Pakistan's most authentic and foremost Aviation and Aerospace magazine

PAKISTAN AIR FORCE

April 2021

SECOND to NONE

QUARTERLY

EXCLUSIVE

WINGS OF FREEDOM

TAKING CHARGE

A Look at the Future of Air Power

MANNING THE UNMANNED

Myth or Reality?

FLYING SAUCERS

A Nimble Fighter of RPAF

FABULOUS FURY

History of Indo-Pak Water Disputes

WATER WARS

A View from Cholistan

DESERT, DUST & DAREDEVILS

JINNAH'S LEGACY

MIRACLE MIRAGES

www.secondtononepaf.com

EDITORIAL TEAM

Contact Us

051- 950 6551
051- 950 7753

chiefeditor@secondtononepaf.com
www.secondtononepaf.com

Advertising 0331 9356324

Cover Photo: Awais Lali.

from the Editor-in-Chief

Perhaps the most important event of the last quarter was the change of command ceremony held at Air Headquarters on 19 March. The event marked the culmination of the glorious command of outgoing CAS, Air Chief Marshal Mujahid Anwar Khan. Three years of his command saw various high-stake scenarios and challenges that were handled judiciously with the wise counsel of the outgoing Air Chief. The nation is thankful for his relentless services. The occasion also marked the beginning of a promising era under the leadership of Air Chief Marshal Zaheer Ahmed Baber Sidhu. The incoming Air Chief is a harbinger of renewed rigor for PAF and would surely carry on the legacy left by his worthy predecessors. We have comprehensively covered the proceedings of the historical event in our main feature. Moving ahead, we take up coverage of Pakistan Day celebrations. Air Chief was just in time to supervise the impressive air display put on by his men on this historical day. PAF's flypast was the highlight of the day's proceedings and also a source of reassurance of the nation's trust on its air force. Our team has aptly covered the proceedings of the day in the inside pages.

Two special features which we carry in this edition required detailed research, collection of data/ photo archives and in-depth interviews of the serving and retired PAF personnel. After several sleepless nights and painstaking efforts, we are proud to put together these pieces which will surely interest our worthy readers. First is a tribute to the personnel of No 12 Sqn who have proudly carried forward the legacy of the founder of the nation, Quaid-e-Azam Muhammad Ali Jinnah to this day. Flying the PAF air chiefs, head of the states, and premiers of Pakistan to locations where they are needed the most is no easy job. It requires 24/7 commitment and utmost responsibility, which these gallant men are fulfilling for years now. Next is a legendary tale of the aircraft from RPAF days that replaced the already impressive Hawker Tempest and immediately became the new favourite, the feisty Sea Fury. The aircraft and its crew made history on many fronts. From performing watch and ward duties in the troubled west to carrying out anti-locust operations in drought-ridden south, the services of this nifty fighter and its crew shall be long remembered.

Another aircraft that has earned itself the title of PAF workhorse is the Miracle Mirage. From 1971 Indo-Pak war to the latest conquest of Ops Swift Retort, Mirages have been on the frontlines of all the major conflicts the nation has seen over the period. This year, PAF orchestrated a formal ceremony to acknowledge the services of its various units which have operated this aircraft for decades. The services of its veteran crew were also recognised keeping in line with the finest traditions of PAF. Following the usual contrast, we travel from the past to the future, diving in to the hi-tech world of UAVs. Tracing the evolution of these pilotless birds, we shall dissect the strategic importance these never-before-seen assets hold in modern battlefields.

Have you ever taken UFO stories seriously? The US of the 1950s definitely did. In this issue we carry the mysterious tale of how flying saucers became reality and how an entire nation was obsessed over them for almost a decade. Another interesting piece of aviation technology that we'll discuss is the Ramjet. Beginning with its basic working, we shall go on to analyse how the technology can prove itself to be a prudent alternative to the other types of jet engines. Delving into regional problems, we shall elaborate the history and the future of water politics between Pakistan and India, examining the Indus Water Treaty and the various violations made by our belligerent neighbour in this regard. Ending on a higher note, the last article is a coverage of the massive desert rally held every year in exotic Cholistan. Attended this year by over a hundred modified, advanced, rugged off-roaders, it is an affair fuelled by gas and adrenalin.

Towards the end, we would like to remind our worthy readers and public at large about the alarming onslaught of third wave of covid-19 pandemic in Pakistan. We urge everyone to take precautions in line with the guidelines provided by the concerned authorities; stay indoors, avoid public gatherings and wear a mask. This is the least we can do as responsible citizens in our fight against this menace.

Coming back to this edition, as you have probably guessed by now, it's going to be a little more than an interesting read this time. So, stay indoors, grab a warm cup of tea and dive right in. Happy Readings!

Muhammad Ali

Air Cdre (R) Muhammad Ali, SI (M)
Editor-in-Chief
email: chiefeditor@secondtononepaf.com

Page Photo: Air Cdre Hamid Faraz (Retd).

PAKISTAN AIR FORCE
SECOND to NONE
QUARTERLY

Contents

Page Photo: Wg Cdr Mudassir Khan.

TAKING CHARGE

DAWN OF A NEW ERA

"PAF has always had the fortune of having visionary leaders at its helm, especially when it mattered most. The last three years have been a testimony to this undeniable fact. From Ops Swift Retort to fighting the menace of Covid 19, the challenges seemed insurmountable. However, its leadership proved equal to the task on all fronts and led the force with razor-sharp intelligence. The legacy of the glorious command of Air Chief Marshal Mujahid Anwar Khan culminated on 19 March this year, only to be carried forward by his worthy successor, Air Chief Marshal Zaheer Ahmed Baber Sidhu. The day also holds historic importance in PAF as the tradition of 'Change of Command' ceremony originally dates back to 1957, when the first Pakistani Air Chief took over the command of the then nascent PAF. And there on, the legacy continued."

by Air Cdre (R) Muhamamd Ali, SI (M)

This March, the arrival of Spring Solstice in Islamabad not only witnessed the official change of seasons but also marked the change of command of Pakistan Air Force. 19 March, every three years, carries a historic importance as the new Chief of the Air Staff takes charge of the prestigious Pakistan Air Force. 19 March 2021 was no different. The weather was near perfect, the skies over Islamabad were clear with a cosy sunshine. In a solemn ceremony held at Air Headquarters, Islamabad the outgoing Chief of the Air Staff, Air Chief Marshal Mujahid Anwar Khan, NI (M) handed over command of the Pakistan Air Force to his worthy successor, Air Marshal Zaheer Ahmed Baber Sidhu, Chief of the Air Staff (Designate). A day earlier, the new Air Chief was appointed by Mr Imran Khan, the Prime Minister of Pakistan.

On arrival, the outgoing Air Chief was received by Air Marshal Zaheer Ahmed Baber Sidhu, Chief of the Air Staff (Designate). A smartly turned out contingent of PAF presented the guard of honour to the outgoing Air Chief. Later, he reviewed the parade, saluting Pakistan and PAF colours while marching past them. Back on the dais, it was the time for the address of the outgoing Air Chief. Amidst large gathering of Ex Air Chiefs', senior serving and retired PAF officers and families the outgoing Air Chief delivered his farewell address. The Air Chief said, "Certainly, I cannot think of a greater honour than leading one of the finest air forces of the world."

Recalling the PAF's achievement in Operation Swift Retort, he added, "Alhamd-u-Lillah! PAF once again lived up to the Nation's expectations and proved to be the guardians of our free blue skies through a timely and well-calibrated response, which kept the enemy at bay." He further said that PAF had made great strides on its journey to excellence and continued transformation for a Next Generation Air Force – 2047.

Congratulating the new Air Chief he said, "My successor is a sound professional with extraordinary leadership qualities and above all he is an excellent human being.

> "Air Chief Marshal Zaheer Ahmed Baber Sidhu is the 23rd Chief of the Air Staff of Pakistan Air Force."

I congratulate Air Chief Marshal Zaheer Ahmed Baber Sidhu on his appointment as Chief of the Air Staff, Pakistan Air Force, and wish him success in his new assignment. I am confident that during his tenure of command, Pakistan Air Force shall scale to new heights of excellence, InshaAllah!

Next up in the ceremony was the flypast by the four-ship formation of Pride of the Nation, JF-17 Thunder from No 26 Multi-Role Squadron of PAF. Led by its officer Commanding Wg Cdr Shaharyar, the formation comprised Sqn Ldr Waqas (left wing), Sqn Ldr Monim (right wing) and Wg Cdr Omer (slot). The perfectly-timed formation appeared on the horizon at the prescribed time and pulled up right in the centre of the venue, bidding farewell to the outgoing Air Chief.

> My successor is a sound professional with extraordinary leadership qualities and above all he is an excellent human being: ACM Mujahid Anwar Khan

The news clippings regarding the appointment of Air Chief Marshal Zaheer Ahmed Baber Sidhu appeared in the leading national newspapers.

Air Marshal Zaheer Sidhu appointed new air chief

OUR CORRESPONDENT

ISLAMABAD: Air Marshal Zaheer Ahmad Babar Sidhu has been appointed new Chief of the Air Staff of the Pakistan Air Force (PAF), replacing Air Chief Marshal Mujahid Anwar Khan on his retirement on Thursday.

Air Marshal Sidhu, who is currently serving as the Deputy Chief of Air Staff (Admin) at the Air Headquarters, will take over the command of the force during a change of command ceremony scheduled for Friday.

The incoming air chief hails from Sadh village in Punjab's Gujrat district. He joined the PAF as a GD pilot in 1986. He attended Combat Commanders School, Air War College and Royal College of Defence Studies in the UK for higher studies.

ACM Zaheer to take over as PAF chief

Air Chief Marshal Mujahid Anwar retires today

By our correspondent

ISLAMABAD: Air Marshal Zaheer Ahmad Babar Sidhu has been promoted as Air Chief Marshal and appointed as the new Chief of the Air Staff of Pakistan Air Force (PAF).

The newly-appointed air chief will assume command of the Pakistan Air Force on March 19, the spokesman of PAF said Wednesday. Air Marshal Zaheer

As the roaring JF-17 Thunder disappeared from the venue, it was time for the grand finale, the award of rank badges and command sword to Chief of the Air Staff (Designate). Amidst large round of applause, Air Chief Marshal Mujahid Anwar Khan decorated Air Marshal Zaheer Ahmed Baber with the ranks of Air Chief Marshal and later handed over the command sword to his worthy successor. On assumption of PAF command, ACM Zaheer Ahmed Baber received general salute from the assembled parade. The ceremony concluded with a farewell general salute to the outgoing Air Chief.

A Page from History

The history of change of command ceremonny dates back to 23 Jul 1957, when Air Marshal Mohammad Asghar Khan took over the command from AVM AWB McDonald, as the first Pakistani Commander-in-Chief of PAF. He was only 36 years of age when he took over the command of the then nascent Pakistan Air Force. The illustrations depicts some of the glimpses of the change of command ceremony that was held at Air Headquarters at Mauripur, Karachi. Illustration (Above) shows AVM AWB McDonald receiving the farwell guard of honour from the smartly turned out contingent of PAF, while illustration (below) shows newly appointed C-in-C, delivering his inaugural address. (All Pics PAF Archives).

Profile of CAS

Born on 16 April 1965, Air Chief Marshal Zaheer Ahmed Baber Sidhu was commissioned in GD (P) Branch of Pakistan Air Force in April, 1986. During his dazzling career, he has commanded a Fighter Squadron, a Flying Wing, an Operational Air Base and Regional Air Command. In his staff appointments, he has served as Assistant Chief of the Air Staff (OR&D), Assistant Chief of the Air Staff (Training-Officers) and Additional Secretary at Ministry of Defence. He also served as Director General Projects, Director General Air Force Strategic Command, Deputy Chief of Air Staff (Air Defence) and Deputy Chief of the Air Staff (Administration) at Air Headquarters Islamabad. He is a graduate of Combat Commanders' School, Air War College Institute and Royal College of Defence Studies (RCDS), UK. In recognition of his outstanding services, he has been awarded with Tamgha-i-Imtiaz (Military), Sitara-i-Imtiaz (Military), Hilal-i-Imtiaz (Military) and Nishan-i-Imtiaz (Military).

President Confers Nishan-i-Imtiaz (Military)

President Dr Arif Alvi conferred Nishan-i-Imtiaz (Military) upon Chief of Air Staff, Air Chief Marshal Zaheer Ahmed Baber Sidhu at a special investiture ceremony held in Islamabad on 22 March 2021. The prestigious award was betowed upon the air chief as an ackowledgement of his professional services and achievements while serving the Pakistan Air Force, over the years.

WINGS of FREEDOM

A View from the Parade Venue

Title Photo: Pushing through the Air- Combining speed and agility, JF-17 Thunder pierces through cloudless Islamabad skies during solo aerobatics display. (Photo: Awais Lali).

Left: ACM Zaheer Ahmed Baber Sidhu getting ready to lead the Pak Day flypast. (Photo: WO Iftikhar).

"Marking an important moment that really changed our history, the Parade Day celebrations featured an armada of flying machines belonging to its armed forces. The focal point of the event was a salute to the nation by the new air chief of Pakistan Air Force, Air Chief Marshal Zaheer Ahmed Baber Sidhu who took charge of PAF at the change of command ceremony held at AHQ. The author presents the thrilling account of the flypast which was the highlight of the event."

by S. Khalil

After three consecutive days of just a few colours, mostly shades of greys and heavy showers over the capital city Islamabad, the morning of 25 March was warm and wind checks were good. The stands where guests were seated and the decorations at the parade venue were a sea of colours. The show was a go, when the ACM Zaheer Ahmed Baber, Chief of Air Staff, PAF in state-of-the-art F-16 D Block-52, came up in a burst of speed and pulled up in front of the chief guest, heads of the army and the navy and the audience in the stands - a visual symbol of the trust between the people and PAF.

Flying 500 feet above ground and following the Air Chief, were Air Vice Marshal Zafar Aslam and Wg Cdr Junaid, leading the formation of the four multirole F-16s of the No 9 Sqn 'The Griffins'. Behind this group was Wg Cdr Sarmad, heading the No 16 Sqn in the JF-17 Thunder and the newly inducted dual seat JF-17 Thunder B. This squadron is famously known as the 'Black Panthers'. The sky above the capital city was then filled by the noise made by the 'Zarars' from the No 27 Sqn flying the 'Miracle' Mirage aircraft. Wg Cdr Hammad Khurshid was leading the formation of the four delta winged jets that are feared for their speed and agility. While Wg Cdr Kamran Yasin led the 'Tigers' from the No 17 Sqn in their F-7PGs, close behind

Left Above: 'Solo Turk' performance on Pak Day celebrations was nothing short of spectacular. (Photo: Hamza Tariq).

Right Above: Star of the Show-ACM Zaheer Ahmed Baber, Chief of the Air Staff salutes the nation in his roaring F-16 D Block-52. (Photo: Rana Suhaib Snappers Crew).

was his comrade, Wg Cdr Farhan Zia, from the CCS, leading the 'Dashings' formation of four F-7PG fighter jets on his wings.

After the fighting complements of the PAF, the force multipliers closed in at the parade venue. Wg Cdr Kashif Hussain and Sqn Ldr Umair Mumtaz, led the formation of the Karakoram Eagle (KE-03) and two Saab 2000 aircraft from the No 3 and No 4 squadrons, respectively. Air Force support and transport helicopters, the Mi-17 and AW-139 from No 83 and No 87 squadrons followed close behind.

Soon after, the aviation assets of Pak Army and Pak Navy followed. The venue echoed with the deafening sounds of the incoming 'Choppers', sleek and lethal 'Cobras', mighty MI-35 and veteran MI-17, were all there to enthral the audience. Pak Navy assets were next to appear on the scene. Sea King, Orion, Z9-EC all zoomed past the cheering audience. SSG Commandoes of Pak Army, carrying Pakistan flag, hanging with a sling from the over flying heli, was nothing short of a spectacle.

Left: The F-16 D Block-52 seizes centre stage as the world's elite multi-role fighter. ACM Zaheer Ahmed Baber, Chief of the Air Staff, moments before final pull up over the venue. (Photo: Waqas Shah Snappers Crew).

Below: Its power and small size make it one of the most versatile aircraft in PAF's airborne arsenal - The Thunder is truly the backbone of PAF. (Photo: Awais Lali).

Above: No 27 Sqn 'Zarrars' make ice water run through the veins. (Photo: Awais Lali).

Below: On missions, the first order of business for the CCS 'Dashings' in their F-7PGs, is to out-manoeuvre the adversary in air combat. (Photo: Hamza A Mughal).

Above: No 9 Sqn 'Griffins' - Angels of war trained to square off any challenge thrown in their way. (Photo: Rana Suhaib Snappers Crew).

Below: No 17 Sqn 'Tigers' can strike terror in the heart of the enemy. (Photo: Awais Lali).

Taking off from PAF Base Minhas and inbound for the next high-octane mission was Wg Cdr Mudassir Riaz, who brought his 'A' game flying the JF-17 Thunder. "The JF-17's solo performance spelled thrilling and beautiful any way you looked at it," said an audience member after the show. "It was an adrenaline rush," said another.

It was the moment Wg Cdr Mudassir Riaz, had practice so hard for. The rolls, the loops and tight turns pulling high Gs in the corners were a marriage between gutsy and precision flying. The after-burner was thrown in and the Thunder looked like a ballistic missile. Thunder turn, barrel-roll, muscle-climb, high alpha-pass and half cuban-eight were some of exotic manoeuvres which kept audience on the edge of their seats. Towards the finale, the roaring Thunder disappeared in the skies over Islamabad performing multiple

Below: Severe High 'G' turns and sudden escape moves-Tracking the horizon for enemy fighters the JF-17 jet project power from the air. (Photo: Awais Lali).

vertical rolls dispensing flares all the way.

Next, the air space belonged to aerobatic sensation, the internationally acclaimed 'Solo Turk', who had flown in especially to perform at the Pakistan Day celebrations. All the way from Turkey, Solo Turk had arrived early, to get some extra practice, doing above and beyond manoeuvres in his high performance F-16.

"Solo Turk is always incredible to watch fly. He is a huge name in the demonstration flying industry after all," said a guest witnessing the air show. Wearing all black livery with a prominent golden eagle on its tail and gold colours of the crescent star on the lower side, the Solo Turk F-16 was a treat to watch. Flying for about 18 to 20 minutes over the venue, Capt Serdär Dogän displayed some jaw-dropping manoeuvres. During the performance, the aircraft demonstrated variety of manoeuvres including high-G steep turn, loop, inverted pass, high alpha pass etc. From dropping speeds to meagre 220 Km/h and then accelerating to 1200 Km/h, Capt Dogän made the performance look like child's play. Capt Mustafa Birjan, official commentator of Solo Turk along with Sqn Ldr Hasssan Jalal (PAF commentator) equally enthralled the audience with their powerful commentary.

According to another guest, watching Solo Turk perform was like leaning forward and seeing the edge of the cliff. That was just cold courage strapped in the Fighting Falcon, with thousands of pounds of deafening thrust, she said. All eyes were on Solo Turk especially when his low level passes looked like close scrapes with the after burner kicked in, added another spectator. Just when the guest could all breathe again after the end of Solo Turk's demonstration flying, rolled in the PAF's official aerobatic team 'The Sherdils', and the blinking was not allowed. The Sherdils are the dream team of demonstration flying business, made up of some of the best formation

pilots of the PAF. In aviation, there is nothing more dangerous than formation flying. With nine jets up there, it is extremely complicated what the pilots are trying to achieve sticking a few feet from each other and maintaining steady positions through the loops and rolls. Above all, formation flying is about absolute trust. It took every bit of concentration to pull off their tightly-boxed formation stunts at the same time showing off the amazing handling of the K-8 aircraft. With the angle of the sun making the jets glisten, the PAF's demonstration team had put together a tight routine of various manoeuvres filling the Pakistan flag coloured trails in the sky, finishing their demo with their favourite gig, the bomb burst.

The event was a huge success and came with an inherent message. It's not merely a 'Show of Force' showcasing the might of the Pakistani military but also a reassurance to the nation that the defence of the motherland is, and would always remain, in the safe hands of its professional armed forces.

Above: No 16 Sqn 'Black Panthers' have only one purpose - to gain control of the space above and the territory below. (Photo: Rana Suhaib Snappers Crew).

Left Page Inlet: Hunter of Seas- P3C Orion has brought new meaning to maritime surveillance capability of Pak Navy. (Photo: Awais Lali).

Left: Flying Fortress- Sky echoes with the rumble of armed-to-teeth Pak Army Mi-35. (Photo: Awais Lali).

Left Page Above: Blinking Not Allowed- Sherdils have proved their mettle time and again, truly the stars of the show. (Photo: Rana Suhaib Snappers Crew).

Left Page Bottom: Turns on a tight radius and performing rapid rolls is not its only hallmark, Solo Turk can also display slow speed ability of his F-16. (Photo: Awais Lali).

Bottom: The Formidable Duo- PAF AWACs are the game changer. (Photo: Awais Lali).

A Tale of Burraqs'

JINNAH'S *Legacy*

"The crews and aircraft in the No 12 squadron have helped premiers make history - occasionally they made history themselves. Anywhere, where the presence of our Presidents, the Prime Ministers and heads of the armed forces and senior government dignitaries was necessary, the No 12 Sqn has always stood with them. "It's a great honour and amazing experience to fly the most important men in the country across landscapes. Something we are very proud of doing," said Wg Cdr Rizwan Waqar Satti, OC No 12 VIP Sqn. And if the walls of the Viscounts', the Dakotas', Tridents', the Falcons', Boeings' that have served the heads of state could talk, imagine the stories they could tell. There are only two ways to find out what they were like - either get elected or continue reading."

by Air Cdre (R) Muhamamd Ali, SI (M)

S.Khalil

Communication was always a challenge during the height of conflict in the 1990s Afghanistan. The tenuous air bridge between Islamabad and Kabul, Kandahar and Mazar-e-Sharif was the only practical method for peace talks. Tasked with flying peace missions, the No 12 Squadron flew several unprecedented flights. On one such mission in July 1997, No 12 Sqn crew was flying the Afghan Foreign Affairs diplomat from Mazar-e-Sharif to Peshawar, when an inflight emergency developed. Continuing with the journey made the PAF Fokker an inviting target over hostile territory. Wg Cdr Khalid Kamal (later retd as an Air Cdre) who had the controls, decided to divert the Fokker aircraft back to Mazar-e-Sharif, not knowing that it was about to become the most dangerous flight of his career.

"It was a night mission. I switched on landing lights and began orbiting over the runwaystrip in Mazar-e-Sharif. We made several failed attempts to establish contact with radio controls on the ground. The radio controller had clocked out. There were no flights after dark due to threats from Taliban and trucks would be parked on the runway blocking it," Air Cdre Khalid Kamal (Retd) said explaining that they did get through eventually and were permitted to land.

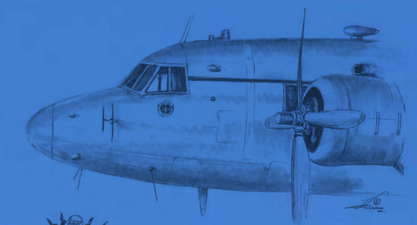
Engines still running, only the captain of the aircraft was allowed to disembark. Several armed men aiming at the aircraft, Khalid Kamal stepped out with hands over his head and slowly walked over to the men in-charge to explain this was the same flight that took off earlier with Afghan delegation and was forced to land due to a technical problem. "I found out that forces on ground mistook us for a Taliban aircraft and we were about to be shot down. It was only a matter of a trigger happy Afghan expending everything they had," said Khalid Kamal.

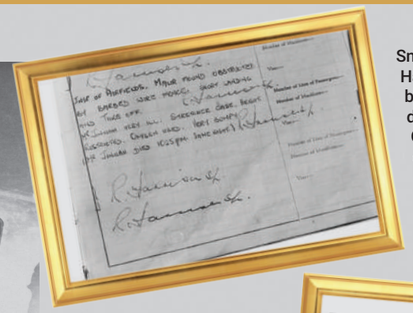
Above: Gulfstream 450 (Tail No J-756) is the latest edition in the inventory of No 12 Sqn. (Photo: Alistair Zammit).

Bottom Left: Quaid-e-Azam Muhammad Ali Jinnah along with Mohtarma Fatima Jinnah climbing down from Vickers Viking (Tail No 750). It was the unit's first VIP aircraft especially designed for the Quaid. Unfortunately, the aircraft carried the Quaid for a short span, as the father of the nation died few months after its induction. (Photo: PAF Archives).

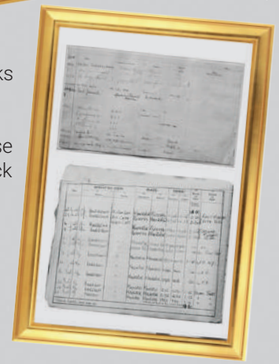
"The dignitary on board, blissfully unaware of the storm that was about to unleash uptil then, felt something sink in his gut when I shared this news with him," Khalid Kamal recalled.

Khalid Kamal likes to say he was born in No 12 Sqn. Besides the shuttle services traversing the foreboding land barriers and helping bridge the ideological, cultural and religious chasms, he also flew several relief missions to Africa, transporting both goods and personnel. His most memorable missions were flying heads of state especially in his favourite aircraft. The Fokker helped him graduate to an experienced pilot. From General Zia-ul-Haq to General Pervez Musharraf and everyone in between, he has had the honour to fly missions which have shaped the history of our nation.





Snapshot of Sqn Ldr Harrison's flying log book depicting the date and time of Quaid-e-Azam's demise. He was the last person to fly Quaid from Quetta to Karachi. (Photo: PAF Archives).



The one mission he talks about often, for which then President Farooq Leghari owes him a case of beer, was a flight back from Australia. Shortly after taking off, the No 3 engine of VIP B-707 tail No 635, flamed out, also rupturing a fuel tank. "The engine quit but luckily the plane did not plummet," he said as his mind went back to training, in the time of crisis. Without letting the fears of the moment overcome his rational judgement, Khalid Kamal landed the Boeing safely back at Darwin.

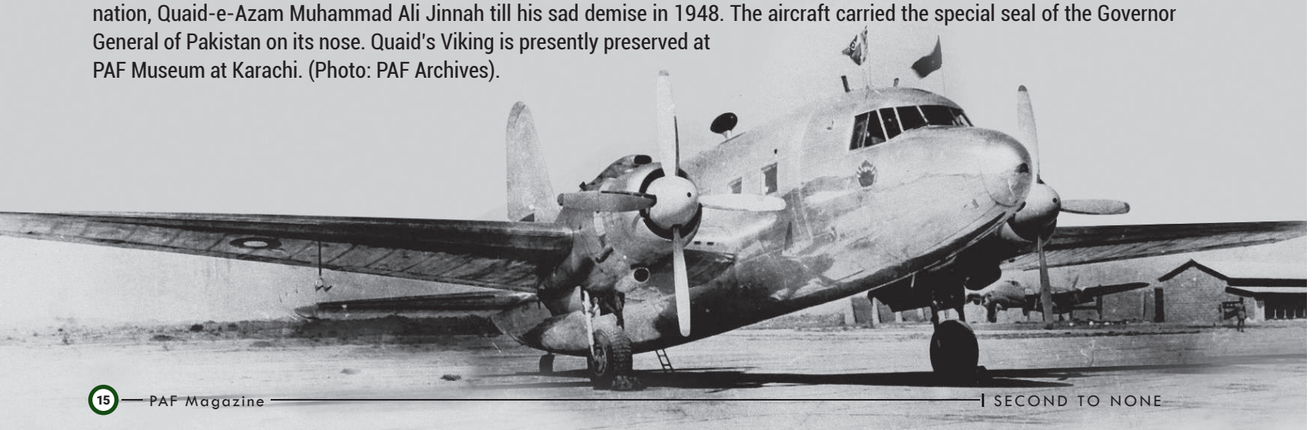
There are many symbols of power in the Pakistan Air Force but none show more strength than the No 12 Sqn. When Gulf Stream 450, a pinnacle of speed with comfort, pulls up to the spot for arrival, when the door is opened and the premiers' step out, it symbolizes the strength of the country. Behind every journey, whether in prop planes or modern jets, there has been an extraordinary team tasked with transporting our leaders. The No 12 Sqn has assisted PMs conduct foreign policies across the world in veritable air force workhorses. Its crews and their planes have played parts in our profound national dramas. From Jinnah's last air journey and tragic death recorded in the flying log book of Sqn Ldr RJ Harrison (Officer Commanding Governor General's flight), to opening up the world for President Ayub Khan, to transporting relief goods where they were needed the most to airlifting Pak Army troops for UN special missions across the world, No 12 Sqn and his crew has always proved itself equal to the task.

Above: Quaid-e-Azam Muhammad Ali Jinnah along with Mohtarma Fatima Jinnah arriving at Karachi for the first time after the declaration of Independence of Pakistan. (Photo: PAF Archives).

Center: Quaid along with Mohtarma Fatima Jinnah being received at PAF Rislapur in April 1948 on his VIP Dakota of No 1 Comm Flt. (Photo: PAF Archives).

Vickers Viking

Built by famous Vickers Company of UK, Viking was a medium range passenger aircraft. The first prototype flew on 22 June 1945. In 1947, one specially built VIP version Viking C MK-2 joined the inventory of two Douglas Dakotas and two Harvard of No 1 Communication Flight stationed at Mauripur station at Karachi. The aircraft has the rare honour of carrying the Father of the nation, Quaid-e-Azam Muhammad Ali Jinnah till his sad demise in 1948. The aircraft carried the special seal of the Governor General of Pakistan on its nose. Quaid's Viking is presently preserved at PAF Museum at Karachi. (Photo: PAF Archives).

