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EVALUATION OF METHODS FOR CALCULATING SYSTEM OPERATING TIME IN --ETC(U)

MAR 78 A A BILODEAU, P M DALLOSTA

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FINAL REPORT ✓

EVALUATION OF METHODS FOR CALCULATING SYSTEM
OPERATING TIME IN ACCORDANCE WITH RELIABILITY IMPROVEMENT
WARRANTY (RIW) CONTRACTUAL TERMS

March 1978

Prepared for
U.S. AIR FORCE LOGISTICS COMMAND
WRIGHT PATTERSON AFB
DAYTON, OHIO
under Contract F09603-77-A-3104

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The cooperation, imagination and initiative displayed by these people greatly enhanced our ability to perform the contract tasks.

Evaluation of Methods for Calculating System
Operative Time in Performance With Reliability
Improvement Warranty (RIW) Contractual Terms

700603-77-A-3104

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March 1978

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Prepared for

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Wright Patterson AFB
Dayton, Ohio

under Contract 15 F09603-77-A-3104

by

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FOREWORD

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ABSTRACT

↓ ARINC Research Corporation conducted a six-month study to investigate the validity of contractual techniques for calculating warranty statistics for the AN/ARN-118(V) TACAN. TACAN field data were collected from eleven U.S. Air Force Bases by ARINC Research. Additional TACAN data submitted by the Air Force were used in support of this study. Average Operating Time (AOT), Total Operating Hours (TOH), and Mean Time Between Failures (MTBF) based on these field data were compared with the values of these parameters calculated by contractual methods. No significant differences between field data estimates and the contractual-methods of calculation were identified. ↗

SUMMARY

ARINC Research Corporation assessed the adequacy of the methods for computing warranty statistics for the AN/ARN-118(V) TACAN as set forth in the RIW and MTBF Guarantee terms and conditions of Contract F19628-76-C-0144. The work was performed for the USAF Logistics Command, AFLC/LOM, under Contract F09603-77-A-3104.

The company performed five contract tasks. During Task 1, a plan for data collection and evaluation was developed to identify the data to be acquired and addressed how these data would be analyzed. In Tasks 2 and 3 data were obtained from both Air Force Bases and the TACAN manufacturer, Collins Avionics Group, Rockwell International Corporation, Cedar Rapids, Iowa. Tasks 4 and 5 consisted of evaluating the acquired data and developing suggested changes to the current methods of computing warranty statistics.

The following conclusions were drawn from this study:

- . The computational methods outlined in the AN/ARN-118(V) RIW and MTBF Guarantee terms and conditions of Contract F19628-76-C-0144 are adequate for estimating field performance. The set MTBFs obtained with both the contractual and field computations are excellent; current estimates indicate that they exceed ultimate performance goals.
- . There is evidence that the need for accurate data recording on the R/T record card is not fully understood by AFB personnel.
- . The contractual method of estimating average operating time (AOT) is adequate for assessing field experience. The AOT differential between field readings and contractual computation was 6 percent.
- . The contractual method of estimating total operating hours (TOH) is adequate for assessing field experience. A difference of 12 percent between contractual and field computational approaches was observed.
- . During the TACAN build-up phase, the accuracy of the TOH estimate could be increased by using an improved technique for estimating N, the average number of installs.

- . The contractual method of estimating MTBF is adequate for assessing field experience. A difference of 12 percent between contractual and field computational approaches was observed.
- . Large differences in TACAN MTBF were noted between aircraft types.

The following recommendations are presented on the basis of the field visits and computational exercises:

- . The present contractual method of computation is adequate for estimating field performance and should not be changed for this program.
- . An alternate (averaging) approach for computing \bar{N} (average number of equipments installed over the measurement period) should be considered for use in future RIW procurements.
- . Each Air Force Base should be given a presentation outlining the rationale and objectives of a warranty procurement. Special emphasis should be placed on the need for accurate data recording.
- . It was evident from the field visits that not all Air Force Bases have adapted equally well to the warranty program. Bases showing evidence of excessive nonverified returns and/or exclusions and poor data recording should be assisted. This assistance could take the form of an educational presentation that would address use of tests, specifications, and equipment, as well as data requirements. This program would be similar to the one noted in the preceding recommendations, except that it would be structured to help only bases that already have the AN/ARN-118(V).
- . Careful consideration must be given in predicting future aircraft mixes since achieved MTBF differs significantly by aircraft type.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The U.S. Air Force plans to procure approximately 8,000 AN/ARN-118(V) TACAN sets through a basic buy and subsequent exercise of options from the Collins Avionics Group (CAG), of Rockwell International, Cedar Rapids, Iowa. This procurement, initiated in July 1975, is based on a development program and production phase that emphasized Reliability Improvement Warranty (RIW) concepts. As a result of that emphasis, the production contract contains extensive RIW provisions. Among the salient features of the RIW provisions are an agreement on guaranteed growth of mean time between failure (MTBF) and a contractual price adjustment based on operating hours.

Measurements of MTBF and operating hours have been considered major contractual issues by both the Government and the contractor. On the basis of the achieved MTBF and the utilization of the TACAN by the Air Force, contractual price adjustments may be made depending on the variations from the contractually specified goals.

This investigation into the divergence of MTBF values and the reading of operating hours was precipitated by the results of the TACAN IOT&E exercise (see References 1 and 2). ARINC Research monitored the TACAN during the IOT&E period and performed sample calculations of both average operating time (AOT) and MTBF. These calculations were performed in two ways: the first utilized elapsed-time-indicator (ETI) readings of all installed units, while the second method used ETI readings of the units returned to Collins. As shown in the final report of the ARINC Research investigation (Reference 2), the contractual computation method, based on the sample of units (24) returned to Collins, resulted in a contractually computed AOT higher than the actual AOT (2.241) hours per day versus 1.651 hours per day. Using these two different AOT figures in the MTBF computations resulted in a contractually estimated MTBF 41.7 percent higher than the MTBF calculated from the field data (771 hours versus 544 hours). Our report recognized that the sample size of 24 returned units was small and anticipated that the contractual method would provide a better indication of actual experience once a

larger quantity of returns was received. It was recommended that the Air Force continue to monitor these parameters to determine the adequacy of the contractual computations in gauging the actual performance being achieved.

1.2 STUDY OBJECTIVES

The objectives of this study are twofold:

- . Determine from field data whether the contractual computational approaches for MTBF, TOH, and AOT adequately estimate actual operational experience.
- . If a marked disparity was found, develop or suggest alternative computational methods.

In working to meet these objectives, the project team was able to observe during the field data collection visits other TACAN operations that have some bearing on the effectiveness of the RIW program. These observations are also presented in this report.

1.3 OVERVIEW OF WORK PERFORMED

The technical approach to achieving the goals of this investigation consisted of six tasks as described below.

1.3.1 Task 1: Develop a Data Accumulation and Evaluation Plan

The number of currently installed TACANS and the location of those TACANS throughout the Air Force Bases were identified. Then a plan of travel was outlined, and a formal plan for data gathering and evaluation was presented to the Air Force for approval.

1.3.2 Task 2: Obtain Data Needed to Determine the Actual Average Operating Time per Day for the Operational Fleet

Approved Air Force bases were visited for the physical reading of aircraft TACAN ETIs, flying hours, and installation data. Every effort was made to obtain the required information on as many TACANS as possible; however, 100 percent readings were not always possible because of unavailability of aircraft. In these cases, data forms were left with the individuals at the Air Force Bases for completion and return to ARINC Research. Since it was not possible under the contract to visit every TACAN base (of which there were 29), an Air Force data-gathering effort was initiated, with ARINC Research data forms being distributed to the balance of the bases by AFLC for completion and return to ARINC Research.

1.3.3 Task 3: Obtain Data Necessary to Determine the Computed Average Operating Time per Day for the Operational Fleet

Visits were made to Collins Avionics to obtain ETI readings, installed days, failure data, and other pertinent information that had been returned with failed units under the warranty. Two such visits were made, and in both case extensive data records were obtained from Collins.

1.3.4 Task 4: Analyze/Evaluate Data Obtained to Compute Actual and Contractually Computed Average Operating Time (AOT)

As outlined in the Data Accumulation and Evaluation Plan (Appendix A), the data from both sources were analyzed for the base level and aircraft generic type, as well as from a total fleet aspect; the analysis addressed not only AOT and TOH but also MTBF for the TACAN LRUs and set.

1.3.5 Task 5: Investigate Alternative Warranty Computation Methods

ARINC Research reviewed the computational methods and developed an alternate approach that more realistically accounts for N, the average number of equipments installed over an observation period.

1.3.6 Task 6: Prepare Reports and Briefings

Documentation of this effort was achieved through an Interim Letter Status Report recounting the experiences and observations of the data-gathering effort, this technical report, and a management brief for AFLC, presented on 3 March 1978.

1.4 REPORT ORGANIZATION

This report is organized into seven subject areas (chapters) as follows:

- . Chapter One presents the study background and objectives.
- . Chapter Two outlines the study approach.
- . Chapter Three presents illustrations of both the field and contractual computations. Comparative (field vs. contractual) computational results are shown for each of the eleven bases visited and for aircraft categories. Overall consolidated results are also presented.
- . Chapter Four is a discussion of the overall computational results for the USAF-submitted data.

- . Chapter Five presents the qualitative observations for the AN/ARN-118(V) TACAN program gathered during the base visits.
- . Chapter Six presents an alternative technique for computing the average number of installs per month (\bar{N}).
- . Chapter Seven provides the conclusions and recommendations of this study effort.

The following Appendixes are also included:

Appendix A - Data Accumulation and Evaluation Plan

Appendix B - Basic Field Data and Preliminary Calculations Prepared by ARINC Research

Appendix C - Basic Contractor (Collins Avionics Group) Data Collected by ARINC Research

Appendix D - Basic USAF-Submitted Data and Preliminary Calculations Prepared by ARINC Research

CHAPTER TWO

STUDY APPROACH

This investigation was approached in a manner that was consistent with the objectives of the contract, namely, to gather field and contractor data, evaluate these data, and, if necessary, develop alternative computational methods that would more accurately estimate the true MTBF of the TACAN. The following steps were taken to achieve those goals:

1. Determine the current distribution of AN/ARN-118(V) TACAN in the USAF fleet.
2. Identify the statistical information needed for a valid assessment of MTBF and AOT, while providing information that might be used in the event alternative computational methods were needed.
3. Develop a logical method of analysis for all data sets.
4. Develop a sampling plan to obtain the desired information, with maximum coverage of aircraft types and deployment locations.

Since it was necessary to define the individual actions as the study progressed and to explain the relationship between the above steps, a Data Accumulation and Evaluation Plan was written. This plan, reproduced in Appendix A to this report, outlines the ARINC Research contractual efforts. It will be used as a reference in this report to illustrate the approach to this study.

2.1 DETERMINATION OF TACAN DISTRIBUTION IN THE USAF FLEET

The previous ARINC Research experience with the AN/ARN-118(V) TACAN had concluded in December 1976 with a final report (Reference 2) under a TRACALS SPO Contract F19628-76-C-0053. This contractual effort involved not only the monitoring of the Collins TACAN from a warranty viewpoint but also a performance evaluation during the period of January through October 1976. During that period, approximately 50 TACANS were equally divided between 3 bases and 4 aircraft types as follows:

<u>Air Force Base</u>	<u>Aircraft Type</u>	<u>Number of TACANS</u>
Randolph AFB, TX	T-38	15
Castle AFB, CA	B-52/KC-135	8/7
Nellis AFB, NV	F-111	15

At the time of the preparation of the final report, the installation of the TACANS had begun to take place at a much more rapid rate. By March 1977, there were approximately 520 TACANS installed, with an additional 700 sets delivered to the Air Force. Of these sets (units provided under the initial buy and the exercise of the first option for additional units), the great majority were either awaiting installation or being held in bonded storage as spares.

On the basis of the events of the several previous months, a significant increase in the number of TACANS delivered to and installed by the Government was expected. To ascertain the exact number of installs and deliveries, ARINC Research contacted AFLC/LOM for a current distribution of the AN/ARN-118(V) TACANS in the fleet. Table 2-1, which was developed from information provided by AFLC, illustrates the known installs as of 2 September 1977. As the table shows, some 1102 TACANS were recorded as installed at that time in 8 aircraft types.

Table 2-1 provides an excellent starting point for identifying the TACAN numbers and locations. An analysis of Table 2-1 yielded the following observations:

- . The great majority of TACANS were on station within the CONUS. The trainer/fighter-attack and heavy cargo/bomber aircraft types represented roughly a 80/20 mix, with the former consisting mostly of T-38s, and the latter comprising of predominantly C-130s and B-52s.
- . While the aircraft types were dispersed throughout the CONUS, the TACAN population tended to be concentrated at a few bases for each aircraft type. For example, the B-52 TACAN population was distributed over 10 bases, with 3 bases comprising roughly 50 percent of the fleet. The same holds true for T-38s (4 bases with 71 percent), F-111s (3 bases with 99 percent), and C-130s (1 base with 88 percent).

While the estimated number of TACANS and their deployment were known to be constantly increasing, ARINC Research used the AFLC provided information as a starting point for its investigation. In light of the dynamic state of the program, a basic position taken with respect to those increasing numbers was that ARINC Research, whenever feasible within time and resources constraints, would identify and

Table 2-1. AN/ARN-118(V) DEPLOYMENT*

Base	State	T-38	A-10	A-7	F-111	VC-137	C-130	KC-135	B-52	Notes
Anderson (PACF)	Guam									
Andrews	MD					5			12	
Barksdale	LA								6	
Blytheville	AR				44				5	
Cannon	NM								20	B-52s are training.
Carwell	TX							7	18	
Castle	CA									
Columbus	MS	106								
Davis-Monthan	AZ		28				12+		9	+C-130s may be dual installs.
Dyess	TX									
Edwards	CA		2							
Eglin	FL				1					
England	LA			12						
Fairchild	WA								5	
Grand Forks	ND								3	
K.I. Sawyer	MI								4	+C-130s may be dual installs.
Little Rock	AR						92+			
Laughlin	TX	103								
March	CA								15	
Minot	ND								2	
Mountain Home	ID				77					
Myrtle Beach	SC		16	1						
Nellis	NV	8								
Randolph	TX	78								
Reese	TX	115								
Upper Heyford	England				74					
Vance	OK	93								
Williams	AZ	118								
Wurtsmith	MI								5	
Totals		621	52	13	196	5	104+	7	104	1102+

*Per AFLC/LOM 2 September 1977.

collect data on any additional (to the AFLC accounting) TACANs that might be encountered during field visits.

Therefore, with the physical scope of the TACAN population having been identified, the emphasis of the study was shifted to identifying the statistical information needed to properly assess TACAN equipment and warranty performance. This topic is the subject of Section 2.2

2.2 IDENTIFICATION OF STATISTICAL INFORMATION

2.2.1 TACAN Field Data Collection

A primary difference between field and contractual estimates of AOT, TOH, and MTBF is that field calculations are based on information obtained from all TACANs in the Air Force inventory, while the contractual information is drawn only from pieces of equipment that have been returned to the contractor because of failure or as a result of error, e.g., nonverified returns and exclusions.

To better organize and process the information from the "true" field environment, the data collection form shown in Figure 2-1 was developed.

2.2.1.1 Data Element Discussion

The data categories shown in Figure 2-1 are the basic elements needed to record TACAN field experience. Data elements such as install days are described in Columns C, F, and G. The Total Elapsed Time is determined by subtracting Collins ETI Read at Ship from Column E, ETI Reading. As a point of historical reference, as well as for use in determining Installed Days, Column H Date Read is also included.

Table 2-2 describes the data elements of Figure 2-1.

2.2.1.2 Contractual Data Collection

Collins receives information only on failed units or units returned for other reasons (nonverified returns and exclusions). The emphasis in the Collins data is on the number of failures, total elapsed times, total install days, and average number of installs, \bar{N} .

The data collection form for this information, presented in Figure 2-2, was used to show, for each base visited, each failure (by LRU serial number) and its classification. Also presented is the ETI reading upon receipt by Collins (ETI IN), and the ETI reading at the time of the original or previous Collins shipment (ETI Prior).

Table 2-2. ELEMENTS OF TACAN DATA COLLECTION FORM

- A. Aircraft Type - Trainer (T-38), fighter/attack (F-111, A-7, A-10) and bomber/cargo categories (C-130s, B-52s, KC-135s, VC-137s).
- B. Aircraft Tail Number - The military identification number of the aircraft in which TACAN is installed.
- C. R/T Record Card Information - A permanent card, affixed to the TACAN R/T, which contains information regarding install and removal dates. Multiple entries, if encountered, would document removals/installs for reasons other than failures. From this record, the number of install days is obtained.
- D. R/T Serial Number - Provides a means of tracking a specific piece of equipment through its lifetime.
- E. ETI Reading - Provides an accounting of actual operating time.
- F. Flying Hours at Install - Establishes a point of reference in establishing flying hour statistics.
- G. Flying Hours at Reading - Establishes a point of reference in establishing flying hour statistics.
- H. Date Read - Used to establish cut-off points of computations.
- I. Collins ETI Reading at Ship - Establishes initialization time for subsequent Air Force usage.
- J. Comments - Provided for any required special notes or comments.

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments

Figure 2-2. RETURNED UNITS FORM CPO F09603-77-A-3104

The difference between these two numbers, Δ ETI, yields the total operating time of the R/T. The next Column, Δ Install Days, yields the total period of calendar days during which the TACAN was installed in an aircraft as a working asset.

Identification of the statistical information required for the analysis of field and contractual data provided a base core of variables that could be analyzed and evaluated for purposes of computing MTBF, TOH, and AOT. The methods by which these variables were to be analyzed is the subject of Section 2.3.

2.3 DEVELOPMENT OF DATA ANALYSIS METHODS

Following identification of the types of aircraft in which the TACAN were installed, together the information needed to describe the field and contractual performance of the equipment, a method of analyzing the obtained data was developed.

The data analysis was completed for the following categories (as noted in the Data Accumulation and Evaluation Plan, Appendix A):

- . Air Force Base - 11 bases
- . Aircraft Type - T-38, T-39, A-10, A-7, F-111, VC-137, C-130, KC-135, B-52
- . Generic Type
 - .. Trainer: T-38, T-39
 - .. Fighter-Attack: A-10, A-7, F-111
 - .. Cargo/Bomber: VC-137, C-130, KC-135, B-52
- . Total Air Force Fleet (for the 11 bases visited)

For each of these categories, the following statistics would be calculated by both the field and contractual methods:

- . Total Operating Hours, TOH
- . Average Operating Time, AOT
- . Install Days
- . Average Number of Installed TACANs during the Measurement Period, \bar{N}
- . MTBF (by LRU and TACAN set)

2.4 DEVELOPMENT OF A SAMPLING PLAN FOR DATA COLLECTION

The Data Collection and Evaluation Plan (Appendix A) was developed as the outline for the contractual efforts in gathering and evaluating field and contractual data. As such, it guided the actual data collection activities.

The following factors influenced the development of the plan:

- . Since time and budget constraints did not permit measurement of all TACAN fleet data, the ARINC Research approach was to visit a limited number of bases and attempt to collect 100 percent of the TACAN data available at these bases.
- . Simple or stratified sampling of TACANS was not feasible since such methods would require travel to nearly all bases and in some cases might result in limited data collection (perhaps only a small percentage of TACANS would be available at the base).
- . Data would be collected from each type of aircraft that contains TACANS.
- . When an aircraft type is deployed at several bases, visits would be made to more than one base.
- . At each base visited, a maximum effort to read 100 percent of the TACAN data would be made. If aircraft were not available for reading, blank data forms would be left for completion and submittal to ARINC Research.
- . The Air Force, under the direction of AFLC/LOM, would collect TACAN data from sites not visited by ARINC Research and would supply these data to ARINC Research. The data would be used, to the extent possible, to extend the acquired data base.

Table 2-3 illustrates the proposed plan for the TACAN data collection. Of the 29 Air Force bases, 11 were chosen to be visited by ARINC Research, for the combination of reasons previously detailed. At these bases, 572 out of a population of 1,104 installs were projected to be read. (Two T-39s at Randolph had been identified following receipt of the 2 September list shown in Table 2-1). These readings would include a sampling of each of the 9 types of aircraft currently containing AN/ARN-118(V) TACANS.

Table 2-3. PROPOSED TACAN DATA COLLECTION PLAN

Air Force Base	City	State	TACAN Population by Aircraft Type												
			T-38	C-130	F-111	B-52	A-10	A-7	KC-135	VC-137	T-39	Totals			
Reese	Lubbock	TX	115												115
Laughlin	Del Rio	TX	103												103
Randolph	San Antonio	TX	78										2		80
Little Rock	Little Rock	AR		92											92
Mt. Home	Boise	ID			77										77
Carswell	Fort Worth	TX				20									20
Castle	Merced	CA				18				7					25
March	Riverside	CA				15									15
Davis-Monthan	Tucson	AZ						28							28
England	Alexandria	LA									12				12
Andrews	Washington	DC										5			5
(1) Total per aircraft type sampled			296	92	77	53	28	28	12	7	5	2	2		572
(2) Total aircraft per type			621	104	196	104	52	13	7	5	2	2			1,104
(3) Percent of installed TACANs sampled per aircraft type			48.0	88.0	39.0	51.0	54.0	92.0	100.0	100.0	100.0	100.0	100.0		---

Details of aircraft and TACAN distribution are as follows:

- . T-38 (621 installs). These aircraft were deployed at 7 sites. However, 3 sites in Texas have 296 (48 percent) of all T-38 installations. This was considered a compact arrangement that would minimize inter-base travel requirements.
- . T-39 (2 installs). These aircraft (2 planes) were deployed at Randolph AFB. No extra travel effort for obtaining these data was envisioned.
- . F-111 (196 installs). Significant numbers were deployed at Mountain Home, Idaho (77), and Upper Heyford, England (74). Inclusion of both sites would have imposed unacceptable travel requirements. Therefore, Mountain Home was selected, and these sets represented 39 percent of all F-111 installs at the time of observation.
- . B-52 (104 installs). The B-52 TACANS were deployed in rather small numbers (from 2 to 20) at 12 sites. The plan provided for visits to the 3 most populous bases (one in Texas and two in California), which contained 51 percent of the TACAN population at the time of observation.
- . Other Aircraft. For other types of aircraft, a visit was planned either to the sole base of deployment (VC-137 and KC-135) or to the base of greatest deployment (A-10, A-7, and C-130).

A total of 572 aircraft, or 52 percent of fleet installs, were scheduled to be visited under this plan. Lines (1) through (3) of Table 2-3 show other features of the plan. Line (1) shows the total number of each type aircraft to be sampled during the field visits. Line (2) shows the total install population for each aircraft type as of approximately 2 September 1977. Line (3) shows the percentage of total installs for each aircraft type proposed to be sampled during the field visits.

2.5 FIELD DATA COLLECTION SCHEDULE

Figure 2-3 illustrates the planned travel, the timing, and the individuals associated with the data collection for the TACANS. The actual field data collection efforts commenced on 3 October and were completed on 21 October, exactly as planned for the schedule of Figure 2-3. All bases scheduled were visited as noted. The actual dates and duration of each visit, however, were adjusted to accommodate work loads and Air Force Base operations.

Event	Individual	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Man Days
		S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
1. ANA to DEL RIO	All/Dallosta			●	▲																			8
2. DEL RIO to SAN ANT	All/Dallosta						●	▲																6
3. SAN ANT to LUB	All										●	▲												3
4. LUB to MAR	All																							3
5. MAR to SF	All																							2
6. SF to Boise	All																							4
7. Boise to ANA	All																							1
8. SAN ANT to TUC	Dallosta																							3
9. ANA to TUC	Bilodeau*																							3
10. TUC to ANA	Bilodeau																							1
11. TUC to DFW	Dallosta																							1
12. DFW to ALEX	Dallosta																							3
13. ALEX to LR	Dallosta																							4
14. LR to ANA	Dallosta																							1
15. ANA to WDC	Bilodeau																							1
																								44

● Travel

▲ End of Base visit

* Program Review with customer representative

ANA - Annapolis, MD

SAN ANT - San Antonio, TX (Randolph)

LAR - Laredo, TX (Laughlin)

LUB - Lubbock, TX (Reese)

TUC - Tucson, AZ (Davis-Monthan)

MAR - March AFB, Riverside, CA

SF - San Francisco, CA (Castle)

Boise - Boise, ID (Mt. Home)

DFW - Dallas, TX (Carswell)

ALEX - Alexandria, LA (England)

LR - Little Rock, AR (Little Rock)

WDC - Washington, D.C. (Andrews)

Figure 2-3. SCHEDULE OF TRAVEL, OCTOBER 1977

2.6 TACAN DATA COLLECTION (Actual)

As discussed previously in the Data Accumulation and Evaluation Plan, approximately 50 percent of the AN/ARN-118(V) TACANs were to be surveyed at 11 Air Force Bases and in 9 classes of aircraft. The actual field distribution as determined by the ARINC Research visits is shown in Table 2-4, which illustrates the number of installed TACANs by aircraft type and base. As an example, for the T-38s, three bases -- Reese, Laughlin, and Randolph -- had respective total installs of 91, 111, and 105. At these installations, the number of TACANs with usable readings were, respectively, 79, 111, and 72.

All data from these AF Bases were used in the computations except F-111 data, Mountain Home AFB. Base level computations for Mountain Home AFB, are shown in Table 3-1, Chapter Three, but for information purposes only. ALL F-111 aircraft observed at Mountain Home AFB were transfers from Nellis AFB. It could not be determined whether actual installs were made by Mountain Home or or some or all of the F-111s had AN/ARN-118(V) TACANs on arrival.

While Table 2-4 is similar to Table 2-3, there are several differences in categories; therefore, the table is explained in the following paragraphs.

Lines (1) through (5) provide additional statistical information. Line (1) shows that 764 TACANs were recorded as installed in the USAF bases visited, in contrast with the 572 installed TACANs that were planned to be read on the basis of the data of 2 September. The table shows that 307 TACANs were installed in T-38s, 2 in T-39s, 24 in A-10s, etc. Comparing line 1 of Table 2-4 with line 1 of Table 2-3 shows that T-38s, A-7s, F-111s, C-130s, and B-52s have, in some cases (especially in A-7s and C-130s), a significantly larger number of installs than expected.

Line (2) of Table 2-4 shows that 558 installed TACANs provided usable readings out of a possible 762 installs. There are three basic reasons for unavailability of aircraft: (1) flying schedules that prevented access to aircraft; (2) maintenance actions, such as fuel system repairs; and (3) especially in the B-52 fleet, the alert status, which imposed strict security procedures on those aircraft. As an example of the contents of line (2), and its relationship to line (3), 262 TACANs had usable readings out of a possible 307 installed in T-38s, for 85.3 percent of the total possible readings. For the T-39s, 1 of 2 (50 percent) and for the A-10s, 24 of 24 (100 percent) were read. The other aircraft statistics are presented in the same manner.

Line 4 yields a total (based on the bases visited) of 1296 installs. When compared with Table 2-3, line (2) of Table 2-4 shows that the A-7s had the largest increase in the number of TACANs installed.

Table 2-4. ACTUAL TACAN DATA COLLECTION PLAN (3-21 OCTOBER 1977)

Air Force Base	City	State	TACAN Population by Aircraft Type										Totals			
			T-38	C-130	F-111	B-52	A-10	A-7	KC-135	VC-137	T-39					
Reese	Lubbock	TX	79/91													79/91
Laughlin	Del Rio	TX	111/111													111/111
Randolph	San Antonio	TX	72/105												1/2	73/107
Little Rock	Little Rock	AR	92/173													92/173
Mt. Home	Boise	ID		45/94												45/94
Carswell	Fort Worth	TX			17/27											17/27
Castle	Merced	CA			16/25					5/7						21/32
March	Riverside	CA			14/15											14/15
Davis-Monthan	Tucson	AZ						24/24		16/19						40/43
England	Alexandria	LA								61/66						61/66
Andrews	Washington	DC										5/5				5/5
(1) Total TACANS Installed by Aircraft Type			307	173	94	67	24	85	7	2	764					
(2) Total TACANS Read by Aircraft Type			262	92	45	47	24	77	5	1	558					
(3) Percent of Installed TACANS Read (By Aircraft Type)			85.3	53.2	47.8	70.1	100.0	90.5	71.4	50.0	73.0					
(4) Estimate of Total TACANS			632	185	213	118	48	86	7	2	1296					
(5) Percent of Total Estimated TACANS Read			41.4	49.7	21.2	39.8	50.0	89.5	71.4	50.0	43.0					

Line (5) of Table 2-4 gives the individual percentages for the aircraft based on a total population (estimated from the information gained only at the Air Force Bases visited) of 1296 installed TACANS. As shown, the 262 TACANS read out of a possible (estimated) total of TACANS installed in T-38s (632) yields a percentage of 41.4 percent. For other aircraft, such as the A-7, 77 of the estimated 85 planes (90.5 percent) containing TACANS were read. For the total fleet, 558 of 1296 (estimated) TACANS could be read, yielding 43 percent.

CHAPTER THREE

COMPARISON OF FIELD AND CONTRACTUAL COMPUTATIONS

3.1 BACKGROUND

The primary objective of this study was to determine whether the contractual method of estimating average operate time (AOT), total operate hours (TOH), and mean time between failures (MTBF) for the AN/ARN-118(V) TACAN adequately reflects actual field experience for these parameters. As noted in the previous chapters, data were collected directly by visiting 11 Air Force bases (Appendix B) and the AN/ARN-118(V) manufacturer (Appendix C) to determine actual field performance.

This chapter presents results developed from these field data and the equivalent contractual computations.

3.2 BASIC DATA COLLECTION AND PROCESSING

The data represented in Appendixes B and C represent all field experience from "initial install" to "read" for each base.

3.2.1 Basic Field Data

The basic data were collected on the work sheet illustrated in Figure 2-2. The information was transcribed to the format shown in Appendix B, and preliminary calculations were made to develop the differences in ETI hours, install days, and flying hours. These data were supplemented by the Collins information presented in Appendix C. The sources for the entries are as follows:

<u>Column</u>	<u>Entry</u>
Column 1 Aircraft Type	Each base was identified, e.g., Andrews AFB Each aircraft was identified by direct observation.
Column 2 Aircraft Tail Number	Each aircraft tail number was identified by direct observation, with the exception of aircraft that were away from the base on temporary duty. For these aircraft, the data were received by phone message from the "away" base.

<u>Column</u>	<u>Entry</u>
Column 3 R/T Serial Number	Each R/T serial number was obtained by direct reading of the unit, with the exception noted previously.
Column 4 ETI Hours at Read	Each ETI was read directly from the R/T unit observed, with the exceptions noted previously.
Column 5 ETI Hours at Ship	With few exceptions, the ETI at shipment (from manufacturer) had to be obtained from the manufacturer's data documents as follows: <ul style="list-style-type: none"> Log 1 - Initial Delivery Record Log 2 - Subsequent Delivery Record Log 3 - Corrective Action Summary
Column 6 Δ ETI Hours	The Δ ETIs were computed by taking the difference between entries in Columns 4 and 5.
Column 7 R/T Record Card Install/Remove Dates	The install and remove dates were read directly from the cards attached to each R/T unit. In many instances, entries either had not been made or had been made incorrectly. In these cases, the Time Compliance Technical Order (TCTO) information was used to fill in or correct the install data. The TCTO records were usually the output from base computer programs.
Column 8 Date Read	The date of the observation was entered by the observer at the time of reading.
Column 9 Δ Install Days	The number of install days was computed by taking the difference between entries in Columns 7 and 8. In a few instances where removals were entered, the interval was taken from the install and remove dates.
Column 10 Flying Hours at Read	Flying hours at read were taken from the aircraft's Flying Hour Log and Maintenance Record. At Castle AFB, the flying hours were taken from a squadron-maintained record.
Column 11 Flying Hours at Install	Same source as for Column 10.

<u>Column</u>	<u>Entry</u>
Column 12 Δ Flying Hours	The Δ flying hours were computed by taking the difference between entries in Columns 10 and 11.

3.2.2 Manufacturer's Data

Other data required in the computations were collected from the TACAN manufacturer. These data, shown in Appendix C, address the units returned to the manufacturer, for test verification or repair, from the Air Force bases visited by the project team. Since these units were returned, their times could not be recorded at the bases visited. In addition, the manufacturer's records had to be studied to determine the number of valid failures (e.g., some units were classified as excluded or nonverified failures). Units classified as excluded or nonverified could not be used in determining failure totals. ETI and install days information, where entered on returned R/T units, were combined with other field data in the computations. The data shown in Appendix C include the following:

<u>Heading/Column</u>	<u>Entry</u>
Heading	The origin (AF Base) of each return is identified.
Column 1 Unit Description	These data were taken from the manufacturer's Log 3 (Corrective Action Summary): <ul style="list-style-type: none"> R/T - Receiver/Transmitter MX - Analog/Digital Converter MT - Mount Control - Control Box
Column 2 Serial Number	The serial number was taken from the manufacturer's Log 3 (Corrective Action Summary).
Column 3 Failure Classification	The failure classifications were taken from Log 3 (Corrective Action Summary): <ul style="list-style-type: none"> V - Verified failure NV - Nonverified failure EXC - Exclusion

Heading/Column

Entry

Column 4 ETI In	The ETI In is the ETI reading of a returned R/T unit when it is received by the manufacturer. These entries were taken from Log 3 (Corrective Action Summary). In some instances, Repair Data Sheets (RDS) developed by the manufacturer were used to check Log 3 entries.
Column 5 ETI Prior	The prior ETI indication represents the hours recorded on an R/T ETI when the unit previously left the manufacturer's documents: Log 1 - Initial Delivery Record Log 2 - Subsequent Delivery Record Log 3 - Corrective Action Summary
Column 6 Δ ETI	The ETI interval was computed by taking the difference between the entries of Columns 4 and 5.
Column 7 Δ Install Days	The number of days from actual install to read/remove days for a returned R/T were obtained from Log 3 (Corrective Action Summary).
Column 8 Comments	Column 8 carries any special notation that helps clarify the previous entries; e.g., in some cases no entries are made since no failures were returned to the manufacturer.

3.3 ILLUSTRATIVE BASE-LEVEL COMPUTATIONS

3.3.1 Field Computations

Randolph Air Force Base is chosen to illustrate the field computation procedures. In the field computation, data read from the base visits are used and the AOT, TOH, and MTBF calculated. The basic data collected and used in this illustration are presented in Appendixes B and C.

3.3.3.1 Field Average Operating Time (AOT) Computation
Total Operate Hours

The sum of the Δ ETI hours taken from Randolph AFB (Appendix B) was as follows:

$$\Sigma \Delta \text{ ETI} = 27,618$$

obtained by summing all Δ ETIs (Column 6, Appendix B). While

installed TACANs totaled 91, not all installs could be read since aircraft were not available. As a consequence, only 80 of the total 91 installs could be used in the computation. Since it was necessary to estimate the total AFB operation, the actual readings were extrapolated as follows:

$$\begin{aligned} \text{Extended Operate Hours (Randolph AFB)} &= 27,618 \text{ hours (actual)} \times \\ &\frac{91 \text{ Total Installs}}{80 \text{ Usable Reads}} = 31,415.5 \text{ hours} \end{aligned}$$

Note: The operate hours noted above cover the period from the initial install (31 December 1975) to the date of read (October 7-11, 1977).

This does not represent the total operate hours over the time interval (December 1975 through October 1977). The operate hours for units returned to the manufacturer for verification or repair also represent activity for the Randolph AFB aircraft fleet. These times were added to the direct reads to complete the total operate time. Thus for R/Ts operating at Randolph but returned to Collins,

$$\Sigma \Delta \text{ ETIs} - 7374 \text{ hours}$$

These data were taken from the R/T return records (Sum of Δ ETIs, Column 6, Appendix C - Randolph AFB).

In this case, all ETI readings could be used. If it had been necessary, the operating (ETI) hours would have been extended, using the ratio of total R/T returns to the number of actual reads.

$$7374 \text{ ETI} \times \frac{31 \text{ Total R/T returns}}{31 \text{ Reads}} = 7374 \text{ hours}$$

This figure was then added to the Extended Operate Hours at the base, i.e.,

$$\begin{aligned} \text{Total Operate Hours} &= 31,415.5 \text{ hours} + 7374.0 \text{ hours} \\ &= 38,789.5 \text{ hours} \end{aligned}$$

Sum of Install Days

The sum of the install days for TACANs at Randolph AFB (Appendix B) was as follows:

$$\Sigma \Delta \text{ Install Days} = 19,187 \text{ days}$$

This total was arrived at by summing all Δ Install Days (Column 9, Randolph AFB, Appendix B). The install days were extended in a manner identical to the ETIs.

Extended Install Days (Randolph AFB) = 19,187 install days x

$$\frac{91 \text{ Total Installs}}{75 \text{ Reads}} = 23,280.2 \text{ install days}$$

As with the ETI information, it is necessary to agument the install day information to include R/Ts returned from Randolph to Collins. Install days from the returned R/Ts were computed by summing the Δ Install Days (Column 7, Appendix C, Randolph AFB).

$$\Sigma \Delta \text{ Install Days} = 3459 \text{ install days}$$

The install days data were extended in the same manner as noted for the ETIs:

$$3459 \text{ Install Days} \times \frac{31 \text{ Total R/T Returns}}{24 \text{ Reads}} = 4467.9 \text{ total install days}$$

Thus the total installed days are 23280.2 + 4467.9 or 27748.1.

