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REPORT OF THE ARMY SCIENTIFIC ADVISORY PANEL AD HOC GROUP ON WHITE SANDS MISSILE RANGE INSTRUMENTATION

Army Scientific Advisory Panel
Washington, D. C.

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PANEL AD HOC GROUP ON
WHITE SANDS MISSILE RANGE INSTRUMENTATION

Introduction

An ad hoc group was convened by the Army Scientific Advisory Panel Executive Committee to review the instrumentation capability at White Sands Missile Range. The terms of reference for the group are: "The rapid growth and technological change in instrumentation, simulation, and data reduction systems over the past few years dictate an evaluation and an assessment of the current capability at White Sands Missile Range in regard to instrumentation, data handling, and test evaluation capabilities. It is necessary to know whether the system at this facility compares favorably with other systems in the country and whether we have not just adequate, but fully capable equipment economically to carry out effective testing on present and envisioned weapons systems, particularly such sophisticated systems as SAM-D."

In the review of the task statement the group decided, in the interest of maximizing the output within the constraints of available time, not to compare WSMR with the other national ranges (because of the different character of WSMR), but to compare the capability of the WSMR against the demand of the users or potential users of that range.

The White Sands Missile Range is one of eight national ranges. It is the only inland national missile range and as such it provides accurately surveyed instrumentation sites which cover the entire trajectory for missile tests of moderate range. This capability makes it particularly suitable for employment by missile developers of all services since the potential ability to make detailed observation over the entire trajectory and to recover the hardware contributes significantly to the definition of missile capability and to the diagnosis of missile failures. This unique character makes it important to have a well instrumented and well managed range. The group reviewed the status of the instrumentation and management of WSMR.

Members of the ad hoc group are:

- Dr. Seth Bonder
- Mr. Charles Ellis
- Mr. Howard Gates
- Mr. Robert Johnson
- Dr. Richard Montgomery
- Dr. Bruce Reese, Chairman
- Dr. Gerhard Reethof
- LTC Johnny Humphrey, Military Staff Assistant

The group met at WSMR on 30-31 May 1974 and at the Pentagon on 27-28 June 1974 to be briefed by (1) range personnel on the capabilities of the range and (2) users of the range to determine their satisfaction with those capabilities. Copies of the agenda for those two sessions are presented as Appendix A and B. At the Pentagon session the group was briefed by Dr. C. Crenshaw (AMCDL) on the results of a study he had conducted of the range capability as a result of a malfunction of the range during a SAM-D missile firing. The group met again at WSMR on August 1, 2, and 3. During this session they were briefed by Mr. R. Clinton (MICOM) on a comparative study of US-USSR range capabilities in ballistic missile defense and air defense, and took an abbreviated tour of the ARMTE facilities. The balance of the session was devoted to individual discussions with WSMR personnel and preparation of the report.

General Assessment of WSMR Performance

The group believes that WSMR accomplishes capably and efficiently the tests and measurements required by its range customers, within the constraints imposed by existing range instrumentation and geographical location. The range is heavily utilized and it was not possible to find serious detrimental impact on any missile program at WSMR because of the age, condition or type of instrumentation. As a result of a 1963 ASAP ad hoc group recommendation, there was a range modernization program which was to permit the range to replace instruments that were no longer cost effective. However, it is the group's opinion that the range modernization program has not been continued at an adequate level. The range has not kept pace with the increasing requirements of the users, particularly in respect to measurement accuracy, timeliness of data reduction and report preparation, low altitude coverage, and multitarget and multimissile capability.

The most serious problem in range management is inadequate leadtime for any new test instrumentation required for the development and test of new weapons systems. While everyone is "aware" of range inadequacies in connection with new weapon system testing, no acquisition of needed capability occurs until official approval and notification is given by the project manager that WSMR will be utilized. There is a long delay in submitting the official notification apparently because under certain conditions the project manager pays for range improvements and under other conditions the range pays. While this "poker game" is played, the notification is frequently delayed until the "crisis" state is reached. The long delay from initiation of the weapon system program until official notification to the range does not permit research and development on instrumentation to develop adequate test capability. Because of the constraint of "no action" until official notification, the panel finds that the range is inordinately constrained by DOD policy in the forecasting of needs, purchase and development of new long-lead-time instrumentation, rather than by a considered assessment of test needs for future weapons. The leadtime is inadequate even when R&D is not required to identify the changes required by the range since leadtime of much equipment now is 50 weeks.

