Federal Department of Environment, Transport Energy and Communications **No. 1858**

Final Report by the Aircraft Accident Investigation Bureau

concerning the serious incident

to the DC-9-83 aircraft, HB-INV,
operated by Helvetic Airways under flight number OAW 8100
on 21 October 2004
in Pristina (Kosovo, Serbia-Montenegro)

Bundeshaus Nord, CH-3003 Berne, Switzerland

Ursachen

Der schwere Vorfall ist darauf zurückzuführen, dass das Flugzeug im Endanflug nicht stabilisiert war, die Besatzung das Durchstartmanöver zu spät einleitete und das Flugzeug in der Folge mit dem linken Flügelende den Boden berührte.

Die Untersuchung hat folgende kausale Faktoren für den schweren Vorfall ermittelt:

- Der Anflug auf Piste 35 wurde bei ungenügenden meteorologischen Bedingungen durchgeführt.
- Die Besatzung wählte eine unzweckmässige Flugtaktik, was zur Folge hatte, dass die *crew coordination* nicht optimal war.
- In Bodennähe wurden Flugmanöver mit grosser Querlage durchgeführt.

Final Report

Owner	Orest-Immorent Leasing GmbH, Windmühlgasse 22-24, A-1060 Vienna
Operator	Helvetic Airways AG, Postfach 250, 8058 Zurich Airport
Aircraft type	DC-9-83
Manufacturer	McDonnell Douglas Corporation
State of registration	Switzerland
Registration	HB-INV
Location of the incident	Pristina (Kosovo, Serbia and Montenegro)
Date and time	21 October 2004, 08:16 UTC

Summary

Brief description

On 21 October 2004 the aircraft McDonnell Douglas DC-9-83, HB-INV, operated by Helvetic Airways under flight number OAW 8100 was scheduled on a charter flight from Zurich to Pristina. The first approach was performed on runway 35 at Pristina. A go around was performed under demanding weather conditions because the aircraft could not be stabilized in short final. On this occasion the left wing made contact with the runway surface, whereby parts of the wing were damaged. There were no injuries to persons. After a second approach from the opposite direction the landing on runway 17 was uneventful.

Investigation

The serious incident was notified to the Aircraft Accident Investigation Bureau (AAIB) by the operator and by the aviation authorities, UNMIK-Civil Aviation Regulatory Office (CARO) in Pristina (Kosovo, Serbia and Montenegro). This authority delegated the investigation of the serious incident to the AAIB who started the inquiry pursuant to art. 5 of the VFU (Verordnung über die Untersuchung von Flugunfällen und schweren Vorfällen - Decree on the investigation of aircraft accidents and serious incidents).

The serious incident is attributable to the fact that in its final approach, the aircraft was insufficiently stabilised, the crew initiated the go-around to late and as a result the left wingtip touched the ground.

The investigation determined the following causal factors for the serious incident:

- The approach to runway 35 was conducted under insufficient meteorological weather conditions.
- The crew had chosen an inappropriate flying tactic which resulted in a non optimal crew coordination.
- Flight manoeuvres with considerable bank were conducted close to the ground

1 Factual information

1.1 History of the flight

The aircraft, a McDonnell Douglas DC-9-83, operated by Helvetic Airways under flight number OAW 8100, took off from Zurich (LSZH) on 21 October 2004 at 05:40 UTC for a charter flight to Pristina (BKPR). Based on the weather conditions, the crew decided to carry an additional quantity of fuel, which would have been sufficient for about two hours holding time.

Based on the fog situation and the available terminal aerodrome weather forecast, the departure from Zurich was delayed by 45 minutes. Until overhead the destination, the flight with 6 crew members and 165 passengers was uneventful.

At 07:31 UTC, the aircraft entered the airspace, controlled by Pristina approach, at 8000 ft QNH and flew into a holding pattern some 15 km to the north of the aerodrome.

The aerodrome weather report (METAR) and the logbook of the Pristina control tower indicate that the meteorological visibility would improve from 150 m to 200 m between 07:30 UTC and 08:00 UTC. Between 07:50 UTC and 08:00 UTC the runway visual range (RVR) for runway 17 varied between 250 m and 350 m and for runway 35 between 400 m and 700 m respectively.

At 07:40 UTC the crew informed Pristina approach that they would need an RVR of 800 m for an approach to runway 17 and they would start the approach with an RVR of 900 m: *"And OAW 8100 we need 800 m RVR runway 17 and aaa would like to start the approach as soon as you have 900 m"* - Pristina approach confirmed that they would inform the crew accordingly: *"OAW 8100, roger, we will advise you".*

During the following approximately 14 minutes no transmission between the crew and Pristina approach was recorded on the data media made available to the AAIB.

At 07:54:30 UTC the crew asked for the RVR of runway 35: *"And aaa OAW 8100, what's the RVR of runway 35? It looks like it is getting better from south"* – The answer from Pristina approach is not recorded on the data media made available to the AAIB.

Shortly after the crew of OAW 8100 asked for the cloud base: *"Ok, thank you, and the cloud base?"* – The answer from Pristina approach is not recorded on the data media made available to the AAIB.

At 07:55:19 UTC the crew asked for confirmation about the cloud base being at 200 ft: *"Aaa just confirm broken 200, hä?"* – Pristina approach: *"That's correct Sir, broken 200".*

At 08:04:46 UTC the crew of OAW 8100 requested the permission to overfly the aerodrome in order to clarify whether the threshold of runway 35 would be visible from overhead: *"Ok, OAW 8100 aaa, we would like to have, aaa, to overfly the field to look out for the threshold runway 35, is that ok for you?"* – Pristina approach agreed with this request: *"8100, that is no problem, do you need to descend below, aaa, lower or how you gonna do?"* At this time the aircraft was at 8000 ft QNH and the crew decided to maintain this altitude.

About 6 minutes later the crew reported that they could see the threshold of runway 35 and that they would start the approach to this runway: *"And OAW 8100, aaa, we have the threshold runway 35 in sight, we start the approach"* – Pristina approach confirmed: *"Roger Sir, now you may proceed on BLACE 35A arrival"* (cf. Appendix 2 and 3)

The crew announced at 08:11:01 UTC to the approach control: *"OAW 8100, we do a right hand visual and try to stabilize on aaa the VOR/DME primary 35, OAW 8100"* – Subsequently Pristina approach inquired whether the crew had sight to the ground, which they confirmed: *"OAW 8100, uuu, roger, no problem, do you have any ground contact possible maybe?" – "Yes, we have ground contact, OAW 8100".*

After the serious incident the crew stated that they had a minimum visibility of 2000 m at the time they started the approach. The approach control officer of Pristina stated in his written report that an RVR of 1700 m was prevailing at the time he advised the crew to follow the standard approach route BLACE 35.

According the crew's statement, they applied the split approach procedure for the approach.

At 08:11.23 UTC the commander informed the approach control centre that he would deviate from the published flight path in case of a go around. This was granted by Pristina approach. When the aircraft was about 8 NM south east of the VOR/DME Pristina the crew started a right turn in order to follow radial 165° inbound (track 345°). The approach onto this radial took place at a flat angle. The vertical profile corresponded roughly to a 3° glide path.

On reaching an altitude, which corresponds to the minimum descend altitude for the VOR/DME approach runway 35 (2460 ft QNH / approx. 700 ft above ground), the commander ordered the copilot *"continue, tuesch mer en no uf d'centerline – continue, bring it (the aircraft) onto the centreline".* He stated that regarding the visual references, he intended to bring himself in a better position for a successful landing. At 08:15:29 UTC the crew asked the approach control centre to switch the approach and runway lights to maximum intensity. 10 seconds later OAW 8100 received from Pristina approach the landing clearance for runway 35: *"OAW 8100, aaa, yes, no problem for that and cleared to land runway 35, wind is calm".* According to the approach controller's written report he had a runway visual range indication of 2000 m on the respective display.