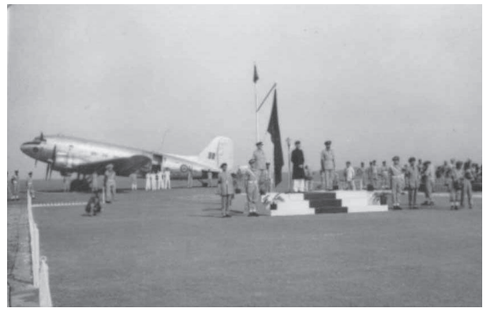


> "Presently, No 12 Sqn is equipped with Gulfstream 450, Gulfstream –IV SP and a Citation 560 excel for carrying the President, Prime Minister, Chief of the Air Staff and other senior civil and military dignitaries."

Prime Minister Zulfiqar Ali Bhutto was the regular passenger of Sqn Ldr Sardar Asif (later retd as AVM). On one particular tour when it was chucking down with rain, a young pilot Sqn Ldr Sardar Asif, was tasked to fly Zulfiqar Ali Bhutto to Quetta on an important assignment the premier couldn't afford to miss.

Vickers Viscount

Vickers Viscount was a four-engine progressive development of the Viking aircraft, but beyond the fact that the wing and fuselage construction followed the same general system the two types had little in common. The aircraft was fitted with four Rolls-Royce Dart turboprop engines. In 1956, a VIP version of Viscount aircraft replaced the ageing Viking in the No 12 Sqn for carrying out VIP duties. The aircraft flew for 12 years with the sqn before it was gifted to Chinese government as a goodwill gesture in 1968.



Top Left: Commander-in-Chief, RPAF AVM Atcherley being seen off for a flight on No 12 Sqn VIP Dakota (tail no C-406). (Photo: PAF Archives).

Top Right: Prime Minister Liaquat Ali Khan seeing off Shah of Iran at Peshawar. No 12 Sqn Viking seen in the background. (Photo: PAF Archives).

Bottom Left: Quaid-e-Azam delivering the historic speech at the RPAF College Risalpur on 13 April, 1948. Governor General's Dakota seen parked in the backgroud. (Photo: PAF Archives).

Bottom Right: No 12 Sqn's first Squadron Commander, Sqn Ldr AKS Ahmed along with Flt Lt Kamal Ahmed (navigator) in the cockpit of Dakota C-406, the C-in-C aircraft. (Photo: Air Cdre Kamal Ahmed).

"It can be a dreadful flight in an overcast conditions to Quetta, in a Fokker aircraft that does not have the luxury of climbing to high altitudes to avoid weather. Throughout the flight the weather was really bad, it became worst as we approached our destination. As soon as I broke the clouds during descent, I realized that we were only 500 feet above ground, too low for comfort," he recalled the unforgettable event that he never says much about. Had he continued descending, the plane could have hit the ground in less than 30 seconds.

Walking through a flying squadron is pretty cool and this one can get anyone excited. The history and heritage of the No 12 Sqn extends quite a way back. In the squadron memorabilia's lining the walls of sqn headquarter building, complete with polished marble floors, gives a sense of how incredible were the crews that made up the No 12 Sqn.

"Carrying VIPs since the 1940s and having transported prime ministers and presidents, air force, army and naval chiefs and high level officials, is an almost indescribable experience until you've done it", Wg Cdr Ali Akbar Flt Cdr Operations No 12 Sqn said.

"We're always there always standing by whether we are needed or not. This is the job of No 12 Sqn, a military mission that never ends. The moment of truth comes when flying a high profile dignitary such as Pakistan 1, which is the VIP aircraft call sign for the President of Pakistan. We try not to be overwhelmed with it because we have a job to do and stay focussed," Ali Akbar explained.

While the No 12 Sqn has played critical

An Ideal example of a composite squadron. At one point of time No 12 Sqn was equipped with variety of aircraft including the Auster, Harvard, Tempest, Dakota, Viking etc (Photo: PAF Archives).

Sqn Ldr Masood Khan, Flt Lt MM Sohail along with air hostess Panthaky of PIA, in the cockpit of President's Viscount. (Photo: Air Cdre Kamal Ahmed)

Top Left: Sqn Ldr Mukhtar A Dogar along with officers of No 12 Sqn . Seen in background is the Halifax Bomber with which the squadron was equipped at the time of establishment in 1950. (Photo: PAF Archives).

Top Right: Commander-in-Chief VIP Dakota C-406 was the aircraft of choice for AVM Atcherley when it comes to visiting RPAF's far-flung air stations like Dacca, East Pakistan. Seen in picture are Gp Capt Asghar Khan (2nd from right) and Sqn Ldr AKS Ahmed , the then Sqn Cdr No 12 Sqn. (Photo: PAF Archives).

> What many of us probably didn't know was that heads of states, premiers when flying over most countries often exchange greetings and share messages of peace, prosperity and friendship, even when flying over countries with whom they have poor relations. It is a diplomatic norm which majority of the leaders follow in true letter and spirit.

role in transporting the Prime Ministers and his staff to events and engagements across the world since the times of Quaid-e-Azam Muhammad Ali Jinnah, the aircraft have matched the leadership role. However, long before the PAF was sending premiers across the globe in the comfort of modern flying offices that they use today, chief executives got by in less efficient modes of transportation. Aircraft like the Viking and the Viscount, represented the quality of comfort back then.

Taking a look at No 12 Sqn's humble beginnings, its story began in June, 1948, when it was just a communication flight stationed at Mauripur (now PAF Masroor). The flight was equipped with specially appointed Viking, PAF's first aircraft that came fitted with luxury upholstery for VIP flights. It was called the Governor General's aircraft, and was meant exclusively for him. As a bonus, it was also beautiful. Since there was no RPAF pilot with sufficient experience to undertake VIP flights, an RAF officer was the Viking's sole pilot and the commander of the Governor

HP-57 Halifax

Fitted with two Rolls-Royce Vulture 24 cylinder engines, Handley Page Halifax bomber was manufactured by UK in late 1930s. It was extensively used in WWII by the British against Nazis. In 1949, RPAF purchased eight refurbished ex-RAF Halifax (2 MK VIII and 6 MK VI) aircraft from the UK to equip its newly raised No 12 sqn for bomber ad transport operations. Although, the aircraft had a short career in RPAF, it flew many important supply drop missions in Northern areas, during 1948 Kashmir war against India. The aircraft retired from RPAF service in 1954.

In early 1954, No 12 Sqn received two new Bristol Freighters for VIP operations. The Freighters of No 6 and No 12 Sqns differed in colour schemes. No 12 Sqn freighters were painted in silver and white livery with green colour painted on spinners, whereas No 6 Sqn aircraft were painted in usual desert camouflage with spinners painted in red. The aircraft retired from service in 1966. Unfortunately, out of 81 in service, none of the Freighter was stored for PAF museum.

Top Left: PM Zulfiqar Ali Bhutto being received by AM Zafar Chaudhry on his arrival at Peshawar. Seen in the background is PM's favorite aircraft, DA-20 Falcon, tail no J-753. (Photo: PAF Archives).

Left: Flg Off Sardar M Asif flying the Bristol Freighter during early days of his career. (Photo: AVM (R) Sardar M Asif).

> On 25 Mar 1991, sqn flew Prime Minister to Kuwait just after the end of Gulf war. It was a challenging mission with VVIP on board as the Kuwait airport had no navigation lights and the city was engulfed in thick cloud of smoke rising from the burning oil wells.

General's Flight. Before the arrival of Viking, the Governor General Quaid-e-Azam Muhammad Ali Jinnah flew on special VIP version of Douglas Dakota. It was this aircraft that carried the Quaid to RPAF Risalpur on 13 April 1948, where he delivered the famous speech of PAF being the Second to None. All the VIP version Dakotas and Viking carried the seal of the Governor General on the nose of aircraft underneath the pilot side windshield. While taxiing, the aircraft showed Pakistan colour and Governor General flag whenever it carried the Governor General on board.

Above: President Ayub Khan waves to the crowd as he concludes his historic official visit to Japan on No 12 Sqn's Viscount, tail no J-751. (Photo: GettyImages.com).

Bottom: VIP version Viking VC-1 MK-2 with RPAF tail no J-750, had the honour of carrying the Father of Nation after independence in 1947. It was phased out in 1960 and was later preserved at PAF Museum Karachi. (Photo: PAF Archives).

The PAF inherited a few Auster aircraft in August 1947, which were meant primarily for training of air observation post (AOP) pilots of the army. However, in the absence of any special aircraft for light communication duties, some of these Austers were harnessed into this role. Together with a stray Fox Moth and a couple of Harvards, a Communication flight was formed in March 1948, which serviced the bulk of the RPAF's light communication needs till the early 1950s. In 1953, this flight was made part of No 12 Composite Squadron. A De Havilland Dove had also joined the light communication aircraft inventory three years earlier and the Austers and Harvards gradually faded out.

During the period from 1947-49, one of the Dakota (tail no C-406) of No 1 Communication Flight was modified for the then Commander-in-Chief of RPAF, AVM Atcherley, to provide an office, a sleeping compartment, working space for steward and ground crew and about half a dozen passenger seats. In the crew compartment the navigator's area was used for installing a fuel tank that would allow the aircraft to fly direct from Karachi to Dacca. AVM Atcherley being a bachelor spent most of the time in the aircraft, flying from air station to air station, working late nights and even conducting Court Martials in the aircraft. When flying to Dacca, he used to arrive at the station the night before at 10 PM, get into the aircraft, put on a white coverall and go to sleep. The aircrew had the standard briefing to carry out the pre-flight checks and take off the next morning without disturbing the C-in-C.

> No 12 Sqn has provided services that are suitable for the heads of states. Ever since the time of Quaid-e-Azam Muhammad Ali Jinnah, the squadron has been carrying immeasurable prestige. All VIP aircraft in the 12 Sqn have been assigned a tail number beginning with the letter 'J' symbolising Jinnah's legacy to this very day. Every member of the sqn is proud of this legacy.

Hawker Trident

Three-engined Hawker Siddeley (formerly DeHavilland DH 121) Trident was designed in UK in 1957 and flew its first flight on 9 Jan 1962 with a mach speed of 0.90. Several version of the aircraft were produced of which Trident I E was most popular, largely acquired by number of airlines. PIA acquired 4 Trident 1Es in 1967 whereas PAF operated one VIP version for transportation of VVIPs. The aircraft had a short career with PAF and was reverted back to PIA on orders from the PM of that time.

Left: No 12 Sqn crew pose in front of Viscout aircraft at PAF Mauripur, late 50s. From Left- Flt Lt Masood A Khan (Pilot), Flt Lt Ahmed Shamim Sheikh (Pilot), Flt Lt Barkat Ali (Navigator) & Flg Off Siraj (Air Signaler). (Photo: AVM (R) Tahir Ranjha).

SA-16A Albatross

Starting 1956, RPAF received four SA-16s from USA under the assistance agreement. They initially formed a Search and Rescue flight but later joined the No 12 Composite sqn at Mauripur. The aircraft was equipped with special search radars and had exceptionally long endurance. In Aug 1959, it participated in exercise 'Jet North' involving navies of New Zealand and UK. In November of the same year, during exercise 'Midlink-II', the aircraft flew its longest ever non-stop flight for 15.46 hours. During 1965 war, the aircraft played an important role in south sector of PAF.

> From January 1993 to April 1994, No 12 Sqn flew 181 hours on B-707 aircraft transporting Pak Army troops in support of UN's peacekeeping mission in Mogadishu (Somalia). From 1993 to 1998, Sqn flew 590 hours for relief missions to Ankara, Colombo and Almaty.

Such were the early days in the nascent RPAF which appears to be from another world in the present times.

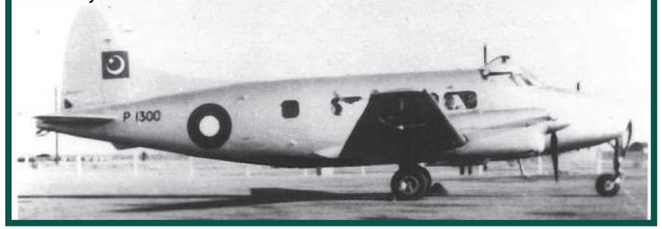
No 12 Sqn was formed in March 1950, with Sqn Ldr AKS Ahmed as its first commanding officer. It was the first heavy bomber squadron with eight Halifax 4-engined WWII bombers and started flying on April 5 with two MK VIII and six MK VI aircraft. In September, 1953, the unit was converted into No 12 Composite Squadron with Sqn Ldr Mukhtar Dogar as its first officer commanding. It was assigned a variety of tasks including VIP and Air Headquarters communication flights on Viking and Dakota aircraft, target towing for ack ack on Furies, and heavy bomber operations on Halifaxes.

In early 1954, the squadron received two new Bristol Freighters followed soon after by two Wayfarers and two Tempests. Everything was analogue and that vintage vibe continued throughout the airplanes. In May a Freighter, especially equipped for para-trooping role, was added to the fleet.

In April 1956, a Viscount aircraft replaced the aging Viking. However, the Viscount did not last long. Developing structural weaknesses

DeHavilland Dove

DeHavilland DH-104 Dove was designed in late 1940s to meet the commercial requirements for a light transport aircraft. A military version of the aircraft was also used by some Commonwealth air forces for light communication duties. RPF acquired one Dove in 1949 which served the No 1 Communication flight (later merged into No 12 sqn) for twelve years until 1961.



Left Page Above: King Hussein of Jordan being received by Gp Capt Ghulam Haider, Station Commander, PAF Base Sargodha in Mar 1970. Seen in picture is also AM Abdul Rahim Khan, C-in-C PAF arriving with the entoruge. No 12 Sqn F-27 parked in the background. (Photo: PAF Archives).

Left Page Center: Flt Lt Haseeb Gul (later AVM) along with UK Prime Minister Margaret Thatcher after flying a VIP mission on DA-20 Falcon of No 12 Sqn. (Photo: AVM Haseeb Gul).

Right Center: PM always on the move. Whenever they have needed to travel, the No 12 has always been on standby. PM Benazir Bhutto pose with the crew of No 12 Sqn after the inaugural flight. (Photo: No 12 Sqn).

Bottom: No12 Sqn's Citation Excel (tail No J-754) has been carrying the Chief of the Air Staff, PAF and other dignitaries for years now. (Photo: PAF Archives).

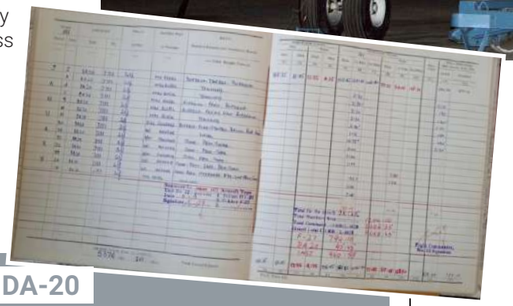
Left Page Bottom: Air Marshal Omar Dhani, Commander of the Indonesian Air Force, visiting PAF installations on No 12 Sqn's VIP Dakota duirng his visit to Pakistan in early 1960s. (Photo: PAF Archives).

Boeing 737

In 1994, Boeing 737 was officially handed over to No 12 Sqn by PIA to carrying out VVIP duties. Initially eight officers were sent abroad for training and type conversion. Later they continued their line training with Boeing instructors in Pakistan. The aircraft flew its first VVIP mission on 13 December 1994 with President Farooq Ahmed Leghari on-board. The aircraft had a short career with the sqn and was reverted back to PIA after remaining for few years in service.

after a few years of service, PAF retired the aircraft. A little later, the PAF selected a VIP version of the F-27 aircraft when Pakistan International Airlines, decided to acquire several of this type for its domestic networks. In the mid-60s, a need was felt to have a larger, long-range aircraft for the President. Since PIA had already bought some Tridents, another Trident, in VIP Configuration, was acquired by the PAF. To ensure maximum utilization of this large and expensive aircraft for public benefit, the President directed that the Trident be transferred to PIA for regular use.

February 1957, saw the squadron flying its newly acquired SA-16 Albatross maritime aircraft in a sea rescue exercise. The SA16s, which were primarily meant for search and rescue, were equipped with special search radars and had exceptionally long endurance. In August 59, SA16s participated in exercise Jet North, with the navies of the UK and New Zealand.



Dassault Falcon DA-20

Falcon DA-20 was developed by Sub-Aviation of France and the construction of prototype began in 1962 with its maiden flight on 4 May 1963. The Business division of PAN AM World airways ordered 54 DA-20s with an option of buying 106 more aircraft. In 1972, the then Prime Minister of Pakistan, having seen the Agha Khan's Gulfstream aircraft, without specifying any preference wished to have similar aircraft which was fast and comfortable. Resultantly, PAF shortlisted DA-20 Falcon which joined No 12 Sqn in 1972. Sqn Ldr Sardar Asif (later retd as AVM) was the first pilot who got conversion training on the type at Bordeaux, France and had the honour of flying the first ferry of the aircraft to Pakistan. It served the head of the states, premiers and VVIP dignitaries from around the world for a very long time. The aircraft remained in service for almost 27 years before it was handed over to No 24 Sqn for EW duties.

Above: B-707 tail no 866 remained the workhorse of PAF relief operations for decades. (Photo: No 12 Sqn Archives).

Left: A snapshot of the log book of AVM Sardar M Asif indicates the date, route and timings of DA-20s first ferry flight from France. (Photo: AVM (R) Sardar Asif).

Right Page Above: Governor General seal seen on the nose of Jinnah's Viking tail no J-750. (Photo: PAF Museum).

Right Page Bottom: Airbus A-310 (Tail No J-757) was inducted in No 12 Sqn on 5 Oct 2009. However, after flying for more than 1000 hours with the sqn, the aircraft was handed over to PIA for commercial flights. (Photo: Richard Vandervord).

Finally, on 9 July, 1960, the entire air transport element of the PAF's - No 3, 6, and 12 squadrons was moved from Mauripur to Chaklala, where it was equipped with a Fokker F-27 aircraft for the use of VIPs and visiting dignitaries. Since then, the No 12 Sqn became another arm of the air force and the base has remained the hub of all peacetime military air transport activity in Pakistan.

In 1972, the Prime Minister, having seen the Agha Khan's Gulfstream aircraft, indicated his preference for a similar aircraft. After comparative analysis of several types, Air Headquarters selected the French Falcon DA-20. However, its limited fuel capacity severely restricted its non-stop range. Nevertheless, both the F-27 and the Falcon provided safe and timely VIP service over the years. After completing ground and flight training in this modern aircraft, Wg Cdr Sardar Asif was the pilot-in-command who flew the first ferry of DA-20 from France to Pakistan. Another interesting aspect of this maiden flight was that the then Commander-in-Chief of PAF, Air Marshal Zafar Chaudhry who was on a routine visit to France chose to fly back on this aircraft.

Aircraft Tail Nos Over the Years	
Serial NO	**Aircraft**
J-750	Vickers Viking VC-1
J-751	Vickers Viscount
J-752	Fokker F-27
J-753	DA-20 Falcon
J-754	Citation Excel C-560
J-755	Gulfstream IV-SP
J-756	Gulfstream 450
J-757	Airbus A310-300

Fokker F-27

The Fokker Friendship is considered to be one of the most popular and reliable aircraft around the world. It was designed in mid 50s as a medium sized airliner for short and medium range flights. The first prototype flew on 24 Nov 1955. In 1965, No 12 Sqn received one VIP version of F-27 for carrying out VIP duties. It flew almost 50000 hours serving the sqn for 43 years. It was finally retired from PAF and was handed over to Pak Navy for operational duties.

Most VIP transport propeller planes in the PAF inventory were the WWII piston engine designs. They were slower, and its passengers all the while endured noise and vibration especially during those white-knuckle rides through rough weather. Their careers, overlapped into the jet age and the appearance of rapidly developing new technologies, brought down premature curtains on their lifespan. The difference between the first piston engine VIP aircraft and the advanced jets of today is like night and day. They have cut flight hours, can fly above the weather and are more fuel efficient.

Today, two Gulf Streams and a Citation-XL are the latest in a series of jet powered aircraft that make up the No 12 VVIP Sqn. Entering service in 2005 and 2007, these jets are the newest in

> 17 August 1988 was a sad day in the history of No 12 Sqn, when its officer commanding Wg Cdr Mashood Hassan got shahadat along with Gen Zia-ul-Haq in a tragic air crash of a VIP C-130 aircraft just after take-off. US Ambassador and Chairman Joint Chief of Staff along with an entrouge were on board the ill-fated aircraft.

an evolution that began with the Viking and the Viscount aircraft to take heads of state aloft.

The PAF is responsible for operations of all three. Pulling the world closer than ever, they represent a new level of flying comfort for the premiers, with an impressive serviceability rate.

Above: Carrying the dignitary on board, Gulfstrean SP-IV seen taxing at a foreign airfield. (Photo: No 12 Sqn).

Bottom: Gulf Stream helps Premier conduct foreign policies across the world. PM Imran Khan receives a historic reception on his arrival at Malaysia on 3 Feb 2020. (Photo: thestar.com).

Right Page Bottom: No 12 Sqn VVIP B-707 (tail no 635) remained the aircraft of choice for the various Presidents and Premiers for more than two decades. (Photo: Fergal Goodman).

Fitted with twice as powerful Rolls-Royce engines, streamlined wings, and better cabin area, plush seating, exotic looks, they leave prop planes far behind. Keeping ahead of the technology curve, these jets have large iPad looking touch screens, and zoom like an arrow through the sky for nine hours plus non-stop. With more style and substance over their predecessors, these executive jets, with the white livery and proudly displayed words Pakistan Air Force on the fuselage, are the most recognisable at the Nur Khan Air Force base.

In the office, the Gulf Stream holds two pilots up front. Quite often, they miss their flight engineer and especially the navigator. He's the guy who determines the route. He was someone all Gulf Stream and Citation pilots were used to having around in the cabins of the C-130 and other bigger planes before transitioning from the transport sqn to the VIP Sqn.

No 12 Sqn is on alert 24/7, because it is a 24/7 ops mission, said Wg Cdr Rizwan Satti, Sqn Commander No 12 Sqn. "Missions are no child's play, very demanding especially when flying the Air Chief with call sign Shahbaz 1. It's also the time for the team to earn its stripes. The Air Chief is an experienced pilot himself and so are his staff officers on board. They second guess every move, every decision we take. They can ask you anything - the distance to the nearest landing strip, names of countries to the south of the Caspian Sea, why the particular light is flashing, cities, runways and coordinates etc etc," said Wg Cdr Rizwan.

Even though the crew walks into work every day with a smile because every flight is a special mission, gravity of the job really hits home when they are readying the aircraft and then suddenly

Lest We Forget!

Probably the most tragic incident in the history of No12 Sqn was the crash of its VIP Fokker F-27 on 20 February 2003 with ACM Mushaf Ali Mir, Chief of the Air Staff, PAF on board. Other passengers included his wife and senior PAF officials from AHQ. The aircraft flight crew included Sqn Ldr Ahmed Yousuf, Sqn Ldr Mumtaz Kiyani and Flt Lt Abdul Rab. Air Chief along with his team of senior officials was proceeding to PAF Base Kohat for a routine visit when the aircraft crashed short of airfield after hitting a hill.

For decades, the formidable duo of B-707s (VIP version tail no 635 and Cargo version tail no 866) served the No 12 VIP Sqn with admirable serviceability rate. On 31 Jan 1989, Gp Capt Maqsood, Wg Cdr Sabahat and Wg Cdr Inam operated the first VIP flight on B-707 tail no 635. From there on these two aircraft remained the backbone of all the PAF VIP and cargo operations. From carrying the head of the states/ premiers to transporting relief equipment to far flung regions of the world, the aircraft always delivered in the best possible manner. On one such occasion shown in the painting, the aircraft brought back the remains of the fallen soldiers of Pak Army who attained shahadat during their line of duty with a UN mission.

Left: Crew of the VVIP 12 Sqn with a global mission. Wg Cdr Ali Akbar, Flt Cdr (Ops) No 12 Sqn along with officers of the sqn. (Photo: S Khalil).

Center: Hall of fame at the No 12 Sqn Headquarters boasting a proud history. (Photo: S Khalil).

Bottom: An air force of pilots with the ethos that they can do anything. Wg Cdr Ali Akbar proudly displays his shoulder patch carrying the insignias of dignitaries they carry on board. (Photo: Air Cdre (R) Muhammad Ali).

Pride of the No 12 Sqn lives here. The front of a retired B-707 aircraft adds to the elegance of No 12 Sqn HQ building. (Photo: S Khalil).

see the PM getting out of his car and walking towards the plane.

"It makes you sit up straight and take the job a little more seriously. It's not combat stress. Not worrying about providing air support. It's about supporting the most important person. It was an unforgettable moment of pride etched into memory the first time I announced over the radio that Pakistan 2, which is the call sign of the Prime Minister, is ready to fly," said Wg Cdr Rizwan.

Then there are those astonishing expressions of the faces of our country's leaders when they see they are going to be in the hands of young Squadron Leaders and even younger Flight Lieutenants. "They are used to seeing rather more grey-haired pilots on commercial flights," said former No 12 Sqn Cdr and a Falcon pilot, AVM Haseeb Gul, especially when he used to fly them into conflict zones to Afghanistan for pivotal meetings. However, with passage of time when they closely observed PAF pilots' professionalism and more importantly their conduct, they realized that they were in safe hands.

Only the best pilots from the transport wing have the privilege to fly the executives. After years of rigorous training in transport fleet, only the best of the best qualify to serve in the No 12 Sqn. Equally important is the job of the air steward on board VIP flights. Besides luggage handling, he is also responsible to ensure safety protocols are in place in case there is an emergency.

In last years of string of perfect touchdowns, No 12 Sqn have most dutifully transported premiers with pride. For the handpicked aircrew entrusted with the responsibility to carry the premiers on board, it has been an honour none of them can ever forget. They describe the task of keeping the executives soaring through the skies as the best job in the world.

Top: Handpicked specialist air crew who fly the President, the Prime Minister and the Air Chief. Wg Cdr Rizwan Satti, OC No 12 Sqn (center) along with officers of the unit. (Photo: S Khalil).

Center: There is no room for failure in competence, both mechanical and human. Crew of Gulfstream 450 gets ready for mission. (Photo: S Khalil)

Bottom: The Gulf Stream 450 can fly its VIP passengers half way across the world in a single day. (Photo: Wg Cdr Mudassar).

FABULOUS FURY

A Nimble Fighter of RPAF

"Dubbed as the Pilots' aircraft, Hawker Sea Fury served the nascent RPAF for over a decade. From performing watch and ward duties in the troubled tribal areas of the West to anti-locust campaigns in the South, the aircraft was used in a variety of roles. Being a nifty fighter bomber of that time, the aircraft gained popularity among the young fighter pilots- thanks to its simple handling and high manoeuvrability. It's the tale of fabulous Fury and its equally fabulous aircrew that served the RPAF during those challenging times."

by Franciszek Grabowski

The Hawker Sea Fury was intended to replace the Hawker Tempest, and that is exactly what it did in the Royal Pakistan Air Force. Starting its career in 1950s, it primarily served the nascent RPAF in ground attack role. This made it the only combat aircraft that had the unique honour of serving in both the Dominion of Pakistan and Islamic Republic of Pakistan.

The initial design concept of Sea Fury dates back to Sep 1943, however, its maiden flight took place in 1944. The first test flight pointed out certain design flaws which were rectified in no time.The improved concept was named Tempest Light Fighter (Centaurus), and intended to replace Tempests in RAF Squadrons. However, it rolled out a bit too late to fly in WW II and the project was shelved. RAF considered it unnecessary and obsolete. The Fleet Air Arm came to the unwanted aircraft's rescue, however, and ordered a carrier-based naval variant named 'Sea Fury'. As the early-design jet aircraft were not considered suitable for carrier-borne operations, hence piston engine aircraft were retained. Orders from Royal Navy as well as numerous export agreements saved the aircraft, which otherwise would have followed the fate of its contemporaries like Supermarine Spiteful, North American P-51H Mustang and Grumman F8F Bearcat.

Formation of No 9 Sqn flying over Miranshah in December 1957. L974 in the lead, L991 right wing, L965 left wing, L958 box. (Photo: PAF Archives).

RPAF Peshawar, 12 February 1952. No 5 Sqn pilots pose with the Inter Squadron Armament Trophy known as Perry Keene Trophy that they just won. From left: unknown, Plt Off Mir Mohammad Ali Khan (PAK 1199), Plt Off Syed Mohammad Ahmed (PAK 1194), Flg Off Stefan Tronczyński (PAK 841), Sqn Ldr Fuad Shahid Hussain (PAK 3002), Flg Off Muhammad Zakria Butt (PAK 1022), Flg Off Aftab Ahmad (PAK 1080), Flg Off Farid-Ud-Din Hashmi (PAK 783) - Engineering Officer, Plt Off Abdul Hamid Khan Ghaznavi (PAK 1189) and Plt Off Nazir Ahmad Sheikh (PAK 1192). Crouching with the trophy Plt Off Syed Mohammad Hassan (PAK 1108). Hussain and Tronczyński were in the team of No 9 Sqn, which won the trophy in 1949. (Photo: PAF Archives).

A PAF Official introduces Prime Minister Liaquat Ali Khan to the cockpit of the first delivered Fury, dual seater K850, at RPAF Mauripur in early Dec 1948. (Photo: PAF Archives).

Line up of No 9 Sqn aircraft at Miranshah, December 1957. The aircraft in foreground, L974, could be distinguished as a personal mount of Officer Commanding thanks to rectangular Sqn Ldr pennant painted under the windscreen. The aircraft had its rudder recovered recently, and still painted in the silver dope. Otherwise the green grey finish seems to be in immaculate condition despite three years of service. (Photo: PAF Archives).

