

Technology For The Second Tier Air Forces

- Air Marshal PK Mehra (retd)

Introduction

There is one debate which is likely to continue forever in all the Air Forces and that is about the **'quality and quantity' of aircraft and equipment**. The question **"How much is enough"** both in terms of numbers and level of technology remains unanswered. The debate however does shift to **affordability** in all the countries whether rich or poor. Ever since **Air Power has emerged as the weapon of first choice** a number of countries have embarked upon **modernising their Air Force to meet the future challenges** thus starting a race. The **rate of technology obsolescence has further encouraged a tight race** amongst the various Air Forces to remain ahead. The technology denial regimes and **curbs on transfer of dual use technologies has spurred** the urge in all nations to become self reliant. The question remains: Do all the countries need to build a first rate Air Force or this aspect should be **situational and contextual**?

Which is a Second Tier Air Force?

My topic is meant to focus on the Technological needs of the Second Tier Air Forces but before I come to the topic per se, I must endeavour to **define the "Second tier Air Force"**. Should this classification be based on the familiar **concept of developed and developing countries** or should it **depend upon the size of the country, its Air Force and the level of self reliance**? Even when we consider size, both the **strength of the combat aircraft including the weapon systems vis a vis the total fleet** is an important indicator of the Air Power potential. **Size of the air force and the level of technology put together** have an important connotation on the capability to **sustain a modern campaign and the level of attrition**. The **number of 4+ generation** aircraft in an Air Force can be one of the criteria for ranking. It is also well known that some of the countries have been **maintaining a higher level of alert status because of the hostile environment** in the neighbourhood and there are **others who do not foresee a conflict** in their region in the near future and will only be **supporting coalition** efforts in diverse areas of the world. It is obvious that the **manning level and the training of the personnel** in

the Air Force maintaining a higher status of alert will be better. It is also possible that a **second tier Air Force may not be balanced and may be part of a military grouping like NATO where all action is collective and the deficiencies of one are overcome by others.**

It is indeed **difficult to classify the various Air Forces in tiers** because of **diverse conditions and requirements** as mentioned earlier and hence I have taken help from the recently **published data of 162 countries** maintaining Air Forces. The two big and powerful Air Forces those of **USA and Russia have been placed in Tier 1** and the **other smaller but very significant ones are placed in Tier 2**. I have used the data published by **Flight International of the World's Air Forces December 2009** and have deliberately left out some Air Forces because of their small size and low technology levels. Although the **total number of combat aircraft with the PLAAF and PLAN is larger than that of Russia** and they possess nearly 400 fourth generation aircraft but I have **not included the Chinese Air Force in Tier 1** since **more than 50% of its fleet comprises of old technology** aircraft with very limited possibility of being further upgraded. Moreover the **Aviation technology base of China** presently **does not match that of USA and Russia** and is also lower than some of the western European countries. I have **included the number of combat heptrs and special mission aircraft** in the table below to **indicate the combat potential** of the various Air Forces. Further analysis of the various Air Forces has shown that more than 50% of them have less than 30 fighter aircraft in their inventory. Besides the **developed countries only the countries affected by conflict zones have a significant strength of combat aircraft**. Country wise active aircraft fleet and the combat aircraft of the **top twenty Air Forces** is tabulated below:

SI No	Country	Active Fleet	Combat Fleet	Combat Heptrs	Spl Mission
1	United States	13945	3102	5342	701
2	Russia	3954	1536	1732	88
3	China	3425	2527	496	20

4	India	1778	659	557	52
5	Japan	1741	322	719	25
6	S Arabia	1562	360	309	26
7	France	1488	501	599	38
8	S Korea	1478	451	705	12
9	Iran	1340	293	827	7
10	Germany	1222	341	428	15
11	Turkey	1161	350	439	31
12	UK	1149	335	419	74
13	Egypt	1138	452	248	14
14	Italy	1122	257	539	25
15	N Korea	1033	665	203	----
16	Ukraine	996	633	250	15
17	Brazil	933	135	272	37
18	Syria	901	581	208	----
19	Pakistan	900	534	258	30
20	Israel	832	431	174	28
	Others	16084	4909	5656	478
Total	Incl others	58182	18968	20380	1716

Geopolitical Scan

The **size of the air force will be normally governed by the size of the country, strength of the adversaries and the nature of geopolitics in the region.** A quick

scan of the different continents and regions indicates that there are **perennial conflict zones as well as there are areas of relative peace**. The **end of cold war did unleash the forces**, which had remained suppressed through ruthless state force, **causing break up** of a few countries in Eastern Europe and Central Asia. This **reorganisation of the states may still be incomplete** especially in Eastern Europe and may undergo further transformations but is **likely to be controlled with NATO and EU playing a major role**.

