Federal Department of Environment, Transport Energy and Communications **No. 1826**

Final Report by the Aircraft Accident Investigation Bureau

concerning the accident

of the Antonov-2 aircraft, LY-KAG
on 15 March 2003
Samedan Airport / GR

Bundeshaus Nord, CH-3003 Berne, Switzerland

Ursache

Der Unfall ist darauf zurückzuführen, dass der Motor des Flugzeugs in der Steigflugphase aussetzte und das Flugzeug nicht über genügend Höhe für eine Umkehrkurve verfügte.

Zur Motorpanne haben möglicherweise beigetragen:

- Vergaservereisung
- falsche Einstellung der Gemischregulierung

Final Report

This report has been prepared for the purpose of accident / incident prevention. The legal assessment of accident / incident causes and circumstances is no concern of the incident investigation (Art. 24 of the Air Navigation Law)

Aircraft	Antonov AN-2 LY-KAG
Operator	AB “Kauno aviacijos gamykla”, J. Bakanausko 29, 3018 Kaunas, Lithuania
Owner	“Klaipedos avialinijos“ Ltd., LT-5843 Dirvupiù km Klaipedos rajonas, Lithuania

Pilot	Lithuanian citizen, born 1966			
Licence	Commercial pilot, ATPL KA Lithuanian flying instructor authorisation issued on 22.09.2000			
Flight experience	**Total**	3004:00	**In the previous 90 days**	14:50
	On incident type	440:56	**In the previous 90 days**	13:39

Place	Samedan aerodrome, GR		
Coordinates	---	**Altitude**	1707 MASL
Date and time	15.03.2003, 17:25 LT (LT = UTC+1)		

Type of flight	Private flight, VFR
Phase of flight	Initial climb
Type of incident	Engine failure

Injuries to persons

	Crew	Passengers	Third parties
Fatal	---	---	---
Serious	---	---	---
Minor or none	1	2	

Damage to aircraft	Seriously damaged
Other damage	None

General

In February 2003 a private pilot who was an aviation enthusiast living in St. Moritz founded the "Anuschka Club International". Via the finance company "Poseidon Finance Ltd." Bermuda, which was represented by him in Switzerland, he leased an aircraft of the Antonov AN-2 type from the Lithuanian company "Klaipedos avialinijos di Klaipeda" with the intention of allowing club members to fly it.

The company "Klaipedos avialinijos" provided a flying instructor of Lithuanian nationality, with the aim of allowing club members to fly the aircraft as private pilots from the right-hand pilot's seat.

History of flight

On 15.03.03, at 16:47[1], the club's founder (hereinafter designated the "representative of the Poseidon company") took off with the flying instructor and five passengers on a training flight. During a problem-free flight of 25 minutes' duration he flew over the locality of St. Moritz and the Bernina and reached an altitude of approximately 2700 m above mean sea level. He then reduced engine power to minimum and initiated the descent for a direct approach to runway 03 via Pontresina. During the descent the carburettor pre-heater was set to an intermediate position.

After the landing at 17:12 the representative of Poseidon and the five passengers left the aircraft and two new passengers boarded. The flying instructor remained at the aircraft controls and during the change-over allowed the engine to run at just above the minimum idling speed. In so doing he observed a carburettor temperature of +5° Celsius. After the two passengers had boarded, he taxied the aircraft to the taxi holding position for runway 03.

At 17:21 the flying instructor took off with flaps set to 20°. The runway length available for take-off was 1800 m. After reaching a height of 60 m above the ground, the flaps were retracted from 20° to 5° and the engine power was reduced to the corresponding figures for the climb.

