MINISTRY OF TRANSPORT CONSTRUCTION AND REGIONAL DEVELOPMENT OF THE SLOVAK REPUBLIC

Aviation and Maritime Investigation Authority
Námestie slobody 6, P.O.BOX 100, 810 05 Bratislava 15

Reg. No.: SKI2012040

F I N A L R E P O R T

on investigation of air incident

of aircraft **Beechcraft B90 Cargo liner**

Registration No. **G-JOTA**

Date: 03.04.2012

Location: FL120 during the climb out from LZIB airport on a TOVKA2K departure routing

The investigation of air accident, serious incident, has been conducted pursuant to Art. 18 of the Act No 143/1998 on Civil Aviation (Civil Aviation Act) and on Amendment of Certain Acts and in accordance with the Regulation (EU) No. 996/2010 of the European Parliament and of the Council on investigation and prevention of civil aviation accidents and incidents, governing the investigation of civil aviation accidents and incidents.

The final report is issued in accordance with the Regulation L 13 that is the application of the provisions of ANNEX 13 Air Accident and Incident Investigation to the Convention on International Civil Aviation.

The exclusive aim of investigation is to establish causes of accident, serious incident, and to prevent their occurrence, but not to refer to any fault or liability of persons.

This final report, its individual parts or other documents related to the investigation of the air accident in question have an informative character and can only be used as recommendation for the implementation of measures to prevent occurrence of other air accidents and serious incidents with similar causes.

A. INTRODUCTION

Operator / owner:	JOTA Aviation
Type of aircraft:	Beechcraft B90 Cargo liner
Registration number of aircraft:	G-JOTA

Take off site:	Bratislava airport / LZIB
Planned landing site:	Naples airport / LIRN
Type of Flight:	Positioning
Date and time of incident:	03.04.2012, 13 h 35 min

Note: All time data in this report are stated in the UTC time.

B. INFORMATIVE SUMMARY

On 03.04.2012 the pilot carried out a flight from the LZIB airport to LIRN with an empty aircraft. The flight was performed under single pilot IFR conditions. After take off from LZIB airport during the climb to FL120, the aircraft's crew door, which is located on the left hand side of the aircraft, detached.

The aircraft diverted back to LZIB, landed safely without any other damage and crew vacated the aircraft without injury.

Person appointed for investigation of causes of the air incident:

Igor BENEK – Inspector in charge

The final report is issued by:

Aviation and Maritime Investigation Authority of the Ministry of Transport, Construction and Regional Development of the Slovak Republic

C. MAIN PART OF REPORT

1. FACTUAL INFORMATION

1.1 Pre-flight history and history of the flight

The pilot finished the previous duty in LZIB at 15:35 on 2 April 2012.

The aircraft, G-JOTA, positioned to LZIB the evening before the incident.

The pilot came back on duty at 12:45 after 21 hours of rest, for a positioning flight to LIRN. The pilot printed off and checked the weather, NOTAMS and flight paperwork in the handling agent's crew room and had the aircraft fuelled.

The pilot entered to the aircraft via the main cargo door however the crew hatch (crew door) was open for cooling on the ground.

At approximately 13:10 the pilot received departure clearance and clearance to start engines and closed the crew hatch in accordance with company SOPs by pulling and turning the handle, before securing it in its stowed position. The pilot started the engines and completed pre-taxi checks with nothing unusual indicated. The aircraft taxied off stand at approximately 13:15.

At 13:24 aircraft departed on a TOVKA2K departure, climbing to 5 000 feet. Before reaching 5 000 feet Bratislava re-cleared him to FL120 and changed to Vienna Radar before reaching TOVKA.

Shortly after accelerating to cruise speed of 190 kts the pilot noticed an unusually strong draft by his left elbow. The draft was coming from the front edge of the crew hatch.

At this point the crew door came open extremely quickly with a bang.

The pilot reduced the power to slow down and disengaged the autopilot to allow for trimming of the new speed (approximately 160 kts) and as soon as he could make a call to Vienna Radar (about 30 seconds), he announced a PAN and requested a return to LZIB. Vienna Radar acknowledged the call and cleared him to turn left to a heading of 090°for LZIB.

The pilot missed the remainder of the call because his headset was caught by the airflow and taken out of the aircraft. The pilot set the new heading and re-engaged the autopilot before reaching for the spare headset. After that the pilot realised that he had not correctly engaged height hold on the autopilot and had lost some altitude

Vienna Radar was trying to get acknowledgement, so he called them again.

Vienna Radar cleared him to descend to FL70 and asked him to repeat the nature of the emergency and the pilot repeated that he had a crew door on the aircraft which had become detached, and confirmed his intention to return to LZIB. He was transferred to Bratislava Radar. After passing through a layer of cloud at approximately FL100 the pilot was visual with LZIB and approaching FL70 the pilot requested a visual approach, for which he was cleared. The pilot slowed the aircraft to 145 kts and put out landing gear and approach flaps, then reduced speed further to approximately 130 kts.

