US Naval Aviation Training in the 21st Century

Naval Air Warfare Center
Training Systems Division (NAWCTSD)

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Presented by: CDR Henry Phillips, Executive Officer, NAWCTSD

NAVAIR

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NAVAIR

[NAWCTSD MISSION]

To be the principal Navy center for research, development, test and evaluation, acquisition and product support of training systems, to provide inter-service coordination and training systems support for the Army, Marine Corps, and Air Force, and to perform such other functions and tasks as directed by higher authority.

[SELECTED FOCUS AREAS]

+ Naval Aviation

+ Surface

+ Undersea

+ Cross Warfare

- **FLEET READINESS**
  - Maintain relevant fielded devices that support current ops
- **EXPANDED FLEET CAPABILITY**
  - Delivering integrated warfighting capability/networked training opportunities
  - Foster Live, Virtual, Constructive training solutions
- **EVALUATION OF NEW TECHNOLOGIES**
  - Rapid prototype deployment
  - Embedded assessment and data analysis tools

TEAM ORLANDO MISSION

Support the U.S. Department of Defense's requirements by providing a consolidated inter-service military entity in the Central Florida area for Human Performance, Modeling and Simulation and Training. **Facilitate research** and **collaboration** of new technologies, programs and agile processes across the **inter-agency** to further advance a thriving and innovative environment to best support Service requirements and initiatives for **effectiveness** and **efficiency**.

Improving **HUMAN PERFORMANCE** through **SIMULATION**

A community of organizations working together to accomplish their respective missions with a common goal.

COLLABORATIVE ALLIANCE

TEAM ORLANDO

ALL SUPPORTED BY GOVERNMENT OFFICES AND COMMITTEES

LOCAL STATE FEDERAL

SUPPLEMENTED, SUPPORTED AND AUGMENTED BY

THE NATIONAL CENTER FOR SIMULATION
NCS and 240+ Industry Leading Businesses

University of Central Florida and Others from Academia

THE CORRIDOR
Regional High Tech Interests

ORLANDO ECONOMIC PARTNERSHIP

UNIQUE COLLABORATION OF LEADING MILITARY SIMULATION COMMANDS

PEO STRI

TRAINING SYSTEMS — MARCORSYSCOM

NAWC — NAVAL AIR WARFARE CENTER

[AVIATION TRAINING PROGRAMS]

P-8A Poseidon Operational Flight Trainer (OFT) Cockpit

Australia F/A-18

- Costs of sim vs flight
- Costs & capabilities of traditional OFTs vs new AR/VR part-task trainers

[AUGMENTED REALITY VS VIRTUAL REALITY]

MIXED REALITY CONTINUUM

- <u>Augmented reality:</u> User can see the real world and we overlay virtual objects into their field of view

- <u>Augmented Virtuality</u>: Mixing real world objects into virtual/augmented reality

- <u>Virtual reality:</u> User's field of view is fully covered and immersed into a virtual environment

- <u>Virtual Environment</u>: Interactive 3D models or worlds used for training (standard gaming console)
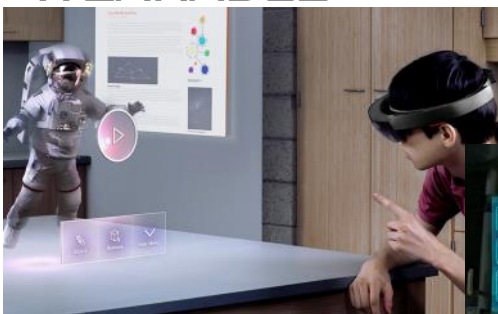

Augmented   **Virtual**

VIDEO-BASED

Your Reality Has Already Been Augmented

WEARABLE

Mixed Reality

Real Environment	Augmented Reality	Augmented Virtuality	Virtual Reality

[AR/VR TRAINING EFFECTIVENESS]

