



Toward Single Pilot Operations: A Conceptual Framework to Manage In-flight Incapacitation

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11th SESAR Innovation Days





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Current operations



PIC



ATCOs

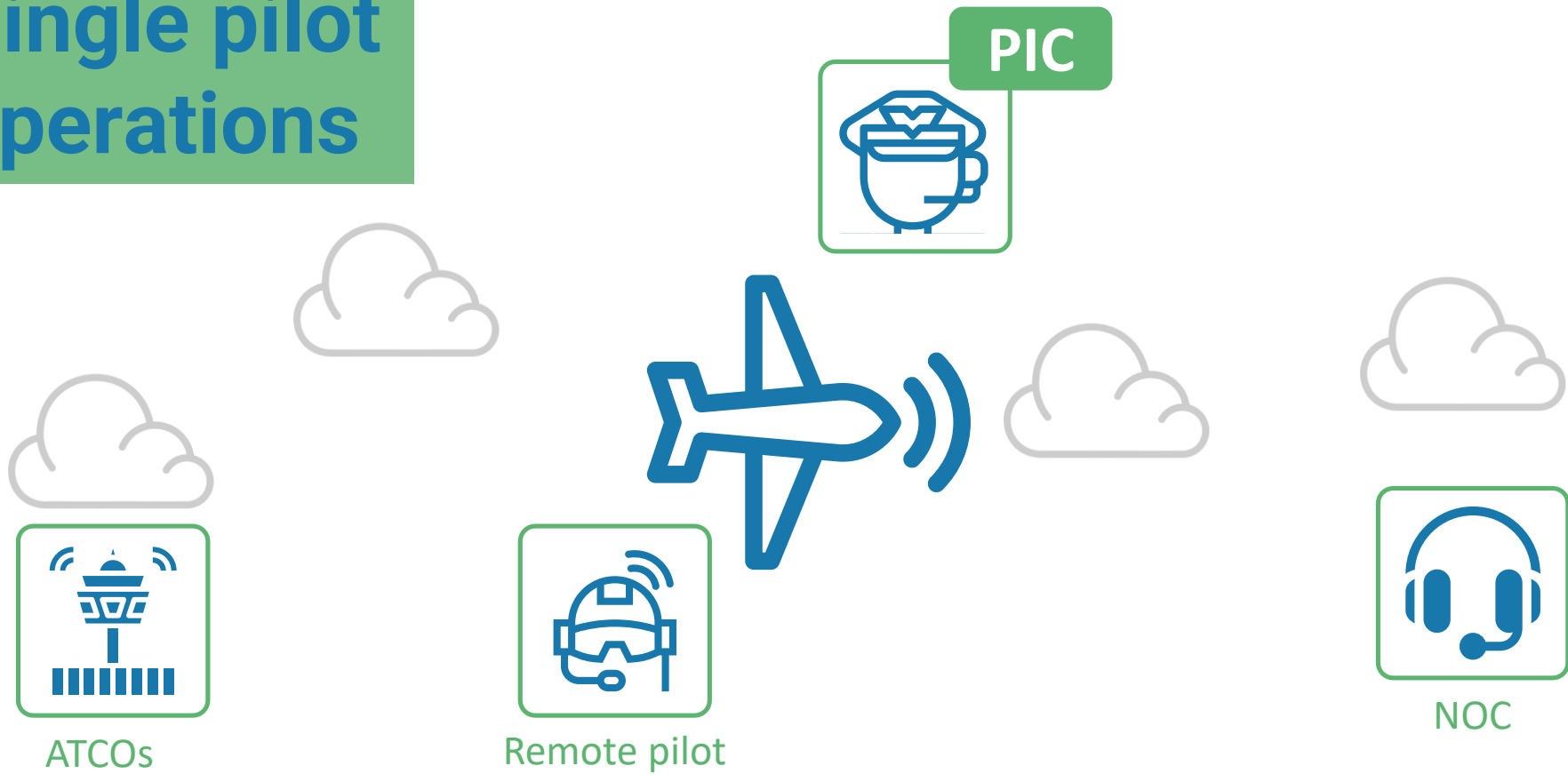


NOC

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Single pilot operations

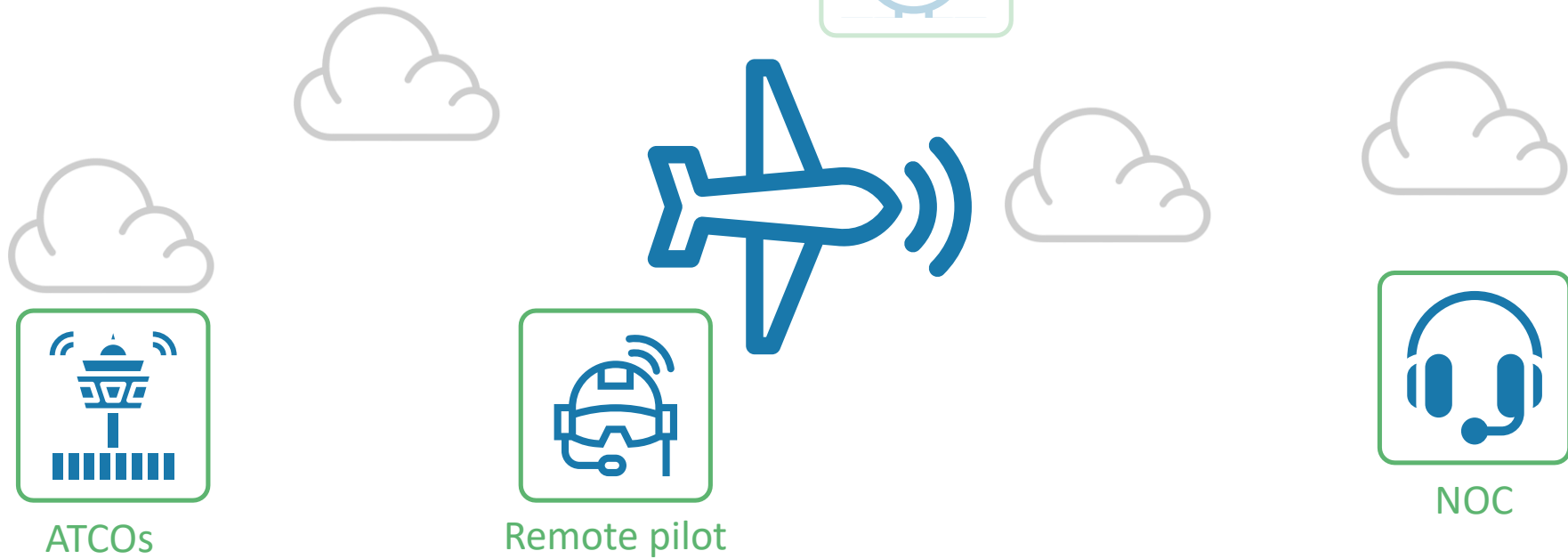


