



Overview of Project Management at JPL

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Key Project Management Characteristics



Overview of Project Management at JPL

- Goal: Develop required product within the given schedule and budget
- Key ideas to project management
 - Phased Development
 - System Engineering
 - Peer Reviews
 - Institutionalized of best practices

Project Development Phases



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NASA Phases	FORMULATION			APPROVAL	IMPLEMENTATION		
	Pre-Phase A: Advanced Studies	Phase A: Mission & Systems Definition	Phase B: Preliminary Design		Phase C: Design & Build	Phase D: ATLO	Phase E: Operations
JPL Life Cycle Phases							
Major JPL Reviews	Concept Review	PMSR	PDR	CDR	ARR	MRR	PLAR
	TEAM X System Design Service						

- ARR** Assembly, Test, & Launch Operations Readiness Review
- CDR** Critical Design Review
- CERR** Critical Events Readiness Review
- MRR** Mission Readiness Review
- PDR** Preliminary Design Review
- PLAR** Postlaunch Assessment Review
- PMSR** Preliminary Mission & Systems Review

Key Characteristics



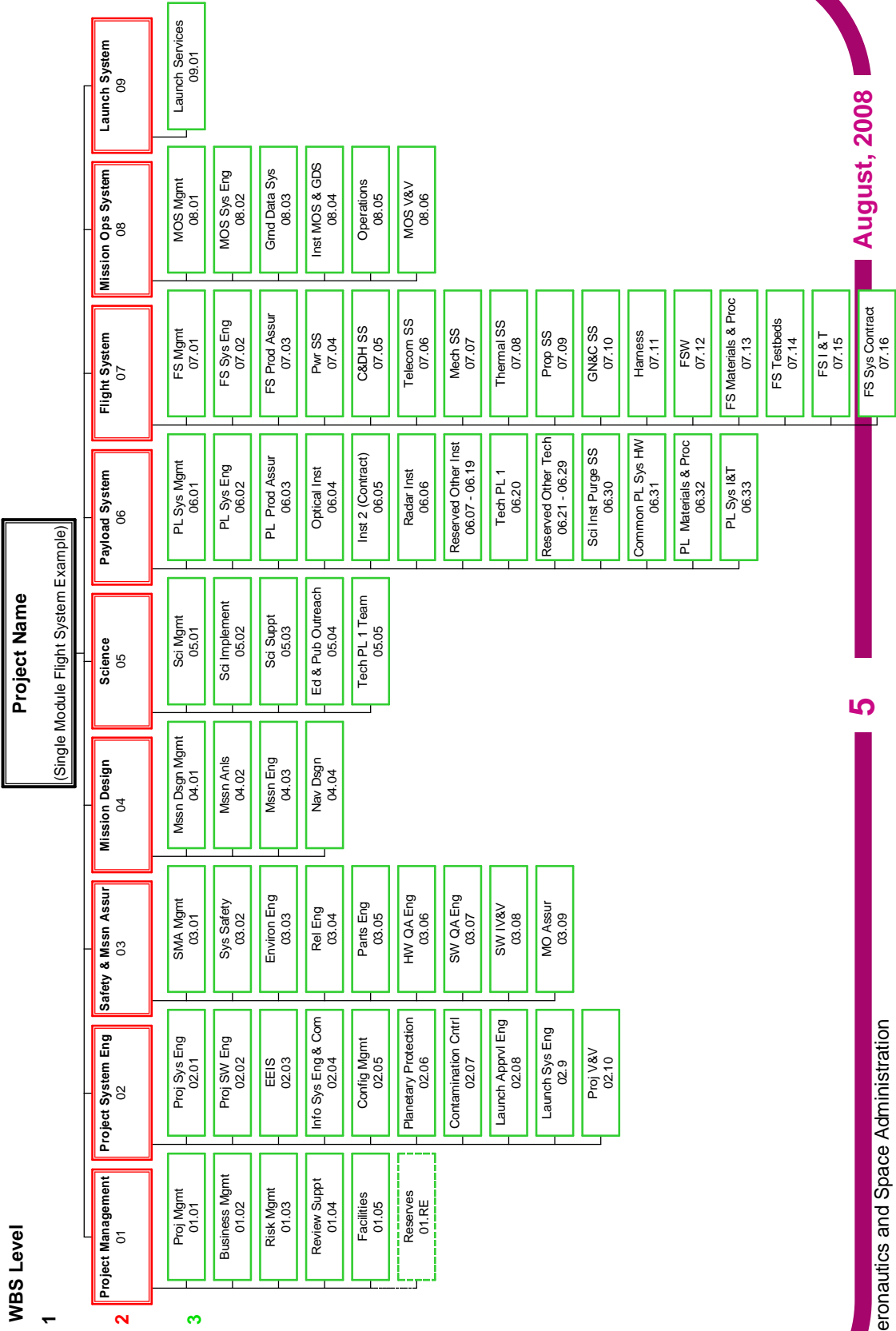
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- **Project Phases**
 - Develop the project in distinctly defined phases
 - Provide go, no-go gates to proceed from one phase to another
 - Define success criteria for each gate
 - Responsiveness, maturity, scope and contingency
- **Project Architecture**
 - Breakdown the system into hierarchical levels
 - Subsystems, assemblies, and components and use similar development processes for all levels
 - Project organization follows the project architecture

