

## ANNEX C

### SPACE MEDICINE DEVELOPMENT REQUIREMENTS

For any potential contractor desirous of a major role in the development of an advanced space exploration program, the obligation exists for that contractor to develop a capability in the field of Space Medicine and Human Factors which will contribute to human adaptation to living and working in a space environment. This capability must be demonstrated in the form of Human Factors research contracts designed to augment the "Man in Space" program. Potential contracts in Human Factors are relatively small, dollar-wise, but are <sup>mandatory</sup> ~~necessary~~ to achieve major space contracts.

#### SUGGESTED PROGRAM FOR MARTIN-DENVER

In addition to the initiation of a one-man sealed cabin development for a minimum orbital mission, several steps are proposed as developments which will increase Martin-Denver capabilities in Space Medicine and Human Factors.

- 1) A proposal on "The Effect of Sign and Magnitude of Ionized Air on the Performance of the Human Operator" has been submitted to WADC. The facility, equipment and personnel required for this study have been outlined in the proposal.
- 2) The development of space flight simulators will enable the assessment of human performance under certain conditions prevailing in space flight. The development of two simulators are recommended at this time:
  - a) Reaction control simulator - will determine the amount of training required for efficient use of reaction controls, individual differences in adaptability, and will provide adequate indoctrination in this type of control, prior to actual flight. Possible costly



errors of in-flight training can be eliminated.

- b) Visual orientation simulator - will provide actual space flight visual conditions and problems as closely as they can be simulated on earth, and will train the crewman in coping with them.
- 3) The construction of a lunar base housing simulator would provide a close approximation, with the exception of gravitational conditions, to actual living and working conditions which are expected to prevail at a Moon Base. Learning to live and work in an artificial atmosphere at a half to one-third normal barometric pressure can be accomplished. In this simulator, the problems associated with photosynthetic exchange systems can be worked out and the solutions constantly improved upon, prior to the building of a Moon Base. The unit can then be duplicated quickly and efficiently at the proper stage of lunar exploration.

Conceptual designs for each of these simulators are now being formulated.

It is recommended that the chamber for the ION <sup>study</sup> ~~study~~, the reaction control and visual orientation simulators be contained in the same research building in common with the facilities and equipment required by the Personnel Systems Group. In addition, such other laboratories and equipment as could be shared by both Personnel Systems Development and Space Medicine, due to overlapping of interests, should be in this facility.

#### PHYSICAL CHARACTERISTICS AND PERSONNEL REQUIREMENTS

The size of the Space Medicine facility will depend on the acquisition of a major space contract. If Martin-Denver obtains such a contract, a facility costing in the order of one-half million dollars, and another one-half million dollars for equipment, is anticipated. Floor space for a facility of this magnitude would be approximately 6000 sq. ft.



The Space Medicine facility would contain the following:

Laboratories

Physiology  
Algal  
Biochemistry  
Electronics  
Radiobiology  
Flight Simulators  
Human Operator  
Medical Treatment and Recovery  
Room  
Animal Section

Stock Rooms

Medical Equipment  
Engineering Equipment(limited)  
Chemicals  
Tool Crib

Small Precision Machine Shop

Library

Medical and Related Engineering  
Administrative Offices

In the event that a major contract is not obtained in the initial space contracts awards, the Space Medicine facility will be slower in growth, but will be just as <sup>mandatory</sup> ~~important~~ to implement. The capability must still be developed to increase the possibility of gaining major contracts in the future.

*During 1958*  
Basic facility requirements are in the order of 3000 sq. ft. Personnel and laboratory requirements are listed in Table I(not listed according to project or "function of Column I). This nucleus of key personnel will provide the foundation for Martin-Denver Space Medicine research program.

An initial Space Medicine and Human Factors development as outlined above can lead into contracts in three separate areas:

- 1) Space Medicine and Human Factors research
- 2) Development of operational hardware for space exploration and conquest
- 3) Simulator ~~systems~~ and products <sup>& sales</sup> as a natural outgrowth of steps 1 and 2.



TABLE I

# DEPARTMENT OF SPACE MEDICINE DEVELOPMENT REQUIREMENTS

TIME	FUNCTIONS	PERSONNEL		FACILITIES ***	
		1958	FUTURE	1958	FUTURE
1958	SPACE CABIN	PHYSIOLOGIST (PH.D.)		LABORATORY IN S.M.F. **	
		RSCH. BIOLOGIST (PH.D.)		(PHYSIOLOGY)	FIELD LABORATORY
	IONIZED AIR STUDY*	EXP. PSYCHOLOGIST (PH.D.)		SPECIAL CHAMBER IN S.M.F.	(NEEDED 1959)
		INSTRUMENT. SPEC.			
	REACTION CONTROL SIMUL.	DESIGN DRAFTSMAN		R.C. SIMULATOR IN S.M.F.	
		SECRETARY			
	ALGAL EXCHANGE SYSTEMS	LOW PRESS. CHAMB. TECH.		ALGAL LABORATORY IN S.M.F.	
		3-6 TECHNICIANS			
	ADVANCED CABIN STUDY	1-2 MAINTENANCE		HUMAN OPERATOR LAB. IN S.M.F.	
				(S.M.F. = 1 ea. Bldg containing above)	
FUTURE	VISUAL ORIENTATION SIMUL (INITIATED EARLY '59)		6-8 PROFESSIONAL		SIMULATOR LAB IN S.M.F.
			10-12 TECHNICIANS		
	LUNAR BASE SIMULATOR (INITIATED MID '59)		1-2 SECRETARIAL		SEPARATE FACILITY OF SPECIAL DESIGN (NEEDED 1959)
			2-3 MAINTENANCE		

\* INCLUDES BOTH STRUCTURE AND EQUIPMENT. REQUIRED<sup>in</sup> F.Y. 1959. COST EST. \$1 MILLION - ULTIMATE FACILITY

† SPACE MEDICINE FACILITY - SPACE REQUIREMENTS FOR BASIC FACILITY APPROXIMATELY 3000 SQ FT

\* PERSONNEL PRESENT