EA-6B MISSION PLANNING PROGRAM

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THESIS

EA-6B MISSION PLANNING PROGRAM

by

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(20. ABSTRACT Continued)

retrieval, display, and plotting of information. All decision making is done by the aircrewman. The desired goals of this program are increased mission planning efficiency and effectiveness through automation of the clerical tasks of the planning process.

EA-6B Mission Planning Program

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ABSTRACT

The EA-6B Mission Planning Program is designed for use by aircrewmen deployed on board aircraft carriers. It is an interactive computer program for automated sorting, retrieval, deisplay, and plotting of information. All decision making is done by the aircrewman. The desired goals of this program are increased mission planning efficiency and effectiveness through automation of the clerical tasks of the planning process.

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I. INTRODUCTION

The process of planning the electronic warfare support for an air strike is complex and time consuming. There are sophisticated methods for data collection, analysis, and storage, and the effective employment of today's weapon systems depends on such data. However, no automated interface has been developed to assist the Electronic Warfare Officer in his efforts to correlate the two. It's all done by hand.

The mission planning process reveals a pattern common to many technical problem solving efforts. The majority of one's time is spent gathering information and setting up the problem to be solved. Very little time is devoted directly to solving it. The data and information needed for EA-6B mission planning must be retrieved, by hand, from numerous source documents such as Kilting lists, TACMANUALs, computer printouts of the Electronic Order of Battle (EOB), radar handbooks, etc. Much of the information contained in these documents is non-essential to the immediate problem of mission planning, and only adds to the time required for sorting and retrieval. Data lists must be made for later reference in flight, and charts must be marked showing the EOB, route of flight, and emitter detection envelopes. Only when all this preliminary work is complete can the scenario

be subjectively analyzed by the planner, and jammer positioning optimized. Some calculations of jamming effectiveness may be performed, but these are so cumbersome and time consuming that an operator can seldom afford to make more than one or two such calculations, just to obtain a "feel" for the situation. The inefficiency is apparent, and under some circumstances, unaffordable.

II. DESIGN CONSIDERATIONS

The primary objective was to automate as much of the planning process as possible, and allow the operator to devote more of his time to solving the problem of asset optimization. Speed and simplicity were the foundation for design considerations. The following is a description of the rationale used, and the decisions made which led to the final system design.

Sorting, plotting, and calculating can be most effectively accomplished by a computer. Making decisions, or choosing between options is a relatively simple task for a human. Therefore, the software system is not a completely hands off, optimization routine. Rather, it is a series of steps requiring decisions from the planner at various points, indicating in which direction to proceed. The decision points arise whenever it is more efficient for the planner to perform some portion of the planning process rather than generating a computer code to do the same thing. All probable situations have been included in the system design.

To minimize cost, the system is intended to utilize equipment and facilities currently on board aircraft carriers. Access to the ship's main computer at arbitrarily random times is not considered practical. Therefore, the system is designed for a small, peripheral type, general purpose computer. All Pacific Fleet carriers have been funded for

the WANG 2200 system, which is such a computer. The WANG system has:

1) Central processor of moderate capacity - 32K
2) Auxiliary storage of three 250K floppy disks
3) Video display
4) Typewriter for hard copy output
5) X-Y plotter capable of accommodating aeronautical charts.

Naval Ocean Systems Command has developed an interface between the WANG computer and the ship's main computer for fast transfer of information, with no apparent interruption of the main computer's functions.

The ship's computer contains the EOB for areas of the world in which the Navy has responsibility. The information contained in other reference documents is not presently in computer files, and the EA-6B TACMANUAL lists 13 separate publications for reference during mission planning. Therefore, an Emitter Parameter Library file was developed containing information retrieved from these various sources and stored in the floppy disk for reference. The library is an array containing EA-6B pertinent information on each type radar listed in the ship's EOB. When site locations are retrieved from the EOB in the main computer, the site type is retrieved also. The listing routine matches site types retrieved with the corresponding type in the Emitter Library and builds a "working" EOB. The parameters listed when the EOB is printed out are:

1) Site number

2) Latitude and longitude

3) Threat type, e.g. Low Blow or Tall King

4) Emitter function, e.g. Fire Control or Early Warning

5) Frequency band and frequency range of emitter

6) PRF range

7) Automatic and manual jamming codes against the emitter

8) Percent of frequency band of the emitter

9) Pertinent remarks, e.g. "HOJ against noise", or "SA-2, DLJ beacon at ___MHZ".

The listing would be used by the operator to determine computer lists to generate for the mission, site locations to be programmed, and any preemptive jamming assignments to be made. The information included in the Emitter Library is arbitrary, and items can be added or deleted to suit the preferences of the squadron or community. Computer space may be at a premium, so the intent here is to include information of primary importance for quick reaction planning. No in-depth information on how the various codes were generated is presented.

This first generation program produces a "Flat Earth" solution. This was necessary to keep solution time to a minimum. Geographical features are not presently stored in the ship's computer, and an algorithm will have to be

devised to accommodate this problem. One approach will be discussed in the proposals for system expansion. At present, it would require a great deal of time and inputs from the operator to include terrain features, which is at cross purpose with the guidelines of speed and simplicity. All conflicts concerning whether or not to automate a certain phase of the mission planning process were resolved within this framework.

III. SYSTEM DESCRIPTION

A computer simulation was accomplished utilizing:

1) IBM 360/67 general purpose computer

2) Tektronix 4012 graphics terminal (30/12 system)

3) Tektronix 4610 hard copy unit.

FORTRAN language was used in the simulation and conversion to BASIC language used on the WANG 2200 is relatively straightforward due to the similarities of the two languages.

The system that has been designed assists the operator as follows: The operator initiates the planning process by choosing one of three basic mission profiles; escort, modified escort, or standoff. Next, either a route of flight for the strike group is entered, if it has already been chosen, or just the latitude and longitude of the target may be entered, allowing the operator to choose and enter a route later. The system produces a printout of the area's EOB. Next, the EOB, detection evelopes of the various emitters, and the route of flight are visually presented to the operator. This is a key point in the planning process, for once the visual presentation is available, the optimum route is often apparent at a glance. A large X-Y plotter appropriately marks the operator's chart with this presentation, if and when desired. If the operator wishes to consider a number of alternatives, each may be plotted on a transparent overlay, several of which may be presented to

the strike leader or staff for final decision. Then hard copies of the complete navigation solution and the Time Scenario of the route are printed. The Time Scenario is a minute-by-minute listing of the sites within detection range of the strike group and/or EA-6B. It contains all necessary information to react as quickly as possible to an onboard jamming system malfunction which would cause operation in a degraded mode.

The operator may consider as many combinations of routes and mission profiles as he desires. The point to remember is that this is not an optimization routine. The aircrewman must make all the decisions. The success of his planning efforts will depend on how he uses his training, experience, and imagination, which is no different from the way things have always been. Hopefully he will have the chance to be considerably more effective by utilizing a system which performs most of the clerical tasks of mission planning for him.

IV. DETAILED PLANNING SESSION

A. INTRODUCTION

The following is a description of all aspects of system assistance available in a complete planning session. The assumption made is that the strike aircraft route of flight to and from the target has already been designated. The operator's task is to pick the most appropriate EA-6B mission profile, and optimize his assets accordingly.

B. ESCORT MISSION

Upon initiating the program, the operator can select any of the mission profiles for consideration. This example assumes consideration of the Escort mission profile first. The system then asks the operator to enter the strike aircraft route of flight to and from the target, including turnpoints, speeds on each leg of the route, and the magnetic variation of the area. At this point the system takes the given L/L's of the route, determines the maximum and minimum of each, and adds and subtracts 120 NM to the maximum and minimum, respectively. This sets the geographical limits of search in the EOB to be obtained from the ship's main computer. The system then accesses the current listing of the EOB. It searches through the EOB and retrieves all sites that fall within the geographical limits of the maximum and minimum latitudes and longitudes previously calculated.

It retrieves the site L/L and the site type (Fansong, Barlock, etc.). All these sites are stored in an array (list) in the peripheral machine, and matched with the appropriate parameters in the Emitter Parameter Library, as described in Design Considerations.

The "working" EOB now contains all sites listed in the ship's EOB within the geographical limits set. The operator is asked if he wants to add any additional sites to the EOB that may be a result of recent intelligence (VQ, returning strike a/c, RA-5C missions, etc.). He also has the option to build his own complete EOB, ignoring the ship's listing entirely. This would be useful in exercises against friendly EOB's such as U.S. coastlines, EW ranges at Fallon and Pinecastle, etc.

When the "working" EOB is complete, the system asks if the operator wishes a printout of the EOB. If a listing is desired, the operator can be selective by choosing to list all emitters, just EW/Acq type emitters, or just Terminal Threat types. The information presented comes from the "working" EOB and the Emitter Parameter Library. The listing contains information pertinent to EA-6B operators (see Fig. 1).

The next step in the process is to display the EOB and route of flight to the operator. He can display the route of flight and radar detection envelopes of all emitters, EW/Acq types only, or terminal threat types only. Once the desired combinations are entered, the sites, route of flight,

and detection envelopes are displayed (see Figs. 2,3,4), and the margin is scaled with appropriate L/L. The L/L convention used is + for N and E, - for S and W. The operator may choose to have this presentation drawn on his aeronautical chart, or on a transparent overlay. The display and chart can be studied for terrain features, appropriateness of route, etc.

The next choice offered the operator is 'Do you wish a Navigation solution?' for the route currently being considered. It is necessary to have the NAV solution if a time scenario (discussed in System Description) is desired also. Several items calculated in the NAV solution, such as speeds, headings, times, etc., are used in determining present position of the EA-6B as it proceeds around the route. If the operator doesn't want the NAV solution, he is then asked if he wishes to consider a different route, or a different mission profile. If he does want the solution, it is displayed for him, and a hard copy is produced (see Fig. 8).

Next, the system asks "Do you want a listing of the Time Scenario?" If desired, the system proceeds as follows:

1) It asks operator to indicate emitters of interest by type (all, EW/Acq only, Terminal Threat only) and by frequency band.
2) It calculates present position (p/p) of the EA-6B beginning at the first point of the route.

3) It filters the "working" EOB for the proper type and frequency bands, calculates the range from p/p to each emitter having passed the filter, checks that distance against the "threat" range for that emitter listed in the Emitter Parameter Library. If the distance is within "threat" range, the important inflight parameters are displayed.

4) After all sites are checked, time is incremented by a minute, and a new p/p is calculated using headings and speeds obtained from the NAV solution.

5) There are detailed routines in this portion to check if the p/p increment goes around a turnpoint and if heading speed changes occur, or if the end of the route is reached.

