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Public-Private Partnership In The Infrastructural Development Of Domestic Water Aerodromes For Seaplane Operations In India

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Introduction

The important element of aviation in popularity of the seaplane can be traced to a combination of operational, performance and economic characteristics which can revolutionize the nation's regional connectivity to remote locations. As airports and airlines are economic engines for a nation, likewise water aerodromes and seaplanes are pivotal to remote regional connectivity, remote access, tourism, search and rescue operations. India being endowed with a lengthy coastline of 11098.91 km[2] can be used at an optimum level including the establishment of water aerodromes and the seaplanes paving way for a new way to travel with huge impetus to tourism, allied sectors and employment.

Taking the advantage of establishing water aerodromes in India, the author tries to focus for a speedy infrastructural development of water aerodromes through the initiative of Public-Private Partnership (PPP). The said PPP has proved beyond reasonable doubt in establishing the world class airports in India through its Greenfield and Brownfield airports in India in Hyderabad, Bangalore, New Delhi and Mumbai and also in many sectors like the national highways, energy sectors etc.

This research paper will focus on various areas like introducing the concept of Public-Private Partnership through its various mechanisms in establishing the "water aerodromes"; regulatory framework; emerging legal issues and the challenges ahead along with suggestions and conclusion being derived after a thorough study on the infrastructural development of domestic water aerodromes for seaplane operations in India.

Significance of Indian Coastal line

Coastal areas stand as an invaluable resource providing numerous goods and services to humanity since ages and sages. However, India has a significant coastal line on States and Union Territories measuring a total length of 11098.91 Km[3] from Gujarat to Pondichéry along with Lakshadweep Islands and the Andaman & Nicobar Islands. Primarily, the coastal areas play an important role in its ecological significance with diverse ecosystems; habitat and nursery grounds; natural defences; water quality; secondly; focussing the economic importance it keeps pace with tourism; fishing industries providing food and livelihood to coastal communities; facilitates trade and transportation; extraction of mineral and non-mineral resources like the oil, gas and the salt; thirdly; the blue economy relating to marine and coastal resources, sustainable tourism, fisheries and aquaculture.

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2 https://surveyofindia.gov.in/webroot/UserFiles/files/Length%20of%20Coastline%20of%20India.pdf (visited on 13-01-2024).

3 *Ibid.*

Historically, coastal areas have become preferred locations for human settlement as was witnessed in the past by various kingdoms settling at the coast and even the then Britishers used the coast as a means of trade and transportation. The coast serves as a livelihood for many settled at the coast. Many sports are conducted as a matter of recreation and leisure such as swimming, surfing and boating. Focusing the energy; coastal areas stand for conventional energy resources like the shale deposits along the coasts of Gujarat, Tamil Nadu and Andhra Pradesh; and the unharnessed deposits of rich methane hydrate at Krishna-Godavari (KG) Basin; secondly; a potential point for renewable energy like the wind energy; solar energy; tidal energy and the Ocean Thermal Energy Conversion (OTEC).

Exploring the coastal areas, India has mineral resources like the monazite sands and also include several critical minerals vital for India's nuclear energy security like the titanium minerals, zirconium and rare earth elements (REEs) etc. The Indian coast contains the good food resources rich in protein are being exported and sea weeds for food and fertilizers. Finally, the coasts stand for their beautiful beaches entertaining the entertainers through tourism and adventure sports. However, coastal areas are prone for threats like uncontrolled coastal development; sea level rise; pollution; over-exploitation of resources and natural disasters.

Length of Coastline of India[4]

The State-wise/UT-wise 'Length of Coastline of India' are hereby mentioned below:

Sl. No.	State/Union Territory	Coastline Length (In Km)
1	Gujarat	2340.62
2	Maharashtra	877.97
3	Goa	193.95
4	Karnataka	343.30
5	Kerala	600.15
6	Tamil Nadu	1068.69
7	Andhra Pradesh	1053.07
8.	Odisha	574.71
9	West Bengal	721.02
10	Daman & Diu	54.38
11	Pondichéry	42.65
12	Lakshadweep Islands	144.80
13	Andaman & Nicobar Islands	3083.50
	Total Length of Coastal Line:	11098.81

Concept of Public-Private Partnership

The concept "Liberalisation, Privatisation and Globalisation" (LPG) of 1990's has brought a sea change in the dynamics of economy for every nation, globally. The barriers or the restrictions were liberalised by

[4] https://surveyofindia.gov.in/webroot/UserFiles/files/Length%20of%20Coastline%20of%20India.pdf (visited on 13-01-2024).

which every State got an opportunity to trade with the other nation. The said LPG was introduced through "Public-Private Partnership" (PPP) which invites the private party to invest capital due to the budgetary constraints on the part of the government. Private party was given an opportunity to be partnered with the State as the private party has a potential of capital; technical know-how; application of advanced technology and the personnel having the managerial skills in implementation of the projects and finally, within a time-frame the projects are completed by the Project Company, globally.