The aircraft landed in LZIB safely and the pilot vacated the aircraft without injury.

Flight rules: IFR

1.2 Injuries to person

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor/None	1	-	-

1.3 Damage to aircraft

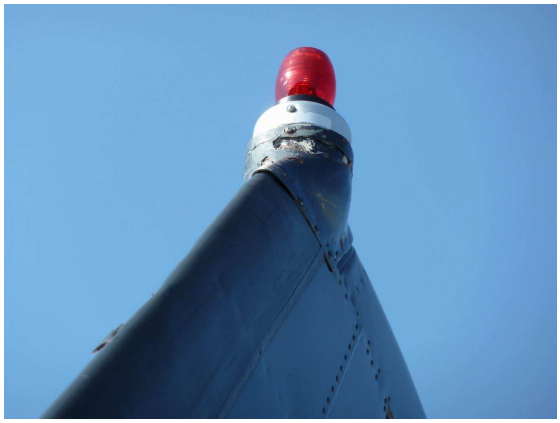
Crew access door detached / the door has still not been recovered.

No damage to door frame.

Comm 2 antenna detached / missing - heavily damaged.

Damage Tail De-Ice boot vertical fin

Damage to dorsal fin faring



1.4 Other damage

The Aviation and Maritime Investigation Authority was not informed about circumstances with potential application of other claims for compensation of damages towards a third party.

1.5 Personnel information

Pilot in command:

Citizen of the United Kingdom aged of 38 years.
Holder of the commercial pilot's Licence No.: UK/CP/349964B/A, issued by the Civil Aviation Authority of UK on 07.06.2007, with marked validity until 06.06.2012.

Company LPC and OPC (including type rating and single-pilot IR renewal) on 17.01.2012 valid until 31.01.2013.

Released to line under single pilot operations on 31.01.2012 after 8 line training sectors.
Medical certificate of 1st class with marked validity until 14.03.2013.

Flying experience:

Total flight hours before the air incident:	3 400 hours
Total flight hours on type before the incident:	77 hours
Total flight hours with JOTA Aviation:	400 hours

2nd day of duty after a period of 2 consecutive days off

Rest period of 20 hours and 50 minutes gained before report on the 03.04.2012.

1.6 Aircraft information

a) Airframe:

Type:	Beech B-90
Serial number:	LJ-327
Year of manufacture:	1968
Manufacturer:	Beechcraft

Total number of flight hours since manufacture: 22 812 h 54 min

Modification status: Full Aero Crafters Cargo liner conversion, installed 1991

The aircraft was release to service by the Part 145 holder Iscavia engineering based in Exeter. The aircraft had a phase 2 check completed on the 13th February 2012, and had 85 hours 19 minutes before its phase 3 check before the flight on which the incident took place. The aircraft was not carrying any deferred defects at the time of the incident and was in an airworthy condition.

There were no performance restrictions on the aircraft operating out of LZIB.

Special certificate of airworthiness No. 0595011002, was issued by the Civil Aviation Authority of the United Kingdom on 12th May 2011. Verification of airworthiness with marked validity until 12.05.2012 ARC reference 059501/002/001.

Type of fuel used: Jet A1

b) Engine:

Type: 2 x PRATT & WHITNEY CANADA PT6A-20

c) Propeller:

Type: 2 x HARTZELL HC-B3TN-3B/T10173B-8

d) Calculation of aircraft weight at the time of air incident

Mass and balance calculated at 8143 lbs at 153.11 inches which is well within limits.

e) Maintenance

The aircraft's maintenance schedule did not contain any requirement to inspect the door locking mechanism of the crew hatch. There was no evidence in the technical log to indicate that the locking mechanism had ever been inspected since the Supplemental Type Certificate (STC) modification to install the crew hatch, had been embodied.

1.7 Meteorological information

The meteorological situation at the airport LZIB at the time of incident was suitable for this type of flight and had no influence on the air incident.

1.8 Aids to navigation

Not applicable.

1.9 Communications

The aircraft was equipped by radio communication system enabling two-way radio communication at every moment of flight with all air stations.

1.10 Aerodrome information

LZIB is an international airport. The runway system of LZIB consists of two perpendicular runways. The runway 04/22 is 2 900 m long and 60 m wide. It is equipped by light and radionavigation systems for precision approach in conditions of ICAO Category I Weather Minima. The runway 13/31 is 3 190 m long and 45 m wide. It is equipped by light and radionavigation systems for precision approach in conditions of ICAO Category III Weather Minima.

1.11 Flight recorders

Not applicable.

1.12 Wreckage and impact information

Not applicable.

