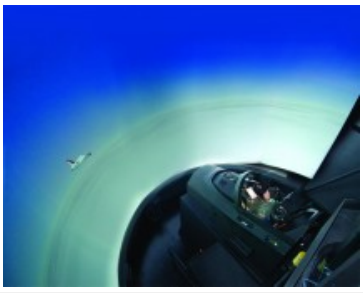
Virtual Bargain

Can more simulation cut flight training costs?



Written by: Eric Tegler on November 11, 2011

Categories: Aerospace, Programs & Tech

Tags: Military News, Training and Simulation, US Military

Comments: No Comments

Lt. j.g. Jon Michael Chombeau, a flight student assigned to Training Air Wing (TRAWING) 2, Squadron 21, conducts ground flight training in the T-45C visual simulator at Naval Air Station Kingsville. The T-45C simulator produces a 180-degree video in a dimensional perspective for realistic flight perception. U.S. Navy photo by Richard Stewart

Flight training is costly. The Air Force spends roughly $2.6 million to train a fighter pilot and roughly $600,000 to train an airlift pilot. The Navy spends a similar amount to train carrier aviators. With U.S. defense spending set to decline amid Super Committee deliberations, reducing the price of producing pilots will be one of many “cost efficiencies” the armed forces must find.

When it comes to flight training, one of the most common cost-saving suggestions is the increased use of simulators, saving airframe hours, maintenance, and fuel. Seems logical, but following through is far from simple. Could increasing the use of simulators in undergraduate pilot training significantly reduce its cost? The answer appears to be a definite … maybe.

For insight, Defense spoke to both the Air Force’s Air Education & Training Command (AETC) and the Navy’s Chief of Naval Air Training (CNATRA) but it should be pointed out that the U.S. Army has apparently decided that flight training simulation can lower its costs. The Army’s Flight School XXI program at Fort Rucker, Ala. is moving to make contractor-provided simulation the major part of initial flight training for its pilots.

A commercial team led by CSC has built a

Latest Edition

View all Publications »

Defense - Fall

Photos | Videos

Coast Guard Outlook Photo Favorites

View all Photos »

View all Videos »

Featured Industry Profiles / White Papers

View all Aerospace Profiles / Papers »

new 136,000-square-foot facility at Fort Rucker dubbed 'Warrior Hall,' which hosts 38 aviation training simulators. CSC is responsible for all aspects of the facility from building security to simulator and facility operations and maintenance. In a separate government facility, collective training consists of 18 reconfigurable training devices that can communicate with each other and be reconfigured into a specific aircraft with exchangeable panels and software.

Flight simulators at Warrior Hall help U.S. Army Flight School XXI students learn flight techniques and instrument control without the aid of actual aircraft. Recently, flight students passed the 250,000-hour mark in TH-67 Creek simulator training. U.S. Army photo

The contractor team has worked with the Army to adapt its basic syllabus to allow the service to meet its long-term training objective – several months of 60 percent simulation and 40 percent live training. This balance of simulation and live flight represents a revolution in basic flight training.

> *The Navy and Air Force (USAF) have yet to make such a commitment to the use of simulation. Obviously, the scale and breadth of their respective training commands differ markedly from the Army, but both express degrees of inclination to head in the same direction.*

John Gillis is the Undergraduate Flying Training Pipeline Manager, A3F Undergraduate Flying Training Standardization Division, Headquarters AETC. He makes the point that the current Air Force live flight/simulator training balance varies from pipeline to pipeline. Primary training that all USAF pilots go through in the T-6 Texan II demonstrates the current emphasis on live flight. The division between live flight and simulation events is 65 percent/35 percent. That equates to about 87 hours in the aircraft and 46 hours in the simulator.

T-38 Talon pilots prepare for takeoff Jan 26, 2011, at Whiteman Air Force Base, Mo. U.S. Air Force photo by Senior Airman Kenny Holston

For the airlift/mobility pipeline where students fly the T-1 Jayhawk, the current balance is similar, 71 percent of events occurring in the aircraft and 29 percent in the simulator. This will shortly change, however. The USAF is working its way through a "tech refresh" of its T-1 simulation devices, which will grow significantly in capability. With T-1 flight training total time scheduled to drop to 130 hours, the pipeline will move toward a 60/40 percent live flight/simulator split by 2013. This represents 76.5 hours of aircraft time and 53.5 hours of simulator time.

As the Air Force's upgrade to the TH-1H Iroquois helicopter with its new engine and glass cockpit progresses, the live flight/simulator balance for rotary-wing students will go from 77 percent/23 percent to 74 percent/26 percent. The fighter-bomber track sees students in the venerable T-38C Talon 71 percent of the time, comprising 96 hours, and in the simulator 29 percent of the time or 39 hours.

