EFFECT OF NVG MOUNT AND SHROUD ANGLES ON NIGHT VISION GOGGLE ORIENTATION RANGES

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INTRODUCTION

Given the wide range of shapes and designs of military helmets, night vision goggle (NVG) shroud angles vary considerably. The same variability exists with NVG mounts as well, with some mounts having a greater deployment angle, and/or greater range of adjustability, or tilt, than others. Given these differences across helmet designs/shroud angles, and NVG mounts, the potential range of NVG orientation relative to the helmet may vary, depending on helmet/mount combinations. It is important to understand how these factors influence NVG orientation, and more importantly, where the user-preferred orientation falls within these bounds.

PURPOSE

This preliminary study was conducted to quantify the range of shroud angles resulting from various helmet designs, range of NVG mount deployment and adjustability/tilt angles, and where user-preferred NVG orientation falls within the range of NVG orientations possible given the different helmet/mount combinations.

METHODS

Equipment tested:

- Helmets: Enhance Combat Helmet (ECH), Caiman (CAI), and Prototype boltless helmet (PRO)
- NVG mounts: Wilcox G24 (WIL) and Norotos Rhino (NOR)
- NVG's: PVS-31

NVG adjustment ranges were calculated and expressed relative to the long axis of the helmet accessory rail for each helmet/mount combination.

Within this adjustment range, preferred NVG orientation was established from six users.

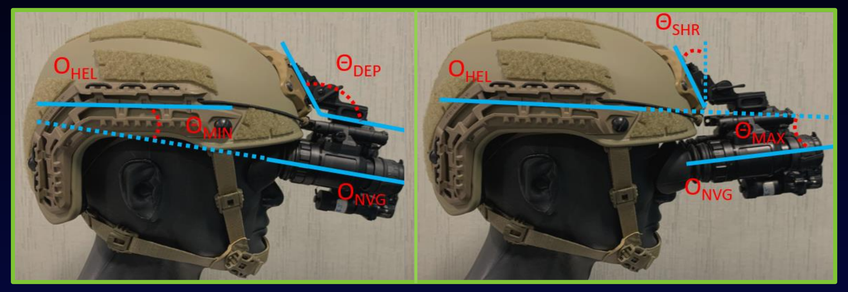

Figure 1. Measured angles: Helmet Orientation (O_{HEL}), NVG Orientation (O_{NVG}), Max NVG Angle (Θ_{MAX}), Min NVG Angle (Θ_{MIN}), Shroud Angle (Θ_{SHR}), Deployment Angle (Θ_{DEP}).

	CAI	ECH	PRO
Shroud angle	24°	34°	14°

Figure 2. Shroud angles (from vertical) of the three helmets tested.

	NOR	WIL
Deployment angle*	110°	115°
Adjustment range	20°	15°

Figure 3. Deployment angle and adjustment range of the two NVG mounts tested.

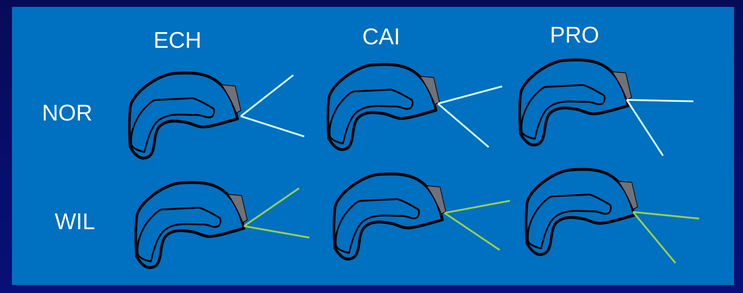

Figure 4. Visualization of the possible NVG orientations based on the helmet shroud angle, NVG mount deployment angle, and NVG mount tilt for each of the helmet/mount combinations.

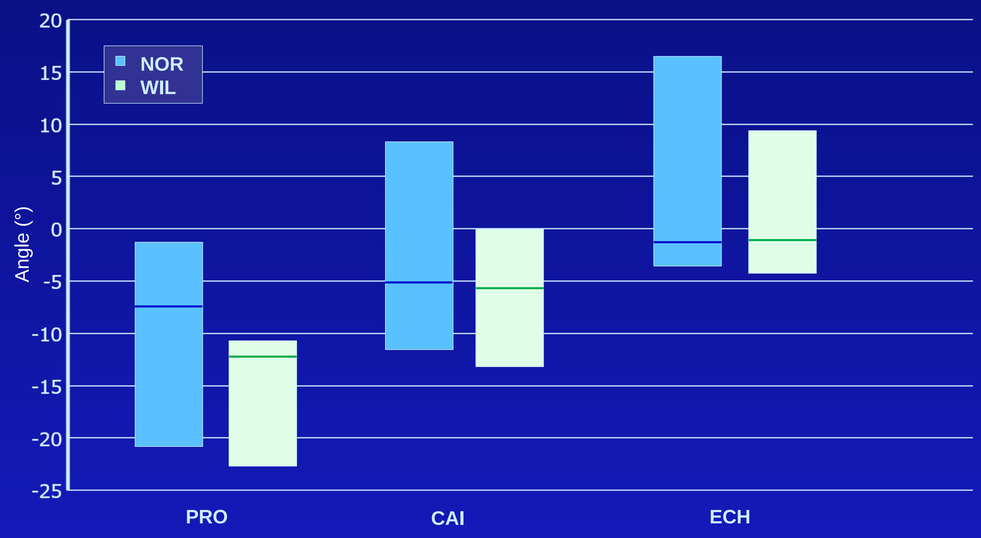

Figure 4. User preferred line of sight relative to the range of NVG adjustability across the helmet and NVG mount options.

RESULTS AND DISCUSSION

- Shroud angles varied from 14-34° for the PRO and ECH (respectively), with the CAI falling in between at 24°.
- Adjustment range was 5° greater for the NOR mount than the WIL (20° vs 15°, respectively),
- Deployment angle (from the stowed position) was 5° greater for the WIL mount than NOR (115° vs 110°, respectively).
- Preferred angle for the ECH fell at the lower end of the adjustability range for both the WIL (-1°, within -4° to 10° adjustment range) and NOR mount (-1°, within -3 to 16° adjustment range
- Preferred angle for the PRO helmet tended to fall on the upper end of adjustment ranges for the WIL (-7°, within -23° to -1° adjustability) and NOR mount (-8° within -21° to -2° adjustability).
- Preferred angle for the CAI helmet was the most centered in the adjustability range for both mounts of the helmets tested (WIL: -6°, within -13° to 0° adjustability; NOR: -5°, within -12° to 8° adjustability)

DISCUSSION/CONCLUSIONS

- Of the six helmet/mount combinations tested, helmets with the greatest shroud angle resulted in preferred NVG positions closer to the lower end of overall NVG adjustability.
- Helmets with the steepest shroud angle resulted in preferred NVG positions closer to the upper end of overall NVG adjustability.
- Helmets with an intermediate shroud angle (24°) resulted in preferred NVG positions that were more centered in the overall range of adjustability, allowing for more user variability and adjustability in the lower and upper ranges.
- In general, preferred NVG orientations fell between 0° and 10° below the longitudinal axis of the helmet rail.
- Based on the current data, and the most commonly used NVG mounts, a helmet shroud angle between 20-25º appears to be most ideal to center the user-preferred line of sight within the overall NVG mount range of adjustability.