PRELIMINARY REPORT
AIRCRAFT ACCIDENT INVESTIGATION COMMISSION

Aircraft Accident involving helicopter Sikorsky S76 C+
Registration mark OH – HCI

Tallinn Bay, 10 August 2005

TALLINN
2005

SYNOPSIS

On 10 August 2005 at 12:45 local time, an accident occurred with helicopter **Sikorsky S76C+,** registration **OH – HCI**, on its scheduled passenger service from Tallinn to Helsinki. All the 14 occupants of the helicopter were killed in the accident, the helicopter was destroyed. The helicopter hit the water 2 km southwest of the island of Aegna. i.e. at the 12 km distance of the take-off place at the City Hall heliport and sank to the depth of 45 meters.

None of the occupants of the helicopter were found in the course of search and rescue operation that started immediately. Only a light trace of oil pollution and the helicopter main rotor blade floating on the surface of the sea were found close to the accident site.

The wreckage of the helicopter was found 5 hours later with the help of robot. The operation of rescuing the bodies of the victims of the accident started the next day. Divers succeeded in lifting the bodies of all the 13 victims who had occupied the helicopter in 24 hours. The body of one of the victims (pilot-in-command of the helicopter) was found 15 days later in the course of additional search operation approximately 45 off the place were the helicopter sank.

The wreckage of the helicopter was lifted to the surface on the third day after the accident (13.08.2005.a.) and was it taken to the hangar on Tallinn airport for the purpose of examination

On the day of the accident, a 8-member commission for investigating into the causes of the accident was appointed under the decree of the Minister of Economic Affairs and Communications. The composition of the commission is as follows:

Chairman:

Taivo Kivistik	Deputy Secretary General, Ministry of Economic Affairs and Communications

Deputy Chairman:

Tõnu Ader	Executive Officer, Emergency Management Department, Ministry of Economic Affairs and Communications

Members of the Commission:

Oleg Harlamov	Counsellor to the Minister, Ministry of Economic Affairs and Communications
Mati Iila	Counsellor, Emergency Management Department, Ministry of Economic Affairs and Communications
Tiit Kaurla-	Executive Officer, European Union and International Cooperation Department, Ministry of Economic Affairs and Communications

Toomas Kasemaa	Head of the Bureau of Border Guard Policy, Internal Security Policy Department, Ministry of the Interior
Aleksander Dintšenko	Senior Inspector, Department of Air Traffic Services and Aerodromes, Civil Aviation Administration
Jaanus Ojamets	Senior Inspector, Flight Operations Department, Civil Aviation Administration

USA as a State of Manufacture and the State of Design of the helicopter appointed Aircraft Accident Investigator Ms Lorenda E Wardi, National Transportation Safety Board (NTSB), as its official representative at the Commission.

Finland as the State of Operator appointed Aircraft Accident Investigator at the Finland´s Aircraft Accident Investigation Centre, Mr Hannu Melaranta as its official representative at the Commission.

Preliminary report of the aircraft accident investigation was signed on 12 September 2005.

BODY

1. FACTUAL INFORMATION

1.1. History of the flight

Helicopter Sikorsky S76C+ with registration mark OH – HCI, with 12 passengers and 2 pilots as crew members on board, departed from Tallinn City Hall heliport on 10 August 2005 at 12:39 p.m. local time (i.e. at 09:39 UTC) and started its normal flight on the route to Helsinki. The flight on the route usually lasts 18 minutes, the distance is 80 km.

The crew of the helicopter, consisting of Finnish nationals, had performed 5 landings on Tallinn City Hall heliport that day. Weather was suitable for the flight and another take-off (i.e. the fifth one) at the direction of Helsinki took place as usual, not to mention the delay from schedule due to the delays of previous flights. 6 nationals of Finland, 4 nationals of Estonia and 2 nationals of USA, including 7 women and 5 men, were on board of the helicopter as passengers. Before take-off, automatic passenger briefing was started in Finnish, Estonian and English languages. There were no problems with completing pre-flight and after-take-off checklists.

