

PROJECT ADMINISTRATION DATA SHEET

ORIGINAL



REVISION NO. _____

Project No. A-3082DATE 11/3/81Project Director: Mr. J. W. DaltonSchool/Lab EML/RSDSponsor: CAS, Incorporated; Huntsville, AL 35805Type Agreement: Purchase Order No. 024 under Prime Contract No. DAAH01-81-C-B190-001Award Period: From 10/1/81 To 7/7/82 (Performance) _____ (Reports) _____Sponsor Amount: \$41,825 Contracted through: _____Cost Sharing: None GTRI/~~CRX~~Title: PATRIOT Guidance AnalysisADMINISTRATIVE DATAOCA Contact Duane Hutchison x4820

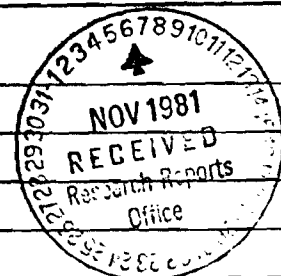
1) Sponsor Technical Contact:

William H. Stender, Jr., Program ManagerCAS, Incorporated500 Wynn DriveSuite 320Huntsville, AL 35805205-837-3903

2) Sponsor Admin/Contractual Matters:

Buyer: Same as block 1Defense Priority Rating: NoneSecurity Classification: SecretRESTRICTIONSSee Attached Government Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval - Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of \$500 or 125% of approved proposal budget category.

Equipment: Title vests with GovernmentCOMMENTS:COPIES TO:

Administrative Coordinator
Research Property Management
Accounting
Procurement/EES Supply Services
FORM OCA 4.781

Research Security Services
Reports Coordinator (OCA) ✓
Legal Services (OCA)
Library

EES Public Relations (2)
Computer Input
Project File
Other Mr. Dalton - Huntsville

SPONSORED PROJECT TERMINATION SHEETDate 9/30/82

Project Title: PATRIOT Guidance Analysis

Project No: A-3082

Project Director: J. W. Dalton

Sponsor: CAS, Inc.

Effective Termination Date: 7/7/82

Clearance of Accounting Charges: _____

Grant/Contract Closeout Actions Remaining:

- ☒ Final Invoice and Closing Documents
- ☐ Final Fiscal Report
- ☒ Final Report of Inventions
- ☒ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
- ☐ Other _____

Assigned to: EML (School/Laboratory)COPIES TO:

Administrative Coordinator
Research Property Management
Accounting
Procurement/EES Supply Services

Research Security Services
Reports Coordinator (OCA)
Legal Services (OCA)
Library

EES Public Relations (2)
Computer Input
Project File
Other Dalton - 110

A-082

Monthly Technical Report No. 001
and
Monthly Cost and Performance Report No. 001

Report Period
October 1 through 31, 1981

Report Prepared On
November 13, 1981

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to become familiar with the MIRADCOM Digital Air Defense Simulator (MIDAS) and implement the ground guidance software for the acquisition phase of the guidance scheme.

The actual code from the Guidance Data Processing Software Requirements (DPSR) for the PATRIOT missile system is being implemented in MIDAS to mimic the actual ground guidance system. The acquisition phase of guidance starts the terminal guidance phase of PATRIOT. This acquisition logic has been programmed using Fortran to execute on the CDC-6600 computer; however, the code has not been debugged at this time. This debug process will begin as soon as the track logic has been implemented.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The track logic will be programmed into MIDAS using the DPSR software. Once the actual code is resident in the simulator, debug of the coding will begin in conjunction with the interface process with the existing MIDAS simulator. Also, the hand-shake with the signal processing and ECM logic being implemented by CAS, Inc. should occur near year end.

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period October 1 through October 31, 1981.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$363.10	-0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Retirement (11.59% of PS)	16.12	-0-
Subtotal	<u>\$379.22</u>	<u>-0-</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	208.57	-0-
TOTAL	<u>\$587.79</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	139.10	6.5
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	224.00	36.5
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$ 363.10</u>	<u>43.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$ 363.10	\$ -0-	\$23,217.90
Materials and Supplies	410.00	-0-	-0-	410.00
Travel and Shipping	260.00	-0-	-0-	260.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	16.12	-0-	2,716.88
Overhead	14,841.00	208.57	-0-	14,632.43
FUNDING	<u>\$41,825.00</u>	<u>\$ 587.79</u>	<u>-0-</u>	<u>\$40,972.21</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 2% of the proposed task has been completed.

Monthly Technical Report No. 002
and
Monthly Cost and Performance Report No. 002

Report Period
November 1 through November 30, 1981

Report Prepared On
December 2, 1981

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the ground guidance software for the track phase of the guidance scheme has been coded in the MIDAS simulator. This completes the basic coding task of implementing the actual code from the Guidance Control Data Processing System Requirements (DPSR). The track phase is initiated after the acquisition phase has been completed and the head track-off is complete. The Fortran code was structured to mimic the DPSR with the acquisition and track routines being named ACK1 and TRACK, respectively. All the intermediate calculations are obtained through entry points in support subroutines as shown in the flowchart of Figure 1.

The debug of this code is in process along with the setup of the commons for data transfer between the main subroutines and their entry points. Also, the data required by the guidance logic from the signal processing model being developed by CAS, Inc. and the existing MIDAS program will be obtained through special interface commons.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The debug of the guidance software should be completed near year-end in conjunction with a special output to show the signal returns in the dual mode processor matrices along with the flags that define the guidance system states. This output should reduce the effort required to complete the interface task with MIDAS and the signal processing model and the future simulator analysis and validation. The data required by the guidance logic from the signal processing model is outlined in Attachment 1.

