

# Space and Missile Systems Center

---



## Acquisition Strategy Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) Space Block 0 Program

24 Sep 2018

Col Dennis O. Bythewood  
System Program Director

**Version 4**



# Agenda

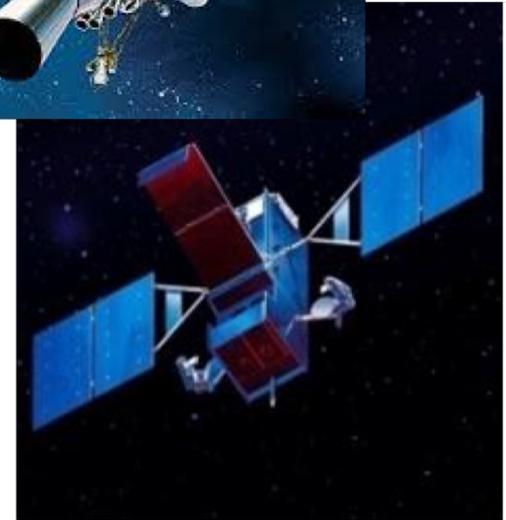
- Strategy for a Capable, Resilient, Defendable Missile Warning Architecture
- Future Next-Gen OPIR Space and Ground Architecture
- Acquisition Strategy
- Schedule
- Funding
- FY18/19 Funding Detailed Breakout
- Contractor/Government Activities

**AF understands requirements and industry capabilities.  
AF strategy will meet JROC mandate & make speed a strategic advantage**



# Space as a Warfighting Domain

- **Adversaries recognize the advantage the U.S. gains from operating in space**
- **Responding by**
  - Fielding their own systems to exploit the domain
  - Holding our systems at risk to deny our ability to operate freely in a conflict
- **Strategically survivable missile warning is foundational to deterrence ... must protect and defend**
  - First alert of ballistic missile launch
  - Next-Gen OPIR key to attribution
  - Without it, USSTRATCOM would require heightened, resource-intensive posture



**Our Historical Advantage is Under Threat**  
 Requires change in mindset ... rapidly deliver capability,  
 continually adjust to threat, leverage enterprise capabilities

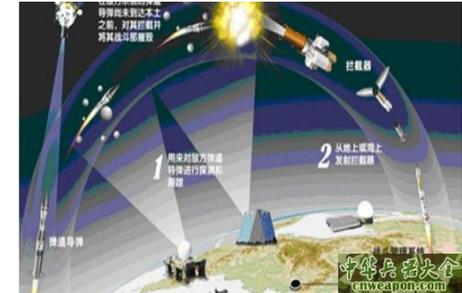


# OPIR is Critical Capability

*Must Protect and Operate Through*

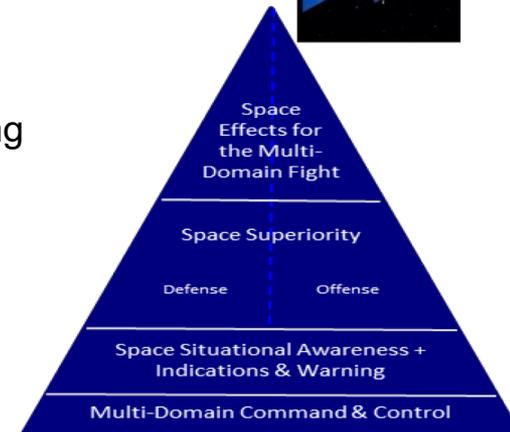
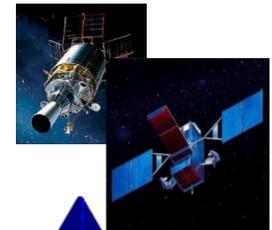
## ■ Current SBIRS satellite design limits growth & resiliency

- Current sensor design not adaptable to changing adversary threat environment
- Enterprise space defense requires satellites that can participate in their own defense
  - Maneuver, ability to host adjunct payloads critical... requires Size, Weight and Power (SWaP) margin to accommodate



