

## Space Shuttle Program 2020 Assessment

The Space Shuttle Program 2020 Assessment was a NASA effort commissioned by then Office of Space Flight, Associate Administrator, Fred Gregory, in March 2002, to identify and prioritize the future investments required to safely and effectively fly Shuttle through 2020. At the time the 2020 Assessment was commissioned, the Shuttle service life was planned through 2012. This assessment was viewed as a prudent step to better understand what might be required to extend the planned service life of the Space Shuttle.

The Space Shuttle Program office, working with its contractors, conducted the preliminary effort between March and August of 2002, with activities planned to continue through August of 2003 leading to specific recommendations for new activities to start in FY 2004. Preliminary results of this assessment were briefed to NASA Headquarters in August of 2002 and provided information used during formulation of the revised Integrated Space Transportation Plan (ISTP) and development of the FY 2003 Budget Amendment. As elements of the revised ISTP and the amendment, the Shuttle Service Life Extension Program (SLEP) was created to extend the life of the Shuttle to the middle of the next decade.

While the August 2002 preliminary results of the 2020 Assessment were very helpful for formulating the ISTP revision and FY 2003 Budget Amendment, a more rigorous assessment process was sought in support of the new Space Shuttle Service Life Extension Program. In December 2002, the Office of Space Flight Deputy Associate Administrator for International Space Station and Space Shuttle Programs, Michael C. Kostelnik, established plans for an annual SLEP Summit as a process to both prioritize short-term needs and endorse long-term requirements to safely fly the Space Shuttle to meet the needs of the ISTP.

The initial SLEP Summit was held in March 2003 in Michoud, Louisiana at the plant where Shuttle external tanks are produced. Results from the Summit are currently being worked as part of NASA's internal budget formulation process in preparation of the FY 2005 budget request.

The August 2002 NASA HQ briefing of the Space Shuttle Program 2020 Assessment is attached and provided for historical interest only and does not serve as an endorsement of project recommendations.



# Space Shuttle Program 2020 Assessment



**Parker V. Counts**  
**Senior System Integration Manager Shuttle**  
**August 21, 2002**



## ISTP Study for FY04 Budget Why are we here?

### **TASK 1. Assess Space Shuttle Strategy**

- a. Provide basis for figures of merit for selecting competitive sourcing business options and candidates for 2020 assessment. Also, provide methodology that links Shuttle safety with budget investments that goes beyond just Shuttle Safety Upgrades but include other activities (e.g., supportability, personnel facilities, competitive sourcing results).
- b. Provide recommended Shuttle investment strategy for 2010 retirement date within budget guidance.
- b. As retirement date is extended, recommended priority investments and competitive sourcing approach based on affect to figures of merit. Investment should be based on two scenarios:  
(i) within budget guidance, and (ii) over guidance.
- d. Reconcile findings from independent studies (i.e., Rand competitive sourcing business study, and ICE for ops and upgrades, ASAP).



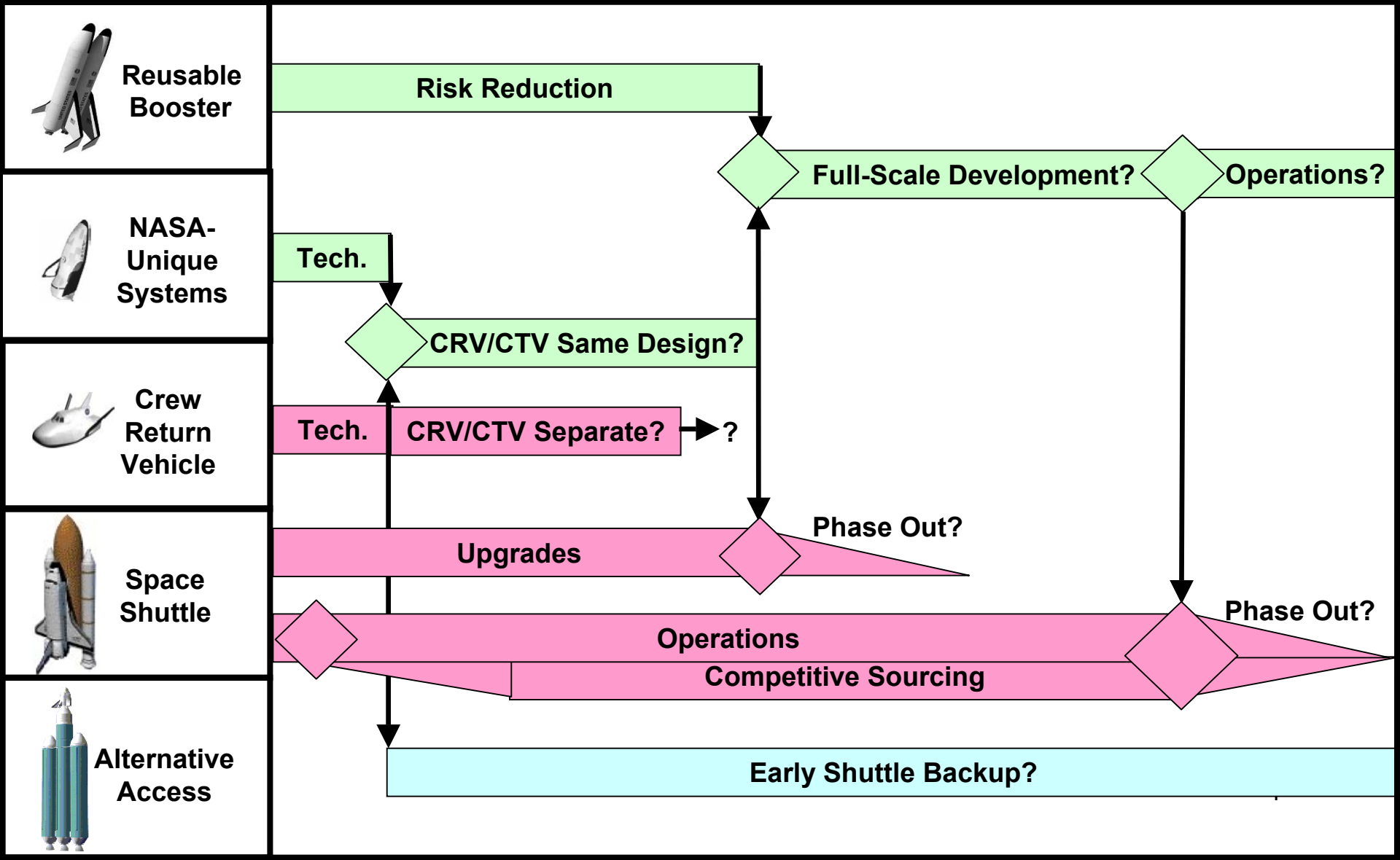
# Space Shuttle Program 2020 Assessment ISTP Assumptions FY03 Budget



Today

2005-6

2010-12







# Space Shuttle Program 2020 Assessment



## Strategy

- **Task**
  - **Identify and prioritize the future investments required to safely and effectively fly Shuttle through 2020.**
- **Strategy**
  - **Safety drives the strategy**
    - **Maintain safety and integrity of systems and processes**
    - **Improve safety – make selected safety upgrades to vehicle systems**
  - **Integrate issues/concerns across the Shuttle to establish a priority of investments based on need (risk and urgency)**
    - **Safety upgrades**
    - **Maintaining safety and integrity (human capital, suppliers, CoFR, knowledge, etc.)**
    - **Infrastructure (facilities, special test equipment, ground processing/ production, etc.)**
  - **Develop and Utilize tools to aid in establishing overall investment need and priority**
    - **Probabilistic Risk Assessment (PRA)**
    - **Analytical Hierarchy Process (AHP)**
  - **Align with agency space transportation goals**



## Objectives

- **Primary objective is to maintain a safe, reliable space shuttle transportation system through 2020**
- 1. Maintain SAFETY:** Resolve issues that represent increased safety risk
  - Hardware/software sustaining
  - Infrastructure
- 2. Improve SAFETY:** Implement improvements to reduce risk
  - Ground and flight safety
- **Utilize partnership of government and industry leadership and resources to develop integrated investment details — “living” prioritization and selection**
- **Process must be flexible and recurring evaluations must be made as the projects mature. Today’s vision can not predict all future needs and requirements**



## Observations

- **Program Elements and industry partners have worked to develop the strategy and to define the process that will allow the Shuttle to fly safely to 2020**
- **Process was very thorough and broad in scope – overall tool ranking is representative of the program priorities**
- **The beginnings of erosion are evident in many areas common to multiple Shuttle elements; flight subsystems, ground facilities, special test equipment, vendor support, process escapes, and human capital. Strategy must address all these areas**