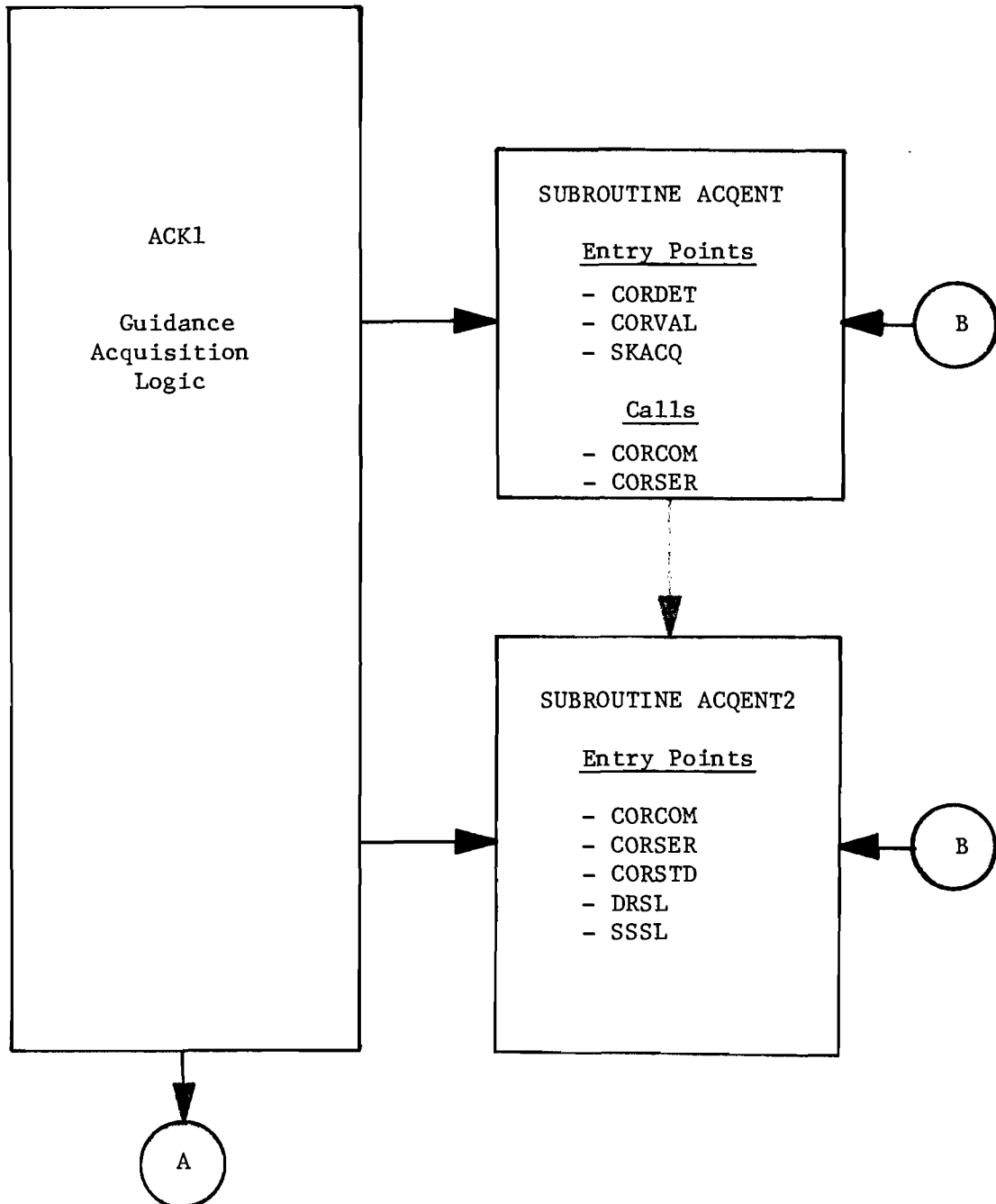


Figure 1. Guidance Logic Flowchart

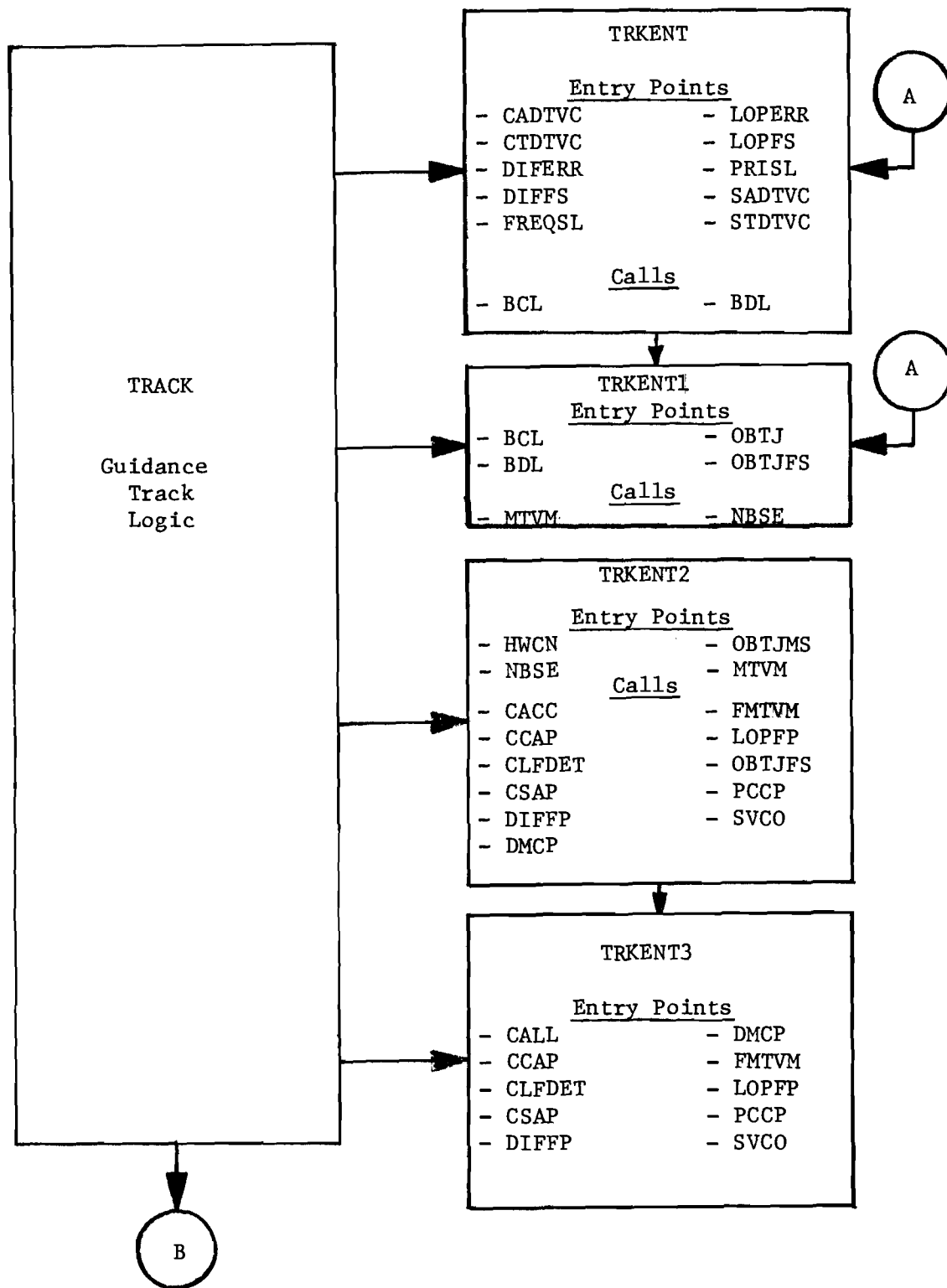


Figure 1. (Continued)

