NAMRL Technical Memorandum 99-01

AIRCREW MODIFIED EQUIPMENT LEADING TO INCREASED ACCOMMODATION (AMELIA) SUMMARY

A. H. Bransdorfer and K. R. Johnson

20000330 112

Naval Aerospace Medical Research Laboratory
51 Hovey Road
Pensacola, Florida 32508-1046

Approved for public release; distribution unlimited.

NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY
51 HOVEY ROAD, PENSACOLA, FL 32508-1046

NAMRL Technical Memorandum 99-01

AIRCREW MODIFIED EQUIPMENT LEADING TO INCREASED ACCOMMODATION (AMELIA) SUMMARY

A. H. Bransdorfer and K. R. Johnson

Approved for public release; distribution unlimited.

DTIC QUALITY INSPECTED 3

ABSTRACT

Aviation life support systems (ALSS) equipment is a critical and essential component for mission success in naval aviation. Anecdotal comments by naval aircrews have indicated that ALSS equipment is perceived as ill-fitting and substandard. Additionally, many aircrews in naval aviation are not satisfied with current urine collection devices (UCDs). The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) survey was completed by 2,055 U.S. Navy and Marine Corps aircrew. The sample population included 85 women and 1,970 men. According to the survey results, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit. The overall performance of current ALSS was rated slightly above the median with the exception of the anti-exposure suit (rated below the median). Aircrews identified the flight suit as the number-one priority with respect to safety, thermal protection, and comfort. The helmet was identified as the number one priority item with respect to survivability. The majority of the sampled aircrew has required the use of urine collection devices (UCDs) during flight. These aircrews selected the piddle pack and relief tube as moderately acceptable solutions for urination during flight.

Acknowledgments

We would like to acknowledge a number of individuals without whom this report could not have been completed. First, CDR T.L. Pokorski, LCDR B.E. Ortel, and LCDR D.G. Smith were the catalysts at the inception of the AMELIA study. A special thanks to J.G. Gandy and H.E.Cotton for formatting the tables in the appendix. Numerous individuals at all of the Aviation Survival Training Centers (ASTCs) spent hours administering and collecting the surveys. We would like to thank P.D. Collyer for his tireless contribution entering data and assisting in the statistical analyses. We are also thankful to all of the aviators who completed the questionnaire. Through their efforts, this report has become a reality.

PROBLEM

Aviation life support systems (ALSS) equipment is a critical component for mission success in naval aviation. The continued development and improvement of ALSS is mission essential. According to anecdotal comments by naval aircrew, ALSS equipment has historically been perceived as ill fitting and substandard. Additionally, many aviators in naval aviation are not satisfied with current urine collection devices (UCDs).

BACKGROUND

The Naval Air Systems Command (NAVAIRSYSCOM) funded an initial survey in 1993 to assess problems that female aircrew were encountering with current ALSS. The initial survey recorded responses for 67% of female aircrew in the Navy and Marine Corps. Following the initial survey, the study was expanded to include all naval aircrew, both male and female. The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) project was an effort sponsored by the Naval Air Warfare Center, Aircraft Division (NAWC-AD) and Program Manager Air-202 (PMA-202).

The purposes of this study were to evaluate ALSS fit characteristics, determine aircrew ALSS priorities, and identify problems associated with UCDs. The Naval Aerospace Medical Research Laboratory (NAMRL) designed the survey instrument, coordinated its administration, and analyzed the results. Completed surveys were received from 2,055 U.S. Navy and Marine Corps aircrew; this sample included 85 women and 1,970 men.

DISCUSSION

Respondents were asked to answer questions concerning the fit and performance of selected ALSS equipment in the first section of the questionnaire. The fit of ALSS was scored from one to three, with one being a "poor" fit, two an "ok" fit, and three fitting "well." The overall performance of an item was rated on a scale from one to five, one being the lowest (poor performance) and five the highest (good performance).

The fit of ALSS appears to be an important fleet concern during ready room conversations with aircrew. According to the respondents of the AMELIA survey, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit (Table 1). The overall performance of current ALSS was slightly above the middle value of three. Again the anti-exposure suit was the exception with a performance rating of 2.8 (Table 1).

Table 1. Mean ALSS Fit Sores.

