



FIXED-WING BENEFITS: Mission, Machine & Models

By John Nielsen, California Highway Patrol (ret.)

A question to be asked by a new or established unit when considering the acquisition of fixed-wing aircraft is, “Why use a fixed-wing aircraft instead of a helicopter?” The answer is simple. Fixed-wing aircraft provide the following three benefits:

- 1 Reduced cost of operations.
- 2 Increased time on station (an unblinking eye in the sky).
- 3 Low noise signature for increased stealth (especially for undercover operations).

Above all other considerations, experience has shown that units that fly the greatest number of hours are the most effective, and thereby the most appreciated by the department. Unfortunately, too often air units purchase the wrong platform for their core mission and decide to acquire aircraft that are too expensive to operate. This results in what I would refer to as the “air unit death spiral.” A unit buys an aircraft that is too expensive to fly and maintain, then cuts down on flying hours to control costs. Once flying hours are cut, the officers on the ground don’t experience the capabilities of airborne patrol support on a daily basis. The unit then loses support of leadership, which results in further cuts to flying hours. Ground response deployment is the last resort to control cost, and we already know how that plays out.

If we start by using the three principles above to justify the use of fixed-wing law enforcement aircraft, it stands to reason that operating cost, time on station and stealth

should be critical factors in determining the best aircraft for an airborne law enforcement operation. Let’s take these factors on one at a time.

OPERATING COST

If one of the points of having fixed-wing aircraft is to increase the number of flight hours flown, then it’s logical that we need to decrease the cost per flight hour of fixed-wing aircraft. In broad terms, most law enforcement helicopters cost more to maintain and operate, some a great deal more. With a few exceptions, most of these helicopters are turbine powered, and their cost per hour is reflective of a fuel burn that averages anywhere from 28 to 60 gallons per hour or more. The benefit of piston aircraft is a big reduction in the cost of keeping a platform and sensor in the air. Our core critical task should always be focused on airborne patrol support.

Some units start the fixed-wing discussion with a thought process like: “We have turbine powered helicopters, shouldn’t we also have turbine powered aircraft?” This thought process misses a major point of fixed-wing aircraft, which is to minimize fuel burn and operating costs. If you replace a turbine-powered helicopter with a turbine-powered aircraft that burns a similar 30 to 60 gallons per hour, your operating savings are marginal.

Contrast that with smaller piston engine aircraft that have the ability to reduce operating costs to below \$200 per hour and to reduce fuel burn down to the 20 gallon per hour range (with aircraft like the Cessna 206 or Airvan) or

even below the 10 gallons per hour range (with the twin-engine Diamond DA-42, which in full disclosure is an aircraft that I represent).

Operating cost really comes down with engine and aircraft size, so the question becomes, how big of an aircraft do you really need to do the job? Is an eight-seat aircraft with 3,000 pounds of useful load required, or is it overkill? Consider a “healthy” weight of 500 pounds for an aircrew of two with gear, around 100 pounds for a typical sensor and about 75 pounds for associated mission equipment. This leaves 325 pounds for fuel, which is roughly 48 gallons of Jet-A (over five hours of endurance with a DA-42).

In my opinion, going much lower than 1,000 pounds of useful load is likely to only work in a single-piloted aircraft with a small sensor and no TFO. There are departments doing this today with small sensors like the Cloud Cap and flying light sport aircraft. More may follow by using two-way video downlink that may allow the sensor operator to control the sensor from the ground rather than having a TFO in the airplane.

TIME ON STATION

While time on station is certainly associated with operating cost and fuel burn, it is important to speak to this in a little more detail. One of our typical flights at the California Highway Patrol would average about three hours, at which point most aircrew need to take a break, hit the head and stretch. This is roughly twice the average helicopter flight. But it still doesn’t take into account the excellent time on station afforded by most fixed-wing aircraft.



