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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

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BYE-44407-67/1
Copy 1 of 3

28 November 1967

MEMORANDUM FOR: Executive Secretary, United States Intelligence Board

SUBJECT : Mapping, Charting and Geodesy Requirements for Image Forming Satellites
USIB-D-46.4/6 (COMIREX-D-15.2/6), 17 November 1967

1. I recognize the existence of a military requirement for large-scale maps for operational purposes with the horizontal and vertical accuracies as set forth in USIB-D-41.14/295. I am not, however, in a position to determine whether the area coverage specified in the COMIREX paper is actually necessary in the foreseeable future.

2. I concur, therefore, in the recommendations of COMIREX, on the understanding that use of the HEXAGON for mapping, charting and geodesy purposes will be monitored to avoid any interference with its primary intelligence mission, and subject to DoD review to ensure that the total area coverage specified, 6.7 million square miles, is in fact needed in the foreseeable future.

R. J. Smith
R. J. SMITH
Acting CIA Member, USIB

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BYE # 4586-67
29 November 1967

MEMORANDUM FOR CHAIRMAN, USIB

SUBJECT : Mapping, Charting and Geodesy Requirements for Image Forming Satellites

REFERENCE : USIB-D-46.4/6, 17 November 1967, Limited Distribution

1. All other USIB members have now concurred in the attached COMIREX recommendations (see tab) on mapping and charting requirements in light of acquisition and production costs involved, including the NRO studies summarized in the attached memorandum from Dr. Flax (see tab).

2. The Acting CIA Member, however, concurred with certain reservations as stated in the attached memorandum from Dr. R. J. Smith (see tab). A copy of the CIA briefing note follows Dr. Smith's memorandum.

3. Request your action with respect to:

a. Approval of the COMIREX recommendations.

b. Concurrence in the reservations by the Acting CIA Member.

James S. Lay, Jr.
JAMES S. LAY, JR.
Executive Secretary

Approve:
Para. 3.a. above ✓
Para. 3.b. above ✓

Richard Helms
Chairman, USIB

4 DEC 1967
Date

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USIB-D-46.4/6
(COMIREX-D-15.2/6)
17 November 1967
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UNITED STATES INTELLIGENCE BOARD

MEMORANDUM FOR THE UNITED STATES INTELLIGENCE BOARD

SUBJECT : Mapping, Charting and Geodesy Requirements for Image Forming Satellites

REFERENCES : a. USIB-D-41.14/294 (COMOR-D-13/63), 21 June 1966, Limited Distribution through Restricted channels, and Memorandum for Holders, 8 July 1966, as approved by USIB on 14 July 1966 (see USIB-D-41.14/296 (COMOR-D-13/66) 20 July 1966)

b. USIB-D-41.14/295 (COMOR-D-13/65), 11 July 1966, Limited Distribution through Restricted channels, as approved by USIB on 14 July 1966 (see Memorandum for Holders, 25 July 1966)

c. USIB-D-46.8/18, 12 October 1967, Limited Distribution through Restricted channels

d. USIB-D-46.8/25 (COMIREX-D-15.2/3), 8 November 1967, Limited Distribution through Restricted channels

1. The attached memorandum on the subject from the Chairman, Committee on Imagery Requirements and Exploitation (COMIREX), reporting the results of that Committee's study of the letter from the Director of the NRO to the DCI in reference d., is circulated for Board consideration of the recommendations in paragraph 6 thereof.

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USIB-D-46.4/6
(COMIREX-D-15.2/6)
17 November 1967
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USIB ACTION REQUESTED

2. Board Members are requested to advise the USIB Secretariat not later than close of business Wednesday, 22 November, of their concurrence in or other views on the recommendations in paragraph 6 of the attached COMIREX memorandum.

James S. Lay, Jr.
JAMES S. LAY, JR.
Executive Secretary

Attachment

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Attachment
USIB-D-46.4/6
(COMIREX-D-15.2/6)
17 November 1967
Limited Distribution

MEMORANDUM FOR: The United States Intelligence Board

SUBJECT: Mapping, Charting and Geodesy Requirements for Image-Forming Satellites

REFERENCES:
a. USIB-D-46.8/25 (COMIREX-D-15.2/3), 8 November 1967, Limited Distribution

b. USIB-D-41.14/295 (COMOR-D-13/65), 11 July 1966, Limited Distribution through restricted channels, as approved by USIB on 14 July 1966 (See Memorandum for Holders, 25 July 1966).

1. COMIREX has studied the letter of 4 November 1967 from the Director of the NRO to the DCI, and its attachment, and as requested by the DCI (reference a) provides a recommendation in paragraph 6.

2. The review conducted by the COMIREX has included a re-examination of the mapping and charting requirement (reference b) in the light of the acquisition and production costs involved. There is a priority need for data capable of providing accuracies for large scale (1:50,000) map production to support present and future military operations. The critical requirement is to produce contours with a vertical uncertainty no greater than 5 meters over 10-mile distances and no greater than 10 meters over 20 miles. Enclosure 1 is from a DOD paper and explains graphically the sensitivity of weapon effectiveness to vertical error. Army estimates of the operational benefits of artillery effectiveness are translated in Enclosure 2 into illustrative, hypothetical logistic and cost advantages for total military achievement.

