



Department of Defense *Space Test Program*

“Access to Space”



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Agenda



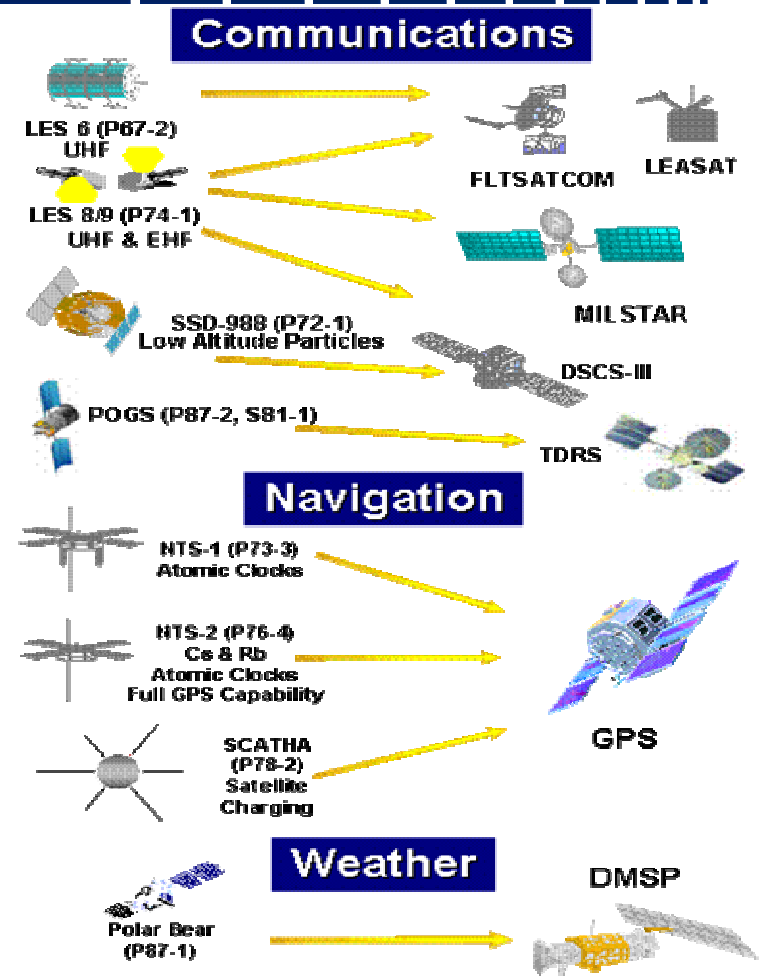
- **STP Overview**
 - **SERB Process**
 - **Reimbursable Flight Basis**
- **STP Access to Space**
 - **Enablers**
 - **Standards**
 - **Roadmap**
 - **Rideshare Opportunities**
 - **Government Rideshare Working Group**
 - **EELV Standard Service**
- **Summary**



DoD Space Test Program (STP)



- Chartered by OSD in 1965
 - First flight in 1967
- Primary provider of mission design, s/c acquisition, integration, launch, and on-orbit ops for DoD and DoD sponsored space experiments, technologies & demos
 - Ability to provide all spaceflight services except the experiment itself
- Single manager for all DoD payloads on the Space Shuttle and ISS
- Designated AFSPC's "Front door" for all auxiliary payloads seeking flight opportunities on DoD missions

