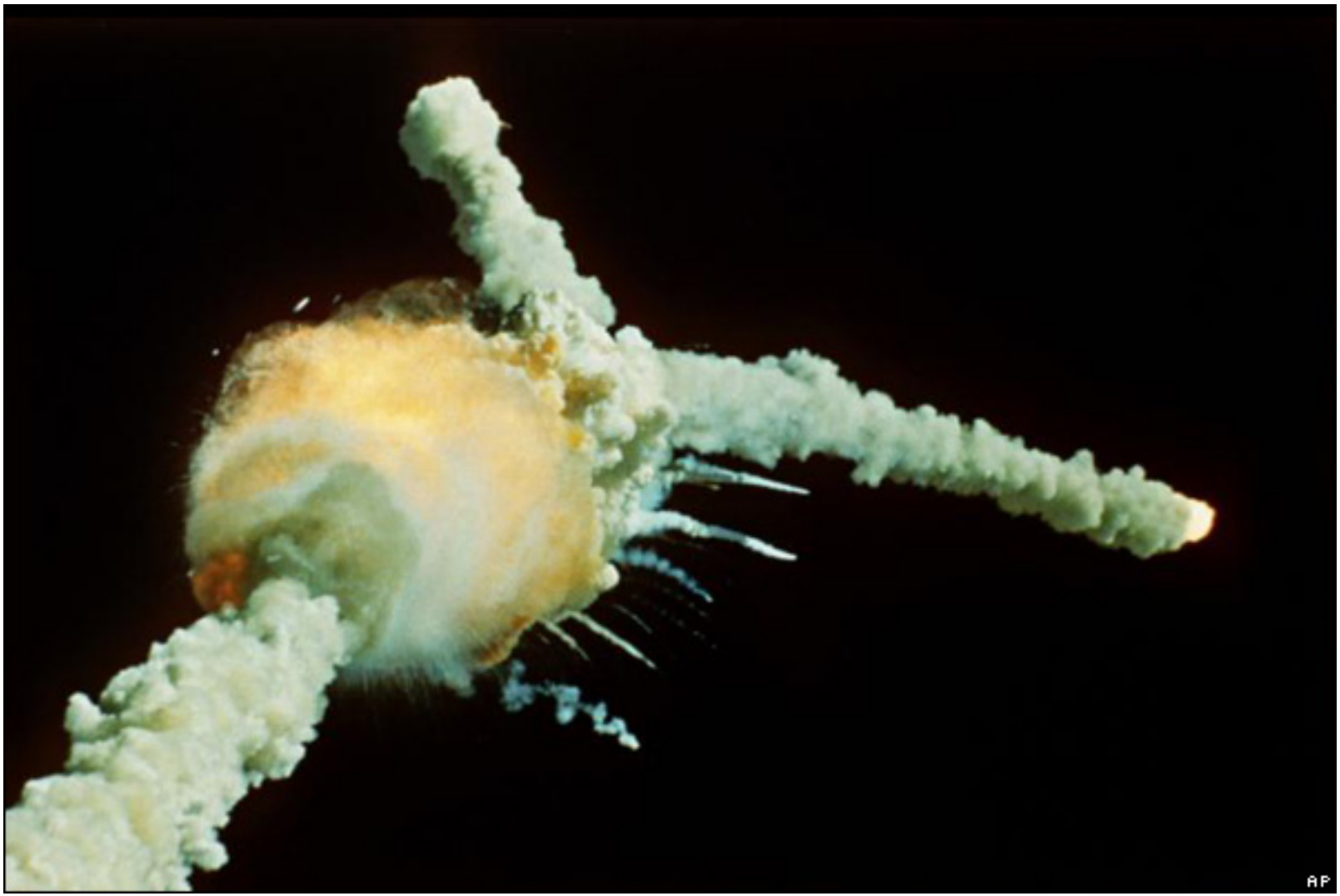
CS 335 — Software Development

Problems in Engineering (Space Lecture)

