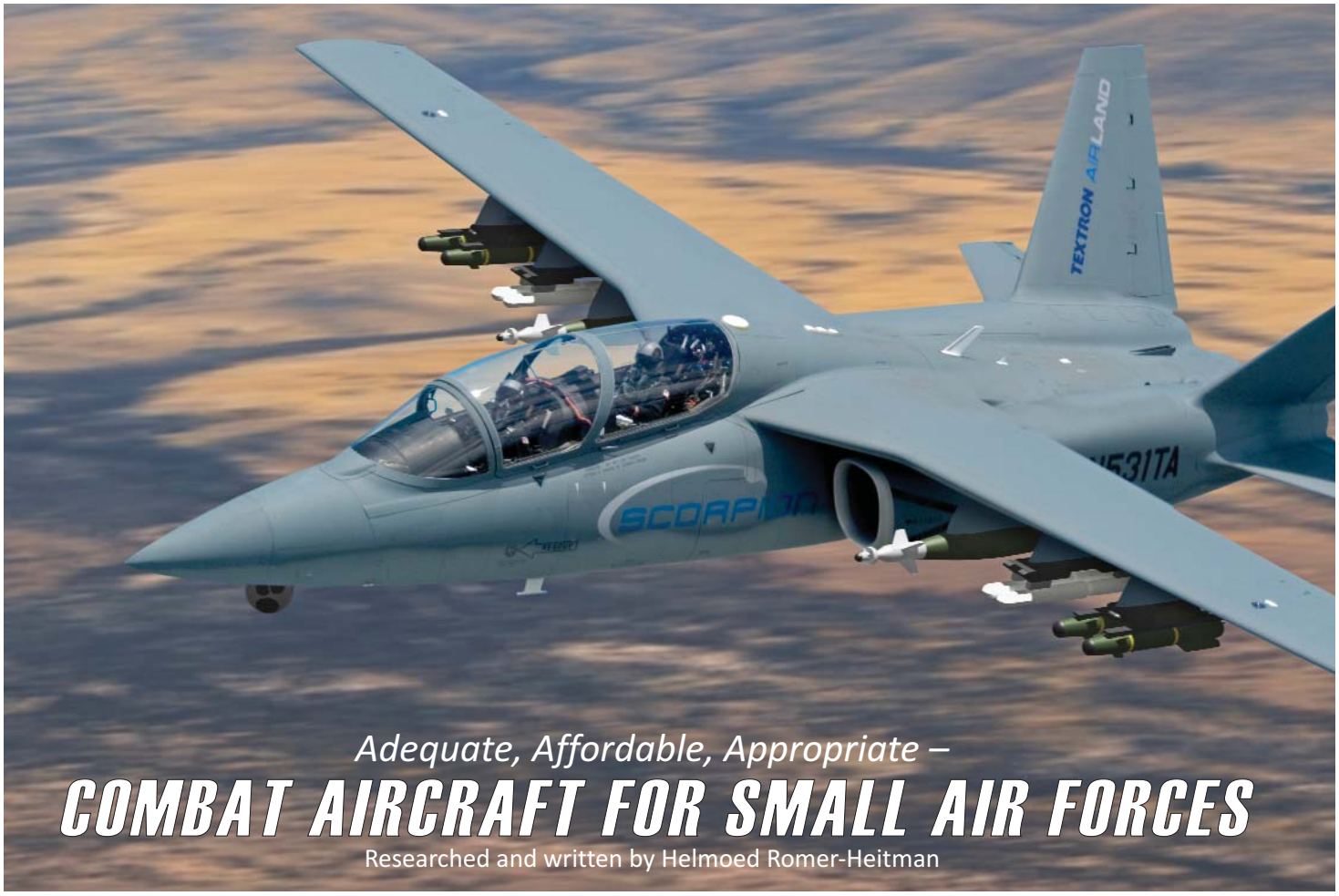


Adequate, Affordable, Appropriate –

COMBAT AIRCRAFT FOR SMALL AIR FORCES

Researched and written by Helmoed Romer-Heitman

AIR POWER can be critical in its own right for some small countries, and will almost always be an immensely valuable force multiplier. But air forces are expensive, so the acquisition of aircraft, even combat aircraft, must be handled rationally.

It will not do to buy aircraft incapable of meeting the mission requirements just because they are cheap; nor should any air force chase the "latest and greatest" if that is not required for the missions likely to fall to it – not even if it could afford to do so, as there will always be opportunity costs to consider. *Hence the sub-title of this article:*

Adequate: Able to perform effectively the missions likely to fall to the particular air force without undue risk.

Affordable: Able to be acquired and supported in adequate numbers within available funding and without crippling other force elements.

Appropriate: Optimal for the likely missions, with some margin for the unforeseen, but not "over the top".

OPERATIONAL REQUIREMENT

Considering just combat aircraft, and leaving maritime operations for another day, most African air forces, over the next two or three decades, will not face a major conventional threat, and some are unlikely to ever face such a threat. But many, perhaps even most, will be required to deal with lower intensity threats presented by guerrillas, terrorists and even large criminal groups.

Some of these groups, however, will be well armed and highly mobile, using "technicals" mounting a range of heavy weapons, including twin and quad 14,5 mm machineguns and twin 23 mm cannon and even, in a few cases, truck-mounted twin 37 mm cannon.

