Risk Versus Risk Trades

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Risk and Risk Trades

- NASA’s Human Space Flight endeavors all involve the management of risk, usually described as the potential for loss of the crew or loss of the mission.
- Such discussions of risk, and the acceptance of the residual risk after all controls have been put in place, normally happen at a pace that allows for an in-depth, detailed discussion of the options and the risk inherent in each one.
- Even the decision to do an Extravehicular Activity (EVA) on the International Space Station to repair a faulty device is reached after a lengthy discussion of the risk of the EVA versus the risk of not performing the repair.
- However, not all risk trades allow the decision makers the luxury of extended discussions of options.
- Such was the case on July 20, 1969, as the Lunar Module (LM) descended towards its landing on the surface of the moon.
The Trade

• After the LM separated from the Command Module, the crew of the LM began their descent to the lunar surface

• Multiple Program alarms sounded as the landing entered into the critical phase:
  – The “1202” and “1201” Program-level alarms
  – Essentially, too much information coming into the main computer, primarily from range data sensors
  – The 1202 alarm was not instantly familiar to the crewmen
    • “We couldn’t look it up in the book to see what the problem was ‘cause we were watching where we were going!” – Buzz Aldrin

• Houston Flight Controller Steve Bales gave Houston Flight the “go” to continue to landing as long as the alarm was intermittent:
  – “In the middle of landing, it was almost as dangerous to try to abort with a bad computer as it was to carry on with the landing. So balancing the risk versus risk, we decided that the safest thing would be to continue to land.” – Steve Bales

• Contrary to popular belief, several individuals from Bales, to Gene Kranz, to backroom personnel knew exactly what these Program alarms were:
  – Just two weeks earlier, the same personnel were involved in a simulation of such alarms, which had incorrectly resulted in an abort:
    • Led to four additional hours of Program alarm simulations
Lunar Landing Profile

Actual landing was 3.87 nm downrange from planned site.

Actual Landing was 0.85 nm crossrange from planned site.
Lessons to Be Learned

• The need to perform risk trades is extremely common in the spaceflight arena
• The element of time available to make the trade drives the need for clear and concise data being available
• In the world of operations, familiarity with the situation through simulations can aid in development of the correct, rapid response
• If rapid decisions have to be made during critical operational phases, ensure that the right information is available to make the risk trades
• Trust the people who know
• Simulate, simulate, simulate!