SVHSER 3998

HUMAN ENGINEERING DESIGN CRITERIA HANDBOOK for LUNAR SCIENTIFIC EQUIPMENT

Revision Number 1
January 15, 1967

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION

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PREPARED FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
CONTRACT NUMBER NAS8-20095
REQUEST NUMBER 1-5-56-01257

PREPARED BY : K. C. Jones
K. C. JONES
ANALYTICAL ENGINEER, HUMAN FACTORS GROUP

APPROVED BY : R. J. Leonard
R. J. LEONARD
PROJECT ENGINEER

Ronald Lang
RONALD LANG
PROGRAM MANAGER

Hamilton Standard DIVISION OF UNITED AIRCRAFT CORPORATION
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1.0 SCOPE

This document has been prepared by the Space & Life Systems Department of Hamilton Standard in accordance with the requirements of the National Aeronautics and Space Administration, Contract Number NAS8-20095. It summarizes the human factor portion of the phase I program effort for this experimental investigation of specific lunar mission scientific equipment mockups.

During the phase I testing effort, it became evident that there was a definite need to delineate the constraints which must be placed upon equipment designs due to such inherent human limitations as range of mobility, applied force and the resulting torques, and the further psychophysiological and mobility restrictions of an Apollo type space suit working environment.

This report is a preliminary attempt to establish a human engineering design criteria baseline for pressure-suited man-mission, man-equipment interfaces.

Human engineering, as applied to this specific program effort, is defined as the engineering or designing of equipment to be compatible with the needs, capabilities, and limitations of pressure-suited personnel who will operate, control, and maintain the mission equipment.

The information presented herein is intended for use by engineers and designers engaged in the development and evaluation of proposed lunar mission tasks and associated scientific equipment.

Details of the simulated lunar mission and a discussion of the test method are contained in Report SVHSER 3997, "Man System Task Analysis for Lunar Surface Experiments, Phase I Program Summary 3 April 1966".

2.0 HUMAN PERFORMANCE TEST CONDITIONS

The human performance test effort consisted of a series of lunar traverse and geological survey mission simulations within the Task Analysis Facility (TAF).

The specific constraints imposed upon the mission simulations in the TAF are as follows:

- One-g, room ambient temperature and pressure conditions existed throughout the test sequences.
- An A-4H Apollo Training Suit with a Model C3 nonrestraining fixed helmet was utilized.
- A Hamilton Standard commercial liquid cooling garment (LCG) was used to maintain the body in a state of thermal equilibrium.
- The missile grade air was delivered to the suited test subject at a controlled pressure (3.7 ± 0.2 psig), flow (6-12 cfm at 3.7 psig), humidity (40-70°F dew point range). These limits correspond to Apollo pressure suit specifications.
- Pulverized coke and slag spread on a sand base was used to simulate lunar soil characteristics.

The lunar scientific equipment mockups provided for these experiments by the Special Projects Office of the Research Projects Laboratory included: magnetometer; gravimeter; walking staff with detachable 35 mm Nikon camera and Brunton pocket transit; geophones with cable and hand actuated take-up reel; explosive charge; and radio-controlled detonator. In addition, an LSSM type of vehicle was provided.

3.0 REFERENCE SOURCES

The overall selection of the design criteria considered applicable to this program effort was based entirely upon the observations, measurements, and subsequent evaluations of data generated during the human performance test sequences conducted at Task Analysis Facility, Manned Space Flight Center (MSFC).

The specific design criteria inputs which are included in this handbook have been taken from the following sources and are so referenced in the text.

Reference A. Direct measurement taken during the Human Performance Testing Program.

B. Research of applicable documents with specific emphasis placed upon interpretation of the information in terms of pressure-suited use.

C. General research and development design criteria acquired as a result of Hamilton Standard pressure suit development, evaluation, and test simulation efforts.

4.0 EQUIPMENT DESIGN CRITERIA

4.1 Walking Staff

The combined weight of the walking staff and the equipment to be mounted on it (cameras, transit, etc.) should not exceed 30 pounds (maximum for one-hand, short duration use) (ref. B, MSFC-STD-267A, ARDCM 80-6). The specific allocation of this total weight to the various components was not within the scope of this program because no specific mission requirements were supplied.

4.1.2 Specific Design Criteria

4.1.2.1 General - The staff (primarily a walking aid) should be designed to incorporate an instrument mounting bracket, upon which specific mission equipment may be temporarily positioned.

In the staff configuration which was evaluated, the following equipment was included:

- Transit (Brunton Pocket Transit)
- Camera (Nikon)
- Camera (Realist Stereo)
- Penetrometer (simulated)
- Bullseye Level
- Television Camera (simulated)

4.1.2.2 Instrument Mounting Bracket - The instrument mounting bracket to be incorporated in the staff design should be an adjustable device with vertical and rotational movement capabilities.