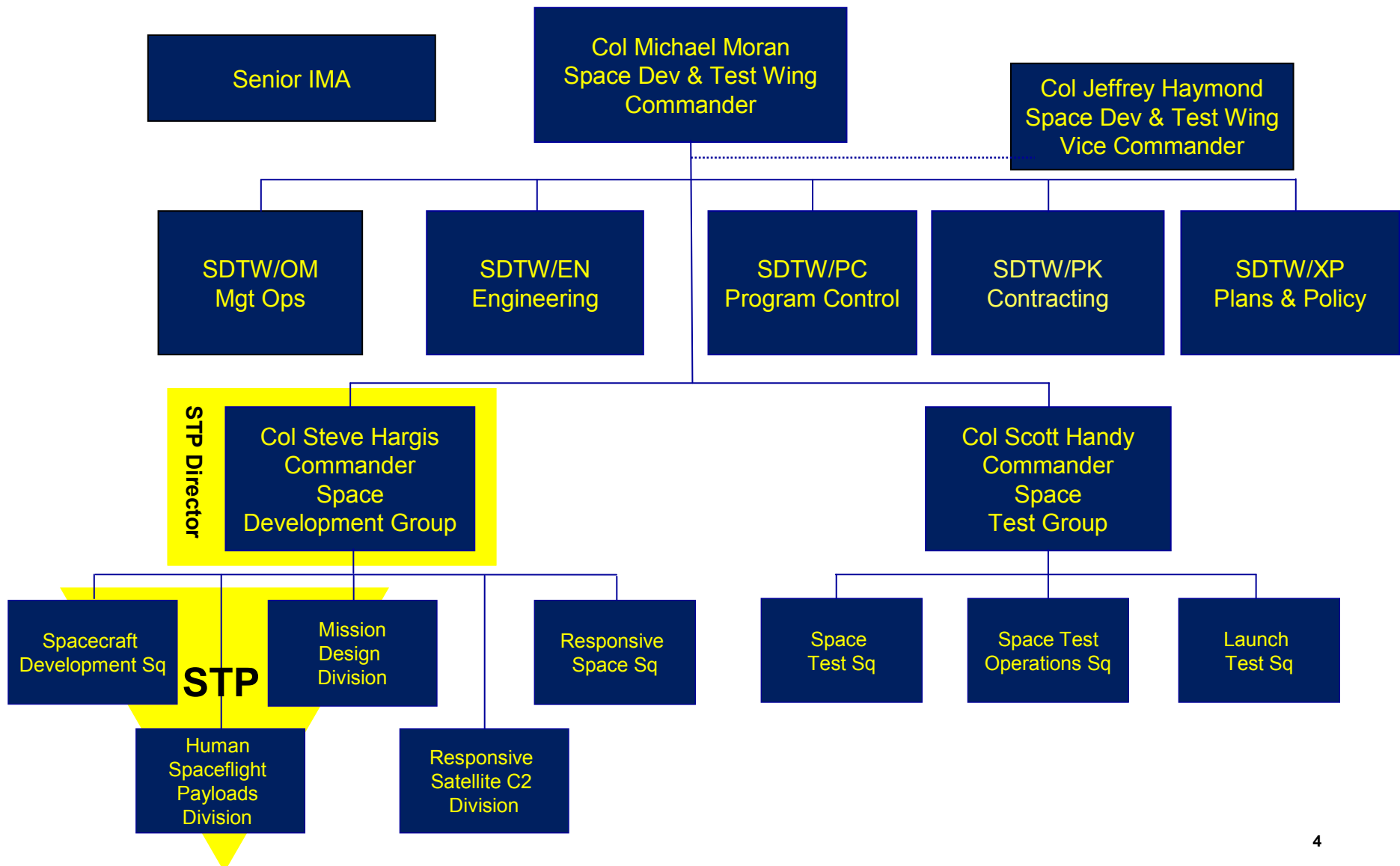


STP has flown 491 experiments on
Over 203 missions since 1967

(As of 23 Mar 10)



SDTW Organization





Access to *STP* Services



- **Space Experiments Review Board (SERB)**

- Manifest based on:
 - SERB rank
 - Flight opportunities
 - Mission requirements
 - *Available STP funds*
 - >\$10M = SAF/USA approval
 - <\$10M = STP director approval



- **Reimbursable flight basis**

- Manifest based on:
 - Flight opportunities
 - Available manpower
 - *Available customer funds*
 - SMC/CC and HQ AFSPC approval



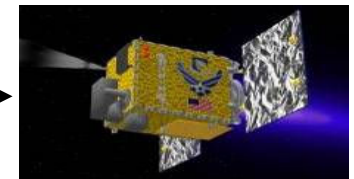


Space Experiments Review Board (SERB) Process



- Experiments must address operational need
- Strategic S&T investment for DoD
- Military Relevance is 60% of DoD SERB score

- AF
- AFRL
- Navy
- Army
- DARPA
- MDA
- NRO



DoD SERB

- SAF/USAL chairs
- Hears 15-min. brief from experimenter
- Multi-service membership
- Evaluates military relevance
- Does not evaluate funding
- Experiment may be kept off by maj. vote

SAF/USA

- Approves SERB List
- Approves missions >\$10M
- AF funding via Corporate process
- EA for DoD

STP

- Executes mission
- Approves missions <\$10M
- Satellite bus development
- Launch
- Operations (1 yr)
- Shuttle/ISS ops
- Does NOT fund experiments

Service & Lab SERBs

- Rank experiments
- Submit to DoD



SERB Annual Schedule



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
AFRL SERB						X						
Navy SERB							X					
AF SERB								X				
Other Service SERBs									X	X		
DoD SERB				Mid SERB							X	
SERB List												X

Notional timeline--actual dates dependant on individual organizations



Service SERB Process

- **AF10-1202, AR70-43, OPNAVINST 3913.1B provides Space Test Program (STP) Management guidance**
- **Service/Organization level SERBs administered by local directives**
 - Organization/Service determines: board membership, presentation requirements, scoring criteria
 - Results and required documentation from service SERB provided to SAF/USA

- **Air Force Coordinator:**

- Mr John Cao, AFRL/RVE, ABQ, 505-846-7222, john.cao@kirtland.af.mil

- **Navy Coordinator:**

- LCDR Richard Murphy, DoD STP, ABQ, 505-853-3766, richard.murphy@kirtland.af.mil

