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ValuJet Article Summary

The crash of ValuJet flight 592 was the perfect storm of things going wrong all at once. Many individual factors came together in the creation of this disaster, and if one of these factors was not present, flight 592 would likely have not crashed at all. Everything from pilot, maintenance, shipping, inspection, and administrative errors all played a role in this disaster.

**Summary**

It all started with the replacement of oxygen generators in a separate aircraft. Every so often, the oxygen generators that supply oxygen to passengers during a sudden depressurization of the cabin must be replaced. These devices are not very safe ironically enough. They are trigger when the passenger pulls down the lanyard to supply oxygen to themselves through the face mask. A spark from a hammer hitting the capsule begins an exothermic chemical reaction that releases pure oxygen as a byproduct. However, this reaction also produces a great deal of heat that heats the generator to almost 500 degrees Fahrenheit. This is as hot as a kitchen oven turned to its warmest setting, more than enough to burn plastic and rubber.

Unfortunately, the mechanics who were replacing these miniature fire bombs were rather careless with the devices when they had removed them. Not only did they forget to install safety caps to block the hammer from triggering the reaction, they also placed the devices into large cardboard boxes. These boxes were then sealed and delivered to the ValuJet shipping department to be returned to headquarters. The mechanics had failed to follow protocol when uninstalling the generators.

The shipping clerk, uneducated on the danger of these generators, placed a shipping label on the boxes to be delivered by the next flight headed to ValuJet headquarters. Flight 592 turned out to be the unlucky carrier of this hazardous load. The ramp agent and copilot were the last persons to check-off the boxes for delivery to headquarters. Both of whom knew very well that they were not authorized to carry such hazardous cargo in the cargo hold, but ignored regulation in lieu of a tight schedule and poor company policy towards safety.

The hazardous cargo was placed vicariously into the cargo hold along with rubber tires stacked near the boxes. During flight, at least one of the generators was triggered by loose cargo smacking the trigger hammer. The resulting heat reaction fed by the oxygen from the generator created an intense fire that sent smoke in the passenger cabin and cockpit of the aircraft. The crew and passengers suffered from inhalation of thick black smoke from burning rubber tires and other chemicals inside the airplane. Eventually, the pilots lost control of the aircraft and it crashed into the Everglades of Florida.

**Reflection**

What makes this series of events terrifying is not the suffering of the crew and passengers of the aircraft before their violent deaths, but rather the gross negligence of multiple personnel in the employee chain of ValuJet. The negligence of the mechanics, supply clerk, ramp agent, copilot, inspectors, and ValuJet administrators all played a role in this horrible tragedy. Safety inspectors had failed to notice that hazardous materials were being mishandled by ValuJet staff. Administrators failed to do their due diligence in verifying that their subordinates had actually completed the tasks they had written off on correctly. For these reasons, 110 people died on that flight.

What makes this engineering failure even more weird, is the fact that there were so many small interrelated problems that all came together to create this disaster. If only one of these things had been discovered and fixed, this horrible tragedy could have been avoided altogether. For example, if the mechanics had installed the safety caps, the oxygen generators in the cargo hold would not have been triggered. If any of the clerks and agents in the supply line had been paying attention and deferred the cargo elsewhere to a suitably equipped aircraft to carry such hazardous cargo, then the fire would not have started in the first place. There are many things that could have happened that could have saved these people’s lives. Unfortunately for the flight attendants and passengers who were unaware of these issues, they were simply at the wrong place at the wrong time. Such gross negligence has no place in the professional environment, were everything from a loose O-ring to a missing safety cap can mean the difference between life and death.

**Comparison to Software Development**

As I had stated previously, everything that licensed professional technicians do must be done with great attention to detail. This includes us Computer Scientists who will be working with other professionals to develop software for all sorts of applications. These applications include everything from self-driving car operating systems, to aircraft computer firmware, or even the code running a Gameboy. All of these systems are interrelated in one way or another to contribute the larger picture of everyday life. If these systems fail, at best people are slightly inconvenienced and show up late for work, at worst people die. This is why even computer scientists working on seemingly harmless systems must do their part to ensure their code runs smoothly and correctly.

For example, a young child is playing a game on his brand new Nintendo Switch while sitting in the car with his mother at the wheel. Imagine now that one of the drivers controlling input on the Nintendo Switch decides to stop working, and the little boy can no longer play his game. His undeveloped prefrontal cortex sends him into an angry fit of rage and throws the device across the car. The projectile strikes the mother on the back of the head just as she is driving through an intersection and loses control of the vehicle slightly. The car detects this user error and attempts to course correct the vehicle to “stay between the lines”. Of course, the vehicle is now in the middle of an intersection and there are no dotted lines to guide the vehicle whatsoever. The vehicles software become confused and decides to turn sharply to the right rather than slightly to the left. This happens so quickly that the mother does not have time to react and the vehicle collides head-on into a traffic pole.

As we can see, everything that occurred in this chain of events had a small piece that could have prevented the whole thing from occurring. If the software developers at Nintendo had found the bug in their Nintendo Switch, the child would not have flung the device across the car. If the software developers at the car manufacturer had correctly designed their course correction software to handle passing through intersections, the vehicle would not have turned sharply to the right. This is why it is so important that software developers take their work seriously and do their best to create high quality work.

**Other Observation**

The article related to flight 592 also discussed some very high level problem in the engineering world that make producing high quality work so difficult. One of them is engineer speak. All companies that specialize in technical services or products use long acronyms and unusual words to describe their product or service. This is often referred to as “engineer speak” and creates a sort of barrier in language between managers and their less educated subordinates. This creates lingual problems that create tension on confusion when communicating with technicians. If I was the owner of a company, I would encourage the usage a much planner sounding words and phrases to describe these systems rather than use long, hard to remember, acronyms to describe them. For example, calling an Operations Order an “OPORD” is confusing for new workers, so a better phrase to use could be “Day Plan” or “Today’s Orders”.

Another issue at hand within the professional environment is the complexity of the systems in question. Looking at the administrative chain of command at ValuJet, it was quite obvious that an unaware administrator had designed the system without thinking about what things would look like at the lowest level. Uneducated workers who would do most of the grunt work like replace old oxygen generators had no idea what the regulation was on their storage and disposal. The administrators had not planned out a way for them to receive this information effectively, opting instead to fill a useless manual which some of them could not even understand. Perhaps if the manager was charged with the dissemination of this knowledge and careful instructions to handle the equipment carefully, the problem could have been avoided to begin with. The aircraft manufacturers could have designed these aircraft with much simpler oxygen tanks that supplied already present oxygen rather than complex oxygen generators that had to generate it in an unstable manner. All of these issues played a role in the crash of flight 592.

**Conclusion**

Technicians from all professional environments, including software development, have something to learn from this tragedy. Attention to detail and effective communication are one of the most important aspects of any team effort. Administrators must be able to bridge the gap between low-level laypersons and technicians effectively. If we fail to address these concerns effectively, we put the lives of other at risk.