



*Accident
on 5 November 2000
at Paris Charles de Gaulle (95)
to the Boeing 747-200
registered TJ-CAB
operated by Cameroon Airlines*

REPORT

tj-b001105

F O R E W O R D

This report presents the conclusions reached by the BEA on the circumstances and causes of this accident.

In accordance with Annex 13 of the Convention on International Civil Aviation, with Directive 94/56/EC and with Law N° 99-243 of 30 March 1999, the investigation is intended neither to apportion blame, nor to assess individual or collective liability. Its sole objective is to draw lessons from the occurrence which may help to prevent future accidents.

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 BEA to make its reading easier for English-speaking people. As accurate as the translation may be, please refer to the original text in French.

Table of contents

FOREWORD	2
SYNOPSIS	6
1 - FACTUAL INFORMATION	7
1.1 History of Flight	7
1.2 Injuries to Persons	8
1.3 Damage to Aircraft	8
1.4 Other Damage	8
1.5 Personnel Information	9
1.5.1 Captain	9
1.5.2 Co-pilot	9
1.5.3 Flight Engineer	10
1.6 Aircraft Information	10
1.6.1 Airframe	10
1.6.2 Engines	11
1.6.3 Maintenance	11
1.6.4 Weight and Balance	12
1.6.5 Landing Performance	12
1.7 Meteorological Conditions	12
1.8 Aids to Navigation	13
1.9 Telecommunications	13
1.10 Aerodrome Information	14
1.11 Flight Recorders	14
1.12 Wreckage and Impact Information	16
1.12.1 Examination of marks	16
1.12.2 Examination of the Aircraft	16
1.12.3 Examination of the Cockpit	17
1.13 Medical and Pathological Information	18
1.14 Fire	18

1.15 Survival Aspects	18
1.16 Tests and Research	19
1.16.1 Examination of equipment	19
1.16.2 Behaviour of certain automatic systems on landing	19
1.16.3 Similar Events	20
1.17 Information on Organisations and Management	21
1.17.1 Operating Manual and Cockpit Resource Management	21
1.17.2 Feedback System	21
1.18 Supplementary Information	22
1.18.1 Summary of Flight Crew's Testimony	22
1.18.2 Chief Flight Attendant's Testimony	23
1.18.3 ATC Office Agent's Testimony	23
2 - ANALYSIS	24
2.1 Accident Scenario	24
2.1.1 Residual Thrust during Flare	24
2.1.2 Positive Thrust on Engine Number One and Runway Excursion	25
2.1.3 Retraction of n°2 Thrust Reverser	25
2.2 Cockpit Resource Management	25
2.3 Presence of Third Parties in the Cockpit	25
3 - CONCLUSIONS	27
3.1 Findings	27
3.2 Probable Causes	28
4 - RECOMMENDATIONS	29
LIST OF APPENDICES	30

Glossary

APU	Auxiliary Power Unit
ATIS	Automatic Terminal Information Service
BEA	French bureau for investigation and analysis for safety in civil aviation (Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation civile)
CAS	Calibrated Air Speed
CEMPN	Principal flight crew medical test centre
CRM	Cockpit Resource Management
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DGAC	French directorate for civil aviation (Direction Générale de l'Aviation Civile)
DME	Distance Measuring Equipment
EGT	Exhaust Gas Temperature
FAI	Final Approach Index
FAR	Federal Aviation Regulations
FCU	Flight Control Unit
FE	Flight Engineer
FMA	Flight Mode Annunciator
ft	Feet
IGS	Instrument Guidance System
ILS	Instrument Landing System
JAR	Joint Airworthiness Requirements
kt	Knots
LOC	Tower frequency control position
METAR	Meteorological Aviation Report
PAPI	Precision Approach Position Indicator
PF / PNF	Pilot Flying / Pilot Not Flying
PFD	Primary Flight Display
QNH	Altimeter setting to obtain aerodrome elevation when on the ground
UTC	Universal Time Co-ordinated
VOR	VHF Omnidirectional Radio Range

SYNOPSIS

Date and Time

5 November 2000 at 20 h 57¹

Aircraft

Boeing 747-200
registered TJ-CAB

Site of Accident

Paris Charles de Gaulle Airport (95)

Owner

Cameroon Airlines

Type of Flight

Public transport of passengers
Douala - Paris Charles de Gaulle
Flight UYC070

Operator

Cameroon Airlines

Persons on Board

187 passengers (*)
3 Flight crew
13 Cabin crew

Summary:

Towards the end of the landing roll on runway 09L, the aircraft suddenly deviated to the right of the runway centre line and left the runway between taxiways Z6 and Z7.

When the aircraft passed over a rainwater collector tank, the nose gear was torn off and damaged the fuselage at the level of the electronics bay. The aircraft came to a stop on the concrete structure over the tank.

The thrust reversers on both left engines were found to be in the retracted position, those of the right engines in the extended position.

	Persons			Equipment	Third Parties
	Killed	Injured	Unhurt		
Crew	-	-	16	Very seriously damaged	
Passengers	-	-	187(*)		

(*) A difference of four passengers was noted relative to the data initially provided by the airline, which had stated that there were 183 passengers.

¹ All times in this report are UTC except where otherwise specified. One hour should be added to obtain the legal time applicable in metropolitan France on the day of the accident.

1 - FACTUAL INFORMATION

1.1 History of Flight

On Sunday 5 November 2000, the Boeing 747-200 registered TJ-CAB operated by Cameroon Airlines was carrying out the scheduled service between Douala and Paris Charles de Gaulle under the operational call sign UYC070. Take-off from Douala took place at 14 h 25 about five hours late. The stopover at Yaoundé was cancelled due to the operational delays accumulated the previous day. The flight crew was made up of the Captain, one Co-pilot and one Flight Engineer.

Cruise was performed at flight level 350. The beginning of the approach was unremarkable. Two female passengers invited by the Captain were present in the cockpit during the last part of the flight and occupied the two jump-seats.

After establishing contact with Paris Charles de Gaulle approach control, the crew prepared for an ILS approach to runway 09L. The final approach was performed at night at an average speed of 160 knots. The values on the landing card were: IRF 140, wind 140 degrees 20 knots.

Since the leading edge slats 3 did not extend pneumatically, the crew extended them electrically. The landing gear was extended, the flaps set at 30° and the speed maintained at 158 knots.

N.B.: after the event, the Captain indicated that the auto-throttle and the auto-pilot were disconnected on final approach.

Touch-down occurred at 20 h 57 at a speed of 151 knots.

The Captain, pilot flying, moved the thrust reverser levers. During braking, the spoilers did not deploy automatically and the auto-brake system disarmed.

N.B.: the Flight Engineer stated that he told the Captain that the four reversers were deployed. He also stated he had said "speed brake" and had pulled the lever back in order to deploy the spoilers manually (see illustration in §1.12.3).

After a landing roll of about 1700 metres, the aircraft veered off laterally to the right. It went onto the central area situated between taxiways Z6 and Z7. While passing over a rainwater collector tank, the nose landing gear was torn off and damaged the airframe at the level of the electronics bay. The aircraft came to a stop on the concrete structure of the collector tank.

When at a stop, the normal cabin lighting went off. The emergency lighting automatically took over. In addition the public address system and radio communications with the tower were no longer operational. The evacuation was carried out calmly.

1.2 Injuries to Persons

There were no fatal or other injuries in this accident; the three cabin crew who were slightly injured during the runway excursion were not counted, in accordance with international definitions.

1.3 Damage to Aircraft

The structure of the airframe was severely damaged at the level of the electronics bay; it was impossible for the aircraft to be returned to service.



1.4 Other Damage

The 747 was embedded in the concrete part of a rainwater collector tank, of which a part of the vault collapsed under the weight. The damage caused to the airport infrastructures was as follows:

- three blue runway side lights were broken and one PAPI box damaged,
- grass verges damaged all along the path of the aircraft after its runway excursion between taxiways Z6 and Z7,
- complete destruction of an inspection point on underground tank n°3 for rainwater collection.

The operations to lift and remove the aircraft took place continuously until Friday 10 November at 6 h 00. Given the need to work in the operations areas, most of the work took place at night, runway 09L/27R being able to be closed only between 22 h 00 and 6 h 00. A temporary road was constructed in order to push the aircraft back; it was impossible to pull it forwards towards Lima taxiway since it would have crossed the underground tank, whose vault cannot bear more than 40 tons (the aircraft's weight on landing was about 247.8 tons).

The accident had consequences on the airport's capacity. The presence of the immobilised 747 near runway 09L/27R prevented operations using category II and III ILS approach procedures.

1.5 Personnel Information

1.5.1 Captain

- Male, aged 58
- Commercial Pilot's Licence valid until 31 January 2001
- Qualified instructor
- Type ratings: DC 3, Boeing 737, Boeing 727, Boeing 707, Boeing 747
- Experience

Flying hours	All aircraft types	Of which on B747
Total	20,250	12,000
In the previous month	34	34

- Most recent checks:
 - Last medical check-up on 7 July 2000 (valid six months), fit for service with a restriction relating to the wearing of glasses for short and medium vision,
 - Simulator check (Air France) on 12 April 2000,
 - Line check on 28 June 1999.

CRM training course in Douala from 5 to 6 June 1996. The operator also provided the date of 19 April 2000.

In the three months preceding the accident, the Captain had performed two flights to Paris Charles de Gaulle: on Sunday 15 October 2000 and on Sunday 13 September 2000.

1.5.2 Co-pilot

- Male, aged 52
- Commercial Pilot's Licence valid until 31 January 2001
- Type ratings: Boeing 707, Boeing 737, Boeing 747

- Experience

Flying hours	All aircraft types	Of which on B747
Total	14,188	9,767
In the previous month	34	34

- Most recent checks:
 - Last medical check-up on 24 July 2000 (valid six months), fit for service with a restriction relating to the wearing of glasses,
 - Simulator check (Air France) on 31 January 2000,
 - Line check on 12 February 1999.

