Naval Submarine Medical Research Laboratory

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Improved Submariner Eyewear for Routine Wear and Emergency Equipment Use Underway

by

Alison America, MA
Wayne G. Horn, MD

Approved and Released by:
P.C. KELLEHER, CAPT, MC, USN
Commanding Officer
NAVSUBMEDRSCHLAB

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14. ABSTRACT

The purpose of this project was to investigate the possibility for prescription eyewear to replace the standard P3-submariner eyewear that is currently being issued to submariners.The wire framed eyewear, assessed in the present study, offers a more suitable option to submariners, which ensures a tight seal with a full face mask, greater viewing with the periscope and overall improved utility within the submarine environment. The wire framed eyewear were clearly favored by active duty submariners over all other options presently available. The wire-framed eyewear produced by Rochester Optical improved the levels of fit with the Emergency Air Breathing (EAB) mask and with the periscope. The new wire framed eyewear proved to be a significant improvement in safety and comfort for submariners who wear prescription eyewear with an EAB mask and with the periscope. Furthermore, we recommend that the tested wire framed eyewear replace current submariner eyewear and should be offered to submariners who wear prescription glasses underway.

15. SUBJECT TERMS

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Authors:

Alison America, MA
Wayne G. Horn, MD

Naval Submarine Medical Research Laboratory

Approved and Released by:

CAPT P.C. Kelleher, MC, USN
Commanding Officer
Naval Submarine Medical Research Laboratory
Submarine Base New London Box 900
Groton, CT 06349-5900

ADMINISTRATIVE INFORMATION
The views expressed in this report are those of the author(s) and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the United States Government.

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ACKNOWLEDGMENTS

We gratefully acknowledge the contributions by Rochester Optical, and the crews and Independent Duty Corpsmen (IDCs) of the USS *Hampton*, USS *Philadelphi*a, and USS *New Hampshire*.

SUMMARY

The objective of this study was to investigate prescription eyewear for use with the Emergency Air Breathing (EAB) mask. The eyewear options that are currently available to submariners are unacceptable for many reasons. Primarily, the current eyewear is not compatible with donning the EAB mask. Frames of choice, when worn by submariners, cause a break in the seal of the EAB mask, putting the submariner at risk for inhaling dangerous gases. Rochester Optical designed wire-framed eyewear that did not break the EAB gas tight seal. We assessed the comfort, compatibility, and appearance of the new eyewear in a normal submarine environment using 39 participants.

Purpose

The purpose of this project was to investigate the possibility for prescription eyewear to replace the standard P3-submariner eyewear that is currently being issued to submariners.

Problem

At a meeting on 03 May 2006, the Naval Ophthalmic Support and Training Activity (NOSTRA) requested that the Naval Submarine Medical Research Laboratory (NSMRL) investigate prescription eyewear to replace the current frames supplied to submariners for use underway. Presently, the P3-submariner eyewear is unacceptable for many reasons. Primarily, the current eyewear is not compatible with donning an Emergency Air Breathing (EAB) mask. The P3 eyewear causes pain around the temple region and disfiguring facial creases as illustrated in Figure 1. Rather than wearing the P3 glasses, submariners often opt to wear their frames of choice with the mask, which may prevent the mask from maintaining a tight seal around the individual's face. This causes dangerous gases to seep into the mask and puts the submariner at risk. Thus, interest in this issue has gained considerable attention by Fleet personnel [1] and NOSTRA, both of whom would like to see improvements to the current eye frames, which will allow greater submariner acceptability and use underway.

Figure 1. Disfiguring facial creases resulting from prolonged wear of the P3 submariner glasses.

METHODS

Phase I Evaluation

The first phase of testing was designed to be an exploratory evaluation to identify improved eyewear for use aboard submarines and with an EAB mask. New eyewear was identified by posting a Request for Information (RFI) on 01 January 2007 (see Appendix C). The RFI requested interested vendors submit for testing prescription eyewear frames that would be compatible with the EAB mask. The primary requirement was for the improved eyewear to remain in place and not obstruct the submariners' vision when donning the EAB mask. Not only should the improved prescription eyewear frames be compatible with the EAB mask, they should also be compatible with the periscope, perform well in the submarine environment, and be acceptable to the crew. The eyewear must be made of durable, low-maintenance material and construction. Also, the improved eyewear must be comfortable to wear on a regular basis, either alone for daily use or with the EAB mask. Finally, the improved eyewear must have an appearance and fit that is acceptable to submariners. The initial evaluation was conducted at Naval Undersea Medical Institute (NUMI) and Naval Submarine Support Center (NSSC) using 13 Independent Duty Corpsman as evaluators. The new test eyewear was found to fit comfortably when the wearer donned the EAB mask. Also, the test eyewear was found to maintain a tight seal with the EAB mask. NSMRL Memo Report 2008-1266 provides additional information pertaining to Phase I of the eyewear evaluation. As a result of this evaluation, the eyewear manufactured by Rochester Optical was further evaluated during normal submarine underway conditions.