Definition of PPP

"PPP means an arrangement between the central, a statutory entity or any other Government-owned entity, on one side, and a private sector entity, on the other, for the provision of public assets or public services or both, or a combination thereof, through investments being made or management being undertaken by the private sector entity, for a specified period of time, where there is predefined allocation of risk between the private sector and the public entity and the private entity receives performance linked payments based on performance standards"[5].

"PPPs broadly refer to long-term, contractual partnerships between the public and private sector agencies, specially targeted towards financing, designing, implementing and operating infrastructure facilities and services that are traditionally provided by the public sector"[6].

"PPPs are a mechanism for government to procure and implement public infrastructure and/or services using the resources and expertise of the private sector. Where governments are facing ageing or lack of infrastructure and require more efficient services, private sector partnership can help foster new solutions & bring finance"[7].

"PPPs are a tool that help governments leverage the expertise and efficiency of the private sector, raise capital, and spur development. They also help allocate risk across the public and private sectors to where it can best be managed and ensure that resources are wisely distributed in addressing the most urgent development needs"[8].

Main Object of PPP

The main object is that, In order to gain efficiency, financial security, and the traditional procurement of public infrastructure, has paved way in inviting the private sector to assume responsibility for performance of the project

Principle Aim of PPP

The principal aim is that, as the State has to focus on core functions, the private party is given an opportunity to provide infrastructural services to the public sector under the concept Public-Private Partnership applying the relevant mechanism like the Built-Operate-Own-Transfer (BOOT or the Built-Own-Transfer (BOT).

5 Manual for Procurement of Goods, 2017, Department of Expenditure; https://doe.gov.in/files/manuals_documents/Manual_for_Procurement_of_Goods%202017_0_0.pdfhttp http//www.pppinindia.gov.in/report/Book%20Reference%20Guide%20for%20PPP.(visited on 21-01-2024).

6 Asian Development Bank; https://www.adb.org/site/public-private-partnerships/overview. (visited on 12-01-2024).

7 World Bank, https://ppp.worldbank.org/public-private-partnership/# (visited on14-01-2024).

8 International Finance Corporation, https://www.ifc.org/en/what-we-do/sector-expertise/public-private-partnerships.

Mechanisms under PPP

The said PPP consists of several types of mechanisms applied for infrastructural activities through and among them a few are; Operation and Maintenance (OM); Design-Build-Finance-Operate-Maintain-Transfer (DBFOMT); Build-Own-Operate (BOO); Buy-Build-Operate (BBO); Build-Operate-Transfer (BOT); Built-Operate-Own-Transfer (BOOT); Developer Finance (DF); Enhanced Use Leasing or Underutilized Assed (EUL/UA); Lease-Develop-Operate-or Build-Develop-Operate (LDO/BDO) and Hybrid Annuity Model (used in India).

PPP Initiative in India

In India, PPP was applied for the development of Aviation industry by which India was able to witness the world class airports classified into Greenfield International Airports (the Hyderabad and the Bangalore International Airports) and the Brownfield International Airports (the Delhi and Mumbai International Airports). A wide range of other sectors also had an opportunity of development through PPP in the sectors like the infrastructure (particularly transportation, which focussed on roads and highways; railways; ports; airports; transport; healthcare, power etc.); secondly, the energy sector focusing on the power generation and its distribution; and thirdly; social and commercial infrastructure focusing on education; healthcare and urban regeneration.

