

# NGMS Parts Management 101

*THE VALUE OF PERFORMANCE.*

***NORTHROP GRUMMAN***

April 25, 2017

Sr. Advisory Engineer & Space PMPCB Chair  
**Space Engineering**

- **Parts, Materials & Processes (PMP)**
  - What is PMP
  - Key Players
  - PMP Life Cycle (Macro & Micro)
  - PMP Requirements Flow-down
  - Role of the Parts Manager
  - Tools, Boards, Documentation & Data Review
- **Parts Management Process**
  - New Parts Request
  - Product Structure & Configuration Control
  - PMP Approval Process
  - PMP - Everything Else
  - Product Structure & Configuration Control (Reprise)
- **Space PMP Challenges**
  - What's so Special About Space?
  - Why Does it Cost so Much & Take so Long to Get my Parts!
  - Challenges With Space PMP Selection

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# Parts, Materials & Processes (PMP)

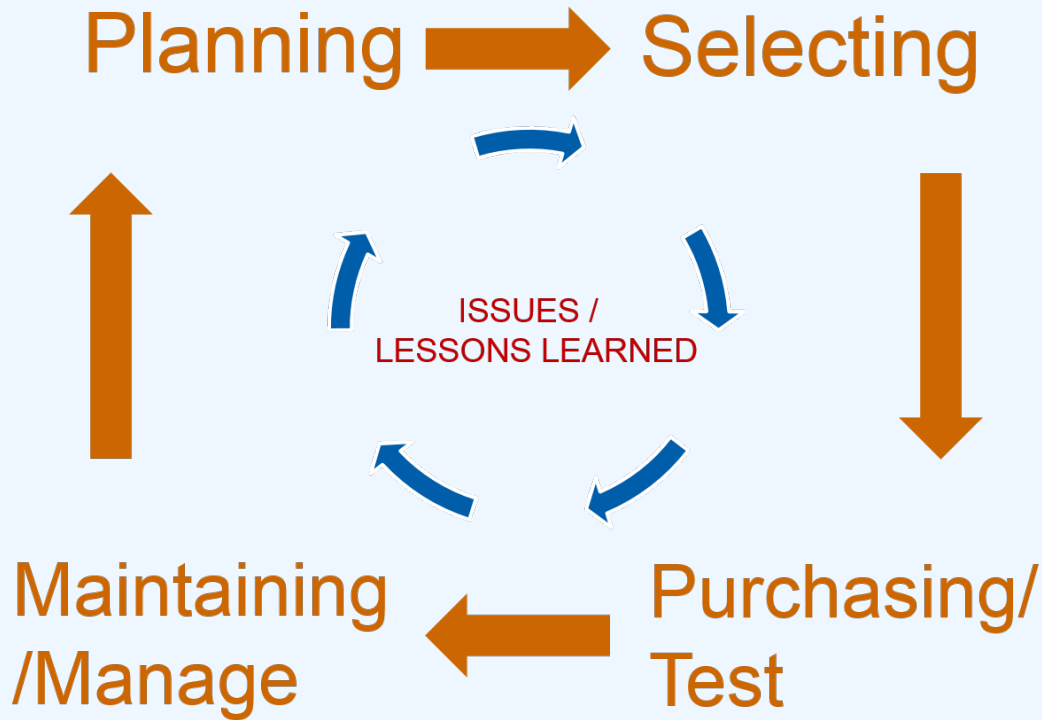
# What is PMP?

- PMP (Parts, Materials & Processes):
  - Parts
    - Electrical, Electronic, Electro-mechanical & Electro-optical (EEEE)
      - Simply: “If you put current through it” it’s EEEE
        - » \*Exception: Some customers classify connectors & wire as materials
      - Capacitors, Connectors & Contacts\*, Crystals, Crystal Oscillators, Fiber Optics, Filters, Fuses, Heaters, Magnetics, Microcircuits (Hybrids, Monolithic, Plastic), Relays, Resistors, Semiconductors (Transistors & Diodes), Switches & Thermostats, Thermistors, Wire & Cable\*
  - Materials:
    - Anything that is not EEEE
      - Metals, Composites, Mechanical Piece Parts (nuts, bolts, screws, washers, inserts, cable ties, etc.), Adhesives, Elastomers, Paints, Coatings, Primers, Potting & Staking Compounds, Sleeving & Tubing, Lubricants, Inks, Plastics, Tapes & Films, Fluids, Gas & Liquids
        - » Based on customer: wire, cabling & connectors
  - Processes:
    - Fabrication & Installation, Identification & Packaging, Electrical Assembly, Welding & Brazing, Non-destructive Evaluation, Heat Treatment, Surface Finishes, Precision Cleaning & Contamination Control
    - Special Processes (requires extra oversight & approvals)
      - ESD, Soldering, PWBs, Magnesium Alloy Processing, Passivation & Chem. Conversion Coating

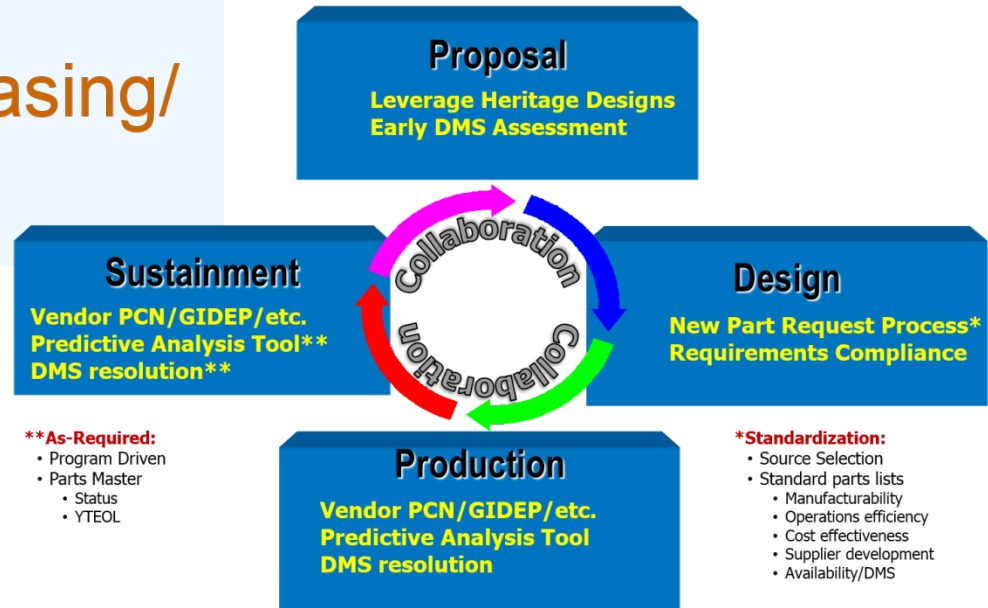
# Key Players in the PMP Process

- **Parts Managers**
- **Hardware Engineering (Electrical & Mechanical)**
- **Component Engineering Specialists**
- **Production Engineering**
- **Materials & Processes Engineering**
- **Reliability Engineering**
- **Radiation Engineering**
- **Manufacturing Engineering**
- **Mission & Supplier Mission Assurance**
- **Other Subject Matter Experts (e.g., Thermal, Structural, etc.)**
- **The Customer (and consultant team!)**

