Private F-16 Aggressors Getting Ability To Insert Synthetic Bandits Into Live Training

Top Aces' new constructive wingman initiative will make it appear that another aggressor is in the air to enemies and friends alike.

ERIC TEGLER / UPDATED MAR 3, 2025 2:19 PM EST / 44 / ADD TWZ

COURTESY OF THOMAS BACKUS

The TWZ Newsletter

Weekly insights and analysis on the latest developments in military technology, strategy, and foreign policy.

Enter your email

SIGN UP

Terms of Service and Privacy Policy

As the Air & Space Forces Association's annual Air Warfare Symposium kicks off today in Aurora, Colorado, private adversary air company Top Aces is previewing its new "constructive wingman" capability that will begin test and evaluation on its F-16A/B aggressor aircraft starting this spring.

The constructive wingman is essentially a synthetic aircraft that Top Aces' F-16 aggressor pilots can control from their cockpits. It is inserted digitally into the sensor 'pictures' of both the aggressors and the aircraft training against it. While there is no aircraft physically added to the aerial engagement, for the aircrews involved, it appears as real on their cockpit displays.

The artificial intelligence and algorithms that comprise the constructive wingman are based on software developed by EpiSci (now merged into Applied Intuition), a company that *TWZ* has covered in relation to its work with the Defense Advanced Research Projects Agency's (DARPA) Alpha Dogfight program and subsequent live-flight augmented reality dogfights with AI agents.

Adding one or more synthetic wingmen to a red air sortie complicates the tactical picture for the blue forces that train against Top Aces' aggressors and can do so at very little cost. Among its activities, the company provides aggressor training through the Air Force's Combat Air Force Contracted Air Support (CAFCAS) program to F-35 pilots going through Formal Training Units (FTUs) at both Eglin Air Force Base in Florida and at Luke AFB in Arizona.

F-16s from Top Aces refueling alongside Luke-based F-35s. (USAF)

Students at both locations go through an eight month B-course (basic course) as they transition to the F-35, learning to employ its deep capabilities in a variety of missions including offensive/defensive air to air.

In beyond visual range (BVR) scenarios, the extra synthetic aircraft that Top Aces plans to introduce represent more targets for the new F-35 students to grapple with, and larger and more varied formations than they would typically see with only live aircraft or in fully simulated training environments. It also fits in with the USAF's push to more deeply integrate seamless live, virtual, and constructive training, which you can read all about in our previous explainer here.

Live And Constructive Aircraft Pump Up Real World Stress

The War Zone spoke with Top Aces' vice president of business development, Brian "Taz" Delemater, and the company's director of enterprise technology, Aaron "Fang" Steffens, about the added training value that the constructive wingman capability could offer.

As Steffens acknowledges, seeing expanded formations of mixed real and synthetic adversary aircraft, which all appear as legitimate target tracks, while

actually in the air ratchets up psychological pressure on blue force students that simulated environments cannot.

“That’s the thing about live training. There are so many things you can and want to do in a virtual environment right now, especially high-end tactics. But we don’t think there’s a replacement for live training with real airplanes out there. It changes the dynamic on how the student, or even an experienced instructor, is thinking when moving at speed. There are other live aircraft out there that are trying to shoot you and there’s an element of risk.”