The range does not adequately interact with its customers to make them aware of its capabilities and limitations. For example, they should advise customers early in the design phase of ways by which the customer can mitigate demands on the range and reduce test costs through provision of on-board instrumentation. It would be highly desirable for on-board instrumentation to be available throughout the life cycle of the weapon system, not for just the development phase prior to the installation of the warhead.

Each of the above items, plus a number of other findings and recommendations are discussed in the following sections of the report. In summary, the recommended significant changes required to improve WSMR's operation are as follows:

1. Additional funds are required for new development and test capability. The current funding is only adequate for maintaining or modifying the existing capability.

2. Test requirements for new missile systems, whenever possible, should be specified to accommodate two WSMR programmed test capabilities if they are to be tested at the range and/or provide for space on the missile for on board instrumentation.

3. Where WSMR's programmed test capabilities are inadequate for the testing of a new system, the inadequacies must be identified early in the design phase and additional funding with adequate leadtime must be provided for the development of the test capability.

4. To reduce test time and cost the Army should have the development team perform DT II tests as well as DT I-tests with TECOM supporting the tests and certifying the results. The motivation is to have a single team performing the tests and a separate group certifying the process.

5. To further reduce test costs and time in the weapon system acquisition process, a "test to cost" philosophy should be made part of the initial system development planning.

Observations and Recommendations:

In the following paragraphs the observations of the ad hoc group are presented along with related recommendations. These will include expansion of the items mentioned in the foregoing section and also a number of observations on specific technical and managerial items.

1. **Funding.**

Observation:

WSMR is allocated approximately the right amount of money to procure equipment to replace or modify existing equipment or capability. This judgement is based on the industrial practice of budgeting funds for replacement of equipment on a 15-20 year cycle. The WSMR has a present capital value in instrumentation of approximately $150 million and an annual budget level for instrumentation and modernization of $8-9 million. However, as allocated this annual budget is for both the maintenance of existing capability and for providing new test capabilities.

Recommendation:

Continue to provide WSMR funds for procuring equipment oriented towards maintenance and modification of existing functions at the rate of $8 to $9 million per year. An additional approximately $4 million/year is required for the next five years for new capability already identified as listed in Appendix C.

2. User Interfaces.

Observation:

WMSR is justly proud of its capability to respond on short notice to requirements to assist in the development of a new missile system or to test an old missile system in a new role. Over three fourths of WSMR's work load is on projects which have given the range less than a year's official notice of intent to utilize the range. With current delivery schedules of technical equipment this means that the missile must be developed or tested with existing range capability. In the list of project leadtimes presented to the ad hoc group the longest official notice that was given was twenty six months. Twenty six months is inadequate for the development of test capability for high technology systems, e.g., SAM-D, because the sophisticated instrumentation that is required is, or should be, a major development program.

WSMR already interfaces with the new weapon systems developers who are potential customers, and therefore WSMR is aware of programs long before the official notice of intent to test. Under present management schemes, however, WSMR can only do some preliminary planning and research. TECOM and the range are prevented from acquiring long leadtime equipment to achieve new test capability until the official notice is given.

There are a number of results of this practice. The range rarely meets the customers demands on accuracy of measurement (this will be discussed under 3). With the newer high technology systems there will be severe stress on the range to meet the test requirements (e.g., multitarget intercepts by SAM-D). No satisfactory methods were presented to the ad hoc group on testing of missile systems under certain conditions (ECM, very low altitude, etc.). The most serious consequence of the practice of inadequate early interaction with the developer is the inefficiency of the test process. Many measurements can be made easily from a missile platform, whereas they are difficult from ground based instrumentation, e.g., miss distance, missile attitude. Flight demonstration and testing are important time and cost factors in the development process, and forced interaction between the developer and range should be helpful in reducing both time and cost.

With the advent of the direct funding policy and the new high technology systems the nature of WSMR work may change (more complex tests, longer test periods, reduced work load), thus making the forecasting problem even more difficult.