6) The process iterates around the entire route, minute by minute.

7) The parameters printed out for the operator (see Fig. 9) in hard copy form are:

   a) Time

   b) Present Position

   c) Emitter Type

   d) "Working" EOB Number

   e) Range and Bearing to the emitter

   f) Automatic and Degraded jamming modes to use

   g) Relative percent of frequency band of the emitter.

The entire purpose of producing this scenario is to provide the operator with all information necessary to devote a minimum of "inflight" time searching, analyzing, and reacting to known sites, allowing more time to concentrate on the unknown or unexpected emitters. The information will allow him to handle system degradations with as little confusion and consternation as possible. This program does not attempt to solve the problem of having fewer assets than number of sites in range. Here, again, the operator must decide relative priorities using information available such as ranges to the various sites (just entering or about to exit an envelope), type emitters (AAA vs SAM, or SA-2 vs SA-6), and choose his asset deployment scheme accordingly. If the route is too saturated, perhaps a case can be made for an alternative route.

After the Time Scenario is complete, the system offers the operator the options to consider a different strike route, or a different mission profile. If he wishes to consider a new strike route, he enters it and the system returns to the Display portion of the program. This example will retain the same strike route and next, consider the Standoff mission profile.

C. STANDOFF MISSION

A standoff mission is hereby defined as using an EA-6B to primarily jam EW/Acq type radars as the strike group proceeds to and from the target. The "raid" can usually be

divided into three phases; ingress, over the target, and egress. The standoff objective is to optimize jamming against EW/Acq emitters during ingress and egress. While the strike aircraft are over the target there is little in the way of effective jamming that can be accomplished (from a standoff orbit) against narrow beam fire control and missile control radars. Therefore, the operator usually attempts to optimize his track or orbit to cover the first and last phases of the strike.

The program offers the operator a chance to view the EOB and various standoff stations. Often a single orbit for each phase (ingress and egress) is the optimum jamming position. Standoff jamming positioning is dictated by strike aircraft location. Therefore the system takes as inputs for the standoff solution, the strike aircraft route (in this example it has already been entered and need not be done so again), and the latitude and longitude of a standoff jamming point. Standoff jamming orbits are usually short enough in length with respect to distances to target emitters that jamming effectiveness will not vary significantly from one point in the orbit to another. Therefore, the midpoint of an orbit will suffice for most cases.

Next the system displays the strike aircraft route, the EOB sites and their detection envelopes, and the standoff point for the EA-6B. The display may be filtered by the operator, as before, by type emitter groupings. Additionally,

detection envelopes depressed by jamming may be displayed. The operator can assess the effectiveness of this jamming orbit for various strike group locations around the route. Several different standoff points may be considered before the operator decides on the optimum position(s). As an example, perhaps a stationary orbit is optimum for the first 15 minutes of the strike. Then the EA-6B must transit to an orbit some distance away, say 100 NM, for optimum positioning to cover the egress. The operator can display the first orbit, the last orbit, and as many points between the two as desired. He would then have a visual indication of how his jamming effectiveness will be affected during the transit phase, and where the strike group is most vulnerable to EW/Acq emitters during the strike (see Figs. 5,6).

As with the Escort mission discussed earlier, the operator would receive a hardcopy printout of:

1) Strike group navigation solution
2) List of jamming parameters for use in flight (see Fig. 11)
3) Chart appropriately marked with the EOB, route of flight, and emitter detection envelopes.

Operator judgment will play a large part in determining the success and speed at which optimum positioning of the standoff EA-6B is accomplished. He must vary the parameters, consider the options, and then make the decision. The system will not do it for him. It does provide enough speed

and ease of computation to allow the operator the luxury of considering many alternatives before making his selection, something seldom affordable with current planning procedures.

D. MODIFIED ESCORT

The Modified Escort mission profile is one in which the jamming aircraft directly accompanies the strike group on it's route until such time as the group must penetrate AAA or SAM weapon envelopes. At such time, the EA-6B parallels the strike group just outside the weapon envelopes. Timing and positioning of the EA-6B is critical if any measurable success is to be achieved against fire control and missile control radars.

If the operator wishes to plan for this profile, he proceeds as mentioned in the previous sections. He may enter the strike group route and the EA-6B route, or just the strike group route, or neither. In this example, the strike group route has been entered previously. The operator has the option of viewing the EOB and strike route before entering the modified escort route for the EA-6B. He also has available the NAV solution for the strike group, with the times at various turnpoints on the route. He may use this information to coordinate the timing and positioning of the EA-6B, consistent with the strike group route. Once this route has been entered, the Modified Escort route is added to the visual presentation (see Fig. 7). If this

route is acceptable to the operator, he may have his chart marked with that route. He receives a printout of the EA-6B navigation solution, and a Time Scenario for the mission, if desired (see Figs. 8,10). The Time Scenario considers threats to both the strike group and the EA-6B, and lists the emitters "in range" accordingly. At the end of this sequence, the operator can alter the strike route, change the EA-6B route, change mission profiles again, or terminate the planning process.

V. PROPOSALS FOR PROGRAM EXPANSION

1) The data base (Emitter Parameter Library) could be expanded to include EA-6B information grouped by weapon platforms such as ships, aircraft, and missile threat (ASM, SSM, and AAM). This information is easily compiled and requires no additional computer calculations. Current auxiliary storage space is sufficient. A simple call for information on a particular ship or aircraft would produce a printout similar to the EOB listing available in the current program (see Fig. 12).

2) Terrain consideration is one of the most important aspects of EW mission planning. The U.S. Geological Survey has developed a procedure to store geographical features in computer format that may prove adaptable to this planning program. The approach would be to store the terrain features of various areas of the world on cassette tapes and load the particular area of interest into the computer when planning a mission. The amount of computer space and complexity of application may prove to be beyond the capabilities of a mini computer, but that should be investigated.

3) If a refresh graphics display is available (the Tektronix is a storage tube, i.e. once the picture is drawn, it cannot be altered without redrawing the entire presentation), it

may be possible to present a dynamic visual display of jamming effectiveness as a mission proceeds from beginning to end. The current program presents "snapshots" of the situation at various points selected by the planner.

4) A current proposal for the ICAP II version of the EA-6B is to load a complete mission plan into the aircraft with a cassette tape. The intent is to go through the complete mission planning procedure in the Ready Room, compile all necessary data, enter it on a cassette tape, then take it to the aircraft and load it. The entire known scenario would then be stored in the aircraft's computer, lists would be automatically activated and deactivated, pre-programmed jamming assignments made, etc. Practially all the information required for such an effort is available in its current status. There would be a necessity to develop a language interface between the WANG and the aircraft computer.

SITE	NAME	MSN	BAND	RNGE	LIST	FLO	FHI	PRF1	PRF1	PRF2	PRF2	AUTO	DEGR	PRCT	REMARKS
1	FANSONG B-F 29.05 -97.30	MC	7	20.	11	2700	2759	1000	1050	2000	2100	T950	WSS	44	SA-2, CCI RCN AT 800MHZ
2	TALL KING 29.32 -97.44	EW	2	100.	8	190	200	190	200	200	240	FT7	WFT	40	NONE
3	FANSONG C-E 27.20 -99.20	MC	3	20.	15	4200	4250	800	850	1000	1700	T902	WSS	36	SA-2,CCI RCN AT 800MHZ,E-O BACKUP
4	SPNRST AC 27.27 -99.28	EW	2	150.	8	180	190	120	180			FT2	WFT	40	SA-2 ACQUISITION
5	LOW BLOW 27.50 -97.33	MC	9	10.	17	8725	8775	1.20	+-50			T900	WSS	83	SA-3, LOW ALT 150FT, E-O BACKUP
6	SPNRST B 27.58 -97.37	EW	1	120.	6	50	60	60	90			FT4	WFT	28	NONE
7	FIREWHEEL 27.54 -97.21	FC	7	5.	11	2600	2720	1800	1900			T483.	SS1	18	AAA, CONSCAN
8	FANSONG C-E 27.54 -97.12	MC	3	20.	15	4200	4250	800	850	1600	1700	T902	WSS	36	SA-2,CCI RCN AT 800MHZ,E-O BACKUP
9	STRAIT FLUSH 27.33 -97.22	MC	8	10.	15	4210	4280	308C	4000			T385	WSS	12	SA-6, ACQ-TRKR, FAST FLYER, 3-6 SEC
10	BRLK-BCBAR B 28.31 -95.00	EW	7	90.	11	2050	2080	420	430	840	860	FT3	WFT	21	BRLK, 6 BEAMS, STAPLE PRF 330
11	TALL KING 28.41 -96.48	EW	2	100.	8	190	200	190	200	200	240	FT7	WFT	40	NONE
12	FIRECAN 28.44 -97.03	FC	7	5.	11	2710	2730	2500	2520			T377	SS3	32	AAA, CONSCAN
13	STRAIT FLUSH 29.16 -98.01	MC	8	10.	15	4210	4280	3080	4000			T385	WSS	12	SA-6, ACQ-TRKR, FAST FLYER, 3-6 SEC
14	LOW BLOW 29.29 -98.19	MC	9	10.	17	8725	8775	1.20	+-50			T900	WSS	83	SA-3, LOW ALT 150FT, E-O BACKUP
15	WHIFF 29.23 -98.23	FC	7	5.	11	2620	2640	2000	2050			FT3	SS2	27	AAA, CONSCAN
16	LOW BLOW 29.38 -98.58	MC	9	10.	17	8725	8775	1.20	+-50			T900	WSS	83	SA-3, LOW ALT 150FT, E-O BACKUP
17	LOW BLOW 29.15 -98.38	MC	9	10.	17	8725	8775	1.20	+-50			T900	WSS	83	SA-3, LOW ALT 150FT, E-O BACKUP

Figure - 1 Listing of E.O.B. with EA-6B pertinent parameters.

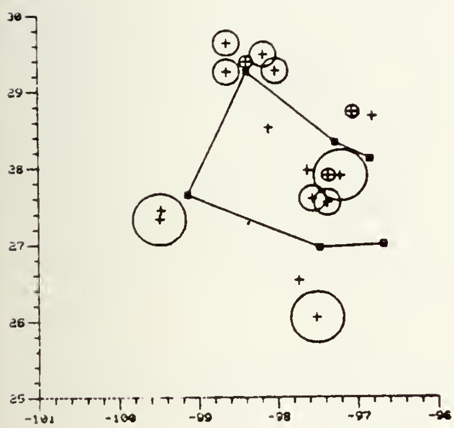

Figure - 2 Visual presentation for an escort mission profile with only terminal threat (fire control, missile control) emitter detection envelopes displayed. Site locations +, and route of flight ——■—— are shown. The scale indicates lat/long with the convention N/S = +/-, and E/W = +/-.

