

n.d.

I M C C

E V A L U A T I O N

## IMCC

The Integrated Mission Control Center (IMCC), is Being Implemented at Houston to be Operational in 1964 as the Manned Space Flight Control Facility.

The IMCC is Presently Scheduled to be Available to Support the Gemini Rendezvous and Apollo Manned Missions.



## MAJOR ELEMENTS OF THE IMCC

- \* COMMUNICATIONS SYSTEM.
- \* DISPLAY SYSTEM
- \* SIMULATION AND CHECKOUT SYSTEM.
- \* REAL-TIME COMPUTING SYSTEM-IBM.
- \* DESIGN AND CONSTRUCTION OF THE IMCC BUILDING.



## TASKS OF IMCC CONTRACTOR

- \* DESIGN, DEVELOPMENT AND IMPLEMENTATION OF IMCC OPERATIONAL SYSTEMS.
- \* MANAGEMENT OF IMCC SYSTEMS INTEGRATION.
- \* RECOVERY CONTROL CENTER STUDY.
- \* DESIGN, DEVELOPMENT AND IMPLEMENTATION OF LAUNCH CONTROL CENTER INTERFACE.
- \* DETERMINE AND RESOLVE GROUND OPERATIONAL SUPPORT SYSTEM INTERFACE PROBLEMS.
- \* PROVIDE INITIAL MAINTENANCE AND OPERATION OF THE SYSTEMS.



## EVENTS LEADING TO EVALUATION

\* STUDY CONTRACT FOR GOSS & IMCC  
REQUIREMENTS

17 Contractors Submitted Bids.  
Philco Chosen on Basis of Evaluation to Make the Study.

\* KAISER SELECTED BY CORPS OF ENGINEERS  
TO:

Design IMCC Building.

Design Requirements Based on Study Contract.

Building Design Now Complete and Initial Building Contracts have been Awarded.

Contract for Remainder of Building to be Awarded in Feb.

\* IBM SELECTED AS RTCC CONTRACTOR

IBM Selected as Contractor on Basis of Source Evaluation from 11 Proposals.



## EVENTS LEADING TO EVALUATION (cont'd)

- \* PREPROPOSAL REVIEW OF COMPANIES DESIRING TO BID  
To Be Discussed in More Detail
  
- \* IMCC AND GOSS STUDY RESULTS AVAILABLE TO ALL BIDDERS  
Latest Philco Study Documents Given all Bidders.  
70 Percent Building Design Also Made Available.
  
- \* QUESTION-ANSWER CONFERENCE HELD WITH ALL PROSPECTIVE BIDDERS AFTER RFP INITIATED
  
- \* ORAL PRESENTATION BY BIDDERS



# P\_R\_E\_P\_R\_O\_P\_O\_S\_A\_L\_ \_R\_E\_V\_I\_E\_W

## INITIAL LETTER FROM NASA TO 103 COMPANIES OF NASA'S INTENT TO HAVE IMCC DESIGNED AND IMPLEMENTED

Letter Listed Five Major Requirements:

1. Participated as Major Contractor in Design and Implementation of a Large Tracking & Data Systems Network.
2. Had Prime Responsibility for Integration of Activities of a Substantial Number of Contractors Involved in the Implementation of a Geographically Wide - Spread Data Handling System.
3. Been Responsible for Design and Implementation of a Control Center Facility in Support of a Research or Defense Project.
4. Demonstrate Capability and Experience in the Design and Implementation of High Speed Data Transmission & Computing System.



PREPROPOSAL REVIEW (cont'd)

5. Been Responsible for the Design of an Extensive Communications Network Involving Voice, TTY, and Digital Data.

AS A RESULT OF THIS PROCEDURE, 19 CONTRACTORS SUBMITTED MATERIAL TO NASA TO QUALIFY THEM AS BIDDERS ON THE IMCC CONTRACT.

