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TADIXS GROUND REMOTE COMMUNICATION LINKS EXISTING FCC-TO-NAVCOM--ETC(U)
MAY 79 J L DODD, C T OGATA, W J POMPER

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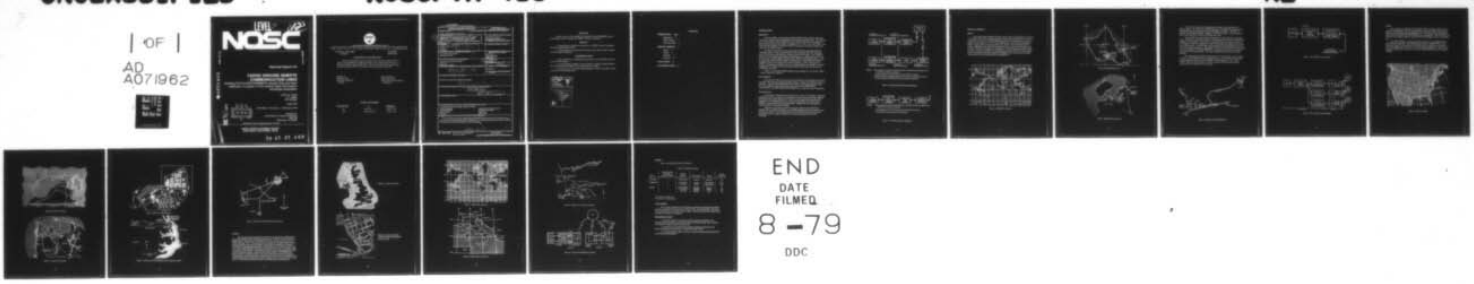

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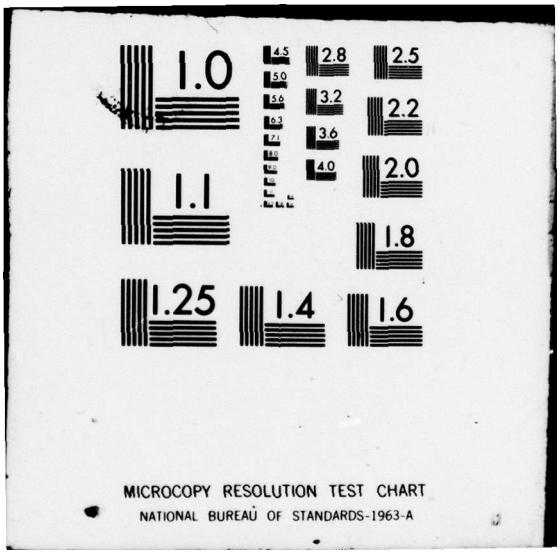
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TADIXS GROUND REMOTE COMMUNICATION LINKS

Existing FCC-to-NAVCOMMSTA remote links and their adequacy in support of the tactical data information exchange subsystem

LCDR JL Dodd
CT Ogata
WJ Pomper

6 May 1979

Final Report: 20 January — 28 February 1979

Prepared for
Naval Electronic Systems Command
PME 106
Washington, DC 20360

NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The tactical data information exchange subsystem (TADIXS) requires local resources at the fleet command center to remote the base-band signal to the rf transmission site. A study was performed to determine the adequacy of existing links in supporting the TADIXS concept of operations.

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OBJECTIVE

Conduct a study of the capability of existing FCC-to-NAVCOMMSTA remote communication links to support the TADIXS concept of operations.

RESULTS

1. Existing links are capable of supporting the TADIXS concept of operations for the Pacific and Atlantic FCCs.

2. The European FCC connectivity will require a lead time of about 6 months for minor landline installations.

RECOMMENDATIONS

1. Take early action to establish hard requirements for the TADIXS connectivities in the three theaters.

2. Use back-channel modems in the connectivity to maintain synchronization of the control and base-band signals in spite of differential time delays.

3. Consider the use of statistical TDM equipment to reduce the number of lines in the Pacific and European areas.

CONTENTS

INTRODUCTION

Background

The fleet satellite communications (FLTSATCOM) system provides communication links via satellite between designated mobile platforms and shore sites. The coverage area for these links, between latitudes 70°N and 70°S, is worldwide. Four satellites in geosynchronous orbit will be located at longitudes 23°W, 75°E, 172°E, and 100°W. The system includes satellites, rf terminals, subscriber subsystems, personnel, training, documentation, and logistic support.

Of interest in this report is the tactical data information exchange subsystem (TADIXS), which is a direct communications network between Navy fleet command centers (FCC) ashore and task force command centers (TFCC) afloat. The TADIXS rf channel will carry digitized half-duplex communications at 2.4 kilobits per second over the uhf or uhf–demand assigned multiple access (DAMA) FLTSATCOM system. It will be compatible with the defense satellite communications system (DSCS) shf satellites. TADIXS will also use low-speed hf for relay and backup. A TFCC which has lost satellite communication capability will use its existing long-haul hf capability for backup transmission and reception of alert precedence traffic between itself and the nearest TADIXS link controller.

Figure 1 is an overall TADIXS subsystem block diagram for uhf and shf. Figure 2 shows a typical FCC terminal.

