

EMCO SIPO EASA.2022.C17

D-COM.3.1 - FIRST STAKEHOLDER ENGAGEMENT WORKSHOP

MINUTES OF THE MEETING

eMCO-SIPO – Extended Minimum Crew Operations- Single Pilot Operations

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Abbreviations

Table 1: Acronym List

ACRONYM	DESCRIPTION
ATC	Air Traffic Control
ATCO(s)	Air Traffic Controller(s)
CANSO	Civil Air Navigation Services Organization
CNS	Communication, Navigation, Surveillance
DBL	Deep Blue
ECA	European Cockpit Association
eMCO(s)	Extended Minimum Crew Operations
EUROCAE	European Organisation for Civil Aviation Equipment
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IFALPA	International Federation of Air Line Pilots' Associations
IFATCA	International Federation of Air Traffic Controllers' Associations
NLR	Netherlands Aerospace Centre
SCG	Stakeholder Consultation Group
SiPO(s)	Single Pilot Operations

1. Summary

This document presents the Minutes of the Meeting of the first Stakeholder Engagement Workshop of the eMCO-SiPO Project, held on the 19th of June, 2023.

The meeting took place on the web app Google Meet.

2. Agenda and Participants

2.1 Agenda

Table 2: Agenda of the workshop

Topic	Speaker	Time
Welcome & Introduction	Stefano Bonelli – DBL	09:30-10:00
Project Presentation	Rolf Zon – NLR	10:00-10:30
Presentation of Risk Assessment Methodology	Alfred Roelen – NLR	10:30-11:15
Coffee Break	/	11:15-11:30
Final discussion	Stefano Bonelli – DBL Rolf Zon – NLR	11:30-12:00
Wrap Up & Next Steps	Stefano Bonelli – DBL	12:00-12:30

2.2 Participants

Table 3: Participants to the workshop

Invited Participant	Organisation	Present
Boiardi Andrea	EASA	Yes
Bonelli Stefano	Deep Blue	Yes
Cavagnetto Nicola	Deep Blue	Yes
Denjean Jean-Christophe	Dassault	Yes
Drogoul Fabrice	EUROCONTROL	No
Ferraiuolo Vera	Deep Blue	Yes
Garcia Eduardo	CANSO	Yes
Harter Tanja	ECA	Yes
Knowles Ian	ICAO	Yes

Lozano Juan Carlos	IFALPA	Yes
Malakis Stathis	IFATCA	Yes
Nguyen Tri Thuc	EUROCAE	Yes
Niermann Christian	DLR	Yes
Powell David	IATA	Yes
Roelen Alfred	NLR	Yes
Salmon-Legagneur François	Dassault	Yes
Zon Rolf	NLR	Yes

3. Minutes

3.1 Welcome and Introduction

Stefano Bonelli (DBL) starts the meeting asking permission to record. Nobody objects, the registration starts.

A brief project introduction on the main project topic is delivered, then a round of presentation from the Consortium members and the Stakeholder Consultation Group (SCG) takes place. Stefano Bonelli concludes the presentation by illustrating the workshop objectives and structure.

3.2 Project presentation

Rolf Zon (NLR) introduces the project, with the presentation as scheduled.

While discussing Task 5 “Incapacitation of Pilot Flying”, Tanja Harter (ECA) raises a question, asking if the framework addresses the detection of incapacitation as well. Rolf Zon answers that detection of incapacitation is included in task 5. Tanja Harter is satisfied by the answer. The presentation ends.

At the end of the presentation, Tanja Harter proposes to investigate the impact of the indirect effects of workload. David Powell (IATA) raises security and access to the cockpit concerns, asking if the project is considering them and what is the status of the technology granting these functions. Rolf Zon answers that the eMCO-SIPO Project is taking those concerns into account.

