

**AAID# A13-02444**



**NASSAU, N. P., BAHAMAS**

# **AIRCRAFT ACCIDENT REPORT**

**RUNWAY EXCURSION**

**SAAB 340B**

**C6-SBJ**

**MARSH HARBOR, ABACO**

**BAHAMAS**

**June 13, 2013**



## **The Air Accident Investigation Department (AAID)**

The Air Accident Investigation Department (AAID) is the independent accident investigation unit under the Bahamas Ministry of Transport & Aviation (MOTA) charged with the responsibility of investigating all aviation accident and serious incidents in the Bahamas.

The AAID's function is to promote and improve safety and public confidence in the aviation industry through excellence in:

- Independent investigation of aviation accidents and other safety occurrences
- Safety data recording, analysis and research
- Fostering safety awareness, knowledge and action.

**The AAID does not investigate for the purpose of apportioning blame or to provide a means for determining liability.**

The AAID performs its functions in accordance with the provisions of the Bahamas Civil Aviation Act 2016, Civil Aviation (Investigations of Air Accidents and Incidents) Regulations 2017, Bahamas Civil Aviation (Safety) Regulations (BASR) 2015, Schedule 1 and 19, International Civil Aviation Organization (ICAO) Annex 13 and, where applicable, relevant international agreements.

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The AAID makes public its findings and recommendations through accident reports, safety studies, special investigation reports, safety recommendations and safety alerts. When the AAID issues a safety recommendation, the person, organization or agency is required to provide a written response within 90 days. The response shall indicate whether the person, organization or agency accepts the recommendation, any reasons for not accepting part or all of the recommendation(s), and details of any proposed safety action(s) resulting from the recommendation(s) issued.

Official Copies of accident reports can be obtained by contacting:

Air Accident Investigation Department  
2<sup>nd</sup> Floor, Manx Corporate Center  
West Bay Street  
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Nassau N. P., Bahamas  
1 (242) 397-5513 or (242) 397-5509

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**AIR ACCIDENT  
INVESTIGATION DEPARTMENT  
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P. O. BOX N-3727  
WEST BAY STREET  
NASSAU N. P., BAHAMAS**

## **AIRCRAFT ACCIDENT REPORT**



**SAAB 340B  
C6-SBJ**

**RUNWAY EXCURSION  
MARSH HARBOR, ABACO, BAHAMAS  
JUNE 13, 2013**

Abstract: This report outlines the circumstances involving the accident of a SAAB 340B aircraft registered to Advance Aviation Limited, doing business as SkyBahamas Airlines. The aircraft with registration C6-SBJ was involved in a runway excursion while landing during a thunderstorm at Marsh Harbor International Airport, Marsh Harbor, Abaco, Bahamas on June 13, 2013.

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## EXECUTIVE SUMMARY

On June 13, 2013 at approximately 1750UTC (1:50pm local), C6-SBJ, a SAAB 340B aircraft registered to Advance Aviation Limited and operated by Sky Bahamas Airlines, a Bahamas AOC holder, was involved in a runway excursion during the landing sequence at Marsh Harbor International Airport, Marsh Harbor, Abaco, Bahamas (MYAM).

The flight was a scheduled passenger flight on an instrument flight rules (IFR) flight plan from Ft Lauderdale, Florida (KFL) to Marsh Harbor, Abaco, Bahamas (MYAM) as SkyBahamas Flight # 9561 (SBM9561). The aircraft departed KFL at 1706UTC (1:06pm local) with 21 passengers and 3 crew members. The flight enroute was uneventful. While attempting to land on Runway 09, during heavy rain showers, the aircraft touched down and bounced several times before finally departing the runway surface to the right, approximately 6,044 feet from the threshold of Runway 09 and approximately 60 feet from the end of runway 09. During the excursion the aircraft travelled through a runway water drain-off area and came to rest in a swampy area on a heading of 131 degrees.

As a result of the excursion, the right underside of the fuselage, right propeller, nose landing gear and right wing were substantially damaged. There was also minor damage to at least one of the Runway 09 edge lights. As a result of the accident the airport was closed briefly. Weather conditions at the time of the accident were reported as instrument meteorological conditions (IMC) with heavy rain and thundershowers in the area of the airfield. There were no reports of serious injuries as a result of this occurrence.

The official notification of the accident was made to Bahamas Civil Aviation Department (BCAD) shortly after the occurrence and the investigation commenced. The investigation was conducted by the AAID (formerly AAIPU) and assisted by Airworthiness and Operations Inspectors seconded from the Flight Standards Inspectorate office. Assistance was also received from the Swedish Accident Investigation Authority and SAAB Group.

The Air Accident Investigation Department has determined that the probable cause of this accident was the decision of the crew to initiate and continue an instrument approach into clearly identified thunderstorm activity over the landing field during landing, resulting in a loss of control of the airplane from which the flight crew was unable to recover and subsequent collision with obstacles and terrain resulted during the runway excursion.

Contributing to the severity of the accident was the poor decision-making and lack of situational awareness by the crew while attempting to land during a thunderstorm. Also contributing to the severity of the accident was the thunderstorm, convective activity and heavy rain over the field at the time of the accident.

Safety issues raised in this report include: Pilot training in recognizing thunderstorm hazards and recovering from unusual attitudes and radar interpretation. Pilots were required to be given additional training in the following deficient areas uncovered:

- Aeronautical Decision Making
- Adverse weather flying
- Crew Resource Management
- Aircraft Systems
- Civil Aviation Regulations and
- Company Standard Operating Procedures

Recommendations concerning these issues were addressed to the Civil Aviation Department and SkyBahamas Airlines.

## **FOREWARD**

April 30, 2017

Mrs. Glenys Hanna-Martin  
Minister - Transport & Aviation  
3<sup>rd</sup> Floor, Manx Corporate Center  
West Bay Street  
P.O. Box N-3727  
Nassau, N.P., Bahamas

Madam:

The Air Accident Investigation Department is duty-bound to submit this report on the circumstances of the accident involving C6-SBJ, a SAAB 340B aircraft, registered in the Bahamas to Advance Aviation Limited and operated by SkyBahamas Airlines. The aircraft was involved in an accident as a result of a runway excursion that occurred while landing during heavy rain showers at Marsh Harbor International Airport on June 13, 2012 at approximately 1:50pm local (1750 UTC).

This report is submitted pursuant to Civil Aviation (Investigations of Air Accident and Incident) Regulations, 2017 and Annex 13 to the Convention on International Civil Aviation (ICAO). In accordance with referenced regulations and annex, the fundamental purpose of such investigation is to determine the circumstances and causes of these events, with a view to the preservation of life and the avoidance of similar occurrences in the future. It is not the purpose of such investigations to apportion blame or liability.