The vertical and rotational adjustment should be accomplished through the use of threaded set-pins incorporating a knurled knob, similar in design to the control described in paragraph 4.3.2.6 of this report.

The preferred type of mounting bracket is a tubular sleeve base with the various mounting receptacles attached in such a manner as to provide a smooth, unobstructed profile when all of the mission instruments are in place. It should be designed so that the astronaut will not be tempted to utilize the instruments or the bracket as a handle or grasp area.

The mounting bracket should provide quick-disconnect receptacles for each instrument to be temporarily positioned on the staff. The receptacles should be designed so that it is impossible to install an instrument in a wrong position. This could be accomplished through the use of shape-coded receptacles, either mated splines or key and mated slot.

4.1.2.2 (Continued)

The vertical range of mounting bracket displacement should be within the following limits (ref. B MSFC-STD 267A, Table 15):

- minimum positional height 45.0 inches (95th percentile man waist height)

- maximum positional height 60.8 inches (5th percentile man eye height)

4.1.2.3 Size - In determining both the size and shape of the staff, the design criteria should be based on the staff's primary purpose; to be a walking aid to the astronaut.

Definite unit dimensional constraints are not practical at this time, but the unit's dimensional envelope in those areas where pressure glove contact may exist should fall within the following limits (ref. A, C):

- minimum diameter of the staff 3/4 inches
- optimum diameter of the staff 1 inch
- maximum diameter of the staff 1-1/4 inches

The height of the staff should fall within the following limits (ref. B, MSFC-STD-267A, table 15):

- minimum staff height 52.8 inches (5th percentile man shoulder height - acromion)

- maximum staff height 73.1 inches (95th percentile man, stature)

4.1.2.4 Tripod Configuration - The staff that was studied was a monopod configuration. During those operations when the staff was functioning as an instrument mounting platform, this design became very difficult for the astronaut to handle.

A solution to this problem would be the incorporation of retractable tripod legs which could be extended by the astronaut to support the staff. The tripod legs should be designed to retract and remain stored within contoured sections of the monopod central staff in order to provide a clean cylindrical profile when the staff is functioning as a walking aid.

The position of the tripod legs should be set through the use of a threaded set-pin, actuated by a knurled knob similar in design to the control described in paragraph 4.3.2.6 of this report.

The tripod legs should extend to a length which will provide a stable platform from which to work but will not make them a hazard to the astronaut moving in the immediate area. A maximum dimension for the tripod radius is 12 inches (ref. A).

4.1.2.5 Weight - Care shall be taken in the distribution of weight to avoid any unbalanced condition when the staff is grasped or carried.

The staff must be evaluated with the fully instrumented mounting bracket placed at its maximum and minimum heights to ensure that effective balance is maintained. A similar evaluation must be conducted with the staff in various load conditions.

4.2 Camera

4.2.1 Weight

The combined weight of the walking staff and the equipment to be mounted on it (cameras, transit, etc.) should not exceed 30 pounds (maximum for one-hand, short duration use) (ref. B, MSFC-STD-267A, ARDCM 80-6). The specific allocation of this total weight to the various components was not within the scope of this program as no specific mission requirements were supplied.

4.2.2 Specific Design Criteria

4.2.2.1 General - The camera assembly should be designed to reduce the number and complexity of the tasks required of the crewman in handling and operating the camera during the photographic mission. Therefore, the camera should incorporate as many automatic functions as is practical within the design state-of-the-art.

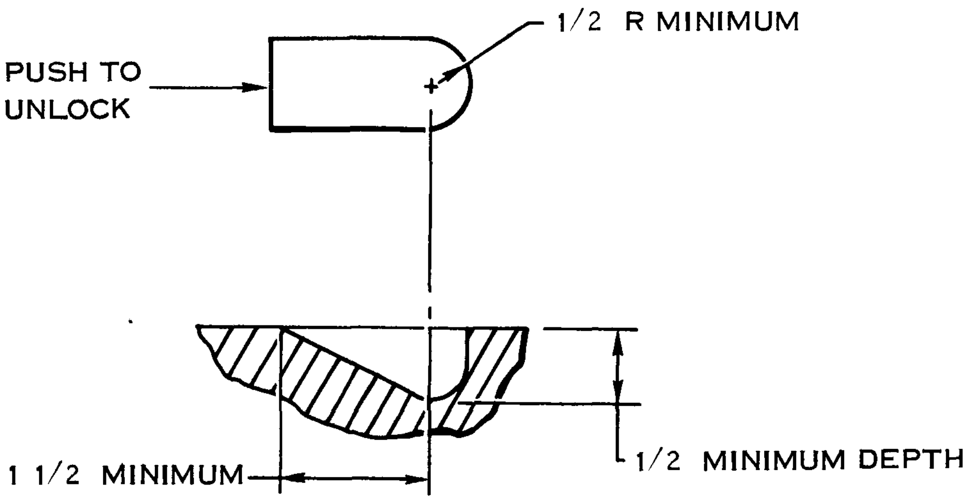
4.2.2.2 Film Pack - The camera should be provided with individual film packs which can be inserted into, and removed from, the camera by the crewman while he is on the lunar surface. The use of the self-contained film pack would make it unnecessary for the astronaut to handle the film.

