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PRESSURE SUIT PRE-FLIGHT SYSTEM

Activities, Requirements, and Specifications

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THE MATRIX CORPORATION
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PRESSURE SUIT PRE-FLIGHT SYSTEM
Activities, Requirements, and Specifications

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SUMMARY

This report presents a basis for evaluating pressure suit Ready Rooms, both shipboard and shorebased. Recommended ideal facilities and equipment for dressing and locker areas, administrative areas, maintenance areas, and briefing areas are given. The facilities and equipment are directly keyed to the activities of the personnel for whom the areas are designed and the requirements which these activities imply.

An important contribution of the research reported is the method presented for updating the evaluation standards as activities and requirements change.

ACKNOWLEDGEMENTS

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The Matrix Corporation also wishes to express sincere thanks to the officers and men of the units mentioned below for their excellent support and assistance during the field study phases of this program. It should be noted, however, that much of the data presented in this report represents an interpretation, by Contractor personnel, of field study information and, thus, does not necessarily reflect the precise feelings or operational procedures of any particular individuals or units.

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TABLE OF CONTENTS

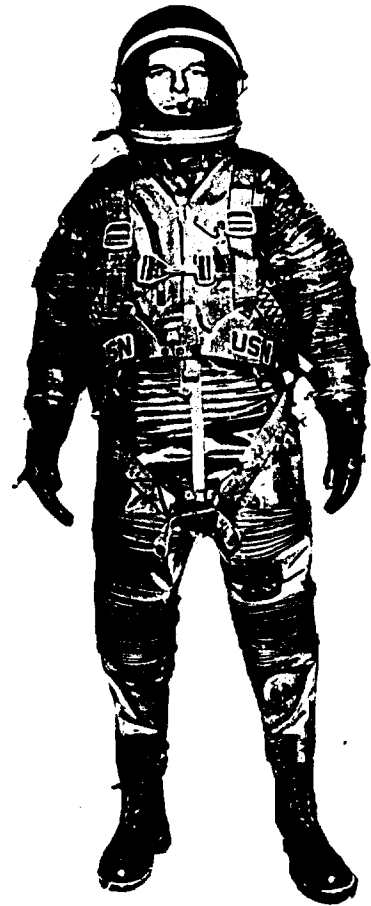
<u>Chapter</u>		<u>Page</u>
I	THE METHOD	1
II	ACTIVITIES AND REQUIREMENTS	5
	Pre-Suit Up	7
	Suit Up	9
	Briefing	10
	Ready Room Alert	13
	Post Briefing	15
	Pre-Flight Check.	17
	Pilot (and RIO) Entry	19
	Catapult Alert.	21
	Shutdown	22
	Post Flight	25
	Divestment	26
	Post Divestment	27
	Routine Maintenance	28
	Periodic Tests	30
	Corrective Maintenance	31
	Maintenance Administration	32
	General Environmental Requirements	33
	General Communication Requirements	40
III	SPECIFICATION OF FACILITIES	41
	Locker Room	42
	Ready Room.	47
	Administrative Office and Pantry.	53
	Toilet and Shower Room	55
	Maintenance Area	57
	BIBLIOGRAPHY	65

LIST OF FIGURES

Figure		Page
1	Scale of Effective Temperature	35
2	Locker Room - Guidance Sketch	43
3	Pressure Suit Locker - Guidance Sketch	44
4	Pressure Suit Ready Room - Guidance Sketch	48
5	An Area Jury-Rigged as a Pressure Suit Ready Room	50
6	Shipboard Passage to Locker Room	58
7	Pressure Suit Drying - Existing Facility	60



B. F. GOODRICH COMPANY



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MARK IV LIGHT WEIGHT HIGH ALTITUDE
FULL PRESSURE SUIT

CHAPTER I

THE METHOD

The research reported herein was addressed to the general problem of the evaluation of Ready Rooms and Ready Room requirements. While most of the information presented concerns pressure suit Ready Rooms, the basic information and methodology can be equally well applied to other types of Ready Rooms and, indeed, the methodology can be applied to other Navy installations.

It is common knowledge that Ready Rooms throughout the Navy whether on ships or shorebased are different in the kinds of facilities and equipment which are installed. Some of these differences are valid differences; some of these differences are not. Some differences are based on the fact that squadrons have different requirements. Some differences, it would seem, are based on fortuitous judgments made in the course of Ready Room design. Some differences appear to be based on a lack of specific requirements; hardware is frequently installed because it is found in older installations, "because we've always had it," although the requirement for the particular item may no longer exist.

Even where a preliminary design is based on well documented requirements, local installation is frequently made without the document. Thus, compromises which are a function of local feasibility problems are made without a full understanding of how this will affect the activity for which the installed hardware is required. "Jury-rigging" frequently solves an immediate problem but just as frequently creates new problems because of conflict with requirements which are not taken into consideration when the installation is made. When a particular means is needed to satisfy a requirement, too often the suggestion is made, "Why not make it just like _____?" This means-oriented rather than requirement-oriented solution frequently ignores the fact that the requirements of installations are different.

Inadequacies of a given installation are frequently noted and reported. Changes may be made by the reviewing authority on the basis of the application of a single criterion, "Does the change solve this particular problem?" or the change may not be recommended because the evaluator is using a different criterion than the reporter of the inadequacy.

The methodology outlined in this report is an attempt to provide a solution to these problems. This solution is not an ideal facility design to be replicated in all situations where a Ready Room is required. This solution is not the installation of new and "better" equipment as it is developed. The equipment and facilities provided must be a function of the mission activities of the officers and men for whom the facility is designed.

The solution requires:

1. A documented description of the mission activities
2. A documented list of requirements derived from the activities
3. A review of the hardware and subsystems which could satisfy the requirements
4. A documented standard for use in evaluating existing facilities and for evaluating new facility plans
5. An item-by-item comparison of existing or projected facility requirements with the standard
6. A design for the Ready Room area under consideration in which compromises necessitated by local constraints and feasibility problems are arrived at with the full knowledge of the activities and their associated requirements AND, MOST IMPORTANT
7. An updating procedure for the standard which allows facility re-design and equipment changes to be made on the basis of changes in mission activities and the resultant changes in requirements

The body of this report contains two major items: (1) a list of personnel activities coupled with their implied requirements, see Chapter II, and (2) a description of a facility designed to meet the requirements, see Chapter III. These major items are the end products of a research program which included: (1) activity analyses of pilots and support personnel in existing pressure suit facilities, (2) review of existing documentation relevant to pressure suits and pressure suit facilities, and (3) a critical review of shipboard and shorebased facilities presently existing. It should be noted that this report is oriented primarily in terms of a typical F4H squadron.

No one design will satisfy the different requirements of various installations. Nor will the most appropriate design for a given installation remain most appropriate. The activities and requirements will change and will require updating of the facility.

It is intended that the two major items of this report be kept "open." Frequent review of typical activities and updating of the standard lists of activities will be accompanied by changes in documented requirements which, in turn, will lead to changes in the standard description. As newly developed equipment is proposed for introduction, it can be evaluated against the documented requirements to see if it meets them better than the existing equipment. As activities and requirements change, the existing hardware can be similarly checked. If existing hardware is not meeting the requirement, new and different means for satisfying the requirement can be sought.

As failure reports and suggested modifications are received by the evaluating authority, they can be checked against the documented materials to be sure that a proposed improvement does not create an associated inadequacy because the complete activity/requirement picture was not reviewed.

CHAPTER II
ACTIVITIES AND REQUIREMENTS

In this chapter, the activities and requirements of personnel using the pressure suit Ready Room and associated facilities are listed. No attempt has been made to derive requirements for other kinds of flying than pressure suit flying. The activities are divided into the following phases:

Pre-Suit Up	Pilot Entry
Suit Up	Catapult Alert
Briefing	Shutdown
Ready Room Alert	Post Flight
Post Briefing	Divestment
Pre-Flight Check	Post Divestment

Under each of the above headings the activities of Pilots, Briefing Officers, Parachute Riggers, Plane Captains, and other personnel are listed separately.

Activities and requirements for pre- and post-flight maintenance are listed under the headings:

Routine Maintenance	Corrective Maintenance
Periodic Tests	Maintenance Administration

Under each activity, the implied requirements of the activity are listed with, where necessary, an explanatory paragraph. Throughout this chapter, the activities are coded serially within each phase. The coding is used in the description of a Ready Room facility presented in Chapter III in order that the recommended equipment can be readily associated with the activities and requirements which led to its recommended installation. Some of the activities performed prior to the pilot entering an aircraft are the same as those which are performed after leaving the aircraft. This repetition is reflected in the list of activities given in this chapter. The repetition is also indicated in the keying of the activities to the facility description.

The activities presented in this chapter follow a typical sequence. Local custom and SOP will undoubtedly call for changes to the sequence here presented. Likewise, peacetime and wartime conditions will call for different sequences. For example, debriefing in wartime would more likely precede divestment rather than follow it.

A discussion of general environmental requirements such as temperature, humidity, ventilation, illumination, and acoustics is presented following the lists of activities and requirements.