Importance of Water Aerodromes

The world has witnessed the primary modes of transport which includes, road, rail, air and water transport (maritime). Later, intermodal transport, seaplane operations and space transport were brought under the umbrella of "transport". The said water aerodromes-seaplanes will prove to be the "third means of travel"[9] in future. As this topic of researach is based on the infrastructure of water aerodromes through PPP, it was felt that the water aerodromes-seaplanes have key importance for a country like India, where remote areas can be accessed through the seaplanes. The said seaplanes can become the best transport system for those areas which are geographically isolated. Many benefits can be derived with the initiation of seaplanes in India for example, water sports, entertainment, tourism, water ambulance, disaster relief, emergency evacuations etc. The seaplanes prove economically for the developing States. Taking an example from Russia, China which cater five lakhs' passengers annually, use seaplanes[10]. Secondly, Indonesia recognizes the water aerodromes and seaplanes catering the connectivity with people and places.

Definitions of Water aerodrome

A defined area, primarily on water, intended to be used either wholly or in part for the arrival, departure and movement of seaplanes, and any building and equipment on ground or water[11].

'Water Aerodrome' shall mean a designated area for landing and take-off of seaplane(s) where scheduled and/or non-scheduled commercial seaplane operations can be permitted as per DGCA regulations and applicable law[12].

Historic Perspective – Seaplanes

The successful story of aviation started by the two bicycle shop owners known as the Wright brothers, Orville and Wilbur the then pioneers in aviation invented the first successful "airplane" in the year 1903. Their efforts in aviation started in the year 1899 which has led to the invention of the airplane. Later on, they were named as the "seaplanes"[13].

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9 Third means of Travel mean; because they offer a unique and often overlooked alternative to both land-based air travel and water transport. 27-01-2024).

10 https://unitingaviation.com/news/safety/anc-talks-water-aerodromes/.(

11 ICAO's Asia Pacific Regional Guidance on Requirements for the Design and Operations of Water Aerodromes for Seaplane Operations.

12 Para 1.4.1.30 of Guidelines for Seaplane Operations in NSOP under RCS-UDAN.

13 https://hartzellprop.com/history-of-seaplanes/ (visited on 14-01-2024).

Internationally, the successful stories of seaplanes started in the year 1910 in Marseilles, France and later the dynamics of seaplanes played a vital role because seaplanes don't require runways and this had led seaplanes to access connectivity to remote areas. In India, the first seaplane was launched in the year 2010 and later the UDAN Regional Connectivity Scheme was introduced.

Definitions of Seaplane

A seaplane is a fixed-wing aeroplane designed for taking-off and landing on water. There are two types of seaplanes; flying boats[14] and floatplanes[15].

"The carriage of passengers by a non-scheduled operator's permit holder may be performed on per seat basis or by way of chartering the whole aircraft on per flight basis or both. There is no bar on the same aircraft being used for either purpose as per the requirement of customers from time to time. The operator is also free to operate a series of flights on any sector within India by selling Individual seats but will not be permitted to publish time table for such flights. Operation of revenue charters to points outside India may also be undertaken as per paragraph 9.2.[16]"

Role of Ministry of Civil Aviation (MoCA)

The government after witnessing the feasibility and viability of seaplane operations in India, and to boost the economy, connectivity and tourism at various regions at coastal India, the MoCA through its agency the Airports Authority of India (AAI) proposed potential locations for setting up of water airports or water aerodromes and hence the government approved flights for six water airports[17] in Andaman and Nicobar Islands and Lakshadweep Islands in 2019, awarding various routes for seaplane operations under its UDAN[18] 4.0 scheme[19]. A total of 10.6 lakh scheduled flights carried a total of 153.7 million scheduled passengers during the financial year 2023-2024.[20] As the government witnessed a 13% growth in scheduled passengers[21] and also recognizing the immense potential of seaplane operations to tap into the vast coastlines, undertook the revival of unserved and underserved airports under which two Water Aerodromes had a place of development.

Incentives for Airlines

In India, the infrastructure projects are funded and supported financially known as Viability Gap Funding (VGF)[22] by the Government of India even if the project is economically unviable. The whole object of VGF is to give scope to a private party to invest capital in the said project. Many incentives are provided by the government(s) like bearing of VGF by UT administration; two percent excise duty on aviation turbine fuel (ATF), one percent reduction of VAT to 1% for ten years from the date of notification; provision free-land; security and safety; and extension of additional support in cases of marketing etc.

14 A flying boat is a fixed-winged seaplane with a hull allowing it to land on water that usually has no type of landing gear to allow operation on land.

