Mission Assurance of Mission Operations

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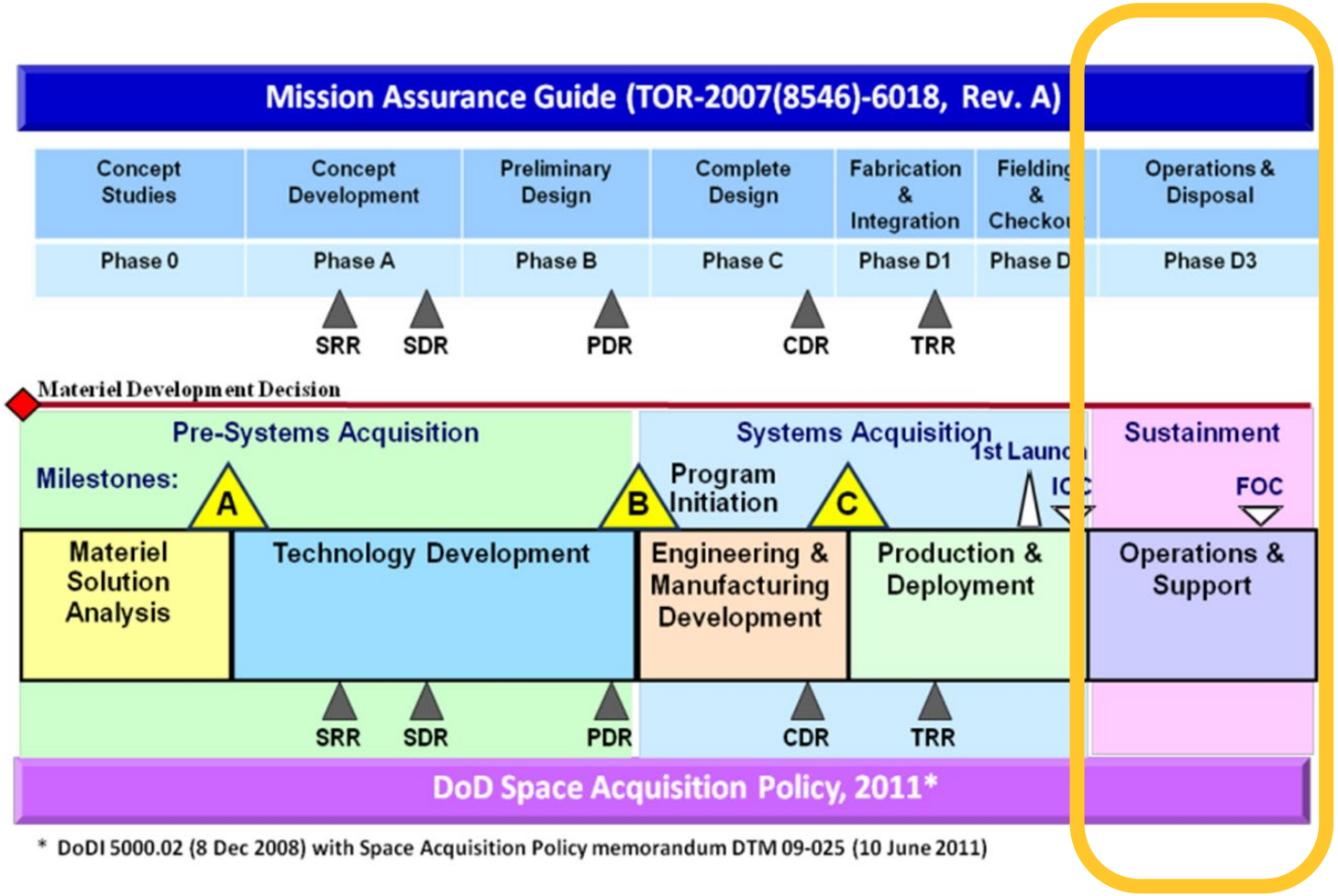
Mission Assurance Baseline

