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ARTIFICIAL INTELLIGENCE

A Force Multiplier for Flight Training



A wireframe airplane is centered on a runway at night. The runway is illuminated by blue lights, and the background features a control tower and other airport structures, all rendered in a wireframe style. The sky is dark with some stars visible.

How SATCE and Virtual Instruction Will Power Up Flight Training



CASE STUDY

Virtual Reality-based Flight Training within the US Navy

Benefits:

- Cost per training device is much lower than conventional FTD
- Footprint of VR trainer is significantly less than conventional FTD
- The visual effectively provides an unlimited field of view, ideal for Initial Pilot Training focused on VFR

Of course VR is not without **problems**:

- VR “sickness”
- The human-machine interface, flying is a tactile experience for much of the time

What's the real problem when you have lots of VR FTDs?

Conventionally you need lots of Instructors, ideally one per device.

But there are problems:

- There aren't enough instructors
- The instructor can't see what a student is doing directly
- Role-playing ATC is distracting to the adjacent VR device student/instructor

Perhaps some form of automated instruction could help?

Introducing the Virtual Instructor

A unique combination of game design fundamentals, AI and data analytics.



Delivers high-quality, self-guided, fully-interactive training:

**Real-time
instruction**

**Dynamic
feedback**

**Objective
scoring**

**Short and quickly repeatable scenarios
to maximize training time**

**But we are still
missing a very
important
piece... ATC**

Learning to use the radio remains one of the most challenging aspects for initial flight training

Even in our state of the art Level D full flight simulators, ATC remains human role-played, which was not an option here

Removing an instructor from the loop leaves a significant and critical deficit

**To support virtual instruction, we
need an automated ATC
solution...**

Fortunately this was already being worked on!

Completely in parallel, not connected to concerns related to VR training, development of Simulated ATC Environment (SATCE) had been in-process for many years to address the wider deficiency across all flight training devices.

So, what is SATCE?



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Let's Start With “Why” SATCE?

Without SATCE...

WHERE'S THE TRAFFIC?

**This is how current simulators
represent the world...**



...with SATCE

IN REALITY

**The airport and the skies are busy, filled
with threats...**



What does SATCE add?

- ATCs
- Other aircraft traffic
- Airport operations

LEADING TO:

- Immersion
- Crew workload
- ATC and traffic threats
- Consistent Radio/ATC training
- Reduced instructor workload



Data

**Speech
Recognition**

**Expert
Systems**

**SATCE is a training technology
leveraging several
core AI components**

Analytics

**Synthetic Speech
(TTS)**

**Error
Detection**



AI meet AI

A match made in 'virtual' heaven

The simple question asked was:

*"Could your AI, talk to another product's AI, **and work together?**"*

Fast forward a few months...

The Virtual Instructor (VI) and SATCE AI sub-systems are now 'talking'

A fully integrated self-paced training program is now available to the student

Both the VI and SATCE sub-systems report student progress to the LMS

SATCE system is also available for non-VI flights

System is available 24/7

Gamification of the training program is popular with the students

Significant improvement in graduation rate:

- Prior to the introduction of this technology graduation rate was 91% (2012-2022)
- 2023 graduation rate was 101% (the +1% are previously held-back students)

STATUS

The SATCE element has been deployed beyond the initial pilot training program to multiple conventional FTDs and OFTs.

The current capability has been deemed very promising and the program is planning to expand from the current 50 VR sleds to a total of 150 equipped with both VI and SATCE.

The same capability is now being added to two new US Navy flight training programs. One for helicopter training and the other for multi-engine aircraft training.

The program is being used as a flagship demonstration for other services (Air Force and Army).

Other uses of SATCE technology and VR include Embry-Riddle Aviation University, who have reported significant improvements in student ATC proficiency.

Vision for The Future?

The potential for self-paced learning supported by AI is powerful and cost-effective

Data analytics applied to metrics generated by these tools provide guidance on training focus to improve flight crew performance

Stepping outside of the conventional training pipeline can bring significant cost savings:

- Either through **improved outcomes** (101% graduation rate)
- Or a **reduction in the time required** to meet 'milestones' (Embry-Riddle 30-50% reduction in time from program entry to first solo flight)
- And **elimination of actual aircraft flight time** to learn ATC (major airline MPL program)

Thank You!

Neil Waterman

neil.waterman@asti-usa.com

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