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OSA-1083-69

Distribution for
AMA/OSA 28 JUL 1969

DATE

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MEMORANDUM FOR THE RECORD

SUBJECT: Trip Report, 22-24 July 1969

1. Locations and Purposes of Visits:

The undersigned visited the David Clark Company in Worcester, Massachusetts, on 22 and 23 July 1969, and the ARO Corporation in Buffalo, New York, on 24 July 1969. The purpose of these visits was to identify the requirements and existing assets to rework or fabricate S 1010-PPA's for the new pilots coming aboard in FY-70. In addition, it was necessary to review the delivery problems of the ARO Corporation, especially in view of the strike at the parent facility in Bryan, Ohio.

2. Results of Visits:

(a) David Clark Company - A complete review was held with the two factory technical representatives of both customer S 1010-PPA requirements for the coming year. Customer Two is increasing its total mission pilot complement from 15 to 18 each of whom will eventually require two S 1010-PPA's. Technical status of Engineering activities on the S 1010-PPA were discussed with special attention directed at helmet tie-down straps and improved glove disconnects. A preliminary

USAF review(s)
completed.

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cold-water immersion evaluation was conducted in the water tank utilizing the new thermal protective layer with the undersigned as the experimental test subject. (See attachment # 1). Plans are being made at the present time for final testing in early fall in a climatic chamber.

(b) ARO Corporation - A review of all Task Orders was accomplished with [redacted] the Company representatives, Mr. Roy Horton of the WRAMA, [redacted] the Contract Monitor, and the undersigned in attendance. Estimated delivery dates for items still outstanding will be forwarded by ARO to this Headquarters by the end of July. Discussions were held on the FY-70 contracts and the impact of the ARO Corporation strike on our mission. The Buffalo facility is presently attempting to meet its obligations with a physical move of much of the equipment from the parent facility at Bryan, Ohio, to Buffalo.

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[redacted]

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Attachment
As stated above

AMS/OSA [redacted]

- Distribution
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ATTACHMENT

Evaluation of Cold-Water Survival Protection
Provided by the S1010 Pilot's Protective Assembly
Utilizing a New Thermal Protective Layer

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1. BACKGROUND - Testing of the S1010PPA in cold-water immersion and subsequent life raft boarding is a matter of record in a complete and comprehensive report by [redacted] formerly of this Headquarters. At his suggestion, following the immersion studies, a method of increasing insulation without sacrificing comfort to any degree was undertaken at the David Clark Company Engineering Study GN-3-107 Design, fabricate and evaluate a Thermal Protective Layer for installation in the S1010-PPA.

2. METHOD - A prototype orally inflatable thermal layer was fabricated and installed in the S1010 prototype suit number 400. The oral inflator valve exits the right arm and is of the typical lock-type valve presently in use in all inflatable survival and protective equipment. (LPU-2P underarm preserves, one-man rafts, etc.) For the preliminary test the suit was donned and the subject immersed in a water tank cooled to 38°F.

3. RESULTS - Upon initial immersion, the inflatable layer failed due to a weak seam and the subject was immediately removed from the tank. Repair was accomplished and re-immersion carried out with the thermal layer inflated prior to water entry. Subjective observations and comments (see table 1) indicate that this thermal layer will greatly improve insulation characteristics of the S1010-PPA. After one-half hour in the water, there was no reduction in body temperature measured with an oral thermometer. This compares favorably with earlier studies indicating a trend to reduction

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in body temperature with the S-1010-PPA alone. Additional effort is being made to fabricate another garmet for installation and final testing will be accomplished in early fall.

4. DISCUSSION:- It would appear from comparing data from the cited study above (table # 2) with this preliminary evaluation, that an inflatable protective layer will greatly increase the survivable immersion time of a downed crewmember. Admittedly, this study had artifacts, namely, the pre-chilling of the subject when the first exposure failed, the constant leak of the garmet itself making it impossible to measure pressure that is necessary for adequate protection and finally, the use of two oral thermometers in as much as the first one was dropped. Hopefully, without these problems, a reliable index for cold-water immersion protection can be established with the final testing.

