Swedish Air Force Tp-79 Inspection After Action Review

Prepared by: Bob Christ

Date of Operation	[2300] October 13 to [0700] 14, 2003
Location:	Baltic Sea East of Gotska Sandön Island, Sweden
Operation:	Tp-79 (C-47) Underwater Crash Scene Investigation
ROV Pilots:	Bob Christ [SeaTrepid] and Daniel Karlssen [Wildland Fire International]
Wreck Inspected:	*Douglas DC-3/Tp-79 (79001)*
Observed Wreck Depth:	Approximately 127 msw [meters salt water] (417 feet)
Underwater Visibility:	Approximately 3-5 meters (9-15 feet)
Surface Conditions:	Scale #8 on the Beaufort Scale, temperature 8C (46F)
Vessel of Operation:	Swedish Navy *HSwMS BELOS*
Vessel Station Keeping:	Kongsberg Dynamic Positioning System
ROV Systems Used:	VideoRay Pro II system (for further information please refer to http://www.videoray.com/Products/PRO2.htm)
On-board Sonar Used:	Imagenex 851 675 kHz mechanically scanning sonar
Sub Method of Deployment:	Hand deployment through the moon pool of the BELOS
Number of Dives:	6 dives with 2 systems operating simultaneously
HSwMS BELOS CO	CMDR Frederik Hallstrom
HSwMS Diving Officer	LCDR [xxxxxxxxx] (Daniel, please provide D.O.'s name)
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Introduction:

The above referenced aircraft was reported missing in June, 1952 during an ELINT mission over the Baltic Sea. In the 1990's, Russia admitted to shooting the aircraft down with a MiG-15. According to the MiG-15 pilot's report, the intercept was made at 4,000 meters above sea level with the MiG pilot losing sight of the aircraft after the attack as it descended toward the water. Wildland Fire International and VideoRay LLC were called into this project by the Swedish Navy to do an initial wreck site assessment with our Remotely Operated Vehicle system.

Micro-ROV investigation of this site was necessary in order to examine the wreckage in-situ so that details and clues could be gleaned as to the cause of the wreck before any salvage work was attempted. The system was able to make a full external and internal video investigation of the wreck site at depth.

The purpose of this report is to outline the ROV operator's (Bob Christ – ATP-rated aircraft pilot with flight experience on the DC-3 aircraft) initial estimate of the site as well as possible theories as to the cause and results of the accident based upon the evidence observed. This report was created from the author's memory just after completion of the project and could be updated upon closer review of the videotapes taken during the operation. It is the author's understanding that the wreck is to be salvaged. In addition, the author did not have access to the MiG pilot's report which could have given additional corroborating evidence to complete the details of the final moments of flight. Closer examination of the debris upon salvage would definitely shed further information for this report giving a clearer picture of the final minutes of flight prior to impact.

Operation:

The Micro-ROV was deployed through the moon pool of the Swedish Navy HSwMS BELOS using dynamic positioning equipment to position the vessel directly overhead the wreck site (starboard side quarter of the wreck). A VideoRay Pro II system equipped with a 675 kHz scanning sonar was used for the initial location of the wreck on the initial deployment.

Please download a diagram of the aircraft for further reference from the following web site: http://www.douglasdc3.com/tecnew/tecnew.htm

General Observations are as follows:

1. The wreck rests on the bottom (bottom of the aircraft to the silt) with the longitudinal axis of the aircraft facing approximately 270 degrees true. The right wing is attached to the fuselage with the bottom of the right wing above the silt to the engine nacelle. The top of the left wing is buried in the silt, inverted, detached at the wing root and laying next to the aircraft with the axis of the wing approximately 60 degrees facing aft.
2. The nose of the aircraft is splayed open (to approximately station 103) with the majority of the wreckage canted toward the co-pilot's side.
3. The right wing tip is hanging down into the mud attached by the skin only.
4. On all control surfaces, the skin is missing (probably due to corrosion of the fabric covering).
5. The skin on the underside of both wings is buckled slightly.
6. Both engines are missing to the engine mounts.
7. Flaps were noted to be at approximately 15 degrees on the right wing.
8. Pilot's escape hatch cover was noted to be missing.
9. Brow above cockpit (station 40) is the only intact portion of the cockpit remaining. The VHF antenna behind the pilots' station (station 86) was intact and in good condition.
10. Pilot's side baggage door (attachment point at station 86) was observed to be missing.
11. Left wing was observed to be essentially detached from the fuselage inverted with the top of the wing buried in the mud. It was not known if there were any

remaining attachment points (i.e. skin remaining attached) due to submersion under the mud layer.

