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Space System Production Cost Benefits From Contemporary Philosophies in Management and Manufacturing

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The cost of manufacturing space system hardware has always been expensive. Coupled with funding cutbacks, tight budgets and NASA's shrinking share of the federal monies, the need to find space system manufacturing cost savings is ever present.

The Engineering Cost Group of the Program Planning office at the Marshall Space Flight Center is attempting to account for cost savings that result from new technologies in manufacturing and management. Currently, historical programs are used as data points in parametric estimates of future space system programs. The concern of the Engineering Cost Group is that the historical analogs reflect costs of space system hardware produced with the use of old technology. These systems may have cost less if current technologies would have been available when they were manufactured. Because the implementation of new technology changes are not being represented in the historical programs, the cost of future space system programs could be overstated.

The objective of the Engineering Cost Group is to identify and define contemporary philosophies in manufacturing and management. Through interviews, literature searches, and direct discussions with NASA engineers and contractors, a list of seven management and manufacturing categories were identified: Design, Testing, Materials Processing, Factory Automation, Quality Systems, Production Management Systems and Materials Selection.

The scope of this project is to collect information which would assist in quantifying the reduction in cost of space system hardware and launch vehicles due to current philosophies within contemporary management and manufacturing. Figure 1 illustrates the seven broad categories that make up the areas where technological advances can assist in reducing space system costs. Included within these broad categories in figure 1 is a list of the processes or techniques that specifically provide the cost savings within todays design, test, production and operations environments. The processes and techniques listed all provide some cost saving. They achieve their savings in the following manner:

1. Increased Productivity
2. Reduced Down Time
3. Reduced Scrap
4. Reduced Rework
5. Reduced Man Hours
6. Reduced Material Costs

In addition, it should be noted that cost savings from production and processing improvements effect 20% to 40% of production costs whereas savings from management improvements effect 60% to 80% of production cost. This is important to note because most efforts in reducing cost are spent trying to reduce cost in the production.

It should also be noted that a panel assembled by the Director of Science and Technology Policy, Executive office of the President was given the task of identifying similar technologies. These technologies were deemed critical to the national economic prosperity and to national security. The panel's list of technologies fell into six broad categories. Two of the panel's six broad categories (Materials and Manufacturing) represent a majority of the technologies identified by the Engineering Cost Group.

The Engineering Cost Group is planning to continue the work started during the summer of 1991. Future plans for the continuation of this project are as follows:

1. Continue to compile information on new technologies and document areas of savings.

2. Use National Critical Technologies Panel report to the president as a guide for classification and documentation of new technologies.

3. Investigate savings achieved by prime contractors through the installation of new technologies within management and manufacturing .

4. Use the above information to develop cost factors for the new technologies

Item number one will discuss current philosophies within contemporary management and manufacturing and include specific areas of cost savings associated with them. Using the National Critical Technologies Panel report as a guide for the materials and manufacturing section will insure continuity and credibility with current national reports. Item three will investigate past and present cost savings from new management and manufacturing advances on current space system hardware. Prime government contractors as well as leading corporations will be served to collect information on the successful implementation of the new technologies. Specifically, cost saving documentation will be gathered. Finally, item four will conclude with possible cost factors associated with each new management and manufacturing technology. The developed cost factors associated with the new management and manufacturing innovation could then be applied to cost estimates developed from historical cost data to reflect the use of new technologies. Collected data could also be evaluated to determine production quantities required to amortize the cost of implementation.

