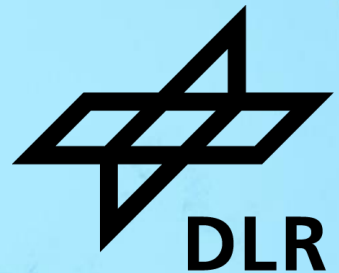


KICK-OFF MEETING

“Accommodation Validation 2023” study



Agenda for Today



11:00 – 11:10 **Welcome and Introduction**
Christophe Vivier (HoU SES unit), Nathalie Hasevoets (EDA) and
Dirk-Roger Schmitt (DLR)

The TOPs are also addressing the findings from the Evaluation Report

11:10 – 12:10 **Objectives, Operational Options and Timeline**
Joonas Lieb (DLR)

Lunch Break

13:00 – 13:45 **Review and Update Task 1, Task 2, Task 3**
Henk Hesselink (NLR) and Frank van Rijn (NLR)

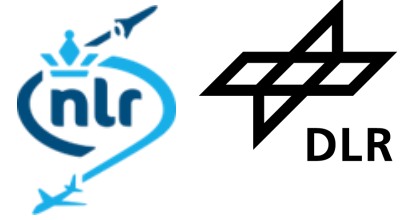
13:45 – 14:45 **Consultation Strategy and Resources, Quality and
Risk Management**
Dirk-Roger Schmitt (DLR) and Joonas Lieb (DLR)

Coffee Break

15:00 – 16:30 **Discussion on Open Issues**
Nathalie Hasevoets (EDA)

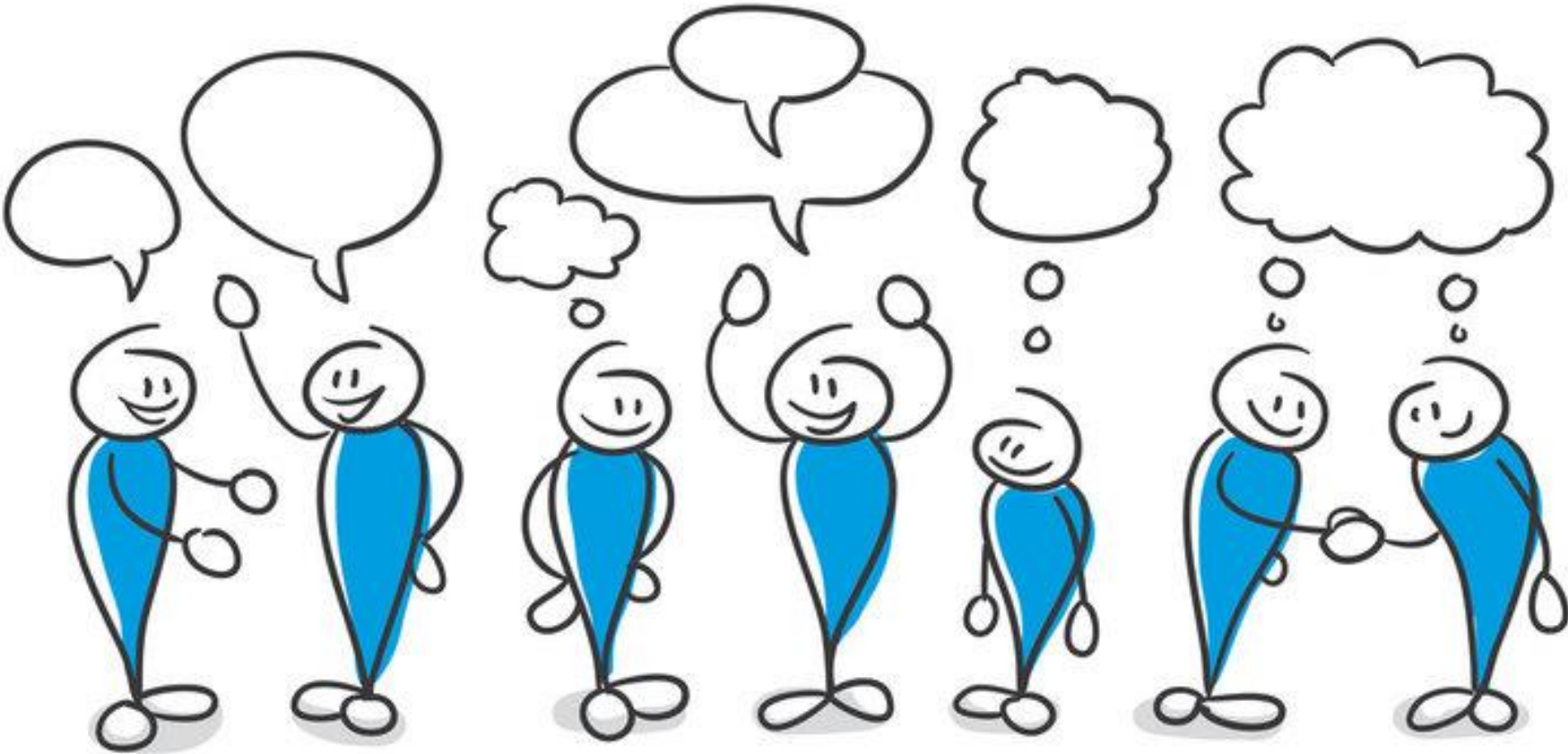
16:30 – 17:00 **Open Questions and AOB**
All

Agenda (for this presentation)



- Round table and Introduction of Organisations
- Operational Options and Specific Objectives
- Scenarios and RPAS availability
- Updated Study Timeline

Round table





DLR

Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center



DLR

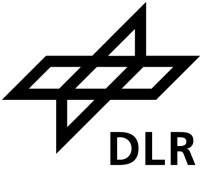


- Research Institution
- Space Agency
- Project Management Agency
- Budget: 1 billion Euros
(each task)

Research Fields

- Aeronautics
- Space Research and Technology
- Transportation
- Energy
- Defense & Security
- Digitalisation (cross-sectional field)

DLR – German Aerospace Center



- More than 10.000 employees
- 50+ Institutes at 25+ locations
- **Institute of Flight Guidance**
in Braunschweig



