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MAKE OR BUY PROGRAM
Letter Contract AF 04(694)-270
M57A-1 STAGE III MINUTEMAN MOTOR

DDC
MAY 17 1963
TISA A

Prepared by

CONTRACT ADMINISTRATION DIVISION
HERCULES POWDER COMPANY
CHEMICAL PROPULSION DIVISION
Minuteman Research and Development Group
Bacchus, Utah

Prepared for

HEADQUARTERS, BALLISTIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Norton Air Force Base
California

MAKE OR BUY PROGRAM
Letter Contract AF 04(694)-270

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SECTION I

INTRODUCTION AND GENERAL COMMENTS

Outlined herein is the Hercules Powder Company Make or Buy Program applicable to Letter Contract AF 04(694)-270.

Make or Buy decisions have been arrived at after a comprehensive review and evaluation by management of all known factors. Initially, decisions to "make" are formed upon the factors of facilities, manufacturing knowhow, adaptability, etc. After formulating a decision of "make" from these factors, studies are then conducted into the areas of unit cost, transportation, management control, etc., the result of which confirms or changes the "make" decision. Unit cost consideration is based and weighted upon detailed, comprehensive cost analyses of both in-house manufacture and vendor furnished costs.

Hercules basis for vendor selection is predicated on an initial "Vendor Survey" followed by successful contractual performance in areas of quality, capability, delivery and final qualification of the product to prescribed standards using reliability techniques developed through the R & D Program under Contract AF 04(647)-243 and production contracts AF 04(647)- 690 and AF 04(694)-127.

SECTION II

SMALL BUSINESS PARTICIPATION

Hercules, Bacchus, has a firm policy to develop and maintain a roster of technically and financially competent Small Business concerns and afford all Small Business concerns an equitable opportunity to compete for business within their capability. Procedures are established in the Purchasing Division, HPC Bacchus, to insure that bids are received from Small Business concerns whenever practical and that vendors having contracts with HPC comply with the Small Business requirements in their subcontracts.

The effectiveness of Hercules' Small Business policy can readily be evaluated by comparison of the Small Business participation in all defense procurement, which on a total dollar volume for fiscal year 1962 was 31.8%, while here at Bacchus the participation by Small Business was 39.43%; 8% above the national average. Presently the monthly volume of orders to Small Business at Bacchus is 75% of total orders placed.

SECTION III

"MAKE OR BUY" REVIEW BOARD

Bacchus Works of the Hercules Powder Company, Chemical Propulsion Division, has initiated a Make or Buy procedure under Management Manual Procedure 4-24, 8 February 1963, which establishes a Make or Buy Review Board consisting of management and technical representation under the chairmanship of the Superintendent of Contract Administration, for the purpose of making Make or Buy decisions at the appropriate time in a contract program.

SECTION IV

VENDOR SELECTION

The individual quantity requirements of the items subcontracted to the individual vendors is contingent upon vendor capability, production schedules, available special tooling, vendor qualification, performance, and reasonableness of price, with prime emphasis being placed on ability for performance and maintenance of reliability. Because of the reliability and confidence level that must be maintained in the end item being produced under this contract, reasonableness of price cannot be utilized as the determining factor in the selection of a vendor. Price is not totally disregarded in this respect, however, as Hercules strives by aggressive negotiation and value analysis to obtain reliability at the most reasonable price.

SECTION V

FACT SHEET - MAKE OR BUY PROGRAM

Program MINUTEMAN

Contract No. AF 04(694)-270

1. Number of items requiring Make or Buy decisions.....	<u>13</u>
2. Number of items - Make	<u>5*</u>
3. Number of items - Buy.....	<u>10*</u>
4. Number of items - Deferred.....	<u>0</u>
5. Total Dollars.....	<u>\$5,610,091</u>
6. Total Dollars - Make	<u>\$3,252,620</u>
7. Total Dollars - Buy.....	<u>\$2,357,471</u>

8. Statement regarding Small Business: (What the per cent of Dollars on Buy items are to Small Business)

Participation by small business in the "Make or Buy" decision items is 3.42%

9. Statement concerning Deferred items: (List items deferred and approximate date they will be submitted to the Contracting Officer for review and approval.)

none

* Item M, External Insulation, and Case Machining, are both "Make and Buy" items and included in both of these figures.