The aircraft followed the radial 165° inbound (track 345°) for the VOR/DME approach, until reaching a radar altitude (RA) of 120 ft. At that time the aircraft had a heading of 342° and flew, with respect to the approach direction, left of the extended runway centreline of runway 35. According to the crew's statement they decided for a flight path through the runway centreline in order to avoid wisps of cloud. In order to get back onto the centreline the pilot flying initiated a right turn. While doing so, at about 100 ft RA, bank angles of more than 15° were reached. A Boeing 737 was waiting at the holding position west of runway 35, that means left of the runway centreline. The copilot stated that this might have influenced the crew to continue the right turn in a pronounced manner. This manoeuvre finally brought the aircraft in a position right of the runway centreline. The crew now commenced a left turn with considerable bank to get back on the runway centreline.

As the crew stated they initiated a go around between 80 and 40 ft AGL. The flight data recorder shows that the power levers were advance from idle to maximum thrust within 1 second at 10 ft RA only. The aircraft farther descended

down to 6 ft RA. At this moment the left wing tip touched the runway surface with a bank angle of 15-16° and right of the runway centreline.

At the time the go around was initiated the aircraft was in a position substantially to the right of the runway centre line with a heading of 346°. With respect to the runway axis, the aircraft's longitudinal axis had an angle of 7°. The flight data analysis showed that in this phase the rudder was fully deflected to the right.

The subsequent go-around took place normally. According to the crew, no adverse aerodynamic effects were noticeable on the aircraft. In the interim, the weather situation had improved to such an extent that an approach on runway 17 was possible. The approach and landing on runway 17 were uneventful.

1.2 Injuries to persons

	Crew	Passengers	Third parties
Fatally injured	---	---	---
Seriously injured	---	---	---
Slightly injured or uninjured	6	165	

1.3 Damage to aircraft

As a result of the contact of the left wing with the runway surface, the extended left outboard slat (slat #5 left) was badly chafed. Part of the left wingtip was abraded, so that the skin was punctured (cf. Appendix 1).

The extended landing light was torn off and was left hanging from the electrical cables. The left wing strobe light and logo light were damaged.

1.4 Other damage

There was no damage to third parties.

1.5 Personnel information

1.5.1 Commander

Person	Swiss citizen, born 1975
Licence	Air transport pilot licence ATPL (A) according to JAR
Ratings	Radiotelephony international RTI
	Night flying NIT
	Instrument flying IFR
Ratings to be extended	SE piston, valid until 16.06.2004
	DC9 80/MD88/MD90 PIC, valid until 04.05.2005
Registered aircraft types	DC9-80/MD88/MD90 PIC
Medical certificate	Commencement of validity on 11.04.2004, Classes 1 and 2

Last medical examination	22.03.2004, findings: fit to fly without restrictions
Crew times	Start of duty on the previous day: 03:50 UTC
	End of duty on the previous day: 10:45 UTC
	Flight duty time on the previous day: 6:55 h
	Rest time: 17:05 h
	Start of duty on 21.10.04: 03:50 UTC
	Flight duty time on 21.10.04: 4:55 h
Flight experience	3305 h total
on powered aircraft	3305 h
on the type involved	3160 h
as copilot	2803 h
as commander	357 h
during the last 90 days	211 h

The MD83 was the first jet-engined aircraft type which the commander had flown. He completed the type rating course in the co-pilot function with his previous employer. He flew as co-pilot on the MD83 from January 1999, and then as commander from June 2004. The available assessment documentation gives a predominantly positive picture.

With regard to his employment, line operation, training and promotion to commander, his qualifications were regarded as good to very good by Helvetic Airways. Some critical comments are documented concerning problem analysis and decision-making.

Since 1 January 2004, the commander had additionally been designated by the company as MD83 fleet pilot.

1.5.2 Copilot

Person	Swiss citizen, born 1970
Licence	Commercial pilots licence CPL (A)
Ratings	Radiotelephony international RTI
	Night flying NIT
	Instrument flying IFR
Ratings to be extended	DC9 80/MD88/MD90 COPI, valid until 20.03.2005
Registered aircraft types	DC9-80/MD88/MD90 COPI
Medical certificate	Commencement of validity on 21.10.2003, Classes 1 and 2

Last medical examination	16.10.2003, findings: fit to fly, requires to wear glasses (VDL)
Crew times	Start of duty on the previous day: Off duty
	End of duty on the previous day: Off duty
	Flight duty time on the previous day: 0 h
	Rest time: Not relevant
	Start of duty on 21.10.04: 03:50 UTC
	Flight duty time on 21.10.04: 4:55 h
Flight experience	1960 h total
on powered aircraft	1960 h
on the type involved	1750 h
as copilot	1750 h
during the last 90 days	242 h

The copilot attained his professional pilot licence with instrument rating in October 1999. Additionally he passed the theoretical examination for line pilots (Air Transport Pilot Licence – ATPL). Selection by his subsequent employer indicated a few weaknesses in the areas of coping with stress, imposing his authority and self-confidence. The type rating course as well as the prescribed proficiency- and line-checks were completed positively, without any distinctive features and with the grading "standard – above standard".

In May 2003 the copilot passed through a selection process by Odette Airways, the predecessor company of the operator. The respective results led to an employment. Critical comments found in the respective documents show deficits in the areas of flexibility, initiative and sense of judgement.

Since 1 January 2003, the copilot had been additionally designated by the company as flight safety officer.

1.6 Aircraft information

1.6.1 Aircraft HB-INV

Aircraft type:	DC-9-83
Manufacturer:	McDonnell Douglas Corporation
Registration:	HB-INV
Serial number:	F/N 1349, S/N 49359
Year of construction:	1987
Owner:	Orest-Immorent Leasing GmbH, Windmühlgasse 22-24, A-1060 Vienna
Operator:	Helvetic Airways AG, Postfach 250, 8058 Zurich Airport
Certificate of Airworthiness:	dated 18.2.1998, issued by the Federal Office for Civil Aviation

Certificate of Registration:	dated 19.9.2003, issued by the Federal Office for Civil Aviation
Airframe flying hours:	40 624 h
Airframe, number of cycles:	30 028
Engine 1:	JT8D-219, S/N P696366, last shop visit 8.2.2004
Engine 2:	JT8D-219, S/N P708144, last shop visit 17.7.2001
Fuel:	Jet A1
Wingspan:	32.85 m
Wingtip above ground:	2.56 m

1.6.2 Mass and centre of gravity

Take off mass actual:	70 665 kg	Max. 72 575 kg
Take off fuel:	17 100 kg	
Landing mass actual:	60 815 kg	Max. 63 276 kg
Loaded index take off:	52	

The mass and centre of gravity were within the permitted limits.

1.6.3 Maintenance of the aircraft

Date of the last C-Check:	14.05.2004
Date of the last A-Check:	08.09.2004

1.6.4 Condition of the aircraft at the time of the serious incident

No technical problems were mentioned by the crew of flight OAW 8100 in connection with the serious incident.

With particular reference to the navigation displays in the cockpit, no malfunctions were observed or reported by the crew.

1.7 Meteorological information

1.7.1 General weather situation

The overall weather situation was dominated by a high pressure area.