The film pack should incorporate a positive locking device which is actuated when the unit is positioned in the camera. A mechanical, spring-loaded lock is preferred.

Example: A recessed, sliding panel, contoured to accommodate a pressure-gloved finger is one possible configuration. This would allow for positive activation and require a minimum of tactile feedback. The following illustration indicates the minimum dimensions for such a recessed panel (ref. A, C):

Definite dimensional constraints for the film pack are not practical at this time, but the dimensional envelope in those areas where pressure glove contact is required should be within the following limits (ref. A, C):

- minimum dimension 3/4 inch
- maximum dimension 2 inches



4.2.2.3 Automatic Film Advance - The camera should incorporate a device which will automatically advance the film to the next frame as soon as the shutter-actuating mechanism is triggered.

The possibility of utilizing electrical power from an integral power pack to actuate the film advance should be considered. A spring-actuated film advance is less desirable because of the need to periodically rewind this type of mechanism.

4.2.2.4 Light Sensor - The camera shall incorporate an automatic compensating light sensor to make unnecessary the need for light meter readings, with resulting lens aperture adjustments.

4.2.2.5 Camera Sight - The use of any type of peephole sighting device incorporated in the camera body is undesirable because of the possibility of visor/camera contact during the sighting operation. The minimum eye relief distance for a pressure helmet is 2.06 inches from the eye to the primary visor (ref. B Apollo Spec CSD-A096).

A preferable sight design would be of a refined gunsight type, utilizing an externally mounted, collapsible field of vision frame with reference crosshairs and an indexed reference focal point.

This type of sighting device will allow accurate sighting by the crewman without placing his helmet visor in close proximity to the camera, the camera mounting fixture, or associated equipment.

4.2.2.5 (Continued)

The field of vision frame should be stored within the camera body when not in use. It should be deployed by a spring-loaded actuated pushbutton device.

To replace the field of vision frame in the unit, the crewman should be able to push it into its receptacle, and in so doing, engage a mechanical lock.

4.2.2.6 Lenses - The camera should be provided with a series of fixed focal length, turret-mounted lenses, thus making unnecessary range estimations with resulting fine lens adjustments.

The series of lenses should include the following types:

- close up
- medium range
- telephoto
- wide angle

It may also be desirable to incorporate stereo capability into the camera, to provide more descriptive coverage of specific subjects.

Each lens should be provided with a protective cover which can be easily snapped in place and removed with a pressurized glove.

4.2.2.7 Filters - If filters are to be utilized in accomplishing the photographic requirements of the mission, they should be designed so as to be easily snapped in place over the particular lens.

The filters should be interchangeable with respect to the series of lenses.

4.2.2.8 Activation Mechanism - The camera should be provided with a type of positive contact, activating mechanism to trigger the shutter and expose the film. The recommended design is a finger-actuated pushbutton.

The activating mechanism should be located in such a position on the camera that visual reference can be made at all times, making dependence upon tactile response unnecessary.

4.2.2.9 Surface Texture - The outer surface texture of the camera, particularly in those areas were pressure glove contact is required, should be of a material with a high friction coefficient.

4.2.2.10 Size - The camera should be of such size and shape as to be easily grasped and handled by the astronaut using a full pressure glove.

In the basic camera unit design, every effort should be made to establish a smooth contoured exterior, free of thin flanges, sharp corners, protrusions, and other obstructive devices which could become a hazard to the astronaut while in contact with the unit.

Definite unit dimensional constraints are not practical at this time, but the dimensional envelope in those areas where pressure glove contact is required should fall within the following limits (ref. A, C):

- minimum dimension 3/4 inch
- maximum dimension 2 inches

4.2.2.11 Mounting Fixture - The camera should be provided with a quick-disconnect type of rigid mounting fixture to facilitate mounting and removal. A position-to-engage, trigger release, mechanical restraint should be used.

The mounting operation should consist of positioning the camera mount in contact with a mated receptacle on the walking staff. The camera would then automatically be held in place by a spring-actuated locking device.