The Design

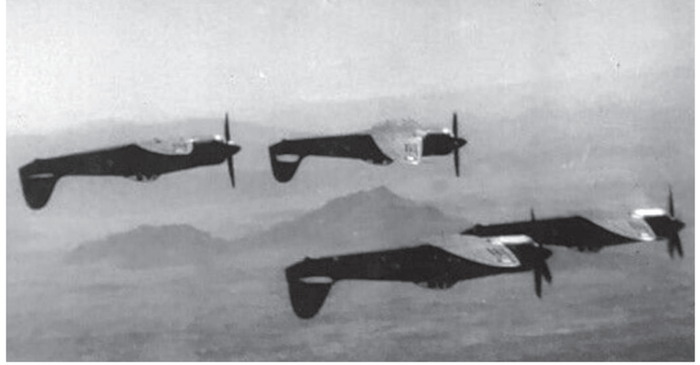
The Sea Fury was a modified aircraft, navalized to give it the capability of operating from aircraft carriers. The design evolved from the Hawker aircraft, most notably the Tempest. An example of its heritage was evident in its partially elliptical wings and fuselage, a feature directly lifted from the Tempest. However, the fact that the wings had more strength to withstand the excessive force of landing on an aircraft carrier, marked its superiority over the Tempest. While being lighter in weight and volume, the Sea Fury boasted much higher speed and power. This makes it the last and the fastest of the Hawker engine lineage.

When it comes to pitting heads amongst the two aircraft, there is no competition. The Sea Fury wins by a long shot. The Sea Fury possesses double the velocity and climb rate, and this while being equipped with much heavier equipment and substantially longer range. It could accelerate to an impressive speed of 460 mph and could climb to a height of 20, 000 feet in less than 5 minutes.

The Fury featured the Bristol Centaurus reciprocating engine, which operated with a five-bladed propeller. The Centaurus engine distinguished itself from other engines by the fact that several of its subsystems were electrical and were run by a generator backed by two independent batteries.

Fury in Pakistan

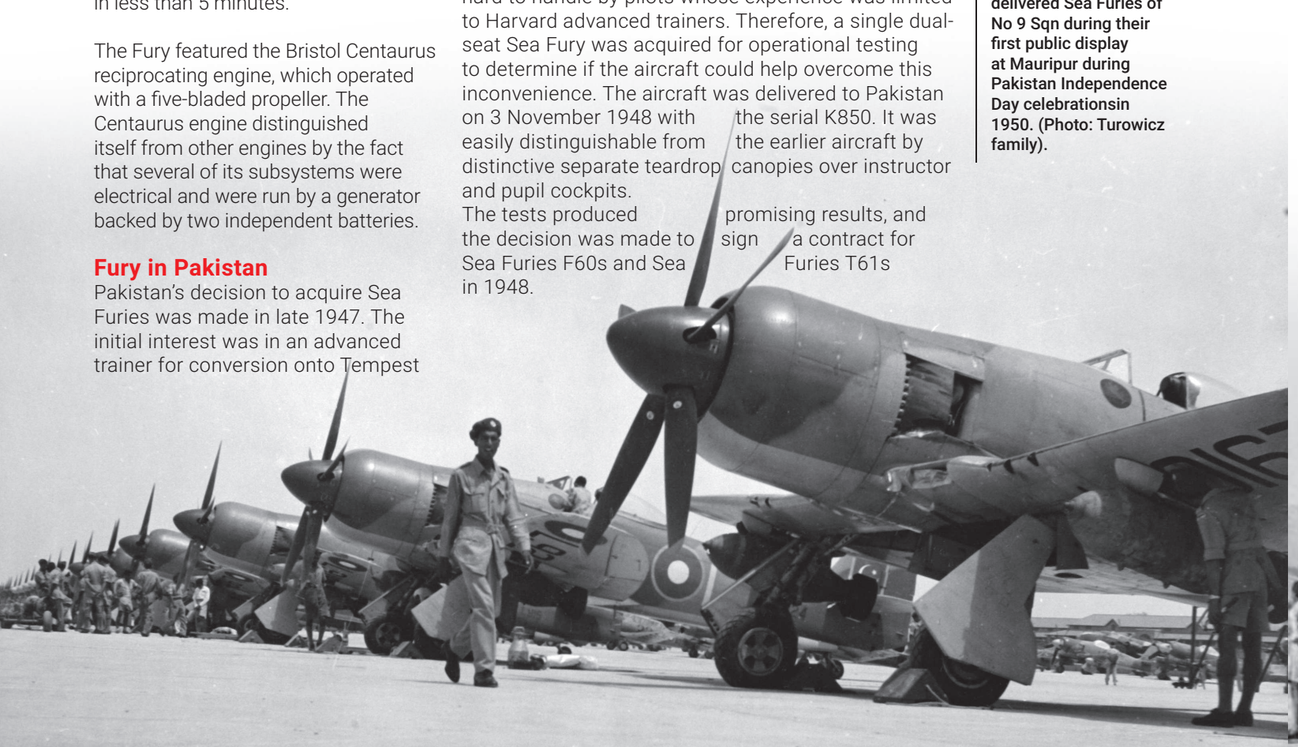
Pakistan's decision to acquire Sea Furies was made in late 1947. The initial interest was in an advanced trainer for conversion onto Tempest fighters. The high-performance Tempests were often hard to handle by pilots whose experience was limited to Harvard advanced trainers. Therefore, a single dual-seat Sea Fury was acquired for operational testing to determine if the aircraft could help overcome this inconvenience. The aircraft was delivered to Pakistan on 3 November 1948 with the serial K850. It was easily distinguishable from the earlier aircraft by distinctive separate teardrop canopies over instructor and pupil cockpits.
The tests produced promising results, and the decision was made to sign a contract for Sea Furies F60s and Sea Furies T61s in 1948.



Above: Red Dragons during an aerobatic display over Peshawar posing for camera aircraft flown by Sqn Ldr F. S. Hussain (3002), a distinguished aerobatic pilot himself. (Photo: PAF Archives).

Center: Young Flt lt Raees Rafi (later retd as Air Cdre) in the cockpit of No 14 Sqn Sea Fury at Peshwar. (Photo: Air Cdre Rafi Family).

Bottom: Freshly delivered Sea Furies of No 9 Sqn during their first public display at Mauripur during Pakistan Independence Day celebrationsin 1950. (Photo: Turowicz family).



The original requirement dictated by PAF had three Fighter Bomber squadrons, each of which would compromise 8 aircraft, with 22 Sea Furies to be held in reserve. The conversion squadron was to be equipped with three dual and two single cockpit Sea Furies. The conversion squadron were supposed to have four aircraft in reserve. This brought the total to 55 aircraft. However, the contract made brought in 52 aircraft in total. The small difference in the number was owed to budget constraints at the time.

The ordered aircraft started to arrive in the autumn of 1949, with FB-60s L900 to L925 (serial nos) being delivered until the end of the same year. The next year L926 to L949 as well as T61 trainers K851 to K854 were delivered. Those aircraft also wore standard desert scheme livery as in the case of previously delivered Sea Furies.

Integrating the Fury in RPAF

Once all aircraft made to Pakistan, the re-equipment process commenced. No 9 Sqn was the first unit to be converted on the new aircraft in July 1950. The markings used were identical to those used on Tempests – Desert Scheme, standard glossy national insignia, and black serial numbers on tail and under surfaces. Spinners were repainted in squadron colours: No 5 – blue, No 9 – red, No 14 – presumably white. Individual code letters tied to pilot name's initials were painted on the fuselage roundel in white, no codes on lower cowling. Additionally, squadron emblems painted just in front of windscreens for the first time. Shields were painted in the squadron colour. Emblems of No 5 and No 14 Sqn were likely painted in black, while Dragon of No 9 Sqn possibly in red.

Expanding the Fighter Bomber Wing was quite an effort. The strict requirement was that each operational aircraft needed ground crew made up of 10 personnel, while unarmed training aircraft of the conversion squadron required team of seven ground crew. The expansion was executed in parallel, as both Sea Fury and Tempest aircraft were considered interchangeable. Tempests were to be held in reserve until superseded by Sea Furies. At the time policy for pilots' training called for two years at the RPAF College, Risalpur, with the last six months allotted for conversion training on Fury/Tempest aircraft. The conversion was obligatory for all pilots. Sea Furies offered another substantial advantage

PAKISTAN'S WILD WILD WEST

The crew of No 5 Sqn having a rest at pilot's hut at Miranshah during a detachment around 1955. Sand and brown Sea Fury coded 5 in the background. (Photo: PAF Archives).

Operations from Miranshah FOB in early 50s, depicted the picture of RPAF's Wild Wild West. No 5 and No 9 sqn each equipped with Fury aircraft took turns to Miranshah for tour of duties. These missions were carried out in support of the Pak Army which was fighting against tribal war lords in the adjoining areas. All the aircraft were stationed inside the gates of the Miranshah Fort, only to taxi out for the mission. To deter tribal forays in the dark, the gates of the Fort had to be closed before nightfall.

Preparations for Independence Day celebrations at Mauripur, possibly in 1951. The aircraft in the foreground, L934 displays an emblem of No 14 Sqn. The next one cannot be identified, and then a line up of No 9 Sqn aircraft follows with L921 R, L927, L972 Y visible. (Photo: Nick Stroud).

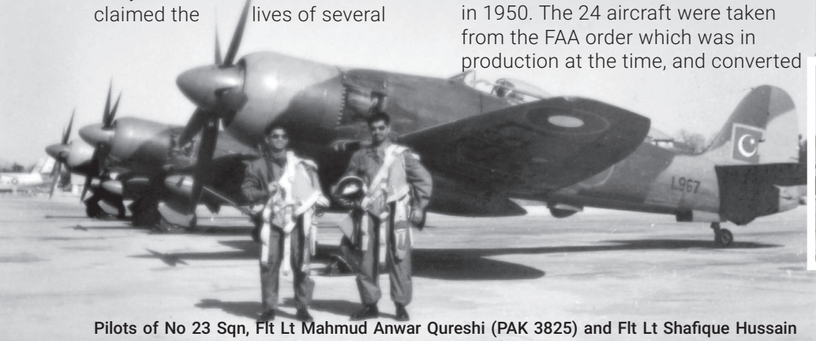
Left: Sqn Ldr Salahuddin (PAK 2901) of No 5 Sqn posing in front of newly delivered Sea Fury, already in new green-grey camouflage. The remaining aircraft are still in sand-brown scheme. Peshawar, early 1954. (Photo: PAF Archives).

Left inlet: Practice bombs being hanged on No 5 Sqn Sea Fury. Peshawar, late 1950s. (Photo: PAF Archives).

All personnel of No 9 Squadron poses in front of a Sea Fury at Kohat in the winter 1957/58. Sitting in the first row from left: unk, Flg Off A Hanif (PAK 1437), unk, Flg Off Mehmood-uz-Zaman Khan (PAK 3639), Flt Lt Altaf Hussain Butt (PAK 1248) GD(P), Sqn Ldr Zulfiqar Ali Khan (PAK 1088), Flg Off Jamaluddin (PAK 1495). (Photo: PAF Archives).

over the Tempests. The aircraft had the provision for a reconnaissance camera, so it was possible to use it for reconnaissance without any modifications, once the camera was installed. This made Fury the first multi-role combat aircraft of PAF.

Before the Pakistan Independence Day celebrations of 1950, all three Squadrons were converted on fury and displayed their new planes at the RPAF Mauripur during the ceremony. It seems that despite better handling, Sea Fury was still a demanding aircraft, and perhaps too tempting to fly it to the limits. The aircraft claimed the lives of several experienced officers during initial years of service with RPAF, which led to shortfall in the availability of aircraft. Due to a shortage of Sea Furies a desperate step was taken and No 9 Sqn converted back to Tempests in November 1950. Simultaneously, another batch of Sea Furies was immediately acquired in 1950. The 24 aircraft were taken from the FAA order which was in production at the time, and converted to de-navalised standard according to the RPAF specification. They were delivered between late January and July of the next year. They received serial numbers L950-L973, and looked like the previous batch.



Pilots of No 23 Sqn, Flt Lt Mahmud Anwar Qureshi (PAK 3825) and Flt Lt Shafique Hussain Qadri (PAK 5045) pose in front of a Sea Fury during anti-locust operations, Drigh Road, late 1961. (Photo: PAF Archives)

The Red Dragons

Meanwhile, Sqn Ldr Zafar Ahmad Chaudhry (PAK 3095) Officer Commanding of No 9 Sqn, formed an aerobatics team. He was inspired by the show of 'Blue Angels' of the US Navy which he had seen in Florida in 1949, while supervising RPAF cadets training there. The team started training in the winter of 1951, still on Tempest aircraft. When the Squadron received Sea Furies in February 1951, the team continued training on the new aircraft accordingly.

Sea Fury T.61 K858 of No 9 Sqn taxies for take off for a photo session at Miranshah in December 1957. (Photo: PAF Archives).

The team was named 'Red Dragons', after the colour of the squadron and the emblem on its shield, also used as a call sign. Red Dragons had its debut on 2 May 1951, during the farewell ceremonies for AVM R.L.R. Atcherely. The first team consisted of Sqn Ldr Zafar Ahmad Chaudhry (PAK 3095) – right wing, Flt Lt Syed Muhammad 'Boss' Ahmad (PAK 2880) - reserve, Flg Off Saeed Ullah Khan (PAK 3241) – left wing, Plt Off Trevor Harold Gotting (PAK 802) – lead, and Plt Off Frederick Alan 'Fred' Isaacs (PAK 981) box. This was the first display team of the RPAF and rose to fame in national/ international media in no time.

Perhaps the only person who flew the Hawker Fury to its maximum limits in RPAF was the famous solo aerobatics pilot of PAF, the legendary Air Cdre FS Hussain-affectionately known in PAF as 'The Prince of Pilots'.

During his hey days, Flt Lt FS Hussain gained mastery over this aircraft and rose to fame at national and international levels with his signature eight point inverted slow role manoeuvre.

In November, 1951 Sqn Ldr FS Hussain, took over No 5 Squadron from Sqn Ldr Żuromski. The squadron excelled tremendously under his professional command and won many laurels. He led the unit for the second shooting competition of RPAF. On 12 February 1952, the Commander-in-Chief Air Vice Marshal L. W. Cannon presented the Perry Keene Inter Squadron Armament Trophy to his squadron. It is interesting to note, that FS Hussain and Flg Off Stefan Tronczyński were both

Above: No 5 Sqn pilots pose in front of a Sea Fury in the Summer of 1954. From left: Plt Off Nisar Ahmad Chugtai (PAK 1438), Plt Off Jamaluddin (PAK 1495), Flg Off Muniruddin Ahmad (PAK 5030), Flt Lt Nazir Latif Bill (PAK 1081), Sqn Ldr Mohammad Zafar Masud Mitty (PAK 3314), Flt Lt Muhammad Zakria Butt (PAK 1022), Anwar Ahmad (PAK 1305), Plt Off Ahmad Saleem (PAK 1440), Muhammad Aslam (PAK 1310), Plt Off Waheed Ahmad Butt (PAK 1480). (Photo: PAF Archives).

Center: Flg Off Jamaluddin (PAK 1495) of No 9 Sqn took a classic pose in the cockpit. No 9 Sqn emblem is painted under windscreen. (Photo: Hamza Salahuddin).

The first Sea Fury FB.60 delivered to Pakistan, L900 ended its days at Target Towing Flight of No 12 Sqn. Mauripur, late 1957. A typical yellow-black zebra pattern introduced by the RAF to make target towing aircraft recognisable for the gunners is clearly visible. (Photo: PAF Archives).

winners of the first Perry Keene Trophy, held back in 1949.

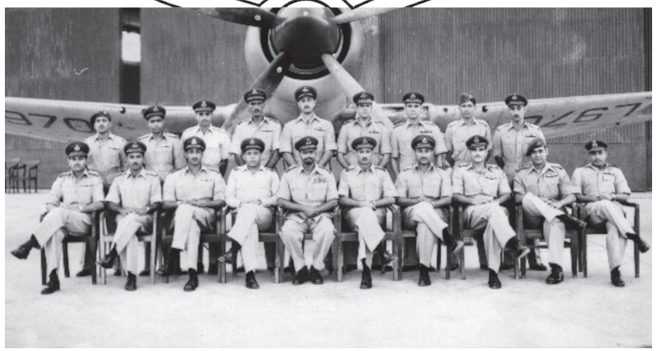
In Combat Roles

Sea Furies continued training the young pilots in variety of roles including ground attack, air combat, formation flying etc. In Sep 1950, No 5 Sqn transferred to Miranshah to take up its duty. The Sea Furies saw some intense flying there, providing necessary reconnaissance and support, as well as continuing combat training including live firing and bombing. The latter role was considered a power demonstration for the insurgents watching the fort and necessary to counter Faqir of Ipi's rebellion as well as incursions from Afghan territory. These transfers were much liked by Fury pilots, as they broke the monotony, and allowed to escape the daily drill at the permanent stations. At Miranshah, Furies were dragged within the fort boundaries at night, and pilots could enjoy local cuisine as well as watch films in a makeshift cinema.

It was at this time that multiple changes in markings of the Furys took place. Squadron emblems were painted with white background. Black and white photos cannot determine with certainty if the emblems were painted in black or in squadron colours. Also, code letters started to be applied on white rectangular section on the lower cowling, just like on Tempests.

Around this time another tragically bizarre incident came to pass. On 4 June 1953 Plt Off Syed Enver Ali Mirza (PAK 1355) was killed in a Sea Fury. He was the son of Iskander Ali Mirza, the first Defence Secretary in the Liaquat Ali Khan's government. As Defence Secretary, he was closely involved in the purchase of the Sea Furies, one of which later consumed the life of his beloved son. Iskander Ali Mirza would go on to become the first President of Pakistan.

Several Sea Furies had been lost to accidents by this time. So, to



5 vs 9 Rivalry

After the induction of Sea Fury aircraft in the RPAF, a healthy spirit of competition grew between the two arch rival squadrons; No 5 and No 9 sqns, equipped with these aircraft. Sqn Cdrs and the flying crew of these two oldest fighter units of RPAF kept challenging each other to prove their professional skills. Sometimes the gauntlet was thrown to each other even telephonically and was accepted in no time. The painting shows the first pair of the four challenged Furies of No 5 sqn from Peshawar making a low pass over Kohat, the home of No 9 sqn. Earlier in the morning the gauntlet was thrown telephonically by the sqn cdr of No 9 sqn which was instantaneously accepted by the rival. The aircraft would go to the designated area for a 'dog fight', each side trying to humble other. On return, enlarged frame prints of the victims taken from the Furies jerky gun camera would be delivered by road to the side that was beaten temporarily-all this in very healthy and festive mode.

Top: Sea Fury T.61 K858 of No 9 Sqn taxies for take off for a photo session at Miranshah in December 1957. (Photo: PAF Archives).

Left: A group photo of No 9 Sqn personnel at Peshawar in the Summer of 1953. Officer Commanding Sqn Ldr Mohammad Wasim Khan (PAK 2977) in the centre.. (Photo: PAF Archives).

No 9 Squadron while at Kohat was popular amongst visitors, who came from various countries to Pakistan. (Photo: PAF Archives).

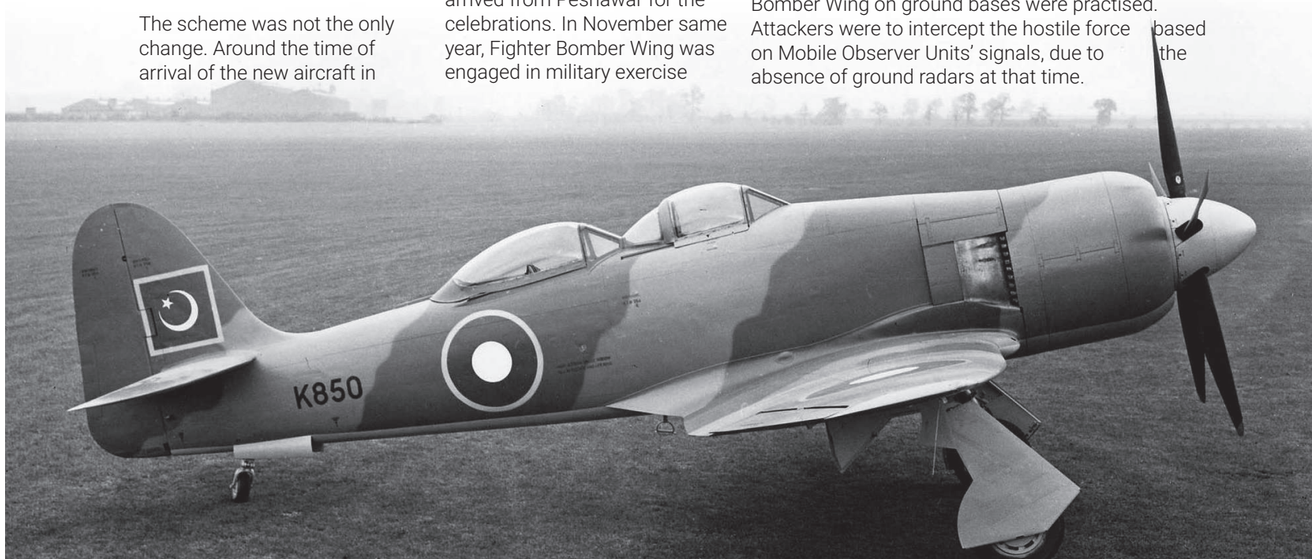
Pilots of No 9 Sqn pose in front of Sea Fury L949 at Kohat during one of the winters between 1958 and 1961. By the time codes were deleted and the aircraft were recognised by their serial number only. For ease of identification the last two digits were painted on the cowling. From left: Plt Off Khan Muhammad Sultan (PAK 3727), Plt Off Khalid Latif Khan (PAK 3858), F/O Syed Arif Ali Hasni (PAK 3684), Flt Lt Shafique Hussain Qadri (PAK 5045), Sqn Ldr Nazir Ahmad Mirza (PAK 1079), Flg Off Reginald S Nazareth (PAK 5073), Flg Off Muhammad Ahmed Farooq (PAK 1448), unk, unk. (Photo: Archives).

Bottom: The first Fury of Pakistan, K850 in a pre-delivery photo. An early cockpit arrangement with separate canopies made the aircraft easily recognisable. Later on, with Conversion Squadron, the aircraft received black code letter N. (Photo: PAF Archives).

supplement the losses, further 18 aircraft were ordered. By the end of 1953 eight aircraft were delivered with serial numbers L974-L981, and the remaining ten numbered L982-L991 arrived the next year. The last Sea Fury delivered was a dual seater K858 which arrived in 1955. They were painted in a new RAF Day Fighters Long Range and Day Intruders Scheme consisting Dark Green and Dark Sea Grey disruptive pattern with Blue under-surfaces. The previously acquired aircraft were gradually repainted in the scheme as well. It is easily distinguishable on B&W photos by reversing the order of darker and lighter shade of the camouflage, darker under surfaces and less careful demarcation lines.

The scheme was not the only change. Around the time of arrival of the new aircraft in 1954, code letters identifying each aircraft were replaced with numbers. Additionally, Squadron pennants started to appear on the aircraft. This followed a RAF custom from inter-wars years, originating from WWI, when actual pennants were used to denote leading aircraft.

In April 1954, King Saud visited Pakistan and was flown out for an inspection of RPAF Base Peshawar. An appropriate air display was arranged for the King. The following month, a firepower demonstration was performed at Fort Sandeman by No 14 Sqn on their Furies. On 15 August 1954, a yearly air display took place in Karachi to celebrate Pakistan Independence Day. As every year, Fighter Bomber Wing arrived from Peshawar for the celebrations. In November same year, Fighter Bomber Wing was engaged in military exercise appropriately named 'November Handicap'. This was the very first large-scale Air Force and Army Air Cooperation exercise. It was held at RPAF Station Chaklala, Murid Airfield and land areas north of Jhelum River. All available RPAF aircraft including Attackers, Sea Furies, Harvards and Freighters of No 6 'Multi Role Transport' and Bomber squadrons were involved. Such scenarios like attack of Fighter Bomber Wing on ground bases were practised. Attackers were to intercept the hostile force based on Mobile Observer Units' signals, due to the absence of ground radars at that time.



In May 1955 No 14 Sqn took part in a summer camp at Samungli. During October and November 1955, No 14 Sqn took its shift for a tour at Fort Miranshah. As 1955 came to an end, 1956 brought many changes for the Sea Fury.

The Swan Song of Fury

In 1956, the long-negotiated agreement with the USA resulted in the arrival of F-86 Sabre fighter jets. It was the beginning of new era of jet dominance and brought many changes in flying and ground handling procedures in RPAF. New organisation schemes were prepared, flying discipline was tightened and flight time increased. These changes coincided with Pakistan becoming a Republic on 23 March 1956.

With the deliveries of F-86 Sabres, a gradual conversion process had started. In January 1956, No 11 Sqn bid farewell to their Supermarine Attackers and the personnel proceeded for courses that were to train them to handle Sabres. Then, Sea Fury Squadrons began conversion. No 5 Sqn did so in March 1956. Sabres built specifically for Pakistan started to arrive in June 1956.

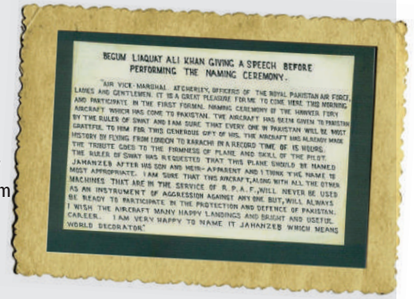
Much to disappointment of its pilots, No 9 Sqn retained Sea Furies. Apart of No 9 Sqn, few Furies were assigned to Target Towing Flight of No 12 (Composite) Sqn. The introduction of the type was supervised by the new commander of the Flight, Flt Lt Nisar ul Haq (PAK 1245), who had previously flown Sea Furies in No 5 Sqn back in 1952-53. These aircraft towed drogue targets for other aircraft and anti-aircraft artillery and were also used in calibration of radars and other national emergency duties. The aircraft retained their green-grey camouflage, but the under-surfaces were painted in distinctive yellow and black striped pattern, to make them visible to ground observers.

Furies moved to Kohat in November 1956 to make room for Sabre Squadrons coming in large numbers. Detachments to Miranshah were continued throughout. It was during one such detachment in December 1957, when the Squadron was visited by the famous British reporter John Fricker. A perfect show of ground strafing and rocket firing on Sea Furies was arranged and it deeply impressed the British guest, well known for his praise for PAF. Another impressed visitor was Lt. Gen. Axel Georg Ljungdahl, Chief of the Royal Swedish Air Force, accompanied by his wife Ruth, who visited No 9 Sqn at Miranshah, the same year.

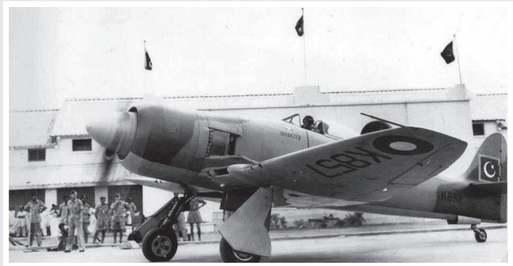
In September 1959, Furies were used in fighting insurgents in the Bajaur area, intruding from Afghanistan. This was last of the actions the Furies saw in No 9 Sqn. In March 1961, No 9 Sqn finally retired their Furies being selected for conversion on supersonic F-104 Starfighters.

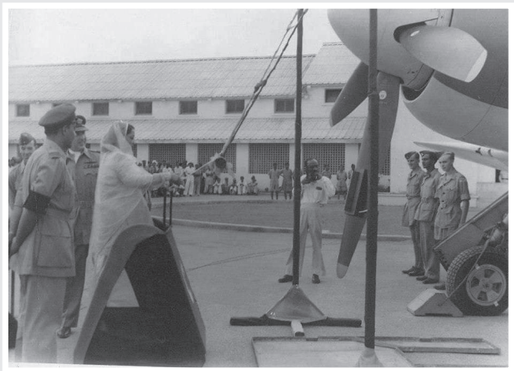
At the same time, No 23 Sqn was established at PAF Kohat, on 16 March 1961. Initially, the sqn borrowed some aircraft and the personnel of No 9 Sqn for operations and continued service in NWFP. The Squadron continued

JAHANZEB



After the independence, RPAF was badly in need of aircraft and had planned to induct Sea Fury fighter aircraft from UK. For the love of the country the then Wali of Swat Honorary General Miangul Abdul Wadud (Bacha Sahib) showed a great gesture. On 9 July 1949 the Wali contributed (the cost of almost Rs 200,000) for purchasing a Hawker Fury fighter for the newly independent country's air force. The aircraft was named as 'Jahanzeb' (meaning 'world decorator') after the son of the Wali of Swat and bore this name on its fuselage for quite some time during service with RPAF. To commemorate this historic occasion, a handing over ceremony of the aircraft was held at RPAF Mauripur air station at Karachi. Begum Rana Liaquat Ali Khan was the chief guest at the occasion and Air Vice Marshal R.L.R. Atcherly, the then C-in-C of RPAF received the aircraft on behalf of Govt of Pakistan. The aircraft was ferried from UK and had already created a new speed record by flying from London to Karachi in just 15 hours. The collage of the photographs shows the glimpses of the induction ceremony held at RPAF Station Mauripur, Karachi.





close support for the army with the additional responsibility of carrying out anti-locust operations in South, whenever required. It was also considered a unit providing flying roles to pilots near the end of their commissions and who were found not suitable for jet or helicopter conversions.

In May 1961, the No 23 squadron participated in operations in the Dir-Bajaur area. From 21 to 24, and on 31 May the Squadron was called upon to provide close support and to destroy specified targets in the Bajaur valley. A total of 23 sorties were flown and 60 lbs rockets and 20 mm ammunition were used. Later in the same year, possibly the last fatality involving Sea Fury occurred. On 2 September 1961 Flg Off Syed Arif Ali Hasni (PAK 3684) crashed in poor weather near Fatehjang. On 16 and 17 November 1961, No 23 Sqn participated in exercise 'Hastings' flying five sorties.

Later in the year three or four aircraft were flown to PAF Drigh Road for anti-locust operations in Sind. Sea Furies were flown as reconnaissance aircraft locating locust swarms and then directing spray-fitted Freighters onto them. The operation was a big success. No 23 Sqn flew a total of 28 missions between 21 and 30 November 1961. On 23 March 1963, a pair of Sea Furies carried out a flypast over Miranshah Fort during the Republic Day parade of Tochi Scouts.