This report contains facts, which have been established up to the time of publication. Information is published to inform the aviation industry and the public of the circumstances surrounding this accident. The contents of this report may be subjected to alterations or corrections if additional factual information becomes available.

Regards



Capt. Delvin R. Major  
Chief Investigator of Air Accidents  
Air Accident Investigation Department  
2<sup>nd</sup> Floor, Manx Corporate Center  
West Bay Street  
Nassau, N. P., Bahamas

**AIR ACCIDENT  
INVESTIGATION DEPARTMENT**

**TITLE**

**Registered Owner:** Advance Aviation Limited

**Operator:** Sky Bahamas Airlines

**Manufacturer:** SAAB

**Aircraft Type:** SAAB 340B

**Nationality:** Bahamas

**Registration:** C6-SBJ

**Place of Accident:** Runway 09, Marsh Harbor International Airport, Abaco, Bahamas

**Date and Time:** June 13, 2012 at 1750 UTC (1:50pm EST)

**Notification:** DCA, NTSB, FAA, SAAB, ICAO

**Investigating Authority:** Bahamas Air Accident Investigation Department

**Investigator in Charge:** Mr. Philip Romer

**Accredited Representatives:** Mr. Nicolas Seger, Swedish Accident Investigation Authority

**Technical Advisors:** Anders Bergstrand, SHK Advisor FDR/CVR,  
Aircraft Systems and Cabin Safety  
Jan Pettersson, SHK Advisor, Aircraft Systems and Maintenance  
Stefan Thuresson, SHK Advisor, Structures and Stress  
Jan Erik Andersson, SHK Advisor, Chief Coordinator Accident  
Investigations

**Releasing Authority:** Civil Aviation Department, Nassau, N. P., Bahamas

**Date of Draft Report Publication: August 27, 2015**

## ABBREVIATIONS & TERMINOLOGY

When the following terms are used in this report, they have the following meanings:

AAIPU	Air Accident Investigation and Prevention Unit	a) a person is fatally or seriously injured as a result of: — being in the aircraft, or — direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or — direct exposure to jet blast, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or
ATS	Air Traffic Services	
BASR	Bahamas Civil Aviation (Safety) Regulations	
CRM	Crew Resources Management	
CVR	Cockpit Voice Recorder	
EST	Eastern Standard Time (-4 hours to convert from UTC)	
FDR	Flight Data Recorder	
FDAU	Flight Data Acquisition Unit	
ICAO	International Civil Aviation Organization	b) the aircraft sustains damage or structural failure which: — adversely affects the structural strength, performance or flight characteristics of the aircraft, and — would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or
ILS	Instrument Landing System	
IFR	Instrument Flight Rules	
IMC	Instrument Meteorological Condition	c) the aircraft is missing or is completely inaccessible. Note 1.— For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO. Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.
KIAS	Knots Indicated Airspeed	
KFLI	Ft. Lauderdale Int'l Airport	
MET	Meteorological Office / Department	
(M)	Magnetic	
METAR	Weather Report furnished by Meteorological Department	
NM or nm	Nautical Miles	
SOP	Standard Operating Procedures	
STC	Supplemental Type Certificate	
VFR	Visual Flight Rules	
UTC / Z	Universal Coordinated Time / Zulu time	

## DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for Aircraft Accident and Incident Investigation, they have the following meaning:

**Accident.** An occurrence associated with the operation of an aircraft that takes place between the times any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

**Accredited representative.** A person designated by a State, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State.

**Adviser.** A person appointed by a State, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

**Aircraft.** Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

**Causes.** Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident.

**Fatal injury.**- means any injury which results in death within 30 days of the accident.

**Flight recorder.** Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

**Investigation.** A process conducted for the purpose of accident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations.

**Investigator-in-charge.**A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

Note.— Nothing in the above definition is intended to preclude the functions of an investigator-in-charge being assigned to a commission or other body.

**Maximum mass.** Maximum certificated take-off mass.

**Operator.** A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

**Preliminary Report.** The communication used for the prompt dissemination of data obtained during the early stages of the investigation.

**Safety recommendation.** A proposal of the accident investigation authority of the State conducting the investigation, based on information derived from the investigation, made with the intention of preventing accidents or incidents.

**State of Design.** The State having jurisdiction over the organization responsible for the type design.

**State of Manufacture.** The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

**State of Occurrence.** The State in the territory of which an accident or incident occurs.

**State of the Operator.** The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

**State of Registry.** The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International

**“State of Design”** - The State having jurisdiction over the organization responsible for the type design

**“State of Manufacture”** - The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

## 1.0 FACTUAL INFORMATION.

### 1.1 HISTORY OF THE FLIGHT

On Thursday June 13, 2013 at approximately 1750UTC (1:50pm local time), a fixed wing, twin turboprop regional airliner, was involved in an accident as a result of a runway excursion while landing during heavy rain showers at Marsh Harbor Int'l Airport, Marsh Harbor, Abaco, Bahamas.

The aircraft, a SAAB 340B aircraft was operated by SkyBahamas Airlines and bore Bahamas registration C6-SBJ, serial number 316. C6-SBJ departed Fort Lauderdale Int'l Airport (KFLA), Fort Lauderdale, Florida in the USA as Tropical Sky 9561.

The airline, SkyBahamas Airline is a Bahamas Air Operator Certificate Holder with approved scheduled operations to and from Fort Lauderdale International Airport, Florida USA (KFLA) and Marsh Harbor Int'l Airport, Marsh Harbor, Abaco in the Bahamas.

The crew received weather information and IFR route clearance from KFLA Control Tower. This passenger carrying flight departed KFLA at 1706UTC (1:06pm local) on an instrument flight rules (IFR) flight plan. The point of intended landing was Marsh Harbor International Airport, Abaco, Bahamas (MYAM).

The crew selected runway 09 at MYAM for landing. At 17:45:30, the aircraft leveled off at 1,500 feet ASL on a heading of 096 degrees magnetic, with airspeed of 236 knots indicated (KIAS). The flaps were extended to 15 degrees at 17:47:18 with the aircraft level at 1,300 feet ASL, approximately 4.2 nm on the approach. The autopilot was disconnected at 17:47:26 with the aircraft level at 1,300 feet ASL, approximately 3.8 nm on the approach. Heading was 097 degrees magnetic and airspeed was 166 KIAS. The Landing Gear was extended and in the down and locked position by 17:48:01 as the aircraft descended through 730 feet ASL. At 17:48:03, the flaps were extended to landing flap 20 degrees with the aircraft approximately 1.9 nm from the runway on the approach. At 17:48:47, as the aircraft approached the threshold, the power levers were retarded (from 52

degrees) and the engine torques decreased from approximately 20%. Approximately one second later, the aircraft crossed the threshold at a radio altitude of 50 feet AGL on a heading 098 degrees magnetic and airspeed of 171 KIAS. The crew encountered rain showers and a reduction in visibility. The aircraft initially touched down at 17:49:02 with a recorded vertical load factor of +2.16G\*,<sup>1</sup> approximately 14 seconds after crossing the threshold.