To remove the camera from the mounting receptacle, a lever or trigger release for the spring lock would be actuated. The time needed by the astronaut to connect or disconnect the camera from the walking staff should be no more than a few seconds.

It may be desirable to place the camera mount in the vertical plane, and utilize a discrete rotary mounting bracket to provide angular motion in the vertical plane. This type of mounting bracket would make it unnecessary to reposition the work platform for a change in line-of-sight elevation.

4.2.2.12 Power Source - The camera is provided with an individual power pack unit. The unit should be capable of being inserted and removed by the crewman while he is on the lunar surface. This power pack could be used as a source of electrical power for the automatic film advance device and other devices associated with the camera assembly requiring electrical power.

The power pack should be a completely self-contained unit such that all necessary circuit connections will be made automatically when the unit is inserted and locked in place within the camera.

The power pack should utilize a positive locking device such as is described in paragraph 4.2.2.2 of this report.

4.2.2.12 (Continued)

Definite unit dimensional constraints are not practical at this time, but the dimensional envelope in those areas where pressure glove contact is required should be within the following limits (ref. A, C):

• minimum dimensions	3/4 inch
• maximum dimensions	2 inches

4.2.2.13 Indicators - The camera should incorporate a digital readout indicator which displays the number of unexposed film frames in the camera.

4.3 Transit

4.3.1 Weight

The combined weight of the walking staff and the equipment to be mounted on it (camera, transit, etc.) should not exceed 30 pounds (maximum for one-hand, short duration use) (ref. B, MSFC-STD-267A, ARDCM 80-6). The specific allocation of this total weight to the various components was not within the scope of this program as no specific mission requirements were supplied.

4.3.2 Specific Design Criteria

4.3.2.1 General - Every attempt should be made in designing the transit assembly to reduce the number and complexity of the tasks required of the crewman in handling and operating the transit during the lunar mission.

The transit should be capable of taking horizontal deflection reference angles and vertical elevation reference angles, utilizing the same basic hardware with a minimum of configuration or positional change.

4.3.2.2 Leveling - The transit should incorporate a method of leveling the unit in both the horizontal and vertical reference planes.

A bubble-center point type of reference level could be utilized in leveling the unit in the horizontal reference plane. This device is small and could be incorporated into the body of the transit, thereby offering no obstruction.

A tubular-bubble type of reference level could be utilized in leveling the unit in the vertical reference plane. This device is also small enough to be incorporated into the body of the transit, thereby offering no external obstruction.

4.3.2.2 (Continued)

- The possibility exists for using a refined type of plumb-bob and reference index, for both horizontal and vertical plane leveling. The penalties for this type of unit would be external hardware, space, and storage and handling complexity.

- The transit position in both the horizontal and vertical reference planes should be adjusted and held through the use of a friction-type transit mount.

4.3.2.3 Transit Sight - The use of any type of peephole sighting device or any external probe designed to function as a sight for the transit is undesirable because of the possibility of visor/transit contact during the sighting operation.

Following are two types of sighting devices:

Conventional Surveyors Transit

The possibility exists of adapting the conventional surveyor's transit to accomplish the lunar survey mission. However, the problem of designing for a compatible transit-eye piece/visor interface may make this concept impractical.

Provisions must be made to ensure that, during the sighting operation, the astronaut is not required to place the helmet or visor in close proximity with any piece of mission hardware which would present a safety hazard.

Pocket Transit

The possibility of adapting the presently suggested pocket transit design to accomplish the lunar mission should be considered in the light of certain design constraints stated in this report.

The considerations discussed relative to the conventional surveyor's transit are also applicable in the design of the pocket transit.

4.3.2.4 Surface Texture - The outer surface texture of the transit, particularly in those areas where pressure glove contact may be expected, should be of a material with a high friction coefficient.

4.3.2.5 Size - The transit should be of such size and shape as to be easily grasped and handled by the astonaut using a full pressure glove.

In the basic transit unit design, every effort should be made to establish a smooth contoured exterior that is free of thin flanges, sharp corners, protrusions, and other

4.3.2.5 (Continued)

obstructive devices which could become a hazard to the crewman.

In the design of the conventional surveyors transit, the use of long slender cylindrical, square, or rectangular shapes are undesirable.

Definite unit dimensional constraints are not practical at this time, but the unit dimensional envelope in those areas where pressure glove contact may exist should fall within the following limits (ref. A, C):

- minimum dimension 3/4 inch
- maximum dimension 2 inches

4.3.2.6 Mounting Fixture - The transit should be provided with a quick-disconnect type of rigid mounting fixture to facilitate using a walking staff as a working platform.

The basic mount design should be of the same type as described in paragraph 4.2.2.11 of this report.