Phase II Evaluation

METHOD

The goal of the present study was to evaluate the wire framed eyewear for acceptability and compatibility within the submarine environment. Subjects were administered two questionnaires, pre- and post-test assessments (Appendix C and D), and were provided two pairs of prescription eyewear for evaluation.

Subjects

There were 57 submariners from three different submarine crews recruited for participation in the study over the course of one year. Of those initial 57 subjects, 39 (68%) successfully completed the trial and provided completed post-assessment questionnaires. All participants were male and most (87%) were enlisted personnel. The remaining 13% of the study sample were officers. The average age of the participants was 29.

The USS Hampton was represented by six participants whose trial period was approximately nine months. The USS *Philadelphia* was represented by 17 participants

whose trial period was approximately two months and the USS *New Hampshire* was represented by 16 participants whose trial period was approximately two months.

Apparatus

Testing was conducted using the wire framed eyewear manufactured by Rochester Optical illustrated in Figure 2. The width of the frame is 4 3/34 inches. The frame is constructed of a thin, durable stainless steel material (1/32 of an inch thick) and has a crimp in the temple piece, which allows for a better fit and a tight seal with the EAB mask. Additionally, the wire framed eyewear has an ear hook adjustment and the ear hooks are surrounded by soft rubber for more comfort.

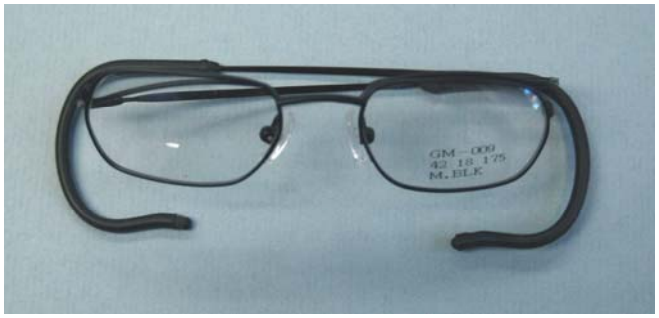

Figure 2. Wire frame eyewear manufactured by Rochester Optical.

Procedure

When a submarine crew was identified as possible participants in the study, subjects were briefed on the intent of the study and provided an opportunity to examine the new eyewear. Participants were administered the Informed Consent Document and Privacy Act Statement. Next, participants were instructed to complete the pretest questionnaire. The Independent Duty Corpsman (IDC) of each crew provided a copy of the participants' eyeglass prescription.

The new test eyewear was delivered to the subjects just prior to underway. Participants received two pairs of prescription eyewear, a cleaning cloth, sunglass attachment and a case. Participants were administered a pretest assessment, which assessed the comfort, compatibility and appearance of the eyewear they normally wore during underway time. Participants were instructed to wear the new eyewear as they normally would during underway conditions. To be considered for any comparison analysis, participants must have worn the eyewear for at least 30 days underway. After at least 30 days of underway time, participants completed a second questionnaire, which assessed the wire framed eyewear.

Analysis

The difference in ratings scores was calculated on levels of comfort, appearance, compatibility with the submarine environment, fit with the EAB mask, and fit with the periscope. Due to the non-normal distribution of scores, the Wilcoxon Signed Rank test

was used for analysis. The Wilcoxon Signed Rank test is a non parametric test for matched groups (paired scores). It is computed by calculating a difference score for each pair of scores, and then ranking all of the difference scores (regardless of sign). Then the algebraic sign is reapplied to the difference in the ranks. Finally, the sum of the negative ranks and the sum of the positive ranks are calculated and the lower absolute value is compared against a test statistic.

RESULTS

There were 57 individuals recruited to evaluate the wire framed eyewear and 39 individuals completed both pretest and posttest assessments. In the pretest assessment, 75% of the participants reported wearing frames of choice (FOC) during underway time. The remaining 25% of the sample wore P3 Submariner glasses, contacts or safety goggles.

Fit, comfort, appearance, and compatibility of the wire framed eyewear

A majority (89%) of the participants reported that the eyewear they usually wore during underway was *A Poor Fit* or *A Very Poor Fit* with the EAB mask. Conversely, 86% of the participants reported that the wire framed test eyewear provided *A Good Fit* or *A Very Good Fit* with the EAB mask. Additionally, 60% of the participants (N = 8) reported *A Poor Fit* or *A Very Poor Fit* when evaluating their personal eyewear for use with the periscope. Conversely, 67% of the participants reported that the wire framed test eyewear provided *A Good Fit* or *A Very Good Fit* with the periscope.

