

**1996 NASA/ASEE SUMMER FACULTY FELLOWSHIP PROGRAM  
JOHN F. KENNEDY SPACE CENTER  
UNIVERSITY OF CENTRAL FLORIDA**

52-51  
1996

*A MODEL FOR NASA-KSC's PRIVATIZATION TRANSITION*

Dr. Jerome P. Lavelle, Assistant Professor  
Mr. Dennis W. Krumwiede, Graduate Student  
Industrial and Manufacturing Systems Engineering Department  
Kansas State University  
Manhattan, Kansas

KSC Colleague - Jean Flowers  
Industrial Engineering

Contract Number NASA-NGT10-52605

July 26, 1996

## ACKNOWLEDGMENTS

The authors wish to express their deepest thanks and appreciation to all those who have made this summer fellowship a sublime and vastly rewarding experience. We earnestly have been invigorated by the wonderful people at KSC and feel confident that they are motivated and committed to ensuring that at NASA-KSC the space program will remain a world-class operation.

Thanks go to many people; we would like to name them explicitly. First, to the folks in the Industrial Engineering group at KSC, our sponsors, we wish to say thank you for the sedulous professionalism and positive attitude that you bring to your work: to Jean Flowers, Amanda Mitskevich, Colleen Orr, Tim Barth, and Tim O'Brien, thanks guys and best of luck this next year! To their bosses, Bob Sieck, Larry Ellis and Eric Redding, a big thanks for your time, energy, and encouragement. Also to the NASA/ASEE folks, Roger Johnson, Gregg Buckingham and Kari Stiles, we wish to express our deepest appreciation for the effort you put into developing and sustaining this excellent opportunity for ordinary people like us. Thanks too to other folks that we've enjoyed meeting and working with this summer: Pepper Philips, Nicole Passonno, Bill Carew, Scott Cilento, Jenny Lyons, Louie Garcia, Carlos Estrada, Mary Scholtz, Elaine Liston, Beverly Bush and Terrie Bunch

Many thanks to all of you again for helping to make this summer both enjoyable and professionally interesting and expansive. Best of everything to all!

## ABSTRACT

This paper reports on the results of the authors' 1996 NASA/ASEE Summer Faculty Fellowship research. The authors have developed a model for government agencies that are considering privatization of all or part of their functions. Privatization encompasses the transitioning of government functions from "government run" to "contractor run". The model developed in this paper is used to analyze the National Aeronautics and Space Administration's (NASA's) decision to privatize space shuttle operations at the Kennedy Space Center (KSC). Several specific recommendations are given to KSC as they attempt to operationalize this privatization decision at the Center and to transition to a new relationship with their contractors.

## *A MODEL FOR NASA-KSC's PRIVATIZATION TRANSITION*

Dr. Jerome P. Lavelle and Mr. Dennis W. Krumwiede

### **1. INTRODUCTION**

The National Aeronautics and Space Administration (NASA), like many other United States government agencies, is undergoing a transition toward privatization of all or some agency functions. The process of transitioning toward privatization requires a systematic methodological approach. Given is a methodology for use at NASA-KSC as it transitions from its current and traditional role, with respect to shuttle processing and operations, to the use of contractor performance-based metrics.

### **2. BACKGROUND**

Voters today are demanding a more lean and responsive government, and politicians and policy makers have taken notice. Concepts like "re-inventing government" which stress efficiency and decision making accountability in the public arena have set the stage for what people expect of their government. Voters are looking for reduced government size, fiscal responsibility through balanced budgets and privatization where practical and possible. The National Performance Review (NPR) is a reaction to that demand; it brings federal government employees together to work toward: eliminating red tape, putting the customer first, empowering employees, and cutting back to return to the basics (Government Reform, 1995). Governments, as with corporate America, are being asked to do more with less and do it better each year. Government branches and agencies are challenged to establish tangible strategic plans and justify all activities (and expenses) in light of stated goals. The Government Performance and Results Act of 1993 mandates that all U.S. federal agencies use a strategic planning process as a core tool in establishing work plans and budgets and in scoping resource needs and deliverables to the customer (the voter).