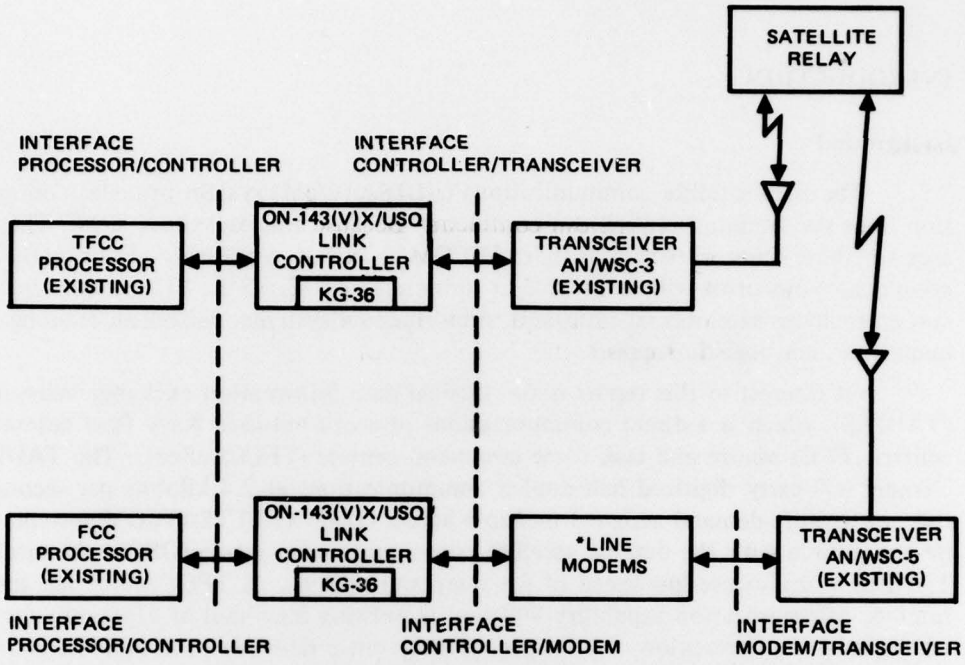
Work Objectives

The objective of this work was to study the capability of existing links between fleet command centers and naval communications stations to support the TADIXS concept of operations. This involved studying the Pacific, Atlantic, and European theaters, since FCCs are installed in each of these areas–collocated with the CINCPACFLT, CINCLANTFLT, and CINCUSNAVEUR Headquarters–to support the fleet commanders.

Work Procedures

Each theater of operations was visited by one or more of the authors. Liaison by telephone and letter was made to identify points of contact and to prime the cognizant personnel for the desired information. During the visits, appropriate personnel were questioned at each headquarters site and at the communication area master station (CAMS), and the physical layouts and equipment configurations were examined for adequacy relative to supporting TADIXS.

Operational and technical personnel were also briefed on the TADIXS and supplied with all available information on TADIXS equipments and their impacts on the local physical layouts. The proposed system was well received because of the small physical size and few support requirements for Interconnecting Group ON-143 (V)X/USQ.



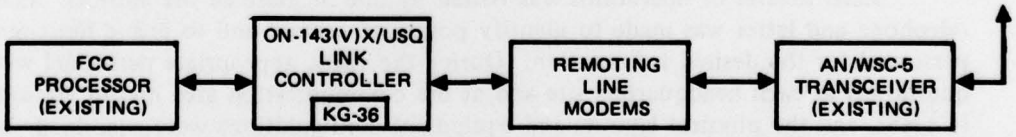
*NOTES: When necessary for remote rf-to-terminal operation, C2-conditioned voice grade lines are required to connect the line modems.

The interface points of the link controller and the KG-36 are not shown.

Hf and shf transceiver equipment shall be used in place of the AN/WSC-5 as required.

The block diagram for uhf-DAMA and AJ shf will differ in equipments.

Figure 1. Tactical data information exchange subsystem.



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The interface points of the link controller and the KG-36 are not shown.

Uhf-DAMA and AJ shf equipments will be different.

Figure 2. FCC station equipment configuration.

RESULTS ACHIEVED

Pacific

The Pacific theater stretches from the western coast of the Americas to just short of the eastern coast of the African continent. Because this extensive sea area cannot be covered by the footprint of one FLTSATCOM spacecraft, some strategy is necessary to supply the connectivity for a TFCC in the Indian Ocean and the FCC in Pearl Harbor, Hawaii. Figure 3 shows the area required to be covered. The CINCPACFLT FCC is located at Makalapa, just outside the boundaries of the naval base at Pearl Harbor (fig 4 and 5). The FCC is located on the fourth floor, while the integrated information display (IID) computer is scheduled for installation on another floor of the same building. A port is reserved on the IDD computer for TADIXS in the current Naval Command Control System (NCCS) baseline plan for CINCPACFLT.

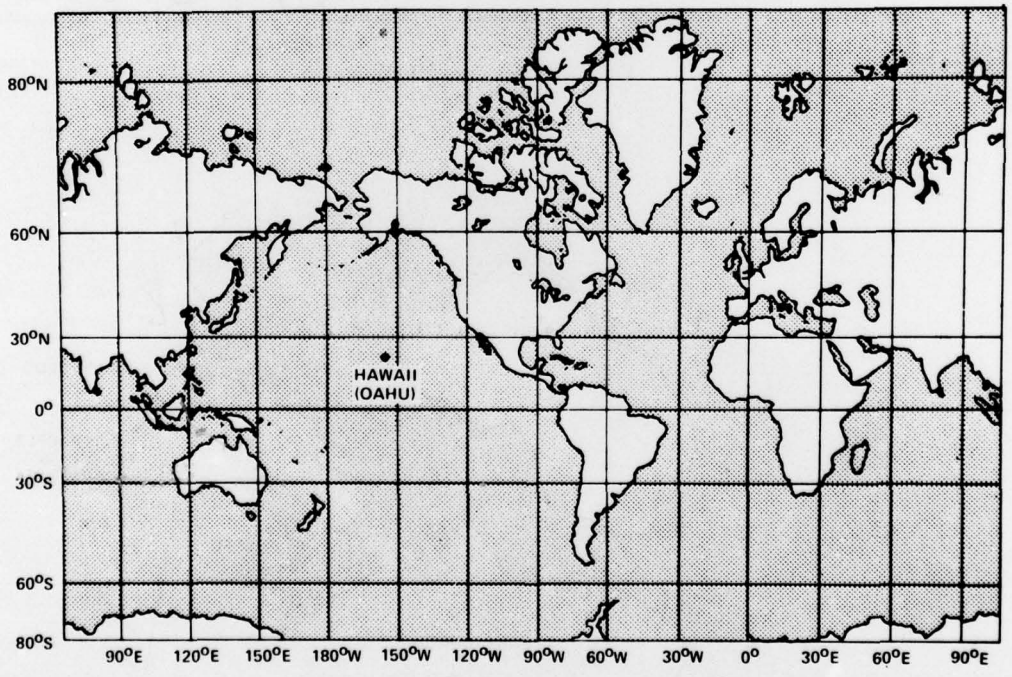

Figure 3. Makalapa HI, world map.