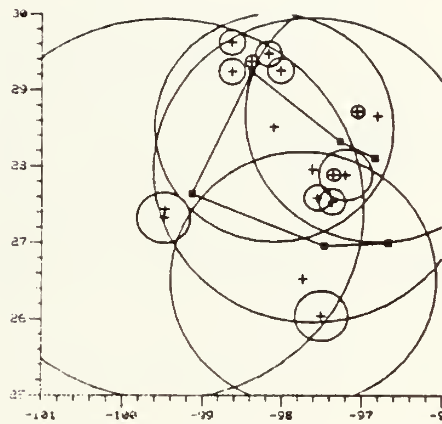

Figure - 3 Visual presentation for an escort mission profile with all emitters and their detection envelopes presented. Site locations +, and route of flight ——■—— are shown, and the scale indicates lat/long with the convention N/S = +/-, and E/W = +/-.

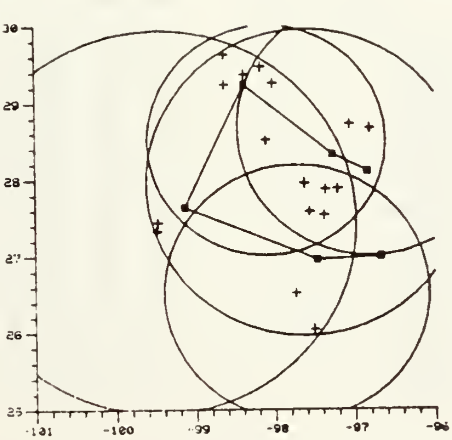

Figure - 4 Visual presentation for an escort mission profile with only Early Warning/Acquisition type radar detection envelopes presented. Site locations +, and route of flight ——■—— are shown. Scale indicates lat/long with the convention N/S = +/-, and E/W = +/-.

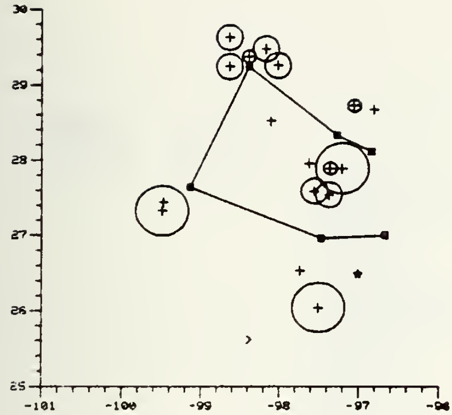

FIGURE - 5 SHOWS STRIKE GROUP ROUTE, STANDOFF JAMMER POSITION • AND TERMINAL THREAT EMITTER ENVELOPES (NOT DEPRESSED BY JAMMING).

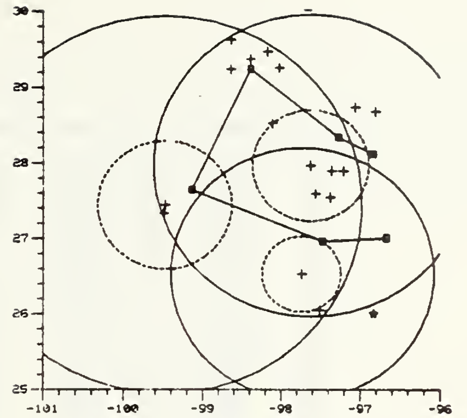

FIGURE - 6 SHOWS STRIKE GROUP ROUTE, STANDOFF JAMMER POSITION •, EW/ACQ EMITTER ENVELOPES UNJAMMED (SOLID LINES) AND JAMMED (DASHED LINES).

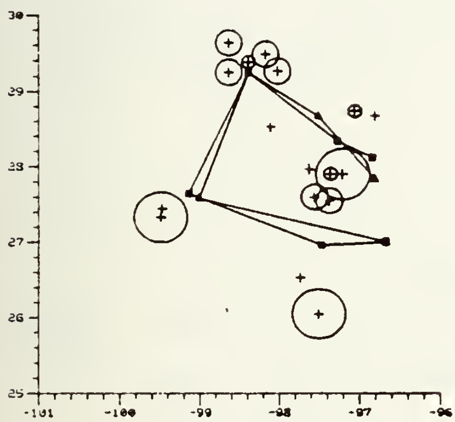

FIGURE - 7 SHOWS STRIKE GROUP ROUTE 8, EA-6B ROUTE ∆, AND TERMINAL THREAT EMITTER ENVELOPES (NOT JAMMED).

Strike Group Navigation Solution

Leg	Dist	Time	TH	MH	TAS	TOTT	TOTD	To Turnpt L/L	
1	[illegible]3.0	7	67	259	350	7.[illegible]	[illegible]3.0	26.68	-97.28
2	98.2	14	295	287	420	21.2	141.2	27.39	-99.08
3	10[illegible]	13	22	14	480	34.2	245.1	29.15	-98.23
4	80.6	10	133	125	480	44.3	325.7	28.80	-97.16
5	26.4	3	119	111	480	47.6	352.1	28.07	-96.50

Mod Escort Navigation Solution

Leg	Dist	Time	TH	MH	TAS	TOTT	TOTD	To Turnpt L/L	
1	129.7	19	286	278	420	18.[illegible]	129.7	27.35	-99.00
2	105.2	13	18	10	480	31.7	234.9	29.15	-98.23
3	58.3	7	127	119	480	39.0	293.2	28.40	-97.30
4	62.3	8	143	135	480	46.8	36[illegible].5	27. 0	-96.43

FIGURE - 8 THIS IS A LISTING OF THE STRIKE GROUP AND EA-6B NAVAL SOLUTIONS FOR A MODIFIED ESCORT MISSION.

8 27 00 -CP
>

TIME	PRES POS	TYPE	EOB	RNGE	BRG	AUTO	DEGR	PRCT
0	27 00 -96 40							
		TALL KING	2	63	244	FT7	UFT	40
		SPNRST B	6	77	319	FT4	UFT	28
1	26 60 -96 46							
		TALL KING	2	58	242	FT7	UFT	40
		SPNRST AC	4	140	281	FT2	UFT	46
		SPNRST B	6	74	322	FT4	UFT	28
2	26 59 -96 52							
		TALL KING	2	54	239	FT7	UFT	40
		SPNRST AC	4	141	281	FT2	UFT	46
		SPNRST B	6	71	326	FT4	UFT	28
3	26 59 -96 58							
		TALL KING	2	49	236	FT7	UFT	40
		SPNRST AC	4	136	282	FT2	UFT	46
		SPNRST B	8	68	330	FT4	UFT	28
4	26 59 -97 04							
		TALL KING	2	44	233	FT7	UFT	40
		SPNRST AC	4	131	282	FT2	UFT	46
		SPNRST B	6	66	334	FT4	UFT	28
5	26 58 -97 10							
		TALL KING	2	40	229	FT7	UFT	40
		SPNRST AC	4	126	283	FT2	UFT	46
		SPNRST B	6	64	338	FT4	UFT	28
6	26 58 -97 16							
		TALL KING	2	36	224	FT7	UFT	40
		SPNRST AC	4	121	284	FT2	UFT	46
		SPNRST B	6	63	343	FT4	UFT	28
7	26 58 -97 22							
		TALL KING	2	32	217	FT7	UFT	40
		SPNRST AC	4	116	285	FT2	UFT	48
		SPNRST B	6	62	347	FT4	UFT	28

FIGURE - 9 THIS IS A PORTION OF THE TIME SCENARIO FOR AN ESCORT MISSION SHOWING PARAMETERS NECESSARY TO ANTICIPATE ALL KNOWN SITES, AND TO REACT TO SYSTEM MALFUNCTIONS CAUSING DEGRADED MODE OPERATION WITH A MINIMUM OF CALCULATION. THE SITES ARE ONLY LISTED IF THE STRIKE GROUP IS WITHIN THE DESIGNATED DETECTION RANGE.

>

TIME	PRES POS	TYPE	EOB	RNGE	BRG	AUTO	DEGR	PRCT
0	27 00 -96 34							
		TALL KING	2	78	248	FT7	UFT	40
		SPNRST B	6	87	312	FT4	UFT	28
1	27 02 -96 31							
		TALL KING	2	81	249	FT7	UFT	40
		SPNRST AC	4	170	279	FT2	UFT	46
		SPNRST B	6	90	300	FT4	UFT	28
2	27 03 -96 25							
		TALL KING	2	84	249	FT7	UFT	40
		SPNRST AC	4	173	278	FT2	UFT	46
		SPNRST B	6	92	308	FT4	UFT	28
3	27 04 -96 22							
		TALL KING	2	86	249	FT7	UFT	40
		SPNRST AC	4	175	278	FT2	UFT	46
		SPNRST B	6	93	307	FT4	UFT	28
4	27 04 -96 20							
		TALL KING	2	87	250	FT7	UFT	40
		SPNRST AC	4	176	278	FT2	UFT	46
		SPNRST B	6	94	306	FT4	UFT	28
5	27 04 -96 19							
		TALL KING	2	88	250	FT7	UFT	40
		SPNRST AC	4	178	278	FT2	UFT	46
		SPNRST B	6	94	306	FT4	UFT	28
6	27 05 -96 18							
		TALL KING	2	88	250	FT7	UFT	40
		SPNRST AC	4	177	278	FT2	UFT	46
		SPNRST B	6	94	306	FT4	UFT	28
7	27 05 -96 17							
		TALL KING	2	89	250	FT7	UFT	40
		SPNRST AC	4	177	278	FT2	UFT	46
		SPNRST B	CP					

FIGURE - 10 THIS IS A PORTION OF THE TIME SCENARIO PRINTOUT FOR A MODIFIED ESCORT MISSION. RANGES ARE FROM THE EA-6B TO VARIOUS EMITTERS. EMITTERS ARE LISTED IF EITHER THE STRIKE GROUP OR THE EA-6B ARE WITHIN THE DESIGNATED ENGAGEMENT RANGE.

STANDOFF L/L
26.00 -96 50

TYPE	EOB	RNGE	BRG	AUTO	DEGR	PRCT
FANSONG B-F	1	36.	275	T969	WSS	44
TALL KING	2	58	304	FT7	WFT	40
SPNRST AC	4	165	302	FT2	WFT	46
LOW BLOW	5	103	338	T900	WSS	83
SPNRST B	6	125	340	FT4	WFT	28
FIREWHEEL	7	117.	346	T483	SS1	18
BRLK-BGBAR B	10	165	336	FT3	WFT	21
TALL KING	11	161.	1	FT7	WFT	40
FIRECAN	12	164	356	T377	SS3	32
LOW BLOW	14	221	341	T900	WSS	83
WHIFF	15	219	338	FT3	SS2	27
LOW BLOW	16	238	336	T900	WSS	83
LOW BLOW	17	222	332	T900	WSS	83

FIGURE - 11 JAMMING PARAMETERS FOR A STANDOFF MISSION FROM ORBIT POINT INDICATED.

