10 AUG 1972

MINUTES OF LIFE SUPPORT CONFERENCE

1 - 2 August 1972

Washington, D.C.

Attendees:

25X1

[redacted]

1. Introduction and Opening Remarks:

25X1 [redacted] opened the meeting with a brief resume of the planned activities for the Conference and then turned the meeting over to [redacted] who presented the current posture of the Special Projects. Since this was a classified presentation, the contents will not be recorded in these minutes. 25X1

2. Houston Suit Briefing Report

25X1 [redacted] presented the Houston trip review indicating that the theme of the meeting was to cross-fertilize the state of the art with respect to Special Project and Air Force full-pressure suits (S1010 PPA, 901J, and -6FPS) with those of NASA. This interface hopefully would include hardware, vendors, and systems. The NASA crew systems branch had twenty-five (25) people in attendance. Of major interest to NASA were the maintenance problems of pressure suits at both field and depot levels. NASA personnel also expressed concern over their B-57 program and this concern
25X1 was also re-inforced by [redacted] of the Tyndall depot who recently visited the NASA facility. Apparently one of the weak links in this chain is the pilot launch phase probably from lack of experience, however, NASA does recognize the problem and is approaching it aggressively. Participating in these discussions in addition to [redacted] 25X1 who gave the S1010 PPA review were [redacted] 25X1 who gave the 901J - SR-71 FPS activity, [redacted] 25X1 who gave a historical review of pressure suits with particular emphasis on the GEMINI suit, and [redacted] who 25X1 presented the Air Force -6 FPS. [redacted] commanded the 25X1 greatest interest during the discussions primarily because of the utilization of the -6 suit in the B-57.

3. APOLLO Medical Problems

25X1 [redacted] reviewed the NASA Manned Space Flight Medical problems with 9000 hours of Space flight experience for a source of information and data. Physiological disturbances were reviewed with a particular emphasis on vestibular sickness in the APOLLO Program. The problem has been unique in APOLLO probably as a result of nitrogen gas residuals in the vehicle coupled with movement inside the spacecraft. In both MERCURY and GEMINI astronauts did not have the privilege of internal spacecraft mobility. In the APOLLO vehicle there is a nitrogen bleed off once the vehicle goes into orbit. This nitrogen-oxygen mixture is an approach to fire protection while on the launch pad. As a result of this, the removal of N_2 to a 5 psi pressure is never complete. Another physiological disturbance of more concern to the Soviets than to the U.S. space effort is that of cardiovascular deconditioning. There was noticeable vasomotor

insufficiency following APOLLO with a definite decreased work capacity, blood chemistry changes, and cardiac rhythm changes primarily recurring paroxsysmal tachycardia and extra systole. Almost all of the above changes were repetitive problems and will be studied at great length
25X1 in the early [redacted] missions.

25X1 [redacted] at this point directed the group's attention to the international space machine and the possibility of a dual space mission in 1975. Language interface does not seem to be a major problem in that the Soviets handle English acceptably. The Space cabin atmosphere will require a solution, however, in that the Soviets carry 14.7 psi (sea-level pressure) and the U.S. pressurizes to 5 psi. There is some speculation that 8.43 psi will be selected as the compromise.

The Soviets have also surpassed the U.S. in a very nicely graphed space effort whereas the U.S. has a four-year interim between the completion of the Skylab mission and the beginning of the Space Shuttle. The General then briefly reviewed the most recent Russian fatalities and confirmed the cause of the accident as a sudden decompression.

25X1 [redacted] did interject at this point that the David Clark Company had been asked to fabricate a lower body pressure garment to assist in reversing the cardiac deconditioning episode. This suit may be prepared for the next APOLLO mission. The garment will be called appropriately a hypotensive-protective assembly. It will also be used in the medical investigation on the Skylab Missions.