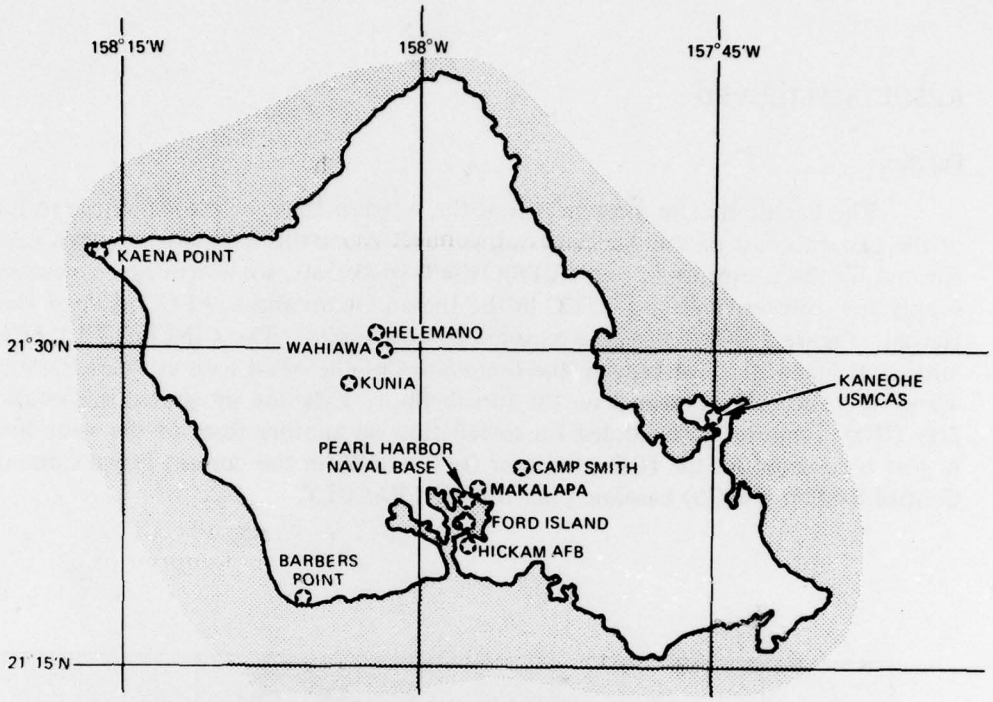

Figure 4. Makalapa HI Oahu map.

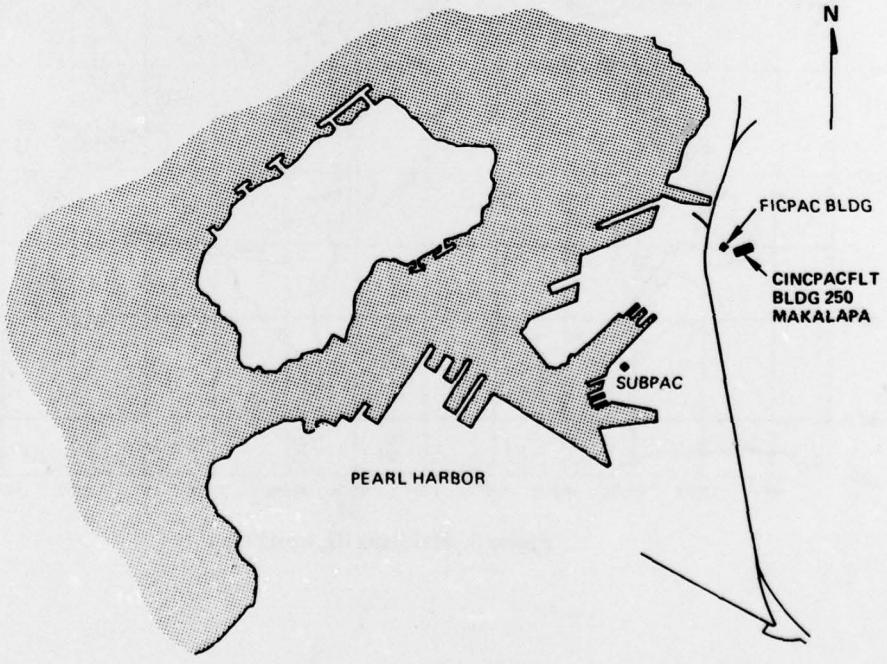

Figure 5. Makalapa HI local area map.

The rf site for virtually all communications leaving or entering Oahu is at Wahiawa (fig 4). The link for the TADIXS processor is via landline to the basement of building 250, then via microwave relay from Makalapa to Wahiawa. The WSC-5 is located at NAVCAMS EASTPAC, building 261, at Wahiawa (fig 6). This connectivity (fig 7) is the same for any choice of rf range—uhf or shf.

Two methods exist for achieving connectivity to a TFCC located in the Indian Ocean. The first is via submarine cable to a transmitting site visible to the Indian Ocean (longitude 75°E) satellite. The second is by using more than one satellite and sites in the footprints of both the longitude 75°E and 172°E satellite as possible relay locations for an all-uhf system. A system using one shf satellite and one uhf satellite could also achieve the desired connectivity. The method of choice for the Indian Ocean connectivity is to use a landline to NAVCAMS WESTPAC, at Finegayan, Guam, then to access the Indian Ocean FLTSAT spacecraft. This choice simplifies routing and avoids timing problems.

The connectivities for TFCCs in the eastern and western Pacific areas are easier to achieve. NAVCAMS EASTPAC, at Wahiawa, HI, is in the footprint of the CONUS satellite (longitude 100°W) and the WESTPAC satellite (longitude 172°E). These satellites may be accessed directly from Oahu to support the system requirements. Figure 8 shows the details of the connectivity.

