KSC SPEC-G-0003

GROUND SUPPORT EQUIPMENT COST ESTIMATING, SPECIFICATION FOR

PCN 80111

July 5, 1977

DESIGN ENGINEERING DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center

NASA

GROUND SUPPORT EQUIPMENT COST ESTIMATING, SPECIFICATION FOR

This specification has been approved by the Design Engineering Directorate of the John F. Kennedy Space Center and is mandatory for use by KSC and associated contractors.

Approved:

Raymond L. Clark
Director of Design Engineering

July 5, 1977

JOHN F. KENNEDY SPACE CENTER, NASA

TABLE OF CONTENTS

1.0 SCOPE

1.1 Purpose. This specification prescribes the requirements for the preparation of Ground Support Equipment (GSE) cost estimates and establishes uniform practices for cost estimating preparation.

1.2 Application. This specification applies to all GSE under the responsibility of John F. Kennedy Space Center (KSC). All GSE installation and operational end items shall be estimated according to this specification. GSE is any equipment that is manufactured and can be used as Government furnished equipment on construction of facility (C of F) contracts, or for installation of operational end items by an operational and maintenance organization. Components fully assembled are also considered GSE. All construction GSE shall be estimated in accordance with KSC-SPEC-G-0002, Specification for Compiling Construction Cost Estimates and TR-1495, KSC Estimating Orientation.

1.3 GSE. GSE shall be classified according to one of the following functional designations (see TR-1287, KSC Support Equipment List):

1.3.1 Servicing. The servicing support equipment is defined as equipment capable of supplying fluids, gases, and ground power/generation (electrical, hydraulic, and pneumatic) to the flight hardware and/or associated GSE. Typical are the functions of transferring, flushing, purging, conditioning, vapor disposal, and decontamination.

1.3.2 Checkout and Test. The checkout and test support equipment is defined as equipment required in all test and checkout of flight hardware and associated GSE. Typical in this area are stimuli monitoring and evaluation equipment.

1.3.3 Handling and Transportation. The handling and transportation equipment is defined as equipment required for movement and support of flight hardware. Typical in this area are slings, dollies, trailers, and support stands.

1.3.4 Auxiliary. Auxiliary equipment is defined as that equipment that aligns, protects and calibrates flight hardware. This equipment includes, but is not limited to, protective devices and alignment and calibration sets.

1.3.5 Uncategorized. Miscellaneous equipment that does not fit the other categories and is required to support test, checkout, and launch operations falls in this category.

2.0 APPLICABLE DOCUMENTS

The following documents, of the latest issue, provide reference materials for guidance on preparing cost estimates. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall take precedence.

2.1 Government Publications.

John F. Kennedy Space Center (KSC)

KSC-SPEC-G-0002	Specification for Compiling Construction Cost Estimates
TR-1495	KSC Estimating Orientation
TR-1287	KSC Support Equipment List
DE-ID 1142.23	Implementing Directive for Special Handling Information on Procurement of Products and Services
NMI 7330.2	Management Instruction, Preliminary Engineering for NASA Facility Projects
TR-1508	Budget Cost Data For Facilities Construction Elements
TR-1511	KSC Monthly Facility Construction Cost Index

Department of Labor, Bureau of Labor Statistics

Bulletin 917	Handbook of Work and Output

Occupational Safety and Health Administration (OSHA)

Occupational Safety and Health Act, Volume III

2.2 Pricing Information Sources. Estimators shall have ready access to reference books, catalogs, and other documents usable as sources of current price information. Source documents recommended for use in compiling cost estimates for NASA/KSC projects are as follows:

General Estimating Publications

AACE-Twenty Year Publication Index 1956-1975	American Association of Cost Engineering, Morgantown, W.Va.
Cost and Optimization Engineering	F. C. Jelen, Lamar University, Beaumont, Tex.

Engineering News Record	McGraw-Hill, Inc., N.Y.,N.Y.
Net Prices Catalog	McMaster-Carr Supply Company, Chicago, Ill.
Process Plant Construction Estimating Standard	Richardson Engineering Service, Inc., Solana Bch., Calif.

Mechanical Estimating Publications

Bigham Insulation and Supply Co. Inc.	A. D. Bigham, Fort Lauderdale, Fla.
Cost Manual for Piping and Construction	H. Herkimer-Chemical Pub., N.Y., N.Y.
Crosby Laughlin - Cat. No. 950-6	Tulsa, Okla.
Lebus - Cat. No. 950-6	Tulsa, Okla.
Limitorque Catalog	Lynchburg, Va.
Machine Shop Estimating	Nordhoff, McGraw-Hill, N.Y., N.Y.
Mechanical Estimating Guidebook	John Gladstone, McGraw-Hill, N.Y., N.Y.
Mechanical Estimating Handbook	Craftman, Solana Beach, Calif.
Process Plant Estimating, Evaluation and Control	K. Guthrie, Craftman, Solana Beach, Calif.
The Crosby Ground Engineering Journal	No. ET-76, Tulsa, Okla.

Electrical Estimating Publications

Cramer Magnacraft	Cramer, Orlando, Fla.
Electrical Engineers Master Catalog (EEM)	United Technical Publishers, Garden City, N.Y.
Electronic Industry Cost Estimating Data	Hartmeyer-Ronald Press, N.Y., N.Y.
Engineering Manual and Purchasing Guide	Allied Electronics, Ft. Worth, Tex.

Graybar Catalog	Graybar Electr., N.Y., N.Y.
Newark Electronics	Fort Lauderdale, Fla.

(Copies of the above listed documents are available through the KSC Library, Engineering Documentation Center, or KSC Cost Engineer.)

3.0 REQUIREMENTS

GSE cost estimating shall be accomplished in accordance with the following requirements.

3.1 Estimating Practices. A cost estimate is required for each design review, final design, and final government estimate for each procurement. The final government estimate shall include costs for special conditions and amendments.

3.1.1 Safeguarding Estimates and Supporting Data. Preparation of estimates for NASA/KSC shall be considered, at all times, as administratively confidential work (see DE-ID 1142.23). Records, interdepartmental and interagency correspondence, or material that in any way relates to preparation of estimates for NASA/KSC shall be accessible only to authorized NASA/KSC personnel or representatives. Code G-100 cost estimates shall be stamped FOR OFFICIAL USE ONLY. Supporting data that are not attached to the bid schedule estimates due to their bulky nature shall be retained under appropriate security measures. After bid opening, a copy of the supporting data shall be furnished to the NASA/KSC Procurement Office for evaluating contractor requests for payment and as an aid in negotiations.

3.1.2 Cancellation of Protective Markings. Protective markings on cost estimates shall be cancelled immediately after the announcement of the successful bidder.

3.1.3 Code Classification. Eight different types of cost estimates are used at KSC. Each type relates to a specific phase of a GSE project as follows:

3.1.3.1 Code G-1, Budget Cost Estimate. The Code G-1 budget cost estimate is used for project authorization. It is the initial determination of the project that can be completed for a stipulated monetary amount and serves as a basis for overall program planning and control, for establishing equitable design fees, and for comparative cost analyses.

The cost estimate shall be prepared using NASA/KSC Form 1510 or other forms as specified by NASA/KSC. Budget confidence factor shall be noted. General and Administrative (G&A) costs and profit should be included in Engineering Unit Costs.

3.1.3.2 Code G-2, Study or Preliminary Engineering Report (PER) Estimate. The Study or PER is the product of detailed analyses of user requirements determining a concept resulting in lowest possible life cycle cost for the GSE work proposed. The Study or PER incorporates all information needed to formulate a basis for design and includes the basis for requirements, analyses of GSE, evaluation of different approaches and recommended solutions, a detailed cost estimate that accommodates additional and reasonable cost escalation and contingency factors, drawings, schematics, equipment lists, etc.

Cost estimates for studies or PER's shall be prepared using KSC Form 21-193 and in accordance with NASA Management Instruction NMI 7330.2. The development of the estimated cost for design and engineering services shall be included with the estimate submittal.

3.1.3.3 Code G-U, Labor and Materials Unit Cost Estimate. Code G-U is based on combined unit labor and materials plus mark up.

These estimates may be required at any predetermined milestone established by the Lead Design Engineer in the design process up to and including the 49-percent point of design completion of design documents used for compiling the estimates. For example, an estimate prepared from 30-percent review design documents would be identified as a Code G-U-30 cost estimate.

Code G-U estimates shall be prepared using KSC Form 21-224, which combines costs for labor and materials into single unit costs.

3.1.3.4 Code G, GSE Cost Estimate. Code G estimates show separate costs for labor and materials associated with each divisional task estimated for GSE. Unless otherwise specified, they shall be prepared for the 30-, 60-, and 90-percent review milestones or as often as directed by the cognizant NASA/KSC lead designer. The code designation shall indicate the design review milestone (G-30, G-60, and G-90). Prices shown in cost breakdown shall be in the greatest detail possible.

Code G cost estimates shall be prepared using KSC Form 21-243. As required for code G-U estimates, code G estimates shall indicate the degree of completion of source design documents.

3.1.3.5 Code G-95, GSE Cost Estimate. This reflects the final estimate of project design or 100-percent design.

Code G-95 cost estimates shall be prepared using KSC Form 21-243. As required for code G-U estimates, code G-95 estimates shall indicate the degree of completion of source design documents.

3.1.3.6 Code G-100, GSE Cost Estimate. This estimate often called the final or Government Estimate, is a G-95 cost estimate to which costs for bid documentation and all special conditions and amendments have been added.

Code G-100 cost estimates shall be prepared using KSC Form 21-243.

3.1.3.7 Code G-CO, Change Order Cost Estimate. Code G-CO cost estimates are used to determine cost of proposed changes and supplemental work to existing contracts and to support negotiations for additions and deletions.

Code G-CO cost estimates require considerably more detail than final design estimates. It may be desirable to organize the NASA/KSC estimate in accordance with the format used by the contractor to facilitate rapid resolution of cost differences existing between the two estimates and the contractors proposal. Code G-CO cost estimates in final form, shall however, conform to requirements of this specification. The code designation shall indicate the review milestone (G-CO-30, G-CO-60, G-CO-95, and G-100). The degree of completion of source design documents shall also be indicated in the estimate.

Timing and issuance of contract change orders for which Code G-CO cost estimates are required are important factors. All facets of the work shall be studied, including status of materials, procurement by the contractor, change order impact on the contractor's work progress program, and other factors that may influence overall project costs.

3.1.3.8 Code G-O, (Other) Cost Estimate. Code G-O estimates are compiled as specified by NASA/KSC to support special studies, surveys, program analyses, and effective GSE cost management. Format, item identifications, pricing, organization, and coverage shall be as specified by the Lead Designer.

3.1.4 Forms. NASA/KSC forms shall be used in preparation of GSE cost estimates.

3.1.5 General Practices.

3.1.5.1 Levels of Costing. The costing of GSE shall be accomplished at the following levels:

(a) Production Quantities (Off-the-Shelf items)

(b) Preproduction or Prototype Modifications to design units

(c) Research and Development

(d) Others

Consideration shall be given as to whether a unit will be fabricated by an in-house contractor or one not on site at KSC.

3.1.5.1.1 Confidence Factor. Design allowances shall be applied based on the complexity of the unit. A confidence factor should be considered to help determine accuracy in the four levels of budget estimates as follows:

(a) Production Quantities (Off-the-Shelf items) = ± 15 percent

(1) Minor changes, such as nameplates or indicator lights
(2) Escalation

(b) Preproduction or Prototype Modifications to design units = ± 50 percent

(1) Variation of design
(2) Based on rework, such as adding or deleting components or scope changes in units
(3) Escalation

(c) Research and Development = ± 100 percent

(1) Conceptual (never designed or built)
(2) Escalation

(d) Others = ± 100 to 500 percent

(1) Complexities
(2) Advanced technology
(3) Escalation

3.2 Work Flow. The steps necessary for the preparation and approval of a GSE cost estimate are shown in Figures 1 and 2.

4.0 PREPARATION OF THE ESTIMATE

4.1 General Instructions. Cost estimates shall be prepared on the forms cited in this specification. Originals shall be neatly prepared in pencil and on forms that are reproducible by dry bond (Photostat) type copying process. Originals and four copies shall be delivered to the Lead Designer or KSC Cost Engineer.

4.1.1 Contingencies. Design, estimating, or engineering contingencies shall not appear in a detail estimate.

4.2 Compilation and Submittal. Cost estimates shall be compiled and processed as required for the 30-, 60-, 90-, and 100-percent cost estimates in accordance with the applicable directives.

