Author: Shyam Hajare

VOORPLAAT FOTO INVOEGEN

Operations Manual UAS

Drone Chiefs

Adres	
Email	
Website	
KvK Number	

COLOPHON

OPERATIONAL MANUAL

DESCRIPTION	EDITOR	AUTHORIZED BY	OWNER OF MANUAL

Cover page

Author: Shyam Hajare

Operational Manual for Drone Chiefs	24 November 2021	[datum]	Drone Chiefs

[naam]	[naam]
Accountable Manager	Flight Safety Manager)

Consultant Droneconsultancy.nl
www.droneconsultancy.nl

To do list

	Drone-consultancy	Uren Drone Chiefs	Planning
Planning opstellen/bespreken vragenlijst	2	1	Week 6
ConOps bespreken en 1e opzet SORA maken	4		Week 6
Drone gegevens compleet? Checklist doorlopen voor aanvraag/SORA en Handboek via Zoom	2	2	Week 7
Organisatorische aspecten/procedures inbedden	1	1	Week 7
SORA bijwerken	4	0	Week 8

Second page

2e bespreking/online over SORA	3	1	Week 8
Handboek personificeren op basis van SORA	4	0	Week 9
Dronegegevens invoegen in Engels EU handboek	1	1	Week 9
3e bespreking online over handboek en SORA	2	1	Week 9
Handboek bijwerken	5		Week 9
SORA bijwerken	2	1	Week 9
Eindopmaak	2		Week 10
Indienen online samen (8 weken wachten)	1	2	Week 10
Training handboek / update tussentijds	1	1	Week 14
Reactie doornemen	2	2	Week 18
Aanpassingen na 1e beoordeling ILT	15	2	Week 19
Bespreking wijzigingen	2	2	Week 20
Definitieve versie indienen voor 2e beoordeling	2	2	Week 20
Vergunning gerealiseerd			Week 22
Afronden opdracht / evaluatie en vervolgafspraken	1	1	Week 24
Totaal	**56**	**20**	

Table of Contents

Intentionally Blank Page

INTRODUCTION OPERATIONS MANUAL[IOHE]

[0.0] Introduction OM, structure and definitions

In this chapter the structure of the document is explained.

[0.1] Safety Statement

I, the undersigned, hereby declare that the UAS operation will comply with:

- any applicable Union and national rules related to privacy, data protection, liability, insurance, security and environmental protection (article 12, regulation EU 2019/947);
- liability coverage of the policy which is in accordance with the European Union Regulations Nr.785/2004 dated 21 April 2004. Drone Chiefs is insured against war risk and hijacking.;
- the applicable requirement of Regulation (EU) 2019/947; and
- Drone Chiefss documentation;
- the limitations and conditions defined in the authorisation provided by the competent authority.

For Approval Drone Chiefs

Name (Accountable Manager):

Signature:

[0.2] Structure

The Operations Manual is structured as follows:

- **Part A: General.** This part contains organisation, concept of operations, general operational policies, company rules, instructions and procedures needed for a safe operation.
- **Part B: UAS Operating Information.** This part contains all type-related instructions and procedures needed for a safe operation. It takes account of any differences between types, variants or individual UAS used by the operator.
- **Part C: Specific Operating Procedures.** This part contains all instructions and information needed for the area of operation.
- **Part D: Training & Instructions.** This part contains regulations, all training instructions and general knowledge for personnel required for a safe operation.

This structure is commonly used by airline operators and will therefore be recognised by those who are familiar with avation.

[0.2.1] Structure according to AMC1 UAS.SPEC.030 (3)(e)

All items mentioned in AMC1 UAS.SPEC.030(3)(e) Application for an operational authorisation are written in this OM, however the sequence of the items is different. In order to check the compliance, [APPENDIX B] Compliance Check List is attached.

[0.3] Revision Number and Amendment List

Revision numbers and amendments

Version number	Subject	Date of Revision	Revised page(s) / paragraph	Signature of the authorised person*
	Changes to EU (from ROC): • EU regulations, including SPEC.050 & UAS.SPEC.060, EU OM Template • SERA • Procedure UAS-vluchten above sparsely populated area; • Atypical airspace • Conflicterend verkeer in VLOS condities; • CTR-procedures en height; • Risk buffers (ground en air); • Het ERP; • Declaration other types of UAS; • Declarantion other pilots ; • Cross-border operations; • Exploitant registration on the UAS; • Other Specific Procedures • Operational Volume, EASA definitions		• A1.2 Tasks/ A3.2, A11/A12 • D1.1 • C3.1.A or B Sparsely • 0.5 Definitions • A5.21 Cooperation • C3.3 and C3.4 • A6.4.3 GRC • Chapter C6 • A7.23 • A7.23 • A7.24 • A7.23 • Chaper C3 • A6.4 ev.	

* Accountable Manager

Intentionally Blank Page

[0.4] System for Amendment and Revision of the OM

RESPONSIBILITIES

The operations manual shall include all the changes which are required by ILT. The accountable manager shall inform all the changes to all operating staff so that they will be able to conduct the operations according to the latest operations manual. Furthermore, the Accountable manager is responsible for maintaining the up-to-date information of the operations manual and its appendices. Each operating staff is responsible for possessing the latest version of the operations manual.

REVISING PROCEDURE

Handwritten amendments are not permitted except in situations requiring immediate amendment or revision in the interest of safety. Therefore any amendments shall be performed following the revising procedure.

Each version of the operations manual is identified with a version number. Version numbers are divided into sets of numbers, separated by decimal points. A change in the leftmost number indicates a major change in the manual. The major change of the manual means that almost the entire contents are replaced. Changes in the rightmost number typically indicate a minor change.

The revision date of the operations manual is the date where the new version is compiled.

Once the operator receives approval from the ILT, the operations manual shall not be changed or revised. When an amendment is made with regards to a flight operation, the whole operation procedure and/or risk analysis and/or mitigations should be reviewed by ILT. For any urgent amendments, it is possible to request approval from ILT afterwards if only the (flight) safety permits.

For the amendments, the extra costs will be charged by ILT. Minor changes, corrections of texts, typos, adding extra information and modification of the layout are however not included.

Suggestions or changes for the manual shall be processed by the Safety Manager. When the suggestions/changes are approved by the Accountable Manager, those shall be added to the OM so that the OM is up to date. Also the document with changes shall be distributed to all crew members. Each crew shall confirm that he/she has read the document.

There are two types of amendments:

Minor amendments

- Additional pilots or changes to existing pilots
- Additional observers or changes to existing observers

- New UAS Type

Major amendments

- Improving/addition of operational procedures
- Change of Accountable Manager

CAA-NL (ILT) shall in be possession of the most recent version of the operations manual.

[0.5] Definitions, Abbreviations and Acronyms

Definitions

1. 'Airspace observer' means a person who assists the remote pilot by performing unaided visual scanning of the airspace in which the unmanned aircraft is operating for any potential hazard in the air;
2. 'Assemblies of people' means gatherings where persons are unable to move away due to the density of the people present;
3. 'Atypical Airspace' is a part of the airspace that is:

    - Prohibited, restricted and danger areas;
    - Airspace where manned aircraft normally cannot go (e.g. airspace within 30 metres of buildings or structures);
    - Airspace where it can be demonstrated that the collision speed of manned aircraft (collision is defined as a distance of 3000 ft. Horizontal and ± 350 ft. vertical) is less than 1E-6 per flight hour during the operation);
    - Airspace that does not fall under Airspace Encounter Categories (AEC) 1 to 12.

1. 'Autonomous operation' means an operation during which an unmanned aircraft operates without the remote pilot being able to intervene;
2. 'Beyond Visual Line of Sight' ('BVLOS') means a type of UAS operation which is not conducted in VLOS;
3. 'C2 link service' means a communication service supplied by a third party, providing command and control between the unmanned aircraft and the CU;
4. C3 Link: The term "C3 link" encompasses: the Command and Control (C2) link, and any communication link required for the safety of the flight.
5. 'Contingency area' means the projection of the contingency volume on the surface of the earth;
6. 'Contingency volume' means the volume of airspace outside the flight geography where contingency procedures described in point (6)(d) of Appendix 5 to the Annex are applied;
7. 'Controlled Ground Area' means the ground area where the UAS is operated and within which the UAS operator can ensure that only involved persons are present;
8. 'Dangerous goods' means articles or substances, which are capable of posing a hazard to health, safety,

property or the environment in the case of an incident or accident, that the unmanned aircraft is carrying as its payload, including in particular:

   a. explosives (mass explosion hazard, blast projection hazard, minor blast hazard, major fire hazard, blasting agents, extremely insensitive explosives);
   b. gases (flammable gas, non-flammable gas, poisonous gas, oxygen, inhalation hazard);
   c. flammable liquids (flammable liquids; combustible, fuel oil, gasoline);
   d. flammable solids (flammable solids, spontaneously combustible solids, dangerous when wet);
   e. oxidising agents and organic peroxides;
   f. toxic and infectious substances (poison, biohazard);
   g. radioactive substances;
   h. corrosive substances;

9. ‘Flight geography area’ means the projection of the flight geography on the surface of the earth;
10. ‘Flight geography’ means the volume(s) of airspace defined spatially and temporally in which the UAS operator plans to conduct the operation under normal procedures described in point (6)(c) of Appendix 5 to the Annex (Easy Access Rules);
11. ‘Geo-awareness’ means a function that, based on the data provided by Member States, detects a potential breach of airspace limitations and alerts the remote pilots so that they can take immediate and effective action to prevent that breach;
12. ‘Geographical zone’ or 'Geo-Zone' means a portion of airspace established by the competent authority that facilitates, restricts or excludes UAS operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment, arising from UAS operations;
13. ‘Ground risk buffer’ is an area over the surface of the earth, which surrounds the operational volume and that is specified in order to minimise the risk to third parties on the surface in the event of the unmanned aircraft leaving the operational volume.
14. ‘Light UAS Operator Certificate’ (‘LUC’) means a certificate issued to a UAS operator by a competent authority as set out in part C of the Annex (see Easy Access Rules);
15. ‘Maximum Take-Off Mass’ (‘MTOM’) means the maximum Unmanned Aircraft mass, including payload and fuel, as defined by the manufacturer or the builder, at which the Unmanned Aircraft can be operated;
16. ‘Night’ means the hours between the end of evening civil twilight and the beginning of morning civil twilight as defined in Implementing Regulation (EU) No 923/2012 [8].
17. ‘Operational volume’ is the combination of the flight geography and the contingency volume;
18. ‘Payload’ means instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is installed in or attached to the aircraft and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller;
19. ‘Populated area’ should be understood as ‘congested area’, as defined in Regulation (EU) No 965/2012 (the ‘Air Operations Regulation’): ‘in relation to a city, town or settlement, any area which is substantially used for residential, commercial or recreational purposes’

