NASA Dryden Overview

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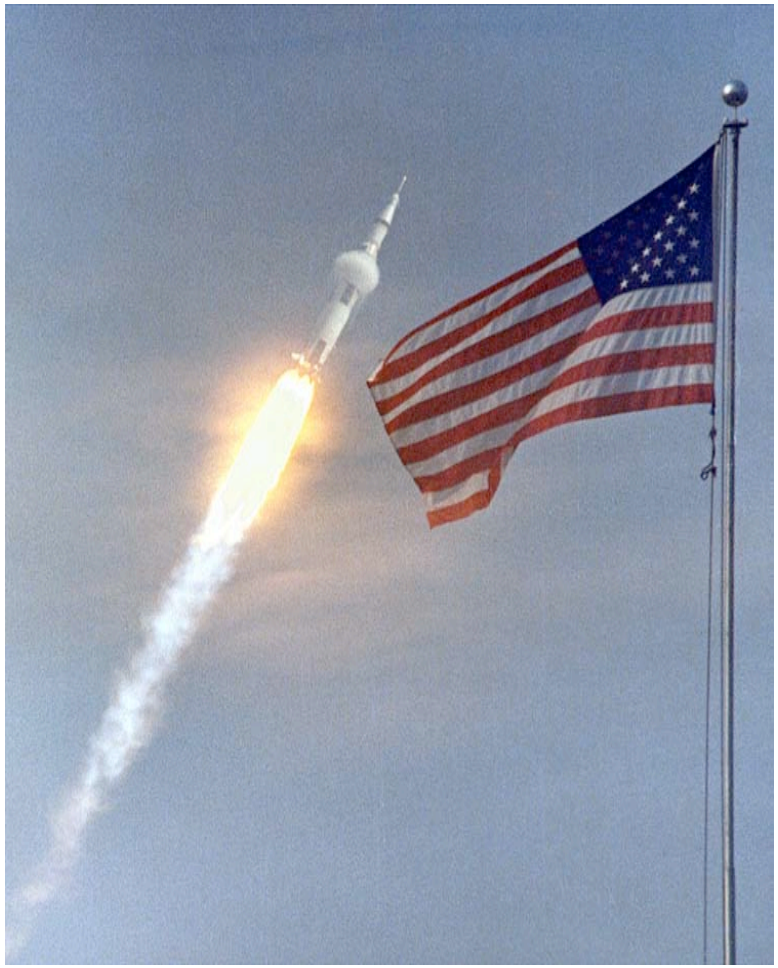
Outline

- Personal Background
- NASA Background
- Dryden History
- Recent and Current Dryden Projects
- Questions



Personal Background

- Goshen High School – 1999
  - Cross Country, Track, Basketball, and Science Olympiad
- Purdue University
  - Undergraduate in AAE 2004
    - Co-op at NASA DFRC
  - Masters in AAE 2006
- Currently Work in the Flight Controls and Dynamics Branch
  - Research Digital Control Systems and Aircraft Handling Qualities are My Primary Focus

NASA Background

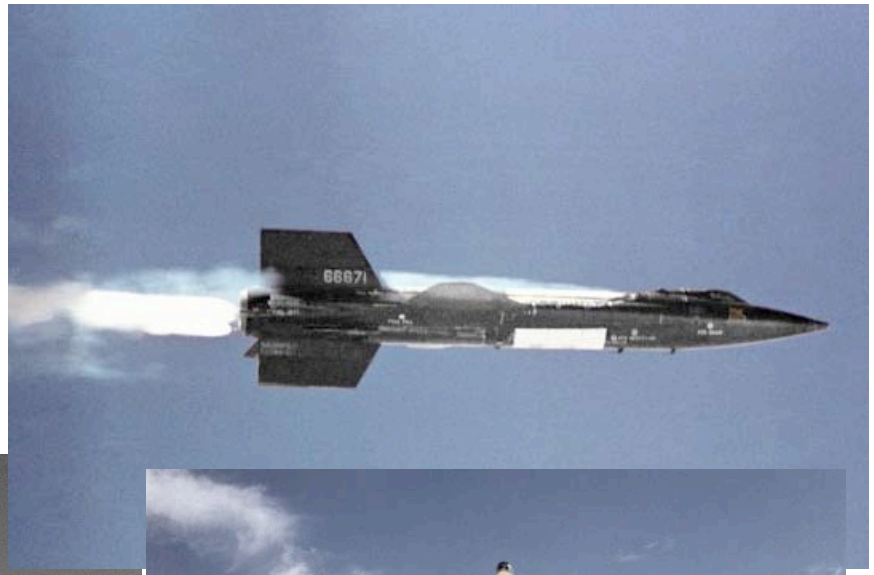
- NASA – National Aeronautics and Space Administration
- One of the Largest Research Organizations in the World
  - The Overall Mission of NASA is to pioneer the future in space exploration, scientific discovery, and aeronautics research
- NASA Funding <1% of the National Budget
- There are 10 Field Centers
  - 4 Centers Focused on Aeronautics Research
    - Ames, Dryden, Langley, and Glenn
  - 4 Centers Focused on Manned Spaceflight
    - Johnson, Kennedy, Marshall, and Stennis
  - 2 Centers Focused on Unmanned Space Science
    - JPL, and Goddard

