Sustainability of the aviation industry

(Presented by IFATSEA)

"Through the perspective of the Human Pillar in CNS&ATM Systems and services"

Everyone within the aviation community agrees that the impact of the COVID-19 pandemic on the aviation industry since March 2020 has been significant, with levels of activity across the industry falling severely compared to those of 2019. This has affected all parts of the industry: airlines, airports, manufacturers, ground handlers and Air Traffic Management (ATM). Not only the aviation community was affected, but also citizen's connectivity and freedom of movement was also severely curtailed, with significant impacts on other sectors that rely on air transport.

- The shared goals are Safety efficiency and regularity of the Aviation services delivery, including passenger comfort and security.

- There is no other than ICAO and the states to continue to assume the leading role with consultation with the aviation industry and users that should address decision-making. There is no lack of decision making frameworks at the time. Trusting a leading role to the industry that is driven by economic for profit motivations, is not sustainable as it was shown by the COVID-Crisis.

- With regard to cooperative arrangements that could be put in place to guide individual state actions and the aviation industry, it is clear that the contrasting objectives of public health and business interests are of contrasting nature but Public health must be prioritized for obvious reasons. After all Airlines were subsidized by their governments in this crisis time.

Although Air Navigation Service Providers had been deprived of almost all their revenue, they managed to maintain available and fully operational the critical infrastructure of CNS (communication Navigation Surveillance) facilities ensuring their high performance figures rendering feasible and safe the movements even of the reduced number of aircraft.

> *IFATSEA firmly believes that in order to have a healthy, safe, resilient, and sustainable ANS industry, the existing Performance baseline of the Air Navigation Services, in all aspects, must be ensured and maintained at all times, including times of Crisis.*

Article 28 of the Chicago convention, states that the provision of ANS is the responsibility of the State. Based on that, one can assume that the State will share some of the burden of the cost (and potentially for the creation of the relief funds) and this is exactly what was done.

Starting from the financing of ANSPs, IFATSEA in its communication in May 2020 to all aviation organizations, *proposed the creation of a Relief Fund within each ANSP budget*, that

being subsidized by a percentage of its revenue during the normal periods, and aiming at financing it in cases of experiencing of extraordinary situations. This would effectively mean that this amount would be used during crisis times and only for this, in order to sustain operations.

Since many years, in EUROPE, there is a cost recovery mechanism of what is anticipated to be spent at the next Reference Period. Currently this is not covered by regulation or the next RP and that is now, 3 years later, is being discussed more and more.

At European level, the trend to proceed with the ultra-fragmentation of ANSPs and establishing competition and thus cost reduction through the SESI++ regulation, has been proved as a non-successful model, especially after the Covid-19 crisis experience.

Moreover, the change in the architecture of the CNS/ATM systems and services from an integrated one to a distributed one (e.g. over SWIM) and geographically separated functional elements turns the existing integrated ANSPs to a fragmented ecosystem that may prove too complex to handle and sustain during economic or technical crises.

Also, the short vision selected by some ANSPs in Europe towards their ANS staff, with huge reductions of salaries, layoffs of experienced professionals, the halting of recruitment and training, resulting in some cases to a reduction of operational staff by up to more than 15%, will certainly have negative impact on performance of ATM/ANS system as a whole in the incoming years. The same goes for the halting of modernization projects necessary for the anticipated air traffic by 2030.

Indeed, there are studies proving that the privatization model promoted in the SESII package, showed unexpected weaknesses during the pandemic. Indeed, ANSPs, borrowing time after time and having to pay back interest, which is not eligible for reimbursement, is not the way to go forward. Revisiting the concept of Privatization may contribute to the Sustainability of the ANS system.

EUROCONTROL in the link referenced Ref. (1) below, states the following:

"What to do about air navigation service providers (ANSPs), usually paid for their services by those who use them, who are required to keep up a service capability even when there is virtually no traffic? Who pays the bills to keep such services in place and prevent even greater long-term damage to the industry?"

Also, it goes on stating: *"Nonetheless, this crisis has highlighted important limitations in the current operational, financial and regulatory arrangements for ATM in coping with and adapting to the shock and unexpected events"*.

The impact can provide a catalyst for change recognizing the ATM industry may be subject to further disruptions and needs to be able to adapt to uncertainty and the challenges of delivering a more sustainable economic aviation ecosystem.

These are interesting and demanding questions. IFATSEA together with the SESAR Deployment Manager in their domain of expertise have produced a working paper named ***"Objectives of a***

robust and resilient CNS infrastructure", which was elaborated in early 2022 in support of the activities under the scope of the CNS Advisory Group in Europe.

This working paper follows a rationale leading to the objectives of a Robust and Resilient CNS infrastructure, essential from IFATSEA's point of view to increase robustness of the ATM network. And as it was said above it reiterates "the *baseline of the Air Navigation Services must be ensured at all times and not be taken for granted."*

Regulatory developments:

Efficient regulation is characterized by not burdening the optimum operation of the regulated entities while at the same time ensures that the constituents parts of the ANS provision, including those foreseen in AAS (Air space Architecture Study by SESAR) will be within technical and operational, interoperability and performance envelopes. This of course includes adherence and compliance to their functional and non-functional specifications, whenever these will be available, because currently they are not.

