

The Science of Aircrafts in Ancient India with Special Reference of Bhāradvāja's *Vaimānikaśāstra*

Submitted by-

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Abstract

India is a land of fertile land in science and technology. Many great sages have written extensive literature on science and technology. Among them, the sage Bhāradvāja's *Vaimānikaśāstra* is a Sanskrit text on aeronautics obtained by automatic writing. In this book, Maharṣi Bhāradvāja says that, the Vimānas mentioned in ancient Sanskrit epics were advanced aerodynamic flying vehicles like rockets. The sage clearly mentions and acknowledges that references to Vimānas are to be found in a vast range of books belonging to different eras, starting with the *R̥gVeda*, *YajurVeda*, *AtharvaVeda*, *Rāmāyana*, *Mahābhārata*, *Mārkaṇḍeya Puraṇa*, *ViṣṇuPurāna*, *Bhāgavat Purāna*, *RahasyaLāhiri*, and *Samarangasūtradhāra*. This paper aims to discuss the whole aspects of the science of Aircrafts in Ancient India.

Key-words:- Vimāna, Vaimānikaśāstra, Bhāradvāja, Aeronautics.

Introduction

In our ancient Indian literature we find descriptions of the Vimānas which are described as being used by our ancient scholars thousands of years ago. Our great epics *Rāmāyana* and *Mahābhārata*, Vedas, *Śrīmadbhāgavata*, ancient historical texts like *Samarangasūtradhāra* of Bhoja deva and many other ancient literary works describe aerial chariots. These aircrafts are further described as being used by the kings, Ṛṣis to travel from one place to another, one country to another and one planet to another. Many great sages authored vast literature on science and technology. Of which sage Bhāradvāja's *Vaimānikaśāstra* is one of the most renowned and relevant texts, even during this technological peak of twenty first century. According to old Indian scholars, Nārada was the inventor of the first airplane. Nārada's vehicle is known as the "Dhekī". The shape of the *Dhekī* is long, thick and sturdy like an airplane. Scholars have referred to Nārada's *Dhekī* as the first aircraft. After that, as mentioned in the *Rāmāyana*, Rāvana used *Puspakavimāna*, which had been captured from Kuvera. However, Rāma took charge of this aircraft after killing Rāvana and used it to reach Ayodhyā along with Sītā, Lakṣmaṇa and others. *Gavopākhyāna* in *Mahābhārata*, also talks of using aircraft. Indian scientists and critics have a different opinion about judging the number of years of the aircrafts. They say that

aircraft was used extensively during *Rāmāyana* and *Mahābhārata* period indicating that aeronautics was a much developed branch of science by that time. It also points to the fact that aircraft was developed much before this period.

Aeronautics or *Vaimānikaśāstra* is a part of *Yantrasarvasva* of Bhāradvāja. This is also known as *Bṛhadvimanasāstra*. *Vaimānikaśāstra* deals with aeronautics, including the design of aircraft, the way they can be used for transportation and other applications, in detail. The knowledge of aeronautics is described in Sanskrit in 100 sections, eight chapters, 500 principles and 3000 Ślokas. Great sage Bhāradvāja explained the construction of aircraft and way to fly it in air, on land, on water and use the same aircraft like a submarine. He also described the construction of war planes or fighter aircraft. *Vaimānikaśāstra* explains how the use of certain metals and alloys and other materials can make an aircraft imperishable in any condition. Bhāradvāja in *Bṛhadvimanasāstra*, mentions Nārāyanamuni, the author of *Vimānacandrika*, Śaunaka, the author of *Vyomayānatāntra*, Garga the author of *Yantrakalpa*, Vācaspati the author of *Yānabindu*, Cakrayani the author of *Kheyānapradīpikā*, Dundinātha the author of *Vyomayānārkaprakāśa* and Lalla the author of *Yantrakalpataru* as the aeronautical scientists of Ancient India.