Work Breakdown Structure



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Management & Development Plan



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- Provide Flight Software Management and Development Plan which addresses:
 - Work breakdown structure based on architectural design
 - S/W organization, staffing, and identification of roles and responsibilities
 - Design trade-offs, alternatives, and selection basis
 - Coordination and interfaces with system, H/W subsystems, I&T, ground support equipment and ground data system
 - Software development process with monitoring
 - Development cycles, entry and exit criteria and schedule
 - Approach to:
 - Elaboration and management of requirements
 - Design, development and documentation of work products
 - Adaptation of inherited software
 - Configuration management of code, documentation, and other work products
 - Scope and schedule of work products reviews including detailed technical reviews
 - Integration and test, including acquisition, and validation of test environment
 - Support to product delivery, I&T and operations
 - Software development risk management

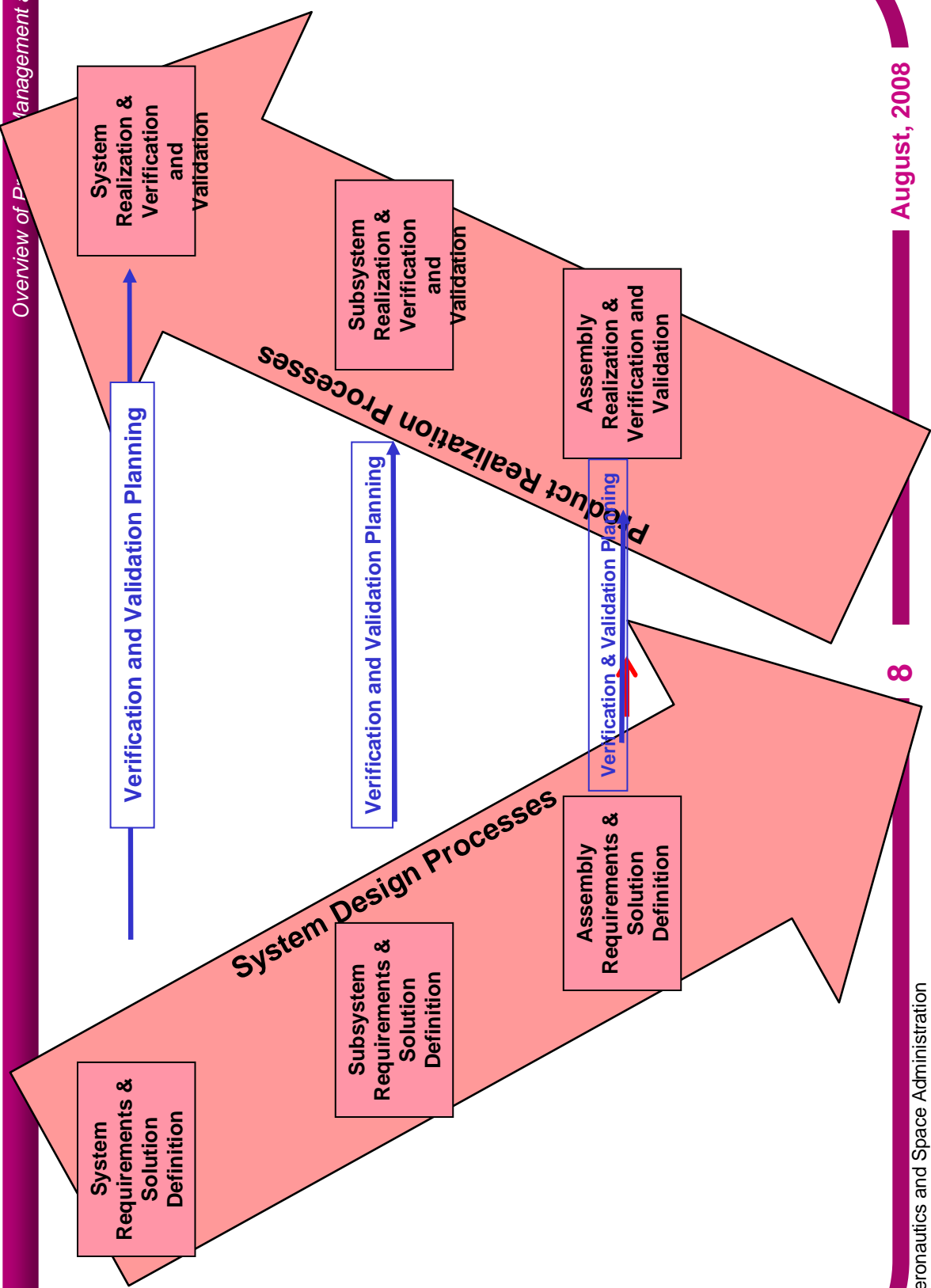
Resources Management



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Example Technical Resource Margin utilization

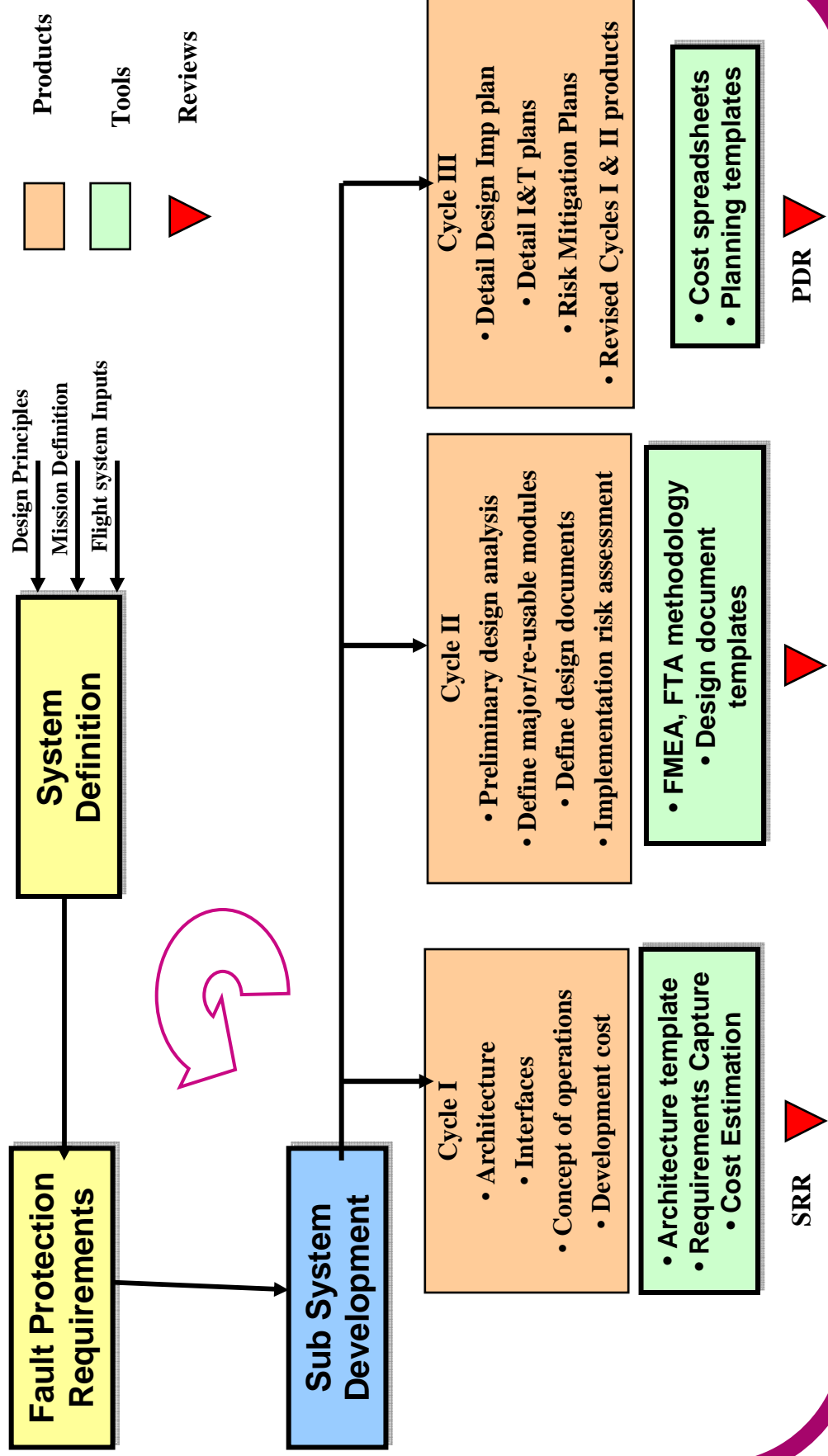
Resource	PDR	CDR	ATLO	Launch	Justification
Mass (unallocated)	15%	10%	5%	2%	High heritage
Power/Energy	25%	20%	15%	10%	High heritage, robust operating margins
Battery Margin	30%	20%	15%	10%	High heritage, robust operating margins
CPU Timing (nominal)	50%	40%	30%	20%	Heritage, robust operating margins



