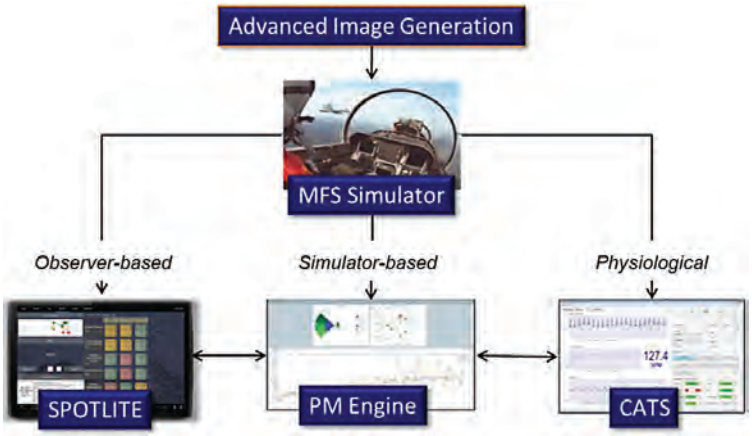
Cognitive Fidelity Synthetic Environment (CFSE)

EXHIBIT FACT SHEET

Cognitive Fidelity Synthetic Environment (CFSE)

Cognitive Fidelity Synthetic Environment (CFSE) provides empirical evidence relating to simulator design and fidelity improvements that will have a large impact on training effectiveness for Carrier Qualification (CQ) training. Specifically, this effort is investigating carrier landing for F/A-18 pilots.

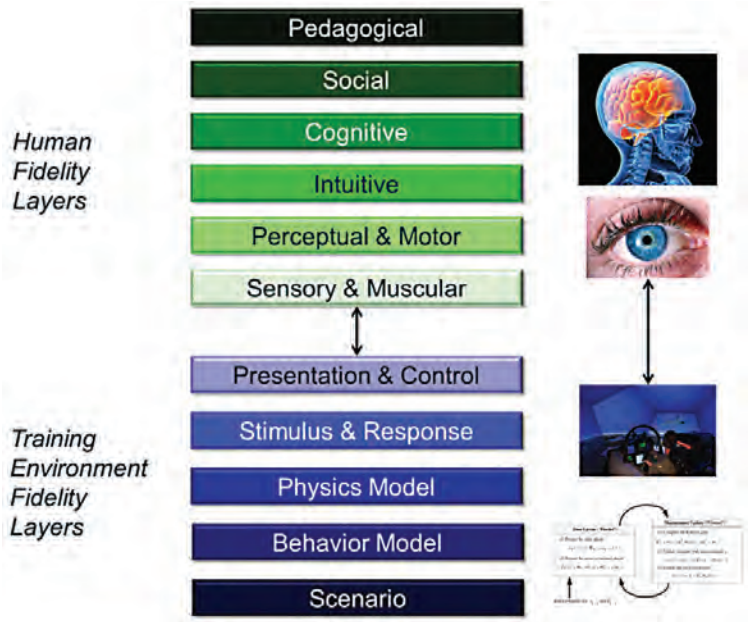


A framework for organizing and measuring the impact of simulator fidelity on training effectiveness, called the Layered Fidelity Framework (Stacy, Walwanis, Wiggins, & Bolton, 2013), identifies measures associated with each human performance layer. The framework accommodates a variety of approaches to human performance measurement, and the CFSE team is using (1) observer-based measures similar to those regularly assessed by Landing Signal Officers (LSOs), (2) simulator-based objective measures with special focus on expert-novice differences, and (3) physiological measures such as pilot cognitive workload as well as eye-tracking based measures.

Layered Fidelity Framework

Typical fidelity discussions about displays include pixel density, contrast ratios, latency, and field of regard; if they are about motion, the topics of latency, frequency, and degrees of freedom often come up; and for audio, it's common to discuss frequency response and dynamic range. These are good and important subjects but there are other important aspects of fidelity.

These other aspects are the target of the Layered Fidelity Framework. The layers can be dichotomized into one set describing the training environment and another set describing the human who is using the training environment. The framework thus includes layers for engineering considerations for designing, building, and using the training environment,



as well as psychological considerations for understanding the effects of fidelity manipulations on the human's experience and on the environment's training effectiveness. Each layer in the human set has an associated set of objective measurements.

