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A Carrier Force for the Indian Navy

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Which country added an aircraft carrier, a nuclear submarine, a squadron of long-range maritime patrol aircraft and two missile corvettes to its inventory in 1987-88? There are no prizes for the right answer, but many in the West are perplexed by India's growing maritime power and are overcome by a sense of the preposterous that a third world country should begin to assume what has traditionally been the "white man's burden."

India has possessed a million-strong army and a thousand-aircraft air force (respectively, the third and fourth largest in the world) for many years without attracting inordinate attention. Current efforts to bring her navy to an equal strength level are raising hackles in some quarters. This, perhaps, significantly indicates the implications of naval power. In this context, the question most often asked is: What is India's purpose in having two aircraft carriers and plans to build a third?

Before discussing the subject of a carrier force for a third world navy, I will establish the historical and geopolitical context of, and define a role for, the Indian maritime force. The carrier is a weapon system which evokes a great deal of controversy in India's political circles, as well as within the military establishment. We will examine the pros and cons of this debate in today's environment and the various choices confronting the Indian Navy, before offering some recommendations.

Centuries before Columbus sailed the Atlantic and Magellan crossed the Pacific, the Indian Ocean had become an active thoroughfare of commercial and cultural traffic. Indian maritime power was instrumental in the spread of Hindu culture through Southeast Asia to the South China Sea.[1] The decline of India's sea power by the 14th century was to a large extent responsible in the next century for the success of the European adventurers who began

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to arrive on her shores. The Portuguese arrived first, followed by the Dutch, the British and the French—all motivated by the lure of Oriental spice and specie, and aiming for the domination of India. Unlike other invaders who came overland, assimilation into the fabric of Indian culture and civilization was perhaps furthest from their minds.

That their country had been prey to centuries of invasions and conquests, and that final domination by an alien power resulted not from overland invasion, but by invasion across her shores, is a racial memory embedded in the Indian psyche. The thought processes of common men and intellectuals alike have been conditioned with a deep-rooted fear that the country faces an ever-present threat of losing its independence—whether the menace be military, economic or political.

Geopolitical Background

During the heyday of the Empire, when Britannia ruled the waves through the potent medium of the Royal Navy, the primary preoccupation of the British in India was with their next move in the "Great Game" designed to thwart the Russian Bear's progress towards the warm waters of the Indian Ocean. This British geopolitical thesis became unacceptable to the Indians after Independence. However, the still-perceived threat from the northwest and the north was proved accurate when the Chinese attacked in 1962. The "continental" bias of Indian thinkers, therefore, remained firmly entrenched in their minds till the 1971 war with Pakistan, when two demonstrations of the classical application of naval power dealt it a firm blow.

The first was a bold display of innovative planning by the Indian Navy, which brought the realization that the navy could make a significant contribution towards achievement of national aims. Off the coast of East Pakistan, naval air power from the task force led by the light-fleet carrier *Vikrant* not only interdicted Pakistani lines of communication and damaged air bases and other installations, but also established an effective blockade that prevented resupply and evacuation of Pakistani forces. This accelerated the capitulation of Pakistani forces, and India took 90,000 prisoners of war. In the West, attacks by missile armed surface raiders sank two warships and a merchantman off Karachi, the headquarters of the Pakistani fleet. A second attack with surface-to-surface missiles (SSMs) fortuitously set ablaze a huge fuel dump and played havoc with Pakistani morale.

In the second instance, the significance of naval power was rudely brought home to Indian strategists and politicians when President Nixon attempted to intervene in the war on behalf of Pakistan by despatching Task Force 74 to the Bay of Bengal. In the words of Henry Kissinger, "An aircraft carrier task force that we had alerted previously was now ordered to move towards

the Bay of Bengal, ostensibly for the evacuation of Americans, but in reality to give emphasis to our warnings to India against an attack on Pakistan."[2]

Nixon's deployment of the *Enterprise* task force was a somewhat ill-considered and ill-timed attempt at gunboat diplomacy. The Pakistani forces surrendered to India while the *Enterprise* was still on passage. The task force therefore had no impact on the course of events. The maneuver did, however, convince Indians that they had been subjected to an insulting piece of military blackmail with, perhaps, nuclear overtones. It helped, more than anything else, to solidify a consensus—both politically and militarily—that there was a need to insulate the country against externally applied pressures and laid a firm foundation for India's naval resurgence.