This actually was the swan song of the aircraft. Sturdy and manoeuvrable Sea Furies were preferred during typical counter-insurgency (COIN) missions over fast jets. They were able to deliver precise attacks, and were easier to handle on low level owing to their slower speed. Lack of aircraft spares restricted their operations, otherwise they would have remained in service for much longer time.

Top Left: Another shot of a formation of Sea Furies over Miranshah, Decemeber 1957. (Photo: PAF Archives).

Inlet: Sea Fury L953 coded 7 of No 5 Sqn at Peshawar around 1955. The aircraft is already repainted in a green-grey camouflage. Old sand-brown colour scheme is clearly visible around the fuselage roundel due to free hand spray painting without masking. 60 lbs rockets visible in the foreground. (Photo: Nick Stroud).

Below: Ground crew of No 23 Sqn pose in front of Sea Fury during anti-locust operations from Drigh Road in the late 1961. Their hard labour was essential for keeping the aircraft serviceable, unfortunately, their names remain unknown. (Photo: PAF Archives).

Towards the beginning of 1960s, wear and lack of spares sealed the fate of Sea Furies. No 23 Squadron was number-plated on 4 March 1964, nearly three years after its establishment. The last surviving aircraft continued to serve in variety of roles, but ultimately all the aircraft were retired in 1964. Unfortunately, neither of them was preserved for PAF Museum.

Fury never saw real action in the shape of full fledge war, however, it played an important role in fighter training of the earlier generation of RPAF pilots who later proved their mettle in subsequent wars against India in 1965 and 1971. Given a chance, its veterans and present day pilots alike would love to fly this fabulous aircraft cherishing its never diminishing legacy.

A Look at the Future of Air Power

THE UNMANNED MANNING

"Unmanned is the inevitable future of aviation. May it be military or commercial, there is semblance of thought between all corridors of power and policy that future of airpower is unmanned. Whether it will be autonomous or remotely piloted is still to be seen. The pace at which artificial intelligence is growing, it is predicted that this switch will be seen before half of the century is over. Moore's Law is at play and effecting tenets of both airpower and aerospace power to force a change in strategic policy mindset where a lot more can be achieved with a lot less!"

by Fahad Masood, MRAeS, Sqn Ldr (R)

Title Pic: Reaper, (also known as Predator B) an outgrowth of combat proven Predator A UAS, became operational in 2007 and began flying combat missions over Afghanistan. With operational ceiling of 50,000ft, and higher cruising speed, Reaper can cover a larger area, under all weather conditions carrying payloads of more than 1.5 tons. (Photo:ainonline.com).

Northrop Grumman RQ-4 Global Hawk is High-Altitude Long Endurance platform, remotely-piloted, surveillance aircraft. Can survey as much as 40,000 square miles (100,000 km2) of terrain a day. Operated by USAF, covers spectrum of intelligence collection capability to support forces in worldwide military operations. (Photo: thediplomat.com)

Left Above: Boeing Airpower Teaming System (ATS), aka Loyal Wingman project, is stealth, multirole, unmanned aerial vehicle capable of flying alongside manned aircraft for support and preforming autonomous missions independently using artificial intelligence. (Photo: flightglobal.com).

Time UTC 0900, loitering over the Indian ocean, upgraded Wing Loong II on search and destroy mission with a pair each on six rails of C-802A1's, smaller in size variants of the original sea skimming anti-ship missiles boasting firing range of 180 km on rails. The MALE (Medium Altitude Long Endurance) UAV flying at the edge of its envelope of 32000 feet has been looking for its targets for 30 hours straight now. With two hours airborne time left, there is an image that catches the eye of pilot sitting in a Tactical Control System (TCS)/ Ground Controlled Station (GCS). The image is initially blur but the high-end electro-optical pod with day & infrared cameras and sensors zooms in from altitude to indicate the vessel of pirates in the gulf who had been disturbing sea lane of operations in the region for days at a stretch. UAV operator sends a snapshot to Operations Control room at a remotely located HQ, thousands of miles away, through secure high speed satcom to take clearance for engaging the enemy. Onboard Beidou based GNSS (Global Navigation Satellite System) enables pin point coordinate location accuracy of the target. The miscreant ship is identified as the offender and a threat. 'Clear to engage' order attained, HOFE (Heart of firing envelope) of weapon accomplished, the pilot lets the mini anti-ship cruise missile off the rail. Dropping from 30000 feet to mere 5 feet above sea level, literally skimming the waves, accelerating from terminal speed of Mach 0.9 to attack velocity of 1.4, the pirates didn't stand a chance. Within minutes of decision made, there is a major hull breach and pirates surrender while abandoning ship. Mission achieved! Threat neutralized without endangering any pilot in cockpit over hostile waters.

If you are thinking that above scenario is a scene from a Hollywood blockbuster movie…think again! This is the new normal for air power employment in the contemporary era. Nations are striving to excel in this ever growing technology for a decent time now.

When we come across various terms like drones, UAVs etc, the first thing which comes to our minds is that it is some new technology that has come to fore front by the turn of this century. However, this assumption is not true as the concept dates back to 18th century. (Image 1: Timeline of UAV Technology Development).

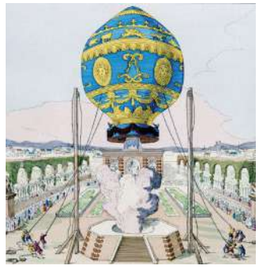
Timeline of UAV Technology Development

Image 1

1783

The Earliest UAV

Earliest hot-air balloons are not typically considered while deliberating on UAVs. Technically these flyers were the first aircraft not to require a human pilot. Joseph-Michel and Jacques-Étienne Montgolfier in 1783 held first public demonstration of an unmanned aircraft, a hot-air balloon in France.



1858

Aerial Photography Begins!

Infamous photographer Gasper Felix Tournachon was first person to take snaps from the air while hoisted up in a hot-air balloon in Paris, France. Unfortunately, the photograph has been lost in history.

1896

Initial Camera on a UAV

Rocket with a camera was launched by Alfred Nobel, famous for invention of dynamite and follow-up Nobel Prizes. For the first time cameras were placed on an unmanned system.

1898

Earliest Radio-Controlled Craft

Enigineers cum Futurist Nikola Tesla put on a show of his radio-controlled boat for a crowd in Madison Square Garden.

1915

Aerial Reconnaissance Photos by Britain

British forces, during battle of Neuve Chappelle, used Orthomosaic type of aerial photography to build a map of German front by overlaying pictures one on top of the other.

1917

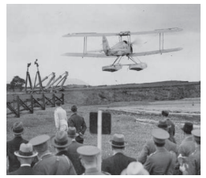
Kettering 'Bug': First UAV Torpedo

The 'Bug' from Ohio was conceived by Charles Kettering a.k.a. unmanned Kettering Aerial Torpedo.

1935

First Modern Drone

An effective scheme to instill skill in aviators was the need of the hour by RAF while it initiated operations in 1918.



1936

Initiation of US Drone Program

1936 test flight of the Queen Bee was observed with awe by U.S. Admiral William Harrison Standley.

1937

Radio-Controlled (RC) UAV Torpedo of U.S. Navy

Curtiss N2C-2 was the first RC UAV. UAV's effectiveness was limited because of a crewed aircraft needed to fly with N2C-2 from which it received its commands. But it was still a significant step in development of radio-controlled UAV technology.

1941

Radio Plane: Actor Reginald Denny's Invention

After forming his company, Denny produced target drones for military and was responsible for numerous drone technology innovations.

1943

First-Person View (FPV) Flight: Humble Beginnings

Boeing and USAF developed the BQ-7, which operated on a crude FPV system.

Old bombers were effectively stripped of non-essential equipment and loaded with explosives. A human pilot would fly the aircraft towards designated target. Once target was in view, autopilot was engaged, and pilot bailed out. BQ-7 would then fly to target on its own.

1973

Israel Develops UAVs for Surveillance and Scouting

Mastiff and IAA Scout series of UAVs represented a leap in capabilities of drones.

1982

Battlefield UAVs

Battle of Jezzine represented first encounter where drones made a considerable difference in the engagement's outcome.

1985

US Significantly Scales Up Drone Production

By conclusion of Vietnam War, U.S. was ready to scale up its drone program.

Successes of Israel's UAV program in early 1980s made it clear that drones would have a growing role on battlefields of future.

1986

RQ2 Pioneer Drone Development

U.S. and Israel jointly develop what would become one of the most successful UAV platforms to date.

System was an upgraded IAI Scout drone and featured significant payload improvements. During Gulf War, some Iraqi forces even surrendered to a Pioneer UAV.

Image 1

1991

Gulf War: UAVs Fly Every day, All Day Long

For first time in a major conflict, at least one drone was airborne from conflict's start until its conclusion.

1996

Development of Predator Drone Program

With help of UAV giants like Abraham Karem, U.S. developed Predator drone. This platform brought weaponized drones to the battlefield like never before. Probably more than any other UAV, Predator created public image of drones striking global targets.

2006

UAVs Permitted in US Civilian Airspace for the First Time

Following the devastation caused by Hurricane Katrina, the FAA allowed UAVs to fly in civilian airspace for search & rescue and disaster relief operations.

2010

Smartphone control of Parrot Drone

At CES, French drone manufacturer Parrot unveiled it's AR Drone.

UAV was a small quadcopter fit for consumer use. An app on a smartphone was all what pilot needed to operate the drone safely.

2012

Initial Phantom Drone produced by DJI

While company was founded in 2006, iconic Phantom series was not released until 2013.

2013

Drone Delivery Initiated by MNCs

FedEx, UPS, Amazon, Google, Uber, and countless other delivery companies recognize drone benefits as a delivery platform. Testing of various UAV concepts and work with regulatory agencies around the world begins.

2014

Rapid Growth of Drone Usage by Consumers and Industry

Since 2014, UAVs have continued to expand in capabilities and use cases.

As more industries explore how drones can make their work safer and more cost effective, growth is expected to rapidly surge in the coming years. By 2030, the entire expected UAV market is set to be worth $92 billion.

2021

Global Epidemic Mitigation

From quarantine & social distancing enforcement to mass disinfection and medical supply delivery assistance, drones have been a staple during the coronavirus outbreak.

War of Semantics

War of semantics regarding various 'unmanned' terms have raged over the previous couple of decades. It is pertinent to clarify some misconceptions regarding various expressions in vogue, mentioned in following paragraphs.

Drone

Searching for the word "drone" in a dictionary and amongst several alternative entries (including an indolent person, a deep humming sound and a monotonous tone of speech) it is found that…

- It is a male bee in a bee colony, which does no work but can fertilize the queen
- It is a pilotless aircraft directed by remote control.

An amazing contrast of idea in between the two. Where the first is a one-time-use existence other than a solitary function. On the other hand, the second plays a pivotal role in air power employment and pivots the whole war in victor's favor just like the Azerbaijan-Armenia conflict in the recent past.

UAV or RPV or UAS?!

It is not as simple as one-two-three but an attention-grabbing schmooze of explication has materialized in academia and industry alike, for some time now on the many types of 'aircraft'. (Image 3)

As seen with reference to Image 2, there is a lot more to it that meets the eye. And it needs a keen eye and lots of deliberation required to identify what is what. But contemporarily speaking, UAV and RPV are synonymously used and UCAS with UCAV have similar context. To make some semblance of relationship between a few terms used to describe drones, terms in italics are no longer recognized by ICAO. (Image 3)

> "USA is a leader in use of armed drones, but it also uses a wide range of UAVs, from massive to tiny, for surveillance. One of Pentagon's efforts to always improve its surveillance capacity is development of tiny and relatively inexpensive Perdix drones."

Components of UAS

An Unmanned Aerial System (UAS) has three components…

- Autonomous or human operated control system usually on ground or a ship but may be on another airborne platform
- Unmanned Aerial Vehicle (UAV)
- Command & Control (C2) system - sometimes referred to as a communication, command and control (C3) system - to link the earlier two.

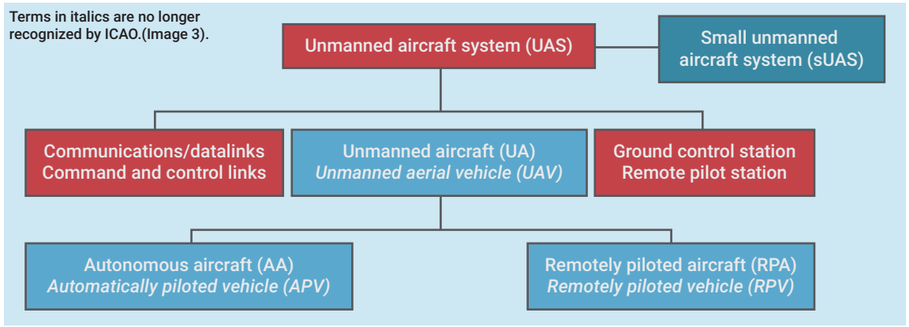
UAS can also include an autonomously controlled UAV or, more likely, a semi-autonomous UAV. In recent years, tendency to refer to any UAV as a Drone has developed but the term is not universally considered appropriate. UAVs can vary in size from those which can be hand launched to purpose built or adapted vehicles size of conventional fixed or rotary wing aircraft.

UAV: Variety of Roles

Erroneously, UAVs are considered to be limited to combat roles only. However that is not true, UAVs since its inception have performed the following diverse roles in aviation:

- Intelligence
- Surveillance and Reconnaissance (ISR)
- Force Protection
- Suppression of Enemy Air Defense (SEAD)
- Counter Narcotics
- Psychological Operations
- All Weather/Night Strikes
- Exercise Support
- Anti-Submarine Warfare

IAI Heron (Machatz-1) is a MALE UAV developed by the Malat (UAV) division of Israel Aerospace Industries. It is Capable of operations of up to 52 hours' duration at up to 10.5 km (35,000 ft). (Photo: stcenturyasianarmsrace.com



Left Inlet: The purpose of Rafael "Drone Dome" is to counter malicious unmanned air vehicles. It defends critical sites against hostile threats, detecting, tracking and neutralising UAVs classified as malicious. (photo: unitedwithisrael.org).

Bottom: BAE Systems Taranis is British demonstrator program for UCAV technology, under development primarily by defence contractor BAE Systems Military Air & Information. Named after Celtic god of thunder Taranis, first flew in 2013. An operational derivative of Taranis, the proposed Future Combat Air System is expected to enter military service after 2030. (Photo: unitedwithisrael.org).

The Big Three!

From data it is currently known that there are at least 150 different military drone systems being used by 48 countries. Drones range in size from hummingbird size Black Hornet mini-copter to the massive 15,000-pound RQ-4 Global Hawk. However, the big three players in the production and use of drone technology would remain USA, China and Israel.

In 2001 United States became first country to use a true armed drone in combat. Now there are at least 28 countries with armed drones in their military, and it is known that at least nine (USA, Israel, UK, Pakistan, Iraq, Nigeria, Iran, Turkey, and Azerbaijan) have actually used them in operations. Six of those countries only first used an armed drone in previous few years.

UAVs in USA

USA is by far the largest researcher, producer, and user of military drones. Teal Group projects that the United States will account for 77% of total military worldwide research, development, test & evaluation (RDT&E) spending on UAVs in coming decade and just over half of all military procurement.

2019 military budget request called for $2.4 billion to be spent on research, upgrades, and procurement of unmanned aerial systems. Single biggest item is $1.2 billion for MQ-9 Reaper, which is primary offensive strike drone for US military.

MQ-9 Reaper is built by General Atomics Aeronautical Systems and latest in their line of Predator®-series. This drone has top speed of 240 KTAS, maximum altitude of 50,000 ft., can carry a 3,750 pound payload, and can operate for 27 hours. Each is equipped with advanced infrared sensors, cameras, laser range finders, and several possible ordinances. They can be controlled remotely or fly autonomously. According to General Atomics, as of last year its Predator-series vehicles clocked a total of four million flight hours.

A highly sophisticated MQ-9 Reaper costs around $14.5 million per airframe, but unit cost of cheapest manned F-35 is still $94.6 million. Military drones are cheaper than planes, cheaper to operate, can operate longer, and may soon be better at combat. Psibernetix – an Ohio-based artificial intelligence company – has developed a fuzzy logic AI they named ALPHA. They claim their AI now easily beat highly trained pilots in simulated aerial combat where opposing plane try to shoot each other down. This AI has not officially been deployed in any military system, but it indicates what can be theoretically done and may be done in the near future.

USA is a leader in use of armed drones, but it also uses a wide range of UAVs, from massive to tiny, for surveillance. One of Pentagon's efforts to always improve its surveillance capacity is development of tiny and relatively inexpensive Perdix drones. These drones have been undergoing testing for past few years.

Unlike large remote-controlled drones that can perform autonomous functions, these cheap AI drones operate entirely autonomously using swarm intelligence. Swarm stays in constant communication with itself and changes its configuration to complete mission if any one drone is lost.
Rise of drones has also created need for development of anti-drone systems. Anti-UAV Defense Systems are being deployed by United States forces to counter small drones being used by rebel groups. US military also recently contracted with Syracuse Research Corp. to build anti-UAV systems with spatial, frequency, and optical surveillance capabilities to detect drones and then disable them with jamming equipment.

UAVs in Israel

State of Israel is believed to be largest military UAV exporter in the world. According to a 2013 report from Frost & Sullivan estimates that Israel's UAS export revenue totaled $4.62 billion from 2005 to 2012. Israel and other countries often don't say exactly how much military equipment they buy or sell so estimates often merely inferred from numerous sources.

Israel owes this dominant position to a few important factors. First, Israel had some of the earliest uses of UAVs for surveillance. Second, as a small country surrounded by large countries it has a highly developed defense industry which often focuses on technology as a force multiplier. Third, long reluctance of United States to share its drone technology created a clear market opportunity.

Abbr.	Term	Meaning or example of usage
	Aircraft	Any machine that can derive support in atmosphere from reactions of air other than reactions of air against the earth's surface
AA	Autonomous aircraft	Unmanned aircraft that does not allow pilot intervention in management of the flight
APV	Automatically piloted vehicle	Aerial vehicle controlled by instructions stored on board the vehicle and executed automatically
ROA	Remotely operated aircraft	Used in FAA statutes (Zaloga, 2008) and in Eisenbeiss (2009)
RPA	Remotely piloted aircraft	Unmanned aircraft piloted from a remote pilot station
RPAS	Remotely piloted aircraft system (Remotely piloted aerial system)	Remotely piloted aircraft, its associated remote pilot station(s), required command and control links and any other components as specified in type design
RPAV	Remotely piloted aerial vehicle	From ENAC , France. Italian Civil Aviation Authority.
RPV	Remotely piloted vehicle	E.g. Bristol International RPV Conference, 1979–1998
sUAS SUAS	Small unmanned aircraft system	Less than 25 kg or 55 pounds (20 kg in UK) Less onerous operating rules apply than for heavier UAVs
sUSA SUSA	Small unmanned surveillance aircraft	Sub-category of unmanned aircraft, e.g. equipped with a camera
UA	Unmanned aircraft	Aircraft which is intended to operate with no pilot on board
UAS	Unmanned aircraft systems (Unmanned aerial systems) (Uninhabited aerial system)	Aircraft and its associated elements which are operated with no pilot on board. First term used by EUROCAE in 2007 but no longer used by ICAO.
UAV	Unmanned aerial vehicle (Unpiloted aerial vehicle) (Unmanned air vehicle)	Pilotless aircraft which is flown without a pilot-in-command on board and is either remotely and fully controlled from another place or programmed and fully autonomous
UAVS	Unmanned aerial vehicle system (Unmanned air vehicle system)	E.g. Bristol International UAVS Conference 1999–2012 (previously the Bristol International RPV Conference)
UCAV	Unmanned combat air vehicle Unmanned cargo air vehicle Uninhabited combat air vehicle	First term used in military circles and by defence companies Second term used by Boeing Third term used by Zaloga (2008
UVS	Unmanned vehicle system	E.g. Eisenbeiss (2009)

Image 2

Reporting indicates Israeli military has more than 100 drones, and they account for around 70 percent of Air Force's flying time.
One of country's leading UAV makers is state-owned Israel Aerospace Industries, which produces Heron family of drones. Super Heron can fly for up to 45 hours, has a top speed of over 150 kTAS, and it has a wide spectrum of sensors. It is equipped with an Autonomous Flight and Automatic Take Off and Landing (ATOL) system. Versions of Heron have been exported to numerous countries globally with India being a major customer.

Israel is also a major innovator in anti-drone systems. Israeli defense contractor Rafael recently announced launch of their "Drone Dome." It is a radar-based system which can identify targets and use a laser to neutralize them from several kilometers away. It is a natural progression of Rafael's Iron Dome system to intercept rockets and artillery shells.

UAVs in China

China has largest army on planet by personnel numbers and second highest military budget behind USA. Country has rapidly become an increased user of drones for its own military and an exporter of these systems to other countries. China has particularly found a market for their UAV among countries that for political reasons would prefer not to buying from Israel and don't meet United States' tight requirements for export.

For example, Saudi Arabia announced it had reached a deal with China to build a military UAV factory in Saudi Arabia. While details are limited, it could be one of largest international drone deals to date. China is a major source of drones for countries in Africa and Middle East.

China claimed that China Aerospace Science and Technology Corporation is ready to start mass producing Cai Hong 5 (CH-5), country's most advanced publicly acknowledged drone. They claim CH-5 is equal to MQ-9 Reaper in technology, although specifications indicate it has a weaker engine. It is said to be able to operate for 60 hours and fly at 30,000 ft.

Chinese government is rather tight lipped about how exactly it is using and plans to use AI for its military, but it has made clear it sees heavy investment AI as critical to country's future and will be used to "maintain national security." Chinese military seeks to capitalize on future of autonomous warfare and use its growing civilian AI development to help do so.

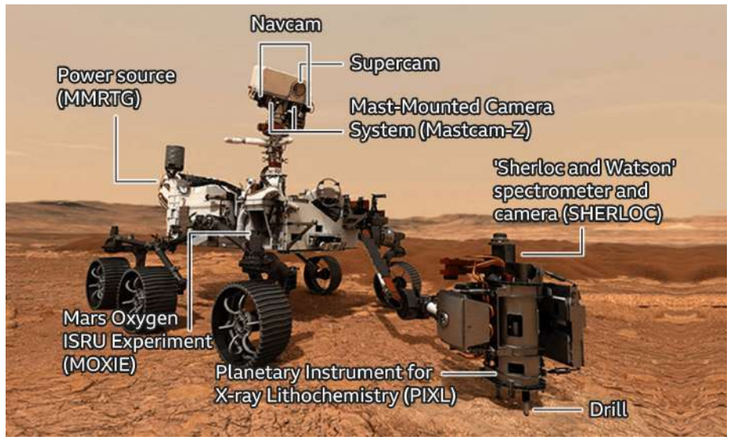
For example, earlier this year China Electronics Technology Group Corporation claimed to have launched a record-breaking intelligent drone swarm with 119 UAVs. They claim drones were flown with ad hoc networks and under autonomous group control, but they have provided no information on when or where this test took place.

Another significant player in this regard is Wing Loong II, a Medium Altitude Long Endurance (MALE) UCAV developed by Chengdu Aircraft

UAS in Civilian Role

Recent rapid progress in extending scope of military & State use of UAS has led to recognition of widespread potential for civil commercial applications of various UAS, majority of which are small UAVs operating below height above terrain normally used by manned aircraft. Many of these uses are now well established and include...

- Security surveillance
- Emergency response including SAR
- Facilitation of communications and broadcast
- Small package and bulk cargo transport
- Visual, spectral and thermal examination of structures
- Monitoring of linear network infrastructure such as railway tracks, power lines and pipelines
- Photography and cartographic survey
- Agricultural fertilizer and chemical application
- Aircraft external maintenance inspection
- Atmospheric research



Industry Group. Range of 4000 km, an endurance of 20 hours, a service ceiling of 16000 feet and maximum speed of 370 kph. This UCAV is an improved version of its predecessor Wing Loong 1. Current version has an optimized aerodynamic design, improved airframe and upgraded airborne systems which feature better capability in terms of flight, payload and information capacity.
It is equipped with satellite communication (SATCOM) system. Its electro-optical payload pad fitted under forward section of fuselage is integrated with daylight and infrared cameras and sensors to collect surveillance and targeting data in both day and low-light/night conditions.

Concluding Thoughts on Military UAVs

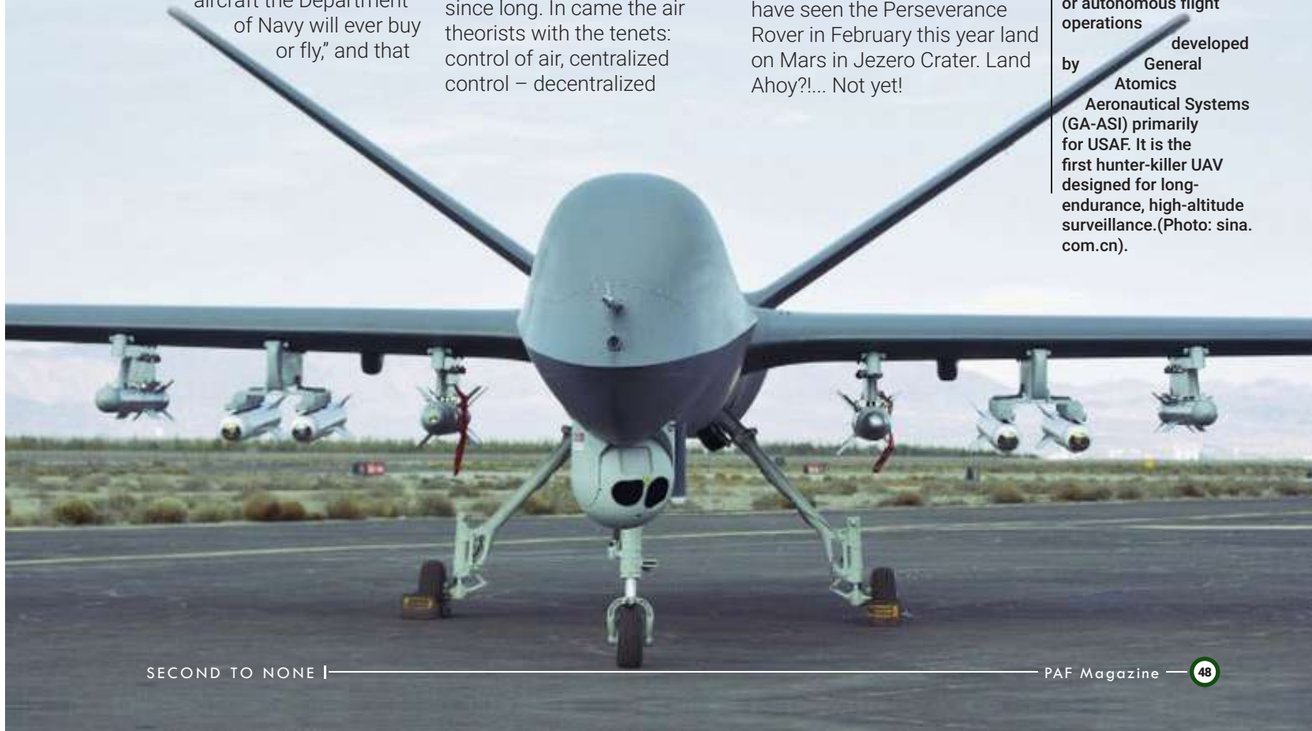
Major and minor militaries globally see UAVs as future of airpower. In 2015 United States Secretary of the Navy Ray Mabus said F-35 Joint Strike Fighter will likely be "the last manned strike fighter aircraft the Department of Navy will ever buy or fly," and that autonomous unmanned vehicles will be the "new normal in ever-increasing areas."

Drones already make up a large share of vehicles in operation in major militaries and percent of airpower and flight hours they make up in air forces is expected to grow significantly. As a result, market for drones is projected to increase several fold in coming decade with United States, Israel, and China playing a major role.

Generationext!

The third dimension has dominated the philosophical thought of military theorists since long. In came the air theorists with the tenets: control of air, centralized control – decentralized execution, priority, balance, concentration. Advances in the unmanned domain have forced the rules of the game to have been in a state of flux. Starting from Boeings loyal wingman concept of evolved AI (Artificial Intelligence) to United Kingdom's BAE Taranis to developing UAV swarm technology, completely unmanned or autonomous aircraft are the inevitable future of the air. Counter-measures to cater for the technological evolution are being sought and have been developed as well. Leaving this subject for later discussion, what is coming next does not end in the air but space exploration. Where we have seen the Perseverance Rover in February this year land on Mars in Jezero Crater. Land Ahoy?!... Not yet!

Above: Chengdu Wing Loong II ('Pterodactyl II') is UAV capable of remotely controlled or autonomous flight developed by Chengdu Aircraft Industry Group of China. Intended for use as a surveillance & aerial reconnaissance and precision strike platform, Chengdu unveiled the concept of Wing Loong II at Aviation Expo China in Beijing in September 2015. Wing Loong II has long range strike capability with a satellite link.(Photo: SalmanFalconsPK).



Bottom: General Atomics MQ-9 Reaper is capable of remotely controlled or autonomous flight operations developed by General Atomics Aeronautical Systems (GA-ASI) primarily for USAF. It is the first hunter-killer UAV designed for long-endurance, high-altitude surveillance.(Photo: sina.com.cn).

PAF's MIRACLE MIRAGES

50 Years Strong

"The tale of the service that Mirage has given to PAF is nothing short of spectacular. Serving the nation for more than five decades alone is no ordinary achievement. That's why all the unsung heroes who flew this bird in its heydays deserved nothing less than a standing ovation. And this is what they received in a dignified ceremony held in February. The President of Pakistan was present at the occasion to honour the distinguished services of the units, veterans and senior operators of this 'Miracle Mirage'. As this rugged platform becomes 50 years strong, it continues to pose enormous threat to the adversary. Its sterling performance during Ops Swift Retort in recent past is just one of many glaring examples."

by S. Khalil

Inlets: President Arif Alvi awarding colours to No 22 OCU and No 27 Attack Sqns during Golden Jubilee Celebrations of Mirage at a PAF operational base. (Photo: PAF Archives)

A No 15 Sqn 'Cobra' shows off its delta while flying inverted during an aerial display. 'Cobras' played an important role in Ops Swift Retort. (Photo: Awais Lali).