SECTION VI

MAJOR COMPONENTS, ASSEMBLIES, OR PARTS RECEIVING
'MAKE OR BUY' MANAGEMENT DECISION

<u>Item No.</u>	<u>Part No.</u>	<u>Part Name</u>	<u>Page</u>	<u>Recommendation</u>
1	01A-00221-083	Case, Motor Chamber	A	Make
2	01A-00224-001	Case, Machining	B	Make & Buy
3	01A-00478-001 01A-00478-003	Insulator, Case, Internal	C	Buy
4	01A-00560-001	Pyrogen Igniter	D	Make
5	KR 80000-07	Igniter S & A Device	E	Buy
6	01A-00768-005 01A-00768-006	Nozzles	F	Buy
7	170326-0101CEC	Pressure Transducer	G	Buy
8	01A-00074-003	TT Subassembly	H	Buy
9	2036-3	TT Shell Insulator	I	Buy
10	7300-9	TT Arm/Disarm Switch	J	Buy
11	01A-00545-001	TT Frangible Sector	K	Make
12	01A-90078	Tumble Motors	L	Make
13	01A-01648 01A-01829	External Insulation	M	Make & Buy

PART A

BM-7000/9, (12-62)

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Date: 24 April 1963

Description: Cylindrical chamber with ovaloid ends fabri-
cated from fiberglass filaments bonded with
epoxy resin.

Contract No. AF 04(694)-270

Recommendation MAKE

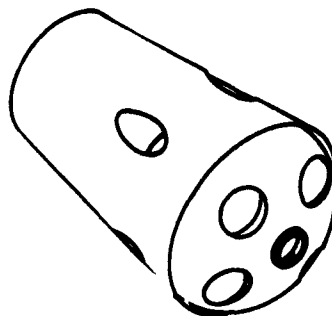
Make: HPC Rocky Hill

Part Number 01A-00221

Part Name Case, Motor

Quantity per motor 1

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per Item	Special Tooling		Estimated Lead Time		Government owned Facilities?	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity	Tool.	Weeks		
Hercules Powder Company Rocky Hill, New Jersey Large Business	\$7572	135	\$7572	Existing production Tooling will be used.			9	no	none



Remarks: Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:
Case Winding is a proprietary process of the Hercules Powder Company developed to provide a suitable case meeting the Stage III Motor design requirements.

Technical and manufacturing competence gained through production AF Contract 04(647)-243, and 04(647)-690 were substantiating factors in recommending Make.

PART B

BM-7000/9 (12-62)

Date: 24 April 1963

DESCRIPTION: Case, Machining, consists of machining the "over-lap" on the aft end, forward ends, and the inter-stage ring. Also includes plaster removal and disassembly of turn-around mandrel shaft assemblies.

HIRTLES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation: Make and Buy

Part Number: 01A-00224-005

Part Name: Case, Machining

Buy: Arrowsmith Plastic Tooling
Make: HPC, Bacchus

Quantity per motor: 1

S.N.	Est. Unit Cost	Est. Qty.	Est. Total Cost per Item	Special Tooling		Estimated Lead Time Weeks		Government-owned Facilities*	Add. Fac. Req.
				Estimated Cost	Monthly Capacity	Tool	Prod.		
Arrowsmith Plastic Tooling Los Angeles, California Large Business Substantial Unemployment	\$3000.00	113	\$3000.00	None	52		15	no	none
HPC, Bacchus, Utah Case Machining of loaded motor for retrofit	*see note below								

Illustration not applicable

Remarks: Requirements for this part, including facilities and special tooling, are estimated.

Arrowsmith has developed capability through operation under R & D Contract AF 04(647)-283 at their Los Angeles plant and Production Contract AF 04 (647)-690 at Clearfield, Utah. Their Clearfield facilities are used for production to reduce handling and transportation effort.

