

No. 22

United States Overseas Airlines, Inc., Douglas C-54-DC, crashed  
60 nautical miles northwest of Narsarssuaq, Greenland, on  
13 May 1957. Summary of a report received from the  
Director of Civil Aviation, Denmark.

Circumstances

The aircraft carried a crew of three and no passengers. It was one of several Company aircraft under contract to transport diesel oil from Narsarssuaq, Greenland, to various DEW Line sites (Distant Early Warning Radar Line). The flight was returning from DEW site 39\* when it crashed during a VFR descent on the Greenland ice cap at approximately 0335 hours local Greenland time, fatally injuring two of the crew.

Investigation and Evidence

Prior to departure of Flight 736 to site 39 the crew were briefed by the USAF weather personnel at Narsarssuaq on the local and en route weather. The weather for the entire route including destination and alternate was favourable. The crew then filed an instrument flight plan through USA Air Force Base Operations at Narsarssuaq (BW1). The flight was cleared for 11 000 ft altitude and direct to site 39, with Frobisher, an airport on the southern end of Baffin Island, as the alternate.

The aircraft departed Narsarssuaq at 1955 hours local Greenland time on 12 May and was routine to site 39, arriving there at approximately 2320 hours. At 0040 hours, 13 May, the flight departed site 39 on the return trip. There were no refuelling facilities or weather information at site 39.

After becoming airborne, an instrument flight plan was filed by radio through DEW site 41. The clearance read "IFR, 11 000 ft direct Narsarssuaq".

At 0301 Narsarssuaq Approach Control received by relay a position report on Flight 736 that had been given by the flight to Søndrestrøm, Greenland, and relayed to Prince Christians Sund (located on the south end of Greenland, east of Narsarssuaq through Simiutaq radio to the Narsarssuaq Air Force Base.

This position report was "USO 736 at 63:42 North Latitude - 53:42 West Longitude - time 0223, 11 000 ft estimating Narsarssuaq at 0410".

There was no further clearance or advisory from Narsarssuaq on any additional messages from the flight.

The failure of Flight 736 to arrive at BW1 at or near the estimated arrival time indicated in the last radio message, along with the expiration of the operating fuel time, served as a basis for considering the aircraft lost.

Narsarssuaq's US Air Force Commander notified the Air Rescue Service who immediately dispatched trained personnel and appropriate aircraft from Goose Bay, Labrador and Harmon Air Force Base, Newfoundland, for the mission. He realized that the Air Rescue Group could not arrive for several hours; therefore, he and USO Airline personnel organized a search party. Several air routes were to be covered and the US Air Force Commander selected the one over the ice cap that was sometimes flown by pilots when operating between the Air Force Base and site 39.

At approximately 1007 the Commander and his crew sighted the wreckage on the ice cap approximately 60 nautical miles

\* The exact location is a military secret.

northwest of BW1. Due to a decrease of visibility resulting from the start of a whiteout,\* the US Air Force crew did not attempt a landing. They did, however, fly close enough to see a survivor and dropped a note of instructions, blankets, clothing, food and other Arctic survival supplies and positioned the wreckage area on a chart prior to returning to BW1. Having experienced complete whiteout conditions they returned to clear weather and remained airborne until the whiteout condition improved. As visibility cleared, the crew of the USO aircraft advised the BW1 personnel of the present weather conditions and the rescue group immediately went into action.

The Air Rescue Group had two amphibian aircraft, para-rescue teams, and Arctic survival supplies. The two aircraft were a SC-54 and a SA-16.

The SA-16 landed at Narsarssuaq Air Base at 1545 hours. After off-loading the Rescue Mission Commander, the Mission Duty Controller, the Radio Operator and all superfluous gear and equipment, loading on the Base Surgeon, and obtaining a briefing, the aircraft departed for the ice cap and scene of the crash at 1705 hours to evaluate snow conditions for possible snow landing. The SC-54 was over the crash site by this time and reported good visibility and winds of 40 - 50 knots. Due to the high winds and the problem of having to evacuate additional personnel from the ice cap, the decision was made not to jump the para-rescue team unless it was impossible to land the SA-16. The SC-54 was advised to drop a URC-4 to the survivor so that he could assist in evaluating snow conditions and wind if possible.

