

# 16.682 The Aerospace Industry

April 27 Class

Special Guest:

Prof. Daniel Hastings

# Agenda

- Seminar “End Game”
  - Journals due Thursday to Barbara Lechner or electronically
  - Interviews planned for May 4-6. Sign up today
  - Class feedback
    - Hard copy form bring to interview
    - On-line version - will receive e-mail.
- Special guest: Prof Daniel Hastings

# Agenda Continued

- 3:15 - 3:55 “What is the Value proposition for human space flight”
- 3:55- 4:05 - Break
- 4:05 - 4:40 - Discuss remaining articles
  - Will Charc perform better than aircraft?
  - Why will IMMARSAT 3 pay off when Iridium hasn’t?
- 4:40-4:55 - The Lean Academy
- Muddy cards

## Value Proposition for Human Space Exploration - I

- Student replies - *Prof Hastings assessment*
- Value of science delivered will be superior to robotics - *maybe.*
- Future of engineering and science - *invest in NSF*
- Spinoffs - medical, velcro effect - *relies on serendipity. Maybe.*
- Bolster space access launch market - *not enough launches to be a driver.*
- Human experience from those who were there - *does it inspire John Q Public? Astronauts are motivational. But it is worth the investment?*
- Maintaining human space flight - *tautology*

## Value Proposition for Human Space Exploration - II

- Student replies - *Prof Hastings assessment*
- Better processes for overall systems integration - *definitely will do this, but it is not unique. Large defense systems, etc.*
- Capability to colonize other planets to avoid following dinosaurs to extinction - *would have to sell to Congress. Statistics may not support this when re-election is near.*
- Better safety standards for aerospace and other fields - *will there be spillover to other fields*
- Scientific gains: geology, fuel - *geology is unknown. Fuel has some merit in Helium 3. No radioactive waste. But no working fusion reactor.*

## Value Proposition for Human Space Exploration - III

- Student replies - *Prof Hastings assessment*
- Technology development and research will contribute value - *serendipity argument. Why human space flight? Why not energy initiative?*
  - Not so much the end goal, but value delivered along the way
  - Useful by a large subset of the population
- Possible moon/mars colonization/bases - *tautological.*
- If you don't care about the end goal, why not just fund research? Human spaceflight will generate new ideas that weren't even considered before hand.  
- *Yes, but does it satisfy a value expectations.*

## Value Proposition for Human Space Exploration - IV

- Student replies - *Prof Hastings assessment*
- Inspirational. Humans have inherent curiosity for space. - *It is inspirational. How much is it worth? Has a high entry barrier economically.*
- Helium 3 benefits - *need cost/benefit analysis*
- Robots don't have curiosity
- Launcher technology which could be used for other things - *addressed earlier*

# Value Proposition for Human Space Exploration - V

- Student replies - *Prof Hastings assessment*
- Social aspect having humans involved. Achieve what sci-fi has indicated
- National pride - *Pride is important. Countries invest in national pride projects. China is a current example. But does this lead you to human space flight. Going to Mars could win the argument. How much are you willing to pay? Would human space flight be more compelling than something else?*
- Commercial benefits - ?? - *Trap. It has not yet succeeded with human space flight. What commercial things have come so far from humans in space? The Tang effect.*
- Educational stimulation - Yes, but why not invest directly in schools.



# Dialog with Prof. Hastings - I

- Apollo Program Value Proposition:
  - National pride in the context of Cold War
  - Technological presentation seen as surrogate for national power
  - Order \$50B spent
- This country spend a couple trillion dollars over 40 years on nuclear weapons
  - Key value was deterrence against a monolithic enemy
- Pres. Bush asked for \$87B for Iraq
  - Public wanted to support country and troops
- This not a question of economics, but of political will

# Dialog with Prof. Hastings - II

- What would drive people and Congress to be willing to invest the level of funding needed for human space flight.
- Need something to form a consensus.
- If over 20 years, the AvWeek funds would accumulate to \$500B.
  - But can it be sustained over that period of time
  - Nuclear weapons was the only program sustained over this long period of time
  - Even Apollo was not sustained.
  - Need an underlying driver

# Dialog with Prof. Hastings - II

- Watch out for the trap of “space satellites”
  - Economic returns from weather forecast is large
  - Com sats are economically feasible
- Military looked at humans in space and concluded there was not a case

# Dialog with Prof. Hastings - IV

- Is there a value proposition for a global effort?
  - Possibly
  - Would not fit for countries who invest in space for economic return
  - Some countries are not interested in exploration