Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 Section 44

Relinquishment of Control of Accident Site

Form: **F44-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description

Loss of control + collision with terrain involving VH-BAA HOBART 7/11/17

Important: This accident site may contain physical, biological and environmental hazards. Entry to the site is at your own risk.

Location of accident

HOBART AIRPORT

This notice is issued by the Chief Commissioner/Delegate declaring that the accident located at the above place is no longer secured under section 44 of the *Transport Safety Investigation Act 2003*. The restrictions on entry to the site no longer apply.

This notice is effective from: [redacted]

ATSB Chief Commissioner/Delegate:

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted]

Phone [redacted]

The following is a plain legal language summary of the relevant section of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 44—Securing accident sites

The Chief Commissioner can secure an accident site.

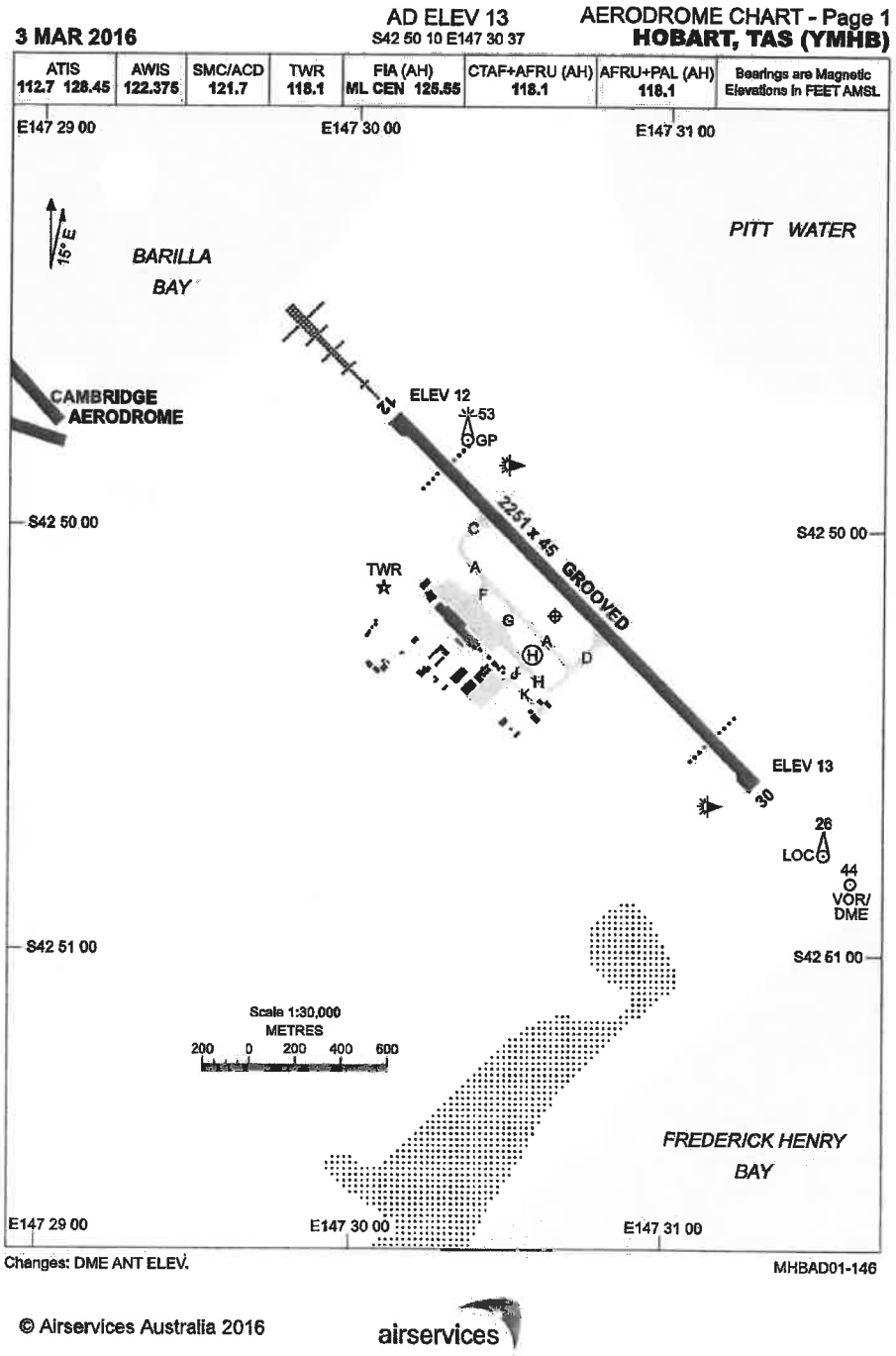
It is an offence to enter a secured accident site without the Chief Commissioner's permission. (The Chief Commissioner cannot unreasonably withhold permission.)

The penalty for entering an accident site without the Chief Commissioner's permission is a fine.

However, it is a defence if the entry was to:

- ensure the safety of people, animals or property
- to remove deceased persons or animals from the accident site
- to move a vehicle to a safe place

to protect the environment against significant damage or pollution.



airservices

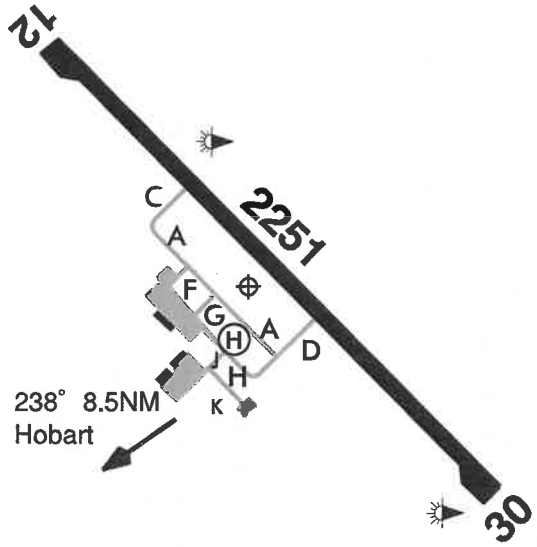
HOBART

ELEV 13

AVFAX CODE 7001

TAS		UTC +10	YMHB
S 42 50.2	E 147 30.6	VAR 15 DEG E	CERT

AD OPR Hobart International Airport Pty Ltd, Hobart International Airport, 6 Hinkler Rd, Cambridge, TAS, 7170. PH 03 6216 1600^. ARO 0418 120 854. Fax 6248 5540. Website www.hobartairport.com.au.



REMARKS

1. This AD is a Security Controlled Airport.
2. AD Charges: All ACFT. Visit www.hobartairport.com.au.

HANDLING SERVICES AND FACILITIES

1. Air BP- Hobart Aviation Refuellers:1900-1000 D, AH Call-out fee,1HR PN. Phone H24 03 6248 5713, Fax 6248 5715, email: hobartar@auswide.net.au. Based on AVBL fuel.
2. ACFT marshalling is the responsibility of ACFT operators.

RESCUE AND FIREFIGHTING SERVICES

1. CAT 7 - HO as per current NOTAM - 131.0 MHz AVBL HO.
2. Water Rescue Service AVBL.

APRONS AND TAXIWAYS

1. Freight ACFT apron pavement rating PCN 40/F/D/1400/U.
2. APN PRKG PSN designation number markings are not sequential.
3. TWY K not AVBL for ACFT above 5,700kg MTOW or wingspan greater than 12M.

AERODROME OBSTACLES

1. Lit and marked OBST phone TWR 738FT AMSL at Single Hill (BRG 177MAG 2.5NM FM ARP). Infringes horizontal SFC.
2. Lit and marked OBST phone TWR 886FT AMSL at Butchers Hill (BRG 310MAG 6.18NM FM ARP). Infringes horizontal SFC.
3. OBST communications TWR 653FT AMSL at Weston Hill (BRG 011MAG 4.82NM FM ARP). Infringes outer horizontal SFC.
4. Lit OBST TWR 652FT AMSL PSN S42 55.7 E147 28.4 Mt Mather communications tower (BRG 182MAG 5.75NM FM ARP). Infringes outer horizontal SFC.
5. Lit and marked OBST TWR 755FT at Lewisham (BRG 081MAG 6.2NM FM ARP). Infringes outer horizontal SFC.
6. OBST BLDG 188FT AMSL BRG 261 MAG 2.63NM FM ARP infringes conical SFC.

Information may be continued on the next page: PTO

METEOROLOGICAL INFORMATION PROVIDED

1. TAF CAT A, METAR/SPECI, AD WRNG.
2. AWIS PH 03 6242 2302 - Report faults to BoM.
3. AWIS FREQ 122.375 (requires three one-second pulses to activate) - Report faults to AD OPR.
4. MET INFO AVBL FM Airservices Pilot Briefing. Elaborative briefing FM MWO 03 6221 2026.

PHYSICAL CHARACTERISTICS

12/30	120	74a	PCN 63 /F /D /1750 (254PSI) /T Grooved	WID 45	RWS 300

AERODROME AND APPROACH LIGHTING

RWY 12/30	HIRL			SDBY PWR AVBL
RWY 12/30	MIRL(1)	PAL+AFRU 118.1		SDBY PWR AVBL
RWY 12/30	PAPI(1)	PAL+AFRU 118.1	3.0 DEG53FT	SDBY PWR AVBL
RWY 12	HIAL-CAT I(1)	PAL+AFRU 118.1		SDBY PWR AVBL

(1) PAL + AFRU requires three one-second pulses to activate. (See INTRO para 23.5)

1. ALS Type and Length: RWY 12 - Distance coded CL: 860M.
2. RWY edge light spacing: 12/30: 59M.
3. RWY guard LGT (RGL) at all RWY/TWY intersections.
4. Responsible person AVBL on CTAF outside TWR HR. Report PAL faults on CTAF or phone 03 6216 1600^, and Melbourne Centre 125.55.

OTHER LIGHTING

ABN ALTN 8 WG

HBN On nearby hills, refer to IAL charts.

1. Secondary PWR switchover time: 1 SEC during LVP; 15 SEC OT.
2. TWY LGT: Green CL. AVBL on all TWY except TWY K.

ATS COMMUNICATIONS FACILITIES

FIA	MELBOURNE CENTRE	125.55 On Ground (Outside HB TWR HR)
SMC	HOBART GROUND	121.7
ACD	HOBART GROUND	121.7
TWR	HOBART TOWER	118.1
ATIS	HOBART ATIS	128.45 112.7

1. TWR HR: 1950-1210 D (1HR earlier HDS).
2. Phone 03 6248 3096^
3. Hobart TWR provides combined TWR & APP CTL services within Class C & D airspace 8,500FT AMSL & BLW DRG TWR HR. CTC TWR for clearance.
4. Outside TWR HR, Melbourne Centre operates Hobart Class C & D airspace above 1,500FT AMSL, frequency 125.55.
5. Outside TWR HR, Hobart CTR Class D airspace 1,500FT AMSL and below becomes Class G.
6. TWR HR may change at short notice, check status of airspace with ATS or Hobart ATIS.
7. HB TWR also provides information for Cambridge AD traffic DRG TWR HR.

RADIO NAVIGATION AND LANDING AIDS

VOR	HB	112.7	S 42 50.8	E 147 31.6	(1)
DME	HB	112.7/ 74X	S 42 50.8	E 147 31.6	(2)
ILS	IHB	109.9 (RWY12)	S 42 50.8	E 147 31.5	
LOC	IHB	109.9 (RWY12)	S 42 50.8	E 147 31.5	
GP	IHB	333.8 (RWY12)	S 42 49.8	E 147 30.4	
OM	IHB	75 (RWY12)	S 42 47.2	E 147 26.2	
MM	IHB	75 (RWY12)	S 42 48.7	E 147 28.7	
DME	IHB	109.9/ 36X (RWY12)	S 42 49.8	E 147 30.4	(3)

(1) RESTRICTION: Coverage reduced by terrain shielding in all sectors.
(2) Antenna ELEV 44 FT.
(3) Antenna ELEV 21 FT.

Outside TWR HR LOC, GP, VOR, DME, monitored by Melbourne Centre. All other aids pilot monitored. ILS not protected outside TWR HR.

LOCAL TRAFFIC REGULATIONS

1. Right hand circuits RWY 30.
2. ACFT ABV 36,000KG MTOW must use nodes for 180DEG turns, except B737, A320, BAE146, B717, B727, C130, A319, A321 and E190.
3. TWYs G, H and D west of A not AVBL for wide body ACFT unless approved prior by AD OPR.
4. Engine ground running of all ACFT (excluding ENG start up PROC) not permitted without prior approval FM AD OPR. CTC senior OPS office 0418 120 854 H24. ACFT OPR required to broadcast on Hobart SMC (121.7) at start and at finish of ground runs maintaining a listening watch during ENG run.
5. Wide body ACFT PRKG requires approval FM AD OPR prior to OPS, only AVBL on Bay 1A unless otherwise directed prior by AD OPR.

FLIGHT PROCEDURES

1. All AWK to be conducted in Hobart TWR airspace must be coordinated with Hobart TWR by phone prior to flight planning. The only exception is circuit training at Cambridge AD.
2. During TWR HR Airways Clearance shall be requested prior to requesting a taxi clearance.
3. **COMMUNICATIONS FAILURE**
   If VFR in Class G airspace.
   a. Carry out general COM failure procedures.
   b. Stay in VMC.
   c. Proceed to CBG.
   d. Broadcast intentions on 118.1
   e. Squawk 7600
   f. Enter CTR from the west between Tasman Bridge (TAS) and Droughty Point (DRP) at 1,500FT AMSL. Remain to the west of a line Seven Mile Beach Township - Hobart Airport - Radio Telescope. Proceed to overhead CBG. Ascertain landing direction and descend to 1,000FT AMSL. Proceed with a normal approach and landing with a circuit direction that will keep the aircraft to the west of CBG and clear of the Hobart runway approaches. Maintain separation from other aircraft. Listen out on ATIS and HB Locator for instructions. Watch for light signals from Hobart Tower.
   g. Contact the tower by phone after landing.
4. Outside TWR HR procedures:
   a. Melbourne Centre provides a non-surveillance Approach Control service below 8,500FT AMSL in the Hobart Class C and D airspace, frequency 125.55 (Aircraft may be identified BLW 8,500FT).
   b. Submission of a Flight Notification (flight plan) by phone, fax or internet will reduce likelihood of delays for VFR aircraft.
   c. All AWK to be conducted above 1,500FT AMSL in HB Class C or D airspace must be co-ordinated with Melbourne Centre by phone prior to flight planning on 03 9235 7400^.
   d. Current wind, QNH and temperature will be provided by Melbourne Centre to departing aircraft on first contact, and to arrivals. Cloud cover, visibility and other MET phenomena from the current METAR or SPECI will be provided to inbound aircraft.
   e. DEPARTURES
      Include RWY and preferred departure procedure (if IFR) with Taxi report to Melbourne Centre.
      Report Ready to obtain airways clearance prior to entering the RWY.
   f. ARRIVALS
      On receipt of weather information, advise Melbourne Centre of intended landing RWY and preferred approach (if IFR).
   g. In the event of a radio failure on the ground, continue to TX intentions, return to apron and contact Melbourne Centre on 03 9235 7400^.

Information may be continued on the next page: PTO

5. VFR Route 1: **VICTOR NORTHWEST**
Inbound: Track CBV-CPA-RCH west of the Colebrook/Richmond Road to west abeam RADT.
Outbound: Track west abeam RADT-RCH-CPA-CBV remain west of the Richmond/ Colebrook Road.
VFR Route 2: **VICTOR NORTHEAST**
Inbound: Track CBV-CPA-Orielton-SORL remain east of Colebrook Road to CPA then via Orielton east of Tasman HWY to SORL. **(Note):** Expect circuit joining instructions **OR** to orbit north of SORL depending on traffic.
Outbound: Track as directed by ATC to SORL then Orielton remain east of Tasman HWY, thence east of Colebrook Rd east of CPA to CBV.
VFR Route 3: **VICTOR EAST**
Inbound: Track DLY-SORL north of the Arthur HWY. **(Note):** Expect circuit joining instruction **OR** to orbit southeast of SORL depending on traffic.
Outbound: Track as directed by ATC to SORL thence north of Arthur HWY to DLY.
VFR Route 4: **VICTOR SOUTHWEST**
Inbound: Track DRP to-CBG west of Mt Rumney.
Outbound: Track west of Mt Rumney to DRP.
VFR Route 5: **VICTOR SOUTH**
Inbound: Track CRM-LAUD-CBG.
Outbound: Track LAUD-CRM.
VFR Route 6: **VICTOR WEST**
Inbound: Track BOWB to Risdon Vale thence Cambridge township.
Outbound: Track to Risdon Vale thence BOWB.

6. **LOW VISIBILITY OPERATIONS**
For CASA approved operators, RWY is capable of supporting takeoffs with an RVR/RWY VIS of not less than 350M.
   a. Preparations for Low Visibility Procedures (LVP) commence when VIS has reduced to 1,800M.
   b. During conditions of less than Cat I minima, only one ACFT is permitted on the manoeuvring area.
   c. All ACFT and vehicle under positive control of ATC.
   d. Vehicle access to manoeuvring area restricted to ARO and ARFF.

CTAF - AFRU 118.1

Outside HB TWR HR.

ADDITIONAL INFORMATION

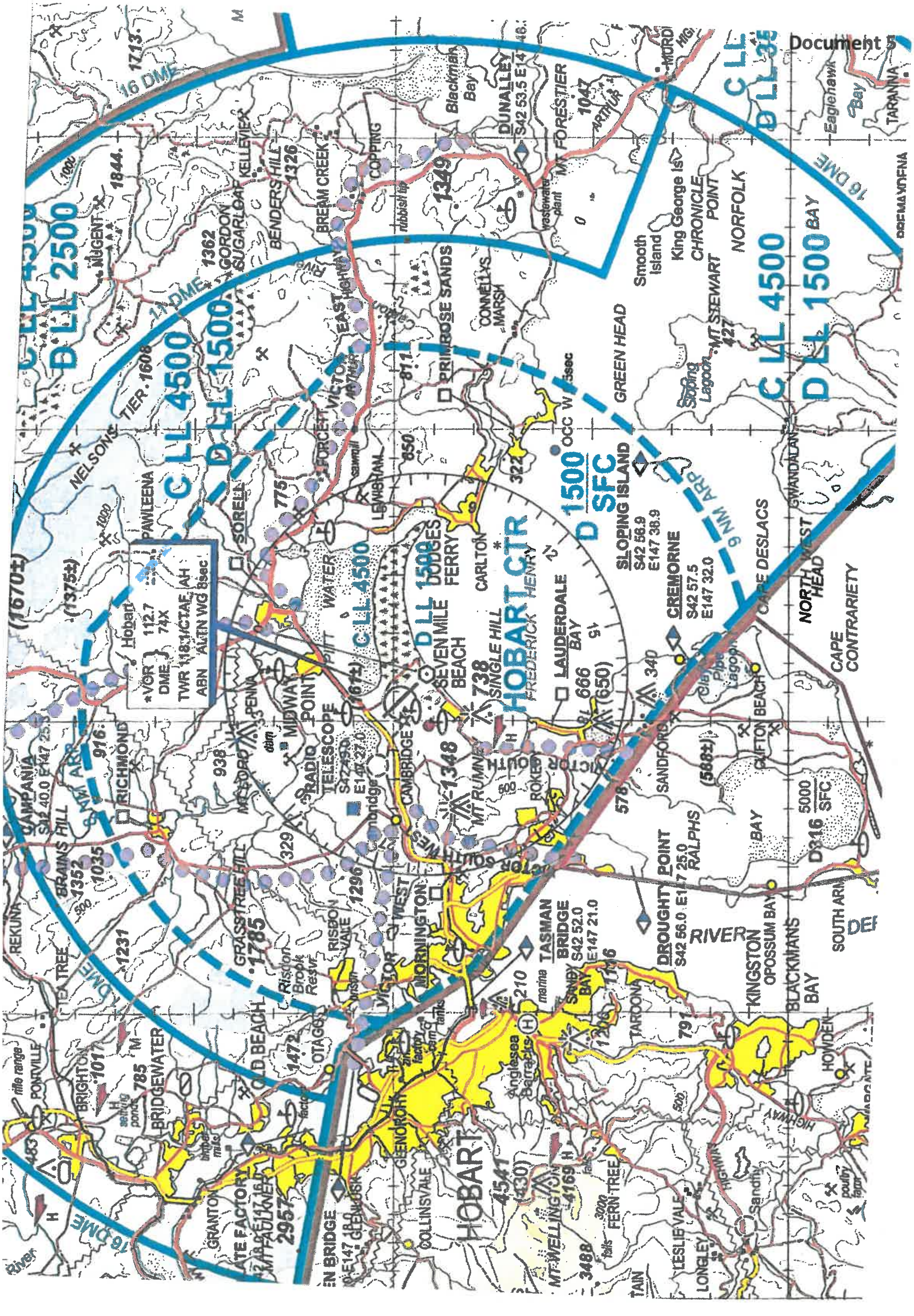
1. Bird hazard exists. Bird watch reports developed by AD OPR for specific wildlife hazards if required. Email: operations@hobartairport.com.au to be included on distribution list.
2. APCH to RWY 30 in strong winds will produce temporary (less than 2 SEC) but minor vertical updrafts (+500FT/MIN) immediately above the sand dune area.
3. Immediately before the sand dune induced updraft of Note 2, a less severe downdraft could occur for a similar short duration.

CHARTS RELATED TO THE AERODROME

1. WAC 3556.
2. Aerodrome Obstacle Chart Type A Rev 3: APR 2013. Email: operations@hobartairport.com.au.
3. Also refer to AIP Departure and Approach Procedures.

Document 4
Hobart International Airport

Document 5



HOBART CTR
C LL 4500
D LL 1500
D LL 2500
D 1500
SFC
16 DME
11 DME
9 NM ARP
VOR 112.7
DME 74X
TWR 118.1 CTAF AH
ABN ALTN WG 8sec
OCC W 8sec
D316 5000 SFC
HOBART
SEVEN MILE BEACH
DODGES FERRY
CAMBRIDGE
RICHMOND
SORELL
MIDWAY POINT
LAUDERDALE
ROKEBY
SANDFORD
KINGSTON
TASMAN BRIDGE
MT WELLINGTON
MT RUMNEY
PENNA
FREDERICK HENRY BAY
NORFOLK BAY
SLOPING ISLAND
CREMORNE
SOUTH ARM
CAPE DESLACS
CAPE CONTRARIETY
DUNALLEY
PRIMROSE SANDS
CARLTON
LEWISHAM
PAWLEENA
NELSONS TIER
NUGENT
BRIGHTON
BRIDGEWATER
PONTVILLE
GRANTON
GLENORCHY
OLD BEACH
OTAGO
RISDON VALE
LINDISFARNE
HOWRAH
TRANMERE
OPOSSUM BAY
BLACKMANS BAY
TAROONA
SANDY BAY
GREEN HEAD
NORTH WEST BAY

Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A13Q0021

LOSS OF CONTROL DURING HYDRAULIC PRESSURE FAILURE TRAINING
EUROCOPTER AS350 BA HELICOPTER, C-GPHN
HÉLI-EXCEL INC.
SEPT-ÎLES AIRPORT, QUEBEC
03 FEBRUARY 2013

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report A13Q0021

Loss of control during hydraulic pressure failure training

Eurocopter AS350 BA Helicopter, C-GPHN
Héli-Excel inc.
Sept-Îles Airport, Quebec
03 February 2013

Summary

On 03 February 2013, at 0853 Eastern Standard Time, the Eurocopter AS350 BA (serial number 1251, registration C-GPHN), operated by Héli-Excel inc., departed for a training flight from the company base northwest of the Sept-Îles Airport, Quebec, with a flight instructor and 2 pilots in training on board . After practising various types of landings in unprepared areas, the aircraft headed to the Sept-Îles Airport to conduct engine failure drills at the hover at the threshold of Runway 27.

At 0954, the aircraft departed from the threshold of Runway 27 to carry out hydraulic failure drills on Runway 31. During the fourth drill, the flight instructor flew a short pattern at low altitude and low speed without hydraulic pressure assistance. In the moments following the start of the final approach, the cyclic stick moved sharply forward and to the left. The flight instructor grabbed the cyclic stick in an attempt to re-establish level flight, since the helicopter was quickly banking to the left in a nose-down attitude. The main rotor blades struck the runway, and the aircraft came to rest on its left side. The helicopter was heavily damaged by the impact, but no fire broke out. The flight instructor sustained serious injuries, while the other 2 pilots sustained minor injuries. The emergency locator transmitter activated during the occurrence.

Le présent rapport est également disponible en français.

Table of contents

1.0 Factual information 1

1.1 History of the flight 1
1.2 Injuries to persons 2
1.3 Damage to aircraft 2
1.4 Other damage 3
1.5 Personnel information 3
1.6 Aircraft information 4

1.6.1 General 4
1.6.2 Conversion history 4
1.6.3 Engine information 5
1.6.4 Maintenance 6
1.6.5 Weight and centre of gravity 6
1.6.6 Flight control hydraulic system 6

1.7 Meteorological information 13
1.8 Aids to navigation 13
1.9 Communications 13
1.10 Airport information 13
1.11 Flight recorders 14
1.12 Wreckage and impact information 16

1.12.1 General 16
1.12.2 Examination of hydraulic system harnesses and contacts 16
1.12.3 Examination of the hydraulic reservoir and hydraulic fluid 16
1.12.4 Examination of the servoactuators 16
1.12.5 Warning lights 17
1.12.6 Cockpit seats 17

1.13 Medical and pathological information 18
1.14 Fire 18
1.15 Survival aspects 18

1.15.1 General 18
1.15.2 Helmet 18
1.15.3 Emergency services 19
1.15.4 Emergency locator transmitter 19
1.15.5 Emergency response plan of the Sept-Îles Airport operator 19
1.15.6 Emergency response 20
1.15.7 Post-occurrence debriefing meeting 21
1.15.8 Emergency drill at the Sept-Îles Airport 21

1.16 Tests and research 22

1.16.1 TSB laboratory reports 22

1.17 Organizational and management information 22

1.17.1 General 22
1.17.2 Flight instructor training 22
1.17.3 Héli-Excel Pilot Training on AS350 23
1.17.4 Héli-Excel's hydraulic failure training 23
1.17.5 Flight instructor's experience with hydraulic failure 24

1.18 Additional information 24

1.19 Useful or effective investigation techniques 24

2.0 Analysis 25

2.1 The aircraft 25
2.2 Centre console 25
2.3 History of the flight 26
2.4 Training provided by the flight instructor 27
2.5 Training procedure for hydraulic failure 28
2.5.1 General 28
2.5.2 Flight instructor's experience with hydraulic failure 28
2.5.3 AS350 rotorcraft flight manual 28
2.5.4 Rotorcraft flight manual typography 29
2.5.5 Rotorcraft flight manual Supplement 7 29
2.5.6 Hydraulic failure training procedure 30
2.6 Survival aspects 30
2.6.1 Evacuation of the aircraft 30
2.6.2 Actions of the pilot observer 31
2.6.3 Presence of the pilot observer on board 31
2.6.4 Cockpit seats 31
2.6.5 Emergency services 31
2.6.6 Emergency response 31

3.0 Findings 34

3.1 Findings as to causes and contributing factors 34
3.2 Findings as to risk 34
3.3 Other findings 35

4.0 Safety action 36

4.1 Safety action taken 36
4.1.1 Transport Canada 36

Appendices 37

Appendix A – Airworthiness directive regarding protection of the hydraulic test switch 37
Appendix B – Diagram of the hydraulic system 38
Appendix C – Rotorcraft flight manual Supplement No. 7 39
Appendix D – Excerpt from Sept-Îles Airport emergency response plan 43

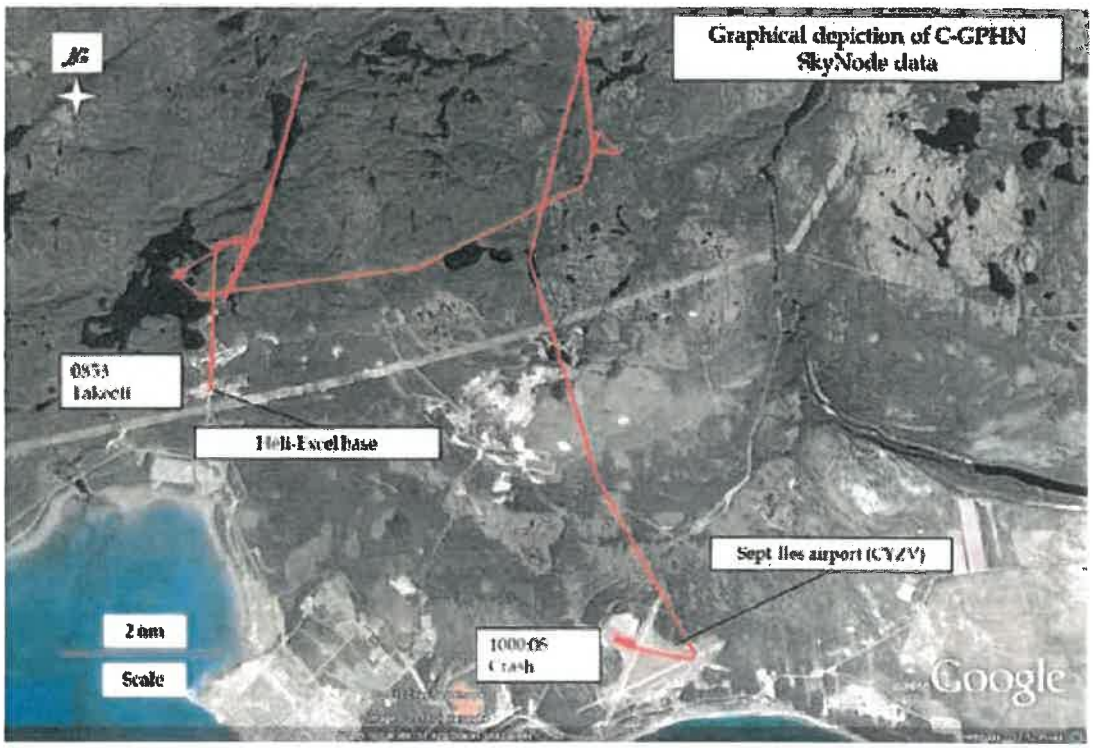
1.0 *Factual information*

1.1 *History of the flight*

On the morning of 03 February 2013, the 3 pilots conducted a visual inspection of the helicopter; no anomalies were detected in the hydraulic system components. They then completed the pre-flight checklist. The "Accumulators check" and "Hydraulic pressure isolation check" did not reveal any malfunction in the hydraulic system.

At 0853,[1] C-GPHN departed from the Héli-Excel inc. (Héli-Excel) base in Sept-Îles, Quebec, for a training flight. The flight instructor was in the left seat, one of the pilots in training was in the right seat, and the other pilot was in seat 1B behind the flight instructor, as an observer. The first 50 minutes of the flight took place north of the Sept-Îles Airport (CYZV), where various types of landings in unprepared areas were conducted (Figure 1). Around 0937, the aircraft headed to the Sept-Îles Airport to conduct drills for engine failure at hover and for hydraulic system failures.

Figure 1. Aircraft flight path (Source: Google Earth, with TSB annotations)



At 0954, after completing drills for engine failure at the hover at the threshold of Runway 27, the helicopter took off to carry out hydraulic failure drills on Runway 31. Shortly after

---

1 All times are Eastern Standard Time (Coordinated Universal Time minus 5 hours), unless otherwise stated.

takeoff, the flight instructor engaged the HYD TEST switch. The horn sounded; the pilot in training saw the HYD light illuminate and confirmed the hydraulic failure. The pilot in training did not notice any flight control loads and set the indicated airspeed at between 40 and 60 knots. After the flight instructor turned the HYD TEST switch to the OFF position, the pilot in training pushed the HYD CUT OFF switch at which point the flight controls stiffened. While close to the ground, the aircraft slowed to the point where the pilot in training felt that the loads on the flight controls prevented him from controling the aircraft to make a safe landing.

The flight instructor took over the controls and flew a tight left pattern at low altitude and low speed without hydraulic pressure assistance. He showed the pilot in training the technique for a landing in manual mode, i.e. without hydraulic pressure assistance. The flight instructor landed and stopped the aircraft on the runway without difficulty.

The flight instructor took off and, again with the flight controls in manual mode, flew a tight left pattern at low speed and low altitude. When the aircraft was established on final approach, the pilot in training took over the controls. He made a no-hover landing at a low translation speed of about 10 knots on the icy runway. Since the pilot in training could not stop the helicopter on the ground, the flight instructor took over the controls at the end of the runway.

At 0959, the flight instructor took off in manual mode and again flew a tight left pattern at low speed and low altitude. At the end of the base leg, at the beginning of the final approach, the helicopter momentarily reached a level attitude. Just before the flight instructor handed the controls to the pilot in training, the helicopter banked slightly to the left and then quickly rolled to the left in a nose-down attitude, and the main rotor struck the runway.

1.2 *Injuries to persons*

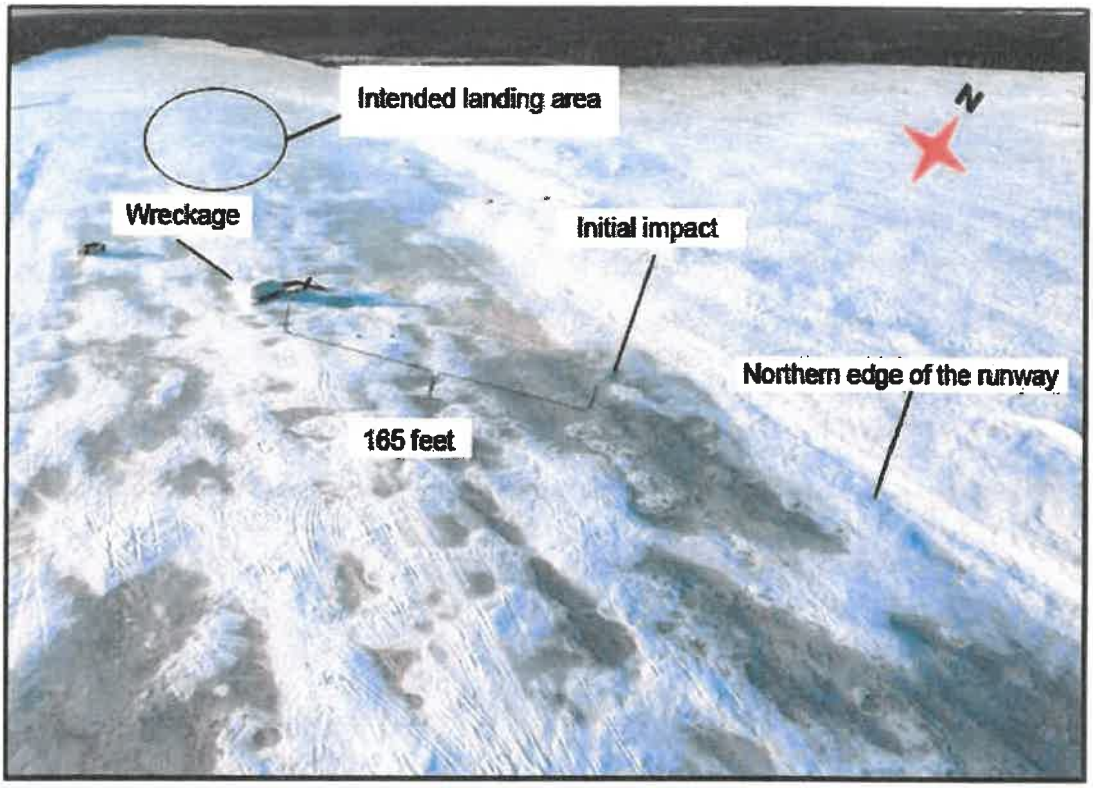
Table 1. Injuries to persons

Injuries	Crew members	Passengers	Other persons	Total
Fatal	0	0	0	0
Serious	1	0	0	1
Minor/None	1	1	0	2
Total	2	1	0	3

1.3 *Damage to aircraft*

The aircraft struck the ground in a nose-down attitude of about 45° and a left bank angle of about 100°. The first point of impact was near the northern edge of Runway 13/31 (Figure 2). The main rotor blades struck the runway first, followed by the nose of the helicopter. The aircraft slid approximately 165 feet on its left side toward the centre of the runway before coming to a stop on Runway 13/31 about 1000 feet from the threshold of Runway 13.