The URC-4 was dropped but the survivor did not come into the open to retrieve it. The SA-16 was advised to land on the snow

if conditions appeared safe. After five evaluation passes across the proposed landing track, and finding the wind approximately 15 - 20 knots below five hundred feet, the aircraft landed on the ice cap at 1744 hours. The altitude of the crash site was 5 900 feet.

The survivor stated that he had searched the wreckage for approximately two hours and he was the only one alive, however, he could only find one body. The navigator and medical officer searched through all major pieces of wreckage and the surrounding area for approximately 25 minutes but failed to locate the third person. An extensive search of the wreckage was not made at this time due to the statement of the survivor and his condition, approaching darkness and the anticipated difficulties in becoming airborne.

On the first take-off attempt it was evident that only two of the four JATO (jet assisted take-off) bottles fired. Further, it appeared that carburettor ice was present in the number one engine. Only 41 inches could be obtained on that engine while number two was obtaining 46 - 47 inches. The line of take-off was up-slope approximately three degrees in order to remain into the wind. Approximately three to four miles were consumed on the initial take-off attempt. Aircraft weight at this time was approximately 26 500 pounds. An attempt was made to drop JATO bottles. The JATO bottles broke away from the parachutes and buried themselves in the snow, making it impossible to recover them. Two other runs of approximately two miles each were attempted but had to be discontinued when engines began to heat up and had to be idled back. The aircraft commander was attempting to work his way up-slope to a level spot, approximately ten miles from the wreckage. At this time the decision

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\* One of the many atmospheric conditions which exist over the ice cap areas - if a crew experiences this condition it is necessary to fly with the use of aircraft instruments for safe operation. This is particularly true since the whiteout condition eliminates a horizon.

was made to further lighten the aircraft and all but approximately eight hundred pounds of fuel were dumped, survival gear, radio and electronic equipment, and everything removable was removed from the aircraft. After a run of approximately two to three miles, and with the co-pilot playing the flaps between 0 and 30 degrees, a successful take-off was accomplished at 1924 hours. The aircraft weighed approximately 24 000 pounds. The SA-16 landed at Narsarssuaq Air Base at 2005 hours and the survivor was turned over to the Base Hospital.

An official visit was made by the CAB investigating team to the Base Hospital and an interview was conducted at the co-pilot's bedside.

The facts disclosed by the co-pilot are as follows:

The trip to DEW site 39 was routine. Shortly after arrival at site 39 the cargo of diesel oil in steel drums was unloaded and the aircraft was ready to return to BW1 with no cargo. At approximately 0040 on 13 May a normal take-off in VFR weather was accomplished. After becoming airborne the co-pilot filed by radio (VHF) an instrument flight plan through site 41. After reaching a cruise altitude and level flight was established, the co-pilot changed seats with the reserve captain as the co-pilot wanted to complete some paper work. The co-pilot reported that cruise power had been set up, however, he did not know but assumed that they were at 11 000 ft. A period of time passed and the captain informed the two crew members that they had reached the shore of Greenland in the vicinity of Frederikshaabs Glacier, were on course, and on time. The co-pilot prepared some coffee, brought a cup to the captain and changed seats with the reserve captain. While changing seats and starting a check of the cockpit, the crash occurred.

The co-pilot's recollection was that there was no malfunctioning of the engines, accessories, radios or aircraft during the flight. He did not have time to read

altitude, check visibility, or position before the crash. He did not notice any drowsiness of the captain.

After the wreckage came to a stop the co-pilot crawled out through a hole in the cabin area. He looked about the wreckage area, noted his wounds and realized that he was alone somewhere on the ice cap. During further search of the area he found the body of the captain but could not locate the reserve captain. He then made a shelter from aircraft debris against the rudder section and prepared to stay there to wait for a rescue team. He was rescued approximately 12 hours later by the Para-Rescue Team.

The co-pilot informed the investigators that there was one possibility he thought of that might have lead to the accident and that was the main loading door coming off in flight. The facts disclosed by him are substantiated by his written statement and from an interview at a later date with another CAB investigator.

The CAB investigating team visited the scene of the accident on 16 May and their survey disclosed the following:

The distance from the first piece of wreckage to the nose section at the stopping place was measured and found to be 4 522 ft. Over this distance wreckage was spread in a near straight path approximately 1 112 ft, at the widest point. The path was from approximately 350° magnetic to 170° or along a path from north to south.