MSC EVALUATED QUALIFICATIONS AND DETERMINED SIX TO BE QUALIFIED AND FOUR TO BE MARGINAL. RFP SENT TO THE TEN AND ALL OTHERS DESIRING TO SUBMIT BIDS. THOSE SUBMITTING BIDS ARE:

* IBM	* ITT	* RCA
* BENDIX		* HUGHES
* LOCKHEED		* PHILCO

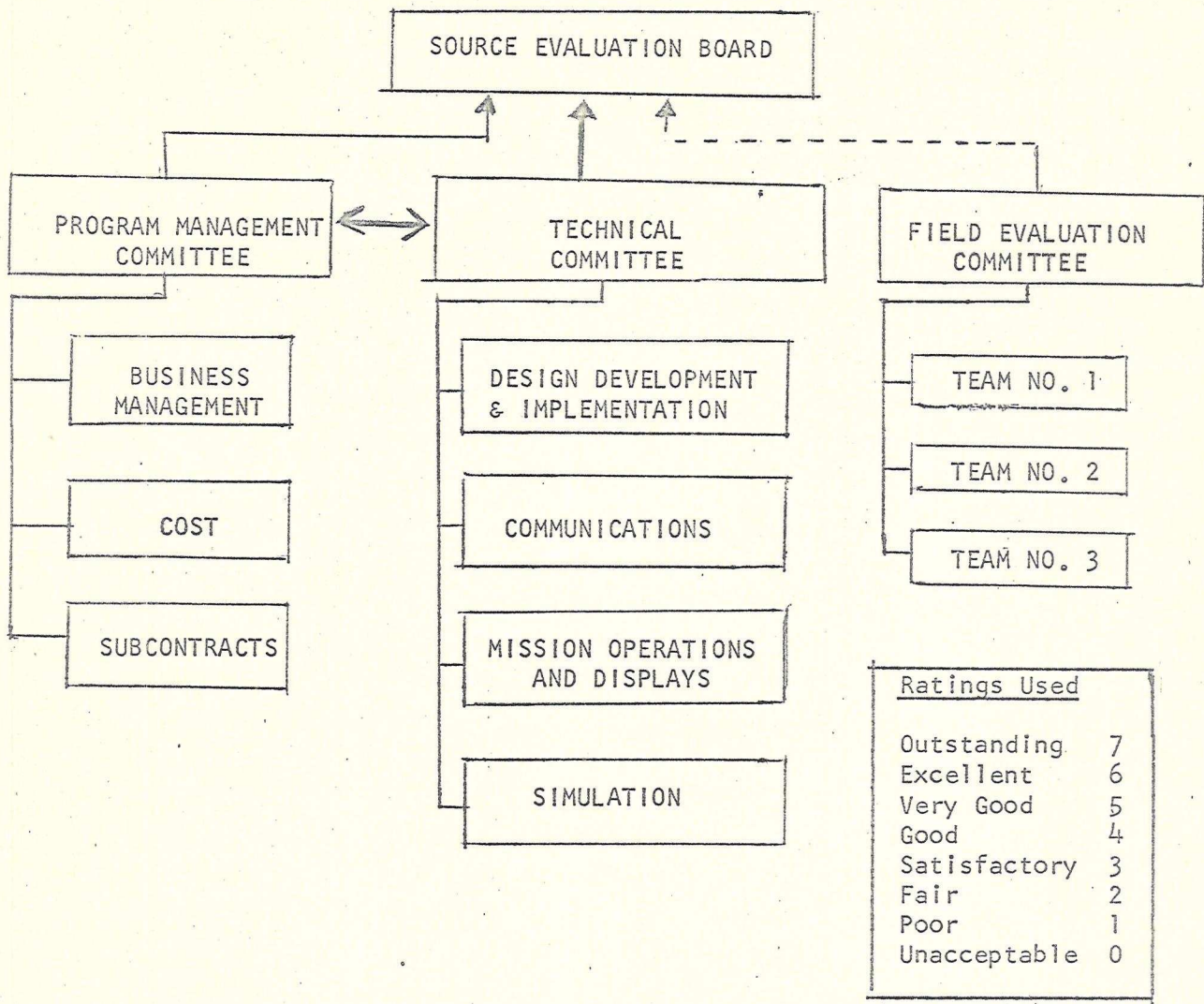
STL WAS CONSIDERED QUALIFIED BUT DID NOT BID.

BENDIX AND HUGHES CONSIDERED TO BE MARGINAL AND NOTIFIED ACCORDINGLY. HOWEVER, ALL PROPOSALS GIVEN EQUAL CONSIDERATIONS DURING EVALUATION.



PREPROPOSAL REVIEW (Con't)

ALSO, A GREAT NUMBER OF SUBCONTRACTORS  
WERE SENT CONDENSED RFP FOR INFORMATION  
PURPOSES.