Historical Context

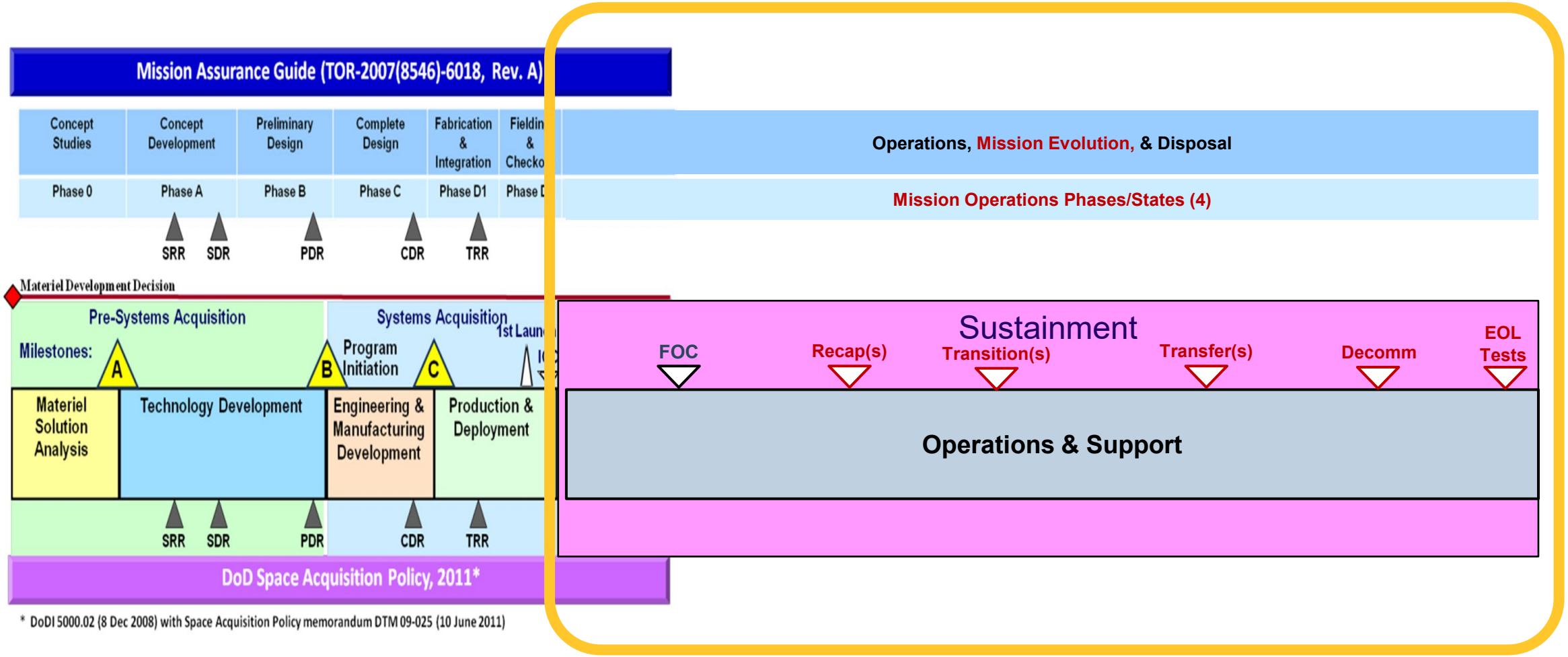


ATR-2013-00505 Mission Assurance Baseline (MAB) Version 2.5.5

- First MAB: 2010
- Current Version: 2018
  ~4,000 tasks in total
- MAB: A set of tasks performed to increase confidence of achieving mission success for a satellite system and associated ground systems
- Focus on acquisition through launch and initial checkup and operations transition
- Tailored for Class A/B/C/D Mission Risk Profiles