At an altitude of about 120 to 130 metres above the ground the engine suddenly stopped. After a failed attempt to re-start the engine by repeated movements of the power lever, which feeds additional fuel via the accelerator pump which is activated in this way, the flying instructor decided on an emergency landing after a 180° turn. The pilot assured the necessary airspeed by immediately pushing forward the elevator and initiated a left turn in order to land on runway 21. The aircraft approached runway 21 in a descent, on a heading of approximately 150° and at a speed indicated by the pilot of approximately 140 km/h. By increasing the landing flap setting, the flying instructor managed to clear a group of trees which was situated in the approach corridor, with only a few treetops touching the aircraft. At minimum speed, the aircraft made contact with the snow-covered area 350 m after the beginning of the runway and approximately 20 metres to the right of runway 21. The aircraft flipped over and came to rest upside-down.

The aircraft was seriously damaged. The persons on board were uninjured. Fire did not break out.

[1] All times local, central European winter time, LT = UTC + 1 hour

Findings

- The pilot was in possession of a valid professional pilot's licence, issued by the Lithuanian authorities on 26.10.1993. He was also in possession of a flying instructor's authorisation issued by the Lithuanian authorities on 22.09.2000.

- There is no indication whatsoever of ill health on the part of the pilot at the time of the accident. The result of an alcohol test was negative.

- The occupants had their seat belts fastened and these withstood the load.

- The mass and centre of gravity were within the prescribed limits.

- A flight data recorder was neither prescribed nor installed.

- The representative of the Poseidon company completed the flight notification for the first flight at 16:47 and inserted the name of the flying instructor as the commander. The name of the Poseidon company representative appears on the take-off list as the commander. The latter was not in possession of the necessary authorisation.

- No flight notification was completed for the accident flight. The Poseidon company representative was indicated on the take-off list as the commander, but was not on board.

- An AFM for the Antonov AN-2 aircraft LY-KAG was missing.

- Before the investigators arrived, some 300 litres of aviation fuel was drained from the aircraft by the representative of the Poseidon company. According to the pilot's statement, the total amount of fuel before departure was approximately 500 litres.

- In view of the damage to the propeller and the ambiguous ownership situation of the aircraft at the time of the investigation, no trial run was carried out.

- During the inspection of the cockpit carried out at the beginning of the investigation it was ascertained that the control lever for regulating the mixture was 20 mm in front of the front stop (lean mix) and the control lever for regulating the carburettor temperature was "open" 30 mm in the pre-heating direction.

- On 10 and 11 April 2003, in the hangar at Samedan airport, the engine was examined by a German aviation expert commissioned by the Aircraft Accident Investigation Bureau in cooperation with a German inspector for Class 1 aircraft. Both experts have been in possession of a valid type licence and instruction licence for the AN-2 aircraft type for many years.

  The examination produced the following results:

  Quote

  .../" Eine Zulassungsurkunde (Airworthniss Certificat) aus dem der Besitzer des Luftfahrzeuges und Angaben zur Lufttüchtigkeit ersichtlich sind wurde im zur Einsicht übergebenen Dokumentenmaterial nicht vorgefunden. Ein Flughandbuch aus dem spezielle Angaben zum Luftfahrzeug, den Systemen Leistungsdiagramme, Anroll- und Startstreckenmonogramm sowie Zusatzinformationen über Sondereinbauten zu entnehmen sind wurde nicht aufgefunden.

Massgebliche Aussagen zu Betriebstunden und technischen Arbeiten konnten nur aus dem aktuellen Bordbuch des Luftfahrzeugs (Aircraft journey log book) und dem Motorjournal entnommen werden. Die Eintragungen im Bordbuch, von den einzelnen Piloten sehr unterschiedlich vorgenommen. Es wurden mehrfach Streichungen von Eintragungen vorgenommen und Eintragungen nachträglich verändert. Bei Aufrechnung der Zeiten im Bordbuch ergaben sich mehrere geringfügige Differenzen.

Schlussfolgerung:

Eine Störung durch Ausfall des Zündsystems kann ausgeschlossen werden. An dem gesamten Teil der mechanisch bewegten Teile des Motors, am Gehäuse und den Aggregaten am Motor wurden keine Mängel festgestellt, die zu einem plötzlich eintretenden Motorstillstand führen konnten. „/...

