

Air and Space this Week

Item of the Week

Deadly Cargo

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Sometimes, the cargo being transported is more of a danger to the transporter than is the environment through which transport is being made...

USS Cyclops

Her name was the *USS Cyclops*, and, at 19,000 tons displacement, she was one of the largest ships then afloat. She and her two sisters were Navy colliers (coal-carriers), built to supply U.S. warships. All three had very large and high superstructure works to support equipment for the rapid on/off-loading of coal. All were lost. None have been found.

The “Bermuda Triangle” myth has never withstood any scrutiny successfully. Only two of the ships/planes lost in that vaguely-defined area are in any way “mysterious,” many of the losses attributed to ridiculous causes didn’t occur anywhere near the “Triangle;” some didn’t even occur at all. Funny how shipping losses occur only in areas with many sea lanes, and how there were a number of unexplained ship losses in the days before good communications, GPS, and weather satellites, but none in the past few decades when such aids were commonplace.

But in 1918, when the *Cyclops* set sail from Barbados for the U.S., there was no worry about mysterious losses. Sailors were well aware of the perils of the sea however, and the potential for military action. (*Cyclops’* sisters, *Nereus* and *Proteus*, were almost certainly the victims of U-boats, but at the start of WWII, not WWI.)

The *Cyclops* disappeared without a trace, and without having sent an SOS. There was bad weather on her planned route, but the indications were that they weren’t going to be bad enough to endanger the *Cyclops*, in spite of her high center of gravity, caused by the heavy superstructure, which would cause her to roll vigorously, especially with a strong wind and a beam sea.

The cargo carried by *Cyclops* on her final voyage wasn’t coal, it was manganese dioxide. MnO₂ is hard and very abrasive, and it loosely filled the holds of *Cyclops’* single hull.

The lack of an SOS indicates that whatever befell the *Cyclops* happened too quickly for an SOS to be sent. One possibility is that she rolled so badly she capsized and sank. A variation on that idea is that she rolled vigorously, causing her MnO₂ to shift to one side, which caused her to capsize and sink. A third possibility, the one most favored by investigators, was that her rolling rubbed abrasive cargo back-and-forth against her thin, old hull, until the MnO₂ plain-old ground its way through.

Her own deadly cargo may well have been the agent of her demise.

Japanese Oil Tankers

By the time WWII came around, most ships of any size were powered by oil-fired steam plants, not coal. Ships, especially large ones moving fast, consumed huge quantities of “bunker oil,” a petroleum product that contained few volatile components. It would burn, but it was difficult to ignite, and it certainly didn’t explode. The USA had a lot of domestic petroleum resources and refining capability. Japan had no oil in the home islands, and the refining capacity of those areas it would capture was somewhat limited. And they had to transport oil and its refined products by sea, making them vulnerable to air and submarine attack.

As the War progressed, the Japanese empire became more and more compressed. They lost some oil producing and refining areas, but the good news (sort of) was the oil they still could get from Tarakan and Balikpapan (both in the northern part of Borneo) was pure enough that it could be used, without refining, in ship’s boilers. True, there were some volatile components that made flammable vapors in the sweet crude, but, did I mention, there were no refineries readily available?

Normally, when a naval tanker is hit by a torpedo, there might be an oil fire, but in many cases, the oil simply poured out of punctured tanks without igniting. But with the Tarakan oil, the cargo of the tanker burned vigorously, not as bad as an avgas cargo would (ka-boom!), but vigorously enough to incinerate the tanker, and its crew. The Japanese lost a lot of ships that might have been salvageable otherwise, and oil shortages began to affect tactical planning significantly.

The *Marine Sulphur Queen*

A lot of cargo ships were built during WWII. Henry Kaiser roamed the Mojave region for the iron ore necessary to build a huge fleet of “Liberty Ships” that were a key part of the overall War effort ([see here](#) about one of the towns founded as part of this effort). After the War, these tired vessels found employment toting a variety of freight.

One of them was converted into a ship that could carry molten sulfur, and renamed the *Marine Sulphur Queen*. (A common way to mine sulfur is to find a sulfur-rich sedimentary layer, of which there are many on the US Gulf Coast, pump hot water into the layer, which melts the sulfur, and then pump the liquid sulfur to the surface and hold it in heated tanks so it stays liquid. It’s easier to handle and more economic to transport that way.)

The conversion of the *MSQ* was pretty drastic; the installation of the main tank required the removal of all transverse bulkheads (warning, do not try this at home, uh, port). Liquid sulfur could generate large quantities of gases, requiring special plumbing to release overpressures.

If the *MSQ* had been in great condition, it would have been more valuable as a busy transport rather than a dead-ended beater. Her gear was in tough shape, the pressure vents were clogged by solidified sulfur, and the insulation around the main tank was in poor condition.

