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PACOM TACAIR TNF IMPROVEMENT
RECOMMENDATIONS

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19. ABSTRACT (Continue on reverse side if necessary and identify by block number) This study recommends a number of force modernization options to improve the capability of land based tactical aircraft to support PACOM's requirements. Current capabilities and deficiencies of these forces in the mission areas of land attack, maritime support, and air superiority are discussed. Recommenda- tions for redressing identified deficiencies are made which are based on existing assets, programmed assets, or modifications to these assets. Both near term (<1985) and longer term options are included. Emphasis has been placed on providing improved dual capable systems to provide CINCPAC with the		

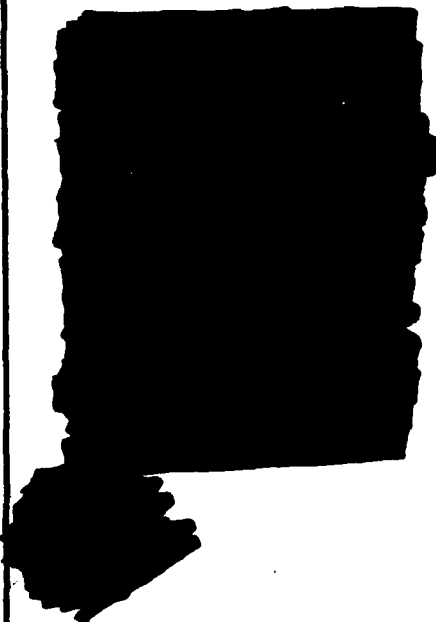
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I. - INTRODUCTION

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This report provides the results of an effort, began in mid-January 1982 (but building on work completed during FY81), to assist the Defense Nuclear Agency (DNA) in formulating suggestions for improving the capabilities of CINCPAC's land-based air component, the Pacific Air Forces (PACAF). We have chosen to focus on PACAF owing principally to the brevity of the time available, but also in the belief that CINCPAC is clearly aware of the important contributions which can be made by the long-range bombers of the Strategic Air Command.

In the sequel we address four principal issues:

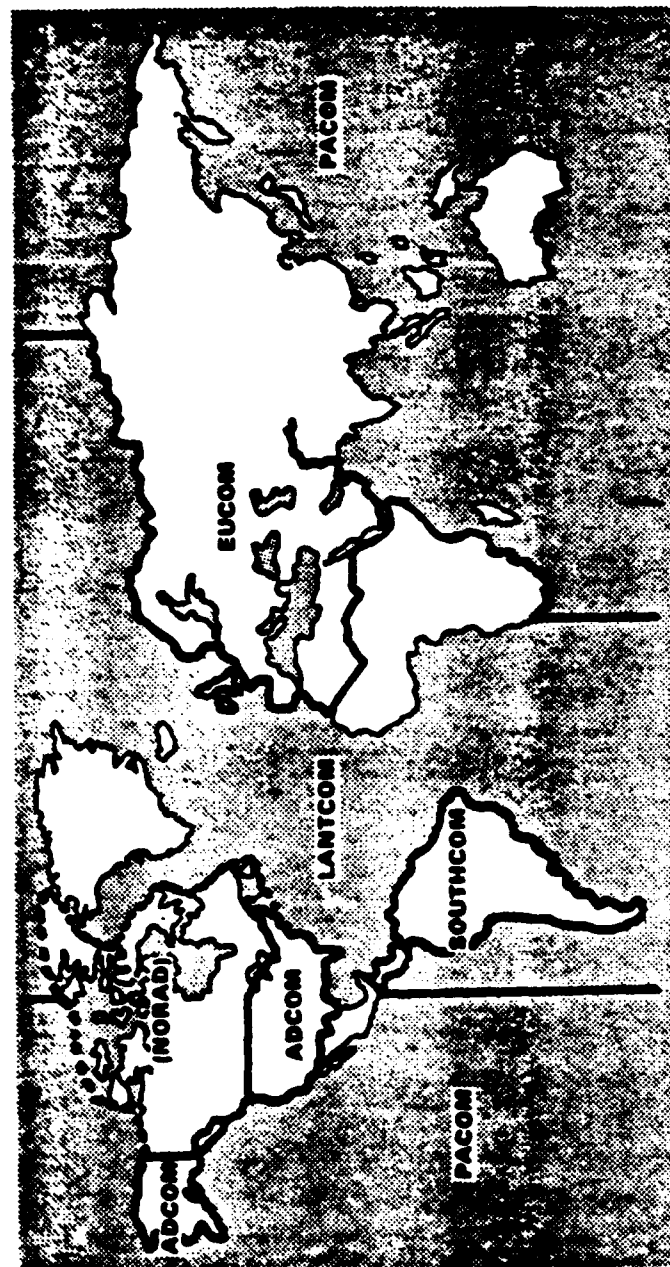
- Increased Range
- Land Attack
- Maritime Support
- Air Superiority

Two of these issues, "increased range" and "maritime support", bear mention here briefly.

