ORIGINAL

MINISTÉRIO DAS OBRAS PÚBLICAS, TRANSPORTES E COMUNICAÇÕES

GABINETE DE PREVENÇÃO E INVESTIGAÇÃO DE ACIDENTES COM AERONAVES

GPIAA

FINAL INCIDENT INVESTIGATION REPORT

CESSNA 340A RAM III

D-ICFG

FLORES AIRPORT (AZORES)

29th OCTOBER 2007

REPORT NR 24/INCID/2007

TABLE OF CONTENTS

FOREWORD

This report contains the technical conclusions determined by G.P.I.A.A. on facts and causes involved in this occurrence.

In accordance with Annex 13 of the Convention on International Civil Aviation Organization of 7th December 1944, on the Council Directive nr. 94/56/EC of 21st November 1994 and on nr. 3, 11th article of Decree-Law 318/99 of 11th August, the sole propose of this report is to gather information for preventing further occurrences of similar circumstances.

The legal assessment of accident/incident causes and circumstances is expressly no concern of the accident investigation. So it is not the object of this report to determine blame or liability but solely to identify causes and deficiencies capable of undermining flight safety.

The original report of this incident has been issued in Portuguese language which is the official version and takes precedence as report of reference. This English translation was published for international readers' information purpose.

SYNOPSIS

On 29th October 2007, the Cessna 340A RAM III, registration mark D-ICFG, departed St. John's International Airport, at Newfoundland – Canada, to fly to João Paulo II International Airport, at Ponta Delgada (S. Miguel Island) – Azores/Portugal with the pilot and a passenger. The time of arrival was estimated to be 16:46 UTC.

When the Cessna pilot contacted Azores ATC, he declared an emergency due to fuel shortage.

Instructed by Santa Maria Control, the aircraft made an uneventful landing at the first island of the Azores archipelago (Flores Island) at 17:26 UTC hours.

FACTUAL INFORMATION

1.1 *History of the flight*

1.1.1. Antecedents

On 28th October the Cessna 340A RAM III, registration mark D-ICFG arrived at St. John's International Airport, Canada, at 22:47 hours[1] having come from Flamingdale, N.Y., USA, on its way back to Germany. To perform the next leg, the pilot considered two alternative flight plans, one via Iceland and another via Azores. A detailed weather briefing regarding the weather along the flight was decisive in choosing the route. For that reason, the pilot requested a telephone briefing by the DWD (Aviation Weather Service Frankfurt/Main). According to DWD advice, a route via Azores was thought to be the safest choice, despite a predicted initial head wind component.

The day after, shortly before the departure, the pilot obtained a new detailed weather briefing, again with the DWD. The weather forecast was confirmed and it was estimated that a flight across Azores could be made without difficulties. The flight plan was submitted accordingly.

1.1.2. The Flight

On 29th October 2007, the Cessna 340A RAM III, registration mark D-ICFG, with the pilot and a passenger on board, departed St. John's International Airport (CYYT), at Newfoundland (Canada) at 11:40 hours, to João Paulo II Airport (LPPD), at Ponta Delgada in S. Miguel Island - Azores (Portugal), where the time of arrival was estimated to be 16:46 hours.

Fig. 1 – The flight plan route (– – – –) and the track performed by the D-ICFG (– · – · – · –).

[1] The time in this report refers to UTC hours.

On the way across the Atlantic, cruising at FL 210, the pilot stated that the weather conditions were different than forecasted: the head wind speed, as well the period of its inconvenient effects, was stronger than foreseen. However, the pilot continued the trip after considering that the spare fuel on board, (although with a little less reserves lost along the route), would be enough to perform the flight safely.

Nevertheless, with Azores ahead, after crossing the PNR, the pilot also stated that the airplane penetrated in dense uprising Cumulonimbus cloud coverage and that he avoided the CBs but continued flying in the area, being reluctant to fly around it (to avoid the bad weather) due to the larger penalty on time and on the subsequently fuel consumption. Soon, the airplane picked up ice on its wings and the IAS decreased 20 Kts.

The pilot re-calculated flying time and concluded that, although the destination (Ponta Delgada) could be reached, the alternate airport would be compromised and eventual holding wouldn't be possible, especially if the headwind become stronger and the ice conditions grew worse.

Thus, he took the decision to make a safety landing. On his first contact with the FIR of Santa Maria (Azores), at 17:26 hours, the Cessna's pilot requested to the Air Traffic Control to divert to the first island of Azores archipelago (LPFL), on its route to Ponta Delgada, due to fuel shortage, although the aircraft still had fuel enough to the destination.

Meanwhile, he was informed that only with the declaration of an emergency he would be allowed to divert and to land at Flores Island. The pilot then has declared emergency and, instructed by Santa Maria Control, the aircraft made an uneventful landing at the first island on its route of the Azores archipelago (Flores Island) at 17:59 hours.

1.2 Injuries to persons

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	
None	1	1	

1.3 Damage to the aircraft

None.

1.4 Damage to third parties

None.

