

# 'If We Are Able To Satisfy The User With The MkI Products..., We Should Be Able To Export The Same To Other Countries When We Develop The MkII Version'

—Chairman, Defence Research and Development Organisation (DRDO) and Secretary Department of Defence R&D, Dr S. Christopher

*You have spoken on the export potential in defence. Can you please elaborate what export are we looking at?*

In the last Aero India, Prime Minister Narendra Modi categorically said that India seems to be the first in the defence equipment import and he was not proud of that. And DRDO as a defence R&D organisation should have fulfilled the requirement of not allowing imports. However, the question is if we are able to satisfy the user with the MkI products that we have made, we should be able to export the same to other countries when we develop MkII version. Especially, when there are several countries in and around India (specifically the East Asian countries) that are looking for our products.

Take the example of Pinaka rocket system. This was made for the Indian armed forces. The Indian Army accepted four regiments in the beginning. Now six more regiments for about Rs 14,000 crore have recently been cleared. The first version of the rocket, Pinaka Mark-I which is in service with the army has the range of 40 km with the margin of error of 1.5 per cent. In the Mark II version, (also called Guided Pinaka), we have increased the range to 60 km; and reduced the CEP (circular error probable) in MkIII. The army has come up with the revised specifications and are interested in this Mark III. In this situation, we feel that we can find somebody else who is interested in Mark II. It is much better ammunition with better capability and we are retaining the cost between MkI and MkII. We have made certain modifications and our production rate is also faster. Furthermore, we are looking at adding correctors to reduce the error. We have done our experiments with two systems in January 2017 and Mark III system is ready for further trials and production.

AEW&C is another example for potential export. We have spent so much



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time and energy in this programme, and based on that we got AWACS (I) programme where it will be the platform and mission system by DRDO based on AEW&C technology Airbus A330. Therefore, Embraer-145I AEW&C can be offered for exports. This system garnered a lot of interest during CAS' visit to Indonesia and also at the Bahrain Air Show. Indonesia comprises about

16,000 small islands which needs monitoring and Bahrain can use AEW&C aircraft which they can use to monitor its oil wells. Interest is also shown by another south American country.

BRAHMOS cruise missile is another example. Being a joint venture between India and Russia, and owing to our mutually friendly relationship, exporting BRAHMOS will not be a problem. However, we have to converge on friendly countries.

There is a market for Akash missile system along with the Rajendra radar for the exports. We do have a history of exporting sonars and radars. Many Battlefield Surveillance Radar (BFSR) have already exported and other radars like Indra are in the pipeline.

**Given this potential, what is really holding you back?**

It is the question of who will do it. This is not the charter of DRDO so far to export. Neither do we have the wherewithal to advertise our products. It is supposed to be the charter of the public sectors companies. But, public sectors are not forceful about exports as they have a captive domestic market.

Today, we can go to a private company as well, though earlier I could go to public sector companies. I have been implementing the recommendations of the Rama Rao committee. The only thing left now is the commercial arm. We can create a commercial arm like Indian Space Research Organisation's (ISRO's) Antrix. I can use BrahMos Aerospace for this purpose. BrahMos

is our own company and they are only selling one product. Why can't I give one more missile project like BrahMos? Akash missile with Rajendra radar is one project that can be given to BrahMos. Rajendra is a fundamental phase control module and it is a passive array. In fact, I have told the CEO & MD, BrahMos Aerospace, Sudhir Mishra to come out with a paper. Instead of creating something new and getting caught in the gestation period of five to 10 years, we can start in a humble way by recreating some of the structures that are available to us and export them.

**Since DRDO is authorised to decide and get foreign technology as part of the defence offset policy, what has been procured so far?**

If I work with somebody, a lot of tacit knowledge comes in. Take the case of long range surface to air missile

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(LR-SAM) which is a joint venture between India and Israel. We have been asked to do the rear portion and they are doing the front portion. Rear portion involves propulsion and motors. There is something called two-pulse motor which enhances the range. If you put propulsion in the rear end and fire it, and continuously power it on, the missile gets energy until the fuel is exhausted. Instead, one could divide the propellant into two sections and ignite the first motor to throw it after some time when the propellant is consumed. As it falls, the missile gains energy with which the missile could fly for a larger distance without consuming the fuel. When you decide that the missile must go forward at a particular point of time, the second pulse can be ignited. The desired momentum to hit the target can be achieved along with increased range. We have learned this two-pulse motor concept from this programme.

