Future Seaplane Traffic in Europe

by

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1 Introduction

The annual air traffic growth rate of 5% and higher was nearly constant over the last decade and IATA forecasts the same or even higher rate for the coming years. As a consequence the capacity overload of current airports and the demand for point-to-point connections even to destinations away from existing airports has considerably grown.

With regard to the large shore lines and lakes as well as the huge number of islands in Europe which were considerably increased by the new EC member states it must be recognised that there is a great potential for a European air traffic system using seaplanes and amphibians. With these vehicles new routes can be developed with the advantage of short flights and the use of natural landing strips. By using amphibians point to point connections from national and international airports to remote places without airfield infrastructures can be realised. Beneficial effects for regional airports by increased feeder traffic as well as for tourist and industrial regions are to be expected by establishing quicker connections. At present scheduled commuter seaplane or amphibian operations are only available in very few locations in Europe. However, it can be observed that seaplane and amphibian operation and manufacturing are very well established in the US and Canada and business opportunities for seaplane operators do exist in a wide variety not only in those countries but in others as the Maldives, as well.

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2 The FUSETRA Project and its Objectives

Based on the facts given in the introduction and preliminary investigations the project “Future Seaplane Traffic” (FUSETRA) was created. The project aim is to investigate the current seaplane situation and to evaluate the strengths and weaknesses as well as to elaborate a set of concepts and requirements for a future seaplane air transportation system for “Improving passenger choice in air transportation” and technical requirements for “new vehicles”.

The general objective of the FUSETRA project proposal is to demonstrate the needs and to quantify the potential of seaplane traffic business development, and to propose recommendations for the introduction of new seaplane/amphibian transportation system.

The main objectives are:

- Identification of possibilities to improve seamless travelling by implementation of seaplane transportation systems within the European air- & landside transportation infrastructure.
- Development of solutions which ensure passenger acceptance (Evidence of seamless travel, flight time reduction, reduced operational cost, reduced travel charges, operational safety, better access to international air traffic).
- Investigation of possible reduction of the environmental impact of air transport by developing solutions for point-to-point seaplane operations).
- Propositions for enabling uniform implementation (EC wide) of the chosen seaplane operational system (Regulatory issues, water landing fields, etc).
- Investigation of possible improvement of the accessibility of regions by serving business as well as private mobility by new seaplane/amphibian connections.
- Identification of number of seaplanes or amphibians needed to replace existing aeroplanes, and needed to satisfy the potential new demand.
- Improvement of trans-national co-operation by organising international workshops

2.1 The European Research Programme FP7

The complete name of FP7 is "*7th Framework Programme for Research and Technological Development* ". It will last for seven years from 2007until 2013. The programme has a total budget of over € 50 billion. This represents a substantial increase compared with the previous Framework Programme FP6 (41% at 2004 prices, 63% at current prices), a reflection of the high priority of research in Europe. The EU strategy with respect to Research was defined in Lisbon (2000) and is "to make the EU the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010". Consequently the two main strategic objectives of the Framework Programmes for Research are to strengthen the scientific and technological base of European industry as well as to encourage its international competitiveness, while promoting research that supports EU policies.

The objectives of FP7 have been grouped into four categories:

- Cooperation,
- Ideas,
- People
- Capacities.

For each type of objective, there is a specific programme corresponding to the main areas of EU research policy. All specific programmes work together to promote and encourage the creation of European poles of (scientific) excellence. The indicative budget breakdown of FP 7 supported categories is shown in Figure 1. Aeronautical programmes belong to the transport segment. The EC budget for research on transport is € 4.1 billion.

The aeronautical goals supported by FP7 are strongly related to a set of future oriented research needs defined by the *Advisory Council for Aeronautics Research in Europe* (*ACARE*). Members of the council came from the European aeronautical industries, from European laboratories and universities, from airports and air traffic control or single persons nominated as aeronautical experts. This group defined technical and programmatic goals which have to be achieved until the year 2020. Figure 2

shows these goals and the related FP7 programme objectives. The budget breakdown for Aeronautics and Air Transport is shown in Figure 3.