There were no indications on the runway to indicate where the initial touchdown had occurred. Upon initial landing however, the aircraft bounced and became airborne, reaching a calculated maximum height of approximately 15 feet AGL.

The aircraft bounced a second time at 17:49:07 with a recorded vertical load factor of +3.19\* G. During this second bounce, the pitch attitude was 1.8 degrees nose down, heading 102 degrees magnetic and airspeed 106 KIAS.

The aircraft made consecutive contact with the runway approximately three times. The third and final bounce occurred at 17:49:14 with a recorded vertical load factor of +3.66G\*. During the third bounce, the pitch attitude was 2.2 degrees nose down, heading 099 degrees magnetic and airspeed 98 KIAS.

As a result of the hard touchdown, damage was sustained to the right wing and right hand engine/propeller. The right hand engine parameters recorded a rapid loss of power with decreasing engine speed and torque, and subsequent propeller stoppage.

The aircraft veered off to the right at approximate time of 17:49:20 on a heading of 131 degrees magnetic at a point approximately 6,044 feet from the threshold of runway 09.

The recorded airspeed was 44 KIAS with the left hand engine torque at 26 % and the right hand engine torque at 0%. The aircraft came to a full stop at approximate time 17:49:25 on a heading of 231 degrees magnetic.

When the aircraft came to a stop, the flight and cabin crew and twenty-one (21) passengers evacuated the aircraft. The evacuation was uneventful using the main entrance door. Due to the damage sustained by the right wing and engine, evacuation on

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<sup>1</sup> \* **Note:** The indicated values for vertical acceleration may not be an accurate indication of the max g-forces obtained during the event. Due to the sampling rate of the parameters the real values might be considerably higher than the values recorded. Further to this, the accelerometers on the aircraft are located close to the aircraft center of gravity which means that the forces further

forward and aft of accelerometer locations most likely were higher than recorded. Consequently the values presented in the report (2.16G, 3.19G and 3.66G) do not likely represent accurate peak values obtained during the event.

the right side was not considered. The evacuation occurred during heavy rainfall.

No injuries were reported as a result of the accident or evacuation process. The airplane sustained substantial damage as a result of the impact sequence.

The elevation of the accident site was reported as approximately 10 feet Mean Sea Level (MSL). Instrument Meteorological Conditions (IMC) prevailed at the time of the accident.

The cockpit voice recorder (CVR) uncovered that this crew used no crew resource management or adherence to company standard operating procedures.

During the final seconds of the flight, there was complete confusion on the flight deck as to who was in control of the aircraft.

After failure of the windshield wiper on the left side of the aircraft, the captain continued to maneuver the aircraft despite having no visual contact of the field due to heavy rain.

Sterile Cockpit procedures were not adhered to by this crew as they continued with non-essential conversation throughout the flight regime from engine start up in KFLL up until the “before landing checklist” was requested prior to landing.

## 1.2 INJURIES TO PERSONS

Injuries	Crew	Passengers	Total
Fatal			
Serious			
Minor			
None	3	21	24
<b>TOTAL</b>	<b>3</b>	<b>21</b>	<b>24</b>

## 1.3 DAMAGE TO AIRCRAFT

The aircraft was substantially damaged as a result of this occurrence.

## 1.4 OTHER DAMAGE

The only damage other than what was sustained by the aircraft occurred to one runway edge light which was destroyed as a result of the runway excursion. No damages to other aircraft, vehicles, buildings or the environment were reported.

## 1.5 PERSONNEL INFORMATION

### 1.5.1 THE CAPTAIN

The pilot in command of C6-SBJ at the time of the accident was a 30-year-old male, with a valid (Bahamas) Airline Transport Pilot License. His licenses are inclusive of Airplane Multi and Single Engine Land and Private Pilot Privileges. He is type rated on the SAAB 340B aircraft.

The total hours flying experience as a pilot was 8,500 hours and the hours flying experience on the SAAB 340B was 4,700 hours up to the time of the accident. The PIC held a valid (Bahamas) First Class Medical Certificate with no limitations or waivers.

### 1.5.2 THE FIRST OFFICER

The second pilot (first officer) of C6-SBJ was a 21-year-old male who held a valid Commercial Pilot License (Bahamas and USA). His licenses included Airplane Single and Multiengine Land with Instrument ratings. He was also type rated on the SAAB 340B. The second pilot also held a valid (Bahamas) First Class Medical Certificate with no limitations or waivers. The total flying hours of the second pilot was not known.

### 1.5.3 CABIN CREWMEMBER

There was one Cabin Crew Member onboard C6-SBJ, the minimum required for this type aircraft. The Cabin Crew Member was a 33 year old male whose responsibility was to perform cabin safety services while onboard this commercial flight. He held a valid Cabin Crew Member License and was endorsed for this aircraft type. He also held a valid (Bahamas) Second Class Medical Certificate.

## 1.6 AIRCRAFT INFORMATION

### 1.6.1 AIRCRAFT HISTORY.

C6-SBJ was a fixed-wing, multi-engine Bahamas registered aircraft. Saab/Fairchild Company manufactured it in 1993. It was model number 340B, and bore serial number 316. It was owned by Advance Aviation Ltd and operated by Sky Bahamas Airlines. The total time in service of this aircraft as recorded on the Aircraft Technical & Journey Log on 13/06/13 was 49,097 flight hours.

The aircraft was fitted with two General Electric CT7-9B Turbo-prop engines and two Dowty /

Aerospace R390/4-123-F/27 propellers. The aircraft was listed in the normal category, transport classification and was issued an Airworthiness Certificate on June 18, 2012 by The Flight Standards Inspectorate.

#### 1.6.2 AIRCRAFT FUEL

The aircraft departed Fort Lauderdale International Airport (KFLL) for Marsh Harbor International Airport (MYAM) with approximately 3,200 pounds of fuel on board as recorded on the Load Manifest / Weight & Balance form.

#### 1.6.3 AIRCRAFT LOAD

The aircraft type certificate listed the maximum allowable takeoff weight at 29,000 pounds<sup>2</sup> and the aircraft was dispatched with 26,942 pounds as evidenced on the load manifest / weight & balance form.

### 1.7 METEOROLOGICAL INFORMATION

Bahamas Area Forecast issued on the day of the accident indicated: **Special Features:** High Pressure Ridge at surface to mid / upper level trough with unstable conditions during the period.

