KISS Concurrent Engineering Exercise

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Team X is JPL's concurrent engineering team for rapid design and analysis of space mission concepts

- Developed in 1995 by JPL to reduce study time and cost
- Used for early formulation concept exploration
- Completed over 1100 studies
- Institutionally endorsed
- Emulated by many institutions
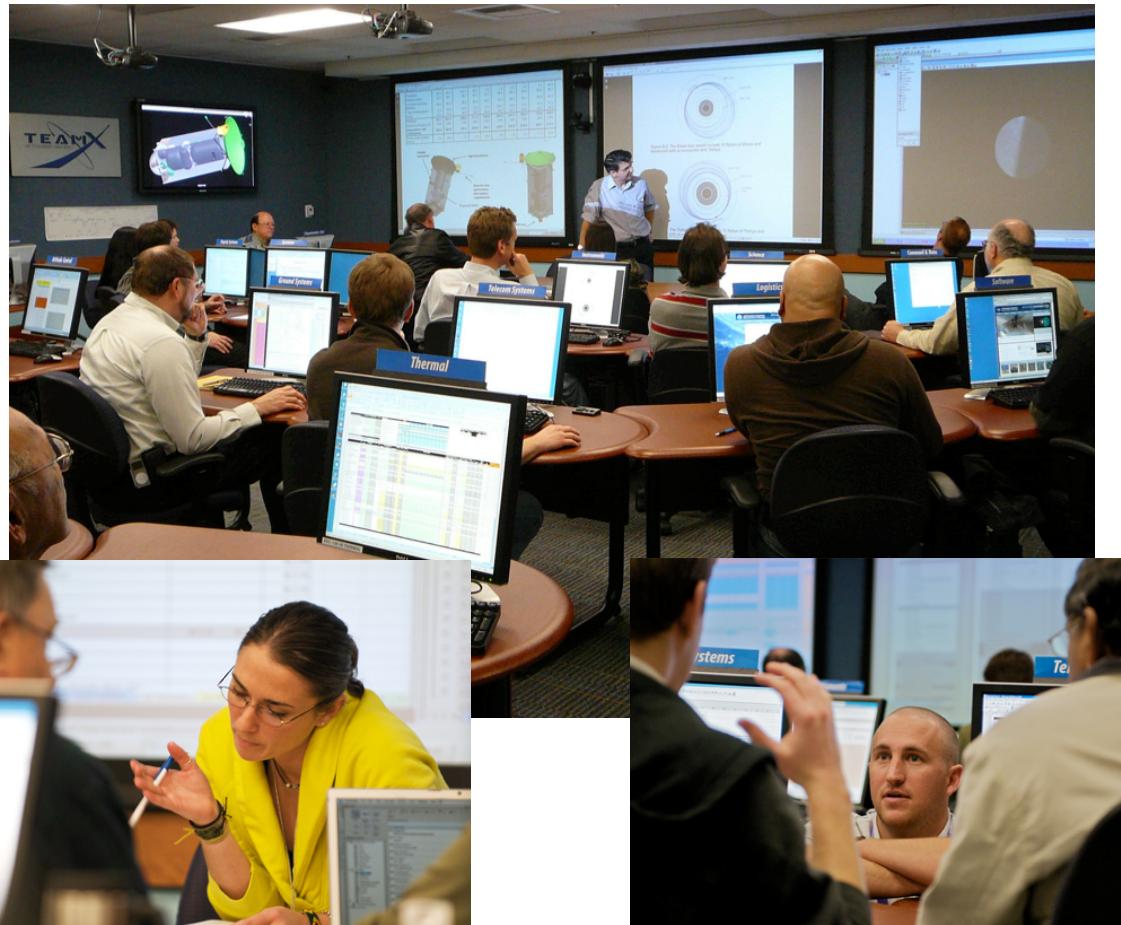
✦ Traditional Method – Serial