The last section of this chapter contains a discussion of communication requirements.

Pre-Suit Up*

Pilot (and RIO) Activities and Requirements

PS 1. Proceed to area and remove uniform.

Requires sufficient space to remove and stow uniform; this space should allow free passage of air; lockable stowage space should be available for stowing personal valuables. Individual space and uniform stowage facilities are required. It should be noted that the number of individual facilities necessary will depend not on the number of pilots but on the number of flight crew personnel. The pressure suit and helmet stowage should be in the suit-up area.

PS 2. Attend to relief requirements.

Requires toilet facilities, lavatory, soap, and towels. Relief and shower facilities should be immediately adjacent to the dressing area. Relief facilities should be used exclusively by flight crew members preparing to use the Ready Room. Relief facilities for other personnel should be provided elsewhere.

PS 3. Remove pressure suit and helmet from stowage.

Requires stowage space.

*It is assumed that the following items of equipment would have been obtained prior to Pre-Suit Up: sheath knife, knee board, flashlight, matches and cigarettes, survival kit; some of these items may be stowed in the Nav Bag.

PS 4. Lubricate zippers and O rings.

Requires supply of lubrication and appropriate stowage. The lubrication of zippers will be performed prior to donning the pressure suit.

PS 5. Defog face piece.

Requires supply of anti-fogging compound and appropriate stowage space for compound. Preparation of the helmet at this time is limited to de-fogging the face piece. It is assumed that any other cleaning operations of the helmet would have been previously accomplished by maintenance personnel.

PS 6. Lay out suit for donning with zippers and straps positioned as required.

Requires a support for layout out suit.

Activities PS 4, PS 5, and PS 6 will probably be performed by or with the assistance of parachute riggers.

Suit Up

Pilot (and RIO) Activities and Requirements

SU 1. Don underwear, socks, and anti-blackout suit.

Requires stowage for underwear, socks, and anti-blackout suit.

SU 2. Assume seated position, insert legs into torso, and don boots.

Requires seat and stowage for boots.

SU 3. Complete donning of suit, closing zippers and adjusting straps.

Requires mirror. The donning of the pressure suit, closing of zippers, and adjustment of straps may require the assistance of another person. The buddy method, with the aid of a mirror is recommended. A parachute rigger could assist in this operation if unusual donning problems are encountered.

SU 4. If anti-blackout suit is not worn, install fitting plug in suit port.

Requires supply of and stowage for anti-blackout fitting plugs.

Briefing

Pilot (and RIO) Activities and Requirements

B 1. Proceed to Ready Room and be seated.

Requires properly illuminated passageway between suit-up area and Ready Room, which should be close together. Passageways to be used by suited personnel should be free of obstructions. Seating facilities are required. Seats should be positioned for easy access and should be free of snagging obstructions. During briefing, such items as photographs, maps, and survival kits may be passed out to flight crew personnel. Thus, the seating arrangement should provide aisles to allow this.

B 2. Connect special suit ventilating hose to conditioned air source.

Requires air conditioning outlets for pressure suit ventilation during briefing. Since suited-up personnel will require ventilation during briefing sessions, air conditioning ventilation outlets must be provided in the Ready Room at some of the chairs. The outlets must be positioned to preclude entanglement of ventilation hoses. Outlet fixtures should present no significant obstruction to Ready Room personnel. Individual valves will be required on these hoses since all outlets may not be used at the same time.

B 3. Obtain information required by the mission. This may include:

- (a) weather
- (b) air intelligence
- (c) tactics

- (d) aircraft assignment
- (e) duty runway and aircraft spotting
- (f) ordnance
- (g) operating area

Requires supply of ash trays, pencils, pencil sharpener, flight logs or paper.

B 4. Record necessary information and prepare required flight materials.

Requires necessary supplies and suitable space for preparing flight materials and retaining them. It would be desirable to provide a Nav Aids Table for use by pilots following briefing. This facility may be located in the administrative office adjacent to the Ready Room.

It may sometimes be desirable to conduct part of briefing in small groups. Possible means for achieving this would be to use the Ready Room, adjacent office space, and the Locker Room facilities.

Briefing

Briefing Officers Activities and Requirements

- B 5. Obtain necessary briefing guides from stowage.

Requires stowage for briefing guides convenient to Ready Room.

- B 6. Transmit mission information to flight crew. In many cases briefing officer will be the flight leader, who will be pressure suited and required to stand and move about.

Requires blackboard, chart board, status board, projector and screen, reading stand, TV monitor or projected teletype, and ventilation outlet. Provision should be made for stowing the projectors when not in use, if permanent installation is not possible. Power outlets must be provided in appropriate locations. Since the flight leader (suited up) may be conducting the briefing session, a ventilation outlet should be provided at the front of the Ready Room. This outlet will require an extended length hose to enable the briefing officer to move about. At shore installations, ambient light will require to be occluded while the projector is in use.

- B 7. Duty Officer receives and transmits all information required in the conduct of squadron operations (a continuous requirement).

Requires telephone and inter-communication facilities.

Ready Room Alert

Pilot (and RIO) Activities and Requirements

A 1. Stand-by in Ready Room.

Requires comfortable, reclining chairs, relief facilities, drinking facilities, light mess facilities, and pressure suit cooling. Since flight crew personnel may be required to stand Ready Room alert for several hours, it is considered important to provide for a reasonable degree of comfort during this period of time. Comfortable reclining chairs are recommended for use in Ready Room alert. In addition, relief facilities should be provided immediately adjacent to the Ready Room.

A 2. Attend to collateral administrative duties.

Since personnel may be required to perform collateral administrative duties while on Ready Room alert, it is recommended that office space adjacent to the Ready Room be provided. Pressure suit cooling facilities should be provided within this area.

Ready Room Alert

Enlisted Personnel Activities and Requirements

A 3. Prepare coffee.

Requires coffee mess, supplies, and necessary cleaning supplies and stowage. Fresh water should be available and means for washing cups and utensils should be provided. A cleaning locker and deep sink should also be provided; these facilities may also be used for general cleaning of the area.

A 4. Obtain food (from Officers' Mess).

A 5. Maintain required temperature of food and drink.

Requires hot plate and refrigerator.

A 6. Obtain any administrative materials required by Pilots on alert status.

Post Briefing

Pilot (and RIO) Activities and Requirements

- PB 1. Disconnect special ventilating hose from conditioned air source.

Requires stowage for ventilation hoses.

- PB 2. (Pilot) Review and sign-off pre-flight inspection sheets.

Requires stowage and access to pre-flight inspection sheets. It is recommended that pre-flight inspection sheets be maintained in the Ready Room area. This would obviate the requirement for suited-up personnel to go to the line shack. The maintenance of pre-flight inspection sheets in the Ready Room implies a requirement for stowage facilities for these records, facilities for communicating with the hangar areas, and suitable desk space.

- PB 3. (Pilot) File flight plan (shore stations only).

Requires supply of flight plan forms, and facility for communicating with Base Operations.

- PB 4. Proceed to suit-up area and don integrated parachute harness and flotation garment.

Requires stowage for integrated parachute harness and flotation garment. As with the pressure suit, donning of the parachute harness and flotation garment requires the assistance of another person. The buddy method is recommended.

- PB 5. Obtain helmet, gloves, and top block assembly (or individual disconnects).

Requires stowage for helmet, gloves, and top block

assembly or disconnects. Parachute harness and flotation garment, helmet, and gloves stowage should be located immediately adjacent to the Ready Room. Thus, when pilot is ready to proceed to flight line, he can easily obtain these items, thereby precluding requirement to carry these items to Ready Room when reporting for briefing or to walk a long distance to obtain them. The top block assembly or disconnect stowage should be located with the helmet and gloves.

- PB 6. Obtain portable conditioned air unit and connect special ventilating hose of unit to pressure suit.

Requires supply of and stowage for portable air conditioning units. Portable air conditioners should be stowed in the Locker Room. A supply of refrigerant will be necessary.

- PB 7. Obtain Nav Bag.

Requires temporary Nav Bag stowage.

Pre-Flight Check

Pilot Activities and Requirements

PC 1. Proceed to aircraft.

May require transportation facility, depending on distance. This requirement will exist only at shore-based installations and then depending on the distance to be traveled. Maintenance of dark adaptation required at night.

PC 2. Perform external inspection of aircraft.

Requires flashlight, with red lens if night flight; assumed to be in Nav Bag.

PC 3. Disconnect special ventilating hose of portable unit from suit.

PC 4. Don helmet and gloves.

If the RIO does not assist the pilot in the pre-flight check of the aircraft, he may don helmet and gloves during the post-briefing period.

Pre-Flight Check

Plane Captain Activities and Requirements

PC 5. Care for pilot's (and RIO's) helmet, gloves, and top block assembly or disconnects during pre-flight inspection.

PC 6. Assist pilot in donning of helmet and gloves.

PC 7. Obtain portable conditioned air unit from pilot (and RIO)

It will be necessary for the unit to be returned to stowage via the maintenance area where the supply of refrigerant will be checked.

