From: Sainik Samachar
Nov 12, 1967

SPEAKING PLANELY

By

V. SIDDHARTHA

Siddhartha is a former student of IIT Madras
He had his post graduate studies at the College of Aeronautics, Cranfield.
At Present he is at the Imperial College of Science, London.

******

Faced with rising costs and increased competition from the United States, the British Aircraft Industry which at one time supplied the western world with its civil and military aircraft, is in the doldrums. When the beautifully designed but inordinately expensive TSR-2 was cancelled by the Government because Britain could not afford it, the industry received a shock from which it has still to recover. Now questions are being raised about the economic viability of the Anglo-French 'Concord' Supersonic Airliner which has a three-year lead over its nearest American rival ! This year the Anglo-French variable geometry project was abandoned. In Europe, the German and French aircraft Industries are in none too happy a position. The European "Air Bus" project has had a rough time and has only just managed to limp to a slow take off. When a question mark hangs over the future of the British and European planemakers, what kind of future is in store for the small but technically competent Indian Aircraft Industry?

India has been a regular customer of British Aircraft, both military civil. Her Air Force is equipped with a very large number of British planes. Until recently, the Viscount has been IAC's workhorse on the trunk routes. The Indian Aircraft Industry has been, and still is, tied very closely to its British counterpart. Apart from the MIG divisions, Hindustan Aeronautics builds aircraft and engines to British designs. It is only since the Indo-Pakistan war that aircraft quality sheet aluminium is being manufactured at great cost in India. Even for the indigenously designed HF-24 and HJT-16 aircraft most of the ancillary components still come from Britain.

... From the ... 2/...

From the political, strategic and prestige points of view no self-respecting nation can afford to be dependent on another for its military aircraft for very long. The availability of replacements and spares becomes a political issue as the fighting with Pakistan amply demonstrated. Even when no restrictions exist, India has to pay an abominably high prices for spare parts. This is partly because Britain no longer makes some of the aircraft that India possesses and spares have to be specially made; and partly because the firms wish to make as much profit as they can and exploit the situation as monopoly suppliers. For example, a single plastic canopy for the Hunter costs Hawker-Siddley only about £ 100 to make while they quote nearly £ 1000 ! Furthermore, no manufacturer will take responsibility for the failure of a component if non-standard parts are used. Thus, while India is fully capable of making nuts and bolts for, say, the Martin-Baker ejection seat she must continue to import them because of the above restrictions.

The situation is somewhat better when aircraft and engines are manufactured under license. But here again one is constrained by a foreign design and the consequent inflexibility in material substitution. Also, foreign aircraft and engines are rarely designed to operate at peak efficiencies under tropical conditions. This fact is directly reflected in increased operating costs.

The key to the deterrent power of the Air Force is its ability to obtain early warning of an enemy's intentions through reconnaissance and to strike at his offensive forces from a distance in case of need. This role has been assigned to the Canberra since the 1950s. This aircraft cannot safely continue after 1970. Tinkering

... with the bomb ...3/..

with the bomb sights for low level work is but a temporary solution. The plane has its range reduced by two thirds if used continuously at low level. With the U.S. actively thinking of deploying an anti-missle system to counter a Chinese ICBM threat that is expected to materialise by 1975, the Canberra will be hopelessly obsolete by that date. The operational requirements for a Canberra replacement can be drawn up fairly readily. Minimum gust response for low level penetration in all weathers, speeds in excess of Mach 2 at altitude to avoid fighter defences, long range at low and high altitude, short take-off capability and so on. Britain spent so much money fulfilling these in the TSR-2 (Tactical Strike and Reconnaissance) that it would have cost her £5 million per aircraft for a production run of 110. Clearly, it is out of the question for India to attempt anything this ambitious and wasteful even if the aircraft were required only in the late-seventies. It is outside the scope of this article to speculate on the politico-economic problems associated with the possibilities of obtaining a Canberra replacement from the U.S. (F-111?) or the Soviet Union.

The alternative is to develop a missile-based air defence system. The advantage of developing missile technology is that, in peace time, the same missiles can be used for space research. Japan realised that the only way to catch up was to concentrate on certain aspects of advanced missile technology and to allow the fall-out to reach a wide spectrum of supporting industries. She is now on the threshold of launching her own sattelites at the almost ridiculously low figure of Rs 4 million per shot. The major problem in this area is not so much the development of the

... propulsion system... 4/...

propulsion system as the design and manufacture of the electronic guidance and control equipment.

The need to build our own military aircraft and missiles is fairly obvious. A start has been made with the HF-24 and the anti-tank missile. But this "obviousness" is dependent upon the external and internal political scene. A shift in foreign policy, a change of Government or a change in defence procurement policy can seriously disrupt an industry whose sole customer is the Air Force. We ought to learn from the experience of British Industry which, even when backed by large civil orders, has been dislocated by military cancellations.