Although these are all intended primarily for use against ground targets, making them extremely dangerous to light forces, they also present a real threat to aircraft that come within range. It is also increasingly likely that rebel forces will have some form of shoulder-launched anti-aircraft missile, at least in limited numbers.

To illustrate the point: The French Army lost an armed Gazelle in Mali to fire from a rebel column it was attacking with its 20 mm cannon; Chad has lost at least one SF-260 and one Mi-25 shot down in the 2000s; Cameroon and Kenya have lost helicopters to ground fire; and rebels shot down a Sudan Air Force MiG-29 in 2008.

In some cases irregular forces may also present an "air threat" in the form of air supply for irregular forces and the smuggling of high-value goods: Aerial (landing and paradrop) supply of Allied Democratic Forces and Lord's Liberation Army elements in the northeast of the DRC; smuggling of cocaine from South America into Africa for onward transport, and flying illegally mined cassiterite ore from the DRC to neighbouring countries, using Let-410 light transports landing on roads.

In 2008 there were reports of armed personnel and "technicals" being flown into the Birao airfield, in the Vakaga province, of the Central African Republic, after it was seized by local guerrillas.

That small air-landed force apparently then fanned out to cover the flank of a major guerrilla force moving through the Vakaga province into Chad as part of the raid on the capital, N'djamena.

There have also been cases of irregular forces developing an air attack capability:

From 2006 to 2009 the "Air Tigers" air wing of the Tamil Tigers insurgency used a number of Zlin Z43 light aircraft and even some micro-lights to attack Sri Lankan air force, army and naval bases, as well as strategic targets, such as a fuel farm outside the capital.

In one instance their ground forces also carried out an attack aimed at destroying an INDRA-II radar used to warn of Air Tiger attacks.

During the Biafra War, Count von Rosen used five very light Malmö MFI-5 aircraft armed with rockets for offensive counter-air strikes against the Nigerian Air Force, destroying a number of MiG-17s and Il-28s. They also flew some attacks on Nigerian supply columns.

The mission set that arises from these "threats short of war" will require aircraft capable of: Armed reconnaissance; close air support; battlefield air interdiction; Interdiction/strike, and air policing.

Barring the air policing mission, the rest look like missions that can be adequately met with specialised counter-insurgency aircraft or simply armed trainers.

REALITY

But the reality is going to be a little different over the coming decade or two:

Firstly, of course, there is that aerial policing requirement, which brings the challenges of locating and catching up with an offending aircraft.

Secondly, guerrillas, terrorists and even some criminal groups have access to MANPADS, which will require at least a flare system and preferably a missile approach warning system.

Thirdly, guerrillas are becoming more proficient in using heavy machineguns and cannon against aircraft, which argues strongly against any attack profile that requires aircraft to fly low and slow to acquire and engage targets.

Finally, there will be a growing demand for precision attack, to reduce the risk of "blue-on-blue" incidents and to keep civilian casualties and damage to a minimum.

Those challenges would seem to rule out the typical counter-insurgency aircraft or armed trainer as a single, multi-role type for the envisaged mission set. Even fixed-wing gunships are likely to have become too vulnerable if they rely on machineguns or even cannon, the obvious exception being the Lockheed Martin AC-130 with its 105 mm gun.

THE SOLUTION?

The obvious solution might seem to be to use fighter aircraft, but they are too expensive for many air forces to acquire and support. Even the new South Korean FA-50 is hardly cheap at some $35-million.

And, although they might be well suited to survive in the face of MANPADS and optically-aimed machineguns and cannon, they are not well suited to the business of finding and engaging elusive targets in bush or rough terrain. Added to that, fighters need real airbases, or at least long, hard-surfaced runways, and those may be so far from the action that even a fast fighter takes too long to respond.

Then there is the attack helicopter, a type originally developed for dealing with irregular forces – the Viet Cong. The attack helicopter will, in fact, be ideal for close air support and for battlefield air interdiction, not least because it can deploy with ground forces and be available at very short notice.

It is also ideal for delivering very precise fire in complex environments, and it can be quite well protected against the most likely threats.

But attack helicopters are not suited to long-range / long-endurance armed reconnaissance missions or to interdiction / strike missions.