Equipment	Fit*	Performance**
Flight Suit	2.7	4.2
Flight Jacket	2.5	4.2
Flight Boots	2.5	4.2
Flight Gloves	2.6	4.3
Torso Harness	2.3	3.8
SV-2B	2.1	3.3
Anti-G Suit	2.5	4.1
O2 Mask	2.2	3.5
Helmet	2.3	3.7
Anti-Exposure Suit	1.9	2.8
Anti-Exposure Liner	2.2	3.4

* 1 = poor, 2 = ok, 3 = well.
** 1 = low, 5 = high.

Anecdotally, many aviators may be more likely to make comments within a ready room than may have been evidenced by the current questionnaire. To account for this limitation, aircrew members were encouraged to write in comments about the fit of each piece of ALSS they used. An appendix is provided for review in lieu of a lengthy

discussion within this summary. The anecdotal comments in the appendix are listed in order of frequency and are grouped by designator and aircraft platform.

The second section of the survey was designed so respondents could rank ALSS items according to 1) safety, 2) survivability, 3) thermal protection, and 4) comfort. The equipment in Table 2 was grouped based upon the total number of times the specific gear was selected by aircrew. The top items for all platforms in each category are listed in Table 2.

Table 2. ALSS Priorities.

Safety	Survivability	Thermal Protection	Comfort
Flight Suit (30.2)	Helmet (25.4)	Flight Suit (29.9)	Flight Suit (27.1)
Helmet (29.2)	SV-2B (23.6)	Anti-Exposure Suit (25.6)	Helmet (22.2)
SV-2B (13.7)	Flight Suit (19.0)	Flight Jacket (15.4)	Anti-Exposure Suit (19.2)
Anti-Exposure Suit (9.5)	Anti-Exposure Suit (11.7)	Boots (9.3)	SV-2B (11.7)

Note: The numbers in parentheses refer to the percentage of responses listing the item as the level-one priority.

The equipment listed in Table 2 highlights the primary ALSS priorities of naval aircrew. The priority items listed by aircrew provide continued support for the development and improvement of ALSS as demonstrated by the customer.

The third section of the survey was designed to identify problems and list solutions related to UCDs. Of the 2,055 respondents completing the section referring to UCD's, 81% had flown missions requiring the use of a UCD.

Aircrew members were asked to rate a number of UCD's on an acceptability scale. The relief tube and piddle pack were identified as moderately acceptable interim (3.7 and 3.2, respectively) and long-term solutions (3.8 and 3.2, respectively) for urination during flight. The tactical jet community ranked the piddle pack above the relief tube. Overall, however, the relief tube was preferred to the piddle pack as a solution for urination during flight.

Aircrew members were also asked how they dealt with urination during flight. A number of methods were listed. The most common method of accounting for urination during flight was "holding it." The piddle pack was the next preferred method of choice by aircrew. Table 3 lists the top five methods of dealing with the need to urinate during flight by all aircrew surveyed.

Table 3. Methods for Dealing With Urination During Flight.

Methods	Percentage
"Hold it"	20.4
Piddle Pack	17.7
Land Aircraft	13.8
Relief Tube	12.4
Pre-Flight "Head Call"	8.5

CONCLUSION

Aviator-mounted systems are mission essential as well as critical for safety and survivability. The AMELIA Report provides a source of data to identify areas for improvement and continued development of ALSS.

APPENDIX

ALSS SURVEY TALLY SHEETS:

Flight Suit
Flight Jacket
Flight Boots
Flight Gloves
Torso Harness
Integrated Torso Harness
SV-2
Anti-G Suit
Oxygen Mask
Helmet
Anti-Exposure Suit
Anti-Exposure Liner
Females

Intentionally blank.

