



Next Generation Identification (NGI)
Engineering Change Proposal (ECP)
Biometric Modification #3
Interstate Photo Capability

Version 2.0
Final
October 20, 2011



NGI-ECP-TS-0004-2.0

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CDRL NGI-51
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Signature Page

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Change Page

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1.0	Initial draft	SMR	08/12/2011	See Signature Page
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PREFACE

This Engineering Change Proposal (ECP), Biometric Modification #3, was prepared by Lockheed Martin Corporation (LMC) for the Federal Bureau of Investigation (FBI) Criminal Justice Information Services (CJIS) Division Next Generation Identification (NGI) Program Office.

This ECP conforms to Data Item Description (DID) NGI-51. Traceability to the DID is documented in Preface Table 1-1.

This ECP is requested in a letter (*COL-2011-0020, Request for NGI Interstate Photo Capability Biometric Modification*) from Michael Young to Barbara Koenig dated April 12, 2011.

Preface Table 1-1: NGI DID Traceability Matrix

Para No.	DID Paragraph Title	Document Section
10.2	Content Requirements: ECP Figure 1	Figure 1-2: ECP Summary per DID-51

Preface Table 1-2: Statement of Work (SOW) Compliance Matrix

Para No.	SOW Text	Document Section
3.3.3.1 Biometric Search Analysis Studies	Except as specifically described in Paragraph 3.3.3.2 below and unless otherwise directed by the CO, the Contractor shall prepare a Firm-Fixed-Price Engineering Change Proposal [CDRL NGI-51 Engineering Change Proposal] to incorporate the Commercial Off-The-Shelf (COTS) hardware, software, and Original Equipment Manufacturer (OEM) maintenance price associated with the implementation of the selected solution set into the NGI System.	All sections of this document

Preface Table 1-3: ECP Request Compliance Matrix

Item	Request Text	Document Section
Reasonable Facial Recognition Assumptions	The Facial Recognition System (FRS) solution should be sized as a single delivery to accommodate the FY15 workload volumes per the SRD Workload Tables version 4.1 p.	2.1.2.1 Workload
	FRS should exhibit accuracy against a large repository of enrolled frontal facial images consistent with NGI requirements SRS2246 when tested against frontal facial photos whose quality is consistent with FBI data used for NIST MBE testing.	2.1.2.3 Accuracy
	Since SRS2246 states that the correct candidate is in the top 50 candidates, no false match requirement is required. Accordingly, SRS2247 which establishes a 20% false match requirement will be deleted.	2.1.2.4 Removed and Modified Requirements
	NGI requirements for Unsolved Photo File (UPF) (SRS2252) and SPC (SRS2255) accuracy were not tested by NIST MBE. The FBI expects these requirements will be affected by the quality of the images enrolled and searched in these repositories	2.1.2.4 Removed and Modified Requirements

Item	Request Text	Document Section
	Consistent with the Facial Trade Study recommendations, SRS requirements modifications will be required to specify the false match rate for UPF and SPC searches is no greater than 0.1 %.	2.1.2.4 Removed and Modified Requirements
Additional Topics Affecting the FRS Bio Mod	Human-Machine Interface (HMI) Implementation: LMC should assume that the facial search HMI needs will be met by the FBI's Universal Facial Workstation (UFW) which will be provided as Government Off-The-Shelf (GOTS) to LMC for incorporation into the NGI system. The remaining service provider HMI requirements currently on contract, and not subsumed by UFW functionality will continue to be developed by LMC (e.g. facial enrollment HMIs). LMC should propose procurement of HMIs necessary to manage and maintain the search engine from the facial recognition vendor. LMC should assess debits and credits for associated labor, hardware and software for the incorporation of the UFW. The details of the debit and credit will be determined and agreed to as a result of a joint working session that will describe how UFW is to be incorporated into the NGI facial solution.	3 Dependencies Discussions and actions regarding debits and credits are outside of the scope of the technical volume. Agreement reached in FBI Letter COL-2011-0035; dated August 8, 2011.
	Workstation Assumptions: The UFW Software will be provided to LMC for installation onto existing Advanced Technology Workstations (ATWs).	1.3 Assumptions
	Material Assumptions: LMC should identify and propose use of available hardware and software proposed/procured in previous Bio Mods, if appropriate (i.e., meets or exceeds technical requirements for this effort), before proposing additional hardware and software. In the event that this hardware and software is applied to Bio Mod 3 and is subsequently required in support of the originally intended effort then the FBI will either provide as GFE or initiate a change proposal.	1.3 Assumptions
	Vendor Security Mitigation (VSM): Due to the pending acquisition of the biometric vendor, LMC should assume the Facial Recognition solution will be subject to the post-IOC approach utilizing object code scanning that was proposed in Bio Mod 1, Part II. The FBI requests these costs to be separable from the base solution in the event that the biometric vendor is exempt from this strategy.	4 VSM
	Capacity Analysis Technology Refresh: LMC is expected to consider capacity expansion for Facial Recognition as part of its annual support to the FBI for identification fingerprint capacity analysis proposed in Bio Mod 1, Part II. No additional support labor is anticipated for capacity analysis specific to Facial. Technology refresh of the Facial Recognition solution should not be included, rather it should be assumed to be covered by one of the annual capacity analysis activities. LMC should further assume that no updated facial biometric vendor software delivery shall be included prior to Full Operational Capability (FOC).	3.3 Performance