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period November 1 through November 30, 1981.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$1,188.30	-0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Retirement (11.59% of PS)	80.61	-0-
Subtotal	<u>\$1,268.91</u>	<u>-0-</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	697.90	-0-
TOTAL	<u>\$1,966.81</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	695.50	33.0
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	492.80	80.0
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$1,188.30</u>	<u>113.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$ 1,551.40	\$ -0-	\$22,029.60
Materials and Supplies	410.00	-0-	-0-	410.00
Travel and Shipping	260.00	-0-	-0-	260.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	96.73	-0-	2,636.27
Overhead	14,841.00	906.47	-0-	13,934.53
FUNDING	<u>\$41,825.00</u>	<u>\$2,554.60</u>	<u>-0-</u>	<u>\$39,270.40</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 6% of the proposed task has been completed.

Attachment 1

The following data are required by the TVM Guidance Software for Handshake with signal processing for the different guidance phases:

I. SKIN ACQUISITION

AVEMMS - Average signal in matrix
VLS - doppler column with largest signal
RLS - Range bin with the largest signal
M[RLVS(1), 1] thru M[RLVS(51), 51] - Magnitude of largest bin in each doppler column
RLVS(1) thru RLVS(51) - Range bin of largest return in each doppler column
M[R(1), VLS-1] thru M[R(24), VLS-1] - Magnitude of each range bin in the doppler column just below the doppler column with the largest signal
M[R(1), VLS] through M[R(24), VLS] - Magnitude of each range bin in the doppler column with the largest signal
M[R(1), VLS +1] thru M[R(24), VLS +1] - Magnitude of each range bin in the doppler column just above the doppler column with the largest signal
AMVS(1) thru AMVS(51) - Average signal in each doppler column

II. RESTRICTED SKIN ACQUISITION

AVEMMS - Average signal in matrix
VLS - doppler column with largest signal
RLS - Range bin with the largest signal
M[RLVS(1), 1] thru M[RLVS(51), 51] - Magnitude of largest bin in each doppler column
RLVS(1) thru RLVS(51) - Range bin of largest return in each doppler column
M[R(12), VLS-1] thru M[R(18), VLS-1] - Magnitude of each range bin of the 7x7 matrix in the doppler column just below doppler column with the largest signal
M[R(12), VLS] thru M[R(18), VLS] - Magnitude of each range bin of the 7x7 matrix in the doppler column with the largest signal
M[R(12), VLS+1] thru M[R(18), VLS+1] - Magnitude of each range bin of the 7x7 matrix in the doppler column just above the doppler column with the largest signal
AMVS(1) thru AMVS(51) - Average signal in each doppler column

Attachment 1 (Continued)

III. SKIN TRACK

SMSS - Sum channel magnitude in track matrix
SMYS - Yaw channel magnitude in angle matrix
SMPS - Pitch channel magnitude in angle matrix
VL3S - Doppler column with largest signal in 3x7 matrix
RL3S - Range bin with largest signal in 3x7 matrix
VL7S - Doppler column with the largest signal in 7x7 matrix
RL7S - Range bin with largest signal in 7x7 matrix
M[R(9), VL7S] thru M[R(21), VL7S] - Magnitude of each range bin of the 7x7 matrix in the doppler column with the largest signal
I, Q(RL3S, V11) thru I, Q(RL3S, V13) - In phase and quarature terms of each doppler cell of the largest return in the 3x3 track matrix
I, Q[R(22), VL3S] and I, Q[R(23), VL3S] - In phase and quarature terms of the largest doppler cell in the split gate matrix
I, Q[R(12), VL3S], I, Q[R(15), VL3S], I, Q[R(18), VL3S] - In phase and quarature terms of the sum channel 3x7 matrix for the doppler cell with the largest return
I, Q[R(11), VL3S], I, Q[R(14), VL3S], I, Q[R(17), VL3S] - In phase and quarature terms of the pitch channel 3x7 matrix for the doppler cell with the largest return
I, Q[R(13), VL3S], I, Q[R(16), VL3S], I, Q[R(19), VL3S] - In phase and quarature terms of the yaw channel 3x7 matrix for the doppler cell with the largest return

IV. SSJ ACQUISITION

AVEMMC - Average signal in matrix
VLC - Doppler column with the largest signal
RLC - Range bin with the largest signal
M[RLVC(1), V1] thru M[RLVC(51), V51] - Magnitude of the largest signal in each doppler column
RLVC(1) thru RLVC(51) - Range bin of the largest return in each doppler column
AMVC(1) thru AMVC(51) - Average signal in each doppler column
M[R(1), VLC-1] thru M[R(9), VLC-1] - Magnitude of each range bin in the doppler column just below the doppler column with the largest signal
M[R(1), VLC] thru M[R(9), VLC] - Magnitude of each range bin in the doppler column with the largest signal
M[R(1), VLC+1] thru M[R(9), VLC+1] - Magnitude of each range bin in the doppler column just above the doppler column with the largest signal

Attachment 1 (Continued)

V. SSJ TRACK

SMSC - Sum channel magnitude in the 7x7 matrix
SMYC - Yaw channel magnitude in the 1x17 matrix
SMPC - Pitch channel magnitude in the 1x17 matrix
VL3C - Doppler column with the largest signal in the 1x3 matrix
VL7C - Doppler column with the largest signal in the 7x7 matrix
RL7C - Range bin with the largest signal in the 7x7 matrix
M[R(34), VL7C] thru M[R(40), VL7C] - Magnitude of each range bin on
the 7x7 in the doppler column with the largest signal
I, Q[R(34), V34] thru I, Q[R(37), V36] - In-phase and quadrature terms
of sum channel in the 1x3 matrix
I, Q[R(33), VL3C] - In phase and quadrature terms of the pitch channel
of the 1x3 matrix for the doppler column with the largest signal
I, Q[R(41), VL3C] - In phase and quadrature terms of the yaw channel
1x3 matrix for the doppler column with the largest signal
I, Q[R(42), VL3C], I, Q[R(43), VL3C] - In-phase and quadrature terms of
the largest doppler column in the split gate matrix