Field Average Operate Time (AOT)

The field AOT was computed as follows:

$$\frac{\text{Total Operate Hours}}{\text{Total Installed Days}} = \frac{38789.5 \text{ hours}}{27748.4 \text{ days}}$$

$$\text{AOT} = 1.3979 \text{ operate hours per install day}$$

3.3.1.2 Total Field Operate Hours TOH)

The field TOH for Randolph AFB over the observation interval (December 1975 through October 1977) is the sum of the ETI hours, or 38789.5 hours as noted previously.

3.3.1.3 Field Mean Time Between Failures (MTBF)

The field MTBFs for each subunit of the TACAN set were computed on the basis of the number of returns as follows:

31 R/Ts
13 Converters
1 Mount
14 Controls

Out of the 31 R/Ts, 3 were classified as nonverified and one was an exclusion. As a consequence, 27 valid R/T failures returned were used to compute MTBF:

$$\text{Field MTBF R/T} = \frac{38789.5 \text{ Total Operate Hours}}{27 \text{ Valid Failures}} = 1436.6 \text{ hours}$$

$$\text{Field MTBF Converter} = \frac{38789.5 \text{ Total Operate Hours}}{13 \text{ Valid Failures}} = 2983.5 \text{ hours}$$

$$\text{Field MTBF Mount} = \frac{38789.5 \text{ hours}}{1 \text{ Valid Failure}} = 38789.5 \text{ hours}$$

$$\text{Field MTBF Control} = \frac{38789.5 \text{ Operate Hours} \times 2 \text{ Controls/set}}{14 \text{ Valid Failures}} = 5541.4 \text{ hours}$$

$$\text{Field MTBF Set} = \frac{1}{\frac{1}{1436.6 \text{ hours}} + \frac{1}{5541.4 \text{ hours}} + \frac{1}{2983.8 \text{ hours}} + \frac{1}{38789.5 \text{ hours}}} = 808.1 \text{ hours}$$

The same field (base level) computational approach for the other bases was performed in an identical manner. The basic data can be reviewed in Appendixes B and C. A Summary of Base Level results can be seen in Table 3-1.

3.3.2 Contractual Computations

The equivalent computations for the AOT, TOH, and MTBFs in the contractual approach are based on the ETI hours and install days of returned R/T units only (Appendix C) (only the R/T unit has ETI and install/remove data recorded on a card attached to the front of the unit). In addition, extension of these data to reflect total install operation must be computed in a different manner.

The following subsections provide an example of the contractual computation, again using Randolph AFB data.

3.3.2.1 Contractual Average Operate Time

The contractual AOT is computed as follows:

Table 3-1. BASE COMPARISON COMPUTATIONS SUMMARY (FIELD VS. CONTRACTUAL)

Base	Computation Method	AUT (per day)	TOH	MTBF R/T	MTBF MT	MTBF MX	MTBF Control	MTBF Set	Population
Laughlin	Field	1.4416	11,657.1	1,457.1	5,828.6	1,942.9	23,314.2	706.5	111 Total Inst. / 111 ETIs & 111 In-Day Reads
	Contractual	1.8705	20,044.3	2,505.5	10,022.2	3,340.7	40,088.6	1,214.8	8 Valid R/T Returns
Randolph	Field	1.3979	38,789.5	1,436.6	38,789.5	2,983.8	5,541.4	808.1	91 Total Inst. / 80 ETIs & 75 In-Day Reads
	Contractual	1.6138	51,463.0	1,906.0	51,463.0	3,958.7	7,351.9	1,072.1	27 Valid R/T Returns
March	Field	1.3732	1,816.7	1,816.7	No Fails	No Fails	No Fails	1,816.7	15 Total Inst. / 14 ETIs & 15 In-Day Reads
	Contractual	1.0000	1,357.2	1,357.2	No Fails	No Fails	No Fails	1,357.2	1 Valid R/T Returns
Castle	Field	2.4846	20,935.4	1,395.7	No Fails	20,935.4	No Fails	1,308.5	25 Total Inst. / 16 ETIs & 16 In-Day Reads
	Contractual	2.6911	28,483.0	1,898.9	No Fails	28,483.0	No Fails	1,780.2	15 Valid R/T Returns
England	Field	1.1183	2,255.8	No Fails	No Fails	No Fails	No Fails	No Fails	65 Total Inst. / 61 ETIs & 61 In-Day Reads
	Contractual	----	----	No Fails	No Fails	No Fails	No Fails	No Fails	No R/T Returns
Carswell	Field	1.5976	3,006.6	1,002.2	No Fails	No Fails	No Fails	1,002.2	27 Total Inst. / 15 ETIs & 17 In-Day Reads
	Contractual	3.7143	8,663.4	2,887.8	No Fails	No Fails	No Fails	2,887.8	3 Valid R/T Returns

(continued)

Table 3-1. (continued)

Base	Computation Method	AOT (per day)	TOH	MTBF R/T	MTBF MT	MTBF MX	MTBF Control	MTBF Set	Population
Little Rock	Field	1.9190	54,361.8	3,624.1	No Fails	7,770.0	No Fails	2,471.4	173 Total Inst. / 73 ETIs & 73 In-Day Reads
	Contractual	2.1532	59,841.2	3,989.4	No Fails	8,548.7	No Fails	2,720.0	15 Valid R/T Returns
Reese	Field	1.5160	51,428.6	1,978.0	51,428.6	4,675.3	34,285.8	1,302.0	105 Total Inst. / 71 ETIs & 63 In-Day Reads
	Contractual	1.3074	43,546.9	1,674.9	43,546.9	3,958.8	29,031.3	1,102.5	26 Valid R/T Returns
Andrews	Field	1.1384	1,069.0	No Fails	No Fails	No Fails	1,069.0	1,069.0	5 Total Inst. / 5 ETIs & 5 In-Day Reads
	Contractual	No R/T Fails	No R/T Fails	No Fails	No Fails	No Fails	No Fails	No Fails	No R/T Returns
Davis-Monahan	Field	1.3422	9,976.1	1,425.2	No Fails	1,995.2	9,976.1	767.4	43 Total Inst. / 39 ETIs & 40 In-Day Reads
	Contractual	0.7727	6,001.0	857.3	No Fails	1,200.2	6,001.0	461.6	7 Valid R/T Returns
Mountain Home	Field	0.7252	13,020.0	No Fails	No Fails	2,604.0	No Fails	2,604.0	94 Total Inst. / 45 ETIs & 44 In-Day Reads
	Contractual	No R/Ts	Returned	----	----	----	----	----	No R/T Returns

Sum of ETIs (operate time)

$$\Sigma \text{ ETIs} = 5582 \text{ hours taken from returned R/Ts only} \\ \text{(sum of } \Delta \text{ ETIs, Column 6, Appendix C, Randolph AFB)}$$

NOTE: Only ETI hours that have a corresponding install-day entry can be used.

Sum of Install Days

$$\Sigma \text{ Install Days} = 3459.0 \text{ days taken from the returned R/Ts} \\ \text{only (sum of } \Delta \text{ install days,} \\ \text{Column 9, Appendix C, Randolph AFB)}$$

NOTE: Only install days that have a corresponding ETI entry can be used.

Then

$$\text{AOT} = \frac{\text{Sum of ETI}}{\text{Sum of Install Days}} \\ = \frac{5582 \text{ Operate Hours}}{3459 \text{ Install Days}} = 1.6138 \text{ operate hours per install day}$$

3.3.2.2 Total Contractual Operate Hours (TOH)

The contractual TOH computation is as follows:

$$\text{TOH} = D \times \text{AOT} \times \bar{N}$$

where

AOT = 1.6138 operate hours per install day as computed above

D = Number of days in the observation period taken from the date of the initial install to the day of the read.

For Randolph AFB:

Initial Install - 31 December 1975

Last day of read - 12 October 1977

Interval = 652 days

\bar{N} = Average number of TACANS installed over the observation period

and

$$\bar{N} = \frac{\sum_{i=1}^M n_i}{M}$$

n_i = Cumulative TACANS installed by month

M = Total months of observation

NOTE: The manufacturer received monthly from the USAF the number of installs for a given month. The number of installs in a given month is the number installed as of the last day of that month.

For the Randolph AFB example*:

1975	1976										
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1 install	+ 12	+ 12	+ 15	+ 15	+ 15	+ 15	+ 15	+ 15	+ 15	+ 15	+ 24
1977											
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	12th
N= + 66	+ 83	+ 85	+ 85	+ 85	+ 85	+ 85	+ 86	+ 86	+ 90	+ 90	
22.39 months											

where 22.39 months of observation =

22 months + 12 days/31 days in Oct = 22.39 mos.

\bar{N} = 48.91 average installs per month

$$TOH = D \times AOT \times \bar{N}$$

= 652 days X 1.6138 hour/install day X 48.91 average installs

= 51463.0 Total Operate Hours

3.3.2.3 Contractual Mean Time Between Failures (MTBF)

The contractual MTBFs are computed in much the same way as those for the field except that in this approach the TOH as computed above is used:

*The cumulative value of TACANS installed at Randolph AFB by month was taken from References 1-5, Appendix B, and information provided by the Base Time Compliance Technical Order (TCTO).

Contractual MTBF R/T	$\frac{51463.0 \text{ hours}}{27 \text{ valid failures}} = 1906.0 \text{ hours}$
Contractual MTBF Converter	$= \frac{51463.0 \text{ hours}}{13 \text{ valid failures}} = 3958.7 \text{ hours}$
Contractual MTBF Mount	$= \frac{51463.0 \text{ hours}}{1 \text{ valid failure}} = 51463.0 \text{ hours}$
Contractual MTBF Control	$= \frac{51463.0 \text{ hours} \times 2 \text{ Controls per set}}{14 \text{ valid failures}} = 7351.9 \text{ hours}$
Contractual MTBF Set	$= \frac{1}{\frac{1}{1906} + \frac{1}{3958.7} + \frac{1}{51463.0} + \frac{1}{7351.9}} = 1072.1 \text{ hours}$

The contractual computations for other Air Force bases are performed in a similar manner. Basic data used can be found in Appendixes B and C. The results are summarized in Table 3-1.

3.4 ILLUSTRATIVE COMPUTATIONS BY PLATFORM TYPE

3.4.1 Field Computations

In addition to computations made at the base level, the data were integrated to reflect the following:

Computations (AOT, TOH, MTBFs) by:

- . Trainers (T-38, T-39)
- . Heavy Platforms (B-52, KC-135, VC-137, C-130)
- . Attack (A-7, A-10)*

*NOTE: F-111 data for Mountain Home AFB were not included in the integration (see Section 2.6)

- . All aircraft at the 11 bases visited

A computation using the heavy platform type aircraft will be used as an illustration. The basic data are from the same sources as noted in the base-level illustration, i.e., Appendixes B and C. In addition, the results of the base-level computation (Table 3-1) are used to complete the integration computation. The illustrative computation is presented in the following subsections.

3.4.1.1 Field Average Operating Time (AOT) Computation (B-52, KC-135, VC-137, C-130 Aircraft)

The total (ETI) operating hours and install days for each AFB responsible for the heavy aircraft are obtained from Table 3-1 and Appendix B for March AFB (B-52), Carswell AFB (B-52), Little Rock AFB (C-130), Andrews AFB (VC-137), and Castle AFB (B-52, KC-135).

Field	March	Carswell	Little Rock	Andrews	Castle
AOT	1816.7 hrs.	+ 3006.6 hrs	+ 54361.8 hrs.	+ 1069.0	+ 20935.4
Heavy Platform	1323.0	+ 1881.9	+ 28327.7	+ 939.0	+ 8426.0
	Inst. Days	Inst. Days	Inst. Days	Inst. Days	Inst. Days

Field
AOT = 1.9852 Operate Hours per install day
Heavy Platform

3.4.1.2 Field Total Operating Hours (TOH) (B-52, KC-135, VC-137, C-130 Aircraft)

The TOH is the sum of the (ETI) operating hours for the bases noted above:

Field	=	March	Carswell	Little Rock	Andrews	Castle
TOH		1816.7 hrs	+ 3006.6 hrs	+ 54361.8 hrs	+ 1069.0 hrs	+ 20935.4 hrs.
Heavy Platform						

Field
TOH = 81189.5 Operating Hours
Heavy Platform

3.4.1.3 Field Mean Time Between Failure (MTBF) (B-52, KC-135, VC-137, C-130 Aircraft)

The MTBFs for the heavy platform aircraft are computed by using the TOHs for the bases noted. The basic data sources are Appendixes B and C, from which these computations have been developed.

Field
 MTBF R/T = $\frac{81189.5 \text{ operating hours}}{34 \text{ Valid R/T failures}} = 2387.9 \text{ hours}$
 Heavy Platform

Field MTBF
 Converter = $\frac{81189.5 \text{ operating hours}}{8 \text{ valid converter failures}} = 10148.7 \text{ hours}$
 Heavy Platform

Field MTBF
 Mount = No Valid Failures
 Heavy Platform

Field MTBF
 Control Box = $\frac{81189.5 \text{ operating hours}}{1 \text{ valid failure}} = 81189.5 \text{ hours}$
 Heavy Platform

Field MTBF
 Set = $\frac{1}{2387.9 \text{ hrs (R/T)}} + \frac{1}{10148.7 \text{ hrs (Conv.)}} + \text{N.F. (Mt.)} + \frac{1}{81189.5 \text{ hrs (Control Box)}} = 1888.1 \text{ hrs}$
 Heavy Platform

3.4.2 Contractual Computations

3.4.2.1 Contractual Average Operating Time (AOT) Computation (B-52, KC-135, VC-137, C-130 Aircraft)

The total (ETI) operating hours and install days for each base responsible for the heavy aircraft are obtained from Table 3-1 (contractual entries). It is again noted that the operating hours and install days in this computation are based only on R/Ts returned to the manufacturer.

The following entries (contractual) were developed from data in Appendix C (Note: Only data were used that have both an Δ ETI and corresponding Δ Install Day entry):

Contractual	March	+ Carswell	+ Little Rock	+ *Andrews	+ Castle
AOT	= 6 hrs	+ 74 hrs	+ 506 hrs	+ -	+ 4295 hrs.
Heavy Platform	6	20	235		1595
	Inst. days	+ Inst. days	+ Inst. days	+ -	Inst. days

*NOTE: there were no returned R/Ts from Andrews AFB.

Contractual
 AOT = 2.630 operating hours per install day
 Heavy Platform

3.4.2.2 Contractual Total Operating Hours (TOH) (B-52, KC-135, VC-137, C-130 Aircraft)

The total operating hours are taken from Table 3-1 for the base/ aircraft of interest.

$$\begin{array}{l} \text{Contractual} \\ \text{TOH} \\ \text{Heavy Platform} \end{array} = \begin{array}{l} \text{March} \\ 1357.2 \text{ hrs} \end{array} + \begin{array}{l} \text{Carswell} \\ 8663.4 \text{ hrs} \end{array} + \begin{array}{l} \text{Little Rock} \\ 59841.2 \text{ hrs} \end{array} + \begin{array}{l} \text{Andrews} \\ \text{(No re-} \\ \text{turned R/Ts)} \end{array} + \begin{array}{l} \text{Castle} \\ 28483.0 \end{array}$$

$$\begin{array}{l} \text{Contractual} \\ \text{TOH} \\ \text{Heavy Platform} \end{array} = 98344.8 \text{ operating hours}$$

3.4.2.3 Contractual Mean Time Between Failure (MTBF) (B-52, KC-135, VC-137, C-130 Aircraft)

The MTBFs for the heavy platform aircraft are computed from the TOHs developed in Subsection 3.4.2.2. The failure data are taken from Appendix C.

$$\begin{array}{l} \text{Contractual} \\ \text{MTBF R/T} \\ \text{Heavy Platform} \end{array} = \frac{98344.8 \text{ operating hours}}{34 \text{ valid R/T failures}} = 2892.5 \text{ hours}$$

$$\begin{array}{l} \text{Contractual} \\ \text{MTBF Converter} \\ \text{Heavy Platform} \end{array} = \frac{98344.8 \text{ operating hours}}{8 \text{ valid converter failures}} = 12293.1 \text{ hours}$$

$$\begin{array}{l} \text{Contractual} \\ \text{MTBF Mount} \\ \text{Heavy Platform} \end{array} = \text{No Valid Failures}$$

$$\begin{array}{l} \text{Contractual} \\ \text{MTBF} \\ \text{Control Box} \\ \text{Heavy Platform} \end{array} = \frac{98344.8}{1 \text{ valid failure}} = 98344.8 \text{ hours}$$

$$\begin{array}{l} \text{Contractual} \\ \text{MTBF Set} \\ \text{Heavy Platform} \end{array} = \frac{1}{\frac{1}{2892.5 \text{ hrs (R/T)}} + \frac{1}{12293.1 \text{ hrs (Conv.)}} + \text{N.F. (Mt.)} + \frac{1}{98344.8 \text{ hrs (Control)}}$$

$$\begin{array}{l} \text{Contractual} \\ \text{MTBF Set} \\ \text{Heavy Platform} \end{array} = 2287.1 \text{ hours}$$

A summary of computational results for the three aircraft categories can be seen in Table 3-2. Computations for the "Trainer" and "Attack" categories were performed in the same manner as for the "Heavy Platform".

3.5 GRAND TOTAL (ALL AIRCRAFT) COMPUTATIONS

The Grand Total* computations were performed in the same manner as the aircraft categories, except that all data were used in the computation. The Grand Total Computation results can be seen in Table 3-3. The data sources from which the computations were developed are identical to those noted previously.

3.6 DISCUSSION - FIELD VS. CONTRACTUAL COMPUTATIONS

Table 3-1, 3-2, and 3-3 represent the comparative results for the three levels of computation, i.e., by base, aircraft type, and total. Data were collected from eleven Air Force Bases and the manufacturer by field engineers. The "field" computations noted in the tables are the results of computations using these data. The "contractual" computations were developed primarily from records taken from the TACAN manufacturer's warranty logs. The average number of installs per month (\bar{N}) was obtained through data collected from the various Air Force Bases (install data from R/T record cards and TCTO information). The \bar{N} , although obtained through base visits, was used in (and only in) the "contractual" computation.

As noted previously, the primary objective of this study was to determine whether the contractual method of estimating AOT, TOH, and MTBF adequately reflected actual field performance. The following sections present a comparison between the field results and the contractual approach.

Comparisons have been developed for three levels of aggregations -- Base, Aircraft Type, and Total.

3.6.1 Field vs. Contractual Computations - Base Level

Table 3-1 breaks out the computational results for the eleven bases visited. The field computations are shown with the equivalent contractual results for each of the bases. It is noted that computations for Mountain Home AFB are in Table 3-1. These results should be viewed with some reservations for the following reasons:

*As is noted in Table 3-2, there were substantial differences in AOT, TOH, and MTBF between aircraft categories. This suggests that each category may be from statistically different populations and data should not be consolidated into a single data set since they are nonhomogeneous. The grand total computation is done here to develop a quantitative measure that can be compared with the existing contractual methods.

Table 3-2. COMPUTATION SUMMARY BY AIRCRAFT GROUPS (FIELD VS. CONTRACTUAL)

Aircraft Type	Computation	AOT	TOH	MTBF R/T	MTBF MT	MTBF MX	MTBF Control	MTBF Set	Population
T-38	Field	1.4650	101,875.2	1,670.1	25,468.8	3,395.8	11,319.5	979.6	307 Total Inst. / 262 ETIs & 249 ID Reads
	Contractual	1.4933	115,054.2	1,886.1	28,763.6	3,835.1	12,783.8	1,106.3	61 Valid R/T Returns
C-130 B-52 KC-135 VC-137	Field	1.9852	81,189.5	2,387.9	No Fails	10,148.7	81,189.5	1,888.1	245 Total Inst. / 123 ETIs & 126 ID Reads
	Contractual*	2.630	98,344.8	2,892.5	No Fails	12,293.1	98,344.8	2,287.1	34 Valid R/T Returns
A-7 A-10	Field	1.2944	12,231.9	1,742.4	No Fails	2,446.4	12,231.9	940.9	108 Total Inst. / 100 ETIs & 101 ID Reads
	Contractual**	0.7727	6,001.0	857.3	No Fails	1,200.2	6,001.0	461.6	7 Valid R/T Returns

*VC-137 data not included (no returned R/T fails) in Contractual Computation.

**F-111 data not included (no transfer information from Nellis AFB).

Table 3-3. COMPUTATION SUMMARY BY ALL AIRCRAFT (FIELD VS. CONTRACTUAL)

All Aircraft	Base		ACT	TOH	MTBF R/T	MTBF MT	MTBF MX	MTBF Control	MTBF Set	Population
	Field	Contractual								
	1.6290	1.7244	195,296.6	219,400.0	1,914.7	48,824.2	4,541.8	14,858.6	1,204.5	660 Total Inst. / 485 ETIs & 471 In-Day Reads
			219,400.0	2,150.9	54,850.0	5,102.3	16,722.2	1,353.3	102 Valid R/T Returns	

- . All install reads at Mountain Home AFB were on planes transferred from Nellis AFB. There is a gap of approximately one year in data. (The initial installs were made at Nellis AFB starting in February 1976. The Mountain Home TCTO shows compliance starting in March 1977).
- . It could not be determined whether actual installs were made by Mountain Home on planes transferred from Nellis AFB or some (or all) of the F-111s had AN/ARN-118(V)s on arrival.

As a consequence, the Mountain Home AFB data were not included in aircraft category computations (Table 3-2) or the Grand Total (Table 3-3).

3.6.1.1 AOT and TOH Comparison

The AOTs and TOHs at the Base Level of Comparison (Table 3-1) indicate variations in both numerical value and orientation. In some instances contractual values are higher and in others they are lower than the corresponding field computations.

The variations should be expected on the basis of large differences in operating hours between bases and the variation in the number of R/T units returned from each base that were used to calculate contractual hours.

To facilitate comparisons between field and contractual AOTs and TOHs, Table 3-4 and Figure 3-1 were developed. Table 3-4 presents, for each AF Base visited, the ratios between:

$$\frac{\text{AOT (Contractual)}}{\text{AOT Field}}$$

and

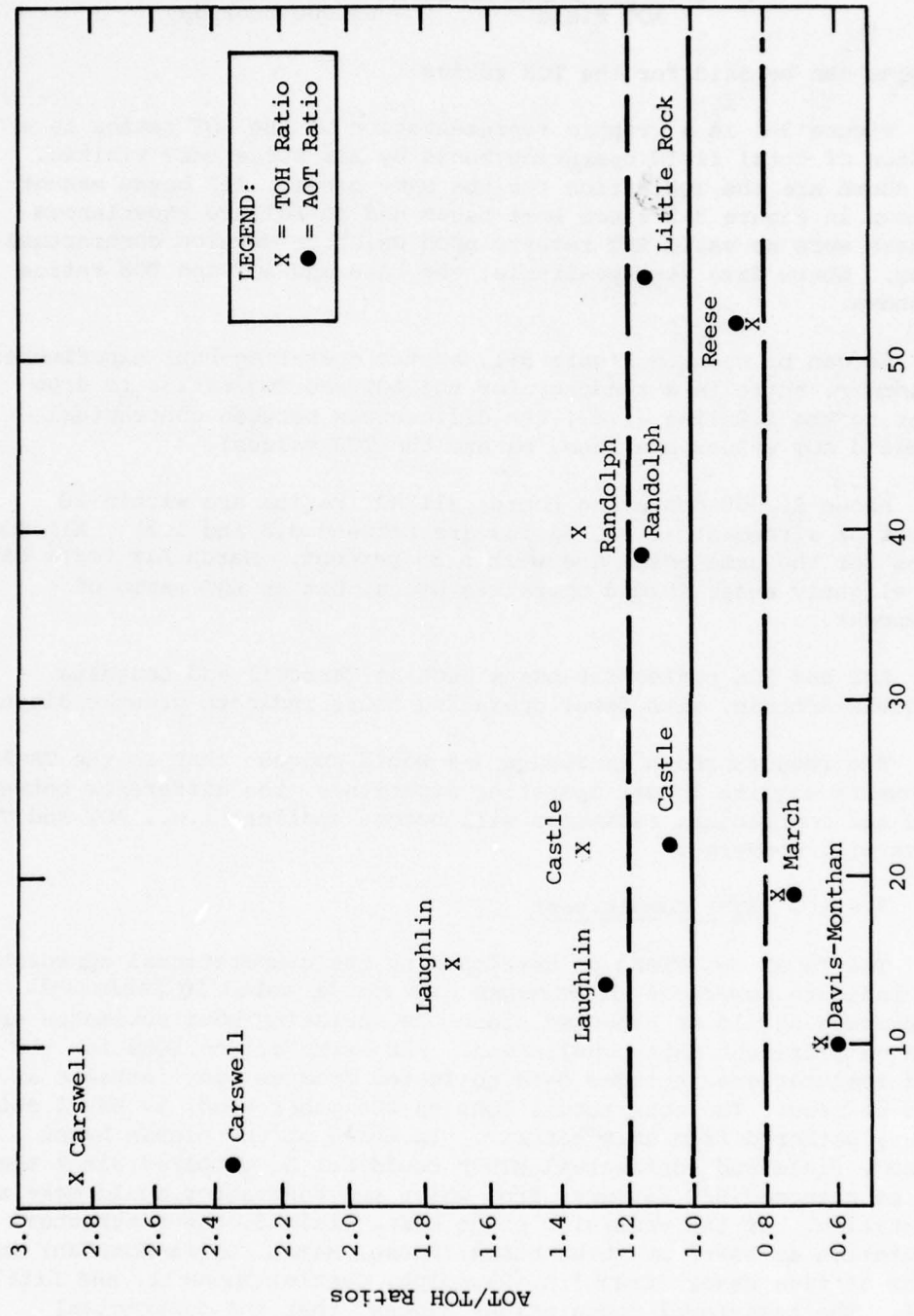
$$\frac{\text{TOH (Contractual)}}{\text{TOH (Field)}}$$

Other data shown in Table 3-4 were taken from Table 3-1 and repeated in Table 3-4 for the convenience of the reader.

If the field and contractual computations yielded identical results, the AOT ratios should be equal to 1.0; e.g.,

Table 3-4. BASE LEVEL RATIO DISTRIBUTION FOR AOT/TOH/MTBF

Base	Number R/T Returns	AOT Contractual	AOT Field	Ratio: AOT-Cont. AOT-Field	TOH Contractual	TOH Field	Ratio: TOH-Cont. TOH-Field	Contr. Set MTBF	Field Set MTBF	Number of Failures
Laughlin	8	1.8705	1.4816	1.2625	20,044.3	11,657.1	1.7195	1,214.8	706.5	17
Randolph	27	1.6138	1.3979	1.1544	51,463.0	38,789.5	1.3267	1,072.1	808.1	55
Reese	26	1.3074	1.5160	0.8624	43,546.9	51,428.6	0.8467	1,102.5	1,302.0	41
Andrews	0	No R/T Fails	1.1384	-	No R/T Fails	1,069.0	-	No R/T Fails	1,069.0	1 Control
Castle	15	2.6911	2.4846	1.0831	28,483.0	20,935.4	1.3605	1,780.2	1,308.5	16
Carswell	3	3.7143	1.5976	2.3249	8,663.4	3,006.6	2.8815	2,887.8	1,002.2	3 R/T
Little Rock	15	2.1532	1.9190	1.1220	59,841.2	54,361.8	1.1008	2,720.0	2,471.4	22
March	1	1.0000	1.3732	0.7282	1,357.2	1,816.7	0.7471	1,357.2	1,816.7	1 R/T
Davis-Monthan	7	0.7727	1.3422	0.5757	6,001.0	9,976.1	0.6015	461.6	767.4	13
England	0	No R/T Fails	1.1183	-	No R/T Fails	2,255.8	-	No Fails	No Fails	0
Mountain Home	0	No R/T Fails	0.7252	-	No R/T Fails	13,020.0	-	No R/T Fails	2,604.0	5 Converters



Field Total Operating Hours (Thousands)

Figure 3-1. RATIO DISPERSION FOR AOT/TOH

$$1.0 = \frac{\text{AOT (Contractual)} = 55,000 \text{ hour/day}}{\text{AOT Field} = 55,000 \text{ hour/day}}$$

The same can be said for the TOH ratios.

Figure 3-1 is a graphic representation of the AOT ratios as a function of total field operating hours by Air Force Base visited. Also shown are the TOH ratios for the same bases. All bases cannot be shown in Figure 3-1 since some bases had no failure experiences or there were no valid R/T returns upon which to develop contractual ratios. Where data were available, the base and AOT and TOH ratios are shown.

As can be seen in Figure 3-1, as the operating-hour experiences are longer, there is a tendency for the AOT and TOH ratios to draw closer to the 1.0 line (i.e., the differences between contractual and field AOT values are less, as are the TOH values).

Above 20,000 operating hours, all AOT ratios are within 20 percent of agreement (i.e., ratios are between 0.8 and 1.2). All TOH ratios for the same bases are within 35 percent. March Air Force Base, with slightly under 20,000 operating hours, has an AOT ratio of 73 percent.

AOT and TOH ratios for bases such as Carswell and Laughlin and Davis-Monthan, with fewer operating hours indicate greater dispersion.

The results shown in Figure 3-1 would suggest that as the TACAN equipments acquire longer operating experience, the difference between field and contractual estimates will become smaller; i.e., AOT and TOH ratios will converge.

3.6.1.2 MTBF Comparisons

The TACAN Set MTBFs as developed by the computational approaches also indicate numerical differences, as can be noted in Table 3-1. Such differences should be expected since the operating hour estimates are based on different data populations. For example, the TOHs for the field computations included data collected from as many installs as could be read. The contractual TOH, on the other hand, is based only on data gathered from unit returns. In three of the eleven bases visited, field and contractual MTBFs could not be compared since there were no returned R/T failures from which the contractor could make a computation. Of the remaining eight bases visited, the contractual computation is lower at three bases (Reese, March, Davis-Monthan) and higher at five bases (Laughlin, Randolph, Castle, Carswell, and Little Rock). The base-level computations suggest that the contractual method is more often higher than the field estimate.

Figure 3-2 shows $\frac{\Delta \text{ MTBF Hours}}{\text{Field MTBF}}$ in terms of both R/T failures and total field operate hours by base. The Δ MTBF is the absolute difference in hours between the field and contractual MTBFs. The field MTBF, since it is the best estimate of performance, is used in the denominator to complete the ratio. The R/T failures shown in Figure 3-2 as the vertical axis are closely associated with the goodness of the contractual MTBF estimate since they are the only source of operate hours and install days that the contractor has. The number of R/T failures is the same for both the contractual and field estimates. On the other hand, the field TOH is closely associated with the field MTBF estimate.

As can be seen in Figure 3-2, as the operating-hour experience increases (and the number of failures increases), the ratio tends to decrease. Therefore, Figure 3-2 indicates that the differences between computational methods decrease as operational experience is accumulated. At bases where there are relatively few operating hours, the contractor (based on data from returned R/Ts) must estimate from small samples. Thus, there will be greater differences reflecting sampling variations. At bases where there are greater operating experiences, the computational methods move numerically closer together. As more TACANs are installed or operating hours increase, the MTBF differences should be smaller than those shown in Figure 3-2.

3.6.2 Field vs. Contractual Computations - Aircraft Categories

The computational methods were also compared after grouping of aircraft by type. The aircraft were categorized as noted in Table 3-2. Since the Mountain Home AFB data (F-111) were not included, for the reasons previously noted, the third category involves only attack types (A-7, A-10). Unfortunately, the TACAN experiences for these aircraft were not extensive (particularly for the contractual computations, which were based on a sample of 187 operating hours and 7 valid returns).

3.6.2.1 AOT and TOH Comparison

Table 3-5 and Figure 3-3 present a comparison of the field and contractual estimates of AOT and TOH. Table 3-5 presents the ratios as follows:

$$\frac{\text{AOT (Contractual)}}{\text{AOT (Field)}}$$

and

$$\frac{\text{TOH (Contractual)}}{\text{TOH (Field)}}$$

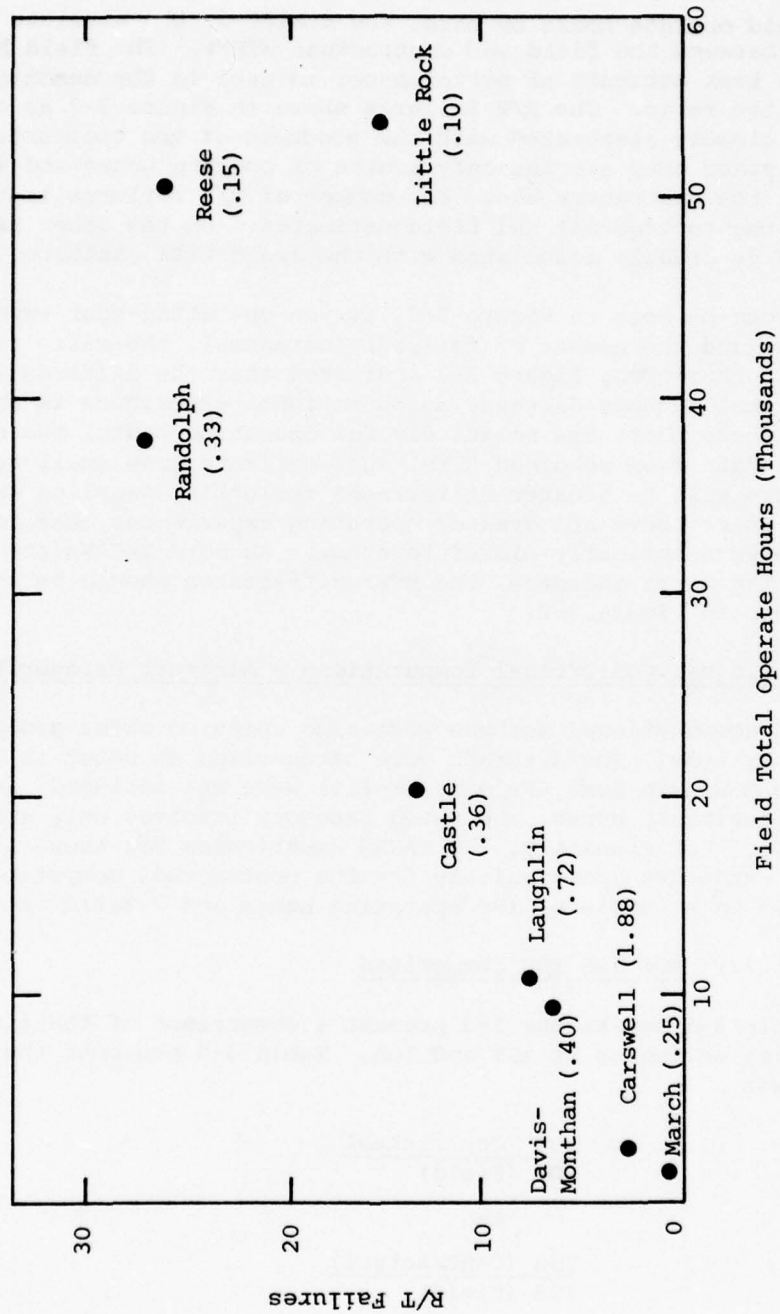


Figure 3-2. $\frac{\Delta \text{MTBF HOURS}}{\text{FIELD MTBF}}$ AS A FUNCTION OF R/T FAILURES AND TOH AT BASE LEVEL

The basic data were drawn from AOT and TOH computations shown in Table 3-2 and reproduced in Table 3-5 for the convenience of the reader. The ratios of Table 3-5 are computed from those values. As for the base-level comparisons, a ratio of 1.0 would indicate that the AOT and TOH field and contractual estimates were identical (no differences). As with the base-level comparison, there are differences between computational approaches due to differences in the data upon which the estimates are based. As more operating hours are accumulated, there are more unit returns on which the contractor bases his estimates. We should therefore expect to see closer agreement between the field and contractual estimates as the operating hours increase.

The results shown in Figure 3-3 indicate convergence between AOT and TOH estimates as operating hours are accumulated. As the data base increases (more hours and subsequently more returns), the contractor is in a better position to estimate actual field performance.

3.6.2.2 MTBF Comparison

Differences in the field MTBFs and contractually estimated MTBFs were also indicated (Table 3-2). In one case (Attack category) the contractual MTBF is lower than the field equivalent. In the other two categories (Trainer and Heavy Platform) the contractual MTBF (Set) is higher than the field value.

Table 3-6 presents MTBF percentage differentials for MTBF by Air Force Base and consolidated by aircraft categories. It shows that percentage differentials by base scored as high as 71.9 percent. The Trainer category differentials obtained by consolidating the bases was only 17.8 percent.

The Heavy Platform differentials ranged from a low of 10 percent up to 188 percent. The consolidated differential was 20.9 percent.

The attack/fighter differential was handicapped by a lack of failure experience. The consolidated differential in this case was also the base figure since Davis-Monthan was the only base with return data.

Figure 3-4 is a plot of Δ MTBF Hours/Field MTBF in terms of both R/T failures and total operate hours by aircraft categories. The interpretation of Figure 3-4 is the same as for the base level (Figure 3-2). As can be noted in Figure 3-4, the greater the accumulation of operating experiences, the smaller the percentage difference between computational methods. As the operate-hours for each category increase, the computational methods converge. As more TACANS are installed and more operate hours are generated, the MTBF differences between the computational methodologies should be smaller than those shown in Figure 3-4.