SOURCE EVALUATION BOARD

PROGRAM MANAGEMENT COMMITTEE

TECHNICAL COMMITTEE

FIELD EVALUATION COMMITTEE

BUSINESS MANAGEMENT

COST

SUBCONTRACTS

DESIGN DEVELOPMENT & IMPLEMENTATION

COMMUNICATIONS

MISSION OPERATIONS AND DISPLAYS

SIMULATION

TEAM NO. 1

TEAM NO. 2

TEAM NO. 3

Ratings Used

Outstanding	7
Excellent	6
Very Good	5
Good	4
Satisfactory	3
Fair	2
Poor	1
Unacceptable	0



M A I N

F E A T U R E S

o f

P R O P O S A L S

B I D D E R S  
E S T I M A T E D C O S T

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COMPANY	TOTAL COST IN MILLIONS
BENDIX	\$17.968
LOCKHEED	\$20.199
RCA	\$21.070
ITT	\$24.624
PHILCO	\$33.899
HUGHES	\$35.090
IBM	\$70.711

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GEN CHART 1

COST - SOFTWARE VS HARDWARE  
Information

\$ In Thousands

SYSTEM	BENDIX	LOCKHEED	RCA	ITT	PHILCO	HUGHES	IBM
COMM	\$ 3,872	\$ 1,582	\$ 2,181	\$ 7,228	\$ 5,390	\$ 9,003	\$10,154
SCATS	2,561	2,580	2,710	4,178	3,388	5,815	11,971
DISPLAYS	6,090	2,872	6,213	8,045	12,395	10,699	24,944
	\$12,523	\$ 7,034	\$11,104	\$19,451	\$21,173	\$25,517	\$47,069
IMCC INT.	\$ 790	\$ 2,420	\$ 4,832	\$ 595	\$ 3,719	\$ 675	\$ 4,640
RCC STUDY	125	35	186	205	129	249	314
GOSS INT	260	2,858	753	215	704	493	4,524
DOC.	1,548	2,610	1,683	2,296	619	3,814	3,768
MGMT		1,372			928		5,945
	\$ 2,723	\$ 9,022	\$ 7,454	\$ 3,311	\$ 6,099	\$ 5,231	\$19,191
O&M	\$ 1,548	\$ 4,143	\$ 2,512	\$ 1,862	\$ 6,627	\$ 4,342	\$ 4,450
INST	1,174						
	\$ 2,722	\$ 4,143	\$ 2,512	\$ 1,862	\$ 6,627	\$ 4,342	\$ 4,450
TOTAL	\$17,968	\$20,199	\$21,070	\$24,624	\$33,899	\$35,090	\$70,711

B E N D I X

POOR UNDERSTANDING OF OVERALL TASK

Technical Depth of Proposal Extremely Limited.

No Major Problem Areas Identified.

No Specific Plans for Integration and Unification Tasks.

Proposed Subsystem Checkout was Good.

DESIGN AND IMPLEMENTATION APPROACH NOT COMPATIBLE WITH SCHEDULE REQUIREMENTS

Proposed to Design and Build Communications Processors.

Proposed to Design and Build Intercom System.

LACKED APPRECIATION OF FUNCTION OF IMCC

Relationship of MOCR and SSR Incorrect. Resulted in Improper Design of Communications and Display System.



BENDIX (cont'd)

MANAGEMENT PLAN

Proposed only a Small Liaison Group in Houston.

Lacked Understanding of Coordination Necessary with NASA.

Key Personnel Related Experience Weak in all Areas Other than Operations and Maintenance.

COST ESTIMATE

Lack of Design Detail and Understanding of Overall Task Suggests Little Reliance can be Placed on the Cost Estimate Presented.



## H\_U\_G\_H\_E\_S

### POOR\_UNDERSTANDING\_OF\_OVERALL\_TASK

Technical Depth of Proposal Extremely Limited.

Weak and Vague in Entire Area of GOSS Unification and IMCC Integration.

Communications System Proposed was Difficult to Understand and Completely Lacking in Detail Design.

Bidder Lacked Knowledge of Communication Carrier Techniques.

Proposed use of Data Processors was Vague and Confusing. In fact, Evidently Proposed Four Computers But Costed Only Two.

### MANAGEMENT\_PLAN

Proposed Small Liaison Group in Houston.

Company has only Limited Related Experience.



HUGHES (cont'd)

Proposed No NASA Systems Review Prior to Delivery.