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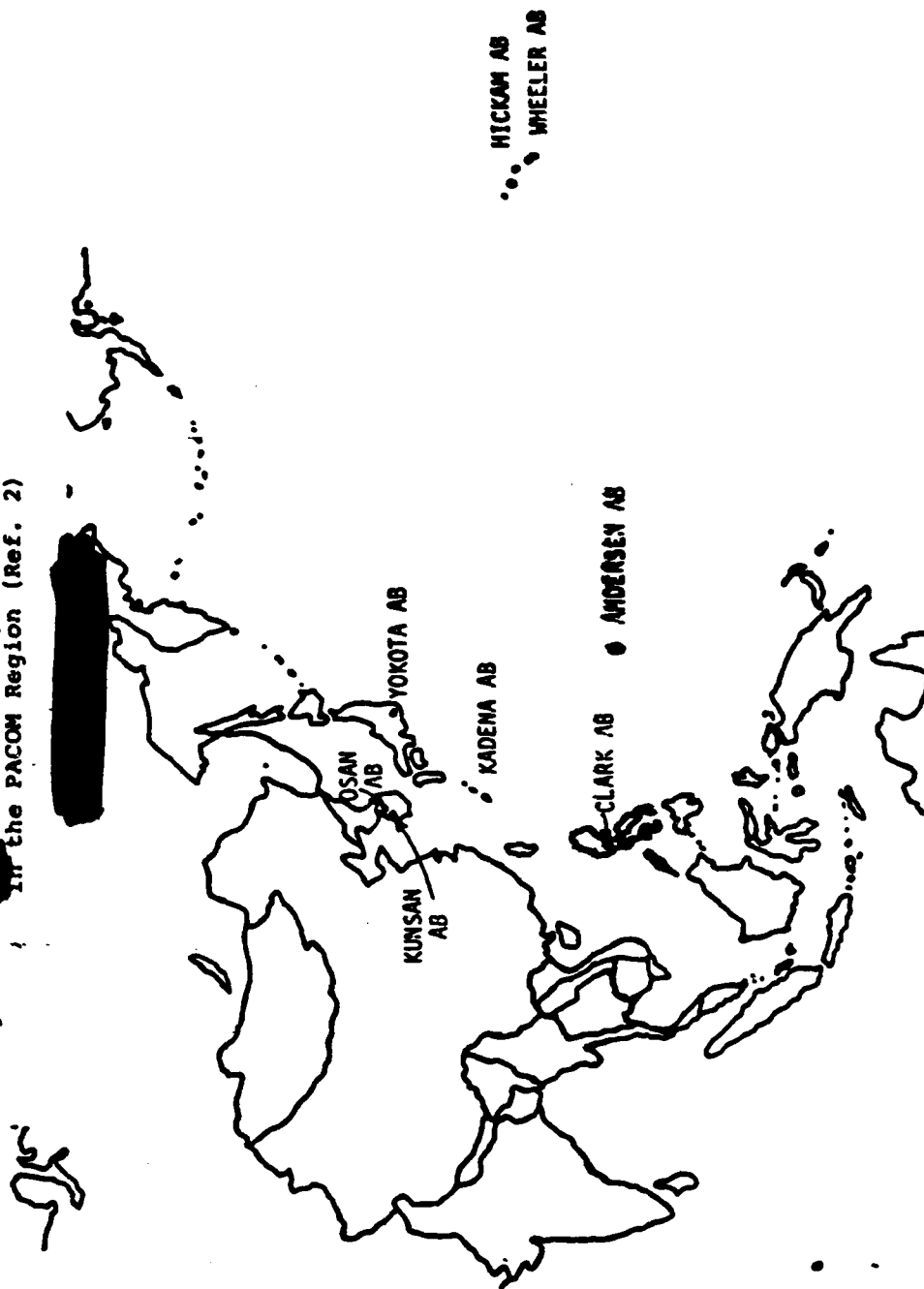
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Figure 1. The PACOM Region in Relation to the Other U.S. Unified and Specified Commands. (Ref. 1)



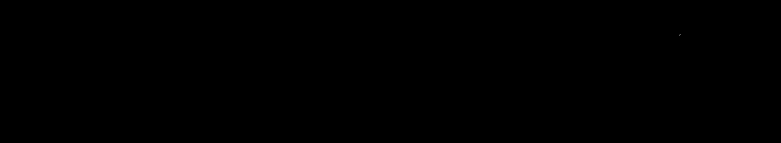
NOTES: Whether or not there is a boundary between EUROM and PACOM through the Soviet Union is classified information. Several areas, such as Mexico and Africa south of the Sahara, lie outside the jurisdiction of any U.S. unified or specified command.

