TECHNICAL REPORT 2002-001

Single Integrated Air Picture (SIAP)
Lessons Learned
Version 1.2 (11 Feb 02)

FEBRUARY 2002

SINGLE INTEGRATED AIR PICTURE (SIAP)
System Engineering
Task Force (SETF)
1931 Jefferson Davis Highway
Crystal Mall 3, Suite 1109
Arlington, VA 22203

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FOREWORD

List of Contributors

The SIAP Lessons Learned Technical Report is the result of collective efforts of members of the SIAP Lessons Learned System Engineering Team (SET), who drafted the content of the report through several face-to-face meetings, teleconferences, and electronic mail exchanges spanning the period from August to December, 2001. The following individuals contributed to the report through their participation in either live or virtual meetings of the SET:

Mr. Luis A. Villalobos, SIAP SE TF (Chair)
David Berlin, USN/NSWC Dahlgren
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Larry Gloss, SIAP SE TF/SPA
Brenda Johnson, SIAP SE TF (Co-chair)
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EXECUTIVE SUMMARY

PROBLEM

The Joint Requirements Oversight Council (JROC) chartered the Single Integrated Air Picture (SIAP) System Engineering Task Force to "Focus initial efforts on identifying, prioritizing, and recommending fixes to the existing JDN deficiencies, while ensuring these fixes are on the path to an effective SIAP capability." To achieve these objectives and develop recommendations to fix JDN deficiencies, the SIAP SE developed an Implementation Plan (IP). The IP defines the specific activities that must be accomplished by the Task Force (TF) to facilitate the evolution of the Joint Theater Air Missile Defense Family of Systems (FoS) toward a SIAP capability. One of the principal activities of the Task Force defined in the IP is the rigorous analytical process to categorize, analyze, and assess all SIAP events of interest. A Lessons Learned Database will be a critical tool necessary to support the successful analysis process.

The SIAP SE TF plans to use the LL DB to support warfighter capability evaluation, requirements evaluation, and performance prediction. The LL DB will support root cause analysis (RCA) of events of interest gathered from selected exercises, HWIL, and OITL events of interest. Additionally, the SIAP LL DB will also leverage knowledge from previous activities such as: Joint Combat Identification Evaluation Team (JCIET) and the Joint Integrated Air Defense Systems Integrated Working Group (JIADS IWG); other tests, exercises and real-world operations; the Joint Composite Tracking Network (JCTN) study and related studies; Joint and individual Service sensor netting studies and analyses; and other sources of lessons learned. The information stored in the database will provide a basis or point of departure for future analyses and a source for the SIAP Capabilities and Limitations Document. Specific use of the LL DB to support efforts of the SIAP Analysis Team (SAT) is documented in the SIAP Integrated Assessment Plan (IAP), selected SAT test plans, and Data Management and Analysis Plans (DMAPs).

OBJECTIVES

The objectives of the Lessons Learned System Engineering Team (LL SET) were:

(1) Collect and consolidate an initial list of TADIL deficiencies, issues, and shortfalls and provide those that were jointly evaluated to the Prioritized Improvement List SET (PIL SET).

(2) Develop and implement an on-line capability that would serve as a database repository for these and future issues, deficiencies, and shortfalls. The LL DB will also serve as a knowledge source for status of the actions being taken to develop and implement the solutions.

(i.e., Capabilities & Limitations).

SCOPE

This Technical Report represents the initial LL SET deliverable documenting the plan, actions, findings, decisions, and initial conclusions and recommendations of the LL SET based on the requirements of the SIAP Implementation Plan (IP) and the LL SET Execution Plan (EP). Services were solicited for their top TADIL concerns and deficiencies.

This Technical Report also recommends the technical requirements for an initial database solution and a Plan of Actions & Milestones (POA&M) for integrating this repository capability into the SE TF process.

APPROACH

The SIAP team initially focused on the findings of the Joint Integrated Air Defense Integrated Working Group (JIADS IWG) and the Joint Mission Area Assessment Technology, Architecture, and Roadmap Splinter Group (JMAA TAR SG). Recurring deficiencies listed in these two reports became the starting point for building a consolidated list of lessons learned.

The LL SET also solicited input from service and agency representatives to ascertain the current state of the SIAP and the relevance of the deficiencies listed in the two reports mentioned above. These service and agency representatives assisted the SE TF in the consolidation of their respective lists of Link-16 and multi-TADIL "Top Ten" SIAP concerns and deficiencies. The resulting list consolidating the concerns, deficiencies, and shortfalls will support the planning and development of the LL DB.

The LL SET also identified a list of 14 DoD databases that stored relevant SIAP information thus narrowing the scope of the research to JCIET, JITC and Roving Sands databases in an effort to isolate system bugs, structural design issues, and TTP-related issues.

FINDINGS

The Services and BMDO provided a list of Link - 16 and multi-TADIL concerns and deficiencies. These correlated with many known deficiencies identified in the Dec 1999 JMAA TAR SG report and the June 2000 JIADS IWG report as well as the Roving Sands 1999 and 2000 reports. These deficiencies showed a high degree of commonality among the Services and BMDO. A summary of the deficiencies is provided in appendix C.

WAY AHEAD

The LL SET plans to pull the best ideas from established DoD databases to develop a tool for tracking SIAP related observations and issues. This prototype will serve as the basis for discussion of the database fields, data input, and desired report(s).

The LL SET should also evaluate the LL DB's potential for addressing the needs identified in CINC JFCOM's memorandum dated 7 Jan 2002 (appendix D), that is, provide feedback on the status of fix implementation and system data link capabilities.

CONCLUSIONS

Because of the high degree of commonality of these issues among the Services and BMDO, this list offers a credible starting point for the development of the Block 1 effort and refinement of Block 1 analysis priorities.

RECOMMENDATIONS

The Services and BMDO in collaboration with the SIAP SE should develop standards and procedures for the collection, sharing, and joint analysis of data from relevant open-air exercises and experiments to support SAT's root-cause-analysis and provide feedback on the implementation progress of system fixes.