SMALL PRECISION WEAPONS

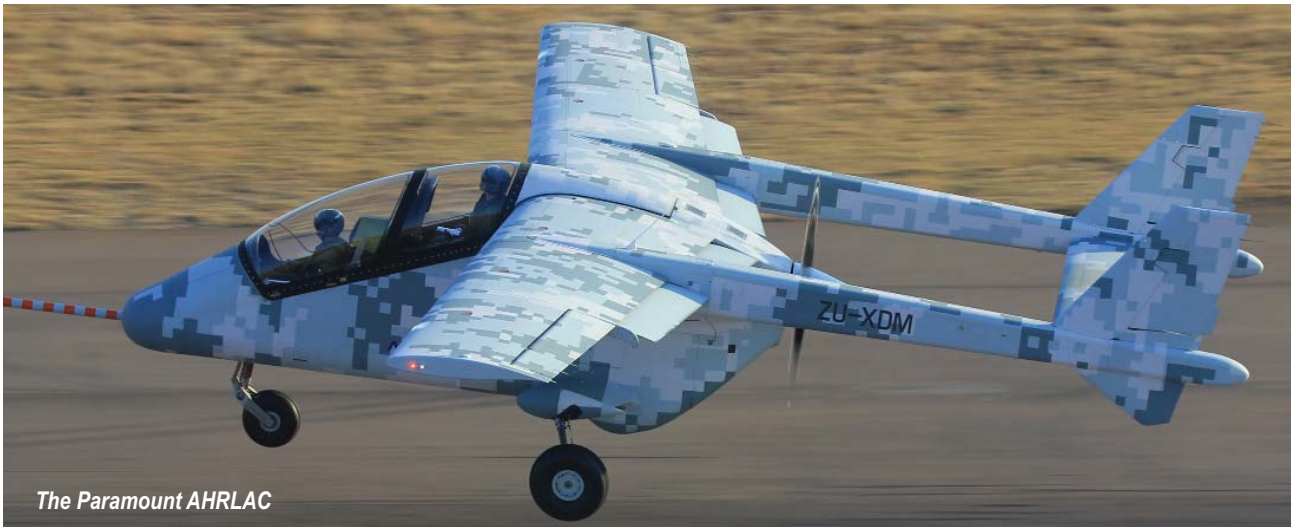
There is, however, good news in the form of a growing range of light precision weapons that will enable a typical counter-insurgency aircraft or a fixed-wing gunship to deliver precision fire from outside the range of most weapons available to irregular forces.

Among those weapons are:

■ Laser-guided bombs, which are manufactured by several countries, including the *Al Tariq* guided bomb kit developed in South Africa and manufactured by Tawazun Dynamics in the UAE, which can also be used in a powered version for stand-off up to 100 km, making surprise attacks and multiple simultaneous impacts practical.

■ Small guided glide bombs, such as the US *Viper Strike* – GPS/semi-active laser; 20 kg with 1,05 kg HEAT warhead; 10:1 glide ratio.

■ Small guided missiles, such as: the Israeli *Spike* NLOS – INS/IIR/CCD; 70 kg with tandem HEAT warhead; 25 km range; the British *Brimstone* – INS/mm wave/semi-active laser; 48,5 kg with a tandem HEAT warhead, 20 km range; the US *Griffin*: INS/GPS/semi-active laser; 20 kg with a 5,9 kg blast/ fragmentation warhead; 20 km range; the South African Denel *Mokopa* – semi-active laser, mm wave or IIR; 49,8 kg with a HEAT or blast/fragmentation warhead; 10 km range;



The Paramount AHRLAC

the South African *Impi* (in development) – semi-active laser; 28,5 kg with a tandem HEAT or multi-purpose warhead; 10 km range and the US *Hellfire* – semi-active laser or mm wave; 49 kg with a 9 kg tandem HEAT or blast/fragmentation warhead; 8 km range).

Also in the small precision weapons are the Russian *Vikhr* (AT16) – Laser beam-rider; 45 kg with an 8 kg tandem HEAT warhead; 8 km range; the Israel *Spike* ER – IIR/CCD homing; 34 kg, with a tandem HEAT warhead; 8 km range (launcher = 55 kg); the Franco/German *PARS-3LR* – IR/CCD homing; 49 kg with a 9 kg tandem HEAT warhead; 7 km range) and the Russian *Taka* (AT-9) – radio command link; 49,5 kg with a 7.4 kg tandem HEAT warhead; 6 km range.

Guided rockets such as: the US *DAGR* – semi-active laser, 15,8 kg with a warhead, 5 - 12 km range (sea level / 20 000 ft). Uses standard Hydra 70 rockets; compatible with Hellfire launcher with four rockets in place of one missile; has lock-on before launch capability.

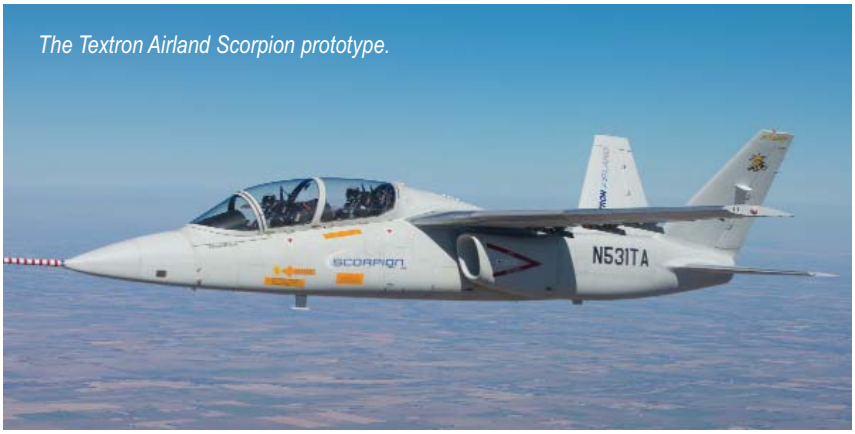
Then there are the US *APKWS* – Semi-active laser, 15 kg with standard Hydra 70 rocket warheads, and 11 km range; the US/South Korean *LOGIR* – IIR homing. otherwise similar to APKWS; the US/Israeli *GATR* – semi-active laser homing seeker for Hydra 70 rockets and the Turkish *Cirit* – INS/semi-active laser; 15 kg with three kg anti-armour or anti-personnel warhead with an eight 8 km range

All of these weapons can be carried by typical light attack aircraft and by the fixed-wing gunships that are in development (CN-235, C-295, C-27J), although most will only be able to carry two or perhaps four of even the smallest of the normal guided bombs (for example, the US 120 kg small diameter bomb), given their weight and size.

