

**Bureau**  
**Enquêtes-Accidents**



**R E P O R T**

*on the accident to Britten Norman  
BN2 B 8P-TAD  
at Bellefontaine (Martinique)  
on July 18 1994*

**8P-D940718**

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## **F O R E W O R D**

*This report presents the technical conclusions reached by the Accident Investigation Office (Bureau Enquêtes-Accidents) on the circumstances and causes of this incident.*

*In accordance with Annex 13 of the Convention on International Civil Aviation and with directive 94/56, the analysis of the incident and the conclusions and safety recommendations contained in this report are intended neither to apportion blame, nor to assess individual or collective responsibility. The sole objective is to draw lessons from this occurrence which may help to prevent future accidents or incidents.*

*Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous interpretations.*

## **SPECIAL FOREWORD TO ENGLISH EDITION**

*This report has been translated and published by the Bureau Enquêtes-Accidents to make its reading easier for English-speaking people. As accurate as the translation may be, please refer to the original text in French.*

# SYNOPSIS

## Date and time

July 18 1994  
at around 01.45 UTC<sup>1</sup>

## Site of accident

Near Piton Lacroix, in the Carbet Hills,  
in the commune of Bellefontaine, Martinique (972)

## Type of flight

Public transport (passengers)

## Aircraft

Britten-Norman BN2 B  
Registration 8P-TAD

## Owner

TIA Holding Ltd  
Grantley Adams Airport  
Christ Church, Barbados

## Operator

Trans Island Air  
for Société Nouvelle  
Air Martinique

## Persons on board

5 Passengers  
1 Flight crew

## Summary

The aircraft took off from Grantley Adams airport for a flight to Fort de France on behalf of Société Nouvelle Air Martinique. On an IFR approach, at night, the pilot requested and received clearance for a visual approach. The airport overflight and environs were not identified by the pilot; the aircraft crashed into high ground in the extension of its arrival route, eight nautical miles from the airport.

## Consequences

	Fatal Injuries	Equipment	Third Parties
CREW	1	Destroyed	N/A
PASSENGERS	5		

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<sup>1</sup> All times in this report are UTC, except where otherwise specified. Four hours should be subtracted to express local official Martinique time on the day of the accident.

# **1 - FACTUAL INFORMATION**

## **1.1 History of the Flight**

On Monday July 18 1995 at 00h45 UTC, expressed in local time as Sunday July 17 at 20h45, the Trans Island Air Britten-Norman BN2B registered as 8P-TAD, took off from Grantley Adams airport (Barbados) bound for Fort de France (Martinique) with one pilot and five passengers on board.

The flight had been preceded by another aircraft, registered as 8P-TAC, of the same type and belonging to the same company, flying the same route. These flights were undertaken on a charter basis on behalf of Société Nouvelle Air Martinique. They were carrying passengers originally scheduled to fly on a Dornier 228 which was out of service, and which was supposed to undertake scheduled flight PN 403.

At 01h39, at the request of the approach controller, the pilot announced his estimated arrival time over the FOF beacon at 01h47.

At 01h40 the pilot said that he was at 2700 feet, thus at the minimum arrival altitude in that sector, still on the 150 radial from FOF; he stated that he had the field in sight and requested permission to make a visual approach.

At 01h42, at the request of the controller, the pilot confirmed that he had the field in sight and obtained clearance for a visual approach.

At 01h45, the pilot of 8P-TAD transmitted for the last time.

At 01h48, he no longer responded to the controller's calls.

At 01h58, the DETRESFA phase of the search and rescue procedure was initiated.

On July 19 1994 at around 08h30, a day and a half after the accident, the wreckage of the aircraft was found in the Carbet hills, near Piton Lacroix in the commune of Bellefontaine.

## **1.2 Injuries to Persons**

The pilot and all five passengers were killed.

## **1.3 Damage to Aircraft**

The aircraft was destroyed.

## 1.4 Other Damage

None.

## 1.5 Personnel Information

### 1.5.1 Pilot

The minimum flight crew for this type of aircraft is one pilot. (cf. Airworthiness Certificate)

The pilot was 39 years old. He possessed the requisite licenses and qualifications to undertake the flight and had a total of 2000 flying hours, of which 1400 on this type of aircraft.

His license (CPL 098) was valid until September 30 1994.

His activity preceding the flight was as follows:

Aircraft	previous 90 days	previous 30 days	previous 24 hr.
BE 58	105 h	47 h	0 h (*)
BN2	18 h	0 h	0 h (*)

(\*) On the day of the accident, he had just returned to service after 2 days break

The pilot's colleagues at the airline did not notice anything in particular which might have indicated a problem in the preparation of the flight, nor any irritants linked to personal problems.

According to the Airline Manager, the pilot had a reputation for serious and rigorous work.

### 1.5.2 Air Traffic Control Organisation

The staff of the control tower consisted of an approach controller in charge of the regional control area airspace (TMA) and of one tower controller in charge of airport control zone airspace.

The approach controller was 39 years old. He was posted to Fort de France on October 10 1989 and qualified as First Controller on January 8 1991. He was fully qualified to carry out his duties.

The tower controller was 40 years old. He was posted to Fort de France on November 7 1984 and qualified as First Controller on April 20 1985. He was fully qualified to carry out his duties

The loss of radio contact with the pilot occurred before handover to the tower controller.

## 1.6 Aircraft Information

The Britten Norman BN2B is a twin-piston-engined aircraft with high wings and fixed landing gear. It performs well in terms of its short takeoff and landing distances, at the expense of a relatively slow cruising speed of around 120 knots. This type of aircraft is well-adapted to the needs of short route stages in the archipelago where runway infrastructure is sometimes modest.

## 1.7 Meteorological Information

The flight took place at night. The moon was in a phase between half and full moon.

The wind at flight level 50 was at 090° relative to geographic north (107° relative to magnetic north), at a speed of 20 knots.

### Ground observations at Fort de France station at 01h00

- Visibility 20 kms
- Wind direction 080° at a speed of 10km/hr
- No precipitation or other significant phenomena
- Cloud base at 600 m, with cover of 3 octas of cumulus
- Temperature 26°C, dewpoint 22.1°C
- Humidity 79%
- Atmospheric pressure at sea level: 1017.2 hPa

### Ground observations at Fort de France station at 02h00

- Visibility 20 kms
- Wind direction 080° at a speed of 10km/hr
- No precipitation or other significant phenomena
- Cloud base at 600 m, with cover of 2 octas of cumulus
- Temperature 25.5°C, dewpoint 22.1°C
- Humidity 82%
- Atmospheric pressure at sea level: 1017.7 hPa

General comment: calm weather with weak instability.  
(Information from the Lamentin Regional Meteorological Center)

## 1.8 Aids to Navigation

The aircraft's flight path being outside of all radar cover (see para. 1.8.2), air traffic control is performed in relation to positions given by pilots. Pilots indicate an estimated overflight time at a radionavigation beacon or a position with a bearing and distance relative to a radionavigation beacon. It is therefore up to the pilot to position himself on his course in relation to indications from his navigation receivers (or by identifying landmarks in visual flight mode) and to transmit his position to the air traffic control service.

### **1.8.1 Aircraft Equipment**

The aircraft was equipped with the requisite navigation equipment for the flight. However, the pilot indicated by radio that he was not receiving indications of the distance from the airdrome on his distance measuring equipment (DME). At the same time, other aircraft were receiving this information normally. This equipment provides useful navigational assistance by providing continuous information on distance and flight time to the station. It is thus easy to transmit a precise estimated arrival time to the air traffic control service. However, to obtain a fix relative to a given point, it is possible to replace bearing/distance data (polar coordinates) by the intersection of two bearings. Thus the BORUS point, the entry point into Fort de France air traffic control airspace, could be determined by intersecting the Saint Lucia VOR bearing with that of Fort de France.

In addition, the pilot positioned himself in relation to the FOF VOR bearing, situated at Fort de France airdrome, determining his course. According to the approach controller, the direction finding indicator positioned the aircraft on the course planned and indicated by the pilot. The pilot thus probably had VOR information available.

Note 1: The aircraft was not equipped with an automatic emergency locator beacon - a locator beacon set off on impact - although this equipment is specified on the onboard Radioelectric Equipment User Certificate.

Note 2: DME is not obligatory for this type of flight.

### **1.8.2 Ground Equipment**

Ground maintenance staff found no functional anomalies in the Fort de France airdrome VOR and DME ground equipment, for which the previous flight check had been carried out in May 1993. This service check was the subject of report # 63/93 and concluded that both systems were fully operational.

Fort de France airport had radar imaging supplied by Point à Pitre. The image is centered on Fort de France but its range is not omnidirectional around this central point. The arrival path of 8P-TAD from the south could not be displayed. On the same radar screen a direction finding plot is displayed which shows the origin and direction of radio broadcasts. According to the controllers' statements, the system was operating normally.

## **1.9 Communications**

Radio communications were not disrupted in any way. The communications in question were recorded, and a transcript is attached in appendix 6.

## 1.10 Aerodrome Information

Fort de France-Lamentin airport is open to commercial air transport. It is situated at the top of Fort de France Bay, south east of the city, and all types of aircraft can use it both during the day and at night, with or without visual flight rules.

## 1.11 Flight Recorders

The applicable regulations do not specify installation of flight recorders for the type of aircraft concerned. Consequently, the aircraft was not equipped with them.

## 1.12 Wreckage and Impact Information

The impact occurred eight nautical miles from the airdrome at an altitude of 2700 feet (823 meters). The wreckage was on a bearing of 331 degree from FOF, precisely in line with the extension of its arrival path.

The dispersion of some debris in the trees for one hundred meters fixes the arrival path at 010 degrees magnetic, in level flight with a slight left attitude. The rest of the wreckage was grouped together in the immediate area of the point of impact. The final trajectory was established through broken branches in the vegetation, some of which had been cut off by the propeller blades, indicating that the engines were running on impact.

The airframe was destroyed but no elements of the structure or of the flight control surfaces were missing. The flaps were retracted, indicating the aircraft was in cruise configuration.

### Examination of the cockpit instrument panel

Some of the instruments gave some readings, but, because of their condition, these cannot be considered as reliable.

- the vertical speed indicator indicated a rate of descent of 250 feet per minute,
- the airspeed indicators showed, respectively, 45 knots on the left instrument and 55 knots on the right instrument,
- on the VOR indicator, the pointers were absent and the "FROM" flag was displayed,
- the direction indicator displayed 250°.

The horizontal situation indicator (HSI) showed:

- a route oriented to the north, with the heading (HDG) flag displayed,
- the vertical pointer deviated one notch to the left, the omni bearing selector (OBS) had disappeared.

The radiomagnetic indicator (RMI) showed:

- a route oriented to the north,
- the single pointer was switched to VOR mode and indicated a QDM of 280°,
- the double pointer was switched to ADF mode, a stop prevented its switching to ADF mode, and it indicated a QDM of 132°,
- the pointers were physically locked together by the force of the impact but could rotate freely; there was an angle of 38° between them.

Since the pointers were locked together but could rotate freely, it was possible to position them in the local radioelectric context by rotating them together by 50° clockwise. Thus, the single pointer indicated the ADF station in the 182 from the wreckage and the single pointer is lined up with the direction of the VOR station, though with an inversion of 180°.

The filter selector units, with analog displays, gave no information on the stations selected by the pilot.

#### Time on board:

The cockpit instrument panel clock, of a clockwork type, was still functioning when the wreckage was examined and indicated 12h23. Watches worn by persons present at the accident site showed the time as between 12h125 and 12h26. No information on the time of the accident could be gleaned from the occupants' watches, since they also continued to function after the impact.

### **1.13 Medical and Pathological Information**

The bodies remained grouped inside the aircraft. The autopsy performed on the pilot revealed no traces of alcohol.

### **1.14 Fire**

There was no fire.