4. Helmet Improvement Report

(Final Report is Attachment #1 of these minutes)

25X1 [redacted] reviewed the final report on the omni-environmental Protective Assembly Phase I - Helmet development. A follow-on effort as a result of this study will be the addition of a bailer bar without impairing vision, a communication cord improvement, mechanically installed face barriers, ear-cup improvement, and improved feeding port.

A mid-September 1972 delivery is anticipated for the next prototype helmet and that will be followed in approximately four (4) months by two (2) flyable helmets.

5. Modified Automated Seat-Kit Development

25X1 [redacted] gave an excellent review on the latest
25X1 update of the [redacted] effort in automatic opening seat kits. The most recent buy on new survival seat kits is in support of the SR-71. This kit will eliminate the bolted-in oxygen system and introduce drop-in oxygen bottles. This compartmentalization in the kit will be a decided improvement. Currently there is no effort to adapt the automatic deployment feature, however, if the terrain surveillance radar system proves itself in tests, it can be adapted to
25X1 this new kit. [redacted] reviewed the state of the art in automatic-deployment devices including some excellent charts on lanyard-activated kits with the standard four (4) second delay. Both this system and the new radar-sensing device will be equipped with a manual override. At the present time the radar-sensing device is in its early stages of development but if tested successfully, should prove to be a major breakthrough in seat-kit engineering. This device can be retro-fitted to existing seat kits without weight or space penalties.

6. S1010/901 J Flotation Studies

25X1 [redacted] presented 16 mm motion pictures and 35 mm slide projections on both flotation evalua-
25X1 tions. [redacted] accomplished his flotation study on the West Coast at Pt. Mugu, California. [redacted] accom- 25X1
plished the S1010 evaluation on the East Coast in the Chesapeake Bay. The 901J flotation has already been accepted by the SPO as confirmed by [redacted] The S1010 25X1
evaluation will include at least a thirty (30) day flight test prior to acceptance and retro-fit.

7. AFFTC Life Support Center Activities

25X1 [redacted] presented 35 mm slide projections on the Edwards AFB Life Support Activities with special emphasis on the

pressure-suit art. He reviewed the mission at Edwards and gave an interesting resume of the X-15 Program and the Aerospace Research Test-Pilot School including the history of that school especially with respect to the NF-104 "Zoom" flight profiles. 25X1 [redacted] reviewed the one episode of pressure-suit failure (glove loss) and pointed out the changes in the "Zoom" profile over the past few years. The Edwards' facility currently supports or has supported in addition to the Research Test Pilot's School such programs as the B-70,Dyna-Soar, "Lifting Body", F-12, F-111, SR-71, F-15, Super-Critical Wing, and B-1 which are all involved in a pressure-suit environment of some sort. The pressure-suit section supports some 400 flights each year in addition to 40-50 suit fittings. With regard to new development efforts, 25X1 [redacted] discussed a new suit concept, the CSU-4/P Partial Pressure Suit, with a new rear zipper installation to be used with or without gloves providing breathing characteristics of the full-pressure suit. Also they are evaluating a NASA light-weight full-pressure suit with high mobility made by Space Age Control, Inc., Palmdale, California.

8. SAC Management Report

25X1 [redacted] presented the HQ SAC position on Life-Support Equipment. Among the major advances he has accomplished was selection and control at field level of survival items to be packed in the SAC Survival Seat Kits. The subject of flash blindness was explored, however, classification precludes it being discussed in these minutes.

9. 901J Operational Experience

25X1 [redacted] reviewed the SR-71, 901J Full Pressure Suit experiences and problems since January 1972. Among the major advances he presented were the completion of the five-year over-haul of all 901J Suit soft goods. He re-emphasized the control of leak in the assembly and the isolation of possible leaks. 25X1 [redacted] discussed a new flotation bladder much improved over the standard bladder cloth. As a result of the flotation study, he became acutely aware of a need for a ring requirement