- **Army Coordinator:**

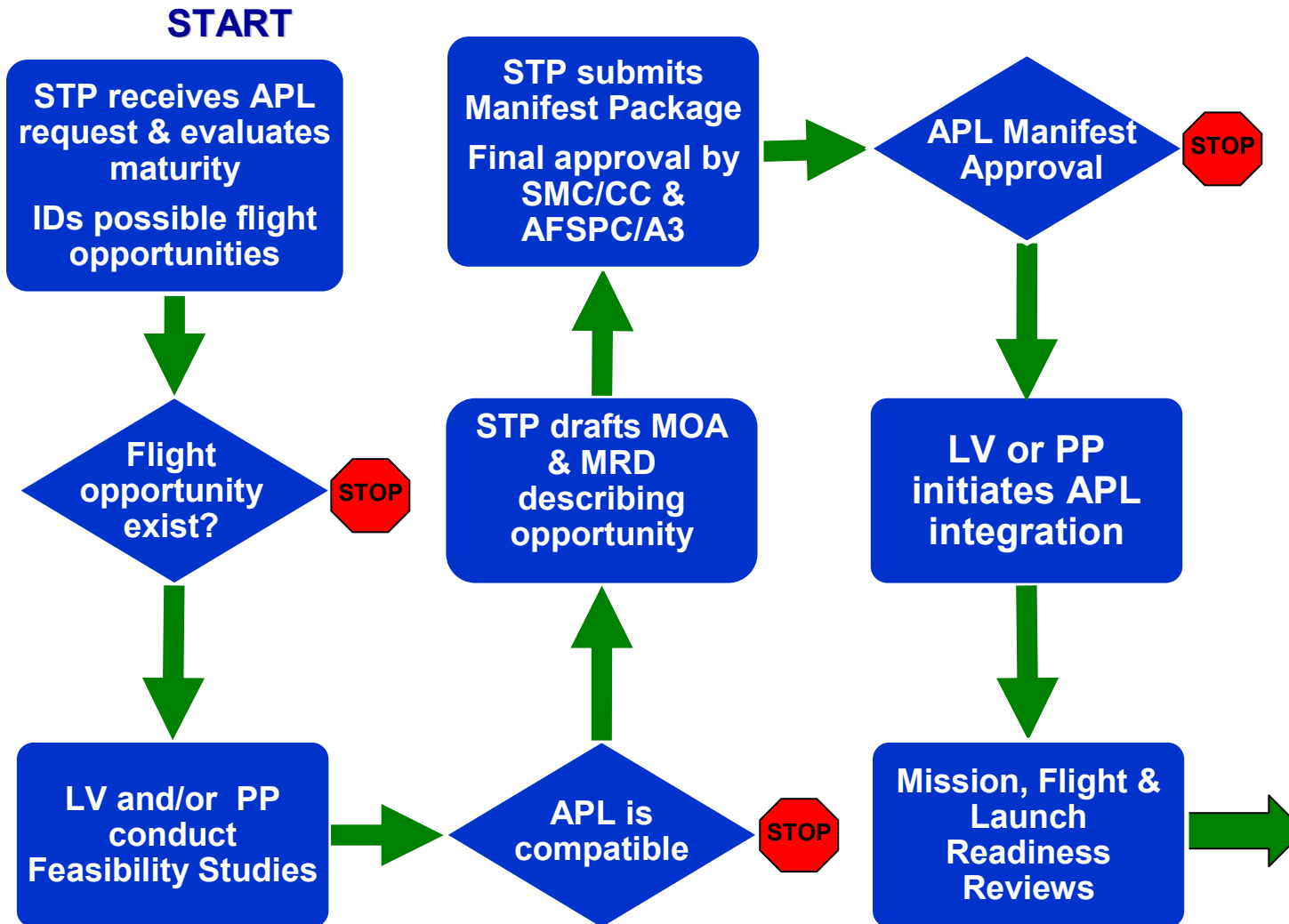
- Mr Stephen Cayson, USASMDC, AL, 256-955-3605, stephen.cayson@smdc.army.mil

- **For all other DoD sponsors contact:**

- Eric Thorson, SAF/USA, Washington D.C, 713-588-7379, eric.thorson.ctr@pentagon.af.mil



Auxiliary Payload Process



Reprinted courtesy of USAF



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STP Access to Space



- **Spaceflight Methods:**

- Shuttle/International Space Station (ISS)/Other NASA vehicles
 - Deployable, payload bay, mid-deck lockers, ISS internal/external
- Auxiliaries
 - Piggybacks payloads: leverage margin on existing SC
 - Secondary SC: leverage margin on existing LV
- Dedicated Launches (Minotaur, Falcon, Raptor, EELVs, sub-orbital sounding rockets)
- Also high-altitude balloons and zero-g flights



Atlas V



Space Shuttle



ISS



Zero G Flight



High-altitude balloon



Sounding rocket



Minotaur IV



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Setting Standards through Enablers



- Proactive measures to standardize SC design & construction
 - Based on 40+ years of lessons learned
 - Cohesive approach throughout space community
 - AFRL, ARMY, DARPA, NASA, NRL, NRO, SMC, along w/contractors and universities
- STP Enablers
 - EELV Secondary Payload Adapter (ESPA) CLASS SC
 - Standard Interface Vehicle (SIV)
 - Fast Affordable Science & Technology Satellite (FASTSAT)
 - Multi-Payload Adapter (MPA) - Minotaur IV
 - Hydrazine Auxiliary Propulsion System (HAPS) – Minotaur IV
 - Poly Picosatellite Orbital Deployer (P-PODs) / CubeSat
 - Accommodations on multiple LVs/SVs, Space Shuttle
 - Multi-Mission Space Operations Center (MMSOC) GSA

Maximize Launch Opportunities using Standardization



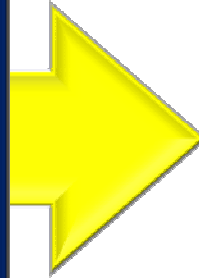
Spaceflight Standards (“Enablers”)



ESPA

(EELV Secondary Payload Adapter)