1.7.2 Terminal aerodrome forecast TAF

Among others, the following terminal aerodrome forecast (TAF) for Pristina was available to the crew in Zurich:

210312 VRB03KT 0300 FG BKN003 SCT080 BECMG 0709 27006KT 9999 NSW FEW040

In plan language that means that on 21 October 2004 the following weather was forecast for Pristina aerodrome for the period from 03:00 UTC to 12:00 UTC:

wind	variable direction, velocity 3 kt
meteorological visibility	300 m
weather phenomena	fog
clouds	5-7/8 clouds (broken) at 300 ft AAL, corresponds to "heavy clouds"
	3-4/8 clouds (scattered) at 8000 ft AAL, corresponds to "scattered clouds"
changes	between 07:00 UTC and 09:00 UTC the wind changes to 270° with a velocity of 6 kt, the visibility increases to above 10 km, no more significant weather phenomena will occur and the clouds will be 1-2/8 (few) at 4000 ft AAL, corresponds to "few clouds"

1.7.3 Aerodrome weather reports METAR

At the time of the serious incident, the following aerodrome weather reports (METAR) were valid for Pristina (BKPR):

METAR 210730Z 00000KT 0150 R17/0250 R35/0325V0800 FG BKN001 12/11 Q1019 NOSIG RMK RED

In plan language that means that on 21 October 2004 at 07:30 UTC the following weather conditions were observed at the aerodrome of Pristina:

wind	calm
meteorological visibility	150 m
Runway visual range	runway 17: 250 m
	runway 35: variable between 325 m and 800 m
weather phenomena	fog
clouds	5-7/8 clouds (broken) at 100 ft AAL, corresponds to „heavy clouds“
temperature	12 °C
dewpoint	11 °C
atmospheric pressure	1019 hPa
landing weather forecast	no significant changes during the next two hours of observation
	Remark: Nato-Code „red“

METAR 210800Z 00000KT 0200 R17/0250V0350 R35/0400V0700 FG BKN002 13/12 Q1019 NOSIG RMK RED

In plan language that means that on 21 October 2004 at 08:00 UTC the following weather conditions were observed at the aerodrome of Pristina:

wind	calm
meteorological visibility	200 m

Runway visual range	runway 17: variable between 250 m and 350 m
	runway 35: variable between 400 m and 700 m
weather phenomena	fog
clouds	5-7/8 clouds (broken) at 200 ft AAL, corresponds to „heavy clouds“
temperature	13 °C
dewpoint	12 °C
atmospheric pressure	1019 hPa
landing weather forecast	no significant changes during the next two hours of observation
	Remark: Nato-Code „red“

METAR 210830Z VRB01KT 1200SW R17/0900VP1500 BR SCT005 SCT200 14/14 Q1019 BECMG 3000 RMK AMB

In plan language that means that on 21 October 2004 at 08:30 UTC the following weather conditions were observed at the aerodrome of Pristina:

wind	variable 1 kt
meteorological visibility	1200 m to the southwest
runway visual range	runway 17: variable between 900 m and above 1500 m
weather phenomena	haze
	3-4/8 clouds (scattered) at 500 ft AAL, corresponds to "scattered clouds"
	3-4/8 clouds (scattered) at 20 000 ft AAL, corresponds to "scattered clouds"
temperature	14 °C
dewpoint	14 °C
atmospheric pressure	1019 hPa
landing weather forecast	During the two hours following the weather observation one can expect that the meteorological visibility will increase to 3000 m
	Remark: Nato-Code „amber“

1.7.4 Weather conditions in Pristina

Local morning fog often forms during the cooler half of the year because of the geographical location of Pristina airport. Depending on the position of the sun, these may clear within a short time.

The crew of flight OAW 8100 were acquainted with these peculiarities. Based on the fog situation and the available terminal aerodrome weather forecast, the departure from Zurich was delayed by 45 minutes. When the aircraft entered the airspace controlled by Pristina approach at 07:31 UTC, the visual conditions were not fulfilled for any of the available approaches.

In view of the fact that a diversion landing in the region had to be avoided whenever possible for political reasons, under the above-mentioned weather conditions a sufficient quantity of fuel had to be carried in order to be able to fly holding patterns. This also applied to flight OAW 8100.

1.8 Aids to navigation

Pristina airport's "Daily status report" for 21.10.2004, 04:45 UTC, says that all navigation facilities were in operation at that time and were not exhibiting any faults.

1.9 Communications

In coordination with the tower, the landing clearance for the landing on runway 35 was issued by Pristina approach control. According to the approach control officer, the reason for this was the fact that he could not see the approaching aircraft from his position under the prevailing weather conditions and that no radar was available to him.

A comprehensible sound recording made up of individual wave files as well as the respective transcript of the communication was available to the AAIB. Some communication was not recorded on the data media.

1.10 Aerodrome information

Pristina aerodrome is situated in a wide valley basin. On the southwest of the aerodrome some mountains raise to an elevation of more than 7000 ft. A range of hills is situated to the east with an elevation of up to 4100 ft.

Runway	Dimension	Elevation of threshold
17/35	2501 x 45 m	1789/1786 ft AMSL

Runway 17 is equipped with an instrument landing system (ILS). The required runway visual range for this approach is 800 m and the ceiling is required to be at 300 ft AAL minimum.

For approaches to runway 35 a VOR/DME is available for a "non precision approach". For aircraft of the category which includes the DC-9-83 a minimum visibility of 2000 m and a ceiling of 700 ft AAL minimum was required.

The approach light system for runway 35 has a length of 900 m. A 3° precision approach path indicator (PAPI) is installed on the left side of the runway.

A threshold and runway edge lighting system is installed on runway 17/35. No centre line lights are installed.

Pristina airport's "daily status report" for 21.10.2004, 04:45 UTC, says that the approach lights and runway lights were functioning normally at that time.

1.11 Flight recorders

1.11.1 Cockpit voice recorder

The cockpit voice recorder could not be analysed because the power supply was not switched off after the aircraft parked and the conversations, relevant for the investigation, were therefore overwritten. The recording time of the installed cockpit voice recorder is 30 minutes.

1.11.2 Digital flight data recorder

The digital flight data recorder was removed after the aircraft returned to Zurich on 23.10.2004 and the data were read out. The quality of the data was usable for analysis of the relevant parameters.

1.12 Wreckage and impact information

Not applicable

1.13 Medical and pathological information

None

1.14 Fire

Not applicable

1.15 Survival aspects

Not applicable

1.16 Tests and research

None

1.17 Organizational and management information

1.17.1 Structure of the airline

The Helvetic Airways airline was the successor company to Odette Airways. Odette Airways commenced flying operations as a charter airline in December 2001, first under Crossair's air operator certificate (AOC) and from February 2002 under its own AOC. It first served Pristina in Kosovo exclusively with one MD 83. Flights to other destinations were later added, which Odette Airways occasionally made on behalf of tour operators.

In November 2003, Odette Airways became Helvetic Airways, under new management, and at the same time the scope of operations was extended to the point where scheduled flights were now also being made. Seven Fokker-100 aircraft were purchased for the scheduled flights. The flights between Zurich and Pristina continued to be made using the MD83. This aircraft was retired from the fleet in November 2004 as planned.

The expansion in the scope of business operations and in particular the enlargement of the fleet required Helvetic Airways to recruit additional pilots.

The operator Helvetic Airways is authorized in accordance with JAR-OPS 1. The organization of Helvetic Airways is described in their operations manual OM-A.

The accountable manager is responsible for all operational matters. Under him are four postholders: flight operations, ground operations, training and maintenance. The flight safety officer function is fulfilled by a pilot who reports directly to the accountable manager. The flight safety officer was involved in the serious incident as copilot.

The quality manager function is exercised by an external and therefore independent company. This company acquires its knowledge of the state of the flight operations and aircraft maintenance by auditing periodically the individual postholder's areas of operation.