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1. INTRODUCTION

The SIAP Implementation Plan states "The *SIAP Lessons Learned Database* will consolidate and leverage previous activities such as: JCIET and the JIADS IWG; other tests, exercises and real-world operations; the Joint Composite Tactical Network (JCTN) study and related studies; Joint and individual Service sensor netting studies and analyses; and other sources of lessons learned." Figure 1 below was extracted from the SIAP SE Implementation Plan, it summarizes the relationships and the products of the LL SET.

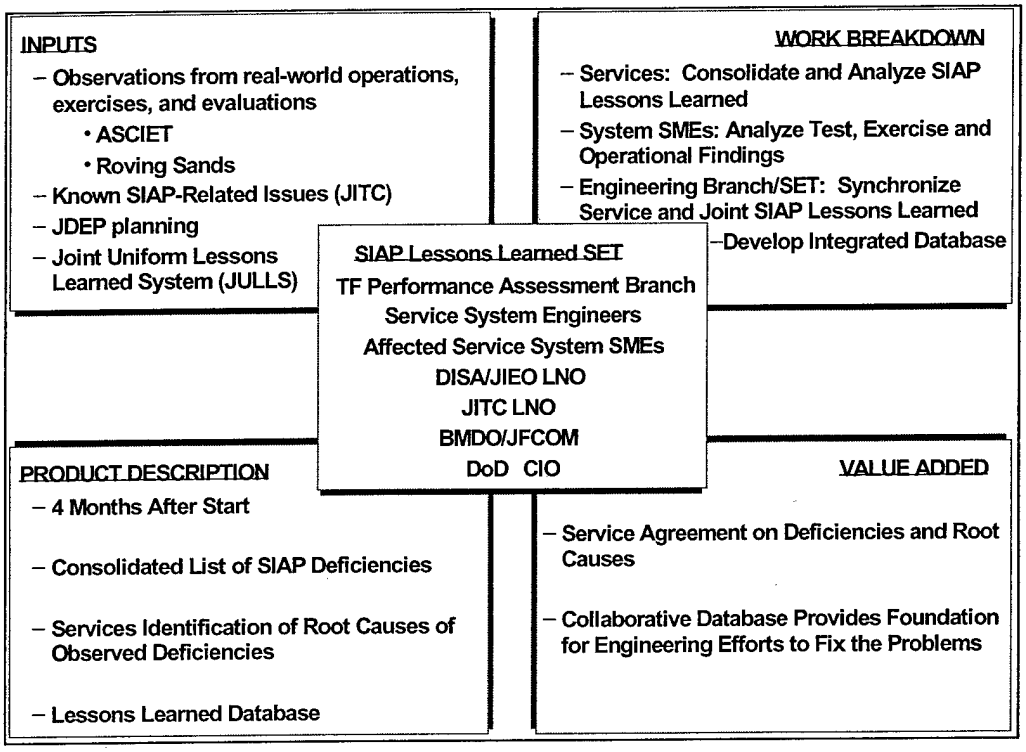

Figure 1. LL SET's Mission

The initial objectives of the Lessons Learned System Engineering Team (LL SET) were to (1) collect and consolidate an initial list of deficiencies, issues, and shortfalls and provide those that were jointly evaluated to the Prioritization Improvement List SET (PIL SET), and (2) develop and implement an on-line capability that would serve as a repository for these and future issues, deficiencies, and shortfalls. The repository also serves as a knowledge source for status of the actions being taken to develop and implementing the solutions to include interim workarounds (i.e., Capabilities & Limitations)."

The purpose of building a Lessons Learned Database was to centralize the collection of documented assessments from observed materiel deficiencies. By pooling this information the services could address the impact, frequency of occurrence, and other trend data to help focus SIAP SE TF objectives. This would support the development

of the SIAP SE Prioritized Improvement List (PIL), make available the objective evidence necessary to demonstrate the existence of pervasive structural Joint warfighting capability shortfalls, and support the development of the SIAP component of the system and technical views of the Theater Air and Missile Defense (TAMD) Integrated Architecture. The database would also support forensic engineering (aka root-cause-analysis) of observed deficiencies.

This technical report addresses the deliverable defined by the SIAP Acquisition Executive (Figure 2) due on 1 July 2001.

