

MARSOC Automated Armory CE		
MASTER Current Limitations and Ways to Overcome		
Team	Current Limitations	Ways to Overcome
Red	Excel	Form based U/I, human input, ingestion of excel files
Red	Non legible IDs	Optical Scans
Red	Dense packing	Storage
Red	# of total items	Storage
Red	Theft	Storage and audit traceability
Red	Diversity of items	Storage
Red	Human Error / Data Entry	Fuzzy matching/Automated and machine learning component
Red	No RFID	Sounds good/etched QR codes
Red	Varying Deployment Envs	Only tracking items inside and issued out of armory, not in the field
Red	Serialized vs Non-serialized	Prioritizing High Value Assets vs manual inventory items
Red	Readability of serialized weapons w/o RF	
Red	QR coded security issues on the assets	
Red	Lacking tech to track inside and outside equipment	Only tracking items inside and issued out of armory, not in the field
Red	Secure fac vs remote	Only tracking items inside and issued out of armory, not in the field
Red	Paper form vs manual audit	Software organization, form generation based off the database
Red	Physical validation of receipt and return	Software organization, form generation based off the database
Red	Silo'd data	
Red	Limitations of audit of records	Establishing database and chain of custody records
Red	Connectivity of cyber requirements	System has to meet organizational requirements
Red	Steel infrastructure or harsh metal environments	Not using RFID or NFC
Red	Interoperability of units or other branches	Garrison assets first, then branch out
Red	Throughput cycle time for issue & receipt	Automated issue and receipt system that does not require manual form generation
Red	Web-based requirement (Req not limitation)	
Red	Re-serializing (ie Upper receivers)	Adaptable database to bring in new gear and take out old equipment
Orange	Pen and paper only	OCR
Orange	Data loss	user training of new platform
Orange	Mismatching and nomenclature standardization	automation
Orange	Time consuming	install hardware - HD cameras
Orange	Manual entry into excel sheets	CAC auth built into software
Orange	Limited authorization	API ingestion
Orange	Lighting/visibility of all items	service level agreements
Orange	Lack of AI/ML trained on items	singular system of record
Orange	Cloud restrictions	appropriate lighting to see serial #s
Orange	Networking restrictions (lack of wifi)	unique identifier
Orange	External integration (GCSS, property book, etc)	consideration for material type
Orange	Differences in native marking on systems	automated data analysis and metrics tracking
Orange	Difficulty with applied labels vs etched, durability	\$\$\$\$\$\$\$\$
Orange	Lack of other data on the end items	CAC associated equipment issue
Orange	<u>Conformity with Marine Corps Arms Room Regulations</u>	location identification within armory
Orange	Location control, i.e. where is a particular item	Maintenance tracking, i.e. when a weapon goes to Depot or other locations
Orange	Facility Limitations, or flexibility with changes in the future	edge-deployed network
Orange	<u>Storage systems optimizing for space vs ease of inventory</u>	
Orange	No active RF emissions or signatures (what does active mean)	

