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Defence Expo 2022: Solid “Atmanirbhar” show...

We visited the Defence Expo 2022 (DefExpo) held at Gandhinagar (Gujarat) to understand how the indigenisation of defence platforms/systems is shaping up the overall sector. Below are the key takeaways:

Total 430 systems/platforms displayed by DRDO

Defence Research and Development Organization (DRDO) displayed a wide range of 430 products including strategic and tactical weapon systems, defence equipment and technologies developed at DefExpo 2022. These included products across engines & propulsion, aerospace & aeronautics, naval weapons, armoured vehicles, advanced electronics, guns & ammunitions, missiles, etc. DRDO showcased advancements in technologies made by its laboratories as well as its partnerships with the industry in recent years while representing a high level of indigenisation in advanced and futuristic defence products and technologies that contribute towards Aatmanirbharta in defence.

The major products displayed in aerospace include LCA MK1, LCA MK2, AMCA, Tapas (Rustom-II) UAV, TEDBF, LCH, LUH, ALH, indigenous multi-role helicopter (IMRH) etc. In engines and propulsion, Kaveri derivative engine (46 kn) for high range combat UAVs, air propulsion system, 25 kn turbofan engine were some of the products displayed.

In missiles, Akash NG, QRSAM, MRSAM, Nirbhay cruise missile, Nag & Amogha ATGMs, Astra air to air missiles, Rudram air to surface, Pinaka rocket system were displayed. In terms of naval weapons and systems, fuel cell based air independent propulsion (AIP) technology for submarines, high endurance autonomous underwater vehicles (AUVs), advanced torpedoes, Shakti EW system, submarine fired decoy, Mareech anti torpedo decoy system were displayed.

Private sector participation to play key role in better execution with more indigenisation

We understand that the government is focused on involving more private players, MSMEs and start-ups for improving overall efficiency in the manufacturing ecosystem of defence platforms. In the FY23 budget, the government had earmarked 25% of the domestic capital acquisition budget for the private sector to encourage them to take part in defence production. Efforts by private sector to develop cutting edge military solutions have also been given a major boost with 25% annual research and development budget reserved for projects spearheaded by start-ups and private companies.

The Innovations for Defence Excellence (iDEX) initiative was also launched by the government in April 2018. iDEX aims to achieve self-reliance and foster innovation and technology development in defence and aerospace by engaging industries including MSMEs, start-ups, individual innovators, R&D institutes and academia.

The government has already notified four positive indigenisation lists in major platforms (which account for 411 items) and three lists in sub-systems/components (which account for 1238 items). Indigenisation of these items will increase private sector participation, which will eventually lead to an increase in indigenisation level of major platforms & systems.

HAL showcased 200 items (components used in aircraft & helicopters), which are currently been imported and will be indigenised with private players. The company's domestic procurement from MSMEs reached ~44% in FY22 against ~32% in FY21.

Sector View: Positive

Top Picks in Defence Space

Hindustan Aeronautics
Bharat Dynamics

Defence stocks have been outperforming broader markets broadly on the back of

- Strong order backlog and healthy pipeline of orders
- Increasing indigenisation of key components driving execution

Key risks to our call

- Dependence on government contracts
- Delay in order finalisation, awards impacting future visibility

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Make in India push: Increasing indigenisation through ToTs in major technologies

Currently, the indigenisation level of major platforms like aircraft, helicopters, warships range from 60-75% as some of the key components including engine used in these platforms have not been manufactured in India. For example, Hindustan Aeronautics (HAL), which is in process of manufacturing combat aircraft like Tejas MK1 and MK1A, has achieved indigenisation level of 60-65% in these aircraft. In helicopters also, indigenisation level of only 55-65% has been achieved. Cochin Shipyard achieved indigenisation level of 75% in recently commissioned INS Vikrant.

However, government and companies nominated for manufacturing these platforms have been in discussions with foreign OEMs for manufacturing these key components & engines in India or proving these technologies on ToT basis. HAL and government are looking for indigenisation level of 90%+ for future combat aircraft (like Tejas MK2 and AMCA), combat helicopter (like LCH Prachand), utility helicopters like LUH and ALH dhruv.

