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AUTHORITY

ESD, USAF LTR, 21 AUG 1973

UNITED STATES AIR FORCE

MISSION ANALYSIS
ON
COMMAND AND CONTROL COMMUNICATIONS
FOR THEATER AIR OPERATIONS (U)

CONTRACTOR REPORT NO. 10

AIR FORCE INTERSERVICE INTERFACE STUDY (U)

VOLUME I

AUGUST 1971

Prepared for

MCT STUDY GROUP
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
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Prepared by

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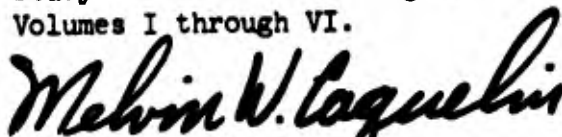Sand Lake Road
Orlando, Florida 91360
under Contract F19628-71-C-0229

1 October 1971

SUBJECT: Special Contractor Studies in Support of
the Mission Analysis on Command and Control
Communications for Theater Air Operations

1. A limited number of contract studies, each with
specific questions to be addressed, were established
in support of the Mission Analysis on Command and
Control Communications for Theater Air Operations.
Outputs from these contractor efforts were useful to
the Study Group in their deliberations and are included
in the annex of the MCT final report as this information
may be of value to others addressing related subjects.

2. This particular report documents the analysis and
findings of the contractor shown for his assigned study
area and may or may not represent the final consensus
of the MCT Study Group on any particular issue. MCT
study results and findings are presented in final report
Volumes I through VI.

MELVIN W. CAQUELIN
Director, MCT Mission Analysis

AIR FORCE INTERSERVICE INTERFACE STUDY

(VOLUME I)

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8 AUGUST 1971

MCT STUDY GROUP XR-SF
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
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ABSTRACT

Tactical Air Force (TAF) communications interfaces with joint services within a theater of operations were identified, defined, and classified to determine any problem areas that will prevent or interfere with the interoperability required between the elements of the TAF and the other services. The interfaces defined are for the Air Force component of; a Joint Force which includes a two-corps Field Army, and a Joint Amphibious Task Force which includes a Marine Amphibious Force.

In addition to categorizing the present-day (1971-1972) interfaces, the near term/future interfaces (1973-1985) were identified for those systems which have been defined in sufficient detail.

The points of interface considered included those with the Joint Services; US Army, US Navy, and US Marine Corps elements; the Joint Forces Headquarters complex; the ICAO within the host country; and with DCA and NSA systems in the field. The interfaces are categorized by system affiliation, link terminal equipments, and end instruments. The interconnections are further classified according to message function, use, type or mode of traffic, format or structure, operational characteristics, and the estimated traffic quantity for the 1975 time period. Tables of the technical parameters and characteristics of the interfacing equipments are included, with charts indicating the relative compatibility of like equipments.

The results of the study are presented in two volumes; the second, which is classified, presents interoperability problems associated with cryptosecurity equipments.

FOREWORD

This is the final report describing the results of an interface
study in support of the Missions Analysis for Command and Control
Communications for Theatre Air Operations. The study was conducted
during June and July 1971.

The work was performed by the Martin Marietta Corporation under
Contract No. F-19628-71-C-0229 for the MCT Study Group XR-SF, Electronic
Systems Division, Air Force Systems Command (USAF). The ESD Project
Monitor is Mr. Robert W. Blanchard. The following engineering personnel
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> W. B. Raymond

CONTENTS

ILLUSTRATIONS

TABLES

I. INTRODUCTION

This study was conducted to identify potential and existing communications interface problem areas between the Tactical Air Force (TAF) and other services in a Joint Force theater operation. The interfaces were defined and categorized by message traffic characteristics and equipment parameters that affect the communications interoperability of the interfacing elements by operational or physical means. Each interface was then analyzed to determine the occurrences of incompatibilities. Near term and future system (1973-1985) interfaces as well as baseline (1971-1972) interfaces representing contemporary equipments were included in the study.

The identification of the TAF interface requirements were derived from the documentation listed in the References and Bibliography. The force composition for the theater operation was modified from the MCT/India deployment model to add a Joint Amphibious Task Force (JATF) comprised of a Naval Force and a Marine Amphibious Force (MAF) to support the two-Corps Field Army. This change permits inclusion of the Marine Corps interfaces, and defines an Amphibious Command Ship for the Navy flag ship. In addition to the communications interfaces with these units, interfaces between the TAF and the Joint Force Headquarters complex, DCA, NSA, and ICAO were also addressed.

The TAF communications interfaces were categorized into the following nine organizational elements or groupings and are presented in block diagram form in Section II. Mission aircraft were treated separately.

BASELINE	NEAR TERM/FUTURE
1. AFCCP	1. AFC HQ
2. TACC	2. TACC
3. ALCC-ALCE	3. ALCC-ALCE
4. DASC-TACP	4. DASC-TACP
5. CRC-CRP	5. CRC-CRP
6. TAB-TUOC-TATCF-CSG-AP	6. TAB-TUOC-TATCF-CSG-AP
7. RITS	7. RITS
8. WECEN	8. WECEN
9. SPECIAL	9. SPECIAL

Message traffic characteristics, derived primarily from references 61 and 62, were added to each element. This data includes information relating to the function of the traffic exchanged over the interface, its use, the type or mode of traffic, the message structure or format, operational characteristics, and the estimated traffic quantity. This information is presented in matrix form in Table II of Section III.

1

Each interface was then analyzed to identify the specific system or subsystem affiliation of the command and control or operations facility of the interfacing elements, and to identify the communications equipments that would be utilized to provide the interconnections down to and including the end instruments. This information is presented in Section IV and is summarized in matrix form by Table III.

The interfaces for the baseline with their qualitative factors, subsystem affiliations, and communications equipment identifications as described in the Interim Report dated 9 July 1971 were coordinated with TAC personnel in a meeting at TAC Headquarters on 23 July 1971. As a result of the meeting the interface diagrams of the Interim Report were revised to reflect TAC Headquarters latest thinking. Changes to the other tables as a consequence of the revised interface points were also made and appear in this report. In addition, the MRC-113 and the Mobile Data Terminal (MDT) were identified as preferred equipment in the baseline system.

Section V contains tables of the characteristics of the equipment listed in Tables III and IV. The characteristics tabulated are those that would primarily affect interoperability. Additional equipments commonly used by the Mobile and Tactical Comm Groups, but not indicated as preferred equipments in Tables III and IV, are included. In addition descriptions of several near term/future command and control systems are incorporated in Section V.

No significant equipment interoperability problems were determined for the Baseline System, with the possible exception of the limited number of common user circuits between some of the elements because of their differing types of switchboards and VFTG multiplexers. The available equipments permit the TAF to communicate with all the interfacing units considered in this study, but only to the degree of the compatibility of the similar equipments. It was beyond the scope of this study to determine if in all cases the degree of compatibility was sufficient to transfer all the required information across the interfaces. However, the obvious restrictions resulting from this limited compatibility can only hinder the flexibility that is desirable in tactical communications, and requires even closer coordination of the operational aspects of the interfaces. The present capability to overcome such deficiencies in voice and teletype communications by deployment of additional equipments will not be possible, or at the least practical, with the automated systems expected by the 1985 time frame. Since the data processing hardware for the majority of the TAF, as well as several of the other services' systems, is undefined at this time, only limited discussion of the near term/future interface problem areas was possible. Details of equipment compatibility and inter perability problem areas are provided in Section VI.

A glossary of abbreviations and acronyms, and an index cross referencing equipments identified in the interfaces with the interfaces with which they are associated may be found in the back of Volume I.

II. IDENTIFICATION OF TAF INTERFACES WITH JOINT FORCE ELEMENTS

A. BASELINE

The identification of the present day or baseline TAF communications interfaces with the joint services is illustrated in Figure 1. The figure is a functionally oriented block diagram of the TAF elements with their interfaces shown by an identification number and the interfaced element with it's generic system identified, where applicable, in abbreviated form. A list of abbreviations is provided in Appendix A. The ID numbers used in this document as a cross reference are similar to the path identification numbers (PIN) of TACM 2-7.

Identification of the particular elements of the interface pairs was not always straightforward, and considerable effort was required to resolve the conflicting information in the available documentation, as well as to determine the operating element within the general designators (e.g., MTDS, ARFOR, AFCCP/TACC, etc) used in many documents.

As a recommendation of TAC Headquarters, the Joint Force weather central (WECEN) is an Air Force facility and is shown collocated with the AFCCP. The ALCC is also assumed to be operating as a part of the TACC, but deployed separately and in close proximity to the AFCCP-TACC complex. In some operations not requiring a TACC, the ALCC operates under the direct control of the AFCCP. For clarity, only one element of multi-element units such as TACPs, TABs, CRPs, etc. are shown.

Figures 2 through 6 are functionally oriented block diagrams of the joint services showing the baseline (present) interfaces with the Air Force elements depicted in Figure 1.

B. NEAR TERM/FUTURE

The near term/future communications interfaces are shown in Figures 7 through 12. In selecting the near term/future systems, only those systems whose equipment were sufficiently defined were specified. Others such as MTACCS, and PLACTRA/CNI being only in the conceptual stage were believed to require effort beyond the scope and time limitation of this study to properly define their detailed interfaces. Some of these systems are, however, briefly described in Section V.C.

In addition to the assumptions of Section II.A, several others were made for the near term/future systems of this section. The concept of a Headquarters complex with separate facilities for the Air Force Component Commander, (designated AFC Hq.), Intelligence Center, Personnel Center (PC), Logistic Center (LC), and Weather Center, as expressed but it would not have TADIL interfaces with the NTDS or MACCS. Instead, it is assumed to receive air situation display input data from the CRC(s). The Army TACFIRE system is assumed to still retain the requirement to provide the fire support coordination with the CRC (this function will eventually be within the TOS). The PC and LC interfaces are included under the AFC Hq.

Figure 1. TAF Interface Diagram - Baseline
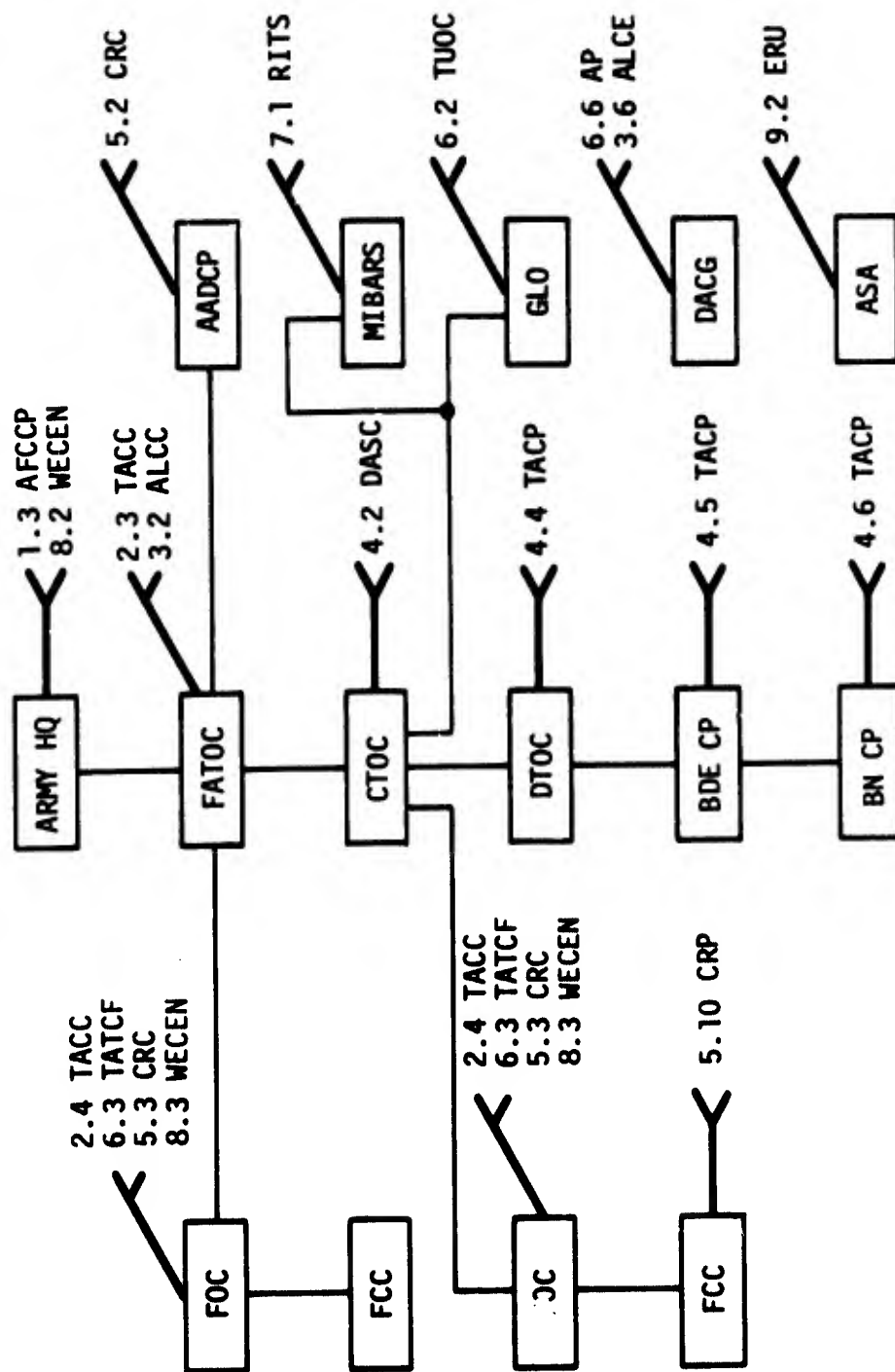
Figure 2. Army/Air Force Interfaces - Baseline

6
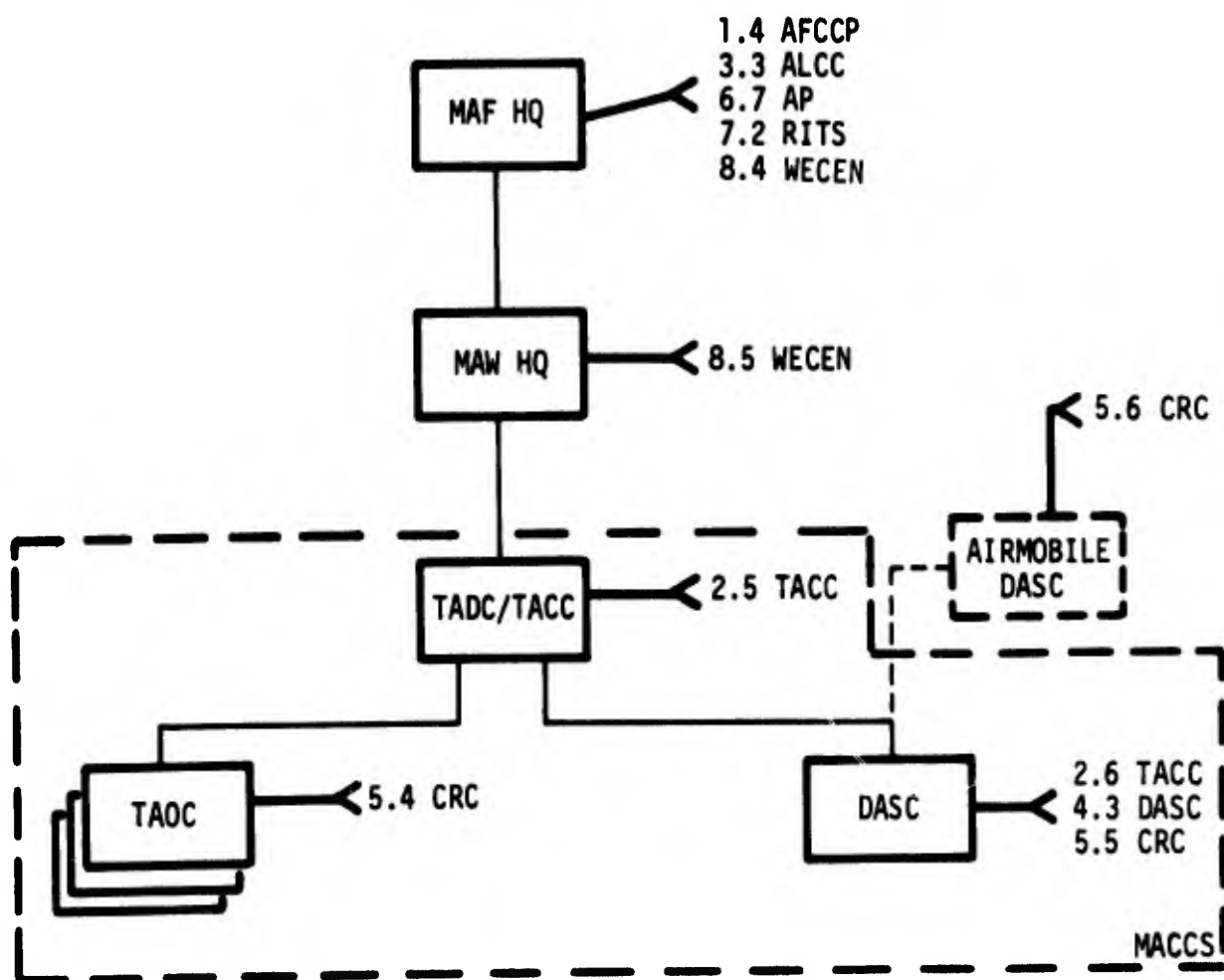
Figure 3. Marine/Air Force Interfaces - Baseline
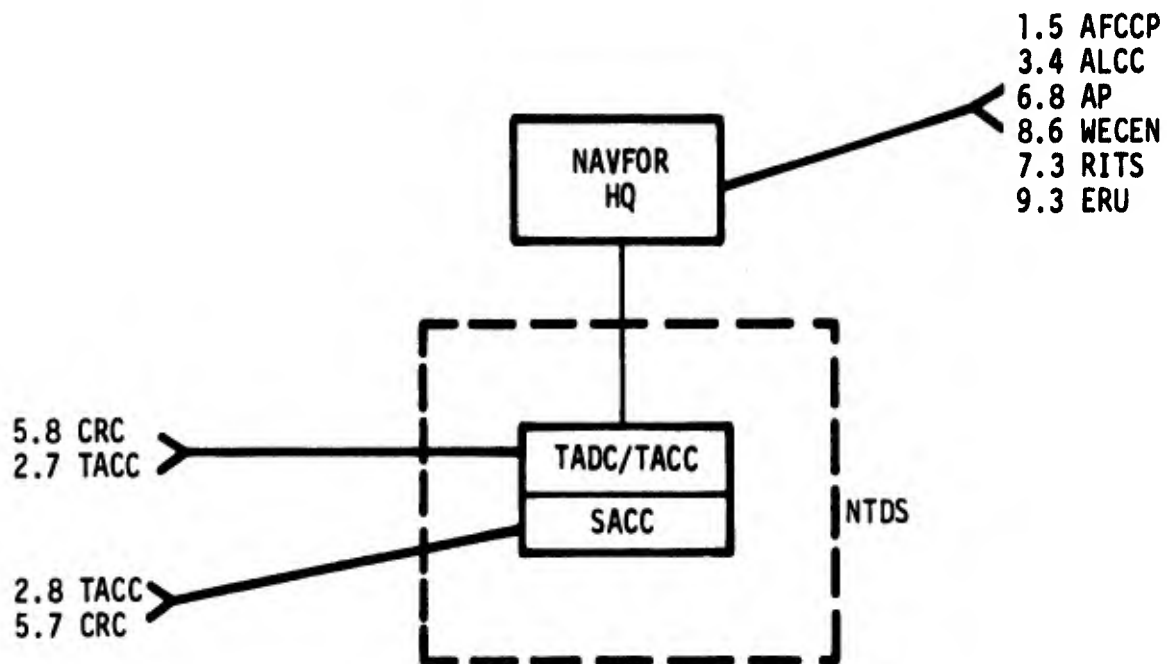
Figure 4.   Navy/Air Force Interfaces - Baseline
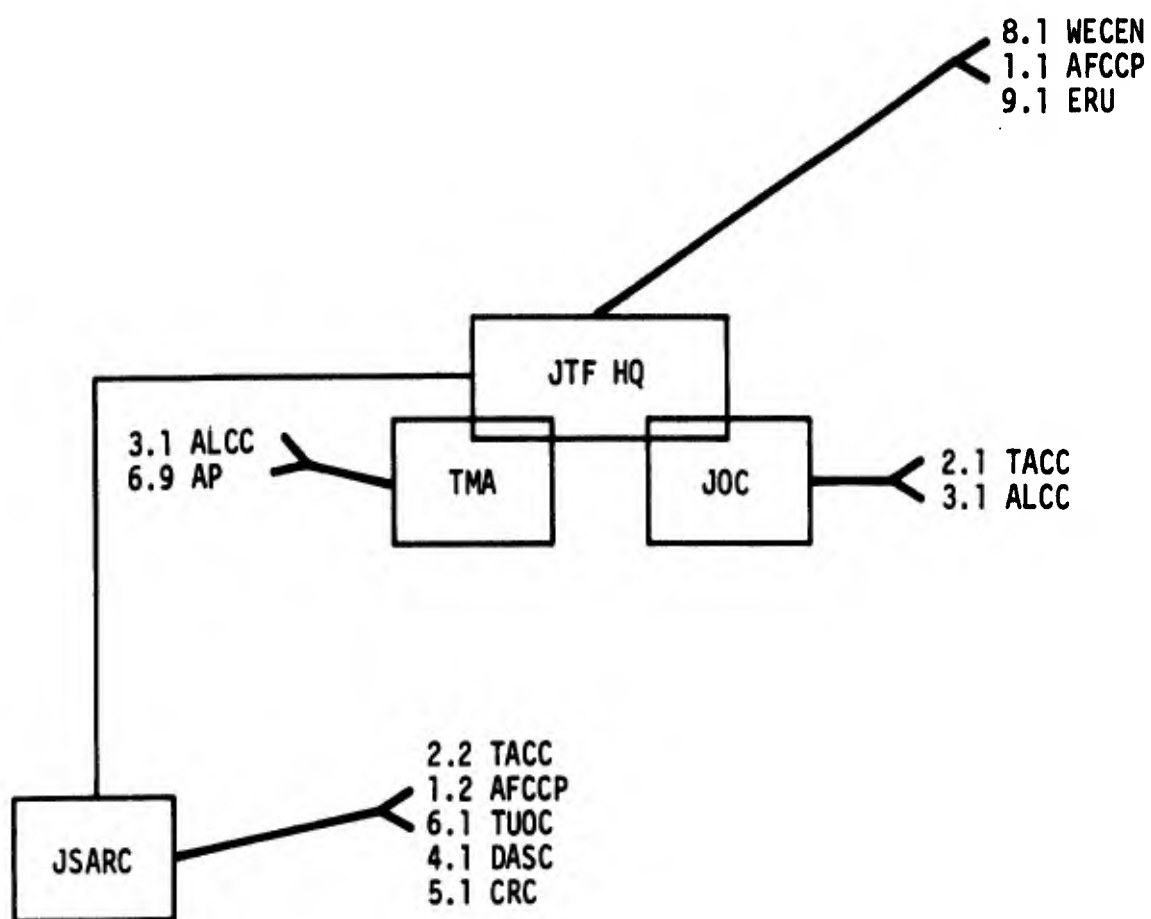
Figure 5.   Joint Force/Air Force Interfaces - Baseline
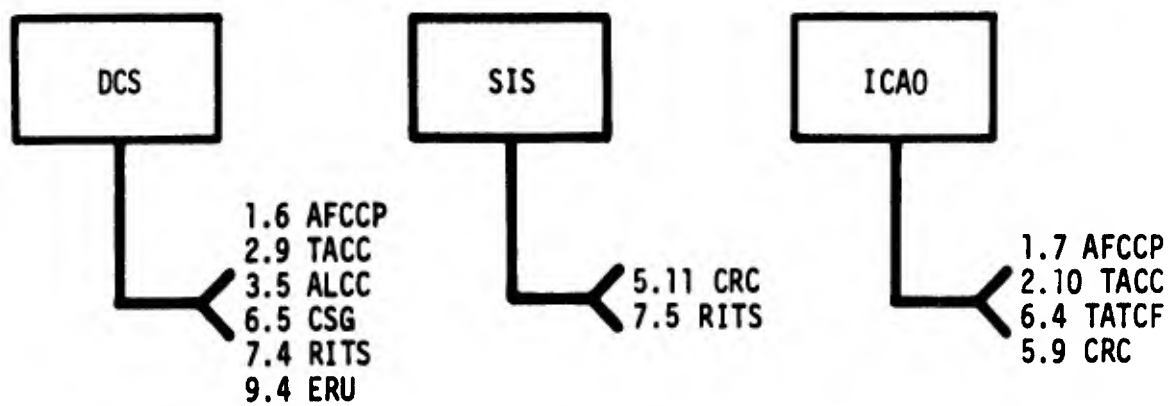
Figure 6. Misc/Air Force Interfaces - Baseline