4.3 Acceptance Criteria. Cost estimates shall be prepared and formatted in accordance with this specification. General criteria to be used in the preparation are as follows:

a. Cost estimates for all codes shall be prepared in the same careful manner as if NASA/KSC were bidding in competition with prudent, experienced, and well-equipped private contractors.

b. Estimates shall be broken down in as much detail as possible. The greater the estimated cost, the greater detail required in the cost breakdown. Costs over $1,000 are to be broken down in more detail

with backup data, quotes, analyses, and evaluation. Cost breakdowns shall indicate materials by individual type, kind, and size and current labor rates.

c. Estimated costs shall be based on current prices from reliable sources. A comparison of all major labor and material prices shall be made against current prices for similar features of work and adjusted for differences in site, local vendors, and sub-contractor prices. The date and source of comparison shall be noted on the estimate sheet. If quoted prices or studies of conditions in the geographical area show labor and material costs varying considerably from those in published pricing guides, costs resulting from specific evaluation of job site conditions shall be used. Excessive price variations shall be investigated and justified.

d. Estimates shall cover all work shown or implied on the plans, specifications, and other pertinent documents. The estimator/cost engineer shall obtain the information to estimate the project in the detail required.

e. Items off-the-shelf shall be costed. The total delivered cost for off-the-shelf (commercial) equipment and devices shall be shown as material dollars on KSC Form 21-370.

f. Each and every cost total shall be rounded to the nearest dollar.

g. All mechanical and electrical labor shall be estimated in manhours and marked up with current G and A overhead, profit, and warranty. Labor rates shall be based on a normal 40-hour week, and shall provide for adjustments if overtime is anticipated (see TR 1508, Budget Cost Data For Facilities Construction Elements and TR 1511, KSC Monthly Facility Construction Cost Index for labor rates).

h. Direct quotations shall be obtained from KSC-reliable sources (those companies who have successfully completed projects for KSC/NASA and/or have the capability and intention to bid on new projects), when no published prices are available, to verify estimated prices, and for unusual applications of products and equipment. To the extent possible, quotes shall only be used to verify estimated prices and shall not be substituted for estimated prices.

i. Lump sums may appear in Budget and Preliminary Engineering Estimates; however, they shall not be used in detail cost estimates since they cannot be properly evaluated.

j. When a Government estimate varies 15 percent or more from the low bid, a detailed review and critique shall be required from the firm or agency responsible for the Government estimate. When errors in fact or judgment are uncovered, or when the scope of work changes subsequent to NASA/KSC approval, the estimate shall be revised in accordance with KSC-SPEC-G-0002, paragraph 4.20. This review and critique shall be used in the evaluation of the bidder's proposal.

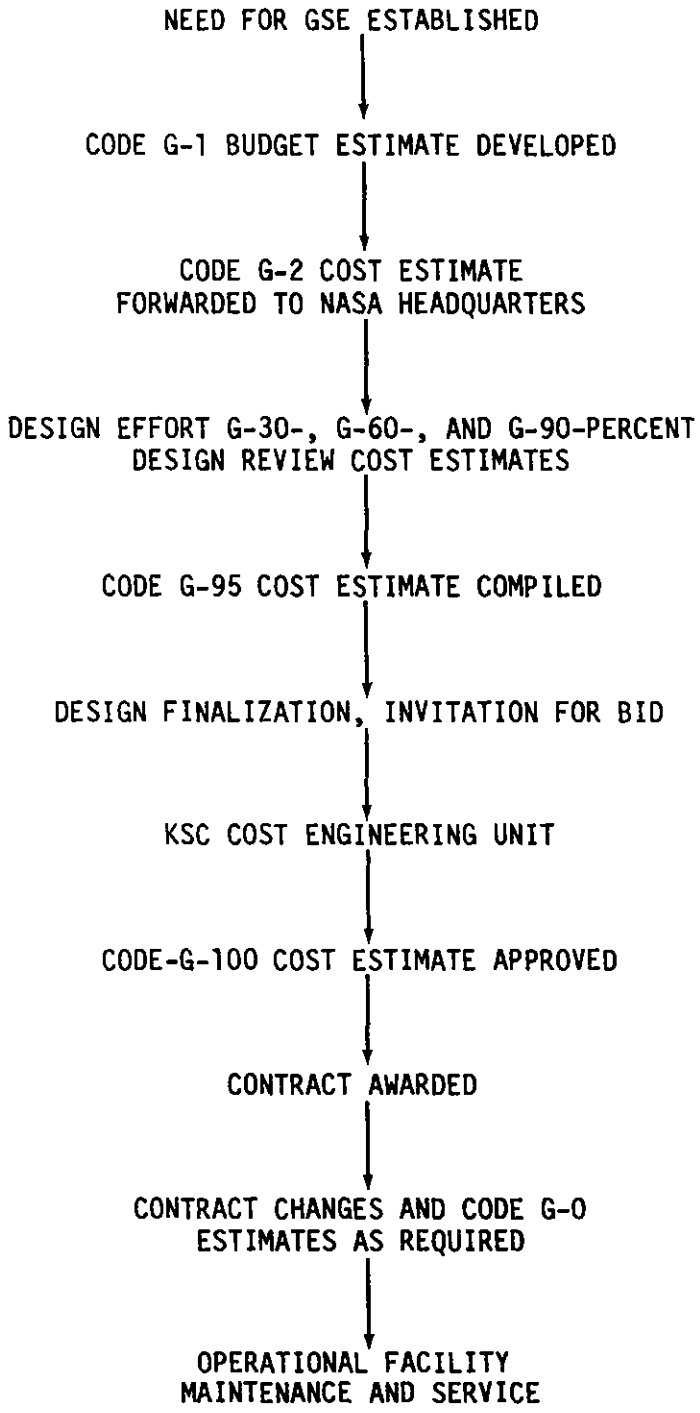

Figure 1. Idealized Flow Plan for Major KSC GSE

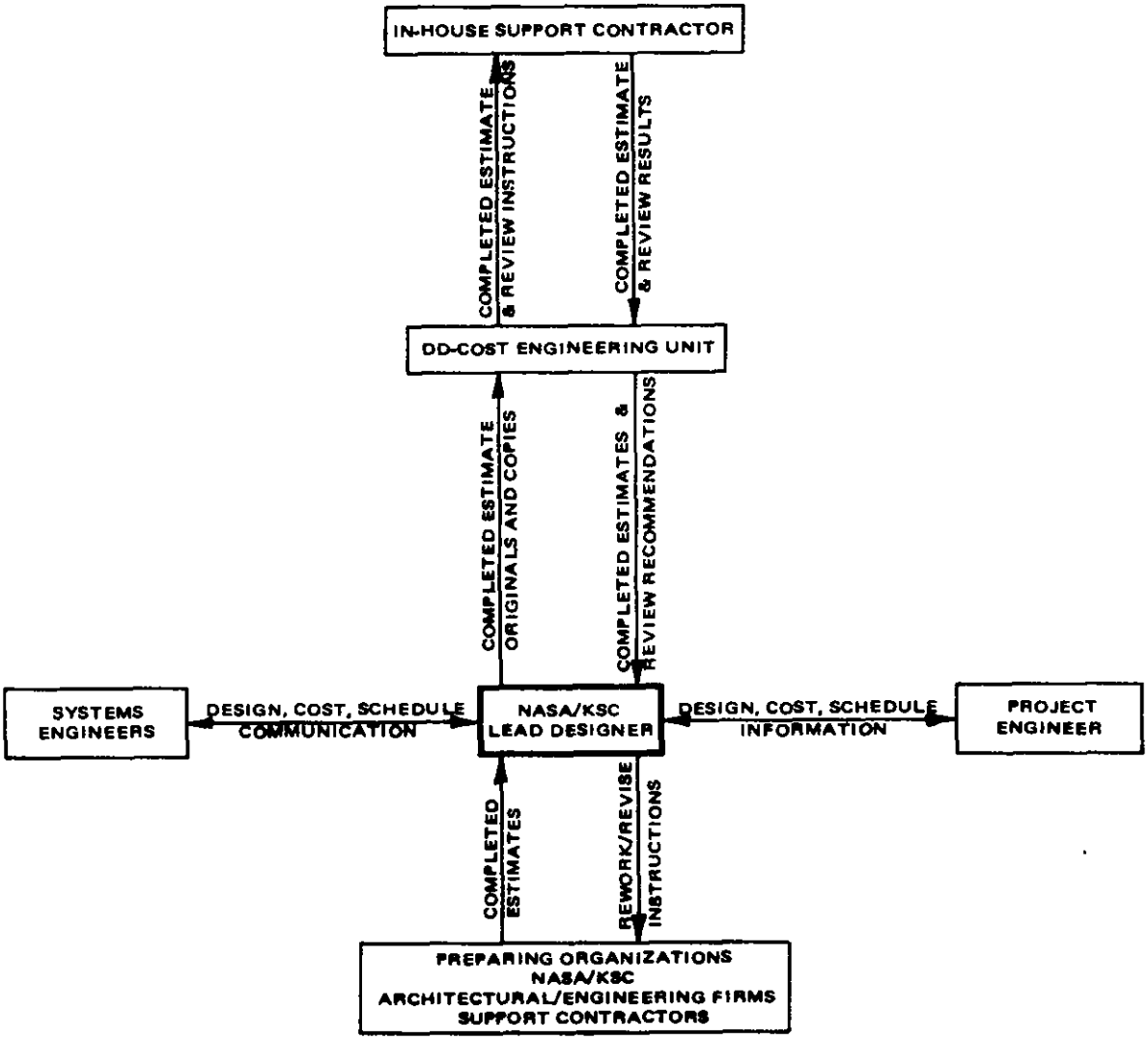

Figure 2. Design Engineering Operating Concept

4.4 Format. Cost estimate submittals shall consist of five parts: cover sheet, estimated GSE bid cost summary, comparison of budgeted and estimated costs summary, labor and materials cost summary, and supporting data (see Appendix A, Exhibit A-1 through A-5). See Appendices B through F for samples illustrating the following types of estimates: electrical, electronics, mechanical, machinery, and structural.

The final Government estimate (G-100) shall include Solicitation Offer and Award Summary (see Appendix A-2, Exhibit A-2)

4.4.1 Cover Sheet. This sheet shall identify the project title and location, drawing number, project control number (PCN), work order (W.O.) number, contract number or program model number (as applicable), appropriate estimate code identification and date submittal. The preparing organization shall be identified by name, address and phone number. Final estimates shall be signed and approved by duly authorized persons to commit the firm or agency to the estimate.

4.4.2 Estimated GSE Bid Cost Summary. A GSE bid cost summary shall be prepared for each item that NASA/KSC designated for the bid schedule.

4.4.3 Comparison of Budgeted and Estimated Costs. Comparisons of budgeted and estimated costs provide early indications of design and cost changes that may impact the project. Each submittal package shall include the current comparison of budget and estimated costs as well as comparisons from previous submittals.

4.4.4 Labor and Material Cost Summary. This part shall list labor and material costs, marked up with taxes, overhead, profit, and G and A for each trade identified in the cost estimate.

4.4.5 Supporting Data. This part shall provide trade summaries identification of price sources, quoted prices, price computations, quantity surveys, mark-ups, value engineering data, comments and recommendations, and other information as required to verify prices in cost estimates.

4.5 Estimate Sheet Headings. The information on the cover sheet shall be inserted in the appropriate heading block of each sheet in the estimate except that the date of completion shall be substituted for the date of submittal. The full names of the estimator(s) and checker(s) shall appear in printed (or typed) and signature form in the heading of each sheet.

4.6 Direct Quotations. When requesting a price quotation, the estimator shall identify himself as representing a Government agency seeking to obtain price information for estimating purposes only. A specified quotation shall supersede published prices. Quotations shall be identified, dated, and submitted with the estimate as directed or maintained for future reference. Quotations are to be considered informal and should be evaluated by the estimator with the logic that a manufacturer or vendor will not compromise his interests or violate the confidence of his customers.

4.7 Utilization of Pricing Guides and Quotations. Prices obtained from pricing guides and direct quotations shall be used solely to verify the estimator's prices for labor, materials, and equipment. The estimator shall break down in detail, prices obtained from pricing guides and quotes into labor, material, equipment, and contractor costs applicable to each task associated with the total project.

4.8 Waivers. The NASA/KSC Lead Designer, with the KSC Cost Engineer's written concurrence, is authorized to waive requirements of this specification. Waivers are justified when project design schedules, scope, or complexity indicate that preparation of certain submittal elements imposes unwarranted or unnecessary work.

5.0 NOTES

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian	Preparing Activity
NASA-John F. Kennedy Space Center	John F. Kennedy Space Center Design Engineering Directorate Facilities Engineering Division

6.0 APPENDICES

APPENDIX A

GENERAL. The following exhibits and backup data are samples of KSC cost estimate and supporting data and the type of information necessary for the completion of these forms.

A-1 Cover Sheet

A-2 Totals from final Government Estimated listed and referenced in Solicitation Offer and Award Bid Form 36 and backup data.

A-3 Comparison of Budgeted and Estimated Costs Summary

A-4 Labor and Material Cost Summary

A-5 Supporting Data

(1) Backup Data for final Labor and Engineering Rates (to be included with each cost estimate submittal)

(2) Forecast of Labor Rates and Backup Data

(3) Computation Sheet Backup Data for G and A, Engineering, Material Handling, and Production

(4) Detail Backup Data for:

(a) Manufacturing/Engineering Cost Summary

(b) Production Labor Cost Summary

(c) Vendor Data Bid Cost Summary

APPENDIX B

ELECTRICAL. This cost estimating exhibit for electrical items includes Budgetary (G-1), Preliminary (GU-30), and Final (G-95) Estimates.

B-1. Budgetary Estimate, G-1 (Two-sided form)

B-2. Preliminary Cost Estimate, GU-30

B-3. Design Estimate, G-95

APPENDIX C

ELECTRONICS. This cost estimating exhibit for electronic items includes Budgetary (G-1), Preliminary (GU-30), and Final (G-95) Estimates.

C-1. Budgetary Estimate, G-1 (Two-sided form)

C-2. Preliminary Cost Estimate, GU-30

C-3. Final Design Estimate, G-95

APPENDIX D

MECHANICAL. This cost estimating exhibit for mechanical items includes Budgetary (G-1), Preliminary (GU-30), and Final (G-95) Estimates.

D-1. Budgetary Estimate, G-1 (Two-sided form)

D-2. Preliminary Cost Estimate, GU-30

D-3. Final Design Estimate, G-95

APPENDIX E

MACHINERY. This cost estimating exhibit for machinery items includes Budgetary (G-1), Preliminary (GU-30), and Final (G-95) Estimates.