somewhere on the pressure suit to assist in helicopter rescue. Another subject of particular interest was a water-activated system for kit sequencing to provide automatic opening of the survival kit in the water. Glove bladders appear to be of major concern in the suit assembly in both 901J and S1010 pressure suits. [redacted] 25X1 mentioned a development effort in the David Clark Company for providing heated gloves to the AF -6 FPS. Information on this subject should be available from the AF Life Support S.P.O. 25X1 [redacted] is aggressively involved with NASA on improved Survival Seat-Kit food. Hopefully, some samples will be available shortly for testing in the packing of the kit as well as in pilot acceptability. Finally, a Life Support Council has been established at Beale AFB through the efforts of 25X1 [redacted] reviewed the minutes of one of their council meetings. This approach more than any to date should be an effective method of resolving Life Support problems and soliciting pilot comments.

10. S1010 Operational Experience

25X1 [redacted] reviewed the U-2 S1010 experiences and problems since January 1972. Primary in his efforts has been a massive standardization and reorganization within his Life Support shop with the addition of check lists, training aids, and mockups for instructional purposes. [redacted] 25X1 reviewed the vent-hose situation and, although admittedly it is less than an ideal device, he feels it will now function properly if hooked up correctly. An interesting problem unresolved at this time is the lack of sufficient instrumentation for calibration of calibraters.

25X1 [redacted] presented the current S1010 in-flight feeding problem and brought with him some possible alternatives to the existing three (3) types of tube food presently provided. The urine collecting device is still causing some physiological difficulties and possibly a larger reservoir is in order. Also inadvertent disconnects have occurred recently.

A discussion was held on PE technician training and the only complete training program appears to be that offered at the factory. Very few training aids are available even to the extent of not having a survival training seat kit. The Survival rifle has been removed from both the S1010 kits as well as the S-901J's. This follows the earlier philosophy expressed in the minutes of removing the control of survival seat contents from HQ SAC and placing it with local commanders. [redacted] also mentioned the low-flight O_2 hose routing and he has solved this problem locally by tucking the excess hose underneath the shoulder harness. 25X1

11. Agenda Items

a. Suit Data Bank Status

25X1 [redacted] presented the data bank status report; and, although he feels the project is a worthy one, there is not enough manpower to evaluate and document the data at this time. It was finally resolved that this item would be left open and that a meeting would be called 25X1 by [redacted] with representatives from each facility present to make one last attempt to resolve this problem.

b. Combat Boots (Jungle Boots)

SAC crews currently are wearing the white pressure-suit boot and dyeing it black. Some effort has been expended in trying to rate the jungle boot, however, it still offers little in protection from the cold and is a threat if ejection occurs in the fireball. The Standard-issue insulated black boot will most likely be used in the future.

c. Tree-Lowering Device

A discussion was held on the possible difficulty that could be encountered if a crewmember inadvertently released his seat kit and then made a tree landing with his tree let-down device hanging three to six feet below him. A possible fish-hook arrangement could be disastrous if the pilot was unable to reach it. This item will be investigated and held open for further discussion.

d. S1010 PPA Pressure Sealing Closure

25X1 [redacted] still has not arrived at a final estimate as to what price tag will accompany the study on completion of the new pressure sealing closure zipper. It would appear though that it will be a little too expensive for consideration during this fiscal year. Item is still open.

e. Poly-Carbonate Visor

David Clark Company is still investigating the possibility of using a new visor for improved performance. "Optical Coating Labs" have done some work for NASA, however, conductive coating is still some distance away. Light transmission vs. reflectance are the stumbling blocks. Optical coating Labs have produced samples of 1 1/2 % to 2 1/2 % reflection and improved transmission approximately 15%. This item is still unresolved and should remain open.

f. Ground Training

25X1 [redacted] has finalized water survival training in the pressure suit including parasail training at Homestead AFB, Florida. Funding problems have been resolved and the problems of scheduling of aircrews are being addressed now. The Homestead syllabus is acceptable to SAC. This should be a closed item.

g. Leak-Rate S1010 PPA, 901J

All leak-rate criteria have been resolved for both of the above systems and this item should be closed.

h. S1010 PPA Glove Cooling

David Clark Company is still in the fabrication stage of a new pressure suit glove that meets all the criteria for flight (good dexterity, mobility, cooling, and warmth). This item remains open

i. Survival Equipment

(1) Survival Gun - A new minature survival weapon is being evaluated for possible inclusion in the seat kit to replace the 22 cal high-standard weapon.