* At this date program requirements are not defined for this effort and therefore, quantities are not available for this Make or Buy. When quantities are defined by BSD this Make or Buy will be revised.

EW-7000/9 (12-62)

Date: 24 April 1963

DESCRIPTION: The internal case insulator is composed of Buna-S Rubber and ultimately forms a bonded liner to the Spiralloy case. The purpose of this insulation is to act as a heat barrier between the burning propellant and the case.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(69A)-270
Recommendation Buy

U. S. Rubber
Goodyear

Part Number 01A-00478-001 (US)
01A-00478-003 (Gdy)

Part Name Insulator, Case
Internal

Quantity per motor 1

Company	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per Item	Special Tooling Required Cost	Monthly Capacity	Lead Time (Wks.)	Government owned Facilities?	Add. Fac. Nec.
U. S. Rubber Mishawaka, Indiana Large Business	\$7800.00	79	\$7800.00	\$ 20,000*		26	no	none
Goodyear 1144 East Market Street Akron, Ohio Large Business	\$8200.00	79	\$8200.00	Existing Tooling will be used on a non-interference basis		26	no	none

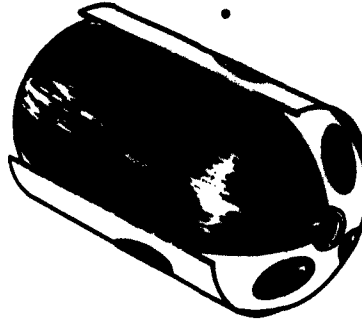
REMARKS: *The \$20,000 represents estimated costs for 7 stainless steel plaster mandrel shafts. The production shafts are made of low carbon steel. It is anticipated that used stainless steel shafts will result in low refurbishing costs.

Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:
HPC does not have the facilities or equipment for manufacture of insulators.

Both suppliers not only have manufacturing availability for the insulators, but also fabricate these from raw materials; rubber production being their main source of business.

The existence of two sources who are capable of providing quality items within the specified delivery schedule at a competitive price was a paramount factor in reaching the decision to "BUY".



PART D

BU-7000/9 (12-62)

Date: 24 April 1963

Description: The igniter assembly consists of a base plate assembly which fits into the aft dome port and a bracket assembly that contains pyrotechnic material enclosed in a small rocket motor. This pyrotechnic material ignites the small rocket motor which spews out flames along the entire burning surface of the full-scale rocket motor.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

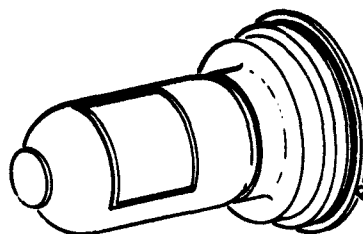
Contract No. AF 04(69A)-270
Recommendation: MAKE

HPC KENVIL

Part Number 01A-00560-001

Part Name Pyromen Igniter

Quantity per motor 1



Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per Lot	Special Tooling Estimated Cost	Monthly Capacity	Lead Time Tool	Estimated Production	Government-owned Facilities?	Add. Fac. Nec.
Hercules Powder Company Kenil, New Jersey Large Business	\$1520.00	58	\$1520.00	none	75	--	16	no	none

REMARKS:

Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:

No other vendor immediately available with technical and manufacturing competence or facilities to produce this item.

Technical and manufacturing competence gained through R&D, availability of adequate facilities at Kenil, were substantiating factors in recommending "MAKE".

This small rocket motor is within the manufacturing field and capability of Hercules Powder Company without requiring extensive additional tooling.

BW-7000/9 (12-62)

24 Apr 11 1963

Igniter S & A Assembly is a mechanical Safe & Arm mechanism used to initiate the Squibs in the igniter which in turn initiate propellant ignition.

WHITEL'S POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation

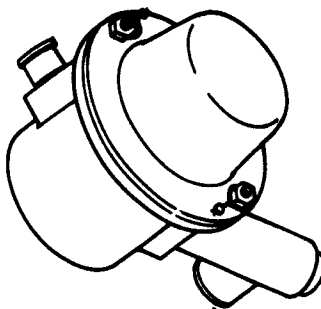
Bulova Research and Development Lab.

