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Defence R&D in UK Some Impressions

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Editor's Note: The author was posted as Deputy Technical Adviser (Defence) at the Indian High Commission in London, UK. During his 3-year stay, he came in close association with the British people engaged in professional activities. He also had an opportunity to observe the functioning of R&D activity of the Ministry of Defence (MOD), UK. His impressions on the Defence R&D in UK have been reported.

1. National Pride

I recall three instances, which illustrate the national pride of the people of UK.

(a) Prior to the pulling down of Berlin Wall, there was a great debate on the replacement of ageing MBT's by Challenger of UK in the NATO Forces deployed in Germany to counter any surprise attack by the Warsaw Pact. Challenger was found wanting in its performance. The TV had shown tanks under evaluation, with the British, German and US dignitaries in their respective tanks. The British public could see for themselves the performance of Challenger, which was not the best. However, despite the compulsions of NATO and the pressure from the Generals and the contending companies backed by their governments, UK stood as one man from the Prime Minister to *panwalla*—so to speak—and it was decided to give one more year to the Vickers to come up with an improved turret to achieve the required performance level. The TV features interviewing public at random clearly showed that the common man on the street was explicit and unanimous in his opinion that UK should make its own Battle Tank. The Vickers were given extension and today Challenger is among the best MBTs in the world.

(b) The type 23 (?) Man of War of the British Fleet was ready to sail out of the dockyard but for some reason—may be too many or too frequent changes in its specifications—the C^3I system was not be ready for the next year or so. The clear option was to buy it from the US or from elsewhere in the continent, fit in the ship and sail. However, the Admirality decided to sail without the C^3I suite and to wait for the British to build it and install.

(c) The year 1990 saw an unprecedented series of strikes by the British Rail, underground tube and bus services. On the first day of the combined strike, my good neighbours, two young ladies, both solicitors working in the city, left early in the morning, around 0530 or 0600 hrs by shared cars (parking in London is a problem; you must experience to believe), reached their offices in time, completed the days work, and returned home in some complex way. As the dav was unusual, we were comparing notes. When I enquired them that they could have transacted more business operating from home on telephone or have simply taken the day off and cool their heels, the unforgetable reply from the spirited young clare was 'We don't give in, we are British'.

2. Active R&D vs Reactive R&D

Leaders are a lonely lot, and have only an inner urge and strength to prop themselves up in difficult times. Not every endeavour of theirs may succeed, but act they must.

Active R&D

Revolutionary concepts and crazy ideas are tried in R&D establishments, which may succeed or fail. A few

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cases of active R&D, from the most challenging to the simplest, all original and pioneering, are:

(a) Tanks: In future, the tanks may have no turret, at least not the conventional type, and shall not throw multipound cannon balls. The replacement will be an electromagnetic plasma gun and a metal bullet of about 6 mm dia. The bullet is used as an ammunition on the gun, accelerated through a linear accelerator made of a coil through which a current of several thousand amperes flow for a few microseconds, accelerating and in the process converting the bullet into the fourth state of matter, plasma. It travels at high speed and on impact, melts a hole through the enemy tank or target. The gun will have new kind of hardware—capacitors of several hundred Farads, conductors with no inductance, circuit breakers that can make and break in microseconds, and a whole range of new devices. There are no precedents and peers to copy. The gun may be ready sooner than expected.

(b) Cavitation : Cavitation is a problem for the Navy and shipping alike. Due to cavitation, down time to change propellor blades and loss of efficiency in transit causes a great loss to the shipping industry as well as hampers the operational readiness of the naval vessels. If only the cavitated edge of the blade is easily replaceable without having to redo the entire blade? It is possible. A small rubber company, which was later bought by the Westland group, has found a solution. A rubber sheath that snugly fits the propellor blade with the same desirable contour, is glued using proper adhesive. The cutting edge of the rubber sheath and its surface are coated with copper and on top of the edge with a suitable metal to get the required hardness. At regular, short intervals, these covers are replaced with new covers. This can be done during berthing periods at a fractional cost and with virtually no loss in efficiency.

(c) Anti-Skid Paint : When the rubber is moulded and used for any intended purpose, both the rubber as well as the waste produced during its production are source of an ecological hazard. It is hard to disintegrate and recycle. Other than using old tyres as fenders for ships in berths, there seems to be no known recycling process. An ingeneous idea involves a process, where the waste rubber is pulverised and mixed in ordinary paint and applied on a surface—we now have an anti-skid surface. This can be used on pavements, bathrooms, or on aircraft carriers and ships; Aircraft may land with less wear and tear, or fewer men may fall overboard on high seas.