In addition consideration was given to the specific cost implications of each of the three options outlined by the NRO for development of a new camera system for mapping and charting purposes.

3. Enclosure 3 presents an unfulfilled requirement for photography by new satellite systems for large-scale maps to cover an area of 6,700,000 square miles,[a] most of which are in denied areas. The enclosure also estimates a $400-500 million cost reduction in the acquisition of photography and the production of maps for this area, and a shortening of the time span required for completion, by roughly one third, through the use of new satellite systems in contrast to conventional aerial systems. Most of the cost reduction would be derived from the benefits of satellite acquisition but approximately one quarter would be attributable to the map production process.

4. An analysis was made of the cost advantage in producing maps using photography from a 12-inch frame camera over photography from a 3-inch frame camera in the HEXAGON system, even though it was recognized that the 3-inch camera would not provide the vertical accuracies desired. It was estimated that the 12-inch camera would provide a cost advantage of about $19,000,000 for the unfulfilled 6,700,000 square miles needing coverage for large scale maps, and $9,000,000 for 20,000,000 square miles needing coverage for medium-scale maps to be produced after FY 1970.

5. COMIREX notes:

a. That there is a priority need for about 5-10 meter contour accuracy for large-scale maps for the support of effective military operations;

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[a] The area figures used in this memorandum are expressed in square statute miles as normally used within the MC&G community. The factor to convert to square nautical miles is 0.755.

b. That a camera system has been proposed by NRO that can meet the large-scale map accuracies;

c. That there is a continuing need for assessment of the tasking and operational implications of the 12-inch focal length SI camera integrated with the HEXAGON, and that the USIB should be kept advised of these implications so as to insure the continuing primacy of the intelligence mission proposed for the HEXAGON.

6. It is recommended that the NRO be requested:

a. To proceed, as a matter of priority, with the proposed development of the 12-inch SI camera integrated with the HEXAGON system.

b. Concurrently to keep the USIB informed of any tasking or operational implications of such a system on the primacy of the intelligence mission for the HEXAGON.

William A Tidwell
Chairman
Committee on Imagery Requirements and Exploitation

Target Location Accuracy Requirements

1. The critical large scale (1:50,000) map accuracy requirements are based on the use of map derived data for location of targets in direct support of Army tube artillery. Target location accuracies essential in order to assure mission success with respect to minimum acceptable casualty levels were determined in an in-depth and detailed study and analyses, the results of which are stated in U.S. Army Combat Developments Command report "Combat Commander's Information Needs (U)" and which was approved by Department of the Army as basic input into Tactical Reconnaissance and Surveillance (TARS-75). Studies and analyses developed target location accuracy requirements for all organic and projected weaponry of the field Army as a function of the range and inherent system accuracy of each weapon.

2. The USACDC studies analyzed virtually every cannon and missile weapons system to be employed by the field Army through 1975, and in part through 1980 and beyond. The methodology utilized in this analysis was based on relating the reduction in target coverage (and therefore the reduction in weapon effectiveness) to target location error. This reduction in coverage is in addition to that fractional coverage imposed by the weapons systems errors. The reduction in coverage produced as a function of target location error was defined as significant when it jeopardizes mission accomplishment. The criticality of reduction, of course, is dependent in part on the mission objective, weapon system, type of target and size of target. In some situations, even a five percent reduction may significantly downgrade the probability of a unit accomplishing its mission, whereas only in rare cases would more than a fifteen percent reduction be acceptable. As result of careful consideration of the various factors affecting the criticality of mission success, it was determined that in general coverage reductions greater than ten percent would be unacceptable. This variation of effectiveness (in terms of reduced probability of mission accomplishment) and reduction in coverage is shown in Figure 1. Using this criterion as a basis, computations were performed for each weapons system over a broad spectrum of ranges and target sizes, and a maximum target location error for each major weapons system was