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Single pilot operations

PILOT
INCAPACITATION

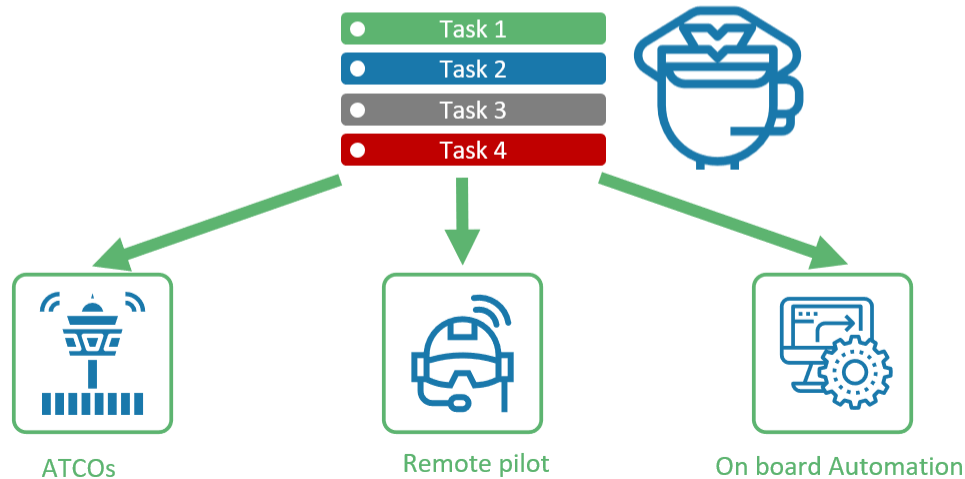


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How to handle single pilot incapacitation?

SAFELAND identified the single pilot tasks that should be distributed among the other actors



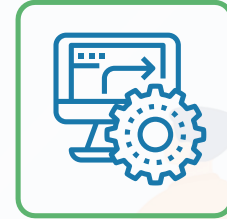
Three possible approaches



ATCO Focused: most of the single pilot tasks are assigned to the Air traffic controller