Pilot-in-command sitting on the right seat was the pilot flying. After the take-off on heading 110°, the helicopter turned left and continued the flight on heading 355° with acceleration and climb. Air Traffic Controller of the Tallinn Tower was reported that the helicopter was airborne.

After reaching the altitude of 1500 ft (according to the flight recorder 2000 ft standard atmosphere) and the speed of 130 knots and approaching the border of Tallinn Airport Control Zone, the crew assessed the cloud conditions ahead and prepared to climb to the altitude of 2000 ft or higher. After telling the co-pilot that he was going to add some power, the pilot-in-command started to raise the collective. Energetic raising of the collective took place 5 seconds after that moment. Until that moment, the flight had proceeded as normal, but starting from that moment (hereinafter "moment 0"), an emergency situation occurred, which lasted for 37 seconds and ended with helicopter` s striking the water. According to the flight recorder recording, the raising of the collective was followed by active pulling of the cyclic approximately half of the maximum travel and immediate (a second later) fully forward movement of the cyclic for a very short period . The pulling of the cyclic was followed, according to the cockpit voice recorder recordings, by the exclamation by the pilot-in-command and, a warning signal. At the same time, according to the flight recorder recordings, the increase of vertical acceleration in 1.5 seconds from + 1G to +3 G took place.

When 1.5 seconds had passed from the moment 0, the helicopter was in the following attitude:

- pitch had increased to 40° and continued to increase;
- roll to the left was 40° and continued to increase;
- heading had changed from 355° to 320°, i.e. the front part of the helicopter had turned left by 35° comparing to the initial heading and the turn to the left continued for more 4 seconds.

The helicopter lost speed, but at the same time climbed for approximately 200 ft (up to the altitude 1700 ft) and maintained this altitude in about 10 seconds, after which the altitude started to diminish with unstable rate of descent. During the next half a minute, the helicopter changed its attitude irregularly, to which the crew reacted by acting with helicopter controls.

After the occurrence of emergency situation the cockpit voice recorder had not recorded any comments by the crew that could explain the causes of the occurrence and the helicopter`s unusual attitude. The only clearly distinguishable phrases were three fast and weakly audible "May Day" calls by the pilot-in-command and a question by the co-pilot "The tail has gone?"

Air Traffic Controller in Tallinn Tower, who was about to communicate to the helicopter their take-off time and the information to contact the air traffic controller of Tallinn approach area on the frequency 127,9 MHz, noticed the abrupt change of helicopter`s heading and the following loss of altitude as well as the disappearance of the radar indication from the screen.

The last seconds of the accident were witnessed by a captain of a pilot boat in port approximately 3 km away from the accident site. The helicopter attracted captain`s attention because of some consecutive loud banging sounds. He called immediately to the emergency service and contacted a pilot boat that was close to the accident site. The boat arrived at the accident site about ten minutes after the accident.

At the same time (at 12:55 pm) the search and rescue helicopter of the Border Guard Aviation Group took off from Tallinn airport and arrived at the accident site approximately 20 minutes after the accident.

According to the recordings of flight recorder, the helicopter turned first left up to the heading 250° (at the moment 4 s) after which the helicopter`s heading started to increase again (the helicopter turned right). Spinning of the helicopter to the right continued till it hit the water. In approximately half a minute, the helicopter made 13 full turns and hit the water on heading 360º.

The collective of the helicopter was in the position of active climb during the period from the moment 0 to 3 seconds. Until the moment 9 s, it maintained the position close to that of maximum climb. After that the collective abruptly resumed the position it had before the moment 0. Later, the collective continued to move downward and was close to lowest position at the last seconds of the flight.

Helicopter rotor revolutions were between 100% and 110% most of the time, except for the period from 4 to 12 seconds, when the rotor speed was significantly lower than normal and fell for a moment (at the moment 6 s) to 70%.

