



Center for a
New American
Security

Can Automation Reduce Training Costs?

*A Preliminary Assessment Based on a Comparison Between
U.S. Air Force Manned and Unmanned Aircraft Pilot Initial
Qualification Training*

Paul Scharre

Fellow and Director of the 20YY Warfare Initiative

Web: cnas.org/20YY Email: pscharre@cnas.org

October 13, 2014

Can Automation Reduce Training Costs?

Hypothesis:

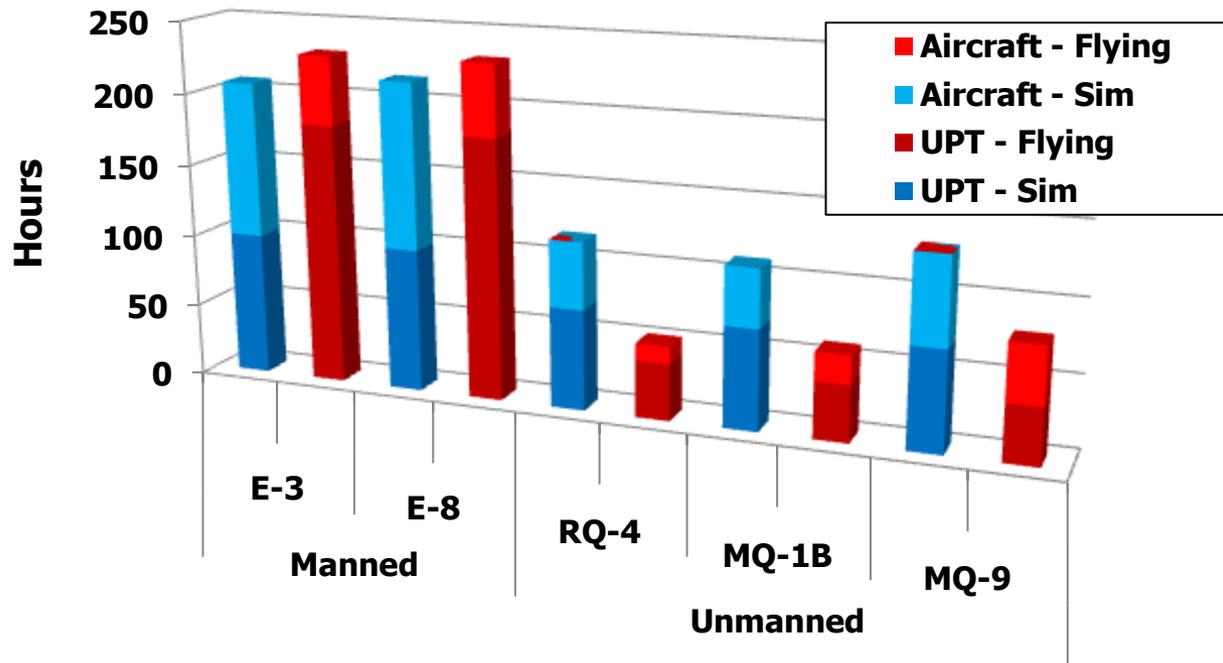
1. Unmanned aircraft need fewer flying hours for training because, with no “seat of the pants” feel to be gained from being in the aircraft, simulators can be used for a greater percentage of training.
2. Flying hours are reduced even further for aircraft incorporating a high degree of automation, since pilots do not need as much time to learn aircraft flight controls.
3. Some flying hours are still needed for mission qualification, but at a reduced rate because even some mission training can be done via simulator.

