The Ground Station Operator in Single Pilot Operation – Active or Passive role?

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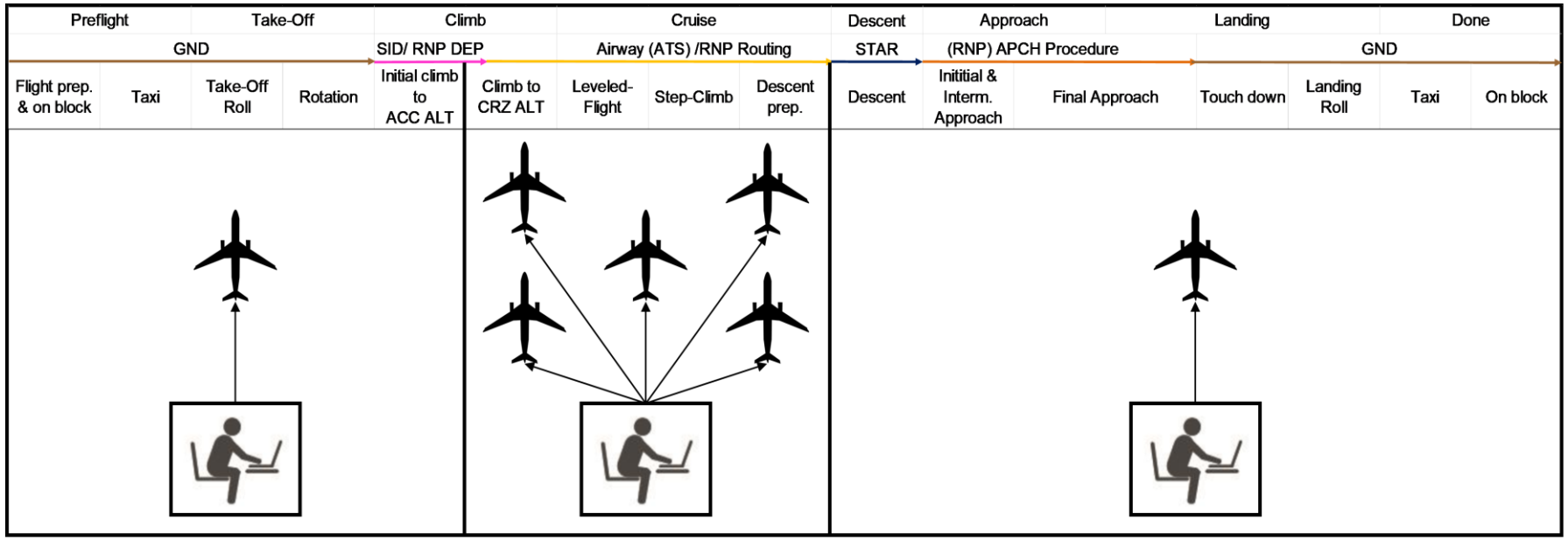
Introduction

- Almost two decades of research on Single Pilot Operations (SPO)
- SPO is expected to lead to economic benefits, more efficient crew scheduling and better aircraft availability
- Two main areas of research: Technical feasibility and **Concept of Operations**
- Tasks of Pilot Monitoring (PM) have to be transferred to the SP, a ground station operator or automation
- Pilot Flying (PF) remains Pilot In Command (PIC)

Nominal Operation Concept for SPO (Schmid & Korn, 2017)