End quote

- **Technical data on the aircraft**

Type:	AN-2
Manufacturer:	PZL MIELEC. KB Antonov
Characteristics:	Six-seater biplane with fixed landing gear
Year of construction:	unknown
Serial number:	1G19522
Engine:	Radial engine with nine cylinders
Manufacturer:	Shvetsov
Type:	ASCH-62 IR
Power:	1000 HP
Serial number:	K 1635475
Propeller:	AW – 2
Serial number:	W 610028
Maximum take-off mass:	5500 kg
Registration certificate:	Republic of Lithuania CAA No. 00836, issued on 17.04.2002
Airworthiness certificate:	Republic of Lithuania CAA No. 00836, issued on 17.04.2002, valid till 24.04.2003
Area of use:	unknown
Keeper according to logbook:	AB Kauno aviacijos gamykla, Lithuania
Owner according to logbook:	M. Paglicci, 52100 Arezzo, Italy
Owner after 30.01.2003:	Klaipedos avialinijos, Lithuania
Leasing contract:	dated 04.03.2003 with the Poseidon company Finance Ltd., Tortola British Virgin Island, represented in Switzerland by Dr. P. Berry, St. Moritz
Flying hours at the time of the accident:	Airframe: 4471:38 Engine: 1408:07
Last 100 hour check:	carried out on 25.04.2002
Last periodic inspection:	carried out on 09.03.2003

- **General weather situation**

  (according to information from MeteoSwiss)

  The centre of an extended high-pressure area was close to Denmark. Switzerland was at the southern edge of this high in a moderate to strong easterly to north-easterly airflow.

- **Weather at the time and location of the accident**

Cloud:	1/8, base at about 10 000 ft AMSL
Weather:	-
Visibility:	about 25 km
Wind:	360 degrees, 5 knots, gusting to 11 knots
Temp./dewpoint:	- 0 °C / -14 °C (relative atmospheric humidity 35%)
Atmospheric pressure:	QFE Samedan 835.7 hPa
	QNH LSZH 1034 hPa
	QNH LSZA 1029 hPa
Hazards:	-
Position of the sun:	Azimuth: 257°, elevation: 10°

Analysis

Technical aspects

The carburettor of the Asch 62/R engine in the AN-2 is designed as a fourway downdraught carburettor with a mechanical accelerator system and a separate idling nozzle system. In view of the large quantities of air to be processed by the large-capacity engine and the four venturi channels, high flow speeds can be expected at the nozzles, especially in a descent (i.e. idling) with the throttle valves almost closed. As a result, it is known that ice formation can occur under appropriate weather conditions. When it is running on the ground, the engine heat is not sufficient to melt the ice, as the carburettor is protected from this heat which is detrimental to operation (vapour bubbles, etc.). The closed throttle valves and the fuel feed by the accelerator pump during taxiing promote rather further ice formation, so an adequate supply of fuel and air to the engine can no longer be guaranteed.

Pre-heating was set to plus 5 °C, which is sufficient to prevent ice formation in constant operation when cruising over longer distances. The temperature is measured below the carburettor as the mixture temperature before entry into the charger. If ice is already present, 5 °C at this point is insufficient, as quite different temperatures are required to remove ice in the venturi area because of the flow conditions precisely in the event of changed cross sections and these can indeed be provided by the pre-heating system if the latter is in order.

With heavy icing, de-icing is only possible with temperatures above approx. plus 30 °C at the cited measurement point. Only consistent use of the pre-heating system prior to take-off or on the ground could have prevented the icing problem. When icing occurs at the carburettor, engine power is reduced. However, carburettor icing can hardly be considered as a cause of a sudden engine stoppage when the throttle valves move freely when operated.

In addition to a possible icing problem, an incorrect setting of the mixture regulation, which can no longer be proven retrospectively, may have led to a sudden engine stoppage due to a mixture which was too rich. This would be favoured by the high density altitude at the location of the accident. Repeated pumping with the power lever in order to feed fuel to the engine via the carburettor's accelerator pump would have led to enrich the mixture.