Significant Weather: For the Northwest/Central Bahamas: Clouds scattered to Broken from 1,200 feet to 2,000 feet; Scattered to Broken from 4,000 feet to 5,000 feet and occasionally Broken from 7,000 feet to 9,000 feet, merging with layers from 22,000 feet to 24,000 feet. Heavy scattered rain showers / thunderstorm and rain with moderate to severe turbulence were forecasted.

It was daylight, overcast, with rain showers moderating between light to heavy in areas on and around the airport at the time of the accident.

### 1.8 AIDS TO NAVIGATION

Navigational Aids were not a factor in this accident.

### 1.9 COMMUNICATIONS

The ATS communication facilities available to aircraft at MYAM are inclusive of Unicom frequency 122.800 MHZ, Nassau Radio primary 128.000 MHZ and secondary 124.200 MHZ frequencies and Freeport Approach frequency 126.500 MHZ.

There were also available Satellite-based remote radio for communications with Nassau Radio within 90 miles, at low altitudes, and while on the ground at the airport.

Cockpit Voice Recording reveals at 1:50pm local, Tropical Sky 9561 requested “would like to go ahead and terminate IFR into Marsh Harbor.” Tropical Sky 9561 proceeded with its approach to land VFR. At 1:58pm local Tropical Sky 9561 requested, “Any traffic Marsh Harbor?” There were no responses. A previous aircraft was overheard on the recordings as he was completing landing procedures.

### 1.10 AERODROME INFORMATION

Marsh Harbor International Airport, MYAM, is a government-operated airport with Port of Entry privileges. It is located in the Bahamas at coordinates 26 degrees 30'36.46N and 077 degrees 05'06.43W. It is elevated eight (8) feet above Mean Sea Level (MSL). It is serviced by one (1) prepared Runway 09/27. The dimension of Runway 09/27 is 6,100 long x 100 feet wide. The runway pavement texture is Asphalt.

On Runway 09, there are threshold lights, which are green at low visibility and at night. On Runway 27, there are white threshold lights and runway end lights. Both Runways 09/27 have edge lights. There are also taxiway lights, apron lights and apron floodlights available.

The aerodrome is equipped with two (2) T-1500 Oshkosh rescue units.

### 1.11 FLIGHT RECORDERS.

#### 1.11.1 FLIGHT DATA RECORDER (FDR)

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<sup>2</sup> Note: The original maximum allowable takeoff weight for Saab 340B aircraft is 28,500 pounds. However, aircraft C6-SBJ had Service Bulletin Saab 340-51-010 (Mod. No. 2438) incorporated

which increased its operational weights by 500 LB which means that the maximum allowable takeoff weight was 29,000 pounds.

The Flight Data Recorder (FDR) was a Honeywell Solid-State unit, which was configured to record data at a rate of 64 words per second (wps); the recording system included a Teledyne Flight Data Acquisition Unit (FDAU). At the 64 wps data rate, the unit was capable of recording more than the required minimum of 25 hours.

The FDR was undamaged and was therefore downloaded without removal of the CSMU. The unit captured approximately 107 hours of flight data, which captured the occurrence flight.

The FDR data indicated recording anomalies with the LH Elevator Position and Rudder Position. The Rudder Position exhibited the same anomalous characteristics on the previous flights, whereas the LH Elevator Position was recording good data on the previous flights intermittent problem. The data suggested possible issues with the associated position sensors on the aircraft.

#### 1.11.2 COCKPIT VOICE RECORDER (CVR)

The CVR was a Solid-State 2-hour unit which recorded the pilot radio channels and an extra channel for the last 30 minutes at high quality (HQ), and a mixed channel (radio channels combine) and cockpit area microphone channel (CAM) for the last 2 hours at standard quality (SQ). The HQ and SQ channels overlapped for the last 30 minutes of the recording.

The CVR was undamaged and was downloaded without removal of the CSMU. The download produced five audio files in standard wav format for playback and transcription. The entire flight was captured, from the takeoff in Fort Lauderdale to the landing and runway excursion at Marsh Harbor. The recording was approximately 2 hours and 5 minutes in length.

The CVR audio was synchronized to the FDR data by matching several events, which included the flight's broadcasts to Marsh Harbor traffic (VHF Keying recorded on the FDR), and the multiple runway touchdowns (with two bounces) that were also identified in both data sources (Vertical G spikes on the FDR)

### 1.12 WRECKAGE AND IMPACT INFORMATION

Following is a summary of the observations made during the technical field examination of aircraft C6-SBJ, performed during September 10-11

at Marsh Harbor International Airport (MYAM), Great Abaco Island, Bahamas.

At the time of the accident the aircraft had, according to available records, accumulated 49,060 flights and 45,680 flight hours. Service Bulletin Saab 340-51-022 allowing operation up to 60,000 flight hours had not been incorporated on the subject aircraft. The initial Design Service Goal in terms of flight hours is stated to be 45,000 flight hours.

The field examination was conducted on request of the AAIPU by personnel from Saab AB, appointed as Advisors to the Swedish Accident Investigation Authority, SHK.

The purpose of the field examination was to perform a factual damage survey of the aircraft in order to support the continued accident investigation.

The observations and results represent the status of the aircraft at the time of the field examination. The aircraft had been recovered after the accident and transported to another location for the examination.

The aircraft was visually inspected in order to obtain an overall status of its structure, systems and interior.



The examination of the aircraft was carried out without any sophisticated devices or equipment, only torches, cameras and standard tooling were used to inspect and document the status of the aircraft.

It should be emphasized that it has not, for practical reason, been possible to examine all areas of the aircraft. The accesses for inspection of some areas of the aircraft were limited. The lower fuselage/wing area and nose landing gear wheel well are examples of areas that were not fully accessible.

Additionally, the aircraft was in some respect, not fully secured allowing a full general visual inspection. Thus, some removable panels /

## **Structure and Systems**

### **A. Forward Fuselage**

1. The nose landing gear (Cylinder, Rims/Wheel Steering mechanism devices) had collapsed and separated from the upper portion of the piston. The impact created a large deformed and punctured/torn area aft of the nose gear bay area. Nose gear well walls (L/H and R/H side) have been shear buckled and found to have numerous ripples.
2. Longitudinal beams located inside of the electrical compartment on both (L/H and R/H at BL 18.3) sides were locally cracked and deformed.
3. NLG landing doors severely damaged - distorted and deformed. The associated fittings were ruptured.
4. The attachments of the weather radar (inside the nose radome) were found to be broken (the lugs of the component).



### **B. Cabin section**

1. The main entrance door was found to have an indentation through the aluminum honey comb panel (outer skin and core). This is a result from some sort of debris from the outside. Some nicks and gouges were also confined to the side panel as a result of minor debris.

fairings were removed to gain access for visual / general inspection.