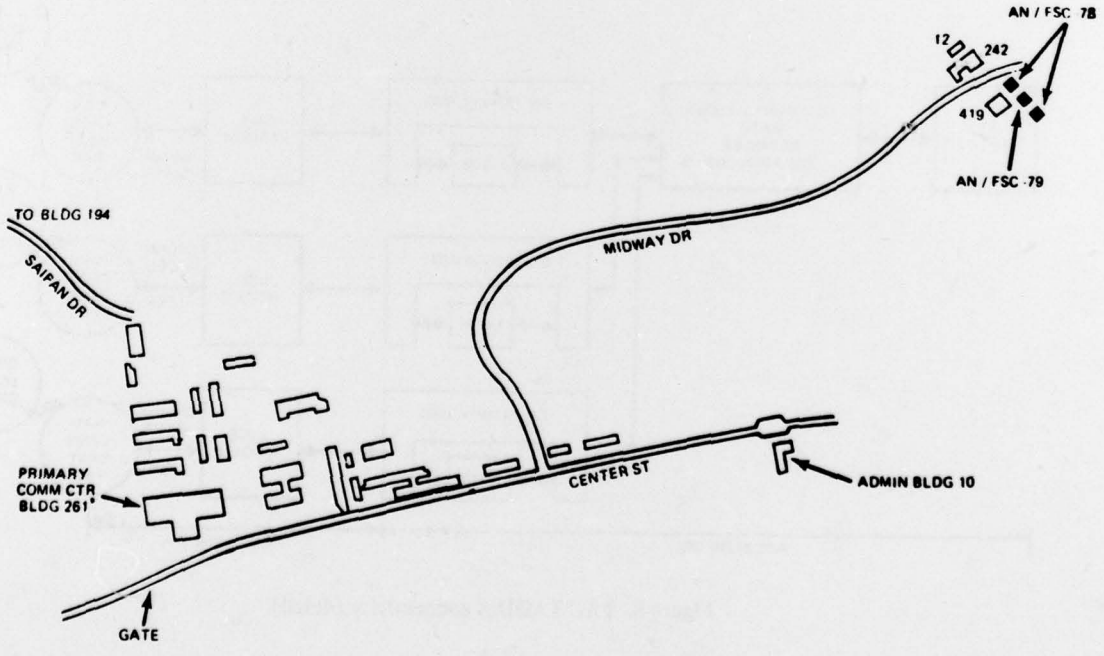

Figure 6. Wahiawa HI NAVCAMSEASTPAC.

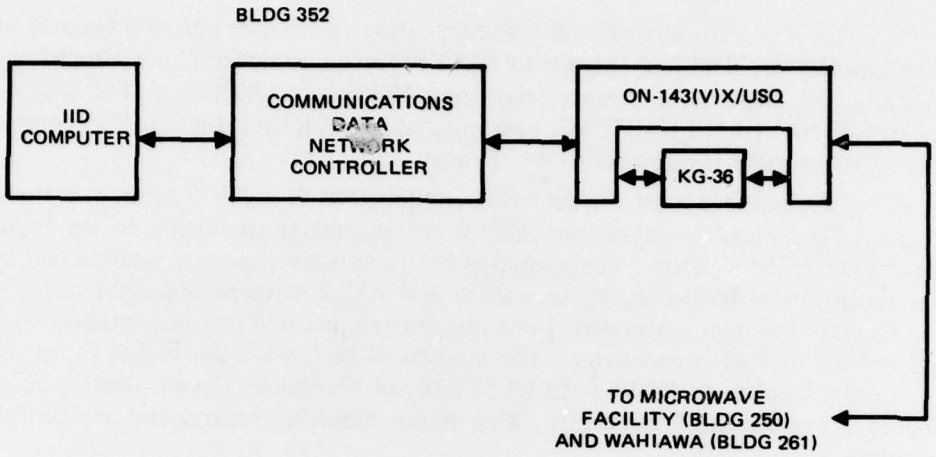

Figure 7. PAC TADIXS connectivity (basic).

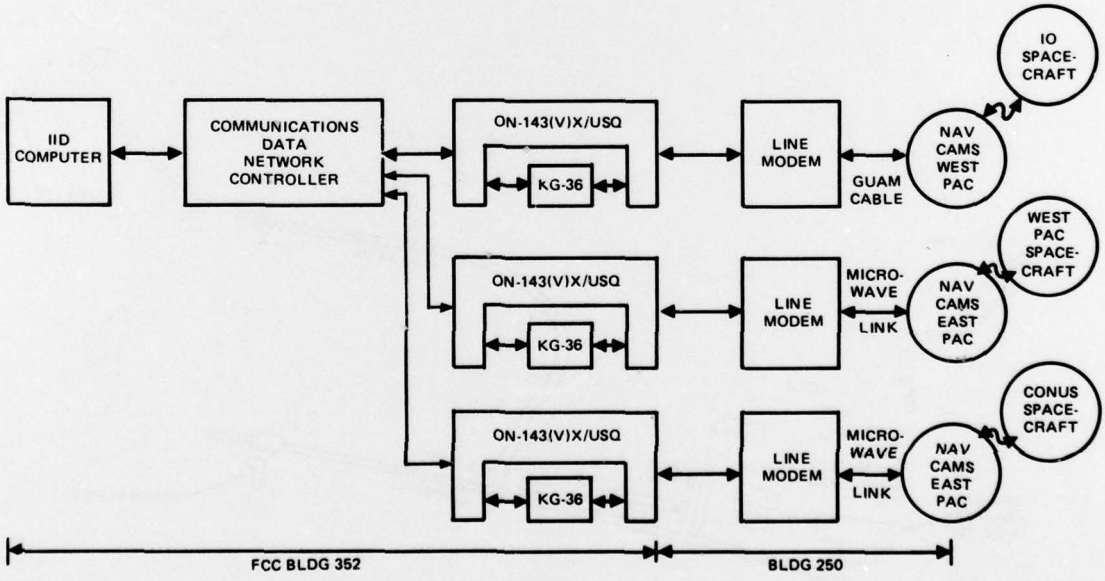

Figure 8. PAC TADIXS connectivity (detail).

Atlantic

The Atlantic area represents the best-defined area of operations with respect to command responsibilities. It is also the simplest in conception, largely because of the location of the Altantic satellite at longitude 23°W. The satellite footprint associated with this location blankets the CINCLANTFLT area of operations. The FCC-TFCC connectivity can be achieved easily by using one ON-143(V)X/USQ and only one TADIXS net.

The CINCLANTFLT is located at Norfolk VA (fig 9-12) in building NH-95 in the CINCLANT compound. NAVCAMSLANT is located in building NH-51 on the naval station (fig 11). Connectivity for TADIXS will be via landline, with technical control in building NH-95. The uhf rf site is located at building M-51. The shf rf site is located at Northwest VA (fig 13, 14). Current CAMS-Northwest links will support TADIXS.