## ■ Modernized strategically survivable space layer sets new paradigm

- Leverages production satellite buses (2 vendors); capitalizes on Gov't investments & establishes continuously competitive environment
- Competitively selected mission payload addresses all core Missile Warning requirements
  - As good as legacy plus SWaP/modularity needed for threat response
  - High technology readiness allows AF to simplify the mission payload
- Space Security & Defense Program analysis indicates a significant survivability improvement attainable





# OPIR is Critical Capability

*Must be Agile to the Threat*

## ■ Current SBIRS ground design limits growth & resiliency

- Stove-piped solution promulgates vendor lock/reduced responsiveness to adversary threat

## ■ Modernized ground sets new paradigm

- Increased agility to meet emerging threats
  - System architecture that is modular & scalable
  - New missile warning capabilities more frequently and efficiently
- Rapid integration of new sensors
  - Sensor agnostic & extensible to other data sources
  - Common standards where applicable
- Automated satellite operations
- Competition via 3<sup>rd</sup> party applications
- Own the technical baseline





# Program Requirements

*Threat has Voted ... Schedule is Paramount*

- **Block 0 requirement set validated by Joint Requirements Oversight Council (JROC) on 12 Dec 17, contained in JROC Memo 130-17 gave following priorities:**
  - “Schedule is paramount...Air Force shall return to JROC if the AF requests to delay the program past 2025”-- Support 1<sup>st</sup> GEO Space Vehicle initial launch capability by FY25 to meet early 2020’s threat
  - Sensor performance to counter emerging threats
  - Resiliency features to increase strategic survivability
- **Two JROC Key Performance Parameters: Missile launch detection & Survivability**
  - Peacetime probability of warning: Block 0 must accurately report launches of missiles with a range at a certain percentage by a specified time in a peacetime environment
  - Survivable/Endurable probability of warning : Block 0 must accurately report launches of missiles with a range at a certain percentage by a specified time in a trans-nuclear attack (survivable) and post-nuclear attack (endurable) environment
- **Inherent capability to augment Missile Defense, Battlespace Awareness, and Technical Intelligence mission areas**
- **Integration into Next-Gen OPIR Ground’s Future Operationally Resilient Ground Evolution Mission Data Processing & Enterprise Ground Services**
  - Off-ramp option to integrate into SBIRS Block 20 ground system

**SECAF set aggressive goal for AF to deliver 1<sup>st</sup> GEO in 5 years**

“As we develop these new systems, speed matters ... The next generation missile warning satellite will be a pacesetter.” - Secretary of the Air Force Heather Wilson



# Rapid Acq Authorities Essential

2016 NDAA Section 804

- **Middle Tier of Acquisition (Rapid Prototyping/Rapid Fielding)**
  - Rapid Prototyping: ... rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs
  - Rapid Fielding: ... field production quantities of new or upgraded systems with minimal development required
- **Prototype priorities fully aligned to JROCM 130-17**
  - Speed – Threat relevant delivery
  - Capability – Mission performance against KPPs
  - Resilience – Defensible within space enterprise
- **Prototyping “mindset” aligned with JROCM direction**
  - Shortened chain of command for critical decisions
  - Small, fast-moving team with authority to make delegated decisions
  - Real-time acquisition/warfighter requirements trades
  - Rigid decision gates to control requirements/ensure focus on capability delivery
- **Focus on schedule paramount ... but not “5 years or bust”**
  - 5 years = Gold Medal
  - 7 years or less is a win

**Must use Rapid Acquisition Authorities**



# Next-Gen OPIR Block 0 Acquisition Strategy (GEO)



- **Sole-Source Award for 3 Next-Gen GEO (NGG) Missile Warning satellites to LMS with a two-phase contracting strategy**
  - **Phase 1: UCA ATP to CDR: Immediately start system design/critical path flight hardware procurement**
    - Leverage A2100TR design activities from SBIRS GEO-5/6
    - LMS-executes payload competition
      - 2 pronged strategy; highly incentivize spiral development for “faster” delivery
        - Objective: bus/payload delivery < 4 years & ready for launch in 5 years
      - Maintain up to 2 payload vendors through delivery
      - Select 3<sup>rd</sup> space vehicle’s payload vendor based on execution performance
  - Include integration requirements and design to host resilience payloads
  - Definitize contract within 6 months of qualified proposal
  - **Phase 2: Release RFP post-NGG Preliminary Design Review; award mod to LMS for final build, assembly integration and test, and launch support**
    - Integration of secondary/resiliency payloads