1.5 Pilot Information

Identification	
Sex	Male
Age	59 years
Nationality	German
Licence Details	
License held / nr.	CPL(A) - 9921000804
First issued / by	1998, 23rd June / LBA Braunschweig Germany
Expire date	2009, 15th June
Flight radio-telephony license	AZF 1998, 19th March
Instrument rating renewal date	2008, 13th June
Medical Certificate	
Class	1
Date of last medical check	2008, 13th May
Limitations	VNL
Flight Experience	
Total flying hours	3 149:00 hours
Total hours on type	925:00 hours
Hours in last 90 days	107:00 hours
Hours in last 30 days	83:00 hours
Hours in last 7 days	33:00 hours
Hours in last 24 hours	7:00 hours

1.6 Aircraft Information

The Cessna 340A, an improved model of the 340, was a six seat pressurised piston twin aircraft positioned in Cessna's product line between the 310 (also a six seat aircraft) and the eight seat 414 and 421 airplanes, inheriting the 414's wings and the 310's undercarriage and tail unit. The pressurized system design allowed a differential of 0.29 bars (4.2 psi) that could maintain an internal cabin altitude of 8000 ft at FL 200.

Fig. 2 – Photography[2] of the Cessna 340A RAM III, D-ICFG.

It was supplied by two 230 kW (310 hp) TSIO-520-NB turbocharged and fuel injected flat six piston engines driving three blade constant speed Mc Cauley propellers. The 340A was offered in optional II and III forms with various levels of IFR avionics fitted.

[2] Photo by Stephan Lane (Source: Airliners.net).

It had a maximum speed of 452 km/h (244 Kts), a maximum cruising speed of 425 km/h (230 Kts), a maximum economical cruising speed of 315 km/h (170 Kts) at 25,000 ft and it service ceiling was 29 800 ft. Its range, with reserves at economical cruising speed, was 2 603 km (1 405 nm) and, at maximum cruising speed, was 774 km (418 nm).

Concerning the D-ICFG, the following data was the only information avail-able to the In-vestigation team:

Aircraft		
Serial nr.	340A-0537	
Date of Manufacture	1978	
Registry Certificate nr	L 11141	
Issued by / on	Luftfahrt – Bundesamt / 1991, 25th September	
Certificate of Airworthiness nr	L 11141	
Issued by / on	Luftfahrt – Bundesamt / 2007, 5th January	
Registered Owner	Friederich Buntz	
Operator	Air 7 GmbH	
Empty weight	2 719 kg (5 990 lb)	
M.T.O.M.	1 780 kg (3 921lb),	
Engines	Nr. 1	Nr. 2
S/N	276927-R	276930-R
Engine Hours Since New	600:00 hours	
Engine Hours Since Last Shop Visit	35:00 hours	

The D-ICFG had standard equipment with BRNAV via GARMIN GNS 530 and was also provided with three further GPS kits.

1.7 Meteorological information

Regarding meteorological information, it was not possible to establish the true conditions present on the day of the flight and for this particular route, namely winds aloft, temperatures, ice formation etc. This information was requested both from the Canadian Point of Contact (POC) and from to the German Meteo Services (DWD) and also from the pilot. The POC has sent weather information to GPIAA. No consistent reply whatsoever was received, neither from the pilot nor, at this stage, from the German Meteo Service. According to the POC and to the ICAO flight plan, the pilot did not request meteorological information from any Canadian sources, anyway.

Part of the IT navigation calculation was based on the most suitable wind forecasted sent by POC and supplied by “American Numerical Weather Products (GFS) 500mb WIND (approximately between 16.000 to 20.000 feet) from Oct 29/2007 at 12Z valid at 18Z”.

On this meteorological chart (fig. 3) it was possible to calculate, broadly, forecast winds for only the first 50%[3] distance of the flight, which were the following:

DISTANCE	WIND/TD	WIND/SP (Kts)
290NM (first 25%)	**± 170º**	**± 45/50**
290NM (second 25%)	**± 130º**	**± 30/25**

AMERICAN NUMERICAL WEATHER PRODUCTS (GFS) 500MB WIND (APPROXIMATLY BETWEEN 16000 TO 20000 FEET) FROM OCT 29 2007 AT 12Z VALID AT 18Z