# PMP Life Cycle (Macro)

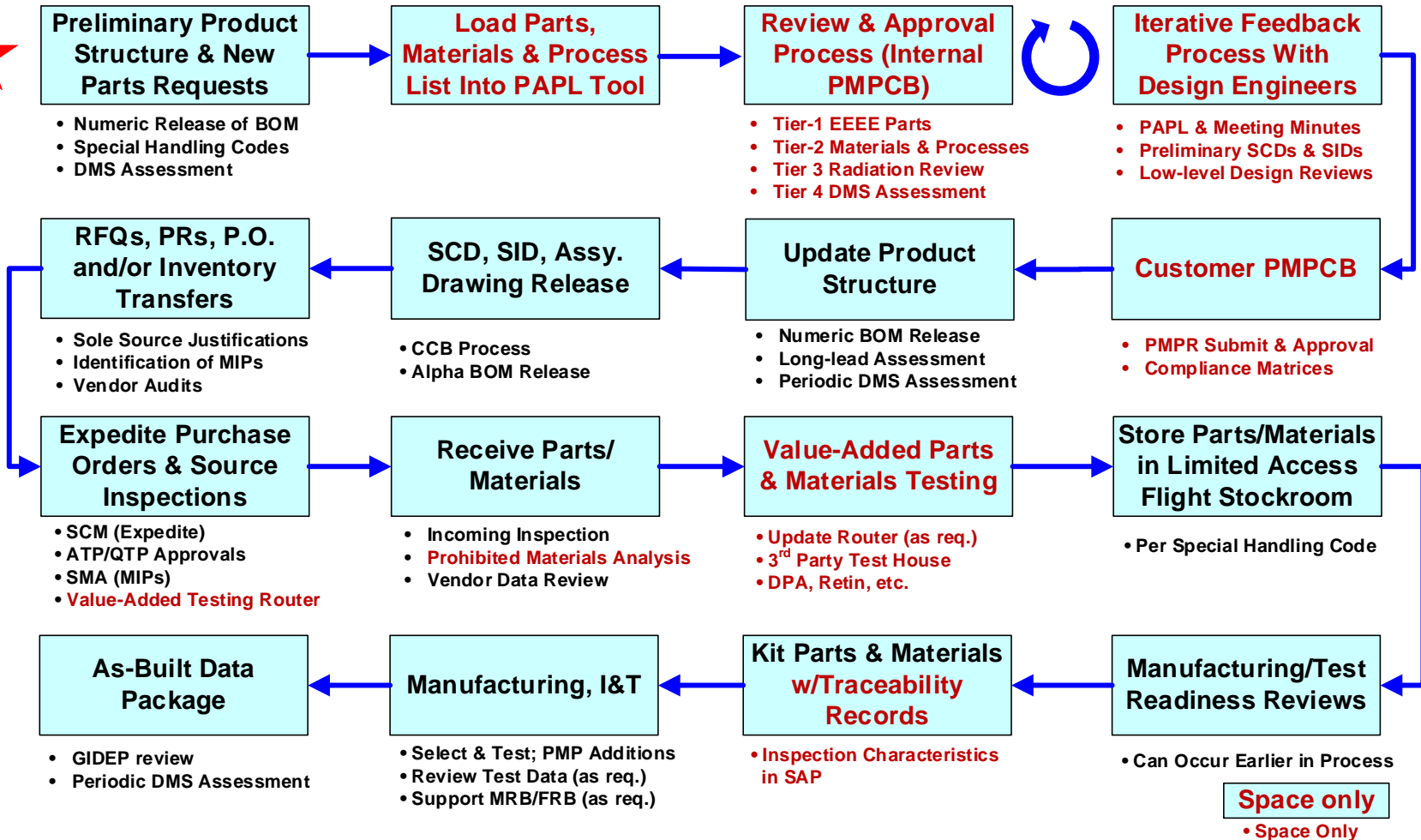


- Click topics for detailed breakout:
  - [Planning](#)
  - [Selecting](#)
  - [Purchasing/Test](#)
  - [Maintaining/Manage](#)
  - [Issues](#)
  - [Lessons Learned](#)