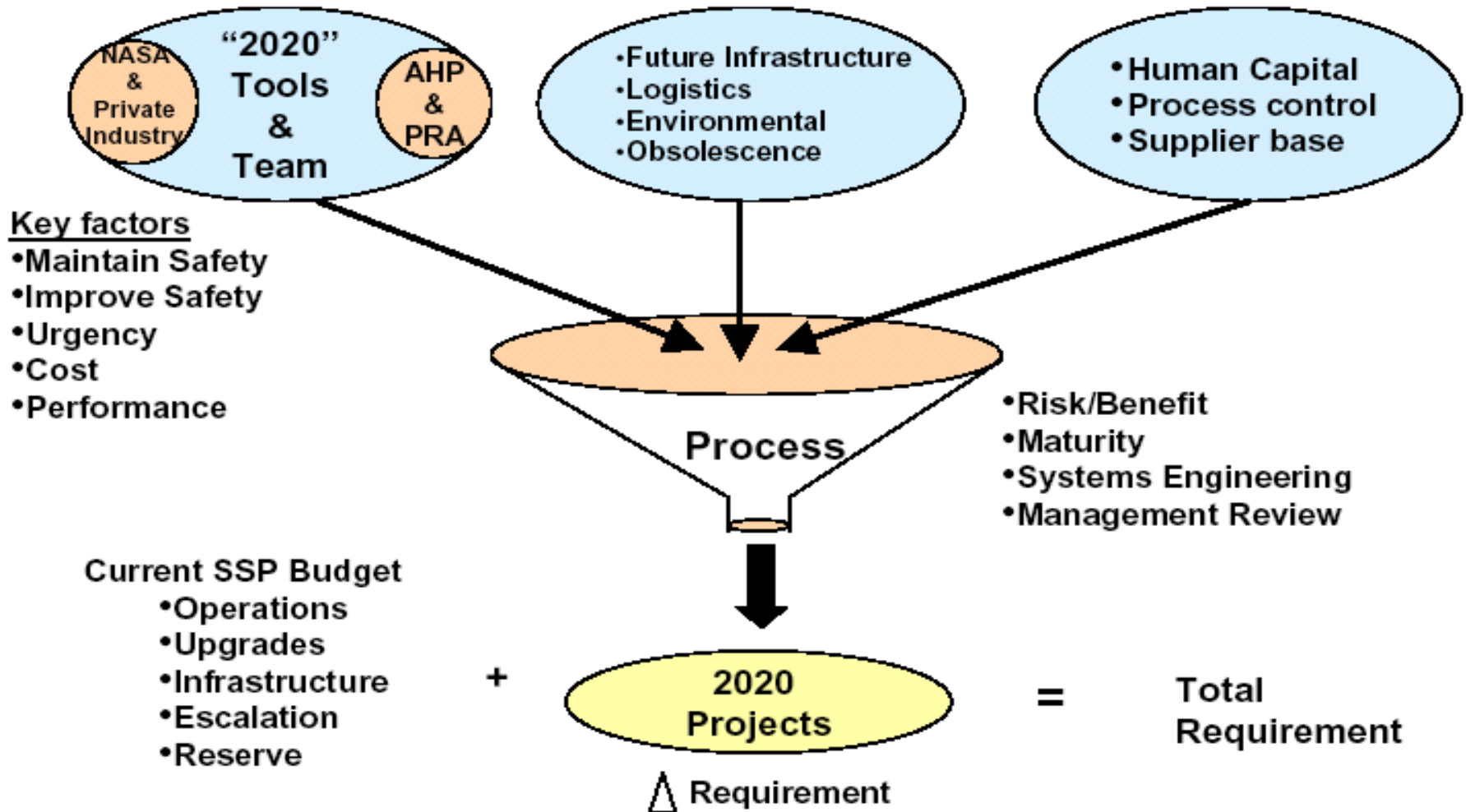




# Space Shuttle Program 2020 Assessment



## “2020” Approach





# Space Shuttle Program 2020 Assessment



## “2020” Approach (Con’t)

**Comprehensive set of investments evaluated, including infrastructure, facilities, special test equipment, human capital, ground systems, etc.**

<b>Element</b>	<b>Total Number</b>
ET	46
Ground Operations	70
Orbiter	125
RSRM	16
SRB	19
SSME	4
Mission Operations	3
Other	9
<b>Total</b>	<b>292</b>

<b>Urgency</b>	<b>Number of Projects</b>
Investment/Action Required within 1 year	47
Investment/Action Required within 5 year	130
Investment/Action Required within 10 year	28
Investment/Action Required after 10 year	13
Not applicable	76



# Space Shuttle Program 2020 Assessment



## Categories

### Improve Safety

Flight Systems	New Configuration
<ul style="list-style-type: none"> <li>Selected safety upgrades to vehicle systems</li> </ul>	<ul style="list-style-type: none"> <li>Low maturity increased complexity and high development risk</li> </ul>
<ul style="list-style-type: none"> <li>SSMEAHMSII</li> <li>CAUPhase II</li> <li>SRBTVC upgrade</li> </ul> <p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>New Candidates</li> </ul>	<ul style="list-style-type: none"> <li>LFBB</li> <li>EAPU</li> <li>5<sup>th</sup> Segment RSRM</li> <li>Crew Escape</li> <li>SSMEChannel Wall Nozzle</li> <li>EMA</li> <li>NTOMS/RCS</li> </ul>

### Maintain Safety & Integrity

Ground Systems & Facilities	Process Control	Flight Systems
<ul style="list-style-type: none"> <li>SSP revitalized infrastructure priority list</li> </ul> <p style="text-align: center;">+</p> <ul style="list-style-type: none"> <li>Special Test Equipment</li> <li>Production Tooling</li> </ul>	<ul style="list-style-type: none"> <li>Items difficult for tool set to evaluate</li> </ul>	<ul style="list-style-type: none"> <li>Safety &amp; Integrity of existing systems &amp; processes</li> </ul>
<ul style="list-style-type: none"> <li>New Investment represents 2008-2020</li> </ul>	<ul style="list-style-type: none"> <li>Human Capital</li> <li>CoFR</li> <li>Process Control</li> <li>Supply Base</li> </ul>	<ul style="list-style-type: none"> <li>RSRMEngr. Test &amp; Motors</li> <li>SRBIEA</li> <li>Avionics replacement</li> <li>Orbiter MPS improvements</li> <li>SRBreusable h/w</li> <li>RSRMCas h/w</li> </ul>



# Space Shuttle Program 2020 Assessment



## 2020 Budget Summary

### Existing Baseline Plus Added 2020 Funding

NOA - FY02\$\$s In Millions

<u>Category</u>	<u>FY03</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	<u>FY07</u>	<u>FY08</u>	<u>FY09</u>	<u>FY10</u>	<u>FY11</u>	<u>FY12</u>	<u>FY13 And Beyond</u>	<u>Total FY03-20</u>
<b><u>Improve Safety</u></b>	148	272	340	250	221	64	64	64	64	64	512	2,063
FY03 Budget	148	163	171	74	38	0	0	0	0	0	0	594
<b>Add 2020 Content</b>	<b>0</b>	<b>108</b>	<b>169</b>	<b>176</b>	<b>183</b>	<b>64</b>	<b>64</b>	<b>64</b>	<b>64</b>	<b>64</b>	<b>512</b>	<b>1,469</b>
<b><u>Flight Systems</u></b>	138	262	331	250	221	64	64	64	64	64	512	2,035
FY03 Budget	138	154	162	74	38	0	0	0	0	0	0	566
<b>Add 2020 Content</b>	<b>0</b>	<b>108</b>	<b>169</b>	<b>176</b>	<b>183</b>	<b>64</b>	<b>64</b>	<b>64</b>	<b>64</b>	<b>64</b>	<b>512</b>	<b>1,469</b>
<b><u>Industrial Safety</u></b>	10	9	9	0	0	0	0	0	0	0	0	28
FY03 Budget	10	9	9	0	0	0	0	0	0	0	0	28
<b>Add 2020 Content</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b><u>Maintain Integrity</u></b>	169	285	321	332	321	286	286	286	286	286	2288	5,146
FY03 Budget	169	185	159	131	107	0	0	0	0	0	0	751
<b>Add 2020 Content</b>	<b>0</b>	<b>100</b>	<b>162</b>	<b>201</b>	<b>214</b>	<b>286</b>	<b>286</b>	<b>286</b>	<b>286</b>	<b>286</b>	<b>2288</b>	<b>4,395</b>
<b><u>Flight Systems</u></b>	31	94	110	113	115	127	127	127	127	127	1016	2,114
FY03 Budget	31	40	34	48	54	0	0	0	0	0	0	207
<b>Add 2020 Content</b>	<b>0</b>	<b>54</b>	<b>76</b>	<b>65</b>	<b>61</b>	<b>127</b>	<b>127</b>	<b>127</b>	<b>127</b>	<b>127</b>	<b>1016</b>	<b>1,907</b>
<b><u>Ground Systems and Facilities</u></b>	138	158	178	184	175	127	127	127	127	127	1016	2,485
FY03 Budget	138	145	125	83	53	0	0	0	0	0	0	544
<b>Add 2020 Content</b>	<b>0</b>	<b>13</b>	<b>53</b>	<b>101</b>	<b>122</b>	<b>127</b>	<b>127</b>	<b>127</b>	<b>127</b>	<b>127</b>	<b>1016</b>	<b>1,941</b>
<b><u>Process Control</u></b>	<b>0</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>31</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>256</b>	<b>548</b>
<b><u>Subtotal</u></b>	317	556	662	582	542	350	350	350	350	350	2800	7,209
FY03 Budget	317	348	330	205	145	0	0	0	0	0	0	1,345
<b>Add 2020 Content</b>	<b>0</b>	<b>208</b>	<b>332</b>	<b>377</b>	<b>397</b>	<b>350</b>	<b>350</b>	<b>350</b>	<b>350</b>	<b>350</b>	<b>2800</b>	<b>5,864</b>
<b>Cost Uncertainty (25%) (of Added 2020 Content)</b>		<b>52</b>	<b>83</b>	<b>94</b>	<b>99</b>	<b>87</b>	<b>88</b>	<b>88</b>	<b>88</b>	<b>88</b>	<b>700</b>	<b>1,466</b>
<b>Total (Including Uncertainty)</b>	<b>317</b>	<b>608</b>	<b>745</b>	<b>676</b>	<b>642</b>	<b>437</b>	<b>438</b>	<b>438</b>	<b>438</b>	<b>438</b>	<b>3500</b>	<b>8,675</b>
* FY03 Budget	317	348	330	205	145	0	0	0	0	0	0	1,345
** <b>Add 2020 Content</b>	<b>0</b>	<b>260</b>	<b>415</b>	<b>471</b>	<b>497</b>	<b>437</b>	<b>438</b>	<b>438</b>	<b>438</b>	<b>438</b>	3500	<b>7,330</b>

