CONCEPT OF PRIVATIZATION

OF THE

SPACE SHUTTLE PROGRAM

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Enclosure

PREFACE

The contents and considerations relative to the privatization of the Space Shuttle Program (SSP) contained in this document are the results of comprehensive reviews conducted from June through September 2001. Participants included: NASA representatives from each of the NASA space flight Centers ((Johnson Space Center (JSC), Marshall Space Flight Center (MSCF), Kennedy Space Center (KSC), and Stennis Space Center (SSC)); NASA Headquarters (HQ); and the United Space Alliance contractor. Team membership is provided in Appendix A.

For the purposes of developing a concept for privatization, five specific areas of emphasis were identified. These areas of emphasis address specific topics necessary for successful implementation of SSP privatization. A set of criteria, previously established by the Associate Administrator, Human Exploration and Development of Space (HEDS), was utilized to guide the discussions (reference Appendix B).

1. SAFETY: Maintaining Critical Checks and Balances, led by Mr. Ralph Roe

2. SAFETY: Independent Assessment, led by Mr. William Harris

3. MERGER: Relationships, Interfaces, and Asset Management, led by Mr. James Costello

4. CIVIL SERVANT TRANSITION: Transition of Critical Functions and Expertise, led by Mr. Ronald Dittemore

5. CONTRACT STRUCTURE, led by Mr. Randy Gish

Privatization represents a significant departure from the way NASA has typically managed programs and provides a new avenue for increased involvement of private industry in human space flight. It establishes increased private industry accountability for human space flight and enables future commercialization opportunities.

This document identifies concepts for the privatization of the SSP. Additional work is required to develop a detailed implementation plan.

Any questions or comments regarding the concept contained in this document should be directed to Mr. Ronald D. Dittemore, Manager, Space Shuttle Program.

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Concept of Privatization of the Space Shuttle Program

1.0 Executive Summary

1.1 Vision

Establish private industry accountability for Space Shuttle operations, combining the experience of NASA and private industry to form a strong company that maintains and develops the skills and experience required for safe, efficient, long-term Space Shuttle operations and future human space flight operations International Space Station (ISS), next generation reusable launch vehicles, exploration, etc.

1.2 Objectives

1. Preserve safe and successful operations of the Space Shuttle for the next 20 years, including the development and infusion of new technology into the fleet.

2. Privatize Space Shuttle operations consistent with the President's "A Blueprint for New Beginnings, A Responsible Budget for America's Priorities" and the NASA Strategic Plan.

3. Establish private industry accountability for human space flight operations, enabling future commercialization opportunities.

1.3 Why Privatize?

The safety of the Space Shuttle Program (SSP) is dependent upon strong check and balance processes. These processes are integral to the structure of the program and must be maintained in order to safely conduct space flight operations. Just as process drift or creep can affect the capability of hardware components, organizational requirements and responsibilities can also drift and significantly affect established checks and balances critical to sustained safe operations. Erosion of critical skills and experience through attrition and personnel change can result in similar impacts.

Since 1993, the NASA SSP civil service workforce has been reduced nearly 50 percent, resulting in a significant loss of skills and experience. The NASA skill base continues to erode as more functions transition to the Space Flight Operations Contract (SFOC).

For the last 5 years, the SSP has approached privatization through a series of contract consolidations. The transition from NASA oversight to insight associated with these consolidations, has evolved far enough in the last several years to recognize that continuing transition, combined with the continuing loss of NASA skills and experience, will result in serious erosion of checks and balances within the program, critical to safety and mission success. Continued consolidation utilizing the existing approach results in a serious threat to safety and mission success. A different approach is required to sustain safe and successful operations for the next 20 years.

Additionally, existing contracts are structured such that contract length and terms significantly influence the contractor to make short-term, profit motivated decisions. An overemphasis on profit can result in program weakness with reduction of critical skills and erosion of checks and balances, biasing program and project decisions. Privatization must address accountability and long-term sustainability, redirecting the profit motive to allow long-term investments and supportability to be a strong factor in decision making.

1.4 What is Privatization?

The success of the SSP is due to the complementary skills and experience of the NASA and contractor workforce. Individually, neither the contractor nor NASA has the necessary expertise and required skills to operate the SSP. However, collectively, the requisite skills and experience exist to maintain the safety and viability of the program.

A hand over of government functions to a private company without providing the associated necessary skills and experience is a recipe for failure. The continued reliance of the prime contractors on NASA combined with the continuing erosion of NASA skills and experience is a serious threat. For the SSP to remain safe and viable, it is necessary to merge the required NASA and contractor skill and experience bases. Anything less than a FULL merger of the identified functions results in a continued threat to safety and mission success.

The merger of skill bases, in addition to those already transitioned to SFOC, involves the following functions, representing approximately 700 – 900 civil servants:

1. Astronauts, including the flight crew members that operate the Space Shuttle
2. Space Shuttle Program and project management, including the orbiter, space shuttle main engine (SSME), reusable solid rocket motor (RSRM), external tank (ET), solid rocket booster (SRB), and extravehicular activity (EVA).
3. Mission operations, including the flight directors and flight controllers.
4. Ground operations and processing, including the launch director, process engineering, and flow management.

Privatization shifts Space Shuttle operational accountability and requirements ownership from NASA to a private company. If NASA continues to retain asset ownership and indemnify the private company, the role of NASA in day-to-day Space Shuttle operations is greatly reduced. NASA will still maintain a strong presence in assessing Shuttle safety through independent assessment of technical issues/concerns, resulting in a NASA safety commit-to-flight Go/No Go determination at the Flight Readiness Review (FRR) chaired and conducted by the private company.

NASA	**Private Company**
Asset ownership (to be established)	Accountable
Indemnify private company	Requirements owner
Safety - independent assessment/insight	Safety - direct accountability
Contract/Budget	Program/hardware element management
Technology development	Mission operations
Payload manifest determination	Ground operations/processing
	Payload customer interface
	Sustaining/supportability
	Astronaut – Space Shuttle flight crew
	Asset ownership (to be established)

The following address specific topics necessary for successful implementation of privatization:

1. **Safety:** A strong independent safety organization, within the private company, reporting to the Chief Executive Officer (CEO)/Chief Operating Officer (COO), is required to maintain program safety, viability, quality, and mission assurance. Additionally, privatization of Space Shuttle operations must include the Space Shuttle astronauts who operate the Space Shuttle to provide a strong safety and mission assurance check and balance. Astronaut ownership of program/project decisions, in addition to being an integral owner of

safety and mission assurance (SMA) decisions, significantly enhances the safety of the program and provides a strong check and balance.

NASA will continue to maintain a strong independent assessment safety function, providing technical insight through surveillance and independent assessment. A healthy tension must be maintained between the private company and NASA within the SMA arena to ensure overall safety of the program. Additionally, independent reviews by the Aerospace Safety Advisory Panel (ASAP) and other appointed panels will continue as an essential ingredient to overall SMA.

2. **Checks and Balances:** The existing check and balance system within the SSP consists of established, healthy tension between program organizational elements responsible for hardware design and the elements responsible for operations and processing. Establishing an organizational structure in which vehicle operations and processing responsibilities are separate from vehicle hardware design, production, and sustaining engineering is critical in maintaining a healthy tension across the program.

   A check and balance system is also maintained today between NASA and prime contractors. NASA project management and engineering/operations skills and experience complement the prime contractor workforce skills. Again, healthy tension exists that challenges assumptions to test results, procedures, processes, problem disposition recommendations, and planned work. This tension is an essential ingredient in today's program structure and constitutes a necessary check and balance process in the critical safety equation. The private company must establish a structure that maintains these checks and balances.

3. **Profit Motive:** Existing Space Shuttle contracts focus heavily on cost incentives and sharing of under-run for profit. An overemphasis on profit can bias decisions, resulting in prioritization that creates program weakness with reduction of critical skills and erosion of checks and balances. Privatization implementation needs to redirect the profit motive, allowing it to be a factor but not the decisive influencing criteria. Incentives and accountability must be established to ensure safe operations, implementation of upgrades, and investment in program infrastructure and supportability.

   Profit reinvestment and company competitive proposal activities should not be restricted. Additionally, executive compensation and incentives should be structured to place emphasis on safety, effectiveness, and program viability, replacing an emphasis on maximization of fee to the company.

   It is the intent of Space Shuttle privatization to expand the business base of the private company responsible for Space Shuttle operations to more than just Space Shuttle operations. It is envisioned that the private company will be a strong competitor for privatized ISS operations. Additionally, because the private company will have a strong resident core competency in human space flight operations, it is envisioned that the private company will be a strong competitor for future space operations contracts (next generation reusable launch vehicles, and Moon, Mars, or other exploration), both human space flight and nonhuman ventures.

4. **Astronaut Selection/Management:** Privatization of Space Shuttle operations must include the flight crew members, who operate the Space Shuttle, to provide a strong safety and mission assurance check and balance. Flight crew members will be integrated within the private company to provide opportunities for astronauts to manage and gain experience in company decision making. Astronaut selection and flight assignment will be

the responsibility of the private company. Utilization of military astronauts may continue with the establishment of an agreement between the private company and the Department of Defense (DOD).

5. **Civil Servant (CS) Transition:** Civil servant transition to the private company is required in order to provide the skills and experience necessary for safe Space Shuttle operations. Specific functions and associated CS will be merged with the contractor workforce. All CS associated with targeted functions will be encouraged to transfer with the function.

   In order to achieve the necessary merger of NASA skills and experience within the private company, the CS must be incentivized to transfer and adequately compensated to account for any change of benefits. The following considerations must be addressed:

   a. Compensation: Compensation must be comparable.
   b. Benefits: Retirement plan and annuity, health benefits, leave, etc. must be compensated in order to keep benefits commensurate with Government benefits.
   c. Job Security: A period of time established with no termination without cause.
   d. Post employment restrictions: Restrictions must be removed to allow key personnel with critical skills and experience to transfer.
   e. Incentives:
      1) Additional years of service credit
      2) Additional years to age credit
      3) No penalty for early retirement
      4) Buyout
      5) Signing bonuses.

   Additional cost will be incurred to establish privatization. These costs must be recognized and funding provided.

6. **NASA's Role After Privatization:** The primary role for NASA in Space Shuttle operations after privatization is implemented will be to provide an SMA independent assessment of the private company operations, processes, procedures, and communication utilizing audit and surveillance techniques. This independent assessment will provide NASA the insight required to determine adequacy of the private company operations and flight preparation process.

   It is envisioned that the private company will conduct the FRR and that NASA will participate in an SMA role. The SMA role in independent assessment is basically unchanged from what exists today within the NASA SMA community, with the exception that additional experienced resources may be required to execute the independent assessment required to provide adequate insight.

   Asset and facility ownership/management has not been determined. However, it is envisioned that NASA will still have a significant role in the ownership/management of infrastructure. The relationship between the NASA and the private company relative to NASA ownership of assets and facilities is still to be determined.

   Privatization will represent a significant change in the business arrangement between the private company and NASA. It is envisioned that management of the business arrangement will be conducted at NASA HQ instead of the current lead Center concept. In addition, because of the high risks associated with human space flight, it is judged that NASA would still provide indemnification. The subject of indemnification and implications in a privatized environment needs further discussion and study.

7. **NASA Engineering Core Competency:** Privatization will not generally include the transfer of NASA engineering core competency to the private company. These skills and functions are necessary for the continued research and development activities that will remain in NASA. Appropriate agreements need to be established to allow private company utilization of Government laboratories and facilities along with the associated NASA engineering skills.

   However, the primary objective of privatization is to maintain the safety and viability of the SSP. By necessity, some engineering critical skills will be required to transition to the private company, although judged to be a relatively small number.

8. **Legal/Legislation:** Legal and/or legislative action may be required to provide necessary incentives for CS transition to the private company. The same may be true in order to remove post employment restrictions.

   The requirement for legal and/or legislative action to support privatization varies with the privatization option under consideration. Three options under primary consideration are:

   a. Modification to the existing SFOC
   b. Establishment of a Government corporation (G-corp)
   c. Expanded competition that would leverage competition while expanding the number of participants in the process.

   The option of modifying the existing SFOC involves the least legal and legislative action. Provisions already exist within the contract to pursue privatization of the SSP. Legal and legislative actions are considerations for incentivizing the CS workforce to transition to the private company. Separate legislation would not be required to establish the private company nor implement necessary contract modifications. Legislative action would be required to establish a G-corp for privatization of the SSP.

9. **Contract Considerations:** Privatization infers the shift from a cost-plus to a fixed-price contract environment. Stable core operations activities may be governed by a fixed price contract, while more volatile supportability and infrastructure activities may require a more creative business arrangement with NASA. Long-term contracting is required for stability; incentivize CS to transition to the private company; implementation of investment options; development, maintenance, and retention of critical skills; reduce cost through long-term/volume agreements (subcontractors, suppliers, lease, etc.); and potentially attract investors.

10. **Funding for Privatization:** Additional funding will be required to establish privatization. Depending on the contract administration and the company structure, initial funding will vary. A long-term budget commitment from NASA is necessary for the stability of the privatization effort.

1.5 Summary

It is believed that utilization of the Space Shuttle for human access to space will continue through at least 2015 and possibly beyond 2020. The longevity and operational aspects of this program demand a different approach to operational management for the future. A different management strategy needs to be employed.

Privatization of the SSP has the potential to provide significant benefits to the Government. However, timing is critical. The continuing erosion of NASA skills and experience threatens the safety of the program. It is critical to take advantage of the existing NASA SSP expertise before further erosion affects the ability to plan and safely implement privatization. Today, the skill and knowledge legacy still remain to formulate the appropriate merger of the NASA SSP and private industry.