20. ‘Robustness’ means the property of mitigation measures resulting from combining the safety gain provided by the mitigation measures and the level of assurance and integrity that the safety gain has been achieved;
21. ‘Rural area’ is used in the context of the air risk and it means the volume outside a populated area and not within the aerodrome traffic zone (ATZ) of an aerodrome.
22. ‘Standard Scenario’ means a type of UAS operation in the ‘specific’ category, as defined in Appendix 1 of the Annex in the Easy Access Rules, for which a precise list of mitigating measures has been identified in such a way that the competent authority can be satisfied with declarations in which operators declare that they will apply the mitigating measures when executing this type of operation;
23. ‘Uninvolved persons’ means persons who are not participating in the UAS operation or who are not aware of the instructions and safety precautions given by the UAS operator;
24. ‘Unmanned aircraft observer’ means a person, positioned alongside the remote pilot, who, by unaided visual observation of the unmanned aircraft, assists the remote pilot in keeping the unmanned aircraft in VLOS and safely conducting the flight;
25. ‘Unmanned Aircraft System’ (‘UAS’) means an unmanned aircraft and the equipment to control it remotely;
26. ‘Unmanned Aircraft System Operator’ (‘UAS operator’) means any legal or natural person operating or intending to operate one or more UAS;
27. ‘Visual Line of Sight’ (‘VLOS’) means a type of UAS operation in which, the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions;

List of abbreviations and acronyms

AEC	Airspace Encounter Category
AEH	Airborne Electronic Hardware
AGL	Above Ground Level
AMC	Acceptable Means of Compliance
AMSL	Above Mean Sea Level
ANSP	Air Navigation Service Provider
ARC	Air Risk Class
ARP	Airport/Aerodrome Reference Point
ATC	Air Traffic Control
ATZ	Air Traffic Zone
BEM	Basic Empty Mass
BVLOS	Beyond Visual Line Of Sight

C2	Command and Control
C3	Command, Control and Communication
CH	Come Home
ConOps	Concept of Operations
CTR	Control Zone
CU	Command Unit
DAA	Detect And Avoid
EASA	European Union Aviation Safety Agency
EMI	Electromagnetic Interference
ERP	Emergency Response Plan
EU	European Union
EVLOS	Extended Visual Line Of Sight
FHSS	Frequency-Hopping Spread Spectrum
GM	Guidance Material
GNSS	Global Navigation Satellite Systems
GRC	Ground Risk Class
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILT	Inspectie Leefomgeving en Transport
ISM	Industrial, Scientific and Medical
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
LiPo	Lithium-ion-Polymeer accu
LoL	Loss of Link (loss of uplink)
MCC	Multi-Crew Cooperation
METAR	METeorological Aerodrome Report
MTOM	Maximum Take-Off Mass
NAA	National Aviation Authority
NOTAM	Notice To Airmen
NSAA	North Sea Area Amsterdam
OEM	Original Equipment Manufacturer

OM	Operations Manual
OSO	Operational Safety Objective
PDRA	Predefined Risk Assessment
PH	Position Hold
PIC	Pilot in Command
R-OABL	Regeling op afstand bestuurde Luchtvaartuigen
RBO	Risk-Based Oversight
RCP	Required Communication Performance
RF	Radio Frequency
RLP	Required C2 Link Performance
RP	Remote Pilot
RPS	Remote Pilot Station
SAIL	Specific Assurance and Integrity Level
SERA	Standardised European Rules of the Air
SMM	Safety Management Manual
SMS	Safety Management System
SORA	Specific Operations Risk Assessment
SPECI	Aviation Selected Special Weather Report
STS	Standard Scenario
SW	Software
TAF	Terminal Aerodrome Forecast
TCAS	Traffic Collision Avoidance System
TMPR	Tactical Mitigation Performance Requirement
TMZ	Transponder Mandatory Zone
TWR	Tower
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
UAS Regulation	Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft
UDP	Uniform Daylight Period
UTC	Coördinated Universal Time
VFR	Visual Flight Rules

VLL	Very Low Level
VLOS	Visual Line Of Sight
VMC	Visual Meteorological Conditions
VO	Visual Observer

international radio communications phonetic alphabet

Alfa	November
Bravo	Oscar
Charlie	Papa
Delta	Quebec
Echo	Romeo
Foxtrot	Sierra
Golf	Tango
Hotel	Uniform
India	Victor
Juliet	Whisky
Kilo	X-ray
Lima	Yankee
Mike	Zulu

Units of measurement

Name of unit	Unit symbol / Unit Abbreviation
Foot/Feet	ft
Ampere	A
Celsius	°C
Fahrenheit	F
Hectopascal	hPa
Imperial gallon	imp gal
Kilogram	kg

Kilometer	km
Kilometers per hour	km/h
Liter	L
Liter per hour	l/h
Pound	lb
Meter	m
Metre per second	m/s
Nautical mile	NM
Miles per hour	mph
Millibar	mbar
Millimeter	mm
Knot	kts
Inch	in
Pound-force per square inch	PSI
Statute mile	Sm
US Gallon	US gal
Volt	V
Yard	yd

[0.6] Conversion Charts

1 m	3.281 ft	
1 ft	0.3048 m	
1 yd	0.9144 m	3 ft
1 in	25.44 mm	
1 mm	0.0394 in	
1 km	0.54 nm	0.63 mi
1 mi	1.61 km	0.869 nm
1 nm	1.85 km	1.15 mi
1 l	0.220 imp gal	0.264 US gal
1 lb	0.45 kg	

1 kg	2.2 lb	
1 km/h	0.54 kt	0.62 mph
1 kt	1.85 km/h	1.15 mph

Conversion chart wind (Beaufort Scale)

Beaufort number	Description	Wind speed in km/h	Wind speed in m/s	Land conditions
0	Calm	0-1	0-0,2	Smoke rises vertically
1	Light Air	1-5	0,3-1,5	Direction shown by smoke drift but not by wind vanes
2	Light breeze	6-11	1,6-3,3	Wind felt on face; leaves rustle; wind vane moved by wind
3	Gentle breeze	12-19	3,4-5,4	Leaves and small twigs in constant motion; light flags extended
4	Moderate breeze	20-28	5,5-7,9	Raises dust and loose paper; small branches moved
5	Fresh breeze	29-38	8,0-10,7	Small trees in leaf begin to sway; crested wavelets form on inland waters
6	Strong breeze	39-49	10,8-13,8	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty
7	High wind, moderate gale, near gale	50-61	13,9-17,1	Whole trees in motion; inconvenience felt when walking against the wind
8	Gale, fresh gale	62-74	17,2-20,7	Twigs break off trees; generally impedes progress
9	Strong/severe gale	75-88	20,8-24,4	Slight structural damage (chimney pots and slates removed)
10	Storm, whole gale	89-102	24,5-28,4	Seldom experienced inland; trees uprooted; considerable structural damage
11	Violent storm	103-117	28,5-32,6	Very rarely experienced; accompanied by widespread damage
12	Hurricane force	>117	>32,7	Devastation

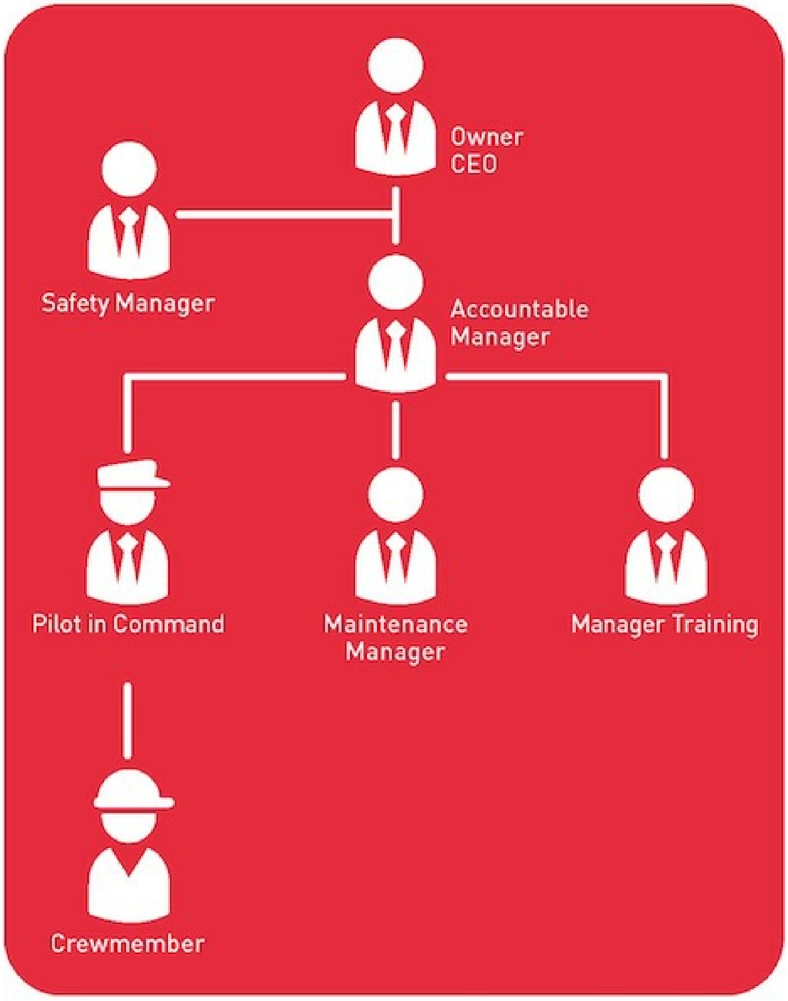
PART A: GENERAL

This part contains regulations, general operational policies, company rules, instructions and procedures needed for a safe operation.