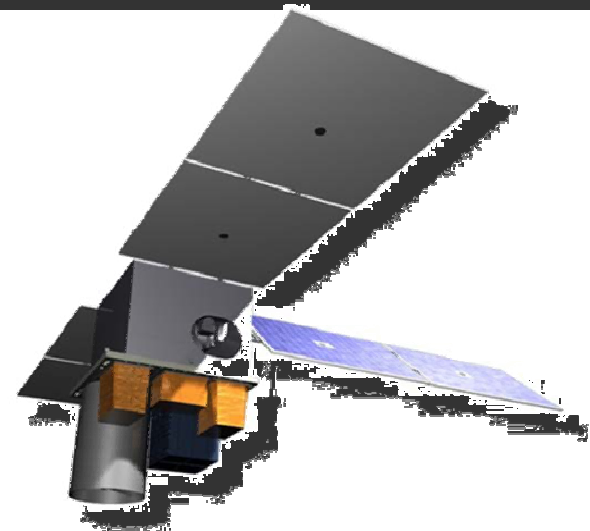
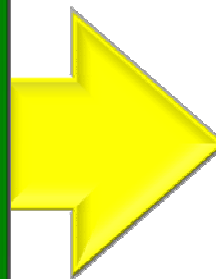
- SC weight $\leq 180\text{kg}$
- SC Volume – 35.5” x 28” x 24”
- CG Location - < 20 ” from the SSIP
- Mechanical Interface – 15”
- Electrical: Battery charge/monitor
- Fundamental Frequency $> 35\text{hz}$



SIV

(Standard Interface Vehicle)

- ESPA Class SC $\leq 180\text{kg}$
- 1-4 Experiments
- Heritage subsystems
- Compatible w/ multiple LVs
- Compatible w/ MMSOC & AFSCN
- Storable until launch identified





Spaceflight Standards (“Enablers”)



FASTSAT

(Fast Affordable Science & Technology)

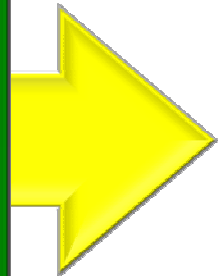
- 6 Expts on maiden voyage (MINI-ME, TDS, MST, TTI, PISA, Nanosail-D)



HAPS

(Hydrazine Auxiliary Propulsion System)

- Dual orbits from small LVs
- Precise orbit insertion
- First demo - STP-S26 ILC May 10





Spaceflight Standards (“Enablers”)



MPA

(Minotaur IV Multi-PL Adapter)

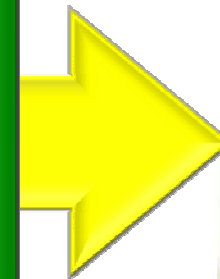
- Holds up to 4 ESPA Class SC
- Mass \leq 180kg
- Volume – 35.5” x 28” x 24”
- Maximizes lift capability
- First demo - STP-S26 ILC May 10



P-POD

(Poly-Picosat Orbital Deployer)

- 10x10x10 cm cube, ~ 1 kg mass (“1U”)
- Qualified LVs: Rockot, Dnepr, Minotaur I
- In Development: Falcon-1, Minotaur IV



1 U CubeSat
(Cal Poly1)



Cal Poly P-POD



MEPSI on STS-113 (Nov 02) & STS-116 (Dec 06)
Proximity Ops and Inspection



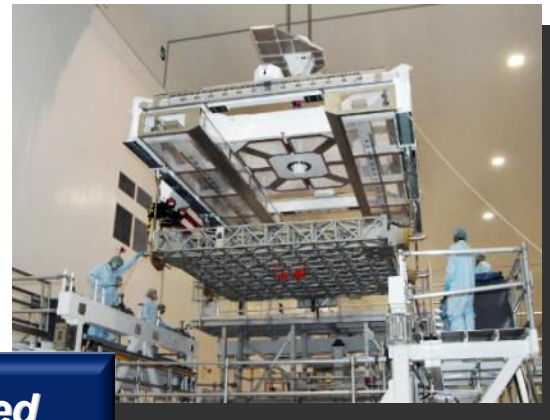
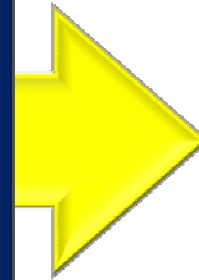
Spaceflight Standards (“Enablers”)



ELC

(Express Logistics Carrier)

- Reusable external platforms on the ISS
- 8 experiment locations
- 500 pounds, > 500 watts
- High and Low rate data
- 24 month design-to-flight ready

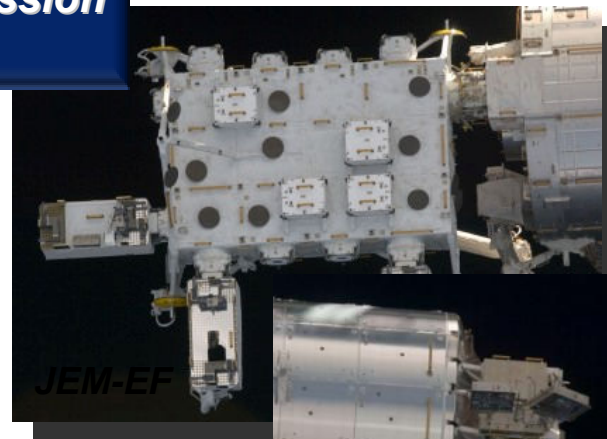
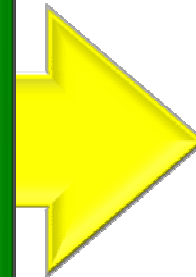