15 Floatplane uses a purpose-designed fuselage which can float, granting the aircraft buoyancy.

16 Para 2.4 of the CAR, Section-3, Air Transport, Series-C, Part-III,

17 Andaman and Nicobar Islands (Hutbay; Long Island; NeilIsland; Havelock) and Lakshadweep Islands (Minicoy; Kavaratti).

18 UDAN-01 (2017: Awarded 128 flight routes to 70 airports); UDAN-02:2018: Announced 73 underserved/Unserved airports); UDAN-03: (2019: Introduced Tourism Routes includes Seaplanes); UDAN-04: (2020: Focused on NER; Hilly States, and Islands, added Helicopter/Seaplane Operations; UDAN: 5.0 Series 2023-2024: Removed Distance caps, ensured affordability).

19 https://pib.gov.in/Pressreleaseshare.aspx?PRID=1595633.(visited on 28-01-2024).

20 Ministry of Civil Aviation, Annual Report, 2024.

21 *Ibid.*

22 Administered by the Department of Economic Affairs, Ministry of Finance.

Benefits of Seaplane Operations

The seaplane operations will boost employment at local areas and also tourism and hotel business and finally it enhances the infrastructural development of water aerodromes at various areas of the coastal line in India.

Concessions Offered to Water Aerodromes Operators

The operators of water aerodromes are offered concessions to operate seaplanes under the Regional Connectivity Scheme (RCS) Flights like non-levy of charges pertaining to landing charges; parking charges; aviation security fee, user development fee and the like; opportunity is given to designated airline operators to undertake ground handling of RCS flights etc.,[23].

Regulatory Framework

International

The Chicago Convention 1944 lays down the foundation principles for international air travel. Article 3 speaks of civil and State aircraft and whereas Article 8 defines pilotless aircraft. The term water aerodromes and seaplanes haven't found place in the said Convention 1944. But ICAO's Annex 14 does not differentiate between land and water as a surface from which aircraft can operate; and Annex 14 defines that an aerodrome can be an area of land or water. The criteria for certification of water aerodromes differ from that of airports on land and its operation of seaplanes. Relating to safety management systems, it remains same for airports on land and water aerodromes on water.

However, the ICAO, under its Asia Pacific Regional Guidance[24], had laid down some specifications water aerodromes and seaplanes; focussing on facilities, services and equipment. Hence, pertaining to water aerodromes, their design and operations include primarily the certification of water aerodromes; secondly; water aerodrome data which focuses on data quality requirements; thirdly; the geographic data pertaining to geometric centre; elevation; magnetic variation; navigational aids; fourthly; water aerodromes dimensions and related information i.e., water runways; turning basins; taxi channel; shore facility; obstacles in the vicinity of the water aerodromes; marking of water runways; hazardous areas; provision for operational information which include high/low water depth; water currents; information on water runways etc.

The physical characteristics of water aerodromes consists of water runways i.e. length, width of water runways; water depth; taxi channels; mooring areas; and shore facilities. However, during the operations of water aerodromes, obstacles will be confronted where objects may project into the water aerodromes by which it must be curbed. and finally visual aids for navigation like wind direction indicator, markings, signs, strobe lights etc., and finally the wild life; like birds on and in the water aerodrome vicinity poses a serious threat to seaplane operational safety, and hence, its hazards are to be reduced.

ICAO's Response to Water Aerodromes and Seaplanes

The ICAO under Annex 14 lays down the rules relating to aerodromes[25] but makes no difference between land and water for operation of aircrafts. Even though the specifications like design and operation under Annex 14 pertaining to facilities, services and equipment, are meant only for the land aerodromes but not for the water aerodromes. Hence, the water aerodromes in Asia, are governed by the Guidance Material[26]

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[23] Refer: Airports Authority of India, Charges for Airports and Air Navigation Services.

[24] ICAO's Asia Pacific Regional Guidance on Requirements for the Design and Operations of Water Aerodromes for Seaplane Operations.

[25] https://store.icao.int/en/annex-14-aerodromes. (visited on 25-01-2024).

[26] Asia Pacific Regional Guidance on requirements for the Design and Operation of Water Aerodromes for Seaplane Operations.
https://www.icao.int/APAC/Documents/edocs/APAC%20Guidance%20on%20WA%.
20for%20Seaplane%20Operations.pdf. (visited on 15-01-2024).

approved by the ICAO, Asia. However, Annex-6 lays down the rules pertaining to operation of aircraft which includes "seaplanes"[27].

