

**FINAL AVIATION
ACCIDENT REPORT**

**BIRGENAIR FLIGHT
ALW-301**

**PUERTO PLATA,
DOMINICAN REPUBLIC**

FEBRUARY 6, 1996

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1.1 REVIEW OF THE FLIGHT

On February 6, 1996, at approximately 03:45 hours UTC, a Boeing 757, registration TC-GEN operated by the firm Birgenair as a charter flight by the Airline Alas Nacionales, had an accident minutes after takeoff from Gregorio Luperón International Airport, Puerto Plata, Dominican Republic. The flight was under an Instrument flight plan (IFR). The aircraft was destroyed and 176 passengers and 13 crewmembers died. The flight originated at 03:40 with a destination of Frankfurt, Germany, with stopovers in Gander, Canada and Shonefield, Berlin, Germany.

Approximately 2 ½ hours before flight departure time, the Department of Operations notified the crew of a mechanical failure of a Boeing 767 that required a change of equipment and the crew that was attached to the flight.

The new crew reported to the airport at approximately 02:15. There was an additional delay of an hour because of a delayed airline flight attendant.

Finally, the flight initiated takeoff at approximately 03:42:11. After a few seconds, the first officer made the standard call "80 knots" to which the captain answered that his airspeed indicator was not working. The first officer confirmed that his indicator was normal. The captain indicated to the first officer that he read the different velocities in order to continue takeoff.

The affected takeoff continued normally and at 03:42:27 the captain announced that his airspeed indicator started to work. At this time, the aircraft reached an altitude of 576 feet and a ground speed (GS) of 121 knots. At 03:44:07 at an altitude of 3,500 feet and a ground speed of 273 knots, the captain ordered the center autopilot to be connected. At this time, the confirmation of the auto-throttle appeared, and the VNAV and LNAV were connected. At 03:44:28, the captain communicated that something abnormal was happening, repeating it again 15 seconds later.

At this time, the first officer recognized that something abnormal was happening and communicated to the captain that his airspeed indicator was indicating 200 knots and decreasing.

At this time, the aircraft had an altitude of 5,344 feet with an indicated airspeed of 327 knots and a pitch attitude of +15.1 degrees and the captain responded that both indicators were incorrect and he asked "What should we do?" immediately ordering a check of the circuit breakers.

At 03:45:04 the captain commented that things happen when an aircraft remains of the ground for a while, like asymmetry of the elevators and other things. Seven seconds later he said, "We do not believe them" (referring to the EICAS messages).

At 03:45:28 at an altitude of 6,688 feet with an indicated airspeed of 352 knots and a pitch attitude of +15.1 degrees with the center autopilot connected the overspeed alarm sounded and the captain commented "This is not important" and ordered the circuit breaker for the overspeed warning pulled, interrupting the sound of the alarm.

At this time, the aircraft had an altitude of 7,040 feet, an indicated airspeed of 349 knots and a pitch attitude of +14.8 degrees.

At 03:45:52 the sound of the stick-shaker began, the center automatic pilot remained connected and the auto-throttle and VNAV disconnected. At an altitude of 7,132 feet and an indicated airspeed of 323 knots and a pitch attitude of +18.3 degrees, the power of both engines was reduced (EPR L=1.144, EPR R=1.152). Five seconds later power to both engines was restored (EPR L=1.620, EPR R=1.585). There was an increase of pitch attitude to +21.0 degrees and then the automatic pilot disconnected. The pitch attitude was unstable from +21.0 degrees to +5.0 degrees.

At 03:46:31 with an altitude of 5,984 feet, a ground speed of 194 knots and a pitch attitude of +14.4 degrees, power to both engines was returned to a low level (EPR L=1.162, EPR R=1.146), and moments of great confusion prevailed in the cockpit. The captain said "[We are] not climbing, what can I do?" maintaining a reduced throttle, and the first officer responded, "You should stop the descent...and I am selecting the altitude hold, sir."

Twenty-one seconds later at 03:46:52 the captain asked about the position of the power levers and the first officer responded that both were pulled back.

Immediately the captain ordered, "Throttle, throttle, don't pull back!" The first officer responded to him, "Okay, they are open, they are open."

At 03:46:57 they increased both power levels (EPR L=1.523, R=1.646) but at 03:46:59 the power of the left motor was reduced to a low level and the power of the right motor was maintained at maximum power (EPR L=1.251 R=1.622).

At 03:47:03 at an altitude of 3,520 feet at zero ground speed, a pitch attitude of -53.3 degrees decreasing to -80.0 degrees and a bank angle of -99.8 degrees, power continued to be asymmetrical (EPR L=1.089 R=1.626).

