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DSP Desert Storm Summary Briefing (S)

Prepared By

Space Systems Division

June 1991



Classified by: F04701-86-C-0023;
 DD254 dtd 27 July 1989
 SCG for DSP dtd 31 Aug 1983

GENCORP
AEROJET

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Briefing Outline (U)

U (S) The first part of this briefing provides data on the performance of the Defense Support Program (DSP) system in providing early warning of short range ballistic missile launches during the Desert Storm conflict. This data is to be used to facilitate continuous process and system improvement. To fully appreciate the DSP System's performance, it is important to understand how the system is configured, deployed and how it was used during Desert Storm.

b1 [REDACTED]

b1 [REDACTED]

J (S) Desert Storm provided DSP System personnel with the first real opportunity to exploit the process of providing early warning of hostile missile activity -- as the system was designed for and has been prepared to do for 20 years.

b1 [REDACTED]

(U) While the system performance exceeded expectations, it was really the men and women who operated the system and delivered the messages -- who delivered the warning despite the challenges -- that made the system work. Therein lies the success.

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Briefing Outline (U)

- Purpose
- DSP Overview
- DSP Deployment And Utilization In Desert Storm
- Attack Scenario And Early Warning Performance
- Tactical Mission Challenges
- Current Program Improvements
- Conclusion
- Summary

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Purpose: Review DSP Performance In Support Of Desert Storm (S) U

U (S) The purpose of this briefing is to summarize the performance of a space based strategic early warning system – specifically the DSP System

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J (S) [REDACTED]
b1 [REDACTED]

b1 (S) [REDACTED]

b1 (S) [REDACTED]

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The Defense Support Program Successfully Performs (U)

(U) For two decades, the DSP has been the Nation's primary source of unequivocal early warning and assessment of any attack by intercontinental or submarine-launched ballistic missiles.

(S) The DSP performs the following three basic strategic missions:

- a) Early warning to National Command Authority of ballistic missile attacks
- b) Nuclear strike reporting and post-impact assessment of atmospheric and exoatmospheric nuclear detonations, and nuclear test ban monitoring and diagnostics



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Desert Storm TBM Warning Resources (U)

b1 [REDACTED]

b1 [REDACTED]

b1 [REDACTED]

4 (S) The two data paths – a digital Tactical Event Reporting System (TERS)/TRAP and USSPACECOM-to-CENTCOM voice network – provided timely messages to the users. Some Patriot batteries had a tactical communications network (TRE) while others relied on voice network.

b1 [REDACTED]

4 (S) The CENTCOM voice network experienced shorter delay times.

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Desert Storm DSP Message Flow (S) U

U (S) The ground station Operational Software (OPS) processes the incoming IR data and presents launch messages with pertinent data to the operators for assessment and disposition. With the exception of the operational modifications made for Desert Storm that were mentioned earlier, this message flow is the exact process used to send messages for ICBM and SLBM launches.

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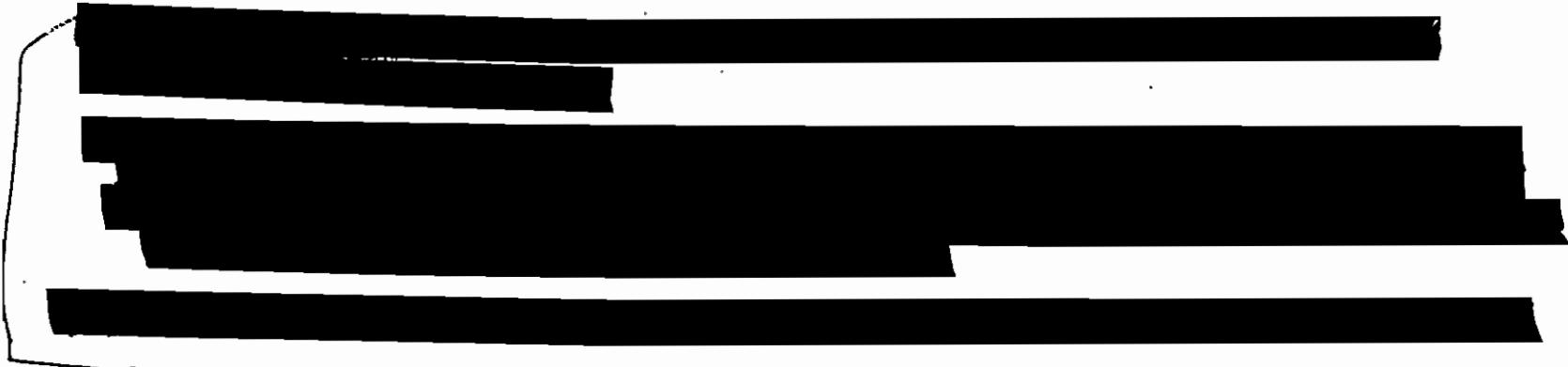
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Real-Time Performance Accuracy (U)