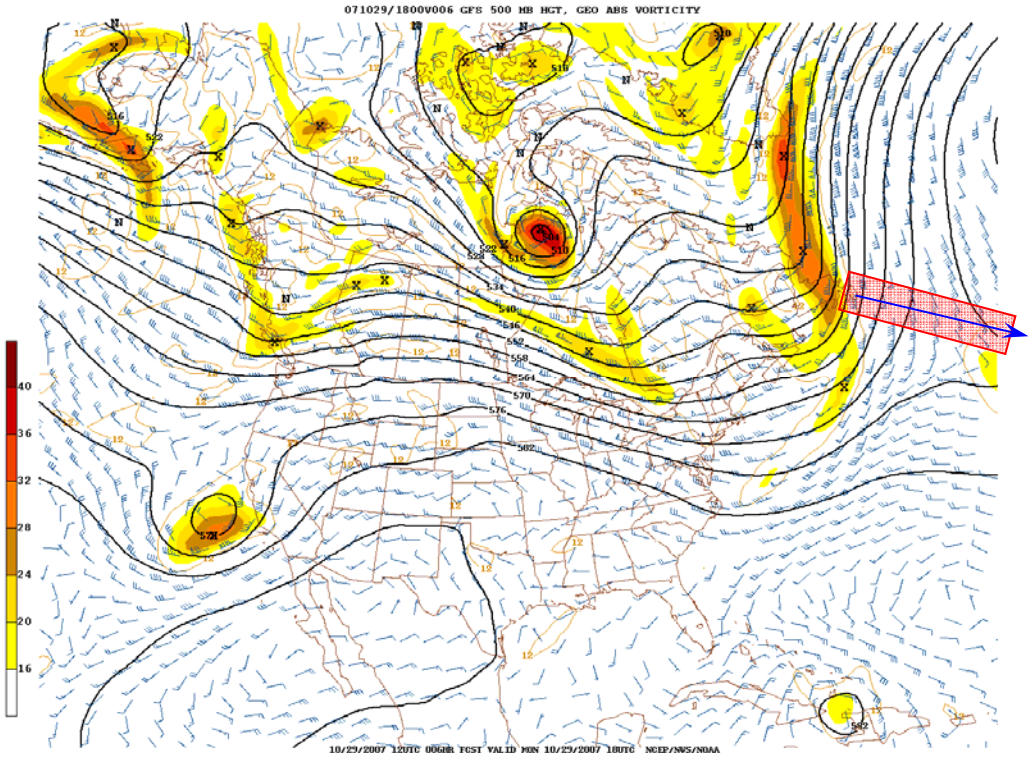


Fig. 3 – Weather forecast with a the red box including the True Course (blue arrow of ± 580NM)

The additional weather information provided by POC, namely SIGMET, PIREPs, Surface Analysis and Turbulence Forecast charts, Soundings Observed in CYYT and satellite imagery, does not display the winds aloft for the area flown.

Yet, the PIREP winds had the disadvantage of being spot information, reported by crews along a route and normally cruising at flight levels higher than the incident aircraft. No METARs or TAFs were made available to the IT.

Later on, DWD has sent also meteorological data record, about the winds forecasted for that Atlantic area at flight level FL180, which may be summarized as following:

[3] 50% corresponds, roughly, at 580 NM (30 NM outbound FIR STA) based in the chart scale (1/50.000.000) meanwhile determined.

Geographical Area	Winds
➢ Canada towards the East	Strong north-westerly winds with a wind speed of 40 knots.
➢ Across the Atlantic	Upper winds would be turning to south-westerly directions though blowing with the same speed.
➢ At about halfway of the route (St. Johns – Azores)	The upper wind would turn to southerly directions. Wind speeds of 20 to 25 knots could be expected.
➢ In the Azores region	Wind direction was variable, with a wind speed of around 15 knots.
➢ Flight route north of 40° latitude (St. John's – Azores)	Mean wind direction from 180 degrees, southerly directions, and a wind speed of 25 knots.
➢ For the route section to the Azores (St. John's – Azores)	Mean wind direction from around 180 degrees and a wind speed of 25 knots could be expected.

The above data broadly matches with meteorological information already supplied to GPIAA by the Canadian Point of Contact, which having been more detailed and precise.

1.8 Aids to navigation

Not relevant for the investigation.

1.9 Communications

There were always standard and undoubted communications between aircraft and ATC while using VHF COMM. The airplane was not equipped with HF COMM. Therefore, the pilot used a satellite telephone to communicate the reporting points.

1.10 Airport Information

Azores archipelago has three international airports:

- The João Paulo II at Ponta Delgada/S. Miguel Island, the busiest airport in the Azores archipelago, which was the destination of the Cessna D-ICFG);
- the Santa Maria airport, at the island of same name, and
- the Lajes Airport, at Terceira Island.

Fig. 4 – Ponta Delgada airport[4], the Cessna's destina-

[4] Source: Google Earth.

The Santa Cruz das Flores airport (at Flores Island), were the Cessna 340A made its precautionary landing, is mainly for domestic flights purposes and it has no Customs facilities available.

Fig. 5 – Photography[5] of the Santa Cruz das Flores airport, at Flores Island.

1.11 Flight recorders

The Cessna 340A has no flight recorders and, even so, these are not required for this aircraft category.

1.12 Information on the local of the accident

Not applicable.

1.13 Medical and pathological information

None.

1.14 Fire

There was no fire.

1.15 Survival aspects

No assistance was required.

[5] *Source:* Enciclopédia, *in* http://www.enciclopedia.com.pt/articles.php?article_id=309

1.16 Tests and research

After being aware of this incident, on 2007, 7th November, the GPIAA has informed the relevant authorities and the pilot that a technical investigation would be carried out. Meanwhile, information was requested from the following entities:

1. TSB - Transportation Safety Board of Canada;
2. St. John's Airport, NF, Canada;
3. BFU - German Federal Bureau of Aircraft Accidents Investigation *Bundesstelle für Flungfalluntersuchung;*
4. Aircraft Pilot;
5. *Deutscher Wetterdienst – Zentrale* DWD (German National Meteorological Service);
6. ANA – *Aeroportos de Portugal*.