Answering your question, DRDO has not directly taken any offsets so far. Presently, Rafale has an offset clause, and DRDO has been asked to fill it up. We are specifically talking of the Kaveri engine's last mile problem. We are running the five Kaveri engines that we have. These were even flown as a part of the experimental test-bed in Russia. We know they are good engines. The problem with the engine is that when used for higher power, it makes a noise. We don't know the effect it can have on the performance. To resolve this issue, DRDO is planning to rope in Snecma (as part of the Rafale offset). The project has already entered the first phase. Snecma will study the engine and work on its modifications, certify and fit it on the Light Combat Aircraft (LCA) Tejas. We should be able to fly one of the LCA's with Kaveri engine at least after two years.

Dassault Aviation is keen to work on the next generation LCA, Advanced Medium Combat Aircraft (AMCA) or the Unmanned Combat Aerial Vehicle, Ghatak as part of the offsets in Rafale programme. They are willing to work on the configuration design and the entire logistic maintenance software for new system. We want the company to do something for us here in India to harness our potentials.

They have had two rounds of meetings so far with Aeronautical Development Agency (ADA) and GTRE. Hopefully, things will move forward.

**What will you list as DRDO's achieve-**

**IN CONVERSATION FORCE** editor Pravin Sawhney with Dr. S. Christopher





**MADE IN INDIA** Arjun Mark II tank showcased during Republic Day parade

**ments in 2015-16?**

The Indian Army is likely to accept 68-ton Arjun Mark II tank for two more regiments. As the army requires the firing of the rocket from the Arjun gun, the trials have to be conducted again. The Indian Army wanted the weight to be brought down to 50-55 tonnes. We may be able to bring the weight down by seven to eight tonnes, but beyond that it will not be possible.

Of Arjun Mark I, 91 out of 124 tanks are in operational condition. We have resolved all the maintenance issues. Ammunition was an issue, and we resolved that also. We are going for the penetration beyond what have achieved so far. In Advanced Towed Artillery Gun System (ATAGS) developed by DRDO along with two Indian private companies — Bharat Forge and Tata Power SED. Both the guns made by these companies are ready, and they were showcased during the Republic Day Parade.

Among the other highlights of the year are: Indian Army's order for additional regiments of Pinaka Mark I. Furthermore, the Defence Acquisition Council (DAC) has cleared six more regiments. The 46-metre, MLC-70 modular bridge is undergoing trials. There is

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a requirement for 83 wheeled armoured vehicles (WhAP).

There are orders for 123 LCA Tejas aircraft for the Indian Air Force (IAF). There are reports that the programme for the naval version of the LCA has been stopped, but as far as we are concerned the indigenous programme is going ahead. In November 2016, DRDO successfully carried out first design validation flight for Rustom-II unmanned aerial vehicle (UAV) in DRDO's Chitradurga ATR facility.

In the AEW&C programme, the flight trials for AEW&C have been conducted at Bhatinda and Jodhpur for the induction of Phase I. Finally, DRDO's heavy weight torpedo Varunastra, was handed over to the Indian Navy in June 2016. Likewise, there are several other prod-

ucts of DRDO are coming up for use in the last 18 months, the value of DRDO products inducted or cleared by DAC for induction have increased from Rs 1.6 lakh crore to Rs 2.7 lakh crore.

**Given that the navy and the army have their own design bureaus and the air force is mulling over the idea of having one, what will this mean for the DRDO and the services partnership?**

I am happy about this. The country is so wide and the requirements so huge, I strongly believe that there is room for all. And probably after getting into that, they might appreciate us more and we may work together, with better coordination from one design house to another.