She did manage to send a partially-garbled SOS, but never made port. Bits of wreckage were found, but even to this day we aren't exactly sure why she broke up and sank. Most of the viable explanations, however, involve her cargo. The gases generated in her main tank couldn't vent, and the tank exploded is one idea. Another is that water splashed into the tank insulation, resulting in a steam explosion that sank her. Another is that the weakening of her structure required for the installation of the tank caused her to break up in seas she would otherwise have withstood. Either directly, or indirectly, the sulfur or what was done to transport it, was likely the source of the calamity.

The V.A. Fogg

Some of the Bermuda Triangle folks count the tanker *V.A. Fogg* as a Triangle victim. However, she could not have been, because she actually went down about 50 miles off her departure point, Freeport, Texas, in February, 1972. She had carried a load of benzene and xylene in her tanks on her previous voyage, and had to wait until she was sufficiently-far from port before she could clean her tanks of their volatile residue (cue ominous background music). A NASA flight instructor aloft in that area reported seeing a two-mile-tall mushroom cloud of smoke. No SOS was received. Yah, sure, Space aliens got her.

In all of the above cases, and there are many other examples out there, the loss of a ship was caused in part or completely by its cargo. For more information de-bunking the Bermuda Triangle myth, see: Kusche, Larry, 1986, *The Bermuda Triangle Mystery: Solved*, Galahad Books, ISBN 10: 1-57866-156-0.

Air travel is not immune to the problem of deadly cargo!

Arrow Air Flight 1285

Sometimes it's not the cargo that causes a disaster, it's the passengers and their baggage. On December 12, 1985, a DC-8, chartered carry members of the Army's 101st Airborne Division from their six-month peacekeeping deployment, began a trip to take them back to their home base at Ft. Campbell, KY. Their journey required two re-fueling stops, in Cologne, Germany, and Gander, Newfoundland. The Cologne stop was uneventful, but the take-off from Gander was not. The morning of that leg of the flight was very cold. The plane appeared to struggle for altitude immediately after take-off, failed to climb or even hold altitude, and crashed and burned a half-mile from the runway. Investigation showed two contributing causes: possible icing conditions that affected wing lift (the plane was not de-iced prior to take-off), and the overloaded condition of the flight. Total plane weight had been calculated by a formula using an average weight per passenger for both them and their baggage. The amount used per person might have been OK for a short Stateside flight, but these were very large soldiers with a lot of gear; the estimate was tens of pounds too light *per person*. There were no survivors among the 248 passengers and crew. The Canadian Aviation Safety Board handled the crash investigation. Their report is [here](#); a [minority opinion](#) was also generated that suggested a terrorist bomb was to blame, but their evidence is unconvincing (this set of investigators believed that icing couldn't down a plane!), especially in the light of the plane's overloading, cold weather, and possible icing. Needless to say, word of the crash was a crushing blow to the

many family members gathered at Ft. Campbell for a reunion with their loved ones. See the Army Historical Society Summary [here](#). See the Smithsonian Channel's *Air Disasters*, season 3, episode 10, "Split Decision" [here](#).

American Airlines Flight 132

On February 3, 1988, this MD-83 on the DFW to Nashville run [suffered a fire](#) in the cargo compartment. The plane was in its descent when smoke began filling the cabin. The plane landed safely, pulled off on a taxiway, and initiated an emergency evacuation. None of the 131 passengers or crew was hurt, and the fire in the cargo hold was quickly extinguished. The culprit was a drum containing different chemicals and a poorly-packed five-gallon jug of concentrated hydrogen peroxide. The jug leaked, and the reaction of peroxide with other chemicals in the drum started the fire. Had the fire started when the plane was much farther from a safe airport, the story would not have ended so well.

ValuJet Flight 592

ValuJet was a budget regional carrier in 1996. It flew DC-9s, a solid aircraft, but it had a reputation, well-deserved, of being less-than-optimally-aggressive when it came to safety. It was so bad that the U.S. military would not use ValuJet to transport its personnel. On May 11, 1996, a 27-year-old aircraft was scheduled for [Flight 592](#), a Miami to Atlanta route. It had a long list of minor electrical problems and other infirmities. It also had *eight emergency landings* in 1994-5. The plane was a klunker, but both pilots were very experienced. Shortly after takeoff, passengers started yelling they smelled smoke. The pilots heard a bang and the plane lost electrical power. The pilots immediately turned to get back to Miami. But there was an intense fire in the cargo hold, which burned through most of the controls in a very few minutes. The pilots, likely incapacitated, lost control of the aircraft, which nose-dived into the Everglades at a very high rate of speed. All 110 persons aboard were killed. The culprit, ironically, were five boxes of expired oxygen generators used to provide oxygen to airliner passengers in an emergency – the masks and plastic tubes demonstrated by a flight attendant before every flight. They were improperly identified and not made safe; existing rules prohibited their shipment in that packaging on a passenger plane. The generators worked by causing a chemical reaction that released oxygen. The problem was that reaction is very exothermic, and the generators got quite hot when they were activated. One generator in the five boxes activated, and its heat chain-reacted the others to go off, causing a very intense oxygen-fed fire. The result was catastrophic damage to the control cables and other parts of the systems necessary for flight. Stricter rules were established after this accident. For more info, see a two-part article [here](#) and [here](#).