KASHIN DLG

ARMAMENT: SAM 20 x SA-N-15 (2 TWIN)

GUNS 4 x 50MM (TWIN MOUNT)

ASW 2 x RBU- 1000
2 x RBU- 2000
4 x 10 IN. TORPEDOES

A/C 1 x HORMONE

ELECTRONICS:

EMITTER	FUNC	BAND	LIST	RNGE	FLO	FHI	PRF1	PRF1	PRF2	PRF2	AUTO	DEGR	PRCT	REMARKS
BIG BOY	EW	1	4	100	25	50	100	110	----	----	S123	WSS	12	PRIMARY AIR SCH
BAD NEWS	EW	4	2	50	100	200	250	269	----	----	FT20	WFT	23	NONE
POPCORN	FC	7	15	22	2000	2100	1000	1010	----	----	T321	WSS	44	AAA, E-O ALSO
DON-2	NAV	9	12	8	4000	4400	8800	8900	9300	9400	FTC3	NFT2	67	NONE
FOOLYA	MC	8	30	45	6000	7000	1800	1850	----	----	T456	NSS	97	SA-N-15, DLJ

FIGURE - 12 TYPICAL PRINTOUT OF EA-6B PERTINENT INFORMATION BY WEAPON PLATFORM.

COMPUTER PROGRAM

```
C       THIS IS THE MAIN PROGRAM FOR EA-6B MISSION PLANNING.
C       FOR TEST PURPOSES, ENTER FILEDEF 4 DSK BEFORE EACH
C       EXECUTION.


      DIMENSION X(10),Y(10),SX(20),SY(20),ST(20),CL(9),SPD(9),TL(9),
     1NTH(9),MH(9),ITAS(9),T(120),SR(20),TT(9),DT(9),TYP(30,15),NB(8),
     2D2(30),IZ(30),D4(30),D5(30),D6(30),D7(30),D8(30),D9(30),
     3D10(30),D11(30),D12(30),D13(30),D14(30),TN(30,3),TRG(30),TRMKS(30,
     49),YME(9),XME(9),MTAS(9),SPDM(9),PJ(30),B(30),GJR(30),PR(30),GAIN(
     530),TLM(9),TTM(9),DLM(9),DTM(9),NTHM(9),MHM(9)
      EQUIVALENCE (IZ,TYP(1,3))
      DATA TN(1,1),TN(1,2),TN(1,3)/'KNFR','ST A',' '/
      DATA TN(2,1),TN(2,2),TN(2,3)/'KNFR','ST B','C'/
      DATA TN(3,1),TN(3,2),TN(3,3)/'SPNR','ST B',' '/
      DATA TN(4,1),TN(4,2),TN(4,3)/'SPNR','ST A','C'/
      DATA TN(5,1),TN(5,2),TN(5,3)/'TALL',' KIN','G'/
      DATA TN(6,1),TN(6,2),TN(6,3)/'BIGB','AR-M','ESH'/
      DATA TN(7,1),TN(7,2),TN(7,3)/'SQUA','TEYE',' '/
      DATA TN(8,1),TN(8,2),TN(8,3)/'BIGM','ESH','D'/
      DATA TN(9,1),TN(9,2),TN(9,3)/'FLAT',' FAC','E'/
      DATA TN(10,1),TN(10,2),TN(10,3)/'BRLK','-BGB','AR B'/
      DATA TN(11,1),TN(11,2),TN(11,3)/'WHIF','F',' '/
      DATA TN(12,1),TN(12,2),TN(12,3)/'FIRE','CAN',' '/
      DATA TN(13,1),TN(13,2),TN(13,3)/'FIRE','WHEE','L'/
      DATA TN(14,1),TN(14,2),TN(14,3)/'FANS','ONG','B-F'/
      DATA TN(15,1),TN(15,2),TN(15,3)/'FANS','ONG','C-E'/
      DATA TN(16,1),TN(16,2),TN(16,3)/'PAT','HAND',' '/
      DATA TN(17,1),TN(17,2),TN(17,3)/'SA-6',2*' '/
      DATA TN(18,1),TN(18,2),TN(18,3)/'FLAP','WHEE','L'/
      DATA TN(19,1),TN(19,2),TN(19,3)/'LOW','BLOW',' '/
      DATA TN(20,1),TN(20,2),TN(20,3)/'STRA','IT F','LUSH'/
      DATA TN(21,1),TN(21,2),TN(21,3)/'SRZO','-2',' '/
      DATA TN(22,1),TN(22,2),TN(22,3)/'TACA','N A3','12A'/
      DATA TN(23,1),TN(23,2),TN(23,3)/'LONG',' TAL','K'/
      DATA TN(24,1),TN(24,2),TN(24,3)/'ROCK','-STC','N CK'/
      DATA TN(25,1),TN(25,2),TN(25,3)/'SPON','GE','CK'/
      DATA TN(26,1),TN(26,2),TN(26,3)/'SA-2',2*' '/
      DATA TN(27,1),TN(27,2),TN(27,3)/'SA-6',2*' '/
      DATA TN(28,1),TN(28,2),TN(28,3)/'PORK','TROU','GH'/
      DATA TN(29,1),TN(29,2),TN(29,3)/'BWRX','-12',' '/
      DATA TN(30,1),TN(30,2),TN(30,3)/'MOON','BEAM',' '/
      DATA  D2/10*'EW',3*'FC',3*'MC','SEKR','FC',2*'MC','IFF','NAV','ATC
     1',2*'HF','BCN','DL','SURV','WX','HF'/
      DATA  IZ/3*1,2,2,4*4,5*7,8,8,3*9,8,3*4,7,7,8,3*9,6/
      DATA TRG/3*120.,150.,2*100.,75.,100.,80.,90.,3*5.,2*20.,30.,10.,5.
```

```
      1,2*10.,2*100.,3*40.,30.,15.,80.,65.,50./                         MAI00460
       DATA  D5/3*'6',2*'8','9','NONE','9','10',5*'11','15','16','C42','1MAI00470
      18','17','15','9','NONE','9','12','13','C45','C47',3*'NONE'/      MAI00480
       DATA  D6/'70','80','50','180','190','600','780','640','800','2650'MAI00490
      1,'2620','2710', '2690','2700','4200','4360','8710','9380','8725','MAI00500
      24210','600','700','600','2500','2800','6150','8000','9000','9200',MAI00510
      3'1900'/                                                          MAI00520
       DATA  D7/'80','90','60','190','200','650','810','690','850','2680'MAI00530
      1,'2640','2750','2720','2759','4250','4380','8800','9410','8775','4MAI00540
      2280','610','800','650','2700','3000',2*' ','9200','9400','1950'/ MAI00550
       DATA  D8/'50','75','60','120','100','300','450','250','350','420',MAI00560
      1'2000','2500','1800','1000','800','5005','1800','6380','1.2G','308MAI00570
      20','PARE','200','400','300','280','SYNC','110','400','40','710'/ MAI00580
       DATA  D9/'80','100','90','180','200','310','460','275','355','430'MAI00590
      1,'2050','2520','1900','1050','850','5015','1900','6390','+-50','40MAI00600
      200','NT','400','480','500','320','WITH','200','500','50','720'/  MAI00610
       DATA D11/4*' ','240',4*' ','860',3*' ','2100','1700',5*' ','R',4*'MAI00620
      1 ','TWS',4*' '/                                                  MAI00630
       DATA D10/4*' ','200',4*' ','840',3*' ','2000','1600',5*' ','RADA',MAI00640
      14*' ','SA-2',4*' '/                                              MAI00650
       DATA D12/2*'FT3','FT4','FT2','FT7','FT2','SPT3','SPT2','FT5','FT3'MAI00660
      1,'FT3','T377','T483','T959','T902','DFT8','T709','T888','T900','T3MAI00670
      285','FT5',3*'SS3',4*'SS2','FT4','SS3'/                           MAI00680
       DATA D13/6*'WFT',2*'WSS',2*'WFT','SS2','SS3','SS1',2*'WSS','SS5','MAI00690
      1SS1','WFT',9*'WSS','WFT',2*'WSS'/                                MAI00700
       DATA D14/'30','33','28','46','40','62','66','55','48','21','27','3MAI00710
      12','18','44','36','65','48','27','83','12','70','75','30','40','45MAI00720
      2','30','40','86','77','78'/                                      MAI00730
       DO 3 I=1,30                                                      MAI00740
       TYP(I,2)=D2(I)                                                   MAI00750
       TYP(I,4)=D4(I)                                                   MAI00760
       TYP(I,5)=D5(I)                                                   MAI00770
       TYP(I,6)=D6(I)                                                   MAI00780
       TYP(I,7)=D7(I)                                                   MAI00790
       TYP(I,8)=D8(I)                                                   MAI00800
       TYP(I,9)=D9(I)                                                   MAI00810
       TYP(I,10)=D10(I)                                                 MAI00820
       TYP(I,11)=D11(I)                                                 MAI00830
       TYP(I,12)=D12(I)                                                 MAI00840
       TYP(I,13)=D13(I)                                                 MAI00850
       TYP(I,14)=D14(I)                                                 MAI00860
     3 CONTINUE                                                         MAI00870
       DO 310 I=1,30                                                    MAI00880
       READ(4,311)(TRMKS(I,J),J=1,9)                                    MAI00890
   311 FORMAT(9A4)                                                      MAI00900
   310 CONTINUE                                                         MAI00910
       DATA PJ/10*20.,10*50.,10*10./                                    MAI00920
       DATA B/30*20./                                                   MAI00930
```

```
      DATA GJR/30*10./                                                  MAI00940
      DATA PR/30*1000./                                                 MAI00950
      DATA GAIN/30*36./                                                 MAI00960


      YMAX=0.                                                           MAI00970
      PI=3.14159                                                        MAI00980
      CS=9.                                                             MAI00990
      CNFLG=1.                                                          MAI01000
      XMAX=0.                                                           MAI01010
      YMIN=300.                                                         MAI01020
      XMIN=300.                                                         MAI01030
      INTEGER VAR,ST                                                    MAI01040
      WRITE(6,1)                                                        MAI01050
    1 FORMAT(' FOR ALL QUESTIONS: ENTER 1 FOR YES, 0 FOR NO')           MAI01060
      WRITE(6,299)                                                      MAI01070
  299 FORMAT(1X,/' DO YOU WISH TO CONSIDER A PARTICULAR MSN PROFILE AT TMAI01080
     1HIS TIME?')                                                       MAI01090
      READ(5,2)MSN                                                      MAI01100
      IF(MSN.EQ.0)GO TO 99                                              MAI01110
      WRITE(6,300)                                                      MAI01120
  300 FORMAT(1X,/' WHICH MSN DO YOU WISH TO CONSIDER (FIRST)? 1=ESCORT ,MAI01130
     12=MOD ESCORT, 3=STANDOFF')                                        MAI01140