(2) RQ-225 Parachute Numbering - A dash number has been added to the pilot's handbook on the RQ-225 parachute to identify those chutes possessing the 6-line release modification.

(3) Rucksacks - A change to the manual has been accomplished on the testing of rucksacks to bring it more in line with acceptable quality control and to eliminate the previous too stringent test requirements.

j. In-flight Food

Discussions on in-flight food were heard throughout the two-day conference with respect to, not only palatable food, but also on safety of opening the visor in flight for eating. This, obviously, will remain an open item and probably for some time unfortunately.

12. SAC - SR-71 - Specific Items

a. URC-64 Radio

25X1 [redacted] has secured this radio for inclusion in the survival seat kits at his operating location.

b. OD Underwear

This type of underwear is being used at the operating location for E and E application.

c. Brown Outer Garment for 901J Suit

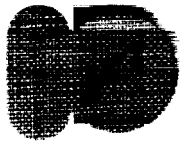
The brown outer garment now replaces the black for anti-reflectance assistance in the SR-71 and is utilized as a pilot option.

13. Pressure Suit Storage

The David Clark Company has made an evaluation on some different methods of pressure-suit storage and have concluded in general that cleanliness of the garment before storage is a more important factor than the storage facility temperature and humidity.

14. Next Meeting

The next Life-Support Conference is scheduled for 5 and 6 December 1972 at Davis Monthan AFB, Tuscon, Arizona.



Final Report

Contract DC-1714

Design Study

of

Omni-environmental Protective Assembly

Phase I - Helmet Development

19 July 1972

I. INTRODUCTION AND SUMMARY

This design study was initiated for the purpose of analyzing and determining what improvements could be made to the S-1010 Pilot's Protective Assembly which was originally developed under Contract DC-1700.

The Contractor submitted a proposal under letter JEF-328-2435, 10 August 1971, covering a Design Study, Omni-environmental Protective Assembly. This was a two-phase proposal consisting of Phase I, Helmet, and Phase II, Coverall and Gloves.

Contract DC-1714 was awarded, effective 15 September 1971, for Phase I, Helmet.

Inputs from the operating locations; including Headquarters units, SAC units at Davis-Monthan AFB, and Beale AFB, and the ADC operated pressure suit depot at Tyndall AFB, were used as the basis for design criteria for the prototype helmet to be developed under the provisions of the contract.

Major emphasis in design was placed in the following areas:

A. Improved Field of Vision

B. Improved Head Mobility

C. Improved Comfort

D. Improved Operating Functions

E. Improved Coverall Interface

F. Improved Maintainability

The evaluation of the prototype helmet (see attached photographs), conducted by the contractor, the headquarters project engineer, field-servicing

I. INTRODUCTION AND SUMMARY (continued)

technicians and twenty-one pilot subjects indicates that the major goals of the design study were achieved, but that several areas should be further improved before the design is adopted as a new standard. These areas include:

1. Better helmet holddown during the pressurized mode.
2. Bailer-bar type visor operation without compromise of the loss of downward visibility gained in the prototype.
3. An acceptable feeding port.
4. Improved electrical leads design at helmet shell interface and relocation to left side of manifold plate.

These design changes should be included in any follow-on helmets, but in conjunction with a program which will include coverall design changes to provide the necessary interface with the helmet and the airframe in order to achieve a flight configuration.

II. DISCUSSION

The study objective was to develop a design for an improved helmet for use in an omni-environmental protective assembly, and to fabricate a prototype helmet suitable for evaluation in a low pressure chamber.

