DATA SUMMARY

LOCATION

Date and time	**February 26th, 2003; 19:35 UTC**
Site	**Palma de Mallorca Airport**

AIRCRAFT

Registration	**EC-ICX**
Type and model	**BOMBARDIER DHC-8-315**
Operator	**Air Nostrum**

Engines

Type and model	**PRATT AND WHITNEY PW-123 E**
Number	**2**

Crew

	Pilot in command	First officer
Age	**57**	**29**
Licence	**ATPL(A)**	**CPL(A)**
Total flight hours	**10,664 h**	**2,282 h**
Flight hours on the type	**387 h**	**94 h**

INJURIES

	Fatal	Serious	Minor/None
Crew			**4**
Passengers			**51**
Third persons			

DAMAGES

Aircraft	**Minor damage in main landing gear**
Third parties	**Nil**

FLIGHT DATA

Operation	**Scheduled passenger transport**
Phase of flight	**Landing roll**

REPORT

Date of approval	**22 February 2006**

1. FACTUAL INFORMATION

1.1. History of the flight

The Bombardier Dash 8 airplane, registration number EC-ICX was to land in Palma de Mallorca airport, authorized by Air Traffic Control (ATC), on Mach, 26th 2003. The flight was originated in Ibiza island airport and there were 51 passengers on board. Crew members were pilot, co-pilot and two cabin attendants. At 19:30 h UTC, the Sun had set and the crew was carrying on the sixth and last landing for the day in a rotation which begun at 14:45 UTC that day.

Meteorological visual conditions prevailed, and only a light wind, with a 3 kt crosswind component to the 24R runway.

Flight had been normal in every aspect save a small discrepancy in hydraulic fluid quantity between the two hydraulic systems on the airplane. The pilots tried to correct the discrepancy, with little success, by means of an in-flight hydraulic fluid transfer procedure. When they approached destination, as the discrepancy in hydraulic quantity was small and the quantities were above the minimum required in both systems they prepared for a normal landing operation.

At the time of touch down it was confirmed that the four wheels of the main landing gear were blocked, and as a consequence, the airplane slid and skid on the runway and the tires on all four wheels burst off; and at the same time hydraulic pressure was lost on Hydraulic System No 2. The airplane stopped after a reduced landing run, in the middle of the runway, its movement controlled by the nose steering wheel.

Although there were many sparks from the abrasion between wheel and the brakes against the runway asphalt surface, no fire was initiated. Soon afterwards the pilot checked that the four tires were blown out and that hydraulic fluid of No 2 HS was lost.

Passengers were de-boarded through the stairways in the middle of the runway where they were picked up in apron buses.

1.2. Injuries to persons

All passenger and crew member were uninjured.

1.3. Damage to the aircraft

Damage in the airplane included the four main tires being blown-out and breakage of several wheels and brakes components.

1.4. Other damage

Runway 06L-24R was closed from 19:30 UTC on the accident day until 3:56 UTC on next day, due to aircraft retrieval and runway cleaning and maintenance operations.

1.5. Personnel information

1.5.1. *Pilot in command*

Male, 57 years old, had an ATPL (A) license and recently he had undergone a simulator proficiency check. His latest medical exam was passed on 12-09-02 and was valid until 11-04-2003.

In his flying experience he had accumulated 10,664 FH, 387 FH of them in the same airplane type.

Resting time prior to the activity of this day had been 12 h.

He had arrived for his duty al 12:00 UTC. Last take-off at IBZ, at 19:00 UTC was on time, and it was the sixth and last jump for the day.

1.5.2. *First officer*

Male, he was and at the date of the incident 29 years old; his flying licenses, CPL (A) y PPL (A) were current.

Recently he has undergone the proficiency simulator check and his latest medical exam was passed on 23-10-02 and was valid until 23-11-2003.

He had accumulated a total of 2,282 FH, 94 of them in Dash 8 type.

Resting time prior to this day duty was above 10:30 h, and he started his working day at 11:40 UTC.

1.6. Aircraft information

The Bombardier DHC-8-315, known as Dash 8, is a bi-turboprop airplane for regional passenger transport.

The airplane involved on the incident had a main cabin arranged for 52 passengers and a maximum take-off weight of 19,495 kg.

1.6.1. *Airworthiness Certificate*

On 06-05-2002 DGAC had issued an Airworthiness Certificate on behalf of the aircraft, valid until 21-04-2003.

1.6.2. *Maintenance status*

With 4,104 FH and 4,172 landings, it had undergone on 25-02-2003 the A01 of 500 HV maintenance check.