Part Number **KR 80000-07**

Part Name: Igniter S&A

Switch

Quantum per motor 1

[illegible]

Remarks: Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:
HPC does not have facilities necessary for the manufacture of this item.

Bulova is currently supplying similar items under R & D Contract AF 04(647)-243 and Production Contract AF 04(647)-690, and AF 04(694)-127. Bulova has the necessary manufacturing skill, adequate trained personnel, and familiarity with materials and techniques required for the manufacture of this technical and precision-type item.

Bulova's production facilities are adequate to meet the increased supply demands in excess of their current contract obligations.

PART F

BM-7000/9 (12-62)

Date: 24 April 1963

DESCRIPTION: A pivoted nozzle, incorporating a blast tube, an integral expansion cone, and a throat section.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation: BUY

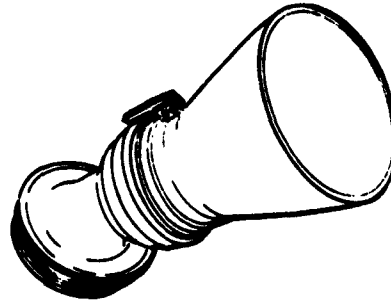
Part Number 01A-00768-006
01A-00768-005

Part Name Nozzles

Thompson-Ramo-Wooldridge
Kaiser Aircraft and Electronics

Quantity per motor 4

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per Item	Special Tooling		Estimated Lead Time Weeks		Government owned Facilities?	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity	Tool.	Prod.		
Thompson-Ramo-Wooldridge 2355 Euclid Avenue Cleveland, Ohio Large Business	\$3900*	100	\$15,600	Existing Production Tooling will be used on a non-interference basis			27	Yes, presently being used on Minuteman Program \$800.089 none	
Kaiser Aircraft and Electronics 800 Doolittle Drive San Leandro, California	\$4,079*	131	\$16,316	Existing Production Tooling will be used on a non-interference basis			27	Yes, presently being used on Minuteman Program \$784,733	none



Remarks:

Requirements for this part, including facilities and special tooling, are estimated.

*Estimated cost does not include tungsten or carbon.

Reason for Decision:

Both sources have supplied nozzles on R&D Contract AF 04(647)-243 and Production Contract AF 04(647)-690, AF 04(694)-127. Quality, delivery, and overall performance by both vendors have been satisfactory to warrant retention as qualified sources.

HPC does not have the facilities or equipment necessary for the fabrication of nozzles. "State of Art" in this field is constantly changing and requires such extensive R&D into manufacturing process so as to discourage entry into such a specialized field.

The existence of two sources who are capable of providing quality items within the specified delivery schedule at a competitive price was a paramount factor in reaching the decision to "BUY".

PART G

BM-7000/2 (12-62)

Date: 24 April 1963

Description: The pressure transducer is a device attached through the igniter base plate that translates the variance in motor chamber pressure to an electrical impulse.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation Buy

Consolidated Electro Dynamic, Inc.

Part Number 170326-0101CEC

Part Name Pressure

Transducer

Quantity per motor 1

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per End Item	Special Tooling		Lead Time Weeks	Estimated Time Weeks	Government owned Facilities?	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity	Tool.	Prod.		
Consolidated Electro Dynamic, Inc. 1400 South Samrock Monrovia, California Large Business - Area of Substantial Unemployment	\$ 950.00	65	\$950.00	Existing Production Tooling will be used		--	21	no	none



Remarks: Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:
Since the nature of the work is not within the normal scope of Hercules Powder Company, the decision was made to buy.