Start → Provide Staff → Subsystem Design → System Trades → Cost → End

Delays
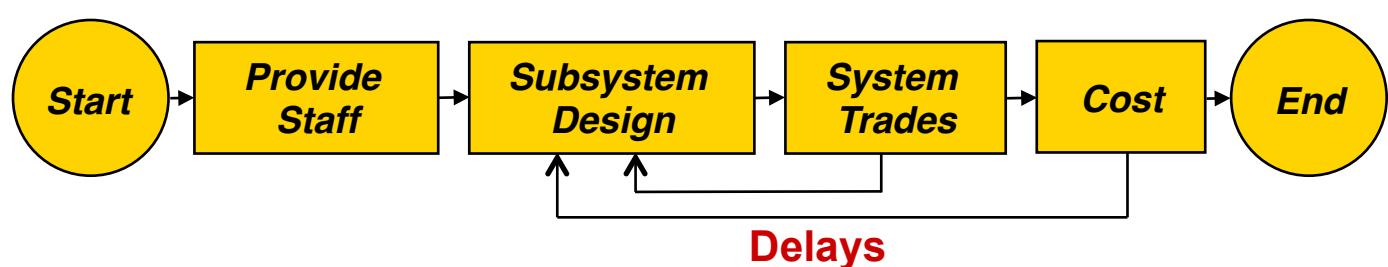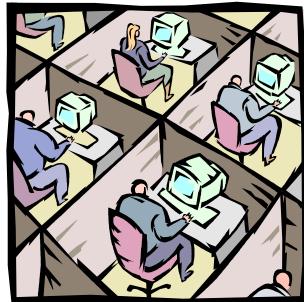
✦ Concurrent Engineering – Parallel

- Diverse specialists working in real time, in the same place, with shared data, to yield an integrated design

Start → { Subsystem Design / System Trades / Cost } → End
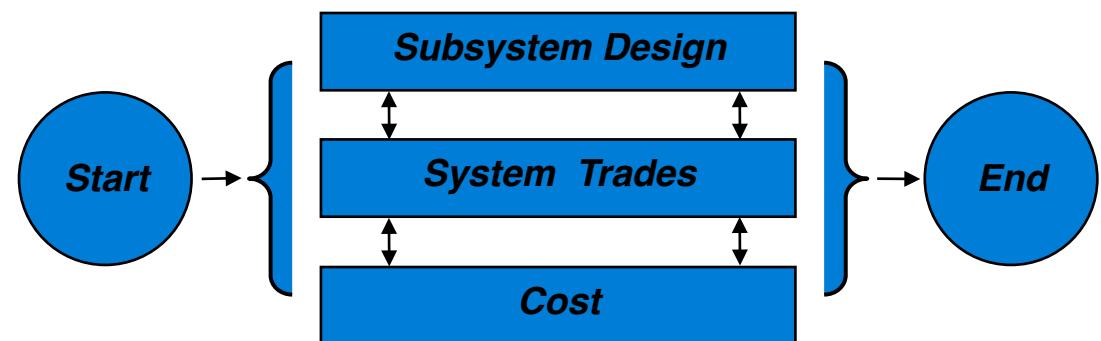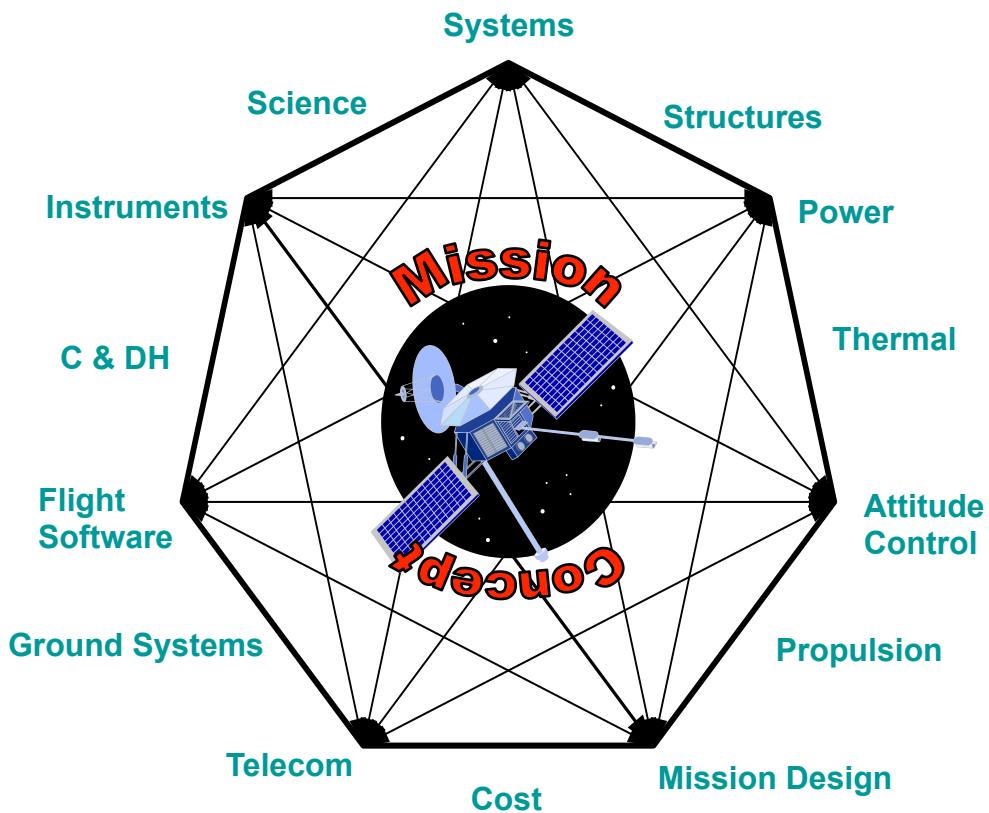
- **AM – Cubesat**
  - Team Study Briefing
  - Guideline Review
  - Review Design Issues
  - Subsystem Design Work…Concurrent Design
  - Power Estimate Review
  - Mass Estimate Review
  - Cost Estimate Review
- **PM – Relay Satellite**
  - Review Design Issues
  - Subsystem Design Work…Concurrent Design
  - Power Estimate Review
  - Mass Estimate Review
  - Cost Estimate Review
- **Risk List Review**

