Concurrent Engineering Teams are 15 Years Old - are they Working?

TEAM X
Jet Propulsion Laboratory

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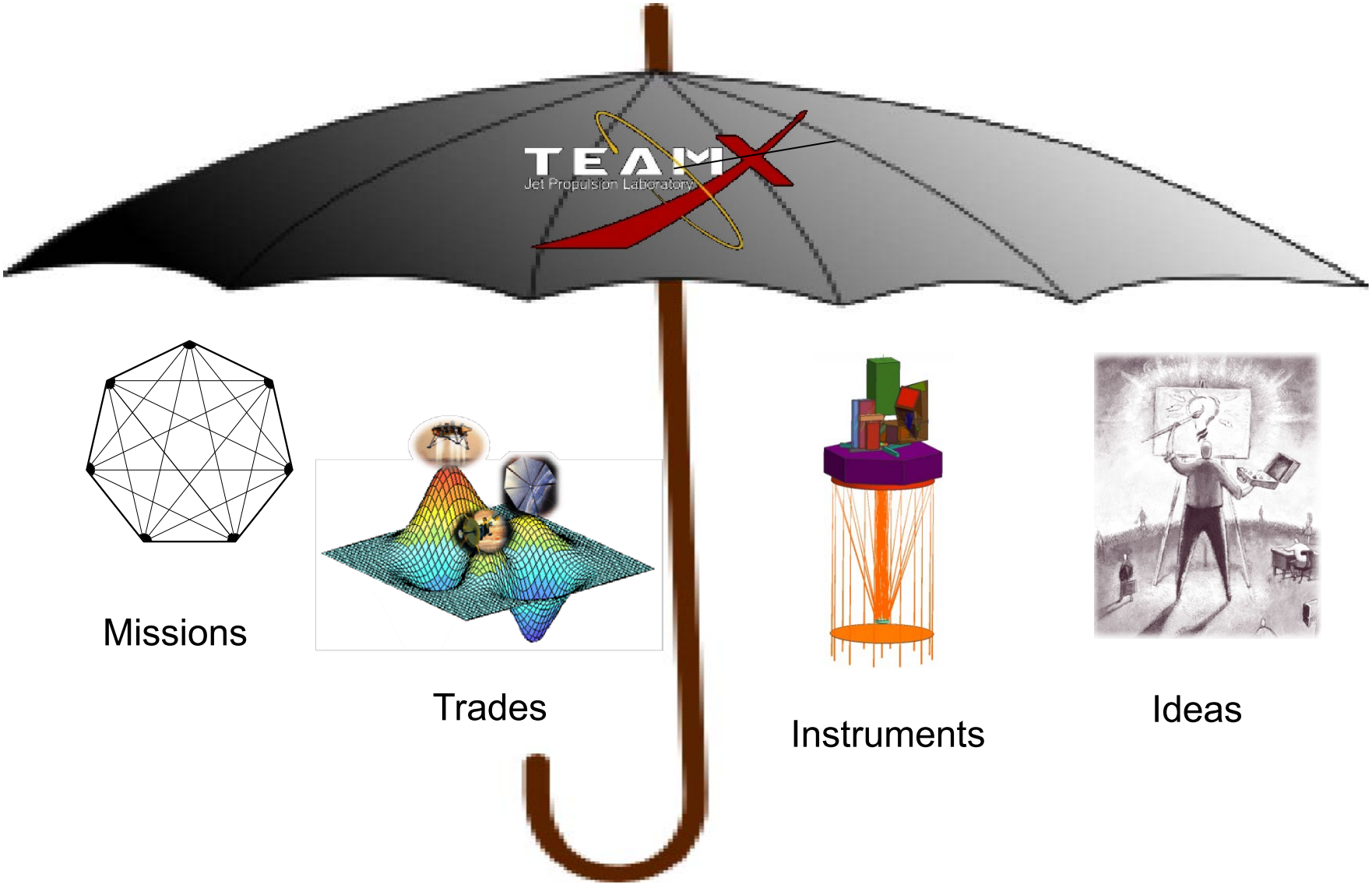
Lead Concurrent Engineer – Team X

