Operations Agreement for Usage of Geographical Zone

June 2024, Offshore Drone Challenge

National Experimental Test Center for Unmanned Aircraft Systems at Cochstedt Airport

DLR

Document Properties

Titel	Operations Agreement for Usage of Geographical Zone
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1 Background of this document

This document describes the operational considerations and requirements towards a drone operator for the use of the geographical zone (hereafter GeoZone) established at the National Experimental Test Center for Unmanned Aircraft Systems at Cochstedt Airport. The GeoZone is to be temporarily established around the days of the Offshore Drone Challenge (hereafter ODC). The GeoZone will be valid in June 2024 and thus not exclusively for the ODC days. The information given hereafter will be the boundary condition for an operator to fly a drone within the GeoZone.

During the ODC there will be a number of invited guests attending the UAS flights as involved persons. Additional requirements during the event of the ODC are therefore described in the safety concept for the ODC and considered e.g. the presence of guests and the character of the event itself. The implanted actions described hereafter are provisions to ensure safety of uninvolved persons and vehicles in the air.

The document is split into five parts giving the information of how to fly in the GeoZone:

- Short explanation of the GeoZone concept as enhanced operation in the open category
- Risk analysis underlying the GeoZone at Cochstedt Airport
- Requirements towards an operator to fly in the GeoZone
- Handling and mitigation of ground risks
- Handling and mitigation of air risks

The final part is the template agreement of the operator to comply to these rules and declare that all prerequisites are met.

2 Concept and Implementation of the GeoZone

A Geographical Zone for extension of the open category operation according to Article 15 (2) of IR (EU) 2019/947 is an area, established by EASA member states, where certain restrictions of the open category do not apply. An operation permit as mandatory for the specific category is not required.

The GeoZone described here is requested by the German Aerospace Center DLR as Operator of the UAS test facility for the days around the Offshore Drone Challenge. It is granted by the Federal Ministry for Digital and Transport for the following scope of application:

Period:	01.06.2024 - 30.06.2024
Place:	Airport Magdeburg Cochstedt EDBC
Flight area:	Fenced Airport plus close Surroundings south of the airport area (see Figure 1 and '*GeoZone_Cochstedt-v1.0.kml*')

Airspace:	ATZ, NOTAM
Max. flight altitude:	120m (40m in the apron area, see Figure 1)
Max. size of the drone:	8m (characteristic dimension, see risk analysis chapter 3)
MTOM drone:	800kg
Vmax of the drone:	25m/s
Operating mode:	VLOS and BVLOS

Although the Geographical Zone was set up for the "Offshore Drone Challenge", it is open to all drone operators who comply with the present operating agreement.

Figure 1: Area of the GeoZone

The operational speed within the geographical zone is limited to reduce the buffers in order to fly in the apron area during the ODC days. The SAIL determination would be the same for much higher speeds of the UAS (see risk analysis chapter 3). To enable higher speeds in a very dedicated area, a 'high speed box' is included inside the flight volume. In this area, the operator may fly at higher speeds than 25 m/s taking into account the buffers. These higher speeds may only be flown under the following conditions:

- In a flight parallel to the runway in the western direction (away from the apron area)
- Up to 50 m/s (maximum value for the established risk class, see chapter 3)
- In an altitude up to 60 m
- Within the area marked in Figure 1 and the kml provided ('GeoZone_Cochstedt-v1.0.kml')

The areas in Figure 1 comply with the definition in the Easy Access Rules (see '*Easy Access Rules for Unmanned Aircraft Systems (Regulations (EU) 2019/947 and 2019/945)*', GM1 Article 2(28-33)) given hereafter:
The 'flight geography' (green area) is the spatially and temporally defined volume of airspace in which the UAS operator plans to conduct the operation under normal procedures; the projection of such volume on the surface of the Earth constitutes the 'flight geography area'. Additionally, the UA positioning errors must be accounted for in the definition of this area.

To cope with abnormal situations (e.g. navigation errors, UA drifting due to wind/gusts, etc.), the UAS operator should define the 'contingency volume' as an airspace volume where contingency procedures are applied in order to bring the UA back to a normal situation within the 'flight geography' (for example, if the UA exits the boundaries of the flight geography, the remote pilot should take actions to pilot the UAS back into the flight geography. If the contingency situation persists, the remote pilot should activate the FTS (if available) before the UAS exits the contingency volume. The flight must be terminated at the latest when the UAS reaches the outer boundary of the contingency volume. The projection of the contingency volume on the surface of the Earth is the 'contingency area' (yellow area).