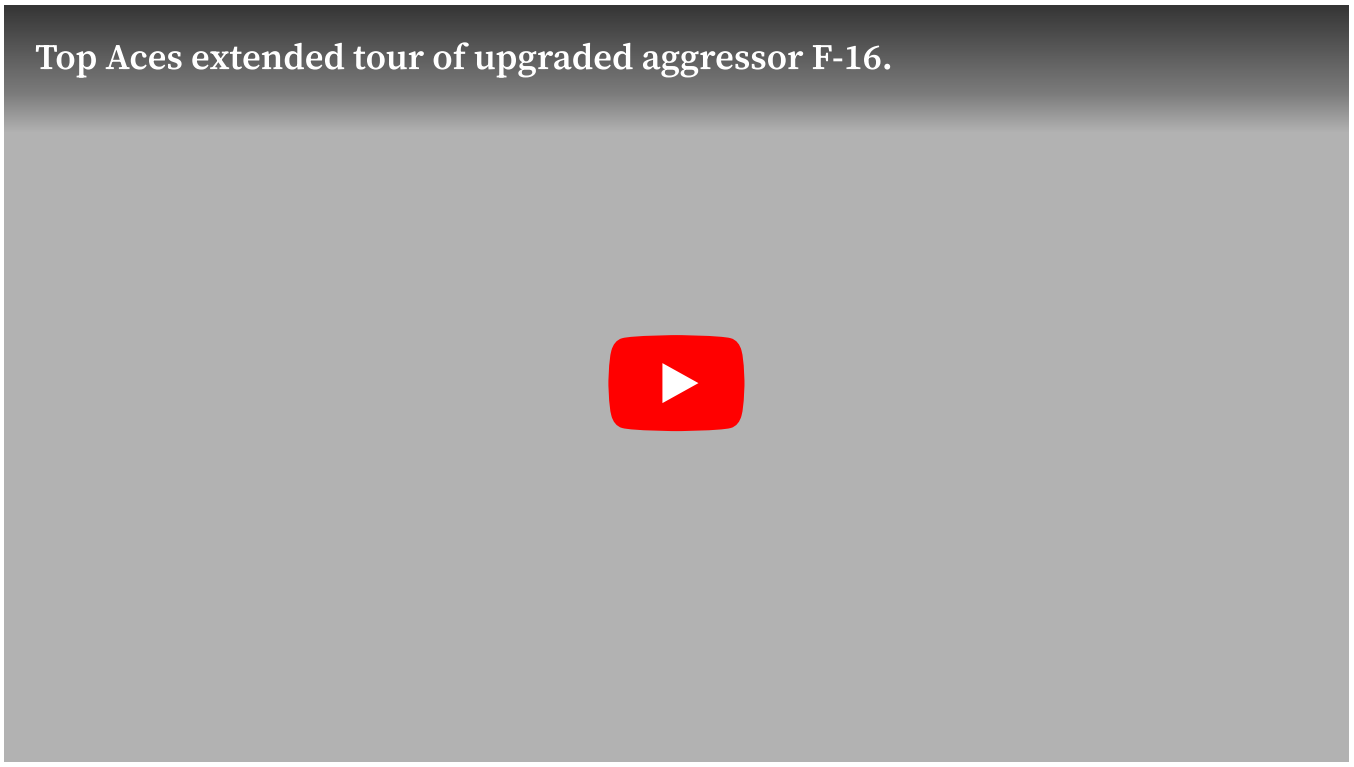
Mixing constructive and live aircraft in an airborne training environment could provide highly valuable lessons for F-35 pilots who often train in flight simulators to replicate fifth-generation adversary threats and threat environments that cannot easily be recreated in the real world.

The War Zone has extensively covered Top Aces in recent years, detailing its operations and its acquisition of ex-Israeli Air Force F-16A/B Netz fighters, as well as the capabilities it has added to them. These include active electronically scanned array (AESA) radars, infrared search and track (IRST) systems, and a proprietary open mission system called the Advanced Aggressor Mission System (AAMS).

But it’s important to point out that these capabilities reside in just a handful of Top Aces’ F-16s, which the company refers to as its F-16 AAF (Advanced Aggressor

Fighter). Top Aces began receiving the ex-Israeli aircraft in 2021, eventually acquiring 29 of the fighters.

By mid-2025, 14 of these will be airworthy and mission-ready. As of now, four jets are configured to the AAF standard including Link-16 datalinks and a Thales Visionix Gen III Scorpion helmet-mounted display system (HMDS), in addition to the capabilities mentioned above.