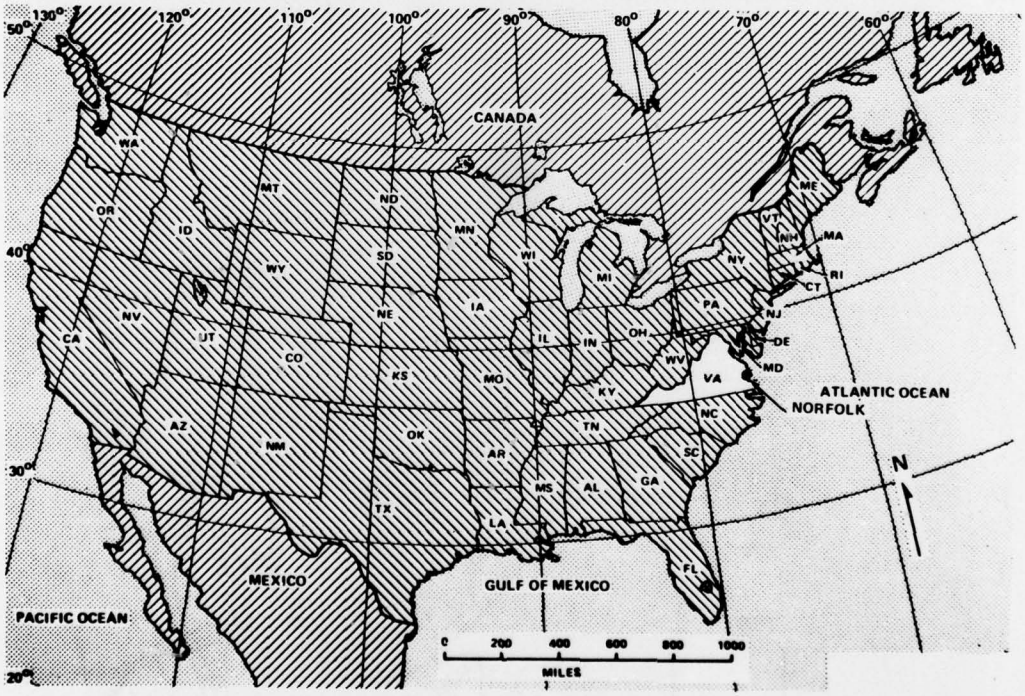

Figure 9. Norfolk VA, US map.

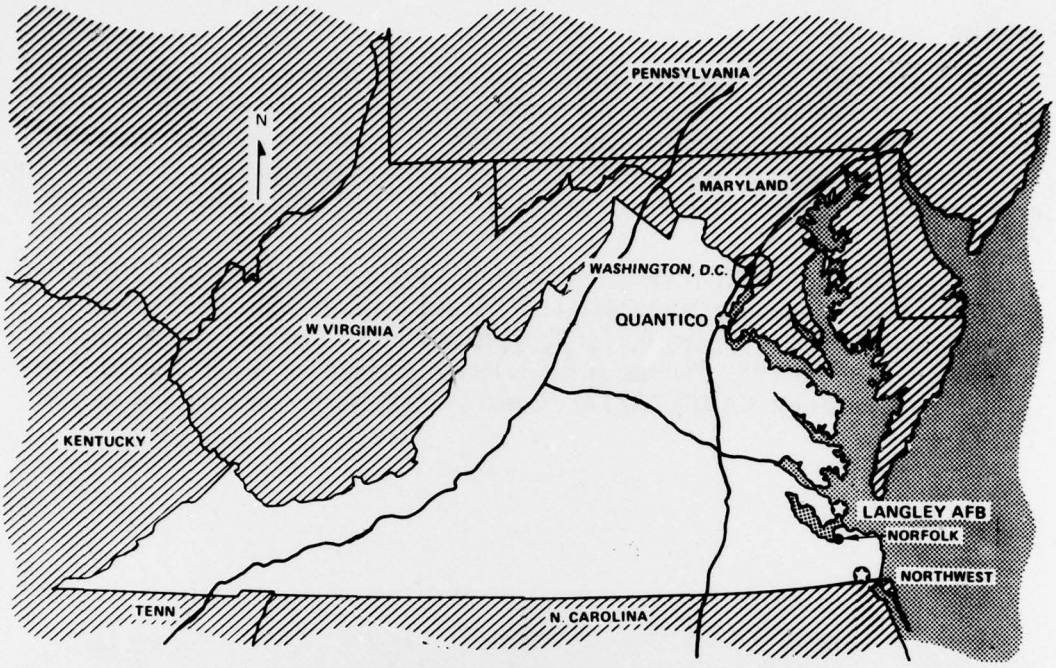

Figure 10. Norfolk VA state map.

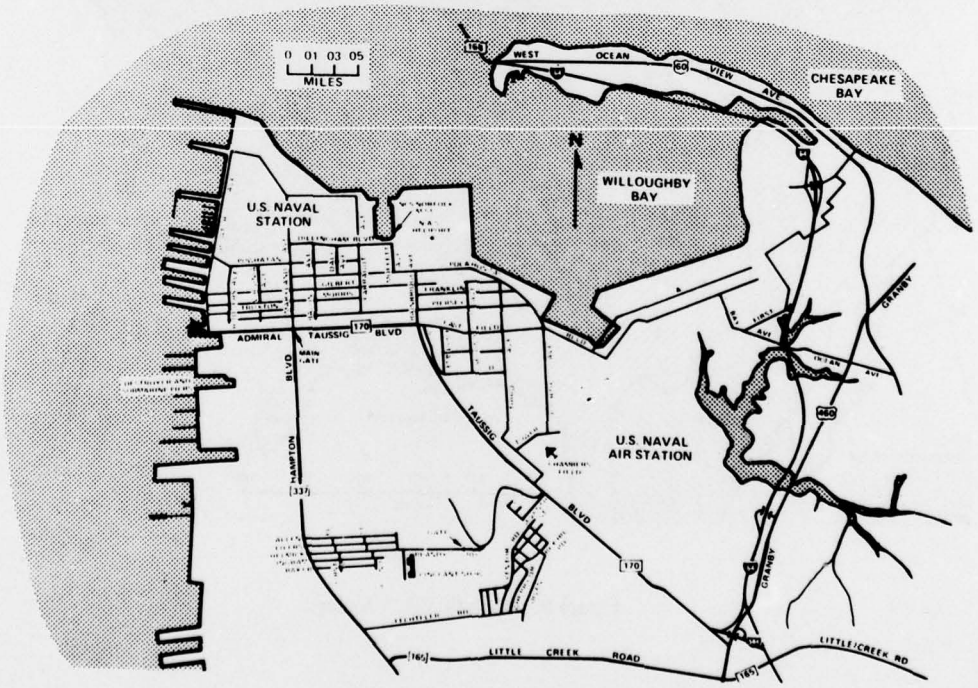

Figure 11. Norfolk VA, NS Norfolk.