With this in mind, NASA has been very active in establishing a vibrant strategic planning process by promoting planning at the Agency, Center and sub-levels. KSC's first formal Strategic Plan was developed in the fall of 1987 and has continued to successfully evolve since that time. In the short term (the 1996-2002 time frame), NASA's strategic goal to *Revolutionize NASA* challenges NASA to consider the way it looks at itself and its customers (NASA Strategic Plan, 1996). This plan calls for continued excellence in research and development in aerospace technologies and to begin privatizing and de-emphasizing operations in areas where technologies are now matured or maturing.

Privatization is a method used by governments to obtain high quality goods and services at lower costs and on a more timely basis through the transfer of programs and functions to the private sector. Privatizers may include private citizens, businesses, and organizations (Kent, 1987; Brinkley, 1987). According to Dimeo (1991) there are three basic types of privatization:

- Contract services to private companies, paying the firms a fee for the work.
- The formation of a partnership with private companies, which will build facilities and operate the services for the government .
- The sale of public assets to the private sector.

NASA-KSC's past and present space shuttle operations transition falls into the first category of privatization given above.

A few of the Agency's strategic objectives that highlight the changing world for KSC are:

- Return NASA to a premier R&D agency.
- Do things that no one else can.
- Change the way that we work with contractors.
- Measure performance and communicate results to demonstrate relevance and contribution to national needs. (NASA Strategic Plan, 1996)
- Decrease Space Shuttle costs and improve the management and operations of the integrated government/contractor team. (HEDS Strategic Plan, 1996)

As of the launch of STS-78 on June 10, 1996 there have been over seventy successful launch and recoveries of NASA's space shuttle orbiter and payload. Clearly the processing of the orbiter and its payload is a mature technology, and, per the strategic goals, a valid candidate for a transition toward privatization.

### **3. PRIVATIZATION MODEL**

Privatization requires a systematic methodology. A general model is suggested by the authors that addresses all phases of the privatization process. This model is given in Table 1 below. It combines the author's personal observations of the process at KSC as well as the United Kingdom Methodology from Miller (1993), and the Air Force Methodology from McSwain and Smith (1989).

Per the model, and with respect to privatization of space shuttle operations, the Agency has been successful in defining privatization goals and in identifying the Centers affected by those goals. The Kennedy Space Center is the NASA entity primarily affected by the privatization of space shuttle operations. The model emphasizes the importance of including Center-level input in the decision making process. NASA-KSC has been empowered to plan for and operationalize the privatization plan. The Center has been given latitude in terms of the time and process to transition from its current role to the privatized role. The model also points to the importance of a formal structure to evaluate privatization and to incorporate lessons and learning into the decision making process at the Agency and Center levels.

### **4. OPERATIONALIZATION OF PRIVATIZATION AT KSC**

Step five of the General Agency-Level Model in Table 1 affects KSC specifically, with respect to the privatization of space shuttle operations. Given the decision to proceed with privatizing this function, the task falls on NASA-KSC to carry out that effort. In Table 2 a specific methodology to operationalize privatizing shuttle operations at KSC is given.

The method in Table 2 requires, as a first step, a clear definition of the goals and objectives of the privatization from the perspective of the Center. It is important that these are aligned with, or result from, privatization goals of the Agency. As with concurrent engineering in product design, it is important to have all relevant impacts planned for at the beginning stages of the process because such efforts affect 95% of what follows in the product life-cycle. This is why it is important to: have goals and objectives established from the beginning of the privatization initiative, have these goals established by top management, and have them communicated downward to those involved in actualizing the goals and objectives of the privatization.