# Next-Gen OPIR Block 0 Acquisition Strategy (Polar)

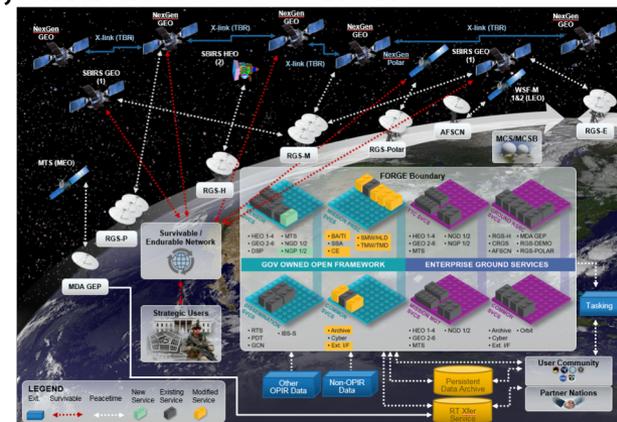
- **Sole-Source Award for 2 Next-Gen Polar (NGP) missile warning satellites to NGAS with a three-phase contracting strategy**
  - **Gov't assesses Molniya as optimal Polar orbit for cost and performance effectiveness and reduced programmatic risks**
  - **Phase 0: UCA for initial requirements study**
    - Leverages previous Eagle-3 designs
    - Requirements definition to meet System Requirements Review
  - **Phase 1: Complete design for production work from ATP to CDR**
    - Procurement of critical path flight hardware items to reduce schedule risks
    - Mature the designs for survivability modifications of Eagle-3 bus
    - Integration requirements and design to host secondary/resiliency payloads
  - **Phase 2: Build, integrate/test, launch, and transition to operations 2 fully integrated Next-Gen Polar SVs**
    - Integration of secondary/resiliency payloads