At the moment of the accident the airplane had accumulated 9 FH and 17 CC more.

1.6.3. *Hydraulic System*

Hydraulic power is provided by two independent hydraulic systems. Each of them includes a main hydraulic pump driven by its respective main engine. Beside that, a standby or auxiliary electrical pump powers the system in case of main pump failure. Normal working pressure is 3,000 psi.

No 1 hydraulic system provides hydraulic power to deploy and rise flaps, to actuate normal braking and antiskid operation, to deploy and retract the in-bound spoilers and for lower rudder actuator.

Normally, No 2 Hydraulic System provides power for landing gear extension and retraction, nose wheel steering, outboard spoilers actuation, upper rudder actuation and for parking/emergency brake system.

No 1 Hydraulic System can transfer power to No 2 Hydraulic System, in case of simultaneous failure of main and standby hydraulic pumps, through a hydraulically driven motor-pump.

Both systems include a ground servicing panel with quick-disconnect connections.

The associated indication systems include: low pressure light which light up when pressure is lower than 2,000 psi, main and auxiliary pressure indicators, hydraulic fluid quantity indicators, and main and auxiliary over temperature indicators.

No 1 hydraulic fluid reservoir capacity is 2.5 lt. No 2 hydraulic system capacity is 5.19 lt.

1.6.4. *Braking Systems*

Each of the main landing gear wheels is braked by a braking assembly, where the rotating disks are trapped between a pressure plate and a torque plate when pressure is applied to a set of piston integrated in the assembly.

Hydraulic pressure reach the piston housings in the braking assembly though two different braking systems.

Normal braking system applies pressure from No 1 HS, when braking pedals, are pushed forward. Braking power is applied directly or through the antiskid system, and the braking action is modulated according the displacement of the pedals.

Parking/emergency braking is accomplished when pressure from No 2 HS is sent, to the four wheels at the same time, when a lever, in the centre pedestal in the cockpit, is actuated. It is not possible to differentiate wheel braking of each main leg, but it is possible to modulate the braking action of the four wheels at the same time, in proportion to the lever displacement. Parking brake lever position is the rear most position of the lever. Forward lever position corresponds to no emergency/parking brake selection.

Both braking systems —each of them is powered by a different hydraulic system, No1 or No 2—, have a common element which is the shuttle valve. The shuttle valve is fed by the hydraulic lines from both systems and its internal piston is displaced to one side or the other depending on the differential pressure between the two systems, allowing

in this way that one or the other system pressure can reach and actuate the pistons in the brake-assembly.

1.6.5. *Antiskid System*

The antiskid system controls the braking action to avoid the airplane skidding due to wheel blockage. There are two subsystems which monitor its use, one on the inbound wheels of each main leg, and the other the outbound wheels. When a wheel begins to slow down in respect to the revolutions of its paired wheel in the other leg the system reduces the hydraulic pressure in order to allow it to regain its revolutions. The system gives braking pressure in proportion to brake pedals displacement, but it is inhibited on the ground when aircraft speed is less than 12 kt. At those low speeds the whole hydraulic pressure is at the disposal of the pilot, although he can reach to block the wheels. On the contrary, with no WOW (Weight On Wheel) signal, the system does not permit that hydraulic pressure reach the brake-assys and so the wheels could spin up quickly on touch down.

The system has a single electronic antiskid control unit and two dual skid control valves.

1.6.6. *Warning and announcement Systems*

The MASTER CAUTION (MC) light, placed on the main instrument panel in the cockpit, illuminates when some abnormality or special condition in the monitorized airplane systems is sensed. A din-don or acoustical warning is sound and that brings pilot attention to the MC light-on. In an annunciator panel set apart, a sign is illuminated simultaneously identifying the abnormality. The MC light can be reset by the pilots to allow that eventually any other later abnormality in any other airplane system could be announced properly. The sign will stay illuminated as long as the abnormality or special condition persists.

When the landing gear is down and the parking/emergency brake is not in the forward position, a «PARKING BRAKE» light is illuminated on the annunciator panel and the MC is activated.

When airborne, selecting the anti-skid switch from OFF to ON, or from ON to TEST with the gear down and locked, causes the INBD ANTISKID and OUTBD ANTISKID lights to illuminate for approximately three seconds and then go out.

1.7. Meteorological information

Night visual meteorological conditions (VMC) prevailed during approach and landing at Palma de Mallorca.