2. Antennas on the bottom panel were partly ruptured (DME & VHF antennas) as a result of contact with the ground.
3. The over wing fairing panel on the R/H side was severely damaged, broken and ruptured.

### **C. Wing structure-Wing box**

1. The wing box was severely damaged and more or less ripped off from the center portion at WS 42 on the right hand side. A kinked and twisted (nose down) wing was noticed on the right side.

### **D. R/H Wing Structure**

1. This wing was severely damaged, kinked and twisted. The main spars (forward and rear) were both completely broken at WS 42. However, the attachment fittings between the fuselage/wing were deemed to be intact.
2. The lower wing panel (between WS 42 and WS 120), area from attachment fittings to nacelle including stringers, were distorted, cracked and afflicted with large permanent settings.
3. Internal ribs at the board portion of the wing box were severely deformed and detached from the lower panel.
4. Due to contact with the runway, the lower panel was grinded resulting in significant material loss adjacent to WS 42.
5. The upper wing panels including the internal stringers sustained severe deformations and distortions at inboard part.
6. Some extensive tear in span wise direction was also noticed.
7. The inboard leading edge portion was ruptured and deformed at the inboard section as a result of the ground contact.
8. The lower trailing edge panel had some indications of high temperature, the paint was locally discolored and blistering paint was noticeable.



#### **E. L/H Wing Structure**

1. The subject wing section was revealed to have deformations in the lower panel from the nacelle extending inboard to the inboard flap fitting (i.e. between WS 120 – WS 60). The deformations were concentrated to the aft edge of the panel where the rear spar is attached through fasteners. Some separation was noted between the wing skin and the lower cap of the rear spar.

#### **F. Undercarriage structure**

1. No visible damage or other discrepancies were identified on the L/H and R/H trunnion, drag brace fittings and connecting links (i.e. undercarriage structure).
2. However, the locking mechanism mounted on the strut was found with damaged to some minor parts.

#### **G. Engine Nacelles**

1. The nacelles were only inspected by opening up forward and center cowl doors. With engine and exhaust devices installed, it was obvious that the access for inspection was compromised.

#### **H. R/H Nacelle**

1. All the prop blades were separated from the hub and the spinner had a significant depression due to contact with some ground installation.
2. The oil cooler had signs of severe grinding and depressions (ground contact).
3. The air intake had severe damage at the forward zone.
4. The aft engine mount was found to be broken; one of the four columns was cracked.

#### **I. L/H Nacelle**

1. The outer portions of all the four blades were locally damaged in terms of missing small parts, de-laminations and splintered zones were identified.
2. Inspection of the nacelle structure revealed no visual damage

#### **J. R/H Flap**

1. The flap was damaged in conjunction with the severe damage on the wing box. A kinked flap was noticed as at the inboard section.

#### **Fuselage Interior - Cabin and Cockpit safety and settings**

##### **K. Cabin Safety equipment**

1. In the RH forward bulkhead compartment, two oxygen bottles with masks and one fire extinguisher was found. Oxygen bottles and PBD were properly attached in their brackets. The snap-lock for the fire extinguisher was open. The extinguisher was still in its bracket.
2. The flashlight at the FA seat was secured and flashing red, indicating normal operation.
3. The PBE located at the last seat row was found outside its storage compartment on the floor in front of the last seat row.
4. The Fire extinguisher located on the floor at the last seat row was still in place and secured.
5. In the forward Overhead Bin, two life vests (without cartridges), portable oxygen masks, a medical kit and a Full Face oxygen mask was found. The protection cap for the FF mask supply connector was not attached. The FF mask was squeezed tightly in the compartment behind the life vests.

##### **L. Belts**

1. All seatbelts were present and attached to the seat structure.
2. The flap and buckle at seat 7A was harder to operate compared to other belts. However, it was no problem to fasten and open the seatbelt.

3. The seatbelt flap and buckle at the FA Station was found to operate as normal. Some resistance was found when extracting the belt by pulling.

#### **M. Exits**

1. The main door exit was operating in a normal way; however, since the fuselage had a slight roll to the right, the door became heavy to open when pushing outwards.
2. The RH fwd emergency exit operated normally.
3. Both LH and RH over wing exit doors operated normally.
4. Exit Handle Covers were missing on all exits and found at various places in the cabin.
5. The RH and LH emergency exit doors were partly blocked by the reclined seats in front of the exits.
6. The Safety On Board folder shows that the over wing exit door shall be kept inside the aircraft and placed in a seat near the exit. The placard located at the exit shows that the door shall be put outside.

#### **N. Seats**

1. Backrests at seats at 2B, 3B, 4A and 7B folds easily forward. This was also found to be documented in the cabin log dated 5/4/2013.
2. Seat 3A reclines, but is no recline seat.
3. Armrest at seat 5B is “sloppy”.
4. Seat 5C reclines and partly obstructs the RH emergency exit. 5C is a recline seat.
5. Seat 5A reclines and partly obstructs the LH Emergency exit. Seat 5A is a recline seat.
6. The table on seat 5B easily comes loose from its stowed/locked position by just pushing on the seat backrest.
7. The seat cushion on seat 9A was found to be loose.
8. No damage on any seat structure/floor attachment was found.
9. The FA seat sliding function was found to be “sloppy” and not secured in the most inward position.
10. A separated ball-bearing was found in the FA seat assembly.
11. The backrest of seat 3B was in a forward folded position, the table was not secured.

#### **O. Overhead bins**

1. All passenger overhead bins were found to be open.
2. The last and the two most forward “crew only” overhead bins were closed.
3. All overhead bins were found to be attached to the structure.

#### **P. Panels and light**

1. Debris from light tubes were found in the aisle, mostly within the area around the emergency exits.
2. One Light tube was found on the floor in front of the avionics rack in the area where the air stair is stowed.
3. Overhead panels at location 3C and 5A had detached and were hanging in their wires.
4. One side of the LH emergency exit “EXIT” sign was missing and found separated in a nearby seat.

#### **Q. Galley and toilet**

1. The lower and top drawers on the LH Galley were not secured with the additional “twist” latches.
2. The smaller pullout drawers on the RH Galley were not secured with the additional “twist” latches.
3. The Trolley was fully open.
4. Wall panels in the toilet had detached and were found on the floor.
5. The toilet bowl looked normal.
6. No visual damage to the Galley structure.

#### **R. Cockpit**

1. The LH pilot seat height adjustment was found to be unserviceable making the seat positioned at the lowest position when used.
2. Both control wheels were in a full RH turn position.
3. The LH pilot oxygen mask was found to be squeezed in between the seat lower structure and the wall partly obstructing the backwards movement of the seat.
4. The co-pilot oxygen mask was found to be squeezed in between the seat lower structure and

the wall partly obstructing the backwards movement of the seat.