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Suit Comment	Total	Jet	Prop	Helo	Pilot	NFO	AC
1	Breast pockets inaccessible during flight	621	158	193	270	420	72	129
2	Bring back shroud cutter pocket	289	66	79	144	164	41	84
3	Reinforce crotch stitching	262	69	120	73	175	37	212
4	Zipper tabs break easily	251	81	67	103	160	28	63
5	Uncomfortable under G-suit	162	58	40	64	85	18	59
6	Heavier material in seat needed	136	26	60	50	86	15	45
7	Poor supply (supply system)	126	26	41	59	85	14	27
8	Need FOD flap	113	26	34	53	71	9	31
9	Wrist needs more flexability	53	20	17	16	17	13	23
10	Need separate male/female	42	15	14	13	16	9	17
11	Patches are burn hazard	41	12	11	18	23	5	10
12	Desert suits fit poorly	30	10	10	10	18	2	10
13	Poor pocket position (old suit)	20	5	8	7	10	4	6
14	Need cushioned kneepads	19	10	7	2	8	4	7
15	Zipper on lower leg falls across knee when kneeling	18	3	7	8	2	2	14
16	Missing inner thigh pocket	18	2	5	11	9	2	7
17	New suit pockets useless	16	7	6	3	6	5	5
18	New suit poor quality	15	9	5	1	3	9	3
19	New suit side zippers useless	12	3	0	9	8	0	4
20	New suit cargo pockets too deep	12	3	4	5	6	0	6
21	Prefer older style to new style	8	3	3	2	5	0	3
22	New suit missing thigh pockets	6	3	2	1	5	0	1
23	New suit fits poorly	6	3	2	1	2	2	1
24	Need three weights: light, normal, winter	5	2	2	1	1	2	2
25	Need more sizes	5	1	3	1	1	1	3
26	New suit pocket flap catches	4	1	2	1	1	0	3
27	New suit too short in crotch	3	1	1	1	2	0	1
28	Wears out too easily	3	1	1	1	0	1	2
29	Seams rip/Poor stitching, thread	1	1	0	0	1	0	0
30	Too small for big or tall person	1	0	0	1	1	0	0
31	New suit baggy in hip & crotch	1	0	0	1	0	0	1

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Jacket									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Leather jacket needs a removable liner	82		33	22	27		38	20	22
2	Need 'bi-swing'on nomex	74		20	38	16		30	13	31
3	Water proof	65		18	24	23		34	14	17
4	Winter jacket needs lining	37		9	17	11		27	6	4
5	Integrate low-profile hood into collar	36		11	12	13		25	0	11
6	Snag hazard	31		9	13	9		17	9	5
7	Winter jacket needs collar lining	28		9	11	8		18	7	3
8	Difficult to don/take off in flight	14		2	7	5		7	2	5
9	Leather jackets need a place for earplugs	14		6	1	7		9	1	4
10	Summer jacket needs lining	13		10	2	1		9	3	1
11	Needs FOD flap	13		1	7	5		9	0	4
12	Summer zippers bad	12		4	2	6		9	1	2
13	Issue both winter/summer	10		3	2	5		4	0	6
14	Sleeves are too short	9		2	3	4		7	1	1
15	Jacket too short when seated (torso size)	9		4	2	3		2	2	4
16	More sizes needed	7		0	4	3		5	0	2
17	Difficult to fit under SV-2, other equipment	6		1	3	2		3	0	3
18	Poor quality (seams tear, etc.)	5		1	3	1		2	0	1
19	Need summer and winter versions	5		1	3	1		4	0	0
20	Leather jacket should have side hand pockets	5		0	2	3		1	0	4
21	Winter jacket too bulky	3		1	1	1		0	1	2
22	Doesn't fit/work well in cockpit	2		1	1	0		0	2	0
23	Need larger sizes	2		2	0	0		1	1	0
24	Poor fit	2		0	2	0		0	0	2
25	Poor supply	1		0	0	1		1	0	0
26	Restricts movement	1		0	0	1		0	0	1