2.2 Funding schemes

Across all the above mentioned themes, support to trans-national cooperation will be implemented through:

1. Collaborative projects
2. Networks of Excellence
3. Coordination and support actions (CSA)
4. Individual projects: Support for "frontier" research
5. Support for training and career development of researchers
6. Research for the benefit of specific groups (in particular SMEs).

2.3 Support Action Programme (CSA)

With regard to the first analysis of the European Seaplane situation and future possibilities on the one side and considering the objectives of FP7 programmes on the other side some common goals were discovered especially within the funding scheme "*Support Action Programme*" with its goals:

- Understanding interactions between air transport, energy, environment and society
- Understanding the behaviour of the different actors and drivers of the air transport system
- Improving passenger choice in air transportation with the incorporation of additional new vehicles Aeronautics and Air Transport Research

The CSA work programme 2008 specifically asked for proposal with focal points on:

- Retrofitting for improved sustainability and economic viability of aeronautical products
- Stimulating improved participation of Member States and FP7 Associated States with aeronautical knowledge
- RTD potential
- Stimulating research with International Cooperation Partner Countries

- Supporting the harmonised dissemination of European scientific knowledge from ad-hoc organisations in the field of aeronautics and air transport
- Raising public awareness of aeronautics and air transport research in Europe
- Supporting the organisation of conferences, workshops and other

CSA is the funding scheme for FUSETRA

3 FUSETRA work plan

The work plan is dominated by two major tasks:

- State-of-the-Art of worldwide seaplane/amphibian operation and their effectiveness
- Definition of future oriented concepts and requirements for a new European seaplane/amphibian transport system and its integration into sea/air/land transport chain and necessary regulatory issues..

The elaboration of new concepts for **"**Improving passenger choice in air transportation with the incorporation of new seaplane/amphibian transport system including additional and new vehicles" shall be based on existing experiences and its evaluation and on research work focussing on future oriented traffic system concepts.

In order to collect relevant experience and ideas workshops across Europe are organized additionally to Internet and literature investigations. In order to attract a large number of stakeholders from all over Europe three different locations are selected. One workshop will be arranged in Malta (September 24th 2010), one in Poland/Baltic and one in France, which already happened on 14th of May this year. Malta was selected for the participants of the Mediterranean and South-East European countries, France for the West-European and Poland/Baltic for the Northern and North-Eastern European Countries. Representatives of governmental and local administration, industries, operators, air traffic control, regulatory authorities for sea and air regulations as well as scientific researchers are invited to participate. The workshops will draw a picture of the existing status of seaplane/amphibian technology and operation in Europe. Present and future projects are presented and the necessary prerequisites for an economical and environmental feasible seaplane traffic system 2020 are elaborated. Introductory

presentation of consortium members and prepared speeches given by experts shall open panel discussions to the topics included in the objectives. Follow-on working group activities with workshop participants and interested experts elaborate specific items. Where ever possible a review on non-European activities will be provided by invited speakers.

The elaboration of new concepts and a road map for embedded regulatory issues are core elements of FUSETRA. The research works shall consider the current experience and the newest technological and environmental trends in seaplane/amphibian traffic and its integration into air/sea/land transport chain. The following paragraphs describe the main topics within the FUSETRA scope to be dealt with.

3.1 Operational Aspects

FUSETRA will exemplarily identify regions where transport connectivity could be improved with seaplane operations (coverage of peripheral areas). Another option would be to identify routes to be improved with seaplane transportation to de-congest highly frequented routes. Seaplane park infrastructure will be investigated to determine the current status of different infrastructures used for seaplane operations. Future improvements for cost efficient and secure seaport operations will be discussed. To exemplify the results of this task, a detailed scenario for future use of a seaplane in the chosen region will be worked out with a commercial view on passenger / cargo / special mission / environmental issues.

