QUALITY
LEADERSHIP FORUM
VIRTUAL SERIES

Risk-Based Assessment and In-Line Assessment Methodologies

Thursday, June 18, 2026 | 1:00 – 2:00 p.m. Eastern

Presenter

Brad Johnson – Quality Engineer Subject Matter Expert, Bastion Technologies, Marshall Space Flight Center

Risk-based Assessment (RBA) and In-line Assessment (ILA) Methodology



Brad Johnson
QE SME / MSFC

BASTION TECHNOLOGIES

18Jun2026

BASTION TECHNOLOGIES

History

Government **Oversight**- Historically has been a hands on monitoring approach in the form of Government Mandatory Inspection Points (GMIPs). It provides a High level of control and verification and is effective for high risk and critical hardware.

Pros

- High Confidence
- Government Control
- Increased Presence

Cons

- Costly
- Increased Manpower
- Creates Bottlenecks
- May discourage Contractor Ownership

The aerospace industry is always evolving and as NASA gains more commercial partners for Space Exploration, we have changed our approach to Government Contract Quality Assurance from an Oversight Model to and Insight Model

Insight- is a data, performance, and risk driven process where the government relies on the contractor's own quality system and maintains visibility into their processes.

Pros

- Encourage Contractor Accountability
- Efficient use of Resources
- Enables early Risk Detection
- Focus on Hardware & Process Maturity

Cons

- Requires Mature Contractor Systems
- Relies on Transparency

BASTION TECHNOLOGIES

What is an RBA?

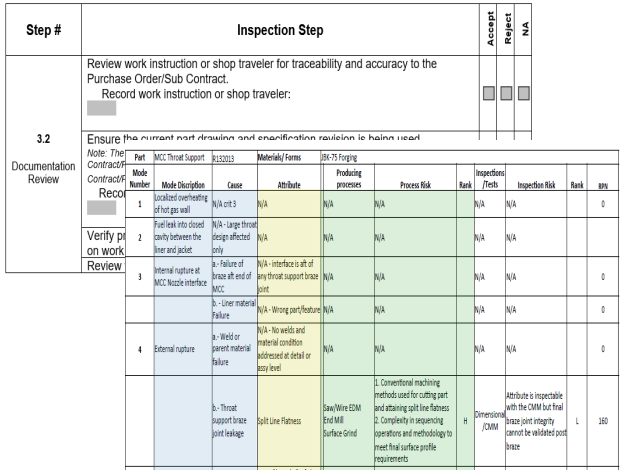
RBA: a methodology of standardizing the Risk-informed Decision Making (RIDM) approach, by using a series of screening questions and risk ranking criteria to assess and communicate risks. Provides more robust understanding of processes leading to improvements.

Considerations

- Hardware Geometry, Complexity, and design considerations
- Processes in the Manufacturing, Assembly, and/or Testing
- Safety and/or Mission Critical Attributes (CIL or Hazard)
- Collaboration of Supplier/Vendor (Team Approach)

Goal

- Continuous presence of government surveillance in the work areas during selected processes to accomplish surveillance in-line with contractor's processes and inspections.
- Government and contractor maintains accountability and tracking of all safety/mission critical attributes . Verification procedures in place to ensure flow down from risk documents (Hazards/CILs) to work procedures.



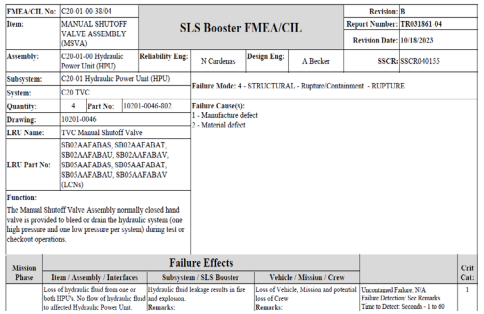
Step #	Inspection Step	Accept	Reject	NA
3.2 Documentation Review	Review work instruction or shop traveler for traceability and accuracy to the Purchase Order/Sub Contract. Record work instruction or shop traveler:			
	Ensure the current part drawing and specification revision is being used. Note: The Contract/P Contract/P Recor			
	Verify pr on work			
	Review			