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Boots									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Need more custom sizes (widths)	109		28	48	33		55	17	36
2	Uncomfortable	58		15	20	23		34	7	17
3	Steel toes uncomfortable in extreme cold/hi-alt	54		11	15	28		36	3	16
4	Need waterproofing	53		10	17	26		28	5	20
5	Too heavy	50		15	15	20		30	5	13
6	Too stiff	48		12	21	15		24	8	16
7	Need two pairs issued	28		10	8	10		19	4	5
8	Lighter weight boot needed	25		11	5	9		12	6	7
9	Better arch support	19		7	3	9		9	4	4
10	Need softer soles	16		1	8	7		8	1	7
11	Leather strap at base of steel toe uncomfortable	16		4	3	9		11	1	4
12	Need lace flap	12		3	3	6		7	3	2
13	Size not compatible with anti-exp	11		3	5	3		7	1	3
14	Side rips out easily	11		5	2	4		4	3	4
15	Size imprint wears off	9		2	4	3		5	1	3
16	Air vents needed	9		2	4	3		4	1	4
17	Need lining	6		0	1	5		4	4	1
18	Poor supply	6		1	2	3		4	0	2
19	Need winter version	5		3	2	0		4	0	1
20	Need better soles (insert)	4		2	1	1		2	2	0
21	Need better traction	3		1	0	2		2	0	1
22	Sole too wide-interfere with pedals	3		1	1	1		3	0	0
23	Too stiff in ankle/poor rudder pedal "feel"	3		1	1	1		2	0	1
24	Speed laces needed	3		0	2	1		1	1	1
25	Need desert style	2		1	0	1		2	0	0
26	Poor construction/quality	2		0	0	2		0	0	2
27	Scratch too easily	2		0	0	2		1	0	1
28	Need toe joint (for extended kneeling)	2		0	0	2		2	0	0
29	Laces need to be longer	2		0	1	1		2	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Flight Gloves									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Poor fit in fingers	83		15	31	37		34	5	44
2	Poor dexterity	55		34	9	12		31	13	11
3	Seams fall apart too easily	54		10	16	28		16	3	35
4	Separate gloves needed for preflight	26		11	3	12		11	8	7
5	Gloves too thick for sense of touch	25		4	13	8		7	2	16
6	Fingers tear too easily	24		7	5	12		12	1	11
7	Poor fit in fingers	23		6	8	9		12	0	11
8	Poor supply	22		5	7	10		12	3	7
9	Need longer fingers	21		2	10	9		11	2	8
10	Winter version needed	21		11	6	4		7	7	7
11	Heavy duty gloves needed	21		2	9	10		8	3	10
12	Gloves get hard after getting wet	18		8	6	4		5	5	8
13	Tank glove replacement inadequate	18		5	6	7		7	5	6
14	Fingertips interfere with fittings (parachute, harness, etc)	18		5	2	11		12	2	4
15	More sizes needed	16		2	5	9		9	0	7
16	Poor durability	11		3	4	4		8	0	3
17	Difficult to use switches	11		4	4	3		8	1	2
18	Gloves too wide for finger length	8		0	4	4		2	1	5
19	More flexibility needed	6		1	2	3		6	0	0
20	Prefer British leather gloves	6		2	2	2		5	0	1
21	Seamless fingertips needed	1		1	0	0		1	0	0
22	Need white gloves for signaling	1		0	0	1		1	0	0
23	Prefer British leather gloves	1		1	0	0		0	1	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Torso Harness									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Difficult to adjust	38		25	11	2		21	11	6
2	Interferes with preflight	33		25	5	3		19	10	5
3	Need velcro thigh straps	17		10	5	2		8	3	6
4	New release mechanism for quick ejector needed	14		14	0	0		12	1	1
5	Added snaps to hold 02 mask	10		8	1	1		7	2	1
6	Restricts movement	10		7	2	1		5	3	2
7	Very uncomfortable	9		6	2	1		4	2	3
8	Poor sizing/fit	4		3	1	0		4	0	0
9	Difficult to put on	4		3	0	1		4	0	0
10	Not compatible with anti-exposure suit	2		1	1	0		2	0	0
11	Too bulky	2		2	0	0		1	1	0
12	Switch to USAF model	2		2	0	0		2	0	0
13	Longer chest strap needed	1		1	0	0		1	0	0
14	Poor availability	1		1	0	0		1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Integrated Torso Harness									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Difficult to put on/off	16		10	3	3		11	3	2