Item	Request Text	Document Section
	<p>Licensing: The FBI is interested in evaluating the value of different licensing options for the Facial COTS product relative to the cost. LMC is requested to share with the FBI the terms for an unlimited license. The FBI then expects to collaborate with LMC on a strategy to obtain licensing terms from the preferred biometric vendor at a cost commensurate with the value beyond the base solution sized for 2015. We do understand that part of exploring unlimited licensing will include collaboration to define reasonable constraints and thresholds that could help control the cost of this strategy, such as an upper bound on future workload expectations.</p>	6 Licensing
	<p>GFx: The FBI anticipates LMC to submit GFx requests for, but not limited to, the following items in support of the FRS Bio Mod:</p> <ul style="list-style-type: none"> - UFW Source Code UFW Documentation determined appropriate and necessary, by the FBI/LMC team, for the successful integration of the UFW software. UFW Test Artifacts that are determined appropriate and necessary, by the FBI/LMC team, for the successful integration of the UFW software. 	3 GFx Dependencies
	<p>L-1: The FBI would like to evaluate an option of having the L-1 SDK delivered, upon definitization of the L-1 contract, for temporary use in the FBI Proof of Concept Pilot. To assist in the FBI evaluation, LMC is hereby directed to solicit information from L-1 regarding the satisfaction of this request. If it is determined that satisfaction of the request would result in an increase to the L-1 cost proposal, then LMC is requested to provide this cost impact as a separately priced option within the BIO MOD 3 proposal.</p>	N/A Discussion and implementation can be found in the Cost Volume.

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1 PROPOSAL INTRODUCTION

1.1 Proposal Summary

Lockheed Martin Corporation is pleased to provide this proposal to add facial search functionality to the NGI system. This represents the next modality in NGI's approach to increase the FBI's biometric capabilities through the addition of best of breed Commercial Off-The-Shelf (COTS) products for each modality. This functionality is based upon a major COTS-based capability, namely, creating and searching repositories of facial photos which will be integrated into the existing NGI framework.

The facial search capability is provided by the Automated Biometric Identification System (ABIS[®]) Search Engine (SE) Facial Recognition System (FRS) from L-1 Identity Solutions (L-1). L-1 was selected based on the demonstrated performance of their product during the Face Trade Study.

Facial HMI capabilities are not included as part of this proposal as they are being provided through incorporation of the Government Off-The-Shelf (GOTS) Universal Face Workstation (UFW) solution being developed by Noblis under a separate contract, not specific to NGI. The UFW solution includes the client side UFW HMIs and the server side UFW Biometric Integration Platform (BIP).

Figure 1-1 depicts an overview of the NGI facial solution, which incorporates UFW's HMIs and case management and L-1's FRS. The figure also shows the primary interface means for each. UFW will exchange enrollment and search requests/responses and receive unsolved notifications through Electronic Biometric Transmission Specification (EBTS) Extensible Markup Language (XML) messages, much like an external authorized contributor using UFW, but without having to go through the CJIS Wide Area Network (WAN) and firewalls. Additional interfaces will expose NGI configuration information to UFW, such as the list of Special Population Cognizant (SPC) groups, which is needed by Face Examiners to formulate accurate enrollment and search requests. An NGI-developed Java Message Service (JMS) to Simple Object Access Protocol (SOAP) Adapter will translate between NGI's native JMS messaging interface and the FRS COTS' SOAP-based interface. Both products operate within NGI's Common Operating Environment including the Red Hat operating system, hardware platforms, networking, enterprise storage, backup/restore, and systems administration tooling.