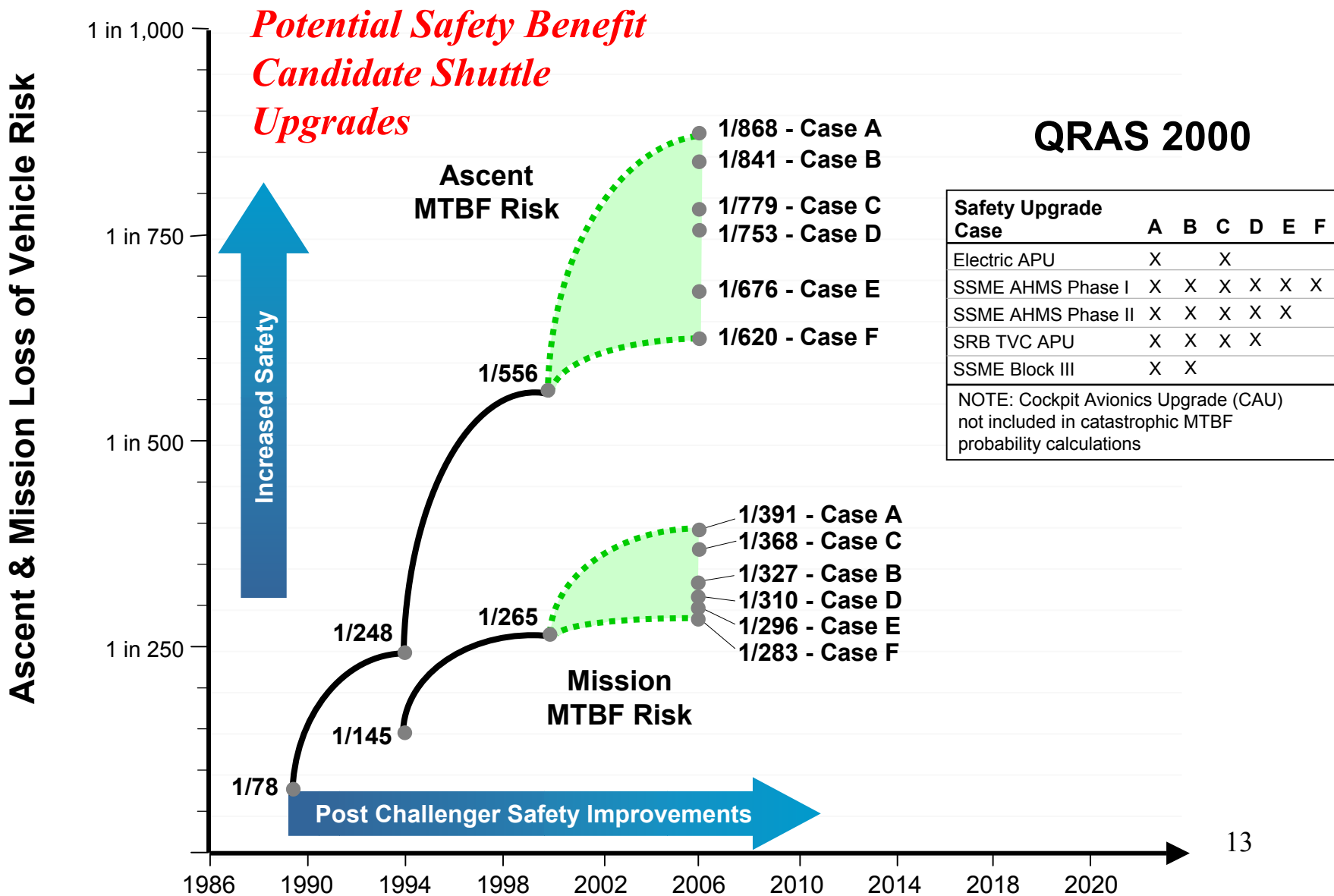
Note: New Configuration was considered and would add to the above.

\* As submitted in the FY 2003 President's Budget

\*\*2020 Content escalated at 4.1% (FY03-08); then flat lined at the FY08 rate (FY09-20)

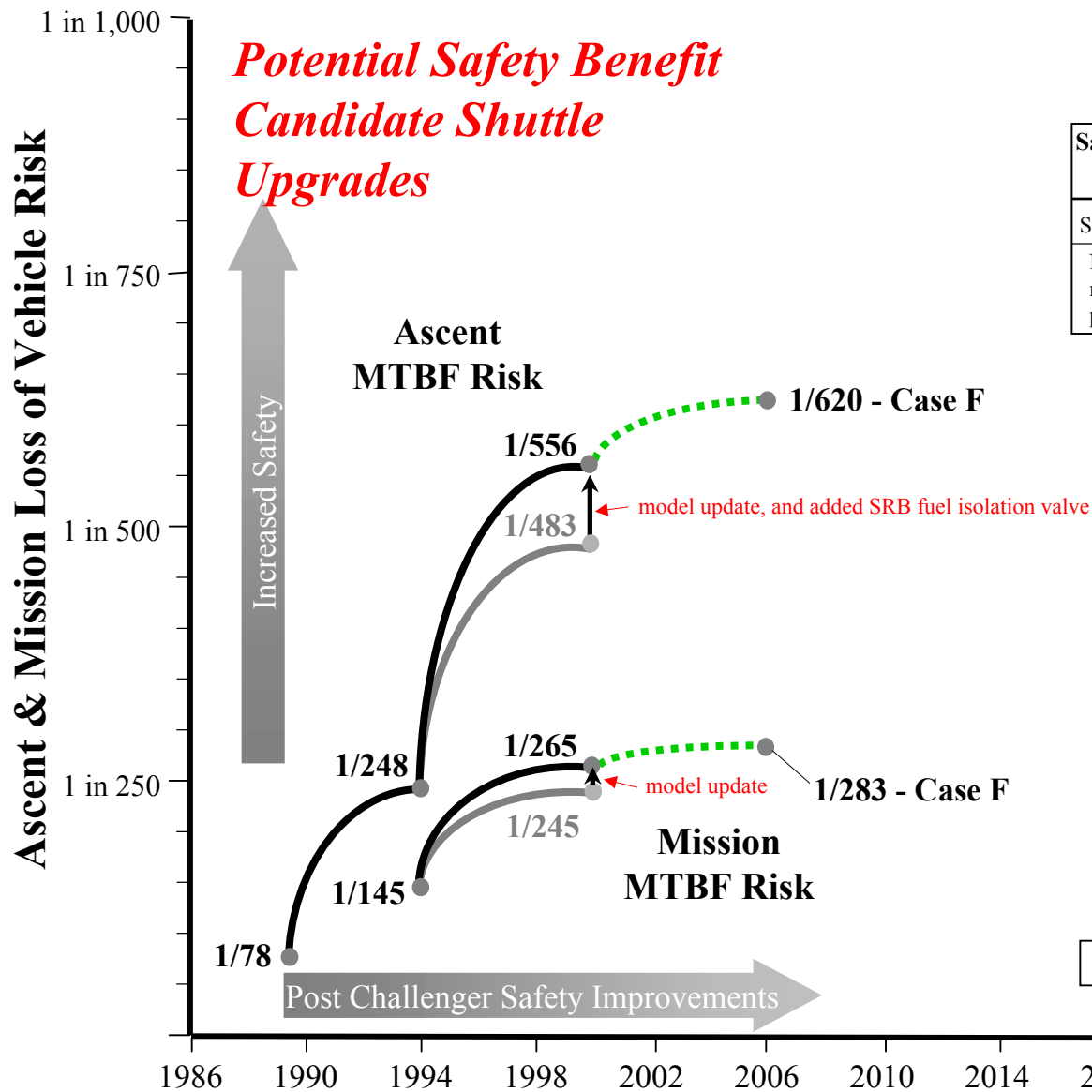


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## Forward Work Plan

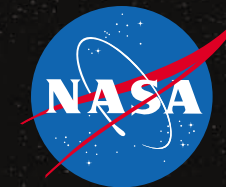
- **Continue validation/ final scoring of additional 270+ initiatives**
- **By November 1 (3 months)**
  - **Recommendations for FY03 special studies**
  - **Identification of specific initiatives for FY2003 starts**
- **By February 1, 2003 (6 months)**
  - **Completed review/ scoring of all initiatives**
- **By May 1, 2003 (9 months)**
  - **Initiate review of new or changed initiatives from current list**
  - **Review special studies and initiate recommendations**
- **By August 1, 2003 (12 months)**
  - **Specific recommendations for initiatives for FY04 starts**

## Acronym List

AHMS II	Advanced Health Monitoring System 2
AHP	Analytical Hierarchy Process
APU	Auxiliary Power Unit
ASAP	Aerospace Safety Advisory Panel
CAU	Cockpit Avionics Upgrade
CoFR	Certification of Flight Readiness
CRV	Crew Return Vehicle
CTV	Crew Transfer Vehicle
EAPU	Electric Auxiliary Power Unit
EMA	Electrical Mechanical Actuator
ET	External Tank
h/w	hardware
ICE	Independent Cost Estimates
ISTP	Integrated Space Transportation Plan
LFBB	Liquid Fly Back Booster
MPS	Main Propulsion System
MTBF	Mean Time Between Failures
NASA	National Aeronautics and Space Administration
NTOMS	Non-Toxic Orbital Maneuvering System
ops	operations
PRA	Probabilistic Risk Assessment
QRAS	Quantitative Risk Assessment System
RCS	Reaction Control System
RSRM	Reusable Solid Rocket Motor
SRB	Solid Rocket Booster
SRBIEA	Solid Rocket Booster Integrated Electronics Assembly
SRBTVC	Solid Rocket Booster Thrust Vector Control
SSME	Space Shuttle Main Engine
SSP	Space Shuttle Program