Figure 2. Aerial view of the accident site



The collision with the ground caused major damage to the aircraft. The front part of the aircraft, including the nose, windshield, canopies and instrument panel, was torn off. The 2 pilot seats separated from their anchors. The impact caused the tail boom to bend upward and to the left; it sustained an almost full-circumference fracture about 24 inches in front of the horizontal stabilizer. The top of the fuel tank was cracked along the left side from front to rear. The 2 tail rotor blades were not damaged. The engine was still running after the crash. The observer pilot seated at the rear of the cabin had to pull the FUEL SHUT OFF VALVE lever to shut it off.

1.4 Other damage

Over 300 litres of fuel spilled on the runway.

1.5 Personnel information

The flight instructor holds a commercial pilot licence delivered in 2000. He has also been type-endorsed on the AS350 since 2002. At the time of the accident, the pilot had accumulated over 3000 flight hours on type. In 2008, the pilot started providing training on the AS350. In 2012, he was hired as a pilot by Héli-Excel.

In early 2013, Héli-Excel's chief pilot provided him with flight training so that he could become a company flight instructor. The training involved flight drills in normal and

emergency situations. After demonstrating his practical skills and theoretical knowledge, the pilot was approved by Héli-Excel's chief pilot as a flight instructor.

The 2 pilots on board the aircraft were the first pilots that the flight instructor was training for the company. The training flight was part of recurrent training and pilot proficiency check (PPC).

The flight instructor was not qualified as such and was not a Transport Canada-approved check pilot; this is not required by the *Canadian Aviation Regulations* (CARs).

The 2 pilots in training had obtained their commercial pilot licences in 2011. The pilot in the right-hand seat was hired by Héli-Excel in August 2012. He had received his AS350 rating in May 2012. His experience on this type was limited to training received with another carrier and a few flights. He had accumulated less than 200 flight hours on an helicopter.

The observer pilot had been hired by Héli-Excel in January 2013 and had no AS350 rating.

1.6 *Aircraft information*

1.6.1 *General*

Table 2. Aircraft information

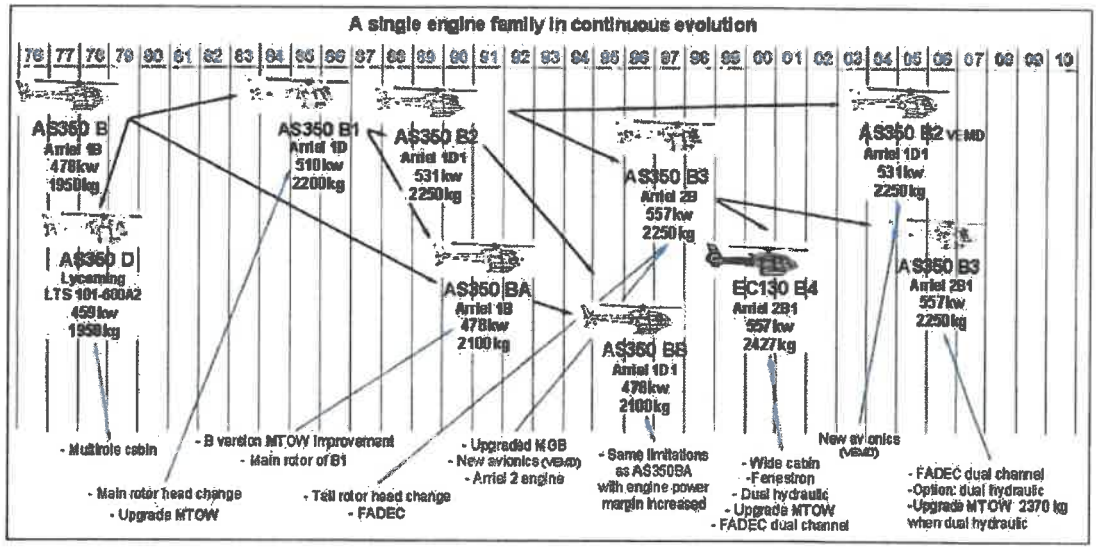
Manufacturer	Eurocopter
Type and model	AS350 BA
Year of manufacture	1980
Serial number	1251
Certificate of airworthiness	Valid
Airframe time	10 017.6
Engine	Allied Signal LTS101-600A-3A
Maximum allowable take-off weight	4961 pounds
Recommended fuel type(s)	Jet fuel
Fuel type used	Jet fuel

1.6.2 *Conversion history*

1.6.2.1 *General*

C-GPHN was originally manufactured as an AS350 D in 1980 by Aérospatiale (Figure 3). On 16 May 2001, the aircraft was converted into an AS350 BA as per Eurocopter service bulletins. At the same time, modifications were made as per Apex Aerospace, Inc.'s Transport Canada-approved SH02-15 supplemental type certification (STC). These changes reduced fuel consumption and increased the helicopter's internal gross weight to that of the AS350 B2, i.e. 2250 kg (4961 pounds). Operators commonly refer to the AS350 BAs that have been modified as per the Apex SH02-15 STC as AS350 BA+ to distinguish them from the other models.

Figure 3. Illustration of the AS350's evolution and changes (Source: Eurocopter)



1.6.2.2 *Apex Aerospace SH02-15 supplemental type certification*

Given that the AS350 BA+ and the AS350 B2 have the same internal gross weight, the drive train systems of models BA, BA+ and B2 were compared. Similarities were noted, except that the AS350 B2 is equipped with a yaw channel load compensator to counter the high forces on the pedals during a hydraulic failure. It was also noted that the torque limits and shaft horsepower of the BA and BA+ are similar, whereas those of the B2 are higher.

Given that the torque limits of the AS350 BA and AS350 BA+ are the same, it can be concluded that the absence of a load compensator on the BA did not affect the handling characteristics of C-GPHN when the hydraulic system was depressurized.

Table 3. Comparison of the drive train systems of models BA, BA+ and B2

	Engine torque limits	Internal gross weight	External gross weight	Shaft horsepower maximum continuous/ take-off
BA+	83%, 88%	2250 kg	2250 kg	590/650
BA	83%, 88%	2100 kg	2100 kg	590/641
B2	94%, 100%, 107%	2250 kg	2500 kg	625/712

1.6.3 *Engine information*

The Allied Signals LTS101-600A-3A engine was not damaged. No engine malfunction was observed during the flight. The overload failure of the main- and tail-rotor shafts shows that the engine was producing power at the time of the accident. The engine logs indicate that it was maintained and serviced in accordance with existing Canadian regulations and

approved procedures. Engine performance and mechanical malfunction were not considered to have been contributing factors in the accident.

1.6.4 Maintenance

The maintenance records show that the helicopter was certified, equipped and maintained in accordance with existing regulations and approved procedures. The helicopter had flown 65.5 hours since its last 100-hour inspection. No pre-flight malfunction was reported or deferred.

1.6.5 Weight and centre of gravity

It is estimated that the helicopter weighed 4150 pounds at the time of the accident. The aircraft's weight and centre of gravity were within the limits prescribed in the Transport Canada-approved rotorcraft flight manual (RFM) and did not play a role in the accident.

1.6.6 Flight control hydraulic system

1.6.6.1 General

The flight controls are assisted by a single hydraulic system that reduces pilot workload during flight and at speeds where loads on the manual flight controls are excessive.

1.6.6.2 Hydraulic system components

The hydraulic system is pressurized by a pump driven by the input shaft of the main transmission gearbox, through a flat strap.

The helicopter is equipped with 4 servoactuators, 3 of which actuate the stationary swashplate: 1 servoactuator for pitch control, and 2 servoactuators for roll control (Appendix B). The fourth servoactuator is in the tail rotor. In order to offset excessive loads in the event of a hydraulic system failure at high speed, a safety unit consisting of an accumulator, a non-return valve and a solenoid valve was installed on each servoactuator. The hydraulic pressure provided by the accumulators allows the pilot to safely reduce the airspeed to a value at which the manual control forces are manageable without hydraulic pressure assistance. The AS350 BA is not equipped with a control channel load compensator on the tail rotor.

The pressure regulator incorporates a pressure switch for low hydraulic pressure and a test solenoid valve. When the pressure switch senses that the hydraulic system pressure drops below 30 bars, the red hydraulic system warning light (HYD) illuminates on the control panel and the horn sounds. The same horn also provides warning of low rotor speed.

1.6.6.3 Hydraulic system controls and monitoring

1.6.6.3.1 General

The hydraulic system is controlled by the HYD CUT OFF [hydraulic system cut-off] switch, mounted on the collective stick of the right-hand seat, and by the HYD TEST [hydraulic system test] switch, mounted on the centre console. The left-hand seat flight controls used by a co-pilot or a flight instructor are removable and the collective stick is not equipped with a HYD CUT OFF button.

1.6.6.3.2 The HYD CUT OFF switch

The HYD CUT OFF switch is a toggle switch with 2 positions – ON and OFF, and is normally set to the ON (forward) position during flight. When the switch is in the OFF position, the hydraulic system becomes depressurized and the main rotor accumulators become depressurized simultaneously in order to prevent asymmetric depletion. Asymmetric depletion of the accumulators can generate asymmetric forces that would make controlling the aircraft difficult. Consequently, the pilot must activate the HYD CUT OFF switch either in the event of a hydraulic system failure or during a hydraulic malfunction simulation once the pilot has reached safety speed, i.e. the speed at which the manual control forces are such that it is possible to maintain control of the helicopter. However, the tail rotor servoactuator is also depressurized by the HYD CUT OFF switch; therefore, the tail rotor servoactuator does not maintain its hydraulic pressure during a simulated failure. If hydraulic pressure is available in the system, the pilot can instantly restore the hydraulic pressure of the servoactuators and repressurize the accumulators by placing the HYD CUT OFF switch in the ON position.

1.6.6.3.3 The HYD TEST switch

The HYD TEST switch, which is mounted on the centre console (Aeronautical Accessories, Inc. Center Console Update model VIA-350-24-001) between the 2 pilots, has 2 positions. The TEST position (forward position) initiates the hydraulic system test function while the OFF position (aft position) restores normal operation. The centre console certified by the manufacturer uses a 2-position pushbutton for this function: TEST when it is pushed in, and OFF when it is released (see paragraph 1.6.6.4).

The HYD TEST switch is intended primarily to allow the pilot to make sure, before the flight, that the accumulators of the main rotor servoactuators are working properly. The HYD TEST switch is also used to simulate a hydraulic system malfunction during a training flight.

When the switch is in the TEST position, the hydraulic test solenoid valve opens, depressurizing the hydraulic system. As a result of this depressurization, the HYD warning light illuminates and the horn sounds. The accumulators are tested during the pre-flight check by the pilot selecting the HYD TEST switch to TEST and moving the cyclic stick 2 or 3 times on each axis (+/- 10% of the complete range) to verify that there is sufficient hydraulic pressure to ensure that safety speed can be reached after a hydraulic failure.

1.6.6.4 Centre console

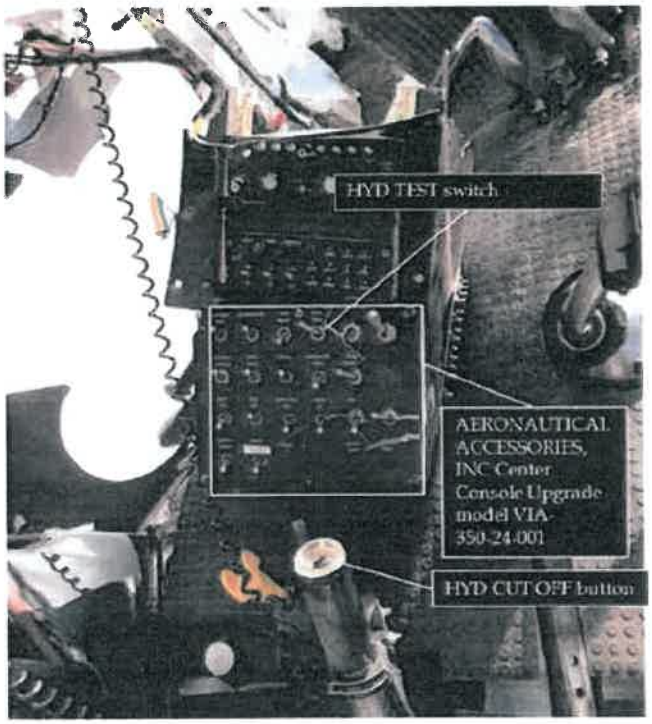
In May 2005, the original centre console (Honeywell Control Unit), which contained the control buttons for the helicopter's various systems, was replaced as per STC No. SR00825NY-D with a Center Console Upgrade model VIA-350-24-001 from Aeronautical Accessories, Inc.

One of the distinguishing features of the new console is that the original latched illuminated pushbuttons[2] were replaced by toggle switches.

The HYD TEST switch is located next to other similarly shaped switches (Figure 4). It was determined that the HYD TEST switch can be inadvertently actuated during flight because of its proximity to other switches. In November 2005, Eurocopter issued Service Bulletin SB 67.00.32 which recommended the installation of a retractable guard/cover (protection flap) over the switch on Honeywell centre consoles to prevent the unintentional operation of the HYD TEST switch.

In September 2007, Transport Canada (TC) issued Airworthiness Directive (AD) CF-2007-19, which required that the HYD TEST pushbutton on Honeywell consoles be equipped with a protection flap with a 90-degree opening to reduce exposure to events leading to hydraulic system loss and control difficulties. This AD was replaced by CF-2007-19R1 on 27 November 2008 (Appendix A), which describes the mandatory installation of a more reliable protection flap with a 180-degree opening, as per revision 1 of Eurocopter's Service Bulletin SB 67.00.32 issued on 19 February 2008.

Figure 4. C-GPHN centre console, rear-to-front view in cockpit



The HYD TEST toggle switch on C-GPHN's Aeronautical Accessories, Inc. centre console is not of a specific shape and is not equipped with a protection flap, or have the "pull-to-unlock" design. Since AD CF-2007-19R1 applies to AS350s equipped with a Honeywell centre console, C-GPHN was not required to comply with the corrective measures set out in the AD.

---

2 A latched pushbutton remains in the selected position until it is pushed again.

1.6.6.5 Hydraulic system certification

During initial certification, the aircraft was shown to have adequate handling characteristics in manual control mode. However, the loads were considered excessive at high speed. Consequently, a safety unit consisting of an accumulator, a non-return valve and a solenoid valve was installed on each servoactuator. The hydraulic pressure provided by the accumulators allows the pilot to reduce the airspeed to the safe recommended speed of between 40 and 60 knots before setting the HYD CUT OFF switch to the OFF position. The control forces are deemed manageable within this speed range.

1.6.6.6 Documentation concerning the effort required without hydraulic pressure assistance

1.6.6.6.1 General

TC and Eurocopter recognize the risks associated with operating outside the recommended safety speed range in the event of a hydraulic system failure. In addition, several investigation reports[3] on loss of control following depressurization of the AS350 hydraulic system document these risks.

1.6.6.6.2 Transport Canada

In 2003[4] and 2004,[5] TC and Eurocopter jointly examined the hydraulics-off handling characteristics of the AS350 B2[6] in very cold weather. Following these in-flight tests, TC concluded that flight control forces were high at speeds above the safety speed and marginally acceptable within the safety speed range, and that their direction and intensity were very high and unstable in hover flight. TC observed that nowadays these forces would be unacceptable for new helicopter designs.

---

3 Among others: TSB Aviation Investigation Reports A03O0012 and A05F0025 (Canada); ISBN: 978-11-098261-2 of the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (France); EW/c2004/10/05 of the Air Accidents Investigation Branch (United Kingdom); and ANC02FA029 of the National Transportation Safety Board (United States).

4 Transport Canada Report, 28 November 2003, AS350 Series, Hydraulics Off Handling Qualities, Preliminary Assessment.

5 Transport Canada Report, 08 March 2004, AS350 Series, Hydraulics Off Handling Qualities, Cold Weather Assessment.

6 Except for the addition of the tail rotor compensator, the hydraulic systems of the AS350 B2 and BA models are similar.

1.6.6.6.3 Rotorcraft flight manual

The helicopter's RFM, developed by Eurocopter contains sections on limits, procedures and performance requirements for safe use of the aircraft. The RFM approved by the Direction générale de l'aviation civile (DGAC) of France contains the following sections: 2 – Limitations, 3 – Emergency Procedures, 4 – Normal Procedures, 5.1 – Regulatory Performance Data, and RFM supplements. Full compliance with section 2 – Limitations is mandatory for Canadian-registered aircraft.

As in all RFMs, Eurocopter uses the terms CAUTION and NOTE to emphasize important or critical instructions for safe flight. Although not defined in the RFM, the warnings in the RFMs are usually codified as follows:

- WARNING means an operating procedure which could lead to injuries or loss of life if not followed correctly.
- CAUTION means an operating procedure, practice, etc. which could lead to equipment damage or loss if not adhered to strictly.
- NOTE means an operating procedure or condition worthy of mention.

The risk of heavy flight control feedback in the event of a hydraulic system failure is mentioned in sections 3 and 7 of the RFM, and in the RFM supplements:

Section 3 – Emergency Procedures, 3.2 – System Failure, subsection 4 – Hydraulic System Failures:

> 4.2 Main servo-control slide-valve seizure
>
> - Actuate the [HYD CUT OFF] switch, situated on the collective pitch control lever, to cut off hydraulic pressure. Load feedback will be felt immediately; load feedback may be heavy if the helicopter is flying at high speed:
> - collective pitch: 20 kg pitch increase load;
> - cyclic: 7 to 4 kg left-hand cyclic load;
> - cyclic: 2 to 4 kg forward cyclic load;
> - yaw pedals: practically no load in cruising flight.
> - Reduce speed to 60 knots (110 km/hr) and proceed as in the case of illumination of the HYD light.

Figure 5 is an excerpt from the procedure in case of illumination of the red HYD light (under Section 3 – Emergency Procedures, 3.3 – Warning-Caution-Advisory Panel and Aural Warning, subsection 2.1 – Red Lights).

Figure 5. Excerpt from the Rotorcraft Flight Manual's HYD light procedure

Light	Failure	Pilot action
HYD	loss of hydraulic pressure or Pressure <30 bars	Keep aircraft to a more or less level attitude. Avoid abrupt manoeuvres. CAUTION: DO NOT ATTEMPT TO CARRY OUT HOVER FLIGHT OR ANY LOW SPEED MANEUVER. THE INTENSITY AND DIRECTION OF THE CONTROL FEED-BACK FORCES WILL CHANGE RAPIDLY. THIS WILL RESULT IN EXCESSIVE PILOT WORKLOAD, POOR AIRCRAFT CONTROL, AND POSSIBLE LOSS OF CONTROL.

Approach and landing

Over a clear and flat area, make a flat final approach, nose into wind. Perform a no-hover/slow run-on landing around 10 knots. Do not hover or taxi without hydraulic pressure assistance.

Section 7 – Description and Systems, 4 – Abnormal Operations, states in part the following:

For loss of hydraulic pressure, at a speed between 40 and 60 knots, the lateral force required to push the cyclic stick to the left is about 4 dekanewtons (daN) (9 pounds). The logitudinal force required to push the cylic stick forward is about 5 daN (11 pounds).

During a no-hover landing at about 10 knots, the pilot could be faced with longitudinal forces of up to 17 daN (37 pounds) for less than 30 seconds with low lateral forces. If the helicopter is hovering, the control load forces change, in both direction and intensity, as the pilot attempts to maintain a steady position. The pilot will exert longitudinal and lateral forces of up to 5 daN (12 pounds), the direction of which could change quickly. This translates into excessive pilot workload and poor helicopter control.

For a failure other than a hydraulic system failure, the maximum forces a pilot should exert on the controls to maintain helicopter attitude are about 15 daN (33 pounds) on the left or right lateral cyclic and 17 daN (37 pounds) on the forward longitudinal cyclic.

1.6.6.7 Transverse flow

When a hovering helicopter begins the transition to level flight, the airflow differs depending on whether it occurs in front of or behind the rotor disk. In the case of the AS350, the rotor

rolls to the right. This results in increased lift and upward flapping in front of the disk, as well as decreased lift and downward flapping behind the disk. This phenomenon is known as transverse flow. The pilot must therefore compensate for this phenomenon by moving the cyclic stick to the left to limit roll.

1.6.6.8 Hydraulic pressure failure training

The RFM Supplement 7 (SUP.7), *Hydraulic Pressure Failure Training Procedures in Cruise Flight Conditions*, describes the procedure for hydraulic failure training in flight (Appendix C). SUP.7 states the measures that the flight instructor and pilot in training must take in the event the HYD light illuminates in order to comply with the emergency procedure set out in the RFM. No environmental limitation other than those stipulated in the RFM, section 2 – Limitations, is mentioned in SUP.7. Hydraulic failure training can be given without wind restriction and in temperatures as low as –40°C.

A hydraulic system failure is simulated in steady flight by activating, in sequential order, the HYD TEST and HYD CUT OFF switches. The training procedure consists of 2 steps:

- The transition between steady flight and the recommended safety speed (40 to 60 knots);
- The landing phase.

First, the flight instructor moves the HYD TEST switch to the TEST position and the pilot in training slows down to the recommended safety speed. The accumulator charge pressurizes the main rotor controls and gives the pilot in training enough time to reach the recommended safety speed. The first step of the training is completed when the flight is stable at a speed between 40 and 60 knots.

Second, when the helicopter is at a stable speed, the flight instructor repressurizes the hydraulic system and recharges the accumulators by placing the HYD TEST switch in the OFF position. The pilot in training then places the HYD CUT OFF switch in the OFF position, and continues flying the aircraft in manual mode. Having these 2 switches in that configuration allows the pilot to turn the hydraulic pressure assistance back on by placing the HYD CUT OFF switch in the ON position during the training drill, if necessary.

Over a clear and flat area, the pilot in training makes a flat final approach, nose into the wind,and performs a no-hover slow landing at about 10 knots. The manufacturer's procedures and warnings are clear and do not allow for any landings other than run-on.

The SUP.7 subsection that describes the procedure for the transition to landing phase notes the possibility, if necessary, of restoring hydraulic pressure during the drill by selecting the HYD CUT OFF switch to ON.

The aircraft's RFM was up to date and contained SUP.7, revision 1, but neither the company nor the flight instructor were aware of SUP.7's existence.

1.7 Meteorological information

According to the aviation routine weather report (METAR) for Sept-Îles, at the time of the accident, the conditions were as follows:

- calm winds;
- visibility 30 statute miles;
- few clouds at 2000 feet above ground level;
- temperature -21°C and dew point -30°C.

1.8 Aids to navigation

Not applicable.

1.9 Communications

The helicopter radio was operating normally. The aircraft reported no problem before the accident.

1.10 Airport information

The Sept-Îles Airport is certified, operated and maintained by TC. The airport has a flight service station (FSS) operated by NAV CANADA. Its reference altitude is 180 feet above sea level (asl). The airport has 2 runways: Runway 09/27 and Runway 13/31 (Figure 6). The elevation of the Runway 31 threshold is 173 feet asl. At the time of the occurrence, Runway 27 was the active runway.

Runway 13/31 had been closed since 31 January 2013. Its paved surface was covered with ice and patches of snow. Communications between the helicopter and the FSS revealed that the crew reported no problems and did not declare an emergency situation before or after the crash.

Figure 6. View of the Sept-Îles Airport (Source: Google Earth, with TSB annotations)

1.11 *Flight recorders*

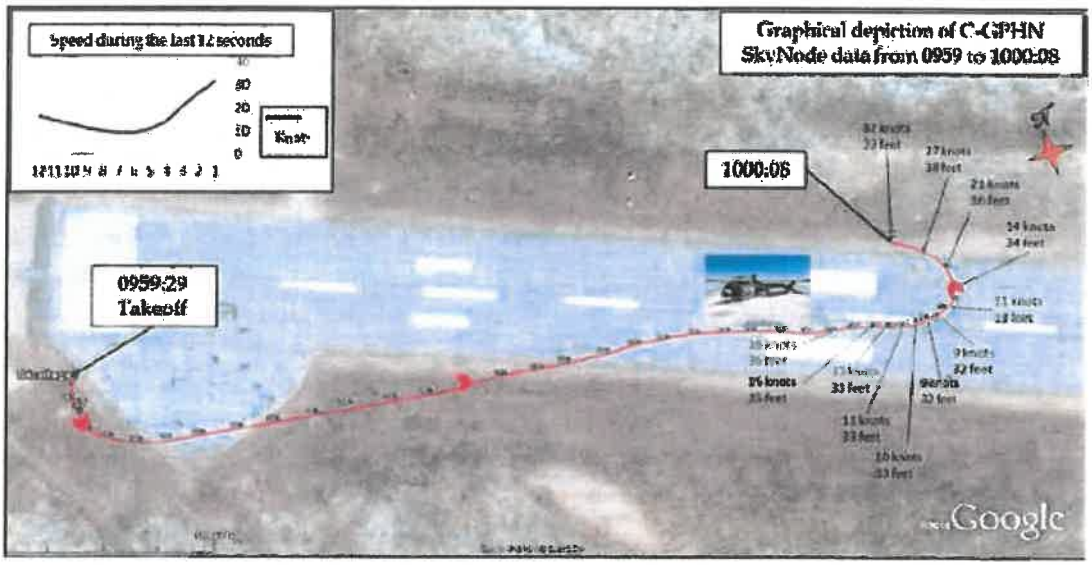
The helicopter was equipped with a SkyNode satellite tracking and data telemetry system.[7] The system records data from the global positioning system (GPS) that is part of the SkyNode module. The logged data include the time of the recording, geographical coordinates, altitude, groundspeed, aircraft direction, and the messages "Take Off h," "Landing h," "Pausing," and "Start Up."[8]

---

7 SkyNode, Model S200-011, manufactured by Latitude Technologies Corporation of Vancouver, British Columbia.

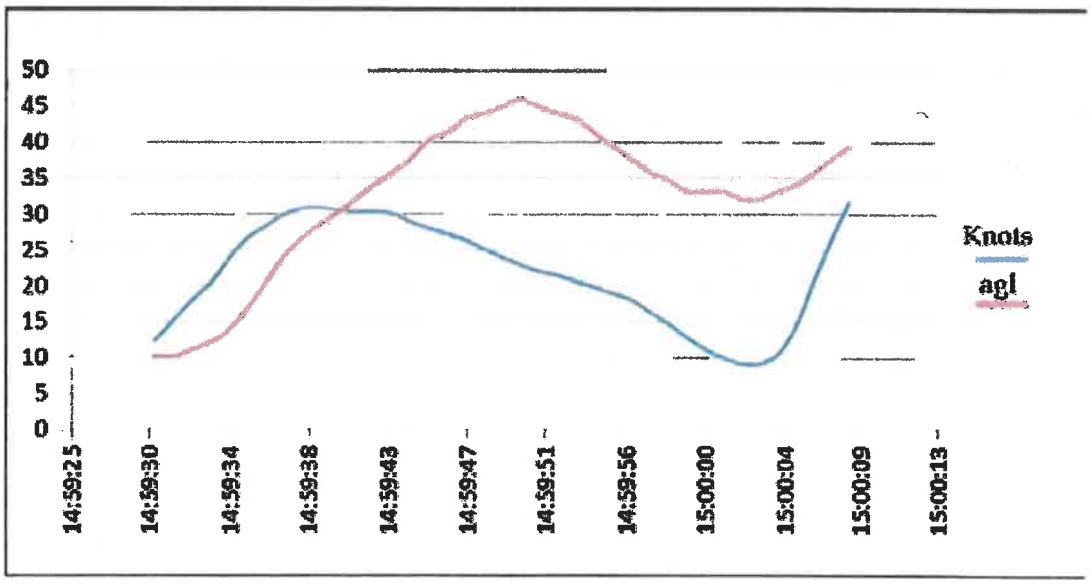
8 The "Take Off h" and "Landing h" messages appear when the GPS speed goes, respectively, above or below 5 knots. The "Pausing" message appears after extended hover flight. In "Pausing" mode, regular transmissions are stopped.

Figure 7. Flight path during last hydraulic failure drill (Source: Google Earth, with TSB annotations)



The SkyNode memory contained data from 1345:57 UTC[9] to 1500:08 UTC. The SkyNode recorded data every 2 minutes, except for the last 2 minutes of the flight when data were recorded every second. With these data, the approximate flight path could be reconstructed (Figure 7). The last recording indicates that the helicopter was 39 feet above ground level (agl) at a groundspeed of 32 knots (Figure 8).

Figure 8. Groundspeed and height of the aircraft before the crash



9 Coordinated Universal Time (Easteern Standard Time plus 5 hours).

1.12 *Wreckage and impact information*

1.12.1 *General*

The wreckage was sent to the TSB laboratory in Ottawa, Ontario, where it was examined in the presence of the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) of France, Eurocopter, and TC. The servoactuators, the hydraulic pump components, the pressure regulator, the accumulators and the hydraulic filter were removed from the aircraft for operating tests at Eurocopter Canada Ltd. in Fort Erie, Ontario, in the presence of the TSB, BEA, Eurocopter, and Héli-Excel. The following observations were made:

- the HYD TEST toggle switch was pushed forward and to the left in the TEST position (Figure 4);
- the HYD CUT OFF pushbutton at the end of the collective stick was set in the CUT OFF position;
- the damages (deformation, failure) observed during examination of the drivetrain were attributable to the accident;
- a continuity and integrity check of the drivetrain revealed that it was intact before the accident;
- no pre-impact deformation or failure was noted in the flight controls.

1.12.2 *Examination of hydraulic system harnesses and contacts*

The solenoid valves of the servoactuators were operating properly as a group and individually. Electrical continuity of the servoactuators was confirmed. The HYD TEST switch and the HYD CUT OFF switch were operating properly.

No anomaly was observed on the electrical components of the hydraulic system, i.e. the harnesses, contacts, solenoids and switches, that could have led to a malfunction at the time of the occurrence.

1.12.3 *Examination of the hydraulic reservoir and hydraulic fluid*

No water accumulation was found in the cone of the hydraulic reservoir cap. Analysis of the hydraulic fluid revealed no anomaly that could compromise the proper operation of the hydraulic system.

1.12.4 *Examination of the servoactuators*

The aircraft was equipped with 4 Dunlop servoactuators. The tests conducted at Eurocopter on the servoactuators, accumulators, solenoid valves, filter and hydraulic pump confirmed that they were functioning properly. However, deviations were noted between some test results and the values specified in the Component Maintenance Manual (CCM). According to Eurocopter, the deviations noted did not have an impact on the operation of these components and could possibly have been caused by the crash.

The servoactuators were then sent to Meggitt Control System[10] in Coventry, Great Britain, where they were examined and tested. The servoactuators were subjected to various tests which showed deviations from the design tolerance range. Three servoactuators exceeded the certification tolerances for extension speeds and 2 servoactuators exceeded the certification tolerances for retraction speeds. The 4 servoactuators operated under hydraulic pressure. According to Meggitt Control System, the test results were typical of servoactuators approaching the end of their operating time between overhauls.

The tests conducted at Eurocopter and Meggit Control System revealed no anomalies in manual mode.

1.12.5 Warning lights

Examination of the light bulb filaments of the warning lights in the annunciator panel revealed either localized or generalized stretching in the HYD, DOORS, F.FILT and M.G.B.T. lights. This stretching is typical of illuminated bulbs.[11]

Table 4. Warning lights with localized or generalized stretching

Warning light	Failure
HYD	Loss of hydraulic pressure or pressure < 30 bars
DOORS	1 or 2 lateral cargo doors open
F.FILT	Pre-blockage fuel filter
M.G.B.T.	Main gearbox, maximum oil temperature

The HYD light was illuminated before impact after the pilot in training pressed the HYD CUT OFF switch as part of the hydraulic failure drill. According to the information obtained, no other light was illuminated prior to impact with the ground. Since the engine continued to run after the accident, the warning system remained operational. It was therefore concluded that the DOORS, F.FILT and M.G.B.T. lights illuminated as a result of the damage caused by the accident.

1.12.6 Cockpit seats

During the occurrence, the 2 pilot seats were subjected to upward vertical forces, lateral forces to the left, and forward longitudinal forces. The right-hand seat separated from the floor, while the left-hand seat separated from its box. The lap belts remained attached to the floor and their straps and buckles were intact. The 2 seats failed in overload. The floor under the base of the left-hand seat was severely damaged, which caused the seat to separate from its box. At the time the aircraft was certified, the seats were designed to resist upward vertical acceleration of 1.5 *g*, downward vertical acceleration of 4.0 *g*, longitudinal acceleration of 4.0 *g*, and lateral acceleration of 2.0 *g*.[12]

---

10 Dunlop-approved centre for servoactuator overhauls.

11 TSB Laboratory Report LP053/2013 - GPS Analysis.

12 United States *Federal Aviation Regulation* (FAR) 27.561 amendment 10.

The resistance standards have since changed. Seats must now resist upward vertical acceleration of 4.0 *g*, downward vertical acceleration of 20.0 *g*, forward longitudinal acceleration of 16.0 *g*, rear longitudinal acceleration of 1.5 *g*, and lateral acceleration of 8.0 *g*.

Airbus Helicopters, the holder of the type certificate, issued a service bulletin (SB 25.00.57) that suggests installing pilot and co-pilot seats with an improved structural design that complies with the new certification requirements.

1.13 *Medical and pathological information*

Not applicable.

1.14 *Fire*

There was no fire.