The Co-pilot did not remember having followed a CRM training course. The operator, however, provided the date of 17 February 2000.

1.5.3 Flight Engineer

- Male, aged 42
- Licence valid until 3 March 2001
- Type ratings: Boeing 747
- Experience

Flying hours	All aircraft types	Of which on B747
Total	2,427	2,427
In the previous month	27	27

- Most recent checks:
 - Last medical check-up on 8 March 2000 (valid twelve months), fit for service with a restriction relating to the wearing of glasses for short and medium vision,
 - Simulator check (Air France) on 27 January 2000,
 - Line check on 15 March 2000.

The Flight Engineer did not remember having followed a CRM training course. The operator, however, provided the date of 27 January 2000.

1.6 Aircraft Information

1.6.1 Airframe

- Manufacturer: the Boeing Company, USA
- Type: B 747-2H7B
- Year of manufacture: January 1981
- Serial number: 22378
- Registration: TJ-CAB
- Registration Certificate N° 110 issued on 2 December 1981 by the Republic

- of Cameroon Civil Aviation Directorate
- Airworthiness Certificate N°1354 renewed on 7 August 2000 for a period of six months
- Entry into service with Cameroon Airlines on 26 February 1981
- Flying hours as of 5 November 2000: 48,770
- Number of cycles as of 5 November 2000: 12,872
- Number of landings as of 5 November 2000: 12,868

1.6.2 Engines

The table below shows the basic engine data:

Manufacturer	Pratt & Whitney (P&W)			
Type	JT9-D7Q			
Position	1	2	3	4
Serial number	702323	702324	702325	702326
Flying hours	37,382	40,615	37,037	40,409
Number of cycles	9,809	10,767	9,779	10,747
Installation date	22/06/00	31/10/00	22/06/00	22/06/00

1.6.3 Maintenance

There were no acceptable deferred defects declared on the day of the accident and searches over the previous three months relating to the following systems brought to light no anomalies:

- Landing gear and braking system,
- Auto-throttle,
- Engines,
- Thrust reversers.

An overhaul (type D) was performed from 4 to 30 June 2000 at 47,940 flying hours, when maintenance of the aircraft was transferred from South African Airways to Air France.

The last type A overhaul was on 20 September 2000.

1.6.4 Weight and Balance

For flight UYC070 on 5 November 2000, the estimated landing weight was 247.8 tons. Taking into account both the distribution of the passengers and the centre of gravity (26 %), the aircraft was within the weight and balance limits defined by the manufacturer.

1.6.5 Landing Performance

Calculations performed after the accident indicated, with or without thrust reversers and AUTOBRAKE on MIN, a roll distance 2,225 metres.

These calculations were made based on the following basic conditions:

- runway orientation: 088°
- pressure altitude: 390 ft
- runway wet
- runway slope nil
- wind: 150° / 20 knots
- outside temperature: 11 °C
- aircraft weight: 247,800 kg
- speed at touch-down: 151 kt
- flaps 30 °
- spoilers deployed

Note: the roll distance calculated with the auto-brake system active with a MIN selection does not depend on the use of the thrust reversers. It is when MAX is selected that the application of reverse thrust has an influence on the roll distance.

1.7 Meteorological Conditions

In line with activity at altitude, the warm sector of an Atlantic disturbance reached the coast of Brittany at 12 h bringing moderate winds from the south to south-east sector. Its progress across the regions of north-west France was accompanied by light to moderate precipitation.

At the time of the landing, the meteorological conditions were as follows:

- Wind: 150° / 17 knots, gusting to 26 knots
- Visibility: 15 km
- Cloud: broken stratocumulus base at 3,800 feet
- Temperature: 11 °C
- Dew point: 5 °C
- Pressure: QNH 987 hPa falling

The runway was wet.

METARs between 20 h 00 and 21 h 00

LFPG 052000Z 15019KT 9999 FEW036 BKN040 BKN100 10/05 Q0989 RERA
BECMG 15025G50KT=

LFPG 052030Z 14019KT 9999 FEW036 BKN039 10/05 Q0988 RERA BECMG
15025G50KT=

LFPG 052100Z 15018KT 9999 BKN038 11/05 Q0987 BECMG 15025G50KT=

1.8 Aids to Navigation

The aids to navigation were working normally. No anomalies were notified by users, either before or after the accident.

1.9 Telecommunications

The crew contacted Paris Charles de Gaulle on the tower LOC-North frequency (119.250) at 20 h 55 min 03. The communications are transcribed below.

POSITION: Loc. North FREQUENCY:119,250 MHz			
Date: 5 November 2000 from 20 h 55 min 03 s to 21 h 08 min 50 s			
DE	A	HEURE	COMMUNICATIONS
UYC070	LOC.N	20 h 55 min 03 s	<i>De Gaulle Tour good day CAM 0 70</i>
LOC.N	UYC070		<i>CAM 0 70 good day cleared for landing 0 9 left 150 20 maximum 26 knots</i>
UYC070	LOC.N		<i>Ok cleared 0 9 left CAM Air 0 70.</i>
UYC070	LOC.N	20 h 56 min 11 s	<i>De Gaulle CAM 0 70 the latest wind?</i>
LOC.N	UYC070		<i>150° 17 knots gusting to 26.</i>
UYC070	LOC.N		<i>17 (?) to 26, CAM Air 0 70.</i>
LOC.N	UYC070	20 h 58 min 32 s	<i>CAM Air 0 70?</i>
LOC.N	UYC070	20 h 58 min 48 s	<i>CAM Air 0 70?</i>
LOC.N	UYC070	20 h 59 min 15 s	<i>CAM Air 0 70?</i>
LOC.N	UYC070	20 h 59 min 54 s	<i>0 70?</i>
LOC.N	UYC070	21 h 00 min 27 s	<i>0 70?</i>
LOC.N	UYC070	21 h 01 min 30 s	<i>0 70?</i>
LOC.N	UYC070	21 h 02 min 59 s	<i>0 70?</i>
LOC.N	UYC070	21 h 06 min 29 s	<i>0 70?</i>
LOC.N	UYC070	21 h 08 min 50 s	<i>0 70?</i>

1.10 Aerodrome Information

Paris Charles de Gaulle is a controlled aerodrome open to public air transport. It is located twenty-five kilometres north-east of Paris, at an average altitude of one hundred and twenty metres. At the time of the accident, it had parallel runways 08/26 to the south oriented 088°/268° with a length of 4,215 metres for 26R/08L and 2,700 metres for 26L/08R, and two runways to the north oriented 090°/270° with a length of 4,200 metres for 09R/27L and 2,700 metres for 09L/27R. The airport is equipped with category 9 and level 9 rescue and fire fighting facilities available twenty-four hours a day.

The use of runway 09L/27R was the subject of a NOTAM valid from 7 September 2000 to 5 December 2000 due to work on construction of taxiways.

The principal operating instructions in place were as follows:

- runway 09R/27L was closed for take-offs and landings;
- taxiways K2, K3, K4 West, K4 East, K5 and K6 were closed;
- runway 09L/27R was usable for takeoffs and landings.

1.11 Flight Recorders

In accordance with the applicable regulations, the aircraft was equipped with two flight recorders:

- a Sundstrand cockpit voice recorder (CVR), P/N 980-6001-010, S/N 2653,
- a Sundstrand digital flight recorder (DFDR), P/N 980-4100-DXUN, S/N 7753.

These flight recorders were read out by the BEA.

CVR: The CVR was functioning correctly at the time of the accident. It was equipped with a 30-minute magnetic loop recording tape. The data relating to the accident was erased as the equipment was left on during the evacuation of the passengers.

Note: The flight crew, who stayed in the cockpit for at least thirty minutes, did not apply the instruction on the last line of the evacuation check-list (appendix 5).

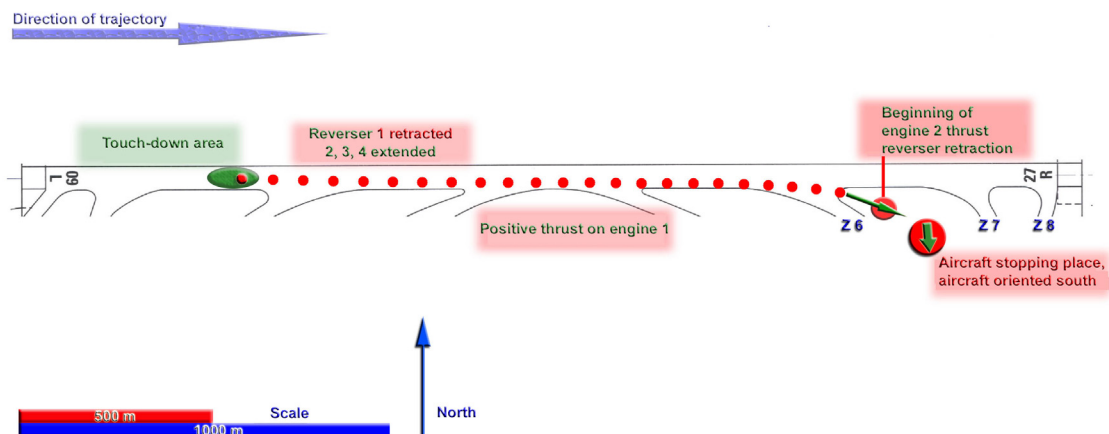
DFDR: The graphs in appendix 4 show the speed of the aircraft during the roll, its trajectory, the evolution of the engine parameters as well as the phases of movement and locking of the thrust reversers.

Note: the movement of the thrust levers is not recorded on the Boeing 747; it can be deduced from the behaviour of the engines.

The DFDR records eighty-three parameters on sixty-four words of twelve bits. The main parameters are summarized in the following table. The phases of the landing procedure are represented in one column and the notable parameters are on the lines. Graphs are given in appendix 4.