Figure 7. TAF Interface Diagram – Near Term/Future

11

Figure 8. Army/Air Force Interfaces - Near Term/Future
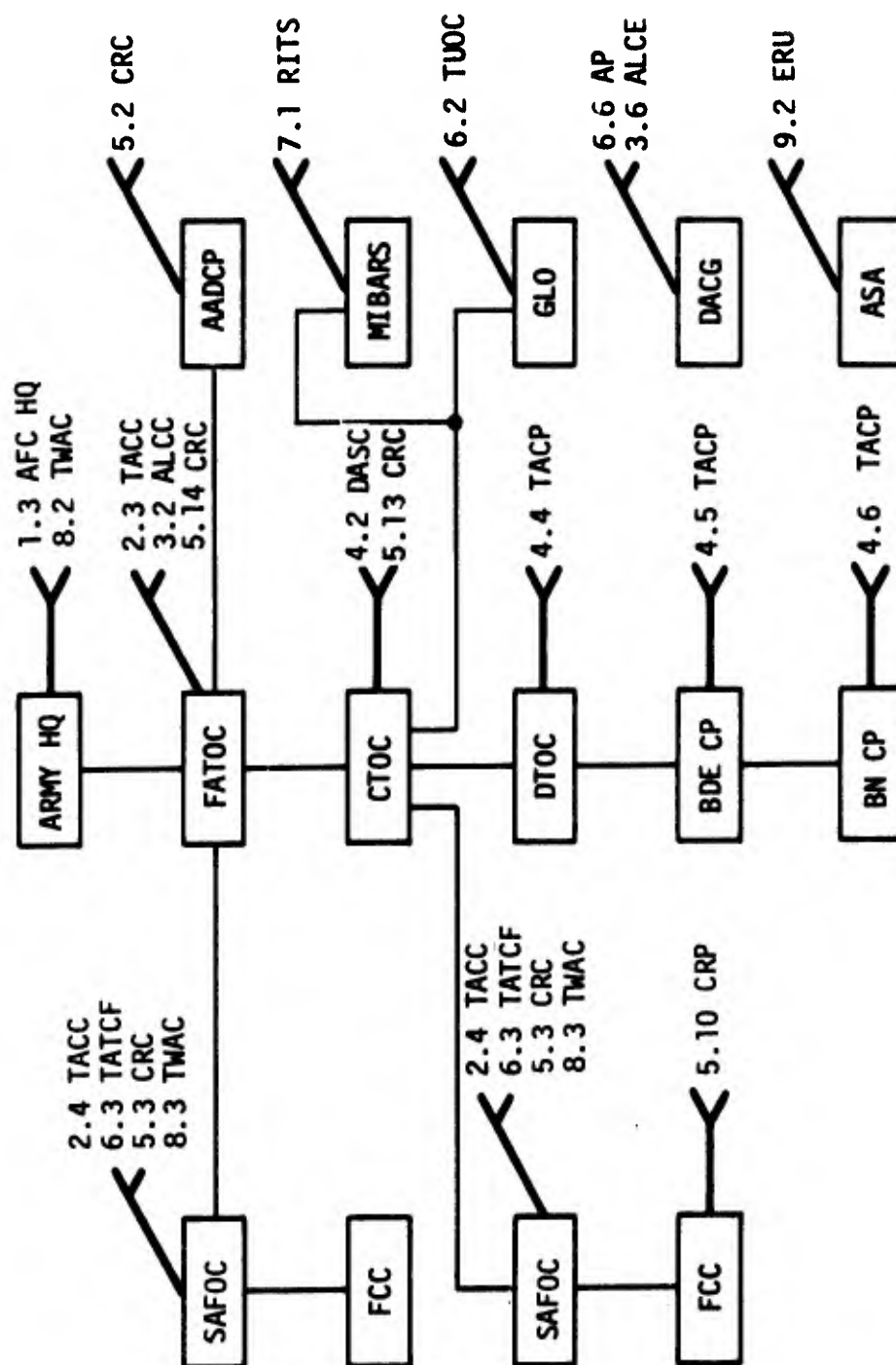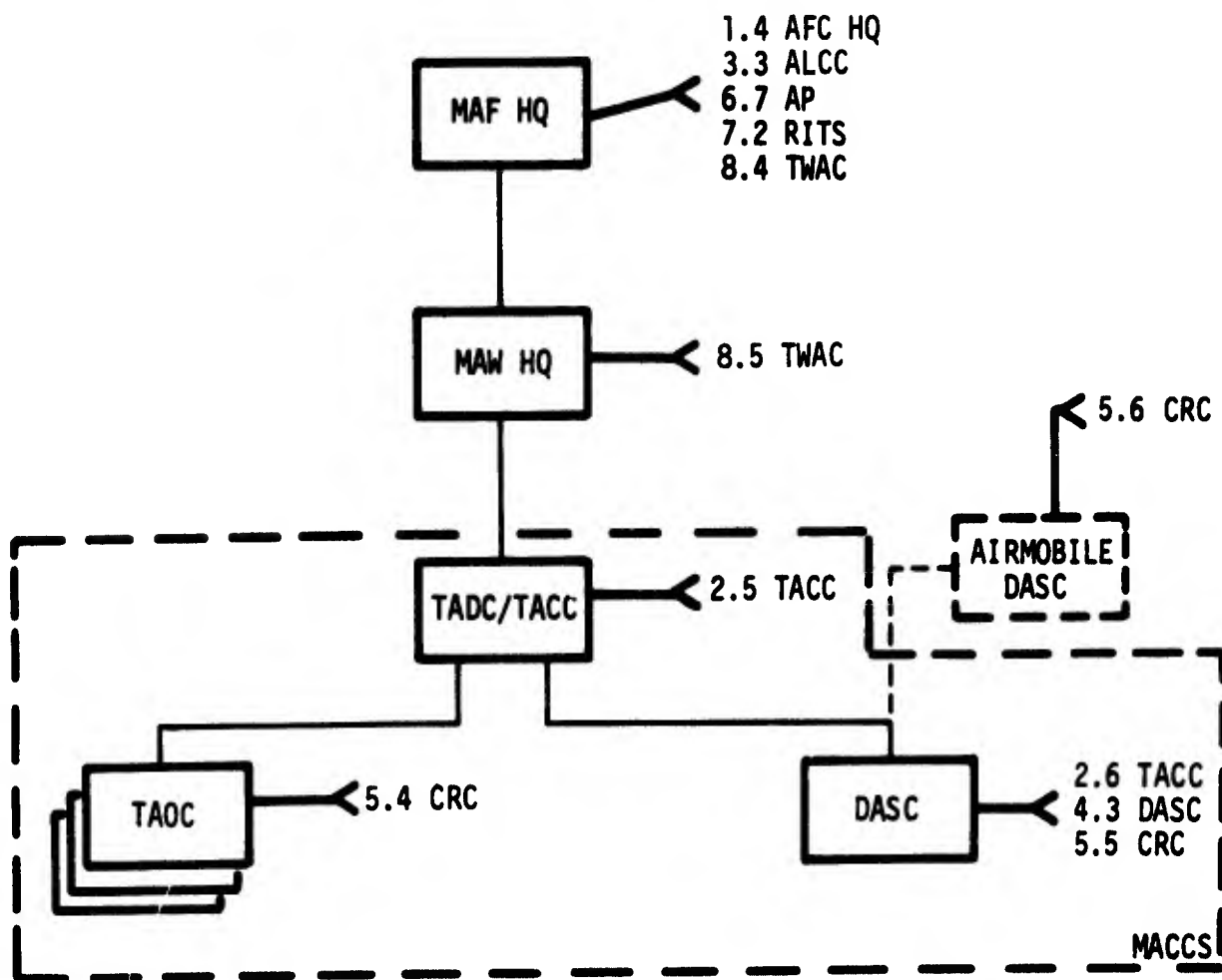
Figure 9.   Marine/Air Force Interfaces - Near Term/Future
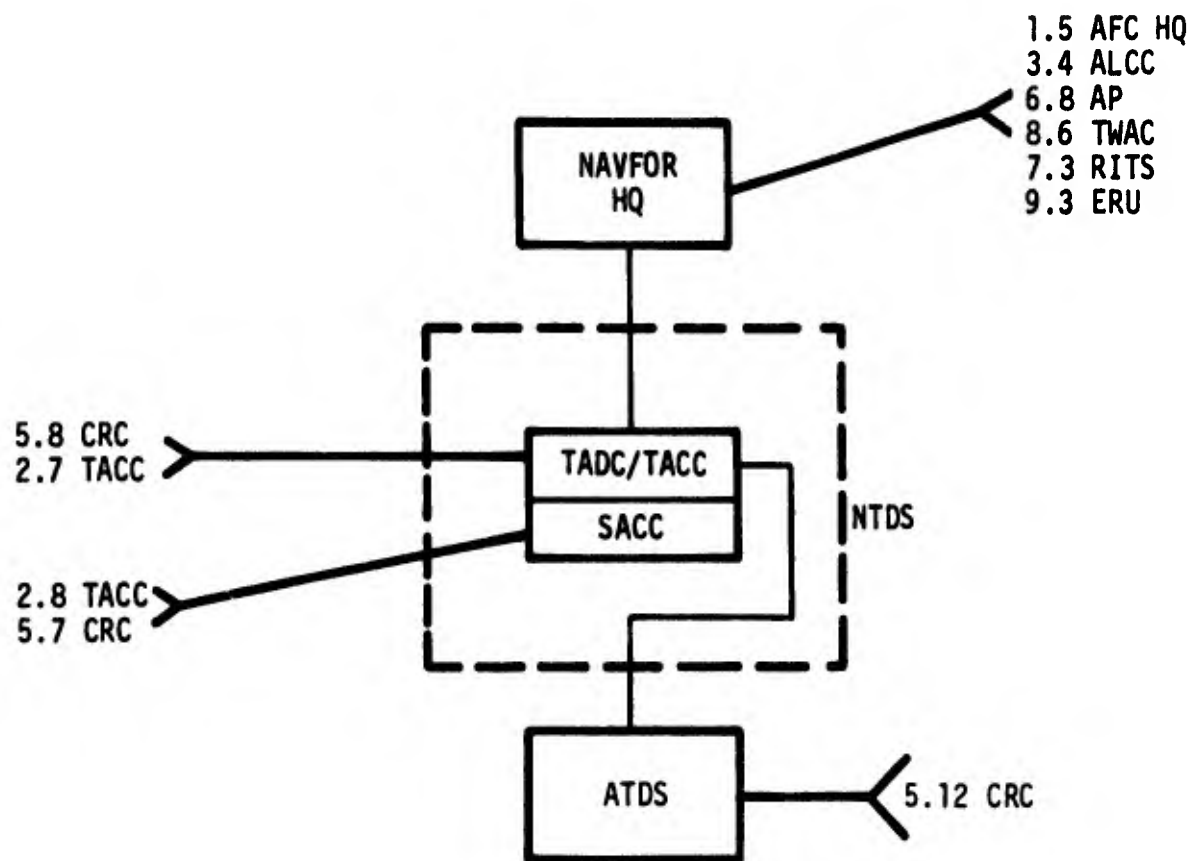
Figure 10. Navy/Air Force Interfaces - Near Term/Future
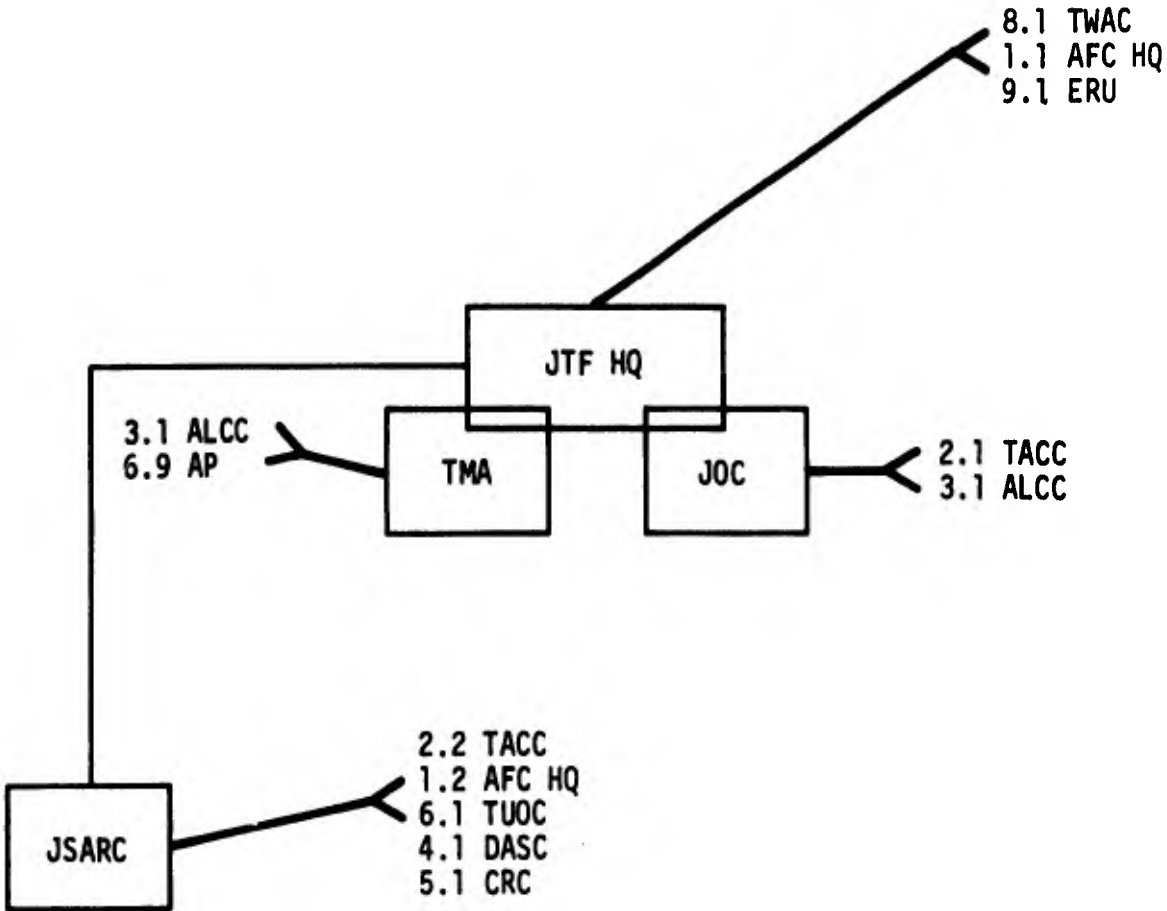
Figure 11. Joint Force/Air Force Interfaces - Near Term/Future
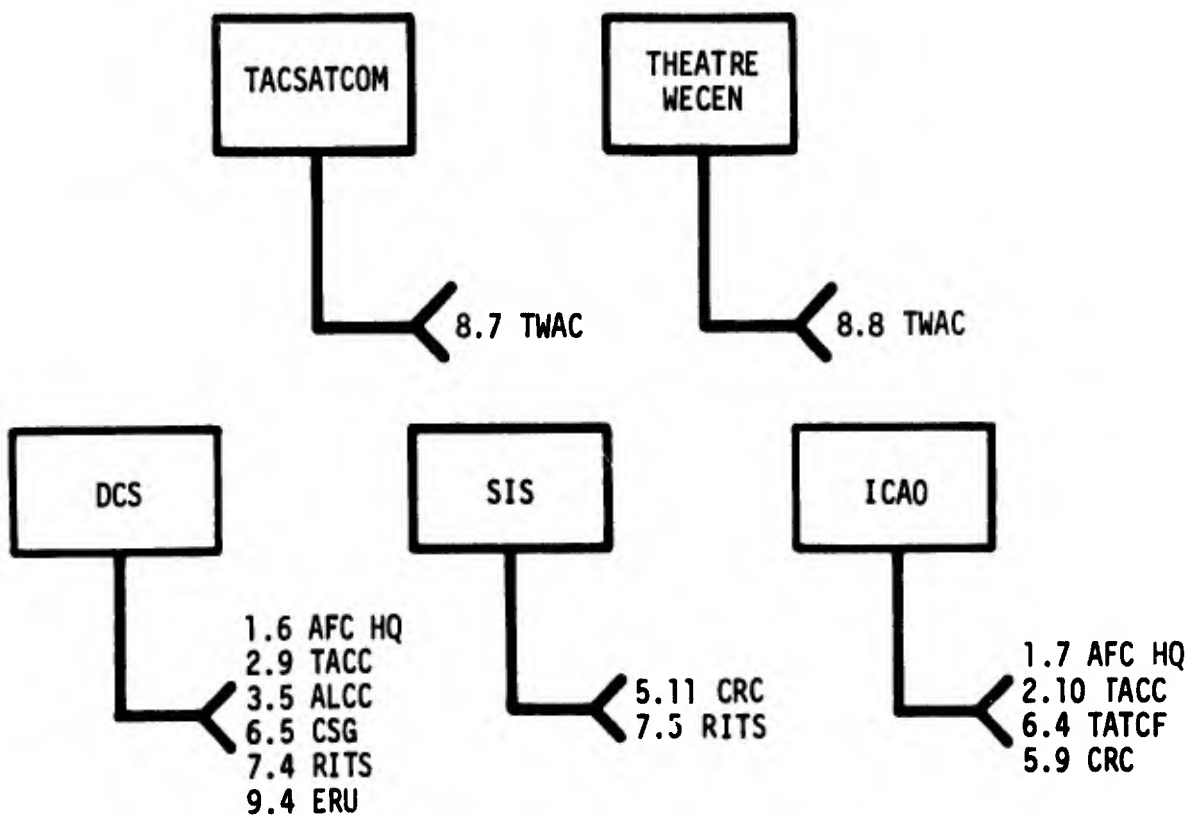
Figure 12. Misc/Air Force Interfaces - Near Term/Future

III. FUNCTIONAL DESCRIPTION OF THE INTERFACES

A. BASELINE

This section classifies the functional characteristics of each interface connection identified in Figures 1 through 6 of Section IIIA. The classifications are made to identify characteristics of the traffic traversing the interconnections which may affect the compatibility or operability of the interface. In addition, quantitative estimates of the 1975 traffic as derived from the Bunker-Ramo Tactical Traffic and System Analysis Study (Reference 64), and references to the TTSA message titles and numbers are included. This data is presented in the interface classification matrix shown in Table I, and consists of the following categories of information:

1 Function - The basic operational function that generates the traffic such as:

   a) Counterair
   b) Air Interdiction
   c) Electronic Warfare
   d) Intelligence
   e) Command/Staff
   f) Airspace Management
   g) Airlift
   h) Close Air Support
   i) Support
   j) Aerial Refuel
   k) Search and Rescue
   l) Reconnaissance
   m) Logistics
   n) Weather

2 Use - The purpose of the traffic is defined by:

   a) Coordination
   b) Directive
   c) Request
   d) Notification/Information
   e) Situation
   f) Status
   g) Approval
   h) Control
   i) Radar Track

17

3 Type Traffic - The type or mode utilized to transmit the traffic:

    a)   Voice
    b)   Teletype
    c)   Mail (to denote courier or messenger)
    d)   Facsimile
    e)   Digital

4 Format/Structure - The message structure:

    a)   Narrative
    b)   Fixed Sequence
    c)   Fixed Sequence Plus Narrative

5 Operational Characteristics - This classification is broken down into four categories:

    a)   Precedence - Represents four classes of precedence:

        (1)   F-Flash
        (2)   I-Immediate
        (3)   P-Priority
        (4)   R-Routine

    b)   Preempt - Preemption capability of the messages as indicated by yes or no.

    c)   Security - Whether the messages are transmitted through security devices (S) or over open or non-secure (O) devices.

    d)   Authentic - Whether or not the messages require authentication as indicated by yes or no.

6 TTSA Message Title Ref - Titles derived from the TTSA Study Message Catalog.

7 Quantity - The number of messages per unit of time.

8 TTSA Msg. # Ref - Message numbers derived from the TTSA Study Message Catalog.

As may be seen, multiple classifications occur within the various categories. The table is arranged by the nine TAF interfacing groups listed in Section I, and utilize the ID numbers of Figures 1 through 6.

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECEDENCE	PRE-EMPT	SECURITY	AUTHENTIC			
1 Counterair	Coordination, Directive	TTY, Voice, Mail	Narrative, Fixed Sequence plus Narrative	P	No	S/O	No	AD Planning & Implem.	One/Week	002, 018, 106
2 Air Interdiction	Coordination, Notification/Information	TTY, Mail, Voice	Narrative, Fixed Sequence	P	No	S/O	No	Rules of Engagement	One/Week	019, 020, 021
3 Air Interdiction	Request	TTY, Voice, Mail	Fixed Sequence	P	No	S	No	Strike Requirements	One/Mission	048
4 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P	No	S	No	EW Interference Problems	One/Mission	076
5 Electronic Warfare	Directive	Mail, TTY	Fixed Sequence plus Narrative	R	No	S	No	Plans & SOP's	One/Plan	077, 078, 081-086
6 Intelligence Support	Status	TTY	Fixed Sequence plus Narrative	P	No	S	No	CIVAF/Claims		406, 407
7 Command/Staff	Coordination	TTY	Narrative, Fixed Sequence	P / I	No / Yes	S	No / Yes	OPREP-1	One/Day 1-10/Day	408, 409
8 Intelligence	Notification/Information	TTY	Fixed Sequence plus Narrative	P	No	S	No	DISUM	One/Day	501
9 Airspace Management	Coordination, Directive, Notification/Information	TTY, Voice, Mail	Fixed Sequence plus Narrative, Narrative	R / I / P	No	S/O	No	Air Space Control	One/Week or Month	700-711
10 Counterair, Air Interdiction, CAS	Status, Request	Voice, TTY, Mail	Narrative	P / I	Yes	S	Yes	Weapons Allocation	0-1/Day or Week	850-855
11 Airlift/Logistics	Request	Voice	Fixed Sequence plus Narrative	R	No	S/O	No	Airlift Request	One/Day	218

1.1 AFCCP w/JTF: HQ, TMA & JOC

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 SAR/Air Inter-diction	Directive	Voice, Mail, TTY	Narrative	P I	No	S/O	No	SAR Requirements	One/Mis-sion	032

1.2 AFCCP w/JSARC

TABLE I INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counterair/ Air Interdiction	Coordination	Voice, TTY	Narrative	P	No	S	No	Air Defense Planning and Implementation	One/Week, Two/Day	002, 017
2 Air Interdiction	Coordination	Voice, TTY	Fixed Sequence	P	No	S	No	Planned Missions	One/Mission	025
3 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Planning	One/Mission	073
4 Intelligence	Situation	TTY	Fixed Sequence plus Narrative	I	No	S	No	INTSUM	One/Day	500
5 Intelligence	Notification/ Information	Voice, TTY	Narrative	F	No	S/O	No	Photo Intell. Report	One/Sortie	551
6 Counterair/ Interdiction/Close Air Spt	Coordination, Notification/ Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative	I	Yes	S	Yes	Weapons Allocations	0-2/Hour or Day	855, 862

1.3 AFCCP w/Army HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counterair/ Air Interdiction	Coordination	Voice, TTY	Narrative	P	No	S	No	Air Defense Planning and Implementation	One/Week, Two/Day	002, 017
2 Air Interdiction	Coordination	Voice, TTY	Fixed Sequence	P	No	S	No	Planned Missions	One/Mission	025
3 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Planning	One/Mission	073
4 Intelligence Situation	Situation	TTY	Fixed Sequence plus Narrative	I	No	S	No	INTSUM	One/Day	500
5 Intelligence Notification/Information	Notification/Information	Voice, TTY	Narrative	F	No	S/O	No	Photo Intell. Report	One/Sortie	551
6 Counterair/Interdiction/Close Air Sp	Coordination/Notification/Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative	I	Yes	S	Yes	Weapons Allocation	0-2/Hour or Day	855, 862

1.4   AFCCP w/MAF HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counterair/ Air Inter-diction	Coordination	Voice, TTY	Narrative	P	No	S	No	Air Defense Planning and Implementation	One/Week, Two/Day	012, 017
2 Air Inter-diction	Coordination	Voice, TTY	Fixed Sequence	P	No	S	No	Planned Missions	One/Mis-sion	025
3 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Planning	One/Mis-sion	073
4 Intelligence Situation	Situation	TTY	Fixed Sequence plus Narrative	I	No	S	No	INTSUM	One/Day	500
5 Intelligence Notification/ Information	Notification/ Information	Voice, TTY	Narrative	F	No	S/O	No	Photo Intell.	One/Sor-tie	551
6 Counterair/ Interdiction/ Notification/ Close Air Sp	Coordination/ Notification/ Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative	I	Yes	S	Yes	Weapons Alloca-tion	0-2/Hour or Day	855, 862

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Air Inter-diction, Planning, Command/Staff	Coordination	TTY	Narrative	P	No	S	No	Policy and Guidance	One/Week	019
2 Air Inter-diction, Planning	Notification/Information	TTY, Mail	Fixed Sequence	P	No	S	No	Ops Plan	One/Week	020
3 Command/Staff Planning, Air Inter-diction	Directive	TTY, Voice, Mail	Fixed Sequence	P	No	S/O	No	Rules of Engagement	One/Change	021

1.6 AFCCP w/DCS Terminal

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE- DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airspace Management	Coordination	Voice, Mail	Narrative	P	No	S/O	No	Airspace Control Procedure Coord.	One/Week	729

1.7 AFCCP w/ICAO

TABLE 1   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECEDENCE	PRE-EMPT	SECURITY	AUTHENTIC			
1 RECCE	Coordination	TTY, Voice	Narrative	P	No	S	No	RECCE Planning Coord.	One/Mission	056
2 RECCE/Intelligence	Notification/Information	Voice, TTY	Fixed Sequence plus Narrative	R	No	S	No	RECCE Daily Mission Summary	One/Day	060
3 Close Air Support	Coordination	TTY, Voice, Mail	Narrative	P	No	S	No	CAS Plan Coord.	One/Mission	066
4 Electronic Warfare	Directive or Notification/Information	Mail	Fixed Sequence plus Narrative	I P	No	S	No	ECM and ECM Information	One/EW Plan	088-091
5 Electronic Warfare	Notification/Information	TTY	Fixed Sequence plus Narrative	I	No	S	No	CAS Mission Record.	One/EW Plan	810
6 Support	Status or Notification/Information	TTY, Mail	Fixed Sequence plus Narrative, Narrative, Fixed Sequence	P	No	S	No	Ops. Spt. Reports	One/Day, Incident or Week	401-407
7 Counterair, Close Air Support, Air Interdiction	Coordination	TTY	Fixed Sequence plus Narrative	I	No	S	No	DEPSUM-1	Three/Deployment	410
8 Intelligence	Notification/Information, situation	Voice, TTY	Fixed Sequence plus Narrative,Narrative	I F	Yes	S/O	No	OPREP-3/SITREP	1-3/Event or Day	414-415
9 Intelligence	Situation	TTY	Narrative	R	No	S	No	C/E Rpt. (COMSEC)	1-2/Month	416
10 Intelligence/Logistics	Situation, status	TTY	Fixed Sequence plus Narrative	I P	No	S	No	LOSREP/INREP	1-6/Event, 0-2/Day	417-418
11 Intelligence	Notification/Information	Voice, TTY	Fixed Sequence plus Narrative,Narrative	R P, I F	Yes	S/O	Yes	Nuclear Reports	0-6/Day	420-428

2.1   TACC w/JTF-JOC

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE- DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
12 Intelli- gence	Situation, Notification/ Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative, Fixed Sequence	I F	Yes	S	Yes	Bio/Chem Reports	One/Day	423, 429, 430
13 Aerial Refuel	Notification	Voice, TTY	Fixed Sequence plus Narrative	R	No	S	No	Deployment Reports	One/De- ployment	438, 439
14 Intelli- gence, Command/ Staff	Situation	TTY	Fixed Sequence plus Narrative, Fixed Sequence	R	No	S	No	OPREP-5/C.O.Act	One/Day	441, 442
15 Planning, Other Support	Status	TTY, Voice	Fixed Sequence	P I	No	S/O	No	A/C and Weapons Status Reports	2-3/Day	450, 451
16 Support	Notification/ Information	Voice	Fixed Sequence plus Narrative	P I	No	S	No	PSYOPS Sortie Request	One/ Mission	750, 751
17 Support	Notification/ Information	Voice	Fixed Sequence	P	No	S	No	SAO-Special Ops	Two/Day	760
18 Intelli- gence/ Electronic Warfare	Notification/ Information	Voice, TTY	Fixed Sequence	P I	No	S/O	No	ECTAR and RFI Reports	0-5/Hour	803

2.1 TACC w/JTF-JOC (Continued)

TABLE 1   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Search & Rescue	Directive	Voice, Mail, TTY	Narrative	P I	No	S/O	No	SAR Spt. Request	One/ Mission	032
2 Air Space Management	Notification/ Information	TTY	Fixed Sequence plus Narrative	I	No	S	No	Bomber Spt. Planning	One/ Mission	054
3 Command/ Staff	Directive	TTY, Voice	Narrative	R	No	S	No	Tanker Planning	One/Day	094
4 Search & Rescue Air Interdiction	Directive	Voice, Mail, TTY	Narrative	P I	No	S/O	No	SAR Plans Coord.	One/ Mission	104
5 Air Lift/ Air Refuel	Request	Voice	Fixed Sequence plus Narrative	P	No	S/O	No	Fighter Excort Request	0.3/ Mission	167
6 Search & Rescue/Air Space Management	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	P I	No	S/O	No	SAR Mission Data	One/ Mission	347, 350, 353
7 Search & Rescue/Air Refuel	Status	TTY, Voice	Fixed Sequence plus Narrative	P	No	S/O	No	A/C and Weapons Status	2-3/Day	450 451

2.2   TACC w/JSARC

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Electronic Warfare	Directive, Notification/Information	Mail	Fixed Sequence plus Narrative	P R	Yes	S	No	ECM and ECCM Info	One/EW Plan	088-091
2 Intelligence	Notification/Information, Situation	Voice, TTY	Fixed Sequence plus Narrative	I	Yes	S	Yes	OPRER-3/SIT REP	1-3/Event or Day	414, 415
3 Intelligence, Logistics	Situation, Status	TTY	Fixed Sequence plus Narrative	I P	No	S	No	LOSREP/INREP	1-6/Event 0-2/Day	417, 418
4 Intelligence	Notification Information	Voice, TTY	Fixed Sequence plus Narrative, Narrative	R P I F	Yes	S/O	Yes	Nuclear Reports	0-6/Day	420-428
5 Intelligence	Situation, Notification Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative, Fixed Sequence	I F	Yes	S	Yes	Bio/Chem Reports	0-6/Day	423, 429, 430
6 Airspace Management	Notification/Information, Coordination	Voice, TTY, Mail	Narrative	P I	No	S/O	Yes	Airspace Control	One/Day	717, 727
7 Support	Notification/Information	Voice	Fixed Sequence	P	No	S	No	Special Air Operations	One/Mission	760
8 Support	Notification/Information	Voice	Fixed Sequence plus Narrative	P I	No	S	No	PSYCOPS Sorties Request	One/Mission	750, 751

2.3 TACC w/FATOC

TABLE 1   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Airspace Management	Coordination	Voice	Narrative	I	No	S/O	No	Air Space Conflicts Coord.	One/Day	727

2.4 TACC w/FOC

TABLE 1   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counterair	Request	TTY, Voice	Fixed Sequence plus Narrative	I	No	S	No	AD Request	One/Week	066
2 RECCE	Coordination	TTY, Voice	Narrative	P	No	S	No	RECCE Plan Coord.	One/Mission	058
3 Electronic Warfare	Directive, Notification, Information	Mail	Fixed Sequence plus Narrative	P R	Yes	S	No	EW, ECM, ECCM	One/EW Plan	088-091
4 Command/Staff, Intelligence	Notification, Information, Situation, Co-ordination	Voice, TTY	Fixed Sequence plus Narrative, Narrative	I F	Yes	S	No	OPREP-3/SITREP	1-3/Event or Day	414, 415
5 Intelligence Logistics	Situation, Status	TTY	Fixed Sequence plus Narrative	I P	Nc	S	No	LOSREP/INREP	1-6/Event 0-2/Day	417, 418
6 Intelligence	Notification, Information	Voice, TTY	Fixed Sequence plus Narrative	R P I F	Yes	S/O	Yes	Nuclear Reports	0-6/Day	420-428
7 Intelligence	Situation, Notification, Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative, Fixed Sequence	I F	Yes	S	Yes	Bio/Chem Reports	One/Day	423, 429-430
8 Airspace Management	Notification, Information, Coordination	Voice, TTY, Mail	Narrative	P I	No	S/O	Yes	Air Space Control	One/Mission	717, 727
9 Support	Notification, Information	Voice	Fixed Sequence	P	No	S	No	Special Operations	One/Mission	760

2.5 TACC w/TADC/TACC (USMC)

TABLE 1   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG. REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Aerial Refuel	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	I R	No	S/O	No	Deployment Report	Two/Hour One/De-ployment	438, 439
2 Airspace Management	Notification/ Information, Coordination	Voice, TTY, Mail	Narrative	P I	No	S/O	Yes	Air Space Conflict	One/ Mission	717, 727

2.6 TACC w/DASC (USMC)

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counterair	Request	TTY, Voice	Fixed Sequence plus Narrative	I	No	S	No	Air Defense Request	One/Week	006
2 RECCE	Coordination	TTY, Voice	Narrative	P	No	S	No	RECCE Planning Coord.	One/Mission	058
3 Electronic Warfare	Directive, Notification/Information	Mail	Fixed Sequence plus Narrative	P R	Yes	S	No	ECM and ECCM Info.	One/EW Plan	088-091
4 Command/Staff, Intelligence	Notification/Information, Situation, Coordination	Voice, TTY	Fixed Sequence plus Narrative, Narrative	I F	Yes	S	No	OPRER-3/SITREP	1-3/Event or Day	412-415
5 Intelligence/Logistics	Situation, Status	TTY	Fixed Sequence plus Narrative	I P	No	S	No	LOSREP/INREP	1-6/Event 0-2/Day	417, 418
6 Intelligence	Notification/Information	Voice, TTY	Fixed Sequence plus Narrative	R P I F	Yes	S/O	Yes	Nuclear Reports	0-6/Day	420-428
7 Intelligence	Situation, Notification/Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative, Fixed Sequence	I F	Yes	S	Yes	Bio/Chem Reports	One/Day	423, 429-430
8 Airspace Management	Notification/Information Coordination	Voice, TTY, Mail	Narrative	P I	No	S/O	Yes	Air Space Control	One/Mission	717, 727
9 Support	Notification/Information	Voice	Fixed Sequence	P	No	S	No	Special Operations	One/Mission	760

2.7 TACC w/TADC/TACC (Navy)

33

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence, Logistics	Intelligence, Situation Status	TTY	Fixed Sequence plus Narrative	I P	No	S	No	LOSREP/INREP	1-6/Event 0-2/Day	417, 418
2 Aerial Refuel, Planning	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	R	No	S	No	Air Refueling Strike Report	One/ Flight	439
3 Airspace Management	Notification/ Information	Voice, TTY	Narrative	I	No	S/O	No	Naval Gunfire	2-10/Day	739

2.8 TACC w/SACC

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 RECCE/ Intelligence	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	R	No	S	No	REECE Mission Summary	One/Day	060
2 Support	Notification/ Information	TTY, Digital, Mail	Fixed Sequence plus Narrative	P	No	S	No	Ops Spt Reports	One/Day, Incident or Week	400-407
3 Counterair, Close Air Spt, Interdiction	Coordination	TTY, Digital	Fixed Sequence plus Narrative	I	No	S	No	DEPSUM-2	Three/Deployment	410
4 Intelligence Command/ Staff	Situation	TTY, Digital	Fixed Sequence plus Narrative	P I	No	S	No	OPRER-5/COACT	One/Day	441, 442
5 Aerial Refuel	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	R	No	S	No	Deployment Rpts	One/Deployment	438, 439
6 Intelligence	Situation, Notification/ Information	Voice, TTY	Narrative, Fixed Sequence plus Narrative, Fixed Sequence	I F	Yes	S	Yes	Bio/Chem Reports	One/Day	423, 429, 430
7 Intelligence	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative, Narrative	R P / I F	No	S	No	Nuclear Reports	0-6/Day	420-428
8 Intelligence Logistics	Situation, Status	TTY	Fixed Sequence plus Narrative	I P	No	S	No	LOSREP/INREP	1-6/Event, 0-2/Day	417, 418
9 Intelligence	Situation	TTY	Narrative	R	No	S	No	C/E Reports (COMSEC)	1-2/Month	416
10 Intelligence	Notification/ Information, Situation	Voice, TTY	Fixed Sequence plus Narrative, Narrative	I F	No	S/O	No	OPREP-3/SITREP	0-5/Hour	414, 415
11 Intelligence Electronic Warfare	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative, Fixed Sequence	P I	No	S/O	No	ECTAR and RFI Reports	0-5/Hour	802, 803

2.9 TACC w/DCS Terminal

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG REF |
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airspace Management	Coordination	Voice, TTY, Mail	Narrative	P	No	S/O	No	Airspace Control Procedure Coordination	1/Week	729

2.10 TACC w/ICAO

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Airlift	Directive, Request	TTY, Voice	Fixed Sequence, Fixed Sequence plus Narrative	R,P,I	No	S/O	No	Special Mission Ops Plan	0.3/A/L Mission	227-229
2 Airlift/ Logistics	Directive Notification/ Information	TTY, Voice	Fixed Sequence plus Narrative	I P	No	S/O	No	A/L Schedules	1/Day	206, 215
3 Airlift/ Logistics	Coordination Notification/ Information	Voice	Narrative	I	Yes	S	No	A/L Mission Diversion	0.2/A/L Mission	245, 253, 254
4 Airlift	Coordination; Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative, Narrative	P I	No/ Yes	S/O	No	RDD Extension Request	0.1/Mis-sion 0.5/Mis-sion	262, 253
5 Other Support	Status	TTY	Fixed Sequence plus Narrative	R P	No	S/O S	No	A/L Mission Priorities	1-2/Day	236

3.1 ALCC w/JTF, TMA, JOC

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Airlift	Request Notification/Information	Voice; Voice/TTY	Narrative Fixed Sequence plus Narrative	I P	Yes/No	S/O	Yes/No	Special Mission A/L Request	.1 A/L Mission .3 A/L Mission	219, 222
2 Airlift/Logistics	Notification/Information, Request or Coordination	Voice, TTY	Narrative, Fixed Sequence	R P	No	S/O	No	A/L Schedules	1-2 Days 0-.5/A/L Mission	215, 237-240

3.2 ALCC w/ FATOC

38

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE- DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airlift/ Logistics	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	P	No	S	No	A/L Schedules	1/Day	215
2 Airlift	Request	Voice	Narrative	I P	No	S/O	No	Special Mission A/L Request	0.1/A/L Mission	219

3.3 ALCC w/ MAF HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Airlift/ Logistics	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	P	No	S	No	A/L Schedule Information	One/Day	215
2 Airlift	Request	Voice	Narrative	I P	No	S/O	No	Request for Cond. of Special Mis-sion	0.1/A/L Mission	219