The 'ground risk buffer' (red area) is the area on the surface of the Earth surrounding the operational volume, which is defined by the UAS operator to minimize the risk to third parties on the surface in case the UA leaves the operational volume. The UAS is intended to impact the ground within the ground risk buffer after flight termination at the outer boundary of the contingency volume. Flight operations outside the operational volume consisting of flight geography and contingency volume (e.g. after a fly-away) are considered an emergency situation.

Further information to the considerations for these areas can be found in the above referenced sections of the Easy Access Rules.

The buffer calculation given hereafter is done on a generic level and covers VTOL configurations. The operator flying in the GeoZone shall review these buffers to evaluate the feasibility for the intended operation. The intended mission shall be considered and be adapted to keep the buffers or maintain additional distance if necessary from flight parameters. This is especially the case for UAS converting to fixed-wing configurations where after transition the buffer in flight direction shall be sufficiently large from the outer boundary of the GeoZone. For estimation the LBA guidance shall be used (see LBA '*Guidance for Dimensioning of Flight Geography, Contingency Volume and Ground Risk Buffer*').

The approach taken for the flight area is conservative as the area outside the GeoZone is still sparsely populated and the flight area could have been chosen to be much larger without increasing the risk. This was purposely done to have an additional level of safety by meeting precautions normally not met for sparsely populated areas (see ground risk handling in chapter 5).

The main purpose of the GeoZone is to be used for the flight demonstrations of seven different drone operators within the ODC. The characteristics of an event with a number of (involved and safety instructed) people not directly part of the operator team (e.g. invited guests) is accounted for in a dedicated safety concept. The safety considerations are summarized in the two following documents:

- Operations Agreement for Usage of Geographical Zone: The requirements given in this document ensure the safety of uninvolved persons when the UAS is operated in the open category extended by the operational limitations described in this document
- Safety Concept of the Offshore Drone Challenge: The requirements given in this document ensure the safety of the event and especially the involved persons of the flight operations

Buffer estimation: max. altitude 120m AGL, calculation with LBA buffer dimension guidance

Details of drone used and intended operation

	Type		multirotor				
Maximum operational speed	V_0	=	25	m/s			
Maximum UAS characteristic dimension	CD	=	10	m			
Altitude measurement error							
- GPS-based	H_{baro}	=	4	m	own value:		m
GPS – inaccuracy	S_{GPS}	=	3	m	own value:		m
Position holding error	S_{Pos}	=	3	m	own value:		m
Map error	S_K	=	1	m	own value:		m
Response time of remote pilot / automatic	t	=	1	s			

6.2 Minimum dimension of flight geography (FG)

Height flight geography	H_{FG}	=	120	m
Minimum height of particularly small FG	H_{FG}	≥	30	m
Minimum width of particularly small FG	S_{FG}	≥	30	m

6.3 Calculation of contingency volume (CV)

Please choose the procedure after leaving the FG: Controlled steering towards flight geography

Lateral

Contingency manoeuvre:	stopping				
Pitch angle	Θ	=	45	°	
Reaction distance	S_{RZ}	=	25	m	
Distance for Contingency manoeuvre	S_{CM}	=	31,9	m	
Minimum lateral dimension of CV	S_{CV}	=	63,9	m	(Tip: Add a reasonable safety buffer in the kml)

Vertical

Response height	H_{RZ}	=	17,5	m	own value:		m
Contingency manoeuvre:	Conversion of forward kinetic energy into potential energy						
	H_{CM}	=	31,9	m			
Minimum vertical dimension of CV	H_{CV}	=	173,4	m			

6.4 Calculation of ground risk buffer (GRB)

Method of termination:	simplified approach (1:1 rule)				
Minimum lateral dimension of GRB	S_{GRB}	=	**178,4**	m	(Tip: Add a reasonable safety buffer in the kml)

7 Calculation of maximum possible VLOS distance

Attitude Line of Sight	$ALOS_{max}$	=	3290	m			
Ground Visibility (**GV_{max} = 5000 m**)	GV	=	5000	m	own value:		m
Detection Line of Sight	$DLOS_{max}$	=	1500	m			
maximum possible VLOS distance	$VLOS_{max}$	=	1500,0	m			