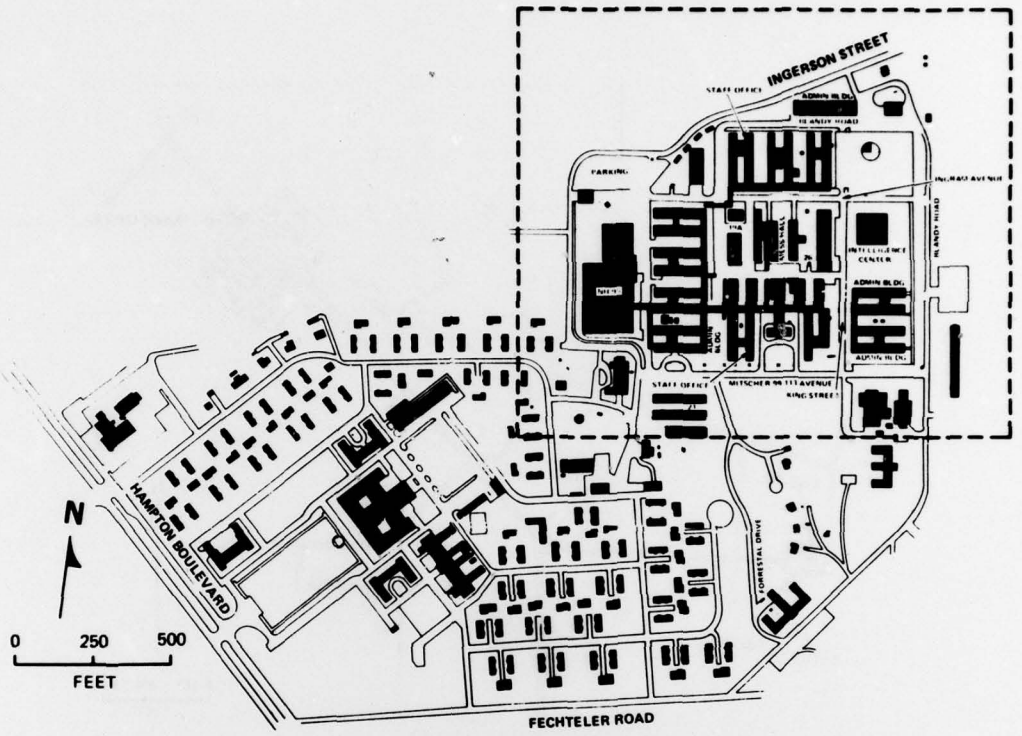

Figure 12 Norfolk VA CINCLANT area.

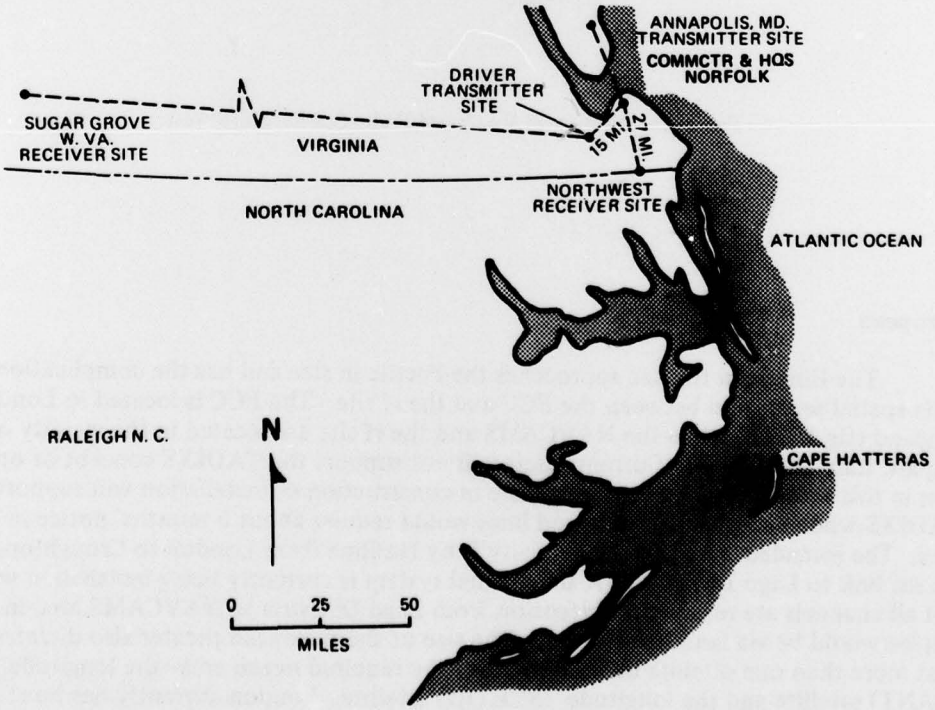

Figure 13. Northwest VA NAVCOMMSTA Norfolk component locations.

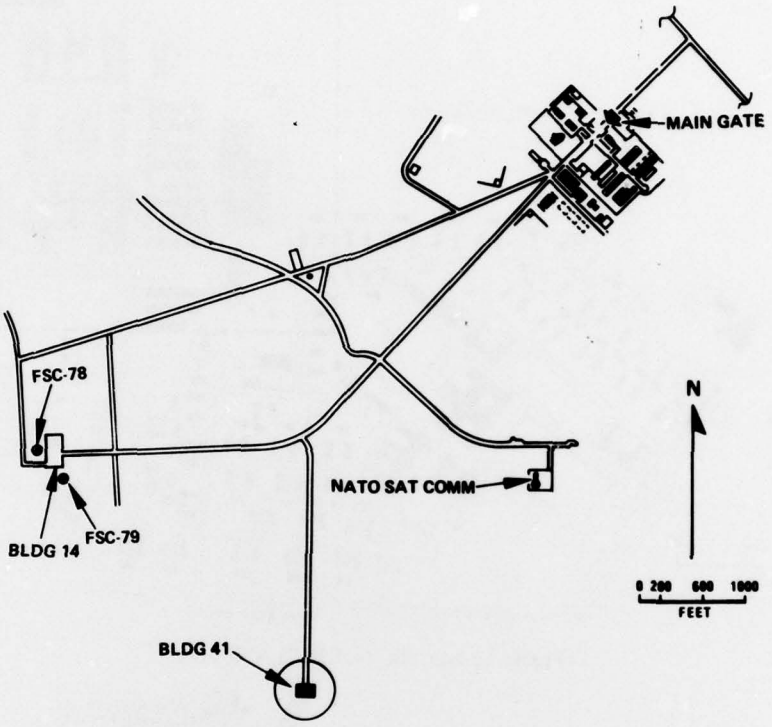

Figure 14. Northwest VA, Naval Radio Station Northwest.

