LEVEL II

12

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Technical Note 12-78

AN INTERFACE EVALUATION OF THE XM-29 PROTECTIVE MASK AND THE AH-1S TELESCOPIC SIGHT UNIT

(10) Paul F. Garrett, Jr.

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Aberdeen Proving Ground, Maryland

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Operational Evaluation (Live Fire)	Nap-of-the-Earth (NOE)	"Scout" Aircraft
Helmet Mounted Sight (HMS)	Terrain Masking	Fire Mission
Telescopic Sight Unit (TSU)	Defilade Position	(continued)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A field evaluation was conducted to determine the effect of the XM-29 protective mask on the mission performance of pilots in scout utility, and attack helicopter. The pilots flew air cavalry-type training missions while wearing the XM-29 and the M-24 protective mask. The evaluation was in accordance with unit training requirements, safety requirements and published standard operating procedures. The maneuvers we evaluated included; hovering, out-of-ground effect hovering, nap-of-the-earth flight, aerial reconnaissance and target engagement with BTM 71A1 (inert TOW missile). Objective performance assessments were made by each pilot and his safety pilot. Subjective (continued)

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19. KEY WORDS (Continued)

Wet Bulb Globe Thermometer (WBGT)
Tube Launched, Optically Guided, Wire Command Link-Guided Missile (TOW)
BTM 71A1 (Inert TOW Missile)

20. ABSTRACT (Continued)

data was collected by using a bipolar adjective technique, debriefings and panel discussions. The data collected indicates an apparent user preference for the XM-29 protective mask.

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AN INTERFACE EVALUATION OF THE XM-29 PROTECTIVE MASK AND THE AH-1S TELESCOPIC SIGHT UNIT

Paul F. Garrett, Jr.

October 1978

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ACKNOWLEDGMENT

We would like to extend our deepest appreciation to B Troop, 1st Squadron, 17th Cavalry of the 82d Airborne Division at Fort Bragg, North Carolina. Special recognition to CW3 Carpenter and CW3 McJohnston for their contribution to the development of the scenario and their personal contribution toward completion of this evaluation.

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CONTENTS

AN INTERFACE EVALUATION OF THE XM-29 PROTECTIVE MASK AND THE AH-1S TELESCOPIC SIGHT UNIT

INTRODUCTION

Chemical-Biological (CB) protection for aircrews has recently come to the forefront of the Army aviation tactical doctrine. The man-machine interface of encapsulated aircrews and their ability to continue to be a pliable element of the combined arms team has long been a concern of the US Army Materiel Development and Readiness Command (DARCOM). One area of particular concern is the tactical compatibility of the AH-1S Telescopic Sight Unit (TSU) and the XM-29 CB Protective Mask.

OBJECTIVE

The objective of this effort was to perform an operational evaluation of the XM-29 CB Protective Mask's compatibility with the AH-1S weapon firing system; helmet-mounted sight (pilot and copilot/gunner) and the TOW telescopic sight unit (TSU) (copilot/gunner). Both point and area fire weapons were employed in a generic day and night engagement scenario.

METHOD

A protocol and test plan (Appendix A) were developed by the US Army Human Engineering Laboratory (USAHEL) to satellite a live fire evaluation of the XM-29 mask and the TSU with an Air Cavalry troop conducting annual gunnery qualification. The evaluation included live firing of all AH-1S weapon systems while a crew member wore the XM-29 mask. Day and night firings with night vision goggles over the XM-29 mask were scheduled. Nap-of-the-earth (NOE) flying, terrain masking and pop-up target engagements were included in the scenario. All subjects (Ss) for the live fire were warrant officers (Biographical Data, Appendix B). Coordination with the cavalry troop and cavalry squadron safety and standards sections produced a realistic training/evaluation scenario. The unit's Standard Operating Procedure formed the basic scenario (firing fans, safety and standards and crew rest).