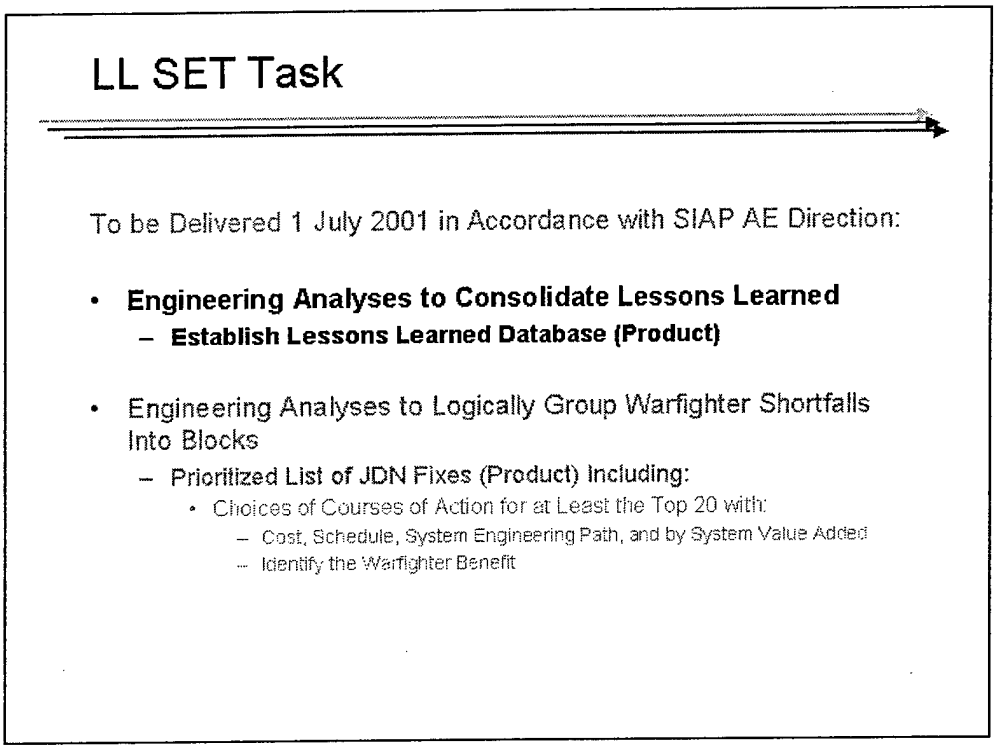

Figure 2. First SIAP SE TF Deliverables

The purpose of this product was to stimulate the SE process by providing inputs, which the TF would use to prioritize Block 1 candidates for analysis.

The SIAP Analysis Team (SAT) will use the LLDB as a critical tool in its various analytical venues. The SAT will support the planning, execution, and analysis (including root cause analysis), and reporting of SIAP-related test and evaluation events. The SIAP LL DB will act as a repository and enabler for comparing results from SIAP related live exercises/critical experiments, Hardware-in-the-Loop (HWIL), Operator-in-the-Loop (OITL), and other Modeling & Simulation (M&S) for the systems engineering decision making process.

2. APPROACH

The SIAP SE Lessons Learned SET membership included Services and BMDO representatives. These representatives served as liaisons between the SET and their respective organizations.

LL SET Membership:
Luis Villalobos (SIAP SETF - lead)
Brenda Johnson (SIAP SE TF - co-lead)
Jim Wylie, Dave Cunefare (Army)
Alvin Murphy, Pete Stafford, Dr. Gordon Whitnall, David Berlin (Navy)
MAJ Mades, Nelson Stewart (Marine Corps)
Dr. John Nordman, TSgt Craig Hayes (Air Force)
John Flynn (BMDO)
None assigned (JITC)

a. The SET initially identified the sources of Lessons Learned. A list of databases and agencies was compiled:

- JIADS IWG Warfighting Capability Shortfalls List
- BMDO BMC3 Issue Tracking Database
- DISA JITC JTAO Trouble Reports
- DISA JIEO ICP Data base
- NCTSI STIR Reports
- JCLL Library
- JCIET
- JNIC
- ROVING SANDS
- FOAL EAGLE
- CALL Library (Center for Army Lessons Learned)
- PMW-159
- Marine Corps Lessons Learned Database
- Navy Warfare Development Center

b. The SET narrowed the number of sources to scale down the amount of data it evaluated to meet the 6-month deadline set by the SIAP AE. This was accomplished by:

1) Considering those sources most familiar to the SET members. Of the sources listed above, Roving Sands, JCIET, and JITC offered immediate potential. The other sources would be addressed during the development of the on-line capability.

2) To further reduce the scope of the effort, the SET selected a timeframe that would maintain a balance between problems needing a solution and those already being addressed by the affected weapon systems. The SET decided

the reports from exercises and experiments starting in 1999 would provide such an appropriate balance while ensuring Service deficiencies were given due regard.

3) Finally, the SET needed to identify and define the data elements that were being collected or could be collected to support analysis by the SAT. These were derived from J-7's CJCSI 3150.01A, CJCS REMEDIAL ACTION PROGRAM, dated 1 November 1999 (Figure 3), and inputs from the Prioritized Improvement List SET (below).

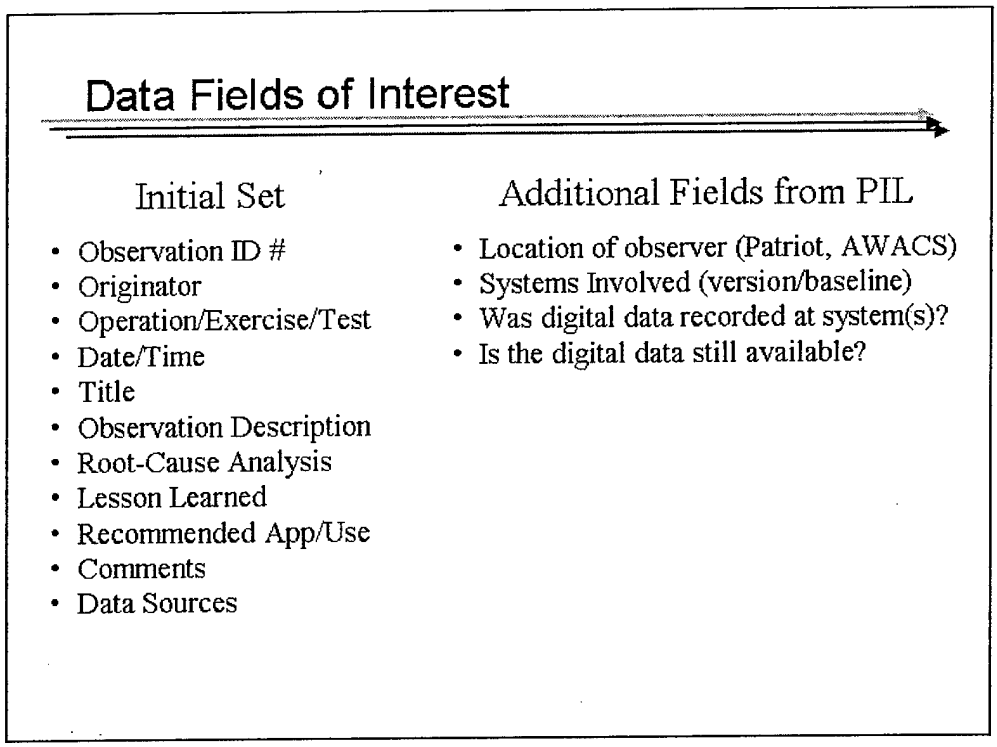

Figure 3. Database data fields

c. The SET developed the following tasks to ensure that all relevant data sources would be eventually identified, collected data would be provided, and that a process would be developed to sustain the above activities on a continuous basis. Key factors include:

1) Identify high-level sources of lessons learned and observation data associated with the aerospace picture and provide several (unclassified) samples of lessons learned records from that source using, as guidance, a SET-defined list of data fields (Figure 3).