GSP Focused: most of the single pilot tasks are assigned to the Ground Station Pilot

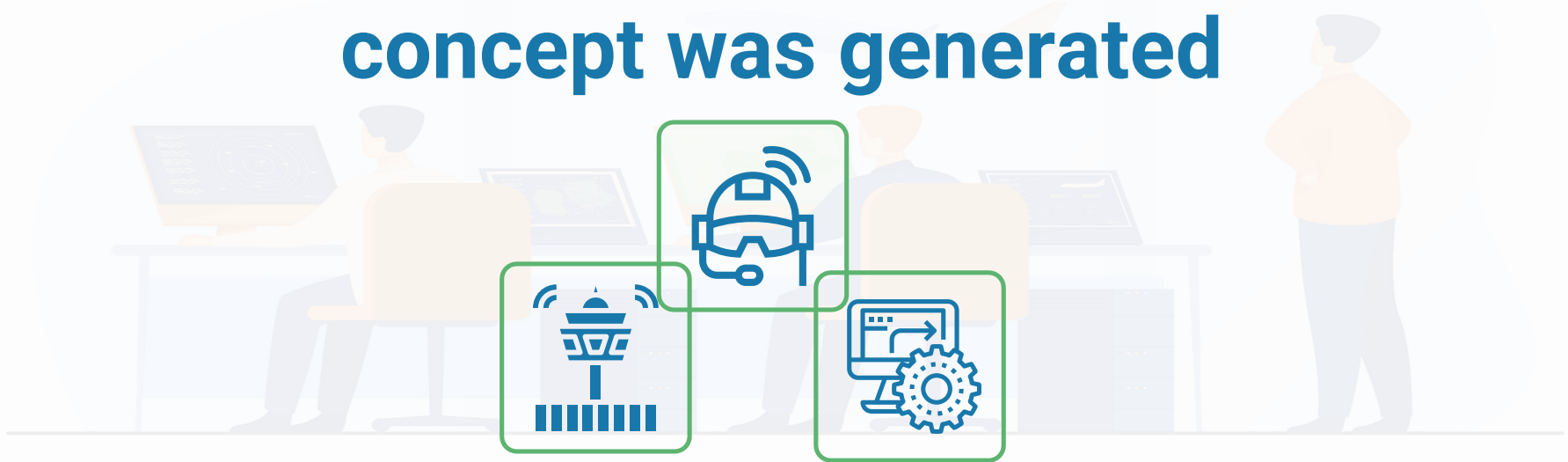


Automation Focused: most of the single pilot tasks are assigned to the cockpit automation

3 Operational Concepts have been generated and evaluated in terms of

Operational feasibility
Impact on safety
Impact on Human Factors
Liability and Certification
Costs

Taking into consideration internal and external feedback, a final hybrid concept was generated