Both engines of the helicopter were running and producing the power necessary for rotors` rotation.

The helicopter continued to spin irregularly and finally hit the water and turned immediately over.
Emergency floatation system did not activate.

The helicopter was quickly filled with water and sank into the sea in approximately 10

seconds.

1.2. Injuries to persons

All the occupants of the helicopter were killed.

1.3. Damage to aircraft

The aircraft had sunk 45 m into the water. One the main rotor blade had injured tail boom and cut through the mechanic transmission of the tail rotor, but the tail cone of the helicopter had retained its integrity. As the result of the impact of the blade, the transmission shaft and its cover had removed to the extent of about 1 meter. The parts that had torn off were lying at about ten metres` distance from the helicopter wreckage on the seabed and they were rescued by divers.

Main rotor hub was in its normal position and root parts of all the four main rotor blades had similar damages, only the length of the parts of the blades attached to the hub was varying. Blades vibration absorbers (dampers) had also broken off.

Panels of the stabilizer had damages indicative of the impact of hitting the water, the right panel had separated from the tail. The left part of the tail gearbox together with tail rotor had broken off its main part and were lying apart from the helicopter. However, there were no detectable damages to the gear transmission and the inner surface of the gearbox had the traces of damage indicating to rotation caused by the slanted cogs of the conical cog-wheel of the rotor shaft when the tail rotor broke off.
Tail rotor transmission shaft (like the engines` transmission shafts) had no distinguishable twisting-shaped deformations indicative of torque.

Right windshield of the helicopter was damaged and heavily cracked, but had practically retained its form and was fixed in its place. Right-hand cockpit door`s window was