Recommendations:

a. Although WSMR is cognizant of the advanced weapon systems developments, they need to be more active, systematic, and analytical in the procedures they employ to forecast instrumentation needs. This would help develop a better rationale for instrumentation requirements and assist in structuring priorities for instrumentation development. An additional function of an "advanced planning" group would be to inform all potential customers of the capabilities, limitations, and fee schedules of WSMR and to work with the customer to optimize the instrumentation between ground based and on-board instrumentation and telemetry to reduce test costs.

While a great deal of reference material on WSMR is available, it is recommended that a single volume be published that describes WSMR capabilities, limitations, fees and guidelines on mandatory range-safety equipment and desirable on-board beacon and instrumentation.

b. Procedures should be developed that will allow TECOM to approve the purchase or development of new instrumentation based on "reasonable rationale" of requirements, rather than the current procedure which requires a firm commitment from the customer. Another step which has additional benefits from the test viewpoint, is for DOD to require the developer to select the range early in the development program (first year). This will permit the range to interact with the design team to "design the weapon system for test" and to integrate the weapon system and test site together to adequately test the weapon system at minimum cost.

c. As the complexity and cost of the missile system and associated instrumentation continue to increase, consideration must be given to the increased use of analysis and simulations, verified by tests, to assure the system fulfills the development specifications.

3. Measurement Capabilities.

Observation:

Apparently the system Required Operational Capability (ROC) is a driving force underlying the stringent instrumentation requirements placed upon WSMR. That is, the ROC gets translated into a set of development specifications. The latter are then used to determine test objectives leading to instrumentation requirements. Usually a rule of thumb is applied that measurements must be ten times more accurate than the system specification. Examination of the data presented to the ad hoc group indicates that the range fails to meet a not insignificant amount of the stated measurement requirements. Further, the breakdown of these data into two populations -- tests of new high technology systems (e.g., SAM-D) and repetitive, production like tests of fielded systems (e.g., LAW) -- doesnot produce any noticeable bias, thus suggesting a general deficiency in the range's ability to meet stated customer requirements. These data and the above observations give rise to a number of alternative hypothesis:

(1) Assuming that the tests demonstrate that the systems meet the development specifications, the customers are overspecifying the instrumentation requirements. That is, the noise associated with instrumentation has significantly less effect than was anticipated. (Although it has been stated that the stringent accuracy requirements are needed to determine causes of failure if a missile fails, we believe that less accurate measurement data, together with telemetry, will be adequate for such purposes), or

(2) Other means, such as laboratory measurements, simulations, etc., are being used effectively to demonstrate that development specifications are being met, or

(3) Test measurements are insufficient to demonstrate that the development specifications are being met and accordingly the systems that have been fielded may not be as good as the community thinks they are.

It is not possible to conclude which of the above alternative hypothesis are correct.

Recommendations:

a. Consideration should be given to allocating volume and weight on the missile to beacons, miss-distance indicators, attitude reference system and telemetry so that these functions will be available throughout the life cycle test program of the missile. Trade off studies which involve the data requirements of the specific system should identify these requirements, e.g., those systems which operate at low altitude (less than 100 meters above the earth's surface) should always incorporate provisions for a beacon.

b. WSMR should be given authority to require the customer to provide more rational and explicit justification for his instrumentation requirements.

c. WSMR should find out how customers have successfully tested their systems at the range when a not insignificant number of requirements are not met.

d. More attention should be given to the cost dimension of a test program with the philosophy of "test to cost" explicitly considered, rather than leaving the test costs open-ended. Quantitative tradeoffs between the number of samples used in a test program and the instrumentation requirements should be considered through the explicit use of statistical procedures. In the past it appears that the tradeoff has been made in the direction of more stringent instrumentation requirements, via the "10 to 1" folklore, i.e., measurement error required to be an order of magnitude less than the quantity measured, without any explicit cost tradeoff analyses. This will probably require an improvement in the organic statistical capabilities of WSMR and ARMTE.

4. <u>Advanced Technology Applications</u>.