1.8. Aerodrome information

Palma Airport, ICAO code LEPA, have two parallel runways its orientation being 06-24, designated Right and Left in each of their senses.

Runway 24R available landing length is 3,200 m.

One third runway, 06-24 Central, is located in between the other two, but ordinary it is not in use and its lighting remain switched off.

There are published landing NDB, VOR-DME, ILS procedures for runway 24R approach and landing.

1.9. Flight recorders

The airplane was equipped with a Digital Flight Data Recorder (FDR) and a Cockpit Voice Recorder (CVR).

1.9.1. *Cockpit Voice Recorder (CVR)*

No cockpit conversations, noises and ATC interchanges transcription have been submitted for the investigation. The recording was not preserved because no measures were taken to avoid its automatic erasing.

1.9.2. *Digital Flight Data Recorder (DFDR)*

DFDR information has been provided for the investigation in paper and graphic format. (See ANNEX B). The DFDR, in its implementation, does not record the Parking Brake actuation nor use or antiskid selection.

Making references to times measured from and to the time of touch down, the following events and observations are shown:

— –28 min The aircraft takes-off from Ibiza according to the WOW, (Weight On Wheels), signal.
— –12 min The airplane overflies notification point SEBAS. (Estimated time).
— –695 s Sixteen successive MASTER CAUTION (MC)[1] warnings begin to activate. The period when the MC warning appears lasts one and a half minutes. The FDR does not record the reason or abnormality that makes

[1] See point 1.6.5 en relation with MC.

the MC to pop out. While the MC appears once and again, the airplane descend, at 230 kt air speed, from level of 8,000 ft to 5,000 ft.
— –590 s Last MC warning which is not reset immediately.
— –549 s The airplane oveflies MJV. (Estimated time). (MJV is a VOR station).
— –524 s Last MC reset.
— –417 s Base turn. (Estimated time).
— 0 s The airplane touches down in Palma according to WOW signal. Its speed is 109 kt IAS.
— +16 s Crew intent to exit runway as perceived by an increase of engine torque.
— +26 s Aircraft stopped.
— +28 s No 2 Hydraulic System loses pressure. Engines on idle.
— +151 s Engines rpm begin to set down.
— +338 s Engines are completely stopped.

Graph B-1 shows MC warnings together with altitude and IAS speed evolution. From instant 0 onwards, when airplane touches down in Palma, it is observed on DFDR recordings a significant longitudinal acceleration increase taking values up to –0.391 g's, equivalent to 3.83 m/s^2.

1.10. Communications

Communications with ATC was maintained through APP and TWR services.

The transcription of TWR communications were provided for the investigation. In the following events noted time references are adjusted to the touch down instant:

— –104 s TWR authorizes the landing on runway 24R.
— –5 s TWR gives a TWR-ground frequency.
— 0 s Air Nostrum acknowledges the frequency as normally.
— +10 s Air Nostrum informs they have got a problem on the right wheel.
— +27 s Air Nostrum confirms they have a blown out tire and that they are obstructing the runway.
— +270 s Fire brigade arrives.
— +12 min 40 s Apron buses arrive.

1.11. Wreckage and impact information

1.11.1. *Tracks and signs on the runway*

The airplane left behind marks and tracks, as seen on the pictures, of its skidding over the runway.

1.11.2. *Inspection of the aircraft after the incident*

Inspection of the main landing gear after the incident showed that the four tires were blown out. Friction of the wheel rims with the ground abraded the aluminium and the steel in the brake assys to the piston housing.

It was disclosed that hydraulic fluid from No 2 HS was leaking.

It was noticed that No 1 HS, which during the flight showed a low hydraulic fluid level, was almost full.

1.12. Fire

The sparks from the wheel rims and asphalt friction did not initiate any fire. The fire brigade arrived after a few minutes.

1.13. Survival aspects

Airplane occupants de-boarded the plane through the stairways and were brought to the terminal building in apron buses without any hindrance.

1.14. Tests and research

1.14.1. *Checks on airplane and brake system components*

After the incident a functional check on the Parking/emergency system was performed with a satisfactory result.

The antiskid control unit was removed and sent to the shop, CRANE Hydro-Aire, INC, for test and functional checks. All the checks were passed satisfactorily.

1.14.2. *Landing roll distance. Estimation*

Taking into account that speed in the touch down moment was 109 kt and that longitudinal accelerations were not above –0,391 g's during the landing braked run out, it can be estimated that the landing roll was over 400 m distance.