DLR Braunschweig



Introduction

Royal NLR in brief



One-stop-shop



Global player with
Dutch roots

100+

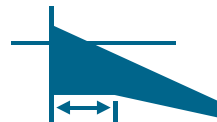
Since 1919



Amsterdam, Marknesse
Rotterdam, Noordwijk, Brussel



Innovative, involved
and practical



For industry and
governmental



For civil and
defence



700+
staff



€ 100 M turnover



69% Dutch, 24% EU
and 7% worldwide

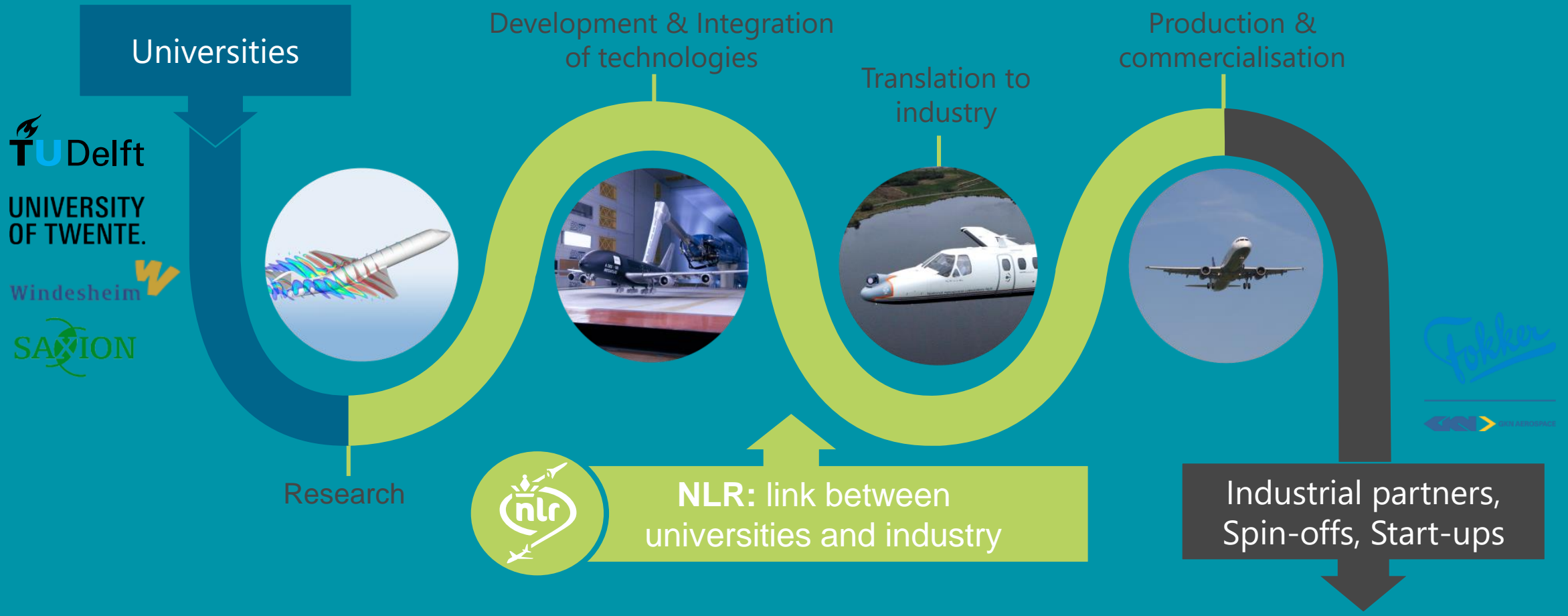


Active in 29+ countries



Very high
customer satisfaction

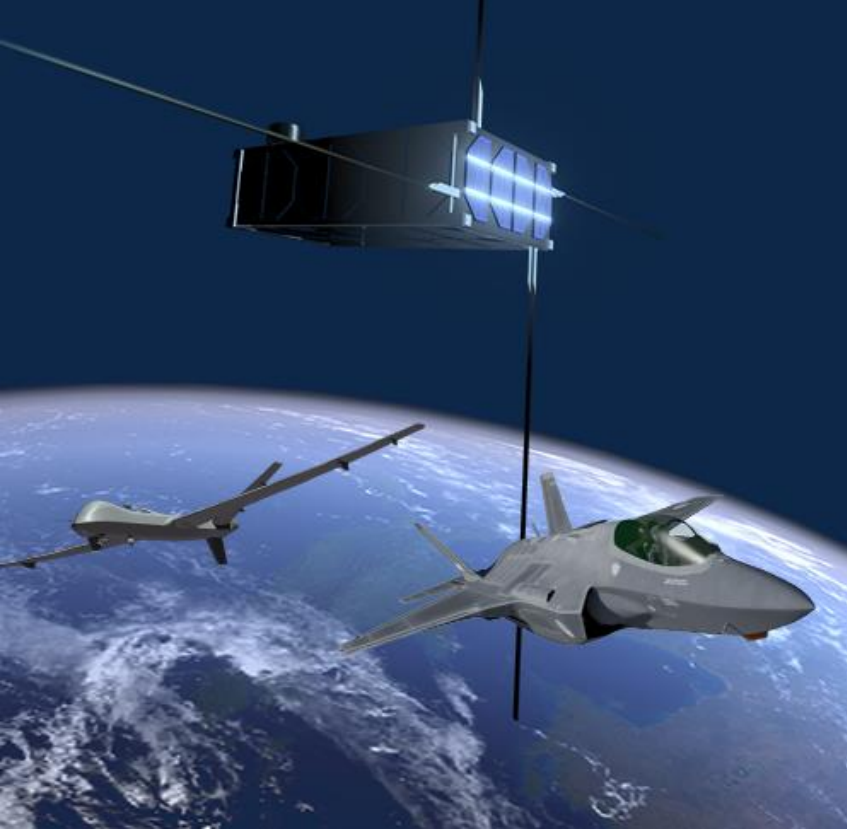
Positioning of NLR



NLR - Multidisciplinary fields of knowledge



Aerospace systems



Aerospace operations



Aerospace vehicles



Introduction

German Armed Forces Support

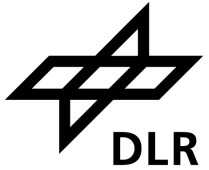


- German Military Aviation Authority
 - Section Chief - Flight Operations Policy Matters: Colonel (GS) Kottmann, Walter-Juergen
 - SO RPAS Operations: LtCol Horz, Oliver
- German Air Force Command
 - Capabilities Development Section: Maj Prass, Tobias
- Tactical Air Force Wing 51
 - GHTP Squadron



Accommodation Validation 2024

Objectives



Project objectives:

- Perform several cross-border demonstration flights at pan-European scale
- Use a legacy large RPAS operated in non-segregated European airspace classes A-C
- ATC services shall be provided by civilian ATCOs

Project implications:

- Transfers between military controlled airspace and the civilian airspace
- Demonstration flights will be expanded operationally and geographically (compared to previous studies) to involve other EDA Member States (i.e. Germany and the Netherlands)
- Different RPAS-type (German Heron TP) compared to previous Accommodation Study

Accommodation Validation 2024

Operational Options



Options 3 and 4 will be addressed within SC1

Option 3: RPAS simulating non-normal/emergency situation(s) with prior coordination and safety analysis

- Cross-border demo flight btw. GER and NLD
- GHTP will face a simulated technical issue in Dutch airspace
- Diversion to alternate airport in the Netherlands
- Another technical issue (i.e. loss of C2 link) will be simulated
- GHTP will perform a “Return to Base” (RTB)

➤ addressed via **demonstration flight(s)** in SC1

Option 4: RPAS flying up to their ceilings (e.g., high Flight level – FL, higher traffic density)

- Cross-border demo flight(s) btw. GER and NLD
- One demo flight operated btw. FL100 - FL245
- Second demo flight operated at FL400
- Flights in non-segregated, controlled airspace
- Encounter high commercial traffic on ATC routes and sectors btw. airports of EHAM, EDDH and EKCH

➤ addressed via **demonstration flight(s)** in SC1

Accommodation Validation 2024

Specific objective



In total, all six (6) Specific Objectives (SO) will be addressed within SC1

SO1: To support, prepare and coordinate the organization of additional demo/test flights

- Involve key stakeholders (e.g. DFS, MUAC, LVNL/NIL) in the planning
- Organisation of dedicated internal meetings
- Development and finetune flight scenarios
- Follow standard ATC routes and published procedures
- Task 1 is devoted to SO1

SO2: To retrieve and develop the lessons learned from the demo/test flights and see the applicability at pan-European level incl. ConOps, guidelines and recommendations. A Validation Plan and a Validation Report must be developed.

- Examination of relevant documentation produced by EDA/ SJU and earlier projects
- Analyse the previous Accommodation Validation studies (i.e. 17.CPS.OP.017, 19.ISE.OP.159) in detail
- Further enhance pan-European ConOps (T3.1) (also) taking previous studies into account
- Substantial experience in the development of VALP and VALR by DLR and NLR
- Develop required VALP (T1.3) and VALR (T2.3) based on planned demo flights

Accommodation Validation 2024

Specific objective



In total, all six (6) Specific Objectives (SO) will be addressed within SC1

SO3: To coordinate/facilitate the practice of non-normal or emergency procedures (e.g., loss of C2 link) during the demo flights, supported by a safety assessment and as/if agreed by all partners involved

- | | |
|---|---|
| <ul style="list-style-type: none">• Include non-normal scenario in the demo flights (i.e. “failure” simulated)• Non-normal scenario will be coordinated with the involved parties (e.g. ANSPs) | <ul style="list-style-type: none">• Assessment of the available platform procedures with key stakeholders (e.g. GAF)• MUSRA methodology or safety case analysis used for risk assessment |
|---|---|

SO4: To investigate the gap/missing elements for an immediate implementation at pan-European level of Accommodated operations and to suggest how to progress in the future to full integration of MALE-type RPAS

- | | |
|---|---|
| <ul style="list-style-type: none">• Establishment of pan-European working group• Review and feedback on pan-European ConOps for RPAS Accommodation | <ul style="list-style-type: none">• Organisation of dedicated exchange meetings• Active participation of ANSPs, ATCOs, military entities and other bodies e.g. EDA, EASA, ECTL |
|---|---|

Accommodation Validation 2024

Specific objective



In total, all six (6) Specific Objectives (SO) will be addressed within SC1

SO5: To disseminate the results of the study to interested parties incl. the Commission, EASA and SJU. The dissemination incl. workshops, social medias, dissemination of movies and documents/leaflets.

- | | |
|--|---|
| <ul style="list-style-type: none">• Organisation of dedicated workshop and creation of factsheet, brochure and movie (T3.2)• Participation in various events and conferences• Development of scientific publications | <ul style="list-style-type: none">• Establishment of (pan-European) Stakeholder Consultation Group (SCG)• Social media experts available at DLR/ NLR |
|--|---|

SO6: To establish close coordination with the experts in charge of the SESAR Accommodation Solution (PJ 13 Solution 1156 or SJU project successor) and promote the findings done on the military side and reciprocally take advantage of any finding on the civilian side; it implies contacting the industrial partners involved at SJU Solution level and exchanging actively with them

- | | |
|--|--|
| <ul style="list-style-type: none">• Get in contact with PJ13 Sol 115(6)• Established connections with former SESAR project partners (e.g. industry) | <ul style="list-style-type: none">• Capitalize rich legacy of DLR and NLR with SJU• SJU „ATM Masterplan“ event held at DLR-FL (Oct. 2023) |
|--|--|

Accommodation Validation 2024

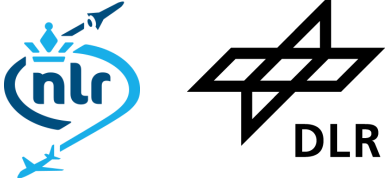
Proposed scenario: Demonstration Flights