# Next-Gen OPIR Block 0 Acquisition Strategy (Ground)

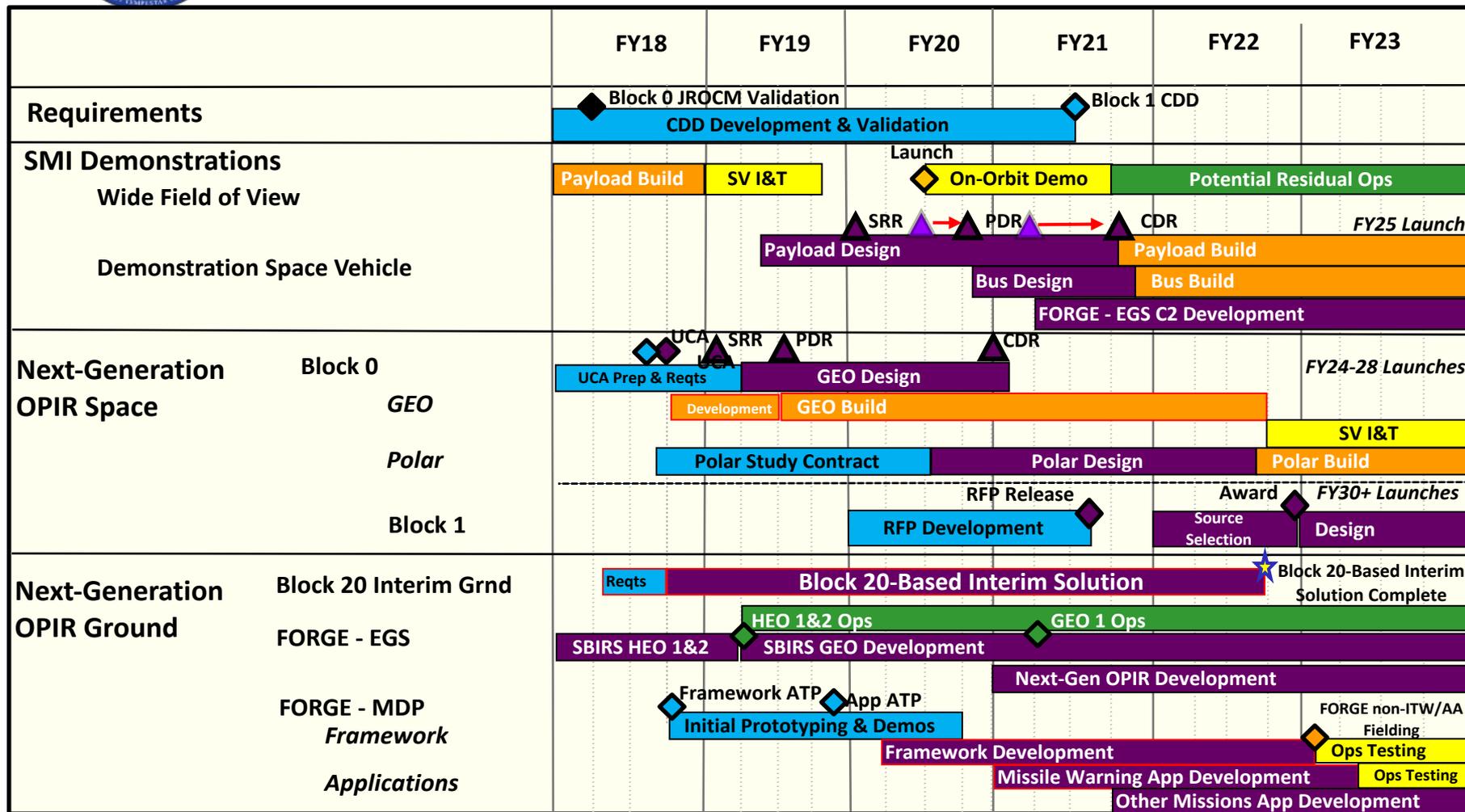
- **Government acts as “general contractor”**
  - Responsible for overall system delivery
  - Utilizes subject matter experts (government team or studies) to perform initial systems engineering
  - Utilizes other Gov organizations to ensure successful delivery
- **Multiple contacting strategy (FY18-19)**
  - Competitive and sole-source across activities
  - Utilization of OTAs for rapid prototyping, competition, and access to non-traditional industry partners
    - Kick-off mission processing framework prototype and down-select
    - Kick-off mission application and software architecture
  - Maximum utilization of existing contacts
  - Field initial SBIRS C2 on Enterprise Ground Services