1.15. Organizational and management information

1.15.1. *Hydraulic fluid transfer procedures*

No procedures have been found in QRH (Quick Reference Handbook) neither in the Airplane Flight manual for in-flight or on-ground, hydraulic fluid transfer procedures.

Usually, maintenance services checks out hydraulic liquid level during the service checks and take the necessary corrective action, if any, purging or refilling fluid liquid directly through the quick disconnect connections of the ground service panels, without starting the engines.

1.15.2. *Internal technical note*

On February 27th, 2003, an operations internal note was issued, addressed to all the Dash pilots where it was said that «From now on, it is cautiously forbidden the procedure for hydraulic fluid transfer from one system to the other in in-flight phase».

1.15.3. *Service Letter[2] (SL) DH8-SL-29-002A*

A Service Letter (DH8-SL-29-002A), dated January 19th, 2001, alerts to the possibility of a hydraulic liquid transfer from one system to the other when both brake systems, normal and parking/emergency, are used sequentially.

As both system's lines reach to the shuttle valve, if one of the systems is pressurized and the other relieves pressure, a fluid transfer is caused.

The SL gives information on procedures to avoid fluid transfer or to correct a mismatch of hydraulic quantity levels through actuation on the normal brake and the parking/emergency brake while the aircraft is on the ground and stationary.

Symmetric sequences in those braking levers and pedals avoid fluid transfer:

Typical taxi-in	Typical taxi-out
— FOOT BRAKE APPLIED	— PARK BRAKE APPLIED
— PARK BRAKE APPLIED	— FOOT BRAKE APPLIED
— (eventually blocks in)	— (eventually blocks out)
— PARK BRAKE RELEASED	— FOOT BRAKE RELEASED
— FOOT BRAKE RELEASED	— PARK BRAKE RELEASED

[2] SL, A Service Letter is an airplane or vendor manufacturer's document by means of which they communicate to the general operator —owner, flight operation, maintenance—, information, advice and recommendations relative to the operation or servicing of the airplane or component.

Anti-symmetric sequences cause fluid transfer, from which advantage can be taken to correct fluid level unbalances:

Fluid transfer from No 1 to No 2	Fluid transfer from No 2 to No 1
— FOOT BRAKE APPLIED — PARK BRAKE APPLIED	— PARK BRAKE APPLIED — FOOT BRAKE APPLIED
— ()	— ()
— FOOT BRAKE RELEASED — PARK BRAKE RELEASED	— PARK BRAKE RELEASED — FOOT BRAKE RELEASED

The SL advises that these procedures should only be accomplished with the aircraft stationary and by personnel familiar with this procedure. It is also said that operator personnel should become familiar with the methods that can be used to control fluid transfer.

1.15.4. *Emergency and abnormal procedures*

The QRH (Quick Reference Handbook) establish emergency procedures to be followed when failures on the hydraulic systems should occur.

All hydraulic quantity loss from one system is regarded as a condition for emergency/abnormal operation.

1.15.5. *Special procedures in Normal Operation*

The Air Nostrum Company issued, on 2nd February 2004, in its PRM (Pilots Reference Manual) a hydraulic fluid transfer on-ground procedure in accordance with Service Letter (DH8-SL-29-002A).

1.16. Additional information

1.16.1. *Crew statements*

Separated interviews with the pilots were held and then a second interview with both pilots was conducted.

Declarations from the pilot in command regarding the flight from Ibiza to Palma, stated that:

— They entered the traffic circuit in SEBAS, (a notification point), and they lowered the landing gear.

— There where no parking brake lights illuminated when the gear was lowered.
— At point MJV (VOR station), they set 5° flap.
— He is reassured the Antiskid was not set in OFF.
— He never enters the runway pushing brakes with the feet.

According to the first officer declarations:

— To facilitate ground maintenance they followed a procedure to transfer hydraulic fluid. He did not know directly the procedure.
— Hydraulic fluid indications were: No 1 HS: QTY 1.5 (scale from 0 to 3); No 2 HS: QTY 3.0 (scale from 0 to 5.
— The procedure did not succeed; there was not much fluid transferred.
— They did not select antiskid in OFF.
— Transfer procedure was performed 10 minutes before touch down.
— At touch down he exclaimed: «You have landed with parking brake On», but he saw how the pilot brought the lever rearwards.

Talking in general about landing and braking procedures on the landing run, they said that usually they do not need to use brakes; they need, as a mater of fact, to put power to exit the runway. It is only in very short runways as in Airports of Melilla (GEML), San Sebastian (LESO) and Leon (LELN) where they use brakes. They do not use reverse power, ground idle is enough.