Definitions of Vimāna:

The word Vimāna originates from the Sanskrit words Vi-Mana, 'Vi' meaning 'Bird' and 'Māna' meaning 'like'. The interpretation will be 'like bird'. Owing to similarity with birds, it is named Vimāna. Bhāradvāja thus defines the word Vimāna:

Vega-sāmyātvimānoandajānām.(Verse no. 1)

(Owing to similarity of speed with birds, it is named Vimāna)

The word 'Andajā' means "egg-born" and includes eagles and other birds which fly by their own volition. The Vimāna is a vehicle which flies in the sky with speed comparable with birds - according to BodhānandaVṛitti.

That which can fly in the sky with speed equal to that of birds, is called Vimāna – according to Lallāchārya.

That which can speed on earth, on water, through air, by its own power, like a bird, is a Vimāna – according to Acharya Nārāyaṇa.

Experts in the science of aeronautics say, that which can fly through air from one place to another is a Vimāna– according to Sāṃkhya experts says that which can fly through air from one country to another country, from one island to another island and from one world to another world, is a Vimāna. The word Vimāna, though of purely ancient Indian origin, is widely adapted and used by not only writers on this science in India, but also extensively quoted as such by the researchers the world over. Basis of arriving at this definition is not

strange. Researchers on flying machines from other parts of the world have also looked at flying birds as their origin of inspiration and conceptualization. Ancient Indian scientists were no different in their approach.

The *Vaimānikaśāstra* is a Sanskrit text on Aeronautics obtained by psychic channelling and automatic writing. It makes the claim that the Vimānas mentioned in ancient Sanskrit epics were advanced aerodynamic flying vehicles, similar to a rocket. The interesting feature of Maharshi Bhāradvāja's rules is that he recalls various definitions of other Āchāryas or preceptors.

Maharshi Bhāradvāja refers to seven ācharyas connected with works on aviation science. Āchāryas name: Narayana, Shownaka, Vishwambhara, Garga, Vachaspathy, Chakrayani and Dhundinatha. He had consulted six treatises by six Different authors previous to him and he gives their names and the names of Their works in the following order : Vimāna Chandrika by Narayanamuni; Vyoma Yana Mantrah by Śaunaka; YantraKalpa by Garga; Yana Bindu by Vachaspati; KhetayānaPradeepika by Chaakraayani; VyomayaanarkaPrakasha by DundiNatha.

Science of Aircraft in Vedic times:

The *ṚgVeda*, the oldest document of the human race includes references to the following modes of transportation: Jalayān – a vehicle designed to operate in air and water; Kāra- a vehicle that operates on ground and in water; Tritala- a vehicle consisting of three stories; Trichakra Ratha– a three-wheeled vehicle designed to operate in the air; Vāyu Ratha- a gas or wind-powered chariot; Vidyut Ratha- a vehicle that operates on power. Also in the *Yajurveda* it is stated that “O royal skilled engineer, construct sea- boats, propelled on water by our experts, and airplanes, moving and flying upward, after the clouds that reside in the mid-region, that fly as the boats move on the sea, that fly high over and below the watery clouds. Be thou, thereby, prosperous in this world created by the Omnipresent God, and flier in both air and lightening”. *Kathasaritsāgara* refers to highly talented woodworkers called Rajyadhara and Pranadhara¹¹. The former was so skilled in mechanical contrivances that he could make ocean crossing chariots. And the latter manufactured a flying chariot to carry a thousand passengers in the air. These chariots were stated to be as fast as thought itself. The aircraft is classified into three types¹⁵- *Māntrika*, *Tāntrika* and *Kṛtaka*, to suit different yugas or eras. In kṛtayuga, it is said, Dharma was well established. The people of that time had the divinity to reach any place using their Aṣṭasiddhis. The aircraft used in Tretāyuga are called Mantrikavimana¹⁶, flown by the power of hymns (mantras). Twenty-five varieties of aircraft including PuṣpakaVimāna belong to this era. The aircraft used in Dvāparayuga were called Tantrikavimāna, flown by the power of tantras. Among many significant contributions of ancient Indian scientists, *Vaimānikaśāstra* is notably a towering work dealing with Vimānas and allied topics. As a subject, aviation has its own charm over other disciplines, even in these days. It is the firm view of many scholars that mere knowledge of Sanskrit or science or both plays little role in true understanding of such a work. The authors were intelligent to use coded terms, symbolic expressions, and archaic language to safeguard knowledge against falling into unauthorized hands. For right understanding, true flair in Sanskrit and science along with an expertise to decode and interpret with reference to context are the key. For the one hundred and ninetieth Ṛca (verse) of the *ṚgVeda* and the aeronautical treatise of Bhāradvāja mention that flying Machines came into full operation when the power of the sun's rays, mercury And another

