Filling the Gaps

The mid term and long term future of
US Human Space Flight

CSIS | CENTER FOR STRATEGIC & INTERNATIONAL STUDIES | Space Initiatives

Characterizing the Gaps

US Human Space Flight Gap

- No US HSF capability for ≥5 years
- Sole reliance on Russia
- Constellation faces several technical and budgetary challenges that could delay the program past its current 2015 IOC date

ISS Utilization Gap

- Ability of international partners to use ISS for research will be severely constrained
- Without research capability, ISS could be deemed a failure
- An ISS failure would jeopardize future European and Japanese HSF

Moon Gap

- Above gaps combine to threaten US plans to return humans to the lunar surface and establish a permanent, international presence there.

Characterizing the Gaps

All three gaps are:

- **Related to space transportation,**
- **National and international issues,**
- **Requiring international coordination.**

ESAS perfectly accounted for all three gaps, in theory, however, in practice, things did not unfold according to plan.

Ares 1, as it stands today, is the critical path for the three gaps

Any delay in the current plan extends all three gaps (lack of robustness)

► **Need for Mitigation**

Main US Goals for Mitigating the Gaps

- **Retire the shuttle**
- **Make a success of the ISS**
- **Return to the moon, in collaboration with international partners, by 2019**
  - 2019 = 50th Anniversary of Apollo 11

Main Constraints for Mitigating the Gaps

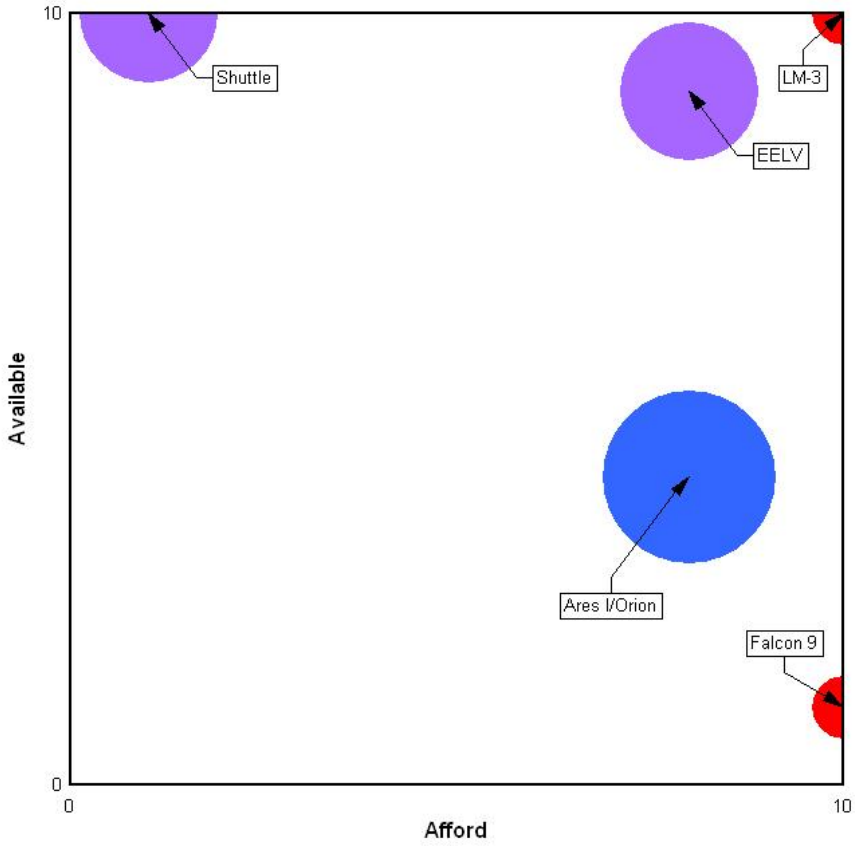
- Renewed US leadership
- Acknowledgement/engagement of emerging international players
- Workforce issue
- Budget issue
- Pragmatic approach
- A huge overcapacity of existing launchers

Options (one or more of the following)

- **Postpone shuttle retirement**
- **Accelerate Ares I/Orion and Ares V**
- **COTS-D**
  - As currently planned
  - EELV/Orion-lite
- **Enhanced international cooperation**
- **DIRECT**