Phase of flight		Passage	Touch-down	Three seconds	Runway
Parameters		flaps 30		after touch-down	excursion
Time		20.54.48	20.56.52	20.56.55	Loss of synchronisation from 20.57.15
CAS		158 kt	151 kt	146 kt	103 kt
Heading		105 °	87 °	86 °	101°
EGT engine	1	420	437	475	598
	2	451	412	446	413
	3	463	418	455	418
	4	441	417	431	426
N 1 engine	1	50	43	54	88
	2	55	45	48	49
	3	56	48	51	46
	4	53	42	46	45
Position of thrust reversers		Retracted	Retracted	1 Retracted 2 Extended 3 Extended 4 Extended	1 Retracted 2 Transit 3 Extended 4 Extended

Aircraft trajectory on landing roll:



The points correspond to the aircraft's trajectory sampled every second. The spacing between the points indicates a lack of deceleration.

Aircraft Braking:

If at least one of the thrust levers is forward of the positive idle position after landing, the auto-brake disarms and the brakes are no longer applied automatically (see also 1.16.2). The longitudinal acceleration curve in appendix 4.1 shows variations which characterise direct action by the pilot on the brakes after touch-down. The curves for the previous flight are also shown in appendix 4.1. The two flights were performed with one active auto-brake selected on MIN. The longitudinal acceleration curve for the previous flight shows few strong amplitude variations, unlike that which was recorded on the accident flight, before the runway excursion.

Note: the sampling set at four seconds of data relating to the thrust reversers recorded by the FDR make it impossible to establish a more precise chronology in this dynamic situation.

1.12 Wreckage and Impact Information

1.12.1 Examination of marks

The calculations made based on the parameters show that the aircraft rolled about 1,700 metres along the runway (appendix 4.2).

The first marks identified were at the level of taxiway Z6, that's to say about 2,100 metres from the threshold of runway 09L. They were on the right side of the runway.

The marks from the main landing gear are continuous and showed traces of rubber, indicating heavy braking before the runway excursion.

The aircraft left the runway just after taxiway Z6 leaving deep marks on the clearance strips (see following photo). The distance travelled between the beginning of its deviation and its stopping position was about two hundred and ten metres (see appendix 6).

1.12.2 Examination of the Aircraft

The aircraft came to a stop at a magnetic heading of 170°. The tail was about one hundred and ten metres from the runway centreline. The nose was resting on the ground on the edge of the taxiway parallel to the runway.

On impact with the concrete structure of the rainwater collector tank, the nose gear, bent backwards, penetrated the airframe at the level of the electronics bay, causing extensive damage to the equipment contained therein.

The thrust reversers on engines 3 and 4 (right side) were deployed. Those on engines 1 and 2 (left side) were in a retracted position. The spoilers were retracted. The flaps were extended at 30° on both two sides. The slats were also extended on both sides.

None of the four engines showed any visible signs of damage.

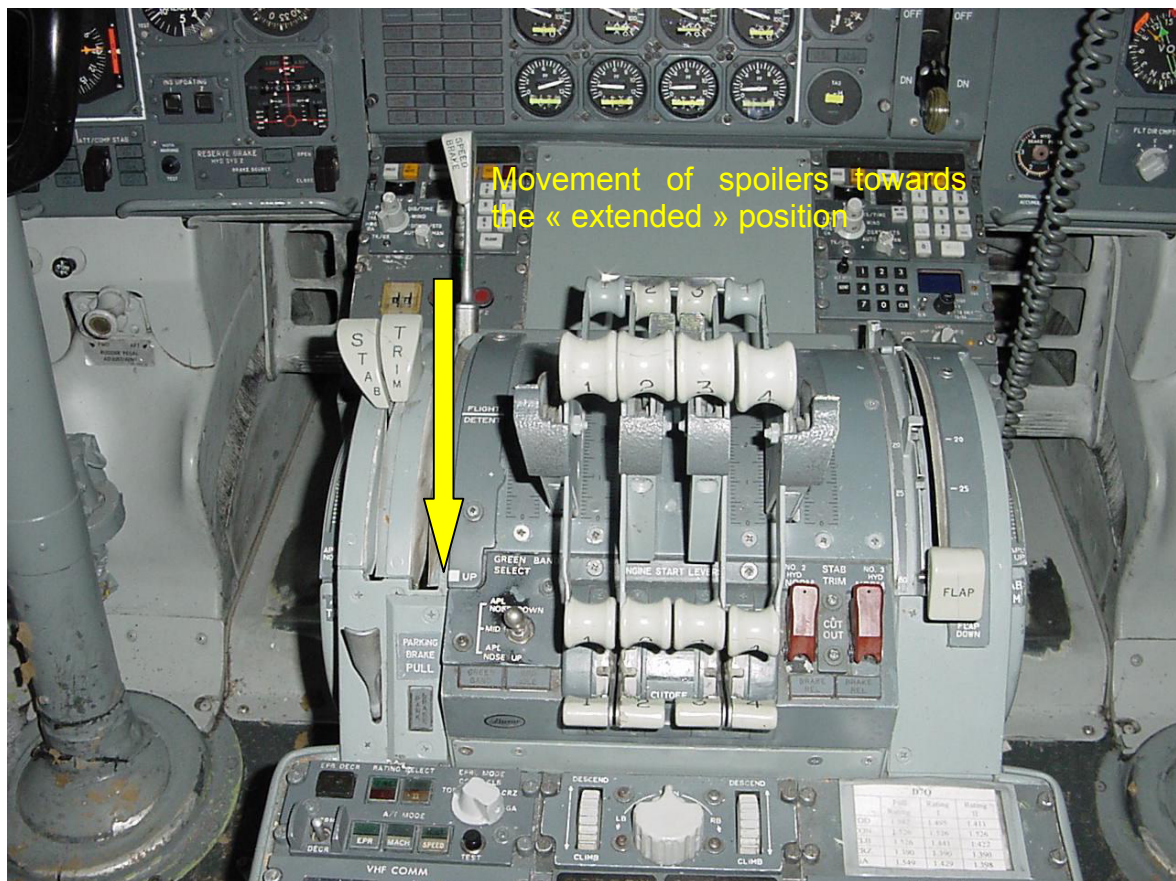
Three emergency slides were deployed on each side of the aircraft.



1.12.3 Examination of the Cockpit

The investigators examined the cockpit the day after the accident.

The four thrust levers were found in the idle position. It was noted that the crew had fired the fire extinguishers and the APU. The electric switch for extension of the number 3 slats was found in the "Extend" position.



Note: the position of the buttons and levers in the cockpit should be taken with care, since the implementation of the "Passenger evacuation" check list was carried out at night.

1.13 Medical and Pathological Information

Not applicable.

1.14 Fire

No fire broke out following the accident.

1.15 Survival Aspects

At 21 h 00 the red alert was given by the control tower. At 21 h 05, a vehicle from the ATC office arrived at the intersection of runway 09L and taxiway Z7. The emergency services were already on the spot.

After the runway excursion, the Captain ordered the evacuation of the passengers. Doors 1, 2, 3 on the right and left sides were used for the evacuation. The aft right and left n° 4 doors were not used due to the position of the aircraft, leaning forwards, which implied a slope which was too steep for the use of the emergency slides at the rear.

After the evacuation of the passengers, one member of the cabin crew went back up an emergency slide to inform the Captain that the evacuation had been carried out successfully and that there were no injured. The chief flight attendant remained with the passengers.

During this phase, the flight crew remained in the cockpit. The passengers and the cabin crew waited, spread out around the aircraft, and were then put onto buses and driven to terminal 1.

1.16 Tests and Research

1.16.1 Examination of equipment

The aircraft and its systems were examined. Details of these examinations are given in appendix 1. No malfunctions were noted on the thrust levers, the thrust reversers or the control systems.

1.16.2 Behaviour of certain automatic systems on landing

In order to study the accident, behaviour on landing of the following systems should be noted:

- **Auto-throttle**

If the auto-throttle is active during the landing, it disconnects automatically two seconds after touch-down of the main landing gear.

- **Auto-brake**

The auto-brake is armed by positioning the "auto-brake" switch on one of the three deceleration rates available (min, medium, max).

The brakes are automatically applied when the ground mode (information supplied by the landing gear) and a wheel speed are detected and the engine thrust levers are in the idle position.

If at least one of the thrust levers is forward of the positive idle position after landing, the auto-brake disarms and the brakes are not or are no longer applied automatically.

Any action by the crew on the brake pedals de-activates the system.

- **Spoilers**

The spoilers extend automatically on landing if the following conditions are met:

- Spoiler control lever in "Armed" position or thrust levers two or four in reverse thrust position,
- Thrust levers one and three in idle position,
- Ground reference present,
- Hydraulic pressure on circuits one or four available.

The spoilers retract if thrust levers 1 or 3 are moved forwards (in relation to the positive idle position).

- **Thrust reversers**

The thrust reverser mechanism is commanded by one lever located on each thrust lever. In the ground position and when the thrust levers are at idle, it is possible to pull the thrust reverser levers back to the "interlock" position which corresponds to reverse. This unlocks the reversers and initiates their deployment. There is blocking in the interlock position when the reversers are in motion or incompletely extended. The use of full reverse thrust is possible when the "in transit" lights are off and the "unlock" lights are on (see appendix 2) to indicate that the reversers are deployed and locked.

1.16.3 Similar Events

The two runway excursions described below have many common features with the accident to TJ-CAB (task sharing within the flight crew, positive thrust applied to engine 1, etc.).

1.16.3.1 Accident on 13 September 1993 at Tahiti-Faaa to the B 747-400 registered F-GITA operated by Air France

The crew performed, with instrument confirmation, a visual VOR-DME approach with flight director and auto-throttle active in VNAV mode.

