



# On air combat philosophy

Pair of Su-30MKIs of the IAF (photo: Simon Watson)

*Air Commodore Parvez Khokar (retd), formerly Director National Flight Test Centre and having over 5000 hours on 62 different aircraft types including virtually all Soviet-origin fighters ranging from the bisonic MiG-21 to the trisonic MiG-25R, writes that the historical perspective on aircrew requirements for combat aircraft must be viewed in context of the combat philosophy of the manufacturer's nation.*

Air Forces belonging to the NATO alliance virtually functioned in an autonomous mode, with aircrew trained accordingly with their better airborne radars, avionics and sensors and aircraft having more endurance. On the other hand, Soviet state-controlled aircraft companies were the only suppliers to the Warsaw Pact nations and thus Soviet control over their philosophies was very stringent. A trust deficit between the State and its citizens always existed, and this was reflected in the operational doctrines of these Air Forces, with more focus given to long range ground radars and constant ground-based control of combat aircraft, even final orders for release of weapons. The IAF initially adopted this approach as well, until it was realised that the potential of the weapon system could be exploited manifold, if

autonomy were exercised in the air. The metamorphosis of the MiG-21F to the MiG-21 Bison is a classic case study and all this essentially because of the IAF's air combat philosophy.

The next phase of development that saw a quantum jump in radar, sensor and weapons development in the West meant that the work load of the single Pilot-Operator become untenable for successful



MiG-21 Bison (photo: Simon Watson)



Mirage 2000H taking off from Gwalior (photo: Angad Singh)

engagements. The F-4 Phantom and the F-14 Tomcat, both manned by a crew of two, became mainstay of the US Air Forces and these two aircraft, during their service lives did more operational sorties than the F-15 and F-16 combined.

Traditionally, two-seat fighters evolved from being as operational conversion trainers, since their primary role was to train pilots. Some limited armament was introduced at a later stage, the main reason not being economy of effort or expense, but to keep the weight and flying qualities as close to that of the fighter, without major design changes. Remember, an extra cockpit, with all its paraphernalia had to somehow be fitted in. Also the trainer was always 'an afterthought'. Stringent economic measures to control expenses also influenced retention of the single seater. After all the most expensive and most difficult commodity to replace will always be the 'man', in the Man-Machine interface.

So why have 4<sup>th</sup> and 5<sup>th</sup> generation fighter aircraft essentially been single seaters ? Has the technology become simpler ? No, technologically the world is far more advanced and so the major reasons for reverting to single seat fighters are :

- ✦ Sensor fusion, which allows major interfaces and co-operation between related sensors, which in turn are coupled to the weapon systems. Selection of one automatically triggers off a host of sensors that complement each other. For example, if a radar is being slewed to follow a target and the target is fast manoeuvring its escape path out of

the radar beam, a Helmet Mounted Display can follow him at more acute angles with the missile sensor also slewing along with the head. As a result the weapon can be fired at erstwhile unimaginable angles abeam of the fighter.

- ✦ Cost of two-seaters with all systems is obviously more than that of a single seater.
- ✦ Cost of two crew means double the costs of training, manning and overheads.
- ✦ Maintenance costs are increased
- ✦ In case of a mishap, two crew members need to be replaced instead of one.

So why does the Indian Air Force continue to forge ahead with two-crew fighters, such as the Su-30 ?

The reasons can be summarised as follows :

- ✦ The philosophy of fighter engagements with long range, long

endurance aircraft, like the Su-30MKI, can best be exploited with the aircraft remaining airborne for extended periods of time, so as to engage targets at extreme ranges or to ensure a quicker response by airborne patrols. This justifies the induction of mid-air refuelers, regarded as 'force multipliers'. Why have these around if you need to land in a shorter duration of time ? Also to accrue optimum benefit while taking off from high altitude airfields/very hot temperature conditions, the aircraft can be fully armed and refuelled in the air.

- ✦ The second cockpit in the Su-30 is not a weapon operator's platform but is a fully configured cockpit from where the aircraft can be flown through its complete envelope. A major factor ignored by the uninitiated is that of aircrew fatigue. It is most telling and can severely compromise the success of a mission. As the IAF envisages using this aircraft at long ranges/ stay on station longer, without any degradation in operational capability, the usage of a two-pilot crew is justified.
- ✦ As to why the Russians do not want a two-seater PAK-FA – perhaps because their rigid philosophy of supremacy of ground control has not been altered an iota since the Cold War. It's still too early to conclude whether India will only go in for the single seat 5<sup>th</sup> generation aircraft. It may still turn out to be a optimum mix of the two, as is in the case of the selected 4<sup>th</sup> generation aircraft.



Single-seat Mirage 2000H (photo : Angad Singh)