**ELC 1 & 2 Installed
During STS-129 mission
16 Nov 2009**

JEM-EF, COL-EPF

(Japanese Experiment Module External
Facility,
Columbus External Payload Facility)

- International Partner external ISS sites
- 4 JEM-EF, 2 COL-EPF available to US
- Similar to ELC; JEM-EF higher mass
- 30-36 month design-to-flight ready



Both Operational



Spaceflight Standards (“Enablers”)



ISS - Pressurized

- Internal experiment volume
- Express Rack, power and data
- Human in the loop testing
- 18-24 month design-to-flight ready



CRS

(Commercial Resupply Services)

- SpaceX and Orbital Sciences Corp
- Pressurized and unpressurized lift
- Sample return via SpaceX Dragon
- Exploring small sat deployment options



Expected to be Operational 2011



Current/Planned ISS External Payloads

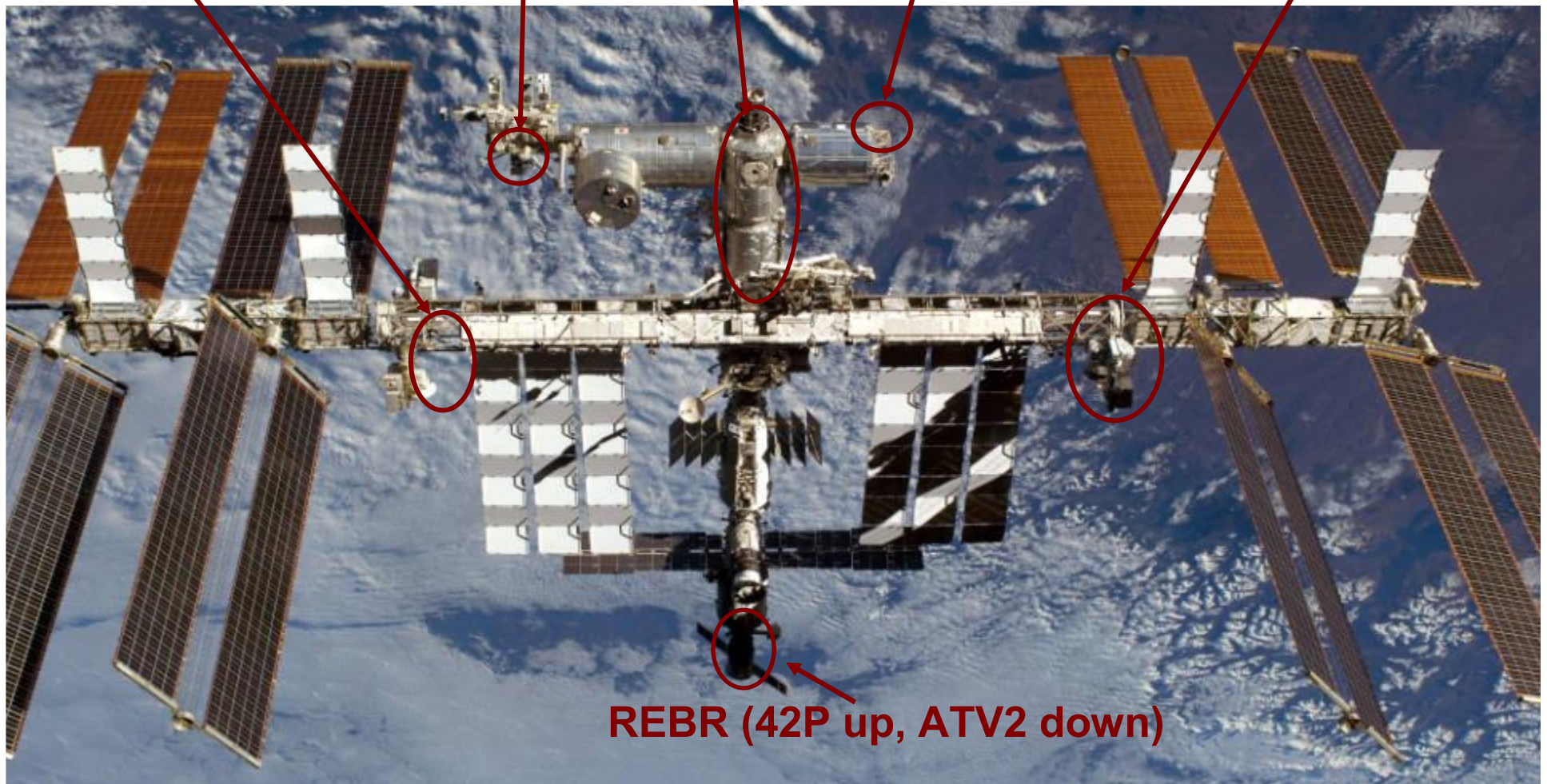
STP-H3
(Launches Jul 10
ELC#3)

HREP
(Launched Sep 09
JEM-EF)

MISSE 6 LWAPA
(returns Mar 10)

MISSE 7 & PRELSE
(Launched Nov 09
& Jul 10 ELC#2)

SPHERES



REBR (42P up, ATV2 down)