Track following was ensured manually by the co-pilot (pilot flying), while the auto-throttle managed the speed.

In accordance with the logic of the active mode of the automatic flight system, the latter initiated an automatic go-around on arrival at the "End of Descent" point and the signal to the FMA (upper part of the Primary Flight Display).

The pilot not flying announced the change in mode status on the FMA, with no comment or analysis.

The aircraft passed above the glide path and the speed increased (it reached $V_{ref} + 35$ kt at a height of one hundred and fifty feet).

The pilot flying pulled back and held the thrust levers; he stated that he felt that the levers "were pulling forwards" and tried unsuccessfully to disconnect the auto-throttle.

About two seconds before touch-down, the n°1 thrust lever slipped out of his control, the auto-throttle still being active in "Go Around" mode. The thrust on engine 1 went to the full positive position, until the aircraft came to a stop, without the crew noticing this.

Consequently, on landing, the spoilers did not deploy, the auto-brake was disarmed and thrust asymmetry was high.

The aircraft veered off the runway and ended up in the lagoon, with no casualties (see the report on the Internet site at www.bea.aero).

1.16.3.2 Accident on 4 November 1993 at Hong Kong to the B 747-400 registered B-165 operated by China Airlines

The report issued by the Hong Kong authorities indicated that the aircraft over-ran the runway following a procedure specific to the Captain for landings in strong cross-winds. The pilot concentrated on roll control while maintaining residual thrust on the engines, in particular on engine 1 whose EGT curve showed values higher than the other engines. The inappropriate positioning of the n°1 thrust lever deactivated the automatic braking system. The aircraft over-ran the runway and ended up in the sea.

1.17 Information on Organisations and Management

1.17.1 Operating Manual and Cockpit Resource Management

Cameroon Airlines uses the Air France Operating Manual.

The normal deceleration procedures on landing are in appendix 3. In the section on task sharing, it is specified that during the deceleration phase the Flight Engineer shall maintain the thrust levers on idle via the handles at the base of the levers until reverse thrust is established.

1.17.2 Feedback System

Despite various requests from the investigators, Cameroon Airlines did not provide information on the establishment of a feedback system. Such a preventive system enables crews to benefit from the experience of other crews who have reported unusual situations.

1.18 Supplementary Information

1.18.1 Summary of Flight Crew's Testimony

The members of the flight crew stated that flight UYC070 was initially scheduled to take off from Douala on 5 November at 8 h 00. Due to the late arrival of the previous flight, the departure was delayed until 14 h 25. A fuel leak noticed before the departure from Douala also caused a further delay.

No problems were experienced on the flight until the approach. The n°3 slats must have extended electrically, which put the aircraft in the normal configuration for landing.

The Captain was pilot flying. At one thousand feet the aircraft was, according to him, stabilised for final approach. The latest information on wind transmitted by the ATC was as follows: wind from 150° at seventeen knots with gusts to twenty-six knots.

The Captain stated that:

- the aircraft had a strong correction to the right on final due to wind,
- the flaps were extended to 30°,
- the auto-brake had been selected on minimum,
- the approach was stabilised on manual,
- the auto-throttle and the auto-pilot were on OFF,
- the FAI of 160 knots was displayed on the auto-thrust speed window on display P10.

He had planned to leave the runway via the exit taxiway for Z7 which is located at the end of runway 09L.

After the touch-down and the announcement of "four blues", (lights corresponding to the indication "reverser in transit") which the Flight Engineer said he had performed, the Captain said that he applied reverse thrust on all four engines. As far as he was concerned, the spoilers were extended. As to the Flight Engineer, he stated that he had seen the blue lights go out and the orange lights corresponding to the "reversers locked" indication come on.

While the speed of the aircraft was around one hundred knots, the Captain noticed that the aircraft was veering off of its trajectory and announced "we're going off" to the crew. He stated that he had retracted the thrust reversers at that moment and then moved the spoilers to the retracted position.

The Flight Engineer noticed that, after the touch-down, the speed was high. He stated that the "SPEED-BRAKE" handle disconnected and that he intervened to extend the spoilers manually, informing the Captain of his action.

After the runway excursion, as soon as the aircraft came to a stop on the central area, the crew, who were no longer in contact radio with the tower, launched an emergency evacuation. The interphone and the lighting were no longer working, with the exception of the emergency lighting. The Flight Engineer shut down the

engines and fired the fire extinguishers on all four engines as well as that on the APU. The crew applied the emergency evacuation check-list (see appendix 5) and stated that they pulled the CVR circuit-breaker ten minutes after the aircraft came to a stop (action by the Flight Engineer).

Note: In the course of the second interview with the technical investigators, the flight crew mentioned the presence of two female passengers in the cockpit. They were sitting on the jump-seats to watch the landing. One of these passengers was contacted by the investigators but did not wish to give any information relating to the end of the flight.

1.18.2 Chief Flight Attendant's Testimony

1.18.2.1 Boarding

Since the investigators noted a difference between the number of people listed on the various on-board documents and that provided by the operator after the accident, the chief flight attendant was questioned on this point.

He indicated that the passenger count on boarding at Douala was the responsibility of the airport staff. He did not remember being informed of the last update at the airport relating to the number of people boarded. Furthermore, he confirmed that no head-count of the passengers on board had been undertaken before take-off.

1.18.2.2 The Evacuation

The chief flight attendant stated that the evacuation was carried out normally. With the exception of the flight crew, all of those on board left the aircraft via the emergency slides after it came to a stop.

1.18.3 ATC Office Agent's Testimony

The red alert was given almost immediately after the accident by the control tower duty chief. The ATC office agent went to the accident site knowing only that a Boeing 747 had had an accident near taxiway Z7 and that there was no further radio contact. The emergency services had already arrived. He took part in mustering the passengers while waiting for the buses. He then went on board the aircraft via an emergency slide to go to the cockpit. The flight crew were still present.

In accordance with the procedures in case of an accident, the agent stated that he asked the Captain to stop the CVR so as to preserve the recorded data. The Captain responded that *"as there was no electricity on board, the flight recorders were thus stopped"*. The agent restated his question, saying that the CVR had a duration of thirty minutes. The co-pilot asked if this meant pulling the circuit breaker and the Flight Engineer said that the CVR circuit breaker had been pulled.

2 - ANALYSIS

2.1 Accident Scenario

The sequence which led to the runway excursion can be broken down into three significant phases. Firstly, the engine 1 thrust lever was not in the idle position at the beginning of the deceleration (just after the touch-down) which inhibited the automatic braking systems. Then, this lever was inadvertently moved forward, which generated thrust asymmetry leading to the lateral runway excursion. Finally, the n°2 thrust reverser was retracted before the aircraft came to a stop.

2.1.1 Residual Thrust during Flare

The recorded parameters, such as the Fuel Flow and N1, show that engine 1, that's to say the outer left engine, was providing greater thrust than the other engines between the touch-down and the runway excursion (appendix 4.3), which indicates that lever n°1 was not in the idle position at the beginning of the deceleration. This hypothesis is reinforced by the absence of any auto-brake.

Equally, the spoilers were not extended automatically after touch-down. The Flight Engineer stated that he had announced "speed brake" and had intervened to extend them manually. Paragraph 1.16.2 showed that thrust levers n°1 and 3 must be in the idle position for the spoilers to extend automatically. The fact that they did not extend confirms that thrust lever n°1 was not in the idle position at the beginning of the deceleration.

It is difficult to explain this incorrect positioning of the thrust lever. The meteorological conditions at the time must certainly have taken up part of the crew's resources during the flare. The aircraft had a tendency to drift with the wind coming from the right, and the pilot had applied firm corrective control. At the time of the flare, he must thus have pushed down on the left rudder pedal to get the aircraft back onto the centre line and moved the control column to the right to continue to counter the effects of the wind. This manoeuvre, which implies simultaneous action of the rudder pedals, the control column and the thrust levers, requires co-ordination. The incorrect positioning of thrust lever n°1 may have been the result of an involuntary and undetected action on this lever during the decrabbing manoeuvre.

Fatigue was perhaps a contributory factor since the flight was arriving at night and with a considerable delay. In addition, the presence of two people who were not members of the flight crew may have disturbed the crew.

2.1.2 Positive Thrust on Engine Number One and Runway Excursion

The Captain felt the aircraft veering off of its trajectory when the speed was around one hundred knots. The positive increase in thrust on engine 1 noted on the FDR parameters implies that the thrust lever was moved even further forwards. The uncontrolled thrust on engine 1 and the effects of the side wind from the south added to this to pull the aircraft right of the runway centre line.

The raisons for the increased thrust on engine 1 remain difficult to explain. It is not impossible that while reaching over to extend the spoilers, which are on the centre console next to the thrust controls (see photo in 1.12.3), the Flight Engineer may inadvertently have moved the n°1 thrust lever towards full positive thrust. A lack of coordination between the Captain and Flight Engineer, as well as an absence of joint control with the co-pilot, may have contributed to the failure to correct the situation.

2.1.3 Retraction of n°2 Thrust Reverser

After the accident, the investigators noted that the reversers on the two left engines were retracted. At the beginning of the deceleration, three reversers out of four were extended. The retraction of the engine 2 thrust reverser was instigated during the runway excursion (appendix 4.2).

This action, of which the crew was not conscious, can only be explained by the confusion which must have reigned at the time of the runway excursion.

2.2 Cockpit Resource Management

Cameroon Airlines was not able to supply the information requested during the investigation on the nature of CRM training provided for its flight crews. It is likely that only the Captain had undertaken CRM training. The absence of CVR data makes it difficult to study precisely the task-sharing within the crew at the time of the landing. The preceding scenario nevertheless shows a lack of co-ordination, an absence of joint control and non-application of landing procedures.