Rescue teams reported that they observed several propeller slash marks in the snow approximately 200 ft. before the first piece of wreckage. These slash marks indicated to them that all four propellers made snow contact at about the same time. The area of the marks was covered with snow and none were found by the investigating team.

The aircraft was broken into many small pieces, the largest of which were

section of the nose forward of the cockpit bulkhead and the complete rudder still attached to the vertical stabilizer and left horizontal stabilizer. The main loading door was found intact in the approximate centre of the wreckage distribution. It did not show any signs of having left the aircraft before the crash.

From the time of the accident to the arrival of the investigating team, frequent snow squalls and blowing snow had covered the wreckage path and much of the wreckage; also, many separated parts were buried deep in the snow during disintegration.

Sections of engines, propellers, nacelle and landing gears were found early in the wreckage path. These were followed by portions of wings and fuselage distributed along the path. Two engine crankcases were found. Pistons, connecting rods and other units examined appeared to be capable of normal operation. Spark plugs examined had no electrode fusing. Valves visible appeared to be capable of normal function. All parts were covered with oil. There were sufficient oily engine parts found in the same area to indicate that the other two engines had separated about the same time and were probably buried in the deep snow. No carburettors or magnetos were found.

Sufficient parts of aircraft extremities were found to conclude that it was intact prior to first contact with the snow.

Control cables found in sections of wings, the tail group and fuselage were separated from tension, broken ends were frayed indicating a severe pull during component separation. The cables and pulleys located did not show any abnormal wear and there appeared to be continuity of cables prior to the accident.

Rudder, elevator, aileron and tab hinges found were capable of normal operation. Some were free, others were restricted by the bending of attach units during the break up.

A section of the fuselage belly, approximately 20 feet in length, was flattened in the same manner throughout and indicated that a near level contact with the snow had occurred.

The tail section was found upright. The section of fuselage intact was rolled on its left side followed by the nose section, rolled further on the left than the fuselage. These findings along with parts from the left wing in the same area indicate that the left wing struck the snow early in the path, separated into small parts and started the remaining aircraft sections rolling left.

Propeller blades that were dug out of deep snow were bent forward indicating rotational force at the time of snow contact.

The radio and cockpit instruments were so badly smashed that reliable readings could not be obtained at the scene. The investigating team planned another visit to the scene, however, this was not possible due to the bad weather that followed.

There was nothing found during the investigation to indicate a fire in flight or to indicate any mechanical failure prior to striking the snow.

#### Weather

Material studied from Air Force documents indicates that a whiteout condition can exist with the sun rising over the horizon, shining against the snow and reflecting back from an overhanging cloud base. An explanation of a whiteout follows:

"They occur in clear air when sunlight is reflected constantly between the snowy surface and a flat bottom cloud overhead. The snow reflects sunlight upward. The cloud reflects light downward. It bounces back and forth constantly hitting everything at all possible angles so that there are no shadows - often referred to as

like being submerged in a pool of milk."

This flight was operating in a south-east direction. High mountains and land marks had been flown over and a broken cloud condition appeared to exist. It is reported that radio communication is often affected by the Arctic atmospheric conditions.

The surface weather prepared by the Narsarssuaq Air Force Base Weather Unit for 13 May covering the period of the accident time is as follows:

"0252	local time,	ceiling estimated 6 000 broken, 10 000 overcast, visibility 15 miles, sea level pressure 078, temp. 40°, Dew point 28, wind north northeast at 2 knots, altimeter 975
0300	" "	ceiling 1 000 scattered, estimated 6 000 broken, 10 000 overcast, visibility 15 miles, sea level pressure 078, temp. 40°, Dew point 28, wind north northeast 2, altimeter setting 975
0330	" "	ceiling 100 scattered, measured 6 000 broken, 10 000 overcast, visibility 15
0340	" "	ceiling measured 6 000 broken, 10 000 overcast, visibility 15.

The weather for 0350 and 0400 - same as 0340.

Weather and the area atmospheric conditions are considered to be contributing factors.

#### Reconstruction of the Flight

There were no witnesses to the accident other than the survivor. Another USOA aircraft, Flight 975, departed DEW site 39 approximately 30 minutes after Flight 736 and pertinent information was obtained from its captain during an interview.