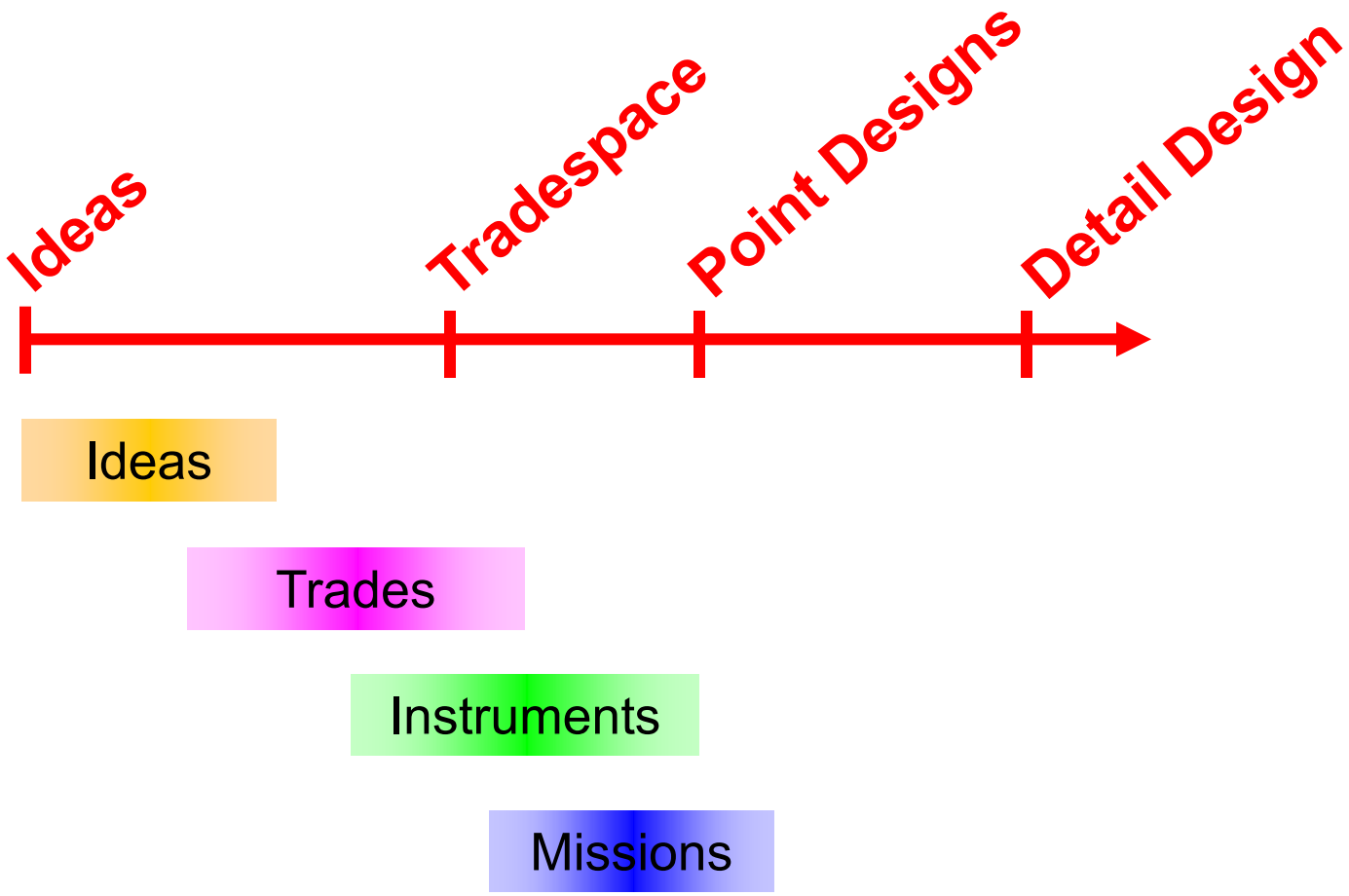
AIAA Space 2010
Anaheim, CA
September 2, 2010

The New "Team X"