Pilot (and RIO) Entry

Pilot (and RIO) Activities and Requirements

- PE 1. Enter cockpit.
- PE 2. Assure that external power sources have been attached to aircraft (this includes vent air).
- PE 3. Perform interior checks and (pilot) start engines.

Pilot (and RIO) Entry

Plane Captain Activities and Requirements

- PE 4. Connect top block assembly or individual disconnects to aircraft and hose assemblies to suit ports.
- PE 5. Obtain portable air conditioner from pilot (and RIO).
- PE 6. Hook ladder to cockpit.
- PE 7. Assist pilot (and RIO) to enter.
- PE 8. Assist pilot (and RIO) in securing restraint system.
- PE 9. Remove ladder.
- PE10. Start auxiliary power unit.

Activities PE 5, PE 7, and PE 8 may be performed by a parachute rigger.

Catapult Alert

Pilot (and RIO) Activities and Requirements

CA 1. Remain in aircraft in a mission-ready state for a period of several hours.

Requires facility for vent air (or warm air during operations in cold climate).

Since the pilot (and RIO) may be required to stand catapult alert for several hours, it will be necessary to provide heating or cooling facilities which operate from an external power source.

Shutdown

Pilot Activities and Requirements

- S 1. Prior to landing, communicate with Duty Officer, notifying him of time of arrival (shore stations only).

Requires radio facility at Duty Officer's desk.

This activity requires the pilot to change radio frequencies at a very inopportune time. If possible, it is recommended that ETA be relayed to Duty Officer by the tower. If this is done, telephone facilities could be substituted for radio facilities at Duty Officer's desk.

- S 2. Perform shutdown activities.

Shutdown

Plane Captain Activities and Requirements

S 3. Obtain portable conditioned air unit and proceed to flight line.

Requires supply of and stowage for portable air conditioning units.

S 4. Secure ladder to cockpit.

S 5. Assist pilot (and RIO) with harness and in leaving aircraft.

S 6. Remove ladder.

S 7. Assist pilot (and RIO) in removing helmet and gloves.

Activities S 3, S 5, and S 7 may be performed by a parachute rigger.

Shutdown

Duty Officer Activities and Requirements

- S 8. Prior to landing of aircraft, communicate ETA of flight to parachute rigger and plane captain.

Requires facility for communicating with maintenance area and plane captain.

Post Flight

Pilot (and RIO) Activities and Requirements

P 1. Connect portable conditioned air unit.

The use of supplemental ventilation may not be required at this time if immediate divestment is anticipated.

P 2. Relinquish items to be stowed in Nav Bag.

Divestment

Pilot (and RIO) Activities and Requirements

D 1. Detach portable cooling unit from suit.

It is anticipated that the portable cooling unit will require servicing at the maintenance area before being returned to storage in the Locker Room.

D 2. Remove harness, pressure suit, boots, anti-blackout suit, underwear, and socks.

Requires seat. The divestment of the pressure suit will probably require the assistance of another person. The buddy method is recommended.

D 3. Stow harness and boots.

Requires stowage. Other equipment removed to drying area by parachute rigger.

D 4. Deposit underwear and socks for laundering (or stow).

Requires temporary stowage and laundering facilities for underwear and socks. With respect to socks and underwear requiring laundering, it would be desirable to provide a temporary stowage facility within the divestment area. Use of a common stowage facility will be adequate provided items bear wearer's identity.

D 5. Note pressure suit and personal equipment discrepancies.

Requires means for noting discrepancies. It is recommended that pilots be provided with a check-list. This should be located at the locker and might include discrepancies with regard to: flotation garment CO₂ cartridges, flashlight batteries, and Pressure Suit items.

Post Divestment

Pilot (and RIO) Activities and Requirements

PD 1. Attend to relief requirements.

Requires toilet facility, lavatory, soap, and towel.

PD 2. Attend to personal cleanliness requirements.

Requires shower facility, soap and towel, and stowage for clean and wet towels.

PD 3. Don uniform (or flight coveralls) and obtain valuables.

Requires stowage facility for uniform (or flight coveralls) and valuables.

PD 4. Proceed to Ready Room and note aircraft discrepancies on pre-flight check sheet.

PD 5. Relate required mission information to debriefing personnel.

Requires a supply of pencils, paper, and mission accomplishment forms, as well as conference space and seating facilities. A tape recorder may be quite useful as an item of debriefing equipment. As with briefing, it may sometimes be desirable to conduct debriefing in small groups. Possible means for achieving this would be to use the Ready Room, adjacent office space, and the suit up/divestment area.

Routine Maintenance

Activities and Requirements

RM 1. Dry pressure suit and anti-blackout suit.

A means is required for drying the interior of the torso, gloves, and helmet following each period of use, particularly in warm climates. The means must be such that drying will be accomplished within a minimum time period to allow for subsequent use of the suit. A drying time of no more than two hours should be adequate for most situations. The number of suits to be dried simultaneously will vary from one to twelve. Heat utilized to speed drying must not exceed 120° F. Such means must also accommodate a sufficient number of suits to preclude any delays in the drying process during periods of heavy flight activity. It should be noted that the exterior of the torso may occasionally become wet through use or as the result of washing. Drying facilities should also incorporate provisions for drying the exterior of the suit. Some means should also be provided for drying the anti-blackout suit.

RM 2. Wash (and dry) accessory garments.

A means is required to wash and dry the pressure suit underwear and socks after each use. The use of heat is not recommended for drying the underwear. Soap or detergent are required.

RM 3. Wash pressure suit and related gear.

Facilities are required for occasional hand washing of the torso, gloves, anti-blackout suit, and flotation garment. This will require warm water and soap and an area on

which to wash and rinse these items. A supply of neat's-foot oil is required for applying to the gloves following washing and drying. (It should be noted that drying facilities in addition to those mentioned previously will be required for the flotation garment.) Facilities must also be provided for cleaning the headpiece, facepiece, and tinted visor. This will require soap, water, a supply of clean cloths and chamois, and a supply of solvent recommended for cleaning the facepiece and visor.

RM 4. Stow pressure suit and accessory garments.

All garments and stowage lockers must be appropriately labelled to facilitate proper stowage by the parachute rigger.

RM 5. Check and refill portable conditioned air units.

Requires supply of refrigerant.

Periodic Tests

Activities and Requirements

- PT 1. Perform periodic (every 30 days) leakage, strength, and pressure relief valve tests.

Some form of test arrangement is required to accomplish leakage and strength tests of the torso, helmet, and gloves, and a pressure relief valve test, as outlined in the handbook "Operation and Maintenance Instructions, Light Weight, High Altitude Full Pressure Suit, MARK IV". This must include a table, on which to lay out the torso, a filtered compressed air supply, a supply of aviator's breathing oxygen, and the necessary fixtures and equipments to regulate and maintain specified test pressures and accurately measure leakage rates. If torso, gloves, and headpiece are to be tested separately, that is, not as a completely assembled suit, special test plates and plugs will be required.

- PT 2. Perform periodic (every 30 days) test of headpiece.

Some form of test arrangement is required to check the operation of the oxygen regulator and the breathing compartment. This will require, basically, a test stand and a supply of aviator's breathing oxygen.

- PT 3. Perform periodic (every 30 days) check of seat pan.

A means is required to test the operation of the pressure suit controller, and to inspect the seat pan manifold system.

Corrective Maintenance

Activities and Requirements

- CM 1. Accomplish repairs and parts replacement on pressure suit helmet, torso, and gloves.

Requires sufficient work area and table space for proper handling and laying out of suit. Requires convenient stowage facilities for special tools, expendable supplies, and replacement parts to accomplish the repairs authorized in the maintenance handbook. Such stowage facilities must be capable of being locked. Requires nearby facilities for accomplishing major repairs exclusive of those which must be sent to overhaul.

- CM 2. Accomplish repairs and parts replacement on accessory equipments.

Requires stowage facilities for tools, and replacement parts, for such items as top block assemblies and pressure suit hoses. Such facilities must be capable of being locked.

- CM 3. Accomplish repairs and parts replacement on seat pans.

Requires work area and table space for handling seat pan. Requires lockable stowage space for tools and replacement parts.

Maintenance Administration

Activities and Requirements

- MA 1. Keep maintenance records on pressure suit, accessory equipments, and seat pan.

A cabinet of sufficient size is required to file maintenance cards on each item for 32 suits and 14 aircraft.

- MA 2. Schedule periodic tests.

A means is required for scheduling periodic tests of the pressure suit, helmet, and seat pan.

- MA 3. Schedule personnel.

A means is needed for scheduling the activities of parachute rigger personnel. This must include a consideration of periodic testing of components, minor and major repairing, and pre-flight and post-flight assistance of flight personnel.

- MA 4. Maintain documents and administrative supplies.

A means is required for filing maintenance documents such as handbooks, BACSEBs, parts lists, and related instructions. Facilities are also required for stowage of such items as pencils, ordering forms, and maintenance tags.