Table 3-5. AOT & TOH RATIOS BY AIRCRAFT CATEGORY

Aircraft Category	Field AOT	Contractual AOT	Ratio: $\frac{\text{AOT-Contr.}}{\text{AOT-Field}}$	TOH Field	TOH Contr.	Ratio: $\frac{\text{TOH-Contr.}}{\text{TOH-Field}}$	R/T Returns
Trainer	1.4650	1.4933	1.0193	101,875.2	115,054.2	1.1294	61
Heavy Platform	1.9852	2.630	1.3248	81,189.5	98,344.8	1.2112	34
Attack	1.2944	0.7727	0.597	12,231.9	6,001.0	0.4906	7

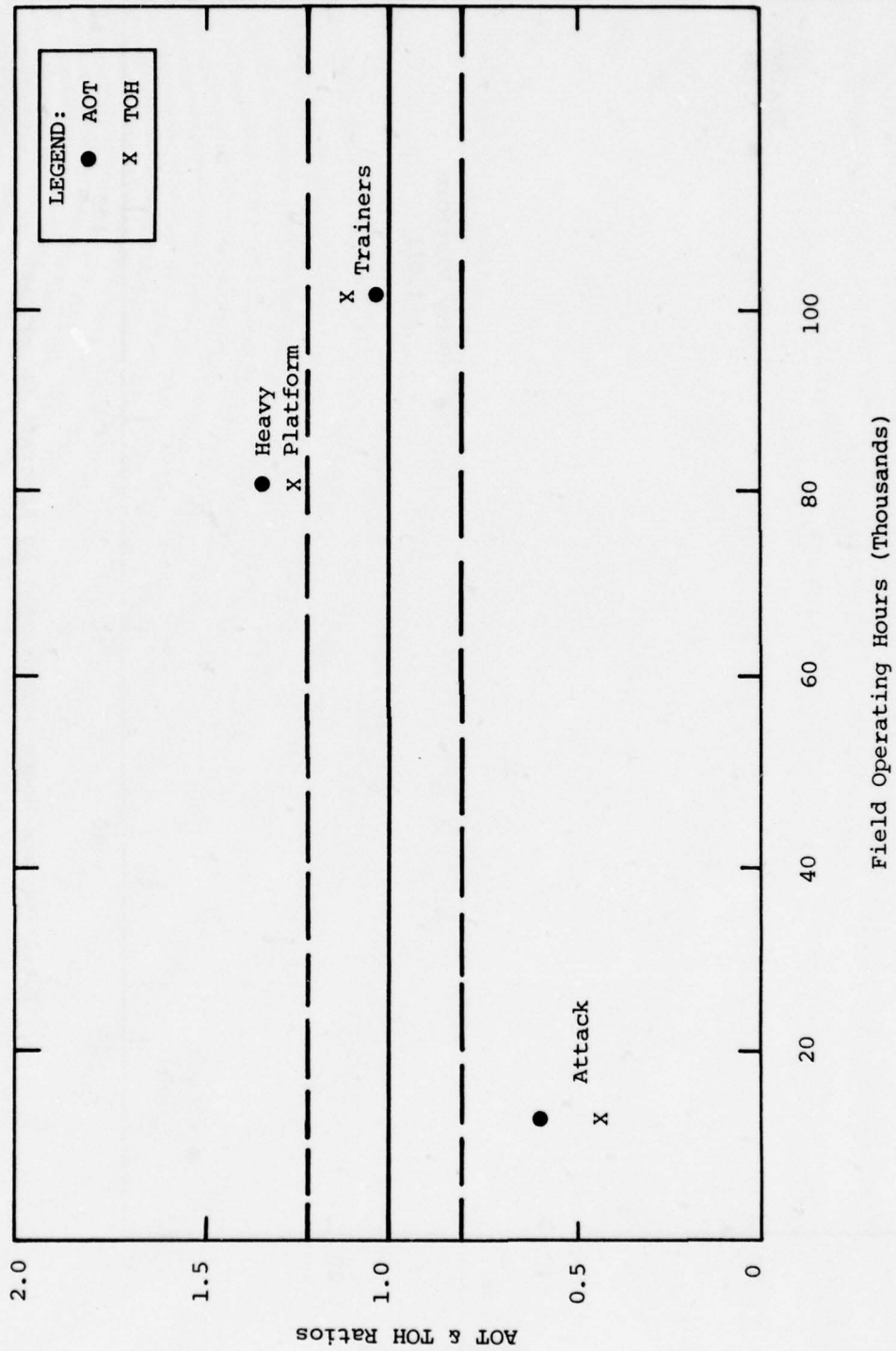
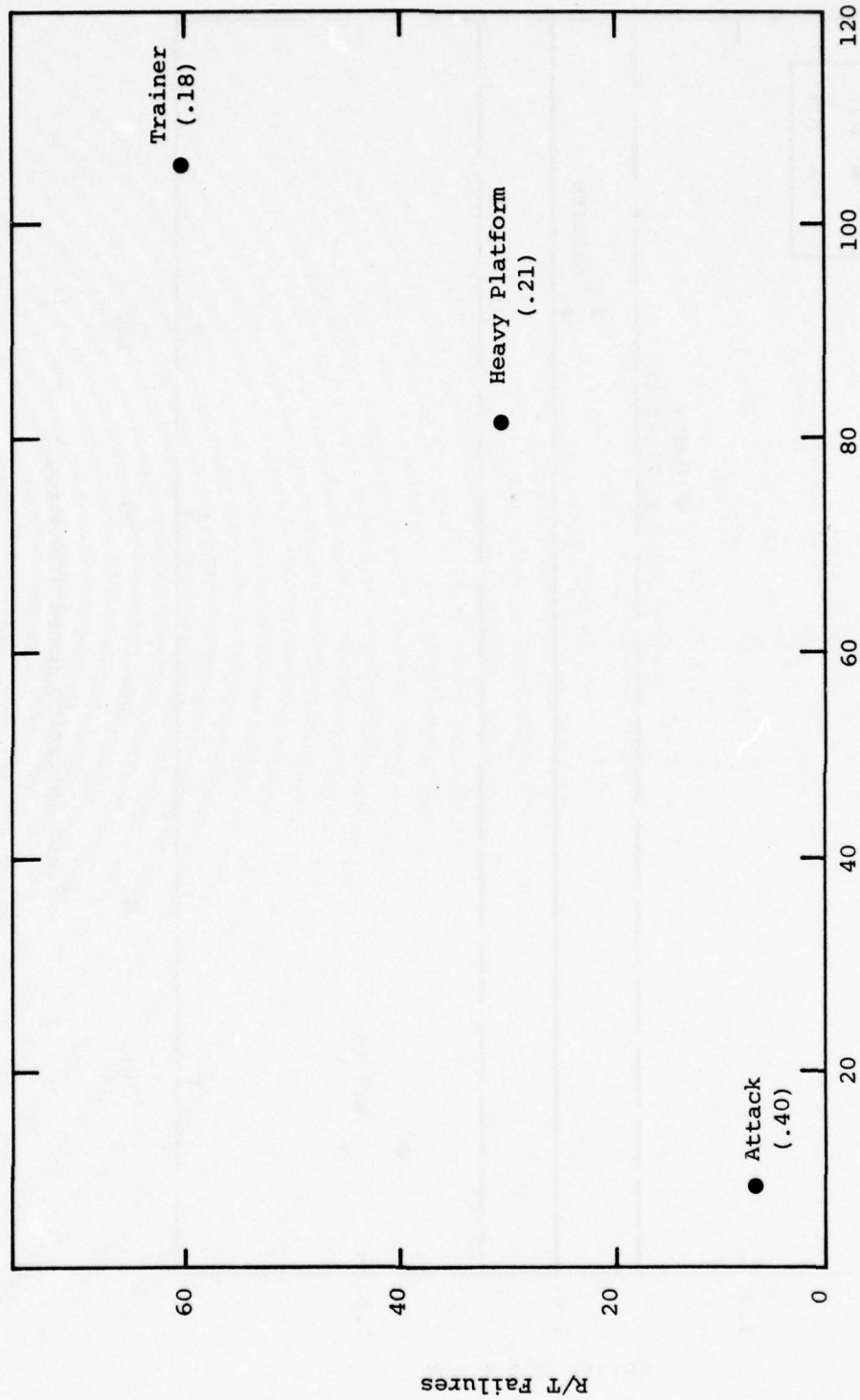


Figure 3-3. PLOT OF AOT AND TOH RATIOS BY AIRCRAFT CATEGORY



Total Operate Hours (Thousands) by Aircraft Categories

Figure 3-4. $\frac{\Delta \text{MTBF}}{\text{FIELD MTBF}}$ FOR R/T FAILURES AND TOH BY AIRCRAFT CATEGORY

Table 3-6. MTBF PERCENT DIFFERENTIALS BY AIRCRAFT CATEGORY

Air Force Base	Aircraft Type	Percent Difference MTBF Field - Contractual	Percent Difference MTBF Field - Contractual
Trainer			
Laughlin	T-38	71.9	17.8
Randolph	T-38, T-39	32.7	
Reese	T-38	15.3*	
Heavy Platform			
Andrews	VC-137	No contractual computations - No returns	20.9
Castle	B-52, KC-135	36.0	
Carswell	B-52	188.0	
Little Rock	C-130	10.0	
March	B-52	25.3*	
Attack/Fighter			
Davis-Monthan	A-7, A-10	39.9*	39.9*
England	A-7	No contractual computations - No returns	
Mountain Home	F-111	No contractual computations - No returns	
*Contractual MTBF differential less than the field value.			

3.6.3 Grand Total Comparison

When all data are consolidated (Table 3-3), the AOT, TOH, and Set MTBF are as follows:

- . The difference between field and contractual AOTs is 0.0954 hours. The percentage of difference is less than 6 percent:

$$\frac{0.0954}{1.6290}$$

- . The difference between field and contractual TOHs is slightly over 24,000 hours. The percentage of difference is approximately 12 percent:

$$\frac{24103.4}{195296.6}$$

- . The 6 percent, 12 percent, and 12 percent values are within the ranges that could be expected from a sampling-type approach. Thus it is concluded that the contractual methods are satisfactory estimates of field performance.

3.7 TREND ANALYSIS

During the October 1977 field trips, it was not possible to collect operating time data (ETI readings) that would reflect incremental monthly operating hours. Since the ETI meter is a cumulative mechanism, readings during the field visits represented cumulative operating times. If the data could have been collected in such a fashion, it would have been possible to present comprehensive trends in AOT, TOH, and MTBF over the TACAN field implementation period.

It is possible, however, to make several comparisons by using the data in References 1 through 5. These reports were prepared under a previous study of the AN/ARN-118(V) -- primarily during the IOT&E program for that equipment.

Table 3-7 summarizes TACAN field and contractual computation results for the initial six months of AN/ARN-118(V) field operations. Equivalent contractual computations are also shown for the reporting periods indicated. The total consolidated results from the October 1977 field visits (also shown in Table 3-3) are reproduced in Table 3-7 for comparison purposes.

Table 3-7. AN/ARN-118(V) AOT, TOH AND MTBF TRENDS

Month	Type of Computation	AOT	Set TOH	MTBF Set	TACAN Population
January through February 1976	Field.	1.441*	1,712.0	190.0	Average 20 installations/month
	Contractual	1.955	2,346.0	271.8	
January through March 1976	Field	1.470*	3,651.0	260.8	Average 27.3 installations/month
	Contractual	2.433	6,052.0	464.3	
January through May 1976	Field	1.486*	7,772.0	389.0	Average 34.4 installations/month
	Contractual	2.360	12,340.0	655.0	
January through June 1976	Field	1.470*	9,658.0	439.0	Average 36.1 installations/month
	Contractual	2.630	15,221.0	732.0	
January 1976 through end of October 1977 visits	Field	1.652	199,554.7	1,204.5	485 ETI 471 Ins. Day Reads
	Contractual	1.724	219,400.0	1,353.3	102 Valid R/T Returns

*AOT computed from average number of installations, number of days in period and total operate hours (reported by field).

As can be seen in Table 3-7, there is a general trend toward closing of differentials between the October 1977 data set and the January-June 1976 results. For example, the AOT differential between field and contractual computations is approximately 0.1 hour as compared with 0.5 to more than 1.0 hour for previous months. The MTBFs also exhibit a similar trend.

Since the basic populations for each data set are increasing, the differentials between the initial program months and the October data can be better seen in Figures 3-5, 3-6, and 3-7. Figure 3-5 presents the differences between field and contractual AOT computations. For example, in January-February 1976 there was a difference of 36 percent, computed as follows:

$$\begin{array}{r} 1.955 \text{ AOT (contractual computation)} \\ \underline{1.441 \text{ AOT (field)}} \\ 0.514 \text{ hour} \div 1.441 = 0.36, \text{ or } 36 \text{ percent} \end{array}$$

NOTE: The field AOT for the initial months was computed from the average number of installs in the reporting period, days in the period and operating hours reported by the field. The January-October 1977 AOT was based on actual readings of install times and ETIs.

Percentages ranged from 26 percent to 79 percent over the initial reporting periods. In contrast, the final differential based on October field readings was only 6 percent.

Figure 3-6 shows TOH percentage differences between computational methods. The ratios in the initial months are relatively constant. Again, however, there is a large drop in the January 1976 - October 1977 value. The percentage differences for the TOH during the initial months ranged from 37 percent to 66 percent. The final differential ratio dropped to 12 percent.

Figure 3-7 shows MTBF percentage differences between computational methods. The ratio for the Set MTBF during the initial months ranged from 37 percent to 66 percent. The ratio for the final reporting period, however, dropped to only 12 percent.

The dramatic decreases in contractual-to-field ratios for AOT, TOH, and MTBF between reporting periods strongly suggest that the contractual computations are converging with field computations as actual field usage increases.

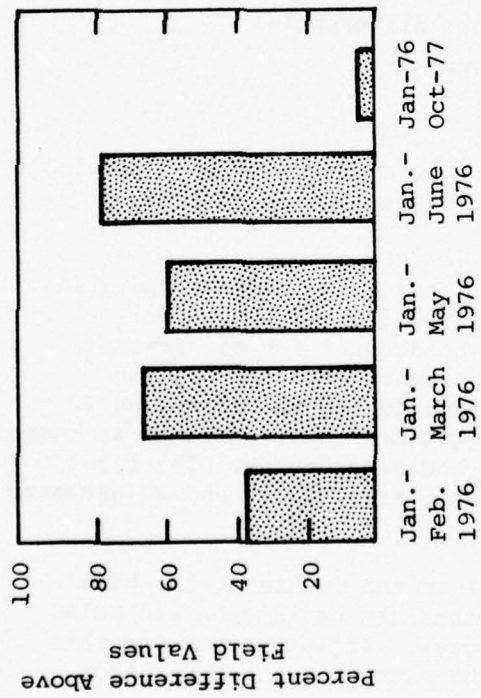


Figure 3-5. AOT COMPARISON

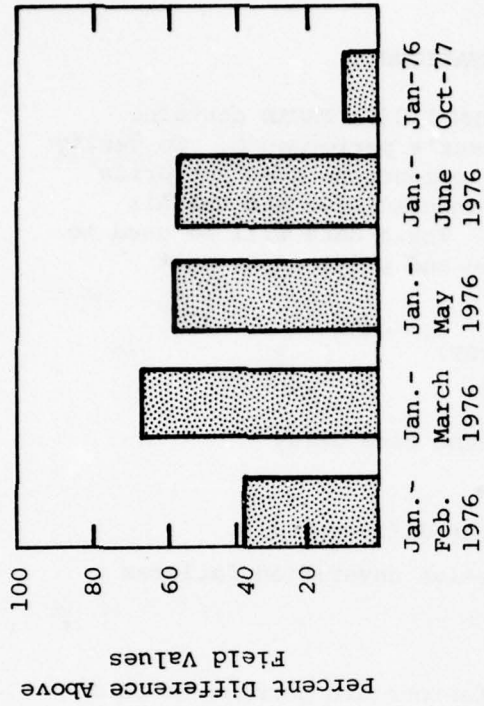


Figure 3-6. TOH COMPARISON

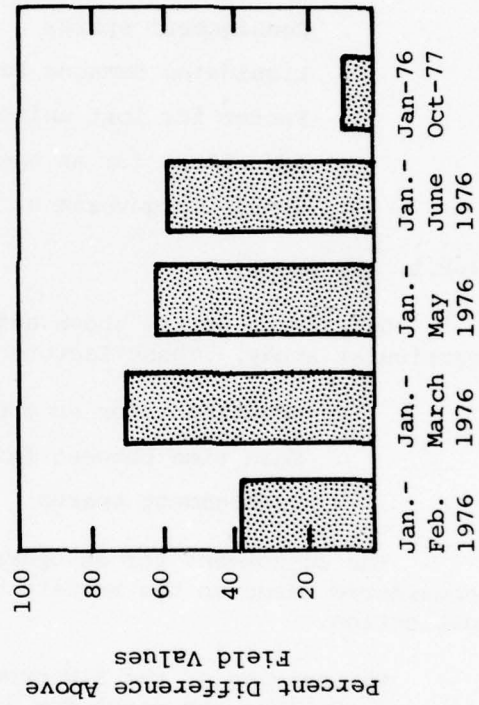


Figure 3-7. SET MTBF COMPARISON

3.8 IMPACT - FIELD VS. CONTRACTUAL COMPUTATIONS

The production contract for the AN/ARN-118(V) TACAN contains provisions for evaluation of the manufacturer's performance. To verify achievement of contractual goals and make appropriate contract price adjustments, it is necessary for both the manufacturer and the Air Force to collect large quantities of data. These data will be used to quantify the following contract performance and price-adjustment factors:

- . Mean time between failures (MTBF)
- . Consignment spares
- . Liquidated damages for turnaround time delay
- . Factor for lost units
- . Adjustment for an operating hour differential
- . Charge to government for excessive unverified failures

3.8.1 AOT Impact

Only three of the above adjustment factors are germane to this particular study. These factors are:

- . Adjustment for an operating hour differential
- . Mean time between failures (MTBF)
- . Consignment spares

The adjustment for an operating hour differential will be initially considered based on the results of the ARINC Research field data collection.

The pricing of the RIW provision is based on an average operating time of 68 hours per month for installed R/T units. The contract provides that the price shall be adjusted to account for significant deviations (greater than plus or minus 5 percent) from the 68-hour standard. The readings of R/T units returned during the preceding 12 months are used to estimate total operating time. This estimate is compared with the expected average operating time of 68 hours per month. The first adjustment period will be 16 April 1977 to 16 April 1978, and adjustments will be made every 12 months thereafter.

Since the adjustment period is still in the future at the time of the document, computation will be hypothesized based upon the ARINC Research field AOT (1.6290 hours/install-day). It is assumed for this computation that this AOT value will be the same that the contractor

will use to assess operating hours over the 16 April 1977 to 16 April 1978 period. Further assume that the average monthly number of installs over this period will be 1500 TACANS.

The anticipated average operating time (AOT) per the contract is as follows:

$$\begin{aligned} T_{68} &= \text{R/T operating time over the 12 month} \\ &\quad \text{period based on a 68 hour-per-month} \\ &\quad \text{average} \\ &= 12 \text{ months} \times 68 \text{ hours/month} \times 1500 \text{ average installs} \\ &= 1,224,000 \text{ hours} \\ T_{\text{ETI}} &= \text{estimated R/T unit operating time based} \\ &\quad \text{on the field AOT} \\ &= 1.6290 \text{ hours/install-day} \times 365 \text{ days/yr} \times \\ &\quad 1500 \text{ average installs} \\ &= 891,877.5 \text{ hours} \end{aligned}$$

The operating-time price adjustment is then calculated as follows:

If $0.95 T_{68} \geq T_{\text{ETI}} \leq 1.05 T_{68}$, there would be no adjustment.

For $T_{\text{ETI}} < 0.95 T_{68}$, the downward price adjustment would be equal to $\$0.50 \times [(0.95 \times T_{68}) - T_{\text{ETI}}]$, with a downward limit of $\$200 \times \bar{N}$ for any 12-month period.

For $T_{\text{ETI}} > 1.05 T_{68}$ the upward price adjustment would be equal to $\$0.50 \times [T_{\text{ETI}} - (1.05 \times T_{68})]$.

In this example, T_{ETI} equals 891,877.5 hours which is less than $0.95 T_{68}$; therefore a price adjustment would be computed as follows:

$$\begin{aligned} &\$0.50 \times [(0.95 \times T_{68}) - T_{\text{ETI}}] \text{ with a downward limit of} \\ &\$200 \times \bar{N} \text{ for any 12 month period.} \\ &= \$0.50 [1,162,800 - 891,877.5] \\ &= \$135,461.25^* \text{ decrease in contract price} \end{aligned}$$

*NOTE: This is hypothetical only. It is based on the assumptions noted previously.

If the contractual value for AOT (1.7244 hours/install-days) had been used there would have been a smaller decrease in contract price (i.e., less advantage to the USAF).

$$T_{68} = 1,224,000 \text{ hours}$$

$$T_{ETI} = 1,7244 \text{ hours/install-day} \times 365 \text{ days/yr} \times 1500 \text{ average installs}$$

$$= 944,109 \text{ hours}$$

$$\$0.50 [(0.954 T_{68}) - T_{ETI}]$$

$$= \$0.50 [1,162,800 - 944,109]$$

$$= \$109,345.50 \text{ decrease in contract price.}$$

3.8.2 MTBF Impact

The manufacturer guarantees that each type of nomenclature unit or line-replaceable unit (LRU) will achieve a mean time between failures (MTBF) such that the TACAN set's MTBF is equal to or greater than the following values:

	<u>Calendar Periods</u>	<u>MTBF</u>
Period 1:	17 April 1977 - 16 April 1978	500 hours
Period 2:	17 April 1978 - 16 April 1979	625 hours
Period 3:	17 April 1979 - 16 April 1981	800 hours

The contract was awarded on 16 July 1975. The calendar periods listed above are based on the following: 33 months after award of contract (MAC) (end of period 1), 45 MAC (end of period 2), and 69 MAC (end of period 3). For the guarantee evaluation, MTBF is defined as the total operating hours that were accumulated during the period by all TACAN sets in the active government inventory divided by the total number of relevant verified failures of all such sets during the period. The contract provided for computing the MTBF every six months, with the initial computation covering the period 16 April 1977 through 16 October 1977.

As was noted in Table 3-3, the set MTBF using as a basis, either the field or contractual values was well in excess of all the MTBF objectives including the Period 3 target of 800 hours.

3.8.3 Consignment Spares

The contract provides that in the event a unit's (LRU) measured MTBF is shorter than the guaranteed unit MTBF, the contractor shall furnish, at no additional cost, pipeline unit spares according to the following formula:

$$n = (AXS) - Sp, \text{ rounded to next highest whole number}$$

where

n = maximum number of consignment spares

Sp = quantity previously loaned and retained by the government

A = calculated number defined as follows:

$$A = \frac{G}{M} - 1 \text{ (if greater than 1.0, A shall be redefined to be equal to 1.0; if negative, A shall be redefined to be zero)}$$

G = guaranteed MTBF value for the unit

M = measured unit MTBF

S = a target spares level based on the percentage of the average number of installed sets over the measurement period. S is defined to be equal to $P \times \bar{N}$, where P is as specified below for each of the nomenclatured units:

<u>Unit</u>	<u>Percentage P (S = P X \bar{N})</u>
R/T	15.3
Converter	6.0
Control	2.6
Mount	2.5

The contract provides that the consignment-spares adjustment shall be computed for the same periods as the MTBF calculations. The first computation will therefore cover the period 17 April 1977 through 16 October 1977, and computations will be made every six months thereafter.

The following computation is used to illustrate the potential impact. For this illustration the field MTBFs noted in Table 3-3 will be used (CAUTION: the contractor bases his assessment on all R/T

returns from all bases. The values used in this example are only for the ARINC Research field sample for the period 1 January 1976 - October 1977.

The consignment computations are as follows:

R/T Unit (allocated value per Collins letter dated 10 March 1976 for Period 1)

$$A = \frac{629}{1914.7} - 1 = 0 \text{ (equated to zero if negative)}$$

$$S = 0.153 \times 1500 \text{ installs}$$

$$= 229.5 \text{ or } 230 \text{ R/Ts}$$

$$n = A \times S - S_p$$

$$n = 0 \times 230 - 0 = 0$$

No consignment R/Ts are required

Converter Unit (allocated value)

$$A = \frac{3121}{4541.8} - 1 = 0 \text{ (equated to zero if negative)}$$

$$S = 0.06 \times 1500 \text{ installs} = 90 \text{ converters}$$

$$n = A \times S - S_p$$

$$n = 0 \times 90 - 0 = 0$$

No consignment converters are required

Control Unit (allocated)

$$A = \frac{12,106}{14858.6} - 1 = 0 \text{ (equated to zero if negative)}$$

$$S = 0.026 \times 1500 \text{ installs} = 39 \text{ controls}$$

$$n = A \times S - S_p$$

$$n = 0 \times 39 - 0 = 0$$

No consignment controls are required

Mount Unit (allocated value)

$$A = \frac{131,579}{48824.2} - 1 = 2.695 - 1 = 1.695$$

redefined as 1.0 in accordance with
contractual provisions

$$S = 0.025 \times 1500 \text{ installs} = 37.5 \text{ mounts}$$

$$n = A \times S - Sp$$

$$n = 1 \times 37.5 - 0 = 37.5 \text{ or } 38 \text{ mounts}$$

38 consignment mounts would be required

CHAPTER FOUR

ANALYSIS OF U.S. AIR FORCE DATA

4.1 INTRODUCTION

As outlined in the Data Accumulation and Evaluation Plan and Chapter Two of this report, the U.S. Air Force Logistics Command carried out a data collection program concurrently with the ARINC Research data collection effort. The goal of this exercise was to obtain data on TACANS that were installed in aircraft deployed at Air Force Bases that were not visited by ARINC Research. Based on the deployment listing of 2 September, 1977, twenty-nine (29) Air Force Bases were reported as having 118(V) TACAN installs. Of these bases, eleven (11) were visited by ARINC Research; it is the balance of those bases (eighteen (18)) that was documented by the AFLC data collection.

The forms used in the data collection were the same Data Collection Forms as developed and used by ARINC Research and AFLC/LOM. The data forms were distributed by AFLC with instructions regarding their completion and were to be returned to AFLC/LOM. After a review of the data by AFLC/LOM, the information was then sent to ARINC Research.

This chapter discusses the completeness and quality of the data so obtained by the Air Force. It also provides estimates of AOT, TOH, and MTBFs of the TACAN LRUs and set. Attached as Appendix D, U.S. Air Force Data, are the information that was provided to ARINC Research by AFLC.

4.1.1 Reception of Air Force Distributed Data Forms

As relayed through correspondence with AFLC/LOM, the majority of the Air Force Bases not visited by ARINC Research responded to the AFLC request for data. These data were received by ARINC Research and were analyzed as time and resources permitted. The following Air Force Bases responded to the collection activity:

<u>Air Force Base</u>	<u>Aircraft Type</u>	<u>Number of TACANs Read</u>
Andersen	B-52	14
Barksdale	B-52	5
Blytheville	B-52	5
Columbus	T-38	115
Dyess	C-130/B-52	54/16
Edwards	A-10	2
Elgin	F-111	1
Fairchild	B-52	5
Grand Forks	B-52	3
Minot	B-52	2
Nellis	A-10	1
Sawyer	B-52	4
Upper Heyford	F-111	102
Vance	T-38	55
Williams	T-38	97
Wurtsmith	B-52	5

A total of 457 TACAN readings were obtained through this data collection effort. It is assumed that all of the information returned in this manner reflected dates as contained in the TCTO documents for the particular aircraft. The data returned were purported to be the total number of TACANs installed at each AFB. As a consequence, these data did not require extrapolation to account for missing TACAN reads as was done in Chapter Three.

4.1.2 Quality of Data

A basic premise of the data collection was that ARINC Research data were collected from aircraft that were representative of the U.S. Air Force fleet as a whole. The data collected by ARINC Research required the correction of much of the install day information. These corrections were done at the Air Force bases during observation of the TACAN warranty data cards. ARINC Research did not participate in the Air Force submitted data collection effort. As a consequence, ARINC Research could not verify (at the source) data such as the install dates. The Air Force submitted data may also reflect the hidden data discrepancies. The Air Force computation that follows is therefore shown only as an illustration.

4.2 ANALYSIS OF USAF DATA

4.2.1 Preliminary Analysis

As it was received by ARINC Research, the USAF data were analyzed by ARINC Research for completeness and quality. Accordingly, basic calculations of elapsed time, installed days and whenever possible, total flight hours were made. In order to accomplish the ETI calculations it was necessary to obtain the ETI hours at Collins shipment for each of the TACANs reported by the Air Force. This was accomplished for some 457 aircraft.

4.2.2 Calculation of Statistics

The USAF data were analyzed using the field method of calculations for AOT and TOH from the data as contained in Appendix D. MTBFs were computed using data from Appendix D and failure information taken from the contractor data logs. While the analysis process was similar to the methods used in the earlier analysis of ARINC Research data (i.e., the use of correction factors and quality judgements) it was performed only as illustration information due to the reservations noted previously.

Table 4-1 presents the results of a computation using the USAF submitted data.

Lines 1 and 2 of the table present the summarizations of ETI operating hours and install days from the sixteen (16) reporting bases. Since the data submitted were purported to be all installs at each base it was not necessary to extend the data to reflect TACANs that were not read. THE USAF submitted data were adjusted (extended) however, to account for an occasional missing entry.

Lines 3 and 4 of the table present summarizations of the ETI hours and install days taken from failed R/Ts returned to the manufacturer. As with the ARINC Research collected information, these data were extended to reflect missing information.

Line 5 presents the AOT computation level upon the USAF submitted data.

Line 6 presents the AOT contractual computation based only upon the returned unit data.

Line 7 presents the TOH developed from the US Air Force submitted information.

Table 4-1. USAF DATA STATISTICS

1. Σ field ETI = 118,306
2. Σ field Installed Days = 87,304
3. Σ ETIs for returned R/Ts (extended) = 6878.0
4. Σ Install days for returned R/Ts (extended) = 5687.0
5. AOT field = $\frac{\Sigma \text{ field ETI} + \Sigma \text{ returned unit (extended) ETIs}}{\Sigma \text{ field Installed days} + \Sigma \text{ returned units (extended) Install Days}}$
 $= \frac{118306.0 + 6878.0}{87304.0 + 5687.0} = \frac{125184}{92991.0} = 1.3462 \text{ hrs/install-day}$
6. AOT Contractual = $\frac{\Sigma \text{ ETIs for returned R/Ts}}{\Sigma \text{ Install days for returned R/Ts}}$
 $= \frac{3514}{2994.0} = 1.1737$
7. TOH field = $\Sigma \text{ field ETI} + \Sigma \text{ returned R/Ts (extended)} = 125184.0$
 TOH Contractual = $\bar{N} \times \text{AOT} \times D = 111,161.1$
8. Returned LRU Data

Classification	LRU			
	RT	MT	C	MX
Verified Failure	72	4	11	22
Non-Verified	8	4	1	6
Exclusion	3	1	21	5

9. Field (AF Submitted data)	Contractual
MTBF (hours)	MTBF (hours)
RT 1738.7	RT 1543.9
MT 31296.0	MT 27790.3
C 18744.3	C 13967.4
MX 5690.2	MX 5052.8
SET 1195.9	SET 1049.1

Line 8 in the table summarizes the failure data taken from contractor documents for the sixteen (16) Air Force Bases reporting.

Line 9 in the table summarizes MTBF computations based upon the data submitted by the bases, and failure information is noted in Line 8.

4.3 SUMMARY - USAF SUBMITTED DATA

The computational results noted in Section 4.2 have been provided to show the statistics of Air Force submitted data.

These data were submitted by the Air Force and were not subject to quality control review at the source by ARINC Research as were the data noted in Appendix B.

In order to assist other analysts who may wish to use the data in the future, the basic data submitted by the USAF were prepared as follows:

- . The basic data were transferred to the format of Appendix D and typed.
- . The ETI hours at ship were developed from the manufacturer's data logs and entered into the Appendix D.
- . The Δ ETIs were computed as noted in Appendix D.
- . The Δ Install Days were computed and entered into Appendix D.
- . Δ Flying Hours were computed and entered.

An illustrative computation was performed as seen in Section 4.2.

4.4 COMBINATION OF ARINC RESEARCH FIELD AND USAF SUBMITTED DATA

Much of the install day data collected by ARINC Research required correction. Since ARINC Research did not participate in the AF submitted data collection, effort, it is not known whether the AF submittals contain similar errors. For the sake of discussion, both ARINC Research and USAF submitted data have been combined to develop an overall assessment. It should be pointed out that the net result may not be valid for the reasons noted. Care should be taken in interpretation of the combined results. Table 4-2 summarizes the results generated by combining ARINC Research field and USAF submitted data.

As can be seen in Table 4-2, differences exist in the number of ETI hours and install days for each population. Aside from consideration

of data errors, differences could be expected due to the fact that statistics were developed from different populations. It will be noted that the ARINC Research collection developed 75,000 more ETI hours (195,296.6 vs. 125,194.0) than the USAF submitted information. This was true although only eleven (11) bases were visited versus the other sixteen (16) reporting activities. This reflects an earlier observation concerning high density bases selected by ARINC Research. The AOT difference between populations appears high (1.6290 vs. 1.3462 or 17.4%) particularly in light of the small differential between the ARINC Research field sample and contractual value (6%) noted previously. Part of the AOT difference may be due simply to population characteristics. The install day data collected during the ARINC Research field visits was obtained only after a correction effort.

Install day errors may be present in the USAF submitted data. This might also account for part of the difference between AOT computations. The MTBFs, despite obvious differences in population, are remarkably close (e.g. set MTBF 1204.5 vs. 1195.9).

In general, results obtained using the USAF submitted data are numerically lower. The combined values, as noted in Table 4-2, lie between the two population sets.

Table 4-2. COMBINED ARINC RESEARCH AND
USAF SUBMITTED DATA

	<u>ARINC DATA</u>		<u>USAF SUBMITTED</u>		<u>COMBINED</u>
1. Σ ETIs	= 195,296.6 hours	+	125,184.0 hours	=	320,480.6 hours
2. Σ Installed Days	= 119,887.1 days	+	92,991.0 days	=	212,878.1 days
3. AOT	= 1.6290 hrs/install-day		1.3462 hrs/install-day	=	1.5055 hrs/install-day
4. TOH	= 195,296.6 hours	+	125,184.0 hours	=	320,480.6 hours
5. MTBF (Hours) =					
	RT = 1,914.7		1,738.7		1,841.8
	MT = 48,824.2		31,296.0		40,060.1
	C = 14,858.6		18,744.3		16,237.4
	MX = 4,541.8		5,690.2		4,930.5
	Set = 1,204.5		1,195.9		1,201.5

CHAPTER FIVE

ARINC RESEARCH FIELD AND OTHER QUALITATIVE OBSERVATIONS

5.1 INTRODUCTION

This section will discuss the activities of ARINC Research during its TACAN data collection trips to Collins and to Air Force bases in the period of 2 through 21 October 1977. The facts and observations presented within this chapter were prepared as a summary of project events. Therefore, the section will present qualitative observations of events and general discussions of data taken.

5.2 SCHEDULE

The scheduled period of field TACAN data collection was from 2 October through 21 October, 1977. With the exception of several minor variations, the planned and actual scheduling were as presented in the Data Accumulation and Evaluation Plan (Appendix A).

5.3 WARRANTY CARD DOCUMENTATION

An important aspect of the AN/ARN-118(V) TACAN warranty is the proper documentation of the Warranty Data Card that is physically placed on the front of the R/T 1159 A. This is the medium by which the Air Force and Collins Avionics calculate the installed days of the TACAN and the elapsed time that has been accrued since its installation in the aircraft. These pieces of information are key elements in the calculation of MTBF for the TACAN.

The warranty card must be documented in the following manner:

- (1) The date of install must be entered at the time of install, and in the format of month/day/year.
- (2) The removal date should also be recorded on the tag at the time of the TACAN removal, and in the same format as described above.
- (3) The serial number of the R/T must be entered on the card in the space provided in the upper right hand side.

(4) All entries are to be made in ink only.

The following observations were made with regard to the above procedures:

5.3.1 Install Data Information

The installed dates were, for the most part, either incorrectly entered, or entered with pencil or felt tip ink. The percentage of incorrect entries has been estimated to be better than 60%. Of the incorrect entries, the most common method of formatting the information was day/month/year. In cases such as in an example date of 01/12/76, it was very difficult to tell if the date was the 12th of January, 1976, of the 1st of December, 1976. In such situations, or in the event of no install date whatsoever, a print-out was usually obtained from the AF Base's Job Control Section, listing dates of TCTO compliance. Whenever it was appropriate, the corrected install date would be entered on the card, or the TCTO compliance date would be written in. Other variations on the format existed, for example, 3 Oct 77, or 29/3/77. In either case, it is doubtful that a mistaken date could be assumed, due to the written out month, or the obvious fact of there not being a 29th month. However, when it was felt to be necessary, (i.e., pencil entries) such entries were changed to the correct format.

5.3.2 Removal Dates

The great majority of TACANs that had been removed for maintenance did have the removal date entered. When this was not the case, internal documents were consulted to determine on the Data Card the date of removal. A more serious problem surfaced in the area of determining the proper time to enter the removal date. If a TACAN were removed for failure verification, in some instances, the removal date would not be entered until the bench testing was accomplished. In some cases, it was understood that several days might pass from the time of removal to the time of verification, thereby crediting the TACAN with several extra installed days. In such situations, the AF Bases were advised to record the removal date at the time (day) of removal. If a Cannot Duplicate (CND) condition were found to exist, the date of install should be entered at installation, regardless of the fact that the TACAN might be put back in the same aircraft.