**Table 1: General Agency-Level Model for Privatization**

<p><b>1. Define Agency-Level Goals and Objectives With Respect to Privatization</b></p> <ul style="list-style-type: none"> <li>• Define through strategic planning process.</li> <li>• Communicate throughout the organization.</li> </ul>
<p><b>2. Identify Affected Centers of Potential Privatized Functions</b></p> <ul style="list-style-type: none"> <li>• Communicate Agency-level privatization goals and objectives.</li> </ul>
<p><b>3. Evaluate Privatization Alternatives at Agency and/or Center Level</b></p> <ul style="list-style-type: none"> <li>• Include Centers in the evaluation.</li> <li>• Identify potential functions to privatize.</li> <li>• Specify the type of privatization.</li> <li>• Perform cost and risk analyses on the Agency and Center(s).</li> <li>• Evaluate alignment with, or affect on, the strategic plan.</li> <li>• Understand the political implications.</li> </ul>
<p><b>4. If Privatization Chosen, Communicate</b></p> <ul style="list-style-type: none"> <li>• Insure communication methods saturate the organization.</li> <li>• Relate current and potential plans through communication channels.</li> <li>• Use complete and honest tones in communication.</li> <li>• Relate updates and future communications.</li> </ul>
<p><b>5. Empower Centers to Plan and Operationalize Privatization</b></p> <ul style="list-style-type: none"> <li>• Ensure Center-level privatization strategic plans align with Agency strategic plans.</li> </ul>
<p><b>6. Evaluate Effectiveness of all Privatization Efforts at Agency and Center Levels</b></p> <ul style="list-style-type: none"> <li>• Measure effectiveness against expected goals and objectives over time.</li> <li>• Decide to continue present effort, add to, or eliminate privatization portions.</li> </ul>
<p><b>7. Document Lessons and Learning at Agency and Center Levels</b></p> <ul style="list-style-type: none"> <li>• Document inputs, processes and outputs throughout.</li> <li>• Incorporate lessons and learning into the process of evaluation and execution.</li> </ul>

**Table 2: Methodology to Operationalize Privatization at KSC**

<p><b>Overall Methodology</b></p>
<p>1. Center top management should ensure that specific goals and objectives of privatization at the Center are aligned with Agency privatization strategic plans.</p>
<p>2. Develop a set of contract measures that incentivize the contractor to perform in alignment with the goals and objectives of privatization. These are the measures that are used for making contract evaluations and are explicitly incentivized.</p>
<p>3. Develop an exhaustive list of all processes involved in meeting the goals and objectives of the privatization.</p>
<p>4. In a matrix format, map the key processes from the exhaustive list to the contract measures that are incentivized explicitly through the contract. These key processes are insight measures that can be aggregated (either 1-to-1 or many-to-1) to the contract measurement level. These measures provide insight and confidence; they are not incentivized directly.</p>
<p>5. Do not measure or track other processes that are not primary in supporting the goals — these processes provide no insight or confidence, and are not incentivized through the contract.</p>
<p>6. Establish a system, for both the contract measures and the insight measures, to track, report, and manage those measures.</p>

Once privatization goals have been defined a set of contract measures that explicitly support these goals should be developed. It is important that contract measures are incentivized in the contract. These contract measures should lead the contractor to perform with respect to them, thus performing with respect to the overall goals. A lack of goals makes it impossible to develop contract measures that promote contract performance in alignment with those goals.

The next step in the Methodology to Operationalize Privatization at KSC is to exhaustively identify all processes associated with the privatization, on both the NASA-KSC and contractor side, and list them explicitly. These processes then should be mapped, in a matrix format, to the contract measures developed previously. The identification of the processes, as well as the mapping of those processes to contract measures involves both NASA-KSC and contractor process owners. Mapping the processes to contract measures involves identifying those processes that associate to specific contract measures. These may associate in a one-to-one or a many-to-one fashion. However, these processes are not incentivized directly; their role is to both provide insight into the contractor's processes and to aggregate forward to form the contract measures. In mapping processes to contract measures not all processes may be accounted for. From a measurement perspective, it is important to track only those processes that either provide insight or are at the contract measurement level. Processes that are not insight or contract measures do not explicitly relate to the goals and thus do not require measurement.