In addition, the transit mounting device should have the capability of being positioned rigidly with respect to either the horizontal or vertical reference planes, and still providing full rotational freedom in the selected reference plane.

The possibility of using a ball and adjustable socket with a vertical slot to provide the required reference plane mobility in the unit mount should be considered. A knurled ring would be used to compress the socket, thereby imposing sufficient resistance to hold the unit rigid. If such a knurled ring is to be used, it should fall within the following dimensional limits (ref. A, C):

- minimum depth 1/2 inch
- minimum diameter 1 inch
- maximum diameter 2 inches

4.3.2.7 Indicators - The transit should incorporate a display of the compass scale to provide a reference from which the horizontal deflection angles and the vertical elevation angles can be made. The display should be placed in such a position within the confines of the unit that it is readily visible with the characters readable when the unit is in either the horizontal or the vertical reference plane position.

The scale may be an internal display with a transparent cover or an external display with the scale incorporated in the unit mount.

4.4 Magnetometer, Gravimeter, Radio-Controlled Detonator

4.4.1 Specific Mission Constraints

Not specified

4.4.2 Specific Design Criteria

4.4.2.1 General - Because of the similarity of deployment tasks and of the external hardware and circuitry, these three instruments will be combined in one section with any specific instrument constraints so identified.

These instruments are to be designed for remote site deployment and activation on the lunar surface. They should be of such a design as to make the accomplishment of all deployment and operational tasks possible by one crewman using only one hand under normal conditions.

Each instrument should contain a leveling device, such as a bubble-centerpoint type of reference level, to aid in the placement of the unit.

4.4.2.2 Size - The recommended configuration envelope is a cylinder.

The minimum diameter will be established by the volume of equipment to be included in the instrument. The maximum diameter of the unit should be limited to 10 inches to avoid a hazardous instrument/suit interface when the instrument is being carried (ref. A).

With the instrument in the deployment position, the handle should be within the grasp range of an astronaut in a standing position (ref. B, MSFC-STD 267A, table 15):

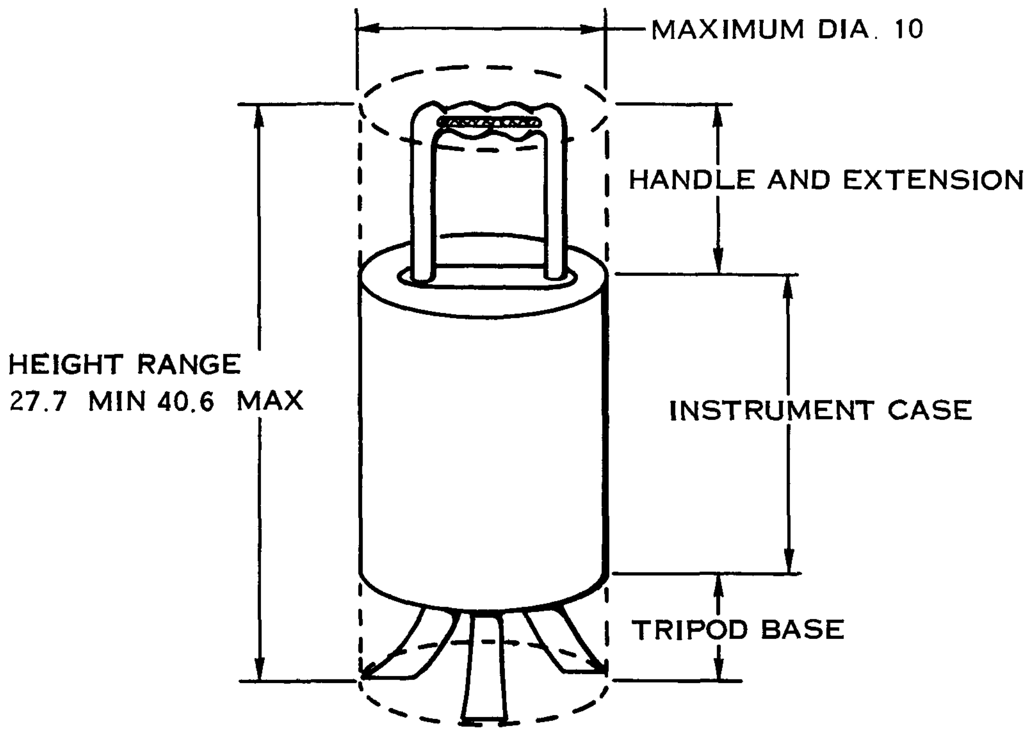
- minimum handle height, 32.4 inches (95th percentile man, knuckle height)
- maximum handle height, 40.6 inches (5th percentile man, elbow height)

4.4.2.3 Tripod Base - To provide the astronaut with the capability of placing and leveling the instrument on the rough, uncertain lunar terrain, the instruments should incorporate a retractable tripod base.