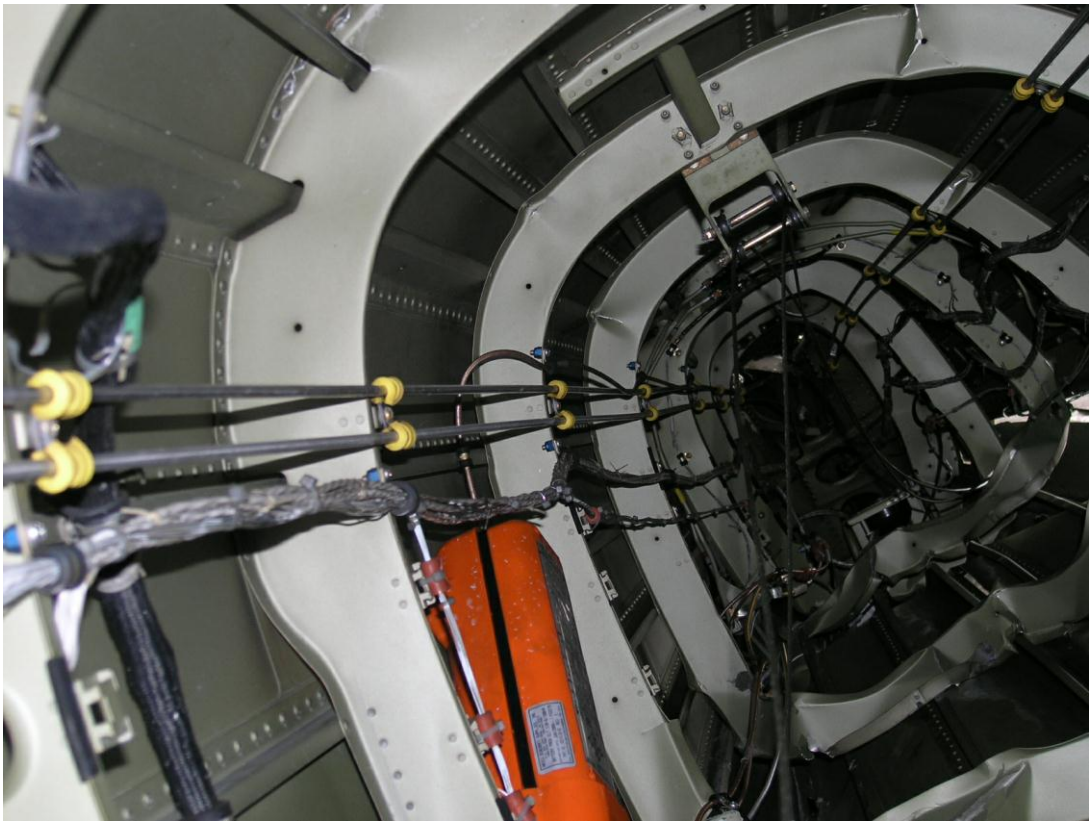
destroyed,

the pieces of the central part of the organic window class could not been found. Both downward vision windows situating at pilots´ feet were destroyed. Right cockpit door was closed, but heavily deformed and the airframe surrounding the door was also heavily deformed.

There were crushing deformations caused by pressure on helicopter fuselage skin on the fuselage right front side, on the lower part of the fuselage and on the left part of the tail boom.

The doors of right and left main landing gears had slight damages to the parts far from hinges. Helicopter´ s nose floating bags had fell out of their wells and the yellow bags hung attached to the airframe uninflated. The explosive door links that are used to separate the door linkage upon deployment of floats were intact.

Emergency Locator Transmitter (ELT) of the helicopter was at its place on helicopter´ s tail and its switch was in the "***off***" position.



Helicopter´s flight recorder was not damaged and it was removed from the helicopter.

1.4. Other damage

There was no other damage. Environmental pollution was minimal, since the amount of petrol used as helicopter fuel was small (approximately 400 litres).

1.5. Personnel information

1.5.1 Pilot-in-command : man, 41years

Licence JAR- (ATPL (H)),

valid until 21.11.2007

Medical fitness JAR class 1, valid until 4.10.2005

Ratings All the necessary ratings were valid

Flight time	In previous 24 hours	In previous 30 days	In previous 90 days	Total flight time and number of flights
All aircraft				
Helicopter S 76		109 h 48 min flights		

1.5.2 Co-pilot: man, 56 years

Licence (ATPL (H)),

valid until 22.3.2010

Medical fitness JAR, class 1, valid until 3.02.2006.

Ratings All the necessary ratings were valid

Flight time	In previous 24 hours	In previous 30 days	In previous 90 days	Total flight time and number of flights
All aircraft				
Helicopter S 76		40 t 06 min flights		

1.6. Aircraft information

Helicopter **Sikorsky S76 C+** is a common lay-out helicopter designed and manufactured in USA, with two turbine engines, two pilots seats and 12 passengers seats.
Passenger seats are situated behind pilots` seats in three rows, 4 seats in each row.

The helicopter has 4-blade main rotor turning counter-clockwise and a 4-blade tail rotor.

Maximum speed: 155 knots.

Maximum take-off weight of the helicopter is 11700 lb (5307 kg).

Actual take-off weight of the helicopter was 10867 lb.

Engines **Arriel 2S1**, produced in France, ***Turbomeca*** plants.

The helicopter is produced in 2000 by ***Sikorsky Aircraft Corporation***, USA.

Registration mark of the helicopter: OH-HCI, date of registration: 21.03.2000.

State of registration: Republic of Finland.

Serial number of the helicopter: 76058.

Airworthiness Certificate of the helicopter was valid until 31.03.2006.

The helicopter has been insured.