E-1. Budgetary Estimate, G-1 (Two-sided form)

E-2. Preliminary Cost Estimate, GU-30

E-3 Final Design Estimate, G-95

APPENDIX F

STRUCTURAL. This cost estimating exhibit for structural items includes Budgetary (G-1), Preliminary (GU-30), and Final (G-95) Estimates.

F-1. Budgetary Estimate, G-1 (Two-sided form)

F-2. Preliminary Cost Estimate, GU-30

F-3. Final Design Estimate, G-95

Appendix A

EXHIBIT A-1. SAMPLE COVER SHEET

PROJECT Space Shuttle

LOCATION Kennedy Space Center

IFB NO. 387

BID DATE 6-21-76

AMENDMENT #1, dated 5/16/76
#2, dated 5/23/76

ESTIMATE CODE G-100

PCN 77823

CONTRACT W.O. 0750

~~FOR OFFICIAL USE ONLY~~ Cancelled 6/30/76 GAB

DRAWING NO. 79K09876 **SHTS** 1-6

MODEL NO. UL 251

LEAD DESIGNER T.A. Cadwell

KSC COST ENGINEER J.A.Brown

PROJECT ENGINEER J.J. Kelley

PREPARED BY (FIRM) General Engineering, Inc

LOCATION Kennedy Space Center

SUBMITTAL DATE 6-21-76

ESTIMATED BY R Long

REVIEWED BY J. Smith

APPROVED BY Joe A. Jones

KSC FORM OT-881 (4/77) (ONETIME FORM – REPRINT NOT AUTHORIZED)

STANDARD FORM 36, JULY 1966 GENERAL SERVICES ADMINISTRATION FED PROC REG (41 CFR) 1-16.103	CONTINUATION SHEET	REF. NO. OF DOC. BEING CONT'D 10-0023-7	PAGE 6 OF

NAME OF OFFEROR OR CONTRACTOR
General Engineering, Inc. Est: W. T. Long Ck. by: C. F. Smith Date: 1-6-77

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	SECTION I - ENGINEER & FURNISH EQUIPMENT				
1	MR 74653 (F) Engineer, fabricate, assemble, test, mark, package and deliver one E. T. Hydrogen Vent Umbilical and Intertank Swing Arm, in accordance with KSC Specification 1093 Revision A dated 12/21/76, and KSC Drawing 79K01016 Revision A dated 12/21/76. (Ref. to Est. Shts. 61 of 62) -Cancelled 2/1/77 jlb	1	ea	435,890	435,890
	FOR OFFICIAL USE ONLY				
2	Vendor Data in accordance with Clause entitled "Vendor Data Requirements" Reproducible Copies	1 3	ea ea	5,500 15.73	5,500 47
3	Quality Control Plan in accordance with the Quality Requirements" Clause.	4	ea	491.25	1,965
4	Certificate of Compliance in accordance with the "Quality Requirements".	1	ea	500	500
5	Shop Drawings Reproducibles Copies	2 5	ea ea	5,500 31.47	11,000 157
6	"As-Built" Drawings Reproducibles Copies	2 5	ea ea	3,665 26.22	7,330 130
7	Prcofs of compliance in accordance with KSC Specification 79K01016.	2	ea	250	500
8	Test Procedures in accordance with "Acceptance Checkout Procedure Criteria". Reproducibles Copies	1 2	ea ea	11,137 31.47	11,137 63
9	Test Results and Records in accordance with KSC Specification 79K01016.	3	ea	733.33	2,200

EXHIBIT A-2. Continued (Backup Data for Final Government Estimate)

☒ GROUND SUPPORT EQUIPMENT — **COST ESTIMATE** — ☐ CONSTRUCTION

CODE	DATE COMPLETED	SHEET 61 OF 62
G-100	1-6-77	SHEET ___ OF ___

PROJECT	DRAWING NO(S)	SHEET NO
ET H_2 Vent & Swing Arm	79K01016	1-6, A1, M1-5

LOCATION	PROG. MODEL NO.	PCN
LC-39, KSC	738B	72480

ARCHITECT OR ENGINEER	WORK ORDER OR CONTRACT NO
General Engineering, Inc.	0019

ESTIMATOR	CHECKER	APPROVED
R. Long R. Long	J. Smith J. Smith	DD FED-1 Joe C. Brown

Bid SUMMARY

	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) ☐ FIELD TOTAL ☐ FAB.	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
ITEM 1							
Eng. Fab. & Assembly							$435,890
		(Ref. to Est. Shts 2 & 3)					
ITEM 2							
Reproducibles (15)	300	Hrs	18.33	5,500			
Copies (45)	3	EA			15.73	47	5,550
ITEM 3							
Qual. Control Plan	4	EA,			52.00	204	
Eng.	80	Hrs	22.00	1,760			1,965
ITEM 4							
Certificate of Compliance							500
ITEM 5							Cancelled 2/1/77 JAB
Shop Drawings (30)							
Reproducibles (2)	600	Hrs	19.33	11,000			
Copies	5	EA			31.47	157	11,157
ITEM 6							
"As Built" Dwgs. (25)							
Reproducibles (2)	400	Hrs	18.33	7,330			
Copies	5	EA			26.22	130	7,450
ITEM 7							
Proofs of Compliance	2	EA	250.	400			500

COMPARISON OF BUDGETED AND ESTIMATED COSTS

SHEET 1 OF 1

DRAWING NUMBER	SHEETS	PCN	LOCATION	PROJECT
79K01016	65 SHEETS	72480	L.E.T.F KSC	ET H_2 VENT & SWING ARM

WORK ORDER/CONTRACT	ARCHITECT/ENGINEER	ESTIMATOR	CHECKER	CODE / SUBMITTED
0019	General Engineering Inc.	W.T. Long W.T. Long	C.F Smith C F Smith	G-100 Feb. 12 - 1977

BUDGETED LINE ITEMS	BUDGETED COSTS	ESTIMATED COSTS														REMARKS
		% DIF	CODE A-2	% DIF	CODE B-30	% DIF	CODE C-60	% DIF	CODE C-90	% DIF	CODE C-100	% DIF	CODE	% DIF	CODE	% DIF	CODE	
STRUCTURAL			135,678	+156	346,773	-59	142,475	+5	149,791	+51	④225,441							
MECHANISMS (EQUIP'T)			—		405,794	-80	② 80,922	+7	151,458	+5	159,225							
MECHANICAL			122,501	+77	241,747	-61	90,165	+23	101,262	+8	109,793							
ELECTRICAL					1,201	+7	2,245	+14	③ 11,549	+9	12,356							
SUB TOTAL (ECBC)			258,179	+249	1,015,515	-69.9	315,807	+31	414,060	+29.6	536,845							
ESCALATION			51636	+32	275,103	-43	155,630	-5	147,074	-11.7	26 842							
SPECIAL CONDITIONS			—		294,499	-87	37,897		—		6092							
SOFTWARE											55429							
SPARE PARTS											94114							
ROM A-1-C (R1D) TOTAL	500,000		①209815	+11	1585,117	-68	509334	+10	561,134	+28	719,322							
PCT DIFFERENCE, BUDGETED/ESTIMATED TOTALS																		

Cancelled 3/1/79 JAG

NOTES: ② B-30 ESTIMATE BASED ON SKETCHES & VERBAL DISCUSSIONS
③ BASED ON REFURBISHING EXISTING MECHANISMS
④ INCREASED QUANTITIES ADD'L XFORMER
① INCREASE IN MATERIAL & LABOR COSTS

NSC FORM 3--388 10/701

LABOR AND MATERIAL COST SUMMARY FOR SYSTEMS

SHEET 1 OF —

DRAWING NO 77501016 | SHEETS 65 SHEETS | P/N 72480 | LOCATION LETF KSC | PROJECT ET H_2 Vent Arm Swing Arm

WORK ORDER CONTR NO 0019 | ARCHITECT/ENGINEER General Engineering Inc | ESTIMATOR W T Long | CHECKER C F Smith | CODE G-100 | SUBMITTED April 21, 1977

LINE ITEM	SITE WORK LABOR	SITE WORK MATERIAL	ARCHITECTURAL STRUCTURAL LABOR	ARCHITECTURAL STRUCTURAL MATERIAL	MECHANICAL LABOR	MECHANICAL MATERIAL	ELECTRICAL LABOR	ELECTRICAL MATERIAL	SPECIALIZED CONSTRUCTION LABOR	SPECIALIZED CONSTRUCTION MATERIAL	OTHER & QUIP'T LABOR	OTHER & QUIP'T MATERIAL	PROJECT TOTALS
ARCHITECTURAL STRUCTURAL			55826	136564									192,390
MECHANICAL													
SYS A/C													
SYS FIRE PROTECTION					5971	1744							7,715
SYS WATER													
SYS CRYOGENIC GH_2 Vent					2923	26784							29,707
SYS HYPERGOLIC													
SYS ENVIR CONTROL					9255	10,089							19,344
SYS PNEUMATICS					7006	5,215							12,221
SYS HYDRAULICS					6,985	1,355							8,340
SYS													
SYS													
ELECTRICAL													
SYS POWER AND LIGHTING							3096	5687					8,783
SYS INSTR & COMM													
SYS LPS													
SYS UPS													
SYS													
SYS													
SYS													
SYS													
SYS													
SYS													
OTHER EQUIPMENT											35847	83939	119,786
SYS													
SUBTOTAL LABOR			55826		32,140		3096				35847		126,909
SUBTOTAL MATERIAL				136,564		45,187		5687				83939	271,377
SALES TAX 4 %				5463		1807		227				3358	10,855
P T & I 20 %			11,165		6428		619				7169		25,381
SUBTOTAL			66,991	142,027	38,568	46,994	3715	5914			43016	87297	
TOTAL			209,018		85,562		9629				130313		434,522
CONTR OVHD 10 %			20902		10% 8556		10% 963				10% 13031		43,452
SUBTOTAL			229920		94,118		10592				143344		477,974
CONTR PROFIT 10 %			22992		10% 9412		10% 1059				10% 14334		47,797
SUBTOTAL			252912		103,530		11651				157678		525,771
PRIME MARKUP — %			① —		5% 5176		5% 583				—		5,759
SUBTOTAL			252912		108706		12234				157678		531,530
BOND 1 %			2529		1% 1087		1% 122				1% 1577		5,315
TOTAL			255,441		109,793		12356				159,255		536,845

NOTES ① Principle Architectural/Structural Assumed to be prime with 30% of work. No prime mark up Required

NSC FORM 21 370 10 76

Cancelled 5/1/79 JHS

EXHIBIT A-5 (1)

Backup Data for Final Labor and Engineering Rates
-COMPUTATION - FISCAL YEAR ENDING 3/31/77

(In 000's)

DESCRIPTION	G&A	ENGINEERING	MATERIAL HANDLING	PRODUCTION
Indirect Labor	817	1027	403	687
Vacation Expense	40		18	
Sick Leave (Unused)	2		2	
Employee Welfare	42	464	30	440
Employee Welfare (Disab.)				
Employee Relocation	3			
Employee Recruitment	18			
Severance	4			
Payroll Taxes	33		20	
Job Shopper		31	6	23
Supplies & Expenses	20	57	19	74
Outside Services	3			7
Travel	75	60	7	32
Misc. Travel	6	2	2	4
Entertainment				
Rent	63	132	44	135
Rental-Mech. & Equip.	7	7	3	14
Light, Heat & Power	22	41	16	55
Telephone & Telegraph	43	38	25	29
Maint. & Repair (Bldg. Only)	11	9	7	30
Protective Service	19	15	9	34
Cleaning & Sanitation				
Labor Allocation to Subs. & Corp.				12
Maint. & Repair (Equip.)	7	4		38
Dues & Subscriptions	10	5		1
Office Equipment Maint.	2			
Freight Out			3	
Commissions				
Interest Expense				
Professional Fees	71	12	1	1
Contributions				
Postage	10			
Interplant Exp.				3
Data Processing	51		3	
Auto Expense	8			
Advertising Inst.				
Sales Promotion	6			
Taxes - Other	52	9	2	9
Bid & Proposal		48		1
Moving Expense		6		67
Depreciation - Test Equip.		62		
Insurance Expense	24			
Allocated Charge - Corp	342			
Test Main. to Engineering		49		53
Depre. Furn. & Fixt.	13			
Depre. Auto	1			
Amort - Leasehold Imp.	10	7	4	17
Cash Discounts	(31)			
Depre. Mach. & Equip.	1080	13		25
Independent R&D Costs	339			
Less R&D Cost Sharing	-93			
TOTAL	2054	2098	624	1663
Dir. Eng. Labor/Mat./Prod. Labor		1189	7459	1356
Total Mfg. Costs	10,004			
Overhead Rate	20.5%	176.45%	8.37	122.64

Computation Sheet

The overhead rate for each category, such as G&A Engineering, material handling, and production was arrived at as follows:

$$G\&A\ \% = \frac{\text{TOTAL}}{\text{Total Mfg Cost}} \quad \text{or} \quad \frac{2054}{*10,004} = 20.5\%$$

Sum of Engineering, Material Handling, and Production = Total Mfg. Cost.

$$G\&A\ \% = \frac{\text{TOTAL G\&A COST}}{*\text{TOTAL MFG COST}}$$

$$MAT'H\ HDLG\ \% = \frac{\text{TOTAL M.H. COST}}{\text{DIRECT M.H. COST}} \quad \text{or} \quad \frac{\$6243}{7459} = 8.37\%$$

* Sum of ENGINEERING DIRECT LABOR - $ 2,098
MATERIAL HANDLING 6,243
PRODUCTION DIRECT LABOR 1,663
$10,004

$$PROD\ \% = \frac{\text{TOTAL PROD. COST}}{\text{DIRECT PROD. LABOR}} \quad \text{or} \quad \frac{\$1663}{1356} = 122.64\%$$

$$ENG\ \% = \frac{\text{TOTAL ENG. COST}}{\text{DIRECT ENG. LABOR}} \quad \text{or} \quad \frac{\$2098}{1189} = 176.45\%$$

EXHIBIT A-5 (2)

KSC-SPEC-G-0003
July 5, 1977

FORECAST OF LABOR RATES

COMPANY GENERAL ENGINEERING
CONTROLLER L. B. STANG
DATE 7-4-77

PROFESSIONAL EMPLOYEES — RATES BASED ON PREVAILING WAGES IN BIG APPLE, N.Y.