1.15 *Survival aspects*

1.15.1 General

After the crash, the aircraft came to rest on its left side, and the 2 front seats failed in overload. The 2 pilots in these seats were unconscious. The pilot in the left-hand seat was leaning on the pilot in the right-hand seat. The pilot observer seated in the back unbuckled his seat belt and exited the aircraft through the large hole formed in the roof of the cabin. Once outside the aircraft, he noted that the other 2 pilots were lying motionless in the wreckage and that the engine was still running. He also noticed a large fuel spill. He returned to the aircraft and first had to remove the 2 pilots from their seats to gain access to the fuel shut-off lever. He dragged the pilots, whose clothes were soaked with fuel, several metres away from the wreckage. After shutting off the engine, he administered first aid to the pilots, who regained consciousness a few minutes later. The 3 pilots sustained injuries to the head and face. None of them was wearing a helmet, nor were they required to do so by regulations.

1.15.2 Helmet

Although the CARs do not require helicopter pilots to wear a helmet, the TSB has documented a number of cases where wearing a helmet would likely have reduced or prevented pilot injuries. On 30 October 2009, the TSB issued Aviation Safety Advisory A09A0016-D2-A1 – *Low Usage of Head Protection by Helicopter Pilots*, emphasizing that without ongoing and clear communication promoting the benefits of using head protection, helicopter pilots will continue to operate without a helmet, increasing the risk of head injury and consequent inability to provide necessary assistance to crew or passengers.

1.15.3 Emergency services

The Sept-Îles Airport does not provide aircraft rescue and firefighting (ARFF) services.[13] The fire department of the city of Sept-Îles provides firefighting services in the event of an accident or incident at the airport. Response time is at least 15 minutes. Fires in the city of Sept-Îles have priority.

The crash site was more than 4000 feet away from active Runway 09/27. The airport remained open after the accident, meaning that aircraft could take off and land.

1.15.4 Emergency locator transmitter

The aircraft was equipped with a KANNAD emergency locator transmitter (ELT), model 406AF-COMPACT, serial number 259637, that can broadcast on frequencies 121.5 MHz and 406 MHz. The ELT was not damaged and it activated following the impact.

1.15.5 Emergency response plan of the Sept-Îles Airport operator

The operator of an airport must develop and maintain an emergency response plan.[14] In 2000, the Sept-Îles Airport operator adopted an emergency response plan identifying the roles and responsibilities of each responder in the event of, among other things, an aircraft accident at the airport.

In the event of an accident at the airport, the FSS immediately contacts the CAUREQ (Centre d'appel d'urgence des régions de l'Est du Québec) by dialling 911. The CAUREQ notifies the fire department, the Sûreté du Québec (SQ) and ambulance services, which in turn notify the Sept-Îles Health and Social Services Centre, the hospital, and lastly, the airport manager or duty manager.

The airport manager or duty manager, who is not necessarily present at the airport, immediately heads to the emergency operations centre (EOC) and notifies the relevant response units. The EOC, where representatives of the response units gather, contains communication, information and recording equipment and becomes the communications centre (Photo 1). The responders use various radio frequencies to communicate with each other. The EOC also remotely controls gate 7, located between the terminal and the airport multi-purpose building.[15] In an emergency, the gate is identified by a flashing red light, and the SQ controls its access. To ensure that the EOC is opened as quickly as possible, the airport operator had provided some first responders with a key to the premises. However, at the time of the occurrence, some of them either did not know they had a key or had lost it.

---

13 Since the total number of enplaned and deplaned passengers does not exceed 180 000 per year, the Sept-Îles Airport is not required to provide aircraft rescue and firefighting (ARFF) services (Subpart 303 of the *Canadian Aviation Regulations*).

14 *Canadian Aviation Regulations* (CARs) 302.202 - Airport Emergency Response Plan.

15 Gate 7 is the meeting point for response units heading to an accident site.

The airport manager or duty manager is responsible for, among other things, coordinating activities in the EOC and providing any assistance required by the operations commander at the accident site. He is also responsible for managing the airport during the emergency and making decisions concerning its operation.

Photo 1. View of Sept-Îles Airport's emergency operations centre

The airside is protected by a security fence and access is mainly controlled by 2 magnetic-card activated gates. The distribution of these magnetic cards is controlled. Users are NAV CANADA and TC personnel, as well as others who have an airside vehicle operator's permit (AVOP).

Airside driving is regulated by AVOP standards, and persons without an AVOP must be escorted.

1.15.6 Emergency response

At 1000, the NAV CANADA FSS specialist on duty[16] observed the aircraft strike the ground; he did not receive any distress call from the helicopter either before or after the impact. He immediately dialled 911 and reported the accident to the CAUREQ, which alerted the fire department, SQ and ambulance services, but did not inform airport officials of the emergency situation.

Given that the crash site was more than 4000 feet away from the active runway, Runway 09/27, the airport remained open after the accident, meaning that aircraft were able to continue taking off and landing during the emergency response.

At 1005, by telephone,[17] the FSS dispatched to the accident site an ambulance, which was on the apron for a medical evacuation.

Between 1006 and 1015, 2 SQ vehicles, 2 ambulances, and Sept-Îles fire department officials arrived at gate 7. The SQ officer in charge went to the FSS tower to coordinate the activities of the ground crews.

---

16 There was only 1 flight service specialist on duty at the time of the crash.

17 Ambulances do not have radio equipment to communicate with the flight service station.

Around 1015, an employee from a medical carrier opened gate 7. The responders' vehicles immediately started driving on Runway 09/27 unescorted and without authorization or means of communicating with the FSS. They believed the airport was closed to air traffic. Once they were on the runway, the responders became disoriented; although they could see the wreckage and the ambulance, they did not know how to reach them. Meanwhile, a de Havilland DHC-8, operated by Air Canada Express, was making its final approach for the runway and had to pull up after being notified by the FSS specialist of a runway incursion.

At 1028, 2 fire trucks from the Sept-Îles fire department and the airport fire truck arrived at the accident site. At 1031, the 2 pilots who had been sitting in the front seats were en route to the hospital. At 1037, the airport duty manager was notified of the accident by the airfield supervisor. He arrived at the crash site at 1045. At 1145, the duty manager opened the EOC and activated the emergency response plan. At 1249, the emergency response ended and the EOC was closed.

1.15.7 Post-occurrence debriefing meeting

The responders held 2 debriefings after the accident. During these meetings, they identified the following irregularities in relation to the emergency response plan:

- The first responders did not have their keys to access the EOC.
- The CAUREQ did not inform the airport manager or the duty manager of the emergency.
- The EOC was opened 1 hour and 45 minutes after the accident.
- A responder opened gate 7 without authorization.
- Response vehicles drove unescorted in the airport's manoeuvring areas and without authorization or means of communicating with the FSS.

1.15.8 Emergency drill at the Sept-Îles Airport

The Sept-Îles Airport must test its emergency response plan by conducting full-scale drills at least every 4 years.[18] In addition, the airport operator must hold table-top exercises every year that full-scale drills are not held.

The last full-scale drill held at the Sept-Îles Airport before the accident was conducted on 09 October 2008. The drill consisted of a simulated aircraft crash at the airport. Based on the minutes of the debriefing, the results of the drill were generally satisfactory.

However, the very nature of an emergency drill is such that some shortcomings are always identified. The presence of a large number of responders in the FSS tower impeded the specialist's work. It was also found that there was insufficient personnel at gate 7 to escort responders to the accident site.

---

18 *Canadian Aviation Regulations* (CARs) 302.208 - Testing of the Emergency Plan.

1.16 Tests and research

1.16.1 TSB laboratory reports

The TSB completed the following laboratory reports in support of this investigation:

- LP022/2013 – Download of SkyNode Transmitter
- LP032/2013 – Seat Examination
- LP035/2013 – Hydraulic System Examination
- LP052/2013 – Flight Path Analysis
- LP053/2013 – GPS Analysis

1.17 Organizational and management information

1.17.1 General

Héli-Excel holds a valid operating certificate and its base is located about 7 nautical miles (nm) northwest of the Sept-Îles Airport. At the time of the accident, Héli-Excel operated a fleet of 20 helicopters, comprising Bell 205, Bell 206, Bell 206L, Bell 214B-1, Eurocopter AS350 B, BA,B2, D, and Eurocopter AS355-F. These aircraft are operated according to Subparts 2 and 3 of Part VII of the CARs. The occurrence flight was operated under Subpart 3, Air Taxi Operations.

Héli-Excel uses a safety management system (SMS), although it is not required to do so by the CARs. The program validation inspection (PVI) conducted by TC in February 2010 found no non-compliance with any operational control aspect since Héli-Excel met all the measurement criteria. In fact, the company earned a high score because it met 5 of the 8 criteria required for a perfect score.

1.17.2 Flight instructor training

At the time of the accident, the company provided pilot training. The chief pilot[19] and 2 flight instructors reporting to him were delivering annual type training and specialized training in accordance with the company's training program.[20]

Flight instructors were not required to have an instructor's rating. They were, however, required to hold a commercial pilot licence and be type-endorsed for AS350 to provide flight instruction. As stipulated in the CARs, they also had to show that they knew the content of the helicopter's RFM, of the company check pilot manual, and of the company's operations and training manuals.

---

19 The chief pilot was responsible for developing and implementing all the training programs required for the air operator's flight crews.

20 Héli-Excel operations manual, Partie 8 – Formation.

The flight instructors' training and qualifications were in accordance with the CARs,[21] and Héli-Excel had not set requirements other than those in the CARs.

The company selected flight instructor candidates on the basis of their experience and flight skills. The chief pilot then reviewed the aircraft's in-flight emergency procedures with them. The candidates were appointed flight instructors after demonstrating their ability to correctly execute the procedures in the aircraft's RFM.

Together with the chief pilot, the flight instructors were responsible for implementing and promoting the flying standards and techniques that flight crews must follow during operational flights and with which compliance must be shown during initial and periodic checks. They were also responsible for delivering flight training to all flight crews, in accordance with the training program approved for the type of assigned aircraft.[22]

The company encouraged its pilots in training to observe the training drills of other pilots on board the aircraft. This practice was considered helpful to the pilots' learning since it allowed them to observe first-hand normal, abnormal and emergency procedures being carried out. According to TC, this practice contravened the CARs,[23] which stipulate that only individuals essential to the flight can be on board during a training flight. Since the occurrence, the company no longer authorizes pilots, other than the flight instructor and pilot in training, to be on board an aircraft during a training flight.

1.17.3 Héli-Excel Pilot Training on AS350

According to the company's operations manual, the purpose of technical ground training and flight training is to teach the crew about the aircraft's systems and the procedures to follow in normal, abnormal and emergency situations. In this occurrence, the pilot in training had just completed his technical ground training on the AS350 and knew the procedure for hydraulic failure as well as the risks associated with flying without hydraulic pressure assistance.

1.17.4 Héli-Excel's hydraulic failure training

The company was not aware that Eurocopter had published a flight training procedure for hydraulic pressure loss which could be found in SUP.7. The company's training procedure was in fact similar to and complied with the one in SUP.7, except that flight instructors did not know that pressurizing the hydraulic system was permitted in flight. Some pilots reported that they believed that pressurizing the hydraulic system in flight, coupled with the inherent instability of a helicopter and the forces on the controls, would lead to a loss of control as a result of excessive corrections.

---

21 *Canadian Aviation Regulations* (CARs), Standard 723 – Air Taxi – Helicopters.

22 Héli-Excel operations manual.

23 *Canadian Aviation Regulations* (CARs) 703.26 states as follows: "No person shall, where passengers are on board an aircraft, simulate emergency situations that could affect the flight characteristics of the aircraft."

When a pilot in training was unable land because of difficulty controlling the aircraft, the company expected the flight instructor to take over the controls and land the aircraft. If landing was impossible, the flight instructor was to pull up and reach safety speed before completing a pattern and landing without hydraulic pressure assistance.

With regards to loss of hydraulic pressure training, the investigation found minor procedural differences among companies and in relation to SUP.7. At one large AS350 operator, the hydraulic failure drill always begins halfway through the downwind pattern and invariably ends with a landing. After landing, the hydraulic system is repressurized before conducting the drill again. As well, the manipulation sequence differs from the procedure described in SUP.7; after pressing the HYD TEST pushbutton, the pilot in training pushes the HYD CUT OFF switch before restoring pressure with the HYD TEST button. Flight instructors find that this method more closely simulates a real-life hydraulic failure than the one suggested in SUP.7. However, activating the HYD CUT OFF switch before restoring pressure in the hydraulic system using the HYD TEST button does not recharge the tail rotor accumulator on a helicopter equipped with a compensator.

The investigation also revealed that some flight instructors were not fully aware of the risks associated with manoeuvres at low altitude and in hover without hydraulic pressure assistance. Flight instructors tend to believe that loss of control incidents stem from mechanical anomalies rather than from the handling characteristics of the AS350.

1.17.5 Flight instructor's experience with hydraulic failure

During his career, both as a pilot and as an instructor, the flight instructor had always encountered manageable forces during hydraulic failure drills. Moreover, during their hydraulic failure training, pilots trained on the earlier models of the AS350[24] experienced less feedback loads than those generated by later models because the earlier models had lighter rotor feedback loads.

1.18 Additional information

Not applicable.

1.19 Useful or effective investigation techniques

Not applicable.

---

24 Eurocopter AS350 B and D.

2.0 *Analysis*

2.1 *The aircraft*

Neither the examination of the aircraft and its hydraulic components nor servoactuator tests revealed any anomaly that could have contributed to the loss of control of the helicopter. As previously stated, the hydraulic system functioned normally during the flight. Nothing indicates that the helicopter malfunctioned or that a failure occurred in flight.

2.2 *Centre console*

The HYD TEST switch was not equipped with a protection mechanism. The switch was found pushed up and to the left in the TEST position. The 2 switches located diagonally on the second and third rows of the centre console were also pushed up and to the left (Figure 4). It was concluded that the 3 switches were pushed in the direction of impact, probably when the pilot in training hit the centre console. If the HYD TEST switch is not equipped with a protection mechanism, there is an increased risk of unintentional operation, which can cause the hydraulic system to depressurize.

In May 2005, the original Honeywell pushbutton centre console was replaced with a toggle switch console from Aeronautical Accessories, Inc. as per supplemental type certification (STC) No. SR00825NY-D. When the new console was installed, the HYD TEST switch was not required to be fitted with a protection flap. Following events that led to hydraulic system failure and control difficulties due to accidental operation of the hydraulic test switch, Transport Canada (TC) issued an airworthiness directive (AD)[25] in September 2007 that made the installation of a protection flap on the HYD TEST switch mandatory in order to prevent accidental operation. However, the AD applied only to AS350 helicopters equipped with Honeywell consoles. Thus the HYD TEST toggle switch on C-GPHN was not equipped with a protection flap nor was it required to be.

Nonetheless, the intended purpose of the AD was to prevent the unintentional deactivation of the hydraulic system. Given the serious risks involved in such a situation, it is reasonable to think that all HYD TEST switches should be fitted with a protection flap or mechanism to prevent unintentional operation. In this instance, Aeronautical Accessories, Inc. published Aircraft Service Bulletin No. AA-13062 in December 2013 providing instructions for the replacement of the existing HYD TEST toggle switch with a "pull-to-unlock" design. Aeronautical Accessories, Inc. states that the bulletin must be complied with no later than 30 June 2014. However, in Canada, compliance with aircraft service bulletins is not mandatory for private aircraft. According to the information obtained during the investigation, TC is contemplating issuing an airworthiness directive in this regard, making a protection mechanism mandatory for the HYD TEST button on all centre console models.

---

25 Airworthiness Directive No. CF-2007-19.

Although this accident was not caused by the unintentional operation of the HYD TEST switch, if TC's airworthiness directive requiring a protection flap on the HYD TEST switch does not apply to all centre console models, there is a risk that AS350s will be equipped with a HYD TEST switch that can be unintentionally activated.

2.3 *History of the flight*

The flight instructor followed a procedure similar to the one described in the rotorcraft flight manual (RFM) Supplement 7 (SUP.7) at the beginning of the first hydraulic failure drill. He placed the HYD TEST switch in the TEST position; the horn sounded, the HYD warning light illuminated, and the servoactuators remained pressurized. The flight instructor then waited for the pilot in training to reach the safety speed range before placing the HYD TEST switch back to the OFF position; the HYD light extinguished, and the horn stopped. It can therefore be concluded that, at this stage of the training flight, the hydraulic system functioned as intended and that the drill was conducted in accordance with the directives in SUP.7.

The pilot in training then placed the HYD CUT OFF switch in the OFF position. At that point, the controls stiffened, the HYD light illuminated and the horn remained silent. Since the flight controls were no longer being assisted by the hydraulic system, the flight continued in manual mode. The pilot in training began an approach to the threshold of Runway 13. He had to transition slowly from the recommended safety speed to touchdown at about 10 knots without hovering. Since the loads on the flight controls were manageable and there was no unbalanced force that could result from asymmetric residual pressure in the accumulators, it can also be concluded that the HYD CUT OFF switch functioned properly.

The aircraft arrived at the chosen landing area without incident. However, once close to the ground, the pilot in training, who was not familiar with the handling characteristics of the AS350, was unable to control the aircraft sufficiently to carry out a safe landing. The fact that the SkyNode system did not record a "Landing h" message seems to indicate that the aircraft was flying at a speed over 5 knots. However, the reduction in the helicopter's speed in anticipation of landing very likely increased the control forces, which the pilot in training was unable to control completely. The flight instructor had to take back the controls and initiate pull-up. The operation of the helicopter and the pilot's workload were consistent with the description in the RFM regarding helicopter operation in case of hydraulic failure. This therefore leads to the conclusion that the aircraft behaved normally in the absence of hydraulic pressure assistance.

The drill deviated from the recommended procedure[26] when the flight instructor took over the controls. Without hydraulic pressure assistance, he flew a first low-altitude tight pattern, culminating in a landing. On the ground, with a red warning light illuminated on the instrument panel, he took off in manual mode, flew a second pattern and then handed the controls to the pilot in training. Finally, he took back the controls when he saw that the pilot

---

26 Flight Manual Supplement 7 (SUP.7) warns pilots that they could lose control of an aircraft in hover and in low-speed manoeuvres without hydraulic assistance.

in training was unable to stop the aircraft on the ground, and he flew another low-altitude tight pattern during which he lost control of the helicopter.

The aircraft slowed to 9 knots 6 seconds before the pilot lost control. According to flight tests by TC, the control forces at that moment must have exerted pressure toward the right and aft, thereby pushing the cyclic stick into the palm of the flight instructor's hand. The pilot therefore had to counter these forces by pushing the cyclic stick forward and to the left.

The marks from the impact and the data from the SkyNode system show that the loss of control occurred while the helicopter was slightly north of the runway, at about 35 feet above ground level (agl), and flying at a ground speed of 32 knots (Figure 8). Since the aircraft was not aligned with the runway centreline, the pilot in training was probably applying additional pressure, moving the cyclic stick to the left, in order to reach the landing area at the end of the runway.

The sudden movement of the cyclic stick forward and to the left occurred while the helicopter was accelerating from 9 to 32 knots and was not aligned with the landing point. Thus, the sudden change in direction of the aerodynamic feedback forces generated by the rotor head caused the cyclic stick to move in the direction of the forces exerted by the flight instructor and out of the palm of his hand.

The quick change in intensity and direction of the control forces, which is characteristic of the AS350 without hydraulic pressure assistance and flying at low speed, combined with the transverse flow effect, probably caused the cyclic stick to unexpectedly move forward and to the left. The lateral roll of the rotor disk to the left when the helicopter was accelerating from 9 to 32 knots caused the cyclic stick to move in the same direction. The suddenness of the movement took the flight instructor by surprise, preventing him from reacting in a timely manner. Since the aircraft was flying at less than 39 feet agl, or a distance almost equivalent to the diameter of the rotor disk, the severe rollover of the helicopter gave the flight instructor little opportunity of leveling off before the blades struck the runway.

2.4 *Training provided by the flight instructor*

The flight instructor flew 3 patterns and 2 takeoffs without hydraulic pressure assistance despite the CAUTION in the RFM. Training staff must be aware of the importance of following the instructions in the aircraft's RFM. The flight instructor is in a position to eliminate incorrect, dangerous or illegal habits. In this occurrence, the flight instructor set a negative example for the 2 pilots in training. Training that does not follow the approved procedure is detrimental to pilots in training in that it deprives them of a contextual experience to manage an emergency situation.

2.5 *Training procedure for hydraulic failure*

2.5.1 *General*

The flight instructor did not encounter an unusual critical emergency because the flight without hydraulic pressure took place during a training flight. Although the sudden movement of the cyclic stick from right to left took him by surprise and caught him off guard, the flight instructor should have expected it to happen as this phenomenon is symptomatic of loss of hydraulic pressure and documented in the RFM.

On this topic, the RFM contains 5 warnings about the risks associated with heavy control feedback, during hover and low-speed manoeuvres. It seems that despite these warnings, the flight instructor had inadequate knowledge of the hydraulics-off handling characteristics of this AS350 model. Moreover, other flight instructors seem to be under the impression that they could overcome the loads exerted by the main rotor on the controls.

2.5.2 *Flight instructor's experience with hydraulic failure*

Because of the lighter rotor feedback loads they encountered during their hydraulic failure drills, pilots trained on earlier models of the AS350 experienced less feedback loads than those generated by later models. The flight instructor had always encountered manageable forces during hydraulic failure drills. Consequently, his previous flight experience might have prompted him to not fully follow the procedure for hydraulic failure and to fly at low speed near the ground without hydraulic pressure assistance.

Pilots trained on the earlier AS350 models, equipped with a rotor system that generated lighter loads, might expect to experience less feedback loads than those generated by later models. Consequently, there is a risk that pilots will wrongly assume that they could overcome the feedback loads of newer models.

2.5.3 *AS350 rotorcraft flight manual*

Although the RFM officially cautions against the dangers of low-speed and hover flight without hydraulic pressure, it seems that not all of the pilots were aware of the pressing nature of this warning. The presentation of this information in the RFM could negatively affect pilot perception of the aircraft's handling characteristics. The only forces indicated in the approved RFM[27] in case of hydraulic failure are 2 to 7 kg for the cyclic stick, and 20 kg for the collective stick. Yet the part[28] of the RFM that is not approved states forces of 15 to 17 kg for the cyclic stick in case of hydraulic failure.

Although the warning in the emergency procedure stresses that the feedback forces could lead to loss of control, it does not quantify the intensity of these forces. The lack of specific information regarding the intensity of the feedback forces could lead pilots to assume that

---

27 Eurocopter, *AS350 Rotorcraft Flight Manual*, Section 3 – Emergency Procedures, Paragraph 4 – Hydraulic System Failures.

28 Eurocopter, *AS350 Rotorcraft Flight Manual*, Section 7 – Description and Systems.

they would encounter much lighter forces than in reality. Therefore, pilots might believe that they could overcome the control feedback forces.

2.5.4 *Rotorcraft flight manual typography*

The typography used in RFMs essentially follows somewhat codified conventions, with differences and variations found in the finer points. Although there is no hard and fast rule on warnings, there is consensus on their objective, namely, that they should stand out and emphasize the importance of the message. In the case of the warning in the RFM, its wording does not suggest that the instructions are critical to occupant safety and its formatting does not highlight the safety alert. Given that there is a risk not only of material damage but also bodily injury if the instructions are not followed, pilots could expect the warning to immediately catch their eye and to read WARNING instead of CAUTION.

If the wording of the warning in the emergency procedure for hydraulic failure and the procedure for hydraulic failure training does not comply with the generally accepted standard for flight manual (RFM) typography, there is a risk that the warning may not be heeded.

Past experience and the interpretation of the RFM might lead pilots to believe that they can control the aircraft at any stage of flight without hydraulic pressure assistance, without factoring in the unpredictable nature of flight control loads.

2.5.5 *Rotorcraft flight manual Supplement 7*

Héli-Excel's in-flight training on the AS350 is based on the aircraft's RFM. This means that, to the extent possible, pilots must respect the limits and procedures set out in the approved sections of the RFM, including SUP.7. Nonetheless, the company's flight instructors did not follow SUP.7 when training pilots during a hydraulic failure simulation. It was determined that pilots and instructors, including the occurrence instructor, were unaware that Eurocopter had published a specific procedure for hydraulic failure training.

It goes without saying that pilots must be familiar with the content of the RFM and particularly with the approved sections. Flight supplements are usually published to set out the limits, procedures and performance of a specific piece of helicopter equipment, but SUP.7 was an exceptional RFM supplement published in response to accidents resulting from hydraulic failures. Since pilots do not usually refer to flight manual supplements for training procedures, SUP.7 could go unnoticed.

The directives in SUP.7 are consistent with the recommended hydraulic failure procedure in the RFM. Although SUP.7 is based on the hydraulic failure procedure, the RFM does not indicate in section 3 – Emergency Procedures, that a training procedure was developed specifically for this type of emergency. In the absence of such a reference, flight instructors might not refer to SUP.7. If the procedures set out in SUP.7 are not followed during hydraulic failure training, there is a risk of loss of control of the aircraft.

2.5.6 *Hydraulic failure training procedure*

For lightweight helicopters, although loss of hydraulic pressure is an urgent situation, it is not critical. In the case of the AS350, when hovering in manual mode, the flight control forces are very high and unstable, and only marginally acceptable.[29] Hence the importance of following the instructions for a hydraulics-off flight to the letter.

To avoid encountering such forces, the pilot must make a flat approach, nose into the wind, and progressively reduce the aircraft's speed to perform a no-hover, slow run-on landing at about 10 knots. Nonetheless, in a training situation, it is realistic to expect some deviation from the recommended procedure. Sometimes a pilot in training who is not familiar with the handling characteristics of the AS350 might fly outside the recommended safety speed range and experience difficulty controlling the aircraft as a result of the feedback forces.

Although the NOTE in the Transition to landing section of SUP.7 mentions the possibility of restoring hydraulic pressure[30] during the drill if necessary, there is no specific directive aimed at the flight instructor in case of deviation from the recommended flight profile. If pilots do not know the content of SUP.7 and in the absence of a pre-hydraulic failure drill briefing, there is a risk that pilots will not be able to restore hydraulic pressure while applying considerable forces on the flight controls. Consequently, the flight instructor might inadvertently opt for a hazardous flight profile. This is all the more likely since the method to take over and hand back the controls is further complicated by the absence of a HYD CUT OFF button on the flight instructor's collective stick.[31] Since only the pilot in training can switch the flight from manual to hydraulic-assisted mode, lack of clear instructions can make coordination between the 2 pilots difficult.

In the absence of a strict framework, pilots might hesitate to restore hydraulic pressure while applying considerable forces on the flight controls. Nonetheless, the pilot could not have restored hydraulic pressure even if he wanted to do so since there was no HYD CUT OFF button on his collective stick. Moreover, the proximity to the ground when the aircraft rolled over most likely meant that the pilot in training did not have enough time to coordinate to restore hydraulic pressure.

2.6 *Survival aspects*

2.6.1 *Evacuation of the aircraft*

Given that the helicopter struck the ground in a nose-down attitude with a left bank angle of almost 100°, the front of the cockpit was heavily damaged and so severely deformed that it changed the space and structure that housed the 2 pilots. Apparently, the impact load did not exceed the limits of human tolerance. Since the front seats separated from their anchors, partly compromising the effectiveness of their seat belts, the 2 pilots hit their heads and faces

---

29 Report of a flight test conducted in November 2003 by Transport Canada.

30 Hydraulic pressure is restored by deactivating the HYD CUT OFF switch.

31 The flight instructor sits in the left-hand seat.

on the instrument panel before they lost consciousness. Helmets probably would have reduced the severity of their head injuries as well as the risk of losing consciousness. As they were unconscious, the 2 pilots were unable to evacuate or help evacuate the aircraft. Helicopter pilots who do not wear helmets are at an increased risk of incapacitation, serious injuries or loss of life in the event of an accident.

2.6.2 *Actions of the pilot observer*

The pilot observer extracted the unconscious pilots from the cockpit and dragged them a safe distance away from the wreckage. He then returned to the helicopter to shut off the engine. The pilot observer's quick reaction and knowledge of the aircraft reduced the risk of fire and more serious injury.

2.6.3 *Presence of the pilot observer on board*

The pilot observer's presence on board during the training flight was against existing regulations. Although training flights are structured with a view to minimizing risk, simulated emergency situations such as autorotations, hydraulic failures and tail rotor failures, by their very nature, entail a greater risk of accident. While a pilot in training can certainly benefit from observing his colleagues during a training flight, the fact is that a pilot observer is not essential to the flight and is exposed to a risk, albeit low, of accident.

2.6.4 *Cockpit seats*

According to the design documents, the cockpit seats complied with the standards in effect at the time the aircraft was certified. Load resistance requirements have since changed. The investigation could not determine the maximum accelerating forces reached during the accident. Consequently, it could not be determined whether seats constructed according to current standards would have lessened the impact loads and the injuries.

2.6.5 *Emergency services*

Emergency services were quickly notified because the crash occurred in broad daylight with good visibility and was witnessed by the flight service station (FSS) specialist, who promptly called 911, as he was supposed to do. He then dispatched to the accident site an ambulance that was awaiting a medevac flight on the apron. By clearly and accurately reporting the accident and its location, the actions of the FSS specialist were consistent with the airport's emergency response plan. As a result, the occupants of the helicopter were attended to by health professionals as soon as possible.

2.6.6 *Emergency response*

The success of an emergency response depends in large part on the effective use of all available resources at the time of the emergency. Effective coordination between the first responders is all the more important when an airport does not have its own aircraft rescue

and firefighting services.[32] Since external emergency response crews are typically unfamiliar with airport operations, it is vital that they know their roles, responsibilities and duties in an airport setting.

The emergency response was not carried out according to the airport's emergency response plan and compromised air safety. The deficiencies in the response did not, however, affect the survivability and health of the helicopter's occupants.

According to the emergency response plan, the coordination of responders must be done from the emergency operations centre (EOC), under the supervision of the airport manager or airport duty manager. Therefore, the presence of the airport manager on site was crucial to the smooth conduct of the emergency response as he had to coordinate the activities from the EOC, manage the airport, and make decisions regarding its partial or total closure and reopening. The 911 emergency service did not inform the airport manager of the helicopter crash.

Since the accident occurred on a Sunday, the airport manager was not at the airport. Therefore, he could not put the EOC into operation, and no decision was made regarding the airport's operations.

The EOC was only opened at the very end of the emergency because the other responders either did not know they had the key to the premises or had lost it. Because the airport manager was not on site and the EOC was not opened, there was a lack of coordination between the airport operator and the external emergency response units; consequently, emergency vehicles drove on the active runway with no means of communicating with the FSS, while a transport aircraft was on final approach. Such a situation could have serious consequences in poor weather conditions or darkness. Moreover, in the event of a more serious accident, such a situation could greatly delay the emergency response, with serious consequences for the survivability and health of the occupants on board the occurrence aircraft.

When emergency vehicles drive on an active runway without coordination between the airport operator and emergency response units, and with no means of communicating with the FSS, there is a risk of collision on the runway.

These errors and omissions stem from the fact that several key responders did not know their roles, responsibilities and duties as described in the airport's emergency response plan.

- Airport management was not notified by 911.
- An emergency response unit did not know that it had a key to open the EOC.
- An emergency response unit could not find its key to open the EOC.
- An emergency responder opened the gate, giving the emergency vehicles access to the manoeuvring area without coordinating with the airport authority.

---

32 The Sept-Îles Airport does not have its own aircraft rescue and firefighting services.

- The vehicles of 2 emergency response units drove on the manoeuvring areas unescorted and without authorization.

The emergency response plan assumes that any emergency response will be coordinated by airport management. Emergency drills were therefore always conducted with an airport coordinator. Consequently, the emergency response units were ill prepared to act without the EOC. Regardless, the emergency drills failed to instill in the first responders the basic principles of driving on the manoeuvring areas of an airport.

If the basic principles of driving on the manoeuvring areas of an airport are not instilled in first responders during emergency drills, there is a risk of incursion on an active runway.

3.0 *Findings*

3.1 *Findings as to causes and contributing factors*

1. The flight instructor did not follow the approved procedure as he flew 3 patterns and initiated 2 takeoffs without hydraulic pressure assistance. The helicopter's flight profile deviated from the flight profile recommended by the aircraft manufacturer when the hydraulic system is depressurized. As a result, the flight instructor encountered heavy, unpredictable flight control feedback forces.

2. The left collective stick does not have a HYD CUT OFF button. The flight instructor was therefore unable to restore hydraulic pressure.

3. The nose of the helicopter pitched down in a steep left bank at an altitude that made it impossible for the flight instructor to regain control of the aircraft before it struck the ground.

3.2 *Findings as to risk*

1. If the HYD TEST switch is not equipped with a protection mechanism, there is a greater risk of unintentional operation, which can cause the hydraulic system to depressurize.

2. If Transport Canada's airworthiness directive requiring a protection flap on the HYD TEST switch does not apply to all centre consoles, there is a risk that AS350s will be equipped with a HYD TEST switch that can be unintentionally activated.

3. If the wording of the warning in the emergency procedure for hydraulic failure and the procedure for hydraulic failure training does not comply with the generally accepted standard for rotorcraft flight manual typography, there is a risk that the warning might not be heeded.

4. If the procedures set out in the rotorcraft flight manual Supplement 7 are not followed during hydraulic failure training, there is a risk of loss of control of the aircraft.

5. If pilots do not know the content of the rotorcraft flight manual Supplement 7 and in the absence of a pre-hydraulic failure drill briefing, there is a risk that pilots will not be able to restore hydraulic pressure while applying considerable forces on the flight controls.

6. Helicopter pilots who do not wear helmets are at an increased risk of incapacitation, serious injuries or loss of life in the event of an accident.

7. When emergency vehicles drive on an active runway without coordination between the airport operator and emergency response units, and with no means of

communicating with the flight service station, there is a risk of collision on the runway.

8. If the basic principles of driving on the manoeuvring areas of an airport are not instilled in first responders during emergency drills, there is a risk of incursion on an active runway.

9. Pilots trained on the earlier AS350 models, equipped with a rotor system that generated lighter loads might expect to experience less feedback loads than those generated by later models. Consequently, there is a risk that pilots will wrongly assume that they could overcome the feedback loads of newer models.

3.3 *Other findings*

1. The pilots' seats separated from their anchors, partly compromising the effectiveness of their seat belts. The seats complied with the standards in effect at the time the aircraft was certified. The resistance standards have since changed, and seats now must be able to withstand much greater acceleration.

2. Héli-Excel encouraged its pilots to be on board as observers during emergency drills. The company was not aware that this practice contravened the *Canadian Aviation Regulations*.

4.0 Safety action

4.1 Safety action taken

4.1.1 Transport Canada

Transport Canada issued Airworthiness Directive (AD) CF-2015-10 that applies to supplemental type certification (STC) No. SR00825NY-D requiring a protection flap for the HYD TEST switch on Aeronautical Accessories, Inc. consoles model VIA-350-24-001 and VIA-350-24-002.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 10 June 2015. It was released on 04 August 2015.

