



1992
Pioneering Space Exploration
The JSC Strategy

"Levels of Vision"

The cover artwork highlights the pioneering spirit that is the hallmark of the Johnson Space Center's legacy and future. Titled "Levels of Vision," the illustration depicts JSC's role in space exploration -- the first level in near-Earth activities; the middle level in our mandate to return to the moon to stay; and the top level in our vision to explore Mars and beyond. The underlying illustration of an Apollo astronaut and U.S. flag expresses our pride in NASA, our Nation and its space leadership.

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas
77058

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NASA

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Reply to Attn of:

DA-92-009

January 10, 1992

TO: All JSC Team Members
FROM: AA/Director
SUBJECT: JSC Strategic Plan

When I met with JSC's directors, program managers, key staff, and their deputies for our first Total Quality Management retreat in March 1991, the need for an updated strategic planning process was identified as the top business issue for the Center. To meet this need, the Senior Staff initiated a series of deliberations and reviews that resulted in the strategic plan presented here.

The enclosed document presents the framework that JSC's senior management will use to guide effective decision making to achieve our long-range goals while soliciting inputs from all levels of the Center. JSC's senior management is fully committed to leading this ongoing strategic planning process and is responsible for the implementation and revision of the plan.

Using the 1987 strategic plan as a starting point, this new plan was developed to allow us to meet head-on the responsibilities and challenges we have today while assuring that we are well prepared to meet the opportunities and challenges of tomorrow. In developing our strategy for the Center, we carefully considered all the various advisory group recommendations. The time had come, however, for us to define our own vision, to define a consistent and clear plan of action--a plan that will be read and acted on. It was time for us to review our objectives, our roles, our responsibilities, and our capabilities. It was time for us to define and articulate how we at JSC intend to support NASA's future.

The JSC strategy is closely aligned with the overall strategic direction currently being defined by the Agency. One of our major goals was to keep our plan and our process tightly focused but flexible enough so that as our national interests in the exploration of space evolve, so can JSC. A strategic planning process that supports the Agency's role in building our country's future in space also builds the career potential of the members of our team, civil servants and contractors alike. That is who this plan is for: It is for you, a member of the JSC Team.

This plan is intended to serve as a road map for the future--a road map that is subject to change as new waypoints and routes are selected over the course of time. You will notice as you read this plan that it is less formal than most official JSC publications. It is in a fairly plain three-hole punched format that is designed to be a working document. It is designed for you to put in a notebook and read with pen in hand.

As the JSC strategy evolves to take into account major resource or policy changes, updated pages will be issued. These revisions will be a result of changes in the Agency or JSC strategy. They will also be the result of your recommendations. In this way, the ongoing planning process becomes open to all of us at JSC, to our ideas, and to our participation. The goals and objectives stated in this plan offer each of us the opportunity to align our personal initiatives and commitments with those of the Center.

Aaron Cohen

Aaron Cohen

Enclosure

Pioneering Space Exploration

The JSC Strategy

Contents

Section	Page
Introduction	ii
Pioneering Space Exploration: The JSC Vision	1
Our Guiding Principles	2
Our Basic Strategy	4
What We're Going to Do and How We're	
Going to Do It	5
<i>Doing Business Differently</i>	6
<i>Providing Access to Space</i>	11
<i>Living and Working in Space</i>	13
<i>Extending Our Reach</i>	16
<i>Assuring Technologies Are Ready</i>	
<i>When Needed</i>	17
<i>Helping Our People Reach Their Potential</i>	20
<i>Using Our Facilities Effectively</i>	22
<i>Fostering Educational Outreach and</i>	
<i>Public Awareness</i>	23
How This Plan Will Be Implemented	26
<i>Focusing on Exploration:</i>	
<i>A New Center Perspective</i>	26
<i>Pioneering Space Exploration:</i>	
<i>Achieving Our Mission</i>	29

I *ntroduction*

*JSC is the right
center to lead this
country's human space
exploration endeavors.*

The strategy presented in this plan is based on an exploration-focused future for JSC. Exploration, after all, is a fundamental element of our Nation's heritage. It is the heritage of this country's space program, and it is most certainly the heritage of JSC. Exploration is what NASA has been about for the last 30 years. It is our past. And it is our future. NASA has a presidential mandate telling us that we will continue to uphold that heritage. We will return to the Moon—and this time to stay. And we will continue on with a manned journey to Mars.

If we as a Nation are to continue to remain leaders on a global scale, we must stretch our scientific and technical capabilities to their limits. We must enhance this country's intellectual wealth and improve our economic health. We must stimulate new commercial ventures and provide a forum for increased international cooperation. We believe that the exploration of space is one of the best ways to achieve these things.

With our experience and requisite expertise as the Center that has led this Nation's manned space flight activities, JSC is the right center to lead this country's human space exploration endeavors. By incorporating an exploration focus into our strategic planning process, we can look beyond the near-term challenges associated with the Shuttle and Space Station. We can be adequately prepared for our role in NASA's future.

We know that, right now, we have to be extremely successful in fulfilling our role in the Shuttle and Space Station programs. Our emphasis on exploration enables us, however, to define a strategy that integrates all our responsibilities. It results in a clearer picture of the long-term role JSC can and should play for the Agency. Our emphasis on an integrated exploration strategy also reinforces our commitment to improving our current program processes as a means of finding the resources required to pursue that future.

Pioneering Space Exploration: *The JSC Vision*

As a direct result of our Nation's commitment to a civilian space program, we possess a far greater understanding of our planet and universe than we had only 30 years ago. Every American has had some element of their day-to-day life enhanced by the U.S. space program. This country's manned space flight program was initially fostered by a national interest in maintaining scientific and technological preeminence in the world. It was founded on a pioneering spirit manifested in that basic human desire to explore the unknown and to search for means to improve the condition of our lives. The essence of that pioneering spirit is still very much with us as this country prepares to extend the boundaries of the space frontier and open new opportunities for America.

