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Science IV 2°

### Executive Summary

#### **Problem Definition:**

On January 16, 2003, the space shuttle *Colombia* launched with seven astronauts on board. On February 1, 2003 the shuttle disintegrated on reentry, killing all crew members and wasting millions of taxpayer dollars. This disaster could have been avoided if not for dismissal of dissenting opinions in NASA, the issue of the foam shedding, and the normalization of “safe” anomalies.

#### **Key Findings:**

This was not the first time that a space shuttle had caused the loss of human life. The shuttle program began in 1972 with the first flight occurred in 1981. This shuttle, the *Columbia*, lifted off and was in space for 2 days. 25 missions later in 1986, the space shuttle *Challenger* went up for its 10<sup>th</sup> mission. Sadly, during lift off, the shuttle exploded, killing 7 crew members. This was because of poor management and oversight in the bureaucracy, like with *Colombia*. After this tragedy, NASA was expected to have dealt with the managerial and technical issues. The technical issues of the O-rings were fixed, but as it is evident from *Colombia*, the managerial issues were not corrected.

With the flight, the issue arose from a large piece of foam that broke away from the attachment point between the *Columbia* and the fuel tanks 81 seconds into liftoff. This piece of foam hit the left-wing near the fuselage creating a hole in the wing. However, given the low quality of the imagery available, it was extremely difficult to gauge the full degree of damage. In the history of the space shuttle program, many shuttles experienced the shedding of foam on lift off. Because of this, it was only classified as a “maintenance issue” that did not prove to be a threat to the shuttles. Over time, the shedding of foam became normalized, accepted, and eventually expected, causing a lack of second thought on the foam shedding on the *Colombia* mission. Nevertheless, some still believed that the foam was real issue, but due to the communication problems, were unable to do anything about it in fear of being reprimanded due to lack of seniority

In NASA, there were communication issues that led to this disaster. Many criticized the organization for having communication issues and a complex chain of command that led to a game of telephone, diluting information that passed through it. Besides this, in NASA, those who had been engineers for many years were granted seniority over others. This becomes evident with Calvin Schomburg, a long-lasting engineer who had been at NASA for nearly 40 years, who believed that the foam collision would lead to no damages. In NASA, what Schomburg stated was taken as the word of

God, and those who dissented, like the co-leader of the Disaster Assessment Team Rodney Rocha, were ignored.

**Recommendations:**

To fix these issues, NASA needs to train engineers and others on how to be assertive. Even when being denied the proper respect and attention that the issue demanded, the engineers needed to impose upon the management that the issue is real, that it is dangerous, and that it needs to be addressed. In addition, management needs to be educated on the importance of dissenting and differing opinions. The first priority of the management should be getting the crew safely home, and when protecting the lives of others, all risks need to be accounted for. For this to occur, the idea of normalized issues must be eradicated. No matter how small the issue, it should never be pushed aside. It was due to this normalization of foam shedding that led to the deaths of the crew members of the *Columbia*, and it could have been prevented if all issues were recorded and presented as a high priority.

**Critical Risks:**

If these managerial changes are not put in place, more normalized issues will lead to more tragedies. When small failures are ignored over time, it will lead to larger issues, where more lives and shuttles will be lost. Besides the loss of life, the public opinion of NASA will also be at risk. NASA should be our path to the future beyond the stars. After this disaster, the public will learn of the managerial and communication issues of NASA, and lose support for an organization that was once the symbol of the future and the American way. If these solutions are not put into place, more lives and the public respect for NASA will be lost, which is something that cannot be allowed to occur.