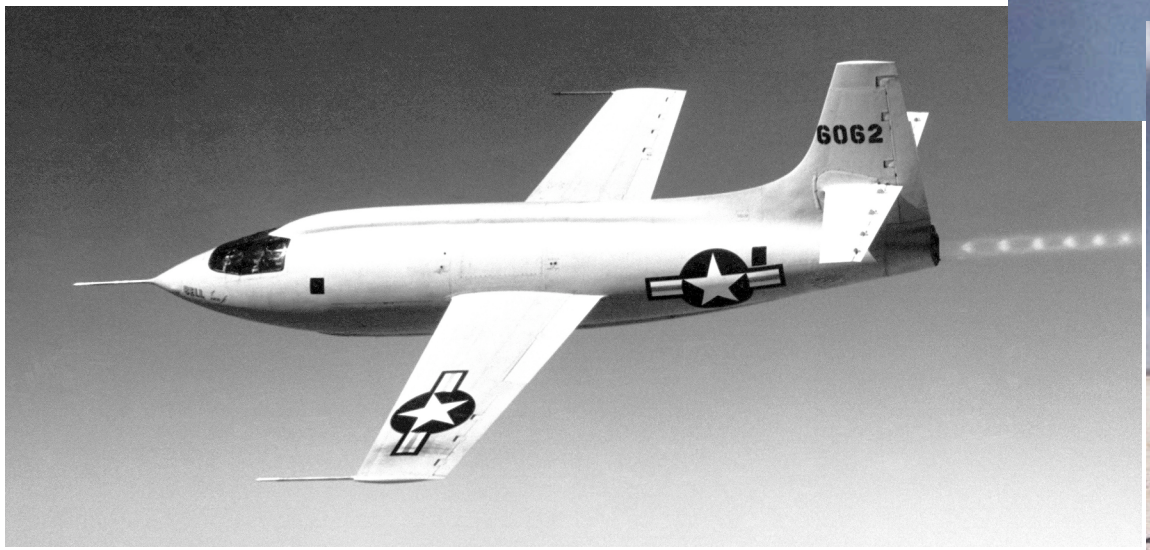
Dryden's Mission

- Purpose of Flight Research
  - To Fly What Others Only Imagine
  - "Flight research separates the real from the imagined, and makes known the overlooked and unexpected." Hugh L. Dryden
- Why Edwards Air Force Base
  - ~350 Flyable Days a Year
  - Very Sparse Population
  - Seven Mile (37,000ft) Long Runway on One of the Flattest Natural Surfaces
    - O'Hare's Main Runway is 13,000ft Long
  - Within Supersonic Corridor

Dryden History

- NACA High Speed Test Facility
- X-1 Was the First Vehicle to Break the Sound Barrier
- X-15 “Flew” Into Space During the Mercury Era and Hit Speeds Exceeding Mach 6.5
- Lifting Bodies Like the HL-10 Paved the Way for Shuttle Operations