Mission Assurance Baseline

Mission Operations Lifecycle Context



ATR-2013-00505 Mission Assurance Baseline (MAB) Version 2.5.5

New MAB Mission Operations Section

2025 Draft

- Adds ~400 Tasks to MAB
- Based on Current MAB and operational SMEs

Section #	Section Task Name	L1 #	L1 Category
1	Assess Mission Management	1-1	Mission Planning
		1-2	Constellation management
		1-3	Mission Performance
		1-4	Mission Partner Interfaces/Services
		1-5	Incomplete Operations Transitions
		1-6	Administration
2	Assess Operational Processes	2-1	Situational Awareness
		2-2	Orbit Management
		2-3	Satellite Operations
		2-4	Ground Operations
		2-5	Trouble Ticketing Process
		2-6	Anomaly Response
		2-7	Anomaly Team Support
3	Assess Mission-Specific Operations	3-1	Mission Processing
		3-2	User Support
4	Assess Mission Support Functions	4-1	Engineering Support
		4-2	Contracted Services
		4-3	Facility Management
5	Assess Mission Maintenance & Sustainment	5-1	Maintenance & Sustainment Program Management
		5-2	Proactive Inspections
		5-3	System Calibration
		5-4	Testing System Changes
6	Assess Configuration Management	6-1	Change Management
		6-2	Configuration Control
		6-3	Archival of Mission Historical Data
7	Assess Mission Security	7-1	Information Assurance
		7-2	Security Services
8	Assess Mission Protection	8-1	Mission Protection Program
		8-2	Mission Protection Tactics, Techniques and Procedures (TTPs)
		8-3	Threat Awareness
		8-4	Flight Safety
9	Assess Operations Training Program	9-1	Position Training Program
		9-2	Operations Simulation/Emulation
10	Unique Operational Phase Activities	10-1	Primary Mission
		10-2	Backup/Residual Mission
		10-3	Alternative Missions
		10-4	End of Life

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Change Management	6-1-1	Ensure process exists to manage updates to ground software, flight software, ground system configuration files, and mission operations products
	6-1-2	Ensure changes to operational procedures implemented in operational scripts by operators are version controlled and rigorously tested before use in operations.
	6-1-3	Ensure an expedited/emergency process for Configuration Management (CM) submission, approval, and deployment exists
	6-1-4	Ensure operational support staff that are assigned to the Configuration Manager role have the operating system level permissions necessary to deploy approved software and operational products and files
	6-1-5	Ensure operational support staff are assigned as the approval authority for changes to the ground system software baseline or flight operations products
	6-1-6	Ensure the approval authority has the subject matter expertise to evaluate changes or the authority to assign a reviewer before approval
	6-1-7	Ensure the operational/engineer staff or contractor who develop, and test ground system software changes and flight operations product changes are different and independent of staff who approve those changes or deploy those changes (prior two positions, above)
	6-1-8	Ensure engineering change processes review spectrum implications due to operational parameter change

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How to Assess Mission Assurance During Operations