Observation:

There have been significant advances in electronics capabilities and products in the last four years. It is time to apply these advances to WSMR requirements for new capabilities and the replacement of existing capabilities. These advances include:

Use of Metal Oxide Semi conductor/Large Scale Integration Circuits
- Very small but powerful computers
- Miniature communications applications

Time of arrival techniques
Global positioning satellites
Look down radars (AWACS, F-15)
Laser ranging and tracking techniques

Applications of these advances may provide significant new capabilities in:

Beacons
On-board transmitting with trilateration systems
Airborne miss distance measurement in real time
Very accurate trajectory information in real time
Low level tracking
Multiple object tracking

Onboard attitude measurement
Telemetry data encryption
Multiple drone control in close formation
Drone ground vehicles
ECM protection of range equipment
Decentralization of computers used for computation and range management

Recommendations:

a. Provide adequate funding for the most important of these new capabilities. The approximate level recommended is $12-13 million per year for at least five years to provide for both modernization and new capability (see Appendix C.)

b. WSMR should not confine themselves to ground instrumentation capabilities but either pursue or have undertaken by other agencies development of the necessary airborne elements.

c. WSMR should insist that the weapon system developer apply these technologies to obtain information such as vehicle attitude and miss distance by miniaturized airborne components rather than by attempting to refine long range optical equipment for such purposes.

d. The advent of the mini- or micro-computer has caused the Army to review its programs that were moving in the direction of "one large computer doing everything." WSMR should review its procedures to see if economies could be achieved by similar decentralization, using mini- or micro-computers for control, safety, and data reduction.

5. Test Range Responsibility.

Observation:

Under the current arrangement, the Army Missile Test and Evaluation Directorate is responsible to TECOM for verification of development. Frequently, the developer defers to DT-II tests that should have been performed in DT-I. Further, the developer is not responsible for performing DT-II tests. Thus, the development cannot be considered complete by the time the system comes to ARMTE for test. As a consequence, ARMTE often is called upon to perform excessively extensive testing and retesting to verify system performance over the full spectrum of required capabilities. To accomplish this, ARMTE may require additional test facilities that duplicate those in the developer's plant and laboratories. In today's resource-constrained environment it is vital that duplication of test efforts and facilities be minimized.

Recommendation:

ARMTE's responsibility and role in the test program should be modified. The developer should be required to carry the development through DT II. ARMTE's responsibility would be to establish, early in the program, the level of verification (numbers of tests, flights vs. simulation, etc.) required. This responsibility could be accomplished by ARMTE reviewing and providing input to the Project Managers' offices test plan in order to include all needed objectives in that test plan and assuring that all testing would be accomplished by the completion of the test program (Both DT I and DT II would be completed by the Development Team). The execution of this philosophy will not necessarily reduce manpower in the ARMTE laboratories, nor would the group recommend the transfer of those labs to the National Range. It would force the responsibility of the development, and demonstration of that development upon the Project Manager, where that responsibility belongs. It would further aid in forcing the designer to devote additional effort to designing for testing.

6. Simulation.

Observation:

The Army Missile Test and Evaluation Directorate with the support from several other Directorates performs missile flight simulation activities on most missile programs under test at WSMR. The expressed purpose of this type of simulation is to:

a. Support the test program by both pre- and post-flight simulations.

b. Establish systems performance limits.

c. Provide guidance to mathematical model development at contractor and MICOM.

d. Use simulator as sub-system checkout before flight test.

e. Contribute to trouble shooting and problem identification.

f. Provide independent evaluation of systems models and system performance.

Significant contributions have been indicated for the Chaparral, Hawk and Redeye programs.

The present Hybrid (analog-digital) facility is to be replaced by a new facility incorporated in a $1.3 million request for FY 1976. This new facility is designed to support SAM-D, SHORADS and the Advanced Hawk programs, and incorporates the use of actual components.

The ad hoc group notes that the contractor for the SAM-D program, Raytheon, has a comprehensive hybrid simulator, the GTSF (Guidance Test and Simulation Facility). MICOM has and uses a major hybrid simulation facility for the same program. In addition, Martin uses simulation to study the missile aerodynamics and propulsion system performance for the SAM-D missile.

The panel believes that ARMTE must contain an effective technical capability to direct flight tests, reduce data, analyze flight test data and interpret results in terms of systems performance requirements. The capability must exist to understand simulation to the degree of requesting simulations for either flight test direction or mathematical model verification if significant departures exist between simulations and actual flight. However, for the cases where the contractor and/or MICOM perform extensive simulations on available facilities, the panel believes that duplication (or triplication) at ARMTE of facilities and technical activities such as development of mathematical models would neither be cost effective in terms of needed simulation facilities at ARMTE nor effective in terms of use of technical talent and personnel.