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Table I
Initial Test # 1

SUBJECT:

TIME	EVENTS	TEMPERATURES (°F)			REMARKS
		ORAL	AIR	WATER	
1045	Suit donning	98.7	74	38	
1100	Entered water	--	74	38	Attempt at inflation failed with a torn seam in the thermal protective layer
1105	--	--	--	--	Subject removed

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Initial Test 1ASUBJECT:

TIME	EVENTS	TEMPERATURES (°F)			REMARKS
		ORAL	AIR	WATER	
145	Suit donning	98.7	74	38	
200	Entered water	--	74	38	No extreme coldness upon entry
210	Water immersion period	99	74	38.5	Subject denied being uncomfortable
215	Water immersion period	99	74	38.5	Subject commented that body was becoming cold especially lower limbs. A pressure check of thermal layer indicated a drop from 45 mm Hg to 5 mm Hg. Re-inflation accomplished at this point to 45 mm Hg.
220	Right hand under water. Left hand under water with mitten	99	74	38.5	After 3 minutes the unprotected hand was painful to subject. The protected hand remained immersed until the experiment terminated with discomfort.
230	Water immersion	99	74	38.5	Test aborted as pressure within protective layer had again leaked to 5 mm Hg.
240	Subject out of water	99	74	38.5	No noticeable complaints other than lower limbs quite cold. Subject was mobile without technician assistance.

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Table II
INITIAL TESTSUBJECT:

TIME	EVENTS	TEMPERATURES (° F)				REMARKS
		ORAL	AIR	WATER	RAFT	
1030	Suit donning	99.3	55	--	--	Suit was donned in a cool location, but no suit ventilation. Subject got fairly warm and sweaty during donning.
1043	Entered water	--	46	36	--	No extreme coldness noted upon entry, but cold in crotch area shortly after due to normal slight leakage there.
1048	Water immersion period	--	46	36	--	Right hand extremely cold, numb. Could not keep hand immersed. Left hand o.k. Noted coldness of legs and back.
1056- 1057	Water immersion period	--	50	36	--	Shivering started at 13 minutes
1058	Boarded life raft	--	50	36	36	Doffed right glove - replaced with special mitten - hand numb, painful. Shivering cont'd.
1109	Closed raft cover	--	50	36	40	Shivering cont'd whether active or inactive
1119	Raft period	97.2	46	36	40	Right hand warming up. Shivering cont'd.
1145	Raft period	97.2	46	36	42	Right hand o.k. Shivering cont'd.
1203	Raft period	95.8	48	36	42	Replaced glove on right hand. Shivering cont'd.
1206	Re-entered water	95.8	48	36	--	Extremely cold immediately. Right hand, back, legs, crotch and feet worse.
1209	Ended test - left water	95.8	48	36	--	Shivering continued, violently after doffing suit. For approximately 30 minutes even sitting in front of a fire in a warm room fully dressed. Feet were numb for same period. No cyanosis or skin mottling, however. Completely recovered within 1 hour.

TABLE II (continued)
SECOND TESTSUBJECT:

TIME	EVENTS	TEMPERATURES (°F)				REMARKS
		ORAL	AIR	WATER	RAFT	
1255	Suit Donning	97.8	55	--	--	Suit damp & cold when donned, as was location. Subject chilled during period. Subject partially rewarmed after completely suited and walked to lake.
1324	Entered water	97.8	45	36	--	Subject noted extreme coldness almost immediately. Felt that suit was taking on water in crotch up back and down legs.
1329	Water immersion period	--	45	36	--	Shivering started within 5 minutes. Rgt hand extremely cold.
1341	Water immersion period	95.6	47	36	--	Extremely cold and shivering intense
1342- 1345	Boarded raft	95.6	47	36	36	Replaced rgt glove with wool mitten and exposure mitten. Hand numb. Shivering continued. Left hand o.k.
1358	Ended Test - Pulled from Water	95.0	47	36	36.5	Extreme discomfort and 95° oral temperature. Judged limit to exposure. Pulled subject from water while in raft. Legs were so numb, subject could not stand unsupported at first. Needed support to walk to cabin. Violent shivering during suit doffing and for approximately 45 minutes in front of fire in cabin. Feet numb same period. Suit legs were completely wet. No cyanosis or skin mottling. Completely recovered within 1 hour 15 minutes.