Second Shift M and O Personnel Flown in for Missions only.

LACKED UNDERSTANDING OF RTCC INTERFACE

Systems Checkout Largely Accomplished in California.

REDIRECTION REQUIRED BY NASA PROHIBITIVE



I B M

STRONG IN COMPUTER RELATED AREAS

Design of Communications Processor was Very Good and Showed Good Design Detail. Very Good Understanding of RTCC Interface Problems.

LACKED DETAILED UNDERSTANDING OF OPERATION REQUIREMENTS

The Bidder's Presentation of the Tasks to be Performed was Poorly Developed and Considered inadequate.

Proposal Showed Improper Use of the Mission Operations Room and a complete lack of Understanding of a Centralized Control Concept.

However, Detailed Data Network Checkout was Very Good.

DISPLAY SYSTEM OVER SOPHISTICATED

Duplication of Group Displays in Several Areas Considered to be Unnecessary and Unjustified.



IBM (Con't)

Unnecessary Display Transfer System.  
Elaborate and Unjustified Display  
Storage Subsystem.

### MANAGEMENT PLAN

Key Personnel Drawn from Widespread  
Organization Making for Difficult Manage-  
ment Problems.

Personnel Experience Very Good in Com-  
puters, but Poor in all Other Areas.

Manpower Levels Proposed Considered to be  
Excessive Reflecting Lack of Understanding.

### COST ESTIMATE

In Spite of Elaborate and Over Sophis-  
ticated System, the Exorbitant Cost  
Could not be Justified.



I T T

VERY GOOD UNDERSTANDING OF PROBLEM

Good Appreciation of Overall Task But Lacked Unified Display Concept.

MAJOR TECHNICAL RESERVATIONS

Excessive Number of Tasks Assigned to the Communications Processor. Eliminated the Capability to Separate Major Systems to Facilitate Check Out and Future Modification.

Major Elements of the IMCC Dependent on Early Operation of the Communications Processor.

Existing Concept Would Require Significant Redirection of the RTCC Contractor.

MANAGEMENT PLAN

Strong Organization Group to be Located in Houston.

## ITT (Con't)

Subcontract Structure Very Good.

Procurement Policies and Procedures Were Good.

### INADEQUATE MANPOWER

Manpower Proposed for Unification and Integration Considerably Underestimated.

Only One Shift of M And O Personnel Provided.

### FIELD SURVEY REPORT

Previous Customer Interviewed Reported Poor Performance (Big Rally II).

The Other Customer Interviewed Reported It was Necessary to Direct ITT to Provide Adequate Manpower (465L).

### COST ESTIMATE

System Costs Considered Realistic.



ITT (Con't)

Software Costs Considered Low Because  
of Inadequate Manpower.

CONSIDERABLE REDIRECTION

Extensive Modifications to Achieve Desired  
Utilization of the Communications Proces-  
sors.

Considerably More Work Required in Display  
Area, Particularly Personnel Consoles.



# L O C K H E E D

## GOOD APPRECIATION OF NETWORK OPERATING PROBLEMS

Proposal Reflected Bidder's Experience in Network Operations.

However, Showed Lack of Appreciation of Manned Aspects of Space Flight.

## GROSS MISCONCEPTION OF THE IMCC REAL - TIME FUNCTION

Failed to Show any Understanding of Rapid Reaction Required by Flight Control Team.

Failed to Show an Appreciation of the Large Amounts of Data Required at the IMCC.

## PROPOSED MANUAL SYSTEM INADEQUATE

Manual Display System Requires Excessive Number of Operating Personnel.

Results in Cumbersome and Undesirable Operating Procedures.



## LOCKHEED (Con't)

Manually Controlled Communications Switching Cannot Satisfy Real-Time Data Requirements.

### MANAGEMENT PLAN

Project Organization in Houston and Considered to be very good.

Work Experience on Satellite Test Center can be Applied to IMCC.

Subcontract and Control Considered very good.

### FIELD SURVEY REPORT

Field Committee Reports on Past Performance on Cost and Schedules were Unfavorable.

### LOW COST ESTIMATE DUE TO MANUAL SYSTEM

Substantial Increase in Cost Would Result from Redesign Required in the Display and Communications Systems.



LOCKHEED (Con't)

MAJOR REDIRECTION

All of the Above Considerations would  
Require an almost Prohibitive Amount  
of Redirection by the NASA.