Chapter A1: ORGANISATION OVERVIEW [OE]

[A1.1] Drone Chiefs Organisational Structure

The organisation structure of Drone Chiefs:



All the nominated individuals or crew members will be listed in [APPENDIX A] CONTACT INFORMATION OF CREW MEMBER.

[A1.2] Responsibilities and Duties

ACCOUNTABLE MANAGER

Responsibilities

- Establishing and maintaining an effective Management System

- Ensuring the safety of the UAS operations of Drone Chiefs
- Compliance with the requirements

Duties

- Updating and communicating the operations manual and its appendices;
- Informing crew members of the changes that relate to their position(s);
- Managing that every flight is carried out by the procedures of the operations manual;
- Providing UAS that is suitable and approved for the planned operations;
- Providing sufficient and skilled manpower for the conducted flights;
- Creating a "just culture" in the organisation;
- Being the contact person for the authorities and informing them of changes to the operations manual;
- Appointing crew members;
- Appointing the commander of the mission;
- Maintenance of the operations manual and, if necessary, suspension of the crew member who does not comply with the procedures;
- Approving flights;
- Managing the yearly inspection of the UAS equipment to ensure that they meet the legal requirements;
- Supervising reports of incidents and/or accidents

FLIGHT OPERATIONS MANAGER / PILOT IN COMMAND

Responsibilities

- Ensuring the safe operation of the UAS system;
- Ensuring the safety of all flight crew involved in operating with the UAS;

Duties

- Execution of safe UAS flights conform the operations manual and pre-flight safety briefing;
- Checking the UAS construction;
- Checking other operational equipment;
- Taking into account specific field circumstances;
- Surveillance on the entire operation and all operational staff;
- Reporting incidents and/or accidents to the Safety Manager and Accountable Manager;
- Keeping his logbook and UAS logbook.

VISUAL OBSERVER

Responsibilities

- Scanning the skies, the ground and the weather to identify potential hazards and notify the pilot of those

hazards as they arise;
- Communicating with the pilot about crucial information needed to ensure the safe operation of the drone.

Duties

- Keeping the UAS within sight;
- Ensures that the maximum range of the radio connection is not exceeded between the pilot and the UAS during the operation;
- Supporting the operation on location;
- Performing emergency procedures if necessary.

MANAGER TRAINING

Responsibilities

- Training of the operational crew;
- Ensuring that the training is carried out following the requirements of the aviation authority and the operations manual.

Duties

- Developing training programs;
- Organising the training of new crew members;
- Organising refresher courses if necessary;
- Keeping a record of the training the crew members participated in.

MAINTENANCE MANAGER

Responsibilities

- Maintenance of the UAS;
- Ensuring the maintenance is carried out by the requirements of the aviation authority and the operations manual.

Duties

- Developing a UAS maintenance program which is complied with the requirements of the authority and the operations manual;
- Implementing the maintenance program;
- Testing the functioning of the UAS after the maintenance;
- Updating maintenance logbook.

SAFETY MANAGER

Responsibilities

- Checking the safety standards used and the correct use of the procedures;

Duties

- Managing the safety management system and risk analysis methods;
- Yearly monitoring of the safety standards within Drone Chiefs;
- Creating a flight safety program;
- Maintaining the Operations Manual, flight procedures and checklists;
- Monitoring incident and accident reports.

Further Reading Section

- [B2.1] Assignment of Duties and its Distribution
- [B2.5] Pre-flight Preparation and Checklists VLOS flights

[A1.3] The Role of Safety Manager

The (Flight) Safety Manager is an individual responsible for the development, operation and continuous improvement of the safety management system. The Safety Manager has an independent position in the organisation. This means that they should not provide any operational instructions and should not be accountable for any operational aspect of the operation. The Safety Manager should communicate any safety-related issues within the organisation directly to top management. This scheme was deliberately chosen to guarantee objectivity to ensure effective and successful safety management. The Safety Manager is accountable for maintaining the safety management system.

[A1.4] Crew Formation

Assignments can be categorised by their complexity. Depending on the complexity, an assignment can be performed alone or as a team. The complexity is linked to the flying situation and the type of operation.

Low Complexity Open Category assignments

Drone Chiefs flies within the restrictions of the Open Category, unless the specific operation with the specific UAS cannot be flown within these restrictions.

For Specific Category Flights, three categories apply; Low, Medium and High

Low complexity Specific Category assignments (solo operations)

Low complexity assignments are in circumstances where hardly any risks are recognized for machines, people and the surroundings. Examples of such situations are:

- Flying rural areas/farms/fields without special objects/people within a radius of 100 meters from the start and landing area;
- Objects where no people, who are not involved in the assignments, are present during the operation.

The operations that fall under low complexity are taking photos and video recordings and simple inspections. Such assignments often involve nothing more than just taking a few photos of an object. The following pre-conditions apply:

- The horizontal distance between the pilot and the drone will not exceed 150 meters;
- The maximum flight height may not exceed 80 meters AGL (Above Ground Level);
- All scores of the risk analysis during flight preparation are lower than 12 (or 1A-1E, 2D, 2E, 3E) = green in risk analyses in Operational Plan in appendix C1);
- No flying in a low-flying area that is active;
- There are no active NOTAMs for the flying area for that moment;
- Wind not higher than 5 (Beaufort);

In the case of a solo flight, the pilot is also responsible for completing the checklists.

With a team of a pilot and an observer, it is possible to fly in all types of circumstances and all types of assignments where there are no non-mitigable risks for a machine, people and surroundings.

Average complexity of assignments (team)

These assignments have a relatively simple flight plan and the complexity, in this case, depends on the circumstances. Examples are as following:

- Flying <25 meters other than the object to be inspected;
- Flying in active low-flying areas and or CTR's (if allowed).

For assignments with an average complexity, the minimum crew formation for the flight operation is 2 people, namely a pilot and an observer. Conducting an operation without this minimum condition is not possible.

Depending on the situation, several observers and/or a payload operator can also be deployed. The requirement for the extra member(s) can be led from the risk analysis as a mitigating measure.

High complexity assignments (team)

An assignment with high complexity is in a circumstance where there is a higher risk for machines, people and the surroundings and/or a complex flight plan. The following preconditions apply to these operations:

- Accountable manager approval is required;
- Several observers (ground) are needed.

In situations, where the safety of people who are not directly related to the flight operation, additional observers will be deployed. Think of flying at factory sites that are operational at that time or places where there is public access to the flying area via several places.

Several observers are needed for this type of assignment. This is one of the mitigating measures required for safe operation.

A payload operator is only needed if the control of the payload must be separate from the flight movements and where this is not automated.

Further Reading Section

- [B2.2] External System
- [B2.5] Pre-flight Preparation and Checklists VLOS flights

[A1.5] Role of the Pilot in Command (PIC)

A PIC is appointed by the Accountable Manager for each project. It will be stated both in the flight plan and also in the UAS journey logbook as well.

- The PIC is directly responsible for and is the ultimate authority as to the operation of the UAS;
- The PIC should ensure that the UAS complies with all applicable regulations of the Operations manual.
- The PIC is allowed to deviate from the regulations if the circumstances do not guarantee the safety of the operation.

Chapter A2: CONCEPT OF OPERATIONS[CONEU]

[A2.0] Introductions Drone Chiefs Operations

In this chapter, a brief overview is given on the ConOps of Drone Chiefs. For the structure of the OM jump to Introduction.

[A2.1] ConOps 'RoabL'

As a former ROC holder, Drone Chiefs flies under the ConOps Roabl. This ConOps is in accordance with privileges and restrictions for ROC holders under the Dutch Unmanned Aircraft Regulation (Regeling onbemande luchtvaartuigen).

This ConOps has a number of conditions that are defined in the document 'Transposition+Criteria+General.pdf' of ILT. The conditions are:

- Max UAS characteristic dimension is 3 meters
- Typical kinetic energy < 34 KJ
- Maximum operating height 400 feet AGL (unless in atypical airspace)
- Operations in atypical airspace (maximum 30 meters away from building/object)
- VLOS above sparsely populated area
- VLOS above controlled ground area (in populated area only in combination with atypical airspace)
- Thethered drones (M1 = low)
- No testing experimental flights
- Adjacent area which are outside the ground risk buffer may contain assemblies of people
- Adjacent airspace which are outside the operational volume may be up to and including ARC-D airspace.
- TMZ/RMZ subject to SERA regulations and restrictions unless the locally published procedures are deviate from them

Optional conditions/restrictions/privileges are:

	No.	Privilege	Condition
	4.3.a	EVLOS	Over sparsely sopulated area or controlled ground area (latency not more than 15 seconds)
	4.3.b	Civilian controlled CTR	(ICAO class C or D Airspace) subject to SERA requirements and/or in accordance with local/national published procedures
	4.3.c	Military controlled CTR	(class C or D Airspace) subject to SERA requirements and/or in accordance with local/national published procedures
	4.3.d	NSAA	In atypical airspace
	4.3.e	NSS	Outside atypical airspace

	4.3.f	BVLOS	In accordance with PDRA-01-CAA-NL2020 and: MTOM up to 1 kg & typical kinetic energy <700 J over controlled ground area within atypical airspace.

Chapter A3: STANDARD QUALIFICATIONS OF CREW

[NIBE]

[A3.1] Crew Qualification

AMC1 UAS.SPEC.050(1)(d) and UAS.SPEC.050(1)(e), Responsibilities of the UAS operator, in Annex II to ED Decision 2022/002/R, states:

The ‘specific’ category may cover a wide range of UAS operations with different levels of risk and a wide range of UAS designs, in particular in terms of level of automation. The UAS operator is, therefore, required to identify the competency required for the remote pilot according to the outcome of the risk.