3.2 Aircraft Aspects

FUSETRAs aim is to identify the State-of-the-Art of the seaplane / amphibian transport system. Therefore, it is important to identify current aircraft types available for commercial transport as well as current modes of operation. Other issues to be identified are:

- Total demand for aircraft in 2020
- Possibilities for conversion of existing non-seaplanes
- Seaplane requirements derived from operational issues
- European mission profile of Seaplanes / Amphibian

3.3 Regulatory Aspects

A critical aspect for commercial seaplane operation is certification and operational regulations. Therefore, a major part of the discussions during the project will deal with regulatory aspects as a result from the obvious hurdles commercial seaplane operators have to deal with. Topics are:

- Legislative aspects (infrastructure, airworthiness, national differences)
- Legislative aspects of seaplane / amphibian operation
- Safety
- Pilots training & certification; Availability of pilots
- Uniform legislation within Europe

3.4 FUSETRA Consortium

The consortium was chosen to perform the objectives in the best way. For the theoretical studies including the definition of requirements for new market oriented vehicles, seaplane parks and its infrastructure and the integration into the traffic chain sea/land/air researchers were found at the technical universities in Munich (TUM), Rzeszow (RUT) and Glasgow (GU) with its complementary orientation in airplane design (GU), system layout and operation (TUM) and system optimisation (RUT). All of them have a long experience in airplane design and aeronautical traffic system research. Furthermore all involved institutes have co-operations with aeronautical industries and are practical oriented. A valuable insight into current commercial seaplane operation in Europe is given by Harbour Air Malta (HAM), the largest European operator with scheduled commuter flights in the Mediterranean and by Iren Dornier (DTA) himself. Dornier Technology (DTA) is the industrial partner with the experience of designing and producing amphibians and with the experience of designing and producing the Dornier commuter family DO 228 + DO 328.

The important certification, administration and authority aspects will be covered by the operator HAM, Iren Dornier and DTA and by BIS. EASA is an associated partner and supports the programme. BISDTA, SC and GU have experience as event organizer. Together with the partners in Malta and Poland they will prepare and organize the workshops. Organizing support for the first workshop came

by the city of Biscarrosse in France which supported the integration of the Atlantic workshop in its international of European largest ampamphibian/seaplane festival in May this year. This seaplane festival takes place each two years and is the largest one in the world. is the partner with the experience of organizing events and workshops together with SC. BIS will combine the Atlantic workshop with its next international seaplane event in 2010. The operational and legal background of BIS is additionally used in other Work packages.

The international connection of HAM, BIS, DTA and SC to operators, seaplane parks and authorities and the connection of the universities to international researches will assure that many stakeholders can be addressed and mobilised.

The success factor is the mix from experience, research activities, international networks and management capabilities.

4 Current Seaplane Situation

As already mentioned, commercial seaplane operation is limited to a few regions in the world. Most of the 327 registered operators have their home base in North America. Figure 4 indicates the worldwide distribution. Today commercial operations are mainly oriented to applications like:

- Passenger, Mail, Cargo Transport
- Recreation, Sports (Skydiving)
- Fire Fighting
- Flight Training, Education

Most of the companies fly with small float equipped general aviation planes only a few use amphibians. Most of them offer tourist flight. Only a limited number of scheduled commercial flights can be found in destinations like Vancouver, Seattle, Malta and Maldives. Fire fighting is a special market with special planes like Fire Boss or Bombardier CL-415. For getting more detailed and actual information about worldwide seaplane operation the FUSETRA team arranged a questionnaire which is distributed to all registered operators and to worldwide seaplane associations (see www.fusetra.eu/survey).

Figure 5 shows the production rate of seaplanes over the last 100 years. The curve shows one reason why seaplane operation is not widely spread over the world. The production rate dramatically decreased from peaks during the world wars to a very low level. There are only a few companies like Beriev, Bombardier, Shinmaywa producing larger multi-mission planes which may be used for commercial seaplane operation. Nevertheless, more and more companies producing smaller amphibians step into the market. Producers can be found in Germany, USA, Hungary, France and other countries. The market for leisure and recreation products including very light aircrafts is growing. Commercial flights are limited to a few types of aircraft like Single- and Twin-Otter, Caravan or Beaver which are all equipped with floats. The airplanes are very old and near to end of lifetime with all the disadvantages in noise emission, high fuel consumption and limited payload/range. Viking starts a reproduction of an upgraded Twin-Otter. Real seaplanes for the commuter market are not available at present but in a project stadium in different companies like Beriev, Dornier Aviation, Avana and Dornier Seawings. Better performance and better acceptance by certification and administrative authorities can be expected.