Operational aspects

The checklist of the Antonov AN-2 specifies that the pilot should continue to fly in a straight line after an engine failure on take-off. The flying instructor at the controls of the aircraft considered the altitude at the time of the failure to be sufficient and initiated a 180° turn. On coming out of the turn he found himself to the right of the runway axis and was forced to fly towards runway 21 on a heading of approx. 150°. In this flight phase the aircraft brushed the tops of a group of trees which was 200 m from the set-down point and was decelerated. The two main wheels came into contact with the approx. 40 cm covering of snow 350 metres after the beginning of the runway and about 20 m to the right of the runway. The wheels sank into the snow, at which point the aircraft flipped over and came to rest upside-down.

Cause

The accident was caused by an engine failure in the climbing phase, in which the altitude of the aircraft was not sufficient for a 180° turn.

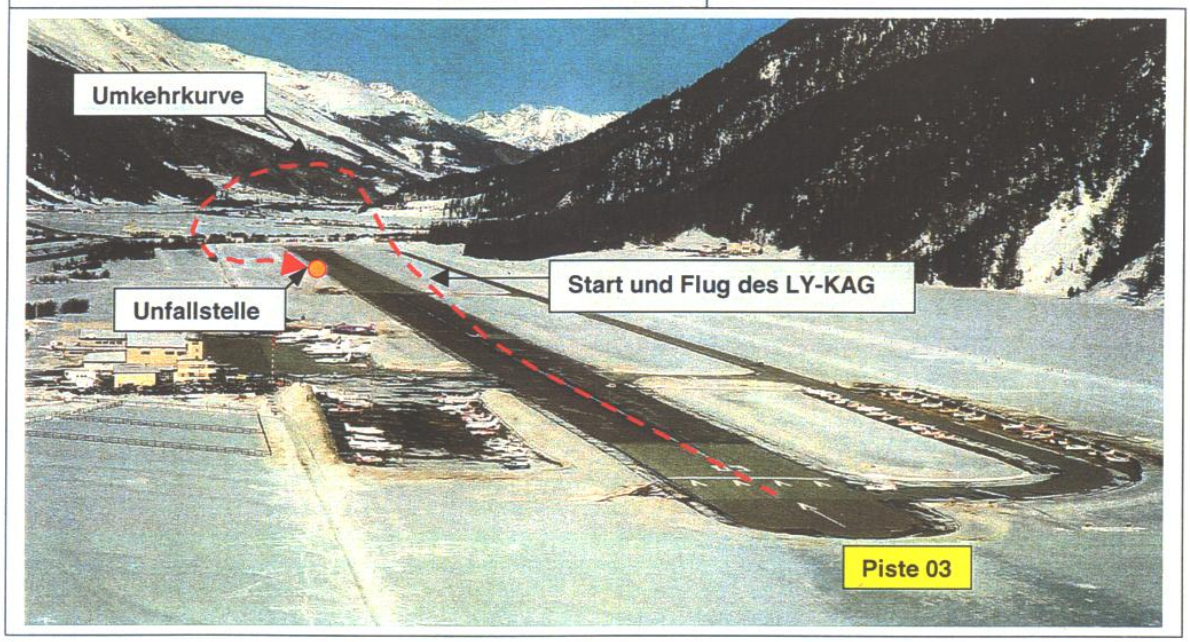
The following possibly contributed to the engine failure:

- carburettor icing
- incorrect mixture regulation setting

Berne, 23 September 2004 Aircraft Accident Investigation Bureau

Annex 1

Flugplatz Samedan (LSZS) aus SW. (Winteraufnahme 2002)



Flugplatz Samedan, (LSZS) aus Norden. (Aufnahme im Monat April)

Annex 2

Hebelstellung nach der Bergung am 16.03.03