2) Provide a cost estimate for providing access or delivering the data identified in Task #1 above (soft format preferable) to the SIAP SE Task Force by 12 April 2001.

3) Provide an estimate of any additional costs for maintaining the data of interest for the SIAP SE LL SET (Include supporting mechanisms and any configuration management required).

4) Provide a preferred method to establish a permanent agreement through which the SIAP SE Task Force would be able to access the database and extract data.

These tasks were included with the request for data sample to the sources selected in this round.

d. The estimate to complete the collection, consolidation, analysis, and sorting of the data exceeded the deadline of 1 July 2001 by several months. The SET evaluated and then adopted an interim approach to obtain an initial list of issues to feed to the PIL process and initiate the development of the on-line capability. This list of issues would be made from the Top Ten SIAP related issues from each Service and BMDO. [The term "Top Ten" in this report is used to describe this list as a relevant subset of issues irrespective of the exercise they were derived from and not to limit the Services or BMDO ability or willingness to submit additional issues] Once the issues were consolidated, the SET met to categorize them into the following bins:

- "Bugs" – specific system related issues usually caused by a failure to properly implement a requirement. "Bugs" are returned to the respective program offices for action.

- "Structural" – root-cause issues shared by two or more systems usually caused by improperly derived or omitted operational requirements. "Structural" Theater Air Warfare issues are forwarded to the SIAP SETF for prioritization, engineering analysis, and solution recommendations.

- "Tactics, Techniques, and Procedures (TTPs)" – issues identifying human error or faulty procedures as a possible source for the deficiency, including training. Clearly defined TTP issues must be returned to the warfighting community, i.e., JFCOM for action.

- "Non-repeatable" – these are issues not seen by anyone else or after review; they are impossible to replicate or analyze due to missing or wrong information.

The results of the LL SET analyzing and sorting the Services and BMDO "Top Ten" interoperability issues into these categories were provided to the PIL SET on July 13, 2001. These are listed in appendix A.

The Top Ten issues will help "prime the pump" for the SIAP SE TF analysis efforts (in lieu of hard analytical evidence), help capture recent developments missed by preceding studies, and identify key interest areas for qualitative prioritization.

e. The LL SET also collected the database data field elements identified in Figure 3 for each of the issues submitted by the Services and BMDO. This information will be the initial input used for the construction of the SIAP SE Lessons Learned Database.

3. FINDINGS

a. The SIAP SE TF developed a list of issues from the results of the JIADS IWG and JMAA TAR SG engineering analyses. This list encapsulated the known issues the TF needs to jointly resolve with the Services to define solutions that will result in the development and maintenance of the SIAP:

1. Data Registration:
   - Common Time Reference/Standard Issues

2. Track Quality:
   - PPLI Issues

3. Correlation/Decorrelation:
   - Consistency of Distributed Track Databases
   - Tracking/Track Management
   - TBM Reporting
   - TBM Data Association/Correlation
   - TBM EW Impact Point Prediction

4. Bandwidth:
   - Link 16 Throughput Issue
   - Multi-link Translation/Forwarding Issue

5. Engage on Remote (EOR)

6. Identification:
   - Combat Identification
   - IFF/SIF

b. The TF sorted the "Top Ten" interoperability issues under the above headings. The result showed the Service's "Top Ten" interoperability issues pointed to five issues already identified in the JIADS IWG and JMAA TAR SG reports. These were:

1) Data registration
2) Track Quality
3) Bandwidth

4) Correlation/Decorrelation
5) Identification

4. WAY AHEAD

To date there are no documented technical specifications for the database, nor "inch stones" along a proposed implementation path. Matching the technical specifications (data fields, data structure) of a proposed SIAP LL DB with those of the other services and agencies is expected to be a complex challenge for the SIAP SE TF. Securing a Secret Internet Protocol Network (SIPRNET) presence for a classified SIAP Lessons Learned Database will require an extremely deliberate and sustained effort.

Synchronizing and standardizing protocols and data fields among the various service and agency lessons learned sites (for a SIPRNET-based database) might well prove to be necessary and appropriate for the SIAP SE TF. In the interim, however, focusing initial efforts on clear and consistent technical specifications and on the development of a prototype database should be the first priority. This is definitely a crawl-walk-run approach, but it appears far more manageable given time and resource constraints. If this prototype database entirely (and only) supports SIAP events of interest (per the appropriate DMAP), it becomes a more focused and a far more realizable goal.

The LL SET plans to pull the best ideas from established DoD databases to develop a tool for tracking SIAP related observations and issues. This prototype will serve as the basis for discussion of the database fields, data input, and desired report(s). The clearest steps to achieve this are:

1. Define database requirements including: potential users, data fields, technical specifications, etc.

2. SIAP SE TF will use an existing tool or build an Access 2000 data management system (database). The data maintained by the system will consist of pre-defined fields common to the input sets provided by the SIAP Lessons Learned data sources. Data input and modification will be facilitated by a Windows-based graphical user interface. Users will be able to enter new lessons learned records, as well as view, modify, and print existing records. Users will also be able to perform simple, pre-defined queries on the data and view or print the results in report format.

3. Input Service and Agency Top Ten Lists.

4. Evaluate the Air Force Center for Knowledge Sharing of Lessons Learned program. This will help understand DB development issues and defining future SIAP Lessons Learned database interface requirements.