Design and development of a 25 kn thrust class turbofan engine, which can be used on trainer aircraft and large UAV applications, is under progress at HAL. The 1200 KW Turbo shaft engine, which would be used as power plant for 3-6-tonne category helicopters, is also under development at HAL. HAL and Safran Helicopter Engines signed a strategic MoU for helicopter engines in March 2022 under which they will set up a JV facility in Goa for manufacturing helicopter engines.

Regarding the aircraft engines, Gas Turbine Research Establishment (GTRE) of DRDO is working on indigenous Kaveri engine and considerable progress has been achieved in terms of thrust level of 75 kn. Though Kaveri is short of expectations currently as LCA requires 90 kn and AMCA requires 110 kn, GTRE is working diligently to achieve this kind of thrust in Kaveri engines in the next four to five years.

However, General Electric (GE) has agreed to ToT of F414-INS6 engines (with thrust of 98 kn) which will be used in Tejas MK2 and AMCA MK1. F414-INS6 is an upgraded version of F404-IN20, which is being used in Tejas Mk1 and Tejas MK1A. Rolls Royce (UK based OEM) has also offered its powerful engine (110 kn variant used in Eurofighter jets) with ToT. In terms of marine engines, HAL has established an assembly line for GE's LM2500 marine engine that power indigenous aircraft carrier, INS Vikrant.

Going forward, we believe indigenisation levels of these major platforms are slated to go up significantly with the indigenisation of engines and other key sub-systems & components through technology transfer (ToTs) from DRDO & foreign OEMs and MoUs with private players, MSMEs & start-ups.

Rise of unmanned aerial vehicles (UAVs)

We understand that unmanned aerial vehicles are expected to witness significant growth in India. Many private players have already developed UAVs and drones for military and civil use. Since many of these UAVs and drones developed by private players and start-ups would not have very high operational range, these will be offered to armed forces for only monitoring, surveillance and utility functions. Indian Army and Navy are also considered ready to have their own unmanned aerial vehicles for these functions.

For combat function, Indian Air Force is looking for faster induction of unmanned combat aerial vehicles (UCAVs) in the years to come. Moreover, IAF is envisioning a right mix of both manned and unmanned aircraft for combat role. The fifth generation manned combat aircraft (Tejas Mk2), 5.5th and sixth generation AMCA MK1 are already under development. In the unmanned combat aerial vehicles, DRDO has been working on MALE (Medium Altitude Long Endurance) UAVs - Rustom II (Tapas BH1) and Ghatak. Tapas BH1 will be manufactured by HAL with indigenised Kaveri engine. HAL is in process of developing combat air teaming system (CATS warrior) which is also the unmanned aerial vehicle for combat role. The higher version of Kaveri engine is also under development for the same.

Larger projects in warships/submarines are expected

Indian Navy's plans of inducting new generation destroyers (next phase of P-15B), new generation frigates (next phase of P-17A), next generation corvettes, anti-submarine corvettes and other vessels were already in place but now larger projects like the landing platform docks (with displacement of about 30000-40000 tonnes), third indigenous aircraft carrier (INS Vishal) with about 65000 tonnes displacement and the next submarine project (P-75I) are also on cards with a longer term perspective.

Vice Admiral of Indian Navy has said that three aircraft carrier force would be essential to provide sea control in the vast Indian Ocean region. Standing committee on defence has also brought out that Navy requires a third aircraft carrier for the maritime security of country. Landing Platform Dock (LPD) is also one of the larger projects, which is included into the recently notified fourth positive indigenisation list. The LPDs are multi role support vessels for amphibious warfare. In August 2021, the MoD issued a revised RFI for the procurement of four landing platform docks to domestic Indian shipyards (including Mazagon Dock, Garden Reach, Cochin Shipyard and L&T Shipbuilding).

New missiles under development

In terms of missiles & torpedoes, the surface to air missile variants like Akash, medium range SAM, quick reaction SAM are in process of final approvals. Next variant of Astra air to air and indigenous anti-tank guided missiles like Amogha and Nag are also under development. Bharat Dynamics is the nominated agency for manufacturing of these missiles.

Moreover, the new missiles like smart anti airfield weapon (SAAW), man portable anti-tank guided missiles, very short range air defence system (VSHORADS), Rudram air to surface anti-radiation missile, Nirbhay cruise missile, Pralay surface to surface short range missile were also being displayed by Bharat Dynamics (BDL). These missiles are also in the development phase and contracts for these are also expected in the coming years.