2.0 Fundamental Principles

Because the privatization of the SSP will be a challenging activity, it is imperative that fundamental principles be established during the formulation process to guide selection of options and preserve the framework that will enable successful implementation and operation of a privatized program.

Privatization will entail a significant paradigm shift in the way business is conducted, both internal and external to NASA. Consequently, many factors will need consideration. It is possible that Government and private industry influences may contribute to a weakened framework in this process. Therefore, it is mandatory to identify a set of fundamental principles that are considered inviolate in order to proceed further with Space Shuttle privatization.

The following fundamental principles are established by the NASA SSP management team:

1. **Safety will not be compromised.**

    a) The private company must establish an organizational structure that maintains critical checks and balances.
    b) Anything less than a FULL merger of all the identified functions and associated civil servants results in a continued threat to safety and mission success.
    c) Transfer of civil servants to the private company is critical to maintaining the safety and viability of the program.

2. **Merger of NASA and private industry will create a new company leadership team and an associated new company culture (i.e., NOT an acquisition, consolidation, or a handover).**

    a) Post employment restrictions must not affect the leadership team available for transition.

3. **Business arrangement terms and conditions must be in concert with a long-term commitment for privatization (i.e. minimum 10 years) to eliminate short-term mentality that results in limited investment; to provide stability to allow development, maintenance, and retention of critical skills; to incentivize CS to transition to the private company; to reduce cost through long-term/volume agreements (subcontracts, suppliers, lease, etc.); and to potentially attract investors.**

    a) A long-term budget commitment from NASA is necessary for the stability of the privatization effort.

4. **Incentives and accountability must be established to ensure safe operations and investment in supportability and infrastructure.**

    a) Government influence at board of directors or advisory board level must be established to ensure essential safety features are maintained and that profit motive does not compromise long-term viability.
    b) Asset/facility transfer must be considered to establish accountability.

3.0 SAFETY: Maintaining Critical Checks and Balances

3.1 Introduction

NASA has traditionally provided external checks and balances to the organizations conducting human space programs. The checks and balances have done much to ensure the safe execution of human space flight operations. If a private company is to be created that operates safely but is free of day-to-day Government involvement, care must be taken to ensure the organizational structure captures these necessary checks and balances. Key elements of this structure and its safety processes must ensure the private company is not compromised under pressure to improve operating efficiency.

3.2 Scope

This study will outline the key organizational checks and balances elements that are necessary for safe processing and flight operations.

3.3 Assumptions

It is assumed that the private company will perform all Space Shuttle operations. It is also assumed that NASA will maintain contract and budget management, manifest priorities, and SMA independent assessment.

3.4 Key Elements

There are three key elements that make today's human space flight operations safe that must be built into this organizational structure:

1. A healthy tension between the design and operations elements of the organization.
2. Strong in-line checks and balances between design and operations.
3. Value added forms of internal independent assessment.

Healthy tension between design and operations organizations can be established simply by maintaining distinctly separate and equal chains of command within the private company. Pressure will constantly be on the operations organizations to maintain schedule and cost, while the design organizations must ensure the requirements are established and followed. Operations organizations will be larger, but the organizational structure and chain of command must ensure the design organizations are on equal footing.

Strong in-line checks and balances are established by requiring concurrence or approval, either in the form of a signature or vote on a board, from the complimentary organization. In the case of ground operations, this would require design representation concurrence on critical operations. And in the reciprocal case of hardware design and development, it would require operations concurrence at a design review or board. The appropriate checks and balances levels have been established over the years and should be maintained and strengthened, not diminished in the private company.

The term value added independent assessment infers that the organization performing the independent assessments has the appropriate skills and expertise for the operation or task being assessed. Internal independent assessment should be found in safety, engineering, and quality insight designed to capture all aspects of the operations, from design to procedure development to the work on the floor, launch, mission operations, and landing/recovery. The astronaut office must maintain the "man on the rocket" perspective on all issues as an additional level of independent assessment.

3.5 Concepts

The team reviewed the organizational structures of both the existing contractor and Government organizations along with the existing models for healthy tension between design and operations, strong in-line checks and balances, and independent assessment. In addition, best practices for checks and balances in Government, industry, and military organizations, based on the members' experience, were reviewed.

The following were identified as the primary private company functions:

1. Safety assurance
2. Quality assurance
3. Ground, flight, manufacturing, and logistics operations
4. Design/product requirements, sustaining maintenance, management, and control
5. Program and project management
6. Process integrity
7. Independent assessment
8. Other functions to sustain the business.

In the context of the three key elements healthy tension between design and operations; strong in-line checks and balances; and independent assessment, were grouped into four company generic functions as depicted in Figure 3-1.

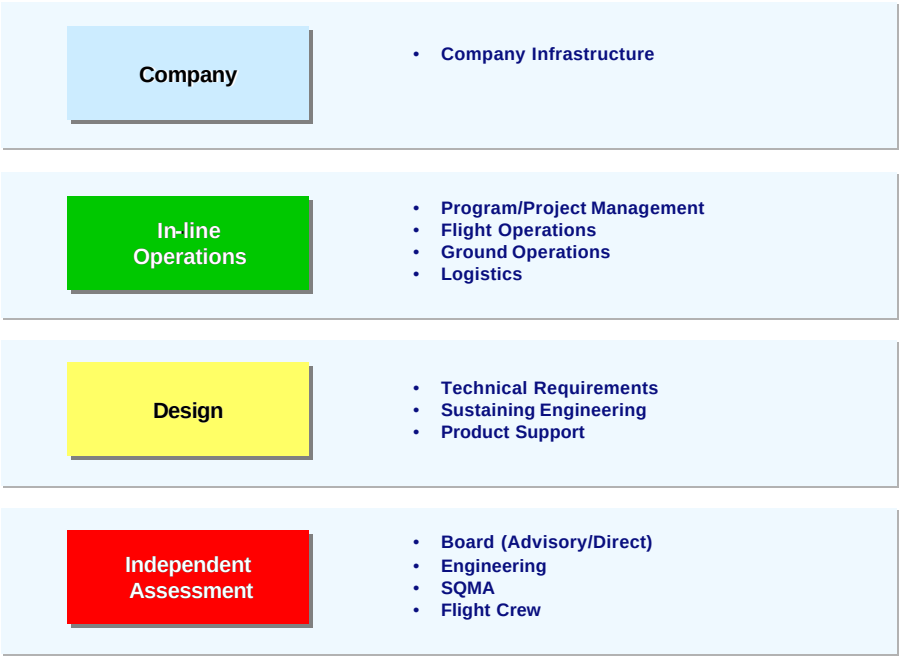

Figure 3-1 Generic Functions

These generic functions were then used as building blocks to develop organizational structures incorporating the three key elements. The first example shown in Figure 3-2 is a classic hierarchical organizational structure with the SSP Office in-line. This example will be used to illustrate how the three key elements could be implemented in the organizational structure. At the top, NASA would retain safety independent assessment. A board or advisory panel, identified in red, would provide senior-level management independent assessment of the private company. The SSP and its in-line operations are shown in green. In this example, the program has an internal safety, reliability, and quality assurance (SRQA) organization that performs in-line inspections of all operations. Healthy tension between design and operations is depicted by the separate but equal chains of command for those two elements of the organization. In the ground operations case, yellow arrows depict the in-line approval required from the design organization for critical tasks carried out by operations. Internal independent assessment in the form of engineering insight is depicted by the red insight blocks reporting back to the Chief Engineer, who reports to the CEO. Independent assessment in the form of quality insight, current Government mandatory inspection points (GMIP's) and audit, is depicted by the red arrows and blocks reporting back to the SRQA Director, who also reports back to the CEO. The Chief Astronaut Office, in red, continues to provide independent assessment of all issues from the flight crew's perspective. Similar examples for implementation of the three key elements can be shown for each of the other functions in the SSP.

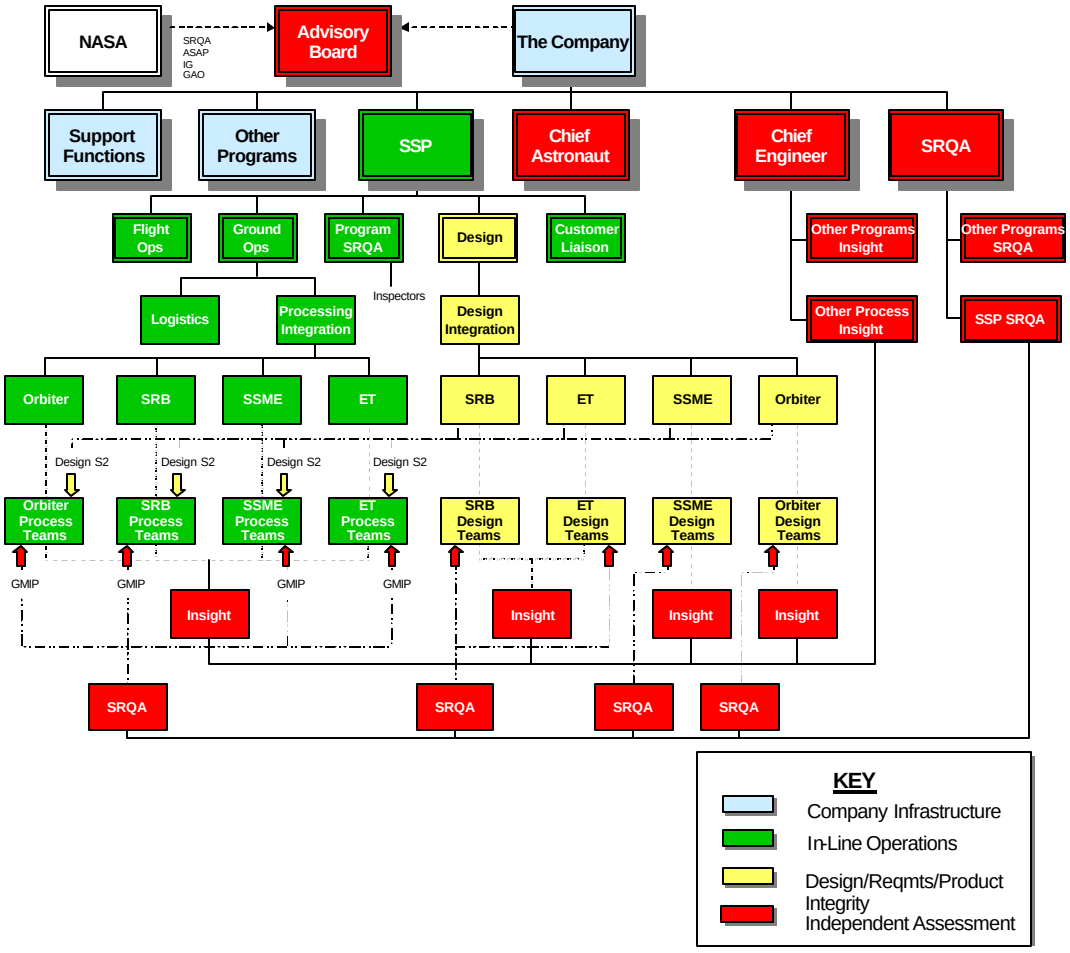

Figure 3-2

The next example, shown in Figure 3-3, is identical to Figure 3-2 except the program level SRQA function has been removed. This example places the entire SRQA role (inspection, audit, and independent assessment) in a position totally independent from the program. All other aspects of the three key elements would be implemented as already explained in example one.

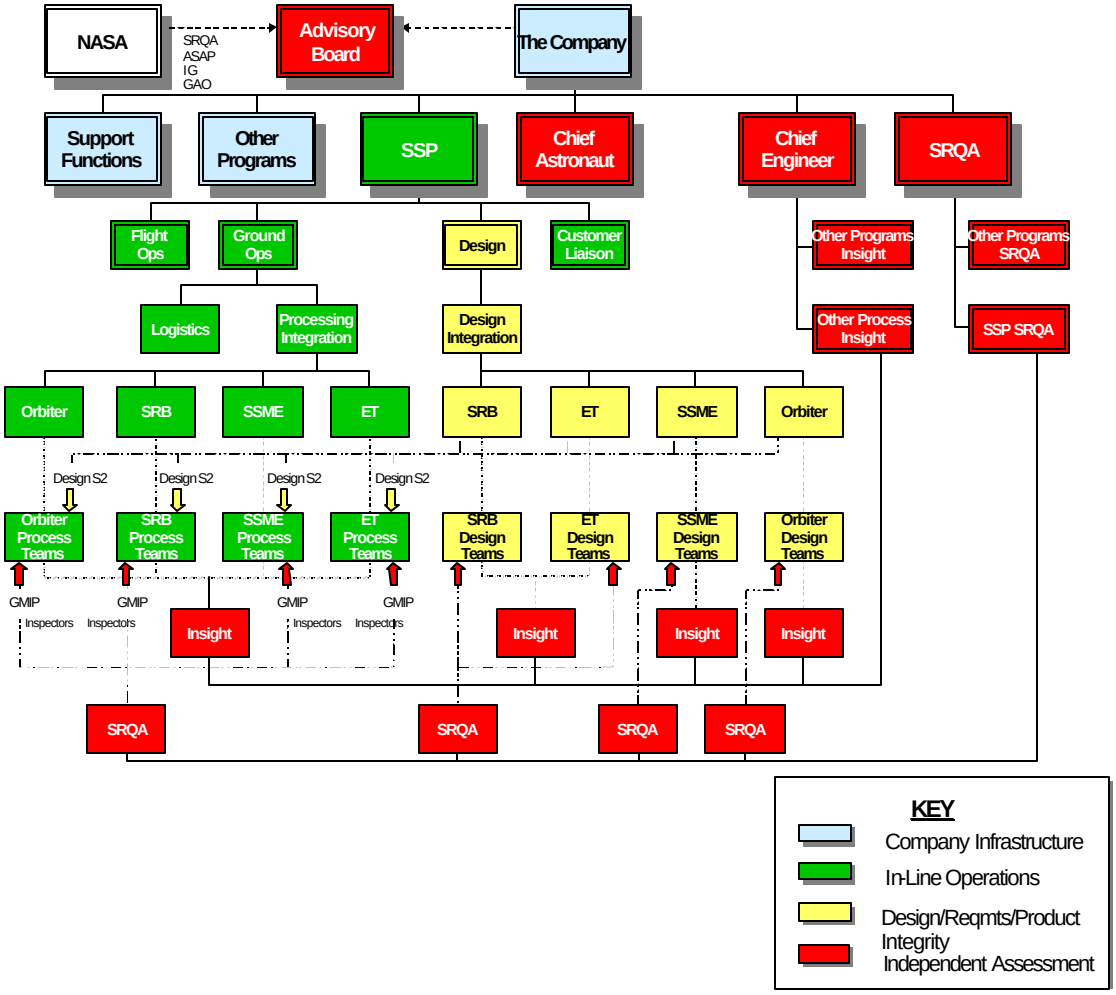

Figure 3-3

The third example, shown in Figure 3-4, is a matrix organization broken up by functions, not programs. This example has been referred to as the CEO version, because from a CEO's perspective, this matrix organization may be better suited to handle multiple programs, with the SSP being only one. Again the key elements could be implemented as in example one. In addition, this structure allows known problem areas such as training and facilities to be put on equal footing with all other private company functions.