5. Provide technical documentation of the system as appropriate.

The LL SET recognizes that additional steps still need to be clearly identified to meet the objective of the SIAP SE LL DB. The definition of these should include those steps needed to address the void identified in paragraphs 4.a. and b. of CINC JFCOM memorandum dated 7 Jan 02 (appendix D). To address this void the LL DB should consider the following:

a. Developing a joint methodology to provide feedback to CINCs about the numerous Link-16 deficiencies identified during operations.

b. Tracking data link implementation and certification across all members of the TAMD FoS to ensure that "bugs" are being fixed.

c. Integrating knowledge stored in other databases to provide system data link capabilities to a community of users to support FoS configuration control, joint testing, and JICO planning.

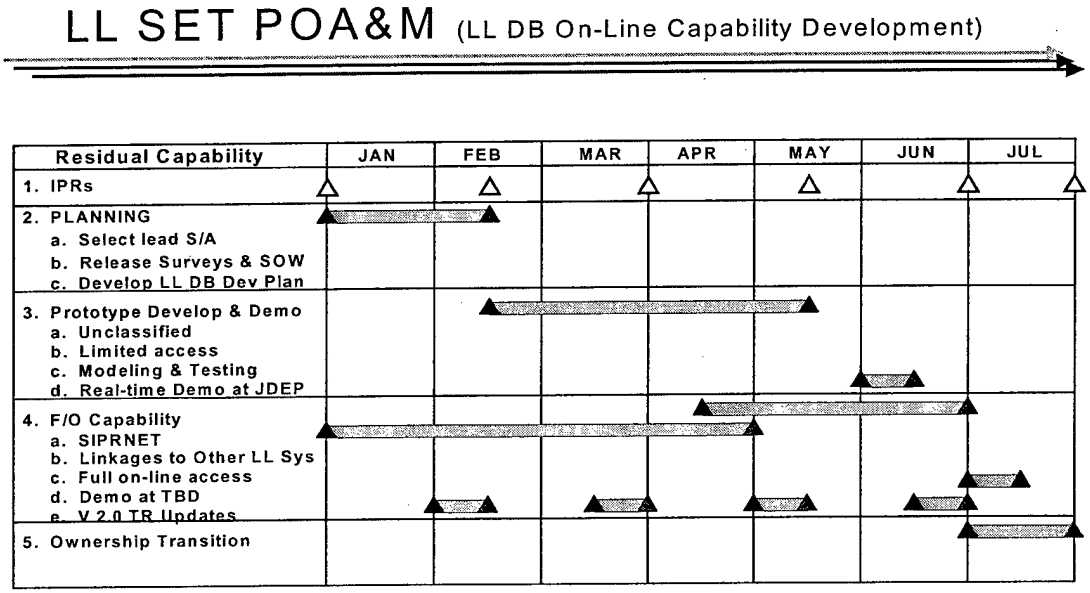

Figure 4. LL Way Ahead POA&M

Key Milestones and action items.

Milestones	Action Items
(D – Day)	SETF provides database functional requirements and data field definitions/descriptions.

D + 14	List of Database Fields. Presentation and discussion of database fields content and format.
D + 42	Prototype Demonstration. The prototype will be a working version of the data input screen (GUI). It will not be the final product but will serve as the basis for discussion of the database fields, data input, and desired report(s).

5. CONCLUSION

Because of the high degree of commonality of the issues among the Services and BMDO, the consolidated list of deficiencies offers a credible starting point for the development of the Block 1 effort and refinement of Block 1 analysis priorities.

6. RECOMMENDATIONS

The Services and BMDO in collaboration with the SIAP SE should develop standards and procedures for the collection, sharing, and joint analysis of data from relevant open-air exercises and experiments to support SAT's root-cause-analysis and provide feedback on the implementation progress of system fixes.

7. REFERENCES

SIAP SE Task Force Charter, 26 October 2000
SIAP SE Task Force Implementation Plan, 05 January 2001
JMAA SIAP TAR SG Report, 19 December 1999
JIADS IWG Warfighter Capability Improvement List, 5 June 2000
Lessons Learned Database Execution Plan of 5 June 2001

Appendix A Services/BMDO Top Lessons Learned Interoperability Issues for SIAP

	Services/BMDO Top Lessons Learned Interoperability Issues For SIAP				
ITEM #	**Interoperability Issues**	**SIAP Category Bugs/Struct /TTP**	**System Function**	**Root Cause Analysis Data Available**	**Comments**
Army-01	Evaluation of the ASCIET '99 and '00 data has shown that FAAD C2 had contributed to the dual tracks, which can be pinpointed to correlation. These anomalies occurred for two main reasons: 1) different track correlation box sizes between system's (e.g. PATRIOT's) and 2) tracks not correlating due to unstable communication links. As a direct result of these findings, FAAD C2 increased the correlation gate sizes for external tracks. When the correlation logic was originally designed, stable communication links were assumed. However, recent exercises have shown this to be an invalid assumption.	Structural	TC	Yes	
Army-02	MIL-STD-6016A identifies 7 (Friend, Assumed Friend, Hostile, Suspect, Neutral, Unknown and Pending). FAAD C2 maps these IDs into one of three (Friend, Hostile, Unknown) for graphical display. However, access to the JDN ID can be viewed via the ID Event History Table in the Message Menu Viewport. {*Consideration should be given to the operational impact of displaying all the seven different ID's to the Shorad gunner.*}	Bug	ID, Display	Yes	