The company is relatively young and the management individuals have a different background of company culture. Various members of the management mentioned that they attempt to promote an open dialogue in order to foster mutual trust.

The fact that the body of personnel is still comparatively small facilitates communication.

Changes concerning flight operations are communicated to personnel by means of “OPS NOTES”. The personnel can also keep up to date from home via the internet.

1.17.2 Reporting system

In addition to the technical log book, the airline also maintains a so called flight log and occurrence report (FLOR). This FLOR is handed over to the flight crew by the dispatcher before commencement of the flight and is used to enter data concerning the flight. Thus, for example, flight times, fuel consumption and the names of crew members are entered in the flight log. In addition, for statistical purposes, information on landings carried out under category II or category III is provided. Space is provided on the rear of the FLOR for notifying occurrences.

After the flight, the FLOR is returned to the dispatcher, who is responsible for forwarding it to the relevant postholders or the flight safety officer.

The flight safety officer records occurrences which are relevant to safety. His task is to analyse the data and identify any trends. In such cases he is responsible for ensuring that the information is provided to crews.

Within the ambit of the internal reporting system, the following documents are used to record data:

- Flight log and occurrence reports (FLOR): the FLOR must be completed for all flights and returned to the dispatch office after the flight. It contains occurrences of a technical and/or operational nature.
- Crew reports (CR): the CR should be completed in the event of any noted deviations from operational procedures in flight operations.
- Confidential crew report (CCR): the CCR gives each crew member an opportunity to report any incidents and occurrences observed or experienced which represent a potential risk to flight operations, without being punished for doing so. The CCR is passed directly to the flight safety officer and remains anonymous.

1.17.3 Pilot selection

At the time of selection of the pilots involved in the serious incident, regulations laid down by Odette Airways were in force. According to the available documents an interview was carried out by several assessors. Among other things, the selection criteria comprised personality and style of working.

Under the personality criterion, appearance, demeanour, dynamics/initiative, the ability to communicate, flexibility and self-awareness were assessed.

Under the working style criterion, problem analysis, sense of judgement, crew resource management (CRM), use of documentation, decision-making, imposing of authority and communication with flight crew/cabin crew involved in the operation were assessed.

In the present case, the flying abilities of both pilots were not further assessed by the operator, based on the fact that they where flying the same aircraft type with the previous employer.

1.17.4 Training and promotion to commander

The selection process to get authorized for training and promotion to commander at Helvetic Airways is based on several conditions. In this context a minimum of 2000 h flying hours in the multi crew concept (MCC) is required. A further condition is readiness to take on additional responsibilities within the company.

An external psychological report is designed to assess the strengths and weaknesses of the candidate in connection with his future activity as a commander. In the event of any weaknesses, recommendations are issued with the report.

The decision board, including the accountable manager, then makes the decision with regard to the authorisation for commander training.

The commander involved in the serious incident underwent the selection process described above.

1.17.5 Visual approaches

1.17.5.1 Recommendations of the International Civil Aviation Organisation ICAO

9. Visual approach

9.1 An IFR flight may be cleared to execute a visual approach provided that the pilot can maintain visual reference to the terrain and:

a) the reported ceiling is at or above the approved initial approach level for the aircraft so cleared; or

b) the pilot reports at the initial approach level or at any time during the instrument approach procedure that the meteorological conditions are such that with reasonable assurance a visual approach and landing can be completed.

9.2 Separation shall be provided between an aircraft cleared to execute a visual approach and other arriving and departing aircraft.

9.3 For successive visual approaches, radar or non-radar separation shall be maintained until the pilot of a succeeding aircraft reports having the preceding aircraft in sight. The aircraft shall be instructed to follow and maintain separation from the preceding aircraft. Transfer of communications should be effected at such a point or time that clearance to land or alternative instructions can be issued to the aircraft in a timely manner.

1.17.5.2 Directives of the Joint Aviation Requirements

Among others, the following Joint Aviation Requirements (JAR) directives exist regarding visual approaches:

JAR-OPS 1.435 Terminology

(...)
(8) Visual approach. An approach when either part or all of an instrument approach procedure is not completed and the approach is executed with visual reference to the terrain.

Appendix 1 to JAR-OPS 1.430 Aerodrome Operating Minima

(...)
(g) Visual Approach. An operator shall not use an RVR of less than 800 m for a visual approach.

Appendix 1 to JAR-OPS 1.1045 Operations Manual Contents

A. GENERAL/BASIC

8 OPERATING PROCEDURES

8.3.1 VFR/IFR Policy. A description of the policy for allowing flights to be made under VFR, or of requiring flights to be made under IFR, or of changing from one to the other.

B AEROPLANE OPERATING MATTERS – TYPE RELATED

2 NORMAL PROCEDURES

2.1 The normal procedures and duties assigned to the crew, the appropriate check-lists, the system for use of the check-lists and a statement covering the necessary coordination procedures between flight and cabin crew. The following normal procedures and duties must be included:

(h) VFR Approach;

(j) Visual Approach and circling;

1.17.5.3 Directives of the Federal Aviation Regulations

Regarding the visual approach, the following definitions were found in the Federal Aviation Regulations (FAR):

VISUAL APPROACH.

An approach conducted on an instrument flight rules (IFR) flight plan which authorizes the pilot to proceed visually and clear of clouds to the airport. The pilot must, at all times, have either the airport or the preceding aircraft in sight. This approach must be authorized and under the control of the appropriate air traffic control facility. Reported weather at the airport must be ceiling at or above 1000 feet and visibility of 3 miles or greater. (See ICAO term Visual Approach)

1.17.5.4 Operations manual of the operator

In the OM A of Helvetic Airways the visual approach is defined as follows:

A visual approach is an instrument approach where either part or all of the procedure is not completed and the approach is executed with visual reference to the terrain. The visual approach takes place under an IFR clearance but shifts the responsibility for terrain and traffic avoidance to the flight crew.

Helvetic crews are not endorsed to cancel the IFR flight plan and to proceed on a VFR flight plan. This, however, does not exclude the acceptanc of a visual clearance (e.g. visual climb, visual approach, visual contact approach etc.).

Visual approaches are approved when:

- *The traffic flow can be accelerated*
- *An instrument or visual approach aid can be utilized for back-up*
- *The TCAS is operational and used to assist traffic separation*

The visual approach must be initiated only after ATC authorization has been obtained and the crew has established the required visual reference to the airport. If published visual approach procedures are available they must be applied.

Crew coordination during Visual Approach:

During visual approaches the Pilot Flying (PF) maintains responsibility for the control of the aircraft in attitude and flight path based on accurate navigation. He orders the backup navigation setting which must be tuned and identified by the Pilot Non Flying (PNF).

The Pilot Flying (PF) calls out:

- *"airport in sight"*
- *Altitude Pre-selector Alerter (APA) setting*
- *Flight Guidance System (FGS) engagement status and any deviations.*

For the visual approach the Pilot Flying (PF) mainly concentrates on the visual navigation of the aircraft while the Pilot Non Flying (PNF):

- *Scans the flight instruments with special care to the indicated airspeed (IAS), altitude and the radio altitude*
- *Monitors the engine instruments and proper power setting*
- *Assists the Pilot Flying (PF) with visual hints*

In the OM-A of Helvetic Airways, the published procedure for a visual approach does not contain any regulation on weather minima.