1.7. Meteorological information

Weather in the area of the accident was dominated by the north-eastern part of the low pressure system. The centre of the cyclon was located about 150 km south-west of the accident site and moved to north-east at the speed of 10 km/h. At the time the accident occurred, south-easterly wind 110° 14 knots was blowing on surface in the region of Tallinn Bay. In the layer 1000-2000 ft, south-easterly wind 130°25-30 knots was blowing. Visibility was 7-8 kilometres. It was raining lightly/moderately, drizzling. The lowest cloud base of stratus and nimbostratus was 800-1400 ft. The Harku observatory registered at 12:00 local time (09UTC) isolated cumulonimbus and light shower. There were no freezing in the lower layer of clouds, freezing level was 9500 ft. Moderate turbulence was forecasted between layers close to the surface up to the altitude 4000 ft.

Pressure QNH was 989 hPa. Air temperature was 14°C, dew point was 13°C. According to meteorological radar, main layer of clouds having effect on the flight reached from Tallinn to some kilometers distance of the island of Aegna.

1.8. Aids to navigation

Aids to navigation had no effect on the accident

1.9. Communications

The helicopter communicated with Tallinn Control Zone air traffic controller (Tallinn Tower) on the frequency 120,6 MHz in English language.

Communications had no effect on the occurrence of the accident.

1.10. Heliport information

The accident did not take place on heliport. The helicopter took off from the City Hall heliport (EECL), situated at Tallinn Bay, 17 ft of sea level.

1.11. Flight recorders

The helicopter was equipped with a combined flight recorder ***(Penny+Giles Solid State Combined Voice and Flight Data Recorder),*** Type 2000, manufactured in the United Kingdom, which recorded crew voice communications during the last 30 minutes of the flight and flight data during the last 35 hours of the flight.

The flight recorder was not damaged in the accident, it was removed from the helicopter and sent to the United Kingdom for the read-out of data. The data of the both parts of flight recorder were well preserved and they could be used in investigating into the causes of the accident.

The recordings of Tallinn Secondary Radar were also used in the investigation. The recordings revealed the abrupt change of helicopter track (about 50°) to the left, the loss of speed and the preliminary coordinates of the helicopter wreckage.

1.12. Wreckage and impact information

The helicopter was in the depth of 45 meters on the seabed, the coordinates of the location were **N59°32,546 E 024°43,852.**

The part of the helicopter that was found first was the main rotor blade marked with black colour, which was found floating on the surface close to the accident site. The blade was relatively slightly damaged and, unlike the other three blades, had broken off practically next to the hub.

Initial examination of the helicopter with an aim to detect damages was carried out on the basis of the data of diving machine and video recordings taken by divers. The quality of the video recordings was bad since, due to suspended matter, visibility near the helicopter wreckage was approximately one meter. The helicopter lay on seabed in the reversed („wheels-up") position. Landing gear was extracted. Main rotor hub had sunk into the sandy clay of the seabed. Helicopter tail rotor had broken off the gearbox and was lying some meters off the helicopter. The ends of main rotor blades and some other smaller parts of the helicopter were also found. Tail cone of the helicopter was still attached to the main part of the fuselage, but it had strong traces of tear at the back of the fuselage. The right-hand cockpit door window was broken and the right-hand windshield was also damaged.

After the bodies of the victims had been lifted to the surface, the wreckage of the helicopter was turned so that it would be possible to fix straps to the rotor hub and the helicopter was lifted to the surface.

It was detected at the initial inspection of the helicopter that the landing gear of the helicopter was extended, but it had not been extended by the crew. Out of the four floating bags those situated at the front part of the helicopter had fallen out of their wells, but they had not been filled with compressed nitrogen. Two floatingbags that were fixed to the inner sides of main rotor doors were at their positions. All the compressed nitrogen bottles were pressurised and the system had not activated. The floats switch on the overhead console was in the deactivated (i.e. switched off) position.

There were no evidence of fire.

There were no evidence indicating that a bird strike or collision with some other object could take place in the air.