Buffer estimation: max. altitude 40m AGL, calculation with LBA buffer dimension guidance

Details of drone used and intended operation

	Type		multirotor				
Maximum operational speed	V_O	=	25	m/s			
Maximum UAS characteristic dimension	CD	=	10	m			
Altitude measurement error							
- GPS-based	H_{baro}	=	4	m	own value:		m
GPS – inaccuracy	S_{GPS}	=	3	m	own value:		m
Position holding error	S_{Pos}	=	3	m	own value:		m
Map error	S_K	=	1	m	own value:		m
Response time of remote pilot / automatic	t	=	1	s			

6.2 Minimum dimension of flight geography (FG)

Height flight geography	H_{FG}	=	40	m
Minimum height of particularly small FG	H_{FG}	≥	30	m
Minimum width of particularly small FG	S_{FG}	≥	30	m

6.3 Calculation of contingency volume (CV)

Please choose the procedure after leaving the FG: Controlled steering towards flight geography

Lateral

Contingency manoeuvre:	stopping						
Pitch angle	Θ	=	45	°			
Reaction distance	S_{RZ}	=	25	m			
Distance for Contingency manoeuvre	S_{CM}	=	31,9	m			
Minimum lateral dimension of CV	S_{CV}	=	63,9	m	(Tip: Add a reasonable safety buffer in the kml)		

Vertical

Response height	H_{RZ}	=	17,5	m	own value:		m
Contingency manoeuvre:	Conversion of forward kinetic energy into potential energy						
	H_{CM}	=	31,9	m			
Minimum vertical dimension of CV	H_{CV}	=	93,4	m			

6.4 Calculation of ground risk buffer (GRB)

Method of termination:	simplified approach (1:1 rule)				
Minimum lateral dimension of GRB	S_{GRB}	=	98,4	m	(Tip: Add a reasonable safety buffer in the kml)

7 Calculation of maximum possible VLOS distance

Attitude Line of Sight	$ALOS_{max}$	=	3290	m			
Ground Visibility (**GV_{max} = 5000 m**)	GV	=	5000	m	own value:		m
Detection Line of Sight	$DLOS_{max}$	=	1500	m			
maximum possible VLOS distance	$VLOS_{max}$	=	1500,0	m			

3 Risk analysis for UAS flights in the open category within the GeoZone

The basis for the established GeoZone is a risk analysis to show that the operating risk is low and the measures being undertaken and described in the next chapters are appropriate to the operation.
As the only currently established acceptable means of compliance (by EASA) to show the risk associated with a drone operation is the SORA approach, an analysis of the operation is given hereafter. The analysis takes the most conservative values into account to establish the risk.
The operator using the GeoZone is responsible to consider this risk critically and make sure that the operation intended is within or below these considerations.

Generic SAIL determination for GeoZone	
SORA step for operational risk assessment	**Rationale**
Based on kinetic energy consideration (E_{kin}) Max. takeoff mass (MOTM): 800 kg Max. velocity: 180 km/h (50 m/s) E_{Kin}: 1000kJ **Maximum characteristic dimension**: 8m	*Both requirements must be fulfilled. The characteristic dimension is the biggest measurable dimension that can be measured between two points on the UAS (see* NfL 1-1163-17*). All values impose maximum values for using the GeoZone. This is the maximum velocity considered for the risk analysis. It is further limited for operations to reduce the buffers (see next chapters).*
Type of UAS configuration: Helicopter, Multirotor, Hybrid/VTOL	*Buffers consider the capability of hovering and very slow flight and assume a VTOL capable configuration. See chapter 2 for handling of buffer consideration and mission adaptation.*
Tethered operation: Tethered or untethered	*Tethered operation is not in the focus of this GeoZone but imposes a smaller risk and is therefore possible.*
Type of propulsion system: Electric, Combustion or hybrid	
Transport of dangerous goods: no	*No dangerous goods transportation is allowed within the enhanced open category operation of the GeoZone.*
Type of operation BVLOS or VLOS	
The remote pilot may control only one UAS at a time; **only one flight of UAS at a time in the GeoZone is allowed.**	
Type of operational areas on the Ground: Sparsely populated area	*Airport area and adjacent fields. Sparsely populated area with few access ways (see chapter 5). Additional measures for risk reduction are taken but are not considered in terms of risk (additional layer of safety).*
Intrinsic ground risk class iGRC: 5	