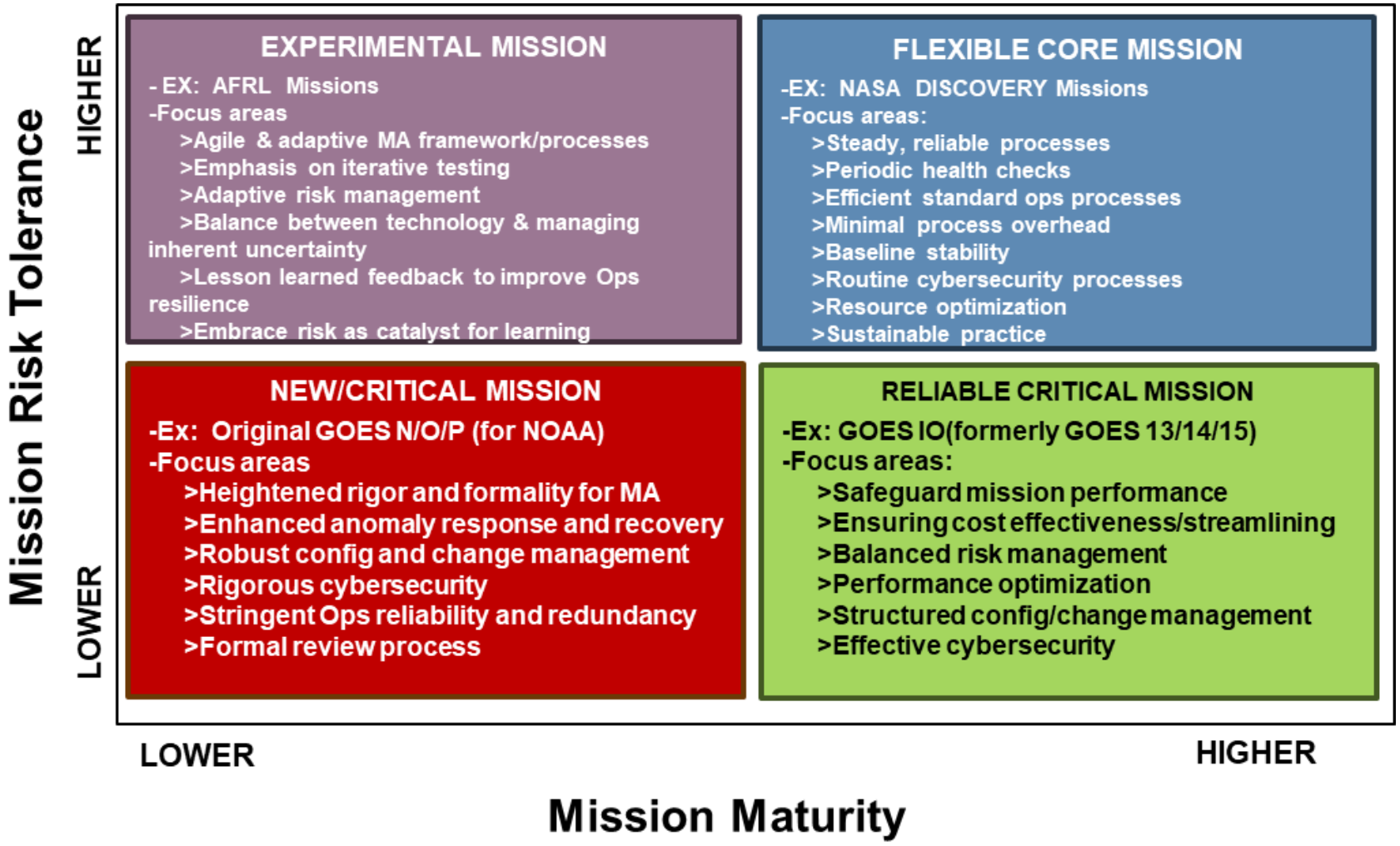
Balancing Mission Unique Considerations during Operations

- Mission Risk Profile
- Mission Operations Lifecycle Phase(s)
- Age of Mission Systems
- Large Constellation Operations
- Automation of Mission Functions
- Organizational Constructs
- Contracted Operations Functions
- Mission's Protection Program
- Mission Specific Operations Concepts

Mission assurance emphasis areas change over time for a mission in operations

Mission Operations Risk Profile

Unlike space acquisitions, the risk profile for a mission in operations will likely change over its lifetime.



A single mission operations center may manage multiple space and ground systems with different risk profiles

“Phases” of Mission Operations

Represents the “states” of specific space assets in operations at a specific point in time