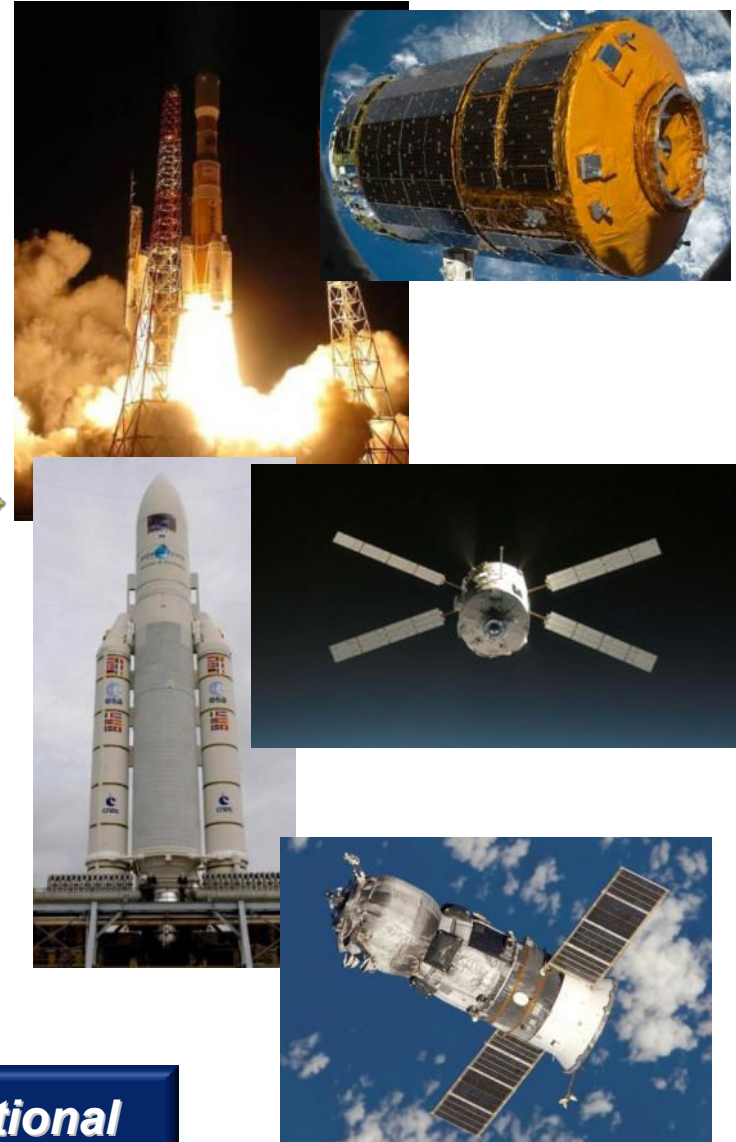


Spaceflight Standards (“Enablers”)



NASA International Partner Vehicles

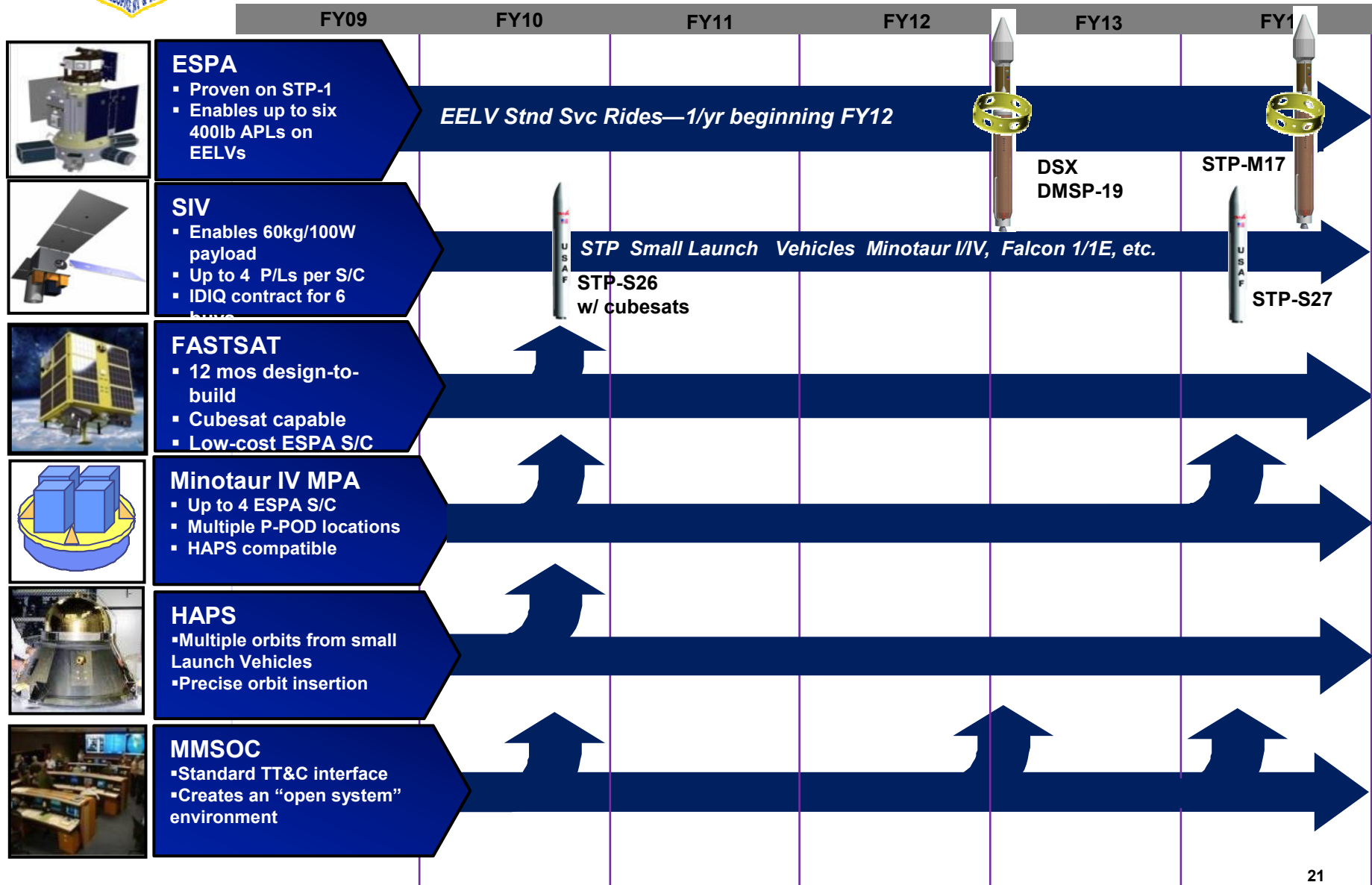
- Japanese H-IIB Transfer Vehicle
 - Pressurized and Unpressurized
 - JEM-EF & ELC payload lift
 - No return
- European Automated Transfer Vehicle
 - Pressurized payload lift
 - No return
- Russian Progress
 - Pressurized payload lift
 - No return
- Russian Soyuz
 - Primarily crew rotation
 - Very limited payload lift
 - Very limited sample return