Applied ground risk mitigations	
M1 strategic mitigations for ground risk Medium level of robustness ⇨ - 2	*The population density in the flight area, confirmed by the districts, is 100 times lower than the reference for sparsely populated. The confirmations of the local authorities are available from the DLR test facility on demand ('Population_density_confirmation-v1.0.pdf').*
M2 effects of the ground impact are reduced None ⇨ +/- 0	
M3 an emergency response plan (ERP) is in place, the UAS operator is validated and effective Medium level of robustness ⇨ +/- 0	*An emergency response plan is provided as draft (to be adapted with operator data) for the operators of the ODC days (based on existing ERP from DLR flight tests) that may be used by the operators. Alternatively an operator may use his own ERP if the local requirements are considered (e.g. contacts for fire fighting) and the airport is informed about the ERP activation during execution.* *For use of the GeoZone outside of the ODC days, the operator may implement an ERP based on the DLR draft and without considerations of the ODC event. The ERP draft will be provided on demand ('ERP_Template_v1.0.docx').*
Final ground risk class GRC: 3	
Determination of airspace risk	
Classification of the airspace where the operation is intended to be conducted ARC-c	*Following the SORA process, the airspace within the operational volume is classified as an airport environment in Class G airspace, resulting in the initial ARC-c.*
Strategic mitigations of the air risk class strategically by activating ATZ in combination with PPR control	*"Air Risk Operating Agreement between DLR and UAS Operator" (accepted by LBA): The ATZ in Cochstedt serves to separate UAS operations from manned air traffic. Procedures are used to ensure a very low risk of mid-air collisions. Flight operations are carried out within the Cochstedt ATZ(HX) above and next to Cochstedt Airport. The maximum operating altitude is fully covered by the ATZ limits. At the same time, Cochstedt Airport will be closed (for ODC days) or the PPR status for airport operations be activated (both via NOTAM). See "Air Risk-Operating agreement Cochstedt".*
Residual air risk class ARC-b	
Tactical mitigations performance Requirements BVLOS in ARC-b airspace: low TMPR	*BVLOS flight in ARC-b classified airspace requires low TMPR assurance (see chapter 6.2 for implementation details).*
Final SAIL Level: 2	

	There is a low risk resulting from operating under the described conditions.

The adjacent areas do not contain large assemblies of people (around 20,000 people or more) within 1 km distance from the operational volume and are not populated areas, thus enhanced containment measures do not apply (see LBA ‘I*nformative letter of the German federal aviation office (Luftfahrt-Bundesamt) on the implementation of the "Alternative Means of Compliance SORA 2.0 Containment" for operators in the specific category according to Article 12 of the Implementing Regulation (EU) 2019/947*’).
The speed considered for this risk analysis is higher than what will be allowed during operations to reduce the buffers. During operations the speed will be restricted to be maximum 25 m/s (=90 km/h) especially when flying close to the borders of the operational volume (outside high speed box).

4 Requirements for operators to fly in the GeoZone

To achieve an equivalent level of safety, all requirements for operators follow principles, defined by specific category operation of drones, according SAIL II. Each operator confirms to fully comply to the following regulations:

4.1 Preconditions:

- The operator has an aviation liability insurance that covers the flight operations to be carried out within the GeoZone
- Qualification of drone pilot A2 or comparable
- Authorization of data links for command and control or other radio communication if not in the free use of ‘spectrum plan’ of Bundesnetzagentur (BNetzA)
- Use of the airport facilities is coordinated via the National Experimental Test Center of unmanned Aircraft Systems (contact: cochstedt@dlr.de)
- No transport of dangerous goods
- VTOL, helicopter or multirotor for UAS Configuration, capable of hovering and low speed flying for risk mitigation.
- All following criteria must be fulfilled: UAS MTOM < 800 kg and Characteristic Dimension UAS <8 m, UAS Vmax < 50m/s and 25m/s in given safety relevant areas

The compliance to these preconditions has to be declared to DLR.