So where neither such a large warhead nor the penetration (for example against bunkers) of a 120 kg bomb are required, they will not be as useful in this context as the *Griffin* or the various light missiles and rockets that will allow an aircraft to carry more weapons for any required combat radius and endurance on station.

In fact, for many targets the lighter and faster rockets will be the weapon of choice, although they are more dependent on launch altitude for their range than are some of the missiles.

Of course, all of these weapons are considerably more expensive than their unguided cousins, but their stand-off range will greatly reduce the risk to the aircraft and crews, reduce the risk of "blue-on-blue" incidents and of civilian casualties or collateral damage, and reduce the number of sorties that have to be flown and the number of weapons used, the latter two aspects to an extent offsetting the higher cost.



The Textron Airland Scorpion prototype.

So these weapons will remain the weapons of choice where the opposing irregular force has effective capability against "low and slow" flying aircraft or where the nature of the target or of its surroundings demands precision.

The bottom line is that these weapons can restore to aircraft their edge over irregular forces despite the latter having better anti-aircraft capability.

THE AIRCRAFT *(See Table 1)*

The remainder of this article considers some of the aircraft that could employ the weapons outlined above, excluding gunships, which we have discussed previously, and combat helicopters, which we can consider another day.

Light Attack Aircraft: Although most light attack aircraft are variants of trainers, there are three purpose-designed types, two designed as ISR/light attack types and a dedicated light attack type.

The Scorpion being developed by Textron Airland and the AHRLAC designed by Aerosud in South Africa and being developed by the Paramount Group, are new aircraft developed to an essentially new concept for the ISR and light attack missions, their only real predecessor being the OV-10 Bronco that is no longer in service.

The Argentine twin-engine Pucara is a dedicated light attack aircraft that has been around for some time and has seen service in several air forces.

SCORPION

The Textron Airland Scorpion is in a class of its own, offering better range than almost any of the turboprop types at similar cruising speed, but with the potential of a 450 knot dash speed and more than double the weapons load, as well as an internal bay that can be used for sensors, fuel or weapons.

Using the bay for fuel should increase internal fuel range to some 2 457 nm while keeping all six under-wing stations free, giving the Scorpion a combat radius/time on station potential unmatched by anything other than a fixed-wing gunship or some of the top-end fighters that cost vastly more to own and operate and are not well suited to this mission set.

One illustration might be an ISR/precision attack mission in a low intensity conflict context – 3,5 hours on station at 145 nm from base with four Hellfire class missiles and two laser-guided bombs.

Less time on station could extend the combat radius to better than 260 nm with the same weapons, or a Scorpion on ground alert could reach a contact scene 100 nautical miles from its base in 18 minutes and stay on station for 3,9 hours, with that same weapons load.

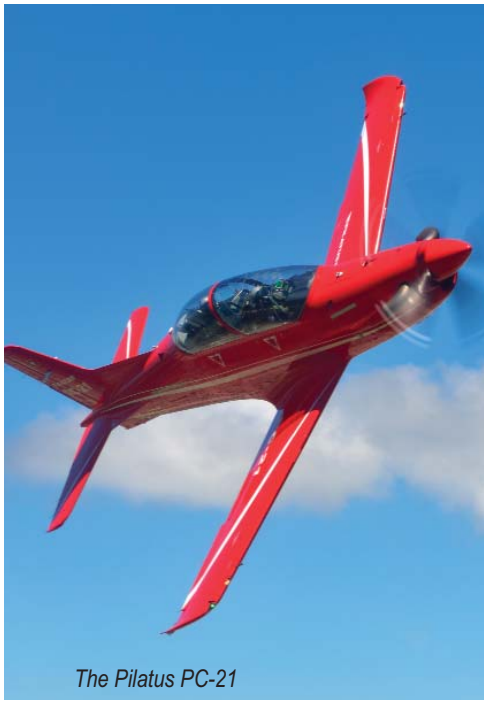
Finally, the Scorpion has space and weight

TABLE 1

Aircraft	Power:Weight (shp/t/mtow)	Cruise (knots)	Range[1] (nm)	Weapons Load (kg)
Scorpion	0,68 (thrust/weight)	356	1 650[2]	4 200 on 7 stations[3]
AHRLAC[4]	250	272	1 100[5]	1 800 on 6 stations
Bronco	317	200	1 207	630 on 7 stations[6]
Pucara[7]	288	232	850[8]	1 620 on 3 stations

NOTES:

1 Internal fuel only. **2** Ferry range with internal auxiliary tank and two external tanks is 2 457 nm. The Scorpion will also have in-flight refuelling capability. **3** Six under-wing stations for total of 2 800 kg plus internal weapons bay for 1 400 kg. **4** Unusual in being a high-wing and a pusher aircraft for better visibility. Weapons bay that can accept a 20 mm cannon or an EO/IR turret. Cruise speed estimated. **5** 1 996 nm ferry range. **6** Four 7,62 mm machineguns in the stub wings; can carry a centreline 20 mm pod; under-nose sensor turret; one variant had a turreted triple-barrel 20 mm cannon. **7** 2 x 20 mm cannon, 4 x 7,62 mm machineguns built-in; some with 2 x 30 mm DEFA cannon. **8** 2 000 nm ferry range



The Pilatus PC-21

available for an air-to-air radar, which would suit it to air policing, and the design provides for a cannon in the internal bay as an alternative to a sensor pack or fuel.