Additionally, the wire framed eyewear was evaluated on measures of comfort, appearance and compatibility with the submarine environment. Results of the assessment found,

a. 51% of the participants reported that their usual eyewear was *Somewhat Comfortable* or *Very Comfortable*, compared to 67 % of participants who reported the wire framed eyewear was *Somewhat Comfortable* or *Very Comfortable*.
b. 49% of the participants reported that their usual eyewear was *Somewhat Attractive* or *Very Attractive*, compared to 31% of participants who reported the wire framed eyewear was *Somewhat Attractive* or *Very Attractive*.
c. 15% of the participants reported that their usual eyewear was *Somewhat Compatible* and none reported it to be *Very Compatible* with the submarine environment, compared to 82% of participants who reported the wire framed eyewear to be *Somewhat Compatible* or *Very Compatible* with the submarine environment.

A Wilcoxon Signed Rank test was calculated to compare the submariners' usual frames of choice to the test eyewear. Analysis was conducted on levels of comfort, appearance and compatibility with the submarine environment. A significant difference ($z = -4.95$, $p < 0.001$) was found between the usual eyewear and the wire framed eyewear on compatibility with the submarine environment. There was no difference in median ratings for comfort ($z = -.64$, $p = .60$) or appearance ($z = -1.57$, $p = .14$).

A Wilcoxon Signed Rank test was also calculated to assess how well the wire framed eyewear fit with the EAB mask and with the periscope. A significant difference ($z = -4.56$, $p < 0.001$) was found between the usual eyewear and the wire framed eyewear on levels of fit with the EAB mask. Additionally, there was a significant difference ($z = -2.22$, $p = .03$) in median ratings when assessing fit with the periscope. Table 1 shows the Wilcoxon Signed Rank test for median scores on comfort, appearance, compatibility and fit with the EAB mask.

Table 1. Wilcoxon Signed Rank test for comfort, appearance, compatibility and fit.

Item	Test	Median	Min, Max	P value	N
Comfort	Pretest	4.00	1, 5		39
	Posttest	4.00	1, 5		39
	Diff	0.00	-3, 2	.60	37
Appearance	Pretest	3.00	1, 5		39
	Posttest	3.00	1, 5		39
	Diff	0.00	-2, 3	.14	39
Compatibility	Pretest	3.00	1, 4		39
	Posttest	5.00	0, 5		39
	Diff	-1.00	-2, 2	.00	39
EAB fit	Pretest	1.00	1, 4		39
	Posttest	4.00	0, 5		28
	Diff	-3.00	-4, 0	.00	27
Periscope Fit	Pretest	2.00	1, 5		20
	Posttest	4.00	2, 5		10
	Diff	-2.00	-4, 1	.03	8

Durability of the wire framed eyewear

The wire framed eyewear was examined for durability by assessing how many times the eyewear broke during underway time. Table 2 presents the number of times participants' usual eyewear broke during their last 30 days of underway time and the number of times the wire framed eyewear broke during the testing period. The few instances of breakage occurred at the brazed junction of the temple piece. The IDC reported that the breakage resulted from rough treatment.

Table 2. Durability of the eyewear, pre and post assessment.

Usual eyewear pretest	Freq	Percentage
0 times broken	21	64%
1 time broken	8	24%
2 times broken	1	3%
3 times broken	2	6%
8 times broken	1	3%
Wire eyewear posttest	Freq	Percentage
0 times broken	26	87%
5 times broken	2	6%
8 times broken	1	3%
Missing response	3	9%

A Wilcoxon Signed Rank test showed no difference in the median number of times each type of eyewear broke ($z = -.84$, $p = 0.4$). Table 3 shows the range and median scores for the durability of both the usual eyewear and wire framed eyewear.

Table 3. Median scores for the durability of the usual eyewear and wire framed eyewear.

Item	Min, Max	Median	N
Usual eyewear pretest	0, 8	0.00	33
Wire framed eyewear posttest	0, 8	0.00	30

Submariner acceptance and comments

Finally, there was overwhelming support in favor of the new eyewear. When asked if participants would like the new eyewear offered to submariners as an additional choice, 95% reported that they would like this option made available to them. Also, 63% of participants reported that they preferred the new wire framed eyewear to what they usually wore during underway time.

The following are taken from the posttest assessments where participants were encouraged to provide comments about the test eyewear.