Observer Based Measurement Capabilities

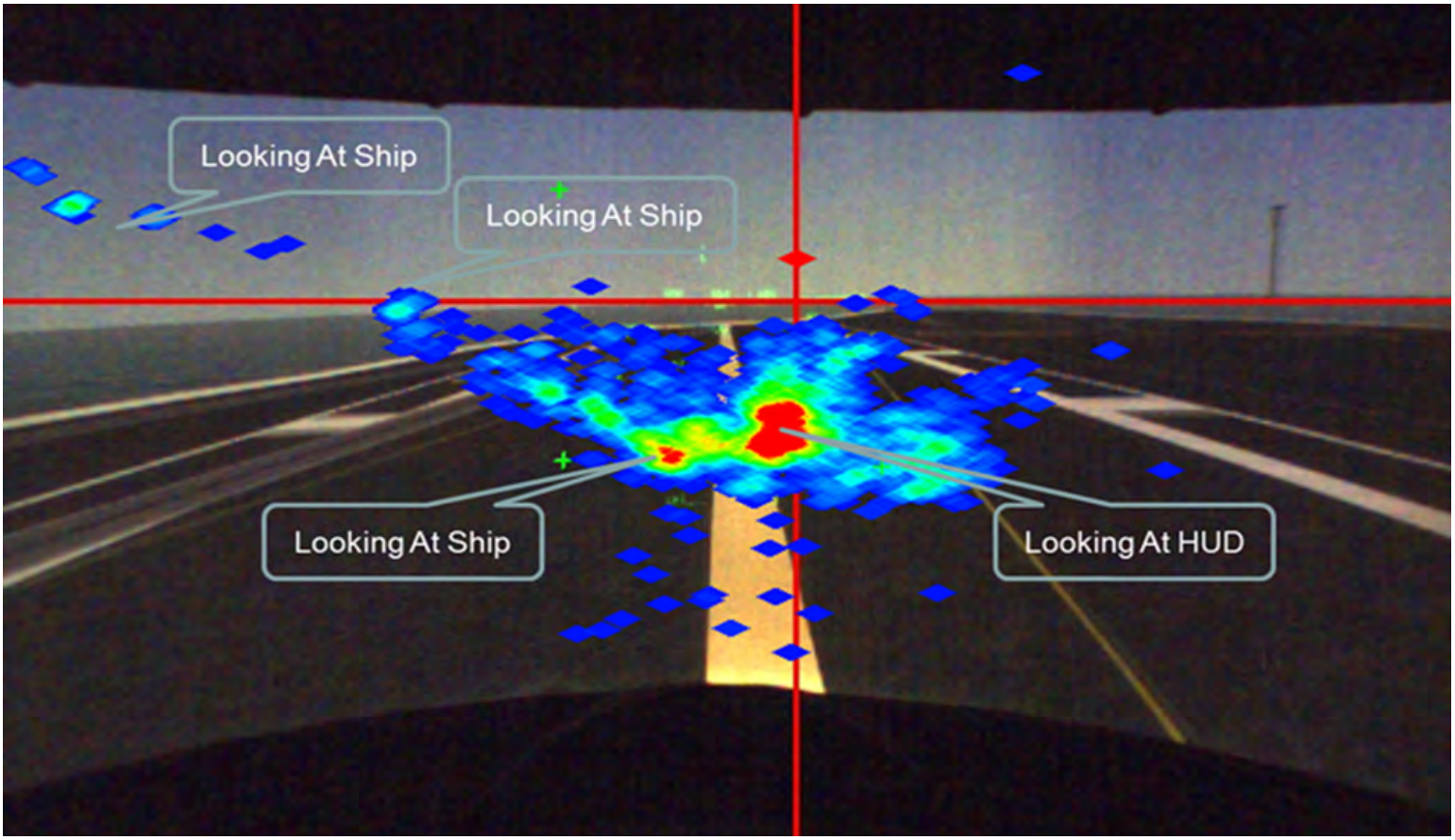
Scenario-based Performance Observation Tool for Learning in Team Environments (SPOTLITE) is a hand-held data collection device for real-time assessment of human performance in live and simulated environments. Evaluators are able to access, analyze, and present performance data immediately following the exercise. Using Performance Measurement (PM) Engine, a user can define criteria, such as assessment levels in the PM Engine, that cue the SPOTLITE user to collect additional data, directing those measure cues to occur in real-time as the training exercise unfolds. LSOs are expert observers of carrier landings, and their evaluations are invaluable for assessing pilot performance.

Simulator Based Objective Measurement Capabilities

The PM Engine is an application that connects to a simulation data source, gathers and stores the raw data, interprets the data based on instructions in the Human Performance Markup Language (HPML), and computes and outputs the resulting performance measurements. The PM Engine interprets the measurement requests and performs the calculations on the data being collected through the data source. It defines and coordinates the multi-step processes that are used to collect data, parse HPML, instantiates performance measurement objects, and return the results to the end user. Performance measurement objects are the rules, tasks, computations, and logic that is used to turn raw data into performance measures.

Physiological Measurement Capabilities

The Cognitive Assessment Tools Set (CATS) is a tool that uses physiological measurement capabilities to assess simulator fidelity requirements. CATS is a suite of software tools used to capture, synchronize, and store data from human factors studies, including pilot physiological and simulator state data. CATS also incorporates a set of After Action Review (AAR) algorithms, one of which is the novel cue detection methodology that allows drill-down investigation of cues pilots rely on when performing flight training tasks. This capability enables the automatic detection of cue usage, even when pilots are not aware of using them and thus cannot verbally report their usage during AAR. Human state data is primarily obtained from electrocardiogram (ECG) and eye gaze behavior.



For further information on this exhibit, or on business opportunities with the Office of Naval Research, Warfighter Performance Department please feel free to check our web site at http://www.onr.navy.mil/Home/Science-Technology/Departments/Code-34.aspx or contact us by mail at: Office of Naval Research, One Liberty Center, Warfighter Performance Department ONR34, 875 N. Randolph St., Arlington VA, 22203.