2.3 Presence of Third Parties in the Cockpit

The Operation Manual, in the General/Operations section, sets out the conditions for access to the cockpit subject to authorisation from the Captain. In particular, it specifies that “in the interests of safety, the Captain ensures that admission to the cockpit does not create any distractions, nor interferes with the correct execution of the flight”.

Persons with no aeronautical function may, despite their best intentions, interfere with the correct execution of the flight, especially during specific phases of flight such as take-off and landing. This has already been noticed on various occasions

during investigations in France and abroad, as is illustrated by the following recommendation from the report on the mid-air collision which occurred on 30 July 1998 in Quiberon Bay (56) between the Beech 1900D registered F-GSJM operated by Proteus Airlines and the Cessna 177 registered F-GAJE.

“Paragraph 100 of the OPS 1, sections a) and b), restrictively defines the conditions for access to the cockpit. However, section c) recalls that the final decision rests with the Captain, which may be interpreted as giving the latter the possibility of over-riding the provisions of the sections a) and b), even without any reasons of safety. In addition, especially in small cockpits, interference between the passengers and the crew may occur without there being any real access to the cockpit.

Consequently, the BEA recommends:

That the DGAC ensure that paragraph OPS 1-100 are correctly understood and applied by operators. The BEA believes that the provisions adopted should, in particular, specify:

- 1) that section c) allow sections a) and b) to be over-ruled only for reasons of safety,***
- 2) that apart from the cruise phase, access to the cockpit be limited, apart from members of the crew, to the airline’s technical personnel and representatives of official bodies, within the context of their official functions, and that the cockpit access door on public transport aircraft, where there is one, must then be closed.”***

Though this point could not be studied in detail in the case of the accident to TJ-CAB, given the loss of the CVR data, it cannot be ruled out that the presence of two female passengers may have distracted the crew at certain times.

3 - CONCLUSIONS

3.1 Findings

- The crew possessed the necessary licences and qualifications to perform the flight
- The aircraft possessed a valid Airworthiness Certificate.
- The flight had left Douala very late.
- A difference was noted between the number of persons listed in the on-board documents and that which was provided by the operator after the accident.
- During the approach and the landing, two female passengers were present in the cockpit.
- The landing took place at night on a wet runway and with a strong side wind.
- The approach was stabilized. Touch-down occurred at 20 h 57 at a speed of 151 knots.
- The auto-brake systems were de-activated after touch-down.
- The Flight Engineer intervened to extend the spoilers manually.
- The thrust reverser on the left outer engine did not deploy during the deceleration. The engine had high positive thrust.
- The roll distance between touch-down and the runway excursion was 1,700 metres.
- The aircraft left the runway laterally, to the right, between taxiways Z6 and Z7.
- The evacuation of the passengers was ordered after the aircraft came to a stop.
- The CVR data was not saved.
- There were no aircraft system malfunctions during the landing.

3.2 Probable Causes

The initial cause of the accident was the incomplete reduction of thrust on the left outer engine at the beginning of deceleration. This caused the de-activation of the automatic braking systems and the non-extension of the n° 1 thrust reverser. The inadvertent selection of full thrust on this engine after the landing created high thrust asymmetry leading to the runway excursion.

The lack of co-ordination and of joint control by the crew members, perhaps aggravated by the presence of third parties in the cockpit, contributed to the development of this situation.

4 - RECOMMENDATIONS

In accordance with article 10 of Directive 94/56/CE on accident investigations, a safety recommendation is intended neither to apportion blame, nor to assess individual or collective responsibility for an accident or incident.

In 1995 the ICAO amended Annex 6 concerning the operation of aircraft in order to encourage the establishment of initial and on-going CRM training for operators' crews.

The accident to TJ-CAB brought to light deficiencies in the domain of task-sharing and joint control. Consequently, the BEA recommends that

the Civil Aviation Authority of the Republic of Cameroon ensure that Cameroon Airlines:

- **establishes an additional systematic CRM training programme for all flight crew,**
- **limits access to the cockpit during the takeoff and landing phases.**

Annex 6 recommends "that from 1 January 2002, operators of aircraft whose takeoff weight exceeds 20,000 kg establish and maintain a flight data analysis programme in the context of their accident prevention and flight safety programme".

The existence of such a system within Cameroon Airlines could not be established during the investigation, due to a failure to reply to the investigators' requests. Consequently, the BEA recommends that

the Civil Aviation Authority of the Republic of Cameroon:

- **check that Cameroon Airlines has a satisfactory flight safety programme, and if this is not the case, imposes the establishment of such a programme in the shortest possible time.**

The CVR data was not saved following the accident. Consequently, the BEA recommends that

the Civil Aviation Authority of the Republic of Cameroon:

- **request that Cameroon Airlines takes appropriate measures to save CVR data after an incident or an accident.**

LIST OF APPENDICES

APPENDIX 1

Summary of the technical examinations of equipment

APPENDIX 2

2.1 Diagram of thrust reversers

2.2 Thrust reverser – Controls

APPENDIX 3

Normal procedures (extract from the T.U.)

3.1 Conduct of flight

3.2 Deceleration on landing

APPENDIX 4

FDR curves

4.1 Braking on the accident flight and on the previous flight

4.2 Calculation of the runway roll distance

4.3 Engine power

APPENDIX 5

Evacuation procedure

APPENDIX 6

Plan of accident site

Appendix 1

Summary of technical examinations of equipment

On 9 November 2000 primary checks were carried out on the thrust controls. The results were as follows:

- The four thrust levers moved normally from idle to the centre console stop.
- Thrust reverser levers one and two (reversers retracted side at the level of the GTR) moved normally to interlock with movement transmitted to the console relays. There was a blockage in interlock which is normal since the reverser must be physically extended to allow reverse acceleration.
- Thrust reverser levers three and four (reversers extended side at the level of the GTR) were operative throughout the travel range, which is normal since the reversers are physically deployed, so there is no blockage in interlock and the use of full reverse thrust is possible.
- The speed brake levers were operating normally throughout the travel range and released correctly with thrust reverser levers two or four.

On 29 November 2000 checks were carried out on reverser number one using the following methodology:

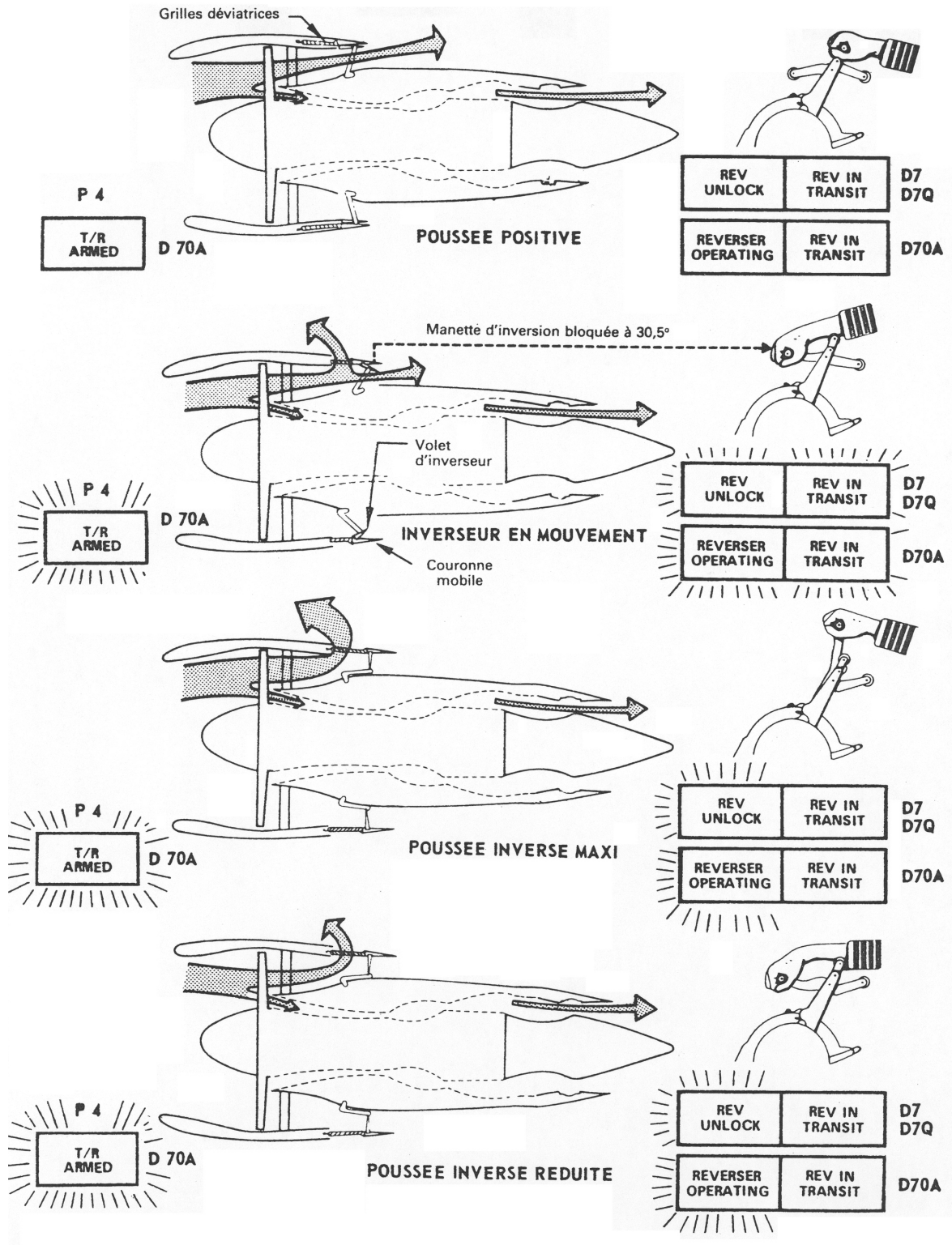
- Pressurisation of pneumatic manifold.
- 24V c.c. electrical supply on connexion 14 of D1826P (wing root level).
- Manual release of 3° lock, synchrolock in six' o'clock position.
- Manual opening of the «console valve».
- Actuation of the n°1 reverser control in the cockpit to allow actuation of the internal switch on the reverser motor. The actuation was noted as occurring as well as correct extension of the n°1 thrust reverser.
- Actuation of the n°1 reverser control in the cockpit to allow retraction of the n°1 thrust reverser. Retraction of the reverser was noted as occurring.
- Opening of the engine casing in order to check mechanical operation of the FCU control mechanism in positive and reverse thrust. The assembly was operating correctly

On 6 December 2000 additional checks were performed on the n°1 thrust reverser electrical circuit. All electrical connections were correct. The solenoid and the relays were operating correctly.