1.17.6 Split Approach

In the OM-A of Helvetic Airways, the so called split approach was recommended for precision approaches category I and for non precision approaches with meteorological conditions to be expected close to the respective approach minima. The procedure was described as follows:

- *Approach briefing is done by the Commander*
- *Latest on passing the Initial Approach Fix (IAF) the Copilot shall become the Pilot Flying (PF) and solely remain on the instruments without searching for visual references*
- *The Commander is Pilot Non Flying (PNF) and searches for visual cues with scanning back to the instruments from time to time*
- *The Commander takes over control once visual references for landing are sufficient by stating "my controls". This call-out shall be made only if a stabilized visual final approach and a controlled landing are assured. In case of circling approach take-over of controls by the Commander may occur at any time during the visual part of the approach*

- *Without the statement "my controls" by the Commander, the Copilot remains the Pilot Flying and initiates a go around on his own when reaching the Decision Altitude (DA) during precision approaches or latest when reaching the Missed Approach Point (MAP) during non precision approaches by stating "go around". In case of circling approach the order "continue for visual circling" must be given by the Commander latest when reaching the Missed Approach Point (MAP). Otherwise, the Copilot initiates a go around on his own by stating "go around"*.
- *Helvetic calls this approach technique a split approach*

1.17.7 Stabilized final approach

1.17.7.1 Recommendations of the Flight Safety Foundation

The Flight Safety Foundation Approach-and-landing Accident Reduction (ALAR) task force analysed 76 accidents that happened worldwide during approach and landing respectively and came up with the following recommendations for conducting a stabilized approach[1]:

All flights must be stabilized by 1000 feet above airport elevation in instrument meteorological conditions (IMC) and by 500 feet above airport elevation in visual meteorological conditions (VMC). An approach is stabilized when all of the following criteria are met:

1. *The aircraft is on the correct flight path;*
2. *Only small changes in heading/pitch are required to maintain the correct flight path;*
3. *The aircraft speed is not more than V_{REF} + 20 knots indicated airspeed and not less than V_{REF};*
4. *The aircraft is in the correct landing configuration;*
5. *Sink rate is no greater than 1000 feet per minute; if an approach requires a sink rate greater than 1000 feet per minute, a special briefing should be conducted;*
6. *Power setting is appropriate for the aircraft configuration and is not below the minimum power for approach as defined by the aircraft operating manual;*
7. *All briefings and checklists have been conducted;*
8. *Specific types of approaches are stabilized if they also fulfil the following: instrument landing system (ILS) approaches must be flown within one dot of the glideslope and localizer; a Category II or Category III ILS approach must be flown within the expanded localizer band; during a circling approach, wings should be level on final when the aircraft reaches 300 feet above airport elevation; and,*
9. *Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.*

An approach that becomes unstabilized below 1000 feet above airport elevation in IMC or below 500 feet above airport elevation in VMC requires an immediate go-around.

[1] Flight Safety Foundation ALAR Briefing Note 7.1 - Stabilized Approach

1.17.7.2 Operations manual of the operator

For an instrument approach under instrument meteorological conditions, the OM-A chapter 8.3.2.3.3 states that the approach must be stabilized latest at 1000 ft AGL. For an instrument approach under visual meteorological conditions, in chapter 8.3.2.3.4 the corresponding value is 500 ft.

In both cases an approach is considered stabilized if the following conditions are fulfilled:

- *lateral line-up (half-scale deflection, for NDB approaches +/- 5°)*
- *glide path (half-scale deflection, respectively + 100 ft/- 0 ft of step down altitude)*
- *speed +10 KIAS /-0 KIAS V_A*
- *landing configuration*
- *final check completed*

If the stabilisation is not confirmed, a go-around must be initiated.

1.18 Additional information

1.18.1 Actions by the aircraft maintenance company

After the serious incident the following checks and repairs were carried out in Pristina on the left wing:

- The damaged outboard slat #5 was replaced.
- In the area of outboard slat #5, a visual check of the structure, the electrical wiring, the slat tracks, the slat bearings and the anti-ice system was carried out.
- At the wingtip, a small puncture was sealed using high speed tape.
- The logo light, the strobe light and the landing light were repaired or replaced.

The following function checks were then carried out:

- Function check on the slats, flaps and aileron systems.
- Function check on the logo lights, strobe lights and landing lights.
- Airtightness check on the anti-ice system.
- Inspection according to AMM 05-51-01 (“A” check – high drag/side loads or unusual handling conditions)

On the basis of the above repairs and checks, the aircraft manufacturer issued the airline with an NTO (no technical objections) for a ferry flight from Pristina to Zurich. This NTO was tied to several operational conditions.

After the ferry flight to Zurich, the wingtip was repaired definitively in accordance with the SRM (structural repair manual).

1.19 Useful or effective investigation techniques

Not applicable

2 Analysis

2.1 Technical aspects

The data recording showed that the aircraft reached a minimum height above ground of 6 ft RA during the go-around manoeuvre.

The radio altimeter measures the distance between the respective antennas at the fuselage and the ground. This value is corrected in the way that it shows the distance between the unloaded main landing gear and the ground. This corrected value is applicable for both main landing gears as long as the aircraft does not have any bank. The radio altitude and the bank angle are recorded on the flight data recorder once a second.

An analysis has shown that at 6 ft RA a bank angle of 15-16° was necessary before the wingtip could touch the runway. In this situation, based on the aircraft's geometry and the actual bank angle the left main landing gear was about 4 ft above the ground.

2.2 Operational aspects

2.2.1 General

The crew flew with the aircraft type involved in the serious incident exclusively to Pristina and were acquainted with the local and meteorological conditions. From experience, they knew that the visibility conditions at this time of day and under the prevailing weather situation could change quickly. The two pilots often flew together and knew each other well.

The landing mass, at 60.8 t, was relatively close to the maximum permitted landing mass of 63.3 t. The approach speed of 146 KIAS was correspondingly high. The landing configuration was established early.

2.2.2 Regulations in force concerning visual approaches

The visual approach procedure published in the Helvetic OM-A contains no regulations on weather minima.

JAR-OPS 1, subpart E prescribes that the minimum visibility for a visual approach shall not be less than 800 m RVR.

In contrast, the FAR regulations prescribe a cloud base of at least 1000 ft AFE[2], with a minimum visibility of 3 SM[3] equal to 4827 m.

It is surprising that JAR-OPS 1 requires such a low visibility for a visual approach based on visual meteorological references. In addition, it is not comprehensible why the minimum visibility for a visual approach according to JAR is given in RVR and not in meteorological visibility. It is remarkable, that contrary to the ICAO recommendations, JAR does not give any directives concerning a ceiling.

2.2.3 Crew

The crew were accustomed to flying to Pristina. The rapidly changing weather conditions were known to them. Based on the available weather information it was suitable to delay the departure in Zurich.

[2] AFE: above field elevation
[3] SM: statute miles, 1 SM = 1.609 km

The fact that the commander and the co-pilot knew each other well, that they both exercised a function within the company and often flew the same route together may have contributed to insufficient querying of proposals and decisions.

The flying workload over the last 10 days led to the conclusion that the crew was not overtired at the time of the serious incident. Within this period, the commander made seven flights to Pristina and back to Zurich. In this same period, the copilot made five trips to Pristina and back to Zurich.

2.2.4 Analysis of flight history

Flight OAW 8100 reached the published holding pattern north of PRT VOR/DME via approach route XAXAN 17A at about 07:31 UTC. Since the visibility conditions at this time were below the minimum for an approach on either runway, the crew decided to remain in the holding pattern and wait for a weather improvement. They had sufficient fuel to be able to hold for about two hours. There was no pressure of time in this phase.

The initial intention was to land on runway 17 which is equipped with an instrument landing system. The crew informed approach control that they would begin the approach at a runway visual range of 900 m. The necessary runway visual range for an ILS/DME approach to runway 17 was 800 m.