At 03:47:09 the GPWS (Ground Proximity Warning System) began to sound, "WHOOOP, WHOOOP, PULL UP," at an altitude of 2,368 feet, a pitch attitude of -17.6 degrees and a bank angle of -9.0 degrees. Varying these parameters two seconds later upon impact with the Atlantic Ocean at 14 NM to the northeast of Puerto Plata, with a pitch attitude of -34.3 degrees and a bank angle of -34.6 degrees; all occupants died and the impact resulted in 100% destruction of the aircraft.

1.2 INJURIES TO PEOPLE

<u>Injuries</u>	<u>Crew members</u>	<u>Passengers</u>	<u>Total</u>
Fatalities	13	176	189
Grave	0	0	0
Slight	0	0	0
Uninjured	0	0	0
Total	13	176	189

1.3 DAMAGE TO THE AIRCRAFT

As a result of the impact with the water, the aircraft was totally destroyed.

1.4 OTHER DAMAGE

No other damage was caused by or after the impact.

1.5 INFORMATION ABOUT PERSONNEL

Pilot in Command:

Name	Ahmet Erdem
Sex	Male
Date of Birth	03/12/34
Age	62 years
Nationality	Turkish
Profession	Transport Pilot for Linea Aerea
License #	312
Last medical check	03/12/95, valid until 03/12/96

Equipment:

Multiengine	03/11/68
Instruments, CAT II	04/12/94
Types	Viscount 794, DC-9, B-707, B-727, DC-8, B-757-200, B-767-200, B-737-300. B-757-200 05/27/92
Last training	03/12/95 United Airlines Flight Training Center SIM. B-757/767

Flight Experience:

Total time	24,750 hours
In B-757	1,875 hours
In the last 3 months	Dec. 95 – 59 hours, 25 min. Jan. 96 – 69 hours, 00 min. Feb. 96 – 00 hours, 00 min.

Duty time before accident- No assigned service from January 27, 1996

Relief Captain:

Name	Muhlis Evrenesoglu
Sex	Male
Date of Birth	7/18/44
Age	51 years
Nationality	Turkish
Profession	Transport Pilot for Linea Aerea
License #	754
Last medical check	11/29/95, valid until 11/29/96

Equipment:

Multiengine	02/06/78
Instruments CAT II	04/13/93
Types	C-47, C-160, PA-23, B-727, DC-9, B-737-400, A-310, B-757/767, A-300-B-4

In B-757 03/15/95

Last training 01/28/96 Pan Am International Flight Academy
SIM. B-757/767

Flight Experience:

Total time 15,000 hours

In B-757 121 hours, 30 min.

In the last 3 months Dec. 95 – 48 hours, 30 min.
Jan. 96 – 73 hours, 00 min.
Feb. 96 – 00 hours, 00 min.

Duty time before accident – No service assigned before January 27, 1996

1.6 INFORMATION ABOUT THE AIRCRAFT

Aircraft:

Registration TC-GEN

Type of aircraft B-757-225

Model 1985

Serial Number SN 22206

Certificate of Airworthiness #980 DGAC of Turkey

Maximum Takeoff Weight 108,864 kg.

Total hours on fuselage 29,269 hrs.

Total cycles 13,499 cycles

Engines:

Type	RB211-535E4
Serial Numbers	#1 – 30511, #2 – 30514
Total hours	#1 – 22,567, #2 – 24,264
Total cycles	#1 – 10,258, #2 – 10,918

Inspections:

Check "A" (400 hrs.)	01/16/96 at 29,300.50 hrs., 13,476 cycles
Check "C" (5,000 hrs or 18 months)	05/30/95 at 27,012.55 hrs., 12,613 cycles
Check S4C" (12,000 cyc. or 18 months)	07/25/90 at 17,289 hrs., 8,689 cycles
Check "SA" (300 cyc.)	01/05/96 at 29,090.50 hrs., 13,451 cycles
Check "SC" (18 months or 3,000cyc.)	05/30/95 at 27,012.55 hrs., 12,613 cycles
Fuel used	AV-JET

1.7 METEOROLOGICAL INFORMATION

The meteorological conditions in the Puerto Plata terminal area between 20:00 and 02:00 local time showed signs of wind from the east-southeast at 10 knots, good visibility, 1 to 4 octaves clouds at 1,800 feet and 4 to 7 octaves of middle clouds at 7,000 feet. At 23:40 local time (03:40 UTC) the observation was light precipitation with some storm cells of major intensity towards the south and northeast. "THEY DID NOT OBSERVE STORM CELLS OR PRECIPITATION TO THE NORTH OF SOUSA," these cells were 10 kilometers to the south of Sousa.