It is useful to see how the regulatory context in ICAO and Europe, has been changed during the past few years which will probably unveil additional and unforeseeable weaknesses:

- ICAO Annex 19 (dealing with the Safety Management has removed direct reference to the CNS/ATM systems and Providers and does not clearly mandate the need for them to implement an SMS. Can they proceed without implementing one for example to minimize cost? Is this acceptable? Will/is this case audited by USOAP

- Additionally, and still within the ICAO documentation framework, namely in ICAO Annex 10, very little if any, exists for performance standards for Radar and ATM fusion and Flight Plan Data processing which has impact on standardization towards the global alignment, harmonization and interoperability of air navigation systems.

- In Europe, the new Common requirements EU 2017/373, again does not mandate that CNS/ATM providers implement a Safety Management System anymore but to only supply a report of the so called, Safety Support assessment. On the contrary, the previous regulatory framework required compliance of CNS providers with the SMS of its ATSP. The obvious conclusion leads to expectation that future ADSP units, a conceptual notion and building element of the Airspace Architecture Study (AAS), which are essentially Radar and Flight Data processing systems, together with Safety Nets software (which in the future will highly depend on Artificial intelligence algorithms and automation) will be kept outside the Safety envelope in contradiction to the findings of the EC ADSP Study. Can we afford this safety wise? All this when we rely more and more on Automation applications which are running in the said CNS&ATM systems.

- The regulatory environment, including **Standardization** and harmonization are crucial activities and enable the promotion of requirements and Safety standards that

in turn promote Sustainability and Resilience. The question on how to regulate complex concepts like Software Safety Assurance of the safety critical Software (following the repealing of EU 482/2008) implementations is a demanding one, and thus cannot be left unanswered. However, it remains unanswered.

So the lack of standards for all the CNS/ATM systems and their interoperability requirements supporting all future concepts, in a distributed, geographically separated environment of the service provision and the data layers, if successfully addressed, **will undoubtedly constitute a significant enabler, together with the Human pillar, for sustainability,** avoiding impacts on airport capacity and delays derived from ATM inefficiencies.

In this case, ATSEP, behind the scenes will have to tactically deal with the new technologies concepts and particularities resulting from different distributed architectures due to the potential geographical separation of the ATM/ANS Service delivery context. New tasks like ensuring the service delivery to clients will have to be elaborated within the data chain e.g.

Sensors (Data Production) - Data processing -> Data presentation

The data flows, integrated, correlated and synchronized with Communication interactions between different providers but **under the same Contingency measures** will be a task of huge complexity and safety criticality. All this while maintaining and operating the current legacy and state of the art CNS&ATM Systems.

The Human pillar as an enabler to Sustainability

The Human pillar-lack of ATSEP Regulation: While training and competence requirements are listed in EU regulation 373 and ATSEP are **authorized maintain,** to put into and remove from operation CNS/ATM systems, a more unified and harmonized approach starting from the European ANSPs must be elaborated e.g. Licensing system tailored for ATSEP as it is mentioned in the ADSP study by EC (Legal, economic, and regulatory aspects of ATM data services provision & capacity on demand as part of the future European Airspace architecture Ref.(2) and ensuring a pan European common level and rigor of ATSEP training and competence, like the ATCOs' one.

Standard Training Devices (STDs) and Simulators for ATSEP and ATCO: It appears imperative that the training for these ATSEP towards distributed systems architectures will have to be done with modern training tools already existing for other industries. For example, the new SESAR based **distributed System of Systems** will have to be translated in Digital Twins and simulated train take place for ATSEP in this new environment for Qualification Training before assuming real time technical responsibilities of the CNS&ATM system they will serve. Contingencies will have to be simulated for both ATSEP ATCO and other professions before assuming duties. This training must also include Cybersecurity training for tactically and strategically be prepared for cybersecurity crises also. It goes without saying that ATSEP in the different countries cannot be of different Training and Competency qualitative and quantitative

levels. It is now more than ever that ATSEP professionals be subject to specifically tailored Licensing Scheme according to ICAO.

● The ATSEP Licensing scheme will be within the **authorization context of the regulation** and **ensure uniform levels of ATSEP, identified as a safety critical profession by an EU study (Ref: (4), competence across Europe**. This will also constitute an **improvement towards efficiency, resilience, and sustainability**. In fact, ANS is the only safety critical industry where its technical professionals are not under a Licensing scheme**.**

IFATSEA firmly believes that ensuring resilience and robustness of the ATM infrastructure should be a top priority. Only ensuring that the nominal service base of CNS/ATM systems and services availability and continuity, is properly protected will allow, as today, react quickly and effectively based on trusted technical situational awareness to avoid service disruption and allowing all ATM network nodes to operate at full capacity and with minimum delay.