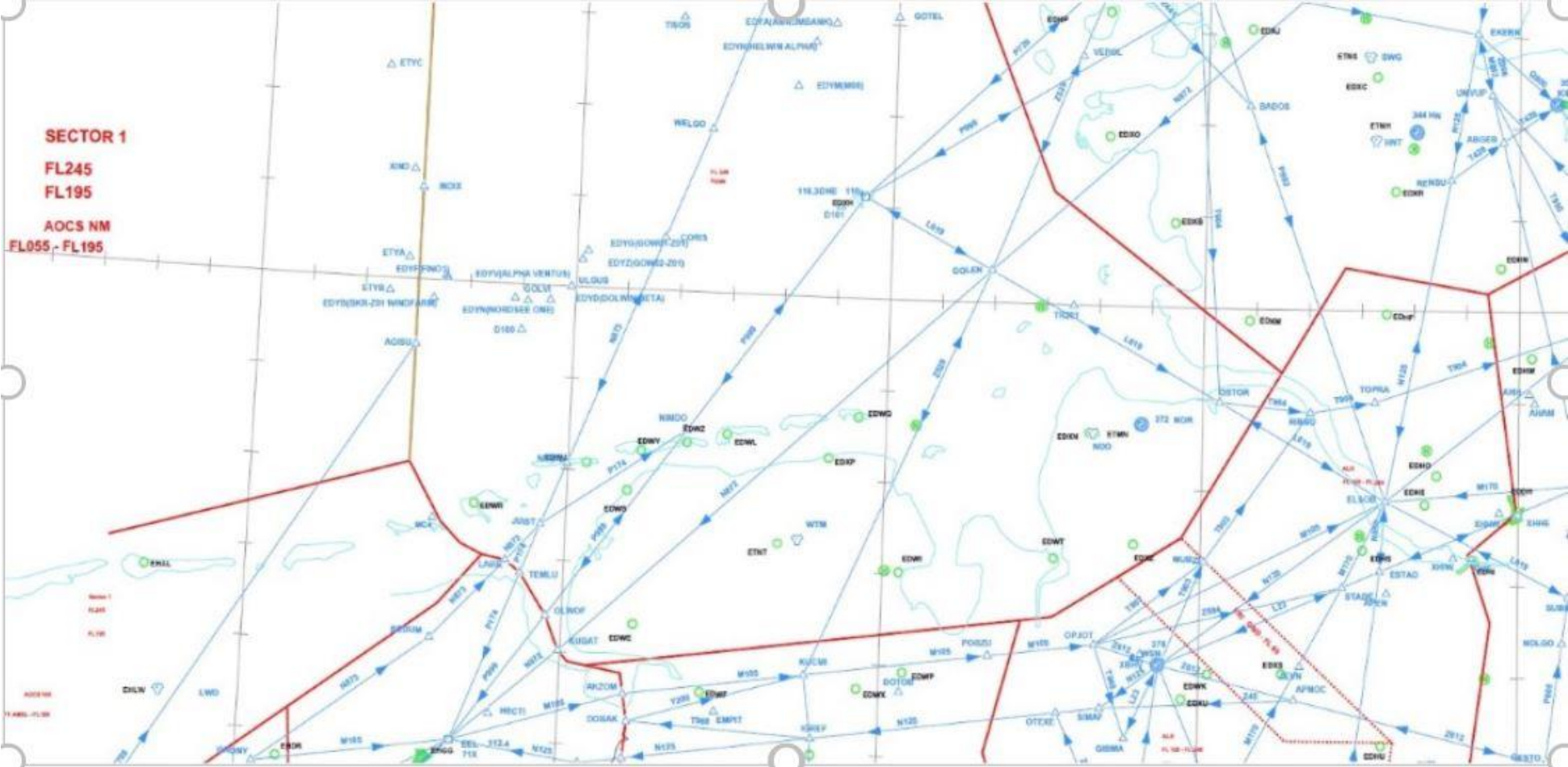
- 3 IFR-Flights, based on approved, individual GAT- flight plans (i.e. we intend not to use identical flight plans but various routings through the relevant ATC-sectors while)
- All flights take-off from and land at Schleswig Air Base (ETNS) with the intend to fly to Leeuwarden Air Base (EHLW)
- Military ATC will be in control at Schleswig, Leeuwarden and while inside military training areas, while civil ATC will control the GHTP during transit phases
 - Demo Flight #1:
take-off, ED-R 201 TRA (delay), transit FL 240 , descent EHLW, transit FL 230, land at ETNS
 - Demo Flight #2:
take-off, ED-R 201 TRA (delay), transit >FL 300 , ED-D 100 (delay), transit < FL 200, descent EHLW, climb, transit > FL300, land at ETNS
 - Demo Flight #3:
take-off, transit FL 240, simulated emergency requiring own navigation to EHLW, decent EHLW, climb, ED-R 201 TRA (delay), simulated C2 link loss incl. loss of en-route radio comms, return to base on link loss route, land at ETNS