1.13 Medical and pathological information

Not applicable.

1.14 Fire

Fire did not break out.

1.15 Survival aspects

Search and rescue operations were not required.

1.16 Tests and research

The aircraft was located at East-Air maintenance facility Bratislava airport Slovakia. On investigation it was apparent that crew door had opened in flight. The crew door has still not been recovered.

Inspection of the door structure showed no apparent damage to indicate aircraft structural failure. The upper frame, forward frame, aircraft frame and lower frame were inspected internally and externally for missing or loose fasteners, gouging, scoring, cracking. Door shoot bolt striker plates were inspected for security and serviceability. No defect was noted to indicate aircraft structural failure.

Both the forward and aircraft door hinges were attached to the aircraft structure. The hinges are structured from stainless steel material. The forward hinge lower half had torn away from upper half aircraft structure and the aircraft hinge was intact but the lower hinge half was deformed and twisted around the fastener attachment holes. Both hinge pins were still intact.

There was evidence of scratches aligning with the striker plate lock holes but the scratches were dirty and oxidisation was evident. The scratches were assumed to be from general wear and tear from general daily usage and not part of the door failure.

The new replacement door fitted after the incident has a different mod standard to the original Supplemental Type Certificate Modifications for aircraft and so it was not possible to make a direct comparison.

1.17 Organizational and management Information

The flight operation was carried out in accordance with flight rules that are valid in the territory of the Slovak Republic.

1.18 Additional information

1.18.1 General information

JOTA Aviation is an ad hoc charter operator with a fleet of 4 x King Air 90s, three of which are based at Southend on Sea and one of which is based at Liverpool in the UK.

The JOTA operation is a mixture of single and dual crew flying depending on flight time limitations. This sector was planned as a single crew operation.

G-JOTA is a one-off version of a modified BE90 with a cargo door and crew hatch. There are some other BE90s operating in the USA with a crew hatch, however G-JOTA is the only aircraft with a full cargo conversion – full size cargo door and a crew hatch. The original STC was embodied in the 1990s by King Cargo when the aircraft was on the Danish register.

The current STC holder is Aerocrafters Cargoliners, who purchased the STC from King Cargo in 2001.

JOTA Aviation do not hold any of the original STC drawings for the crew hatch fitted to G-JOTA at the time of the incident. All of the other BE90s fitted with a crew hatch have a different door locking mechanism (rotational handle) installed. It is not known why G-JOTA was not modified to the new standard of door locking mechanism. Following the incident to G-JOTA the replacement crew hatch installed was to the new STC standard.

1.18.2 JOTA Aviation Internal Investigation

The company engineer did not find any evidence of corrosion on the remains of the door attachment hinges.

The door handle fitted to G-JOTA was a Z-shaped handle with an over-centre mechanism, which operated two shoot bolts.

From the outside: the lock handle is pulled out and forward to retract the shoot bolts. The door opens upwards.

From the inside: the lock handle is pulled out and aft to retract the shoot bolts. The door is pushed out of aperture. The internal lock handle is held in the closed position with a spring-loaded ball bearing that locates the handle in a recess when in the closed position. The shoot bolts protrude approximately one inch from the door structure, and locate in recesses in the door frame.

1.19 Useful or effective Investigation techniques

Standard investigation methods were used.

2. ANALYSIS

2.1 Technical aspects

Discussion of the test results

The aircraft is equipped with a position indicator light for the cargo door however there is no indicator light for the crew hatch. If the crew hatch is closed but the door handle is not in the locked position, the door handle would protrude such that it would stick into the pilot's ribs. It is possible to rotate the door handle to the locked position even when the door is not closed; in this case the locking bolts would extend but would not engage in the door frame. The crew hatch would protrude from the frame and not sit flush and a larger than normal gap between the door frame and the door would be evident from the cockpit.

On review of the pilot's testimony, transcript correspondence and the damage assessment, the commission is not able to determine the root cause of the crew door failure.

There was no information in the aircraft technical records that the crew door locking mechanism had ever been inspected, nor was there a specific requirement for it to be. Due to the to door not being recovered after the incident, mechanical failure could neither be proved nor disproved as the door locking components were all contained in the door unit.

JOTA aviation made contact after the incident with the STC holders Aero Crafters Inc. and they reported that this was first incident they have been made of aware of since the STC gained approval in July 1991.

2.2 Activity of pilot

Because of the design of the handle fitted at the time of the incident, the pilot believed that if the crew door had not been fully closed and locked before departure the handle would have been protruding such that it would stick into his chest / ribs. The handle required a positive push (outwards) to seat it in the correct detent, and had it not been correctly closed and locked at this point, the pilot believes the door would have moved when pushed.

The pilot did not become aware of the draft around the door until levelling off at FL120 and accelerating to 190 kts. The pilot considered that had the door not been correctly locked before flight, it would have been evident during the takeoff / climb and he believes the air loads would have been sufficient to open the door much earlier.