The ad hoc group found that ARMTE had been assigned the task of testing Army computer systems, e.g. TOS[2]. The group expressed concern about that assignment, but did not have time to verify whether that capability existed within ARMTE, or to determine if some other Army facility was better qualified to perform those tests.

Recommendations:

a. ARMTE should modernize the current hybrid simulation facility in keeping with the mission of ARMTE as discussed above. Achievement of this capability may be accomplished by utilizing the present excellent analog facility and procuring only an improved digital and interface facility.

b. ARMTE should continue to perform missile flight simulations in cases where their effort does not excessively duplicate the simulation activities at the contractor and/or MICOM.

c. ARMTE should continue to use the simulator as a checkout tool when necessary for missile components and sub-systems in support of the test programs.

d. A review should be conducted to determine whether testing of "battlefield management computers" should be done at WSMR.

7. <u>SAM-D</u>.

Observation:

With respect to WSMR support of SAM-D, the ad hoc group supports the urgent need for WSMR to provide:

a. Control of multiple drones in close formation.

b. Tracking of multiple missiles, especially near launch.

c. Drones and aircraft equipped with ECM designed to test the SAM-D system.

d. Range instrumentation which can provide necessary range data during tests which employ ECM.

The need to perform evaluations of electronic countermeasures against the SAM-D system is recognized as is the need to perform multiple target tests in an environment that would provide security from outside observation.

The feasibility of the proposed Weapons System Test Facility which was to simulate multiple targets and ECM in an enclosed chamber was studied by Stanford Research Institute and ARMTE and SAM-D personnel. The general conclusion is that the concept entails severe technical risks, cannot be accomplished in time to be useful to key phases in the program and is not effective.

There are requirements and plans of the SAM-D test program which if eased or modified would make WSMR support easier and more economical. Suggestions are as follows:

a. Portions of the SAM-D systems under ECM conditions can be tested through captive seeker flights against manned aircraft carrying ECM gear. This would simplify range operations and probably also save the SAM-D program money through fewer missile flights.

b. At present SAM-D has envisioned the need for a multiple drone formation to test the SAM-D system. It is possible that this requirement can be fulfilled by one powered drone in each set with the second being a towed target. The two powered drones, being much farther apart, could be tracked and controlled by existing equipment. This would not relieve the requirement for the eventual attainment of a more flexible multiple drone formation control system. It might, however, relieve schedule pressure on such a system to allow a more systematic and thorough development to be accomplished.

c. SAM-D has placed a requirement on the range to measure missile attitudes to $\pm 1^{o}$ and target attitudes to $\pm 2^{o}$ via external optical instruments. This is unlikely to be obtained using range instrumentation and, if really required, should be obtained by on-board instrumentation.

d. A large number of SAM-D missile flights are planned to obtain the statistical distribution of missile attitude as it passes the target. It would appear that this could be obtained more economically through simulation verified by a few actual firings.

A final observation is that the SAM-D radar is a very capable radar and it is possible that it could supply useful data for range use. While the tactical data rate is too low for some range purposes, it is possible that either missile ground guidance commands or telemetry data could be used for update purposes.

Recommendations:

a. WSMR should abandon plans to build the Weapon System Test Facility and instead should utilize captive seeker, ECM tests simulations and component tests, and the anechoic chambers at Redstone Arsenal.

b. The range should be funded to provide capabilities of controlling multiple drones in close formation, tracking of multiple missiles, and testing the system in an ECM environment.

c. The SAM-D program manager and contractor should consider modifying their present range requirements to utilize captive seekers flights to test the ECCM capability of SAM-D, the use of towed drones, and on-board attitude measuring systems.

8. <u>User Funding</u>.

Observation:

Starting in July 1974, the range switched from purely institutional funding of tests to a direct charge basis. This required that the customer absorb a fraction of the cost of his test program (approximately 17% FY 1975). Although it is doubtful that instantaneous changes in demand will result, it is not unreasonable to expect that both the nature and quantity of demand will shift over time due to this modification in funding and costing policy. Yet the ad hoc group did not observe any conscious effort to quantitatively forecast or determine the impact of a possible demand shift on instrumentation requirements, nor to act to counter a possible reduction in useage.