Each S occupied pilot (P) and copilot/gunner (CPG) crewstations for the evaluation. Subjects were briefed on the scenario and signed a volunteer statement before participating in the evaluation. Standard A CB clothing, body armor and SRU-21 (survival vest) were optional wear with the XM-29 mask. The first S on the evaluation course was the squadron standardization officer. Each S flew the NOE course three times; unmasked, masked with the M-24, and masked with the XM-29. Upon completion of the NOE portion, the aircraft was positioned at the firing point.

While the aircraft was in a defilade position, a "call for fire" from the "scout" aircraft initiated the XM-29/TSU live fire evaluation. After receipt of the fire mission, the pilot (safety pilot) would maneuver the aircraft into position for target engagement by the CPG. After the target had been engaged, the aircraft would return to a defilade position and wait for the second fire mission. The same firing point and target were used for all fire missions. The target was a

vehicle hulk approximately 3 km from the firing position. All NOE and firing sequences were recorded on film. Upon completion of firing, each crew completed a questionnaire (Appendixes C and D) and were debriefed by the evaluation team. When all S's had completed the evaluation, an open discussion was held on various aviation CB related topics. The discussion also included a briefing on the physical characteristics of the XM-29 mask. A portable Wet Bulb Globe Thermometer (WBGT) Index Instrument provided the WBGT index in accordance with TB MED 175.

RESULTS

Only one S chose to wear the CB ensemble (Standard A chemical clothing, body armor and survival vest). He could not wear the body armor and engage the TSU in the CPG station (S1's height– 77" or 99 percent stature). (The body armor not only restricts torso movement, it also restricts head movements which impact on S's search/scan area.) After 1-1/2 to 1-3/4 hours, he took the ensemble off because he became uncomfortable (WBGT $< 78^{o}$).[1,2] S did not complete his portion of the evaluation. He did not have any problems with the CB overboots interfering with aircraft controls. He did comment on lack of dexterity with the CB gloves and an inability to feel/touch controls or arming switches on TSU.

The NOE flights were in accordance with FM 1-1, Terrain Flying. Hovering evaluations were done at 5, 10 and 25 feet above the ground. Two Ss (AH-1S and UH-1H) also performed an out of ground effect 360^{o} pedal turn.

Generally, all comments by the Ss on the XM-29 mask and terrain flying were favorable. One comment on depth perception came from the observation helicopter aircrew. The S thought he was closer to the terrain then he actually was. The observation pilot chose only to wear the CB hood under his helmet while flying. He felt it was "unsafe/dangerous" because he felt that the hood broke the seal on the earcup and permitted aircraft noise to enter his headset and that he might suffer hearing damage. Some of the Ss mentioned distortion around the nose cup on the mask. This distortion is a characteristic of the mask and its construction. It is the product of the different cooling rate of the silicon in the mask and the metal fastener. The silicon cools faster than the metal clamp and is stretched by the shrinkage of the metal clamp as it continues to cool. When constriction is complete, there is a very narrow area of distortion around the voicemitter.

The questionnaire was used to qualify individual S response to apparent differences between the standard M-24 protective mask and the XM-29 mask. The ratings used were a variation of the Osgood and Likert scales. The rating format (Appendix C) consists of bipolar adjective pairs marked at one point only along a seven point scale of equal intervals. The scale position of 4, "neutral," represents the M-24 mask for comparison with the XM-29 mask. Scale positions of 1 and 7, 2 and 6, and 3 and 5, correspond to judgments of "extreme," "moderate," and "slight." For differences in ratings to be significant, there must be 0.85 scale point differences. Appendix D is similar except in place of slight, moderate, and extreme; +1, +2, and +3 are favorable responses; -1, -2, and -3 are unfavorable responses; 0 is neutral. All tables are recapitulations of subjective empirical data and are not representative of the actual formats in Appendixes C and D.

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[1]Bartley, J.D. Heat stress: Is total prevention possible? Military Medicine, July 1977, p. 528-535.

[2]Goldman, R. Tactical implications of the physiological stress imposed by chemical protective clothing system. Presented at West Point, 1970.