Stereotyped images are not easily dispelled, and even many Indians find it hard to believe the emerging realities of their country. The world's largest democracy has the second largest population, with a middle class of about 100 million earning more income than the average European.[3] India ranks amongst the ten greatest industrial powers in the world and has the world's third largest pool of scientists and engineers, right after the United States and the U.S.S.R. Many are engaged in the high-tech fields of nuclear energy, computer software, missiles, and shipbuilding. The country's 6 percent annual rate of economic growth over the past decade has been nearly double that of the United States, and the GNP is projected to rapidly overtake those of the United Kingdom, Federal Republic of Germany, and Italy in the next 30 years.[4]

When an Indian examines the prerequisites of geography, territory, population and national institutions stipulated by Admiral Mahan as affecting the sea power of nations against the background of these facts, he may well arrive at the reasonable conclusion that a strong Indian Navy not only has a *raison d'etre*, but is essential for the well-being of his country.

The Indian Navy's Mission

With Robert Clive's victory at the Battle of Plassey on 23 June 1757, the Indian province of Bengal fell to the British. The thin end of the wedge was in position, and this date is commonly accepted as the beginning of Britain's 190-year rule of India. Commenting on this historic event, Admiral Mahan remarks, ". . . it may be said that the foundation thus laid could never have been kept nor built upon, had the English nation not controlled the sea. The conditions in India were such that Europeans of nerve and shrewdness, dividing that they might conquer, were able to hold their own against overwhelming odds."[5]

Mahan's statement contains seminal wisdom which retains its relevance even today, albeit with some modification. The Indian subcontinent and its neighbourhood remain volatile and vulnerable entities because the nation

states there are prone to internal disorder and external interference. Her policy of "nonalignment" notwithstanding, the core values of the Indian republic, like democracy and religious freedom, are subject to direct and indirect external pressures. It is obvious that efforts to maintain stability amongst the region's nation states and to ward off threats to India's integrity must be backed by powerful military tools. To ensure that interlopers are never again given an opportunity to divide "that they may conquer," the seas must be secured—and the best tool for this is the Indian Navy.

Assets and Liabilities. The most prominent land feature of the Indian Ocean region (IOR) is India herself, a peninsula jutting two-thousand kilometers into the sea. This configuration brings nearly half of the IOR within a 1500-km arc from Indian territory. Two groups of islands, one off each coast, provide convenient locations for naval and air bases. In a strategic context, the implication is that military power can be projected by India's sea power over a wide swath of the IOR.[6]

Geographical location has given India one of the largest exclusive economic zones (EEZ) in the world (over two-million sq km). India is one of the six nations worldwide that is developing the technology of seabed exploitation. Once the ocean is ready to yield its bounty, India will have important commercial and economic assets to guard in the EEZ.

A burgeoning offshore oil industry generates 30 million tonnes of crude, which is adequate to meet 40 percent of the country's requirements—the rest comes from the Gulf and the U.S.S.R. India has a growing merchant fleet of over 6 million GRT. With 10 major and 190 minor ports, there is an active overseas trade which equals 25 percent of the gross national product and is virtually the country's lifeline.[7] A little-known fact is India's active exploration of Antarctica. Commencing in 1981, India has so far sent eight scientific expeditions and established a permanent base in Antarctica. Should the disposition of Antarctica's wealth become an issue, India will have growing interests to guard in this area too.

Sources of Tension. Having fought four wars (three with Pakistan and one with China) since Independence, India has now been at peace for 19 years. However, the *casus belli* of the past wars have not been removed, and regional tensions persist. Pakistan, considered to be India's primary adversary, is an ally of the United States and receives generous supplies of modern arms in the form of aid which continues in spite of the Russian withdrawal from Afghanistan and of a thinly disguised nuclear weapon programme. China has openly proclaimed its right to administer "lessons" by military means to its southern neighbours, and remains a source of concern to India. Although Chinese naval deployments to the Indian Ocean have been infrequent, that country's navy is a substantial force with a number of SSBNs and SSNs in

commission and must be taken into account in strategic calculations. A new factor in the region is the burgeoning strength of Saudi Arabia. Equipped with IRBMs, the AWACS, an air-to-air refuelling capability, and a long-range Tornado strike force, Saudi forces (or their friends) have the ability to reach the west coast of India. The recent events in Sri Lanka and the Maldives Republic have shown that India's interests lie in her ability to resolve regional tensions without superpower intervention.