Identified Criteria

- **Safety**
  - Launch Abort System on capsule normalizes safety across different scenarios
- **Availability**
- **Affordability**
- **Capability**
  - Current and future (LEO and beyond)
  - Interoperability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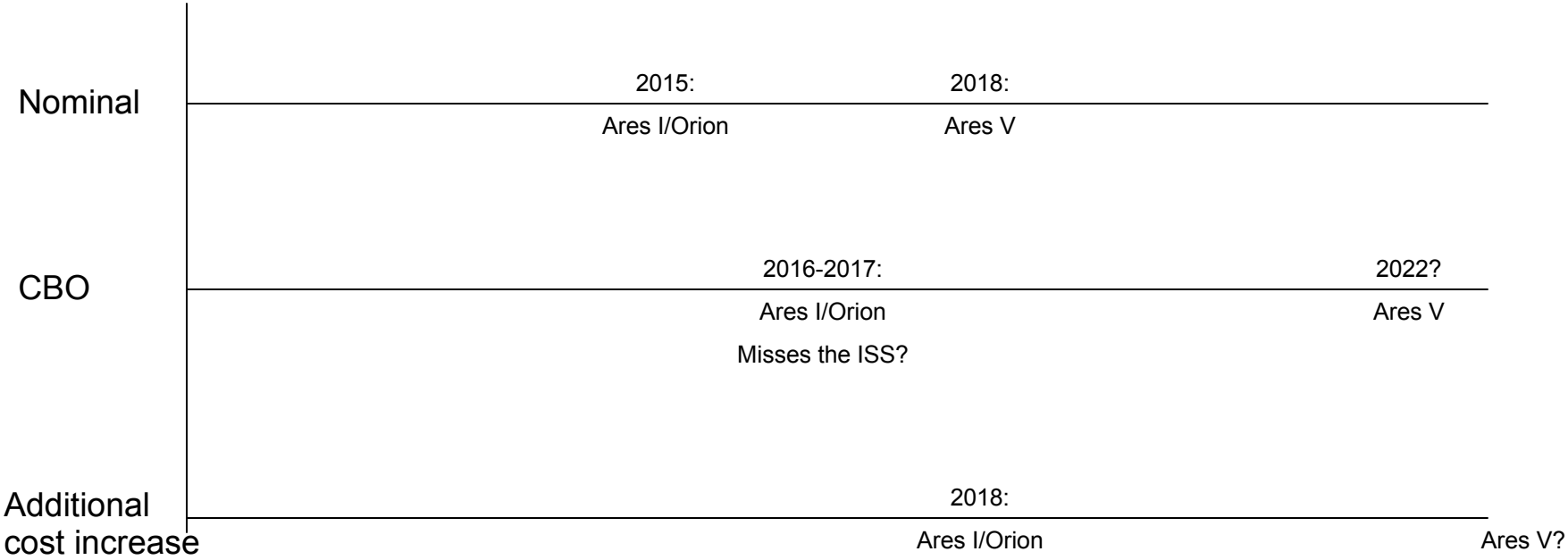
Available
Afford
Shuttle
LM-3
EELV
Ares I/Orion
Falcon 9

Scenario Analysis

- How much more money for HSF?
- How many more shuttle flights?
- How many more years to use the ISS?
- How long a delay for Constellation?
- How long a delay on Ares V?

Scenario One: Maintain status quo



Scenario Two: Addt'l $2B/year for HSF

- **Secures current timetable for Constellation (protects against delays caused by cost increase) - $14B**
- **Fly the shuttle for two more years – two flights/year (compatible with existing hardware) - $4B**
- **Invest in a COTS-D that takes full advantage of existing launchers - $2B**
- **To get to an additional $2B for HSF, NASA would need an overall increase of $3-4B ($2B campaign promise is for all NASA)**

Scenario 3: Addt'l $1B/year for HSF

- **Ares I/Orion unchanged – leave it to NASA to manage**
- **Put additional money to Ares V to ensure it is available by 2018 - $8B**
- **For the remaining $2B:**
  - Invest in a COTS-D that takes full advantage of existing launchers
  - OR, make a smaller investment in COTS-D and extend the shuttle a year