Pioneering Space Exploration: These three words succinctly summarize our vision of JSC's role in the future of the U.S. space program. At JSC, we are all pioneers charged with the enviable task of implementing the dreams that not too long ago existed only in the world of science fiction. JSC is homebase to the explorers of the new frontier—a frontier that continues to surprise and astound us, but also presents us with unimaginable opportunities to learn more about the universe in which we live and, hence, our home planet and ourselves. JSC will provide direction in the expansion of human activity in the exploration and utilization of space. We will continue to support and to improve the ways that we transport people to and in space. And we will provide the leadership for establishing frontier outposts where we will learn to use the resources unique to those environments.

We know all too well that the risks associated with this pioneering venture are great, and possibly costly. But, historically, the benefits have always been ultimately far greater and enriching. We at JSC stand willing to take the risks in what we see as our destiny—our destiny to reach out and explore the unknown, to bring back the returns on our investment in space to benefit the American people.

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Our Guiding Principles

The Mission of the Johnson Space Center is the expansion of human presence in space through exploration and utilization for the benefit of all.

The JSC mission is without a doubt incredibly challenging and broad reaching. And it is so intentionally. Historically, JSC has served as the proponent and leader for this country's manned space flight activities. We have the know-how to do manned space flight and to do it well. Our astronauts have flown every mission. We have excelled in engineering and science, mission operations, and project and program management. We are prepared to continue that leadership role as this country expands the presence of humans in space. That is JSC's mission.

At JSC, as we pioneer space exploration, we will strive to keep the following fundamental principles always to the fore.

Pursuit of Excellence

We will pursue excellence in all our efforts, striving to develop innovative, more effective approaches to managing and operating our programs.

We will emphasize safety in space and on the ground, while working to reduce the cost of space operations.

We will share our specialized expertise and facilities to assist other NASA centers, and rely on the specialized expertise and facilities of other NASA centers to aid us in our endeavors.

Respect for the Individual

We will enhance the experience level of our civil service staff.

We will foster individual empowerment and accountability.

We will provide avenues for open communication throughout our organization.

Public Trust

We will conduct a space program that benefits the U.S. public and promotes the transfer of technology and science to U.S. industry.

We will enhance our working relationships with other government agencies, academia, and industry.

We will inspire and support efforts to educate and prepare the U.S. work force for the future.

We will respect the environment of Earth, space, and other planets.

We will conduct the business of JSC in accordance with integrity and the highest professional standards.

Historically, JSC has served as the proponent and leader for this country's manned space flight activities.

Our Basic Strategy

*We must link our efforts
together and evolve, not
just transition.*

As a vital part of the Agency, as the leader in human exploration activities, JSC has the potential for an incredibly exciting and rewarding future. In building that future, we as a Center are faced with one of our biggest challenges. We no longer have one specific flight program. We have multiple programs and several jobs to do. And we must do them all well.

Supporting several programs at various stages of development and operation is something that is still relatively new to us. If we are to do these multiple tasks well and support our larger exploration-focused mission successfully, we must seek opportunities to improve the way we currently manage our work and handle our responsibilities. We must think in terms of multi-program processes. We must plan and implement our work using processes that are not simply one-program specific, but that can be applied across a range of activities, all of which support our exploration focus. We must link our efforts together and evolve, not just transition. That is a simple statement for such a complex task, but it is fundamental to the future success of our manned exploration endeavors. And it is a *new way* for us to think and act at JSC.

We must begin to evaluate current and future strategies and options in terms of their usefulness across all program elements. We must find ways to perform new work with our available resources because increases in NASA's funding level are likely to be *limited over the next several years*. We are also likely to receive no major increase in our civil service work force. We must train and prepare the people we have to do the job.

Obviously, making adjustments like these in the way we operate as a Center is not going to be an easy task. It is going to take hard work and commitment on the part of everyone who works here.

What We're Going to Do and How We're Going to Do It

To promote a long-range exploration perspective in our planning process, the Senior Staff considered an illustrative Moon and Mars exploration scenario to examine the roles JSC will play in the future. This strawman scenario, based on the Synthesis Group report, "America at the Threshold," allowed the Senior Staff to assess required elements, capabilities, technologies, and possible options as well as resource, schedule, and other challenges inherent in JSC's taking the leadership role in human space exploration.

One of the most significant understandings that emerged from these strawman scenario discussions was the criticality of linking all our programs and projects in support of space exploration. Exploration cannot be viewed simply as another specific program. Exploration is not a program. For us, it is an orchestrated process or sequence of steps designed to probe and use space for the benefit of all citizens of the United States and the Earth. The Space Shuttle, Space Station Freedom, settlement of the Moon and missions to Mars are all part of the ongoing exploration process, an integrated multi-program process that is the U.S. space program.

In the sections that follow we detail the specific steps we intend to take in the areas we've identified as crucial to our success during the 1990's and into the next century. Each area is a vital link in the overall exploration process. The areas are treated somewhat separately in the text to highlight specific initiatives that are the enabling capabilities for achieving our mission as NASA's leader in human space exploration.

*Exploration is not a
program....it is an
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▣ *Doing Business Differently* ▣

We will better define long-term organizational roles and responsibilities and balance the program management, engineering, operations, and science roles of the Center.

JSC has a marked record of success. To ensure that we maintain that record, we must pursue our future with a renewed gusto and commitment to finding new and even better ways of conducting our business. By adopting an interconnected, evolutionary approach to our work, we can better define long-term organizational roles and responsibilities and balance the program management, engineering, operations, and science roles of the Center. This new approach will also enable us to streamline our management, fine-tune our expertise, and improve those processes critical to our program activities.