The legs should be so designed that they can be stored within the unit when the unit is not in use, and can be deployed and locked in place when the astronaut is ready to deploy the instrument.

When the tripod is in the deployed position, the legs should remain within the configuration envelope as shown in paragraph 4.4.2.2 of this report.

Illustration of the Configuration Envelope



4.4.2.4 Handle Extension - Each unit's handle should be mounted on a telescoping or collapsible extension to provide a compact storage profile, and also allow the astronaut to deploy the instrument from a standing position. The handle should be deployed by applying a tension force on the shaft, and replaced by applying a compression force on the shaft.

4.5 Electrical Cables

4.5.1 Specific Design Criteria

4.5.1.1 General - Electrical cables were utilized as external circuitry during the deployment sequence of the magnetometer, gravimeter, and radio-controlled detonator. These conductors represented the power and telemetry circuit in these specific instruments.

The electrical cable should be sufficiently flexible to allow deployment on rough, uncertain lunar terrain. It should utilize a plug and receptacle connector at the instrument interface, and a fixed connection at the vehicle panel interface.

4.5.1.2 Coding

A separate, coded cable should be provided for each of the lunar scientific instruments in order to eliminate the use of an incorrect cable. Visual coding is preferred, using colors or patterns or a combination of the two.

Dependance upon the sense of touch as a means of identifying the cables is undesirable because of the ineffective tactile responses caused by a pressurized glove.

4.5.1.3 Size - The conductor size should be kept to a minimum to utilize as little storage space as possible. The conductor should not be designed to function as a grasp area for the pressure glove.

4.5.1.4 Recoil Device - Because of the difficulty encountered by suited test subjects in handling loose cables in both the deployment and recovery sequences, it was apparent that cables should be provided with a type of recoil device to facilitate storage and handling.

The type of recoil device on each instrument should have the following general configuration constraints.

- The cable should be deployed by applying a noticeable steady tension.
- The recoil device should maintain the cable position along its entire deployed length when the applied tension is released.
- The cable should be recovered by actuating a simple release mechanism located at the LSSM panel. This will automatically begin recovery of the cable at such a rate that the astronaut can inspect it for damage as it is recovered.

4.6 Connectors

4.6.1 Specific Design Criteria

4.6.1.1 General - Each instrument that is designed for remote activation using a cable should incorporate in the design of the cable/instrument interface a quick-disconnect type of plug and receptacle. The device should be either of the following types:

- push to engage and snap to lock
- push to engage and turn to lock

NOTE: If a turning operation is to be required for locking the plug and receptacle, a maximum rotational deflection should be 1/4 turn.

4.6.1.2 Coding - To increase the effectiveness with which the astronaut handles the plugs and receptacles, they should be color-coded and/or shape-coded.

Additional means of coding such as numbers or letters may be used to increase reliability.

4.6.1.3 Alignment - All plugs or receptacles should be provided with aligning pins or some other alignment device.

If aligning pins are incorporated in the plug, they should project beyond the electrical connectors.

The plugs and receptacles should be arranged so that the alignment pins orient in the same direction throughout the systems. The shapes should prevent inadvertent interchange of connectors.

4.6.1.4 Protection - To preclude contamination of the plug and/or receptacle, both the plug and the associated receptacle should be sealed with captive covers when they are not engaged.

4.6.1.5 Connector Spacing - To provide sufficient clearance between adjacent unit connectors for the pressurized glove to effectively grasp, connect, and disconnect the specific type of connector, a recommended cylindrical swept volume of 6-inches diameter should be used with the optimum one-inch diameter grip area dimension (ref. A).