The tailcone of the helicopter was practically broken off the place were it was mounted to the fuselage and was hardly attached (practically by electric cables and hydraulic pipes) to the fuselage. The frames of the back part of the fuselage were deformed, there were more deformations on the left lower side of the frames. Before the helicopter was lifted out of the water, the two tail rotor control cables were unbroken, they broke due to the load caused by the hanging tail. Due to that load, a tail rotor control rod had also bent on the cabin.

Right pilot seat was torn off the floor at its two left housings and there were deformations on the seat back, which indicated loads with right-ahead effect. Cockpit floor was also deformed and the pedal mechanism of the right pilot was heavily twisted. Right pilot´s cyclic was bent ahead near to the floor.

Pilots´ headphones were connected to their sockets. There was a through crack on the case of right pilot´s headphone.

The inflatable floats system switch at the cockpit ceiling was in the switched-off position. The switches of electric generators were in the switched-off position.

Engine condition levers of the overhead panel in the cockpit were in the following positions: fuel cut-off cocks of the right and left engine (levers with yellow knobs) were in the normal *direct* position.

T-handles (fire handles): left engine handle in its normal position, right engine handle moved back by about a quarter of the travel. Engine power control levers: the left one practically in the engine-out position and the right one moved slightly forward of the idle run position.

Landing gear handle was in the *"Gear Up "* position and the gear emergency extension handle was not activated.

Helicopter main rotor hub was complete, it had the root ends of four main rotor blades attached to it, every one of different length (from 30 cm to 1 m).

Both engines of the helicopter, their cowlings and their main output shafts were undamaged.

Left fuel tank of the helicopter was intact, the right one was damaged.

1.13. Medical and pathological information

As the result of the dissection it was determined that the death of the victims was caused by drowning.

1.14. Fire

There was no fire.

1.15. Survival aspects

The helicopter was equipped with 4 inflatable floats which would have enabled the helicopter to float in the normal attitude and would have ensured the fuselage to stay close to surface in case the helicopter had turned over. The helicopter was equipped with serviceable inflatable life jackets under the seats of every occupant of the helicopter.

The speed of the helicopter was not high the moment it hit the water, the occupants of the helicopter were at that moment rather influenced by high sink rate and the impact load caused by spinning of the helicopter to the right. The inertia vector caused by spinning of the helicopter over its vertical axis had stronger effect on the occupants of the front part of the helicopter, who suffered more serious injuries.

Fatal factor was suffocation caused by quick sinking of the helicopter.

It was not possible to assess the activation of Emergency Locator Transmitter (ELT), since radio signals from an aircraft deep under the water do not reach search and rescue satellite.

'May Day" call by the crew of the helicopter was weak and did not reach the air traffic services.

Thanks to the air traffic controller who noticed the disappearance of the radar indication from the screen and a phone-call by an eyewitness, the information on the accident was received immediately and search operation was launched in a couple of minutes.

No one of the occupants of the helicopter got out of the helicopter while the aircraft sank

Passengers of the helicopter had 4-point safety harnesses, the pilots had 5-point safety harnesses.

The safety harnesses of all the occupants of the helicopter were fastened at the moment the helicopter hit the water. Divers detected that the safety harnesses of the both pilots were unfastened under the water. The pilot-in command had (probably unwillingly) got out of the helicopter through the broken right-hand cockpit door

window and the body of the pilot was found at the distance of 45 meters of the helicopter after the search operation had been officially closed.

The jettison handle of the left pilot's door was in the upright position, but the door had not separated from the helicopter. The door was separated from the helicopter by divers in the course of rescue operation and it was lifted to the surface on 18 August.

1.16 Tests and research

The investigation commission have had examined:

- engines of the helicopter to detect deviations of the helicopter operation caused by possible malfunctions of the engines. According to unofficially reported information on the examination of the engines, there are no observations regarding the operation of engines;

- main gearbox of the helicopter to assess the possible brake torque of the main gearbox transmission. No malfunctions of the main gearbox were detected as the result of the examination.

- tail gearbox and intermediary gearbox to assess their possible impact on helicopter`s deviation from its heading. Examination continues.