5.3.3 R/T Serial Number

The R/T serial number was not correctly entered in a large number of TACANs. When this was the case, it was written into the space provided by ARINC Research. Usually, the serial number was omitted, rather than an error in the number. On several occasions, the number of the mounting tray was listed on the card. This was, for some aircraft installs, a

somewhat natural error to make due to the close physical proximity of the equipment nameplates of the R/T and Mounting Tray.

5.3.4 Failure Coding

There appeared to be widespread confusion regarding the filling in of the blank for the "Code". Many individuals had written in USAF codes, for example, 800, which indicates that the TACAN had been removed for other maintenance. Another common occurrence was that the TACAN ETI reading at install would be written down in the code space.

5.3.5 General Remarks Concerning the Warranty Cards

In addition to the above-mentioned aspects of the R/T cards (See Figure 5-1), several general comments should be made. With regard to the writing ink, a number of inks were used, but few as successfully as black or blue ball point. The other classes of writing methods (felt point pen, pencil, fountain pen, etc.) had a marked tendency to fade with time, or were easily smudged. Whenever these conditions were encountered, it was suggested that ball point pens be used.

A problem was discovered when it became necessary to write on the R/T cards. On the cards where no previous entry had been made, either ARINC Research personnel or escorting military maintenance personnel made the correct (by the TCTO compliance date) entry on the card. It was discovered that the card was difficult to write on. The ball point pen could not, without some effort, write upon the card. Only by preparing the card surface with an ink eraser could a date of installation or serial number be easily entered.

There were no cases in which the warranty card was found to be missing from the R/Ts, nor were there cases of damaged cards. The retaining screws appeared to be excellent fasteners.

5.3.6 Spares/Mock-Up Units

Data for spares and mock-ups were taken as a part of the data accumulation plan.

The disposition of the spares in most cases was that the organizations were authorized one spare, and had, in their possession, only one spare. A general feeling of uneasiness was felt towards this sparing level, especially among some squadrons that had not yet had time to accumulate appreciable operate experiences.

Another observation concerns TACAN units awaiting installation. There appeared to be no standard method of unpackaging or scheduling for acceptance testing. As an example, at Laughlin AFB, the "to be installed"

RT1159/A		SER NO
INSTALL DATE	REMOVE DATE	CODE
USE INK ONLY		
M/D/Y	M/D/Y	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	
///	///	

← Date identification added by the contractor. Not on original card format.

Figure 5-1. COLLINS AVIONICS R/T CARD

TACANs were unpackaged and tested for acceptance upon arrival. On the other hand at Andrews AFB, where approximately 10 R/T units were shipped (without the accompanying converters), the units were placed in storage, awaiting opening and installation in T-39s. It is recommended that Andrews AFB be provided with the necessary test equipment and verify test at receipt as is the practice with other bases.

Mock-up units were, with the exception of Andrews AFB, which has yet to have a mock-up set delivered, found to be working well, and have gained acceptance with the maintenance personnel as being a good, easily configured test set.

5.3.7 Packaging, Storage and Transportation

There did not appear to be standards by which the Maintenance Squadrons, unpackaged, stored, or repackaged the TACANs. As a general rule, AF Bases, upon reception, unpackaged all received TACAN units and immediately performed acceptance testing. In some cases, the majority of TACAN shipping containers were then either destroyed, or were used for other purposes, with a reasonable number of containers held in reserve.

The repackaging of the TACAN after a confirmed failure was not felt to be a problem. The containers were felt to be reusable, and there were no problems encountered in this area.

The storage of spare TACANs was physically located in all cases in the Maintenance Squadron Facilities. There were no reported problems associated with the supply procedures, although there was some scattered concern expressed over the sparing level. While the authorization of one spare per AMS was not felt to be sufficient, no problems had been encountered with sparing or Collins ability to ship replacement TACANs.

The transportation of failed TACANs was not considered to be a problem. Once an item was verified as failed, it was packaged and sent to the transportation facilities. No instances of "batch" shipments had been reported, and the previously corrected Collins shipping address was clearly visible and understood by all personnel.

5.3.8 Reliability

The AF bases in most cases do not locally document ARN-118(V) reliability. There were opinions expressed at every Base, however, concerning their intuitive feelings. These observations are noted as follows. The general impressions of the reliability of the TACAN were, that the units were extremely reliable, and were well accepted by maintenance personnel and pilots. In some cases, units originally installed during IOT&E were reported to be operational. The general opinion of the maintenance personnel regarding the TACAN was that its reliability was on order of 99.999% and that the equipment that it replaced, and had not their

maintenance burden for equipment up to 50%. They looked upon the TACAN as a piece of equipment that had virtually eliminated TACAN problems and had now provided them with an opportunity to devote more time to other maintenance areas.

5.4 PROBLEM AREAS

5.4.1 Installation Problems

The only aircraft which appeared to have a problem with installation was the T-38. Due to the "sideways" mounting of the TACAN, a problem usually occurred during installation or removal from the aircraft. A bundle of cables was routed in the COMM/NAV panel such that the TACAN could not be easily positioned. In many cases, the bundle insulation could be cut by the mounting tray as attempts were made to install/remove the TACAN.

On the T-38, a liquid oxygen fill-valve bracket was also positioned such that upon installation of the TACAN the Warranty Information sticker would be scraped off. Repositioning of the sticker to the left by approximately three inches would resolve this problem.

5.4.2 Damage to Control Boxes

A high incidence of control boxes have been returned to Collins Avionics with broken glass. Opinions as to who or what phenomena were responsible for such a condition varied from individuals queried. ARINC Research personnel made inquiries into this problem and observed the following facts and opinions.

The position of the control box in some aircraft, most noticeably the T-38s, A-10s and A-7s, is such that a breakage could occur due to a seat belt or other objects falling on it. For the T-38, an experiment was conducted at Randolph AFB in which a pilot intentionally unbuckled his various belts in such a way as to test the seat belt "hypothesis". After a thorough test (with no breakage) it was concluded that an intentional seat belt dropping could not break the control box glass.

It was the opinion of several maintenance crewmen that the breakage was due to abuse by the maintenance crews who either carelessly placed or dropped their tools on the glass. It was also reported that breakages occurred due to using the area around the control box as a foot-step. Other incidents, especially in the T-38s, contributed to breakage by the practice of applying pressure to the glass while seating the control box in the cockpit. This was verified at Reese AFB by the actual observance of such an incident by military personnel.

5.4.3 Need for Accurate Data Recording

At many installations, it was felt that there was an unawareness of the need for accurate data recording. Most maintenance personnel did not know why RIW existed, or its basic features, but were satisfied that the ARN-118 TACAN meant less work for them. In no case was it discovered that maintenance personnel were apathetic; rather, they were found to be most cooperative and receptive to any concept that would help them in their work.

5.4.4 Accelerated Installs Schedule

At England AFB, the reliability of the previous model TACAN was such that their flight schedule could not be met. Because of the expected reliability of the ARN-118, an order was issued to move up the scheduled install date to an immediate schedule. Consequently, 66 TACANs were found to be installed at England rather than the expected 13.

5.5 COLLINS AVIONICS GROUP DATA

As indicated, the source of much contractual data for MTBF and AOT calculations, as well as information regarding non-verified and excluded returns is the manufacturer of the TACAN, the Collins Avionics Group of Rockwell, International. As such, Collins maintains extensive warranty logs describing the just mentioned subjects, and other topics, such as delivery information, installation data, and summaries of corrective actions. The contractual information used in TACAN calculations is obtained from these Warranty Logs.

5.5.1 Results of Visits to Collins Avionics

An initial visit to Collins Avionics was made on 26-28 September, 1977, in order to obtain Collins' support of the contractual effort, and to relate to them the exact details of the proposed Data Accumulation and Evaluation Plan. Additionally, updated Collins Logs were obtained, and were used to provide the latest information on the following areas:

- Log 1 Initial Delivery Log
- Log 2 Subsequent Install Delivery
- Log 2 A Subsequent Delivery
- Log 3 Corrective Action
- Log 8 Warranty Population
- Log 9 Lost, Nonrepairable, Inactive Units
- Log 10 Monthly R/T Operating Time Summary

Also, a record of the Average Number of Installs (by month), as provided to Collins by the Air Force, Warner Robins Air Logistics Center, was obtained.

These logs and records were then used to further complete the ARINC Research data collection forms (most noticeably, the Collins ETI at ship, and also, an accounting of several previously confirmed failures was made to further clarify the average number of installs by month).

5.5.1.1 Comparison of Field Data to Collins Data

The major point of interest with regard to any comparison of the two data sets is in the area of failed units and their return to Collins. Although all of the Bases visited had TCTO print-outs showing the data of compliance and aircraft for which the Technical Order was complied, no official records have been kept with respect to failed TACANS. Therefore, the Collins record is the only reliable source of information with respect to the number of failures by LRU.

5.5.1.2 Trip of 7-9 November

A second trip to Cedar Rapids was made on the above date in order to discuss with Collins the data collection effort of the previous month, and to further update the information contained in the Collins Logs, especially Logs 1, 2, 2A, and 3.

This latter updating is particularly important in light of the fact that additional installs, subsequent deliveries, and failures have occurred, not only since the first visit to Collins, but also since the end of the data collection effort.

CHAPTER SIX

ALTERNATE TECHNIQUES

Alternate computational techniques were to have been developed, if the study results revealed that the present contractual computational techniques were not felt to be adequate estimates of field performance.

As noted in Chapter 3, it was found that percentage differences between the contractual and field approaches were:

- . The contractual AOT estimate was within 6% of the field value.
- . The contractual TOH estimate was within 12% of the field value.
- . The contractual set MTBF estimate was within 12% of the field value.

As a consequence, of the above considerations and the investigations of Chapter 3, it is felt that the contractual estimating techniques are adequate estimates of actual field performance. It should be noted that the contractual estimates (at the time of the field visits) were based on less than 200,000 total operating hours (with no AF Base having more than 55,000 hours) and 102 R/T unit returns.

As was noted in Chapter 3, the data trends indicate convergence between the contractual and field estimates as operating usage increases and more R/T units are returned. As a consequence, in future reporting periods, the percentage differences (6% - AOT, 12% - TOH, and 12% Set MTBH) should be the same or less.

The ARN-118(V) TACAN program is - and will be in a rapid build-up phase in the immediate future. As a result, there will be increased usage and many more returned units upon which the contractor can base his estimates. As an illustration, consider the following: in the six months following the ARINC Research field visits, the number of installs should reach 2000 sets. Assuming that the field AOT (i.e. 1.6290 hours/install day) and the R/T MTBF (i.e. 1914.7 hours) previously observed remain the same we could expect the following:

$$\begin{aligned}
 & \text{(AOT)} \\
 & \frac{1.6290 \text{ hrs/install-day} \times 180 \text{ days} \times 1800 \text{ installs}}{1914.7 \text{ hours}} \\
 & \quad \text{(R/T MTBF)} \\
 & = 276 \text{ Returned R/Ts}
 \end{aligned}$$

The estimates noted in Chapter 3 were based upon only 102 returns. Even making allowance for the fact that 20% of the R/T returns may not have data - the contractor would still have over 200 records upon which to base the estimates (or over twice as many as were available for the computations in Chapter 3).

As a consequence of the increased usage and the convergence between computational approaches, the AOT, TOH and MTBF differences (6%, 12%, 12%) should be no greater in future reporting and probably much smaller.

The above considerations therefore indicate that the contractual computational techniques as now used are adequate estimates and alternate techniques are not required for the TACAN program.

One technique adjustment has been developed and is discussed in subsequent sections of this document. This technique, while not required for the TACAN program with the planned installation schedule, should be used in future warranty programs.

6.1 ALTERNATE METHOD - \bar{N} COMPUTATION

As was noted in Chapter 3, the consolidated Total Operating Hours (TOH) contractual computation (Table 3-3) was found to be numerically greater than the equivalent field observation (219400 hours vs. 195296.0 hours). Although this amounted to only a 12% difference - the following was observed. The contractor is provided (on a monthly basis) by the USAF, the total number of TACAN (ARN-118(V)) installs. The number of installs is based on the TACAN installs on the last day of each month reported. The contractor uses the number of installs (n_i) in the computation \bar{N} (average number of installs per month) over the measurement period.

$$\bar{N} = \frac{\sum_i^M n_i}{M}$$

where:

n_i = number of installs in the i^{th} month

M = number of months in the measurement period

Since: $TOH = D \times AOT \times \bar{N}$, the \bar{N} directly impacts upon the TOH estimates. If the \bar{N} estimate is higher than the actual number of installs, then the TOH and subsequent MTBs ($= \frac{TOH}{Failures}$) will also reflect higher values.

6.1.1 The Present Estimate

The present estimate of \bar{N} , at least during an install buildup period, tends to overstate the average number of installs per month. In the present approach, the installs reported as of the last day of the month assume that the units were installed over all days of the month in which reported. As an illustration, Laughlin AFB had 1 install in May, 29 in June, 27 in July, 37 in August, 8 in September and 9 in October for a total install fleet of 111 units at the conclusion of the latter month. These units were, however, actually installed in T-38 aircraft over various days of each month - not all on the first day of the month.

As a consequence, the \bar{N} indicates more installs (on average) over the month than is the actual case. Subsequently, the TOH and MTBF computation would also reflect higher values. The following suggested approach, would help moderate the overinflation during an install buildup period.

6.1.2 Average \bar{N} Method

The ideal approach to computation of \bar{N} would be to read the install date of all equipments to arrive at an exact measure of the average number of equipments for a given reporting period. This would, of course, involve considerable expenditure of manpower and is probably not economically feasible. An alternate method of estimating \bar{N} which is relatively simple to administer is as follows:

The average for each month is given by averaging the number of installs for that month and the total at the end of the month.

In general notation, this would be represented as follows:

The average of each month is given by:

$$\frac{n_{i-1} + n_i}{2}$$

Where:

n_{i-1} = number of installs at the close of the previous month

n_i = number of installs at the end of the new month

Then:

$$\begin{aligned} \bar{N}_{(new)} &= \frac{\sum_{i=1}^M \frac{n_i + n_{i-1}}{2}}{M} \\ &= \frac{\frac{n_1 + n_0}{2} + \frac{n_2 + n_1}{2} + \dots + \frac{n_M + n_{M-1}}{2}}{M} \\ &= \frac{\frac{n_0}{2} + n_1 + n_2 + \dots + \frac{n_M}{2}}{M} \\ &= \frac{\sum_{i=1}^M n_i + \frac{n_0}{2} - \frac{n_M}{2}}{M} = \bar{N} + \left(\frac{n_0 - n_M}{2M} \right) \end{aligned}$$

Thus for any period:

$\bar{N}_{(new)}$ is computed from $\bar{N}_{(old)}$ by adding the correction factor:

$$\frac{n_0 - n_M}{2M}$$

Where:

n_0 = total number of installs at the beginning of the period

n_M = total number of installs at the end of the period

M = number of months in the measurement period

Illustration:

May	Reporting Period		
	June	July	August
900 installed	1000 installed	1100 installed	1200 installed

$$\bar{N}_{(old)} = \frac{1000 + 1100 + 1200}{3 \text{ mos.}} = 1100 \text{ average installed}$$

$$\bar{N}_{(new)} = 1100 + \left(\frac{900 - 1200}{2 \times 3 \text{ mos.}} \right) = 1100 - 50 = 1050$$

Table 6-1 shows a comparison of the consolidated (original total) TOH and MTBFs between the previous contractual approach and the $\bar{N}_{(new)}$ computation. Also shown is the Field Computation as was noted in Chapter 3.

As can be seen in Table 6-1, use of a $\bar{N}_{(new)}$ has resulted in reduction of the number of hours from 219,400 to 204,785.3. The latter TOH is now approximately 9500 hours over the field value or a difference of about 4.9% (from about 12% using the previous \bar{N} computational approach). The MTBFs shown in Table 6-1 are correspondingly brought into closer alignment with the field values.

The \bar{N} averaging approach, during an install buildup phase, brings the contractual estimate into closer alignment with the actual field operational experiences.

Table 6-1. CONSOLIDATED CONTRACTUAL COMPUTATION COMPARISON
(PRESENT \bar{N} VS. AVERAGING \bar{N})

Computation	TOH	MTBF R/T	MTBF MX	MTBF MT	MTBF Control	MTBF Set	
All Aircraft	Contractual (Present) Computation	219,400.0	2,150.9	5,102.3	54,850.0	16,722.7	1,353.3
	Field Computation	195,296.6	1,915.7	4,541.8	48,824.2	14,858.6	1,204.5
	Contractual (Averaging) Computation	204,785.3	2,007.7	4,762.4	51,196.3	15,657.5	1,263.5

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

7.1.1 Overall Conclusions

The contractual computational methods outlined in the ARN-118(V), RIW and MTBF Guarantee terms and conditions as they appear in Contract F19628-76-C-0144 are adequate for estimating field performance for the particular unit. The Set MTBFs are excellent regardless of the computational approach and in any event, currently exceed ultimate performance goals.

The alternate method for computing \bar{N} is recommended for future programs.

There is evidence that the need for accurate data recording on the R/T record card is not fully understood by AFB personnel.

7.1.2 AOT Comparison

The contractual method of estimating AOT is adequate for assessing field experiences. The AOT differential between field readings and the contractual computation is 6%.

7.1.3 TOH Comparison

The TOH contractual method is adequate for estimating field experiences. A differential of 12% was noted on the final field computations. During the TACAN build-up phase, accuracy of the TOH estimation could be improved by using the \bar{N} averaging technique. The percentage differential between contractual and field TOH values is reduced to less than 5% using the \bar{N} averaging technique.

7.1.4 MTBF Comparison

The MTBF contractual method is adequate for estimating field experiences. A differential of 12% was noted between computational approaches. The \bar{N} computation will improve the accuracy of TOH and MTBF estimates during buildup periods. The percentage differential

between contractual and field-set MTBF values is reduced to less than 5% using the N averaging technique.

7.1.5 Field Observations - AFB Data Recording

The warranty data required on the R/T unit record card were generally ambiguous or incomplete. The ambiguity of the month/day/year sequence of recording of install/remove data results in errors in field performance estimates

7.1.6 Field Observations - Equipment Abuse

It was observed that the window of the TACAN control box is frequently broken - apparently through carelessness during maintenance activities. These units when returned to the contractor are "excluded" from normal RIW repair coverage and result in additional costs to the government.

7.1.7 Field Observations - Logistics Handling and Support

Preparation and return of TACANs to the manufacturer seemed to be handled in an expeditious manner by the AF Bases. There was, for example, no evidence of "batching" or non-operable units sitting in the maintenance areas. AF Base personnel expressed satisfaction with the expeditious manner in which replacements were sent by the manufacturer, although this could not be quantified exactly. It was the general opinion that replacements were at the base in 10 - 14 days.

There was concern expressed by AFB maintenance personnel concerning a generally low spares inventory (usually one per base). There was, however, no real evidence of any hardship being imposed upon the operators. Extraordinarily high TACAN reliability was credited by Base personnel for avoiding replacement problems.

7.1.8 Field Observations - Test Specifications and Equipment

The test procedure and equipment as now used by the AF Bases appears adequate. With the exception of one AF Base visited, there did not appear to be any problems nor were any problems noted by the Base personnel.

7.1.9 Manufacturer's Data

The Data required from the manufacturer to perform this study were accurate and complete without exception. Data kept by the manufacturer under the contractual provisions, in addition to being accurate, were current with the program experiences. It was noted during the CAG visits that the data hitherto kept manually were being automated. A programmer-engineer has been assigned to the project to ensure that the automation is quickly completed and the data files maintained. It was also

ascertained during the visits that RIW program management were exceptionally well versed in details of the TACAN program, performance achievements and problems.

7.1.10 Differences Between Aircraft Types

Significant differences in TACAN MTBFs between aircraft types were noted. Heavy aircraft platform types generally achieve set MTBFs two to three times the value for lighter aircraft.

7.2 RECOMMENDATIONS

The following recommendations are presented on the basis of the field visits and computational exercises:

- . The present contractual method of computation is adequate for estimating field performance and should not be changed for this program.
- . In future RIW programs, the method of computing \bar{N} should be revised to reflect the averaging of monthly installs.
- . Each AF Base should be given a presentation (prior to receiving the ARN-118(V)) outlining the nature and intent of a warranty procurement. Special attention should be given to emphasizing the need for accurate data recording.
- . It was evident from the field visits that not all AF Bases have adapted equally well to the warranty program. Bases which show evidence of unusual operations in that there are excessive non-verified (and/or exclusions) returns and poor data recording should be assisted. This assistance could take the form of an educational presentation that would address use of tests, specifications and equipment as well as data requirements. This program would be similar to the one noted previously, except it would be structured to help Bases which already have the ARN-118(V).
- . In TACAN units, such as the control box, which seem to be especially susceptible to damage in handling, a design change strengthening the control box window should be considered.
- . Since achieved MTBF differs by aircraft types, careful consideration must be given in predicting future aircraft mixes under RIW. The mix substantially determines the assessment value upon which the contractor is evaluated. MTBF achievement for aircraft aggregates may be higher or lower than objectives depending upon the accuracy of anticipated fleet proportions.

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F/G 17/7

EVALUATION OF METHODS FOR CALCULATING SYSTEM OPERATING TIME IN --ETC(U)

MAR 78 A A BILODEAU, P M DALLOSTA

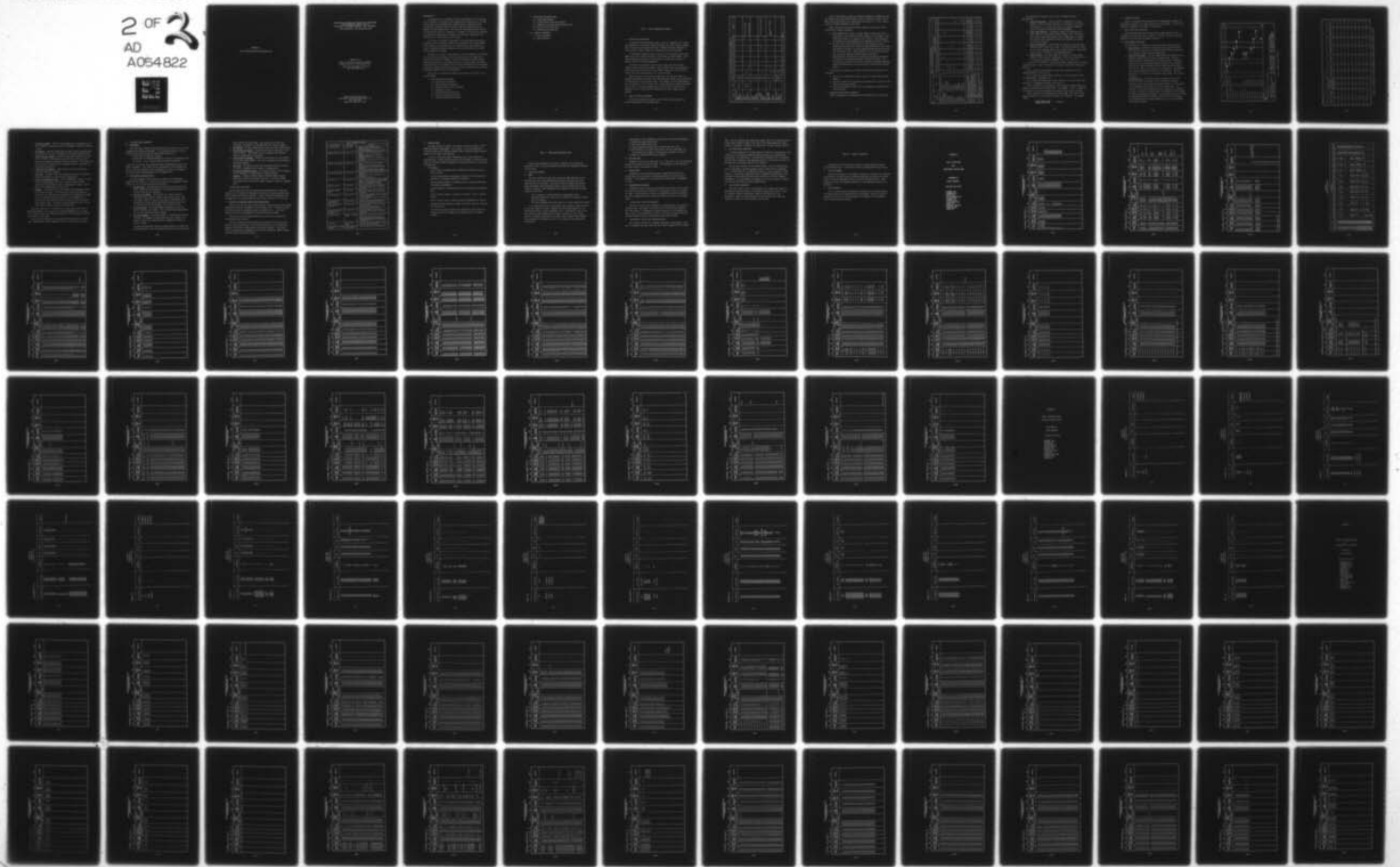
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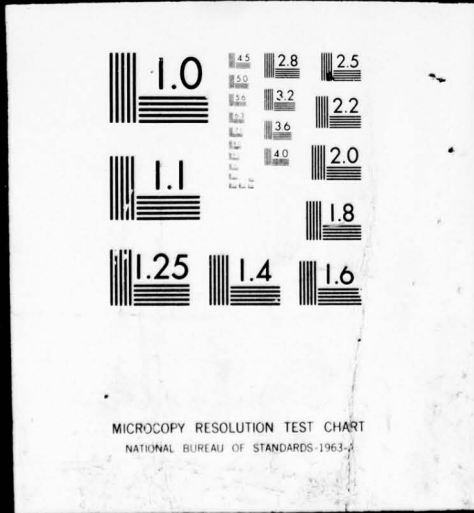
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APPENDIX A

DATA ACCUMULATION AND EVALUATION PLAN

EVALUATION OF CRITERIA AND METHODS FOR DETERMINING
SYSTEM OPERATING TIME AS USED IN
RELIABILITY IMPROVEMENT WARRANTY (RIW) GUARANTEE
DATA ACCUMULATION AND EVALUATION PLAN

Prepared for
The U.S. Air Force Logistics Command
Wright-Patterson Air Force Base, Ohio
under Contract FO9603-77-A-3104
CDRL Item Number A001

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INTRODUCTION

As described in the statement of work, the purpose of this contract is to determine the validity of the computational techniques for the MTBF calculations for the AN/ARN-118(V) TACAN contract, F19628-75-C-0144. Calculations performed during the TACAN IOT&E have shown differences between the MTBF experienced in the field and the MTBF developed through the contractual method of calculation. An MTBF of 771 hours was predicted by contractual computation as compared with 544 hours determined from field data, or a difference of 41.7 percent.

This study is designed to determine if the field MTBF experience is diverging from or converging toward the contractually calculated numbers as the sample size increases and, if a marked trend toward disparity is found, to develop alternative methods that will more accurately predict the true MTBF of the TACAN.

Therefore, as a task in that approach, a Data Accumulation and Evaluation Plan has been developed, and is contained herein for approval by the Air Force Logistics Command. This plan presents the ARINC Research Corporation approach to the identification of aircraft types and numbers which currently utilize TACANs, the statistical sampling plans and methods of analysis needed to obtain the data for these aircraft and the evaluation techniques needed for their interpretation.

This paper is structured to address both phases of the plan, and is outlined below:

- I - DATA ACCUMULATION APPROACH
 - 1.0 TACAN Fleet Description
 - 2.0 Data Collection Guidelines
 - 3.0 Proposed Plan for Data Collection
 - 4.0 Schedule of Travel
 - 5.0 ARINC Field Data Collection
 - 6.0 Collins Radio Data Collection
 - 7.0 USAF Data Collection Program

II - TACAN DATA EVALUATION PLAN

- 1.0 Field Data Analysis
- 2.0 Collins Radio Group Data Analysis
- 3.0 Comparison of Actual and Contractual Data
- 4.0 Air Force Data Collection
- 5.0 TACAN Fleet Observations

III - IMPACT OF ANALYSES

- 1.0 Price Adjustment
- 2.0 MTBF Guarantee

PART I - DATA ACCUMULATION APPROACH

1. TACAN FLEET DESCRIPTION

As obtained through AFLC/LOM, Table 1 (as of 2 September 1977) shows the distribution of installed TACANs throughout the fleet, and the disposition of that fleet throughout the bases. TACANs have been installed in 1104 aircraft in some 9 classes of airplanes at 29 Air Force bases.

Of the TACANs installed, most of the units are on station within the CONUS, with only a small percentage (7.8 percent) deployed abroad. Due to time and budget constraints of the program, no effort will be made to collect data for non CONUS deployments.

The relative percentage of the aircraft types show that trainer, fighter, attack aircraft and bomber, cargo aircraft exist in approximately a 80/20 mix, with the majority of the former class being T-38s, and the latter class being comprised most of C-130s and B-52s.

While the mixes of the aircraft types are such that the planes are dispersed throughout the CONUS, the TACAN population tends to be concentrated at a few bases for each aircraft type. For example, the B-52 TACAN population is spread out over 10 bases, with 3 bases comprising roughly 50 percent of the fleet. The same statement holds true for T-38s (4 bases with 71 percent), F-111s (3 bases with 99 percent) and C-130s (1 base with 88 percent).

2. DATA COLLECTION GUIDELINES

The time and budget allocated to this effort does not permit 100 percent measurement of fleet TACAN data.

Table 1. AN/ARN-118(V) DEPLOYMENT PER AFLC/LOM, 2 SEPTEMBER 1977

Base	Town	State	T-38	A-10	A-7	F-111	VC-137	C-130	KC-135	B-52	Notes
Anderson (PACF)											
Andrews	Shreveport	MD					5			12	
Barksdale		LA								6	
Blytheville		AR				44				5	
Cannon		NM									
Carswell		TX							7	20	B-52's are training
Castle	Merced	CA								18	
Columbus		MS	106								
Davis-Monthan	Tucson	AZ		28				12+		9	+C-130s may be dual
Dyess		TX									
Edwards		CA		2							
Eglin		FL			12	1					
England		LA								5	
Fairchild		WA								3	
Grand Forks		ND									
K. I. Sawyer		MI								4	+C-130 may be dual installs
Little Rock		AR						92+			
Laughlin		TX	103							15	
March		CA								2	
Minot		ND									
Mountain Home		ID									
Myrtle Beach		SC		16	1	77					
Nellis	Las Vegas	NV	8	6							F-111s moved to Mountain Home
Randolph*		TX	78								
Reese		TX	115								
Upper Heyford		England									
Vance		OK	93			74					
Williams		AZ	118							5	
Wurtsmith		MI									
			621	52	13	196	5	104+	7	104	1102+

For the same reasons, simple or stratified sampling of TACANs are also not suitable since each method require travel to nearly all bases, and in some cases would require only limited data collection (i.e., only a small percent of TACANs available at the base).

Thus, the data collection and analysis approach to be used in this effort may be stated as follows:

- a. ARINC Research will visit a limited number of bases and collect 100 percent of the TACAN time data available at those bases. This effort will result in a complete set of data on a sub-population of TACANs which can subsequently be compared with Collins results.
- b. The Air Force, under the direction of AFLC/LOM, will collect TACAN data from sites not visited by ARINC Research and will supply data which is at bases visited by ARINC Research but was not available during the visit. This information, to the extent possible, will be used to expand the ARINC acquired data base.
- c. Comparisons will be made for the TACAN sub-populations comprised of Collins and corresponding ARINC collected field data. Comparisons will be made for the total installed population depending upon the availability of AF collected data, as time and resources permit.

In selecting the bases to be visited, the following guidelines have been used:

- a. Data will be collected from each type of aircraft which contains TACANs.
 - b. When an aircraft type is deployed at several bases, visits will be made to more than one base.
 - c. The total schedule of visits will be developed to minimize travel time and costs.
3. PROPOSED PLAN FOR DATA COLLECTION
- Table 2 illustrates the proposed plan for TACAN ETI data collection.

Table 2. TACAN DATA COLLECTION PLAN

Air Force Base	City	State	Aircraft Distribution															
			T-38	T-39	A-10	A-7	F-111	VC-137	C-130	KC-135	B-52							
Andrews	Washington, D.C.																	
Davis-Monthan	Tucson	AZ			28													
Little Rock	Little Rock	AR									92							
Fandolph	San Antonio	TX	78	2														
Laughlin	Laredo	TX	103															
Mt. Home	Boise	ID						77										
Reese	Lubbock	TX	115															
Castle	Merced	CA														7		18
England	Alexandria	LA							12									
Carswell	Dallas	TX																20
March	Riverside	CA																15
(1) Total per aircraft type sampled (572)			296	2	28	12	77	5	92	7	53							
(2) Total aircraft per type			621	2	52	13	196	5	104	7	104							
(3) Percent of aircraft type sampled			48.0	100.0	54.0	92.0	39.0	100.0	88.0	100.0	51.0							
(4) Percent of aircraft type of total Fleet (1104 aircraft as of 30 August 1977)			56.0	0.2	4.7	1.2	18.0	0.5	9.4	0.6	9.4							
(5) Sampled aircraft as percent of total Fleet (572/1104 = 51.9)			27.0	0.2	2.5	1.2	6.9	0.5	8.3	0.6	4.8							

The guidelines of section 2 were used to develop this plan.

Specifically:

- a. T-38 (621 installs). These aircraft are deployed at 7 sites. However, 3 sites in Texas hold 296 (or 48 percent) of all T-38 installations. It is felt that this is a compact arrangement that will minimize inter-base travel requirements.
- b. F-111 (196 installs). Significant numbers are deployed at Mt. Home, Idaho (77), and Upper Heyford, England (74). Inclusion of both sites produced unacceptable travel requirements. However, Mt. Home has been selected and these sets represent 39 percent of all F-111 installs.
- c. B-52 (104 installs). These TACANs are deployed in rather small numbers (from 2 to 20) at 12 sites. The plan provides for visits to the 3 most populous bases (one in Texas, and two in California) which contain 51 percent of the TACAN population.
- d. Other Aircraft. For other types of aircraft, a visit is made either to the sole base of deployment (T-39, VC-137 and KC-135) or to the base of greatest deployment (A-10, A-7, and C-130).

A total of 572 aircraft or 52 percent of fleet installs will be visited under this plan. Lines (1) through (5) of Table 2 show other features of the plan.

Line 1 shows the total number of each type aircraft that will be sampled during the field visits.

Line 2 shows the total install population for each aircraft type as of approximately 2 September 1977.

Line 3 shows the percentage of total installs for each aircraft type proposed to be sampled during the field visits.

Line 4 indicates the percentage of total installs represented by the sample selected for each aircraft type. For example - T-38s. A sample of 296 installs out of 621 represents 56 percent of the total T-38 fleet.

Line 5 indicates the percentage that each sample (for each aircraft type) represents out of the total installs (all aircraft). For example - T-38s.

$$\frac{\text{Sample 296 (T-38s)}}{\text{Total Fleet 1104}} = 27 \text{ percent}$$

4. SCHEDULE OF TRAVEL

Figure 1 illustrates the predicted travel requirements, timing, and individuals involved in the data collection for the TACANs. A total of 44 man-days is predicted to be spent in this effort.

5. ARINC FIELD DATA COLLECTION

The field TACAN data will be collected by ARINC Research visits in accordance with the plan noted in Table 2. The data collection form and elements to be collected are shown in Figure 2.

5.1 Data Element Discussion

The following is a discussion of each data element shown in Table 4.

- a. Aircraft Type. Record the aircraft type for each observation. These data are required in categorizing statistics by given type, e.g., trainer, fighter/attack, bomber/cargo.
- b. Aircraft Tail Number. The tail number should be recorded to help identify installs that have been previously read. The tail number provides a quicker means of determining this information (versus the R/T serial which requires entry into the aircraft). This will be useful at bases visited by ARINC where all TACANs could not be read (e.g., aircraft is on a mission). AF personnel will later be required to collect this information. The tail number will assist them in identifying which planes still require a reading.
- c. R/T Record Card. All installs/remove information on the R/T Record Card must be recorded. This includes all removals/reinstalls due to false pulls and similar reasons. In most cases this information will consist only of an install date. On occasion, there may be multiple entries (a false pull-reinstall). In order to account for total usage, all information on the TACAN R/T Record Card must be recorded. In situations where the aircraft has experienced multiple installs (due to a failure and return to the manufacturer), previous TACAN history will be determined from Collins records.