4.2 Pre-planning and conduction:

- Compliance with the GeoZone Limitations (Area, Time etc.)
- Compliance with flight area and buffer sizes
- Confirmation to be within the boundaries of the risk analysis presented in chapter 3
- Roles and responsibilities of crew documented. Accountable (responsible) person for flight operation has been appointed.
- Appropriate maintenance of UAS is performed by trained maintenance personnel
- Basic contingency measures for flight area in place
- Compliance with the buffers from Figure 1 (kml reference) during flight
- Registration of the planned flights at the airport with a description of (form available):
    - the aircraft,
    - mission,
    - operating crew,

    - needed infrastructure.
- Attendance to a safety briefing for access to airport, apron and runway for all personnel
- Communication of the mission during the briefing with the airport (ODC excluded)
- Daily registration, preflight briefing, accessibility via radio for ground and airspace deconflicting
- Obtaining permissions for access for persons on apron and runway via radio (ODC excluded)

Operation of the UAS

- Preparation of an Emergency Response Plan (ERP), adapted for Cochstedt Airport conditions
- Documentation and reporting of start and landing times, incidents and accidents
- Procedures or checklists to make the UAS flight ready that should establish at least:
    - Technical readiness (assembly, connectors, free from damage)
    - System readiness (power supply, status and modes, datalinks, sensor health)
    - Mission readiness (mission items, handling of degradation and contingency)
- Normal, contingency and emergency procedures for drone operation set up and adhered to. Operation manual available (Checklists or Procedures)
- Declaration that the personnel involved in the UAS operation is trained and qualified
- Flight and weather limitations (Wind, precipitation, viewing conditions) for UAS defined and adhered to.

For ODC event days:

- Agreement to operate in conjunction with the flight coordinator. This person will be the interface to the event part and will be provided by the organizers. The operator must follow the instructions given by the flight coordinator.
- Adherence to the safety concept that handles the risk of all involved persons during the ODC event
- Handling of datalinks and EMV equipment in accordance with the guidelines provided by the organizers of the event

All documents, conditions and agreements may be reviewed by safety management of DLR or authorities. For completeness and compliance, DLR recommends the LBA template "Formulation template for the creation of an operations manual (Word) - revision 2" and the preparation of documents needed for a regular application for a SAIL II operation.

5 Handling and mitigation of ground risk

This chapter describes the handling of the ground risk for the use of the GeoZone at DLR's National Test Facility of Unmanned Systems at Cochstedt Airport and how safety in the ground is ensured. The operational risk of the GeoZone considers a sparsely populated area as characteristic area on the ground for the risk analysis and a proven population density which is factor 10^{-2} less than the population density underlying the risk matrix of the SORA approach. With these considerations there is no remaining requirement for any measures to be implemented on ground.
Hereafter the requirements for the assurance of ground risk is given which is part of the overall concept on how to operate in the GeoZone and therefor mandatory.
The area of flight volume plus buffer is limited to the area shown in Figure 2. An additional precaution for flying are access denial signs on all ways going into the GeoZone. For the days of the Offshore Drone Challenge 2024 there will be two persons to block the ways and oversee the ground area to consider the character of the event.

The placing of signs and blocking of the roads will be done by DLR as a provided service during the Drone Challenge and the Preparation days. If this description of establishing controlled ground is used outside the context of the Drone Challenge, then the assurance must be provided by the operator himself.

5.1 Limiting access to Ground Area

The risk area (operational area plus ground buffers) must be within (or equal to) the area shown in figure 1. There are some areas in the northern part of the airport that are outside the airport area and thus accessible by uninvolved persons. Additionally, the southern area of the volume is outside the airport area. It is mainly located on fields that enables the blocking described in the next chapter.

Figure 2: Risk area (Operational volume and risk buffer) and blocking of access ways

5.2 Blocking provisions

There are three open ways into the risk zone in the northern part of the airport and only one open way in the southern part between the acres (confirmed by on-site inspection as satellite images are not clear in all places). The fields may be used by farming personnel. On the days of the Offshore Drone Challenge, the farmers will be informed and asked ahead of the event to not be on the fields. On days when the description of this document is used outside of the frame of the Drone Challenge, the fields should be scanned for activity before the beginning of flights and between flights. If there is activity on the fields, the flights cannot be concluded.
The ways into the risk area must be blocked by signs that:

- Clearly indicate that access into the area behind the sign is dangerous and not desired
- State the reason of UAS flight testing for the prohibition of access (to raise awareness for the type of danger)
- Give contact details of a person from DLR/the operator for further questions, complaints or request of access

The signs shall have a minimum size of 20x30cm and be positioned to be clearly remarkable when using these ways. The position of the signs is marked in figure 2.
In addition to the stop signs during the days of the ODC there will be two persons ensuring the clearance in the area of third persons. Both positions are marked as P1 and P2 in figure 2. The observer in P1 shall be motorized and is able to oversee all access ways in the northern area. He can therefor approach any third person coming close to the risk area actively. The observer in P2 shall be static and ensure that people are not passing behind the stop sign on this farm track. The way is known to be used by dogwalkers and people walking. The person shall emphasize the blocking by the sign and, if there are people entering the area, inform the operator, as described in next chapter.