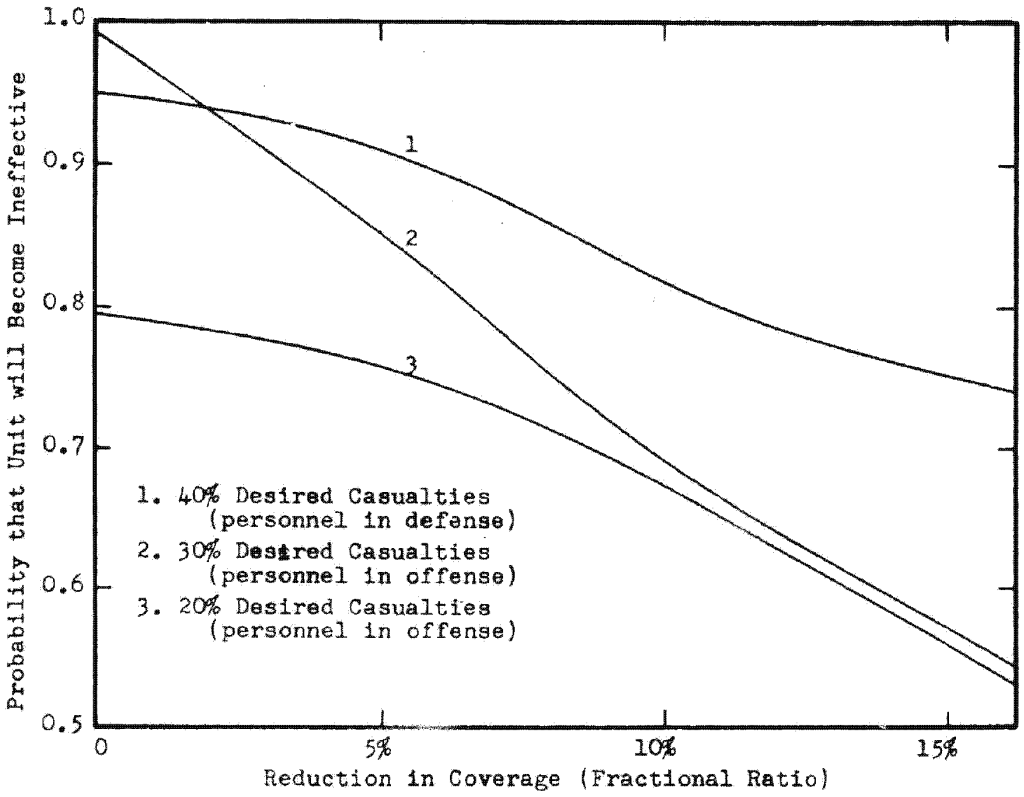
established. Location accuracy requirements were determined for each weapon against several target sizes and the results combined into an overall requirement, with the fact that some target types and sizes are engaged more frequently than others accounted for with weighting factors. The following target location accuracies are required to insure that the specified criterion of no more than 10 percent reduction coverage will be realized for all targets considered:

105 mm Howitzer - 17 meters CEP
155 mm Howitzer M109 - 28 meters CEP
155 mm Howitzer XM138 - 25 meters CEP
8 inch Howitzer - 25 meters CEP
175 mm Gun - 40 meters CEP

As a result of the Army-conducted investigations, a general value of location error which will not reduce effectiveness beyond the minimum critical to mission success for most of the field Army's weaponry was established as 25 meters (CEP). As will be shown below by example, degradation of the target location accuracy beyond this requirement will contribute to loss in weapons effectiveness and reduced probability of accomplishing mission objectives, or the need for additional firing to achieve equivalent effectiveness. The 155 mm Howitzer, the most frequently employed as a direct support weapon, is presented as a significant example for determining of the effect of target location error on target coverage and, particularly, to show sensitivity to the vertical component of target location error. Figures 2 and 3 present graphs for a 155 mm Howitzer battery depicting the percent reduction in target coverage on 100 and 200 meter radius targets for three values of horizontal error over a range of vertical errors. It can be seen that the TARS-75 requirement satisfies the 10 percent reduction in coverage criterion; however, degrading vertical error from 10m to 50m (90 percent assurance) corresponds to a coverage reduction of 26 percent (Figure 2). The impact of location error can be further demonstrated by the following example. As shown in Figure 4, to achieve 0.90 probability of rendering an attacking enemy unit (platoon) ineffective requires casualty level of 22 percent. With no location error, four battery volleys must be fired. Location error corresponding to the TARS-75 requirement drops the casualty level to about 20 percent (0.91 x 22%, Figure 2) and