1.8 NAVIGATIONAL AIDS

It was reported that there were no problems with radio aids or with the radars in use.

1.9 COMMUNICATIONS

There were no problems observed with communications.

1.10 AIRPORT INFORMATION

The "General Gregorio Luperón" International Airport, La Union, Puerto Plata, Dominican Republic, is situated to the north of the island at the following coordinates: 019° 45' 28.4" N and 070° 34' 11.8" W.

The runway has a length of 3,080 meters and is 46 meters wide. The runway is oriented East/West (08/26). It has an elevation of 16.4 feet at the threshold of 08 and 15.9 feet at the threshold of 26; the surface is completely concrete and has a ramp space of 41,325 square meters.

1.11 FLIGHT RECORDERS

The aircraft was provided with a cockpit voice recorder (CVR) brand Fairchild, model A-100, serial #2304 and a flight data recorder (FDR) brand Allied Signal (Sunstrand) model UFDR, serial #6596. Both were located in the tail of the aircraft.

Both recorders were submerged with the rest of the aircraft and were located at a depth of 7,200 feet. On February 28th, a team from the North American United States Navy aided with a vehicle operated by remote control through a fiber optic cable with a capacity to descend to a depth of 20,000 feet, called "CURV III," and after only operating approximately 2 hours, both recorders were recovered and immediately transported to the laboratories of the National Transportation Safety Board in Washington, D.C.

Evaluation of the recorders:

The inspection of the taped information in the recorders indicated that the taping system was operating normally, but the sequence of the information in the flight data recorder was lost at 03:44:16 for one second, and the values of calibrated airspeed (CAS) do not correlate with the other recorded parameters and they should be considered invalid. These calibrated airspeeds correlate with a “TOTAL BLOCK OF THE CAPTAIN’S PITOT TUBE.” When an aircraft has a blocked pitot tube, as the altitude increases, the indicated airspeed (IAS) will also increase; the airspeed indicator will eventually be able to exceed the maximum operational airspeed (IAS) and the affected air data computer will generate an Overspeed Warning.

1.12 AIRCRAFT WRECKAGE AND IMPACT

The wreckage of the aircraft, completely destroyed on impact, was submerged and was seen by the use of submarine cameras that allowed the wreckage to be seen and to prepare a rough sketch of its position.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

In accordance with the results of the toxicological tests by the group of doctors, it was determined that before death there were no indications of the inhalation of combustible vapors, nor carbon monoxide; this indicates to us that there was no fire, also no combustible leaks before the impact, thus discarding the possibility of a pre-impact fire or explosion.

1.14 FIRE

There was no evidence of fire in the wreckage found, nor in the recovered cadavers.

1.15 SURVIVAL ASPECTS

Due to the severity of the impact, it is believed that no one would have been able to survive this accident.

1.16 ESSAYS AND INVESTIGATIONS

According to the calculations of the manufacturer, when a block of the pitot system occurs at the same time as the aircraft ascends, the pressure diminishes and the air trapped in the system expands giving a directly proportional increase of the airspeed indication (IAS) in relation to the altitude. The increase showed by the flight data recorder (FDR) corresponds with the calculations made by the manufacturer.

Also, the tests in the simulator (with simulated ice blocking the pitot tube) verifies with similar indications why the accident occurred, also in the simulation the same selection of center automatic pilot was used and the Overspeed Warning and stick shaker occurred in a similar pattern to that of the actual flight.

1.17 ORGANIZATIONAL INFORMATION

Bergenair has its base of operations in Istanbul, Turkey; the operations are directed from there, the Department of Trade and also the maintenance base. The flight originated in Puerto Plata and was dispatched by the business Airline Services, contracted by Birgenair for that purpose. The training of the crews was imparted by different schools or flight academies, such as United Airlines Flight Training Center, Pan Am International Flight Academy, etc.

1.18 ADDITIONAL INFORMATION

None.

1.19 EFFECTIVE USE OF NEW TECHNOLOGY

By means of advanced technology they were able to locate the flight recorders, recover them and observe the wreckage of the aircraft, even though they were submerged at a depth of 7,200 feet. See the Annex to this report [not provided].

2.0 ANALYSIS

2.1 GENERALITIES

The facilities of "Gegorio Luperón" International Airport, Puerto Plata, Dominican Republic, the air traffic services and the air-ground communication were totally normal and did not contribute to the accident.