### **1.15 Survival Aspects**

Everything indicates that the occupants were killed instantly. However, the possible survival of an individual would have been compromised by the time taken to locate the wreckage. The time taken, almost 48 hours, was due to the isolated situation of the mountainous area of the crash site and the absence of an emergency locator beacon. In addition, the initial search and rescue operation was, quite logically, focused on the early part of the arrival path, principally over the sea.

## 1.16 Tests and Research

First indications suggested that the flight path followed was that which had been planned up to the level of the airdrome. It thus seemed profitable to make observations in real time on the navigation conditions by visual identification of the ground in a context as close as possible to that which pertained on the day of the accident. A night reconnaissance flight was therefore carried out by investigators on August 25 1994.

The aircraft used was a Beech 58, a twin-engined plane with retractable landing gear which was faster than the BN2. Power was therefore reduced in order to obtain 130 kts ground-speed. This speed corresponds to the ground-speed estimated for the BN2 on the day of the accident, that is to say 120 kts airspeed plus 10 knots of tailwind.

### Meteorological observations on the ground on the day of the flight at 19h00

- Visibility over 10 kms
- The Carbet hills were not visible from the station
- Scattered cloud layer (with 1 to 3 octas of cloud cover) whose base was at 2000 feet above ground level.

### Operation of flight

- Takeoff at 20h16 local time,
- climb away to 4000 feet on bearing 150 from FOF,
- return vertically over BORUS on course 330 towards FOF.

### Overhead at BORUS at 4000 feet

- Fort de France VOR was received normally but not the DME; the aircraft being outside of its theoretical range,
- Saint Lucia VOR was received normally,
- Barbados VOR was not received, the aircraft being outside of its theoretical range.

At 28 nautical miles from FOF, the DME was received normally.

At 24 nautical miles from FOF, descent from 4000 feet towards 2700 feet. The south coast of Martinique was clearly visible, the aircraft passed over Les Salines (reference point noted as "south coast") at 00h52, vertically over the Le Diamant-Le Vauclin axis at 00h55 and arrived overhead at the Fort de France airport facilities at 00h59. The "TO-FROM" flag tripped normally, indicating normal overflight of the VOR.

The flight continued on course 330 for 4 nautical miles, this being halfway between directly over the airdrome and the site of the accident. The highly developed Fort de France basin was strongly lit and the airdrome was easily identifiable. To the north, the horizon was dark. The EDF power station, which

might have led to some confusion, was, in comparison with the airdrome, far less well lit. The lighting of the Saint-Pierre area was clearly visible, but was much less intense than that of Fort de France and environs. The Carbet hills were not visible.

## **1.17 Organizational and Management Information**

The flight was initially scheduled on a Dornier 228 operated by Société Nouvelle Air Martinique (SNAM). That aircraft being unavailable due to an engine breakdown, SNAM leased two BN2's from the Barbadian airline Trans Island Air (TIA). The leasing request was handled by the service company Jet Aviation Services, based at Fort de France-Lamentin airport. JAS confirmed TIA's offer to SNAM in a fax dated the day before the accident at 16h42.

The applicable mandatory regulations specify that the charter by a French public transport airline of an aircraft belonging to a foreign airline is subject to obtaining, in advance, an authorisation issued by the Service des Transports Aériens (Air Transport Service) upon advice from the Service de la Formation Aéronautique et Contrôle Technique (Aeronautical Training and Technical Inspection Service), which checks that such aircraft can be operated in conformity with French technical safety standards.

In the case under consideration, no such request was made and TIA's aircraft could not therefore be chartered legally.

It should also be noted that the local civil aviation services were not informed of this charter arrangement. In addition, the Flight Plan only mentioned the Barbadian registration, with no reference to the Air Martinique flight number (PN 403).

## **1.18 Additional Information**

### **1.18.1 Information on Overall Air Traffic Useful to the Investigation**

Immediately before the accident, the situation of air traffic at Fort de France was as follows, on the approach frequency:

- "LIB 805" in transit on the Piarco (Port of Spain) frequency at 01h31.
- "LIAT 336" on approach transferred to the tower frequency at 01h20 after having obtained clearance for a visual approach.
- "8P-TAC" on approach following KAREX ILS 09 instrument approach procedure. Transferred to tower frequency at 01h28.
- "F-GGKA". At 01h26 at 19 nautical miles DME, the pilot indicated having the runway in sight and requested a visual approach. At 01h38m38s, almost vertically above the airdrome, the plane was transferred to the tower frequency after having obtained visual separation clearance with 8P-TAC in final phase on ILS.
- "OG516AT" departing for Point à Pitre, transferred to Le Raizet frequency at 01h39.

- "APW9433" on approach following instrument approach procedure KAREX, number 2 on approach behind 8P-TAD. During the search and rescue phase for 8P-TAD, the aircraft had to perform 3 circuits in the hold at 4000 feet before declaring a critical fuel situation. Informed of the search taking place, it was authorized to make a final ILS 09 approach at 02h00.
- "MTQ 412" was number 3 on approach following the KAREX instrument approach procedure. The aircraft was authorized to wait at 5000 feet in the FOF hold.
- "MTQ 3607" was on approach following instrument procedures. Its last clearance, as shown in the transcript, was a report from the KAREX hold at 6000 feet.

## **1.18.2 Information on Arrival and Approach Procedures**

### **1.18.2.1 Instrument Procedures**

(See procedure charts in appendix)

The connecting trajectories between the arrival paths and the approach fixes, or the hold if applicable, are defined in terms of magnetic headings and altitudes on the arrival chart (called STAR, for Standard Arrival). The approach procedure under instrument flight regime in service was the ILS of the runway with an easterly heading, in other words runway 09. Arrival and approach procedures at Fort de France use the VOR-DME FOF and the FF ILS. When the Initial Approach Fix (IAF) is FOF, the arrival and approach procedures use the VOR only and the NDB FOF beacon. The DME is not therefore indispensable.

The arrival path from Barbados is performed through point BORUS, on route for FOF on QDM 330°. The final approach sequence is systematically performed on runway 09. To join this sequence, the initial and intermediate approach procedures are described as follows:

Arrival procedure to BORUS:

Follow route 330 on FOF. At 15 nautical miles DME, turn left to trace an arc until point KAREX at the intersection with the ILS localizer. This point constitutes the IAF for this procedure.

The safe altitudes on the BORUS trajectory are as follows:

- 4000 feet until 15 nautical miles from FOF
- 3000 feet on the arc 15 nautical miles DME from FOF until crossing bearing 236 from FOF
- 2000 feet, on course towards KAREX, after having passed bearing 236 from FOF.

Arrival procedure after passing BORUS:

Follow route 330 until overhead at FOF, which becomes the IAF.

The safe altitudes on the BORUS trajectory are as follows:

- 4000 feet until 15 nautical miles from FOF,
- 2700 feet until FOF.

In case of hold at FOF, the minimum altitude is 5000 feet.

Conditions for authorisation for clearance for visual approach:

In a situation where

- the level of the meteorological ceiling is superior to that of the minimum altitude in the sector,
- the pilot can see the runway and estimates that he can proceed by visual identification of the ground,

the pilot may request clearance for a visual approach. Authorisation, given by the air traffic control organisation, frees the pilot from using the instrument approach procedure. This can represent a considerable saving of time, especially with a relatively slow aircraft.

The pilot then takes responsibility for separation with high ground. While remaining on an IFR flight plan, he can freely decide to fly his course by visual identification of the ground until the landing.

#### **1.18.2.2 IFR Approach and Visual Night Maneuvers**

There follows an extract from the Air Traffic Regulations applicable on the day of the accident: RCA para. 5.5.2 Visual approach.

An aircraft in IFR flight is permitted to not carry out the approved or published instrument approach procedure, or to not continue with one, in order to perform a visual approach by visual identification of the ground if the following conditions are met:

- the pilot can see the airdrome;
- the pilot can maintain visual contact with the ground;
- the pilot judges that the visibility and ceiling permit a visual approach and estimates that it is possible to land;
- at night, the level of the ceiling is not lower than that of the minimum altitude in the sector or, if applicable, of the homing track selected, subject to conforming to any instructions specific to a night visual approach at the airdrome in question.

In addition, the regulations specify:

- a ban on visual night maneuvers at certain airdromes (RCA1 para 5.5, part f). Thus, at Fort de France, when wind speed and direction do not allow a landing

on runway 09, the maneuver required to reach the final phase of the opposite axis visually is not authorized at night.

- a ban on flights under visual flight regime at night for passenger flights (Ministerial Order of 5 November 1987 para 7.1.5 part b).

### **1.18.3 Information on Visual Perception of the Ground and Obstacles at Night**

#### **1.18.3.1 Identification of High Ground and Evaluation of Distance from Obstacles in the Dark**

At night it is very difficult, indeed impossible without great knowledge of the terrain, to interpret the absence of light correctly. Such an absence may be due to a sparsely populated or rural area, as in the majority of mountainous areas, overflight of water or the masking effect of clouds.

It is not possible to be certain of the exact distance from a perceived object in such conditions, especially in the case of cloud cover. Thus, the ground can rapidly disappear from view without the pilot having time to carry out avoiding maneuvers to maintain visual flight conditions.

Finally, when the pilot passes under a ridge line at night, visual clues enabling him to appreciate the danger of the situation are tenuous. The masking effect increases insidiously, hiding lights on the ground first slowly, then rapidly, a few seconds before a collision.

These phenomena can be aggravated by modifications in the optical properties of the air, associated with thermal contrasts.

#### **1.18.3.2 Errors Linked to Visual Perception at Night**

Adaptation to night vision involves displacement of the retinal perception zone from the center towards the outer edge of the retina. This is accompanied by an inability to focus on an image in the central retinal area, by a decrease in visual acuity and the loss of color vision.

The disruption of focus on objects is the cause of auto-kinetic illusions. In the dark, the attempt to focus on a weak isolated light source causes small search movements by the eye. In the absence of other reference points, the brain ignores the movement of the eye and interprets the displacement of the light source on the retina as a real displacement of the light source itself. The result is a slow and constant apparent displacement of the light source.

Other illusions result from psychological modes of visual perception at night; confusion of light sources, in particular with starlight or artificial alignment causing roll or pitch or glide slope anomalies; alteration of distance perception, due in particular to the perception of light sources of varying intensity related to the aircraft attitude or the runway slope.

These factors may induce numerous successive adjustments for adequate flight control, (concave rather than constant rectilinear glide slope, effecting the Kraft illusion).

Adaptation to night vision occurs in approximately 30 minutes. A decrease in performance of the order of 30 to 50% can be observed for 5 hours during a night flight, in a situation of prolonged previous exposure to bright light (sunny beaches or snow-covered areas during the day preceding the flight).

#### **1.18.4 Examination of Radio Magnetic Indicator (RMI) and of Filter Selector Boxes**

The RMI was examined at the Flight Test Center in Bretigny and the filter selector boxes at the Rockwell International laboratory in Toulouse.

The request for the RMI examination centered on the study of a possible failure leading to a 180° inversion of the VOR indication. The report on this examination, attached in the appendices, concludes that the ADF bearing is correct, but that of the VOR can be incorrect by 180°.

The examination of the filter selector boxes centered on an attempt to read out the frequencies displayed in the non-volatile memories. The poor condition of the circuits made it impossible to install them on the test bench.

## **2 - ANALYSIS**

### **2.1 The Flight**

#### **2.1.1 Flight Preparation**

Between the moment of the request for the charter arrangement on Saturday July 16 at 20h42 and the takeoff from Barbados on Monday July 18 at 00h45, Trans Island Air had sufficient time to prepare its aircraft. In the context of the investigation, representatives of the airline stated that they did not record any particular events which might have disturbed the preparation of the flight.

#### **2.1.2 Analysis of Recordings of Air/Ground Communications**

At 01h18, the pilot made contact with FOF approach control. The link was established but the density of radio traffic at that moment obliged the controller to delay the communication. This was done, at the controller's initiative, 2m30s later.

At 01h21, the pilot signaled that he was on airway A555 at FL80, approaching or passing point BORUS. He asked to begin his descent.

He was authorized to descend to 4000 feet, the minimum altitude on this flight path. This authorisation indicates that the aircraft was alone on this flight path.