The last task in the Methodology to Operationalize Privatization at KSC is to establish a standardized system of obtaining measurement data and in analyzing and reporting that data in a bi-directional fashion throughout the organization. As one defines the contract and insight measures described in the previous paragraphs (and tracks those over time to form a system of metrics), it is important to use a formal operational definition of each measure. This operational definition is the who, what, when, where, why, and how of each measurement.

## 5. CONCLUSIONS

The following are a series of conclusions and recommendations developed by the authors. These recommendations are based on the General Agency-Level Model for Privatization and Methodology to Operationalize Privatization at KSC described in the preceding sections and impressions of activities at NASA-KSC reached over the tenure of the 1996 NASA/ASEE Summer Faculty Fellowship assignment.

- At KSC it is important for the active measures-and-metrics groups to continue to discover, from the ground up, the goals and objectives that the SFOC promotes. Having understood these fundamentals, a system of measurements can be developed based on the methodology described above. If there is an apparent inconsistency between what is being understood as the goals and what the SFOC incentivizes the contractor to do an adjustment to one of these factors is necessary. As a first step the authors suggest formal training on the SFOC to at least the measures-and-metrics groups.
- The measures-and-metrics groups should utilize a standard set of resources, definitions and analysis methods as part of their system development work. Resources of interest may include: NASA Contractor Metrics Handbook, Measurement Planning Handbook and Measurement Workbook, Air Force Metrics Handbook, and Air War College for Developing a Successful Privatization Project.
- The measures-and-metrics groups should use a local benchmark to learn lessons and gain insight into the metrics development process. The McDonnell Douglas company at KSC

has extensive experience in developing metrics systems. Ms. Sherry Smith is the lead engineer in this area for the company.

- When goals are communicated there needs to be a repository for accessing those goals by all levels of the organization. Difficulty in obtaining information pertaining to those goals leads to misguided and non-uniform approaches to problem solving.
- Continuous improvement (CI) is a “way of life” that proactive organizations pursue, and the goal of promoting CI as a principle of operation is appropriate for such organizations. Given the organizational challenges that face NASA in the future, the goal of promoting CI seems appropriate. If this is a goal (to promote this in the contractor), it must be incentivized in the SFOC explicitly.
- The Goals-Contract-Measures-Metrics integrated system should be documented, communicated, and driven at all levels affected. It should serve as a common “language”.
- In developing a system to track, report and manage contractor metrics, if the goal of promoting the CI philosophy in the contractor is chosen, then the use of statistical process control methods seem appropriate. See Kinlaw (1993) and the Air Force Metrics Handbook (1991). In this context, training session on SPC and other CI tools seems appropriate.
- It is important to track the progress of the privatization effort from cost and customer satisfaction perspectives. If either attribute fails to achieve levels consistent with Agency, or Center goals, privatization should be re-evaluated.
- The technical discipline of industrial engineering provides expertise in methods and process analysis for organizational efficiency and effectiveness. In the privatization effort at KSC, with its resulting need to operationalize changes in the organization, industrial engineering expertise should be emphasized. The industrial engineering group should be empowered to lead the engineering of the required changes. That role should be understood and communicated throughout the Center. To be effective in this role it is important to place such expertise at appropriate organizational levels.

## 6. REFERENCES

1996 Application for the President’s Quality Award Program, National Aeronautics and Space Administration, John F. Kennedy Space Center, September 1995.

Air Force Systems Command, 1991. Metrics Handbook. U.S. Air Force Systems Command. Reproduced by U.S. Department of Commerce National Technical Information Services. 1st Edition. No. PB92-16643.

Bancroft, T., 1991. Pravatization? Forbes. June 24, pp 44.

Binkley, J., 1987. Reagan Appoints Privatization Unit. New York Times. September 4, p. 28.