European

The European theater approaches the Pacific in size and has the complication of wide spatial separation between the FCC and the rf site. The FCC is located in London, England (fig 15, 16) while the NAVCAMS and the rf site are located in the vicinity of Naples, Italy (fig 17–19). Current assets will not support the TADIXS concept of operation in this theater; but projects currently in construction or installation will support TADIXS when completed, and leased lines would require about 6 months' notice in this area. The intended TADIXS connectivity is by landline from London to Croughton, then via shf link to Lago Di Patria. (A six-channel system is currently being installed in which not all channels are reserved.) Extension from Lago Di Patria to NAVCAMS Med in Naples would be via land line (fig 20). The size of the European theater also dictates that more than one satellite be used to cover the required ocean area—the longitude 23° N (LANT) satellite and the longitude 75° E (IO) satellite. London currently has no rf equipment, but a four-channel stacked AN/WSC-3 unit installation has been proposed.

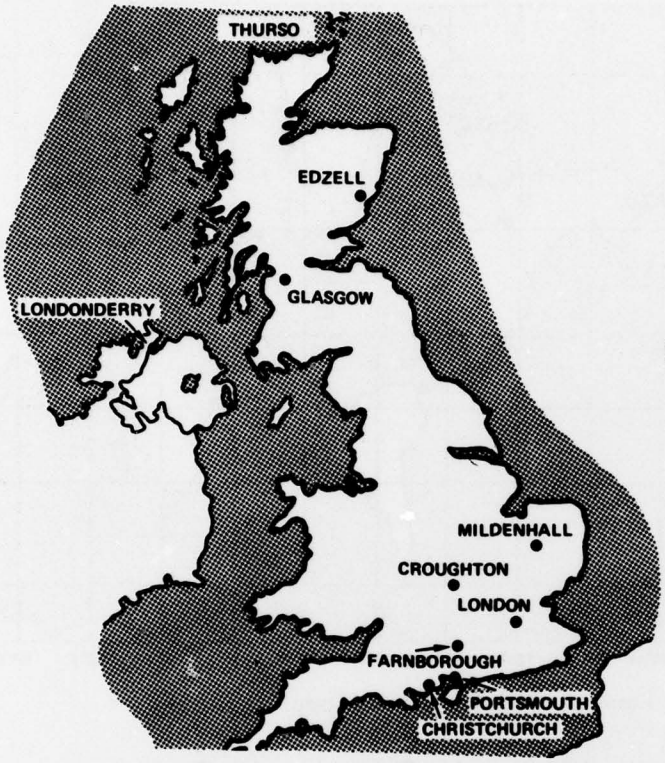

Figure 15. London, Great Britain.

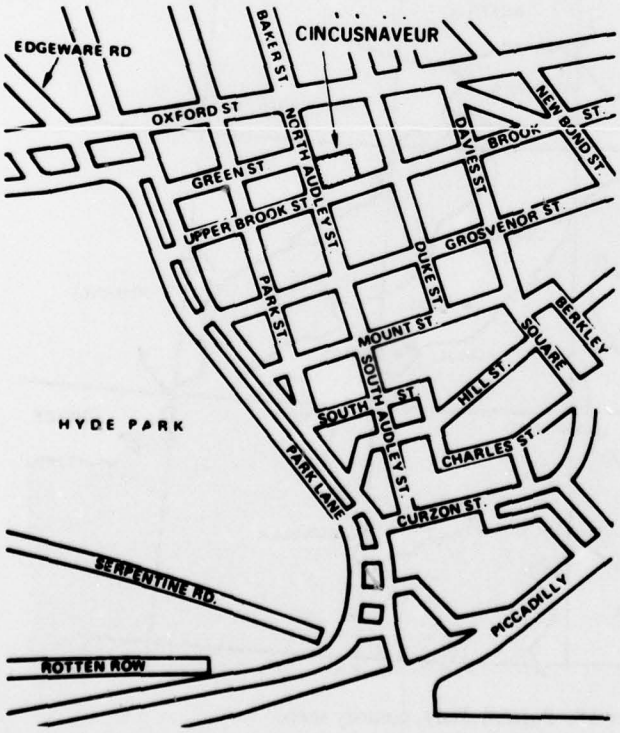

Figure 16. London, Great Britain, CINCUSNAVEUR/NAVCOMMUNIT London, area map.

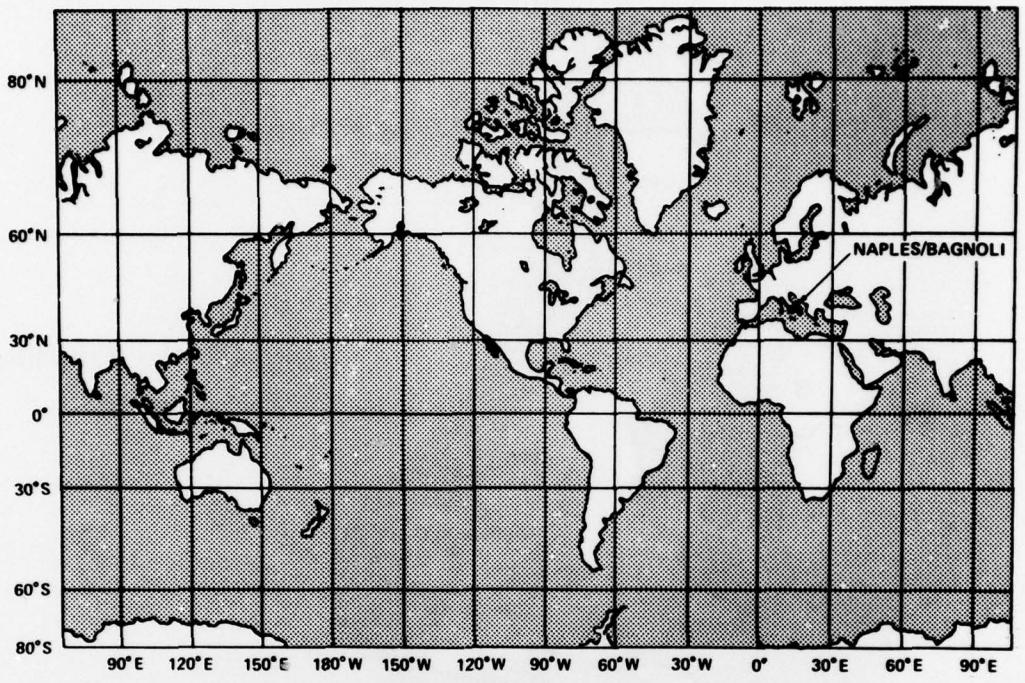

Figure 17. Bagnoli, Italy, world map.