Army-03	FAAD C2 automatically accepts IFF data (e.g., Valid Mode IV) from the JDN without re-interrogating. During ASCEIT, some "Hostile" aircraft were reported as "Friends" to the Fire Units. Analysis of ASCIET data indicated that track mis-identifications (i.e., erroneously declaring a Friend) occurred due to incorrect IFF associations with two (2) air tracks in close proximity of each other. FAAD C2 considers a Valid Mode IV, whether from a remote or local source, a true Friend (i.e., a high confidence event).	Bug	ID	Yes	
Army-04	The current design of FAAD C2 discards tracks received from JDN with the SPI bit set. Although FAAD C2 will receive the J3.2 SPI field, it will internally discard tracks requiring special processing per the FAAD C2 B5 (Software) Specification paragraph I.3.2.11.2.1.2.a.2. Note: This issue is being addressed, and will be resolved upon release of FAAD Version 5.3 (2002 timeframe).	Bug	ID	Yes	
Army-05	PATRIOT (version PDB-5) will set the exercise indicator of a track. The impact to FAAD C2 is that when FAAD C2 receives an exercise track on the JDN, it will display it internally as a Friend (true ID). If FAAD C2 assumes R2 on the track it will retransmit the exercise ID (e.g., Faker, Joker, etc.) that was received onto the JDN. Additionally, FAAD C2 will not contest exercise ID's; it will automatically accept any received exercise ID for retransmission purposes if R2 is assumed. The exercise indication and exercise ID of the track is displayed at the FAAD C2 ABMOC as supplemental track information amplifying the Friend identity	Bug	ID	Yes	
Army-06	FAAD C2 will correlate with a JDN track with a Mode II IFF except during manual correlation when the "reported" two different tracks have non-matching Mode II codes. Specifically, FAAD C2 will not allow manual correlation when a track has had two non-matching Mode II codes in TADIL-J.	Structural	TC	Yes	
Army-07	ABT Corr/Decorr ICP	Structural	TC	Yes	

Army-08	Formation Tracking/Formation Assessment	Structural		Yes	
Army-09	Joint standards for the coordination and exchange of target data suitable for engagement-on-remote	Structural	IFC	Yes	
Army-10	Consistent rules for space track (TBM) reporting and correlation in a debris environment	Structural	DT	Yes	
Army-11	Techniques to improve the bandwidth and/or efficiency of TADIL- J throughput	Structural	TS	Yes	
Army-12	More consistent and correct reporting of Track Quality for air and space tracks	Structural	DT	Yes	
Army-13	Improved gridlock and/or self registration to support Engagement on Remote	Structural	DR	Yes	
Army-14	Link 16 ID Difference Indicator is not properly implemented in AEGIS, E-2C, PATRIOT and E-3 (and possibly other systems) [SIAP WF Shortfall 00-027]	Structural	TC	Yes	
Army-15	AWACS sometimes does not relinquish R2 of a track to a JU reporting a higher TQ [SIAP WF Shortfall 00-020]	Structural	TC	Yes	
Army-16	Rules for joint service TBM engagement coordination to include lower tier-lower tier and upper tier-upper tier	TTP	Nav	Yes	
Army-17	Improve consistency and correctness of reporting by aerial surveillance sensors (e.g., TQ, raid size, height source, position)	Structural/Bug	DT	Yes	
Army-18	Patriot sometimes reverts track ID to pending upon assuming R2 and ignores future ID difference or CDO on that track	Structural	ID	Yes	
Army-19	AEGIS does not terminate all engagements it has reported on the data link {SIAP WF Shortfall 00-016}	Structural	TC	Yes	
Army-20	Lower-Tier - SHORAD Situational Awareness that provides sufficient information to assist with engagement coordination (e.g., J10.2)	TTP	ID	Yes	
NAVY-01	Improve Joint training	TTP	ALL	No	
NAVY-02	Correct system deficiencies	Structural/Bug	ID, DT, DR, TC	Yes	See Navy sub-categories at enclosure 1
NAVY-03	Improve airborne sensors	Structural	ALL	Yes	

NAVY-04	Provide positive ID on friendly A/C (PPLI, Saber, Mode 5, etc.)	Structural	ID	Yes	
NAVY-05	Increase bandwidth/enhance B/W utilization	Structural	DT, Conn	Yes	
NAVY-06	Improve Joint SOP (CJCSM 6120/JMTOP)	TTP	ALL	N/A	
NAVY-07	Provide robust relay capability	Structural	Conn	No	
NAVY-08	Enhance JTIDS Network Library (JNL) Quality/Configuration Control	TTP	Conn	No	
AF-01	TQ discrepancies	Structural	TC, NAV, DR, DT, Conn	Yes	
AF-02	Data registration	Structural	TC, NAV, DR, DT, Conn	Yes	
AF-03	Correlation/decorrelation	Structural	TC, Conn	Yes	
AF-04	Common time standard	Structural	TS, NAV, DT, TC, Conn	Yes	
AF-05	MIL STD 6016 implementation discrepancies	Structural	ALL	Yes	
AF-06	Enable all platforms to use terminal throughput options	Structural	Conn	Yes	
AF-07	Implement TSR on all surveillance sensors	Structural	Conn	Yes	
AF-08	Promote fielding of JRE	Structural	Conn	Yes	
AF-09	Implement contention access for fighters	Structural	Conn	Yes	
AF-10	Develop & implement enhanced throughput	Structural	Conn	Yes	
AF-11	Improved tracking for low flyers (CM)	Structural	TC, DT, IFC	Yes	
AF-12	SIAP in coalition environment	Structural/TTP	ALL	Yes	
AF-13	SIAP in support of offensive missions (air dominance)	Structural/TTP	ID	No	
AF-14	Generation & exploitation of SIAP in coalition environment (e.g., Korea)	Structural	ALL	Yes	
AF-15	Relationship between SIAP and offensive air operations	Structural		Yes	
AF-16	SIGNIT asset integration improvements	Structural	CID,	Yes	