Part	MCC Throat Support	R182013	Materials/ Forms	JBK-75 Forging					
Mode Number	Mode Discription	Cause	Attribute	Producing processes	Process Risk	Rank	Inspections /Tests	Inspection Risk	Rank	RPN
1	Localized overheating of hot gas wall	N/A crit 3	N/A	N/A	N/A		N/A	N/A		0
2	Fuel leak into closed cavity between the liner and jacket	N/A - Large throat design affected only	N/A	N/A	N/A		N/A	N/A		
3	Internal rupture at MCC Nozzle interface	a.- Failure of braze aft end of MCC	N/A - interface is aft of any throat support braze joint	N/A	N/A		N/A	N/A		0
		b. - Liner material Failure	N/A - Wrong part/feature	N/A	N/A		N/A	N/A		0
4	External rupture	a.- Weld or parent material Failure	N/A - No welds and material condition addressed at detail or assy level	N/A	N/A		N/A	N/A		0
		b.- Throat support braze joint leakage	Split Line Flatness	Saw/Wire EDM End Mill Surface Grind	1. Conventional machining methods used for cutting part and attaining split line flatness 2. Complexity in sequencing operations and methodology to meet final surface profile requirements	H	Dimensional /CMM	Attribute is inspectable with the CMM but final braze joint integrity cannot be validated post braze	L	160

Create a standardized checklist to identify all the potential risks and rank them

What Goes in a RBA?

FMEA-CIL



FMEA/CIL No:	C20 01 00 38/04	SLS Booster FMEA/CIL		Revision:	B
Item:	MANUAL SHUTOFF VALVE ASSEMBLY (MSVA)			Report Number:	TR031861 04
				Revision Date:	10/18/2023
Assembly:	C20-01-00 Hydraulic Power Unit (HPU)	Reliability Eng:	N Cardenas	Design Eng:	A Becker
Subsystem:	C20 01 Hydraulic Power Unit (HPU)				
System:	C20 TVC				
Quantity:	4	Part No:	10701-0046-807		
Drawing:	10201-0046				
LRU Name:	TVC Manual Shutoff Valve				
LRU Part No:	SB07AAFABAS, SB07AAFADAT, SB02AAFABAU, SB02AAFABAV, SB05AAFABAS, SB05AAFADAT, SB03AAFABAU, SB03AAFABAV (LCNs)				
Function:	The Manual Shutoff Valve Assembly normally closed hand valve is provided to bleed or drain the hydraulic system (one high pressure and one low pressure per system) during test or checkout operations.				

Failure Mode: 4 - STRUCTURAL - Rupture/Containment - RUPTURE

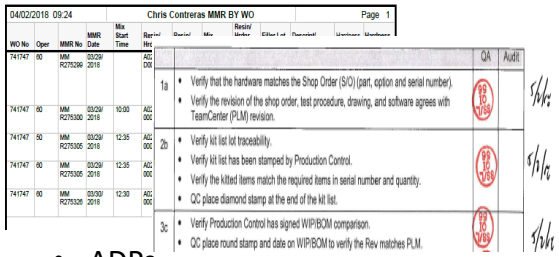
Failure Cause(s):
1 - Manufacture defect
2 - Material defect

Mission Phase	Failure Effects: Item / Assembly / Interfaces	Subsystem / SLS Booster	Vehicle / Mission / Crew	Crit Cat:
	Loss of hydraulic fluid from one or both HPUs. No flow of hydraulic fluid to affected Hydraulic Power Unit.	Hydraulic fluid leakage results in fire and explosion. Remarks:	Loss of Vehicle, Mission and potential loss of Crew Remarks:	1

Uncontained Failure: N/A
Failure Detection: See Remarks
Time to Detect: Seconds - 1 to 60

- Hazards
- Characteristics associated with causes
- Identification of controls

Documentation



04/02/2018 09:24 — Chris Contreras MMR BY WO — Page 1

WO No	Oper	MMR No	MMR Date	Mix Start Time	Resin/ Batch/ Hrs	QA	Audit
741747	60	MM R275200	03/29/ 2018		ADJ 000		
741747	60	MM R275300	03/29/ 2018	10:00	ADJ 000		
741747	50	MM R275305	03/29/ 2018	12:35	ADJ 000		
741747	60	MM R275305	03/29/ 2018	12:35	ADJ 000		
741747	60	MM R275305	03/30/ 2018	12:30	ADJ 000		

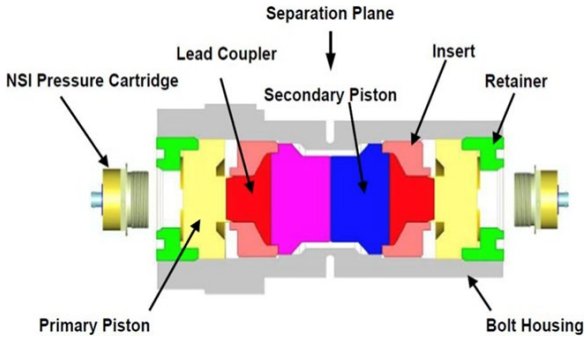
1a
- Verify that the hardware matches the Shop Order (S/O) (part, option and serial number).
- Verify the revision of the shop order, test procedure, drawing, and software agrees with TeamCenter (PLM) revision.