The efforts of the Indian Ocean's littoral and hinterland states to eliminate superpower military presence from the waterspread have inevitably met with scant success. The United States and the U.S.S.R. are not likely to modify their policies to suit the convenience of a few third world countries, and the latter will have to learn to live with the reality that overt or covert pressure may be brought to bear in internecine regional quarrels and that the search for regional bases by both sides will continue.

Objectives and Capabilities. Against this backdrop, the naval tasks that emerge from the national objectives of protecting the country's vital maritime interests and of insulating its freedom of action from external pressures can be capsulized as follows:

- To exercise sea control in specified areas of interest in the Indian Ocean when required.
- To ensure freedom of navigation for shipping and safety of sea lines of communications.
- To safeguard interests in contiguous waters, exclusive economic zones, and island territories.
- To maintain capability for limited power projection.

Currently the largest force in the region, the Indian Navy is comprised of nearly 150 vessels of all types, including two aircraft carriers, 15 submarines, 5 destroyers, 28 frigates and corvettes, and a variety of amphibious, mine warfare, auxiliary, hydrographic and coastal forces. A large naval aviation element of 12 squadrons provides embarked and shore-based assets for strike, patrol, ASW, over-the-horizon targeting and other requirements. A substantial programme for building warships and submarines in the country is underway. The Indian Coast Guard, with its own establishment of surface ships, helicopters, and fixed-wing aircraft, would form a useful adjunct in war.

Deployed in two fleets—one off each coast—the navy has built up high levels of technical competence and seamanship, with the ability to operate at considerable distances for extended periods. The service, therefore, rightfully considers itself a "blue water" force and has the capability to deploy anywhere in the Indian Ocean as an instrument of national policy.

The Need for a Carrier Force

If India's navy aspires to exercise sea control or to project power, an essential prerequisite would be the domination of the airspace above and the capability to sanitize the depths below any part of the ocean which may be of interest at a given time. The tactical guided missile carried by a ship, submarine or aircraft exposes a major vulnerability of the surface combatant to which there is no cut and dried answer. Warning times are so small that decoys, electronic countermeasures, and hard-kill measures may prove ineffective. Advances in submarine and torpedo design have further undermined the surface ship's position. The conditions of high temperature and salinity in the Indian Ocean create unusual bathythermal conditions and make ASW a nightmare for ships with fixed sonars. Variable depth and towed-array sonars provide a marginal advantage.

The proliferation of aircraft, missiles and submarines in the IOR navies is already a fact, and it is evident that a surface force could operate in such a hostile environment only at grave peril. The sure countermeasure against a missile is to destroy the platform before it launches—and only a strike fighter can do this. The adversary that a submarine fears most is the ASW helicopter, which approaches with stealth to find and attack with impunity.

The answer to the dilemma of the surface force is air power, integral to the fleet and embarked on an aircraft carrier so that it is available round the clock in the farthest reaches of the ocean. Critics of naval air power often suggest that shore-based aviation can easily replace aircraft carriers.[8] These are the musings of armchair tacticians. Any navy which has operated with or tried to orchestrate shore-based tactical air support for naval units will know that the command, control and communication problems at even slightly extended ranges can be mind-boggling. The consequences of tying down a fleet to operate within shore-based air support range cannot be anything but disastrous.

Survivability and Affordability of a Carrier

Sitting Ducks? Perhaps the most contentious issue regarding carriers is their vulnerability to attack and the question of their viability after sustaining damage. One must start with the premise that the only certainty in a naval battle is that ships will be lost to enemy action. Admittedly a carrier is a high-visibility target of considerable value, but to demand invulnerability of any weapon system is to condemn it to oblivion. On the other hand, a carrier is not a patrol boat and its deployment must be guided with tactical skill in order to exploit its strengths and guard against its weaknesses.

