From Cayley to Kalam: Advancements in Aerospace

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Our Republic Day is on 26th January and with the advent of event, preparation to showcase our treasure of cultural diversity and military might is also at its zenith. While our nation's achievements adorn the ceremonial boulevard of Rajpath, among the prominent things would be several aerospace equipments. Be it our first indigenously designed and developed Light Combat Aircraft – Tejas, C-130J Super Hercules transport aircraft or the gigantic, heavy lift, long range aircraft C-17 Globemaster- these sophisticated miracles are the epitomes of our aerospace sector.

Aerospace engineering comprising both its aeronautical and astronautical aspects is not a new concept to mankind and its fair beginning dates back to late 19th Century. Though the historic scriptures account to existence of artificial flying object as in 4th Century 'Pao Phu Tau' or the recent controversial announcement of aircrafts existing in vedic period as told by Captain Anand Bodas in 102nd Indian Science Congress this year. With our growing curiosity to explore extra terrestrial life or sophisticated surveillance system, this sector nurtured under the aegis of our necessities. This article features some advancements that revolutionized this field & insights into some that are still revolutionizing.

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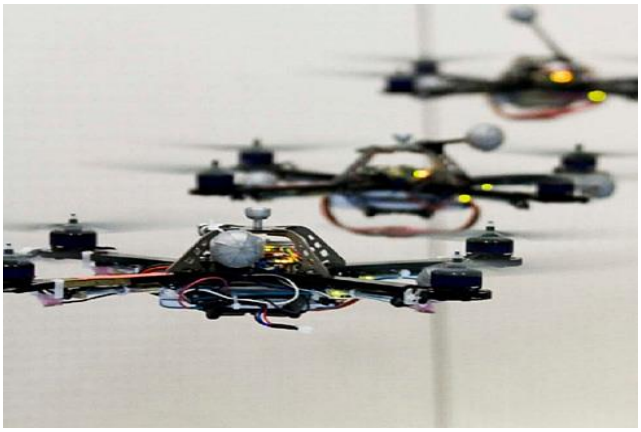
*Light weight combat aircraft **Tejas***

NASA (National Aeronautical Space Agency) when established in 1958 as a response to Cold War, it was hardly anticipated that this organization would make a human walk into space in just 3 years after its inception. Later in 1969, first man set their feet on moon- *It was indeed a giant leap for mankind*. India, on the other hand wasn't far behind and its space sector boomed after the establishment of renowned ISRO (Indian Space Research Organization) in August, 1969. From launching its first artificial satellite Aryabhata in 1975 to Chandrayaan-I mission in 2008 and now the Mars Mission in 2013, its has setup several milestones on its way. MoM (Mars Orbiter Mission) was so far the cheapest space mission concerning such huge distance and it consolidated India's position among leading countries in space programs characterized by its innovations and R&D in indigenous technologies.

Considering the aeronautical aspect- Sir George Cayley, an aeronautical engineering pioneer is considered most significant in its early stage. Wright Brothers came up with their first aeroplane in 1903, the Engineers now has built Airbus A380 and Antonov An-255, the heavies aircraft with maximum takeoff weight of 640 tones. But these advancements were the cumulated impacts of developments in various parameters like aerodynamics, propulsion, avionics, material science, structural analysis and manufacturing technologies.

The Defense system assuringly offers the vast implementation field for aerospace build ups. Air surveillance forms an integral part of our Air force. Moreover greater threat of terrorism and neighbouring countries' interventions poses a need for more sophistication. Beyond-visual-range missiles like Astra & Helina, Unmanned Air vehicles like 'Nishant' are further additions which pushes it forward towards self-sustained military power. Apart from tangible examples, aircraft to aircraft interaction aids these seamless integration enabling flying commuters to piggyback on these changes. But with expanding applications as data acquisition size enhanced, streamlining those to allow for effective decision-making posed another challenge, thus embarking the concept of ‘Big Data Handling’.

Besides the production side, consumer side approach also holds significant ground breaking researches. Daredevil Felix Baumgartner was equipped with ‘Red Bull Stratos Pressure’ suit when he made his much sought after jump from space. Giving humans a feel of flying is not a lunatic fantasy now but is possible with suits like Martin Jetpack, Marc Newson's 'Body Jet'. Moreover Potterheads could relish those dreamy flying cars with ‘Terrafugia’ and ‘Moller International’s skycar’. Evolution of drones & multi-pod copters hold the potential to revolutionize the approach to healthcare and medicinal facilities available to deprived areas and could give a new dimension to product delivery.



Nanocopters flying in formation

Missile technology also grew along parallely as the contingent now holds gems like Hypersonic Cruise Missiles and Scramjets (Supersonic Combusting Ramjets). The Stealth Technology that enables the reduced radar signature further adorns it. The domain of self-propelled guided weapons is not restricted to those giant warheads, researches on smaller level have been done as well. Whether its insect-inspired micro aerial vehicles' 2D airfoil or finding alternatives in carbon-fibre composite substrate & hypergolic propellants, be it autonomous airborne 'bots that can work together to do tasks like map unfamiliar spaces and perform search and rescue’ (developed by The University of Pennsylvania GRASP) or Solazyme, a California startup that makes Solajet by feeding biomass sugars to genetically modified microbial algae (60:40 mix of conventional jet fuel; biofuel adoption in airline industry)- these are the change makers today which would drive the innovations for tomorrow. Leaving the conventional getaway behind, the trend now is to adopt off-the-shelf approach both technologically or commercially.

Neil Armstrong in his speech once said- “Science has not yet mastered prophecy. We predict too much for the next year and yet far too little for the next ten”. Though the development so far may seem substantial but the prospects keep widening with drifting technology. For instance, making commercial flights safer and their proper monitoring are immediate concerns to look through. Recent disappearance of Malaysian MH-370 or AirAsia QZ8501 accident are the wake up calls demanding serious attention.

There lies many mentionable entities but what matters is the pace with which Aerospace sector is exposed to cutting edge advancements. Now it takes a stand where our fantasy of flying cars, hybrid vehicles, massive jets and Mars-bound rockets are no longer seem to be confined to sci-fi movies. Days are not far when the coming generations would even witness the robotic swarm or may be the futuristic utopia of Jetskian era.