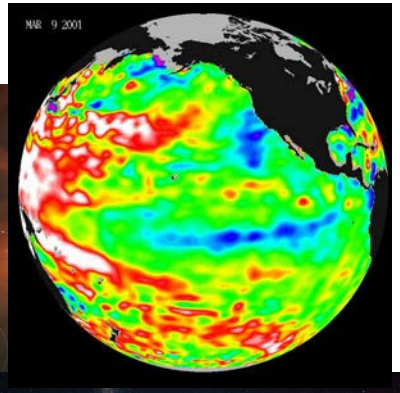
Team X Teams and Concept Maturity

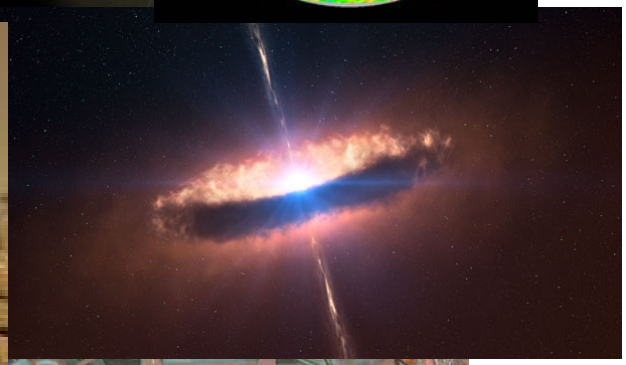
Concept Maturity

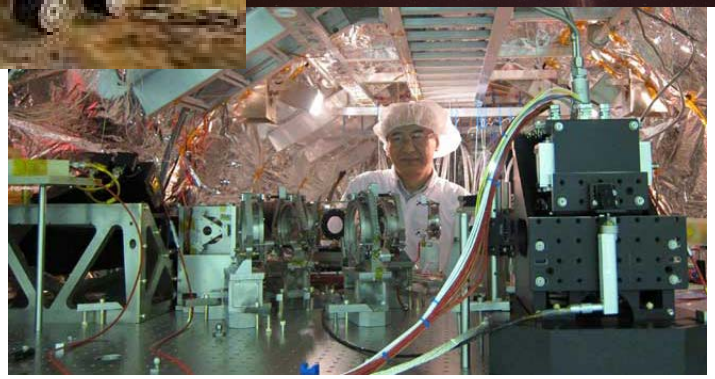


Customers

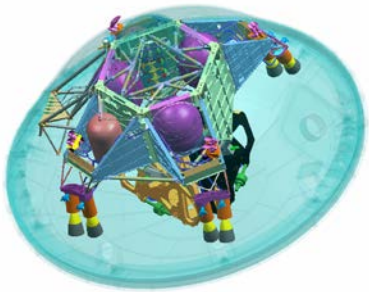
- Earth Sciences
- Astrophysics
- Solar System
- Mars
- Exploration
- Technology