All of AETC's flying training programs have seen reductions in flight time according to Gillis, particularly the advanced training tracks, in which flight time has dropped by 15 percent. Some of this is by design. The airlift/mobility track's less dynamic, more procedures-oriented type of flying allows for a different live flight/simulator balance.

> *"We are adding some things to the syllabus that lend themselves particularly well to the simulator," Gillis said. "For example, the T-1 currently flies simulated air-refueling in the air. They go out and fly the simulated rendezvous, take the airplane to a pre-contact position. In the*

simulator, we'll be able to take that training a little farther. We'll also be able to do more low-level training [in the simulator] with the new visual system which has a database down to a meter resolution. We can fly a lot more realistic low-level in the sim and there's a complementary relationship between what you do in the simulator and what you do in the airplane."

Postgraduate flight training is headed in the same direction Gillis added. Squadron level formal airlift/mobility training units at Altus Air Force Base (AFB) and Little Rock AFB are employing increasing amounts of simulation. For some airlift aircraft, most of the training is done via simulator. Only a couple of events, including the aircraft check ride, are done as live flight sorties.

However, the USAF remains biased toward live flight in undergraduate pilot training, particularly for beginners Gillis said.

"The issue for us has always been how important it is for an ab initio student to get live flight experience. Only then can he really appreciate what goes on in the simulator."

T-45C Goshawk training aircraft are prepped for flight operations aboard the aircraft carrier USS Dwight D. Eisenhower (CVN 69). Dwight D. Eisenhower was under way assisting Chief of Naval Air Training (CNATRA) in preparing naval aviators for future carrier-based operations. U.S. Navy photo by Mass Communications Specialist 3rd Class Erick Kogler

Simulation is viewed as complementary to flying, but the reverse is also true.

"There's an opportunity with the T-1 pipeline, especially with the simulator tech-refresh, for a more complementary syllabus. We've tried to do that in the past. With a basic student you'd do a lot of procedures up front and then put him in the airplane, from which he comes back to the simulator occasionally. Today a T-1 training block may have ten aircraft sorties in it. We're looking at maybe six in the airplane and four in the simulator, so as students go along, there will be a back and forth approach."

On the Navy side, enthusiasm for the possibilities and cost efficiency of simulation may be a bit higher. Nonetheless, the current breakdown between live flight and simulation looks much like the balance at AETC. Simulator time accounts for between 26 and 29 percent of flight training events said CNATRA Simulator Requirements Officer Wilfred Merkel. Those averages hold across multiple tracks within and between the various pipelines. Like their USAF counterparts, naval aviators receive primary training in the T-6. Rotary-wing students move on to the TH-57 Sea Ranger, multi-engine students step into the T-44A Pegasus, and fighter/attack students progress to the T-45B Goshawk.

"We think we can eventually modify the syllabus to move to an overall goal of being somewhere in the high 40 percent range for [the] simulation proportion of flight training," Merkel explained. "Going from the high 20s to high 40s is a challenge but it's what we think we can accomplish in most of the syllabi."

Of course that goal hinges on having the right training devices.

"At CNATRA, we have a vision of a training spectrum of devices and we're applying that in our roadmap," Merkel said.

Don’t get the wrong idea from the word “roadmap’” he stressed.

This screenshot shows flight simulation software created by Air Force researchers who leveraged existing commercial gaming software to demonstrate an alternative way to quickly deliver a low-cost, realistic simulation program with genuine training effectiveness. Researchers integrated the graphics-rich commercial package with high-fidelity real-world aircraft models. U.S. Air Force image

There is no formal, programmatic effort to bring a new array of training devices to the command. It’s more of a philosophy that CNATRA will try to realize where it can. Merkel said the desire is to see devices, ranging from laptop computers that allow students to practice using and accessing information provided by modern digital integrated avionics systems on multi-function displays (MFDs), to ground training devices with flat panel control presentations, interactive cockpit procedural trainers with basic controls, unit training devices (lower-end simulators with visual presentation), and finally to full-blown operational flight trainers with high-fidelity visuals and motion.

“We think there’s a place for each one of those, and we’re in the process of acquiring some of the laptop and basic devices for our T-6,” Merkel said. “The example I give is that in the days of round gauges, you could hand the student a flight manual of a couple hundred pages and they could flip through every option that every instrument could give them.

> *“Today, there are thousands of options that any MFD can present. The only way to have students learn glass cockpits is to give them something that functions like the actual cockpit device, laptops or desktops running software like or similar to the onboard version.”*

AETC has desktop representations of cockpits for some its types as well. Just like the most complex and sophisticated operational flight trainers, these simpler devices offer a key cost advantage – availability.