The **conflict zones are primarily confined to Africa, West Asia and South Asia where territorial disputes** have not been resolved and hence can lead to mini wars between the states. **Central Asia can also undergo some regime changes** but that could be **through internal turmoil** rather than boundary disputes. When we narrow the field further we can see that only the **countries in Middle East and South Asia have been building up strong Air Forces**, which can affect the result of any conflict. Countries in the Asian continent have increased their defence expenditure in the last decade to build up Air Power and a higher level of deterrent capability. Some of them have shown their intent to **develop or acquire nuclear weapons to maintain deterrence**, which has not been taken kindly by the neighbours and hence **has led to tension**.

Nature of Conflict

The **nature of wars has undergone substantial change** in the last two decades but each one of these conflicts has **strengthened the primacy of the Air Power**. Even though all the **conflicts in the recent past were between unequal Air Forces** both in technology and numbers that **may not be true in our case**. Present **employment of Air Power in Iraq and Afghanistan** without any opposing Air Force is **not a correct example** to quote when discussing the conflicts of future. Should we take it that the **future operations will be mainly the fourth generation type** and the chances of a conventional war is remote? **I do not think so**. Considering the geo-politics of our region and the emergence of China, **India should be prepared for conflict across all spectrums**.

Asymmetric warfare, use of long range missiles and terrorist threats are potent and will be played out in future also. It is possible that a number of countries may use **asymmetric warfare tactics** along with the conventional warfare and also **develop niche capabilities in space denial** to fight a stronger adversary. Major **development of long range cruise and ballistic missiles by even smaller powers** indicates that they **intend to attack the infrastructure** using surface to surface missiles. **Terrorist threats will remain and unless we are able to anticipate and thereby thwart the attacks** we will not be able to protect the nation.

The **nature of conflict USA is presently involved in** has made it **change track in their development and procurement priorities of combat aircraft** but I feel that it is **only after establishing a technological superiority with a certain minimum number** of aircraft and systems to fight conventional warfare that they have **shifted focus to different capability aircraft.**

Impact of Technology

This presentation is limited to 'Technology' but I would like to emphasise that **Air Forces and the equipment they acquire and operate** are not confined to technology but are a **combination of doctrine, CONOPS, training, leadership, morale** etc and includes aviation components of naval and land forces also. **Intelligence too is a very important ingredient** and could be pivotal in the successful employment of Air Forces. Technology has its own status and will determine whether the **air force has adequate capability to deter** and in case **deterrence fails then defend the country.** Hence the major constituents of a **first tier air force** will be a **balanced air force, adequate size commensurate with the task and technologically capable of defending the territorial integrity of the country.**

There is near unanimity in the thought that **technology can win wars, technology can reduce losses, technology is expensive, technology can make the user its slave, innovations are the key to technologies and technology provides choices to the operator.** It is also an accepted fact that **technology and numbers develop a synergy when the technology is used to enhance survivability.** For

example, **AWACS and Tankers are the winning formula** in Air combat and **UCAS have changed the way the forces are operating in Afghanistan**. So much so that **Commanders in Afghanistan are reluctant to send a convoy on a road** without a drone watching over it. What is the **downside of this technology**? USAF is planning to mount cameras looking in ten different directions simultaneously and increasing it ultimately to 65 directions on its Reaper drones. They will be **swamped with the volume of video pictures** and unless the analysis is either automated or the number of analysts is increased, the data will remain unutilised.

Better technology will lead to success in operations, improve survivability and is the formula for winning wars. An aircraft equipped with **better radar and weapon system has got a much greater chance of defeating the adversary** and this fact has been **proven during exercises and combat simulation**. The **level of technology of combat support systems** like AWACS, EW aircraft, UAS/UCAS, PGMs, etc can have a telling effect in any operations. There is of course an important rider that **technology has short term gains** and is effective till the **adversary changes his CONOPS or finds a way to defeat the superior technology** e.g. **Stealth is considered to be a war winning technology** but efforts are on to **defeat this technology through integrating radar arrays, passive radars, OTH radar** etc. The technological developments in **Russian Surface to Air missiles to increase their lethality and success rates** are meant to eventually **defeat stealth aircraft**. The **impact of technology in the fields of UCAS, Net centric warfare, ISR, cyber security, security of space based assets, anti-ballistic missiles** etc is well known and makes headlines.