Regarding the actual landing in Palma, they said it was very smooth, the wind was slight 3 kt across the runway, and that the aircraft did not yaw when the tires burst. They stopped within 150 m. They saw sparks on the braking but no fire.

1.16.2. *About fluid transfer procedures*

Several pieces of information point out that from initial training in Bombardier, a certain procedure was taught in operations circles about in-flight hydraulic fluid transfer, similar to the one described in point 1.6.6 with a prior action of antiskid disconnection. When airborne the antiskid system prevents that hydraulic pressure reaching the wheels if they are not spinning. Selecting antiskid in OFF allows that hydraulic pressure from No1 system to reach the shuttle valves.

2. ANALYSIS

2.1. Flight execution

The airplane departed Ibiza on time. The trip from Ibiza to Palma takes normally half an hour, the orthodromic distance being 76 NM, and in order to arrive to total air distan-

ce travelled, some 15-18 NM have to be added to take account of the traffic circuit pattern to runway 24R.

It was the sixth jump of the day for the crew, and the aircraft had accumulated 17 legs from its latest maintenance check. It was likely, in this connection, that a fluid transfer between both systems could have happened meanwhile, as the SL described in point 1.15.3 explains.

Taking into account the experienced unbalance and the risk of a total fluid loss en No 2 hydraulic system, the crew took the decision to initiate a fluid transfer when they were at midway of the flight, in notification point SABAS, at the highest altitude of the leg, with landing gear deployed according to the declaration of the captain.

Over the course of a few minutes, before reaching the VOR station MJV, where the traffic circuit begins, they performed a procedure, learned in the initial joint flights at the manufacturer's site. It seems that the procedure in not written down in any manual nor procedures book. Because some steps in the systems configurations were forgotten, the procedure did not accomplished the expected result, nevertheless both systems retained enough hydraulic fluid quantity, and flaps, spoilers, landing gear deployment etc, worked normally.

In the spurious procedure, in order to try to transfer fluid from one system to the other, actions on the antiskid selector, the foot brake pedals, parking/emergency brake lever are taken. All this is made sequentially several times and because of that several warnings appears on the annunciator panel as «Parking Brake» and «INBD and OUTBD ANTISKID» as well as the pop out of the Master caution warning lights and sounds. According to the FDR in the flight under study there were 16 consecutive MC warnings in the time space of 1.5 minutes. It can be admitted that those warnings were related to the fluid transfer intents.

The last MC warning was not reset earlier than after 74 seconds. Usually the MC is reset immediately in order to have it ready for any other eventual alarm in any other airplane system. In this case it was not done so possibly due to the crew saturation with the previous 16 warnings while they were trying to transfer fluid, because of their dedication to the pre-landing check list and for the attention to ATC communications

It could have been that the antiskid selector was in OFF —although the crew assures that the selector was not moved—, or, in the other hand, that the Parking/emergency brake lever was in the 'parking' position when the MC was reset without pilot awareness of the signs in the annunciator panel, as they were busy preparing the landing; the pre-landing check lists did not alert and contemplate the possibility of a Parking/emergency brake lever in the rearward position because it is a control that is not used during the flight therefore there is not an occasion to be unplaced since its last actuation when taxing was initiated prior to the latest take off.

2.2. The landing

As the crew declared, in lengthy runways as that of Palma, foot pressure on the brakes before touch down in order to optimize the braking with antiskid is never done, neither normal use of braking is used; usually, they allow the plane to run and slow down with engines in ground idle, and many times they have to increase engine power to exit the runway.

The observed decelerations, however, showed that in this landing run the plane began braking and slowing down as soon as its weight was on the wheels. If pilots did not push their feet on the brakes, it can be discarded as a cause of the wheels blockage the sharp over actuation of brake pedals with antiskid disengaged.

The co-pilot shouted out that they have landed with parking brake ON. It was his first impression, although he declared then that he saw how the pilot moved the lever rearwards, to the parking position, after landing. At these moments the co-pilot was observing the abnormal operation, the sparks flashing in the night and watched a possible fire initiation.

The four wheels burst off, that mean that the four braking assys were braked or blocked, causing the wheels to skid.

Braking action for the plane was stronger than usual; the crew appreciation of a 150 m landing run can not be admitted because, at an initial speed of 109 kt and deceleration in the level of 0.391 g's, the landing run ought to be longer than 400 m. In any case the plane slowed down quickly and the pilot tried to increase speed demanding more power from the engines as seen on the DFDR; the airplane did not respond due to the increased roll resistance of the blown out wheels.