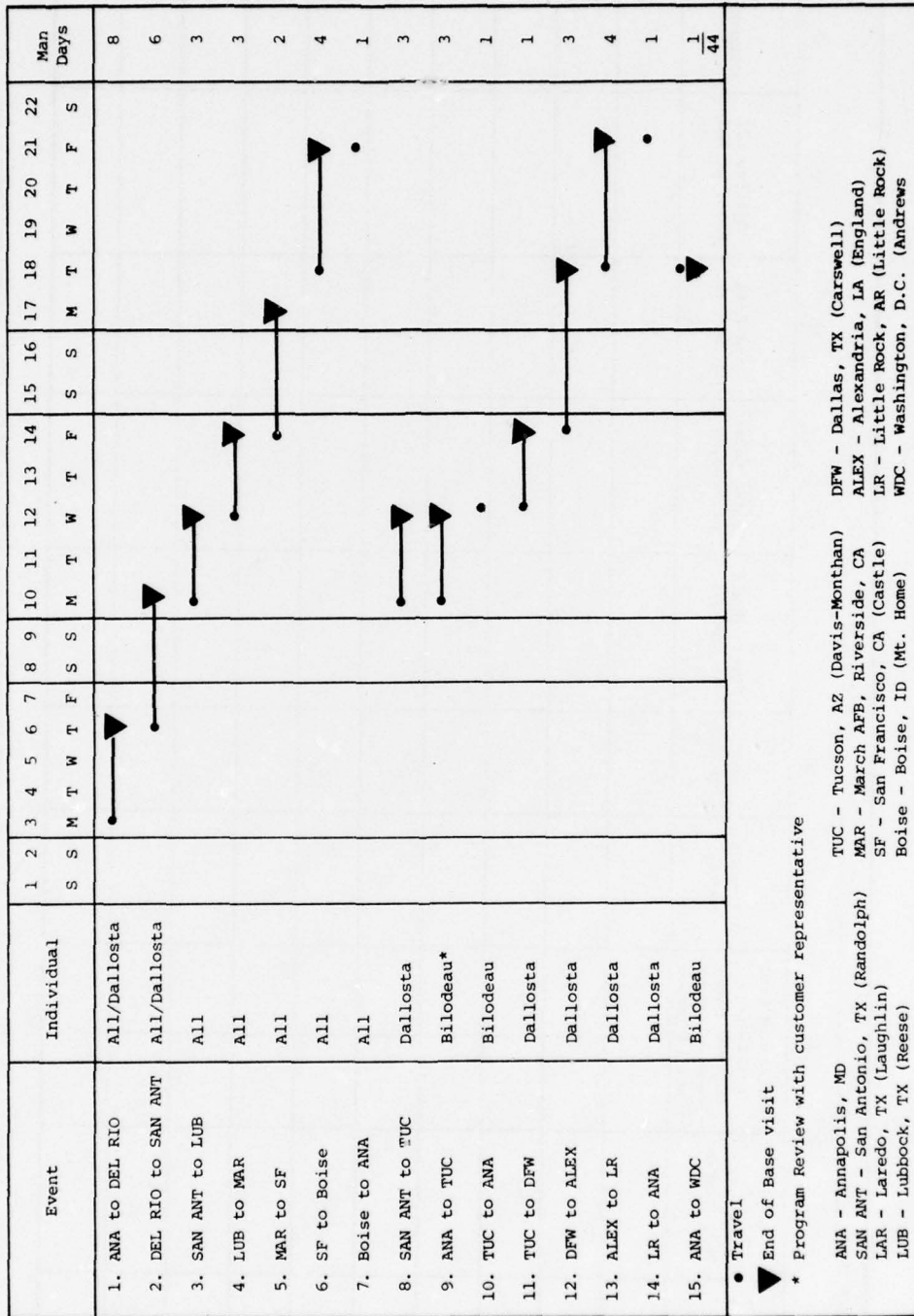


Figure 1. SCHEDULE OF TRAVEL, OCTOBER 1977

- d. R/T Serial Number. The R/T serial number must be recorded to provide a means of tracking the specific equipment relative to Collins records.
- e. ETI Reading. The ETI reading must be taken for each installed R/T. These data will be used in computation of average operating time.
- f. Flying Hours at Install. Record the aircraft flying hours at the time of install. These data may be difficult to obtain unless recorded in squadron production analysis documents. This entry will be used with the "Flying Hours at Reading" entry to determine the flying hours statistics.
- g. Flying Hours at Reading. These entries will be obtained from production analysis documents.
- h. Date Read. The data of R/T ETI observation should be recorded in order to establish cut-off points of computations.
- i. Collins ETI Reading at Ship. Collins customarily "burns in" each unit for approximately 100 hours. The ETI reading at Ship establishes initialization time for subsequent AF usage. These data will be obtained from Collins logs.
- j. Comments. Observations that might impact upon subsequent evaluation should be noted. If the aircraft has multiple TACANs or sub-units, this observation would impact upon computation of MTBF. If it is determined that the install is a replacement for a failure, this notation would flag the need to track the failure using Collins data. The initial TACAN installation date for the tail number (column b) should be recorded here.

Each data sheet will be identified by AF base and a carbon copy or duplicate prepared. The copy will be returned immediately to a central file at ARINC Research for immediate processing, and to provide a back-up in the event of data loss.

Data will be collected for all installed R/Ts from date of program start (approximately from 28 December 1975) up to the time of reading.

6. AIR FORCE DATA COLLECTION

6.1 Background

The field data collection noted previously will be done at 11 of the 29 bases where TACANS are deployed. It is desired, however, to follow through on the data collection by using USAF personnel to:

- Collect data on bases not visited
- Collect data on installed TACANS that could not be gathered during the visits. (e.g., aircraft away from bases on mission)

As part of the overall data collection effort, AFLC/LOM will obtain the above information. This effort will be performed at the convenience of the Air Force and hopefully will be completed in time to be included in the study analysis (approximately end of November 1977).

6.2 ETI/Install Collection Form

The data elements to be collected are shown in the ETI/Install Collection Form (Table 4). Copies of this form will be supplied to AFLC/LOM for use in Air Force data collection efforts.

- a. Aircraft Type. Aircraft type for each installed R/T should be noted. These data are required in categorizing statistics by aircraft type for the evaluation.
- b. Aircraft Tail Number. The aircraft tail number should be recorded to help identify installs that have been read. The tail number provides a quick visual means of determining this information (versus the R/T serial which requires entry into the aircraft) by the AF personnel who must collect data.
- c. R/T Record Card. All install/remove information on the R/T record card must be recorded. This includes removals/reinstalls due to false pulls and similar reasons.
- d. R/T Serial Numbers. The serial number of installed R/Ts must be recorded. The purpose of maintaining the serial number is to provide a means for tracking specific equipments relative to Collins records.

In bases that have been visited by ARINC Research, the USAF will be provided with a list of installed R/T serials (by aircraft and

base) read by the field team. Any serials not on this list represents the balance of installed R/Ts that require reading.

- e. ETI Reading. The ETI reading must be taken for each installed R/T.
- f. Flying Hours at Install. Record the aircraft flying hours at the time of install. This entry should be obtained from squadron analysis documentation if possible.
- g. Flying Hours at Reading. Record the flying hours of the aircraft at the time of the reading. This will be obtained from production analysis documents.
- h. Date Read. The date of the R/T ETI observation must be recorded in order to establish cut-off points of computations.
- i. Collins ETI Reading at Ship. Not required from Air Force readings. Will be obtained, if time permits, by ARINC Research.
- j. Comments. Notation should be made of multiple TACAN installs within the aircraft or multiple sub-units. The initial TACAN installation date for the tail number (column b) should be recorded here.

7. COLLINS DATA COLLECTION

The following data will be collected from the ARN-118(V) TACAN manufacturer for the purpose of determining contractual average operating time (AOT) and mean time between failures. These contractual computations will be compared to the field operational data noted in Section 5 of this plan.

7.1 Data to be Collected, Sources and Applications

Table 3 outlines the type of data required in developing the contractual computations that are available at Collins Radio Group. In addition, these data will be used for providing general information, e.g., unit serial numbers by base for development of field data collection forms.

These data will be collected during two visits to the contractor's Cedar Rapids, Iowa facility.

The first conference would establish the study baseline and provide inputs to the field efforts. This trip would also be used to present the purpose of the study to CRG and gain the latter's support. The second visit would provide an opportunity to obtain any additional update information and discuss field observations.

Table 3. COLLINS DATA COLLECTION		
Data Description	Data Source	Application
Initial Delivery Log	Collins Log #1	<ul style="list-style-type: none"> • Info on each unit initially shipped • Contains: Serial, shipdate, destination ETI reading, mod status • Will be used to establish fleet size, location
Subsequent Delivery Log	Collins Log #2	<ul style="list-style-type: none"> • Provides record of every replacement unit shipped • Contains: Serial, ship date, location mod status, ETI reading • For failed unit: Serial, AFB requesting, date of request • Will be used to establish current AFB inventory, failure info
Corrective Action Summary	Collins Log #3	<ul style="list-style-type: none"> • Provides a record of each unit returned to Collins • Contains: failure location, repair and mod actions, verification, elapsed operating time, install days • Will be used to establish verified failures, operating time and install days for computation
Secure Storage Population	Collins Log #4	<ul style="list-style-type: none"> • Provides running status of receive storage population • Contains listing by unit type quantity on last day of month • Will be used as backup info
Unit Cycle Time	Collins Log #5	<ul style="list-style-type: none"> • Record of the time required for various segments • Contains: Serial, ship date, installation date, removal date, date shipped to Collins • Will be used as backup info in analyses
Modification Status	Collins Log #6	<ul style="list-style-type: none"> • Record for each unit by serial of mod status • Will be used as backup info in ascertaining fleet status
Modification Summary Matrix	Collins Log #7	<ul style="list-style-type: none"> • Shows what mod status of each unit should be • Will be used as backup info in ascertaining fleet status
Warranty Population	Collins Log #8	<ul style="list-style-type: none"> • Produces a monthly snapshot of the total population of unit delivered • Will be used as backup information in ascertaining fleet status
Lost, Nonreparable, Inactive Units	Collins Log #9	<ul style="list-style-type: none"> • Provides info on data description categories • Will be used to adjust fleet statistics
Monthly R/T Operating Time Summary	Collins Log #10	<ul style="list-style-type: none"> • Provides a record of the number of R/T units returned to Collins • Will be used to compute contractual average daily and monthly operating hours
Contract Price Adjustment and MTBF Guarantee Statistics	Collins Log #11	<ul style="list-style-type: none"> • Provides for summary of vital statistics • Will be used as a cross-check on contractual computations
Warranty Data Report	Collins, June 13th report	<ul style="list-style-type: none"> • Contains logs noted previously except Log #2, 10, 11 • Contains narrative and summary statistics • Will be used as baseline. Additions since last report will be obtained to minimize data collection effort.
Conferences	At CRG, Cedar Rapids	<ul style="list-style-type: none"> • Conferences will be used to obtain observations other than those documented above
Average Number of Installs by Month	Collins (provided by AF to CRG)	<ul style="list-style-type: none"> • Used for computation of Total Operate Hours

7.2 Scope of Data

The data outlined in Table 3 are known to exist as a result of CRG TACAN contractual requirements. As a result, it is anticipated that collection efforts will require minimum effort involving primarily manual update of CRG's April 15th baseline.

It will be noted that basic information such as ETI readings of returned units, install days and failures can be found in Logs #3 and #10. Other logs provide useful information on item status and as a cross check of field data.

For example:

Log #1 helps in preparing serial number and locations to which units are sent.

Log #2 helps establish replacement serials for failed units and provides a cross-check reference on failures.

Log #4 could be useful as a backup source in tracking deliveries (including replacements).

Log #5 provides a cross-check source for installation and removal data.

Log #6 could be useful in tracking of returns - not of a failure nature.

Log #7 could be used in cross-referencing information of Log #6.

Log #8 will help provide an insight into fleet status at the time of field visits.

Log #9 will be used to adjust fleet statistics particularly for serials which are no longer in the inventory due to aircraft crashes.

PART II - TACAN DATA EVALUATION PLAN

This section describes how the data collected in the activities described in Part I will be processed to provide the information required in this study.

1. FIELD DATA ANALYSIS

1.1 Base

The data collected at each base visited by ARINC Research will be processed to obtain total TACAN operate hours at that base and total installed days at that base. This will be done by summing the operate times and install days observed on flight line R/T installs and on R/T returns to Collins. This information will provide a total for each base except for R/Ts that:

- are in transit to Collins during the measurement period
- have been removed at a base but are packaged or otherwise unavailable for viewing
- have been exchanged with other bases not visited during this effort.

It is expected that this missing data will represent a small fraction of the total data for a base. However if missing data appears to be a significant portion of base information (e.g., 10 percent or more of all R/Ts involved) extra efforts will be made to acquire it (e.g., phone Collins to request follow-up on in-transit items; request that packaged units be opened for inspection, etc.) or to adjust the available data accordingly.

Once compiled, base information will provide the following estimates:

- a) TACAN total operate time (TOT)
- b) Total base TACAN install days
- c) Average operate time (AOT) per installed day (viz. a/b)
- d) When combined with TACAN return data at Collins, base MTBF (viz. TOT divided by the number of failed units received at Collins)
- e) Number of installed TACAN sets by month

1.2 Aircraft Type

Information by each aircraft type, e.g., T-38, B-52, etc; will be pooled to provide estimates for each aircraft. The parameters to be calculated are those shown in paragraph 1.1 above.

1.3 Generic Type

Information from attack/fighter bases, bomber/cargo bases, and trainer bases will be pooled to provide estimates for those classes of aircraft. The parameters to be calculated are those shown in paragraph 1.1 above.

1.4 Sub-population Estimates

Information from all bases visited during this effort will be pooled to provide sub-population estimates of the parameters shown in paragraph 1.1 above. These results will later be compared with Collins statistics for this sub-population which represents nearly 50 percent of the TACAN fleet.

2. COLLINS RADIO GROUP DATA ANALYSIS

The Collins Radio Group information on TACAN returns, ETI readings, Installed days, and Number of installs will be reviewed and separated into two classes: a) information related to bases in our sub-population and b) other. The information in class a) will be put into the RIW contractual formulas for AOT, Total Operate Time (TOT) and MTBF.

3. COMPARISON OF ACTUAL AND CONTRACTUAL DATA

The estimate of AOT, TOT, and MTBF calculated in paragraphs 1 and 2 will be compared with each other and with similar comparisons with IOT&E

data. We will identify any trends which appear and, to the extent possible, relate these trends in terms to the size of the TACAN population, usage patterns, timeliness of failure or install data, or other relevant factors.

4. AIR FORCE DATA COLLECTION

All data supplied by Air Force sources at bases not visited during this effort will be reviewed by ARINC Research personnel for reasonableness, consistency, and completeness. The resulting information will be combined with the data collection logs completed during our own efforts and will be provided as a deliverable item for this contract.

As time and resources of this effort permit, Air Force supplied data will be processed to provide estimates such as those shown in paragraph 1.1. If these data are of sufficient quality, it may be possible to make actual vs. contractual comparisons for an "expanded" sub-population, viz. the ARINC visited bases plus other bases which have Air Force supplied information. If such analysis is possible, care will be taken to identify the results associated with each sub-population.

5. TACAN FLEET OBSERVATION

The final report for this investigation will address any problem or observations that have come to our attention during base visits. Areas of attention include installation, material and record flow, and maintenance usage or other features that may influence the field performance of TACAN as it was reviewed by this study.

PART III - IMPACT OF ANALYSIS

The results of this study will be used to assess possible impacts in the TACAN contract. The two such areas to be discussed are as follows:

1. PRICE ADJUSTMENT

Since the utilization of the TACAN is based on a tolerance of ± 5 percent, any variation from that value as discovered through this study will reflect itself in a price adjustment based on the actual operating hours. This study will project the possible magnitude of that adjustment should it be necessary.

2. MTBF GUARANTEE

As it is contractually stipulated, the progress of the TACAN towards its growth goals will be monitored by the Government. Based on the data presented in the study, the actual MTBF of the TACAN will be estimated, and its ramifications discussed.

APPENDIX B

BASIC FIELD DATA

AND

PRELIMINARY CALCULATIONS

PREPARED BY

ARINC RESEARCH

INCLUDES DATA FROM

ANDREWS AFB
CARSWELL AFB
CASTLE AFB
DAVIS-MONTHAN AFB
ENGLAND AFB
LAUGHLIN AFB
LITTLE ROCK AFB
MARCH AFB
MOUNTAIN HOME AFB
RANDOLPH AFB
REESE AFB

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Andrews AFB, MD

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
VC-137	7000	1178	201	114	87	4/22/77	-	10/21/77	183	1463.8	1394.7	69.1	
VC-137	6970	11070	328	122	206	4/22/77	-	10/21/77	183	10588.4	10380.2	208.2	
VC-137	6971	11096	446	112	334	4/24/77	-	10/21/77	181	13336.4	13043.9	292.5	
VC-137E	6972	11083	513	130	383	4/26/77	-	11/8/77	197	13500	13162.1	337.9	
VC-137C	6000	11127	168	109	59	4/28/77	-	11/8/77	195	5324.5	5249.5	75	
S	-	11024	107	-	-			10/21/77					Spare
M	-	12487	114	-	-			10/21/77					Mock-up
S		12319			121			10/21/77					Spare
S		12421			-			10/21/77					Spare
S		12489			-			10/21/77					Spare
S		12353			-			10/21/77					Spare
S		12174			122			10/21/77					Spare
S		12371			102			10/21/77					Spare
S		12460			102			10/21/77					Spare
S		12436			113			10/21/77					Spare
S		12456			113			10/21/77					Spare
S		12257			110			10/21/77					Spare
S		12422			105			10/21/77					Spare

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Carlswell AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Use tail	Remove						
B-52	687	11031	254	155	99	8/21/77	-	10/17/77	58	11142.2	11069.4	72.8	
B-52	690	10562	277	113	164	7/5/77	-	10/17/77	105	13424.4	13265.8	158.6	Alert
B-52	692	-	-	-	-	9/23/77	-	-	-	-	11286.9	-	
B-52	695	11100	430	109	321	3/25/77	-	10/17/77	207	11411.8	11153.8	258	
B-52	698	10992	176	146	30	8/30/77	-	10/17/77	49	11813.8	-	-	None in Stock
S	-	-	-	-	-	-	-	10/17/77	-	-	-	-	
M	-	-	119	114	5	-	-	10/17/77	-	-	-	-	
B-52	586	11075	160	-	-	9/1/77	-	10/17/77	48	12928.3	12895.4	32.9	
B-52	587	10954	217	111	116	8/8/77	-	10/17/77	71	12236.0	12162.2	73.8	
B-52	617	-	-	-	-	7/11/77	-	-	-	-	-	-	TDY
B-52	658	-	-	-	-	9/30/77	-	-	-	-	12034.0	-	Alert
B-52	662	11033	292	107	185	7/12/77	-	10/17/77	98	11720.7	11566.5	154.2	
B-52	663	11062	339	162	177	7/13/77	-	10/17/77	97	12085.0	11953.0	132.0	
B-52	667	10158	342	-	-	7/1/77	-	10/17/77	108	12596.0	12468.2	127.8	
B-52	672	11111	181	106	75	8/16/77	-	10/17/77	33	11798.3	11735.9	62.4	
B-52	674	-	-	-	-	8/10/77	-	-	-	-	12833.5	-	Alert
B-52	679	-	-	-	-	9/28/77	-	-	-	-	13382.6	-	Alert
B-52	686	-	-	-	-	9/7/77	-	-	-	-	-	-	Alert
B-52	057	11041	148	125	23	10/7/77	-	10/14/77	8	12302.6	12284.3	18.3	
B-52	059	-	-	-	-	10/14/77	-	-	3	-	12252.5	-	Flying
B-52	067	11066	215	107	108	8/18/77	-	10/17/77	62	10950.5	10859.4	91.1	
B-52	068	11039	138	118	20	10/11/77	-	10/18/77	2	12915.7	12899.0	16.7	
B-52	071	11040	186	125	61	9/16/77	-	10/18/77	33	12397.8	12344.6	53.2	
B-52	074	-	-	-	-	7/25/77	-	-	-	-	-	-	TDY
B-52	085	-	-	-	-	7/7/77	-	-	-	-	11032.4	-	Fuel Cell
B-52	086	11081	211	127	84	7/29/77	-	10/17/77	81	11732.9	11667.0	65.9	
B-52	090	-	-	-	-	7/14/77	-	-	-	-	13046.2	-	Alert
B-52	095	11061	175	112	63	9/22/77	-	10/17/77	26	12605.8	12556.1	49.7	
B-52	105	11069	234	133	101	8/2/77	-	10/17/77	77	12588.3	12516.0	72.3	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Castle AFB, Calif.

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	0205	11534	345	186	159	9/12/77	-	10/19/77	38				
B-52	0236	10036	1706	161	1545	2/23/77	-	10/19/77	236				
B-52	0012	11086	402	109	293	7/18/77	-	10/19/77	94				
B-52	6477	11658	293	104	189	8/17/77	-	10/19/77	64				
B-52	0168	11093	361	130	231	7/22/77	-	10/19/77	90				
B-52	6514	10126	770	130	640	11/23/76	-	10/19/77	331				
B-52	0033	10113	1446	128	1318	7/8/76	-	10/19/77	469				
B-52	0041	11107	402	134	268	7/25/77	-	10/19/77	87				
B-52	0179	11115	276	158	114	8/1/77	-	10/19/77	80				
B-52	1018	10082	1323	165	1158	4/1/76	-	10/19/77	567				
B-52	0184	10907	491	127	364	7/13/77	-	10/19/77	99				
KC-135	3559	10052	1423	178	1245	7/31/76	10/18/77	10/19/77	446				
KC-135	8024	10052	1423	1423*	0	10/18/77	-	10/18/77	0				R/T 10052 removed a/c 3559 on 10/18/ 77
KC-135	0080	10026	1283	185	1098	8/11/76	-	10/19/77	435				
KC-135	1515	10200	425	141	284	4/21/77	-	10/19/77	182				
KC-135	1501	10077	1037	222	815	7/21/76	-	10/19/77	456				
KC-135	1488	10041	997	168	829	4/16/76	-	10/19/77	552				
													See Castle AFB Attachment for Flying Hours

*1423 hours at reinstall.

Air Force Base Davis-Monthan AFB, AZ

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install Mo-Day-Yr	Remove						
A-10	291	11057	354	221	133	10/8/77	-	10/13/77	6	93.8	0	93.8	
A-10	287	10241	558	117	441	3/31/77	-	10/13/77	197	363.5	0	363.5	
A-10	278	10275	474	117	357	2/22/77	-	10/13/77	234	266.8	0	266.8	
A-10	301	10012	341	-	-	7/13/77	-	10/13/77	93	181.6	0	181.6	
A-10	268	10111	731	218	513	9/23/76	-	10/13/77	386	449.5	0	449.5	
A-10	270	10147	543	124	419	10/7/76	-	10/13/77	372	343.3	0	343.3	
A-10	276	10115	652	154	498	12/21/76	-	10/13/77	297	364.2	0	364.2	
A-10	283	10708	327	116	211	3/3/77	-	10/13/77	225	221.5	0	221.5	
A-10	285	10162	464	127	337	3/29/77	-	10/13/77	199	278.5	0	278.5	
A-10	279	10186	506	111	395	1/13/77	-	10/13/77	274	230.0	0	230.0	
A-10	277	10486	342	134	208	12/17/76	-	10/13/77	301	299.3	0	299.3	
A-10	282	10373	421	113	308	3/3/77	-	10/13/77	255	257.5	0	257.5	
A-10	280	10167	409	116	293	2/3/77	-	10/13/77	253	315.7	0	315.7	
A-10	275	10093	576	119	457	1/21/77	-	10/13/77	265	272.2	0	272.2	
A-10	273	10098	657	113	544	11/30/76	-	10/13/77	317	440.6	0	440.6	
A-10	271	10316	346	119	227	11/10/76	-	10/13/77	338	294.6	0	294.6	
A-10	281	10142	510	153	357	2/7/77	-	10/13/77	249	295.6	0	295.6	
A-10	293	10437	418	121	297	5/5/77	-	10/13/77	162	237.2	0	237.2	
A-10	289	10091	397	110	287	3/30/77	-	10/13/77	198	317.7	0	317.7	
A-10	290	10610	400	109	291	4/1/77	-	10/13/77	196	264.5	0	264.5	
A-10	272	10118	581	146	435	11/10/76	-	10/13/77	338	340.2	0	340.2	
A-10	274	10096	553	111	442	12/8/76	-	10/13/77	310	361.1	0	361.1	
A-10	288	10182	193	111	82	4/1/77	-	10/13/77	196	251.8	0	251.8	
A-10	286	10095	743	426	317	3/24/77	-	10/13/77	204	263.1	0	263.1	
A-7	002	11592	111	106	5	10/5/77	-	10/12/77	8	1866.3	1866.3	0.0	
A-7	036	11723	104	104	0	10/11/77	-	10/12/77	2	1683.8	1683.8	0.0	
A-7	984	11551	174	104	70	9/2/77	-	10/13/77	42	1931.8	1877.8	54.0	
A-7	056	11455	246	237	9	10/7/77	-	10/13/77	7	1621.2	1611.5	9.7	
A-7	009	11726	119	107	12	9/29/77	-	10/13/77	15	1167.2	1158.1	9.1	
M	NA	10050	120	-	-	-	-	10/13/77	-	-	-	-	Mock-up
A-7	013	11614	175	136	39	9/9/77	-	10/12/77	34	982.5	926.6	55.9	
A-7	003	11621	146	103	43	9/6/77	-	10/12/77	37	1566.3	1535.5	30.8	
A-7	216	11537	159	106	53	9/15/77	-	10/12/77	28	1973.9	1931.0	42.9	
A-7	025	11826	156	138	18	8/30/77	-	10/12/77	44	1506.2	1470.2	36.0	

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Air Force Base Davis-Monthan AFB, AZ

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
A-7	217	11632	122	107	15	9/30/77	-	10/12/77	13	1982.1	1971.3	10.8	
A-7	935	11517	153	144	9	9/26/77	-	10/12/77	17	1934.5	1928.2	6.3	
A-7	046	10506	188	138	50	9/12/77	-	10/12/77	31	1668.1	1641.2	26.9	
A-7	209	11542	165	118	47	8/29/77	-	10/12/77	45	1886.7	1850.3	36.4	
A-7	240	11639	122	102	20	9/28/77	-	10/12/77	15	1975.6	2063.4	-	
A-7	257	11397	169	110	59	9/8/77	-	10/12/77	35	1475.3	1433.1	42.2	
A-7	989	11554	108	108	0	10/12/77	-	10/12/77	1	1987.8	1987.8	0.0	

Air Force Base England AFB, LA

AN/ARN-118(V) TACAN FIELD DATA
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(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
A-7	184	12303	174	109	65	8/23/77	-	10/18/77	57	1238.4	-	-	
A-7	175	12334	195	115	80	8/22/77	-	10/18/77	58	1318.0	-	-	
A-7	178	12346	179	120	59	8/17/77	-	10/18/77	63	1387.7	-	-	
A-7	193	12259	206	120	86	8/23/77	-	10/18/77	57	1126.4	-	-	
A-7	303	12070	125	111	14	10/6/77	-	10/19/77	14	1087.3	-	-	
A-7	332	12355	182	105	77	8/18/77	-	10/19/77	63	1603.9	-	-	
A-7	345	12132	112	107	5	10/13/77	-	10/19/77	7	1506.6	-	-	
A-7	348	12299	188	118	70	8/29/77	-	10/19/77	52	1143.2	-	-	
A-7	020	12027	164	139	25	10/5/77	-	10/19/77	15	1472.6	-	-	
A-7	374	12339	133	122	11	10/4/77	-	10/19/77	16	1080.1	-	-	
A-7	179	12037	127	115	12	9/23/77	-	10/19/77	27	1205.3	-	-	
A-7	181	12100	124	107	17	9/29/77	-	10/19/77	21	1229.1	-	-	
A-7	207	12089	144	127	17	9/23/77	-	10/19/77	27	1865.5	-	-	
A-7	201	11022	121	104	17	10/3/77	-	10/19/77	17	1796.5	-	-	
A-7	314	12067	134	112	22	10/4/77	-	10/19/77	16	1752.8	-	-	
A-7	1019	11748	196	130	66	9/8/77	-	10/19/77	42	1598.1	-	-	
A-7	298	11902	132	106	26	10/1/77	-	10/19/77	19	1340.2	-	-	
A-7	307	11688	184	155	29	8/29/77	-	10/19/77	52	1749.6	-	-	
A-7	308	12133	139	134	5	10/1/77	-	10/19/77	19	1649.1	-	-	
A-7	215	12025	131	112	19	9/30/77	-	10/19/77	20	961.1	-	-	
A-7	216	12127	110	104	6	10/13/77	-	10/19/77	7	1245.2	-	-	
A-7	023	11874	121	105	16	9/15/77	-	10/19/77	35	1230.3	-	-	
A-7	751	12139	198	127	71	8/25/77	-	10/19/77	56	652.1	-	-	
A-7	000	12395	165	105	60	9/7/77	-	10/19/77	43	1554.5	-	-	
A-7	759	11845	414	105	309	9/13/77	-	10/19/77	37	549.5	-	-	
A-7	758	12304	190	107	83	8/22/77	-	10/19/77	59	686.0	-	-	
A-7	750	12354	177	100	77	8/24/77	-	10/19/77	57	632.7	-	-	
A07	969	12117	111	105	6	10/3/77	-	10/19/77	17	1595.0	-	-	
A-7	948	12381	116	102	14	9/20/77	-	10/19/77	80	1991.7	-	-	
A-7	376	11814	106	106	0	10/5/77	-	10/19/77	15	1893.3	-	-	
A-7	940	11013	150	120	30	9/26/77	-	10/19/77	24	1080.8	-	-	
A-7	187	11977	112	106	6	10/5/77	-	10/19/77	15	2020.1	-	-	
A-7	187	12047	120	120	0	10/6/77	-	10/19/77	14	1105.4	-	-	
A-7	213	10910	194	159	35	9/28/77	-	10/19/77	22	1167.0	-	-	

Air Force Base England AFB, LA

AN/ARN-118(V) TACAN FIELD DATA
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(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install Mo-Day-Yr	Remove						
A-7	188	12265	158	127	31	9/8/77	-	10/19/77	42	1112.0	-	-	
A-7	209	10420	129	121	8	9/10/77	-	10/19/77	40	1141.9	-	-	
A-7	208	11828	115	107	8	9/11/77	-	10/19/77	39	1151.9	-	-	
A-7	171	11786	169	133	36	8/27/77	-	10/19/77	54	1264.3	-	-	
A-7	212	12013	147	120	27	9/26/77	-	10/19/77	24	1207.4	-	-	
A-7	192	12075	159	127	32	9/29/77	-	10/19/77	21	1217.4	-	-	
A-7	203	10467	145	124	21	9/12/77	-	10/19/77	38	1223.5	-	-	
A-7	205	10943	163	104	59	8/29/77	-	10/19/77	52	1126.2	-	-	
A-7	177	12314	160	108	52	9/9/77	-	10/19/77	41	1143.5	-	-	
A-7	218	12093	180	140	40	9/26/77	-	10/19/77	24	1104.9	-	-	
A-7	223	11868	119	113	6	10/5/77	-	10/19/77	15	1091.6	-	-	
A-7	226	11999	116	115	1	10/5/77	-	10/19/77	15	1046.5	-	-	
A-7	292	12021	174	168	6	10/13/77	-	10/19/77	7	1157.0	-	-	
A-7	295	11879	147	127	20	10/4/77	-	10/19/77	16	1153.7	-	-	
A-7	331	12125	115	106	9	10/7/77	-	10/19/77	13	1809.0	-	-	
A-7	329	12085	120	109	11	10/11/77	-	10/19/77	9	2001.2	-	-	
A-7	333	12108	132	107	25	9/29/77	-	10/19/77	21	1189.4	-	-	
A-7	339	11746	160	119	41	9/13/77	-	10/19/77	37	1226.2	-	-	
A-7	353	11876	231	156	75	8/24/77	-	10/19/77	57	1288.3	-	-	
A-7	360	11797	161	152	9	9/13/77	-	10/19/77	37	1321.4	-	-	
A-7	943	12035	130	112	18	9/30/77	-	10/19/77	20	1961.7	-	-	
A-7	942	11841	127	111	16	9/21/77	-	10/19/77	29	1933.1	-	-	
A-7	754	12082	148	111	37	9/23/77	-	10/19/77	27	685.9	-	-	
A-7	752	12380	110	107	3	9/19/77	-	10/19/77	31	689.7	-	-	
A-7	021	12054	171	137	34	9/29/77	-	10/19/77	21	1547.7	-	-	
A-7	379	12352	170	113	57	9/8/77	-	10/19/77	42	1429.8	-	-	
A-7	169	12129	148	148	0	9/22/77	-	10/19/77	28	1243.9	-	-	

AN/ARN-118(V) TACAN FIELD DATA
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Air Force Base Laughlin AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	23708	11607	142	141	1	9/30/77	-	10/4/77	5	7439.0	7431.0	8.0	
T-38	13236	11450	298	115	183	6/21/77	-	10/4/77	106	6722.3	6575.2	147.1	
T-38	97077	11864	282	142	140	6/21/77	-	10/4/77	106	3684.0	3568.8	115.2	
T-38	13227	11509	845	158	687	7/13/77	-	10/4/77	84	6235.2	6157.1	78.1	
T-38	13282	11600	275	111	164	6/21/77	-	10/4/77	106	5970.0	5862.5	107.5	
T-38	38220	11385	303	126	127	6/28/77	-	10/4/77	99	6185.2	6075.2	110.0	
T-38	14926	11653	304	116	188	6/2/77	-	10/4/77	125	4649.6	4493.6	156.0	
T-38	38139	11950	202	110	92	8/20/77	-	10/4/77	46	6825.1	6749.0	76.1	
T-38	38150	11930	171	112	59	7/26/77	-	10/4/77	71	6664.8	6618.8	46.0	
T-38	38241	11622	263	107	156	6/28/77	-	10/4/77	99	5963.2	5835.9	127.3	
T-38	14932	11838	188	113	75	8/20/77	-	10/4/77	46	4623.8	4580.4	43.4	
T-38	13255	11953	253	108	145	7/11/77	9/29/77	10/4/77	81	6626.9	6515.7	111.2	
T-38	13254	12214	159	108	51	9/29/77	-	10/3/77	6	-	-	-	
T-38	13237	11911	188	118	70	6/30/77	-	10/3/77	96	6442.3	6408.5	33.8	
T-38	13195	12184	141	108	33	8/2/77	-	10/3/77	63	6061.5	6002.8	58.7	
T-38	13197	12186	187	105	82	9/12/77	-	10/3/77	22	5822.5	5724.6	97.9	
T-38	13244	11903	271	161	110	8/11/77	-	10/3/77	54	5825.9	5758.7	67.2	
T-38	13250	11079	232	180	52	8/16/77	-	10/3/77	49	6053.0	5963.0	90.0	
T-38	13305	12018	177	102	75	9/3/77	-	10/3/77	31	6675.7	6514.5	161.2	
T-38	13283	11846	236	110	126	8/20/77	-	10/3/77	45	6252.6	6191.2	61.4	
T-38	13259	11940	130	102	28	7/10/77	-	10/3/77	86	6336.5	6231.1	105.4	
T-38	13230	11716	252	144	108	8/16/77	-	10/3/77	49	6061.9	6038.7	23.2	
T-38	10826	11694	245	107	138	7/11/77	7/14/77	10/3/77	4	5851.1	5760.9	90.2	
T-38	38157	10871	238	106	132	9/21/77	-	10/3/77	13	7672.7	7665.5	7.2	
T-38	13241	12301	202	105	97	8/7/77	-	10/3/77	43	6716.1	6594.1	122.0	
T-38	64380	11558	254	126	128	8/4/77	-	10/3/77	89	6456.5	6375.4	81.0	
T-38	10879	11956	138	108	30	8/16/77	-	10/3/77	49	5262.6	5139.5	123.1	
T-38	38156	11978	218	102	116	8/25/77	-	10/3/77	40	7904.6	7802.6	2.0	
T-38	10419	11983	286	104	182	8/1/77	-	10/3/77	64	5855.4	5761.7	93.7	
T-38	13247	11925	187	111	76	6/30/77	-	10/3/77	96	5726.0	5617.8	108.2	
T-38	10872	11570	287	108	179	6/7/77	-	10/3/77	119	6438.4	6326.8	111.5	
T-38						7/7/77	-	10/3/77	89	8039.5	-	-	