General Environmental Requirements

Temperature Requirements

A range of approximately +68° F. to +75° F. is considered desirable for the activities associated with pressure suit ground environments whether shipbased or shorebased. Dressing room areas should be kept in the upper half of this range; Ready Rooms in the lower half. However, for brief periods which do not require prolonged mental activities, such as would be the case in shower rooms, temperatures of +80° F. to +90° F. are acceptable with proper ventilation. The activities which require manual effort and light physical exertion such as maintaining the suit or those concerned with mental activities such as briefing sessions will not tolerate the higher temperatures allowed in the dressing and shower areas even for brief periods or performance will start to deteriorate. Thus, separate heating controls and/or cooling units may be required to stay within the recommended temperature ranges.

With respect to the Ready Room, it should be noted that this room will sometimes be occupied both by personnel wearing pressure suits and by personnel not wearing pressure suits. It is not feasible to maintain a temperature in the Ready Room at a level which will assure comfort to suited personnel and yet not be too cold for non-suited personnel. Rather than keeping the entire room at a very low temperature, then, it would be more appropriate to maintain an ambient room temperature within the optimum comfort range for persons wearing normal indoor clothing (see discussion below) and provide a blower system with hose connections to enable individual suited-up personnel to circulate air within this temperature range through their suits.

Effective Temperature Requirements

A family of curves is formed by a plot of all combinations of relative humidity and temperature that yield the same sensation of temperature.

These curves comprise a scale of Effective Temperature. (See Figure 1.) The optimum comfort range for persons wearing normal indoor clothing is $+65^{\circ}$ to $+73^{\circ}$ ET. It is generally accepted that the effective temperature comfort zone will be achieved through the appropriate control of room temperature between $+70^{\circ}$ and $+80^{\circ}$ F (day bulb) and relative humidity between 40 and 60 per cent.

The efficiency with which tasks are performed usually will not begin to decline until the environmental temperature rises several degrees above the optimum range. A noticeable increase in fatigue in performing physical tasks often begins to occur at temperatures above $+75^{\circ}$ ET. Mental performance is also adversely affected at temperatures in excess of $+85^{\circ}$ ET. Serious degradation in performance may result when the temperature exceeds $+87^{\circ}$ ET.

Prolonged exposure to effective temperatures below the optimum for physical comfort may directly affect work performance. The effects of these lower temperatures are somewhat dependent on individual differences among people. However, prolonged exposure to temperatures below $+55^{\circ}$ ET often results in a stiffening of fingers, thus degrading performance in tasks which require manual dexterity.

Humidity Requirements

The amount of moisture in the air (i. e. , the relative humidity) combines with air temperature to affect human performance as was pointed out in the section dealing with effective temperature. A relative humidity above 30% and below 70% is considered to be adequate if the optimum temperature range for physical comfort is maintained. In general, as the temperature of the work area rises, the moisture content of the ambient air should be reduced. At warm temperatures, comparatively small differences in the relative humidity of air may have significant effects on human performance.

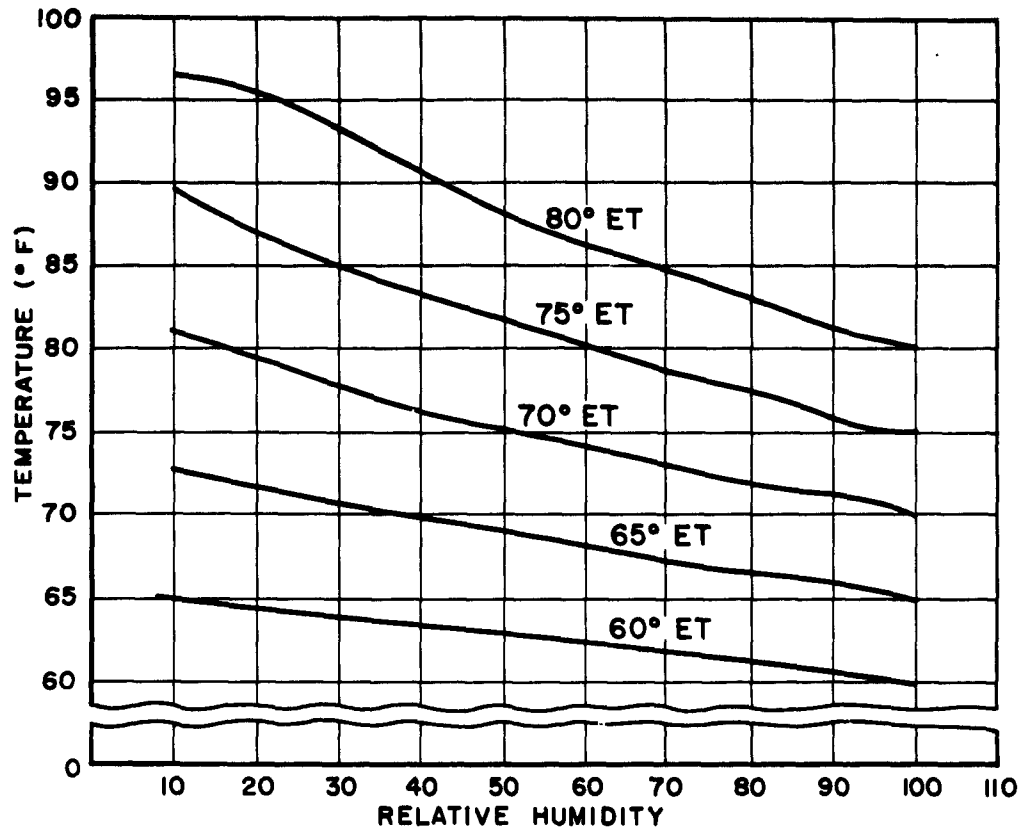


Figure 1. Scale of Effective Temperature

Ventilation and Circulation Requirements

Ventilation facilities should provide a minimum supply of 1000 cubic feet of fresh air per person per hour. The recommended rate of air circulation for enclosed work spaces is from 20 to 40 cubic feet per minute for a winter climate and slightly higher for a summer climate.

Acoustic Requirements

Excessive ambient noise in the work environment may have degrading effects on personnel performance. Studies in this area have been many but conflicting and for the most part non-conclusive. However, in general it can be concluded that performance decrement may occur above 90 db. The most acceptable maximum level for areas such as those involved with a pressure suit facility is 70 db.

Illumination Requirements (Day Operations)

The following table presents the essential reflectance values to minimize glare and optimize the lighting for such surfaces as might be encountered in a pressure suit facility.

<u>Surface</u>	<u>Reflectance Value</u>
Walls	40 - 90% (60% optimum)
Ceilings	60 - 90% (60% optimum)
Floors	15 - 30% (15% minimum)
Desk & Bench Tops	35%
Cabinets & Lockers	25 - 30%

Direct lighting should be avoided wherever possible. When light is directed downward or directly toward the work area, it causes shadows, glare, and brightness differences. Direct lighting is acceptable only if many light sources are located on a high ceiling or if it is essential to supplement diffuse lighting for work surfaces.

Diffuse lighting may be used if several luminaries are employed and if they are positioned close together on a high ceiling. But, when undirected light is scattered evenly in all directions, it causes some glare and shadows. Thus, fluorescent tubes can be improved by enclosure baffles. Indirect lighting is to be preferred.

The following table indicates the recommended level of illumination in foot candles for various work areas or tasks such as might be encountered in a pressure suit facility.

<u>Work Area or Type of Task</u>	<u>Foot Candles</u>	
	<u>Recommended</u>	<u>Minimum</u>
Ordinary visual tasks	30	
Office work, general	30	25
Reading		
large print	10	5
newsprint	25	10
handwritten reports, in pencil	20	10
small type	30	
prolonged reading	50	
Service Areas, general	10	
Severe visual tasks, in general work situations	50	40
Repair work		
general	50	
instrument		100
passageways	5	

Concerning Red Lighting

For night operations, some degree of dark adaptation is required in order for the pilot to obtain visual information from the darkness outside of his aircraft. The particular type of dark adaptation required and the time that should be allowed depend upon the visual tasks and the level of sensitivity to be attained.

Most night flying operations require that the pilot achieve some level of rod adaptation. That is, his external visual tasks primarily involve such things as locating dim or distant lights, and spotting the outline of a nearby aircraft or profile of a mountain. It is generally agreed that thirty minutes in darkness or in red illumination provides maximum rod sensitivity. It is important to note, however, that once dark adaptation has been achieved, flight personnel should not be exposed to any illumination, other than red illumination, for even an instant. Brief exposure even to low white illumination will produce a measurable decrease in rod sensitivity requiring several minutes for recovery.

For cone adaptation, required for tasks such as seeing details or color, five to ten minutes in complete darkness will produce maximum sensitivity to brightness. The cones may be exposed to low brightness for a brief period and regain full dark adaptation within a matter of seconds.

During the conduct of this project effort, it was found that the provision of low intensity red lighting aboard carriers for the purpose of dark adaptation was for the most part adequate. Shore stations, however, vary from quite sophisticated provisions to no provisions at all. At one facility visited, for example, the pre-flight area interior lighting circuits incorporate an override switch which may be utilized during night operations to render individual white lighting controls inoperative. This precludes the possibility of inadvertent illumination of pre-flight areas with white lights which would impair dark adaptation. In conjunction with an external photometric device, the override switch may be set to extinguish the white lights and illuminate the red lights automatically when daylight illumination has diminished to the level which requires that pilots be dark adapted. Once the pilot leaves the building, however, little provision has been made for protecting him from the various sources of white illumination which may be encountered en route to the flight line and in the vicinity of the aircraft.