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(U) This noteworthy performance was demonstrated by people operating machines at the edge of design limits under the stress of a wartime environment.

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Current Program Improvements (U)

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u (S) System 1 is a ground processing system upgrade that is designed to maximize the capability of the SED sensors. Tactical parameters, probability of launch detection and launch report correlation will all see marked improvements with stereo processing. Desert Storm data was processed through System 1 mono and stereo algorithms and the results are very promising. A tactical parameter improvement summary in comparison to the current system performance for Desert Storm is provided on page 53. The System 1 upgrade is expected to be in place at the ground stations in 1994.

b1 [REDACTED]

u (S) The laser crosslink is a space command/data link intended to connect an eastern satellite with a western satellite and western ground station. The laser crosslink adds stereo benefits and reduces the impact of the loss of an eastern ground station, since data from the eastern satellite would be available in the western satellite downlink. Eastern satellite command capability would also be available through the western satellite.

u (S) The laser crosslink capability will be installed on Flights 18 and beyond, making this feature available in 1995 or beyond.

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Current Program Improvements (U)

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System 1
<ul style="list-style-type: none">● Tactical Parameter Accuracy Improvement● Increase Probability Of Detection● Automatic Launch Report Correlation

Data Control System
<ul style="list-style-type: none">● Reduce Data Loss Due To Flare/Glare● Enhanced Theater Coverage

Laser Crosslink
<ul style="list-style-type: none">● Makes World Wide Stereo Processing Possible● Data Protection And Accessibility● Mitigate Threat Of Losing Overseas Ground Stations

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Conclusions (U)

u (S) Desert Storm provides historical data for successful exploitation of DSP capabilities to support tactical conflict with timely reports and data of TBM launches. Strategic system capabilities exceeded expectations in a real-time real-world tactical war.

b1 [REDACTED]

b1 [REDACTED]

b1 [REDACTED]

b1 [REDACTED]

(U) The need for good sensor data bases was evident when tactical parameter accuracy analysis was performed. Data base improvements were provided during Desert Storm to reduce tactical parameter errors.

u (S) Communications and Improved data processing (two-point algorithm, stereo) are candidates to improve timeliness of alerts, especially for shorter range TBM launches.

u (S) Coordinated data analysis would provide more timely assessment of events.

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u1 [REDACTED]

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Conclusions (U)

- **DSP Demonstrated That Strategic System Can Provide Early Warning In Tactical Scenario**
 - **Performance Expectations Exceeded**
 - **Communications Components Critical For Capability Exploitations**

- **Some Tactical Requirements More Stringent Than Strategic**
 - **Counting Missiles Within Salvos**
 - **Filtering Conflict Generated Background IR Sources**
 - **Requirement For Quicker Alert Response**
 - **Near Real Time Post Event Analysis**

- **Importance Of Multiple Sensor Coverage And Integration Of Resulting Data Highlighted**

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Summary (U)

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[REDACTED]

1 (S) DSP, as a space based strategic system, was a primary source of launch warning, [REDACTED] and launch determination.