#-5162

Monthly Technical Report No. 3
and
Monthly Cost and Performance Report No. 3

Report Period
December 1 through December 31, 1981

Report Prepared On
January 21, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to implement the DPSR guidance software in the MIDAS simulator. This integration effort required certain modifications to the "TERMN" subroutine to use the new DPSR logic instead of the existing functional acquisition and track logic. These changes are shown in Figure 1. Also, the data transfer from other MIDAS subroutines are required. This transfer is being performed by a common named "CMIDAS". Figure 2 shows the interface between MIDAS, the guidance logic and the anticipated signal processing. The MIDAS data required by the guidance logic is shown in Table 1. This integration was performed such that the modified MIDAS simulator could use the existing functional guidance logic by setting the "IDPSR" flag to zero. This logic was verified by simulating both a quiet and an SSJ target engagement using the two simulators.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The next effort in the task is to integrate the signal processing into the modified MIDAS simulator. Due to the 30K words increase in the required storage to implement the guidance logic, plus the additional storage required for the signal processing; the modified MIDAS is being changed to a segmented load to reduce the storage requirements from the 165K words. This large storage requirement increases the computer turn-around time significantly. The first cut at integrating the signal processing should be completed prior to the meeting planned for January 29, 1982. This meeting will be in Room E-312 of Building 5400.

