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**RISK ANALYSIS OF THE 155MM
CANNON-LAUNCHED GUIDED PROJECTILE**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A risk analysis of the schedule and cost associated with the development of the Army 155mm CLGP was performed. The time frame considered for this analysis is "Begin Engineering Development" in July 1975 to "Multi-Year Buy". This analysis is an extension of one performed in Dec 74 and is in preparation for an ASARC/DSARC III. The VERT risk analysis technique was employed to perform the analysis.		

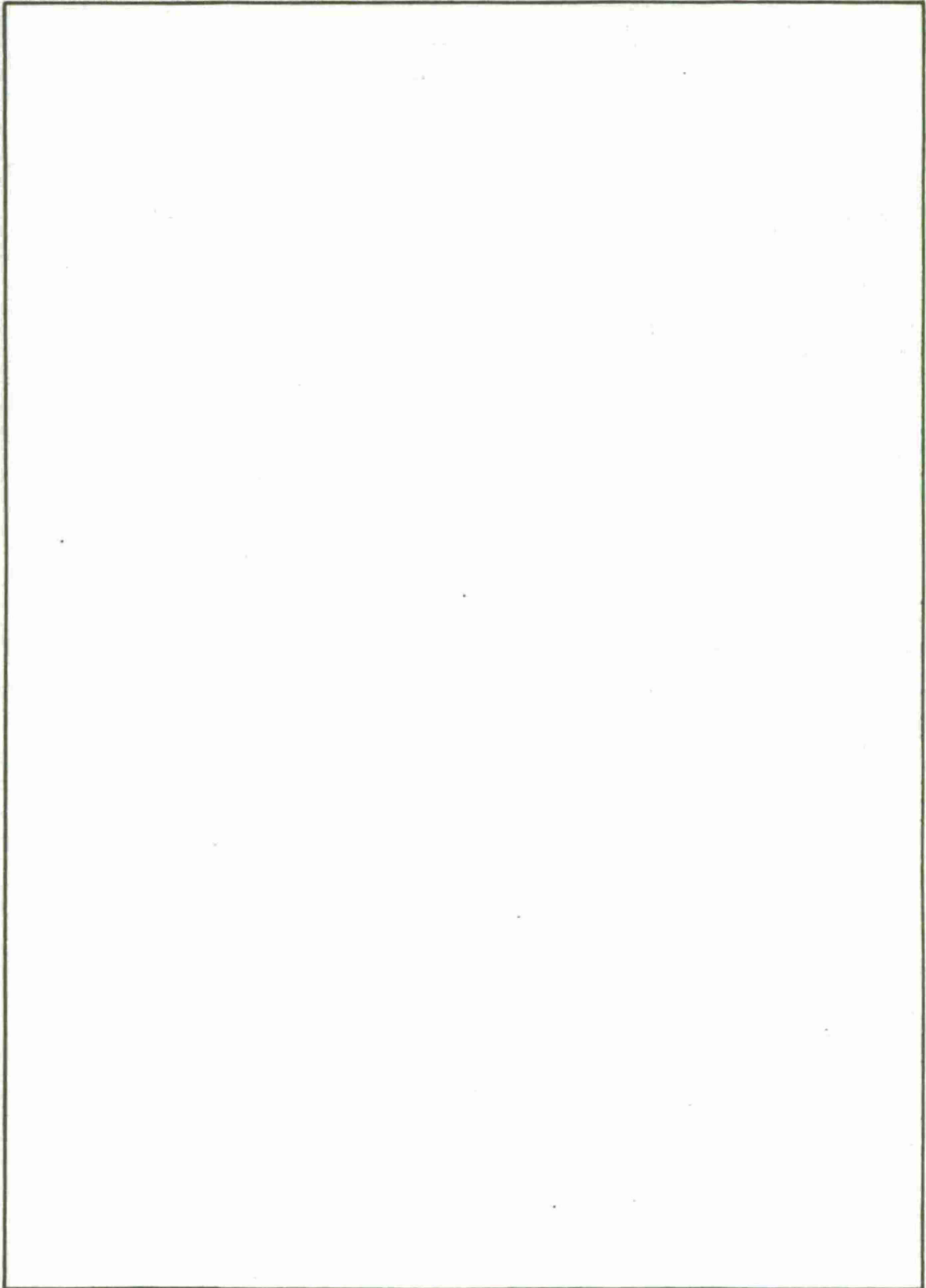
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OBJECTIVE

This note updates the Cannon-Launched Guided Projectile (CLGP) Risk Analysis (AMSAR/SA/N-30) which was completed in December 1974. This update includes modifications to the CLGP base-line program, of which one modification is an additional Low Rate Initial Production (LRIP) contractor.