Neutral comments

- *Some people have wide faces and the frames of the glasses should be sized accordingly.*
- *More rectangular [lens shape] not so square.*
- *If the lens was a bit wider I'd wear more often.*

- *Frames can be used with periscope, but slightly too wide for comfortable fit inside the eyepiece.*

Negative comments

- *After about 4 months of daily wear the rubber sleeve round the ends of the arms began to split and peel away.*
- *The wire framed glasses gave me a headache.*
- *Initial wear resulted in a sore spot on the nose. Nose pieces widened help a lot.*
- *Because the frame was too narrow, my peripheral vision was significantly affected causing my overall vision to be distorted and causing headaches.*

Positive comments

- *I think it would be great to have a choice when getting the glasses at optometry. I like these glasses better, but I still think that a choice is better.*
- *Overall I think the new frames work very well on submarines. I felt they were comfortable to wear, but my own eyeglasses work better for me.*
- *I felt that overall the wired frames were well suited to boat use, though I would change a couple of things. The side pieces should be a bit shorter to fit on the ears better. The part in the front where the lenses join the sides is a bit fragile (one sailors broke at the weld). The width of the glasses should be offered in varying widths to fit wider faced individuals; they were fine for those with narrow faces.*
- *These glasses work well with the periscope and due to the flexibility I am able to flip them to the top of my head if they are getting uncomfortable when looking out the scope.*
- *The flexible ear hooks are far more comfortable than the P3 glasses which couldn't be worn for more than a day without being painful.*
- *The wire framed glassed do fit inside the EAB. They are not very comfortable but nothing would be very comfortable. I can wear them in an EAB without pain like the P3. I had a positive experience with these glasses and recommend them for submarine use.*

DISCUSSION

The Submarine Fleet and NOSTRA have reported that the current eyewear options for use with an EAB mask are unacceptable for many reasons. The P3 glasses cause pain in the temple region, uncomfortable temple creases, and fail to adequately fit with the EAB mask and the periscope. Rather than wear the painful P3 glasses, submariners instead choose to wear their frames of choice. Yet, this alternative creates additional problems in failing to maintain a tight seal around the face with the mask. This may cause dangerous gases to leak into the face mask, thus putting the user and crew at risk.

In response to these issues, initial testing was conducted on new eyewear manufactured by Rochester Optical. This new eyewear has a smaller lens width, a flexible framing structure and a thinner, more durable frame. In phase I of this study, the new eyewear was favorably reviewed by active duty submariners at NUMI and NSSC. In phase II of this study, the new wire framed eyewear was tested in the submarine environment on levels of comfort, appearance, durability and compatibility with the EAB mask and periscope.

There were 39 submariners who completed both the pretest and posttest assessments. Of interest was the durability of the test eyewear. Because the wire framed eyewear was constructed of noticeably thinner material compared to most FOC eyewear, there was some concern that they might be more fragile and breakable than typical eyewear. This was not found to be the case. The wired framed eyewear did not break more often then usual frames of choice. When assessing the number of times the wire framed eyewear broke during underway, six people where removed from analysis because of inconsistent data responses. These individuals all reported that the test eyewear broke more than 10 times during their underway, yet all reported that they would like to see the wire framed eyewear offered to submariners. These six individuals all came from the same crew. On further examination of the questionnaire, it is likely that the participants did not carefully read the question and misinterpreted the question, believing it assessed how many times they wore the wire framed eyewear. One area of improvement for the current study would have been to collect or, at least, inspect the test eyewear for damage or breakage. The participants were permitted to keep the wire framed eyewear at the completion of the study and the researcher did not further inspect the eyewear.

In this sample, most submariners wore their usual frames of choice (FOC) during underway and they reported that the FOC eyewear offered a poor fit with both the EAB mask and the periscope. Clearly, a better fitting alternative was the wire framed eyewear. A majority of the participants reported that the wire framed eyewear provided a better fit with the EAB mask and with the periscope. Additionally, a greater percentage of submariners found the wire framed eyewear to be more comfortable and more compatible with the submarine environment compared to their usual eyewear, but not more attractive than their usual eyewear.

The median ratings for both types of eyewear did not differ significantly on scores for comfort and appearance. This lack of significant difference may have been due to most

participants choosing to wear their frames of choice rather than the P3 submariner glasses. Yet, there was a significant difference in median ratings on scores for compatibility with the submarine environment. Also, there was a significant difference in median ratings on scores for fit with the EAB mask and fit with the periscope. These results indicate that submariners found the wire framed eyewear to be better suited to the submarine environment compared to their usual eyewear. Submariners also found the wire framed eyewear fit better with the EAB mask and with the periscope.

Participants were asked to provide comments on the posttest assessment concerning the wire framed eyewear and its utility with the EAB mask, periscope and/or submarine environment. The most common remarks surrounded the need to have more options made available for frame size and lens size. A number of participants reported that the lens and frame size were too small for their face. It is recommended that alternative frame sizes and lens sizes be available to individuals with a larger head size, which will allow for better fit and more comfort when wearing the wire framed eyewear. One participant reported that after a few months of wear, the rubber around the ear hook began to peal away. While this may be an anomaly, it is recommended that repair options or rubber replacements be available for this possible situation. Finally, one participant remarked that the sunglass clips were particularly useful for wear on the bridge of the submarine. We recommend continuing to provide sun clips with the wire framed eyewear.