Subsonic Research

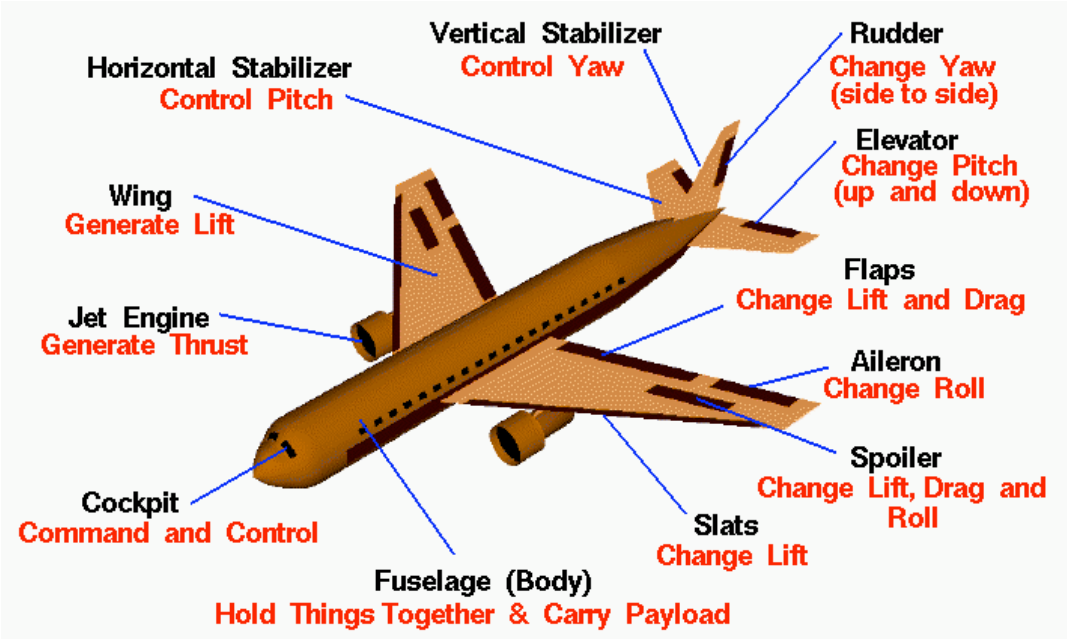
- Research Goals
  - Improved Fuel Economy
  - Noise and Emissions Reduction
  - Greater Reliability
- Blended Wing Body (X-48B)
  - Hybrid Design Combines the Reduced Drag Properties of a Flying Wing with Some of the Advantages of a Conventional Design
  - Current Research Pertains to Controllability and Low Speed Characteristics

Aviation Safety

- Primary Goal is to Improve Overall System Safety for Both Military and Civilian Applications
- Intelligent Flight Control Systems
  - Uses Neural Networks to "Learn" and Adapt to Changes in Aircraft Behavior
    - Things Like Hydraulic Failures
  - Should Help Pilots to Control Damaged Aircraft

Aviation Safety

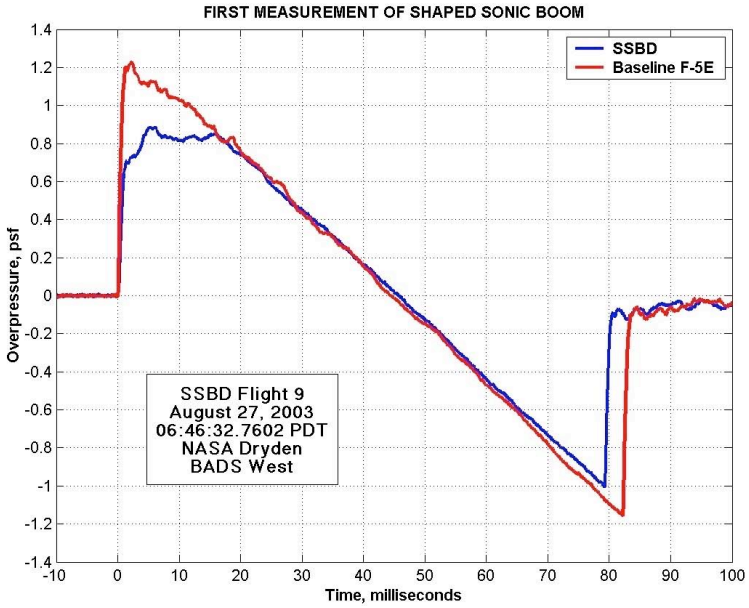
- Propulsion Controlled Aircraft
  - Uses Engines Instead of Control Surface to Control the Aircraft
  - Two Possible Solution Scenarios
    - Pilot Training
    - After Market Digital System