Last month, Pakistan Air Force service members paused to reflect on the history and the heritage of Mirage, the aircraft which has served the force for more than 50 years in numerous combat roles. The event was also orchestrated to recognise the services of No 22 Operational Conversion Unit and No 27 Tactical Attack Sqn for their meritorious services in a war time role. These squadrons employed this multirole fighter that could perform a wide range of missions producing enviable results. Both the operational fighter squadrons were awarded Colour at an operational air force base, where Dr Arif Alvi, President of Islamic Republic of Pakistan, was the Chief Guest on the occasion. Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force was also present. A large number of serving and retired PAF officers and veterans also attended the event.

Addressing the audience the Air Chief said, "I acknowledge the vision of our predecessors for keeping the aircraft abreast to meet challenges of modern warfare through upgradation. He emphasized, "Over the years, the Mirage aircraft has amply demonstrated its capability in the 1971 War, the two-decade long War

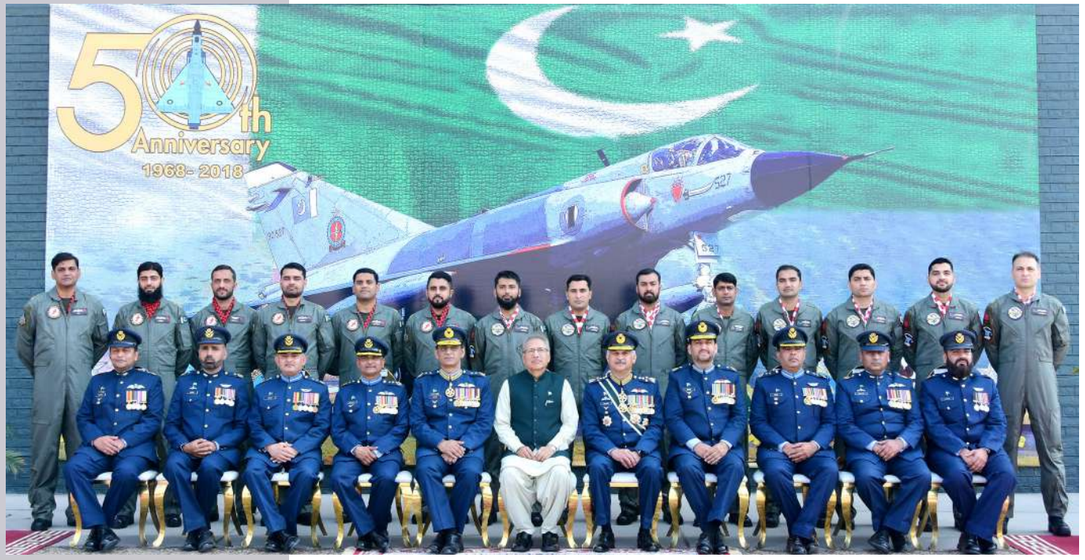
on Terror; and recently during Operation Swift Retort. My felicitations to Mirage operators for employing 17 different variants of this legacy platform in various applications of airpower and providing Pakistan Air Force the desired capabilities in air-to-air, air-to-ground, air-to-sea or specialist roles."

The Chief Guest, President of Islamic Republic of Pakistan, Dr Arif Alvi in his address, appreciated the opportunity to interact with heroes of the Nation. While commending the contributions of Air Marshal Nur Khan and Air Marshal Asghar Khan towards PAF, the Chief Guest said, "For a good air force, excellent professionalism and honest leadership is required. For leadership, the vision given by the Quaid should be followed." He further said, "I was filled with pride on your performance on 27 February, 2019. It was a remarkable job, you are the master of your own destiny despite the fact that the aircraft on the other side were advanced. You are second to none."

Earlier on arrival, President Arif Alvi, along with other dignitaries, was received by Air Vice Marshal Zafar Aslam, Air Officer Commanding Central Air Command and Air Cdre Gohar-ul-Hassan Syed, the Base Cdr. A smartly turned out contingent comprising PAF personnel from No 22 OCU and No 27 Attack Sqns presented the guard of honour to the chief guest. Later, President Arif Alvi reviewed the parade and awarded colours to both the squadrons for their distinguished services over the years. Wg Cdr Naveed Mehmood, Sqn Cdr No 22 OCU and Wg Cdr Hammad Khursheed, Sqn Cdr No 27 Attack sqn received the prestigious colour for their respective squadrons.

An impressive flypast of Mirage fighter jets was the highlight of the event. First to enter the scene was the formation of four Mirages in echelon formation from No 15 Sqn, 'The Cobras'. The formation comprised Sqn Ldr Hassan, Flt Lt Ammar, Flt Lt Qasim and Flt Lt Danyal. It is pertinent to mention that No 15 sqn is the oldest unit of PAF equipped with Mirage aircraft. The squadron played an important role in Ops Swift Retort when its aircraft delivered stand-off weapons with pin point accuracy against enemy targets. With the exit of formation of the senior-most squadron of Mirages, appeared on the horizon, the youngest Mirage sqn of PAF, No 27 Sqn - 'The Zarrars'. Flown by Sqn Ldr Ali, Flt Lt Ramish, Flt Lt Waleed and Flt Lt Waqar, the four-ship formation presented a captivating bomb burst manoeuvre over the venue.

The recognition of services of senior officers and veterans who had served the Mirage weapon system for decades was long overdue.



Above: President Arif Alvi and Chief of the Air Staff along with senior officials and officers of No 15 Sqn. (Photo: PAF Archives).

Right Inlets: President Arif Alvi presenting mementos to veterans. (Photo: PAF Archives)

Left Page: A PAF Mirage with tail painted in Golden Jubilee celebration theme takes off from an operational base. (Photo: Syed Zohaib Zaidi).

Left Page Above: President Arif Alvi presenting memento to pilots of No 15 Sqn 'Cobras' who had participated in Ops Swift Retort. (Photo: PAF Archives).

Golden Jubilee celebration of Mirage aircraft was the perfect forum for honouring these heroes who showed extraordinary courage and dedication while discharging their duties in various Mirage sqns. President Arif Alvi presented crests and mementoes to these senior officers. The honoured veterans included AVM Farooq Umer (Retd), AVM Saleemuddin (Retd), Air Cdre Farooq Haider (Retd), Air Cdre Safdar Khan (Retd) and Sqn Ldr Jamil Rana (Retd).

Last event of the ceremony was the inauguration of Mirage Monument, recently erected at the base to commemorate the Golden Jubilee of Mirage service in PAF. President Arif Alvi inaugurated the artistically designed memorial. The overall design of the monument symbolises Mirage's Delta wing. Centre of the monument highlights three PAF modified Mirage variants ROSE-I, II and III pulling up vertically. Three vertical wings symbolises three Mirage kills during 1971 war against India whereas ascendency of these wings depicts ever-growing contribution of Mirage workhorse over the years. The highest wing carries five horizontal strips indicating five decades of service in Pakistan. The globe in the centre is a representative of global presence of Mirage aircraft. On the base of the monument, eleven insignias are mounted highlighting PAF fighter squadrons that have the honour to be

Above: A PAF Mirage with tail painted in special 50 years theme takes off for an aerial display during the Golden Jubilee Celebrations. (Photo: Awais Lali).

Right Page Above: Cobras from No 15 Sqn presented the flypast in echelon formation over the venue. (Photo: PAF Archives).

President Arif Alvi inspecting the static display of Mirage aircraft during the ceremony. (Photo: PAF Archives).

Right Page Bottom: Armed to Teeth: A Mirage shows off its lethal arsenal at an Operational air base. (Photo: PAF Archives).

Inauguration of Mirage Monument

Mirage operators for so long.

Over the decades, air crews at the Mirage Rebuild Factory, with a 'can do' attitude and willingness to adapt quickly, made this undefeated jet even better. The key to everlasting youth and sustained performance lies in its constant routine maintenance by teams of trained PAF specialists that service this tangible piece of flying history and send them back to fighter sqns to defend our airspace. In the jet shop, trained crew of engineers strip the aircraft down to its smallest elements and then rebuild, with the efficiency of a race car pit crew.

There have been 17 Mirage variants produced over the years, each gaining some combination of updated software, avionics, engines and other enhancements, with increased numbers of weapons stations. While its impressive loadouts include a range of air to air missiles, its air to ground arsenal boasts freefall bombs, smart bombs, air to ground rockets etc.

The Mirage fighter jet and all its 17 modified variants are pilot's aircraft. It can fly at more than twice the speed of sound, one very fascinating performance feature. Every fighter pilot in the air force would dream of flying it in its hey days between 1969 and 1983. It continues to enjoy the advantage of speed over the F-16 even today. It is a thrilling feature that impressed pilots in all the air forces wherever this aircraft is operating.

Designed around a single engine, its aerodynamic superiority, combined with its firepower, and turn rates that will put your stomach at the back of the airplane, make this elegant beast a lethal adversary. The Mirage was built as a strike aircraft. As strong as a powerlifter and as nimble as a gymnast, the Mirage really does anything a pilot wants. And it has done so for the past 50 years it has been in service in the Pakistan Air Force.

FLYING SAUCERS

Myth or Reality?

"Jack" Frost demonstrates the Coandă effect. Pressurized air flows out of the end of the red tube, and then over the top of the metal disk. The Coandă effect makes the air "stick" to the disk, bending down at the edges to flow vertically. This airflow supports the disk in the air. (Photo: blogto.com).

"Flying saucers and aliens go hand-in-hand in pop culture. From baby boomers to millennials, several generations have grown up with tales of alien sightings which almost always involved a flying saucer. It can't be denied that there is substantial allure in the concept of a perfectly sleek, round disc zooming about in the skies at phenomenal speeds. It sounds like something out of a sci-fi fantasy but isn't it said that the truth is always stranger than fiction? Let's delve into how the intriguing aircraft could be utilized in modern warfare and how it came close to becoming a reality."

by Muhammad Khan

Born in 1916, George Cooper was a US citizen who had survived world wars, raised a family and was living a quiet life in the suburbs. The year was 1953 and life was good. He had a good job and a happy family. For a man who has lived through the horrors of two wars, it was all he could ask for. On the surface, George put on a huge smile for everybody. After all, he had reason to be grateful and happy. He lived in the greatest country in the world, didn't he? The land of the free. Why, then, did he feel this knotted dread in his stomach?

"Flying saucers...blubbering idiots, the lot of them!" He muttered furiously as he drove back home after a late shift at the factory. The 'idiots' he was referring to were a group of his colleagues. One of them had started a conversation about 'flying saucers'. George found himself the only one in the group who thought the entire affair was laughable. Everyone else seemed to have one theory or another. The empty factory certainly didn't help. As if the Soviets spies weren't enough, now they had to worry about green little men, as well?!

George found himself wondering if his cynicism was entirely bulletproof. It was childish, of course, the idea of flying saucers zooming in the skies. However, during the last decade, there had been so many events that were getting tougher and tougher to explain away through logic or reason. It all started with those night-flying pilots seeing those damn lights that followed them. George remembered joking about it with the same colleagues when the news channels started talking about flying saucers. At the time, none of them took it seriously. But then, Roswell happened. And wasn't there that one time that a flying saucer had been seen hovering the white house and an air force jet had to attack it? And what was with hundreds of books and movies about aliens all of a sudden? Were they being prepared for something? His children alongside majority of others, definitely believed in them. He can't do much, he can only wait for the time when this mystery is finally solved, may be not in his life time...

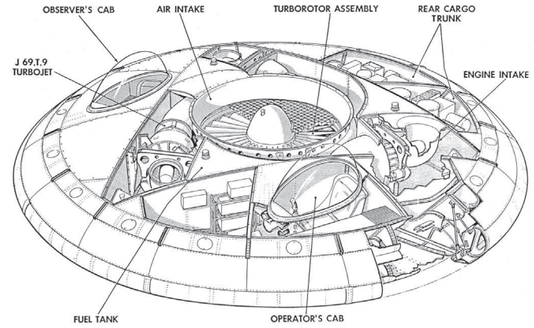
The Mystery

These days, UFO sightings and alien aircraft are usually restricted to sci-fi movies and are rarely mentioned in conversation between adults. However, at the peak of the Cold War, flying saucers were a legitimate military concern for the US. It was an era of paranoia. American life was heavily intoxicated on two bitter-sweet fixations. The first one was the already ubiquitous, state-approved anti-Soviet sentiment and the second was the increasing fascination with UFOs. With the air of suspicion, movies like 'The Day the Earth Stood Still', 'It came from outer space', 'Earth vs. the Flying Saucers' and 'War of the worlds' gained immense popularity. The similarity between the two requires no deep pondering. Both Soviets and Aliens were concepts revolving around an elusive, unknown enemy hidden amongst their ranks. Military anxiety from the Cold War can be attributed to the widespread paranoia about UFOs.

Military pilots reported eerie, unexplainable phenomenon. During World War II, British and American pilots were being trained to fly under the cover of darkness. Several pilots, during these exercises, reported unusual lights that apparently followed them and seemed to react to their presence. A piece published by the Associated Press' Robersons C. Wilson in December of 1944 brought the concern to the general public. Three years later the Roswell crash occurred, an incident still shrouded in mystery and speculation. In 1945, an Air National

Left Page: Before free-flight tests, the Avrocar was flown with tethers, seen here in front and behind the aircraft, for safety reasons. (Photo: US Air Force)

Right: Schematic of the Avrocar showing its major components and mechanisms. (Image: US Air Force)




INDIANAPOLIS NEWS

HUNDREDS IN STATE SEE 'FLYING SAUCERS'

Franklin 'Dogfight' Alerts State Troopers

Guard P-51 Mustang was ordered to intercept a flying saucer over North Dakota. In another incident that was a bit too close for comfort for the US, flying saucers were spotted hovering above the White House, this time prompting the Air Force to launch a bevy of F-94 to intercept the aircraft. During this time, the US government officially instructed citizens to report supposed UFOs to a new division of the Air Force called 'Project Blue Book'. Citizens reported over 12,000 UFO sightings that occurred between 1947 and 1969. More logical minds started speculating that these UFOs were, in fact, not aliens but Soviet aircraft, much more sophisticated than any technology that the US possessed at the time. This perspective was also propagated, to win over support from the public to spend more funds in developing advanced aircraft. A dirge of experimental aircraft was already being developed by the allies, some of which had designs which would be considered 'out there', even by current standards. It was the perfect time for the Avrocar to make its entry. A project that originated in Canada, the Avrocar was literally a flying saucer in the making, one that would fly at unimaginable speeds and heights, dominate the battlefield effortlessly. Recently declassified documents by the U.S. National Archives have shed light on this extraordinary project. Turns out, while beings from outer space might exist or not, flying saucers nearly did.

Background

Military interest in the Avrocar was deeply embedded in a capability termed Vertical Take-Off and Landing (VTOL). As is obvious from the name, these aircraft possessed the ability to take-off and land vertically, eliminating the need for cumbersome runways and the accompanying infrastructure. The Allies were seeking VTOL capabilities owing to America's atomic bombs' attacks on Japan and the Soviet testing of its own atomic bombs in 1949. It was predicted that in case of the next war, the first targets of nuclear attacks would be military installations and air strips. VTOL was the most promising solution. These aircraft would eliminate the need for lengthy runways and require much lesser storage space.

Avro Aircraft Ltd was a Canadian aircraft manufacturer that was working on VTOL technology, along with numerous other endeavours. Now defunct, Avro was founded in 1945 and hired 50, 000 employees right off the bat. This fact made it the 3rd largest company in Canada before eventually closing down in 1962. Avro had a department titled 'Special Projects Group' (SPG).

Jack Frost was at the helm of SPG, a man who knew what he was doing. The British engineer had worked on multiple cutting-edge aircraft designs. Before joining Avro in 1947, he had been a valued part of Britain's de Havilland Aircraft Company. There he had been a crucial part of the team that had developed the jet-powered, twin-boom DH-100 Vampire, the twin-engine DH-103 Hornet and the tailless DH108 Swallow. Once recruited by Avro, he helped design Canada's first and long-range fighter-interceptor, the CF100 Canuck. Frost was perfect for the development of a flying saucer because one, he believed that the VTOL was the dire need of the times and two, that flying saucers had been developed by the Germans.

"Frost believed that the Germans had developed some form of flying saucer-like aircraft," Palmiro Campagna, an engineer with the Canadian Department of National Defence, has explained. Campagna wrote a book about Avro called 'Requiem for a Giant'.

In 1952, the Canadian government funded an Avro project titled Project Y-2 to create a VTOL aircraft. After just a year, Frost and his crew had developed a wooden mock-up of a flying disc. The press somehow got hold of images of the project and the Canadian military were pressed into revealing the details of the project, claiming that aircraft was not only capable of a vertical take-off but could reach speeds up to 1500 mph. However, despite these claims, the government prioritized other on-going projects and securing funds was not easy.

Top: 2 volunteers remove rivets from the Avrocar for restoration at the hangar at National Museum of the United States Air Force. (Photo: US Air Force).

Left: The Avrocar Predecessor: Project Y mock-up in the Experimental Flight Hangar in 1954. (Public Domain).

Right Page Bottom: VZ-9AV Avrocar in the Research & Development Gallery at the National Museum of the USAF in Dayton, Ohio. (U.S. Air Force photo by Ken LaRock).

Luckily for Avro, the US was exceptionally open to novel approaches and technology in that particular era. In 1953, a delegation of defence experts from the US were on an official visit of the Avro plant. When the group toured Avro's SPG building, Frost showed them his secret models, and mock-ups of the VTOL aircraft he was working on. Some of these materials had not even been seen by Avro's top brass. The visitors left impressed. The timing couldn't have been better. Both the US army and the air force were fastidiously looking for an aircraft that would meet their individual needs.

The US Army was on the lookout for a subsonic aircraft that would act as both a reconnaissance and transport vehicle. USAF, on the other hand, had even more gruelling requirements. It needed an aircraft that possessed VTOL capability, completely obliterating the need for runways. Another requirement of USAF was the capability to hover behind enemy lines while possessing the speed needed to easily intercept in-bound fighters and bombers.

The Avrocar boasted abilities to fulfil each and every single one of these requirements. Two years after the visit, Pentagon gave the go ahead to develop a $750, 000 contract to further develop Frost's flying saucer. The project was re-designated the VZ-9AV Avrocar. 'VZ' stood for 'experimental vertical flight,' '9' for the ninth concept proposal, and 'AV' for Avro.

Avro had Jack Frost set up the required infrastructure for construction and testing of new aircraft. All of this was done in the SPG at the Avro plant in Malton, Ontario. Large spaces, empty lots and aircraft hangars were hastily constructed. The operations at SPG were highly guarded. Only personnel with the highest security clearance had access to the SPG facilities. Frank Harvey, ex-president of Aerospace Heritage Foundation of Canada, was an assembly line employee at Avro at the time. He had no access to SPG.

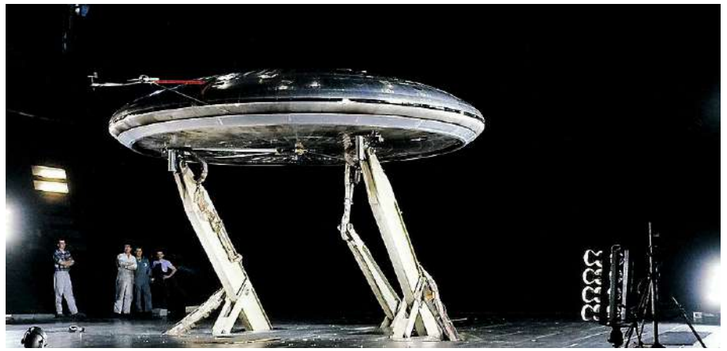
"Very few people got in there," he recalls "If you walked anywhere near, there were security guards."

Apparently, the caution was prudent on part of Avro.

The 50s was a strange time for the US. Still recovering from the trauma of two world wars, the US was gripped by a new fear; UFOs. The paranoia was so strong that even the military was involved. This dread was fueled even further by movies based on UFOs. Grossing impressively, these movies had very high production value and were instrumental in instilling the fear of flying saucers in US citizens. The best of these include 'The day the Earth stood still', 'The war of the worlds', 'It came from outer space' and 'Earth vs the flying saucers'.

Declassified notes from the Soviet era made by a Major named Vasili Mitrokhin reveal that a spy had indeed infiltrated the Avro facility to gain intel on the Arrow program.

The Pentagon was confident that the Avro flying saucer would forever change the face of warfare. Bernard Lindenbaum, a member of the American Helicopter Society, was part of the flying saucer program as an Air Force officer. Writing for the society, he recalls a



Left: A gleaming Avrocar can be seen here in Ames Wind Tunnel, mounted on variable height struts. (Photo: NASA).

Right Page Top: The Avrocar S/N 58-7055 on the day of its roll-out being examined by an Avro engineer. (Photo: NASA).

Right Page Bottom: Stylish Still: The Avrocar shows off its sleek design at National Museum of the United States Air Force in Dayton, Ohio. (Photo: WikiCommons).

conversation to this effect. In meeting held in Washington, D.C. a proposal was approved to finalize funds for research and development of the UH-1 'Huey' helicopter. After the meeting dispersed, he remembered overhearing an army general commenting that UH-1 would be most likely the last helicopter the army would ever buy. The replacement? Avro's flying saucer.

The Technology

The technology for the Avrocar was flawed yet ambitious. The design went through multiple iterations, the disk/doughnut shape the most promising of all of them. This airframe was designed to solve a problem that had been posing problems for aircraft engineers for years at the time. This was to design and construct an aircraft that could perform at both subsonic and supersonic speeds. To elaborate, lift is created at subsonic speeds by air flowing around the wings of the aircraft. However, once the aircraft reaches supersonic speeds, lift is produced by shockwaves that are formed along specific points on the airframe of the aircraft.

To counter this, the Avrocar intended to exploit the Coandă effect – "the tendency of a fluid jet to be attracted to a nearby surface" – to provide lift and thrust in the form of a single "turbo rotor" blowing exhaust out the rim of the disk-shaped aircraft, similar to a hovercraft – but on steroids. The main structure was a large equilateral triangle, to which the various components were attached. The turbo-rotor was a 124-blade contraption which was placed right in the middle of the triangle. The rotor's thrust was ejected through an opening in the lower surface in the downwards direction. Some of this thrust was also diverted to the outer rim of the disk to power the control system.

Swept wing supersonic jet fighter DH108 'Swallow' was also designed by Jack Frost. (Photo: Wikipedia)

It was 18 feet in diameter and 3.5 feet tall at the centre. The upper surface being curved, the bottom less so. The airframe of the saucer was comprised primarily of aluminium, weighing around 1400 kgs. It consisted of 3 Continental J69-T-9 jet engines which supplied power to the rotor. Each of these 3 engines had its own fuel storage, oil tank and other supplementary systems. 3 small castoring wheels made up the aircraft's undercarriage, which would later be replaced with a set of skids in later testing.

The saucer was piloted via a single side-mounted control stick. Yaw was managed using a twisting motion while pitch and roll could be controlled using standard fore-aft and side-to-side movements. The mechanism was inherently mechanical. The stick managed the flow of high-pressure air surrounding the saucer, directly attaching to several control surfaces or through cable connections.

The thrust was controlled through a large ring placed around the main disk. From a side profile, the control flap is almost invisible, designed to not be noticeable. The pilot's controls controlled the ring in relation to the entirety of the saucer, manipulating airflow emanating outwards from the centre of the saucer. Vertical lift was achieved by pushing the entire ring downwards, which resulted in directing substantially more airflow over the saucer's upper surface, which in turn would bend down over this surface towards the ground. Directional control relied asymmetric thrust which was attained by tilting the ring in the required direction.

It quickly became apparent that the saucer was uncontrollably wobbly when it came to forward flight. This was attributed to the fact that the aerodynamic centre of pressure was well forward from the centre of gravity. To counter this, a mechanical stability augmentation mechanism was installed in the Avrocar which operated independent of the pilot's controls. Avrocar's turbo-rotor cast a substantially large angular momentum and was intended to be utilized as a powerful gyroscope, which would mean a normal direction

of flight for the saucer. The saucer was flown by a crew of two in the main design, situated on the airframe at separate positions.

The Moment of Truth

After months of untangling one disaster after another, it's finally time for the big one. On 12 November 1959, Test pilot Wladyslaw "Spud" Potocki is in the cockpit of the Avrocar. The site is the emptied out industrial park in Avro's headquarters, away from prying eyes. Spud takes a deep, contemplative breath. He's no amateur. He has received the much-coveted British Flying Cross in WWII. He was also the test pilot for Avro's Arrow. Today, he has been trusted with the 5680-pound Avrocar for its first flight without the 3-cable tether. He knows perfectly well how quickly everything can go downhill with this sort of unstable technology. He braces himself and pulls the control stick towards himself.

The saucer responds immediately, 18 feet of aluminium frame blasting snow and ice in all directions of the vacant park. The industrial park of Avro's facility resonates with the shrill shriek of the 3 turbojet engines. It is noisy. Very noisy. And this is with just 3 turbojet engines, not with the eventual 6 that the saucer will have. The saucer gains height slowly yet steadily. For a few blissful moments, it seems that the years of endless toil would finally pay off and the world would enter the undeniable next stage of aviation. But then, as the aircraft rises above its 3-feet cushion of exhaust, it happens. The saucer tips to a side. Then another. In a matter of seconds, the saucer starts drooping in all directions. The crew knew this could happen. They have a term for it. They call it 'hubcapping', for its similarity to the way a tire's hubcap oscillates when dropped on the ground.

It's like trying to balance a football on a nail for Spud. He tries to stay afloat but the efforts are in vain. He aborts the flight and sets the Avrocar down.

This was not by any means Avrocar's first test flight. The first test was undertaken in May 1959, in a static hover rig. Hot gas from the exhaust was found to be getting mixed with the intakes which made a considerable dent in

overall engine thrust. The ducts were found to have unexpectedly high loss, as well. The second prototype, #59-4975, was completed August 1959 and was tested on 29 September. The flight was undertaken with the saucer tethered to the ground. This was the first time 'hubcapping' was observed. Although, several modifications were made to the Avrocar in the coming months, it became increasingly clear that hubcapping was a problem that was inherent to the design of the saucer.

52 holes were drilled in the base of the saucer to counter the problem, each located at a distance of 3 feet from the centre. The flight test on 12 November described above with Spud Potocki, proved this modification to be inadequate, as well. After this flight, testing was halted on 5 December, 59.

Over the winters, a design overhaul was the new hope. The spoilers were taken off and a new singular ring was installed below the annular flap. This ring shifted in relation to the craft under control input. Testing was once again resumed from January 1960 and things finally seemed to be looking up. The thrust was much more powerful, the lift was adequate. However, although the redesigned control systems had reined in the hovering qualities, the saucer was much more unstable at higher speeds, starting from 30 knots. The first Avrocar, which had been sent to NASA's Ames Research Centre at Moffett Field in Calif was also modified. In April 1960, it was tested in the centre's 40 by 80 ft wind tunnel. This test helped diagnose the problem. The ring that had been installed obstructed a sizeable portion of the engine thrust. This led to the power being significantly reduced. As the craft sped up, the airflow on the underside decreased the recirculation, lowering the lift owing to airflow over the upper surface of the saucer.

With Avrocar's rocky yet promising journey, Jack Frost resolutely believed that the project was still salvageable. He proposed a set of new modifications. Unfortunately, Pentagon didn't play ball. Frost's designs were not accepted and the funding for Avrocar and related WS-606A supersonic VTOL programs was officially shut down in December 1961. Avro aircraft's executives tried to launch additional VTOL research projects. These included designs pertaining to the existing disk frame and a different 'lift jet' variety. Unfortunately, Avro was unable to secure funding from the Canadian government or any other source. This marked the end of the Special Projects Group of the firm. The sudden lack of interest in VTOL technology was partially owing to the strategic realization on the military's part that a nuclear first strike would not be used at the start of a European war.

After SPG shut down, Jack Frost left for New Zealand. He designed innovative aircraft for the national airline. After he had officially retired, he spent his time designing out-of-the-box solution with promising aviation students and enthusiasts. He passed away from a heart attack in 1979, leaving behind a legacy of aviation designs that continuously pushed the boundaries of convention.