The helmet for the Pilots Protective Assembly S-1010 was used as the basis for the design study. From this base, design effort was concentrated on the specific areas outlined in proposal JEF-328-2435, Para. 4.1. Some additional changes have also been made to increase the capabilities of the helmet.

II. DISCUSSION (continued)

Following is a summary of the changes incorporated in the design study and prototype unit.

A. Visibility

Increased visibility in the vertical plane has been obtained by the following steps:

1. The shell has been re-designed to allow better location of the subject's head in relation to the visor opening.

2. The vertical chordal distance or length of the visor has been increased. This allows a greater angle of visibility by making the helmet shell opening the limiting factor for visibility rather than the transparent area of the visor.

3. The breathing regulator has been removed from the suit and installed in the back section of the helmet.

4. The visor actuating lever has been changed from a bar across the helmet between the visor pivot points to a knob located on the left pivot point only. This puts the actuating lever completely out of the visible area.

B. Head Mobility

Better head mobility has been realized by:

1. Re-designing the helmet ring bearing. The new design uses larger diameter balls in a true thrust bearing configuration to give less frictional resistance to rotation.

II. DISCUSSION (continued)

B. Head Mobility (continued)

2. The helmet ring bearing is held in position in relation to the suit by using a cord woven from the bearing to loops located at the helmet disconnect.

This cord extends around the full circumference of the bearing and helmet disconnect. This suspension allows easier mobility in the vertical plane as well as a more even support of the bearing to reduce deformation of the bearing races, thereby reducing friction and binding problems of bearing rotation.

C. Helmet Comfort and Ventilation

Helmet comfort and ventilation have been increased by using a new concept in helmet liners. Instead of a relatively thick molded foam pad with a cover of tightly woven nylon, the new liner uses three materials stitched together to form a lightweight sandwich construction. This design also allows the liner to adjust to all head sizes, thus eliminating sizing problems associated with the molded liner.

The interior material of this sandwich construction is an open weave red nylon tricot backed by 5/16" thick polyurethane foam. The material in the middle is a 3/16" thick white polyethylene foam which has good shock absorbing qualities.

C. Helmet Comfort and Ventilation (continued)

The external material -- which is also used on the inside of the earcups -- is black "Curon". This material is actually a fine Velcro pile with a light foam backing.

Between the center head section and the earcup sections are two narrow panels. These panels have large openings in the polyurethane foam and have inner and outer covers of open mesh to enhance ventilation of the liner. They also allow the earcup sections to move in relation to the center head section to accommodate various head sizes. Leather earseals are used and are backed with fine Velcro hook. Thus the earseals can be adjusted simply by pressing them in the desired position on the "Curon" lining in the inside of the earcups.

D. Emergency Visor Defogging

The prototype helmet being fabricated will be supplied with a defogging system using the spray bar which directs the oxygen over the visor. This method of providing emergency fogging has its precedence in other systems, including the S901J PPA and the standard USAF A/P22S-6 Flying Outfit. It was not a compatible system for the S-1010 PPA because of the low pressure at which oxygen was introduced into the oral nasal cavity.

II. DISCUSSION (continued)

E. Hypoxia Indicator

The possibility of including an hypoxia indicator in this helmet has been considered. It is one reason why a 19-pin connector was chosen for the communications/electrical cord penetration. The sensor and its receptacle (approximately 1/2" diameter x 1-1/4" long) would most likely be mounted on the face barrier in a position determined by testing to give the most reliable results. The electrical connections would be routed through the face barrier to the connector in a manner similar to that used for the microphone wires. (See Bechman ATO-1001-B). Delivery of an hypoxia indicator in the prototype helmet was not a requirement under the contract.

F. Visor Anti-Reflectance Coating

Investigations have shown that a process is available by which an anti-reflectance coating can be applied to a plastic visor. However, application of this coating cannot be considered until an alternate method of heating visors, such as imbedding heating wires in a laminated visor, has been perfected, since the anti-reflectance coating and gold coating cannot both be applied.