5.3 Communication and handling of people in the area

The reaction to people in the risk area must be divided into two cases:

- UAS is on ground and flight is imminent
- UAS is in flight

5.3.1 UAS on ground and flight imminent:

The clearance for flight is given either by the flight coordinator (person coordinating between all instances involved in the Offshore Drone Challenge and communicating to the ops team) or the flight test lead (besides the days of the Offshore Drone Challenge). Prior to this clearance, it must be checked that there are no uninvolved people in the area or the safety buffers considered for the UAS are maintained for these persons during mission execution (plus accounting for possible movements of these persons), this must be confirmed by the two positions north and south (established contact to these positions mandatory) and the positions must be ready (only valid during ODC days).

5.3.2 UAS in flight:

If a person is spotted either by flight team, airport team or the two positions north and south of the airport (only valid during ODC days; also, if they cannot physically stop a person from entering into the risk area), this must be immediately reported to the flight coordinator (if present) or the flight team. The flight must then be adapted or ended in a safe and appropriate way to avoid danger to the uninvolved persons (move to areas far enough away from the persons such that the buffers are ensured or end the flight if maintaining the buffers is not possible or cannot be ensured). If the flight coordinator instructs the ops team to end the flight during the Offshore Drone Challenge, this is a mandatory action to be followed.

6 Handling and mitigation of air risk

This chapter describes the handling of air risk for the use of the GeoZone at DLR's National Test Facility of Unmanned Systems at Cochstedt Airport and how safety in the air is ensured. It will be applicable for the days of the Offshore Drone Challenge 2024 and other days in the same way, meaning there will be no difference in the implementation.
As in other chapters, the implementation is valid for drone flights within the area of the GeoZone and under the requirements imposed thereby.
The description hereafter is split in two parts: First, the Strategic Mitigation of Air Risk by use of the ATZ and the operational agreement between drone operator and DLR and second, the implementation of Tactical Mitigation Performance Requirements (TMPR).
The Mitigation acts as a reduction from the from ARC-c to ARC-b classification of the airspace in the GeoZone. The low-robustness TMPR is, in a SORA-based authorization, a follow-up requirement on the operation. Both requirements shall be fulfilled for the use of the GeoZone as well. For the meaning of this airspace risk handling the Airport Cochstedt and especially the tower is operated by DLR. The drone operating team however may be external but must be aware of the routines described hereafter and follow communication paths required from the mitigation and TMPR. The mitigation related document '*air risk operational agreement*' (see 'Air Risk-Operating_agreement_Cochstedt) must be signed prior to any operation.

6.1 Mitigation of Air Risk

This chapter describes how the air risk is mitigated. The classification of the airspace from the SORA (v2.0) analysis is ARC-c. This is mitigated to an ARC-b airspace by the means described hereafter. The referenced document Air Risk – Operating agreement becomes therefor binding for operators under the GeoZone conditions. In a SORA approach this will result in an TMPR implementation. This is also foreseen to establish safety in the air when the GeoZone is used. The TMPR implementation as a result of the mitigation is described in the next chapter.

6.1.1 Location and Airspace of the Operation: Cochstedt Airport

The operation will take place at Cochstedt Airport (51° 51′ 21″ N, 11° 25′ 6″ E). The take-off and landing point of the UAS is within the airport site. The air traffic at the airport is managed by a "Flugleiter".

6.1.2 ATZ

The operation will take place at and around Cochstedt Airport (51 51'21" N, 11 25'6" E, 183 m (600 ft) MSL) inside an activated ATZ according to the valid operational agreement with Cochstedt airport, with following general properties:

- To ensure safe operations of unmanned aerial systems (UAS) at Magdeburg Cochstedt airfield, an ATZ was established with effect from 09 September 2021. The dimension of the ATZ is shown by Figure 3. [reference NfL 2021-1-2257]

- In order to keep the restrictions for VFR aviation as low as possible, the ATZ will be activated only when required (HX) and additionally divided vertically into two sectors ("Low" from GND to 1600 ft Medium Sea Level (MSL) and "High" from 1600 ft MSL to 3000 ft MSL), so that depending on the respective type of UAS operation not the entire airspace always needs to be activated.