Note: only the electrical connections between the cockpit console and the wing root could not be checked due to the cable having been torn out at the level of box P252 in the electronics bay. With regard to the Air/Ground function, if one of the relays in question had not been supplied with electrical power, symmetrical reverse would also have been affected.

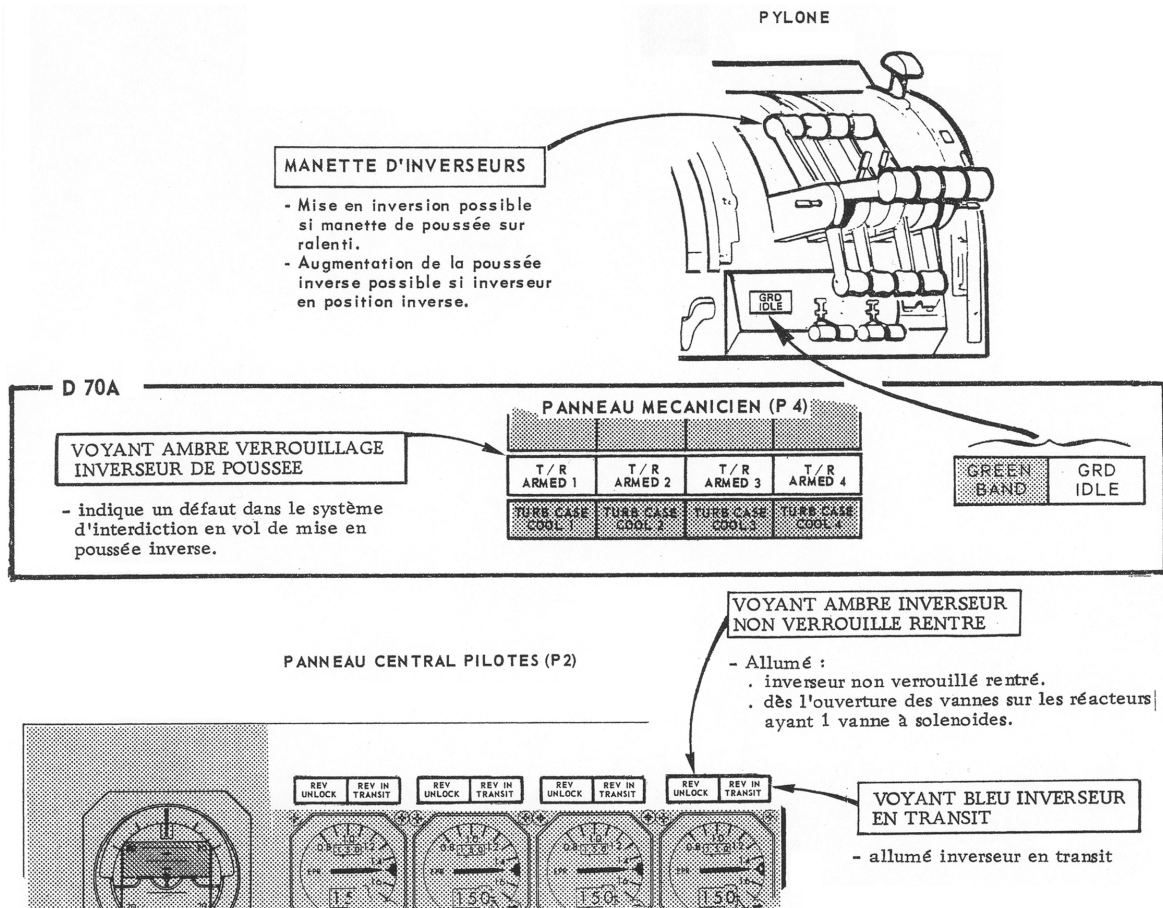
Supposing that the unchecked connections were in good condition before the accident, the checks performed showed no malfunctions in thrust reverser n°1.

Réacteur **INVERSEUR DE POUSSEE - Schéma**



Réacteur

INVERSEUR DE POUSSEE - Commandes et contrôles



Procédures Normales

CONDUITE DU VOL - DECELERATION

Les annonces techniques standard pendant l'atterrissage et la décélération doivent être faites conformément au Manuel GEN OPS

La procédure de décélération recommandée consiste à appliquer, lorsque les conditions opérationnelles le permettent, la séquence **INVERSEURS** et **FREINS** dès le toucher des roues des trains principaux.

PF PILOTE AUTOMATIQUE OFF
. s'il a été utilisé pour l'atterrissage.

PF AUTOMANETTE Débrayée
. par les leviers des manettes réacteur 1 ou 4.

PF MANETTES DE POUSSEE Ralenti

M MANETTES DE POUSSEE Maintenues ralenti
. jusqu'à ce que la poussée inverse soit établie.

PF MANETTES D'INVERSION
. Tirées vers l'arrière jusqu'à l'INTERLOCK
. dans tous les cas tirer les quatre manettes d'inversion jusqu'à la position INTERLOCK (correspondant au ralenti inverse).
. l'AUTOMANETTE est débrayée par le passage en inversion des réacteurs 1 et/ou 2.

ATTENTION : NE TENTER EN AUCUN CAS UNE REMISE DE GAZ LORSQUE LA PROCEDURE D'INVERSION DE POUSSEE EST ENTAMEE. Si un inverseur ne revenait pas en poussée positive, la réussite de la remise de gaz pourrait être compromise.

C M MANETTE SPEED BRAKE Vérifiée UP
. si les aérofreins ne sont pas sortis, l'OMN annonce "SPEED BRAKE" ; le CDB sort manuellement les aérofreins ou demande de les sortir.

M SIGNALISATION INVERSEURS Vérifiée
. 4 voyants UNLOCK allumés
. 4 voyants IN TRANSIT éteints

M ANNONCES Effectuées

"LE X NE PASSE PAS"

. Si la signalisation n'est pas conforme, l'OMN annonce l'inverseur en défaut, surveille les paramètres de ce réacteur et le coupe, si nécessaire, en l'annonçant.

PF POUSSEE INVERSE Maintenue ralenti
. maintenir les manettes d'inversion à l'INTERLOCK.

M "LES INTERIEURS" ou "LES EXTERIEURS"
. L'OMN annonce les inverseurs symétriques utilisables.

PF POUSSEE INVERSE (si nécessaire) .. Utilisée
. Bien qu'il soit recommandé, dans ce cas, de laisser les manettes d'inversion sur INTERLOCK, la **pleine poussée inverse peut être appliquée** sur les **REACTEURS SYMETRIQUES** utilisables, en particulier si la sécurité de la trajectoire le nécessite.

"LES QUATRE PASSES"

L'action d'abaisser le nez de l'avion vers la piste étant amorcée :

PF POUSSEE INVERSE Appliquée
. tirer les quatre manettes d'inversion jusqu'à la pleine poussée inverse

M COHERENCE PARAMETRES REACTEURS/POSITION MANETTES Surveillée
. Surveiller attentivement :
- les N1 pendant la phase de montée en régime et pendant l'application de la pleine poussée inverse.
- l'EGT pendant la phase de retour d'inversion **et au moins les dix secondes suivant le retour en poussée positive.**

EGT en augmentation rapide
. Arrêt du réacteur affecté (annonce et ventilation).

"EGT normale"

M ANNONCE après 10 s, Effectuée

ATTENTION :

- POUR TOUTE AUGMENTATION DE POUSSEE SUR UN REACTEUR NON PASSE EN POSITION INVERSION,
- POUR TOUTE SURCHAUFFE PENDANT L'UTILISATION DE LA POUSSEE INVERSE **OU** PENDANT LES DIX SECONDES SUIVANT LE RETOUR :

L'OMN PREVIENT LE PF ET ARRETE IMMEDIATEMENT LE REACTEUR AFFECTE, EN PLACANT LA MANETTE DE DEMARRAGE SUR CUT OFF.

SIMULTANEMENT, LE PF REDUIT LA POUSSEE JUSQU'AU RALENTI INVERSE (INTERLOCK) SUR LES AUTRES REACTEURS.

UNE VENTILATION DU GTR ARRETE DOIT ETRE EFFECTUEE LE PLUS RAPIDEMENT POSSIBLE

UTILISATION INVERSEURS

La recherche d'un meilleur contrôle directionnel par l'utilisation de poussée inverse dissymétrique est à proscrire. En cas de difficultés de tenue d'axe à l'atterrissage, ramener toutes les manettes d'inversion sur ralenti et n'utiliser que le palonnier et les freins. Au besoin, repasser en poussée ralenti positive.

Si un ou plusieurs N1 dépassent la valeur limite opérationnelle (cf tableau ci-dessous) :

CF6	D7	D7Q	D70A
100 %	70 %	75 %	85 %

M ANNONCE "N1"

PF POUSSEE INVERSE Réduite légèrement
. réduire légèrement la poussée inverse sur les **quatre réacteurs**, sans chercher à agir plus précisément sur celui ou ceux qui sont à l'origine de l'annonce.

Pour éviter le pompage, effectuer la procédure suivante :

PNF IAS Annoncée
. tous les 10 kt en valeur ronde.