3.4   ALCC w/   NAVFOR HQ

40

TABLE I INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Airlift/ Logistics	Status, Notification/ Information	Digital, TTY, Voice	Fixed Sequence	I P	No	O	No	ALOREP/DAAR	1/Day	281, 283
2 Other Sup-port	Status	TTY	Fixed Sequence plus Narrative	R P	No	S	No	Ops Spt. Reports MEDREP	1-2/Day	400-402

3.5 ALCC w/DCS Terminal

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Other Support	Request	Voice, TTY	Fixed Sequence Plus Narrative	I	No	S/O	No	Request FSE Coord	0.1/Immed Mission	250

4.1 DASC w/JSARC

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Command/Staff	Directive	Voice	Narrative	R	No	S	No	Pert. Part of Frag. Orders	One/Day	014
2 Close Air Support	Coordination	Voice, Mail	Narrative	P	No	S	No	CAS Plans and Coord.	One/Mission	066, 068
3 Electronic Warfare	Notification/Information	Voice, Mail	Narrative	P	No	S	No	EW Mission Data	One/ECM Mission	074
4 Close Air Support	Coordination	Voice	Fixed Sequence	I	No	S/O	No	FS Coordination	One/Mission	158
5 Close Air Support	Approval	Voice	Fixed Sequence	I	Yes	S/O	No	CAS Mission Denial/Approval	.5/Request	156, 157
6 RECCE	Approval	Voice	Fixed Sequence plus Narrative	I	No	O	No	REECE Missions Denial/Approval	.5/Request	170, 174
7 Intelligence	Notification/Information	Voice, Mail	Narrative	I P F	No	S/O	No	Photo Interpretation Reports-G2	1-3/Day, 12-32/Day	506, 508
8 Intelligence	Notification/Information	Voice, Mail	Narrative	I R P	No	S/O	No	Intelligence Reports-G2	1-3/Day, 1/Day	506, 572
9 Counterair/Interdiction Close Air Support	Notification/Information	Voice	Fixed Sequence plus Narrative	I	Yes	S	Yes	Nuclear Warning	0-2/Day	862
10 Airlift/Search and Rescue	Coordination, Notification/Information	Voice	Fixed Sequence plus Narrative	I	No	S/O	No		One/Mission	158, 163
11 Airspace Management	Notification/Information	Voice	Fixed Sequence	P	No	S/O	No	Army Fire Area-Not Zone	One/Hour	745

4.2   DASC w/CTOC

43

TABLE 1   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG. REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Close Air Support	Coordination	TTY, Voice, Mail	Narrative	P	No	S	No	FS Coordination	One/Mis-sion	153
2 Close Air Support	Coordination	Voice, TTY	Fixed Sequence	I	No	S/O	No	CAS Plans & Coord	One/Mis-sion	066 068
3 Close Air Support	Approval	Voice	Fixed Sequence	I	Yes	S/O	No	CAS Mission Denial/Approval	.5 Request	156 157

4.3   DASC w/DASC (USMC)

44

TABLE I INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Search & Rescue	Notification/Information	Voice, TTY	Narrative	P I	No	O	No	SAR Plans Coord	1/Mission	104
2 Search & Rescue	Notification/Information	Voice, TTY	Fixed Sequence plus Narrative	P I	Yes	S	No	SAR Mission Data	1/Mission 4-8 Flt. 12/Hour	350-352
3 Airspace Management	Notification/Information	Voice	Fixed Sequence	R I	No	S/O	No	ATC Handover/Coordination	2-8 Flt. 10-20 Hr.	301 302
4 Search & Rescue	Request	Voice	Narrative	R P I	No	S/O	No	Refueling Request	1/Request	354

5.1 CRC w/JSARC

TABLE 1 INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counter Air	Coordination	Voice, TTY	Narrative	P	No	S	No	AD Areas of Responsibility	1/Exchange	013
2 Air Space Management/Interdiction	Coordination	Voice, TTY	Narrative	P	No	S/O	No	Air Space Clear Coord	5-15/Hour	043
3 Air Space Mgt Counter Air	Notification/Information	Voice, TTY	Fixed Sequence plus Narrative	P,..,F	Yes	S/O	Yes	AD Conditions	1/Change	319
4 Counter Air	Control	Voice	Fixed Sequence	I	Yes	S	Yes	SAM Engagement Assign	1/Engagement	320
5 Counter Air	Status	Voice, TTY	Fixed Sequence plus Narrative	P	No	S/O	No	SAM/ADA Weapons Status	1/Change/Day	461-463, 465
6 Air Space Mgt	Notification/Information	Voice, TTY	Narrative	P	No	S/O	No	Change to Missile Zone	1/Change	738

5.2 CRC w/AADCP

TABLE I INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Air Space Management/Interdiction	Coordination	Voice	Narrative	P	No	S/O	No	Air Space Clearance Coord	5-15/Hr	043
2 Search & Rescue	Notification/Information	Voice, Mail	Narrative	R,P	No	S/O	No	SAR Plans/Proc. Coord	1/Plan/Procedure	105
3 Air Space Management	Control/Coordination	Voice	Fixed Sequence	R,I	No	S,S/O	No	ATC Handover Data/Coord	2-8/Flt, 10-20 Hr	301, 302
4 Air Space Management/Counter Air	Coordination	Voice	Narrative	P	No	S/O	No	Track ID Coord	2-3/Minute	315
5 Air Space Management	Coordination, Request	Voice, Mail	Fixed Sequence plus Narrative	P,I	No	S/O	No	Flight Clearance Request, Flight Plan Info, Mission Routing, Traffic Control Coord	1/Mission	099, 730, 732, 733

5.3 CRC w/FOC

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Search & Rescue	Notification/ Information	Voice,TTY, Mail	Narrative	R,P	No	S/O	No	SAR Plans Coord	1/Plan/ Mission	105
2 Air Space Management	Control/ Coordination	Voice	Fixed Sequence	R,I	No	S,S/O	No	ATRC-ATC Handover Data/Coord	2-8/Flt 10-20/Hr	301, 302
3 Air Space Management	Notification/ Information Radar Track	Voice	Fixed Sequence	P,R	No, Yes	O	No	Initial Track Data Report	1/Flight 1-3/minute Flight	313
4 Air Space Management	Request & Coordination	Voice, TTY, Mail	Narrative, Fixed Sequence	P,I	No	S/O	No	Tactical Clear Request,Flight Plan	1/Mission	730
5 Air Space Management	Directive Coordination	Voice,TTY	Narrative, Fixed Sequence plus Narrative	I,P	Yes, No	S,S/O	No	Traffic Control Coord	1-3/Day, 5/Day	733

5.4   CRC w/TAOC

48

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counter Air	Coordniation	Voice, TTY	Narrative	P	No	S	No	AD Areas of Responsibility	1/Change	013
2 Counter Air Air Space Management	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	P,I,F	Yes	S/O	Yes	AD Conditions	1/Change	319
3 Air Space Management	Directive, Coordination	Voice, TTY	Narrative, Fixed Sequence plus Narrative	I,P	Yes/ No	S S/O	No	Traffic Control Coord	1-3/Day, 5/Day	733

5.5   CRC w/DASC

49

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Counter Air	Coordination	Voice, TTY	Narrative	P	No	S	No	AD Areas of Responsibility	1/Change	013
2 Counter Air Air Space Management	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	P,I,F	Yes	S/O	Yes	AD Conditions	1/Change	319
3 Air Space Management	Directive, Coordination	Voice, TTY	Narrative, Fixed Sequence plus Narrative	I,P	Yes/ No	S S/O	No	Traffic Control Coord	1-3/Day, 5/Day	733

5.6   CRC w/Air Mobile DASC

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Air Space Management	Notification/ Information	Voice, TTY	Narrative	I	No	S/O	No	Naval Gunfire	2-10/Day	739
2 Air Space Management	Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	P	No	S	No	Restrictive Fire Plan	1/Plan	716

5.7 CRC w/SACC

51

TABLE 1   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Air Space Management	Control/Coordination	Voice	Fixed Sequence	R,I	No	S,S/O	No	ATRC-ATC Handover Data/Control	8/Flight 10-20/Hr	301, 302
2 Air Space Management	Coordination, Notification/Info Request, Control Directive	Voice	Fixed Sequence	R,P	No/Yes	O	No	Initial Track Data	1-3/Minute	354-370
3 Counter Air Space Management	Notification/Information	Voice, TTY	Fixed Sequence plus Narrative	P,I,F	Yes	S/O	Yes	AD Condition	1/Change	319
4 Air Space Management	Request/Coordination	Voice, TTY, Mail	Narrative/Fixed Sequence	P,I	No	S/O	No	Flight Clear Request	1/Mission	097, 730, 732, 733
5 Search and Rescue	Coordination	Voice, Mail, TTY	Narrative	R,P	No	S/O	No	SAR Plans and Procedures	1/Plan/and Procedures	105

5.8 CRC w/TADC/TACC (Navy)

52

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Air Space Management	Control, Coordination	Voice	Fixed Sequence	R,I	No	S/O	No	ATRC-ATC Handover Data/Coord	2-8/Flight 10-20/Hr	301, 302
2 Air Space Management, Counter Air	Coordination	Voice	Narrative	P	No	S/O	No	Track I.D.Coord	2-3/Minute	315

5.9   CRC w/ICAO

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Air Space Management/ Interdiction	Coordination	Voice	Narrative	P	No	S/O	No	ATRC-ATC Air Space Clearance Coord	5-15/Hr	043
2 Search and Rescue	Notification/ Information	Voice	Narrative	R,P	No	S/O	No	SAR Plans/Procedures Coord	1/Plan/ Procedure	105
3 Air Space Management	Control/ Coordination	Voice	Fixed Sequence	R,I	No	S,S/O	No	ATC Handover Data Coord	2-8/Flt, 10-20/Hr	301, 302
4 Air Space Management/ Counter Air	Coordination	Voice	Narrative	P	No	S/O	No	Track I.D. Coord	2-3/Minute	315
5 Air Space Management	Coordination Request	Voice, Mail	Fixed Sequence plus Narrative	P,I	No	S/O	No	Flight Clear Request, Flight Plan Info Mission Routing Traffic Control Coord	1/Mission	099 730, 732, 733

5.10 CRP w/FOC

54

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification, Information, Coordination	Voice, TTY Digital	Narrative	RP FI	Yes	S	Yes	TBDL	None	None

5.11 CRC w/SIS

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE- DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Air Space Management	Control, Coordination	Voice	Fixed Sequence	R,I	No	S/O	No	ATC Handover and Data	2-8/Flight 10-20/Hr.	301 302
2 Air Space Management	Situation, Notification/ Information	Voice, TTY	Fixed Sequence plus Narrative	I	Yes	S/O	No	A/C Distress Report	1/Emergency	343, 344
3 SAR Coordination	Request, Information	Voice, TTY	Narrative; Fixed Sequence	I,F	Yes	S	Yes	Request for Pilot Authent, Card Data	1/Event	345, 346

6.1 TUOC w/ JSARC

56

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Air Space Management	Control, Coordination	Voice	Fixed Sequence	I,R	No	S/O	No	ATC Handover and Data	2-8/Flt.. 10-20/Hr.	301 302
2 Air Space Management	Coordination	Voice, Mail	Narrative	P	No	S	No	Air Space Control Procedures Coord.	1/Week	729

6.3 TATCF w/FOC

57

TABLE 1   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Airspace Control	Coordination	Voice	Narrative	P	No	S/O	No	Air Space Control Procedure Coord.	1/Week	72?

6.4 TATCF w/ICAO

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Logistics	Request	Digital	Fixed Sequence	P	No	S/O	No	Supply Requests	5/Day, 1/Day	655, 657, 659

6.5 CSG w/DCS Terminal

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airlift/ Logistics	Directive	TTY	Fixed Sequence	P	No	0	No	Cargo Schedules and Move Instructions	1-5/Day	264
2 Airlift Logistics	Notification/ Information	Voice	Fixed Sequence plus Narrative	P I	No	0	No	Cargo Management Message Traffic	1/Day	271

6.6   AP w/DACG

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airlift/ Logistics	Directive	TTY	Fixed Sequence	P	No	0	No	Cargo Schedules and Move Instruc- tions	1-5/Day	264
2 Airlift/ Logistics	Notification	TTY	Fixed Sequence	P	No	S/O	No	Cargo Mgt. Msg. Traffic	1/Day	207, 275, 276

6.7 AP w/MAF HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airlift/ Logistics	Directive	TTY	Fixed Sequence	P	No	O	No	Cargo Schedules and Move Instructions	1-5/Day	264
2 Airlift/ Logistics	Notification/ Information	TTY	Fixed Sequence	P	No	S/O	No	Cargo Mgt. Msg. Traffic	1/Day	207, 275, 276

6.8 AP W/NAVFOR HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REP
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Airlift/ Logistics	Directive	TTY	Fixed Sequence	P	No	O	No	Cargo Mgt. Msg. Traffic	1-5/Day	207, 271, 275- 276
2 Airlift/	Request	Voice	Fixed Sequence plus Narrative	R	No	S/O	No	A/L Requests	1/Day	

6.9 AP w/ JTF-TMA

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information, Coordination	Mail, Fax, Voice, TTY	Narrative	R P F I	No	S/O	No	Intelligence Materials	1/Package, Mission, or Sortie	550, 552, 522

7.1   RITS w/MIBARS

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information, Coordination	Mail, Fax, Voice, TTY	Narrative	R P F I	No	S/O	No	Intelligence Materials	One/Pkg, Mission, or Sortie	550, 552, 522

7.2 RITS w/MAF HQ

65

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification, Information, Coordination	Mail, Fax, Voice, TTY	Narrative	R P F I	No	S/C	No	Intelligence Materials	One/Pkg., Mission, or Sortie	55/-, 552, 522

7.3   RITS w/NAVFOR HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REP
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information, Coordination	Voice, TTY, Digital	Narrative	R P F I	No	S/O	No	None	None	None

7.4 RITS w/DCS Terminal

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE- DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Intelligence	Notification/ Information, Coordination	Voice, TTY, Mail	Narrative	R P F I	Yes	S/O	No	None	None	None

7.5   RITS w/SIS

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REP | QUANTITY | TTSA MSG # REP |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Weather	Request, Notification/ Information	Voice, TTY	Narrative	P	No	O	No	Weather Information	3-12/Hour	900-905 907-910

8.1   WECEN w/JTF HQ

69

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG REF |
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Weather	Request, Notification/ Information	Voice, TTY	Narrative	P	No	0	No	Weather Information	3-12/Hour	903, 905, 907, 909, 910

8.2   WECEN w/Army HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REP
				PRECE DENCE	PRE- EMPT	SECU- RITY	AUTH- ENTIC			
1 Weather	Request, Notification/ Information	Voice, TTY	Narrative	P	No	O	No	Weather Information	3-12/Hour	900- 905, 907, 909, 910

8.3   WECEN w/FOC

TABLE :   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REP
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Weather	Request, Notification/ Information	Voice, TTY	Narrative	P	No	O	No	Weather Information	3-12/Hour	90?,- 905, 907, 909, 910

8.4   WECEN w/MAF HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG # REF |
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Weather	Request, Notification/ Information	Voice, TTY	Narrative	P	No	O	No	Weather Information	3-12/Hour	900-905, 907, 909, 910

8.5   WECEN w/MAW HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Weather	Request, Notification/ Information	Voice, TTY	Narrative	P	No	O	No	Weather Information	3-12/Hour	904, 905, 907, 909, 910

8.6   WECEN w/NAVFOR HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information	TTY, Mail, Voice	Narrative	P I F R	No	S	No	Summary Reports	5/Day 32/Day	591, 508
2 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Plans Coord.	One/Mis-sion	073

9.1 ERU w/JTF HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information	TTY, Mail, Voice	Narrative	P I F R	No	S	No	Summary Reports	5/Day 32/Day	591, 508
2 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Plans Coord.	One/Mis- sion	073

9.2 ERU w/ASA

TABLE I . INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG # REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information	TTY, Mail, Voice	Narrative	P I F R	No	S	No	Summary Reports	5/Day	591, 508
2 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Plans Coord.	One/Mission	073

9.3 ERU w/NAVFOR HQ

TABLE I   INTERFACE CLASSIFICATION MATRIX

| FUNCTION | USE | TYPE TRAFFIC | FORMAT/STRUCTURE | OPERATIONAL CHARACTS | | | | TTSA MESSAGE TITLE REF | QUANTITY | TTSA MSG REF |
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
1 Intelligence	Notification/ Information	TTY, Mail, Voice	Narrative	P I F R	No	S	No	Summary Reports	5/Day 32/Day	591, 508
2 Electronic Warfare	Coordination	Voice, TTY, Mail	Narrative	P I	No	S	No	EW Plans Coord.	One/Mis-sion	073

9.4   ERU w/DCS TERMINAL

78

B. NEAR TERM/FUTURE

The functional characteristics of the interface connections of the near term/future systems are essentially the same as for the baseline interfaces with the addition of the air space management and coordination TADILs that are well defined. These additions are shown in Table II. In some cases the data links replace the other modes of information transfer, and supplement the modes in others. In either case, the alternate mode will remain as a back-up to the data mode.

Other data link interfaces will certainly be implemented in the time frame of interest, however, their operational interfaces have not been fully agreed upon, nor as can be seen in Table IV, have their data processing equipments been defined. Table IV does indicate, however, where the initial data links are expected to occur.

TABLE II. INTERFACE CLASSIFICATION MATRIX

FUNCTION	USE	TYPE TRAFFIC	FORMAT/STRUCTURE	OPERATIONAL CHARACTS				TTSA MESSAGE TITLE REF	QUANTITY	TTSA MSG REF
				PRECE-DENCE	PRE-EMPT	SECU-RITY	AUTH-ENTIC			
5.3 CRC w/AADCP										
3 Air Space Mgt, Counter Air	Radar Track, Control/ Coord.	Digital	Fixed Frame (TADIL B)	Requires Dedicated Channel		S/O	N/A		1-80/min.	
5.5 CRC w/TADC										
3 Air Space Mgt, Counter Air	Radar Track, Control/ Coord.	Digital	Fixed Frame (TADIL A & TADIL B)			S/O			1-80/min.	
5.8 CRC w/TADC/TACC (USMC)										
3 Air Space Mgt, Counter Air	Radar Track, Control/ Coord.	Digital	Fixed Frame (TADIL A & TADIL B)			S/O			1-80/min.	
5.10 CRC w/TADC/TACC (Navy)										
3 Air Space Mgt, Counter Air	Radar Track, Control/ Coord.	Digital	Fixed Frame (TADIL A)			S/O			1-60/min.	
5.11 CRC w/SAAWC										
3 Air Space Mgt, Counter Air	Radar Track, Control/ Coord.	Digital	Fixed Frame (TADIL A)			S/O			1-60/min.	

Near Term/Future

IV. SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS

A. BASELINE

Using the interfacing pairs as identified in Section II, each interface was analyzed to determine the subsystem nomenclatures of the elements, and to list the communications equipment that would be involved in the interconnection of the two elements.

In addition to the assumptions of the previous section, it was necessary to make additional ground rules for this portion of the task. It is realized that the communications groups responsible for the installation and operation of the communications equipment for all of the services have a wide variety of equipments from which they can select. It is therefore possible, and quite often is the rule, to preplan the interfaces so that incompatibilities do not exist. However, it is partly due to the fact that so many different equipments exist that the incompatibilities occur. The selection of the radio terminals was made with an attempt to list, in order, those most likely to be selected on the basis of the latest equipments, the expected quantity of traffic to be exchanged, and the expected separation of the units in a typical deployment. Most end instrument equipments are organic to the ops and message centers, and were so shown. Others were selected using rationale similar to that used for the radio terminals.

The AFCCP, TACC and ALCC are assumed to be deployed in separate facilities, but collocated. The AFCCP and TACC are assumed to have their own telephone switchboards. Other minor assumptions are included in the discussions of the particular interfaces that follow. The information for this section is presented in both tabular and narrative forms. The narratives were felt to be necessary due to the difficulties of presenting the complex data in an unambiguous table.

1.0 AFCCP

The AFCCP is an element of the TAF. It is composed of a group of shelters for operating positions for the Air Force Component Commander and his staff. The AFCCP is equipped with communications equipment by a Mobile Comm Group (MCG). It is assumed, for this study, that the AFCCP will share a teletype communication central AN/TGC-26, a Mobile Data Terminal (MDT) and some radio terminals with the normally collocated TACC. The AFCCP utilizes TA-236 dial telephones in conjunction with an AN/TTC-28 automatic switchboard, and also utilizes two AN/TGC-27 comm centers.

1.1 Interface with JTF HQ

Responsibility for this link is normally assigned to the MCG by the JTF HQ. These two elements may be located in close proximity allowing

81

interconnection by cable. If a radio link is required, the AN/MRC-113 is preferred with the AN/TRC-97A as an alternate.

The JTF HQ is assumed to be equipped with an AN/TTC-22 switchboard and TA-236 telephones, and an AN/TSC-65 message center containing TT-76 and TT-98 teletypewriters.

1.2 Interface with JSARC

The JSARC is located near the JTF HQ allowing the link in 1.1 to be utilized for this interface.

1.3 Interface with Army HQ

Responsibility for the links to these units may be assigned to either the Air Force, or the Army by the JTF, HQ. The ARFOR is normally located in close proximity to the AFCCP allowing landlines to be used for the interface. If a radio link is required, it would be implemented by the Air Force with AN/TRC-97A terminals, while the Army would utilize AN/TRC-145 or AN/TRC-112 radios.

The Army HQ utilizes TA-312 telephones with an AN/MTC-9 switchboard, and TT-98 and TT-119 teletypewriters in an AN/MSC-32 comm center.

1.4 Interface with MAF HQ

The Marine Amphibious Force (MAF) Headquarters normally requires a radio link which may be tropo or HF/SSB. IF tropo, the TRC-97, used by both services would be utilized. The HF link would be implemented with TSC-60's by the Air Force and TSC-15's by the Marine Corps. In some cases the MAF HQ will be afloat, with the interface link then being by HF/SSB radio.

The MAF HQ is equipped with SB-86 and SB-22 type manual switchboards, TA-312 telephones, and AN/TGC-14A and AN/TGC-29 teletypewriters.

1.5 Interface with NAVFOR HQ

The link to NAVFOR HQ is by HF/SSB radio with the AFCCP terminal supplied by the MCG. An AN/TSC-60 or AN/TRC-136 HF/SSB radio would be utilized by the Air Force for its terminal of the link. The Navy terminal would depend upon the particular ship utilized as the commanders flag ship.

1.6 Interface with DCS Terminal

The link to the DCS terminal is provided by the MCG. The AFCCP MDT would be linked to the DCS Terminal by either cable for a local terminal or an AN/MRC-113 link to a remote terminal. Voice and teletype circuits would be included in the link.

1.7 Interface with ICAO

This interface is assumed to be through the AFCCP switchboard to the Host Country Telephone Network.

2.0 TACC

The TACC is an element of the TACS and is part of the 407L system. Its operations facility is designated AN/TSQ-92. The interface with the TACC is through AN/TRC-97A and AN/TSC-60 radios, or landlines via J-1077A/U junction boxes. Circuits from these units are tied into a TSC-62 comm central and distributed to a TTC-30 telephone central office, the TSQ-92, an AN/TGC-28 teletype comm centers and the TGC-26 comm central.

The TSQ-92 is equipped with TA-720 and TA-741 telephones, and the TGC-28 contains five teletypewriters with secure capability. The TGC-26 is a torn tape facility with 24 simultaneously circuits.

2.1 Interface with JTF HQ

Same as 1.1.

2.2 Interface with JSARC

Same as 1.2.

2.3 Interface with the FATOC

The link with the FATOC may be supplied by either service. The centers are often closely situated so that they may be interconnected by landlines or existing telephone lines. The FATOC has TA-312 telephones, an AN/MTC-1A switchboard, and an AN/TSC-58 comm center with TT-98 teletypewriters.

The Air Force would implement a radio link with TRC-97A's, while the Army would utilize AN/TRC-145 or AN/TRC-112 terminal sets.

2.4 Interface with FOC

The FOC is an element of the Army Air Traffic Regulation System (AATRS). Its operation center is designated AN/MSC-53. The TACC-FOC link may be supplied by either service. The Air Force would supply a TSC-60 or TRC-97A link, while the Army would supply a MRC-126 link. The MSC-53 contains an FGC-25 teletype, and 20 Hz ring telephone key panels with H-101 headsets.

2.5 Interface with the Marine TADC/TACC

The Marine Corps TADC/TACC is an element of the Marine Air Command and Control System (MACCS). The TADC's equipment system is designated

AN/TYQ-1. The communications interface is with the AN/TYA-16 communication group, which contains a manual 80 line switchboard made from SB-22 components, for the TADC's TA-312 telephones. The TADC utilizes an AN/TGC-29 teletypewriter.

The TACC-TADC link would be implemented with each service's TRC-97 terminals, unless distance dictates an HF link be implemented. The Air Force would utilize an AN/TSC-60 and the Army an AN/TSC-15 for the HF link.

2.6 Interface with Marine DASC

The DASC is an element of the MACCS, and is housed in an AN/TSC-6 shelter. It utilizes TGC-14A and TGC-29 teletypewriters, and TA-312 telephones. It also contains an AN/TSA-16 communications console.

The link may be implemented by either tropo or HF radios. The AF would install a TRC-97A or TSC-60 radio while the Marine Corps would implement their terminal with a TRC-97C or TSC-15 radio.

2.7 Interface with Navy TADC/TACC

The Navy TADC/TACC is normally located on the Amphibious Command Ship. The interface would be through an HF link with the Air Force utilizing an AN/TSC-60 radio. The Navy radio terminal and comm end instruments would depend on the particular ship utilized by the Navy.

2.8 Interface with SACC

The SACC is collocated with Navy TADC/TACC, and this interface would be the same as 2.7.

2.9 Interface with DCS Terminal

Same as 1.6.

2.10 Interface with ICAO

Similar to 1.7.

3.0 ALCC

The ALCC is an element of the TACS and part of the 407L system. It is normally collocated with the AFCCP/TACC complex and is so assumed for this report. It is further assumed it will utilize the AFCCP switchboard and teletype comm centers. The ALCC uses TA-236 telephones.

3.1 Interface with JTF

The ALCC communicates with the TMA and JOC at JTF HQ. The interface is through link 1.1.

3.2 Interface with DCS Terminal

Same as 1.6.

3.3 Interface with MAF HQ

Same as 1.4.

3.4 Interface with NAVFOR

Same as 1.5.

3.5 Interface with DCS Terminal

Same as 1.6.

ALCE

The ALCE is an element of the TACS. It is normally located at a TAB,
but contains a mobile capability for deployment with an Army or Marine
Air Base. The ALCE interfaces on a face-to-face or local base comm facil-
ity basis with the joint unit being airlifted or the joint unit for which
a logistic airlift is being conducted. A DACG is supplied by the Army
to coordinate these functions.

3.6 Interface with DACG

The Army's DACG is collocated with the ALCE, with the interface being
face to face or through the TAB local network.

4.0 DASC

The DASC is an element of the TACS and is part of the 407L system.
Its operating facility is identified by the nomenclature AN/TSQ-93. The
communications interface with the DASC is through an AN/TRC-97A, an
AN/TSC-60, an AN/MRC-107/8, or J-1077 A/U junction box for landlines.

The DASC contains a TTC-32 switchboard with 4-wire AC and DC super-
vision, and 2-wire 20-Hz ringdown. The TSQ-93 is equipped with TA-720
DTMF telephones. Circuits may be patched through the switchboard to the
TSC-60, TRC-97, MRC-107/8 or landline, or be patched directly to these
units.

The facility contains two AN/UGC-41 teletypewriters one of which is
secured. Both operate full duplex and may be patched to the TSC-60 or
TRC-97.

4.1 Interface with JSARC

The DASC would utilize an AN/TSC-60 radio to access the search and
rescue HF net.

4.2   Interface with the CTOC

The collocation of the DASC with the CTOC allows these two facilities
to be interfaced with landlines. Since only voice traffic is exchanged,
a direct telephone to telephone connection is normally provided by land-
line. Depending on the availability of circuits, lines may be run from
DASC phones to the CTOC switchboard and from CTOC phones to the DASC
switchboard. The CTOC employs TA-312/PT telephones and an MTC-9 manual
switchboard.

4.3   Interface with Marine DASC

Voice interface with the Marine Corps DASC is required if there is
a closely adjacent area of ground operations with the Army. Since this
interface is only minimal it can best be served by a circuit through
the CTOC-Marine DASC link. For Marine DASC system affiliation see 2.6.

TACP

The TACP's are an element of the TACS and part of the 407L system.
TACP's are provided to all Army battalion and higher ground force head-
quarters to coordinate close air support and tactical air reconnaissance.
TACP interface communications with the Army Command Post is either face
to face, or through the TACP mobile communication central AN/GRC-107/3
into Army command and control nets. The MRC-107 and 108 each contain
an AN/GRC-160 VHF/FM set for this interface. In addition, the TACP's
are provided an AN/PRC-77 that may be used in this net. It is assumed
for this study that the MRC-107/8 have been modified to incorporate the
wide band radios as indicated.

The organization, personnel and equipment for processing, evaluation
and coordinating of the tactical air support within the Army makes up the
Army Air Ground System (AAGS). The Army utilizes the AN/VRC-12 family of
radios for their division, brigade and battalion command nets (VRC-46,
VRC-47), used in interfaces 4.4 thru 4.6.

5.0   CRC

The CRC is an element of the TACS and part of the 407L system. Its
operations facility is designated AN/TSQ-91. The communications interface
with the TSQ-91 is through an AN/TRC-97A or AN/TSC-60 to an AN/TSC-62
communications central. From the TSC-62, circuits may go directly to the
TSQ-91, or through an AN/TTC-30 telephone central office. Also, TTY cir-
cuits go from the TSC-62 to an AN/TGC-28 teletype communications center.

The telephone sets in the TSQ-91 are of the TA-720 DTMF type. The
TGC-28 provides 5 full duplex teletype circuits, any or all of which may
be secured.

5.1   Interface with JSARC

The CRC would use an AN/TSC-60 to access the search and rescue HF net.

5.2   Interface with the AADCP

The AADCP is an element of the Army Air Defense System (AADS).   Until the AN/TSQ-73 is developed, the Army would use either an AN/MSG-28 or an AN/TSQ-38 for its AADCP.   These units were developed as part of the AN/MSG-4 system.   The MSQ-28 is the Corp OPS Center, but the existing units are committed, and a TSQ-38 battalion AADCP would probably be utilized for the Corps Center.

The OP centers utilize headsets with a manual control panel at each operator position to allow connection to any one of 10 lines terminated on a main distribution patch panel.   The MDF allows these 2 wire circuits to be distributed to the AADCP's AN/MTC-7 switchboard.   The AADCP has an AN/TSC-58 comm center containing TT-98 teletypewriters that may be secured with KW-7 crypto units.   The radio link may be supplied by either service. If by AF, TRC-97 radios would be utilized.   The Army would use AN/TRC-117, AN/TRC-145 or AN/TRC-112 radios for the implementation.

5.3   Interface witn the Army FOC

The FOC is an element of the Army Air Traffic Regulation System (AATRS).   It is designated AN/MSC-53, and utilizes comm equipment described in 2.4.

The link may be provided by either the Air Force or the Army as directed by the JTF HQ.   The AF would implement the link with either TSC-60 or TRC-97A radios, and the Army would utilize MRC-126 radios.

5.4   Interface with the TAOC

The TAOC is an element of the Marine Air Command and Control System (MACCS), and the TAOC's equipment system is designated AN/TYQ-2.   The communications interface is with the AN/TYA-12 Communications Group.   The AN/TYQ-12 contains a manual switchboard made from SB-22 components for the TAOC's TA-312 telephones.   The TAOC utilizes TGC-29 teletypewriters.

An AN/TRC-97 link would be implemented with the Air Force using a TRC-97A, and the Marine Corps a TRC-97E.

5.5   Interface with the Marine Corps DASC

The DASC is an element of the MACCS, and is housed in an AN/TSQ-6 shelter.   It utilizes TGC-14A and TGC-29 teletypewriters and TA-312 telephones.   It also contains an AN/TSA-16 communications console.