2	Velcro comes undone	8		7	1	0		4	4	0
3	Still need SV-2 for survival gear	8		4	4	0		4	4	0
4	Excess hanging straps	7		7	0	0		6	1	0
5	Leg straps too wide	6		4	2	0		5	0	1
6	Not enough room for add-ons	6		5	1	0		4	2	0
7	Poor fit	3		2	0	1		2	1	0
8	Too bulky	3		3	0	0		2	1	0
9	Switch to USAF type	2		0	0	2		0	0	2
10	Custom fit needed	2		2	0	0		2	0	0
11	Zipper pops out	2		2	0	0		2	0	0
12	Need adapter for anti-exposure suit	2		2	0	0		2	0	0
13	Modify harness for OBOGS	1		1	0	0		1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	SV-2									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Too heavy	427		75	79	273		227	28	122
2	Poor fit	165		23	56	86		83	14	64
3	Bulky	132		6	8	118		98	3	31
4	Interferes with preflight	112		5	10	97		74	4	34
5	Poor equipment position	78		6	13	59		24	8	46
6	HEEDS bottle interferes with movement	76		30	21	25		45	10	21
7	Doesn't fit over winter jacket	58		5	10	43		42	0	16
8	Flashlight too cumbersome	35		0	3	32		27	0	8
9	Neck lobe straps interfere with parachute risers	20		0	10	10		10	4	6
10	More sizes needed	20		0	6	14		12	3	5
11	Incompatible with chest armor	19		1	8	10		10	5	4
12	Need SV-2 fitted with expansion flap (anti-exposure suit, suit)	17		3	3	11		15	0	2
13	Doesn't fit over anti-exposure suit	16		5	4	7		6	2	8
14	Want mesh jacket	15		1	3	11		10	0	5
15	Too much non-useful gear	15		3	5	7		6	3	6
16	Poor supply	13		1	0	12		10	0	3
17	Air Force version better	12		6	2	4		7	4	1
18	Too hot	11		0	0	11		9	0	2
19	HEEDS needs to be shorter	11		5	0	6		10	1	0
20	Need more room for pistol and ammo	10		8	0	2		8	2	0
21	Remove elastic on back for better fit	10		2	4	4		10	0	0
22	Difficult to operate zippers	10		4	2	4		7	0	3
23	Army vest better	9		4	4	1		4	0	5
24	Not enough space for flares	9		1	2	6		7	0	2
25	Integrate life raft	7		5	2	0		5	1	1
26	Rides over release on gunner's belt	7		3	2	2		6	1	0
27	OBOGS bracket shifts pocket	7		4	0	3		5	1	1
28	Tangles in perforated safety/seat belts	6		3	1	2		3	1	2
29	Lobes come loose under G-stress	6		0	5	1		0	1	5
30	Poor quality	5		0	0	5		4	0	1
31	Need more water use in-flight	5		0	1	4		3	0	2
32	Modified for OBOGS difficult to zip/unsat	4		0	0	4		4	0	0
33	Difficult to adjust leg straps	4		0	2	2		1	0	3
34	Lobes interfere with koch release	4		0	0	4		3	0	1
35	Chest strap too long/need more Velcro	4		0	0	4		4	0	0
36	Velcro ineffective (collar lobes)	4		0	2	2		0	2	2
37	Zipper stick	2		1	0	1		1	1	0
38	Straps can hang up on egress	2		0	2	0		0	2	0
39	Need climate-specific supplies	1		1	0	0		1	0	0
40	Integrate HEEDS bottle	1		1	0	0		0	1	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Anti-G Suit									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Need full body suit	28		26	2	0		20	8	0
2	Need lower back support	13		12	0	1		8	5	0
3	Need additional for anti-exposure suit	13		13	0	0		10	2	1
4	Might interfere with ejection	6		6	0	0		5	1	0
5	Poor stitching/bladder leaks	5		5	0	0		4	1	0
6	No quick adjustment feature	5		5	0	0		5	0	0
7	Material pills	4		4	0	0		4	0	0
8	Difficult to put on	4		4	0	0		2	2	0
9	Not compatible with anti-exposure suit	3		3	0	0		3	0	0
10	Incorporate leg restraints into suit	3		3	0	0		3	0	0
11	Need quicker inflate	3		3	0	0		2	1	0
12	Switch to USAF model	3		3	0	0		3	0	0
13	Poor fit	2		1	0	1		1	1	0
14	Need more sizes	2		2	0	0		2	0	0
15	Zippers go bad	2		2	0	0		1	1	0
16	Navy G-suit better than USAF	2		2	0	0		2	0	0
17	Left pocket can catch on power switch	2		2	0	0		2	0	0
18	Want/Need "Combat Edge System"	2		2	0	0		2	0	0