It is highly advantageous to the health and safety of the crew to provide eyewear that fits well with the EAB mask and maintains the necessary tight fitting seal. Also, it is equally important to provide eyewear that allows for better viewing when using the periscope. The wire framed eyewear, assessed in the present study, offers a more suitable option to submariners, which ensures a tight seal with a full face mask, greater viewing with the periscope and overall improved utility within the submarine environment. The wire framed eyewear were clearly favored by active duty submariners over all other options presently available.

CONCLUSION

In conclusion, the wire-framed eyewear produced by Rochester Optical improved the levels of fit with the EAB mask and with the periscope. The new wire framed eyewear proved to be a significant improvement in safety and comfort for submariners who wear prescription eyewear with an EAB mask and with the periscope. Furthermore, we recommend that the tested wire framed eyewear replace current submariner eyewear and should be offered to submariners who wear prescription glasses underway.

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REFERENCES

1. Email correspondence from CDR Michaud in support of this project, which was received 05 February 2008.

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APPENDIX A

QUAD CHART

Title: Improved submariner eyewear for routine wear and emergency equipment use underway

Sponsor: Naval Ophthalmic Support and Training Activity **IOC POM Cycle Year**: FY09

Proposed Performer: NSMRL **Funding Years**: FY08

PI: Alison America **Organization**: Naval Submarine Medical Research Laboratory

Capability Gap Identification

- Operational Medicine Research Vector
- Frames of choice do not permit functional use of the EAB mask and allow dangerous gases into the mask.
- Non-use of prescription eyewear results in impaired vision underway and puts the submariner at risk during emergencies.
- Fleet personnel and the Naval Ophthalmic Support and Training Activity (NOSTRA) report that current Submarine eyewear frames are uncomfortable and cause disfiguring facial creases, resulting in a high rate of non-use by crewmembers.
- The Fleet is highly interested in this issue and would like to see changes to the current submariner eyewear options.

Key Performance Parameters (KPPs)

- Eyewear frames must be compatible with an EAB mask and maintain a tight seal around the face.
- Eyewear frames must be created from sturdy material and be durable for regular use.
- Eyewear must not obstruct the individual's vision or be uncomfortable when wearing the eyewear and mask together.
- The appearance of the eyewear must be acceptable to submariners.

Desired Capability & End User

- Improved prescription eyewear frames that are compatible with EAB masks, periscopes, the submarine environment, and crew acceptance.
- Durable, low-maintenance eyewear that maintains a tight seal with EAB mask and does not obstruct sight in normal submarine duty use and emergency response.
- Frames must be comfortable and acceptable to submariners.
- Able to replace both the submariner eyewear and frames of choice, resulting in the potential for cost savings to the Fleet.
- The Submarine Fleet and individuals who regularly wear an EAB mask are the intended end users. NOSTRA is responsible for transition to the fleet.

Potential Solution and Alternative Solutions

- Several vendors have developed prescription eyewear that is compatible with the EAB mask and maintains a tight seal; yet preliminary results indicate these alternatives are unacceptable to submariners for many reasons.
- Another vendor, Rochester Optical, developed prescription eyewear that is compatible with the EAB mask and is suitable enough to be worn as frames of choice.

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APPENDIX B

Date of Submission		**MEDICAL DEVELOPMENT USE ONLY**
Initiative Title	Improved submariner eyewear for routine wear and emergency equipment use underway	
Fleet/Force Sponsor/Champion	Submarine Force Naval Ophthalmic Support and Training Activity	
POC/INITIATOR	**NAME/RANK OF POC: Alison America** **TELEPHONE NUMBER: 860-694-2522** **FAX NUMBER: 860-694-2547** **MAILING ADDRESS: NSMRL** **Department of the Navy** **Box 900** **Groton, CT 06349-5900** **E-MAIL ADDRESS: Alison.America@med.navy.mil**	