The controller asked the pilot to call back when 20 nautical miles DME and to give an estimated arrival time at FOF. In fact, the controller had very little information to position this flight. The elements requested would allow him to authorize the descent to the minimum altitude in the sector and to plan a procedure at FOF without delay.

No reply was forthcoming to this request. On the supposition that the pilot received this message, it is possible that he then noticed that he did not have DME information and that he was obliged to calculate his estimated arrival time:

- the request was not repeated by the controller, communications continue with other aircraft.

At 01h27, the first BN2, registered 8P-TAC, declared itself in the final phase of the instrument approach procedure.

The pilot of 8P-TAD indicated that he was arriving at 4000 feet, that he wished to continue his descent and, when asked by the controller, that he was still not receiving the DME.

This anticipation of events in relation to the descent phase, without precise positioning, suggests that the pilot envisaged an arrival above FOF without reference to the altitudes prescribed by the procedure. The procedure by FOF is shorter and is the only one possible without DME. It is also possible that he was already envisaging a visual approach.

To give authorisation to allow a continued descent, the controller must necessarily know the estimated arrival time, since clearance to descend to 2700 feet, the minimum sector altitude (MSA), means effectively designating him number 1 in the instrument approach procedure.

Instead of giving a DME distance to FOF, as requested, or an estimated time of arrival over FOF, the pilot tried to specify his time of passage at BORUS:

"OK so we estimate just by borus, borus time two three"

The pilot was clearly not able to give a DME distance nor, apparently, able to locate himself geographically in a precise enough way to give an estimated arrival time at FOF. He therefore implicitly delegated estimation of his arrival time to the air traffic control service.

The controller then specified that it was 01h28.

- It seems that the time indication available to the pilot was 4 minutes slow, but he adjusted his BORUS overflight time to 01h24:

"OK we estimate by borus time two four alpha delta"

- It is also possible that the time on board was correct (within a minute) and that the entry point had been overflowed four minutes before. This message was unusable for the air traffic control service and remains incomprehensible.

The imprecise language reveals confused navigation:

- the term "just by" seems to indicate that the aircraft is overflying or has just overflowed the point,
- the term "estimate" is used for an actual overflight time or for a passed one.

Without any precise position or estimated time, the controller asked the pilot to maintain his altitude at 4000 feet.

At 01h33, the pilot announced an estimated distance of 20 nautical miles while stating that he was still not receiving the DME.

By making a rapid approximation, considering only the aircraft's own speed, at 120 knots, this distance gives an estimated time at FOF ten minutes later, at around 01h43.

The controller authorized him to descend to an altitude of 2700 feet.

At 01h39, the controller asked for an estimated arrival time over the airdrome; the pilot said 01h47. This time is not coherent with the estimation of 20 nautical miles at 01h33. This estimation of the distance would have led to airdrome overflight at 01h43, and the accident probably occurred at around 01h47, which is coherent with the fact that the last contact occurred at 01h45 and that the pilot was no longer responding to calls at 01h48m41s.

There is a difference of 4 minutes between these two estimations. This length of time is also the flying time between the south coast (village of Sainte Luce) and the airdrome, as well as that between the coast of Fort de France and the accident site. A hypothesis based on a confusion between these two coasts is therefore a plausible one.

At 01h40, the controller asked the pilot if he was then receiving DME information. The pilot replied in the negative but indicated that he was still on bearing 150, that he had the airdrome in sight and that he could continue in visual flight mode.

The controller asked him to maintain altitude at 2700 feet and to call back when within sight of the south coast, the pilot replied that he was within sight of the south coast; the controller then asked him to call back when passing the south coast.

At 01h42, the controller asked the pilot:

- to confirm that he was passing the south coast; the pilot replied in the affirmative:  
"Affirm sir we just by the south coast"
- to confirm that he had the runway in sight; the pilot again replied in the affirmative,
- to indicate his speed, the pilot stated his speed at 120 knots.

The controller asked him to maintain maximum speed (to avoid any delay for the following flight) and authorized him to perform a visual approach.

At 01h45, the controller asked the pilot to reconfirm his position; the pilot replied that he was still inbound at 2700 feet.

The controller confirmed that he was authorized to make a visual approach and that there were therefore no more altitude restrictions, and asked the following aircraft, on an IFR procedure, to perform a holding circuit;

### **2.1.3 Conduct of the Flight After Clearance for Visual Approach**

- After having asked for and obtained clearance for a visual approach, the pilot is responsible for visual separation with the ground and he has complete freedom of maneuver to land while keeping visual contact with the runway. The fact that he maintained the minimum safety altitude suggests that the pilot did not identify the airdrome's installations. He believed himself to still be on approach and protected, whereas he was already past Fort de France, on an extension where the MSA is not 2700 feet but 6000 feet. It is clear that the overflight of the installations was not noticed by the pilot. In fact, the reconnaissance flight undertaken in the course of the investigation showed that it is practically impossible not to identify the airdrome and doubtful that one could confuse the Fort de France urban area with another place. The pilot therefore never saw the airdrome.

During this phase searching for the airdrome, the pilot could have asked the controller for a bearing fix. He did not do so:

- the estimated arrival time over the airdrome, as well as the VOR indication on the RMI were incorrect; for the pilot, the airdrome was still in front of him,
- in case he was in any doubt, revealing the difficulty of his position probably contained major dangers in his view, relative to:
  - \* the air traffic control organisation; it was difficult to reveal that he didn't have the runway in sight,
  - \* other aircraft on arrival; he would probably impose an extra delay on them.

## **2.2 Failure of Onboard Equipment**

- The pilot indicated that he was not receiving distance and time information from the station on his DME. His equipment was clearly faulty.
- The position of the pointers on the RMI, fixed in place on impact, indicate an inversion of 180° by the single pointer, that is to say the VOR indication. The posted frequencies could not be determined. However, the radioelectric and altitude infrastructure meant that the only usable VOR signal was that of Fort de France.

The equipment could have been inoperative, as the examination showed. In this case, however, if the indication given was erroneous by 180°, it would have been in this condition throughout the flight, which would mean that the pilot would have done all of his navigation with this error. Obviously, this seems highly unlikely.

It appears much more realistic to suppose that the pilot was searching for the airdrome and that his attention was thus exclusively drawn to external reference points, without regard to his navigation instruments.

## **2.3 Policy on Technical Requirements**

The presence of an emergency locator beacon, in working order, is obligatory for French aircraft or for aircraft operated on behalf of a French airline.

It should be noted that the activation of an emergency locator beacon would have speeded up the localization of the wreckage.

# **3 - CONCLUSIONS**

## **3.1 Findings**

- The pilot possessed the certificates, licenses and qualifications required to undertake the flight.
- The aircraft had a valid airworthiness certificate as well as the necessary navigation and control equipment.
- The pilot stated that he was not receiving DME information; at the same time, other aircraft in the sector received the signal normally.
- The ground navigation and landing equipment and the approach lighting systems were in normal working order.
- The flight was undertaken under a charter arrangement between Société Nouvelle Air Martinique and the Barbadian airline Trans Island Air, through the intermediary of a service company, Jet Aviation Service.

- The airline owning the chartered aircraft is not one of the foreign airlines authorized for charter arrangements by the legally competent authority.
- After having stated that he had the runway in sight, the pilot requested and received authorisation for a visual approach.
- The accident site is directly in the extension of the arrival course, at the minimum altitude for the south sector and eight nautical miles from the airdrome.
- The aircraft was not equipped with an automatic emergency locator beacon.
- The indication of the single pointer of the RMI (VOR information) was found inverted at 180°. The examination showed that such a fault was possible, but it would not be coherent with the navigation undertaken during the flight.
- Examination of the wreckage did not reveal any loss of power in the engines, nor any loss of aircraft components in flight.

### 3.2 Causes

The accident was caused by the pilot's failure to identify the airdrome installations before the start of the night visual approach procedure under an IFR flight plan.

The probable failure of the onboard DME and the imprecise navigation contributed to the accident.

## 4 - RECOMMENDATIONS

Navigation at night by visual identification of ground reference points makes it difficult to ensure separation from high ground, obstacles and clouds. In addition, night identification of ground reference points is not reliable, due to:

- the need for correct interpretation of the absence of light, which is impossible, and,
- the fact that significant reference points, such as the coastline, can appear very similar.

In case of loss of or dubious acquisition of visual references, or of going astray, it is difficult, even impossible to have recourse to a new clearance for an instrument approach.

Consequently, the Bureau Enquêtes-Accidents recommends:

**- that the conditions for which clearance for visual approaches at night under IFR can be requested and authorized be studied.**

# Appendices

## **APPENDIX 1**

Official Procedures for Approval of Charters

## **APPENDIX 2**

Arrival Procedures in the Fort de France TMA (STAR Chart)

## **APPENDIX 3**

Regional Chart

## **APPENDIX 4**

KAREX - ILS RWY 09 Procedure Chart

## **APPENDIX 5**

Visual Approach Chart for Fort de France

## **APPENDIX 6**

Transcript of Radio Communications

## **APPENDIX 7**

Report on Examination of Navigation Instruments

## OFFICIAL PROCEDURES FOR APPROVAL OF CHARTERS

### 1. Approval of Charters

The following table lists, for each charter arrangement, the procedure to be followed by the chartering airline. It details the respective services of the D.G.A.C. (Direction Générale de l'Aviation Civile) to which requests for prior approval or, where appropriate, notification of charter arrangements, should be addressed, as well as the minimum time limits within which requests must be registered before the start of chartered flights.

Type of Company Chartered	Length of Charter		
	Less than one week	Between one week and three months	Over three months
French Airline	Simple notification to STA and DRAC	a) if in conformity with program: simple prior notification to STA and DRAC  b) if not: - request to be addressed two weeks prior to STA (1) copy to SFACT and DRAC - approval by STA after consultation with DRAC	- notification to be addressed one month prior to STA (1), copy to SFACT and DRAC.  - approval by STA after consultation with DRAC
Foreign Airline included on list approved in advance by the DGAC (see 2 below)	- Simple prior notification to STA and DRAC	- request to be addressed two weeks prior to STA (1) copy to SFACT and DRAC  - approval by STA	- request to be addressed one month prior to SFACT and DRAC  - approval by STA after consultation with SFACT
Foreign Airline not included on an approved list	- request to be addressed as soon as possible to STA (2) copy to SFACT and DRAC  - approval by STA after consultation with SFACT	- request to be addressed two weeks prior to STA (2) copy to SFACT and DRAC  - approval by STA after consultation with SFACT	- request to be addressed one month prior to STA (2) copy to SFACT and DRAC  - approval by STA after consultation with SFACT

(1) The request must include information relative to paragraph 1 of this memorandum.

(2) The request must include, in addition to information relative to paragraph 1 of this memorandum, information required by paragraphs 4 and 5 of appendix 1 (technical conditions).

Requests for approval (or renewal) of charter arrangements can in some cases be sent to the STA when registering seasonal operation programs, in the case of scheduled service airlines, or of registration of charter programs in the case of non-scheduled service airlines. This in no way dispenses chartering airlines from addressing approval requests to other services concerned in the DGAC, nor from respecting time limits set in the above table.

## 2. List Of Foreign Airlines

Airlines may obtain advance approval for a list of foreign airlines which may be chartered. The list is registered with the STA (copy to SFACT and DRAC) with pertinent information relative to paragraph 1 of this memorandum and the technical information required by paragraphs 4 and 5 of appendix 1, at the latest one month before the start of charter flights. The list is approved by the STA after consultation with SFACT, with possible associated conditions.