AHRLAC

The AHRLAC is an interesting approach to the mission set, with a major focus on ISR and armed reconnaissance, although it should be equally adept at close air support.

Particularly interesting are the choice of a "pusher" layout that gives the two-man crew a view similar to that from an attack helicopter (the designers previously designed the Rooivalk attack helicopter), and the provision of a reconfigurable bay in the fuselage under the cockpit, which can be used to fit a forward-firing cannon or a sensor turret among other possibilities.

The "pusher" layout may also make it less vulnerable to damage on gravel runways than conventional types.

The combination of outstanding visibility from the cockpit and seven hours endurance at loiter speed also suggest the AHRLAC as perfect for the forward air controller role, in which role its relatively low weapons load would not present a problem – there is ample capacity there for smoke rockets for target marking and for lethal weapons to engage targets of opportunity.

PUCARA

The Pucara is not in production, but there has been some thought at various times of restarting the production of an upgraded type, although that does not seem likely anymore.

It has the advantages of being proven in service, of twin-engine configuration and of a heavier cannon/MG armament and a heavier payload than any other turboprop type, and remains in service with several air forces.

BRONCO

The Bronco also seems to have considerable future potential if further developed, which was proposed for operations in Afghanistan and Iraq, but that was also not followed up.

It remains in service with several air forces in its original counter-insurgency role.

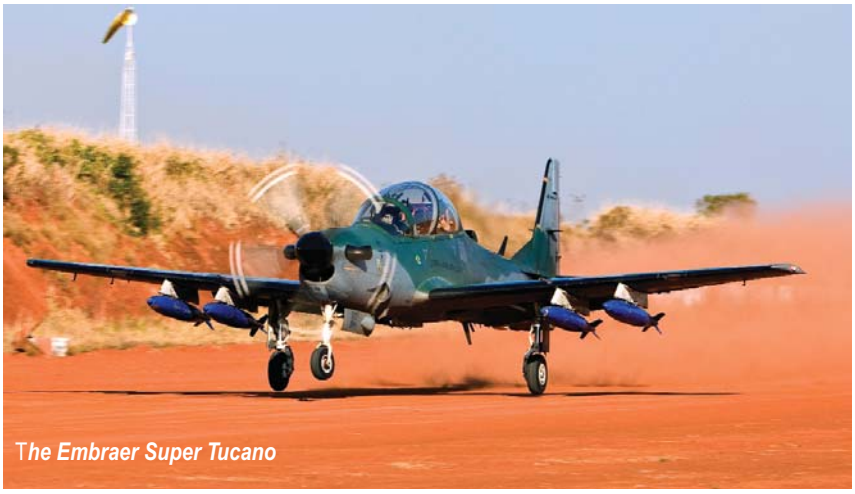
ARMED TURBOPROP TRAINERS *(see Table 2)*

The turboprop trainers that have been developed into light attack aircraft fall into two quite distinct categories, one with markedly better weapons load and, in three cases (Super Tucano, AT-6, Hürkus), also fitted with a day/night target acquisition and designation turret, and the second with markedly less payload.

The second group generally has the advantage of being cheaper and so could be a choice for a poorly funded air force that perhaps faces a lower level of threat. Both have the obvious advantage of commonality with the basic trainer variant, offering air forces the benefit of economies of scale.

Of these types, the Super Tucano has been the most successful in this role, both in sales and in its operational employment. It is also the only aircraft in this group that has a built-in forward-firing armament, one 12,7 mm machineguns in each wing, giving better accuracy than any under-wing machinegun or cannon pod, and has an interesting "jump start" capability that allows one aircraft to jump start another using built-in cables.

But the Beechcraft AT-6 now presents a real challenge, offering a better power-to-weight ratio, higher cruise speed, greater range and two more under-wing weapons stations



The Embraer Super Tucano

TABLE 2: ARMED TURBOPROP TRAINERS

Aircraft	Power:Weight (shp/t/mtow)	Cruise (knots)	Range[9] (nm)	Weapons Load (kg)
AT-6[10]	352	304	769[11]	1 361 on 6 stations
Super Tucano[12]	296	281	797[13]	1 550 on 5 stations
Hürkus	300	278	800	1 500 on 4 stations
Pilatus PC-9	297	300	280	1 220 on 6 stations
Pilatus PC-21	282	320	720	1 150 on 4 stations
PC-7 Mk.II[15]	259	255	810	1 040 on 6 stations
KA-1	287	270	720	770 on 5 stations
Orlik	254	270	1 187	700 on 6 stations
Kobac[16]	431	270	830	500 on 5 stations
Epsilon	180	195	705	480 on 4 stations
SF-260TP	269	178	1 105	300 on 2 stations
Lasta 95N	137	173	625	200 on 2 stations
LH-10 Ellipse	183[19]	145	810	2 pods of 7 rockets