International Maritime Organization (IMO)

IMO was established in the year 1958 with an object to promote safe and security[28], a sound environment, and a sustainable shipping. IMO recognizes some similarities vis-à-vis ICAO. Legal issues relating to shipping, its liability is dealt by the IMO. IMO being a UN technical organization has its regulatory framework on the navigation of vessels, with relevance to seaplanes and Wing-In-Ground (WIG) craft etc. Among the various technical committees, Committee for Water Aerodromes will function as the Maritime Safety Committee (MSC). The said MSC, work for the navigation communication, search and rescue a universal function that can also apply to water aerodromes. However, IMO believes that the States have an obligation to frame rules and regulations for the said water aerodromes, but must be in consonance with global standards.

National

In India, the Ministry of Civil Aviation is accountable for overall activities run by the civil aviation sector, which includes, air transportation; airport development; establishing Greenfield airports; Brownfield airports; airport infrastructure; bringing into various policies, schemes, rules, regulations, etc., for the growth and efficiency in working of the aviation industry at large, in India. DGCA also plays an important role in registration, licencing etc. Adhiniyam, 2024); Aircraft Rules 1937; Airports Authority Act, 1994 (Amendment Act, 2003), and the relevant Civil Aviation Regulations (CARs) etc.

Every country's economic development is based on aviation industry. And in turn, the aviation industry denotes that unless an airport or the so-called world-class airport whether it may be a greenfield airport or a brownfield airport is established, no airliner whether domestic or international can do the business in carrying air passengers by using the various freedoms of air linked with an international airport. Hence, airlines are dependent on a well-established airport. Focusing on the flights, they are classified into two; (i) scheduled air services[29] and (ii) right of non-scheduled flight[30] under the Chicago Convention 1944.

Focusing the, water aerodromes and the seaplanes, the government issued temporarily some guidelines[31] for seaplane operations in Non-schedule Operator Permit (NSOP). The said guidelines facilitate seaplane operations under the Regional Connectivity Scheme (RCS-UDAN) by "simplifying regulations" and promoting safety. These guidelines extend to Viability Gap Funding (VGF) to seaplane operations also.

In India, seaplane routes have been awarded at fewer places under the UDAN Scheme. To operate the said seaplane, one has to take a permit under Scheduled Operator or Scheduled Commuter Operator (SCO). And it also states that, such flights could be undertaken only from a licensed water aerodrome. As for the first time in India, two water aerodromes were developed in Gujarat at Ahmedabad and Kevadia, under NSOP guidelines by providing connectivity through seaplane operations operated by M/s SpiceJet, depriving the residents of other places at other coasts of India, the benefits of connectivity through the establishment of water aerodromes.

Infrastructure and Water Aerodromes

Indonesia is country that has a total 17,508 islands. Indonesia's water aerodromes infrastructure connects remote areas and advocates for international standards in operation. However, it does have challenges relating to registration, certification and safety of water aerodromes. It's infrastructure includes pontoons

27 Part I-International Commercial Air Transport-Aeroplanes Eleventh Edition, July 2018.

28

29 Article 6, Chicago Convention 1944.

30 Article 5, Chicago Convention 1944.

31 Guidelines for Seaplane Operations in NSOP under RCS-UDAN, Dt. August 22, 2024.

or mooring buoys for a stable platform for docking the aircrafts; embarking and disembarking made easy; has support structure which includes control towers, hangers and terminals. It includes ramps and equipment making connectivity easy by serving the purpose of recreation allowing tourists to access remote destinations.

Illustrations of Water Aerodromes

Indonesia: Indonesia is country that has a total 17,508 islands. Indonesia uses seaplanes where there are no airfields. Isolated islands are connected by providing transportation to remote communities. Seaplanes are used for medical care, for emergency evacuations and also, they are used tourism and also has access to waterfront resorts and beaches.

Canada: Water aerodromes are also used in Canada having more than 30,000 islands and had expressed a need for establishing global standards and water aerodrome certification and seaplane operations. Annex 14 of ICAO provides aerodrome design and operations; obstacle limitation surfaces; facilitation and services; safety management systems; aerodrome certification and SARPs. Civil Aviation Regulations (e.g. CAR 302) are applied for the water aerodromes. The final approach is to enhance the safety for passengers, crew and populated areas surrounding a water airports and also adequate facilities for the intended operations. Obstacle Limitation Surfaces[32] (OLS) and objects are the physical characteristics (denotes height, location and dimensions of obstacles within the defined airspace). Regulatory compliance is a must to ensure safety by operational control and coordinating functions. Hence, the Water Airport Emergency Plan was chalked out for any untoward incidents like aircraft accidents within or outside water airport boundaries; water rescue; fire response; fuel spill; medical emergencies etc.