Delivering a Comprehensive Strategy and Implementation Plan  
Identify and Prioritize Safety,  
Supportability, and Performance  
Technology Push, Requirements Pull, Operations Support



**Space  
Shuttle  
Service  
Life  
Extension  
Program**

*Summit I  
March 2003*



National Aeronautics and  
Space Administration  
Headquarters  
Code M-1  
300 E Street SW  
Washington, DC 20546-0001

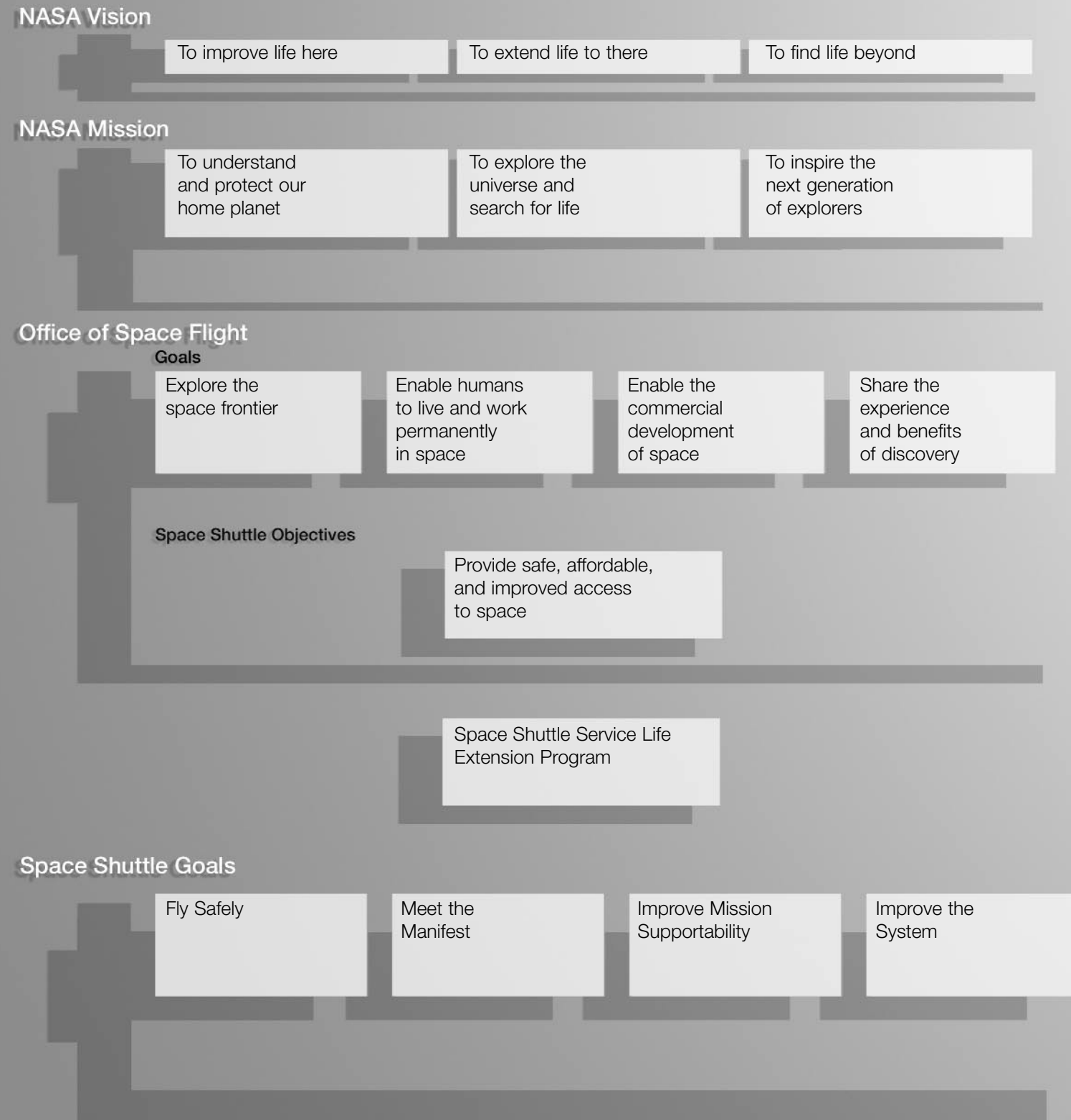
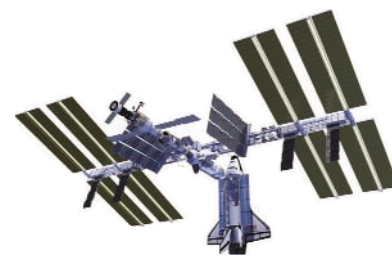
Space Shuttle  
Service Life Extension Program  
Summit I  
March 2003

<http://www.mafevents.com/SLEP/home.htm>



# Space Shuttle Program Hierarchy of Related Goals and Objectives

# Delivering a Comprehensive Strategy and Implementation Plan



**Service Life Extension Program Objective:**  
Assure that all critical assets are in place to safely and efficiently fly the Space Shuttle through at least the middle of the next decade.

- Summit Objectives:**  
Bring together all interested stakeholders to:
- Define a strategy and implementation plan
  - Identify and prioritize safety, supportability, performance enhancements, and infrastructure initiatives
  - Develop a plan to gain support





*As we look to the next century of exploration, we will focus with renewed vigor on the challenges that lie before us and on developing unique capabilities that strengthen America while addressing our critical needs.*

NASA is facing one of its most difficult challenges. We have lost seven family members and are trying to come to terms with that loss, to find the cause, to fix it, and to continue the critical work we do to expand the knowledge of our planet, our universe, and our origins. We understand that space flight is risky; we are committed to making those risks as small as possible. The Space Shuttle Service Life Extension Program (SLEP) is a key element of that endeavor.

NASA is moving into a new era. We are looking forward to what our space transportation needs will be over the long term to support NASA's entire mission. As we look to the next century of exploration, we will focus with renewed vigor on the challenges that lie before us and on developing unique capabilities that strengthen America while addressing our critical needs. We developed a new Integrated Space Transportation Plan (ISTP) that provides a roadmap for taking the next step in this journey.

This roadmap more closely integrates the Space Station, Space Shuttle, and the planned Orbital Space Plane. It also calls for the Space Shuttle to fly safely and effectively through at least the middle of the next decade until we can field another means of sending humans into space. The SLEP is the means by which we will ensure that the Shuttle can continue to support this key goal, and that NASA can continue to fulfill its mission.

I am looking to the entire Shuttle Team to use this summit process to ensure our goals for this program are attained. To that end, my wishes are with you for a very successful summit.

Sean O'Keefe  
Administrator



*The Space Shuttle plays a role in every area of NASA's mission enabling goals that are key elements of the Agency Integrated Space Transportation Plan.*

Space Flight occupies a unique place in NASA. It is through the capabilities we provide that NASA is able to accomplish its mission and fulfill its vision. It was the pursuit of this mission, and the expansion of human knowledge, that was the focus of the Columbia and her crew on STS-107, a dedicated research mission. As we mourn their loss, we want to celebrate their accomplishments and sustain their legacy for research and human exploration of space. We find renewed reasons to dedicate ourselves to the continued improvement of our space transportation system, to ensuring its safety and reliability, and to continuing the work that NASA does better than anyone in the world.

The Space Shuttle plays a role in every area of NASA's mission, enabling goals that are key elements of the Agency Integrated Space Transportation Plan. It is currently the only means this nation has for human access to space, and we are dedicated to increasing its safety, reliability, and affordability. The Shuttle Service Life Extension Program (SLEP) will provide the Office of Space Flight with the road map for making this goal a reality.

To ensure the success of the SLEP, Major General Michael Kostelnik (USAF, ret), Deputy Associate Administrator for International Space Station and Space Shuttle Programs, has initiated the SLEP Summit process. The Summit is an ongoing process that will frame both the immediate and long-range direction for the SLEP and assist in the prioritization of NASA investments. Its focus will be to ensure that the Shuttle can fly safely and reliably through at least the middle of the next decade.

I join the Administrator in wishing you a successful summit, a critical element as we chart the course for the Shuttle Program.

William F. Readdy  
Associate Administrator for Space Flight





*The SLEP Summit will be an ongoing process, which will revisit and update Shuttle strategic investment planning on an annual basis.*

The loss of the Space Shuttle Columbia and her crew was a tragic event and it is clear that there is a problem that needs to be fixed. We will find that problem and fix it, and when we return to flight, we will ensure the future investments in our Shuttle fleet keep them safe and reliable. We need to be able to identify and prioritize investments in all areas of the Shuttle Program from a “system of systems” perspective. We must also ensure that we can meet our human exploration goals while supporting continued assembly and maturation of the International Space Station consistent with the Integrated Space Transportation Plan (ISTP). To respond to this need for a strategic investment plan, I have initiated an annual Space Shuttle Service Life Extension Program (SLEP) Summit.

The Summit is structured around eight panels: safety, sustainability, infrastructure, resources, performance, operations, and integration will look at proposed Shuttle investments from a systems perspective. An industry panel with representation from the major NASA contractors will provide an industry perspective. Experienced leaders from across NASA’s human space flight centers chair the panels. The panels are charged to review current proposals for Shuttle investments and to develop new approaches, which ensure safe and effective Shuttle operations consistent with ISTP expectations. The end product of the Summit process will be a strategic plan and a set of prioritized investments for the Space Shuttle Program, which will ensure that this critical system continues to meet the requirements of the ISTP. The Shuttle fleet must be able to support the International Space Station and fly safely and effectively through at least the middle of the next decade, and perhaps beyond.