19	Bottom pocket too small	1		1	0	0		1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Oxygen Mask									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Poor fit	125		90	35	0		85	32	8
2	Poor quality	42		9	33	0		23	7	12
3	Snap attachment to harness needed	39		24	15	0		26	13	0
4	Better placement for bayonet fittings needed	25		3	22	0		14	2	9
5	Poor comm/O2 integration	22		14	8	0		11	7	4
6	Incompatible with helmet	20		14	6	0		13	6	1
7	Not compatible with glasses	19		18	1	0		13	4	2
8	Smoke mask poor fit	16		13	3	0		11	3	2
9	Incompatible with headset	14		8	5	1		11	2	1
10	Poor fit - quick don	12		6	6	0		7	3	2
11	More sizes needed	11		7	2	2		11	0	0
12	Need quick-don capability	10		3	7	0		4	4	2
13	Seal leaks during G's	10		5	5	0		7	3	0
14	Straps need constant adjustment	10		7	3	0		6	4	0
15	Custom fit required	10		5	5	0		4	4	2
16	Quick don frame catches on switches	10		6	4	0		7	0	3
17	Restricts movements	8		4	4	0		6	0	2
18	OBOGS lower hose too long	7		7	0	0		7	0	0
19	Longer hose for longer seat height	7		6	1	0		5	2	0
20	Use USAF	5		5	0	0		4	1	0
21	Hose too stiff (bulky)	5		3	2	0		3	2	0
22	Comm cord interferes with koch fittings	4		4	0	0		4	0	0
23	Incompatible with helo helmet	3		3	0	0		3	0	0
24	Difficult to valsalva	3		1	1	1		3	0	0
25	Sweat collects and shorts mike	3		1	2	0		2	1	0
26	Uncomfortable	2		2	0	0		2	0	0
27	Restricts visibility (down)	1		0	1	0		1	0	0
28	Too heavy/bulky	1		0	1	0		1	0	0
29	Fog up	1		0	1	0		0	0	1
30	No headphones in mask (P-3)	1		1	0	0		1	0	0
31	Softer material or padding for sizing	1		1	0	0		1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Helmet Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Standardize helmets	250		58	93	99		142	36	72
2	Chin strap uncomfortable	127		15	34	78		77	6	44
3	Need eye protection with NVG	104		8	7	89		69	4	31
4	Dual visors not compatible with oxygen mask	85		9	11	65		67	2	16
5	New helmet HAS wire easily broken	71		13	25	33		49	10	12
6	Make helmet warmer	58		12	18	28		42	1	15
7	Need to discard NVG's to eject	52		5	7	40		34	3	15
8	ICS communications difficult	49		12	11	26		31	5	13
9	Need laser protection	45		15	9	21		29	9	7
10	Not compatible with AR-5 gas mask	40		14	12	14		24	12	4
11	UV visor needs better visibility (wider field of vision)	33		8	10	15		25	4	4
12	Need USAF style	32		9	11	12		14	3	15
13	Poor hearing protection	31		5	2	24		23	2	6
14	Too heavy/bulky	26		4	12	10		13	2	11
15	Hot spots	24		5	10	9		15	2	7
16	Difficult to adjust in flight	23		6	4	13		22	1	0
17	Poor molding	23		6	1	16		19	2	2
18	Need custom fit (for all helmets)	22		2	0	20		14	2	6
19	New helo helmet needs visor cover/change system	20		4	7	9		10	5	5
20	Poor availability (supply, new helmet)	19		3	3	13		10	1	8
21	New helmet not compatible with NVG	11		2	1	8		10	0	1
22	New helmet poor fit	10		6	2	2		7	1	2
23	Need better fitting ear cups	9		1	0	8		13	3	6
24	Poor visibility with helmet	9		1	6	2		6	2	1
25	Visors easily scratched	8		0	0	8		5	0	3
26	Visor lifts off in wind stream	8		1	4	3		2	0	6
27	Need tighter fit	8		3	2	3		4	2	2
28	Uncomfortable	8		2	6	0		4	2	2
29	Need more sizes	7		2	5	0		5	2	0
30	Liner slips on new helmet	6		1	1	4		5	1	0
31	NVG's shift under G-loads	6		0	2	4		4	0	2
32	Difficult to preflight while wearing	5		0	1	4		5	0	0
33	Need air-cooled helmet	5		0	2	3		4	1	0
34	Pads fall out	3		2	0	1		3	0	0
35	One prong pigtail system needed	2		0	0	2		2	0	0
36	Poor construction	2		1	0	1		2	0	0
37	New helo helmet too many parts (FOD)	2		1	1	0		2	0	0
38	Cobra helmet attachments should run through one quick dis	1		0	0	1		1	0	0
39	Visor should be UV protected	1		0	0	1		1	0	0
40	More sizes needed (new helmet)	1		0	0	1		0	0	1