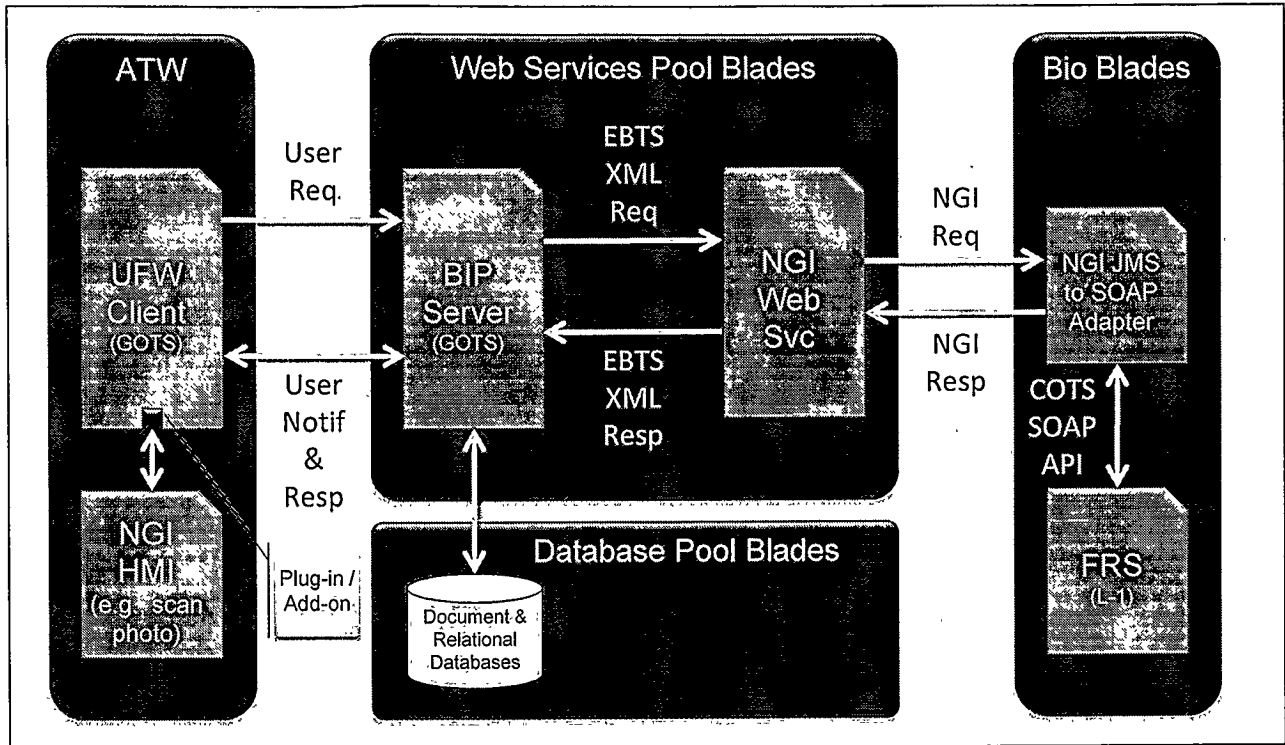


Figure 1-1: NGI Facial Solution Overview

As directed in the ECP Request Letter, this proposal includes the Vendor Security Mitigation approach that has been implemented on NGI post-Increment 1 Initial Operating Capability (IOC). This approach is described in Section 4 and is consistent with the approach proposed in Bio Mod 2.

Figure 1-2 provides an ECP Summary in tabular form per DID-51.