Visit the Transportation Safety Board's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

Appendices

Appendix A – Airworthiness directive regarding protection of the hydraulic test switch

Transport Canada / Transports Canada

TF 7246E

No. CF-2007-19R1 1/1

Issue Date 27 November 2008

AIRWORTHINESS DIRECTIVE

The following airworthiness directive (AD) may be applicable to an aircraft with our records indicate is registered in your name. ADs are issued pursuant to Canadian Aviation Regulation (CAR) 605. Pursuant to CAR 605.84 and the further details of CAR Standard 625, Appendix H, the continuing airworthiness of a Canadian registered aircraft is contingent upon compliance with all applicable ADs. Failure to comply with the requirements of an AD may invalidate the flight authorization of the aircraft. Alternative means of compliance may be applied for in accordance with CAR 625.55 and the following instructions.

This AD has been issued by the Continuing Airworthiness Division (AARDC), Aircraft Certification Branch, Transport Canada, Ottawa, telephone 613 952-4157.

Number: CF-2007-19R1

Subject: Hydraulic Test Switch Protection

Revision: Supersedes Airworthiness directive (AD) CF-2007-19 issued on 7 September 2007.

Effective: 31 December 2008

Applicability: Eurocopter AS 350 Series Helicopters equipped with a Honeywell Control Unit .

This directive also applies to spare Honeywell Control Units P/N 350A61-1614-0004, 350A61-1722-0001, 350A61-1722-0002, 350A61-1722-0010, 350A61-1755-0001 and 350A61-1755-0101.

Helicopters equipped with a Honeywell Control Unit with sealed push-buttons (post-MOD 071262) are excluded from this directive.

Compliance: No later than 1 May 2009, unless already accomplished.

Background: It has been determined that inadvertent selection of the Hydraulic Test Switch can occur in flight due to close proximity to other switches. Transport Canada has concluded that a Hydraulic Test push-button protection flap is needed to reduce exposure to events leading to hydraulic system loss and control difficulties.

Because of several failures of the original protection flap with a 90° opening, Eurocopter designed a more reliable protection flap with a 180° opening.

This revision mandates installation of an improved protection flap with a 180° opening as per Eurocopter Service Bulletin (SB) 67.00.32 revision 1, issued 19 February 2008.

Corrective Actions:

1. Install the Hydraulic Test push-button 180° protection flap on the Honeywell Control Unit in accordance with paragraph 2.B.2.a or 2.B.2.b, as applicable, of Eurocopter SB 67.00.32 revision 1 dated 19 February 2008.
2. Identify (re-number) the modified Honeywell Control Units as per paragraph 2.C.2 of Eurocopter SB 67.00.32 revision 1 dated 19 February 2008.
3. Make an entry in the logbook regarding compliance with SB 67.00.32 revision 1 dated 19 February 2008.

Authorization: For Minister of Transport, Infrastructure and Communities

Derek Ferguson
Acting Chief, Continuing Airworthiness

Contact: Mr. Bogdan Gajewski, Continuing Airworthiness, Ottawa, telephone (613) 952-4453, facsimile (613) 996-9178 or e-mail: bogdan.gajewski@tc.gc.ca or any Transport Canada Centre

Pursuant to CAR 202.54 the registered owner of a Canadian aircraft shall, within seven days, notify the Minister in writing of any change to his or her name or address.

To request a change of address, contact the Civil Aviation Communications Centre (AARC) at Place de Ville, Tower C, Ottawa, ON K1A 0N8, or 1 800 305-2059, or www.tc.gc.ca/civilaviation/communications/centre/menu.htm

Canada

34-0023 (01-2008)

Source: Transport Canada, Airworthiness Directive CF-2007-19R1, issued 27 November 2008

Appendix B – Diagram of the hydraulic system

Activation of the HYD TEST switch opens the manifold solenoid valve and depressurizes the hydraulic system.

Activation of the HYD CUT OFF switch opens the actuator solenoid valves of each servoactuator accumulators and depressurizes the accumulators for flight without hydraulic pressure assistance.

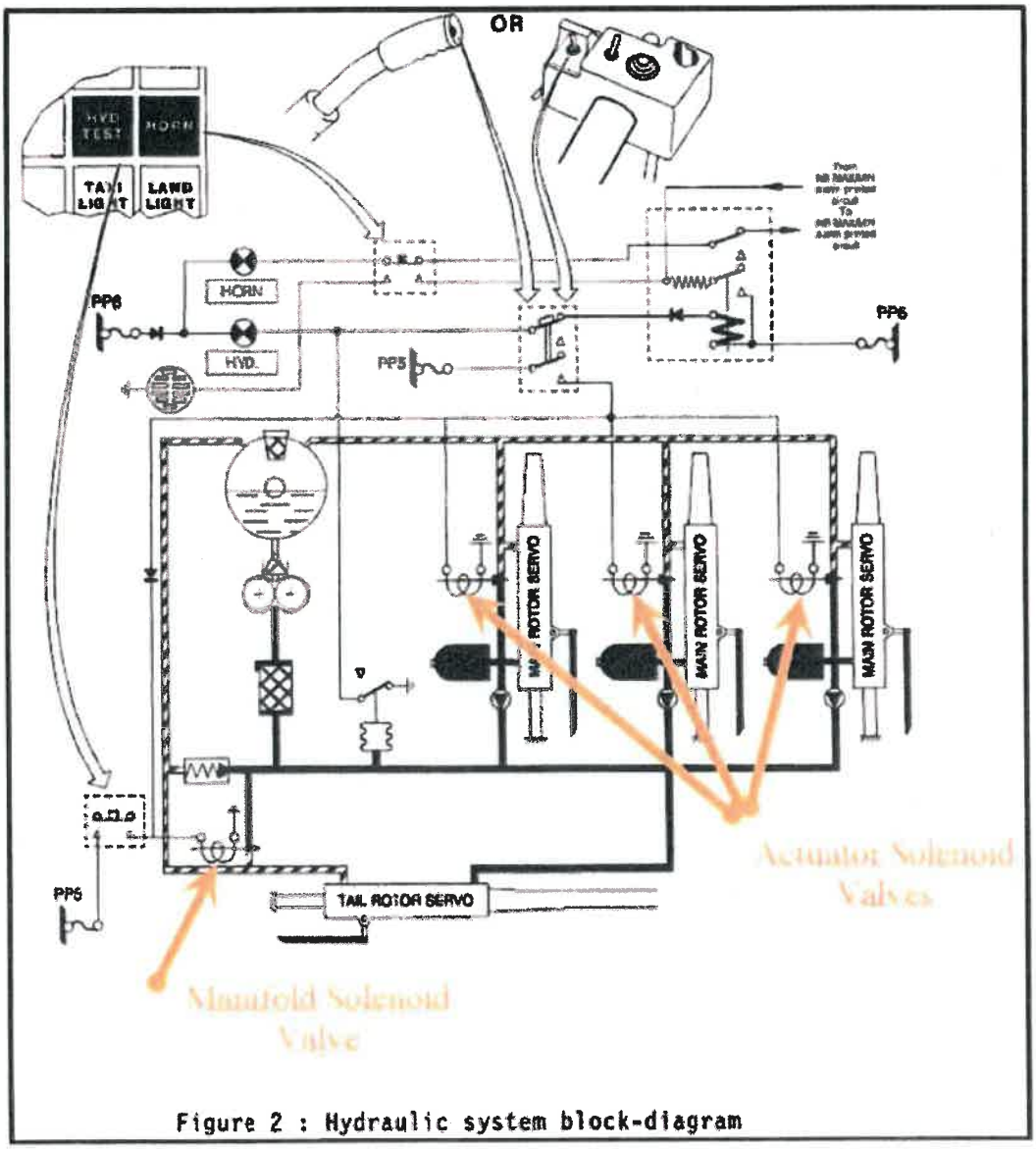
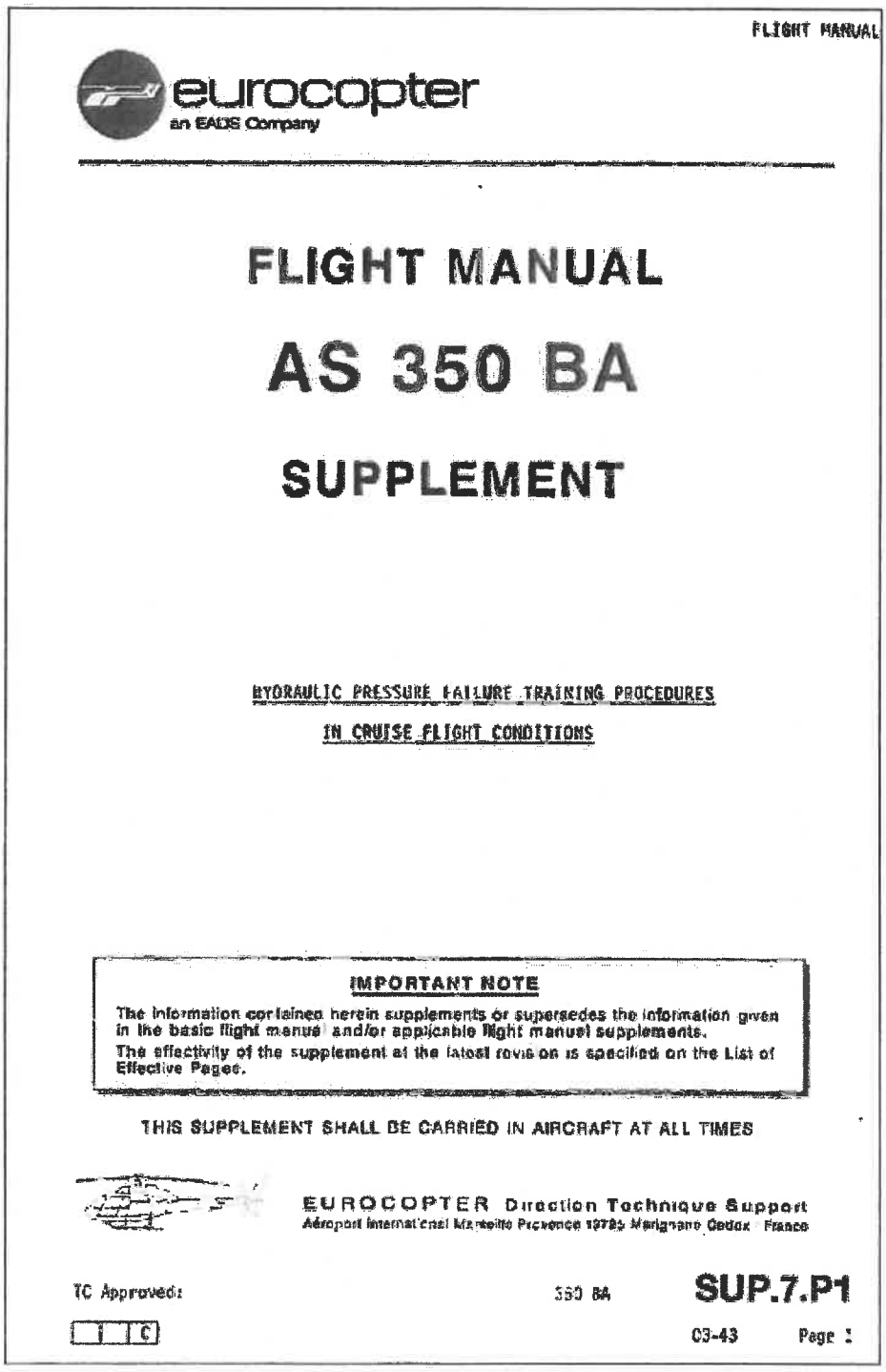


Figure 2 : Hydraulic system block-diagram

Source: Eurocopter, with TSB annotations

Appendix C – Rotorcraft flight manual Supplement No. 7



FLIGHT MANUAL

eurocopter
an EADS Company

FLIGHT MANUAL

AS 350 BA

SUPPLEMENT

HYDRAULIC PRESSURE FAILURE TRAINING PROCEDURES

IN CRUISE FLIGHT CONDITIONS

IMPORTANT NOTE

The information contained herein supplements or supersedes the information given in the basic flight manual and/or applicable flight manual supplements.
The effectivity of the supplement at the latest revision is specified on the List of Effective Pages.

THIS SUPPLEMENT SHALL BE CARRIED IN AIRCRAFT AT ALL TIMES

EUROCOPTER Direction Technique Support
Aéroport International Marseille Provence 13725 Marignane Cedex France

TC Approved:

350 BA

SUP.7.P1

03-43 Page 1

1 GENERAL

This procedure allows hydraulic failure training for single hydraulic system equipped AS 350 BA. R R

In case of loss of hydraulic pressure (HYD red warning light illuminates and horn sounds), the hydraulic pressure accumulators allow sufficient time to establish the recommended safety speed range, from 40 to 60 kt. R R R
Then, the pilot must cut-off the hydraulic pressure switch on the collective stick and apply the emergency procedures. R R

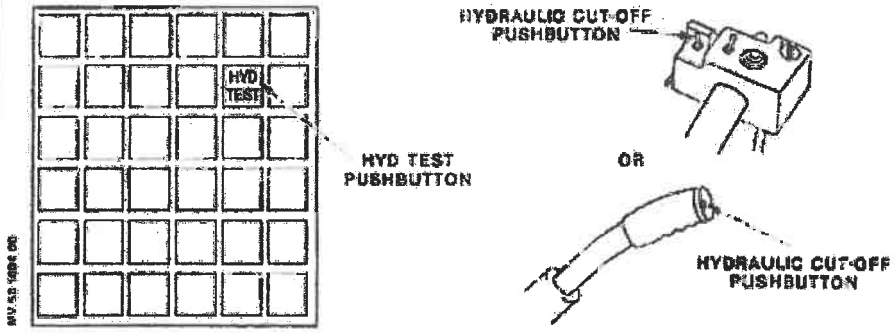
- Failure simulation R

If the pilot selects the "HYD TEST" pushbutton on the center console to "Test" (depressed position) in flight, the indications are as follows : R R
. HYD light illuminates. R
. HORN continuous sound. R
. Flight controls remain powered by accumulators. R
. Tail rotor pedals exhibit force feedback. R

If the pilot selects the hydraulic cut-off switch on the collective to OFF in flight, the indications are as follows : R R
. HYD light illuminates. R
. HORN silent. R
. Flight controls exhibit force feedback, pilot must exert the following (approximate) forces to maintain 60 Kt level flight : R R
  - Lateral cyclic 4 daN (10 lbs) left. R
  - Longitudinal cyclic 5.5 daN (12 lbs) forward. R
  - Collective zero at the neutral point but requires force to maintain a different collective position. R R
. Cyclic control feedback forces increase as airspeed is increased. Collective force to command more or less power than the neutral point may be high, requiring the pilot to pull upwards with approximately 13 daN (30 lbs) to maintain hover power, and to push downwards with approximately 13 daN (30 lbs) to achieve minimum collective pitch. R R R R

So, to simulate a loss of hydraulic power, depressing the "HYD TEST" pushbutton on the central console produces the same effects as a real failure : R R R
. The hydraulic pump pressure is by-passed. R
. The main rotor accumulators give limited time hydraulic assistance back-up. R R
. The red HYD light comes on, the Horn sounds. R

FLIGHT MANUAL



2 TRAINING PROCEDURES R

The training procedures consist of two phases : R
- Transition to recommended safety speed from steady flight conditions. R
- Transition to landing. R

CAUTION : DO NOT ATTEMPT TO CARRY OUT HOVER FLIGHT OR ANY LOW SPEED R
MANEUVER WITHOUT HYDRAULIC PRESSURE ASSISTANCE. THE INTENSITY AND R
DIRECTION OF THE CONTROL FEEDBACK FORCES WILL CHANGE RAPIDLY. R
THIS WILL RESULT IN EXCESSIVE PILOT WORKLOAD, POOR AIRCRAFT R
CONTROL, AND POSSIBLE LOSS OF CONTROL. R

NOTE 1 : The pilot must ensure that the "HYD TEST" pushbutton is selected R
off (upper position) prior to cutting off hydraulic assistance. R

NOTE 2 : Do not silence the HORN by using the HORN switch. The HORN will R
be silenced when the pilot selects the hydraulic cut-off switch R
to OFF. If the pilot uses the HORN switch to silence the HORN R
before using the hydraulic cut-off switch, this crucial step R
could be forgotten. This could then result in significant R
unbalanced lateral cyclic feedback forces, especially at low R
speed, if one of the lateral accumulators depletes before the R
other one. In addition, de-activating the HORN using the HORN R
switch makes it unavailable to warn the pilot of low or high R
rotor RPM. R

Transition to recommended safety speed : R

- From steady flight conditions : R
  . Instructor - - - - - Depress "HYD TEST" pushbutton on center console. R
  . Red HYD light - - - Illuminates, Horn sounds. R
  . Trainee - - - - - - Reduces collective pitch, set airspeed R
  between 40 and 60 kt, safety speed. R

- Once safety speed set or when control loads appear : R

. Instructor - - - - - Reset "HYD TEST" pushbutton (up position), Horn stops, HYD light extinguishes. R

. Trainee (*)- - - - - Set the hydraulic switch on the collective to OFF, HYD light comes on, moderate control loads are felt within 1 or 2 seconds, Horn remains silent. R

Aircraft may now be maneuvered around the safety speed to demonstrate changes in control loads with speed and maneuvers. R

- To terminate this phase : R

. Trainee - - - - - - Set airspeed between 40 and 60 kt. R

. Trainee - - - - - - Reset the hydraulic switch on the collective to ON. R

Transition to landing : R

NOTE : The instructor must ensure that the "HYD TEST" pushbutton on center console is selected OFF (upper position) before the collective hydraulic cut-off switch is selected OFF to enable the pilot to restore the hydraulic power system by re-setting the hydraulic cut-off switch to ON during the training exercise should it become necessary. R

- From level flight conditions at 40 to 60 Kt : R

. Trainee - - - - - - Set the hydraulic switch on the collective to OFF, HYD light comes on, moderate control loads are felt within 1 or 2 seconds, Horn remains silent. R

. Trainee (**) - - - - Apply the appropriate emergency landing procedure for red HYD warning light, refer to SECTION 3.3 page 2 of the present Flight Manual. R

These two different phases can be realized in sequence by stepping from step (*) during transition to recommended safety speed to step (**) of the transition to landing. R

IMPORTANT : As described in the emergency procedures : R

- Over a clear and flat area, make a flat final approach, nose into the wind. R
- Perform a no-hover/slow run-on landing around 10 knots. R
- Do not hover or taxi without hydraulic pressure assistance. R

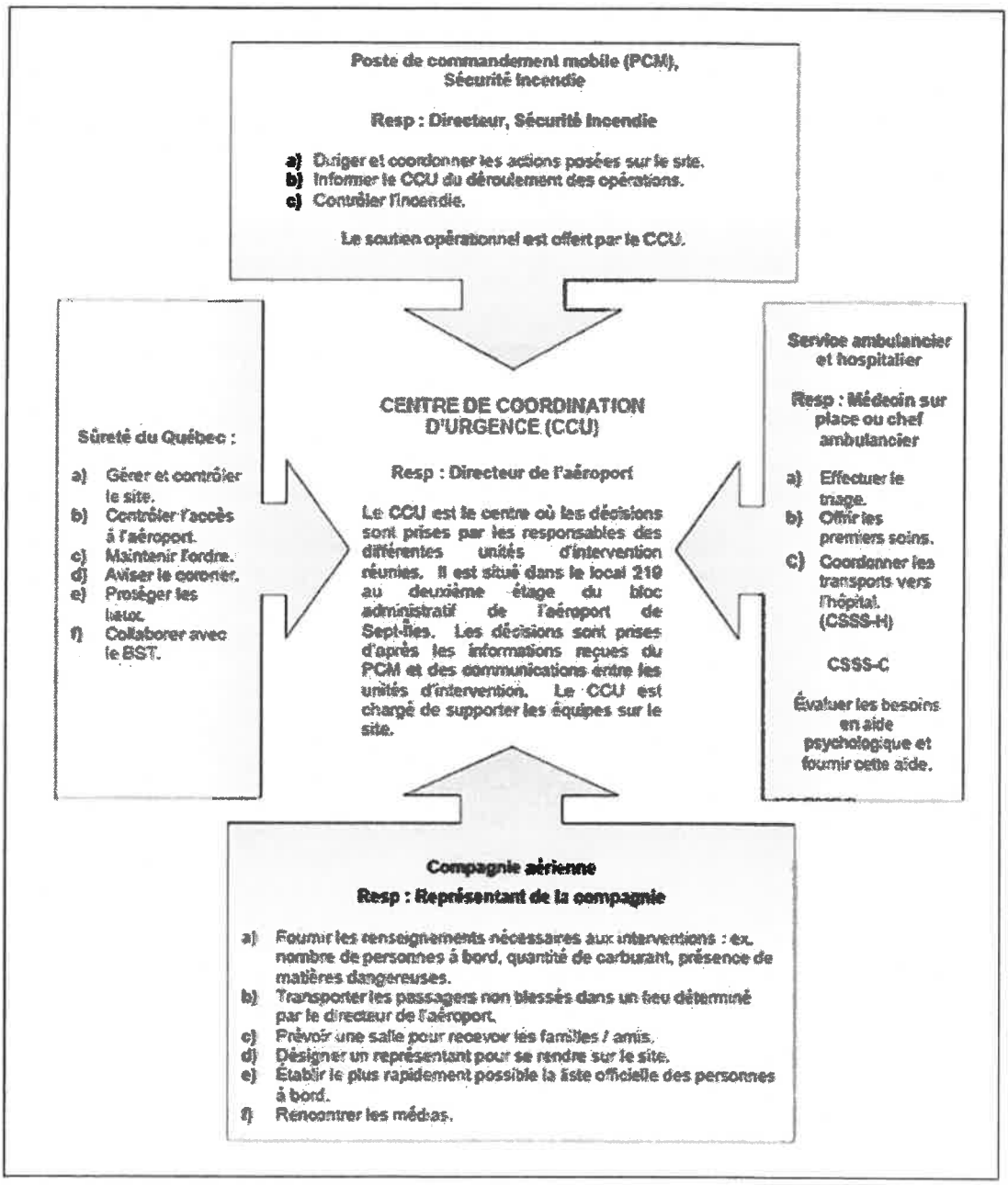
- After landing, and before any other take-off or hovering flight : R

. Trainee - - - - - - Reset the hydraulic switch on the collective to ON to restore hydraulic assistance. R

. Crew - - - - - - - - Check red HYD light off within 3 seconds, Horn sounds briefly the time for the light to go out. R

Source: Eurocopter, Flight Manual AS 350 BA Supplement, SUP 7.

Appendix D – Excerpt from Sept-Îles Airport emergency response plan



Source: Sept-Îles Airport, *Plan des mesures d'urgence de l'exploitant*, revision 0, June 2000, p. 2-9 [in French only]

Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A13Q0021

LOSS OF CONTROL DURING HYDRAULIC PRESSURE FAILURE TRAINING
EUROCOPTER AS350 BA HELICOPTER, C-GPHN
HÉLI-EXCEL INC.
SEPT-ÎLES AIRPORT, QUEBEC
03 FEBRUARY 2013

Canada

Aviation Investigation Report A13Q0021

Loss of control during hydraulic pressure failure training

Eurocopter AS350 BA Helicopter, C-GPHN
Héli-Excel inc.
Sept-Îles Airport, Quebec
03 February 2013

Summary

On 03 February 2013, at 0853 Eastern Standard Time, the Eurocopter AS350 BA (serial number 1251, registration C-GPHN), operated by Héli-Excel inc., departed for a training flight from the company base northwest of the Sept-Îles Airport, Quebec, with a flight instructor and 2 pilots in training on board . After practising various types of landings in unprepared areas, the aircraft headed to the Sept-Îles Airport to conduct engine failure drills at the hover at the threshold of Runway 27.

At 0954, the aircraft departed from the threshold of Runway 27 to carry out hydraulic failure drills on Runway 31. During the fourth drill, the flight instructor flew a short pattern at low altitude and low speed without hydraulic pressure assistance. In the moments following the start of the final approach, the cyclic stick moved sharply forward and to the left. The flight instructor grabbed the cyclic stick in an attempt to re-establish level flight, since the helicopter was quickly banking to the left in a nose-down attitude. The main rotor blades struck the runway, and the aircraft came to rest on its left side. The helicopter was heavily damaged by the impact, but no fire broke out. The flight instructor sustained serious injuries, while the other 2 pilots sustained minor injuries. The emergency locator transmitter activated during the occurrence.

Le présent rapport est également disponible en français.

Table of contents

1.0 Factual information 1

1.1 History of the flight 1
1.2 Injuries to persons 2
1.3 Damage to aircraft 2
1.4 Other damage 3
1.5 Personnel information 3
1.6 Aircraft information 4

1.6.1 General 4
1.6.2 Conversion history 4
1.6.3 Engine information 5
1.6.4 Maintenance 6
1.6.5 Weight and centre of gravity 6
1.6.6 Flight control hydraulic system 6

1.7 Meteorological information 13
1.8 Aids to navigation 13
1.9 Communications 13
1.10 Airport information 13
1.11 Flight recorders 14
1.12 Wreckage and impact information 16

1.12.1 General 16
1.12.2 Examination of hydraulic system harnesses and contacts 16
1.12.3 Examination of the hydraulic reservoir and hydraulic fluid 16
1.12.4 Examination of the servoactuators 16
1.12.5 Warning lights 17
1.12.6 Cockpit seats 17

1.13 Medical and pathological information 18
1.14 Fire 18
1.15 Survival aspects 18

1.15.1 General 18
1.15.2 Helmet 18
1.15.3 Emergency services 19
1.15.4 Emergency locator transmitter 19
1.15.5 Emergency response plan of the Sept-Îles Airport operator 19
1.15.6 Emergency response 20
1.15.7 Post-occurrence debriefing meeting 21
1.15.8 Emergency drill at the Sept-Îles Airport 21

1.16 Tests and research 22

1.16.1 TSB laboratory reports 22

1.17 Organizational and management information 22

1.17.1 General 22
1.17.2 Flight instructor training 22
1.17.3 Héli-Excel Pilot Training on AS350 23
1.17.4 Héli-Excel's hydraulic failure training 23
1.17.5 Flight instructor's experience with hydraulic failure 24

1.18 Additional information 24

1.19 Useful or effective investigation techniques 24

2.0 Analysis 25

2.1 The aircraft 25
2.2 Centre console 25
2.3 History of the flight 26
2.4 Training provided by the flight instructor 27
2.5 Training procedure for hydraulic failure 28
2.5.1 General 28
2.5.2 Flight instructor's experience with hydraulic failure 28
2.5.3 AS350 rotorcraft flight manual 28
2.5.4 Rotorcraft flight manual typography 29
2.5.5 Rotorcraft flight manual Supplement 7 29
2.5.6 Hydraulic failure training procedure 30
2.6 Survival aspects 30
2.6.1 Evacuation of the aircraft 30
2.6.2 Actions of the pilot observer 31
2.6.3 Presence of the pilot observer on board 31
2.6.4 Cockpit seats 31
2.6.5 Emergency services 31
2.6.6 Emergency response 31

3.0 Findings 34

3.1 Findings as to causes and contributing factors 34
3.2 Findings as to risk 34
3.3 Other findings 35

4.0 Safety action 36

4.1 Safety action taken 36
4.1.1 Transport Canada 36

Appendices 37

Appendix A – Airworthiness directive regarding protection of the hydraulic test switch 37
Appendix B – Diagram of the hydraulic system 38
Appendix C – Rotorcraft flight manual Supplement No. 7 39
Appendix D – Excerpt from Sept-Îles Airport emergency response plan 43

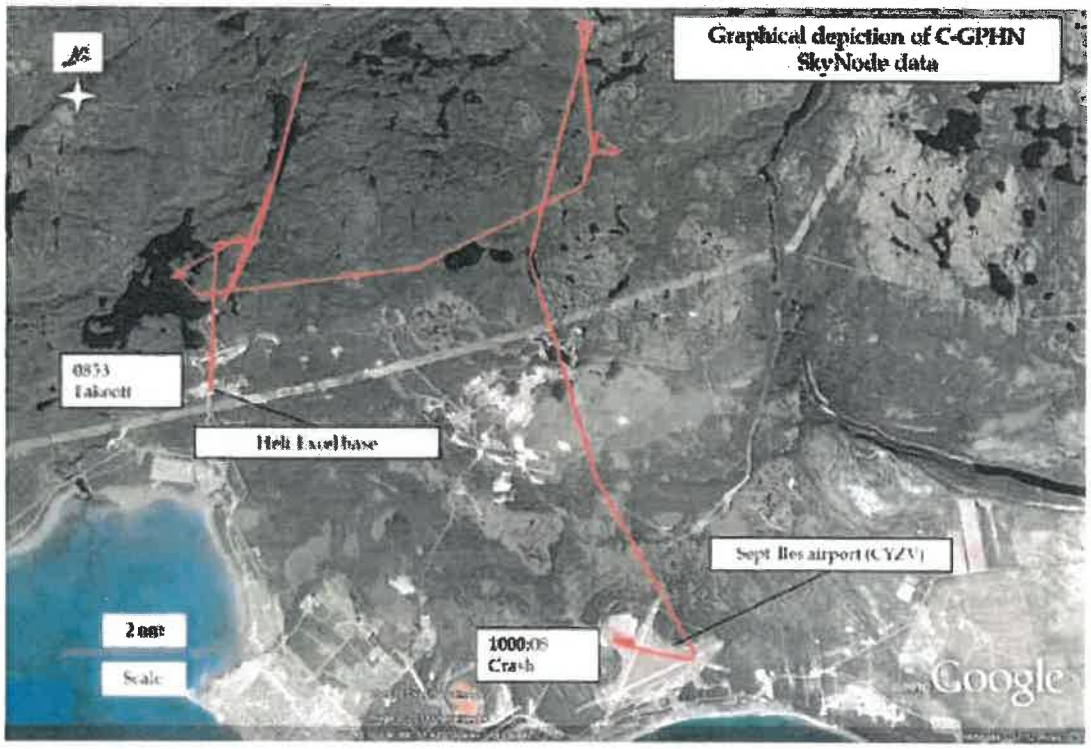
1.0 *Factual information*

1.1 *History of the flight*

On the morning of 03 February 2013, the 3 pilots conducted a visual inspection of the helicopter; no anomalies were detected in the hydraulic system components. They then completed the pre-flight checklist. The "Accumulators check" and "Hydraulic pressure isolation check" did not reveal any malfunction in the hydraulic system.

At 0853,[1] C-GPHN departed from the Héli-Excel inc. (Héli-Excel) base in Sept-Îles, Quebec, for a training flight. The flight instructor was in the left seat, one of the pilots in training was in the right seat, and the other pilot was in seat 1B behind the flight instructor, as an observer. The first 50 minutes of the flight took place north of the Sept-Îles Airport (CYZV), where various types of landings in unprepared areas were conducted (Figure 1). Around 0937, the aircraft headed to the Sept-Îles Airport to conduct drills for engine failure at hover and for hydraulic system failures.

Figure 1. Aircraft flight path (Source: Google Earth, with TSB annotations)



At 0954, after completing drills for engine failure at the hover at the threshold of Runway 27, the helicopter took off to carry out hydraulic failure drills on Runway 31. Shortly after

---

1 All times are Eastern Standard Time (Coordinated Universal Time minus 5 hours), unless otherwise stated.

takeoff, the flight instructor engaged the HYD TEST switch. The horn sounded; the pilot in training saw the HYD light illuminate and confirmed the hydraulic failure. The pilot in training did not notice any flight control loads and set the indicated airspeed at between 40 and 60 knots. After the flight instructor turned the HYD TEST switch to the OFF position, the pilot in training pushed the HYD CUT OFF switch at which point the flight controls stiffened. While close to the ground, the aircraft slowed to the point where the pilot in training felt that the loads on the flight controls prevented him from controling the aircraft to make a safe landing.

The flight instructor took over the controls and flew a tight left pattern at low altitude and low speed without hydraulic pressure assistance. He showed the pilot in training the technique for a landing in manual mode, i.e. without hydraulic pressure assistance. The flight instructor landed and stopped the aircraft on the runway without difficulty.

The flight instructor took off and, again with the flight controls in manual mode, flew a tight left pattern at low speed and low altitude. When the aircraft was established on final approach, the pilot in training took over the controls. He made a no-hover landing at a low translation speed of about 10 knots on the icy runway. Since the pilot in training could not stop the helicopter on the ground, the flight instructor took over the controls at the end of the runway.

At 0959, the flight instructor took off in manual mode and again flew a tight left pattern at low speed and low altitude. At the end of the base leg, at the beginning of the final approach, the helicopter momentarily reached a level attitude. Just before the flight instructor handed the controls to the pilot in training, the helicopter banked slightly to the left and then quickly rolled to the left in a nose-down attitude, and the main rotor struck the runway.

1.2 *Injuries to persons*

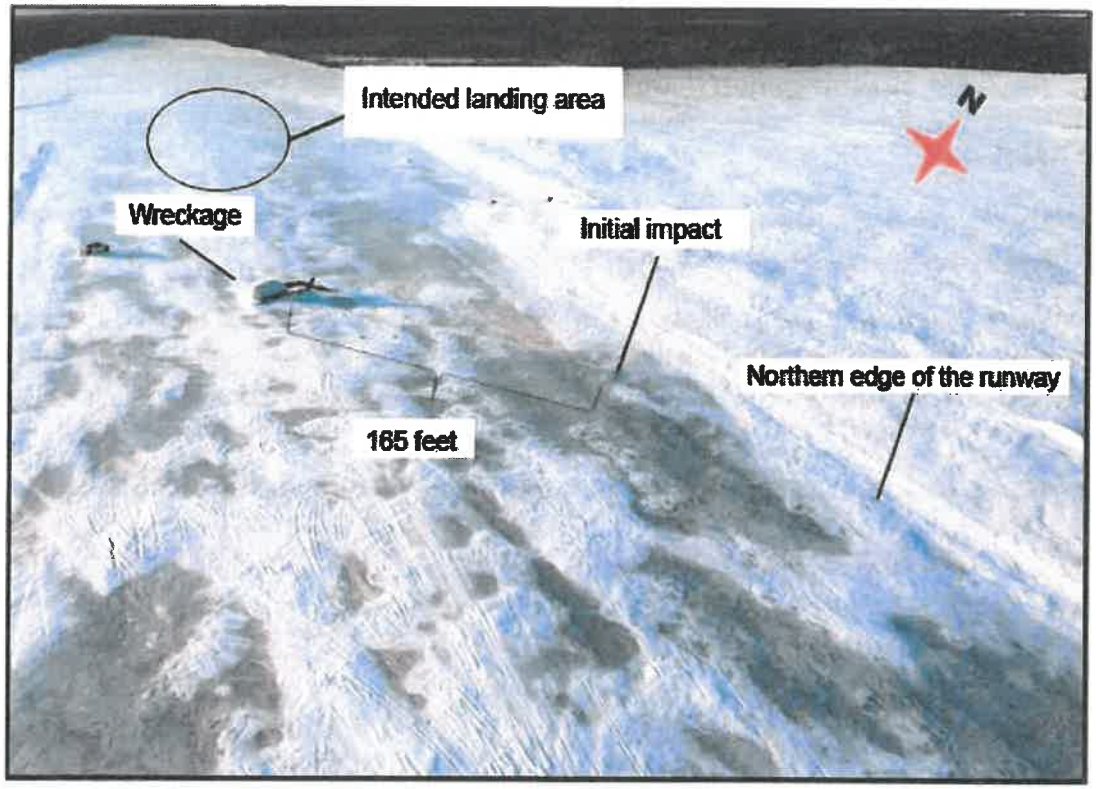
Table 1. Injuries to persons

Injuries	Crew members	Passengers	Other persons	Total
Fatal	0	0	0	0
Serious	1	0	0	1
Minor/None	1	1	0	2
Total	2	1	0	3

1.3 *Damage to aircraft*

The aircraft struck the ground in a nose-down attitude of about 45° and a left bank angle of about 100°. The first point of impact was near the northern edge of Runway 13/31 (Figure 2). The main rotor blades struck the runway first, followed by the nose of the helicopter. The aircraft slid approximately 165 feet on its left side toward the centre of the runway before coming to a stop on Runway 13/31 about 1000 feet from the threshold of Runway 13.