The AMC covers the theoretical knowledge subjects while AMC2 UAS.SPEC.050(1)(d) covers the practical knowledge subjects applicable to all UAS operations in the ‘specific’ category. In addition, for both theoretical and practical knowledge subjects, the UAS operator should select the relevant additional modules from AMC3 UAS.SPEC.050(1)(d), as applicable to the type of the intended UAS operation. The UAS operator should achieve a level of robustness consistent with the assurance integrity level (e.g. SAIL) of the intended UAS operation.

Additional topics to cover areas under national competence, such as national regulations for security, privacy and data protection, may be added by the national competent authority.

A pilot who conducts the flight operations for Drone Chiefs shall therefore:

- Be at least 18 years;
- In possession of at least A1, A2, A3 certificate (OPEN);
- Hold additional certificates for the SORA, STS or PDRA in de Specific Category (both theoretical and practical training);
    - Topics to be covered are noted in chapter D2 Training
- Have followed additional training for the specific procedures for the intended UAS operation.
- In possession of a (digital) flight logbook.

A (visual) observer shall be at least 16 years old and must be able to see the UAS and scan its surroundings for potential collision hazards. Also, he or she must be able to readily communicate with the pilot.

Source: Annex II to ED Decision 2022/002/R

[A3.2] Currency Requirements for Flight Crew

To stay current, the crew members of Drone Chiefs shall be trained annually:

Theoretical part

For all operational crew members and consists of theoretical knowledge of all procedures and responsibilities regarding a flight as decrypted in this operation manual. Minimum once a year.

Safety part

All operational crew members will have a workshop with the safety manager. During this workshop all safety procedures will be discussed. Minimum once a year.

Practical part

For all operational crew members and consists of at least 1 operation every 6 months. In addition, yearly currency training is required. During the training, the next subjects are trained: the Emergency Response Plan, Multi Crew Coordination (including communication with ATC) , testing abnormal and emergency procedures, Identification of critical environmental conditions and human error.

Pilot logbook

The pilot administrates all flights in his/her pilot logbook according to AMC1 UAS.SPEC.050(1)(g):

Name of Remote Pilot	Date	Flight location	Starting time	Landing time	Flight duration	UAS ID nr.	Total number of flight hrs	Activity / reference to author-isation	Incident / Accident	Defects	Repair / changes

If applicable, also note the information required to comply with SPEC.100. (use of certified equipment)

Visual Observers shall follow the training which is given by pilot. During the training, the following points should be addressed:

- A summary of technical information of the UAS and payload;

- Flight operational plan;
- Operational regulations;
- Operational procedures;
- Proceedings in case of emergency;
- Understanding of the failsafe function of the UAS.

Further Reading Section

- [A12.1] Record Keeping Procedures
- AMC1 UAS.SPEC.050(1)(g) Responsibilities of the UAS operator

[A3.3] Alcohol Consumption

The Dutch regulations prohibit drinking alcohol ten hours before duty or flying with a blood alcohol concentration greater than 0,2 mg of alcohol per millilitre of blood or a breath alcohol concentration of 90 µg per litre of exhaled air or higher.

[A3.4] Physiological aspects (IMSAFE)

In the Dutch aviation law (Artikel 2.11 Wet Luchtvaart) it is stated:

The holder of a license or certificate of equivalence is prohibited from performing activities for which that license entitles the holder to undertake them, due to his physical or mental condition, which endangers the safety of air traffic or could endanger it.

General Aspect

In good health of the flight crew is of great importance for the good process and flight safety.

Good Airmanship

Airmanship is defined as:

- A sound acquaintance with the principles of flight;
- The ability to operate an aeroplane with competence and precision both on the ground and in the air;
- The exercise of sound judgment that results in optimal operational safety and efficiency.

The crew can use the IMSAFE checklist. IMSAFE stands for:

- *Illness: A*re you currently sick or have been recent?

- ***Medication:** A*re you taking prescription or over the counter medications?
- ***Stress:** A*re you experiencing psychological pressure or anxiety?
- ***Alcohol:** W*hen did you last consume alcohol, or are you hungover?
- ***Fatigue:** A*re you exhausted or overtired? When did you last eat?
- ***Emotion:** A*re you upset about anything?

When one of the answers is yes, a pilot or a visual observer should not conduct a flight or start a series of flights. In addition, the crew should contact his Accountable Manager to request a substitute and/or rescheduling the operation.

Health

The state of being free from illness or injury is crucial to execute safety flights. Therefore the following agreement should apply for the pilot. For the crew members it is prohibited to prepare or conduct any flight activities;

- When he is under the influence of substances that influence his judgement of his reactions.
- When he has consumed alcoholic beverages in the previous 10 hours.
- During the period when his driver's license is suspended.

Wearing corrective glasses or lenses

A pilot who has a medical record which states that he needs corrective glasses or lenses should wear them during the conduct of the entire flight operation or a series of flight operations.

Health Precautions

Utilizing the following substances by crew is strictly prohibited:

- Alcohol;
- Drugs.

Utilizing the following substances by crew is prohibited, unless this is approved by a doctor and the Accountable Manager:

- Sleep aid supplement such as Melatonin;
- Medicines which both on prescription and not on a prescription that could influence his judgement or reaction time such as:
  - Antibiotics
  - Painkiller
  - Antihistamine

- Decongestant
- Cough suppressants with antihistamine or decongestant
- Stimulant
- Any medicines or substances which are not stated above are prohibited if they influence his behaviour, ability of judgement, sight, hearing or balance.

If you, as crew, doubt your capability to conduct the activities due to the medicine you take, you should seek the advice of a qualified health professional.

The Attitudes

Attitude affects the quality of aeronautical decision making. Studies have identified five hazardous attitudes that can interfere with the ability to make sound decisions and exercise authority properly. These are 5 hazardous attitudes and antidotes.

The Five Hazardous Attitudes	Antidote
Anti-authority: "Don't tell me." This attitude is found in people who do not like anyone telling them what to do. In a sense, they are saying, "No one can tell me what to do." They may be resentful of having someone tell them what to do or may regard rules, regulations, and procedures as silly or unnecessary. However, it is always your privilege to question authority if you feel it is in error.	You are within your right to question authority if you think it is incorrect. Talk to the Accountable Manager. No hearing? The second step is to share your doubts with the Safety Manager.
Impulsivity: "Do it quickly." This is the attitude of people who frequently feel the need to do something, anything, immediately. They do not stop to think about what they are about to do, they do not select the best alternative, and they do the first thing that comes to mind.	Build in a timeout just before the start of the operation and use the checklists from the handbook.
Invulnerability: "It won't happen to me." Many people falsely believe that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. However, they never really feel or believe that they will be personally involved. Pilots who think this way are more likely to take chances and increase risk.	Speak to the other person if he or she shows unsafe behavior because of the urge to prove and report an incident to the Accountable Manager and the Safety Officer.
Macho: "I can do it." Pilots who are always trying to prove that they are better than anyone else think, "I can do it—I'll show them." Pilots with this type of attitude will try to prove themselves by taking risks to impress others. While this pattern is thought to be a male characteristic, women are equally susceptible.	Make a flight plan and agree that you will stick to the limits and agreements in the plan. Speak to the other person if he or she shows unsafe behavior because of the urge to prove. Report an incident to the Accountable

	Manager and the Safety Officer.
Resignation: “What’s the use?” Pilots who think, “What’s the use?” do not see themselves as being able to make a great deal of difference in what happens to them. When things go well, the pilot is likely to think that it is good luck. When things go badly, the pilot may feel that someone is out to get them or attribute it to bad luck. The pilot will leave the action to others, for better or worse. Sometimes, such pilots will even go along with unreasonable requests just to be a "nice guy."	Talk to the pilot about maintaining the flight plan and keeping the goal in mind.

Chapter A4: SAFETY MANAGEMENT SYSTEM [VMSE]

[A4.1] Security Policy Objective

Drone Chiefs pursues a policy aimed at preventing avoidable accidents.

[A4.2] Safety Culture

Drone Chiefs strives for a corporate culture in which all crew members dare to be vulnerable. Making mistakes is human and more often than we are aware of. Structure and procedures notably overcome the consequences of these errors, but unfortunately, they are never perfect. Improving safety is a continuous process.

Information is required to implement improvements. The management of Drone Chiefs depends on its crew to obtain this information. They should feel free to report incidents without fear. Declaring “zero tolerance” (not allowed to make mistakes) applicable is not part of an open corporate culture and certainly not in aviation. It suggests that crew should not make mistakes and that procedures are always perfect for every thinkable situation. On the contrary, there are circumstances conceivable under which crew must deviate from the standard procedures.

It is important the crew feels free enough to share information. The accountable manager contributes to a "just culture" that will never punish the reporting of incidents. Of course, intentional violation of rules, other than for security reasons, is not included.

[A4.3] Reporting Accident

Under European Regulation (EU) No. 376/2014, it is mandatory to report all accidents and serious incidents. This obligation also applies to pilots and organizations working with remotely piloted aircraft. See chapter

[A11.1] Reporting Procedures

[A4.4] Safety Assurance

The safety officer speaks annually with the accountable manager about incidents, accidents and occurrences, the procedures followed and the tasks and responsibilities performed. This way of working follows Deming's PDCA circle, Plan Do Check Act. The next steps are as followed:

1. Schedule an annual appointment between the safety officer and the accountable manager.
2. Planning training twice a year with the flight crew in which all possible incidents, accidents and the subsequent procedures and course of action are taken into account (See section [D2.1] Training General).
3. Reporting of both activities.
4. Annual evaluation between the safety officer and the accountable manager (can be combined with point 1 in small organizations. This frequency is increased to every two years as soon as more than 100 flight hours are made per year).
5. Implementing points for improvement in the organization: safeguarding in agreements, manual and other internal procedures.
6. Distribute the feedback for improvement and agreements within the organization of Drone Chiefs.
7. If adjustments to procedures in the manual are necessary, those adjustments will be processed and communicated internally. Then they should be presented to ILT.