The SLEP Summit will be an ongoing process that will revisit and update Shuttle strategic investment planning on an annual basis. This approach will provide the Shuttle Program with an excellent tool for measuring the impacts and outcomes of investment strategies while keeping the team focused on our highest priority needs from an Agency perspective.

The success of this summit depends on active participation of all those involved. I know with everyone’s help, we will have a very successful summit, and will lay the foundation for a strong Shuttle Program, aggressively supporting NASA’s human space flight goals.

Michael C. Kostelnik  
Deputy Associate Administrator for  
International Space Station and  
Space Shuttle Programs



*Improving our Shuttle Program is not only our passion but it is our inherent responsibility to our work force, our flight crews, and to the American public.*

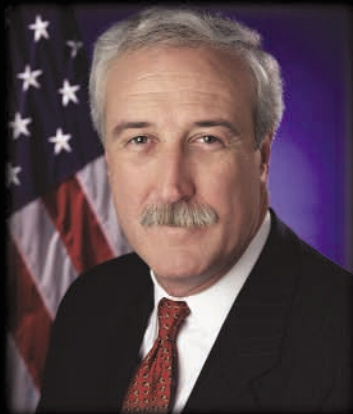
With the advent of the Space Shuttle Service Life Extension Program (SLEP), NASA will take the next bold step in assuring the Shuttle System is prepared to meet the challenges of human space flight through the year 2020 and beyond. Improving our Shuttle Program is not only our passion but it is our inherent responsibility to our work force, our flight crews, and to the American public. The SLEP will allow us a unique opportunity to identify and implement key projects, which will revitalize our infrastructure, improve the safety of our hardware, and enhance the operation of our systems. Broad based active participation in this process is not only welcomed, but is absolutely essential for us to properly address the key initiatives. I encourage every participant to approach this SLEP Summit as their personal opportunity to ensure the Shuttle Program is prepared to meet the future demands of human space flight.

Ronald D. Dittmore  
Manager, Space Shuttle Program





# Space Flight Leadership Council



*Strong leadership is necessary to provide direction and guidance to ensure the future of the Shuttle Program. At this critical juncture, the Space Flight Leadership Council will provide this direction and guidance. The experienced leaders we have selected for this council bring a wealth of program knowledge and leadership skills that will achieve our long-term programmatic goals.*



**William F. Readdy**  
Associate Administrator for Space Flight

Bill Readdy is Associate Administrator for Space Flight at NASA Headquarters in Washington, DC, reporting to the NASA Administrator. In addition to overseeing NASA's key space flight programs, he provides oversight of the four NASA centers responsible for space flight activities and is responsible for the formulation and articulation of NASA's space flight strategy and policy. Mr. Readdy has served in a variety of capacities at NASA, including manager of Space Shuttle Program Development, and is a veteran NASA astronaut having served as both Shuttle pilot and commander.



**Bryan D. O'Connor**  
Associate Administrator for Safety and Mission Assurance

As Associate Administrator for Safety and Mission Assurance, Bryan O'Connor is responsible for the safety, reliability, maintainability, and quality assurance of all NASA programs, reporting to the NASA Administrator. When Mr. O'Connor took this job in 2002, he brought a wealth of experience garnered from the U.S. Marine Corps, NASA, and the aerospace industry. Mr. O'Connor is a veteran NASA astronaut and Shuttle pilot and commander. Among other positions, he has served as Deputy Director of Flight Crew Operations, Deputy Associate Administrator for Space Flight and Director, Space Shuttle Program.



**Michael C. Kostelnik**  
Deputy Associate Administrator for International Space Station and Space Shuttle Programs

Michael Kostelnik joined NASA in 2001, as the first leader of an integrated Space Shuttle and Space Station Program. He is responsible for integration, oversight, and policy formulation for these two cornerstone space flight programs. Prior to joining NASA, General Kostelnik had a distinguished career in the U.S. Air Force, from which he retired as a Major General. His extensive military experience included assignments as commandant of the U.S. Air Force Test Pilot School, and commander of the Air Armament Center.



**Roy D. Bridges, Jr.**  
Director, NASA John F. Kennedy Space Center

Roy Bridges has been Director of the NASA Kennedy Space Center in Florida since 1997. He is responsible for all facilities and activities at Kennedy, the majority of which are directly related to the processing and launch of the Space Shuttle. He is also responsible for the processing of all launched payloads, including the International Space Station, and the development of spaceport and range technologies, improving safety and reducing cost of access to space. Mr. Bridges is a NASA astronaut and Shuttle pilot, and retired from the U.S. Air Force as a Major General.



**Jefferson D. Howell, Jr.**  
Director, NASA Johnson Space Center

General Jefferson Howell assumed the position of Director, NASA Johnson Space Center, Houston, Texas, in April 2002, following a distinguished career in the U.S. Marine Corps and the aerospace industry. As Director of the Johnson Space Center, General Howell is responsible for programs including human space flight, spacecraft engineering and design, flight crew training, space and life science research, and mission operations. General Howell was a naval aviator, an instructor at the U.S. Naval Academy, Deputy Commander of the Marine Forces Pacific; and Commander U.S. Marine Forces Central Command.



**William W. Parsons, Jr.**  
Director, NASA John C. Stennis Space Center

Bill Parsons directs the NASA John C. Stennis Space Center in Mississippi. Stennis is a unique facility that is home to more than 30 federal, state, academic, military and private organizations. As Director of Stennis, Mr. Parsons is responsible for NASA's rocket propulsion test capabilities, as well as managing NASA's commercial remote sensing application programs, and leading the nation in the development and transfer of NASA technology. Mr. Parsons held a number of management positions in the Shuttle Program. Before joining NASA in 1990, Mr. Parsons served in the Marine Corps.



**Arthur G. Stephenson**  
Director, NASA Marshall Space Flight Center

Art Stephenson currently serves as Director of the NASA Marshall Space Flight Center in Huntsville, Alabama. In this capacity, he is responsible for the propulsion elements of the Space Shuttle, development of advanced launch vehicles, International Space Station payload operations, and projects in microgravity, earth, and space science. At Marshall, he is responsible for work on critical Agency initiatives such as the development of new reusable launch vehicles. Mr. Stephenson brings to NASA over 35 years extensive experience in the aerospace industry, beginning with work on the Apollo Program.



# Shuttle Service Life Extension Program Panel Structure



Mike Rudolphi

**Safety Panel**

Mike Rudolphi, Deputy Director of the Stennis Space Center, is a seasoned Shuttle manager and has many years of experience as a senior leader in the Agency. His panel will identify, evaluate, and prioritize proposals that can improve safety of flight. They will assess technical merit, cost, schedule, risk, maturity, and integration impacts of each proposal and propose strategies that optimize safety benefit for the cost. In addition, they will assess the Industrial Engineering for Safety (IES) activity.



Dave King

**Sustainability**

Dave King, the current Deputy Director of the Marshall Space Flight Center, has extensive experience as a senior leader in the Agency, most recently serving as Shuttle Launch Director at KSC. His panel will identify, evaluate, and prioritize proposals designed to maintain safety by ensuring the capabilities needed to fly the Space Shuttle do not erode. The scope of this activity includes flight and ground logistics needs, obsolescence, supplier viability, process control, special test equipment and devices (STE/D), project-unique special tooling, and lab equipment. They will assess the cost, schedule, risk, maturity, and urgency of each proposal. Funding requirements will be estimated and time phasing of these requirements will be recommended.



Gene Hubbard

**Infrastructure Panel**

Gene Hubbard, Director of Facilities for the Agency, has many years of experience as a senior leader with extensive background in infrastructure management both with NASA and DOD. He and his panel will identify, evaluate, and prioritize proposals designed to assure that the basic facility needs are in place to support the Space Shuttle. The scope of this activity includes all program and direct supporting institutional Construction of Facilities (CofF) activity, facility maintenance, facility support systems, ground support equipment (GSE), generic tooling capability, and production support equipment (PSE). The geographic scope includes not only KSC, but also facilities throughout the Shuttle Program. Funding requirements will be estimated and time phasing of these requirements will be recommended.



Jim Eyman

**Industry Panel**

Jim Eyman, current Vice President and Program Manager of Space Shuttle Upgrades Development for United Space Alliance has many years of experience as a senior executive in the aerospace industry. His panel will provide a consolidated view of existing industry capability as it supports Shuttle service life extension. They will identify skills and resources that are critical to the long-term support of the Space Shuttle Program and Human Space Flight and identify methods and requirements to sustain those critical skills and resources. In addition, they will identify areas for technological advancements that would benefit the Space Shuttle Program and identify areas for potential cost reduction through efficiency, innovation, and/or consolidation of capabilities.



Jim Kennedy

**Performance Panel**

Jim Kennedy, current Deputy Director of the Kennedy Space Center, is an experienced senior Agency leader, both in and out of the Shuttle Program. The Performance Panel will assess the existing capabilities of the Space Shuttle relative to the anticipated manifest. They will assess the ability of the Space Shuttle to meet potential future needs, including extended on-orbit duration. This assessment will include review of potential improvements in performance capability and reduction in critical abort mode exposure. The panel will assess the technical merit of each proposal along with the integration impacts, cost, schedule, and risk versus benefits.



Randy Stone

**Operations Panel**

Randy Stone, current Deputy Director of the Johnson Space Center, has many years of experience as a senior Agency leader with a background in Shuttle mission operations. His panel will evaluate changes in operational guidelines, ground processing, or vehicle design that will expand the capability and improve the operational efficiency of the Space Shuttle. The scope of this effort will include a review of Mission Rules, Launch Commit Criteria, OMRSD, mission design products, and mission training processes. They will assess the integration and cost impacts of each proposal and the risk versus benefit, making recommendations for implementation.