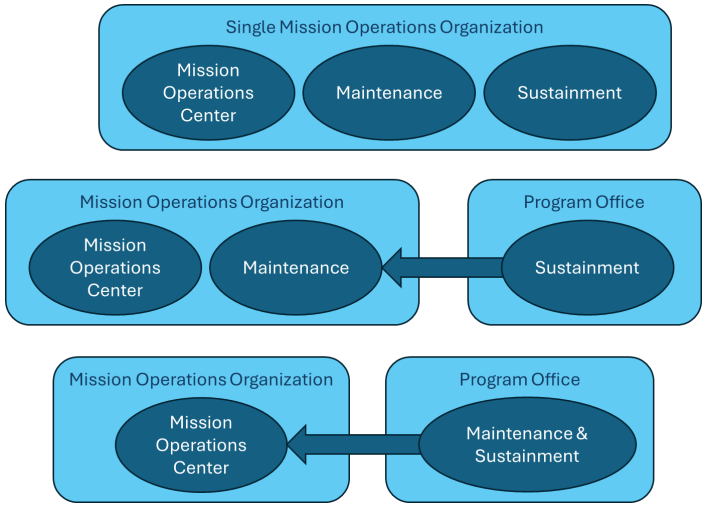
Lifecycle Phase	Description
Primary Mission Operations	The spacecraft or set of spacecraft in a constellation is performing the intended mission with little or no on-orbit failures or degradation. This phase includes some initial learning of a new system’s on-orbit behavior and performance. It may also include degraded mission capabilities in a spacecraft or portions of a constellation that has degraded performance, and/or the need to perform special on-orbit procedures to keep in mission or performance thresholds. Degradation of primary mission capabilities may be a gradual change over the expected primary mission life, or result from a sudden change after a significant mission impacting anomaly is resolved.
Backup/Residual Mission Operations	This phase starts after the initial satellite or constellation is replaced by a new satellite or constellation. The initial satellite or constellation typically still has significant residual mission capabilities that are needed to serve in one of two roles: a) backup role to the primary mission satellite or constellation or b) auxiliary role providing additional mission data/capabilities considered highly valuable. The key difference in this phase from the alternative mission operations phase is that the satellite and constellation capabilities are still considered mission essential and, in some cases, sufficient to replace the primary satellite or constellation if there is an unexpected failure in the primary satellite(s) that is mission ending (i.e., returning the initial satellite/constellation to the degraded or primary mission operations phase).
Alternative Mission Operations	This phase of mission operations may or may not occur in a satellite or constellation’s lifecycle. An alternative use may be defined such as a Test and Checkout (TACO) satellite, a subject of research and development (R&D) projects, a training platform for operators or for other ancillary missions. The original mission data may still be produced, but it is not normally considered an adequate alternative for use in primary mission systems. In this phase, the spacecraft or constellation may or may not have an operational payload or a fully operational bus.
End-of-Life (EOL) Operations	This phase of mission operations is usually the shortest and occurs on all mission satellites near end-of-life or after a mission ending failure. There are four types of activities in this final phase: **1)** **EoL Testing** – A period before disposal, passivation, and/or deorbit operations may be allocated to support testing that is often considered too risky to perform on a satellite in operations. It is often performed to explore the limits of operations, the effects of failed or degraded bus or payload components, or to evaluate new operations concepts. This period of operation may or may not involve use of the primary mission payload. **2)** **Disposal Orbit Transition** - Usually, a short operational period where the satellite or constellation is either placed into a suitable orbit for disposal or allowed to passively drift into that orbit without correction. Placing spacecraft into a disposal orbit may be performed using the spacecraft’s internal bus capabilities or an external space capability (e.g., space tug). No mission is performed in this phase of operations. **3)** **Passivation** - Operations in this last phase are focused on expending all fuel and power on the spacecraft, so it is safe from creating additional debris. Any residual bus or payload capability is usually not recoverable after this operations phase. **4)** **Deorbit Operations** - Usually, the shortest phase of operations where the spacecraft or constellation is deorbited or put permanently out of service in the disposal or “graveyard” orbit.

Phases in mission operations for a specific space system may change sequentially, but not necessarily.