5. The RH fire extinguisher had detached and was found on the right hand side of the co-pilot seat.
6. The crash-axe was missing from its location.
7. Seatbelts were easy to open/close, some resistance was found when pulling the belt for extension.
8. Both belts locked when pulled quickly.
9. Recline function was operational on both seats.
10. Slide fwd. /back was operational on both seats (after removal of oxygen masks).
11. Up/down adjustment worked as intended on the RH Co-pilot side.
12. The WXR panel was set to Gain Max, STB (button pushed), TILT 0 and Range 50.
13. The settings of some switches on the OH panel indicate that the EMG checklist had been executed.
14. Both windshield wiper switches were in the OFF position.
15. The co-pilot flashlight was operational.
16. The pilot flashlight was not found.
17. The Crew Hatch could be set to both “Ventilation” and “Open” as normal.
18. The crew escape “rope” was in place and in a “not used” condition.
19. The LH PLA was movable. The right PLA was stuck.
20. The LH CL was movable. The right CL was stuck.
21. The LH Front Windshield heat was placarded as inoperative.
22. The Altitude Pre-alert was set to 1300ft.
23. The Altimeter Barometer setting on the LH altimeter was set to 30.04.
24. Some newspapers were found on the cockpit floor below the center pedestal.
25. On the RH CB panel, the CB for TCAS was “marked” with a green tie rap, reason unknown.
26. On the RH CB panel, the CB for the R Fire Bottle was open.
27. The floor panel to the Emergency Hyd. Pump was open.

## **S. Avionics Rack**

1. The Avionics Rack seemed to be in a normal (but dirty) condition. No structural damage was found.

### **1.13 MEDICAL AND PATHOLOGICAL INFORMATION**

There were no reported fatality or injury at the time of the accident.

### **1.14 FIRE**

There was evidence of fire as soot was evident on the underside of the wing.

### **1.15 SURVIVAL ASPECTS**

The aircraft accident was survivable because the fuselage remained intact without any outside obstacle intrusion.

### **1.16 TESTS AND RESEARCH**

The Transportation Safety Board of Canada Engineering Laboratory in Ottawa Canada tested the FDR/CVR.

#### Summary of CVR and FDR Recorders

#### **FDR**

1. FDR was found to have good quality information.
2. Data frame were present with no gaps.
3. Normal flights, no abnormalities were noted on takeoff and climb.
4. Approach was insignificant with no findings.
5. On landing no wind shear was detected.
6. On first bounce the airspeed was 130 knots, on the second bounce airspeed was 110 and on the third bounce airspeed measured at 100 knots at an altitude of 27 feet.

#### **CVR**

1. Quality of audio was good
2. 400 Hz sound heard (possibly from inverter) should not be heard on recorder
3. All radio channels were working

**1.17 ORGANIZATIONAL MANAGEMENT  
INFORMATION**

The airline, SkyBahamas Airline is a Bahamas Air Operator Certificate Holder with

approved scheduled operations to and from Fort Lauderdale International Airport, Florida USA (KFL) and Marsh Harbor Int'l Airport, Marsh Harbor, Abaco, Bahamas.

## 2.0 ANALYSIS

During the period August 6 through 12, the following individuals graciously assisted the AAIPU with the investigation into this accident involving C6-SBJ. Mr. Jan Erik Anderson, Mr. Anders Berstrand (representatives of SAAB and accredited representatives of the Swedish Civil Aviation Authority) and Mr. Ted Givens and Mr. Peter Kramer engineers of the recorders and vehicle performance branch of the Transport Safety Board of Canada.

As the preliminary plots of the FDR and draft of the CVR were completed a disturbing pattern emerged with regards to flight crew performance which, it was hoped, was isolated to just this crew and not fleet wide within SkyBahamas Airlines.

While the data plots of the FDR were being refined to be used to animate and reconstruct the final flight path up to the crash sequence, the CVR provided valuable insight as to what took place on the flight deck during the final approach, landings, and runway excursion and evacuation process.

As the goal of accident investigation is not to apportion blame, the following observations are listed here factually for the reader to arrive at their own conclusion as to what took place. All findings and observations listed here are actual recorded parameters of the FDR and actions as recorded and revealed by the CVR.

The information presented here is just preliminary and further information was uncovered as the in-depth analysis of the FDR parameters and animation was completed.

Information and findings listed were in order from the commencement of flight 9651 from Ft Lauderdale Florida to Marsh Harbor and involved the boarding, startup, taxi, takeoff, enroute, approach and landing sequence of the flight.

Analysis of Findings and deviations from company procedures or observations follows in italics and bold. They will also be included in the findings minus the observations and analysis portions.

1. From this flight and the previous flight recorded on the CVR it is obvious there were little or no communication between flight and cabin crew.

***The CVR did not record any instructions from the flight crew to the cabin attendant prompting to prepare the aircraft for taxi or to be seated for the takeoff. This pattern was also observed during***

***playback of the previous flight 9560 into Ft Lauderdale.***

2. Flight crew arrived into Fort Lauderdale during heavy rain showers and departed for Marsh Harbor presumably during VFR conditions.

***The CVR did not record the flight crew brief or discuss the “weather for departure or enroute”, nor did the CVR record the crew discuss “in the event of an emergency” during their before departure brief as is company procedures.***

**NOTE:**

The CVR was functional and recording from the boarding process in KFLI up until the accident and evacuation in MYAM. Therefore any reference to the CVR not recording certain actions or functions is an indication that the crew omitted to do the particular function, as every other function that was completed or conducted was recorded by the CVR.

3. During start up and taxi, checklist philosophy was not adhered to, checklist responses were hurried and rushed and there were no challenge and response to actions that needed a challenge and response.
4. Flight crew spent an exorbitant amount of time engaged in personal conversation during the taxi and not focused on runway incursion or excursion procedures. The CVR recorded no discussion by the crew of pre-takeoff and emergency procedures. Sterile cockpit was not observed during the period of startup up to the takeoff point.
5. During climb out and at a critical altitude (four hundred feet), just as flying pilot asked for “climb power, climb checks” non-flying pilot was observed making reference to a yacht which they were flying over, in contravention of company sterile cockpit and profile policies and requirements.
6. During the enroute portion of the flight, pilots continued the non-essential conversation and at no time did the conversation focused on the approach and weather at Marsh Harbor Airport. The CVR also did not record any discussion of an alternate airport by the flight crew in the event the runway could not be made.
7. After termination of radar following with Miami Center, the pilots started their descent and

approach without advising the cabin attendant. As the cabin attendant appeared familiar with his duties, he instinctively conducted the approach and before landing briefing, without prompting or directions from the flight deck.