12. Wheel in left wing nacelle was observed to be in the up position.
13. Most of the left wing was buried in the mud.
14. The right wing pneumatic deice boot was observed to be missing from the wing tip to the engine nacelle.
15. Right wing was in generally good condition.
16. Many popped rivets were observed along the upper part of the fuselage indicating strong and sudden stress to that area.
17. The cockpit was completely destroyed and in disarray up to approximately station 100.
18. Bulkhead behind pilots' station was pushed back to approximately station 140.
19. Right side over-wing cabin emergency exit door was observed to be missing. Upon close investigation, the hinges were shown to be sheared to the pivot pin.
20. Fuselage showed significant buckling on the top-side from approximately station 180 to station 400 [essentially the over-wing areas].
21. Navigator's sighting bubble at station 140 was observed to be broken (sextant mount still attached). The remaining radio bubbles were observed to be intact.
22. Cabin windows were observed to be intact.
23. No significant deflections on any trim tabs or control surfaces were noted.
24. Both horizontal stabilizers were bent upwards so as to come close to contact with the vertical stabilizer.
25. A rupture of the fuselage on the right side just forward of the horizontal stabilizers at approximately station 620 was observed with breaks of both the stringers and longerons.
26. The entire empennage was observed to be rotated approximately 30 degrees to the left side at the fuselage rupture.
27. Right side horizontal stabilizer was noted to be bent aft of the left side stabilizer.
28. The main cargo door was observed to be missing with the aft hinges (station 520) sheared from the fuselage.
29. The top of the cargo door opening was above the mud line allowing for access with the Micro-ROV.
30. The main cabin was noted to be in general disarray.
31. A thick silt layer covered the entire cabin interior.
32. No positively identifiable crew remains were located.
33. Bullet holes were noted throughout the length of the fuselage. Some appeared to be entry holes and others appeared to be exit holes.
34. Door to the main cabin lavatory appeared to be buckled and pushed back to approximately station 520.
35. All radio technician stations appeared to have been destroyed.
36. Various pieces of radio equipment were noted in the debris field outside of the fuselage.
37. Both engines were recovered separately from this expedition aboard the BELOS. From discussions with the crew of the BELOS, the separation of the engines from the main wreck site was approximately 100 meters.
38. The engine mounts on the right engine appear to be intact and showed shearing on the top tubular mount attachment point (at vibration dampener).
39. Cabling was noted strewn about the inside of the cabin. The ROV pilot could not ascertain if it was control cabling.

40. Right side wing trailing edge wing root was below the mud line covering the wing root trailing edge to approximately station 350.
41. Right side wing root leading edge was covered with debris from the co-pilot's side of fuselage making it inaccessible to observation with the Micro-ROV.
42. Prop controls were found in the cabin debris at approximately station 70 and were noted to be even with each other.

Fuselage openings were as follows:

1. Opening of the entire nose section (to approximately station 90) apparently through damage from water contact.
2. Opening of the pilot's escape hatch apparently by force of impacted water forced through the nose.
3. Opening of the pilot's side baggage hatch apparently by force of impacted water forced through the nose.
4. Opening of the right side cabin over-wing emergency exit apparently by force of impacted water [or through cabin over-pressure] forced through the nose (close examination of the hinges on top of the opening showed shearing of the exit door attachment).
5. Opening due to the breakage of the navigator's bubble on top of the navigator's station (station 140) – again, through water ingress or cabin overpressure.
6. Cargo door missing (both forward and aft sections).
7. Fuselage rupture just forward of the empennage on the right hand side (approximately station 620).