An overall reflection of S's judgment of the XM-29 mask's physical characteristics is illustrated in Table 1. The scale points are shown in parentheses.

TABLE 1

Pilots' Mean Ratings of XM-29 Physical Characteristics

	1 Extreme	2 Moderate	3 Slight	4 M-24 Neutral	5 Slight	6 Moderate	7 Extreme	
Comfortable	0 X (1.6)	0	0	0	0	0	0	Uncomfortable
Good Fit	0	0 X (2.5)	0	0	0	0	0	Poor Fit
Easy to Breathe	0	0 X (2.6)	0	0	0	0	0	Hard to Breathe
Stays Clear	0	0 X (3.0)	0	0	0	0	0	Fogs Up
Dry	0	0 X (2.6)	0	0	0	0	0	Sweaty
Stays Clean	0	0 X (2.5)	0	0	0	0	0	Picks up Dirt
Easy to Hear/ Understand	0	0 X (2.6)	0	0	0	0	0	Hard to Hear/ Understand
Safe	0 X (1.6)	0	0	0	0	0	0	Dangerous

NOTE: Table 1 shows XM-29 versus M-24.

Five pilots experienced some minor physical discomfort associated with the mask; one pilot did not. Table 2 represents the incidence and severity of these problems associated with the XM-29 only.

TABLE 2

Subjective Assessment of Physical Discomfort
Due to XM-29 Mask (Day NOE)

Symptom	Severity	Frequency	Duration (% Mission Time)
Head/Face Pressure	4 slight	intermittent	1 - 10
Eye Strain		none	
Nausea		none	
Dizziness		none	
Headache		none	
Disorientation	1 slight	once	1
Nasal Dryness		none	

Two pilots experienced problems reading instruments due to the XM-29 mask. Table 3 presents the incidence and severity of these problems.

TABLE 3

Problems Reading Instruments Due to Mask

Instrument Type	Severity	Frequency
Warning Lights	no problems	
Caution Lights	no problems	
Status Lights	no problems	
Flight Attitude	1 slight	intermittent
Engine Condition	1 slight	intermittent

A collation of the Ss' judgment pertaining to visual perception while wearing the XM-29 mask is illustrated in Table 4. The scale points are shown in parentheses.

TABLE 4

Visual Perception

	1 Extreme	2 Moderate	3 Slight	4 M-24 Neutral	5 Slight	6 Moderate	7 Extreme	
(Facepiece) Clear	0	8 (2.0)	0	0	0	0	0	Hazy
(Field of View) Wide	0 X(1.3)	0	0	0	0	0	0	Narrow
(Image) Sharp	0 X(1.3)	0	0	0	0	0	0	Fuzzy (Blurred)
Good Depth Perception	0	0 X(2.3)	0	0	0	0	0	Poor Depth Perception
(Image) Undistorted	0 X(1.1)	0	0	0	0	0	0	Distorted
(Facepiece) Unreflective	0	0	0 X(3.3)	0	0	0	0	Reflective
(Facepiece) Reduces Glare	0	0 X(2.5)	0	0	0	0	0	Transmits Glare

NOTE: The S perception that the XM-29 reflects less light than the M-24, the rating is not significant, i.e., M-24=4.0, XM-29=3.3. This is less than 0.85.

Tables 5 through 9 show the pilot's impressions in three conditions (wearing the M-24, XM-29 flying and XM-29/live firing) compared with no mask condition. Table 5 shows TSU interface; the XM-29 was significantly favored over the M-24 mask. Table 6 shows field of view (FOV) impressions of the copilot/gunner. Table 7 shows impressions of hovering. Table 8 shows impressions of the masks during NOE and target engagement. Table 9 shows pilot impression of the M-24 and XM-29 mask while firing the TOW missile. (None of the Ss had fired the TOW missile with the M-24 mask.)

