The following specifications are for components which, when assembled, will create a Head-Worn Display (HWD) to be used in research studies conducted at NASA for simulator experiments. NASA shall provide the mounting structure for the HWD.

The assembled HWD will provide augmented reality and ambient vision capability for aviation and/or spacecraft operations. The HWD design to meet our research requirements requires a head-coupled system with minimum latency in the forward field-of-view (FOV) for the symbology and NASA-generated imagery fed to the system. In addition, head-coupled HWD imagery outside the forward FOV is added where the information content and the placement of these data are varied by NASA. These variations are created by NASA's assembly of the modular system component in different fashions. The HWD components shall include: a) display modules; b) head-tracker; c) symbology generation, image processing, and display electronics; and, d) associated cables and miscellaneous interfaces and electronics.

The system shall be delivered no more than 90 days contract award.

The HWD components shall meet the following specifications:

1. Total system weight of the components to be placed on user's head shall be less than 1.0 kilogram.
2. Four HWD display modules shall be provided to create the HWD. The display modules will be mounted on the NASA provided head-gear to create the complete HWD system. The display modules will be used by NASA to create four piece-wise continuous, display areas in which to show imagery using these 3 modes: 1) monocular (the HWD shall be configurable to use either eye), 2) bi-ocular, and 3) ambient.
3. Each display module shall have a minimum FOV of 25 degrees Horizontal by 20 degrees Vertical when viewed from a 25 mm eye relief position.
4. The HWD display modules shall consist of a near-eye, eye-piece display with full color real-time rendering with a minimum vertical refresh rate of 100 Hertz.
5. The near-eye image generated by the HWD display module shall appear at a minimum collimated distance of at least 10 feet.
6. The resolution of the display should be a minimum of 30 pixels per degree across the display module field-of-view.
7. The HWD display module shall provide an eye relief of at least 25 mm to accommodate typical eye-glasses eye wear.
8. The minimum brightness of each display module shall be 2,000 foot-Lamberts.
9. The brightness of the HWD display modules shall be easily adjustable by the user in real-time.
10. The HWD shall have a minimum contrast ratio of 500:1.
11. The optical transparency of the HWD shall be at least 80%.
12. The rendered real-time imagery on the HWD display modules shall be capable of receiving video output from a GeForce 670 GTX NVIDIA (or a NVIDIA graphics card with greater performance specifications) graphics card.
13. The HWD display modules shall be capable of displaying real-time symbology in the following reference frames: 1) aircraft; 2) Earth and 3) display.
14. The HWD display modules shall be capable of displaying real-time scalable video in the following reference frames: 1) aircraft; 2) Earth and 3) display.

15. The total end-to-end symbology latency in the forward FOV display modules (monocular or bi-ocular optics) shall not exceed 20 milliseconds.
16. The total end-to-end video latency in the forward FOV display modules (monocular or bi-ocular optics) shall not exceed 20 milliseconds or 1 source video frame
17. The delivered components shall include an integrated, non-magnetic, non-acoustic head-tracking system, measuring head position and angular orientation at frame rates no less than 120 Hertz.
18. The head-tracker shall be capable of tracking the user's head within a minimum volume of 3.0 inches lateral, by 2.0 inches vertical, and 4.0 inches longitudinal from a reference point which should be coincident to a design reference point.
19. Within this volume, all performance requirements shall be met.
20. The accuracy of the coupled, head-tracked HWD image shall not result in greater than 8 milliradians of error.
21. The symbology and video imagery on the coupled HWD when viewed from the design reference point shall exhibit less than 0.6 milliradians of display jitter and the display flicker - brightness variations at frequency above 0.25 Hertz – shall not be objectionable.
22. The contractor shall provide on-demand technical support via phone calls and email for the life-time of the HWD.
23. The supporting equipment shall be powered via standard Type A or Type B electrical outlet.
24. The contractor shall provide a written user's guide for using the HWD. The minimum content of the user's guide shall be: 1) any necessary calibration needed for the display modules and head tracking system; 2) nominal operating instructions; 3) display boresight procedures; 4) procedures to ensure the displays and head tracker are functioning nominally.