Procédures Normales

CONDUITE DU VOL - DECELERATION

à 80 kt :

- PF MANETTES D'INVERSION vers ralenti
- . ramener les manettes d'un mouvement lent et régulier vers le ralenti inverse qui doit être atteint au plus tard à 60 kt.
 - . le retour en poussée positive vers 60 kt est recommandé.
 - . En cas de nécessité opérationnelle, la pleine poussée inverse peut être utilisé aussi longtemps que de besoin. Surveiller attentivement les paramètres moteurs aux faibles vitesses.

ATTENTION :

Ne pas modifier le sens de déplacement des inverseurs, avant que ceux-ci n'aient eu le temps d'atteindre leur fin de course. Le temps de passage en inversion est normalement de deux secondes et le retour en poussée positive de 5 secondes environ.

Eviter d'exercer sur les manettes d'inversion de rapides sollicitations alternatives qui risquent de détériorer le moteur pneumatique, même en cas de difficultés de passage ou de retour des inverseurs. Lors de la réduction de poussée inverse, si les manettes d'inversion sont ramenées au-delà de la position ralenti inverse, une nouvelle augmentation de la poussée inverse peut provoquer des détériorations des mécanismes d'inverseur.

Si, au cours de l'utilisation des inverseurs de poussée, il est constaté un écart significatif ($\geq 5\%$) entre les N1, ou des N1 $\geq$ aux valeurs du tableau ci-dessous, noter l'OAT et le ou les N1 anormaux.



CF6	D7	D7Q	D70A
107 %	75 %	80 %	92 %

- . En cas de surchauffe ou de pompage, noter :
OAT, N1, IAS, EGT atteinte.
- . Pour le suivi technique, en cas d'impossibilité de passer en inversion de poussée, noter l'angle de blocage de la manette et les signalisations inverseur.

UTILISATION DES FREINS

Dégager la piste par la bretelle permettant une décélération de l'avion jusqu'à la vitesse de roulage, sans utilisation excessive des freins.

Cette recommandation est importante en cas de masse avion élevée et/ou de terrain en altitude.

Cependant, en cas d'urgence, l'arrêt de l'avion en toute sécurité prime sur les considérations d'usure ou d'échauffement des freins.

PF FREINS Appliqués

FREINAGE NORMAL AVEC AUTOBRAKE :

Surveiller l'efficacité du freinage et, si nécessaire, ne pas hésiter à reprendre le freinage aux pieds;

Si le voyant AUTOBRAKE s'allume, l'OMN annonce "AUTOBRAKE" ; utiliser le freinage manuel.

Lorsque l'état de la piste et la distance restante le permettent, appliquer une pression sur les pédales de freins pour désactiver le freinage automatique. Vérifier que le voyant AUTOBRAKE s'allume, et que le sélecteur passe sur DISARM. Utiliser le freinage normal.

- M VOYANT GRD IDLE Vérifié
- . allumé cinq secondes environ après le toucher des roues.

Juste avant de dégager la piste :

- C BODY GR STEERING ARM
- . lorsque la vitesse de roulage est atteinte.

Lorsque les conditions le permettent :

- M AUTOBRAKE OFF

ATTENTION : L'utilisation du freinage autobrake ou sans autobrake, sans l'aide des inverseurs, pour un atterrissage à masse élevée sur un terrain en altitude, peut amener les freins à la limite de l'énergie absorbable (risque de fonte des fusibles de roues, 10 à 15mn après l'atterrissage).

FREINAGE SANS AUTOBRAKE :

- . appliquer sur les pédales une pression constante dès le toucher des roues du TP,
- . ne pas tenter de moduler aux pédales la pression hydraulique de freinage.
- . ne pas relâcher complètement les pédales tant que l'avion n'a pas atteint une vitesse normale permettant de dégager la piste.

Pour la recherche d'une distance minimum d'arrêt, appliquer les freins à fond dès le toucher du train avant.

Procédures normales
Phases de vol
DECELERATION A L'ATTERRISSAGE

- PF **AUTOMANETTE**..... **Débrayée**
Débrayer l'automanette au toucher du train principal.
- PF **PILOTE AUTOMATIQUE** **Débrayé**
Débrayer le pilote automatique au toucher du train principal.
- M **SPEED BRAKE**..... **Vérifiés**
L'OMN vérifie que la manette SPEED-BRAKE passe sur UP, ou la positionne manuellement.
- PF **POUSSEE INVERSE**..... **Appliquée**
L'OMN vérifie que les voyants indiquent un fonctionnement normal et que les N1 et EGT sont dans les limites.

ATTENTION

Lorsque les inverseurs ont commencé à se déployer, un atterrissage complet doit être effectué.

Immédiatement au toucher du train principal, tirer les quatre manettes d'inverseurs jusqu'à la position Interlock quelque soit le nombre d'inverseurs utilisables. Lorsque l'OMN annonce « LES QUATRE PASSEES », appliquer la poussée inverse 95% N1.

Dès 80 kt, réduire progressivement la poussée selon les conditions de décélération afin d'obtenir 60% N1 vers 60 kt, le N1 ralenti vers 50 kt. Si nécessaire, la poussée inverse maximum peut être appliquée jusqu'à l'arrêt; dans ce cas, une surveillance particulière des paramètres moteurs doit être effectuée à basses vitesses.

Si un GTR ne passe pas en inversion de poussée, l'OMN annonce: "le X NE PASSE PAS".

Laisser les 4 manettes d'inversion de poussée en position Interlock.

L'OMN annoncera les inverseurs symétriques utilisables

"LES INTERIEURS" ou "LES EXTERIEURS" seulement si un Briefing préalable à été effectué (cas de panne).

Si la sécurité l'exige, notamment en cas d'atterrissage sur piste contaminée, le PF peut appliquer la poussée inverse sur les GTR symétriques après avoir demandé lesquels sont disponibles.

Le PNF annonce les vitesses indiquées de 10 kt en 10 kt afin d'assister le PF dans la gestion de la poussée inverse en insistant sur 80kt, 60kt, 30kt.

L'OMN surveille les paramètres GTR et annonce toute approche des limitations, dans ce cas le PF ramène légèrement les 4 manettes d'inversion vers l'avant.

- M **FREINS**..... **Vérifiés**
L'OMN vérifie que la pression des freins est dans l'arc vert, que les voyants "ANTI-SKID" et "AUTOBRAKE" sont éteints.
(continuer page suivante)

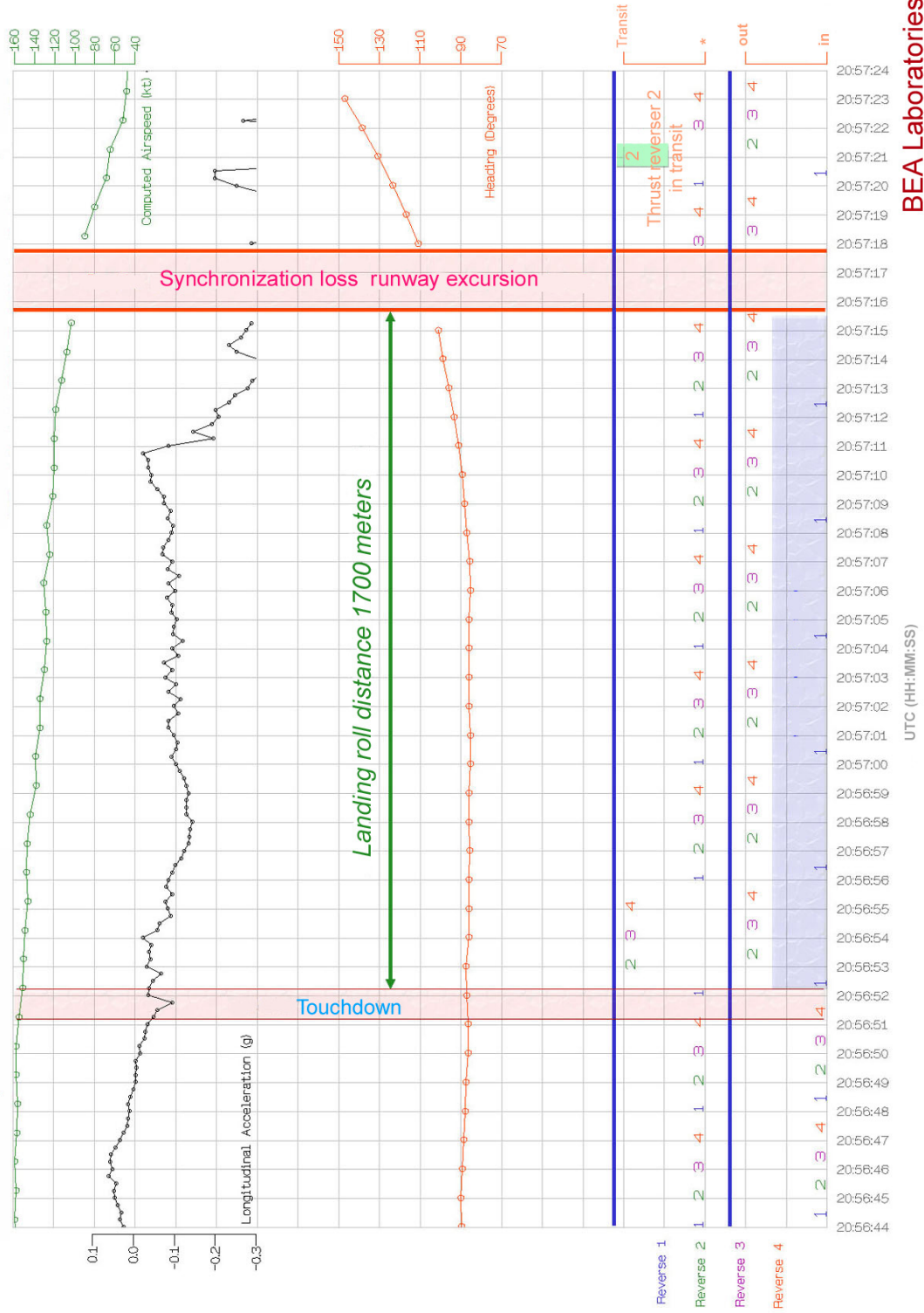
Procédures normales
Phases de vol
DECELERATION A L'ATERRISSAGE

- PF **FREINAGE** **Vérifié**
Si le voyant "AUTOBRAKE" s'allume, freiner aux pieds.
Lorsque la vitesse de roulage est atteinte, débrayer le système
Autobrake.
Vérifier l'allumage du voyant "AUTOBRAKE".
- C **BODY GEAR STEERING** **ARM**
Après l'annonce "30kt", le CDB annonce "BODY GEAR
STEERING" puis place l'interrupteur Body Gear Steering (P5) sur
ARM.
L'OMN contrôle l'action.