Juan Carlos Lozano (IFALPA) comments that extended Minimum Crew Operations (eMCOs) are expected to be alive in 2025, but the agency updated the numbers for 2027. Moreover, IFALPA raises an issue in the way the project is set up: the pre-assumption is that eMCOs have the same level of safety of current multi-crew operations, but there is no agreement on the current level of safety. Therefore, it is difficult to compare two different kinds of operations without clear references and data. Secondly, IFALPA claims that if the project aims to equalise the safety levels in 2024, if eMCOs are implemented in 2027 then the safety levels will be lower. Rolf Zon proposes to postpone the discussion on the safety approach after the presentation of the Risk Assessment Methodology.

Ian Knowles (IATA) raises the issue of cabin problems that can arise: Rolf Zon answers the cabin problems are considered in the safety assessment.

Tri Thuc Nguyen (EUROCAE) raises the issue of safety and security of remote controls, from a perspective of an increased latency due to encrypted data. A second issue raised by EUROCAE regards the technologies embedded in AI for Single Pilot Operations (SiPOs), that should consider the EASA AI roadmap 2.0, taking also into account a timeline for adoption comprising the acceptance from a societal perspective.

Stathis Malakis (IFATCA) states that both eMCOs and SiPOs should take into account the fact that they risk to disrupt the Air Traffic Controllers' (ATCOs) work practices, increasing their workload.

Stefano Bonelli (DBL) introduces MentiMeter as the tool selected to gather live feedbacks from the participants for each task of the eMCO-SiPO Project.

The question guiding the content gathering for all the task reported below was: "Which are the aspects that you consider important and that we should consider in our analysis?"

1. Task 1: Cockpit configuration and basic risk assessment

The MentiMeter answers:

- Use of checklist and other procedures that are designed for 2 pilot operation
- Existing cockpits usable or new design needed? What about non-duplicated controls e.g. steering tiller? Should the bathroom and rest bunks be within the flight deck (as they were on H747)?
- Interaction with ATC
- Piggy Back on the first answer: Training involved with that
- Some scenarios in the risk assessment conducted by the OEMs did not include certain emergency/abnormal scenarios like fumes/smoke in the cockpit, fumes/smoke in the passenger cabin,
- Failure on the PF Side while there is only one at the controls... including heavy abnormal like fires
- Define clear roles and responsibilities – pilot – machine – remote monitoring
- Redundancy, Backup Systems and Ergonomics for cockpit design
- RCF and HIJ scenarios. Sequencing in busy aerodrome. ATM CNS failures like radar failure

2. Task 2: Nominal operations

The MentiMeter answers:

- It would be interesting to address what pilots "do right" in nominal ops as an additional resource to understand pilot workload and task sharing
- For normal ops, how to provide cross-checking – e.g., level changes, diversions, fuel transfers, decisions on destination weather
- Methods to provide equivalent level of safety with regards to changes in aircraft state – level changes, headings etc. That would normally be cross-checked
- Standard Operating Procedures (SOPs), Task Management and Cockpit Design layout
- Operational reality, e.g. Operational Environment, not only the licensing tasks
- Readback hearback errors that were normally caught by the second crewmember
- Checklist challenges
- Safety two approach... what is the additional layer of Safety a second person actually provides. Not only based on regulation but also based on the reality
- Effects of additional workload in longterm

3. Task 3: Failure conditions management

The MentiMeter answers:

- Complex failures with loss of automation
- Effects of having to switch from handling a failure in a multi crew environment and handling them alone. SOPs for both required, both can happen on one flight...
- ATFCM disruptions. Weather rerouting. Extensive holdings due to apron stand unavailability. CNS failures. Hijack interaction with UAVs Military exercises. Special events that change the normal routing
- How to deal with the excessive workload when managing a failure. In eMCO this will be less of a problem once the other pilot has been woken and brought to the flight deck, but in SiPOs will persist
- Decision-making aspects as single pilot operations require more effective decision making under significant stressful conditions
- Startle/surprise effect in single pilot ops
- Also consideration of cabin emergencies (e.g. a medical emergency requiring unplanned diversion)
- Multiple failures, failures including ripple effects, complex procedures... how is the aircraft state determined?
- Redundant systems can help maintain critical function and provide the pilot with alternatives to address failures. Saying that the flight deck technology should be improved consistently
- TCA Ras. Separation minima infringements. Inadequate separation. Failure of ATM system security
- Fuel dumping
- Again: failures, whether single or multiple do not happen in isolation. In a real operational environment there will be a lot of additional communication tasks (Cabin crew, ATC, Passengers, Company)
- Decision making process... is there one when being alone? How to avoid e.g. confirmation biases?
- In single pilot ops nobody will challenge pilots' decisions

4. Task 4: Duration of sleep inertia

The MentiMeter answers:

- depends on every individual and condition
- this is difficult because it is not clear for how long significant sleep inertia lasts – and it varies between individuals
- every person is different... and not always the same... it's an ever-changing state
- pilots should be aware of their individual circadian rhythms and schedule their sleep and duty periods accordingly. Should clearly define SPO in short-haul and long-haul flights
- how can controllers detect the effects of sleep inertia of the single pilot.
- How long does it take to be properly functioning? How does the other pilot know? What is the probability that problem solving and reasoning could be impacted leading to poor decision making
- Factors influencing sleep, sleep inertia, and how to detect in which state oneself and the other person is... (might not have slept but be startled)
- How to find out that sleep inertia is over
- Napping strategies? To understand optimal nap duration
- Sleep inertia is already a theoretical problem when rotating pilots in and out of the bunk, and it is likely to have been an actual problem in some incidents (e.g., AF447), worse with only one pilot
- How air traffic controllers deal with this situation?

5. Task 5: Incapacitation of Pilot Flying

Rolf Zon claims all the feedbacks will be considered.

The answers:

- Firstly, how to DETECT incapacitation especially if it is subtle
- Detection can become quite difficult in cases of subtle incapacitation
- How to detect not only sudden but subtle incapacitation? It's already difficult for another person to do that
- How the ATCOs deal with this situation?
- Possible effects of subtly incapacitation, inclusion erroneous actions... and how to detect those?
- And then how to assume control in SiPO with one pilot incapacitated, (or in eMCO, how to automatically alert the resting pilot)
- Remember that falling asleep is a form of incapacitation, and how to manage this has to be considered
- Important to address what to do in case of pilot incapacitation (role of other crewmembers, autonomous flight, ...)
- Establish the fatigue management for pilot (health check for example)
- How the flight crews of the affected air traffic are informed'
- What about how to deal with a form of ACTIVE incapacitation (e.g. a seizure) which may interfere with controls
- How to take care of the incapacitated person? Might be a serious medical condition. Effects of that additional pressure of immediate actions that might be required for the other pilot.

6. Task 6: Pilot fatigue and boredom

The MentiMeter answers:

- Needs a lot of attention in case of monitoring tasks
- Known effects of fatigue and boredom? Brain activity still at full speed?
- These are different eMCO could potentially improve fatigue – e.g., ops currently performed with 3 pilots each resting 1/3 of the cruise phase, in eMCO could allow the 2 pilots to each have ½
- Will there be another selection process required (Fleishman?)
- Training aspects of the pilots to detect and manage these situations
- How good is the monitoring when fatigued (alone) and bored (alone) and the subsequent reaction times.
- Consider ergonomics, usability, and the pilot's ease of interaction with cockpit systems
- Detection by automation on board
- Boredom and startle effect: how to do the right thing at the right time
- The boredom aspect is a huge and unexplored issue, for long periods during the cruise
- Mental simulation
- Is fatigue indeed addressed by eMCO, e.g., is the rest quality indeed sufficient or does the longer awake time being alone have a detrimental effect

7. Task 7: Solutions in relation to breaks due to physiological needs

EUROCAE points out that mental simulation can be used to measure how fatigued the pilot is from his operations and tasks.