“We’re training in different parts of the country where we may have a thunderstorm every afternoon, bad weather at night, hurricanes a couple times a year,” said Merkel, a former USAF flight instructor himself. “We can run a simulator 16, 18, or more hours a day and turn it back to back. So a single simulator is giving eight, perhaps 10 events a day. We can generate sorties all day.”

With weather not an obstacle, the follow-on advantages in scheduling and syllabus progression should further reduce costs. How much? No one really knows. Both the Navy and Air Force have done marginal cost comparisons of a sort, but not to the level of detail really necessary to divine whether real savings would accrue or not.

Gillis confirmed that AETC leaders are in discussion about the impact of likely budget cuts and that there are several working committees assessing various aspects of the command’s cost structure. Energy is chief among them, and Gillis sits on an AETC panel that takes a holistic view of energy usage, which would theoretically include simulation.

Merkel admitted that CNATRA isn’t sure whether increasing the use of simulation would absolutely lower the overall cost of flight training, at least in the short run. “The initial acquisition per singular device can very well exceed the cost of a single airplane,” he said.

High-fidelity full-motion simulators are expensive, $10 million to $12 million per copy, in fact. The lack of certainty underscores the fact that no one has yet defined the variables that go into calculating flight training simulation costs versus live flight costs.

“We’ve got a lot more fidelity on cost per flying hour than for cost per simulator hour,” Gillis said. “It depends on how you do the calculation. When you buy a simulator you have an up-front investment, the cost of the facility it goes into, power, HVAC, all the things that go into it. You have to decide how to divide that up – can it be done per hour over the life of the simulator?”

Midshipman 3rd Class Juan Vielma, a student at the Illinois Institute of Technology, pilots a helicopter simulator while learning about the various job opportunities for prospective Navy and Marine Corps officers. Midshipmen in the Navy ROTC were touring the military installations in the San Diego-area for Career Orientation and Training for Midshipmen (CORTRAMID) to get an idea of what they want to do during their military careers. U.S. Navy photo by Mass Communication Specialist 2nd Class Alan Gragg

Energy consumption, maintenance, and the cost of outsourcing are more variables. Both AETC and CNATRA use contractor-provided simulator instructors. Running the bid process and awarding the contracts are costs that could be factored in to any calculation. Curiously, AETC is moving to bring simulator instruction and academic instruction back into its fold, converting those contractor slots to government civilian positions.

CNATRA has toiled with the possible cost calculations as well. Merkel asserted that to have a proper comparison one would have to lay out exactly which variables would need to be included on both the simulation and aircraft sides. That would include various value-added simulator attributes such as being able to include training events too dangerous to train to in live flight (extreme spin recovery, rotary-wing vortex ring state). There have been suggestions that were such a calculus properly done, the aircraft would likely cost six to 10 times as much as the simulator.

> *“What if the [costs] were absolutely equal?” Merkel asked. “If flying an aircraft cost exactly the same amount as running a simulator, would you still want to do the simulation? You probably would, because of all those other things. Would you want to do it all? Probably not. There’s intrinsic value in just getting air under your wings and experiencing the stressors of actually being in the aircraft.”*

Simulation is doubtless an effective teaching tool that presents opportunities that live flight does not. And the computing power necessary to render highly realistic visuals in concentrated spaces, Merkel pointed out, is accelerating at the same rapid rate as commercial technology, holding the promise of lower costs in the future. Nevertheless, integrating the right “spectrum of devices” to significantly alter the balance of simulation versus live flight in undergraduate pilot training isn’t free.

The irony is that even if significant reductions in flight training costs are achievable using a higher degree of simulation, the forces tightening the defense budget may prevent the services from making the initial investment in simulation devices necessary to get there.

This article was first published in Defense: Fall 2011 Edition.




Leave a Comment

Log in now for instant approval. Not a member yet? Become a member today!

Name *

Email *

Website

Notify me of followup comments via email

Submit Comment »

Our Newest Tweet

Follow us » on twitter

DefenseMediaNet: [Photo Slideshow] A Herd of Hercs, a Knot of Phrogs, and a Warthog's Welcome Home http://t.co/BpkdWGVO
Thursday, November 10, 2011

Categories

- Defense-Wide
- Aerospace
- Land Forces
- Naval
- Spec Ops
- Homeland Security
- VA / MILMED
- Multimedia
- Profiles / Papers

Tag Cloud

Military News, Issues, Military History, US Navy, US Military, US Army, US Marine Corps, US Air Force, Research and Development, Programs, US Coast Guard, World War II: 70 Years, Centennial of Naval Aviation, Rotary-wing Aircraft, Fighter Aircraft, Commentary, C4ISR, Small Arms, Attack Aircraft, Armored Fighting Vehicles, Surface Ships, Desert Storm Anniversary, Training and Simulation, Logistics, Tactical Vehicles