## 3. Quarterly Statement

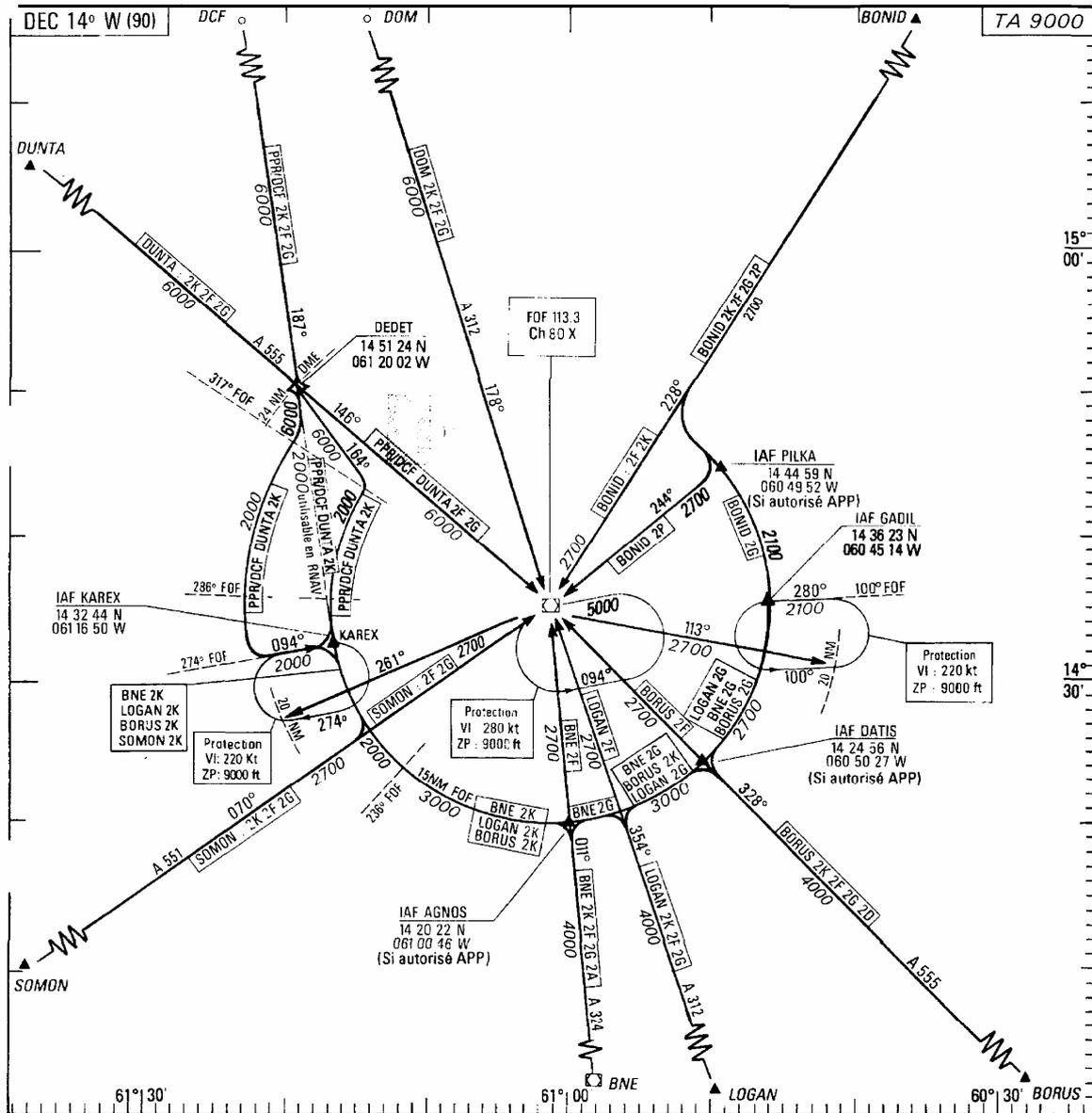
A quarterly statement of flights undertaken must be addressed to the STA, the SFACT and the relevant DRAC.

## 4. Authorisation to Employ Foreign Air Crew

Requests are to be addressed to the Bureau du Travail et de l'Emploi (BTE) of the DGAC.

TMA FORT DE FRANCE LE LAMENTIN  
STAR

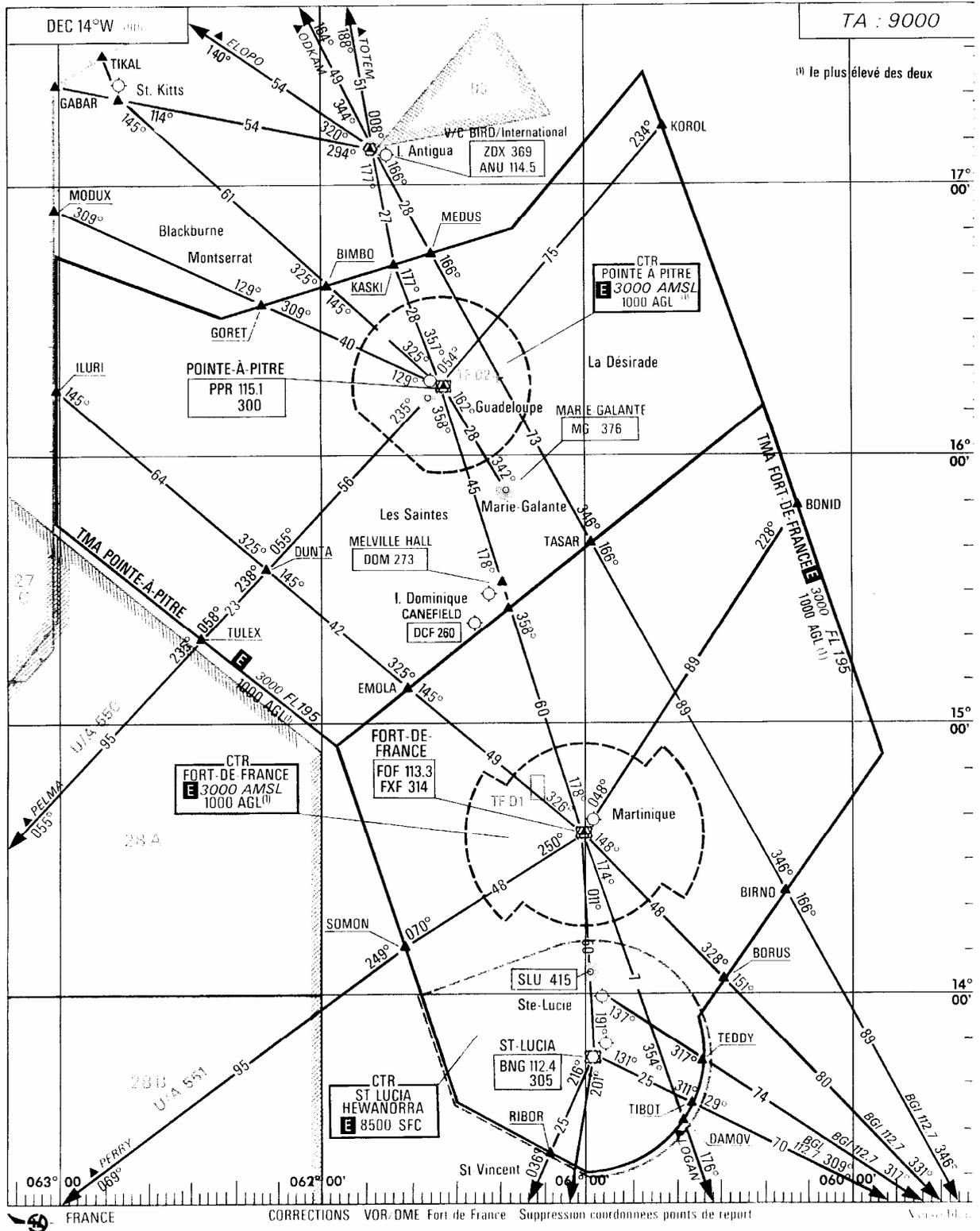
APP : FORT DE FRANCE Approche 121.0  
TWR : FORT DE FRANCE Tour 118.5



Carte régionale

APP : FORT-DE-FRANCE Approche 121.0, RAIZET Approche 121.3, RAIZET Radar 121.3  
 TWR : FORT-DE-FRANCE Tour 118.5, RAIZET Tour 118.4

APP: HEWANORRA Approche: 119.8  
 TWR: VIGIE Tour: 118.0  
 CANEFIELD Tour: 118.7  
 Melville HALL Tour: 118.9



# APPROCHE AUX INSTRUMENTS CAT. A B C D

# 02 FORT DE FRANCE LE LAMENTIN TFFF KAREX - ILS RWY 09

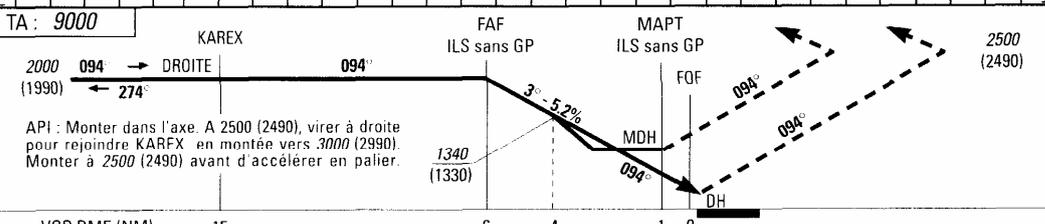
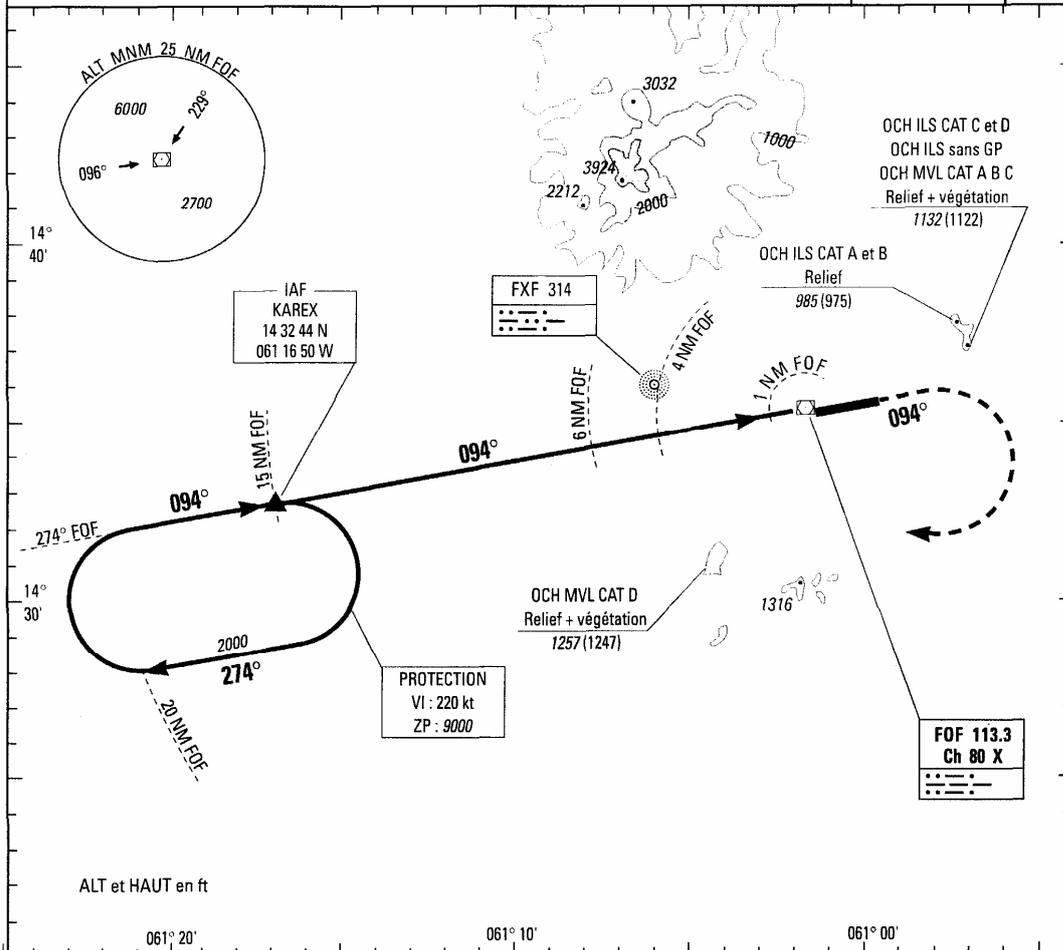
ALT AD : 16 , Seuil : 10 (1 hPa)