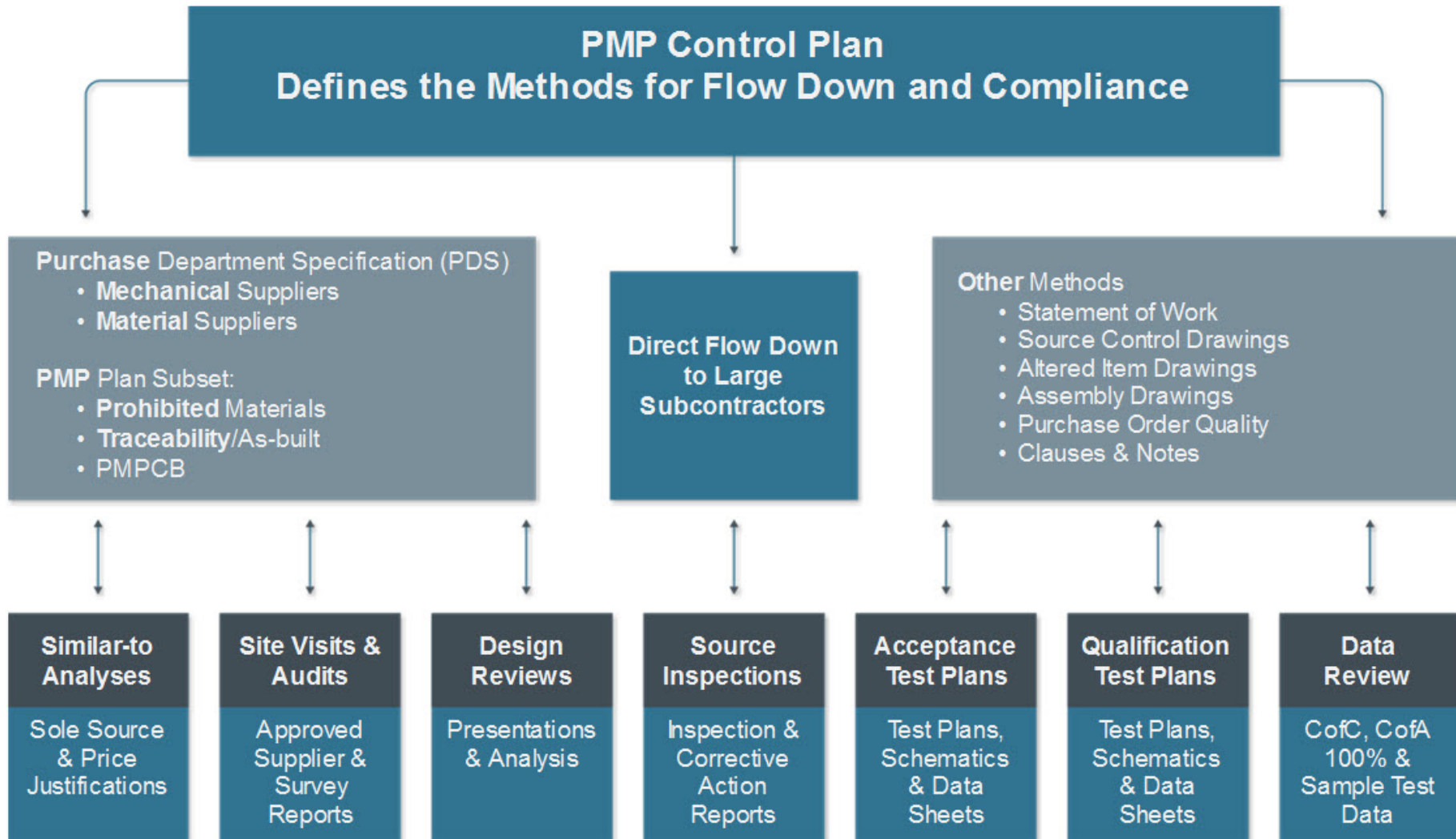


# PMP Lifecycle (Micro)

Don't Wait! Start Talking With PMP Team Here!



# PMP Requirements Flow-down



**Multiple Methods of Oversight & Verification**



# Role of the Parts Manager

- Parts Managers are involved in the flow-down and compliance of requirements to ensure specific parts, materials and processes used in manufactured products and systems are reliable and effective. Their work spans all program phases, including: **proposal, design & development, manufacturing, integration & test, and post-delivery/launch support for repair and anomaly investigations.**
- Parts Managers serve as the interface between internal and external customers and the Program. Parts management oversight and compliance related activities include (but are not limited to):
  - Proposal cost estimations & technical volume support
  - Generation of program parts materials & processes control plan
  - Approval of parts, materials & processes
  - Facilitate and chair parts, materials & processes control boards
  - Generation of parts, materials and processes test & qualification plans
  - Generation of non-standard parts, materials & processes approval requests
  - Generation of source control drawings, selected item drawings, statement of work, etc.
  - Approval of subcontractor/supplier non-standard parts, materials & processes approval requests
  - Approval of subcontractor/supplier acceptance & qualification test procedures
  - Approval of suppliers and test houses
  - Approval of parts, materials and process related test data
  - Support Supply Chain Management Procurement: RFQ, sole source & similar to justifications
  - Approval of assembly and related drawings
  - Support change control board approvals
  - Generation of program selected data requirements list items including preliminary, as-designed and as-built parts, materials and processes lists
  - Approval of subcontractor/supplier selected data requirements list items
  - Generation and/or presenter at program reviews (TIM, PMR, PDR, CDR, EDR, MRR, etc.)
  - Support program IMS, EVMS, Risk & Opportunity, and other tasks.
  - Review of GIDEP, DMSMS, etc. related alerts and advisories
  - Support failure anomaly and material review board investigations

# Tools, Boards, Documentation & Data Review

## Database/Tools

PMP Related Database Maintenance (PAPL, Spreadsheets, etc.)
aClass/SPL Maintenance
Work Requests (SharePoint)
New Part, Material or Process Development (NPRs)
Part Maintenance (ISE)
Coordination of SAP Routings & Coding Flags
GIDEP & Sentinel (REACT)
DMS & Obsolescence (Pilot)
Lessons Learned
Hardware Design Review Signoff (SharePoint)

## Boards & Oversight

Risk & Opportunity Assessments
PMPCB Lead/Chair
PMP Selection
Supplier & Test House Selection (ASL)
Technology Insertion Board
Supplier Audits
CCB
Subcontractor Oversight
Support Manufacturer Source Inspections
Support VMDA
Support FRB & MRB Activities

## Documentation

PMP Proposal Generation
Review Program PMP Plan/SOW
Create/Maintain Program PMP Schedule
Requirements flow-down(PMP Plan, PDS documents, etc.)
Develop Screening & Qualification Plans
PMPR/NSPAR Generation
Generate Subcontractor Statement of Work (SOW)
Drawing Reviews & Signoff
CDRLs/SDRLs Generation & Support
Sole Source Justifications

## Data Reviews

ATP/QTP
Vendor & Manufacturing Test Data & DPA
Engineering Analyses Support (Thermal, Mechanical, Reliability, Survivability)

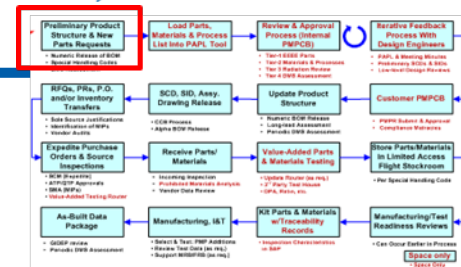
## Program/Customer Interface

Program Meetings
Program Status Reporting (IMS, EVMS, PMRs, etc.)
Design Reviews (TEMs, PDR, CDR, MRR, TRR, etc.)