4.7 Handles

4.7.1. Specific Design Criteria

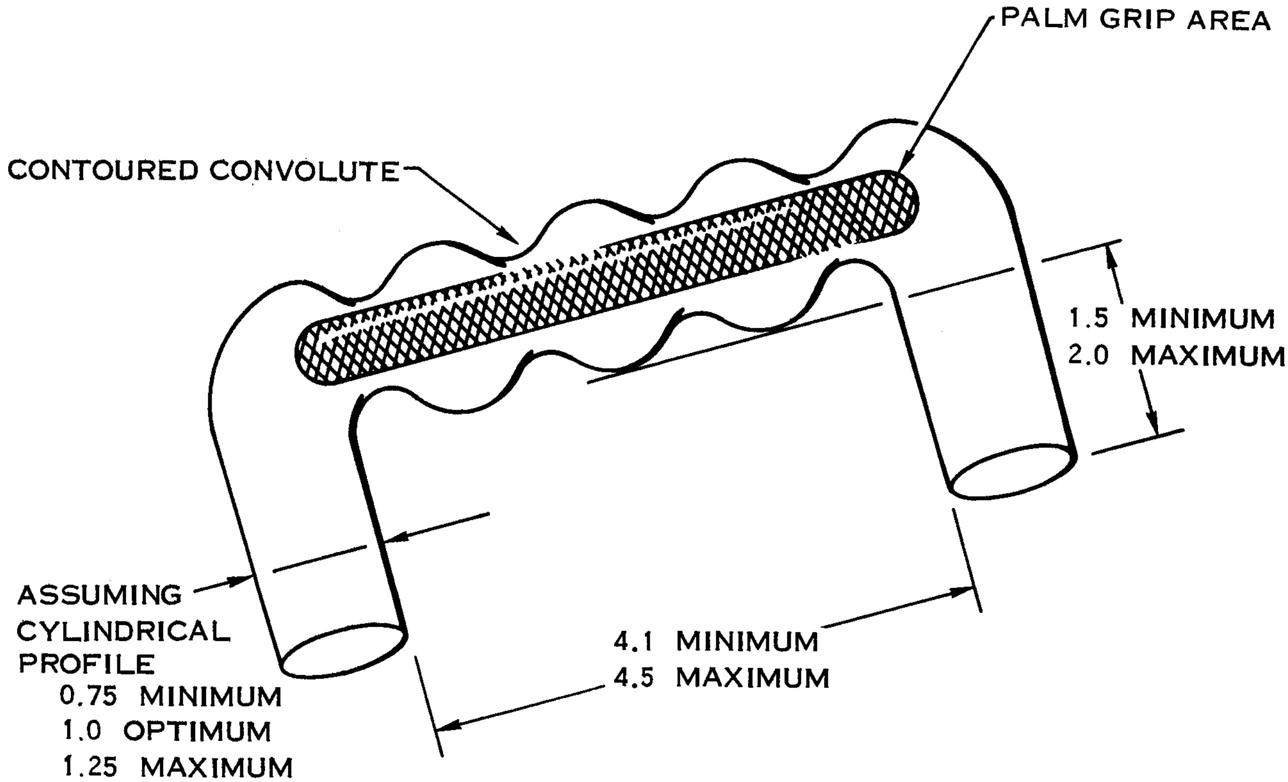
4.7.1.1 General - Each instrument to be carried should be provided with a handle of such design as to allow a crewman weraring a full pressure glove to grasp and maintain effective control of the instrument.

The selection of the optimum handle design should be determined by the following:

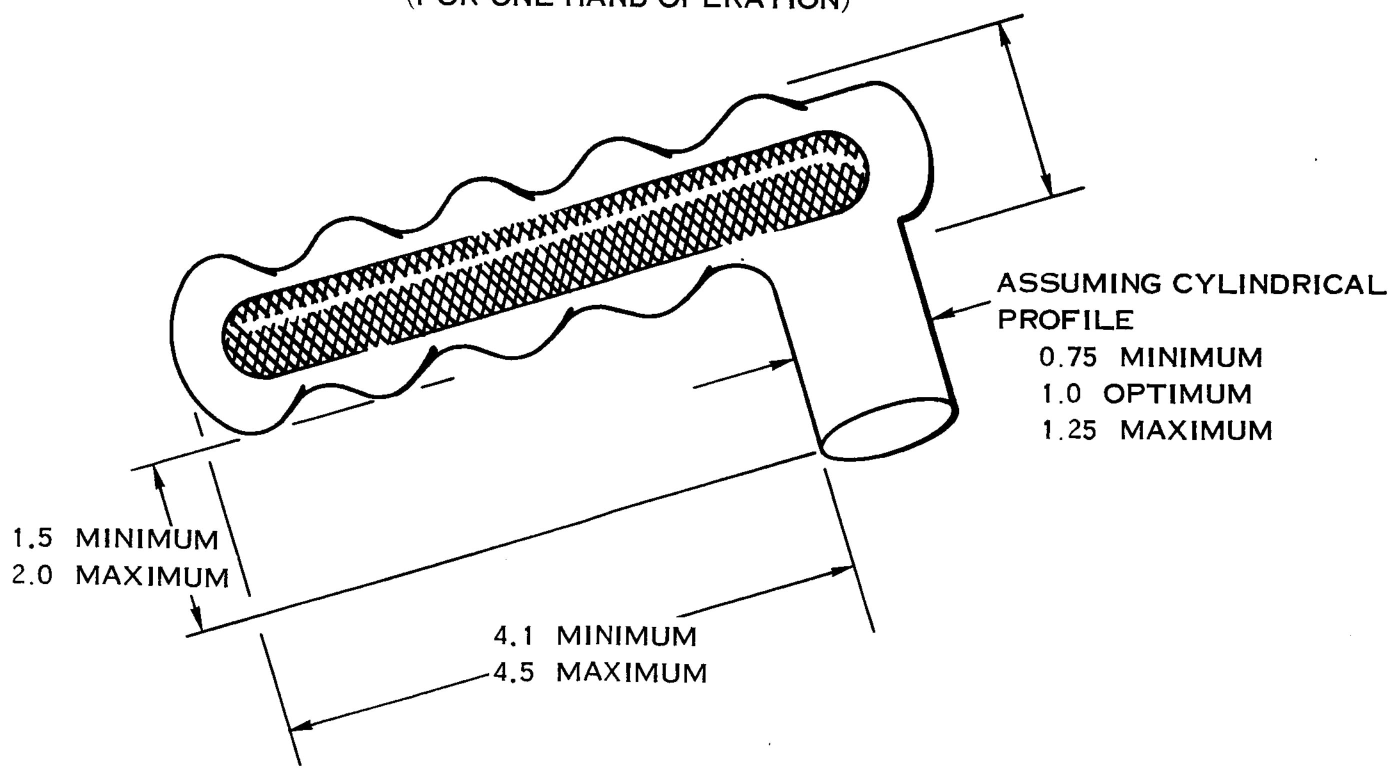
- the weight of the unit
- the number of hands required to lift or carry the unit
- the manner in which the unit is to be handled or positioned
- the additional uses which the handle could serve