- hydraulic servos and actuators of the helicopter controls, to assess possible "overcontrol" caused by the hydraulic servos. Examination continues.

Preliminary acoustic analysis of the cockpit voice recorder was made with an aim to detect possible characteristic sounds that could be heard in the cockpit and to receive information on the causes of the accident on the basis of pilots' communication. Provisional data on the cockpit voice recordings do not include any direct information indicating to the causes of emergency situation. Analysis continues.

On the basis of flight recorder data a flight simulation (animation) was developed to assess the helicopter attitudes and manoeuvres. Simulation information is under review.

The Investigation Commission intends:

- to examine the automatic flight control system data (RDAU);
- examination of primary surveillance radar recordings;
- to assess floating ability of the helicopter and the rate at which the helicopter was filled with water;
- to arrange necessary simulations on the S-76 C+ flight simulator to assess the helicopter`s attitude and controllability;
- to study pilots' safety harnesses locking system.

1.17. Organisational and management information

The flight was a scheduled passenger flight in controllable airspace. The take-off and landing are performed under Visual Flight Rules (VFR) and the en-route flight is performed under Instrument Flight Rules (IFR). There was no cargo on board.

2. ANALYSIS

2.1 Damage to the helicopter and helicopter attitude on hitting the water

The investigation did not detect any evidence on parts that could have been separated from the helicopter or could have been damaged in the air. Most of the damages to the helicopter were caused by the impact of water, some by hitting the seabottom, others by lifting of it from the seabed and by the transportation. The parts that had separated from the helicopter were located quite close to the helicopter at the seabed. The only part of the helicopter that was located further away (approximately 0.5 km) was the main rotor blade floating practically in the upright position, which could be carried away from the accident site by air due to the rotor rotation speed. It is also likely that it had drifted away due to streams or wind, since the period between the moment the blade broke off the helicopter and the moment it was found was about 20 minutes.

No fatigue damage was detected on any part of the helicopter. Damages to the main rotor blades` cylinders inner surfaces were quite similar for all the four blades.

Considering the above, the separation of the rotor blade in flight cannot be considered the cause of the accident by the Investigation Commission.

The helicopter attitude on striking the water could be detected on the basis of flight recorder data and studying the damages to the helicopter. On striking the water, the helicopter pitch angle was practically normal. It had a slight roll (20°) to the right and at the same time it was spinning to the right over its vertical axis with the rotational speed 1 full turn in 2.5 s. The helicopter tail cone struck the water first, followed immediately by the front part of the fuselage. The impact of the water to the tail and the impact load produced a crack to the aircraft skin between the front and rear part of the helicopter extending almost from the bottom to the top. That caused the bending of the helicopter tail upwards until it reached the main rotor plane of rotation and a main rotor blade (with yellow markings) cut the tail obliquely. The impact of the tail cut off part of the tail rotor transmission shaft and its cover, which sank close to the wreckage. The same impact of the blade damaged vertical stabilizer (pylon). The leading edge of the blade that cut the tail had some small yet clear deformations and traces of blue colour originating from the helicopter tail.

Main rotor blade edges hit the water probably right of the helicopter on their forward movement and separated due to the loads caused by brake torque. The blades' light composite plastic edge fairings, the elements with highest linear velocity that are not intended to withstand loads, broke off when the blade edges hit the water.

At the same time, tail rotor encountered the cloud of water created by the helicopter's hitting the water and, as the result of resultant actions, the tail rotor was torn off off the tail gearbox.

The condition of the main gearbox and the nature of main and tail rotor damages exclude the possibility that rotor blade could separate before hitting the water. The same can be concluded on the basis of flight recorder recordings.

Since the speed of the helicopter on striking the water was not significant, most of the damages were due to the sink rate and the spinning of the helicopter.