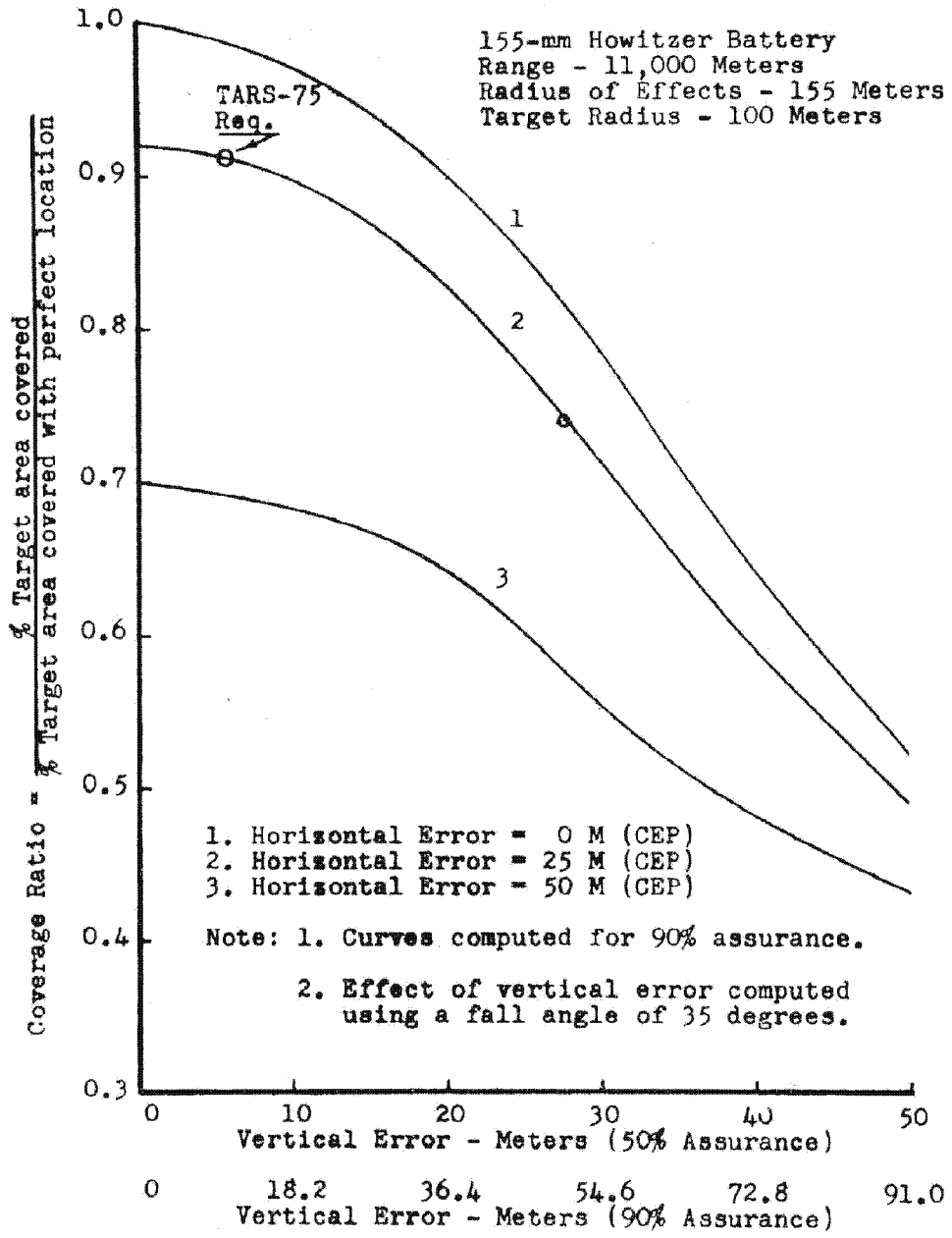
the probability of defeating the platoon drops to 0.80 (Figure 4). This is perhaps acceptable. If, however, vertical error is degraded to 50 meters as above, the casualty level drops to 16.3 percent and the probability of rendering the enemy ineffective falls to 0.44. In this event, the mission is probably not accomplished and more volleys must be fired to achieve the desired casualty level. This will require seven volleys or an increase in ammunition expended of 75 percent.

4. In summary, degradation of artillery effectiveness would result from relaxing the accuracy requirements approved last year by the USIB for designing a satellite system to provide photographic inputs for large-scale, tactical maps to support ground combat operations. The marked sensitivity of weapon effectiveness to vertical error is particularly noteworthy.