P\_H\_I\_L\_C\_O

BEST\_TECHNICAL\_PROPOSAL

Complete and Well Thought out Design Concept.

Systems Proposed were Detailed. Each Major Function Separated.

Very Good Appreciation of Implementation Problems, Unification and Integration Tasks.

MINIMUM\_OF\_REDIRECTION

Design Reflects MSC Requirements.

Design More Developed Than any Other Bidder.

MANAGEMENT\_PLAN

Strong Organization Group to be Located in Houston. Key Personnel Relevant Experience was Impressive. Procurement Policies and Procedures were Good.



PHILCO (cont'd)

COST ESTIMATE

For System Proposed Cost is Considered  
Realistic.

MOST LIKELY TO MEET SCHEDULE

Systems Concept More Developed Than Other  
Bidders Resulting in Initial Performance  
Specifications Already Available.



R\_C\_A

GOOD APPRECIATION OF OPERATIONAL PROBLEMS

Well Outlined Formulation of Tasks.

Particular Attention to GOSS Unification.

LACK OF DEFINITIVE SYSTEMS

Number of Systems Solutions Presented.

Tradeoffs Established but Final Systems not Developed.

Lacks Unified IMCG Concept.

UNDUE RELIANCE ON RTCC AND COMMERCIAL CARRIER

Assumed all Communications Processing and Display Driving to be RTCC Function.

Contrary to RFP but not Justified.

Assumed Rented Terminal and Intercom Equipment.

Not Desirable Due to Management Control Problems.



RCA (cont'd)

MANAGEMENT PLAN

Unique System of Part-time Program Management at Houston & New Jersey.

COST ESTIMATE

Proposal Cost Reflected Unwarranted Assumptions.

Costed System not the Recommended System in the Proposal.

Required System\Substantially Higher in Cost.

MAJOR REDIRECTION

Proposal far from Final Design Stage.

Would Require Considerable NASA Direction.



## EVALUATION RESULTS

COMPANY	RATING	
1. PHILCO	VERY GOOD	PREFERRED
2. ITT	GOOD	ACCEPTABLE
3. RCA	SATISFACTORY	MARGINAL
4. LOCKHEED	SATISFACTORY	
5. IBM	SATISFACTORY	UNDESIRABLE
6. HUGHES	FAIR	
7. BENDIX	FAIR	

### ADJECTIVE RATING USED:

OUTSTANDING  
EXCELLENT  
VERY GOOD  
GOOD

SATISFACTORY  
FAIR  
POOR  
UNSATISFACTORY



P R E F E R R E D  
C O N T R A C T O R

P H I L C O



PRESENTATION BY PROSPECTIVE CONTRACTORS ON THE  
INTEGRATED MISSION CONTROL CENTER PROCUREMENT

<u>Company</u>	<u>Time</u>	<u>Representatives</u>
Bendix	9:00	1 E. K. Foster, Vice President and Group Executive 3 D. M. Heller, Asst. General Manager of Bendix Radio, Manager, Government Products Division 2 B. R. White, Program Manager IMCC
Hughes	9:35	1 L. A. Hyland, General Manager 2 N. A. Begovich, Asst. Group Executive and Vice President B. E. Oldfield, Manager, GOSS Program Division
IBM	10:10	1 O. M. Scott, Vice President and Group Executive 3 H. E. Cooley, Manager, Data Processing Product Development 2 B. G. Oldfield, General Manager, Command and Control Center, Federal Systems Division
ITT	10:45	1 W. M. Duke, General Manager, ITT U.S. Defense Group 2 M. H. Dubilier, President, International Electric Corporation 3 J. O. Paivinen, IMCC Program Manager
Lockheed	11:20	1 E. P. Wheaton, Vice President and General Manager, Space Systems Division 3 K. T. Larkin, IMCC Program Director 2 R. J. Stewart, Asst. Director IMCC Program
Lunch	11:50 to 1:00	
Philco	1:00	C. E. Beck, President O. T. Simpson, General Manager, Western Development Laboratories A. Laberge, Asst. Manager, Western Development Labs
RCA	1:35	1 J. H. Sidebottom, Vice President and General Manager, Moorestown Missile and Surface Radar Division 3 W. L. Richardson, Manager, Program Management (Project Manager designate IMCC) 2 N. Hjorth, Manager, Project Engineering IMCC Implementation