6.1.3 Regulations

The ATZ (HX) is activated by NOTAM.
Pilots are required to avoid the activated ATZ unless there is an intention to land or take off within it.

- Information on the activation status of the ATZ is provided by "COCHSTEDT-RADIO" (frequency 131.130 MHz) and "LANGEN INFORMATION" (frequency 119.825 MHz).
- During approaches, voice radio communication with COCHSTEDT-RADIO shall be established at least 10 minutes before reaching the airfield.

The opening hours of the airfield, regulations concerning closing or PPR as well as current NOTAM are to be considered.

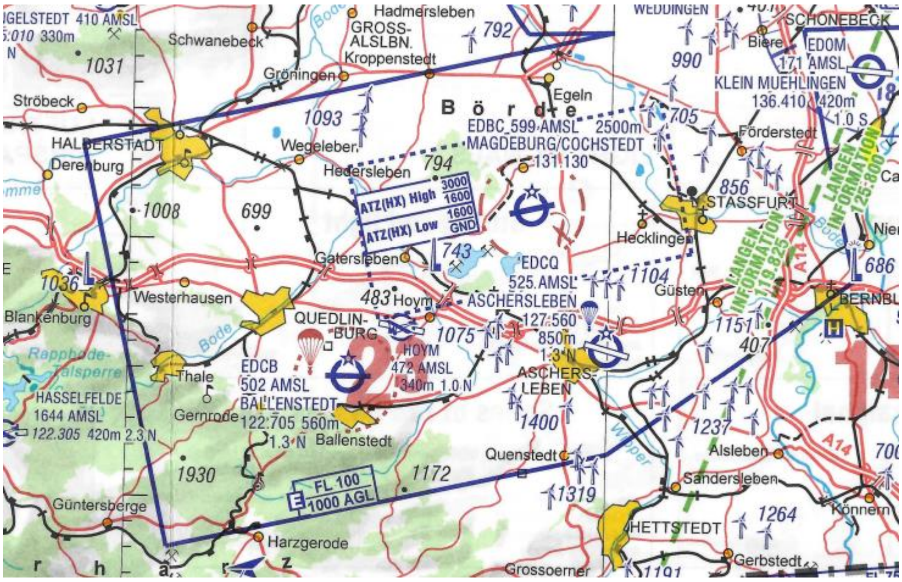

Figure 3: ATZ Cochstedt

6.2 TMPR IMPLEMENTATION

In the following section, the implemented Detect And Avoid (DAA) system and how it fulfills the TMPR, are described.

6.2.1 Detect

The complete flight takes place inside the activated Cochstedt ATZ. In general, air traffic with no intention to land, is required to avoid the ATZ. If a manned aircraft intends to land during UAS-

operations (e. g. due to an emergency), the first means of the DAA strategy is the aeronautical radio communication. The aeronautical radio communication from the air traffic is first handled by "Cochstedt Flugleitung". From this position a warning will be directly given to the flight crew in case of incoming traffic with the potential to endanger the operation.
In the event of uncooperative air traffic penetrating the ATZ without radio contact, the detection is based on an ATC software by Deutsche Flugsicherung (DAS Phoenix system), which is available at the "Flugleitung" and monitored by a second person. The Phoenix system has a web-based system which provides a traffic display with a data-fusion of several data sources: secondary-surveillance radar (SSR), primary surveillance radar (PSR), automatic dependent surveillance – broadcast (ADS-B) and multilateration (MLAT). The traffic display is monitored by the Airspace Observer. Based on this system, a detection rate of more than 50% is ensured.