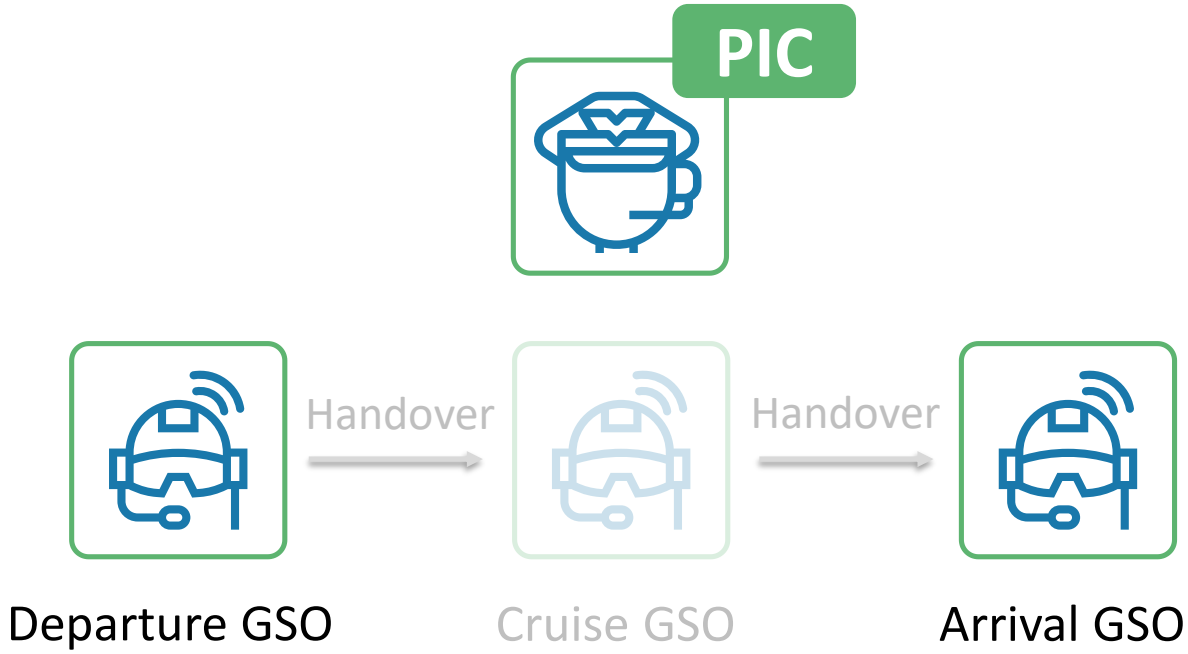
The presence of three different kinds of ground stations (GS) is assumed:

- Departure GS – the GSO supports one single pilot
- Cruise GS – the GSO supports multiple single-piloted aircraft simultaneously
- Arrival GS – the GSO supports one single pilot



Objectives

- Investigate task allocation options for a GSO
- Specifically compare passive vs active GSO while giving dedicated support during departure/ arrival phases
- Cruise GSO would always have a passive role



Tasks of Pilot Monitoring

PM tasks according to Norman (2007) – starting point:

- Communications
- Checklist
- Record significant flight information
- Verbal callouts
- Monitor Aircraft State and Navigation
- Monitor External Hazards
- Verify visual Contact on Approaches
- Normal Systems Management
- Flight Guidance and Autopilot & Autothrottle Configuration
- Aircraft Configuration
- Passenger and Cabin Crew Management
- Abnormal Procedures
- Emergency Procedures
- Monitor PF

Task allocation

Task delegated to automation

- Proposed task allocation to automation for Single Pilot Operations

Task	Reasoning
Radio Frequency changes	Automated change in frequencies, speech recognition.
Checklists	Checklists presented to the SP in a display and if some item is not executed, automation provides a warning
Verbal callouts for speeds, altitudes, configuration states	Verbal callouts conducted by automation (e.g., takeoff rotation, 50 feet altitude, and deviations)
Check altitudes, headings and speeds against current clearances	Automation can check the values and issue a warning if the actual value deviates from the cleared value
Aircraft configuration (e.g. landing gear, flap settings)	Automation can execute the setting of flaps, landing gear, landing lights etc. with the single pilot monitoring

Task allocation

Task allocation to GSO

- Proposed task allocation to multi-aircraft cruise GSO, **dedicated** passive vs. active GSO

Task	Cruise GSO	Passive GSO	Active GSO
Configure Flight Guidance, Autopilot /Autothrottle modes	No. Remains with SP		
Monitor External Hazards, including visual contact in Instrument Meteorological Conditions	No. Remain with SP		
Cabin Crew Management	No. Remains with SP		
Communication with Flight Dispatch, AOC	Yes	Yes	Yes
Monitor Weather Conditions	Yes	Yes	Yes
System Monitoring incl. pressures, fuel balance, engine power	Yes	Yes	Yes
Abnormal Procedures	Yes	Yes	Yes
Emergency Procedures	Yes	Yes	Yes