When at last the airplane stopped, the friction of the wheel rims with the asphalt had abraded the piston housing of the brake assys and the hydraulic fluid leaked out. The low quantity of fluid made the pressure drop to less than 2,000 psi and the respective warning lights illuminated.

They asked the TWR for help and after checking that no fire was initiated, they let cool down the engines before shutting down. Under fire brigade presence the plane was deboarded to the apron buses which came up to the plane without hindrance.

2.3. The systems

Flaps, spoilers, nose wheel steering, rudder, landing gear extension, etc, worked normally, and that implies that there was no hydraulic fluid shortage in any of the systems.

The four wheels simultaneous blockage leads to search for a common cause. There exist four brake assys, four shuttle valves and two dual antiskid valves, whose independent failure would have affected only some of the wheels.

As a common element in the normal braking system, the electronic antiskid control unit was removed and sent to the shop for investigation, and it was found faultless and in working condition.

In the side of the Parking/emergency braking system, (that actuates on the four wheels simultaneously as seen in 1.6.5), the parking/emergency brake selector valve was checked and it was found that it worked satisfactorily.

In sort, no failure was in the braking systems; however, the No 2 hydraulic fluid leakage shows that the parking/emergency system lines were pressurized, and that only can happen, in the absence of other malfunction, when parking/emergency brake is selected.

The braking systems were manipulated 12 minutes before landing as reckon by crew declarations and DFDR recordings. If the MC warnings had had a different origin unrelated to antiskid and braking system actuation, the pilots should have stated that on their declarations.

The crew assured that the antiskid selector was never set to OFF. In this situation any transfer intent would have been in vane. As the antiskid system prevents hydraulic pressure to reach the shuttle valves with no WOW signal, it is not possible to pressurize the shuttle valves through No 1 HS side, with antiskid selector in ON, when airborne.

Another system, the CVR, has not been useful in this investigation because its recordings were not preserved.

2.4. The procedures

Any procedure which is not written, relegated to memory, and not subject to amendments is a bad procedure.

The co-pilot did not know the supposed transfer procedure but for an oral tradition from pilots who learned it in Canada. The pilot forgot that, for it to work out, the antiskid has to be set first in OFF. And last, he possibly forgot to reconfigure the systems as they initially were, leaving, supposedly, the parking/emergency braking lever ON, when the pre-landing preparations required his attention.

As this case has made clear, a procedure for in flight hydraulic fluid transfer, entangling braking systems controls, has the dual risk of leaving the systems un-configured for landing, with parking brake in ON or antiskid selector in OFF.

However, an on-ground procedure to correct hydraulic fluid unbalance when the airplane is stationary or a procedure to avoid the undesired fluid transfer may be welcomed and desirable for some operators, bearing in mind that it should always be prevented on a complete hydraulic fluid loss.

Some times it has been understood that the (DH8-SL-29-002A) procedures are applicable only to maintenance personnel. It seems not to be the case; maintenance services have more direct procedures to fix hydraulic fluid unbalance and they have to follow them when performing programmed checks or when required by pilots.

The procedure established by the Air Nostrum Company, mentioned in paragraph 1.15.5, allows corrective action to possible fluid quantity discrepancies, while the aircraft is on-ground and stationary, in normal flight operation of the aircraft.

In other respect, some procedures on CVR are to be refreshed. In cases of incidents where power supply to the recorders are not interrupted, there is a risk for the recorded information to get lost. Precautions to avoid erasing of the recordings have to be taken in order to gather a better knowledge of the circumstances surrounding the incident.

In this case, the cockpit recordings should have disclosed how the transfer intents were done, the reactions on the pilots to the little success and the cockpit work load before the imminent landing.

3. CONCLUSION

3.1. Findings

— The pilots had appropriate licenses.
— The airplane was airworthy and the programmed maintenance checks were duly accomplished.
— A spurious hydraulic fluid transfer procedure, badly learned and badly executed, was followed.
— In-flight, with landing gear down, the controls of normal brakes and parking/emergency brake systems were actuated several times twelve minutes prior to landing.
— The airplane landed in VMC-night, with the four brake assys blocked, without crew awareness.
— Touch down was smooth and the airplane quickly slowed down in the middle of the runway.
— The four tires burst off and the wheels skidded and were abraded by the friction with the asphalt.
— No fire was initiated; the passengers deboarded the plane through the stairways and were brought to the terminal building on apron buses.