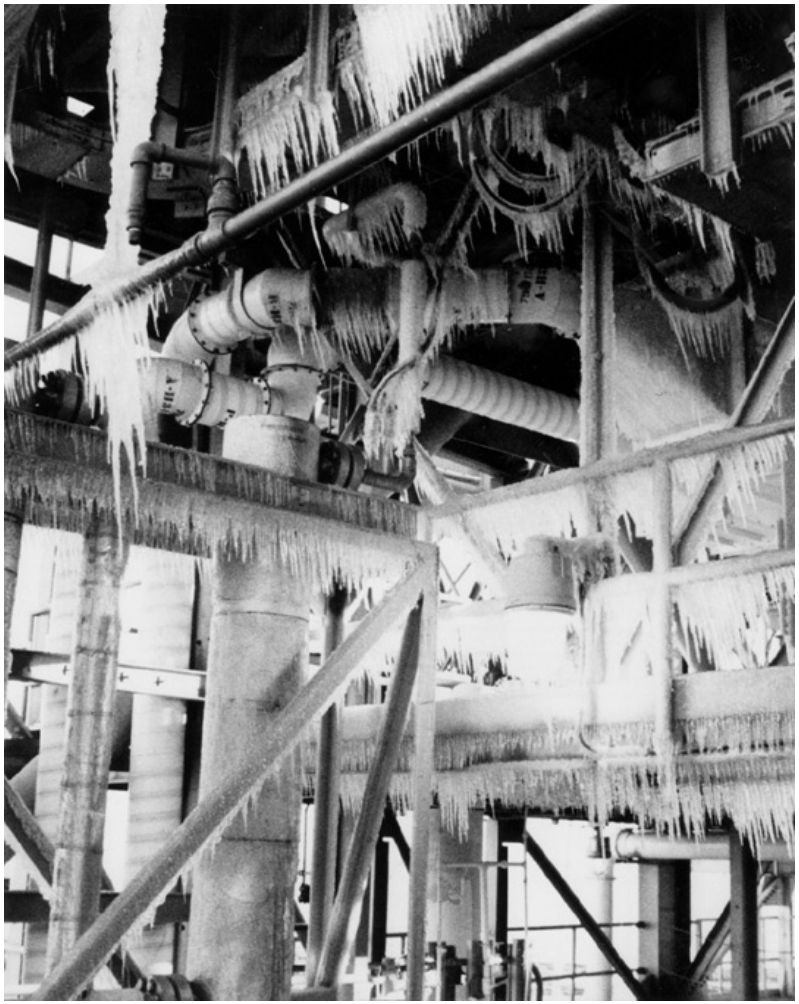
Jan 23, 2009

Lockheed Martin Corporation employs a Level 5 software group that puts together the shuttle software. . . . Because we cannot afford to have deaths in the space program, the cost and effort are worth it. The cost amounts to making each subroutine a career-long research project.

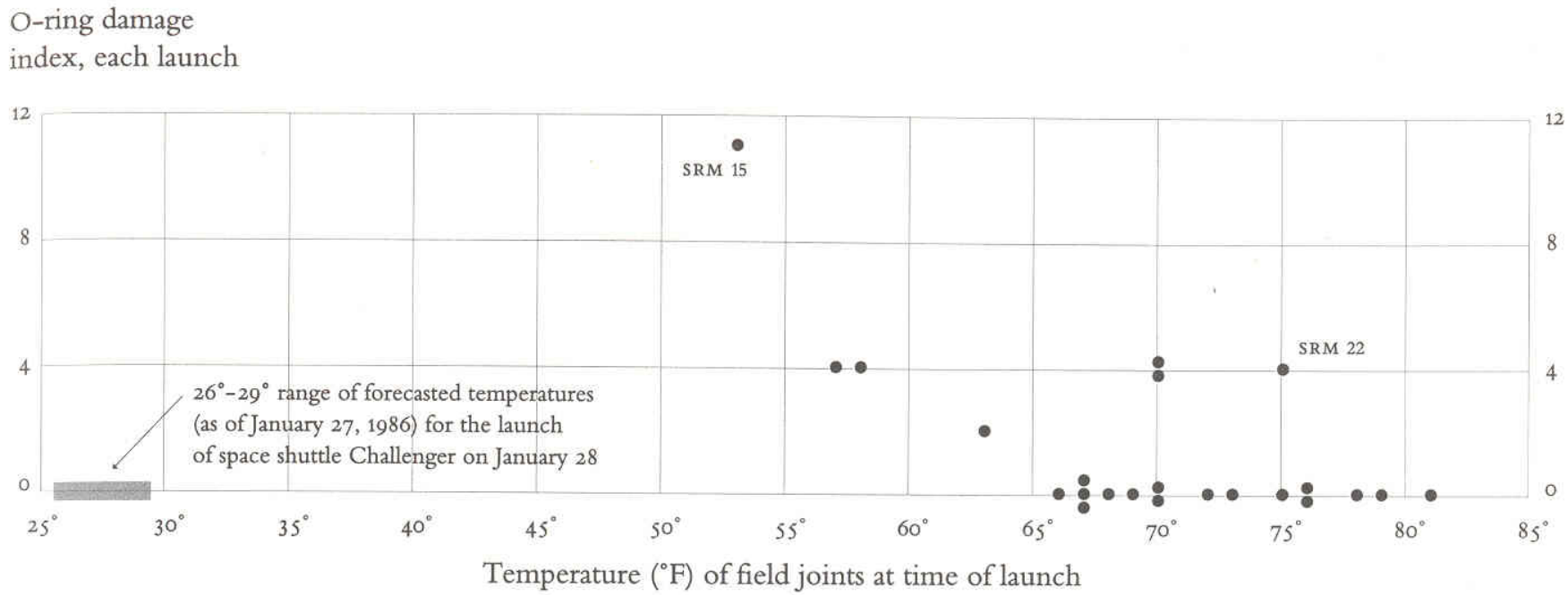
Richard Gabriel, "Mob Software: The Erotic Life of Code"