The answers:

- Physiological needs cannot be predictable so cannot be “pre-planned”
- Physic break foreseen? Not only toilets, but e.g. stretching the legs etc...
- Is the pilot still “in command” when leaving the pilot seat for physio breaks?
- Anticipate the need for unscheduled breaks due to unexpected physiological needs or emergencies
- Need bathroom on flight deck if possible? Does the lone pilot get cabin crew to “monitor” the flight deck short-term? Or does a remote monitor assume control/monitoring?
- Stress factor of pilot feeling that they shouldn’t take a break even if they need to
- How these can be announced to the ATC and what will the ATC do during these breaks
- What is an acceptable duration where you have to “hold” (medical)
- Mental simulation
- Possible medical effects of not drinking enough (which in itself also has an effect) to avoid “needing to go”
- Possible undesired effects of wanting to avoid toilet breaks – pilots already have higher rates of kidney stones probably due to fluid restriction
- One pilot in the bunk, one in the toilet = no pilot at the controls... effects (all tasks I believe) of that

8. Task 8: Preliminary safety risk identification for SiPOs

The MentiMeter answers:

- Everything that was said before
- Already identified. Workload, error, fatigue, boredom, social effects, challenges with incapacitation and with emergencies
- Workload on the ground... (realistic operational environment, not based only on OEM books, but as a minimum operator description, ideally operational observations)
- How to manage all of the identified risks when there is no second pilot to wake up
- A whole new set of rules (design, certification, operation) is needed. Current SPO are conducted in aircraft designed and certified for being operated by one or two pilots. No comparable safety level
- Differentiation of ATC service provision (e.g. different separation minima). Integration in a dense AI/ML air traffic ecosystems. Known limitations of AI/ML. Just culture issues (who is accountable)
- Identify potential sources of distractions or interruptions that may divert the pilot's attention from critical tasks
- How to provide an equivalent level of safety using remote monitoring and the potential for remote intervention
- Long term (that also is true already for eMCO) retention and transfer of knowledge...
- New medical standards (the OML or multi-crew limitation would become useless, and the 1% concept would need to be re-evaluated)
- Decision making process... how to avoid e.g. wrong interpretations, confirmation biases etc...
- How to detect deviation from SOPs

3.3 Presentation of the Risk Assessment Methodology

Alfred Roelen presents the general risk assessment approach.

IFALPA comments the list of scenarios asking if the project is considering events dealing with aircraft performance, for instance the loss of an engine or flight controls. Alfred Roelen answers that the project aims to take into account all the possible contingencies and that this kind of contingency will most likely involve loss of altitude. IFALPA points out that also an uncontained engine failure should be considered. Alfred Roelen answers that the project will consider this contingency.

ECA points out that also combinations of failures, ripple effects and turbulence encounters when one pilot is not in the seat should be taken into account. Alfred Roelen answers that it is complicated but the project is exploring ways to include combinations of scenarios.

IFATCA asks about Air Traffic Control (ATC) related failures, for instance a radar failure, and that ATC contingencies should be considered. Alfred Roelen answers that ATC failures are captured in the situation "Communication with ATC required". IFATCA reinforces that ATC failures may involve ATCOs requiring actions from the pilot, not only communication. Therefore, different instrument approach procedures should be addressed, for instance ATC related operations with Communication, Navigation, Surveillance (CNS). Alfred Roelen answers that the project will try to include ATC failures in existing scenarios or to create a new one.

IFALPA raises the issue of testing, asking how to compare the risks of eMCOs and SiPOs in relation to multi-crew operations, and measure the differences. Alfred Roelen answers that the project approach will measure the differences in terms of severity, likelihood and probability of the events.