2b
- Verify kit list lot traceability.
- Verify kit list has been stamped by Production Control.
- Verify the kitted items match the required items in serial number and quantity.
- QC place diamond stamp at the end of the kit list.

3c
- Verify Production Control has signed WIP/BOM comparison.
- QC place round stamp and date on WIP/BOM to verify the Rev matches PLM.

- ADPs
- Operations, Build Books, Travelers
- QA Surveillance
- Records

Design Risk



- Understand functional purpose/operating conditions
- Identify part specific characteristics and requirements

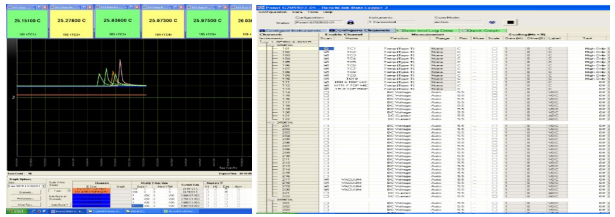
RBA

Process Risk



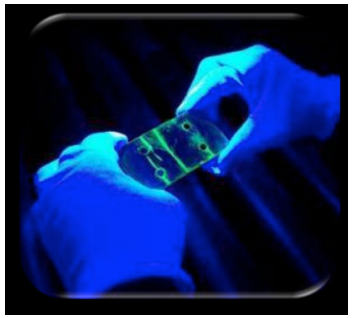
- Process Knowledge
- Training/Certification
- Controls
- Sensitivity to variance

Data



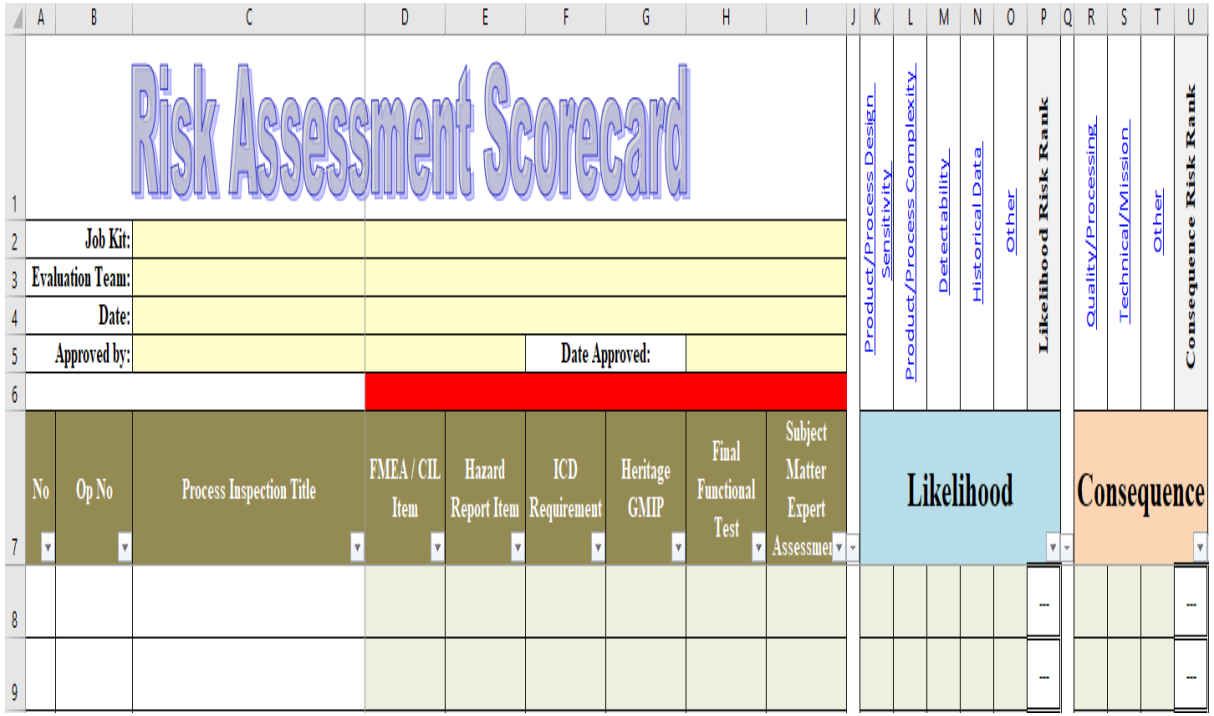
- Test Reports
- Measurements
- Environmental Controls