ENGINEERING CHANGE PROPOSAL		DATE PREPARED: October 20, 2011	ECP NO. NGI-ECP-TS-0004	PROCURING ACTIVITY NO.	
1. ORIGINATOR NAME AND ADDRESS: Lockheed Martin, 9211 Corporate Boulevard, Rockville, MD 20850					
2. SPECIFICATIONS AFFECTED			3. DRAWINGS AFFECTED		
MFR CODE:	SPECIFICATION/DOCUMENT NO.:		MFR CODE:	NUMBER:	REV:
	N/A			N/A	
4. TITLE OF CHANGE: Biometric Modification #3			5. CONTRACT NO.: J-FBI-08-041		
6. CONFIGURATION ITEM (CI) NOMENCLATURE: N/A			7. IN SERVICE: ___ YES <input checked="" type="checkbox"/> NO		
8. NAME OF PART OR LOWEST CI AFFECTED: N/A			9. CI IMPACTED: N/A		
10. DESCRIPTION OF CHANGE: Facial Recognition Search COTS-based solution					
11. NEED FOR CHANGE: Incorporate product selection for FRS based on the trade study results					
12. EFFECT ON ASSOCIATED EQUIPMENT: New equipment to support the selected product included in this ECP.					
13. PRODUCTION EFFECTIVITY: N/A			14. DEPENDENCIES: Facilities for equipment at FBI locations, Network infrastructure, Enterprise storage, Facial HMI		
15. ESTIMATED DELIVERY SCHEDULE: Refer to associated Integrated Master Schedule (IMS) delivery					
16. ESTIMATED OPERATIONAL CUT-IN SCHEDULE: Refer to associated IMS delivery					
17a. SUBMITTING ACTIVITY AUTHORIZING SIGNATURE:				17.b. TITLE:	

Figure 1-2: ECP Summary per DID-51

1.2 Description of Work

The focus of this Bio Mod is the implementation in Increment 4 of a COTS-based facial search solution built around L-1's product, which was selected based upon the results of the Face Trade Study. The primary elements of the Bio Mod are the facial search product, the supporting software upon which the facial search product depends or which are necessary to integrate into NGI's system infrastructure, and the blade servers and chassis needed to host the software.

Hardware and software for the facial search solution will be deployed to CJIS's Operational Environment (OE) and Non-operational Environments (NOEs) in Clarksburg and LMC's development and Integration and Test (I&T) labs in Rockville and Fairmont. The hardware is sized to Fiscal Year 2015 (FY2015) workload volumes and described in Section 3.7. The facial search solution is discussed in detail in Section 0.

The VSM approach for biometrics products will, as directed by CJIS's ECP Request Letter, comprise the Object Scanning Approach proposed in Bio Mod 1 Part II. It will use a multi-layered security approach where CJIS is responsible for Object Scanning and Analysis. The primary LMC VSM work included in this proposal is relative to the initial validation of the biometric vendors' build environments (Golden Disk) and assisting the biometrics vendors in creating a debug build for Object Scanning consistent with the requirements of the Object Scanning tool. The VSM solution is discussed in detail in Section 4.

The GOTS UFW solution (includes HMI and server side components) will be integrated into the NGI system, hosted on NGI hardware (ATWs and blades), and using CJIS enterprise network, storage, and backup/restore solutions. LMC does not intend to modify the source code for UFW in any way, preserving the Government's ability to accept future releases from Noblis containing fixes and/or enhanced functionality without having to re-apply NGI-specific modifications. Extensions to the GOTS level of functionality will take advantage of UFW's plug-in architecture and/or other documented APIs. Through ongoing working level technical meetings with CJIS, Noblis, and LMC, these interfaces will be defined, refined, and if necessary extended to completely address NGI's functional requirements. UFW's primary interface with NGI is EBTS XML messages, which for example support enrolling unknown subjects, searching the FRS repositories, receiving search results, and delivering unsolicited notifications of hits against the Unsolved Photo File (UPF). LMC will integrate the UFW solution with NGI's security, management, monitoring, deployment, build, and Configuration Management (CM) solutions.

1.3 Assumptions

This section documents the key assumptions that form the basis for this Bio Mod. Some assumptions will include references to other sections of the document where additional detail or background information is provided.

1.3.1 General Assumptions

1. Maintenance is priced through September 2014, after which the FBI assumes the maintenance costs.

1.3.2 Search Assumptions

1. Accuracy testing and quality recommendations are to be based upon frontal data only, which is consistent with the NIST testing.
2. The system may accept a non-frontal image as a search probe (or any other image that has quality characteristics less than any recommended), though the accuracy would likely be below stated requirements. At this time, full profile images are not expected to yield match results.

1.3.3 VSM Assumptions

1. No allowances are made for critical security findings resulting from the analysis of the code such as a finding that prevents us from continuing to use the biometric product in the NGINet, NOEs and OE. Critical is defined as any finding which results in FBI direction to remove a software release, close network access, or halt development.