PART H

BB-7000/9 (12-62)

Date: 24 April 1963

Description: A cylindrical aluminum tube assembly consisting of a shell and a nylon insulator.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation BUY

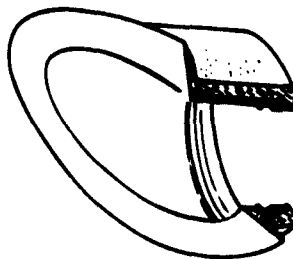
Kaiser Aircraft and Electronics
Edler Industries

Part Number 01A-00074-001
01A-00074-003

Part Name TT Subassembly

Quantity per motor 4

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per Item	Special Tooling		Lead Time	Estimated Weeks		Government owned Facilities?	Add. Fac. Rec.
				Estimated Cost	Monthly Capacity	Tool.	Prod.	Prod.		
Kaiser Aircraft and Electronics 800 Doolittle Drive San Leandro, California Large Business	\$275.00	413	\$1,100.00	Existing Tooling will be used	Production will be used	N/A	18	18	Yes, presently being used on Minuteman \$320,474	none
Edler Industries 5629 Firestone Blvd. Los Angeles, California Small Business - Area of Substantial Unemployment	\$324.00	268	\$1296.00	Existing Production Tooling will be used.		N/A	18	18	no	none



Remarks:

Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:

Both sources listed have been utilized in supplying requirement for R & D Contract AF 04(647)-243 and Production Contracts AF 04(647)-690, AF 04(694)-127. Quality, delivery, and overall performance by both vendors have been satisfactory to warrant retention as qualified sources.

The existence of two sources who are capable of providing quality items within the specified delivery schedule at a competitive price was a paramount factor in reaching the decision to "BUY".

HPC does not have the necessary facilities or equipment necessary for the manufacture of this item.

PART I

BW-7000/9 (12-62)

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Date: 24 April 1963

Description: Phenolic insulation ring that surrounds
the TI Subassembly.

Contract No. AF 06(69A)-270

Recommendation: BUY

Svedlow, Incorporated

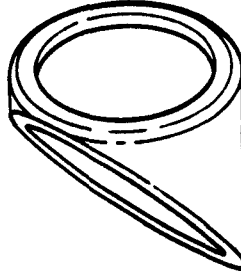
Part Number 2036-3

Part Name TI Shell

Insulator

Quantity per motor 4

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per End Item	Special Tooling		Estimated Lead Time, Weeks		Government owned Facilities?	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity	Tool.	Prod.		
Svedlow, Incorporated 6086 Banduna Blvd. Los Angeles, California Small Business - Area of Substantial Unemployment	\$231.00	744	\$924.00	Existing Production Tooling will be used.		6	8	no	none



Remarks:

Requirements for this part, including facilities and special tooling are estimated.

Reason for Decision:

Cost of special forms and dies required to form this item in consideration of the relatively small requirement, would reduce profit to a point that other sources within the industry could not produce at a competitive price.

Svedlow, Incorporated has capability and capacity to furnish all production needs of this item.

PART J

BU-7000/9 (12-62)

Date: 24 April 1963

Description: Mechanical Safe & Arm Mechanism through which current flows to initiate the frangible sector prior to thrust termination.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

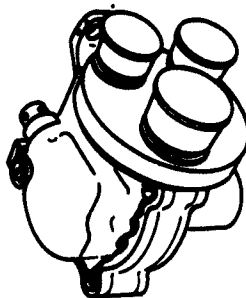
Contract No. AF 04(694)-270
Recommendation BUY

Part Number 7300-9

Part Name TT Arm/Disarm

Switch

Quantity per motor 1



Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per End Item	Special Tooling		Estimated Lead Time Weeks	Government owned Facilities?	Add. Fac. Rec.
				Estimated Cost	Monthly Capacity	Tool.		
*Consolidated Controls Corp. 750 South Isis Englewood, California Large Business - Area of Substantial Unemployment	\$2111.70	138	\$2111.70	None	60	21	Mo	None

Reason for Decision:

Remarks: *This source was formerly known as Electro-Actuators, 9705 Klingeran, El Monte, California. Consolidated Controls purchased Electro-Actuators on October 1, 1962.

Consolidated Controls Corporation (previously Electro-Actuators) has been qualified through production effort under the R & D Contract AF 04(647)-243 and have been supplying 7300-5 configuration switches for AF contracts AF 04 (647)-690, and AF 04(694)-127. Currently this vendor is being qualified for production of the 7300-9 TT Arm/Disarm switch.