TABLE 5

TSU Interface

	Favorable				Neutral	Unfavorable			
	3	2	1	(+)	(no mask)	(-)	1	2	3
Ground Check			+		*			#	
Aerial Flight			*		+			#	
Target Tracking				+	*			#	

- M-24 * - XM-29 + - XM-29 live fire

TABLE 6

Field of View

Favorable				Neutral	Unfavorable			
3	2	1	(+)	(no mask)	(-)	1	2	3
		*				+		#

- M-24 * - XM-29 + - XM-29 live fire

TABLE 7

Hovering

	Favorable				Neutral	Unfavorable			
	3	2	1	(+)	(no mask)	(-)	1	2	3
5 feet			*				#		
10 feet				*				#	
25 feet				*				#	

- M-24 * - XM-29

(NOTE: XM-29 live not included. Height above ground is dictated by terrain and aircraft clearance.)

TABLE 8

Airspeed

	Favorable				Neutral	Unfavorable			
	3	2	1	(+)	(no mask)	(-)	1	2	3
Is it critical for NOE?					*			#	

- M-24 * - XM-29

NOTE: Ss were asked if airspeed was critical for NOE and in which mask (M-24 or XM-29) did they get the best visual cues. XM-29 live fire not included—aircraft fires from stationary position.

Initial test plans included competitive firings with M-24 and XM-29 against a neutral "no mask." The test plan was altered for logistical reasons. Ss were asked to "war game" the mask from experience. Results: no mask favored, XM-29 $< +1$ and M-24 < -1. (Units do not fire masked.)

The firing results are listed by S (S 1-4) and missile number (msl 1-8). The engagement times reflect the time from fire mission receipt (i.e., last record of fire mission) to missile impact.

TABLE 9

Missile Firing

Subject	Missile	Engagement Time (Observer No. 1/No. 2 [min:sec])	Status
S 1	msl 1	1:57 / 1:58	Target hit
S 1	msl 2	-- / --	TSU malfunction
S 2	msl 3	:55 / :47	Target hit
S 2	msl 4	:55 / :46	Target hit
S 3	msl 5	-- / --	SCA failure
S 3	msl 6	-- / --	SCA failure
S 4	msl 7	:59 / :57	Target hit
S 4	msl 8	:27 / :26	Target hit

S 1-msl 2, TSU malfunction was determined as the cause after an evaluation by the Squadron Standardization Instructor Pilot at Fort A.P. Hill and a review of the films at USAHEL. Investigations by USAHEL to establish contributing cause for failure S1 - msl 2 revealed:

1. Five inert missile failures from an unknown quantity at Fort Ord, CA.

2. Eight inert missile failures out of 16 fired at Fort Hood, TX. S3 - msl 5 and S3 - msl 6, lost missiles were caused by a failure of the aircraft stabilizer control amplifier. All Ss were able to get prelaunch information from the TSU. An advantage of the CP/G being able to see the prelaunch flags is that he gets an indication what the aircraft is doing while he is looking in the TSU (i.e., aircraft takes evasive maneuvers).

It may be significant that some pilots undergoing TOW COBRA qualification or who are already qualified, have problems seeing the flags in the TSU without any protective mask on. A product improvement has been submitted to the TOW COBRA Project Manager on the TSU facepiece.

GENERAL COMMENTS OF PILOTS

The following comments are by the pilots who participated in the XM-29/TSU evaluation at Fort A.P. Hill, VA:

1. Rubbed upper bridge of nose.

2. Area around nose was distorted.

3. Sense of touch was reduced significantly by loss of sensitivity in texture of glove.

4. Slight rubbing on nose bridge.

5. Had to tilt head to look through upper portion of mask while viewing instruments instead of just glancing eyes downward around mask nosepiece.

6. Distortion around mask nosepiece when looking at aircraft instruments.

7. Mask did not quite fit into TSU eyepiece allowing full field of view, gunner had moderate difficulty focusing target and viewing TSU flags.

8. It was necessary to move your head to look down.

9. As copilot on AH-1S, the flight performance of the pilot with mask was undistinguishable from his performance without mask. (This is a subjective evaluation of the S pilot by the safety pilot.)

