P-3A Orion 152159 Accident Investigation

P-3A Orion 152159 at NAS Iwakuni, Japan, courtesy VPNAVY

David Trojan, davidtrojan@earthlink.net June 2007, updated August 2015

Navy P-3A, BuNo 152159, belonging to Patrol Squadron 17 (VP-17) stationed at NAS Barbers Point Hawaii crashed 3 August 1970 in Nevada. The aircraft was on an extended navigation flight to the west coast and back when it ran into a thunderstorm after leaving Nellis AFB Nevada en route to San Diego CA. Witnesses on the ground saw a flash in the clouds and burning debris falling to the ground. There were no survivors among the ten crewmembers aboard the plane. The Navy concluded that the aircraft was struck by lightning, but Lockheed determined that the breakup of the aircraft in flight was caused by structural overloading of the right wing from a positive high angle of attack condition. Lockheed concluded that it was the uncontrollable flight and the resultant stresses that caused the aircraft to disintegrate in flight. I wanted to come to a conclusion about what may have caused the plane to crash using modern accident investigation methods as well as historical data about the same type of aircraft that were not available at the time of the original investigation. I also had the benefit of having the completed original accident investigation report with its completed tests and conclusions. After reviewing all the data and visiting the crash site to see for myself first-hand the evidence at the site, I came to a new conclusion for the cause of the accident.

Visit to the crash site:

The wreck site was rediscovered a few years ago by an ex-Navy man researching VP-17 squadron history. He put me in contact with locals who guided me to the site. The search for the crash site began at 8am, 22 June 2007 on a very hot dusty morning in the town of Search Light Nevada, located about 70 miles from Las Vegas. We headed out in into the desert in a Dune Buggy and an old Chevy Blazer.

Dune Buggy (*Wreck Chasing Vegas Style*) and an old Chevy Blazer

As we drove to the site we passed by Mormon Tea bushes, Joshua trees and Pinon pines. I spotted a pair of Red Tailed hawks in a Joshua tree and hairless ground squirrels running to get out of the way of our dune buggy. Lucky no rattle snakes. I guess it was too hot for them. After about 15 miles from town and an hour of wild driving we reached the crash site main impact area. The elevation in the town of Search Light was 3400', at the wreck site the elevation was 4600'. The temperature in town was 105 degrees and the temperature at the crash site was about 95 degrees. I spent only about two hours on site due to the heat.

Scattered wreckage at the main impact site, photo by Dave Trojan

Wreckage is scattered over a mile and a half across the desert floor according to the accident report. I explored the main impact area that included the center crew compartment section of the wreck. By looking at the site wreckage, it definitely looked like the aircraft broke up in flight and was burning at the time it fell to the ground. Splattered aluminum droplets were found on some rocks as evidence of the in-flight breakup. I found it strange that the crash site still contained a number of crew seats, steal aircraft parts, parachutes, fabric, and fiberglass, but little aluminum fragments. The aluminum must have been picked up by the recovery crew or aluminum scavengers. Interesting things found at the wreck site included an unbroken vacuum tube and an ASW equipment dial. The largest piece found was an engine nacelle. It made me wonder what else is out there undiscovered in the desert.

Scattered parts near the main impact site, photo by Dave Trojan

#1 or #4 engine nacelle at the crash site

Memorials:

Memorial in Searchlight NV

Dream catcher memorial at the crash site

Thirty five years after the accident, family members gathered in the town of Search Light Nevada to remember the crew and place a permanent memorial to the crew members in the town. Family members of the crew also placed a ceremonial hoop at the crash site in a tree that contained the names of all the men who had been aboard the plane. Each crewman's name was painted onto a separate feather and attached around the hoop with leather ties. It was made with respect for the men that they had lost and was prayed over before it was then hung in their memory. The families knew that over time the feathers would break loose from the leather ties by the wind and blow away. When I visited the site all of the feathers had been blown away. I think this was the most sentimental memorial tribute that I have ever seen.