A typical law enforcement fixed-wing aircraft has at least four hours of time on station, with the lower fuel burning pistons typically providing a much greater endurance (as much as six to eight hours in a typical configuration). While a six to eight hour flight might be more of a disincentive for some flight crews, I would characterize this capability as being highly desirable when you are in a position of needing that endurance. On surveillance or search missions that are located a long way from the nearest fuel source, or when it is near the end of a normal patrol flight and (as Murphy would have it) a pursuit starts which is heading away from your fuel source, any increase in aircraft endurance will certainly have a corresponding decrease in your stress factor. There's no dead time or bingo fuel when you have long legs.

STEALTH

One of the greatest benefits of fixed-wing aircraft is their ability to orbit at higher altitudes without alarming criminals or angering our neighbors. Most aircraft noise comes from the engines and propellers, with the near supersonic propeller tips of some aircraft emitting the vast majority of noise. While no aircraft is completely silent, some great advances in noise control have been engineered in recent years. There are companies that can provide quiet muffler systems for a variety of aircraft. Some can be equipped from the factory with a built-in noise-suppression muffler kit.

More than anything, the best way to understand the benefits of low-noise, is to not only demo different aircraft, but also to have them fly over at different power settings and altitudes to get a feeling for just how high the aircraft needs to be in order to minimize detection from the ground.

THERE ARE A NUMBER OF GREAT REASONS TO CONSIDER ADDING FIXED-WING AIRCRAFT TO A FLEET OR TO STARTING A NEW FLEET WITH INEXPENSIVE, LIGHT FIXED-WING AIRCRAFT. I WOULD ENCOURAGE ANY UNIT CONSIDERING SUCH A DECISION TO INVEST IN THE ADVICE OF PROFESSIONALS WHO HAVE OPERATED FIXED-WING LAW ENFORCEMENT AIRCRAFT.

SELECTING A MODEL

One of the questions that comes up when considering fixed-wing aircraft for law enforcement is whether to utilize high-wing or low-wing aircraft. The question to consider is, "Which is more important: the sensor field of regard, or the pilot's downward field of view?" The military considered this question long ago, and the results were clear. Every military intelligence, surveillance and reconnaissance aircraft is low-wing.

While both pilot visibility and sensor view are important, our CHP experience was that most of our work was done at night, and 95 percent or more of that was done using our EO/IR camera. Unfortunately, our side-mounted sensor could not look straight ahead due to obstructions from the fixed landing gear and engine exhaust throwing oil on the gimbal. Based on that personal experience, I would trade an unobstructed sensor field of view over better pilot look-down anytime.

Another question to consider would be whether to fly a single-engine or twin. This is easy for me, as an in-flight engine failure in a piston-powered airplane is a real possibility. My agency has experienced this scenario on several occasions, so we plan for it and are always thinking about a dead stick landing. The key to risk management is simple: if you can perceive a bad outcome, you can take steps to prevent it from occurring. As law enforcement officers, much of our work is done over densely populated areas at night. This scenario begs for a second engine. While there are many proponents of the merits of the single engine turboprop, I would argue that few pilots would turn down a cost competitive second engine if they had the option. The bottom line is that this is a question of safety and affordability; if you can afford spending a little more for a twin, you will not regret it when you are over a city at night.

There are a number of great reasons to consider adding fixed-wing aircraft to a fleet or to starting a new fleet with inexpensive, light fixed-wing aircraft. I would encourage any unit considering such a decision to invest in the advice of professionals who have operated fixed-wing law enforcement aircraft. Get unbiased cost of operation numbers from a source other than the manufacturer. Solicit multiple opinions from ALEA members and from ALEA online discussion boards, and ultimately take the time to fly and demo a number of aircraft types. 

John Nielsen is a retired California Highway Patrol pilot. He teaches ALEA fixed-wing patrol classes and consults with law enforcement agencies seeking to establish a fixed-wing unit. He is a partner with Clarity Aerial Sensing, an aerial sensing solution provider and distributor.