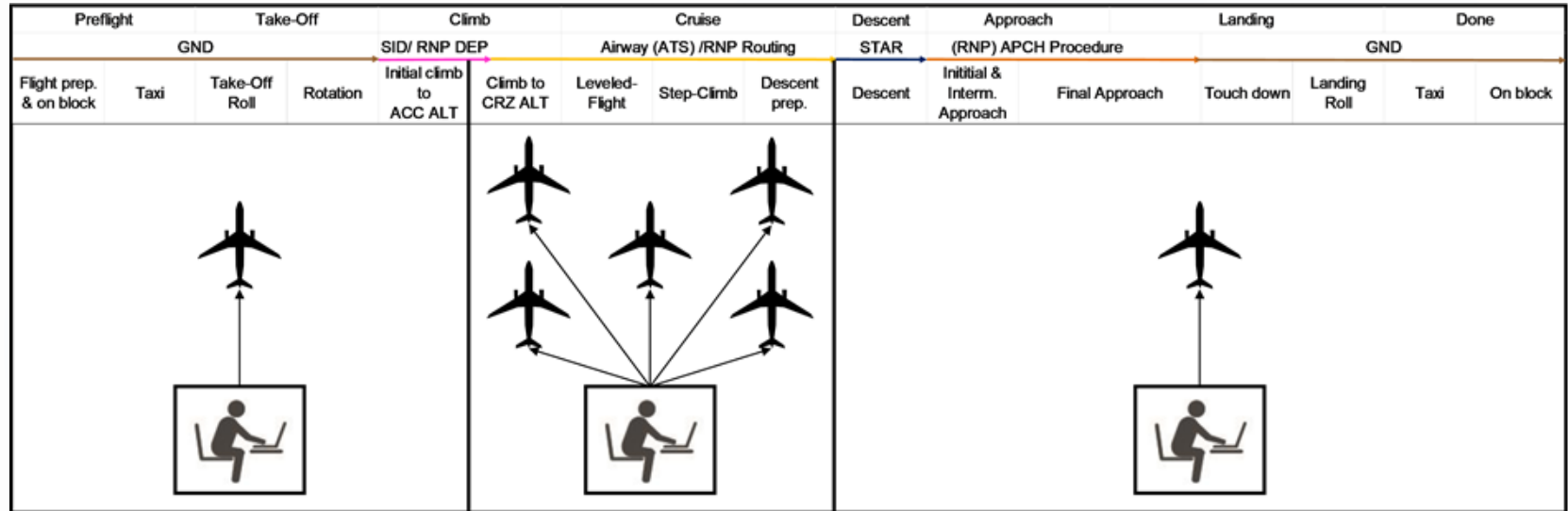
We are going to present the work done until now...



Key feedback

- (1) Presence of a **Ground Station** that would (at least) monitor aircraft system and **pilot health** throughout the flight
- (2) Need for **sophisticated onboard systems**
- (3) **Flight authority cannot be transferred to automation (liability)**
- (4) **Minimize change to current ATM processes, strategies and procedures** for an aircraft in an emergency situation
- (5) **Ground Station located next to NOC**