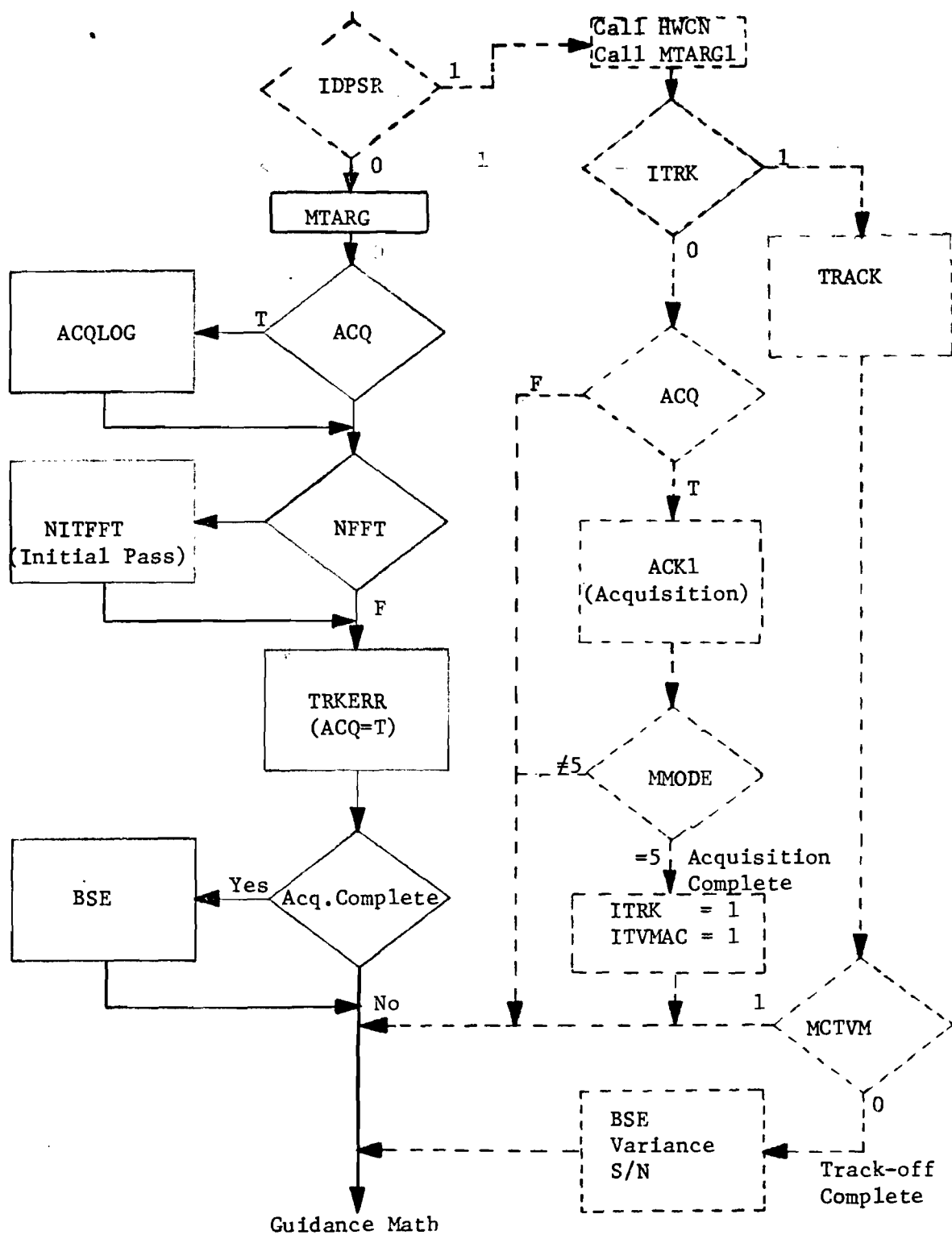


Figure 1. Flowchart of Modified Subroutine
"TERMN" for DPSR Software Interface

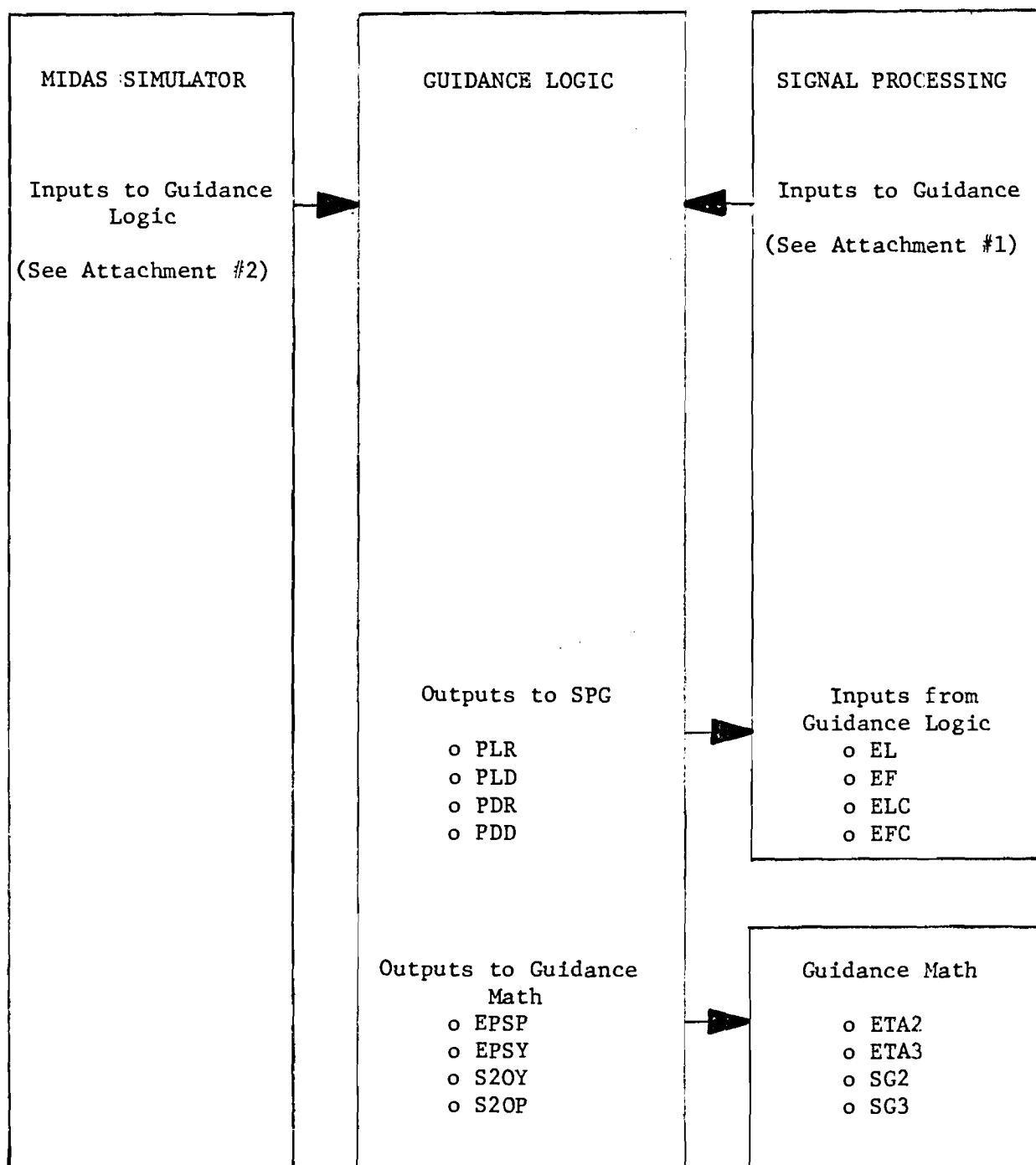


Figure 2. MIDAS Interface with DPSR Guidance Logic

ATTACHMENT 2

Table 1. INTERFACE VARIABLE FROM MIDAS TO DPSR SOFTWARE

Definition	Name			
	DPSR	Location	MIDAS	Subroutine
1. Data Rate	DT (XDT)	ALL	DT	
2. Target Track Type	ENVR	ACK1	IKALT	1
3. Seeker Unit Vector	IA(3)	ACK1	FIA	TE
4. Predicted Range to Missile @ N.U.L.	RMP	LOPFS	PMI	TE
5. Predicted Missile Range Rate @ N.U.L.	RMDP	LOFFS	PMID	TE
6. Predicted Target Range @ N.U.L.	RTP	LOPFS	PTI	TE
7. Predicted Target Range Rate @ N.U.L.	RTDP	LOPFS	PTID	TE
8. Predicted Missile to Target Range @ N.U.L.	RMT	Track	RMTE	
9. Predicted Missile Acceleration @ N.U.L.	RMDDP	CACC	EAM	
10. Predicted Missile Azimuth Angle	SAMP	CCAP	MSM(3)	TE
11. Predicted Missile Elevation Angle	SBMP	CCAP	MSM(2)	TE
12. Time-to-Go	TGO(XTGO)	ACK1	TGO	
13. Flight Time	TIME(XTIME)	ALL	Time	
14. TVM Time	TTVM(XTTVM)	ACK1	TTVM	
15. Missile to Target Unit Vector	UVRMTS(3)	ACK1	UEMT(3)	TE
16. Predicted Missile to Target Unit Vector @ N.U.L.	UVRMT(3)	HWCN	UEMT(3)	TE
17. Predicted Target Velocity @ N.U.L.	VT (XVT)	CACC	VT	
18. Predicted Missile Velocity Vector	VM(3)	HWCN	PVM(3)	TE
19. Closing Velocity	VC	TRACK	EVC	TE
20. Missile to Target Relative Velocity	VREL(3)	CACC	EVMT(3)	TE
21. Predicted Missile Acceleration in X-Axis	XMDDP	CACC	EAM(1)	WCCST
22. Predicted Missile Acceleration in H-Axis	HMDDP	CACC	EAM(2)	WCCST
23. Predicted Missile Acceleration in Z-Axis	ZMDDP	CACC	EAM(3)	WCCST
24. Predicted Missile X-Position @ N.U.L.	XMP	CSAP	PRM(1)	TE
25. Predicted Missile H-Position @ N.U.L.	HMP	CSAP	PRM(2)	TE
26. Predicted Missile Z-Position @ N.U.L.	ZMP	CSAP	PRM(3)	TE
27. Predicted Target X-Position @ N.U.L.	PRTX	CSAP	PRTIL(1)	TE
28. Predicted Target Y-Position @ N.U.L.	PRTY	CSAP	PRTIL(2)	TE
29. Predicted Target Z-Position @ N.U.L.	PRTZ	CSAP	PRTIL(3)	TE

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period December 1 through December 31, 1981.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$1,712.70	-0-
Materials and Supplies	7.10	-0-
Travel	-0-	-0-
Retirement (11.59% of PS)	80.61	-0-
Subtotal	<u>\$1,800.41</u>	<u>-0-</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	990.23	-0-
TOTAL	<u>\$2,790.64</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	695.50	33.0
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	1,017.20	165.0
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$1,712.70</u>	<u>198.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$ 3,264.10	\$ -0-	\$20,316.90
Materials and Supplies	410.00	7.10	-0-	402.90
Travel and Shipping	260.00	-0-	-0-	260.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	177.34	-0-	2,555.66
Overhead	14,841.00	1,896.70	-0-	12,944.30
FUNDING	<u>\$41,825.00</u>	<u>\$5,345.24</u>	<u>-0-</u>	<u>\$36,479.76</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 13% of the proposed task has been completed.

