

H-60R AR

2018



SPAWAR



H-60R AUGMENTED REALITY PREFLIGHT CHECKLIST TRAINER

A tablet-based Augmented Reality (AR) preflight checklist trainer for aircrew and student pilots.

In 2018, the Office of Naval Research funded Naval Air Warfare Center Training Systems Division to develop a tablet-based Augmented Reality (AR) preflight checklist trainer for use by aircrew and student pilots, in partnership with SPAWAR Systems Center Pacific. The effort, scheduled for final delivery in December 2018, was coordinated with HSM Wing Atlantic and HSM Wing Pacific, both of which provided access to aircraft to support this. HSM Wing Atlantic also provided subject matter experts to help define requirements and scope the effort. PMA-205 and PMA-299 representatives are engaged to monitor user-reported utility of the prototype to enhance student pilot mastery of preflight checklist contents, possible follow-on efforts, and sustainment of the capability to be developed. Development of the training system was enabled by key contributions from SPAWAR, which provided point cloud data models of the H-60R airframe thereby accelerating AR application development.

Using AR cues to help students identify external aircraft features.

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Trainee uses the AR Checklist Trainer to evaluate Pocket Checklist items interior to the nose cone.



The prototype developed in this initial effort is intended for use by teams of two Fleet Replacement Squadron student pilots together. It uses AR cues to help students identify external aircraft features at 11 stations around the helicopter as defined in the preflight checklist and is expected to incorporate internal nose cone components as well upon final delivery. In addition to the vehicle components' locations, the system displays digital content which amplifies information presented in the H-60R Pocket Checklist.

FOCUS ON TRAINING REQUIREMENTS

The goal of this initial prototype is to demonstrate how an AR-enabled technology can be used to help students master preflight checklist content more quickly, enabling quicker progression to mastery of learning requirements for students' initial aircraft familiarization check (FAM-0).

One of the keys to the success of this prototype is focus on how the tool will be used. It is critical to ensure that the system be designed to ensure that it helps students master learning requirements more quickly. Such a system must be easy to operate, sufficiently durable, reliable, and must not be overly cumbersome. The prototype must incorporate interpretable, easy-to-follow cues to ensure not only that it presents the information students need at the right times and locations, but also that students will want to use it.

OPERATIONAL REGISTERED AR

The training system being developed utilizes an AR registration capability which displays digital cues with high spatial accuracy, in wide-ranging operational settings, and requiring minimal placement of fiducial markers. Given the size of an H-60R, and considering the environments where training takes place, this capability is critical to ensure the cues displayed on the device are seen in exactly the right locations—from within the nose cone to the tip of the tail rotor—to help students correctly identify the components to be inspected. AR cue placement error tolerances for some external items on the preflight checklist are as low as an inch.

Follow-on efforts to build additional training applications will incorporate component checklists with more demanding placement error tolerances. The existing registration capability will meet these needs by utilizing additional fixation points that are intrinsic to the air vehicle. Ultimately, the AR training system will be capable of helping students differentiate among cockpit internal compartment components separated by distances measured in fractions of an inch.



Screenshot depiction of checklist items from Area 1 of the H-60R.

FUTURE DEVELOPMENT AND TRANSITION GOALS

Following initial prototype delivery, future efforts are planned to conduct empirical training effectiveness evaluation, as well as development of additional checklist content for pilots, aircrew, and maintainers. These efforts will incorporate additional internal compartments, cockpit instruments, and more detailed AR cue depiction. Transition success for the prototype in development and any follow-on efforts will consist of incorporation into routine self-practice for students, potential incorporation into FRS syllabus events, and low-rate production and sustainment of sufficient units to meet FRS demand.