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# Parts Management Processes

# New Part Request Process (NPR)



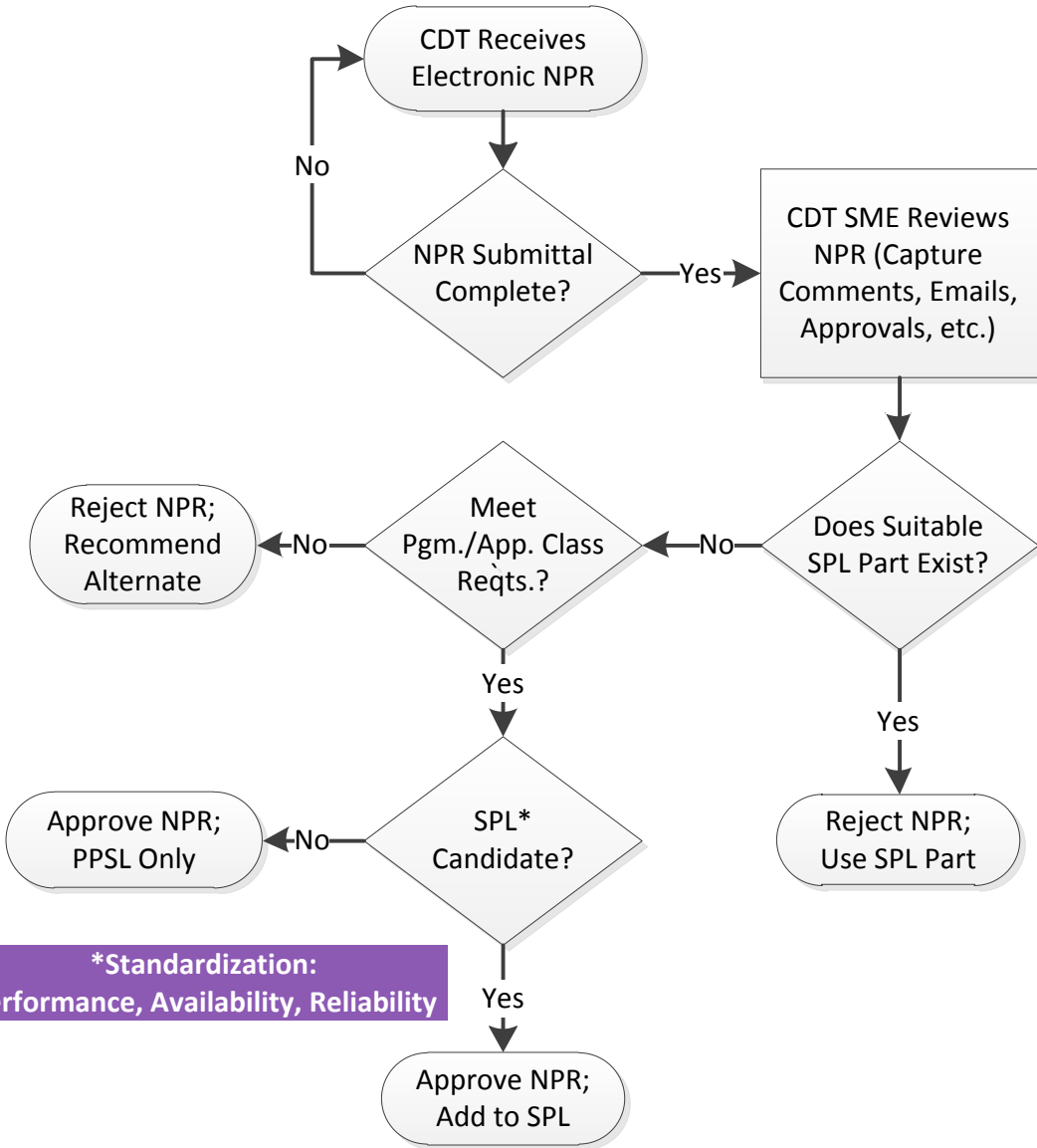
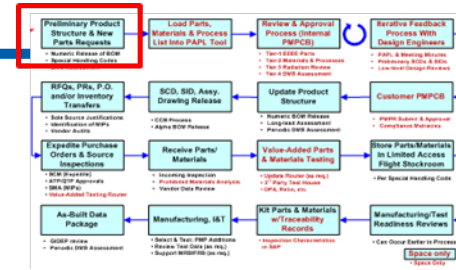
- All parts, must be assessed for suitability for their intended application
- Parts classified into 10 applications per table below:

Code	Application	Requirements
SF	Space Flight	Used only for parts qualified to military, space-level requirements, Note 2.
MXT	Military Extended Temperature Range	Complies with Table E241-MSO-A1-8 requirements Operation and storage temperatures of -55°C to +150°C
MIL	Military Temperature Range	Complies with Table E241-MSO-A1-8 requirements Operation and storage temperatures of -55°C to +125°C
AUF	Airborne Uninhabited Fighter	Complies with Table E241-MSO-A1-8 requirements Operation and storage temperatures of -40°C to +85°C
AIF	Airborne Inhabited Fighter	
GM	Ground/Surface Mobile	
NS	Naval Sheltered	Complies with Table E241-MSO-A1-8 except HAST and 85/85 are not required Operation and storage temperatures of -0°C to +70°C
GSH	Ground Sheltered	
FTE	Factory Test Equipment or Commercial	Support equipment and engineering models not subject to reliability data Operation and storage temperatures of -0°C to +70°C
NP	Non-Production (RAPID) / Prototype	Parts approved for RAPID programs only. NP is for development programs and are not subject to reliability data analysis or temperature limits.

**Note 1:** Temperature limits are for ambient air unless noted otherwise.

**Note 2:** Qualification requirements for Space Parts are dependent on contractual requirements based on mission type and duration.

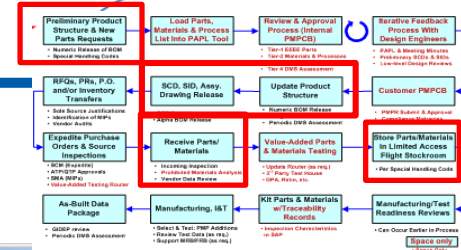
# New Part Request Process (NPR) Cont'd



**\*Standardization: Performance, Availability, Reliability**

- **SPL = Standard Parts List**  
By Sector & App. Class  
5 SPL's Used at NGMS:  
**BWI-SF-SPL**  
BWI-AUF-SPL  
BWI-AIF-SPL  
BWI-FTE-SPL  
BWI-NP-SPL
- **PPSL = Pgm. Parts Selection List**  
Parts Approved for a Given Program  
Can be an SPL Items  
Includes SCD/SID items
- **Alternate Approach to Rejection:**  
Approve at Lower App. Class  
Generate SCD/SID for Screen/Qual  
SCD/SID Added to PPSL  
**Space: PMP/PCB → PPSL**

# Product Structure & Configuration Control



- ISE Database (Information System for Engineers)

## Part Master

Special Handling Codes  
Shelf Life & YTEOL Information  
Maintains Supplier Test Data