      READ(5,2)MSN                                                      MAI01150
   99 WRITE(6,101)                                                      MAI01160
  101 FORMAT(' DO YOU HAVE A STRIKE ROUTE TO ENTER AT THIS TIME?')      MAI01170
      READ(5,2)LRTE                                                     MAI01180
    2 FORMAT(I1)                                                        MAI01190
      IF(LRTE.EQ.1)GO TO 113                                            MAI01200
      N=2                                                               MAI01210
      WRITE(6,103)                                                      MAI01220
  103 FORMAT(' THEN ENTER APPROX START PT LAT/LONG,THEN TGT LAT/LONG')  MAI01230
      READ(5,4)(Y(I),X(I),I=1,N)                                        MAI01240
    4 FORMAT(F7.2)                                                      MAI01250
      CALL LL(X,Y,2)                                                    MAI01260
      GO TO 42                                                          MAI01270
  113 WRITE(6,115)                                                      MAI01280
  115 FORMAT(' ENTER NUMBER OF TURNPTS')                                MAI01290
      READ(4,6)N,K                                                      MAI01300
    6 FORMAT(I2)                                                        MAI01310
      M=N-1                                                             MAI01320
      WRITE(6,13)                                                       MAI01330
   13 FORMAT(' ENTER LAT, THEN LONG OF EACH TURNPT IN ORDER.')          MAI01340
      READ(4,4)(Y(I),X(I),I=1,N)                                        MAI01350
      CALL LL(X,Y,N)                                                    MAI01360
      WRITE(6,40)                                                       MAI01370
   40 FORMAT(' ENTER MAG VAR TO NEAREST DEGREE,+ FOR W,- E, EX:-12=12E')MAI01380
```

```
      READ (4,41)VAR
   41 FCRMAT(I3)
      WRITE(6,17)
   17 FCRMAT(' ENTER TAS FOR EACH LEG IN ORDER.')
      READ (4,41)(ITAS(I),I=1,M)
      DC 20 I=1,M
      SPD(I)=ITAS(I)/60.
   20 CCNTINUE
   42 CALL MAX(X,N,FR)
      CALL MAX(Y,N,TOP)
      CALL MIN(X,N,FL)
      CALL MIN (Y,N,BOT)
      TCP=TOP+2.
      BCT=BOT-2.
      FR=FR+2.
      FL=FL-2.
      READ(4,16)(SY(I),SX(I),ST(I),I=1,K)
   16 FORMAT(2F7.2,I3)
      CALL LL(SX,SY,K)
      IF(LRTE.EQ.0)GO TC 44
      IF(MSN-2)44,400,298
  400 WRITE(6,401)


  401 FORMAT(1X,/' DO YOU HAVE A MOD ESCORT ROUTE TO ENTER NOW?')
      READ(5,2)MERTE
      IF(MERTE.EQ.0)GO TO 44
      WRITE(6,402)
  402 FCRMAT(1X,/' ENTER NUMBER OF TURNPTS IN MOD ESCORT ROUTE')
      READ(4,2)MEN
      WRITE(6,403)
  403 FORMAT(1X,/' ENTER LAT, THEN ENTER LONG OF EACH POINT IN ORDER')
      READ(4,4)(YME(I),XME(I),I=1,MEN)
      CALL LL(XME,YME,MEN)
      MEM=MEN-1
      WRITE(6,404)
  404 FCRMAT(1X,/' ENTER TAS FOR EACH LEG, IN ORDER')
      READ(4,41)(MTAS(I),I=1,MEM)
      DC 405 I=1,MEM
  405 SPDM(I)=MTAS(I)/60.
      GC TO 44
  298 WRITE(6,301)


  301 FCRMAT(1X,' DO YOU HAVE A STANDOFF POINT TO CONSIDER YET?')
      READ(5,2) LSO
```

```
      IF(LSO.EQ.0)GO TO 44                                              MAI01810
  327 WRITE(6,302)                                                      MAI01820
  302 FORMAT(1X,/' ENTER LAT, THEN LONG OF STANDOFF POINT')             MAI01830
      READ(5,4)STOY,STOX                                                MAI01840
      CALL LL(STOX,STOY,1)                                              MAI01850
   44 WRITE(6,56)                                                       MAI01860


   56 FORMAT(' DO YOU WISH TO USE SHIPS F.O.B. ?')                      MAI01870
      READ(5,2)L                                                        MAI01880
      IF(L.EQ.0)GO TO 55                                                MAI01890
   55 WRITE(6,51)                                                       MAI01900
   51 FORMAT(' OPERATOR WISH TO ENTER SITES IN ADDITION TO OR INSTEAD OFMAI01910
     1FROM THE SHIPS E.O.B.?')                                          MAI01920
      READ(5,2)L                                                        MAI01930
      IF(L.EQ.0)GO TO 57                                                MAI01940
      WRITE(6,52)                                                       MAI01950
   52 FORMAT(' ENTER TOTAL NUMBER OF SITES OPERATOR IS ENTERING,USE 2 DIMAI01960
     1GITS, E.G. 04,OR 07 , OR 13')                                     MAI01970
      READ(5,6)J                                                        MAI01980
      NL=K+J                                                            MAI01990
      K1=K+1                                                            MAI02000
      WRITE(6,53)                                                       MAI02010
   53 FORMAT(' ENTER LAT,THEN LONG OF EACH SITE IN ORDER')              MAI02020
      READ(5,4)(SY(I),SX(I),I=K1,NL)                                    MAI02030
      WRITE(6,54)                                                       MAI02040
   54 FORMAT(' ENTER SITE TYPE ACCORDING TO EMITTER LIST NUMBER IN SAME MAI02050
     1ORDER AS YOU ENTERED THE SITES')                                  MAI02060
      READ(5,4)(ST(I),I=K1,NL)                                          MAI02070
      K=NL                                                              MAI02080
   57 WRITE(6,58)                                                       MAI02090
   58 FORMAT(' DO YOU WISH A LISTING OF THE F.O.B.?')                   MAI02100
      READ(5,2)L                                                        MAI02110
      IF(L.EQ.0)GO TO 35                                                MAI02120
      CALL RLL(SX,SY,K)                                                 MAI02130
      WRITE(6,70)                                                       MAI02140
   70 FORMAT(' CHOOSE TYPE EMITTERS TO LIST: 1=ALL;2=EW/ACQ ONLY; 3=TERMMAI02150
     1 THREAT ONLY')                                                    MAI02160
      READ(5,2)L                                                        MAI02170
      WRITE(6,59)                                                       MAI02180
   59 FORMAT(1X,//' SITE',1X,'     NAME     ',1X,'MSN',1X,'BAND',1X,'RNGE'MAI02190
     1,1X,'LIST',3X,'FLO',2X,'FHI',1X,'PRF1',1X,'PRF1',1X,'PRF2',1X,'PRFMAI02200
     22',1X,'AUTO',1X,'DEGR',1X,'PRCT',1X,'REMARKS')                    MAI02210
      IF(L-2)71,72,73                                                   MAI02220
   71 DO 74 I=1,K                                                       MAI02230
      WRITE(6,75)I,(TN(ST(I),J),J=1,3),TYP(ST(I),2),IZ(ST(I)),TRG(ST(I))MAI02240
     1,(TYP(ST(I),JN),JN=5,14),(TRMKS(ST(I),J1),J1=1,9),SY(I),SX(I)     MAI02250
```

```
 75 FORMAT(1X,I3,2X,3A4,1X,A4,3X,I1,2X,F4.0,10(1X,A4),1X,9A4,/5X,F7.2,
   12X,F7.2)
 74 CONTINUE
    CALL LL(SX,SY,K)
    GO TO 35
 72 DO 76 I=1,K
    IF(ST(I).GT.10)GO TO 76
    WRITE(6,75)I,(TN(ST(I),J),J=1,3),TYP(ST(I),2),IZ(ST(I)),TRG(ST(I))
   1,(TYP(ST(I),JN),JN=5,14),(TRMKS(ST(I),J1),J1=1,9),SY(I),SX(I)
 76 CONTINUE
    CALL LL(SX,SY,K)
    GO TO 35
 73 DO 77 I=1,K
    IF(ST(I).LE.10)GO TO 77
    WRITE(6,75)I,(TN(ST(I),J),J=1,3),TYP(ST(I),2),IZ(ST(I)),TRG(ST(I))
   1,(TYP(ST(I),JN),JN=5,14),(TRMKS(ST(I),J1),J1=1,9),SY(I),SX(I)
 77 CONTINUE
    CALL LL(SX,SY,K)
    GO TO 35


 35 WRITE(6,32)
 32 FORMAT(1X,//' DO YOU WISH TO DISPLAY EOB & RTE?')
    READ(5,2)J
    IF(J.EQ.0.)GO TO 34
    WRITE(6,31)
 31 FORMAT(' AFTER DISPLAY PRESENTED, ENTER ANY SINGLE CHARACTER TO CO
   1NTINUE')
    WRITE(6,63)
 63 FORMAT(' DO YOU WISH TO DISPLAY FOR THREAT ENVELOPES ALSO?')
    READ(5,2)LDISP
    IF(LDISP.EQ.0) GO TO 66
    WRITE(6,61)
 61 FORMAT(' TO DISPLAY WEAPON/RADAR ENVELOPES, ENTER APPROPRIATE NUMB
   1ER:  1=ALL EMITTERS, 2=EW/ACQ ONLY, 3= TERMINAL THREAT ONLY')
    READ(5,2)LEMIT
    IF(MSN.NE.3)GO TO 66
    WRITE(6,600)
600 FORMAT(1X,/' DO YOU WANT TO SEE ENVELOPES DEPRESSED BY JAMMING?')
    READ(5,2)JAM
 66 CALL MAX(X,N,XMAX)
    CALL MAX(SX,K,XMAX)
    XMAX=XMAX+.2
    CALL MAX (Y,N,YMAX)
    CALL MAX(SY,K,YMAX)
    YMAX=YMAX+.2
    CALL MIN (X,N,XMIN)
```

```
      CALL MIN (SX,K,XMIN)                                      MAI02710
      XMIN=XMIN-.2                                              MAI02720
      CALL MIN (Y,N,YMIN)                                       MAI02730
      CALL MIN (SY,K,YMIN)                                      MAI02740
      YMIN=YMIN-.2                                              MAI02750
      CALL SCALE(XMAX,XMIN,YMAX,YMIN)                           MAI02760
   50 CALL INIT                                                 MAI02770
      CALL LINE (0)                                             MAI02780