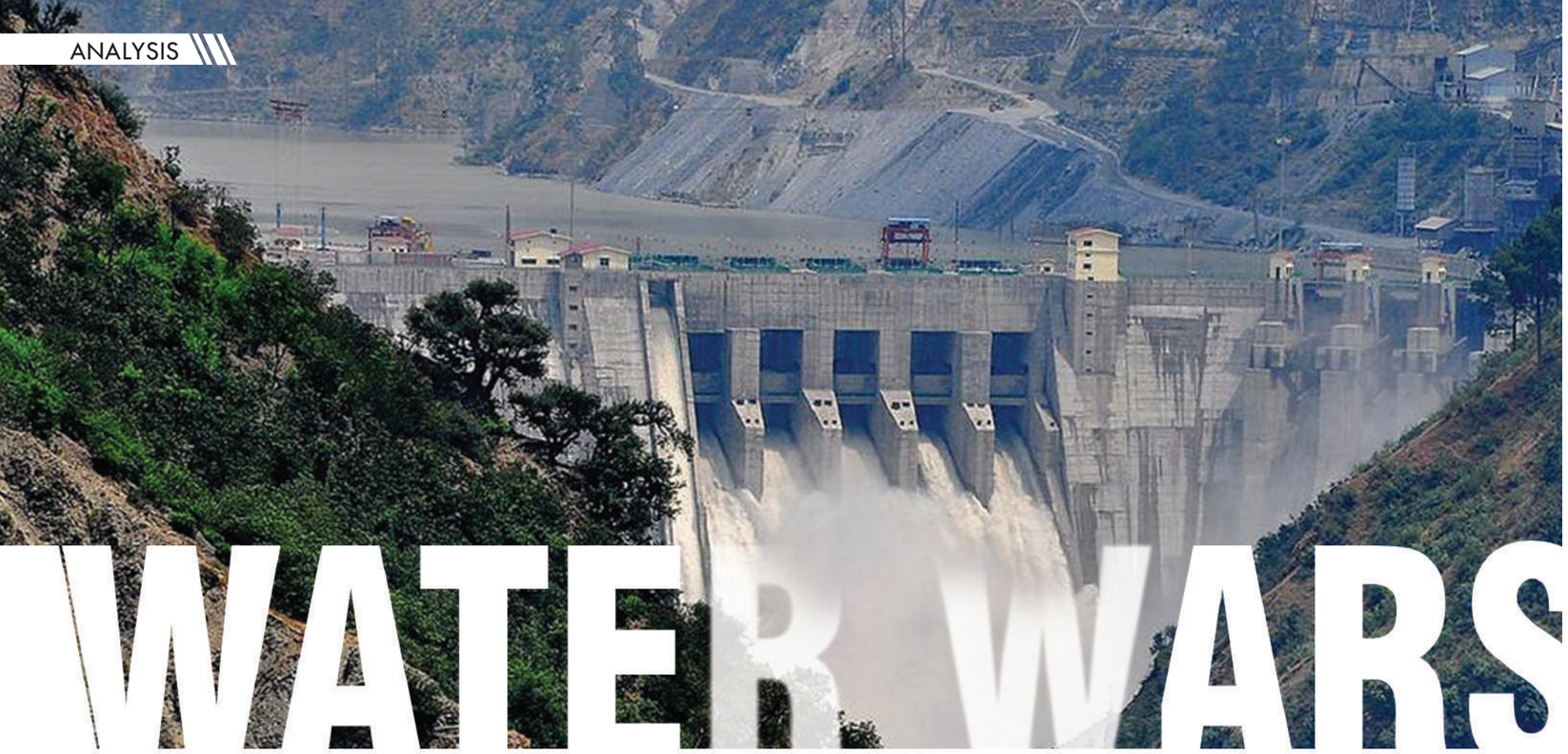
The legacy of the Avrocar

The US military still possess the two Avrocar prototypes. One is kept in storage, disassembled in crates, at Joint Base Langley-Eustis in Virginia under the custody of the U.S. Army Transportation Museum. The other prototype used to be in the Smithsonian, where it gathered dust as a sort of seldom observed novelty. In 2007, however, the National Museum of the U.S. Air Force at Wright-Patterson Air Force Base requested the Smithsonian for the saucer in a swap of sorts.

The prototype was flown in from the Smithsonian to Wright-Patterson inside a C-5 Galaxy transport plane. A special restoration crew constructed new pilot canopy bubbles, entire new seats and made general aesthetic repairs. The Avrocar was ready to shine once again in 2008, after decades in the shadows.

Even though the Avrocar was not able to achieve what it had set out to be, the work was not in vain. The findings of the development of the Avrocar would go on to be used in the airframes of later aircraft like the British AV-8B Harrier jump-jet II and the current F-35B Joint Strike Fighter. The influence of the flying saucer can also be found in the advanced fighters like F-22 Raptor and the Russian Su-35, both of which use the Avrocar's mechanics of directing the flow of exhaust as it ejects the aircraft with the objective of controlling the direction of flight.

Seen here taking off, the F-35 is one of the aircraft that benefited from the research done for the Avrocar. (Photo: US Air Force).



WATER WARS

HISTORY OF WATER DISPUTES BETWEEN INDIA AND PAKISTAN & WAY FORWARD

"The Indus Waters Treaty is dubbed one of the most successful transboundary treaties brokered by the World Bank. It has endured perpetual hostility between India and Pakistan, including three border wars. The Treaty notwithstanding, there still exist a number of water disputes between the two major South Asian countries including construction of controversial Wullar Barrage, Kishanganga Power Project and Baglihar Dam. The author discusses these issues with historical background and political context."

by Maham S. Gillani

Centre for Aerospace and Security Studies (CASS)

Water conflict is an endemic in South Asia. Every country has an outstanding water dispute in the region, except Bhutan. India has the dubious distinction of being at the centre of most these transboundary water issues, having a conflict with each of its neighbours—China, Bhutan, Bangladesh, Nepal and Pakistan. History of water conflict between India and Pakistan dates back to 1948 when India forestalled the flow of water to Punjab. Due to Pakistan's overwhelming dependence on water flowing from rivers and tributaries emanating in India, it locked the two countries in a serious dispute. Thereafter, the World Bank brokered the Indus Waters Treaty to resolve their perennial water conflict.

Indus Waters Treaty was signed in 1960, after nine years of arduous negotiations between India, Pakistan and the World Bank. The Treaty provided a framework for water distribution, wherein Pakistan was to be given exclusive rights to the western rivers: Indus, Chenab and Jhelum, while India was given unrestricted access to the eastern rivers: Ravi, Beas and Sutlej. Some of the salient features of the Treaty are shown in Fig 1.

The Indus Waters Treaty is dubbed as one of the most successful transboundary treaties brokered by the World Bank. It has endured perpetual hostility between India and Pakistan, including three border wars. Dwight Eisenhower, former US President, termed it as "one bright spot ... in a very depressing world picture that we see so often."[i] The Treaty notwithstanding, there still exist a number of water disputes between the two major South Asian countries. These include dispute over Wullar Barrage, Kishanganga Power Project and Baglihar Dam. They are discussed in more detail below:

Wullar Barrage Dispute

The Wullar Barrage dispute surfaced in 1984 at a time when India began plans to construct a barrage, within the territorial confines of Indian-Occupied Kashmir, on the outfall of the Jhelum river, without fulfilling the legal requirement of informing Pakistan.[x] With a storage capacity of 300,000 acre feet, it was located in the Baramullah district to create a linkage with Srinagar.[xi] Nevertheless, Pakistan raised strong objections to the move and, as a result, India was compelled to suspend its construction in 1987. Pakistan underscored that the Barrage violated its rights as a lower riparian state granted by the World Bank. However, India has still not completely abandoned the project, imperilling Pakistan's water security. Islamabad claims that the storage capacity of the Wullar Barrage as planned by India is 32 times higher than the maximum limit stipulated by the Indus Waters Treaty. Moreover, one of Pakistan's overwhelming fears is that the Barrage would obstruct the free flow of water through the Jhelum river, thereby jeopardising its agricultural economy. While India has been attempting to refute such claims, Pakistan maintains that the height of the barrage should not be increased, and it should continue to stay at the point at which it was suspended in 1987.

Kishanganga Water Dispute

The Kishanganga water dispute revolves around the construction of a hydroelectric power plant on the Kishanganga River, which is a tributary of the Jhelum river, known as the Neelum River in Pakistan. Indian Prime Minister Narendra Modi inaugurated the contentious project in 2018, which also includes building of a dam on the tributary. The project is expected to produce 1,713

"One of Pakistan's overwhelming fears is that the Wullar Barrage would obstruct the free flow of water through the Jhelum River, thereby jeopardizing its agricultural economy."

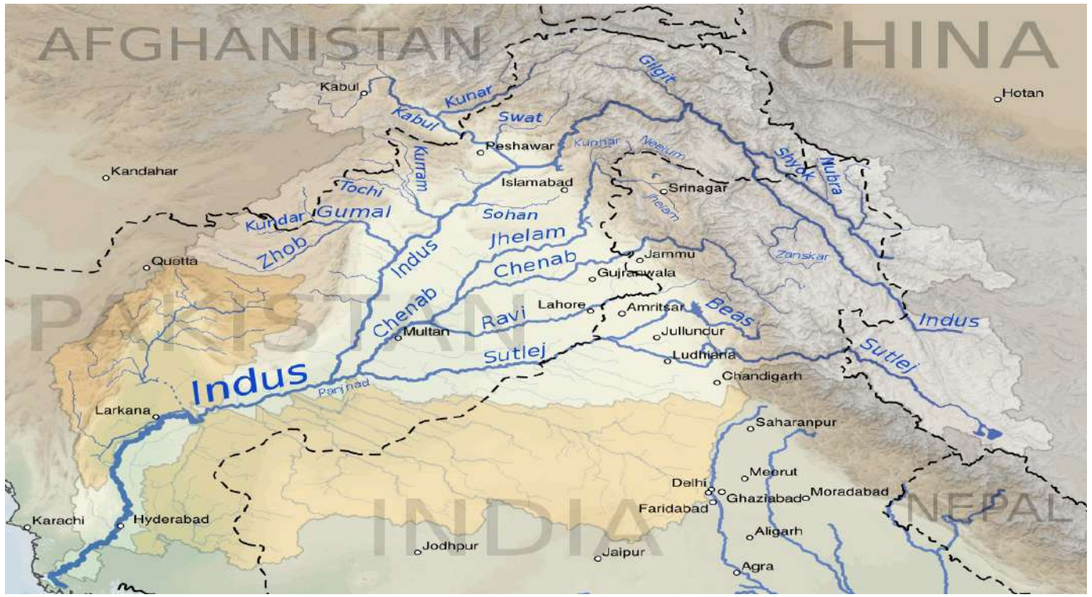
Salient Features of Indus Water Treaty

- **Article 2:** India receiving unbridled right to utilise water flowing through the eastern rivers—Ravi, Sutlej, and Bias.[ii]
- **Article 3:** Pakistan receiving uninhibited right to utilise water flowing through the western rivers—Indus, Jhelum, and Chenab. India remains bound to allow the free flow of water through these rivers.[iii]
- **Article 4:** Pakistan establishing a system of works in a bid to ensure replacement of water sources for irrigation canals that were previously dependent on the eastern rivers.[iv]
- **Article 5:** India making financial contribution for the purpose of facilitating the aforementioned works to be accomplished by Pakistan.[v]
- **Article 6:** Both parties—Pakistan and India—committing to exchange water flow data of rivers, canals and streams on a regular basis.[vi]
- **Article 8:** Setting up of a permanent Indus Waters Commission in order to help in resolving water disputes between the two parties.[vii]
- **Article 9:** While the procedure for settling water-related issues and disputes is spelled out, resolution may also be sought through the International Court of Arbitration.[viii]

Fig 1

Above: With a gravity dam standing at 133 m (436 ft) tall and two power stations adjacent to one another, the Ratle Hydroelectric Plant is a run-of-the-river hydroelectric power station currently under construction on the Chenab River, downstream of the village near Drabshalla in Kishtwar district of the occupied territory of Jammu and Kashmir. (Photo: Public Domain).

Right: President Ayub Khan and Indian Prime Minister Jawaharlal Nehru sign the historic document, the Indus Waters Treaty (IWT), in Karachi on 19 September 1960. (Photo: World Bank).



million units of electricity per year. It is aimed at diverting the water flowing in the Jhelum River towards an underground powerhouse, ultimately making it flow in the opposite direction into Kashmir.[xii] The Kishanganga (Neelum) River flows through the Neelum Valley located in Azad Kashmir before reaching Gurez—an Indian-occupied region. Therefore, the dam project is geared towards furnishing India with control over a river that flows through Pakistani territory into the Indian-occupied Kashmir before re-entering Pakistan. Pakistan postulates that construction of the hydroelectric power plant on the Neelum River as well as building of the dam is against the 1960 Indus Waters Treaty as it gives Pakistan control of the three western rivers—Indus, Chenab and Jhelum—and India may only use the waters of the rivers thereof in a "non-consumptive" manner.[xiii] Experts interpret it as a permission to construct "run-of-the-river" hydel projects that by no means change the course of the river or deplete the level of water flowing downstream. Islamabad argues that the power project violates both the conditions set forth in the Indus Waters Treaty by changing the course of the river and also diminishing the level of water flowing downstream.

> **"India's capacity to store and release Pakistan's water resources at its will could invariably jeopardize its water supplies in the times of drought or conflict. India has been unlawfully building dams and hydropower projects on the western rivers and their tributaries"**

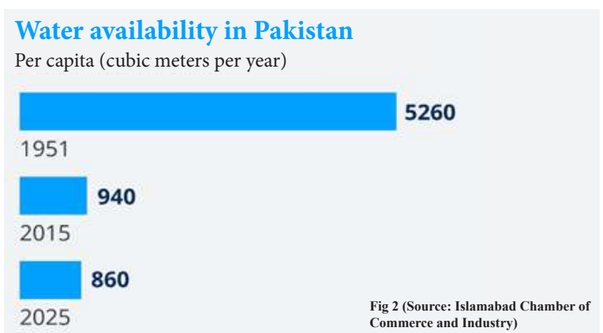


Fig 2 (Source: Islamabad Chamber of Commerce and Industry)

Baglihar Dam Dispute

India erected the Baglihar Dam—part of a hydroelectricity project—on the Chenab River in the Ramban district of Indian Occupied Kashmir. Islamabad has been raising objections to the project since 1999 when India announced changes to the project design; however, the dam was made operational in 2008. India raised the Dam's hydro-electricity output to 450 megawatts. Pakistan claims that the new design allows India to potentially inflict colossal damage on it by storing water from the river during the dry season or in the event of a conflict. It could possibly create conditions of drought or flooding in Pakistan.[xiv] The dispute was ultimately referred to the World Bank, and in 2011 Professor Raymond Lafitte, a neutral expert appointed by the World Bank, announced his final and binding ruling in the case. Interestingly, both the countries hailed the verdict. Although several specifications contested by Pakistan were addressed, the overall design of the dam was left intact. Pakistan believes that the minor changes in design parameters will not make a considerable difference to the initial design.

Implications for Pakistan

The International Monetary Fund (IMF) has reported that Pakistan is one of the most water stressed countries in the world. (Fig 2) The Pakistan Council of Research in Water Resources (PCRWR) has also warned that Pakistan could run out of water by 2025 if efficacious measures are not taken by the government. In this context, water conflict with India poses staggering challenges for the country. Pakistan is worried that the Indian projects would substantially decrease the amount of water for its agricultural, industrial and domestic use. Rendering the matter more intractable is the fact that India's capacity to store and release Pakistan's water resources at will could invariably jeopardize its water supplies in the times of drought or conflict.[xv] India has been unlawfully building dams and hydropower projects on the western rivers and their tributaries. In fact, it has constructed over a dozen dams in Indian Occupied Kashmir on Chenab, Indus and Jhelum rivers, thereby waging a silent war against Pakistan by violating the Indus Waters Treaty. India is trying to use water as a weapon of war, which could potentially cause hunger, death and destruction in Pakistan.[xvi] In the recent past, Indian policymakers unabashedly threatened to revoke the treaty and run Pakistan dry. For instance, in the aftermath of the Uri attack in 2016, India's Ministry of External Affairs Spokesman Vikas Swarup remarked about the Indus Water Treaty, "There are differences on the treaty. For any such treaty to work, it is important there must be mutual trust and cooperation. It can't be a one-sided affair."[xvii] Many observers deemed it as a veiled threat to Pakistan that India may revoke the Treaty. Ultimately, New Delhi did not abrogate, but suspended meetings between the Indus Water Commissioners of the two countries. This demonstrates that Pakistan's concerns stemming from the "water terrorism" being perpetuated by India are real and vital.

Above: Baglihar Dam, also dubbed Baglihar Hydroelectric Power Project, is a run-of-the-river power project on the Chenab River in the Ramban district of Indian occupied Jammu and Kashmir. (Photo: Wikipedia.com)

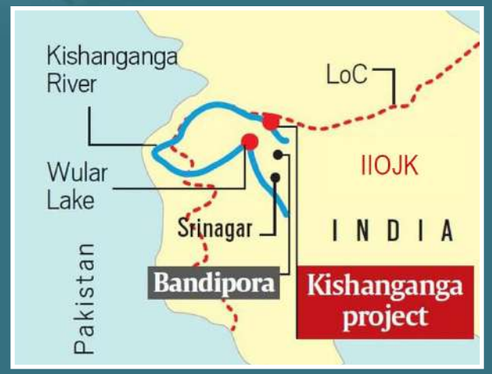
Center: Pakistan and India share the mighty Neelum river, which transcends into Kishanganga in its Indian tributary, passing through the disputed lands of Kashmir. (Photo: strategicfront.org)

Way Forward

It is important that both the countries work together for peace, mutual gains and shared prosperity. In this context, resumption of talks is a prerequisite for working together and advancing negotiations to achieve tangible results. Relations between Pakistan and India have been on a downward trajectory after the Pulwama attack, but the two countries must realize that dialogue is the only way forward. Also, the Indian government must realize that water negotiations could provide the much-needed thaw in relations that could pave the way for opening up of communication channels. This means that meaningful dialogue over the water disputes could create a positive domino effect, translating into Pakistan-India engagement potentially paving the way for resolution of all outstanding issues.

Furthermore, a multilateral regional organization such as SAARC could be utilised to diffuse bilateral tensions and forge cooperation in the area of water management. South Asia is blighted by water scarcity, water pollution and flooding, which have added to tensions in the region. While in the previous SAARC summits member countries have discussed several issues of mutual concern, water management remains a neglected subject. Water disputes in South Asia are interconnected; therefore, a collective solution for resolving these conflicts is needed.

The need for a comprehensive water dialogue between Pakistan and India dovetails with the desire to metamorphose the conflictual relationship between the two countries into constructive engagement. In this regard, the media as well as the civil society can play a pivotal role in creating mutual trust between Islamabad and New Delhi, thereby leading towards larger peace building initiatives. Taking into consideration that India and Pakistan are arch-rivals, having fought three border wars, and the hostile posture of the Modi government towards Pakistan, any suggestion for peace and cooperation is likely to be met by some degree of scepticism. However, it would be in the best interest of both states to transform the zero-sum-mentality underpinning their ties into the one based on engagement and dialogue.



> The need for a comprehensive water dialogue between Pakistan and India dovetails with the desire to metamorphose the conflictual relationship between the two countries into constructive engagement.

Furthermore, it is also pertinent to mention the role of US in the water conflict between India and Pakistan. The close strategic ties between India and the US have exacerbated the India-Pakistan water dispute. During the Cold War era, India remained willing to respect the Indus Waters Treaty and amenable to address Pakistan's concerns. A case in point is Salal Dam, when Pakistan raised objections in the 1970s over its design, India modified it. Another example is of Wullar Barrage/ Tulbul Navigation project, when Pakistan objected to its design, India halted construction activity. However, development of close Indo-US strategic partnership has emboldened New Delhi, which has started violating the IWT with impunity. It is in this context that India is pursuing a number of new projects in stark violation of IWT, such as Ratle, Lower Kalnai and Pakal Dul.[xviii] The US should play the role of a responsible power and deter India from playing the role of a regional bully, antagonizing its neighboring countries.

Lastly, the demand for water is going to increase in Pakistan in the future with its rising population and expanding economic needs – a manifestation of this lies in the severe shortage of water in many parts of the country. Hence, Pakistan also needs to look inwards and take practical and urgent steps to improve its existing water infrastructure. Doing so would have the added advantage of putting Pakistan in a better position to voice its concerns regarding India's hydroelectric power projects that are jeopardizing its water supplies.

Left Page Above: Kishanganga dam diverts water from the Kishanganga River (Neelum River) to a power plant in the Jhelum River basin. Located 5 km (3 mi) north of Bandipore in Jammu and Kashmir, the dam has an installed capacity of 330 MW.

Above: Baglihar Dam was the first power project executed by the Jammu and Kashmir Power Development Corporation, conceived in 1992 and approved in 1996, with construction begun in 1999. The project was estimated to cost US$1 billion.

References

[i]"Neighborhood Tensions: India's Trans-Boundary Water Relations," Global Asia, 2021, https://globalasia.org/v10no1/cover/neighborhood-tensions-indias-trans-boundary-water-relations_ramaswamy-r-iyer

[ii]"The Indus Waters Treaty, 1960," https://www.internationalwaterlaw.org/documents/regionaldocs/IndusWatersTreaty1960.pdf.

[iii]Ibid.

[iv]Ibid.

[v]Ibid.

[vi]Ibid.

[vii]Ibid.

[viii]Ibid.

[ix]Anwar Iqbal, "Positive Attitude Raises Hopes for Resolution of Pakistan-India Water Dispute,", Dawn News, 2021, https://www.dawn.com/news/1350718/positive-attitude-raises-hopes-for-resolution-of-pakistan-india-water-dispute.

[x]Dawn News, No Headway in Talks on Wullar Barrage, 2021, https://www.dawn.com/news/198297/no-headway-in-talks-on-wullar-barrage.

[xi]Ibid.

[xii]Anwar Iqbal, "Explainer: What Is the Kishanganga Water Dispute", Dawn News, 2021, https://www.dawn.com/news/1408795.

[xiii]Ibid.

[xiv]CJ Werleman, "The Human Cost of India's Baglihar Dam In Disputed Kashmir," TRT World, 2020, https://www.trtworld.com/opinion/the-human-cost-of-india-s-baglihar-dam-in-disputed-kashmir-38796.

[xv]Shahid Ahmad, "Water Insecurity: A Threat for Pakistan and India," Atlantic Council, 2012, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/water-insecurity-a-threat-for-pakistan-and-india/.

[xvi]Fateh Ullah Khan, "Silent Water War by India Against Pakistan Violating IWT and Using Water as Weapon Of War," Fatehuk.Blogspot.Com, 2011, http://fatehuk.blogspot.com/2011/05/silent-water-war-by-india-against.html.

[xvii]"India Cannot Unilaterally Revoke or Alter Indus Treaty: Pakistan," The Hindu, 2021, https://www.thehindu.com/news/international/India-cannot-unilaterally-revoke-or-alter-Indus-Treaty-Pakistan/article15474407.ece.

[xviii]The Express Tribune, "India Decides to Go Ahead with Controversial Power Project," 2021, https://tribune.com.pk/story/2280987/india-sidesteps-pakistans-objections-to-build-power-project-on-chenab-river.

All About Ramjets

Past, Present and the Future

"As the speed and range of the jet engine becomes a limiting factor both in the military and civilian domains, advances are being made in air propulsion. The answer comes in the form of one of the most promising air breathing propulsion engines - the Ramjet and all of its derivatives."

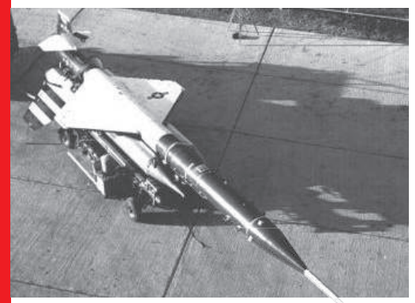
by Bilal Haque

Title Pic: An artist's conception of the SR-72. (Photo: thedrive.com).

Inlet 1: Ukraine's Bliskavka supersonic-cruising air-to-surface missile (ASM). (Photo: quwa.org).

Inlet 2: Meteor- A 'Beyond Visual Range Air-to-Air Missile' system developed by MBDA. (Photo: ukdefencejournal.org.uk).

Left Page: An AQM-60 Kingfisher, the first production ramjet to enter service with the US military. (Photo: Wikipedia.com).



For an idea which predates its younger brother - the jet engine, ramjets are still not widely used in military or civilian aviation. However, ramjets are now extensively used in missilery and artillery and we may see civilian uses of this technology in transport in not too distant future.

The idea of ramjets was conceived in France and Hungary in the early 20th century, however, the first ramjet powered missile was used by the USA in the 1950s.

The first ramjet was introduced by a Soviet engineer I.A. Merkulov in 1940, later on the USA also came up with ramjet powered missile family named 'Gorgon'. Many design concepts appeared in Hungary, France and Britain but none came to fruition. In the 50s the US and UK both tested surface-to-air missiles powered by ramjet engines especially against high flying, high speed bombers of the Soviet Union.

Due to the limits of the laws of aerodynamics, supersonic jet engine flight started to become unfeasible at high supersonic speeds i.e Mach 3. Beyond that speed there were only two options; using a non-air breathing rocket or an air breathing ramjet. However both of these technologies had inherent disadvantages.

As we can see from the figure 1, turbofan engines are effective up to Mach 3, a ramjet can start just short at Mach 2 and go all the way to Mach 5 with decreasing efficiency, whereas the Scram jet can operate between Mach 6 to Mach 10.

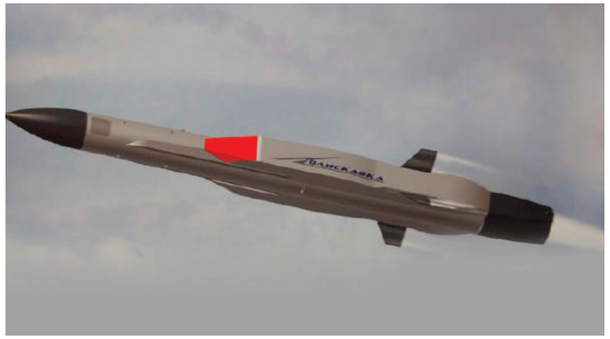
Fast reacting rocket motors, used in air-to-air and air-to-ground missiles, are solid fuel rockets and cannot be switched off after being ignited, they carry their oxidizers on board and do not need air for their burn cycle. Therefore they cannot be throttled, however they can cover the whole speed spectrum from zero to extremely high Mach numbers. Ramjets on the other hand can be throttled as they are air breathing but cannot start from zero due to the fact that they need inlet airspeed to achieve combustion so they have to be piggy-backed on a booster vehicle which can take them to the desired speed to get the correct inlet and combustion air pressure.

All jet and ramjet engines work on the principle of Newton's 3rd law of motion which says 'to every action there is an equal and opposite reaction'. So a hot jet of gas coming out of an engine induces equivalent motion forwards which is called the 'thrust'.

To understand how a ramjet works, first, we need to understand how a jet engine operates (fig 2). A jet engine takes in a jet of air and makes it go through a turbine whose blades compress the air to very high pressures before it gets ignited with fuel and then released through a nozzle to produce thrust which propels the aircraft forward. Jet engines can be powered up from zero speed and can generate higher thrust as more air and fuel is compressed and ignited. And since these engines are 'air breathing', their thrust and therefore fuel ignition can be regulated to control the speed and other parameters of the aircraft flight.

A ramjet also uses thrust to propel the aircraft forward. However it does not use turbines to compress the air like a jet engine, thrust is produced by passing hot gas after combustion through a nozzle (Fig 3). The combustion happens due to the highly compressed air and fuel mixture being ignited inside the ram jet cross section. The nozzle accelerates the flow and therefore produces thrust as a reaction as per Newton's third law of motion. To maintain thrust the combustion must occur at a higher pressure than the pressure at the nozzle exit so as to avoid having an adverse pressure gradient.

In ramjets the forward speed of the aircraft is used to compress the air before it is brought to the combustor. To maintain thrust, the combustion must occur at a higher pressure than the pressure at the nozzle exit. Instead of compressor as in turbojet engine, rammed high pressure air is used in ramjets which reduces the number of moving



parts and makes them simpler in architecture. However, that means that the ramjet powered vehicle needs to be brought to flight and to a certain speed using some other kind of propulsion so as to give air enough pressure to be combusted in the combustion chamber.

However the combustion in the ramjet occurs at subsonic speed, for high supersonic speeds the air needs to be slowed down by the ramjet inlet to be usable, later. However, above Mach 5 the ramjets become inefficient due to the supersonic velocity of the air coming in. Answer to this problem is supersonic combustion ramjet, the Scramjet (Fig 4). The difference between a ramjet and a Scramjet, basically, lies in the speed of air at which combustion takes place. As previously discussed, a ramjet slows down supersonic inlet air speed to achieve combustion, whereas the Scramjet does not need to slow down the air and can achieve combustion with supersonic inlet speeds therefore proving extremely effective at high hypersonic speeds.

That's why we can see ramjets having a launch propulsion system that engages before the ramjet takes over, so as to take the ramjet at a speed at which the inlet air speed is enough for its own combustion to take over. These 'piggy back' propulsion systems are normally jet engines or rocket engines.

In the world of missilery we have the example of ramjet powered missile and a dual pulse rocket motor powered missile as contrasting examples. The dual pulse missile uses two solid fuel rocket motors which are fired at separate times to give the missile enough range, but since they are solid rocket fuelled and not 'air breathing' they cannot be throttled. Therefore it maintains the same rate of combustion during motor firing time, making them easier and cheaper to manufacture. However, during the burn phase it is hard to maneuver the missile due to the rockets forward momentum and after the burn time, its glide time with optimum energy is lower than that of a throttle-able 'air breathing' engine which uses the air as the oxidizer. This means that the 'No Escape Zone' for the dual pulse rocket motor engine would be smaller than that of an air breathing propulsion system such as a ramjet.

Because in ramjets, the speed can be optimized till it gets to the terminal phase of its flight to have enough energy to engage a maneuverable target with a bigger 'No Escape Zone'. The 'No Escape Zone' being the area in which the missile cannot be beaten by the kinetic energy as it has enough energy to target a maneuvering aircraft.

We might see ramjet powered antiramjet missiles in the future, so its' going to be very interesting to see how things move forward on the ramjet missile defense due to high supersonic speeds ramjets get to. The fastest commercial planes we have seen so far have been the Anglo French Concorde and the Russian Tu144. Both could sustain Mach 2 but were commercially unsuccessful. Therefore we still see commercial aircraft speeds at subsonic levels and long flights of up to 15 hours or more. With the existing levels of technology we can still not make supersonic commercial aircraft which will be economically viable. However things are changing rapidly in the military domain, it wasn't long ago when Lockheed's skunk works designed SR-71 was the king of the world in terms of top and sustained speed, believed to be in excess of Mach 3. To go faster, jet engines showed limitations and needed a rocket engine which also had its own inherent limitations.

That's why, today we see the development of the successor of SR-71, the SR-72.

Researchers predict it will reach Mach 6 and if stationed in different parts of the world, will be able to reach any trouble spot for strike in an hour and will be able to circumnavigate the world in 6 hours flat! Try chasing that!

Rumor also has it that it will be powered by a hybrid turbofan/ Scram jet engine with common inlets and nozzles. Apparently the same hybrid engine will be used to power the next generation of hypersonic missiles and hypersonic glide vehicles coming out of USA. However, it won't be long before we can manufacture aircrafts which is not only fast but economically viable in commercial use as well.