2.3 Human and operations aspects analysis by JOTA Aviation

On review of the checklist it is noted that the crew hatch is only mentioned in the pre –flight cockpit checks and only the main cargo door security is mentioned before engine start.

In normal operation it is noted that the crew hatch can sometimes be the last door to be closed and latched as when the aircraft is loaded it is the only way to gain access to the cabin and is also left open for cockpit ventilation prior to start up in warm weather condition once the main cargo door has been secured closed.

The second aspect was pilot training in JOTA Aviation. Although an experienced pilot with 3400 total hours, the pilot was relatively new on type, with only 77 hours at the time of the incident. The pilot was released to line flying after 8 line sectors and a total of 23 hours 50 minutes. In the period between being released to the line and the date of the incident, the pilot had completed a further 36 sectors and 60 hours without any reported incident.

The third aspect was the pilot's personnel file which included a formal warning dated 31st August 2010. The formal warning related to the pilot's apparent lack of care and attention given to pre-flight checks.

3. C O N C L U S I O N S / CAUSE OF AIR INCIDENT

3.1 Findings

3.1.1 Human and operations aspects

- The pilot was in under single pilot IFR conditions and he was properly licensed.
- The pilot had valid qualifications for the flight;
- The pilot's medical was properly issued.
- From the pilot's testimony and FTL records it is very unlike that fatigue was contributing factor to the incident.
- The pilot was an experienced pilot with total 3400 hours, but was relatively new on type.
- Nobody was injured in this incident.

3.1.2 Technical aspects

- The aircraft had a valid documentation and did not show any faults before the air incident.
- The aircraft was properly maintained and had a valid Certificate of Airworthiness.
- The lack of checklist items raised concern that in a busy single pilot operation the security of the crew door could be missed before starting engine checks and could have been a contributing factor to the incident.
- The meteorological conditions had no influence on the air incident.

3.2 Cause of air incident

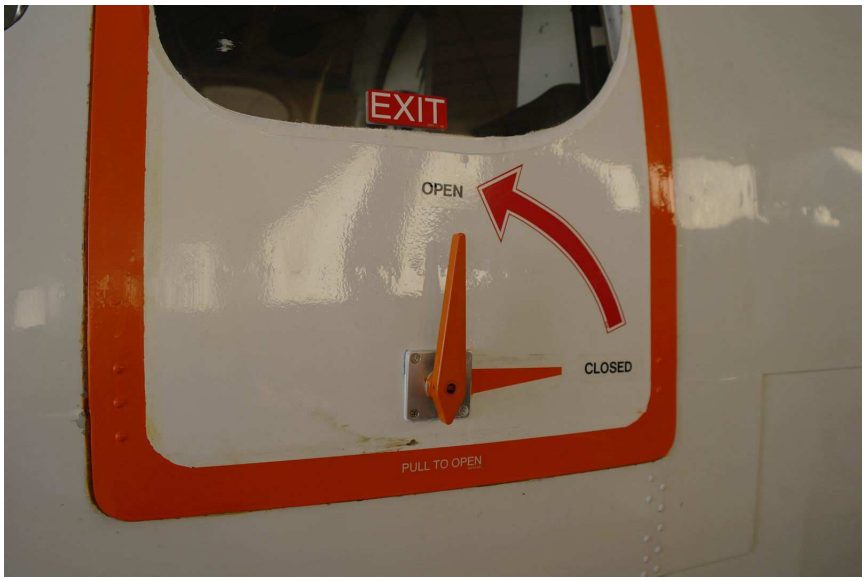
It was not possible to determine the cause of the door detaching inflight due to a lack of evidence. Mechanical failure could not be ruled out. Additionally the possibility that the pilot failed to correctly secure the door prior to take off could not be discounted, given the demands of the single pilot IFR operation and the lack of clear guidance in the checklist.

4. SAFETY RECOMMENDATIONS

Actions taken by JOTA Aviation

Following repair of G-JOTA, JOTA Aviation have painted the crew hatch door and door frame orange. When the crew door is correctly closed, the orange paint is not visible. If the door is not correctly closed, the orange paint would be visible and this will serve as an indication to the pilot that the door is not correctly closed.

On the outside of the door the handle 'locked position' and the handle were also painted orange. This will provide a visual indication (e.g. to ground crew) if handle is not in the locked position.



JOTA Aviation have also reviewed the aircraft checklist in response to the incident and amended it to include an item to verify that the crew hatch and door are correctly closed before engine start. This will ensure the crew door is always secured and latched prior to engine start if correct checklist procedures are followed.

Annual emergency and safety equipment training to include actual operation of crew door replacing instruction and touch drills on B90, G-JOTA

Bratislava, 01.10.2012