Figure 2. Aerial view of the accident site



The collision with the ground caused major damage to the aircraft. The front part of the aircraft, including the nose, windshield, canopies and instrument panel, was torn off. The 2 pilot seats separated from their anchors. The impact caused the tail boom to bend upward and to the left; it sustained an almost full-circumference fracture about 24 inches in front of the horizontal stabilizer. The top of the fuel tank was cracked along the left side from front to rear. The 2 tail rotor blades were not damaged. The engine was still running after the crash. The observer pilot seated at the rear of the cabin had to pull the FUEL SHUT OFF VALVE lever to shut it off.

1.4 Other damage

Over 300 litres of fuel spilled on the runway.

1.5 Personnel information

The flight instructor holds a commercial pilot licence delivered in 2000. He has also been type-endorsed on the AS350 since 2002. At the time of the accident, the pilot had accumulated over 3000 flight hours on type. In 2008, the pilot started providing training on the AS350. In 2012, he was hired as a pilot by Héli-Excel.

In early 2013, Héli-Excel's chief pilot provided him with flight training so that he could become a company flight instructor. The training involved flight drills in normal and

emergency situations. After demonstrating his practical skills and theoretical knowledge, the pilot was approved by Héli-Excel's chief pilot as a flight instructor.

The 2 pilots on board the aircraft were the first pilots that the flight instructor was training for the company. The training flight was part of recurrent training and pilot proficiency check (PPC).

The flight instructor was not qualified as such and was not a Transport Canada-approved check pilot; this is not required by the *Canadian Aviation Regulations* (CARs).

The 2 pilots in training had obtained their commercial pilot licences in 2011. The pilot in the right-hand seat was hired by Héli-Excel in August 2012. He had received his AS350 rating in May 2012. His experience on this type was limited to training received with another carrier and a few flights. He had accumulated less than 200 flight hours on an helicopter.

The observer pilot had been hired by Héli-Excel in January 2013 and had no AS350 rating.

1.6 *Aircraft information*

1.6.1 *General*

Table 2. Aircraft information

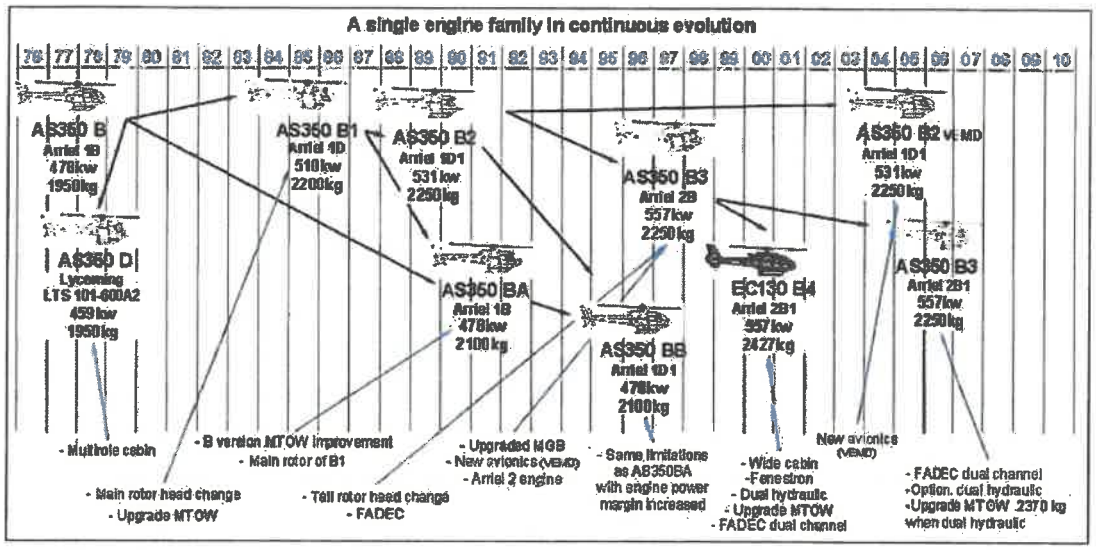
Manufacturer	Eurocopter
Type and model	AS350 BA
Year of manufacture	1980
Serial number	1251
Certificate of airworthiness	Valid
Airframe time	10 017.6
Engine	Allied Signal LTS101-600A-3A
Maximum allowable take-off weight	4961 pounds
Recommended fuel type(s)	Jet fuel
Fuel type used	Jet fuel

1.6.2 *Conversion history*

1.6.2.1 *General*

C-GPHN was originally manufactured as an AS350 D in 1980 by Aérospatiale (Figure 3). On 16 May 2001, the aircraft was converted into an AS350 BA as per Eurocopter service bulletins. At the same time, modifications were made as per Apex Aerospace, Inc.'s Transport Canada-approved SH02-15 supplemental type certification (STC). These changes reduced fuel consumption and increased the helicopter's internal gross weight to that of the AS350 B2, i.e. 2250 kg (4961 pounds). Operators commonly refer to the AS350 BAs that have been modified as per the Apex SH02-15 STC as AS350 BA+ to distinguish them from the other models.

Figure 3. Illustration of the AS350's evolution and changes (Source: Eurocopter)



1.6.2.2 *Apex Aerospace SH02-15 supplemental type certification*

Given that the AS350 BA+ and the AS350 B2 have the same internal gross weight, the drive train systems of models BA, BA+ and B2 were compared. Similarities were noted, except that the AS350 B2 is equipped with a yaw channel load compensator to counter the high forces on the pedals during a hydraulic failure. It was also noted that the torque limits and shaft horsepower of the BA and BA+ are similar, whereas those of the B2 are higher.

Given that the torque limits of the AS350 BA and AS350 BA+ are the same, it can be concluded that the absence of a load compensator on the BA did not affect the handling characteristics of C-GPHN when the hydraulic system was depressurized.

Table 3. Comparison of the drive train systems of models BA, BA+ and B2

	Engine torque limits	Internal gross weight	External gross weight	Shaft horsepower maximum continuous/ take-off
BA+	83%, 88%	2250 kg	2250 kg	590/650
BA	83%, 88%	2100 kg	2100 kg	590/641
B2	94%, 100%, 107%	2250 kg	2500 kg	625/712

1.6.3 *Engine information*

The Allied Signals LTS101-600A-3A engine was not damaged. No engine malfunction was observed during the flight. The overload failure of the main- and tail-rotor shafts shows that the engine was producing power at the time of the accident. The engine logs indicate that it was maintained and serviced in accordance with existing Canadian regulations and

approved procedures. Engine performance and mechanical malfunction were not considered to have been contributing factors in the accident.

1.6.4 *Maintenance*

The maintenance records show that the helicopter was certified, equipped and maintained in accordance with existing regulations and approved procedures. The helicopter had flown 65.5 hours since its last 100-hour inspection. No pre-flight malfunction was reported or deferred.

1.6.5 *Weight and centre of gravity*

It is estimated that the helicopter weighed 4150 pounds at the time of the accident. The aircraft's weight and centre of gravity were within the limits prescribed in the Transport Canada-approved rotorcraft flight manual (RFM) and did not play a role in the accident.

1.6.6 *Flight control hydraulic system*

1.6.6.1 *General*

The flight controls are assisted by a single hydraulic system that reduces pilot workload during flight and at speeds where loads on the manual flight controls are excessive.

1.6.6.2 *Hydraulic system components*

The hydraulic system is pressurized by a pump driven by the input shaft of the main transmission gearbox, through a flat strap.

The helicopter is equipped with 4 servoactuators, 3 of which actuate the stationary swashplate: 1 servoactuator for pitch control, and 2 servoactuators for roll control (Appendix B). The fourth servoactuator is in the tail rotor. In order to offset excessive loads in the event of a hydraulic system failure at high speed, a safety unit consisting of an accumulator, a non-return valve and a solenoid valve was installed on each servoactuator. The hydraulic pressure provided by the accumulators allows the pilot to safely reduce the airspeed to a value at which the manual control forces are manageable without hydraulic pressure assistance. The AS350 BA is not equipped with a control channel load compensator on the tail rotor.

The pressure regulator incorporates a pressure switch for low hydraulic pressure and a test solenoid valve. When the pressure switch senses that the hydraulic system pressure drops below 30 bars, the red hydraulic system warning light (HYD) illuminates on the control panel and the horn sounds. The same horn also provides warning of low rotor speed.

1.6.6.3 Hydraulic system controls and monitoring

1.6.6.3.1 General

The hydraulic system is controlled by the HYD CUT OFF [hydraulic system cut-off] switch, mounted on the collective stick of the right-hand seat, and by the HYD TEST [hydraulic system test] switch, mounted on the centre console. The left-hand seat flight controls used by a co-pilot or a flight instructor are removable and the collective stick is not equipped with a HYD CUT OFF button.

1.6.6.3.2 The HYD CUT OFF switch

The HYD CUT OFF switch is a toggle switch with 2 positions – ON and OFF, and is normally set to the ON (forward) position during flight. When the switch is in the OFF position, the hydraulic system becomes depressurized and the main rotor accumulators become depressurized simultaneously in order to prevent asymmetric depletion. Asymmetric depletion of the accumulators can generate asymmetric forces that would make controlling the aircraft difficult. Consequently, the pilot must activate the HYD CUT OFF switch either in the event of a hydraulic system failure or during a hydraulic malfunction simulation once the pilot has reached safety speed, i.e. the speed at which the manual control forces are such that it is possible to maintain control of the helicopter. However, the tail rotor servoactuator is also depressurized by the HYD CUT OFF switch; therefore, the tail rotor servoactuator does not maintain its hydraulic pressure during a simulated failure. If hydraulic pressure is available in the system, the pilot can instantly restore the hydraulic pressure of the servoactuators and repressurize the accumulators by placing the HYD CUT OFF switch in the ON position.

1.6.6.3.3 The HYD TEST switch

The HYD TEST switch, which is mounted on the centre console (Aeronautical Accessories, Inc. Center Console Update model VIA-350-24-001) between the 2 pilots, has 2 positions. The TEST position (forward position) initiates the hydraulic system test function while the OFF position (aft position) restores normal operation. The centre console certified by the manufacturer uses a 2-position pushbutton for this function: TEST when it is pushed in, and OFF when it is released (see paragraph 1.6.6.4).

The HYD TEST switch is intended primarily to allow the pilot to make sure, before the flight, that the accumulators of the main rotor servoactuators are working properly. The HYD TEST switch is also used to simulate a hydraulic system malfunction during a training flight.

When the switch is in the TEST position, the hydraulic test solenoid valve opens, depressurizing the hydraulic system. As a result of this depressurization, the HYD warning light illuminates and the horn sounds. The accumulators are tested during the pre-flight check by the pilot selecting the HYD TEST switch to TEST and moving the cyclic stick 2 or 3 times on each axis (+/- 10% of the complete range) to verify that there is sufficient hydraulic pressure to ensure that safety speed can be reached after a hydraulic failure.

1.6.6.4 Centre console

In May 2005, the original centre console (Honeywell Control Unit), which contained the control buttons for the helicopter's various systems, was replaced as per STC No. SR00825NY-D with a Center Console Upgrade model VIA-350-24-001 from Aeronautical Accessories, Inc.

One of the distinguishing features of the new console is that the original latched illuminated pushbuttons[2] were replaced by toggle switches.

The HYD TEST switch is located next to other similarly shaped switches (Figure 4). It was determined that the HYD TEST switch can be inadvertently actuated during flight because of its proximity to other switches. In November 2005, Eurocopter issued Service Bulletin SB 67.00.32 which recommended the installation of a retractable guard/cover (protection flap) over the switch on Honeywell centre consoles to prevent the unintentional operation of the HYD TEST switch.

In September 2007, Transport Canada (TC) issued Airworthiness Directive (AD) CF-2007-19, which required that the HYD TEST pushbutton on Honeywell consoles be equipped with a protection flap with a 90-degree opening to reduce exposure to events leading to hydraulic system loss and control difficulties. This AD was replaced by CF-2007-19R1 on 27 November 2008 (Appendix A), which describes the mandatory installation of a more reliable protection flap with a 180-degree opening, as per revision 1 of Eurocopter's Service Bulletin SB 67.00.32 issued on 19 February 2008.

Figure 4. C-GPHN centre console, rear-to-front view in cockpit

The HYD TEST toggle switch on C-GPHN's Aeronautical Accessories, Inc. centre console is not of a specific shape and is not equipped with a protection flap, or have the "pull-to-unlock" design. Since AD CF-2007-19R1 applies to AS350s equipped with a Honeywell centre console, C-GPHN was not required to comply with the corrective measures set out in the AD.

---

2 A latched pushbutton remains in the selected position until it is pushed again.

1.6.6.5 Hydraulic system certification

During initial certification, the aircraft was shown to have adequate handling characteristics in manual control mode. However, the loads were considered excessive at high speed. Consequently, a safety unit consisting of an accumulator, a non-return valve and a solenoid valve was installed on each servoactuator. The hydraulic pressure provided by the accumulators allows the pilot to reduce the airspeed to the safe recommended speed of between 40 and 60 knots before setting the HYD CUT OFF switch to the OFF position. The control forces are deemed manageable within this speed range.

1.6.6.6 Documentation concerning the effort required without hydraulic pressure assistance

1.6.6.6.1 General

TC and Eurocopter recognize the risks associated with operating outside the recommended safety speed range in the event of a hydraulic system failure. In addition, several investigation reports[3] on loss of control following depressurization of the AS350 hydraulic system document these risks.

1.6.6.6.2 Transport Canada

In 2003[4] and 2004,[5] TC and Eurocopter jointly examined the hydraulics-off handling characteristics of the AS350 B2[6] in very cold weather. Following these in-flight tests, TC concluded that flight control forces were high at speeds above the safety speed and marginally acceptable within the safety speed range, and that their direction and intensity were very high and unstable in hover flight. TC observed that nowadays these forces would be unacceptable for new helicopter designs.

---

3 Among others: TSB Aviation Investigation Reports A03O0012 and A05F0025 (Canada); ISBN: 978-11-098261-2 of the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (France); EW/c2004/10/05 of the Air Accidents Investigation Branch (United Kingdom); and ANC02FA029 of the National Transportation Safety Board (United States).

4 Transport Canada Report, 28 November 2003, AS350 Series, Hydraulics Off Handling Qualities, Preliminary Assessment.

5 Transport Canada Report, 08 March 2004, AS350 Series, Hydraulics Off Handling Qualities, Cold Weather Assessment.

6 Except for the addition of the tail rotor compensator, the hydraulic systems of the AS350 B2 and BA models are similar.

1.6.6.6.3 Rotorcraft flight manual

The helicopter's RFM, developed by Eurocopter contains sections on limits, procedures and performance requirements for safe use of the aircraft. The RFM approved by the Direction générale de l'aviation civile (DGAC) of France contains the following sections: 2 – Limitations, 3 – Emergency Procedures, 4 – Normal Procedures, 5.1 – Regulatory Performance Data, and RFM supplements. Full compliance with section 2 – Limitations is mandatory for Canadian-registered aircraft.

As in all RFMs, Eurocopter uses the terms CAUTION and NOTE to emphasize important or critical instructions for safe flight. Although not defined in the RFM, the warnings in the RFMs are usually codified as follows:

- WARNING means an operating procedure which could lead to injuries or loss of life if not followed correctly.
- CAUTION means an operating procedure, practice, etc. which could lead to equipment damage or loss if not adhered to strictly.
- NOTE means an operating procedure or condition worthy of mention.

The risk of heavy flight control feedback in the event of a hydraulic system failure is mentioned in sections 3 and 7 of the RFM, and in the RFM supplements:

Section 3 – Emergency Procedures, 3.2 – System Failure, subsection 4 – Hydraulic System Failures:

> 4.2 Main servo-control slide-valve seizure
>
> - Actuate the [HYD CUT OFF] switch, situated on the collective pitch control lever, to cut off hydraulic pressure. Load feedback will be felt immediately; load feedback may be heavy if the helicopter is flying at high speed:
> - collective pitch: 20 kg pitch increase load;
> - cyclic: 7 to 4 kg left-hand cyclic load;
> - cyclic: 2 to 4 kg forward cyclic load;
> - yaw pedals: practically no load in cruising flight.
> - Reduce speed to 60 knots (110 km/hr) and proceed as in the case of illumination of the HYD light.

Figure 5 is an excerpt from the procedure in case of illumination of the red HYD light (under Section 3 – Emergency Procedures, 3.3 – Warning-Caution-Advisory Panel and Aural Warning, subsection 2.1 – Red Lights).

Figure 5. Excerpt from the Rotorcraft Flight Manual's HYD light procedure

Light	Failure	Pilot action
HYD	Loss of hydraulic pressure or Pressure <30 bars	Keep aircraft to a more or less level attitude. Avoid abrupt manoeuvres. CAUTION: DO NOT ATTEMPT TO CARRY OUT HOVER FLIGHT OR ANY LOW SPEED MANEUVER. THE INTENSITY AND DIRECTION OF THE CONTROL FEEDBACK FORCES WILL CHANGE RAPIDLY. THIS WILL RESULT IN EXCESSIVE PILOT WORKLOAD, POOR AIRCRAFT CONTROL, AND POSSIBLE LOSS OF CONTROL.

Approach and landing

Over a clear and flat area, make a flat final approach, nose into wind. Perform a no-hover/slow run-on landing around 10 knots. Do not hover or taxi without hydraulic pressure assistance.

Section 7 – Description and Systems, 4 – Abnormal Operations, states in part the following:

For loss of hydraulic pressure, at a speed between 40 and 60 knots, the lateral force required to push the cyclic stick to the left is about 4 dekanewtons (daN) (9 pounds). The logitudinal force required to push the cylic stick forward is about 5 daN (11 pounds).

During a no-hover landing at about 10 knots, the pilot could be faced with longitudinal forces of up to 17 daN (37 pounds) for less than 30 seconds with low lateral forces. If the helicopter is hovering, the control load forces change, in both direction and intensity, as the pilot attempts to maintain a steady position. The pilot will exert longitudinal and lateral forces of up to 5 daN (12 pounds), the direction of which could change quickly. This translates into excessive pilot workload and poor helicopter control.

For a failure other than a hydraulic system failure, the maximum forces a pilot should exert on the controls to maintain helicopter attitude are about 15 daN (33 pounds) on the left or right lateral cyclic and 17 daN (37 pounds) on the forward longitudinal cyclic.

1.6.6.7 Transverse flow

When a hovering helicopter begins the transition to level flight, the airflow differs depending on whether it occurs in front of or behind the rotor disk. In the case of the AS350, the rotor

rolls to the right. This results in increased lift and upward flapping in front of the disk, as well as decreased lift and downward flapping behind the disk. This phenomenon is known as transverse flow. The pilot must therefore compensate for this phenomenon by moving the cyclic stick to the left to limit roll.

1.6.6.8 Hydraulic pressure failure training

The RFM Supplement 7 (SUP.7), *Hydraulic Pressure Failure Training Procedures in Cruise Flight Conditions*, describes the procedure for hydraulic failure training in flight (Appendix C). SUP.7 states the measures that the flight instructor and pilot in training must take in the event the HYD light illuminates in order to comply with the emergency procedure set out in the RFM. No environmental limitation other than those stipulated in the RFM, section 2 - Limitations, is mentioned in SUP.7. Hydraulic failure training can be given without wind restriction and in temperatures as low as –40°C.

A hydraulic system failure is simulated in steady flight by activating, in sequential order, the HYD TEST and HYD CUT OFF switches. The training procedure consists of 2 steps:

- The transition between steady flight and the recommended safety speed (40 to 60 knots);
- The landing phase.

First, the flight instructor moves the HYD TEST switch to the TEST position and the pilot in training slows down to the recommended safety speed. The accumulator charge pressurizes the main rotor controls and gives the pilot in training enough time to reach the recommended safety speed. The first step of the training is completed when the flight is stable at a speed between 40 and 60 knots.

Second, when the helicopter is at a stable speed, the flight instructor repressurizes the hydraulic system and recharges the accumulators by placing the HYD TEST switch in the OFF position. The pilot in training then places the HYD CUT OFF switch in the OFF position, and continues flying the aircraft in manual mode. Having these 2 switches in that configuration allows the pilot to turn the hydraulic pressure assistance back on by placing the HYD CUT OFF switch in the ON position during the training drill, if necessary.

Over a clear and flat area, the pilot in training makes a flat final approach, nose into the wind,and performs a no-hover slow landing at about 10 knots. The manufacturer's procedures and warnings are clear and do not allow for any landings other than run-on.

The SUP.7 subsection that describes the procedure for the transition to landing phase notes the possibility, if necessary, of restoring hydraulic pressure during the drill by selecting the HYD CUT OFF switch to ON.

The aircraft's RFM was up to date and contained SUP.7, revision 1, but neither the company nor the flight instructor were aware of SUP.7's existence.

1.7 *Meteorological information*

According to the aviation routine weather report (METAR) for Sept-Îles, at the time of the accident, the conditions were as follows:

- calm winds;
- visibility 30 statute miles;
- few clouds at 2000 feet above ground level;
- temperature -21°C and dew point -30°C.

1.8 *Aids to navigation*

Not applicable.

1.9 *Communications*

The helicopter radio was operating normally. The aircraft reported no problem before the accident.

1.10 *Airport information*

The Sept-Îles Airport is certified, operated and maintained by TC. The airport has a flight service station (FSS) operated by NAV CANADA. Its reference altitude is 180 feet above sea level (asl). The airport has 2 runways: Runway 09/27 and Runway 13/31 (Figure 6). The elevation of the Runway 31 threshold is 173 feet asl. At the time of the occurrence, Runway 27 was the active runway.

Runway 13/31 had been closed since 31 January 2013. Its paved surface was covered with ice and patches of snow. Communications between the helicopter and the FSS revealed that the crew reported no problems and did not declare an emergency situation before or after the crash.

Figure 6. View of the Sept-Îles Airport (Source: Google Earth, with TSB annotations)

1.11 *Flight recorders*

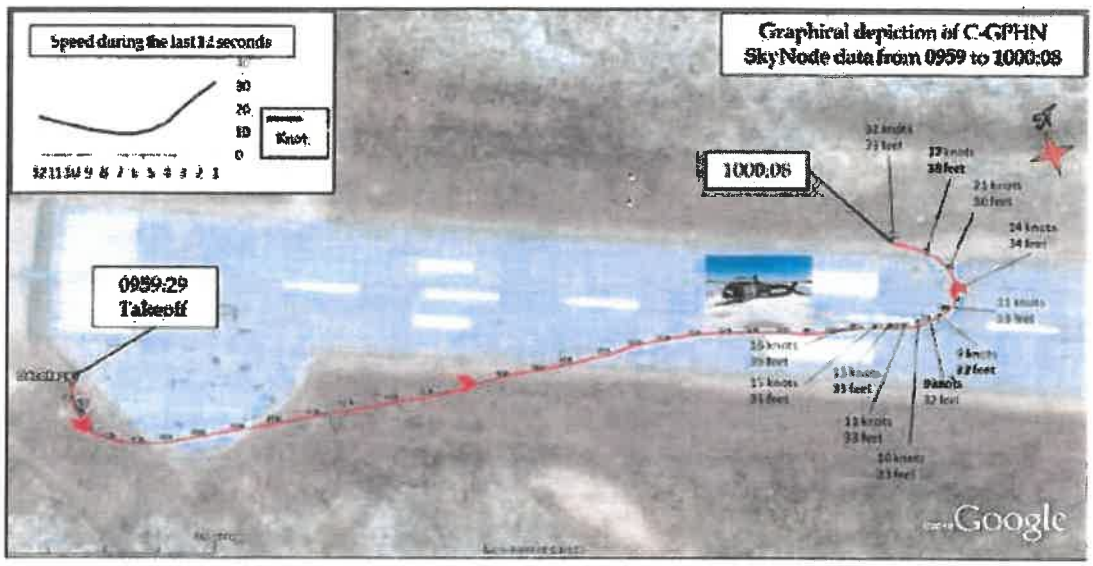
The helicopter was equipped with a SkyNode satellite tracking and data telemetry system.[7] The system records data from the global positioning system (GPS) that is part of the SkyNode module. The logged data include the time of the recording, geographical coordinates, altitude, groundspeed, aircraft direction, and the messages "Take Off h," "Landing h," "Pausing," and "Start Up."[8]

---

7 SkyNode, Model S200-011, manufactured by Latitude Technologies Corporation of Vancouver, British Columbia.

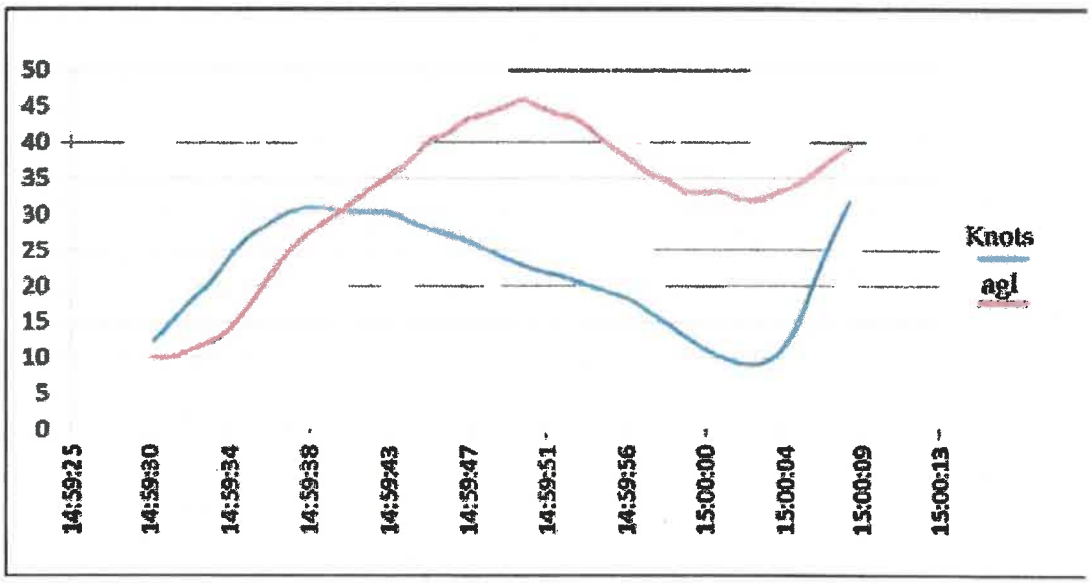
8 The "Take Off h" and "Landing h" messages appear when the GPS speed goes, respectively, above or below 5 knots. The "Pausing" message appears after extended hover flight. In "Pausing" mode, regular transmissions are stopped.

Figure 7. Flight path during last hydraulic failure drill (Source: Google Earth, with TSB annotations)



The SkyNode memory contained data from 1345:57 UTC[9] to 1500:08 UTC. The SkyNode recorded data every 2 minutes, except for the last 2 minutes of the flight when data were recorded every second. With these data, the approximate flight path could be reconstructed (Figure 7). The last recording indicates that the helicopter was 39 feet above ground level (agl) at a groundspeed of 32 knots (Figure 8).

Figure 8. Groundspeed and height of the aircraft before the crash



9 Coordinated Universal Time (Easteern Standard Time plus 5 hours).

1.12 *Wreckage and impact information*

1.12.1 *General*

The wreckage was sent to the TSB laboratory in Ottawa, Ontario, where it was examined in the presence of the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) of France, Eurocopter, and TC. The servoactuators, the hydraulic pump components, the pressure regulator, the accumulators and the hydraulic filter were removed from the aircraft for operating tests at Eurocopter Canada Ltd. in Fort Erie, Ontario, in the presence of the TSB, BEA, Eurocopter, and Héli-Excel. The following observations were made:

- the HYD TEST toggle switch was pushed forward and to the left in the TEST position (Figure 4);
- the HYD CUT OFF pushbutton at the end of the collective stick was set in the CUT OFF position;
- the damages (deformation, failure) observed during examination of the drivetrain were attributable to the accident;
- a continuity and integrity check of the drivetrain revealed that it was intact before the accident;
- no pre-impact deformation or failure was noted in the flight controls.

1.12.2 *Examination of hydraulic system harnesses and contacts*

The solenoid valves of the servoactuators were operating properly as a group and individually. Electrical continuity of the servoactuators was confirmed. The HYD TEST switch and the HYD CUT OFF switch were operating properly.

No anomaly was observed on the electrical components of the hydraulic system, i.e. the harnesses, contacts, solenoids and switches, that could have led to a malfunction at the time of the occurrence.

1.12.3 *Examination of the hydraulic reservoir and hydraulic fluid*

No water accumulation was found in the cone of the hydraulic reservoir cap. Analysis of the hydraulic fluid revealed no anomaly that could compromise the proper operation of the hydraulic system.

1.12.4 *Examination of the servoactuators*

The aircraft was equipped with 4 Dunlop servoactuators. The tests conducted at Eurocopter on the servoactuators, accumulators, solenoid valves, filter and hydraulic pump confirmed that they were functioning properly. However, deviations were noted between some test results and the values specified in the Component Maintenance Manual (CCM). According to Eurocopter, the deviations noted did not have an impact on the operation of these components and could possibly have been caused by the crash.

The servoactuators were then sent to Meggitt Control System[10] in Coventry, Great Britain, where they were examined and tested. The servoactuators were subjected to various tests which showed deviations from the design tolerance range. Three servoactuators exceeded the certification tolerances for extension speeds and 2 servoactuators exceeded the certification tolerances for retraction speeds. The 4 servoactuators operated under hydraulic pressure. According to Meggitt Control System, the test results were typical of servoactuators approaching the end of their operating time between overhauls.

The tests conducted at Eurocopter and Meggit Control System revealed no anomalies in manual mode.

1.12.5 Warning lights

Examination of the light bulb filaments of the warning lights in the annunciator panel revealed either localized or generalized stretching in the HYD, DOORS, F.FILT and M.G.B.T. lights. This stretching is typical of illuminated bulbs.[11]

Table 4. Warning lights with localized or generalized stretching

Warning light	Failure
HYD	Loss of hydraulic pressure or pressure < 30 bars
DOORS	1 or 2 lateral cargo doors open
F.FILT	Pre-blockage fuel filter
M.G.B.T.	Main gearbox, maximum oil temperature

The HYD light was illuminated before impact after the pilot in training pressed the HYD CUT OFF switch as part of the hydraulic failure drill. According to the information obtained, no other light was illuminated prior to impact with the ground. Since the engine continued to run after the accident, the warning system remained operational. It was therefore concluded that the DOORS, F.FILT and M.G.B.T. lights illuminated as a result of the damage caused by the accident.

1.12.6 Cockpit seats

During the occurrence, the 2 pilot seats were subjected to upward vertical forces, lateral forces to the left, and forward longitudinal forces. The right-hand seat separated from the floor, while the left-hand seat separated from its box. The lap belts remained attached to the floor and their straps and buckles were intact. The 2 seats failed in overload. The floor under the base of the left-hand seat was severely damaged, which caused the seat to separate from its box. At the time the aircraft was certified, the seats were designed to resist upward vertical acceleration of 1.5 *g*, downward vertical acceleration of 4.0 *g*, longitudinal acceleration of 4.0 *g*, and lateral acceleration of 2.0 *g*.[12]

---

10 Dunlop-approved centre for servoactuator overhauls.

11 TSB Laboratory Report LP053/2013 - GPS Analysis.

12 United States *Federal Aviation Regulation* (FAR) 27.561 amendment 10.

The resistance standards have since changed. Seats must now resist upward vertical acceleration of 4.0 *g*, downward vertical acceleration of 20.0 *g*, forward longitudinal acceleration of 16.0 *g*, rear longitudinal acceleration of 1.5 *g*, and lateral acceleration of 8.0 *g*.

Airbus Helicopters, the holder of the type certificate, issued a service bulletin (SB 25.00.57) that suggests installing pilot and co-pilot seats with an improved structural design that complies with the new certification requirements.

1.13 *Medical and pathological information*

Not applicable.

1.14 *Fire*

There was no fire.

1.15 *Survival aspects*

1.15.1 *General*

After the crash, the aircraft came to rest on its left side, and the 2 front seats failed in overload. The 2 pilots in these seats were unconscious. The pilot in the left-hand seat was leaning on the pilot in the right-hand seat. The pilot observer seated in the back unbuckled his seat belt and exited the aircraft through the large hole formed in the roof of the cabin. Once outside the aircraft, he noted that the other 2 pilots were lying motionless in the wreckage and that the engine was still running. He also noticed a large fuel spill. He returned to the aircraft and first had to remove the 2 pilots from their seats to gain access to the fuel shut-off lever. He dragged the pilots, whose clothes were soaked with fuel, several metres away from the wreckage. After shutting off the engine, he administered first aid to the pilots, who regained consciousness a few minutes later. The 3 pilots sustained injuries to the head and face. None of them was wearing a helmet, nor were they required to do so by regulations.

1.15.2 *Helmet*

Although the CARs do not require helicopter pilots to wear a helmet, the TSB has documented a number of cases where wearing a helmet would likely have reduced or prevented pilot injuries. On 30 October 2009, the TSB issued Aviation Safety Advisory A09A0016-D2-A1 – *Low Usage of Head Protection by Helicopter Pilots*, emphasizing that without ongoing and clear communication promoting the benefits of using head protection, helicopter pilots will continue to operate without a helmet, increasing the risk of head injury and consequent inability to provide necessary assistance to crew or passengers.

1.15.3 Emergency services

The Sept-Îles Airport does not provide aircraft rescue and firefighting (ARFF) services.[13] The fire department of the city of Sept-Îles provides firefighting services in the event of an accident or incident at the airport. Response time is at least 15 minutes. Fires in the city of Sept-Îles have priority.

The crash site was more than 4000 feet away from active Runway 09/27. The airport remained open after the accident, meaning that aircraft could take off and land.

1.15.4 Emergency locator transmitter

The aircraft was equipped with a KANNAD emergency locator transmitter (ELT), model 406AF-COMPACT, serial number 259637, that can broadcast on frequencies 121.5 MHz and 406 MHz. The ELT was not damaged and it activated following the impact.

1.15.5 Emergency response plan of the Sept-Îles Airport operator

The operator of an airport must develop and maintain an emergency response plan.[14] In 2000, the Sept-Îles Airport operator adopted an emergency response plan identifying the roles and responsibilities of each responder in the event of, among other things, an aircraft accident at the airport.