      CALL SLIMX(150,850)                                       MAI02790
      CALL SLIMY(050,700)                                       MAI02800
      CALL XFRM(2)                                              MAI02810
      CALL YFRM(2)                                              MAI02820
      CALL DLIMX(XMIN,XMAX)                                     MAI02830
      CALL DLIMY(YMIN,YMAX)                                     MAI02840
      CALL NPTS (K)                                             MAI02850
      CALL SYMBL (8)                                            MAI02860
      CALL SIZES (1.)                                           MAI02870
      CALL PLOT (SX,SY)                                         MAI02880
      CALL NPTS (N)                                             MAI02890
      CALL SYMBL (4)                                            MAI02900
      IF(LRTE.EQ.0)GO TO 45                                     MAI02910
      CALL LINE(1)                                              MAI02920
      GO TO 46                                                  MAI02930
   45 CALL LINE (0)                                             MAI02940
   46 CALL CPLOT (X,Y)                                          MAI02950
      IF(MSN-2)47,420,380                                       MAI02960
  420 CALL NPTS(MEN)                                            MAI02970
      CALL SYMBL(3)                                             MAI02980
      CALL CPLOT(XME,YME)                                       MAI02990
      GO TO 47                                                  MAI03000
  380  CALL NPTS(1)                                             MAI03010
      CALL LINE(0)                                              MAI03020
      CALL SYMBL(5)                                             MAI03030
      CALL CPLOT(STOX,STOY)                                     MAI03040
      CALL LINE(1)                                              MAI03050
   47 IF (LDISP.EQ.0)GO TO 36                                   MAI03060
      IF (LEMIT-2)81,82,83                                      MAI03070
   81 DO 80 I=1,K                                               MAI03080
      XO=SX(I)                                                  MAI03090
      YC=SY(I)                                                  MAI03100
      RAD=TRG(ST(I))/60.                                        MAI03110
      IF(TRG(ST(I)).GE.100.)GO TO 90                            MAI03120
      IF (TRG(ST(I)).GE.50.)GO TO 100                           MAI03130
      J=31                                                      MAI03140
      GC TO 110                                                 MAI03150
   9C J=51                                                      MAI03160
      GO TO 110                                                 MAI03170
  100 J=41                                                      MAI03180
```

```
110 CALL CIRCLE(XO,YO,RAD,J)                                        MAI03190
    IF(MSN.NE.3)GO TO 80                                            MAI03200
    IF(JAM.EQ.0)GO TO 80                                            MAI03210
    CALL DIST(XO,YO,STOX,STOY,RJ)                                   MAI03220
    RAD=BTHRU(PJ(ST(I)),B(ST(I)),GJR(ST(I)),PR(ST(I)),CS,RJ,GAIN(ST(I)MAI03230
   1),CMFLG)                                                        MAI03240
    J=41                                                            MAI03250
    CALL LINE(121)                                                  MAI03260
    CALL CIRCLE(XO,YO,RAD,J)                                        MAI03270
    CALL LINE(1)                                                    MAI03280
 80 CONTINUE                                                        MAI03290
    GO TO 36                                                        MAI03300
 82 DO 84 I=1,K                                                     MAI03310
    IF(ST(I).GT.10)GO TO 84                                         MAI03320
    XO=SX(I)                                                        MAI03330
    YO=SY(I)                                                        MAI03340
    RAD=TRG(ST(I))/60.                                              MAI03350
    IF (TRG(ST(I)).GE.100.)GO TO 85                                 MAI03360
    J=41                                                            MAI03370
    GO TO 86                                                        MAI03380
 85 J=51                                                            MAI03390
 86 CALL CIRCLE(XO,YO,RAD,J)                                        MAI03400
    IF(MSN.NE.3)GO TO 84                                            MAI03410
    IF(JAM.EQ.0)GO TO 84                                            MAI03420
    CALL DIST(XO,YO,STOX,STOY,RJ)                                   MAI03430
    RAD=BTHRU(PJ(ST(I)),B(ST(I)),GJR(ST(I)),PR(ST(I)),CS,RJ,GAIN(ST(I)MAI03440
   1),CMFLG)                                                        MAI03450
    J=41                                                            MAI03460
    CALL LINE(121)                                                  MAI03470
    CALL CIRCLE(XO,YO,RAD,J)                                        MAI03480
    CALL LINE(1)                                                    MAI03490
 84 CONTINUE                                                        MAI03500
    GO TO 36                                                        MAI03510
 83  DO 88 I=1,K                                                    MAI03520
    IF((ST(I).LE.10).OR.(ST(I).GT.20))GO TO 88                      MAI03530
    XO=SX(I)                                                        MAI03540
    YO=SY(I)                                                        MAI03550
    RAD=TRG(ST(I))/60.                                              MAI03560
    J=31                                                            MAI03570
    CALL CIRCLE(XO,YO,RAD,J)                                        MAI03580
    IF(MSN.NE.3)GO TO 88                                            MAI03590
    IF (JAM.EQ.0)GO TO 88                                           MAI03600
    CALL DIST(XO,YO,STOX,STOY,RJ)                                   MAI03610
    RAD=BTHRU(PJ(ST(I)),B(ST(I)),GJR(ST(I)),PR(ST(I)),CS,RJ,GAIN(ST(I)MAI03620
   1),CMFLG)                                                        MAI03630
    J=41                                                            MAI03640
    CALL LINE(121)                                                  MAI03650
    CALL CIRCLE(XO,YO,RAD,J)                                        MAI03660
```

```
      CALL LINE(1)
   88 CONTINUE
   36 CALL PAUSE
      CALL FIN


   34 IF(LRTE.EQ.0)GO TO 331
      IF (MSN.EQ.0)GO TO 322
      CALL TD(X,Y,M,SPD,TL,TT,DL,DT)
      CALL HDG(X,Y,M,VAR,NTH,MH,PI)
      WRITE(6,21)
   21 FORMAT(' WANT NAV SOLN? ITS NECESS. FOR TIME SCENARIO')
      READ(5,2)L
      IF(L.EQ.0.)GO TO 331
      WRITE(6,500)
  500 FORMAT(1X,//' STRIKE GROUP NAVIGATION SOLUTION')
      WRITE(6,23)
   23 FORMAT(1X, /' LEG',3X,'DIST',2X,'TIME',3X,'TH',3X,'MH',2X,'TAS',3X
     1,'TOTT',3X,'TOTD',6X,'TO TURNPT L/L')
      CALL RLL(X,Y,N)
      DO 25 I=1,M
      WRITE(6,24)I,DL(I),TL(I),NTH(I),MH(I),ITAS(I),TT(I),DT(I), Y(I+1),
     1 X(I+1)
   24 FORMAT(I2,4X,F5.1,3X,F3.0,2X,I3,2X,I3,2X,I3,3X,F4.1,3X,F5.1,2X,F7.
     12,2X,F7.2)
   25 CONTINUE
      CALL LL(X,Y,N)
      IF(MSN-2)93,450,330
  450 CALL TD(XME,YME,MEM,SPDM,TLM,TTM,DLM,DTM)
      CALL HDG(XME,YME,MEM,VAR,NTHM,MHM,PI)
      CALL RLL(XME,YME,MEN)
      WRITE(6,451)
  451 FORMAT(1X,//' MOD ESCORT NAVIGATION SOLUTION')
      WRITE(6,23)
      DO 452 I=1,MEM
      WRITE(6,24)I,DLM(I),TLM(I),NTHM(I),MHM(I),MTAS(I),TTM(I),DTM(I),YM
     1E(I+1),XME(I+1)
  452 CONTINUE


   93 WRITE(6,92)
   92 FORMAT(1X,//' DO YOU WISH A TIME SCENARIO?')
      READ(5,2)L
      IF(L.EQ.0)GO TO 331
      WRITE(6,121)
  121 FORMAT(' ENTER NUMBER OF DIFFERENT BANDS INTERESTED IN')
```

```
      READ(5,2)NUMBND
      WRITE(6,122)
  122 FORMAT(' ENTER THE BAND NO.S ONE AT A TIME, NO COMBOS LIKE 5/6')
      READ(5,2)(NB(I),I=1,NUMBND)
      WRITE(6,123)
  123 FORMAT(' INDICATE TYPE EMITTERS INTERESTED IN FOR THE BANDS YOU HA
     1VE SELECTED: 1=ALL, 2=EW/ACQ ONLY, 3=TERM THREAT ONLY')
      READ(5,2)NTYP
C  PRINT OUT HEADINGS FOR TIME SCENARIO
      WRITE(6,124)
  124 FORMAT(1X,//' TIME',5X,'PRES POS',8X,'TYPE',6X,'EOB ',2X,'RNGE',2X
     1,'BRG',2X,'AUTO',2X,'DEGR',2X,'PRCT')
C  SET INITIAL CONDITIONS FOR TIME SOLUTION
      IF(MSN.EQ.2)GO TO 700
      TIME=0.
      PPX=X(1)
      PPY=Y(1)
      CALL RLL(PPX,PPY,1)
      WRITE(6,125)TIME,PPY,PPX
  125 FORMAT(1X,F4.0,2X,F7.2,1X,F7.2)
      CALL LL(PPX,PPY,1)