ECA asks about the effects of increasing air traffic and the long term effects on the retention of knowledge, knowledge transfer, gain of experience and accumulation in workload. Alfred Roelen points out that these are very good points to be considered, and that he cannot provide a detailed answer now but that the concern has been raised also in multi-crew operations, therefore the project will consider these aspects.

EUROCAE comments on the system malfunctions and how to reconfigure the system, and how to understand when the output is back to normal, considering there is nowadays no reference point on what is to be considered “normal” in SiPOs, since it is a scenario never faced before. Alfred Roelen confirms the project will consider this analysis.

Dassault asks about why the project is not using a methodology that is recognised by the industry such as bow-ties. Alfred Roelen points out that there are no fundamental differences between bow-ties and the scenarios used in the risk assessment. Mathematically they are identical. Dassault asks if during a deeper level of analysis, some academic recognised and demonstrated tools will be used. Alfred Roelen answers that the project has to do a generic risk assessment for the eMCO Concept of Operations (CONOPS) for all the types of manufacturers that approach EASA with a request for an eMCO, adding that the project will not have detailed information about how exactly the aircraft system works. Therefore, it needs to be quite generic risk assessment to adapt to different manufacturers. Dassault asks then how the project aims to provide a valuable result concerning the fact the project is doing generic analyses for concepts that are design dependant? Alfred Roelen answers that the project doesn't have the needed level of detail to do the specific risk assessment, the project can describe what kind of performance an aircraft should achieve to be equally safe than in multi-crew operations in the specific scenarios presented. Dassault acknowledges the understanding of the concept and will ask for continuous information in later stages of the project.

IFALPA asks if in the risk assessment the project will assume that the pilot will stay in normal alertness situation considering fatigue and boredom. Alfred Roelen answers that first the project needs to define the influencing factors and the performance shaping effects to then describe how they can affect the likelihood of a performance effect.

Deep Blue asks the participants how to include real life constraints into the project analysis. IFALPA and ECA answer that the project could use various resources such as Line Operations Safety Audits (LOSAs), real life observations capturing the whole working environment, and the build-up and pressure of day-to-day operations that might have detrimental effects, to avoid to conduct a risk assessment just in a simulated environment.

Deep Blue asks the participants if they would be available to be consulted one-to-one for inputs and clarifications. IFALPA and ECA give their availability for various topics since they both have many committees with real airline pilots on every operational aspect. IFATCA gives the availability for every ATCO-related aspect. EUROCAE gives availability to involve the working groups for AI that may be relevant to the project.

3.4 Final Discussion

Deep Blue presents the final MentiMeter poll on ideas and expectations on the eMCO concept.

The MentiMeter answers:

- This concept does not solve any existing safety issue. Therefore we believe this is going to create new safety issues. Additionally, it is not going to increase the level of safety
- There needs to be a clear justification for proceeding
- It's a loss of redundancy... no matter how many assistance systems there are. Human error (apart from being also in the systems, since they are designed by humans) is not reduced by reducing the humans
- New type of errors and safety not assured

Deep Blues asks for general comments to conclude the workshop. IFALPA points out that it would be important from a project perspective to focus more on real-life operations reality, avoiding assumptions more related to simulated environment, not to focus only on the certification part. ECA mentions that the operational concept is changing, triggering design changes, therefore it is fundamental for the eMCO-SiPO project consider the ever-changing operational reality, especially in SiPOs where most of the work would be taking place at ground level. There is general appreciation for the composition of the Stakeholder Consultation Group

4. Next Steps

The second Stakeholder Consultation Group Workshop is presented, taking place in February 2024. Deep Blue also states that the project outcomes will be available on the website emco-sipo.eu and on the project's LinkedIn page.

A brief discussion on how to accommodate both IATA and FAA representatives at the same time takes place, since the project will have just a one-to-one session with FAA after the 1st SCG workshop.

Deep Blue provides the participants with the contacts of the project.

The 1st SCG Workshop closes.



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