More than 100,000 component parts go into one aircraft. A small 8 seat executive jet such as the Hawker Siddley HS.125 contains some 100 Km. of cabling, 810 different types of components, 1700 meteres of piping, 800,000 rivets and bolts, 950 square meters of sheet metal skinning, 13 tonnes of special steels and 33 tonnes of light alloy for the airframe and the whole thing is put together from some 25,000 drawings. Then there are the engines. Clearly, an Industry capable of making such an aircraft is a national asset. The technological fall-out from such an industry is felt far and wide. A whole host of industries benefit from the high quality precision engineering needed to build aircraft. The capability defines and improves the state of the art in the entire technological scene. India cannot afford to let such an exciting, glamorous and highly complex business as planemaking be at the mercy of political monsoons.

If the Indian aircraft industry is to grow, it must diversify and enter the civil market. IAC's order of 15 HS 748's

... placed with ... 5/...

placed with the Kanpur division is a good start.

The unity, cultural development and industrial health of a nation are directly related to the speed and efficiency with which she can transport her people and materials from place to place. A large percentage of India's people breed and die within 15 kilometers of the place of their birth. The economics of industrial location demand that plants be located where transportation costs of raw material, services and finished products are lowest; but in a developing economy evenness of distribution to avoid regional disparities is, in many cases, an overriding consideration. Extensive and costly road and rail networks have then to be built to feed these industries.

India enjoys perfect flying weather almost the whole year round. If she can crisscross her rural and semi-urban areas with an air network by the late seventies, she can jump decades of painful development and by pass the above necessity. But India cannot afford either the space or the cost of hundreds of airfields. The solution lies in the vigorous development and extensive use of the VTOL (Vertical Take Off and Landing) transport. Villagers and their produce can be transported quickly and efficienty from the farms to the distribution centres. A coverted transport can act as a highly mobile family planning clinic. VTOL promises a vast improvement in postal services. It will allow industries to be located further apart thus all eviating the problem of urban congestion.

VTOL is already a reality. Britain has pioneered in the VTOL concept especially in the development of the engines. Dornier of Germany has been working with Hawker Siddley on the Do 31 VTOL transport using Rolls-Royce RB. 162 lift-jets and the Bristol Sidd ...

... Pegasus vectored ...

Pegasus vectored thrust engine, which powers the worlds only operational VTOL fighter - the Kestrel.

VTOL is a genuine alternative to travel by rail or road. It offers a higher block speed (distance covered divided by time taken from standstill to standstill) than conventional aircraft because of the virtual elimination of taxying time. To equal the block speed of a Mach 0.7 VTOL transport on the Madras Bangalore hop, a conventional aircraft would have to cruise at Mach 2.0. The improvement in journey speed is even more dramatic. Because the VTOL transport can get close to the passenger, ground journey times and costs can be drastically reduced. The allowable noise level determines the penetration the VTOL transport can make into a city but assuming two suitable open spaces (of the order of a couple of acres each) can be found fairly close to the cities journey times on the above route can be halved. Passenger and baggage handling times determine the door to door journey time. It is pointless to build a fine aeroplane if at the end of it, inefficient terminal facilities delay and frustrate passengers. This and similar considerations in the integration of VTOL into the entire transportation system underline the necessity of adopting a 'systems' approach to the whole problem. An example is the systems analysis of in the densely populated North-East corridor of the US of short-haul air transport prepared by the Massechusets Institute of Technology for the US Department of Commerce.

How much will it cost? Development costs in India are still comparatively low. A study by the Advanced Projects Group

.. at HAL ... 7/...

at HAL indicated that the cost of developing and building four prototypes of the STOL type of transport including imported raw materials and imported engines would be in the region of Rs 150 million. Engines are more complex and require a greater lead time for their perfection. But remembering that India does not have to start from scratch, she can, with some well directed effort, produce a lift-engine of between 16 : 1 and 20 : 1 thrust-to-weight ratio in ten years at a development cost of around the same sort of figure (i.e. Rs 150 million). In Rs 300 million spread over 10 years too much to spend on something that promises to revolutionise transport in India ? Even if the above figure turned out to be an underestimate by 50%, it would be worthwhile. The export potential of such an aircraft would be very large. Depending on how closely it can meet individual customer requirements (for example, the planes sold to IAC, Middle-eastern and South-east Asian countries would require a different toilet design to the ones sold to the West) the industry can be sure of a production run topping 200 aircraft. This figure can be pushed even further if the armed forces at home and abroad have a requirement for a military version; a very likely possibility considering the terrain on our northern borders and in Indo-China and Africa. A production run of 200 would put the unit cost of an 80 seat VTOL transport of 343 kilometer range between Rs 10 and 12 million. It will cost India the equivalent of Rs 25 million a piece in dollars to buy similar aircraft from the United States assuming suitable ones exist.