At 07:54 UTC the crew asked for the runway visual range for runway 35, as they were under the impression that visibility was improving to the south of the aerodrome. They requested clearance to overfly the aerodrome in order to get a better picture of the prevailing conditions. This request was granted. From the voice communication it follows that the crew asked for the runway visual range for runway 35 at 07:54:30 UTC. The answer from Pristina approach is not recorded on the data media made available to the AAIB. A further inquiry by the crew at 07:55:19 UTC allowed concluding that at this time the crew was already in possession of the aerodrome weather report (METAR) transmitted at 08:00 UTC.

At 08:10 UTC the crew reported that they had sight of the threshold of runway 35 and that they would begin the approach. Approach control instructed OAW 8100 to follow the standard approach route BLACE 35A. This approach route prescribes flying south-east until 15 NM from Pristina VOR/DME and then lining up via the 17 NM DME arc with radial 165° inbound (track 345°) (see Appendix 2). The decision do start the approach under the prevailing weather conditions at this time was not appropriate.

The crew announced to approach control at 08:11 UTC: *"OAW eight one hundred we do aaa right hand visual and try to stabilize on aaa the VOR/DME primary three five OAW eight one hundred"*. With that, the crew decided to go ahead with a mixture of a visual approach and a VOR/DME approach. This flight tactic was inappropriate in two ways. On one side a consequent conduction of a VOR/DME approach under the still existing reduced visual conditions would have given the better prerequisites for a stabilized final approach. On the other side the mixture of two different procedures led to uncertainties in the crew cooperation during the further approach.

The commander informed approach control that he would deviate from the published flight path in the event of a go-around. From this, one may conclude that he was considering the possibility of a go-around.

In order to be able to concentrate on the visual references for a successful landing, the crew conducted the split approach procedure. According to the operator's OM-A, this procedure can only be applied in conjunction with a precision approach category I or with a non precision approach but not in conjunction with a visual approach. In this phase of flight, the copilot was pilot flying (PF).

The crew considered it adequate to turn onto radial 165° inbound (track 345°) as early as about eight miles south-east of Pristina VOR/DME. The approach to the inbound radial was made in such a way that the aircraft was within 5° of the inbound radial at about five miles, on a heading of 311°.

When the aircraft reached an altitude, which corresponds to the minimum descend altitude for the VOR/DME approach runway 35 (2460 ft QNH / approx. 700 ft above ground), the commander ordered the copilot *"continue, tuesch mer en no uf d'centerline – continue, bring it (the aircraft) onto the centreline".* According to the operator's procedures, the term *"continue"* is intended to be used only as *"continue for visual circling"* and only for a split approach followed by a circling.

From the copilot's statement one can conclude that it was not clear to him during this phase of flight whether and when the commander would take over control of the aircraft or whether he himself would have to take the decision to land or go-around. The commander's order to the copilot to line up the aircraft on the runway centreline is in contradiction to the split approach procedure. This procedure is based on the idea that the copilot would fly the aircraft using exclusively his instruments until the commander takes over control of the aircraft. Upon reaching the decision altitude, respectively the minimum descend altitude for an approach, the commander should take over control of the aircraft in order to land using visual references. In the actual case the commander requested the copilot to continue to fly using visual references. With that a change from instrument flying to visual flying became necessary which was additionally hampered by the 8° approach offset and the marginal visibility conditions.

At about the same time, the crew requested approach control to switch the runway lights to full intensity. This points to the fact that the visual conditions were still critical.

The aircraft followed the radial 165° inbound (track 345°) for the VOR/DME approach, until reaching a radar altitude (RA) of 120 ft. At that time the aircraft had a heading of 342° and flew, with respect to the approach direction, left of the extended runway centreline of runway 35. According to the crew's statement they decided for a flight path through the runway centreline in order to avoid wisps of cloud. In order to get back onto the centreline the pilot flying initiated a right turn. While doing so, at about 100 ft RA, bank angles of more than 15° were reached. A Boeing 737 was waiting at the holding position west of runway 35, that means left of the runway centreline. The copilot stated that this might have influenced the crew to continue the right turn in a pronounced manner. This manoeuvre finally brought the aircraft in a position right of the runway centreline. The crew now commenced a left turn with considerable bank to get back on the runway centreline.

As the crew stated they initiated a go around between 80 and 40 ft AGL. However, the flight data recorder shows that the power levers were advance from idle to maximum thrust at 10 ft RA only. This difference to the perception of the crew points to a considerable high level of tension during this phase. The aircraft farther descended down to 6 ft RA. At this moment the left wing tip touched the runway surface with a bank angle of 15-16° and right of the runway centreline.

At the time the go around was initiated the aircraft was in a position substantially to the right of the runway centre line with a heading of 346°. With respect to the runway axis, the aircraft's longitudinal axis had an angle of 7°. Since the wind was calm no crab was necessary. The flight data analysis showed that in this phase the rudder was fully deflected to the right.

The decision to fly around wisps of cloud shortly before the runway and clearly below 500 ft AGL was inappropriate and dangerous. The analysis of the flight data shows that with this manoeuvre the crew brought the aircraft an unstabilised condition on short final.

2.3 Influence of the company

During the selection process of the crew members concerned, conducted by several assessors of Odette Airways, distinctive features were revealed; these manifested themselves during the approach to Pristina.

There is no indication that the crew had any commercial- or time pressure to conduct the landing in Pristina.

The training and promotion to commander took place in accordance with Helvetic Airways procedures (cf. 1.17.4). The training in the simulator and during the route introduction shows consistently positive results. For the period between rating as a commander and the serious incident, no reports which would allow a more detailed assessment were available.

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- There is no indication that aircraft HB-INV was not in an airworthy condition at the time of the serious incident.
- The ground navigation aids used for the approach were functioning normally.
- The approach lights and the runway lights were on and functioning normally.

3.1.2 Crew

- The crew were in possession of the necessary licences.
- The crew flew with the aircraft type DC-9-83 predominantly to Pristina and were acquainted with the local and meteorological conditions.
- The local weather conditions were not correctly assessed.
- An approach procedure was chosen which is not compatible with the company procedure.
- The crew coordination was not optimal.

3.1.3 History of the flight

- With regard to fuel reserves, the crew were not under pressure of time at any phase of the flight.
- The mixture of different approach procedures was not appropriate.
- It was unclear to the copilot flying the aircraft when and whether the commander would take over control of the aircraft.
- The attempt to fly around wisps of cloud below 500 ft AGL was inappropriate and dangerous.
- The aircraft was not stabilised for the landing.
- The decision for the go-around was taken to late.
- During the go-around manoeuvre, the aircraft descended to a minimum of 6 ft RA, whereby it's position was considerably to the right of the centre line of the runway. The angle between the longitudinal axis of the aircraft and the centre line of the runway was 7°.
- At the moment when the left wing tip touched the ground, the aircraft had a bank angle of 15-16°.
- The control inputs around the longitudinal and vertical axes were pronounced.

3.1.4 General conditions

- An angle of 8° exists between the approach radial and the axis of runway 35.
- For the aircraft type involved in the serious incident a minimum visibility of 2000 m and a ceiling of at least 700 ft is required for the standard VOR/DME approach runway 35.
- No weather minima was published in the operator's operations manual for the visual approach.

3.2 Causes

The serious incident is attributable to the fact that in its final approach, the aircraft was insufficiently stabilised, the crew initiated the go-around to late and as a result the left wingtip touched the ground.

The investigation determined the following causal factors for the serious incident:

- The approach to runway 35 was conducted under insufficient meteorological weather conditions.
- The crew had chosen an inappropriate flying tactic which resulted in a non optimal crew coordination.
- Flight manoeuvres with considerable bank were conducted close to the ground.