Summary of Analytic Approach

- In order to evaluate hypotheses, compare U.S. Air Force training pipelines for manned and unmanned aircraft
- Why Air Force?
 - Air Force unmanned aircraft are operated in theater-level support, vice primary role of Army, USMC, and Navy unmanned aircraft at tactical level. Allows closest comparison to manned aircraft.
- Data limitations:
 - No single aircraft available in unmanned and manned variants, allowing a direct apples-to-apples comparison.
 - Different aircraft & different missions makes comparing training difficult
- Mitigation measures:
 - Compare unmanned aircraft to manned intelligence, surveillance, and reconnaissance and command-and-control aircraft for closest comparison
 - Break down hours by specific training task in order to better isolate deltas due to different aircraft vs. different mission

Manned & Unmanned Aircraft Comparison

Flying and Sim Hours for Undergraduate and Aircraft-Specific Initial Qualification Training



Difficult to make comparisons

- Different aircraft
- Different missions

However, can draw some conclusions:

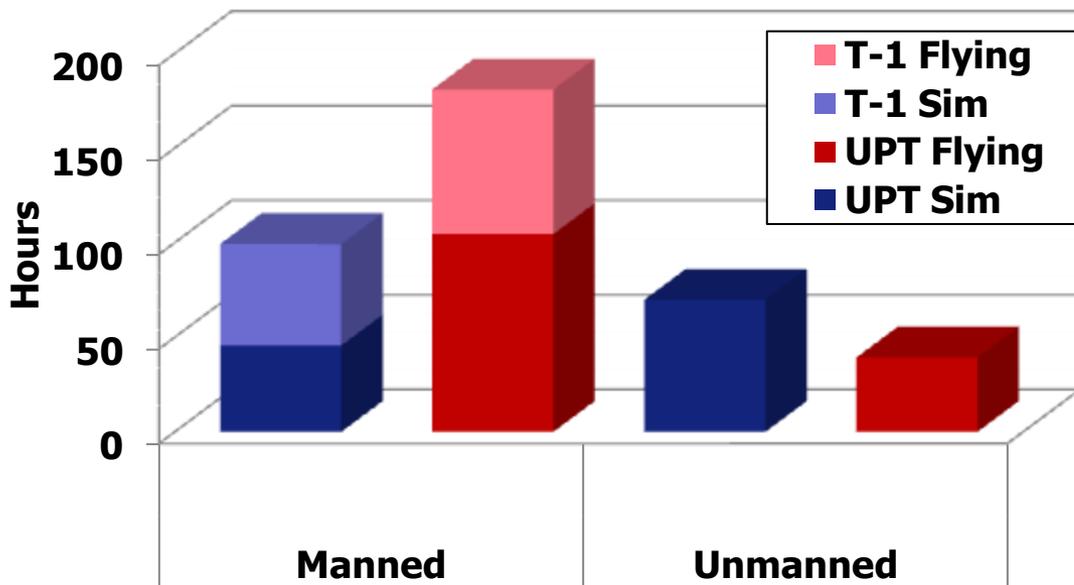
- Ratio of sim-to-flying hours is drastically different for unmanned.
- This is most significant in the RQ-4 which has a high degree of automation.

Note: U-2 and MC-12 training are not included because they use transition pilots already qualified in other aircraft.

UPT = Undergraduate pilot training

Undergraduate Training Comparison

Sim and Flying Hours for Undergraduate Training



Undergraduate training, which occurs prior to aircraft-specific training, allows a more direct comparison.