Find Synergies in Current Programs

Finding synergies in our current programs will allow us to combine common support functions and to recover resources where there is overlap. To accomplish this, JSC will

Identify Shuttle operations where efforts can be combined and made more efficient within JSC and implement changes as appropriate.

Identify areas of consolidation, clearly define roles and responsibilities, and set priorities in our Orbiter sustaining engineering efforts.

Identify opportunities to shift and consolidate functions between NASA centers and their contractors to reduce resource requirements across the Agency.

Promote consolidation of Shuttle and Space Station operations at the appropriate time.

Consolidate hardware and software development, flight certification, management of government-furnished and crew equipment, and information and data systems across all our activities.

Establish cross-functional process analysis teams to streamline and improve the quality of our critical program activities.

Implement New Approaches to Major Programs

Programs that involve people actually living and working in space will demand entirely new approaches to how we think about programs, how we develop them, and how we operate them. Our current and future work offers JSC an opportunity to develop and refine new approaches to the multi-program, long-term operations challenges inherent in the exploration process. To implement these new approaches, JSC will

Manage and organize major programs on the basis of long-term ownership and the evolution of sustaining operations.

Strive to clearly define program interfaces between centers and contractors and emphasize simple standardized interfaces between technical elements.

Use common systems elements, including ground support systems, across major programs.

Build on existing hardware and capability rather than treating new programs as stand-alones.

Apply risk management strategies that make the most effective use of our resources to achieve acceptable levels of risk.

Ensure wherever possible that our development processes and systems for any future program are designed and built to be used in effective sustaining operations.

Our current and future work offers JSC an opportunity to develop and refine new approaches to the multi-program, long-term operations challenges inherent in the exploration process.

Keep Our Civil Service Work Force on the Leading Edge

By shifting and consolidating our tasks, we can increase the number of civil servants who are available to work on our exploration-related activities. JSC is committed to making our in-house requirements definition and project management capabilities stronger. To accomplish this, JSC will

Consolidate functions, shift personnel and resources, and continuously improve our performance on current activities to create a civil service work force wedge dedicated to new exploration roles.

Give the people who comprise this wedge opportunities to develop enhanced technical expertise and project management skills by defining, developing, and building in-house projects that fit within the scope of JSC's strategy for the future.

Emphasize the critical role civil servants must play early in the life cycle of a project to ensure final delivery of a better, less-expensive product.

JSC is committed to making our in-house requirements definition and project management capabilities stronger.

Cultivate Our Partnerships with the Contractor Community

The JSC community of contractors is the largest segment of the JSC team. Our contractor partners are integral and invaluable to the success of our mission. To tap the expertise, innovation, and unique capabilities of these partners and to best use the collective creativity of our total team, we must effectively involve our contractors in the exploration process. To achieve this, JSC will

Clarify the roles and responsibilities of civil servants and contractors to make the best use of our team during the entire life cycle of a project or program.

Define contractor tasks and management responsibilities to permit and facilitate the transfer of appropriate functions, including some aspects of major program sustaining operations, to a government-owned, contractor-operated mode, if this is to the advantage of the government.

Eliminate, wherever possible, barriers to consolidating services and economies-of-scale in procurement processes.

Use incentives to promote quality, productivity, and cost efficiency in our contracts.

Simplify statements of work to allow contractors to meet NASA requirements in the most cost-effective manner possible, which may mean using industry rather than NASA standards, systems, and processes. Use existing contractor reporting systems when possible.

Examine pre-contract specifications and documentation requirements to make sure they are truly necessary to the successful implementation of the contract.

Build In Safety, Reliability, and Quality Assurance

Given the importance of safety, reliability, and quality assurance (SR&QA) to our overall mission, we must promote a culture at JSC that instills in every individual the responsibility for ensuring that quality is continuously built into everything we do. We cannot rely on testing and inspection alone as effective mechanisms to assure quality assurance. Quality and reliability must be goals during the entire life cycle of a project or program. To accomplish this, JSC will

Involve SR&QA specialists early in the system engineering process to influence design decisions that will ultimately result in high reliability systems.

We must effectively involve our contractors in the exploration process.

Quality and reliability must be goals during the entire life cycle of a project or program.

Develop a cadre of SR&QA-oriented expertise to work from the beginning with new initiatives and new technologies to ensure that quality is built into every process and product.

Stay up to date on industry standards and advocate their use in lieu of NASA-unique standards in those instances where equal or higher quality and reliability can be attained at a lower cost. Make it easier and less time consuming to use industry, military, and international standards.

Apply quality management tools, such as concurrent engineering and integrated risk assessment, to achieve a total systems approach in our development organizations.

Improve Our Service Base

In the not-so-distant future, service capabilities will become increasingly important as multiple exploration programs result in an increase in the number of contracts, new partnerships with other centers and agencies, and joint ventures with the academic and private sector. Because of this, we must improve the processes we use to administer and support our program management and technical and scientific functions. Improving these processes will require an innovative and resourceful team effort on the part of all our service organizations. To improve our service base, JSC will

We must improve the processes we use to administer and support our program management and technical and scientific functions.

Foster Centerwide continuous improvement initiatives already underway such as those in the procurement and budget processes.

Consolidate information systems and data bases and improve our accessibility to them.

Investigate using fee-for-service practices in our service organizations and develop efficient methods to use these where practical.

Encourage and facilitate the use of available commercial off-the-shelf technologies, systems, and processes. Develop a much-improved data base of what is available.

