THE HIGHS AND LOWS OF ENGINEERING FLIGHT

BY LT COL WES “BOXER” ARDT (RET.)

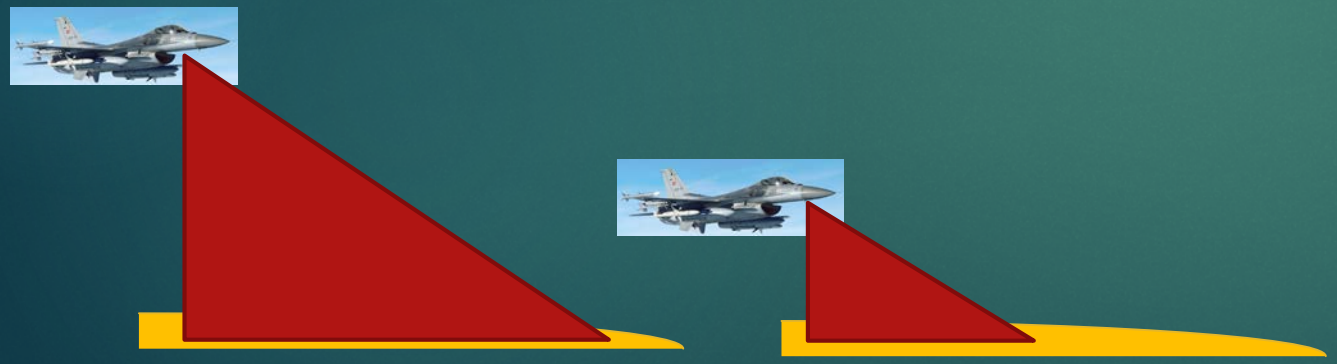
So you WANNA fly HIGH, do ya???

NOOOO?

OH! … You want to fly LOW

Mission Considerations

- I. Why Fly HIGH?
  - A. You can see FAR away (Reconnaissance)
  - B. You can fly out-of-reach (of enemy missiles and bullets)



- II. Why Fly LOW?
  - A. Not as easily seen ("Element of Surprise")
  - B. Very low = more challenging for enemy to shoot the aircraft (Self-Protection)
  - C. Closer may = better accuracy
  - D. Make an "impression!"

Physical and Engineering Considerations: Aerodynamic / Flight Control

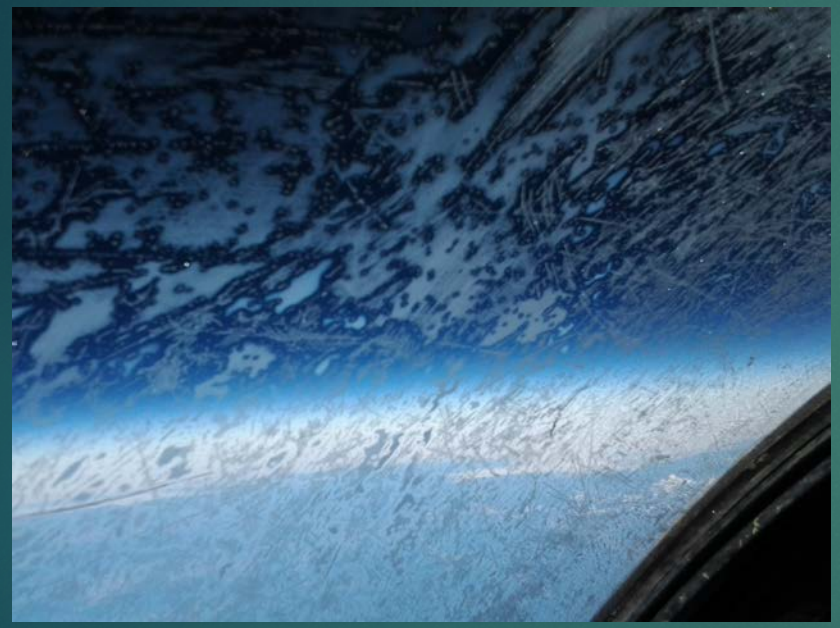
HIGH ALTITUDE

- Thinner Air means LESS LIFT under wings
- Thinner Air means turns are wider
- Aircraft Stall risk is greater
- Fuel burn is better

LOW ALTITUDE

- Thicker Air means MORE LIFT, better climbing and turning
- Tighter turns means HIGHER “G’s”
- Stall risk less, but …
- More fuel is burned

Physical and Engineering Considerations: Human Factors



The HIGHER you fly, the COLDER !!!

HIGHER = Less Air Pressure, Less Oxygen

Above “ARMSTRONG’s Line” body fluids will “BOIL” !!!

Physical and Engineering Considerations: Electrons

- What are electrons?
- When / Why do we use them?
- Free-space electron travel
- How altitude affects use of electrons

Altitude Summary

- Altitude affects mission
- Altitude affects flight control
- Altitude affects humans
- Altitude affects electrons

QUESTIONS ??

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Wesley A. Ardt, NH-03, USAF

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This presentation is to elementary or junior high/middle school students.

14. ABSTRACT
Presentation will instruct very basic STEM principles in how engineers must consider altitude factors when designing aircraft and components for flight. No reference to any test projects or talk around classified information is involved.
Topics covered will be:
Why fly high; Why fly low?
Mission considerations: Flying higher allows systems to see farther, and you might be out of the reach of enemy weapons. Flying lower can allow system to use terrain to hide from enemy eyes.
Flight performance considerations: Higher altitude means less positive control, but better fuel efficiency; Lower flight means better control, but worse fuel efficiency.
Human considerations: Oxygen and pressure are lower at high altitudes; Above Armstrong's Line, body fluids can "boil."
We use electrons to communicate and detect, but electrons don't stop at high altitudes; At low altitudes, terrain affects them.

15. SUBJECT TERMS
Altitude, Armstrong's Line, G-forces, free-space propagation

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