4 Safety recommendations

4.1 Increase of weather minima for visual approaches

4.1.1 Safety deficiency

On 21 October 2004 the aircraft McDonnell Douglas DC-9-83, registered HB-INV, operated by Helvetic Airways under flight number OAW 8100, was scheduled for a charter flight from Zurich to Pristina.

The Pristina aerodrome weather report (METAR) of 08:00 UTC was as followed:

METAR 210800Z 00000KT 0200 R17/0250V0350 R35/0400V0700 FG BKN002 13/12 Q1019 NOSIG RMK RED

Runway 17 was equipped with an instrument landing system (ILS). The required runway visual range for this approach was 800 m and the ceiling was required to be at 300 ft AAL minimum.

For approaches to runway 35 a VOR/DME system is available for a "non precision approach". For aircraft of the category which includes the DC-9-83 a minimum visibility of 2000 m and a ceiling of 700 ft AAL minimum was required.

Flight OAW 8100 was in a holding north of the aerodrome to wait for a weather improvement. Since the weather appeared to improve from the south, the crew decided at 08:11 UTC to commence the approach to runway 35. Subsequently, the crew reported that they would start a visual approach to runway 35. According to the approach control officer's statement the runway visual range RVR was 1700 m at that time.

In order to avoid wisps of cloud the crew flew left of the extended runway centreline of runway 35. To get back onto the centreline the crew initiated a right turn at about 100 ft RA. This manoeuvre finally brought the aircraft in a position right of the runway centreline. The crew now commenced a left turn with considerable bank to get back on the runway centreline. From this position the crew initiated a go around. On this occasion the left wing made contact with the runway surface, whereby parts of the wing were damaged. There were no injuries to persons. According to the approach control officer's statement the runway visual range RVR was 2000 m at that time.

After the serious incident the landing on runway 17 was uneventful.

Among others, the following Joint Aviation Requirements (JAR) directives exist regarding visual approaches:

JAR-OPS 1.435 Terminology

(...)
(8) Visual approach. An approach when either part or all of an instrument approach procedure is not completed and the approach is executed with visual reference to the terrain.

Appendix 1 to JAR-OPS 1.430 Aerodrome Operating Minima

(...)
(g) Visual Approach. An operator shall not use an RVR of less than 800 m for a visual approach.

In addition the International Civil Aviation Organization ICAO recommends:

9. Visual approach

9.1 An IFR flight may be cleared to execute a visual approach provided that the pilot can maintain visual reference to the terrain and:

a) the reported ceiling is at or above the approved initial approach level for the aircraft so cleared; or

b) the pilot reports at the initial approach level or at any time during the instrument approach procedure that the meteorological conditions are such that with reasonable assurance a visual approach and landing can be completed.

(...)

Contrary to that the Federal Aviation Regulations FAR require a ceiling of at least 1000 ft AFE[4] and a minmum visibility of 3 SM, equal to 4827 m, for visual approaches.

4.1.2 Safety recommendation no. 364

The Federal Office for Civil Aviation shall arrange for swiss aviation companies and swiss airports to use a minimum visibility of 5 km and a ceiling of at least 1000 ft AAL for visual approaches.

4.2 Improvement of the state of knowledge for flight crews

4.2.1 Safety deficiency concerning the serious incident of flight OAW 8100

On 21 October 2004 the aircraft McDonnell Douglas DC-9-83, registered HB-INV, operated by Helvetic Airways under flight number OAW 8100, was scheduled for a charter flight from Zurich to Pristina.

The Pristina aerodrome weather report (METAR) of 08:00 UTC was as followed:

METAR 210800Z 00000KT 0200 R17/0250V0350 R35/0400V0700 FG BKN002 13/12 Q1019 NOSIG RMK RED

Runway 17 was equipped with an instrument landing system (ILS). The required runway visual range for this approach was 800 m and the ceiling was required to be at 300 ft AAL minimum.

For approaches to runway 35 a VOR/DME system is available for a "non precision approach". For aircraft of the category which includes the DC-9-83 a minimum visibility of 2000 m and a ceiling of 700 ft AAL minimum was required.

Flight OAW 8100 was in a holding north of the aerodrome to wait for a weather improvement. Since the weather appeared to improve from the south, the crew decided at 08:11 UTC to commence the approach to runway 35. Subsequently, the crew reported that they would start a visual approach to runway 35. According to the approach control officer's statement the runway visual range RVR was 1700 m at that time.

[4] AFE: above field elevation

In order to avoid wisps of cloud the crew flew left of the extended runway centreline of runway 35. To get back onto the centreline the crew initiated a right turn at about 100 ft RA. This manoeuvre finally brought the aircraft in a position right of the runway centreline. The crew now commenced a left turn with considerable bank to get back on the runway centreline. From this position the crew initiated a go around. On this occasion the left wing made contact with the runway surface, whereby parts of the wing were damaged. There were no injuries to persons. According to the approach control officer's statement the runway visual range RVR was 2000 m at that time.

After the serious incident the landing on runway 17 was uneventful.

4.2.2 Safety deficiency concerning the accident of flight CRX 3597

On 24 November 2001 at 20:01 UTC the aircraft AVRO 146 RJ 100, registered as HB-IXM of the Crossair airline company took off in darkness from runway 26L at Berlin-Tegel airport as scheduled flight CRX 3597 to Zurich.

At 20:58:50 UTC, after an uneventful flight, the aircraft received the clearance for a standard VOR/DME approach at Zurich airport.

At 21:05:21 UTC flight CRX 3597 reported on the aerodrome control frequency. When the aircraft reached the minimum descent altitude (MDA) of 2390 ft QNH at 21:06:10 UTC, the commander mentioned to the copilot that he had certain visual ground contact and continued the descent.

At 21:06:36 the aircraft collided with treetops and subsequently crashed into the ground.

The aircraft caught fire on impact. Twenty-one passengers and three crew members died from their injuries at the site of the accident; seven passengers and two crew members survived the accident.

4.2.3 Summary

In both cases it is recognizable that on one side the pilots involved had incomplete knowledge of the respective procedures. On the other side the crews were not enough aware of the fact that the mixture of clearly defined procedures, respectively the imprecise and undisciplined execution of such procedures result in a reduction of the safety margin.

In case of Helvetic Airways' flight OAW 8100 on 21 October 2004 in Pristina, the crew mixed up several procedures and continued the approach even though the weather conditions did not allow a stabilized approach based on visual references.

In case of the accident of Crossair flight CRX 3597 on 24 November 2001 near Bassersdorf/ZH, the aircraft descended below the minimum descent altitude, while executing a non precision approach, after the commander had mentioned to the copilot that he would have certain visual ground contact. During this approach the crew never had the required visibility to see the approach lights respectively the runway.

4.2.4 Safety recommendation no. 365

The Federal Office for Civil Aviation should verify that all pilots in possession of swiss pilot licences with an instrument rating have the necessary basic knowledge concerning actual instrument flight procedures and PANS-Ops (procedures for air navigation services).