CAT NO.	DESCRIPTION	6/76	9/76	12/76	3/76	6/78	9/78	12/78	3/77	6/77
08	PROD SUPERVISOR	$ 6.31	$ 6.31	$ 6.50	$ 6.83	$ 7.17	$ 7.17	$ 7.17	$ 7.17	$ 7.53
10	TEST SUPERVISOR	6.18	7.00	7.00	7.35	7.35	7.72	7.72	7.72	8.11
11	QC TECH	4.83	4.83	4.97	5.22	5.52	5.48	5.48	5.48	5.75
12	QC ENGINEER	7.31	7.31	7.53	7.53	7.91	7.91	8.31	8.31	8.73
13	QC SUPERVISOR	7.85	7.85	8.09	8.09	8.49	8.49	8.91	8.91	9.36
17	FIELD ENGINEER	6.96	6.96	7.17	7.17	7.53	7.53	7.91	7.91	8.36
23	PROTOTYPE TECH	4.89	4.89	5.04	5.04	5.29	5.29	5.55	5.55	5.83
24	RELIABILITY ENGR	7.99	7.99	8.23	8.23	8.64	8.64	9.07	9.07	9.52
34	METHODSMAN	6.78	6.78	6.98	6.98	7.33	7.33	7.70	7.70	8.09
40	ELECT ENGINEER	9.08	9.08	9.35	9.35	9.82	9.82	10.31	10.31	10.83
41	MECH ENGINEER	7.97	7.97	8.21	8.21	8.62	8.62	9.05	9.05	9.50
42	DESIGN TECH	5.02	6.02	5.17	5.17	6.43	5.43	5.70	5.70	5.99
44	RELIABILITY TECH	5.87	5.87	6.04	5.84	6.13	6.13	6.44	6.44	6.76
45	DRAFTSMAN	4.94	4.94	5.09	5.09	4.34	5.34	5.61	5.61	5.89
46	PARTS LIST	5.84	5.84	6.02	6.02	6.32	6.32	6.64	6.64	6.97
47	PUBLICATIONS	6.88	6.88	7.09	7.09	7.44	7.44	7.81	7.81	8.20
48	MATERIAL CONT	4.27	4.27	4.40	4.40	4.62	4.62	4.85	4.85	5.09
55	COORDINATOR	7.75	7.75	7.98	7.98	8.38	8.38	8.80	8.80	9.24
20	ELECT ENGINEER	10.37	10.37	10.68	10.68	11.21	11.21	11.77	11.77	12.36
21	MECH ENGINEER	9.25	9.25	9.53	9.53	10.01	10.01	10.51	10.51	11.04
22	DESIGN TECH	5.06	5.06	5.21	5.21	5.47	5.47	5.74	5.74	6.03
25	DRAFTSMAN	4.94	4.94	5.09	5.09	5.34	5.34	5.61	5.61	5.89
26	PROGRAM MGT	8.34	8.34	8.59	8.59	9.02	9.02	9.47	9.47	9.94
27	PUBLICATIONS	6.88	6.88	7.09	7.09	7.44	7.44	7.81	7.81	8.20
29	RFI ENGINEER	10.37	10.37	10.68	10.68	11.21	11.21	11.77	11.77	12.36
37	TYPIST	2.87	2.87	2.96	2.96	3.11	3.11	3.27	3.27	3.43
38	PC DESIGNER	7.86	7.86	8.10	8.10	8.51	8.51	8.94	8.94	9.39
39	HUMAN FACTORS SPEC	10.37	10.37	10.68	10.68	11.21	11.21	11.77	11.77	12.36
50	PRIN SYS ANALYST	12.42	12.42	12.79	12.79	13.43	13.43	14.10	14.10	14.81
51	SR SYS ANALYST	10.72	10.72	11.04	11.04	11.59	11.59	12.17	12.17	12.78
52	SYSTEM ANALYST	9.65	9.65	9.94	9.94	10.44	10.44	10.96	10.96	11.51
53	ANALYST	7.81	7.81	8.04	8.04	8.44	8.44	8.86	8.86	9.30
53	ASSOC ANALYST	4.62	4.62	4.76	4.75	5.00	5.00	5.25	5.25	5.51
	INTERNATIONAL UNION OF ELECTRICAL WORKERS UNDER CONTRACT									
			7/76—6/77		7/77—6/78		7/78—6/79			
30	INSTRUMENT ASSEMBLER WIRER & SOLDERER ASSEMBLERS REWORK & REPAIR		4.05		4.45		4.91			
07	SPRAYER & PLATER		4.18		4.60		5.06			
31	TEST & TROUBLESHOOT		5.32		5.85		5.44			
32	SHEET METAL SHOP		5.56		6.11		6.72			
33	PACKERS		3.78		4.16		4.58			
16	LINE INSPECTION		4.84		4.99		5.49			

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Cancelled 5/1/77 JAB

EXHIBIT A-5 (3)

Computation Sheet Backup Data

Labor Rate

This is a sample of backup data for labor and overhead rates to be furnished with each cost estimate submittal.

Labor rate of $15 was arrived at as follows:

				Refer to
Technician-Test	Cat. 31	$5.85	Factor 1/3	Page 22, Exh A-5 (2)
Machinist	Cat. 32	6.11	Factor 1/3	Page 22, Exh A-5 (2)
Wire & Assy	Cat. 30	4.46	Factor 1/3	Page 22, Exh A-5 (2)
		16.42		

$\frac{16.42}{3}$ = $5.47 use $5.50 for average

Average	5.50		Page 22, Exh A-5 (2)
Supervision Cat. 10	1.10	Factor 1/7	Page 22, Exh A-5 (2)
Mfg. Overhead 122.64%	8.09		
	$14.69	Round-off & use $15/hr.	

Labor rate of $18 was arrived at as follows:

Draftsman	Cat. 25	5.61 *		Page 22, Exh A-5 (2)
Eng.	Cat. 20 & 21	.93	Factor 1/12	Page 22, Exh A-5 (2)
Eng. overhead	176.45%	11.54		Page 22, Exh A-5 (2)
		$18.08	Use $18/hr for Eng. Aver.	

* Cat. 20 = $11.77/hr
Cat. 21 = $10.51/hr

$\frac{\$22.28}{2}$ = Aver. Eng = $\frac{11.14}{12}$ = .93

(Used in Cost Estimate Samples in Appendix B, C, D, E, & F.)

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EXHIBIT A-5 (4)a

MANUFACTURING/ENGINEERING COST SUMMARY

FOR OFFICIAL USE ONLY

ENGINEERING
LABOR COST ESTIMATE
MATERIAL COST ESTIMATE

Cancelled 6/2/77 JAB

BID NO. 7705

TITLE	ITEM (1) QTY	ITEM (2) QTY	ITEM (3) QTY	ITEM (4) QTY
Ku BAND RCVR	DDT&E + (1)	QUAL. TEST & REFURB.	SOFTWARE	

	LABOR TITLE	CAT	RATE	(1) HOURS	(1) DOLLARS	(2) HOURS	(2) DOLLARS	(3) HOURS	(3) DOLLARS	(4) HOURS	(4) DOLLARS
ENGINEERING	HUMAN ENG	39									
	RFI ENG	29									
	ELECT ENG	20	11.77	2000	23540	100	1177	1000	11770		
	MECH ENG	21	10.51	2000	21020	100	1051	1500	15765		
	DESIGN TECH	22									
	DRAFTSMAN	25	5.61	1000	5610			2000	11220		
	PC ENGINEER	38	8.94	1500	13410						
	PUBLICATIONS	27	7.81					2000	15620		
	PUB TYPIST	37	3.27					500	1635		
MANUFACTURING	SHEET METAL	32	6.11	320	1955						
	TRAINING CO-ORD	56									
	FIELD ENG	17									
	REL TECH	44	6.44			500	3220				
	REL ENG	24	9.07	1000	9070	500	4535				
	PROTO TECH	23	5.55	1500	8325						
	PROD DESIGN TECH	42									
	QC ENG	13	8.91	500	4455	100	891	100	891		
	PARTS LISTER	46	6.64					500	3320		
	MAT'L CONTROL	48	4.85	350	1698			100	485		
	PROD EE	40									
	PROD ME	41									
	PROD ENG	34									
	QC TECH	11									
	GRAND TOTAL – TOTAL BASIS ENG				63580		2228		56010		
	GRAND TOTAL – UNIT BASIS ENG										
	GRAND TOTAL – TOTAL BASIS MFG				25503		8646		4696		
	GRAND TOTAL – UNIT BASIS MFG										

MATERIAL	(1) TOTAL DOLLARS	(1) UNIT DOL	(2) TOTAL DOLLARS	(2) UNIT DOL	(3) TOTAL DOLLARS	(3) UNIT DOL	(4) TOTAL DOLLARS	(4) UNIT DOL
BREADBOARD MATERIAL	20000				3000			
PROTOTYPE	12000	*	3600					
SPECIAL TEST EQUIP								
PUBLICATIONS					2000			
SPECIAL TOOLING								
SUBCONTRACTS								
OUTSIDE SERVICES								
TRAVEL & SUBSISTENCE	2500							
* 30% OF PROTO TYPE MAT'L								
CAPITAL EQUIPMENT								

COMPUTED BY:	John Doe ALPHA Co	DATE	3-17-77	PAGE 1 OF 3
CHECKED BY:	Al Green ALPHA Co.	DATE	3-17-77	EXHIBIT NO.

KSC FORM OT-978 (4/77) (ONE TIME FORM – REPRINT NOT AUTHORIZED)

PRODUCTION SUPPORT/LABOR COST SUMMARY

BID NO. 7705

TITLE	ITEM (1) QTY	ITEM QTY	ITEM QTY	ITEM QTY
KU BAND RCVR	DDTE + 1			

	LABOR TITLE	CAT	RATE	HOURS	DOLLARS	HOURS	DOLLARS	HOURS	DOLLARS	HOURS	DOLLARS
BASIS	INSTRUMENT ASS'Y	01	4.46	100	446						
	WIRERS & SOLDERERS	30	4.46	300	1338						
	SPRAYERS/PLATERS	07									
	SHEET METAL SHOP	32									
	PACKAGING	33							Cancelled 6/2/77 JAB		
A	SUB TOTAL			400							
B	TESTERS	31	5.85	300	1755						
LABOR											
	PROD SUP 10 % LINE A	08	7.17	40	287						
	TEST SUP 10 % LINE B	10	7.72	30	232						
	LINE INSP 15 % LINE A	15	4.99	60	299						
	QC SUP 15 % CAT 15 + 11	13	8.91	21	187						
	QC TECH 20 % LINE A	11	5.48	80	438						
C	SUB TOTAL – UNIT BASIS				4982						
SUPPORT LABOR – BASIS	REL ENG	24									
	REL TECH	44									
	MAT'L EXP	48									
	PROD ENGINEERING	34									
	TECH	42									
	QC ENG	12									
	PARTS LISTER	46									
	STATISTICAL TYP	37									
	E. E.	40									
	M. E.	41									
	PROD DRAFT	45									
D	SUB-TOTAL – TOTAL BASIS										
E	D ÷ QTY = UNIT COST										
F	C+LINE E (GRAND)TOTAL–UNIT–BASIS				4982						
G	MATERIAL										
H	O.D.C.										
I	TRAVEL & SUBSIST										
J	VENDOR TOOLING										

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ESTIMATED BY		DATE	
COMPUTED BY	John Doe ALPHA Co.	DATE 3-17-77	PAGE 2 OF 3
CHECKED BY	Al Green ALPHA Co.	DATE 3-17-77	EXHIBIT NO.