Dave Bates

**Resources Panel**

Dave Bates, current Chief Financial Officer of the Marshall Space Flight Center, has many years of experience as a senior leader and financial specialist, both at NASA HQ as well as field centers. His panel will examine existing and proposed Space Shuttle budgets and review and validate estimates provided by the other panels. Comparing the needs identified by each panel to the current budget plan, they will recommend proposals that offer the most effective return on investments. Additional proposals whose goal is to reduce operations costs through innovation and efficiency will be reviewed. They will analyze the human resource and critical skill requirements to maintain current capability. Their charter also includes providing recommendations on how to improve project cost estimates and execution against the approved budgets from a business management perspective.

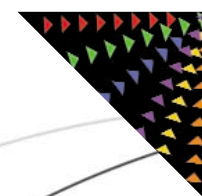
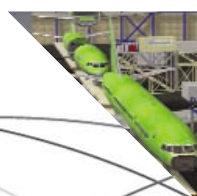
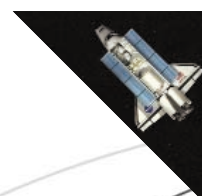


Mark Craig Steve Pitotti

**Integration Panel**

Mark Craig, current Associate Director of the Johnson Space Center, was selected to co-chair this panel with Steve Pitotti, Assistant Associate Administrator for the Office of Space Flight. Mark is a senior Agency leader, most recently serving as Deputy Director of the Stennis Space Center. Steve has an extensive background in Air Force research and logistics. Their panel will accomplish four tasks:

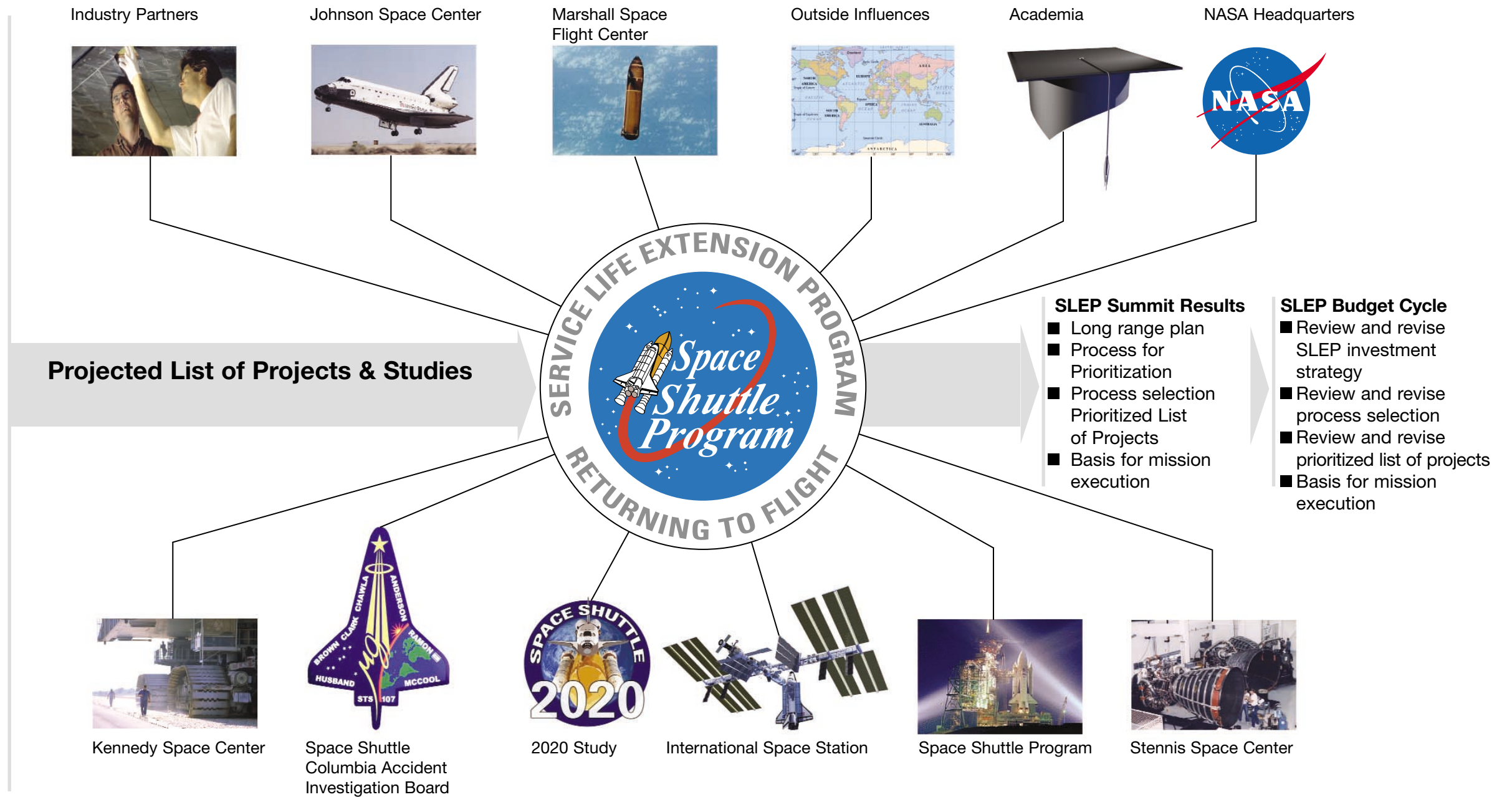
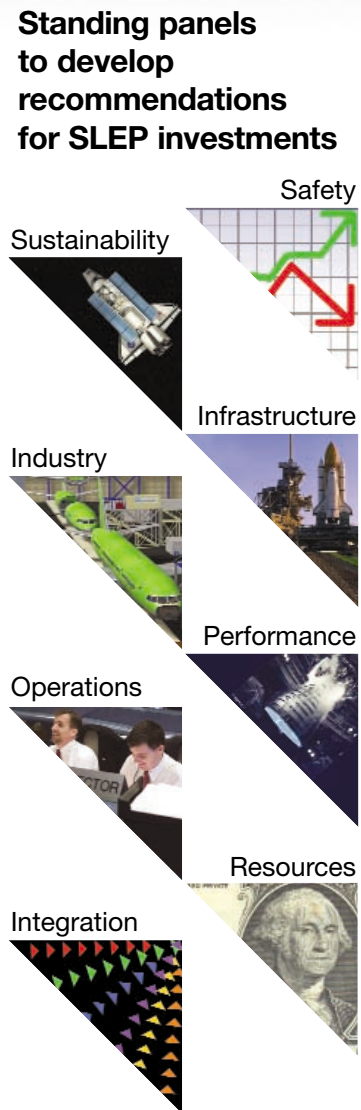
- 1) Define and develop requirements, guidelines and assumptions, including strategic considerations for NASA Human Space Flight,
- 2) Review the structure and utilization of the process currently being used by the Space Shuttle Program to prioritize potential initiatives,
- 3) Review the Integrated Space Transportation Plan (ISTP) to assure that the emerging Shuttle SLEP is consistent with overall agency strategic planning, and
- 4) Review and integrate the prioritized recommendations from each panel to develop the Shuttle SLEP content and funding profile.



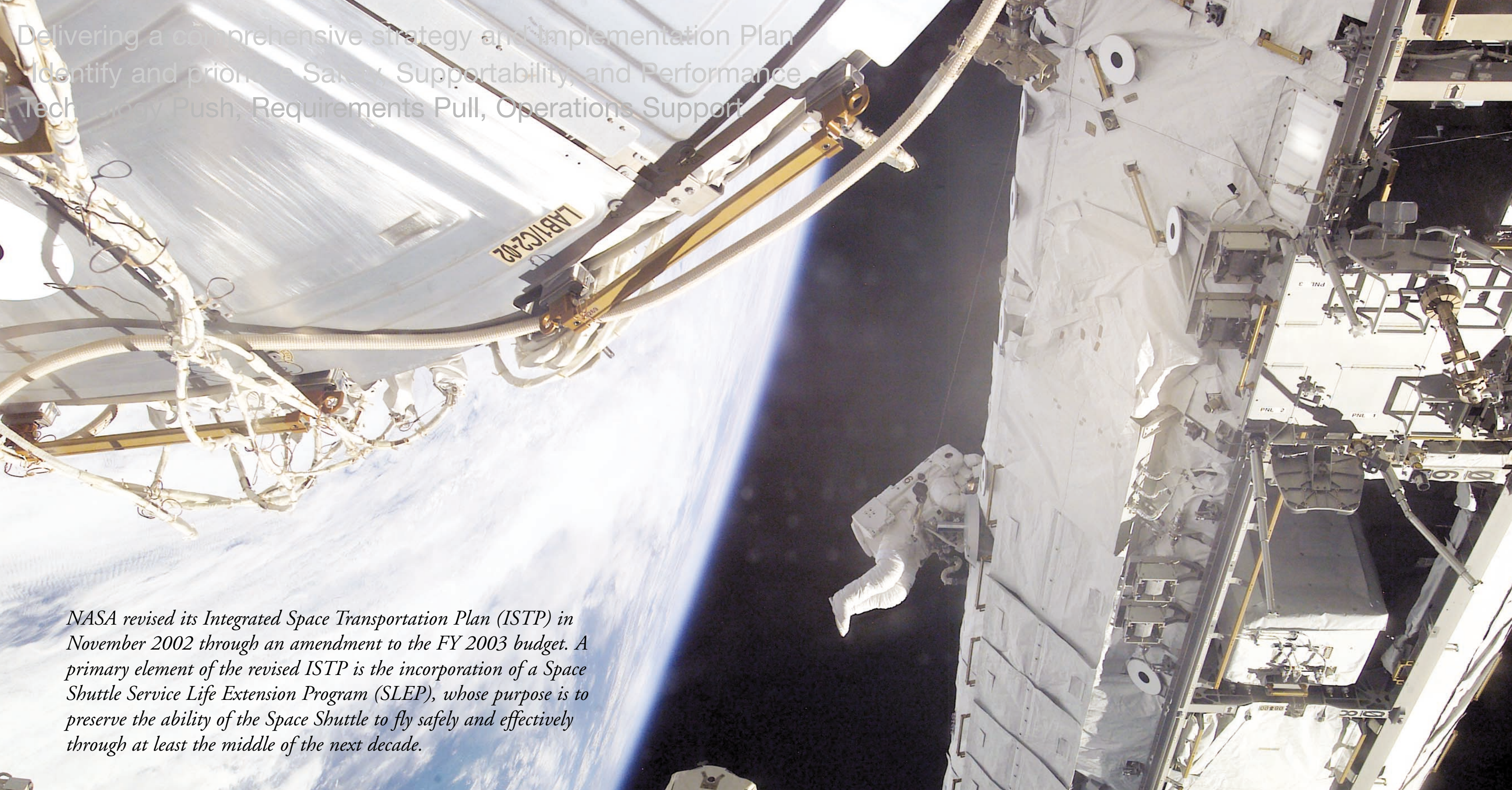
# 2003 Shuttle Life Extension Program Focus: Process Flow, Participating Organizations, and Stakeholder's Representatives