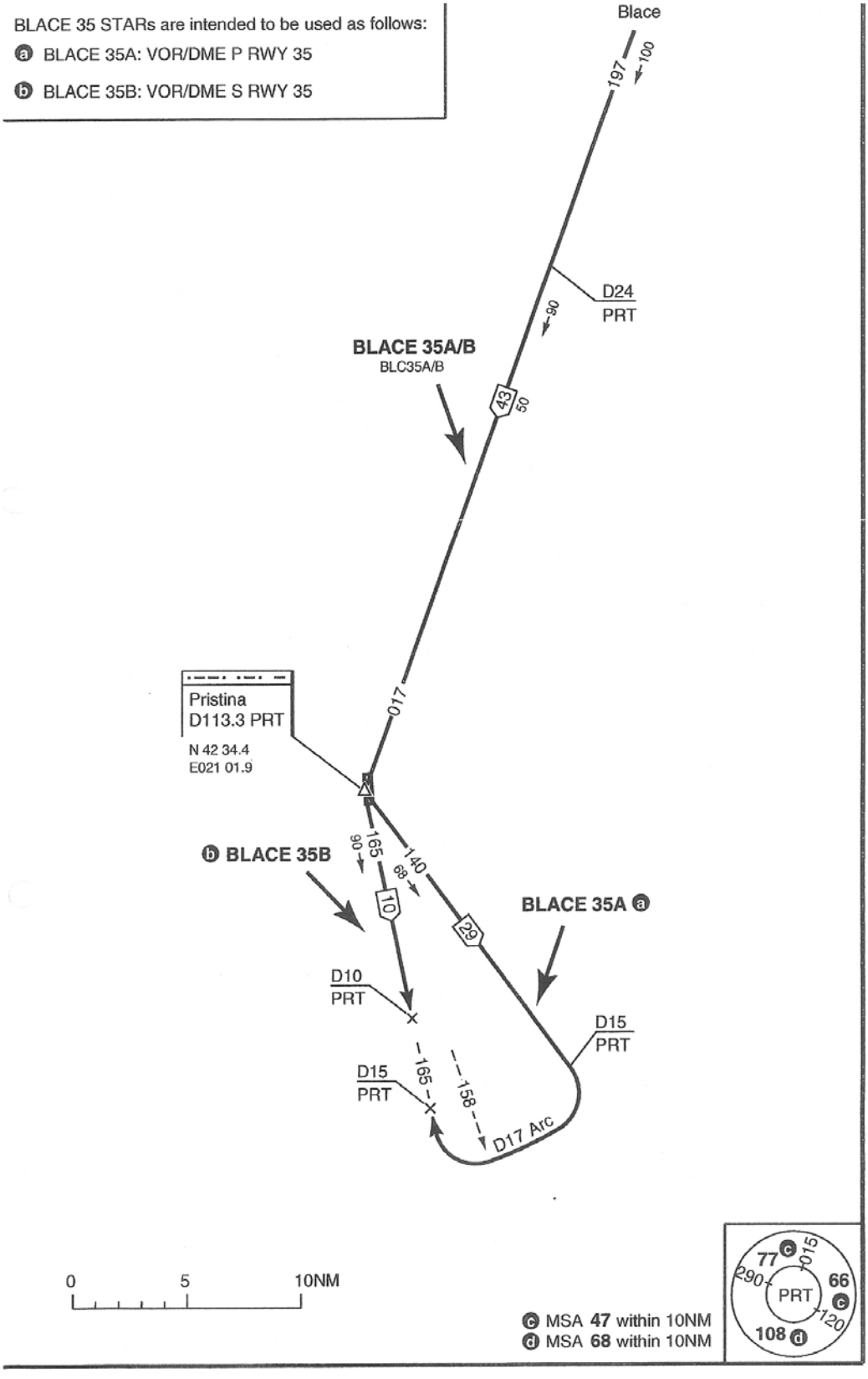
Berne, 03 August 2005 Aircraft Accident Investigation Bureau

This report has been prepared solely for the purpose of accident / incident prevention. The legal assessment of accident / incident causes and circumstances is no concern of the incident investigation (art. 24 of the Air Navigation Law). For data protection reasons the masculine form is used exclusively in this report for the naming of both sexes.

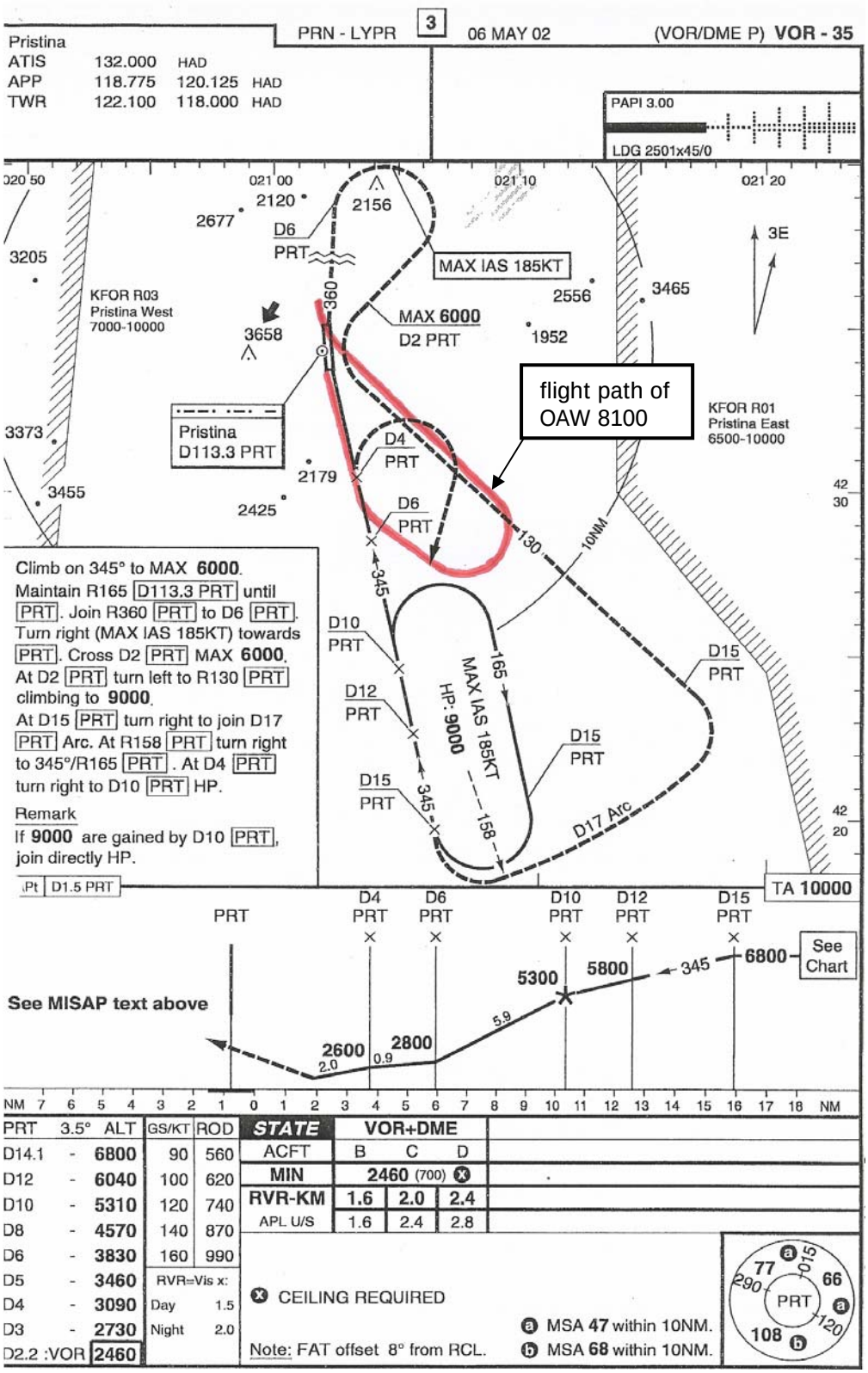
5 Appendices

5.1 Damage to the left wing

5.2 Standard arrival route BLACE 35A



5.3 Reconstructed flight path of OAW 8100



The reconstructed flight path of flight OAW 8100, presented on the VOR/DME approach chart runway 35.