

*Dr Thornton - MSC*

# SOUTHWEST RESEARCH INSTITUTE

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15 September 1970

USAF School of Aerospace Medicine  
Aerospace Medical Division (AFSC)  
Brooks Air Force Base, Texas 78235

Attn: W. S. Guttman, AMSKR

Subject: R & D Contract Status Report No. 3  
Contract F41609-70-C-0029  
SwRI Project 16-2837  
Engineering Services, Fabrication and Testing of Specimen  
and Body Mass Measurement Equipment for NASA Skylab

Reference: Our Proposal 16-7372A

Period Covered: 1 August to 1 September 1970

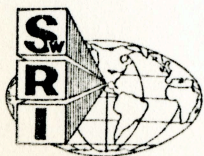
Gentlemen:

During this period, the major effort has been (1) final design, (2) continued development and (3) development evaluation.

Electronic design effort was continued on the zero crossing detector, completion of the intervalometer circuit and control circuit for the digital thermometer, and the reduction of the power regulator peak pulse to conform to MIL STD 461-CE01.

The improved zero crossing detector previously reported is being fabricated. The mechanical model has two degrees of freedom permitting adjustments during test to optimize conditions for final design. The intervalometer circuit is complete and the preset numbers for the thermistors determined. A filter added on the power regulator input has lowered the required pulse power, however, additional reduction will be necessary. The control circuit for the digital thermometer has been completed and final testing of the circuit will be included in testing of the zero crossing detector.

Final mechanical design and evaluation has progressed. A number of SMMD and BMMD development articles were fabricated, tested and evaluated in various stages of completion. The SMMD development articles consisting of the basic plate fulcrum springs, frame, tray and a lockout system were vibration tested. This test, previously



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reported 28 August 1970 on Contract F41609-70-C-0028, (closely simulating the qualification test procedure) caused the springs to fracture in several places. Design modifications and development article changes made to eliminate such fractures include: tray stiffening posts, increasing spring fulcra thickness and changing several resilient teflon parts to metal. Vibration tests will be conducted on these modified articles at the beginning of the next reporting period.

Calibration mass designs for the SMMD have been completed and will be detailed, after which development articles will be fabricated. The perforated elastomer sheet has been selected for bag hold-down and will be detailed. A new wooden mockup of the latest SMMD design has been fabricated.

Drawings and fabrication of a BMMD frame (development article) are complete. Honeycomb seat construction has been selected for the final design and preliminary drawings completed. Fabrication of a development article will commence during the next reporting period. Design is continuing on the lockout mechanism and the adjustable crossbar. Both will be fabricated as development articles for evaluation. Study of the restraint system and design of a test unit for determining coupling forces have been initiated.

Electronics packaging design and test is continuing. A simulated electronics unit was used as a heat source to determine the best practical location for the temperature sensor. The electronics envelope dimensions have been determined and layout of the complete electronics package is proceeding. Special consideration is being given to EMI shielding.

Additional storage cabinets and work benches have been added to the laboratory space in preparation for production. Development articles fabricated for proving the design have influenced manufacturing methods and techniques. Many areas of manufacturing control have been documented in the recently completed Section II, Quality Assurance, of the Management Plan. Included in the document are our present plans for contamination control.



Efforts to better determine requirements for manufacturing control have continued. Guidelines obtained from NASA/MSC, and discussed with NASA by Mr. Oakey on September 1, will be used but model documents are not available. Important areas of manufacturing control were pointed out for CDR. Process control numbers have been assigned to the mechanical processes which are anticipated to be used during manufacture.

Documents developed by the Reliability and Quality Assurance program, are listed in Table A. Messrs. Hewgley, Lorenz and Millington visited parts suppliers to perform quality control audits. Work continued on preparation of procurement specifications for critical parts such as the 1 MHz oscillator, integrated circuits (IC's), light emitting diodes (LED's) and thermistor temperature sensors.

PIRN-D-IA to 13M12091 entitled, "M074 Specimen Mass Measurement Mechanical Requirements," Revision NC, was reviewed by the Configuration Manager and other key project personnel. Several changes proposed in the PIRN were judged to be beyond the scope of the present contract; accordingly, discussions on this matter were initiated with the Contracting Officer.

The present stage of final design does not warrant a Critical Design Review (CDR) by 15 October as originally scheduled. The Institute now intends to recommend the CDR during 4-6 November 1970. This delay is primarily the result of the delayed response to our proposal of 10 July 1970 (Reference) received on 1 September 1970.