## Configuration Control

Product Structure  
Bill of Materials (BOMs)  
Traceability Data (Receiving)  
New Parts Requests

## CADSTAR

Drawings & RNs  
Electronic Sign-off

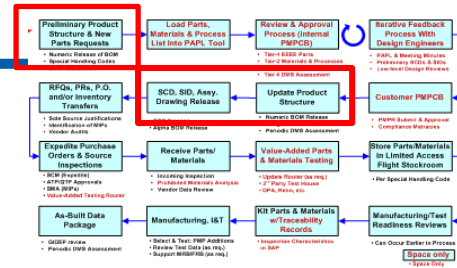
Other (use ISE data)  
DMS/Obsolescence  
GIDEP

Inactive parts are blocked automatically

Estimate Years To End Of Life Shown Here

Approvable parts are based on Mission Class

# Product Structure & Configuration Control Cont'd



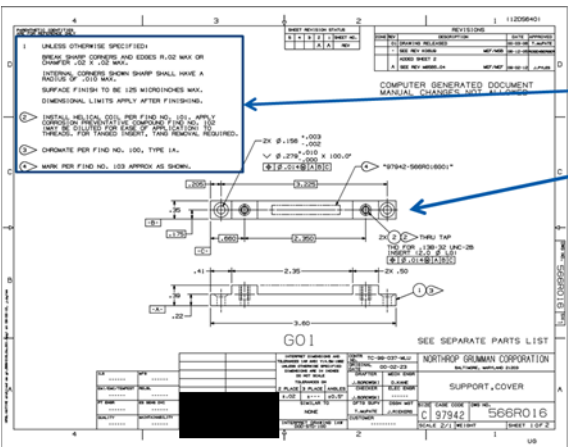
- BOM Creation & Revision (TeamCenter, ISE, NX & Mentor)
- Mechanical Drawings & Parts Lists
  - Fully Dimensioned (stand-alone)
  - Database Drawings (assoc. CAD model)
- Configuration Control Board (CCB)
  - Document Master
  - Drawing Release
  - Revision Notice (RN) Generation

<b>PARTS LIST</b> NORTHROP GRUMMAN CORPORATION BALTIMORE, MARYLAND 21203		CONTRACT NO: [REDACTED]	DOCUMENT TITLE: SUPPORT, COVER	<b>PL 566R016</b>
			CAGE CODE: 97942	REV: A SHEET 1 OF 3

PARTS LIST FOR GRAPHIC REVISION A

PARTS LIST FOR 566R016G01 - SUPPORT, COVER

FIND/ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NUMBER	SYM	NOMENCLATURE OR DESCRIPTION	EXTERNAL IDENTIFICATION	INTERNAL IDENTIFICATION	P L
001	1 EA	97942	566R016H01	M/P B	SUPPORT, COVER BAR, AL, .375 X .500 (3.60)	AMS-QQ-A-200/8, ALLOY 6061	566R016 (12005BP37530051) (79500-12005BP)	
002	2 EA	80205	NAS1130-06L20		INSERT, HELICOIL, SLF-LCK TANGLESS, .138 X 32, .276 LG	NAS1130		
003 - 004					NOT REQUIRED IN THIS ASSEMBLY			
005 - 099					NEVER USED			
100	REF	81349	MIL-DTL-5541		CHEMICAL CONVERSION COATINGS ON ALUMINUM AND ALUMINUM ALLOYS TYPE I CLASS 1A - CONTAINS HEXAVALENT CHROMIUM (BEST CORROSION PROTECTION)	MIL-DTL-5541		
	SPD	81349	MIL-C-5541		SPD AT REV -	MIL-C-5541		
101	REF	96906	MS33537		INSERT, SCREW THREAD, HELICAL COIL, INCH SERIES, COARSE AND FINE THREAD, STANDARD ASSEMBLY DIMENSIONS FOR	MS33537		
102	AR	97942	32240DH	B, H L	PRIMER, ZINC CHROMATE	TYPE I, CLASS C, COLOR Y (TT1757-1CY)	32240DH	
103	REF	97942	PS83869NB		MARKING PROC A CL 4 - UID NOT REQ'D - MARKING BY INK (MECH. METH.), ETCHING, OR LABEL		PS83869NB	

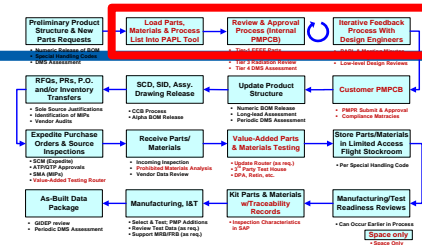


Drawing Notes

Drawing Graphic Field of View

Document Type	Graphic ?	Graphic Type	Graphic Size	PL ?	PL Type	PL size
HDD- Mechanical	Yes	Unigraphics	D	Yes	SQL TABLE	A
HDD- Electrical	Yes	Mentor	D	Yes	SQL TABLE	A
TSPEC	Yes	MS Word	A	No	-	-
SCHEMATIC	Yes	Mentor	D	No	-	-
ICD	Yes	Varies- usually Unigraphics	D	No	-	-

# PMP Approval Process



- Program Approved Parts List (PAPL Tool)
  - Exclusive to Space Programs
    - Airborne/Other NPR Approval → PPSL
  - Separate PAPLs for EM, Qual, Flight Structures
    - Imports Data from ISE Database

RS2 DVU Last Product Structure Breakdown performed on 3/3/2017

Parts Management	Parts, Materials, and Process Control Board	Reports
PAPL Part Review	Parts List Review - Full	PAPL Data Items
Open Part Information	PL Review - Radiation	PAPL Complete Listing
	PL Review - Materials	
	PL Review - Hardware	
NPR Project Status		PMPCB Review Crosstab
	Configuration PL Review	NPR Status Review
	Part Review - PNSA	Production Planning Qty's
		PMPCB Pending/Rejected

*Parts Control Engineering*

View New Parts Not Listed in Part Specific Data

View New Parts Not In Part Review Data (Program

View Parts Not Listed In Product Structure Breakdown

View Parts Listed in Prod Structure Breakdown (NPR Status, Type

Assy Groupings List    Update Special Handling Codes

v14.10.20

RS2 - Flight Last Product Structure Breakdown performed on 3/3/2017

Parts Management	Parts, Materials, and Process Control Board	Reports
PAPL Part Review	Parts List Review - Full	PAPL Data Items
Open Part Information	PL Review - Radiation	PAPL Complete Listing
	PL Review - Materials	
	PL Review - Hardware	
NPR Project Status		PMPCB Review Crosstab
	Configuration PL Review	NPR Status Review
	Part Review - PNSA	Production Planning Qty's
		PMPCB Pending/Rejected