96 01 04

APP : FORT DE FRANCE Approche 121.0  
TWR : FORT DE FRANCE Tour 118.5  
ATIS FORT DE FRANCE 127.85

**ILS**  
**FF 109.9**  
RDH : 52

**DEC**  
**14° W**  
(90)



Minimums standard : distances verticales en pieds, VH en mètres REF HAUT : ALT Seuil

CAT	ILS (1) API 2.5%		ILS sans GP		MVL (2)		OCH ILS	OCH ILS sans GP	Observations : (1) Pour minimums particuliers voir feuillet complémentaire (2) HJ seulement MDH MVL CAT D 1570 si VI ≤ 180 kt
	DH	VH	MDH	VH	MDH	VH			
A	330	1000	620	1600	1470	1600	A : 327	A : 614	
B	340	1100	620	2000	1470	2000	B : 338	B : 614	
C	350	1250	660	2700	1570	2800	C : 350	C : 660	
D	370	1350	660	3300	1690	3500	D : 363	D : 660	

Observations (1) Pour minimums particuliers voir feuillet complémentaire. (2) HJ seulement.	70 kt	85 kt	100 kt	115 kt	130 kt	160 kt	185 kt
FAF - MAPT 5.0 NM	4 min 17	3 min 32	3 min 00	2 min 37	2 min 18	1 min 53	1 min 37



AIP CAR

CORRECTIONS : Format

© SIA

APPROCHE A VUE

01 FORT DE FRANCE Le Lamentin TFFF

Visual approach

Ouvert à la CAP  
Public Air Traffic

94 05 26

ALT : en pieds

LAT : 14 35 26 N

LONG : 060 59 59 W

ALT AD : 16 Ft (1 hPa)

DÉC 14° W (90)

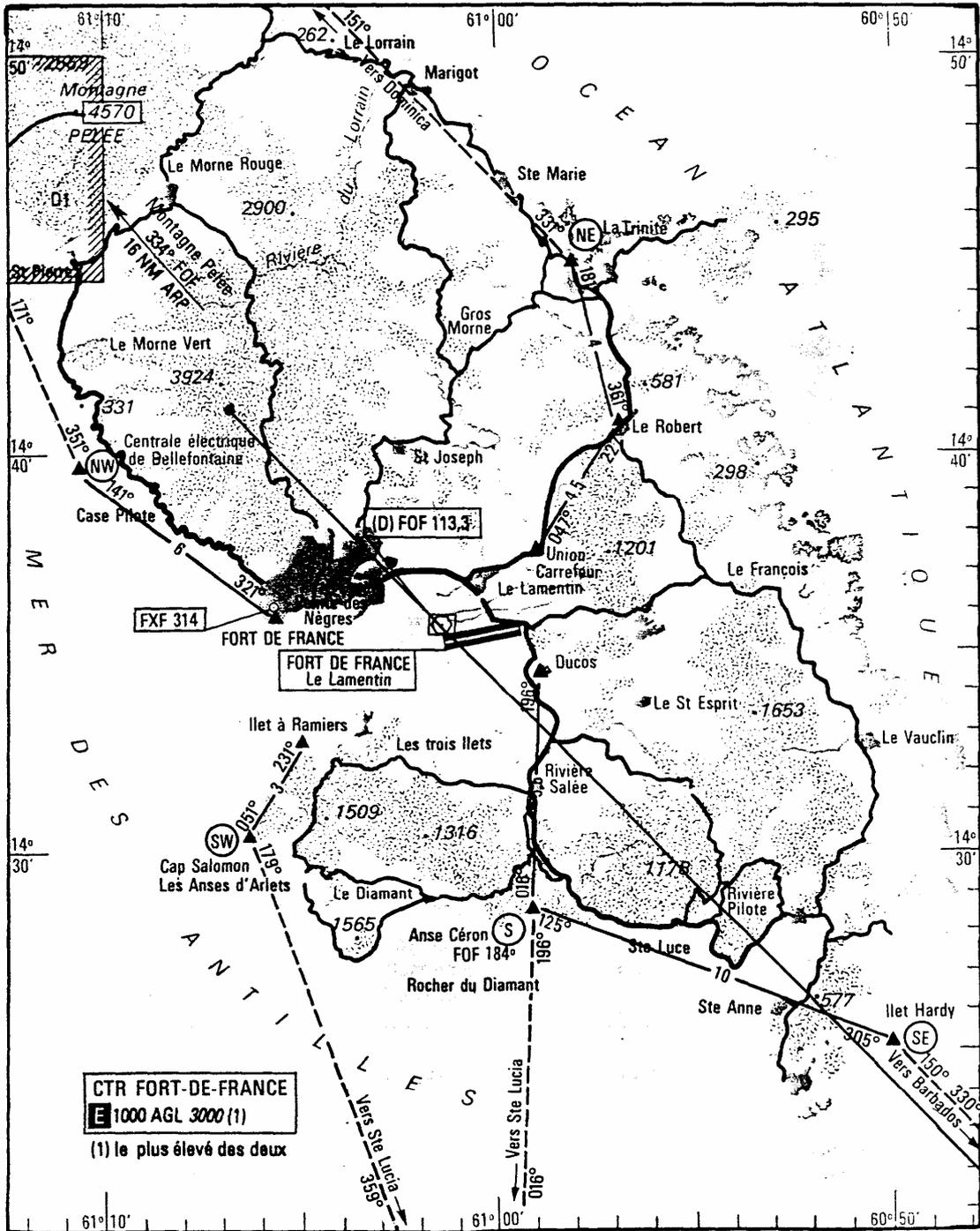
ATIS : Fort de France 127.85

VDF : Fort de France Gonio 121.0

APP : Fort de France Approche 121.0

TWR : Fort de France Tour 118.5

ILS RWY 09 FF 109.9



Heure UTC	de	à	TRANSCRIPTION
<b>01H18'26"</b>	8P-TAD	FdF	Martinique approach (*) eight Papa Tango Alpha Delta
<b>01H18'31"</b>	FdF	8P-TAD	Alpha Delta Bonsoir I call you back
	FdF	LIB 805	Liberté huit cent cinq sur la fréquence ?
	LIB 805	FdF	Oui affirmatif
<b>01H18'40"</b>	FdF	LIB 805	Huit cent cinq votre altitude en montée ?
	LIB 805	FdF	Quatre mille pieds à huit DME
	FdF	LIB 805	Ok vous poursuivez jusqu'à six mille pieds avant le virage
	LIB 805	FdF	Oui reçu six mille pieds avant le virage
	FdF	LIB 805	(*) un Dash huit en provenance de Ste Lucie qui approche la verticale par le sud
<b>01H18'57"</b>	LIB 805	FdF	Oui reçu
	Liat 336	FdF	Martinique Liat three three six eight DME level five thousand feet
	FdF	8P-TAC	Alpha Charlie say your altitude?
	8P-TAC	FdF	Alpha Charlie going through three thousand two hundred
	FdF	8P-TAC	Three thousand two hundred?
	8P-TAC	FdF	Affirm
<b>01H19'27"</b>	FdF	Liat 336	Three three six continue four thousand feet
	FdF	Liat 336	Three three six descent four thousand feet
	Liat 336	FdF	Three three six leaving five for four thousand
<b>01H19'45"</b>	FdF	Liat 336	Three three six say your DME now?
	Liat 336	FdF	Six DME Liat three three six
	FdF	Liat 336	Three three six you are cleared for a visual approach runway nine... report passing overhead for a left turn... please, runway nine
<b>01H20'02"</b>	Liat 336	FdF	OK three three six call you overhead left down wind zero nine
<b>01H20'08"</b>	LIB 805	FdF	On vire par la gauche à six mille pieds ah euh Air Liberté huit cent cinq
	FdF	LIB 805	Roger huit cent cinq vers le niveau cent quatre vingt unité huit zéro
	LIB 805	FdF	Oui vers le cent quatre vingt unité huit zéro

Heure UTC	de	à	TRANSCRIPTION
<b>01H20'29"</b>	FdF	LIB 805	Correction Piarco m'a donné deux neuf zéro, deux neuf zéro pour le Air Liberté huit cent cinq
	LIB 805	FdF	OK deux neuf zéro
	8P-TAC	FdF	Level three thousand feet Tango Alpha Charlie
<b>01H20'39"</b>	FdF	8P-TAC	Roger Alpha Charlie report Karex
	8P-TAC	FdF	Call you by Karex Charlie
<b>01H20'51"</b>	FdF	Liat 336	Three three six contact now tower one one eight point five
	Liat 336	FdF	One one eight five Liat three three six
<b>01H21'30"</b>	FdF	8P-TAD	Tango Alpha Delta go ahead
	8P-TAD	FdF	Euh maintaining flight level eight zero euh on the Alpha five five five just coming up on by borus at this time request descent
	FdF	8P-TAD	Tango Alpha Delta Descent four thousand feet November Hotel one zero one six report two zero DME in bound say an estimate for overhead Fox Oscar Fox?
<b>01H21'54"</b>	F-GGKA	FdF	Lamentin Kilo Alpha good evening
	FdF	F-GGKA	Kilo Alpha good evening monsieur
	F-GGKA	FdF	Three three DME seven thousand
	FdF	F-GGKA	Ah roger maintain seven thousand feet say your estimate for overhead Fox Oscar Fox
<b>01H22'18"</b>	F-GGKA	FdF	Three five and requesting lower as soon as possible
	FdF	F-GGKA	Kilo Alpha Descent five thousand feet
	F-GGKA	FdF	Leaving seven for five Kilo Alpha
	FdF	F-GGKA	Novembre Hotel Martinique one zero one six
	OG516AT	FdF	Ok cinq cent seize Alpha Tango le départ Bonjour
	FdF	OG516AT	Cinq cent seize Alpha Tango Bonjour
	OG516AT	FdF	On passe quatre mille pieds en montée Lidos deux Echo
<b>01H22'56"</b>	FdF	OG516AT	Oui rappelez stable au niveau cent Lidos
	OG516AT	FdF	OK on rappelle cent et Lidos Air Guadeloupe cinq cent seize Alpha Tango
<b>01H22'56"</b>	OG516AT	FdF	Euh on est toujours limité initialement à six mille pieds Air Guadeloupe cinq cent seize Alpha Tango ?