The departure was planned as a night flight, over water, in a passenger transport aircraft completely equipped by instruments (IFR). The existing meteorological conditions and the forecast for the area were favorable for the flight; this was also not considered a contributing factor to this accident.

The dispatch procedures, including weight and balance and performance calculations, were appropriate for the departure airport and within the limitations of the aircraft. The estimated time en route until reaching the final destination required three (3) pilots, which were on board. This was also not considered a contributing factor to the accident.

The engines performed as certified by the manufacturer and were certified as airworthy by aeronautical authorities. The structure of the aircraft, in agreement with the obtained evidence, remained intact until impact with the water. There was no pre-impact evidence of fire, explosion or hostile activity.

2.2 OPERATIONAL FACTORS

The crew members were appropriately certified in the B-757 in agreement with international requirements; however, it was determined that the crew was not

trained to recognize, analyze and to take the proper actions in an abnormal situation, such as the one they were presented with on this flight.

During the course of the takeoff, the first officer took reference of his airspeed indicator and made the call of "80 knots." The captain responded to him "Check," but two (2) seconds later said, "My airspeed indicator's not working." Meanwhile, the aircraft continued its acceleration for takeoff and the captain verified that the airspeed indicator of the first officer was functioning and ordered, "You tell me," indicating to the first officer to say the velocities taking into account only his airspeed indicator. Two (2) seconds later the first officer said, "V1" and "Rotation" and four (4) seconds after that the aircraft was in the air.

The purpose of doing a check at 80 knots among other things is to verify the proper functioning of the engines and flight instruments. The investigation concluded that the captain underestimated the lack of indication of airspeed and contrary to the established procedures, he continued the takeoff.

Performance calculations made after the accident showed that the aircraft would require only 2,280 feet of runway to decelerate from 80 knots, we also calculated that the captain would have been able to accelerate until V1 and abort the takeoff leaving sufficient runway.

B-757 aircraft of Birgenair utilized five (5) indicators with velocity information, available in the following manner: the captain's airspeed indicator, the first officer's airspeed indicator, the stand-by indicator, and 2 indicators of ground speed (GS) both in the captain's and first officer's EFIS screens. The flight data recorder (FDR) only tapes the indicated airspeed (KIAS) from the flight computer of the captain (AIR DATA COMPUTER). The taped ground speed was obtained from the inertial reference units.

The cockpit voice recorder (CVR) and the flight data recorder (FDR) indicated that at approximately 500 feet and at 120 knots, the captain affirmed: "It started to operate."

Investigators determined that this indication resulted in a decrease in pitot system pressure due to the combination of the ascending path of the aircraft and the expansion of the blocked air by an obstruction of the captain's pitot tube.

These two (2) factors caused the ADC to show an increase in the airspeed indication.

Investigators concluded that the captain underestimated the importance of the discrepancy between airspeed indicators experienced during takeoff, as a result of the apparently correct indication during the initial phase of the ascent. The CVR and the FDR indicated that the crew activity in the cockpit was normal at the time the flaps were retracted, standard radio calls were made after departure and the after takeoff checklist was completed, and normal automatic pilot modes were selected during the continued climb.

However, analysis of the FDR indicated that the pitch attitude of the aircraft during the ascent continued to increase slowly until around 14 degrees, when the aircraft was passing through 4,300 feet and 300 knots. At this time, the EICAS system initiated the warning messages in relation to the rudder ratio and mach trim. The captain affirmed, "There is something strange, there are some problems," and "Okay, there is something crazy, do you see it?" However, the crew did not attempt to clarify the alerts or to take corrective action.

The first officer affirmed, "There is something crazy here right now, right now mine is only two hundred (200) and decreasing, sir." The EFIS indication of the ground speed at this time was around 212 knots. The first officer articulated two hundred (200), investigators concluded that this was correct. An indication of the 200 KIAS came from the ADC belonging to the first officer and his associated pitot system. No members of the flight crew mentioned the presence of the stand-by airspeed indicator in the cockpit or the indications of ground speed on the EFIS.

Investigators concluded that there was much confusion in the cockpit, which interfered with the analysis of the discrepancies of the airspeed and the choice of the appropriate course of action. The captain questioned, "Both of them are wrong, what can we do?" and "Let's check their circuit breakers." The first officer responded "YES," and the captain said, "Alternate is correct." The investigators concluded that this discussion was in reference to the airspeed indicator located in the center instrument panel.