Export opportunities emerges with expected rise in indigenisation levels

We believe that exports hold a big opportunity for Indian defence players led by the expected further increase in indigenisation level of major platforms & systems. Most of the missiles manufactured already have high levels of indigenisation, which makes them good export contenders. With the expected increase in other larger platforms like aircraft, helicopters, vessels, boats, we believe that India's export potential in defence is huge and the government's target of touching ₹ 35000-40000 crore of defence exports by FY25E (from ₹ 12000-13000 crore currently) is possible.

Defence companies set to gain from this huge opportunity; HAL, BDL top picks

We believe HAL has a big opportunity in both manned and unmanned combat aerial vehicles, helicopters and aero engines. With development of Kaveri engine variants for different UCAVs, manufacturing of other aircraft engines and maintenance, repair and overhaul (MRO) of these aircraft and engines, we believe HAL is a multi-year growth story with significant growth potential. Current order backlog at 3.2x TTM revenues and healthy orders pipeline gives strong visibility.

BDL also witnesses significant opportunity with the need for new generation missiles from armed forces. The current order book is already strong at 3.8x TTM revenues with healthy pipeline or orders in new missiles & torpedoes. High indigenisation level of 80-85% in most missiles and torpedoes offer export opportunities also.

The Navy's big projects in pipeline give a longer term visibility to defence shipyard companies like Mazagon Dock, Cochin Shipyard and Garden Reach. Moreover, the need of new aircraft for INS Vikrant like twin engine deck based fighter (TEDBF) to be manufactured by HAL. With these new high tech aircraft & warships, players like Bharat Electronics & Data Patterns will also benefit significantly in the future.

Aircrafts, Helicopters, UAVs

Exhibit 1: LCA Tejas MK1



Source: Company, ICICI Direct Research

Exhibit 2: LCA Tejas MK2



Source: Company, ICICI Direct Research

Exhibit 3: Advanced medium combat aircraft (AMCA)



Source: Company, ICICI Direct Research

Exhibit 4: Twin engine deck based fighter (TEDBF) for Navy



Source: Company, ICICI Direct Research

Exhibit 5: Light combat helicopter (LCH – Prachand)



Source: Company, ICICI Direct Research

Exhibit 6: Light utility helicopter (LUH)



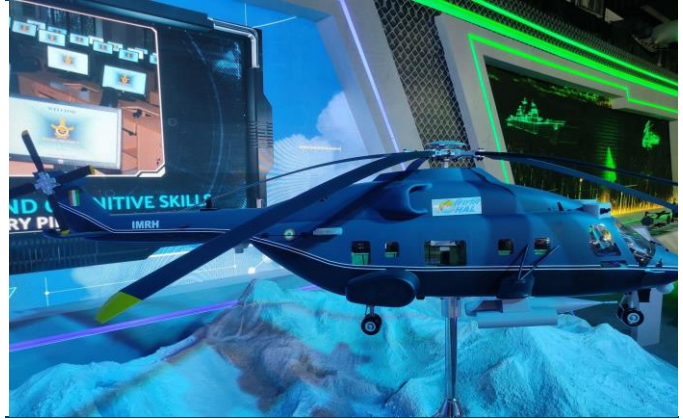
Source: Company, ICICI Direct Research

Exhibit 7: Advanced light helicopter (ALH - Dhruv)



Source: Company, ICICI Direct Research

Exhibit 8: Indian multi-role helicopter (IMRH)



Source: Company, ICICI Direct Research

Exhibit 9: Abhyas UAV



Source: Company, ICICI Direct Research

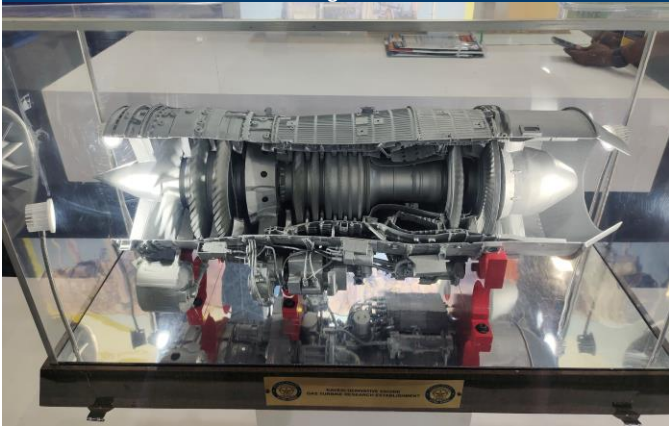
Exhibit 10: Tapas – BH UAV (Rustom-II)