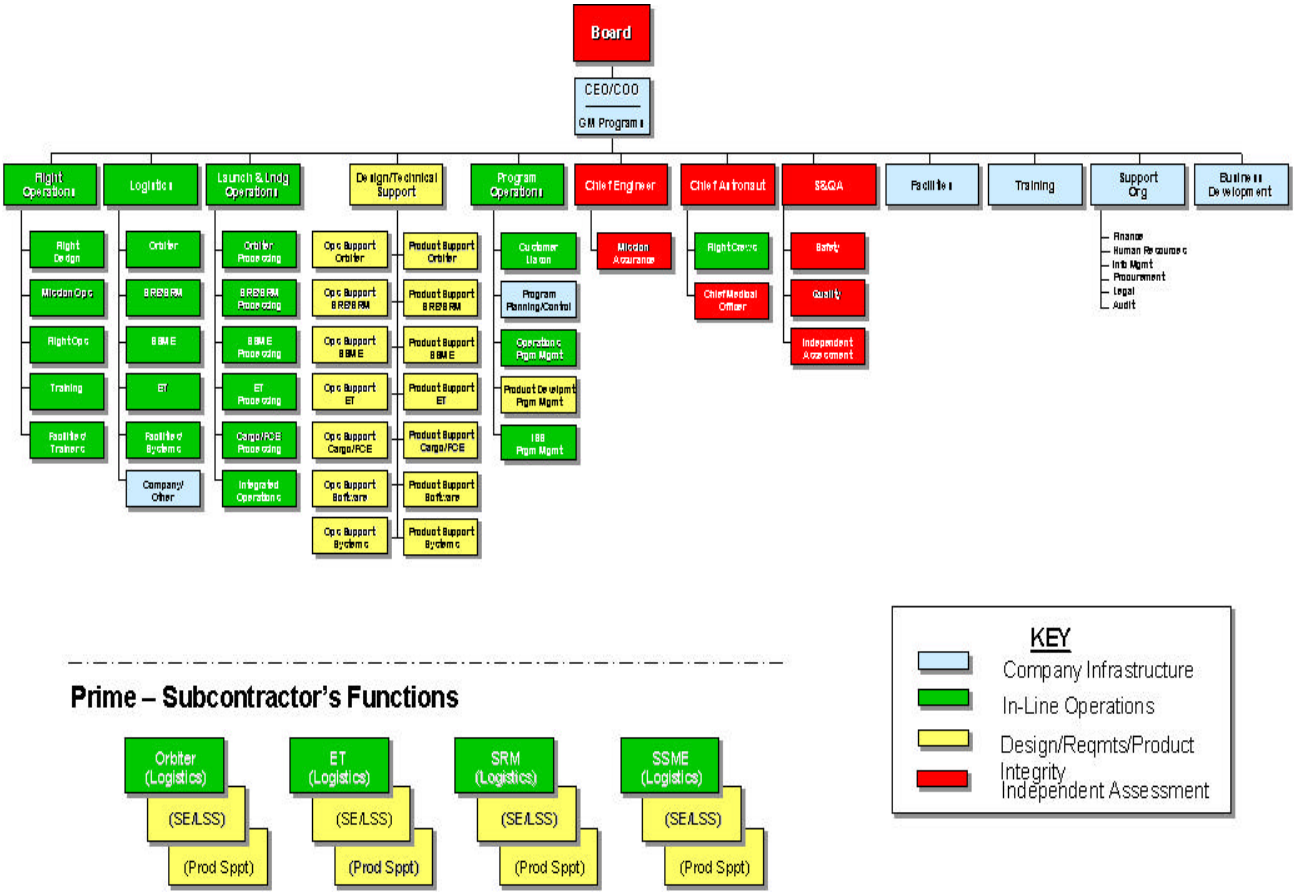

Figure 3-4

3.6 Other Benefits

The employees and managers who make Space Shuttle operations safe today are the same people who will be making Space Shuttle operations safe the day after the transition to the private company. All of the examples are based upon the primary functions that are being performed by Government and contractor organizations today. Because these primary functions should be the same in the future, transition at the working level could be seamless. Differences can be confined to the senior management level. Therefore, an organizational structure can be established that simplifies transition and takes advantage of the skills and expertise of both the Government and contractor organizations. The initial organizational structure should minimize disruption of the processes in place today to ensure continuation to fly safely while this transition takes place.

The organizational structures that are proposed would provide benefits to the individuals involved beyond those immediately apparent. The single-entity organization adopted would provide career path opportunities not present in either government or private industry. In engineering, for instance, a clear career progression from shop floor to design oversight to independent assessment would exist that does not exist today. These new opportunities should help alleviate long-term skill erosion problems while presenting individuals with meaningful, challenging work.

3.7 Assessment

Selection of a given organizational structure would undoubtedly be based on a number of factors other than the necessity of maintaining processing checks and balances. For example, the decision to choose matrix versus an in-line program structure may well depend on how many programs the private company has to operate. Whichever structure is chosen, the following guidelines should be used to ensure healthy tension remains between design and operations, that strong in-line checks and balances are preserved, and that independent assessment is retained in any organizational structure used to operate the SSP:

1. Clear and separate chains of command for operations, design, and independent assessment.
2. Equal organizational footing for leaders of operations, design, and independent assessment.
3. In-line approval by reciprocal organizations (design/operations) for critical operations or decisions.
4. The private company should report to an independent oversight board.
5. The private company must be open to external independent review.
6. Internal independent assessment must include safety, engineering, and quality insight.
7. The Chief Astronaut must provide an independent operator assessment of all issues.
8. Adequate technical skills and expertise are required for all functions.

3.8 Summary

After reviewing today's SSP organizations and assessing some examples of private company organizational structures, viable options exist for a single private company that captures the key elements necessary for safe human space operations. The single-entity structures proposed have additional benefits in terms of transition and individual career progression that make them attractive beyond their flight safety implications.

4.0. SAFETY: In-Line Safety and Independent Assessment

4.1 Introduction

The SSP has a heritage of safe and successful operations built upon strong check and balance processes that are integral to the structure of the program. A structure of in-line and independent safety activities provides insight into the validity of technical recommendations as part of daily SSP operations and the commit-to-flight process. Paramount to the success of any privatization approach will be the maintenance and continuous improvement of these processes in order to safely continue space flight operations. These proven processes are well established and documented and reflect years of lessons learned in Space Shuttle operations.

The proposed privatization approach must maintain the integrity of these requirements and processes but shift the ownership and implementation responsibility of the in-line safety to the private company. Within the private company, these functions must be uniquely independent of the program organizational elements. A separate organizational structure and technical reporting path must be established within the private company to execute the SMA responsibilities.

The NASA process of independent safety assessment will remain intact. The current NASA HQ Office of Safety and Mission Assurance (Code Q), Center safety organizations, and their support contractors will continue to execute current roles and responsibilities, thereby providing an element of stability in the transition to privatization. Execution of responsibilities will shift from intensive control and approval, to surveillance and insight of operations and other management processes considered key to the program's success. NASA engineering organizations will provide technical support to the SMA processes and NASA safety will retain authority to proceed in the Certificate of Flight Readiness (CoFR) process.

This approach to privatization will provide the necessary structure to sustain safe operations of the Space Shuttle.

4.2 Scope

The scope of this activity was to characterize the SMA functions, flight readiness process, and to identify an implementation structure that maintains an essential system of checks and balances.

4.3 Assumptions

The private company will be responsible for safety. The private company will control requirements, conduct boards and panels, and make all decisions related to SMA. This shift of responsibility from NASA to the private company is the basis for the SMA organizational and NASA interface approach and will enable NASA to transition from its current position of approving or controlling contractor activities to a position of allowing, even encouraging, the private company to operate without NASA's control as long as there is evidence that the private company is exerting the controls necessary to maintain safe operations.

Current Government regulations remain applicable. In developing a privatization safety approach, it was assumed that current Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), range safety, and other safety related laws and regulations would remain applicable as currently imposed.

NASA SMA structure will remain intact. The organizational structure and relationships that currently exist between NASA HQ, the NASA Center SRQA organizations, and their support contractors will continue in their current capacity related to independent insight. This approach will provide for an

element of stability during the transition process and ensures continuity in the independent assessment activity.

NASA safety maintains an authority to proceed. This asserts that NASA SMA will continue an involvement and authority in the CoFR process.

4.4 Current State

Safety is primarily an in-line responsibility of the NASA SSP. It is the responsibility of each Center, processing organization, operating organization, and program element to ensure the safety and viability of hardware, design change, and operations where they have a direct ownership and responsibility. As a secondary check, the program employs a separate independent organization to participate in executing in-line functional responsibilities. This secondary check constitutes an independent assessment of in-line activities and is conducted primarily by established SMA organizations at the various NASA field centers (Figure 4-1).

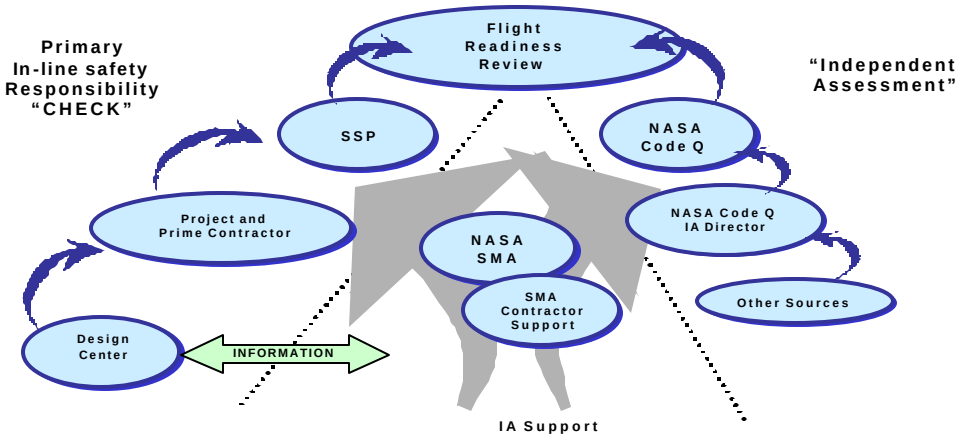

Figure 4-1 Current State: SSP Operations Safety Assessment Relationships

As changes are proposed or issues occur within the program elements and projects, they are reviewed by the SMA organizations and recommendations offered at established SSP boards and panels. Because the primary focus of these independent organizations is safety, quality, and mission assurance rather than hardware design or processing/operations, a healthy tension is established between them and the primary design center, resulting in an effective independent assessment process within the program structure.

External to the SSP structure is a NASA level independent safety assessment process that utilizes information gathered primarily from the SMA organizations and supporting contractors, although the gathering of information can be much broader if required. This level of independent assessment does not replace the SSP's checks and balances process. It is used to ensure that appropriate processes and procedures have been utilized and that communication paths are open and appropriate. Assessments performed by the SMA community provide valuable insight into the validity of technical recommendations as part of daily program operations and the commit-to-flight process. They play a vital role in evaluating hazards and understanding potential risks.

As depicted in Figure 4-2, the assurance approach, as it exists today, is based upon extensive NASA review and approval of contractor plans, procedures, and most work activities. All accountability for the product or service meeting requirements rests with NASA. The contractor's role is the accurate implementation of NASA requirements.

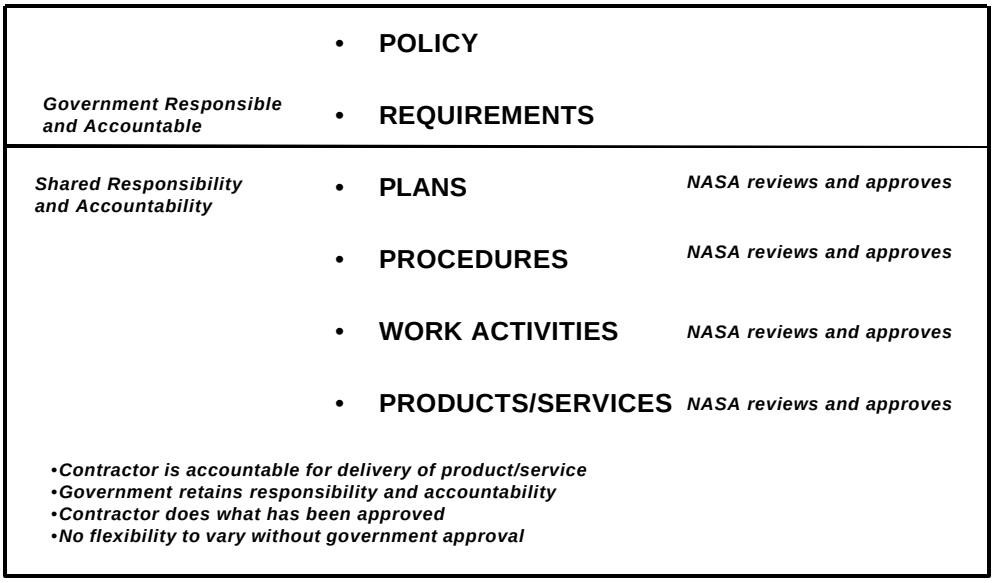

Figure 4-2 Assurance Approach

The SMA functions are characterized into general topics:

1. Program definition and management – includes effort associated with establishment of SMA requirements, subcontract management, internal audit, and surveillance.