Although the affirmations of the captain and the first officer indicated that both crewmembers recognized that the indications of the alternate indicator were

correct, they did not seem to understand the importance of comparing the three indicators. None of the three flight crewmembers suggested the appropriate course of action to compare the indications or to switch the instrument selector for "Alternate Source" to "alternate" to derive airspeed information from the ADC of the first officer and its pitot system. The alternate source was able to be converted for reference of relative airspeed for the autopilot system. The failure of the flight crew to realize the right course of action and to understand the reduction of displayed ground speed information in the EFIS screens indicated a lack of knowledge of the aircraft systems and a lack of Crew Resource Management (CRM) in the cockpit.

Instead of taking definitive action to determine a valid reference for airspeed and to control the increasing pitch attitude, the captain initiated a discussion that forced the crew to rationalize the disparity of airspeed information. He provided information to the crew that "What was happening is normal," because of the extensive time the aircraft was not flying, and "We don't believe them." His analysis prevailed in the cockpit and a period of nineteen (19) seconds of silence followed. The relief captain then said, "Shall I reset its circuit breaker, to understand the reason?"

Birgenair's Operations Manual, Volume 3, contains sections and letters titles "Flights with an untrustworthy airspeed indicator" that offers to the crew recommended pitch attitudes and throttle position (middle EPR % N1 required) to allow safe climb, cruise and landing. While the flight continued to climb, the crewmembers did not discuss or demonstrate that these procedures were available. They never focused their attention on the enormous pitch attitude, which developed, or the alternate sources of velocity information that were present in various indicators in the cockpit.

During the final two (2) minutes of flight, the crew did not take proper actions necessary to prevent the loss of control of the aircraft. An approximate replica of the flight in a training simulator provided investigators the opportunity to observe alternate actions.

At 03:45:28 the CVR and the FDR recorded the activation of the overspeed warning. This occurred because of an indication of 353 knots in the ADC of the captain and continued for nine (9) seconds. At that time, ground speed was 199

knots at an altitude of 6,700 feet with a pitch attitude of 15 degrees, and had pitch attitude been reduced, complete recovery was possible.

At 3:45:46 the FDR indicates that the flight crew disconnected the autopilot VNAV mode and selected VS [vertical speed], increasing the nose pitch up to 15 degrees. Seconds later they disconnected the autothrottle and the EPR values started to decrease. Investigators determined that the flight crew reduced power and increased elevator deflection.

AT 03:45:52 the FDR indicated that the pitch attitude reached 18 degrees and the CVR taped the sound of the stick-shaker. EPR values were increased to 1.6 (the previous level) after the activation of the stick-shaker. A second later, the automatic pilot disengaged due to its limit of operational authority. For almost one (1) minute after the disengagement of the automatic pilot, the aircraft maintained a positive nose pitch attitude (nose up). The aircraft shifted towards the right and towards the left and continued to descend to around 5,000 feet. During this time, the EFIS ground speed indications decreased to around 140 knots. The pitch attitude then changed abruptly to negative values (nose down).

During a profile duplication of the accident in a flight-training simulator, investigators judged that the B-757 was able to demonstrate recovery of a similar flight profile with the application of maximum throttle and the application of proper flight commands for the recovery from stall. The Boeing Company informed the investigators that engineers, during flight, had inadvertently entered into a similar flight profile during the development tests of the aircraft and that they were able to regain control of the aircraft by using normal recovery techniques for stall.

The information from the cockpit voice recorder (CVR) and the flight data recorder (FDR) indicated that the crew of the aircraft did not initiate any action to regain flight control after activation of the stick-shaker at 03:45:52. On the contrary, an atmosphere of confusion prevailed in the cockpit. On two (2) occasions the relief captain said "ADI" (attitude indicator). Investigators believe that the relief captain intended to suggest to the flight crew that they maneuver the aircraft to an appropriate pitch attitude (nose down). The flight crew discussed reducing and increasing engine power. During this period, the first officer said, "You should level off", "I am selecting altitude hold, sir." At 03:46:47, the captain said "Select, Select."

However, the flight data recorder (FDR) indicated that the automatic pilot was no longer connected and for that reason the altitude hold function was not available. Investigators concluded that the atmosphere of confusion continued between the three pilots while the aircraft lost flight control and descended to the sea.

During the descent, the Ground Proximity Warning System activated but it was of no help to the flight crew due to a loss of pitch control. The recorded data ceased at 03:47:17.

The investigation of the crew concluded that their confusion was a result of a lack of knowledge of the aircraft systems and a failure of procedural discipline. The final control loss resulted when the flight crew ceased to recognize the activation of the stick-shaker as an imminent warning of an aerodynamic stall, as evidenced by the fact that they failed to execute the procedures for recovery from loss of control.