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Anti-Exposure Suit									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Restricted movement, uncomfortable, bulky	431		225	89	117		334	84	103
2	Neck and wrist seals uncomfortable	197		60	24	113		136	33	28
3	Zipper painful on underarms and chest	113		70	11	32		76	22	15
4	Does not fit with other gear	87		47	18	22		59	14	14
5	Difficult to put on	51		14	28	9		26	7	18
6	Difficult to preflight with anti-exposure suit	39		9	8	22		23	5	11
7	Causes dehydration	26		10	3	13		21	4	1
8	Difficult to put on	26		8	9	9		17	5	4
9	More sizes needed	25		6	9	10		12	2	11
10	Need larger size	22		8	2	12		20	1	1
11	Incompatible with SV-2	20		5	4	11		9	4	7
12	Too big for small people/one size fit all	18		2	2	14		15	0	3
13	G-suit incompatible with anti-exposure suit	15		0	13	2		2	3	10
14	Sweat pools in bodies	15		5	7	3		8	1	6
15	Urination impossible (relief fly unusable)	14		7	2	5		11	1	2
16	Not functional in cold water environment	14		6	4	4		6	4	4
17	Difficult to wear boots with anti-exposure suit	13		6	2	5		8	2	3
18	Need CG dry suit	13		7	3	3		7	3	3
19	Seals leak	12		1	10	1		5	2	5
20	Gloves should be separable, attached with Velcro	11		2	3	6		5	4	2
21	Poor fit in shoulder due to zipper	9		3	0	6		7	0	2
22	USAF suit better	8		2	1	5		7	0	1
23	Use Brit/Swedish suit	7		1	1	5		3	0	4
24	Difficult to egress	6		4	1	1		6	0	0
25	Booties bunch	5		1	3	1		3	0	2
26	Poor dexterity with gloves on	4		4	0	0		3	0	1
27	Diagonal zippers more comfortable	4		2	0	2		4	0	0
28	Prefer five fingered glove	2		2	0	0		1	1	0
29	Booties wear out	2		1	1	0		1	0	1