Narrative/Mission Impact and Justification of Initiative **DO NOT DESCRIBE A SPECIFIC SOLUTION OR VENDOR HERE** **(Example: Must produce 200 units per minute (T), 300 units per minute (O))** **Be sure to include Threshold (T) and Objective (O) values.**	The goal of the current project is to identify improved eyewear for submariners for use with the Emergency Air Breathing (EAB) mask. Due to the discomfort in wearing the standard submariner glasses, submariners will either wear their frames of choice or not wear eye glasses at all while wearing the EAB mask. This is unsafe and may result in harmful gases seeping into the facemask. The current project is designed to remedy this problem by providing eyewear specifically designed to be worn with the EAB mask that is comfortable, durable and acceptable to submariners. **Initiative/Capability Gap** A deficiency exists with the presently available submariner eyewear choices, which are meant to be worn while wearing the Emergency Air Breathing (EAB) mask. The current eye glasses are unacceptable to many submariners for multiple reasons, including pain around the temple region and disfiguring facial creases. Instead, submariners often opt to wear their frames of choice with the mask, which prevents the mask from maintaining a tight seal around the individual's face. This causes dangerous gases to seep into the mask and put the submariner at risk. Thus, interest in this issue has gained considerable attention by Fleet personnel and the Naval Ophthalmic Support and Training Activity (NOSTRA), both of whom are interested in seeing improvements to the current eye frames, thus allowing greater submariner acceptability and use underway. **Desired Capability and Concept of Operations** The primary requirement is for the improved eyewear to remain in place and not obstruct the submariners' vision when wearing the EAB mask. Not only must the improved prescription eyewear frames be compatible with the EAB mask, they should also be compatible with the periscope, work positively within the submarine environment, and be acceptable to the crew. The eyewear must be made of durable, low-maintenance material and construction and must be comfortable to the wearer. It is likely that the improved eyewear will replace both options for current submariner eyewear and frames of choice, resulting in potential for cost savings to the Fleet. The end users for this initiative will be submariners who wear prescription glasses and/or other military personnel, who regularly wear full-face masks (e.g. Surface Fleet sailors). **Key Performance Parameters** Of most importance, the improved eyewear must be compatible with an EAB mask and permit a tight seal around the face. The improved eyewear must be manufactured from strong, tough materials and be durable enough for regular occupational use. Additionally, the improved eyewear cannot obstruct the individual's vision or move out of place when the submariner dons and wears the EAB mask. Also, the improved eyewear must be comfortable to wear on a regular basis, either alone for daily use or with the EAB mask. Finally, the improved eyewear must have an appearance that is acceptable to submariners.

Solutions and Exit Criteria	**Potential Solution and Alternative Solutions** Many prototypes were supplied by several vendors and nearly all were found to be compatible with maintaining a tight seal with the EAB mask. Yet preliminary results found that these solutions were unacceptable to submariners for various reasons. One vendor, Rochester Optical, developed prescription eyewear specifically designed to work with the EAB mask. Additionally, this eyewear is suitable enough to be worn daily as frames of choice. **Exit Criteria/End Product Specifications** The end product specifications include compatibility with the EAB mask fit, permit a tight seal with the mask, comfortable to wear, made of durable material, and also be acceptable to submariners in appearance. The real exit criteria are submission to BUMED to start procurement.
Who will be the end user of this initiative	The end user of this initiative will be any submariner who wears prescription eyewear and is required to wear an EAB mask. Additionally, other end users may be individuals who are eligible to obtain eyewear from NOSTRA.
POM Cycle FY for Transition	**FY09**
Required Funding ($K)	**101K**
Cost Share if Any and with Whom	**POC: None** **Amount: $_____** **Contact Information:**
Start/Stop Dates for Development to Deployment	**Start Date: Oct 07** **Expected Deployment Date: Oct 08** **(Month/Year)** **(Month/Year)**
Transition Plan Include: **Sponsor** **IOC date** **FOC date**	**NSMRL will identify and determine the suitability, performance and acceptability of the improved eyewear design. COMNAVSUBFOR approves the recommendations. BUMED and NOSTRA initiate the procurement and issuance of the improved eyewear.** **Sponsor is NOSTRA** **IOC date: FY09** **FOC date: no FOC date, as it is a continuing process.**
Dependencies	Describe what other systems or events need to happen before this initiative can be developed, purchased, or deployed. If none, so state. **No dependencies**
Performance Metrics/Critical Milestones	Describe the metric(s) you will develop or use that will allow you to measure the efficiency/effectiveness of this initiative once it is deployed (i.e. ensure this initiative meets the need) Definition/selection of suitable frames that meet performance criteria. Submariners report a preference for the improved eyewear compared to the P3 submariner glasses and other eyewear options when wearing the EAB mask.