2. Engineering support – includes effort associated with technical analysis; anomaly resolution; and test, verification, and acceptance of flight assets.

3. Industrial safety – includes effort associated with OSHA/EPA compliance, awareness/motivation programs, mishap investigation, and industrial hygiene.

4. Quality system – includes effort associated with establishment of manufacturing standards, process control, measurement systems, and continuous improvement processes.

5. Mission safety – includes effort associated with the flight readiness processes, including technical evaluation and acceptance of residual risk.

These functions are implemented by the program and contractors through a variety of extensively documented procedures under the SSP configuration management processes.

4.5 Privatized State

With privatization, the primary responsibility for safety is moved to the private company. As depicted in Figure 4-3, SMA requirements are owned and controlled by the private company. The company, who will have the responsibility, accountability, and authority to manage the risk associated with Space Shuttle operations, will establish configuration management processes.

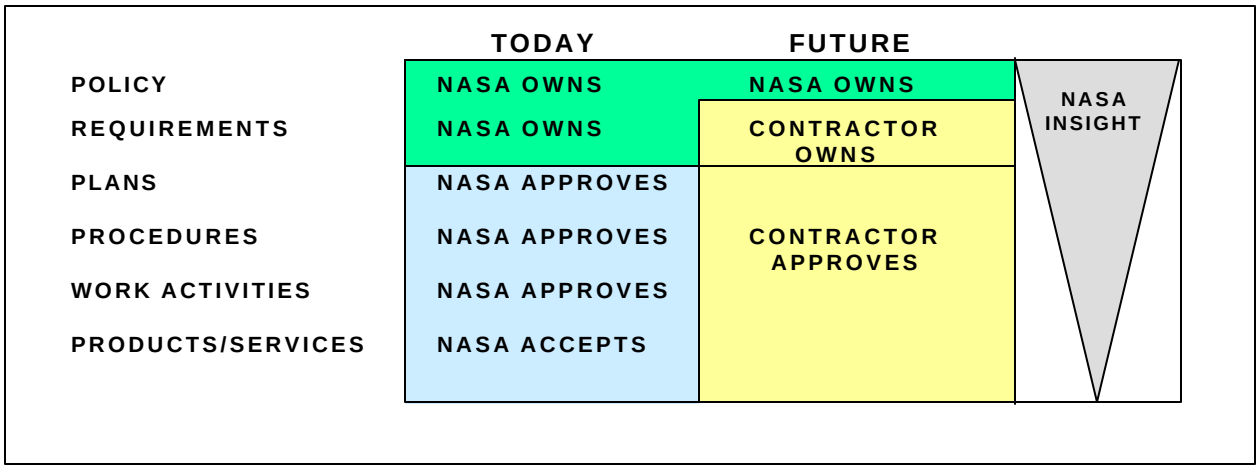

Figure 4-3 SMA Implementation Comparison

NASA will execute insight responsibilities commensurate with level of activity and relative risk. NASA will retain the authority to terminate any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations. This includes the authority to declare a Space Shuttle contingency and to activate working groups and other contingency measures as necessary.

NASA in-line SMA functions will also become the sole responsibility of the private company. The private company will have authority and control over the requirements, processes, and reporting associated with in-line SMA activities. Table 4.1 provides a summary of the major privatized SMA functions as related to current implementation.

FUNCTION	GOVERNMENT CURRENT	CONTRACTOR CURRENT	End State
SMA Program Management –Requirements –Board / Panel membership –Surveillance –Approval authority	**OPR responsibilities** –Requirement owner –Board / panel member –Surveillance and audit –Evaluation / approval	**Implementation** –Product generation –Change initiator –Requirement flowdown	**Privatized**
Engineering Support –FMEA / CIL analysis –Trend / PRA assessments –OMRSD / PRACA	Requirement OPR Evaluate / accept products Surveillance / audit	Implementation –Conduct analysis / document –Submit for approval –Records retention	**Privatized**
Industrial Safety –OSHA compliance –Records / mishap investigation –Industrial hygiene –Environmental Protection	Regulatory Requirements (OSHA/EPA) NASA requirements NASA Managed Compliance –On site facilities –Contractor surveillance	Regulatory Compliance (OSHA/EPA) Implementation Contractor facility compliance	**Maintain Current State** –OSHA / industry standards –Gov furnished services
Acceptance - Residual Risk –Flight Readiness Process –Technical evaluation –Acceptance of risk	OPR of Requirements –Commit to flight / OMRSD SSRP / PSRP / SRP / GSRP Authority – risk acceptance	Implementation / compliance –Analysis conduction –Records administration –Board support Responsive to inquiry	**Privatized**
Quality System	Code Q Policy –NPD 8730.3 –Use ISO 9000 SSP requirements	Company specific systems –"meet or exceed" NASA requirements	**Privatized** –ISO 9000 supplemented –AS–9100 supplemented
Quality Processes	Code Q Policy –ISO 9000 / standards SSP Requirements	Company specific procedures –"meet or exceed" NASA requirements	**Privatized** –Industry adapted quality procedures –Transition to industry standards
Quality Manufacturing	NPG 8735.2 SMA Surveillance (GMIP) Government acceptance / buy	Implement MIP requirements MRB	**Privatized** NASA surveillance risk based –Process monitoring
Procurement Quality	GMIP determination Resident Offices Acceptance	Purchase Orders / Contracts Surveillance / Management Acceptance	**Privatized** NASA surveillance risk based –Process monitoring

Table 4.1 – Summary of Privatized SMA Functions

To implement these in-line functional responsibilities, the private company must utilize a strong secondary check process much like that currently utilized within the SSP. These SMA functions will be executed in support of the design, engineering, and operations by an organization totally independent from the program and the elements. Because the primary focus of the private company SMA will continue to be safety, risk management, quality, and mission assurance rather than hardware design or processing/operations, a healthy tension will be maintained between the private company SMA and the primary design functions resulting in an effective independent assessment process within the privatized structure (Figure 4-4).

The private company independent SMA management structure will serve as the policy and process owner for all functions related to safety, reliability, maintainability, risk management, and quality. The leadership of this organization will be responsible directly to the CEO/COO.

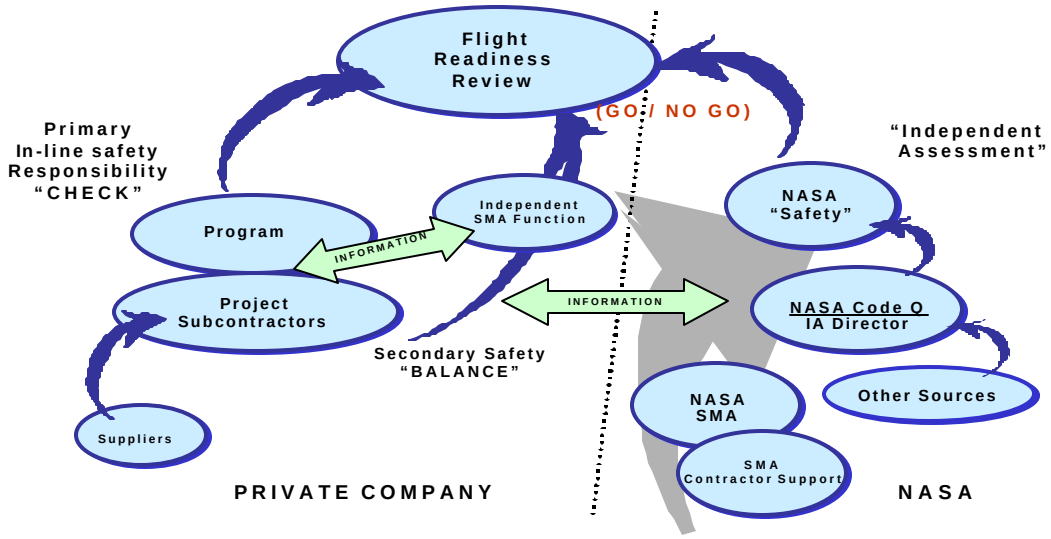

Figure 4-4 Privatized SSP Operations Safety Assessment Relationships

The SMA organization within the private company will participate in all program boards and panels with focus on system safety and risk management. It will chair the various safety panels such as the System Safety Review Panel (SSRP) and Payload Safety Review Panel (PSRP) and will represent SMA functions to program and project level boards. It will be responsible for ensuring that safety related impacts are properly identified and dispositioned.

The private company will be responsible and appropriately staffed for the safety, reliability, maintainability, and quality functions across the company. It will assume responsibility for procurement quality assurance (PQA) currently being performed by NASA. The PQA function will also be staffed to perform the PQA functions currently performed by Defense Contractor Management Agency (DCMA) in Space Shuttle contractor facilities. Various levels of SMA support will be colocated within elements; however, they will be organizationally hard-lined to the SMA organization to ensure the independence and integrity of the functions and to provide a secondary reporting path.

Additional responsibilities of the private company independent SMA organization will be the administration of internal audit functions including audit planning, participation in program and element audits, supporting special audits prescribed by SMA, the ISO Quality Management System, and the OSHA Voluntary Protection Program. The private company independent SMA organization will also serve as the primary interface to external review and audit groups such as NASA safety, ASAP, Office of Inspector General (OIG), etc.

NASA will ensure that each Center will maintain SMA organizations with direct lines of authority to the Center Directors and functional management reporting duties to the Associate Administrator for Safety and Mission Assurance as part of an alternate, independent line of communications. This will ensure unrestricted flow of information concerning safety, risks, or other SMA matters to the appropriate levels of management. The NASA SMA organizations will serve as direct interface to the private company to ensure safety through independent assessments and risk surveillance. This assurance will be administrated in many ways to include audits and top-level milestone reviews.

The Center SMA functional managers will provide for adequate staffing, including support contractors and DCMA at appropriate contractor locations to ensure NASA insight is maintained.

4.6 Flight Readiness Process

The flight readiness process represents the culmination of safety related activities and the disciplined approach to certifying and verifying safety of flight. It also represents the culminated acceptance of residual risk. Today, the final FRR provides senior NASA management a summary of the certification and verification activities completed and rationale for acceptance of residual risk. By signing the CoFR, NASA senior managers in attendance agree to the acceptance of the residual risks associated with mission execution.

In the future, the private company will manage the CoFR process and be responsible for the acceptance of residual risk. The program elements will manage the processes and produce the products that are under SMA surveillance. The private company independent SMA will participate in all program and element level sponsored forums where decisions are made having the potential to affect the safety, reliability, or quality of the Space Shuttle flight and/or ground crew and systems. The private company independent SMA organization will be directly involved in the flight readiness process, will be responsible for CoFR endorsement, and will serve as the safety manager to the Mission Management Team (MMT). This membership provides an alternate independent path for the communication of information and actions concerning safety, risks, and other SMA matters.

The NASA safety function will utilize information from their own surveillance activities, independent assessments, and other sources to formulate a Go/No Go CoFR decision. Current processes such as the Prelaunch Assessment Review (PAR) and HEDS Assurance Board will continue to serve as senior safety management reviews and will provide insight summary and guidance for CoFR endorsement by NASA SMA. While not a member of the company managed MMT, NASA will maintain insight into all aspects of mission execution through observation and participation in technical discussions and decision processes. NASA will retain authority to proceed and will be able to intercede in decisions that pose potential safety issues.

4.7 Areas for Resolution

The presented privatization approach does not present any major issues requiring resolution. The structure and execution of the SSP currently complies with all Government laws and regulations and NASA policies and requirements related to safety. Close observation during transition will ensure effective transfer of responsibilities to the private entity.

There are several areas that will need to be addressed in subsequent discussions of privatization:

1. Provisions for an adequate and skilled NASA SMA workforce. The performance of insight through inspections, audit, surveillance, process analysis, and performing independent technical assessments will require more technical depth of knowledge than currently available in NASA SMA organizations. NASA SMA may require additional support from NASA technical organizations to accomplish this role.

2. Acceptance of residual risk. The current Space Shuttle risk baseline is well documented and changes that reflect risk acceptance are analyzed and approved by NASA. With privatization, this process becomes the responsibility of the private company. If NASA maintains ownership of the assets, the level of involvement in the risk acceptance process needs to be clarified and defined.

3. The role of NASA in configuration management. The quality program is structured around maintaining configuration and acceptance of flight and ground assets. It is perceived that a private company will, over the course of time, change the configuration of these assets. There will need to be an agreement between the private company and NASA with regards to configuration changes.

4.8 Summary

There are no significant safety related actions required to proceed with implementing this privatization approach. Over the past 5 years the SSP, in conjunction with the SMA community, has implemented a series of initiatives that strengthened both the in-line and independent safety functions and provided the foundation for privatization.

The Manager, SSP SMA established a clear SMA in-line responsibility within the program separate from the independent safety organizations. Program safety functions such as requirements of the Office of Primary Responsibility (OPR), SSRP, PSRP, FRR, and Mishap Investigation Team (MIT) have been executed within the program structure uniquely separate from project elements.