1 30-

Monthly Technical Report No. 4
and
Monthly Cost and Performance Report No. 4

Report Period
1 January through 31 January 1982

Report Prepared On
February 15, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to interface the DPSR guidance logic and the Signal Processing Model with the MIDAS simulator. This integration has required knowledge of both the MIDAS simulator plus the Signal Processing model.

Due to the large increase in the required computer storage for the guidance logic and the signal processing model, the MIDAS simulator was changed to a segmented load structure. This segmented load reduces the storage requirements below 130K words which results in improved computer turn-around time.

The interface logic was structured such that the original MIDAS simulator can be used without either of the modifications (Guidance Logic or Signal Processing) or with any combination of the two additional improvements. However, using the simulator with only one of the modifications is for modeling checkout purposes only since an actual simulation requires both modifications.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The next effort in the task is to complete the interface task and start an analysis effort to exercise each path through the guidance logic including the supporting signal processing model. This process should validate the models against the operation of the guidance logic and the SGM simulation.

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period January 1 through January 31, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$8,273.16	-0-
Materials and Supplies	13.10	-0-
Travel	-0-	-0-
Retirement (11.59% of PS)	865.68	-0-
Subtotal	<u>\$9,151.94</u>	<u>-0-</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	5,033.57	-0-
TOTAL	<u>\$14,185.51</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$7,404.39	349.0
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	804.00	130.0
Secretarial/Clerical/Other	64.77	9.0
TOTAL	<u>\$8,273.16</u>	<u>488.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$11,537.26	\$ -0-	\$12,043.74
Materials and Supplies	410.00	20.20	-0-	389.80
Travel and Shipping	260.00	-0-	-0-	260.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	1,043.02	-0-	1,689.98
Overhead	<u>14,841.00</u>	<u>6,930.27</u>	<u>-0-</u>	<u>7,910.73</u>
FUNDING	\$41,825.00	\$19,530.75	-0-	\$22,294.25

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 53% of the proposed task has been completed.

A-2000

Monthly Technical Report No. 5
and
Monthly Cost and Performance Report No. 5

Report Period
1 February through 28 February 1982

Report Prepared On
March 15, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to analyze the modified MIDAS simulator results. This analysis has been a threefold effort. First, verify the interface logic between MIDAS and the added code to model the DPSR logic and the signal processor. This effort discovered an error in the data transfer due to the variable name "ELD" which is used in "RDGATE" as predicted differential range and in "WCCST" as loop doppler. This error resulted in a large error in time-to-go.

The second effort was to verify the interface between the signal processing model and the DPSR logic. The two basic problems were that certain intermediate power calculations in "MTARG1" were defined as integers which resulted in zero energy in the missile receivers from the targets. Also, the antenna pattern tables were not dimensioned correctly and the weighting functions for the signal processing model were altered to use their absolute values.

Several errors were discovered in the coding of the DPSR logic which resulted in degraded guidance track. The third effort was to exercise the logic against the basic threats and compare the results to that of the SGM and MIDAS simulators. This task is in process at the present time.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The comparison effort between the simulators will be continued for the basic threats and expanded to evaluate each path of the logic. A status meeting is planned for this week with the customer.

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period February 1 through February 28, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$4,329.50	-0-
Materials and Supplies	10.70	-0-
Travel	-0-	\$25.00
Retirement (11.59% of PS)	403.04	-0-
Subtotal	<u>\$4,743.24</u>	<u>\$25.00</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	2,608.78	-0-
TOTAL	<u>\$7,352.02</u>	<u>\$25.00</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	-0-	-0-
Senior Research Scientists/Engineers	\$3,477.50	180.0
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	852.00	152.0
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$4,329.50</u>	<u>332.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$15,866.76	\$ -0-	\$ 7,714.24
Materials and Supplies	410.00	30.90	-0-	379.10
Travel and Shipping	260.00	-0-	25.00	235.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	1,446.06	-0-	1,286.94
Overhead	14,841.00	9,539.05	-0-	5,301.95
FUNDING	<u>\$41,825.00</u>	<u>\$26,882.77</u>	<u>25.00</u>	<u>\$14,917.23</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 64% of the proposed task has been completed.

11-3082

Monthly Technical Report No. 6
and
Monthly Cost and Performance Report No. 6

Report Period
1 March through 31 March 1982

Report Prepared On
April 15, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to validate the modified MIDAS simulator for the basic threats. This analysis uncovered several problems. Some of which are associated with the basic MIDAS simulation such as when to initiate terminal guidance against certain basic threats. The major problem in the basic MIDAS was the RPCC filter was only being initialized and not being used for the remaining portion of the engagement. These two problems were corrected along with an error discovered in the transfer of the target states to the signal processing model.

A presentation was made on March 31 to the PATRIOT Project Office and CAS, Inc. This presentation compared the preliminary results from the modified MIDAS simulator including the DPSR logic and the signal processing model against the SGM and basic MIDAS simulator. The simulator was also upgraded to create plots for this presentation.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The ECM models have not been developed as scheduled. This effort will take priority from now until May 15, 1982. This is the projected completion date for all the ECM model development and validation. The remaining time in the contract after May 15 will be used to validate the overall simulator using H-1, SGM, GTSF simulation results and actual flight test data.