At other facilities, essentially no provisions have been made for dark adapting flight personnel prior to night operations. In defense of this situation, pilots report that the normal time involved from aircraft entry to take-off is sufficient for achieving an adequate level of dark adaptation for most night flying operations.

Requirements

Because of the relatively brief period of time involved from aircraft entry to take-off aboard carriers, the provision of low intensity red lighting appears to be a definite requirement. Such also appears

necessary to prepare the pilot for entry into the darkness of the flight deck. This requirement in turn generates a requirement for effective control of the lighting circuits to assure that red light is maintained in all areas utilized by flight personnel during night operations. These areas include dressing and ready rooms, toilets, and the passageways and stairways leading to the flight deck.

For shore stations, the requirement to provide a system of red illumination is at least questionable. The decision to provide such a system must be based to some extent upon a consideration of the cost involved in comparison to the reported limited advantage to be derived. If red illumination is to be provided, however, there is a requirement that it be provided "all the way". There is little point in providing for dark adaptation within buildings and other enclosed areas occupied by the pilot prior to flight if no protection is to be afforded enroute to the flight line and in the vicinity of the aircraft.

Again, the requirement for effective control of the lighting circuits would apply to shore stations where red illumination is provided.

General Communication Requirements

The pre-flight area requires facilities for communication with those areas which are concerned with the use and distribution of air intelligence data, weather data, flying conditions, and briefing. These areas in a shipboard installation are Primary Fly Control, Secondary Fly Control, Air Operations, Carrier Control Approach, Aerological Office, Air Combat Intelligence Office, Special Weapons Control, Flight Crew Ready Rooms, Flight Deck Control Stations, and CIC. At shorebased installations, these areas are represented by the Control Tower, Air Operations and Control Rooms, Aerological Office, Weather Stations, Air Combat Intelligence, Flight Crew Ready Room, and the Line Shack.

In a shipboard installation of a Ready Room area, two types of interior communications should be provided for transmitting and receiving the above information. These are the sound-powered telephone system and the interior communications multi-channel units. At a shore installation, two forms of communications must also be provided. These are the base telephone system and the public address system.

CHAPTER III

SPECIFICATION OF FACILITIES

This chapter contains a description of a Ready Room area consisting of a Locker Room, a Ready Room, toilet facilities, and a Maintenance Area. The description of the Ready Room proper contains recommendations for an administrative office and a pantry. It is not intended that the recommendations contained in this description be followed blindly, but that the description be used as a standard against which to evaluate an existing or proposed Ready Room facility. In many cases, the ideal recommendation can be implemented in a less than ideal manner without seriously affecting mission performance. The important thing is that this not be done unless a review of the activity requirements is made. To facilitate such a review, each recommendation is followed by symbols in parentheses. These symbols refer to items in the list of activities and requirements presented in the preceding chapter.

It is intended that the description apply equally to shipbased and shorebased Ready Rooms. One difference, the distance to the flight line, is largely ignored in the following material. It may be pointed out with respect to space allocation that shorebased installations should be as stringently viewed as are those on shipboard, inasmuch as a major portion of the mission of the shorebased installation is associated with training for later sea duty. Such training will be more adequate if performed in an environmental situation that is similar to the later shipboard environment.

Locker Room

The recommended Locker Room is designed to serve as a suit-up and divestment area, as well as a stowage area for pressure suit equipment. Figure 2 is a guidance sketch of the recommended area, the width being 16 feet, the length dependent on the number of lockers to be installed (32 lockers would require a room approximately 58 feet long). Two doorways, points A & B on the guidance sketch, are located at one end of the room for entering and leaving the pre-flight area. Two additional doorways should be located for access to the Ready Room and toilet and shower facilities. Points C & D on the guidance sketch show the most desirable positions for these doors, though points E & F or the end of the room opposite doors A & B would be appropriate. The facilities provided in the Locker Room should be as follows:

1. Locker stalls for stowage of pressure suit equipment, divested garments, and personal equipment. (PS 1, PS 3, SU 1, SU 4, PB 4, PB 5, D 3, PD 3, RM 4)
2. Benches for donning and removing pressure suit and boots. (SU 2, D 2)
3. Mirrors for self-donning. (SU 3)
4. Work tables for use in preparing suits for donning. (PS 6)
5. Stowage shelves for NAV bags and portable cooling units. (PB 6, PB 7)

The following paragraphs provide a description of these facilities.

Each crew member should be provided an open locker stall to accommodate all items of pressure suit equipment and to allow temporary stowage of uniform and valuables during the flight. (PS 1, PS 3, SU 1, SU 4, PB 4, PB 5, D 3, PD 3) Over-all dimensions of the locker stall should be approximately: height, 80 inches; width, 40 inches; depth, 25 inches. The locker is partitioned vertically into two sections as can be seen in Figure 3. It should bear the user's name. (RM 4)