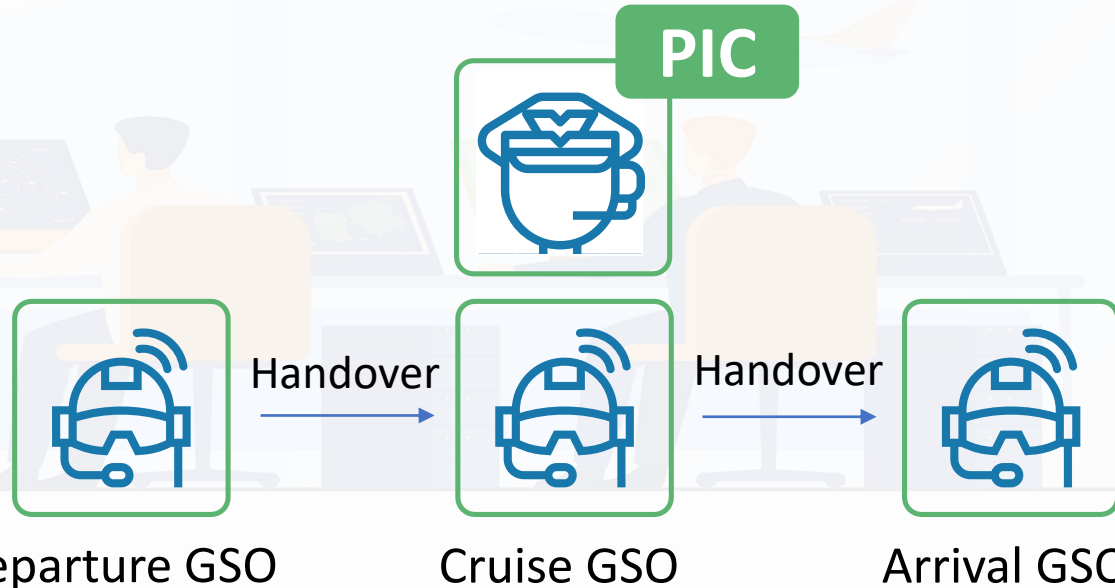
Operational concept



Schmid & Korn (2017)