▣ *Providing Access to Space* ▣

In fulfilling the Nation's space exploration objectives, JSC is responsible for ensuring that the U.S. has the capability to carry people and their equipment into space and to return them safely. As we fulfill our current responsibilities in conducting Shuttle missions safely and successfully, we must begin to think of those responsibilities as building blocks to the future. We recognize that the Shuttle is a vital link in the exploration process. With a focus on continued space exploration, we must also begin to consider long-term manned transportation strategies. We have to develop new ways to gain access to space that can extend our reach beyond low Earth orbit.

JSC is responsible for ensuring that the U.S. has the capability to carry people and their equipment into space and to return them safely.

Fly the Space Shuttle Safely, More Effectively, and at Lower Cost

For our current access capability, our strategy is to continuously improve the Shuttle and flight preparation and operations processes. To accomplish this, JSC will

Provide a Shuttle capability through the first 10 years of the next century, assuring that this capability can be extended, if needed, to the year 2020. This includes maintaining the capability to produce another Orbiter if required.

Evaluate and implement upgrades to the Shuttle system based on the following criteria: increased safety and reliability; cost effectiveness, including return on investment; extended vehicle operational lifetimes; and

decreased technical obsolescence. We will also consider implementing upgrades based on their commonality with other programs.

Continue to implement the Office of Space Flight's continuous improvement initiatives for the Space Shuttle Program.

Reduce our portion of Shuttle program costs by the 15 percent mandated by 1996 without compromising safety.

We are committed to a well-balanced approach to our dependence on current systems as we develop future capabilities.

Ensure Continued Access to Space

For JSC to lead in the development of manned vehicles that will provide continued access to space, particularly as we explore beyond low Earth orbit, we must begin today to study long-term manned transportation systems. JSC is committed to providing the management capability, the technology base, and an environment that guarantees a well-balanced approach to our dependence on current systems as we develop future capabilities. As we examine various options for getting people to and from space, JSC will

Evaluate programmatic needs, the availability and advantages of new technology, and the cost of replacement systems against the capabilities and the operational costs of the Space Shuttle.

Reduce the time it takes to develop human-rated systems.

Structure plans for long-term manned transportation systems that meet the access needs required for extended exploration of space and provide a way to respond quickly in the event of unforeseen factors such as technical obsolescence or attrition in the Orbiter fleet.

Define the manned vehicle requirements for the developers of any future launch vehicle.

▣ *Living and Working in Space* ▣

Using the Space Shuttle, we can provide people access to low Earth orbit where they can live and work for a limited amount of time. As we pursue our exploration-focused future, JSC will articulate, advocate, and demonstrate the capabilities and benefits of humans living and working in space, on the Moon, or on their way to Mars.

Space Station Freedom will provide us unique and immeasurably valuable opportunities for advancements in engineering, science, and research. In addition, Spacelab, an extended duration capability for the Orbiter, and other space-based platforms all have unique aspects that will contribute to our eventual long-term habitation and use of the space environment. The experience we develop from these activities will be the foundation for further steps in the exploration process, just as Mercury and Gemini were the foundation for the Apollo program.

Conduct a Continuum of Life Science Research

Before we can extend the presence of humans in space, we must have a comprehensive understanding of how to sustain people in a healthy, safe, and productive condition for long periods of time in the harsh environment of space. Our research in human life sciences at JSC is critical to developing that understanding—without it, there simply can be no extended exploration of space by humans.

Our efforts in human life sciences research at JSC are, and must continue to be, extensive. We must understand the physiological and psychological impacts of being in the space environment and develop appropriate countermeasures. We must resolve every foreseeable health and safety issue. We must design effective life support systems, build technology that enhances human productivity, and develop operational procedures that make the most of human performance. We must provide food, clothing, and hygiene capabilities. We must have clear-cut radiation

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protection measures in place. We must be prepared to provide people with what they need to be healthy and productive as they learn to live and work outside Earth's boundaries. In addition, we have the opportunity to use biotechnology for basic research into the growth of cells in microgravity, a field of great potential benefit to both earth-based and space medical applications. To increase our understanding of human life science requirements and capabilities, JSC will

Define the projected requirements for humans in space environments.

Develop a plan with specific objectives to verify equipment, methods, and effective countermeasures for keeping people healthy and productive. Have discrete phases of the plan address specific mission duration or environment exposure needs.

Conduct life science research on the Shuttle and Space Station to meet the specific objectives of the life science plan and to develop and verify countermeasures as early as possible for the longest duration flights anticipated.

Conduct biotechnology research to grow cells in microgravity for potential health-related applications in space and on the ground.

Build and Operate Manned Facilities in Space

In addition to learning how people can live and work in space, we must also learn to operate systems and spacecraft for extended periods of time. Assembling the Space Station, bringing the facility into initial use, controlling it during unmanned periods, and achieving permanently manned operational status will provide us with a solid foundation we can build on to further our

Our research in human life sciences at JSC is critical. . .without it, there simply can be no extended exploration of space by humans.

exploration activities. We can also find ways to use our space-based capabilities to accomplish scientific and technical research not possible here on Earth. To develop our expertise in building, operating, sustaining, and using our space-based capabilities, JSC will

Use the Shuttle to perform near-term exploration activities and to support verification of Space Station systems. Use the Space Station as a test bed to validate the longevity of systems and processes needed for future exploration activities.

Develop systems, flight techniques, and operations procedures to accomplish rendezvous, proximity operations, and robotics-assisted assembly of large structures in space using the Shuttle and Shuttle-based extravehicular activity.

Develop techniques to make optimal use of autonomous systems for operational activities in space. Design those autonomous systems carefully considering the needs of the people who will operate and maintain them and serve as backup to the automated functions.

Continue to design and develop an assured crew return capability as an essential safety requirement for Space Station Freedom.