Recommendation:

Attempt to predict the impact that the modification in funding policy will have on the nature and quantity of demand and in turn on the instrumentation requirements in the future. Additionally, insofar as personnel costs are the major part of the total cost of operating the range, WSMR should adopt policies and practices that permit flexible response as demand changes. Specifically, contracts should be written to permit downward or upward adjustment of level of effort without unreasonable contract change costs. Efforts should also be made to attempt to match the civil service employees to the demand. Possibly increased use of temporary employees could occur until the effect of the new funding policy is determined.

9. Personnel.

Observation:

As a result of the reduction in force in the 1965-66 period and the low hiring rate since that time it is noted that: (a) at the present time there are fewer personnel in the GS-5 through GS-11 grades and the experience of that group appears to be less than was the case prior to 1965; (b) the median age has increased to the low 40's whereas it was in the mid thirties in 1965; (c) many key personnel representing much experience have been lost through retirement and additional key personnel are scheduled for retirement in the next few years.

The Crenshaw committee indicated that the ratio of scientists and engineers to technicians was too low to support the testing of new technology systems. A follow-on study by WSMR indicated that they were lacking in middle-level engineering supervisor staff for field operations. During the brief review by the ad hoc group time was not available to verify these conclusions, nor to confirm the job requirement for experienced engineers in the field. However, it is worthwhile noting that the range has more than two hundred GS-11 through GS-16 personnel between the ages of 30 and 45. Assuming career patterns at WSMR are similar to those of government laboratories and industry, these should be highly trained and experienced engineers and scientists and should be adequate to provide needed technical management and supervision.

Recommendations:

a. A study should be made to determine how the 200 "young" high level technical personnel are being utilized. Possibly a significant fraction could be transferred to fill the voids identified by Crenshaw and the WSMR study.

b. Provide 40 to 50 new spaces for grades 5-7 professional personnel absorbing this increase in eventual attrition of higher grades.

c. Develop additional opportunities and incentives for professional development of both young and older personnel to either obtain greater technical depth in certain areas or update in technical specialties. (WSMR College is a very commendable approach).

d. Since the use of applied statistics is a most important aspect of test data analysis and test design special attention ought to be given to assure adequate competence of this discipline at WSMR.

10. <u>Operating Procedures</u>.

Observation:

Some procedures exist to insure that the range safety, instrumentation, and support systems are operative for tests; however, these do not appear to be sufficiently formal, precise, and diagnostic in nature. A summary of the formal "fault tree" analysis of the missile performed by the developer is provided to the range safety officer with probabilistic information of potentially dangerous footprints. However, similar analysis of the range safety instrumentation does not provide probabilistic failure data and is very informal, even lacking a report to describe results of the analysis. Range safety dress rehearsals are performed just prior to a test to insure that personnel are familiar with test procedures; however, these are not conducted with a diagnostic view of determining where the system can fail. Similarly, tests are simulated to determine if the instrumentation will operate rather than for diagnostic purposes. Although the reliability of the overall system (range safety, data collection, data reduction, etc.) has been extremely high in the past, it is not unreasonable to expect that the testing of new, technologically complex systems will severely stress the relatively informal, manual, non-diagnostic procedures in use.

Recommendations:

a. Develop diagnostic procedures for range safety, instrumentation, and support equipment that can be used to determine the weak links in the total man-machine test system. These procedures should be employed a number of times prior to the initial firing on a new system and each time the system (missile or instrumentation) configuration changes or the test procedure is altered.

b. Automate more of the checkout procedures for the range safety, instrumentation, and support equipment.

11. Data Reduction.

Observation:

Total delivery time of optical data from flight test to final report to Range Customer takes 12 to 15 days for priority cases. Film processing time and administrative functions take 5 to 6 days between flight and delivery to Data Reduction Branch. It is the ad hoc group understanding that of these 5 to 6 days during which no data are reduced, 4 to 5 days are lost because of the requirement that film be reviewed by quality assurance and then by the Range Service Contractor.

The Data Reduction Branch has only 1 (one) Cinetheololite Contraves Model "F" Reader, which causes delay when the work load is heavy. A second reader is located at Holloman Air Force Base and apparently is not available.

Recommendation:

a. Perform quality checks after data reduction.

b. Provide a second Cinetheololite Reader to the Data Reduction Branch at WSMR.