10. I consider the XM-29 to be considerably better than the M-24.

11. Could not get far enough into the TSU to see the flags.

12. Sun glare on face plate due to not being far enough into the eyepiece.

13. When utilizing the pilot acquisition switch, I had to move my head to look down instead of just glancing down with eye movement.

14. When head was faced straight ahead and you glanced at instruments, there was distortion around nosepiece.

15. I had some problem with depth perception—thinking I was closer than I actually was. This problem is consistent with the M-24 and hazardous in NOE flight.

Compared to any protective mask, the most liked qualities of the XM-29 mask were:

1. Greater FOV.

2. Lightweight and less cumbersome.

3. Flexibility.

4. Clear vision (less distortion than M-24).

5. Comfort and ease of fit.

Perception or distortion problems with the XM-29 were not a factor in the completion of any segment of the evaluation. Some CONUS units are reluctant to fly with the M-24 because of the distortion in the center portion of the mask.

Employment of area coverage weapons and night firing using the XM-29 with night vision goggles was not accomplished because of inclement weather the first night and the unit flying time restraint (crew rest) the second night. The evaluation was scheduled for one day and one night segment. Due to weather and unforeseen maintenance problems, the evaluation was extended an additional day.

CONCLUSION

During annual TOW qualification by B Troop, 1/17 Cavalry at Fort A.P. Hill, VA, all Ss preferred the XM-29 over the standard M-24 mask. The XM-29 was worn by highly qualified TOW COBRA pilots while engaging targets with the TSU out to a range of 3 km. Five out of eight missiles fired were target hits. (Three missiles were lost due to aircraft system failure.) Aircrews were able to fly NOE, utilize terrain masking and "pop-up" tactics while wearing the XM-29 mask. The XM-29 can interface with the AH-1S TSU and its mission. It will provide the aircrew protection and a continued mission capability commensurate with the CB threat.

To what degree the XM-29 mask is better than the M-24 mask is dependent on evaluator judgment of mask requirements, mask capabilities, and tactical mission requirements. User acceptance of an item is, and will continue to be, the dominant factor with the development and introduction of new items of equipment into the Army inventory. User reluctance to wear the M-24 and its physical deficiencies are readily apparent in the aviation community. USAHEL's evaluations to date indicate an apparent user preference for the XM-29 CB protective mask.

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Standard Operating Procedures:

1st Squadron, 17th Cavalry, 82d Airborne Division, Fort Bragg, NC.

B Troop, 1st Squadron, 17th Cavalry, 82d Airborne Division, Fort Bragg, NC.

NOTE: Information on inert missile failures and TSU problems was gathered by telephone conversation between USAHEL and user representatives throughout CONUS.

APPENDIX A

PLAN OF TEST

XM-29 CB MASK/TOW COBRA, AH-1S

Plan of Test--XM-29 CB Mask/TOW COBRA, AH-1S

OBJECTIVE

To perform an operational evaluation of the XM-29 CB mask compatibility with the AH-1S weapon firing systems; helmet mounted sight (pilot and copilot/gunner) and the TOW telescopic sight unit (TSU) (copilot/gunner). Both point and area fire weapons will be employed in a generic day and night engagement scenario.

BACKGROUND

USAHEL has performed both static ground and limited flight (nonfiring) evaluations of the XM-29 when in use with the AH-1S system. These preliminary tests were conducted in order to determine if any restrictions exist when using the XM-29 with the various AH-1S sighting systems. The results of these evaluations (based on subjective responses of aviators) indicate that near-normal fields of view are attainable and that all internal TSU mode signals are visible. What remains to be determined is can the XM-29/AH-1S interface be used operationally at tactical NOE speeds and at realistic TOW engagement ranges. USAHEL requests authorization for 12 practice missiles from DAMO-RQD to enable limited live missile firings from moving aircraft. Due to missile availability, DAMO-RQD authorized the firing of eight missiles.