Chapter A5: CREW COMMUNICATION [CCE]

[A5.1] Cooperation in General

Making mistakes is human and we make mistakes. Making mistakes happens more often than we think. Sometimes we make mistakes that we are immediately aware of, but the worst are the mistakes that we are not (yet) aware of. Effective communication plays an important role in this. 100% effective communication is when communication is complete and not filtered by emotions. By translating emotion into words of the compiler, mistakes arise. Errors also arise during the transmission and subsequent translation of words into emotion by the receiver. Choosing words is always from a (limited) perspective that is never the same as that of the receiver.

Crew members of Drone Chiefs should make the following task distributions and arrangements of communication for during the flight.

- Pilot: The person designated by the UAS operator who operates the UAS during a flight.

- Observer: Keeps an eye on the airspace and the environment. The observer handles all matters around the operation (dealing with viewers, traffic, etc.).
- Payload Operator: Operates the payload of the UAS and ensures the correct settings.

Depending on the scale of the assignment, several observers are assigned to coordinate traffic or to maintain communication.

To limit errors as much as possible, it is important to agree on how Drone Chiefs flight crew work together. Who does what, how and when? How do we speak clearly to each other? And how do we ensure that troublesome elements have as little effect as possible on our cooperation?

In manned aviation, these agreements are part of the Standard Operating Procedures.

These procedures are just as important for UAS operations. For the operations, several people can be involved who must be able to understand each other clearly.

For the next two sections, general directions of the cooperation between the pilot and the observer are described.

[A5.2.1] Cooperation Pilot/Observer under VLOS

During the cooperation between a pilot and the observer(s) on location, communication must be mutually efficient and goal-oriented. We apply the following rules to streamline communication:

- The pilot is flying and in charge of UAS-related matters, all other tasks during the flight are assigned to the observer(s).
- We speak of left / right from the pilot's point of view.
- There is an appropriate response to risks to avoid a possible shock reaction.
- The pilot and observer remain within speaking distance of each other unless additional communication technology can be used.

During the flight phases, Drone Chiefs uses the following phraseology:

Prior to take-off:

- UAS pilot: “READY FOR TAKE-OFF”
- observer: “CHECK, FLY ZONE IS CLEAR”
- UAS pilot: “TAKING OFF”

Or when the flight cannot be started:

- UAS pilot: "READY FOR TAKE-OFF"
- observer: "CHECK, FLY ZONE IS NOT CLEAR"
- UAS pilot: "ABORT MISSION"

Landing

- UAS pilot: "observer READY FOR LANDING?"
- observer: "LANDING CONFIRMED"

If all crew members agree, the UAS pilot initiates the landing and lands the UAS on the landing zone (LZ).

Or when it is not possible to land:

- UAS pilot: "observer, READY FOR LANDING?"
- observer: "STANDBY, LANDING ZONE NOT CLEAR"
- UAS pilot: "STANDING BY"

Crash

In case of a crash:

- Crew: "CRASH, CRASH, CRASH

Emergency procedure unexpected low battery

- UAS pilot: "EMERGENCY, LOW BATTERY"
- observer: "EMERGENCY, CLEARING LANDING AREA or "EMERGENCY, LANDING AREA IS CLEAR"

Other air traffic

- observer: "INTRUDER, AIRCRAFT (HELICOPTER) AT NORTH/SOUTH/WEST/EAST
- UAS pilot: "VISUAL"

See OM C4.5 for avoiding conflicts with other airspace users (deconfliction scheme).

[A5.2.2] Cooperation Pilot/Observer under EVLOS

In EVLOS flights, the UAS is allowed to be flown beyond visual line of sight of a pilot by using an observer. Therefore, from that moment on, the pilot receives the commands for the flight movements to be carried out from the observer. The UAS pilot remains ultimately responsible for the flight movements of the UAS and always has the final decision.

Essential for flying under EVLOS is that the distance between the UAS pilot and the observer is out of earshot. Therefore, two-way radios will be used as a direct means of communication between the UAS pilot and the observer. See also [A5.2.3] Communication Tools.

If there is a loss of direct communication between the UAS pilot and the observer and there is a visual line between the UAS pilot and the observer, hand signals or mobile phones can be used. This unwanted situation will be used to get the UAS back to the take-off and landing location as quickly as possible. After solving the direct communication problems, the operation can be resumed.

Further Reading Section

- [B2.2] External System

[A5.2.3] Communication Tools

Communication beyond speaking distance must take place via a mobile telephone connection with an earpiece or other means of communication as long as the UAS pilot does not have to detach his hands from the controls and can open the connection automatically by speaking.

Transceiver

If the observer cannot stand next to the pilot or when there are several observers, two-way radios are used. If one or more two-way radios (suddenly) stop working, mobile phones will serve as a backup. The communication plan contains all telephone numbers of those involved.

Further Reading Section

- [B2.5] Pre-flight Preparation and Checklists VLOS flights

[A5.3] Communication Failure Pilot/Observer

In the event of loss of communication between the pilot and the observer(s), the operation must be paused immediately. If possible, the UAS should hover in position until communication can be resumed. If this is not successful instantly, the UAS must be flown to the landing area to restore communication and/or start the landing procedure from here.

Further Reading Section

Chapter A6: NORMAL OPERATION STRATEGY[SE]

[A6.0] Introduction Operation Strategy

Standard procedures contribute to a safe flight process. Above all, these should make clear what is expected of whom; when, how and why? Understanding leads to acceptance.

[A6.1] Understanding Normal Operation Strategy

In manned aviation, SOPs (Standard Operating Procedures) are used to rule out errors in the operation as much as possible. They are written work instructions that describe in detail how a certain action must be performed to create uniformity in the action and therefore also its result. Aviation is all about safety during the execution of the flight.

In principle, this Operations Manual is full of "standard working methods", such as:

- The manner of cooperation between pilot and observer and the payload operator. When you should do, what you should do and when you should say something, see the section [A5.1] Corporation in General;
- Flight preparation, see the section [A7.21] Operational Plan (OP);
- Normal procedure, see chapter B2: Normal Procedures;
- Abnormal or Contingency procedures, see chapter C4;
- Emergency procedures, see chapter C5.

The standard working method of Drone Chiefs distinguishes three phases for flight preparation. Part of the preparation can take place from a few days before the flight until the day of the flight, part takes place on location, and part is aircraft-dependent.

Once the crew has completed the general preparations for the flight, the UAS must be checked and prepared for the flight. Part of this does not take place on location (checking batteries and other equipment, UAS packing list, etc.) and part on location (preparing the UAS completely for flight).

Phase 1: Quick Scan Regulations

In this step a check is performed whether the flight can take place within the legal possibilities:

1. The flight takes place during the daylight period, unless Drone Chiefs has an permit for flying outside UDP hours (Uniform Daylight Period (UDP), for exact times, see http://www.ais-netherlands.nl/, GEN

2.7).
2. The flight takes place at a maximum height of 120 meters (400ft) above the ground or water. N.B.: this does not apply to CTR, low-flying areas and/or (temporary) restricted areas (NOTAM).
3. The flight takes place in uncontrolled airspace (Classification G).
4. The flight takes place (partly) in the open or specific category. If it is possible to fly the operation entirely in the Open category, that is preferable. See [A7.20] Operations in Open Category for more information.

The result of the quick scan is recorded in the first version of the operational plan, see the section [A7.21] Operational Plan (OP). This also includes an assignment description.

Phase 2: Assessment of Location and (airspace) Restrictions

In this step, it is examined whether the location of the flight is suitable for carrying out the flight. Drone Chiefs completes the operational plan [APPENDIX C] Flight Plan and Check Lists.

Among other things, the location concerning obstacles, roads, adjoining buildings, railways, etc. is examined. Drone Chiefs uses the information sources (see [A7.1] Information Resources). Also, the operator, if possible, will visit the location to obtain an up-to-date condition.

Drone Chiefs also checks whether the airspace in which the flight takes place has restrictions that are important for the execution of the flight. In this phase of the flight preparation, Drone Chiefs uses the aforementioned information sources as well.

Phase 3: Flight Preparation on the day of execution

Before Drone Chiefs leaves for the location, the following items are checked:

- The expected horizontal view. In uncontrolled airspace, this must be at least 1500 meters, in CTRs (controlled airspace) at least 5km.
- The wind strength. It must be within the limits of the UAS used. For DJI products the wind strength limit is 10 m/s. See chapter B1 for details.
- The temperature. It must be within the limits of the UAS used. For DJI products the temperature range is between -10 and +40 degree Celsius. See chapter B1 for details.
- Is there precipitation (expected)?
- The Kp index. Is it within the limit <5?
- Check for temporary airspace closures at www.lvnl-ohd.nl.

A final check of the location takes place at the location itself. These are:

- Checking horizontal visibility.
- Measuring the wind strength and direction

- Assess the location. Are there any risks that have not yet been included?

For this, Drone Chiefs uses the checklist [APPENDIX C] Flight Plan and Check Lists.

When the flight preparation has been completed, the UAS pilot agrees to take off. Before, during and after the flight, the procedures must be followed as described in section 'Normal Procedures' in this operations manual. Flight data is recorded in the appropriate logs.

Types of Operations

If the operation requires additional actions, these are described from 'Peculiar to Single Operation' in section 'Normal Procedures' in this operational manual. We speak of an increased risk in these special operations. This should be considered during flight preparation.

Emergency procedures

To minimize risks, a communication protocol is used during the operation. This means that it is discussed with the entire crew how to act in an emergency. Besides, there is an overview of procedures available at the flight location and available for inspection in the event of an emergency. The procedures are described in 'Contingency Procedures' and 'Emergency Procedures' in this Operations Manual.

Checklists

Because a flight can only be conducted safely after proper flight preparation, we use checklists for each intended flight or series of flights. The UAS pilot fills in the results of the checklist in the operational plan that is made for each project, see [APPENDIX C] Flight Plan and Check Lists.