Heure UTC	de	à	TRANSCRIPTION
<b>01H23'04"</b>	FdF	OG516AT	Ah négatif Alpha Tango sans restriction vers le niveau cent unité zéro zéro
	OG516AT	FdF	Oui le cent unité zéro zéro cinq cent seize Alpha Tango
<b>01H23'59"</b>	FdF	8P-TAC	Alpha Charlie say your Fox Oscar Fox crossing radial now
	8P-TAC	FdF	Two four three Alpha Charlie
	FdF	8P-TAC	Roger after crossing the two three six Fox Oscar Fox radial you may continue descent to two thousand feet, you are cleared for final approach
	8P-TAC	FdF	That's affirmative after crossing the two three six descending but we are at the two four six at this time
	FdF	8P-TAC	Confirm after crossing radial two three six Fox Oscar Fox you may continue descent two thousand feet and you're cleared for final approach
<b>01H26'25"</b>	8P-TAC	FdF	Ok we're cleared two thousand feet after crossing two three six and final approach after
	F-GGKA	FdF	Kilo Alpha five thousand feet one nine DME field in sight for a visual
<b>01H26'40"</b>	FdF	F-GGKA	Ah Kilo Alpha... continue descent to two... two thousand seven hundred feet
<b>01H27'00"</b>	F-GGKA	FdF	Leaving five for two point seven
	FdF	8P-TAC	Alpha Charlie confirm position?
	8P-TAC	FdF	Alpha Charlie crossing two... crossing the two seven zero radial one five DME
	FdF	8P-TAC	Roger
<b>01H27'38"</b>	FdF	F-GGKA	Kilo Alpha for information you have a BN2 coming on ILS runway nine at one five DME in bound
	8P-TAC	FdF	Copy
	8P-TAD	FdF	Tango Alpha Delta is coming on... four thousand feet request lower
	FdF	8P-TAD	Say your DME Tango Alpha Delta?
	8P-TAD	FdF	We are not receiving your DME at this time Alpha Delta
	FdF	8P-TAD	Maintain four thousand feet and report with the DME Fox Oscar Fox DME Tango Alpha Delta
<b>01H27'38"</b>	8P-TAD	FdF	We're estimating just by Borus sir Alpha Delta
	FdF	8P-TAD	Say again Alpha Delta

Heure UTC	de	à	TRANSCRIPTION
	8P-TAD	FdF	Ok so we estimate just by Borus, by Borus time two three
	FdF	8P-TAD	Alpha Delta check time is two eight now
	8P-TAD	FdF	Affirm sir
	FdF	8P-TAD	You check Borus at two three confirm?
	8P-TAD	FdF	Ok we estimate by Borus time two four Alpha Delta
<b>01H28'21"</b>	FdF	8P-TAD	Call you back Alpha Delta
	8P-TAD	FdF	Alpha Delta roger
<b>01H28'26"</b>	8P-TAC	FdF	Localizer establish at this time then Tango Alpha Charlie
	FdF	8P-TAC	Roger Alpha Charlie could you say your passing altitude?
	8P-TAC	FdF	Level two thousand Charlie
<b>01H28'42"</b>	FdF	8P-TAC	Your DME Delta eight Tango Alpha Charlie
	8P-TAC	FdF	Twelve DME at this time
	FdF	8P-TAC	Roger keep speed up Alpha Charlie and contact tower one one eight point five
	8P-TAC	FdF	One one eight point five and speed up good day
<b>01H28'57"</b>	FdF	F-GGKA	Kilo Alpha vous me rappelez approchant la verticale et éventuellement en vue sur le BN2 en finale
	F-GGKA	FdF	Ah d'accord
	FdF	F-GGKA	Je l'ai toujours pas en vue mais je vous rappelle
<b>01H29'08"</b>	FdF	F-GGKA	Ok vous pourrez éventuellement faire une verticale et intégrer en vue une vent arrière gauche ?
	F-GGKA	FdF	On va ralentir là on est aussi à douze DME on va plus vite que lui
<b>01H29'23"</b>	FdF	LIB 805	Liberté huit cent cinq contactez Piarco cent vingt trois sept
	FdF	LIB 805	Liberté huit cent cinq contactez Piarco cent vingt trois sept
<b>01H30'52"</b>	LIB 805	FdF	Fort de France Air Liberté huit cent cinq
	FdF	LIB 805	Liberté huit cent cinq Fort de France
	LIB 805	FdF	Ok j'ai reçu la clairance de Piarco on fait direct le dix huit nord soixante ouest en montée vers trois trente
	FdF	LIB 805	Bien reçu Liberté huit cent cinq repassez avec Piarco maintenant au revoir

Heure UTC	de	à	TRANSCRIPTION
01H31'11"	LIB 805	FdF	Merci bonne nuit à la prochaine
	FdF	LIB 805	Au revoir
01H31'22"	F-GGKA	FdF	Kilo Alpha deux mille sept cent pieds six nautiques cinq et toujours pas le BN2
	FdF	F-GGKA	Roger rappelez verticale Kilo Alpha
01H31'45"	F-GGKA	FdF	Reçu
	FdF	F-GGKA	Kilo Alpha si vous n'avez pas visuel vous pourrez poursuivre pour une approche Agnos à partir de la verti euh Agnos deux mille sept cent pieds
01H32'48"	F-GGKA	FdF	Bien reçu
	F-GGKA	FdF	Kilo Alpha on a le BN2 en vue pour une verticale vent arrière gauche
01H33'02"	FdF	F-GGKA	C'est approuvé Kilo Alpha et la tour cent dix huit point cinq
	F-GGKA	FdF	Bonsoir
01H33'02"	8P-TAD	FdF	Tango Alpha Delta Estimating distance two zero request further from, descent further from four thousand feet
	FdF	8P-TAD	Say your DME distance Tango Alpha Delta
	8P-TAD	FdF	We estimate at euh distance two zero DME still... still negative on your DME sir
	FdF	8P-TAD	Roger continue descent two thousand seven hundred feet November Hotel now one zero one seven
01H33'30"	8P-TAD	FdF	Clear down two thousand seven hundred feet Alpha Delta
01H36'00"	APW 9433	FdF	Control (*) nine four three three at flight level one seven zero
	FdF	APW 9433	Nine four three three Fort de France approach bonsoir
01H36'11"	APW 9433	FdF	Roger (*) nine four three three Pass Delta Oscar Mike at three four flight level one seven zero requesting descent
	FdF	APW 9433	Continue descent flight level one one zero (*) nine four three three do you know Karex intersection?
01H36'30"	APW 9433	FdF	Ok understand descent ok to one one zero and present DME Fort de France five three
	FdF	APW 9433	Roger (*) nine four three three do you know the one five DME arcing to Karex intersection?
01H36'52"	APW 9433	FdF	Roger understand the VOR DME arc for the approach understand euh runway ah one one

Heure UTC	de	à	TRANSCRIPTION
01H37'06"	FdF	APW 9433	(* ) nine four three three for your information runway zero nine in use in Martinique and I just asking if you have Karex intersection on your map for the one five DME arcing
01H37'23"	APW 9433	FdF	(* ) one five DME roger understand proceed Karex one five DME arc to runway zero nine
	FdF	APW 9433	That is correct sir
	APW 9433	FdF	Roger
01H37'37"	8P-TAD	FdF	(* ) Tango Alpha Delta two thousand seven hundred feet
01H37'43"	FdF	Liat 470	Four seven zero bonsoir
01H37'45"	Liat 470	FdF	Leaving nine zero climbing to one one zero we are estimating Fox Oscar Fox at time five two
	FdF	Liat 470	You are coming overhead Fox Oscar Fox four seven zero?
01H37'56"	Liat 470	FdF	Affirmative we just pass November Echo at three five at nine zero and estimate Fox Oscar Fox at five two
	FdF	Liat 470	Roger Liat four seven zero maintain flight level one one zero reaching report overhead Fox Oscar Fox squawk one four six two
01H38'14"	Liat 470	FdF	One four six two call you one one zero over Fox Oscar Fox four seven zero
01H38'22"	MTQ 412	FdF	Fort de France bonsoir Martinique quatre cent douze
	FdF	MTQ 412	Oui quatre cent douze bonsoir
	MTQ 412	FdF	Oui quatre mille quatre vers cinq mille et on estime Fort de France à quarante sept
	FdF	MTQ 412	Reçu quatre cent douze rappelle à quinze nautiques
01H38'37"	MTQ 412	FdF	A quinze nautiques quatre cent douze
01H38'50"	APW 9433	FdF	(* ) nine four three three expect ILS approach in use to runway zero nine
	FdF	APW 9433	That's affirm (* ) nine four three three proceed to Karex intersection call me descent to six thousand feet November Hotel one zero one seven
	APW 9433	FdF	One zero one seven continue descent to six thousand feet (* ) euh
01H39'20"	FdF	8P-TAD	Tango Alpha Delta say your estimate for Fox Oscar Fox?
	APW 9433	FdF	(* ) are you calling (* ) nine four three three

Heure UTC	de	à	TRANSCRIPTION
<b>01H39'39"</b>	FdF	8P-TAD	Tango Alpha Delta Fort de France say your estimate for Fox Oscar Fox?
	8P-TAD	FdF	Euh, we estimate overhead at time four seven Alpha Delta
	FdF	8P-TAD	Roger
	OG516AT	FdF	(*) cinq cent seize Alpha Tango (*) niveau cent
	FdF	OG516AT	Alpha Tango maintenez le niveau cent et le Raizet cent vingt et un point trois
<b>01H39'54"</b>	OG516AT	FdF	Le Raizet cent vingt et un point trois Air Guadeloupe cinq cent seize Alpha Tango bonne soirée monsieur
	FdF	OG516AT	Au revoir
	FdF	8P-TAD	Tango Alpha Delta do you receive the DME now ?
<b>01H40'06"</b>	8P-TAD	FdF	Negative Sir we're still not receiving your DME we have you in sight we can proceed visually from this position
	FdF	8P-TAD	Say again the message
	8P-TAD	FdF	We have you in sight we can proceed visually we're still radial one five zero in bound
<b>01H40'16"</b>	FdF	8P-TAD	Roger maintain two thousand seven hundred feet and report if you have the south coast in sight Tango Alpha Delta
<b>01H40'24"</b>	8P-TAD	FdF	We have the south coast sir and we maintain level two thousand seven hundred
<b>01H40'31"</b>	FdF	8P-TAD	Tango Alpha Delta last November Hotel one zero one seven report passing south coast and maintain two thousand seven hundred feet
<b>01H40'39"</b>	8P-TAD	FdF	Roger copy one zero one seven and say again the last part sir
<b>01H40'44"</b>	FdF	8P-TAD	Maintain two thousand seven hundred feet Tango Alpha Delta
	8P-TAD	FdF	Maintaining two thousand seven hundred feet Alpha Delta
	APW 9433	FdF	Control (*) nine four three three confirm continue descent six thousand feet at this time
<b>01H41'06"</b>	FdF	APW 9433	That is affirm nine four three three
	APW 9433	FdF	Roger
	MTQ 412	FdF	Quinze nautiques Martinique quatre cent douze

Heure UTC	de	à	TRANSCRIPTION
<b>01H41'33"</b>	FdF	MTQ 412	Quatre cent douze vers quatre mille pieds et... la verticale numéro trois en approche
	MTQ 412	FdF	Ok euh la verticale vers quatre mille pieds numéro trois en approche
	FdF	MTQ 412	Correction tu maintiens cinq mille pour le stack de Fox Oscar Fox
	MTQ 412	FdF	Ah d'accord bon cinq mille on maintient cinq mille dans le stack de Fort de France
	FdF	MTQ 412	Correct
<b>01H41'47"</b>	MTQ 412	FdF	Eh ils viennent tous de par le nord les autres trafics ?
	FdF	MTQ 412	Négatif j'ai un BN2 qui arrive de Barbade et qui doit passer la côte sud il n'a pas le DME il est en dessous
	MTQ 412	FdF	Ok
<b>01H42'01"</b>	FdF	8P-TAD	Tango Alpha Delta confirm you cross the south coast Martinique
	8P-TAD	FdF	Affirm sir we just by the south coast (*)
			JOHNNY ? What's hap Roger What time you're get in barbados Should be about eleven Ok (*)
<b>01H42'15"</b>	FdF	8P-TAD	Tango Alpha Delta confirm you have the field in sight
<b>01H42'19"</b>	8P-TAD	FdF	Affirm sir we have it in sight
	FdF	8P-TAD	What is your speed Tango Alpha Delta?
	8P-TAD	FdF	Euh we are euh one two zero indicated Alpha Delta
	FdF	8P-TAD	Alpha Delta keep speed up and you're cleared for a visual approach runway nine
	8P-TAD	FdF	Cleared visual approach runway nine Alpha Delta roger
<b>01H42'50"</b>	MTQ 412	FdF	Fort de France Martinique quatre cent douze
<b>01H42'52"</b>	FdF	MTQ 412	Quatre cent douze
	MTQ 412	FdF	Oui on est à deux cent quarante noeuds là on ne peut pas s'éloigner vers l'ouest et passer numéro un ?
	FdF	MTQ 412	Négatif j'ai un sept cent vingt sept qui arrive à Karex d'ici deux minutes