Appendix A - Agenda at White Sands Missile Range

Agenda for the meeting on 30-31 May 1974:

30 May 1974

0830-0840	Welcome and Opening Remarks (Bldg 100, Comd Conf Rm)	MG A. H. Sweeney, Jr.
0840-0940	Briefing: White Sands Missile Range and Film - Firing Sequencies	MG A. H. Sweeney, Jr.
0940-1040	Army Programs	COL B. B. Safar
1040-1140	Air Force Programs	COL J. P. Jones
1140-1150	Travel to Officers' Open Mess	Dr. J. C. Davies, Jr.
1150-1240	Lunch (Bronze Rm, Officers' Open Mess)	MG A. H. Sweeney, Jr.
1240-1250	Travel to Bldg. 100	Dr. J. C. Davies, Jr.
1250-1320	Navy Programs	CAPT H. E. Davies, Jr.
1320-1350	The Universal Documentation System	Mr. J. McKinney
1350-1450	Current Range Instrumentation	M. A. Vick
1450-1455	Travel to Bldg 1504	Dr. J. C. Davies, Jr.
1455-1700	The Army T&E Function and Tour of Army Missile Test and Evaluation Facilities	COL B. B. Safar

30 May 1974

0815-1145	Air Tour of Range to Depart from JFK Helipad and return to Officers' Open Mess	Mr. V. Boudreau Mr. A. Vick

Main Post Area
Nuclear Effects Laboratory
Condron Army Air Field
"C" Station
Nike Avenue Launch Complexes
RAM (Radar)
RAMPART (Radar)

ITINERARY: (cont)

30 May 1974

North Along Eastern Range Boundary

White Sands National Monument
Frequency Monitoring Station
King I
Holloman Air Force Base Track
Tula Peak
East Boundary, 50-Mile Impact Area
Boundary of Red Rio
Oscura Range Camp
Trinity Site
Stallion Range Camp

30 minute refueling stop, Stallion

AFSWC Target Area
East Center Impact
Mockingbird Gap

Salinas Peak
Rhodes Warhead Impact Target
Malpais
Rhodes Canyon Range
Victoria Peak
Northrup Strip
RATSCAT
Lake Lucero
Small Missile Range
Hazardous Test Area
Officers' Open Mess Helipad

1145-1240	Lunch (Bronze Room, Officers' Open Mess)	MG A. H. Sweeney, Jr.
1240-1250	Travel to Bldg 300	Dr. J. C. Davies, Jr.
1250-1430	Briefing and Tour of Range Control Center to Include Pershing R/T Playback	Mr. Bart A. Goode
1430-1530	Briefing: Range Modernization Program	Mr. J. Scott
1530-1700	Discussion, to Include Topics for Future Visit	Dr. R. H. Duncan

Appendix B - Agenda at Pentagon

Agenda for the meeting on 27-28 June 1974:

27 June 1974

0830-1000	Executive Session
1000-1100	Briefing by AF SPO and contractor on Maverick System
1100-1200	Discussion with AF SPO and contractor
1300-1400	Briefing by SAM-D PM and contractor
1400-1500	Discussion with SAM-D PM and contractor
1500-1530	Briefing by Dr. Crenshaw on Review of Instrumentation support of SAM-D to include recommended modernization WSMR
1530-1600	Discussion with Dr. Crenshaw
1600-	Executive Session

28 June 1974

0830-0900	Briefing and discussion of the Universal Documentation System - (20 minute briefing and 10 minute discussion)
0900-0930	Briefing and discussion on 8-10 customer requirements (20 minute briefing and 10 minute discussion)
0930-1100	Briefing on range modernization program
1100-1200	Discussion of modernization program
1300-1330	Briefing and discussion of administrative procedures concerned with modernization
1330-1430	Discussion with WSMR representatives
1430-	Executive Session

Appendix C - Required New Capability

1. Drone Formation Control System and Real Time Display ($7M)

2. Electronic Attitude and Miss Distance Indication System in Real Time ($2M)

3. Laser Tracker ($2.5M)

4. Trilateration System ($2M)

5. Low Altitude Tracking System ($3.3M)

6. Instrumentation of Laser Weapons ($3M)

7. Multiple Missile Tracking ($10M)

8. Drone Ground Vehicles ($0.5M)