Orange	Differences in requirements for class vs individual tracking (i.e. magazines vs rifles)	
Orange	Policy/Governance limitations vs technology limitations	
Orange	Variety of deployment scenarios (home base, shipboard, deployed, etc)	
Orange	Deployment infrastructure (cloud vs on-prem vs local app)	
Orange	Ability to detect either negligent or unauthorized activities	
Orange	The solution being bespoke vs generalizable changes the TAM	
Yellow	Serialized vs non-serialized assets	'Eye-in-Sky' computer vision + human checkout
Yellow	How to capture the serialized items	Use perpetual inventory + cycle counts
Yellow	Lacking technology to track items outside of their govt issued equipment	Instead of EiS, use camera at issue window
Yellow	availability of equipment in the field	Automated racking systems
Yellow	in a secure facility vs deployed and remote, lack of connectivity	Store/issue/return equipment by soldier/kit, not by same item
Yellow	Paper forms/manually auditing	Using manual kitting, custom data workflow system instead of Excel
Yellow	physical validation of receipt and return	Same, but with computer capture of serial number
Yellow	Siloed data	Digital signatures
Yellow	limitation on editability and auditing of records	Paperless for individual soldier
Yellow	type of connectivity and cybersecurity requirements	Fully auditable
Yellow	readability on serialized weapons without RF technology and no emissions	If deployed, manual sync method
Yellow	QR coded security issues if they are on assets, and their ability to stay on assets	Adjust storage so that every item would be visible to EiS.
Yellow	Steel infrastructure/industrial and harsh metal environments	
Yellow	Interoperability with other units and branches	
Yellow	Ability to put cameras in armory	
Yellow	Use of CAC for digital checkout/validation	
Yellow	Edge deployed hardware/software system doesn't exist	
Yellow	Security of assets/files	
Yellow	Sourcing of hardware (domestic vs foreign)	
Yellow	Inter-unit swap/change of packouts	
Yellow	Duplicate issuance to same user / Inaccuracies / human error	
Yellow	Funding/color of money	
Yellow	Inability to scale	
Yellow	Current physical card/print file storage	
Yellow	Change management / deployment of updates cross MARSOC	
Yellow	Accountability for lost/missing armor/munitions	
Yellow	Inefficiencies / time consumption	
Yellow	Audit trail	
Yellow	There is no full DB of all serial numbers per garrison/cage/unit	
Yellow	Outages (power, network)	
Green	Paper-based Process	Digitized paper forms need to be incorporated per policy; no requirement to actually print
Green	Two-times a day manual inventory reconciliation - error prone process	Networked locks to limit reinventory periods
Green	No system interface	Locally stored data (dependent on FOB, security environment)
Green	Lack of standard identification on piece of equipment	Rigorous training of ID recognition to account for varying ID formats
Green	Hand generated reports/scanning of equipment card	Machine vision could help reduce time for inventory and amount of reconciliation that needs to occur
Green	No way to account for future maintenance requirements	Modular/upgradeable system software to account for newly issued maintenance requirements and/or hardware
Green	Time consuming to issue and receive back equipment - leads to long lines	See line 4
Green	2x a day Inventory reconciliation time consuming - takes 4-6 hours	See line 4

Green	Cannot use RFID/radio/Wifi/etc. signature-based inventory accounting	Passive and durable IDs (optical)/codes can still be implemented instead of QR codes, etc. Introduce reference database for comparing damaged serial numbers, etc. to provide "best guess" with validation
Green	Individual Marines must wait in long lines after long missions - degrades readiness	See line 4
Green	Storage based on manual inventory count needs - not on efficiency for issuing equipment by Marine	See line 4. Solution could identify items to be issued for easier issuance process
Green	Marine Corps policy is rigid - inventory innovations must align with current policy requirements	Solution must stay within existing policy - examine DCIL regulations to understand limitations and advocate for change
Green	Facility limitations - small building with limited inventory or additional space for more efficient storage	Should recognize equipment stored in varying configurations. Potential for governance/policy standardization on storage?
Green	Cage access limited to only one custodian	Policy issue, not in scope. Issuance/recieving process affiliated with system should be able to be operated by one custodian
Green	There is no continuity for equipment tracking from armory to armory	Development of standardized data management system accross different units, locations, etc. Allow for exporting of previously stored local/isolated data when available. Integrate with GCSS?
Green	standard comms service not available/ dead spot	See line 17
Green	associated items and assembly	Recognition of subcomponents in various configurations to track independently
Green	mobile armory compatible?	See line 17. Allow for locally stored data with intermittent transmission
Green	inter armory v. intra armory to cmd. visibility	See line 17
Green		Solution must be able to scale for adoption by broader USMC and beyond
Blue	Manual Entry	Automated - OCR
Blue	Loss of records	Cloud based storage of data
Blue	Time consumption	
Blue	Duplicate Issue	Correlation vs GCSS
Blue	Serial decals worn out	Etched ECC200 Dot matrix
Blue	Loss of physical assets	
Blue	Site to site syncing	Azure Cloud
Blue	File storage	Azure Cloud
Blue	Human Error (reading and writing)	
Blue	Lack of redundancy	
Blue	Absence of checks and balance	
Blue	Single point of failure	
Blue	Document generation	3rd party doc gen api
Blue	No metrics or analytics	analytics platform
Blue	Manual chain of custody	Automation solves this
Blue	Large user base	Scalability/Integration w/MARSOC current LDAP
Blue	Limited/no ability to plan	
Blue	Lack/absence of accountability	
Blue	physical / digital organization	
Blue	Limited visibility of transparency	
Blue	Limited [in transit] visibility	
Blue	Limited Omission	
Blue	MX	separate system/nonissue
Blue	Anomaly detection	
Blue	Automation	
Blue	Crypto proof / security	
Blue	Inability to leverage AI to support workflows	
Blue	Innovation and integration	