What are the Current Trends in Technology Development?

There is a **significant technological gap** between the first tier and the other ranking Air Forces. It **may be less in the case of Western European countries, Japan and South Korea** but the other Air Forces are yet to establish strong R&D in aviation. It is interesting to study the developments taking place in first tier countries and the other top Air Forces. Basically all countries **aim to build a technology margin** over their likely adversaries. Some of the **current developments** taking place in USA are listed below:

USA is continuing to **develop fifth generation F-35** aircraft after capping the F-22 programme. Main emphasis is on **sensor fusion, enhanced situational awareness and decision support** to a single pilot through complex avionics and artificial intelligence.

Continued **integration of sensors, combat equipment, interoperability** with coalition partners and decision makers through a **real time communication network for Net Centric Warfare**.

Development of **Precision weapons/missiles including radiation weapons** and accurate air drop technologies. Strong emphasis on **space platforms, space control and development of new concept weapons**. Increasing involvement of space based platforms to control offensive and defensive operations.

Although the **normal tasks of UAVs** like generating information through ISR, signal intelligence, jamming the frequencies used to trigger IED and prevent collateral casualties have seen growth but **path breaking developments are going on for autonomous carrier landing UAVs with stealth features and air combat**.

There is **no unanimity over the QRs for the sixth generation aircraft**. Even though manned aircraft will continue for the foreseeable future, it is possible that the **emphasis may shift to UCAS**.

Development of **airborne laser on a Boeing 747** has been going on to defeat incoming ballistic missiles. **M/s Boeing has recently demonstrated a kill on UAV using Laser**.

Hypersonic flight can become a reality if USAF and DARPA continue to **develop the scramjet**. It could **start off as unmanned** and thereafter be converted into a manned programme.

Long range bomber is in the concept stage. For it to be cost effective, it should have a **very long loiter time over the target area**. It may **eventually be an unmanned bomber** to overcome the human limitations.

Some of the **second tier air forces in Western Europe** can also develop the technologies mentioned above but **they are not prepared to invest huge amounts** in R&D. Although **China does not have such an experienced and advanced technological base** presently but they are providing **huge budgetary support** to bridge the gap and **aim to catch up with USA**. All the Air Forces recognise the growing importance of **precision strike capability, stealth, night vision, longer range attacks, lethality of smart munitions, increased C3I capability, and electronic warfare**. Various technologies being developed by the second tier Air Forces are as follows:

Precision surface to surface ballistic missiles, which can overcome the sophisticated enemy defences. Development of cruise missiles is being undertaken by a large number of second tier Air Forces.

Development and acquisition of **aircraft carriers and submarine launched missiles**.

Development of **fifth generation aircraft** with all the features to match the F-22.

Develop **AWACS/AEW&C aircraft and also EW equipment**.

Long range anti-ship missiles to attack the Carrier Battle Groups (CBG) and long range SAMs.

Develop or continuously upgrade the existing fighter aircraft inventory to **4+ generation standard**. Increased emphasis on development and acquisition of combat helicopters and **Special Mission platforms**.

Develop UAS for both ISR and combat.

Develop **PGMs and the air combat missiles to increase their accuracy, lethality, range and kill probability**. Some research is going on to develop **next generation of weapons including laser, directed energy weapons, electro-magnetic weapons** etc.

Space platforms have become integral to the new generation weapons and hence there is renewed emphasis on **developing space based assets and**

capability to control space. There is growing acceptance of the need to **capture 'Sigint' and 'Imint' both through airborne and space based equipment.**

From the foregoing, it is evident that the **second tier Air Forces are trying to bridge the gap with the present state of the art** in the first tier Air Forces. They can **leap frog through collaboration** and that is the route most of the second rung Air Forces are taking. There is a sobering thought that **do all the Air Forces have to catch up with the first tier Air Forces** or is it the **indication of direction** which the future technology is taking.

What Technology is Suitable?