Inspection Risk



- Material
- Geometry
- Inspection Complexity
- Skills & Experience

RBA Example



Risk Assessment Scorecard

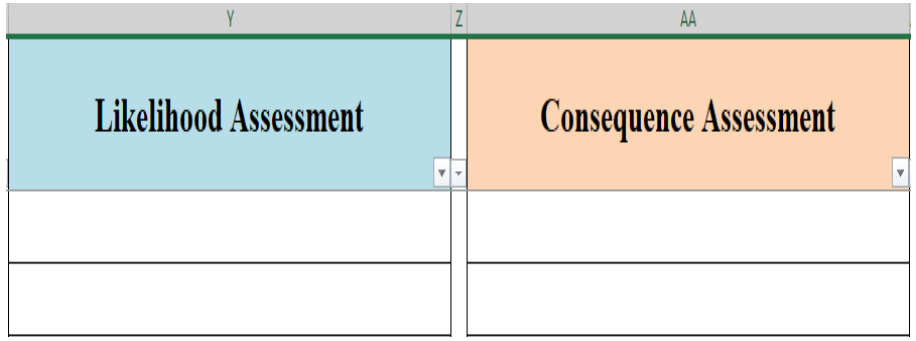
Job Kit:	
Evaluation Team:	
Date:	
Approved by:	Date Approved:

No	Op No	Process Inspection Title	FMEA / CIL Item	Hazard Report Item	ICD Requirement	Heritage GMIP	Final Functional Test	Subject Matter Expert Assessment	Likelihood						Consequence			
									Product/Process Design Sensitivity	Product/Process Complexity	Detectability	Historical Data	Other	Likelihood Risk Rank	Quality/Processing	Technical/Mission	Other	Consequence Risk Rank
														--				--
														--				--

Pull items that have been identified in the FMEA-CIL and load them into a RBA template such as the one seen here (right). This aides in the formulation and standardization of the RBA. The example "Scorecard" walks the though the RBA with a series of questions to identify risks and rate the likelihood and Consequence of Failure/Hazard.

Likelihood: the probability or chance that a risk event will occur.

Consequence: the negative impacts or out-come that occurs if the risk event happens.



Likelihood Assessment	Consequence Assessment

BASTION TECHNOLOGIES

RBA Example: Continued

3 X 3 Risk Matrix

Likelihood				
Highly Likely	Medium Risk	High Risk	High Risk
Likely	Low Risk	Medium Risk	High Risk
Unlikely	Low Risk	Low Risk	Medium Risk
	Minor	Moderate	High

Consequence

5 X 5 Risk Matrix

Likelihood					
Highly Certain	Medium Risk	High Risk	High Risk	High Risk	High Risk
Highly Likely	Medium Risk	Medium Risk	High Risk	High Risk	High Risk
Likely	Low Risk	Medium Risk	Medium Risk	Medium Risk	High Risk
Unlikely	Low Risk	Low Risk	Medium Risk	Medium Risk	Medium Risk
Rare	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
	Low Probability	Minor	Moderate	High	Significant /Critical

Consequence

The purpose of a ***Risk Matrix*** is to provide a simple, visual, and structured way to assess, prioritize, and communicate risks by (Low, Medium, or High). By plotting the potential ***Consequence*** of a risk against its likelihood ***Probability*** of occurring, organizations can make informed decisions about managing their risks.