GPIAA requested suitable data as far as the event was concerned, namely:

a. Fuel requirements for the flight plan;
b. Fuel planning, fuel flow and endurance;
c. Winds aloft which affected the aircraft during the flight;
d. Fuel calculation, range control, fuel progress data or en route analysis;
e. Geographical position when the pilot has decided to divert to Flores Airfield;
f. Geographical position when the pilot communicate to Santa Maria ATC requesting the diversion;
g. Fuel remaining and the relevant endurance at the time of diversion;
h. Equal Time Point (ETP position);
i. Point of No Return (PNR position);
j. Pre-flight and in-flight log;
k. Navigation equipment;
l. It has also requested the filling up of two annexed forms, namely Crew Record and Aircraft Technical Record;
m. Any other issue that the pilot believes should be mentioned in the GPIAA Safe Report;
n. Finally, any other pertinent information able of a safety report improvement.

The data collection of this serious incident was delayed and consumed considerable time. Information gathering from the foreign entities proved to be a difficult task.

Moreover, some information was only partially available and the most important was not obtained.

GPIAA contacted BFU on 07th November 2007 (with no reply) and the pilot on 08th May and on 18th June 2008. On 10th May, the pilot presented his description of the incident and on 30th June, following our request to clarify some points, he stated that he had no written information about the flight and, consequently, after 7 months he was not able anymore to supply the requested specific flight information. Among his memories he solely could only remember that he faced stronger winds than those predicted by DWD.

The missing data would have been essential to "rebuild" the flight, and to understand what really happened. Therefore, the present report was not performed according to GPIAA standards.

Hence, the consequent analysis will be based on the available broad information, namely the pilot ICAO flight plan and the suitable weather forecast received from POC.