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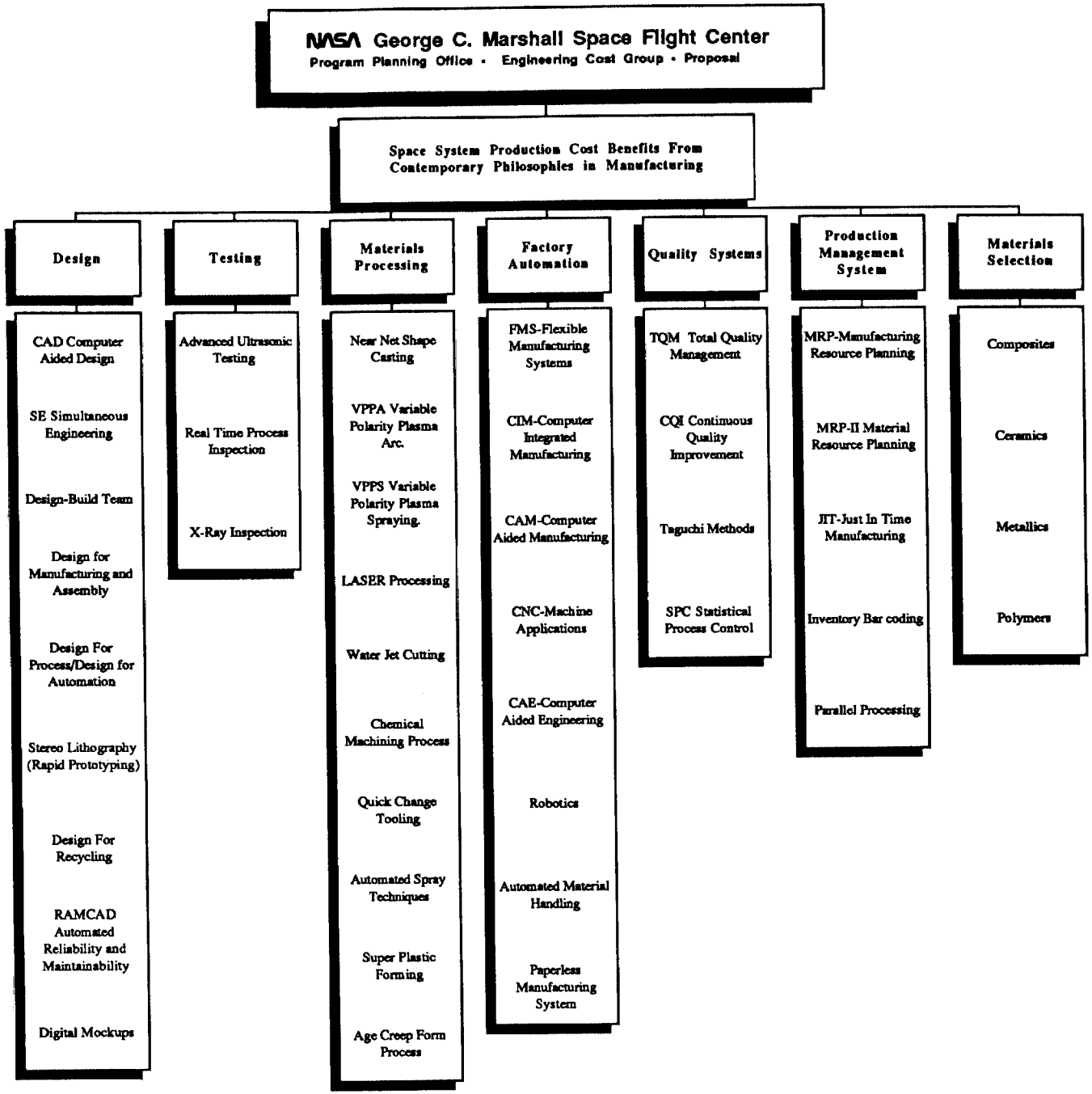
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Program Planning Office • Engineering Cost Group • Proposal
Space System Production Cost Benefits From Contemporary Philosophies in Manufacturing
Design
CAD Computer Aided Design
SE Simultaneous Engineering
Design-Build Team
Design for Manufacturing and Assembly
Design For Process/Design for Automation
Stereo Lithography (Rapid Prototyping)
Design For Recycling
RAMCAD Automated Reliability and Maintainability
Digital Mockups
Testing
Advanced Ultrasonic Testing
Real Time Process Inspection
X-Ray Inspection
Materials Processing
Near Net Shape Casting
VPPA Variable Polarity Plasma Arc.
VPPS Variable Polarity Plasma Spraying.
LASER Processing
Water Jet Cutting
Chemical Machining Process
Quick Change Tooling
Automated Spray Techniques
Super Plastic Forming
Age Creep Form Process
Factory Automation
FMS-Flexible Manufacturing Systems
CIM-Computer Integrated Manufacturing
CAM-Computer Aided Manufacturing
CNC-Machine Applications
CAE-Computer Aided Engineering
Robotics
Automated Material Handling
Paperless Manufacturing System
Quality Systems
TQM Total Quality Management
CQI Continuous Quality Improvement
Taguchi Methods
SPC Statistical Process Control
Production Management System
MRP-Manufacturing Resource Planning
MRP-II Material Resource Planning
JIT-Just In Time Manufacturing
Inventory Bar coding
Parallel Processing
Materials Selection
Composites
Ceramics
Metallics
Polymers

Figure 1