Demonstrate the success of sustained international partnerships.

Find ways for government, academic, or private sector users to take advantage of our assets in space and improve the methods we use to accommodate their specific requirements.

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periods of time.*

▣ *Extending Our Reach* ▣

As part of our exploration-focused future, we will extend our reach in space by returning to the Moon to explore, to live and work there, and to learn to use the resources available in space as we travel to Mars. Leading this country in the human exploration of space is what we at JSC intend to do. As we begin to travel, to live and work beyond low Earth orbit, JSC will lead the development and operation of all human-related transportation vehicles and surface systems. And that is a leadership role we must step up to today.

Develop the Strategy for Returning to the Moon and Traveling to Mars

President Bush presented America with the challenge of returning to the Moon to stay and conducting manned missions to Mars. In 1992, NASA will begin to define the specific course of action we need to take to accomplish what the President tasked us to do. JSC must play an important role in the development of these specific strategies. To fulfill this responsibility, JSC will

Assist NASA Headquarters in developing a strategy to evolve the exploration architecture based on our national goals, identified constraints, and desired achievements. Retain the flexibility to respond to the realities of resource availability and to incorporate advantageous technologies and approaches as they are proven.

Identify and develop the technology requirements to accomplish our milestones and assure that development efforts begin when needed.

Influence and support Agency decisions on establishing partnerships and assigning hardware responsibilities by developing a comprehensive technical understanding of available NASA, Department of Energy, and Department of Defense and other government capabilities; commercial services; university research; and foreign capabilities.

*Leading this country in
the human exploration of
space is what we at JSC
intend to do.*

Develop Manned Vehicles and Human-Related Surface Systems

Consistent with JSC's demonstrated expertise, we will lead in developing the manned vehicles and human-related surface elements of the exploration architecture. The systems development associated with this will include responsibility for program management, systems engineering, flight testing, and operations. To accomplish this, JSC will

Define the early project requirements and concepts for manned transportation vehicles and for human-related surface systems. Provide these requirements for inclusion in the overall exploration architecture.

Build mockups and test beds to develop and verify critical systems and technologies.

Analyze early exploration projects, such as lunar landers and Mars sample return missions, and pursue the manned and unmanned efforts that best fit JSC's expertise and responsibilities in the exploration process. Perform selected precursor activities from requirements definition through fabrication, launch, and operations.

■ *Assuring Technologies Are Ready When Needed* ■

Meet the Technology Needs of Space Exploration

All future space missions will require systems that can operate for long periods of time with high reliability. Spacecraft systems will evolve from those being controlled and monitored from the ground to systems incorporating onboard autonomous control and space-based or surface systems needing minimal logistics support.

JSC will play two key roles in meeting the technology needs of space exploration: we will ensure that technologies are available when needed, and we will develop needed technologies which are

We will lead in developing the manned vehicles and human-related surface elements of the exploration architecture.

We will ensure that technologies are available when needed, and we will develop needed technologies which are unique to the Center's mission.

unique to the Center's mission and in those areas where JSC has particular expertise, experience, or facilities. Figure 1 identifies critical technology areas which have already been identified for future JSC programs and those areas where JSC intends to lead in technology development and application.

To ensure the availability of technologies when they are needed, JSC will

Identify requirements for technologies and capabilities to support exploration missions and advocate those technologies to organizations sponsoring technology development.

Advocate and establish partnerships with other NASA centers, the Department of Defense, Department of Energy and the National Laboratories, other government research centers, academia, and the private sector to increase the effectiveness and efficiency of research and technology programs and to facilitate technology transfer to our Center initiatives.

JSC currently uses a Technology Coordinating Committee (TCC), comprised of senior representatives from all directorates and project offices across the Center, to coordinate and focus technology development at the Center. The TCC defines technology priorities for JSC based on current and future program requirements. To accomplish our role in developing technologies that are unique to our experience and facilities, JSC will

Continue to use the special skills and services of the TCC to assure that technology work at JSC is closely coordinated with overall technology requirements definition activities.

Review Center technology efforts at least annually and discontinue work in areas where the effort does not support the objectives of the JSC strategy.

Figure 1. Technologies Required for Future JSC Programs

	<i>Overview</i>	<i>Technologies and Capabilities</i>
Human Support	Technologies required for spacecraft systems and planet surface systems that will sustain human life and provide productive environment for mission operations	Regenerative life support* EVA suits & personal life support systems* Low gravity countermeasures* Human factors* Crew health maintenance* Radiation health research* Thermal control*
Mission Operations	Technologies to integrate control of mission between ground, spacecraft and planet surface	Space systems monitoring & control* Automated training for crews & operators* Software design/engineering/re-engineering* Automation of flight design & mission preparation* Operations engineering & support tools Mission control display & graphics* Tools for automated requirements design
Spacecraft Systems	Technologies necessary to build and operate higher quality human spacecraft with improved safety, reliability and cost effectiveness for longer duration missions	Aerobraking* Automated operating systems* Vehicle health maintenance* Adaptive guidance, navigation & control* High definition video Automated on-orbit operations* Autonomous landing* Debris and meteoroid modeling & protection* Advanced power & propulsion High data rate communications
Planet Surface Systems	Autonomous, highly reliable, long duration planetary surface system technologies providing capabilities for mission implementation	Surface distributed systems concepts* Survey, mapping & remote sensing Surface guidance, navigation & control Robotic tracking & control Radiation protection* In situ resource utilization* System automation & maintenance On-orbit/surface assembly & construction* Science instruments Surface dust countermeasures*
Management Tools	Technologies required to improve the efficiency and effectiveness of program management and center operations	Requirements documentation & control Configuration control Scheduling Design knowledge capture Budget management <ul style="list-style-type: none"> - Improved cost estimation algorithms - Real-time cost tracking - Correlation of technical and cost progress - Cost to completion estimates Software commonality

* JSC lead center or major contributor for technology development

Foster U.S. Technological Competitiveness

JSC will facilitate early application of technology development to future space activities as well as to the private sector.