NOTES:

9 Internal fuel only; **10** Heavier than the T-6 and with a 1 600 shp engine place of the 1 200 engine. No centreline station as sensor turret permanently fitted there. **11** 1 562 ferry range with four tanks; **12** The most widely exported aircraft in its class, so taken as the bencemark. The only one offered in single-seat configuration and the only one with internally mounted guns (1x12,7mm in each wing). Only four weapon stations if EO/IR turret is fitted on the centreline station. **13** 1537 nm ferry range with tanks. **14** Estimated. No figure for MTOW available. EO/IR turret on centreline, four weapon stations, but production aircraft may have six stations. **15** Weapons load data for Indian Air Force version. **16** Available figures are for a 1 700 kg "gross weight", 500 kg weapons load and a 950 shp engine. **17** The oldest aircraft here but still quite useful. The only side-by-side one in the group. **18** Large number of pistoin-engine SF-260s also still in service and potentially useful. **19** Powered by a Rotax piston engine.

against only a slightly lower weapons load.

Trading those two wing stations for more fuel by carrying two drop tanks, gives the AT-6 a range of 1 320 nm with a sensor turret and four under-wing weapons stations with enough of a weapons load to make a serious difference on the ground in the typical low-intensity scenario for which these aircraft are intended.

Turkey's Hürkus has yet to enter service, but is intended to be fitted with a sensor turret in its light attack version, which will put it squarely in competition with the Super Tucano and AT-6, giving small air forces an interesting choice, not least because the aircraft comes from developing countries rather than from any of the major powers.

The three Pilatus types all have real potential in the light attack role, but that is restricted by tight constraints set by Swiss government policy – although that has not stopped several countries from using their aircraft for tactical reconnaissance and light strike, Angola and Chad among them.

The remaining aircraft have weapons loads that, once allowing for pylons and weapons racks, are mostly too low to allow use in any but the armed reconnaissance role, not being able to carry sufficient weapons – even using guided weapons – to provide sustained support to ground forces, or the heavier bombs that might be required for an interdiction mission against supply lines.

The SF-260 has, nevertheless, proved itself useful in several air forces and has a good operational track record. The LH-10 is, of course, the extreme example, just short of an armed microlight, but might have its niche role in some forces.

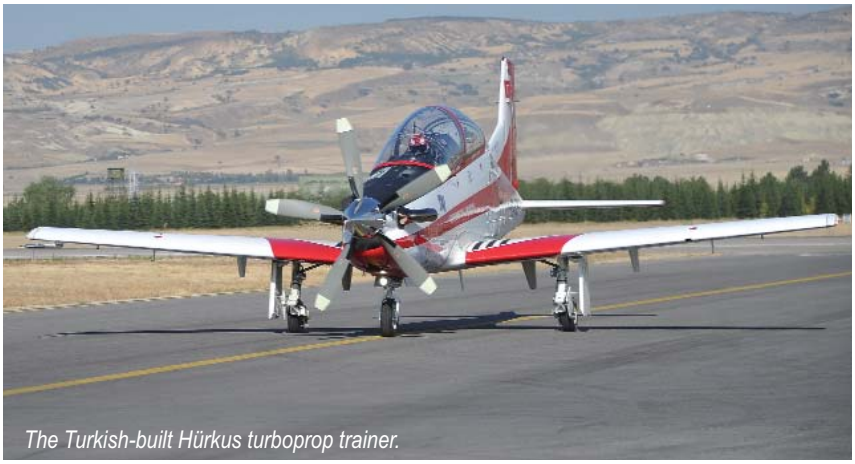
ARMED UTILITY AIRCRAFT *(Table 3)*

Then there are also several utility aircraft that have been developed for the light attack role, among them the Cessna O-2A that is long out of production, but still around in some numbers for those who might want to consider it for a low-intensity armed reconnaissance role.

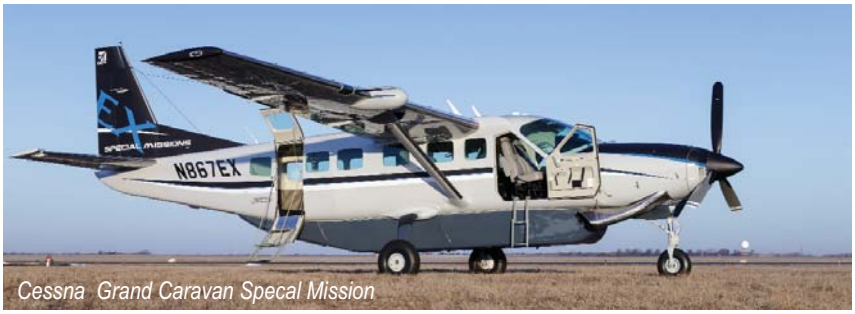
The "Combat Caravan is unusual in that this variant has been developed specifically for light attack using the Hellfire missile, making it, in effect, a dedicated night interdictor, albeit limited by only carrying two missiles.