8. (No chime was heard nor any instructions heard on the CVR to the cabin crew to prepare the cabin, throughout the flight, from before takeoff, to the time of the evacuation).
9. Approach checklist was not requested and possibly not conducted as evident from the CVR recording.
10. As the airplane commenced its approach, the pilot flying requested a “before landing check.” This check was so rushed by the non-flying pilot that it could not be interpreted from the CVR.  
*Again, all checks are a challenge and response. As this check was so rushed the non-flying pilot forgot to advance the propeller to the recommended position as required by checklist. This failure was evident on the FDR data plots as the propeller level stayed the same from the enroute phase up until the crash sequence.*
11. Crew resource management (CRM) was not evident during the approach phase of flight. The crew was aware of the thunderstorms and the fact that it was over the field, as on the CVR they both made reference to the fact that it was over the field.
12. Knowing the condition of the weather, the crew still never discussed the choice of diverting to another airport or entering a holding pattern until the weather passed. The non-flying pilot was adamant about landing at all cost, as he was overheard stating, “See if we can hurry and get in before....”
13. The pilot flying never challenged the non-flying pilot, as they were both stating at differing times that they had the runway in sight, then they lost sight of it, then they had it again and then lost it again, this process repeated several times up to the point of touch down. It was evident from the CVR recording that neither pilot definitively had the runway in sight. Both pilots was aware of the weather before 500 feet in altitude, which gave

them adequate time to shoot a missed approach, divert to another airport with VFR weather or hold at a predetermined position until the field had cleared enough to attempt a landing.

14. No CVR recording showed where crew advised traffic in the area of Marsh Harbor of their approach and intention of landing.
15. Descending through 500 feet and just prior to touch down, the pilot flying stated that he lost sight of the runway; just prior to this the non-flying pilot (PIC) lost his windshield wiper, as for whatever reason, it went over center and was stuck to the left side of the windshield. No decision was made to execute a missed approach as a result of the problems the crew encountered. The non-flying pilot, who just prior lost his windshield wiper, assumed control of the aircraft despite not being able to see the runway due to the heavy rain downpour. After realizing that he could not see the runway either, the flying pilot decided to give control of the aircraft back to the original flying pilot who again stated he had no visual. By this time the aircraft had touched down and bounce back in the air. The atmosphere in the cockpit at this time was chaotic as the control wheel was being exchanged between the pilot flying and pilot non flying based on who had sight of the runway at the time. It was evident from the CVR recordings that no one had a definitive visual of the runway and the field was zero-zero visibility in heavy rain.
16. Aircraft airspeed during the approach was unstable and non-standard. A go around or diversion was not considered nor attempted. There was a constant battle between the crew to slow down, or hurry up, or put in flaps to slow down, all of these non-standard procedures were an attempt to “beat” the weather in to land.
17. This constant exchange of the control wheel was not consistent with control wheel exchange as approved in the SOP and training program of SkyBahamas Airlines. As a result of no visual contact of the runway, the aircraft bounced three (3) times, each bounce progressively larger and higher than the last. The last bounce was measured at 27 feet (FDR data proves this height) above the runway. On the third bounce the nose

gear broke and it is possible the wing may have started to fail at this point.

18. No aileron or elevator control input by the crew was observed during or after the touchdown as per the FDR data reviewed which further confirms that during the bounces and crash sequence neither pilot had positive control of the aircraft.
19. No instructions were recorded on the CVR where the flight crew;
  - a. Advised the cabin attendant to commence the evacuation nor
  - b. Conducted the evacuation checklist
20. The crew had several opportunities to either divert to an airport with visual weather or hold and wait for the thunderstorm over the field to pass. Instead they elected to try and beat the weather as evidenced from the CVR.

### 3.0 CONCLUSIONS

The Air Accident Investigation Department has determined that the probable cause of this accident was the decision of the crew to initiate and continue an instrument approach into clearly identified thunderstorm activity over the landing field during landing, resulting in a loss of control of the airplane from which the flight crew was unable to recover and subsequent collision with obstacles and terrain resulted during the runway excursion.

Contributing to the severity of the accident was the poor decision making and lack of situational awareness by the crew while attempting to land during a thunderstorm.

Also contributing to the severity of the accident was the thunderstorm, convective activity and heavy rain over the field at the time of the accident.

### 3.1 FINDINGS

All findings and observations listed here are actual recorded parameters of the FDR and actions as recorded and revealed by the CVR. Information and findings listed will be in order from the beginning of flight 9651 from Ft Lauderdale Florida and will involve the boarding, startup, taxi, takeoff, enroute, approach and landing regimes of the flight up to the evacuation after the accident in MYAM. The information and findings here are a result of information extracted from the cockpit voice recorder (CVR) as well as the flight data recorder (FDR).

1. The flight crew did not prepare the cabin crew for departure as required by regulations and company procedures. Vital communication was nonexistent.
2. The crew failed to brief or discuss the weather for departure or enroute.
3. The crew failed to discuss “in the event of an emergency” scenarios during their “before departure” brief as is company procedures.
4. The crew failed to complete several important checklists as required. The checklists conducted were rushed and critical items omitted as evidenced by the CVR recordings.
5. Crew failed to observe sterile cockpit procedures during startup, run-up, taxi and takeoff as idle inappropriate conversation was recorded on the CVR during these critical moments when sterile cockpit is essential.
6. Crew, because of their non-stop, idle, non-essential conversations from engine start-up failed to advise cabin crew of required instructions during approach to landing into MYAM, again evidenced by CVR recordings.
7. The crew did not conduct enroute and approach checklist.
8. The “Before Landing” checklist was conducted but was so rushed and hurried that it appeared garbled and no challenge and response methodology was involved as required by company standard operating procedures.
9. Due to the lack of a challenge-response philosophy and the fact that the checklist was rushed, the non-flying pilot failed to **advance the propeller** to the recommended position as required by the “before landing” checklist. This failure was evident on the FDR data plots as the required propeller input remained the same from the enroute phase up until the crash sequence.
10. The crew was aware of the weather conditions at the field at Marsh Harbor; however, they never formulated a plan for diversion if the weather was bad at their time of arrival.
11. As the approach continued there were constant disagreements between both pilots as to who had the runway in sight. Due to the weather conditions, visibility of the runway was intermittent, yet the crew continued descending visually in an attempt to land the aircraft on a runway that was not in sight and not served by an instrument landing system (ILS) or other navigational aid used during inclement weather or periods of reduced visibility.
12. The non-flying pilot (captain) was adamant about landing at all cost, as he was overheard on the CVR stating, “See if we can hurry and get in before....”