ACTIVE QUESTIONS

Why Use AR/VR…. What are you trying to Train?
- Immersion
- Interactivity

Where does AR/VR work?
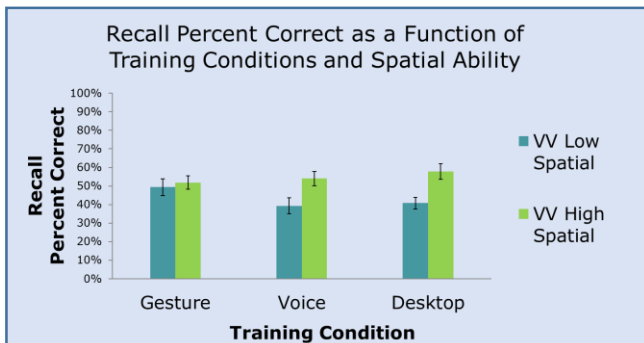- More/As effective as PC-based?
- As Sim/OFT?

For whom does it work?
- Individual differences
- Experience level
- Skill development vs. sustainment

EXISTING BODY OF WORK

- Limited F/A-18 VR Prototype Flight sim. evaluation
- Desktop vs. VR experimental comparison for training maintenance procedures (E-28 Arresting gear system)
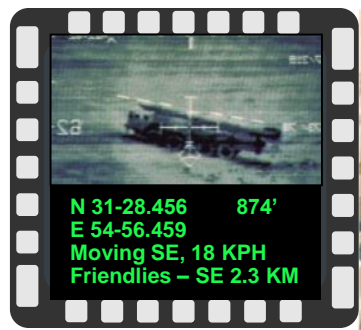

Recall Percent Correct as a Function of Training Conditions and Spatial Ability

CURRENT EFFORTS & EVALUATIONS

- H-60R <u>AR</u> Tablet-based Pre-flight Checklist trainer – https://youtu.be/H5oXR2IR3EI

- H-60S VR Helmet Display Tracking System HUD Trainer

- USAF VR Pilot Training Next

- T-45 VR 4E18 trainer
  Kingsville (4)
  Meridian (4)
  Pensacola (1)

- T-45 VR Part Task Trainer evaluation

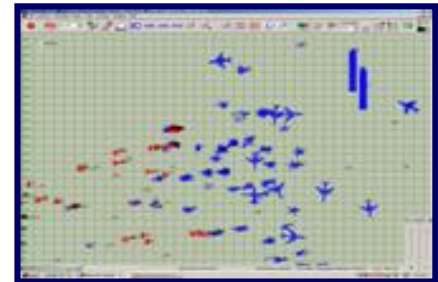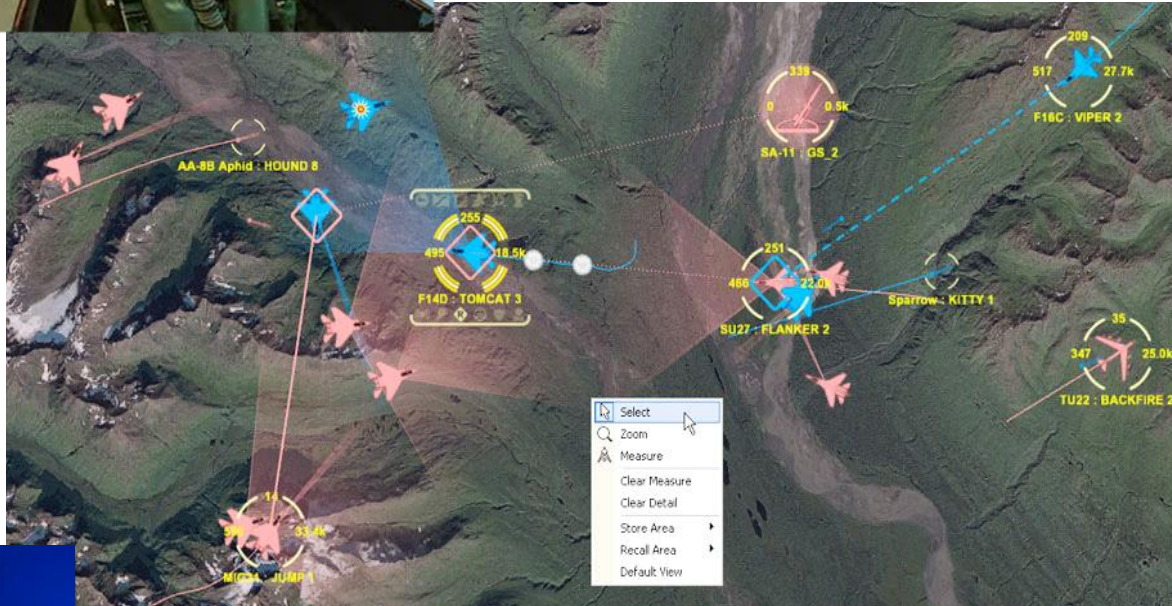- T-45 <u>AR</u> PTT evaluation – Hi-Res COTS HMD