A carrier can travel a distance of 300 nm or more between sunset and sunrise, and in that period can disappear anywhere in an ocean area of 27,000

sq nm. Before the enemy can attack the ship, he must find it. Of course, no object at sea which has a reasonable radar cross section can (yet) evade detection forever. However, by virtue of its size and the aircraft it accommodates, the carrier has more passive and active capability to counter a threat than any other ship afloat. As far as survivability is concerned, because of its larger volume, greater compartmentation, and inherent structural strength, the carrier can withstand far more missile or torpedo hits than any other type of warship and yet continue with its primary mission. This has been proved time and again, not only in World War II, but also off Vietnam.

Therefore, a carrier is not only difficult to find, but it can defend itself better than any other ship; if attacked, it has a tremendous capacity to absorb damage and to continue aircraft operations.

The Numbers and Economics. In 1961 India acquired the *Vikrant*, a 20,000-ton light fleet carrier, from the United Kingdom. It has been operating under the Indian flag for 29 years, initially with the Sea Hawk strike-fighter and subsequently with the Sea Harrier, from a 10-degree ski jump. In 1987 the country acquired a second carrier from the Royal Navy—the 30,000-ton Falklands veteran, HMS *Hermes*, and renamed her INS *Viraat*. This ship has a 12-degree ski jump.

The *Vikrant*, laid down in 1945 as the *Hercules*, is unlikely to last beyond the end of the century, and the *Viraat* for perhaps a further decade. In order to ensure the continuous availability of one carrier at all times. the IN requires at least three vessels of this type, which means that the first would have to be in service by the end of the century, with two more to follow in the following decade.

The purchase of the *Hermes* is understood to have cost under $100 million, which was a bargain price when compared to what an even modest current-day ship would cost. In 1978 it was estimated that a 35,000 to 40,000-ton carrier would cost in the region of a billion dollars to build in the United States.[9] While no firm figures are available, allowing for much lower labour and material costs, a "guesstimate" of $600-800 million may not be too widely off for the cost of building a similar ship in an Indian yard. Therefore, it is evident that rather than buying a carrier from a foreign builder, it would be more advantageous to build it in an Indian yard for economic reasons as well as the technological spin-offs that are bound to accrue. Bigger sums have been spent by the Indian government on military acquisitions ($3.3 billion on the Mirage 2000 deal for example),[10] but an expenditure of this magnitude on a controversial item is likely to provoke much debate in the country and therefore needs to be examined in a broader perspective.

The myth that defence expenditures retard developmental activities and that it is somehow immoral for a poor nation to spend on arms was shattered by the war with China in 1962, which made it obvious that India's

development could only take place within a secure environment and that a certain level of defence expenditure was inevitable. This level was pegged at about 3.5 percent of the gross national product, where it remained for the next two decades. Gradually a view emerged that the increased "aggregate demand" provided by defence taps idle resources in a developing country and promotes a national psyche that encourages saving and investment. Economic studies of countries such as Israel, Taiwan and South Korea show that high rates of defence expenditure are not only compatible with high growth rates, but may even contribute to the latter. Similarly, it is argued that although defence spending does contribute marginally to inflation, an inflation rate of 5-10 percent may be healthy for a country like India, because it draws money into productive ventures.[11]

Against this background it can be argued that in the case of large-scale defence spending on an indigenous project like carrier construction, not only will the shipbuilding and ancillary industries get a fillip, but benefits to industry and technology in the country will far outweigh any adverse economic effects.

The Options Available

Any navy considering the choice of a new aircraft carrier is initially confronted with basically two options. If it chooses to confine the carrier to VSTOL machines, then it can choose a simple design without flight deck machinery and keep it reasonably small in terms of size, weight and propulsion. If it is considering conventional aircraft, then a more complex ship with catapult and arresting gear and of a much bigger size overall must be contemplated.

For a small navy with a limited budget, both options have some merit and deserve consideration. In India's case, since the determination of ship size appears to be contingent on the nature of its aircraft, it may be logical to address that issue before returning to the subject of ships.

A survey shows that countries with small or medium-sized carriers in their naval inventories are limited in their choice of aircraft, because many of the more capable machines are so big and heavy that their operation would impose severe constraints on the smaller carriers. Often, aircraft from external sources which meet all other requirements are unavailable due to political considerations. In other words, even if a dramatic sea change in Indo-U.S. relations made it possible for the IN to obtain, for example, the F/A-18 Hornet, this might require a carrier bigger and faster than the one India is planning to build. On the other hand, Soviet state-of-the-art equipment has normally been available for sale to the Indian armed forces and therefore a brief examination of the new Soviet conventional (as opposed to VSTOL) carrier, *Tblisi*, is germane.