2.3 MAINTENANCE FACTORS OF THE AIRCRAFT

The aircraft was certified in agreement with international regulations. The required inspections for international standards of air navigation were complete. There were no abnormalities noted during routine, recommended maintenance while the aircraft was on the ground in Puerto Plata.

During the time that the aircraft was on the ground, it is believed that the plane had not flown for twenty (20) days. During this period, an engine inspection was performed that required an engine ground test before the next takeoff. Investigators believe that the engine and pitot covers were not installed before or after the engine ground test.

The subsequent analysis of the cockpit voice recorder (CVR) and the flight data recorder (FDR) revealed that there was no initial indication on the captain's airspeed indicator, but during the aircraft's ascent it began presenting inaccurate information due to an obstruction of the left upper pitot tube. The aircraft crashed into the sea and the debris was not recovered. The exact reason for the obstruction of the pitot tube was never determined.

However, the authorities of the investigation concluded that the probable source of obstruction in the pitot system was mud and/or debris from a small insect that was introduced in the pitot tube during the time the aircraft was on the ground in Puerto Plata.

In spite of the fact that the aircraft remained on the ground and was not flown for twenty (20) days before the crash, the aircraft was returned for service without a verification of the pitot static system as recommended by the manufacturer's maintenance procedures. If this inspection had been completed as a part of the return to service, it may have discovered the blocked pitot tube system and it would have been corrected before the flight. The investigators concluded that the obstructed pitot tube was not the probable cause of the accident, however, it was a contributing factor.

2.4 THE FLIGHT CREW

The three (3) flight crewmembers had proper medical authorizations indicating their abilities as flight crewmembers. However, the captain was 62 years old, which in certain countries excludes him from being the pilot in command.

The investigation was not able to verify the activities of the flight crewmembers during the time before reporting for the flight. Post-mortem examinations were not available, therefore no physiological evaluation could be conducted.

2.5 AIRLINE ADMINISTRATION

The circumstances of the accident indicate that in spite of the fact that there was flight crew training from outside sources that met requirements, events confirmed that the training was not adequate in this situation. The flight crewmembers were qualified "on the record," but did not demonstrate the necessary basic knowledge of procedures, aircraft systems and crew discipline to

recognize and to restore trustworthy information to the airspeed indicator of the flying pilot or autopilot system.

Equally, they did not refer to the section pertaining to "flights with an untrustworthy airspeed indicator" from the B-757 Operations Manual, or that section dealing with recovery from an aerodynamic stall. Moreover, there was a complete failure of the administration of crew resources in the anomalous handling of the aircraft.

The investigators are under the opinion that this accident is an indicator that international requirements for flight crew training have not been maintained at a level consistent with the growth and modernization of the air transport industry and the development of modern aircraft. Furthermore, they believe that the individual authorities of air navigation should have revised training requirements to attain maximum efficiency and utilization of the flight crew.

3.0 CONCLUSIONS

The probable cause of the accident was the failure on the part of the flight crew to recognize the activation of the stick-shaker as an imminent warning of an entrance to aerodynamic stall and their failure to execute proper procedures for recovery of the control loss. Before activation of the stick-shaker, confusion of the flight crew occurred due to the erroneous indication of an increase in airspeed and a subsequent overspeed warning.

Series of events that contributed to the accident:

- * Flight crew training, actions taken in the cockpit, use of proper procedures and basic aeronautical abilities.
- * Lack of knowledge of the aircraft on the part of the flight crew: including aircraft systems, airspeed indications, automatic pilot, aircraft procedures, selection of alternate sources of data and flight with an untrustworthy airspeed indicator.

* Maintenance practices – not installing the pitot system covers while the aircraft was on the ground, the failure to perform tests for the return to service of the pitot/static system after a lengthy time on the ground.

Additional factors:

* It is possible that the flight crew was not physically or mentally rested and prepared to fly the trip due to the unexpected call of the crew during scheduled free time.

* The age of the captain (62 years) did not allow him to act as pilot in command in certain countries.

* Birgenair's training did not include Crew Resource Management and there was a combination of training from outside sources that failed to provide continuity or an integrated approach to attaining the maximum efficiency of the flight crew.

* The Operations Manual of the Boeing 757/767 did not contain detailed information to provide the flight crew with a list of appropriate verifications, to signal a discrepancy in the indications of airspeed, simultaneous activation of rudder/mach trim and other EICAS warnings, and a flight with an airspeed indicator that may not be trustworthy.