# Next-Gen OPIR

## SECAF 5-Yr Goal Schedule

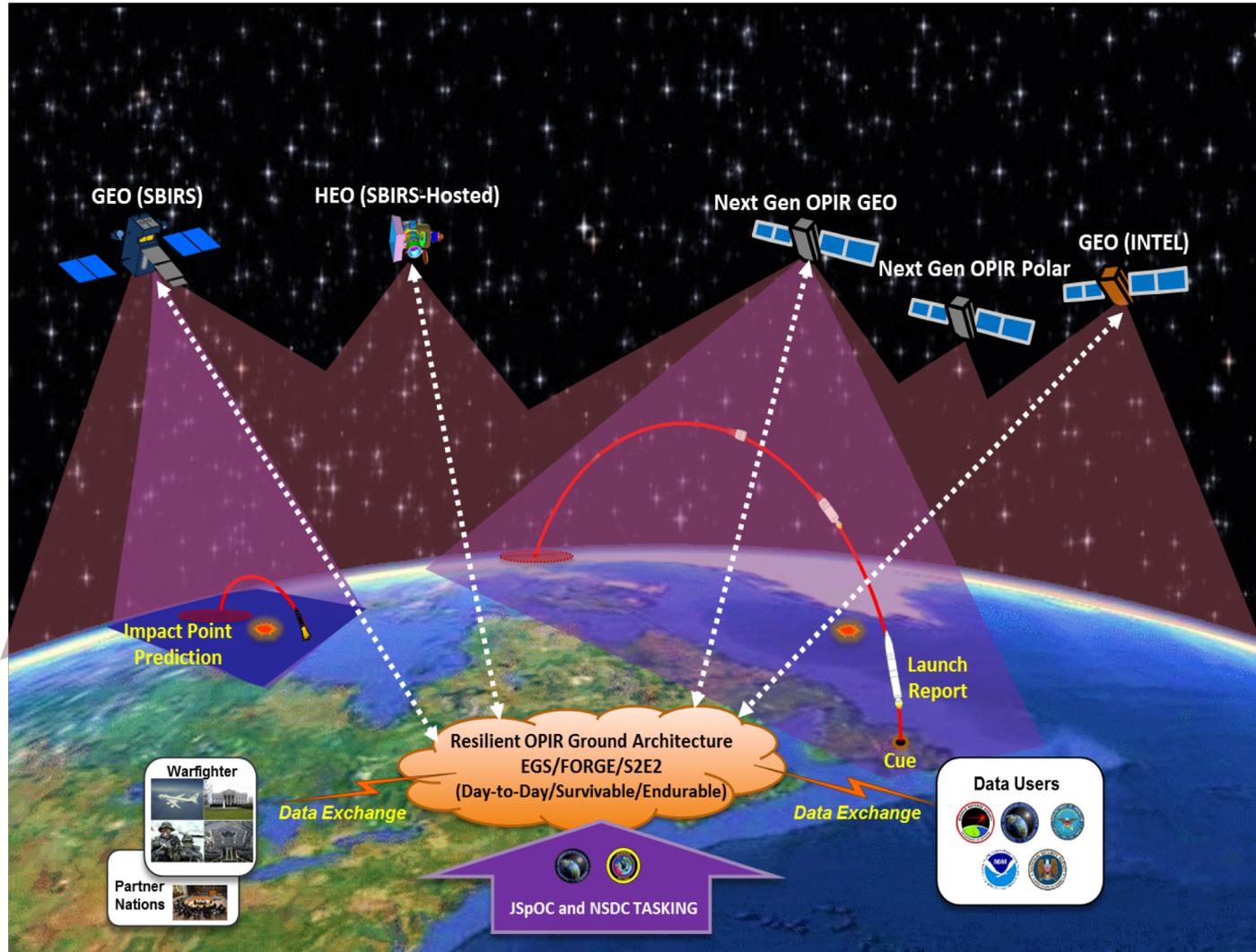


ATP: Authority to Proceed  
 CDR: Critical Design Review  
 PDR: Preliminary Design Review  
 RFP: Request for Proposal  
 SRR: System Requirements Review  
 SV I&T: Space Vehicle Integration & Test



# Next-Gen OPIR Architecture

Capable, Resilient, Defensible



## Next-Gen Polar free-flyer satellites

- High-latitude coverage

## Next-Gen GEO satellites

- Mid-latitude global coverage

## Future Operationally Resilient Ground Evolution (FORGE)

- Modular, open framework ground modernization effort for mission data processing and Command and Control

## Relay Ground Stations (RGS)

- Relay downlinked satellite data; Europe and Pacific locations

## Mobile Ground System (MGS)

- USSTRATCOM survivable/endurable requirements with SBIRS Survivable Endurable Evolution (S2E2)