The* Tblisi *Experiment. For nearly half a century the Soviets scoffed at aircraft carriers as "sitting ducks," and the Red Navy relied on the *morskaya aviatsia* (shore-based aviation) for support at sea. It was only in the 1960s that the advent of the Polaris submarine prodded them to relent in their doctrinaire opposition and put organic aviation at sea. First came the ASW helicopter carriers *Moskva* and *Leningrad* in 1967-68, followed a few years later by the *Kiev*-class flat-tops carrying Yak-36 Forger VTOL interceptors. To Western observers it appeared that, having lagged behind so badly in the esoteric art of carrier aviation, the Soviets had decided to leapfrog a technological age and go down the VSTOL path in a big way.

However, the Forger, a complex three-engine machine, turned out to be far less capable than its Western counterpart, the AV-8A Harrier. Its lack of a short take-off capability (which made it merely a VTOL rather than a VSTOL machine) and its limited payload and endurance detracted substantially from its utility as a shipborne fighter. It also did not have the potential for supersonic performance, and it soon became obvious that the Soviets had backed the wrong horse.

It now appears that, if the reports of the *Tblisi* trials are substantially correct, the Soviets have made two fairly dramatic breakthroughs in a field where they are relative tyros.

Firstly, they have taken current models of land-based aircraft—the MiG-29, the Su-27, and the Su-25—and modified them for carrier operations. These modifications involve changes in aerodynamic configuration to reduce landing speed, as well as strengthening of the undercarriage, and include the addition of a tail hook for deck landing—all of which increase the weight of the aircraft.

Secondly, the Soviets have done away with a catapult and now use a moderately inclined ski-jump for the unassisted launch of heavy, high-performance aircraft.[12] It was previously believed that only VSTOL aircraft with thrust-vectoring ability could be launched from ski jumps.

It remains to be seen whether the modifications and consequent weight increase significantly detract from the capabilities of these aircraft. It is also not clear at what percentage of their maximum all-up weight the aircraft can be launched. Whereas a light aircraft using afterburner, a long deck run, and strong relative wind might leap off the ski jump with ease, a fully armed and fuelled machine might encounter difficulty. Moreover, with this system it appears unlikely that the carrier would be capable of simultaneous launch and recovery operations. It is obvious that the Soviets have some way to go before they have an operational weapon system in the *Tblisi* and her flying machines. Therefore, this option is not at present viable for the Indian Navy.

Aircraft Options. In view of the foregoing, the three options available to the Indian Navy at this moment are:

- The Indian Light Combat Aircraft (LCA) on the design board for the Indian Air Force, which is likely to fly in 1995.
- A VSTOL machine.
- The French Rafale "M" carrier-borne fighter.

Equipped with fly-by-wire controls, a phased array radar, and a U.S.-built General Electric F-404 engine, the LCA promises to be a very capable aircraft. However, it is still in the design stage, and the progress of such an ambitious project is likely to contain many elements of uncertainty. Moreover, it is well known that aircraft designed for shipboard use can be easily adapted for the air force, but the reverse is rarely true because exacting naval demands are often difficult to accommodate in an existing airframe (hence the scepticism about Soviet conversions). In view of this, it may be imprudent to base the ship's design on what is essentially a "dark horse."

At this moment there are only two VSTOL aircraft flying at sea—the British-built Sea Harrier and the Soviet Yak-36 Forger. The IN has been flying the far more capable Sea Harrier for eight years and is most unlikely to consider the Russian aircraft because of compatibility problems if nothing else. The Sea Harrier has often attracted criticism for its perceived lack of performance as compared to carrier-borne aircraft of the U.S. Navy and the shore-based aircraft of India's likely adversaries. Many who criticize its subsonic performance forget, or are unaware, that the pilot of a shore-based aircraft is most unlikely to use the supersonic regime 200-300 nm out at sea because of its exponential rise in fuel consumption. In the subsonic regime, the Harrier can more than hold its own as demonstrated against the Mirages and Skyhawks in the Falklands war. The IN is in the process of arming its Sea Harriers with the Sea Eagle ASM and the all-aspect Matra Magic II AAM. Also in the offing are performance improvements being offered in a mid-life update package. While the Sea Harrier probably will not attain supersonic performance in the foreseeable future, it certainly will remain the most capable machine available to medium navies for some time.