Operational Concept

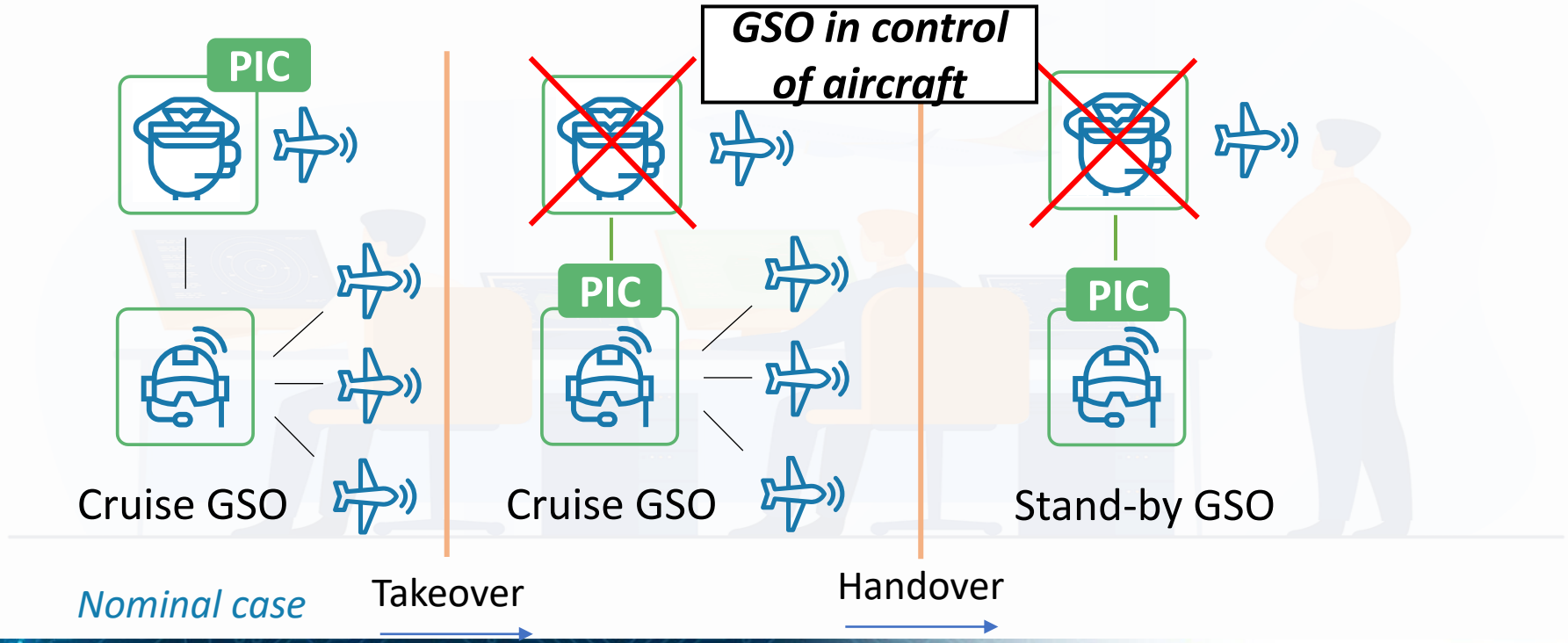
Aircraft pilot always in control



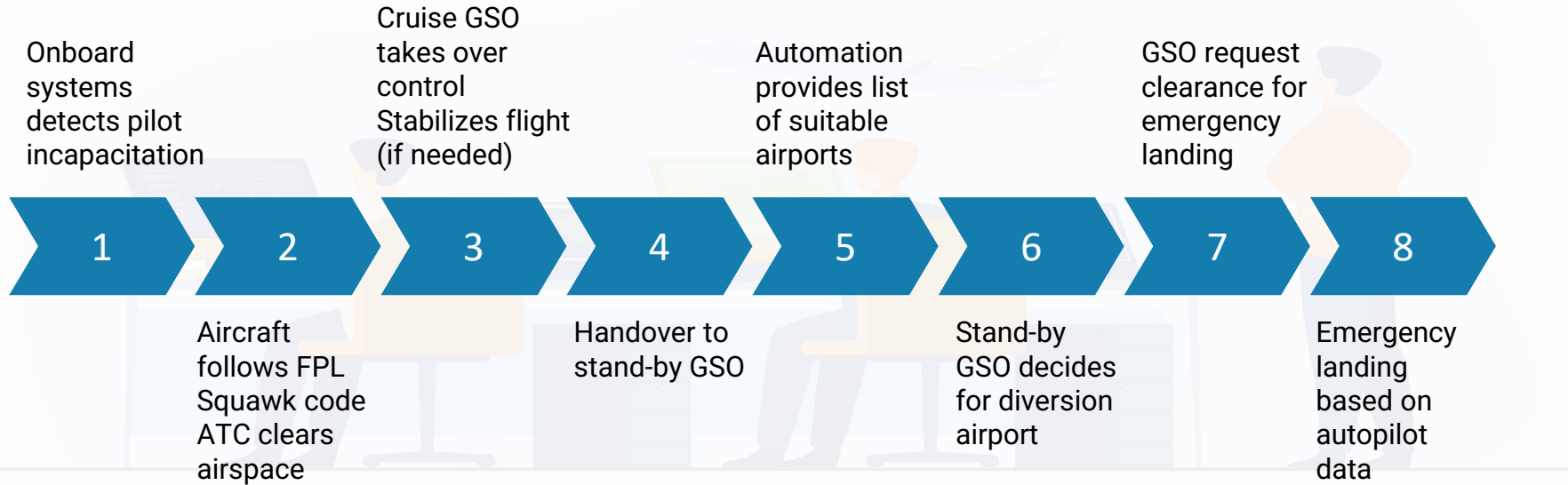
11th SESAR Inn *GSO only monitoring duties*