			Conn		
AF-17	Undertake comprehensive Link 16 network design study to maximize Link 16 support to JTAMD operations	Structural	Conn	Yes	
AF-18	Develop family of datalink-to-datalink gateways	Structural	Conn	Yes	
AF-19	Combine NPG 7 & 8	Structural	Conn	Yes	
AF-20	Explore new continuation word for J3.2 providing time stamp and covariance data	Structural	DT, DR, IFC, Conn	Yes	
AF-21	Allow variable update reporting (VUR) on the JDN	Structural	Conn	Yes	
AF-22	Allow multiple reporters on the JDN (e.g., relax R2 rules during maneuvers)	Structural	DT, DR, IFC, Conn	Yes	
AF-23	Develop low-cost PPLI terminals for non-link 16 Blue aircraft	Structural	DT, Nav, DR, Conn	Yes	
USMC -01	Sensor registration and lack of clock synchronization: Especially w/r TPS-59 north finding and requirement for manual entry of radar location in TAOM. Leads to track suppression and dualing.	Structural/Bug	NAV, TS, DR	Yes	
USMC -02	Track error caused by Latency (both compensated and uncompensated)within operational facilities	Structural/Bug	DT	Yes	
USMC -03	Unreliable PPLI's (Translation of some aircraft 100's of km owing to faulty integration of nav system with terminal and latency). PPLI's for ships can also move erratically (gyro drift) in which case entire air picture shifts with the PPLI.	Structural/Bug	NAV, DR, DT, TC	Yes	
USMC -04	Significantly Different correlation rule sets between operational facilities. Leads to track suppression and dualing.	Structural	TC	Yes	
USMC -05	Lack of time tag and height rate in air track messages. Inhibits correlation accuracy during interupdate period	Structural	TC	Yes	
USMC -06	J3.2 TQ calculation inconsistency at different units, especially with arbitrary TQ assigned instead of derived from actual tracker performance estimates.	Structural	TC	Yes	

USMC -07	Inconsistent definition between J3.2 TQ and PPLI GPQ values, and unhelpful dynamic range: the tabular values for air track TQ are not pegged to meaningful operational values.	Structural	DT, TC	Yes	
USMC -08	Inflexible time slot allocation (fix is TSR or DNS)	Structural	DT, Conn, IFC	Yes	
USMC -09	Inefficient bandwidth use tied to RRN values (update rates). For example, land PPLIs, surveillance J3.2 set at 8-20 seconds, status message updates, etc.	Structural	DT, TC	Yes	
USMC -10	Doctrinal ID shortfalls (for example, ships and aircraft become TBMs if they happen to fly in a particular airspace, friendly interceptors interpreted as hostile TBMs)	Structural	ID	Yes	
USMC -11	Lack of net-wide ID definitions (inconsistent ID taxonomies)	Structural	ID	Yes	
BMDO -01	Drop Track Messages Not Transmitted for LP and IP. AEGIS: LP/IP are transmitted on the data link long after impact.	Structural	DT	Yes	
BMDO -02	AEGIS Drop Track Reports. AEGIS: AEGIS incorrectly transmits Drop Track reports for tracks which it does not have R2.	Structural/Bug	DT	Yes	
BMDO -03	CMC/EMT Does Not Perform Space track R2: CRC: The CRC Expert Missile Tracker (EMT) does not perform R2 iaw MIL-STD 6016. It is in broadcast mode only and, therefore, always assumes R2.	Bug	DT, TC	Yes	
BMDO -04	Debris Tracking. All: Several units reported numerous drbris tracks which clutter the JDN picture.	Structural	DT, Conn, TC, IFC	Yes	
BMDO -05	TBM Lost Tracks are reported after splash. AEGIS: USS LAKE ERIE continued to send Lost Tracks on Track Number 5031 after splash had occurred.	Bug	DT	Yes	
BMDO -06-A	MIL-STD 6016 provides no guidance for TBM correlation.	Structural	DT, TC	Yes	
BMDO -06-B	PATRIOT only performs local-to-remote correlation once. PATRIOT: The PATRIOT PDB-4 computer program will only perform local-to-remote correlation for a given local track once, which in some situations results in a dual designation.	Structural	DT, TC	Yes	

BMDO -07	TAOC can process and display only a limited number of PU's and JTIDs Units (JU's). TAOC: This is a significant problem for the TAOC. With the planned increase in the number of JU's in any theater of war, or exercise, without fixing this problem the TAOC will not be able to handle a majority of datalink management of BMC4I functions.	Structural	NA	Yes	
BMDO -08	JTAGS-Related Dual Tracks. JTAGS: JTAGS ability to correlate and implement R2 was not fully demonstrated during HWILT 00a.	Structural	TC	Yes	
BMDO -09	JTAGS J10.2 and J3.0 Implementation. JTAGS: JTAGS does not use the J10.2 and Drop Track It generated J3.0 and J3.6 data for nonexistent tracks, as if there was early burnout.	Structural	DT, IFC	Yes	
BMDO -10	JTAGS TBM ID Incorrect. JTAGS: JTAGS classifies TBMs by type but reports them as unknowns in TADIL-J J3.6 messages throughout their trajectory.	Structural/TTP	TC	Yes	
BMDO -11	JTAGS Correlation Capability. JTAGS: During HWILT testing, JTAGS did not appear to attempt to correlate their track with existing tracks before initiating a new track on the link	Structural/Bug	TC	Yes	
RS99/ 00-03	JTIDS training was needed for units arriving to their respective field locations.	TTP	Conn	Yes	
RS99/ 00-04	There were two primary methods for managing air track production in a Joint Integrated Air Defense System (JIADS): Track Production Areas (TPA) and Mutual Support. Both methods have benefits and limitations that must be understood so that training and planning can insure successful implementation.	Structural/TTP	DT, TC	No	
WCSL-019	PATRIOT sometimes reverts track ID to pending upon assuming R2 and ignores future ID difference or CDO on that track.	Structural/Bug	ID	Yes	
WCSL-028	Incorrect response to Command orders (machine receipts)	Bug	Display	Yes	
WCSL-032	PATRIOT improperly transmits CANTPROs	Bug	Display	Yes	

Appendix B Roving Sands 99 Observations Summary

General exercise description.

1. JICO/AADC/32nd AMDC authority relationships.
2. Deputy AADC focused primarily on ARFOR issues w/little support for Joint Air Operations Center.
3. Identification authority was not well defined for C2 and ADA units causing track management problems for the JICO.