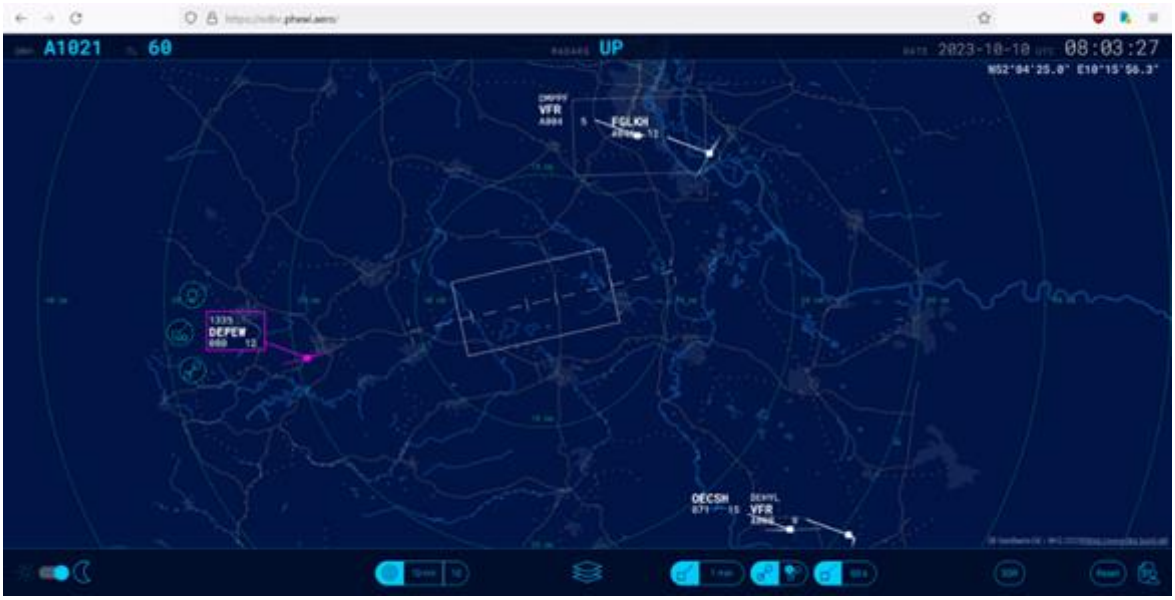

Figure 4: User Interface of DAS Phoenix System

The person inside the tower monitoring the DAS Phoenix system will additionally observe the airspace visually with and without binoculars.

6.2.2 Decide

The following deconfliction scheme and communication phraseology is applied.

<table>
<tr><td colspan="2">1. Manned aircraft intends to land at Cochstedt airport (radio contact) and cannot be advised to stop the approach (e.g. emergency landing)</td></tr>
<tr><td>If area south of the runway guarantees adequate separation:</td><td>If UAS is close to apron and flying south is not possible:</td></tr>
</table>

Flugleiter: "Manned traffic in area, deconflict south." Drone operations team: "Confirm flying south."	Flugleiter: "Manned traffic in area, hold or land in current position." Drone operations team: "Confirm position keeping." After landing the UAS may be removed from the apron area by ground personal if sufficient time is confirmed by the tower.

2. Uncooperative manned air traffic enters ATZ and is within 2km range of the apron area (no radio contact).
Flugleiter: "Traffic, traffic, traffic, end flight." Drone operations team: "Confirm end of flight, landing ASAP."

3. Separation not possible, immediate danger. Highest de-escalation.
Flugleiter: "Close traffic, land in place!" Drone operations team: "Landing in place."

3. Command

The requirement that the command link latency is less than 5 seconds shall be fulfilled by the UAS system design.

4. Execute

The requirement is for the descent speed and max altitude to be sufficient to descend from the maximum operating altitude to an altitude below obstacles in less than 60s.

5. Feedback Loop

The latency and update rate of the Phoenix system are significantly better than the 5-second update rate and 10-second latency, which are required for a 3 NM threshold. The Phoenix system is used in ATC services such as Tower and Center. Therefore, the performance is adequate.

7 Operator Agreement

By signing this document, the operator of the unmanned aircraft system (UAS) declares that

- The UAS fulfills the restrictions under which UAS may be operated in the enhanced open category operations of the geographical zone
- The requirements given in this document are fulfilled by the operator, especially but not exclusively
  - the procedures to ensure flight readiness are implemented and regarded
  - procedures for flight execution and handling of abnormal behavior are implemented and regarded
  - all personnel involved in the operation of the UAS are qualified
  - an emergency response plan is in place and considers the event coordination during the days of the offshore drone challenge 2024
  - the mitigations and risk handling of this document and the fulfillment is the responsibility of a UAS operator

We hereby confirm that we have taken note of the above operating agreement, accept it, and undertake to implement it.

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Place, date, signature of UAS operator*

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Place, date, signature of flight test lead

*in case of legal entities a person being entitled to represent by indicating the function