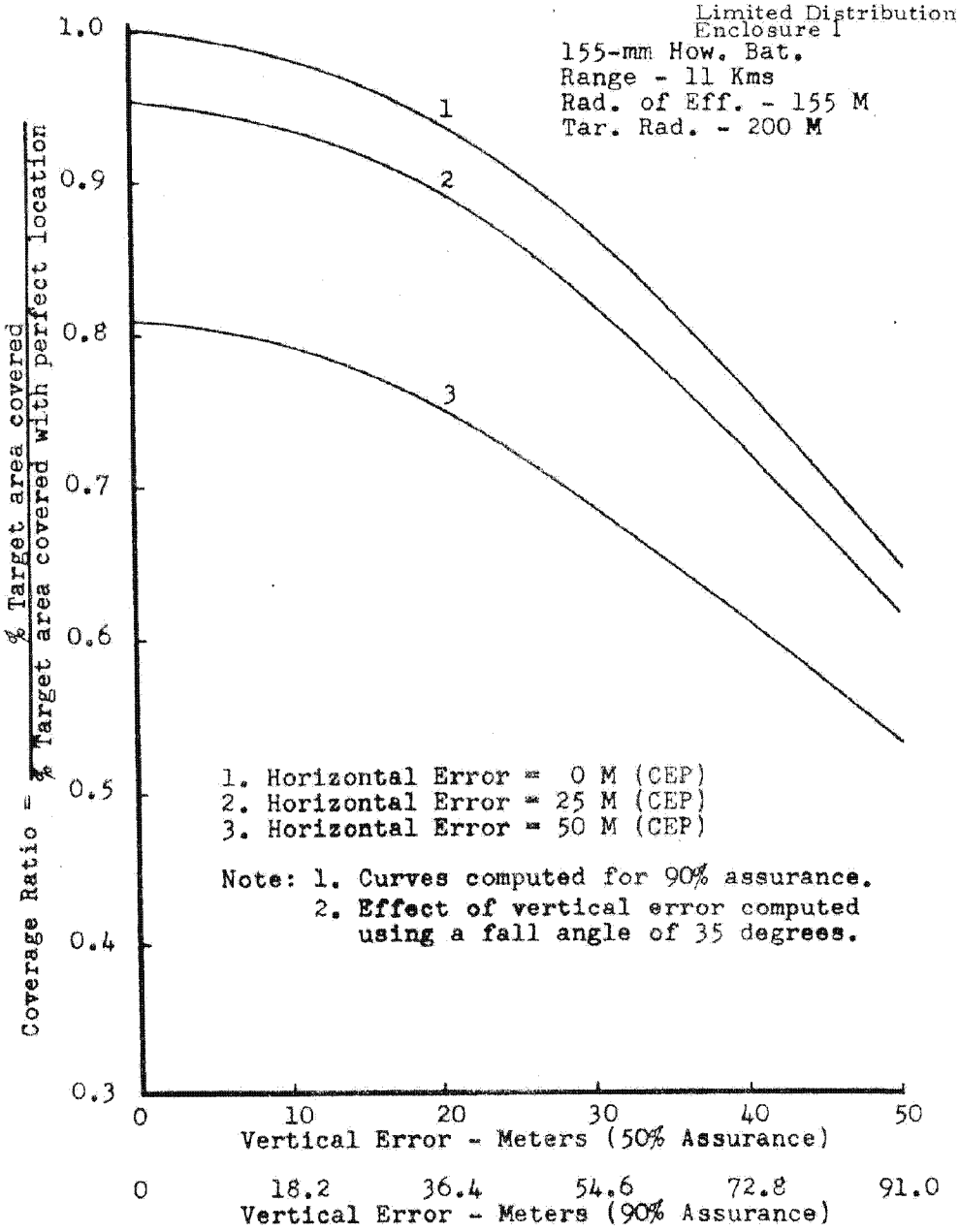
Reduced probability of effectiveness versus fractional reduction in coverage.

Figure 1



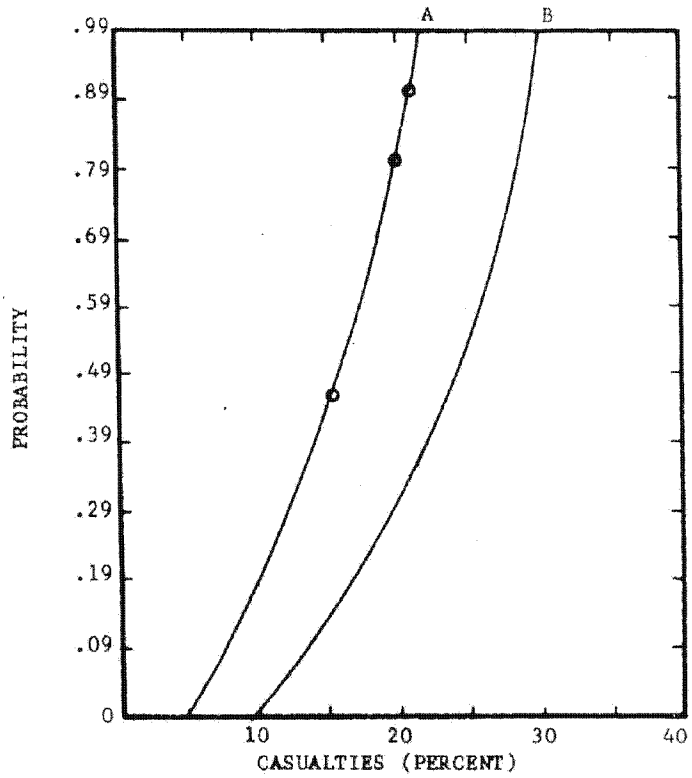
Sensitivity of target coverage ratio to increase in vertical error for 100-meter radius target.

Figure 2



Sensitivity of target coverage ratio to increase in vertical error for 200-meter radius target.

Figure 3



A - Probability of becoming ineffective 2-24 hrs.

B - Probability of becoming ineffective for at least 48 hrs.

Critical casualty levels, attacking units.

(Extracted from FM 6-141-1)

Figure 4

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USIB-D-46.4/6
(COMIREX-D-15.2/6)
17 November 1967
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Enclosure 2

Mapping Accuracy and Artillery Effectiveness

The Army, regarded as a weapons system, consists of people, means for transport and communication, and firepower. To be effective the Army must know, in considerable detail, the nature of the terrain over which it operates. Topographic maps constitute the principal means of providing this knowledge to the field commander.

While maps are important in planning operations and to answer the questions "Where am I?", and "What is over the hill?", highly accurate maps are required primarily because of their importance as a component in the firepower system of the Army.