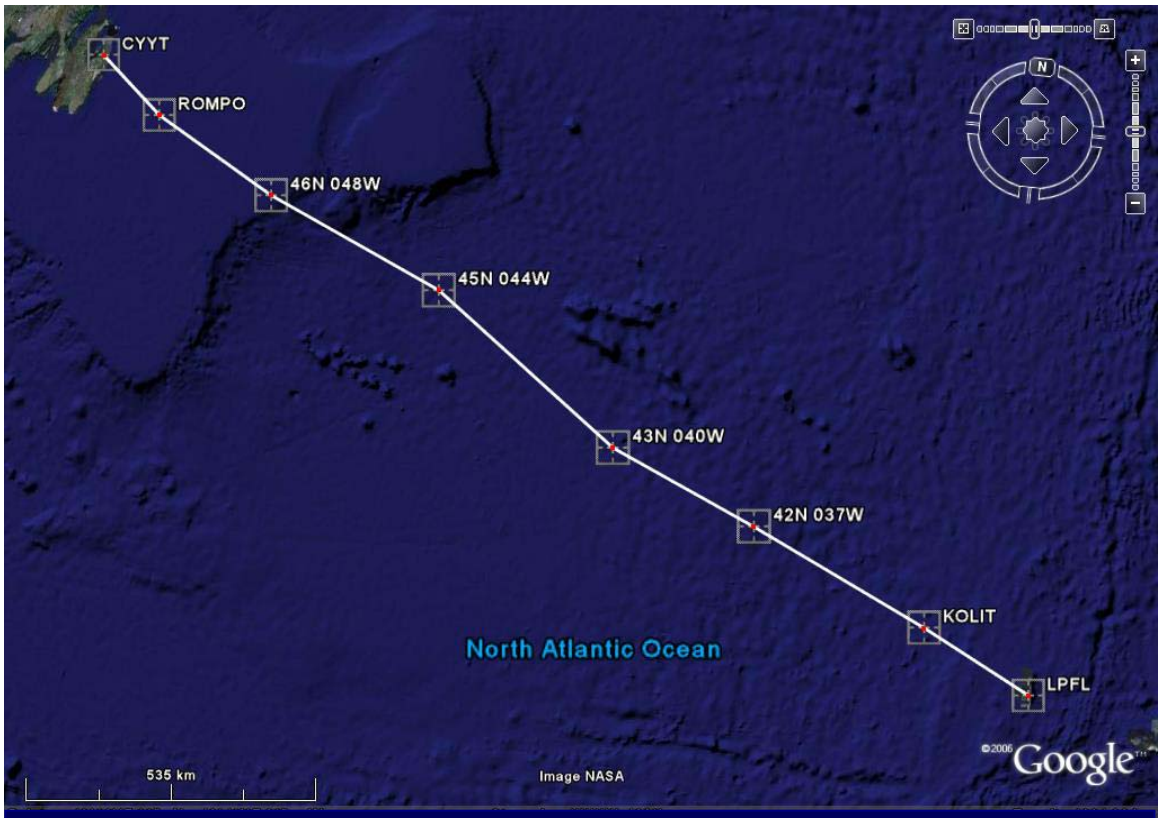
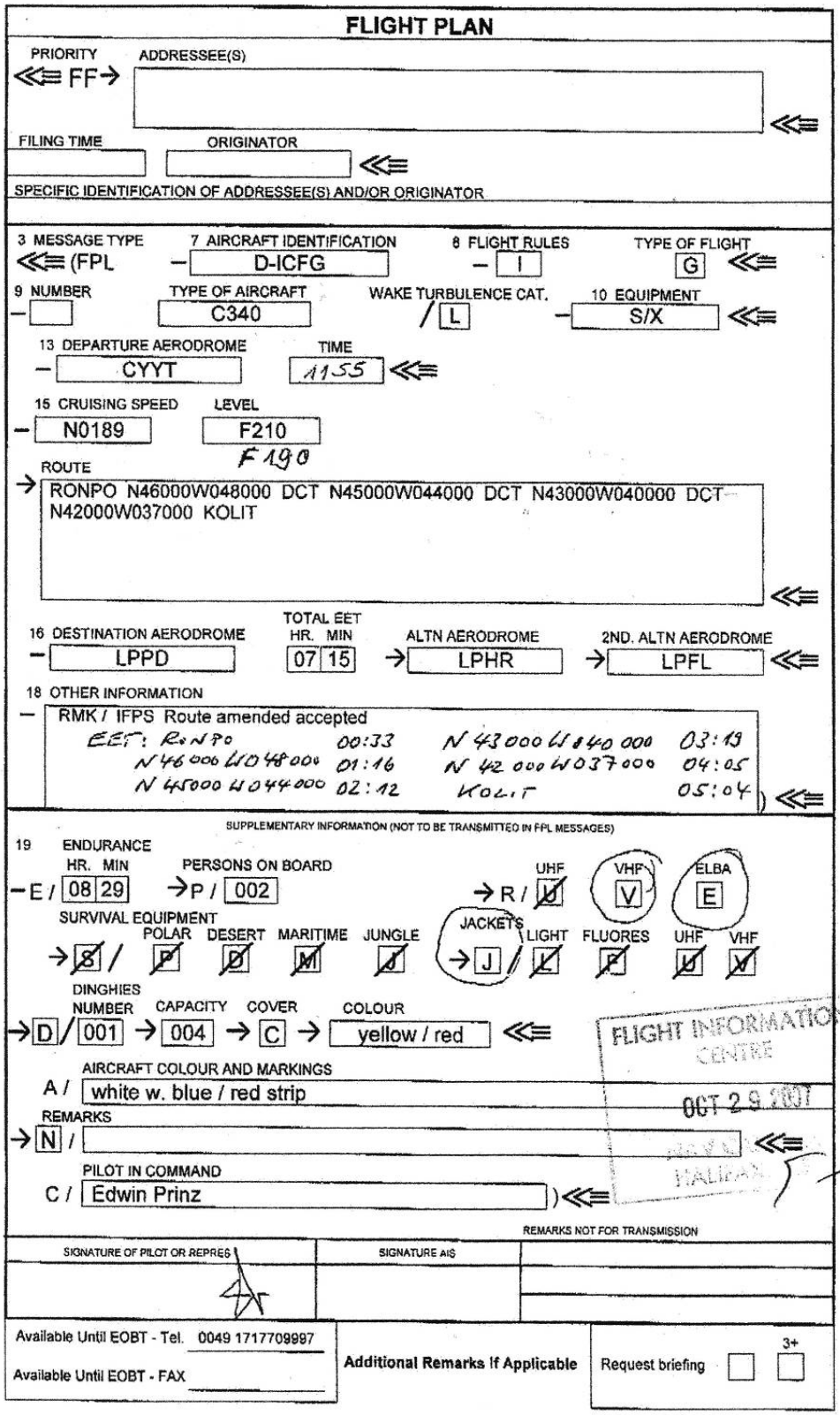


Fig. 6 – Cessna's en route course from St. John's airport to Santa Cruz das Flores airfield.[5]

[6] NASA Image selected form Google Earth.



FLIGHT PLAN

PRIORITY: FF
ADDRESSEE(S):
FILING TIME:
ORIGINATOR:
SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR:

3 MESSAGE TYPE: (FPL
7 AIRCRAFT IDENTIFICATION: D-ICFG
8 FLIGHT RULES: I
TYPE OF FLIGHT: G
9 NUMBER:
TYPE OF AIRCRAFT: C340
WAKE TURBULENCE CAT.: L
10 EQUIPMENT: S/X
13 DEPARTURE AERODROME: CYYT
TIME: 1155
15 CRUISING SPEED: N0189
LEVEL: F210
F190
ROUTE: RONPO N46000W048000 DCT N45000W044000 DCT N43000W040000 DCT N42000W037000 KOLIT
16 DESTINATION AERODROME: LPPD
TOTAL EET HR. MIN: 07 15
ALTN AERODROME: LPHR
2ND. ALTN AERODROME: LPFL
18 OTHER INFORMATION:
RMK / IFPS Route amended accepted
EET: RONPO 00:33 N43000W040000 03:19
N46000W048000 01:16 N42000W037000 04:05
N45000W044000 02:12 KOLIT 05:04