4. Joint Communication Control center and JICO relationships benefited by having a communications liaison officer on the JCC team.
5. Coalition representation to JICO cell needed to support timely operation with the allied forces.
6. The boundaries and dimensions of defended assets not identified so units assign default radius leading to SAM wastage and missiles being classified as leakers.

7. Airspace control order contained many routes to prevent blue-on-blue engagements was unrealistic and distracting to multinational operators.
8. Coalition interoperability revealed US and coalition SAM forces use different terminology, doctrine, and have different methods to communicate orders and intent.
9. Broadcast paging for TBM early warning focused on troops in the predicted area but these moved the pager among their organic units causing the wrong unit to be warned if the database is not properly updated.

10. Passing, sharing, and processing information between organizations into a website with no warning or indication created a dangerous time lag were opportunities for engagement, situational awareness, and CINC targeting priorities were lost.
11. Attack operations dilemma caused by lack of proper cataloging (time sensitive targets, emerging targets, and ATO targets) of targets compounded by the competition for sensors and shooters between JFLCC and the JFACC.
12. parallel between the 32nd AAMD and the TMD cell at the AOC introducing delays in the process.

13. Successful TAMD battle management requires voice and data to successfully integrate systems such as THAAD, NTW, ABL in upper tier as well as to perform battle hand-offs to lower tier.
14. Lower and upper tier deconfliction needed due to numerous over-engagements of TBMs by both tiers, necessitated the establishment of a voice link until a better JDN-based solution is developed as well as a JTTPs.
15. Communication liaison with Allies hindered by lack of communications background MOS personnel.

16. JTIDS training was needed for units arriving to their respective field locations.

SUMMARY - Roving Sands 2000.

- Observation - Joint Theater Air and Missile Defense (JTAMD)
- Observation - JTAMD Liaison Officer (LNO) Cell within the JTF
- Observation - Theater Ballistic Missile (TBM) Defense Coordination
- Observation - Theater Ballistic Missile (TBM) Voice Early Warning Grid
- Observation - Procedures/Definition of Time Sensitive Targets (TST)
- Observation - Data Link Connectivity and Identification Issues
- Lesson Learned - Use of Track Production Areas versus Mutual Support
- Observation - Serial J Links
- Observation - SAA and COP Managers

Issue - Airframes within TBMCS AODB

- Observation-Air Defense Artillery Fire Control Officer (ADAFCO) Integration
- Observation - Airspace Control Order (ACO) Management Procedures
- Observation - Dissemination of SAM/SHORAD Tactical Orders (SSTO)
- Observation - Web-Based Distribution

Appendix C SIAP Deficiencies

1) Common Time Reference/Standard Issues (Only non-Block 1 deficiency)
2) Data Registration Issues
3) Track Quality Issues
4) PPLI Issues
5) Consistency of Distributed Track Databases Issue
6) Tracking/Track Management Issues
7) TBM Reporting Issue
8) TBM Data Association/Correlation Issues
9) TBM EW Impact Point Prediction Issue
10) Link 16 Throughput Issue
11) Multi-link Translation/Forwarding Issue
12) Engage on Remote (EOR) Issues
13) Combat Identification Issues
14) IFF/SIF Issues

Appendix D CINC JFCOM's Memorandum

DEPARTMENT OF DEFENSE
COMMANDER IN CHIEF
U.S. JOINT FORCES COMMAND
1562 MITSCHER AVENUE SUITE 200
NORFOLK, VA 23551-2488

IN REPLY REFER TO:
J01

07 January 02

MEMORANDUM FOR SINGLE INTEGRATED AIR PICTURE SYSTEM ENGINEER

Subject: Single Integrated Air Picture (SIAP) Candidate Block 1 Issues

1. Your letter of 2 November 2001 requested United States Joint Forces Command (USJFCOM) endorsement of the SIAP SE Task Force's Block 1 effort. This letter provides that endorsement and asks for additional specific action in related areas.

2. Background. USJFCOM is tasked by the DUSD (AT&L) to assist in setting SIAP SE TF operational requirements and priorities. The USJFCOM review of the candidate Block 1 issues was bounded by the JROC validated TAMD, CID and GIG CRDs; the 2010 TAMD Operational Concept; and anticipated improvement to joint warfighting capabilities. Informal review and discussions of the Block 1 list have also been conducted with JCIET, JTAMDO, and BMDO.

3. USJFCOM endorses the Block 1 operational focus on further reduction of dual tracks, improving Combat Identification (CID), TAMD performance and data networking capabilities and the technical issues associated with each.

4. Additional concerns in areas that impact and intersect the SIAP SE TF are provided below:

a. Several primary TAMD systems are non-compliant with MIL-STD-6016A. These deficiencies may negate or degrade the improved performance Block 0 and Block 1 are designed to provide joint warfighters. This includes system "bugs" that have been identified since 1999. There is no feedback method to ensure compliance.

b. There needs to be a database to track data link implementation and certification across all members of the TAMD Family of Systems (FoS). A central repository, coordinated with Service Program Managers, is needed to maintain and provide system data link capabilities to a community of users to support FoS configuration control, joint testing and JICO planning.

5. Request provide USJFCOM:

a. Technical assessment and recommendations of how to address the issues identified in paragraph 4 within 90 days.

b. The Block 1 list upon completion of the SIAP TF system engineering process. Timeliness of delivering warfighting capabilities is a continuing concern. With development of the Block 1 Decision Support Binder, request you include options for more timely implementation of the proposed actions.

6. We look forward to continued discussions in these areas and are devoted to working with you and your staff to do all possible to effect a SIAP for the warfighters. My POCs are COL Howard Harmatz, J85, DSN 836-7947, harmatz@jfcom.mil, and CAPT Joe Horn, J61, DSN 836-5540, horn1@jfcom.mil.

MARTIN J. MAYER
Vice Admiral, U.S. Navy
Deputy Commander in Chief

Reference:
Single Integrated Air Picture System Engineer ltr 9800 Ser SIAP/072 dtd 02 Nov 01

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