In the event of an accident at the airport, the FSS immediately contacts the CAUREQ (Centre d'appel d'urgence des régions de l'Est du Québec) by dialling 911. The CAUREQ notifies the fire department, the Sûreté du Québec (SQ) and ambulance services, which in turn notify the Sept-Îles Health and Social Services Centre, the hospital, and lastly, the airport manager or duty manager.

The airport manager or duty manager, who is not necessarily present at the airport, immediately heads to the emergency operations centre (EOC) and notifies the relevant response units. The EOC, where representatives of the response units gather, contains communication, information and recording equipment and becomes the communications centre (Photo 1). The responders use various radio frequencies to communicate with each other. The EOC also remotely controls gate 7, located between the terminal and the airport multi-purpose building.[15] In an emergency, the gate is identified by a flashing red light, and the SQ controls its access. To ensure that the EOC is opened as quickly as possible, the airport operator had provided some first responders with a key to the premises. However, at the time of the occurrence, some of them either did not know they had a key or had lost it.

---

13 Since the total number of enplaned and deplaned passengers does not exceed 180 000 per year, the Sept-Îles Airport is not required to provide aircraft rescue and firefighting (ARFF) services (Subpart 303 of the *Canadian Aviation Regulations*).

14 *Canadian Aviation Regulations* (CARs) 302.202 - Airport Emergency Response Plan.

15 Gate 7 is the meeting point for response units heading to an accident site.

The airport manager or duty manager is responsible for, among other things, coordinating activities in the EOC and providing any assistance required by the operations commander at the accident site. He is also responsible for managing the airport during the emergency and making decisions concerning its operation.

Photo 1. View of Sept-Îles Airport's emergency operations centre

The airside is protected by a security fence and access is mainly controlled by 2 magnetic-card activated gates. The distribution of these magnetic cards is controlled. Users are NAV CANADA and TC personnel, as well as others who have an airside vehicle operator's permit (AVOP).

Airside driving is regulated by AVOP standards, and persons without an AVOP must be escorted.

1.15.6 Emergency response

At 1000, the NAV CANADA FSS specialist on duty[16] observed the aircraft strike the ground; he did not receive any distress call from the helicopter either before or after the impact. He immediately dialled 911 and reported the accident to the CAUREQ, which alerted the fire department, SQ and ambulance services, but did not inform airport officials of the emergency situation.

Given that the crash site was more than 4000 feet away from the active runway, Runway 09/27, the airport remained open after the accident, meaning that aircraft were able to continue taking off and landing during the emergency response.

At 1005, by telephone,[17] the FSS dispatched to the accident site an ambulance, which was on the apron for a medical evacuation.

Between 1006 and 1015, 2 SQ vehicles, 2 ambulances, and Sept-Îles fire department officials arrived at gate 7. The SQ officer in charge went to the FSS tower to coordinate the activities of the ground crews.

---

16 There was only 1 flight service specialist on duty at the time of the crash.

17 Ambulances do not have radio equipment to communicate with the flight service station.

Around 1015, an employee from a medical carrier opened gate 7. The responders' vehicles immediately started driving on Runway 09/27 unescorted and without authorization or means of communicating with the FSS. They believed the airport was closed to air traffic. Once they were on the runway, the responders became disoriented; although they could see the wreckage and the ambulance, they did not know how to reach them. Meanwhile, a de Havilland DHC-8, operated by Air Canada Express, was making its final approach for the runway and had to pull up after being notified by the FSS specialist of a runway incursion.

At 1028, 2 fire trucks from the Sept-Îles fire department and the airport fire truck arrived at the accident site. At 1031, the 2 pilots who had been sitting in the front seats were en route to the hospital. At 1037, the airport duty manager was notified of the accident by the airfield supervisor. He arrived at the crash site at 1045. At 1145, the duty manager opened the EOC and activated the emergency response plan. At 1249, the emergency response ended and the EOC was closed.

1.15.7 Post-occurrence debriefing meeting

The responders held 2 debriefings after the accident. During these meetings, they identified the following irregularities in relation to the emergency response plan:

- The first responders did not have their keys to access the EOC.
- The CAUREQ did not inform the airport manager or the duty manager of the emergency.
- The EOC was opened 1 hour and 45 minutes after the accident.
- A responder opened gate 7 without authorization.
- Response vehicles drove unescorted in the airport's manoeuvring areas and without authorization or means of communicating with the FSS.

1.15.8 Emergency drill at the Sept-Îles Airport

The Sept-Îles Airport must test its emergency response plan by conducting full-scale drills at least every 4 years.[18] In addition, the airport operator must hold table-top exercises every year that full-scale drills are not held.

The last full-scale drill held at the Sept-Îles Airport before the accident was conducted on 09 October 2008. The drill consisted of a simulated aircraft crash at the airport. Based on the minutes of the debriefing, the results of the drill were generally satisfactory.

However, the very nature of an emergency drill is such that some shortcomings are always identified. The presence of a large number of responders in the FSS tower impeded the specialist's work. It was also found that there was insufficient personnel at gate 7 to escort responders to the accident site.

---

18 *Canadian Aviation Regulations* (CARs) 302.208 - Testing of the Emergency Plan.

1.16 Tests and research

1.16.1 TSB laboratory reports

The TSB completed the following laboratory reports in support of this investigation:

- LP022/2013 – Download of SkyNode Transmitter
- LP032/2013 – Seat Examination
- LP035/2013 – Hydraulic System Examination
- LP052/2013 – Flight Path Analysis
- LP053/2013 – GPS Analysis

1.17 Organizational and management information

1.17.1 General

Héli-Excel holds a valid operating certificate and its base is located about 7 nautical miles (nm) northwest of the Sept-Îles Airport. At the time of the accident, Héli-Excel operated a fleet of 20 helicopters, comprising Bell 205, Bell 206, Bell 206L, Bell 214B-1, Eurocopter AS350 B, BA,B2, D, and Eurocopter AS355-F. These aircraft are operated according to Subparts 2 and 3 of Part VII of the CARs. The occurrence flight was operated under Subpart 3, Air Taxi Operations.

Héli-Excel uses a safety management system (SMS), although it is not required to do so by the CARs. The program validation inspection (PVI) conducted by TC in February 2010 found no non-compliance with any operational control aspect since Héli-Excel met all the measurement criteria. In fact, the company earned a high score because it met 5 of the 8 criteria required for a perfect score.

1.17.2 Flight instructor training

At the time of the accident, the company provided pilot training. The chief pilot[19] and 2 flight instructors reporting to him were delivering annual type training and specialized training in accordance with the company's training program.[20]

Flight instructors were not required to have an instructor's rating. They were, however, required to hold a commercial pilot licence and be type-endorsed for AS350 to provide flight instruction. As stipulated in the CARs, they also had to show that they knew the content of the helicopter's RFM, of the company check pilot manual, and of the company's operations and training manuals.

---

19 The chief pilot was responsible for developing and implementing all the training programs required for the air operator's flight crews.

20 Héli-Excel operations manual, Partie 8 – Formation.

The flight instructors' training and qualifications were in accordance with the CARs,[21] and Héli-Excel had not set requirements other than those in the CARs.

The company selected flight instructor candidates on the basis of their experience and flight skills. The chief pilot then reviewed the aircraft's in-flight emergency procedures with them. The candidates were appointed flight instructors after demonstrating their ability to correctly execute the procedures in the aircraft's RFM.

Together with the chief pilot, the flight instructors were responsible for implementing and promoting the flying standards and techniques that flight crews must follow during operational flights and with which compliance must be shown during initial and periodic checks. They were also responsible for delivering flight training to all flight crews, in accordance with the training program approved for the type of assigned aircraft.[22]

The company encouraged its pilots in training to observe the training drills of other pilots on board the aircraft. This practice was considered helpful to the pilots' learning since it allowed them to observe first-hand normal, abnormal and emergency procedures being carried out. According to TC, this practice contravened the CARs,[23] which stipulate that only individuals essential to the flight can be on board during a training flight. Since the occurrence, the company no longer authorizes pilots, other than the flight instructor and pilot in training, to be on board an aircraft during a training flight.

1.17.3 Héli-Excel Pilot Training on AS350

According to the company's operations manual, the purpose of technical ground training and flight training is to teach the crew about the aircraft's systems and the procedures to follow in normal, abnormal and emergency situations. In this occurrence, the pilot in training had just completed his technical ground training on the AS350 and knew the procedure for hydraulic failure as well as the risks associated with flying without hydraulic pressure assistance.

1.17.4 Héli-Excel's hydraulic failure training

The company was not aware that Eurocopter had published a flight training procedure for hydraulic pressure loss which could be found in SUP.7. The company's training procedure was in fact similar to and complied with the one in SUP.7, except that flight instructors did not know that pressurizing the hydraulic system was permitted in flight. Some pilots reported that they believed that pressurizing the hydraulic system in flight, coupled with the inherent instability of a helicopter and the forces on the controls, would lead to a loss of control as a result of excessive corrections.

---

21 *Canadian Aviation Regulations* (CARs), Standard 723 – Air Taxi – Helicopters.

22 Héli-Excel operations manual.

23 *Canadian Aviation Regulations* (CARs) 703.26 states as follows: "No person shall, where passengers are on board an aircraft, simulate emergency situations that could affect the flight characteristics of the aircraft."

When a pilot in training was unable land because of difficulty controlling the aircraft, the company expected the flight instructor to take over the controls and land the aircraft. If landing was impossible, the flight instructor was to pull up and reach safety speed before completing a pattern and landing without hydraulic pressure assistance.

With regards to loss of hydraulic pressure training, the investigation found minor procedural differences among companies and in relation to SUP.7. At one large AS350 operator, the hydraulic failure drill always begins halfway through the downwind pattern and invariably ends with a landing. After landing, the hydraulic system is repressurized before conducting the drill again. As well, the manipulation sequence differs from the procedure described in SUP.7; after pressing the HYD TEST pushbutton, the pilot in training pushes the HYD CUT OFF switch before restoring pressure with the HYD TEST button. Flight instructors find that this method more closely simulates a real-life hydraulic failure than the one suggested in SUP.7. However, activating the HYD CUT OFF switch before restoring pressure in the hydraulic system using the HYD TEST button does not recharge the tail rotor accumulator on a helicopter equipped with a compensator.

The investigation also revealed that some flight instructors were not fully aware of the risks associated with manoeuvres at low altitude and in hover without hydraulic pressure assistance. Flight instructors tend to believe that loss of control incidents stem from mechanical anomalies rather than from the handling characteristics of the AS350.

1.17.5 Flight instructor's experience with hydraulic failure

During his career, both as a pilot and as an instructor, the flight instructor had always encountered manageable forces during hydraulic failure drills. Moreover, during their hydraulic failure training, pilots trained on the earlier models of the AS350[24] experienced less feedback loads than those generated by later models because the earlier models had lighter rotor feedback loads.

1.18 Additional information

Not applicable.

1.19 Useful or effective investigation techniques

Not applicable.

---

24 Eurocopter AS350 B and D.

2.0 *Analysis*

2.1 *The aircraft*

Neither the examination of the aircraft and its hydraulic components nor servoactuator tests revealed any anomaly that could have contributed to the loss of control of the helicopter. As previously stated, the hydraulic system functioned normally during the flight. Nothing indicates that the helicopter malfunctioned or that a failure occurred in flight.

2.2 *Centre console*

The HYD TEST switch was not equipped with a protection mechanism. The switch was found pushed up and to the left in the TEST position. The 2 switches located diagonally on the second and third rows of the centre console were also pushed up and to the left (Figure 4). It was concluded that the 3 switches were pushed in the direction of impact, probably when the pilot in training hit the centre console. If the HYD TEST switch is not equipped with a protection mechanism, there is an increased risk of unintentional operation, which can cause the hydraulic system to depressurize.

In May 2005, the original Honeywell pushbutton centre console was replaced with a toggle switch console from Aeronautical Accessories, Inc. as per supplemental type certification (STC) No. SR00825NY-D. When the new console was installed, the HYD TEST switch was not required to be fitted with a protection flap. Following events that led to hydraulic system failure and control difficulties due to accidental operation of the hydraulic test switch, Transport Canada (TC) issued an airworthiness directive (AD)[25] in September 2007 that made the installation of a protection flap on the HYD TEST switch mandatory in order to prevent accidental operation. However, the AD applied only to AS350 helicopters equipped with Honeywell consoles. Thus the HYD TEST toggle switch on C-GPHN was not equipped with a protection flap nor was it required to be.

Nonetheless, the intended purpose of the AD was to prevent the unintentional deactivation of the hydraulic system. Given the serious risks involved in such a situation, it is reasonable to think that all HYD TEST switches should be fitted with a protection flap or mechanism to prevent unintentional operation. In this instance, Aeronautical Accessories, Inc. published Aircraft Service Bulletin No. AA-13062 in December 2013 providing instructions for the replacement of the existing HYD TEST toggle switch with a "pull-to-unlock" design. Aeronautical Accessories, Inc. states that the bulletin must be complied with no later than 30 June 2014. However, in Canada, compliance with aircraft service bulletins is not mandatory for private aircraft. According to the information obtained during the investigation, TC is contemplating issuing an airworthiness directive in this regard, making a protection mechanism mandatory for the HYD TEST button on all centre console models.

---

25 Airworthiness Directive No. CF-2007-19.

Although this accident was not caused by the unintentional operation of the HYD TEST switch, if TC's airworthiness directive requiring a protection flap on the HYD TEST switch does not apply to all centre console models, there is a risk that AS350s will be equipped with a HYD TEST switch that can be unintentionally activated.

2.3 *History of the flight*

The flight instructor followed a procedure similar to the one described in the rotorcraft flight manual (RFM) Supplement 7 (SUP.7) at the beginning of the first hydraulic failure drill. He placed the HYD TEST switch in the TEST position; the horn sounded, the HYD warning light illuminated, and the servoactuators remained pressurized. The flight instructor then waited for the pilot in training to reach the safety speed range before placing the HYD TEST switch back to the OFF position; the HYD light extinguished, and the horn stopped. It can therefore be concluded that, at this stage of the training flight, the hydraulic system functioned as intended and that the drill was conducted in accordance with the directives in SUP.7.

The pilot in training then placed the HYD CUT OFF switch in the OFF position. At that point, the controls stiffened, the HYD light illuminated and the horn remained silent. Since the flight controls were no longer being assisted by the hydraulic system, the flight continued in manual mode. The pilot in training began an approach to the threshold of Runway 13. He had to transition slowly from the recommended safety speed to touchdown at about 10 knots without hovering. Since the loads on the flight controls were manageable and there was no unbalanced force that could result from asymmetric residual pressure in the accumulators, it can also be concluded that the HYD CUT OFF switch functioned properly.

The aircraft arrived at the chosen landing area without incident. However, once close to the ground, the pilot in training, who was not familiar with the handling characteristics of the AS350, was unable to control the aircraft sufficiently to carry out a safe landing. The fact that the SkyNode system did not record a "Landing h" message seems to indicate that the aircraft was flying at a speed over 5 knots. However, the reduction in the helicopter's speed in anticipation of landing very likely increased the control forces, which the pilot in training was unable to control completely. The flight instructor had to take back the controls and initiate pull-up. The operation of the helicopter and the pilot's workload were consistent with the description in the RFM regarding helicopter operation in case of hydraulic failure. This therefore leads to the conclusion that the aircraft behaved normally in the absence of hydraulic pressure assistance.

The drill deviated from the recommended procedure[26] when the flight instructor took over the controls. Without hydraulic pressure assistance, he flew a first low-altitude tight pattern, culminating in a landing. On the ground, with a red warning light illuminated on the instrument panel, he took off in manual mode, flew a second pattern and then handed the controls to the pilot in training. Finally, he took back the controls when he saw that the pilot

---

26 Flight Manual Supplement 7 (SUP.7) warns pilots that they could lose control of an aircraft in hover and in low-speed manoeuvres without hydraulic assistance.

in training was unable to stop the aircraft on the ground, and he flew another low-altitude tight pattern during which he lost control of the helicopter.

The aircraft slowed to 9 knots 6 seconds before the pilot lost control. According to flight tests by TC, the control forces at that moment must have exerted pressure toward the right and aft, thereby pushing the cyclic stick into the palm of the flight instructor's hand. The pilot therefore had to counter these forces by pushing the cyclic stick forward and to the left.

The marks from the impact and the data from the SkyNode system show that the loss of control occurred while the helicopter was slightly north of the runway, at about 35 feet above ground level (agl), and flying at a ground speed of 32 knots (Figure 8). Since the aircraft was not aligned with the runway centreline, the pilot in training was probably applying additional pressure, moving the cyclic stick to the left, in order to reach the landing area at the end of the runway.

The sudden movement of the cyclic stick forward and to the left occurred while the helicopter was accelerating from 9 to 32 knots and was not aligned with the landing point. Thus, the sudden change in direction of the aerodynamic feedback forces generated by the rotor head caused the cyclic stick to move in the direction of the forces exerted by the flight instructor and out of the palm of his hand.

The quick change in intensity and direction of the control forces, which is characteristic of the AS350 without hydraulic pressure assistance and flying at low speed, combined with the transverse flow effect, probably caused the cyclic stick to unexpectedly move forward and to the left. The lateral roll of the rotor disk to the left when the helicopter was accelerating from 9 to 32 knots caused the cyclic stick to move in the same direction. The suddenness of the movement took the flight instructor by surprise, preventing him from reacting in a timely manner. Since the aircraft was flying at less than 39 feet agl, or a distance almost equivalent to the diameter of the rotor disk, the severe rollover of the helicopter gave the flight instructor little opportunity of leveling off before the blades struck the runway.

2.4 *Training provided by the flight instructor*

The flight instructor flew 3 patterns and 2 takeoffs without hydraulic pressure assistance despite the CAUTION in the RFM. Training staff must be aware of the importance of following the instructions in the aircraft's RFM. The flight instructor is in a position to eliminate incorrect, dangerous or illegal habits. In this occurrence, the flight instructor set a negative example for the 2 pilots in training. Training that does not follow the approved procedure is detrimental to pilots in training in that it deprives them of a contextual experience to manage an emergency situation.

2.5 *Training procedure for hydraulic failure*

2.5.1 *General*

The flight instructor did not encounter an unusual critical emergency because the flight without hydraulic pressure took place during a training flight. Although the sudden movement of the cyclic stick from right to left took him by surprise and caught him off guard, the flight instructor should have expected it to happen as this phenomenon is symptomatic of loss of hydraulic pressure and documented in the RFM.

On this topic, the RFM contains 5 warnings about the risks associated with heavy control feedback, during hover and low-speed manoeuvres. It seems that despite these warnings, the flight instructor had inadequate knowledge of the hydraulics-off handling characteristics of this AS350 model. Moreover, other flight instructors seem to be under the impression that they could overcome the loads exerted by the main rotor on the controls.

2.5.2 *Flight instructor's experience with hydraulic failure*

Because of the lighter rotor feedback loads they encountered during their hydraulic failure drills, pilots trained on earlier models of the AS350 experienced less feedback loads than those generated by later models. The flight instructor had always encountered manageable forces during hydraulic failure drills. Consequently, his previous flight experience might have prompted him to not fully follow the procedure for hydraulic failure and to fly at low speed near the ground without hydraulic pressure assistance.

Pilots trained on the earlier AS350 models, equipped with a rotor system that generated lighter loads, might expect to experience less feedback loads than those generated by later models. Consequently, there is a risk that pilots will wrongly assume that they could overcome the feedback loads of newer models.

2.5.3 *AS350 rotorcraft flight manual*

Although the RFM officially cautions against the dangers of low-speed and hover flight without hydraulic pressure, it seems that not all of the pilots were aware of the pressing nature of this warning. The presentation of this information in the RFM could negatively affect pilot perception of the aircraft's handling characteristics. The only forces indicated in the approved RFM[27] in case of hydraulic failure are 2 to 7 kg for the cyclic stick, and 20 kg for the collective stick. Yet the part[28] of the RFM that is not approved states forces of 15 to 17 kg for the cyclic stick in case of hydraulic failure.

Although the warning in the emergency procedure stresses that the feedback forces could lead to loss of control, it does not quantify the intensity of these forces. The lack of specific information regarding the intensity of the feedback forces could lead pilots to assume that

---

27 Eurocopter, *AS350 Rotorcraft Flight Manual*, Section 3 – Emergency Procedures, Paragraph 4 – Hydraulic System Failures.

28 Eurocopter, *AS350 Rotorcraft Flight Manual*, Section 7 – Description and Systems.

they would encounter much lighter forces than in reality. Therefore, pilots might believe that they could overcome the control feedback forces.

2.5.4 *Rotorcraft flight manual typography*

The typography used in RFMs essentially follows somewhat codified conventions, with differences and variations found in the finer points. Although there is no hard and fast rule on warnings, there is consensus on their objective, namely, that they should stand out and emphasize the importance of the message. In the case of the warning in the RFM, its wording does not suggest that the instructions are critical to occupant safety and its formatting does not highlight the safety alert. Given that there is a risk not only of material damage but also bodily injury if the instructions are not followed, pilots could expect the warning to immediately catch their eye and to read WARNING instead of CAUTION.

If the wording of the warning in the emergency procedure for hydraulic failure and the procedure for hydraulic failure training does not comply with the generally accepted standard for flight manual (RFM) typography, there is a risk that the warning may not be heeded.

Past experience and the interpretation of the RFM might lead pilots to believe that they can control the aircraft at any stage of flight without hydraulic pressure assistance, without factoring in the unpredictable nature of flight control loads.

2.5.5 *Rotorcraft flight manual Supplement 7*

Héli-Excel's in-flight training on the AS350 is based on the aircraft's RFM. This means that, to the extent possible, pilots must respect the limits and procedures set out in the approved sections of the RFM, including SUP.7. Nonetheless, the company's flight instructors did not follow SUP.7 when training pilots during a hydraulic failure simulation. It was determined that pilots and instructors, including the occurrence instructor, were unaware that Eurocopter had published a specific procedure for hydraulic failure training.

It goes without saying that pilots must be familiar with the content of the RFM and particularly with the approved sections. Flight supplements are usually published to set out the limits, procedures and performance of a specific piece of helicopter equipment, but SUP.7 was an exceptional RFM supplement published in response to accidents resulting from hydraulic failures. Since pilots do not usually refer to flight manual supplements for training procedures, SUP.7 could go unnoticed.

The directives in SUP.7 are consistent with the recommended hydraulic failure procedure in the RFM. Although SUP.7 is based on the hydraulic failure procedure, the RFM does not indicate in section 3 – Emergency Procedures, that a training procedure was developed specifically for this type of emergency. In the absence of such a reference, flight instructors might not refer to SUP.7. If the procedures set out in SUP.7 are not followed during hydraulic failure training, there is a risk of loss of control of the aircraft.

2.5.6 *Hydraulic failure training procedure*

For lightweight helicopters, although loss of hydraulic pressure is an urgent situation, it is not critical. In the case of the AS350, when hovering in manual mode, the flight control forces are very high and unstable, and only marginally acceptable.[29] Hence the importance of following the instructions for a hydraulics-off flight to the letter.

To avoid encountering such forces, the pilot must make a flat approach, nose into the wind, and progressively reduce the aircraft's speed to perform a no-hover, slow run-on landing at about 10 knots. Nonetheless, in a training situation, it is realistic to expect some deviation from the recommended procedure. Sometimes a pilot in training who is not familiar with the handling characteristics of the AS350 might fly outside the recommended safety speed range and experience difficulty controlling the aircraft as a result of the feedback forces.

Although the NOTE in the Transition to landing section of SUP.7 mentions the possibility of restoring hydraulic pressure[30] during the drill if necessary, there is no specific directive aimed at the flight instructor in case of deviation from the recommended flight profile. If pilots do not know the content of SUP.7 and in the absence of a pre-hydraulic failure drill briefing, there is a risk that pilots will not be able to restore hydraulic pressure while applying considerable forces on the flight controls. Consequently, the flight instructor might inadvertently opt for a hazardous flight profile. This is all the more likely since the method to take over and hand back the controls is further complicated by the absence of a HYD CUT OFF button on the flight instructor's collective stick.[31] Since only the pilot in training can switch the flight from manual to hydraulic-assisted mode, lack of clear instructions can make coordination between the 2 pilots difficult.

In the absence of a strict framework, pilots might hesitate to restore hydraulic pressure while applying considerable forces on the flight controls. Nonetheless, the pilot could not have restored hydraulic pressure even if he wanted to do so since there was no HYD CUT OFF button on his collective stick. Moreover, the proximity to the ground when the aircraft rolled over most likely meant that the pilot in training did not have enough time to coordinate to restore hydraulic pressure.

2.6 *Survival aspects*

2.6.1 *Evacuation of the aircraft*

Given that the helicopter struck the ground in a nose-down attitude with a left bank angle of almost 100°, the front of the cockpit was heavily damaged and so severely deformed that it changed the space and structure that housed the 2 pilots. Apparently, the impact load did not exceed the limits of human tolerance. Since the front seats separated from their anchors, partly compromising the effectiveness of their seat belts, the 2 pilots hit their heads and faces

---

29 Report of a flight test conducted in November 2003 by Transport Canada.

30 Hydraulic pressure is restored by deactivating the HYD CUT OFF switch.

31 The flight instructor sits in the left-hand seat.

on the instrument panel before they lost consciousness. Helmets probably would have reduced the severity of their head injuries as well as the risk of losing consciousness. As they were unconscious, the 2 pilots were unable to evacuate or help evacuate the aircraft. Helicopter pilots who do not wear helmets are at an increased risk of incapacitation, serious injuries or loss of life in the event of an accident.

2.6.2 *Actions of the pilot observer*

The pilot observer extracted the unconscious pilots from the cockpit and dragged them a safe distance away from the wreckage. He then returned to the helicopter to shut off the engine. The pilot observer's quick reaction and knowledge of the aircraft reduced the risk of fire and more serious injury.

2.6.3 *Presence of the pilot observer on board*

The pilot observer's presence on board during the training flight was against existing regulations. Although training flights are structured with a view to minimizing risk, simulated emergency situations such as autorotations, hydraulic failures and tail rotor failures, by their very nature, entail a greater risk of accident. While a pilot in training can certainly benefit from observing his colleagues during a training flight, the fact is that a pilot observer is not essential to the flight and is exposed to a risk, albeit low, of accident.

2.6.4 *Cockpit seats*

According to the design documents, the cockpit seats complied with the standards in effect at the time the aircraft was certified. Load resistance requirements have since changed. The investigation could not determine the maximum accelerating forces reached during the accident. Consequently, it could not be determined whether seats constructed according to current standards would have lessened the impact loads and the injuries.

2.6.5 *Emergency services*

Emergency services were quickly notified because the crash occurred in broad daylight with good visibility and was witnessed by the flight service station (FSS) specialist, who promptly called 911, as he was supposed to do. He then dispatched to the accident site an ambulance that was awaiting a medevac flight on the apron. By clearly and accurately reporting the accident and its location, the actions of the FSS specialist were consistent with the airport's emergency response plan. As a result, the occupants of the helicopter were attended to by health professionals as soon as possible.

2.6.6 *Emergency response*

The success of an emergency response depends in large part on the effective use of all available resources at the time of the emergency. Effective coordination between the first responders is all the more important when an airport does not have its own aircraft rescue

and firefighting services.[32] Since external emergency response crews are typically unfamiliar with airport operations, it is vital that they know their roles, responsibilities and duties in an airport setting.

The emergency response was not carried out according to the airport's emergency response plan and compromised air safety. The deficiencies in the response did not, however, affect the survivability and health of the helicopter's occupants.

According to the emergency response plan, the coordination of responders must be done from the emergency operations centre (EOC), under the supervision of the airport manager or airport duty manager. Therefore, the presence of the airport manager on site was crucial to the smooth conduct of the emergency response as he had to coordinate the activities from the EOC, manage the airport, and make decisions regarding its partial or total closure and reopening. The 911 emergency service did not inform the airport manager of the helicopter crash.

Since the accident occurred on a Sunday, the airport manager was not at the airport. Therefore, he could not put the EOC into operation, and no decision was made regarding the airport's operations.

The EOC was only opened at the very end of the emergency because the other responders either did not know they had the key to the premises or had lost it. Because the airport manager was not on site and the EOC was not opened, there was a lack of coordination between the airport operator and the external emergency response units; consequently, emergency vehicles drove on the active runway with no means of communicating with the FSS, while a transport aircraft was on final approach. Such a situation could have serious consequences in poor weather conditions or darkness. Moreover, in the event of a more serious accident, such a situation could greatly delay the emergency response, with serious consequences for the survivability and health of the occupants on board the occurrence aircraft.

When emergency vehicles drive on an active runway without coordination between the airport operator and emergency response units, and with no means of communicating with the FSS, there is a risk of collision on the runway.

These errors and omissions stem from the fact that several key responders did not know their roles, responsibilities and duties as described in the airport's emergency response plan.

- Airport management was not notified by 911.
- An emergency response unit did not know that it had a key to open the EOC.
- An emergency response unit could not find its key to open the EOC.
- An emergency responder opened the gate, giving the emergency vehicles access to the manoeuvring area without coordinating with the airport authority.

---

32 The Sept-Îles Airport does not have its own aircraft rescue and firefighting services.

- The vehicles of 2 emergency response units drove on the manoeuvring areas unescorted and without authorization.

The emergency response plan assumes that any emergency response will be coordinated by airport management. Emergency drills were therefore always conducted with an airport coordinator. Consequently, the emergency response units were ill prepared to act without the EOC. Regardless, the emergency drills failed to instill in the first responders the basic principles of driving on the manoeuvring areas of an airport.

If the basic principles of driving on the manoeuvring areas of an airport are not instilled in first responders during emergency drills, there is a risk of incursion on an active runway.

3.0 *Findings*

3.1 *Findings as to causes and contributing factors*

1. The flight instructor did not follow the approved procedure as he flew 3 patterns and initiated 2 takeoffs without hydraulic pressure assistance. The helicopter's flight profile deviated from the flight profile recommended by the aircraft manufacturer when the hydraulic system is depressurized. As a result, the flight instructor encountered heavy, unpredictable flight control feedback forces.

2. The left collective stick does not have a HYD CUT OFF button. The flight instructor was therefore unable to restore hydraulic pressure.

3. The nose of the helicopter pitched down in a steep left bank at an altitude that made it impossible for the flight instructor to regain control of the aircraft before it struck the ground.

3.2 *Findings as to risk*

1. If the HYD TEST switch is not equipped with a protection mechanism, there is a greater risk of unintentional operation, which can cause the hydraulic system to depressurize.

2. If Transport Canada's airworthiness directive requiring a protection flap on the HYD TEST switch does not apply to all centre consoles, there is a risk that AS350s will be equipped with a HYD TEST switch that can be unintentionally activated.

3. If the wording of the warning in the emergency procedure for hydraulic failure and the procedure for hydraulic failure training does not comply with the generally accepted standard for rotorcraft flight manual typography, there is a risk that the warning might not be heeded.

4. If the procedures set out in the rotorcraft flight manual Supplement 7 are not followed during hydraulic failure training, there is a risk of loss of control of the aircraft.

5. If pilots do not know the content of the rotorcraft flight manual Supplement 7 and in the absence of a pre-hydraulic failure drill briefing, there is a risk that pilots will not be able to restore hydraulic pressure while applying considerable forces on the flight controls.

6. Helicopter pilots who do not wear helmets are at an increased risk of incapacitation, serious injuries or loss of life in the event of an accident.

7. When emergency vehicles drive on an active runway without coordination between the airport operator and emergency response units, and with no means of

communicating with the flight service station, there is a risk of collision on the runway.

8. If the basic principles of driving on the manoeuvring areas of an airport are not instilled in first responders during emergency drills, there is a risk of incursion on an active runway.

9. Pilots trained on the earlier AS350 models, equipped with a rotor system that generated lighter loads might expect to experience less feedback loads than those generated by later models. Consequently, there is a risk that pilots will wrongly assume that they could overcome the feedback loads of newer models.

3.3 *Other findings*

1. The pilots' seats separated from their anchors, partly compromising the effectiveness of their seat belts. The seats complied with the standards in effect at the time the aircraft was certified. The resistance standards have since changed, and seats now must be able to withstand much greater acceleration.

2. Héli-Excel encouraged its pilots to be on board as observers during emergency drills. The company was not aware that this practice contravened the *Canadian Aviation Regulations*.

4.0 Safety action

4.1 Safety action taken

4.1.1 Transport Canada

Transport Canada issued Airworthiness Directive (AD) CF-2015-10 that applies to supplemental type certification (STC) No. SR00825NY-D requiring a protection flap for the HYD TEST switch on Aeronautical Accessories, Inc. consoles model VIA-350-24-001 and VIA-350-24-002.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 10 June 2015. It was released on 04 August 2015.

Visit the Transportation Safety Board's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

Appendices

Appendix A – Airworthiness directive regarding protection of the hydraulic test switch

Transport Canada / Transports Canada

TP 7245E

No. CF-2007-19R1 1/1

Issue Date 27 November 2008

AIRWORTHINESS DIRECTIVE

The following airworthiness directive (AD) may be applicable to an aircraft which our records indicate is registered at your name. ADs are issued pursuant to Canadian Aviation Regulation (CAR) 625. Pursuant to CAR 605.84 and the further details of CAR Standard 625, Appendix H, the continuing airworthiness of a Canadian registered aircraft is dependent upon, but not limited to, compliance with all applicable ADs. Failure to comply with the requirements of an AD may invalidate the flight authorization of the aircraft. Appropriate records of compliance must be applied for in accordance with CAR 605.84 and the above-referenced Standard.

This AD has been issued by the Continuing Airworthiness Division (AARDC), Aircraft Certification Branch, Transport Canada, Ottawa, telephone 613 952-4377.

Number: CF-2007-19R1

Subject: Hydraulic Test Switch Protection

Revision: Supersedes Airworthiness directive (AD) CF-2007-19 issued on 7 September 2007.

Effective: 31 December 2008

Applicability: Eurocopter AS 350 Series Helicopters equipped with a Honeywell Control Unit.

This directive also applies to spare Honeywell Control Units P/N 350A61-1614-0004, 350A61-1722-0001, 350A61-1722-0002, 350A61-1722-0010, 350A61-1755-0001 and 350A61-1755-0101.

Helicopters equipped with a Honeywell Control Unit with sealed push-buttons (post-MOD 071262) are excluded from this directive.

Compliance: No later than 1 May 2009, unless already accomplished.

Background: It has been determined that inadvertent selection of the Hydraulic Test Switch can occur in flight due to close proximity to other switches. Transport Canada has concluded that a Hydraulic Test push-button protection flap is needed to reduce exposure to events leading to hydraulic system loss and control difficulties.

Because of several failures of the original protection flap with a 90° opening, Eurocopter designed a more reliable protection flap with a 180° opening.

This revision mandates installation of an improved protection flap with a 180° opening as per Eurocopter Service Bulletin (SB) 67.00.32 revision 1, issued 19 February 2008.