AP; retreived from http://news.bbc.co.uk/1/shared/spl/hi/pop_ups/06/sci_nat_1986_challenger_disaster/html/1.stm



Retreived from http://grin.hq.nasa.gov/index.html



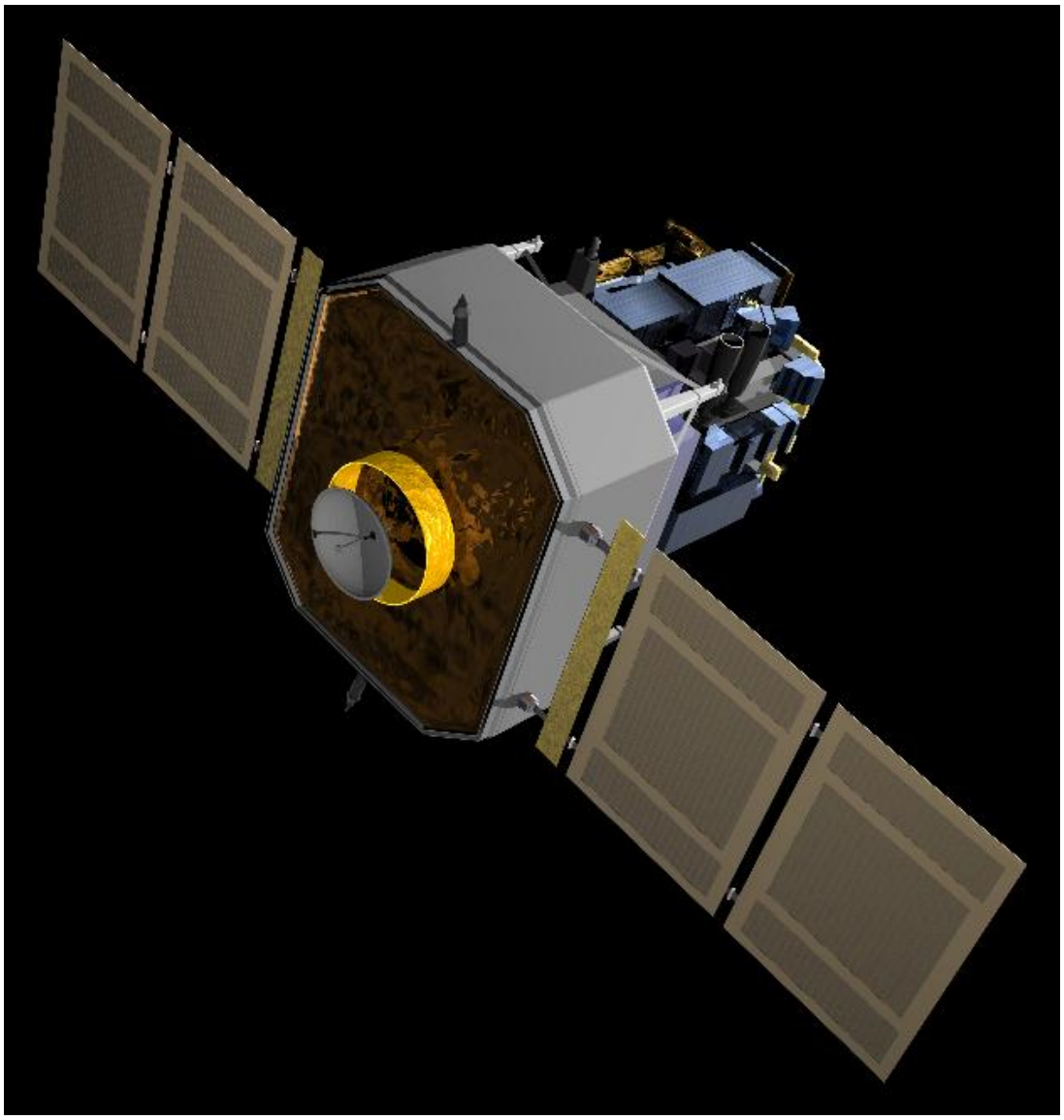
Edward Tufte, *Visual Explanations*, pg 45.