These checklists must be completed on location by the pilot to ensure the quality and safety of the operation. The packing checklist must take place before transportation and upon return to the Drone Chiefs location. The other checklists must be completed on-site before the UAS is found to be airworthy. The checklists must be available hard copy and must be available for every crew member before, during and after the operation.

[A6.2] Deviation from the "Normal Operation Strategy"

Sometimes a normal procedure is not available. In this case, the crew has the freedom to deviate and/or to improvise it.

The crew may deviate from these procedures. Drone Chiefs then appeals to the common sense of and good cooperation between its crew members.

Deliberate violation of rules, other than in the interest of safety, is not permitted.

[A6.3] VLOS

VLOS stands for Visual Line Of Sight. Flying under VLOS means that the pilot has direct visual contact with UAS without any support.

Sight distance

The EU regulation 2019/947 assumes for VLOS operations that the observer is not able to detect other air traffic further than 2 NM. The distance of 2 NM (rounded off to 3700 metres) is not considered a fixed value and will depend to a large extent on atmospheric conditions, dimensions of the UA and other air traffic, speed of approach, altitude etc. The operator must therefore adjust his operations and/or procedure accordingly.

The distance between the pilot and the UAS is not limited to a distance, although the UAS should always remain visible to the pilot. There may be circumstances where visibility or communication with the UAS is restricted, such as:

- Bright sun
- Objects
- EM fields
- Size of the UAS
- Dark sky (grey clouds so that the UAS no longer stands out)

In these circumstances, the maximum distance is equal to the distance at which the UAS is sufficiently visible.

The table below "maximum VLOS distances in relation to sight distances" shows the weather conditions under which the operations can be performed:

VLOS distance (m)	Sight distance (m)	Cloud base (m)	Precipitation (m)
≤ 1000	5000	≥ 1000	No Precipitation
> 1000 ≤ 3500	10.000	≥ 1500	No chance of precipitation

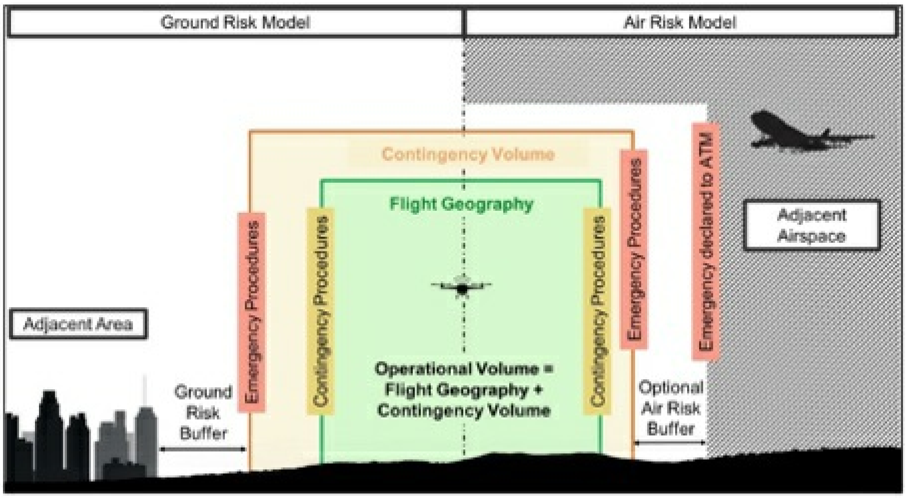
Priority rules applied

Remotely piloted aircraft give way to aeroplanes, helicopters, gliders, free balloons and airships by decending as quickly as possible.

In the case where two aircraft are encountering at or about the same flight level and lowering is not an option anymore, keep right (in flying direction).

[A6.4] Determination of the Operational Volume

Part of the flight preparation is determining the Operational Volume (OV). The Operational Volume consists of a 'Flight Geography' and a 'Contingency Area'. In addition to these two areas, the Ground Risk Buffer and the Air Risk Buffer must also be determined during flight preparation. The required volume is examined and described in the Operational Plan.



A6.4.1 Flight Geography

An area of flight geography is the projection of a flight area onto the Earth's surface and the spatially and temporally defined airspace volume(s) in which the pilot intends to operate in accordance with the normal procedures described in this Operations Manual. The following points should be considered while determining the flight geography:

1. The required maximum height for the operation. Depending on the zones in which the flight or series of flights are operated, Drone Chiefs verifies the geozone in order not to invade controlled airspace or a regulated airspace (defined via a geozone).
2. The UA shall not exceed the maximum flight altitude specified in the UAS manual, see Chapter B1. UAS Characteristics. The pilot takes the maximum height from the manual as the value. In this OM, the maximum legal heights are described, insofar as they have not been changed by law, in the chapter air traffic rules.
3. The maximum distance between pilot, observer and UAS shall be as short as possible and always comply with the legal requirements described in the chapter air traffic rules, insofar as they have not been modified by law.
4. The required volume is examined and described in the operational flight plan: see [Appendix C] Flight

Plan and Check Lists.

A6.4.2 Contingency volume

The contingency volume is the zone for unforeseen circumstances. During flight preparation, Drone Chiefs shall consider a Contingency Volume of at least 10 m in addition to the limit(s) of the flight geography (not tethered UA).

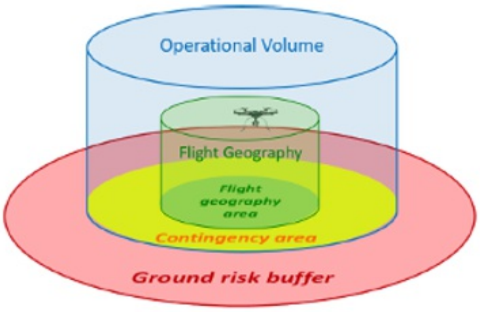
The area with the projection of the airspace volume on the Earth's surface outside the flight geography in which the following described contingency procedures are applied:

i) procedures in case the unmanned aircraft leaves the designated flight geography	Fly Away. This procedure is described C4.1 Unmanned Aircraft leaves the Flight Geography
ii) procedures in case uninvolved persons enter the controlled area	This procedure is described in C4.2 Uninvolved persons enter the controlled area
iii) procedures in the event of adverse operating condition	This procedure is described in C4.3 Adverse operating conditions
iv) procedures in case of compromise of external systems supporting the flight operations	This procedure is described in C4.4. Failure of external systems supporting the flight operations
v) if airspace observers are used, the phraseology to be used	See [A5.2.1] Cooperation Pilot/Observer under VLOS.
vi) procedures to avoid conflicts with other airspace users	This procedure is described in C4.5 Avoid conflicts with other airspace users

The required volume is examined and described in the operational flight plan.

A6.4.3. Ground Risk Buffer

The ground risk buffer is an area above the earth's surface that encloses the operational volume and is specified to minimize the risk to third parties on the surface in the event the unmanned aircraft leaves the operational volume. The following picture shows that the ground risk buffer serves as a safety margin in case a drone is out of control.



3D model Operational Volume and Risk buffer

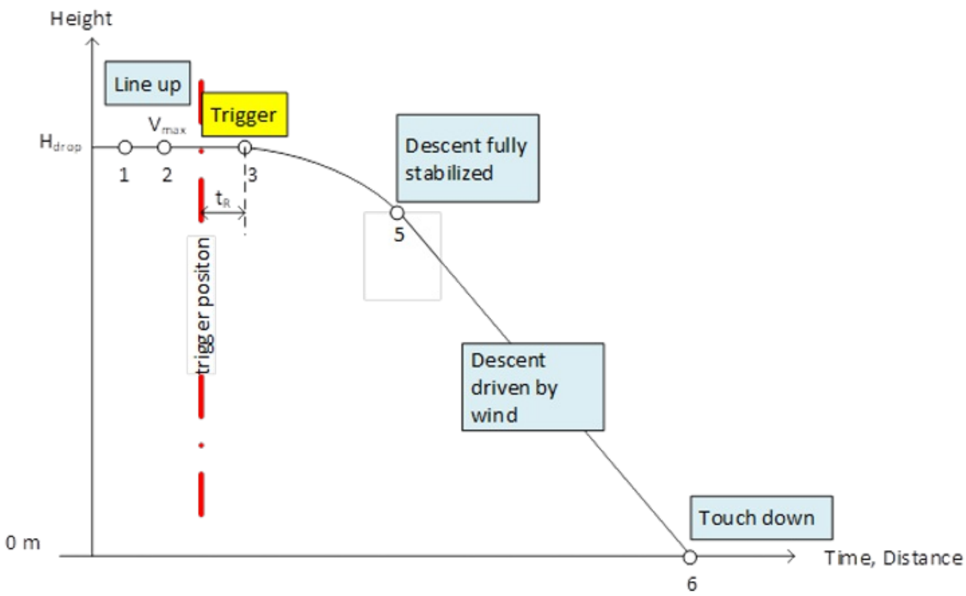
The buffer applies to the territory with a higher risk than where the operation takesplace, i.e.:

1. For operations above sparsely populated areas, the buffer applies to contiguous buildings and gatherings of people.
2. For operations over controlled territory (former STS2A), this applies to unchecked territory.

A.6.4.3.1 Determining the Ground Risk Buffer

Drone Chiefs chooses the ballistic method. If not applicable, the 1:1 rule is applied, where 80 meters of buffer is also used when flying at an altitude of 80 meters.

The method is to determine the maximum distance travelled when the value of the trigger is known (see the figure below). Be noted that it would depend on factors such as airspeed, weight and wind.



