NASA Johnson Space Center
Total Quality Partnership

Charlie Harlan - NASA JSC SR&QA
Sam Boyd - Loral Space Information Systems
Abstract

NASA JOHNSON SPACE CENTER

CONTINUOUS IMPROVEMENT PARTNERSHIP

This presentation traces the development of and benefits realized from a joint NASA, support contractor continuous improvement process at the Johnson Space Center (JSC). The joint effort described is the Safety, Reliability and Quality Assurance Directorate relationship with its three support contractors which began in early 1990.

The Continuous Improvement effort started in early 1990 with an initiative to document and simplify numerous engineering change evaluation processes. This effort quickly grew in scope and intensity to include process improvement teams, improvement methodologies, awareness and training. By early 1991, the support contractor had teams in place and functioning, program goals established and a cultural change effort underway. In mid-1991 it became apparent that a major redirection was needed to counter a growing sense of frustration and dissatisfaction from teams and managers. Sources of frustration were isolated to insufficient joint participation on teams, and to a poorly defined vision.

Over the next year, the effort was transformed to a truly joint process. The presentation covers the steps taken to define vision, values, goals and priorities and to form a joint Steering Committee and joint process improvement teams. The most recent assessment against the President's award criteria is presented as a summary of progress. Small, but important improvement results have already demonstrated the value of the joint effort.

Mr. Charlie Harlan is the Director of Safety, Reliability and Quality Assurance at the Johnson Space Center, and Mr. Alfred A. "Sam" Boyd is Program Manager and Vice President for the major support contractor, Loral Space Information Systems.
Space Shuttle Program

STS-50 JUNE 25 - JULY 9
- MANNED VEHICLE
- LONG DURATION MISSION
- EXTREMELY NARROW MARGINS
- HAZARDOUS FLUIDS
- EXTREME LOADS
- COMPLEX SYSTEMS

Space Station Freedom Program

SPACE STATION FREEDOM
- PLANNED 1995 FIRST LAUNCH
- PERMANENTLY MANNED
- 30 YEAR LIFE
- COMPLEX, SOFTWARE INTENSIVE SYSTEMS
- LOW MARGIN LIFE SUPPORT
- RESUPPLY DEPENDENT
Safety, Reliability, and Quality Assurance Role

- PROVIDE ASSESSMENTS AND RECOMMENDATIONS TO SENIOR NASA MANAGERS

Where We Started

- STRANGLLED BY PAPER
- COMPLEX PROCESSES, NOT WELL UNDERSTOOD
- INSUFFICIENT ENGINEERING ANALYSIS

WE WERE PROCESSING TOO MUCH PAPER THAT TOOK UP TOO MUCH TIME
Evolution of Loral Total Quality
1990 to Mid 1991

- BEGINNINGS
  - CUSTOMER DEMAND FOR PROCESS DOCUMENTATION AND SIMPLIFICATION
  - FEE BASED ON CONTINUOUS IMPROVEMENT
- LORAL TQ RESPONSE
  - DOCUMENTATION - 40 PROCESSES
  - EDUCATION AND AWARENESS BEGINS JULY 1990
  - TQ PLAN AUGUST 1990
  - TQ STEERING COMMITTEE SEPTEMBER 1990
  - TEAMS NOVEMBER 1990
  - GOALS AND MANAGEMENT TEAM BUILDING JANUARY 1991
  - CULTURE SURVEY MARCH 1991
  - RECOGNITION PROGRAM MAY 1991

Problems

- NO STRATEGIC DIRECTION
- NASA INVOLVEMENT WAS NOT ADEQUATE
  - ON TEAMS AND IN STRUCTURING THE PROCESS
  - JOINT PROCESSES BUT CONTRACTOR-ONLY PROGRAM
- A HOST OF PERIPHERAL PROBLEMS
  - COMPETITION FOR EMPLOYEES TIME
  - BUY-IN FROM SUPERVISORS
  - UNFOCUSED TRAINING
  - PRESSURE FOR EARLY SUCCESS
  - INATTENTION TO CULTURE
Joint Total Quality
Mid 1991 to Present

- RECOGNITION OF GENERAL FRUSTRATION
- JSC STRATEGIC PLANNING AND TQ INITIATIVE MARCH 1991
- JOINT TQ ACTIVITIES
  - JSC SR&QA/CONTRACTOR JOINT RETREATS MARCH - OCTOBER 1991
  - JOINT TEAMS JUNE 1991
  - PATHFINDER TEAMS AUGUST 1991
  - JOINT STEERING COMMITTEE AUGUST 1991
  - JOINT MISSION STATEMENT, GOALS, VALUES OCTOBER 1991
  - IMPROVEMENT OBJECTIVES DECEMBER 1991
  - JOINT RECOGNITION PROGRAM IN WORK
  - EMPOWERMENT INITIATIVES APRIL 1992
  - TQ ASSESSMENT CAPABILITY MAY 1992

Typical Teams

- PARTS APPROVAL PROCESS NASA LEAD, JOINT MEMBERSHIP
- WORK PLANNING LORAL LEAD, JOINT MEMBERSHIP
- FMEA/CIL LORAL LEAD, JOINT MEMBERSHIP
- OPERATIONS REQUIREMENTS LORAL LEAD, JOINT MEMBERSHIP
- CHANGE REQUEST PROCESS LORAL LEAD, JOINT MEMBERSHIP
- ADP SUPPORT LORAL LEAD, JOINT MEMBERSHIP
- SAFETY SUPPORT LORAL LEAD, JOINT MEMBERSHIP
Q+ Team Membership