2. The security risk and vulnerability analysis is determined to be complete for a particular version of the product once the object code analysis tools have been run, analysis of the identified potential risks/vulnerabilities has been conducted by CJIS, and the risks/vulnerabilities are determined by CJIS to be acceptable.
3. The FBI accepts that the security mitigations put in place through the VSM activities leveraging object code analysis provide a sufficient level and rigor to satisfy those risks and will be treated separately from the Certification and Accreditation (C&A) requirements for FRS. Vulnerabilities found in FRS code through object code scan will not be used to withhold C&A.
4. The purpose of the VSM activities is to identify vulnerabilities which indicate "malicious intent." Neither LMC nor the biometric vendor has an obligation to correct other security vulnerabilities identified. Such vulnerabilities will be reported to the biometric vendor and handled per their commercial practices.
5. In lieu of an LMC Security Liaison, the FBI will provide a liaison to participate in the object analysis activities.
6. Subsequent to the delivery of FRS to the NOE or OE, should "patches" be required on an expedited basis, CJIS will support the special exception process in order to mitigate schedule impact.
7. The additional software license costs do not include support for the "upon request" requirements to support analysis of warnings generated by the object code scanning or to load temporarily the source on the CJIS Vulnerability Analysis Lab (VAL).
8. The biometric vendor has assumed one FBI audit of its secure build environment is performed per increment.
9. Once object code analysis is complete, CJIS shall review and disposition the identified risks/vulnerabilities within 1 week so as not to impact the Inc 4 schedules.
10. No provisions are provided in this Bio Mod for Object Scanning of the UFW.

1.3.4 Facial HMI Assumptions

1. The Facial HMI will be provided by the UFW and will be provided to NGI as a GOTS solution.
2. LMC assumes that the NGI requirements discussed in the May 30th, 2011 meeting with CJIS, Noblis and NGI will met by the UFW in accordance with the Inc 4 schedule. See Appendix A for complete list of requirements.
3. LMC assumes that the Services, Evaluation, and Analysis Unit (SEAU) will retain responsibility for managing and tasking Noblis. Any interaction between Noblis and LMC will be coordinated through the NGI Contracting Officer's Technical Representative (COTR).
4. LMC assumes, similar to other GOTS/COTS solutions, the Increment 4 design will focus on the interface to the GOTS HMI solution and not the internal workings of the provided solution.

1.4 GFx Dependencies

This section documents Government-Furnished Action/Information/Equipment (GFA/GFI/GFE) dependencies on the FBI for facilities, systems, resources (people or materials), and data needed to successfully deploy the capabilities described in this Bio Mod with the corresponding needs dates. GFx process will be followed for all GFx requests, including consideration of time constraints (i.e. installation time, procurement time, board approval, etc.).

Table 1-1: GFx Dependencies

Artemis Identifier (ID)	Item	Source	Rationale for Need
G3-0190-0001	Facial HMI	FBI	The Facial HMI will be provided by the UFW as a GOTS solution and delivered per the Inc 4 development schedule
G3-0234-0258	NOE assets for System Acceptance Test (SAT)	FBI	System acceptance at FBI facility
G3-0234-0438	Power and cooling for new hardware at Clarksburg	FBI	FBI responsible for providing power and cooling
G3-0234-0438	Network bandwidth and connectivity for new hardware at Clarksburg	FBI	FBI responsible for providing network
G1-0225-0363	Primary and secondary storage	FBI	Table 3-2 lists the sizes of Enterprise Storage Area Network (ESAN) Logical Unit Number (LUN) volumes per server-type in the FRS.
G3-0190-0003	Data for UPF testing	FBI	We request the FBI provide us a minimum of 12,000 unsolved facial photos representative of the type and quality expected to be enrolled in the NGI UPF

1.5 Risks

Risk Management (RM) is both event driven and continuous in nature, and occurs throughout the project life cycle. The NGI Project team's risk management process couples risk with schedule and cost to provide a complete view of the complex relationship of schedule, cost, performance, and risk. The key elements of the RM process include risk identification, risk assessment/prioritization, response planning/execution, and risk control. NGI Project team members, NGI Project management, and the NGI Program Office share the responsibility or risk identification by reviewing plans, constraints, and requirements that could impact the project. Risks are assessed and prioritized in terms of their probability of occurrence and the potential impact of their occurrence. In order to ensure that the execution of the risk response plan becomes as straightforward and assured as execution of any other aspect of the project schedule, actionable response plan steps are incorporated into the Integrated Master Schedule (IMS). Risk Radar Enterprise[®] application serves as the Risk Register and the reporting mechanism and it is accessible via the NGI Portal.