A6.4.3.2 Applying the ballistic method

The drone must meet the standards defined within the SORA, max 3m diameter and maximum typical Kinetic energy expected < 34KJ

Kinetic Energy factors are

- Mass (M)
- Speed (V)
- Surface of the RPAS (A)
- Height (H)
- Time of Fall (T)

Calculate the kinetic energy:

1. Determine the area A of the UAS (length x width) in meters
2. Calculate the Air Resistance coefficient (k) = p (air density = 1,225) x A x Drag Coefficient = 0.9) / 2
3. Use the websitehttps://www.omnicalculator.com/physics/free-fall-air-resistance#air-resistance-formula to calculate the Maximum velocity.
4. If the Air Resistance Coefficient cannot be determined, the UAS is assumed to fall in free fall and the impact speed is calculated as follows; V = 9,81 x (T = SQRT from Height/0,5*9,81)
5. Then calculate Kinetic Energy; KE = 0,5 x M x V^2

Calculate a safe distance, Ground Risk Buffer, to assemblies of people of other adjacent area:

1. Wind speed and direction affects how much distance the UAS travels in the event of a failure, so it must be considered when determining horizontal speed and distance to open air assembly of people.
2. Speed of the UAS, altitude and direction determine the minimum distance to be taken from the open-air assembly of people.
3. Use the following calculation to determine the minimum distance;
    a. Minimum Safe Distance = (UAS forward speed + windspeed) x (fall duration = SQRT from Height / 0,5 * 9,81)
    b. There must be a safe distance that prevents the UAS from ending up in an open-air assembly of people or other higher risk adjacent area in case of a failure.
    c. Or use this calculation method: https://www.omnicalculator.com/physics/projectile-motion

Air Risk Buffer

- There is no formal buffer for air risk, unless otherwise determined by the geozone.
- However, the adjacent flight area with a higher risk must be considered, for example if flying close to a CTR area.
- Step 9 of the SORA requires: a possible fault of the system (internal or external) must not give rise to a flight outside the operational volume. Drone Chiefs declares that the UAS is airworthy for these ConOps and uses a type declaration (which will be published tzt via ILT website). If the type of UAS has previously been equipped with a special BvL, this fact supports the explanation.
- The pilot always tries to avoid possible collisions and immediately takes the necessary distance from other UAS, aircraft or birds.

[A6.5] Controlled Ground Area

'Controlled ground area' is an area on the ground (on the surface of the Earth) where Drone Chiefs is able to ensure that only the persons involved are present. Such area comprises the 'flight geography area', the 'contingency area' and the 'ground risk buffer'.

Drone Chiefs may protect the controlled ground area by means of fencing or using other methods, as appropriate, considering the population density.

[A6.6] Involved and uninvolved persons

Persons considered **uninvolved** by Drone Chiefs:

Persons that do not take part in the UAS operation, either directly or indirectly, and that could be potentially affected by the UAS operation.

Persons protected by a shelter (e.g. a roof) are not considered to be affected by the UAS operation nor exposed to direct risks if the MTOM of the UA is below 25 kg or if the UA complies with the conditions defined in criterion #2 of mitigation M1 of the SORA (refer to point B.2 of Annex B to the SORA).

People that sit at a beach or in a park, or walk on a street or on a road, are considered uninvolved persons.

Involved persons

A person may be considered to be 'involved' in the UAS operation when the following conditions are met

Before the flight, the person:

a. has given explicit consent (it may be verbal) to the UAS operator or to the remote pilot to be part of the UAS operation (even indirectly as a spectator or just accepting to be overflown by the UAS); and

b. has received from the UAS operator or from the remote pilot clear instructions and safety precautions to follow in case the UAS exhibits any unexpected behavior.

Drone Chiefs is responsible for ensuring that all persons involved are able to follow in a timely manner the emergency procedures. In principle, in order to be considered a 'person involved', one:

(a) is able to decide whether or not to participate in the UAS operation;

(b) broadly understands the risks involved;

(c) has reasonable safeguards during the UAS operations, introduced by the site manager and the aircraft operator; and

(d) is not restricted from taking part in the event or activity if they decide not to participate in the UAS operation.

The person involved is expected to follow the directions and safety precautions provided by the UAS operator or the remote pilot, and the UAS operator or the remote pilot should check by asking simple questions to make sure that the directions and safety precautions have been properly understood.

Source: AMC to Annex I to ED 2022/002/R

[A6.7] Population Density of an Area

The EU regulations distinguish three levels:

1. Controlled Ground Area
2. Sparsely Populated Area
3. Populated Area

When an area cannot be seen as a Controlled Ground Area (1) and not as a Populated Area (3), it is automatically Sparsely Populated.
The basic principle is that a densely populated area corresponds to the areas within the built-up area of towns and villages.

To research the statistical human density in an area during flight preparation, the following sources can be used:

1. https://ec.europa.eu/regional_policy/mapapps/urban/degurba.html#: green area = sparsely populated
2. https://ec.europa.eu/regional_policy/mapapps/urban/degurba.html# : yellow, purple or red area = densely populated

Note: Population density figures can determine the type of environment, but not the number of people on site and/or the potential risk for the UAS operation. It is therefore important that the pilot estimates the number of persons who are not involved and sees whether the operational volume is densely or sparsely populated at that specific moment. This estimate must be noted on the Operational Flight Plan for flights outside the controlled ground area.

[A6.8] Take-off and landing locations within the Operational Volume

The site(s) of operation must allow the take-off and landing of the UA in complete safety and the safety of persons and property on the ground must never be compromised.

A main and at least one alternative take-off and landing location must be established at the flying location. Besides, it must be acknowledged at which landing site the UAS will perform the emergency landing, if applicable.

Depending on the risk analysis, the flight location is cordoned off and set up following the provisions of the Regulations on airports and other sites.

The take-off and landing site meets the following requirements:

- For landing and take-off, a surface area should be available with at least 5 times the diameter of the UAS, unless other means of safety around the zone are in place (e.g. forest, trees, walls);
- The ground conditions, in terms of flatness and bearing capacity, such that the relevant UAS can take off and land safely;
- There are no obstacles on the surface. The crop height in the surface is a maximum of 15 centimetres high, insofar as it does not endanger a safe flight operation;
- If necessary, a landing pad is used for the UAS;
- The obstacle-free zone is at least 20 m^2.

The site should be cordoned off and marked with cones and/or restricted tapes to keep uninvolved persons away, for example by posting warning signs.

When designing and choosing, also consider access and availability to the following items:

- Fire extinguisher;
- A shovel;
- First aid kit;
- Accessibility for emergency services.

Procedure to keep bystanders away

The observer is responsible for keeping bystanders at a safe distance so that the pilot can maintain focus on the operation. The procedure is as follows:

- The observer addresses bystanders who are threatening to enter the flying area and kindly asks them to keep their distance.
- The observer tries to act in a de-escalating manner so that the pilot can remain focused on the operation.
- The observer will remain between the pilot and the bystander in case of aggression.
- The situation escalates further, the observer will contact the police.

The pilot retrieves the UAS, lands and follows shutdown procedure.

The pre-flight check is performed at the starting location. The procedure for shutting down UAS immediately after the flight is described in [B2.8] Post-flight Procedures.

The take-off and landing location should be checked for debris after the flight. Each crew is responsible that all materials are taken back after the flight.

Alternative take-off and landing location

An alternative take-off and landing place must meet the same requirements as stated above. The alternative take-off and landing location must be chosen strategically. The following criteria are used for this:

- In line with the UAS flight path;
- Not in line from the UAS to the pilot. In an emergency, the intention is to fly off the pilot and crew;
- In a place visible to the pilot;

An open area with no waste, obstructions or combustible objects.

Chapter A7: FLIGHT PREPARATION[VVE]

[A7.0] Introduction Flight Preparation

UAS operations are, in principle, based on customer demands asides from test and training flights. The customer indicates requirements, whereby the Drone Chiefs ensures that the operation fits within the current legislation and regulations and technical frameworks. During flight preparation, the following matters should be considered:

- Legal frameworks
- Operational frameworks

- Technical constraints
- Human constraints, see [A3.4] Physical aspects (IMSAFE)
- Risk analysis
- Mitigating measures

Good flight preparation is essential for conducting a safe flight operation. It is crucial that the remote pilot, together with his crew members, reviews all the steps before each flight.

[A7.1] Information Resources

The pilot of Drone Chiefs utilises the following official information references when compiling the operational plan (OP):

a. The ICAO (Aeronautical Chart The Netherlands ICAO 1: 500 000) map including corrections on the map. See AIS. This map shows all areas (CTRs, EHP, EHR, EHD, ATZ etc) that are important for the execution of the flight. The card is published once a year by LVNL (at the beginning of flight season. i.e., March/April) and is available at LVNL or aircraft clubs. Any corrections which take place and affect the map during the year are shown in the AIP GEN 3. 2-8.
b. Aeronautical Information Products, AIP, at https://www.lvnl.nl/informatie-voor-luchtvarenden/publicaties-voor-luchtvarenden
c. Amsterdam integrated briefing (for NOTAMs) at https://lvnl.ead-it.com
d. KNMI Aviation Weather at https://luchtvaartmeteo.nl
e. Special activities at https://en.lvnl.nl
f. Basic registration of addresses and buildings (BAG) viewer for current buildings: http://bagviewer.kadaster.nl
g. Information about Natura2000 area, railways, municipal boundaries, road network, waterways etc: https://www.pdok.nl/viewer/
h. High voltage cables: http://geodata.rivm.nl/netkaart.html
i. Antenna register: http://geodata.rivm.nl/netkaart.html

The quality and correctness of the above references have been checked and guaranteed.

In addition, the following references can be used for flight preparation.

- Internet resources: Google earth, Google Streetview (Please not that they might not be up-to-date)
- Drone maps: https://map.godrone.nl and https://aeret.kaartviewer.nl/
- Natura2000 areas: https://www.natura2000.nl/gebieden
- KNMI Metar: https://www.knmi.nl/nederland-nu/luchtvaart/vliegveldwaarnemingen
- KNMI TAF: https://www.knmi.nl/nederland-nu/luchtvaart/vliegveldverwachtingen
- Sun direction, time, date etc.: https://www.timeanddate.com

- Weather check: https://www.windfinder.com

Aeronautical Chart The Netherlands ICAO 1: 500 000

One of the most important sources for flight preparation is the '[Aeronautical Chart ICAO 1: 500 000 the Netherlands](#)', referred to as the VFR chart. This chart is published once a year prior to the VFR flying season (spring). The areas mentioned in the AIP are included in this chart. Major changes in the airspace are planned as much as possible around the publication date of the aviation chart.