Obviously, AAF jet use is at a premium which is why they are heavily tasked with aggressor training for fifth-generation blue forces. Top Aces has stationed four of its F-16s at Eglin and another four at Luke. Two of the jets at each location are AAFs. Adding constructive wingman capability to these would effectively increase the number of enemies Top Aces can present to F-35 students in a given sortie.

How It Works

Top Aces has developed constructive wingman software through its own Patuxent River, Maryland-based integration lab. Much of its work has centered on building out the pilot-vehicle interface for the new capability.

The constructive wingman will be managed by Top Aces' aggressor pilots through a multi-functional display (MFD) on the lower center pedestal panel in the cockpit rather than via a knee-mounted tablet display as has become common with other additive AI-based systems. Pilots will use standard HOTAS (hands on throttle and stick) controls to command the constructive wingman.

Top Aces Viper cockpit. *James Deboer*

The software is integrated through the company's AAMS and the constructive wingman is presented via Link-16 data-link to the blue forces and other Top Aces

aggressor aircraft. The F-16 AAF pilot sees his constructive wingman on his MFD "just like you would see a radar track or anything else," Steffens explains.

Before engaging during a red air sortie, the Top Aces pilot sets up the constructive wingman for desired formation offset and spacing. The virtual aircraft can be put into any kind of formation to give a beyond visual range look that matches the sortie training objectives.

"This is the same way that we would look to direct a manned or unmanned live wingman," Steffens says. His mention of unmanned aircraft is purposeful.

An image showing the Advanced Aggressor Fighter F-16's multi-function display capability screen. It provides high-situational awareness displaying information from the radar and other onboard sensors as well as from other platforms via data-link. Tracks are also projected in the pilot's Scorpion helmet-mounted display system. It also shows weapons engagement envelopes for threat profile simulation., *James DeBoer*

Delemater points out that Top Aces sees its constructive wingman capability as a possible prelude to training with mixed manned-unmanned formations using the same control methodology. The concept of unmanned aggressor aircraft, called ADAIR-UX, was viewed with enthusiasm a couple of years ago as *TWZ* highlighted but has since been overtaken by the increased focus on collaborative combat aircraft (CCAs).

But unmanned aggressors may yet find favor. Until such time, Top Aces reckons that its constructive wingman could add immediate value and experience that may later translate to some form of ADAIR-UX.

After configuring his constructive wingman, the Top Aces pilot will give general commands to it on how to engage blue forces. “You’re telling him to be West, now turn ‘hot’, to drag-out,” Steffens says, “those kinds of higher level directions just like you would give to a live F-16 wingman, you just cue them through the hands-on throttle and stick [controls].”

The AI engine then “flies” the constructive wingman, maneuvering the synthetic sensor target with faithful kinematics. The AAF pilot can see the maneuvering as part of the friend-foe target tracks on the F-16’s MFD.

Blue force F-35s see the same combination of maneuvering real and synthetic aggressor aircraft on their displays. The constructive wingman is transmitted from the Top Aces F-16 via Link-16 and appears as a real adversary aircraft in the F-35’s missions systems and cockpit display.

For a given sortie, Top Aces can change the kinematics of the constructive wingman as well. “We could have it fly like an F-16, we could have it fly like a different type of adversary aircraft as well,” Delemater adds.

Top Aces F-16s flying in formation. *James DeBoer*

As a blue force-red force engagement proceeds and possibly closes to shorter-range, the constructive wingman may no longer populate the blue force/red force

operating picture rendered via Link-16. That's because physically merging with Top Aces' constructive wingman is not possible.

To ensure that any remaining synthetic targets disappear or are disregarded as red and blue forces physically merge, Steffens explains that, "We would develop a plan with the blue lead or instructor of record and the range training officer [RTO] beforehand. If there is an RTO, which is usually the case, particularly for larger fights, they can handle it all in real time. If there's no RTO, there are still ways to manage [the constructive aircraft] depending on the training scenario. Then any discrepancies would get ironed out in the debrief."