      CALL  PPS(PPX,PPY,SX,SY,ST,K,NB,NUMBND,NTYP,TYP,IZ,TN,TRG,MSN,XSTK,
     1YSTK)
C  NOW PROCEED AROUND THE ROUTE 1 MIN AT A STEP
      I=1
  129 TIME=TIME+1.
      DINC=SPD(I)/60.
      IF(TT(I).GT.TIME)GO TO 126
C NOT TRUE MEANS TURNPT WAS .LE. TO ONE MINUTE FROM LAST COMPUTED POSIT.
C FIGURE TIME TO TURNPT, SUBTRACT FROM 1 MIN, INCREMENT I TO GET NEW HEA
C DING,SPEED.  USE TIME REMAINING IN MINUTE TO GET NEW PP.
      PARTIM=TIME-TT(I)
      I=I+1
C IS THIS LAST TURNPOINT?
      IF (I.EQ.N)GO TO 127
      PPX=X(I)
      PPY=Y(I)
      CALL RADN(I,NTH,H)
      PPX=PPX+PARTIM*SPD(I)/60.*COS(H)
      PPY=PPY+PARTIM*SPD(I)/60.*SIN(H)
      GO TO 128
C  IT WAS THE LAST TURNPOINT
  127 PPX=X(N)
      PPY=Y(N)
      TIME=TT(M)
      GO TO 128
C NEXT SECTION MEANS HAVE NOT GONE PAST A TP, JUST ADD INCREMENT FOR THI
C  LEG AND CONTINUE.
```

```
  126 CALL RADN(I,NTH,H)                                                      MAI04570
      PPX=PPX+DINC*COS(H)                                                     MAI04580
      PPY=PPY+DINC*SIN(H)                                                     MAI04590
  128 CALL RLL(PPX,PPY,1)                                                     MAI04600
      WRITE(6,125)TIME,PPY,PPX                                                MAI04610
      CALL LL(PPX,PPY,1)                                                      MAI04620
      CALL PPS(PPX,PPY,SX,SY,ST,K,NB,NUMBND,NTYP,TYP,IZ,TN,TRG,MSN,XSTK,MAI04630
     1YSTK)                                                                   MAI04640
      IF(TIME.GE.TT(M))GO TO 331                                              MAI04650
      GO TO 129                                                               MAI04660
PAGE
SKIP003
  700 TIME=0.                                                                 MAI04670
      PPX=XME(1)                                                              MAI04680
      PPY=YME(1)                                                              MAI04690
      XSTK=X(1)                                                               MAI04700
      YSTK=Y(1)                                                               MAI04710
      CALL RLL(PPX,PPY,1)                                                     MAI04720
      WRITE(6,125)TIME,PPY,PPX                                                MAI04730
      CALL LL(PPX,PPY,1)                                                      MAI04740
      CALL PPS(PPX,PPY,SX,SY,ST,K,NB,NUMBND,NTYP,TYP,IZ,TN,TRG,MSN,XSTK,MAI04750
     1YSTK)                                                                   MAI04760
      I=1                                                                     MAI04770
      J=1                                                                     MAI04780
  729 TIME=TIME+1.                                                            MAI04790
      DINC=SPD(I)/60.                                                         MAI04800
      DINCM=SPDM(I)/60.                                                       MAI04810
      IF(TT(I).GT.TIME)GO TO 726                                              MAI04820
      PARTIM=TIME-TT(I)                                                       MAI04830
      I=I+1                                                                   MAI04840
      IF(I.EQ.N)GO TO 727                                                     MAI04850
      XSTK=X(I)                                                               MAI04860
      YSTK=Y(I)                                                               MAI04870
      CALL RADN(I,NTH,H)                                                      MAI04880
      XSTK=XSTK+PARTIM*SPD(I)/60.*COS(H)                                      MAI04890
      YSTK=YSTK+PARTIM*SPD(I)/60.*SIN(H)                                      MAI04900
      GO TO 728                                                               MAI04910
  727 XSTK=X(N)                                                               MAI04920
      YSTK=Y(N)                                                               MAI04930
      GO TO 728                                                               MAI04940
  726 CALL RADN(I,NTH,H)                                                      MAI04950
      XSTK=XSTK+DINC*COS(H)                                                   MAI04960
      YSTK=YSTK+DINC*SIN(H)                                                   MAI04970
  728 IF(TTM(J).GT.TIME)GO TO 736                                             MAI04980
      PARTIM=TIME-TTM(J)                                                      MAI04990
      J=J+1                                                                   MAI05000
      IF(J.EQ.MEN)GO TO 737                                                   MAI05010
      PPX=XME(J)                                                              MAI05020
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```
      PPY=YME(J)
      CALL RADN(J,NTHM,H)
      PPX=PPX+PARTIM*SPDM(J)/60.*COS(H)
      PPY=PPY+PARTIM*SPDM(J)/60.*SIN(H)
      GO TO 738
  737 PPX=XME(MEN)
      PPY=YME(MEN)
      GO TO 738
  736 CALL RADN(J,NTHM,H)
      PPX=PPX+DINCM*COS(H)
      PPY=PPY+DINCM*SIN(H)
  738 CALL RLL(PPX,PPY,1)
      WRITE(6,125)TIME,PPY,PPX
      CALL PPS(PPX,PPY,SX,SY,ST,K,NB,NUMBND,NTYP,TYP,IZ,TN,TRG,MSN,XSTK,
     1YSTK)
      IF(TIME.GT.TTM(MEM)) GO TO 331
      GO TO 729


  330 WRITE(6,315)
  315 FORMAT(1X,/' DO YOU WANT A PRINTOUT OF JAMMING PARAMETERS FOR THIS
     1STANDOFF POINT?')
      READ(5,2)L
      IF(L.EQ.0)GO TO 331
      WRITE(6,121)
      READ(5,2)NUMBND
      WRITE(6,122)
      READ(5,2)(NB(I),I=1,NUMBND)
      WRITE(6,123)
      READ(5,2)NTYP
      WRITE(6,316)
  316 FORMAT(1X,//' STANDOFF L/L',12X,'TYPE',6X,'EOB ',2X,'RNGE',2X,'BRG
     1',2X,'AUTO',2X,'DEGR',2X,'PRCT')
      CALL RLL(STOX,STOY,1)
      WRITE(6,317)STOY,STOX
  317 FORMAT(1X,F7.2,1X,F7.2)
      CALL LL(STOX,STOY,1)
      CALL PPS(STOX,STOY,SX,SY,ST,K,NB,NUMBND,NTYP,TYP,IZ,TN,TRG,MSN,XST
     1K,YSTK)


  331 WRITE(6,329)
  329 FORMAT(1X,/' ARE YOU THROUGH PLANNING?')
      READ(5,2)L
      IF(L.EQ.1)GC TO 33
```

```
      WRITE(6,324)                                                      MAI05440
  324 FORMAT(1X,/' WANT TO CONSIDER A (DIFFERENT) MISSION PROFILE?')    MAI05450
      READ(5,2)L                                                        MAI05460
      IF(L.EQ.0) GO TO 91                                               MAI05470
      WRITE(6,300)                                                      MAI05480
      READ(5,2)MSN                                                      MAI05490


   91 WRITE(6,26)                                                       MAI05500
   26 FORMAT(1X,//' DO YOU WISH TO CONSIDER (ANOTHER) STRIKE ROUTE?')   MAI05510
      READ(5,2)LAGAIN                                                   MAI05520
      IF(LAGAIN.EQ.0)GO TO 322                                          MAI05530
      WRITE(6,115)                                                      MAI05540
      READ(4,2)N                                                        MAI05550
      M=N-1                                                             MAI05560
      WRITE(6,13)                                                       MAI05570
      READ(4,4)(Y(I),X(I),I=1,N)                                        MAI05580
      CALL LL(X,Y,N)                                                    MAI05590
      WRITE(6,17)                                                       MAI05600
      READ(4,41)(ITAS(I),I=1,M)                                         MAI05610
      DO 28 I=1,M                                                       MAI05620
   28 SPD(I)=ITAS(I)/60.                                                MAI05630
      LRTE=1                                                            MAI05640
  322 IF(MSN-2)35,400,318                                               MAI05650


  318 WRITE(6,319)                                                      MAI05660
  319 FORMAT(1X,/' WANT TO CONSIDER ANOTHER STANDOFF POINT?')           MAI05670
      READ(5,2)LSO                                                      MAI05680
      IF (LSO.EQ.0)GO TO 331                                            MAI05690
      WRITE(6,302)                                                      MAI05700
      READ(5,4)STOY,STOX                                                MAI05710
      CALL LL(STOX,STOY,1)                                              MAI05720
      GO TO 35                                                          MAI05730


   33 STOP                                                              MAI05740
      END                                                               MAI05750
```

```
C   THIS IS THE SUBROUTINE TO CALCULATE DISTANCE FROM A/C PRESENT