METHOD

B Troop, 1/17th CAV, 82 ABD, will be conducting a FTX (missile qualification) at Fort A.P. Hill, VA (4 - 8 Jun 78). This is an AH-1S equipped unit. They will be tactically firing TOW missiles. The unit has agreed to allow USAHEL to introduce CB equipment as part of their exercise. In addition to the unit's nine TOW missiles, USAHEL will provide eight additional TOW missiles. These eight missiles will be used for the XM-29 equipped firings. The unit's nine missiles will be used for normal unit pilot/gunner qualification.

SUBJECTS

The unit's four most experienced pilot/gunners will be used as subjects. The four men selected have all fired TOW missiles and will be firing during the field exercises one missile for their normal qualification. Each will be equipped with a full CB ensemble, body armor, and SRU/21 survival vest.

DESIGN

General

Unit SOP for CB ensemble will be in effect; that is, only one pilot will be allowed to fly in CB ensemble. The other pilot will act as a safety pilot. Prior to any NOE flights, the pilots will be required to perform a 5, 10, and 25 ft hover to verify aircraft reserve power.

Pilot/Gunner (P/G)

Each of four P/G's will make eight NOE runs through the Fort A.P. Hill course.

Run 1-- no mask, simulated firing, filmed.

Run 2-- M-24 mask, simulated firing, filmed.

Run 3-- XM-29 mask, simulated firing, filmed.

Run 4-- XM-29 mask, live firing, filmed.

This sequence will be repeated twice. A KD28TSU camera will film each run through the sight on 16mm motion picture film. In addition, P/G's will fill out previously developed semantic differential rating scale.

Pilot

Same as above (no missile firings), just area fire weapons, rockets, and mini-gun.

Night-Pilot

Same as above, with the addition of third generation night vision goggles.

Night-Pilot/Gunner

Same as above, simulated missile firings.

APPENDIX B

BIOGRAPHICAL DATA

Biographical Data

FACTOR	RANGE	MEAN	N
Age	25 - 39 years	30.0	6
Rotary	ALL		
Total Rotary Flight Time	800 - 3500 hours	2000.0	6
Total Rotary Night Time	90 - 400 hours	180.0	6
M-24 Wearing Time	2 - 75 hours	20.8	6
Total TOW Missiles Fired by S Prior to XM-29 Evaluation	3 - 45 missiles	14.0	4

Standardization Pilot	2
Instructor Pilot	1
Pilot	3

NOTE: Four S participated in the live fire evaluation. Two additional S participated in the NOE/hovering evaluation.

Physical Characteristics

	AVERAGE	RANGE
Height	68.5 inches	56 - 77
Weight	171 pounds	135 - 224
Waist	33.3 inches	30 - 36
Inseam	31.5 inches	29 - 36

APPENDIX C

XM-29 CB PROTECTIVE MASK

(INDIVIDUAL BIOGRAPHICAL DATA)

This information is requested for evaluation of the XM-29 by the US Army Human Engineering Laboratory, Aberdeen Proving Ground, Maryland. (Point of Contact: CPT Paul F. Garrett, Jr. AUTOVON 283-4061/4092.)

NAME AGE

DUTY MOS

TOTAL FLIGHT TIME (Rotary, w/in 100 hours)

TOTAL NIGHT TIME (Rotary, w/in 5 hours)

RATING	YES	NO
IP		
SIP		
IFE		
FSO		

HEIGHT _____(inches)

WEIGHT _____ (lbs)

WAIST _____ (inches)

INSEAM _____ (inches)

XM-29 EVALUATION

AIRCRAFT_____ NAME_____

MISSION TYPE_____ DATE_____

TIME MISSION BEGAN_____

TIME SPENT MASKED_____

1. WERE YOU ABLE TO WEAR THE MASK FOR THE ENTIRE MISSION? _____YES _____NO

2. DID YOU EXPERIENCE ANY PHYSICAL DISCOMFORT ASSOCIATED WITH THE MASK? _____YES_____NO. IF YES, CHECK APPROPRIATE BOXES BELOW.