The NASA independent safety organizations have established an Independent Assessment (IA) Directors Office directly responsible to NASA HQ, Code Q, that provides a management structure and focus for Space Shuttle insight. Independent review processes such as the PAR and the HEDS Assurance Board have effectively implemented technical insight and audit. These functions are well integrated with all aspects of Space Shuttle operations and would continue in this role in a privatized environment.

The safe and successful operation of the Space Shuttle has been achieved through a series of well-documented SMA processes and the appropriate level of checks and balances. While there are a number of implementation details, the fundamental approach to privatization, including incorporating of an internal independent SMA organization, provides for adequate checks and balances, provides for secondary reporting paths, and the continuation of a strong NASA independent safety function, will provide a framework for continued safety of the SSP in a privatized environment.

5.0 Merger: Relationships, Interfaces, and Asset Management

5.1 Introduction

The envisioned privatization of the Space Shuttle is a merger of Government and contractor capabilities. The private company will have a new leadership team, a strengthened skill and experience base, and an associated new culture. Business arrangements and operations management terms and conditions must be in concert with a long-term commitment for privatization to create workforce stability; allow development, maintenance, and retention of critical skills; incentivize CS to transition to the private company; and eliminate the short-term limited investment mentality associated with today's contracting methods. The primary objective of the private company will be the safe, efficient, long-term utilization of the Space Shuttle.

5.2 Scope

The scope of this activity was to review and assess the operations and business related issues associated with the privatization of the Space Shuttle, including the identification and review of options for changes in relationships, interfaces, budgets, and assets.

5.3 Assumptions

Three assumptions were dominant in the formulation of options and the identification of issues:

1. The current state of the NASA budget, assets, and facilities today has high inherent risk, and the resolution or nonresolution of these risks can significantly influence decisions regarding asset and interface disposition.
2. Multi-program laboratories and facilities at NASA Centers will be retained by the NASA Center, as appropriate, and will be available to the private company through some use agreement.
3. The private company's long-term goal is sustained human space flight operations.

5.4 New Company, New Leadership, and New Culture

The merger of NASA and contractor skills and experience will in reality establish a new company with a new leadership team comprised of contractor and former NASA leadership. This new leadership team will have an impact on the culture of the new company, utilizing the best of the today's cultural influences (i.e., safety first) with additional influences that will be in the best interests of the private company for the near term and long term.

Because the Government continues to be the majority stakeholder (i.e., budget, risk, etc.), it seems appropriate that the Government and the private company establish an agreement that defines the levels of control and participation between the two entities. For instance, Government participation or appointment authority for a board of directors or advisory board, or selection of key executive management positions in the private company, is one method of achieving assurance that critical elements of privatization are not compromised and that the Government's interests are maintained. These types of arrangements and definition of roles and responsibilities will need further study and development.

Another option is Government participation in ownership of the company through a G-corp. This option permits the Government to appoint certain members of the board of directors of the private company and perhaps to have an influence over the appointment and incentives of the top executives in the private company in order to ensure the proper balance between profit and investment.

Ultimately, the board of directors or advisory board and the chief executives of the private company influence the direction and goals of the private company. Since a highly visible set of national assets are at stake and the Government will remain the dominant customer of the private company for the foreseeable future, it is important to establish a business arrangement at this senior executive level to protect both the interests of the private company, potential investors, and the Government. Additional study and definition is required to define the details of this arrangement.

5.5 Asset Ownership

5.5.1 Identification of the Assets

The assets that are employed in Space Shuttle operations include the Space Shuttle vehicles (e.g., four orbiters, SSME's, ET's, SRB's, and RSRM's) and associated flight hardware; program training aircraft (T-38, Shuttle training aircraft, Shuttle carrier aircraft, etc.); buildings and facilities (i.e., Vehicle Assembly Building (VAB), Mission Control Center (MCC), Orbiter Processing Facility (OPF), Launch Control Center (LCC), launch pads, mobile launch platform (MLP)); laboratories and test facilities (i.e., Shuttle Avionics Integration Laboratory (SAIL), SSME test stands at SSC, etc.]; communications capabilities (i.e., Merritt Island Launch Area (MILA)/Ponce de Leon (PDL), Tracking and Data Relay Satellite System (TDRSS) etc.); special test equipment (STE); Government furnished property (GFP); and intellectual property. Many of these assets are shared and receive funding from other NASA programs. Depending upon the utilization of the facility, it may be desirable to retain multiprogram assets within NASA provided private company utilization is available. However, Space Shuttle unique facilities are candidates to transition to the private company.

The DOD provides unique assets to the SSP within the continental U.S. and at remote international locations. Examples of these assets include: range safety systems facilities and equipment; weather facilities and equipment; search and rescue facilities and equipment; fire, medical, security facilities and equipment; and remote site tracking network equipment. Other DOD and NASA programs utilize these DOD assets. Foreign governments also contribute unique assets to the SSP for emergency landing site support.

Other NASA programs use many SSP assets. These assets include: the MCC, mission/crew training facilities; flight operations development and production facilities; flight planning and mission design tools; special crew quarters and rehabilitation facilities; medical facilities; operations and research data; food preparation facilities; and flight crew equipment, facilities etc. These common and shared assets could remain with NASA rather than transferring to the private company, allowing the private company to operate the facilities in order to retain existing synergies. These options need to be reviewed further for final resolution.

5.5.2 Considerations Regarding Asset Ownership

Movement toward a private company that owns the SSP assets and is operating as a commercial provider of services brings some significant advantages to the company arrangement. Advantages and disadvantages of asset ownership by the private company are shown in Table 5.1.

Assets	Advantages	Disadvantages
General Considerations	▪ Stewardship responsibility strengthens motivation for long-term care. ▪ Transfer of stewardship responsibility to private company allows reduction in CS workforce.	▪ Tax liabilities accompany asset ownership.
Flight Hardware and Support Equipment	▪ May alleviate compliance with federal use policies.	▪ High asset value. ▪ High risk liability. ▪ Current state of assets needs improvement.
Ground Facilities	▪ Possibility of state participation if spaceport concept adopted.	▪ High asset value. ▪ High risk liability. ▪ Current state of assets needs improvement. ▪ Potential environmental remediation expenses.

Table 5.1 Asset Ownership by Private Company

There is an inherent attention to care for the assets that comes with ownership. The size of the remaining CS workforce in NASA will be determined, to some degree, by the asset ownership issue. Government ownership of the assets requires more oversight of asset operations than if the private company owns the assets. However, the risk inherent in the current state of the assets and the large asset valuation may necessitate a gradual transition of the assets to the private company, as investments are made to improve them, and an improved business case warrants the risk. Private company ownership is possible provided sufficient funding is available to mitigate the existing risks.

Presently the major ground facilities utilized by the Space Shuttle have a replacement value of approximately $4.5 billion (B). The reusable flight hardware assets represent another $8 to10 B and the ground support equipment, special test equipment, and other smaller assets are valued at $1.2 B. In addition to the large asset value, there is a large backlog of maintenance and repair needed on the assets. The major ground facilities are in need of investments on the order of $600 to $900 million (M) over the next 10 years. There are several flight hardware systems in need of replacement due to age and obsolescence issues. This large asset value, the current condition of the assets, and the inherent risk associated with operation of the Space Shuttle make the potential liabilities from operations substantial. Indemnification will also have to be addressed.

There are three options for asset management and ownership transfer. They are:

1) Private company asset accountability and management with Government ownership.
2) Private company asset accountability and management with partial Government ownership.
3) Complete asset ownership transfer from the Government to private company.

Transfer mechanisms that could be used include: a facility contract, Government owned/contractor operated (GOCO), lease, sale, license, and gift. Other considerations associated with asset ownership that must be addressed include taxation, environment implications, competition, financial risk and opportunity, export control, and insurance.

If the asset ownership remains with the Government, the private company must be given complete control of the assets employed in providing space transportation services. The assets must be easily and substantially made available to the private company, including the support services NASA employs to operate these assets. Changes to the existing construction of facilities (CoF) processes would be necessary to facilitate utilization of facilities by the private company. When ground facilities and laboratories are shared with other programs, it is generally assumed that NASA will retain these assets, but additional reviews and discussions are required before determination is made.

Independent of the decisions on asset management, accountability, and ownership, the critical factor is that the assets are essential to the performance of safe and successful Space Shuttle missions. Private company ownership provides increased accountability for keeping the assets in acceptable operating condition to maintain safety, enable efficiencies in operations, retain/maintain assets necessary for current Space Shuttle operations, and retain/maintain assets necessary for long-term viability.

5.6 Private Company Management

Privatization must consider the relationships and interfaces that currently exist. Any changes must be well defined between the private company and NASA.

5.6.1 Operations Management

A significant operations management consideration is mission operations. There is significant synergy achieved to date by the combined mission operations of Space Shuttle and the ISS. Astronaut and flight controller training for both programs are predominately accomplished through the existing SFOC contract. Additionally, SSP and ISS operations functions are predominately conducted through a combination of CS and SFOC personnel (i.e., mission operations, EVA, etc.). With the privatization of the SSP, an option exists to transfer the ISS operations activity currently conducted under the SFOC to the private company. The private company would contract with the NASA ISS for specific operations support activities (ISS astronaut training, flight controller training, flight execution, etc.), which is similar to today's arrangement. This option would be transparent to operations implementation and have the added advantage of maximizing the synergies between SSP and ISS support within the private company.

Another option is to split the workforce and assets between the two programs. This would most assuredly result in increased costs to both programs initially but could offer the opportunity for competition of the function in the future and possibly result in cost reductions at that time.

Operations management also includes the necessary engineering skills to adequately maintain and operate the program assets. The primary sources of these engineering skills will reside with the design center contractors who are currently responsible for sustaining the hardware. The transfer of design/system engineering core skills from NASA to the private company is judged to be a relatively small number. However, the private company will need to establish a cooperative agreement with NASA for the utilization of resources where specific expertise continues to reside within NASA.

5.6.2 Business Management

From a business point of view, the focus of the private company's marketing program will be the full use of the Space Shuttle for the benefit of the nation. The private company will be free to develop customers for the Space Shuttle. These customers will include NASA as the anchor tenant along with other United States (U.S) government agencies, other space faring nations, and U.S. industry. In the short term, it is intended that the private company will focus on the construction and operation of the ISS. In the long term, it is intended that both the ISS and the Space Shuttle will be fully utilized and will enable U.S. industrialization of space for economic benefit. The Space Shuttle use policy must be addressed.

Business arrangements terms and conditions must be in concert with a long-term commitment for privatization to create workforce stability; allow development, maintenance, and retention of critical skills; incentivize CS to transition to the private company; and eliminate the short-term limited investment mentality associated with today's contracting methods. Additionally, a long-term business arrangement (i.e. minimum of 10 years) increases the private company's ability to attract investors and reduce costs through long-term/volume agreements with subcontractors, suppliers, lease agreements, etc.

5.6.3 Financial Management

A primary objective of the private company will be to reduce program cost while maintaining a long-term viable program, foster and encourage private investment in the Space Shuttle operations, obtain access to capital markets, and make the company financially self-sustaining. Independent of the structure of the private company, the objective will be sustained economically efficient Space Shuttle services. Once privatization is implemented, increased opportunities exist for cost reduction. Short-term cost reduction at the expense of long-term health will not be acceptable.

5.7 Interfaces

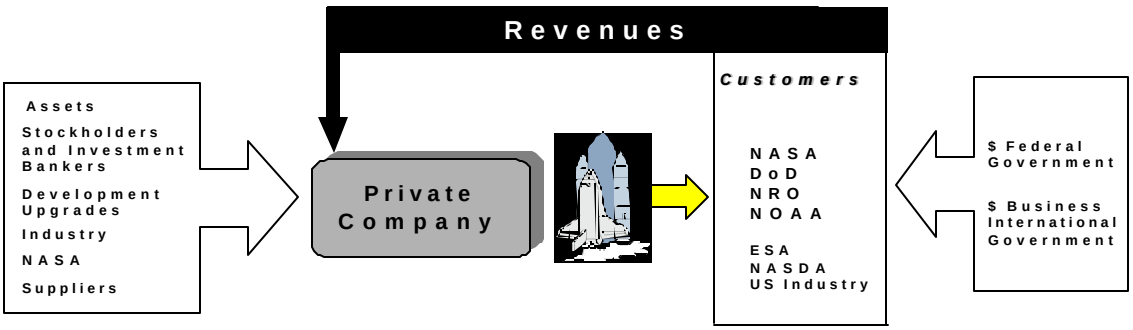

Figure 5-1 External Interfaces

5.7.1 External Interfaces with Other U.S. Government Organizations

Figure 5-1 shows that there are many suppliers to the private company, both in the way of contractors and government organizations. These NASA relationships may be continued for the benefit of both NASA and the private company no matter which option is implemented.

For example, KSC and Cape Canaveral Air Force Station (CCAFS) have formed the Joint Base Operations Support Contract (J-BOSC). Under this structure, Government services are provided to the SFOC and other launch providers based on a prorated cost determined by percentage of use from a particular program. As multiple programs/agencies use a service, fixed costs for using the service are shared between the multiple programs/agencies.

Based on these synergies, it may be useful to examine an option to the privatization scenario that establishes a spaceport that provides launch site capabilities and infrastructure to multiple launch customers. This entity could leverage not only Federal Government and private industry involvement but could possibly add state government participation in supporting the SSP.

NASA will retain interfaces with other Government agencies and departments for DOD landing support. The private company will contract with NASA to provide these interfaces.