The link would be implemented similarily to, and with the same type of equipment as described in 5.4.

5.6 Interface with the Air Mobile DASC

The Marine Corps has an Air Mobile DASC designated AN/UYQ-3. This is a minimal unit having 7 operating positions in a S-444/U shelter, and may be utilized prior to setting up the TSQ-6. Its interface is through HF/SSB radio RT-648/ARC-94, up to four external radios, and 6 telephone lines. Each of the 7 positions has a comm panel with 20 Hz ringers and H-157 head sets. The UYQ-3 contains a TGC-14A teletype, KW-7 crypto unit, 3 each KY-28's and a TA-312 telephone.

5.7 Interface with the SACC

As described in 1.5 the Navy interface is via HF radio, with the Navy equipment depending upon the particular ship assigned as the Amphibious Command Ship.

5.8 Interface with the TADC/TACC

Same as 5.7.

5.9 Interface with ICAO

This interface is assumed to be through the CRC TTC-30 switchboard into the host country's telephone system.

CRP

The CRP is an element of the TACS and part of the 407L system. The CRP is subordinate to the CRC, but is similarily configured with an AN/TSQ-91 shelter and may operate as an alternate CRC. It therefore may be equipped with comm equipment as shown for the CRC.

5.10 CRP Interface with FCC

The FCC has a similar relationship to the FOC as the CRP to CRC. Its operating facility is an AN/TSC-61A, and is equipped with a 20 Hz telephone key panel with H-101 headsets.

The CRP and FCC are located in forward areas for air space and traffic control by the respective services, and would interface if their areas of responsibility were adjacent to each other.

5.11 CRC Interface with SIS

An SIS element may be collocated with the CRC in which case their facilities would be interconnected by cable. The end instruments used by the SIS could not be determined.

6.0 TAB

The elements of the TAF located on the tactical air bases are grouped in this category.

TUOC

The TUOC is an element of the TACS, and is located at each TAB. The TAB communications facilities utilized by the TUOC are provided by the MCG. Radio terminals include the TRC-97A, TSC-60 and TRC-136 as the preferred sets. It is assumed the TTC-30 switchboard will be available with TA-341 telephones, and that a TGC-27 teletype comm center will be located at each TAB.

6.1 Interface with JSARC

The link to JSARC may be a point to point AF link using the TSC-60 or TRC-136, or voice messages may be routed through the TAB to TACC link through the AFCCP TTC-28 switchboard to the AFCCP to JTF HQ link 1.1.

6.2 Interface with GLO

The GLO is an Army representative located at each TAB. The interface is either through the TAB telephone system, or on a face to face basis.

TATCF

The TATCF is an element of TACS, and provides the terminal landing and traffic control system at the TABs. The RAPCON operation center AN/TPN-19 and control tower AN/TSW-7 are the voice interface points through the Base TTC-30 switchboard. The TGC-27 TTY comm center provides the teletype interface.

6.3 Interface with FOC

The Army FOC with its communications equipment is described in 2.4. The interface link may be supplied by either service. The Air Force would utilize TRC-136 or TSC-60 radios, and the Army would utilize MRC-126 radios for the link.

6.4 Interface with the ICAO

The TAB TTC-30 switchboard would be cabled to the host country's telephone system. Remote TAB's would relay through a TAB to TAB link to the ICAO.

CSG

The Combat Support Group is an element of the TAF. A CSG or detachment is located at each TAB, and utilizes the TAB comm facilities for external interfaces.

6.5   Interface with DCS

The MCG would provide an TSC-60 to interface the base MDT with the DCS terminal.

Aerial Port

The AP is an element of the TAF. The AP personnel located at an air base utilizes the communications provided at the base by the MCG.

6.6   Interface with DACG

The Army DACG is also located at the air base, with the interface being through the base network, or face to face.

6.7   Interface with MAF HQ

The AP's at the various TAB's would interface the MAF HQ through the TAB to TACC link to the AFCCP switchboard to the AFCCP to MAF HQ link.

6.8   Interface with NAVFOR HQ

Similar to 5.7.

6.9   Interface with TMA, JF

The TMA at JTF HQ is interfaced through the comm link between the air base and JTF HQ provided by the MCG. An AN/TRC-136 or AN/TSC-60 would be utilized.

7.0   RITS

The RITS is an element of the TAF, and coordinates the reconnaissance intelligence function for the DI of the AFCCP. The RITS facility is collocated with the AFCCP and shares its comm facilities.

7.1 thru 7.4   Interfaces

These RITS interfaces as shown by Table III are through the AFCCP comm center and shared links to the joint services headquarters and the DCS Terminal.

7.5   Interface with SIS

The location and equipments utilized by the SIS were not determined for this interface.

8.0 WECEN/RAWIE

As previously stated, it is assumed for this study that the JTF weather responsibility has been assigned to the Air Force. It is further assumed the 433L Tactical Weather System will not be available for the baseline time frame. Therefore, the WECEN/RAWIE facility is shown as the existing AN/MSQ-10 supplemented by spare FGC 25 teletypes, and is assumed to be collocated with the AFCCP and shares its comm facilities. The inability of this equipment to provide up-to-date weather information in suitable form to support a tactical operation of the size assumed for this study is well documented in the requirements of the 433L system.

8.1 thru 8.6 Interfaces

The weather information is normally linked through an HF net to the other services. An AN/TRC-136 HF radio is shown for this purpose. The MSQ-10 is a receive only station that is utilized as a RAWIE and to receive weather information from a global or theater weather station. Additional FGC-25 teletypewriters are supplied to operate with the TRC-136 or other AFCCP terminals to distribute processed weather data to the joint services.

9.0 ERU

Information was not available on the ERU interfaces.

10.0 Mission Aircraft

The ground to air to ground (G/A/G) interfaces are too numerous and varied in the sense of equipment types, to present in the form of the ground to ground (G/G) interfaces. The G/A/G radio interface between the inter-service functional groups is simplified by a high degree of radio equipment commonality. This reduces the radio interface problems to those of frequency allocation and coordination. Aircraft of all services operating in the area of the deployment are at all times under control of an element of the joint services AC and W system, with hand-overs between the elements coordinated through the G/G and G/A/G comm system. TAF interfacing units with joint service A/C include:

1.	CRC	8.	CSG
2.	CRP	9.	TUOC
3.	FACP	10.	TATCF
4.	FAC	11.	ALCC
5.	ASRT	12.	ALCE
6.	DASC	13.	CCT
7.	TACP	14.	AP

Air Force A/C in turn interface with the joint service control systems as follows:

      1. TAOC
      2. DASC (USMC)
      3. SAAWC (N)
      4. JSARC
      5. AAT
      6. ASRT (USMC)

Typical aircraft radios operate in a simplex voice mode and in the VHF/UHF bands where some 800 VHF channels and 3500 UHF channels in 50 KHz increments are available. There are several applications including airborne command post use where high frequency radios are included. These have 28,000 simplex voice channels at 1 KHz spacing.

Some typical radio sets are:

AN/ARC-102, 2-30 MHz, SSB-AM, 400 watts PEP
AN/ARC-54, 30-70 MHz, FM, 10 watts
AN/ARC-51BX, 225-400 MHz, AM, 20 watts

DATA Link - Ground/Air/Ground

Tactical Digital Information Link (TADIL) standards are specified in JCS Pub 10. TADIL C is specified for the ground/air/ground data link. This link has been in use for a number of years. Air Force, Navy, and Marine Corps fighter aircraft are equipped to communicate with ground or airborne control elements via this data link. Control elements could include SAGE, BUIC, 407L CRC, NTDS fitted ships, and Marine Corps TAOC. AWACS could function as an airborne control element. If present and future aircraft and control systems continue to use TADIL C, interface difficulties will be minimized.

Table III lists the subsystems and interconnecting communications equipments for the interfaces under the following headings:

1. Air Force Element - Lists the AF element of the interface, followed by its subsystem and ops center identifiers after the elements first listing in the table.

2. Interface Service - Lists the interfacing elements association to one of the following:

      a. Joint Force (JF)
      b. Army
      c. Marine Corps
      d. Navy
      e. DCA
      f. Allied
      g. NSA

3. Interface Element - Lists the joint service element of the interface, followed by its subsystem and ops center identifiers.

4. AF Link Terminal Equipment - Lists the radio equipment that would be utilized by the Air Force if they were given the responsibility of implementing the interfacing link, or the equipment that would be utilized as the Air Force terminal of a link with a joint service having a compatible terminal.

5. Joint Service Link Terminal Equipment - As in Column 4 this column lists in order of probability of implementation those radio equipments that would be utilized by the interfacing service if they were given the responsibility for the link, or as a terminal of a link to a compatible Air Force terminal. Since bulk encryption (i.e. encryption at the terminal) is the present practice of the joint services rather than channel encryption at the end instrument as implemented by the Air Force, the bulk encryption equipment is listed in this column for Tables I and II of Volume II.

6. The remaining six columns lists the end instruments for voice, teletype and facsimile, and data for the Air Force (columns 6, 8 and 10 respectively) and the interfaced elements (columns 7, 9 and 11 respectively). Columns 6 and 7 identify switchboards, switch panels and headsets, telephones and channel encryption devices where appropriate. Teletype message centers, teletypewriters, facsimiles, and channel encryption devices are listed in column 8 and 9. Columns 10 and 11 lists computers, data processors, data terminals and their associated crypto equipment. Crypto equipment appears only in Volume II.

Differences in equipment types in the table do not necessarily indicate incompatibility. As an example, the Air Force's TTC-30 automatic switchboard, which is assumed to be available as baseline equipment, has trunk and line provisions to interface manual switchboards and 2 wire manual telephones. Therefore, the only incompatibility may be in the number of available circuits, or the fact that a call from one service to another may have to be routed through both services' switchboard tying up both operators. This latter case is an example of a non-transparent interface, i.e., one that requires a special interface device. Compatibilities are discussed in Section VI.

93

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
1.1 AFCCP - TAF	JF	JTF-HQ, TMA, JOC	MRC-113 TRC-97A	TRC-97A TRC-136	TTC-28 TA-236	TTC-22 TA-236	TGC-26 TGC-27	TSC-65 TT-76 TT-98	N/A	N/A
1.2 AFCCP	JF	JSARC	→	→		→		→	N/A	N/A
1.3 AFCCP	ARMY	ARMY HQ	CABLE MRC-113 TRC-97A	CABLE TRC-145 TRC-112		MTC-9 TA-312		MSC-32 TT-98 TT-119	N/A	N/A
1.4 AFCCP	MARINE CORPS	MAF HQ	TRC-97A TSC-60	TRC-97C TSC-15		SB-86 TA-312		TGC-14A TGC-29	N/A	N/A
1.5 AFCCP	NAVY	NAVFOR HQ	TSC-60	HF RADIO - Various	→	HEADSETS - Various	→	TT-299 and Various	N/A	N/A
1.6 AFCCP	DCA	LCS TERM	CABLE MRC-113	N/A		Various		Various	MDT	Various
1.7 AFCCP	ALLIED	ICAO	CABLE	N/A		HOST COUNTRY TELEPHONE SYSTEM	N/A	N/A	N/A	N/A

1. AFCCP

94

TABLE III   SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
2.1 TACC - TACS - 407L - TSQ-92	JF	JTF - JOC	MRC-113 TRC-97A	TRC-97A TRC-136	TTC-30 TA-720 TA-741	TTC-28 TA-236	TGC-26 TGC-27	TSC-65 TT-76 TT-98	N/A	N/A
2.2 TACC	JF	JSARC	→	N/A		→	→	→	N/A	N/A
2.3 TACC	ARMY	FATOC	CABLE TRC-97A	CABLE TRC-145 TRC-112		MTC-1A TA-312		TSC-58 TT-98	N/A	N/A
2.4 TACC	ARMY	FOC - AATRS - MSC-53	TSC-60 TRC-97A	MRC-126		20Hz TP KEY PANEL WITH H-101 HEADSET	N/A	N/A	N/A	N/A
2.5 TACC	MARINE CORPS	TADC/TACC- MACCS - MTDS - TYQ-1	TRC-97A TSC-60	TRC-97C TSC-15		TYA-16 SB-22 TA-312	TGC-26 TGC-27	TYA-16 TGC-29	N/A	N/A
							Same as 2.?			
2.6 TACC	MARINE CORPS	DASC - MACCS - MTDS - TSQ-6	TSC-60	TSC-15 MRC-134	→	TSA-16 TA-312		TSA-16 TGC-29 TGC-14A	N/A	N/A
2.7 TACC	NAVY	TADC/TACC	TSC-60	HF RADIO - Various		HEADSETS - Various		TT-299 and Various	N/A	N/A
2.8 TACC	NAVY	SACC	→	→		→	→	→	N/A	N/A

2. TACC

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
2.9 TACC	DCA	DCS TERM	CABLE TRC-97A	N/A	Same as 2.1 →	Various	Same as 2.1 →	Various	MDT	Various
2.10 TACC	ALLIED	ICAO	CABLE	N/A		Host Country Telephone System		Various	N/A	N/A

2. TACC (Continued)

96

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
4.1 DASC - TACS - 407L - TSQ-93	JF	JSARC	TSC-60	VSC-2- GRC-106	TTC-32 TA-720	TTC-22 TA-236	UGC-41	TSC-65 TT-76 TT-98	N/A	N/A
4.2 DASC	ARMY	CTOC	CABLE	CABLE		MTC-9 TA-312	N/A	N/A	N/A	N/A
4.3 DASC	MARINE CORPS	DASC See 2.6	Via ARMY Link DASC-TRC-97E	CTOC to TRC-97E		SB-86 TA-312	N/A	N/A	N/A	N/A
4.4 TACP - TACS - 407L -	ARMY	DTOC-AAGS	MRC-107/8 GRC-160	VRC-47 VRC-46 VRC-12	These radios are used in Div CG Command Net; other interfaces are face to face.		N/A	N/A	N/A	N/A
4.5 TACP	ARMY	BDE, CP - AAGS			These radios are used in Bde Command Net; other interfaces are face to face.		N/A	N/A	N/A	N/A
4.6 TACP	ARMY	BN, CP - AAGS	None	None	Face to Face		N/A	N/A	N/A	N/A

4. DASC - TACP

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
3.1 ALCC - TACS	JF	JTF -TMA, JOC	MRC-113 TRC-97A Same as 1.1	TRC-97A TRC-136	TTC-28 Same as 1.1 TA-236	TTC-22 TA-236	TGC-26 TGC-27	TSC-65 TT-76 TT-98	N/A	N/A
3.2 ALCC	ARMY	FATOC	CABLE TSC-60	CABLE MRC-126	Same as 1.1	MTC-1A TA-312		TSC-58 TT-98	N/A	N/A
3.3 ALCC	MARINE CORPS	MAF HQ	TRC-97A TSC-60 Same as 1.4	TRC-97A TSC-15		SB-86 TA-312		TGC-14A TGC-29	N/A	N/A
				Same as 1.4						
3.4 ALCC	NAVY	NAVFOR HQ	TSC-60 TRC-136 Same as 1.5	HF RADIO- Various		HEADSETS - Various	──────►	TT-299 and Various	N/A	N/A
3.5 ALCC	DCA	DCS TERM	Same as 1.6	N/A		Various	──────►	Various	MDT Same as 1.6	Various
3.6 ALCE - TACS	ARMY	DACG - AAGS	None	None	Face to Face TTC-30 Same as 6.1 TA-341	TA-341 Part of Tab Comm Equip	N/A	N/A	N/A	N/A

3. ALCC-ALCE

TABLE III   SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
5.1 CRC - TACS - 470L - TSQ-91	JF	JSARC	TSC-60	VSC-2 - GRC-106	TTC-30 TA-720	TTC-22 TA-236	TGC-28 →	TSC-65 TT-76 TT-98	N/A	N/A
5.2 CRC	ARMY	AADCP - AADS - MSG-4- MSQ-28 or TSQ-38	TRC-97A	TRC-117 TRC-145 TRC-112		MTC-7 TA-312	→	TSC-58 TT-98	N/A	N/A
5.3 CRC	ARMY	FOC - AATRS - MSC-53	TSC-60 TRC-97A	MRC-126		20Hz TP Key Panel with H-101 Headset	N/A	N/A	N/A	N/A
5.4 CRC	MARINE CORPS	TAOC - MACCS-MTDS TYQ-2	TRC-97A	TRC-97E		TYA-12 TA-312	TGC-28	TYA-12 TGC-29	N/A	N/A
5.5 CRC	MARINE CORPS	DASC See 2.6	TSC-60 TRC-97A	TSC-15 TRC-97C MRC-135	→	TSA-16 TA-312	Same as 5.1 →	TGC-14A TGC-29	N/A	N/A

5.   CRC-CRP

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
5.6 CRC	MARINE CORPS	AIR MOBILE - DASC - MACCS - UYQ-3	TSC-60	RT-68/ ARC-94 TSC-15 MRC-134	TTC-30 TA-720 Same as 5.1	20Hz Ring 2 Wire SW Panel. H-157 Headset. TA-312	TGC-28 Same as 5.1	TGC-14A	N/A	N/A
5.7 CRC	NAVY	SACC	TSC-60	HF RADIO - Various		Headsets - Various		TT-299 and Various	N/A	N/A
5.8 CRC	NAVY	TADC/TACC	TSC-60						N/A	N/A
5.9 CRC	ALLIED	ICAO	CABLE	N/A		Host Country Telephone System	N/A	N/A	N/A	N/A
5.10 CRP - TACS - 407L	ARMY	FCC - AATRS - TSC-6LA	TSC-60	MRC-126		20Hz TP Key Panel with H-101 Headsets	N/A	N/A	N/A	N/A
5.11 CRC	NSA	SIS	CABLE	N/A		TBDL	N/A	N/A	HM-4118	Undefined

5. CRC-CRP (Continued)

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
6.1 TUOC - TAB	JF	JSARC	TSC-60 TRC-136	VSC -2-GRC-106	TTC-30 TA-341 TA-312	TTC-22 TA-236	TGC-27	TSC-65 TT-76 TT-98	N/A	N/A
6.2 TUOC	ARMY	GLO	None	None	Face to Face TTC-30 TA-341	Face to Face TA-341 Part of Tab Comm Equip	N/A	N/A	N/A	N/A
6.3 TATCF - TACS - 407L	ARMY	FOC See 2.4	TRC-136 TSC-60	MRC-126	TTC-30 Same as 6.1 TA-341 TA-312	20Hz TP Key Panel with H-101 Headset	N/A	N/A	N/A	N/A
6.4 TATCF	ALLIED	ICAO	CABLE	N/A	TTC-30 Same as 6.1 TA-341 TA-312	Host Country Telephone System	N/A	N/A	N/A	N/A
6.5 CSG	DCA	DCS TERM	TSC-60	N/A	N/A	N/A	N/A	N/A	MDT	Various
6.6 AP - TAF	ARMY	DACG	None	None	Face to Face TTC-30 Same as 6.1 TA-341	Face to Face TA-341 Part of Tab Comm Equip	N/A	N/A	N/A	N/A
6.7 AP	MARINE CORPS	MAF HQ	Via AFCCP to MAF HQ Link 1.4	Same as Link 1.4	TTC-30 Same as 6.1 TA-341	SB-86 TA-312	N,A	N/A	N/A	N/A

6. TAB-TUOC-TATCF-CSG-AP

TABLE III   SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
6.8 AP	NAVY	NAVFOR HQ	Via AFCCP to NAVFOR HQ Link 1.5	Same as Link 1.5	TTC-30 Same as 6.1 TA-341	Headsets - Various	N/A	TT-299 and Various	N/A	N/A
6.9 AP	JF	JTF - TMA	TRC-136 TSC-60 or Via AFCCP to JTF HQ Link 1.1	N/A		TTC-22 TA-236	TGC-27 Same as 6.1	TSC-65 TT-76 TT-98	N/A	N/A

6. TAB-TUOC-TATCF-CSG-AP (Continued)

TABLE III   SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
7.1 RITS	ARMY	MIBARS	CABLE MRC-113 TRC-97A Same as 1.3	CABLE TRC-145 TRC-117	TTC-28 Same as 1.1 TA-236	MTC-9 TA-312	TGC-27	MSC-32 TT-119 TT-98	N/A	N/A
7.2 RITS	MARINE CORPS	MAF HQ - MAGIS	TRC-97A TSC-60 Same as 1.4	TRC-97C TSC-15		SB-86 TA-312	GXC-7(FAX)	TGC-29 GXC-7(FAX)	N/A	N/A
7.3 RITS	NAVY	NAVFOR HQ	TSC-60 Same as 1.5	HF RADIO Various		Headsets Various		TT-299 and Various UXH-2	N/A	N/A
7.4 RITS	DCA	DCS TERM	CABLE MRC-113 Same as 1.6	N/A	Various	Various		Various	MDT	Various
7.5 RITS	NSA	SIS	TBDL	N/A	TBDL	TBDL		TBDL	N/A	N/A

7.   RITS

103

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
8.1 WECEN - TAF	JF	JTF HQ	MSQ-10 TRC-136	N/A	TTC-28 Same as 1.1 TA-236	TTC-22 TA-236	UXH-2 TT-98 FGC-25	FGC-26	N/A	N/A
8.2 WECEN	ARMY	ARMY HQ		GRC-106		MTC-9 TA-312		GGC-3 PGC-1 GXC-5	N/A	N/A
8.3 WECEN	ARMY	FOC See 2.4				20 Hz TP Key Panel with Headsets		FGC-25	N/A	N/A
8.4 WECEN	MARINE CORPS	MAF HQ		FSC-15		SB-86 TA-312		TGC-29	N/A	N/A
8.5 WECEN	MARINE CORPS	MAW HQ							N/A	N/A
8.6 WECEN	NAVY	NAVFOR HQ		HF Radios-Various		Headsets-Various		UXH-2 TT-321/UX TT-130A/UG	N/A	N/A

8. WECEN/RAWIE

TABLE III SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - BASELINE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
9.1 ERU	JF	JTF HQ	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
9.2 ERU	ARMY	ASA	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
9.3 ERU	NAVY	NAVFOR HQ	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
9.4 ERU	DCA	DCS TERM	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

9. SPECIAL

105

B. NEAR TERM/FUTURE

The Near Term/Future Subsystem affiliations and equipment identifications are shown in Table IV. This table is organized identically to Table III, with the column header descriptions described in Section IV-A.

In addition to the assumptions in the previous sections, it was assumed the TRC-167 will be developed, and either or both the TRI-TAC and ICMS switches will be available.

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
1.1 AFC HQ-TACS-485L	JF	JTF-HQ, TMA, JOC	TRC-167 TRC-97A	N/A	ICMS (TRI-TAC) TA-720 TA-341	TTC-30 TA-341	ICMS (TRI-TAC) TGC-27	TBDL	Undefined	Undefined
1.2 AFC HQ	JF	JSARC	→	N/A			→		N/A	N/A
1.3 AFC HQ	Army	Army HQ	Cable MRC-113 TRC-97A	Cable TRC-145 TRC-112		TRI-TAC (ICMS) TA-341		MSC-32 TT-98 TT-119	N/A	N/A
1.4 AFC HQ	Marine Corps	MAF HQ	TRC-167 TRC-97A TSC-60	TRC-97C TSC-15		TTC-31 TA-341		TGC-29 TGC-( )	N/A	N/A
1.5 AFC HQ	Navy	NAVFOR P	TSC-60	HF RADIO-VARIOUS		HEADSETS-VARIOUS		TT-299 & VARIOUS	N/A	N/A
1.6 AFC HQ	DCA	DCS TERM.	Cable TRC-167	N/A		VARIOUS		VARIOUS	MDT	VARIOUS
1.7 AFC HQ	Allied	ICAO	Cable	N/A		Host Country Telephone System	N/A	N/A	N/A	N/A

AFC HQ

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
2.1 TACC-TACS-485L-TSQ-92	JF	JTF-JOC	TRC-167 TRC-97A	N/A	ICMS (TRI-TAC) TA-720 TA-741	TTC-30 TA-341	ICMS (TRI-TAC) TGC-27	Same as 1.1	Undefined	Undefined
2.2 TACC	JF	JSARC	→	→	→	→	Same as 1.. →	→	N/A	N/A
2.3 TACC	Army	FATOC-TOC-ADSAF	Cable TRC-97A	Cable TRC-145 TRC-112		TRI-TAC (ICMS) TA-341		TSC-58 TT-98	Undefined	Undefined
2.4 TACC	Army	SAFOC-ATARS	TSC-60 TRC-97A	MRC-126		20 Hz TP Key Panel with Headsets	N/A	N/A	N/A	N/A
2.5 TACC	Marine Corps	TADC/TACC-MACCS-MTDS-TYQ-1	TRC-97A or TSC-60	TRC-97C or TSC-15 KY-65		TYA-16 TA-312	Same as 2.1	TYA-16 TGC-( ) TGC-29	Undefined	DTAS UYK-7 TADIL D
2.6 TACC	Marine Corps	SA-DASC-MACCS-UYQ-4	TSC-60	TSC-15 MRC-134		TA-312 Headsets	N/A	N/A	N/A	N/A
2.7 TACC	Navy	TADC/TACC-	TSC-60	SSQ-29 SRC-16	N/A	N/A	N/A	N/A	Undefined	DTAS UYK-7 TADIL D

2. TACC

TABLE IV   SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS – NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
2.8 TACC	Navy	SACC	TSC-60 Same as 2.7	HF Radio– Various	Same as 2.7	Headsets– Various	Same as 2.7	TT-299 & Various	N/A	N/A
2.9 TACC	DCA	DCS Term.	Cable TRC-167	N/A		Various		Various	MDT	Various
2.10 TACC	Allied	ICAO	Cable	N/A		Host Country Telephone System		Various	N/A	N/A

2. TACC (Continued)

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS – NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
3.1 ALCC-TACS	JF	JTF-TMA, JOC	TRC-167 TRC-97A Same as 1.1	N/A	ICMS (TRI-TAC) Same as 1.1 TA-720	TTC-30 TA-341	TGC-26 TGC-27	Same as 1.1	Undefined	Undefined
3.2 ALCC	Army	FATOC	Cable TSC-60	Cable MRC-126		TRI-TAC TA-341	Same as 1.1 →	TSC-58 TT-98	Undefined	Undefined
3.3 ALCC	Marine Corps	MAF HQ	TRC-167 TRC-97A TSC-60 Same as 1.4	TRC-97C TSC-15		TTC-31 TA-341		TGC-( ) TGC-29	Undefined	DTAS UYK-7 TADIL D
3.4 ALCC	Navy	NAVFOR HQ	TSC-60 Same as 1.5	HF Radio- Various		Headsets- Various		TT-299 & Various	Undefined	Undefined
3.5 ALCC	DCA	DCS Term	Cable TRC-157 Same as 1.6	N/A	Various	Various	Various	Various	MDT Same as 1.6	Various
3.6 ALCE-TACS	Army	DACG-AAGS	None	None	Face to Face ICMS (TRI-TAC) Same as 6.1 TA-341	Face to Face TA-341 Part of TAB Comm Equip	N/A	N/A	N/A	N/A

3. ALCC-ALCE

110

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
4.1 DASC-TACS-485L-TSQ-93	JF	JSARC	TSC-60	VSC-2-GRC-106	TTC-32 TA-720	TTC-30 TA-341	UGC-41 KW-7	Same as 1.1	N/A	N/A
4.2 DASC	Army	CTOC-TOS-ADSAF	Cable	Cable		TRI-TA (ICMS) TA-341	N/A	N/A	Undefined	Undefined
4.3 DASC	Marine Corps	SA-DASC See 2.6	Via Army Link TO SA-DASC, TRC-97E	Via Army Link CTOC, TRC-97E		TA-312 Headsets	N/A	N/A	N/A	N/A
4.4 TACP-TACS-485L	Army	DTOC AAGS	Same as Baseline	Same as Baseline						
4.5 TACP	Army	BDE CP-AAGS								
4.6 TACP	Army	BN CP-AAGS								

4. DASC-TACP

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
5.1 CRC-TACS-485L-TSC-91	JF	JSARC	TSC-60	VSC-2- GRC-106	TTC-30 TA-720	TTC-30 TA-341	TGC-28	Same as 1.1	N/A	N/A
5.2 CRC	Army	AADCP- AADS- TSC-73	TPC-167 TRC-97A	TRC-117 TRC-145 TRC-112		TRI-TAC (ICMS) TA-341		TSC-58 TT-98	HM-4118 TADIL B	TBDL TADIL B
5.3 CRC	Army	SAFOC- ATAPS	TRC-97A TRC-167	MRC-126 TRC-145		20Hz TP Key Panel W/ H-101 head sets	N/A	N/A	HM-4118 TADIL B	HM-4118 TADIL B
5.4 CRC	Marine Corps	TAX- MACCS- TYQ-2	TRC-167 TRC-97A and TYA-17	TRC-97E and TYA-17		TYA-12 TA-312	TGC-28 Same as 5.1	TYA-12 TGC-29	HM-4118 TADIL A TADIL B	TYQ-3 TYA-19 & TYA-20 TADIL A TADIL B
5.5 CRC	Marine Corps	SA-DASC- See 2.6	TRC-97A TSC-60	TRC-97C MRC-135		TA-312 Headsets	N/A	N/A	N/A	N/A
5.6 CRC	Marine Corps	Air Mobile DASC- MACCS- UYQ-3	TSC-60	RT-648/ ARC-94 TSC-15 MRC-134		20Hz ring 2 wire SW panel H-157 Head Set TA-312	TGC-28 Same as 5.1	N/A	N/A	N/A

5. CRC-CRP

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
5.7 CRC	Navy	SACC	TSC-60	HF Radio-Various	TTC-30 TA-720	Headsets-Various	TGC-28	TT-299 & Various	N/A	N/A
5.8 CRC	Navy	TADC/TACC	TSC-60 and TYA-17	SSQ-29 SRC-16	→	TYA-16 TA-312	Same as 5.1	TYA-16 TGC-14A TGC-29	HM-4118 TADIL A	SSQ-29 USQ-20 TADIL A
5.9 CRC	Allied	ICAO	Cable	N/A		Host Country Telephone System	N/A	N/A	N/A	N/A
5.10 CRP	Army	FCC-ATARS	TSC-60	MRC-126	→	20 Hz TP Key Panel W/H-101 Headsets	N/A	N/A	N/A	N/A
5.11 CRC	NSA	SIS	Cable	N/A	TTC-30 TA-720	TBDL	N/A	N/A	HM-4118	Undefined
5.12 CRC	Navy	ATDS	TYA-17	ASQ-52 ARC-80	N/A	N/A	N/A	N/A	HM-4118 TADIL A	TADIL A
5.13 CRC	Army	CTOC-TACFIRE-ADSAF	Via DASC to CTOC Link 4.2		N/A	N/A	N/A	N/A	HM-4118	GYC-2 GYK-12 TADIL D
5.14 CRC	Army	FATOC-TOS-ADSAF	Via TACC to FATOC Link 2.3		N/A	N/A	N/A	N/A	HM-4118	Undefined

5. CRC-CRP (Continued)

113

TABLE IV   SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
6.1 TUCC-TAF	JF	JSARC	TSC-60 TRC-136 or via TAFHQ to JTFHQ Link 1.1	N/A	ICMS (TRI-TAC) TA-341 TA-312	TTC-30 TA-341	ICMS (TRI-TAC) TGC-27	Same as 1.1	N/A	N/A
6.2 TUOC	Army	GLO	None	None	Face to Face	Face to Face	N/A	N/A		
6.3 TATCF-TACS-485L	Army	SAFOC See 2.4	TRC-136 TSC-60	MRC-126	ICMS (TRI-TAC) Same as 6.1 TA-341 TA-312	20 Hz TP Key Panel with Headsets	N/A	N/A	N/A	N/A
6.4 TATCF	Allied	ICAO	Cable	N/A	→	Host Country Telephone System	N/A	N/A	N/A	N/A
6.5 CSG-TAF	DCA	DCS, TERM	TSC-60	N/A	N/A	N/A	N/A	N/A	MET	Various
6.6 AP-TAF	Army	DACG	None	None	Face to Face TTC-30 Same as 6.1 TA-341	Face to Face TA-341 Part of TAB Comm Equipment	N/A	N/A	N/A	N/A
6.7 AP	Marine Corps	MAF HQ	Via AFC HQ to MAF HQ Link 1.4	Same as Link 1.4	→	TTC-31 TA-341	N/A	N/A	N/A	N/A
6.8 AF	Navy	NAVFOR HQ	Via AFC HQ to NAVFOR HQ Link 1.5	HF Radio Various	→	Headsets Various	N/A	N/A	N/A	N/A

6.   TAB-TUGC-TATCF-CSG-AP

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
6.9 AP	JF	JTF-TTA	TRC-136 or via AFC H₂ to JTF 1.1 Link 1.1	N/A	TTC-30 Same as 6.1 TA-341	TTC-30 TA-341	TGC-27 Same as 6.1	Same as 1.1	N/A	N/A

6. TAB-TUOC-TATCF-CSG-AP (Continued)

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
7.1 RITS-TAFIES 428A (TIPI)	Army	MIBARS	Cable MRC-113 TRC-97A Same as 1.3	Cable TRC-145 TRC-112	ICMS (TRI-TAC) Same as 1.1 TA-341	TRI-TAC (ICMS) TA-341	TGC-27 GXC-7(FAX)	MSC-32 TT-119 TT-98	N/A	N/A
7.2 RITS	Marine Corps	MAF HQ-MAGIS	TRC-97A TSC-60 Same as 1.4	TRC-97C TSC-15		TTC-31 TA-341		TGC-29 GXC-7(FAX)	N/A	N/A
7.3 RITS	Navy	NAVFOR HQ	TSC-60 Same as 1.5	HF RADIO Various		Headsets Various		TT-299 and Various UXH-2	N/A	N/A
7.4 RITS	DCA	LCS TERM	CABLE TRC-167 Same as 1.6	N/A		Various		Various	MDT KG-13	Various
7.5 RITS	NSA	SIS	TBDL	N/A		TBDL		TBDL	N/A	N/A

7. RITS

116

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
8.1 TWAC-TWS-433L	JF	JTF HQ	433L E&C Modules and AFC HQ Links	N/A	ICMS (TRI-TAC) Same as 1.1 TA-312	TTC-30 TA-341	Undefined	Same as 1.1	Via AFC HQ C&C Computer	Undefined
8.2 TWAC	Army	Army HQ-TOS-ADSAF		GRC-106		TRI-TAC (ICMS) TA-341		GGC-3 PGC-1 GXC-5		
8.3 TWAC	Army	SAFOC-ATARS				20 Hz TP Key Panel w/Headsets		TBDL	N/A	N/A
8.4 TWAC	Marine Corps	MAF HQ		TSC-15		TTC-31 TA-341		TGC-29 TGC-( )	Via AFC HQ C&C Computer	Undefined
8.5 TWAC	Marine Corps	MAW HQ								
8.6 TWAC	Navy	NAVFOR HQ		HF Radio Various		Headsets - Various		UXH-2 TT-321/UX TT-130A/UG		
8.7 TWAC	JF	TACSATCOM	MKR-9	N/A		N/A		N/A	N/A	N/A
8.8 TWAC	JF	Theatre WECEN	433L E&C Modules and AFC HQ Links	HF Radio - Various		Various		Various	Via AFC HQ C&C Computer	Undefined

TABLE IV SUBSYSTEM AFFILIATIONS AND EQUIPMENT IDENTIFICATIONS - NEAR TERM/FUTURE

AIR FORCE ELEMENT	INTERFACE SERVICE	INTERFACE ELEMENT	AF LINK TERMINAL EQUIPMENT	JOINT SERVICE LINK TERM. EQUIPMENT	AF SWBD AND/OR TELEPHONE EQUIPMENT	INTERFACE SWBD AND/OR TELEPHONE EQUIPMENT	AF MSG CENTER AND/OR TTY EQUIPMENT	INTERFACE MSG CENTER AND/OR TTY EQUIPMENT	AF DATA TERMINAL	INTERFACE DATA TERMINAL
9.1 ERU	JF	JTF HQ				UNKNOWN				
9.2 ERU	Army	ASA								
9.3 ERU	Navy	NAVFOR HQ								
9.4 ERU	DCA	DCS TERM.								