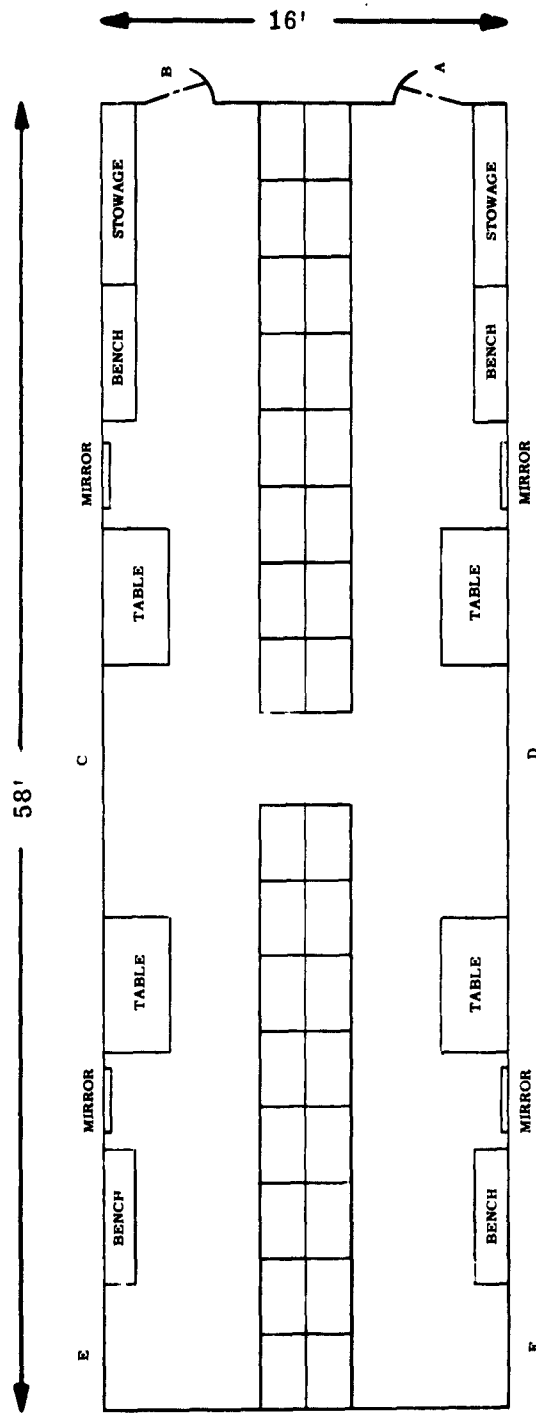


Figure 2. Locker Room - Guidance Sketch

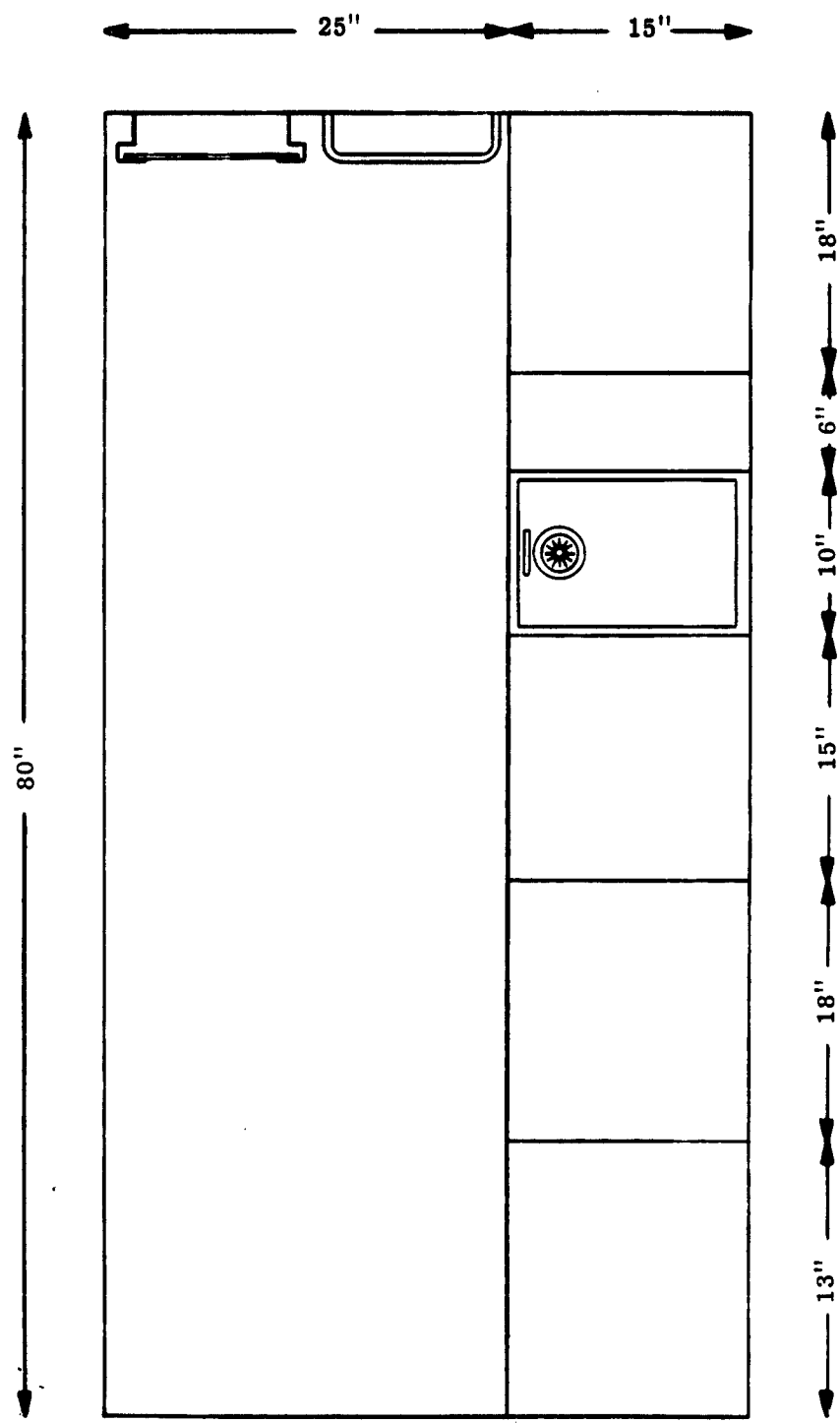


Figure 3. Pressure Suit Locker - Guidance Sketch

The larger section should be approximately 25 inches wide and is designed for hanging the torso of the pressure suit, integrated parachute harness and flotation garment, and uniform/flight suit. (PS 3, PB 4, D 3) The hanger for the torso consists of a plastic or fiberboard plate which can be positioned horizontally several inches from the top of the locker on runners or slides. This plate has a circular opening and access slot to allow suspension of the torso by the neck bearing. It should be noted that plastic or fiberboard is utilized for the hanger plate to preclude wear in the neck area. The remaining space is allocated for the provision of a rod with three conventional captive hangers for the harness/flotation garment and uniform or coveralls. (PS 1, PB 4, PD 3)

The adjacent section of the locker stall contains cubicles for the stowage of smaller items. The height of each cubicle and the equipment to be stowed therein is as follows (from top of locker).

- | | | |
|----|-----------|---|
| 1. | 18 inches | helmet in case (PB 5) |
| 2. | 6 inches | gloves, top block assembly, and anti-blackout fitting plugs. (SU 1, SU 4, PB 5) |
| 3. | 10 inches | safe, with combination lock for personal valuables and weapon. (PS 1, PD 3) A checklist for pressure suit and personal equipment discrepancies should be mounted on the door of the safe. (D 5) |
| 4. | 15 inches | pressure suit underwear, normal underwear and socks. (SU 1) |
| 5. | 18 inches | anti-blackout suit (SU 1) |
| 6. | 13 inches | pressure suit boots and uniform shoes (SU 2, D 3) |

Thirty-two lockers of this type are required to accommodate the flight personnel of an F4H squadron. As illustrated in the guidance sketch, Figure 2, the lockers extend along the centerline of the room and are aligned in two rows, back to back and separated by a mesh partition to allow for air circulation. (PS 1) Such an arrangement provides two dressing areas. A four foot aisle in the center of the

room connects these areas; this is desirable to facilitate passage of flight personnel to the shower and toilet facilities, Ready Room, and back through the Locker Room en route to the flight line. (B 1)

Temporary stowage for soiled underwear and socks should be provided in the form of a hamper. (D 4)

A bench and mirror are provided along the side wall for each row of eight locker stalls. Each bench is 72 inches long by 18 inches wide to allow seating for three persons. The mirrors are full length and three feet wide. (SU 2, SU 3, D 2)

A work table is provided along the side wall for each row of locker stalls. This table is 72 inches long and 36 inches wide to allow adequate area for preparation of the suit for donning and should be equipped with a drawer or built-in cabinet for the stowage of zipper lubricant and anti-fogging materials. (PS 4, PS 5, PS 6)

Shelf space for items such as NAV bags and portable cooling units is located adjacent to doorways, A and B. (PB 6, PB 7) To reduce traffic on leaving the area, the stowage racks at each side of the room should contain space for both NAV bags and cooling units (rather than NAV bags on one side and cooling units on the other). It is assumed the stowage is temporary; i. e., during the period that the Pilot is in the Ready Room area.

To preclude interference among flight personnel during donning and divestment and to allow sufficient room for suited flight personnel to proceed to other areas, a minimum aisle spacing of four feet has been maintained throughout the Locker Room. (B 1)

The Locker Room in a shipboard installation requires loudspeakers for the 1MC, 3MC and 28MC with handsets for the 2JG and X2JG circuits. At a shore installation, the Locker Room should have a base telephone and an intercommunications unit with a P. A. loudspeaker.

Ready Room

The following paragraphs describe a Ready Room designed to meet the requirements listed in Chapter II. This room represents a departure from the concept of a typical Ready Room since its purpose is to provide support only for the business at hand - "briefing and alert". Facilities to support other activities such as collateral administrative duties, temporary stowage, and dressing have been allocated to areas adjacent to the Ready Room. (See Figure 4)

The Ready Room should be situated immediately adjacent to the pressure suit Locker Room. This is recommended to eliminate the need for Pilots either to return to a remote locker area to obtain helmet, flotation garment, and gloves following briefing, or to stow these items in the Ready Room during briefing.

For specific mission briefing prior to flight, seating must be provided in the Ready Room for the maximum anticipated number of flight personnel to be briefed. Fleet personnel contacted during the course of this project are generally in agreement that in an operational F4H squadron, which typically consists of 12 to 14 aircraft and 14 to 16 flight teams (14 to 16 pilots and an equal number of RIO's), no more than six teams, or 12 flight personnel, would be briefing or standing alert at any given time.

It is suggested, then, that 12 seats be provided for suited flight personnel during briefing and Ready Room alert. Four additional seats are recommended to accommodate visiting officers who may be in attendance during the briefing. (B 1, A 1)

Seats should be aligned, facing forward, no more than two abreast with 24 inch front to back spacing between seats. A minimum four foot aisle should be available to each seat location. (B 1)

For optimum comfort and convenience during briefing, seats should be equipped with padded back and arms, cushioned seat, and