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CPO F08603-77-A-3104

Air Force Base Laughlin AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	38218	12275	138	106	32	8/10/77	-	10/3/77	55	5249.4	5221.3	28.1	
T-38	13293	11547	152	114	38	8/20/77	-	10/3/77	45	5841.2	5809.5	31.7	
T-38	88121	11932	176	108	68	7/12/77	-	10/3/77	84	4318.3	4273.5	44.8	
T-38	38151	11665	231	104	127	6/22/77	-	10/3/77	104	6504.7	6400.0	104.7	
T-38	38148	11637	176	115	61	7/1/77	-	10/3/77	94	6330.4	6316.8	13.6	
T-38	38239	11640	360	186	174	7/6/77	-	10/4/77	91	6025.3	5943.3	82.0	
T-38	38152	11948	281	112	169	7/7/77	-	10/4/77	90	6785.9	6641.0	144.9	
T-38	14951	11676	313	103	210	6/8/77	-	10/4/77	119	4304.6	4128.7	175.9	
T-38	14955	11680	302	109	193	6/23/77	-	10/4/77	103	4434.6	4271.2	163.4	
T-38	38246	11962	237	107	130	8/1/77	-	10/4/77	65	6383.3	6274.5	108.8	
T-38	38147	11957	139	111	28	9/9/77	-	10/4/77	26	6405.1	6382.1	23.0	
T-38	88118	11659	225	107	118	6/23/77	-	10/4/77	104	4799.5	4700.6	98.9	
T-38	38155	11965	134	103	31	7/29/77	-	10/4/77	68	6556.8	6530.3	26.5	
T-38	13182	11979	124	107	17	7/13/77	-	10/5/77	84	6418.5	6406.4	12.1	
T-38	0424	11941	176	109	67	7/15/77	-	10/6/77	82	5780.2	5727.1	53.7	
T-38	3187	11981	187	107	80	7/18/77	-	10/6/77	79	6590.3	6525.1	65.2	
T-38	13194	11675	373	139	234	6/20/77	-	10/5/77	107	6341.6	6148.0	193.6	
T-38	10388	12254	128	104	24	8/15/77	-	10/5/77	52	5809.3	5789.8	19.5	
T-38	10390	11996	182	106	76	6/13/77	-	10/5/77	115	5765.7	5702.5	63.2	
T-38	10336	11645	353	115	238	7/12/77	-	10/5/77	86	6124.8	6013.3	111.5	
T-38	13167	11949	266	107	159	8/3/77	-	10/5/77	64	5952.1	5852.0	100.1	
T-38	01568	11231	250	114	136	10/5/77	-	10/5/77	1	2542.9	2433.4	109.5	
T-38	10464	12716	114	114	0	10/5/77	-	10/5/77	1	5212.8	5212.8	0.0	
T-38	13249	11856	115	107	8	10/5/77	-	10/5/77	1	6394.3	6310.3	84.0	
T-38	3284	12694	236	236	0	7/21/77	-	10/5/77	77	5829.3	5829.3	0.0	
T-38	13243	11993	254	113	141	7/13/77	-	10/5/77	85	6765.0	6650.0	15.0	
T-38	13173	11567	313	131	182	6/2/77	-	10/3/77	124	5873.7	5722.2	151.5	
T-38	13225	11697	340	104	236	6/1/77	-	10/3/77	125	6317.3	6116.4	200.9	
T-38	13224	11956	158	108	50	8/16/77	-	10/3/77	49	6030.6	5984.3	46.3	
T-38	13179	11959	211	103	108	9/14/77	-	10/3/77	20	6269.6	6175.9	93.7	
T-38	13178	11573	290	144	146	8/2/77	-	10/3/77	63	6302.6	6203.4	99.2	
T-38	13208	12223	178	108	70	8/11/77	-	10/3/77	54	5702.4	5641.4	61.0	
T-38	13189	11656	231	105	126	6/14/77	-	10/3/77	112	5622.7	5515.8	106.9	
T-38	13219	11682	233	107	126	6/9/77	-	10/3/77	117	6493.3	6386.9	106.4	

Air Force Base Laughlin AFB, TX

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	13176	11964	166	105	61	6/23/77	-	10/3/77	103	6555.4	6453.7	101.7	
T-38	13296	11626	296	108	188	6/01/77	-	10/3/77	125	6089.6	5932.2	157.4	
T-38	13258	11374	262	116	146	6/20/77	-	10/3/77	106	5898.7	5794.9	103.8	
T-38	3191	11995	238	105	133	7/7/77	-	10/5/77	91	-	6849.5	-	
T-38	8222	11454	315	116	199	7/21/77	-	10/5/77	77	6686.6	6431.1	255.5	
T-38	3252	11636	246	107	139	6/2/77	-	10/5/77	126	6782.5	6664.1	118.4	
T-38	13181	11647	172	105	67	8/27/77	-	10/3/77	38	6762.4	6726.7	35.7	
T-38	10420	10022	889	110	779	5/18/77	-	10/3/77	139	5303.4	5174.4	129.0	
T-38	10338	11851	846	815	31	8/16/77	-	10/3/77	49	5909.2	5886.2	23.0	
T-38	14852	12274	162	112	50	8/10/77	-	10/3/77	55	4757.6	4714.7	42.5	
T-38	38141	11477	205	138	67	7/28/77	-	10/3/77	68	6643.5	6544.4	99.1	
T-38	13183	12268	193	130	63	8/11/77	-	10/3/77	54	6313.9	6262.8	51.1	
T-38	10383	11624	264	105	159	6/21/77	-	10/3/77	105	5407.0	5276.2	130.8	
T-38	14844	12307	174	111	63	8/11/77	-	10/3/77	54	4760.8	4709.7	51.1	
T-38	13239	12237	167	107	60	8/9/77	-	10/3/77	56	6589.2	6539.8	49.4	
T-38	10915	11921	187	107	80	7/20/77	-	10/3/77	76	7805.6	7770.5	35.1	
T-38	01954	11973	181	106	75	8/16/77	-	10/3/77	49	2947.6	2884.7	62.9	
T-38	13186	11893	112	111	1	8/15/77	-	10/4/77	51	6437.6	6434.0	3.6	
T-38	38240	12115	223	190	33	8/9/77	-	10/4/77	56	6834.4	6795.5	38.9	
T-38	38236	11985	111	105	6	7/8/77	-	10/4/77	89	6610.7	6610.7	0.0	
T-38	13196	11915	132	114	18	7/29/77	-	10/4/77	68	6505.8	6489.8	16.0	
T-38	12251	11889	175	118	57	7/29/77	-	10/4/77	68	6306.4	6277.2	29.2	
T-38	38154	11944	165	108	57	8/1/77	-	10/4/77	65	6524.1	6481.1	43.0	
T-38	10378	11484	168	159	9	6/1/77	-	10/4/77	126	5674.1	5667.3	6.8	
T-38	13235	11954	140	107	33	7/19/77	-	10/4/77	78	6294.6	6274.4	20.2	
T-38	13246	11975	228	108	120	6/30/77	-	10/4/77	97	6265.2	6163.6	101.6	
T-38	10421	11562	207	111	96	7/15/77	-	10/3/77	81	5102.6	5021.6	81.0	
T-38	01591	11717	163	113	50	9/1/77	-	10/3/77	33	2946.5	2849.8	96.7	
T-38	13171	11905	146	107	39	6/3/77	-	10/3/77	123	6238.3	6187.9	50.4	
T-38	10331	11546	268	136	132	6/22/77	-	10/3/77	104	6061.5	5954.7	106.8	
T-38	13185	11652	276	105	171	6/16/77	-	10/3/77	110	6135.6	6005.7	129.9	
T-38	13228	12212	192	105	87	8/10/77	-	10/3/77	55	6824.9	6737.7	87.2	
T-38	13174	12191	218	149	69	8/16/77	-	10/3/77	49	6521.6	6464.5	57.1	
T-38	13220	12812	191	119	72	8/9/77	-	10/3/77	56	6061.7	5988.8	72.9	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Laughlin AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install Mo-Day-Yr	Remove Mo-Day-Yr						
T-38	13222	12256	158	116	42	8/11/77	-	10/3/77	54	6225.3	6190.3	35.0	
T-38	13221	11976	210	111	99	7/25/77	-	10/3/77	71	5994.4	5910.9	83.5	
T-38	13256	12124	135	114	21	8/9/77	-	10/3/77	56	5985.7	5968.3	17.4	
T-38	4924	12605	113	113	0	10/4/77	-	10/4/77	1	-	-	-	
T-38	3273	12538	106	106	0	10/4/77	-	10/4/77	1	-	-	-	
T-38	3257	12503	140	140	0	10/4/77	-	10/4/77	1	-	-	-	
T-38	8209	12528	105	105	0	10/4/77	-	10/4/77	1	-	-	-	
T-38	1586	11854	104	104	0	10/3/77	-	10/4/77	2	-	-	-	
T-38	0384	12729	121	121	0	10/4/77	-	10/4/77	1	-	-	-	
T-38	3216	12194	-	118	-	8/20/77	10/3/77	-	44	-	-	-	
T-38	3284	12694	218	118	100	10/3/77	-	10/3/77	1	-	-	-	
T-38	50392	11927	236	236	0	10/5/77	-	10/5/77	1	-	-	-	
-	-	-	241	107	134	8/16/66	10/3/77	-	48	-	-	-	
-	-	12551	126	-	-	10/3/77	-	10/3/77	1	-	-	-	Spare
-	-	12652	105	-	-	10/6/77	-	10/6/77	-	-	-	-	Spare
-	-	12658	193	-	-	10/6/77	-	10/6/77	-	-	-	-	Spare
-	-	12716	114	-	-	10/6/77	-	10/6/77	-	-	-	-	Spare
-	-	12734	104	-	-	10/6/77	-	10/6/77	-	-	-	-	Spare
-	-	12804	104	-	-	10/6/77	-	10/6/77	-	-	-	-	Mock-up
-	-	10034	278	-	-	10/6/77	-	10/6/77	-	-	-	-	Spare
-	-	12737	104	-	-	10/6/77	-	10/6/77	-	-	-	-	Spare

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Little Rock AFB, AR

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
						R/T Record Card Date Mo-Day-Yr	Remove						
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	Install	Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments	
C-130	0949	11625	250	118	132	8/29/77	-	10/19/77	52	6511.3	6100.3	411.3	
C-130	7888	10900	677	153	524	3/31/77	-	10/19/77	203	14548.2	14145.0	403.2	
C-130	7836	11006	278	150	128	3/29/77	-	10/19/77	205	13157.3	12880.0	277.3	
C-130	7823	10322	409	109	300	3/28/77	-	10/19/77	206	10245.0	9834.0	411.0	
C-130	7889	10955	562	111	451	4/6/77	-	10/19/77	197	14873.2	14500.0	373.2	
C-130	1298	10883	599	147	452	4/6/77	-	10/19/77	203	2885.3	2666.7	218.6	
C-130	1590	11379	221	152	69	3/31/77	-	10/19/77	157	2367.9	2160.5	207.4	
C-130	1587	11341	342	233	109	5/16/77	-	10/19/77	121	2651.8	2350.0	301.8	
C-130	1586	11366	343	235	108	5/16/77	-	10/19/77	146	18379.5	14540.0	308.4	
C-130	7892	11969	365	117	248	6/21/77	-	10/19/77	199	9606.3	9424.5	181.8	
C-130	7839	11712	294	128	166	7/25/77	-	10/19/77	161	2324.6	2085.6	239.0	
C-130	1588	11811	434	107	327	5/27/77	-	10/19/77	198	14955.2	14600.2	355.2	
C-130	7892	11272	279	106	173	8/8/77	-	10/19/77	209	13728.2	13320.0	408.2	
C-130	7839	11282	282	106	176	8/8/77	-	10/19/77	204	13056.6	12718.0	338.6	
C-130	7892	10721	1260	824	436	4/4/77	-	10/19/77	164	12251.9	12115.0	136.9	
C-130	7839	11352	359	134	225	5/12/77	-	10/19/77	257	10073.3	9670.0	403.3	
C-130	1588	11387	336	115	221	5/12/77	-	10/19/77	164	2250.0	2250.0	-	
C-130	1588	11714	413	152	261	6/16/77	-	10/19/77	164	2503.2	2290.0	213.2	
C-130	7882	11698	381	114	267	6/16/77	-	10/19/77	148	2397.6	2120.0	277.6	
C-130	7790	10342	620	112	508	4/5/77	-	10/19/77	157	12910.3	12620.0	290.3	
C-130	7786	10366	545	103	442	3/25/77	-	10/19/77	206				
C-130	1821	10929	511	146	365	3/30/77	-	10/19/77	157				
C-130	0538	11348	489	121	368	5/5/77	-	10/19/77	206				
C-130	1585	11634	226	104	122	2/5/77	-	10/19/77	164				
C-130	1585	11413	408	110	298	5/9/77	-	10/19/77	164				
C-130	1583	11357	413	110	303	5/9/77	-	10/19/77	148				
C-130	1581	11718	249	106	143	5/25/77	-	10/19/77	157				
C-130	7793	11796	342	112	230	5/25/77	-	10/19/77	206				
C-130	7793	11349	406	106	300	5/16/77	-	10/19/77	157				
C-130	7793	10581	408	109	299	5/16/77	-	10/19/77	206				
C-130	7793	10893	565	107	458	3/28/77	-	10/19/77	206				

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Little Rock AFB, AR

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
C-130	7841	11351	417	110	307	5/5/77	-	10/19/77	168	9879.6	9575.0	304.6	
C-130	7804	11386	415	109	306	5/5/77	-	10/19/77	168	10395.8	10395.8	297.8	
C-130	9813	11388	456	103	353	6/17/77	-	10/19/77	125	16114.7	15609.0	505.7	
C-130	9814	10845	476	114	362	6/17/77	-	10/19/77	125	14280.6	13930.0	350.6	
C-130	1594	10875	706	158	548	3/31/77	-	10/19/77	203	2250.9	2000.0	250.9	
C-130	0530	11987	498	134	364	3/31/77	-	10/19/77	118	10551.8	10200.0	351.8	
C-130	1595	11984	472	115	357	6/24/77	-	10/19/77	118	10551.8	10200.0	351.8	
C-130	1597	10904	603	144	459	6/24/77	-	10/19/77	210	2387.9	2156.1	231.8	
C-130	0526	10866	563	116	447	3/24/77	-	10/19/77	126	2489.5	2180.0	309.5	
C-130	0535	10802	411	108	303	6/16/77	-	10/19/77	153	10429.0	10150.0	279.0	
C-130	1292	11804	385	105	280	5/20/77	-	10/19/77	198	10845.8	10434.0	411.8	Mock-up
C-130	1291	11808	477	118	359	6/16/77	-	10/19/77	126	-	-	-	
C-130	7887	10932	417	108	309	4/5/77	-	10/19/77	205	2461.9	2200.0	261.9	
C-130	1582	10838	684	174	510	3/29/77	-	10/19/77	205	3190.1	2902.5	287.6	
C-130	9817	10884	656	138	518	3/29/77	-	10/19/77	205	3180.9	2815.0	365.9	
C-130	7765	10851	210	-	-	-	-	10/19/77	162	12064.7	11657.0	407.7	
C-130	1582	11410	329	105	224	5/11/77	-	10/19/77	162	2436.8	2240.0	196.8	
C-130	9817	11338	336	110	226	5/11/77	-	10/19/77	162	12739.0	12539.0	200.0	
C-130	7765	11586	273	119	154	8/28/77	-	10/19/77	121	12609.8	12430.0	179.8	
C-130	1582	11822	436	105	331	6/20/77	-	10/19/77	122	-	-	-	
C-130	9817	11795	415	118	297	6/16/77	-	10/19/77	126	-	-	-	
C-130	1582	11185	404	111	293	6/16/77	-	10/19/77	206	-	-	-	
C-130	9817	11185	263	105	158	3/28/77	-	10/19/77	121	-	-	-	
C-130	7765	10658	1201	859	342	3/28/77	-	10/19/77	121	-	-	-	
C-130	1582	11669	286	127	159	6/21/77	-	10/19/77	122	-	-	-	
C-130	9817	11754	292	133	159	6/21/77	-	10/19/77	122	-	-	-	
C-130	7765	11766	322	103	219	6/20/77	-	10/19/77	122	-	-	-	
C-130	1582	11775	220	002	218	6/20/77	-	10/19/77	91	-	-	-	
C-130	9817	11326	251	116	135	7/21/77	-	10/19/77	129	-	-	-	
C-130	7765	11763	340	126	214	6/13/77	-	10/19/77	129	-	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Little Rock AFB, AR

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
C-130	7781	11393	465	109	356	5/11/77	-	10/20/77	163	9687.6	9328.0	359.6	
		11361	460	104	356	5/11/77	-	10/20/77	163				
C-130	1598	11364	585	128	457	5/5/77	-	10/20/77	169	2535.9	2225.0	310.9	
		11331	643	189	454	5/5/77	-	10/20/77	164				
C-130	0570	11362	433	131	302	5/10/77	-	10/20/77	164	11221.6	10940.0	281.6	
		11373	420	109	311	5/10/77	-	10/20/77	150				
C-130	7896	11729	376	105	271	5/24/77	-	10/20/77	150	9512.6	9284.0	228.6	
		11752	340	109	231	5/24/77	-	10/20/77	150	14111.5	13750.0	361.5	
C-130	7850	11381	385	117	268	5/6/77	-	10/20/77	168				

AN/ARN-118(V) TACAN FIELD DATA
 (Late Data - Received December 16, 1977)
 CPO F09603-77-A-3104

Air Force Base Little Rock AFB, AR

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
C-130	0542	11345	507	106	401	5/10/77	-	11/11/77	186	-	-	-	
C-130	0543	10302	227	110	117	11/1/77	-	11/11/77	11	-	-	-	
C-130	0948	10834	427	105	322	5/21/77	-	11/29/77	193	-	-	-	
C-130	0950	11810	113	112	1	11/16/77	-	11/29/77	14	-	-	-	
C-130	0951	11371	568	117	451	5/16/77	-	12/2/77	201	-	-	-	
C-130	1293	11835	201	156	45	11/17/77	-	12/2/77	16	-	-	-	
C-130	1294	11919	331	113	218	7/6/77	-	11/11/77	129	-	-	-	
C-130	1295	11794	410	120	290	7/6/77	-	11/11/77	129	-	-	-	
C-130	1296	11807	527	105	422	6/20/77	-	11/8/77	142	-	-	-	
C-130	1297	11332	532	109	423	11/8/77	-	11/8/77	1	-	-	-	
C-130	1298	11793	497	112	385	6/29/77	-	11/17/77	142	-	-	-	
C-130	1299	11862	497	120	377	6/29/77	-	11/17/77	142	-	-	-	
C-130	1299	12020	517	105	412	6/28/77	-	11/17/77	143	-	-	-	
C-130	1299	11937	534	126	408	6/28/77	-	11/17/77	143	-	-	-	
C-130	1299	11363	685	110	575	5/11/77	-	11/11/77	185	-	-	-	
C-130	1299	11342	698	108	590	5/11/77	-	11/11/77	185	-	-	-	
C-130	1584	11662	157	105	52	10/17/77	-	11/11/77	26	-	-	-	
C-130	1592	11848	439	135	304	7/27/77	-	11/11/77	108	-	-	-	
C-130	1592	11654	366	172	194	6/15/77	-	11/8/77	147	-	-	-	
C-130	1827	11769	297	105	192	6/15/77	-	11/8/77	147	-	-	-	
C-130	6579	11934	409	103	306	6/29/77	-	11/8/77	133	-	-	-	
C-130	6579	11936	403	108	295	6/29/77	-	11/8/77	133	-	-	-	
C-130	7680	11598	530	114	416	6/29/77	-	12/2/77	157	-	-	-	
C-130	7680	11192	520	110	418	6/29/77	-	12/2/77	157	-	-	-	
C-130	7680	11742	548	128	420	7/28/77	-	11/17/77	114	-	-	-	
C-130	7680	11358	510	111	399	6/14/77	-	11/17/77	156	-	-	-	
C-130	7680	11372	487	111	376	5/9/77	-	11/11/77	187	-	-	-	
C-130	7680	11369	471	115	356	5/9/77	-	11/11/77	187	-	-	-	
NOTE:	These data not included in Chapter 3 computation.												

AN/ARN-118(V) TACAN FIELD DATA

(Late Data-Received
December 16, 1977)

Air Force Base Little Rock AFB, AR

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
C-130	7768	11739	550	109	441	5/24/77	-	12/2/77	193	-	-	-	
C-130	7769	11776	553	106	447	5/24/77	-	12/2/77	193	-	-	-	
C-130	7787	11839	162	125	37	8/5/77	-	11/20/77	108	-	-	-	
C-130	7791	11805	220	104	116	6/21/77	-	11/30/77	133	-	-	-	
C-130	7799	11356	511	103	408	5/10/77	-	11/17/77	205	-	-	-	
C-130	7799	10934	419	106	313	11/17/77	-	11/17/77	1	-	-	-	
C-130	7818	11908	537	128	409	6/29/77	-	11/17/77	142	-	-	-	
C-130	7808	12007	528	120	408	6/29/77	-	11/17/77	142	-	-	-	
C-130	7835	11765	529	115	414	5/19/77	-	11/8/77	174	-	-	-	
C-130	7858	11830	518	107	411	5/19/77	-	11/8/77	174	-	-	-	
C-130	7880	11773	494	102	392	6/20/77	-	12/2/77	166	-	-	-	
C-130	7899	11369	551	115	436	7/12/77	-	11/17/77	129	-	-	-	
C-130	7899	11924	513	120	393	7/27/77	-	11/11/77	108	-	-	-	
C-130	7899	12083	123	105	17	11/5/77	-	11/11/77	7	-	-	-	
C-130	7899	10926	442	107	335	6/15/77	-	11/11/77	150	-	-	-	
C-130	7899	11729	454	105	349	5/25/77	-	11/11/77	171	-	-	-	
C-130	7899	11832	203	107	96	9/27/77	-	11/8/77	43	-	-	-	
C-130	7899	11344	608	114	494	5/10/77	-	11/8/77	183	-	-	-	
C-130	7899	11402	678	117	561	5/10/77	-	11/8/77	183	-	-	-	
C-130	9810	11783	527	103	424	6/17/77	-	11/17/77	154	-	-	-	
C-130	9812	11772	532	107	425	6/17/77	-	11/17/77	154	-	-	-	
C-130	9812	11399	541	132	409	6/27/77	-	11/17/77	144	-	-	-	
C-130	9812	11579	314	126	188	10/1/77	-	11/17/77	48	-	-	-	

NOTE: These data not included in Chapter 3 computations.

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Little Rock AFB, AR (Late Data-Received
December 16, 1977)

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card Date Mo-Day-Yr		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
	The following aircraft have been transferred to Pope AFB, N.C.												
C-130	0539	10925	-	111	-	4/19/77	-	-	-	-	-	-	
		10349	-	106	-	4/19/77	-	-	-	-	-	-	
C-130	0569	11432	-	105	-	5/9/77	-	-	-	-	-	-	
		11354	-	112	-	5/9/77	-	-	-	-	-	-	
	The following aircraft are at Depot												
C-130	7771	10956	-	108	-	3/25/77	-	-	-	-	-	-	
		11843	-	125	-	3/25/77	-	-	-	-	-	-	
C-130	7795	11860	-	110	-	6/23/77	-	-	-	-	-	-	
		11821	-	103	-	6/23/77	-	-	-	-	-	-	
C-130	7800	10810	-	125	-	3/28/77	-	-	-	-	-	-	
		10819	-	125	-	3/28/77	-	-	-	-	-	-	
C-130	7038	11886	-	-	-	7/5/77	-	-	-	-	-	-	
		11943	-	104	-	7/5/77	-	-	-	-	-	-	
C-130	7869	10336	-	112	-	4/8/77	-	-	-	-	-	-	
	The following is awaiting installation												
C-130	1836	12276	94	94	0	-	-	-	-	-	-	-	
		12258	111	110	1	-	-	-	-	-	-	-	
NOTE:	These data not included in Chapter 3 computations.												

Air Force Base March AFB, CALIF.

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	5062	11384	252	104	148	7/19/77	-	10/17/77	91	-	-	-	
B-52	5070	11400	307	124	183	6/30/77	-	10/17/77	110	-	-	-	
B-52	5080	11471	278	105	173	8/2/77	-	10/17/77	77	-	-	-	
B-52	5111	11485	181	103	78	8/3/77	-	10/17/77	76	-	-	-	
B-52	6612	11515	249	119	130	7/15/77	-	10/17/77	95	-	-	-	
B-52	6694	11339	255	123	132	8/22/77	-	10/17/77	57	-	-	-	
B-52	5088	11359	113	107	6	7/11/77	7/13/77	10/17/77	2	-	-	-	
B-52	6683	10496	206	156	50	7/13/77	-	10/17/77	97	-	-	-	
B-52	5066	11555	253	106	147	8/8/77	-	10/17/77	71	-	-	-	
B-52	6588	11427	267	135	132	7/18/77	-	10/18/77	93	-	-	-	
B-52	6660	11530	235	102	133	8/12/77	-	10/18/77	68	-	-	-	
B-52	6629	11506	259	108	151	7/6/77	-	10/18/77	105	-	-	-	
B-52	6696	11447	247	112	135	7/13/77	-	10/18/77	98	-	-	-	
B-52	6580	11448	134	133	1	6/30/77	-	10/18/77	111	-	-	-	
B-52	6606	11535	-	103	-	8/5/77	-	10/18/77	75	-	-	-	
B-52	6606	11419	263	132	91	7/20/77	-	10/18/77	91	-	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Mountain Home AFB, ID

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install Date Mo-Day-Yr	Remove						
F-111	6052	10384	311	114	197	3/25/77	-	10/21/77	211	-	-	-	
F-111	6044	10065	333	134	199	2/25/76	2/28/77	10/21/77	4	-	-	-	
F-111	6056	10359	289	195	94	3/15/77	-	10/21/77	211	-	-	-	
F-111	6057	10030	266	158	108	3/23/77	1/21/77	10/21/77	2	-	-	-	
F-111	6037	10196	386	225	161	6/1/77	-	10/21/77	143	-	-	-	
F-111	7073	10225	355	108	247	4/19/77	-	10/21/77	186	-	-	-	
F-111	7075	10114	573	500	73	3/15/77	-	10/21/77	221	-	-	-	
F-111	7069	10199	179	111	68	4/12/77	-	10/21/77	193	-	-	-	
F-111	7083	10254	290	109	181	8/4/77	-	10/21/77	232	-	-	-	
F-111	7084	10151	300	118	182	2/25/77	-	10/21/77	239	-	-	-	
F-111	7058	10205	217	112	105	3/31/77	-	10/21/77	205	-	-	-	
F-111	7052	10195	183	120	63	6/6/77	-	10/21/77	138	-	-	-	
F-111	7044	10146	316	117	199	5/23/77	-	10/21/77	152	-	-	-	
F-111	7034	10191	224	124	100	3/12/77	-	10/21/77	224	-	-	-	
F-111	7039	10206	300	124	176	6/10/77	-	10/21/77	134	-	-	-	
F-111	7053	10178	191	112	79	3/23/77	-	10/21/77	213	-	-	-	
F-111	7061	10193	192	114	78	2/24/77	-	19/21/77	239	-	-	-	
F-111	7076	10129	473	450	23	3/9/77	-	10/21/77	227	-	-	-	
F-111	7097	10202	431	114	317	4/24/77	-	10/21/77	181	-	-	-	
F-111	7047	10222	339	108	231	8/6/77	-	10/21/77	77	-	-	-	
F-111	7081	10198	155	112	43	3/15/77	-	10/21/77	221	-	-	-	
F-111	7038	10398	314	160	154	3/18/77	-	10/21/77	218	-	-	-	
F-111	7101	10406	306	170	136	4/3/77	4/13/77	10/21/77	11	-	-	-	
F-111	6039	10087	501	187	314	5/2/77	-	10/21/77	173	-	-	-	
F-111	7101	10406	306	170	136	4/11/77	-	10/21/77	194	-	-	-	
F-111	7093	10300	408	190	218	3/25/77	-	10/21/77	211	-	-	-	
F-111	7095	10365	209	127	82	3/25/77	-	10/21/77	233	-	-	-	
F-111	7094	10292	258	110	148	4/13/77	-	10/21/77	192	-	-	-	
F-111	7100	10188	259	125	134	3/17/77	-	10/21/77	219	-	-	-	
F-111	7110	10149	285	123	162	4/13/77	-	10/21/77	225	-	-	-	
F-111	7105	10391	130	113	17	4/8/77	-	10/21/77	197	-	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Mountain Home AFB, ID

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
F-111A	7090	10156	223	122	101	3/17/77	-	10/21/77	219	-	-	-	
F-111A	7079	10172	374	125	249	3/4/77	-	10/21/77	232	-	-	-	
F-111A	7065	10106	400	222	178	3/3/77	-	10/21/77	233	-	-	-	
F-111	6038	10207	213	128	85	4/18/77	-	10/21/77	187	-	-	-	
F-111	6032	10277	254	166	88	-	-	10/21/77	-	-	-	-	
F-111	6047	10417	022	005	17	4/12/77	-	10/21/77	193	-	-	-	
F-111	6035	10203	262	112	150	3/26/77	-	10/21/77	210	-	-	-	
F-111	6023	10232	139	111	28	4/26/77	-	10/21/77	179	-	-	-	
F-111	6018	11611	185	149	36	9/17/77	-	10/21/77	35	-	-	-	
F-111	6030	10385	193	112	81	2/28/77	-	10/21/77	236	-	-	-	
F-111	6048	10214	279	109	170	3/27/77	-	10/21/77	209	-	-	-	
F-111	6036	10174	217	122	95	4/29/77	-	10/21/77	176	-	-	-	
F-111	6045	10236	373	104	269	4/19/77	-	10/21/77	186	-	-	-	
F-111	6016	10083	427	166	261	4/25/77	-	10/21/77	179	-	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Randolph AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	4379	10689	-	162	-	-	-	10/11/77	-	-	4358.1	-	
T-38	3627	10516	-	-	-	-	-	10/11/77	-	7499.7	-	-	
T-38	8400	10743	624	109	515	1/4/77	-	10/11/77	281	5156.8	4716.3	440.5	
T-38	1949	10662	523	118	405	12/23/77	-	10/11/77	293	2917.5	2572.9	233.6	
T-38	4369	11236	145	109	36	9/27/77	-	10/11/77	15	4607.5	-	-	
T-38	4950	10120	446	183	263	12/7/76	-	10/11/77	309	4387.3	-	-	
T-38	4855	10655	485	110	375	12/15/76	-	10/11/77	301	4575.3	42.53.2	322.1	
T-38	4853	10053	962	116	846	2/6/76	2/23/76	10/11/77	17	4959.4	-	-	
T-38	7083	10754	567	102	465	3/29/76	-	10/11/77	481	3746.0	-	-	
T-38	4833	10018	1155	152	1003	1/5/77	-	10/11/77	280	4673.4	-	-	
T-38	4365	10081	865	207	658	12/1/76	-	10/11/77	315	4925.4	-	-	
T-38	0867	11553	246	133	113	10/5/76	-	10/11/77	372	7941.9	-	-	
T-38	4386	10016	848	111	737	5/31/77	-	10/11/77	134	4951.2	-	-	
T-38	8124	10642	536	112	424	12/31/75	3/8/76	10/11/77	69	449	-	-	
T-38	7085	10587	606	126	480	7/20/76	-	10/11/77	449	4485.7	4115.2	370.5	
T-38	8190	10557	1075	138	937	12/21/76	-	10/11/77	295	3750.6	3341.1	409.5	
T-38	0445	12404	-	141	-	12/15/76	4/12/77	10/11/77	118	4032.8	3742.2	290.6	
T-38	0453	12825	-	106	-	4/10/77	-	10/11/77	289	5202.3	5202.3	-	
T-38	3262	10137	-	113	-	-	-	10/11/77	-	5649.5	5649.5	-	
T-38	3749	10439	594	134	460	-	-	10/11/77	-	6066.4	6066.4	-	
T-38	4357	10636	-	107	-	8/4/77	-	10/11/77	69	6520.8	6343.8	177.0	
T-38	4376	10689	-	109	-	-	-	10/11/77	-	4758.7	4758.7	-	
T-38	8095	10434	407	143	264	12/28/76	-	10/11/77	288	5135.3	4735.5	399.8	
T-38	4952	10731	445	102	343	5/4/77	-	10/11/77	157	4511.1	4057.9	453.2	
T-38	4935	10477	250	111	139	1/20/77	-	10/11/77	265	4207.2	-	-	
T-38	8397	10739	425	170	255	4/20/77	8/4/77	10/11/77	107	4399.3	4136.7	262.6	
T-38	8403	10649	423	109	314	8/4/77	-	10/11/77	69	4616.6	4396.2	220.4	
T-38						1/18/77	1/4/77	10/11/77	267	4527.2	4267.3	259.9	
T-38						1/6/77	-	10/11/77	279				

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Randolph AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	4383	10473	534	146	388	1/6/77	-	10/11/77	279	4830.2	4499.4	330.8	
T-38	4826	10652	510	110	400	12/29/76	-	10/11/77	287	4829.4	4502.1	327.3	
T-38	4831	10741	499	110	389	1/2/77	-	10/11/77	283	4267.3	3930.8	336.5	
T-38	4832	10515	281	114	167	4/18/77	-	10/11/77	177	4686.2	4386.3	299.9	
T-38	0829	11483	254	126	128	-	-	10/11/77	288	8079.8	-	-	
T-38	4381	10699	524	114	410	12/29/76	-	10/12/77	288	4821.7	4475.5	346.2	
T-38	4384	-	-	-	-	-	-	10/11/77	-	-	4472.3	-	
T-38	4946	10661	597	117	480	12/23/76	-	10/12/77	294	4412.1	4003.9	408.2	
T-38	4948	10682	407	106	301	12/17/76	-	10/12/77	300	4648.5	4390.8	257.7	
T-38	8135	11260	127	110	017	10/5/77	-	10/12/77	8	3976.5	3700.0	276.5	
T-38	8357	-	-	-	-	-	-	10/12/77	-	-	4853.4	-	
T-38	8401	-	454	-	-	12/23/76	3/21/77	-	89	5204.7	-	-	
T-38	8358	10739	855	161	694	5/4/77	-	10/11/77	161	5142.7	-	-	
T-38	8136	10686	453	117	336	11/3/76	-	10/11/77	343	4157.3	3868.2	289.1	
T-38	0345	10582	396	119	277	12/21/76	-	10/7/77	291	6066.2	5830.0	236.2	
T-38	4923	10724	375	108	267	12/29/76	-	10/7/77	283	4730.4	4527.8	202.6	
T-38	8112	10722	449	115	334	12/28/76	3/30/77	10/7/77	167	4108.3	3822.8	285.5	
T-38	4333	10717	514	118	396	4/24/77	-	10/7/77	285	5392.7	5062.1	330.6	
T-38	0373	10102	594	123	471	1/4/77	-	10/7/77	277	5841.1	5476.6	364.5	
T-38	4847	11633	248	103	145	1/31/77	-	10/7/77	250	4902.4	-	-	
T-38	0433	12832	103	102	1	9/29/77	-	10/7/77	9	5131.3	5131.3	0	
T-38	8402	10020	721	590	131	2/9/76	-	10/7/77	10	4636.3	-	-	
T-38	4384	10573	1018	122	896	2/26/76	-	10/7/77	589	4728.3	4472.3	256.0	
T-38	4829	10538	599	165	434	12/29/76	-	10/7/77	283	4760.7	4468.7	292.0	
T-38	8399	10706	261	154	107	7/11/77	-	10/7/77	89	4721.2	3158.5	1562.7	
T-38	7087	10570	371	106	265	12/23/76	-	10/7/77	289	3557.4	3153.5	403.9	
T-38	8191	10621	467	103	364	4/12/77	-	10/7/77	179	3938.0	3622.2	315.8	
T-38	4361	10638	584	114	470	12/17/76	-	10/7/77	295	4954.5	4550.5	404.0	
T-38	3272	11623	189	122	67	12/20/76	-	10/7/77	292	6152.8	-	-	
T-38	4942	10685	467	116	351	12/29/76	-	10/7/77	283	4808.8	4500.0	308.8	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Randolph AFB, TX

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card Data		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	8404	10569	503	114	389	12/20/76	-	10/7/77	292	4963.1	4635.2	327.9	
T-38	4375	10333	418	119	299	-	-	10/7/77	-	5173.7	4872.7	301.0	
T-38	4827	10735	518	138	380	1/4/77	3/9/77	10/7/77	65	4518.3	-	-	
T-38	4388	10742	427	163	264	3/14/77	9/12/77	10/7/77	208	5162.5	1803.7	3358.8	
T-38	4828	10714	447	121	326	9/21/77	-	10/7/77	17	5002.2	4721.6	280.6	
T-38	3639	10155	584	140	444	1/5/77	-	10/7/77	276	6855.9	6469.8	386.1	
T-38	1549	11531	124	113	11	12/29/77	-	10/7/77	283	3297.9	2940.6	357.3	
T-38	4947	10474	364	118	246	10/4/77	-	10/7/77	4	4708.4	4479.4	229.0	
T-38	4939	11270	248	122	126	11/3/76	-	10/7/77	339	4724.8	4340.7	384.1	
T-38	8107	10579	540	110	430	7/24/77	-	10/7/77	76	4433.2	4058.1	375.1	
T-38	8141	10159	522	154	368	12/20/76	-	10/7/77	292	4560.2	4209.7	350.5	
T-38	8172	10732	350	109	241	1/10/77	-	10/7/77	271	4056.8	3844.5	212.3	
T-38	8144	10234	367	104	263	1/24/77	-	10/7/77	257	-	5991.7	-	
T-38	8357	10653	316	105	211	3/8/77	4/14/77	10/7/77	38	5031.4	4853.4	178.0	
T-38	1951	10084	817	159	658	4/18/77	-	10/7/77	173	2908.3	2496.6	411.7	
T-38	1554	10767	598	110	488	12/27/76	-	10/7/77	285	3446.8	3030.1	416.7	
T-38	4379	10516	592	162	430	9/20/76	10/20/76	10/7/77	31	4727.2	4351.8	375.4	
T-38	4368	10716	621	232	389	10/21/76	-	10/7/77	352	5116.2	4760.9	355.3	
T-38	0582	10640	334	109	225	1/6/77	-	10/7/77	275	2807.9	2613.5	194.4	
T-38	4382	10602	557	115	442	2/9/77	1/4/77	10/7/77	241	4989.5	-	-	
T-38	-	10014	156	132	024	12/28/76	-	10/7/77	15	-	-	-	Mock-up
T-38	4828	10714	447	122	325	2/7/77	-	10/7/77	296	5002.2	4721.6	280.6	
T-38	4859	10756	335	108	227	12/16/76	-	10/11/77	-	4323.2	4127.1	196.1	
T-38	0874	10523	278	120	158	1/5/77	-	10/11/77	280	7074.0	-	-	
T-38	8398	10047	383	112	271	1/6/77	-	10/11/77	279	5310.6	4928.1	382.5	
T-38	8132	10744	407	112	295	5/31/77	-	10/11/77	134	4101.8	3852.6	249.2	
T-38	8182	10760	451	123	328	6/16/77	-	10/11/77	118	3893.6	3519.2	374.4	
T-38	0432	12794	128	128	000	1/18/77	1/31/77	10/11/77	14	5107.9	5107.9	0.0	
						3/31/77	-	10/11/77	195				
						9/28/77	-		14				