V. EQUIPMENT PARAMETERS AND CHARACTERISTICS

A. GENERAL

This section lists the technical parameters and characteristics of the interfacing systems and euqipments which are pertinent to determining compatibility and interoperability. Broadly, they are:

1 Transmission medium

2 Signal modulation

3 Data codes and formats

4 Signaling and control procedures

It is important to understand that similar or even identical equipments available at both locations do not necessarily result in a successful interface during stress conditions. In fact, the general rule is to designate a supporting organization to be responsible for, and provide all equipment for the complete interconnection. For example, if the Marine TACC is made responsible by prearrangement to establish a radio interface with the Air Force TACC, the AN/MRC-135 equipments may, because of mobility and quick setup time, be selected for the link even though this equipment is not used by the Air Force. A more desirable concept would be to establish a joint force communications subsystem responsible for intersystem interface which would provide all equipment including end instruments and modems, if nece s as an attempt to provide a transparent interface.

This section is sub-divided under the following headings:

B. Radio Equipment Characteristics

C. Communications Terminal Equipment Characteristics

D. Near Term/Future Communications and Command and Control Systems

B. RADIO EQUIPMENT CHARACTERISTICS

The radio equipments listed for each interface terminal in Tables III, and IV are compiled in order of their assigned AN/ number and listed together with their technical characteristics in Table V. Only those characteristics that primarily affect interoperability are included. They are; frequency band, transmit power, type of transmission, number of voice/data and teletype channels, and modulating bandwidth. Transmit power may be excluded from consideration as an interface factor, however, it is useful to know relative power levels. Signal levels and impedance values are not included since these are well established by governing criteria of MIL-STD-188C and DCA circular 330-175-1. Furthermore most equipments have adjustments that permit compliance with the required levels.

TABLE V   EQUIPMENT TECHNICAL CHARACTERISTICS

Radio Set AN/ No.	Receiver/ Transmitter	Frequency MHz	Type of Transmission	Transmit Power KW	Channels Voice	Channels TTY	Modulating Bandwidth KHz	Comments
ARC-80	T-899/ARC-80 R-1153/ARC-80	2 - 30	USB LSB DSB SSBRC ISB FSK	.004	1	-	.3 - 3.05/SB	Data on USB,LSB, or DSB. Voice on USB Simplex
ARC-94	RT-648/ARC-94	2 - 30	AM CW SSB	.4 PEP .1 Avg	1	-	nominal 4	Simplex
FRC-153(V)	KWM-2A	3.4-30 3.4-5.0 6.5-30	SSB,USB LSB voice or CW FSK with tone keyer)	.1 PEP .090 CW	1	-	.3 - 3.5	Simplex
FRT-39C	GPT 010KAC No Receiver	2 - 28	AM CW FSK FAX SSB ISB Vestigial SB	2.5 - 5 10 PEP(A3a)			20 KHz .35 - 3/SB	Shipboard, used on LCC-19, 20
GRC-106	RT-662( ) GRC AM-3349( )/"	2 - 30	AM CW SSB FSK(with addtl eqpt)	.400 PEP .200 Avg	1	-	nominal 4	
GRC-125	RT-505/PRC-25	30-52.95 53-75.95	FM	.0015	1	0	.3 - 3.3/voice channel	1/2 Duplex
GRC-160	RT-841/PRC-77	30 - 76	FM	.002	1	-	nominal 4	Secure capability with crypto equipment, GRC-161 is same except has 25 w ampl AM4306
MRC-92	TR,KWT-6	2 - 30 225 - 399.9	ISB, SSB AME	.5 .125	2 1	0 8	3 KHz/sideband UHF=2 simplex or 1 duplex V	Duplex, 80 Baud Max., TSEC/KW-26 (1 channel)

Note: Data where applicable is assumed to be carried on a voice channel

TABLE V   EQUIPMENT TECHNICAL CHARACTERISTICS

Radio Set AN/No.	Receiver/ Transmitter	Frequency MHz	Type of Transmission	Transmit Power KW	Channels Voice	Channels TTY	Modulating Bandwidth KHz	Comments
MRC-107	GRC-106	2 - 30	SSB	.4	1		Voice (4 nominal)	
	GRC-125	30 - 75.95	FM	.002	1		"	
	Wilcox 807A	116 - 149.9	AM	.03	1		"	
	ARC-51BX	225 - 399.9	AM	.02	1		"	
	PRC-47	2 - 11.999	USB	.1	1		"	
	PRC-41	225 - 399.9	AM	.003	1		"	
MRC-108	Collins 718F2	2 - 29.999	AM CW-SSBFSK	.1 - .4	1		Voice (4 nominal)	Duplex on SSB
	AN/PRC-47	2 - 11.999	USB	.1	1		"	
	GRC-125	30 - 75.95	FM	.002	1		"	
	Collins 618MIC	116 - 149.975	AM	.030	1		"	
	Collins 718M2W	225 - 399.95	AM	.016	1		"	ARC-51BX
	PRC-41	225 - 399.9	AM	.003	1		"	
MRC-113 Tropo LOS		755 - 985 / 2500-2700	FM FDM	10	60	0	Nominal 4 / Baseband = 60 - 300 KHz	12, 24/36, or 60 duplex channels / Inband signaling / 1600 Hz for 24 channels / 2600 Hz for 60 channels
					59	16		
MRC-126	GRC-103	220-404.5	FM(F9) PCM,TDM	.025	6/12			
MRC-134	MRC-109 RT-524/VRC R-442/VRC	30 - 75.95	FM FDM FSM	.035	4 / 1 OW		V = .3-3.5 / TTY = .145 / OW = .3 - 2.1 / Baseband = .3 - 19.7	Duplex, 1/2 Duplex / 1600 Hz Signaling / 20 Hz Ringdown
MRC-135	MRC-109 RT-524/VRC R-442/VRC	30 - 75.95	FM FDM FSM	.035	8 / 2 OW	8	Same as above / Baseband = .3 = 39.7	
PRC-25	RT-505/PRC-25	30 - 52.95 / 53 - 75.95	FM	.002	1	0	.3 - 3.3	
SRC-16	2-OA-4623/SRC-16, 2 AM-3712	2 - 30	AM CW FSK & SSB	6 Avg 11 PEP	4		Nominal 4	NTDS Data, simplex or Duplex

TABLE V   EQUIPMENT TECHNICAL CHARACTERISTICS

Radio Set AN/ No.	Receiver/ Transmitter	Frequency MHz	Type of Transmission	Transmit Power KW	Channels		Modulating Bandwidth KHz	Comments
					Voice	TTY		
TRC-97A	T-943/TRC-97 R-1245/TRC-97 AM-3972/TRC97	4400-5000	FM FDM	.001 - 1.0	24 23	0 16	Baseband = 12 - 108 V = .3-3.4/ch	Duplex, 1/2 Duplex 2600 Hz Signaling in band 20 Hz ringdown
TRC-97C	Same as above							
TRC-97E	Same as above, except:				24 22	0 32		Includes an Addt'l TTY Mux
TRC-112	GRC-143 R-1287 T-961	4400-5000	FM PCM TDM	1.0	12/24 1	0 1	1200 .3 - 1.8 ow	TROPO, includes GRC-106 as tech control order wire
TRC-117(V)	R-331(P)/GRC T-843(P)/GRC 2 AN/GRC-50	610.5 to 999.5 or 1350.5 to 1849.5	TDM PCM (F9)	.03 .02	24	-	.3 - 3.5 per channel	Unit complete to voice equipment terminals duplex
TRC-136		2 - 29.999	AM FDM FSK SSB ISB CW	1.0	4 3 3	0 4 1	.3 - 3.0/channel (wideband TTY)	Duplex/Simplex
TRC-145	T-0983 (P)/ GRC-103 V	220-1900	TDM PCM (F9)	.025	6/12	-	.3 - 3.5/channel	
TRC-167		4500-5000	FDM or TDM	1.0	60 FDM 12 TDM	16+	64 (baseband)	Status April '71 to replace TRC-97A, small, light weight Tropo Duplex
TSC-15	T-730/TRC-75 R-761/ARC-58	2 - 15 15-29.999	USB-SC, AM, LSB-SC, ISB, FDM/FSK	.9 PEP .750 PEP AM =.180 FSK .700 CW .700	4 3	0 4	.3 - 1.5/channel 1.5 - 3.0/channel	Unit complete with cordless SWBD, TTY machine & an- cilliary equipt Duplex & 1/2 Duplex
TSC-20 A	FRT-53 (2) 2 - R-390/URR	2 - 32	ISB/SSB AM CW FSK	1. PEP 1. Avg	4 3	0 8	3/channel 12 KHz baseboard	One VF channel is used for OW,Duplex 2 wire/4 wire 1 secure TTY channel, duplex In-band signaling 2300 Hz, 20 Hz ringdown

TABLE V EQUIPMENT TECHNICAL CHARACTERISTICS

Radio Set AN/ No.	Receiver/ Transmitter	Frequency MHz	Type of Transmission	Transmit Power KW	Channels Voice	Channels TTY	Modulating Bandwidth KHz	Comments
TSC-28	TSC-32 Trans OA-4778/ GRC-126 TSC-31 Receiver OA-4776/ GRC-124	2 - 30	AM CW SSB USB LSB ISB FDM FSK	2.5 PEP 1.25 Avg	3	16	3/channel 12 KHz Baseband	Includes cordless 20 line 8 Trunk Switch-board, and TTY unit Duplex encrypted TTY(8 channels)
TSC-38 #1	--/1978 Lo 651F1 Lo	2 - 30	AM ISB SSB FDM FSK SSBSC	1.0	3	2	3/channel 12 KHz Baseband	Duplex includes switch-board,Dual Unit
#2	--/1978 Hi 651F1 Hi	2 - 30	"	10.0	3	16	3/channel 12 KHz Baseband	Duplex Unit TSEC/KW-7
TSC-60( )1	AN/GRR-18 AN/GRT-17 OG-88/TSC-60(V)	2 - 30	AM USB LSB ISB FDM FSK SSB CW	1.0	4 4 3	0 4* 8	3.0 each voice channel	Duplex/Simplex 2CW (1 each SB)*1 each channel Unit complete to voice,TTY terminals
TSC-60( )2	AN/GRR-18 AN/GRT-17 OG-90/TSC-60(V)	2 - 30	AM USB LSB ISB FDM FSK SSB	2.5 reduceable	4 4 3	0 4 16	3.0 each voice channel	Duplex/Simplex 2 CW (1 each SB)*1 each channel Unit complete to voice,TTY terminals
TSC-60( )3	AN/GRR-18 AN/GRT-17 OG/89/TSC60(V)	2 - 30	AM USB LSB ISB FDM FSK SSB	10.0	4 4 3	0 4 16	3.0 each voice channel	Duplex/Simplex 2CW (1 each SB)*1 each channel Unit complete to voice,TTY terminals

TABLE V EQUIPMENT TECHNICAL CHARACTERISTICS

Radio Set AN/ No.	Receiver/ Transmitter	Frequency MHz	Type of Transmission	Transmit Power KW	Channels Voice	Channels TTY	Modulating Bandwidth KHz	Comments
TYA-19	DA-4829/ SEC-23(V) (2 each)	2 - 30	SSB	1. PEP	1 Data		Nominal 4/Channel	Data link comm Simplex/duplex voice, Simplex data
URC-32	KWT-6, Type 8 AM-2064/URC	2 - 30	AM CW SSB USB LSB ISB FDM FSK	.500PEP .125Avg	1	1	.3 - 3.0/sideband	FAX, transceiver, Navy Simplex
VRC-46	RT-524/VRC	30 - 75.95	FM	.003 - .035	1	0	Nominal 4	
VRC-47	RT-524/VRC R-442/VRC	30 - 75.95	FM	.003 - .035	1	0	Nominal 4	Duplex or monitor 2 channels
WRC-1, 1A, 1B		2 - 30	AM CW SSB ISB USB LSB FDM FSK	.100PEP	1	1	Nominal 4	Transmitter/Receiver
WRT-2 (URT-23)		2 - 30	AM CW SSB USB LSB ISB FDM FSK	.500Avg 1.0 PEP	1	1	Nominal 4	Simplex, general purpose transmitter (no receiver)
	Receiver, Satellite - Weather USAF/ESD (part of 433L), Mobile equipment							Development
	R-390A/URR	.5 - 32	AM CW FSK		1	1		General purpose receiver, FAX, SSR with CV-591
	R-1051/URR	2 - 30	receives all transmission types		1	1		Standard all ships. Used on LCC-19,20
MSQ-10	R-388/URR	.5 - 30.5	AM CW FSK		1	1		Weather receiver, FAX,TTY, Voice

124

The above interface characteristics which help define compatibility should not be confused with information transfer function parameters which relate to performance quality.

Some characteristics show operational incompatibility directly, such as differing frequency bands, AM and FM, or TDM and FDM. Other character-istics are more subtle and while inferring compatibility, actually result in only partial compatibility and hence less than might be assumed capabilities if used for a radio link. Differences in multiplexer techniques, modulating bandwidths, and signaling frequencies are generally responsible for less obvious incompatibilities. An example is a comparison of the AN/TSC-60 and AN/TSC-15 multichannel radios (see Table V). Both radios operate in the HF band, use ISB FDM FSK modes, modulating two upper and two lower sidebands to produce four voice channels, or three voice and four TTY channels (up to 16 TTY channels in the TSC-60). These two radios appear to be compatible for four voice and at least four TTY channels. However, the modulating band-width per channel of the TSC-15 is only one-half that of the TSC-60. Actually voice operation would be possible on only two channels using the ISB mode. That is, with both upper side bands combined as a single 3 kHz sideband to match only the upper 3 kHz sideband of the TSC-60. The same procedure would apply to the second voice channel on the lower sideband. Telephone signaling frequencies for these two radios were not identified in the literature studied, so this potential problem area remains undefined here. The TTY channels are not compatible since the TSC-15 uses a non-standard 160 Hz shift instead of the standard 85 Hz as with the TSC-60 multiplexer (see Table IX). Thus, technically, the TSC-15 and TSC-60 are only partially voice compatible and are TTY incompatible.

C. COMMUNICATIONS TERMINAL EQUIPMENT CHARACTERISTICS

All communications equipment other than radio equipment has been grouped together under the classification of communications terminal equipment. This equipment was further subdivided into the following categories:

1 Communications Centers

2 Data Processing and Data Terminal Equipment

3 Distribution Boxes

4 Facsimile Equipment

5 Telephone Equipment

6 Teletypewriter Equipment

A summary of communications equipment characteristics is given in Table V In compiling the equipment listed therein, equipments were generally limited to those shown in Table III and Table IV. In some cases additional equipments is included in the listing. These equipments were originally included in

either the baseline or near term/future interfaces. Subsequent information caused their deletion from these interfaces as preferred equipment but the data gathered is included for completeness since the equipment originally selected could still perform its intended function, and may well be used as alternates in some deployments.

The characteristics shown are considered pertinent to the interfacing problem. No attempt was made to compile information not related to equipment compatibility. For example, power requirements, size and weight are not factors. Some teletypewriters are identical except that one model utilizes a synchronous motor and the other model employs a series-governed motor. These teletypewriters will be fully interoperable when operated on a common net or circuit.

TABLE VI COMMUNICATIONS TERMINAL EQUIPMENT CHARACTERISTICS

I. COMMUNICATIONS CENTERS

An/MSC-32 OPERATIONS CENTRAL

Major Components:

	Shelter
SB-22/PT	Switchboard
LS-147/FI	Interphone Set
AN/TNH-5	Tape Recorder/Reproducer
TH-5/TG	Telegraph Terminal
AN/GRC-106	HF/SSB Transceiver
AN/VRC-46	VHF/FM Transceiver
TT-4A/TG	Teletypewriter Set
TA-312	Telephone

The AN/MSC-32 Operations Central provides the location and facilities for the planning, engineering, control, and status reporting of tactical communications systems.

AN/MSQ-10 ( ), RADIO TELETYPEWRITER AND FACSIMILE SET

Major Components:

R-388/URR	Radio Receiver
C-1899/U	Radio Set Control
C-172/U	Frequency Shift Converter, Facsimile Input Signal
Type 174	Frequency Shift Converter, Input
CU-166/FRR	Antenna Coupler
Type 153 Model 1	Frequency Shift Keyer
AN/UXH-2( )	Facsimile Recorder
TT-98/FG	Teletypewriter

CW, Voice, Facsimile, and Teletype receiving station used primarily to receive weather information. May also transmit CW, Voice, and Teletype. Remote Control is provided for the four channels individually or simultaneously.

AN/TGC-26 TORN TAPE RELAY CENTER

Manual torn-tape relay capability of 24 full-duplex teletype circuits
Two subscriber telephones compatible w/AN/TTC-30
Two order-wire TA-312/PT telephone circuits
18 secure full duplex channels
Teletype equipment accommodates 5-level, Baudot code, stop-start at
  modulation rates of 45.5, 50 and 75 bauds.
Digital interface conforms to MIL-STD-188 for high-low-level requirements
Teletype and instruments interface with both TSEC/KW-7 and TSEC/KG-13
Crypto units included in center

AN/TGC-27   TELETYPEWRITER COMMUNICATIONS CENTER

Capable of receiving, originating, transmitting and relaying TTY
  communications
4 full-duplex teletypewriter circuits
Crypto interface options: 8 TSEC/KW-7 or 4 TSEC/KG-13 crypto units
Equipment handles 5-level, Baudot, stop-start teletype code at modu-
  lation rates of 45.5, 50, and 75 bauds.
Digital interface conforms to MIL-STD-188 for high-level and low-level
  requirements

AN/TGC-28   TELETYPEWRITER COMMUNICATION CENTER

Functionally interchangeable with AN/TGC-27
5 full-duplex teletypewriter circuits
Crypto interface option for up to ten TSEC/KW-7

AN/TSA-16   CONSOLE COMMUNICATION CONTROL

Receives, monitors, and transmits both radio and telephone signals
  in conjunction with AN/TSQ-5 and AN/TSQ-6
Ringing frequency: 20 Hz

AN/TSC-15   COMMUNICATION CENTRAL

Major Components:

T-730/TRC-75	Radio Transmitter
R-761/ARC-58	Radio Receiver
CV-976/U	Converter-multiplexer
AN/TGA-1	Telegraph Terminal Group
AN/TGC-14(V)	Teletypewriter (TT-297A(V))

Multichannel HF radio system employing ISB, SSB, AME
Three voice channels and four teletypewriter multiplexed channels
  can be transmitted/received simultaneously
Control console has a cordless switchboard with telephone dial
Manual ring circuit uses 20 Hz ringer

AN/TSC-20   COMMUNICATIONS CENTRAL

Provides access to the worldwide DCS network for the commander of a
  Strike Force
Utilizes two AN/GC-25 teletypewriter sets
Crypto security provided by TSEC/KW-9 and TSEC/KW-26
  HF SSB provides long haul link to DCS terminal
VHF link provides access to subscriber
Four voice frequency channels
Eight teletypewriter channels on one voice channel

AN/TSC-28 COMMUNICATIONS CENTRAL

   Major Components:

        AN/TSC-32   Transmitter Shelter
        AN/TSC-31   Receiver Shelter
        AN/TSC-33   Technical Quality Control Shelter
        AN/TSC-34   Crypto Shelter
        AN/TSC-40   Communications Center Shelter

   An HF radio system capable of transmitting and receiving SSB, ISB,
      CW, or AME
   Permits simultaneous operation of three 3 KHz VF channels for voice
      and one VF channel of 16 composite teletype tones.
   Provides link encrytion using TSEC/KW-26 equipment for 8 full duplex
      TTY channels.

AN/TSC-38 COMMUNICATIONS CENTRAL

   Major Components:

        Telegraph Terminal C-8102
        Switchboard SE-1020T
        Teletypewriter TT-117/FG
        Teletypewriter Reperforator TT-109/FG
        Radio Receiver 651F-1
        Exciter 310V-1
        Linear Power Amplifier 208U-10
        Receiver/Exciter 671B-1
        Linear Power Amplifier 584L-4

   Provides full duplex operation of both primary and secondary HF radio
   Both systems capable of 4 channel HF ISB operation
   Primary system: 3 voice, 16 TTY
   Secondary system: 3 voice, 2 TTY
   Switchboard: 20 line automatic
   Teletypewriters: 5
   Crypto: 2 full duplex on-line channels

AN/TSC-40 COMMUNICATIONS CENTER

   Part of AN/TSC-28 Communications Central
   Voice: 3 channels long haul
   TTY Channels: 16 full duplex
   Crypto Facilities: Link encryption by KW-26 equipment available for
                       eight channels (Crypto equipment installed in the
                       AN/TSC-34 shelter of the AN/TSC-28)
   Ringdown frequency: 1000 Hz
   Voice Channel Bandwidth: 375 to 3040 cps
   Teletype Equipment: Modified to accept a 7.0 unit code with one unit
                        start and one unit stop elements; equipment
                        adjusted for 107 wpm operation

AN/TSC-58 TELEGRAPH TERMINAL

Provides page printing, tape reperforating and automatic transmitter-
distributor
On-line crytographic capability using TSEC/KW-7 for 6 half-duplex
circuits
Uses six TT-98/G teletypewriter sets
Uses Telegraph Terminal Th-22/TG to provide frequency shift modulation

AN/TSC-60 COMMUNICATIONS CENTRAL

Major Components:

AN/GRR-18	Radio Receiving Set
AN/GRT-17	Radio Transmitting Set
AM-4477/GR	Amplifier-Power Supply
AN/UCC-3 Type I	Multiplexer
AN/UCC-3 Type II	Multiplexer

Two complete sets of HF radio equipment
Each radio capable of four channels of voice plus one TTY/voice channel
of three channel voice plus one telegraph multiplex in fourth channel
for a total of 8 channels of voice frequency telegraph
Compatible TADIL A & B with appropriate modems
Two other versions provide 16 channels of voice frequency telegraph

AN/TSC-65 CENTRAL OFFICE, TELETYPEWRITER

Major Components:

TT-76	Teletypewriters
TT-98	Teletypewriters
TH-22	Telegraph Terminals
KW-7, 26	Security Equipments
UCC-1	Multiplexers
Codex Units Mod TD-12	
S-280	Shelter
GOAT	Mobilizer
	Power Supplies

The facility is employed to provide termination of up to four/six full
duplex secure teletype circuits in its air transportable configuration.

AN/TYA-12 COMMUNICATIONS GROUP

Part of the AN/TYQ-2 (USMC TAOC)
Provides faiclities for all external and internal voice communications,
as well as for external teletype and digital communications
Interfaces the Operator Groups (AN/TYA-9), the Central Computer Group
(AN/TYA-5), the UHF Group (AN/TYA-11), and all external radio and other
communications equipment
Communications circuits include: teletype, missile battery digital data,
intercenter digital data, air-to-ground digital data, intercommunication
voice, and external voice

AN/TYA-16(V) A COMMUNICATIONS GROUP

Part of the AN/TYQ-1 (USMC TACC)
Provides switchable interconnections for the intercommunication stations
    within the command group with up to 16 radio channels
Two direct access terminals and manual switchboard provide facilities
    conference and single line loops within the TACC or remote telephones
Provides for remote operation of the radio sets located in the communi-
    cations central group
Interconnect remote teletype channels with local teletype circuits
80 circuit manual switchboard is assembled from SB-22/PT components

II. DATA PROCESSING AND DATA TERMINAL EQUIPMENT

AN/ASQ-52 DATA TERMINAL SYSTEM

Part of the Navy ATDS, Airborne Tactical Data System
A single sideband HF automatic data system, TADIL A link
Includes Radio Set AN/ARC-80, and Data Terminal Set AN/ACQ-2

AN/GYC-2 DATA TERMINAL UNIT

Part of U.S. Army TACFIRE system
  provides interconnection of communication nets with the TACFIRE computer
AN/GYC-12(V), Variable Format Message Entry Device AN/GSC-21, Battery
    Display Units, and communications security equipment

AN/SSQ-29 DATA TERMINAL SET

Part of the Navy Tactical Data System
Interface between the NTDS computer, AN/USQ 0 and the TADIL A Link
    Transmitter, AN/SRC-16

Provides netted TADIL A link with other NTDS equipped ships, ATDS, MTDS,
    and the 407L CRC when it is provided with A Link capabilities

AN/TYA-17 DATA TERMINAL GROUP

Part of the AN/TYQ-3 (USMC Tactical Data Communication Central (TDCC)
    of the MTDS), providing link between the AN/TYQ-1 (TACC) and the
    AN/TYQ-2 (TAOC)
For transmit cycle D/A converts the digital data word received from
    the computer group (AN/TYA-20)
For receive cycle A/D converts the received analog signals to digital
    data form for use of the computer group
Equipment included: Data modem set - AN/USC-8(V)
                     Data control unit - C-6706/U
                     Data control indicator unit - C-6700/U

AN/TYA-20 COMPATIBILITY COMPUTER GROUP

Part of AN/TYQ-3 (USMC Tactical Data Communication Central, TDCC)
Provides message translation capability required for transfer of
  target data between elements of MTDS and NTDS or other elements
  of MTDS
Performs data processing operations for operation of the USMC TACC,
  AN/TYQ-1
Performs data processing enabling the TAOC,AN/TYQ-2 to function as an
  alternate TACC

AN/USQ-20 COMPUTER

Computer subsystem for the Naval Tactical Data Systems, NTDS
14 input/output channels operate randomly and without program attention
Can accept data from any type sensor so long as the input message is
  properly formatted
Two channels used for inter-memory transfers whenever two or more AN/USQ-20's
  are lashed into a single operating system

AN/UYK-7(V) COMPUTER GENERAL PURPOSE TACTICAL DIGITAL

Planned for usage as the data processor in the USMC MAGIS and DTAS systems
General purpose, parallel, binary
Data word size -- 8/16/32 bits
Real-time clocks
Modular memory-units of 16,384 - 32 bit words, expandable to 262,144
  words
Input/output:
      Independent asynchronous programmable controller
      Each controller may communicate with three processors
      Sixteen channels per controller
      Optional electrical interfaces in four channel groups:
            NTDS slow (-15 volt)
            NTDS fast (-3 volt)
            A-NEW   (3 volt)
      Integrated circuit buffer control memory (64 words)
      Maximum input/output word rate per controller is 167 KHz

HM-4118 COMPUTER

Part of the AN/TSQ-92 (407L CRC)
Planned usage in the SAFOC system
Integrated circuit, high-speed, general-purpose digital computer
Random access coincident current memory
Modular memory units of 16,384 words, 18 bits each, expandable to
  131,072 words
Real time clocks
Input/output module contains 4 buffered input/output channels

HM-4118 COMPUTER

    Part of the AN/TSQ-92 (407L CRC)
    Planned usage in the SAFOC system
    Integrated circuit, high-speed, general-purpose digital computer
    Random access coincident current memory
    Modular memory units of 16,384 words, 18 bits each, expandable to
      131,072 words
    Real-time clocks
    Input/output module contains 4 buffered input/output channels

MDT MOBILE DATA TERMINAL

    Compatible with AUTODIN as Mode I and II Message Switching Unit
    Input/Output Devices: Card reader
                           Card punch
                           Paper tape reader
                           Paper tape punch
                           Page printer
    Codes: 64 character subset of USASCII
                           ITA #2 (American version)
    Crypto Equipment: TSEC/KG-13
    Error Detection and Correction: Codex TD-1000 Series
    High speed tape reader speed: 75, 150, 300, 600, 1200 and 2400 baud

III. DISTRIBUTION BOX

DISTRIBUTION BOX J-1077 A/U

    The J-1077 A/U consists of two terminal blocks (each with 26 binding
posts) and two U-187/G cable connectors, with the terminal block binding
posts and cableconnector pins wired together within the J-1077 A/U. Each
binding post is wired to one connector pin, and is numbered accordingly.
Within the DASC, the J-1077 A/U is used to interconnect the operations
central with signal sources external to the DASC. The J-1077 A/U is also used
as a breakout point during fault isolation.