INTRODUCTION

This analysis examines the cost/schedule uncertainties of the major activities and probability of success of the CLGP program from the beginning of Engineering Development (ED) to awarding of the Multi-Year Buy (MYB).

A network technique was used to examine the effects of activities which consume time and cost resources on the CLGP program. Statistical distributions were used to subjectively quantify schedule uncertainties. The cost uncertainties for each activity were considered either constant or time related.

ANALYSIS

Figure 1 presents the network model of the CLGP program. Table 1 presents the estimated cost and time data for each activity and probability of redesign efforts or program termination.

This network differs from the CLGP milestone chart in two respects: (1) Following each test (i.e., DT/OT II, DT/OT III, and IPT) the program may enter a redesign phase or terminate. A redesign effort would correct the deficiencies before the scheduled program is continued. (2) One or both LRIP contractors may fail to produce acceptable hardware. Failure of one will not terminate the program; however, termination will occur if both fail.

RESULTS

Table 2 presents the expected time and cost with 90% confidence intervals and the probability of occurrence of each outcome. The possible outcomes are as follows:

Awarding of MYB

1. Both Contractors Succeed - The LRIP contractors have proven the producibility of acceptable hardware.
2. Only One Contractor Succeeds - Only one LRIP contractor has proven producibility.

Termination of Program

3. Both Contractors Failed - LRIP hardware produced was not acceptable.

4. ASARC/DSARC III Decision - Program terminated after evaluation of DT/OT II performance data.

The probability of completing the program from ED to MYB with two LRIP contractors is approximately 84%. The expected time and cost is 92 months and \$321M.

The probability of completing the program with only one contractor is approximately 11%. The expected time and cost is 89 months and \$264M.

Program termination can occur by both contractors failing (i.e., LRIP test failures) or an ASARC/DSARC III decision after DT/OT II. The probability of both contractors failing is approximately 0.3% at an expected time of 75 months and an expected cost of \$206M. The probability is approximately 5% that a decision would occur to terminate the program at ASARC/DSARC III at an expected time of 45 months and cost of \$106M.

CONCLUSIONS

The time and cost of the CLGP base line program from the beginning of ED to the awarding of MYB is 83 months and \$313.9M. As indicated by the results, the probability that both LRIP contractors will produce acceptable hardware is approximately 85%; however, the award of MYB is expected to be delayed by 9 months at a cost overrun of \$9M. There is approximately 5% probability of meeting the base line cost and schedule. There is a 95% probability that the program will be completed to the MYB award with at least one acceptable LRIP contractor.

