Value of a Full Mission Simulator in the fighter world and the user/industry combined way to realize the project
Overview

- Why does the Air Force need a Full Mission Simulator
- What is a Full Mission Simulator (FMS)
- Why is high class training needed
- How to start the project to build a FMS
- Things to absolutely avoid while executing the project
- Work together or fail!
Why does the AF need a Full Mission Simulator 1

It all starts with an elected government, they set the frame work for the military

Out of this frame work the definition of ConOps alludes to certain capabilities for the aircraft and pilots in terms of excellence and numbers to fulfil the given political task.

After a choice of an government for the aircraft part 1 is done.

Part 2 is the pilots and their training.

Only once both conditions are met the government has what it has asked for.
Why does the AF need a Full Mission Simulator 2

In a normal process a pilot goes through ground school to the simulator not necessarily to an FMS.

Then the student pilot will fly the aircraft.
   If you have a fleet with single seaters alone a FMS is very helpful!

Once he can fly the aircraft he is ready to be trained for his real job.
Why does the AF need a Full Mission Simulator 3

A FMS is needed because many elements are difficult to train in the real aircraft due to resources or secrecy or environment:

Examples:

- Tanker ops
- EW
- Large forces
- Weapon employment and weapon accuracy
- Accuracy of the aircraft and the avionics
- And especially a combination of all this!
What is an FMS? 1

- A machine which replicates all features of a real mission and allows the instructor to fully control it

  - 100% behavior as the aircraft, not 99%
    - the key to this is to use a/c SW
    - cockpit and switches, particularly HOTAS
  - original pilot’s equipment Real Mission Data can be used and evaluated
  - sensor behavior real in fidelity, timing and performance
  - 360 visual (projector, Image generator (IG) with special effects)
  - Helmet Mounted Sight System (HMSS)
  - Night Vision Googles (NVG)
  - Direct Voice Input (DVI)
  - motion cueing vs full G
  - network capable (local and WAN)
What is an FMS? 2

- Computer generated Forces (CGF) performance for the flight, the sensors and the weapons
- Data Base (DB) with enough detailed libraries
- doctrine set up at a Scenario Generator (SG)
- Debriefing Station (DBS) with all sensors of everybody showing as well as all pilots actions and impressions, also for the one not looked at before during the life mission
- weapon flies from aircraft to target like the real one would with prelaunch data from the aircraft plus correct msl guidance and correct flight model
- countermeasures, fuses, detonation model,
Why is high class training needed

Standard Scenario the pilot has to survive and win
Why is high class training needed

Again, the answer is:

- We need pilots who can orchestrate any mission with the full suite of capabilities of the own aircraft and forces in an extremely hostile environment.

- Only these well trained pilots make the aircraft performance and capability equal to the aircraft and weapon specifications.

- This is only trainable in a FMS.
Today's still existing boundaries for Fighter Pilot Training

In 2018 technology only provides an add-on

Cognitive Tasks
Workload & Environment Stressors and physical stress

Current Simulators

Real G sim

Level of Simulation Fidelity
motion cueing with real Gs

the G wall in simulation
How to start the project 1

- Out of your ConOps users derive their User Requirements
- Discussion between the users (instructor pilots, auxiliary personal) and the industry building it, has to be executed intensively.

- Each user Requirement has to be understood by all participating persons at the same time resulting in User or Engineering stories
- Which is nothing else then a written explanation in engineering language about the User requirements

- Latest in SDRs, PDRs and CDRs the whole community from users and industry has to meet again for clarification issues.
How to start the project 2

- After the CDR there must be a customer POC for further clarification issues.
- Test manuals have to be agreed between the parties and have to be corrected over the time up to a certain maturity level of the product.
- During the integration their must be Quality Gates (QG) held, the first ones as paper, later ones as hands-on exercises.
- Out of these QGs further fine-tuning and prioritization will result.
How to start the project (or not)

- Usual mistakes

- Not to take the time to discuss all points in detail with the whole community before starting the development
- Engineering likes to use methods and SW they have already used without realizing, that the world has continued to turn
- For so called timing reasons many of the requirements reviews or quality gates are not done with the full community.

- Biggest one: Users not reviewing the details at the beginning!
- The later the changes, the bigger the impact!
Work together or fail

- To build a FMS is such a complex task that it needs permanent user attendance or observation.

- The „permanent“ can be mitigated and reduced to the reviews and gates in case there are. „skilled users“ provided by industry.
All tasks from overview fulfilled?

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- Things to absolutely avoid while executing the project

- Work together or fail!