# Funding Requirements

Requirement	FY18	FY19	FY20	FY21	FY22	FY23	FY24	Total
<b>Product Development</b>	<b>634.9</b>	<b>1004.9</b>	<b>1266.1</b>	<b>1644.1</b>	<b>1880.9</b>	<b>1938.7</b>	<b>2127.6</b>	<b>10497.2</b>
<b>Space</b>	<b>428.7</b>	<b>568.3</b>	<b>794.2</b>	<b>921.5</b>	<b>1112.1</b>	<b>1332.9</b>	<b>1542.7</b>	<b>6700.4</b>
Block 0 - GEO	414.0	524.7	676.4	599.4	694.4	584.9	454.5	3948.2
Block 0 - Polar	9.0	32.4	89.7	266.6	333.2	499.6	498.8	1729.4
Block 1 - GEO	0.0	0.0	0.0	0.0	0.0	166.6	513.3	679.8
CGR, SBIR, CC Cont Withhold	5.7	11.2	28.1	55.5	84.6	81.8	76.1	343.0
<b>Ground</b>	<b>60.8</b>	<b>233.0</b>	<b>230.1</b>	<b>464.6</b>	<b>505.5</b>	<b>313.3</b>	<b>279.5</b>	<b>2087.0</b>
<b>SMI</b>	<b>127.1</b>	<b>171.4</b>	<b>179.2</b>	<b>186.3</b>	<b>180.6</b>	<b>200.6</b>	<b>216.8</b>	<b>1262.1</b>
Technical Mission Analysis	11.9	8.9	30.7	29.2	36.2	33.9	28.8	179.6
SE&I	6.4	19.2	28.3	38.8	42.8	44.2	45.5	225.2
Product Support	0.0	4.1	3.5	3.6	3.7	13.8	14.2	43.0
<b>Management Services</b>	<b>36.1</b>	<b>38.3</b>	<b>77.4</b>	<b>99.6</b>	<b>120.8</b>	<b>115.9</b>	<b>109.2</b>	<b>597.2</b>
FFRDC	9.7	5.3	20.3	18.4	25.6	24.1	20.9	124.4
A&AS	11.6	18.4	29.3	38.8	43.2	43.6	44.9	229.8
Other Support	14.8	14.6	27.8	42.4	51.9	48.3	43.3	243.0
<b>Total Requirement</b>	<b>671.0</b>	<b>1043.3</b>	<b>1343.5</b>	<b>1743.6</b>	<b>2001.7</b>	<b>2054.7</b>	<b>2236.7</b>	<b>11094.4</b>
<b>FY19 PB</b>	<b>327.0</b>	<b>643.3</b>	<b>911.5</b>	<b>1493.1</b>	<b>2257.8</b>	<b>2014.8</b>	<b>1843.9</b>	<b>9491.4</b>
<b>Delta</b>	<b>(344.0)</b>	<b>(400.0)</b>	<b>(432.0)</b>	<b>(250.5)</b>	<b>256.1</b>	<b>(39.9)</b>	<b>(392.8)</b>	<b>(1,603.1)</b>

Downselect to one Payload Vendor at CDR – best mitigates payload detailed design risk, does not mitigate assembly, integration and test risk