The following subsections contain risks that have been identified for this Bio Mod:

1.5.1 General Risks

1. Eng_329 – If all Free and Open Source Software (FOSS) and COTS specified in this Bio Mod is not approved by CJIS after release from the LMC FOSS approval process, then additional costs and schedule impact will be realized to replace the FOSS/COTS.

Mitigation Plan

- a. Provide CJIS the FOSS/COTS list as part of the proposal to identify any FOSS/COTS at risk of approval or previously denied; this is included with the delivery package of this document under the file name *103 NGI-ECP-TS-0004-2.0 FOSS List.pdf*
- b. Request early identification by the Facial vendor of FOSS/COTS changes

1.5.2 Search Risks

1. Eng_333 – If the FRS UPF and SPC accuracy requirements cannot be achieved against representative operational data, then the UPF and SPC functions may not meet their operational need.

Mitigation Plan

- a. Acquire operationally representative test data from the FBI.
 - b. Perform lab tests to measure UPF and SPC performance against operationally representative data.
 - c. If the measured performance fails to meet operational need, meet with the FBI to discuss available trade-offs to improve performance.
 - d. Disposition (waive or modify) accuracy requirements as agreed to with the FBI.
2. Eng_332 – If the quality thresholds on the Facial Investigative File (FIF) gallery and facial searches have to be adjusted to accommodate poor-quality data, then the accuracy results and the size of the repository available for search may fail to meet operational needs.

Mitigation Plan

- a. Facial vendor to perform quality threshold testing to recommend thresholds for use on NGI
- b. Leverage the FBI facial pilot to evaluate quality thresholds and characterize the quality of the data
- c. Validate the quality thresholds as part of vendor testing against the trade study data
- d. If projected quality thresholds fail to meet operational need, meet with FBI to discuss available trade-offs

3. Eng_336 – If the bulk enrollment and data migration approach and design are immature, then the duration, complexity, and effort could be larger than the baselined plan resulting in cost and schedule impacts for testing and operational data loads

Mitigation Plan

- a. Coordinate with the Facial vendor to obtain prior customer bulk enrollment performance metrics
 - b. Hold design working groups with the facial vendor on data migration and enrollment functions prior to Critical Design Review (CDR)
 - c. Evaluate the bulk enrollment performance during the test lab setup effort
4. Eng_334 – If the Facial Pilot drives changes to the COTS ABIS[®] SE FRS product, then there may be a schedule and cost impact associated with the COTS product delivered to NGI.

Mitigation Plan

- a. Work with CJIS to understand any potential changes
- b. Review any potential changes with L-1 and clearly understand potential scope impact
- c. Work with CJIS to define impacts and alternatives

1.5.3 VSM Risks

1. Eng_337 – If object code scanning takes longer than expected or produces insufficient outputs, then schedule delays and associated costs will be incurred to perform the necessary analysis to validate the vulnerability posture of the biometric COTS product.

Mitigation Plan

- a. Complete “pre-flight test” of object scanning service using an early delivery of existing Facial object code
 - b. Execute an Early Object Scan and review object scan output with CJIS
 - c. Implement process changes to reduce object-scan timelines
2. Eng_338 – If the Object code analysis tool has issues with analyzing the L-1 code, then there may be a schedule impact due to either L-1 making changes to their code or Object code vendor making fixes to the analysis tool.

Mitigation Plan

- a. Conduct Early Scans
- b. Work with L-1 and Object code vendor to resolve issues

1.5.4 Facial HMI Risks

1. Eng_335 - If the UFW implementation deviates from the agreed to implementation, then integration with NGI may take longer than planned causing both schedule and cost impact.

Mitigation Plan

- a. Review UFW design issues at existing CJIS/LMC meetings
- b. Manage changes through the existing process
- c. Hold regular technical interchange meetings
- d. Clearly identify scope of UFW vs. NGI custom HMIs developed by LMC

1.6 Opportunities

1.6.1 Bill of Materials

This section documents opportunities to leverage existing infrastructure to reduce required hardware for this Bio Mod.

1. EngOp_341 – If NGI can use available IdFP blade chassis slots in NOE2-5 environments, then there would be a reduction in the number of new chassis required for this Bio Mod.

Plan

- a. CJIS to consider alternatives as part of the modification comment cycle