IV. FACSIMILE EQUIPMENT

AN/GXC-5 FACSIMILE SET

    Maximum size of copy: 8-1/2 inches wide on a continuous 2,200 inch long roll
    Scanning: 96 lines/inch @ 90 or 180 scans/minute
    Trans Time: 5.5 minutes for an 8-1/2 x 11 inch page @ high speed

AN GXC-7 FACSIMILE SET

    Document size: 8-1/2 x 11 inches
    Transmission Time: Approximately 6 minutes
    180 lines/minute
    96 lines/inch horizontal and vertical resolution
    uses normal voice band of telephone circuit
    secure mode available with appropriate crypto equipment
    uses acoustic coupler to connect to telephone line

AN/UXH-2 FACSIMILE SET

    A continuous page fax recorder designed to make direct recordings
    Capable of recording double sideband, amplitude modulated, 1800 Hz
    carrier such as the output of the AN/TXC-1 or vestigial sideband,
    amplitude modulated, 2400 cps carrier with a carrier modulation of
    75 percent or greater and the upper sideband suppressed.

    Input:
        Frequency: 600 to 4200 Hz
        Control Signal: 1800 to 3600 Hz carrier modulated by 300 Hz to start,
                         60 Hz to start record, and 450 cps to stop.
        Levels: +4 to -36 dBm
        Signal Contrast: 8 to 16 dB
        Impedance: 600 ohms
    Other:
        Recording Type: Direct Stylus
        Recording Width: 18 3/4 inches
        Index of Cooperation: 576 (International)
        Resolution: 96 lines/inch
        Scanning Speed: 60, 90, or 120 scans per minute
        Recording Time: 19.2 minutes for 12 x 18 1/2 inch copy at 60 scans
                         per minute
        Type Modulation: AM
        Black Recording Maximum density on maximum signal level

TT-321A/UX FACSIMILE TRANSCEIVER

    A revolving drum fax recorder capable of making direct or photographic
recordings.

    Requires power supply PP-86F/UF to supply operating voltages.

    Input:
        Frequency: 1500 to 3300 Hz (60 rpm operation)
                     600 to 4200 Hz (120 rps operation)
                    (Optional VSB filter may be used to eliminate most of
                     upper sideband)'
        Level: 0 dBm nominal (adjustable from -40 to +4 dBm) and +26 dBm
        Impedance: 600 ohms

134

TT/321A/UX FACSIMILE TRANSCEIVER (Continued)

Other:
    Recording Type: Stylus or photographic (positive or negative)
    Copy Size: 12 by 18-11/16 inches
    Index of Cooperation: 576 (International)
    Resolution: 96 lines/inch
    Drum Speed: 60 or 120 RPM
    Recording Time: 20 minutes @ 60 RPM
    Type Modulation: AM

V. TELEPHONE EQUIPMENT

AN/MTC-1A CENTRAL OFFICE, TELEPHONE MANUAL

    180 Local and 20 trunks telephone circuits (manual or dial trunk circuits)
    Local/Common battery switchboard
    3 operator positions

AN/MTC-7 CENTRAL OFFICE, TELEPHONE MANUAL

    Central office containing swtiching facilities for 60 circuits
    Contains one SB-86/P switchboard

AN/MTC-9 CENTRAL OFFICE, TELEPHONE MANUAL

    Provides terminations for 600 local or common battery subscriber circuits
and manual or dial trunk circuits.

AN/TTC-22 COMMUNICATIONS CENTRAL

    One hundred line solid state switchboard
    Two hundred line manual switchboard
    Dial switched subscriber
    Manual switched subscriber
    Common battery
    2-way dial trunks
    4 wire circuits

AN/TTC-28 CENTRAL OFFICE TELEPHONE

    Complete transportable dial central office
    Three-position switchboard
    Number of lines: 600
    Maximum simultaneous conversations: 84
    Direct dial between subscribers
    Direct dial to a distant dial central office
    Manual service to a distant manual office
    Also includes: Two-way ringdown trunks (maglines) and battery station
                    (common battery) lines
    Step-by-step electromechanical switching

135

AN TTC-30 CENTRAL OFFICE, TELEPHONE EQUIPMENT

    475 line automatic switching central
    Automatic Electronic Switchboard
    AC or DC subscriber loops
    DTMF Subscriber signaling
    Electronically programmed directories
    Two levels of priority and preemption
    Automatic alternate routing
    Stored Address
    Conference capabilities
    Can be used with AN/TTC-19, AF/TTC-27, -28, and -29
    384 subscriber and turnk terminals

AN/TTC-31 CENTRAL OFFICE, TELEPHONE EQUIPMENT

    Type of Switch: Circuit
    Form of Signal: Analog
    Bandwidth: 108 KHz
    Maximum Number of Terminations: 600
    Switching Matrix: Space Division
    Control: Stored Program
    Fully Electronic 4 wire tactical switching system
    Modular in 75 line increments
    Variable precedence level - 2 to 5 levels
    Flexible trunk and subset compatibility with other systems both military
       and commercial
    Automatic alternate routing - one primary and two alternate

AN/TTC-32 SWITCHBOARD

    Cordless Switchboard
    25 four-wire dc supervision)
    15 four-wire ac supervision) ground-to-ground

    12 two-wire 20 Hz ringdown) landlines
    12 trunk circuits

SB-22/PT MANUAL TELEPHONE SWITCHBOARD

    Switching and signaling of 12 field telephones, 12 TTY circuits, 12 remote
       radio control circuits, or any combination of these
    1 Common battery signaling trunk
    Manual ringer 90 to 100 volts, 20 Hz

SB-86/P MANUAL TELEPHONE SWITCHBOARD

    Maximum of 30 telephones or voice-frequency telegraph lines
    Signaling by hand ringing generator or common battery
    One conference call at a time

TA-236/FT   TELEPHONE SET

    General purpose desk telephone
    Common battery (manual or dial)
    Two party selective ringer
    Includes antiside tone feature
    Working limits of 36 dB

TA-312/PT   TELEPHONE SET

    Types of operation: Common battery, local battery, and common battery
                         signaling
    Ringing: Hand-ringing gen, 90V, 20 Hz
    Working limits: 36 dB (14.4 mi on WD-1/TT, non-loaded)

TA-341/TT   TELEPHONE EQUIPMENT

    Used with - 4 wire area automatic switched comm system
    Non-seal, desk type case, local battery xmitter current supply 4 ea
      type C cells, self contained;
    Ringer type is included in base; cradle switch type, ten (0 thru 9)
      numbering system)
    DTMF signaling

TA-623/TG   TELEPHONE SET

    Used with the 4-wire automatic switched communication system. Has
same electrical characteristics as the TA-341 but is packaged in a
sealed field case.

TA-720/TTC   TELEPHONE SET SUBASSEMBLY

    Will operate back-to-back, four-wire with (TA-718, TA-719, TA-720,
      and TA-721)
    Used with AN/TTC-30 and AN/TTC-32
    Uses dual-tone multi-frequency (DTMF) number signals for dialing

TA-741/TTC-30   TELEPHONE REGISTER

    Stores 9 telephone addresses.

INTEGRATED CIRCUIT AND MESSAGE SWITCH - ICMS

    Matrix Configuration: Space and Time Division
                           Stored Program Control
                           4-wire, Full Duplex

    Terminal Capacity: Incremental 150-2400 lines

137

INTEGRATED CIRCUIT AND MESSAGE SWITCH - ICMS (Continued)

Interface Compatibilities:

    Analog Telephone
    Digital Telephone, Wideband Secure
    Digital Telephone, Narrowband
    Teletypewriter
    Data Terminals
    Autovon, Autodin,
    OCR Terminal
    Manual Switchboard: TTC-4,5,7; TC-10, SB-22
    Auto Switches: TTC-31; TTC-22, 28; TTC-25,30

Signaling Plans:

    Analog and digital
    Rate 64 KB/s
    Bandwidth 100 KHz
    Advanced Signaling and Supervision using correlatior-orthogonal coding

Channel Bit Rates:

    2400-9600 B/s Vocoded
    19.2-39.4 PCM or Delta modulation
    4 KHz analog voice
    2400 b/s data

Security:

    Bulk encryption on multiplexed trunks
    End-to-end and link encryption on limited basis

TRI-TAC SWITCH (MODEL A) CONCEPT

    Matrix Configuration: Hybrid Analog/Digital (Single Rate)
    Terminal Capacity: Maximum of 1440 in increments of 120
    Interface Compatibilities: AN/TTC-32, AN/TTC-30, AN/TTC-25, AN/TTC-22,
                                AN/TTC-4, AN/TTC-5, AN/TTC-7, TC-10, SB-22,
                                TA-341, TA-720, TA-312
    Numbering Plan: Capable of handling a varying number of digits and
                     adapting to the numbering plans used by most existing
                     interfacing systems
    Signaling Plan: Undefined
    Security Concept: Full end-to-end encryption using new key distribution
                       plan; limited link encryption

138

VI.   TELETYPEWRITER EQUIPMENT

AN/FGC-25   TELETYPEWRITER SET

    Component teletypewriter is the TT-117/FG
    Standard communications keyboard
    Transmitter-distributor
    Page printer and reperforator
    Type of Signal: Transmit -- 20 or 60 ma neutral
                     Receive -- 20 or 60 ma dc neutral or 30 ma dc polar
    Speed: 368.1, 404, 460 or 600 operations/minute
            60, 66, 75, or 100 words/minute
            75 baud (at 100 wpm)
    Signaling code: Five-unit, start-stop (7.42 unit)

AN/FGC-26   TELETYPEWRITER SET

    Similar to AN/FGC-25 except has weather keyboard
    Component teletypewriter is TT-118/FG
    Standard English characters
    Signaling Code: Five unit, start-stop (7.42 unit)
    Type of Signals: Send, neutral (20 or 60 ma); Receive, neutral (20 or
                      60 ma) or polar (30 ma)
    Speed: 368.1, 404, 460, 600 operations/minute
                      60, 66, 75, 100 words/minute
    Transmitter-distributor
    Operates half or full duplex

AN/GGC-3   TELETYPEWRITER SET

    Standard communications keyboard
    Transmitter-distributor
    Message printed and perforated on 7/8 in paper tape
    Type of signal: Neutral or polar receiving; neutral sending
    Operation: Full duplex or half duplex
    Speed: 368.1, 404, 460, or 600 ops/minute
            60, 66, 75, or 100 wpm
            75 Baud (at 100 wpm)
    Line current required: DC line 60 ma; VF line: 20 ma DC; Polar 30 ma DC
    Signaling code: Five-unit, start-stop (7.42 unit)
    Major Components: Reperforator-Transmitter TT-76/GGC, Table FN-52/GGC,
                       Case CY-1110/GGC

AN/TGC-1   TELETYPEWRITER SET

Component teletypewriter is the TT-4/TG
Standard communications keyboard
Page copy
Type of Signal: Neutral (rcv and xmit)
Operations mode; half-duplex
Speed: 368.1, 404, 460, or 600 operations/minute
        60, 66, 75, or 100 words/minute
        74 Baud (at 100 wpm)
Line current required: 20 or 60 ma
Signaling code: Five-unit, start-stop (7.42 unit)

AN/TGA-1   TELEGRAPH TERMINAL GROUP

A 5 channel, non-synchronous, frequency shift, telegraph terminal
Full duplex operation
Speeds up to 100 wpm using standard dc 60 ma TTY equipment
Four channels are multiplexed with $\pm$80 Hz frequency shift
One FSK channel is shifted $\pm$ 425 Hz
Channel Frequencies: MUX -- 1955 Hz, 2295 Hz, 2635 Hz, 2975 Hz
                      FSK -- 2000 Hz

AN/TGC-14A(V) TELETYPEWRITER SET

Standard communication keyboard, English characters
Words/minute: 60, 75, or 100
Signal code type DC pulse, five-level 7.42 unit, Baudot serial, neutral line
Characters/line: 72 or 76
Impedance:
     High current range (20 to 80 ma): 115 ohms @ 60 ma
     Low current range (1 to 5 ma): 2200 ohms @ 5 ma

AN/TGC-29(V) TELETYPEWRITER SET

Provides both page copy and/or printed perforated tape
Standard communication keyboard, English characters
Words/minute: 100 maximum
Signal code type DC pulse, five-level code
Characters/line: 72 or 76
High current range: 20 to 80 ma
Low current range: 2.5 to 10 ma

AN/TGC( ) TELETYPEWRITER SET

Planned replacement for the AN/TGC-14A(V)

AN/UCC-1(V) TELEGRAPH TERMINAL SET

Frequency Division Multiplex terminal equipment; 16 Voice Frequency channels, FSK.

Accepts keying speeds of either 100 wpm or 200 wpm; converts nominal 48-120V dc, 20-60 ma input signals into FSK tones for transmission.

Receives by converting FSK tones to DC impulses suitable for driving telegraph printer loops.

AN/UGC-41 TELETYPEWRITER SET

One teletypewriter secure
One teletypewriter non-secure
Keyboard send/receive
Words/minute: 100, 75, or 50

TT-48A/UG TELETYPEWRITER

Page printer with facilities for ke·board sending. Line currents, Input, 60 or 200 ma, neutral supplied by external source
Output, 60 ma neutral

Polarity positive or negative

Rate 60, 75, 100 wpm
    45.6, 57.0, 74.2 bauds

Signaling, 5 unit start-stop permutation code using 7.42 unit transmission pattern.

TT-76/GGC REPERFORATOR-TRANSMITTER

Used as part of AN/GGC-3 Teletypewriter Set which also includes a table and a case

TT-98/FG TELETYPEWRITER

Page printer, sending and receiving
Standard communication keyboard
Part of AN/MSQ-10
Signal Code: 7.42 unit start stop, 5 level
Keying speed: 60, 75, or 100 wpm

TT-119/FGC   PAGE PRINTER AND KEYBOARD USED IN AN/FGC-25 TELETYPEWRITER SET

TT-130A/UG   TELETYPEWRITER

    Aerological weather keyboard
    Page printer
    Type of Singal: Transmit -- 60 ma neutral
                Receive -- 20 or 60 ma neutral
    Speed: 45.6, 57.0, 74.2 Baud
          60, 75, 100 wpm
    Signaling Code: Five-unit, start-stop (7.42 unit)
                (Mod kit MK-698/UG converts to 7.00 unit character
                 interval)
    Polarity: Either positive or negative

TT-299/UG TELETYPEWRITER

    Part of AN/UGC-12, but may be used independently
    Standard English characters
    Communication keyboard
    76 characters per line
    Signaling code: Five-unit, start-stop (7.42 unit)
    Rapid speed change
    Automatic carriage return line feed at 76th character

D. NEAR TERM/FUTURE COMMUNICATIONS AND COMMAND AND CONTROL SYSTEMS

This section provides an overview of the communications and command and control systems with which the TAF will interface for the near term and future time frames. Like the TAFICCS, many of these systems are in the conceptual and planning stages. They will utilize computers to automate many of the present manual tactical functions. Since these systems are in development, up to date detailed information is primarily available only from those agencies and contractors associated with their development. Since the operational data interfaces with these systems are undefined, except in the area of air space management and control, it is the intent of this section to familiarize the reader with the functions, and where possible, status of the systems.

The systems listed are as follows:

1.	IBCS	10.	TAO
2.	TACFIRE	11.	MAGIS
3.	CS^3	12.	MIPLOGS
4.	MISSILE MINDER (TSQ-73)	13.	NTDS
5.	SAFOC	14.	ATDS
6.	TOS	15.	SA-DASC
7.	MTACCS	16.	DTAS
8.	MJFAS	17.	JIFDATS
9.	TCO	18.	NIPS
		19.	AACOMS

Figure 13 is a general block diagram of the multiple service interfaces expected in the near term/future.

1. Integrated Battlefield Communication System - IBCS

IBCS is an integrated system of sensors, readout stations, and data processors, all supported by a tactical communications system and the Army Area Communications System (AACOMS). It provides real time, near real time, and routine receipt, display and analysis of information with vastly improved retrieval capability. It consists of four functional subsystems; a commanders integrating subsystem supported by inputs from intelligence, operations, and support subsystems.

Systems included within IBCS include the following:

TACFIRE - An artillery oriented computer system. Expected completion date is late 1973.

CS^3 - Combat Service Support System, in prototype stage.

AN/TSQ-73 - Army Air Defense System, a fourth generation air defense control system. Date of completion is late 1973
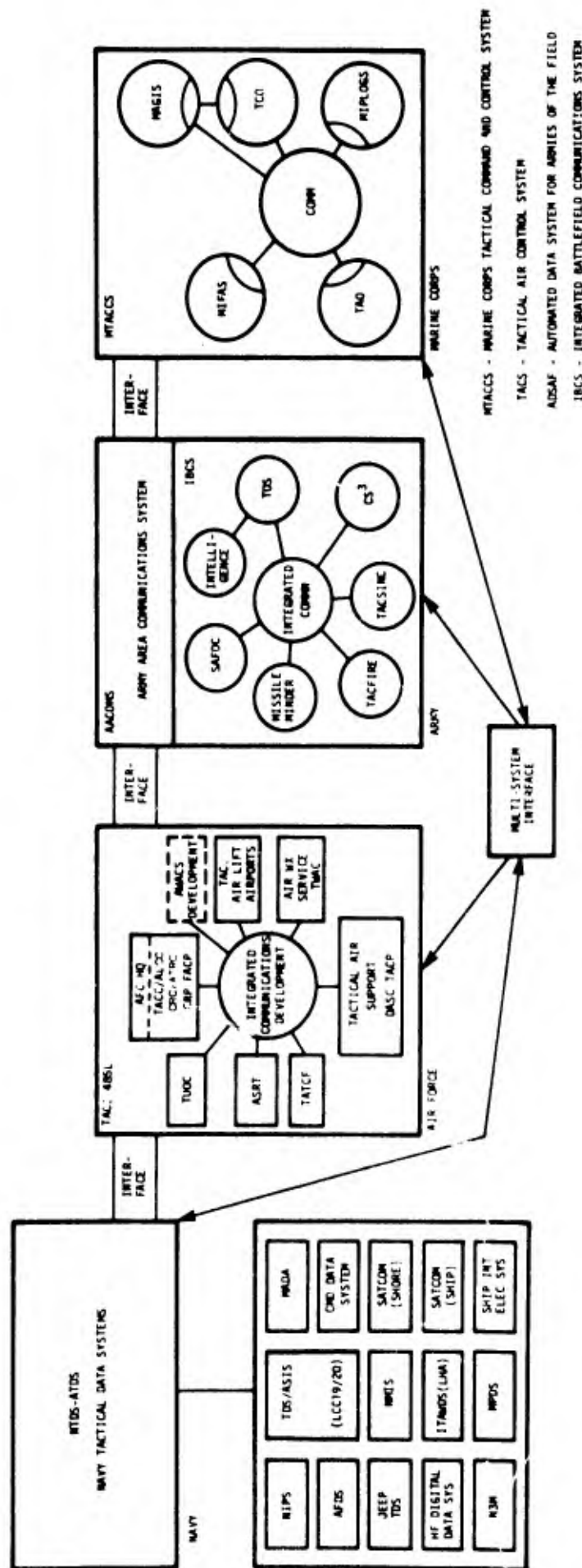
Figure 13. Interrelationship of Future Tactical Systems

MTACCS - MARINE CORPS TACTICAL COMMAND AND CONTROL SYSTEM

TACS - TACTICAL AIR CONTROL SYSTEM

ADSAF - AUTOMATED DATA SYSTEM FOR ARMIES OF THE FIELD

IBCS - INTEGRATED BATTLEFIELD COMMUNICATIONS SYSTEM

SAFOC - Semiautomated Flight Operations Control System; date of completion is 1972.

TACSINC - Tactical Army Security Combat Intelligence and Counter-measures systems.

TOS - Tactical Operations System, the commanders system which draws on information from the others.

2.   TACFIRE - Tactical Fire Direction System

TACFIRE is an integrated on-line tactical computer system which will be fielded throughout the Army's field artillery units during the time period 1972-1974. TACFIRE applies automatic data processing techniques to these field artillery functions:

1.	Technical Fire Control	5. Artillery Survey
2.	Tactical Fire Control	6. Meteorological Data
3.	Fire Planning	7. Ammunition and Fire Unit Status
4.	Artillery Target Intelligence	

The system will also provide a backup capability for the fire support element, which is part of the tactical operations center, to include the following functions:

1.   Preliminary Target Analysis
2.   Nuclear Target Analysis
3.   Nuclear Fire Planning
4.   Chemical Target Analysis
5.   Fallout Prediction

TACFIRE equipment will be located at the division FDC, battalion FDC, firing battery, and forward observer.

3.   Combat Service Support System - CS^3

CS^3 is designed to bring automatic data processing capability to the Army's combat service support activities:

Logistics

    Supply
    Transportation
    Maintenance
    Medical

Personnel and Administration

    Personnel Management
    Military Police Activities
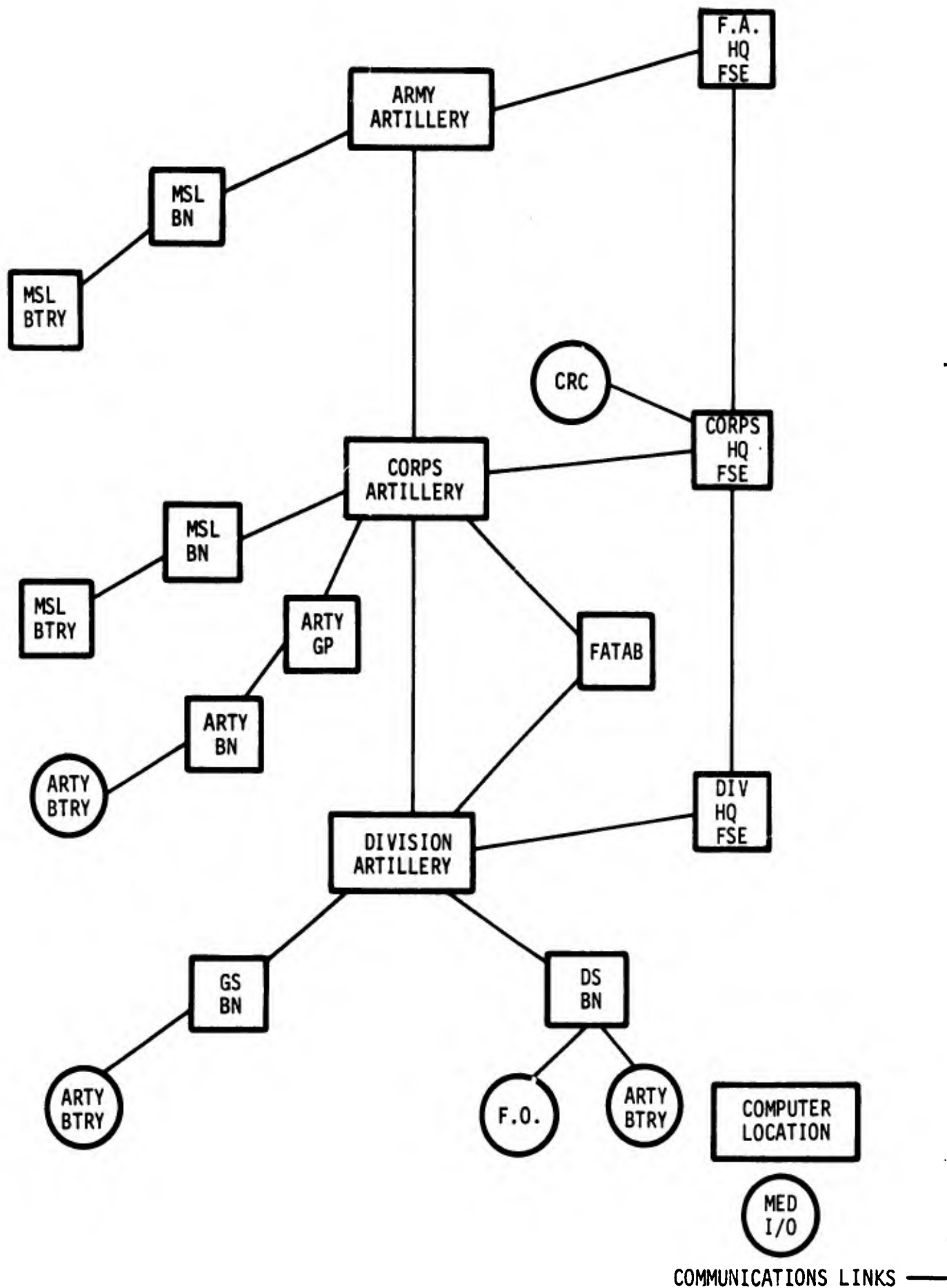   Pay
    Unit Readiness Reporting

Figure 14.   Tactical Fire Direction System - TACFIRE

The system will furnish commanders and system operators with summary information of the status of Logistics and Personnel & Administration matters as a part of the decision making process.

Standard operating procedures for the use of the data handling will also be prescribed in the system design. Computer centers will be connected by high speed, digital links for information interchange.

ADP equipment which is used in the CS^3 System includes:

Central Processor	I/O Devices
Card Read Punch	Transceiver
Magnetic Tape Unit	Modem
Mass Storage Device	Security Device
High Speed Printer	

4.   Missile Minder (AN/TSQ-73)

The Missile Minder Army air defense system functions as an electronic fire distribution system for the AADCP. The AN/TSQ-73 is connected via digital data links to the assigned battalions' fire distribution equipment and to the Air Force CRC responsible for air defense and air space coordination for the area. The AN/TSQ-73 system can be used by the commander to exercise fire distribution, supervise fire unit operations, and exchange information and intelligence with adjacent AADCP's and the Air Force CRC, and/or the USMC TACC.

The AN/TSQ-73 provides target information from tracking utilizing radar inputs, and by exchange of track information with other systems. The JCS Pub 10 TADIL B link is used to interface with the Air Force CRC and the USMC TACC.

The compatibility of these systems will be demonstrated in the TACS/TADS test bed at Camp Pendelton, California.

5.   Semiautomatic Flight Operations Center (SAFOC)

The Semiautomatic Flight Operations Center (SAFOC) is an element of the Army Air Traffic Regulation System providing en route traffic regulation service for Army aircraft. The SAFOC system provides the capabilities to:

1. Regulate the movement of aircraft operating under instrument flight rules (IFR).

2. Monitor the movement of cooperating aircraft operating under visual flight rules (VFR).
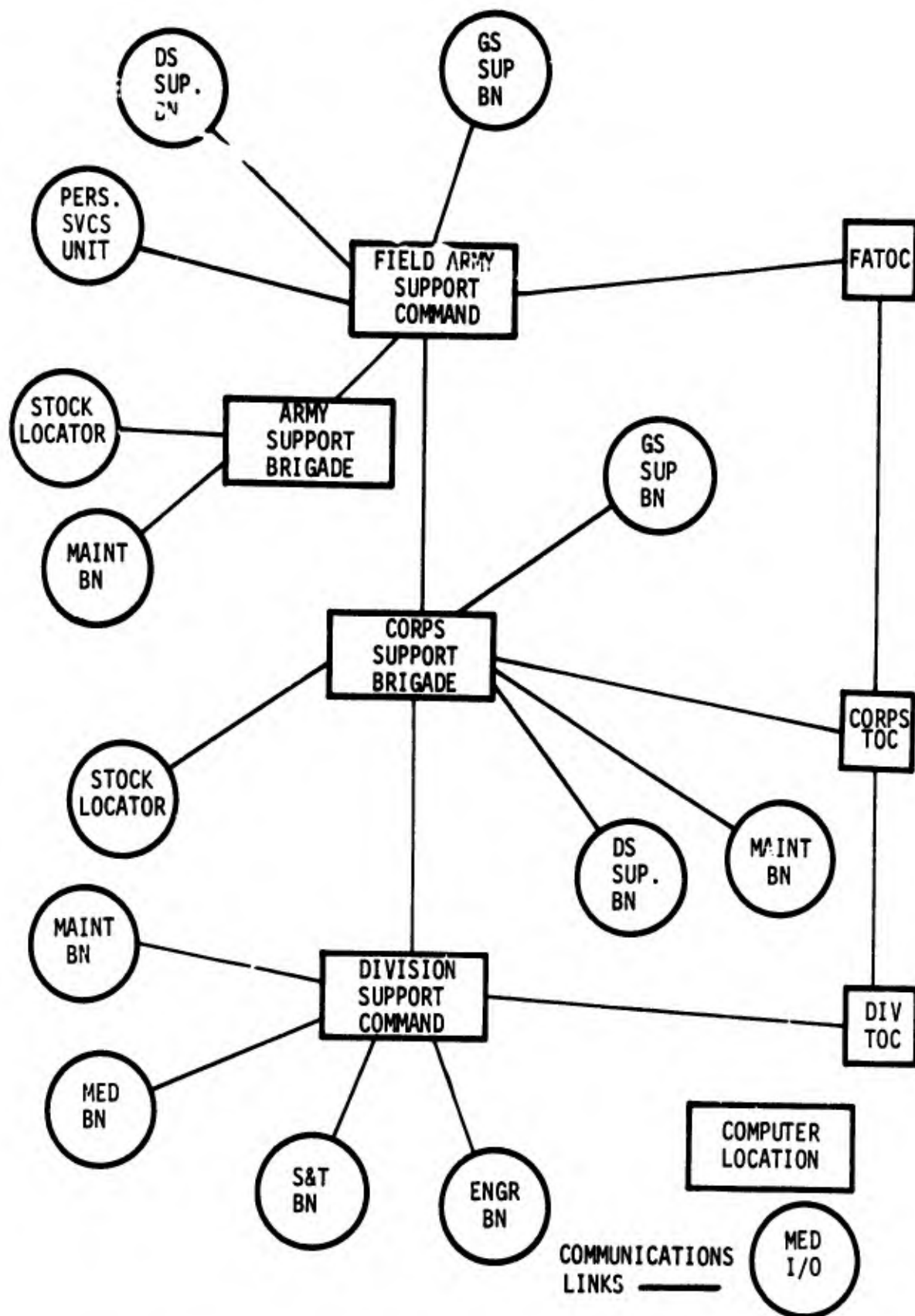
147

Figure 15. Combat Service Support System - CS[3]

In providing these capabilities, SAFOC performs the following functions:

1. Flight Data Processing
2. Flight Following
3. Flight Handoff
4. Identification
5. Distressed aircraft Location
6. Air/Ground Coordination
7. Ground/ground Coordination

Air traffic regulation services provided by SAFOC cover:

1. Flights following standard air routes
2. Point-to-point flights
3. Area Flights

SAFOC accepts both new and updated flight plan information. Newly entered flight plans are checked against all previously entered flight plans for potential conflicts. Aircraft positional information is obtained from several sources including:

1. Aircraft navigation equipment
2. Beacon radar equipment
3. Primary surveillance radar equipment
4. Stored flight plans

Off-the-shelf modified components of the Army's AN/TSQ-51 Fire Distribution System are used in the implementation of SAFOC, along with the high-speed militarized HM-4118 computer from the Air Force's 407L System.

6. Tactical Operations System - TOS

TOS is an information, storage, retrieval, and display system utilizing automatic data processing assistance to provide information upon which the military command decisions and actions may be based. The system serves U.S. Army elements from Battalion echelon to Field Army Headquarters. The functional scope of the system is limited to the processing of information in the fields of operations, intelligence, and fire support coordination.