*Parts Control Engineering*

View New Parts Not Listed in Part Specific Data

View New Parts Not In Part Review Data (Program

View Parts Not Listed In Product Structure Breakdown

View Parts Listed in Prod Structure Breakdown (NPR Status, Type

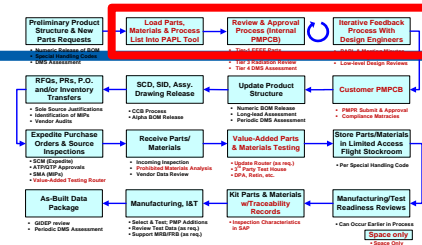
Assy Groupings List    Update Special Handling Codes

v14.10.20

“Fills Gap” Between NPR/SPL & Program PMP Control Plan Requirements



# PMP Approval Process



- Program Approved Parts List (PAPL Tool)
  - Captures SME Reviews & Parts Information



<b>Eng Part Number</b>	<b>CAGE Code</b>	<b>Notes</b>	<b>NPR_Apvl:</b>
JANSR2N7587U3	81349		

Part Information	Material	Radiation	PMPCB	New Part Request	Where Used	Production Planning
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<b>Eng/PL Part Number</b>	<b>Mfr CAGE</b>	<b>Manufacturer - Design Authority</b>
JANSR2N7587U3	81349	Military specification

<b>Type</b>	<b>FSC / Type</b>	<b>Description</b>
PART	5961b	TRANSISTOR, FET, N-CHANNEL, SPACE, RAD, 75W, 100V,

<b>Make From Part Number</b>	<b>Generic / Mfr Number</b>	<b>MIL / FED / IND Part Number</b>	<b>NGC Part Number</b>
562R691H26	2N7587	JANSR2N7587U3	594R278H02

<b>Mfr CAGE</b>	<b>Manufacturing Authority</b>
<b>Mfr CAGE</b>	<b>Value Added Supplier</b>

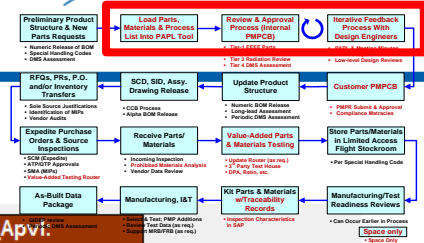
  

<b>Package</b>	<b>Pkg Matl</b>	<b>Lead Form</b>	<b>Lead Finish</b>
SMD-0.5	Ceramic	SMT	Au
<b>Mil Spec</b>	<b>Proc. Dwg.</b>	<b>PIND Testing</b>	
MIL-PRF-19500	MIL-PRF-19500/746	Not required	
<b>Operating Temp</b>	<b>Storage Temp</b>	<b>Junct Temp Max</b>	<b>Voltage</b>
Min	Max	Max	Rated
-55	+150	+150C	Applied

<b>Part Qualification</b>
JANS
RelClass
S
Technology
Family
Semiconductor

# PMP Approval Process



• PAPL PMPCB DVU "Reject" Example:

<b>Eng Part Number</b> JANS2N2222AUB	<b>CAGE Code</b> 81349	<b>Notes</b>	<b>NPR_Apvi.</b> SPL
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Part Information | Material | Radiation | **PMPCB** | New Part Request | Where Used | Production Planning

<b>Radiation Review Summary</b> Not recommended	<b>Test Qty</b>	<b>PMPCB Actions</b>	<b>PMPCB Approval</b> Reject
<b>DPA Requirements</b>	<b>DPA Qty</b>		
<b>Material Review Summary</b>			

**PMPCB Recommendation** | **Qual Test Report** |  **Traceability Required?**

**PMPCB Comments**  
Part rejected. Use "R" part as non-R has had recent low rad test results. FM part will need NHA for Gold removal. Use non-R TXV for DVU. Will need new SID as 594R278H01 is for JANSR, not JANSR.

<b>Replacement Part Number</b> JANSR2N2222AUB	<b>Replacement Document</b>
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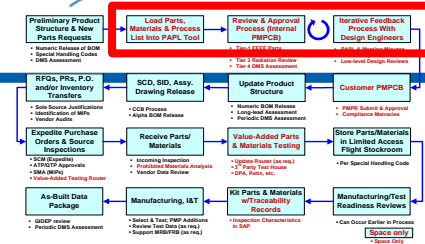
<b>Internal PMPCB Review</b> Approve	<b>Meets Apvd PL Req</b> Yes	<b>PAR Number</b>	<b>Part Approval</b> Yes on PMPSL
<b>PMPCB Comments</b>			
<b>Replacement Part Number</b> JANSR2N2222AUB			

Record: 1 of 1 | No Filter | Search

<b>Engineering Part Number</b> (New)			
<b>Internal PMPCB Review</b> (New)	<b>Meets Apvd PL Req</b> No	<b>PAR Number</b>	<b>Part Approval</b>
<b>PMPCB Comments</b>			
<b>Replacement Part Number</b> JANS2N2222AUB			

Record: 1 of 1 | No Filter | Search

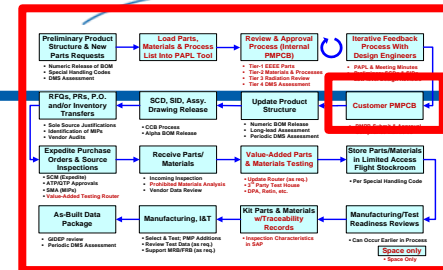
# PMP Approval Process



- PMP “Typical” Documentation

- Non-Standard Part Approval Requests (NSPARS)
  - Non-SPL or Non-1<sup>st</sup> Order Selection per PMP Control Plan
- SCDs, SIDs, & AIDs
  - Flow-down: Screening, Qualification, Traceability, Data, etc.
- SDRLS (Internal or Customer)
  - PMP Control Plan
  - As-Designed & As-Built PMP Lists
  - Other SDRLs (per Contract)
- Other Documentation
  - Review & Approval of Assembly Drawings, Test Specs, etc.
  - Generation of Technology Readiness Assessment (New Technology)
  - Program Monthlies, Technical Exchange, & Design Reviews
    - PMR, TEMs, iPDR/PDR, iCDR/CDR, MRR, TRR, etc.
  - Page & Line, Earned Value & Other Status Reports