Accommodation Validation 2024

Proposed scenario: Demonstration Flights



Overview of ATC sectors

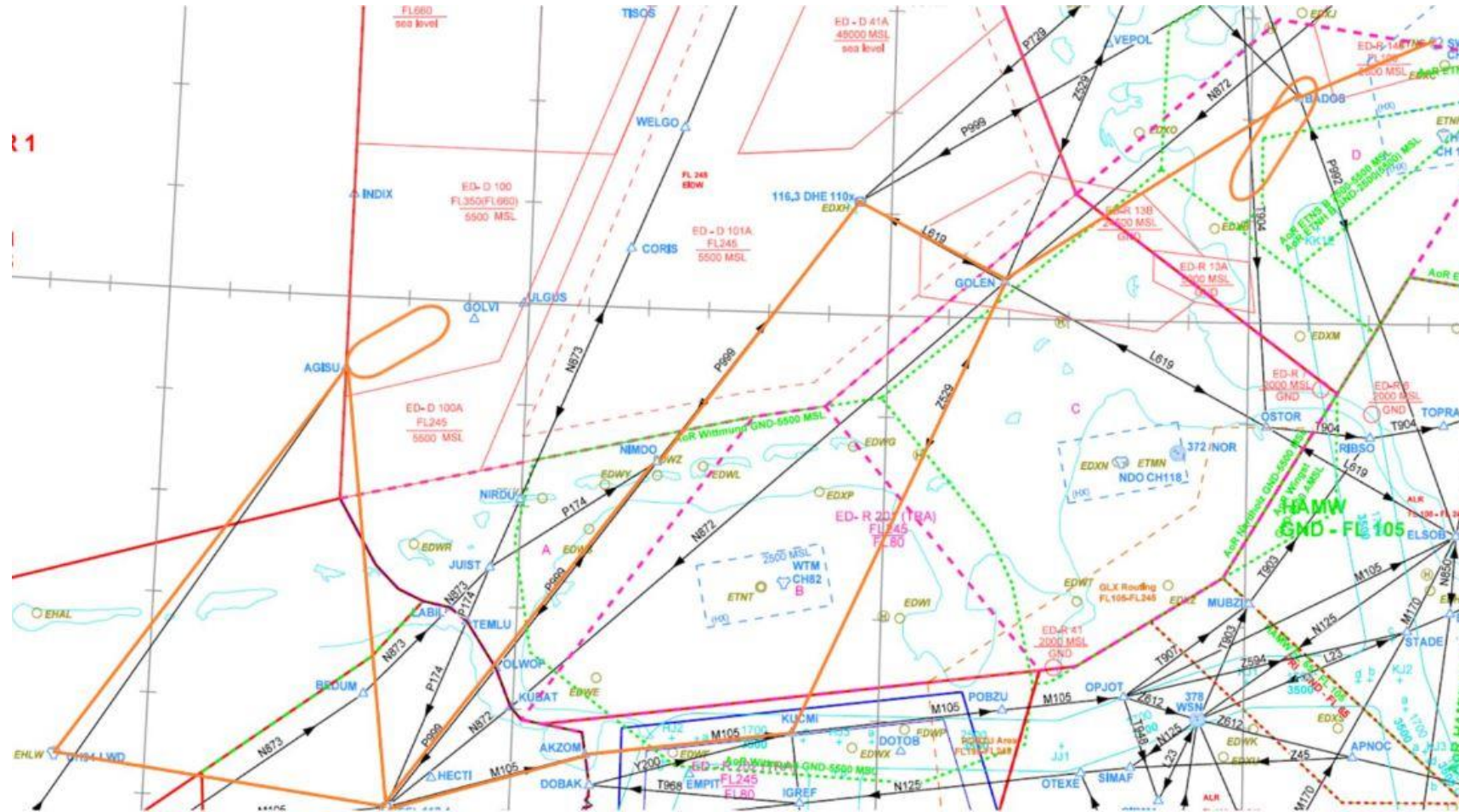


Accommodation Validation 2024

Proposed scenario: Demonstration Flights



Visualisation of (potential) routing in lower airspace structure (< FL245)

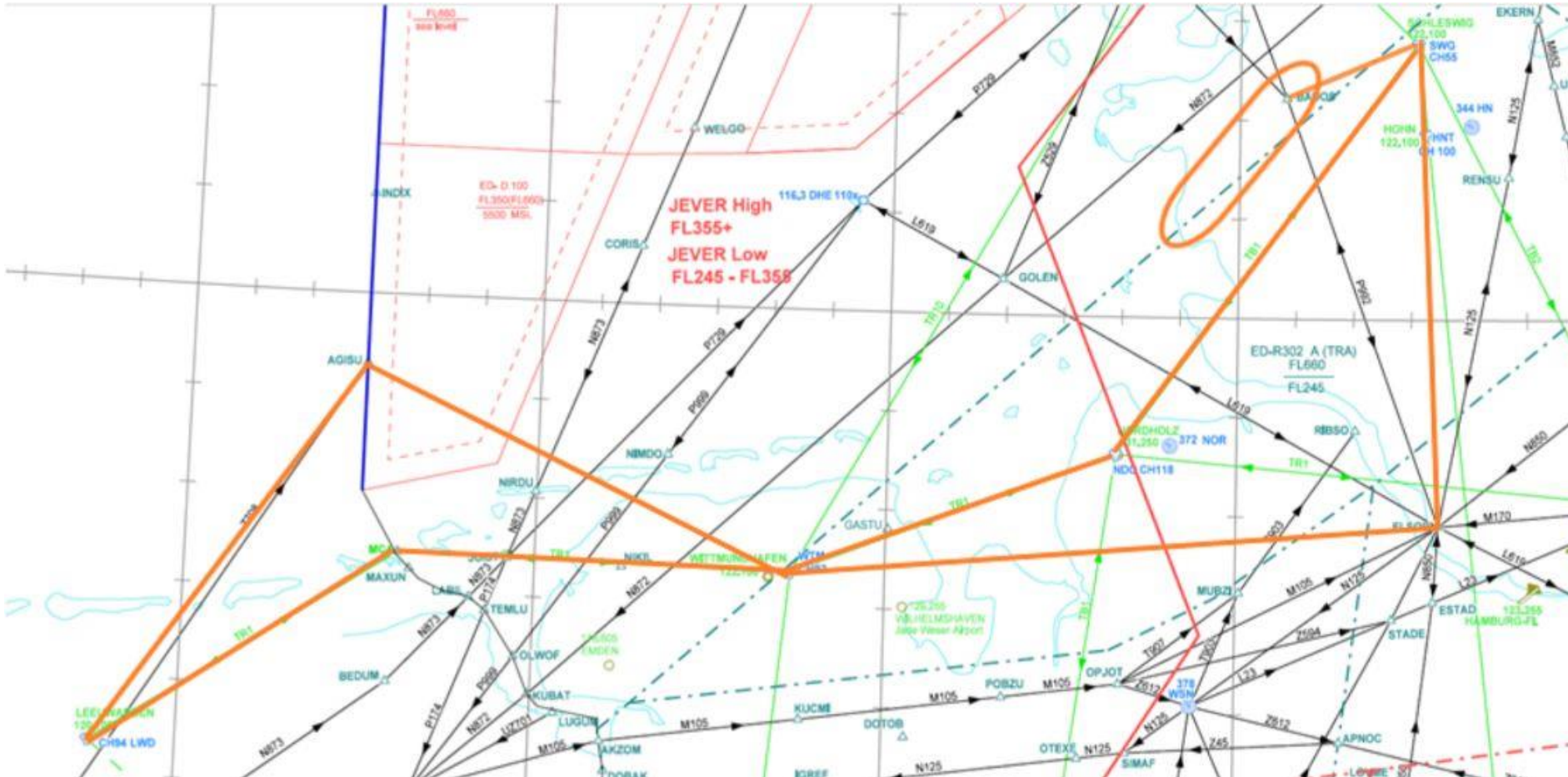


Accommodation Validation 2024

Proposed scenario: Demonstration Flights

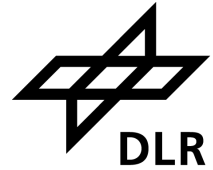


Visualisation of (potential) routing in upper airspace structure (> FL245)



Accommodation Validation 2024

Proposed RPAS



German Heron TP (GHTP)