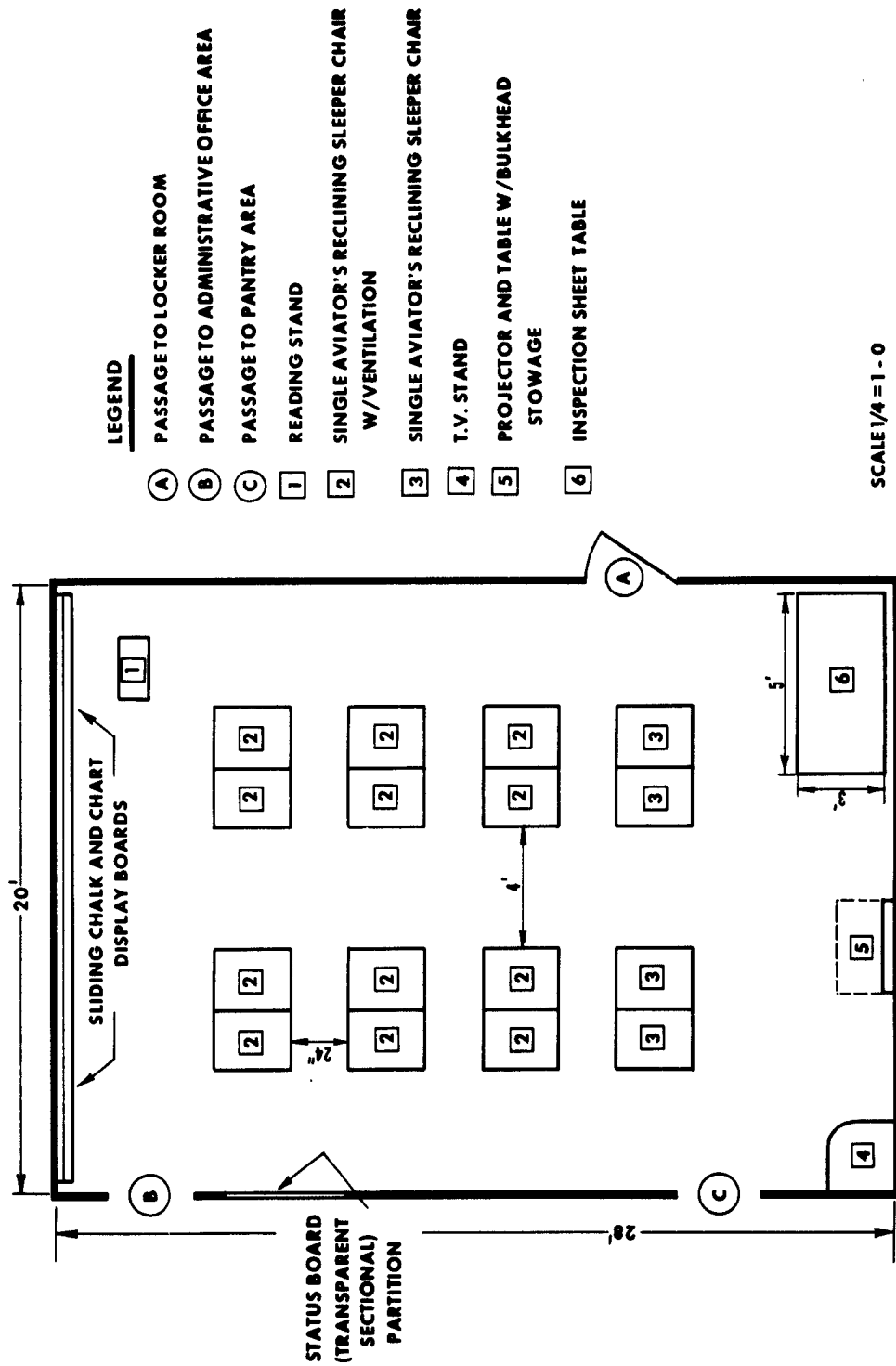


Figure 4. Pressure Suit Ready Room - Guidance Sketch

ash tray. A writing surface should be provided for the recording of briefing information and the preparation of flight materials. The seats for suited personnel should be of the reclining sleeper type. (A 1, B 3, B 4, PD 5)

Provision must be made for supplying cooled, dried air to flight personnel wearing the full pressure suit during briefing and alert. An individual outlet and hose should be provided at the front 12 seat locations to allow the occupants access to ventilating air from a remote conditioned air source. The hose fitting for attachment to the pressure suit must be compatible with the pressure suit port. The outlet and its individual valve should be located such that the hose does not restrict movement of the occupant in the seat nor interfere with the recording of briefing information. A hook or snap fastener should be provided on the seat front to secure the hose when not in use to prevent tripping of personnel and damage to the hose and fitting. (B 2, A 1, PB 1)

An additional conditioned air outlet and ventilating hose of extended length should be provided along the forward bulkhead for use by the briefing officer in the event he may also be suited. (B 6)

Seating within the Ready Room of some facilities visited during the course of this study was found to be grossly inadequate, as is illustrated in Figure 5.

It is recognized that for such purposes as general squadron briefings, safety and training lectures, all flight personnel may be required to be in attendance. For these cases, then, seating is required for the entire complement of squadron flight personnel. It is not a requirement that the pressure suit Ready Room area be utilized for these purposes, and the requirements for comfort and seating are somewhat less stringent. Where personnel must take notes, however, a writing surface is still a desirable feature.



Figure 5. An Area Jury-Rigged as a Pressure Suit Ready Room

It is recommended that facilities other than those of the Ready Room be provided in the squadron area to be utilized for those purposes not related to pressure suit pre-flight briefing and alert. In certain locations, such as aboard carriers, space constraints may dictate the use of a common area for both situations. In such instances, the area must be of a size sufficient to accommodate seats for 32 flight personnel plus four extra seats. It should be noted, however, that only the first twelve of these seats need be of the type described previously for briefing and alert, i. e., reclining and provided with ventilation.

In the front area of the Ready Room should be located equipments and facilities required for the visual presentation of information prior to flight. Individual squadrons may differ with respect to their needs in this area. The provision of briefing aids for a given squadron should be based upon the particular function of the squadron and the associated flight activity requirements. The following provisions, in addition to a reading stand, are recommended to meet typical needs. (B 6)

1. Chalk and chart boards. Two chalk boards should be provided for the presentation of dynamic information. A ledge should be provided below each board for chalk and eraser. Chalk boards should be oriented such as not to interfere with the viewing of information which may be required concurrently from the chart boards. Four chart boards 60 inches wide and approximately 48 inches high should be provided for the hanging of such materials as full length charts. A sliding display board arrangement mounted on the forward bulkhead is suggested for this purpose.

2. Status board. A status board, with runway diagram or outline of flight deck permanently etched thereon should be provided. It is suggested that a transparent sectional partition such as is used in modular CIC be considered for this purpose.

3. Projector Screen. A pull-down projector screen should be mounted from the overhead in front of the chart boards.

4. Projector. A projector and table should be provided at the rear of the room with adjacent storage space for these items if a permanent mounting is not feasible. Window shades or blinds should be provided at shore installations.

5. Television. A closed circuit TV or projected teletype should be provided for weather and updated mission information. It is not necessarily a requirement that this be placed in the same location with other briefing equipment if space becomes a consideration. It is necessary only that flight personnel obtain this information at some time prior to leaving the Ready Room to man their aircraft.

It is a mandatory requirement that pilots sign off aircraft inspection sheets prior to and following each flight. (PB 2, PD 4) The maintenance of these sheets in the Ready Room will expedite the accomplishment of these activities. It is recommended, then, that a table of approximately 36 by 60 inches be provided in the rear of the Ready Room for these purposes. The sheets should be kept in the Ready Room at all times, maintenance being effected through the use of work orders issued from the recommended inspection sheet table.

The Ready Room in a shipboard installation requires a 19MC I. C. unit and loudspeakers for the 1MC, 3MC, and 28MC. Handsets and jack boxes on the 2JG and X2JG circuits are also needed. At a shore installation, the Ready Room should be provided with a P. A. loudspeaker, base telephones, including two hot line telephones and an intercommunications unit. A radio with loudspeaker is also required.

Administrative Office and Pantry

An office area immediately adjacent to the front of the Ready Room should be provided for the Duty Officer and for the use of flight personnel in carrying out collateral administrative duties while standing Ready Room alert. (B 4, B 5, B 7, A 2, S 1, PD 5) It is suggested that passage between the Ready Room and office be open; that is, the provision of a door is not recommended. It should be noted that the Duty Officer's facilities have been allocated to the office area, rather than the Ready Room proper. Interference with briefing activities has been reported at several facilities where the Duty Officer's desk is located in the Ready Room near the briefing area.

The Duty Officer should be provided with:

1. A single pedestal desk 30 by 40 inches (B 7, S 8)
2. A tilting chair with padded back and arms and a cushioned seat
3. A transparent sectional partition to allow visual access to the Ready Room (B 7)
4. At least one chart board, 60 by 48 inches, for displaying such information as may be required in the conduct of his duties (B 4)
5. Two metal file cabinets (B 5, PB 3)
6. A book rack and storage cabinet for Ready Room supplies (B 5)

The administrative office aboard ship requires installation of the 3MC, 19MC, 21MC, and 28MC I. C. units and a 1MC loudspeaker. In addition, 2JG and X2JG handsets shall be provided. At a shore installation, the administrative office shall be provided with base telephones, including two hot line telephones, a P. A. system and an intercommunications unit.

For the administrative needs of flight personnel on Ready Room alert, small group briefings, and for debriefing purposes, it is recommended that the office area also include the following provisions (B 4, A 2, PD 5):

1. A work table, approximately 84 by 40 inches
2. Two tilting chairs with padded back and arms and a cushioned seat
3. Three conditioned air outlets and hoses for pressure suit ventilation

A pantry area immediately adjacent to the Ready Room should be provided for supplying coffee and interim sustenance to flight personnel on Ready Room alert. (A 1, A 3, A 4, A 5) It is recommended that passage between the Ready Room and pantry be of arch rather than door construction.

Facilities to be provided within the pantry area are those required for making coffee and for maintaining prepared food items. Preparation of foods should be accompanied within the normal galley or mess facilities. The facilities required for the provision of interim sustenance will include:

1. A small refrigerator
2. A hot plate
3. A coffee maker
4. A serving table to accommodate hot plate and coffee facilities and with sufficient area for placing cups and plates. The table should also contain a drawer for spoons and other utensils.
A cabinet or rack is required for storage of dishes.

A means is required for obtaining fresh water and for the washing of cups and plates. (A 3) This may be provided in the form of a deep sink in the vicinity of the toilet and shower area if it is located adjacent to the pantry.

The pantry area should contain a scuttle butt. (A 1) This is a requirement not only during Ready Room alert but for the convenience of personnel required to be in the area for any extended period of time.