The attached photographs show the Mockup of the BMMD, the SMMD, and the Electronics Subsystem for Mass Measurement Devices. These photographs represent development at the time of PDR.

The attached marked project schedule shows the status of the program as of 1 September 1970. It will be noted that the mechanical design is approximately three weeks behind schedule, and the development articles and evaluation are less than a week behind schedule. Special emphasis and assistance, including overtime, in these areas is accelerating the effort.



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Because authorized funding on this project remains partial, it is insufficient for completion of all work. Additional funds in the amount of \$100,000 expected subsequent to this reporting period will be sufficient to cover expenditures through 18 October, 1970.

Yours very truly,

Douglas N. Travers, Director  
Applied Electromagnetics

HFB:mb  
attach.

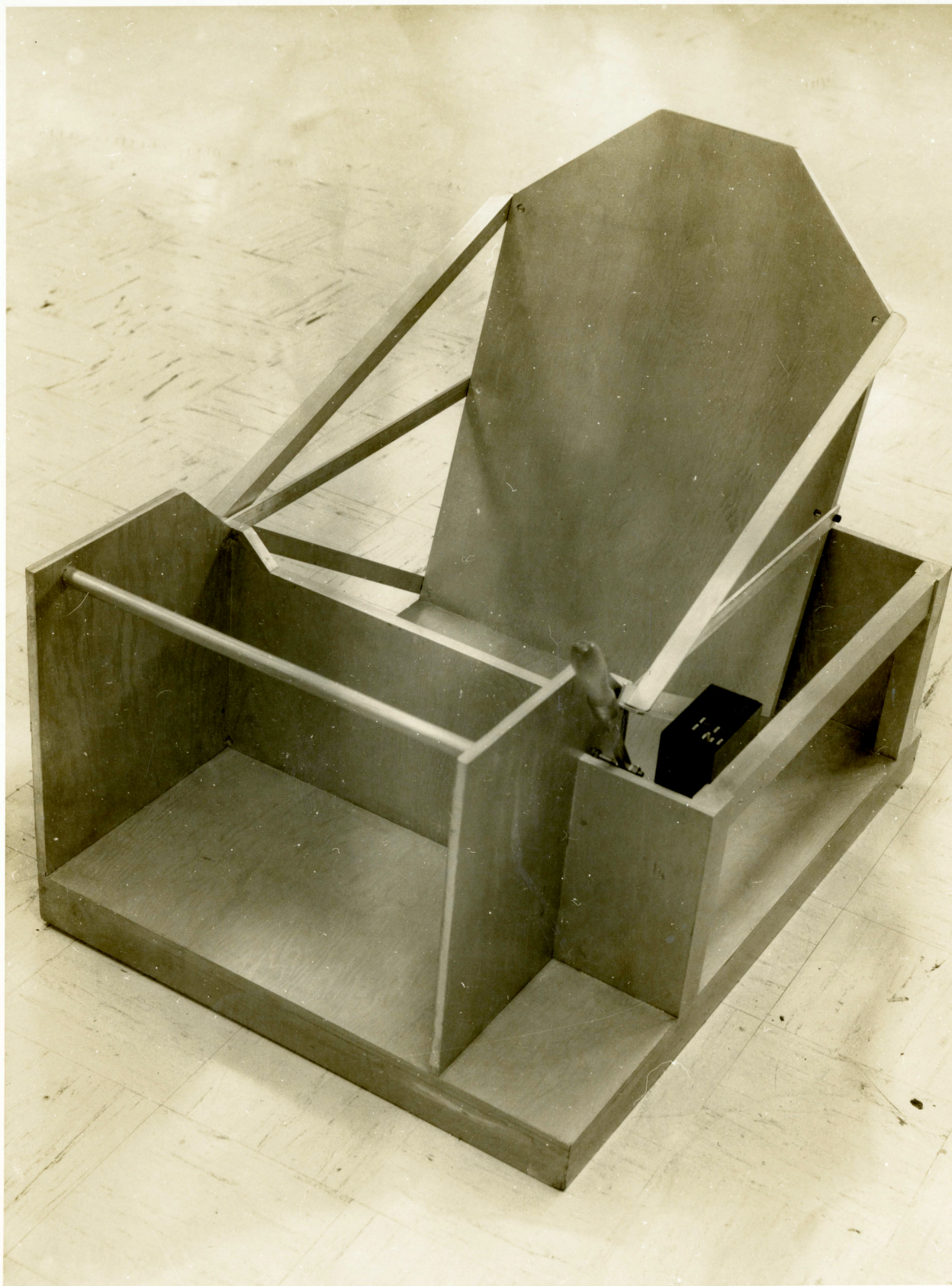


TABLE A

DOCUMENTS PREPARED DURING AUGUST

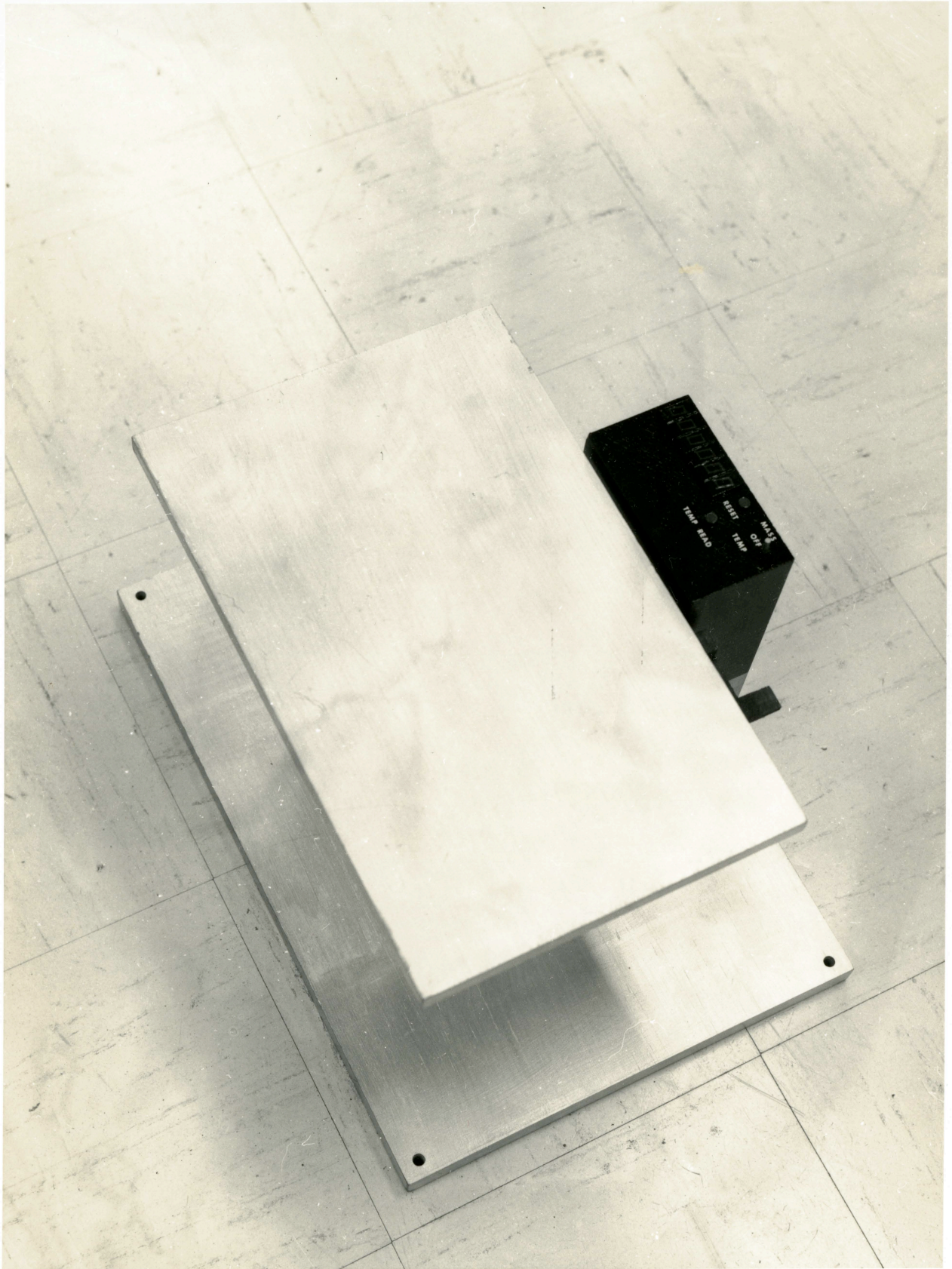
<u>Document No.</u>	<u>Title</u>	<u>Release Date</u>
MP-1, Section II	Management Plan for the M074 Specimen Mass Measurement Device and the M172 Body Mass Measurement Device Section II - Quality Assurance	25 August 1970
MP-1, Section III	Management Plan for the M074 Specimen Mass Measurement Device and the M172 Body Mass Measurement Device Section III - Reliability	21 August 1970
MP-1, Section IX	Management Plan for the M074 Specimen Mass Measurement Device and the M172 Body Mass Measurement Device Section IX - Nonmetallic Materials	1 September 1970