Cubesat Design Issues

- **All Subsystems**
  - Mass, Power and Cost Est.
  - Subsystem Risks
  - Ops Modes & Scenarios
- **ACS**
  - Inertia
  - Torque Calculations
  - Wheel and Thruster Sizing, Number and Locations
  - Kickoff Stabilization
  - Wheel Desaturation
- **CDH**
  - Data Volume/Data Storage
  - Bus Interface

- **Instruments**
  - Data Volume Calculations
  - Orientation/Pointing Req.
  - Calibration
  - Instrument Operations
  - Bus Interface
- **Mechanical**
  - Deployments
- **Mission Design**
  - Delta V Budget
  - Cubesat Positions and Orientation

Power

- Battery Sizing
- Solar Array Sizing
- Bus Voltage(s)
- Subsystem Efficiency

Propulsion

- Propellant Load
- Tank Sizing

Science

- What Spatial Res. Is Req'd?
- Survey or Targeted? Is Tracking Req'd?
- Operations Scenarios
- Data Volume Sizing

Software

- Estimate Lines of Code

Telecom

- UHF Link Budget
- Downlink Data Rate

Thermal

- Internal Operating Temp

- **All Subsystems**
  - Mass, Power and Cost Est.
  - Subsystem Risks
  - Ops Modes & Scenarios
- **ACS**
  - Torque calculations
  - Wheel and Thruster Sizing, Number and Location
  - Wheel Desaturation
- **CDH**
  - Data Volume/Data Storage
  - Bus Interface

- **Ground System**
  - Downlink Durations
- **Payload – Dispensers**
  - Interfaces
- **Mechanical**
  - Deployments
  - Mechanisms
  - Packaging
- **Mission Design**
  - Delta V Budget
  - Launch Vehicle Performance
  - Trajectory

- **Power**
  - Battery Sizing
  - Solar Array Sizing
  - Bus Voltage(s)
  - Power Sys Efficiency
- **Propulsion – RCS and Primary Systems**
  - Prop System Types
  - Propellant Loads
  - Tank Sizing
- **Science**
  - Operations Scenarios
- **Software**
  - Estimate Lines of Code

- **Telecom**
  - UHF Multi Link Support
  - X-Band Link Budget
  - X-Band Downlink Data Rate
  - HGA Articulation?
- **Thermal**
  - Internal Operating Temp