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Randolph AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(6) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	8139	10576	377	107	270	12/15/76	-	10/11/77	301	4072.0	3837.9	234.1	
T-38	8134	10710	478	124	354	1/17/77	5/4/77	10/11/77	108	4407.8	4130.1	277.7	
T-38	8356	11190	176	002	174	5/12/77	-	10/11/77	153	5400.6	5003.5	397.1	
T-39	3478	10231	498	110	388	7/28/77	-	10/12/77	76	4815.5	-	-	
T-39	0649	-	-	-	-	-	-	-	-	-	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Reese AFB TX

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	3297	10565	387	156	231	5/27/77	-	10/13/77	140	-	-	-	Spare
S	3671	11205	244	116	128	NA	-	10/13/77	NA	-	-	-	
T-38	3651	10577	492	115	377	3/10/77	-	10/13/77	218	-	-	-	
T-38	3674	10529	627	131	496	12/31/76	-	10/13/77	287	-	-	-	
T-38	3640	10623	685	115	570	12/1/76	-	10/13/77	317	-	-	-	
T-38	3213	10616	568	108	460	2/10/77	-	10/13/77	246	-	-	-	
T-38	1583	10998	535	104	431	2/11/77	-	10/13/77	245	-	-	-	
T-38	3677	10424	506	117	389	11/11/76	-	10/13/77	337	-	-	-	
S	0816	11564	176	123	59	NA	-	10/13/77	NA	-	-	-	Spare
T-38	3701	10356	820	106	714	11/4/76	9/27/77	10/13/77	328	-	-	-	
T-38	8190	10161	503	122	381	2/10/77	-	10/13/77	16	-	-	-	
T-38	3643	10264	689	124	565	12/29/76	-	10/13/77	246	-	-	-	
T-38	8179	10386	595	113	482	12/25/76	-	10/13/77	289	-	-	-	
T-38	8189	10675	471	104	367	3/2/77	-	10/13/77	293	-	-	-	
T-38	3631	10541	444	121	323	12/30/76	-	10/13/77	226	-	-	-	
T-38	3636	10152	655	135	520	11/4/76	-	10/13/77	288	-	-	-	
T-38	0416	10485	629	106	523	1/26/77	-	10/13/77	344	-	-	-	
T-38	0379	11657	119	118	1	8/19/77	-	10/13/77	261	-	-	-	
T-38	1577	10622	603	131	472	11/30/76	-	10/13/77	318	-	-	-	
T-38	3628	10279	633	118	515	10/29/76	-	10/13/77	350	-	-	-	
T-38	3654	10226	492	109	383	2/10/77	-	10/13/77	246	-	-	-	
T-38	3669	10547	694	126	568	11/4/76	-	10/13/77	344	-	-	-	
T-38	3681	10624	426	148	278	-	-	10/14/77	288	-	-	-	
T-38	3705	11175	273	117	156	-	-	10/14/77	-	-	-	-	
T-38	3675	10235	481	122	359	-	-	10/14/77	246	-	-	-	
T-38	1588	10409	802	138	664	-	-	10/14/77	246	-	-	-	
T-38	4841	10380	535	141	394	-	-	10/14/77	333	-	-	-	
S		10021	488	119	369	NA	-	10/14/77	NA	-	-	-	Spare
T-38	3650	11286	295	111	184	-	-	10/13/77	-	-	-	-	
T-38	4363	10493	138	118	20	-	-	10/13/77	-	-	-	-	
T-38	3706	10471	561	124	437	10/28/76	-	10/13/77	351	-	-	-	
T-38	1562	10665	620	112	508	-	-	10/13/77	-	-	-	-	

Air Force Base Reese AFB, TX

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	3704	10491	712	108	604	-	-	10/13/77	-	-	-	-	
T-38	8198	10394	790	131	659	10/28/76	-	10/13/77	351	-	-	-	
T-38	3634	10309	408	128	280	2/25/77	-	10/13/77	231	-	-	-	
T-39	3692	10508	407	114	293	-	-	10/14/77	-	-	-	-	
T-38	3285	10480	711	105	606	11/13/76	-	10/13/77	335	-	-	-	
T-38	8195	10346	552	117	435	10/28/76	-	10/13/77	351	-	-	-	
T-38	3672	10310	512	128	384	-	-	10/13/77	-	-	-	-	
T-38	3696	10144	618	151	467	1/6/77	-	10/14/77	282	-	-	-	
T-38	1564	11918	115	154	-	10/3/77	-	10/14/77	12	-	-	-	
T-38	3688	10613	506	114	392	2/17/77	-	10/14/77	240	-	-	-	
T-38	8180	10132	712	207	505	11/1/77	-	10/14/77	348	-	-	-	
T-38	3277	10512	702	108	594	7/30/76	-	10/14/77	442	-	-	-	
T-38	8182	10617	486	119	367	1/18/77	-	10/14/77	270	-	-	-	
T-38	3210	10466	603	120	483	12/28/76	-	10/14/77	291	-	-	-	
T-38	3289	10423	729	138	591	12/29/76	-	10/14/77	290	-	-	-	
T-38	0363	10428	570	137	433	12/29/76	9/19/77	10/14/77	265	-	-	-	
T-38	8224	10585	710	121	589	1/24/77	-	10/14/77	25	-	-	-	
T-38	4845	10556	674	181	493	2/28/77	-	10/14/77	264	-	-	-	
T-38	8185	10432	536	118	418	12/19/76	-	10/14/77	229	-	-	-	
T-38	0366	10643	356	106	250	3/23/77	-	10/14/77	300	-	-	-	
T-38	3693	10399	409	111	298	12/30/76	-	10/14/77	206	-	-	-	
T-38	4917	10392	796	126	670	10/29/76	-	10/14/77	289	-	-	-	
T-38	8238	10633	591	106	485	11/25/76	-	10/14/77	351	-	-	-	
T-38	3690	10469	645	123	522	12/31/76	-	10/14/77	324	-	-	-	
T-38	3699	10609	643	114	529	3/1/77	-	10/14/77	288	-	-	-	
T-38	8226	10550	615	134	481	12/28/76	-	10/14/77	228	-	-	-	
T-38	3625	10599	529	114	415	12/1/76	-	10/14/77	291	-	-	-	
T-38	8225	10519	620	112	495	1/12/77	-	10/14/77	318	-	-	-	
T-38	3645	10090	476	189	287	6/28/76	-	10/14/77	276	-	-	-	
T-38	3656	10449	511	120	391	12/9/76	-	10/13/77	473	-	-	-	
T-38	0415	10451	737	195	542	11/11/76	12/28/76	10/13/77	309	-	-	-	No re-install date

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Reese AFB, TX

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install Mo-Day-Yr	Remove						
T-38	8228	10600	364	118	246	12/10/76	-	10/13/77	308	-	-	-	
T-38	3629	11102	360	111	249	7/7/77	-	10/13/77	99	-	-	-	
T-38	3652	10651	673	105	568	-	-	10/13/77	-	-	-	-	
T-38	3659	10545	597	108	489	1/4/77	-	10/13/77	283	-	-	-	
T-38	3702	10454	677	184	493	11/14/76	-	10/13/77	334	-	-	-	
T-38	3268	10327	629	135	494	12/27/76	-	10/13/77	291	-	-	-	
T-38	3698	10355	744	110	634	10/30/76	-	10/13/77	349	-	-	-	
T-38	3686	10252	452	104	348	2/9/77	-	10/14/77	248	-	-	-	
T-38	3669	10547	695	126	569	11/4/76	-	10/14/77	344	-	-	-	
T-38	1588	10409	804	138	666	10/28/76	-	10/14/77	351	-	-	-	
T-38	0413	10456	653	132	521	12/29/76	-	10/14/77	289	-	-	-	

APPENDIX C

BASIC CONTRACTOR DATA
(COLLINS AVIONICS GROUP)

COLLECTED BY

ARINC RESEARCH

INCLUDES DATA FROM

ANDREWS AFB
CARSWELL AFB
CASTLE AFB
DAVIS-MOUNTHAN
ENGLAND AFB
LAUGHLIN AFB
LITTLE ROCK AFB
MARCH AFB
MOUNTAIN HOME AFB
RANDOLPH AFB
REESE AFB

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

ANDREWS, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	-	-	-	-	-	-	No Failures
MX	-	-	-	-	-	-	No Failures
Mount	-	-	-	-	-	-	No Failures
Control	10071	V	-	-	-	-	No Failures

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

Carswell, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	11136	V	128	124	4	ND	
R/T	11048	V	180	128	52	11	
R/T	11082	V	144	122	22	9	
R/T	10562*	V	-	-	-	-	*Failed after field visit
MX	-	-	-	-	-	-	No Failures
Mount	-	-	-	-	-	-	No Failures
Control	-	-	-	-	-	-	No Failures

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

CASTLE, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	10049	V	1,614	179	1,435	330	
R/T	10989	V	208	153	55	No Data	
R/T	10038	V	1,079	182	897	453	
R/T	11128	NV	227	132	95	28	
R/T	10120	V	284	183	101	No Data	
R/T	10031	V	976	111	865	296	
R/T	10046	V	353	109	244	94	
R/T	10032	V	248	225	23	4	
R/T	10044	V	513	399	114	111	
R/T	10030	V	628	470	158	162	
R/T	10043	V	306	102	204	65	
R/T	10032	V	191	187	4	0	
R/T	10038	V	134	21	113	8	
R/T	10049	V	134	113	21	8	
R/T	10043	V	187	107	73	22	
R/T	10041	V	217	168	49	14	
Converter	10047	V					
Mount	No Failures						
Control	No Failures						

COLLINS DATA
RETURNED UNITS

CPO F09603-77-A-3104

DAVIS-MONTHAN, AFB - AZ

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	11827	V	162	133	21	21	
R/T	10447	NV	361	107	254	ND	
R/T	10189	V	292	103	189	ND	
R/T	10276	V	180	125	55	ND	
R/T	10109	V	331	176	155	205	
R/T	10045	V	132	121	11	16	
R/T	10090	NV	127	110	17	ND	
R/T	10034	V	248	124	124	ND	
R/T	10047	V	113	112	1	ND	
MX	10133	V	-	-	-	-	
MX	10573	V	-	-	-	-	
MX	10095	V	-	-	-	-	
MX	10090	V	-	-	-	-	
MX	10051	V	-	-	-	-	
Mount	-	-	-	-	-	-	No Failures
Control	10109	EXC	-	-	-	-	
Control	10054	EXC	-	-	-	-	
Control	10095	EXC	-	-	-	-	
Control	10068	EXC	-	-	-	-	
Control	10090	EXC	-	-	-	-	
Control	10075	EXC	-	-	-	-	
Control	10092	NV	-	-	-	-	
Control	10098	EXC	-	-	-	-	
Control	10106	EXC	-	-	-	-	
Control	10071	EXC	-	-	-	-	
Control	10047	EXC	-	-	-	-	
Control	10048	EXC	-	-	-	-	
Control	10060	V	-	-	-	-	

ENGLAND, AFB
 COLLINS DATA
 RETURNED UNITS
 CPO F09603-77-A-3104

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	-	-	-	-	-	-	No Failures
MX	-	-	-	-	-	-	No Failures
Mount	-	-	-	-	-	-	No Failures
Controls	-	-	-	-	-	-	No Failures

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

LAUGHLIN, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	11952	V	145	113	32	00	
R/T	12275	V	141	106	35	62	
R/T	11970	NV	185	110	75	28	
R/T	11374	V	266	116	150	No Data	
R/T	12172	V	196	128	68	19	
R/T	12149	V	155	105	50	23	
R/T	12297	V	122	104	18	08	
R/T	11615	V	189	109	80	47	
R/T	11456	V	231	228	3	06	
Converter	12722	V	-	-	-	-	
Converter	11870	V	-	-	-	-	
Converter	11782	V	-	-	-	-	
Converter	12235	NV	-	-	-	-	
Converter	10541	V	-	-	-	-	
Converter	11790	V	-	-	-	-	
Converter	11900	V	-	-	-	-	
Mount	10684	V	-	-	-	-	
Mount	10492	V	-	-	-	-	
Control	11698	EXC	-	-	-	-	
Control	11648	NV	-	-	-	-	
Control	11628	V	-	-	-	-	

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

LITTLE ROCK, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	11899	V	267	105	162	ND	
R/T	11350	V	246	107	139	ND	
R/T	11674	V	425	123	302	ND	
R/T	10936	V	523	134	389	ND	
R/T	10590	V	639	274	365	157	
R/T	10763	EXC	565	241	324	ND	
R/T	10048	NV	329	267	62	Invalid Data	
R/T	11809	V	156	107	49	ND	
R/T	11942	V	178	107	71	34	
R/T	11812	NV	140	105	35	ND	
R/T	10919	V	288	116	112	ND	
R/T	11782	EXC	133	106	25	ND	
R/T	11704	NV	270	111	149	ND	
R/T	11421	V	145	102	43	34	
R/T	12023	V	103	103	0	ND	
R/T	11333	NV	132	108	24	9	
R/T	10278	V	419	153	266	ND	
R/T	11403	V	103	103	0	ND	
R/T	11416	EXC	114	114	0	ND	
R/T	10938	V	103	103	0	ND	
R/T	10295	V	172	171	1	ND	
R/T	10269	V	176	173	3	1	
MX	11304	V	-	-	-	-	
MX	11901	V	-	-	-	-	
MX	10279	NV	-	-	-	-	
MX	11995	V	-	-	-	-	

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

LITTLE ROCK, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
MX	11418	V	-	-	-	-	
MX	11478	V	-	-	-	-	
MX	10406	EXC	-	-	-	-	
MX	11946	V	-	-	-	-	
MX	11844	V	-	-	-	-	
MX	11444	NV	-	-	-	-	
MX	10314	NV	-	-	-	-	
Mount	10395	NV	-	-	-	-	
Mount	10393	NV	-	-	-	-	
Mount	10386	NV	-	-	-	-	
Control	10004	EXC	-	-	-	-	
Control	10244	EXC	-	-	-	-	
Control	10019	EXC	-	-	-	-	
Control	10212	EXC	-	-	-	-	
Control	10088	EXC	-	-	-	-	
Control	10273	EXC	-	-	-	-	

COLLINS DATA
RETURNED UNITS

CPO F09603-77-A-3104

MARCH, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	11359	V	113	107	6	6	Hours and Install Days counted in Field data.
Converter	No Failures						
Mount	No Failures						
Control	No Failures						

COLLINS DATA
RETURNED UNITS
CPO FO9603-77-A-3104

MOUNTAIN HOME, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	No Failures						
Converter	10211	V	-	-	-	-	
Converter	10511	V	-	-	-	-	
Converter	10234	V	-	-	-	-	
Converter	10198	V	-	-	-	-	
Converter	10232	V	-	-	-	-	
Control	10086	EXC	-	-	-	-	
Mount	No Failures						

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

RANDOLPH, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	10183	V	431	125	206	No Data	
R/T	10413	V	452	134	318	266	
R/T	11018	V	183	120	63	14	
R/T	10673	V	509	106	403	133	
R/T	10958	V	366	155	210	213	
R/T	10027	V	776	130	646	553	
R/T	10017	V	885	107	778	168	
R/T	10734	V	517	123	301	216	
R/T	10737	NV	307	121	186	181	
R/T	10687	V	414	136	278	178	
R/T	10849	V	152	152	0	No Data	
R/T	10627	NV	417	153	264	No Data	
R/T	10611	V	290	118	172	No Data	
R/T	10024	V	881	118	763	421	
R/T	10439	V	140	134	6	63	
R/T	10023	NV	525	104	421	Invalid Data	
R/T	10701	V	217	115	102	83	
R/T	10022	V	738	110	628	No Data	
R/T	10712	V	242	141	101	No Data	
R/T	10088	EXC	475	110	365	294	
R/T	10618	V	202	106	96	64	
R/T	10055	V	297	112	185	161	
R/T	10021	V	450	119	331	192	
R/T	10122	V	148	136	12	4	
R/T	10026	V	151	127	24	7	
R/T	10015	V	126	116	10	1	
R/T	10021	V	148	119	29	16	
R/T	10020	V	165	118	47	27	
R/T	10053	V	147	116	31	17	

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

RANDOLPH, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	10016	V	183	111	172	68	
R/T	10019	V	332	106	226	119	
Converter	10377	V					
Converter	10604	V					
Converter	10511	V					
Converter	10205	V					
Converter	10721	V					
Converter	10658	V					
Converter	10623	V					
Converter	10291	V					
Converter	10598	V					
Converter	10017	V					
Converter	10115	V					
Converter	10621	V					
Converter	10705	V					
Mount	10018	V					
Mount	10006	EXC					
Control	10689	EXC					
Control	10023	V					
Control	10642	EXC					
Control	10628	V					
Control	10546	EXC					
Control	10021	V					
Control	10512	V					
Control	10611	V					
Control	10039	EXC					

COLLINS DATA
RETURNED UNITS

CPO F09603-77-A-3104

RANDOLPH, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
Control	10610	EXC					
Control	10651	V					
Control	10674	EXC					
Control	10527	EXC					
Control	10025	V					
Control	10575	V					
Control	10248	V					
Control	10063	EXC					
Control	10562	EXC					
Control	10531	EXC					
Control	10023	V					
Control	10051	V					
Control	10016	V					
Control	10017	V					
Control	10035	V					

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

REESE, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	10493	V	145	118	27	92	
R/T	10455	V	410	184	226	270	
R/T	10395	V	473	112	361	265	
R/T	10359	V	159	123	36	37	
R/T	10639	V	417	110	307	175	
R/T	10535	V	157	134	23	35	
R/T	10268	V	328	220	108	ND	
R/T	10596	V	130	107	23	ND	
R/T	10487	V	653	180	473	279	
R/T	10520	V	190	138	52	ND	
R/T	10360	EXC	254	106	148	191	
R/T	10244	EXC	107	107	0	ND	
R/T	10194	NV	304	111	293	165	
R/T	10330	NV	187	125	62	126	
R/T	10882	V	161	154	7	25	
R/T	10343	V	137	112	25	ND	
R/T	10338	V	342	109	233	132	
R/T	10470	V	219	130	89	107	
R/T	10306	V	1,091	844	247	Invalid Data	
R/T	10593	V	166	103	63	ND	
R/T	10328	V	404	114	290	164	
R/T	10372	V	245	120	125	120	
R/T	10122	V	271	207	64	42	
R/T	10165	V	252	156	96	97	
R/T	10019	NV	473	448	26	7	
R/T	10424	V	150	117	33	23	

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

REESE, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
R/T	10533	V	188	172	15	16	
R/T	10527	V	122	109	13	ND	
R/T	10537	EXC	136	133	3	ND	
R/T	10331	V	126	125	1	ND	
R/T	10268	V	170	170	0	ND	
R/T	10420	V	628	121	507	271	
MX	10403	V	-	-	-	-	
MX	10341	V	-	-	-	-	
MX	10557	V	-	-	-	-	
MX	10147	V	-	-	-	-	
MX	10641	V	-	-	-	-	
MX	10526	V	-	-	-	-	
MX	10327	V	-	-	-	-	
MX	10524	V	-	-	-	-	
MX	10638	V	-	-	-	-	
MX	10086	V	-	-	-	-	
MX	10363	V	-	-	-	-	
MX	10446	NV	-	-	-	-	
Mount	10070	V	-	-	-	-	
Mount	10123	EXC	-	-	-	-	
Control	10446	EXC	-	-	-	-	
Control	10338	EXC	-	-	-	-	
Control	10172	V	-	-	-	-	
Control	10388	V	-	-	-	-	

COLLINS DATA
RETURNED UNITS
CPO F09603-77-A-3104

REESE, AFB

Unit Description	Serial Number	Failure Classification	ETI In	ETI Prior	Δ ETI	Δ Install Days	Comments
Control	10265	EXC	-	-	-	-	
Control	10193	EXC	-	-	-	-	
Control	10334	EXC	-	-	-	-	
Control	10365	V	-	-	-	-	
Control	10248	EXC	-	-	-	-	
Control	10145	EXC	-	-	-	-	
Control	10289	EXC	-	-	-	-	
Control	10232	NV	-	-	-	-	

APPENDIX D

BASIC USAF SUBMITTED DATA
AND
PRELIMINARY CALCULATIONS

PREPARED BY

ARINC RESEARCH

INCLUDES DATA FROM

ANDERSEN AFB
BARKSDALE AFB
BLYTHEVILLE AFB
COLUMBUS AFB
DYESS AFB
EDWARDS AFB
EGLIN AFB
FAIRCHILD AFB
GRAND FORKS AFB
K. I. SAWYER AFB
MINOT AFB
NELLIS AFB
UPPER HEYFORD AFB
VANCE AFB
WILLIAMS AFB
WURTSMITH AFB

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Andersen AFB, Guam

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	00073	10435	267	125	142	7/25/77	-	10/12/77	80	11848.6	11746.3	102.3	
B-56	00075	11273	122	105	17	8/30/77	-	10/12/77	44	11810.7	11803.7	7.0	
B-52	00077	11282	272	106	166	9/21/77	-	10/12/77	13	12353.1	12336.6	16.5	
B-52	00079	11279	191	109	82	7/22/77	-	10/12/77	82	12220.8	12157.4	63.4	
B-52	00083	11196	224	123	101	8/05/77	-	10/12/77	68	13013.0	12932.0	81.0	
B-52	00091	11167	344	214	130	8/11/77	-	10/12/77	62	11802.0	11698.8	103.2	
B-52	00101	11132	265	212	53	8/25/77	-	10/12/77	48	12141.1	12098.1	43.0	
B-52	00104	10521	264	110	154	9/12/77	-	10/12/77	31	13395.1	13366.0	29.1	
B-52	00596	11208	261	119	142	9/14/77	-	10/12/77	29	11705.4	11660.3	45.1	
B-52	00621	10248	209	117	92	7/29/77	-	10/12/77	75	12089.5	12012.4	77.1	
B-52	00628	11243	209	126	83	7/15/77	-	10/12/77	89	11518.3	11461.1	57.2	
B-52	00671	11229	215	134	81	8/19/77	-	10/12/77	54	12843.8	12772.5	71.3	
B-52	00675	11268	174	144	30	9/22/77	-	10/12/77	21	12265.6	12223.1	42.5	
B-52	00677	10430	222	117	105	8/08/77	-	10/12/77	65	11505.0	11430.2	74.8	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Barksdale AFB, La.

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card Date		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52G	0202	11256	352	101	251	8/15/77	-	11/17/77	95	7553	7405	148	
B-52G	2597	11296	286	110	176	7/27/77	-	11/18/77	115	9769	9624	145	
B-52G	6468	11269	333	103	230	7/22/77	-	11/17/77	119	9095	8955	140	
B-52G	6513	11239	244	115	129	8/10/77	-	11/18/77	101	12502	12100	402	
B-52G	6516	11238	312	138	174	8/4/77	-	11/17/77	106	9869	9733	136	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Blytheville AFB, AR

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	706495	10368	197	119	78	7/11/77	-	10/20/77	108	9143.3	9080.9	62.4	
B-52	800244	11487	212	113	99	7/14/77	-	10/07/77	56	9143.3	9006.3	137.0	
B-52	800191	10323	274	112	162	7/27/77	-	10/20/77	92	10044.0	9924.1	119.9	
B-52	706486	-	-	-	-	7/28/77	-	-	-	9014.5	-	-	
B-52	709598	10376	290	107	183	7/29/77	-	10/19/77	89	7770.1	7632.6	137.5	Aircraft impounded

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Columbus AFB, MS

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	3161	10997	422	118	304	2/8/77	-	10/18/77	253	6910.0	-	-	
T-38	0372	10974	482	107	375	1/5/77	-	10/18/77	287	5223.6	-	-	
T-38	0374	10463	447	128	319	2/8/77	-	10/18/77	253	5888.8	-	-	
T-38	0380	10991	399	110	289	2/8/77	-	10/19/77	254	5765.2	-	-	
T-38	0386	10949	486	152	334	2/8/77	-	10/18/77	253	5609.5	-	-	
T-38	0404	10747	564	134	430	1/5/77	-	10/18/77	287	5871.1	-	-	
T-38	0408	10867	479	185	294	2/8/77	-	10/18/77	253	6068.9	-	-	
T-38	0417	10889	490	-	-	2/7/77	-	10/18/77	254	4968.0	-	-	
T-38	4324	10773	466	110	356	1/5/77	-	10/21/77	290	5177.2	-	-	
T-38	4327	10999	455	111	344	2/8/77	-	10/18/77	253	4876/7	-	-	
T-38	4329	-	408	-	-	3/1/77	-	10/19/77	233	5059.2	-	-	
T-38	4337	11020	406	104	302	2/9/77	-	10/18/77	252	5023.9	-	-	
T-38	4339	10969	482	112	370	2/8/77	-	10/18/77	253	4936.1	-	-	
T-38	4358	10836	386	112	274	1/5/77	-	10/18/77	287	4889.9	-	-	
T-38	4362	10812	525	117	408	1/5/77	-	10/19/77	288	4688.0	-	-	
T-38	0430	12468	102	102	0	10/17/77	-	10/17/77	1	5287.2	-	-	
T-38	8160	10980	125	113	12	1/7/77	-	10/18/77	285	6602.2	-	-	
T-38	8168	10820	532	118	414	2/8/77	-	10/18/77	253	6521.3	-	-	
T-38	4854	10514	334	107	227	1/7/77	-	10/18/77	-	4734.5	-	-	
T-38	4916	10730	460	146	314	2/8/77	-	10/18/77	253	4115.3	-	-	
T-38	0823	12505	114	114	0	10/14/77	-	10/14/77	1	7636.8	-	-	
T-38	4925	10415	505	129	376	2/10/77	-	10/18/77	251	4538.4	-	-	
T-38	4930	10927	448	129	319	2/8/77	-	10/18/77	253	3905.0	-	-	
T-38	4933	10753	507	116	391	1/5/77	-	10/19/77	288	4514.0	-	-	
T-38	4934	10887	461	129	332	2/11/77	-	10/21/77	253	4062.0	-	-	
T-38	4953	10824	402	115	287	1/5/77	-	10/18/77	287	4376.7	-	-	
T-38	4957	10964	502	109	393	2/8/77	-	10/18/77	253	3906.8	-	-	
T-38	0440	12541	0120	120	0	10/17/77	-	10/17/77	1	5491/7	-	-	
T-38	0397	12323	0113	113	0	10/17/77	-	10/17/77	1	5393.2	-	-	
T-38	3162	10793	447	110	337	2/9/77	-	10/18/77	252	6105.8	-	-	
T-38	3163	10971	457	135	322	2/8/77	-	10/19/77	254	6559.4	-	-	
T-38	8096	10690	367	113	254	2/8/77	-	10/19/77	254	3827.9	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Columbus AFB, MS

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	8097	10852	528	167	361	2/9/77	-	10/19/77	253	3980.3	-	-	
T-38	8098	10229	475	105	370	2/9/77	-	10/19/77	253	4381.6	-	-	
T-38	8099	10166	595	108	487	1/24/77	-	10/20/77	270	4329.0	-	-	
T-38	8101	10823	619	155	464	2/9/77	-	10/19/77	253	4241.6	-	-	
T-38	8102	10961	494	114	380	2/9/77	-	10/18/77	252	4198.6	-	-	
T-38	8104	11113	198	109	89	2/7/77	-	10/18/77	254	3627.1	-	-	
T-38	8105	11009	458	103	355	2/10/77	-	10/18/77	251	4257.4	-	-	
T-38	8114	10899	449	115	334	2/9/77	-	10/18/77	252	4130.3	-	-	
T-38	8119	10606	400	111	289	1/7/77	-	10/19/77	286	4192.4	-	-	
T-38	8120	10921	386	113	273	2/9/77	-	10/19/77	252	3983.9	-	-	
T-38	8122	10808	301	105	196	1/7/77	-	10/19/77	286	3541.9	-	-	
T-38	8125	10728	500	132	368	1/6/77	-	10/19/77	287	4060.1	-	-	
T-38	8127	10855	441	130	311	2/7/77	-	10/19/77	255	4233.5	-	-	
T-38	8129	10055	550	112	438	3/9/77	-	10/18/77	224	3995.6	-	-	
T-38	8130	10968	510	120	390	2/10/77	-	10/20/77	253	3842.1	-	-	
T-38	8143	10873	464	106	358	1/7/77	-	10/18/77	285	3883.7	-	-	
T-38	8146	10789	514	107	407	1/7/77	-	10/19/77	286	4208.6	-	-	
T-38	8147	10177	317	914	-	1/7/77	-	10/19/77	286	3604.9	-	-	
T-38	8150	10976	273	118	155	2/9/77	-	10/20/77	254	3825.0	-	-	
T-38	8151	10314	559	133	426	1/6/77	-	10/20/77	288	3885.1	-	-	
T-38	8157	10858	436	119	317	2/10/77	-	10/19/77	252	3761.8	-	-	
T-38	8158	10894	463	136	327	2/8/77	-	10/19/77	234	6664.7	-	-	
T-38	8159	10896	397	248	149	2/10/77	-	10/18/77	251	5952.9	-	-	
T-38	4378	10953	391	102	289	2/10/77	-	10/18/77	1	5450.6	-	-	
T-38	4331	12463	112	111	1	10/18/77	-	10/18/77	1	5298.2	-	-	
T-38	1582	12475	105	105	0	10/14/77	-	10/14/77	1	3314.9	-	-	
T-38	8161	10996	374	108	266	2/10/77	-	10/19/77	252	3989.5	-	-	
T-38	8162	10965	491	102	389	2/8/77	-	10/19/77	254	3825.1	-	-	
T-38	8163	10966	393	113	280	2/8/77	-	10/19/77	254	3726.6	-	-	
T-38	8165	10923	440	114	326	2/9/77	-	10/18/77	252	4090.6	-	-	
T-38	8166	10787	463	127	336	1/7/77	-	10/18/77	285	3869.4	-	-	
T-38	8167	10697	1153	863	290	2/18/77	-	10/19/77	244	4018.2	-	-	
T-38	0473	12430	117	117	0	10/7/77	-	10/17/77	1	5450.6	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Columbus AFB, MS

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	0840	12442	105	105	0	10/17/77	-	10/17/77	1	7688.4	-	-	
T-38	9169	10733	566	193	373	1/7/77	-	10/18/77	285	3940.9	-	-	
T-38	8170	10805	618	137	481	1/7/77	-	10/21/77	288	3843.1	-	-	
T-38	8171	10814	366	102	264	2/9/77	-	10/19/77	253	3979.3	-	-	
T-38	8172	10831	372	109	263	1/7/77	-	10/19/77	286	6384.8	-	-	
T-38	8173	10952	488	113	375	2/10/77	-	10/21/77	254	-	-	-	
T-38	8174	10799	349	111	238	1/6/77	-	10/18/77	286	1280.0	-	-	
T-38	3206	12306	111	111	0	10/18/77	-	10/18/77	1	6297.3	6297.3	0	
T-38	8177	10978	425	110	315	2/11/77	-	10/19/77	251	6510.1	-	-	
T-38	8178	10821	576	109	467	1/7/77	-	10/19/77	286	7038.5	-	-	
T-38	8179	10833	352	108	244	1/6/77	-	10/19/77	287	3501.0	-	-	
T-38	8180	10829	416	107	309	1/7/77	-	10/19/77	286	3485.7	-	-	
T-38	8181	10921	522	107	415	2/11/77	-	10/19/77	251	4055.7	-	-	
T-38	8188	10795	564	120	444	1/7/77	-	10/19/77	286	3581.0	-	-	
T-38	0827	12262	119	119	0	10/17/77	-	10/17/77	1	7831.8	-	-	
T-38	8189	10797	357	150	207	1/7/77	-	10/18/77	285	3570.9	-	-	
T-38	8195	10725	1236	817	419	2/11/77	-	10/19/77	251	3066.1	-	-	
T-38	8196	10785	420	116	304	1/6/77	-	10/18/77	286	3754.0	-	-	
T-38	8197	10457	234	125	109	2/10/77	-	10/18/77	251	3616.6	-	-	
T-38	8198	10847	619	289	330	2/9/77	-	10/18/77	252	3759.8	-	-	
T-38	8199	10360	488	119	369	2/8/77	-	10/19/77	254	3892.7	-	-	
T-38	4387	10778	549	110	439	1/5/77	-	10/19/77	288	4644.8	-	-	
T-38	1569	12192	117	116	0	10/14/77	-	10/14/77	1	3220.8	-	-	
T-38	8164	11604	250	141	109	1/7/77	-	10/19/77	286	3307.4	-	-	
T-38	8175	10566	589	270	319	1/6/77	-	10/19/77	287	6329.0	-	-	
T-38	4837	10178	576	119	457	1/24/77	-	10/19/77	269	5120.2	-	-	
T-38	3173	11010	413	114	299	2/9/77	-	10/19/77	253	6741.3	-	-	
T-38	8200	10887	561	129	432	2/7/77	-	10/19/77	255	3859.8	-	-	
T-38	8201	10906	362	117	245	3/11/77	-	10/18/77	222	3652.2	-	-	
T-38	8202	10809	513	107	406	1/6/77	-	10/19/77	287	3690.8	-	-	
T-38	8203	10249	533	118	415	2/7/77	-	10/18/77	254	3836.4	-	-	
T-38	8204	10995	393	133	260	2/10/77	-	10/19/77	252	3747.9	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Columbus AFB, MS

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	8206	10828	609	120	489	1/6/77	-	10/19/77	287	3899.8	-	-	
T-38	8207	10957	423	112	311	2/10/77	-	10/19/77	252	3963.3	-	-	
T-38	8208	10775	525	108	417	1/6/77	-	10/19/77	287	3578.3	-	-	
T-38	8210	11003	422	105	317	2/10/77	-	10/19/77	252	3746.6	-	-	
T-38	8211	10510	384	129	253	2/10/77	-	10/18/77	251	3496.7	-	-	
T-38	8213	10962	240	109	131	2/10/77	-	10/20/77	253	3561.3	-	-	
T-38	8215	11003	262	105	157	2/11/77	-	10/21/77	253	3569.7	-	-	
T-38	8217	10718	242	114	128	2/15/77	-	10/19/77	247	3409.1	-	-	
T-38	8187	11016	466	104	362	2/8/77	-	10/18/77	253	4345.1	-	-	
T-38	7073	10776	488	148	340	1/7/77	-	10/21/77	288	3681.9	-	-	
T-38	7074	10815	415	177	238	2/10/77	-	10/18/77	251	3118.3	-	-	
T-38	3210	12335	211	211	0	10/17/77	-	10/17/77	1	6794.5	-	-	
T-38	7075	10951	597	112	485	2/9/77	-	10/19/77	253	3735.1	-	-	
T-38	7076	10746	621	160	461	1/6/77	-	10/19/77	287	3615.1	-	-	
T-38	1560	10251	465	110	355	1/6/77	-	10/21/77	289	3141.1	-	-	
T-38	1576	10839	609	174	435	2/9/77	-	10/18/77	252	3137.3	-	-	
T-38	1583	10998	554	104	450	2/11/77	-	10/19/77	251	2876.0	-	-	
T-38	1590	10868	633	221	412	2/14/77	-	10/19/77	248	2717.2	-	-	
T-38	3711	11667	292	125	167	5/27/77	-	10/18/77	145	7454.3	-	-	
-	-	11855	129	124	-	-	-	10/20/77	-	-	-	-	Spare
-	-	11610	108	125	-	-	-	-	-	-	-	-	Spare
-	-	10818	-	146	-	-	-	-	-	-	-	-	No Record
-	-	10827	-	110	-	-	-	-	-	-	-	-	No Record