KSC FORM OT-860 (4/77) (ONETIME FORM – REPRINT NOT AUTHORIZED)

VENDOR DATA BID COST SUMMARY

TITLE Ku BAND · KGVR BID NO. 7705

CUSTOMER PAGE 3 OF 3

	ITEM		ITEM I D.D, T&E + -		ITEM II QUAL, TEST & REFURB.		ITEM III SOFTWARE	
1	DIRECT MATERIAL		12000		3600		3000	
2	ENGINEERING MATERIAL		20000					
3	PACKAGING MATERIAL							
4	TOTAL OF LINES 1, 2 & 3		32000		3600		3000	
5	FREIGHT IN	.004 % OF 4	128		14		12	
6	TOTAL OF LINES 4 & 5		32128		3614		3012	
7	ATTRITION & REWORK	.05 % OF 6	1606		181		151	
8	TOTAL MATERIAL		33734		3795		3163	
9	MATERIAL HANDLING	8.37 % OF 8	2824		318		265	
10	DIRECT ENGINEERING LABOR		63580		2228		56010	
11	ENGINEERING OVERHEAD	176.45 % OF 10	112187		3931		98830	
12	DIRECT MANUFACTURING LABOR		30485		8646		4696	
13	MANUFACTURING OVERHEAD	122.64 % OF 12	37387		10603		5759	
14	TRAVEL & SUBSIST		2500					
15	SPECIAL TEST EQUIPMENT							
16	SPECIAL TOOLING							
17	OUTSIDE SERVICE							
18	PUBLICATIONS MATERIAL						2000	
19								
20	TOTAL MFG COST	(8 THRU 19)	282,697		29,521		170,723	
21	G & A EXPENSE	20 % OF 20	56539		5904		34,145	
22	WARRANTIES	1 % OF 20 & 21	3392		354		2049	
23	TOTAL COST	(20, 21 & 22)	342628		35779		206917	
24	PROFIT OR FEE	15 % OF 23	51394		5367		31038	
25								
26								
27	UNIT PRICE	(23 THRU 26)						
28	TOTAL PRICE	(27 X QTY)	394,022		41,146		237955	

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Cancelled 6/12/77 JAB

TOTAL $673,123

	NAME	DATE
GENERAL MANAGER	Geo Holt	3-15-77
DIRECTOR OF ENG'G	J.L. MIMS	3-15-77
MANUFACTURING	A.T HART	3-15-77
ACCOUNTING	R. Rodale	3-16-77
CONTRACTS	G. Nelson	3-16-77
ESTIMATING MANAGER	H. WONG	3-16-77
COMPUTED BY ALPHA CO.	John Doe	3-17-77
CHECKED BY ALPHA CO.	AL GREEN	3-17-77

REMARKS: THIS IS A HYPOTHETICAL EXAMPLE

ADDITIONAL CAPITAL EQUIPMENT REQUIRED $

26

EXHIBIT A-5 (4)c

KSC-SPEC-G-0003 July 5, 1977

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

☒ GSE — BUDGETARY **PROJECT COST ESTIMATE** — ☐ OTHER

INSTALLATION/PROGRAM OFFICE: KSC INDUSTRIAL AREA	CONTROL NO: 72866 G-1
PROJECT TITLE AND LOCATION: 28-Volt Distributor Servicing	DATE: MAY 15, 1976
BASIS OF COST ESTIMATE: Previous Shuttle Estimate	REVISION NO:

I SUMMARY OF COST ESTIMATE

DESCRIPTION	AMOUNT a.	PERCENT b
(1) ENGINEERING ESTIMATE	10,324	
(2) CONTINGENCIES, GOVERNMENT *(Enter percentage of item (1) a to right in col (2)b)*	1,032	10%
(3) SUPERVISION, INSPECTION AND ENGINEERING SERVICES *(Enter percentage of items (1)a and (2)a to right in col (3)b)*	1,136	10%
SUBTOTAL ((1)+(2)+(3))	12,492	
(5) COST ADJUSTMENT *(Enter percentage of item (4)a to right in col (5)b)*	3,408	27.3%
(6) OTHER BURDEN COSTS		
(7) TOTAL BUDGET ESTIMATE ((4)+(5)+(6))	$15,900	

(8) IDENTIFICATION OF ADJUSTMENT AND BURDEN COSTS, AND ESCALATION
Based on Jan 76 cost with escalation @ 1% per mo.
From Jan 76 to July 76 – for FY 1978 funding 25 mos

II. PLANNING AND DESIGN

DESCRIPTION	STATUS: NEEDED a.	IN-WORK b.	COMPLETE c.	IN-HOUSE/AE d.	COST e.
(1) PRELIMINARY ENGINEERING REPORT	✓	—	—	In-house	300
(2) SPECIAL STUDIES *(Specify)*	—	—	—	—	
(3) FINAL DESIGN	✓	—	—	In-house	600
(4) SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES	✓	—	—	In-house	125
TOTAL PLANNING AND DESIGN COST					$1,025

III. RELATED COST DATA

(Not included in this approved project cost estimate but required to make the system complete)

(1) RELATED COSTS INVOLVED ☐ a YES *(Identify in items (2) through (10))* ☑ b NONE

(2) PER *(Amount)* | (3) DESIGN *(Amount)*

OTHER RELATED EQUIPMENT	ITEM	AMOUNT	ITEM	AMOUNT
	(4) TO BE PURCHASED		(8) GFE	
	(5) TRANSFER OF EXCESS		(9) OTHER *(Specify)*	
	(6) EXISTING			
	(7) FUTURE FUNDING			

EXHIBIT B-1 (cont)

INSTALLATION/PROGRAM OFFICE	CONTROL NO	DATE
KSC LETF	72866	MAY 15, 1976

☒ GSE — IV. PROJECT COST ESTIMATE — ☐ OTHER _____

DESCRIPTION TYPE, SIZE, KIND, ETC.	UNIT OF MEASURE 1.	QUANTITY 2.	UNIT COST ENGNG * 3.	TOTAL COST ENGNG 4.	TOTAL COST BUDGET 5.
28-V DISTRIBUTOR					
Chassis Assy	EA	1	485	485	747
Front Panel Alum	EA	1	362	362	557
BAR Insulators	EA	6	108	648	998
Bus BAR	EA	56	19.88	1113	1714
Circuit Brkrs 1, 2 & 3P	EA	48	39.77	1909	2940
Cables	EA	4	397.75	1591	2450
Misc Hd. screws, nuts, etc	EA	380	5.94	2256	3474
Installation	—	—	1323	1323	2037
c/o - Valid - test	EA	1	636	636	979
*G&A OF 20.5% & PROFIT OF 10%					
Included					
TOTAL				$10,324	$15,900

(7) SOURCE OF COST DATA, ESTIMATOR'S NAME, COMPANY OR AGENCY
LETF PHASE I, JOE BROWN, FED-1

(8) ESTIMATE OF THE BUDGET CONFIDENCE

CONFIDENCE FACTOR

A. OFF-THE-SHELF	±15 ☐	C. R&D	±100 ☐
B. PREPRODUCTION	±50 ☑	D OTHER _____	☐

V. RELATED ITEMS/ACTIONS

(EXPLAIN AS APPROPRIATE USE EXTRA SHEETS, AS NECESSARY, FOR THIS BLOCK AND ABOVE)

July 5, 1977

KSC PRELIMINARY COST ESTIMATE WORK SHEET G.S.E.

W.O. NO.	ECN	DATE PREPARED	SHEET 1 OF 1
0488	77613	9-2-76	

PROJECT: 28 VOLT DISTRIBUTOR CHECKOUT

LOCATION: KSC INDUSTRIAL AREA — CODE: GU-30-A

~~ARCHITECT~~ ENGINEER: PRC — ESTIMATOR: W.T. LONG

DRAWING NO.: 79K06823, SHEETS E1-3 — CHECKED BY: C.F. SMITH — APPROVED BY:

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	28 VOLT DISTR. ASS'Y				
	CHASSIS ASS'Y	1	EA	440	440
	FRONT PANEL	1	EA	327	327
	INSULATOR BARS	6	EA	98.33	590
	BUS BARS	38	EA	20.36	774
	BREAKERS 20AMP, 3P, 3φ-208V	30	EA	35.96	1,079
	CONNECTOR	4	EA	90	360
	WIRE	870	L.F.	.14	115
	LUGS	340	EA	1.52	517
	CLAMPS	12	EA	2.42	29
	CABLE ASS'Y	4	EA	269.75	1,079
	MARK & IDENT.	24	EA	11.96	287
	MISC. HDWRE.	200	EA	1.80	360
	INSTALLATION	50	EA	18	900
	TOTAL				6,854
	G & A	20.5	%		1,405
			SUB-TOTAL		8,259
	PROFIT	10	%		826
	ESTIMATED COMPETITIVE BID COST				# 9,085

EXHIBIT B-3

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

B-3

CODE: G-95	DATE COMPLETED: 10-5-76	SHEET 1 OF 1 SHEET ____ OF ____
PROJECT: 28 VOLT DISTRIBUTOR PANEL ASSY		DRAWING NO(S): 79K06823 / SHEET NO: 1-6
LOCATION: KSC - L.E.T.F.		PCN: 77613
ENGINEER: PRC	PROGRAM MODEL NO: RV-127	WORK ORDER OR CONTRACT NO: 0488
ESTIMATOR: W.T. LONG W.T. Long	CHECKER: C.F. SMITH C.F. Smith	APPROVED:

ELECTRICAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
79K06823-1 DIST. PANEL ASSY	1	EA					
79K06823-2 CHASSIS ASSY	1	EA	20	20	6	6	
79K06823-4 FRONT PANEL	1	EA	18	18	3	3	
79K06823-5 BAR INSULATOR	2	EA	6	12	1.50	3	
79K06823-6 BAR INSULATOR	4	EA	5	20	1.50	6	
79K06823-7 BUS BAR LARGE	8	EA	1	8	1.75	14	
79K06823-8 BUS BAR SMALL	48	EA	1	48	1.75	84	
79K06823-10 BRKT STIFFGNER	4	EA	2	8	2	8	
7.5 AMP-SM3 CIRCUIT BKR	48	EA	.25	12	26.85	1260	
MS3122-24-61P CONNECTOR	4	EA	.25	1	60.32	241	
WIRE MIL 16878/1 B-16	300	EA	.006	2	.021	6	
WIRE MIL 16878/1 B-20	570	EA	.006	4	.017	10	
MS25036 LUGS ASSY	340	EA	.08	27	.06	20	
MS21919-8 CHAMP SUPPORT	12	EA	.1	1.	.25	3	
60 c #20 CABLE ASSY	4	EA	25.0	100	-	-	
INSTALLATION	10	EA	5.0	50	-	-	
MISC. MARK IDENTIFICATION	2	EA	8.0	16	-	-	
MISC. HARDWARE	1506	EA	.01	15	.05	75	
CHECKOUT-VALIDATE-TEST	-3	EA	8	24			
SUB-TOTAL				386.0		1739	
LABOR HOURS X RATE	386.0	HRS	$15*	5790			
SALES TAX		%			4	70	
SUB-TOTAL				5790		1809	$75 99
GENERAL & ADMINISTRATION	20	%					15 2
					SUB-TOTAL		911
PROFIT	10	%					912
ESTIMATED COMPETITIVE BID COST							$10,031
* SEE APPENDIX A-5 (3) (P 23)							

KSC FORM 21-243 (REV 4/77)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

☑ GSE — BUDGETARY **PROJECT COST ESTIMATE** — ☐ OTHER _____

INSTALLATION/PROGRAM OFFICE	CONTROL NO
KSC - LC39 SHUTTLE	76954 G-1
PROJECT TITLE AND LOCATION Checkout & Test Equipt Fuse Interrupt Box LC39	**DATE** MAY 15, 1976
BASIS OF COST ESTIMATE Previous Shuttle Estimate	**REVISION NO**

I. SUMMARY OF COST ESTIMATE

DESCRIPTION	AMOUNT a.	PERCENT b
(1) ENGINEERING ESTIMATE	18,425	
(2) CONTINGENCIES, GOVERNMENT *(Enter percentage of item (1) a to right in col (2)b)*	1,843	10%
(3) SUPERVISION, INSPECTION AND ENGINEERING SERVICES *(Enter percentage of items (1)a and (2)a to right in col (3)b)*	2,027	10%
SUBTOTAL ((1) + (2) + (3))	22,295	
(5) COST ADJUSTMENT *(Enter percentage of item (4)a to right in col (5)b)*	6,080	27.23%
(6) OTHER BURDEN COSTS		
(7) TOTAL BUDGET ESTIMATE ((4) + (5) + (6))	$ 28,375	

(8) IDENTIFICATION OF ADJUSTMENT AND BURDEN COSTS, AND ESCALATION
Based on Jan '76 cost with escalation @ 1% per mo.
from Jan '76 to July '76 - For F/Y 1978 funding 25 mos

II. PLANNING AND DESIGN

DESCRIPTION	STATUS: NEEDED a.	IN-WORK b.	COMPLETE c.	IN-HOUSE/AE d.	COST e.
(1) PRELIMINARY ENGINEERING REPORT	✓	-	-	In-House	500
(2) SPECIAL STUDIES *(Specify)*	-	-	-	-	
(3) FINAL DESIGN	✓	-	-	In-House	1,100
(4) SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES	✓	-	-	In-House	240
TOTAL PLANNING AND DESIGN COST					

III. RELATED COST DATA

(Not included in this approved project cost estimate but required to make the system complete)

(1) RELATED COSTS INVOLVED — ☐ a YES *(Identify in items (2) through (10))* ☑ b NONE

(2) PER *(Amount)* | (3) DESIGN *(Amount)*

	ITEM	AMOUNT	ITEM	AMOUNT
OTHER RELATED EQUIPMENT	(4) TO BE PURCHASED		(8) GFE	
	(5) TRANSFER OF EXCESS		(9) OTHER *(Specify)*	
	(6) EXISTING			
	(7) FUTURE FUNDING			

EXHIBIT C-1 (cont)

INSTALLATION/PROGRAM OFFICE	CONTROL NO	DATE
KSC LC39 SHUTTLE	76954	MAY 15, 1976

☑ GSE — IV. PROJECT COST ESTIMATE — ☐ OTHER _____

DESCRIPTION TYPE, SIZE, KIND, ETC.	UNIT OF MEASURE 1.	QUANTITY 2.	UNIT COST ENGNG * 3.	TOTAL COST ENGNG 4.	TOTAL COST BUDGET 5.
FUSE INTERRUPT BOX	EA	1	1500	1500	2310
BANANA JACK MOLDED NYLON	EA	256	3.31	848	1306
FUSE HOLDER	EA	128	11.23	1437	2213
HARNESS & INSTALL.	EA	1	1025	1025	1579
Checkout - VALIDATE & TEST	EA	1	795	795	1224
MISC SMALL ITEMS	EA	35	32	1120	1725
ENG HOURS DESIGN & SUPV	HRS	250	18	4500	6930
DRFT HOURS	HRS	400	18	7200	11088
*G&A @ 20.5% & PROFIT INCLUDED					
TOTAL				$18,425	$28,375