UPS Flight 6

Have you ever been annoyed at an airline's insistence that you not bring devices with a Lithium-Ion battery aboard? Well, there is a good reason behind it.

On September 3, 2010, UPS Flight 6, a B747 cargo-hauler, took off from Dubai with a large general cargo bound for Cologne, Germany. Dubai is a major trans-shipment point with many

such nighttime flights all over the region; much of the cargo now aboard Flight 6 was on-loaded at Hong Kong. The pilots had long experience; the captain had flown large aircraft for UPS for 15 years.

The take-off and climb out were uneventful and routine. However, twenty minutes into the flight, a cargo hold fire alarm went off. The pilots followed the book procedures flawlessly, engaging the fire suppression system and venting the hold to remove oxygen. They began a return to Dubai.

Air traffic control had a difficult time supporting the pilots, because of the many countries within radar range. Outstanding work was performed by the controllers and the many other aircraft that helped relay messages.

The aircraft was really sick. Fire alarms for different zones within the hold (the entire fuselage was open) went off in succession. Smoke filled the cockpit, the pilots donned oxygen masks, and control mechanisms began to malfunction. The pilots had shut off the auto-pilot when the emergency began, and now they turned it back on as their own controls began to fail. The plane stabilized, but the pilots could not see their controls through the smoke.

Only a few minutes had elapsed since the first alarm, and now the pilot's oxygen system failed. The co-pilot took control while the pilot left his seat to get to a walk-around emergency oxygen bottle in the aft part of the cockpit. He never returned, no doubt overcome by smoke.

The co-pilot gamely stuck with the dying aircraft as the controllers *et al.* struggled to guide him in. He was getting close to Dubai, but was literally flying blind, and the plane's elevator and landing gear controls had failed, leaving him with no control over the plane's pitch and no way to avoid a crash-landing. He overflew the Dubai runway, and in desperation headed to a smaller field nearby. No pilot ever fought more valiantly against the odds. But alas, he ran out of sky. The Flight Data Recorder revealed that in his final seconds, the brave ex-Marine, knowing he was doomed, saw he would hit a heavily-populated area, and with his last act managed to slew the aircraft into a vacant spot, saving many lives on the ground. Both he and the pilot (likely already dead) perished in the crash.

Investigation showed that the cargo loaded in Hong Kong included several large boxes of Li-ion batteries. One overheated, ignited the others, and the rest went up all at once. [Subsequent experiments](#) showed that Li-ion batteries could not only burn intensely, they were liable to explode violently, with the fire-spreading effect of an incendiary bomb. The pilot controls ran over the top of the cargo hold where the 2000+° fire began, causing the loss of control; the control system for the auto-pilot was below the hold, so it lasted longer.

Lithium-ion batteries were known to be hazardous cargo, especially in large lots, but this problem happened anyway. A number of changes came about because of this accident, that, based on the experience of AA Flight 132 over twenty years earlier, this one should not have happened. **Especially now, after UPS Flight 6 and the over [300 air/airport incidents](#) involving Li-ion battery fire/explosion as of 11/30/2020!**

For more information on this accident, see the report of the accident investigation [here](#), for a general report on the accident with links, see [here](#), and see also the Smithsonian Channel's Air Disasters, season 9, episode 5, "Fatal Delivery," [here](#). Other information sources on Li-ion battery risk, see [here](#) and [here](#).

In summary, please understand that air travel is extremely safe (you are much more at risk getting to and from the airport than you are in the air!), and that millions of tons of freight are moved daily by sea without incident. So please don't go away from reading this Item with a sense that you are taking your life in your hands to fly, at least once COVID is out of the picture.

DOCENTS: We know from considerable experience with public programs at the Smithsonian National Air and Space Museum that the general public is very interested in the fine work of the [National Transportation Safety Board](#). We invited their participation in the annual "Fly-in" and other events, and they were always crowded with an interested audience, especially when they had a used "black box" and other props. People were glad to interact with a government agency that really does look out for our collective safety. Don't underestimate this interest! You can use it to engage the learning process.

Last Edited on 27 December 2020