All Operational

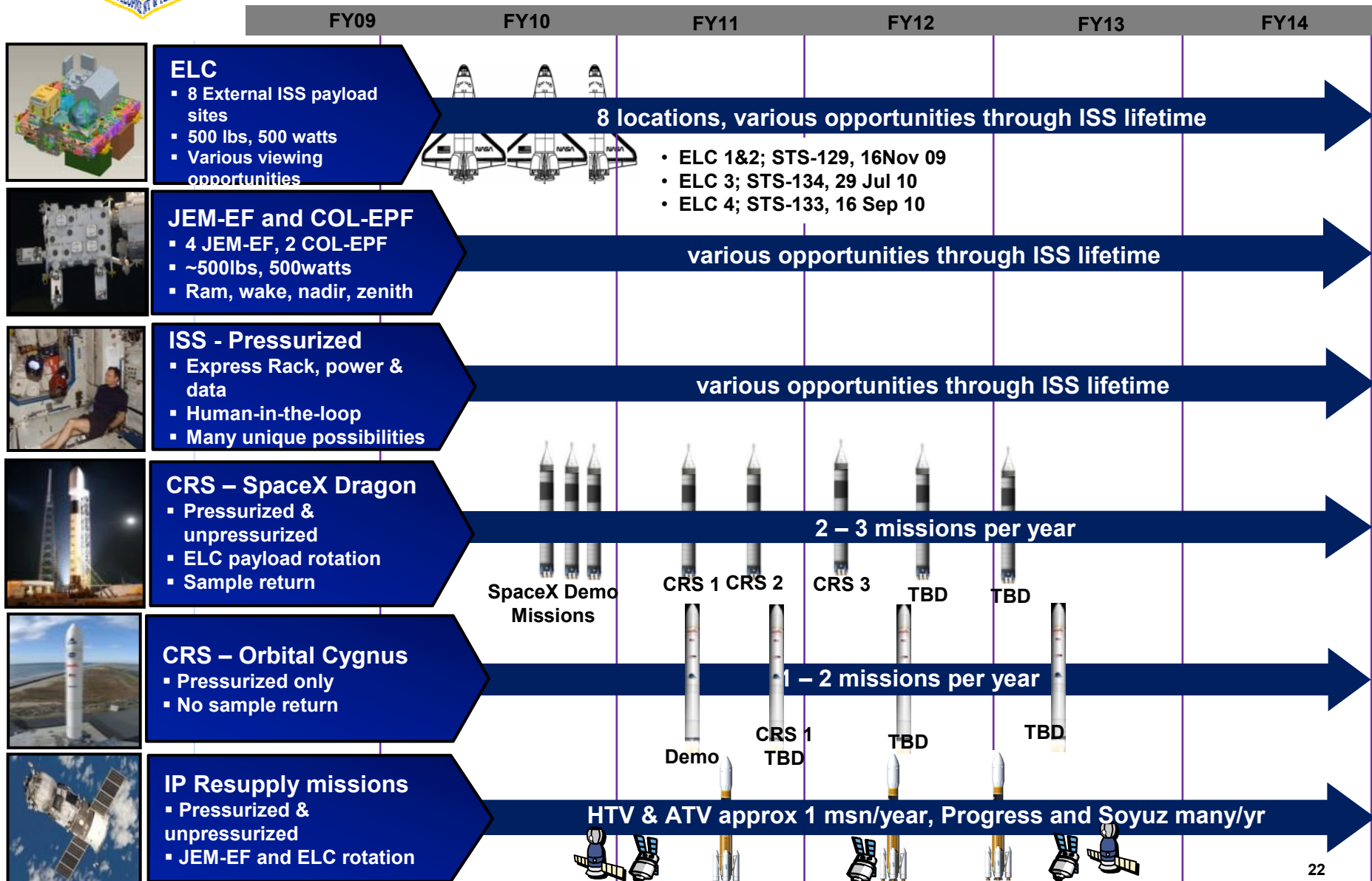


STP Enablers Roadmap





STP Enablers Roadmap





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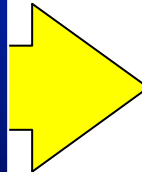