G. Helmet Locking

The visor actuating lever has been changed to a knob located at the left pivot point of the visor. This knob allows easy

II. DISCUSSION (continued

G. Helmet Locking (continued)

one-hand operation of the visor. A new lip-type seal mounted on the visor makes this new latching method possible. The seal utilizes internal helmet pressure to increase seal effectiveness between the visor and helmet shell. Therefore, the initial sealing force does not have to be as high as that required by present static seals so that a knob, rather than the current high leverage actuating bar is sufficient.

A latch to lock the visor in the open position is also included as an integral part of the new actuating mechanism.

H. Face Barrier and Face Seal

The face barrier and face seal remain relatively unchanged at present. The only change has been in the material used on the periphery of the barrier. This material should result in better cementing and easier removal of the face seal.

Related to this, however, are changes made in the take-up mechanism to provide a smoother and easier operating adjustment of the face seal.

A tentative design for a new type face barrier has been conceived, but not included in the prototype. This design would allow the face barrier to be easily pressed into position or pulled out for replacement. No cementing would be required.

II. DISCUSSION (continued)

I. Helmet Disconnect

The helmet disconnect has been completely redesigned. Instead of a complicated latching mechanism built into cumbersome hardware, a simple light-weight connection utilizing nearly all software instead of hardware has been designed. A solid ring is stitched into the neck opening of the suit. The helmet has a sealing surface stitched at the bottom of the pressure retaining bladder. The covering over this sealing surface has a steel cable stitched into it at the top and also at the bottom. These steel cables have a circumference somewhat less than the circumference of the steel ring in the suit. The bottom cable is split so that it can be slipped over the ring in the suit and then locked in place with a latching mechanism. This latch axially locks the suit ring and bottom cable to connect the helmet to the suit and at the same time wraps the sealing surface on the helmet around the fabric surrounding the suit ring to give an effective gas tight seal.

This simplified construction also increases the effective inside diameter of the helmet by approximately 5/16" for easier donning and doffing.

J. Feeding Port

Changes in the helmet to increase visibility, comfort, and mobility have made normal placement of the feeding port

II. DISCUSSION (continued)

J. Feeding Port (continued)

impractical. A feeding port was designed and located to the right side of the helmet. A curved stainless steel feeding tube with a covering of Teflon was used for ease of entry through the sealing door and comfort in the subject's mouth.

This system proved, from the outset, to be difficult to operate and an alternate method was proposed, but not fully engineered for the prototype helmet.

K. Communication/Electrical Cord Penetrations and Routings

A standard 19-pin microdot hermetically-sealed communications/electrical entrance fitting has been incorporated in the design. It was located at the right rear of the helmet allowing entrance and routing of all required wiring at one easily accessible location. The 19-pin configuration has been chosen so that several spare entrance connections will be available to accommodate any future wiring needs.

L. Microphone Mounting

The basic microphone mount will be attached to the helmet face barrier inside the helmet as currently used on the helmet of Pilots Protective Assembly S-1010. The microphone itself, however, will be attached by means of a newly designed

II. DISCUSSION (continued)

L. Microphone Mounting (continued)

ball-swivel mounting. This mounting allows easy adjustment of the microphone through a full 360° revolution in the horizontal plane and a 15° motion up or down in a vertical plane. It also allows forward or backward tilt of 15°. All of these adjustments can be made with light finger pressure only, thus making microphone adjustment easier and more exact.

M. Additional Design Features

1. The breathing regulator has been moved to a position in the rear of the helmet. As part of the design for this change, a manifold has been made which allows the breathing regulator to be replaced in a few minutes time without even the necessity of having the subject remove the helmet. This is done by mounting the regulator on a manifold which interfaces with the internal oxygen and sensing lines by using O-rings to seal the interface. By means of only two screws, this entire manifold and regulator unit can be removed and a new one inserted.

2. The sunshade is held in place by a friction lock of improved design. This lock is a clamping ring which rotates around the sunshade pivot and to which the sunshade is attached. By simply using the adjusting screws located in the clamping ring, the desired friction force for proper sunshade tension can be obtained.