* The EICAS system of the B-757/767 aircraft did not include an alert of "caution or warning" when a signal of erroneous airspeed is detected.

4.0 RECOMMENDATIONS

As a result of the investigation, the Junta Investigadora de Accidentes Aéreos (JIAA) of the Director General of Civil Aeronautics of the Dominican Republic makes the following safety recommendations:

To the International Civil Aviation Organization:

* To issue a directive requiring that the flight manual of the Boeing 757/767 be revised to notify the pilots that simultaneous activation of the warnings

“MACH/SPD TRIM” and “RUDDER RATIO” may be an indication of discrepancies in airspeed indicators.

* To require Boeing Company to modify the B-757/767 alert system to include “an advisory” (CAUTION ALERT) when an erroneous airspeed is detected.

* To require Boeing Company to modify the Operations Manual of the B-757/767 to include in the emergency procedures section information about “Identification and elimination of an erroneous airspeed indication.”

* To issue a Flight Standards Information Bulletin directed to all operations inspectors to assure that the Operations Manuals of B-757/767 operators contain procedures about “Identification and elimination of an erroneous airspeed indication.”

* To issue an aeronautical information bulletin notifying the inspectors of the circumstances of this accident, to assure that in training there will be an emphasis on the importance of recognizing a malfunctioning airspeed indicator during the course of takeoff.

* To assure that all training in the B-757/767 includes a scenario flight in the simulator where the pilot is trained to respond appropriately to the effects of a “Blocked Pitot Tube.”

* That each air business has a manual of specific training and is specialized for the type of operations specific to that airline without taking into account the generic training of the flight crew offered by businesses dedicated to the sale of training (Academies, schools, etc.).

* To establish as a requirement of all commercial air businesses a program of flight crew training in “Crew Resource Management” (CRM).

* To revise the existing training requirements to gain better efficiency for flight crews.

BIRGENAIR B757 ACCIDENT INTRA-COCKPIT COMMUNICATION

CAM = Cockpit Area Microphone
HOT-1 = Captain
HOT-2 = First Officer
CAM-3 = Relief Captain

**** = Unintelligible

Time	Source	Content
0341:40 (42:02)	HOT-2	Have a nice flight
0342:08 (42:30)	CAM	((sound of increasing engine noise))
0342:09 (42:31)	HOT-1	EPR select
0342:10 (42:32)	HOT-2	EPR
0342:16 (42:38)	HOT-2	Power's set
0342:18 (42:40)	HOT-1	OK, checked
0342:23 (42:45)	HOT-2	Eighty knots
0342:24 (42:46)	HOT-1	Checked
0342:26 (42:48)	HOT-1	My airspeed indicator's not working
0342:28 (42:50)	HOT-2	Yes
0342:29 (42:51)	HOT-2	Yours is not working
0342:30 (42:52)	HOT-2	One twenty
0342:32 (42:54)	HOT-1	Is yours working?

0342:32 (42:54) HOT-2 Yes sir

0342:33 (42:55) HOT-1 You tell me

0342:35 (42:57) HOT-2 Vee one

0342:36 (42:58) HOT-2 Rotate

0342:43 (43:05) HOT-1 Positive climb, gear up

0342:43 (43:05) HOT-2 Positive climb

0342:44 (43:06) CAM ((sound of landing gear handle being moved))

0342:46 (43:08) HOT-2 Gear is up

0342:50 (43:12) HOT-2 LNAV?

0342:51 (43:13) HOT-1 Yes, please

0342:52 (43:14) HOT-2 LNAV

0342:59 (43:21) HOT-1 Yes

0343:00 (43:22) HOT-1 It began to operate

0343:02 (43:24) HOT-1 Could you turn off the wipers?

0343:03 (43:25) HOT-2 Okay, wipers off

0343:05 (43:27) CAM ((sound of windshield wipers stops))

0343:08 (43:30) HOT-1 Climb thrust

0343:09 (43:31) HOT-2 Climb thrust

0343:10 (43:32) HOT-1 VNAV

0343:11 (43:33) HOT-2 VNAV
0343:16 (43:38) HOT-2 Okay, flap speed
0343:17 (43:39) HOT-1 Flaps five
0343:24 (43:46) HOT-1 Flaps one
0343:25 (43:47) HOT-2 Flaps to one
0343:30 (43:52) HOT-1 Gear handle off
0343:32 (43:54) HOT-2 Gear handle's off
0343:33 (43:55) HOT-1 Flaps up
0343:34 (43:56) HOT-2 Flaps up
0343:36 (43:58) HOT-1 After takeoff checklist
0343:38 (44:00) HOT-2 After takeoff checklist, landing gear up and off, flaps are up, checked up, altimeters later, after takeoff completed
0343:47 (44:09) HOT-1 Okay
0344:07 (44:29) HOT-1 Center autopilot on, please
0344:08 (44:30) HOT-2 Center autopilot is on command
0344:10 (44:32) HOT-1 Thank you
0344:12 (44:34) HOT-1 One zero one three
0344:13 (44:35) HOT-2 One zero one three
0344:25 (44:47) HOT-1 Rudder ratio, mach airspeed trim