Class ring found at crash site

Another interesting story concerning this crash site is about how the ex-Navy man who first rediscovered the crash site found a High School class ring at the

site. After much research by himself and another family member they determined the ring belonged to crewman John Maas. After more research they located John Maas' sister, Suzanne. He mailed the ring to her and she wears her brother's ring on a chain around her neck every day.

I did not remove anything from the crash site, but I did leave an American Flag as my own memorial to the lost crew.

Investigation:

A report was submitted in an effort to explain some of the known facts concerning the P-3A accident that occurred on 3 August 1970 using current investigative techniques and to speculate about a possible cause for the accident. I am no expert in accident investigation and trying to determine a possible cause without seeing all the evidence first hand after so much time is subject to much speculation. However, I do have some things that they did not have more than thirty years ago. I have increased knowledge about the history and operating characteristics of the aircraft. I have reports of other similar aircraft accidents with their conclusions. Lastly, I have a better understanding of weather phenomenon. For this report I am speaking for myself, but the opinions expressed were in agreement with other Tech Reps who reviewed, discussed and reached the same conclusions. After visiting the crash site, carefully reviewing the accident report and crash site photos I have reached the following conclusions.

I discount the Navy’s lightning theory as being the major cause of the accident because of the analysis completed by Lockheed determined wing overstress was the cause of the breakup. There was no solid evidence of a lightning caused explosion, even though lightning was reported in the area. There was a difference of opinions by the witnesses; some reported a lightning strike and some did not. If lightning had struck the aircraft, then most likely it may have caused a fire, but not necessarily an explosion. Other known lightning strikes

upon aircraft have caused fires, but not explosions. The accident report stated that parts had no heat damage or soot on them indicating that the aircraft started breaking up before ignition of the fuel and the fireball. The Lockheed analysis concluded that none of the aircraft fuel tanks exploded from combustion of a fuel vapor mixture.

The following circumstances are known about the accident. The P-3A aircraft was ascending during a very hot day near thunderstorms and mountains on the right hand side. It is now understood that these conditions were suitable for a wind shear condition. The wind shear phenomenon was not understood at the time. Wind shear would not have been picked up on radar at the time and the crew would have had no way of knowing they were flying into wind shear conditions. From the official report, “The pilot could have been forced to turn to the right by some mechanical or control problem, or for other unknown reasons,” I believe that reason was wind shear. The wind shear theory explains the known actions by the crew and maneuvers by the aircraft.

The aircraft probably encountered wind shear phenomenon on the right side that caused the right wing to drop, which in turn caused the plane to descend, roll and turn very rapidly to the right. The sudden maneuver caused an increase in airspeed. The crew would not have had time to call on the radio because they would have been too busy trying to control the aircraft and just hang on. The pilot in command would have most likely tried to overcorrect for the condition which also contributed to the stresses on the airframe as the aircraft tumbled out of control. The steep descent and turn caused the fuel in the wing tanks to slosh and move rapidly inside the wing further stressing the wing. Lockheed analysis determined that the breakup of the aircraft in-flight was caused by structural overloading of the right wing from a positive high angle of attack condition. It was the uncontrollable flight and the resultant stresses that caused the aircraft to disintegrate in flight. As stated in the report “wind gust loads” could have caused the condition and contributed to the wing failure. I believe these wind gusts were most likely what we now understand to be wind shear.

Notes on the wind shear phenomenon:

Wind shear phenomenon is commonly observed near weather fronts, and near mountains. It is a key factor in severe thunderstorms. An additional hazard is turbulence often associated with wind shear. When winds blow over a mountain, vertical shear is observed on the lee side. If the flow is strong enough, turbulent eddies known as rotors associated with lee waves may form, which are dangerous to ascending and descending aircraft. Strong outflow from thunderstorms cause rapid changes in the three-dimensional wind velocity just above ground level. Initially, this outflow causes a headwind that increases airspeed, which normally causes a pilot to reduce engine power if they are unaware of the wind shear. As the aircraft passes into the region of the downdraft, the localized headwind diminishes, reducing the aircraft's airspeed, and

increasing its sink rate. Then, when the aircraft passes through the other side of the downdraft, the headwind becomes a tailwind, reducing airspeed further, leaving the aircraft in a low-power, low-speed descent. This can lead to an accident if the aircraft is too low to affect a recovery before ground contact. In most cases wind shear accidents and incidents result from the fact that the wind shear phenomenon is not understood by the pilot due to his training and the cockpit instrumentation. In such situations the pilot is not able to act in the correct way. This problem is illuminated by the fact that some of the correct safety procedures in wind shear contradict the pilot's feeling of how to control an aircraft.

In the U.S., a string of fatal accidents near thunderstorms downed passenger airliners during final descent and initial ascent. As the result of the accidents in the 1970s and 1980s, in 1988 the U.S. FAA mandated that all commercial aircraft have on-board wind shear detection systems by 1993. The result of these efforts was immediate. Between 1964 and 1985, wind shear directly caused or contributed to 26 major civil transport aircraft accidents in the U.S. that led to 620 deaths and 200 injuries. Of these accidents, 15 occurred during take-off, three during flight, and eight during landing. Since 1995, the number of major civil aircraft accidents caused by wind shear has dropped to approximately one every ten years due to the mandated on-board detection, as well as the addition of Doppler radar units on the ground.

Note on a similar aircraft accident during the same time period:

An Electra accident in 1968 provides an example of stressing the aircraft induced by turbulence associated with a thunderstorm. The Lockheed Electra L-188 was the design basis for the P-3 Orion.

On 3 May 1968, Braniff Flight 352 departed Houston (IAH) at 16:11 for a flight to Dallas (DAL) and climbed to FL200. Some 25 minutes into the flight, the L-188A Electra was approaching an area of severe thunderstorm activity. The crew requested a descent to FL150 and a deviation to the west. ARTCC then advised the crew that other aircraft were deviating to the east. The Electra crew still thought it looked all right to the west and were cleared to descend to FL140 and deviate to the west. At 16:44 the flight was further cleared to descend to 5000 feet. At 16:47 the aircraft had apparently encountered an area of bad weather, including hail, and requested (and were cleared for) a 180 degree turn. Subsequent to the initiation of a right turn, the aircraft was upset. During the upset, N9707C rolled to the right to a bank angle in excess of 90 degrees and pitched nose down to approximately 40 degrees. A roll recovery maneuver was initiated and the aircraft experienced forces of 4.35 g. Part of the right wing failed and the aircraft broke up at an altitude of 6750 feet and crashed. The probable cause: "The stressing of the aircraft structure beyond its ultimate strength during an attempted recovery from an unusual attitude induced by turbulence associated with a thunderstorm. The operation in the turbulence resulted from a decision to penetrate an area of known severe weather."

Conclusions:

In conclusion, I am left with the following thoughts. The aircraft crashed not because of what the Navy concluded and what Lockheed and everybody else did not understand at the time. The aircraft was built to the standards of the time and operated in a safe manner for the known conditions. The probable cause was an act of nature, or you could say an act of God. Wind shear phenomenon almost certainly was the major cause of the accident. As in all accidents there were a number of other contributing factors that all added up to the final outcome. Other factors included the fuel mixture, the altitude and direction of flight, the way the aircraft was constructed and the training of the crew.

Changes to the P-3 aircraft were made as a result of this accident. New lightning proof fuel filler caps, fuel quantity probes and access doors and were installed to prevent sparking. Later model P-3B aircraft wing structures were beefed up to strengthen them. In the end, it was not the fault of the crew because the wind shear phenomenon was not understood at the time. This analysis was presented in an effort to try and answer some of the unanswered questions surrounding this accident and should in no way take anything away from the brave actions by the crew. They are and will always be heroes for serving their country.

VP-17 BuNo 152159 only known photo of the aircraft in flight courtesy VPNAVY