Corrective Actions:

1. Install the Hydraulic Test push-button 180° protection flap on the Honeywell Control Unit in accordance with paragraph 2.B.2.a or 2.B.2.b, as applicable, of Eurocopter SB 67.00.32 revision 1 dated 19 February 2008.
2. Identify (re-number) the modified Honeywell Control Units as per paragraph 2.C.2 of Eurocopter SB 67.00.32 revision 1 dated 19 February 2008.
3. Make an entry in the logbook regarding compliance with SB 67.00.32 revision 1 dated 19 February 2008.

Authorization: For Minister of Transport, Infrastructure and Communities

Derek Ferguson
Acting Chief, Continuing Airworthiness

Contact: Mr. Bogdan Gajewski, Continuing Airworthiness, Ottawa, telephone (613) 952-4460, facsimile (613) 996-9178 or e-mail: bogdan.gajewski@tc.gc.ca or any Transport Canada Centre

Pursuant to CAR 202.61 the registered owner of a Canadian aircraft shall, within seven days, notify the Minister in writing of any change to his or her name or address.

To request a change of address, contact the Civil Aviation Communications Centre (AARCI) at Place de Ville, Ottawa, Ontario K1A 0N8, or 1-800-305-2059, or www.tc.gc.ca/civilaviation/communications/section1/address.asp

31-0002 (01-2006)

Canada

Source: Transport Canada, Airworthiness Directive CF-2007-19R1, issued 27 November 2008

Appendix B – Diagram of the hydraulic system

Activation of the HYD TEST switch opens the manifold solenoid valve and depressurizes the hydraulic system.

Activation of the HYD CUT OFF switch opens the actuator solenoid valves of each servoactuator accumulators and depressurizes the accumulators for flight without hydraulic pressure assistance.

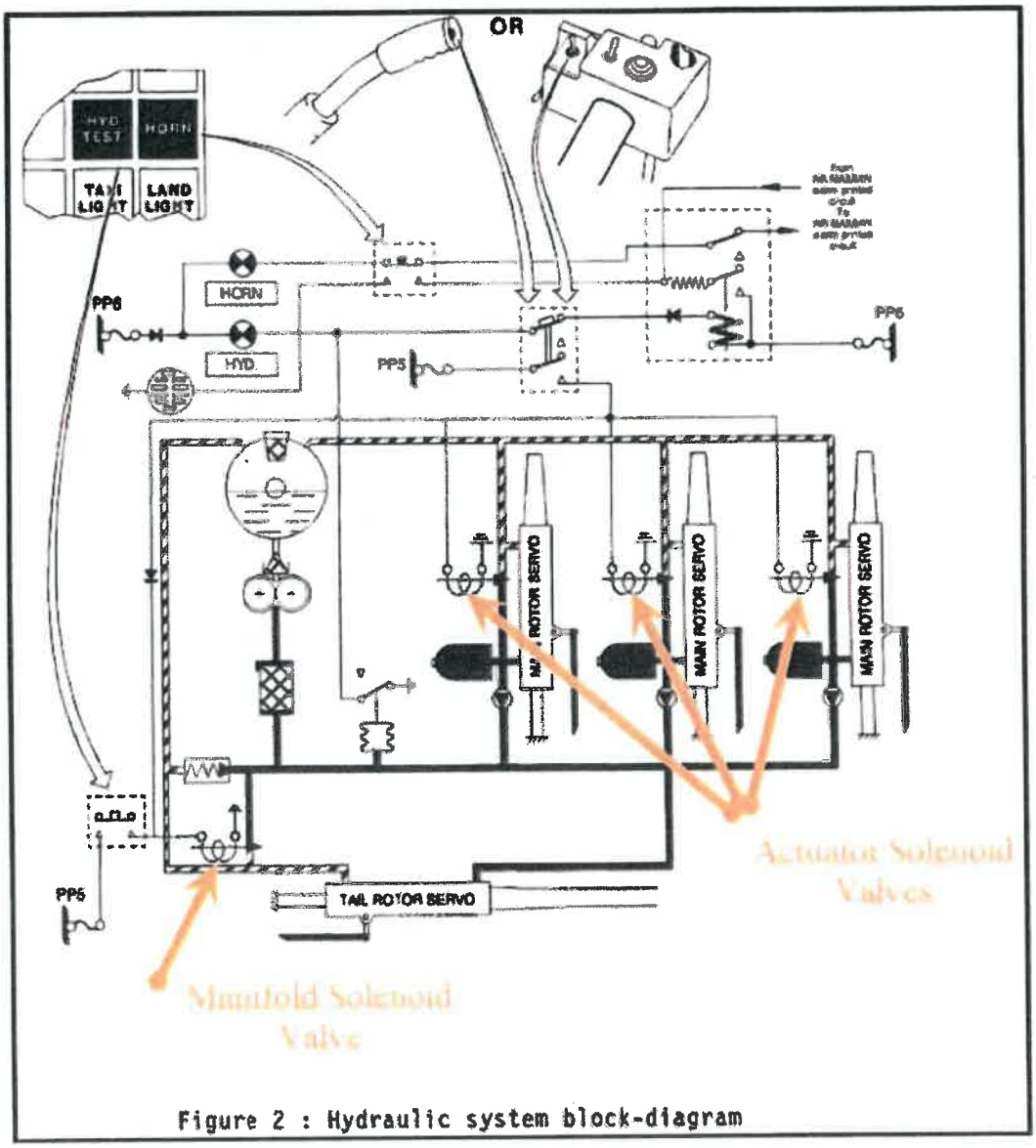
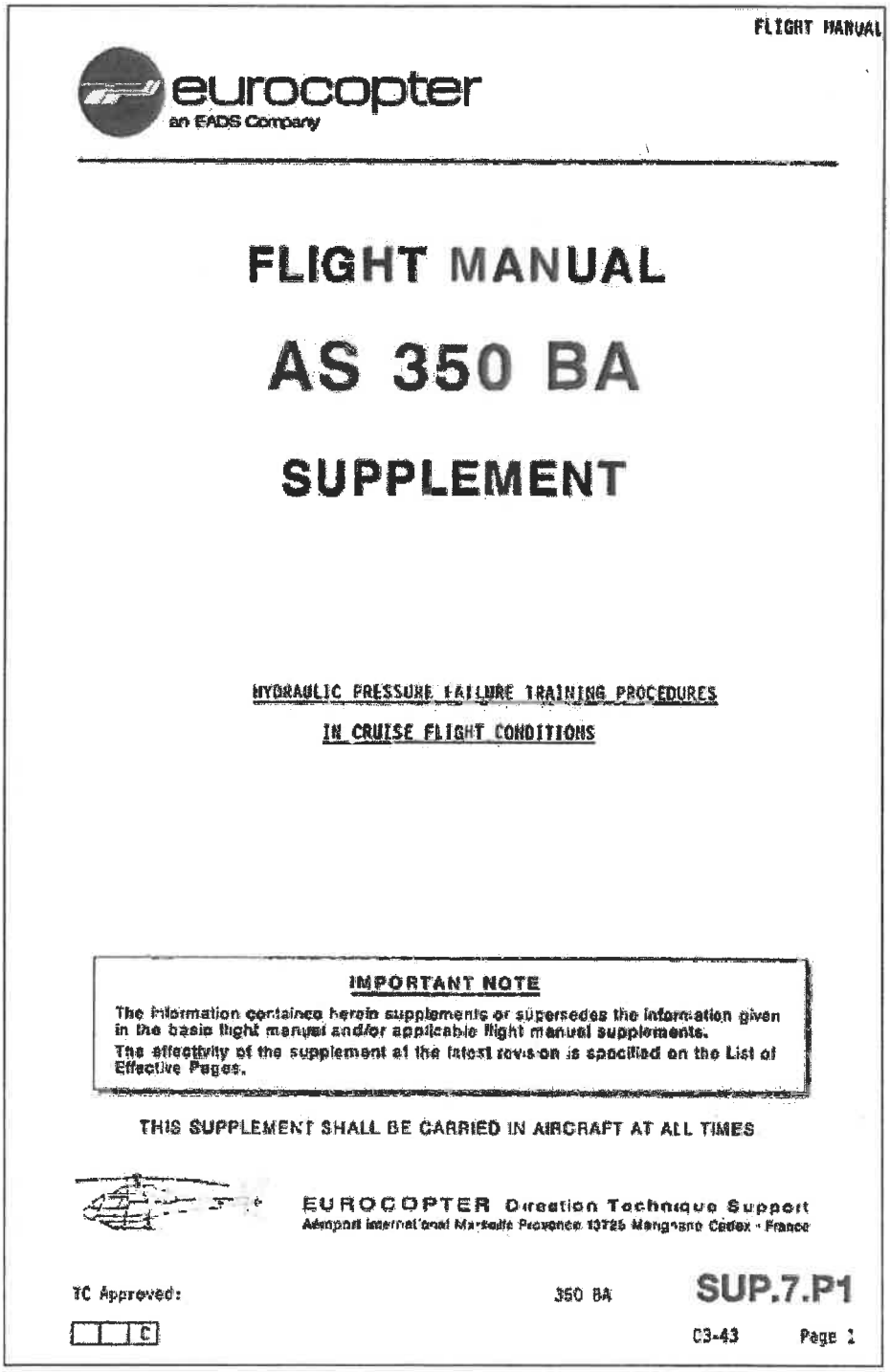


Figure 2 : Hydraulic system block-diagram

Source: Eurocopter, with TSB annotations

Appendix C – Rotorcraft flight manual Supplement No. 7



FLIGHT MANUAL

eurocopter
an EADS Company

FLIGHT MANUAL

AS 350 BA

SUPPLEMENT

HYDRAULIC PRESSURE FAILURE TRAINING PROCEDURES

IN CRUISE FLIGHT CONDITIONS

IMPORTANT NOTE

The information contained herein supplements or supersedes the information given in the basic flight manual and/or applicable flight manual supplements.

The effectivity of the supplement at the latest revision is specified on the List of Effective Pages.

THIS SUPPLEMENT SHALL BE CARRIED IN AIRCRAFT AT ALL TIMES

EUROCOPTER Direction Technique Support
Aéroport International Marseille Provence 13725 Marignane Cedex - France

TC Approved:

C

350 BA

SUP.7.P1

C3-43 Page 1

1 GENERAL

This procedure allows hydraulic failure training for single hydraulic system equipped AS 350 BA. R R

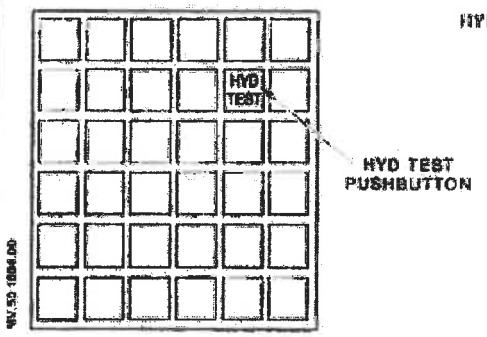
In case of loss of hydraulic pressure (HYD red warning light illuminates and horn sounds), the hydraulic pressure accumulators allow sufficient time to establish the recommended safety speed range, from 40 to 60 kt. R R R R
Then, the pilot must cut-off the hydraulic pressure switch on the collective stick and apply the emergency procedures. R R

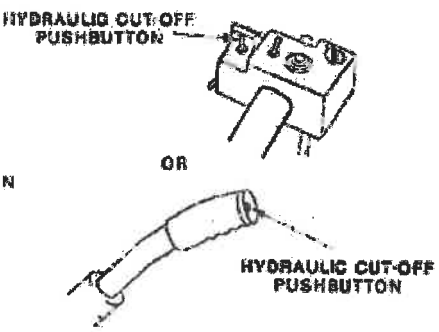
- Failure simulation R

If the pilot selects the "HYD TEST" pushbutton on the center console to "Test" (depressed position) in flight, the indications are as follows : R R
. HYD light illuminates. R
. HORN continuous sound. R
. Flight controls remain powered by accumulators. R
. Tail rotor pedals exhibit force feedback. R

If the pilot selects the hydraulic cut-off switch on the collective to OFF in flight, the indications are as follows : R R
. HYD light illuminates. R
. HORN silent. R
. Flight controls exhibit force feedback, pilot must exert the following (approximate) forces to maintain 60 Kt level flight : R R
  - Lateral cyclic 4 daN (10 lbs) left. R
  - Longitudinal cyclic 5.5 daN (12 lbs) forward. R
  - Collective zero at the neutral point but requires force to maintain a different collective position. R R
. Cyclic control feedback forces increase as airspeed is increased. Collective force to command more or less power than the neutral point may be high, requiring the pilot to pull upwards with approximately 13 daN (30 lbs) to maintain hover power, and to push downwards with approximately 13 daN (30 lbs) to achieve minimum collective pitch. R R R R R

So, to simulate a loss of hydraulic power, depressing the "HYD TEST" pushbutton on the central console produces the same effects as a real failure : R R R
. The hydraulic pump pressure is by-passed. R
. The main rotor accumulators give limited time hydraulic assistance back-up. R R
. The red HYD light comes on, the Horn sounds. R





2 TRAINING PROCEDURES R

The training procedures consist of two phases : R
- Transition to recommended safety speed from steady flight conditions. R
- Transition to landing. R

CAUTION : DO NOT ATTEMPT TO CARRY OUT HOVER FLIGHT OR ANY LOW SPEED R
MANEUVER WITHOUT HYDRAULIC PRESSURE ASSISTANCE. THE INTENSITY AND R
DIRECTION OF THE CONTROL FEEDBACK FORCES WILL CHANGE RAPIDLY. R
THIS WILL RESULT IN EXCESSIVE PILOT WORKLOAD, POOR AIRCRAFT R
CONTROL, AND POSSIBLE LOSS OF CONTROL. R

NOTE 1 : The pilot must ensure that the "HYD TEST" pushbutton is selected R
off (upper position) prior to cutting off hydraulic assistance. R

NOTE 2 : Do not silence the HORN by using the HORN switch. The HORN will R
be silenced when the pilot selects the hydraulic cut-off switch R
to OFF. If the pilot uses the HORN switch to silence the HORN R
before using the hydraulic cut-off switch, this crucial step R
could be forgotten. This could then result in significant R
unbalanced lateral cyclic feedback forces, especially at low R
speed, if one of the lateral accumulators depletes before the R
other one. In addition, de-activating the HORN using the HORN R
switch makes it unavailable to warn the pilot of low or high R
rotor RPM. R

Transition to recommended safety speed : R

- From steady flight conditions : R
  . Instructor - - - - - Depress "HYD TEST" pushbutton on center console. R
  . Red HYD light - - - Illuminates, Horn sounds. R
  . Trainee - - - - - - Reduces collective pitch, set airspeed R
  between 40 and 60 kt, safety speed. R

- Once safety speed set or when control loads appear : R

. Instructor - - - - - Reset "HYD TEST" pushbutton (up position), Horn stops, HYD light extinguishes. R R
. Trainee (*)- - - - - Set the hydraulic switch on the collective to OFF, HYD light comes on, moderate control loads are felt within 1 or 2 seconds. Horn remains silent. R R R R
Aircraft may now be maneuvered around the safety speed to demonstrate changes in control loads with speed and maneuvers. R R

- To terminate this phase : R
. Trainee - - - - - - Set airspeed between 40 and 60 kt. R
. Trainee - - - - - - Reset the hydraulic switch on the collective to ON. R R

Transition to landing : R

NOTE : The instructor must ensure that the "HYD TEST" pushbutton on center console is selected OFF (upper position) before the collective hydraulic cut-off switch is selected OFF to enable the pilot to restore the hydraulic power system by re-setting the hydraulic cut-off switch to ON during the training exercise should it become necessary. R R R R R R

- From level flight conditions at 40 to 60 Kt : R
. Trainee - - - - - - Set the hydraulic switch on the collective to OFF, HYD light comes on, moderate control loads are felt within 1 or 2 seconds. Horn remains silent. R R R R
. Trainee (**) - - - - Apply the appropriate emergency landing procedure for red HYD warning light, refer to SECTION 3.3 page 2 of the present Flight Manual. R R R

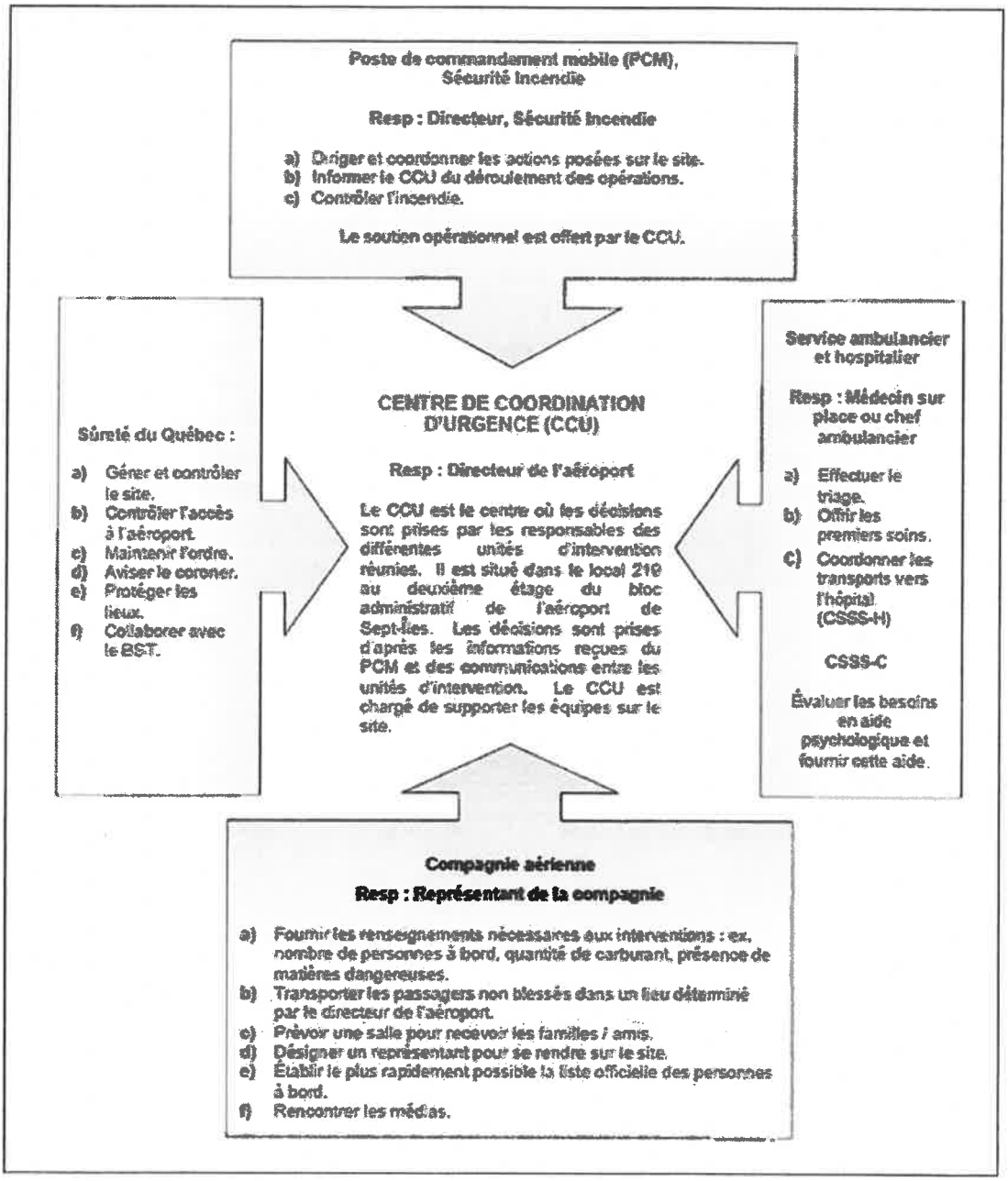
These two different phases can be realized in sequence by stepping from step (*) during transition to recommended safety speed to step (**) of the transition to landing. R R R

IMPORTANT : As described in the emergency procedures : R
- Over a clear and flat area, make a flat final approach, nose into the wind. R R
- Perform a no-hover/slow run-on landing around 10 knots. R
- Do not hover or taxi without hydraulic pressure assistance. R

- After landing, and before any other take-off or hovering flight : R
. Trainee - - - - - - Reset the hydraulic switch on the collective to ON to restore hydraulic assistance. R R
. Crew - - - - - - - - Check red HYD light off within 3 seconds, Horn sounds briefly the time for the light to go out. R R

Source: Eurocopter, Flight Manual AS 350 BA Supplement, SUP 7.

Appendix D – Excerpt from Sept-Îles Airport emergency response plan



Source: Sept-Îles Airport, *Plan des mesures d'urgence de l'exploitant*, revision 0, June 2000, p. 2-9 [in French only]

Document 8

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate [redacted]

Name of ~~Chief Commissioner~~ /Delegate : [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information will not be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)		
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]		
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]		
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]		
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]		
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies		
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.		
Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)		
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

Document 10

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate [redacted]

Name of ~~Chief Commissioner~~/Delegate : [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information **will not** be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)		
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]		
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.)		
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]		
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]		
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies		
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.		
Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)		
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information will not be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

 Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	ATSB	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.)
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.

Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)	[redacted]	
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

Document 13

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate

[redacted]

Name of ~~Chief Commissioner~~/Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003.* The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate [redacted]

Name of ~~Chief Commissioner~~ /Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information **will not** be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

 Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested

Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)		
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]		
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]		
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]		
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]		
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies		
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.		
Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)		
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name Position Business Phone Mobile Signature	[redacted]

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information **will not** be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested
(list requirements under the relevant headings)

Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.)

[redacted]

Flight information (e.g. flight plan, flight progress strips, SAR details, etc.)

[redacted]

Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.)

[redacted]

Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.)

[redacted]

Requested by (date)

[redacted]

Note: 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies

Quarantine (ATSB and CASA only use only)

Required? [redacted] Expected duration of quarantine required: [redacted]

Note: Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals.

Note: Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.

Requesting officer to complete the following on receipt of the operational safety information

Description of safety information received (audio, radar, ATIS, etc.)	[redacted]	
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information will not be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency		
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	[redacted]	[redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.

Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)	[redacted]	
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

Document 18

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003.* The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate [redacted]

Name of ~~Chief Commissioner~~/Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information **will not** be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

 Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested

Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)		
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]		
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]		
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]		
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]		
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies		
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.		
Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)		
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate

[redacted]

Name of ~~Chief Commissioner~~ /Delegate : [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information will not be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency		
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)	
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]	
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]	
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]	
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]	
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies	
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.	
Requesting officer to complete the following on receipt of the operational safety information	
Description of safety information received (audio, radar, ATIS, etc.)	[redacted]
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name Position Business Phone Mobile Signature [redacted]

Document 22

Transport Safety Investigation Act 2003- Section 32

Australian Government

Australian Transport Safety Bureau

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Location of interview [redacted] Interview Date [redacted] Interview Time: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate [redacted]

Name of ~~Chief Commissioner~~ /Delegate : [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

Document 23

Transport Safety Investigation Act 2003- Section 32

Australian Government

Australian Transport Safety Bureau

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Location of interview [redacted] Interview Date [redacted] Interview Time: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate [redacted]

Name of ~~Chief Commissioner~~/Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

Document 24

Transport Safety Investigation Act 2003 – Section 32

Australian Government
Australian Transport Safety Bureau

Request for Interview and/or Relevant Material

Form F32-1

ATSB Investigation No. AO-2017-109 **ATSB Ref No.**

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description
LOSS OF CONTROL + COLLISION WITH TERRAIN
INVOLVING VH-BAA ON 7/11/13 IN HOBART

To [redacted] Organisation [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar events occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 of the TSI Act is to ensure that the information or material that you provide is protected as restricted information under the Act.

Attend an interview *(delete if not applicable)*

Location, date and time of interview
[redacted]

Produce relevant material *(delete if not applicable)*

Description of material, date required and any special instructions
[redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted] Phone ( ) [redacted]

Document 25

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 – Section 32

Request for Interview and/or Relevant Material

Form: F32-1

ATSB Investigation No. AO-2017-109 **ATSB Ref No.**

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description

Loss of control + collision terrain involving VH-BAA 7/11/17 IN HOBART.

To Name [redacted] Organisation [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar events occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 of the TSI Act is to ensure that the information or material that you provide is protected as restricted information under the Act.

Attend an interview *(delete if not applicable)*

Location, date and time of interview

[redacted]

Produce relevant material *(delete if not applicable)*

Description of material, date required and any special instructions

[redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted] Phone [redacted]

Document 26

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 – Section 32

Request for Interview and/or Relevant Material

Form: F32-1

ATSB Investigation No. AO-2017-109 **ATSB Ref No.**

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description
LOSS of control + COLLISION WITH TERRAIN INVOLVING VH-BAA ON 7/11/17 IN HOBART.

To Name [redacted] Organisation [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar events occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 of the TSI Act is to ensure that the information or material that you provide is protected as restricted information under the Act.

Attend an interview *(delete if not applicable)*

Location, date and time of interview

Produce relevant material *(delete if not applicable)*

Description of material, date required and any special instructions

[redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted] Phone [redacted]

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 - Section 45

Receipt for Evidential Material to Owner or Agent

Form F45-1

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description
loss of control + collision ℰ terrain INVOWING
VH-BAA HOBART 7/11/17

The items listed below have been retained in accordance with Part 5, Division 7, Section 45 of the *Transport Safety Investigation Act 2003*. It is [redacted]

[redacted]

The items have been collected:

under s32 [redacted]
with consent under s36(1)(g)
seized under Special Premises powers - s36(3)(b)
seized under a warrant - s36(4)(b)

ATSB Chief Commissioner/Delegate:

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted]

Contact details of Owner or Agent

Postal address of Owner or Agent

Postcode

Phone for owner or agent ( )

Fax for owner or agent ( )

Email for owner or agent

Acknowledgement by Owner or Agent

For items obtained with consent under s36(1)(g), I acknowledge that I have been informed of the purpose for which the material is required. I also acknowledge that consent was voluntary and that I was informed I had the right to refuse consent.

Signature of Owner or Agent

Name of owner or agent

Date

Please return a signed copy of this form to the above person at the ATSB

PO Box 967
Civic Square ACT 2608 Australia

Phone ( )

Fax ( )

Email

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 - Section 32

Request for Interview and/or Relevant Material

Form F32-1

ATSB Investigation No. AO-2017-109 ATSB Ref No.

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description
loss of control + collision ℰ terrain INVOWING
VH-BAA HOBART 7/11/17

To Name [redacted] Organisation [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar events occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are requested to attend an interview and/or produce relevant material under section 32 of the Transport Safety Investigation Act 2003. The reason that the request is made under section 32 of the TSI Act is to ensure that the information or material that you provide is protected as restricted information under the Act.

Attend an interview (delete if not applicable)

Location, date and time of interview

Produce relevant material (delete if not applicable)

Description of material, date required, and any special instructions

[redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted]

Phone [redacted]

Document 27

Document 28

Transport Safety Investigation Act 2003- Section 43

Protection Order

Form: **F43-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving AS350BA Squirrel helicopter, VH-BAA at Hobart Airport, Tasmania, 07 November 2...

Protection Order under the Transport Safety Investigation Act 2003 - Section 43

This is an order from the Chief Commissioner/Delegate issued under section 43 of the Transport Safety Investigation Act 2003 directing that the following specified things, or things in a specified class of things, must not be removed or interfered with. Exceptions are provided for some 'emergency response' type activities by section 43 (information relating to section 43 of the TSI Act is provided overleaf) and the Chief Commissioner/Delegate may grant permission to engage in other activities as considered necessary.

This protection order is effective from: [redacted] and applies to the following things

[redacted]

Signature of ~~Chief Commissioner~~ /Delegate

[redacted]

Name of ~~Chief Commissioner~~ /Delegate: [redacted]

Date [redacted]

Phone: [redacted]

Revocation of a Protection Order

This is a notice from the Chief Commissioner/Delegate under the Transport Safety Investigation Act 2003 declaring that the Protection Order issued for the specified things or specified class of things identified in this notice is to be/has been revoked, effective from the date and time of revocation shown below.

Date and time of revocation

Signature of ~~Chief Commissioner~~ / Delegate

.....

Name of ~~Chief Commissioner~~ / Delegate

Date

Phone:

The following is a plain legal language summary of the relevant section of the *Transport Safety Investigation Act* 2003. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 43—Protection orders by Chief Commissioner

To protect evidence, the Chief Commissioner may direct that specified items not be removed or interfered with except with the Chief Commissioner's permission. (The Chief Commissioner cannot withhold permission unreasonably.)

The penalty for breaching the Chief Commissioner's direction is imprisonment.

However, it is a defence if the breach was necessary to:

- ensure the safety of people, animals or property
- remove deceased persons or animals from an accident site
- move a vehicle to a safe place
- protect the environment against significant damage or pollution.

Document 29

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 43

Protection Order

Form: **F43-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving AS350BA Squirrel helicopter, VH-BAA at Hobart Airport, Tasmania, 07 November 2...

Protection Order under the Transport Safety Investigation Act 2003 - Section 43

This is an order from the Chief Commissioner/Delegate issued under section 43 of the Transport Safety Investigation Act 2003 directing that the following specified things, or things in a specified class of things, must not be removed or interfered with. Exceptions are provided for some 'emergency response' type activities by section 43 (information relating to section 43 of the TSI Act is provided overleaf) and the Chief Commissioner/Delegate may grant permission to engage in other activities as considered necessary.

This protection order is effective from: [redacted] and applies to the following things

[redacted]

Signature of ~~Chief Commissioner~~ /Delegate

[redacted]

Name of ~~Chief Commissioner~~ /Delegate:

[redacted]

Date [redacted]

Phone: [redacted]

Revocation of a Protection Order

This is a notice from the Chief Commissioner/Delegate under the Transport Safety Investigation Act 2003 declaring that the Protection Order issued for the specified things or specified class of things identified in this notice is to be/has been revoked, effective from the date and time of revocation shown below.

Date and time of revocation

Signature of ~~Chief Commissioner~~ / Delegate

.....

Name of ~~Chief Commissioner~~ / Delegate

Date

Phone:

The following is a plain legal language summary of the relevant section of the *Transport Safety Investigation Act* 2003. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 43—Protection orders by Chief Commissioner

To protect evidence, the Chief Commissioner may direct that specified items not be removed or interfered with except with the Chief Commissioner's permission. (The Chief Commissioner cannot withhold permission unreasonably.)

The penalty for breaching the Chief Commissioner's direction is imprisonment.

However, it is a defence if the breach was necessary to:

- ensure the safety of people, animals or property
- remove deceased persons or animals from an accident site
- move a vehicle to a safe place
- protect the environment against significant damage or pollution.

Revocation of a Protection Order

This is a notice from the Chief Commissioner/Delegate under the Transport Safety Investigation Act 2003 declaring that the Protection Order issued for the specified things or specified class of things identified in this notice is to be/has been revoked, effective from the date and time of revocation shown below.

[redacted]

Date and time of revocation

[redacted]

Name of Chief Commissioner/Delegate

[redacted]

Signature of Chief Commissioner/Delegate

[redacted]

Date

[redacted]

Phone

( )

[redacted]

The following is a plain legal language summary of the relevant section of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 43—Protection orders by Chief Commissioner

To protect evidence, the Chief Commissioner may direct that specified items not be removed or interfered with except with the Chief Commissioner's permission. (The Chief Commissioner cannot withhold permission unreasonably.)

The penalty for breaching the Chief Commissioner's direction is imprisonment.

However, it is a defence if the breach was necessary to:

- ensure the safety of people, animals or property
- remove deceased persons or animals from an accident site
- move a vehicle to a safe place
- protect the environment against significant damage or pollution.

Document 31

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 - Section 43

Protection Order

Form F43-1

ATSB Investigation No AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter:

investigate the above safety matter

Loss of control + collision + terrain involving
VH-BAR HOBART 7/11/17

Protection Order under the Transport Safety Investigation Act 2003 - Section 43

This is an order from the Chief Commissioner/Delegate issued under section 43 of the *Transport Safety Investigation Act 2003* directing that the following specified things, or things in a specified class of things, must not be removed or interfered with. Exceptions are provided for some emergency response type activities by section 43 (information relating to section 43 of the TSI Act is provided overleaf) and the Chief Commissioner/Delegate may grant permission to engage in other activities as considered necessary.

This Protection Order is effective from [redacted] and applies to the following things:

[redacted]

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted]

Phone [redacted]

Permission under a Protection Order

This is confirmation of permission given by the Chief Commissioner/Delegate under subsection 43(1) for the person named below to take the following action in relation to the things, or specified class of things under protection:

Within the limits of the required action, I agree to take every precaution to preserve the specified things, or specified class of things for the purposes of the ATSB's investigation.

Signature of authorised person

Name of authorised person

Date

Phone ( )

Form F43-1 Issue date: 01/07/2008

Revocation of a Protection Order

This is a notice from the Chief Commissioner/Delegate under the Transport Safety Investigation Act 2003 declaring that the Protection Order issued for the specified things or specified class of things identified in this notice is to be/has been revoked, effective from the date and time of revocation shown below.

Details

[redacted]

Date and time of revocation

[redacted]

Signature of Chief Commissioner/Delegate

[redacted]

Name of Chief Commissioner/Delegate

[redacted]

Date

[redacted]

Phone

( ) [redacted]

The following is a plain legal language summary of the relevant section of the *Transport Safety Investigation Act 2003*. Please see the ATSB website www.atsb.gov.au for the complete text of the TSI Act.

Section 43—Protection orders by Chief Commissioner

To protect evidence, the Chief Commissioner may direct that specified items not be removed or interfered with except with the Chief Commissioner's permission. (The Chief Commissioner cannot withhold permission unreasonably.)

The penalty for breaching the Chief Commissioner's direction is imprisonment.

However, it is a defence if the breach was necessary to:

- ensure the safety of people, animals or property
- remove deceased persons or animals from an accident site
- move a vehicle to a safe place
- protect the environment against significant damage or pollution.

Document 33

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 – Section 43

Protection Order

Form: F43-1

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description

Loss of control + collision + terrain involving VH-BAA HOBART 7/11/17

Protection Order under the Transport Safety Investigation Act 2003 - Section 43

This is an order from the Chief Commissioner/Delegate issued under section 43 of the *Transport Safety Investigation Act 2003* directing that the following specified things, or things in a specified class of things, must not be removed or interfered with. Exceptions are provided for some 'emergency response' type activities by section 43 (information relating to section 43 of the TSI Act is provided overleaf) and the Chief Commissioner/Delegate may grant permission to engage in other activities as considered necessary.

This Protection Order is effective from: [redacted] and applies to the following things:

[redacted]

Signature of Chief Commissioner/Delegate [redacted]

Name of Chief Commissioner/Delegate [redacted]

Date [redacted]

Phone ( ) [redacted]

Permission under a Protection Order

This is confirmation of permission given by the Chief Commissioner/Delegate under subsection 43(1) for the person named below to take the following action in relation to the things, or specified class of things under protection:

Within the limits of the required action, I agree to take every precaution to preserve the specified things, or specified class of things for the purposes of the ATSB's investigation.