Wing openings were as follows:

1. Gear doors on the left engine were separated exposing the left main gear. The cowling on the underside nacelle of the left engine was open to the trailing edge of the wing.
2. Both engine and accessories were missing to the engine mounts on the right wing.
3. A servicing panel was open just aft of the firewall on the right wing.
4. The right wing tip was broken and hanging down to the mud line exposing the rib on the wing tip attachment point (outside end of aileron).

Results and Summary:

1) The accident appears to have involved uncontrolled flight into water.
2) The initial cause of the accident appeared to be bullet ingress into the aircraft due to shots fired from the MiG-15.
3) The most likely cause of the accident is pilot loss of control of the aircraft due to unknown reasons.
4) Due to the observed position of the propeller controls, it would not appear that neither engine was feathered at the time of impact [pending review of the positions of the electric propeller feathering switchs located above the pilot/co-pilot stations].
5) Once the aircraft contacted the water, it would appear that both engines were separated at that point – probably due to forces at the time of impact caused by the difference in densities of the engines versus the remainder of the aircraft.
6) Due to the 100-meter separation of the engines from the main fuselage, it would appear that the main wreck floated for at least a short period of time.
7) Since no significant control surface deflection was noted, either the pilots may not have been exerting control over the aircraft at the time of impact (possibly due to

bailing out or incapacitation) or all control surface cabling was severed releasing control surface pressures.

8) The top of the cockpit was observed to be intact while the bottom of the cockpit was completely destroyed and canted toward the co-pilot's side. This would indicate a force of impact with the water coming from below and to the left side of the nose of the aircraft.
9) Due to the left wing being severed from the aircraft while laying inverted and canted rearward, it would appear that the left wing contacted the water first with an upward turning moment.
10) Both horizontal stabilizers were forced upward toward the vertical stabilizer indicating a strong and direct force from water impact.
11) Buckling on top of the fuselage along the longitudinal axis of the aircraft would indicate a strong bending moment perpendicular to the longitudinal axis of the fuselage – probably coming from the axis of the wing.
12) The damage sustained in the cockpit area (force coming from below and left), coupled with the damage to the empennage (rupture on the forward right side of the fuselage just forward of the right horizontal stabilizer) and the detached left wing would indicate that these 3 items sustained direct contact with the force of the water impact (probably close to simultaneously).
13) Bullet holes (both entry and exit holes) noted at the top and sides of the fuselage were inconclusive as to the number of passes made by the MiG-15 pilot due to unknown aircraft attitude at the time of bullet strike.
14) GENERAL NOTE: The Tp-79 is a highly-modified version of the venerable Douglas DC-3 aircraft. The modifications involved installation of various equipment items (radio equipment which would probably be quite dense and heavy) within the cabin aft of the center of gravity of the aircraft. The author of this report did not have access to weight and balance information for this flight. The presence of an aft CG (center of gravity) condition would directly affect the controllability of the aircraft along the vertical axis (yaw) in the low-speed flight regime.
15) The extent and apparent timing of this damage would be consistent with the aircraft being in a flat spin to the left at the time of impact.
16) Due to the absence of residual control surface deflection, it would appear the pilot(s) may not have been in control of the aircraft at the time of impact. Only the propeller controls were located (not the mixture controls or the throttle controls). If the pilots were in place and functional, the throttle control position would shed further information as to whether the pilots were attempting to bring the aircraft back into control prior to impact.
17) Due to the extent of damage to the aircraft, it is the opinion of the author of this report that there were no on-board survivors of the initial impact with the water.
18) Due to the lack of apparent crew remains, some of the crew may have been able to bail out of the aircraft before impact. If the aircraft were in a flat spin to the left, any crew remains within the cabin will most likely be under the silt layer in the right rear of the cabin just forward of the lavatory station. Any remains of the flight crew will most likely be within the debris area around the cockpit.

For questions on this report, please field all correspondence through Daniel Karlssen (e-mail: daniel@wildlandfireint.com) of Wildland Fire International (www.wildlandfireint.com, Ånge, Sweden – Telephone: +46 690 230 00, Fax: +46 690 233 01). The opinions, conclusions and speculations reached in this report are of the **authors' only** and should

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