JSC will foster the Nation's technological competitiveness by facilitating early application of technology development to future space activities as well as to the private sector. To accomplish this, JSC will

Expand our efforts through the Technology Utilization network to disseminate information about ongoing and planned scientific and engineering activities which may provide valuable "spin-off" technology to ensure early transfer to and use of this technology by American industry.

Work closely with the Mid-Continent Regional Technology Transfer Center and state agencies to facilitate access by the private sector to technologies from NASA, our aerospace contractors, and other Federal laboratories.

▣ *Helping Our People Reach Their Potential* ▣

Space is a marvelous motivator. Many of us who work at JSC came from faraway cities and states to be a part of the U.S. space program. Many of us have always dreamed of being a part of the space program. We feel proud when we tell people we work for NASA at the Johnson Space Center. We have a profound sense of purpose and community here that in and of itself gives us reason to do our jobs well.

JSC's proven success is directly related to its people and the dedication and pride they feel in their work. Our people are our most valuable resource. We know that our future success is dependent on continuing to provide our people with exciting work, a proper work environment, and the tools that allow them to be productive, innovative, and to reach their full potential.

Build the Talent, Knowledge, and Capability of Our People

Given the challenges of our future, we must put greater emphasis on developing the abilities of all members of the JSC team through job experience and varied training opportunities. To help our people obtain these skills, JSC will

Perform selected projects in house to build the expertise required to handle the large-scale exploration projects.

Develop project management skills by requiring people to take greater responsibility for clear, concise definition of project requirements, followed by management of cost, schedule, and performance to meet those requirements.

Define job responsibilities and accountability for results to allow decision making at the lowest practical levels.

Increase opportunities for rotational assignments both within JSC and to Headquarters, other centers and with other partners in space exploration, broadening job knowledge and enhancing understanding of cross-organizational processes.

Enhance the JSC Work Environment

As JSC actively pursues its exploration-focused future, we must ensure that we continue to provide a work environment that allows people to do their jobs the best they can. To accomplish this, JSC will

Promote an environment of open communication that recognizes the contributions of all employees and that stimulates the transfer of our hard-learned corporate knowledge to the next generation of pioneers.

JSC's proven success is directly related to its people and the dedication and pride they feel in their work.

Attract, develop, and retain a high-caliber work force diverse in culture, race, and gender.

Use the rewards and recognition systems to acknowledge superior contributions from the JSC team and to encourage continuous performance and quality improvements that support our mission.

Reward innovators who succeed in making major changes in their work areas, and consider innovation as one of the factors in selecting people for leadership roles.

Continue to provide opportunities for professional growth through multiple career paths.

▣ *Using Our Facilities Effectively* ▣

Promote Common Support and Evolution of Facilities

We must identify in a timely manner requirements for new or upgraded facilities and evaluate the best means of meeting these requirements.

JSC has several unique facilities available for spacecraft and technology development, space life sciences, crew training, and mission operations. As we define and implement new projects and programs in the future, we will require new and upgraded facilities. New initiatives development organizations will work with the institutional facilities organizations to ensure that requirements for new or upgraded facilities are identified in a timely manner and that the best means of meeting these requirements are evaluated. To ensure that we are using our current and future facility resources most effectively, JSC will

Inventory our existing facilities, their capabilities, and their projected use.

Define and implement a plan for multi-program, cross-organizational use of these specialized facilities wherever possible.

Make optimal use of our existing facilities by allowing contractors access to them, to the extent possible, to avoid spending program dollars on creating their own, often duplicate, facilities.

Use White Sands Test Facility as a National Resource

The White Sands Test Facility (WSTF) represents a major asset to JSC engineering, program development, testing, and verification activities. Indeed, with its specialized propulsion, spacecraft systems, components and materials testing environment, it is a unique national asset. To ensure that we are using this resource to its full potential, JSC will

Continue to use WSTF to serve a variety of users and be a model for reimbursable work agreements with other Federal agencies.

Have all development organizations annually identify testing and verification procedures that can best be performed at WSTF.

■ *Fostering Educational Outreach and Public Awareness* ■

The public should be able to know not only what NASA is doing, but *why* we are doing it. JSC shares in the NASA-wide responsibility to ensure that the American public is fully informed about the activities of the Nation's space program and its efforts to meet the challenges of space exploration.

The public should be able to know not only what NASA is doing, but why we are doing it.

Enhance Educational Outreach and Public Awareness Programs

JSC must continue to expand its outreach activities both in education and public information to provide increased recognition of the value of the space program as a resource and incentive to return technical excellence to our Nation's educational system. JSC's unique facilities, talented work force, and challenging mission enable us to make an important contribution to the development of a talent pool that will enhance U.S. leadership in aeronautics, space science, and technology development. To increase educational outreach, JSC will

Assess the current impact of NASA and JSC educational activities and better fulfill unmet needs.

Expand the creative application of space-related knowledge and techniques to the classroom and campus environments.

Expand the use of NASA Select Television educational programming, innovative audiovisual products, publications, and syllabus materials.

Use our emphasis on exploration to inject excitement into educational programs.

Reach beyond traditional aerospace industry and technical fields of study to establish partnerships in support of educational programs.

To foster public awareness of what we're doing and why, JSC will

Structure public information programs to inform the public of NASA's emphasis on exploration.

Make more effective use of NASA Select and other special interest television systems and media resources.