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)
19 ENDURANCE HR. MIN: E / 08 29
PERSONS ON BOARD: P / 002
R / UHF VHF ELBA
SURVIVAL EQUIPMENT: S / POLAR DESERT MARITIME JUNGLE
JACKETS: J / LIGHT FLUORES UHF VHF
DINGHIES NUMBER CAPACITY COVER COLOUR: D / 001 004 C yellow / red
AIRCRAFT COLOUR AND MARKINGS: A / white w. blue / red strip
REMARKS: N /
PILOT IN COMMAND: C / Edwin Prinz

FLIGHT INFORMATION CENTRE
OCT 29 2007

REMARKS NOT FOR TRANSMISSION
SIGNATURE OF PILOT OR REPRES
SIGNATURE AIS
Available Until EOBT - Tel. 0049 1717709997
Available Until EOBT - FAX
Additional Remarks If Applicable
Request briefing 3+

Fig. 7 – Cessna's flight plan.

According to the ICAO flight plan, the en route course and the "possible" pre and pos-flight log was established:

PRE & POS - FLIGHT LOG ACCORDING TO THE PILOT ICAO FLIGHT PLAN:

WAYPOINTS From:	WAYPOINTS To:	TRUE COURSE	WIND	IAS (?)	TAS (Kts)	GS (Kts)	DIST (NM) PART	DIST (NM) ACC	TIME UTC	Time es-timated by pilot	Acc. time estimated by pilot
CYYT 47º 37' 07"N 052º 45' 07"W	**ROMPO** 46º 52' 38"N 051º 00' 00"W	121,2º	?	?	189	153,3	84,31	84,31	**ATD 11h36**	00:33	00.33
	46ºN 048ºW	111,8º	?	?	"	189,4	135,75	220,06		00:43	01:16
	45ºN 044ºW	108,1º	?	?	"	191,3	179,13	399,19		00:56	02:12
	43ºN 040ºW (FIR STA)	123,3º	?	?	"	188,7	210,68	609,87		01:07	03:19
	42ºN 037ºW	113,2º	?	?	"	190,5	146,02	755,89		00:46	04:05
	KOLIT (TMA AZORES) 40º 32' 54.90N 033º 23' 20.82"W	116,8º	?	?	"	188,2	185,07	940,96		00:59	05:04
KOLIT (TMA AZORES) 40º 32' 54.90N 033º 23' 20.82"W	**LPPD** 37º 44' 31"N 025º 41' 52" W	112,6º	NOT FLOWN			***189,0*** [7]	396,29	1337,25		02:11	07:15
2ND. ALTN USED				**TOTAL**		**184,7 Kts**	**1.337,25 NM**				**07H15**
KOLIT (?) (TMA AZORES) 40º 32' 54.90N 033º 23' 20.82"W	**LPFL** 39º 27' 29"N 031º 07' 56"W	121,4º			**189**		122,88		**ATA 17h59**		**ATE: 06h23**
ALTN PLANNED		**TOTAL FLIGHT:**				**GS MEAN 166,66 Kts**	**DIST. FLOWN 1.063,84 NM**				
LPPD	**LPHR**	287,5º					**141,4**				
						TOTAL	**1.480,6 NM**				

GRAPH 1 **AIRCRAFT ENDURANCE** (it is the time an aircraft can remain airborne, not including minimum required fuel)**: 08h29**

FLIGHT LOG ACCORDING TO THE SUITABLE WEATHER FORECAST [AMERICAN NUMERICAL WEATHER PRODUCTS (GFS) 500 MB WIND] AND EXTRAPOLATED NAVIGATION DATA:

WAYPOINTS		TRUE COURSE	WIND	IAS (?)	TAS (Kts)	GS (Kts)	GRD DIST (NM)		TIME UTC	ETE	Acc. Time
From:	To:						PART	ACC			
CYYT 47º 37' 07"N 052º 45' 07"W	**ROMPO** 46º 52' 38"N 051º 00' 00"W	121,2º	170/45	?	189	156	84,31	84,31	**ATD** **11h36**	00:33	
	46ºN 048ºW	111,8º	170/45	?	"	158	135,75	220,06		00:52	01:25
	45ºN 044ºW	108,1º	130/25	?	"	166	179,13	399,19		01:05	02:30
	43ºN 040ºW (FIR STA)	123,3º	130/25	?	"	164	210,68	609,87		01:17	03:47
	42ºN 037ºW	113,2º	?	?	"	167 (?)	146,02	755,89		00:52	04:39 (?)
	KOLIT (TMA AZORES) 40º 32' 54.90N 033º 23' 20.82"W	116,8º	?	?	"	167 (?)	185,07	940,96		01:07	05:46 (?)
2ND. ALTN USED				**LEG FLOWN**							
KOLIT (?) (TMA AZORES) 40º 32' 54.90N 033º 23' 20.82"W	**LPFL** 39º 27' 29"N 031º 07' 56"W	121,4º	?	?	**189**	167 (?)	122,88	1.063,84		00:44	06:30 (?)
		TOTAL FLIGHT:				**GS (MEAN)** **167 Kts**	**DIST. FLOWN** **1.064 NM**		**ATA** **17h59**	**ATE** **06h23**	

GRAPH 2

- It was selected the most "favourable" wind components (meaning lower speeds);
- The difference between Estimated Acc. Time (06h30) and the ATE (06h23) is due to different Ground Speeds.