That would leave live aircraft to tackle the close-in fight if the training sortie calls for such a scenario, Steffens noted. "Then, they have the highly maneuverable live F-16s that they're actually merging with."

Steffens adds that most of the B-course training flights that Top Aces does are scripted to provide targeted training to the F-35 student — working out a plan in advance is common and not difficult.

Given the one constructive wingman-per-AAF Viper capability, the current maximum four-ship formations that Top Aces can fly at Eglin and Luke could become six-ship formations — a flight of two standard F-16s and two AAF-configured F-16s that are also controlling two synthetic wingmen.

However, Delemater told *TWZ* that a future iteration of the constructive wingman software may allow one F-16 to project/control two synthetic aircraft. As experience with the constructive agents is gained, the company will be able to assess what sort of workload directing two synthetic targets would impart to pilots. Such experience may eventually extrapolate to cockpit control of unmanned aggressor aircraft as well.

"We're going to continue to develop the capability," Delemater affirms. "A lot of it depends on how OT&E goes and the feedback from the customer."

The Value Proposition

Top Aces executives point out that the constructive wingman effort is entirely driven and funded by the company and its partners, including EpiSci, which Top Aces has an ownership stake in. As things stand, there is no U.S. Air Force or Navy requirement for contract aggressor-generated constructive target capability.

But if the company can demonstrate enough bang for the training buck, the services might become interested. Real aggressor aircraft and pilots are extremely expensive, if essential, training tools. Added constructive capability could stretch the return on investment from training beyond presenting taller challenges to blue forces.

Simple math illustrates the cost efficiency potentially gained with constructive wingman capability. Top Aces declined to share information on the cost of operating its F-16 AAFs with *TWZ* but some rough estimation is possible.

Steffens confirmed that the average red air sortie for Top Aces F-16s has a 1.3 to 1.6 hour duration based on factors such as transit distance to ranges and time in afterburner. According to recent estimates, the USAF cost per flight hour (CPFH) of operating an F-16C is approximately $27,000. Using this number and given a 90-minute aggressor training flight, the cost of flying an aggressor F-16 may be on the order of $40,500 per average sortie.

Top Aces F-16 flies off the wing of a tanker. (USAF)

It's worth noting that contracted red air support is traditionally less expensive all-in than the cost of organic red air support with a similar aircraft from within the service, but many factors impact cost. Regardless, it's not massively different as fuel and maintenance and other primary factors are what they are for a given type.

So, adding another F-16 or two could cost an additional $40,000-$80,000 per sortie. Top Aces' potential fee for adding constructive wingman capability is unknown but the cost is theoretically a tiny fraction of flying one or two additional real aircraft, and this would largely be up-front investment for Top Aces, not a high per-sortie expense.

"For the price of one F-16, they're going to get two," Delemater asserts. Steffens adds that "at range, they can get multiple targets for the price of one."

Zoom out and look at the total expense of adding real vs. synthetic targets across the F-35 B-course syllabus and the cost differential should grow markedly in favor of the constructive wingman.

NEWSLETTER SIGNUP

Weekly insights and analysis on the latest developments in military technology, strategy, and foreign policy.

Enter your email

SIGN UP

By signing up you agree to our Terms of Service and Privacy Policy.

Top Aces distinguishes their EpiSci AI-driven constructive wingman from other synthetic entities because it can be manipulated from the cockpit rather than by an operator typically on the ground. Eliminating the need for ground control of the constructive wingman and shifting it to the cockpit potentially represents further savings.

Top Aces has yet to formally brand or name the capability because of copyright concerns. The company was on the precipice of previewing its constructive wingman at last September's AFA Air, Space & Cyber Conference in Washington DC, planning to use the moniker "Red 5."

But a release on the capability was pulled, partly out of concern about copyright infringement. According to Top Aces' vice president of business development, that was not the only reason. Delemater said the constructive wingman was and is awaiting clearance from DoD to use specific Link-16 transceivers to facilitate its function.