13. The crew flew a non-stabilized approach and speed was not constant as they kept increasing and decreasing speed throughout the final approach.
  14. The captain, who initially was the non-flying pilot, while on final approach and below 500 feet AGL, assumed control of the aircraft from the flying pilot (first officer). At some point the captain lost use of his windshield wiper as it went over-center and was stuck. During the final moments of the approach. The copilot again assumed control of the aircraft and seconds before touch down, the captain (despite having no visual contact with the runway due to the intense downpour of rain and the non-use of his windshield wiper), again took control of the aircraft from the first officer.
  15. By the time the aircraft touched the runway, there were several control wheel exchanges between both pilots while neither had a visual of the runway.
  16. The aircraft bounced three (3) times, each bounce progressively larger and higher than the last. The last bounce was measured at 27 feet (FDR data proves this height) above the runway. On the third bounce the nose gear broke and it is possible the wing may have started to fail at this point.
  17. No aileron or elevator control input by the crew was detected during or after the touchdown as evidenced by the data retrieved from the FDR. This evidence further confirms that during the bounces and crash sequence neither of the pilots had positive control of the aircraft.
  18. The crew failed to instruct the evacuation process.
  19. The crew failed to conduct the emergency and evacuation checklist as required by company SOPs.
  20. Crew failed to adhere to regulations which required aircraft to avoid thunderstorms by at least 20 miles. The thunderstorm was practically over the field at the time the crew attempted to land and try “get in before it got worse.”
  21. The lack of proper CRM, complacency and a complete departure from company standard operating procedures and regulatory requirements were evident.
- 22. Additional Observations**
1. CRM was not evident with this crew. Decision making process of crew is a serious safety concern.
  2. Complacency was the order of the day, it appears throughout this and the previous flight recorded, familiarity with each other led to crew omitting duties because they knew the other person would do what is required. This is a serious departure from company policies and should be done regardless of who the crew happens to be. In addition to a departure from company policies, this is a serious safety concern that must be investigated by the Flight Standards Inspectorate.
  3. Crew, during interviews, stated wind shear as the possible cause of the accident. This statement by the crew has been disproved, as the data plots of the FDR and conversations of the CVR did not bolster this claim.
  4. Non Standard terminology was being used by crew e.g. during approach and configuration for landing the term used by the flying pilot was “set me up, however you like”.
  5. Checklist, though limited when conducted, appeared to have been conducted from memory and was rushed and no challenge and response was completed, switches were moved back and forth with no one confirming its position as required by company SOP.
  6. No call outs were recorded for speed, altitude, heading etc., as required by company SOP.
  7. Before landing checklist was not completed as pilot non-flying was focused on looking for the runway and cut short the checklist when he thought he saw it and missed a critical function (advance propeller to full travel).
  8. Failure to advance propeller levers during this approach could have had catastrophic consequences; had the decision been finally made to go around and the crew not realized

that the propellers were not at full travel required for takeoff.

9. There was a total lack of situational awareness. During the last few seconds of the flight no one was flying the aircraft, as the controls were constantly being transferred between the flight crew during the 3 bounces that occurred.
10. Weather (thunderstorms) and heavy rain showers though present during this accident was a contributing factor. The crew had the option well in advance to divert or even after attempting an approach, to execute a missed approach well in advance of this occurrence.
11. This approach was also in contravention of regulations, as aircraft are required to avoid thunderstorms by at least 20 miles.
12. Wind shear was not present and not a factor in the accident.
13. Un-stabilized approach and non-standard airspeed is a major contributing factor as the aircraft approached too fast in an attempt to beat the weather.

### **3.2 CONTRIBUTING FACTORS**

- Inexperienced and undisciplined crew.
- Lack of crew resource management training.
- Failure to follow company standard operating procedures.
- Condition known as “get-home-itis” where attempt is made to continue a flight at any cost, even if it means putting aircraft and persons at risk in order to do so.
- Failure to retrieve, observe and respect weather conditions.
- Thunderstorms at the airfield.

## 4.0 SAFETY RECOMMENDATIONS

### Recommendations

Recommendations are not listed in any particular order of occurrence or priority; they are just listed here based on the findings and observations of the data and information derived from the post-crash interviews and FDR, CVR analysis.

1. The Flight Standards Inspectorate mandated with oversight of AOC holders should reevaluate the SOP's in use by SkyBahamas Airlines to verify action taken by this particular flight crew is isolated and not consistent with current company training procedures.
2. It is recommended that the Flight Standards Inspectorate increase surveillance of AOC holders with emphasis on the actions of flight crew and their adherence to SOPs by conducting more frequent flight deck observation.
3. The Flight Standards Inspectorate must observe on an increased basis, the training and checks being delivered to crewmembers of SkyBahamas Airlines.
4. SkyBahamas Airlines should be required to examine its policies and a cultural change may need to be investigated and implemented to ensure crew are conducting themselves as professionals, despite their familiarity with each other during required duties.
5. Company should examine all its aircraft to verify area microphone and panel match, this can also eliminate or reduce the loud noise heard on the CVR.
6. Cockpit Voice Recorder Manufacturer should be petitioned to have high quality separate channel for 2 hours, as pilot channel could not be heard when cabin attendant is talking, as cabin attendant channel overrode pilot channel. This override of channel prevented a lot of the flight crew conversations, which are vital; to not be heard during the time the cabin attendant is conducting announcements.
7. The Flight Standards Inspectorate should ensure that all AOC holders operating this type of aircraft are required to ensure all recorders in its fleet are outfitted with the solid-state type of recorders as data is better preserved on this type of equipment.
8. The Flight Standards Inspectorate should ensure that SkyBahamas Airlines and all other operators of this type of equipment, ensure its maintenance personnel check setting on all remaining aircraft's FDAU to ensure time and date are correct (procedures in maintenance on how to accomplish this task) as the information for time and date on this particular aircraft was incorrect.
9. Transducers on left hand elevator and rudder position were found unreliable. The Flight Standards Inspectorate as part of their oversight functions should ensure that SkyBahamas Airlines and all other operators of this type of aircraft check all transducer on its aircraft fleet (procedures in maintenance manual on how to accomplish this task) to ensure their reliability.
10. The Flight Standards Inspectorate should require SkyBahamas Airlines and all other operators with this aircraft fleet be required to do a complete download of the CVR and FDR at prescribed intervals (at least twice a year), to ensure they are operating as per manufacturer's recommendations or regulatory requirement.
11. Company should be required to institute a flight data-monitoring program.
12. It is also recommended that Flight Standards Inspectorate ensure that the crew of this aircraft be removed from active line duty and re-examined for their fitness to hold type rating on this aircraft type. Training should also be given to this crew in the following deficient areas.
  - Aeronautical Decision Making
  - Adverse weather flying
  - Crew Resource Management
  - Aircraft Systems
  - Civil Aviation Regulations and
  - Company Standard Operating Procedures