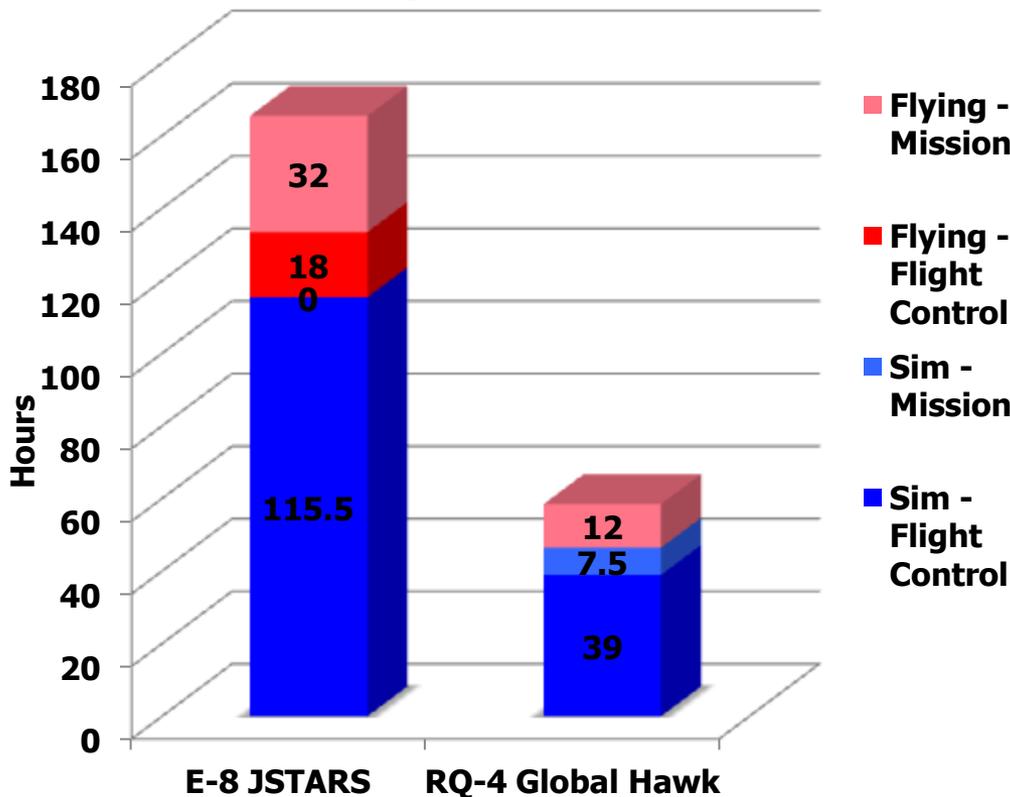
Unmanned aircraft undergraduate training has significantly fewer flying hours (62% fewer), even without counting follow-on T-38 or T-1 training required for manned aircraft before beginning aircraft-specific training.

Manned undergraduate pipeline: Initial flight screening + T-6A primary training + T-1 / T-38 training (highlighted separately)

Unmanned undergraduate pipeline: Remotely piloted aircraft (RPA) pilot flight screening + RPA instrument qualification + RPA fundamentals course

Initial Qualification Training Comparison

RQ-4 Global Hawk vs. E-8 JSTARS Initial Qualification Training Comparison - Mission & Flight Control Hours



Detailed comparison of initial qualification training sheds further light on savings:

Manned aircraft require actual flying to learn to control the aircraft. For RQ-4, all training to control the aircraft occurs via simulator.

And a significant fraction of mission training (38%) is now conducted via simulator, which for E-8 did not even begin until the flying phase.

Can Automation Reduce Training Costs?

Hypotheses appear supported by USAF training comparisons:

- ✓ Unmanned aircraft need fewer flying hours for training because, with no “seat of the pants” feel to be gained from being in the aircraft, simulators can be used for a greater percentage of training.
- ✓ Flying hours are reduced even further for aircraft incorporating a high degree of automation, since pilots do not need as much time to learn aircraft flight controls.
- ✓ Some flying hours are still needed for mission qualification, but at a reduced rate because even some mission training can be done via simulator.

Second-order savings includes:

- Reduced training infrastructure
- Fewer instructors needed
- Fewer aircraft needed for training
- Fewer flying hours = fewer attrition aircraft

Conclusions

- Cost analysis of future unmanned aircraft programs should take into account cost savings enabled by increased automation.
 - Training is needed to perform the mission, but not to “fly” the aircraft. Simulators can replace all flight control training and a significant fraction (~40%) of mission training.
 - Same principle should apply to recurrency training as well. No need to stay current on skills to control the aircraft. Actual flying hours only needed for large exercises.
 - Second order savings in reduced buys for training, depot, and attrition aircraft.
- These savings should be particularly significant for carrier aircraft where pilot training and recurrency for carrier landings accounts for a significant amount of flying hours.