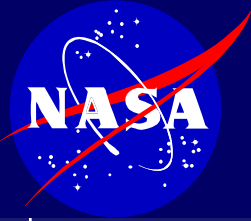


National Aeronautics and Space Administration

# History Panel, Gene Winkler

- Summary – Technology Development and Flight Experience
- Developing New Technology and Making it Work in Space - Shuttle and ISS ECLSS Lessons Learned

ICES History Panel, July 2007



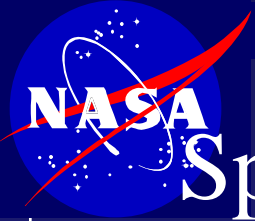
National Aeronautics and Space Administration

# Advanced Life Support Lunar - Mars Life Support Project

**Phase I: 15-day, 1-Person Test  
March 1995**



**Phase II: 30-day, 4-Person Test - June 1996**  
**Phase IIA ISS: 60-day, 4-Person Test - January 1997**  
**Phase III: 90-day, 4-Person Test - September 19, 1997**



# Space Hardware Development Lessons Learned - Principles

## Principles:

- “The concept or process that you know least about tends to trade off the best” - Harlan Brose
- "Design it right the first time" or "Investing during concept selection and early design has a very large payoff. At start of production, payoff is zero to negative. But we basically reward for problems saved in production and operations, not concept selection" (1)

Reference 1: Lessons Learned in Engineering, James Blair, Robert Ryan, and Luke Schutzenhofer.