Review of Test Data Indicates Conservatism for Tile Penetration

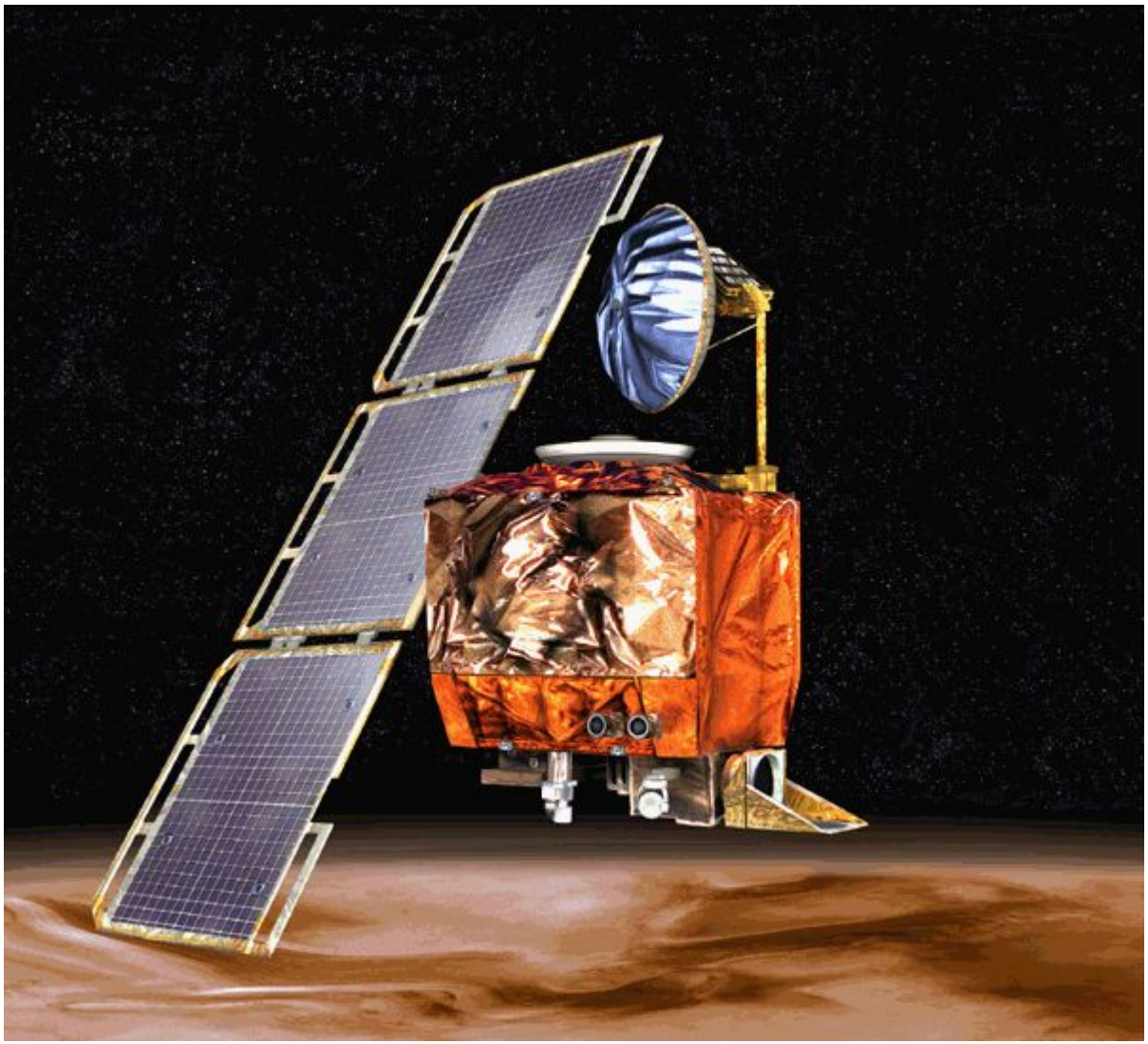
- **The existing SOFI on tile test data used to create Crater was reviewed along with STS-87 Southwest Research data**
  - **Crater overpredicted penetration of tile coating significantly**
    - **Initial penetration to described by normal velocity**
      - Varies with volume/mass of projectile (e.g., 200ft/sec for 3cu. In)
    - **Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating**
      - Test results do show that it is possible at sufficient mass and velocity
    - **Conversely, once tile is penetrated SOFI can cause significant damage**
      - Minor variations in total energy (above penetration level) can cause significant tile damage
  - **Flight condition is significantly outside of test database**
    - **Volume of ramp is 1920cu in vs 3 cu in for test**

From "Orbiter Assessment of STS-107 Bipod Insultation Ramp Impact", retrieved from http://www.nasa.gov/columbia/foia/index.html

http://www.esa.int/SPECIALS/Launchers_Access_to_Space/ASEVLU0TCNC_1.html



http://soho.esac.esa.int/gallery/Spacecraft/SOHOLower2.html



http://en.wikipedia.org/wiki/Mars_Climate_Orbiter