The AU-23A is essentially a PT-6 equivalent and so could be recreated given a demand, and has the ability to fit a side-firing cannon if the operational situation allows such close engagement.

Finally the AT-802U in various guises is an armed crop sprayer with a sensor turret and brings to the role the immense inherent toughness of those aircraft, but also has very limited downward visibility from the cockpit by comparison with the others.



The Turkish-built Hürkus turboprop trainer.



Cessna Grand Caravan Specal Mission

ARMED JET TRAINERS *(Table 4, Page 20)*

A step up from the light attack/COIN variants of the turboprop trainers are the armed variants of jet trainers, offering higher speeds, mostly better range and higher weapons loads, at the cost of being more expensive to buy and operate (particularly the twin-engine types), and more complex to support, as well as generally not being suited to forward basing on gravel airfields, or as well suited to loitering over a contact area.

Their higher speed also makes it more difficult to acquire targets in rough terrain without sensors, the same problem that bedevils fighter aircraft in the close air support role. None of these aircraft is known to be fitted with sensor turrets, so have to carry any sensors on a weapons station, which reduces the payload in both mass and the number of weapons that can be carried, the latter being the greater problem in the context of light attack operations.

With their primary advantage being greater speed and range, and their main disadvantage the fact that turbofan and turbojet aircraft are not suited to operations from semi-prepared airstrips, these aircraft are arguably best suited to operational theatres that are large and where either geography or the threat limit how many airfields there are or can be used.

Large mountainous theatres are the obvious example. In that situation it is the speed and range that will give these aircraft an edge over turboprop types, allowing combat power to be quickly focused where it is needed to support troops in contact, or to act on intelligence with an armed reconnaissance/strike mission.

The better payload/range performance also suits them more for interdiction operations, while their speed will make air policing missions more practicable if there is radar coverage. And several are offered with air-to-air radar (T-50, Yak-130, L-15) or have space and weight reserves for a radar (MB-346).

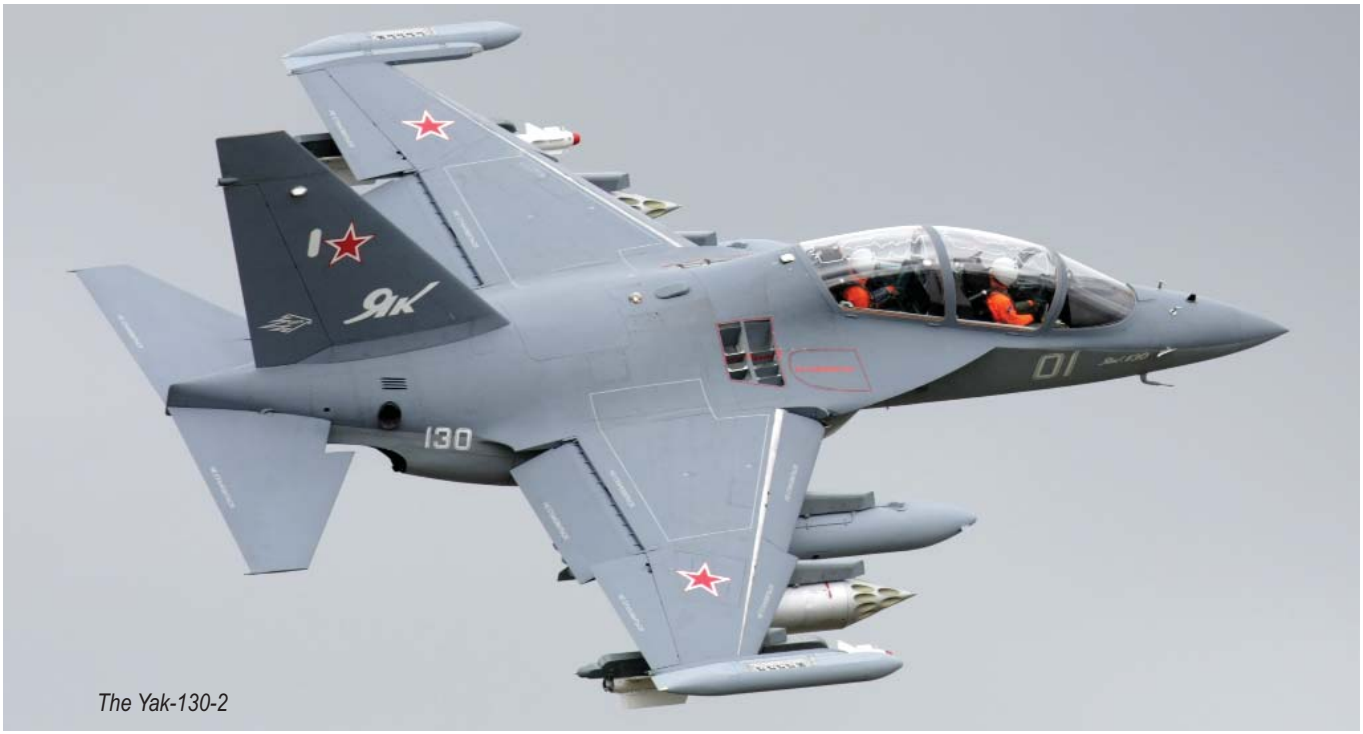
Finally, when the tactical situation demands low-level operations, their higher speed can make them less vulnerable to most of the anti-aircraft weapons available to irregular forces, although that, too, is to an extent a factor of