Product Development Process



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Requirements at PDR



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- Software Requirements Development and Management
 - System requirements allocated to software are agreed upon and documented
 - Derived s/w requirements analyzed to ensure that they satisfy system requirements, design guidelines, are verifiable and are documented
 - s/w requirements traced upwards to system requirements and downwards to software units
 - traceability and compliance matrix developed
 - Resource margin requirements established and documented
 - S/W requirements for interfaces (internal, external and especially hardware) identified and documented
 - Level 3 (system) final
 - Level 4 (subsystem) preliminary
 - Level 5 draft

S/W Configuration Management at PDR



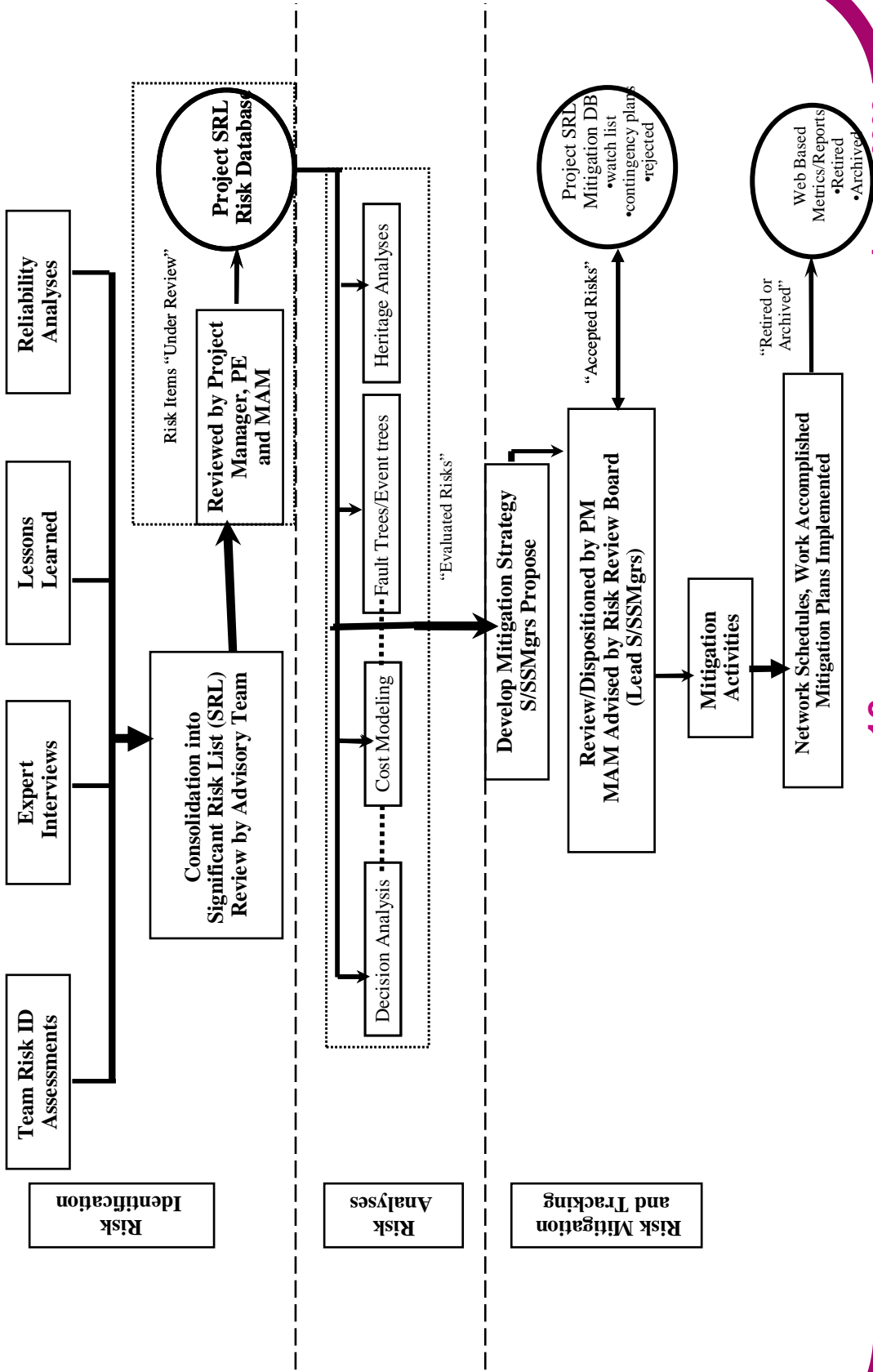
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- Software Configuration Management
 - Establish configuration management procedures for work products, development and test environments
 - Identify the versions of all software items that constitute a specific build
 - Document all s/w and h/w used so that development and test environments may be accurately recreated
 - Baselines for software work products established and maintained and the criteria for base-lining defined
 - Build procedures established, documented and maintained
 - Change control authority identified and process defined
 - Provisions to collect metrics to help assess the state of product development incorporated

Risk Management Process



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S/W Risk Management Plan



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- Classify software risks (high, moderate) in the following areas:
 - Requirements that are uncertain/ambiguous/unstable and assumptions that are unverified
 - Hardware availability (historically late)
 - Technical interfaces that have not been defined or verified