*The Summit framework depends on the findings and recommendations of several panels, chaired by experienced NASA leaders. These panels include safety, sustainability, infrastructure, resources, performance, and operations. An integration panel will help to consolidate the results and an industry panel will provide perspective from the NASA contractor community.*

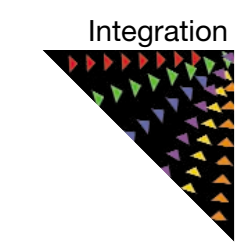
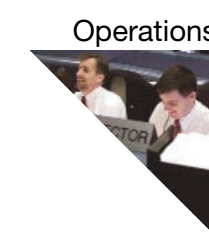
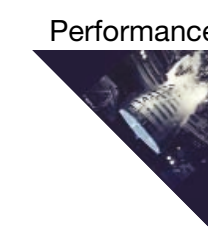
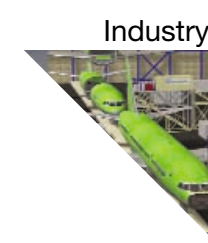
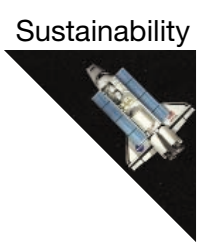


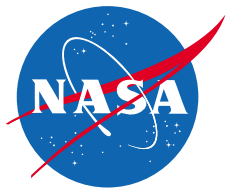




Delivering a comprehensive strategy and Implementation Plan  
Identify and prioritize Safety, Supportability, and Performance  
Technology Push, Requirements Pull, Operations Support

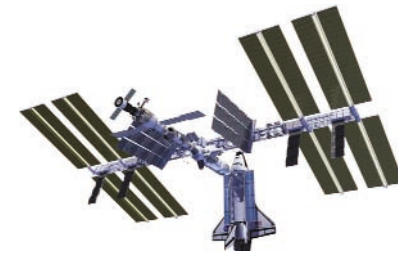
*NASA revised its Integrated Space Transportation Plan (ISTP) in November 2002 through an amendment to the FY 2003 budget. A primary element of the revised ISTP is the incorporation of a Space Shuttle Service Life Extension Program (SLEP), whose purpose is to preserve the ability of the Space Shuttle to fly safely and effectively through at least the middle of the next decade.*





# Integrated Space Transportation Plan

## A Framework for Continued Space Shuttle Operations and Key Decisions



### ■ Service Life Extension Program

Cost, schedule, risk, maturity, and integration impacts as well as an investment strategy required to fly Space Shuttle safely to the middle of the next decade and beyond.

### ■ Space Shuttle

Provide human access to space through the middle of the next decade.

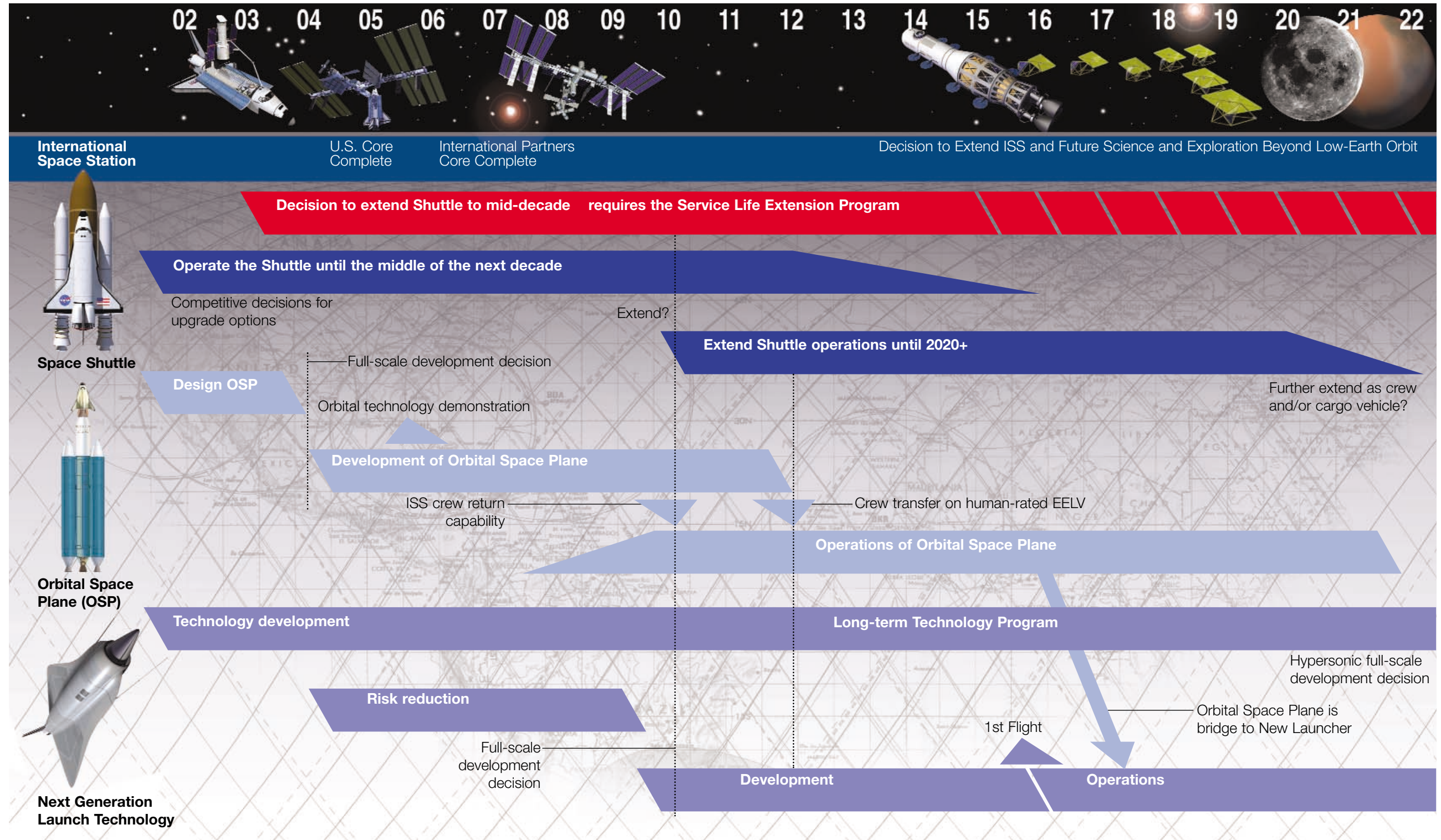
### ■ Orbital Space Plane

The Orbital Space plane will provide alternate crew access to station from U.S. and serve DOD and future missions.