0344:27 (44:49) HOT-2 Yes, trim

0344:28 (44:50) HOT-1 There is something wrong, there are some problems

0344:43 (45:05) HOT-2 Direct Pokeg

0344:44 (45:06) HOT-1 Okay, there is something crazy...do you see it?

0344:46 (45:08) HOT-2 There is something crazy there...right now mine is only two hundred and decreasing, sir

0344:52 (45:14) HOT-1 Both of them are wrong, what can we do?

0344:54 (45:16) HOT-1 Let's check their circuit breakers

0344:55 (45:17) HOT-2 Yes

0344:57 (45:19) HOT-1 Alternate is correct

0344:59 (45:21) HOT-2 The alternate one is correct

0345:04 (45:26) HOT-1 As the aircraft was not flying and on the ground, something happening is normal

0345:07 (45:29) HOT-1 Such as elevator asymmetry and other things

0345:11 (45:33) HOT-1 We don't believe them

0345:23 (45:45) CAM-3 Shall I reset its circuit breaker?

0345:24 (45:46) HOT-1 Yes, reset it

0345:25 (45:47) CAM-3 To understand the reason...

0345:27 (45:49) HOT-1 Yeah

0345:28 (45:50) CAM ((sound of aircraft overspeed warning))

0345:30 (45:52) HOT-1 Okay, it's no matter

0345:39 (46:01) HOT-1 Pull the airspeed, we will see...

0345:39 (46:01) CAM ((sound of overspeed warning stops))

0345:40 (46:02) HOT-2 Now it is three hundred and fifty, yes?

0345:47 (46:09) HOT-1 Let's take that like this...

0345:50 (46:12) CAM ((Sound of four warning alert tones))

0345:52 (46:14) CAM ((Sound of stick shaker starts and continues to end of recording))

0345:56 (46:18) CAM ((Sound of four warning alert tones))

0345:56 (46:18) HOT-1 ****

0345:57 (46:19) HOT-2 ****

0345:59 (46:21) HOT-2 Sir

0346:00 (46:22) CAM-3 *ADI

0346:05 (46:27) HOT-1 ****

0346:07 (46:29) HOT-2 Nose down

0346:19 (46:41) HOT-2 ****

0346:22 (46:44) CAM-3 Now*

0346:23 (46:45) HOT-2 Thrust

0346:25 (46:47) HOT-1 Disconnect the autopilot, is the autopilot disconnected?

0346:25 (46:47) HOT-2 Already disconnected, disconnected sir

0346:31 (46:53) CAM-3 * ADI *

0346:38 (47:00) CAM-3 *

0346:39 (47:01) HOT-1 Not climbing? What am I to do?

0346:43 (47:05) HOT-2 You should level off, altitude okay, I am selecting altitude hold, sir

0346:47 (47:09) HOT-1 Select, select

0346:48 (47:10) HOT-2 Altitude hold

0346:51 (47:13) HOT-2 Okay, five thousand feet

0346:52 (47:14) HOT-1 Thrust levers, thrust thrust thrust thrust

0346:54 (47:16) HOT-2 Retard

0346:54 (47:16) HOT-1 Thrust, don't pull back, don't pull back, don't pull back, don't pull back

0346:56 (47:18) HOT-2 Okay, open, open

0346:57 (47:19) HOT-1 Don't pull back, please don't pull back

0346:59 (47:21) HOT-2 Open sir, open

0347:01 (47:23) HOT-2 ****

0347:02 (47:24) CAM-3 Sir, pull up

0347:03 (47:25) HOT-1 What's happening?

0347:05 (47:27) HOT-2 Oh, what's happening?

0347:06 (47:28) CAM-3 *

0347:09 (47:31) CAM ((Sound of GPWS, sink rate, whoop whoop pull up warning starts and continues until the end

0347:13 (47:35) HOT-2 Let's do like this

0347:14 (47:36) CAM-3 *

0347:17 (47:39) ((End of recording))