CNS equipment

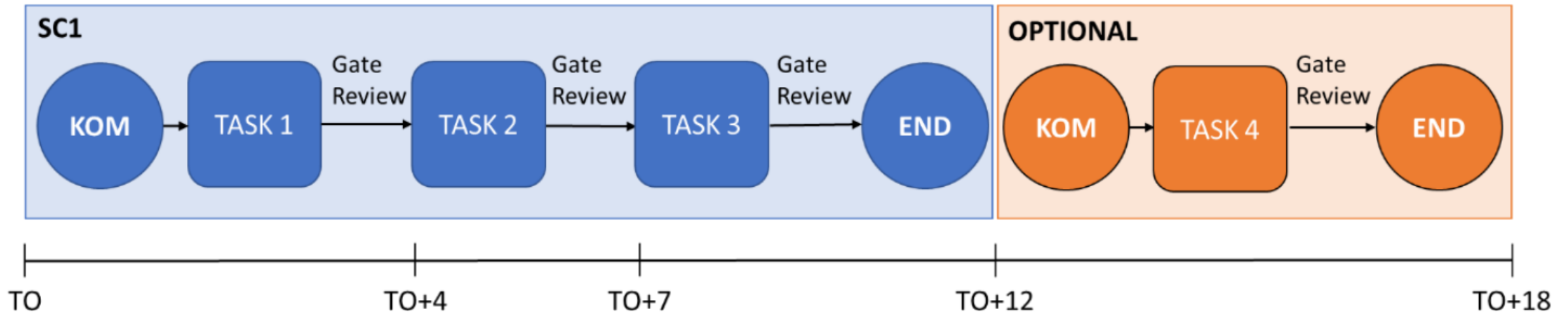
- 2 x UHF/VHF radios
- Mode S transponder
- TCAS, ADSB – out
- RNP 1, RVSM capable
- Ice Detection and protection
- Weather Radar
- Automatic Take Off and Landing System (ATOL)
- Multiple redundant LOS & BLOS command and control links



Attribute	Value
max. Take-Off Weight (MTOW)	5.679 kg
Overall Length	14 m
Wingspan	26 m
Powerplant	1.200 hp PT6 Turbo Prop
Endurance	30 h
Range	BLOS > 100 km
Altitude	> 40,000 ft
max. Speed	130 KCAS / 0.35 Mach

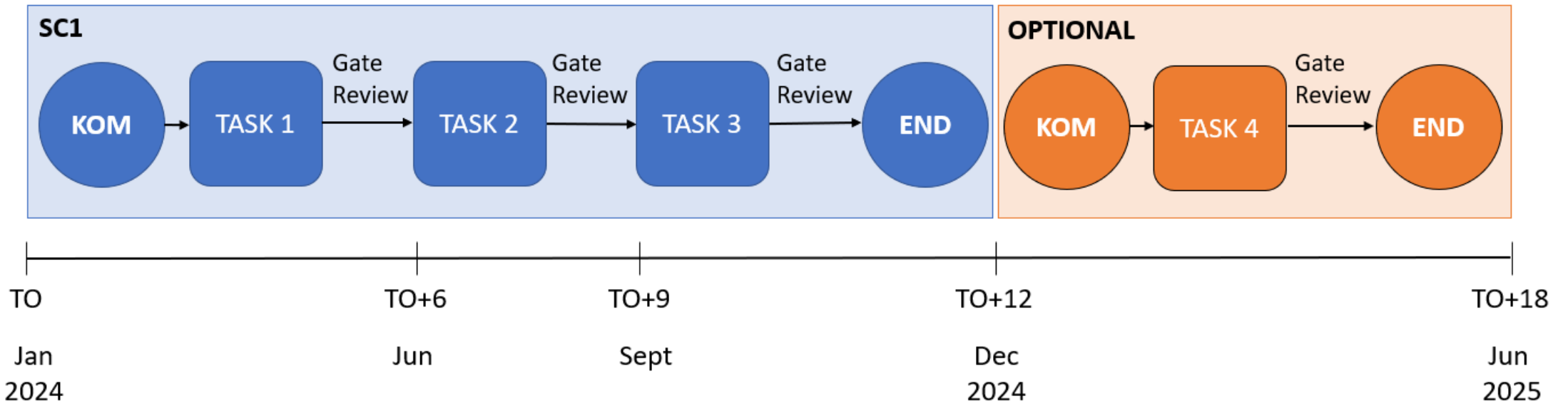
Accommodation Validation 2024

Proposed Timeline



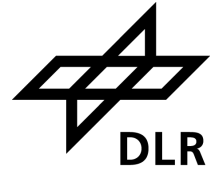
Accommodation Validation 2024

New Timeline



Accommodation Validation 2024

New Gantt Chart



No.	Title	SC1												OPTIONAL					
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	Flight Preparation																		
1.1	Review material and coordinate with stakeholders																		
1.2	Preparation and organisation of the planned demonstration flights																		
1.3	Development of Validation Plan and Human Factors investigations																		
2	Validation Campaign																		
2.1	First Demonstration Campaign																		
2.2	Second Demonstration Campaign																		
2.3	Development of Validation Report																		
3	SC1 Final Report and Dissemination Activities																		
3.1	Development of pan-European military ConOps for RPAS operations																		
3.2	Dissemination activities and workshop																		
3.3	Development of SC1 Final Report																		
4	Simulation Activities																		
4.1	Scenario and simulation infrastructure development																		
4.2	Simulation execution and final recommendations																		

 : marks the submission of a deliverable

Accommodation Validation 2024

Deliverables and Milestone



Deliverables

Ref.	Title	Lead Participant	Initial submission
D1	Validation Plan	NLR	May 2024
D2	Validation Report	DLR	July 2024
D3 (draft)	SC1 Final Report (draft)	DLR	Oct 2024
D3	SC1 Final Report	DLR	Nov 2024

Milestones

Ref.	Title	Lead Participant	Initial submission
Review Gate 1/ M1	Review Gate for D1 – Validation Plan	NLR	May 2024
Review Gate 2	Review Gate for D2 – Validation Report	DLR	July 2024
Final Review Gate/ M2	Review Gate for D3 – SC1 Final Report	DLR	Oct 2024



THANK YOU!