5.7.2 External Interfaces with Foreign Governments

Foreign government interfaces that will be retained by NASA include those that are established with transoceanic abort landing (TAL) sites (Zaragosa and Moron, Spain; Ben Gurrier, Morocco; Banjul, The Gambia). These relationships have agreements with NASA to provide runway/tower facilities and support as well as local security where necessary.

International partner relationships will be retained with NASA. It is expected that the U.S. State Department, primarily through foreign country embassies, will continue to serve as a host country interface for NASA required agreements and clearances. If these interfaces remain with NASA, agreements and contracts will need to be worked between NASA and the private company that enable continued benefit to the SSP.

Current export control laws are very restrictive to the contractors that support the SSP. If the selected privatized end state is to follow the G-corp model, it is believed that the private company can maintain the identified interfaces and manage export control compliance using the existing Government standards. If the selected privatized end state follows the private company model, compliance requirements might become too restrictive and may require NASA intervention. Further study of this issue is required.

5.8 Budget Estimates

Budget implications of the privatization of Space Shuttle operations are being developed. The basic full costs of the SSP will be affected by privatization, depending on the nature of the final private company model. It will also be affected by the continued relationships with NASA for use of services that do not transfer from the Government to the private company. These changes, relative to the Space Shuttle full cost, will have to be estimated. Unique costs associated with privatization will also be estimated. There are nonrecurring costs associated with the transition of workforce and assets with the formation of the private company. There are also potential recurring impacts that will need to be estimated as well.

A long-term budget commitment from NASA is necessary for the stability of the privatization effort.

5.9 Summary

The merger of NASA and contractor skills and experience is a significant undertaking, involving the establishment of a new company, new leadership, new culture, asset ownership, private company management, and interface resolution for provision of all services for Space Shuttle operations. The changes in the assets, relationships, interfaces, and budget will be affected by the private company option that is selected. Once determination is made, additional reviews and discussions will be required to define the details and requirements.

There are many issues that need resolution before operations begin under the private company. Additional merger activities are required to establish the detailed steps to implement the privatization of the Space Shuttle and fulfill the fundamental principles that were established by the NASA SSP management team.

6.0 Civil Servant Transition: Transition of Critical Functions and Expertise

6.1 Introduction

The success of the SSP is due to the complementary skills and experience of the NASA and contractor workforce. Individually, neither the contractor nor NASA have the necessary expertise and required skills to operate the SSP. However, collectively, the requisite skills and experience exist to maintain the safety and viability of the program.

A handover of Government functions to a private company without providing the associated necessary skills and experience is a recipe for failure. The continued reliance of the prime contractors on NASA combined with the continuing erosion of NASA skills and experience is a serious threat. For privatization to succeed, it is necessary to merge the required NASA and contractor skill and experience bases. Anything less than a FULL merger of the identified functions and associated skills results in a continued threat to safety and mission success.

Not all Space Shuttle related and support functions will be targeted for merger. By necessity, some design/system engineering critical skills will be required to transition to the private company. However, for the most part, NASA engineering core competencies will remain within NASA to support continued research and development activities.

6.2 Scope

The scope of this effort was to identify functions for transition and estimate the number of CS associated with the function, identify compensation and benefits issues, and identify options for military personnel.

6.3 Assumptions

The following assumptions were made with regards to CS transition:

1. All identified functions must be transferred in their entirety.
2. Privatization requires a full merger of the identified functions.
3. CS would have a job either with the private company or with NASA.
4. Not all Space Shuttle related functions would merge with the private company.
5. NASA engineering core competencies will remain with the NASA Center to continue research and development activities.

6.4 Current State

There are approximately 1800 civil servants charging the majority of their work time to the SSP. These CS are predominately located at JSC in Houston, Texas; MSFC in Huntsville, Alabama; and KSC in Florida. Approximately one third of the CS are part of the Civil Service Retirement System (CSRS) and the other two thirds are part of the Federal Employee Retirement System (FERS).

6.5 Identified Functions for the Merger

All identified functions must be transferred in their entirety. CS within the identified functions will be encouraged to transfer with the function. The merging of skill bases, in addition to those already transitioned to the SFOC, involves the following functions:

1. Space Shuttle Program Office (SSPO)**:** This function is located at JSC with extended offices at MSFC and KSC. The SSPO, comprised of the SSP manager, staff, and workforce, provides overall direction and management of the SSP, including management of program configuration; contract, budget, and resources; Shuttle upgrades leadership; program integration; launch integration at KSC; propulsion projects integration at MSFC; systems integration; cargo engineering and integration; orbiter vehicle; flight crew equipment; vehicle software; and customer and flight requirements. In addition to the SSPO, it is envisioned that some additional support from the JSC Engineering Directorate would be required for the merger.

2. Shuttle Flight Crew Operations: The flight crew operations function, located at the JSC, is comprised of the astronauts that operate the Space Shuttle as well as the aircraft operations in support of astronaut training and program support (T-38, Shuttle training aircraft (STA), Shuttle carrier aircraft (SCA)). The astronaut office is a combination of both civilian and military personnel.

3. Mission Operations**:** The mission operations function is located at JSC and includes the management and leadership associated with flight preparation, training, and flight execution. Facilities managed by this function include the MCC and Shuttle mission simulators (SMS). Included within this function is operations project management, flight directors, flight controllers, training instructors, and flight design and mission planners. Because the Mission Operations Directorate (MOD) supports both the SSP and the ISS Programs, resolution regarding skills and core competencies that remain with NASA in support of the ISS must be addressed.

4. Ground Operations and Processing**:** The ground operations and processing function is located at KSC. This function includes the Shuttle Processing Directorate Manager and staff, launch director, flow management, process engineering, logistics, and SMA. Facilities managed by this project include complex 39 (VAB, OPF, pads 39A/B, etc.). Excluded from this function for privatization merger are Safety, Health, and Independent Assessment; Spaceport Services; Spaceport Engineering and Technology; Chief Financial Officer; Joint Performance Management Office; procurement; and project/contract management.

5. Propulsion Projects Management**:** These functions reside at MSFC and are comprised of the Space Shuttle Projects Office, the SSME Project, the RSRM Project, the ET Project, and the SRB Project. In addition to the above project offices, it is envisioned that some additional support personnel from the Engineering Directorate, Flight Projects Directorate, SMA, and Space Transportation Directorate may be required for the merger.

6. Extravehicular Activity (EVA): The EVA Projects Office is located at JSC. This function includes the management and workforce required to support EVA integration, training, and operations; hardware configuration management; and hardware sustaining engineering. Facilities managed by this office include the Neutral Buoyancy Laboratory (NBL).

The workforce numbers provided in the following Table 6.1 are preliminary rough order estimates and are provided for sizing purposes only. Further work is required to identify the critical skills within each function and to identify civil servant transition minimum success criteria.

	Current CS Workforce	Transfer to Private Co	Remain With NASA
Johnson Space Center	**735**	**432**	**303**
Kennedy Space Center	**628**	**371**	**257**
Marshall Space Flight Center	**400**	**100**	**300**
Stennis Space Center	**12**	**0**	**12**
Dryden Flight Research Center	**4**	**0**	**4**
Goddard Space Flight Center	**2**	**0**	**2**
NASA Headquarters	**10**	**0**	**10**
Total	**1791**	**903**	**888**

Table 6.1: CS Workforce Estimates for Identified Functions

6.6 Legal/Legislative Considerations

For privatization to be successful, the merger of CS program/project management and workforce must be accomplished. Legal and/or legislative action may be required to provide necessary incentives for CS transition to the private company. Incentives such as early retirement, buy-outs, adding years of service credit, adding years of age credit, and no penalty for early retirement must be considered. The same may be true to waive post employment restrictions for CS and military personnel serving in management positions.

6.7 Compensation and Benefits

As a baseline premise, the CS must be kept whole to encourage the employee to transfer. This premise must have the highest priority consideration. Compensation and benefits that must be addressed include, salary, retirement (CSRS and FERS), health insurance, life insurance, vacation leave, sick leave, job security, work location, promotion potential, thrift savings, etc.

In order to achieve the necessary merger of NASA skills and experience with the private company, the CS must be incentivized and adequately compensated to transfer and to account for a change of benefits. Based on recent examples of contractor benefit packages utilized for Government functions being transitioned to the private sector, it is clear that there exists a wide range of compensation and benefit options available that can be utilized to incentivize the CS workforce to transition to the private company. These benefit packages can be structured to compensate for CS benefit impacts, including retirement, health and life insurance, leave, and salary, thus potentially relieving the need for legal or legislative remedies. In addition to providing for differences in benefits, reviews have also shown the effectiveness of private industry utilizing an attractive hiring or signing bonus to capture the necessary workforce. These types of options will be necessary to successfully transition the CS workforce supporting the critical functions previously identified. Additional funding for compensation and benefits packages, in addition to the budgetary allowances for the transfer of the CS workforce, will be required to establish the private company. Job security is also a major element that requires a firm commitment to the CS employee. The CS employee must be assured that for some established period of time, termination from the private company will not occur except for cause.

6.8 Military Personnel

For military personnel, programs already exist that allow the utilization of military personnel to support private company operations. Continuing to attract and utilize military personnel as a part of the astronaut cadre is a capability that should continue. A memorandum of understanding (MOU) with the DOD to continue this capability under a privatized agreement is an option that should be pursued.

6.9 Summary

The privatization model selected will further define the nature of the CS transition challenges to be resolved. Keeping the CS compensation and benefits whole is a primary objective. Incentivizing the management and workforce to transition will be paramount in establishing successful privatization of the SSP. Additional cost will be incurred to establish privatization. These costs must be recognized and funding provided.

Post employment restrictions, identification of critical skills, and union awareness, etc., are issues that must be resolved as privatization discussions continue. Additional review and discussion are required to further refine the details and requirements for CS transition to a private company. Anything less than a FULL merger of identified functions and associated skills results in a continued threat to safety and mission success.

7.0 Contract Structure

7.1 Scope

The scope of the activity was to identify and examine business options and related contractual arrangements in support of SSP privatization. The task included the identification of related ground rules and goals; the identification and review of most probable business options; the identification of potential contract structures within those options; and documentation of relevant research and lessons learned from like exercises.

7.2 Ground Rules and Goals

All identified contract structure options would:

1. Conform to the President's Blueprint for New Beginnings.
2. Preserve safe and successful operations for the life of the SSP.
3. Provide for long-term health of the program, including:
    a. Foster the development and infusion of new technology.
    b. Ensure supportability, reliability, and the implementation of upgrades.
    c. Ensure optimization of all resources (Government and contractor), and.
    d. Foster strong program leadership focused on long-term success as well as provide an experienced and skilled base of expertise.
4. Ensure that any resulting organization is viable in the human space flight marketplace and does not preclude future competition for human space flight activities.
5. Ensure appropriate assignment of responsibility and accountability in the areas of program management, cost, and schedule.

7.3 Assumptions

The following assumptions were made that would affect any option: Privatization infers a shift in responsibilities as well as a cultural change; any arrangement would require significant employee transition and significant issues need resolution; relationship to OMB Circular A-76 would need to be accomplished (sets federal policy for determining whether commercial activities associated with conducting the Government's business will be performed by federal employees or private contractors); any requisite legislation will be approved; significant goals (e.g., safety) would receive strong incentives; and privatization was not defined.

7.4 Most Probable Business Options

Three most probable business options were selected and assessed. There are many types of arrangements available with many variations but it was determined that all generally fit into three scenarios:

1. Modification of the current NASA SFOC arrangement (i.e., utilize a single contract/contractor) to include increased contract consolidation and merger of civil service functions and employees.
2. The Government corporation (G-corp).
3. Expanded competition that would leverage competition while expanding the number of participants in the process.

7.5 Description and Assessment of the Three Most Probable Business Options

(Note that references appear as a superscript. All references are provided after the contract structure summary)

7.5.1 Option 1: Modification of the Current NASA SFOC Arrangement

Description of the End State: This arrangement most closely resembles the current contract structure used within the SSP. Anticipated modification to support privatization would include: the augmentation of additional production elements (i.e., ET, SSME, RSRM) as well as the consolidation of other Shuttle support contracts. The private company would be responsible for design, purchase, and installation of ground support equipment (GSE) and the operation of SSP program facilities. The private company would assume SSP management. This would require the transition of NASA employees, including but not limited to: SSP flight crews, integrated program management, flight and ground operations, hardware and software purchases, GSE replacement, and capital investments. It is expected that NASA would continue to provide indemnification for unusually hazardous risk. The private company would have flight readiness authority in the form of CoFR signature responsibility. It would also have the ability to expand commercialization efforts including pricing launches for other customers within regulatory limitations. It is anticipated that the Government would retain ownership of SSP major assets, but ownership transfer of minor assets may be possible. Legislation may be needed to deviate from existing property disposal regulations. It is anticipated that NASA would retain program budget authority.

7.5.1 Option 1: Advantages

1. The merging of additional contracts in concert with merging the CS and contractor workforce leverages critical skills and enhances continued safe and successful Space Shuttle operations.
2. The merged workforce would reduce redundant critical skills between the Government and the contractor, thus allowing for increased efficiency and critical skills retention.
3. This merger option is an expansion of a known commodity and would leverage lessons-learned.
4. The current contractor has demonstrated processes and procedures for safe and successful operations.
5. With proper contract incentives and a long-term contract arrangement, the option may motivate the private company to make investments in program improvements.
6. Future competition is not precluded, which is similar to today's state.
7. Merging of existing resources with a known management team may reduce the risks in achieving SSP long-range goals.
8. The need for special legislation is minimized.
9. This option has the least impact to the current SSP.

7.5.1 Option 1: Issues or Barriers

1. This option anticipates a long-term, noncompetitive contract that may enhance competition at the national/international level.
2. The parties will experience a cultural shift as privatization shifts from a cost-type to a fixed-price-type contract environment.
3. Many questions on legislation related to market expansion (e.g., pricing/launching of non-NASA payloads).
4. This option could impact current interfaces.
5. Excessive parent company influence on profit and competing business opportunities with the existing United Space Alliance joint venture agreement is a significant concern.