III. PROTOTYPE EVALUATION

Evaluation of the prototype was conducted at three operating locations including the Headquarters unit, Davis-Monthan AFB, and Beale AFB.

Results of the evaluation by twenty-one pilots using the Subjective Evaluation Sheet (Attachment 1.) to record results, indicated the following:

A.	Field of Vision		
1.	Unpressurized,	Improved	19
		Same	1
		No Comment	1
2.	Pressurized,	Improved	15
		Same	3
		Worse	2
		No Comment	1
B.	Head Mobility, Horizontal		
1.	Unpressurized,	Improved	18
		Same	3
2.	Pressurized,	Improved	14
		Same	5
		Worse	2
C.	Head Mobility, Vertical		
1.	Unpressurized,	Improved	3
		Same	7
		Worse	11

III. PROTOTYPE EVALUATION (continued)

C. Head Mobility, Vertical (continued)

2.	Pressurized,	Improved	3
		Same	7
		Worse	11

D. Comfort (all elements combined)*

1.	Unpressurized,	Improved	59
		Same	57
		Worse	8
		No Comment	2

*Includes ventilation, helmet holddown, weight distribution, suspension system, spray bar pattern.

E. Operating Components (all elements combined)**

1.	Unpressurized,	Improved	14
		Same	22
		Worse	46
		No Comment	2

** Includes visor opening, closing and locking, sunshade operation, feeding port function, and coverall/helmet disconnect function.

III. PROTOTYPE EVALUATION (continued)

F. Coverall Interface (all elements combined)***

1. Unpressurized,	Improved	23
	Same	36
	Worse	3
	No Comment	1

*** Includes O_2 Hose Routing, Electrical Leads, and Manifold Location.

In the major areas of concern for normal operation, i.e., Field of Vision, Head Mobility, and Comfort Unpressurized the acceptance comments were: 74, Improved; 39, Same, and 2, Worse. In the pressurized mode, it was evident that the interface of the helmet with the coverall and helmet holddown assembly was the major contributing factor in evaluation results which showed a Worse condition in eleven, Same in seven, and only three Improved out of twenty-one subjects.

One other area which proved to be of major concern in the evaluation was the Visor Opening, Closing and Locking Mechanism. Inputs from the operating units gave no indication of the degree of reliance upon the use of visor-operating bailer bar of the current S-1010 Helmet for assistance in turning and nodding the head. The lack of the bailer bar on the prototype helmet prompted sixteen out of twenty-one subjects to indicate preference for the bailer bar mode for closing the visor and commenting that they felt they would lose

III. PROTOTYPE EVALUATION (continued)

some mobility and field of vision without the bailer bar to use as an assist in turning and nodding.

The microphone mount described under Section L. was judged to be more complex and critical to adjust than was practically necessary. It was replaced with the current S-1010 type of mount prior to subjective evaluation by the pilot subjects with the approval of the project engineer.

Considering the fact that the helmet was adapted to one coverall size and was fitted with one helmet liner size only, it should be recognized that an optimum fit was not attainable in many cases and that some decisions as to whether the subject found the conditions the same or worse could have been influenced by less than optimum fit.

IV. CONCLUSIONS

1. The Contractor concludes that the prototype helmet demonstrated a definite improvement in the important areas of Field of Vision, Mobility, Donning and Doffing, Weight Reduction, and Comfort.

2. Problem areas not fully resolved include:

   A. Feeding Port Location

   B. Electrical/Communications Connector Engagement (External)

   C. Downward Vision and Mobility while Pressurized

   D. Earphone Adjustment in Helmet Liner

IV. CONCLUSIONS (continued)

3. The problem areas cited in Paragraph 2 can be resolved with additional effort.

V. RECOMMENDATION

1. The Contractor recommends that a program be established which will provide helmets for flight evaluation.

2. The availability of modified S-1010 PPA's should be considered in the program.