chemical called *Nakṣarasa* were blended together. This energy was, it seems, stored in something like an accumulator or storage Batteries. The Vedas refer to eight different engines in the plane and Bhāradvāja adds that they are worked by electricity. Mr. Talpade carried on his research along these lines and constructed an Aeroplane. In his experiments he was aided by his wife, also a deep scholar of The Vedic lore, and an architect friend. The plane combined the constructional Characteristics of both “*Puṣpaka*” and “*Marut Sakha*”, the sixth and eighth Types of aircraft described by Bhāradvāja. Ancient Sanskrit literature is full of descriptions of flying machines –*Vimānas*. From the many documents found it is evident that the scientist-sages Agastya and Bhāradvāja had developed the lore of aircraft construction. The Agastya *Samhitā* gives us Agastya’s descriptions of two types of Aeroplanes. The first is a *chatra* (umbrella or balloon) to be filled with Hydrogen. The process of extracting hydrogen from water is described in elaborate detail and the use of electricity in achieving this is clearly stated. This was stated to be a primitive type of plane, useful only for escaping from a Fort when the enemy had set fire to the jungle all around. Hence the name, *Agniyāna* the second type of aircraft mentioned is somewhat on the lines of the parachute. It could be opened and shut by operating chords. This aircraft has been described as *Vimānadvigunam* i.e. of a lower order than the regular Aeroplane. Great sage Bhāradvāja explained The construction of aircraft and way to fly it in air, on land, on water and use The same aircraft like a sub-marine. He also described the construction of war, Planes and fighter aircraft.

Maharṣi Bhāradvāja was the great sage of ancient Indian Sanskrit literature, who wrote the *Vimānikaśāstra* which is one of the great literary masterpieces of all time. *Vimānikaśāstra* consists of nearly 6000 lines, or 3000 verses of lucid Sanskrit, dealing with the construction of *Vimāna* or aeroplane. The first principle of *Vaimānikaśāstra* defines an aircraft, ‘*vegasamyātvimānaaṇḍajānāma*’, which means *Vimāna* is the one which can fly in air like a bird. Subsequent principles explain the requirements for being a *Vimānādhikari* or pilot.

The pilot and the secret features of *Vimāna*:-

Having thus defined the name of the *Vimāna*, the sage proceeds to describe its details.

Rahasyagñyodhikāre. (Verse no. 2)

(The pilot is one who knows the secrets.)

According to Bhāradvāja, there are 32 secret techniques to fly an aircraft. One of the most distinct and attractive essence of *Vaimānikaśāstra* is its explanation of certain special operational features provided on *Vimānas*. Later in this presentation, the features and systems provided to operate the devices are discussed under ‘*Yantrādhikāraṇam*’. The pilot must know the structure of the aeroplane, know the means of its take off and ascent to the sky, know how to drive it and how to halt it when necessary, how to manoeuvre it and make it perform spectacular feats in the sky without crashing. Those secrets are given in “*Rahasya-Lāhari*” and other works, by Lalla and other masters, and are described thus: 1. Mantrikā, 2. Tantrikā, 3. Kṛtakā, 4. Antarāla, 5. Gūda, 6. Dṛśya, 7. Adṛśya, 8. Parokṣa, 9. Aparokṣa, 10. Saṁkosa or Contraction, 11. Viṣṭṛita, 12. Virūpakaraṇa, 13. Rūpāntara, 14. Surūpa, 15. Jyotirbhāva, 16. Tamomaya, 17. Pralaya, 18. Vimukha, 19. Tārā, 20. Mahāśabda

Vimohana, 21. Langhana, 22. Sarpa Gamaṇa, 23. Chāpala, 24. Sarvatomukha, 25. Paraāśabda Grāhaka, 26. Rūpākaraṇa, 27. Kṛyagrahaṇa, 28. Dikpradarāṇa, 29. Ākāśākāra, 30. Jaladarūpa, 31. Stabdhaka, 32. Karsana.