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Anti-Exposure Liner									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Uncomfortable/bulky	355		0	1	0		0	0	1
2	Need longer sizes	73		27	7	39		49	11	13
3	Restricts movement	37		20	2	15		26	4	7
4	Size like flight suit	12		7	0	5		8	3	1
5	Does not fit with other gear	10		3	3	4		8	1	1
6	Tight	8		5	2	1		7	1	0
7	Do not like short liner	6		4	0	2		6	0	0
8	Go back to green mesh	4		0	2	2		2	0	2
9	Needs to be one piece	4		3	0	1		3	1	0
10	Need larger wrists	3		1	0	2		3	0	0
11	Use wet suit	2		1	0	1		2	0	0
12	Longer zipper needed to urinate easily	1		1	0	0		1	0	0
13	Poor supply	1		1	0	0		1	0	0

ALSS Survey Tally Sheet (FY-95-97) NAMRL

#	Females									
	Comment	Total		Jet	Prop	Helo		Pilot	NFO	AC
1	Flight suit not made for female measurements	20		7	6	7		11	5	4
2	Glove fingers are too long	14		0	7	7		9	4	1
3	More boot sizes needed	14		5	3	6		8	3	3
4	Flight suit requires disrobe for urination	14		2	4	8		11	1	2
5	Helmet poor fit/hot spots	11		1	6	4		8	1	2
6	Poor helmet molding	11		4	4	3		4	3	4
7	Flight suit too long in the crotch	9		2	4	3		5	1	3
8	More glove sizes needed	8		4	4	0		5	3	0
9	Boots are too big	8		6	2	0		5	3	0
10	SV-2 is bulky	7		1	2	4		6	1	0
11	Oxygen mask poor fit/need quick don	7		3	2	2		2	3	2
12	SV-2 is too big/poor fit	6		1	4	1		4	2	0
13	Anti-exposure suit liner fits poorly	5		1	3	1		3	2	0
14	Glove fingers rip open	5		2	1	2		1	3	1
15	Anti-exposure suit is difficult to don	5		1	3	1		4	1	0
16	Helmet hearing protection insufficient	5		0	2	3		4	1	0
17	SV-2 Heeds bottle a cockpit hazard	5		1	2	2		2	2	1
18	Anti exposure suit liner shrinks when washed	4		1	3	0		3	0	1
19	O2 mask not easily compatible w glasses	4		2	2	0		2	1	1
20	Anti-exposure suit too bulky	3		1	1	1		3	0	0
21	Smaller size boots not readily available	3		0	1	2		2	1	0
22	Oxygen mask is a poor fit	3		0	1	2		3	0	0
23	Extra small sizes needed for jacket	2		0	0	2		2	0	0
24	Anti-exposure suit shoulder zipper is uncomfortable	2		0	1	1		2	0	0
25	Exposure fit neck fittings are uncomfortable	2		0	1	1		1	1	0
26	Flight jacket needs more shoulder room	2		1	0	1		1	0	1
27	Flight jacket too long	2		0	0	2		2	0	0
28	Need anti-exposure suit with diagonal zipper	2		0	2	0		0	2	0
29	Helmet ear pads press too hard	2		1	0	1		1	0	1
30	Poor pocket placement on new suit	2		1	1	0		1	1	0
31	Torso harness doesn't fit	1		0	0	1		1	0	0
32	Glove fingers slick when wet	1		1	0	0		0	1	0
33	Anti-exposure suit is too big/egress difficult	1		0	0	1		1	0	0
34	O2 mask ICS hookup w helmet difficult	1		0	0	1		1	0	0
35	Oxygen snap fittings awkward	1		0	0	1		1	0	0
36	Anti-G suit fits poorly	1		0	0	1		1	0	0

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE
22 Dec 99

3. REPORT TYPE AND DATES COVERED

4. TITLE AND SUBTITLE
Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) Summary

5. FUNDING NUMBERS
NAWC-AD & PMA-202 work unit 9307 B994

6. AUTHOR(S)
A.H Bransdorfer and K.R. Johnson

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Aerospace Medical Research Laboratory
51 Hovey Road
Pensacola, FL 32508-1046

8. PERFORMING ORGANIZATION REPORT NUMBER
NAMRL Technical Memorandum 99-01

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Naval Air Warare Center-Aircraft Division (NAWC-AD)
Bldg 439, Suite F
47110 Liljencrantz Road, Unit 7
Patuxent River, MD 20670-1545

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

Aviation life support systems (ALSS) equipment is a critical and essential component for mission success in naval aviation. Anecdotal comments by naval aircrews have indicated that ALSS equipment is perceived as ill-fitting and substandard. Additionally, many aircrews in naval aviation are not satisfied with current urine collection devices (UCDs). The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) survey was completed by 2,055 U.S. Navy and Marine Corps aircrew. The sample population included 85 women and 1,970 men. According to the survey results, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit. The overall performance of current ALSS was rated slightly above the median with the exception of the anti-exposure suit (rated below the median). Aircrews identified the flight suit as the number-one priority with respect to safety, thermal protection, and comfort. The helmet was identified as the number-one priority item with respect to survivability. The majority of the sampled aircrew has required the use of urine collection devices (UCDs) during flight. These aircrews selected the piddle pack and relief tube as moderately acceptable solutions for urination during flight.

14. SUBJECT TERMS
Aviation equipment performance aircrew survival

15. NUMBER OF PAGES
23

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
UNCLASSIFIED

18. SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

19. SECURITY CLASSIFICATION OF ABSTRACT
UNCLASSIFIED

20. LIMITATION OF ABSTRACT
SAR

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102