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period March 1 through March 31, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$6,295.20	-0-
Materials and Supplies	7.10	-0-
Travel	-0-	\$25.00
Retirement (11.59% of PS)	454.36	-0-
Subtotal	<u>\$6,756.66</u>	<u>\$25.00</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	3,716.16	-0-
TOTAL	<u>\$10,472.82</u>	<u>\$25.00</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	-0-	-0-
Senior Research Scientists/Engineers	\$3,638.00	171.0
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	2,657.20	432.0
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$6,295.20</u>	<u>603.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$15,866.76	\$ -0-	\$ 1,419.04
Materials and Supplies	410.00	30.90	-0-	372.00
Travel and Shipping	260.00	-0-	25.00	235.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	1,446.06	-0-	832.58
Overhead	14,841.00	9,539.05	-0-	1,585.79
FUNDING	<u>\$41,825.00</u>	<u>\$26,882.77</u>	<u>25.00</u>	<u>\$ 4,444.41</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 89% of the proposed task has been completed.

Monthly Technical Report No. 7
and
Monthly Cost and Performance Report No. 7

Report Period
1 April through 30 April 1982

Report Prepared On
May 14, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to develop and integrate the ECM models into MIDAS. These models of the threat ECM techniques will provide the capability to analyze the ECCM logic resident in the guidance ground software. Most of the models have been completed with the exception being the ECM types which require modeling the effects on surveillance such as the "RFST" filter and the guidance search capability. These models are anticipated to be completed by June 1, 1982.

The eight month status report was completed on May 10, 1982. In this report, the models of the ECM techniques and their effects on the Surveillance and Guidance Systems were discussed in detail along with the noted anomalies detected in the modified MIDAS simulator. These anomalies are being resolved at the present time.

The validation effort has begun for the basic threats, i.e., simulations are being made and a literature search for typical engagements is in progress.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The completion of the ECM models and their effects on Surveillance and Guidance are required prior to the validation of these models. This validation effort and the final report are the remaining tasks to be performed.

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period April 1 through April 30, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$1,605.63	-0-
Materials and Supplies	2.40	-0-
Travel	-0-	\$25.00
Retirement (11.59% of PS)	4.20	-0-
Subtotal	<u>\$1,612.23</u>	<u>\$25.00</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	886.73	-0-
TOTAL	<u>\$2,498.96</u>	<u>\$25.00</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	-0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	1,569.40	255.0
Secretarial/Clerical/Other	36.23	5.0
TOTAL	<u>\$1,605.63</u>	<u>260.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$23,767.59	\$ -0-	\$ (186.59)
Materials and Supplies	410.00	40.40	-0-	369.60
Travel and Shipping	260.00	-0-	25.00	235.00
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	1,904.62	-0-	828.38
Overhead	14,841.00	14,141.94	-0-	699.06
FUNDING	<u>\$41,825.00</u>	<u>\$39,854.55</u>	<u>25.00</u>	<u>\$ 1,945.45</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 95% of the proposed task has been completed.

A-3082

Monthly Technical Report No. 8
and
Monthly Cost and Performance Report No. 8

Report Period
1 May through 31 May 1982

Report Prepared On
June 16, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to evaluate the Patriot guidance system in simulated non-gaussian ECM environments. These ECM models were used to exercise the guidance ECCM logic which has been incorporated into the MIDAS simulator. Several errors were detected in both the ECM models and erroneously programmed DPSR logic plus an error in the MIDAS target track logic for large boresight errors.

The final report was started on June 7, 1982 with a rough draft expected by the week of June 21 - 25. This report will briefly explain the need for this type simulator, define in general the Patriot system and the MIDAS simulator. This report will discuss in detail the four (4) major modifications to the MIDAS simulator as outlined below:

- (1) TVM Signal Processing
- (2) TVM Guidance Emulation Software
- (3) Non-Gaussian ECM for Engaged Targets
- (4) Effects of Non-Gaussian ECM on Surveillance

Also, the simulation results from a large set of threat characteristics including ECM jamming will be compared to other simulations such as SGM, MIDAS, H1 and GTSF plus actual flight test data.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

The completion of the validation of the MIDAS derivative and the preparation of the final report are the remaining tasks to be performed.

NOTE: A contract modification was received on 5/3/82 for \$27,960.24. Expenditures on this sub-budget A-3082-100 are also enclosed.

A-3082 COST INFORMATION

The following charges have been incurred against the contract during the period May 1 through May 31, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$1,168.00	-0-
Materials and Supplies	7.91	-0-
Travel	44.40	\$25.00
Retirement (11.11% of PS)	-0-	-0-
Subtotal	<u>\$1,220.31</u>	<u>\$25.00</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	671.17	-0-
TOTAL	<u>\$1,891.48</u>	<u>\$25.00</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	-0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	\$1,168.00	190.0
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$1,168.00</u>	<u>190.00</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$24,935.59	\$ -0-	\$(1,354.59)
Materials and Supplies	410.00	48.31	-0-	361.69
Travel and Shipping	260.00	44.40	25.00	190.60
Equipment	-0-	-0-	-0-	-0-
Retirement	2,733.00	1,904.62	-0-	828.38
Overhead	14,841.00	14,813.11	-0-	27.89
FUNDING	<u>\$41,825.00</u>	<u>\$41,746.03</u>	<u>\$25.00</u>	<u>\$ 53.97</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 99% of the proposed task has been completed.

A-3082-100 COST INFORMATION

The following charges have been incurred against the contract during the period May 3 through May 31, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$4,136.80	-0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Retirement (11.59% of PS)	423.82	-0-
Subtotal	<u>\$4,560.62</u>	<u>-0-</u>
Equipment	-0-	-0-
Overhead (at 55% of Subtotal)	2,508.34	-0-
TOTAL	<u>\$7,068.96</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	3,477.50	160.00
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	\$ 480.00	80.00
Secretarial/Clerical/Other	179.30	25.00
TOTAL	<u>\$4,136.80</u>	<u>265.00</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$10,402.90	\$4,136.80	\$ -0-	\$ 6,266.10
Materials and Supplies	150.00	-0-	-0-	150.00
Travel and Shipping	-0-	-0-	-0-	-0-
Retirement	1,034.35	423.82	-0-	610.53
Overhead	6,372.99	2,508.34	-0-	3,864.65
FUNDING	<u>\$17,960.24</u>	<u>\$ 7,068.96</u>	<u>-0-</u>	<u>\$10,891.28</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 39% of the proposed task has been completed.

A-21254

Monthly Technical Report No. 9
and
Monthly Cost and Performance Report No. 9

Report Period
June 1 through June 30, 1982

Report Prepared
July 16, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

During this reporting period, the main effort has been to complete the development of the Patriot ECCM Guidance Simulator (PEGS) and prepare the final report. The rough draft was given to CAS, Inc. on June 24, 1982.