	SEVERITY		FREQUENCY				DURATION
SYMPTOM	SLIGHT	MODERATE	SEVERE	ONCE ONLY	INTERMITTENT	CONTINUOUS	percent of mission time you experienced symptom
Head/Face Pressure							
Eye Strain							
Nausea							
Dizziness							
Headache							
Disorientation							
Nasal Dryness							

3. DID YOU HAVE ANY PROBLEMS READING INSTRUMENTS? _____YES _____NO. IF YES, CHECK APPROPRIATE BOXES BELOW.

	SEVERITY			FREQUENCY		
INSTRUMENT TYPE	SLIGHT	MODERATE	SEVERE	ONCE ONLY	INTERMITTENT	CONTINUOUS
Warning Lights						
Caution Lights						
Status Lights						
Flight Attitude						
Engine Condition						

4. DID THE MASK REQUIRE EXCESSIVE HEAD/EYE MOVEMENTS? _____YES _____NO

5. RATING SCALES--INTERACTION BETWEEN YOU AND PHYSICAL CHARACTERISTICS OF THE MASK.

	EXTREME	MODERATE	SLIGHT	M24 NEUTRAL	SLIGHT	MODERATE	EXTREME	
COMFORTABLE	0	0	0		0	0	0	UNCOMFORTABLE
POOR FIT	0	0	0		0	0	0	GOOD FIT
EASY TO BREATHE	0	0	0		0	0	0	HARD TO BREATHE
FOGS UP	0	0	0		0	0	0	STAYS CLEAR
DRY	0	0	0		0	0	0	SWEATY
PICKS UP DIRT	0	0	0		0	0	0	STAYS CLEAN
EASY TO HEAR/ UNDERSTAND	0	0	0		0	0	0	HARD TO HEAR/ UNDERSTAND
DANGEROUS	0	0	0		0	0	0	SAFE

6. RATING SCALES--VISUAL PERCEPTION

	EXTREME	MODERATE	SLIGHT	M24 NEUTRAL	SLIGHT	MODERATE	EXTREME	
(FACEPIECE) CLEAR	0	0	0		0	0	0	HAZY
(FOV) NARROW	0	0	0		0	0	0	WIDE
(IMAGE) SHARP	0	0	0		0	0	0	FUZZY (BLURRED)
GOOD DEPTH PERCEPTION	0	0	0		0	0	0	POOR DEPTH PERCEPTION
(IMAGE) DISTORTED	0	0	0		0	0	0	UNDISTORTED
(FACEPIECE) REFLECTIVE	0	0	0		0	0	0	UNREFLECTIVE
(FACEPIECE) REDUCES GLARE	0	0	0		0	0	0	TRANSMITS GLARE

7. RATING SCALES--HOOD

	EXTREME	MODERATE	SLIGHT	M24 NEUTRAL	SLIGHT	MODERATE	EXTREME	
UNCOMFORTABLE	0	0	0		0	0	0	COMFORTABLE
GOOD FIT	0	0	0		0	0	0	POOR FIT
DANGEROUS	0	0	0		0	0	0	SAFE
HELPS	0	0	0		0	0	0	HINDERS
WORTHLESS	0	0	0		0	0	0	VALUABLE
LOOSE	0	0	0		0	0	0	RESTRICTS
HARD TO DON	0	0	0		0	0	0	EASY TO DON