**What was the problem with Nirbhay cruise missile?**

In the last trial in December 2016, the missile took off as anticipated. However, mid-flight, the wings did not open fully. In that partial position, it has a tendency to roll. Then the inertial navigation system (INS) lost its orientation. Consequently, it recovered and started going for 15 minutes. But since it was going beyond the zone that we had notified, we had to kill it. We are now plan-

**INDIGENOUS PRIDE** Light combat aircraft, Tejas



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ning to do another trial within three months.

Now we are going to use the turbojet engine. Presently, we have the imported turbofan engines. We have made a few turbofan engines already but they are not tested yet. By the time we get into production, we would have tested them. We are planning to fly this missile with our own turbofan engine sooner or later.

**Do you have TERCOM (terrain contour mapping) for the accuracy of the cruise missiles?**

We have it in the sense that we can fly identical to the Chinese cruise missiles which have terrain mapping capability. But in an unmapped territory and when Nirbhay will fly at the height until TERCOM is developed.

**What is the update on Prithvi missile?**

We will not make any more Prithvis.

**Except for the BRAHMOS missile which is a joint venture, it seems that the DRDO is not focussed on the cruise missiles.**

On the contrary, cruise missiles are one of our major focus areas. There is another new programme which will have a supersonic end phase. It is a turbofan with the range of around 1,000 kilometres.

In this new project, a booster will lift the missile up, and the turbofan will take the missile to the desired location within 1,000 km. In the final flight stage, we will ditch the turbofan, fly

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with another engine which will take the missile to the supersonic speed and hit the target. The DRDO HQ has cleared this project already. Two labs — Aeronautical Development Establishment (ADE) and Defence Research and Development Laboratory (DRDL) — are involved in this.

**What is the update on Russian FGFA? Since ADA's proposal of the AMCA is also a FGFA, can India afford two 5th Gen aircraft?**

FGFA programme is mainly driven by Hindustan Aeronautics Limited (HAL). AMCA is our indigenous programme with low budget.

**What is the update on the UAV programme?**

Design of Unmanned Combat Air Vehicle (UCAV) Ghatak is coming up very well. The dry engine of the Kaveri will power Ghatak. The second aspect is stealth. If you look at the shaping of the existing UCAV like B2 it is designed in such a way that it deflects the energy and can remain undetected. The coating on the UCAV only amounts to 20

per cent of the stealth.

I have given ADA time till April to produce a life-size model of UCAV (fully metallic, without any coating for RCS reduction) and measure its RCS (Radar Cross Section) to understand its detection range. RCS reduction and painting will simultaneously proceed thereafter. As far as the electronics part is concerned, if all payloads of Rustom UAV are certified, we will use them as it is in Ghatak programme. We will know the acceptance on the Rustom payloads by next year.

**What is the update on Nag anti-tank missile?**

Nag will only have the infrared guidance system. There won't be any millimetric wave because the diameter of the missile is small. If we go for an X-band or a Ku-band system, the size has to be reasonable. The only problem is that it is not able to reach the desired 7km during the day time (11 am to 3 pm) when the temperature of the body is higher than the surroundings. We are only getting about 5 km range during this time.

**The DRDO's theme during DefExpo 2016 was 'Rise of Futurism'. What has been achieved in this in terms of your collaboration with IITs, science institutes and select universities and in creating an indigenous ecosystem?**

Academic institutions give more importance to the publications which can be done in a shorter term rather than working on one programme which will go on for 10 years. We are trying to change that culture. Instead of them coming to us, now we go to them. We are building R&D centres inside academic the institutions with specified focused areas in mind. In 2016, three new Centres of Excellence have been created: Centre of Propulsion Technology (CoPT) in IIT-Bombay and Chennai which will focus on aero engine, hypersonic propulsion, solid propellant, combustion modelling, morphing aircraft; JCB Centre for Advanced Technology (JCBCAT) in Jadavpur, Kolkata to focus on directed energy, secure systems, cognition, unmanned systems and Robotics; and Joint Advance Technology Centre (JATC) in IIT Delhi which will focus on advanced ballistics, special structures and protection, advanced electromagnetic devices and terahertz and brain computer interface. We believe that these will enhance our outcomes. ||