(7) SOURCE OF COST DATA, ESTIMATOR'S NAME, COMPANY OR AGENCY
ENG. JUDGEMENT — W.T. LONG —

(8) ESTIMATE OF THE BUDGET CONFIDENCE

CONFIDENCE FACTOR

A. OFF-THE-SHELF	± 15 ☐	C. R&D	± 100 ☑
B. PREPRODUCTION	± 50 ☐	D. OTHER _____	☐

V. RELATED ITEMS/ACTIONS

(EXPLAIN AS APPROPRIATE USE EXTRA SHEETS, AS NECESSARY, FOR THIS BLOCK AND ABOVE)

KSC PRELIMINARY COST ESTIMATE WORK SHEET

W.O. NO.	ECN	DATE PREPARED	SHEET 1 OF 1
0850	76954	10-15-76	

PROJECT: FUSE INTERRUPT BOX - CHECKOUT & TEST

LOCATION: KSC - LC - 39 Shuttle

CODE: GU-30

ENGINEER: PERRY PRC 1965

ESTIMATOR: W. T. LONG W.T. Long

DRAWING NO.	CHECKED BY	APPROVED BY
40M6727, SHEET E1	C.F Smith	

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	FUSE INTERRUPT BOX				
	COVER	1	EA	73	101
	BOX ALUM 12" X 10" X 10"	1	EA	1125	1560
	CONN. RECEPT. (128)	1	EA	87	120
	CONN. PLUG (128)	1	EA	56	78
	RIVNUT	4	EA	2.25	12
	BANANA JACK molded NYLON	128	EA	2.50	444
	FUSE Holder	128	EA	8.47	1504
	FUSES	128	EA	1	177
	1 DENT. PLATE	1	EA	11	15
	WIRE #20	150	L.F.	.22	46
	ASSY - (WIRING) (HARNESS) (30)	30	EA		624
	CHECKOUT, VALIDATE & TEST (30)	1	EA		750
	CONN	20	EA	43	860
	ENG (160) DFT (240)	500	HRS	18*	9000
	TOTAL COST				15291
	G & A	20.5	%		3135
				Sub-total	18426
	PROFIT	10	%		1842
	ESTIMATED COMPETITIVE BID COST				* 20268
	* SEE APPENDIX A-5 (3) (P23)				

☑ GROUND SUPPORT EQUIPMENT **CONSTRUCTION COST ESTIMATE** ☐ CONSTRUCTION

CODE: G-95	DATE COMPLETED: 1-3-77	SHEET 1 OF 1 SHEET ____ OF ____	
PROJECT: FUSE INTERRUPT BOX		DRAWING NO(S): 40M6727	SHEET NO: EL-3
LOCATION: LC-39 KSC SHUTTLE		PCN: 76954	
~~ARCHITECT OR~~ ENGINEER: PERRY PRC 1965		WORK ORDER OR CONTRACT NO: 0850	
ESTIMATOR: W.T. LONG W.T. Long PRC 1965	CHECKER: C.F. SMITH C.F. Smith PRC 1965	APPROVED:	

ELECTRONIC SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) ☐ FIELD TOTAL ☐ FAB.	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
CARRYING CASE *X105-11-22R-P10	1	EA	8.0	8.0	1250	12.50	ZERO MFG.
PANEL 12 x 20 x 1/8 ALUM	1	EA	24.0	24.0	35	35	ZERO MFG.
JP00-RE-24-1P RECEPT.	2	EA	.5	1.0	74.24	148	
M53114 E-24-61P "	2	EA	.5	1.0	46.90	94	
M53114 E-20-41P "	2	EA	.5	1.0	32.26	65	
M53114-E 22-21P "	2	EA	.5	1.0	27.70	55	
JP0G-RE-24-1S PLUG	2	EA	.5	1.0	98.59	197	
M53116 E 24-61S "	2	EA	.5	1.0	43.42	87	
M53116 E 20-41S "	2	EA	.5	1.0	30.82	62	
M53116 E 22-21S "	2	EA	.5	1.0	24.06	48	
RIVNOT	4	EA	.25	1.0	1.	4	
BANANA JACK MOLDED NYLON	256	EA	.25	64.0	1.25	320	
FUSE HOLDER	128	EA	.25	32.0	4.72	604	
FUSES 2A	128	EA	.05	6.4	.25	32	
IDENT. PLATE	1	EA	.5	.5	3.00	3	
WIRE MIL-W-16878D B20	300	L.F.	.006	1.8	.027	8	
ASSY WIRING		A/R	50.0	50.0	—	—	
CHECKOUT-VALIDATE & TEST	1	EA	40.0	40.0	—	—	
SUB-TOTAL				235.7		3012	
LABOR HRS x RATE — SALES TAX	235.7	HRS	$15*	3536	4%	120	
ENG & DRAFT	200.0	HRS	$18*	3600			
*SEE APP. A-5 (3) (P.23) SUB-TOTAL				7136		3132	10,268
G&A @	20.5	%					2,105
					SUB-TOTAL		12,373
PROFIT	10	%					1,23
ESTIMATED COMPETITIVE BID COST							$13,610**
**COST REDUCED FROM G-30 DUE TO CHANGE IN SCOPE & LESS ENG. HOURS							

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

☑ GSE — BUDGETARY **PROJECT COST ESTIMATE** — ☐ OTHER _____

INSTALLATION/PROGRAM OFFICE: KSC INDUST. AREA	CONTROL NO: 72867 G-1A
PROJECT TITLE AND LOCATION: Checkout & Test PRSD GN_2/GHe Service - SSAT PAD	DATE: April 20, 1976
BASIS OF COST ESTIMATE: Previous Shuttle Estimate	REVISION NO:

I. SUMMARY OF COST ESTIMATE

DESCRIPTION	AMOUNT a.	PERCENT b
(1) ENGINEERING ESTIMATE	23,200	
(2) CONTINGENCIES, GOVERNMENT *(Enter percentage of item (1) a to right in col (2)b)*	2,320	10%
(3) SUPERVISION, INSPECTION AND ENGINEERING SERVICES *(Enter percentage of items (1)a and (2)a to right in col (3)b)*	2,552	10%
SUBTOTAL ((1)+(2)+(3))	28,072	
(5) COST ADJUSTMENT *(Enter percentage of item (4)a to right in col (5)b)*	7,651	27.3%
(6) OTHER BURDEN COSTS		
(7) TOTAL BUDGET ESTIMATE ((4)+(5)+(6))	$35,723	

(8) IDENTIFICATION OF ADJUSTMENT AND BURDEN COSTS, AND ESCALATION
Based on Jan '76 Cost w/Escalation @ 1% Per Month From JAN 76 To July 76 - For F/Y 1978 Funding 26 months

II. PLANNING AND DESIGN

DESCRIPTION	STATUS: NEEDED a.	IN-WORK b.	COMPLETE c.	IN-HOUSE/AE d.	COST e.
(1) PRELIMINARY ENGINEERING REPORT	✓			IN HOUSE	700
(2) SPECIAL STUDIES *(Specify)*	-	-	-	-	-
(3) FINAL DESIGN	✓			IN HOUSE	1,300
(4) SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES	✓			IN HOUSE	300
TOTAL PLANNING AND DESIGN COST					

III. RELATED COST DATA

(Not included in this approved project cost estimate but required to make the system complete)

(1) RELATED COSTS INVOLVED ☐ a YES *(Identify in items (2) through (10))* ☑ b NONE — (2) PER *(Amount)* — (3) DESIGN *(Amount)*

	ITEM	AMOUNT	ITEM	AMOUNT
OTHER RELATED EQUIPMENT	(4) TO BE PURCHASED		(8) GFE	
	(5) TRANSFER OF EXCESS		(9) OTHER *(Specify)*	
	(6) EXISTING			
	(7) FUTURE FUNDING			

EXHIBIT D-1 (cont)

INSTALLATION/PROGRAM OFFICE	CONTROL NO	DATE
KSC LETF	72867	April 20, 1976

☑ GSE — IV. PROJECT COST ESTIMATE — ☐ OTHER _____

DESCRIPTION TYPE, SIZE, KIND, ETC.	UNIT OF MEASURE 1.	QUANTITY 2.	UNIT COST ENGNG * 3.	TOTAL COST ENGNG 4.	TOTAL COST BUDGET 5.
GN_2 /GHe SERVICE PANEL	36x18x.250 ALUM				
PRESSURE XDUCER	EA	1	1,790	1,790	2,756
PRESSURE REGULATORS	EA	2	635	1,270	1,955
ASS'Y VALVES	EA	20	242	4,840	7,453
PRESSURE GAGES	EA	4	218.75	875	1,347
FILTER, TEE TYPE	EA	2	3215	6,430	9,902
TUBE ASSY	EA	33	4.85	160	246
MISC BRACKETRY	LBS	250	6.64	1,660	2,556
KC FITTINGS, etc	EA	250	21.14	5,285	8,138
CLEAN TUBE ASSYS LEVEL 300	EA	16	45.63	730	1,124
LEAK TEST PANEL ASSY	EA	1	160	160	246
* G&A @ 20.5 % & PROFIT @ 10%					
INCLUDED					
TOTAL				$23,200	$35,723

(7) SOURCE OF COST DATA, ESTIMATOR'S NAME, COMPANY OR AGENCY
EXPERIENCE - W. T. LONG — PAD "A"

(8) ESTIMATE OF THE BUDGET CONFIDENCE

CONFIDENCE FACTOR

A OFF-THE-SHELF	±15 ☑	C. R&D	±100 ☐
B PREPRODUCTION	±50 ☐	D OTHER _____	☐

V. RELATED ITEMS/ACTIONS

(EXPLAIN AS APPROPRIATE. USE EXTRA SHEETS, AS NECESSARY, FOR THIS BLOCK AND ABOVE)

July 5, 1977

KSC PRELIMINARY COST ESTIMATE WORK SHEET

GSE

W.O NO.	ECN	DATE PREPARED	SHEET / OF
0877	24668	APRIL 24 1976	1 OF 1

PROJECT: PRSD GN2/GHE SERVICE - SSAT (PAD)

LOCATION: LC 39 | CODE: GU-30-A

~~ARCHITECT~~ ENGINEER: PRC 1965 | ESTIMATOR: W.T. LONG W.T. Long

DRAWING NO.: 79K08499, SHEETS M1-3 | CHECKED BY: C.F. SMITH | APPROVED BY:

MECHANICAL

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
AL	FACE PLATE & BRACKETRY-36"X28"X250	114	LB	4.61	526
	SUPPORT ALUM.	210	LB	1.74	366
	PAINT ETCH & ANODIZE	60	SF	1.15	69
	XDUCER, PRESSURE	1	EA	1714	1714
	REGULATOR PRESSURE	1	EA	539	539
	METERING VALVE	4	EA	169.25	677
	SHUT OFF VALVE	5	EA	308.	1540
	RELIEF VALVE	2	EA	567	1134
	PRESSURE GAGE	2	EA	165	330
	FILTER TEE	3	EA	2060	6180
	ORIFICE	1	EA	260	260
	TUBE ASS'Y	16	EA	330	660
	BULKHEAD REDUCER	2	EA	81	162
	KC TEES	10	EA	38.50	385
	KC ADAPTER	10	EA	15.50	155
	KC UNION	4	EA	32.50	130
	KC NUT	34	EA	3.82	130
	KC SLEEVE	34	EA	3.82	130
	KC SEAL RING	86	EA	2.91	250
	INDENT. TAG	33	EA	3.03	100
	INDENT. PLATE	41	EA	10.24	420
	CAP	4	EA	15	60
	PANEL LABEL	55	EA	10.18	560
	LEAK TEST PANEL ASS'Y.	1	EA	150	150
	SUB-TOTAL				16627
	G & A	20.5			3409
	SUB-TOTAL				20036
	PROFIT	10			2004
	ESTIMATED COMPETITIVE BID COST				22,040

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE: G-95	DATE COMPLETED: 5-2-76	SHEET 1 OF 2 / SHEET ____ OF ____
PROJECT: PRSD GN_2/GHe SERVICE- SSAT (PAD)		DRAWING NO(S): 79K08499 SHEET NO: 3
LOCATION: LC 39		PCN: 77729
ENGINEER: PRC	PROGRAM MODEL NO.: LV-287	WORK ORDER OR CONTRACT NO: 0877
ESTIMATOR: W.T. LONG W.T Long	CHECKER: C. F. SMITH C.F. Smith	APPROVED:

MECHANICAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
FACE PLATE & BRACKETRY	114	LB	.22	25.1	.30	34	
SUPPORT 79K06529 TYPE 2	210	LB	.07	14.7	.30	63	
PAINT ABOVE	60	S.F.	.05	3.0	.15	9	
79K03438 GC10 XCLUCER PRESS	1	EA	.80	.8	1336	1336	SCIENTIFIC COLUMBUS 4/26 6
79K08002-7 REGULATOR PRESS 3/8"	1	EA	.96	1.0	406	406	
79K08009-7 REGULATOR PRESS	1	EA	.96	1.0	392	392	
79K08049-1 VALVE, SHUT-OFF 1/4"	4	EA	.80	3.2	116	464	
79K08050-1 VALVE, METERING 1/4"	4	EA	.80	3.2	120	480	
79K08057-1 VALVE, SHUT-OFF 3/8"	5	EA	.96	4.8	200	1003	
79K08156-3 VALVE, RELIEF 1/2"x1"	2	EA	1.12	2.2	425	851	
79K08235-1 VALVE, VENT CHECK 1/4	4	EA	.80	3.2	122	490	
79K08173-3 GAGE, PRESS 4-1/2" DIAL	2	EA	.40	.8	123	247	
79K08173-9 GAGE, PRESS 4-1/2 DIAL	2	EA	.40	.8	127	255	
79K08229-6 FILTER TEE 3/8	2	EA	.96	1.9	2409	4819	WINTEC CO.
79K08239-41 ORIFICE 3/8	1	EA	.48	.5	196	196	
79K08239-47 ORIFICE 3/8	1	EA	.48	.5	196	196	
TUBE ASSY 1/4"x.035 304S.S	17	EA	1.60	27.2	1.84	31	
TUBE ASSY 3/8 x .035 304S.S	16	EA	2.0	32.0	2.36	38	
KC106C6-4 REDUCER, ADAPTER	6	EA	.24	1.4	6.25	38	
KC144C6-8 REDUCER, BULKHEAD	2	EA	.28	.6	59.50	119	
KC107C6 TEE	2	EA	.36	.7	18.18	36	
KC109C4 TEE	1	EA	.30	.3	14.30	14	
KC109C6 TEE	2	EA	.36	.7	18.18	36	
KC110C4 TEE	6	EA	.30	1.8	19.45	117	
KC110C6 TEE	5	EA	.36	1.8	24.90	125	
KC111C16 TEE	2	EA	.66	1.3	54.97	109	
KC112C4 ADAPTER	10	EA	.20	2.0	8.60	86	
KC112C6 ADAPTER	13	EA	.24	3.1	12.-	156	
SUB-TOTAL TO SHEET #2				139.6		12,146	

EXHIBIT D-3 (cont)

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE: G-95	DATE COMPLETED: 5-2-76	SHEET 2 OF 2 SHEET ___ OF ___
PROJECT: PRSD GN_2/GH_e SERVICE- SSAT (PAD)	DRAWING NO(S): 79K08499	SHEET NO: M1-5
LOCATION: LC39-PAD	PCN: 77729	
ENGINEER: PRC 1965	PROGRAM MODEL NO.: LU-287	WORK ORDER OR CONTRACT NO.: 0877
ESTIMATOR: W.T. LONG W.T. Long PRC 1965	CHECKER: C. F. SMITH C.F. Smith PRC 1965	APPROVED:

MECHANICAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (MH) PER UNIT	LABOR (MH) TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
KC 124C4 UNION	4	EA	.20	.8	10.60	42	
KC 124C6 UNION	5	EA	.24	1.2	11.90	60	
KC 150C6 CAP ASSY	5	EA	.12	.6	3.25	16	
KC 142C4 NUT	34	EA	.10	3.4	.80	27	
KC 142C6 NUT	38	EA	.12	4.6	.95	36	
KC 143C4 SLEEVE	34	EA	.10	3.4	.80	27	
KC 143C6 SLEEVE	32	EA	.12	3.8	.95	30	
KC 103-4, -6 SEAL RINGS	86	EA	.10	3.6	.25	22	
75M04185 IDENT. TAG	33	EA	.10	3.3	.30	10	
AN924-6K NUT	7	EA	.12	.8	.50	4	
AA1509-0504 J CAP	4	EA	.10	.4	8.95	36	
79K05922 PANEL LABEL	55	EA	.50	27.5	.15	8	
IDENT. PLATE	41	EA	.50	20.5	.30	12	
MS21104-4 CLAMP	2	EA	.10	.2	.40	1	
MISC. HARDWARE	120	EA	.10	12.0	.25	30	
CLEAN TUBE ASSY'S LEVEL 300	33	EA	1.0	33.0	3.25	107	
LEAK TEST PANEL ASSY	1	EA	6.0	6.0	1—	1	
SUB-TOTAL THIS SHEET				130.1		469	
SUB-TOTAL SHEET # 1				139.6		12,146	
SUB-TOTAL				269.7		12,615	
LABOR HRS x RATE	269.7	HRS	$15*	4046			
SALES TAX		%			4	505	
SUB-TOTAL				4046		13120	17166
G&A	20.5	%					3519
					SUBTOTAL		20685
PROFIT	10	%					2069
ESTIMATED COMPETITIVE BID COST							$22 754
* SEE APPENDIX A-5 (3) (P.23)							

KSC FORM 21-243 (REV 4/77)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

☑ GSE — BUDGETARY **PROJECT COST ESTIMATE** — ☐ OTHER _____

INSTALLATION/PROGRAM OFFICE	CONTROL NO
KSC - LC39	78654 G-1-B
PROJECT TITLE AND LOCATION	**DATE**
ACCESS ARM MECHANISM	MAY 25, 1976
BASIS OF COST ESTIMATE	**REVISION NO**
PREVIOUS ESTIMATE MOD	

I. SUMMARY OF COST ESTIMATE

DESCRIPTION	AMOUNT a.	PERCENT b.
(1) ENGINEERING ESTIMATE	24,500	
(2) CONTINGENCIES, GOVERNMENT *(Enter percentage of item (1) a to right in col (2)b)*	2,450	10%
(3) SUPERVISION, INSPECTION AND ENGINEERING SERVICES *(Enter percentage of items (1)a and (2)a to right in col (3)b)*	2,695	10%
SUBTOTAL ((1)+(2)+(3))	29,645	
(5) COST ADJUSTMENT *(Enter percentage of item (4)a to right in col (5)b)*	8,085	27.3%
(6) OTHER BURDEN COSTS		
(7) TOTAL BUDGET ESTIMATE ((4)+(5)+(6))	$37,730	

(8) IDENTIFICATION OF ADJUSTMENT AND BURDEN COSTS, AND ESCALATION
BASED ON JAN '76 COST W/ESCALATION @ 1% PER MONTH
FROM JAN '76 TO JULY '76 - FOR F/Y 1978 FUNDING 25 MONTHS

II. PLANNING AND DESIGN

DESCRIPTION	STATUS: NEEDED a.	IN-WORK b.	COMPLETE c.	IN-HOUSE/AE d.	COST e.
(1) PRELIMINARY ENGINEERING REPORT	✓	-	-	IN-HOUSE	700
(2) SPECIAL STUDIES *(Specify)*	-	-	-	-	-
(3) FINAL DESIGN	✓	-	-	IN-HOUSE	1,200
(4) SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES					600
TOTAL PLANNING AND DESIGN COST					2,500

III. RELATED COST DATA

(Not included in this approved project cost estimate but required to make the system complete)

(1) RELATED COSTS INVOLVED — ☐ a YES *(Identify in items (2) through (10))* ☑ b NONE

(2) PER *(Amount)* | (3) DESIGN *(Amount)*

	ITEM	AMOUNT	ITEM	AMOUNT
OTHER RELATED EQUIPMENT	(4) TO BE PURCHASED		(8) GFE	
	(5) TRANSFER OF EXCESS		(9) OTHER *(Specify)*	
	(6) EXISTING			
	(7) FUTURE FUNDING			

INSTALLATION/PROGRAM OFFICE	CONTROL NO	DATE
KSC – LC 39 SHUTTLE	78654 G-1-B	5-25-76

☑ GSE — IV. PROJECT COST ESTIMATE — ☐ OTHER _____

DESCRIPTION TYPE, SIZE, KIND, ETC.	UNIT OF MEASURE 1.	QUANTITY 2.	UNIT COST ENGNG * 3.	TOTAL COST ENGNG 4.	TOTAL COST BUDGET 5.
3/8" PLATE	LB	808	1.62	1308	2014
5/8" PLATE	LB	6,881	1.62	11128	17137
3/4" PLATE	LB	1000	1.51	1511	2327
C3 X 6.0"	LB	452	1.56	706	1087
4" x 4" x 1/2" ANGLE	LB	492	1.56	769	1184
LOCKING DET. 1" x 1 7/8" x 6 1/2"	EA	4	162.–	648	998
SHOCK ABSORBER (ASA-2-3-85-54)	EA	4	564.50	2258	3477
MISC HARDWARE	EA	142	20.59	2925	4505
1" PLATE	LB	1,086	1.56	1698	2615
FAB DET "F"	EA	16	42.18	675	1040
* INCLUDES G&A @ 20.5 % &					
PROFIT 10 %					
TOTAL				$24,500	$37,730

(7) SOURCE OF COST DATA, ESTIMATOR'S NAME, COMPANY OR AGENCY
EXPERIENCE J. White ABC Co

(8) ESTIMATE OF THE BUDGET CONFIDENCE

CONFIDENCE FACTOR

A OFF-THE-SHELF	± 15 ☐	C. R&D	± 100 ☐
B PREPRODUCTION	± 50 ☑	D OTHER _____	☐

V. RELATED ITEMS/ACTIONS

(EXPLAIN AS APPROPRIATE USE EXTRA SHEETS, AS NECESSARY, FOR THIS BLOCK AND ABOVE)

KSC PRELIMINARY COST ESTIMATE WORK SHEET

W.O NO.	ECN	DATE PREPARED	SHEET
0725	78654	JUNE 10 - 1976	1 OF 2

PROJECT: ACCESS ARM MECHANISM

LOCATION: L.E.T.F. | CODE: G-30

~~ARCHITECT~~ ENGINEER: ABC Co. J.R.FORD (J.R. Ford) | ESTIMATOR: J. WHITE ABC Co.

DRAWING NO.: 79K03456, SHEETS MA1-2 | CHECKED BY: S. CART ABC Co. | APPROVED BY:

ITEM NO.	MACHINERY MECH. DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	LAUNCH PIVOT FIXTURE				
	3/8" PLATE	835	LB	1.11	926
	5/8" PLATE	7098	↑	1.11	7879
	3/4" PLATE	964		1.11	1070
	C3 x 6.0"	450		1.11	500
	4"x 4" x 1/2" ANGLE	490		1.11	544
	LOCKING DET. 1"x1 7/8" x6 1/2"	4	↓	114.68	459
	LOCKING DET. 1"x2"x2'-2 1/2"	14	LB	27.85	390
	ASSEMBLY FAB. PKG.	1	EA	180.00	180
	MISC. HARDWARE	41	EA	16.33	670
	SUB-TOTAL				12,618
	WITHDRAWAL MECH.				
	1/4" PLATE	161	LB	1.11	179
	1/2" PLATE	276	↑	1.11	306
	3/8" PLATE	412		1.11	457
	1" PLATE	520		1.11	577
	1 3/4" x 4 3/4" x 6" ST'L BAR	15		18.83	282
	FAB DET. "B"	1	↓	322.67	323
	FAB DET. "F"	1	LB	617.82	618
	EYE BOLT	2	EA	80.14	160
	MISC. HARDWARE	49	EA	15.24	747
	SHOCK ABSORBER (ASA-2-3-B5-54)	2	EA	400.10	800
	SUB-TOTAL				4,449
	SUB-TOTAL				17,067

July 5, 1977

KSC PRELIMINARY COST ESTIMATE WORK SHEET

W.O. NO.	ECN	DATE PREPARED	SHEET
0725	78654	June 10, 1976	2 OF 2

PROJECT: Access Arm Mechanism

LOCATION: L:E.T.F. | CODE: G-30

ARCHITECT ENGINEER: ABC Co. J.R. Ford J.R.Ford | ESTIMATOR: J. White ABC Co. J.White

DRAWING NO.: 79K03456, SHEETS MA1-2 | CHECKED BY: S. Cant S. Cant ABC. Co | APPROVED BY:

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	DECELERATION UNIT				
	1/2" PLATE	398	LB	1.11	442
	3/4" PLATE	245	↑	1.11	272
	1" PLATE	563	|	1.11	625 .
	1 3/4" x 4 3/4" x 6" ST'L. BAR	15	|	18.79	282
	2" DIA X 5 3/4" CRES BAR	16	|	23.29	373
	1" HEX CRES BAR	8	↓	15.79	126
	1/2 x 6 1/2" x 5" CRES BAR	16	LB	29.89	478 .
	MISC. HARDWARE	52		12.57	654 . -
	SHOCK ARSORBER (ASA-2-3-BS-54)	2		400.10	800 .
	SUB-TOTAL THIS SHEET				4,052
	" " SHEET #1				17,067
			SUB-TOTAL		21,119
	G&A	20.5	%		4,329
			SUB TOTAL		25,448
	PROFIT	10	%		2,545
	ESTIMATED COMPETITIVE BID COST				27,993

KSC FORM 21-224 (8/74)

NASA/KSC AUG/74

EXHIBIT E-3

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE: G-95	DATE COMPLETED: 6-30-76	SHEET 1 OF 2 SHEET ____ OF ____
PROJECT: ACCESS ARM MECHANISM		DRAWING NO(S): 79K03456 / SHEET NO: MAI-4
LOCATION: L.E.T.F		PCN: 78654
ENGINEER: ABC CO J.R. FORD (J R Ford)	PROGRAM MODEL NO.: UL-632	WORK ORDER OR CONTRACT NO.: 0725
ESTIMATOR: J. WHITE (J White)	CHECKER: S. CART (S. Cart.)	APPROVED:

MACHINERY SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) ☐ FIELD TOTAL ☐ FAB.	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
① LAUNCH PIVOT FIXTURE							
3/8 PLATE	618	LB	.03	18.5	.70	433	RYERSON
5/8 PLATE	5031	LB	.03	150.9	.70	3522	U.S. STEEL
3/4 PLATE	764	LB	.03	22.9	.70	535	RYERSON
C3x6.0	315	LB	.03	9.5	.70	221	KAISER
4"x4"x1/2" ANGLE	430	LB	.03	12.9	.70	301	FLA. ST
LOCKING DET 3/4"x1"x3 1/4"	1	LB	4.0	4.0	180.00	180	
LOCKING DET. 1"x1 7/8"x6 1/2"	4	LB	4.0	16.0	40.00	160	
LOCKING DET. 1"x2"x2'-2 1/2"	15	LB	4.0	60.0	20.00	300	
ASSEMBLY FAB. PKG	1	EA	80.0	80.0	100.00	100	
MISC. HARDWARE	46	EA	.43	19.8	8-	368	
SUB-TOTAL				394.5		6120	
② WITHDRAWAL MECH.							
1/4 PLATE 160	160	LB	.03	4.8	.70	112	RYERSON
1/2 PLATE 235	235	LB	.03	7.1	.70	165	U.S. STEEL
3/8 PLATE 390	390	LB	.03	11.7	.70	273	RYERSON
1" PLATE 415	415	LB	.03	12.5	.70	291	IND. STL.
1 3/4 x 4 3/4 x 6" BAR	16	LB	.03	0.5	18.33	275	FLA. STL.
FAB DETAIL "B" M-15	1	LB	1.0	1.0	205	205	
FAB DETAIL "F" M-15	1	LB	1.0	1.0	400	400	
FAB DETAIL "D" M-15	1	LB	1.0	1.0	300	300	
EYE BOLT	2	EA	0.5	1.0	45.23	90	McMASTERS
MISC. HARDWARE	56	EA	.43	24.1	8.-	448	
SHOCK ABSORBER (ASA-2-3-BS-54)	2	EA	.40	0.8	300	600	EEDY
SUB-TOTAL				65.5		3159	

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE	DATE COMPLETED	SHEET 2 OF 2
G-95	6-10-76	SHEET ____ OF ____

PROJECT	DRAWING NO(S)	SHEET NO
ACCESS ARM MECHANISM	79K03456	MA1-4

LOCATION	PCN
L.E.T.F.	78654

ENGINEER	PROGRAM MODEL NO	WORK ORDER OR CONTRACT NO.
ABC CO J.R. FORD	UL-632	0726

ESTIMATOR	CHECKER	APPROVED
J. WHITE J. White	S. CART. S cont. ABC CO	

____ SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
DECELERATION UNIT							
½" PLATE	315	LB	.03	9.5	.70	221	RYERSON
¾" PLATE	195	LB	.03	5.9	.70	137	U.S. STEEL
1" PLATE	360	LB	.03	10.8	.70	252	KAISER
1¾" x 4¾" x 6" BAR	15	LB	.03	0.5	13.20	198	RYERSON
1¼" x 2" x 2'	24	LB	.03	0.7	5.75	138	FLA. STL.
2" DIA x 5¾" CRES BAR	16	LB	.03	0.5	22.80	365	FLA. STL.
1" HEX CRES BAR	8	LB	.03	0.2	15.30	122	
½" x 6½" x 5" CRES BAR	18	LB	.03	0.5	18.27	329	
MISC. HARDWARE	59	EA	.43	25.4	3.31	195	
SHOCK ABSORBER (ASA-2-3-BS-54)	2	EA	.40	0.8	300.	600	EFDYN
SUB-TOTAL THIS SHEET				54.8		2557	
① " " SHEET #1				394.8		6120	
② " " SHEET #1				65.5		3159	
SUB-TOTAL				515.1		11,836	
LABOR HOURS X RATE	515.1	HRS	13.60	7005			
SALES TAX		%			4	473	
SUB-TOTAL				7005		12309	19314
G&A	20.5	%					3959
					SUB-TOTAL		23273
PROFIT	10	%					2327
ESTIMATED COMPETITIVE BID COST							$25,600

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

☑ GSE — BUDGETARY **PROJECT COST ESTIMATE** — ☐ OTHER _____

INSTALLATION/PROGRAM OFFICE: KSC LC-39 SHUTTLE	CONTROL NO: 77823 G-1-B
PROJECT TITLE AND LOCATION: INTERTANK ACCESS ARM & STRUCTURAL ACCESSORIES	DATE: MAY 25, 1976
BASIS OF COST ESTIMATE: PREVIOUS SHUTTLE ESTIMATE MOD.	REVISION NO

I. SUMMARY OF COST ESTIMATE

DESCRIPTION	AMOUNT a.	PERCENT b.
(1) ENGINEERING ESTIMATE	156,000	
(2) CONTINGENCIES, GOVERNMENT *(Enter percentage of item (1) a to right in col (2)b)*	15 600	10 %
(3) SUPERVISION, INSPECTION AND ENGINEERING SERVICES *(Enter percentage of items (1)a and (2)a to right in col (3)b)*	17 160	10 %
SUBTOTAL ((1)+(2)+(3))	188 760	
(5) COST ADJUSTMENT *(Enter percentage of item (4)a to right in col (5)b)*	51 480	27.3 %
(6) OTHER BURDEN COSTS		
(7) TOTAL BUDGET ESTIMATE ((4)+(5)+(6))	240 240	

(8) IDENTIFICATION OF ADJUSTMENT AND BURDEN COSTS, AND ESCALATION
BASED ON JAN '76 COST W/ESCALATION @ 1% PER MONTH FROM JAN '76 TO JULY '76 - FOR F/Y 1978 FUNDING 25 MOS.

II. PLANNING AND DESIGN

DESCRIPTION	STATUS: NEEDED a.	IN-WORK b.	COMPLETE c.	IN-HOUSE/AE d.	COST e.
(1) PRELIMINARY ENGINEERING REPORT	✓	–	–	IN-HOUSE	4600
(2) SPECIAL STUDIES *(Specify)*	–	–	–	–	–
(3) FINAL DESIGN	✓	–	–	IN-HOUSE	9000
(4) SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES	✓	–	–	IN-HOUSE	15,600
TOTAL PLANNING AND DESIGN COST					

III. RELATED COST DATA

(Not included in this approved project cost estimate but required to make the system complete)

(1) RELATED COSTS INVOLVED: ☐ a. YES *(Identify in items (2) through (10))* ☑ b. NONE

(2) PER *(Amount)* | (3) DESIGN *(Amount)*

	ITEM	AMOUNT	ITEM	AMOUNT
OTHER RELATED EQUIPMENT	(4) TO BE PURCHASED		(8) GFE	
	(5) TRANSFER OF EXCESS		(9) OTHER *(Specify)*	
	(6) EXISTING			
	(7) FUTURE FUNDING			

INSTALLATION/PROGRAM OFFICE	CONTROL NO	DATE
KSC - LC 39 SHUTTLE	77823	5-25-76

☑ GSE — IV. PROJECT COST ESTIMATE — ☐ OTHER _____

DESCRIPTION TYPE, SIZE, KIND, ETC.	UNIT OF MEASURE 1.	QUANTITY 2.	UNIT COST ENGNG * 3.	TOTAL COST ENGNG 4.	TOTAL COST BUDGET 5.
R 3/8"	LB	300	2.00	600	924
R 1/2"	LB	200	2.00	400	616
R 1"	LB	900	2.00	1,800	2,772
R 1 1/4"	LB	50	2.00	100	154
R 2 1/2"	LB	800	2.00	1600	2,464
2" SCH 80	LB	20000	2.00	40,000	61,600
3" ϕ SCH 40	LB	6000	2.00	12,000	18,480
3 1/2" ϕ SCH 40	LB	13000	2.00	26,000	40,040
5" ϕ SCH 40	LB	20000	2.00	40,000	61,600
6" ϕ SCH 40	LB	10000	2.00	20,000	30,800
GRATE	LB	2000	2.00	4,000	6,160
HANDRAIL	LB	400	20.00	8,000	12,320
STAIRS	RISER	30	50.00	1,500	2,310
*INCLUDES G&A @ 20.5%					
AND PROFIT @ 10%					
TOTAL				$156,000	$240,240

(7) SOURCE OF COST DATA, ESTIMATOR'S NAME, COMPANY OR AGENCY

EXPERIENCE JOHN JONES LETF PHI SYSTEM

(8) ESTIMATE OF THE BUDGET CONFIDENCE

CONFIDENCE FACTOR

A. OFF-THE-SHELF	±15 ☐	C. R&D	±100 ☐
B. PREPRODUCTION	±50 ☑	D. OTHER _____	☐

V. RELATED ITEMS/ACTIONS

(EXPLAIN AS APPROPRIATE. USE EXTRA SHEETS, AS NECESSARY, FOR THIS BLOCK AND ABOVE)

KSC PRELIMINARY COST ESTIMATE WORK SHEET

G. S. E.

W.O. NO	ECN	DATE PREPARED	SHEET / OF 1
0750	77823	6-7-76	

PROJECT: INTER TANK ACCESS ARM & ACCESSORIES

LOCATION: L.E.T.F. | CODE: G-U-30

~~ARCHITECT~~ ENGINEER: ABC Co. J. Silver J. SILVER | ESTIMATOR: J Jones JOHN JONES ABC Co.

DRAWING NO.: 79K09876, SHEETS S1-S3 | CHECKED BY: A Green AL GREEN ABC Co. | APPROVED BY:

ITEM NO.	STRUCTURAL DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE MATERIAL & LABOR	ESTIMATED AMOUNT
	BUILT-UP-GIRDER				
	PL 3/8"	300	LB	1.00	300
	PL 1/2"	250	LB	1.00	250
	PL 1"	800	LB	1.00	800
	PL 1 1/4"	20	LB	1.00	20
	PL 2 1/2"	800	LB	1.00	800
	WASTE 10%	217	LB	1.00	217
	INTER TANK ACCESS ARM				
	2" ϕ SCH. 80	19500	LB	1.10	21450
	3" ϕ SCH. 40	6600	LB	1.10	7260
	3½" ϕ SCH. 40	13800	LB	1.10	15180
	5" ϕ SCH. 40	22800	LB	1.10	25080
	6" ϕ SCH. 40	13000	LB	1.10	14300
	5"-3½" REDUCER	30	LB	1.10	33
	6"-5" REDUCER	21	LB	1.10	23
	WT 2X2.75	50	LB	1.10	55
	WT 3X7.75	230	LB	1.10	253
	GRATE	3150	LB	1.10	3465
	MISC. PL	3600	LB	1.10	3960
	MISC. METALS				
	REMOVABLE HANDRAIL	350	LF	20.00	7000
	KICK PL 1/4"	1400	LB	.80	1120
	STAIRS	32	RISER	70.00	2240
	SUB-TOTAL				103 806
	G&A @	20.5	%		21 280
				SUB-TOTAL	125 086
	PROFIT @	10	%		12 509
	ESTIMATED COMPETITIVE BID COST				$137 595

KSC FORM 21-224 (8/74)

NASA/KSC AUG/74

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE: G-95	DATE COMPLETED: 6-21-76	SHEET 1 OF 2 SHEET ____ OF ____
PROJECT: INTERTANK ACCESS ARMS & ACCESSORIES		DRAWING NO(S): 79K09876 / SHEET NO: S1-S6
LOCATION: L.E.T.F.		PCN: 77823
ENGINEER: ABC CO J. SILVER (J Silver)	PROGRAM MODEL NO: UL-251	WORK ORDER OR CONTRACT NO.: 0750
ESTIMATOR: JOHN JONES ABC CO (J Jones)	CHECKER: AL GREEN ABC CO (A Green)	APPROVED:

STRUCTURAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR ($ OR MH) TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	QUOTES
BUILT-UP GIRDER							
PL 3/8"	306	LB.	.30	92	.70	214	IND. STL.
PL 1/2"	254	LB.	.30	76	.70	178	
PL 1"	796	LB.	.30	239	.70	557	
PL 1¼"	20	LB.	.30	6	.70	14	
PL 2½"	816	LB.	.30	245	.70	571	
WASTE 10%	219	LB.	.30	66	.70	153	
INTERTANK ACCESS ARM							
2"Ø SCH. 80	18958	LB.	.30	5687	.90	17062	IND. STL.
3"Ø SCH. 40	6691	LB.	.30	1992	.90	5977	"
3½"Ø SCH. 40	12866	LB.	.30	3860	.90	11579	"
5"Ø SCH. 40	21618	LB.	.30	6485	.90	19456	"
6"Ø SCH. 40	11080	LB.	.30	3324	.90	9972	"
5"-3½" REDUCER	34	LB.	.30	10	.90	31	
6"-5" REDUCER	22	LB.	.30	7	.90	20	
CORROSION INHBITOR	6254	LF	.39	2439	.06	375	
WT 2 x 2.75	55	LB.	.30	17	.90	50	
WT 3 x 7.75	233	LB.	.30	70	.90	210	
GRATING	2200	LB.	.30	660	.90	1980	DORDEN CO
MISC. PL	2600	LB.	.30	780	.90	2340	
SHEET SUBTOTAL				26056		70739	

EXHIBIT F-3 (cont)

☑ GROUND SUPPORT EQUIPMENT **COST ESTIMATE** ☐ CONSTRUCTION

CODE: G-95	DATE COMPLETED: 6-21-76	SHEET 2 OF 2 SHEET ____ OF ____
PROJECT: INTERTANK ACCESS & ACCESSORIES	DRAWING NO(S): 79K09876	SHEET NO: S1-S6
LOCATION: L.E.T.F		PCN: 77823
ENGINEER: J Silver ABC CO J. SILVER	PROGRAM MODEL NO.: UL-261	WORK ORDER OR CONTRACT NO: 0750
ESTIMATOR: JOHN JONES ABC CO J Jones	CHECKER: AL GREEN A Green	APPROVED:

STRUCTURAL SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($) PER UNIT	LABOR ($) TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
MISC. METALS							
REMOVABLE RAILING	366	LF	5.	1830	15	5990	
KICK PL 1/4"	1412	LB	.30	424	.60	847	
STAIRS	32	RISER	22.	704	60	1920	
SUB TOTAL				2958		8257	
SOB TOTAL FROM SHT. 1				26055		70739	
S/T				29013		78996	108009
G&A 20.5%							22192
S/T							130151
PROFIT 10%							13015
ESTIMATED COMPETITIVE BID COST						$	143,166