Heure UTC	de	à	TRANSCRIPTION
<b>01H43'15"</b>	FdF	MTQ 412	Quatre cent douze tu veux procéder par Karex ?
	MTQ 412	FdF	Ah ou on fait la verticale et Karex ouais
	MTQ 412	FdF	Ah ben non on va attendre verticale finalement quatre cent douze
<b>01H43'29"</b>	FdF	MTQ 412	(* ) tu maintiens cinq mille pieds donc à la verticale de Fox Oscar Fox quatre cent douze je te rappelle
<b>01H44'39"</b>	FdF	APW 9433	(* ) nine four three three continue descent four thousand feet November Hotel one zero one seven
<b>01H44'44"</b>	APW 9433	FdF	Roger one zero one seven continue descent four thousand feet (* ) nine four three three
<b>01H44'54"</b>	FdF	8P-TAD	Tango Alpha Delta confirm position?
	8P-TAD	FdF	Ah we're still in bound sir maintaining two thousand seven hundred
	FdF	8P-TAD	You cleared for a visual without restriction Alpha Delta
<b>01H45'05"</b>	8P-TAD	FdF	We understand I am cleared for a visual Alpha Delta roger
<b>01H45'33"</b>	FdF	APW 9433	(* ) nine four three three I'm sorry but you have to make one turn in Karex pattern
<b>01H45'39"</b>	APW 9433	FdF	Roger understand one turn at Karex holding pattern maintain four thousand feet
	FdF	APW 9433	That's correct sir report in the pattern Karex pattern
	APW 9433	FdF	Roger
<b>01H46'27"</b>	Liat 470	FdF	Lamentin Liat four seven zero is level one one zero
	FdF	Liat 470	Ok Liat four seven zero say estimate for Delta Oscar Mike?
	Liat 470	FdF	Delta Oscar Mike at time one zero
	FdF	Liat 470	Roger
<b>01H46'45"</b>	Liat 412	FdF	(Sifflement)... Fox Oscar Fox VOR Martinique euh quatre cent douze
	FdF	MTQ 412	Quatre cent douze bien reçu maintiens cinq mille pieds dans le stack de Fox Oscar Fox je confirme numéro trois le numéro un est un BN2 qui termine à vue le numéro deux est un sept cent vingt sept qui attend à Karex
	MTQ 412	FdF	Ok reçu numéro trois
	MTQ 412	FdF	Il est où le BN2 ?

Heure UTC	de	à	TRANSCRIPTION
<b>01H47'16"</b>	FdF	MTQ 412	Je le cherche
<b>01H47'18"</b>	MTQ 3607	FdF	Fort de France approche bonjour Martinique trente six zéro sept
	FdF	MTQ 3607	Trente six zéro sept Fort de France approche bonsoir
	MTQ 3607	FdF	Trente six zéro sept niveau cent cinquante quarante six DME de Papa Papa Roméo et on estime Karez à l'heure ronde
	FdF	MTQ 3607	Reçu rappelez pour descendre Martinique trente six zéro sept
	MTQ 3607	FdF	Trente six zéro sept
<b>01H47'44"</b>	Liat 336	FdF	Have a good evening Liat three three six
	FdF	Liat 336	Three three six bonsoir report establish on zero one two Fox Oscar Fox radial and climb initially flight level one zero zero
	Liat 336	FdF	Liat three three six is established on radial zero one two and climb flight level one zero zero
<b>01h48'05"</b>	APW 9433	FdF	(*) nine four three three I am in the holding pattern
	FdF	APW 9433	Roger I call you back (*) nine four three three
	APW 9433	FdF	Roger
<b>01h48'15"</b>	FdF	APW 9433	Maintain four thousand feet (*) nine four three three
	APW 9433	FdF	Roger maintain four thousand feet (*) nine
<b>01H48'38"</b>	FdF	8P-TAD	Tango Alpha Delta say position?
<b>01H48'48"</b>	FdF	8P-TAD	Tango Alpha Delta say position?
<b>01H48'59"</b>	FdF	8P-TAD	Islander Tango Alpha Delta say position ?
<b>01H49'19"</b>	FdF	8P-TAD	(*) Tango Alpha Delta Transisland Tango Alpha Delta how do you read Fort de France ?
<b>01H49'51"</b>	FdF	8P-TAD	Transisland Tango Alpha Delta Fort de France
	APW 9433	FdF	Fort de France (*) nine four three three turning in bound
<b>01H50'00"</b>	FdF	APW 9433	(*) nine four three three I am sorry expect one more turn
<b>01H50'07"</b>	APW 9433	FdF	Roger
	FdF	8P-TAD	Transisland Tango Alpha Delta Fort de France
<b>01H50'17"</b>	FdF	8P-TAD	Transisland Tango Alpha Delta Fort de France

Heure UTC	de	à	TRANSCRIPTION
01H51'08"	FdF	MTQ 412	Quatre cent douze prévois un délai plus important j'ai un Islander là qui devait terminer à vue avec qui je n'ai plus de contact
01H51'22"	MTQ 412	FdF	Reçu
01H51'35"	APW 9433	FdF	(*) control (*) nine four three three approaching now Karex understand one more turn in holding pattern
01H51'42"	FdF	APW 9433	That's affirm
01H51'49"	APW 9433	FdF	Roger understand affirmative
01H51'51"	FdF	APW 9433	Correct
	FdF	8P-TAD	Transisland Tango Alpha Delta Fort de France ?
01H52'03"	MTQ 3607	FdF	Martinique trente six zéro sept pour descendre
01H52'41"	FdF	MTQ 3607	Trente six zero seven descendez à six mille pieds Novembre Hotel mille dix sept rappelez Karex circuit d'attente
01H52'49"	MTQ 3607	FdF	Six mille pieds mille dix sept on rappelle Karex circuit d'attente
01H52'57"	FdF	MTQ 3607	Pour information un sept cent vingt sept attend à Karex mille pieds en-dessous
01H53'01"	MTQ 3607	FdF	Oui on a copié merci
	MTQ 412	FdF	Fort de France Martinique quatre cent douze
01H53'08"	FdF	MTQ 412	Quatre cent douze
	MTQ 412	FdF	Oui en parfaites conditions là, on peut pas descendre au nord du terrain pour se poser ?
	FdF	MTQ 412	Je suis désolé j'ai le... l'Islander là qui ne répond plus je te rappelle dès que possible
01H53'16"	Liat 336	FdF	Liat three three six maintaining one zero zero two four DME
01H53'25"	FdF	Liat 336	Three three six calling
01H53'36"	Liat 336	FdF	Three three six maintaining one zero zero two five DME
	FdF	Liat 336	Liat three three six climb flight level one two zero
01H53'42"	Liat 336	FdF	We're leaving one zero zero to one two zero Liat three three six
	FdF	8P-TAD	(*) Tango Alpha Delta Fort de France
01H54'45"	APW 9433	FdF	Control (*) nine four three three is turning in bound (*)
01H55'15"	FdF	APW 9433	Make one more turn and I call you back (*) nine four three three

Heure UTC	de	à	TRANSCRIPTION
01H55'27"	APW 9433 FdF	FdF APW 9433	Roger and what are the traffic positions? (* ) an Islander that was proceeding visually for runway nine we have lost contact
01H55'35"	Liat 336	FdF	Liat three three six maintaining one two zero three four DME requesting direct present position Papa Romeo
01H56'03"	FdF	Liat 336	Three three six maintaining one two zero report lidos
01H56'11"	Liat 336	FdF	Roger
	MTQ 3607	FdF	Lamentin trente six zéro sept
01H56'34"	FdF	MTQ 3607	Trente six zéro sept
	MTQ 3607	FdF	Il vient d'où le BN ?
01H56'38"	FdF	MTQ 3607	Barbade
	MTQ 3607	FdF	Ah d'accord
01H56'54"	FdF	MTQ 412	Quatre cent douze tu pourrais faire un essai radio pour le Transisland Tango Alpha Delta ?
	MTQ 412	8P-TAD	Transisland Tango Alpha Delta this is Martinique four one two calling how do you read?
01H57'24"	APW 9433	FdF	Break control (*) nine four three three approaching Karex (*)
01H57'32"	FdF	APW 9433	Call you back (*) nine four three three
	APW 9433	FdF	Say again please?
01H57'38"	FdF	APW 9433	I call you back (*) nine four three three
01H57'42"	MTQ 412	FdF	On a rien sur heu... le cent vingt et un zéro on a tenté sur le cent vingt et un cinq et on a rien quatre cent douze
01H57'49"	FdF	MTQ 412	Reçu quatre cent douze
01H57'52"	MTQ 3607	FdF	Martinique trente six zéro sept on a coupé le trois dix sept neuf mille cinq en descente vers six mille
01H 57'56"	FdF	MTQ 3607	(* ) six mille pieds dans le stack à Karex trente six zéro sept
	MTQ 3607	FdF	Six mille pieds dans le stack à Karex trente six zéro sept
01H58'04"	APW 9433	FdF	Break break control (*) nine four three three requesting descent to the airport
01H58'16"	FdF	APW 9433	(* ) nine four three three I confirm we have lost one BN2 I call you back as soon as possible
	APW 9433	FdF	Roger understand nine four three three to continue the hold at four thousand

Heure UTC	de	à	TRANSCRIPTION
	FdF	APW 9433	That is correct
<b>01H58'51"</b>	APW 9433	FdF	Control (*) nine four three three we're getting no more fuel requesting descent for landing
<b>01H58'58"</b>	FdF	APW 9433	(*) nine four three three I call you back say your endurance
	APW 9433	FdF	Negative at this time but were are requesting landing descent in one minute
<b>01H59'10"</b>	FdF	APW 9433	I call you back say your endurance (*) nine four three three
<b>01H59'18"</b>	APW 9433	FdF	Nine four three three requesting landing descent
<b>01H59'24"</b>	FdF	APW 9433	I call you back sir
	---	---	(*) il dit qu'il commence à être short petrol
<b>01H59'33"</b>	FdF	---	Appelant Fort de France
<b>01H59'50"</b>	APW 9433	FdF	Fort de France (*) nine four three three requesting descent immediatelly landing
<b>02H00'04"</b>	FdF	8P-TAD	Transisland Tango Alpha Delta Fort de France
<b>02H00'15"</b>	FdF	8P-TAD	Transisland Tango Alpha Delta Fort de France
<b>02H00'22"</b>	APW 9433	FdF	Fort de France (*) nine four three three is declaring fuel emergency or immediate departure to euh Vigie
<b>02H00'41</b>	FdF	APW 9433	(*) nine four three three you are cleared for ILS runway nine I confirm we expect we have lost one Islander at two thousand now about ten minutes
	APW 9433	FdF	Nine four three three roger (*) feet we cleared for an ILS approach and we'll check for (*) and any emergency signal final approaching
	FdF	APW 9433	Thank's
<b>02H01'09"</b>	Liat 336	FdF	Lamentin Liat three three six by Lidos maintaining one two zero
<b>02H01'19"</b>	Liat 336	FdF	Lamentin Liat three three six by Lidos maintaining one two zero
<b>02H01'23"</b>	FdF	Liat 336	Liat three three six is calling?
<b>02H01'27"</b>	Liat 336	FdF	Three three six checking lidos level one two zero
	FdF	Liat 336	Roger three three six contact le raizet one two one point three

# EXAMINATION REPORT

## **1 - EQUIPMENT EXAMINED**

- COLLINS type 30 Radio Magnetic Indicator (RMI)  
Part number 622-4938-001, Serial number 2637
- KING type KI-525A Horizontal Situation Indicator (HSI)  
Part number 066-3046-03, Serial number 25835
- KING type KI-206 Omni-Range Bearing Selector (OBS)  
Part number 066-3034-12, Serial number 16383
- AIRBORNE model 1G2-1 Depression Indicator  
Serial number BNB 231

## **2 - OBSERVATIONS**

### **Radio Magnetic Indicator**

The photograph of the RMI, as delivered to the Bretigny Inflight Test Center (CEV) is shown in plate 1.

The BEA drew attention to the fact that the two pointers locked together had pivoted 180° between the time of the initial observation at the accident site and the observation made at the CEV when the package was opened.

Nevertheless, the angle between the two needles was approximately 38° and they were mechanically locked together.