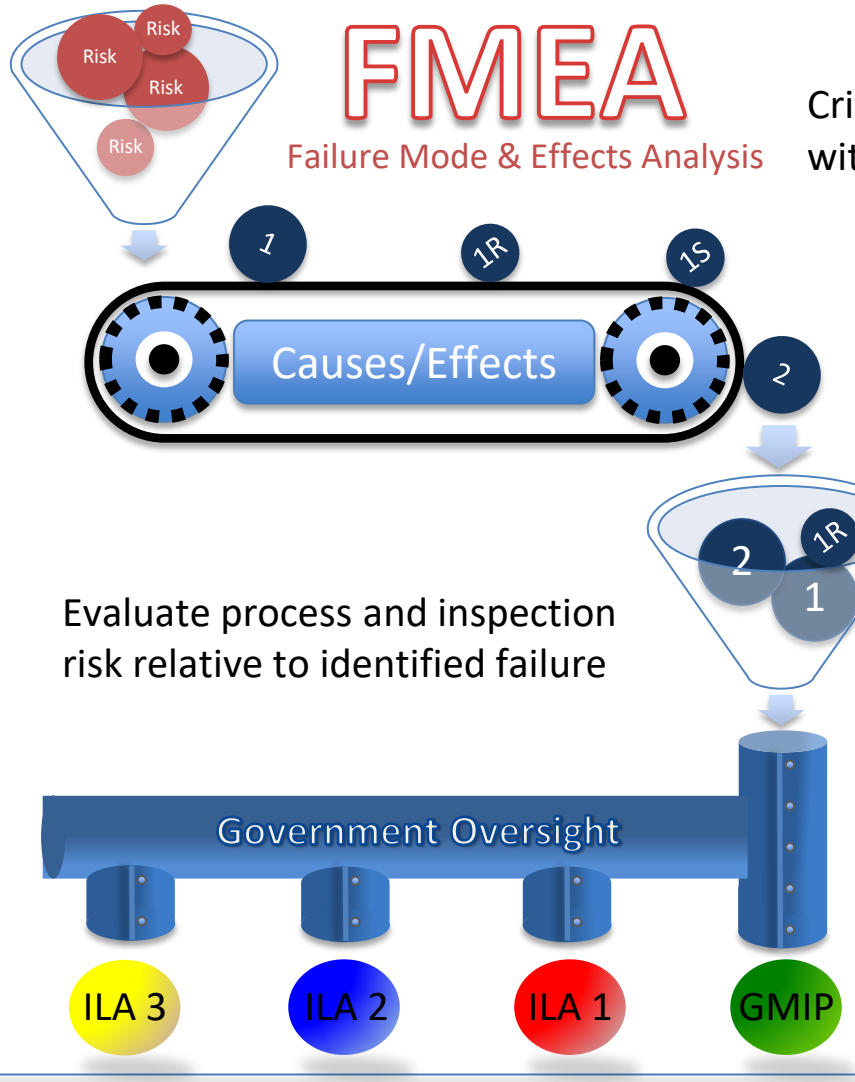
Low Risk: It is a risk that is not likely to result in significant failure, harm, or injury and is considered acceptable with minimal to routine monitoring.

Medium Risk: :a risk that warrants attention and resource allocation to prevent it from escalating. A manageable risk that requires a planned, documented, and routine monitoring.

High Risk: a critical and immediate issue that requires urgent attention and robust mitigation strategies.

BASTION TECHNOLOGIES

RBA Process Flow



BASTION TECHNOLOGIES

What is an ILA?

ILA: is an assessment conducted by a team of subject-matter experts to evaluate and document a process and/or product support planning. The assessment identifies issues or areas for improvement that could increase or decrease risk.

SLS-RQMT-014

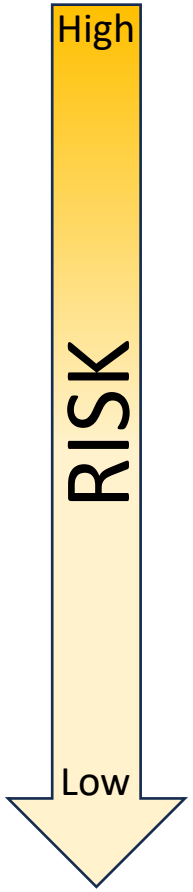
ILA is intended to be a methodology to maintain an appropriate level of knowledge and onsite experience with safety and mission critical operations, without imposing any mandatory inspection delays to the contractor's/performing organizations' processing schedules.



Unlike GMIPs, ILA inspection points are not considered mandatory on the part of the Element Contractor/Performing Organization. It is the Government's intention to maintain a continuous presence during processing operations in order to perform ILA

BASTION TECHNOLOGIES

ILA Methodology



GMIP — Government Mandatory Inspection Point is a 100% inspection point with defined government activity

ILA 1 — Similar to a GMIP, performed along with supplier to evaluate & assure process controls are being managed relative to critical attributes on a product.

ILA 2 — Periodic process-based assessments to ensure process controls are adequate and accurate, independent of specific hardware

ILA 3 — Determined to be low-risk, Typically a desk top assessment that involves a review of documentation

ILA 4 — High volume, low risk tasks or items. Can be set up to sample a lot, batch, or predetermined random quantity.