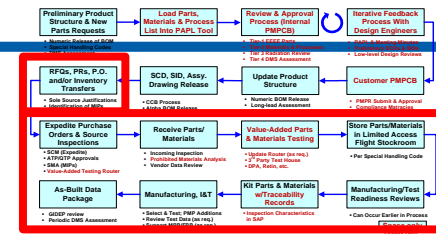
# PMP Approval Process



- The Customer and the Consultant Team
  - The “Small Box”
    - Approval of 1<sup>st</sup> Order Parts During PMPCB
    - Approval of NSPARS, SCDs, SDRLs, TRA, etc.
      - 2-3 Week Minimum for Initial Documentation Approval/Comments
        - Longer Based on # of Consultant Assessments Required
        - **Iterative Process – Ensure Time Allocated in Program Schedule (IMS)**
        - Include Time for Updates & Resubmittals
  - The “Big Box”
    - Attendance at Design Reviews (Pre & Formal)
      - Want to be Part of the “Sausage Making”
      - **Drawback:** Often Results in Reluctance on Asking “The Hard” Questions
    - On & Off-site Technical Exchange Meetings (TEMS)
    - Onsite Representation
      - **Can be Good Thing:** “Quick Access” For Inspections & Consultation

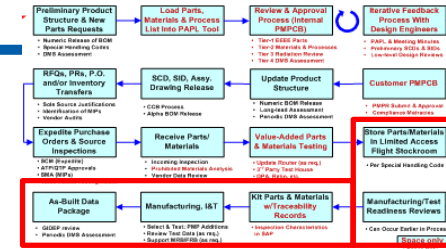
The “Big Box” – Customer has Privy Into Every Aspect of Design & Build

# PMP - Everything Else



- Procurement, Receiving, 3<sup>rd</sup> Party Testing, Kitting, & Manufacturing:
  - Purchase Requisitions & Purchase Orders (Supply Chain & Buyers)
    - Sole Source Justifications
    - Traceability & Data Requirements
    - T's & C's for Counterfeit Avoidance, FARs & DARs, etc.
  - Supplier & Program Mission Assurance
    - Approved Supplier List (ASL)
    - Supplier Audits & Oversight
    - Inspection Requirements (pre-cap & final source, MIPs, photos, etc.)
  - Receiving Inspection & Kitting Traceability & Testing
    - Capture & "Push" of Traceability Data
      - Support GIDEP / Customer Alert
      - As-Built Configuration
    - Prohibited Materials Analysis
      - Tin / Other Prohibitions
    - Data Review (performed by component specialists)
      - Supplier & 3<sup>rd</sup> Party Test House
      - Store Data in ISE (Part Master)
  - Manufacturing
    - Build & Test
    - Process & Equipment Qualifications
    - As-Built Configuration Records

# Product Structure & Configuration Control (Reprise)



- ISE handoff to SAP Database
  - SAP = Enterprise Resource Planning (ERP) Database

**Manufacturing Queue**

Work Center/Cell: MEMP03 MANUAL ASSY OPN FOR SPACE PROGRAMS Plant P001 BWI- Gate 3, Location 1  
 Operator: DOVERSPIKE R JOLEEN Total Records: 20

Start	C	TO	S	P	WkCtr	Material	Order	Oper	SN / MCN / BATCH	PersNo	Qty	MD	TD	SR	CM	QN	IB	RT
0516			N		MEMP03	245K160G01	101422976	2502	1001		1	▲	●	●	▲	▲	+	●
0522			N		MEMP03	245K160G01	101422976	2512	1001		1	▲	●	●	▲	▲	+	●
0213			N		MEMP03	253K820G02	101688385	7001	1003		1	●	●	●	▲	▲	+	●
0218			N		MEMP03	253K820G02	101688385	7003	1003		1	●	●	●	▲	▲	+	●
0227			N		MEMP03	255K450G01	101738850	6801	1002		1	●	●	●	▲	▲	+	●
0228			N		MEMP03	253K821G01	101656445	8991	1002		1	●	●	●	▲	▲	+	●
0312			I		MEMP03	255K351G01	101723686	2580	1001	8962	1	●	●	●	▲	▲	+	●
0411			N		MEMP03	255K451G01	101667482	4200	1001		1	●	●	●	▲	▲	+	●
0417			N		MEMP03	255K451G01	101667482	4201	1001		1	●	●	●	▲	▲	+	●
0522			I		MEMP03	NP262K701G01	70055601	8991	1001	8962	1	●	●	●	▲	▲	+	●
0627			I		MEMP03	264K936G01	101726833	2700	1001	28122	1	●	●	●	▲	▲	+	●
0627			N		MEMP03	264K936G01	101726834	2700	1002		1	●	●	●	▲	▲	+	●
0627			N		MEMP03	264K936G01	101726835	2700	1003		1	●	●	●	▲	▲	+	●
0627			N		MEMP03	264K936G01	101726836	2700	1004		1	●	●	●	▲	▲	+	●
0628			I		MEMP03	264K936G01	101726783	2700	1005	28122	1	●	●	●	▲	▲	+	●
0702			I		MEMP03	264K939G01	101726710	2700	1001	9888	1	●	●	●	▲	▲	+	●
0702			I		MEMP03	264K939G01	101726711	2700	1002	9888	1	●	●	●	▲	▲	+	●
0702			I		MEMP03	264K939G01	101726712	2700	1003	9888	1	●	●	●	▲	▲	+	●
0702			I		MEMP03	264K939G01	101726713	2700	1004	9888	1	●	●	●	▲	▲	+	●
0703			I		MEMP03	264K939G01	101726634	2700	1005	9888	1	●	●	●	▲	▲	+	●