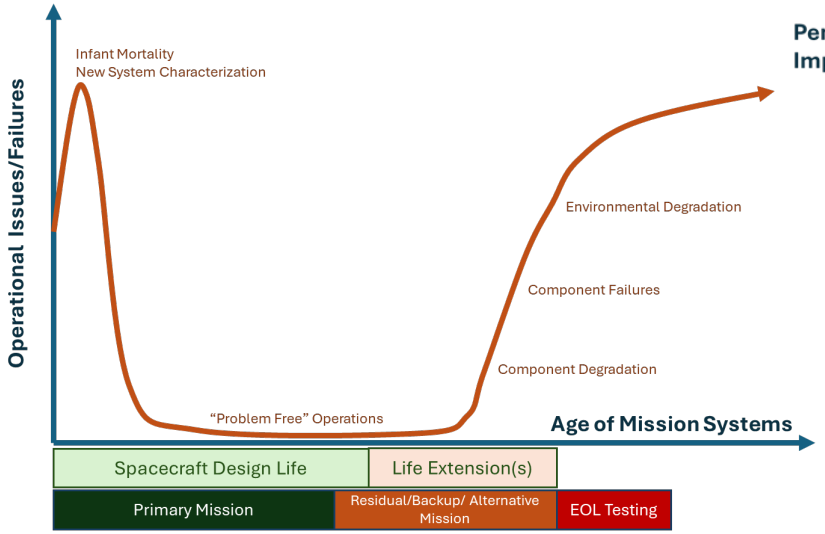
Other Consideration in Tailoring Mission Assurance Assessments

Examples

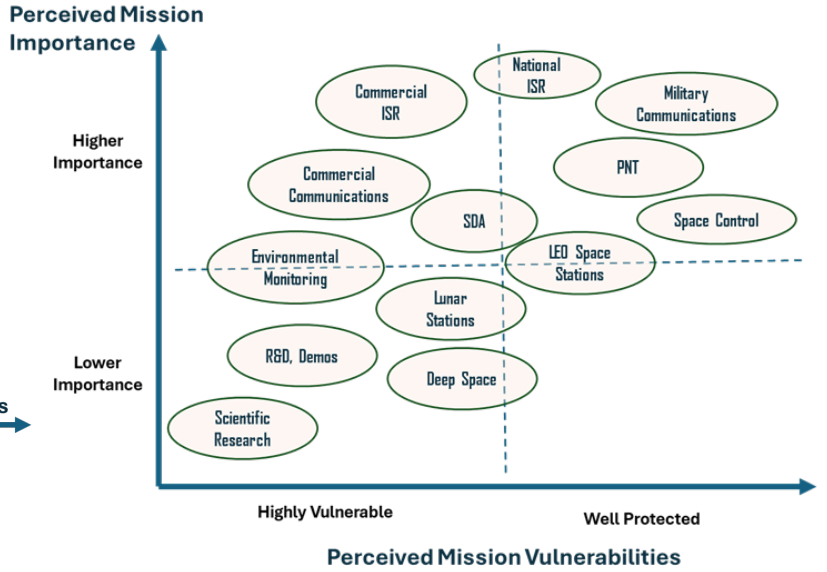
Organizational Constructs & Contracted Functions