TJ-CAB

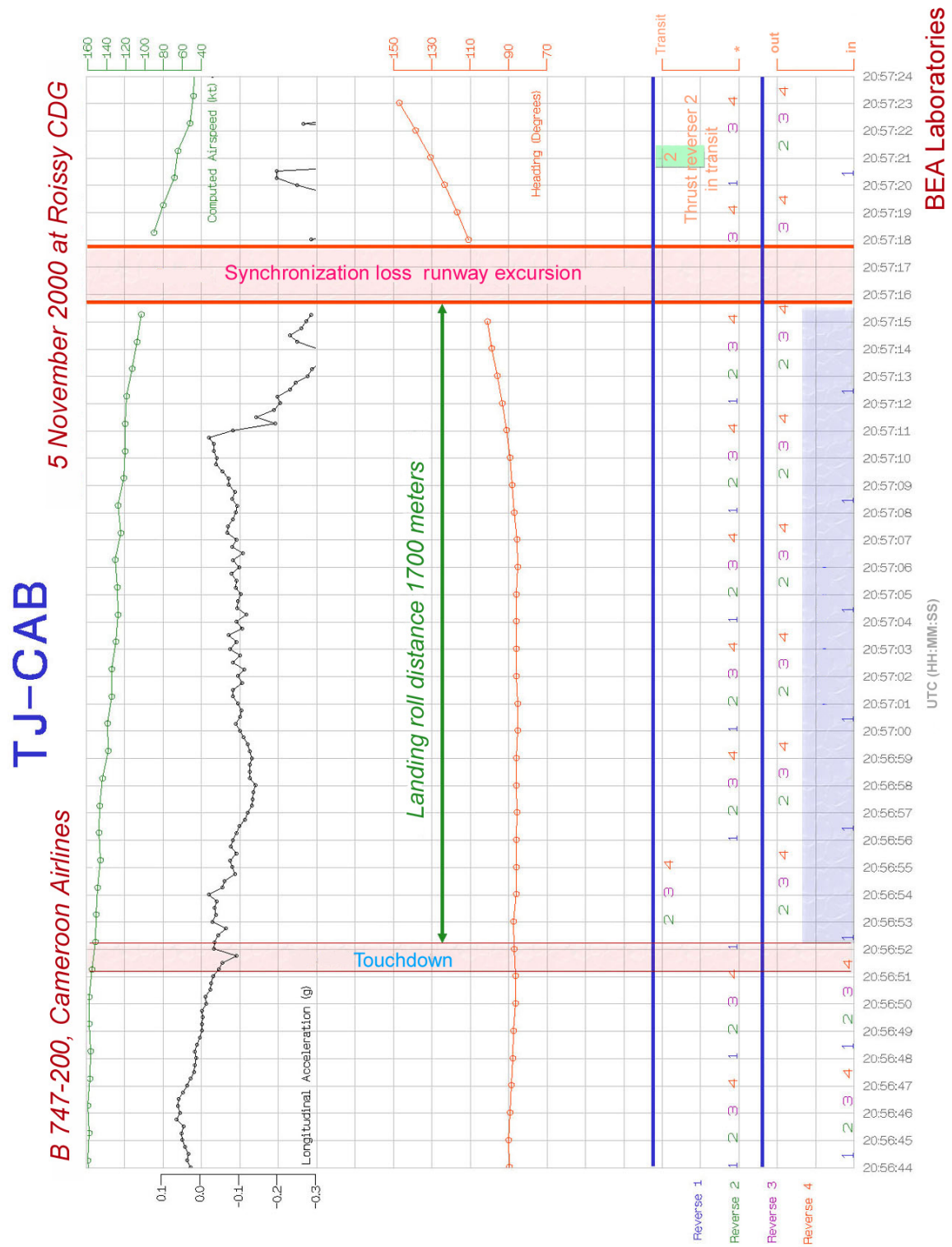
B 747-200, Cameroon Airlines

5 November 2000 at Roissy CDG



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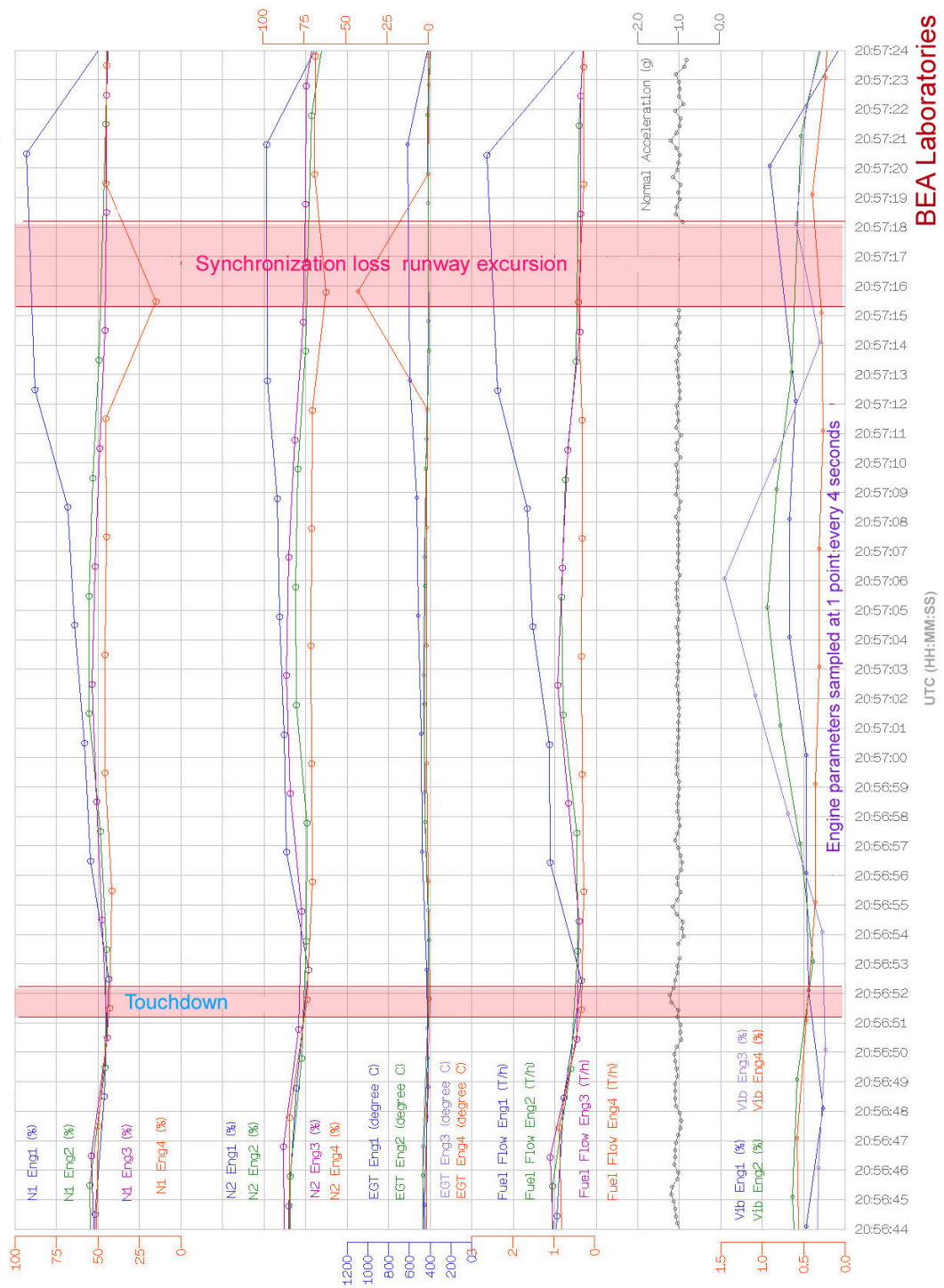
BEA Laboratories



TJ-CAB

B 747-200, Cameroon Airlines

5 November 2000 at Roissy CDG



BEA Laboratories

B747 AIR FRANCE DT-NT	Livret Check-lists Secours	C/L AR 07 OCT 99
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EVACUATION PASSAGERS

C	PARKING BRAKE.....	Serré
C	MANETTES DE DEMARRAGE.....	CUTOFF
C	PNC.....	Prévenu
P	ATC.....	Informé
M	BATTERY et STANDBY POWER.....	Alimentés
M	OUTFLOW VALVES.....	Vérifiées ouvertes et annoncées
M	COUPE-FEU GTR et APU.....	Tirés
M	POUSOIR BTL GTR et APU.....	DISCHARGE
C	EVACUATION	

➤ **NECESSAIRE**

C	EVACUATION PASSAGERS.....	Annoncée
C	EVACUATION.....	Déclenchée

➤ **NON REQUISE**

C	' Mesdames, Messieurs, ici le Commandant,.....(Ladies and Gentlemen, here is your Captain	Annoncée
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Si les conditions le permettent,tirer le disjoncteur VOICE REC (P7).