The Kingdom of Saudi Arabia[33] has a coastline of 2640 Kms, will be setting a new standard in regenerative tourism and sustainable development creating air connectivity through seaplane services. Its certification, authorization and operation of water aerodromes[34] with supporting infrastructure has started its journey of introducing water aerodromes and seaplanes in 2022 itself.

PPP-Precautionary Measures

India, while introducing the water aerodromes and the seaplane operations under the PPP model, must frame a plan for untoward incidents whether it may be for any such accidents or incidents within or outside water aerodrome boundaries; water rescue operations; fire-fighting services; oil spills; fuel spills; recovery of seaplanes from movement areas; medical emergencies etc. with passenger centric.

Emerging Legal Issues

The introduction of Water Aerodromes and the seaplane operations in India is not free from legal issues. Even though guidelines[35] were put into effect, they are temporary and hence a comprehensive legal framework is the need of the hour to address (i) legal issues in establishing water aerodromes and (ii) legal issues emanating from operation of seaplanes.

(i) **Water Aerodromes:** Legal issues in establishing water aerodromes include; water aerodrome data (geographical data); approvals and permits to water aerodromes, Licencing; infrastructural development; land acquisition; rehabilitation; resettlement; and reparation; finally, a comprehensive legal framework is the need of the hour for bringing out a robust water aerodromes and seaplane operations through the Public-Private Partnership initiative.

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[32] Obstacle Limitation Surfaces (OLS) are imaginary surfaces surrounding an aerodrome that define the limits to which obstacles (like buildings, trees, or towers) can extend into the airspace. The purpose of OLS is to ensure safe and efficient aircraft operations, particularly during take-off, approach, and landing.

[33] https://www.icao.int/Meetings/a41/Documents/WP/wp_543_en.pdf. (visited on 02-02-2024).

[34] https://www.icao.int/Meetings/a41/Documents/WP/wp_543_en.pdf. (visited on 05-02-2024).

[35] Guidelines for Seaplane Operations in NSOP under RCS-UDAN.

(ii) **Seaplane Operations:** It is understood that, the airports and airlines on land cannot exists without each other, so the seaplane operations cannot go ahead without the water aerodromes. Seaplane operations are much in technical form where it is dependent on various technicalities for a safe and secure take-off and landing. As human life is involved seaplanes must adhere to technical aspects pertaining to water runway, mooring areas; obstruction and removal of such objects and structures which causes impediment in air navigation and also its operations[36]; visual aids for navigation (installation of wind direction indicator); installation of strobe lights to delineate water aerodromes facilities whenever necessary). Here, the Directorate General Civil Aviation must take initiative in applying various technicalities. Here the authorities much check whether SARPs are applied to the said operations.

(iii) Whether it's Water Aerodromes or the Seaplane Operations, must adhere to other aspects of regulatory compliance like the safety standards, standard operating procedures (SOP); environmental protection and its impact assessment; water quality; noise pollution; wildlife protection; emergency procedures, etc.

(iv) It was stated that, as an interim measure till infrastructure for water aerodromes gets completely developed, seaplane operations will continue. At this juncture, the author points out, how, seaplane operations could be possible without the infrastructural development of water aerodromes in India.

(v) There are budgetary constraints; lengthy procedural aspects in floating greenfield and brownfield airports (tenders); application of innovative and advanced technology; managerial skills; and the capital are a few constraints on the part of the government, hence, there is a need for initiation of PPP Model Water Aerodromes in India for a quick and a better economic development and also which growth in employment etc.