Blue	Scalability (field extension)	
Blue	Lack of connectivity	
Blue	Secure environment limits camera usage	
Blue	No training/reference data	
Blue	API/database integration	
Blue	No HIL	
Blue	Disparate deployment environments (DDIL, etc)	
Blue	Varying compliance standards depending on items	
Blue	Independently verifiable proof bundles	
Blue	DoW/MARSOC standard compliance	
Blue	Upgradeable future state	
Blue	Manageable error threshold	
Blue	Environmental considerations	
Blue	Need for streamlined data visualization	
Purple	Highly manual process / Human Error	Use computer vision to identify equipment which results in standardized data
Purple	Many like items	Tag major pieces of equipment and use computer vision to link accessories
Purple	Requirement for speed	Implement automated data capture and updates to data on the equipment (status, location, etc.)
Purple	Accuracy vs speed	Create bare bones mobile solution that can be used in the field to quickly capture equipment status after movement in the field
Purple	Maintenance and Prev Maint	Capture historical data and equipment status to develop predictive maintenance estimates
Purple	Property Book operations?	
Purple	No active error checking	Replace paper cards with standardized labeling and digital solution that can read in label data
Purple	Detecting unauthorized / irregular events	Use dashboard to capture information and current status of each piece of equipment. Can identify if wrong piece is returned or someone tries to check out same item twice
Purple	No active transmission for solution	Use rubee magentic technology can be non-detectable or within 15 feet (in use by USAF, USCG, other countries)
Purple	RE computer vision: particularizing / identifying individual pieces of equipment	
Purple	external integrations (i.e. GCSS, WDP), also see property book line	
Purple	Locations where this system would be deployed, DDIL, etc	Could develop ATAK hand-held solution to handle in the field operations
Purple	Hosting: on-prem vs cloud	Create solution that uses cloud infrastructure with offline, mobile, and edge connectivity
Purple	Does this include munitions/explosives, e.g. HERO certification	Use of Army system to track munitions
Purple	Does this solution conform to MC regulations on arms room operations	
Purple	Records audit	Create a single integrated database of all equipment and build in relationships
White	Scalability	Deploy local on edge test/validate, scale on MARSOC cloud \ IL4/iI5 envs. Hardware, scanning infra, tagging, IDs
White	Requirement to Tag Every Asset	Non physical (CV capture/ingest/tag/flag), operator training, armory enablement with core tech (potentially optical, scan, etc.)
White	Line-of-Sight Requirements	Initial inventory. Using sub-cage Is to know unit is.
White	Initial Inventory - how?	NSN/desc pre filled into library/1st order models --> log/ingest asset match against --> rack it with armory set pre-config
White	CAC-integration	DISA approval with CAC access for checkout (ties back to line 6)
White	Forecasting Maintenance/Replacement	Configurable reporting and tracking
White	Storage/Re-racking	Physical redesign with visual tracking of assets from top-down (at least recommendations). RMR like items will still need manual count/input
White	Recommended Groupings/Associated Items	Approved pre-package libraries for use/adoption/adjustment at the cage level. System needs to be nimble enough for localized customization

White	Ties to Budget/Procurement - inventory levels	\$\$\$\$\$\$ ---> supplier/vendor/prime
White	Discrepancy annotation/approval process	System valiated/immutable SOR
White	Integration into other Services/COCOMs	Not in initial problem set/solution, but system needs to be standarized for future interoperability
White	Disconnected Capability	Air-gap / edge env solution to start, sync when connected
White	Tag / Serial #s Removed / Damaged	Part of Line 4 requirements, including redundant capture/tag/flag ingest process
White	Legibility, Number Recognition, Sloppy Penmanship	CV/AI has solved this, even as local on edge SLMs usin first order models/OCR recognition/normalization
White	Lack of Chain of Custody	System itself becomes the SOR/chain of custody via IDs/scans/CV --> persistent scans to accomidate change in weapon characteristics
White	No real time data / delay in 'the count'.	Solved by system infrastructure
White	Dependencies beween components	I.e. Mortar, parent/child DB relationship. i.e. parent ID/signature/thumprint ties to child entities.
White	Tracing items at kit level	Temp version of LINE 19