During the past decade, a great deal of attention has been paid to improving the effectiveness of artillery shells, to improving the reliability and accuracy of artillery systems, and to developing computers, communication gear, and meteorological measurement techniques which will permit accurate coordination of fires from dispersed artillery pieces. Thus, we should be able to bring upon targets, as they are identified, sufficient artillery fire to neutralize those targets efficiently. At the same time, much effort has been given to the development of target acquisition and surveillance means to permit detection of enemy movements and identification of useful targets as they develop in the course of the battle.

The utility of all of these developments depends critically on the availability of accurate maps. Without them, the sophistication of other elements of the overall weapons system becomes virtually useless, and the artilleryman is reduced to using his weapons as a means of locating the target with respect to the firing pieces. It was because of the lack of precision in maps, the lack of accurate, rapid, range finding equipment, and the lack of computer facilities to solve the ballistic problem in the field that the technique of forward observer-controlled fire was developed. This technique demands the firing of a few "spotting rounds" into the target area under the eyes of a forward observer simply to determine the location of the target, so that multiple tube volleys may be delivered in what is called "time-on-target" fire.

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USIB-D-46.4/6.
(COMIREX-D-15.2/6)
17 November 1967
Limited Distribution
Enclosure 2

The effectiveness of time-on-target fire against personnel depends critically on whether or not the enemy in the target area has warning. Calculations by the Ballistic Research Laboratories, based on experimental data for various target postures and various kinds of artillery shell, indicated that, in general, the vulnerability of a target may be reduced approximately ten (10) times if the target is warned of incoming fire and the people in the target area have time to seek shelter in foxholes. The system of using forward observers to control fire provides that warning of necessity. If the available maps are not sufficiently good to permit exploitation of the fire control system to permit precise delivery of effective first rounds against targets in known locations, then the ten-fold advantage of surprise is denied us.

Accurate maps also have a role in the control of artillery fires where surprise cannot be exploited. In many situations it is important to deliver artillery fire on enemy units close to our own troops. Under such circumstances, friendly units under attack will call for artillery fire to be delivered as close to their positions as possible, even to the extent of risking friendly casualties to assure effectiveness against the attacking enemy. The closeness with which such fires can be called down depends not only on the accuracy of the artillery system, but also on the accuracy with which the relative positions of the artillery piece and the friendly unit can be determined. In any case, a few tens of meters are significant in such operations.

When 105mm Howitzers are used against enemy troops at ranges of a few kilometers, the number of rounds to produce a specified level of casualties increases by approximately 25% if the current requirement for $\pm$ 10-meter vertical target location accuracy is relaxed to $\pm$ 40-meters. Ammunition for Army 105mm Howitzers in South Vietnam is presently issued at a rate of approximately 20 rounds per tube per day, resulting in a 105mm ammunition cost of approximately $150 million per year. The 105mm Howitzer is normally employed for indirect, unobserved fire for up to 80% of its targets. In possible 1970-75 conflicts, up to half of this could be targetted from large scale tactical maps, with the balance being used for harrassing and interdiction fire. If maps of the required $\pm$ 10-meter vertical accuracy are available for locating targets for unobserved 105mm Howitzer fire in such a future conflict of the present level of

intensity, the increased effectiveness as compared with using maps having ± 40-meter vertical accuracy, can be valued at approximately $15 million per year.

The 155mm Howitzer is planned as the primary artillery weapon for fire support at ranges of 10 to 20 kilometers through the mid-1970's. For 155mm Howitzer battery fire against enemy troops in company-sized cantonments at these ranges, calculationsshow that approximately 25% more rounds are required for the same target coverage if the required 25-meter horizontal target location accuracy is relaxed to 50-meters. (It should be noted that because of a projectile's relatively flat vertical angle of approach to a target, the horizontal error is only half as sensitive as the vertical. Changing from a 25-meter to a 50-meter horizontal error is approximately equivalent to changing from a 12.5-meter to a 25-meter vertical error.) For the current level of intensity in Southeast Asia, 155mm Howitzer ammunition is being expended at a rate of more than 30 rounds per tube per day, also representing a cost of approximately $150 million per year. Thus, for this level of intensity and again assuming 80% unobserved fire, half of which is targetted from map data, the degradation in 155mm Howitzer effectiveness can also be valued at approximately $15 million per year if the requirement for horizontal target location accuracy is relaxed from 25-meters to 50-meters.

Over and above the dollar values cited, the advantage of surprise against enemy troops which can accrue from accurate, unobserved fire can be assigned a significant value in achieving the field commanders' objectives. Assuming that, on the average, half of the troops engaged by such fire will be caught in vulnerable postures (standing, as opposed to crouching in foxholes), the BRL data indicates a factor of five increased effectiveness for all such engagements. If a significant percentage of targets engaged are troops, say 50%, the overall effectiveness of a dollar spent on ammunition would at least be doubled. To achieve comparable levels of effect by increasing ammunition expenditures would cost $2-3 hundred million per year, for the example cited. The real savings are more difficult to quantify - since they lie in shortening the time required to "win." At Vietnameseexpenditure rates, these savings are measured in billions of dollars per month. The cost of preparing the data bank from which adequately accurate maps can be prepared is less than one day's cost of the current war.