Figure 2. Current Basing for USAF Forces
in the PACOM Region (Ref. 2)



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will be addressed in four categories. [REDACTED]



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a. Maritime surveillance--The required maritime surveillance capabilities, to support an expanded role for land-based aircraft in maritime support, include the ability to detect, track and identify naval surface forces over large ocean areas in the Western Pacific. Current airborne surveillance assets have the potential to perform these functions, with systems currently under development promising further enhancements. Of course, the U.S. Navy surveillance assets already provide the type of acquisition capability desired and with proper coordination could support maritime attack missions by land-based tactical aircraft. However, a sole reliance on these assets could unduly limit the potential areas of operation, depending on USN battle group dispositions.

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Another advantage of PLSS over any current ELINT systems is that in addition to be a location system it is also a strike system. It can provide accurate mid-course guidance for long range standoff munitions. This will be explored further in the next section in which recommendations to provide a strike capability are examined.

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APPENDIX A

PLSS + GPS + ANACS: A SURVEILLANCE SYSTEM

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The first function, location of emitters, is performed using the time-difference-of-arrival (TDOA) of a given signal between two pairs of airborne platforms (TR-1 aircraft); the location being determined by the common intersection of the two hyperboloids, calculated from the time-differences, with the surface of the earth. This technique may be thought of as an inverse-LORAN process, where the locations of three receivers are very accurately known with the location of the transmitter subsequently determined. (With LORAN, it is recalled, the locations of three transmitters are very accurately known, with the location of the receiver subsequently determined--the processes are identical.)

In this process, the positions of the three receiving platforms (TR-1s) are determined with considerable precision

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by DME (distance measuring equipment). DME is nothing more than an extremely accurate version of the DME associated with standard TACAN stations. Each TR-1, then, must be in line-of-sight (LOS) of three surveyed, ground-based DME stations--from which three-coordinate position data can be determined. (DME also provides the data which supports accurate weapon guidance for the PLSS strike function.)

Additionally, the principal part of the processing of the signal data collected by the TR-1s, including the calculation of emitter locations, is performed at a ground-based processing center.

Thus, the present PLSS (IOC FY 86) is linked inextricably to ground-based assets for two critical functions: TR-1 navigation, and data processing. For NATO's Central Region this linking provides no particular difficulties due to the very large LOS of this high-altitude system. Unfortunately, what for central Europe is "large" LOS is for the western Pacific "not large." What is wanted, then, is some scheme which decouples PLSS from its present airborne links with the ground, while retaining (and, in fact, increasing) its present capabilities.

To achieve this aim, RDA has conceived a system which replaces the navigation function (the strike function would be retained) presently performed by DME with GPS. That is, a GPS receiver would be installed on each TR-1 with "ground truth" determined from GPS data (actually, GPS will provide three-coordinate location plus velocity determination). We have rather carefully examined this notion to determine an estimate of navigation (location) accuracy thus derived. This analysis is presented in Appendix B to this report.

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APPENDIX B

PLSS ERRORS USING GPS FOR NAVIGATION

1. INTRODUCTION

It has been suggested that the Precision Location and Strike System (PLSS) could be deployed over the sea to locate shipboard emitters over a wide area. If this were done, PLSS navigation using precisely located groundbased beacons would be very difficult to implement. An alternative navigation system that should be available within two years after PLSS is fielded is the Global Positioning System (GPS). This system is presently expected to employ 18 satellites in orbits that have a period of 12 hours and a radius of about 14,000 nmi. Each satellite transmits an accurately timed signal which can be received at any point that is near the earth and within line of sight. The position of the receivers can be determined by measuring the times of arrival of the signals from three appropriately located satellites or by measuring the differences in the times of arrival of the signals from four satellites. This appendix will give an estimate of the errors incurred in locating emitters when PLSS uses GPS for navigation.

Since each PLSS platform will be equipped with a very accurate clock, it will be assumed that it will determine its position by measuring the absolute times of arrival of the signals from each of three GPS satellites. Each of these times will be compared with the known time at which the signal was transmitted to determine the one-way transit time. Each transit time determines the distance of PLSS from one of the satellites, and the PLSS

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