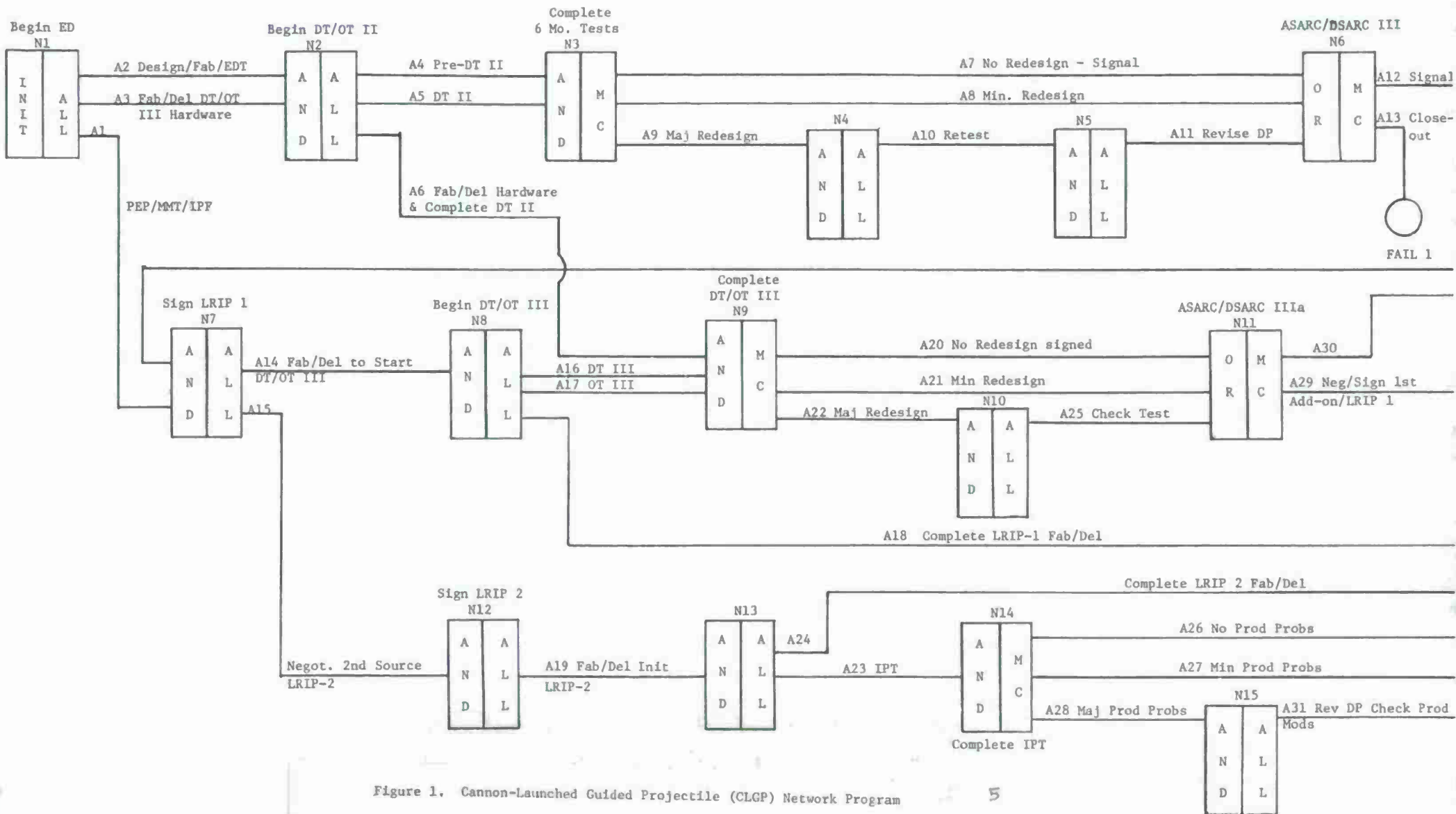


Figure 1. Cannon-Launched Guided Projectile (CLGP) Network Program

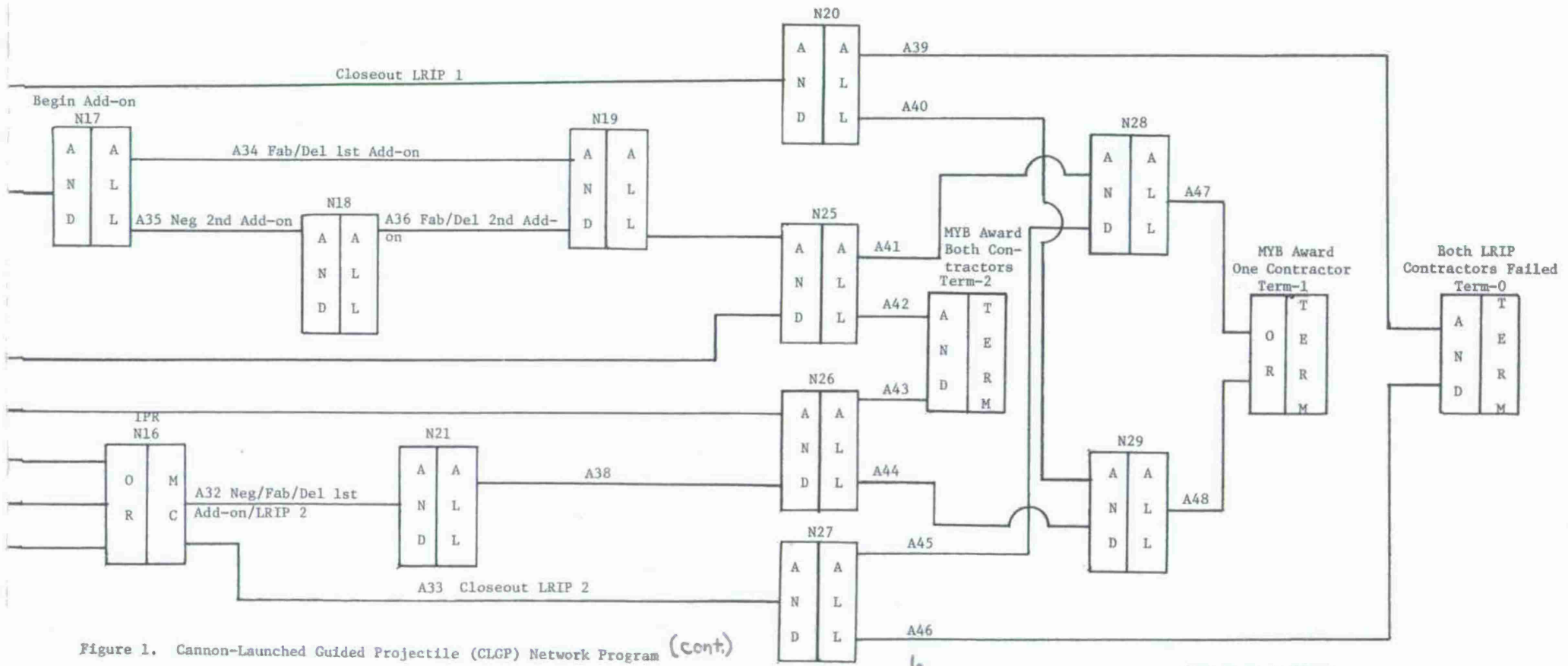


Figure 1. Cannon-Launched Guided Projectile (CLGP) Network Program (cont.)