Balances payload risk mitigation vs outyear funding spikes

Delivers 3 resilient satellites on orbit by FY28



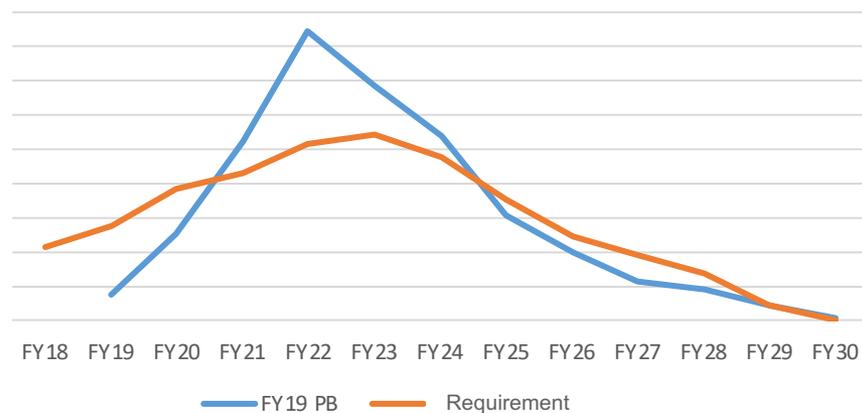
# NEXT GEN BLOCK 0 GEO & POLAR

## FY18 ATR JUSTIFICATION

### Strategy Meets JROCM requirements—IJC25

- Both GEO and Polar Contracts in place (13 August)
- FY18 (\$344M) & FY19 (\$400M) Above Threshold Reprogramming fills gap in early funding
  - Begins critical path development/parts buys
  - Lowers program risk
  - Reduces inefficient funding spike in FY19 PB

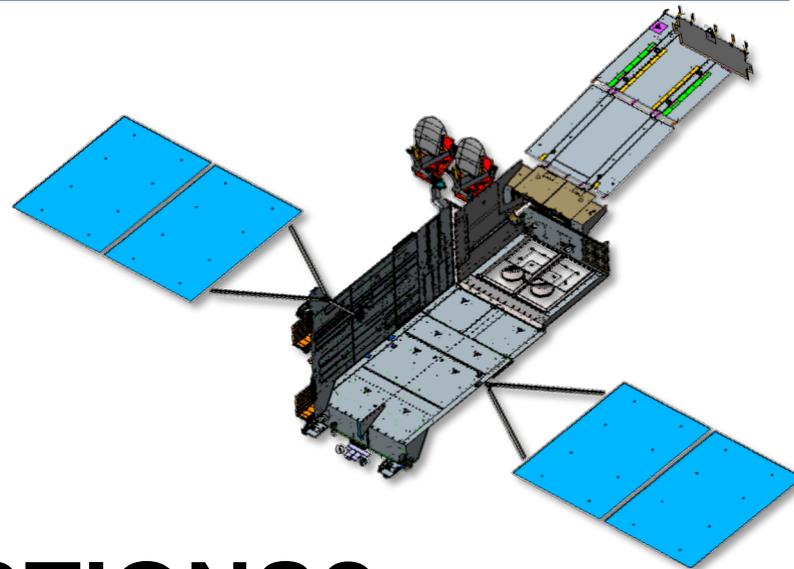
Funding Profile Comparison (Block 0 GEO & Polar)