ICAO FLIGHT PLAN vs. PRE FLIGHT LOG

In ICAO Flight Plan, ITEM 16: TOTAL EET[8], it is written 07h15. This item means the Destination Aerodrome, Total Estimated Elapsed Time and Alternate Aerodrome with a cruising speed of 189 Kts. However, the aircraft flew an average Ground Speed (GS) of 166,6 Kts, between CYYT and LPFL. Consequently, it was been subject to a mean head wind speed component of 23 Kts.

If the pilot had intention for the flight to proceed directly to the destination airport and assuming that the GS was maintained, the following navigation calculations were established:

- Adding the ETE (Estimated Time Enroute) (02h23) with the accumulated flying time (CYYT to KOLIT) of approximately 05h46 (Graph 2), a total flying time between CYYT and LPPD amounts to 08h09 (Total ETE).

From:	To:	Distance:	GS (mean)	ETE	Endurance
Kolit	**LPPD**	**396,3 NM**	**166,6 Kts**	**02h23**	
CYYT	**LPPD**	**----**	**----**	**08h09**	**08h29**

Comparing this value Total ETE with aircraft Endurance of 08h29 (Flight Plan ITEM 19), the crew would have about 20 minutes fuel reserve available for holding, missed approach and diverting to the first alternate aerodrome (LPHR).

Actually, the crew experienced a strong head wind, and according to the pilot statement also ice formation was encountered. Nevertheless, the extension, type and duration of icing that affected the flight are unknown issues.

These two factors, head wind plus ice formation, reduced the GS drastically, seriously increasing the time flown.

1.17 Organizational and management information

Not applicable.

[8] EET (Estimated Elapsed Time) Definition – for IFR flights, the estimated time required from take-off to arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with destination aerodrome, to arrive over the destination aerodrome. For VFR flights, the estimated time required from take-off to arrive over the destination aerodrome. Doc.4444 ICAO - Procedures for Air Services Air Traffic Management.

1.18 Additional information

None.

1.19 Useful or effective investigation techniques

None.

2. ANALYSIS

In spite of GPIAA efforts in obtaining all the factual information needed to carry out a complete investigation, the fact is that the available data was elusive and the Investigation Team had to use the ICAO flight plan, the pilot's written statement and the weather forecast covering half aircraft course to rebuild the possible scenario.

The Cessna 340A RAM III, registration mark D-ICFG, landed at St. John's International airport from Flamingdale, New York, USA, after having flown one stage more on its way back to Germany.

For the next leg, the pilot considered two flight plans: one via Iceland and another via Azores. The option was dependent upon meteorological conditions prevailing on each route. Disregarding the possibility in getting meteorological information from Canadian Flight Information Centre, the pilot opted to contact DWD (Aviation Weather Service Frankfurt/Main) by telephone and try to obtain the most detailed possible weather briefings concerning along either flight across Iceland or across Azores. The safest alternative was, according to DWD advice, the route across Azores, despite a forecasted initial head wind.

The next morning, shortly before the departure, the pilot re-checked the weather information, again with the DWD. The forecast was confirmed and it predicted a flight across Azores without difficulties. The flight plan was submitted accordingly, reflecting a stopover at João Paulo II International Airport for refuelling. It was estimated that there would be fuel enough for the flight, diversion to the alternate and an eventual holding, as well.

On 29th October 2007, the Cessna 340A D-ICFG, with the pilot and a passenger on board, took off at 11:40 hours up to FL210 to continue the flight to Germany - St. John's International Airport (Canada)/João Paulo II Airport (Azores-Portugal) - with an ETA for 16:46 hours.

The pilot also stated that after a short time of flight it became evident that the weather conditions were different from those predicted. The wind speed was stronger than foreseen and also present for a longer part of the flight. However, the pilot maintained the routing, after considering that the spare fuel on board was enough to perform a safely flight.

Nevertheless, with the Azores ahead, having already crossed the PNR, the airplane found a large and dense Cumulonimbus clouds squall line. Being unable to fly around it to avoid the bad weather (due to the larger penalty on time and on additional fuel consumption), the pilot had no other choice than fly through this hazardous weather area.

Soon, the airplane got ice on its wings, reducing aerodynamic efficiency. This phenomenon induced an additional drag, bringing down the IAS in 20kts (pilot report), also increasing the fuel consumption and lengthening the flight time.

The pilot's calculations for the remaining flight time and for the necessary fuel to complete the trip showed him that, although the destination (Ponta Delgada) was reachable, the alternate airport would be compromised as well an eventual holding wouldn't be possible, especially if the head wind become stronger and the ice conditions got worse.

Therefore, he decided to make a precautionary landing at the earliest available airport of the Azores archipelago. On his first contact to the FIR of Santa Maria (Azores), at 17:26 hours, the Cessna's pilot requested to the ATC to divert and to land at the first island airport of Azores archipelago (Flores Island).