KICK-OFF MEETING

“Accommodation Validation 2023” study



Agenda



- Overview of Tasks

- Review and update Task 1
- Review and update Task 2
- Review and update Task 3

- Questions and discussion

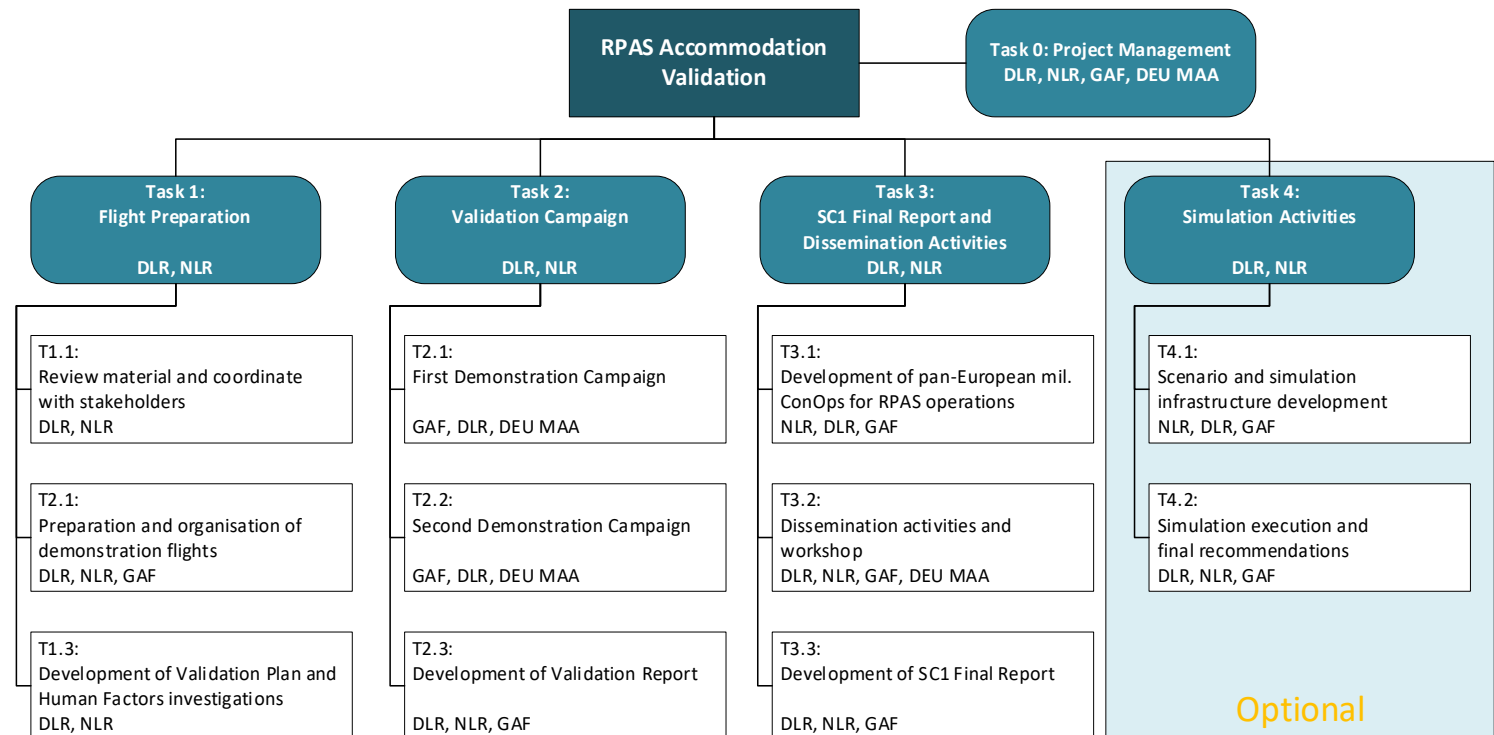
Overview

Tasks



Accommodation Validation 2024 comprises five tasks:

- Task 0 is devoted to project management and general coordination.
- Tasks 1, 2 and 3 are the technical tasks for this specific contract.
- Task 4 proposes follow-up human-in-the-loop simulation activities.



Task 1

Flight Preparation



Objectives

- Examine existing pertinent information from previous studies (i.e. 17.CPS.OP.017 and 19.ISE.OP.159)
- Retrieve lesson learned from previous MALE-types RPAS demonstration flights
- Establish coordination with relevant stakeholders
- Organize and prepare planned demonstration flights including finalization of scenario specification
- Analyse in-flight handover procedures for in-flight RPIL and ATCO handover procedures
- Create validation plan deliverable

No.	Title	SC1				
		Jan	Feb	Mar	Apr	May
1	Flight Preparation					
1.1	Review material and coordinate with stakeholders					
1.2	Preparation and organisation of the planned demonstration flights					
1.3	Development of Validation Plan and Human Factors investigations					

Subtask 1.1

Review material and coordinate with stakeholders (M1-M2)



- Analyse existing literature
 - EDA documents, Accommodation Studies, Numerous research papers
 - Towards VALP and further enhancement of pan-European ConOps for RPAS in Task 3

- Coordinate with stakeholders
 - MoD, NMAA, DEU MAA, ANSPs
 - Consultation with relevant stakeholders to plan and discuss the flight scenarios

This **collaborative approach** aims to increase the likelihood of successful conduction of the planned demonstration flights

Subtask 1.2

Preparation and organisation of demonstration flights (M2-M3)



- “Prepare”
 - Assess RPAS operating limits and requirements for any arrival airport
 - Select potential destination for normal and non-normal operations
 - Select optimal date, day-time and final flight route
 - Develop of specific scenarios (considering environment, platform, contingency/emergency plans)
- “Organise”
 - Coordinate with relevant authorities and inform stakeholders
 - Obtaining necessary permits
 - Conduct a Safety Case Analysis (or MUSRA methodology)
- Specify procedures for in-flight RPIL handover for the GHTP (and, if appropriate, on ATC side)
- Establish communication plans between relevant stakeholders (e.g. civil ATC-NEL, civil ATC-DLD, RPAS ground pilot, etc.)
- Investigate RPIL-ATCO communication implementation

Subtask 1.3

Development of VALP and HF investigation methods (M3 – M5)

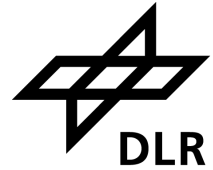


- Develop the required Validation Plan (VALP) → **Deliverable D1**
 - Describe the validation activities (planned in Task 2) following SJU VALP template
 - Address validation objectives and technical, operational and safety aspects
 - Formulate general assumptions regarding the conceptual framework, scope, and contextual elements of MALE RPAS accommodation
 - Determine initial and targeted maturity levels (using E-OCVM) of the accommodation process
- Develop methods for gathering valid and relevant data
 - Employ established human factors methodologies to gather data (e.g., develop questionnaires, interviews)
 - Develop tailored questionnaires for RPIL crews and ATCOs to quantitatively assess challenges, operational considerations and potential safety concerns
 - Prepare interviews with RPIL crews and ATCOs to gather qualitative data

The actual data gathering is being conducted during and after the demonstration flights in Task 2.