Attachments	**Required: QUAD CHART** **Optional: Other Documents ☒ (list): 3 photographs** **Photo 1 Temple Gouge: temple crease resulting from long term use of the P3 type of submariner glasses.** **Photo 2 Old Frames Gouge: IDC wearing P3 eyewear causing painful temple gouge.** **Photo 3 Improved eyewear on IDC: IDC wearing the improved frames, which relieves the pressure on the temple.** **Note:** A formal ICD or CDD can substitute for this summary document. If none exist, identify responsible office to create it with coordination from that office**.**
Category	*(a) Note: Medical Development initiatives are expected to be developed to initial deployment. Once deployed, these initiatives will need to be sustained and funded by one of the other entities listed below. Please identify the one category in each column that best fits the sustainment of this initiative.*
	(b) Surgeon General's Research Vector Major Initiative Area
	(c) ***(d)*** ☐ ***Medical Countermeasures for ID*** ☐ **Medical Countermeasures for CBRNE** ☐ **Battlefield Medicine & Surgery** ☒ **Aerospace & Operational Medicine** ☐ **Health Promotion & Medical Mission Support** ☐ **Environmental Medicine & Physiology** *(e)* ☐ **Combat Medical Support** ☒ **Medical Equipment** ☐ **Casualty Care** ☐ **Medical Management** ☐ **Mental Health** ☐ **Dental Operations** **Other _____** **(Specify)**
Other Comments:	

APPENDIX C

Request for Information for eyewear for Submariners that would be compatible with an Emergency Air Breathing (EAB) mask

1.0 SUBJECT

Request for Information (RFI) for eyewear designed to provide prescription eyeglasses that are compatible when wearing an Emergency Air Breathing (EAB) aboard submarines. Responses are due to this RFI by 4:00 PM on November 3, 2006. See section 8.0 for further information.

2.0 DESCRIPTION

Naval Submarine Medical Research Laboratory (NSMRL) is seeking information from the eyewear industry that will provide prescription eyewear frames for use when wearing an EAB aboard a submarine.

Specifically, this RFI seeks the following information:

Conceptual technical architecture alternatives

- Prescription eyewear frames. The frames should permit ready assembly of prescription lenses by the Navy Ophthalmic Support Center, Yorktown, VA.
- Sturdy material. The frames must be durable.
- For use by Submariners wearing an EAB mask.
- Approximate cost information (i.e., order of magnitude, ballpark estimates, etc.) for alternatives
- Schedule estimates

3.0 REQUIREMENTS

The primary requirement for this RFI is prescription eyewear frames that remain in place and provide an air tight seal when the individual is wearing the EAB mask. The eyewear frames should not move around inside the mask or interfere with wearing the mask in any way. They should be durable and comfortable for the wearer.

Additionally, the frames are required to provide an airtight seal when worn with the EAB mask. The masks are worn to protect the individual from smoke inhalation and therefore, no break in the seal can be permitted due to the eyewear frames. The frames, when worn, should permit easy donning of the EAB mask and fit readily inside the mask. The frames must permit an airtight seal of the mask against the face of the wearer, using either a flexible metal or plastic temple or a circumferential strap. The frame assembly must be comfortable when worn.

The purpose of this RFI is to gather information about those requirements enumerated above. To the extent simplifying assumptions are needed, respondents are encouraged to make and document such assumptions in their responses.

4.0 POSSIBLE EYEWEAR SOLUTION

The eyewear must meet the functional requirements specified above. NSMRL is open to alternative concepts for solutions that meet these requirements. NSMRL encourages creativity and outside the box thinking in responses to this RFI.

This RFI seeks information about prescription eyewear that would be compatible when wearing an EAB mask. In doing so, NSMRL seeks to understand the tradeoffs among risks, costs (initial and ongoing) and alternative technical architectures that incorporate increasing degrees of sharing.

5.0 SAMPLE RESPONSE OUTLINE

Following is a suggested outline and suggested page counts for a response to this RFI. This outline is intended to minimize the effort of the respondent and structure the responses for ease of analysis by NSMRL. Nevertheless, respondents are free to develop their response as they see fit.

Section 1 – Conceptual Alternatives

Briefly describe types of prescription eyewear that are easily worn with an EAB mask. It should remain in place and not impair the individual's vision when wearing the EAB mask. Eyeglass frames should be sturdy material. Providing pictures is encouraged. (1 page)

Section 2 – Feasibility Assessment

Briefly describe the feasibility of each alternative and the design tradeoffs involved as matched against the functional requirements. (1 page)

Section 3 – Cost and Schedule Estimates

Provide cost estimates for each alternative. Also, discuss cost drivers, cost tradeoffs, and schedule considerations (1 page)

Section 4 – Corporate Expertise

Briefly describe your company, your products and services, history, ownership, financial information, and other information you deem relevant. (no suggested page count)

In particular, please describe any projects you have been involved in that are similar in concept to what is described in this RFI, including management and operations approach, security requirements, security assurance processes, and any relevant lessons learned (1 page).

Include any comments on the structure of the requirements for a formal RFP response.

Section 5 – Additional Materials

Please provide any other materials, suggestions, and discussion you deem appropriate.

6.0 INFORMATION EXCHANGE MEETINGS

NSMRL will hold an information exchange meeting to discuss this RFI with interested potential respondents. Details about this meeting will be made available at a later date. If you wish to attend this meeting, please respond to the contact provided in section 8.0, below.