[LIVE-VIRTUAL-CONSTRUCTIVE TRAINING]

N 31-28.456   874'
E 54-56.459
Moving SE, 18 KPH
Friendlies – SE 2.3 KM

Live: real people operating operational systems

Virtual: real people operating simulators
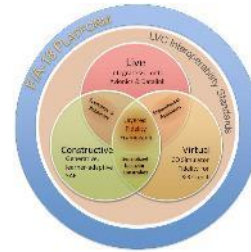
Constructive: computer generated entities

"The cost to operate present and future platforms - combined with advanced capabilities that are rapidly exceeding the capabilities of our current training ranges - demands that we innovate in combining live, virtual, and constructive training." - The Vision of Naval Aviation 2025

[LIVE-VIRTUAL-CONSTRUCTIVE TRAINING]

[WHAT IS IT]

- Live: Pilots in live aircraft
- Virtual: Pilots in simulators
- Constructive: Artificial entities

- CNO has designated FFC as EA for LVC
- NAVAIR has designated CO, NAWCTSD as the LVC for Training Lead

[WHY DO WE NEED IT]

- Range limitations
- Need to keep tactics secret
- Cost of flight hours
- Lifespan of existing a/c

[TARGETED NEEDS]

- Cross-Domain Solutions
- Data interoperability
- Secure IP-based comms
- Sustainable distributed operations centers
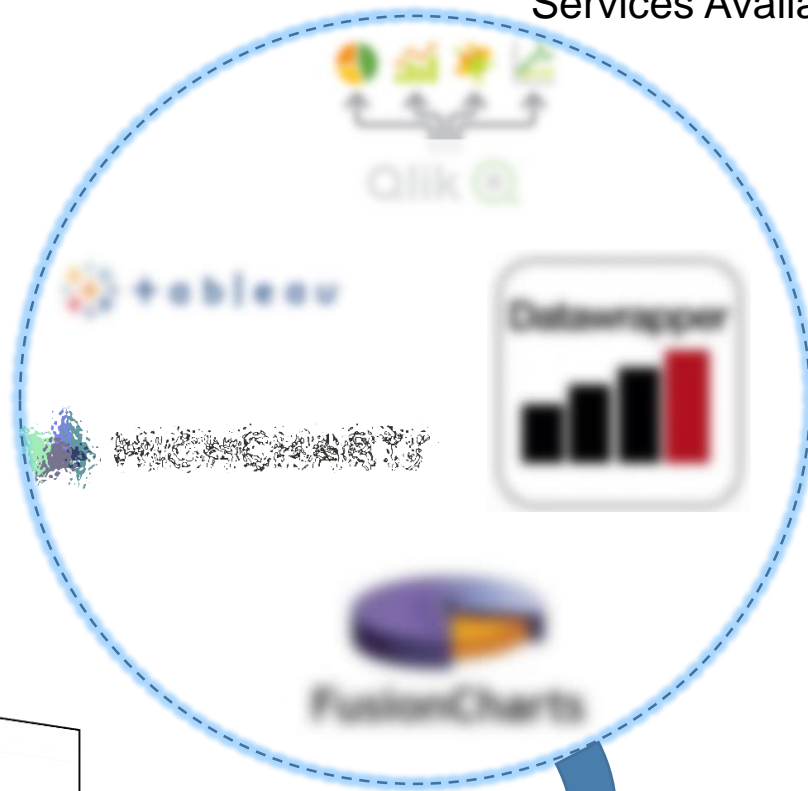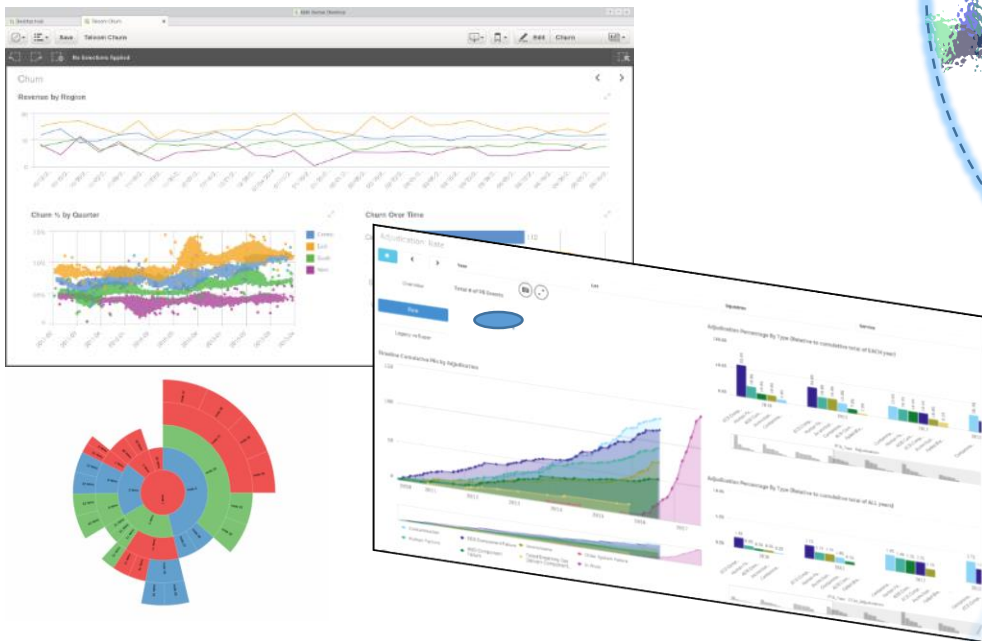- Training Effectiveness Framework
- Timeline

[ENTERPRISE ANALYTICS]