TABLE 1. CLGP COST/SCHEDULE DATA

No.	Description of Activity	Prob.	Time (Mo) (T)			Cost Function (\$K)
			Min	Max	ML	
A1	Conduct PEP & MMT		29	33	30	468.8T+30794
A2	Design, fabricate, and test ED hardware		23	30	26	189T+11802
A3	Fabricate & deliver DT/OT II Items		11	17	14	160T+11998
A4	Conduct Pre-DT II		5	8	6	1928
A5	Conduct OT II		2	4	3	1641
A6	Fabricate & deliver remaining ED hardware & complete DT II (less A3 & A4)		11	17	15	352.5T+15805
A7	No redesign - signal	0.40				
A8	Minimum redesign (No retest required)	0.45	2	6	4	352.5T
A9	Major redesign	0.15	4	12	6	352.5T+11998
A10	Retest if major redesign		3	5	3	1928
A11	Revise DP and documentation		1	3	2	
A12	Signal	0.95				
A13	Closeout activity if project fails	0.05	6	12	9	330T
A14	Fabricate & deliver enough LRIP-1 item to begin DT/OT III		10	15	12	204.2T+3196.8
A15	Negotiate 2nd source for LRIP-2		6	8	6	
A16	Conduct DT III		4	6	5	2518
A17	Conduct OT III		2	4	3	300
A18	Complete fabrication & deliver LRIP-1		18	26	20	194T+60738
A19	Fabricate & deliver initial LRIP-2 items		10	16	12	212T+1995
A20	No redesign after DT/OT III	0.65				
A21	Minimum redesign due to production problems as well as design problems	0.30	2	5	3	212T

TABLE 1. (Con't)

No.	Description of Activity	Prob.	Time (Mo) (T)			Cost Function (\$K)
			Min	Max	ML	
A22	Major redesign	0.05	5	10	7	212T+1995
A23	IPT LRIP-2 items and evaluate		4	7	5	1750
A24	Complete fabrication/deliver LRIP-2		9	13	9	212T+34279
A25	Check test after major redesign of LRIP-1 item		1	3	2	1300
A26	No production problems after IPT	0.10				
A27	Minimum production problems after LRIP-2	0.60	2	4	3	212T
A28	Major production problems after LRIP-2	0.30	6	11	9	212T+1995
A29	Negotiate and sign LRIP-1 add-on buy	0.95	4	5	4	
A30	Closeout activity if LRIP-1 fails	0.05	6	12	9	330T+6700+3459T (A18) ^a
A31	Check production modification of LRIP-2		1	3	2	1000
A32	Negotiate/fabricate/deliver 1st add-on buy to LRIP-2	0.95	18	24	20	180.7T+35933
A33	Closeout activity if LRIP-2 fails	0.05	6	12	9	330T+8.3+4047T (A24) ^a
A34	Fabrication and deliver 1st add-on buy to LRIP-1		18	24	20	180.7T+35933
A35	Negotiate and sign 2nd add-on buy to LRIP-1		4	5	4	
A36	Fabricate and deliver 2nd add-on buy to LRIP-1		24	32	27	194T+13700
A37 thru A48	Signal arcs					

^aSunk cost of LRIP production (A18 or A24)
at time of contractor close out (A30 or A33).

TABLE 2. CLGP - COST/SCHEDULE ANALYSIS WITH UNCERTAINTIES

(From Engineering Development, July 1975, to Awarding Multi-Year Buy)

<u>POSSIBLE OUTCOMES</u>	<u>PROBABILITY OF OCCURRENCE</u>	<u>TIME (Mo)</u>				<u>COST (\$M)</u>	
		<u>5%^a</u>	<u>EXPECTED</u>	<u>95%^b</u>	<u>5%^a</u>	<u>EXPECTED</u>	<u>95%^b</u>
<u>Award of MYB</u>							
Both Contractors Succeed	.842	83	92	102	314	321	334
Only One Contractor Succeeds	.107	80	89	100	244	264	289
<u>Termination of Program</u>							
Both Contractors Failed	.003	67	75	87	182	206	240
ASARC/DSARC III Decision	.048	39	45	56	101	106	119

^aThere is a 5% chance that the value will be less than displayed value.

^bThere is a 95% chance that the value will be less than displayed value.

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