Everybody talks about Digitalization and Automation, including applications that are running on Artificial Intelligence algorithms that will be **incorporated in a hybrid environment** of geographically separated CNS/ATM data chain instances, deployed at Sensor geographically fixed sites or even space based. Installed also in processing elements called ADSPs functions or entities, that are integrated today within each ANSP but geographically and culturally, as concerns the Human, separated in the future.

All these issues are still essentially absent from the research agendas of any technical shared awareness on the **ATSEP Working Positions,** with no foreseen, for the time being, specific related R&D integration.

We are designing a system without clearly defined coordination of monitoring and Control concept, on which the new concept of operations can be properly sustained and contained at service degradation times.

*In the d*ocument *Ref. (3) **ATM Automation: Guidance on human technology integration CAP 1377** it is stated for the ATSEP WP for Systems Monitoring and Control (geographically distributed)*

*"The (ATSEP WP for) SMC system should **give the ATSEP the opportunity to adjust and mitigate potential risks and failures of their systems. In addition, it can provide continuous monitoring enabling assessment of the safety level achieved and identifying areas for future improvement**."*

So, it is imperative that we take the view and perspective of a **Total System approach** instead of developing individual potentially interoperable technical solutions of very high complexity, albeit without a defined technical monitoring and control through the ATSEP WP.

This is contrary to all other safety critical industries where the Systems Monitoring and Control suites (SMC) is implicit.

So this concept (ATSEP WP) that enables to maintain the ATM Technical System Resilience, Continuity, and sustainability, that drives performance and saves cost and improves the environmental footprint, is not considered, or rather starts to be considered following intense IFATSEA efforts, position papers and argumentation.

There starts to be a glimpse of hope that the technical part of ATM and its people will be recognized for their contribution into the efficiency of providing ATS to the final user and indeed directly to the pilot when we are talking of Navigation.

There are procedures, processes, and CNS/ATM systems such as Flight Inspection that are taken for granted It was the Covid crisis that revealed their importance again. More specifically, during the pandemic when mobility of people and consequently ATSEP, came about, the validity of certification of the **Periodicity** of CNS systems e.g Navigation, came close to expiring and that would severely impact the performance if not the safety of the system. This is also true for **the   Regional Safety Oversight Cooperation System (Ref.6) that produced** **Guidance booklet for the safety risk analysis and management applicable to the periodicity for ground and flight testing of radio navigation aids**.

To address this ICAO also produced a state letter **((see Ref.5)** exactly for this reason, the expiration of periodicity checks, as required a very technical paper with relates to the requirements from ICAO Annex 10 volumes and ICAO Doc 8071 and more.

This procedure of flight inspecting Navaids and the lack due the mobility restrictions of the associated ATSEP personnel both on the ground and in the air, impacted negatively the Continuity of Navigation service provision, the implementation of the associated procedures, the AIP requirements and the capacity of airports as it constituted (where it actually happened) as a forced stopping of the associated service due to the expiration of their periodicity.

*Therefore, the Continuity of the **provision of CNS services must be retained and improved so sustainability (including business wise) and Resilience can be sustained**.*

Cybersecurity: The *transversal issue of Cybersecurity* could also be addressed here, as cascaded failures of the interconnected systems are becoming a reality. **ATSEP being responsible for addressing the impact of the cyber-attack both tactically and strategically,** have to be efficient and effective on their role. This can be achieved through their competence levels and schemes (according with EU 373/2017) together with supporting associated tools, that need to be properly defined at requirements phase, from an technical-operational point of view.

These cyber tools for the ATSEP WP do not exist at the moment.

This constitutes a latent safety and business hazard, as the impact of a cascaded failure of ANS systems can be a reality and will not be able to be contained, as the tools have not been thought off yet. So IFATSEA **recommends developing these tools proactively in order to ensure the Functional System Resilience.**

> *Developing the necessary cyber-toolbox for the ATSEP Working Position, can be a major contributor to the Resilience of ANS service delivery Continuity.*

As a final word, the proposed way to go is by :

> *ensuring the Continuity and nominal performance of the CNS/ATM systems and services, applying efficient regulation, standards and specifications with competent front line actors like ATSEP, ATCO, AIM, AIS and Pilots, while avoiding experimenting with business models based on competition.*

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References:

1.(Ref.(1).https://www.eurocontrol.int/article/life-beyond-covid-19-how-will-aviation-need-change)

2. (Ref. (2). SESAR Joint Undertaking | Airspace Architecture Study - Full (sesarju.eu)

3.(Ref. (3). 20160200-CAP-3177-ATM-Automation-Guidance.pdf (atsep.eu)

4.(Ref: (4). Study on safety-related and safety critical functions and related jobs in ATM/ANS

   D7: Final Report (E-Library - IFATSEA - http://www.ifatsea.org/membership-resources/e-library/)

5.https://www.icao.int/safety/COVID-19OPS/Pages/ANS.aspx

6.https://www.srvsop.aero/en/

7. **Guidance booklet for the safety risk analysis and management applicable to the periodicity for ground and flight testing of radio navigation aids**

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