The development of the VTOL transport will demand the establishment of advanced technological skills that span the fields of materials, structures, propulsion, electronics, systems, production and management. The fall-out from these will vastly improve the quality of India's engineering products and make available knowhow that is now imported at great cost involving precious foreign exchange. It will be on investment not only in an aircraft, but in a complete technology well suited to the needs of the 1980's.

In the next twenty years the world's demand for light aircraft (gross weight less than 5700 kilograms) is going to grow at a phenomenal rate. There will be an estimated 25,000 light civil and military aircraft flying by 1975. This is a field that India ought to have entered by now. With their uncanny ability to accurately gauge future demand, the Japanese have secured markets in the US. The first aircraft to be built in Japan since the war has been designed and built with export in mind. 133 Mitsubishi MU-2B's are to be sold in the US by the end of 1967. Markets are also being secured for the 60 seat YS-11's. In some ways Japan's aircraft Industry is less developed than ours but lack of imagination and guts has again robbed us of millions of dollars. It is still not too late to enter this vast market.

Already people in the US fly between nearby cities in much the same way as they would use a car. However, the automobile industry in the US is highly organised and aircraft have to compete with automobiles on more or less equal terms. The situation in India is very different. The automobile industry has hardly developed and most people travel either by rail or public road transport. The cost of a light aircraft like the Pushpak is about the same as that of a medium sized car and less than the prices some people are prepared to pay for imported cars

...In the ... 9/...

In the next twenty years many more people in India are going to be able to afford personal transport. If India can build large numbers of four or five seater aircraft using the latest in technology (Laminated plastics, all aluminium engines, metal bonding and the like) she can, by 1985, be on par with the industrialised nations of the world in being able to provide for her people the 'with it' transport of the day.

While high-speed surface transport will cover distances upto 50 kilometers, VTOL transport will handle upto eighty passengers over intermediate distances from 50 to 350 kilometers. What about the range between 350 and 2400 kilometers now being served by IAC's Caravelles? What kind of aircraft will IAC need by 1980 and will it need a sufficient number to make indigenous development and production a worthwhile proposition?

It is rather more difficult to gauge developments in this medium haul range. Only an airline has a true feel of the subtle relationships linking load factor, frequency, traffic growth, route density and sector distance. Consequently, only an airline can make a decision on the type of aircraft it will want. Nevertheless, one can see a general pattern in the rate at which IAC has been buying Caravelles and the growth of traffic on the Delhi-Bombay sector which has necessitated the introduction of a Boeing 707.

The tendency is to buy bigger aircraft which offer lower seat kilometer costs. An example is the Boeing 747 "Jumbo Jet" ordered by TWA to carry 400 odd passengers over intercontinental distances. The sort of aircraft that IAC will probably need by 1980 is a 190 to 240 seat 'air bus'. People will be a lot more airminded, especially after the introduction of the VTOL transport. With rapid industrialisation, air cargo will form a significant part of IAC's earnings. Inspite of these developments the number of aircraft IAC will need is not likely to exceed five or six. The armed forces will have (or can be made to have!) a requirement for a military version to be used as a transporter. One may thus estimate the internal market to be in the region of fifty aircraft. Clearly, this is too small a number to make indigenous development and manufacture an economical proposition, though it might be better to incur the expenditure in local currency rather than spend half the amount in foreign exchange.

The world market for this type of aircraft is expected to be extraordinarily large. Some US companies quote 1000 aircraft as the potential market in the 1980's. This is nearly equal to the entire pure jet fleet of the world's airlines in 1964. It is defeatist to argue that Boeing and Douglas have the market wrapped up anyway, so why even try? The technology that India develops to build these aircraft will define her ability to remain in the aircraft business in the 1990's when supersonic aircraft will be used for medium haul and hypersonic aircraft for intercontinental travel. But India cannot undertake both the VTOL and the air bus project. The solution: Collaborate.

Japan and the UAR are two countries that would be receptive to ideas in this direction. It will take courage, determination, diplomacy and the best technical and scientific talent, together with imagination and guts, to begin exploratory work on a joint Indo-UAR-Japanese air bus project capable of competing with the products of such giants as Douglas and Boeing.

The whole scheme sounds far-fetched and peripheral to India's immediate pressing problems but so did nuclear power way back in 1948. Unless we look beyond our noses and seriously investigate avenues leading towards the early establishment of capability in advanced technology there will be little hope of catching up. Planemaking, nuclear power and electronics are among the spearpoints of advanced technology and unless we nurture them, the present disparities in food, shelter and steel production will merely change to disparities in television sets, transportation systems, communication satellites and underwater colonies.

(By kind courtesy - Commastimes - Feb. 1967)

SM:RNM:August 7,1967