- Notable Hydraulic Failure Mishaps
  - Japan Airlines 123 in 1985
    - Large Structural Failure
    - 4 of 524 Survive
  - United 232 in 1989
    - Uncontained Engine Failure
    - 185 of 296 Survive
  - ValuJet 592 in 1996
    - Cargo Fire
    - 0 of 110 Survive
  - DHL Cargo Flight 2003
    - Surface to Air Missile
    - Successful but Stressful Landing, No Fatalities

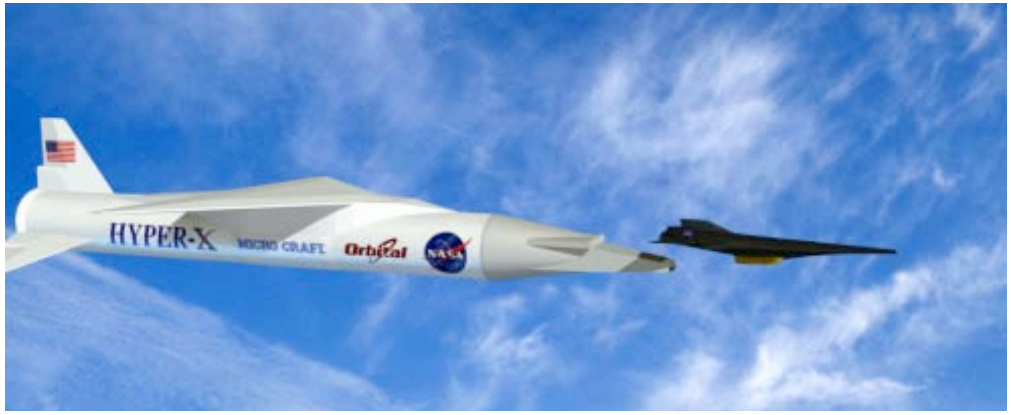
Supersonic Research

- What is a Sonic Boom?
  - Shockwave Resulting From Rapid Air Displacement
- Supersonic Flight Not Allowed Over Land in the US
  - Sonic Booms Generated Are Too Disruptive and Can Cause Damage to Property
  - Flight Times Between Los Angles and New York
    - Mach 0.8 – 4 hours 40 minutes
    - Mach 1.7 – 2 hours 12 minutes
- Quiet Spike and the Shaped Sonic Boom Demonstrator
  - Attempt to “Soften” the Sonic Boom and Make it Less Objectionable to People on the Ground



