



Houston, we've had a problem

10:08 PM EST, April 13, 1970 – With those words Jim Lovell initiated what may be as perfect a poster child for crisis response as can be found. As the Apollo 13 spacecraft was on its way to the Moon, at a distance of 321,860 kilometers (199,990 mi) from Earth, the number two oxygen tank, one of two tanks contained in the Service Module (SM), had exploded.

Considerable ingenuity under extreme pressure was required from the crew, the flight controllers, engineers, the astronaut team, and all support personnel to work out how to jury rig the craft for the crew's safe return, with much of the world watching the developing drama on television.

A major challenge in keeping the crew alive was that the Lunar Module (LM) "lifeboat" was only equipped to sustain two people for two days, but had to sustain three people for four days. The lithium hydroxide canisters available for the LM's carbon dioxide scrubbers would not last for all four days. The Command Module had an adequate supply of replacement canisters, but they were the wrong shape to fit the LM's receptacle. An adapter then had to be fabricated from materials in the spacecraft. The astronauts called it the "mailbox." (second from the left above) Given the limited power available and "never been thought about" or done before, a complete new set of cockpit procedures had to be developed "on the fly." In summary, despite multiple dilemmas, great hardship caused by severe constraints on power, cabin heat, and potable water, the crew successfully returned to Earth. The mission was thus called a "Successful Failure".

Were it not for the 1995 movie based on Lovell's book Lost Moon, the story of Apollo 13 would probably be lost to all but the astronauts, NASA, and space buffs. Like all movies, it uses literary license to turn days into 140 minutes, but by most accounts, including Lovell's, it is very reasonably accurate. It certainly portrays the cascading set of failures, the severe time constraint hovering over all, and the unrelenting team adaptability and creativity required for problem solving. Indeed, one inaccuracy in the movie has Ken Mattingly (role played by Gary Sinise) solving a power consumption problem for Apollo 13 as it approached re-entry. Lovell (played by Tom Hanks) points out repeatedly in his commentary that in this case, Mattingly was a composite of several astronauts and engineers – all of whom played a role in solving the problem.

Whether accurate or point making, the following movie quotes are instructive:

Forget the flight plan; we're improvising a new mission.

I don't care what it's designed to do, what can it do?

You never know what events are going to transpire to get you home.

The *successful failure* was without question a superb example of adaptability, creativity, teamwork and team decision making, of transfer from failed mission to completion of next mission. It was an organization and people in complete accord with the necessary *observe-orient-decide-act* loop of John

Boyd. It was “snowmobile” making when needed at its best. I submit, Apollo 13, on the final frontier, like our founding fathers, represented all the characteristics of a resilient community.

The Spring Edition of Project White Horse *084640* focused on **Resilient Communities** is on line (www.projectwhitehorse.com), as is a newly formatted Forum (blog.projectwhitehorse.com)

(NASA archives on line, Wikipedia, and the movie, Apollo 13 were referenced for this announcement)

Please share your comments by posting on the Forum or email me at projectwhitehorseatroadrunnerdotcom (note the spam-protected spelling).

JEB

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