- Real-time data analyses
- Analyze relationships that would otherwise never be possible
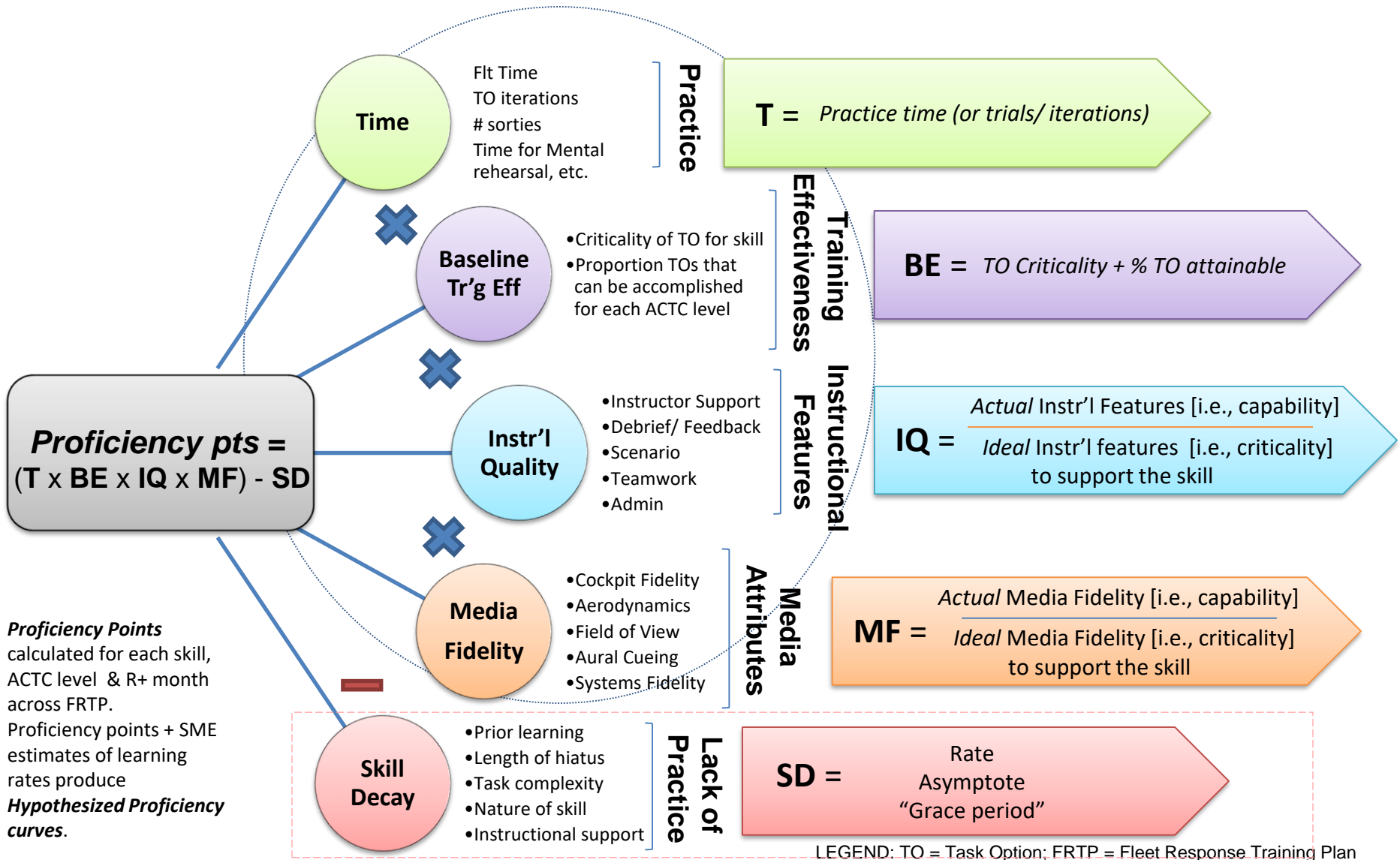- Find multi-dimensional trends and interactions

Many Visualization Services Available

Real-Time Visualization & Insights

Proficiency pts =
$(T \times BE \times IQ \times MF) - SD$

Time
- Flt Time
- TO iterations
- # sorties
- Time for Mental rehearsal, etc.

Practice

$T =$ *Practice time (or trials/ iterations)*

Baseline Tr'g Eff
- Criticality of TO for skill
- Proportion TOs that can be accomplished for each ACTC level

Training Effectiveness

$BE =$ *TO Criticality + % TO attainable*

Instr'l Quality
- Instructor Support
- Debrief/ Feedback
- Scenario
- Teamwork
- Admin

Instructional Features

$$IQ = \frac{\textit{Actual} \text{ Instr'l Features [i.e., capability]}}{\textit{Ideal} \text{ Instr'l features [i.e., criticality] to support the skill}}$$

Media Fidelity
- Cockpit Fidelity
- Aerodynamics
- Field of View
- Aural Cueing
- Systems Fidelity

Media Attributes

$$MF = \frac{\textit{Actual} \text{ Media Fidelity [i.e., capability]}}{\textit{Ideal} \text{ Media Fidelity [i.e., criticality] to support the skill}}$$

Proficiency Points calculated for each skill, ACTC level & R+ month across FRTP. Proficiency points + SME estimates of learning rates produce *Hypothesized Proficiency curves*.

Skill Decay
- Prior learning
- Length of hiatus
- Task complexity
- Nature of skill
- Instructional support

Lack of Practice

$SD =$
Rate
Asymptote
"Grace period"

LEGEND: TO = Task Option; FRTP = Fleet Response Training Plan

BACKUP