Challenges Ahead

The author, based upon operations in India, foresees that challenges are inherent in floating the "water aerodromes" and the "seaplanes" in India and can be simplified by initiating the concept of Public-Private Partnership in the functioning, development, and operation of water aerodromes and the seaplanes in India. These challenges include the infrastructure; economic factors; environmental concerns and the need for robust regulatory frameworks to ensure a safe, secure and an efficient operation. Some of the challenges foreseeable in the light of "Water Aerodromes" and "Seaplanes" in India are:

(i) **Infrastructural challenges:** It includes water-based site selection[37], floating platform construction and installation which requires a designated water area for take-off and landing, mooring areas, and visuals aids for navigation; vessels to transfer passengers; fire-fighting and rescue facilities; ensuring adequate facilities for aircraft maintenance and docking; efficient transfer systems in handling passengers and cargo via boats.

(ii) **Operational challenges:** They are based on use of renewable energy instead of use of aviation turbine fuel (ATF); dearth of seaplane pilots when compared to pilots flying on land; regional connectivity; and limiting the operations during monsoon seasons or take-off and landing becomes dangerous due to excessive wave heights; unstable water conditions due to strong winds; extreme weather contributed through storms or heavy fog; non-maintenance of stable flight path due to turbulence which can increase the accidental risks; and damage caused due to strong winds or rough water by which seaplanes are moored.

(iii) **Financial challenges:** Establishment of water aerodromes which includes navigational aids; fuel infrastructure; jetties require an upfront capital. Hence, initial investment for

36 ICAO's Annex 14 – Aerodromes, Vol-I, Aerodromes Design and Operations 9th ed., July 2022.

37 https://www.icao.int/APAC/Meetings/2016%20WASWG2/WP%205.pdf. (on 28-02-2024).

establishing water aerodromes is high in nature. Secondly, acquiring seaplanes involves huge cost[38] and at times (due to bad weather); plying seaplanes will be unviable leading to unexpected losses and repairs.

(iv) **Environmental Concerns:** As the water aerodromes and the seaplanes take-off and landing operations are completely on the basis of water, will have impact on aquatic ecosystems and leads to an increase in water pollution. The impact is high if they are ecologically sensitive in nature like the backwaters and the coastal zones. The other side of the coin shows that there is a concern of fisherman's disruption to their livelihoods due to seaplane operations. However, their mitigation measures are becoming costly, having an impact on the financial viability.

(v) **Wild life Concerns:** The seaplane operation while take-off and landing causes noise which becomes a potential threat for the wildlife e.g. elephant corridors or the national parks.

(vi) **Tourism:** In future, where people are attracted to travel by seaplanes, many local communities can be deterred by the visitors. The peaceful life of the local communities will be lost. Here, the author points out that the location or the site for water aerodromes are to be selected in such a way the local communities will not be disturbed.

(vii) **Regulatory Concerns:** There is no concrete policy nor a law where these water aerodromes and the seaplanes in India are governed except the "Guidelines for Seaplane Operations in Non-Scheduled Operator Permit (NSOP0 under Regional Connectivity Scheme (RCS-UDAN) which are in operation temporarily.

(viii) **Safety Concerns:** The water aerodromes and the seaplanes are prone for bad and rough weather conditions during some seasons by which the passenger's safety will be pivotal under circumstances while the seaplanes are in operation.

Conclusion

In India, a policy on Infrastructure on Water Aerodromes is the need of the hour based on PPP Model. There are budgetary constraints; lengthy procedural aspects in floating greenfield and brownfield airports (tenders); application of innovative and advanced technology; managerial skills; and the capital; are a few constraints on the part of the government, hence, there is a need for the initiation of PPP Model Water Aerodromes in India for a quick and a better economic development, growth in employment and regional connectivity to the remote places in India.

In India, except the guidelines, there are no concrete rules or regulations in support of the water aerodromes nor the seaplane operations, but a need for the certification of water aerodromes; guidelines for seaplane docks; ramps and supporting facilities; licensing of water aerodromes; safety and security etc., exists. Globally, several States use the basic standards for the water aerodromes like the water runway(s); length of water runways; width of water runways; water runway strip; taxi channel (taxiway); runway water depth; turning basins (holding point at each end of water runway; mooring facilities – embarking and disembarking passengers and cargo loading and shore facilities-fixed or floating platform. At this juncture, the author states that a legal framework is provided for the airports and the aircrafts whether domestic (by various enactments and civil aviation requirements (CARs) or international (by application of the Chicago Convention 1944, but not for the water aerodromes and the seaplanes.