Now I come back to my initial statement "Is technology dependence of Air Forces **Situational and Contextual?**" It is mainly the **fear of what new technology can deliver in the hands of a capable adversary** that keeps the race going. Technology is ever changing and hence even when ahead **no country can stand still in the race to develop new technologies.** All the major Air Forces are forced to maintain a **mix of aircraft with different levels of technology** because of rapid obsolescence and the costs of modernisation/replacement. Although Afghan and Iraq wars have **shifted the focus to improved sensors and precision ground attack** capability but it is well understood that **capability to fight conventional wars has to be maintained.**

It is an accepted fact that **USA and Russia have maintained a lead in developing technologies** but the **requirement of technology cannot be viewed in isolation** and even USA has **changed their priorities in view of the capability of the likely adversaries.** What is the **current gap** between the technologies of USA and its likely adversaries? Can we **state this in terms of weapon accuracy, sensor capability, stealth technology, number of aircraft/weapon systems, proven UCAS, cyber warfare, space systems, and not to forget the number of nuclear warheads and the delivery systems?** What in our view is the **likely time frame** in which the second tier Air Forces will be **able to develop technologies equivalent** to the present US capability? These are all **difficult questions** without ready answers. It is **difficult to catch up** with the technologies of Tier 1 Air Forces unless **substantial investments** are made to develop them but the **present trend is**

reduced investments by all the countries not facing conflicts except in the case of China.

The existing **technology gap** between the various Air Forces can be **bridged either by joining the race** in case the likely adversaries acquire advanced technologies **or they join a military pact** with other countries in the region. In all the cases it should be the **strategy that guides the capability build up**. Each country needs to identify the **niche technologies** they can develop or acquire **to tilt the balance** in their favour in the region and these niche technologies are **situation specific**. Innovative employment of Air Force and use of **techniques to fight an asymmetric war** can bridge the gap but its **efficacy in a prolonged campaign will be situation specific**. What is clear from the foregoing that **either the countries develop technologies for hardware** or they focus on the **softer aspects like manning, training, ISR capture/analysis and indirectly build up capabilities to fight a strong adversary**.

What are India's Options

India must keep track of the **geo-political and technological developments** taking place in its neighbourhood. It would be **ideal to be pro-active** but for that we have to **change our ethos**. India has to **maintain a balanced Air Force** in the long term but **in the short term it can increase the focus on acquiring combat systems to fight insurgency in the neighbourhood**. The development of a **balanced force will be a true deterrent** and will ensure that even if a **conflict escalates then it will be controlled by us**. **China has clearly indicated their desire to match USA in economic and military strength** and have shifted their focus to PLAAF and PLAN. All the developments and acquisitions by **China are steeped in deep strategy of power projection** by neutralising any advantage enjoyed by the potential adversaries. The **emphasis on development of aircraft carriers, aircraft with super-cruise capability, AWACS/AEW&C, tankers, long range air combat missiles, anti-satellite weapons, recent tests of anti-ballistic missile system** etc all point to China building its arsenal to **develop Blue Water Navy** and pose threat at long ranges to meet their aim of becoming a super power. Their **focus on Taiwan** is strong and they **would not brook any outside interference** including that of USA. The acquisition of aircraft carriers, long range anti-ship missiles, nuclear

submarines are meant to keep US Carrier Battle Groups (CBG) at bay in case USA comes to assist Taiwan. The **double digit growth of the Chinese official defence budget** is enough of an indicator about its intent. Different international institutions have estimated the Chinese defence budget to be about 200% to 300% of the official budget of \$ 70.2 billion for 2009. What is most glaring and one with very long term impact is **\$20 billion investment in R&D as compared to India's \$1.5 billion in 2009**. At present **Indian Air Force is well matched with PLAAF in terms of technology** and has plans to build up the capability through induction in the next ten years but it has to take urgent steps to **develop indigenous technologies** and achieve self reliance. It is the **future projection of China's capability**, which India must monitor and match. India can **focus on developing some niche indigenous capabilities** especially in the field of **AWACS/AEW&C, PGMs, EW, operational data link, UAS, cyber warfare, intercepting ballistic missiles** and give a strong push to defence diplomacy in South Asia, West Asia and Africa. Simultaneously the **manning, training, net centric warfare capability, cyber warfare and ISR** will pay rich dividends against any adversary.

Conclusion

There is an **unending race** amongst all Air Forces to develop or acquire technologies to boost their Air Power. This **trend is very prominent** amongst the countries **facing long term or short term threats** in their neighbourhood. The urge **gets mellowed down when affordability** becomes a consideration. All the countries have to be **prepared to meet threats in all spectrums of conflict** and hence there is a **trend to join military groupings** to share the burden and ensure greater security and stability. The **level of technologies required** depends upon the **threats envisaged** and this leads to a race in the region. Either the countries have to **spend more on developing technologies** of one kind or the other or **they focus on the softer aspects like manning, training and other force multipliers**. The **technologies and size together** will always remain the war winning formula.