6. There is a variation of this option, which would include asset transfer from the Government to the private company. This variation is significant and would require additional research to assess.

7.5.2 Option 2: Government Corporation (G-corp)

As with privatization, there has been, and continues to be, much discussion over the definition of a federal G-corp. History has shown such arrangements to be very flexible. Typically, G-corps are discussed as a transitional step when the desire is to move from having the Government perform certain functions or services to having the private sector take over those functions or services. Issues regularly encompass personnel transition (CS and contractor) and the transfer of assets, facilities, and infrastructure.

There are several like efforts within NASA, most recently the ISS Program study of non-Government organizations. The study entitled "Options for Managing Space Station
October 1999 by Swales Aerospace. [1] It was commissioned by NASA HQ. In that study, the G-corp concept is identified as "an important version of a non-Government organization."

Literature searches were conducted using the NASA Center technical libraries, business publications, newspapers (e.g., Wall Street Journal, Government Executive), Internet searches, case studies, congressional testimony, and informal discussions with various sources. Reports reviewed included congressional studies, funded academic studies, and Government Accounting Office (GAO) reports. A brief scan of the literature reveals significant information on privatization and G-corps. The depth and breadth of research is extensive. An attempt was made to ensure that the latest congressional and executive branch reports that are publicly available were obtained; however, this review was cursory at best given the timeframe to review and the amount of information.

7.5.2 What is a G-corp?

A corporation may be defined as a legal entity, enabled by legislation, that permits a group of people, either as shareholders (for-profit companies) or members (non-profit companies), to create an organization which can then focus on pursuing set objectives and which is empowered with legal rights. In general terms, the three types of corporations are: Public, in which stock can be owned by the public at large; Private, which is owned by its employees or a select group of shareholders; and, Government, in which stock is wholly or partially owned by the Government. [1]

However, the complaint over the years has been that there is no consistent definition. Ronald Moe, a specialist at the Congressional Research Service wrote "Managing the Public's Business: Federal Government Corporations" published in April 1995 for the Senate Committee on Governmental Affairs. [2] In the report, he states that the distinguishing characteristic of the G-corp is that it is an agency of Government established by congress to perform a public purpose which provides a market-oriented service and produces revenue that meets or approximates its expenditures. [2] He goes on to say that there is no universally accepted definition of what constitutes a Government corporation. Further, there is no useful definition in the Government Corporation Control Act (GCCA), as to what constitutes a corporation, or how corporations may differ from other agencies. [2]

In 1981, after the National Academy of Public Administration (NAPA) provided a report to the Office of Management and Budget (OMB) concerning G-corps, the GAO created three classifications based upon the degree of private versus Government financial and management involvement: 1) predominately federal, 2) mixed federal/private, and 3) predominately private. [2] However, categorization continues to be difficult due to the many variables in structure and function. In the 1995 report, "Government Corporations: Profiles of Existing Government Corporations," [3] GAO made

the point that no comprehensive descriptive definition of, or criteria for creating G-corps exists. It also noted that the GCCA does not even list them all.

In 1997, the GAO created their own definition of a G-corp at the request of Representative Scott Klug, Republican-Wisconsin, who was heading a task force on privatization [4]:

> Government corporations are separate legal entities that are created by Congress, generally with the intent of conducting revenue-producing commercial-type activities and that are generally free from certain government restrictions related to personnel and procurement.

Definitions for wholly-owned and mixed-ownership G-corps were cited in the 1981 NAPA report. [3] The NAPA definitions are:

> Wholly-owned G-corp – a corporation pursuing a Government mission assigned in its enabling statute, financed by appropriations, with assets owned by the Government and controlled by board members or an administrator appointed by the Government (President or a department secretary). The Tennessee Valley Authority (TVA) is an example of a wholly owned G-corp.
>
> Mixed-ownership G-corp – a corporation with both Government and private equity, with assets owned and controlled by board members selected by both the President and private stockholders usually intended for transition to the private sector. Amtrak is considered to be a mixed-ownership G-corp.

Since it is not clear there is a widely accepted definition for a privately-owned G-corp, an unofficial definition is a federally chartered private corporation funded by the private capital market. COMSAT is listed in the ISS Options study as "founded as a U.S. government corporation." Fannie Mae is a private corporation with off-budget status. [5] The Corporation for Public Broadcasting is not listed as a G-corp in the GCCA; however, other experts characterize it as a federal corporation since its board of directors is appointed by the President and confirmed by the Senate, and it receives federal appropriations. The precise differences between a privately-owned G-corp and a private corporation are unclear. The United States Enrichment Corporation (USEC) is now a private corporation (not a privately owned G-corp) which presumably enables them to do certain things like fire/replace their board of directors, which G-corps may not do.

The conditions for use of a G-corp [6] are: the operation is primarily business like; it primarily sells goods and services; is substantially self-financing; there is likely a continuing demand for its goods or services; there is an absence of commercially competitive market for the goods or services; there is a need to continue services to an unprofitable market; and it serves public not private purposes.

Few federal G-corps operate in highly competitive markets and, by organizing along corporate lines; it is believed that the transition to privatization (e.g., federal share of equity is bought out) can be facilitated. [1]

7.5.2 Option 2: Summary

Because a standard definition and structure of a G-corp is not established, it is possible that the establishment and charter could be constructed to meet unique requirements and needs. This flexibility is attractive due to the unique nature of the Space Shuttle operations.

7.5.2 Option 2: Advantages

1. Financial and management flexibility. Establishment of the G-corp's charter could meet the unique requirements of the Space Shuttle operations. A standard G-corp model does not exist.
2. Can be an interim step towards full privatization.
3. Can be profit or non-profit
4. Relief from binding regulations.
5. In the case of a wholly-owned G-corp funded by Congress, Congress makes corporate financial resources available for operating and administrative expenses in accordance with the approved budget program.
6. Without fiscal year limitations, the G-corp could permit investment in long-term program improvements that may have minimal near-term payoff.
7. A G-corp is usually given power to determine the character of and the necessity for its expenditures and the manner in which they shall be incurred, allowed, and paid. It is thus exempted from most of the regulatory and prohibitory statutes applicable to the expenditure of public funds.
8. The charter would most likely encourage marketplace participation/expansion.
9. Establishment of a G-corp could enable full transfer of Government assets.
10. There is reduced contract administration with no contract for NASA to manage.

7.5.2 Option 2: Issues or Barriers

1. If the objective is to fully privatize, then the G-corp may not go far enough in the process.
2. Any option must have a guaranteed NASA subsidy for the foreseeable future.
3. While it is clear from the myriad of existing G-corps that it is possible to obtain the required legislation, experience demonstrates that it will take 4 to 6 years to establish the G-corp.
4. Examples exist where excessive Government restrictions have reduced the efficiency of performance.
5. SFOC currently provides significant income to Lockheed Martin and Boeing with limited risk. This issue, as well as the transition of contractor personnel, would need to be closely evaluated and understood.
6. With the establishment of the G-corp, the Space Shuttle budget would be removed from the NASA budget, which could reduce internal NASA flexibilities.

7.5.2 Case Studies and Comparisons

The "Privatizing the Space Shuttle: Issues and Approaches" by Dr. John Logsdon [10] pursued several case studies to compare and contrast to the SSP situation and indicated that the closest analog to the SSP was the U.S. Enrichment Corporation (USEC), in which the Department of Energy (DOE) transitioned its uranium enrichment functions to the private sector.

Such studies will prove a valuable guide in future research. The following are a few examples:

1. The Central Intelligence Agency (CIA) created a non-profit 501© venture capitalist firm in 1999 called In-Q-Tel which seeks out cutting-edge technologies, ideas, and thinkers that would be of benefit to the agency. In-Q-Tel has a basic charter agreement with the CIA as well as a separate funding arrangement to provide seed money. They invest, create companies, and help companies to market, so that the CIA can tap into the latest technology and have commercial off the shelf (COTS)-based solutions at reduced cost and development time to the agency. The basic ground rules are that it must be in certain areas where the CIA has recognized specific needs, it must be unclassified, and it must match up to an idea or need

driven by the commercial market. In-Q-Tel has great flexibility and autonomy in the projects it chooses and is free to use commercial type arrangements and terms in order to encourage the fullest participation of high-tech firms with promising ideas and technologies who would otherwise be unwilling to enter into Federal Acquisition Regulation (FAR)-type contracts.

2. The DOE/Sandia Laboratories created the Technology Ventures Corporation as a not-for-profit organization to assist businesses interested in commercializing technologies that were developed at DOE's laboratories in New Mexico (NM) or at regional NM universities. They link venture capital to promising business concepts and provide various other business consulting services. They are fully funded but in no way controlled by the Lockheed Martin Corporation, who won the base operations support contract at Sandia.

Concepts similar to the CIA's and DOE's might be used in conjunction with other basic business concepts to bring technology, engineering, performance enhancements, and enabling technologies to the SSP at reduced schedule and cost. A model for the SSP could potentially include aspects such as partnering with space business entities like Florida Space Port Authority to synergize payload and launch operations; bring state, federal, and private resources together to leverage assets, infrastructure, and core competencies, thus increasing the potential for optimizing resource utilization; and increasing the probability of success by forging partnerships with entities with proven track records and optimal location in relation to long-term SSP operations.

It is important to note that profit-oriented G-corps do exist.

7.5.3 Option 3: Expanded Competition

Description of End State: There are many definitions of privatization and this exercise has chosen not to provide one specific definition. Thus, depending on the situation, the definition could drive the desired goal/end state or the reverse could be true. For this option, privatization is defined as the desire to maximize competition, and thus participation, in the Space Shuttle business arena. The end state could take two shapes. First, NASA serves as program integrator and the program is separated into competitive pieces. Secondly, the Space Shuttle prime contractor serves as the integrator and NASA requires and reviews competition at the subcontract level.

There are several assumptions that are important to this option, such as competition and expanded participation is of significant importance; contract provisions will be written so as to ensure accountability and responsibility within as well as between contracts or subcontracts; and, while competition is important, there will continue to be extensive non-competitive contracts.

It should be noted that the SFOC is a joint venture agreement, formed by Boeing (was Rockwell at the time) and Lockheed Martin. The decision was made to approve a justification of other than full and open competition (JOFOC) for this effort.

Multiple Contract Variation: There are many ways to divide the SSP into components to compete. The following are three examples:

7.5.3 Option 3a:

1. Space Transportation and Operations: Orbiter, Systems Integration, SSME, ET, SRB, RSRM, MOD, Flight Crew Equipment (FCE), and EVA.
2. Customer Support: Customer Services, Carrier, and Payload Support.
3. Spaceport: Ground Operations, Logistics, Landing Sites and Facilities.

7.5.3 Option 3b:

1. Space Transportation*:* Orbiter, Systems Integration, SSME, ET, SRB, and RSRM.
2. Space Operations*:* MOD, FCE, and EVA.
3. Customer Support*:* Customer Services, Carrier, and Payload Support.
4. Spaceport: Ground Operations, Logistics, Landing Sites and Facilities.

7.5.3 Option 3c:

1. Space Transportation and Operations Elements: *S*eparate contracts and/or contractors for: Orbiter, Systems Integration, Propulsion (SSME, ET, SRB, and RSRM), Tools (FCE and EVA), Operations ((MOD and Flight Crew Operations Directorate (FCOD)).
2. Customer Support*:* Customer Services, Carrier, and Payload Support.
3. Spaceport: Ground Operations, Logistics, Landing Sites and Facilities.

These examples do not capture all program components but are used only to generally illustrate the alternatives.

7.5.3 Integrating Contractor Variation

In this case, NASA would continue to move forward with increased consolidation of contracts within the SSP and these would become core work or as subcontracts under an integrating contractor. But just as the SSP is divided above, the contractor could conduct competitions of specified subcontracted elements the conduct of which would receive NASA oversight.

7.5.3 Option 3: Advantages

1. Competition has the potential to optimize cost, schedule, and technical performance.
2. There would potentially be enhanced competition at the contract level and thus, increased participants in the human space flight marketplace.
3. Specific, focused requirements would enhance responsibility and accountability.
4. With NASA as integrator, it optimizes NASA's position as a smart buyer.
5. The option leverages current competition and does not preclude future consolidations.
6. With more participants, there may be increased public interest and new ideas under internal research and development (IR&D).

7.5.3 Option 3: Issues and Barriers

1. This option would anticipate short-term, competitive contracts. It will be difficult to manage the long-term health of the program.
2. Concept does not advance the state of privatization. It is a regressive step by compartmentalizing the SSP. It hinders program integration and communication, thus increases risk. It exacerbates the current business base inefficiencies.
3. The concept retains NASA as overall program integrator with multiple contracts. This scenario will exacerbate critical skill issues by diffusing skills across multiple contracts/companies. If an integration contract were to be considered, significant additional cost would be incurred.
4. While the option does not inhibit a shift to fixed-price type contracting, it may not strongly encourage it (business as usual pattern).
5. The option increases contract administration expense (i.e., more and shorter-term contracts).
6. The option requires CS transition to multiple subcontractors, negatively influencing the workforce to voluntarily leave Government employment.
7. Success would require adherence across all contracts to program-wide metrics (safety and compliance) and interrelated contract provisions to ensure consistent contractor motivation.

7.6 Summary

While it is important to understand all implications, success seems to lie in making decisions and moving forcefully to implementation. It was interesting to see that unique Government requirements added 18 percent to the cost of a Government contract. (DOD Link) Several options may be able to leverage a move away from typical Government requirements and aid this situation.