In addition, NSMRL will consider meeting individually with interested potential respondents. If you are interested in requesting such a meeting, please respond to the contact provided in section 8.0, below.

7.0 DISCLAIMER

This RFI is issued solely for information and planning purposes only and does not constitute a solicitation. All information received in response to this RFI that is marked Proprietary will be handled accordingly. Responses to the RFI will not be returned. In accordance with FAR 15.202(e), responses to this notice are not offers and cannot be accepted by NSMRL or the US Navy to form a binding contract. Responders are solely responsible for all expenses associated with responding to this RFI.

8.0 CONTACT INFORMATION

Following is the Point of Contact (POC) for this RFI, including the public information exchange meeting:

Ms. Alison America
(860) 694-2522
America@nsmrl.navy.mil

Please submit responses via e-mail in Microsoft Office format by 4:00 PM on November 3, 2006, to the POC at: govnet.ts.fts@gsa.gov. You may also submit supplemental hardcopy materials such as brochures, etc. (5 copies each) to the POC.

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APPENDIX D
STUDY QUESTIONNAIRE PRETEST Subject # ___

Rank: _____ Rate (if applicable): _____
Age: _____

1. What kind of glasses do you currently wear during underway? _____

2. What type of glasses do you wear? **P3 Submariner glasses** **Other**

3. Do you wear bifocals? **Yes No**
3A. Do you wear trifocals? **Yes No**
3B. Do you wear transition lens? **Yes No**

4. How many times did your eyeglasses break during the last 30 days? 0 **1 2 3 4 5 6 7 8 9 10+**

<u>EAB mask use</u>
5. Did you have a chance to wear your current glasses with the EAB mask during your last underway?
Yes No

6. How well do your current glasses fit with the EAB mask?

1	2	3	4	5
Very poor fit	Poor fit	Neutral	Good fit	Very good fit

<u>Periscope use</u>
7. Did you have a chance to wear your current glasses while looking in the periscope? **Yes No**

8. How well do your current glasses fit with the periscope?

1	2	3	4	5
Very poor fit	Poor fit	Neutral	Good fit	Very good fit

9. Please rate the **comfort** of your current glasses:

1	2	3	4	5
Very Uncomfortable	Somewhat Uncomfortable	Neutral	Somewhat Comfortable	Very Comfortable

10. Please rate the **appearance** of your current glasses:

1	2	3	4	5
Very Unattractive	Somewhat Unattractive	Neutral	Somewhat Attractive	Very Attractive

11. Please rate the **compatibility** of your current glasses with the submarine environment:

1	2	3	4	5
Very Incompatible	Somewhat Incompatible	Neutral	Somewhat Compatible	Very Compatible

STUDY QUESTIONNAIRE POSTTEST Subject #___

1. Are the wire framed eyewear bifocals? **Yes No**
1A. Are the wire framed eyewear trifocals? **Yes No**
1B. Are the wire framed eyewear transition lens? **Yes No**

2. Did you wear the wire framed eyewear in place of what you usually wear? **Yes No**

3. **If yes**, how many times did the wire frame eyewear break during the last 30 days?
0 1 2 3 4 5 6 7 8 9 10+

If no, why did you stop using the wire framed eyewear?

_____
_____
_____

4. Would you like to see the wire framed eyewear offered to submariners in addition to the P3 submariner glasses?
Yes No

<u>EAB mask use</u>
5. Did you have a chance to wear the wire framed eyewear with the EAB mask? **Yes No**

6. How well did the wire framed eyewear fit with the EAB mask?

1	2	3	4	5
Very poor fit	Poor fit	Neutral	Good fit	Very good fit

<u>Periscope use</u>
7. Did you have a chance to wear the wire framed eyewear while looking in the periscope? **Yes No**

8. How well did the wire framed eyewear fit with the periscope?

1	2	3	4	5
Very poor fit	Poor fit	Neutral	Good fit	Very good fit

9. Please rate the **comfort** of the wire framed eyewear:

1	2	3	4	5
Very Uncomfortable	Somewhat Uncomfortable	Neutral	Somewhat Comfortable	Very Comfortable

10. Please rate the **appearance** of the wire framed eyewear:

1	2	3	4	5
Very Unattractive	Somewhat Unattractive	Neutral	Somewhat Attractive	Very Attractive

11. Please rate the **compatibility** of the wire framed eyewear with the submarine environment:

1	2	3	4	5
Very Incompatible	Somewhat Incompatible	Neutral	Somewhat Compatible	Very Compatible

12. Overall, do you prefer the wire framed eyewear to the P3 or what you usually wear? **Yes No**

13. Please provide any other additional comments, thoughts or suggestions you may have about the wire framed eyewear and its utility with the EAB mask, periscope, and/or submarine environment in

_____

_____

_____

_____

_____