Table 3: ARMED UTILITY AIRCRAFT

Aircraft	Power:Weight (shp/t)	Cruise (knots)	Range[20] (nm)	Weapons Load (kg)
AT-802U[21]	186	192	695	3 711 on 9 stations
Combat Caravan	217	172	797	2 x Hellfire
AU-23A	235	128	595	875 on 5 stations
O-2A	210	135	1 150	2x7-tube rocket pods

NOTE:

[20] Internal fuel only. [21] Converted crop-sprayer. Cruise speed estimated.



The Yak-130-2

the terrain in which the enemy must be engaged. In this case the turboprop would have the advantage when, for instance, engaging enemy in a mountain valley, where it could use its agility to exploit side valleys and other terrain features to mask its approach and departure, which the faster jet would find difficult.

As with the turboprop aircraft, the jets fall into two quite distinct categories, one with considerably better payload, speed and range, and the other more limited in capabilities, but lower in cost.

The MiG-AT has a good payload and no fewer than seven weapons stations, but is let down by its low range on internal fuel, while the Hongdu K-8 has a very useful range. However, it is limited by having only a 1 000 kg payload that would make it difficult to exploit its range/endurance in a close air support scenario in a low-intensity operations context.

The much underrated Casa 101 is something of an outlier – much slower than any of the other aircraft and with a less than exciting thrust-to-weight ratio, it has by far the best range on internal fuel, has a good payload and a built in cannon, and has an internal bay for weapons or, more usually, sensors.

Another aircraft to consider here is the single-seat L-159, strictly speaking a lightweight multi-role fighter, developed from the L-59.

It offers a better power-to-weight ratio (0,66), higher speed (505 kt) and greater weapons load (2 349 kg on 7 stations) than the L-59 and is fitted with a radar. Its only disadvantage will, in some situations, be the fact that it is a single-seater with no possibility of flying with two crew for an extra pair of eyes and an extra brain for mission coordination.

CONCLUSION

The threat most likely to face most air forces over the medium term is that of irregular forces, be they guerrillas, bandits, narcotics groups or smugglers. But those groups are increasingly well-armed and dangerous.

The days of simply flying "low and slow" to find them, and then engaging with machinegun fire are rapidly becoming something of the past.

Similarly, the focus on avoiding or at least minimizing civilian casualties and collateral damage is increasingly requiring precision attacks, which can bring longer exposure to enemy fire.

The growing range of small and light precision weapons will, despite their cost, restore the edge that the aircraft has long had over irregular forces, and the growing range of aircraft able to use those weapons offers air forces the potential to select an aircraft/weapons mix precisely suited to their needs: Aircraft and weapons appropriate and adequate for the missions, and affordable. ✈

Table 4 ARMED JET TRAINERS

Aircraft	Thrust:Weight MTOW)	Max.speed[21] (knots)	Range[22] (nm)	Weapons Load (kg)
TA-50	0,44[23]	855	1 000	3 740 on 5 stations[24]
Yak-130	0,49	566	1 375	1 374 on 7 stations[25]
Hawk	0,33	555	1 340	3 085 on 5 stations
M-346	0,60	572	1 117	3 000 on 6 stations[27]
Alpha Jet	0,36	540	1 500[28]	2 500 on 5 stations
Hongdu L-15	0,53[29]	807	810[30]	3 000 on 4 stations[31]
CASA 101	0,29	415	1 996	2 220 on 6 stations[32/33]
M-339	0,31	500	850	800 on 6 stations
L-59	0,31	466	847	1 500 on 4 stations
IA-63 Pampa	0,32	442	810	1 550 on 5 stations[34]
MiG AT	0,44	540	648	2 000 on 7 stations
Hongdu K-8	0,38	432	1 215	1 000 on 5 stations
IAR 99	0,33	460	594	1 000 on 5 stations
T-36 Sitara	0,39	540	540[35]	1 000 on 5 stations

Notes:

22 Cruise speed is not readily available for too many types to be a useful criterion here, so maximum speed is used to compare the types, with their respective cruise speeds likely to be proportionate. **23** Internal fuel only. Figures for ferry range with external tanks are available for too few of these aircraft to be a useful comparator here. Most are equipped for in-flight refuelling, but few countries looking at them could afford either the tanker aircraft, or buddy refuelling which does not seem to be a practical option. **24** 0,85 with afterburner. **25** Plus two wingtip stations; built-in 20 mm triple-barrel cannon. **26** Plus two wingtip stations. **27** Plus wingtip stations. **28** 330 nm radius (LO-LO-LO with two tanks, cannon pod and weapons). **29** 0,89 with afterburner in a more powerful variant. **30** Estimate. **31** Plus two wingtip stations. **32** 1 x 30 mm cannon or 2 x 12,7 mm MG built-in. **33** Internal weapons bay behind cockpit; or reconnaissance equipment. 34 1 x 30 mm cannon. **35** Typical 210 nm combat radius claimed.