3.2. Causes

It is likely that the landing was made in a configuration with parking/emergency brake lever in the «Parking» position.

The mishap came from a previous execution during the flight of a certain hydraulic fluid transfer procedure between both systems, not written and sanctioned.

4. SAFETY RECOMMENDATIONS

In the course of this incident investigation, it has come up that the CVR did not keep up the recording of the information relative to the flight in which the incident occurred, because, after the happening, precautions were not taken to avoid its automatic erasing. In this respect, the following Safety Recommendations is issued:

REC 07/06. The aircraft operator should adopt the necessary measures, in order to let the Cockpit Voice Recorders (CVR) installed in its airplanes, preserve the information relative to the flights where accidents or incidents had happened, in accordance with the requirement JAR-OPS 1.160.

ANNEX A
Palma Airport

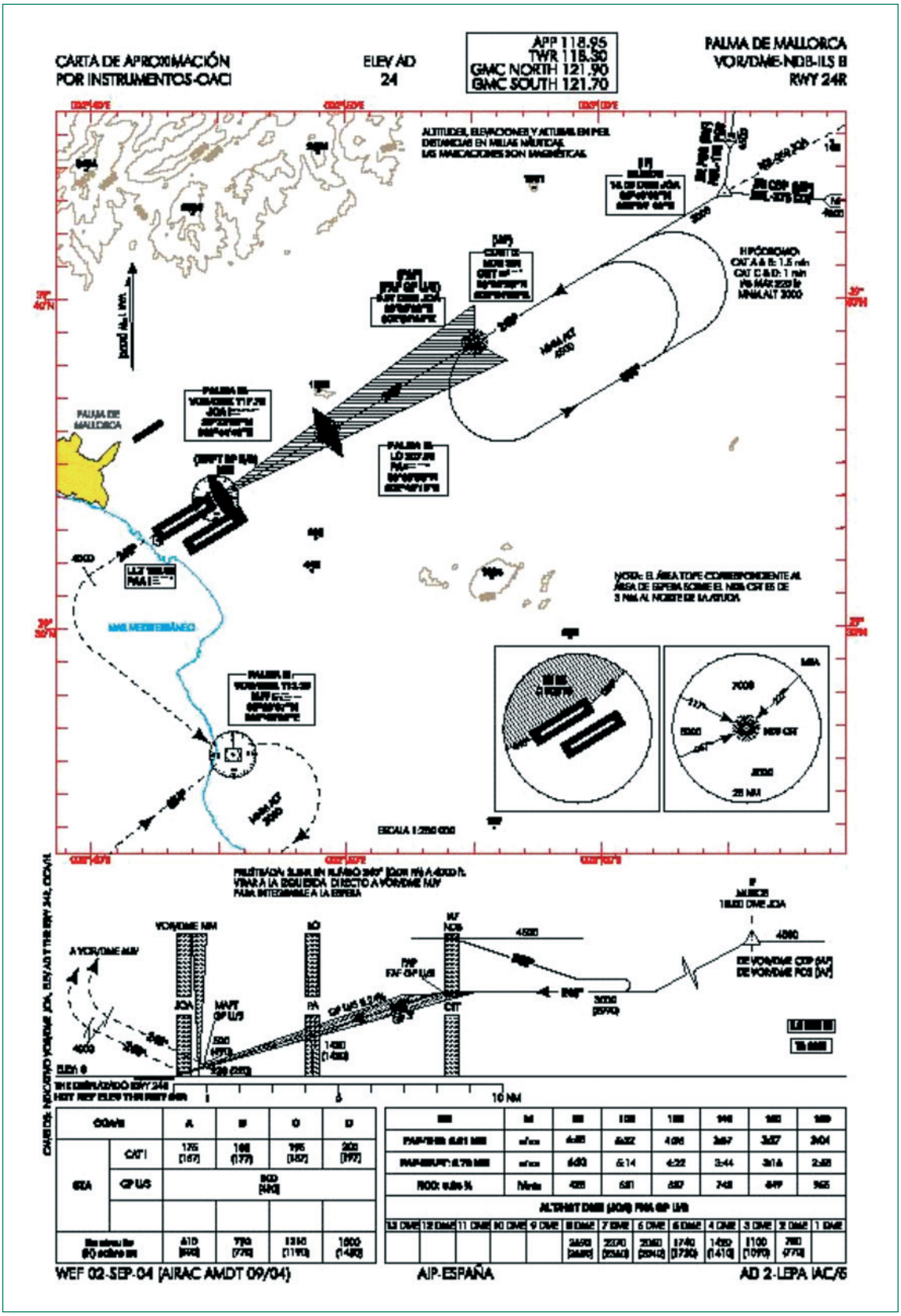

Figure A-1. Approach chart ILS RWY 24R

ANNEX B
Digital Flight Data Recorder graphs

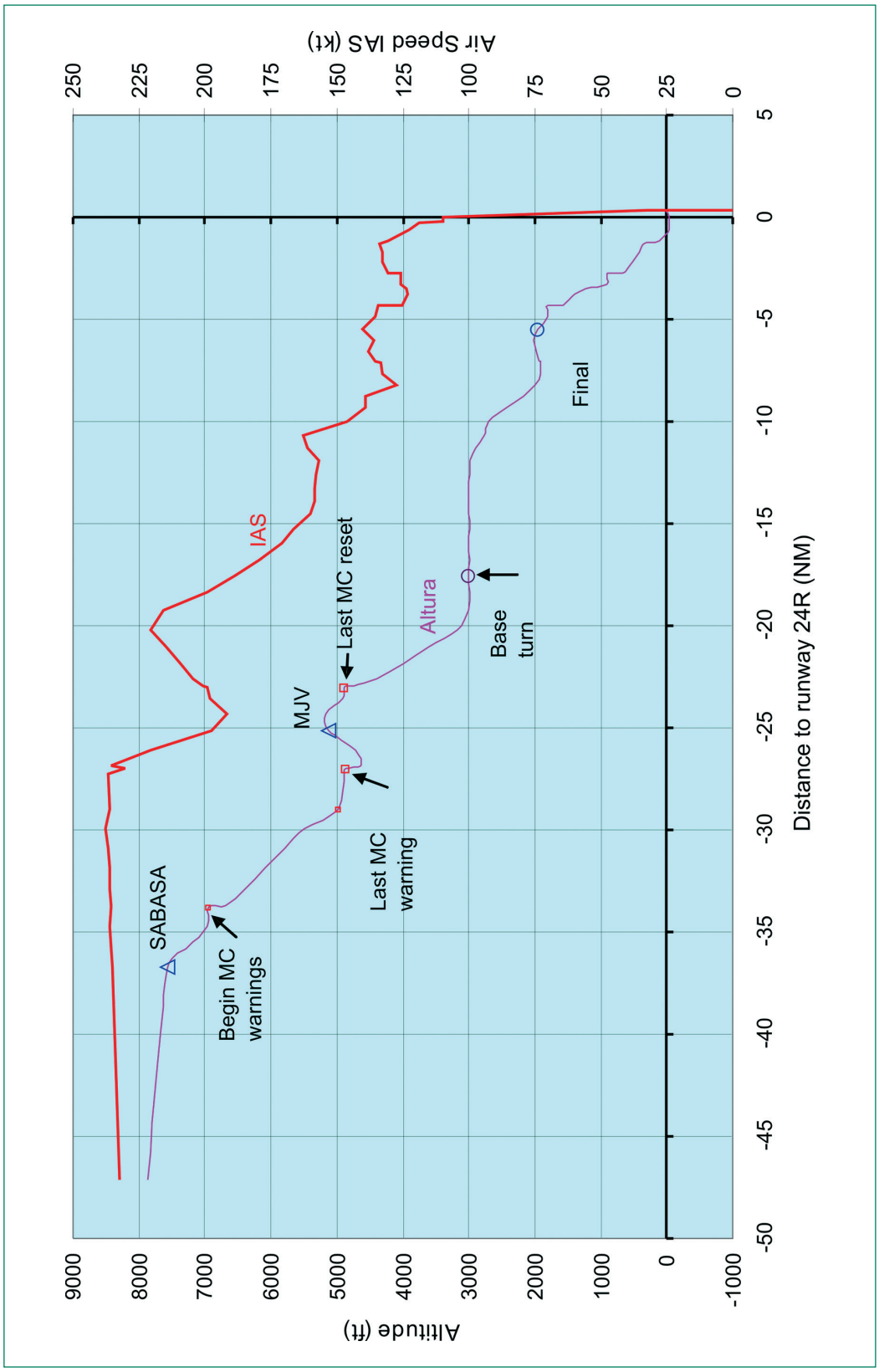

Figure B-1. DFDR events in relation to distance to touch down point estimated by speed integration