4 (S) Based on post-war analysis of DSP data, it is clear that stereo processing or some method for merging data would improve early warning performance.

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Summary (U)

- **First Real-World DSP System Test Was A Success**
- **DSP Significantly Contributed To U.S. Warfighting Capability**
 - **SCUD Early Warning**
 - **SCUD Targeting**

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Facts On Detection Of Unreported Al Abbas Attack (U)

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b1 [REDACTED]

- (U) High clouds over the launch site obscured early scans for Flight 13, precluding a three-point real-time report. A Less Than Releasable (LTR) voice message was sent as probable launch.
- (U) Flight 12 collected three points with a low aspect viewing geometry. Because of low target motion, the resultant launch report had a very low confidence TAI score of 40 and was not released per site release criteria.
- (U) Flight 15 had good viewing geometry and collected three scans of data. This flight was in off-line backup mode (Hot Shadow, described on backup chart, page 49).
- (U) The affects of motion, aspect angle and clouds are illustrated in the "Tactical Mission Challenges" chart, page 27.

b1 [REDACTED]

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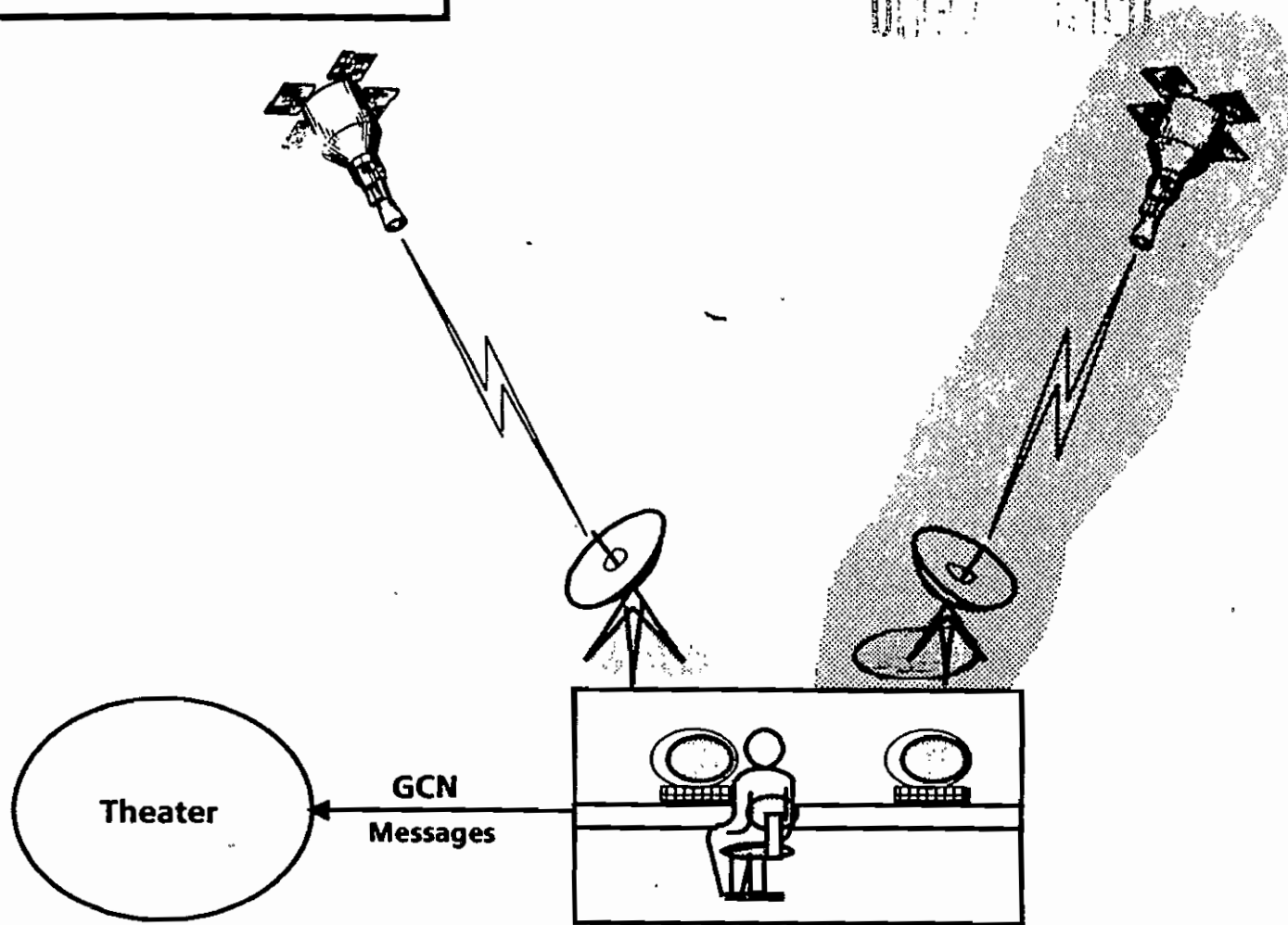
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Hot Shadow (U)