C    POSITION TO EACH OF THE SITES IN THE EOB.  IT FILTERS FOR TYPE
C    EMITTERS AND BANDS DESIRED.  IT PRINTS OUT INFO NECESSARY
C    TO KEEP A RUNNING ACCOUNT OF UPCOMING ACTION REQUIRED BY THE
C    OPERATOR DURING THE FLIGHT.
C     PARAMETERS PASSED:
C         PPY,PPX; A/C PRESENT POSIT ,LAT AND LONG
C         SX,SY; ARRAY CONTAINING LAT/LONG OF EACH SITE IN EOB
C         ST; TYPE OF EACH SITE IN THE EOB
C
C         K; NUMBER OF SITES IN THE EOB
C         NB; ARRAY CONTAINING THE SPECIFIC BANDS INTERESTED IN
C         NUMBND; HOW MANY DIFFERENT BANDS INTERESTED IN
C         NTYP; INDICATES TYPE OF EMITTER INTERESTED IN,1 ALL, 2 EW, 3 TT
C         TYP; ARRAY CONTAINING ENTIRE EMITTER LIBRARY
      SUBROUTINE PPS(PPX,PPY,SX,SY,ST,K,NB,NUMBND,NTYP,TYP,IZ,TN,TRG,MSN
     1,XSTK,YSTK)
      DIMENSION SX(1),SY(1),NB(1),ST(1),TYP(30,15),IZ(1),TN(30,3),TRG(1)
      INTEGER ST
      PI=3.14159
      DG=180./PI
      DO 100 I=1,K
      IC=ST(I)
      IF(NTYP-2)10,20,30
C   ALL SITES TO BE CHECKED AND DISPLAYED IF IN RANGE
   10 DO 11 J=1,NUMBND
      IF(IZ(IC).EQ.NB(J))GO TO 110
   11 CONTINUE
      GO TO 100
C   CHECK ONLY EW/ACQ TYPE EMITTERS
   20 IF(IC.GT.10)GO TO 100
      DO 21 J=1,NUMBND
      IF(IZ(IC).EQ.NB(J))GO TO 110
   21 CONTINUE
C   CHECK TERMINAL THREAT TYPE EMITTERS ONLY
   30 IF((IC.LT.11).OR.(IC.GT.20))GO TO 100
      DO 31 J=1,NUMBND
      IF(IZ(IC).EQ.NB(J))GO TO 110
   31 CONTINUE
C   IF  EMITTER IS RIGHT TYPE AND BAND NOW CHECK IF ITS IN RANGE
  110 SDF=1.024-.0023*ABS((SY(I+1)+PPY)/2.)-.0001*((SY(I+1)+PPY)/2.)**2
      DX=(SX(I)-PPX)*SDF
      DY=(SY(I)-PPY)
      DS=(SQRT(DX**2+DY**2))*60.
      IF(MSN.EQ.3)GO TO 111
      IF (DS.GT.TRG(IC))GO TO 101
      GO TO 111
  101 IF(MSN.NE.2)GO TO 100
```

```
      DXX=(SX(I)-XSTK)*SDF                                              PPS00490
      DYY=SY(I)-YSTK                                                    PPS00500
      DSS=(SQRT(DXX**2+DYY**2))*60.                                     PPS00510
      IF(DSS.GT.TRG(IC))GO TO 100                                       PPS00520
C  WENT BACK TO 100, ANOTHER SITE,  BECAUSE ITS NOT IN RANGE.           PPS00530
C  BUT IF IT IS IN RANGE, CONTINUE BELOW.  CALC BEARING, PRINT OUT EVRYTPPS00540
  111 BRG=ATAN(DY/DX)                                                   PPS00550
      IF(DX.GE.0.)GO TO 60                                              PPS00560
      BRG=(1.5*PI-BRG)*DG                                               PPS00570
      GO TO 80                                                          PPS00580
   60 BRG=(PI/2.-BRG)*DG                                                PPS00590
   80 NBRG=BRG+.5                                                       PPS00600
      IF(NBRG.GE.0)GO TO 40                                             PPS00610
      NBRG=NBRG+360                                                     PPS00620
      GO TO 89                                                          PPS00630
   40 IF(NBRG.LT.360)GO TO  89                                          PPS00640
      NBRG=NBRG-360                                                     PPS00650
   89 WRITE(6,90)(TN(IC,J),J=1,3),I,DS,NBRG,TYP(IC,12),TYP(IC,13),TYP(ICPPS00660
     1,14)                                                              PPS00670
   90 FORMAT(21X,3A4,3X,I2,3X,F4.0,3X,I3,2X,A4,2X,A4,2X,A4)             PPS00680
  100 CONTINUE                                                          PPS00690
      RETURN                                                            PPS00700
      END                                                               PPS00710
```

```
C   THIS SUBROUTINE TAKES THE MAX AND MIN OF THE X AND Y COORDINATES,
C   CHOOSES THE LARGER OF THE TWO SPREADS AND ADJUSTS THE OTHER
C   ACCORDINGLY SO THAT THE PLOT ON THE GRAPH IS ALWAYS SQUARE AND
C   THE DISTANCE SCALE IN THE ORZ. IS THE SAME AS IN THE VERT.
      SUBROUTINE SCALE(XMAX,XMIN,YMAX,YMIN)
      DX=ABS(XMAX-XMIN)
      DY=ABS(YMAX-YMIN)
      IF(DX.GE.DY)GO TO 10
      XMP=XMIN+DX/2.
      XMIN=XMP-DY/2.
      XMAX=XMP+DY/2.
      GO TO 20
   10 YMP=YMIN+DY/2.
      YMIN=YMP-DX/2.
      YMAX=YMP+DX/2.
   20 RETURN
      END
```

```
C   THIS SUBROUTINE COMPUTES THE TIME AND DISTANCE AROUND A PARTICULAR
C   ROUTE.COMPUTES BOTH TOTAL AND INDIVIDUAL LEG VALUES.
C   PARAMETERS PASSED ARE: LONG AND LAT OF TRNPTS, NUMBER OF PTS,
C   SPEED (NAUT MILES/MIN) FOR EACH LEG,TIME/LEG, TOTAL TIME, DIST/LEG
C   AND TOTAL DISTANCE.
      SUBROUTINE TD(X,Y,M,SPD,TL,TT,DL,DT)
      DIMENSION X(1),Y(1),SPD(1),TL(1),DL(1),DT(1),TT(1)
      T=0.
      D=0.
      DO 10 I=1,M
C   MUST CALCULATE A SCALE DOWN FACTOR SDF, LAT.NE.LONG IN DIST
      SDF=1.0294-.0023*ABS((Y(I+1)+Y(I))/2.)-.0001*((Y(I+1)+Y(I))/2.)**2
      DX=(X(I+1)-X(I))*SDF
      DY=Y(I+1)-Y(I)
      DL(I)=SQRT(DX**2+DY**2)
      DL(I)=DL(I)*60.
      D=D+DL(I)
      DT(I)=D
      TL(I)=DL(I)/SPD(I)
      T=T+TL(I)
      TT(I)=T
   10 CONTINUE
      RETURN
      END
```

```
C   THIS SUBRTN CONVERTS TRUE HEADINGS FROM DEGREES TO RADIANS FOR USE IN
C   COMPUTING THE DISTANCE INCREMENT OF LAT/LONG IN THE TIME SCENARIO.
C    SPECIFICALLY: SIN AND COS FUNCTIONS REQUIRE RADIANS.
      SUBROUTINE RADN(I,NTH,H)
      DIMENSION NTH(1)
      X=2.*3.14159/360.
      IF((NTH(I).GE.0).AND.(NTH(I).LE.90))GO TO 10
      H=(450-NTH(I))*X
      GO TO 20
   10 H=(90-NTH(I))*X
   20 RETURN
      END
```

```
C   THIS SUBRTN COMPUTES TRUE HDG AND MAG HDG FOR A ROUTE OF FLIGHT.
C   PARAMETERS PASSED ARE: X AND Y COORDS OF TURNPTS,
C   NUMBER OF TRNPTS, MAGNETIC VARATION, DUMMY LISTS FOR TH AND MH,
C   AND VALUE OF PI.
      SUBROUTINE HDG (X,Y,M,VAR,NTH,MH,PI)
      DIMENSION X(1),Y(1),NTH(1),MH(1)
      INTEGER VAR
      DG=180./PI
      DO 10 I=1,M
C   MUST CALC A SCALE DOWN FACTOR SDF, SINCE LAT .NE. LONG IN DIST
      SDF=1.0294-.0023*ABS((Y(I+1)+Y(I))/2.)-.0001*((Y(I+1)+Y(I))/2.)**2
      DX=(X(I+1)-X(I))*SDF
      DY=Y(I+1)-Y(I)
      TH=ATAN(DY/DX)
      IF(DX.GE.0.)GO TO 60
      TH=(1.5*PI-TH)*DG
      GO TO 80
   60 TH=(PI/2.-TH)*DG
   80 NTH(I)=(TH+.5)
      MH(I)=NTH(I)+VAR
      MD=MH(I)
      IF(MD.GE.0)GO TO 40
      MH(I)=MH(I)+360
      GO TO 10
   40 IF (MD.LT.360)GO TO 10
      MH(I)=MH(I)-360
   10 CONTINUE
      RETURN
      END
```

```
C   THIS ROUTINE CONVERTS DEGREES AND MINUTES TO DEGREES AND TENTHS OF
C   DEGREES.
      SUBROUTINE LL(X,Y,N)
      DIMENSION X(1),Y(1)
      DO 10 I=1,N
      NX=X(I)
      RX=X(I)-NX
      RX=RX/.6
      X(I)=NX+RX
      NY=Y(I)
      RY=Y(I)-NY
      RY=RY/.6
      Y(I)=NY+RY
   10 CONTINUE
      RETURN
      END
```

```
C   THIS ROUTINE RE-CONVERTS LATITUDES AND LONGITUDES FROM DEGREES AND
C   TENTHS OF DEG. TO DEGREES AND MINUTES FOR PRINTOUT.
      SUBROUTINE RLL(X,Y,N)
      DIMENSION X(1),Y(1)
      DO 10 I=1,N
      NX=X(I)
      RX=X(I)-NX
      RX=RX*.6
      X(I)=NX+RX
      NY=Y(I)
      RY=Y(I)-NY
      RY=RY*.6
      Y(I)=NY+RY
   10 CONTINUE
      RETURN
      END
```

```
C   THIS ROUTINE SEARCHES FOR THE MAX VALUE OF THE LIST PASSED TO,
C   AND RETURNS THIS VALUE TO THE MAIN PROGRAM.  IT IS USED TO
C   OBTAIN THE MAX LAT AND LONG FOR USE IN ADJUSTING THE SCALE
C   DURING THE PLOTTING SEQUENCE.
C   PARAMETERS PASSED ARE: ARRAY OF LATITUDES OR LONGITUDES, NUMBER
C   OF ITEMS IN THE ARRAY, DUMMY VALUE OF MAX WITH TRUE MAXIMUM TO BE
C   RETURNED.
      SUBROUTINE MAX(X,N,XMAX)
      DIMENSION X(1)
      XMAX=X(1)
      DO 10 I=1,N
   10 XMAX=AMAX1(XMAX,X(I))
      RETURN
      END
```

```
C   THIS SUBROUTINE SEARCHES LIST PASSED FOR THE MIN VALUE AND
C   RETURNS IT TO THE MAIN PROGRAM.  USED TO SET LIMITS IN SCALING
C   DURING THE PLOTTING ROUTINE.
C   PARAMETERS PASSED ARE:  ARRAY OF LATITUDES OR LONGITUDES,
C   NUMBER OF ITEMS IN THE ARRAY, DUMMY VALUE OF MIN WITH THE REAL
C   VALUE OF MIN TO BE RETURNED TO THE MAIN PROGRAM.
      SUBROUTINE MIN(X,N,XMIN)
      DIMENSION X(1)
      XMIN=X(1)
      DO 10 I=1,N
   10 XMIN=AMIN1(XMIN,X(I))
      RETURN
      END
```

```
C   THIS ROUTINE CALCULATES THE DISTANCE FROM A STANDOFF POINT TO EACH
C   EMITTER  OF INTEREST, WHEN PRINTING PARAMETERS FOR A STANDOFF MSN.
       SUBROUTINE DIST(XO,YO,STOX,STOY,RJ)
       SDF=1.0294-.0023*ABS((YO+STOY)/2.)-.0001*((YO+STOY)/2.)**2
       DX=(XO-STOX)*SDF
       DY=YO-STOY
       RJ=SQRT(DX**2+DY**2)
       RETURN
       END


C   THIS FUNCTION CALCULATES THE BURNTHRU RANGE FOR JAMMING FROM A STANDOFF
C   POINT TO ANY EMITTER OF INTEREST.  USED IN PLOTTING DEPRESSED JAMMING
C   ENVELOPES IN THE DISPLAY PORTION OF THE PROGRAM.
       FUNCTION BTHRU(PJ,B,GJR,PR,CS,RJ,GAIN,CMFLG)
       RJ=RJ*1852.
       PR=PR*1000.
       BTHRU=(((PR*GAIN**2*CMFLG*CS*RJ**2)/(12.56637062*PJ
      1*B*(10.**(GJR/10.))))**.25)/1852.
       RETURN
       END
```

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