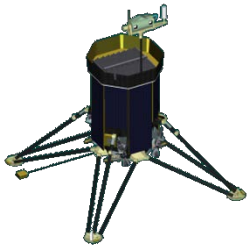


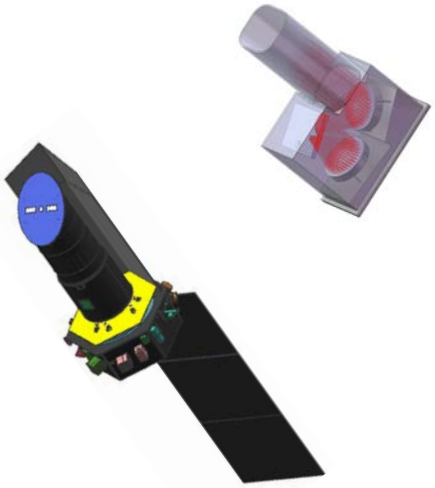




Products







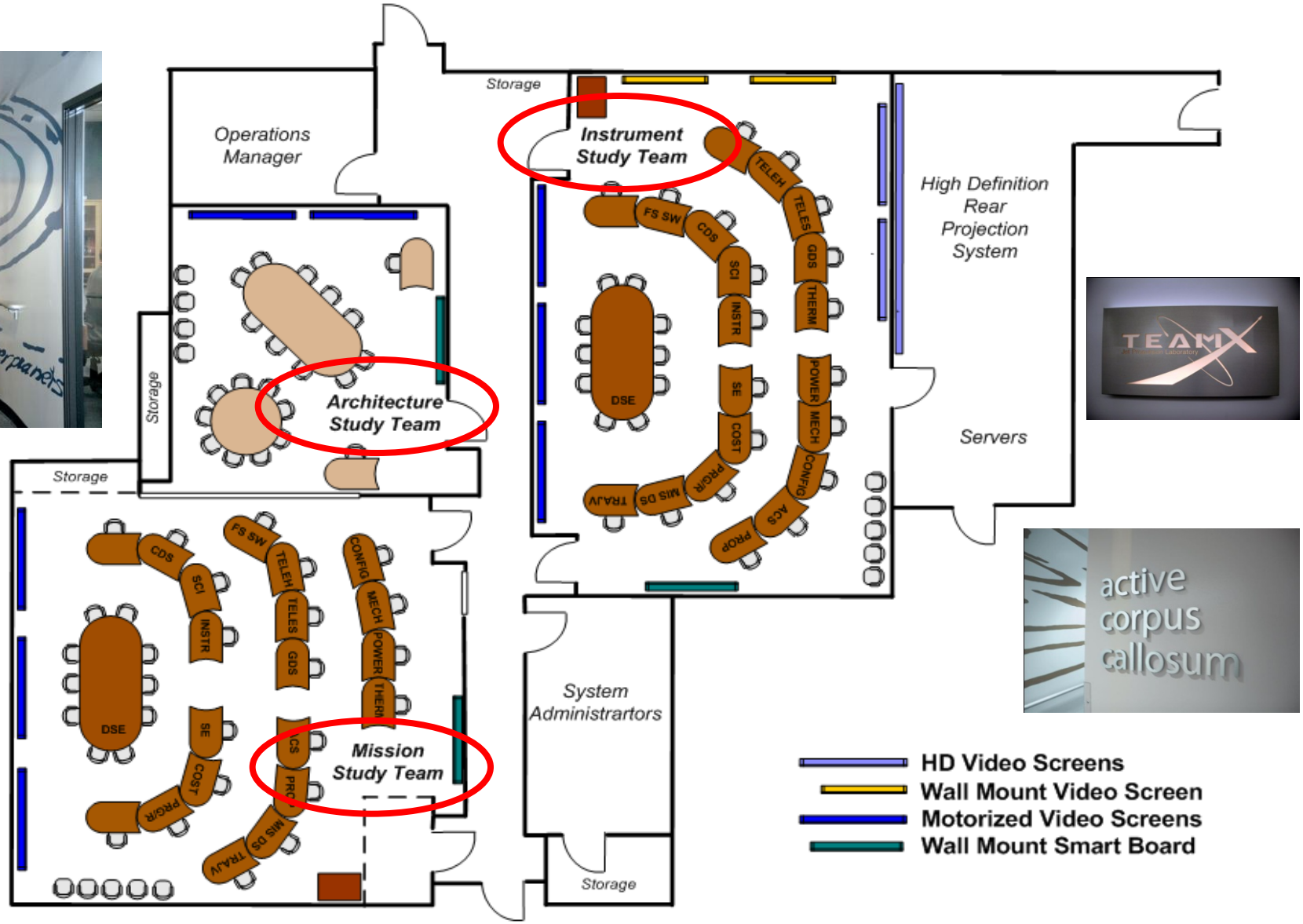
		Study Types								
		Institutional Cost Estimates	Read Team Review	Mission Concept Design	Limited Architecture Trades	Extensive Architecture Trades	Preliminary Feasibility	Technology Assessment	Idea Generation	Portfolio Building
Study Teams	Mission Studies	X	X	X	X					
	Instrument Studies		X	X			X			
	Trade Team		X		X	X	X	X		
	Idea Team						X	X	X	X

Team Size: 20+ ↕ 5

Higher ⟷ Lower

Concept Maturity

Facilities – Project Design Center (PDC)



Lessons Learned

- **The people make the team**
  - Networked computers and tools are not enough
  - Technical experts able to work with limited information and limited time make concurrent engineering work
- **Cost is the most important trade parameter**
  - Almost all trades are in some way done with respect to cost
  - Credible, understandable cost tools are essential
- **Organizational buy-in is essential**
  - Unless implementing organizations accept CE methodology as valid results will be dismissed as meaningless whenever it is convenient to do so
  - Without institutional support concurrent engineering is doomed to remain an interesting experiment
- **Distributed collaborations are difficult**
  - Logistics, interface, and communication barriers work against a unified design team
  - Collocation usually is more effective
- **One size does not fit all**
  - Different types of teams are needed for different work
  - But it is important to coordinate among all to avoid competition for resources and to encourage seamless flow of information

The Future

- **Products for More Developed Concepts**
  - Recently supported a directed mission for Mission Concept Review and follow-up study at KDP-B
  - Some customer demand for Step 1 proposal concept development, proposal writing support and Mission Concept Review technical presentations
- **More Collaboration with Outside CE Teams – Joint CE team support for increasingly large, complex mission studies**
  - Leverage outside CE team expertise and resources
  - Begin collaborative missions with collaborative CE design work
- **Improved Distributed CE Capability**
  - Web-based customer and CE team interfaces
  - Improved High Definition Video Conferencing System
- **Greater Interaction with HQ**
  - Looking for direct participation from NASA HQ in inter-Center CE activities
  - Potential areas:
    - Standardized AO products
    - Greater standardization of Decadal Survey support
    - Standardized design data files for portability outside of JPL
    - Central broker for Agency-wide design tools
    - Central broker for Agency-wide engineering expertise
    - Input into flight project data collection parameters