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- Ability To Switch Between Satellites

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[REDACTED]

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[REDACTED]

(U) Report parameters were generated in essentially a two-step process. The first step enhanced the utilities of single-sensor system measurements by eliminating excessively noisy values and converting the remainder to the standard format and frame of reference. In the second step these single-sensor measurements were metrically fused using the trajectory reconstruction program MVS/TRP. This program uses linearized estimation theory to define the event trajectory, which minimizes the multisensor weighted residuals.

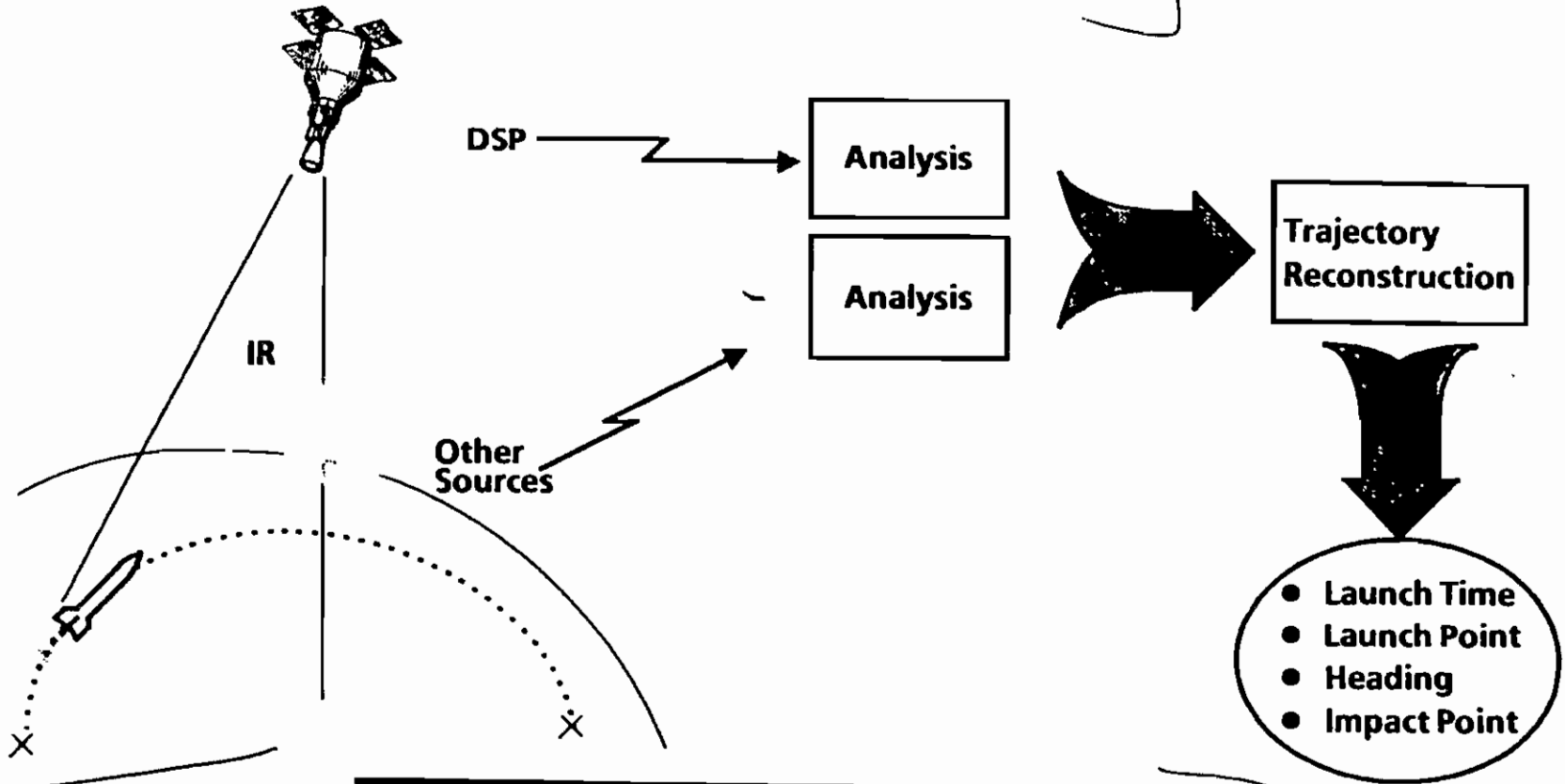
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Tactical Parameter Improvement Summary (U)