4.7.1.2 Handle Location - The optimum location of the handle should be such that:

- it can protect delicate parts or instrument faces
- it can serve as a locking device to secure components in place
- it is located above the center of gravity (C.G.) of the unit
- it does not interfere with equipment operation or maintenance



TYPICAL U—SHAPED BAR HANDLE
(FOR ONE HAND OPERATION)



TYPICAL J—SHAPED BAR HANDLE
(FOR ONE HAND OPERATION)

4.7.1.2 (Continued)

A minimum clearance of three inches should be provided between adjacent handles or any other obstruction (ref. A, C).

When the unit is carried or held, suit-instrument clearance should exist in order to avoid a safety hazard to the astronaut.

4.7.1.3 Size - For best gripping efficiency, the gloved fingers should curl around the handle to a minimum angle of 120^{o} (ref. B, MSFC-STD-267A, table 40).

The basic mobility restrictions placed upon the hands by the pressurized glove require that an effective handle include the following:

- because of the incorporation of a partically restrictive palm restraint, the handle should provide a mated surface at the palm/handle interface. This will allow for more contact area in the grip.

- to provide each digit with the maximum effectiveness in grasping, the handle should incorporate contoured circumferential convolutes, excluding the palm restraint contact area.

Assuming that the basic shape of the handle will be cylindrical, the following should be considered as dimensional constraints (ref. A, C):

- minimum diameter 3/4 inch
- optimum diameter 1 inch
- maximum diameter 1-1/4 inches

4.8 Vehicle Storage and Workspace Area

4.8.1 LSSM Storage Area

The LSSM should provide sufficient storage area for all lunar scientific equipment which is to be used or deployed during the site evalutations. The scientific instrument storage area should be within the range of anthropometric limits to provide effective accessibility by a suited crewman (ref. B, MSFC-STD-267A):

- minimum vertical height, 32.4 inches (95th percentile man, knuckle height)
- maximum vertical height, 52.8 inches (5th percentile man, shoulder height)

The horizontal reach unit within the confines of the vehicle perimeter should be no greater than 17.6 inches (5th percentile man, forearm to hand length). This will allow effective clearance between the suited crewman and the vehicle or associated equipment (ref. A, B, MSFC-STD-267A, table 15).

4.8.1 (Continued)

The possibility of separate, individually contoured storage cells for each of the scientific instruments and the sample containers should be considered. This concept would provide maximum protection for the scientific instruments during the lunar traverse and would eliminate the possibility of these instruments becoming an obstructive hazard to the crewman.

4.8.2 LSSM Work Area

The LSSM should provide a work area to be used by the astronaut on the lunar surface. Such a work area should provide the astronaut with sufficient work space to accomplish the following tasks:

- handle, assemble, and disassemble the scientific instruments
- perform repairs and adjustments to mission equipment, should the need arise.
- receive, prepare, and store lunar samples taken at the various sites.
- make entries in a mission log book and make additions and/or corrections to the aerial photographs and lunar terrain map provided for the mission
- a minimum of eight square feet of flat work space should be provided for these mission needs (ref. A)

The optimum height for this work space is 40 inches above the lunar surface (ref. A).

The location of the work space should provide access to the storage area and the vehicle power and telemetry pane.