Tailor the SMA Oversight / Insight to manage the risks at an appropriate level. Review RBA's upon change to any factors they may cause a change in risk and update the surveillance method as needed.

BASTION TECHNOLOGIES

Government Mandatory Inspection Point (GMIP)



GMIP is a specific hardware driven, designated stage in a production or work process where government personnel (or authorized representatives) must inspect and approve items or processes before work can proceed.

Inspection Method	Summary
Inspect	the physical inspection, measurement, and testing of a supplier's product to verify it exactly matches the contract and engineering requirements.
Witness	the direct, personal observation of a supplier's work to ensure they are following prescribed instructions and contract requirements. While product examination looks at the result, witnessing focuses on the execution of tasks.
Verify	verification (often specifically called record review) is the evaluation of recorded evidence to confirm that a product or process meets contract requirements.

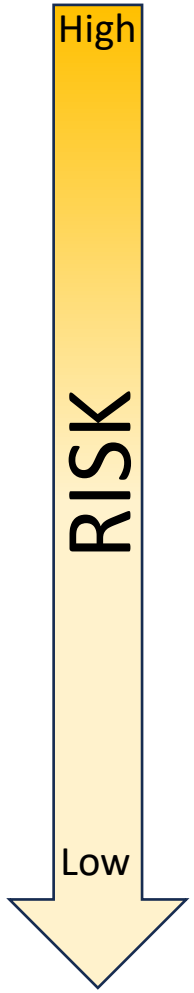
NPR 8735.2

GMIPs are NASA-mandated product assurance actions that are performed at, or prior to, a specific point in the product's life by NASA or a delegated agent of NASA. Product assurance actions include product examination, process witnessing, and record review (often referred to as "verification"). Delegated agents include non-NASA Government agencies and quality assurance support contractors that are independent of the contractor under surveillance.

BASTION TECHNOLOGIES

In-Line Assessment (ILA)

EXAMPLE



ILA-1: HW and Process driven; surveillance that verifies HW compliance while ensuring process controls. Assigned for HW that requires critical process controls and/or may not have a high frequency rate.

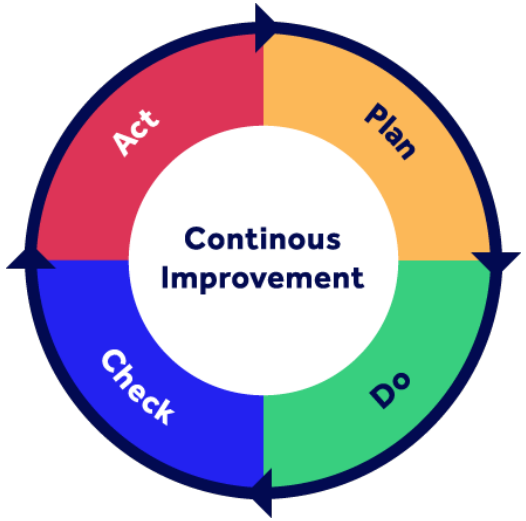
ILA-2: Process driven; assigned to manage process verification. Assesses process risk, control methods, aligns with Prime's production schedule. (i.e. Plating, EDM, NDE, Welding, etc.)

ILA-3: Data driven; assigned for documentation, records, and/or traceability reviews. Routine schedule (day-to-day). (i.e. Build Book, Test Plans, Operations Steps, ADPs, etc.)

ILA-4: Sample driven; usually involves items that have reduced frequency, robust process, and/or high volume with minimal risks.

RBAs to be re-assessed based on:

- Process change
- Design change
- Nonconformance data
- Audits
- New risks
- Demonstrated process/design robustness



Tailor to fit your organizational or program needs!