He added that the (USAF) customer "hasn't been in a rush" to add the capability. "We also thought that maybe it would make more sense to wait until we were closer to being able to truly demo this."

Demonstration will unfold within what Top Aces refers to as a series of operational test and evaluation flights slated for some time this spring. The Air Force will likely sit-in on these flights, which will be done from Eglin Air Force Base. If the capability is appealing enough, the service could build it in as a requirement for the CAFCAS program. That could lead to introducing it elsewhere.

Asked whether Top Aces views its constructive wingman as a value-add for advanced training exercises like Red Flag or the recent Bamboo Eagle, Steffens replied in the affirmative. "We're a deployable exercise force. We do that quite a bit with our customers in multiple exercises and we could bring this constructive wingman capability with us."

Top Aces F-16s at their headquarters in Mesa, Arizona. *James Deboer*

Top Aces might also bring the capability to overseas customers. At least one of the company's A-4N Skyhawks based at Wittmundhafen in northern Germany has been upgraded to full AAF status with the AESA, IRST and AAMS capabilities that its quartet of AAF F-16s have. Adding constructive wingman capability to more of these aircraft would make sense, Steffens says.

"If you think about it, there are going to be 600 F-35s over there. The ability to train against more targets at range and still have live assets out there for all the reasons we've discussed would have value overseas as well."

If the constructive wingman is adopted for aggressor training in the U.S. and abroad, its presence won't be obvious. While the IRST pods, special antennas, and pilots wearing the Scorpion helmet-mounted displays that signal AAF aircraft might be discernible, the software that enables the constructive wingman is as physically invisible.

The outcome of its potential success may one day be seen by the naked eye if the constructive wingman experience leads Top Aces on a path to realizing an ADAIR-UX-like capability.

"Our company still believes that there's a significant benefit to moving forward with unmanned aircraft in an adversary training environment," Steffens concludes.

Contact the editor: Tyler@twz.com

Eric Tegler
Contributor

AMERICAS >
AROUND THE GLOBE >
NEWS & FEATURES >
U.S. HOMELAND >

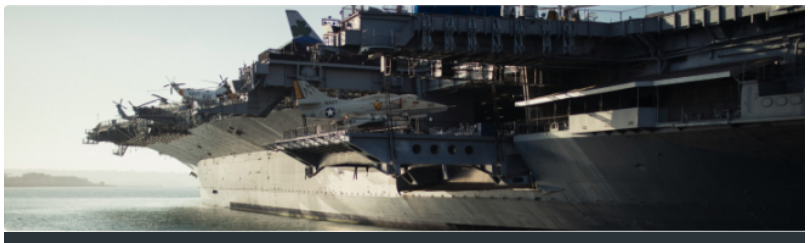
LATEST IN TOP ACES

Top Aces ex-Israeli F-16s are receiving upgrades, including new avionics, radars and infrared search and track systems.

TYLER ROGOWAY

IRST sensors present particular challenges for stealthy aircraft and there is growing demand to include them in training and testing.

JOSEPH TREVITHICK



THE WAR ZONE WIRE

Weekly insights and analysis on the latest developments in military technology, strategy, and foreign policy.

SIGN UP

By signing up you agree to our Terms of Service and Privacy Policy.

MORE IN TOP ACES

Top Aces' Viper The "Most Maneuverable F-16 I Have Ever Flown"

JAMIE HUNTER

Inside The World's Only Privately Owned F-16s That Are Flying As Advanced Aggressors

JAMES DEBOER

The First Privately Owned F-16 Aggressor Jet Has Taken To The Sky

TYLER ROGOWAY

Draken Becomes The Next Red Air Private Contractor To Acquire F-16 Fighter Jets

THOMAS NEWDICK

How The World's First Privately Owned Fleet Of F-16 Aggressor Jets Became A Reality

JAMES DEBOER

The First Contractor-Operated F-16 Aggressor Jets Are Heading To North America

THOMAS NEWDICK

First Contractor-Owned F-16 Aggressors Include MiG Killers, Veteran Of Iraqi Reactor Raid (Updated)