Source: Company, ICICI Direct Research

Engines & Propulsion

Exhibit 11: Kaveri derivate engine KDE– 46 KN



Source: Company, ICICI Direct Research

Exhibit 12: KDE – 46 kN details



Source: Company, ICICI Direct Research

Exhibit 13: Diesel engine for MALE UAVs



Source: Company, ICICI Direct Research

Exhibit 14: MALE UAV Engine details

Diesel Engine for Medium Altitude Long Endurance (MALE) UAV

Specifications

Indigenous Diesel Engine is high specific power compact & fuel efficient engine developed for Medium Altitude Long Endurance (MALE) TAPAS (Rustom-II) UAV. The engine develops take-off power of 180 hp up to 11000 ft. The engine is controlled by indigenously developed state of the art FADEC system. The engine is tested for high altitude performance at Leh (11,500 ft) and Changla (17,600 ft).

- Type : 4-Stroke 4-Cylinder Inline
- Max. Take-off Power : 180 hp available up to 11000 ft.
- Max RPM : 3500 RPM
- BSFC : 220 gm/kWhr
- Displacement : 2378 cc
- Dry Weight : 195 kg

Other features

- (i) Common Rail Direct Injection,
- (ii) FADEC,
- (iii) Turbocharged with Intercooling System

Features

- Aluminum alloy Lightweight cylinder block
- Plasma coating on cylinder bore
- Deep skirt design
- Single speed reduction gearbox
- Higher power to weight ratio
- Multi-fuel capability viz. ATF, Diesel
- Constant Speed propeller
- Glowplug control
- Indigenous Full Authority Digital Engine Control (FADEC) System having:
 - Single lever control
 - Automatic pitch control
 - Dual channel, Redundant ECU
 - Engine health monitoring

Source: Company, ICICI Direct Research

Radar

Exhibit 15: Uttam AESA Radar



Source: Company, ICICI Direct Research

Exhibit 16: Aesa radar details

Active Electronically Scanned Array Radar

AESAR

Broad Features

- Fully Distributed Active Array Antenna
- Azimuth & Elevation Monopulse for high accuracy fire control
- High Resolution SAR
- High resolution ISAR of sea targets
- High Accuracy Ground Target Tracking
- Auxiliary channels for jammer suppression
- Highly compact & modular design to meet size, weight & power constraints in fighter aircrafts

AESAR is a multimode, solid-state active phased array radar. It is fully electronically scanned agile beam radar which uses Transmit / Receive module (TRM). The radar has state of the art ECCM features including wide band RF front end, ultra low antenna side lobes, frequency and waveform agility, multiple SLC channels for jammer suppression, Low Probability of Intercept, Non Co-operative Target Recognition. It provides better situational awareness of the modern battlefield scenario. It is capable of tracking multiple targets with high accuracy suitable for missile firing with interleaved Air to Air, Air to Ground and Air to Sea modes for all terrain solution.

Source: Company, ICICI Direct Research

Missiles

Exhibit 17: Akash Surface to Air Missile



Source: Company, ICICI Direct Research

Exhibit 18: Astra Air to Air missile



Source: Company, ICICI Direct Research

Exhibit 19: Long range surface to air missile (LRSAM)



Source: Company, ICICI Direct Research

Exhibit 20: Man portable anti tank guided missile



Source: Company, ICICI Direct Research

Exhibit 21: Smart anti airfield weapon



Source: Company, ICICI Direct Research

Exhibit 22: Laser beam riding man portable air defence



Source: Company, ICICI Direct Research

Exhibit 23: Very short range air defence system



Source: Company, ICICI Direct Research

Exhibit 24: Nirbhay cruise missile



Source: Company, ICICI Direct Research

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