Toilet and Shower Room

Toilet and shower facilities should be located immediately adjacent to the Locker Room and convenient to the Ready Room. It should be noted that most pilots interviewed during this study expressed a definite preference to shower immediately following a pressure suit flight. Primarily because of the remote location of the shower area relative to the dressing area at some facilities, pilots at some facilities typically do not shower following flight. (PS 2, A 1, PD 1, PD 2)

The following provisions for relief and personal cleanliness should be included in the toilet and shower room:

1. Two water closets
2. Two urinals
3. Three wash basins with mirrors
4. If paper towel dispensers are provided, a disposal facility will be necessary.
5. A shower room with facilities for accommodating at least three persons. In addition to the obvious hot and cold water plumbing fixtures, each shower location should have a safety hand rail mounted on the bulkhead 45 to 50 inches off the deck, and a convenient soap dish. At some facilities visited, such items as soap dishes have, in fact, not been provided. In designing an optimum pre-flight system, the provision of such "standard" equipment is not to be overlooked.
6. Some form of dressing rack convenient to the shower. This should consist of shelves for a supply of clean towels, and shelves and/or hooks for stowing underwear or other personal clothing. It is with respect to these provisions, also, that many facilities are found to be deficient, thus contributing to the situation wherein pilots do not shower following flight.
7. A bench 18 by 72 inches

A supply of soap and clean towels should be available in the toilet and shower room as well as a hamper for used towels. This will eliminate the situation wherein flight personnel must stow wet towels and soap in personal lockers and rely upon personal living quarters or other outside facilities to provide for such needs. (PD 2) It should be noted that the clothes washer and dryer provided in the maintenance area (discussed in a later section) could be utilized for laundering of the towels.

In addition to the above facilities, the toilet and shower room should be of sufficient size to accommodate a locker, for stowing towels, soap, toilet paper, swabs, and other cleaning materials, and the area should be provided with a deep sink. (A 3)

In a shipboard installation, the 1MC, 3MC, 19MC, and 28MC loudspeakers must be audible in this area. If this is not possible, additional loudspeakers must be provided. At a shore installation, the P. A. loudspeaker must be audible in this area.

Maintenance Area

The pressure suit Maintenance Room should be located convenient to the pressure suit Locker Room such that transit time between the areas is minimized. In addition, the physical layout of the connecting passage area must be such as to allow for efficient transit by parachute riggers carrying items of pressure suit equipment. Thus, any passageways should be four feet wide and a minimum number of doorways should be encountered. If the individual carrying the equipment must be passed by someone, wider passages are required. Figure 6 illustrates a situation wherein the location of the maintenance room, approximately 200 feet from the dressing area, requires the parachute rigger to carry the suit through two Zebra doors and four hatch coamings prior to and following flight. This can cause inadvertent snagging of or violence to the suit, such being highly undesirable in the region of the neck bearing.

The squadron pressure suit Maintenance Room should be equipped to accomplish:

1. Maintenance of the suit and related garments which is required as a matter of routine following each flight
2. Squadron level periodic tests of pressure suit equipment
3. Repairs and replacements which are authorized for accomplishment at the squadron level

For non-squadron level tests and repairs, facilities must be available to the squadron within the shore establishment or aboard ship. These facilities should be located within a centralized area for use by all pressure suit squadrons. A brief discussion of such an area is included at the end of this section.

The following paragraphs identify those facilities and equipments which should be provided within the squadron maintenance area.



Figure 6. Shipboard Passage to Locker Room

Six drying lockers should be provided. (RM 1) Each locker should have the capacity for drying two complete pressure suit ensembles consisting of torso, helmet, anti-blackout suit, and flotation garment. A hanging rod with six standard heavy duty hangers should be provided for the garments. A perforated shelf, located above the hanging rod should be provided for the two helmets. Warm, low pressure filtered air should be supplied to the torso by means of a vent air hose connected to the ventilating port. Vent air temperature should not exceed 120° F. For drying the helmets and exterior of the garments, warm ventilating air should be supplied to the locker space. An exhaust fan and ducting should be provided in the top of the locker for venting the exhaust air outside of the maintenance room. Many existing installations provide inadequate drying facilities for the exterior of the pressure suit as is illustrated in Figure 7.

Ventilating air for the lockers should be thermostatically controlled particularly to provide for cut off of the heater when the air to the locker reaches 120° F.

In the event space constraints dictate that less than six double drying lockers be provided, a hanging rod with shelf above should be provided for temporary stowage of pressure suit garments and helmets. Thus, if only three double drying lockers are provided, temporary stowage for up to six ensembles will be required. It should be noted that the provision of temporary stowage for at least four ensembles is suggested in any event for use during corrective maintenance activities. (CM 1)

An automatic clothes washer and associated hot and cold water plumbing fixtures should be provided for the pressure suit underwear and socks. (RM 2) A standard commercial washer with a nine pound capacity is recommended. A small shelf or similar provision should be located near the washer for stowing a supply of soap or detergent.



Figure 7. Pressure Suit Drying - Existing Facility

An automatic tumble dryer should be located adjacent to the washer. (RM 2) This should provide ventilating air to expedite the drying process. Heat, however, should not be utilized. Shelf space or bins should be located convenient to the dryer for temporary stowage of 12 sets of laundered items.

A sink, with hot and cold water plumbing, and an associated drain top should be provided in the laundry area for occasional hand washing of the pressure suit, helmet, gloves, flotation garment, and anti-blackout suit. (RM 3) A cabinet should be situated on the bulkhead above the sink for maintaining a supply of soap, cloths, chamois, recommended cleaning solvent, and neat's-foot oil.

One area of the room should be allocated to accomplishing periodic tests on the squadron pressure suits. A basic item within this area, and one which is often neglected in current facilities, should be a table upon which to lay out the complete suit assembly. A table approximately 3-1/2 feet wide, 7 feet long, and 3 feet high, should be adequate for this purpose. Provision should be made for secure mounting of the headpiece test jig on the table. (PT 1)

The Firewel Test Set, Suit, Full Pressure, MK1 should be provided at the testing table for accomplishing leakage and strength tests and the relief valve test. Aviator's breathing oxygen, clean, dry, compressed air and the necessary shutoff valves, pressure gauges, and regulators, should be available at the test area for use with the test set. It is recommended that stowage of the oxygen supply be external to the maintenance room to facilitate handling and for obvious safety reasons. (PT 1)

A metal stowage cabinet should be located convenient to the test area and to the maintenance work table to be discussed below. It should be of sufficient size to stow all tools and expendable supplies required to maintain, repair, and test the full pressure suit. An adjustable shelf arrangement is recommended such that the internal configuration of the cabinet can be tailored to the needs of user personnel. Double doors are suggested which should be capable of

being locked. With respect to the testing of the pressure suit, the cabinet should have shelf space provided for stowing the neck bearing test plate, headpiece test jig, glove disconnect plugs, glove test plate, safety valve cap assembly, and suit port plugs. (PT 1, CM 1, CM 2)

A second metal stowage cabinet similar to the one mentioned above should be provided for maintaining a supply of replacement parts and spare items of equipment. This cabinet, too, should be lockable. (CM 2, CM 3)

A work table 3 by 14 feet and at least two stools should be provided in the center of the room for accomplishing corrective maintenance and parts replacement. A tool box with partitioned drawers should be secured to the table so as not to interfere with the working surface. (CM 1, CM 2, CM 3, PT 3)

A means of stowing whatever refrigerant is necessary for portable conditioned air units should be provided in or close to the maintenance area. (PB 6, PC 7, RM 5)

One area of the room should be allocated to the accomplishment of administrative activities. A standard single pedestal metal desk should be provided for "paper work" and the stowing of small administrative supplies. The desk should have an associated swivel chair with padded back, arms, and a cushioned seat. Two metal file cabinets should be located convenient to the desk for the stowage of maintenance records and documents. A Cardex type steel cabinet with approximately 20 drawers should be appropriate for the maintenance records. (MA 1, MA 4)

Two status boards should be located on the bulkhead convenient to the maintenance desk. One board should be utilized for presenting status information on all items of pressure suit equipment. This should include all information required for efficient scheduling of periodic tests and corrective maintenance. The second board should be utilized for scheduling the periodic and immediate activities of parachute rigger personnel. (MA 2, MA 3)

BIBLIOGRAPHY

Bureau of Naval Weapons. BuWeps Aviation Clothing and Survival Equipment Bulletin No. 23-61: Subj: Light Weight Full Pressure Suit, MK-IV, Type II B, Operation and Maintenance Information and Instructions. 25 July 1961.

Chief, Bureau of Aeronautics. Operation and Maintenance Instructions, Light Weight, High Altitude Full Pressure Suit, Mark IV, Mod 0. NAVAER 13-10-501. 1 October 1959.

U. S. Naval Air Material Center. Determination of Aircraft Carrier Ready Room Requirements; Evaluation of existing facilities; Recommendations for improvements as necessary. NAEF (SI) Report No. 6455. 10 April 1959.

U. S. Naval Air Material Center. Study to Assess the Effectiveness and Utilization of Full Pressure Suits. NAMC-ACEL-373. 5 May 1958.