Finally, this study was done in a very short period of time and understands that it has only scratched the surface of the topics discussed. Further, the study did not address several potentially important topics such as the use of other tools (e.g., Other Transaction Authority) and the impacts of consolidating NASA programs.

Work needs to continue to refine information. Experts in the area of G-corps as well as special program offices within the DOD need to be interviewed. A plan to continue to research legal and policy constraints, as well as other implications and barriers, will be pursued.

Contract Structure References:

1. Options for Managing Space Station Utilization, October 1999, Swales Aerospace. Report can be found at: www.commerical.hq.nasa.gov.

2. "Managing the Public's Business: Federal Government Corporations" written by Ronald Moe, Congressional Research Service Specialist, published April 1995 for Senate Committee on Governmental Affairs, by the Congressional Research Service Library of Congress, 104th Congress, 1st Session, S. Part 104-18

3. Government Corporations: Profiles of Existing Government Corporations, issued by Government Accounting Office, dated 12/13/95GAO 1995 (GAO report GGD-96-14). The report can be found at following website: http://www.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=gao&docid=f:gg96014.txt

4. The definitions compiled by GAO in 1997 at the request of Representative Scott Klug, Republican-Wisconsin who was heading a task force on privatization at the time were found at the following website: http://www.gao.gov/special.pubs/gg97121.htm.

5. Government Executive magazine article, "Government, Inc.", February 1995.

6. OMB Memorandum M-96-05, December 8, 1995, To Heads of Executive Departments and Agencies, from Alice M. Rivlin, Office of Management and Budget, Subject: Government Corporations.

7. Statement of John A. Koskinen, Deputy Director for Management, Office of Management and Budget, before the Subcommittee of Government Management, Information and Technology of the House Committee on Government Reform and Oversight, July 8, 1997. Available online at: http://www.whitehouse.gov/omb/legislative/testimony/19970708-23251.html

8. "Performance-Based Organizations: A Conversion Guide", 2nd Draft Edition, November 1997, National Performance Review. Available at archived website at: http://govinfo.library.unt.edu/npr/library/pbo/guide1.html

9 Privatization: Eight Lessons of Experience, Worldbank. Available online at: http://www.worldbank.org/html/prddr/outreach/or3.htm

10. Privatizing the Space Shuttle: Issues and Approaches, March 2000, Space Policy Institute, George Washington University.

8.0 The Next Step

The concepts and options contained in this document represent just the beginning in the road to full privatization of the SSP. Concepts presented are not all mature and additional work is required to narrow the options, identify the plan for asset and facilities ownership, and establish a detailed implementation plan.

The following actions have been assigned and are currently underway:

Action	Due Date
Understand the cost of privatization by establishing the full cost of the SSP. This includes the recurring and nonrecurring costs associated with the implementation of privatization.	November 2001
Develop contracting strategies and options for a long-term business arrangement. This includes understanding fixed price versus cost plus contract structure options.	November 2001
Develop a communication plan addressing congressional, state, business interests, and the CS and contractor workforce.	November 2001
Investigate privatization options and select final business options.	January 2002
Initiate Request for Proposal (RFP) on selected business options.	February 2002
Develop an SSP Privatization Implementation Plan.	March 2002

In addition to the above actions, it is necessary that the formulation of any required legal and/or legislative authority be established, as required, to enable the successful transfer of CS to the private company and the transition of assets and facilities, as appropriate.

This document represents just the beginning of a serious effort to define what privatization means, options for the structure of privatization, and the fundamental principles that must govern the establishment of privatization. Much work remains to be completed to establish mature options.

Appendix A: Team Members

Team	Name	Company/Location	Title
Safety-In-Line and IA	William J Harris (Team Lead)	NASA-JSC	Manager, Space Shuttle Program SMA
	William Hill	NASA-HQ	Manager, Shuttle Operations SMA
	Tom Whitmeyer	NASA-HQ	Supporting: SMA
	Amanda Goodson	NASA-MSFC	Director, SMA Office
	Alex Adams	NASA-MSFC	Supporting: SMA
	William Higgins	NASA-KSC	Chief, Shuttle SMA Division
	Scott Johnson	NASA-JSC	Assistant Division Chief
	Dick Beagley	United Space Alliance-TX	VP SQMA
	Craig Lovell	United Space Alliance-TX	Deputy SQMA
	David Valentine	United Space Alliance-TX	Director, SFOC SQMA
Merger	Jim Costello (Team Lead)	NASA-JSC	Space Shuttle Business Office Mgr and SFOC COTR
	Jody Singer	NASA-MSFC	Assistant Manager, SSPO Office
	Pepper Phillips	NASA-KSC	OV-105 Flow Director
	John Mulholland	NASA-JSC	Technical Assistant to SSP Program Manager
	Lee Briscoe	NASA-JSC	Acting Deputy Director, MOD
	Mike Smith	NASA-JSC	Commercialization Manager, SOMO
	Pat Mooney	NASA-SSC	Chief SSME Project Office
	Steve Horton	NASA-JSC	Resource Analyst, Space Shuttle Systems Integration Office
	Ann Halligan	United Space Alliance-TX	Business Manager, SFOC
	Brian Harris	United Space Alliance-FL	Strategic Facilities Support Operations
	Paul Nemitz	United Space Alliance-FL	Shuttle Program Mgmt FL Business Ops
	Jerry Albrigo	United Space Alliance-TX	Manager, SFOC Resources
	Shelly Cooper	NASA-KSC	Legal Counsel
	Darius Hall	United Space Alliance-TX	Business Manager, Flight Operations
	Charles Stegemoeller	NASA-JSC	Supporting: Associate Director Space and Life Science Directorate
	Bobbie Gail Swan	NASA-JSC	Supporting: Technical Assistant to Flight Crew Operation Director
	Randy Sacks	NASA-MSFC	Supporting: Program Analyst, Systems Integration Business Office
	Jim Bean	NASA-KSC	Supporting: Budget and Contracts Lead; Shuttle Processing
	David Alonso	NASA-KSC	Supporting: Chief, Management Integration Office; Spaceport Services
	Ellen Dozier	NASA-KSC	Supporting: Program Resource Specialist; Spaceport Services
	Dave Shelton	NASA-KSC	Supporting: Chief, Business Office; Spaceport Engineering and Technology
	Nancy Bray	NASA-KSC	Supporting: Facilities Project Manager; Spaceport Services
	Connie Milton	NASA-KSC	Supporting: Shuttle Program Infrastructure/Facilities Manager

Safety:**Checks and Balances**	Ralph Roe (Team Lead)	NASA-JSC	Manager, Space Shuttle Vehicle Engineering Office
	A. Lee Briscoe	NASA-JSC	Acting Deputy Director, MOD
	Jim Eyman	United Space Alliance-TX	VP and Program Manager, Space Shuttle Upgrades Development
	Neal Hammond	United Space Alliance-TX	VP and Associate Program Manager, Program Integration
	Jon Harpold	NASA-JSC	Acting Director, MOD
	Steve Hawley	NASA-JSC	Deputy Director, FCOD
	Bill Pickavance	United Space Alliance-FL	Deputy Program Manager, Space Shuttle Program
	Randy Stone	NASA-JSC	Associate Director (Management)
	Jake Vermilyea	United Space Alliance-TX	VP and Associate Program Manager, Flight Ops
	Tim Wilson	NASA-KSC	Chief, Shuttle Processing Fluid Systems Division
	James Wetherbee	NASA-JSC	Director, FCOD
CS Transition	Ron Dittemore (Team Lead)	NASA-JSC	Manager, Space Shuttle Program (SSP)
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	Jon Harpold	NASA-JSC	Acting Director, Missions Operations Directorate
	Dave King	NASA-KSC	Director, Shuttle Processing
	Alex Mc Cool	NASA-MSFC	Manager, Space Shuttle Projects Office
	Joanne Mueller	NASA-HQ	Personnel Management Specialist
	John Mulholland	NASA-JSC	Technical Assistant, SSP (Detailed)
	James Wetherbee	NASA-JSC	Director, Flight Crew Operations (Ops) Directorate
	Dennis Diemoz	United Space Alliance-TX	Vice President (VP) and General Counsel
	Joe Dellerose	United Space Alliance-TX	Director, Compensation and Benefits
	Joe Hammond	United Space Alliance-TX	VP of Human Resources and Administration
	Chuck Knarr	United Space Alliance-TX	Deputy Associate Program Manager, Flight Ops
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	Cheryl Hurst	NASA-KSC	Chief, Mission Support Office
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	Bruce King	NASA-HQ	Program Operations Office, Office of Procurement
	Robbie LaBrier	NASA-JSC	Deputy Manager, Space Shuttle Procurement Office
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	Joyce Simmons	NASA-JSC	Lawyer, JSC Legal Office
	Donna Bartoe	NASA-JSC	Lawyer, JSC Legal Office
	Bob Tepfer	NASA-JSC	Lawyer, JSC Legal Office

Appendix B: Criteria for Privatization

From the July 17, 2001 letter from the Associate Administrator for Space Flight, the following criteria establish the foundation that must be accomplished to ensure critical elements of privatization are satisfied:

1. **Safety:** Ensure adequate programmatic and technical checks-and-balance system to maintain safety of flight and ground processing operations.

2. **Approach:** Develop approach that emphasizes safety, supportability, reliability, as well as development and implementation of future upgrades, and protects against incentives that compromise these objectives.

3. **Benefit:** Show benefits favorable to government that are supported by credible cost assumptions.

4. **Relationships:** Maintain relationships with other governmental agencies and departments, NASA programs, Centers, international partners, and foreign governments.

5. **Competition:** Privatization must not preclude future competition for human spaceflight services.

6. **Responsibilities/Accountability:** Ensure launch service provider has demonstrated management and technical skills commensurate with responsibility and accountability for all Space Shuttle flight and ground operations.

7. **Government Assets:** Transfer mechanism must be defined for launch service provider ownership of those government assets required to support Space Shuttle flight and ground processing operations.

Appendix C: Strategic Information

Blueprint for New Beginnings, A Responsible Budget for America's Priorities
(dated February 28, 2001)

Space Shuttle Privatization: NASA will aggressively pursue Space Shuttle privatization opportunities that improve the Shuttle's safety and operational efficiency. This reform will include continued implementation of planned and new privatization efforts through the Space Shuttle prime contract and further efforts to safely and effectively transfer civil service positions and responsibilities to the Space Shuttle contractor.

Human Exploration and Development of Space Strategic Plan

Complete transition of Space Shuttle operations to the Space Flight Operations Contractor and undertake needed Shuttle upgrades consistent with the objectives of increasing safety by about 50 percent and reducing costs per payload pound by 20 percent (compared to late 1990's levels).

Appendix D: Acronym List

ASAP	Aerospace Safety Advisory Panel
B	Billion
CCAFS	Cape Canaveral Air Force Station
CEO	Chief Executive Officer
CIA	Central Intelligence Agency
CIL	Critical Items List
Code Q	Office of Safety and Mission Assurance
CoF	construction of facilities
CoFR	Certificate of Flight Readiness
COMSAT	commercial satellite
CONUS	Continental United States
COO	Chief Operating Officer
COTR	Contracting Officer's Technical Representative
COTS	commercial off the shelf
CS	civil servant
CSRS	Civil Service Retirement System
DCMA	Defense Contractor Management Agency
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
ET	external tank
EVA	extravehicular activity
FAR	Federal Acquisition Regulation
FCE	flight crew equipment
FCOD	Flight Crew Operations Directorate
FERS	Federal Employee Retirement System
FMEA	failure mode and effects analysis
FRR	Flight Readiness Review
GAO	Government Accounting Office
GCCA	Government Corporation Control Act
G-corp	Government Corporation
GFP	Government furnished property
GMIP	Government mandatory inspection point
GOCO	Government owned contractor operated
GSE	Government support equipment
GSRP	Ground Safety Review Panel
HEDS	Human Exploration and Development of Space
HQ	Headquarters
IA	independent assessment
IR&D	internal research and development
ISS	International Space Station
J-BOSC	Joint Base Operations Support Contract
JOFOC	justification for other than full and open competition
JSC	Johnson Space Center
KSC	Kennedy Space Center

LCC	Launch Control Center
LSS	launch support services
M	million
MCC	Mission Control Center
MILA	Merritt Island launch area
MIT	Mishap Investigation Team
MLP	mobile launch platform
MMT	Mission Management Team
MOD	Mission Operations Directorate
MOU	memorandum of understanding
MRB	Material Review Board
MSFC	Marshall Space Flight Center
NAPA	National Academy of Public Administration
NBL	Neutral Buoyancy Laboratory
NM	New Mexico
OIG	Office of the Inspector General
OMB	Office of Management and Budget
OMRSD	operations and maintenance requirements and specifications document
OPF	Orbiter Processing Facility
OPR	office of primary responsibility
Ops	operations
OSHA	Occupational Safety and Health Administration
OV	orbiter vehicle
PAR	Prelaunch Assessment Review
PDL	Ponce de Leon
PQA	procurement quality assurance
PSRP	Payload Safety Review Panel
PTO	Patents and Trademark Office
RSRM	reusable solid rocket motor
SAIL	Shuttle Avionics Integration Laboratory
SFOC	Space Flight Operations Contract
SMA	safety and mission assurance
SOMO	Space Operations Management Office
SRB	solid rocket booster
SRP	Safety Review Panel
SRQA	safety, reliability, and quality assurance
SSC	Stennis Space Center
SSME	space shuttle main engine
SSP	Space Shuttle Program
SSPO	Space Shuttle Program Office
SSRP	Safety System Review Panel
STE	special test equipment
Subs	subcontractor
TAL	transoceanic abort landing
TDRSS	tracking and data relay satellite system
TVA	Tennessee Valley Authority

U.S.	United States
USEC	U.S. Enrichment Corporation
VAB	Vehicle Assembly Building
VP	Vice President