- COCHAIRS – NASA SR&QA AND LORAL
- MEMBERSHIP
  - NASA SR&QA 8
  - LORAL 6
  - BARRIOS 1
  - WEBB MURRAY 1

Joint Steering Committee

- COCHAIRS – CHARLIE HARLAN AND SAM BOYD
- MEMBERSHIP
  - NASA SR&QA 7
  - LORAL 3
  - SIMCO 1
  - WEBB MURRAY 1
Where Are We Now

- MISSION AND VALUES
- STRATEGIC GOALS
- DIVISION/DEPARTMENT IMPROVEMENT OBJECTIVES
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<tbody>
<tr>
<td>1</td>
<td>Top Executives: Directly Involved in Quality Activities</td>
<td>Quality Management Established Across Organization</td>
<td>Customer Satisfaction</td>
<td>Customer Satisfaction Survey</td>
<td>Customer Complaints Addressed in a Timely Manner</td>
<td>Feedback Systems Providing Information on Quality</td>
<td>Products Reviewed to Meet Customer Needs</td>
<td>Most Significant Indicators Demonstrate Exceptional Results</td>
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Figure E.3 TOTAL QUALITY BENCHMARK - We Assess Our TQ Culture Every 6 Months To Our Status Level In Eight TQ Elements. These Elements Are Used To Select The Recipient of the President's Award.
SR&QA Mission Statement

We as the SR&QA Team in partnership with our customers, assure the success of NASA programs through both technical expertise and innovation.

PEOPLE

PRODUCTS

ENVIRONMENT
# Strategic Goals and Division/Department Improvement Objectives

## Strategic Goal Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Goal</th>
<th>Area of Emphasis</th>
<th>Indicators (Examples)</th>
<th>Targets</th>
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<tr>
<td>Environment</td>
<td>Continuously improve toward a total quality culture</td>
<td>Management</td>
<td>- Depth of Technical Knowledge, Depth of Technical Content of Products, Problem Closeout, Change Paper, FMEA, PAR Process</td>
<td>Show some level of improvement</td>
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<td>Technical</td>
<td>Improve the quality of all products and services</td>
<td>Leadership and Support</td>
<td>- Negotiation of Deadlines, Work Planning and Management Process, Change Paper, Problem Closeout, Verbal Requests, Actions at Boards, Technical Requirements Documents</td>
<td>Show some level of improvement</td>
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<td>Timeliness</td>
<td>Continuously increase on time delivery of all products and services, and improve response time</td>
<td>Employee Training and Recognition</td>
<td>- Cost Drivers within Specifications and STDs E.g., NIB 5300 and 50,000, Parts Program, Supplier Defects E.g., NISPARTS and CAPS, Work Planning and Management</td>
<td>Show some level of improvement</td>
</tr>
<tr>
<td>Cost</td>
<td>Continuously decrease costs of providing products and services while maintaining quality</td>
<td>Empowerment and Teamwork</td>
<td>- Software Assurance, Reliability and Maintainability Analysis, JATL</td>
<td>Show some level of improvement</td>
</tr>
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## Directorate Areas of Emphasis

- Management Leadership and Support
  - Strategic Planning
  - Focus on Customer and Partnerships
  - Employee Training and Recognition
  - Empowerment and Teamwork
  - Measurement and Analysis
  - Quality Assurance
  - Quality and Productivity Improvement Results
  - Organizational Analysis

- Customer Evaluation of Product and Service Quality
- Internal Evaluation of Process and Product

- % of "Expedites" on Time Delivery and Cycle Time
- Cost per Unit and Man Hours
- % of Non-Conformances in JSC Products and Implementation of SW Assurance Program (Milestones)
- Requests for Assistance, Papers Presented/Published, Participation in National Committees and Societies, Being Used as a Benchmark by Others

## Division/Department Improvement Objectives

- Show some level of improvement
- Show some level of improvement
- Show some level of improvement
- Show some level of improvement
- Show some level of improvement
- Show some level of improvement
- Show some level of improvement
- Show some level of improvement

- Risk Assessment, Analysis, and Management
- Application of Concurrent Engineering
- Non-Destructive Evaluation
- Hardware Manufacturing Environment

- Opportunities for Improvement (OFI) System

- % Participation
- # of Suggestions
- % Implementation
First Successes

FMEA/CIL Process Modifications

- THE SOLUTION ELIMINATES PAPER CHANGES WHICH TRANSLATES INTO

  **ANNUAL REDUCTION**

  REPRODUCTION
  369,890 PAGES

  MAN-HOURS
  17,000

- THE POTENTIAL TOTAL COST AVOIDANCE IS ESTIMATED TO BE $688,000 ANNUALLY
NSPAR Process Modifications
Estimated Savings

- VOLUME OF REQUESTS: 2183
- MANHOURS: 15135
- COST: $545K OVER PROJECT LIFE

- SCHEDULE - NONSTANDARD PART APPROVAL CYCLE REDUCED 18 MONTHS
  - CURRENT PROCESS – 24 MONTHS
  - NEW PROCESS – 6 MONTHS

NSPAR Approval Rate

% OF TOTAL NSPARS

F2.1-13
Space Shuttle
Summary for Processing as of 04/09/92

Suggestions

- LAST 10 MONTHS – 233
- PREVIOUS 6 MONTHS – 10
Where Are We Going

- CULTURE
- TEAMS
- TRAINING
- MANAGERS
- IMPROVEMENT OBJECTIVES

JSC Vision
Pioneering Space Exploration

"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."
A Shared Vision:
Partnership of NASA and Rockwell International
In Cost Effectiveness Enhancements (CEE) for
The Space Shuttle System Integration Program

Ninth Annual NASA/Contractors Conference
on Quality and Productivity

Presented by:
Larry Williams, NASA
and
Bohdan Bejmuk, Rockwell International