Requirements for this part, including facilities and special tooling, are estimated.

As this type of commodity is not within the scope of company products, facilities and/or equipment for manufacture are not available.

PART K

BB-7000/9 (12-62)

Date: 24 April 1963

Description: An explosive squib used to release tension on IT closure ring which allows internal pressure to force closure out and thus realize thrust termination.

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation MAKE

HPC PORT EMEN

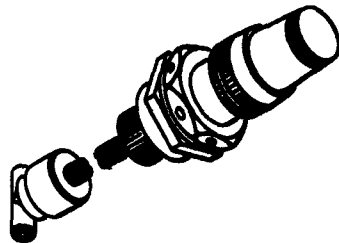
OIA-00545-00
Part Number OIA-00545-001

Part Name TT Frangible

Sector

Quantity per motor 4

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per End Item	Special Tooling		Estimated Lead Time Weeks	Government owned Facilities	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity			
Hercules Powder Company Port Even, New York Large Business	\$120.00	232	\$480.00	none	60	23	no	none



Remarks: Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision: Technical proficiency established through production of similar items and through R&D work accomplished at Port Even. Hercules has manufactured such explosive type squibs as this item for many years and has been one of the prime suppliers to commercial users. Production of this particular type is easily accomplished without additional government or contractor facilities and requires only nominal special tooling.

Cost estimates indicate lower cost than from other suppliers.

Manufacturing facilities and trained personnel available at Port Even.

Anticipate that better quality control and scheduling into motor production can be obtained and maintained by combining Wing VI requirements into manufacturing operation at Port Even.

PART L

BU-7000/9 (12-62)

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Date: 24 April 1963

Description: Aluminum Case, cartridge loaded double base
propellant rocket motor approximately 7½" long.

Part Number 01A-90078

Part Name

Contract No. AF 04(694)-270

Recommendation Make

Tumble

Motors

Hercules Powder Company - Kenvil Plant

Quantity per motor

6

Source	Estimated Unit Cost	Est. Qty.	Estimated Total Cost per End Item	Special Tooling		Estimated Lead Time Weeks		Government owned Facilities?	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity	Tool.	Prod.		
Hercules Powder Company Kenvil, New Jersey Large Business	\$5148.00	400	\$30,888	\$24,893			10	No	none

Remarks: Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:
No other vendor is immediately available with technical and manufacturing competence or facilities to produce this item.

Technical and manufacturing competence gained through manufacture of tumble motors for AF Contract 04(647)-243 and AF 04(694)-127 were substantiating factors recommending Make.

PART M

BM-7000/9 (12-62)

Date: 24 April 1963

Description: External Sheet Cork on the Cylindrical
Section of the case

HERCULES POWDER COMPANY
MAKE OR BUY STRUCTURE

Contract No. AF 04(694)-270

Recommendation: Make and Buy

Part Number 01A-01648
01A-01829

Part Name Insulation

External

HPC Bacchus
Armstrong Cork

Quantity per motor

1 Unit

Source	Estimated Unit Cost	Est Qty.	Estimated Total Cost per Item	Special Tooling		Estimated Lead Time Weeks	Government owned Facilities?	Add. Fac. Nec.
				Estimated Cost	Monthly Capacity			
HPC Bacchus, Utah Large Business	\$800.00*	69	\$800.00	\$2400.00 Plus Existing Tooling	Production	8	Yes, Facilities under Contract AF 04(647)-535 will be used.	none
Armstrong Cork 5037 Patata Avenue South Gate, California	\$5347.00	23	\$5357.00	Existing Production Tooling will be used		8	None	none

Illustration not Applicable

Remarks:

Requirements for this part, including facilities and special tooling, are estimated.

Reason for Decision:

Armstrong Cork has developed capability through operation under R & D Contract AF 04(647)-243 and Production Contract AF 04(647)-690.

*Price does not include ground plane costs

HPC technical capability and price were substantiating factors in recommending Make.

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HERCULES POWDER COMPANY
MAKE OR BUY PROGRAM
LETTER CONTRACT AF 04(647)-270

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