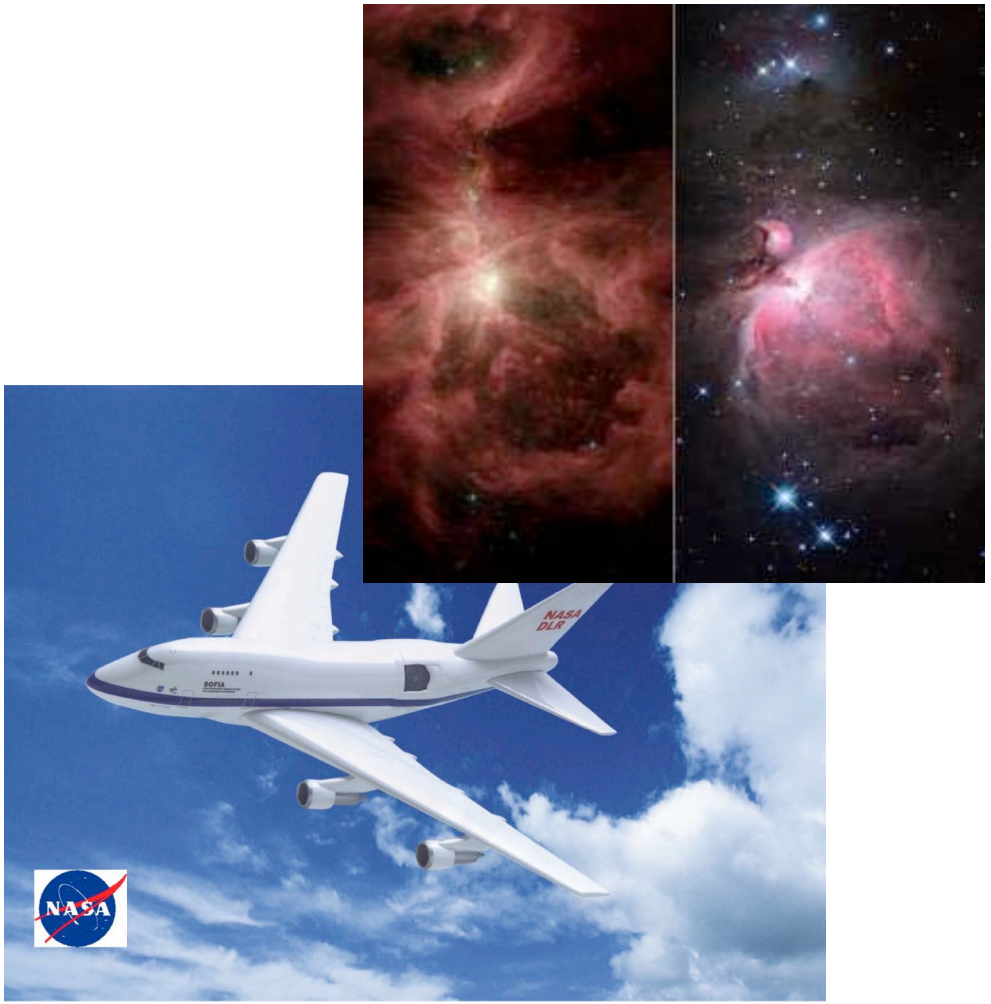
Hypersonics

- Hypersonic Flight is Faster than Mach 5
  - 30-06 Rifle Bullet is at Mach 3 at the Muzzle
- Why Study Hypersonics
  - Cheaper Access to Space (Hybrid Propulsion)
  - Planetary Exploration (AGA, Atmospheric Reentry)
- Hyper-X Research Vehicle (Mach 7 and Mach 10)
  - Fully Integrated SCRAM Jet Engine
    - Uses Shock Waves to Compress Air For Combustion
  - Wave Rider Aerodynamic Shape
    - Uses Shock Waves to Increase Lift and Minimize Drag
  - World Record Holder For Fastest Air Breathing Vehicle



Space Science

- Stratospheric Observatory For Infrared Astronomy
  - 2.5 Meter Infrared Telescope in the Back of a Modified 747
  - Why Infrared
    - Young Stars Emit Mostly Infrared
    - See through dust
    - Allows for Better understanding of Elemental Presence
  - Why Stratospheric
    - Above >90% of Water Vapor
    - 747 Larger, flexible, and modifiable payloads
    - Complements Space Based Measurements



Earth Science

- Purpose
  - Provide Real World Data to Increase our Understanding of this Planet
- Altair Esperanza Fire
  - Modified Highly Instrumented Predator B
  - Within 24 Hours of Receiving Direction From the CA Governors Office Altair Was Flying at 43,000ft Above the Fire Providing Real-time Data to the Firefighters on the Ground

Manned Space Flight

- Why Manned Space Flight
  - Man's Spirit of Exploration
  - Expand Scientific Knowledge
  - Technology Development
  - United States International Leadership
- Backup Landing Site for the Shuttle
- Pad Abort Tests for the Crew Exploration Vehicle

Everyday NASA Stuff

- Hydrogen Sensors Used In Modern Hybrid Cars
- Signal Processing Techniques Used in Most Satellite Based Radios, Phones, and TV's were First Used To Communicate with NASA Spacecraft
- Medical Imaging Techniques Such as MRI's Use NASA Developed Technologies
- State of the Art Fire Fighter Suites All Employ NASA Materials Technology
- Smoke Detectors (First Used on Sky Lab)
- Cordless Power Tools were First Used by NASA Astronauts
- Invisible Braces (Made from Ceramics Developed by NASA)
- Temper Foam (Used in Most Modern Football Helmets)
- Modern Airliners Use Digital Control Systems the First of Which Were Tested at Dryden
- Engine Control Pioneered at NASA has made Air Travel Cheaper Clearer and Less Noisy
- Aerodynamics Research Performed at NASA has Made Air Travel Faster and More Efficient
- Lithium Batteries Used in Cell Phones, Laptop Computers, and Ipods
- Anti-Fog Coatings on Ski Goggles (Originally Developed for Spacecraft Windows)
- Ultra Sonic Sensing Technology Used to Determine Severity of Burns for Burn Victims
- Noise Absorbent Material
- The Foam Used in Many Furnace, and A/C Filters Was First Developed by NASA
- Modern Pacemakers Use Batteries and Sensing Technology Used First at NASA
- See http://www.sti.nasa.gov/tto/ for more examples of Spinoff Technologies First Used by NASA

Questions