication that the flight was operating in icing conditions during the approach to landing.

9.6 **Airbrake Abnormal Procedures**

The DA20 Airplane Flight Manual provided the following Abnormal Procedure pertaining to air brake failures. The manual stated in part that 10 knots must be added to VREF in such condition.



DASSAULT AVIATION

FAN JET FALCON
AIRPLANE FLIGHT MANUAL

BASIC FJF + SERIES D + E

ABNORMAL PROCEDURES

SECONDARY FLIGHT CONTROLS (cont'd)

AIRBRAKE FAILURES

A – Airbrake failure in the retracted position

They are no more serviceable.

– Keep airbrake handle ..... IN

NOTE : Landing distance must be increased by 1,000 ft (300 m).

B – Airbrake failure in the extended position

– AIR BRK circuit–breaker ..... Pulled

If the airbrakes do not retract:

– AIR BRK circuit–breaker ..... Pushed in

– Airbrake handle ..... EXT

– Approach speed ..... VREF + 10 kt

NOTE : Landing distance must be increased by 1,000 ft (300 m).

Figure 9: AFM airbrakes abnormal procedures

10.0 **Operational Control**

According to the SWA GOM, the Director of Operations was responsible for operational control[10] and had the authority to direct all operational functions. It stated the following personnel were also authorized to exercise operational control: The President, Vice President, Chief Pilot, Director of Maintenance for maintenance matters, flight control manager, and flight followers.

10.1 **Organizational Safety**

The Director of Operations reported that the operator does not have an aviation safety action program (ASAP) or a Flight Data Monitoring Program (FDM). He reported that their formal safety management system (SMS) is at the development stage.

F. List of Attachments

- Flight Crew Training Records
- Aircraft Flight and Maintenance Log
- DA20 Airbrakes - Airplane Operating Manual and Service Bulletin Compliance
- Flight and Operations Manual Excerpts
- Flight Crew September and October Schedules
- Jeppesen Charting
- Operator Performance Data – Pilot Trip Sheet
- Operator Trip Summary – Load Manifest

Submitted By:

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NTSB Senior Air Safety Investigator

[10] 14 CFR 1.1 states, Operational control, with respect to a flight, means the exercise of authority over initiating, conducting, or terminating a flight.