As the secrets of Aeronautics are indicated in the second sutra, the five atmospheric regions are referred to in the third sutra. According to Saunaka, the regions of the sky are five. Named, Rekhapatha, Mandala, Kakshya, Shakti and Kendra. In these 5 atmospheric regions, there are 5,19,800 air ways compressed by Vimānas of the seven Lokas or worlds, known as Bhūloka, Bhūvaḥloka, Swaḥloka, Mahaḥloka, Janaḥloka, Tapaḥloka and Satya loka.

Āvartāsaccha. (Verse no. 4)

Āvartās are countless in the above regions. Of them the whirlpools in the routes of Vimānas are five. In the *Rekhapatha* there occurs “Saktyāvarta” or whirlpool of energy. In Mandala – patha there occurs the whirlpools of winds. Kaksyaapatha there occurs Kiranāvarta or whirlpool from solar rays. In Sakti patha there occurs shytyāvarta or whirlpool of cold currents. In the kendrapatha there occurs gharsanāvartha or whirlpool by crush. Such whirlpools are destructive of Vimānas, and have to be guarded against.

The pilot should know these five sources of danger, and learn to steer clear of them to safety.

Angānyekatrimśat. (Verse no. 5)

(The parts are thirty one)

Just as the human body, if it is complete in all its limbs, is best able to accomplish things, the Vimāna, if it is complete in all parts, will be capable of functioning efficiently.

Yantu-Prāvaranēou Prīthak Prīthak Ritubhedāt. (Verse no. 6)

(The clothing should be different for different seasons)

The sutra defines the clothing which is to be provided to the pilot in accordance with different seasonal conditions. The impact of the Sun’s myriad rays on the revolving earth causes seasonal climate changes. Their effects on human life are either wholesome or unwholesome, as the case may be. The evil forces of the seasons are reckoned as 25 and affect the skin, bone, flesh, fat, muscles, nerves, joints and other parts of the pilot’s body. The clothing provided to them should be such as to safeguard against such effects and maintain their efficiency.

Āhārahkalpabhedāt. (Verse no. 7)

As stated in Kalpa Sutra, the food of the pilots is of three kinds, according to the seasons. “Āsana-Kalpa” or “Principles of Diet”. Says, during the spring and summer months, the pilot’s food should consists of buffalo milk among liquids, among grains ādhaka or tuvar dhal and among flesh, the flesh of sleep. In the 4 months of rains and autumn, cow’s milk among liquids, wheat and black gram among grains and flesh of cocks and hens. In the 4 months of winter and snow, goat’s milk among liquids, yava and black gram among grains, and flesh of sparrows. For pilot’s belonging to three *dwija* castes of Brāhmiṇ, Kṣatriya and Vaiśya, the food will not include flesh.

Types of Vimāna:

There are four types of Vimāna we've found in *Vimānikaśāstra*. These are –

Śakuna Vimāna: ŚakunādyāḥPañcāvīmśatKṛtakah.

In Kaliyuga, the kṛtaka or artificial Vimānas are said to be 25. Their names are given below as indicated by sage Gautama : Śakuna, Sundara, Rūkmaka, Mandala, Vakratuṅḍa, Bhadraka, Rūcaka, Virājaka, Bhāskara, Gajāvarta, Pauskala, Virāncikā, Nandaka, Kumuda, Mandara, Haṁsa, Śukāsyā, Saumyaka, Kṛauñcaka, Symhikā, Pañcabāna, Auryāyana, Puskara and Kodanda.