8. STD A CLOTHING FIT (check for each item)

	GOOD	ACCEPTABLE	UNACCEPTABLE
SHIRT	0	0	0
TROUSERS	0	0	0
SOCKS	0	0	0
GLOVES	0	0	0
OVERBOOT	0	0	0

9. MOTION RESTRICTION BY CB CLOTHING, MASK AND HOOD (check for each item)

	NEGLIGIBLE	SOME	MODERATE	EXTREME
HEAD	0	0	0	0
TORSO	0	0	0	0
ARMS	0	0	0	0
LEGS	0	0	0	0

10. MOTION RESTRICTION BY A/C BODY ARMOR (check for each item)

	NEGLIGIBLE	SOME	MODERATE	EXTREME
HEAD	0	0	0	0
TORSO	0	0	0	0
ARMS	0	0	0	0
LEGS	0	0	0	0

11. FIELD-OF-VIEW LIMITED BY (check for each item)

	NEGLIGIBLE	SLIGHT	MODERATE	EXTREME	UNACCEPTABLE
HOOD	0	0	0	0	0
AIRCRAFT	0	0	0	0	0
CREWSTATION	0	0	0	0	0
ACBA	0	0	0	0	0
MASK	0	0	0	0	0

12. HEAT LOAD (check one)

I HAD NO HEAT PROBLEMS. _____

I HAD THE GREATEST PROBLEM WITH HEAT LOAD:

SHORTLY AFTER DONNING THE CB CLOTHING. _____

WHILE PRE-FLIGHTING THE AIRCRAFT. _____

WHILE CONDUCTING RUN-UP. _____

WHILE IN-FLIGHT (GUNNERY INCLUDED). _____

AFTER FLIGHT (SHUT-DOWN AND POST FLIGHT). _____

13. CB PROTECTIVE GLOVES (circle as appropriate)

THE CB GLOVES INCREASED / DECREASED / HAD NO EFFECT (circle one) ON MY MANUAL DEXTERITY.

I FOUND THE GLOVES TO BE COMFORTABLE / UNCOMFORTABLE (circle one). HOW MUCH? VERY SLIGHTLY

14. BASED ON YOUR FLIGHT EXPERIENCES DURING THIS EVALUATION, WHICH MASK WOULD YOU SELECT FOR FUTURE OPERATIONS? (circle one)

M-24 XM-29

15. I HAVE APPROXIMATELY_____HOURS FLIGHT TIME WITH THE M-24.

16. COMPARED TO ANY PROTECTIVE MASK, WHAT DO YOU LIKE MOST ABOUT THE XM-29?

17. COMMENTS (BE SPECIFIC AND BRIEF).

APPENDIX D

XM-29, TELESCOPIC SIGHT UNIT AND NIGHT VISION GOGGLES INTERFACE

Crewmembers Pilot Co-pilot / Gunner

Flight Time / Night Time _____ _____

Age _____ _____

IP SIP IFE FSO IP SIP IFE FSO

Total Mission Flight Time for this Evaluation _____ _____

	DRY RUN	M-24							XM-29							XM-29 / LIVE FIRE						
	NEUTRAL "0"	FAVORABLE 3	2	1	0	UNFAVORABLE 1	2	3	FAVORABLE 3	2	1	0	UNFAVORABLE 1	2	3	FAVORABLE 3	2	1	0	UNFAVORABLE 1	2	3
Telescopic Sight Unit Interface																						
Ground Check																						
Aerial Flight																						
Target Tracking																						
Field of View (CPG)																						
Hover Altitude																						
5' / 10' / 25" (P/IP/SIP)																						
Airspeed																						
Is it critical for NOE? (yes / no) (P/IP/SIP)																						
Is it critical for tgt engagement? (yes/no)																						

	DRY RUN	M-24								XM-29								XM-29/LIVE FIRE							
	NEUTRAL "0"	FAVORABLE 3	2	1	0	UNFAVORABLE 1	2	3		FAVORABLE 3	2	1	0	UNFAVORABLE 1	2	3		FAVORABLE 3	2	1	0	UNFAVORABLE 1	2	3
Missle Firing — 1st msl																									
Missle Firing — 2nd msl																									
Estimated range to tgt — ____m ____m																									
Time to acquire ____sec ____sec																									
Time to engage ____sec ____sec																									
Range of Tgt Detection vs Range of Tgt ID																									
Night																									
Hovering 5' / 10' / 25' (P/IP/SIP)																									
Night Flt / NOE																									
tgt acquisition																									
tgt identification																									
Light reflection canopy (canopy diagrams will be provided)																									

COMMENTS