Many European operators went into insolvency after a few years of operation like the Greece operator Air Sea Lines or ArGo Airways. Other operators reported financial troubles. The main reasons for the current situation have to be investigated and levers for a future improvement towards prosperous commercial seaplane operation have to be identified.

5 First FUSETRA Results

Beside scientific investigations which are not finished yet first preliminary results were achieved by the first workshop held in Biscarrosse during the international seaplane event on 14th of May 2010. Beside an overview of the FUSETRA project 5 papers were given dealing with the situation in France, Malta, Hungarian, Seattle and one paper dealing with certification and operation rules given by EASA. Operators, members of seaplane associations, EASA + DGCA, seaplane enterprises and press intensively discussed the problems and chances of seaplane traffic after each paper and during a panel discussion.

The following areas of challenges and critical items were located:

- Permissions and certifications including special requirements (e.g. environmental)
- Financing, insurance
- Qualified staff
- Take-off and landing infrastructure (seaport)
- Aircraft
- Market Situation

The diversity of authorities involved in the permission process like EASA, maritime authority, harbour authority, local police and the many rules not enough adapted to the special mission characteristics of seaplane operation were the main items where the operators asked for revised versions.

The French Seaplane Association requested the concentration to only one national authority responsible for licensing seaport and seaplane traffic and common European rules binding for all EC states, at least.

Harbour Air Malta (HAM) made the following experience recently. HAM tries to establish a new service into Sicily, Italy, but was blocked by a maritime authority having no guide lines, becomes uncertain as to what is required and where the final decision lies and as such become a showstopper in the process of establishing a new landing site. Operations to license aerodromes provided they are within the operating area stated in the Operations Manual and Air Operator Certificate (AOC) fall under normal EU legislation. It seems reasonable then to expect that the same should apply to water landing sites which are shown to be properly managed, and can provide safe operations.

Generally it is very complicated to start a seaplane business. The permission process is long and the requested number of operation employees is large. All these cost have to be pre-financed. Another burden for a start-up is the non availability of enough experienced crews and the difficult procedure to get a European pilot permission even for very experienced pilots from other continents.

HAM states that a standard set of rules, requirements and acceptable means of compliance for all member states as they would apply across the board for the guidance and co-ordination of both maritime and aeronautical authorities is needed from the European authorities.

EASA is aware of most of those items. EASA currently works on the stepwise transfer of the operation responsibility from the national certification authorities to EASA. EASA is updating existing rules and implementing new rules according to market demands in a continuous process in order to:

- Establish and maintain a high uniform level of safety
- Align rules with ICAO SARPS (Standards and Recommended Practices) and the content of existing rules as far as possible
- Promote performance based rulemaking
- Consider the proportionality of rules
- Provide flexibility to address diverse operational needs and circumstances
- Promote cost-efficiency in the certification and oversight processes

EASA offered the seaplane community to support this upgrade process by giving comments to those chapters that are pre-published but not finally fixed.

Another major point of critics is the availability of suitable aircrafts. The planes for commercial operations have been designed in the fifties or sixties and hence are very old. All of them are non-seaplanes converted into seaplanes by floats. There is only one float manufacturer for larger planes (single- + twin-otter) still manufacturing floats. Floats and planes are suffering by the aggressive salt water in case of ocean operation. To prevent the electrolyte from forming a conductive path between the dissimilar metals can be alleviated by continuous maintenance:

- Anti corrosion means at every 100 hr and annual inspection
- Fresh water rinsing after every water landing
- Continuous Greasing and Waxing
- A sacrificial anode is attached to the floats and kept conductive (Zinc plates)

Spare parts not only for corroded parts are expensive and partially have long lead times. The mission performances are poor because of additional weight and drag from floats; this limits the payload/range. All these issues lead to additional cost in a very low priced market segment and are jointly responsible with other reasons for a high insolvency rate.