It is perceived that such an aircraft would be equipped with the hybrid of jet and ramjet technology that would reduce travel times for circumnavigating the globe to a couple of hours.

As technology improves we can safely say that future of commercial and military air propulsion will be driven by ramjets and scramjets.

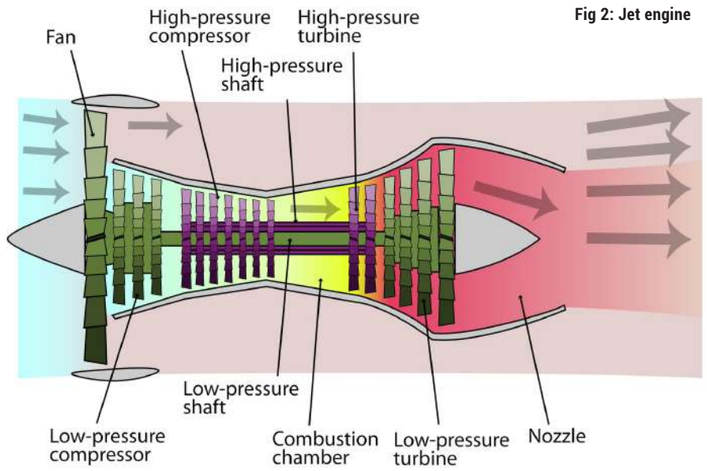


Fig 2: Jet engine

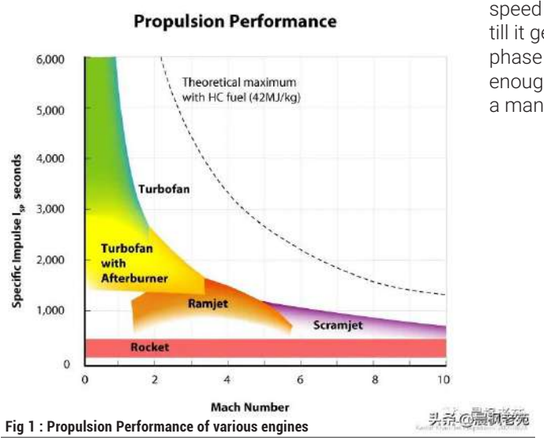


Fig 1 : Propulsion Performance of various engines

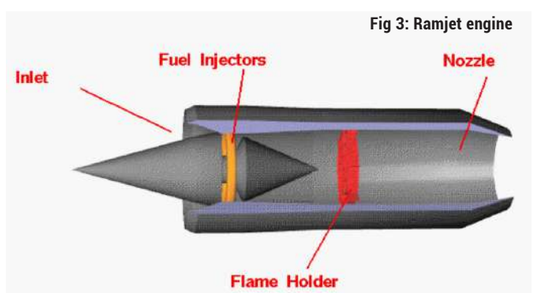


Fig 3: Ramjet engine

The Gorgon 2C was one out of a family of missiles of the U.S. Navy's Bureau of Aeronautics. It was powered by a pulsejet, much like the one used on the famous V-1 German cruise missile of World War II. (Photo: www.si.edu).

> **"Ramjets can be particularly useful in applications requiring a small and simple mechanism for high-speed use, such as missiles. The US, Canada, and UK had widespread ramjet powered missile defenses during the 1960s onward"**

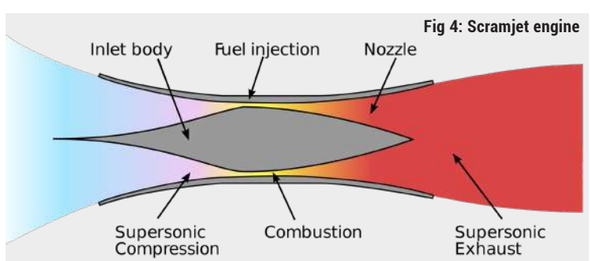


Fig 4: Scramjet engine

Top: A Bloodhound on display at the RAF Museum, Hendon, London. (Photo: wikipedia.org).

Center: In France, the works of René Leduc were notable. Leduc's Model, the Leduc 0.10 was one of the first ramjet-powered aircraft to fly, in 1949. (Photo: wikipedia.org).

DESERT, DUST & DAREDEVILS...

A View from Cholistan

"Deep within the realm of the hot sandy hills and cacti, where civilization avoids commute, there is an enthralling event that captures the eyes and hearts of spectators worldwide; where tempers and adrenaline surge to the highest, tires spit dust and the mighty roars of engines echo far and wide. The writers takes us to a thrilling spectators' cut of the Cholistan Desert Jeep rally where men and women will put everything on the line to reach the finish line."

Talha ul Huda & Sehr Rushmeen

In the sweltering heat of the mighty Cholistan, the howling desert wind blows a little differently today; the 2015 TDCP Desert Jeep rally is about to commence and fear grips the hearts of the participants. Knuckles tight on steering wheels, protective gear damp with sweat, engines rumbling and roaring, the off-roaders await the starting gunshot in front of the 180-kilometer stretch in agitation of what's about to come.

Amidst the apprehensive first timers and even fearful veterans, a Toyota Tacoma stands out; it has a cool flair about it. Inside the cabin of the distinctive red SUV, sits a calm man with the air of someone who has already won. This man isn't different from the others because his 3.5L 2GR V6 engine rumbles differently; this rally participant doesn't care about winning. After winning every desert jeep rally for decades, he stands at the starting line only for the love of the sport itself. As the race begins and adrenaline pumps through his gas pedal, he knows that his beloved desert will never fail him. Nadir Magsi, the Shumacher of Pakistan, is off to win yet another desert rally.

As off-roaders from all across the country struggle to catch up with the Gladiator of Pakistan's Motorsports, an unknown participant emerges out of the dust and levels with the Mighty Magsi. This surprise competition is Sahibzada Sultan Mohammad Ali, a new kid on the block, who will go on to beat the undefeated Mir Nadir Magsi at his own game.

Mir Nadir Magsi and Sahibzada Sultan Mohammad Ali have been thwarting each other on the dirt track since 2015. As the competition now enthralls audiences even more than Magsi's graceful streak, the Cholistan desert rally has grown in its already raging popularity.

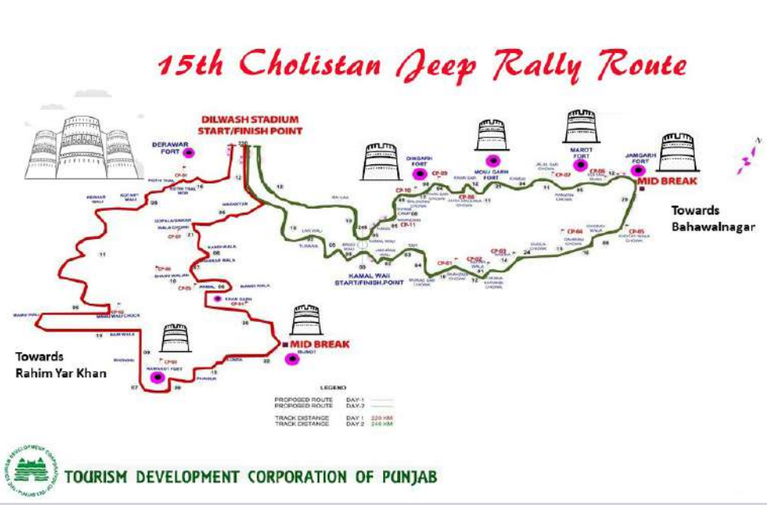
The Cholistan rally is now a globally recognized and followed event. More than 100,000 Adrenaline junkies and extreme motorsports fans from all around the world flock the Cholistan desert to watch their favorite drivers drag through the desert, hundreds of kilometers, tires bursting and engines blowing in the infernal heat, to get to the finish line. Officially commenced in 2005, the Cholistan rally entertains over a hundred participants in five different categories every year, including women. Chaperoned by the Tourism

Top Right Page: King of the Desert Rally – Veteran Nadir Magsi defying the laws of gravity in his loyal Toyota FJ Cruiser. (Photo: Iqbal Ghangla).

Title Page: If everything seems under control, you are not going fast enough. A desert rally driver powers through sand and storms towards the finish line. (Photo: Iqbal Ghangla).

Department of the Punjab Government, the rally stretches over districts of Rahimyar Khan, Bahawalnagar and Bahawalpur. The route was extended to 500 kms in the Cholistan desert and now also includes major forts of the area like Dingarh, Marrot, Khan Garh, Bhijnot, Moujgarh and Jamgarh Fort.

Above: The Surprise Champion- Sahibzada Sultan Ali gears up for battle along with his trusted navigator. (Photo: Sultan Ali).



Cholistan Jeep rally has transcended into a cultural festival of sorts, with Motorsport fans and tourists camping out in tents and caravans for the events. Cholistan transforms into an enthralling battleground during the day and a festival of lights, laughter and music into the night. Traditional Sindhi dances, musical performances and scrumptious food serenades the audiences as they celebrate coming together for a shared love of motorsports alongside their beloved drivers.

The Rally experience isn't fulfilling without the history that surrounds the desert. The forty Bastions of the grand Derawar fort are visible on the horizon of the Cholistan. One of the largest fortresses in Pakistan, the Derawar fort is a unique insight into the history of Southern Punjab and royalty residing in the desert. Near the jeep rally camp, historic marvels like Dingarh, Moujgarh and Marot Forts also astound tourists. Standing in the midst of the desert, foundations and walls eaten away by the sands of time, the ancient forts represent the once-majestic history of the Cholistan. Tourists attending the TDCP rally visit these establishments in the leisure hours, breathe in the history that they stand upon and try to imagine the forts in their prime.

Above: Faisal Khan Shadikhels' monstrous Toyota drifts through the sand in a royal desert rumble. (Photo: Iqbal Ghangla).

Left: Gohar Aslam Sangi drifts his Chevrolet Silverado during Cholistan Desert rally 2021. (Photo: Iqbal Ghangla)

Bottom: A driver drifts through the track, creating the visage of a fierce sandstorm. (Photo: Iqbal Ghangla).

While players of any other dangerous sport might draw daggers at each other, Pakistan's Jeep rally racers are all friends, off the track. The air of

Left: Nadir Magsi, the pioneer of Desert motorsports in Pakistan, poses with his trustworthy Toyota Tacoma. (Photo: Nadir Magsi).

the fierce competition on the rally and warmth of celebration afterwards, showcases true sportsmanship.

In 50 degrees Celcius, gunning at 150Km/h; the eyes of a Jeep rally driver and navigator see the world differently. To gain perspective from inside the daredevils' cabin, we spoke to different participants of the TDCP Jeep rally.

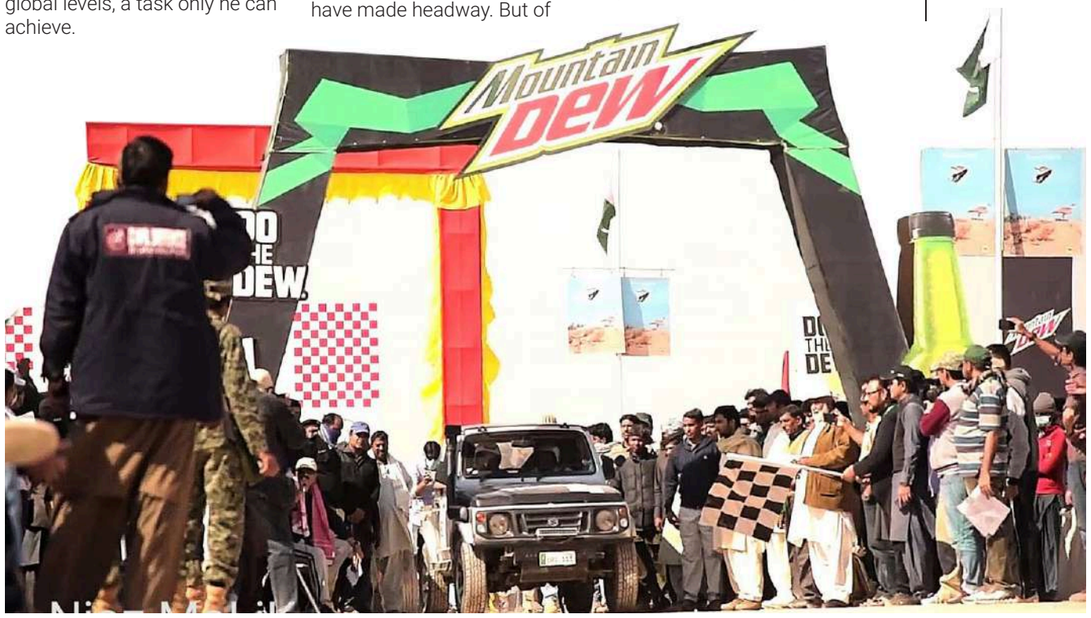
Motorsport enthusiasts associate the sport itself with Mir Nadir Magsi, the pioneer of Jeep Desert rally racing in Pakistan, in the form that it is today. From organizing rallies himself, motivating and mentoring local players to join in, to attracting the interest of international media organizations, there is little to argue with the fact that the sport could not have existed in Pakistan without him. He has won so many rallies that he has probably lost count by now. He is at the pinnacle of the sport where winning or losing doesn't mean anything anymore. He has taken up for himself a much bigger challenge- mentoring and promoting the sport at global levels, a task only he can achieve.

Above: The thrill of the jeep rally comes from loud engines, hot gusts of wind and dunes blown to smithereens. (Photo: Iqbal Ghangla).

Left: Champion through the Ages- Mir Nadir Magsi lifts the trophy for one more time. (Photo: Nadir Magsi).

Bottom: Audiences throng the starting line to cheer on their favorite racers (Photo: Iqbal Ghangla).

Highlighting the importance of promoting the sports at all levels, Nadir Magsi said, "We've made a lot of efforts to establish Desert Rally as a serious sport with several governments and have made headway. But of course, it needs more attention from the public and private sectors". He further added, "Motor Sports has risen from humble beginnings. The first few years were extremely difficult and disappointing. Slowly, the attention of the media turned our way. It made people curious".



The veteran rally driver said that he wishes to cement a better future of the sport "I could retire in a few years, but I want to raise and train a generation that can keep the sport alive and thriving".

Mir Nadir Magsi, who out of sheer passion made a Go-kart out of a generator engine and Triumph gearbox as a child, has continued to dominate the dirt tracks and conquer the desert, year after year, track after track. In the early 2000s, when Nadir Magsi picked up his family's hereditary interest in motorsports, he aimed at his ancestral land Jhal Magsi becoming a pivot for Jeep rallies. Rest assured, the Jhal Magsi Jeep rally is one of the most anticipated Desert jeep rallies in South Asia.

"I would suggest to all racing enthusiasts, Karting is the way to build up a base" the Racing Royal Nadir Magsi tipped. "I practiced a lot on Go-Karts in Florida. I think if you can do Karting, you can become a really good driver. All great drivers built themselves up from Karting".

Sahibzada Sultan Ali, the surprise champion that has given King Magsi a run in his own kingdom, gave an interesting context to the rugged sport. Comparing it to tent-pegging, another internationally recognized Pakistani sport, Sultan Ali said that his first race was the only one that made him anxious "Dreading to forget any last minute checking before starting the race and most importantly making sure the car does not fail you before the finish line. Since I was already in tent-pegging before I joined this rally, the first race for me was the time when I felt a little confused and then the rest is history, all praise to Him".

The top-wheeler shared with us that even though he always thought he had nerves under control, it was not until the introduction of smart watches that he realized his heart beat during the rally goes up as high as 166 per minute, indicating the strength of adrenaline that pumps through a racers' heart at the start of the stretch.

The humble champion credits his rise and success in the Cholistan rally to none other than his greatest competitor, Nadir Magsi. "Despite being my competitor, Mr Magsi has not only taught me everything from scratch, but also helped me even during the rally in terms of assistance required in suspension. Our

CHOLISTAN DESERT RALLY 2020

RANKING	RACER NAME	TIME	PREPARED
1	NADIR MAGSI | NUSRAT ALI	04:28:51	A
2	ASIF FAZAL CH | SAEED TIWANA	04:37:49	A
3	FAISAL SHADIKHEL | ZAFAR SHADIKHEL	04:39:43	A
1	QASIM SAIDHI | HAFIZ REHAN HASSAN	04:51:19	B
2	NAUMAN SARANJAM | ZUBAIR SARWAR	04:53:54	B
3	OWAIS KHAKWANI | SARDAR GHAYOOR KHAN	04:55:33	B
1	GOHAR SANGI | ASAD SHAH	05:15:57	C
2	MAIN RAFIQ AHMED | GHALIB HUSSAIN	05:18:01	C
3	MUKESH KUMAR CHAWLA | HOZAIFA HASHIM	05:20:05	C
1	ZAFAR KHAN BALOUCH | SIRAJ KHAN BALOUCH	05:15:27	D
2	FALAK SHER KHAN | AMEER KHAN	05:22:32	D
3	UMER IQBAL KANJU | AHMED CHANNAR	05:28:39	D

Above: Rally results of Cholistan desert rally 2021. (Photo: Cholistan rally Archives).

Below: The Red Devil- Nadir Magsi's Toyota tears through the track amidst deafening cheers of fans (Photo: Iqbal Ghangla).

Bottom: All in the Middle- the starting point, the finish line and the camping sites, all based inside the circle of the camp. (Photo: INP).

competition was always very close, still we practiced together". This anecdote speaks volumes of the warm atmosphere of humility that hangs over the hot sands of the Cholistan.

Tushna Patel is one of the pioneers of the womens' category in Pakistan's desert rally scene. She has been a part of the rally ever since her husband introduced her to the unique thrill in 2005. A school teacher in her life before the desert engulfed her, Miss Patel says she hasn't been able to go back ever since. Miss Tushna Patel took up the case of starting the women category of the rally, which is now one of the most popular extreme sports events participated in by female players and hailed around the world.

"This sport is not something I feel competitive about but is something very close and personal to me", Miss Patel reminisced. "I have given it my attention for so long that even though internationally the players in this sport are hardcore opponents of each other, I on the other hand felt like I am part of a community that works and plays to lift each other up in the process of learning."

She said that the sense of community within the drivers was a warm factor, one of the many that encouraged her to stay in the circuit. "Players are always there for each other for assistance, guidance and everything you may require to stay on the track", she added while talking to 'Second to None'.

"The type of families the players come from, I feel extremely safe and at home on the track", Miss Patel said, reiterating that women with an interest in thrilling experiences should participate.

One such rising star player of the Desert rally is Maham Sheraz, daughter of rally veteran Sheraz Qureshi, the youngest female player the dirt track has ever seen. Miss Sheraz has given the game a new dimension, one that renders the dangerous sport an open-for-all arena. Speaking to Team Second To None, she said "I was lucky to be blessed with understanding colleagues. I could go for advice

Result: 16th Cholistan Desert Rally (Feb 11-14th 2021)

Position	Racer	Co-racer	Timing
CATEGORY A			
1st	Sahibzada Sultan	Sultan Safdar Ali	03:18:30
2nd	Nadir Magsi	Nusrat Ali	03:22:40
3rd	M.Jaffar Magsi	Imran Magzi	03:24:52
CATEGORY B			
1st	M.Owais Khakwani	Saleh Khakwani	03:36:46
2nd	Numan saranjam	Abdullah Tariqq	03:40:07
3rd	M.Owais Khakwani	Saleh Khakwani	03:43:34
CATEGORY C			
1st	Syed Zaheer Hussain	Major Muneer	03:48:39
2nd	Mehmood Majeed	Farooq Ahmed	03:57:18
3rd	Gohar Aslam Sangi	Asad Ullah Shah	03:58:17
CATEGORY D			
1st	Bewargh Mazari	Shakhal Mazari	03:51:38
2nd	Mian Rafeeq	Galib Soomro	03:52:42
3rd	Umer Iqbal Kanju	Ahmad Channar	03:56:53

Top left: Picturesque for motorsport junkies- Shadikhel SUV conquers the circuit. (Photo: Iqbal Ghangla).

Inlet 1: Unique Achievement: Tushna Patel, the pioneer of women's category in the desert jeep rally. (Photo: Tushna Patel).

Inlet 2: Sahibzada Sultan poses in his battle gear. (Photo: Iqbal Ghangla).

Bottom: The Champion Chariot- Sultan Ali cruising to victory. (Photo: Iqbal Ghangla).

to any of them, especially my father who has been in this sport for years; Ms Tushna, Mr Roni Patel, Mr Nadir and many others were generous enough to mentor me".

She said that the rally is a continuous learning and evolution process and that she's learning by the day. "The sport teaches discipline. I'm highly motivated by the confidence my peers have shown in me. The sport projects a very positive image of Pakistan and I'm proud to be a part of it".

Another brilliant craftsman of the track shed light on how the drivers manage to keep their engines alive in the brutal conditions of the desert. Mr Shabab Haider, who has been on and off the track since the 1980s, said that these rallies are a medium for the youth to push boundaries of self-awareness and to utilize their aggression, "This wouldn't just boost their confidence but will also help them cater to their strength, mental endurance and teach them patience and discipline", he added.

The veteran driver also shared one of the most important constituents of a victory lap: the Navigator. "Without a good navigator, one wrong turn can prove fatal, for the race and for life. "Chemistry is very important between the driver and the navigator. Both complement each other in terms of a strong unbeatable team. If there is any lag between the communications of both, there it spoils the entire concept of the pair sitting together in the car to compete."

He explained the tunnel vision sensation when the race starts: the sensation of cancelling out everything else around and focusing on the steering wheel while scrambling to the finish line before anyone else." It is an in-built love for extreme sports that gets you through the phobias of racing away at high speeds on tough terrains".

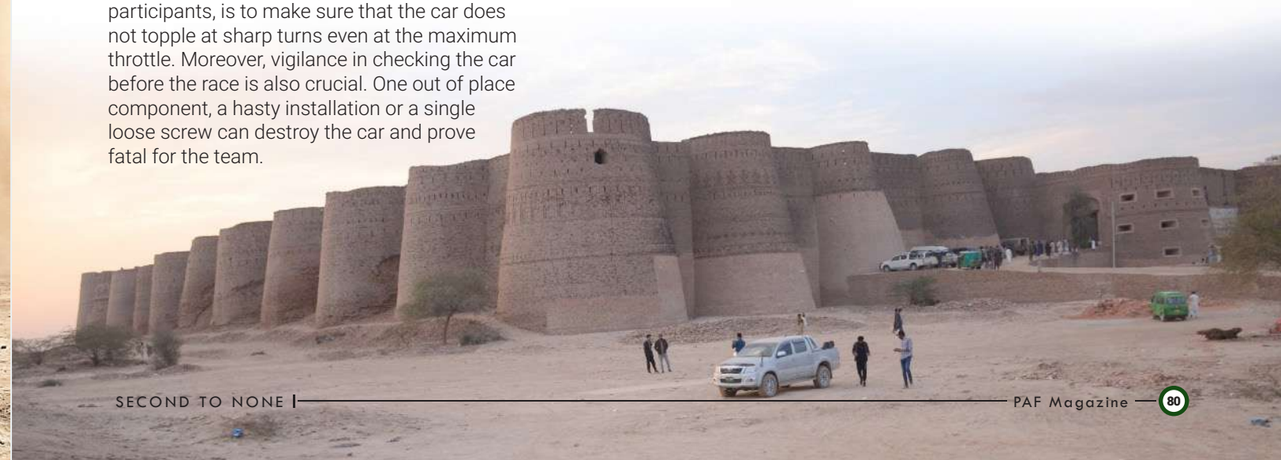
The trick, as explained by the majority of the participants, is to make sure that the car does not topple at sharp turns even at the maximum throttle. Moreover, vigilance in checking the car before the race is also crucial. One out of place component, a hasty installation or a single loose screw can destroy the car and prove fatal for the team.

The way this sport has evolved says a lot about the talent that has come out but also the talent that still exists and needs to be polished to become part of the magnanimous community. The fact that the women's category started just five to seven years ago, indicates the need of clubs in various parts of the country to motivate girls to be able to become a part of this sport and train well under the shadow of prominent women players. There is a need for this sport to be nationally acclaimed in terms of proper coverage and assistance for a larger audience to take part in viewing such an amazing two to three day rally.

Above: Zuhaib Jadoon poses for the camera, moments before taking off into the mirage of the desert. (Photo: Zuhaib Jadoon).

Left: Fearless women rally drivers lifts their coveted trophies. From L to R, Maham Shiraz, Tushna Patel and Salma Marwat (Photo: Tushna Patel).

Bottom: The majestic Derawar fort's Bastions watch over the desert rally routes. (Photo: Tushna Patel).



CAS CALLS ON COMMANDER AZERBAIJAN AIR FORCE

On 12 January 2021, Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force called on Lt Gen Ramiz Tahirov, Commander Azerbijan Air Force. Matters of mutual interest and bilateral cooperation came under discussion.

The Air Chief praised the professionalism of Azerbijan Air Force and assured his counterpart of PAF's full support; especially in the domain of training. Commander Azeribijan Air Force commended the high standards of the PAF training system and acknowledged its support towards training of Azeri Air Force personnel. He also lauded the indigenization efforts undertaken by PAF; especially the JF-17 program. Later in the day, the Air Chief also met with Colonel General Zakir Hasanov, Minister of Defence of Azerbaijan. Matters related to mutual interests were discussed with a consensus to further strengthen the bilateral cooperation. Earlier, the Air Chief also visited the Martyrs' Alley and laid the floral wreath.

CAS CALLS ON SENIOR MILITARY LEADERSHIP OF TURKEY

On 14 January 2021, Chief of the Air Staff, Pakistan Air Force, Air Chief Marshal Mujahid Anwar Khan, who was on a 4-day official visit to Turkey, held meetings with the senior Military leadership of Turkey.

The Air Chief separately called on Minister for National Defence of Turkey Mr. Hulusi AKAR and Chief of the Turkish General Staff General Yaşar GÜLER. During these meetings, the Air Chief reiterated his commitment to enhance cooperation with Turkey in the fields of defence production, security and training by capitalizing on the respective strengths of each side.

Air Chief Marshal Mujahid Anwar Khan also called on Commander Turkish Air Force, General Hasan Küçükakyüz. Both the commanders held detailed discussion on enhancing collaboration and exchanging expertise between the air forces of the two brotherly countries to meet the challenges of the contemporary world. The discussion included PAF's participation in the Anatolian Eagle multinational exercise in Turkey, Turkish Air force participation in various exercises organized by PAF, exchange & training of pilots and cooperation in defence production.

CAS CALLS ON HEAD OF THE PRESIDENCY FOR TURKISH DEFENCE INDUSTRIES

On 16 January, 2021, Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff Pakistan Air Force, called on Head of the Presidency for Turkish Defence Industries, Prof. Dr Ismail Demir.

During his interaction with Prof. Dr Ismail Demir, the Air Chief appreciated the Turkish defence production sector which has made good progress over the last few years. He also reiterated his commitment to enhance cooperation with Turkish defence production by capitalizing on the respective strengths of each side.

Later in the day, the Air Chief also visited Turkish Aerospace Industries (TAI), leading technology firm HAVELSAN and Military Electronic Industries of Turkey (ASELSAN).

PAKISTAN AIR FORCE SKIERS STEAL THE SHOW AT 15th SHAH KHAN ALPINE SKI CUP 2021

On 19 January, 2021, the winter sports season kicked off at the picturesque valley of Naltar with enthusiastic skiers from all over Pakistan arriving at the PAF Ski Resort, Naltar. PAF skiers proved their dominance on the opening day, as they clinched 5 medals in the 15th Shah Khan Alpine Ski Cup, being held in freezing temperatures. In Slalom category, PAF's talented skier Naveed won the gold, while his teammates Ishtiaq and Ashfaq earned silver and bronze medals respectively. PAF skiers also showed their class in the Giant Slalom category races as well. Both Gold and silver medals in the category were won by Ishtiaq and Ashfaq from PAF team, whereas Swat's Ahsan claimed the bronze medal. Around 100 national skiers from all over the country participated in the much awaited winter sports, which are conducted each year in the magnificent Naltar ski resort under the auspices of PAF and Winter Sports Federation of Pakistan. Teams of PAF, Pak Army, GB Scouts, Swat, Punjab, Balochistan, Sindh, Islamabad, Azad Jammu & Kashmir, Higher Education Commission, Civil Aviation Authority and Alpine Club participated in various events like Alpine Skiing, Snow Boarding, Ice Hockey and Ice Skating. Pakistan Air Force and Winter Sports Federation of Pakistan jointly arrange these events each year in a bid to promote winter sports in the country and sports tourism in snowy mountains of Gilgit Baltistan and Khyber Pakhtunkhwa.

Around 100 national skiers from all over the country are participating in the much awaited winter sports, which are conducted each year in the magnificent Naltar ski resort under the auspices of PAF and Winter Sports Federation of Pakistan.

AIR CHIEF CALLS ON COMMANDER QATAR EMIRI AIR FORCE

On 20 January 2021, Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force called on Major General Salim Hamed Eqail Al-Nabet, Commander Qatar Emiri Air Force at Al-Udaid Air Base. On his arrival at the base, the Air Chief was received by Commander Qatar Emiri Air Force, where a smartly turned out contingent of QEAF presented him the Guard of Honour. During the meeting, various matters pertaining to bilateral interest came under discussion.

Commander Qatar Emiri Air Force acknowledged the support of PAF towards training of QEAF personnel. He also praised the successful progress of JF-17 program. Air Chief Marshal Mujahid Anwar Khan commended the remarkable operational preparedness of Qatar Emiri Air Force and assured his counterpart of PAF's full support; especially in the domain of training. Both the commanders agreed to further reinforce bilateral cooperation.