*JSC's unique facilities,
talented work force, and
challenging mission
enable us to make an
important contribution
to...U.S. leadership.*

Increase opportunities to involve the public directly in the adventure and excitement of space exploration through expanded access to the people and events behind our missions and programs.

Develop in the early stages of program or project definition the supporting rationale to foster public understanding of new exploration activities.

Incorporate imaging systems in basic vehicle and ground system designs so the public can participate in the exploration of space.

Continue and expand our efforts to demonstrate the many ways in which the new technologies and scientific requirements of our space program benefit Earth's inhabitants.

Continue to cooperate with museums and visitor centers, such as Space Center Houston.

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"Pioneering Space Exploration"

How This Plan Will Be Implemented

▣ *Focusing on Exploration:* ▣ *A New Center Perspective*

JSC has stepped up to the future. With a new focus on exploration, we will now look at our current activities with a slightly different view: Does our current work relate to our vision? What are the opportunities for use of our Shuttle and Space Station resources to further our exploration goals? How can we do our current jobs better and free resources to take on new work?

The JSC 1992 strategic plan that you have just read begins the process of answering these questions. It takes a long-range view of where the Center wants to be during the 1990's and into the next century. On the last page of this strategic plan, you will find the signatures of all JSC senior-level managers and staff. They are committed to this plan and to implementing a process that will ensure its success. That process will include coordination of Centerwide goals and timetables and periodic review of the progress.

Many of the strategies defined in our JSC strategic plan are already being acted on. Many others, however, obviously go beyond our internal JSC organization and will have to be authorized by the appropriate people before we can implement them. We are committed to pursuing these approvals, where needed, to significantly change the way we are currently doing business. We simply have to. Our mission, our future as the lead center for human exploration, depends on it.

All JSC senior-level managers and staff are committed to this plan and to implementing a process that will ensure its success.

Establish a Formal, Ongoing Process

JSC will update our strategic plan annually. During the course of the year, however, several changes are likely to occur that will need proactive and timely action. As a result, JSC is establishing a formal strategic planning and action management process to assure that Center resources are applied to those activities that best support our mission.

A new JSC Executive Council will serve as the forum and decision-making body for implementing this planning and action management process. The Council will be chaired by the Center Director; its members will include the JSC Senior Staff. The Council will make resource allocation decisions and resolve any issues that arise as we implement this strategic plan.

Additionally, the Council will authorize major changes resulting from continuous improvement in how we do business. Details of the process will be issued at a later date as a JSC Management Directive.

Decide What Activities to Take On

We have defined the vision, mission, and activities we will undertake to get JSC on the road to a vigorous future. Over the next several years, a number of opportunities will be identified and many of the tasks associated with these opportunities will be competing for our valuable resources. When we undertake new assignments, particularly with an emphasis on developing our civil service expertise, we have to look to a structured management process for the Center that can evaluate Center commitments and the deployment of Center resources. We must also evaluate the impact of potential new projects across the Center and evaluate the long-term effects of allocation decisions on the balance of JSC's program management, engineering, science, and operations responsibilities.

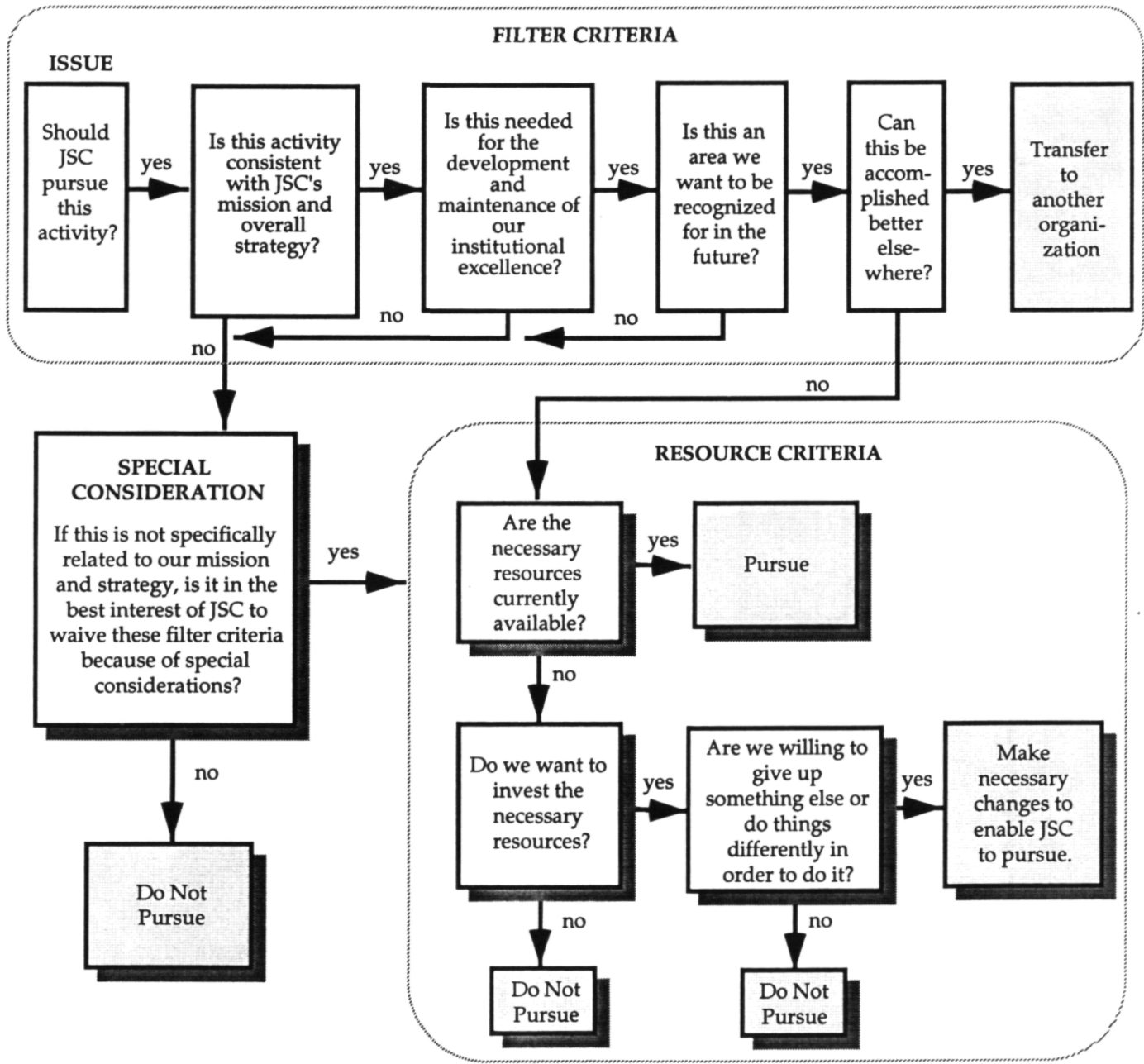
Illustrated in figure 2 is the strategic filter that the JSC Executive Council will use to set priorities and allocate resources between current and new activities. The criteria in this filter are designed to allow us to pursue those activities that are in direct line with our stated mission. We will have to pass or stop work on those projects and activities that do not fit within the frame of our defined future.