Flight 975 was a ferry flight between site 39 and BW1. A flight plan was filed with site 41 as soon as possible after take-off. The crew observed that Flight 736 had also filed a flight plan with site 41. Both flight plans were filed on VHF. After reaching a point where VHF communications with site 41 became out of range and until the flight reached a point 100 miles out of BW1, HF position reports were practically impossible.

Two or three times during the over water portion of the flight, 975 contacted 736 on VHF primarily in an attempt to have 736 relay position reports. This procedure was unsuccessful because 736 was also having difficulties in making position reports.

Upon reaching 100 miles out, 975 made its routine position report to Simiutaq on VHF. An IFR clearance was obtained. 975 was to proceed to Simiutaq and descend from 10 000 ft to 9 000 ft. Weather at Simiutaq was 8 000 ft broken and 12 miles. BW1's weather also was 8 000 ft broken and 12 miles. 975 continued to follow the clearance by descending to and cruising at 9 000 ft until reaching a point about half way to Simiutaq at which time IFR was cancelled and 975 completed the flight under VFR conditions.

The captain of 975 said he elected to follow the standard IFR route at 100 miles out, 975 was at 10 000 ft and VFR, Greenland Coast line was in sight and they were able to determine their position visually. There was a line of scattered cumulus clouds along the coast, with base above their 10 000 ft altitude, but lowering to the

south. Visibility beneath the clouds seemed to be diminishing, looking inward toward the ice cap from over the water and beyond the clouds; a very bright and clear condition seemed to exist.

Due to radio relay difficulties experienced in the area, logging of some of the flight plans was difficult. Sufficient information was obtained by radio messages from persons at northwest territory, the survivor and the crew of Flight 975 to indicate that the flight involved did file an IFR clearance at time of departing DEW site 39.

The clearance was the authority for the flight involved to proceed in the control zone that covered an area of 100 miles from DEW site 41. After passing through this control area, the flight plan is normally cancelled and the flights operate in an uncontrolled area until reaching a point 100 miles from BW1 which again becomes a controlled area and requires a new flight plan for continuance under IFR. Minimum en route altitude (IFR) in the control area is 7 000 ft ASL. There was no record of any radio communications from the flight cancelling the original IFR clearance or refiling for an IFR clearance into the BW1 control area; also there were no emergencies declared by the flight involved.

A USAF Jet Navigation Chart was found in the cockpit area of the wreckage. This chart was folded in a manner so as to make readily available chart information along the tip end and west coast of Greenland.

There were several course lines drawn in a northwest, southeast direction. One heavily drawn course line indicated a true course of 315°. This course line runs alongside the Greenland southwest shore to Nunarssu, then changes to a near east direction to a radio fix at Simiutaq. The approach from Simiutaq to BW1 is in a northeast direction. It was determined

from local pilots that this course is the one most widely used when operating between DEW site 39 and BW1.

Another course drawn on the chart appears to be headed northwest to about the same area as the previously mentioned course. This line crosses the west shoreline of Greenland at Teagus, which is approximately 150 nautical miles north, northwest of Nunarssu and continues in a straight course over the ice cap to Narsarssuaq. It was learned that this course is used by some pilots particularly when they desire to save some time which may result in their taking another load of cargo out of BW1. The wreckage was found approximately 18 nautical miles south of this course line.

The map discloses that the mountainous terrain of the west shoreline in the area where the course line is drawn, is approximately 5 600 ft above sea level. This is the highest point indicated along the entire course. The course line is drawn approximately midway between or 12 nautical miles from two contour lines, one 7 000 ft, the other 5 000 ft ASL. The contour lines on the map indicate that the elevation of the crash site is approximately 5 000 ft ASL. From the crash site, the faint outline of the Shore Line Mountains could be seen from an aircraft at 6 000 ft on a clear day. During the investigation it was determined from the rescue aircraft altimeter that was checked and found to be near accurate that the altitude at the scene was approximately 5 900 ft.

#### Crew Information

The captain of the flight had a total of 12 929:25 flying hours. Of these, 5 150 hours had been flown on DC-4 aircraft.

The reserve captain had a total of 5 675:24 flying hours to his credit of which 3 550 had been flown on the subject aircraft.