An advanced light combat aircraft designed by Avion Marcel Dassault for service in the next century with the *Armee' de l'Air*, the Rafale is also to equip the *Aeronavale* squadrons on board the new carrier *Charles de Gaulle*. Preliminary carrier trials have been carried out but much of the trials programme remains to be done. If concrete performance data and delivery guarantees can be obtained from the Avion Marcel Dassault and the French government, the Rafale appears to be a very suitable candidate for the Indian carrier.

Ship Options. Apart from the dimensions of the hangar, the size of the propulsion plant, and capacity of fuel tanks and magazines, the most important determinant of carrier design is the flight deck, whose size and configuration depend on the type of aircraft operations intended. It has been found

empirically that to operate all conventional high-performance aircraft, a deck length of 912 feet is the minimum required, and this would correspond to a displacement of about 60,000 tons. If heavier aircraft like the F-14 were excluded, the deck length could be reduced to 813 feet with the ship displacing about 35,000 to 40,000 tons. Lower down on the scale, a 650 to 700-foot deck would suffice for purely VSTOL operations and the ship would displace about 20,000 tons.[13]

In view of these aircraft options, it is obvious that the IN should be looking at only the following two ship options:

- Type A, the 800-foot/35,000 to 40,000-ton carrier equipped with catapults and arresting gear and capable of operating light and medium weight conventional aircraft.
- Type B, the 700-foot/20,000-ton ship fitted with a ski jump and capable of operating VSTOL aircraft only.

Since a ski jump and a catapult compete with each other for the same piece of flight deck, it would appear that the operation of VSTOL and conventional aircraft from the same ship is not feasible. However, if a ski jump is installed in the bows of the ship and the catapult on the angled deck, it may still be possible to operate both types, and this may represent a third option. However, there are likely to be design and operational constraints on such a model, which will need to be studied in depth before arriving at a conclusion.

If either the Indian LCA or the French Rafale appear to be firm prospects within a reasonable time frame, then the choice would obviously be the Type A carrier. Such a ship (not equipped with a ski jump) may perhaps be suboptimal for VSTOL aircraft, but these would then be on the way out. However, if uncertainty persists about the new aircraft, it may be prudent to stay with the Sea Harrier and its successor for some more time. In this case the first indigenous carrier can be a smaller Type B pure VSTOL ship with a ski jump and no flight deck machinery.

The Way Ahead for the Indian Navy

It makes sense for the Indian Navy to plan for the construction of three aircraft carriers over a period of 15 years, commencing in the early 1990s. It should conduct a study into the design and operational feasibility of a hybrid catapult/ski jump-equipped carrier. Should this appear to be a viable option, the first ship could be designed around this concept to operate VSTOL aircraft till a conventional aircraft becomes available, after which both or one type could operate from the ship.

Should the above option not be feasible, a choice will have to be made between a small VSTOL carrier or a larger conventional carrier. The decision will pivot on the availability of a light-weight conventional aircraft such as the French Rafale "M" or the Indian LCA. If the status of the aircraft remains

in doubt, the choice would be confined to a 700-foot carrier with a displacement of about 20,000-25,000 tons, built to operate VSTOL aircraft initially, which could be modified at mid-life for conventional aircraft. On the other hand, if the Rafale becomes available, the option changes to the larger 800-foot/35,000 to 40,000-ton ship equipped for conventional aircraft, but also able to operate VSTOL machines.

Whatever the option for the first carrier, the aim should be to change over eventually from VSTOL to more capable conventional machines. Similarly, when the carrier version of the Indian LCA comes to fruition, it should be assigned to supplement or replace the Rafale. A careful watch on the progress of Soviet developments will be necessary. If the operational deployment of the MiG-29 and the Su-27 from a ski-jump ship becomes a proven and viable proposition, the acquisition of these aircraft could be considered for the IN (the Indian Air force has been flying the Mig-29 since 1986).

Limitations of its VSTOL aircraft and the lack of an early warning capability at sea have for the past decade been used by crirics to castigate the navy's carrier-oriented strategy—two points that need ro be addressed here.