STP Rideshare



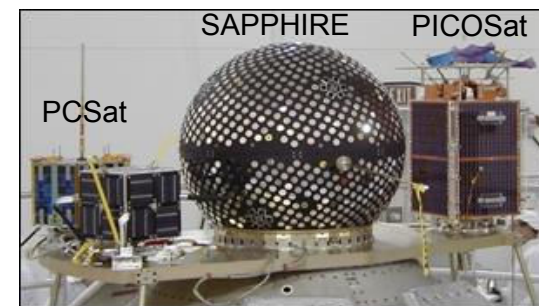
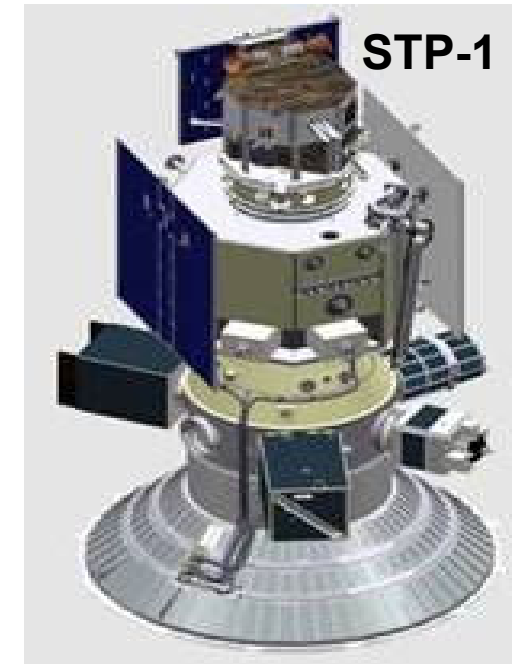
• Why Rideshare?

- ESPA Standard Service
- Standard Interface Vehicle
- M-IV Multi-Payload Adapter
- PPODs



**Standardization
Reduces:
Risk
Complexity
Cost**

- Dedicated launches too expensive
- Partnerships share the financial burden
- Innovation key to success
- DoD STP leads USG Rideshare Working Group
 - Explores USG, commercial & foreign launch opportunities
 - Builds partnership missions
 - Payloads include STP experiments & USG Auxiliary Payloads (APL)



Kodiak Star spacecraft suite



EELV Standard Service



- Expect one ESPA ring to fly a year starting 2012
- Multiple ESPA class SC opportunities a year
- All APLs through STP
- Various Orbits
- Cost TBD



SECRETARY OF THE AIR FORCE
WASHINGTON

February 13, 2008

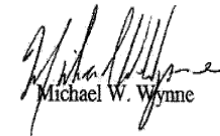
MEMORANDUM FOR AFSPC/CC

SUBJECT: EELV Secondary Payload Adapter (ESPA) Policy

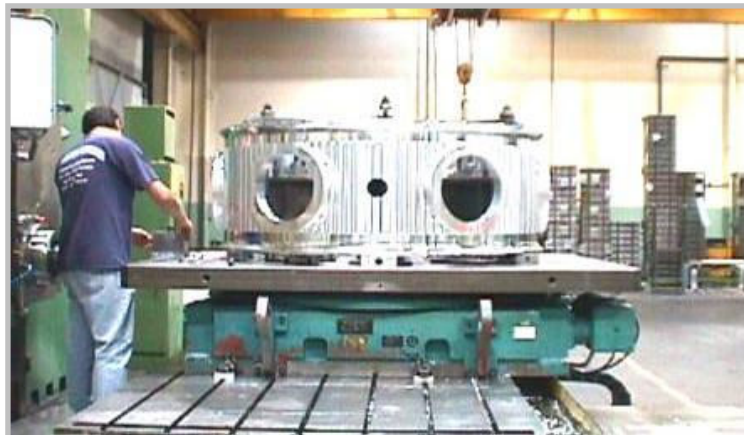
The Air Force has many Evolved Expendable Launch Vehicle (EELV) missions programmed across the FYDP with anticipated excess weight margin. We should leverage this excess capacity by maximizing our use of the EELV Secondary Payload Adapter (ESPA), which was successfully demonstrated in March 2007 on STP-1. As such, it is my policy to make ESPA-hosted satellite launches a routine operation starting NLT FY12.

I would like Air Force Space Command (AFSPC) to develop an ESPA utilization plan and implementation guidance in time to support the FY10 POM. AFSPC should also continue near-term efforts to make the ESPA available as a low-cost, highly reliable, standardized service for small payloads when technically feasible and consistent with overall mission assurance.

This policy is an important milestone in our efforts to provide routine and affordable access to space for scientific, research, development, and Operationally Responsive Space (ORS) missions. I look forward to your continued support in this endeavor.


Michael W. Wynne

cc:
SAF/US
AFPEO/SP
AF/A3/5
AF/A8
AFRL/CC





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Summary



- **STP has a long history of creating successful collaborative missions to provide experiments and auxiliary payloads with access to space.**
- **Payloads can come to STP either via the SERB for a subsidized flight or as a reimbursable.**
- **Personnel at STP are experienced and well versed at developing creative and cost effective missions designed to maximize government and/or customer resources.**





QUESTIONS?