Because Santa Cruz das Flores is not an international airport, with no customs facilities available, the pilot was told that only in emergency condition he could request a landing at that airfield. Thus, the pilot declared emergency due to shortage fuel and, instructed by Santa Maria Control, made an uneventful landing at 17:59 hours at Flores Island.

These transatlantic flights involving "small" aeroplanes, between Canada and Azores Island, have to face normally a lot of difficulties, mainly due to the weather conditions affecting both aircraft and their crews. This sort of flight is longer than 1300 nautical miles and, most of the times, is performed within an adverse and hazardous climate. Of course, there are no available aerodromes between these two locations for eventual emergency landings. Also the flight level is not the most suitable one. Consequently the cruise endurance versus the fuel needed didn't allow any margin for error. Moreover, it is absolutely mandatory that the flight shall be planned very carefully and in due time. Therefore the range control graph, fuel flow, as well as the flight progress data must be monitored very meticulously. The gathering of meteorological information from different sources is a paramount requirement.

Considering that, as stated by the Cessna's pilot, besides the strong head wind and the build up of ice on the wings, it is easy to come to the conclusion that the GS was drastically reduced, increasing seriously the time flown.

By comparing the values of total ETE (08h09) and aircraft endurance of 08h29 (Flight Plan ITEM 19), the crew had about 20 minutes available, which was notoriously short for holding, missed approach and diverting to the first alternate aerodrome (LPHR).

3. CONCLUSIONS

3.1 Findings

A. *Aircraft*

The aircraft had the certification valid and issued by the appropriate authority;

B. *Pilot*

1. The pilot held a CP(A) license and had a valid medical issued by the appropriate authority;
2. Limits concerning crew time, flying and rest time were complied with;
3. The pilot was properly qualified and experienced to undertake the flight;
4. The DWD forecast estimated a flight across Azores without difficulties;
5. The pilot decided for the most suitable route across the Atlantic, considering the DWD forecast;
6. The pilot could have obtained a more detailed weather forecast by consulting the Canadian Flight Information Centre;
7. The submitted flight plan took only into consideration the necessary fuel for the entire flight, diversion to alternate and to an eventual holding, in accordance with the DWD forecast;
8. According to the available facts, the pilot had only 20 minutes[9] more to reach the destination, perform holding, execute a missed approach and a diversion to the alternate aerodrome;
9. In consequence, the pilot decided to land at an “en route” airport as a precautionary decision;
10. He had to declare an emergency situation as this was a requirement to land at a non international airport (no customs facilities);
11. The precautionary landing at a suitable airport was classified as an emergency condition under lawful imposition.

[9] Table page 17

C. Meteorological

1. The meteorological conditions met along the flight could be eventually different from the DWD weather forecast report;

2. A stronger wind force and ice conditions affected the aircraft's performance and aerodynamic efficiency, bringing down the GS, extending the flight time and increasing the fuel consumption.

3.2 Causes

The Investigation Team concludes that:

a. The main cause of the incident was due to the fact that the airplane wasn't suitable refuelled for the enroute flight, holding and diversion to the alternate;

b. The contributory cause might be an eventual adverse weather conditions encountered along the flight across the Atlantic.

4. SAFETY RECOMMENDATIONS

This Report does not sustain any Safety Recommendatios.

The Investigator-in-charge

Artur A. Pereira

The Technical Investigator

Antonio Barros

Lisbon, September 11th, 2008.

ACRONYMS

ALTN	Alternate
ATC	Air Traffic Control
ATD	Actual Time of Departure
BFU	*Bundesstelle für Flugunfalluntersuchung*
CBs	Cumulonimbus
CYYT	ICAO Airport code – St. John's (Canada)
Dist	Distance
DWD	*Deutscher WetterDienst*
EET	Estimated Elapsed Time
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
ETP	Equal Time Point
FIR	Flight Information Region
FL	Flight Level
GFS	Global Forecast System
GPIAA	*Gabinete de Prevenção e Investigação de Acidentes com Aeronaves* (Portuguese Air Accident Investigation Branch)
GRD	Ground
GS	Ground Speed
IAS	Indicated Air Speed
lb	Pound
ICAO	International Civil Aviation Organization
I.T.	Investigation Team
LPFL	ICAO Airport code – *Flores* (Azores)
LPHR	ICAO Airport code – *Horta* (Azores)
LPPD	ICAO Airport code – *Ponta Delegada* (Azores)
Kg	Kilogram
Km	Kilometre
Km/h	Kilometre per Hour
Kts	Knots (NM/hr)
METAR	Meteorological Terminal Air Report
METEO	Meteorology
MTOM	Maximum Take Off Mass
N	North

NM	Nautical Miles
N.Y.	New York
OCT	October
PIREP	Pilot Weather Report
PNR	Point of No Return
POC	Point of Contact
PSI	Pound per Square Inch
SIGMET	Significant Meteorological Information
s/n	Serial Number
SP	Speed
St.	Saint
STA	*Santa Maria*
TAF	Terminal Aerodrome Forecast
TAS	True Air Speed
TD	True Direction
TMA	Traffic Management Advisor
TSB	Transportation Safety Board
UTC	Universal Time Coordinated
vs.	Versus
W	West
Z	Zulu