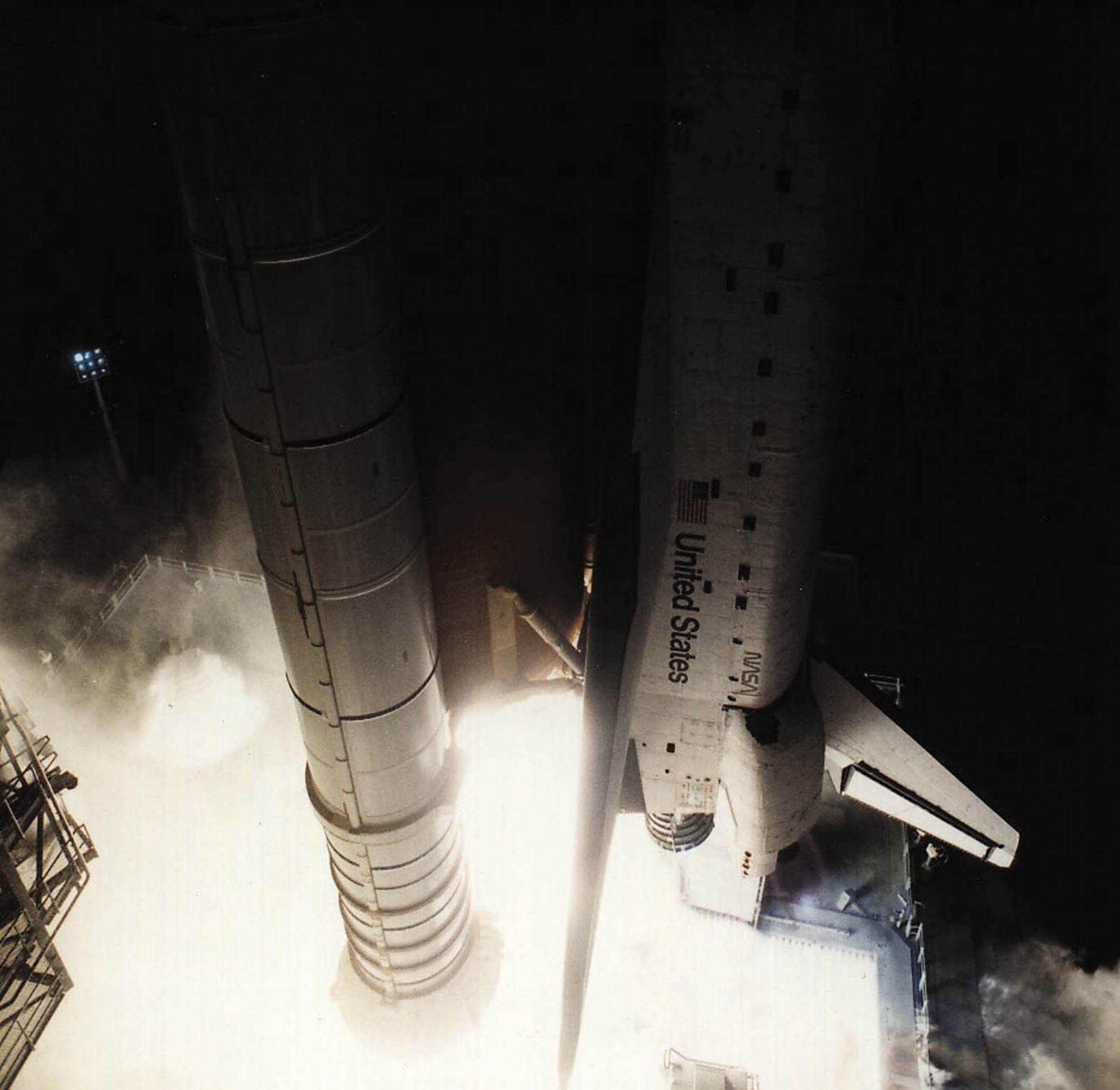
### ■ Next Generation Launch Technology

Develop technology to create the next generation that dramatically surpasses current systems in cost, safety and capability.

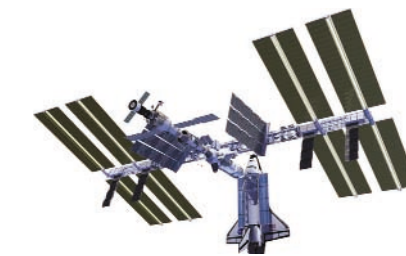
*Access to space is currently accomplished by the Space Shuttle and a fleet of expendable launch vehicles provided by U. S. industry. These will continue to be the Nation's primary space transportation systems into the next decade. To plan for the future, NASA has developed a new Integrated Space Transportation Plan that represents a systematic approach to our space access needs.*



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## Planning for Long-Term Operations



Fiscal Year 2002 was another successful year with outstanding progress in several upgrade projects. The Cockpit Avionics Upgrade, which will significantly increase crew safety by improving situational awareness and reducing workload, has successfully completed its initial design review and several testing milestones. This project is on schedule and within budget, and is slated for a critical design review next year. The Space Shuttle Main Engine's block II fuel turbopump, which was fully implemented in 2002, and the advanced health management system will significantly improve ascent reliability. The External Tank (ET) friction stir welding process, which is being used today to manufacture ET hardware, is producing much stronger, defect-free welds.

### **FY 2002 Upgrade Projects**

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#### **Safety Upgrades**

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Cockpit Avionics Upgrade, Phase I  
Space Shuttle Main Engine Advanced Health Management System, Phase I  
Improved Main Landing Gear Tire and Wheel  
External Tank Friction Stir Weld

#### **Supportability Upgrades**

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Long Life Alkaline Fuel Cell  
Solid Rocket Booster Integrated Electronics Assembly  
Reusable Solid Rocket Motor Nozzle/Case Joint J-leg Insulation  
Solid Rocket Booster Range Safety Command Receiver-Decoder  
Solid Rocket Booster Altitude Switch Assembly  
Micro-meteoroid Orbital Debris  
Device Driver Unit  
Mass Memory Unit

These upgrade accomplishments, along with supportability upgrades, demonstrate our commitment to improving our hardware and ensuring safe, reliable space transportation. Other ongoing projects with significant accomplishments this year are depicted in the table on this page.

#### **Service Life Extension Strategy**

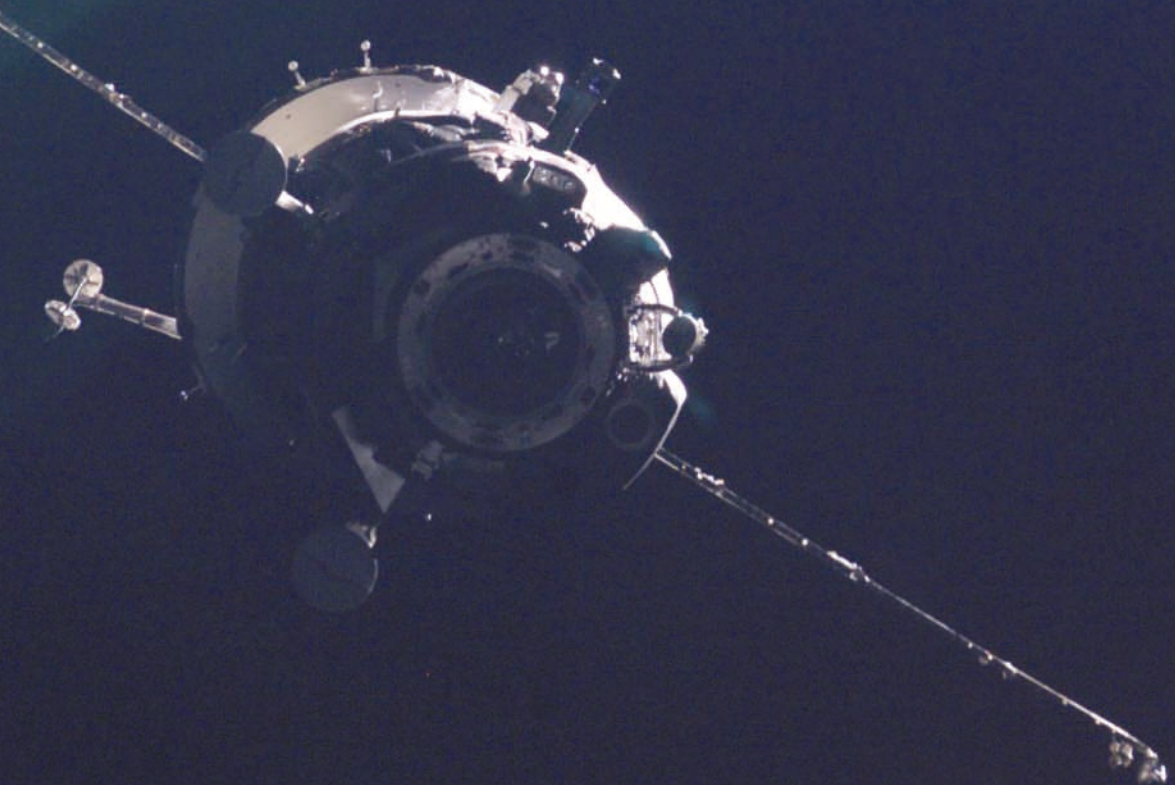
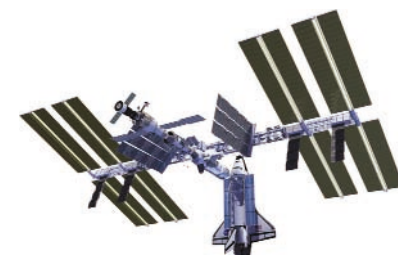
The Space Shuttle Program Development office will have the responsibility for implementing the investment roadmap established by the SLEP Summit process. These investments will ensure the viability of the Space Shuttle fleet through at least the middle of the next decade and potentially through 2020. As input to the SLEP process, a core



# Delivering a comprehensive strategy and Implementation Plan

## Identify and prioritize Safety, Supportability, and Performance

### Technology Push, Requirements Pull, Operations Support



team composed of members from each of the program/project elements and NASA Headquarters was assembled to recommend projects to be funded. A committee composed of Space Shuttle Program council members, NASA Headquarters representatives, and industry partners was established to provide oversight of the core team.

The team selected and developed the Analytic Hierarchy Process as an objective ranking tool to prioritize candidate projects. It is a mathematical-factors-based analytical tool that enables the explicit ranking of projects based on selected factors and weightings. The Analytic Hierarchy Process has been successfully used by many private industry companies and government agencies, such as IBM, Ford Motor, Lockheed Martin, U.S. Department of Veteran's Affairs, Federal Aviation Administration, United States Army, and the Department of Housing and Urban Development.

The request to assess the Space Shuttle capability to fly through 2020 allowed the Space Shuttle Development Program Office to make a longer-term and, therefore, more strategic approach to safety and supportability upgrades. The scope of the review covered all assets needed to fly safely and effectively, noting that any deterioration of these assets could represent additional risk to the program. This assessment included the high-profile safety upgrades as well as ground support and test equipment, facilities and infrastructure, vendors and suppliers, and critical skills. We also solicited ideas from throughout the Space Shuttle government and contractor community to ensure a complete canvassing of the service life extension needs. The outcome of this review has been provided to the SLEP panels for their consideration in developing SLEP projects. The chart below shows the percent of projects recommended to the panels separated by category.

#### Service Life Extension Candidates