BASTION TECHNOLOGIES

Example ILA

Fluid Hardware Checklist

Performed By: Gil Bradshaw		**Assessment Date: 9/5/2025**		
Shift1		**Program: SLS**		
Contractor: Bastion		**Site: Kennedy Space Center**		
Effectivity: 3		**Article:**		
Work Area: VAB Highbay 2		**Work Order #: 05785717**		**Opp #: 0050**
Predecessor Verification	*PASS*	*FAIL*	*N/A*	*Remarks*
Ensure all predecessors are listed and either started or completed. If a predecessor is not marked **COMPLETE**, confirm with Boeing that there are no potential build issues.	☐	☐	☒	
NCR Verification	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that part-specific NCRs and work order (W/O) issued NCRs are addressed to ensure the job is acceptable to proceed.	☐	☐	☒	
Serialized Parts and Hardware Verification	*PASS*	*FAIL*	*N/A*	*Remarks*
Confirm that all issued parts are correctly documented within the W/O and match the required specifications.	☒	☐	☐	
Drawings and Attachments	*PASS*	*FAIL*	*N/A*	*Remarks*
Ensure approved work documents and the correct drawing revisions are available and being followed.	☒	☐	☐	
Certifications	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that assigned personnel hold the applicable certifications and qualifications per HBPI-00-102. Ensure that the planning includes the correct certifications as specified in the work instructions (WI) and aligned with engineering requirements.	☒	☐	☐	
Tool Calibration	*PASS*	*FAIL*	*N/A*	*Remarks*
Confirm all tools and instruments are calibrated, with calibration data recorded in the work order as required (PRO-1087).	☐	☐	☒	
PPE Usage and Availability	*PASS*	*FAIL*	*N/A*	*Remarks*
Confirm that personnel have access to required PPE and are using it correctly per engineering requirements.	☒	☐	☐	
Planning and Workflow	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that the contractor's work instructions are adequate and have been followed as stated in the work document.	☒	☐	☐	
Work Order Processing and Buyoffs	*PASS*	*FAIL*	*N/A*	*Remarks*
Ensure contractor inspection records are complete and meet requirements. Confirm that work operations are properly bought off (Stamp Warranty).	☐	☐	☒	
Data Text Fields	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that all data text fields are accurately completed in accordance with process compliance requirements.	☐	☐	☒	
FOD Processing and Hardware Protection	*PASS*	*FAIL*	*N/A*	*Remarks*
Ensure that tool and FOD controls are in place and followed, including tethering requirements. Confirm adherence to "clean as you go" practices (housekeeping).	☒	☐	☐	

Process Standards

Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Maintain surveillance to ensure directives of DPIF018 are being followed when assembly or disassembly of cleaned components must be performed in an uncontrolled area	☐	☐	☒	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify if any ongoing contamination-sensitive operations have ceased and shall remain ceased for the duration of the operation (i.e., priming, Thermal Protection System (TPS) application, bonding with non-silicone adhesive, etc.).	☐	☐	☒	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that solvents and gases that will contact significant surfaces of cleaned components meet applicable particulate and non-volatile requirements criteria of DPI used to clean part (e.g., DPIF022 -01), DPIF050 -(applicable suffix), DPIF062 -03 or DPIF081 -(applicable suffix).	☒	☐	☐	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that temporary closures of clean components or systems and cleanliness-Maintained tags are sealed, and/or stamped, with a Cleaning Operation Stamp (affirms hardware cleanliness) and Inspection stamp per DPIF018.	☒	☐	☐	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that over-wrapping and tamper-proof seals are applied and stamped by Inspection on closures of installed components which do not complete a closed system per DPIF018.	☐	☐	☒	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify the correct identification and packaging of components prior to installation.	☐	☐	☒	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify the non-significant surfaces of the component are clean and free from dirt, dust, tape residue or other contamination. Verify cleaning operations per DPIF018 if component is contaminated.	☒	☐	☐	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify clean components removed from a system are identified and stamped per DPIF018.	☐	☐	☒	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Verify that interchanging of clean hardware complies with the limitations of DPIF018.	☐	☐	☒	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Were you able to observe in the fluid hardware inspection prior to final mate? Were all components visually examined to be free of visible components (oil, paint, scale, lint, fibers, and other foreign particles) prior to assembly	☒	☐	☐	
Element	*PASS*	*FAIL*	*N/A*	*Remarks*
Were you able to observe fit up, loose install, or final mate of components? Were processes followed to maintain clean?	☒	☐	☐	
Additional Remarks:				

BASTION TECHNOLOGIES

Example Use Case

Critical Weld on a Flight pressure Vessel

Oversight

- Review Procedure
- Verifies Welder Cert
- Witnesses the Weld
- Observes NDE
- Signs-off before next Operation (Buy-off)



Vs.