Age of Mission Systems



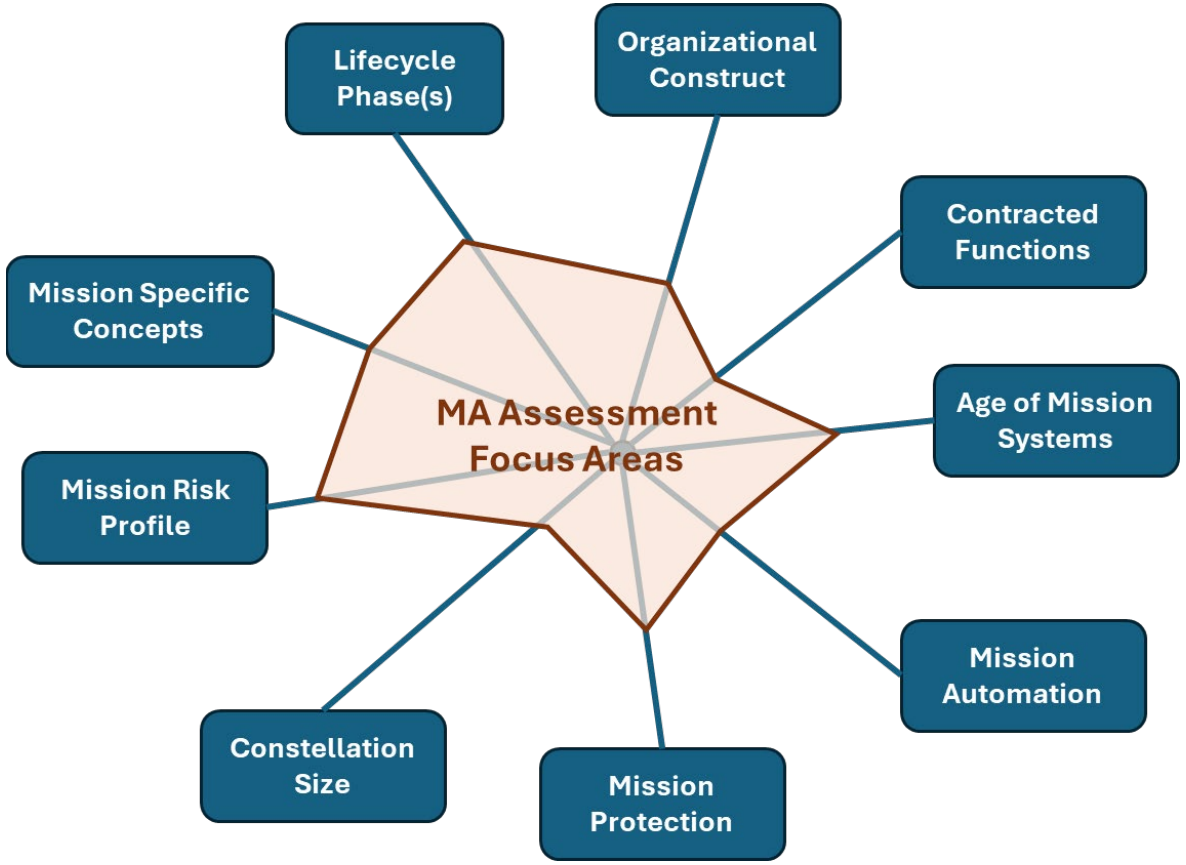
Mission Protection



Each consideration represent different perspectives on how to tailor the MAB for a mission in operations

Determining the focus of a Mission Assurance Assessment

Driven by Mission Operations Organization Priorities



MA Tailoring Considerations Relative Importance Rating (Row vs Column)	Mission Risk Profile	Mission Specific Concepts	Lifecycle Phase(s)	Organizational Construct	Contracted Functions	Age of Mission Systems	Mission Automation	Constellation Size	Mission Protection	Relative Importance
Mission Risk Profile		H	H	H	H	H	H	H	H	7
Mission Specific Concepts			H	H	H		H		H	4
Lifecycle Phase(s)				H	H	H	H			3
Organization Construct					H					1
Contracted Functions						H				1
Age of Mission Systems		H		H			H	H		4
Mission Automation				H	H			H	H	4
Constellation Size		H	H	H	H				H	5
Mission Protection			H	H	H	H				4

The focus of a MA assessment during operations is for a specific point in time in the mission's lifecycle

Notional Mission Operations Mission Assurance Assessment

End Goal!

- Where are the mission assurance risks in current operations?
- Where should resources be applied to reduce operational risks?

	Mission Operations Assessment Focus Areas		Results
1	Assess Mission Management		
2	Assess Operational Processes	Situational Awareness	
		Orbit Management	
		Satellite Operations	
		Ground Operations	
		Trouble Ticketing Process	
		Anomaly Response	
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		Archival of Mission Historical Data	
7	Assess Mission Security		
8	Assess Mission Protection		
9	Assess Operations Training Program	Position Training Program	
		Operations Simulation/Emulation	
10	Unique Operational Phase Activities		

Tailored assessment of the mission's current operational posture and the stage of life of key systems


Thank you