The IN has accumulated a high level of operating skills and tactical expertise in the area of carrier-borne operations over the past three decades. Today it possesses a substantial pool of personnel who are experts in all aspects of aviation at sea. Hardware is easy to come by, but expertise is a function of time, experience and much sweat and blood, as the Soviets will no doubt find out when they work up their new carrier. Criticism of the IN's decision to maintain an air capability at sea through the medium of VSTOL carriers, in spite of their limitations, has an element of validity. However, this was the result of a technology-gap which failed to produce more capable aircraft for small carriers. Technology is not static, and it is vital that the IN keep the art of carrier aviation alive through the means of VSTOL machines, if necessary, rill other options become available.

Lack of airborne early warning (AEW) support at sea is clearly a gap which needs to be filled by the navy to make its carriers more effective and to provide a safer environment for its surface forces. Fixed-wing aircraft, like the Hawkeye, may be too heavy to operate from smaller carriers. Perhaps a combination of helicopter-mounted AEW radar, radar pickets and combat air patrols offset in the direction of the threat may provide a partial solution. Integral AEW effort would eventually have to be supplemented by shore-based, long-range aircraft like the E3A Sentry or the Soviet IL-76 Mainstay.

A final vexing issue in the carrier debate is likely to be the propulsion plant of the proposed ship. Considerable expertise has accumulated in the country with respect to design and fabrication of nuclear power plants, and there is likely to be considerable lobbying, in both the naval as well as the nuclear establishments, in favour of nuclear propulsion for the new carrier. By

military criteria, the case for nuclear propulsion is fairly strong; the great saving in space and increase in speed and endurance are compelling reasons to adopt this course. However, nuclear propulsion is understood to add 30 percent to the acquisition cost of a carrier, and this alone is a powerfully negative factor.[14] The design and construction of a new carrier will pose a major challenge to India's shipbuilding industry. To this, the design, development, and operational problems of a nuclear plant will add many more imponderables that may jeopardize this pioneering venture. It would, therefore, be prudent to design the first ship around a gas-turbine plant and consider nuclear propulsion for subsequent ships.

India's history, geography, and population, as well as industrial and economic potential, predicate her position in the region. While talk of regional doctrines and spheres of influence would be anachronistic and inappropriate, India has certain legitimate and vital interests in the IOR, which she is bound to safeguard—by political and diplomatic means if possible, and militarily if forced to. In this scheme of things, a strong and capable Indian Navy is a vital factor.

As throughout the rest of the world, the Indian Ocean region has seen a great increase in the number of missiles, aircraft and submarines possessed by the littoral navies. In such an environment, the very survival of a naval force, leave alone the execution of its tasks, hinges on the availability of integral air power. Experience has shown that the only effective way of doing this is to have aircraft carriers at sea.

The Indian Navy has been a practicing adherent of carrier aviation for nearly three decades. As the service looks towards the turn of the century, it becomes obvious that its two vintage carriers will need to be replaced. For the navy to discharge any blue-water missions in its native ocean, it must have at least one deck available at all times to put air power to sea.

With a sound industrial base and a developed shipbuilding industry, it makes far more sense for India to build an aircraft carrier than to order one from a foreign yard or to buy one second hand. For economic and political reasons, India's options in aircraft acquisition, and hence carrier configuration, are limited and must be carefully considered before a final decision is made.

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13. Lehman, p. 60.
14. Lehman, p. 52.

Ψ

Landsmen often ask, "When do you say boat and when ship?" A captain I knew used to tell his passengers, "I think in the terms of fleas and their dog."

John G. Rogers
Origins of Sea Terms
Mystic Seaport Museum
1984, p. 19

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When war exists between two nations separated by the sea, it is evident that the one which invades territory occupied by the other takes the offensive, and that the instrument of offense is the arm which carries on the invasion, that is, the army. The navy preserves, and assures, the communications of the army. That the navy alone makes invasion possible, does not make it the invading force. That it alone makes the offensive possible, does not make it the offensive arm. That its own mode of action is offensive does not necessarily constitute it the offensive factor in a combined operation. In the joint action it takes the defensive. That, in pursuit of this defensive role, it takes continual offensive action whenever opportunity offers to destroy an enemy's ships, does not alter the essential character of its operations. It defends by offensive action, wherever its guns reach; but it defends.

Naval Strategy
A. T. Mahan (1911)
Little, Brown (1918), pp. 432-433