The validation effort will include results from the basic threats plus each of the postulated ECM threats modeled in the PEGS simulator. The results from each of the cases will be documented in the Final Report which will be published on July 7, 1982.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

Complete the final report.

NOTE: A contract modification was received on May 3, 1982 for \$17,960.24. Expenditures on this sub-budget A-3082-100 are also enclosed.

A-3082-000 COST INFORMATION

The following charges have been incurred against the contract during the period June 1, through June 30, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$ 0.00	-0-
Materials and Supplies	2.64	-0-
Travel	0.00	-0-
Retirement (11.59% of PS)	0.00	-0-
Subtotal	<u>\$ 2.64</u>	<u>-0-</u>
Equipment	0.00	-0-
Overhead (@ 55% of Subtotal)	1.45	-0-
TOTAL	<u>\$ 4.09</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Man Hours</u>
Principal Research Scientists/Engineers	-0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>-0-</u>	<u>-0-</u>

The current financial status of the contract is as follows:

	<u>Budget as Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services (PS)	\$23,581.00	\$24,935.59	-0-	\$(1,354.59)
Materials and Supplies	410.00	50.95	-0-	359.05
Travel and Shipping	260.00	44.40	-0-	215.60
Equipment	00.00	00.00	-0-	00.00
Retirement	2,841.00	1,904.62	-0-	828.38
Overhead	<u>14,841.00</u>	<u>14,814.56</u>	<u>-0-</u>	<u>26.44</u>
FUNDING	\$41,825.00	\$41,750.12	-0-	\$ 74.88

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 100% of the proposed task has been completed.

A-3082-100 COST INFORMATION

The following charges have been incurred against the contract during the period June 1, through June 30, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$ 5,695.55	-0-
Materials and Supplies	49.60	-0-
Travel	00.00	-0-
Retirement (11.59% of PS)	501.46	-0-
Subtotal	<u>\$ 6,246.61</u>	<u>-0-</u>
Equipment	00.00	-0-
Overhead (@ 55% of Subtotal)	3,435.64	-0-
TOTAL	<u>\$ 9,682.25</u>	<u>-0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Man Hours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	3,477.50	150.0
Research Scientists II/Engineers II	718.68	30.0
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	1,104.00	170.0
Secretarial/Clerical/Other	395.37	55.0
TOTAL	<u>\$5,695.55</u>	<u>405.0</u>

The current financial status of the contract is as follows:

	<u>Budget as Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services (PS)	\$10,402.90	\$ 9,832.35	-0-	\$ 570.55
Materials and Supplies	150.00	49.60	-0-	100.40
Travel and Shipping	00.00	00.00	-0-	00.00
Retirement	1,034.35	925.28	-0-	109.07
Overhead	6,372.99	5,943.98	-0-	429.01
FUNDING	<u>\$17,960.24</u>	<u>\$16,751.21</u>	<u>-0-</u>	<u>\$1,209.03</u>

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 93% of the proposed task has been completed.

Monthly Technical Report No. 10
and
Monthly Cost and Performance Report No. 10

Report Period
July 1 through July 7, 1982

Report Prepared
August 18, 1982

PATRIOT GUIDANCE ANALYSIS

J. W. Dalton

Contract No. DAAH01-81-C-B190-001
Delivery Order No. 024
EES Project A-3082

Effective Date: 10/01/81
Expiration Date: 07/07/82

Prepared for

CAS, Incorporated
Huntsville, Alabama 35805

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS REPORTING PERIOD

The Final Report was completed on July 7, 1982. A preliminary copy was delivered to CAS, Inc. on July 8, 1982.

PROBLEMS ENCOUNTERED

None

WORK TO BE PERFORMED

Publish final Report

NOTE: A contract modification was received on May 3, 1982 for \$17,960.24. Expenditures on this sub-budget A-3082-100 are also enclosed.

A-3082-100 COST INFORMATION

The following charges have been incurred against the contract during the period July 1 through July 7, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$377.17	\$ -0-
Fringe Benefits	76.45	-0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Subtotal	<u>\$453.62</u>	<u>\$ -0-</u>
Equipment	-0-	-0-
Overhead (at 47.2% of Subtotal)	214.11	-0-
TOTAL	<u>\$667.73</u>	<u>\$ -0-</u>

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	377.17	20.0
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	<u>\$377.17</u>	<u>20.0</u>

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$10,402.90	\$10,209.52	\$ -0-	\$193.38
Fringe Benefits	1,034.35	1,001.73	-0-	32.62
Materials and Supplies	150.00	49.60	-0-	100.40
Travel	-0-	-0-	-0-	-0-
Equipment	-0-	-0-	-0-	-0-
Overhead	<u>6,372.99</u>	<u>6,158.09</u>	<u>-0-</u>	<u>214.90</u>
FUNDING	\$17,960.24	\$17,418.94	\$ -0-	\$541.30

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. Approximately 98% of the proposed task has been completed.

A-3082-000 COST INFORMATION

The following charges have been incurred against the contract during the period July 1 through July 7, 1982.

	<u>Expended</u>	<u>Encumbered</u>
Personal Services (PS)	\$ -0-	\$ -0-
Fringe Benefits	-0-	-0-
Materials and Supplies	6.70	-0-
Travel	-0-	-0-
Subtotal	\$ 6.70	\$ -0-
Equipment	-0-	-0-
Overhead (at 47.2% of Subtotal)	3.16	-0-
TOTAL	\$ 9.86	\$ -0-

The breakdown of personal services is as follows:

	<u>Dollars</u>	<u>Approximate Manhours</u>
Principal Research Scientists/Engineers	\$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	\$ -0-	-0-

The current financial status of the contract is as follows:

	<u>Budget As Proposed</u>	<u>Expended</u>	<u>Encumbered</u>	<u>Free Balance</u>
Personal Services	\$23,581.00	\$24,935.59	\$ -0-	\$(1,354.59)
Fringe Benefits	2,733.00	1,904.62	-0-	828.38
Materials and Supplies	410.00	57.65	-0-	352.35
Travel	260.00	44.40	-0-	215.60
Equipment	-0-	-0-	-0-	-0-
Overhead	14,841.00	14,817.72	-0-	23.28
 FUNDING	 \$41,825.00	 \$41,759.98	 \$ -0-	 \$ 65.02

Based on present full funding, the funding and equivalent manhours are sufficient to complete the task. 100% of the proposed task has been completed.