Finally, the coastal areas are not free from (i) natural challenges emanating from cyclones; increased wave activity leading to destruction of natural and beautiful beaches; global warming led to sea level rise becoming a threat to coastal eco systems and large population living on the coasts; ground water becoming saline due to the intrusion of sea water; and (ii) secondly, through the anthropogenic factors, or human-

[38] The cost a multi-engine turbine-powered seaplane typically costs between $500,000 and $1 million. For example, a new DHC-6 Twin Otter Classic 300-G lists for $7.8 million, while monthly lease rentals for the same are around $70,000. Used versions of the same aircraft are typically half the price and lease amount.

caused factors; play a vital role in coastal degradation due to land reclamation; urbanization; coastal constructions i.e. dams, sea walls etc., dredging and dumping; pollution focusing the industrial and agricultural runoff is becoming a threat to marine life, wild life and human health; unsustainable resource exploitation which includes overfishing; deforestation; sand mining; climate change based on sea-level rise; storm intensification; etc. and sand mining etc.

The NSOP Guidelines permits "simplifying regulations" which cannot be compromised due to threat in waters, water turbulence, or rough waters. The routes to and from water aerodromes were introduced under UDAN 3.0. The government has initiated the seaplane operations without focusing the water aerodromes which is a threat to the public-seaplane-passengers. Hence, on war footing, the government must initiate the PPP model for the fast growth of water aerodromes paving way for the aforesaid discussed benefits.

Hence, the author foresees that the establishment of water aerodromes be functional under the PPP model over the Indian coast of 11,098.81 Kms with a clear and streamlined regulatory framework necessary to facilitate the development of seaplane operations based on PPP built Water Aerodrome, connecting the region with remote access.

Suggestions

The author suggests for an amendment to 1944 Convention[39] in the following areas:

Article 3 of Chicago Convention 1944 defines an aircraft as a Civil and State aircraft and Article 8 defines a pilotless aircraft. Hence, the concept of "seaplanes" was unable to find place in the said Chicago Convention 1944. However, a reference was made under Annex-6[40] at a very few places, it lays down the procedure (here the author states that a "partial procedure" is laid down) for seaplanes like the water surface condition for seaplanes[41]; providing life jacket; equipment for making sound signals for preventing collisions at sea[42]; one sea anchor; direction of wind component during take-off[43]. The rules of take-off states that, some conditions like the water of declared density; to be adhered. Regarding the landing distance, it is the horizontal distance measured for seaplanes, to a speed of approximately 6 km/h[44].

The Standard and Recommended Practices[45] (SARPs) laid down under the Chicago Convention 1944 were purely for those aircrafts defined under Article 3 and 8, but not for the "seaplanes".

Article37:

> Each contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation. To this end the International Civil Aviation Organization shall adopt and amend from time to time, as may be necessary, international standards and recommended practices and procedures dealing with:(a) Communications systems and air navigation aids, including ground marking;(b) Characteristics of airport and landing areas;(c) Rules of the air and air traffic control practices;(d) Licensing of operating and mechanical personnel;(e) Airworthiness of aircraft;(f) Registration and identification of aircraft;(g) Collection and exchange of meteorological information;(h) Log books;(i) Aeronautical maps and charts;(j) Customs and immigration procedures;(k) Aircraft in distress and investigation of accidents; and such other matters concerned with the safety, regularity, and efficiency of air navigation as may from time to time appear appropriate.

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39 Chicago Convention 1944.

40 ICAO; Annex-6: Operation of Aircraft, Part-I-International Commercial Air Transport-Aeroplanes Eleventh Edition, July 2018.

41 Annex-6 Operation of Aircraft Part-I, 5.2.6.

42 International Regulations for Preventing Collisions at Sea.

43 Annex-6 Operation of Aircraft-Attachment-B.

44 Annex-6 Operation of Aircraft Attachment-B Landing 3.2. Landing Distance.

45 Article 37, Chicago Convention 1944

As the aforesaid SARPs are meant for the aircrafts defined under Article 3 and 8 of the Convention 1944, it cannot be applied to the water aerodromes nor the seaplanes to some extent, hence, the SARPs for seaplanes and water aerodromes are to be addressed taking into consideration its management, safety, security, design, certification, environment and finally the reporting requirements for operations at water aerodromes. It is also suggested that if civil aviation requirements (CASs) addressed by the State in particular can be developed on the basis of global standards, then there will a meaning in plying the seaplane operations under the water aerodromes uniformly across the globe like that of the application of the Chicago Convention 1944.