Task 2

Validation Campaign



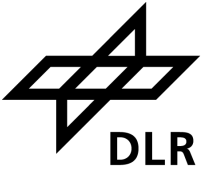
Objectives

- Execute cross-border demonstration flights with a MALE-type RPAS
- Simulate non-normal RPAS operation during demonstration flight
- Collect and analyse onboard flight data
- Collect subjective data from RPIL crew and ATCOs via questionnaires and interviews
- Develop Validation Report incl. feedback from RPIL crew, communication protocols and validation of RPAS impact on current ATM framework

No.	Title	SC1								
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
2	Validation Campaign									
2.1	First Demonstration Campaign									
2.2	Second Demonstration Campaign									
2.3	Development of Validation Report									

Subtask 2.1

First Demonstration Campaign (M6)



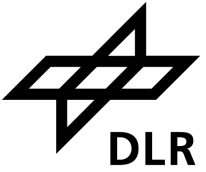
Conduct first series of cross-border flights with the GHTP from German to Dutch airspace

“Option 4”: **Fly at a high ceiling**

- Consider range of used equipment and (current) ATC/ ATM procedures to increase acceptance and recognition from ATCOs and relevant authorities
- Gather (e.g. via flight data recorder, questionnaires, interviews) and summarize data to evaluate the performance
- Describe performed ATC procedures including the handover between different RPIL and from German to Dutch civil ATC
- Conduct post-flight assessments (e.g. interviews) to identify areas for improvement and to enhance future demonstration flights

Subtask 2.2

Second Demonstration Campaign (M7)



Conduct second series of cross-border flights with the GHTP from German to Dutch airspace

“Option 3”: **Simulate a non-normal operation**

- Simulate system failure and (later) the loss of Command and Control (C2) link
- Observe response of the RPAS to divert its course to a pre-defined alternate airport (EHLW)
- Acquire data by
 - Utilization of onboard flight data recorders to capture in-flight information
 - Distribution of questionnaires
 - Conducting interviews with relevant stakeholders

An online survey is also planned to gather insights from the involved stakeholders.

Subtask 2.3

Development of Validation Report (M7 – M8)

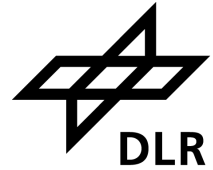


- Develop the required Validation Report (VALR) → **Deliverable D2**
 - Update the VALP with the "conditions of the day"
 - Incorporate tactical decisions from the time of flight execution
 - Summarize results from diverse data sources
 - Aggregate quantitative metrics (e.g. flight performance data), qualitative insights (e.g. communication protocols), and empirical data from surveys and interviews (without analysis).
 - Provide recordings, videos and pictures to EDA, where possible

→ Towards recommendations for stakeholders and decision-makers as well as other dissemination activities in Task 3

Task 3

SC1 Final Report and Dissemination Activities



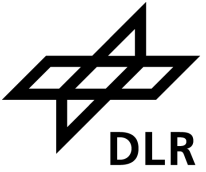
Objectives

- Derive and summarize the lesson-learned from the conducted validation campaign (cf. Task 2) incl. identifying missing elements for immediate RPAS implementation
- Plan, prepare and conduct dissemination workshop for sharing main achievements and relevant results from demonstration flights
- Review and discuss the SC1 Final Report (draft version) with relevant stakeholders
- Provide recommendations and consolidated guidelines on how to operate MALE-type RPAS in non-segregated airspace
- Disseminate project results and establish close coordination with subject matter experts and interested parties
- Create the SC1 Final Report

No.	Title	SC1											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
3	SC1 Final Report and Dissemination Activities												
3.1	Development of pan-European military ConOps for RPAS operations												
3.2	Dissemination activities and workshop												
3.3	Development of SC1 Final Report												

Subtask 3.1

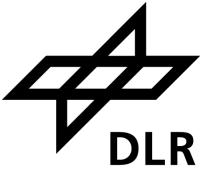
Further enhancement of pan-European military ConOps for RPAS operations (M9)



- The ConOps is aimed to be a **comprehensive framework** based on the lessons learned from Task 2
 - Optimize RPAS utilization, considering diverse airspace restrictions, operational environments, and technology capabilities on RPAS and ANSP side
 - Propose harmonized procedures, command structures, and civil-military communication protocols to streamline cross-border (military) RPAS operations for seamless coordination and collaboration among European Member States.
 - Address regulatory compliance and data sharing

Subtask 3.2

Dissemination activities and workshop (M9 – M10)

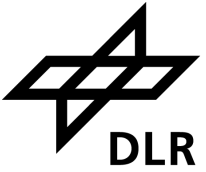


- Plan, prepare and organize a 1-day **dissemination workshop** to
 - Present lessons learned, challenges, results and outcomes of “Accommodation Validation 2024”
 - Present, discuss and review a draft of the SC1 Final Report with the audience
 - Review to further enhance a military ConOps for RPAS
- Suggested location and date: EDA or EUROCONTROL premises in M10
- Suggested audience: Aviation authorities (EASA), industry, research community

- Create a **single-page leaflet** with results and recommendation for follow-up activities
- Design a **brochure** addressing specifically ATCOs
- Create a **short movie** (~1 minute) to be shared on a variety of social media platforms

Subtask 3.3

Development of SC1 Final Report (M9 – M12)

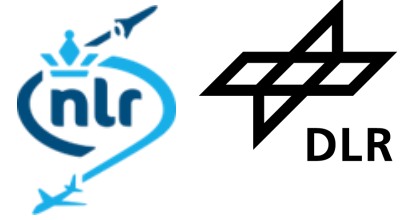


- Summarize and synthesize the outcomes and achievements of the conducted work
- Create the Final Report as a comprehensive and authoritative document
 - Detail the consolidated lessons-learned from the Validation campaign
 - Summarize the research objectives, methodology, data collection and data analysis
 - Formulate major findings, achievements and achievements
- Propose **recommendation for integrating RPAS operations into civil airspace**
- Outline challenges or limitations faced during the project
- Suggest follow-on activities (if applicable)

A satellite with two long solar panel arrays is shown in orbit above Earth. The satellite is gold-colored with various instruments and antennas. The Earth below shows green landmasses, blue oceans, and white clouds. The curvature of the planet is visible against the blackness of space.

THANK YOU

Legal Notice



Topic: **Accommodation Validation 2024**

Introduction

Date: 15.01.2024

Author: Joonas Lieb, Dirk-Roger Schmitt, Gunnar Schwoch, Henk Hesselink (NLR), Oliver Horz (DEU MAA)

Institute: Institute of Flight Guidance

Credits: All images „DLR (CC BY-NC-ND 3.0)“ if not declared otherwise