- b1 (S) System-8 (S-8) performance statistics determined from analysis of real-time monocular (i.e., OGS, CGS or EGS) Desert Storm launch reports are computed by Aerojet against [REDACTED] launch points and launch azimuth values for all correlated single events.
- u (S) MGS and Dual performance was determined by IBM from playbacks of Desert Storm wide band tapes.
- b1 (U) System 1 performance was determined by IBM using algorithm test bed and extracted data. [REDACTED]
- u (S) For MGS, Dual and System 1 cases, the sample size was limited by the number of Desert Storm events processed at the time of this briefing, which reduces the credibility for these performance figures but provides promising indications of marked improvements.

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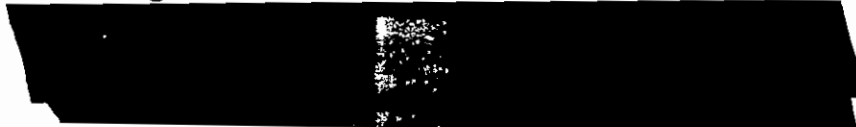
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MMF Performance On Real Events (U)

(U) The Multi-Message Fusion (MMF) system, designed to improve above the horizon (ATH)/strategic missile report tactical parameters, has been evaluated with real tactical and strategic events for cases supported by "truth" data or FTD reference data.

U (S) Strategic events cover the September 1989 to August 1990 period, and Desert Storm data came from the 17 January 1991 to 26 February 1991 period. Both sets of data show excellent performance.

J (S) Because of short downrange TBM characteristics, the heading data is not used in tactical conflicts. Both heading and LPs are provided for strategic event assessment. Especially for ATH, the performance against strategic events compares more favorably with 80 -1 requirements than monocular reports. For reference, the MMF specifications for strategic events are:



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(S) MMF implementation chronology is provided below:

- Final testing was scheduled for week of 21 January 1991 however, the MMF program was diverted to support Desert Storm.
- MMF was shipped to Petersen AirForce Base and installed in the Missile Warning Center on 22 January 1991.



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- MMF continues with its planned testing, which is expected to be completed and reported on in June 1991.

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