2.2 Operation of helicopter equipment

According to the flight recorder data, there were no detectable malfunctions of helicopter equipment before the emergency situation. Likewise, no distinct malfunctions of helicopter equipment have been detected during the period from the occurrence of the emergency situation until the helicopter hit the water.

2.2.1 Both engines of the helicopter were running without interruption and produced the torque necessary for rotors` rotation. The torques of both engines are traceable on flight recorder recordings and they changed constantly in accordance with the power needed for maintaining rotor speed. Only approximately 5 seconds before the helicopter hit the water the left engine was set to idle run (or was switched off, probably by the co-pilot); as the torque for maintaining rotational speed was applied only to the right engine from that moment, the torque produced by the right engine started to increase immediately. Two seconds later (two or three second before the main rotor blades hit the water) also the torque of the right engine started to diminish. It is possible that the co-pilot switched the engine off, moving the T-handle of the right engine to the back position.

2.2.2 Tail rotor continued to rotate and the fracture of the tail gearbox could only take place when the tail hit the water. The separation of the tail rotor blades in flight is excluded since, due to the nature of the helicopter`s design, the imbalance caused by the separation of one blade should have separated also the blade opposite to it together with their linking part by the centrifugal force arising from the rotation of the rotor. The fact that the linking parts of the both rotor blade couples had remained attached to the tail rotor hub indicates that, although only one blade of the four tail rotor blades had remained attached to the hub, the separation of the three blades must have taken place immediately before the tail rotor rotation was definitively stopped on hitting the water. At the same time, the power necessary for the fracture of tail rotor gearbox could only originate from the tail rotor that rotated at normal speed.

2.2.3. The malfunction of helicopter main gearbox, which could have caused helicopter`s abrupt retardation that could lead to uncontrollability **is excluded** on the basis of the results of main gearbox examination.

2.3 Development of uncontrollable attitude

The helicopter was practically uncontrollable after the emergency situation occurred at the moment 0. The drastically increased vertical acceleration (up to +3G) and longitudinal acceleration (actually helicopter`s deceleration - 0,3 G) was followed by active turn to left, which later developed into right turn and constant spinning to the right. In spite of pilot s acting with controls, he was not able to resume control due to low speed and great changes in attitude.

So far, the Investigation Commission has not been able to find out the primary cause for developing the uncontrollable attitude by the helicopter.

3. CONCLUSIONS

3.1 Preliminary assessment of factual information:

- The helicopter was destroyed on hitting the water and sank on a scheduled passenger flight at daytime;
- Helicopter crew had the required licenses and ratings necessary for the flight;
- Helicopter was maintained in accordance with applicable requirements;
- Helicopter Airworthiness Certificate was valid and the helicopter had the equipment, fuel and lubricants necessary for the flight;
- Helicopter mass and the centre of gravity were within the required limitations;
- There were no prior warnings on equipment malfunctions before the emergency situation occurred;
- Helicopter engines remained operable until the end of the flight;
- Meteorological conditions were in accordance with the requirements for the flight;
- Damages to the helicopter were caused by the impact of the water;
- Helicopter sank quickly after hitting the water and no one of the occupants of the helicopter was able to get out of the aircraft.
- Search and rescue operation started with minimum delay and there were no possibilities to rescue the occupants of the helicopter.

3.2 Causes of the accident:

The helicopter encountered an emergency situation in the third minute of the flight at the altitude 1500 fl and speed 130 knots. The emergency situation caused helicopter's significant deviation from normal flight characteristics, which ultimately led to uncontrollable fall.
The Investigation Commission will continue the investigation to find out the causes of the accident.

4. SAFETY RECOMMENDATIONS

On the basis of preliminary analysis and material, the Investigation Commission cannot make any flight safety recommendations so far.

Members of the Investigation Commission:

Taivo Kivistik

Tõnu Ader

Oleg Harlamov

Mati Iila

Jaanus Ojamets

Toomas Kasemaa

Tiit Kaurla

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12 September 2005