The objectives of the system operation are to furnish military commanders and staffs with a better means for receiving, storing, processing, retrieving, summarizing, and disseminating all information pertaining to friendly and hostile forces; for processing information/intelligence of the enemy forces; and for processing information related to weather and terrain among other activities related to operations and intelligence. The system also provides a computation capability in the areas of fire support coordination and communications applications and it is designed to improve upon the dissemination of information and orders.
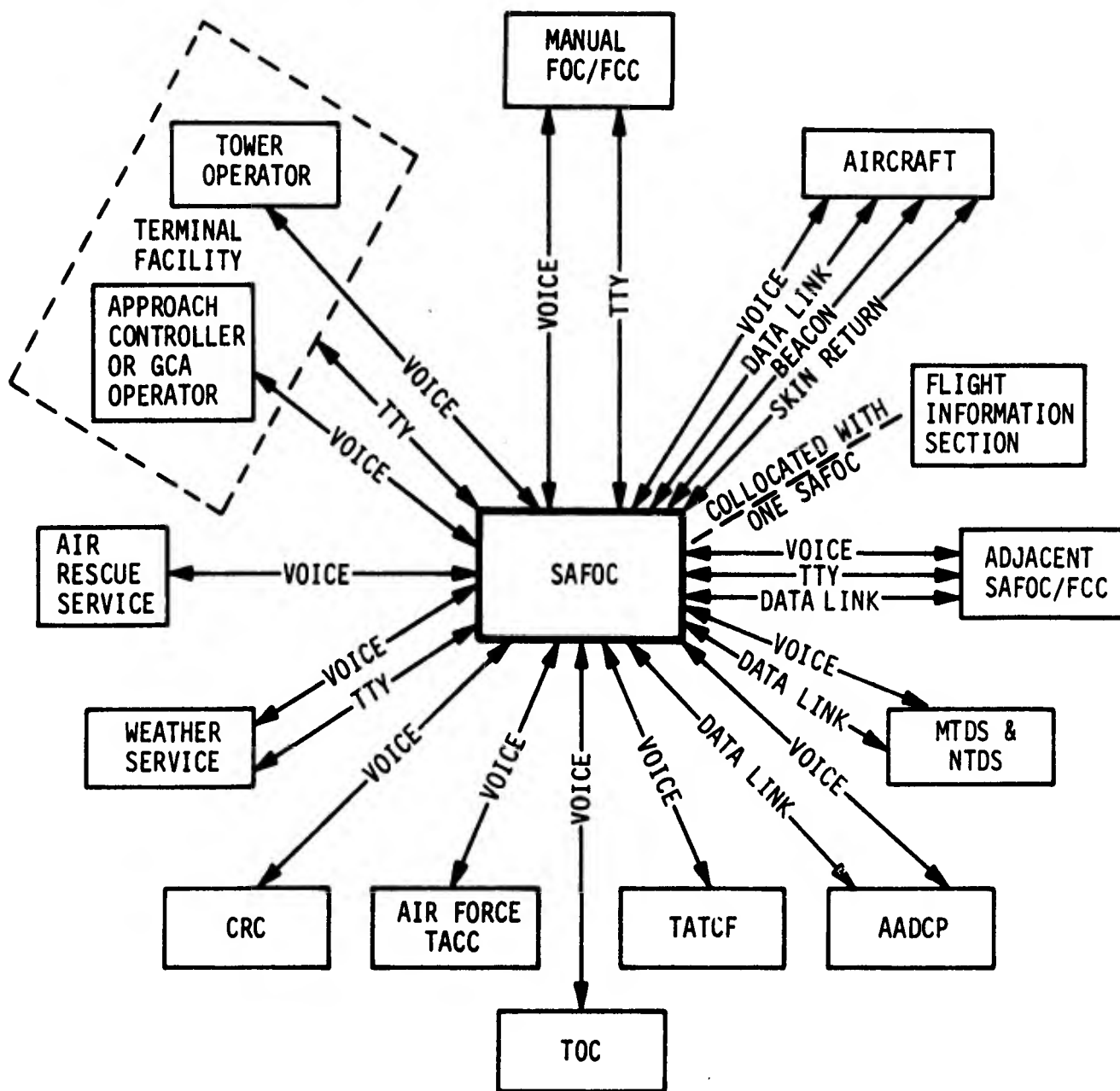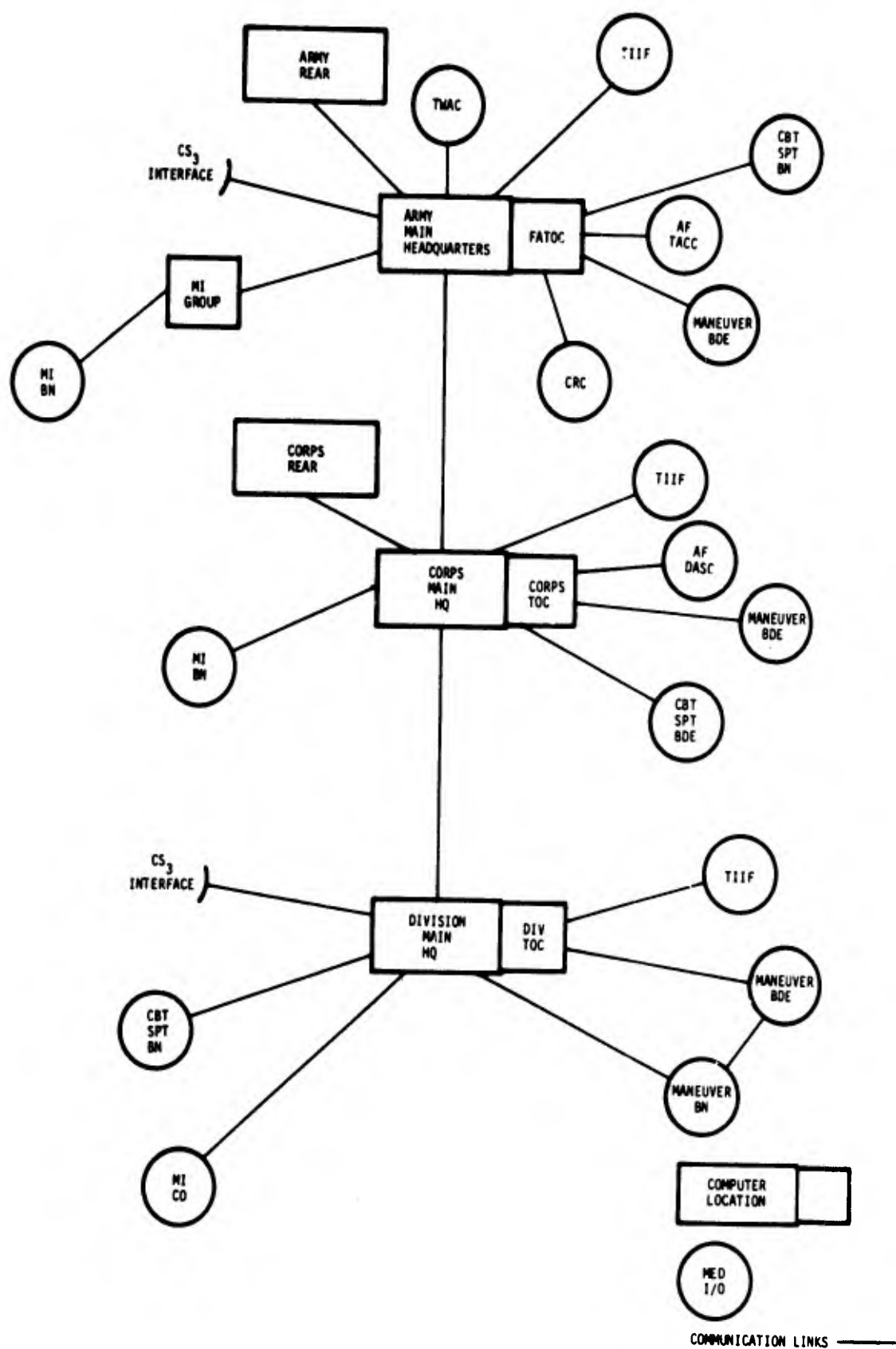
Figure 16. Operational SAFOC System Interfaces

Figure 17.   Tactical Operations System - TOS

The ADP equipment which will be employed with the TOS includes:

General Purpose Computer   Paper Tape Set
Random Access Memory   Work Console
Magnetic Tape Unit   I/O Devices
Group Display   Data Modem
Overlay Reproducer   Security Device
Medium Speed Printer

Data interchange within the system and with other of the ADSAF systems, will adhere to ASCII format.

ADSAF, including TOS, will use contemporary Army communications at the time the system is fielded.

7.   Marine Tactical Command and Control System (MTACCS)

MTACCS is a system to provide automatic processing of information within and between all functional areas of a Marine Air Ground Task Force (MAGTF). The system will be designed to meet the diverse operational requirements of a MAGTF associated with land, air, and amphibious tactical combat operations.

In essence MTACCS, using the integrated system approach, will encompass the employment of a small group of modular equipments that can be easily tailored to fit the specific operational requirements of any size MAGTF. Modules will be completely self-contained to include prime power supply. They will be easily and rapidly transported by truck, ship, landing craft and fixed or rotary-wing aircraft. The system will be sufficiently flexible to be employed at all levels of conflict.

MTACCS will consist of the following subsystems:

1.   Marine Integrated Fire and Air Support (MIFAS)
2.   Tactical Combat Operations (TCO)
3.   Tactical Air Operations (TAO)
4.   Marine Air/Ground Intelligence Subsystem (MAGIS)
5.   Marine Integrated Personnel and Logistics Subsystem (MIPLOGS)

All will be planned, developed, deployed, and operated as an integrated entity. Any of these subsystems will be usable independent of the others.

The concept of MTACCS is to provide a composite, graphical display of units, both friendly and enemy, with the terrain they occupy, direction and rate of movements, their current combat effectiveness, relative combat power, display of status reports, and an analysis of possible courses of action.

A test bed will be used to test concepts and procedures beginning with the MIFAS subsystem in FY-72. A fully integrated and operational MTACCS is planned for FY-83.

8.   Marine Integrated Fire and Air Support Subsystem (MIFAS)

MIFAS will provide for the automated integration of the artillery, naval gunfire and close air support problem. MIFAS is involved with those functions of coordinating and monitoring supporting arms which are normally performed by the Fire Support Coordination Center (FSCC) and the Direct Air Support Center (DASC) as well as tactical and technical artillery fire direction. MIFAS units will be configured with hardware and software to accomplish the operational requirements of the staff agency/agencies being supported by that unit.

Test bed operations commence in FY-72 and production of operational MIFAS equipment will commence in FY-76.

9.   Tactical Combat Operations (TCO)

Tactical Combat Operations is a subsystem of the Marine Tactical Command and Control System (MTACCS). The TCO subsystem is concerned with the information processing functions normally associated with the general staff sections at the various headquarters. It will provide storage of continuously updated information on friendly and enemy forces and generate routine reports to higher and lower echelons.

The hardware and software provided with TCO will provide the functional capabilities for:

    1.   Storage and Retrieval
    2.   Input/Output and Display
    3.   Processing and Computation

Test bed operations for the TCO are planned for FY-74. Production of operational equipment will commence in FY-77.

10.   Tactical Air Operations (TAO)

Tactical Air Operations is one of the subsystems of the Marine Tactical Command and Control System (MTACCS). TAO will be implemented through the evolutionary development of the Marine Air Command and Control System concepts.

TAO will include those tasks normally associated with the command and control of air operations conducted in support of an amphibious operation. TAO units will be configured with equipment and software to accomplish the operational requirements of the staff agency/agencies being supported by that unit.

The TAO subsystem will provide precision guidance to attack aircraft on fire support sorties under all visibility conditions as well as precision guidance and navigational assistance to fixed and rotary wing assault or reconnaissance aircraft.

Test bed operations are scheduled to commence in FY-75. Production of operational TAO equipment will commence in FY-78.

11. Marine Air Ground Intelligence System (MAGIS)

MAGIS, one of the subsystems of MTACCS, will provide automated assistance in processing information in order that timely, accurate, and complete intelligence is available to the commander. MAGIS will consist of Marine Corps intelligence personnel and semi-automated information processing equipment.

The Marine Corps is actively participating in a joint DoD-directed System Program Office (SPO) to develop a single mobile tactical information processing and interpretation system (TIPI) for all land-based services. The SPO operates under the executive direction of the U.S. Air Force Systems Command. The objective of Marine Corps participation in the program is to ensure that the development effort will provide the Marine Corps with the equipment components of a MAGIS.

Employment of the MAGIS will be at the headquarters of the MAF, MARDIV, and Marine Aircraft Wing; a functional segment will be located at the Marine Composite Reconnaissance Squadron (VMCJ). MAGIC will provide intelligence information required by MTACCS and will interface externally with the Naval Intelligence Processing System (NIPS) and other tactical intelligence systems.

Functional areas included in MAGIS include the following:

1. Storage and Retrieval
2. Intelligence Analysis
3. Image Interpretation
4. Image Processing
5. ELINT Processing and Interpretation

Automation will be applied to those areas where complexity, response time, volume of processing, and extent of filing indicate that a significant increase in capability would be realized.

Service tests will commence in 1973. MAGIS will utilize the AN/UYK-7 computer for the data processing functions.

12. Marine Integrated Personnel and Logistics Subsystem (MIPLOGS)

MIPLOGS, a subsystem of MTACCS, will provide assistance to the commander and staff in the management of personnel and logistics resources. MIPLOGS will provide for continuous processing of personnel and logistics information in a manner which will satisfy command and control requirements of Marine Corps data systems and other related data systems, and at the same time provide up-to-the-minute information to the commander. The system will be configured with hardware and software to accomplish the functions

of logistics and personnel administration necessary to support the operating force.

Test bed operations for MIPLOGS will commence in FY-76.

12. Naval Tactical Data System - NTDS

The Naval Tactical Data System contributes to the combat effectiveness of Naval operating forces by providing the necessary equipment required to increase the individual and collective tactical data gathering and utilization capabilities of ships by several orders of magnitude over 'grease pencil' methods. Exchange of tactical information between ships and units of the fleet via digital data links permits a high degree of task force integration and coordination, and enhances the capability of the individual ships to perform their separate tasks. The NTDS computer (AN/USQ-20) permits execution of programmed functions at computer speeds, e.g., solution of the air intercept problem. The net effect is to prevent saturation of a CIC due to high speed and/or high density problems when handling tactical data.

To perform integrated combat direction, it is necessary to exchange tactical information gathered by the ship's sensors and processed by the NTDS computer between commands and their units. Because of the mass of data available and the fluidity of the tactical situation, high speed digital data links are utilized to exchange tactical information. The JCS Pub 10 "A" Link is used with a radio net among the participating NTDS equipped ships, ATDS aircraft, and MTDS equipped Marine units ashore.

Provision is being made to add the Air Force AN/TSQ-92 CRC to the digital data net. The TACS/TADS test bed will test the interoperability of this 407L component with other systems in this NTDS "A" Link.

The NTDS system is fully operational with ships of the fleet that have been equipped.

14. Air Tactical Data System (ATDS)

ATDS is an airborne tactical data system which operates as an extension of the ship-based NTDS and the shore-based MTDS. ATDS can operate independently, when so designated, as an air-early warning (AEW) aircraft and interceptor control station via data link and/or voice control. The "A" link of JCS Pub 10 is utilized to exchange track data with other participating stations (NTDS equipped ships and MTDS units). The "C" link of JCS Pub 10 is used for interceptor control. ATDS also operates, when designated, as a UHF communications relay (AUTOCAT) beyond surface line-of-sight radio range.

155

15. Direct Air Support Central - AN/UYQ-4

The Marine Corps has under development a system utilizing automated equipment to provide control of close air support and assault support operations. This system is sometimes referred to as the Semiautomatic DASC. The AN/UYK-7 general purpose computer will be employed as the data processor for the system.

Five systems are planned to be purchased with FY-71, 72 and 73 funds.

16. Data Transmission and Switching (DTAS)

DTAS is a Marine Corps system intended to improve the utilization of communications and to speed the transfer of information by providing preformatted machine-language messages which can be rapidly encoded, transmitted, decoded, and displayed.

Initial operational capability for DTAS in the Marine Corps and Navy is scheduled for FY-75. This will include equipment for one Marine Division.

The basic units for DTAS system are:

1. Data Message Entry Device (DMED), AN/PST-1, also called the Message Entry Generator (MEG)

2. Digital Message Unit (DMU), a modified receive-only battalion terminal

3. Battalion Terminal, a switching and control unit w/16 I/O channels

4. Regiment Terminal, a switching and control unit w/32 I/O channels

5. Division Terminal, a switching and control unit w/64 I/O channels and a general purpose computer (AN/UYK-7)

The present DMED operates with selectable bit rates of 150, 300, and 600 bits/second using FSK. The final system will probably also operate at 1200 bits/second.

Message formats are intended to follow the formats of TADIL D. The current DTAS can denote 256 message types.

Input/Output channels in the terminals are all capable of full duplex operation over either radio or wire circuits. Bit rates of 75×2^n up to 600 bits/second are provided; 1200 bits/second can also be added. Either TADIL D or teletypewriter transmissions can be accommodated.

In operation, DTAS overlays the voice system without interfering with voice transmissions. Voice priority on the channel is retained.

Message transmission is initiated by the operator, following a keying delay built-in to allow the transmitter to come up to power.

The Navy will have two DTAS terminals - one each on the Amphibious Command Ships Blue Ridge (LCC-19) and the Mount Whitney (LCC-20).

17. Joint Services In-Flight Data Transmission System (JIFDATS)

JIFDATS will provide the tactical forces of the four services with the capability of transmitting airborne reconnaissance information in real/near real-time from multisensor-equipped aircraft to a surface terminal, direct or via a relay.

JIFDATS will permit the sensor data gathered by operational reconnaissance aircraft to be processed in flight, transmitted, and received and reconstituted at the surface terminal for viewing by trained imagery interpreters. The data link is capable of transmitting information with minimum degradation 500 nautical miles via the relay aircraft or 250 miles direct to the surface terminal.

Imagery is collected by a sensor aircraft using normal photography, infrared (IR) photography, laser camera, or sidelooking radar (SLAR) and is converted in such a form that it can be transmitted from the sensor aircraft directly or through a relay aircraft to a surface terminal (either land- or sea-based). The requirements are such that one or more sensors can collect data that is transmitted simultaneously to the recording terminal where imagery on film is made available for viewing. Compatibility with each service's type of sensor and relay aircraft will be assured. The normal mode of data transmission is digital; however, for the newer wideband sensors an amplitude modulation transmission mode is provided. Since the system is modular, functional boxes can be deleted when the requirements so dictate. This modularity concept lends itself well to the built-in test and maintainability specifications.

The surface terminal consists of a Surface Antenna Terminal (SAT) and a Surface Recording Terminal (SRT) and a mobile power generator. The SAT receives the Ku- or C-band signal from the transmitting aircraft and down-converts it to a signal which is cabled to the recording terminal. The recording terminal decodes the multiplexed information, when necessary, and then converts the electrical intelligence to analog signals for processing.

A prototype system is expected to be available in January 1972.

18. NIPS - Navy Intelligence Processing System

NIPS is an operational automated intelligence system that provides the Navy with data processing and exchange of intelligence within and between Naval operating forces; internal distribution of tactical intelligence from fleet collection sources; including shore-based activities; and an exchange of intelligence data with the other services.

The two major components of NIPS are the Fleet Intelligence Centers, which are the primary interface between USMC intelligence and national intelligence centers, and the Afloat Intelligence Centers, of which there are four major centers within NIPS. They are the Fleet Commander's Flagship Center (NFC-IC), the Attack Carrier Integrated Operational Intelligence Center (IOIC), Amphibious Commander's Flagship Intelligence Center (LCC-IC), and the Anti-submarine Warfare Carrier Intelligence Center (CVS-IC). The LCC-IC directly supports the USMC landing force intelligence during the landing phase of amphibious operations.

19. The Army Area Communications System (AACOMS)

AACOMS is a U.S. Army program to design and configure tactical multichannel communications equipments for use within the Army-in-the-field. Various assemblages of equipments consisting of radio relay, multiplexers, and ancillary items are configured to provide link secure multi-channel systems. The AACOMS meets the requirements for common user, sole user, and special purpose needs for all types of field units throughout the Theater extending down to Brigade echelon.

The configurations of electronic equipment are mounted in vehicles, trailers, and in special shelters. The AACOMS is organized into four subsystem applications identified as follows:

Low Capacity (6/12 channels), Pulse Code Modulation, Time Division Multiplexed. Used primarily in the Division area with some special purpose applications.

Medium Capacity (12/24 channels) also PCM/TDM. Used within the Corps and Army areas of operation.

High Capacity (48/96 channels) PCM/TDM. Employed on an area concept bases throughout the Army area of operation to handle high volume common user traffic and serve as an alternate path to the two subsystems mentioned above.

Tropospheric scatter to be used for long distance command oriented links where line-of-sight radio relay is inadequate.

VI.   INTEROPERABILITY PROBLEM AREAS

A.   GENERAL

The equipments tabulated in the previous section of this report were analyzed to determine their compatibility or relative compatibility.

In any discussion of interface compatibility, one must establish where the interface between systems is located. For instance in this study to determine interfaces between Air Force elements and other services in a Joint operation, the technical or electrical interface could occur at a number of points in a given circuit depending on the communications plan being implemented for that specific operation. As an example, in considering a radio multichannel link between two units, each unit could supply all the equipment at one terminal. The interface would then occur between the antennae of the two terminal sets. If one service were to provide one complete terminal and the radio equipment only at the other terminal, the interface would occur at baseband between the radio equipment and the other service's multiplexer. If the multiplexer were included with the radio equipment, then the interface would occur at voice frequency between the multiplexer and the other service's terminal instruments or switching equipment, depending on whether an individual channel is employed as a dedicated circuit or a common user switched circuit. Examples of each of these interfaces occur in the field and are addressed in the report.

The multichannel radio terminals, both baseline and near term/future are presented in a compatibility matrix in Tables VII and VIII. In addition, each interface having differing link terminal equipments in Tables III and IV are discussed in terms of compatibility.

B.   RADIO EQUIPMENT COMPATIBILITY

Compatibility of single channel radios is easily determined by noting the frequency band of operation. Multichannel radio compatibility is not as easily determined because of occasional differences in multiplexer techniques. Table VII is a square matrix designed for quick determination of multichannel radio interoperability. Cross-reference spaces containing an X indicate full compatibility to the extent of the capabilities of the lessor unit. An O indicates only partial compatibility between sets. Blank spaces indicate non-compatibility.

Other end instrument terminal equipment such as telephones and teletypewriters did not lend themselves to matrix type presentations. In general such matricies would show some degree of compatibility between most all units that would be listed. The difference and compatibility factors for teletype, telephone and facsimile equipments are therefore discussed in narrative form. In addition a discussion and matrix (Table IX) relative to voice frequency telegraph (VFTG) compatibility of those radio terminals that will carry teletype messages is included.

TABLE VII

Multichannel Radio Compatibility Chart

Equipment AN/ Nomenclature	Freq. Band	MRC-92	MRC-113	MRC-126	MRC-134	MRC-135	SRC-16	TRC-97A,C	TRC-97E	TRC-112	TRC-117	TRC-136	TRC-145	TRC-167	TSC-15	TSC-20A	TSC-28	TSC-38	TSC-60,1	TSC-60,2,3
		H/U	U	U	V	V	H	S	S	S	U	H	U	S	H	H	H	H	H	H
MRC-92	H/U	X					X					O			O	X	X	X	X	X
MRC-113	U		X																	
MRC-126	U			X									X							
MRC-134	V				X	X														
MRC-135	V				X	X														
SRC-16	H	X					X					X			O	X	X	X	X	X
TRC-97A, C	S							X	X					X						
TRC-97E	S							X	X					X						
TRC-112	S									X				X						
TRC-117	U										X									
TRC-136	H	O					X					X			O	X	X	X	X	X
TRC-145	U			X									X							
TRC-167	S							X	X	X				X						
TSC-15	H	O					O					O			X	O	O	O	O	O
TSC-20A	H	X					X					X			O	X	X	X	X	X
TSC-28	H	X					X					X			O	X	X	X	X	X
TSC-38	H	X					X					X			O	X	X	X	X	X
TSC-60-1	H	X					X					X			O	X	X	X	X	X
TSC-60 2,3	H	X					X					X			O	X	X	X	X	X

Legend: X = Compatible to the extent of the capabilities of the lessor unit

O = Partial compatibility (less than above)

= Not compatible

H = High Frequency, V = VHF, U = UHF, S = SHF

160

C. TELETYPEWRITER EQUIPMENT COMPATIBILITY

In reviewing the equipments proposed for the various communications links it appears that no major compatibility problem exists in the teletypewriter equipment area. Some of the factors that must be considered in determining teletypewriter compatibility are discussed here.

Coded Character Set -- Although MIL-STD-188C specifies ASCII eight level code as standard, the equipment contained herein utilizes the interim standard start stop five unit code (International Telegraph Alphabet No. 2 American variation) as specified in MIL-STD-188C.

Keyboard -- One of two keyboards are utilized; the communications version or the weather version.

Character Interval -- Character intervals of both 7.0 signal elements and 7.42 signal elements are used. These codes are identical except for the stop element which is 1.0 unit long for the former and 1.42 units long in the latter case. Fortunately these two character intervals are compatible for modulation rates that do not exceed 75 bauds.

Modulation Rates -- Most sets function at several modulation rates up to a maximum of 75 Bauds. Speed change is usually accomplished by a gear change.

Type Signaling -- Most sets work at the high level interface standard of 20 or 60 ma neutral or 20 ma polar.

Table VIII shows the compatibility of the teletypewriters related to these parameters.

D. VFTG COMPATIBILITY

The compatibility of voice frequency telegraph is shown in Table IX. The center frequencies for narrow shift 85 Hz voice frequency telegraphy is shown in the upper portion of the left hand column. Mark and space frequencies are shifted ± 42.5 Hz about these center frequencies. To the right of these frequencies an X is shown in each equipment column where a frequency is utilized in the telegraph multiplexer for the corresponding equipment. The symbol (X) indicates the mark and space frequencies are inverted from the values specified in MIL-STD-188C.

161

TABLE VIII

Teletypewriter Compatibility

EQUIPMENT	KEYBOARD		TTY SPEED WPM	CHARACTER INTERVAL	SIGNAL CURRENT (MA)
	COMM	WX			
AN/FGC-25	X		60/66/75/100	7.42	20/60 neutral 30 polar
AN/FGC-26		X	60/66/75/100	7.42	20/60 neutral 30 polar
AN/GGC-3	X		60/66/75/100	7.42	20/60 neutral 30 polar
AN/PGC-1	X		60/66/75/100	7.42	20/60 neutral
AN/TGC-14A(V)	X		60/75/100	7.42	20 to 80 1 to 10
AN/TGC-29(V)	X		100 max		20 to 80 2.5 to 10
AN/TGC-( )	Planned replacement for the AN/TGC-14A(V)				
AN/UGC-41			50/75/100		
TT-48A/UG			60/75/100	7.42	20/60 neutral
TT-98/FG	X		60/75/100	7.42	20/60 neutral
TT-119/FGC	X		60/66/75/100	7.42	20/60 neutral 30 polar
TT-130A/UG		X	60/75/100	7.42/7.00	20/60 neutral
TT-299/UG	X			7.42	

Note: All these teletypewriters use the Start Stop Code International
       Telegraph Alphabet No. 2, American Variation

162

TABLE IX

Voice Frequency Telegraph Compatibility

	AN/TSC-20	AN/TSC-28	AN/TSC-38	AN/MRC-92	AN/TRC-136	AN/URC-56	AN/TSC-15	AN/TSC-60	AN/UCC-1 (V)	AN/TRC-97	AN/MRC-113	AN/MRC-134	AN/MRC-135
85 Hz – Narrow Shift Center Frequency													
1785		X	X			X		X	X	X			
425		(X)	(X)			(X)		X	X	X			
1955		X	X			X		X	X	X			
595		(X)	(X)			(X)		X	X	X			
2125		X	X			X		X	X	X			
765	X	(X)	(X)	X	X	(X)		X	X	X			
2295	(X)	X	X	(X)	(X)	X		X	X	X			
935	X	(X)	(X)	X	X	(X)		X	X	X		X	X
2465	(X)	X	X	(X)	(X)	X		X	X	X			
1105	X	(X)	(X)	X		(X)		X	X	X			
2635	(X)	X	X	(X)		X		X	X	X			
1275	X	(X)	(X)	(X)				X	X	X			
2805		X	X					X	X	X			
1445		(X)	(X)					X	X	X			
2975		X	X					X	X	X	(16 channels believed standard)		
1615		(X)	(X)					X	X	X			
850 Hz – Wide Shift Center Frequency													
2000			X	X	X	X	X						
2550						X							
1000						X							

X Mark/Space

(X) Inverted Channel

163

The bottom portion of the chart shows frequencies used with 850 Hz wide shift voice frequency telegraphy. An X is also used here to show those equipments that employ the corresponding frequency.

Compatibility for voice frequency telegraphy between equipment types is indicated for a given teletype channel when each equipment employs the same frequency. For example, the AN/UCC-1 and the AN/TRC-97 are compatible for 16 teletypewriter channels. Where center frequency is the same but one channel is inverted with respect to the other, the interface is not transparent. The mark/space sense would have to be reinverted at one end of the link by the terminal equipment. The standard signaling sense (MIL-STD-188C) uses the lower frequency for the marking state.

The AN/TSC-15 is not compatible with any other equipment shown for narrow shift. The TSC-15 uses plus or minus 80 Hz shift and different center frequencies. For wide shift the AN/TSC-15 is compatible with other sets since it uses the standard 2000 Hz center frequency.

Note this table shows only a necessary condition for compatibility for voice frequency telegraphy. All required conditions are not indicated, for example, frequency is another condition for radio transmission.

E. TELEPHONE EQUIPMENT COMPATIBILITY

Compatibility must exist from end instrument to switchboard and switch-board to switchboard. Since switchboards usually are very long-life equip-ment, a variety of switchboard types are encountered in the field. Com-patibility is provided among the various types by the newer equipment providing trunks to handle the interface with the older equipment, though it sometimes requires an adapter (black box) for signaling compatibility. For instance the AN/TTC-28 Central Office Telephone is a complete trans-portable dial central office, but it includes some two-way ringdown trunks (maglines) and battery station (common battery) lines. Thus this automatic switchboard is compatible with the small SB-22/PT Manual Telephone Switch-board which has both maglines and a common battery trunk. Likewise some of the manual switchboards (e.g., AN/MTC-1A) have dial trunks permitting the operator to dial into an automatic switchboard.

With more sophisticated automatic switches such as the AN/TTC-30 and the AN/TTC-31, the signaling interface becomes more complex. Existing incompatibilities in the signaling interface between the AN/TTC-30 and the AN/TTC-31 include the following:

1. Answer Tone - used by the 30 but not recognized by the 31.

2. End of Address - used by the 31, but the 30 is not equipped to handle it.

3. All Trunks Busy Signal - the 30 doesn't send it and the 31 requires it.

164

TABLE X

TELEPHONE AND SWITCHBOARD COMPATIBILITY

EQUIPMENT	NUMBER OF LINES	SIGNAL TYPE	REMARKS
AN/MTC-1A	180 Manual 20 Trunks	CB, MAG	Manual or Dial Trunk Circuits
AN/MTC-7	60 Manual	CB, MAG	Uses SB-86 Items
AN/MTC-9	600 Manual	CB, MAG	Manual or Dial Trunk Circuits
AN/TTC-22	100 Automatic Dial 95 Manual (2W), 20 (4W)	CB, MAG, DIAL	
AN/TTC-28	600 Automatic Dial	DIAL, CB, MAG	Two CB/MAG Trunks
AN/TTC-30	475 Automatic	DTMF, CB, MAG	407L
AN/TTC-31	600 Automatic (Max)	DTMF	USMC, Flexible Trunks
AN/TTC-32	25-4W DC, 15-4W AC, 12-2W	CB, MAG	
SB-22/PT	12 Manual	MAG, CB	One CB Trunk
SB-86/P	30 Manual	CB, MAG	
ICMS	150-2400 Automatic	DTMF	Circuit and Message Switch- ing (Model A)
TRI-TAC	120-1440 Automatic	Undefined	
TA-236/FT	Desk Phone	CB, DIAL	
TA-312/PT	Field Phone	CB, MAG	
TA-341/TT	Desk Phone	DTMF	Four-wire, Local Battery
TA/623/TG	Desk Phone	DTMF	Sealed Field Version of TA-341
TA-720/TTC	Telephone Set Subassembly	DTMF	Four-wire, 407L

4. Interdigit Signal - the tone pairs used by the 30 and 31 are different.

5. Precedence Digit on Trunk Routing - the first digit sent by the 30 would have no meaning to the 31.

6. Five versus Seven Digit Numbering Plan - the 30 uses a 5 digit plan.

7. Precedence Indicator Conversion - the 30 uses 2 levels of precedence while the 31 uses 5 levels.

At the request of the TRI-TAC Office these incompatibilities are being examined in depth and potential solutions are being devised by the respective contractors. While the proposed solution are not known to this contractor at this time, it appears from the different techniques employed in the two switches that a completely transparent interface will not be feasible without major modification to either or both the AN/TTC-30 and the AN/TTC-31. The most feasible solution will probably involve a black box adapter at either one or both of the switches, providing the required level of compatibility and interoperability.