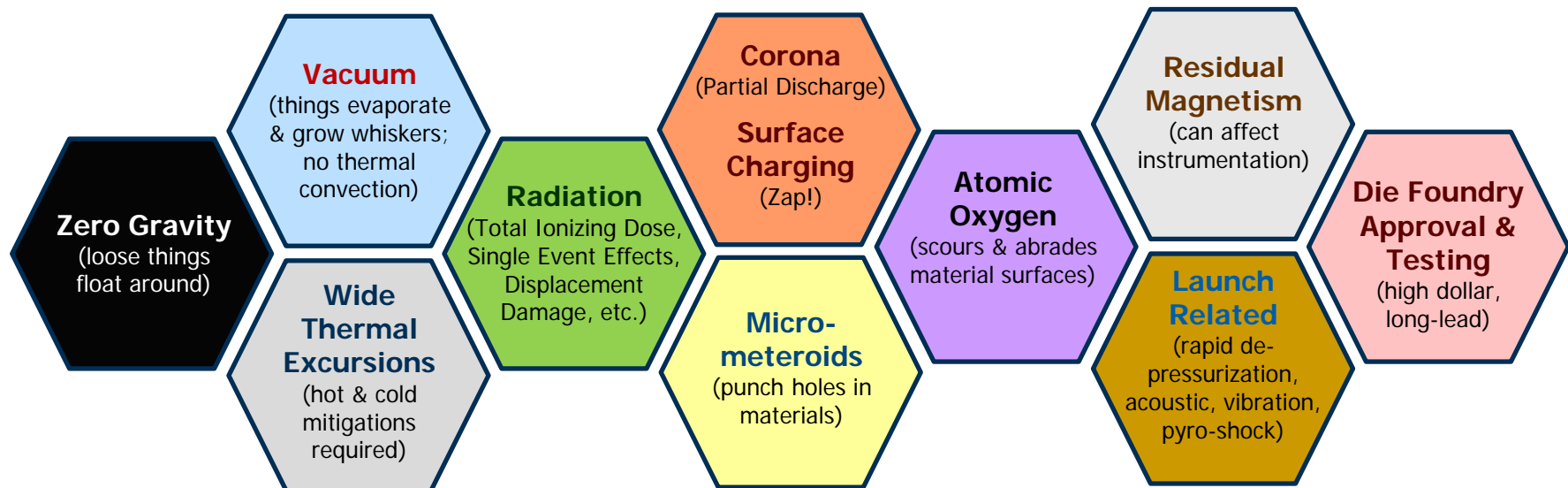
- Manufacturing
  - Manufacturing Readiness Reviews (MRRs)
  - Test Readiness Reviews (TRRs)
  - Work order Generation
  - Job-on & Operation Sign-off
    - Link to LX Training Database
  - As-built Configuration
- Other ERP Functions
  - Kitting Inventory Management
    - ISE Push Traceability Data
  - Purchasing & Quality Records
  - LX Training Database
  - Time Card & Payroll, etc.

*THE VALUE OF PERFORMANCE.*  
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# Space PMP Challenges

# What's so Special About Space?

- Majority of “Space” Unique Requirements are Technical in Nature (graphic below)
- Higher Administrative Burdens Include:
  - Significant Customer Interaction & Oversight; Including On-site Representative(s)
  - Numerous Contract Standard Data Requirements List (SDRL) items
  - Maintenance of As-Designed, As-Built, and Long-Lead PMP Lists
  - PMPCB & Non-standard Part Approvals
  - Various Checklists, Status Reports & Meetings
  - Customer Participation in Supplier & Internal Manufacturing Design Reviews & Audits



**You Only Get one Chance – Must be Right the First Time!**



# Why Does it Cost so Much & Take so Long to get my Parts?

Higher Parts Quality Level (Class-V, K, S)  
 More Restrictive Failure Rates (T & S)  
 PMP Plan  
 All PMP & Alternates Require Approval  
 Parts, Materials & Processes Control Board  
 Prohibited/Restricted PMP (Esp. Pure Tin)  
 Assy. Drawings/SCDs/Travelers PMP Sign-off  
 Processes Require Qualification  
 Non-Standard PMP Approvals  
 Customer Oversight / Approvals  
 Radiation Effects (TID, SEE, DD, etc.)  
 Vacuum Outgassing  
 Vacuum Thermal Constraints (No Convection)  
 EMI/EMC  
 Component Durability Index  
 Micrometeoroids  
 Contamination Control / Atomic Oxygen / Surface  
 Charging / Corona (Partial Discharge)  
 Worst Case Analysis (e.g., margin at end of life)  
 FEMA/FEMCA  
 PWB Design Rules / Restrictions  
 Technology Insertion Board / Heritage  
 iPDRs/iCDRs  
 Manufacturing Readiness Reviews  
 Test Readiness Reviews  
 Page & Line Meetings  
 Monthly Program Reviews  
 Failure & Material Review Boards  
 Pedigree/Traceability  
 OEMs & Authorized Suppliers  
 Foundry Approvals  
 100% Screening  
 Lot Specific Qual Testing & QCI  
 Pre-Cap & Final Source Inspections  
 Certified materials

Serialized Read & Record Test Data  
 Certificate of Analysis (Materials)  
 Data Review/Retention  
 Incoming Inspections (XRF, etc.)  
 Limited DMS/Obsolescence  
 As-Designed PMP/As-Built PMP Lists  
 Various Other SDRs  
 End-Item-Data-Package  
 No repair (except limited software)  
**Long/Tiered Procurements (36-52 Wks)**  
**High Cost \$\$\$**

All PMP w/i Application Class  
 All PMP on Standard Replacement List  
 Open Market Procurement  
 No XRF Testing  
 No DPA or QCI Testing  
 Repair/Maintenance  
 First Article Inspection (FAI)  
 1st Lot Qual (or after process change)  
 Certificate of Conformance Sufficient  
 Design Try-outs (Standard Practice)  
 Limited Program Reviews  
 Funded DMS/Obsolescence  
 Majority Hardware Ext. Manufactured  
**No Traceability**

Space

Avionics

**Common**  
 NPR Process, GIDEP,  
 EVMS (Pgm. Specific), IMS (Pgm. Specific),  
 Counterfeit Control, Limited Life, ITAR,  
 Temperature (Operational / Survival), Vibration, Power,  
 Mission Duration, # Temp. Cycles, Moisture Rating, Derating\*,  
 Parts Age Control\*, ESD, Supplier Audits / Oversight,  
 Sole Source / Similar To Justifications, ATP/QTP Reviews  
 VECR Process, SRR/PDR/CDR (Pgm. Specific), Reliability Analyses  
 Software QA\*  
 \*More Restrictive for Space

# Challenges With Space PMP Selection

- “Google” is not Your Design Tool!
  - Use Space Quality Baseline (1<sup>st</sup> Order) & Heritage Program Parts
- Just Because you Used it on Your Last Program....
  - Heritage & Qualification Processes More Rigorous for Space (refer to “seesaw”)
  - **#1 Thing you can do: Limit use of Plastic Parts & COTS**
    - Ask Yourself: Is Part Mission-enabling, or is There an Alternate Solution?
    - Average Lead-time 36-52 Weeks; \$30K to \$150K+ per lot to Qualify
- Lots of Application Notes & Restrictions on Space PMP
  - Ex. Ceramic Capacitors
    - Use M123 & G311P829; Avoid Base Metal Electrode
    - COTS: Avoid top 3 in tier; Choose Automotive Grade (if necessary)
  - Ex. Resistors:
    - Ask Yourself: Do I Really Need a 0.1% Resistor? It’s O.K. – Just Long-lead & High \$

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