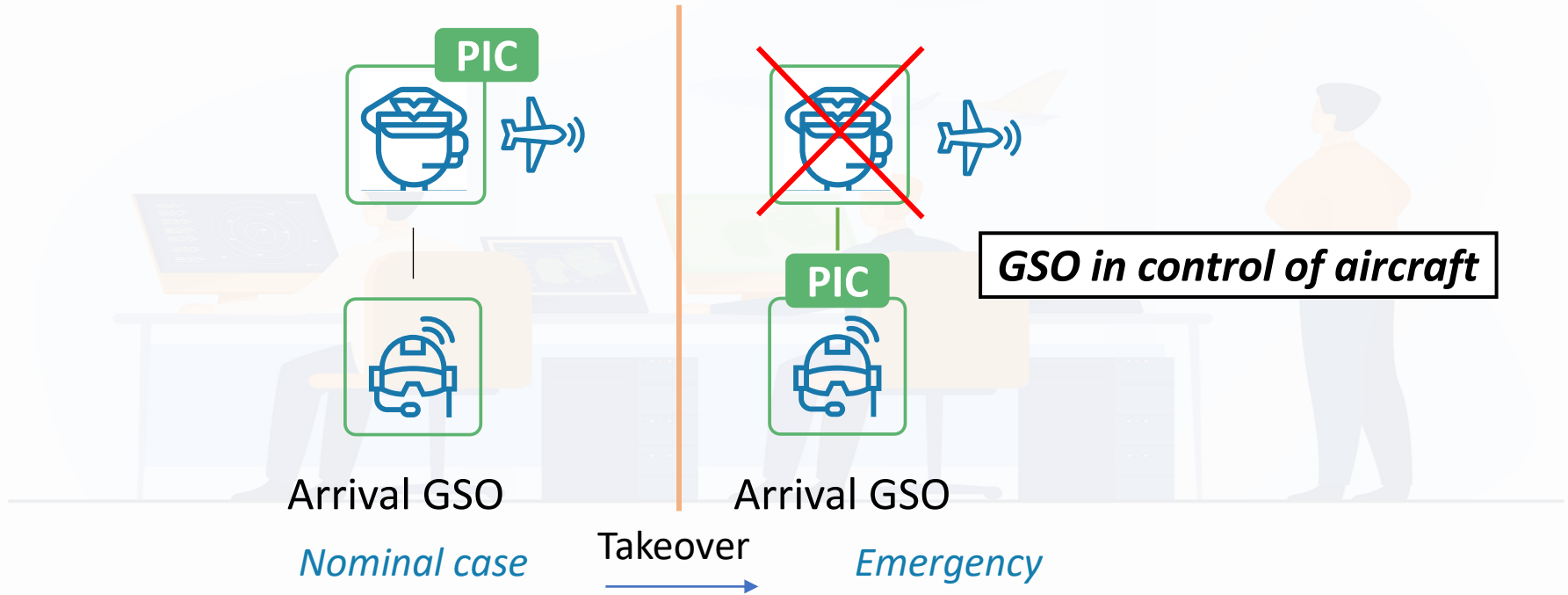
Incapacitation en-route



Takeover phases until safe landing



Incapacitation in TMA



Takeover phases until safe landing (TMA)



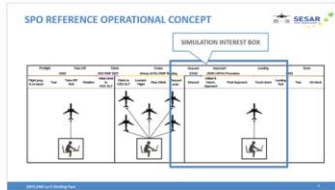
Key attributes of SAFELAND concept

- (1) SAFELAND concept proposes **three different GSO roles: departure, cruise and arrival GSO**
- (2) Concept relies on **more sophisticated onboard automation** to support the SP throughout the flight
- (3) Handover procedures are **closely aligned with current requirement** for remotely piloted aircraft handovers (e.g. ICAO)
- (4) **No significant changes** on the tasks and responsibilities of **ATC**
- (5) Remote pilot able **to control multiple highly automated UASs**
- (6) GSO is **not expected** to operate the aircraft under **manual control**

Low-Fidelity Simulations

MANUAL

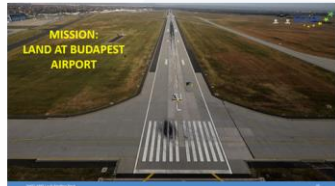
(CONCEPT, ROLES, SYSTEMS, PROCEDURES)



VIDEO EXAMPLE (NOMINAL SPO)



MISSION



- (1) Cooperation with SAFEMODE project: <http://safemodeproject.eu/>
- (2) Descent to land incapacitation over MS Teams: 8 pilots trial of GSP
- (3) First assessment of concept feasibility
- (4) Support to RTS set-up and use

Next events

- **May 2022:** Final concept presentation workshop
- **November 2022:** Final dissemination workshop

Public deliverables

<https://safeland-project.eu>

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**Thank you
very much
for your
attention!**