Signature of authorised person

Name of authorised person

Date

Phone ( )

Document 34

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003 – Section 62

Authorisation to Access Restricted Information

Form F62-1

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Investigation title and/or other description

LOSS of CONTROL & Collision with terrain involving VH-BAA on 7 Nov 17 in Hobart

Authorisation under *Transport Safety Investigation Act 2003* – Section 62

Section 62 of the Act allows the ATSB to authorise a non-staff member to have access to information that is classified as 'restricted information' while requiring the non-staff member to adhere to confidentiality requirements of the Act.

Description of restricted information which access is being given to:

[redacted]

The person or persons listed below have been authorised to access the identified restricted information. Through being authorised access to the information under section 62, the identified person or persons within the Organisation are subject to the confidentiality requirements of subsection 60(3) of the *Transport Safety Investigation Act 2003* (information relating to section 60 of the TSI Act is provided overleaf). The signed persons acknowledge and accept these obligations.

Name of authorised person	Signature of authorised person	Date	
[redacted]			
			( )
			( )
			( )

ATSB/Delegate:

ATSB/Delegate's Signature [redacted]

ATSB/Delegate's Name [redacted]

Date [redacted]

Please return a signed copy of this form to the above person at the ATSB

PO Box 967
Civic Square ACT 2608 Australia

Phone	Fax	Email
( )	( )	

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information will not be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	ATSB	
Requesting officer	Name Position Business phone Mobile Email Signature	[redacted]
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)		
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]		
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]		
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]		
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]		
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies		
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.		
Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)		
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name Position Business Phone Mobile Signature	[redacted]

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted]

Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate

[redacted]

Name of ~~Chief Commissioner~~/Delegate : [redacted]

Date [redacted]

Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information will not be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)	
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]	
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.)	
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]	
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]	
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies	
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.	
Requesting officer to complete the following on receipt of the operational safety information	
Description of safety information received (audio, radar, ATIS, etc.)	
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name [redacted] Position Business Phone Mobile Signature

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate [redacted]

Name of ~~Chief Commissioner~~/Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information **will not** be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

Information provided as a result of this request is copyright to Airservices and may not be reproduced or copied in any form or by any means or otherwise disclosed to any third party external to Airservices without the prior written consent of Airservices. Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.)
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.

Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)	[redacted]	
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

airservices

Operational Safety Information Request and Release Form – External

AA-FORM-SAF-0002

The details on the first two (2) pages of this document must be completed by all external agencies/individuals when requesting release of operational safety related information from Airservices Australia (Airservices), including those agencies subject to existing agreements related to sharing of operational safety related information. On receipt of the operational safety information the agency is to complete the Operational Safety Information Receipt on page 3 and return to Airservices. Airservices operational safety information **will not** be released without the provision of these details on this form. (Receipt of the ATSB – notice to attend or produce evidential material (Sect 32 TSI Act) Form is not sufficient).

 Privacy of individual officers is paramount, and where information identifying individual officers is provided, it must remain secure and shall not be released to third parties. Information provided may only be used for purposes indicated - use of information for purposes other than those indicated on this form must be subject to an additional data request.

Details of the operational safety information requested		
Request date	[redacted]	
Name of requesting agency	[redacted]	
Requesting officer	Name	[redacted]
	Position	
	Business phone	
	Mobile	
	Email	
	Signature	
Occurrence report type and reference	[redacted]	
Date and time of occurrence (as accurate as possible)	UTC: [redacted]	Local: [redacted]
Brief description of incident (including location, aircraft registration, call sign, etc.)	Collision with terrain involving Eurocopter AS350-BA helicopter registered VH-BAA at Hobart Airport TAS on 7 November 2017	
Purpose of the request	[redacted]	

Type of operational safety information requested (list requirements under the relevant headings)		
Recorded information (e.g. surveillance tapes, communication tapes, INTAS files (SMC and ADC) if available, video if available, ATIS, MET, NOTAMs, etc.) [redacted]		
Flight information (e.g. flight plan, flight progress strips, SAR details, etc.) [redacted]		
Reports (e.g. transcripts, Initial Occurrence Brief (IOB), investigation reports, fault reports, hazard log, etc.) [redacted]		
Staff access (e.g. Interview phone/in person, Statement electronic/written/verbal etc.) [redacted]		
Requested by (date) [redacted] **Note:** 10 working days from receipt for ATSB or CASA and 15 working days for all other agencies		
Quarantine (ATSB and CASA only use only) Required? [redacted] Expected duration of quarantine required: [redacted] **Note:** Quarantine will apply for an initial maximum period of 90 days. If no advice is received within that period, quarantine will lapse. The Airservices Contact Officer shall, however, attempt to contact the requesting officer for confirmation of release from quarantine prior to returning the recording medium to operation or disposing of originals. **Note:** Protection Orders (TSI Act 2003, Part 5, Division 5, Section 43) will only be accepted on the ATSB Protection Order Form.		
Requesting officer to complete the following on receipt of the operational safety information		
Description of safety information received (audio, radar, ATIS, etc.)		
Requesting officer I hereby certify that I have taken delivery of the operational safety information described in this request and the property appears to be of sound condition for the purpose of the request.	Name	[redacted]
	Position	
	Business Phone	
	Mobile	
	Signature	

Australian Government
Australian Transport Safety Bureau

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tas on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~/Delegate [redacted]

Name of ~~Chief Commissioner~~/Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

From: [redacted]
To:
Cc: Bureau of Meteorology (request)
Subject: RE: Subject: AMIR-ASIR REQ - AO-2017-109 HOBART 7NOV17 [SEC=UNCLASSIFIED]
Date: Wednesday, 8 November 2017 2:32:36 PM
Attachments: MET-INFO_ATSB_AO-2017-109_YMHB_07NOV2017.pdf

Hello [redacted]

Please find attached a report containing the information you requested re. Hobart on the 7 November 2017.

Please don't hesitate to contact me if you require any additional information.

Kind regards,

[redacted]

Australian Government
Bureau of Meteorology

Bureau of Meteorology
GPO Box 1636 Melbourne VIC 3001
Level 11, 700 Collins st, Docklands VIC 3008
T: (03) [redacted]
[redacted] www.bom.gov.au

-----Original Message-----
From: WebAV
Sent: Wednesday, 8 November 2017 11:57 AM
To: amir; [redacted]@atsb.gov.au
Subject: Subject: AMIR-ASIR REQ - AO-2017-109 HOBART 7NOV17 [SEC=UNCLASSIFIED]

Meteorological Information Request Form

Organisation: Australian Transport Safety Bureau Contact Name: [redacted]
Phone: [redacted]
Email:
Reference Number: AO-2017-109
Incident Date/Time (UTC): 7/Nov/2017 : 0621 Incident Location: Hobart
Reg: VH-BAA
Departure Location: Hobart
Destination Location: Hobart
Incident Description: During flying training operations and while manoeuvring over the aerodrome, the helicopter collided with terrain and was destroyed.
Impact on Operations: To inform ATSB investigation AO-2017-109 Met Info Required: TAF(s) and METAR(s) for the period 0550 to 0630 UTC 7 Nov 17, plus any SPECI(s) for that period.
Legal Proceeding?: No

Any queries about this form should be sent to webav@bom.gov.au

****

This e-mail was generated by http://www.bom.gov.au/survey/amir_request.shtml

****

Australian Government
Bureau of Meteorology

Aviation Meteorological Information

Contact Details	
Name	[redacted]
Organisation	Australian Transport Safety Bureau
Phone	[redacted]
Email	[redacted]

Incident Details	
Reference number	AO-2017-109
Time/Date (UTC)	0621 UTC 07/11/2017
Location	Hobart
Aircraft Detail	VH-BAA
Weather	N/A

Details Requested (as per request)

To inform ATSB investigation AO-2017-109 Met Info Required: TAF(s) and METAR(s) for the period 0550 to 0630 UTC 7 Nov 17, plus any SPECI(s) for that period.

Meteorological Information

Attachment 1 - Hobart aerodrome forecast (YMHB TAF)
Attachment 2 - Hobart aerodrome observations (YMHB METAR/SPECI)

Author Details	
Prepared by	[redacted]
Date	08/11/2017
File No	[redacted]

DISCLAIMER
The meteorological information contained in this document may not have been subject to the Bureau of Meteorology's quality control procedures and is provided as preliminary guidance for the recipient only. As such it may be unsuitable for use in any formal investigation or legal proceeding.

Please be aware that, for flight planning purposes, Airservices Australia is the official publisher of TAFs, METARs and Area Forecasts issued by the Bureau of Meteorology. We cannot guarantee that the information provided in the attachments to this document has been published in the same format, or at all, by Airservices Australia.

Australian Government
Bureau of Meteorology

Attachment 1 – Hobart aerodrome forecast (YMHB TAF) 07/Nov/2017

```
TAF AMD YMHB 062311Z 0623/0724
19015G25KT 9999 -SHRA SCT030 BKN045
FM070100 19015G25KT 9999 BKN050
FM070900 31008KT 9999 SCT025
FM071800 30010KT 9999 BKN025
RMK FM071200 MOD TURB BLW 5000FT TILL071500
T 12 14 15 13 Q 1017 1017 1017 1019

TAF AMD YMHB 070439Z 0705/0806
23015G25KT 9999 BKN050
FM070900 31008KT 9999 SCT025
FM071800 30010KT 9999 BKN025
FM080200 14010KT 9999 FEW030
RMK FM071200 MOD TURB BLW 5000FT TILL072400
T 16 13 11 10 Q 1017 1019 1021 1021
```

Attachment 2 – Hobart aerodrome observations (YMHB METAR/SPECI) 07/Nov/2017 0530 - 0700UTC

METAR YMHB 070530Z 22018KT 9999 FEW050 BKN058 14/01 Q1018 RMK RF00.0/000.0

METAR YMHB 070600Z 23013KT 9999 FEW045 SCT055 15/01 Q1019 RMK RF00.0/000.0

METAR YMHB 070630Z 22011KT 9999 FEW045 BKN050 15/01 Q1019 RMK RF00.0/000.0

METAR YMHB 070700Z 21015KT 9999 FEW045 BKN050 15/01 Q1019 RMK RF00.0/000.0

From: webav@bom.gov.au
To: Bureau of Meterology (request); [redacted]
Subject: Subject: AMIR-ASIR REQ - AO-2017-109 HOBART 7NOV17 [SEC=UNCLASSIFIED]
Date: Wednesday, 8 November 2017 11:57:13 AM

Meteorological Information Request Form

Organisation: Australian Transport Safety Bureau
Contact Name: [redacted]
Phone: [redacted]
Email: [redacted]
Reference Number: AO-2017-109
Incident Date/Time (UTC): 7/Nov/2017 : 0621
Incident Location: Hobart
Reg: VH-BAA
Departure Location: Hobart
Destination Location: Hobart
Incident Description: During flying training operations and while manoeuvring over the aerodrome, the helicopter collided with terrain and was destroyed.
Impact on Operations: To inform ATSB investigation AO-2017-109
Met Info Required: TAF(s) and METAR(s) for the period 0550 to 0630 UTC 7 Nov 17, plus any SPECI(s) for that period.
Legal Proceeding?: No

Any queries about this form should be sent to webav@bom.gov.au
****
This e-mail was generated by http://www.bom.gov.au/survey/amir_request.shtml
****

Document 49

Transport Safety Investigation Act 2003- Section 32

Request for Interview and/or Relevant Material

Form: **F32-1**

Australian Government

Australian Transport Safety Bureau

ATSB Investigation No. AO-2017-109

The Australian Transport Safety Bureau is conducting an investigation into the following transport safety matter.

Collision with terrain involving Eurocopter AS350-BA helicopter, VH-BAA, at Hobart Airport, Tasmania on 7 November 2017

To Name: [redacted] Organisation: [redacted]

The ATSB conducts investigations solely for the purpose of enhancing transport safety. The object of an investigation is to determine the circumstances of the occurrence and to prevent similar event occurring in the future. It is not the object of an investigation to determine blame or liability.

In this context, you are required to attend an interview and/or produce relevant material under section 32 of the *Transport Safety Investigation Act 2003*. The reason that this request is made under section 32 is to ensure that the information or material that you provide is protected as restricted information under the Act

Description of material, date required and any special instructions

[redacted]

Evidence Required by: [redacted]

Section 47 of the TSI Act provides that self-incrimination is not an excuse for not complying with this request. Information relating to section 32 and section 47 of the TSI Act is provided overleaf.

Thank you for your cooperation.

Signature of ~~Chief Commissioner~~ /Delegate [redacted]

Name of ~~Chief Commissioner~~ /Delegate: [redacted]

Date [redacted] Phone: [redacted]

The following is a plain legal language summary of the relevant sections of the *Transport Safety Investigation Act 2003*. Please see the ATSB website **www.atsb.gov.au** for the complete text of the TSI Act.

Section 32—Require attendance to answer questions or produce evidence

For the purposes of an investigation, the ATSB can require a person to produce evidence or to attend and answer questions.

The ATSB must first give the person written notice, allowing a reasonable time to comply.

Expenses may be paid for the cost of complying with a requirement to attend and answer questions (the amount is set by regulation).

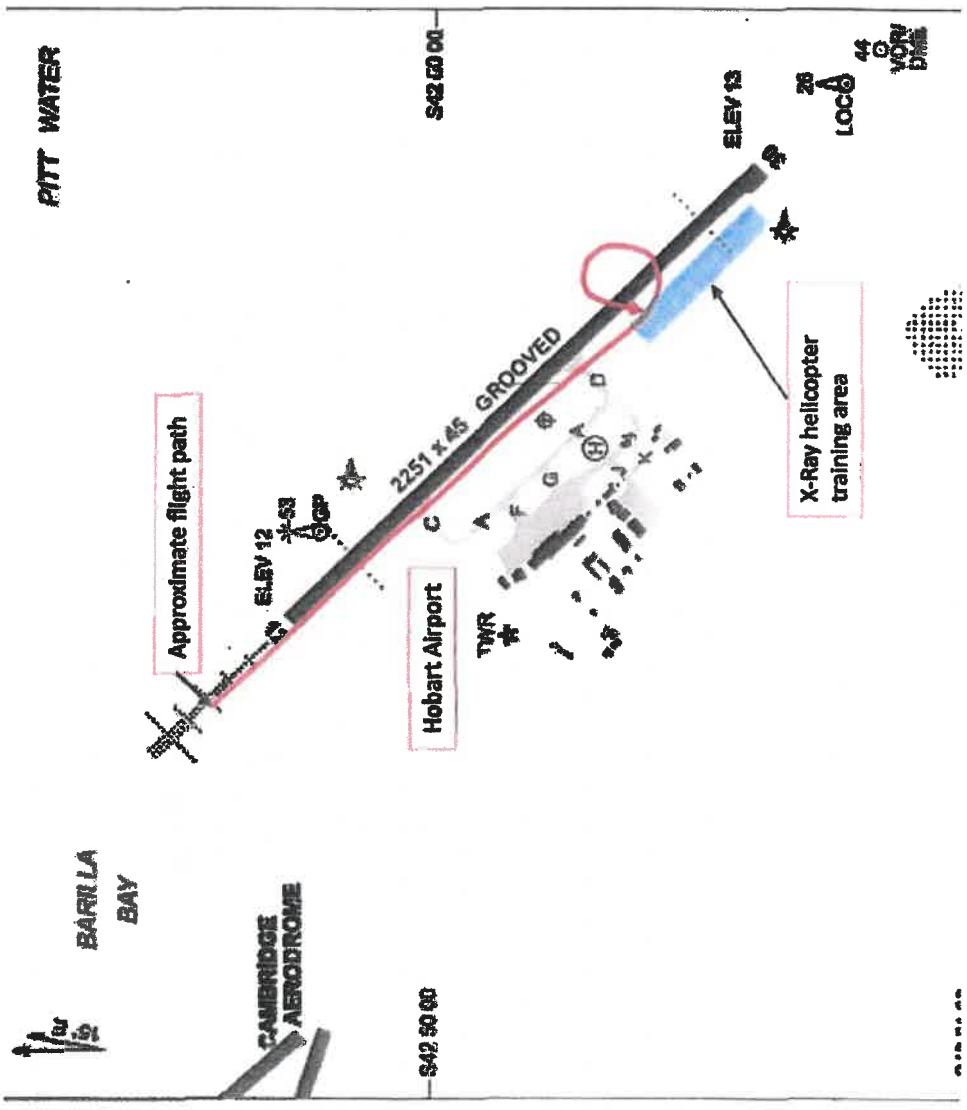
Failure to comply is an offence. The penalty is a fine.

Section 47—Self-incrimination no excuse

You cannot refuse to answer a question or produce evidence in accordance with a requirement under the Act on the ground that it might incriminate you.

However, if you are an individual, information that results from the answer or evidence cannot be used against you in civil or criminal proceedings.

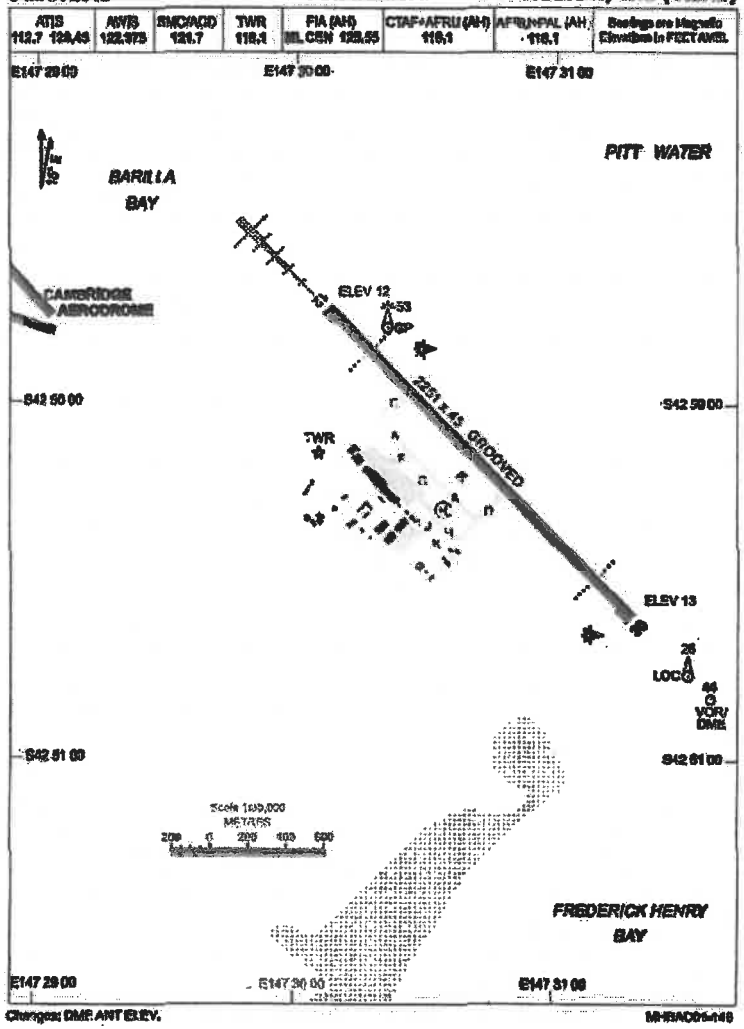
Document 50


PITT WATER
BARILLA BAY
CAMBRIDGE AERODROME
S42 50 00
S42 50 00
Approximate flight path
ELEV 12
53
GP
2251 x 45 GROOVED
Hobart Airport
TWR
ELEV 13
26
LOC
44
VOR DME
X-Ray helicopter training area

3 MAR 2016

AD ELEV 13
S42 58 10 E147 30 37

AERODROME CHART - Page 1
HOBART, TAS (YMHB)



Changes: DME ANT ELEV.

MHBAC01-148

airservices

From: Reports
To: Reports
Bcc: [redacted]
Subject: Release of ATSB Transport Safety Investigation Report [DLM=Sensitive]
Date: Tuesday, 12 December 2017 3:17:00 PM
Attachments: AO-2017-109 web preliminary report.pdf

Dear Interested Party
Attached for your information is a copy of the following ATSB Transport Safety Report:

Report number: AO-2017-109
Report type: Preliminary
Aircraft: AS350BA Squirrel helicopter
Registration: VH-BAA
Location: Hobart Airport, Tasmania
Date of occurrence: 7 November 2017
Public release: 18 December 2017 at 10:30 am AEDT

I am providing you with an advanced copy of the report under the provisions of Section 26(1) of the *Transport Safety Investigation Act 2003*. Under Section 26, the report may only be copied and disclosed prior to their public release for the purpose of taking safety action. Disclosure of these documents in any other circumstance prior to their public release date may constitute a criminal offence.

If new evidence becomes available that impacts upon the investigation findings or the factual accuracy of the report, the ATSB may make changes to these documents before their public release. In a small number of instances, editorial or other changes may also be made. If the changes are substantive, we will provide an amended copy of the relevant document/s before their public release. The final report will be released in accordance with subsection 25(1) of the Act.

On 1 July 2017 the ATSB updated its policy of identifying organisations in its transport safety investigations. For more information visit the ATSB website.

Yours sincerely

[redacted]

[redacted]
Australian Transport Safety Bureau
E ATSBinfo@atsb.gov.au / P 1800-020-616
[redacted]
AVIATION | MARINE | RAIL
Web www.atsb.gov.au
Twitter @ATSBinfo

Australian Government

Australian Transport Safety Bureau

AO-2017-109

Date to go on the website: 18 December 2017

Web update

At about 1635 Eastern Daylight-saving Time[1] on 7 November 2017, a Eurocopter AS350BA (AS350) helicopter, registered VH-BAA, departed Hobart Airport, Tasmania for a local training area to the northeast. On board were a pilot and instructor and the flight was the third training flight of an AS350 helicopter-type endorsement for the pilot.

The endorsement training was conducted over a two-day period. It included ground school training, and three flights that formed the practical component of the training syllabus. One instructor had assessed the first two flights but, since the third focussed on emergency procedure training, the occurrence instructor elected to fly with the pilot.

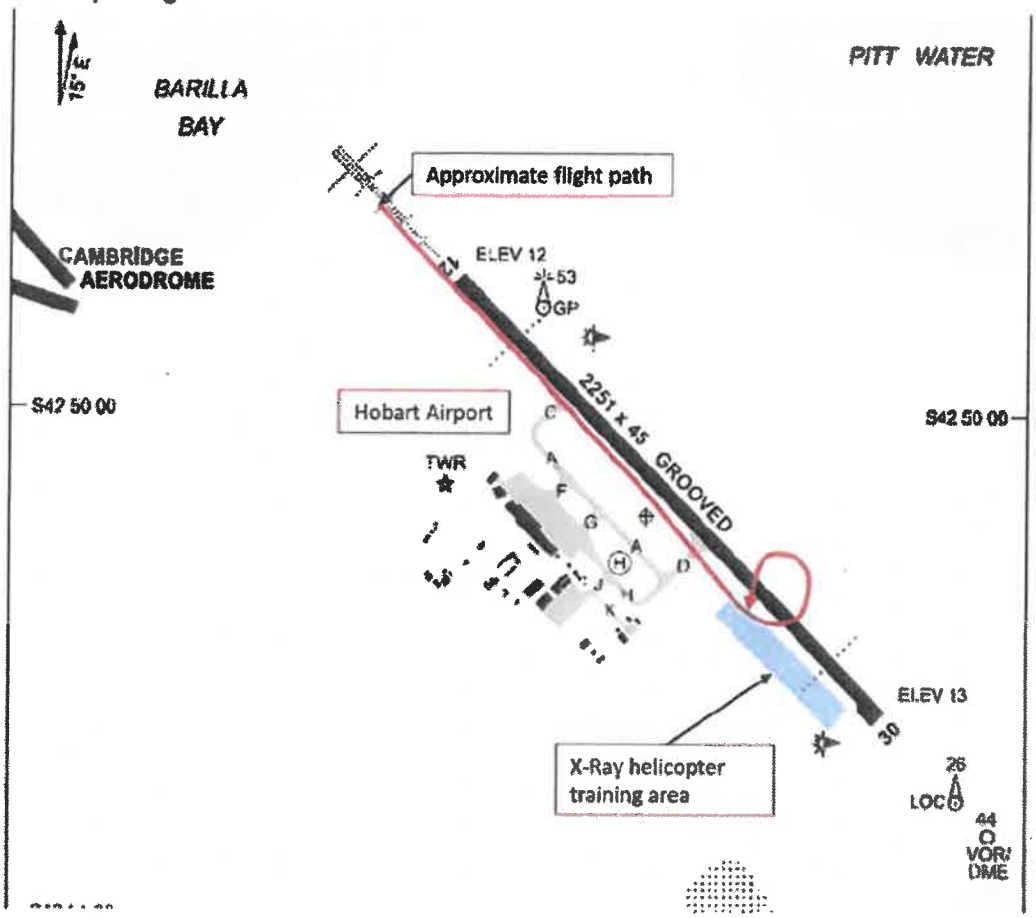
The pilot held a Commercial Pilot (Helicopter) Licence and a valid Class 1 Aviation Medical Certificate. The pilot had experience flying other turbine helicopter types, on various types of operations. The pilot's existing low-level and sling approvals, which were reportedly held on a foreign licence, were also to be assessed during the AS350 type endorsement.

Following arrival in the training area, the pilot's general helicopter handling and low-level flight were assessed. At about 1715, the pilots reported to air traffic control that operations in the training area were complete and requested a clearance back into the Hobart Airport control zone, to conduct practice emergencies. The approach to the airport reportedly involved conducting a simulated hydraulic system failure to the helicopter training area X-Ray (Figure 1).

Training Area X-Ray was located adjacent to and west of the main runway and was familiar to the pilot, as this area was used in the previous day's training.

[1] Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

Figure 1: Approximate flight path of the helicopter (not to scale), showing the approach to the X-Ray training area, where the helicopter slowed before making an abrupt left turn and impacting terrain.



Source: Airservices Australia, modified by ATSB

The instructor reportedly announced the simulated failure to the pilot just prior to commencing the approach. The pilot responded to the simulated failure by stabilising the helicopter and reducing the airspeed to about 60 kt, in accordance with the manufacturer's hydraulic failure procedure detailed in the aircraft's flight manual.

The flight manual emphasised that, without hydraulic assistance, the flight controls exhibited force feedback requiring the pilot to exert additional force on the controls to maintain 60 kt in level flight. The manual also stated that, after transitioning to the recommended safety speed range, the second phase of the hydraulic failure procedure was to transition to slow run-on landing[2] (at around 10 kt) via a flat final approach in to the wind. The pilot reported that, as the helicopter decelerated and descended towards the landing area, they noted the additional control forces required.

A video camera installed at the airport recorded footage of the helicopter's final approach. As the helicopter descended toward training area X-Ray, it initially appeared to be controlled and in a flatter than normal approach profile. The helicopter then appeared to slow into a high hover about 30 ft above the ground. Seconds later, it commenced an abrupt nose-down turn to the left and impacted the ground.

The training procedure section of the helicopter flight manual cautioned pilots to:

---

[2] A landing conducted without establishing the helicopter in a hover.

...not attempt to carry out hover flight or any low speed manoeuvre without hydraulic pressure assistance. The intensity and direction of the control feedback forces will change rapidly. This will result in excessive pilot workload, poor aircraft control, and possible loss of control.

The impact forces caused significant damage to the cockpit area, particularly the left pilot side (Figure 2).

Figure 2: Damage to the helicopter showing significant impact damage to the cockpit area and left landing skid tip, consistent with a left nose-down attitude on impact.

Source: ATSB

Seated on the left side, the instructor sustained fatal injuries, while the pilot seated on the right was seriously injured.

The investigation is continuing, and will analyse the evidence obtained during the on-site investigation phase. Additional work will include a review of the:

- conduct of training operations
- helicopter systems
- any environmental influences that may have affected the operation of the helicopter at the time of the accident.

The information contained in this web update is released in accordance with section 25 of the Transport Safety Investigation Act 2003 and is derived from the initial investigation of the occurrence. Readers are cautioned that new evidence will become available as the investigation progresses that will enhance the ATSB's understanding of the accident as outlined in this web update. As such, no analysis or findings are included in this update.

Australian Government

Australian Transport Safety Bureau

AO-2017-109

Date to go on the website: 18 December 2017

Web update

At about 1635 Eastern Daylight-saving Time[1] on 7 November 2017, a Eurocopter AS350BA (AS350) helicopter, registered VH-BAA, departed Hobart Airport, Tasmania for a local training area to the northeast. On board were a pilot and instructor and the flight was the third training flight of an AS350 helicopter-type endorsement for the pilot.

The endorsement training was conducted over a two-day period. It included ground school training, and three flights that formed the practical component of the training syllabus. One instructor had assessed the first two flights but, since the third focussed on emergency procedure training, the occurrence instructor elected to fly with the pilot.

The pilot held a Commercial Pilot (Helicopter) Licence and a valid Class 1 Aviation Medical Certificate. The pilot had experience flying other turbine helicopter types, on various types of operations. The pilot's existing low-level and sling approvals, which were reportedly held on a foreign licence, were also to be assessed during the AS350 type endorsement.

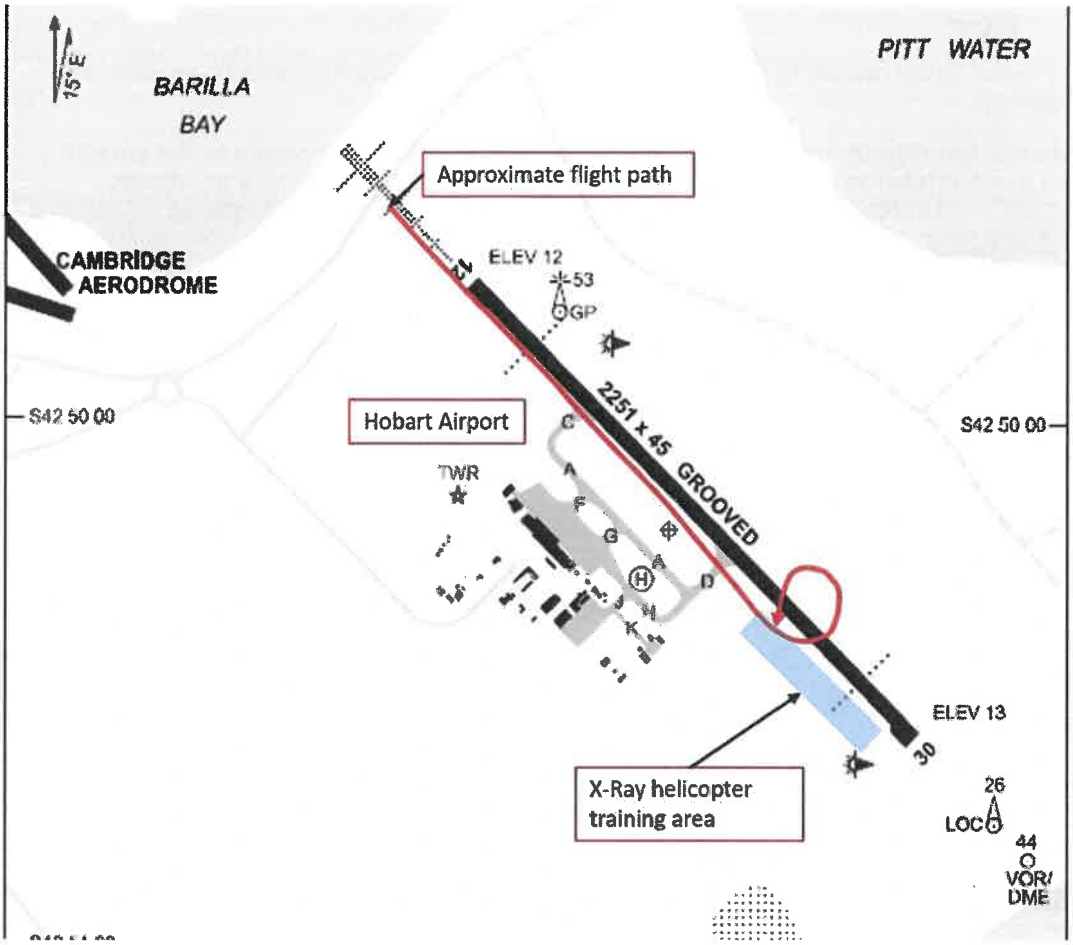
Following arrival in the training area, the pilot's general helicopter handling and low-level flight were assessed. At about 1715, the pilots reported to air traffic control that operations in the training area were complete and requested a clearance back into the Hobart Airport control zone, to conduct practice emergencies. The approach to the airport reportedly involved conducting a simulated hydraulic system failure to the helicopter training area X-Ray (Figure 1).

Training Area X-Ray was located adjacent to and west of the main runway and was familiar to the pilot, as this area was used in the previous day's training.

---

[1] Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

Figure 1: Approximate flight path of the helicopter (not to scale), showing the approach to the X-Ray training area, where the helicopter slowed before making an abrupt left turn and impacting terrain.



Source: Airservices Australia, modified by ATSB

The instructor reportedly announced the simulated failure to the pilot just prior to commencing the approach. The pilot responded to the simulated failure by stabilising the helicopter and reducing the airspeed to about 60 kt, in accordance with the manufacturer's hydraulic failure procedure detailed in the aircraft's flight manual.

The flight manual emphasised that, without hydraulic assistance, the flight controls exhibited force feedback requiring the pilot to exert additional force on the controls to maintain 60 kt in level flight. The manual also stated that, after transitioning to the recommended safety speed range, the second phase of the hydraulic failure procedure was to transition to slow run-on landing[2] (at around 10 kt) via a flat final approach in to the wind. The pilot reported that, as the helicopter decelerated and descended towards the landing area, they noted the additional control forces required.

A video camera installed at the airport recorded footage of the helicopter's final approach. As the helicopter descended toward training area X-Ray, it initially appeared to be controlled and in a flatter than normal approach profile. The helicopter then appeared to slow into a high hover about 30 ft above the ground. Seconds later, it commenced an abrupt nose-down turn to the left and impacted the ground.

The training procedure section of the helicopter flight manual cautioned pilots to:

---

2 A landing conducted without establishing the helicopter in a hover.

...not attempt to carry out hover flight or any low speed manoeuvre without hydraulic pressure assistance. The intensity and direction of the control feedback forces will change rapidly. This will result in excessive pilot workload, poor aircraft control, and possible loss of control.

The impact forces caused significant damage to the cockpit area, particularly the left pilot side (Figure 2).

Figure 2: Damage to the helicopter showing significant impact damage to the cockpit area and left landing skid tip, consistent with a left nose-down attitude on impact.

Source: ATSB

Seated on the left side, the instructor sustained fatal injuries, while the pilot seated on the right was seriously injured.

The investigation is continuing, and will analyse the evidence obtained during the on-site investigation phase. Additional work will include a review of the:

- conduct of training operations
- helicopter systems
- any environmental influences that may have affected the operation of the helicopter at the time of the accident.

The information contained in this web update is released in accordance with section 25 of the Transport Safety Investigation Act 2003 and is derived from the initial investigation of the occurrence. Readers are cautioned that new evidence will become available as the investigation progresses that will enhance the ATSB's understanding of the accident as outlined in this web update. As such, no analysis or findings are included in this update.