Carter, F. G., 1991. Partial Privatization in a small city fleet. Public Works. pp 38-39.

Carter, J., Are You Using the Right Metrics for Continuous Improvement?, Production, September 1994, p. 16-17.



Conner, J., 1995. Privatization seen successful for firm set up by Congress. Wall Street Journal, Public Utilities Fortnightly. Eastern Edition. June 1, pp 38-42.

Deming, W.E., 1986. Out of Crisis, Cambridge, MA. p. 276.

Dimeo, J., 1991. Can privatization help stretch the local dollar? American City & County. September, pp 26-29.

Lessons in Privatization. Euromoney. February 1996, pp. 93-102.

ENR, 1992. Sydney privatization targets water supply. ENR. February 24, 1992.

Government Reform: GAO's Comments on the National Performance Review, US General Accounting Office, Washington, DC. June 27, 1995.

HEDS Strategic Plan, NASA's Enterprise for the Human Exploration and Development of Space, January 1996.

Hewlett, J. G. , 1990. Lessons from the attempted privatization of nuclear power in the United Kingdom. Energy Sources. 16, pp 17-37.

Kent, C. A., 1987. Entrepreneurship and the Privatizing of Government. Greenwood Press, Inc., Westport, Conn.

Kiernan, V., 1995. Hello, this is mission control, how can I help you? New Scientist 145 (Mar. 25), p 6.

Kinlaw, D. C., 1993. Measurement Planning Handbook and Measurement Workbook. Kinlaw Associates. Norfolk, VA.

McSwain, T C. and Smith, W. E.,1989. Criteria for Developing a Successful Privatization Project, Air War College Research Report, AD-A217 523, Air University United States Air Force, Maxwell Air force Base, Alabama.

Miller, A. N., 1994. Privatization: Lessons from the British experience. Long Range Planning. 27 (6), pp 125-136.

Morris, J., 1987. Privatization and the Unions. American City and County. July, pp 68-72.

Morocco, J. D., 1993. Navy shifting depot work to private industry. Aviation Week & Space Technology. June 28, pp 28-30.

New Zealand, 1992. New Zealand expands service while adjusting to privatization. Aviation Week & Space Technology. February, p 55.

NASA Strategic Plan, February 1996, National Aeronautics and Space Administration, Washington, DC, 20546

Norman, J. R., 1991. Unforeseen consequences. Forbes. September 16, pp 150-152.

O'Conner, R., 1991. Going private. International View. November/December, pp 30-66.

Peratta, E., 1995. Despite bumps in the road, privatization races on. American City and County. October, pp 50-61.

Prager, J., 1994. Contracting out government services: Lessons from the private sector. Public Administration Review. March/April Vol. 54 (2) pp 176-184.

Proctor, P., 1992. Privatization, New Sydney Runway boost Australian airport system. Aviation Week & Space Technology. January, pp 40-41.

Reinhardt, W. G., 1988. Privatization focus shifts to feds as practitioners bare shortcomings. ENR. January 28, pp 8-9.

Reinhardt, W. G., 1988. Defense Department warming up to public/private ventures. Public Works Financing. April, pp 6-12.

Rubin, D. K., and Karmer, D., 1995. DOE sees life with less. ENR. May 8, p 16.

SFOC, NonCompetitive, Draft Copy, 12-07-95, RFP 9-BV2-32-6-1P.

Sakita, M., 1989. Restructuring of the Japanese National Railways: review and analysis. Transportation Quarterly. 43, pp 29-45.

Schmeidler, N. F., 1996. Organization Performance Measurement. Lea Edwards Associates.

Tokyo, 1989. Deregulation, privatization spur to Diversify operations. Aviation Week & Space Technology. May, pp 42-43.

Wessel, R. H., 1995. Privatization in the United States. Business Economics. October, pp 45-50.

Zolkus, R. 1995. Huge privatization yields risk management challenge. Business Insurance. October 23.