Table X shows telephone switching equipment and telephone sets with characteristics affecting compatibility.

F. FACSIMILE EQUIPMENT COMPATIBILITY

No insurmountable facsimile problems should be encountered. One prime compatibility item is the index of cooperation in a facsimile system. Since this factor varies greatly between regular and meteorological facsimiles sets, these two types of sets should not be mixed in a common circuit. The standard for the index of cooperation of regular facsimile sets is 264 and 576 for meteorological sets as specified in MIL-STD-188C.

The compatibility of the facsimile equipments are shown in Table XI.

TABLE XI

Facsimile Equipment Compatibility

EQUIPMENT	COPY SIZE (INCH)	INDEX OF COOPERATION*	RESOLUTION (LINES/INCH)	SCANNING SPEED (SCANS/MINUTE)
AN/GXC-5	8-1/2 wide (roll)	**264**	96	90/180
AN/GXC-7	8-1/2 x 11	**264**	96	180
AN/UXH-2	18-3/4 wide (roll)	576	96	60/90/120
TT-321A/UX	12 x 18 11/16	576	96	60/120
AN/TXC-1	12 x 18 11/16	576	96	30/60

* International or diametral

G. IDENTIFICATION OF RADIO PI LEM AREAS BY LINK

Problem areas referred to here are those that may be caused by the use of non-identical radio sets at interface link terminals. To prevent redundancy those links using cable or identical terminal radios having an obvious radio transparent interface are not included in the following section except when other non-identical radios are co-listed that require investigation. A radio transparent interface is also expected if one element of an interface group supplies radios for the other terminals since identical radio sets would be used.

The following paragraphs discuss the interface links between Air Force elements primarily to show the extent of interoperability, if any, between two interface terminals whose radios have different AN nomenclatures.

IDENTIFICATION OF RADIO PROBLEM AREAS - BASELINE

Interface
  Link
Identifier

1.1   AFCCP   -   JTF HQ, TMA, JOC

         TRC-97A   /   TRC-97A &
         MRC-113   TRC-136

Interoperation between the two elements is possible using
their respective TRC-97A units, therefore this link is RF
compatible. The MRC-113 and TRC-136 are not compatible in
frequency with each other or the TRC-97A. If the preferred
MRC-113 or the TRC-136 are used as interface radio, each
must be supplied by the owner element at both ends of the
link.

1.2   AFCCP   -   JSARC
              Same as 1.1 above

1.3   AFCCP   -   Army HQ

         MRC-113   /   TRC-145
         TRC-97..   TRC-112

This interface link is not RF compatible considering the
element owned radios ⃛ their respective terminals since
they differ in type of transmission (FDM vs TDM), and fre-
quency in the case of the TRC-145 (VHF vs. SHF).

1.4   AFCCP   -   Marine MAF HQ

         TRC-97A   /   TRC-97C
         TSC-60   TSC-15

The TRC-97A and 97C are RF compatible. The TSC-60 and TSC-15
are compatible in frequency of operation and type of trans-
mission. However the TSC-15 is narrow band in voice bandwidth
utilizing half the bandwidth per channel (and baseband) as
does the TSC-60, although both provide four channels using a
similar independent sideband technique. A reduced channel
capacity to two channels should be possible between the two
sets by using the ISB mode and modulating only the USB and
LSB of the TSC-60 (one voice channel each) while modulating
the combined USB+UUSB with one voice channel and the LSB +
LLSB with one voice channel. The result is to use the full
6 kHz baseband of the TSC-15 and only half of the 12 kHz
baseband of the TSC-60. These two radio sets are not VFTG
compatible.

```
1.6        AFCCP      -      NAVY NAVFOR HQ

           TSC-60     /      HF Radio - Various Types
                             e.g., URC-32 standard shipboard
                                   WRT-2 on LCC-19, -20
```

The above radio sets provide a compatible link in a simplex
SSB operational mode.

```
2.1        TACC       -      JTF - JOC
```

         Same as 1.1

```
2.3        TACC - FATOC
```

         Same as 1.3

```
2.4        TACC       -      ARMY FOC

           TRC-97A    /      MRC-126
           TSC-60
```

No compatibility on this link. All three are on different
frequency bands and TACC radios are FDM while the Army MRC-126
is TDM

```
2.5        TACC       -      Marines TADC/TACC

           TRC-97A    /      TRC97C
           TSC-60            TSC-15
```

           Same as 1.4

```
2.6        TACC       -      Marine DASC

           TSC-60     /      MRC-134
                             TSC-15
```

This link has only partial compatibility. The MRC-134 is in a
different frequency band than the TSC-60, while the TSC-15 and
TSC-60 will provide only two channels voice and not teletype
capability (see 1.4).

```
2.7        TACC       -      Navy TADC/TACC

           TSC-60     /      Navy HF Radio (see 1.5)
```

         Same as link 1.5

2.8   TACC   -   Navy SACC

        TSC-60 /   Navy HF Radio (see link 1.5)
            Same as link 1.5

3.1   ALCC   -   JTF TMA, JOC
        TACS

        TRC-97A /   TRC-97A
        MRC-113   TRC-136

            Same as link 1.1

3.2   ALCC   -   FATOC

        Cable   /   Cable
        TSC-60   MRC-126

        This link is not RF compatible. The radios are different in
        type of transmission - FDM versus TDM.

3.3   ALCC   -   Marine MAF HQ

        TRC-97A /   TRC-97A
        TSC-60   TSC-15

            Same as 1.4

3.4   ALCC   -   Navy NAVFOR HQ

        TSC-60 /   Navy HF radios (see 1.5)
        TRC-136

        The above radios provide a one channel SSB capability.

4.1   DASC   -   JT JSARC

        TSC-60 /   VSC-2 - GRC-106

        This link is voice compatible on one channel.

4.4   TACP   -   Army DTOC
        MRC-108   VRC-46, VRC-12
        GRC-160   VRC-47

        This link is compatible

4.5   TACP   -   Army BDE CP

        Same as 4.4

5.1   CRC   -   JF JSARC

        TSC-60 /   VSC-2 - GRC-106

        This link is voice compatible on one channel.

5.2   CRC   -   Army AADCP

       TRC-97A /   TRC-112
                    TRC-117
                    TRC-145

This link is not compatible. Radios are not compatible in
type of transmission (FDM vs TDM), and in frequency in the
case of the TRC-117 and TRC-145 (UHF vs. SHF for others).

5.3   CRC   -   Army FOC

       TSC-60   /   MRC-126
       TRC-97A

This link is not compatible. Radios are not compatible in
frequency or type of transmission.

5.4   CRC   -   Marine TAOC

       TRC-97A /   TRC-97E

This link is compatible for 24 voice or 23 voice and 16 TTY
channels.

5.5   CRC   -   Marine DASC

       TRC-97A /   TRC-97C
       TSC-60   TSC-15
                    MRC-134

Compatible, same as link 1.4 except MRC-134 not compatible with
others.

5.6   CRC   -   Marine Air Mobile DASC

       TSC-60 /   ARC-94
                   TSC-15
                   MRC-134

This link has a two channel compatibility. The MRC-134
is not compatible with other radios.

5.7   CRC   -   Navy SACC
&
5.8   TSC-60 /   Navy HF radios

         Same as 1.5

5.10   CRP   -   Army FCC

       TSC-60 /   MRC-126

Not compatible, different frequency bands and type of trans-
mission.

172

6.1   TUOC   -   JF JSARC

        TSC-60 /   VSC-2, GRC-106
        TRC-136

        Provides one channel compatibility.

6.3   TATCF   -   Army FOC

        TRC-136 /   MRC-126
        TSC-60

        Not compatible. Different frequency bands and type transmission.

6.7   AP   -   Marine MAF HQ

        TRC-97A /   TRC 97C
        TSC-60   TSC-15

            Same as link 1.4.

6.8   AP   -   Navy NAVFOR HQ

        TSC-60   /   Navy HF Radio

            Same as link 1.5

7.1   RITS   -   Army MIBARS

        Cable   /   Cable
        MRC-113   TRC-145
        TRC-97A   TRC-117
                       TRC-112

            Not RF compatible. Same as link 1.3

173

IDENTIFICATION OF RADIO PROBLEM AREAS - NEAR TERM/FUTURE

<u>LINK</u>

1.4   AFCCP   -   Marine MAF HQ

Same as 1.4 in Baseline except for added capability of TRC-167
which is in the same frequency band and can operate FDM as
does the TRC-97 but has the ability also to operate TDM.
This link has ample compatibility.

2.7   TACC   -   Navy TADC/TACC

TSC-60 / SRC-16

This link has an improved radio compatibility from one to
four channels.

3.3   ALCC   -   Marine MAF HQ

Same as 1.4 above.

5.3   CRC   -   Army FOC

The difference in this link is the replacement of the TRC-60
by the TRC-167 at AF terminal and the additional TRC-145
at Army terminal. The link is not compatible.

5.4   CRC   -   Marine TAOC

Added TRC-167 to CRC terminal, and TYA-17 (19) at both terminals.
The link is compatible both at HF and SHF for single or
multichannel use respectively.

5.12   CRC   -   Navy ATDS

TYA-17 / ARC-80

This additional link is compatible for one voice or data channel.

H. CONCLUSIONS AND RECOMMENDATIONS

The results of this analysis indicate that even though the various services, for the most part, have different communications equipment, sufficient compatibility exists in this equipment to permit the TAF to establish the required joint service interfaces for the baseline system. However, due to the lack of commonality, an additional burden is placed on the operational coordination required, especially in stress conditions. This lack of commonality also results in inefficient operations by: 1) requiring additional equipments and/or special procedures to compensate for the limited compatibilities, and 2) the inability to use the full capabilities of a piece of equipment when it interfaces a partially compatible system.

Due to the lack of commonality, it is not possible to interface joint services multichannel radios, (except in the case of HF equipments, and the Air Force and Marine Corps TRC-97s) on n owner terminal basis, i.e. each service providing his own radio terminal. However, it is often the case that one service supplies both terminals. As stated previously, voice compatibility, even with different phones and switchboards, is possible because of the availability of special trunk adaptors in many of the switchboards that permit such an interchange. In a sense, however, the interface black box is built into the equipment and a non-transparent interface exists.

The biggest problems exist in the operational aspects of the interfaces. Most documentation of the various services available for this study were very vague and often presented conflicting information in their references to joint services interfaces. Realizing that a great degree of flexibility is required in these interfaces, the apparent lack of information leads us to believe that approved documentation by the joint services does not exist or is not readily available. In today's world of manual equipments, i.e., telephone and teletype, this lack of coordination is not too serious since voice and teletype channels are relatively easy to establish, and procedural changes or opeations in these modes can, if necessary, be instituted in the field. However, in the automated world of tomorrow (see Figure 13, Interrelationship of Future Tactical Systems) such field modifications will be extremely impractical, if at all possible. The automated systems are being designed with the operational procedures built into the hardware and software. Failure to coordinate the interfaces prior to the equipment development will of course lead to more of the undesirable black boxes. Even when data systems are compatible and can interoperate, the operational interface (procedures and data to be transferred) is a formidable coordination task.

As previously stated, digital interfaces require close coordination to insure hardware and software compatibility. Towards this end, it is recommended the Air Force seriously consider a study to develop digital standards for tactical data systems. This study should include considerations of internal as well as external systems.

In addition the lack of information on interface operational aspects, current and accurate data to the desired completeness required on Air Force communications equipment was difficult to obtain in the performance of this

175

study. No single document contains a comprehensive cataloging of equipment characteristics. Air Force Manual AFM 100-14, which is perhaps the most complete, is lacking in detail information on those equipments it does list. Consequently to identify, locate and obtain all the documents required is an arduous and time consuming undertaking in any study involving equipment parameters.

It is recommended that the Air Force consider a computerized Item Data File (IDF) to provide an easily available compilation of equipment data. The advantages of such a file are readily apparent. In addition to the capability of being continuously updated by simple card deck changes, the Data File can be searched on key parameters to obtain readouts on only those equipments of concern. The IDF could contain interface data and usages for the equipment, as well as standard technical characteristics. A computerized IDF, unlike most equipment directories that are obsolete by the time they are printed, can be updated daily to provide users with current information that is organized to present all of the desired characteristics of the equipment.

Lack of firm data on the near term/future equipment for the TAF as well as the other services restricted the efforts in this area. The advent of the ICMS and TRI-TAC switches, especially when message switching is included, will be a big step towards commonality. Even so, the TTC-30, TTC-25 and TTC-31 switches will still be used during and after this transition with the possibility of limited trunking between them through adapters, and to the ICMS and TRI-TAC switches. This will also apply to the smaller manual boards that will co-exist during this time.

The philosophy of a joint multi-channel trunking switching system as discussed in the TACSPARE report was discussed at TAC headquarters (only excerpts of the document were available for this study). The form that such a system might take can only be conjectured, but it may handle all or a majority of the interfaces in the future. The TACSPARE Study also postulated that the AFCCP/TACC communications interface with the higher headquarters of the Joint Services and the JTF HQ would be through the DCS terminal. To meet the cryptosecurity requirements, multichannel equipment of the future will most likely be TDM. The Army's AACOM system is already TDM, and the Marine Corps is considering TDM.

It is anticipated that this document may serve as the basis for a continuing effort that is recommended to provide current interface information as the tactical systems evolve.

176

APPENDIX A: LIST OF ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS, ACRONYMS, AND SHORT TITLES

AACOMS	Army Area Communications System
AADCP	Army Air Defense Command Post
AADS	Army Air Defense System
AAGS	Army Air Ground System
AAOC	Anti-Air Operations Center
AAT	Army Assault Team
AATRS	Army Air Traffic Regulation System
ABCCC	Airborne Battlefield Command and Control Center
ABERU/EARS	Airborne Emergency Reaction Unit/Electronic Airborne Recon Surveillance
Abn/CP	Airborne Command Post
A/C	Aircraft
AC and W	Aircraft Control and Warning
ACP	Airborne Command Post Report/Allied Communications Publication
AD	Air Defense
ADA	Air Defense Artillery
ADP	Automatic Data Processing
ADSAF	Automatic Data Systems within the Army in the Field
ADVON	Advanced Echelon
AE	Aeromedical Evacuation
AECC	Aeromedical Evacuation Control Center
AELT	Aeromedical Evacuation Liaison Team
AELO	Aeromedical Evacuation Liaison Officer
AEO	Aeromedical Evacuation Officer
AEST	Aeromedical Evacuation Support Team
AEW	Airborne Early Warning
AFAC	Airborne Forward Air Controller
AFC HQ	Air Force Component Headquarters
AFCCP	Air Force Component Command Post
AFFOR	Air Force Component Command
AFM	Air Force Manual
AFSC	Air Force Systems Command
AFSN	Air Force Service Number
AFSS	Air Force Security Service
A/G	Air to Ground
A/L	Air Lift
ALCC	Airlift Control Center
ALCE	Airlift Control Element
ALO	Air Liaison Officer
ALOREP	Air Liaison Officer Report
AMCC	Aero Medical Evacuation Control Center
AP	Aerial Port
APCC	Aerial Port Control Center
ARFOR	Army Component Command

ARNO	Air Request Net Operator
ASA	Army Security Agency
ASC	Allowance Source Code
ASCII	American Standard Code for Information Interchange
ASF	Aero Medical Staging Facility
ASO	Air Surveillance Officer
ASRT	Air Support Radar Team
ATARS	Army Tactical Airspace Regulation System
ATC	Air Traffic Control
ATCE	Air Traffic Control Element
ATCL	Air Traffic Control Line
ATDS	Airborne Tactical Data System (Navy)
ATRC	Air Traffic Regulation Center
AUTODIN	Automatic Digital Network
AUTOVON	Automatic Voice Network
AWACS	Airborne Warning and Control System
BDE	Brigade
BN	Battalion
C-E	Communications-Electronics
C and E	Communications and Electronics Staff
CAP	Combat Air Patrol
CAS	Close Air Support
CCT	Combat Control Team
CG	Commanding General
CIC	Combat Information Center (Navy)
CIVAF	Civil Affairs Report
co	Company
CO	Commanding Officer
COACT	Combat Activities Report
COC	Combat Operations Center
comm	Communication(s)
COMSEC	Communications Security Report
CP	Command Post
CRC	Control and Reporting Center
CRP	Control and Reporting Post
CSG or CSGp	Combat Support Group
CSF	Casualty Staging Facility
CSSS or CS3	Combat Service Support System
CT	Combat Team/Control Technician
CTOC	Corps Tactical Operations Center (Army)
CW	Continuous Wave
CWE	Control Weather Element
DAAR	Daily Aviation Activity Report
DAC	Direct Access Capability
DACG	Departure Airfield Control Group
DAS	Direct Air Support
DASC	Direct Air Support Center
DASS	Direct Air Support Squadron
DCA	Defense Communications Agency

DCS	Defense Communications System
deg	Degree
DEPSUM	Development Plans Summary Report
det	Detachment
D/F	Direction-finding unit or equipment
DI	Directorate of Intelligence/data instruction
DISUM	Daily Intelligence Summary
Div	Division
DO	Deputy or Operations/Directorate of Operations
DTAS	Data Transmission and Switching System
DTG	Date/Time Group
DTOC	Division Tactical Operations Center
DTMF	Dual-tone multiple frequency (end-instrument signaling technique)
DZ	Drop Zone
ECCM	Electronic counter-countermeasures
ECM	Electronic countermeasures
ECTAR	Electronic Countermeasures Tactical Action Report
ELINT	Electronic Intelligence
EMS (482L)	Emergency Mission Support System
equip	Equipment
ERU	Emergency Reaction Unit
EW	Electronic warfare/early warning
EZ	Extraction zone
FAC	Forward Air Controller
FACP	Forward Air Control Post
FATOC	Field Army Tactical Operations Center
FCC	Flight Coordination Center
FEBA	Forward edge of the battle area
flt	Flight
FM	Frequency modulation/Field Manual (USMC)
FNWA	Foreign National Weather Agency
FOC	Flight Operations Center
FRAG ORDER	Fragmentary Order
FS	Fire Support
FSE	Fire Support Element
GCA	Ground-controlled Approach
GCI	Ground-controlled intercept
GEOREF	World Geographic Reference System
GLO	Ground Liaison Officer
GMT	Greenwich Mean Time
GP	Group
Helo	Helicopter
HF	High frequency
hr	Hour
IBCS	Integrate Battlfield Communications System
ICAO	International Civil Aviation Organization
ID	Identification
IFF	Identification, friend or foe
IFR	Instrument Flight Rules

INFO	Information
INREP	Installation Damage Report
INTSUM	Intelligence Summary
ISB	Independent Sideband
JANAP	Joint Army/Navy/Air Force publication
JATF	Joint Amphibious Task Force
JEEP TDS	Junior Participating Tactical Data System
JF	Joint Forces
JIFDATS	Joint Service In-Flight Data Transmission System
JOC	Joint Operations Center
JSARC	Joint Search and Rescue Center
JTF	Joint Task Force
kw	Kilowatt(s)
LCC,IC	Intelligence Center aboard Amphibious Force Flagship (LCC-19/LCC-20)
LOSREP	Air Crews/Aircraft Loss Report
LSB	Least significant bit/lower sideband
LZ	Loading Zone/Landing Zone
MAC	Military Airlift Command/Major Air Command/multiple access capability
MACCS	Marine Air Command and Control System
MAF HQ	Marine Amphibious Force Headquarters
MAG	Marine Air Group
MAGIS	Marine Air Ground Intelligence System
MARFOR	Marine Forces
MATCU	Marine Air Traffic Control Unit
MAW	Marine Air Wing
MCE	Mobile Communications Element
MCG	Mobile Communications Group
MEDREP	Daily Medical Status Report
MIBARS	Military Intelligence Battalion Air Reconnaissance Support
MIFAS	Marine Integrated Fire and Air Support Subsystem
min	Minute/Minimum
MIPLOGS	Marine Integrated Personnel and Logistics Subsystem
MODEM	Modulator/Demodulator
msg	Message
msn	Mission
MSS	Machine Subscriber Set
MTACCS	Marine Tactical Command and Control System
MTDS	Marine Tactical Data System
NA or N/A	Not applicable
NASCOM	National Aeronautics and Space Administration Communications Network
NATO CIVIL	NATO Civil Communications Systems
NATO STRATEGIC	NATO Strategic Communications Systems
NAVFOR	Naval Forces
NCOIC	Non-commissioned officer in charge
NIPS	Navy Intelligence Processing System
NLT	Not later than

NMCS	National Military Command System
No	Number
NSA	National Security Agency
NSACS	Naval Ships Advanced Communications System
NSG	Naval Security Group
NTDS	Naval Tactical Data System
OIC	Officer in charge
OPREP	Operational Report Series (planning, start, event/incident, stop, summary)
OPS	Operations
OSI	Office of Special Investigations
PPIF	Photo Processing Interpretation Facility
PSK	Phase Shift Keying
PSYCOPS	Psychological Operations
RAPCON	Radar Approach Control
RAWIE	Radio Weather Intercept Element
RDD	Required Development Data
RECCE	Reconnaissance
recon	Reconnaissance
RFI	Radio Frequency Interference
RITS	Reconnaissance Intelligence Technical Squadron
SAAWC	Sector Anti-Air Warfare Center
SAC ADVON	Strategic Air Command - Advanced Echelon
SACC	Supporting Arm Coordination Center
SA-DASC	Marine Corps Semi-Automatic Direct Air Support Center
SAFOC	Semi-Automatic Flight Operations Center, US Army
SAM	Surface-to-air Missile
SAO	Special Air Operations
SAR	Search and rescue
SAW	Special Air Warfare (SAO preferred)
SEATO CIVIL	SEATO Civil Communication Systems
SFE	Store and Forward Exchange
SHF	Super High Frequency
SIP	Selective Identification Feature
SIS	Special Information System
SITREP	Commander Situation Report
SLAR	Side-looking Airborne Radar
SOP	Standard Operating Procedure
SSB	Single Sideband
TAB	Tactical Air Base
TAB WX	Tactical Air Base Weather
TAC	Tactical Air Command
TAC(A)	Tactical Air Coordinator (airborne)
TACC	Tactical Air Control Center
TACCWF	Tactical Air Control Center Weather Facility
TACP	Tactical Air Control Party
TACS	Tactical Air Control System
TACSATCOM	Tactical Satellite Communication System
TACSINC	Tactical Army Security Combat Intelligence and Counter-measures System

TADC (N)	Tactical Air Direction Center (Navy)
TADIL	Tactical Digital Information Link
TAF	Tactical Air Force
TAFIC	Tactical Air Forces Intelligence Center
TAFICCS	Tactical Air Force Integrated Command and Control Structure
TAFIES	Tactical Air Forces Intelligence Exploitation System
TAO	Tactical Air Operations
TALO	Tactical Air Liaison Officer
TAOC	Tactical Air Operations Center
TATCE	Terminal Air Traffic Control Element
TATCF	Terminal Air Traffic Control Facility
TBDL	To Be Determined Later
TCCS	Tactical Command and Control System
TCO	Tactical Combat Operations
Telecon	Telephone Conversation, Telephone Conference, TTY Conference
TIPI	Tactical Information Processing and Interpretation
TMA	Traffic Management Agency
TOC	Tactical Operations Center (Army)
TOS	Tactical Operations System (Army)
TRACALS	Traffic Control and Landing System
TP	Telephone
TTSA	Tactical Traffic and Systems Analysis (Study)
TTY	Teletype
TUCP	Tactical Unit Command Post
TUOC	Tactical Unit Operations Center
TWAC	Tactical Weather Analysis Center
TWC	Theater Weather Central
TWS	Tactical Weather Satellite
UHF	Ultra-High Frequency
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
UTM	Universal Transverse Mercator Map Projection
VA	Attack Squadron (Navy)
VF	Voice Frequency/Fighter Squadron (Navy)
VFR	Visual Flight Rules
VHF	Very High Frequency
Vol	Volume
WD	Weather Division
WECEN	Weather Central
WWMCCS	World-Wide Military Command Control System
WX	Weather

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EQUIPMENT/INTERFACE LINK INDEX

EQUIPMENT		INTERFACE LINK
AN/ARC-80	HF Radio	5.12
AN/ARC-94	HF Radio	5.6
AN/ASQ-52	Data Tml Sys	5.12
AN/FGC-25	TTY Set	8.1, 8.2, 8.3, 8.4, 8.5, 8.6
AN/FGC-26	TTY Set	8.1
AN/FRT-39C	HF Radio	1.5, 2.8, 3.4
AN/GRC-3	TTY Set	8.2
AN/GRC-106	HF Radio	4.1, 5.1, 6.1, 8.2, 8.3
AN/GRC-160	VHF Radio	4.4, 4.5
AN/GXC-5	Facsimile Set	8.2
AN/GXC-7	Facsimile Set	7.1, 7.2, 7.3, 7.4, 7.5
AN/GYC-2	Data Tml Set	5.13
AN/MRC-107	M/F Radio Tml	4.4, 4.5
AN/MRC-108	M/F Radio Tml	4.4, 4.5
AN/MRC-113	UHF M/C Radio	1.1, 1.2, 1.3, 1.6, 2.1, 2.2, 3.1, 3.5, 7.1, 7.4
AN/MRC-126	UHF M/C Radio	2.4, 3.2, 5.3, 5.10, 6.3
AN/MRC-134	VHF M/C Radio	2.6, 5.6
AN/MRC-135	VHF M/C Radio	5.5
AN/MSC-32	Ops Cen	1.3, 7.1
AN/MSQ-10	Radio TTY, Fax	8.1, 8.2, 8.3, 8.4, 8.5, 8.6
AN/MTC -1A	Tel Cen Ofc	2.3, 3.2
AN/MTC-7	Tel Cen Ofc	5.2
AN/MTC-9	Tel Cen Ofc	1.3, 4.2, 7.7, 8.2
AN/PGC-1	TTY Set	8.2
AN/SRC-16	HF M/C Radio	2.7, 5.8
AN/SSQ-29	Data Tml Set	2.7, 5.8
AN/TGC-14A	TTY Set	1.4, 2.6, 3.3, 5.5, 5.6
AN/TGC-26	Torn Tape Cen	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 3.2, 3.3, 3.4, 3.5, 5.8

Legend: M/C = multichannel
M/F = multi-frequency

EQUIPMENT		INTERFACE LINK
AN/TGC-27	TTY Comm Cen	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 3.2, 3.3, 3.4, 3.5, 6.1, 6.9, 7.1, 7.2, 7.3, 7.4, 7.5
AN/TGC-28	TTY Comm Cen	5.1, 5.2, 5.4, 5.5, 5.7, 5.8, 7.3
AN/TGC-29	TTY Set	1.4, 2.5, 2.6, 3.3, 5.4, 5.5, 5.8, 7.2, 8.4, 8.5
^N/TGC-( )	TTY Set	1.4, 2.5, 8.4
AN/TRC-97A,C,E,	SHF M/C Radio	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.9, 3.1, 3.3, 4.3, 5.2, 5.3, 5.4, 5.5, 6.7, 7.1, 7.2
AN/TRC-112	SHF M/C Radio	1.3, 2.3, 5.2, 7.1
AN/TRC-117	UHF M/C Radio	5.2
AN/TRC-136	HF M/C Radio	1.1, 1.2, 2.1, 3.1, 3.4, 6.1, 6.3, 6.7, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6
AN/TRC-145	UHF M/C Radio	1.3, 2.3, 5.2, 5.3, 7.1
AN/TRC-167	SHF M/C Radio	1.1, 1.4, 1.6, 2.1, 2.2, 2.9, 3.1, 3.3, 3.5, 5.2, 5.3, 5.4, 7.4
AN/TSA-16	Comm Control	2.6, 5.5
AN/TSC-15	HF M/C Comm Cen	1.4, 2.5, 2.6, 3.3, 4.1, 5.5, 5.6, 6.7, 7.2, 8.4, 8.5
AN/TSC-58	TTY Tml	213, 3.2, 5.2
AN/TSC-60	HF M/C Radio Cen	1.4, 1.5, 2.4, 2.5, 2.6, 2.7, 2.8, 3.2, 3.3, 3.4, 4.1, 5.1, 5.3, 5.5, 5.6, 5.7, 5.8, 5.10, 6.1, 6.3, 6.5, 6.8, 6.9, 7.2, 7.3
AN/TSC-65	TTY Cen Ofc	1.1, 1.2, 2.1, 2.2, 3.1, 5.1, 6.1, 6.9
AN/TTC-22	Comm Cen	1.1, 1.2, 3.1, 4.1, 5.1, 6.1, 6.9, 8.1
AN/TTC-28	Tel Cen Ofc	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 7.1, 7.2, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6
AN/TTC-30	Tel Eqpt Cen Ofc	1.1, 1.2, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 3.1, 3.6, 4.1, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8, 6.9, 8.1
AN/TTC-31	Tel Eqpt Cen Ofc	1.4, 3.3, 6.7, 7.2, 8.4
AN/TTC-32	Switchboard	4.1, 4.2, 4.3
AN/TYA-12	Comm Group	5.4
AN/TYA-16	Comm Group	2.5, 5.8

190

EQUIPMENT		INTERFACE LINK
AN/TYA-17	Data Tml Group	5.4, 5.8, 5.12
AN/TYA-19	HF Radio Group	5.4
AN/TYA-20	Compu Group	5.4
AN/UGC-41	TTY Set	4.1
AN/URC-32	HF Radio	1.5, 2.8, 3.4, 5.7, 5.8, 6.8, 7.3, 8.6
AN/USQ-20	Computer	5.8
AN/UXH-2	Facsimile Set	7.3, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6
AN/UYK-7	GP Digit Compu	2.5, 2.7, 3.3
AN/VRC-12	VHF Radio	4.4, 4.5
AN/VRC-46	VHF Radio	4.4, 4.5
AN/VRC-47	VHF Radio	4.4, 4.5
AN/VSC-2	HF Radio	4.1, 5.1, 6.1
AN/WRC-1	HF Radio	1.5, 2.8, 3.4, 5.7, 5.8, 6.8, 7.3, 8.6
AN/WRT-2	HF Radio	1.5, 2.8, 3.4, 5.7, 5.8, 6.8, 7.3, 8.6
HM-4118	Computer	5.2, 5.3, 5.4, 5.8, 5.11, 5.12, 5.13
MDT	Mobile Data Tml	1.6, 2.9, 3.5, 6.5, 7.4
SB-22/PT	Man Swbd	2.5, 5.4
SB-86/P	Man Swbd	1.4, 3.3, 4.3, 6.1, 6.7, 7.2, 8.4, 8.5
TA-236/PT	Tel Set	1.1, 1.2, 2.1, 2.2, 3.1, 4.1, 5.1, 6.9, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6
TA-312/PT	Tel Set	1.3, 1.4, 2.3, 2.5, 2.6, 3.2, 3.3, 4.2, 4.3, 5.2, 5.4, 5.5, 5.6, 5.8, 6.1, 6.3, 6.4, 6.7, 7.1, 7.2, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6
TA-341/TT	Tel Set	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.6, 4.1, 4.2, 5.1, 5.2, 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8, 6.9, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2
TA-720/TTC	Tel Set Subassy	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11
TA-741/TTC 30	Tel Regis	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10
TT-76/GGC	Reperf/Trans	1.1, 1.2, 2.1, 2.2, 3.1, 4.1, 5.1, 6.1, 6.9, 7.1, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6

EQUIPMENT		INTERFACE LINK
TT-119	TTY Set	1.3, 7.1
TT-130A/UG	TTY Set	8.6
TT-299/UG	TTY Set	1.5, 2.7, 2.8, 3.4, 5.7, 5.8, 6.6, 7.3
TT-321A/UX	Fax Transceiver	8.6
ICMS	Integrated Cir & Message Switch	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.8, 2.9, 2.10, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.2, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6
TRI-TAC Sw	Auto Swbd	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.8, 2.9, 2.10, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.2, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6