A new JSC Executive Council will serve as the forum and decision-making body for implementing this planning and action management process.

Figure 2. JSC Strategic Filter

The Mission of the Johnson Space Center is the expansion of human presence in space through exploration and utilization for the benefit of all

- OVERALL STRATEGY**
- JSC is the lead center for human spaceflight, exploration and utilization.
 - JSC will concentrate on piloted vehicles, human systems, life sciences and related technology development.
 - JSC will participate in selected unmanned precursor activities that will develop our expertise and experience required for human space exploration.



Develop Individual Organization Implementation Plans

To assure deployment of our strategy at all levels, each JSC organization will develop its own implementation plan. Individual organizations will identify specific objectives, roles and activities, schedules, resource requirements, interfaces, and support needs that are consistent with the JSC plan. Each organization will provide its own characteristic and measurable milestones.

Implement and Update Plans and Processes

The Executive Council will review all organization plans to ensure that the total of these plans will enable JSC to achieve its goals. While putting their plans into action and measuring progress, individual organizations will also be asked to update their plans at least annually to reflect their progress and to add necessary changes.

To achieve our mission, we must be innovators, seeking new and better ways to manage our limited resources and to do our jobs.

▣ *Pioneering Space Exploration: Achieving Our Mission* ▣

As we implement this plan and new philosophy at JSC, many important changes will be made in the way we do business. To achieve our mission, we must be innovators, seeking new and better ways to manage our limited resources and to do our jobs. JSC welcomes innovation. As we work to make resources available to take on new activities, those of you who have demonstrated leadership in significantly improving the way we do business will be the people we look to to lead our future projects.

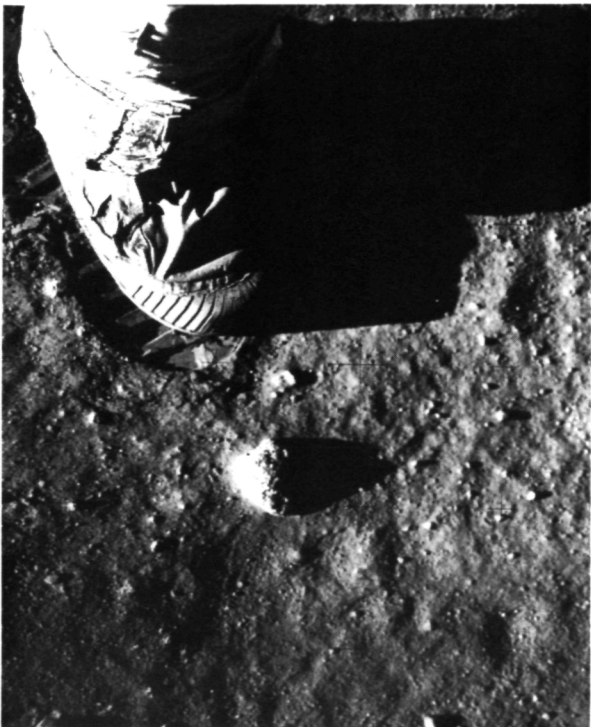
Because of the tremendous challenges ahead of us, our roadmap presented in this plan is bound to change over the course of time. Updated pages will be issued annually or as the situation warrants. We have encouraged you to use your pen while you

have been reading this. This is, indeed, *your* plan. Please write down your ideas and send them via your management for review by the Executive Council.

JSC has already made significant progress in the past year. We have agreed on a vision and strategy for the future. We have established specific waypoints and routes on our roadmap to the future. We have established a formal Centerwide decision-making and analysis process that will enable us to better manage our resources and handle our external environment. By publication of this plan, we bring all JSC employees into the process.

For JSC to vigorously pioneer the future of human space exploration, everyone who works as a member of this Center's team must be willing to contribute their ideas, their expertise, and their enthusiasm to making the promise of our exploration-focused future a reality.

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"At JSC, we are all pioneers."

Ann Chen

Center Director

Office of the Director

Paul Weitz
Daniel A. Feibing
Clarke Covington
John Young
Joseph S. Taylor

Human Resources Office

Harvey Jackson
Gregory W. [unclear]

Administration Directorate

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W. Raymond Young
K. E. Easley

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