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USIB-D-46.4/6
(COMIREX-D-15.2/7)
17 November 1967
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Enclosure 3

Production Costs For Large Scale Maps

1. Cost comparisons for large scale map production using conventional materials and satellite materials have been prepared by the Department of Army and are documented in the Minutes of the COMIREX Mapping, Charting and Geodesy Working Group meeting of 5 September 1967. These data, together with other parameters identified below, have been used to develop the cost comparisons set forth below for large scale maps.

2. Army used the unsatisfied JSOP requirement for large scale maps (after deducting those areas having fair or better coverage and work being done by other countries) as 10,400,000 square miles or 52,000 sheets (average 200 sq. mi. per sheet). This 10 million square miles should be further reduced to eliminate those areas: (1) which have a high probability of cloud cover, (2) where production is expected to be accomplished by the US and other cooperative countries between now and the estimated date of availability of materials from a new satellite system, i.e. FY 71, and (3) where availability of conventional current aerial photography would preclude collection by satellite systems. This reduction would result in a remaining unfilled requirement potential for new satellite systems mapping of 6,700,000 square miles or 33,500 sheets.

3. Army has stated conventional large scale map production costs on a per sheet basis to be as follows:

Acquisition - 200 sq. mi. per sheet @ $57 per sq. mi. for photography and ground control	$11,400
Production - 2200 manhours @ $7 per manhours	15,400
	$26,800

Total based on 33,500 sheets equals $904 million

4. Large scale production using materials from a new satellite system is estimated by Army, on a per sheet basis using

both the frame and panoramic photography as follows:

Production - 1500 manhours @ $7 per manhour $10,500

Total based on 33,500 sheets equals $352 million

In order to make this estimate more compatible with that for conventional materials, acquisition and geodetic control strengthening costs must be added. Preliminary estimates for systems development, integration and proportionate launch costs would approximate $60 million. This considers only a once-over coverage concept, excluding considerations of further improvements and repetitive coverage for currency of man-made features. Geodetic control strengthening in those areas affording access would be desirable to ensure accuracy over distances of 500 miles or more. This effort is estimated at $20 million to support the once-over coverage concept. Thus, costs for producing once-over coverage of the remaining potention and probable large scale requirement area may be estimated at $432 million.

5. Costs for large scale map production using conventional materials, if such could be acquired, compared to production using materials from a new satellite system, would indicate a cost difference of $472 million. By conventional methods, this production, assuming complete accessibility, would require about 50 years. Using materials from a new satellite system, it would be feasible to meet the 6.7 million square mile deficiency in 10-15 years. While not affecting the cost comparison, recognition should be given to the fact that the product resulting from satellite materials is completed without access to the ground for important details pertaining to transportation and other factors. Beyond the costs cited in this statement there is a field completion step when conventional photography is used on a comparative basis with foreign countries.

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COMIREX-D-15.2/1

1 August 1967

MEMORANDUM FOR: Committee on Imagery Requirements and Exploitation

SUBJECT: MC&G Requirement for Image Forming Satellites

REF: COMIDR-D-13/33 and 11 July 1967

1. Attached for consideration at the COMIREX meeting on [redacted] is a memorandum forwarded to the Chairman by the Chairman, MC&GWG on 24 July. [redacted] memorandum requests that NRO be provided with certain problems. The underlying premise of the MC&GWG request is that:

a. The world-wide geodetic requirement as stated in July 1966 continue to be essential to the efficient use of weaponry; and

b. Predicated on the continuing validity of the requirement and the apparent inability of satellite collection systems, as presently designed, to meet them, NRO should study how to reconfigure systems to meet the MC&G requirement.

2. Whereas the attached is quite specific in nature, members should consider it timely to review the total impact of MC&G requirements on satellite reconnaissance.

Hayden Channing
Executive Secretary
Committee on Imagery Requirements and Exploitation

Attachment:
As stated

Copies 2, [redacted] State TCO
[redacted] DIA
6, 7, 8 DIA TCO
9, 10 CIA/OSI TCO
11, 12 ONE TCO
13, 15, 16 AFNIN TCO
17, 18 ASA TCO
20, 21 NRO TCO

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COMIREX-D-15.2/1

MC&G Requirements for Image Forming Satellites

1. The purpose of this memorandum is to summarize results of DoD data reduction activities involving the use of satellite photography toward meeting world-wide geodetic requirements, and to set forth an up-to-date course of action.