GILGIT BALTISTAN SCOUTS LIFTS CJCSC ALPINE SKI CUP AT NALTAR

Waqar Junior's outstanding run in both Slalom and Giant Slalom events helped Gilgit Baltistan Scouts lift the Chairman Joint Chiefs of Staff Committee Alpine Ski Cup at PAF Ski Resort, Naltar on 21 January, 2021. He was in supreme form in both Slalom and Giant Slalom races, and clinched gold and a silver medal in both categories. In the Slalom category, former Olympian Mohammad Abbas from Pakistan Air Force had a fabulous day on the slope and earned the Gold medal in the category. The silver medal in Slalom was won by GB Scouts's Waqar Junior, while Noor Muhammad from Pak Army claimed the Bronze medal. The Giant Slalom category was dominated by the Skiers of GB Scout as besides Waqar Junior's Gold, the Silver and Bronze Medals were also won by his teammates Sajjad Ahmad and Waqas Azam respectively.

Azad Jammu & Kashmir, Higher Education Commission, Civil Aviation Authority and Alpine Club participated in the event.

LOCAL SENSATION MUHAMMAD KARIM BAGS GOLD MEDAL IN SLALOM CATEGORY OF 28TH NATIONAL SKI CHAMPIONSHIP

On 22 January, 2021, Pakistan's two time winter Olympian Mohammad Karim clinched the gold medal in Slalom category on the first day of 28th National Ski Championship at PAF Ski Resort, Naltar. He was in supreme form in both runs of the category leaving behind his rivals with huge margin. The Silver and Bronze medal were won by Mir Nawaz and Zahid Abbas of Gilgit Baltistan Scouts. Meanwhile, the 4th Snowboarding Cup was convincingly won by Gilgit Baltistan Ski Association as all medals in the event were clinched by athletes of Gilgit Baltistan Ski Association. Ahmad Waqeel's remarkable performance earned him the gold medal while Hussain Kahlid and Muhammad Rehman won the Silver and Bronze medals respectively.

GILGIT BALTISTAN SCOUTS CLINCH 28TH NATIONAL ALPINE SKI CHAMPIONSHIP

On 23 January, 2021, Gilgit Baltistan Scouts clinched the 28th National Alpine Ski Championship in the ongoing winter sports events held at PAF Ski Resort, Naltar, Pakistan's two time winter Olympian Mohammad Karim of Pakistan Air Force won gold medals in both Slalom and Giant Slalom categories, but could not secure the coveted trophy for his team as remaining four medals were claimed by the skiers of Gilgit Baltistan Scouts. Mir Nawaz of Gilgit Baltistan Scouts got silver medal in both categories while his teammates Zahid Abbas earned Bronze medal in Slalom and Waqar Junior in Giant Slalom category.

Meanwhile, Gilgit Baltistan Ski Association won the Ice Speed Skating Championship. The Gold and Silver medals were won by Israr Ahamd and Basharat of Gilgit Baltistan Ski Association, earning them the championship trophy, while the Bronze medal was claimed by Zia-ur-Rehman of Gilgit Baltistan Scouts. Another exciting event of the season was the final of 3rd Ice Hockey Championship. The final was played between Gilgit Baltistan Scouts and Gilgit Baltistan Ski Association. It was easy sailing for the team of Gilgit Baltistan Ski Association as they scored seven goals while their rivals could score only one goal. Teams of PAF, Pak Army, GB Scouts, Punjab, Sindh, Civil Aviation Authority and GB Ski Association participated in the event.

JORDANIAN CHAIRMAN JOINT CHIEF OF STAFF CALLS ON AIR CHIEF AT AIR HEADQUARTERS

On 28 January, 2021, Major General Yousef Ahmad Al Hnaity, Chairman Joint Chief of Staff Jordan Armed Forces, called on Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force at Air Headquarters, Islamabad. Both the Commanders discussed various matters pertaining to bilateral cooperation and mutual interest. Chairman Joint Chief of Jordan Armed Forces lauded the professionalism of PAF personnel and expressed his desire to learn from its experience. The Air Chief offered all-out support to the brotherly country in the field of aviation and training. Both the dignitaries agreed to further cement the existing cordial relations between the two air forces.

Earlier, on his arrival at Air Headquarters, the distinguished guest was received by Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force. A smartly turned out contingent of the Pakistan Air Force presented him the Guard of Honour.

GRADUATION CEREMONY HELD AT PAF ACADEMY, ASGHAR KHAN

On 2 February, 2021, the graduation ceremony of 144th GD (P), 90th Engineering Course and 100th AD courses was held at PAF Academy, Asghar Khan.

While addressing at the occasion, Chief Guest said "Pakistan is a peace-loving country that has rendered great sacrifices in its quest for regional and global peace. We stand firmly committed to the ideal of mutual respect and peaceful co-existence. However, we would not allow anybody or any entity to misinterpret our desire for peace as a sign of weakness. We are fully aware of the atrocities being committed to the innocent people of occupied Kashmir who have been held hostage against their free will and in violation of the Resolutions of United Nations. We will continue to extend moral and diplomatic support for their just and indigenous struggle for freedom." He further said that "Armed Forces of Pakistan are fully capable and prepared to thwart any type of threat, be it internal or external. The immaculate coordination and harmony displayed by all the three services in operations against the anti-state elements has brought great improvement in the internal security environment. Let me commend the critical role played by Pakistan Air Force in annihilating the sanctuaries of the terrorists in rugged border areas. The outstanding courage and professional excellence displayed by brave air warriors of Pakistan Air Force during Operations Swift Retort is a manifestation of Quaid's vision of an Air Force second to none. The whole nation is proud of its Air Force and I earnestly hope that PAF will scale further heights of glory and excellence in the years to come." He said that "I am highly pleased to see the cadets of our brotherly country Kingdom of Saudi Arabia at PAF Academy Asghar Khan. Their presence at this premier PAF training institution is a manifestation of warm fraternal ties between Islamic Republic of Pakistan, Kingdom of Saudi Arabia and our Defence Forces indeed, we are proud of the strong bonds of Islam, brotherhood and cultural communion that bind us together.

IRAQI DEFENCE MINISTER VISITS AIR HEADQUARTERS

On 26 February, 2021, Minister of Defence Iraq, Mr Juma Enad Sadoon Al Jibori, visited Air Headquarters Islamabad. On his arrival, the distinguished guest was received by Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force. A smartly turned out contingent of Pakistan Air Force presented the Guard of Honour. Later on, he called on Air Chief Marshal Mujahid Anwar Khan in his office. The visiting guest paid homage to the martyrs of PAF by laying floral wreath on Martyrs' Monument. Both the dignitaries discussed matters of professional and mutual interest.

Defence Minister of Iraq expressed his satisfaction on the level of brotherly relations and bilateral cooperation between the two countries. He praised the exceptional progress made by PAF over the years, especially in the field of indigenization. Air Chief said that both Pakistan and Iraq enjoyed cordial and brotherly relations and reiterated his resolve to further enhance security and defence cooperation.

IF OUR SOVEREIGNTY IS CHALLENGED, OUR RESPONSE WOULD ALWAYS BE SWIFT AND RESOLUTE: AIR CHIEF

"We want to live in peace but if our sovereignty is challenged, our response would always be Swift and Resolute as it was on 27 February, 2019" said the Air Chief while addressing a ceremony held at Air Headquarters, Islamabad on 27 February, 2021 to commemorate the second anniversary of PAF's resounding victory in "Operation Swift Retort". Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force was the chief guest at the occasion.

Addressing the audience, the Air Chief further said, "PAF maintained its Operational Readiness to deter aggression, despite the challenges of COVID-19 Pandemic. He further said, "Pakistan is confronted with varied challenges including a Hybrid War, which demands our enhanced commitment and vigilance. PAF endeavours to augment its capability in all spectrums of operations while pursuing modernization through indigenous efforts."

Former Air Chiefs and a large number of PAF officials witnessed the ceremony. Earlier, a smartly turned out contingent of Pakistan Air Force presented the Guard of Honour. Another important event of the ceremony was a spectacular flypast by two formations of PAF fighter aircraft including F-16, JF-17, F-7 and Mirage. The ceremony was rounded off with soulful performance by the young students of Fazaia School and College.

PAF SAILING TEAM CLINCHES NATIONAL JUNIOR U-25 SAILING CHAMPIONSHIP 2021

On 1 March, 2021, PAF sailing team maintained their supremacy in the National Junior U 25 Sailing Championship 2021 by winning all three Gold Medals at open sea near Clifton beach Karachi. PAF won 8 out of a total 9 medals and made history. On the final day of the Championships held in open sea near Clifton beach Karachi, PAF Sailors were unopposed and comfortably won all medals in Laser Standard, 470 Class and Windsurfing RSX Class championships.

In the Laser Standard category Mr. Awais of PAF maintained his domination throughout the Championship. After a very tough competition Mr. Hamza of Navy managed to get second position followed by Mr. Augustin of PAF.

In 470 Class category, all Gold, Silver and Bronze medals were clinched by PAF. Mr. Azeem & Mubashir Ali won Gold medals, Zain Bin Yameen & Muhammad Abdullah got Silver and Daniyal Tanveer and Imran of PAF were awarded Bronze medals respectively.

In Windsurfing RSX Class category, PAF also dominated by getting all three medals. Sami Ullah was awarded Gold medal, Naveed Iqbal won Silver and Muhammad Suleman got Bronze medal.

AIR CHIEF CALLS ON COMMANDER SLAF

On 05 March, 2021, Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force visited Sri Lanka Air Force Headquarters. A smartly turned out contingent of Sri Lanka Air Force presented him the Guard of Honour.

Air Chief also called on Air Marshal Sudarshana Karagoda Pathirana, Commander Sri Lanka Air Force. Bilateral matters pertaining to mutual professional interest came under discussion during the meeting. Air Chief said that it was a moment of pride for PAF that Commander SLAF was trained in Pakistan. He further added that our armed forces in general and Air Forces in particular, have strong ties of friendship. The Sri Lankan Air Chief thanked Air Chief Marshal Mujahid Anwar Khan for sincere offer of cooperation and agreed to explore new avenues to enhance bilateral professional cooperation.

The Air Chief also attended SLAF's 70th anniversary Parade as Guest of Honour at SLAF Base, Katunayke. The Air Chief extended his felicitations to Sri Lankan Force on completing 70 years of glorious service to the nation. He also congratulated No 5 Fighter Squadron and No 6 Helicopter Squadron of the SLAF on award of President's Colours.

Later in the day, The Air Chief attended launching ceremony of a book titled Iron Wings of Glory. President of Sri Lanka H.E Gotabaya Rajapaksa presented a copy of the book to Air Chief Marshal Mujahid Anwar Khan. The book relates to the evolution of Air Power in the context of SLAF in Indian Ocean Region and achievements of SLAF during the fight against terrorists. The Air Chief interacted with several senior civil and military dignitaries at the occasion, as well.

PRESIDENT DR ARIF ALVI INAUGURATES PAF AIR WAR COLLEGE INSTITUTE AT KARACHI

On 11 March, 2021, President Islamic Republic of Pakistan, Dr Arif Alvi inaugurated the PAF Air War College Institute at Karachi. On his arrival, he was received by Air Marshal Amir Masood, Deputy Chief of the Air Staff (Training), Pakistan Air Force.

Addressing at the occasion, the chief guest appreciated the relentless efforts of the team, who completed the project in record time, as per the standards of Higher Education Commission (HEC). He said that Pakistan is a peaceful country and the world has witnessed that we returned the Indian Pilot without any pressure. Lauding the PAF professionalism the Chief Guest said that the entire world has seen the professional competency of PAF after 27th Feb, 2019. The chief guest also visited various facilities of the Institute and interacted with the faculty and members.

Earlier, Air Marshal Amir Masood, Deputy Chief of the Air Staff (Training), Pakistan Air Force while expressing his views said that education and training has remained the hallmark of PAF ever since its inception. He further said that as a progressive organization, PAF embraced the latest global trends in quality education, embedded the educational theory and practice with state of the art technology, infused education with critical thinking and opened the platform nationwide.

During each course the members of PAF Air War College Institute are exposed to over a hundred subject matter experts including: Civil & Military Professionals, Diplomats, Scholars / Academicians, Lawyers, Industrialists, Scientists, Economists and Media Personnel. Additionally, exclusive interaction with foreign faculty and strategists is ensured to provide depth and academic rigor to the course. Seminars are also regularly conducted to promote inter-services operational harmony and jointness.

"TODAY'S WARFARE SUCCESSFUL ACCOMPLISHMENT DEPENDS ON EFFECTIVE VISION AND FUSION": AIR CHIEF

"Today's warfare successful accomplishment depends on effective vision and fusion", said the Air Chief while addressing the graduation ceremony of No 54 Combat Commanders' Course held at Airpower Centre of Excellence (ACE) on 13 March, 2021. Air Chief Marshal Mujahid Anwar Khan, Chief of the Air Staff, Pakistan Air Force was the Chief Guest on the occasion.

Speaking at the occasion, the Air Chief said, "The lessons of Operation Swift Retort are a manifestation of our operational training in realistic scenarios. You have to be cognizant and be aware of our adversaries, what they are inducting." He further expressed his satisfaction that ACE in general and Combat Commanders' School in particular are taking strides in this very direction to train future combat leadership.

The Air Chief also awarded certificates and trophies to the graduating officers who underwent a strenuous and professionally demanding course. The Chief of the Air Staff Trophy for overall best performance amongst combat pilots was awarded to Wing Commander Waheed Zafar, while Air Officer Commanding Air Defence Trophy for overall best performance amongst combat controllers was awarded to Squadron Leader Ali Ahmed. The ceremony was attended by Principal Staff Officers and field commanders of Pakistan Air Force.

EXERCISE "ACES MEET 2021-1" STARTS

Multi-National air exercise "ACES Meet 2021-1" started at an Operational Air Base of Pakistan Air Force on 29 March, 2021. Pakistan Air Force, Royal Saudi Air Force and United States Air Force are actively participating in the exercise, while Bahrain, Egypt and Jordanian air forces are invited as observers. Air Vice Marshal Waqas Ahmed Sulehri, Deputy Chief of Air Staff (Operations), PAF was the chief guest at the opening ceremony of the exercise.

Addressing the exercise participants he said, "International exercises are new neither for the participants nor for the Airpower Center of Excellence. However, this particular cycle of ACES Meet is unique because participating air forces bring along a vast experience of combat operations, whether in counterterrorism or composite flying domains. Therefore, this platform must be fully utilized to share the invaluable experiences for mutual benefits. "

Defence Attaches of Jordan & Kingdom of Saudi Arabia and Air Attaché of United States of America also attended the ceremony.

COMMANDER STRATEGIC COMMAND, UK CALLS ON CAS PAF

On 26 March, 2021, General Sir Patrick Nicholas Yardley Monrad Sanders, Commander Strategic Command, UK, visited Air Headquarters Islamabad. On his arrival, the distinguished guest was received by Air Chief Marshal Zaheer Ahmed Baber Sidhu, Chief of the Air Staff, Pakistan Air Force. A smartly turned out contingent of Pakistan Air Force presented the Guard of Honour.

Later on, he called on Air Chief Marshal Zaheer Ahmed Baber Sidhu in his office. The visiting guest paid homage to the martyrs of PAF by laying floral wreath on Martyrs' Monument. Both the dignitaries discussed matters of professional and mutual interest.

Commander Strategic Command, UK expressed his satisfaction on the level of relations and bilateral cooperation between the two countries. He praised the exceptional progress made by PAF over the years, especially in the field of indigenization. Air Chief highlighted that both the countries enjoy cordial relations and reiterated his resolve to further enhance the existing bilateral cooperation between the two countries.

Denmark F-35 Lightning II production aircraft takes inaugural flight

airforce-technology.com (Last Updated March 11th, 2021)

Denmark flew its first F-35 Lightning II production aircraft 'L-001' becoming the fifth European Nato nation to be armed with the F-35 fighter jet alongside the UK, the Netherlands, Norway and Italy.

Denmark flew its first F-35 Lightning II production aircraft 'L-001' becoming the fifth European Nato nation to be armed with the F-35 fighter jet alongside the UK, the Netherlands, Norway and Italy.

The F-35 Lightning II joint strike fighter (JSF) is a stealth, supersonic multirole fighter jet. It has been developed by Lockheed Martin Aeronautics Company for the US airforce, navy and marine corps, as well as programme partners from Nato and US allies.

According to Lockheed Martin, the F-35 is 'spearheading' Nato's airpower, and ensuring 'strategic integration of allied combat airpower'.

The interoperability of the fifth-generation F-35 'binds' 13 allies and other US partners in air dominance and allows critical joint capabilities.

Lockheed Martin noted that the F-35 will act as a 'force multiplier' for Denmark.

This allows the Royal Danish Air Force (RDAF) to train and fight alongside Nato allies while creating a strong 'deterrent'.

F-35 acting vice-president and general manager Bill Brotherton said: "Achieving the first flight of Denmark's first F-35 is major milestone for the Denmark F-35 programme and a testament to the outstanding abilities of our dedicated and highly trained joint industry and government team.

"This team's focus on delivering the most effective, survivable and connected fighter in the world will ensure the sovereign protection of Denmark and strengthen allies and partners through the Nato F-35 coalition."

Boeing F-15SG Strike Eagle - serial 8328 (c/n 1438, line number SG23) - shows off its recently applied special tail during a sortie in February 2021. The black tail proudly celebrates ten years of Singaporean F-15SG operations, displaying artwork of an eagle (bird) and the nation's national flag on its vertical stabiliser. Hans Jacobs

The Republic of Singapore Air Force (RSAF) has marked a decade of Boeing F-15SG Strike Eagle operations by applying a special tail scheme to one of its aircraft.

By Hans Jacobs

Operated by the RSAF's 149 Squadron, F-15SG Strike Eagle - serial 8328 (c/n 1438, line number SG23) - has had its tail adorned with special commemorative art to celebrate ten years of the multi-role fighter's operation with the air arm. This recently decorated F-15SG was flown at sunset from Paya Lebar Air Base, Singapore, on February 2.

The first F-15SG for the RSAF rolled out of Boeing's production facility in St Louis, Missouri, in November 2008. The initial aircraft were delivered to Mountain Home Air Force Base (AFB), Idaho, in May 2009. The US Air Force's (USAF's) 428th Fighter Squadron - which is also based at Mountain Home AFB - provides F-15SG training for the Singaporean pilots. The first five examples to arrive in Singapore landed at Paya Lebar on April 5, 2010, with 149 Squadron being Singapore's first operational unit. At present, Singapore maintains a fleet of 40 F-15SGs.

10 March 2021 (Last Updated March 11th, 2021 09:48)

Collins wins IDIQ contract for USAF's Fast-Jet reconnaissance pod

Raytheon Technologies unit Collins Aerospace has received an indefinite-delivery, indefinite-quantity (IDIQ) modification contract.

Raytheon Technologies unit Collins Aerospace has received an indefinite-delivery, indefinite-quantity (IDIQ) modification contract.

The contract has been awarded by the US Air Force (USAF) for its new Fast-Jet reconnaissance pod, dubbed 'MS-110 Multispectral Airborne Reconnaissance system'.

According to Collins Aerospace, the newer MS-110 sensor is an advancement in airborne reconnaissance capability.

It provides next-generation capabilities that are claimed to be 'unmatched' by targeting pods or sensors equipped inside the aircraft body.

These capabilities include achieving high-resolution imagery at long / stand-off range in scenarios such as peacetime cross-border surveillance or high-threat wartime.

The MS-110 sensor also provides advanced multispectral imagery to detect targets with a higher degree of confidence or even in poor weather conditions.

Other capabilities include wide-area coverage in high resolution, flexible planning / re-tasking for real-time changes in dynamic operational situations by aircrew.

Furthermore, the sensor comes with SCi-Toolset, a software suite that helps end-users extract critical intelligence from the MS-110's imagery.

intelligent-aerospace.com

By Shweta Sharma
Tuesday 08 December 2020

Chuck Yeager, the pilot who broke speed of sound, dies

File image: Charles E. "Chuck" Yeager in the cockpit of an F-15 fighter aircraft at US air force base in California

(USAF/AFP via Getty Images)

Aviation pioneer Chuck Yeager, who became the first man to break the sound barrier, has died at the age of 97. Yeager's wife, Victoria Yeager broke the news on Twitter: "It is [with] profound sorrow, I must tell you that my life love General Chuck Yeager passed just before 9 pm ET," she said in a tweet from his official Twitter handle. "An incredible life well lived, America's greatest pilot, and a legacy of strength, adventure, and patriotism will be remembered forever." Yeager was born in West Virginia in 1923 and inducted in the US Army Air Corps in September 1941. He flew for more than 60 years in his career. The Second World War pilot shot down 13 German fighter aircraft and flew 127 combat missions during the war in Vietnam.

The US Air Force gets its first F-15EX

By: Valerie Insinna

The U.S. Air Force took delivery of the first F-15EX from Boeing and will soon begin testing the new jet, the service said Thursday. The Air Force signed off on the acceptance of the first F-15EX at the company's St. Louis facility, the service said in a news release. A photo from Boeing shows the aircraft en route to Eglin Air Force Base in Florida. "This is a big moment for the Air Force," said Col. Sean Dorey, the Air Force's F-15EX program manager. "With its large weapons capacity, digital backbone, and open architecture, the F-15EX will be a key element of our tactical fighter fleet and complement fifth-generation assets. In addition, it's capable of carrying hypersonic weapons, giving it a niche role in future near-peer conflicts." The newest "EX" version of the venerable F-15 comes with advanced avionics such as the Eagle Passive/ Active Warning and Survivability System electronic warfare system, a digital cockpit, the more advanced ADCP-II mission computer from Honeywell, and fly-by- wire flight controls. Boeing's delivery of the F-15EX comes little more than a month after the inaugural flight of the jet on Feb. 2. A second aircraft is due to arrive at Eglin next month, and the remaining six aircraft in the first lot will fly to Eglin in fiscal year 2023 for operational testing.

Top : The first F-15EX departs a Boeing facility in St. Louis, Mo., en route to Eglin Air Force Base, Fla. (Boeing)

US Air Force looks at 'cognitive electronic warfare' for F-15

By Garrett Reim 16 March 2021

The US Air Force (USAF) is researching adding "cognitive electronic warfare" capabilities to the Boeing F-15 fighter.

BAE Systems provides the electronic warfare and countermeasures system, the Passive Active Warning and Survivability System (EPAWSS), for the F-15, including the latest "EX" variant.

Aircraft currently rely on a database of known electronic emissions from adversaries to identify and then counter threats. For example, identifying a surface-to-air missile battery's radar frequency and then using already-developed electronic warfare tactics to jam or interfere with it.

However, as adversaries' radar systems become more sophisticated they are able to track US aircraft with novel signals that are not in the US library of electronic emissions. Gathering information on these new signals and then developing countermeasures takes time, leaving aircraft vulnerable in the meanwhile.

Cognitive electronic warfare aims to use artificial intelligence and machine learning to quickly and automatically identify new signals. In the future, an aircraft's onboard computer might even be able to rapidly come up with a countermeasure.

The extent to which the USAF wants to automate the collection of electronic intelligence and countermeasures is not detailed. However, the service says it wants "algorithms and technologies that provide the capability for [electronic warfare] systems to more rapidly and intelligently respond to emitter ambiguities, emerging threats, in both sparse and dense signal environments".

Saudi Air Force jets arrive in Greece for joint drill

By Magda Panoutsopoulou

To help both sides train in complex air operations, 2 countries will do joint exercise around Crete, says Greek military

As part of military cooperation between Greece and Saudi Arabia, six Royal Saudi Air Force F-15s arrived on the Greek island of Crete this weekend, said a Hellenic National Defense General Staff statement on Sunday.

A joint exercise between Greece and Saudi Arabia this month from Crete's Souda Air Force Base aims for both sides to train in complex air operations such as achieving air superiority/supremacy as well as protection and attack on land and sea targets, according to the statement.

This is the first visit to Greece by the 115th Battalion of the Saudi Royal Air Force.

In the Eastern Mediterranean exercise, Greece and Saudi Arabia will work for peace and stability in the region, said Hellenic Chief of General Staff Gen. Konstantinos Floros on Twitter.

The Saudi personnel were welcomed by Saudi Ambassador to Greece Saad bin Abdulrahman Al-Ammar and other officials.

"The particularly important presence of the Saudi Armed Forces in Souda is added to, among others, those of the United Arab Emirates, France, the USA and [Greek] Cyprus and highlights the important role of Crete in consolidating security and stability in the wider region of the Central and Eastern Mediterranean as well as the Middle East," the statement said.

Italy showcases new multirole mission for Eurofighters

by Gareth Jennings

In a message posted on its official Twitter account on 20 February 2021, the AMI showed a Eurofighter from 36 Stormo (Wing) laden with a mix of air-to-air and air-to-surface weaponry. This loadout comprised a pair of IRIS-T short-range and four AIM-120 AMRAAM air-to-air missiles in the air-to-air role, as well as two Paveway II precision-guided bombs and a Litening targeting pod for the air-to-surface role.

"A multirole aircraft with loads for swing-role missions. In this configuration, the aircraft can perform various roles in the same mission," the AMI said.

While the Eurofighter has been a multirole platform with other operators for many years already, it has been used until very recently by the AMI exclusively in the air-to-air role. This policy was spelled out to Janes during the debut deployment of the AMI's Eurofighters to the 'Red Flag' exercise in early 2016, during which a senior service official noted the 'political' nature of aircraft roles in Italy, saying at that time that if all aircraft could perform all roles, politicians might question the need to maintain different fleets.

Colonel Marco Bertoli, the detachment commander for Red Flag 16-02, told Janes

Belgium, Luxembourg receive third A400M

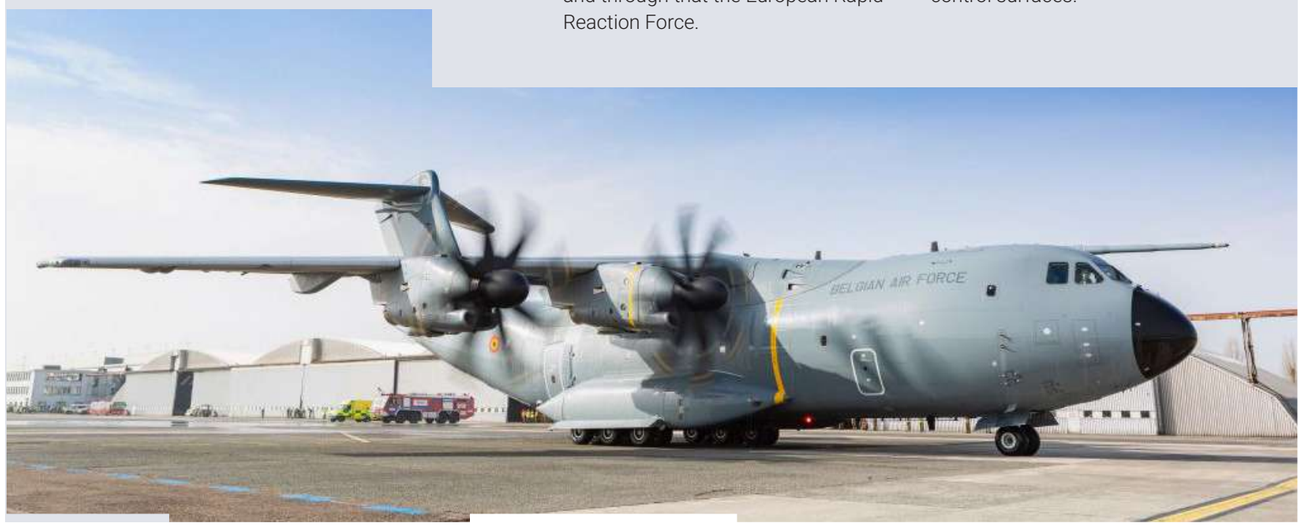
by Gareth Jennings

Aircraft CT-03 arrived at Melsbroek, the military area of Brussels airport, on 4 March. The Belgian Air Component (BAC) will operate a total of seven A400Ms, including one purchased by Luxembourg. The BAC's 15th Air Transport Wing will field the fleet under the auspices of the joint Belgian-Luxembourg Bi-National Unit (BNU). These aircraft will be made available to the European Air Transport Command and through that the European Rapid Reaction Force.

As previously reported by Janes, the remaining six A400Ms will be delivered to the BAC by 2023, with full operating capability for the BNU slated for the end of 2024.

Besides receiving seven aircraft of its own, Belgium is also an industrial contributor to the A400M programme, responsible for manufacturing detailed machined wing elements and flight-control surfaces.

Belgium has received into service its second Airbus Defence and Space (DS) A400M Atlas transport aircraft, bringing the number it now operates as a joint unit with Luxembourg to three.



"THE POLO LOUNGE IS LIKE A FINE OLD MINK COAT: OPULENT, DIGNIFIED AND WARM."

BRYAN MILLER.

Report by Falak Sher Khan.

Polo is considered the sport of kings. It has become a spectator sport for equestrians and society. With the world's best brands sponsoring the game, polo is more of a lifestyle than a game. An amazing event was held in Rawalpindi Polo Club by Murree Brewery. Marking its 117th year, the M.P. Bhandara Memorial Polo Cup took off with a remarkable crowd and much enthusiasm. Ambassador of Sweden, H.E. Henrick Persson Chief Guest of the event was received by Chief Executive of Murree Brewery Mr. Isphanyar Bhandra on this spectacular event. He admired Murree brewery for sponsoring and promoting such an elegant game and appreciated each team's enthusiasm. Eight teams participated in the event; ASC Iqbal won the match while the PAF team scored the second position by very little difference. Both the teams had striking and breathtaking moments. At the time of prize distribution, the Chief Executive Murree Brewery Company Isphanyar Bhandara said sports help in developing the mental and physical abilities of youth. This builds their character along with improving patience and courage in their personalities. He added more, players are assets of the nation and play an important role in promoting sports for the foundation of a healthy society.

NATIONAL DEFENCE THROUGH SELF RELIANCE

PAKISTAN AERONAUTICAL COMPLEX

A SYMBOL OF EXCELLENCE IN AVIATION

PAC Board, Kamra

Tel: 92-51-90996230, Fax: 92-51-9225500, URL: www.pac.org.pk, email: sales@pac.org.pk