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Dyess AFB, TX

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
C-130	41675	12425	196	111	85	8/18/77	-	10/13/77	57	961.5	871.3	90.2	
C-130	41661	12413	187	103	84	8/18/77	-	10/13/77	57	961.5	871.3	90.2	
C-130	41674	12474	204	104	100	8/22/77	-	10/14/77	54	1709.2	1621.2	88.0	
C-130	41674	12444	215	115	100	8/22/77	-	10/14/77	54	1709.2	1621.2	88.0	
C-130	41682	12324	236	168	68	8/23/77	-	10/14/77	53	1322.3	1256.4	65.9	
C-130	41682	12187	179	111	68	8/23/77	-	10/14/77	53	1322.3	1256.4	65.9	
C-130	41663	12372	177	108	69	8/24/77	-	10/12/77	50	942.4	890.6	51.8	
C-130	41663	12042	282	177	105	8/25/77	-	10/13/77	50	1391.2	1298.0	93.2	
C-130	41683	12369	218	112	106	8/25/77	-	10/13/77	50	1391.2	1298.0	93.2	
C-130	41686	12412	200	102	98	8/29/77	-	10/17/77	50	983.7	879.6	104.1	
C-130	2062	12358	224	126	98	8/29/77	-	10/17/77	50	983.7	879.6	104.1	
C-130	1671	12393	242	108	134	8/30/77	-	10/20/77	52	815.5	721.1	94.4	
C-130	2131	12452	208	102	106	8/30/77	-	10/20/77	52	815.5	721.1	94.4	
C-130	5-063	12842	115	104	11	10/11/77	-	10/17/77	7	1158.5	1143.8	14.7	
C-130	5-084	12877	136	125	11	10/11/77	-	10/17/77	7	1158.5	1143.8	14.7	
C-130	5-099	11684	102	106	-	10/13/77	-	10/13/77	1	1260.9	1260.9	0.0	
C-130	5-107	12802	112	112	0	10/13/77	-	10/13/77	1	1260.9	1260.9	0.0	
C-130	5-113	12650	126	127	-	10/14/77	-	10/14/77	1	445.1	455.1	0.0	
C-130	6-585	12858	103	103	0	10/14/77	-	10/14/77	1	445.1	455.1	0.0	
C-130	6-594	11143	236	129	107	10/11/77	-	10/28/77	50	11842	11834	8.8	
C-130	6-614	11145	815	160	655	10/18/77	-	10/28/77	11	12109	11993	116.6	
C-130	6-657	11293	-	151	-	7/25/77	-	10/28/77	96	12803	12669	134.0	
C-130	6-659	11325	240	110	130	6/30/77	-	10/28/77	121	12986	12885	101.0	
C-130	6-666	10544	278	104	174	7/07/77	-	10/28/77	114	12719	12589	130.0	
C-130	6-585	11303	184	131	53	9/23/77	-	10/28/77	36	11581	11528	53.0	
C-130	6-594	11593	158	136	22	9/09/77	-	10/28/77	50	12986	12970	16.0	
C-130	6-614	11307	185	111	74	8/1/77	-	10/28/77	89	11255	11152	3.0	
C-130	6-657	11161	122	147	75	10/17/77	-	10/28/77	21	12038	11195	843.0	
C-130	6-659	10542	234	165	69	8/29/77	-	10/28/77	61	12141	12095	46.0	
C-130	6-666	10920	963	871	92	10/4/77	-	10/28/77	25	11651	11616	35.0	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Dyess AFB, TX

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B52-D	6-668	10354	166	117	49	9/19/77	-	10/28/77	40	11218	11176	42	
B52-D	6-670	11883	162	143	19	10/6/77	-	10/28/77	23	12591	12549	42	
B52-D	6-676	11435	207	111	96	8/12/77	-	10/28/77	78	12446	12376	70	
B52-D	6-689	11317	285	107	178	7/11/77	-	10/28/77	110	12128	11996	132	
B52-D	6-697	10353	151	115	36	9/12/77	10/17/77	10/17/77	35	-	-	-	
						10/17/77	-	10/28/77	12	12531	12516	15	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Dyess AFB, TX

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
C-130	1662	12199	204	118	86	8/30/77	-	10/21/77	53	1406.9	1330.7	76.2	
		12375	200	115	85	8/30/77	-	10/21/77	53	1406.9	1330.7	76.2	
C-130	2064	12291	175	110	65	8/31/77	-	10/18/77	58	912.7	842.7	70.0	
		12171	286	118	168	8/31/77	-	10/18/77	58	912.7	842.7	70.0	
C-130	1673	12251	166	104	62	9/2/77	-	10/14/77	43	1260.2	1208.6	51.6	
		10109	464	176	288	9/2/77	-	10/14/77	43	1260.2	1208.6	51.6	
C-130	2065	12222	142	133	9	9/6/77	-	10/14/77	39	898.9	879.2	19.7	
		10343	201	112	89	9/6/77	-	10/14/77	39	898.9	879.2	19.7	
C-130	1692	12111	200	145	55	9/6/77	-	10/14/77	39	879.9	837.4	42.5	
		12289	161	107	54	9/6/77	-	10/14/77	39	879.9	837.4	42.5	
C-130	1679	12446	170	104	66	9/9/77	-	10/15/77	37	1099.8	1041.0	58.8	
		12305	171	109	62	9/9/77	-	10/15/77	37	1099.8	1041.0	58.8	
C-130	1660	12248	162	126	36	9/9/77	-	10/14/77	36	1374.2	1334.9	39.3	
		12282	170	108	62	9/9/77	-	10/14/77	36	1374.2	1334.9	39.3	
C-130	1659	12220	261	106	155	9/13/77	-	10/11/77	29	1759.6	1687.2	72.4	
		12373	194	121	73	9/13/77	-	10/11/77	29	1759.6	1687.2	72.4	
C-130	1664	12797	125	107	18	9/27/77	-	10/11/77	15	1388.3	1377.0	11.3	
		12849	128	110	18	9/27/77	-	10/11/77	15	1388.3	1377.0	11.3	
C-139	1667	10313	146	113	33	9/28/77	-	10/16/77	19	888.1	856.4	31.7	
		12818	135	103	32	9/28/77	-	10/16/77	19	888.1	856.4	31.7	
C-130	1668	12856	106	106	0	10/3/77	-	10/13/77	11	1448.6	1448.6	0.0	
		12860	109	-	-	10/3/77	-	10/13/77	11	1448.6	1448.6	0.0	
C-130	1666	11671	132	104	28	10/5/77	-	10/17/77	13	1085.1	1075.0	10.1	
		12201	130	101	29	10/5/77	-	10/17/77	13	1085.1	1075.0	10.1	
C-130	41665	12123	190	116	74	8/16/77	-	10/13/77	59	1561.9	1498.1	63.8	
		12408	197	133	64	8/16/77	-	10/13/77	59	1561.9	1498.1	63.8	
C-130	41670	12332	224	150	74	8/17/77	-	10/13/77	58	1438.3	1375.2	63.1	
		12481	180	102	78	8/17/77	-	10/13/77	58	1438.3	1375.2	63.1	
C-130	41676	12409	213	108	105	8/18/77	-	10/13/77	57	1174.9	1078.0	96.9	
		12370	226	121	105	8/18/77	-	10/13/77	57	1174.9	1078.0	96.9	
C-130	41672	12874	202	160	42	8/19/77	-	10/13/77	56	1155.2	1095.4	59.8	
		12434	181	103	78	8/19/77	-	10/13/77	56	1155.2	1095.4	59.8	
C-130	41684	12364	168	107	61	8/19/77	-	10/13/77	56	823.1	757.3	65.8	
		12426	174	106	68	8/19/77	-	10/13/77	56	823.1	757.3	65.8	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Edwards AFB, FL

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
						R/T Record Card Date Mo-Day-Yr	Remove						
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)			Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
A-10A	31668	10060	419	117	302	-	-	10/14/77	-	505.1	-	-	
A-10A	31669	10099	428	117	311	-	-	10/14/77	-	401.4	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Eglin AFB, FL

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
F11E	00058	11572	192	105	87	5/13/77	-	10/18/77	59	1113.4	1072.4	41.0	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Fairchild AFB, WA

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	00158	11710	265	107	158	7/26/77	-	10/17/77	84	10011.1	9907.6	103.5	
B-52	02590	10877	239	124	115	7/28/77	-	10/17/77	82	8394.6	8291.1	103.5	
B-52	06507	12099	256	106	150	7/21/77	-	10/17/77	89	7075.1	6973.2	101.9	
B-52	02565	12017	235	110	125	8/02/77	-	10/17/77	77	9254.4	9161.4	93.0	
B-52	06503	12107	259	114	145	8/04/77	-	10/17/77	75	9380.8	9271.7	109.1	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Grand Forks AFB, ND

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	60028	11225	314	117	197	7/18/77	-	10/14/77	89	6621.1	6173.3	447.8	
B-52	60035	11214	321	193	128	7/21/77	-	10/14/77	86	6782.7	6681.3	101.4	
B-52	60053	11161	265	147	118	7/25/77	-	10/14/77	82	6687.0	6601.2	85.8	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Site Name: MINDOT AFB, ND

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
8-52	00034	11727	213	103	110	7/19/77	-	10/7/77	81	7665.0	7565.5	99.5	
8-52	01029	11760	236	103	133	7/20/77	-	10/7/77	81	7166.2	7044.2	122.0	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Nellis AFB, NV

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
A-10	263	10257	135	101	34	7/15/77	-	10/14/77	62	405.8	65.8	40.0	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Upper Heyford, U.K.

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install Mo-Day-Yr	Remove Mo-Day-Yr						
F-111E	8007	10790	244	111	133	7/13/77	-	11/2/77	113	1486	1395	91	
F-111E	8009	10498	-	115	-	4/4/77	9/13/77	11/2/77	163	-	-	-	
F-111E	8009	10242	174	104	70	9/13/77	-	11/2/77	51	1567	-	-	
F-111E	8010	10243	-	144	-	5/4/77	9/19/77	11/2/77	139	-	-	-	
F-111E	8011	11875	125	106	19	9/19/77	-	11/2/77	45	1718	1704	14	
F-111E	8011	10237	293	118	75	5/10/77	-	11/2/77	177	1732	-	-	
F-111E	8012	10663	382	126	256	4/27/77	-	11/2/77	221	1679	-	-	
F-111E	8013	10105	-	140	-	3/18/77	5/26/77	11/2/77	70	-	-	-	
F-111E	8014	10669	319	121	198	5/26/77	-	11/2/77	161	1488	-	-	
F-111E	8014	10381	128	124	4	5/26/77	6/13/77	11/2/77	161	-	-	-	
F-111E	8015	10497	401	120	281	6/14/77	-	11/2/77	142	1844	-	-	
F-111E	8015	10440	274	106	168	3/16/77	-	11/2/77	232	1346	-	-	
F-111E	7119	10246	241	105	136	4/26/77	-	11/1/77	190	1624	-	-	
F-111E	7121	10476	310	113	197	4/7/77	-	11/2/77	210	1755	-	-	
F-111E	7122	10311	356	108	248	4/25/77	-	11/2/77	192	1871	-	-	
F-111E	8001	10467	330	124	206	3/15/77	-	11/2/77	233	1617	-	-	
F-111E	8002	10414	217	106	111	4/12/77	-	11/2/77	205	1662	-	-	
F-111E	8003	10498	251	115	136	5/26/77	-	11/2/77	161	1590	See 8009	-	
F-111E	8004	10648	343	123	220	4/20/77	-	11/2/77	197	1576	-	-	
F-111E	8005	10668	155	106	49	4/18/77	6/23/77	11/2/77	67	-	See T/N 8039	-	
F-111E	8006	10477	283	111	172	6/23/77	8/31/77	11/2/77	70	-	-	-	
F-111E	8006	10233	325	112	213	8/31/77	-	11/2/77	64	1492	1408	84	
F-111E	8007	10752	261	114	147	6/7/77	7/13/77	11/2/77	171	1471	-	-	
F-111E	8007	10738	-	116	-	5/13/77	-	11/2/77	37	-	See T/N 8037	-	
F-111E	8016	10680	339	103	236	5/13/77	-	11/2/77	174	1680	-	-	
F-111E	8017	10748	308	139	169	6/24/77	-	11/2/77	132	1715	-	-	
F-111E	8019	10677	329	123	206	4/25/77	-	11/2/77	192	1663	-	-	
F-111E	8020	10218	285	107	178	6/1/77	-	11/2/77	155	1616	-	-	
F-111E	8021	10705	332	111	221	5/31/77	-	11/2/77	156	1480	-	-	
F-111E	8022	10286	200	2	198	5/20/77	-	11/2/77	167	1693	-	-	
F-111E	8023	10781	302	114	188	6/9/77	-	11/2/77	147	1492	-	-	
F-111E	8025	10305	389	130	259	5/6/77	-	11/2/77	181	1725	-	-	

AN/ARN-118(V) TACAN FIELD DATA
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Air Force Base Upper Heyford, U.K.

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card Date Mo-Day-Yr		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
F-111E	8026	10259	272	144	128	5/10/77	-	11/2/77	177	1730	-	-	
F-111E	8027	10765	311	110	201	5/31/77	-	11/2/77	157	1520	-	-	
F-111E	8028	10683	-	111	-	3/16/77	3/23/77	11/2/77	8	-	-	-	
		10660	-	197	-	3/23/77	9/19/77	11/3/77	181	-	See T/N 8036	-	
		10803	-	118	-	9/19/77	10/11/77	11/2/77	23	1783	1750	-	
F-111E	8029	11708	196	168	28	10/11/77	-	11/2/77	23	1783	1756	27	
F-111E	8030	10691	177	107	70	5/22/77	-	11/2/77	166	1716	-	-	
		10427	-	138	-	4/6/77	6/9/77	11/2/77	55	-	-	-	
		10299	278	116	162	6/9/77	-	11/2/77	147	1597	-	-	
F-111E	8031	10657	374	134	240	3/15/77	-	11/2/77	233	1588	-	-	
F-111E	8032	10489	313	114	199	4/12/77	-	11/2/77	205	1746	-	-	
F-111E	8034	10176	301	132	169	5/11/77	-	11/1/77	175	1528	-	-	
F-111E	8035	10497	-	120	-	3/15/77	6/1/77	11/2/77	79	-	See T/N 8014	-	
		10103	239	118	121	6/1/77	-	11/2/77	155	1639	-	-	
F-111E	8036	10149	-	123	-	5/16/77	10/12/77	11/2/77	150	-	-	-	
		10660	363	197	166	10/12/77	-	11/2/77	22	1613	-	-	
F-111E	8037	10738	264	116	148	5/26/77	-	11/2/77	161	1690	-	-	
F-111E	8038	10681	-	110	-	4/7/77	4/27/77	11/2/77	21	-	-	-	
		10265	351	117	234	4/27/77	-	11/2/77	190	1660	-	-	
F-111E	8039	10668	-	106	-	6/1/77	6/24/77	11/2/77	24	-	See T/N 8066	-	
		11001	242	117	125	6/24/77	-	11/2/77	132	1801	-	-	
F-111E	8040	10626	340	145	195	4/20/77	-	11/1/77	196	1866	-	-	
F-111E	8041	10719	-	118	-	6/2/77	-	11/2/77	154	-	-	-	
F-111E	8042	10312	300	108	192	6/1/77	-	11/1/77	154	1681	-	-	
F-111E	8043	10440	-	106	-	4/8/77	-	11/2/77	209	-	-	-	
F-111E	8044	11047	280	125	155	7/19/77	-	11/2/77	76	1698	1575	123	
F-111E	8045	10770	-	108	-	3/11/77	5/24/77	11/2/77	75	-	-	-	
		10727	-	140	-	5/24/77	6/1/77	11/2/77	9	-	-	-	
		10497	-	120	-	6/1/77	6/13/77	11/2/77	13	-	See T/N 8014	-	
		10755	233	151	82	6/13/77	-	11/3/77	144	1631	-	-	
F-111E	8046	10697	-	106	-	3/12/77	-	11/2/77	236	-	-	-	
F-111E	8047	10745	-	114	-	5/17/77	9/28/77	11/2/77	135	-	See T/N 8058	-	A/C at Depot

AN/ARN-118(V) TACAN FIELD DATA
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Air Force Base Upper Heyford, U.K.

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
F-111E	8047	11880	134	109	25	9/28/77	-	11/2/77	36	1732	1710	-	
F-111E	8048	10076	276	178	98	7/27/77	-	11/2/77	99	1713	1687	-	
F-111E	8049	10255	176	109	67	5/10/77	7/22/77	11/2/77	74	-	-	-	
		10308	148	146	2	7/22/77	7/22/77	11/2/77	0	-	1245	-	
F-111E	8050	10671	250	-	67	7/22/77	-	11/1/77	103	1322	1248	-	
F-111E	8051	10290	283	135	148	5/23/77	-	11/2/77	164	1675	-	-	
F-111E	8052	10258	256	110	146	4/29/77	-	11/2/77	188	1475	-	-	
F-111E	8053	10302	-	110	-	4/24/77	-	11/2/77	193	1432	-	-	
		10804	-	113	-	5/10/77	8/5/77	11/2/77	88	-	-	-	
		10745	288	114	174	8/5/77	9/28/77	11/2/77	55	-	-	-	
F-111E	8054	11840	200	151	49	9/28/77	-	11/2/77	36	1700	1651	49	
F-111E	8055	10631	255	119	136	8/18/77	-	11/2/77	77	1738	1661	77	
F-111E	8056	10301	285	108	177	8/17/77	-	11/2/77	78	1478	1367	111	
F-111E	8057	10685	-	116	-	5/10/77	-	11/1/77	176	1439	-	-	A/C at Depot
F-111E	8059	10468	185	109	76	4/25/77	-	11/2/77	192	-	-	-	
F-111E	8061	10291	385	110	275	4/7/77	-	11/2/77	210	1537	-	-	
F-111E	8062	10678	274	157	117	5/6/77	-	11/2/77	181	1500	-	-	
F-111E	8063	10286	325	2	323	4/4/77	-	11/2/77	213	1670	-	-	
F-111E	8064	10274	399	135	264	3/14/77	-	11/1/77	233	1644	-	-	
F-111E	8065	10479	289	142	147	3/27/77	-	11/2/77	221	1816	-	-	
F-111E	8066	10681	219	110	109	7/19/77	-	11/2/77	107	1350	1233	-	
F-111E	8067	-	-	-	-	4/28/77	-	11/2/77	189	1742	-	-	A/C at Depot
F-111E	8068	10294	252	141	111	3/3/77	-	11/2/77	184	-	-	-	
F-111E	8069	10751	306	1/1	135	5/16/77	-	11/2/77	171	1574	-	-	
F-111E	8071	10242	-	-	-	6/7/77	-	11/2/77	149	1663	-	-	
		11670	214	104	110	4/25/77	9/14/77	11/2/77	143	1475	See T/N 8009	83	
F-111E	8072	10288	-	-	-	9/14/77	-	11/2/77	50	1391	-	-	A/C at Depot
F-111E	8073	10293	184	118	66	5/6/77	-	11/2/77	181	-	-	-	A/C at Depot
F-111E	8074	10263	-	128	-	5/6/77	-	11/6/77	185	1640	-	-	A/C at Depot
F-111E	8075	10248	160	108	52	5/4/77	-	11/2/77	183	-	-	-	A/C at Depot
F-111E	8076	10698	-	118	-	5/12/77	-	11/2/77	175	1503	-	-	A/C at Depot
			-	-	-	3/14/77	-	11/2/77	234	-	-	-	A/C at Depot

AN/ARN-118(V) TACAN FIELD DATA
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Air Force Base Upper Heyford, U.K.

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Removes						
F-111E	8077	10238	-	130	-	5/2/77	-	11/1/77	184	-	-	-	
F-111E	8078	11247	219	106	113	8/18/77	-	11/1/77	76	1583	1490	93	
F-111E	8079	10779	-	103	-	5/26/77	-	11/1/77	160	-	-	-	
F-111E	8080	10303	-	107	-	5/6/77	-	-	-	-	-	-	A/C at Depot
F-111E	8082	10270	-	107	-	4/28/77	-	-	-	-	-	-	A/C at Depot
F-111E	8083	10245	-	114	-	4/25/77	-	-	-	-	-	-	A/C at Depot
F-111E	8084	10201	-	108	-	5/6/77	-	-	-	-	-	-	A/C at Depot

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Yancey AFB, OK

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	3721	10128	1198	975	223	10/12/77	-	10/12/77	0	7104	7104	0	
T-38	3721	11497	-	108	-	04/28/77	10/12/77	10/12/77	167	7104	6970	234	
T-38	3714	11461	392	104	288	04/28/77	-	10/07/77	162	7724	7478	246	
T-38	3725	11396	386	109	277	04/28/77	-	10/07/77	162	6805	6570	235	
T-38	3728	11474	281	123	158	04/29/77	-	10/07/77	161	6935	6802	133	
T-38	3729	11472	388	103	285	04/29/77	-	10/07/77	161	7015	6775	245	
T-38	3730	11411	480	113	367	04/26/77	-	10/07/77	164	7629	7255	374	
T-38	3739	10822	247	110	137	06/08/77	-	10/07/77	121	7409	7295	114	
T-38	3744	11004	325	108	217	06/08/77	-	10/07/77	121	6840	6840	197	
T-38	4849	11415	344	110	234	05/12/77	-	10/07/77	148	4527	4325	202	
T-38	4851	11692	320	110	210	05/23/77	-	10/07/77	137	4613	4425	187	
T-38	4949	11469	487	232	255	05/17/77	-	10/07/77	143	4496	4276	220	
T-38	8115	13365	190	115	75	05/27/77	-	10/07/77	133	7224	7135	89	
T-39	8117	11486	419	179	240	05/05/77	-	10/07/77	155	4382	4175	207	
T-38	8126	11444	215	107	108	04/28/77	-	10/07/77	162	7320	7232	88	
T-38	8128	11500	233	104	129	04/28/77	-	10/07/77	162	7053	6942	111	
T-38	8137	11743	238	104	134	05/18/77	-	10/07/77	142	7101	6985	116	
T-38	8138	11445	371	134	237	04/25/77	-	10/07/77	165	7293	7091	202	
T-38	8192	11439	340	129	211	05/12/77	-	10/07/77	148	3944	3750	194	
T-38	8193	10204	234	118	116	05/19/77	-	10/07/77	141	3560	3463	97	
T-38	0385	11235	593	108	485	04/07/77	-	10/13/77	189	5756	5220	536	
T-38	1950	11631	214	120	94	07/15/77	-	10/13/77	90	2856	-	-	
T-38	3209	11745	653	106	547	05/24/77	-	10/13/77	142	6145	5915	230	
T-38	3233	11521	534	108	426	04/25/77	-	10/13/77	171	6143	5873	270	
T-38	3299	11370	663	110	553	04/27/77	-	10/13/77	169	6309	6095	214	
T-38	3286	11434	289	117	172	04/28/77	-	10/13/77	168	6245	6099	146	
T-38	3748	11663	400	142	258	05/25/77	-	10/13/77	141	6652	6435	217	
T-38	3717	11420	872	129	743	06/15/77	-	10/13/77	120	7506	7350	156	
T-38	8118	10702	295	108	187	06/09/77	-	10/12/77	125	7230	7070	160	
T-38	8119	11696	348	149	199	05/25/77	-	10/12/77	140	6596	6433	163	
T-38	8127	11687	483	131	352	05/19/77	-	10/13/77	147	7376	7125	251	
T-38	8132	11644	315	117	198	09/06/77	-	10/13/77	37	7250	7167	83	
T-38	8133	11743	373	104	269	05/24/77	-	10/13/77	142	7247	7010	237	
T-38	0395	11452	505	111	394	05/19/77	-	10/13/77	147	5776	5610	166	

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Air Force Base Vance AFB, OK

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	0908	11330	194	119	75	05/04/77	-	10/13/77	162	7559	7525	34	
T-38	0930	11488	505	103	402	04/28/77	-	10/13/77	168	7387	7115	272	
T-38	3623	11406	354	107	247	04/28/77	-	10/13/77	168	6894	6681	213	
T-38	3649	11391	444	112	332	04/28/77	-	10/13/77	168	7582	7298	284	
T-38	3709	11335	264	129	135	04/28/77	-	10/13/77	168	7449	7334	115	
T-38	3723	11443	323	111	212	04/12/77	-	10/13/77	184	7589	7329	260	
T-38	3737	10865	394	134	260	06/30/77	-	10/13/77	105	6778	6670	108	
T-38	3742	11620	331	107	224	05/18/77	-	10/13/77	148	7510	7315	195	
T-38	4936	11559	379	119	260	05/16/77	-	10/13/77	150	4424	4195	229	
T-38	8120	11404	290	113	177	04/28/77	-	10/13/77	168	7166	7010	156	
T-38	0335	11390	347	104	243	04/29/77	-	10/07/77	161	5676	5474	201	
T-38	0358	11525	292	104	188	04/29/77	-	10/07/77	161	5973	5819	154	
T-38	0377	11849	105	105	000	10/12/77	-	10/12/77	000	5290	5290	000	
T-38	1565	11507	243	110	133	04/26/77	-	10/07/77	164	2611	2491	120	
T-38	1581	11441	261	123	138	04/27/77	-	10/07/77	163	2173	2052	121	
T-38	0340	11493	431	102	329	04/29/77	-	10/14/77	168	6087	5799	288	
T-38	0342	11512	469	130	339	04/22/77	-	10/14/77	175	5816	5601	215	
T-38	0349	11206	447	114	333	04/07/77	-	10/14/77	190	5982	5695	287	
T-38	1589	11524	213	118	95	05/17/77	-	10/14/77	150	2234	2200	34	
T-38	3734	11695	264	117	147	05/20/77	-	10/14/77	147	7513	7320	193	
T-38	3713	11479	342	113	229	04/27/77	-	10/14/77	170	7294	7094	200	
T-38	8125	11502	421	103	318	04/28/77	-	10/13/77	168	7543	7210	333	
T-38	3736	11209	407	139	268	04/07/77	-	10/14/77	345	7320	6975	345	
T-38	3727	11589	492	244	248	05/23/77	-	10/14/77	144	7135	6935	200	
T-38	8113	11655	318	121	197	05/27/77	-	10/14/77	140	6779	6610	318	
T-38	8142	11193	432	123	309	03/29/77	-	10/14/77	199	6537	6287	250	

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Air Force Base Williams AFB, AZ

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	3615	11029	530	184	346	3/15/77	-	10/11/77	211	8246	-	-	
T-38	3616	10993	413	131	282	2/22/77	-	10/12/77	233	7740	-	-	
T-38	3618	10723	424	146	278	3/15/77	-	10/11/77	211	8277	-	-	
T-38	3619	11137	508	176	332	3/14/77	-	10/19/77	220	7570	-	-	
T-38	3620	11133	366	114	252	3/28/77	-	10/6/77	193	7664	-	-	
T-38	3621	11630	541	106	435	2/25/77	-	10/7/77	225	8068	-	-	
T-38	8111	11123	406	131	275	7/10/77	-	10/6/77	89	6367	-	-	
T-38	8184	10410	481	127	354	2/23/77	-	10/13/77	233	7420	-	-	
T-38	8191	11095	401	167	234	4/29/77	-	10/11/77	197	7244	-	-	
T-38	8227	11014	460	176	284	3/10/77	-	10/11/77	216	6248	-	-	
T-38	8229	10644	446	126	320	2/18/77	-	10/7/77	232	6651	-	-	
T-38	8230	11212	375	106	269	3/15/77	-	10/6/77	206	6686	-	-	
T-38	8231	11124	344	111	233	3/31/77	-	10/6/77	190	6372	-	-	
T-38	8232	11089	371	111	260	2/18/77	-	10/6/77	231	6672	-	-	
T-38	8233	10881	1055	835	220	3/29/77	-	10/6/77	192	6588	-	-	
T-38	8234	10935	363	114	249	2/14/77	-	10/7/77	236	6100	-	-	
T-38	8235	11159	456	103	353	3/31/77	-	10/7/77	191	6774	-	-	
T-38	8237	11168	266	133	133	3/14/77	-	10/13/77	214	4930	-	-	
T-38	8243	11134	488	114	374	3/29/77	-	10/7/77	193	5750	-	-	
T-38	3180	10981	560	175	385	3/28/77	-	10/7/77	194	6726	-	-	
T-38	3198	10700	518	167	351	5/2/77	-	10/12/77	164	6806	-	-	
T-38	3200	11058	430	125	305	2/23/77	-	10/11/77	231	6709	-	-	
T-38	3201	11077	521	112	409	3/1/77	-	10/12/77	226	6943	-	-	
T-38	3202	11046	582	105	477	2/23/77	-	10/6/77	226	6817	-	-	
T-38	3204	11063	575	122	453	2/23/77	-	10/11/77	231	6898	-	-	
T-38	3206	11032	263	114	149	3/18/77	-	10/13/77	210	5613	-	-	
T-38	3207	11837	148	110	38	8/7/77	-	10/7/77	62	6690	-	-	
T-38	3223	11189	500	109	391	3/14/77	-	10/6/77	206	6670	-	-	
T-38	3231	10163	528	104	424	2/11/77	-	10/13/77	245	6096	-	-	
T-38	3238	11038	441	120	321	3/28/77	-	10/6/77	193	6941	-	-	
T-38	3263	10924	547	164	383	2/24/77	-	10/6/77	225	0547	-	-	
T-38	3266	11051	528	115	413	2/17/77	-	10/6/77	232	7268	-	-	
T-38	3278	11053	331	111	220	3/31/77	-	10/12/77	196	6501	-	-	

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Air Force Base Williams AFB, AZ

(1) Aircraft Type	(2) Aircraft Tail Number	(3) R/T Serial Number	(4) ETI Hours At Read	(5) ETI Hours At Ship	(6) Δ ETI Hours (4) - (5)	(7) R/T Record Card		(8) Date Read Mo-Day-Yr	(9) Δ Install Days (7) - (8)	(10) Flying Hours At Read	(11) Flying Hours At Install	(12) Δ Flying Hours (10) - (11)	(13) Comments
						Install	Remove						
T-38	3279	10404	551	122	429	3/1/77	-	10/13/77	227	6885	-	-	
T-38	3290	11163	374	111	263	3/11/77	-	10/7/77	211	6590	-	-	
T-38	3302	11234	375	111	264	3/16/77	-	10/12/77	211	6703	-	-	
T-38	0317	10371	330	-	-	3/14/77	-	10/11/77	212	6305	-	-	
T-38	0320	11078	428	156	272	3/9/77	-	10/7/77	213	6124	-	-	
T-38	0324	11162	427	119	308	3/14/77	-	10/19/77	220	6837	-	-	
T-38	0332	11028	280	121	159	3/31/77	-	10/13/77	197	6157	-	-	
T-38	0343	10994	376	146	230	2/16/77	-	10/7/77	234	5995	-	-	
T-38	0347	11055	495	110	385	2/22/77	-	10/7/77	228	6397	-	-	
T-38	0359	11149	257	112	145	3/10/77	-	10/11/77	216	6203	-	-	
T-38	0361	11120	479	129	350	3/27/77	-	10/19/77	207	6187	-	-	
T-38	0364	10890	414	136	278	2/12/77	-	10/11/77	242	5808	-	-	
T-38	0387	10372	508	120	388	3/10/77	-	10/12/77	217	5776	-	-	
T-38	0393	11080	404	157	247	3/29/77	-	10/6/77	192	5935	-	-	
T-38	0394	10494	279	117	162	5/6/77	-	10/6/77	154	5880	-	-	
T-38	0398	10446	370	120	250	3/31/77	-	10/11/77	195	5924	-	-	
T-38	0414	10945	396	127	269	2/18/77	-	10/6/77	231	5783	-	-	
T-38	0418	11155	291	160	131	4/20/77	-	10/11/77	206	5988	-	-	
T-38	0442	11094	406	137	269	3/27/77	-	10/7/77	195	4928	-	-	
T-38	4334	10825	402	157	245	2/14/77	-	10/6/77	235	5480	-	-	
T-38	4355	10856	491	129	362	2/15/77	-	10/7/77	235	4934	-	-	
T-38	4356	11151	393	108	285	3/9/77	-	10/13/77	219	4797	-	-	
T-38	4385	11034	383	112	271	2/22/77	-	10/6/77	227	4784	-	-	
T-38	4836	11202	371	129	242	3/15/77	-	10/6/77	206	5046	-	-	
T-38	4838	10552	387	104	283	4/20/77	-	10/6/77	170	4850	-	-	
T-38	4840	10840	524	151	373	2/16/77	-	10/12/77	239	5048	-	-	
T-38	4848	10983	492	153	339	2/15/77	-	10/19/77	247	4753	-	-	
T-38	4857	10985	427	106	321	2/11/77	-	10/6/77	238	4872	-	-	
T-38	4919	10875	414	149	265	5/24/77	-	10/6/77	136	5120	-	-	
T-38	4921	11056	501	112	389	2/16/77	-	10/6/77	233	5130	-	-	
T-38	4922	11131	419	113	306	3/9/77	-	10/12/77	218	4960	-	-	
T-38	4928	11119	369	132	237	3/2/77	-	10/6/77	219	4687	-	-	

AN/ARN-118(V) TACAN FIELD DATA
CPO F09603-77-A-3104

Air Force Base Williams AFB, AZ

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	7078	11068	441	131	310	3/15/77	-	10/6/77	206	3951	-	-	
T-38	7081	10975	518	112	406	2/17/77	-	10/6/77	232	2547	-	-	
T-38	1563	10973	560	125	435	3/1/77	-	10/6/77	220	3886	-	-	
T-38	1573	10870	503	105	398	2/14/77	-	10/6/77	234	3191	-	-	
T-38	1578	11072	393	102	291	2/18/77	-	10/6/77	231	3428	-	-	
T-38	1580	11215	234	108	126	7/7/77	-	10/6/77	92	3381	-	-	
T-38	1952	11660	203	183	20	9/18/77	-	10/6/77	19	3346	-	-	
T-38	1955	10416	541	148	393	3/10/77	-	10/13/77	218	3288	-	-	
T-38	8185	11092	396	152	244	3/10/77	-	10/6/77	211	4749	-	-	
T-38	8219	11032	582	114	468	2/16/77	-	10/7/77	234	7461	-	-	
T-38	3298	10040	1461	112	1349	2/17/76	4/24/77	10/7/77	425	6199	-	-	
T-38	3253	10398	591	160	431	6/20/77	-	10/6/77	109	6372	-	-	
T-38	0883	11140	414	166	248	2/18/77	-	10/13/77	238	8073	-	-	
T-38	0886	11021	593	127	466	6/5/77	-	10/13/77	131	7722	-	-	
T-38	0894	11200	416	103	313	3/10/77	-	10/7/77	212	7773	-	-	
T-38	0899	11211	416	141	275	3/28/77	-	10/11/77	198	7942	-	-	
T-38	0900	11142	367	112	255	3/15/77	-	10/6/77	206	7626	-	-	
T-38	0903	11045	527	113	414	3/26/77	-	10/7/77	196	8142	-	-	
T-38	0909	11012	541	107	434	2/17/77	-	10/19/77	245	7681	-	-	
T-38	0910	11174	360	127	233	2/24/77	-	10/11/77	230	8086	-	-	
T-38	0920	11201	593	127	466	3/28/77	-	10/7/77	194	8226	-	-	
T-38	0923	11224	418	125	293	3/11/77	-	10/7/77	211	8076	-	-	
T-38	0924	11107	593	134	459	3/15/77	-	10/13/77	206	8253	-	-	
T-38	0925	10426	269	128	141	3/15/77	-	10/6/77	206	8124	-	-	
T-38	0927	10457	178	110	68	4/18/77	-	10/7/77	73	8124	-	-	
T-38	0933	11172	385	103	282	3/29/77	-	10/12/77	198	7312	-	-	
T-38	0936	11173	596	149	447	3/15/77	-	10/6/77	206	8070	-	-	
T-38	0942	11050	382	111	271	3/14/77	-	10/12/77	213	7889	-	-	
T-38	0947	11106	344	104	240	2/23/77	-	10/6/77	226	8170	-	-	
T-38	3610	11037	571	108	463	2/22/77	-	10/6/77	227	7015	-	-	
T-38	3611	10798	410	156	254	2/18/77	-	10/12/77	236	7871	-	-	
T-38						3/1/77	-	10/7/77	221	8094	-	-	

AN/ARN-118(V) TACAN FIELD DATA
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Air Force Base Williams AFB, AZ

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card Date		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
T-38	4931	11044	558	128	430	2/22/77	-	10/19/77	240	-	-	-	
T-38	4937	10947	293	122	171	6/17/77	-	10/7/77	113	4937	-	-	
T-38	4938	10960	411	138	273	2/14/77	-	10/12/77	241	4795	-	-	
T-38	4940	10398	500	160	340	2/13/77	-	10/13/77	243	4836	-	-	
T-38	4944	10331	351	125	226	2/14/77	-	10/13/77	242	4609	-	-	
T-38	8128	11108	509	103	406	2/28/77	-	10/6/77	221	4506	-	-	
T-38	8145	11423	389	212	177	2/15/77	-	10/6/77	234	4229	-	-	
T-38	8148	10853	511	117	394	2/15/77	-	10/6/77	234	4287	-	-	
T-38	8152	11085	298	120	178	2/18/77	-	10/6/77	231	4606	-	-	
T-38	8159	11065	477	106	371	2/17/77	-	10/6/77	232	4680	4381	299	
T-38	8160	11125	363	120	243	3/29/77	-	10/7/77	193	4587	-	-	
T-38	8186	11153	491	151	340	3/11/77	-	10/12/77	216	4451	-	-	

AN/ARN-118(V) TACAN FIELD DATA
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Air Force Base Wurtsmith AFB, MI

(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)	(12)	(13)
Aircraft Type	Aircraft Tail Number	R/T Serial Number	ETI Hours At Read	ETI Hours At Ship	Δ ETI Hours (4) - (5)	R/T Record Card Date		Date Read Mo-Day-Yr	Δ Install Days (7) - (8)	Flying Hours At Read	Flying Hours At Install	Δ Flying Hours (10) - (11)	Comments
						Install	Remove						
B-52	00161	11587	315	110	205	7/15/77	-	10/12/77	90	7726	7606	120	
B-52	00189	11618	227	113	114	7/8/77	-	10/12/77	97	7618	7536	82	
B-52	00255	10592	178	134	44	7/6/77	8/19/77	10/12/77	99	7459	7326	133	
B-52	06488	11494	178	151	27	8/19/77	-	10/12/77	55	7459	7409	50	
B-52	06497	11751	325	108	217	7/13/77	-	10/13/77	93	8248	8062	186	
B-52	06497	11719	195	110	85	7/27/77	-	10/12/77	78	8452	8401	51	

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