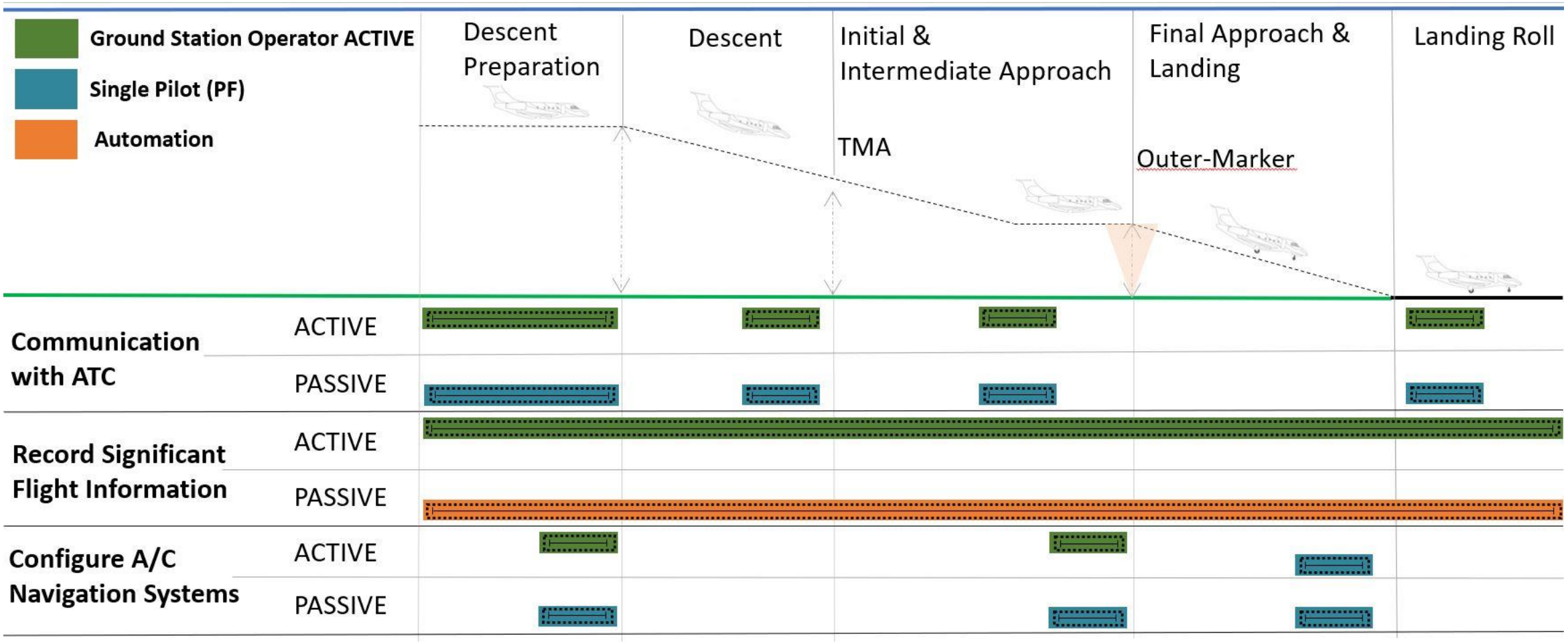
Task allocation

Task allocation to GSO

- Proposed task allocation to multi-aircraft cruise GSO, **dedicated** passive vs. active GSO

Task	Cruise GSO	Passive GSO	Active GSO
Monitor pilot mental state, overall judgment of actions (complemented by a pilot monitoring system)	No	Yes	Yes
Communication with ATC	No	No	Yes
Record flight information received via radio or the datalink system, for future recall (e.g., transmissions involving weather, NOTAMs, clearances, fix reporting requirements)	No	No	Yes
Configure a/c navigation systems incl. planning and executing routes, route and runway changes, etc	No	No	Yes

Comparison task allocation active vs. passive GSO



Conclusions and Next Steps

- GSO needs to be able to take over if needed (in case of pilot incapacitation)
- provide as much support as possible to the SP, while at the same time making SPO safe, profitable and acceptable
- Biggest difference communication with ATC
- In case of passive GSO - > SP get more tasks
- Problem of sit. Awareness and workload to SP and GSO -> should be investigated

Thank you!

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