 - Critical performance requirements that projections indicate inability/marginal to meet
 - Development and test environments whose timely implementation is in question
 - High fidelity testbeds with limited access
 - Partner products that will need longer to integrate and adapt
 - Defect identification and rework resource allocations that are inadequate
 - Integration resources that are insufficient
 - Mitigation plans in the following areas:
 - Resource reserves and their planned criteria for release
 - Descope options and their impact
 - Set aside resources to closely track development schedule
 - Coordinate frequently with dependencies

Cost & Schedule Risk Assessment



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- **Risk: Requirements “creep”**
 - The design keeps changing, but not converging upon an agreed upon set of requirements.
- **Mitigation:**
 - Demonstrate that FSW manager is realistic about matching task to the available budget.
 - Push back to accept some mission risk. If you try cover every potential contingency, every potential fault, no matter how unlikely to occur, it will be very expensive to meet such requirements.
- **General Cost & Schedule “creep”**
 - During the implementation phase. Things take longer to build – and debug - than anticipated. Development “bogs down” trying to meet requirements
- **Mitigation:**
 - Demonstrate at PDR that team members be “in the loop” and “buy off” or push back when setting requirements and schedules
 - Show increase in the margin - or make the case that you staffed with highly skilled implementers who creatively solve unanticipated problems
 - Identify descope options and invocation criteria and stick to it

Summary



- Define distinct development phases and entry and exit criteria
- Set high standard for reviews and incorporate lessons learned
- Architectural breakdown of the system and use for maturing and managing the system
- Develop and follow a risk management plan
- Develop and follow a project descope plan



Questions?