- The right selector of the double pointer was on ADF.
- The left selector of the single pointer was on VOR.
- The heading shown by the rose was NORTH.
- The HDG flag was visible.

Taking into account the heading followed and the location of the accident, the ADF bearing seems correct, but the VOR heading has an error of 180° (see plate 3).

### **Horizontal Situation Indicator**

This equipment presented the following features:

- The HDG flag was showing, which would indicate a lack of heading information.
- The NAV flag normally at the top left was missing.
- The yellow GLIDE light was present on the left of the dial.
- The TO and FROM flags, one of which is usually showing, in the center of the indicator, were missing.

The absence of the NAV, TO and From flags as well as the presence of the GLIDE light tend to suggest that the equipment was in ILS mode.

### **Omni-Range Bearing Selector**

Unreadable.

### **Depression Indicator**

Pointer at maximum stop.

### **3- CONCLUSIONS**

The RMI would give an impact point on a NORTH bearing, a correct ADF bearing but a VOR bearing 180° inverted. Such an error is possible as a result of a 26V/400Hz power failure (see explanations given in figure 4, an extract from test report N°91/EQ/NA carried out at the CEV on 25/01/62).

The HSI has characteristics indicating ILS mode operation.

The readout of the various control box memory cards, as well as examination of the ADF-VOR-ILS cabling of the aircraft should allow identification of the frequencies indicated and the working procedure employed by the pilot.

Head of Examination  
IEF. CHEVEREAU

PLATE 1

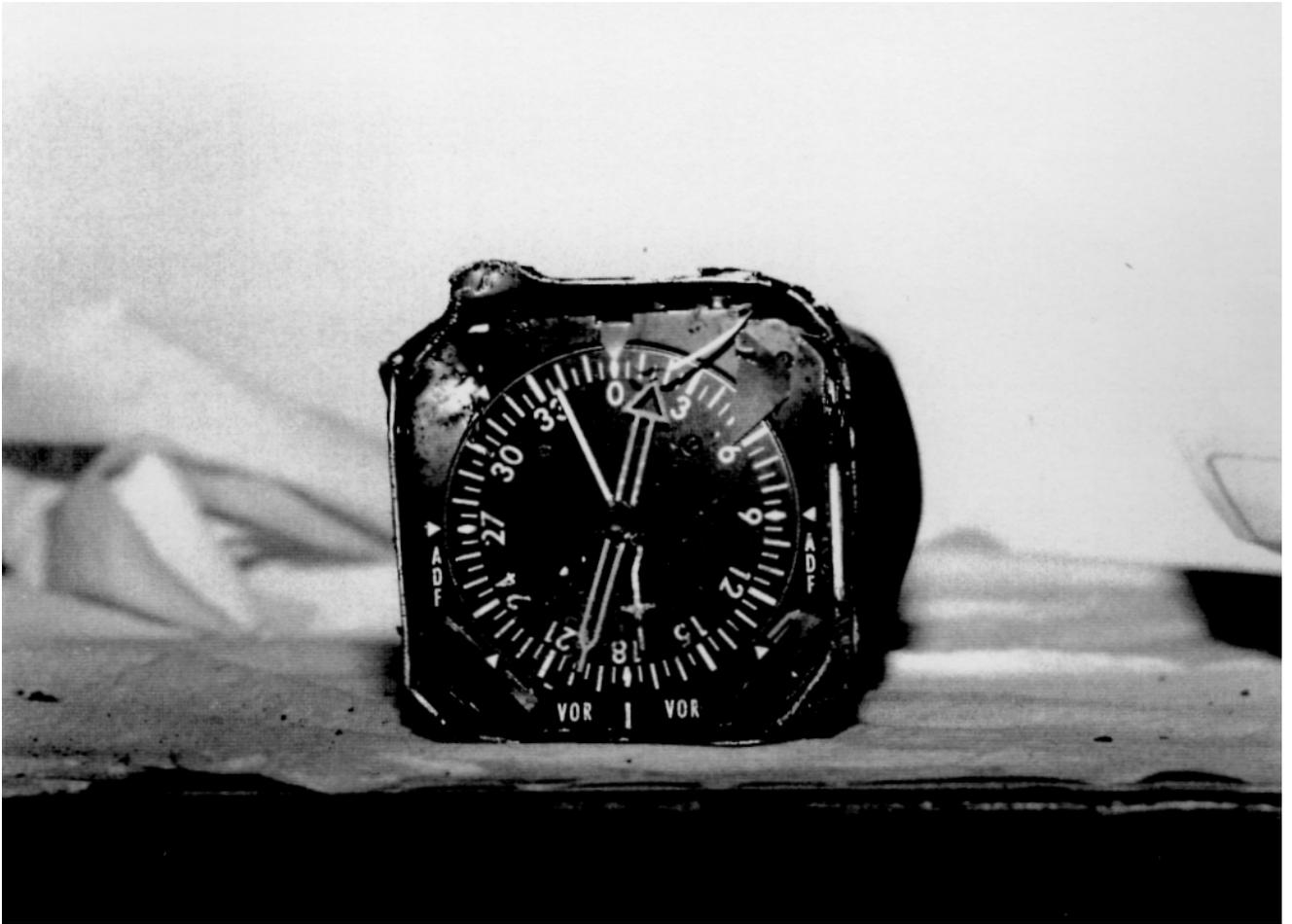


PLATE 2



### PLATE 3 (BN2 8P-TAD Crash Site)

APPROCHE AUX INSTRUMENTS  
CAT. A B C D

02 FORT DE FRANCE LE LAMENTIN TFFF  
KAREX - ILS RWY 09

ALT AD : 16, Seuil : 10 (1 hPa)

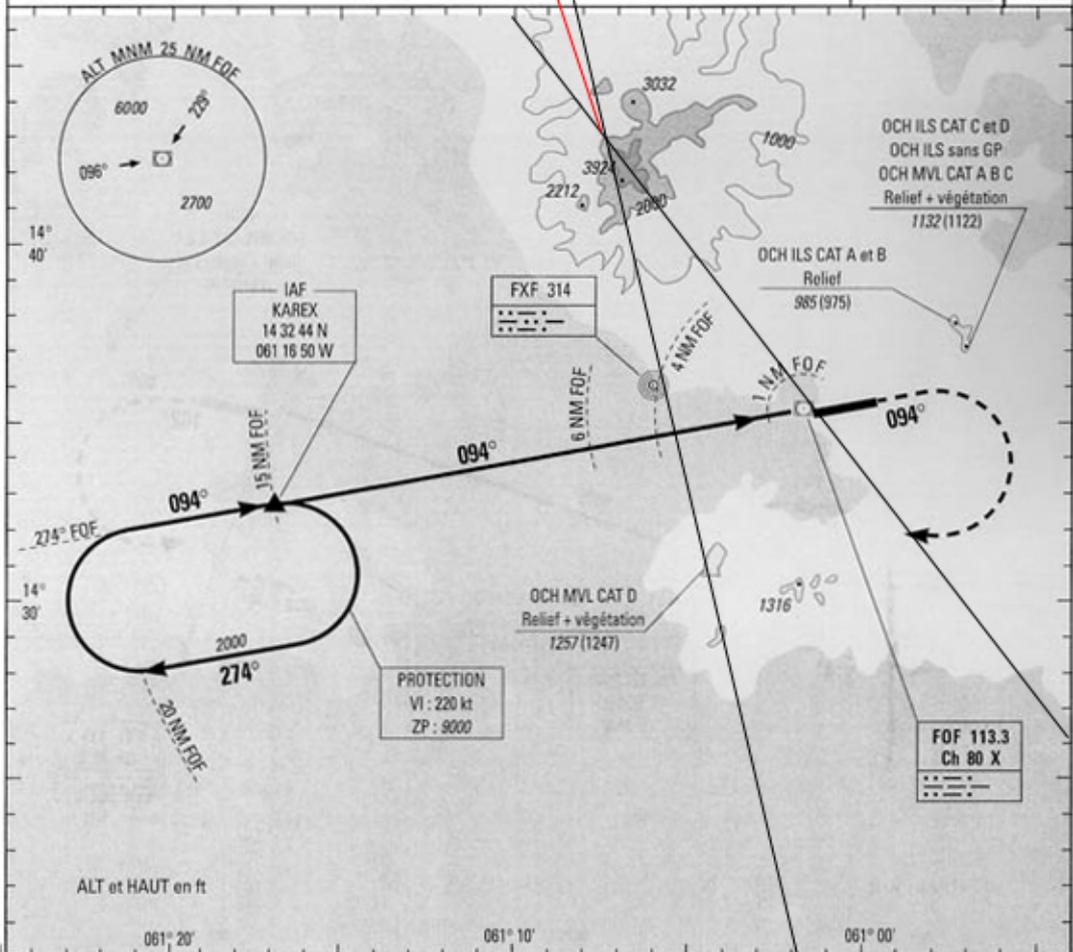
BN2 8PTAD

APP : FORT DE FRANCE Approche 121.0  
TWR : FORT DE FRANCE Tour 118.5  
ATIS FORT DE FRANCE 127.85

Crash site

ILS  
FF 109.9  
RDH : 52

DEC  
14° W  
(90)



TA : 9000	KAREX		FAF	MAPT	2500 (2490)				
2000 (1990)	094° → DROITE	094°	ILS sans GP	ILS sans GP					
	← 274°								
API : Monter dans l'axe. A 2500 (2490), virer à droite pour rejoindre KAREX en montée vers 3000 (2990). Monter à 2500 (2490) avant d'accélérer en palier.									
→ VOR DME (NM) 15 6 4 1 0									
Minimums standard : distances verticales en pieds, VH en mètres REF HAUT : ALT Seuil									
CAT	ILS (1) API 2.5%		ILS sans GP		MVL (2)		OCH ILS	OCH ILS sans GP	Observations : (1) Pour minimums particuliers voir feuillet complémentaire (2) HJ seulement MDH MVL CAT D 1570 si VI ≤ 180 kt
	DH	VH	MDH	VH	MDH	VH			
A	330	1000	620	1600	1470	1600	A : 327	A : 614	
B	340	1100	620	2000	1470	2000	B : 338	B : 614	
C	350	1250	660	2700	1570	2800	C : 350	C : 660	
D	370	1350	660	3300	1690	3500	D : 363	D : 660	
Observations : (1) Pour minimums particuliers voir feuillet complémentaire. (2) HJ seulement.									
FAF - MAPT 5.0 NM		70 kt	85 kt	100 kt	115 kt	130 kt	160 kt	185 kt	
		4 min 17	3 min 32	3 min 00	2 min 37	2 min 18	1 min 53	1 min 37	

## PLATE 4

### Rotor Short Circuits and Power Cutoffs

Another cause of failures can be a rotor power cutoff or short circuit. The following table shows the different possible cases. Observation of the equipment gives some specific indications:

1. Check that the receiver synchro is not blocked.
2. A synchro can be too hot, or simply hotter than another, in a particular interface.
3. The receiver indicator can be defective.
4. The receiver can drift slowly in the same direction as the transmitter.
5. Circuit overload is possible.
6. A synchro can whirr for all transmitter indications.

Receiver Reading (Transmitter at zero)	Symptoms	Causes
Zero or 180°	Weak link to receiver receiver heats up	Transmitter power supply wire cut.
Zero or 180°	Weak link to receiver transmitter heats up	Receiver power supply wire cut.
90° or 270°	Receiver link normal, both synchros heat up, transmitter fuses blow	Transmitter rotor short circuit
90° or 270°	Receiver link normal, both synchros heat up, receiver fuses blow	Receiver rotor short circuit
Random	No load, no overheating, no whirring, no rotation	No power supply

Nom du document : finalreport8ptad.doc  
Répertoire : E:\SHARE\8PTAD\RAPPORT  
Modèle : C:\Documents and Settings\web.BEALAN\Application  
Data\Microsoft\Modèles\Normal.dot  
Titre : 8P-TAD  
Sujet : final report on the accident to the Britten Norman BN2  
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Auteur : BEA  
Mots clés : briten norman, caraibes, Trans Island Air, Air Martinique,  
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