# NGG contractor cost breakout FY18/19 By Quarter

\$M	4QFY18	1QFY19	2QFY19	3QFY19	4QFY19
Mission Payload Materials & Labor 50-60%	<ul style="list-style-type: none"> <li>- Award 2 Payload subcontracts</li> <li>- Start 2 Focal Plane Development</li> <li>- Requirements development for Optical/Mechanical/Electrical</li> <li>- Prepare for Long Lead Parts &amp; Subcontractor awards</li> <li>- Analysis activity for Nov 18 Next Gen GEO (NGG) Systems Requirements Review (SRR)</li> <li>- Mission Payload onboard processing architecture study (includes long lead parts for signal chain demo)</li> </ul>	<ul style="list-style-type: none"> <li>- Engineering Development Unit (EDU) material procurement</li> <li>- Initiate Procurement of long lead (focal plane, ROICs, cryo cooler, electronics &amp; mechanisms to include motor drive electronic design, LOSC design, CDH design, Beryllium procurement, pointing and control assembly design work)</li> <li>- Engineering to Payload SRR</li> <li>- Start Preliminary design activity</li> <li>- Mission Signal Chain testbed development (x2)</li> </ul>	<ul style="list-style-type: none"> <li>- Continue Preliminary design and start preparations for Payload Preliminary Design Review (PDR)</li> <li>- Pointing/Control Assembly design, EDU development</li> <li>- Mirror design/development</li> <li>- Electronics</li> <li>- Payload PDR (vendor A &amp; B)</li> <li>- Fabricate EDU Focal Plane Wafers</li> <li>- Procure EDU parts/materials</li> <li>- Design &amp; Develop Payload STE</li> </ul>	<ul style="list-style-type: none"> <li>- Perform preliminary design for lower level components</li> <li>- EDU build and test EDU Focal Plane Assembly</li> <li>- Fabricate Opto-mech EDU parts</li> <li>- Assemble electronic EDUs</li> </ul>	<ul style="list-style-type: none"> <li>- Perform detail design and analysis for flight CDR</li> <li>- Test EDU Focal Planes</li> <li>- Assemble Opto-mech EDU</li> <li>- Test electronics EDUs</li> <li>- Analyze estimated payload performance</li> </ul>
Space Vehicle Labor 10-15%	<ul style="list-style-type: none"> <li>- Requirements definition and SV analysis for Nov 18 NGG SRR</li> <li>- Evaluate Auxiliary Payloads &amp; Integration</li> <li>- SV subsystem redesign initiation to accommodate resiliency reqmts (prop tank, comm subsystem, C&amp;DH, FSW, GNC, Structures)</li> </ul>	<ul style="list-style-type: none"> <li>- Design activity for new RF Boxes, Electronics (ASIC development) payload interfaces, Propulsion, Electrical systems integrations, Software Design requirements, Engineering through low level SV PDRs</li> <li>- Complete communication architecture design trades</li> </ul>	<ul style="list-style-type: none"> <li>- Design activity for new RF Boxes, payload interfaces, Propulsion, Electrical systems integrations, Software Design requirements, Engineering through low level SV PDRs</li> <li>- Hold SV PDR</li> <li>- Develop STE for SV to Payload interface</li> </ul>	<ul style="list-style-type: none"> <li>- Perform detail design and analysis leading upto component to support completion of EDUs</li> <li>- Fabricate and assemble EDUs and coupons</li> <li>- Support for subcontracts and procurements</li> </ul>	<ul style="list-style-type: none"> <li>- Generate first iteration of analysis products to support upcoming CDRs</li> <li>- Test EDUs and Coupons</li> <li>- Support for subcontracts and procurements</li> </ul>
SEPM/Ground Labor 10-15%	<ul style="list-style-type: none"> <li>- Requirement analysis support to OPIR Enterprise SRR (Sep 18)</li> <li>- Requirements definition and mission analysis for Nov 18 NGG System SRR</li> <li>- Architectural and concept design studies (communications architecture, Crypto, cybersecurity, TT&amp;C for aux payloads)</li> </ul>	<ul style="list-style-type: none"> <li>- Engineering activity to development/modify CONOPS, Interface development, Integration and test planning, Cyber Assessment, Resiliency incorporation, and other specialty engineering through low level PDRs</li> <li>- Hold NGG System SRR and flow requirements for major subsystem</li> </ul>	<ul style="list-style-type: none"> <li>- Engineering activity to development/modify CONOPS, Interface development, Integration and test planning</li> <li>- Cyber Assessment, Resiliency incorporation, and other specialty engineering through low level PDRs</li> <li>- Design Next Gen Interim Operations (NIO) ground system through CDR</li> <li>- Begin design of mission performance simulators</li> </ul>		
Bus Subcontracts, Parts & Materials 10-20%	<ul style="list-style-type: none"> <li>- Initiation of subcontracts for COMSEC-TRANSEC processor, High Rate Transmitter (new design for NGG), Payload Data Formatter &amp; GPS receiver</li> </ul>	<ul style="list-style-type: none"> <li>- Incremental funding for initial subcontracts</li> <li>- Initiation of subcontracts for on-board computer, Guidance Navigation &amp; Control components, 25lbs hydrazine biprop engines</li> </ul>	<ul style="list-style-type: none"> <li>- Initiation of subcontracts for other Propulsion hardware, solar array &amp; mechanisms</li> <li>- Other Bus subcontracts as required to meet the schedule</li> </ul>	<ul style="list-style-type: none"> <li>- Subsystem PDRs</li> <li>- Incremental funding for parts/materials subcontracts</li> </ul>	<ul style="list-style-type: none"> <li>- Subsystem PDRs</li> <li>- Incremental funding for parts/materials subcontracts</li> </ul>



**QUESTIONS?**