(d) Radar Absorbing Paints : Coir or nylon, painted with radar absorbing paints, are made into panels to cover ship flanks, buildings near harbours and airports are painted to reduce significantly the noise in the plan position indicators and make landings at international airports safer. Signatures of ships and aircraft can be altered at will, simple decoys can be made, and aircraft can make forays and penetrate into enemy territory with greater impunity.

Many such cases, from the most difficult and futuristic to the simplest and the obvious, seem to have been achieved with a certain ease. Close interaction with the academia aided by the spirit of enquiry and adventure in ideas, underline the success.

Reactive R&D

The Ministry of Defence is not oblivious to the developments in the US, France and other countries. Where there appears to be adequate market share, MOD will support industry in collaboration, alternative supply, or in competition. Development and supply of effective weapons and countermeasures on crash programmes during local wars and regional conflicts are not uncommon. One such instance worthy of note is that during the Iran-Iraq war, Marconi supplied radar reflectors to be mounted on or towed behind the ships to alter the radar signature. A simple technique known to all, but it was cashed in with great alertness before competition could enter the market.

3. Standardisation

While there are many standardisation organisations in UK, catering for different industries and purposes, MOD has a centrally computerised list of preferred parts and standards to which all military equipment should comply; justifying where exceptions are to be made. Cost-effectiveness is much talked about, but there is no dogma and the approach is pragmatic rather than pedagogic.

For instance, Ferranti is famous for making slotted antennae for radar. The design is old and proven, but the manufacturing techniques, machines and the material to be used changed continuously with time. Of particular importance is the material used for making

the antenna—a prestretched aluminium alloy normally used in aircraft industry. It is expensive as compared to any other material which meets all the requirements, but the reason for its choice is simple and elegant; the hidden cost in selecting alternate cheap material, inspecting and testing it and then subjecting it to quality assurance and compliance for the life time of equipment, is much more than its apparent cost.

4. Private Participation and Export Drive—Levine's Phenomenon

After Levin took over as procurement executive, responsible for deciding on the type and quantity of equipment to be procured for the armed forces, the role and direction of R&D has changed. To prune the expenditure and increase effectiveness, the R&D is funded only to the extent of trying revolutionary and exotic ideas and establish feasibility of futuristic concepts of weapon systems and related hardware. The private industry conducts global survey of market potential, and if interested, it bids for supporting the scheme through development. It retains proprietary rights to manufacture and sell, while MOD retains limited intellectual rights and overriding authority in the national interest. Over the last decade, this policy appeared to have paid off—R&D scientists feeling intellectual freedom for adventure in ideas while, at the lower level, personnel find horizontal movement into the industry and back. The participation by private industry has led to extensive and intensive drive for export, quick reaction and response to the global needs.

5. Dogma vs Paradigm

One cannot help but notice that the Defence R&D in MOD is a vibrant organisation, self-critical (for example, Nimrod or Stingray), and yet responsive to changing circumstances, be it the Iran-Iraq war and its cessation, fall of the Berlin Wall and opportunities to enter the Eastern Block, or 1992 and the rush to gain a foothold in future, without being weighed down by dogma.

The shift in the objective of the organisation appears to lead to polarisation of the R&D activity into futuristic ideas and concepts. While the demand for run-of-the-mill engineers is falling, vision is held at a premium in R&D to conceive and demonstrate feasibility of novel schemes, and in industry to forecast and create markets. With rapid obsolescence in technology, experience is rapidly loosing ground to expertise and adaptability.

6. People

It is remarkable that the average worker is conscious of the forces of change and the willingness to adapt. While trade-unionism is still present, labour is not dogmatic. It fights for protection of the interest of the work force without hindering the progress and change. As the minimum requisites of good life in terms of sanitation, cleanliness, medical care, housing, etc are being met at high level, the system appears to be stable in moving towards greater prosperity without degenerating into anarchy. One may notice Trafalgar Square filled with discarded beer cans, icecream cones, festoons and balloons on the New Year Eve, but by next day morning the entire area is clean as if nothing ever had happened. Such a thing appears to be possible only when there is a universal demand for better things in life backed up by consciousness of the responsibility for the existing state of affairs.

7. The Reputation of R&D

I have attended some international meetings like oceanology international, underwater defence technology, and microelectronics, where a number of papers on contemporary work on equipment, weapons, simulators software, etc were presented by the members of private industry. Almost every author acknowledged that his work is either based on or is an extension of the work carried out by a scientist of the one or the other R&D establishments of MOD.