Figure 18. Bagnoli, Italy, country map.

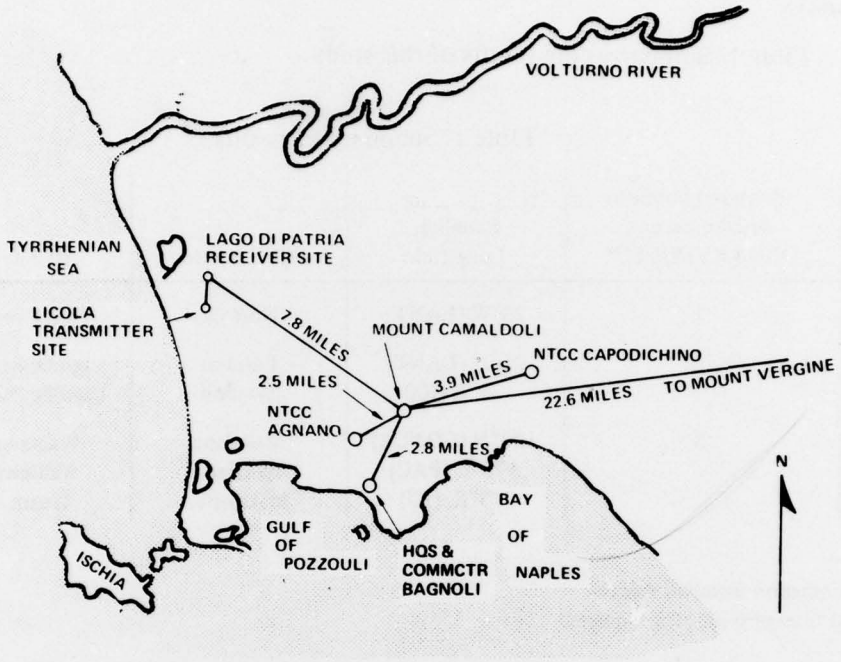

Figure 19. Bagnoli, Italy, NCS Italy components.

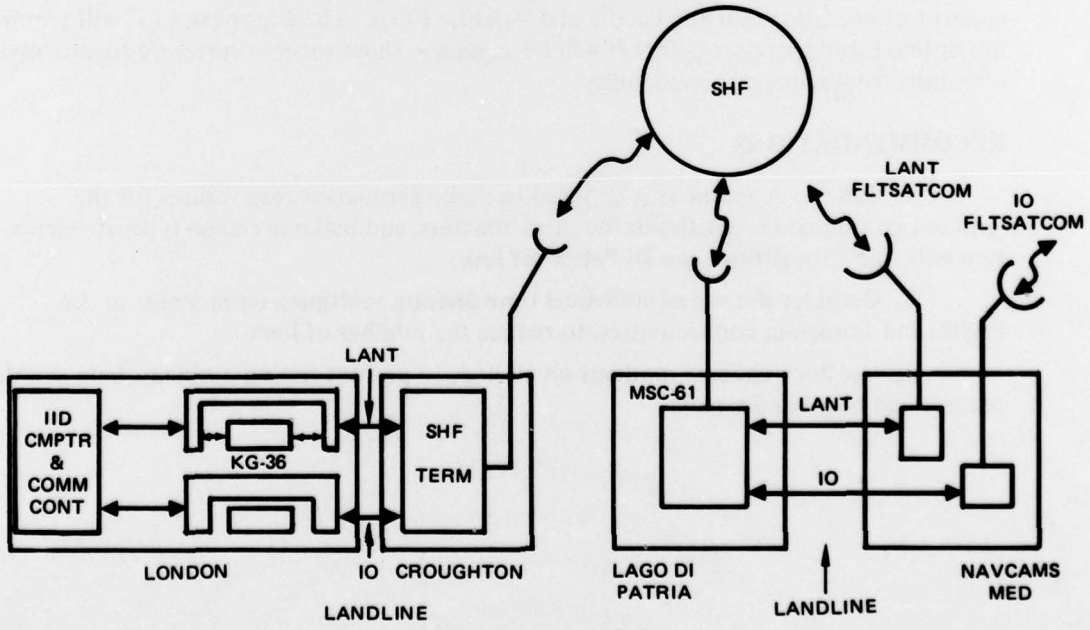

Figure 20. London-NAVCAMSMED connectivity.

Summary

Table 1 summarizes the results of this study.

Table 1. Summary of results.

Theater	Required Subnets or Numbers of ON-143(V)X/USQ*	Satellite, Longitude	FCC Location	Rf Site	Current Connectivity
ATLANTIC	1	23°W (LANT)	Norfolk	Northwest	Yes
EUROPEAN	2	23°N (LANT)	London	Lago Di Patria	No**
		75°E (IO)	London	Lago Di Patria	No**
PACIFIC	3	100°N (CONUS)	Makalapa	Wahiawa	Yes
		172°E (PAC)	Makalapa	Wahiawa	Yes
		75°E (IO)	Makalapa	Guam	Yes

*Assuming no installed spares
**Lead time of 6 months required

CONCLUSIONS

The currently available FCC-to-NCS links are capable of supporting the TADIXS concept of operations for the Pacific and Atlantic FCCs. The European FCC will require minor line-leasing services before it will be capable. These services currently require about 6 months from request to availability.

RECOMMENDATIONS

1. Take such action as is required to make permanent reservations for the required ground connectivities in the three theaters, and make the same type of reservation with the Croughton-Lago Di Patria shf link.

2. Consider the use of statistical time division multiplex equipments in the Pacific and European connectivities, to reduce the number of lines.

3. Use back-channel modems on all lines to prevent timing problems between the control and base-band signals.