2. In COMOR-D-13/65, world-wide geodetic position requirements were stated as 450 feet horizontal and 300 feet vertical, 90% assurance, with respect to the World Geodetic System. These requirements were validated by the Department of Defense to fulfill the needs of advanced weapons systems, primarily long range missiles, and to establish a basic geodetic control network suitable for producing general coverage maps and charts. For the past 2 to 3 years, geodetic programs have been carried out using satellite photography, principally the DAFF photography with 3" focal length, toward meeting the world-wide requirement. It was estimated a year ago that the data derived from DAFF materials, which covers 44 million square miles, when integrated with existing geodetic measurements, would provide geodetic accuracy to within 750 feet, 90% assurance, by 1968. It was further estimated that by 1970, refined horizontal accuracies of 450 feet and vertical accuracies of 300 feet would probably be achieved, but could not be assured. These figures were based on a mathematical refinement combining the covert DAFF data with applicable data from overt U.S. geodetic satellite programs

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with the world primary triangulation network and the 5-year gravity program. Gaps in DAFF photography were to be filled in by bridging photography from existing covert systems. These estimates and the basis for them were included in COMOR-D-13/65.

3. The five DAFF missions (which were all that were suitable for worldwide geodetic reduction) have been reduced on an individual basis, principally by the Army. An initial consolidation of the missions has recently been accomplished in an effort to establish an accurate and consistent control network. The consolidated reduction was accomplished by the Army, working closely with the Air Force, and with assistance from the Navy. Neither the single orbit reduction or the consolidated reduction have met the preplanned objective of 750 feet, 90% assurance. Instead, it is now estimated that the DAFF data, combined with existing overt U.S. satellite programs, is capable of providing accuracies of only 1000 feet in the northern hemisphere and 1500 feet in the sourthern hemisphere by 1968. Principal reasons for failing to meet the 750 feet objective are (1) scale and resolution of the DAFF photographs, (2) uncertainties in the gravity model, (3) uncertainties in the atmospheric drag model and vehicle thrust parameters and (4) quality of the control data which was used in orbit determination. The errors of the camera system (mensuration and attitude) are estimated to be about 420 feet, 90% assurance. Outside the Sino-Soviet bloc it is possible through control densification programs from overt systems to compensate for the major

[illegible] vehicles in the gravity and atmospheric drag models. However, the most critical area which is located inside the Sino-Soviet area, cannot be given the same control densification and is likewise subject to larger inaccuracies, due to uncertainties in the gravity and drag model.

4. Assuming the completion of planned overt programs, it is not at all possible to meet the 750 feet objective, 90% assurance, with the DAFF materials on a world-wide basis. This would involve extensive densification programs by overt systems outside the Sino-Soviet area, and within the Sino-Soviet area special multiple short-arc techniques would be used which would eliminate some of the problems caused by the gravity and atmospheric model, as well as vehicle thrust uncertainties. However, it is certain that the presently validated requirements of 450 feet horizontal and 300 feet vertical cannot be met, principally due to the limitations of the photographic materials, i.e., DAFF. The contribution to be made by the 3" SI on the J-3 package has not been determined.

5. The world-wide geodetic requirement is the same as stated in COMOR-D-13/65, i.e., 450 feet horizontal and 300 feet vertical, 90% assurance, with respect to the World Geodetic System by 1970. The current, and the validated 1968 requirements are appreciably less stringent. Currently, reviews are being made which could result in some changes in these values within the next three to six months. Since there are tradeoffs that can be made in the accuracy requirements of components of the geodetic and geophysical slice of missile CEPs, the cost and time considerations

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...significant factors in the actual accuracy requirements, validated for horizontal and vertical positioning. These tradeoffs encompass overt geodetic and geophysical programs under continuous review within the Department of Defense.

6. The MC&G utilization community will continue to examine and evaluate other approaches to the world-wide positioning problem.

7. It is requested that (a) the NRO be informed of the limitations of existing satellite data to meet world-wide positioning requirements as set forth above, (b) action be taken to ask NRO to study ... within the field of covert satellite systems that would meet the ...-wide positioning requirement by 1970, including cost, development, ... effects that each proposal would have on the primary system activities, ... NRO consult with the technical representatives of the COMIREX MC&G ... Group from the standpoint of evaluating alternate acquisition ... from the data reduction and achievable accuracies point of ..., and for coordination with planning and review of overt geodetic systems and programs, and (d) cost and time considerations for NRO ... for meeting the requirement be presented for review and evaluation against alternate accuracy requirement levels for the horizontal and vertical positioning component of the geodetic and geophysical slice.

/s/

[redacted]
Chairman
COMIREX MC&G Working Group

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28,29	C/CAS [redacted]
30	Special Center TCO
31	IRS ReqBr/RecceGrp
32-40	Asst Ops/NPIC
41	Asst Ops/NPIC for [redacted]
42	Asst Ops/NPIC for [redacted]
43	Asst Ops/NPIC for [redacted]
44	C/IAS/DDI [redacted]
45	TSO CIA
46	DDS&T (Mr. Sheldon)
47	ASA/D/DCI/NIPE
48	D/OSI
49	ExSec, SORS/OSI
5	D/OSP
51	C/TLSS/DDS&T
52	D/OEL
53	D/SA
54	D/O/OSA
55	Intel/O/OSA
56	D/FMSAC
57-61	SA(COMIREX)/DDI