The discussion during the Biscarrosse workshop of the above topics resulted in the following statements:

- *General:*

  FUSETRA aims at a better common understanding of the seaplane pilots / operators requirements for safe and economic operations. It is meant to streamline requirements for future training, licensing and recurrent checking of seaplane aircrew intending to operate within Europe on a European basis. This is meant to be achieved by intensive discussion with all relevant stakeholders.

- *Seaplane Operation:*

  Operators intend to establish a European controlled and regulated system of approving or licensing seaplane operating bases (as regular airfields) acceptable for all commercial seaplane operations. They should have an accepted method of classification when risk assessment is taken into consideration and remove the need for an operator to negotiate with various authorities other than their own authority when extending operations within Europe.

- *Pilots*

  Facilitate seaplane pilot licensing process and adaptation of non-JAA licenses and type ratings.

- *Seaports*

  Set up an achievable minimum level of training and acceptability of Dock Operating Crew so as to be multi-functional with regard to, assisting in the arrival and departure of aircraft on pontoons or piers, passenger handling, as well as manning the requirements of Rescue and Fire Fighting activities. A system of Security management at and around seaplane bases which would be financially achievable to the operating companies and acceptable to the travelling public.

6 Summary and Future Activities

Beside the scientific work which will concentrate on relevant mission routes and scenarios for some European regions including a layout for a future oriented seaport two other workshops will be organized. The next one will take place during the Malta Air Show on 24th September 2010. The third

workshop is not yet fixed; it will be held in early summer 2011. Beside these activities by the FUSETRA consortium we are looking for a broad communication with major shareholders to discuss the strength and weaknesses of European seaplane operations and for new ideas and concepts. The participation in the hydro aviation conference during the Gidroaviasalon 2010 is an opportunity to collect more facts and opinions and to exchange views with other interested people. We like to thank the program committee for giving us the chance to give this paper.

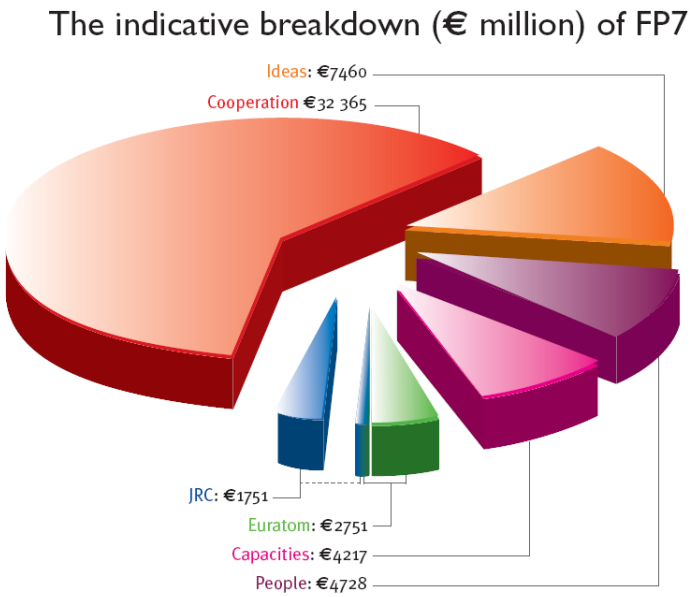

Figure 1: Indicative Cost Breakdown of FP 7 Budget

ACARE High level targets	ACARE Goals (SRA 2002, 2004) (2020 vs. 2000)	FP7 - Aeronautics Air Transport (2007–2013)
Ultra Green	50% cut in perceived noise 80% cut in NOx emissions 50% cut in CO2 emissions	7.1.1 Greening of Air Transport
Time Efficient	99% of flights within 15' of timetable Handling 3 x more flights / y (16m)	7.1.2 Increasing Time Efficiency
Customer oriented	80% cut in accidents	7.1.3 Ensuring Customer Satisfaction and Safety
Cost Efficient	Reducing travel charges Halve time-to-market	7.1.4 Improving Cost Efficiency
Ultra Secure	Zero successful hijack	7.1.5 Protection of Aircraft and Passenger
		7.1.6 Pioneering the Air Transport of the Future 7.1.7 Cross-cutting Activities