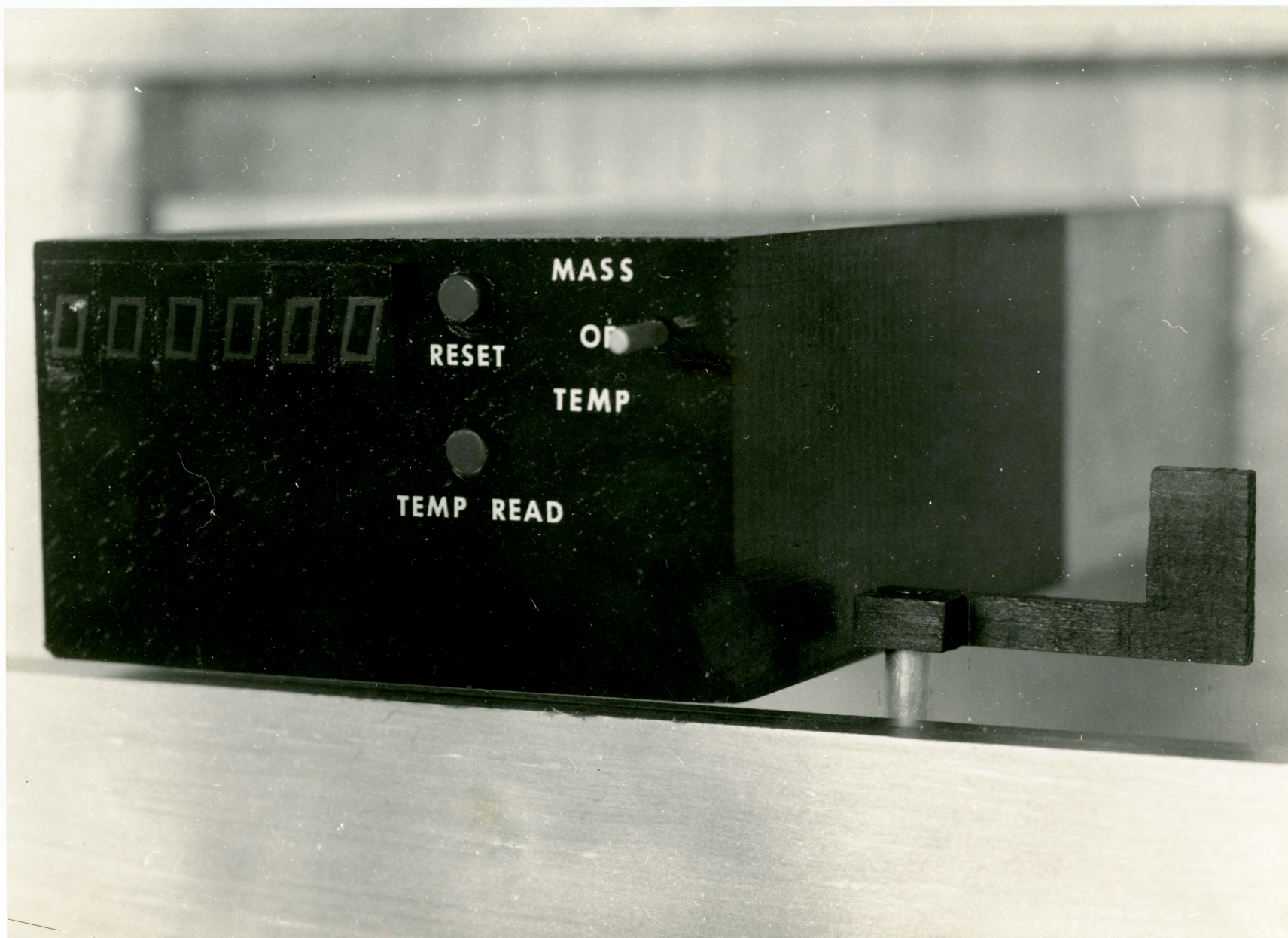
MOCKUP OF BODY MASS MEASUREMENT DEVICE (BMMD)





MOCKUP OF SPECIMEN MASS MEASUREMENT DEVICE (SMMD)





ELECTRONICS SUBSYSTEM FOR MASS MEASUREMENT DEVICES