These 25 Vimānas are to be made of Rājaloḥā metal only. In manufacturing artificial aeroplanes the best of metals are those known as Osmapā or heat resisting metals. Out of them the variety known as Rājaloḥā or king of metals is most suited to Śakuna and other Vimānas.

The parts of *Śakuna Vimāna* are – Pētha or floor board, hollow mast, 4 heaters, air suction pipes, water jacket, oil tank, heater, steam boiler, electric generator, direction indicating banner etc. The construction of vimāna are – the floor board or base should be made of levelled Rājaloḥā sheet, shaped quadrangular, circular, or cradle shaped. The weight of the pētha should be one hundred of that of the plane and its width should be half of the height of the Vimāna. In the centre of the pētha the hollow mast should be fixed with screw joints.

Sundara Vimāna: The second types of Vimāna is Sundara Vimāna. It has got 8 constituent parts. First pētha or ground plate, smoke chimney or nālastambha, 5 gas engines or Dhumodgamayantra, bhūjya metal pipe, wind blower, electricity generator, four – faced heater and Vimānanirṇaya or outer cover.

The Pētha or ground plate should be made of Rājaloḥā metal only. It should be square or round and of 100 feet in circumference, or any other desired size. It should be 8 feet thick. Nālastambha should be 56feet high, and 4 feet in diameter. For storing gas, as its base, A 8feet long circular and 4feet high vessel should be provided. A 4 feet size oil tank should be fixed as its corner.

Rūkma Vimāna: This Vimāna is of golden colour. Therefore it is called RukmaVimāna. Rukma means gold. The Rukma should be made out of Rājaloḥā only. By duly processing Rājaloḥā can be made to assume golden colour. That metal should be used for the Vimāna. Rājaloḥā is pure, golden colour, tensile and mild. The Vimāna, made out this lohā or alloy, will be very beautiful and delightful.

Lallacārya says, in order to make the Vimāna change its course from one path to another or one direction to another, revolving keelakas should be on the eight sides of the Vimāna. Two keelakas should be made, pūrva and apara or right and left side. They should be fitted together.

Tripurā Vimāna: This Vimāna has 3 enclosures or Āvaraṇas or tiers. Each Āvaraṇa is called “Purā”. As it consists of 3 āvaranas it is called “Tripurā” Vimāna. It is operated by the motive power generated by solar rays. The Vimāna which naturally can travel on land, sea, and in the sky by alteration of its structure is called *Tripurā Vimāna*. It has got 3 parts. The first part can travel on land. The next part can travel under and over water. The third part travels in the sky. By uniting 3parts, the plane can be made to travel in the sky. The plane

is divisible into 3 parts so that it might travel on land, sea, or air. The construction of the 1st part is now explained. Tripura Vimāna should be made out of Trinetra metal only.

When the Vimāna has to move on the ground, the electric current is switched on the electric motor in the hub of each wheel, thus causing the rim to revolve and move the Vimāna. But when entering water the wheels are drawn in by the movements of toothed segment and the pinion, the latter being resolved by an electric motor attached to the shaft. The openings in the bottom of the Vimāna are closed by the sliding covers moved by the rack and pinion arrangement, the pinion being worked by an electric motor.

Conclusion:

Among many significant contributions of ancient Indian scientists, *Vaimānikaśāstra* is notably a towering work dealing with Vimānas and allied topics. As a subject, aviation has its own charm over other disciplines, even in these days. It is the firm view of many scholars that mere knowledge of Sanskrit or science or both plays little role in true understanding of such a work. The authors were intelligent to use coded terms, symbolic expressions, and archaic language to safeguard knowledge against falling into unauthorized hands. For right understanding, true flair in Sanskrit and science along with an expertise to decode and interpret with reference to context are the key. The description of the Aircraft or sciences of Aeronautics in our ancient texts are real and the case of our contribution of our ancient scholars to our society is highly appreciable. We do have sufficient proof to the existence of ancient Vimānas and understand how the technology prevalent during ancient era was wiped off as the eras passed by. But with the available literature we understand that they have described wonders which our current scientists and researchers need next hundred years to bring it to reality.

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