Insight

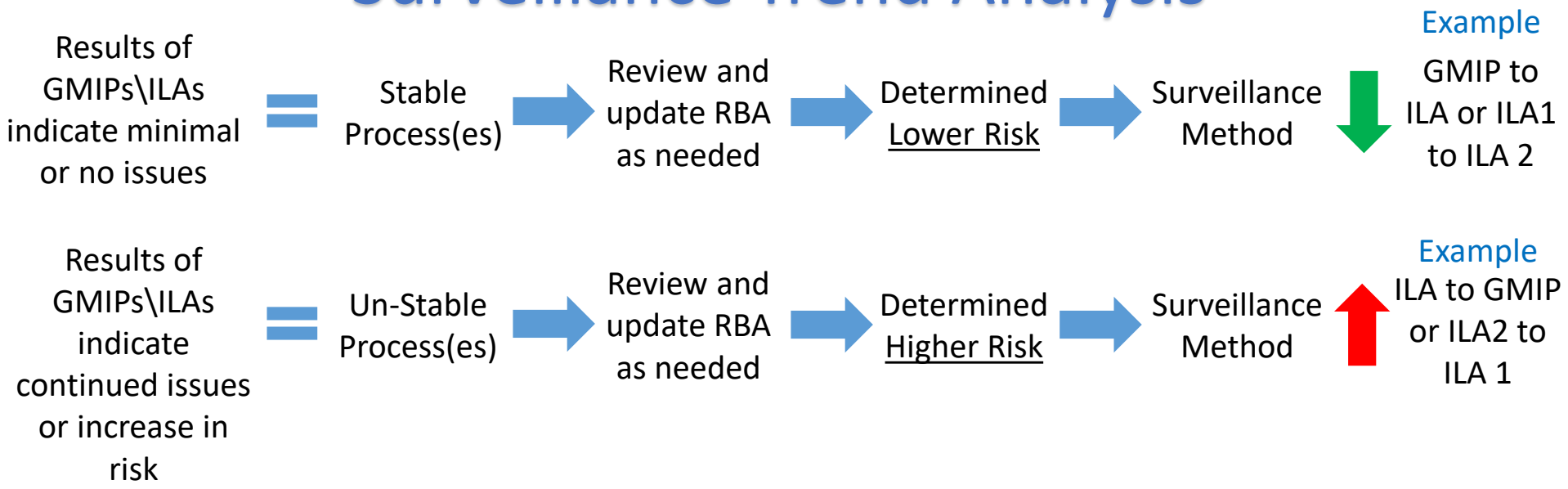
- Contractor Performs Weld
- Gov evaluates system
- Gov evaluates Process
- Assess procedure and qualification records
- Assess welder and weld performance trends
- Assess NDE defect rates and reoccurring indications
- Evaluates Statistical Process Control (SPC) Charts
- Assesses Non-conformance(NC) and CAPA history

What is the difference? What do we gain?

RBA & Surveillance Modification

RBAs should be periodically reviewed to ensure they are accurate and updated accordingly or if significant changes to FMEA-CIL, processes, and/or designs occur. Additionally, they should be reevaluated based on the results (i.e. trends) of surveillance activities.

Surveillance Trend Analysis



Note: If the review of RBA or surveillance activity results in no changes, document the review and periodically reassess as needed to identify and capture changes in risk

Requirements

NPR 7120.10B

Conformity Assessment: A demonstration, whether directly or indirectly, that specified requirements relating to a product, process, system, person, or body are fulfilled. Conformity assessment includes sampling and testing, inspection, supplier's declaration of conformity, certification, and management system assessment and registration. Conformity assessment also includes accreditation of the competence of those activities.

NPR 8735.2C

Assign and execute GMIPs, or acceptable alternatives to GMIPs (e.g., documented and SMA TA-endorsed sampling plan or surveillance plan) as determined by a documented risk assessment, that produce objective evidence of the second party verification, that is traceable to the product or process and the attribute (e.g., work order Government sign-off, status report, database entry of completion date, and acceptable result).

BASTION TECHNOLOGIES

Summary

NASA has moved towards an Insight Model because many program like Artemis are too complex for full-time oversight. Utilizing data analytics and contractor transparency allows for early detection of risks which reduces overall impacts to applicable programs. Insight promotes a partnership with our contractors, rather than policing them and allows for more effective use of government resources.

Bottom Line

Oversight- *"Show me your product is good"*

Insight- *"Show me your system consistency produces good products"*





Brad Johnson
Quality Assurance Engineer-SME
Office: 256-961-0482
bradly.johnson@nasa.gov

QUALITY
LEADERSHIP FORUM

THANK YOU!

Upcoming Webinars

- Aug. 20, 2026 – QLF Virtual Series: COSMIC
- Oct. 2026 – QLF Virtual Series: Fatigue
- Dec. 2, 2026 – QLF Virtual Series: IMAP Lessons Learned

Please visit https://sma.nasa.gov/sma-disciplines/quality/qlf/virtual-series for upcoming virtual events