Figure 2: ACARE Goals and related FP 7 Aeronautics Air Transport programme features

FP7 – Aeronautics and Air Transport	
Closed Calls	
2007	217M€
2008	200M€
Open Calls	
2010	101 M€
WP for CSA and CP-FP Level 1 (Max Funding limit 5 M€) *Focused mainly on Greening and Cost efficiency*	
Future Annual Calls	
2011	130 M€ (estimated)
2012	160 M€ (estimated)
2013	140 M€ (estimated)
Total FP7 EC funding for levels 1 & 2 : 950 M€ (7 years)	
Other:	
CleanSKY JTI (Level 3) : 800 M€ (+ 800M€ by industry, 7 years)	
SESAR JU (Single European Sky ATM Research, 8 years) : 700M€ (+ 700M€ Eurocontrol + 700M€ industry)	

Figure 3: Budget Breakdown Aeronautics and Air Transport

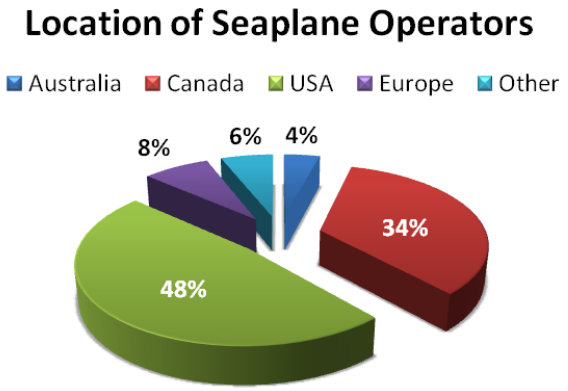

Figure 4: Number and locations of today's seaplane operators

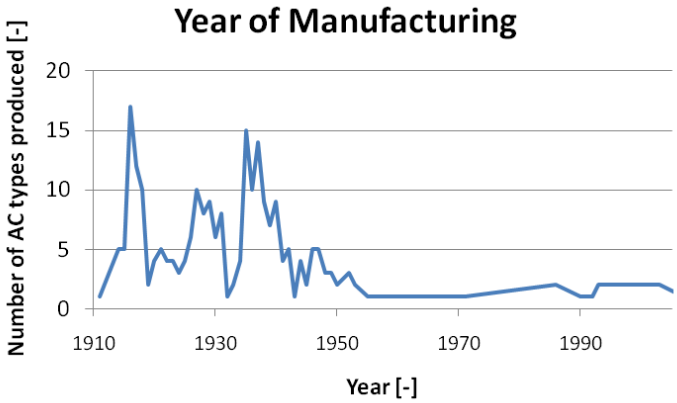

Figure 5: Seaplane production over 100 years

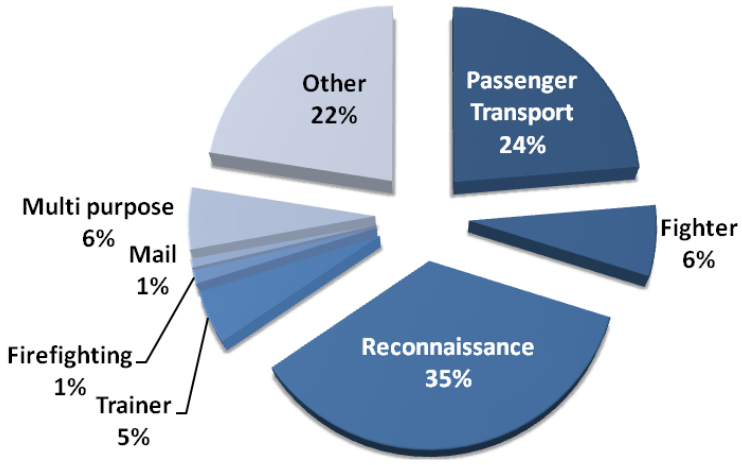

Figure 6: Seaplane types of operation over 100 years