THOMAS NEWDICK

A-4 Aggressor Now Boasts Infrared Search And Track System

THOMAS NEWDICK

SEE MORE

MORE IN PRIVATE CONTRACTOR ADVERSARY SUPPORT

Draken Doubles Its Fleet Of Private Aggressor F-16s With A Dozen Surplus Jets From Norway

THOMAS NEWDICK

Full Scope Of Air Force's Big Contract Awards To Private Aggressor Firms Revealed

JAMIE HUNTER

Aggressor Mirage F1 Fighters Headed To Holloman And Luke Air Force Bases

JAMIE HUNTER

Australia To Sell Retired F/A-18 Hornet Fighters To Private Aggressor Firm Air USA

JOSEPH TREVITHICK AND TYLER ROGOWAY

The First Flight Of A Mirage F-1 Belonging To A Private Aggressor Company Has Occurred

TYLER ROGOWAY

Hawker Hunter Aggressor Jet Ends Up In Field After Aborted Takeoff

JOSEPH TREVITHICK

Su-27 That Mysteriously Vanished After Private Sale Resurfaces

JOSEPH TREVITHICK

F-5s Team With Avenger Drone, Bizjet In Air-To-Air Infrared Sensor Test

JOSEPH TREVITHICK

SEE MORE

MORE IN AGGRESSORS

New Air Force F-16 Aggressor Squadron Stands Up

JOSEPH TREVITHICK

Inside The Air Force's Biggest Fighter Wing

JAMIE HUNTER

Camouflaged Aggressor F-16s Are Intercepting Russian Bombers In Alaska

JOSEPH TREVITHICK, TYLER ROGOWAY

F-35 Stealth Fighters Are Revolutionizing The USAF's Aggressor Force

JAMIE HUNTER

Surplus F-16 Vipers Eyed To Replace Navy Aggressor Squadron's Legacy F/A-18 Hornets

THOMAS NEWDICK

Air Force Eyes Drones For Adversary And Light Attack Roles As It Mulls Buying New F-16s

THE WAR ZONE STAFF

Fighter Pilots Could Soon Train To Dogfight Against Virtual Projections Of Adversary Jets

TYLER ROGOWAY

USAF Wing Boss Is Crowdsourcing New Paint Scheme For Aggressor F-16

TYLER ROGOWAY

SEE MORE

MORE IN AIR

Airmen Design F-16 Boarding Ladder That Fits Inside Cockpit

JOSEPH TREVITHICK

Romania Could Host F-16 Training For Ukraine

THOMAS NEWDICK

Dozens Of Dutch F-16s Were Just Freed Up Potentially For Ukraine

THOMAS NEWDICK

Blending Live Enemies With Virtual Ones Is Transforming The Way Fighter Pilots Train

JAMIE HUNTER

Marine F-35s Fight F-117 Aggressors, Train For Very Long-Range Combat In Huge West Coast Exercise

JAMES DEBOER

Navy Details Its Plans To Add Ex-Air Force F-16s To Its Fleet

THOMAS NEWDICK

The Pentagon May Finally Get The Fighter-Sized Stealth Aerial Target Drone It Badly Needs

TYLER ROGOWAY AND JOSEPH TREVITHICK

The F-35A Is Set To Finally Get Chaff Countermeasures To Confuse Enemy Radars

JOSEPH TREVITHICK

SEE MORE

The TWZ Newsletter

Weekly insights and analysis on the latest developments in military technology, strategy, and foreign policy.

Enter your email

SIGN UP

Terms of Service and Privacy Policy

ABOUT TWZ

DISCLAIMER(S)
© 2026 RECURRENT VENTURES. ALL RIGHTS RESERVED.

ARTICLES MAY CONTAIN AFFILIATE LINKS WHICH ENABLE US TO SHARE IN THE REVENUE OF ANY PURCHASES MADE.

DO NOT SELL OR SHARE MY PERSONAL INFORMATION.