Figure: Example of Aeronautical Chart

However, there are situations in which this is not possible. In this case, a change will be made in the AIP and the change will be included on the map in the next publication of the map. The AIP is therefore always leading.

Google Earth and Kadaster

Google Earth/Street view allows you to view and interact with a wide variety of content, including but not limited to map and area data, business listings, traffic, reviews, and other related information provided by Google. Advanced import functions of GIS (Geographic Information System) data can be used to prepare and plan a mission. Area, range and circumference on the ground are measurable and you can print a high-resolution screenshot. Always check on location whether data corresponds to the actual one.
Bagviewer contains additional information about the owner of the area. See https://bagviewer.kadaster.nl
The BAG (Basisregistraties Addresses en Gebouwen) contains the official data of all addresses and buildings in the Netherlands. The municipalities are responsible for registering and updating these data.

[A7.2] Aeronautical Information Publication (AIP) Introduction

An AIP contains aeronautical information of a permanent character that is essential to airmen. The structure and content of the AIP are standardized through ICAO, the International Civil Aviation Organization. See http://www.ais-netherlands.nl for more information. Please note that the site is subject to change.

AIPs normally have three parts - GEN (general), ENR (en route) and AD (aerodromes). The structure and contents of the document are standardised by international agreement through ICAO. AIPs are kept up-to-date by regular revision on a fixed cycle. For operationally significant changes in the information, the cycle known as the AIRAC (Aeronautical Information And Control) cycle is used: revisions (normally 1 per 28 days) are produced every 56 days (double AIRAC cycle) or every 28 days (single AIRAC cycle). These changes are received well in advance so that users of the aeronautical data can make necessary amendments.

During the flight preparation, the crew members review the following sections:

- ENR 1.4: ATS AIRSPACE CLASSIFICATION and ENR6-3.1 ENROUTE CHART ICAO for the airspace classification (see [A7.3])
- GEN 2.7: SUNRISE / SUNSET for the uniform daylight period (see [A7.4])
- ENR 6-2.6: TRANSPONDER MANDATORY ZONES (see [A7.5])
- ENR 5.1: PROHIBITED, RESTRICTED AND DANGER AREAS for non-flying zones or under specified conditions. (see [A7.6])
- ENR 5.2: MILITARY EXERCISE AND TRAINING AREAS for military low-flying areas (see [A7.10])
- ENR 5.3: OTHER ACTIVITIES OF DANGEROUS NATURE AND OTHER POTENTIAL HAZARD for gas venting

sites, meteorological radiosonde balloon ascents sites, and model flying sites.

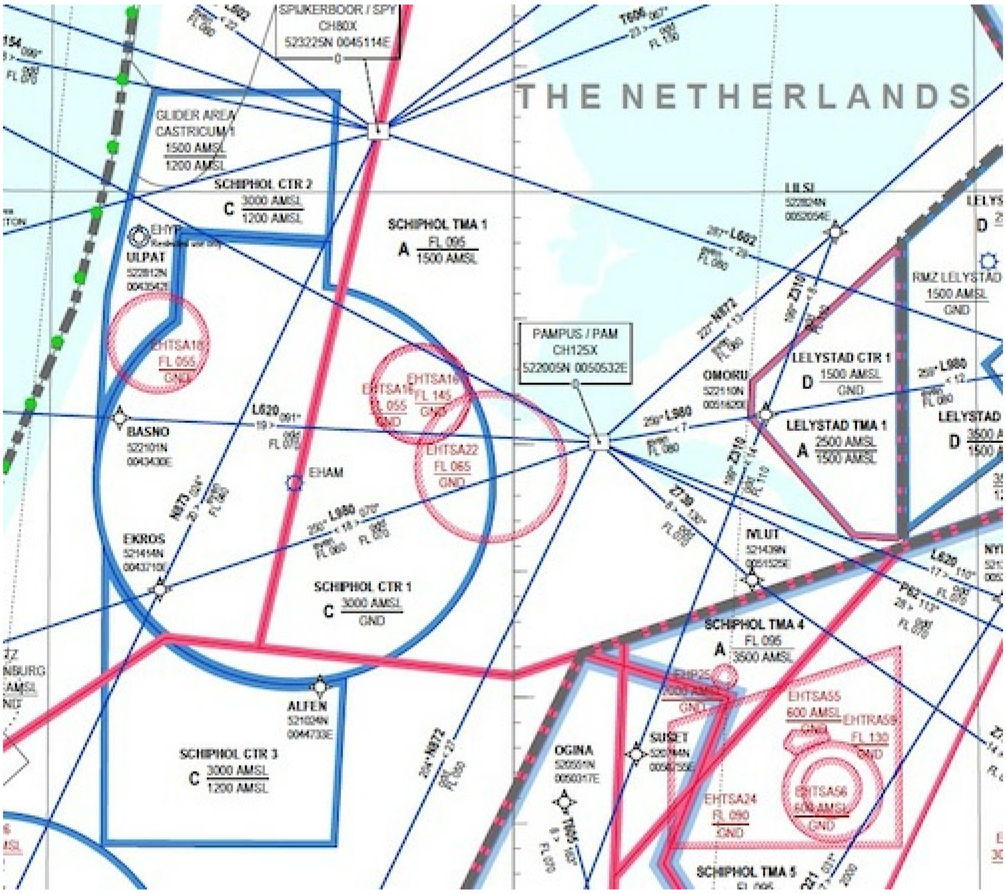
- ENR 5.5: AERIAL SPORTING AND RECREATIONAL ACTIVITIES for areas where paragliding, parachutists and unmanned balloons are allowed. (see also [A7.12])
- ENR 5.6: BIRD MIGRATION AND AREAS WITH SENSITIVE FAUNA for birds migrations, bird sanctuaries, and stork stations.
- ENR 6-5.2: LOW FLYING ROUTES / AREAS CHART for low-flying routes in the Netherlands.
- ENR 6-5.3: BIRD SANCTUARIES, BIRD STRIKE RISK AND WETLAND AREA for nature reserves and bird stork stations.

The following sections describe these components and their features for a UAS flight operation, with any additional measures to be taken.

[A7.3] Airspace Classification

In the AIP, at ENR 6 En route charts, ENR 6-3.1 is stated with the geographic division of the airspace including the lower limit and the upper limit of the different classes. For Drone Chiefs flying in the lowest air space is important (Class G) and in civil or military CTRs (Class C and D).

The CTRs are recognizable areas around the airports. The uncontrolled airspace (Class G) is not indicated on both maps, but it is easy to define. You will be flying between the ground and 120 meters (400ft) AMSL or uncontrolled airspace or in a civil or military CTR. Other airspace classifications do not start until above 450 meters (1500ft) AMSL.



Example Airspace chart

See for example: https://vfrchart.lvnl.nl

Important conditions/requirements associated with an airspace classification are:

- Which service you can expect from which air traffic service.
- Which traffic is separated by the air traffic service.
- What is the minimum weather condition under which (VFR) you are allowed to fly in this airspace.
- Two-way radio contact, a MODE S SSR transponder, flight plan or clearance is required to fly in this airspace.

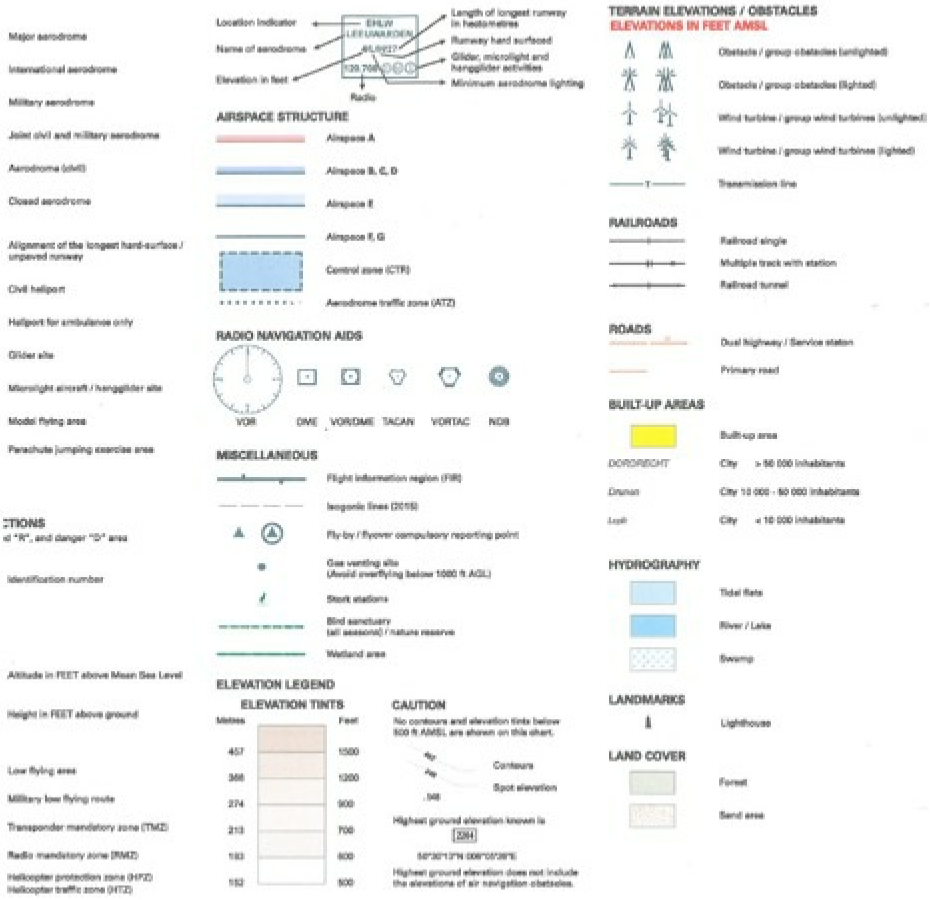


Figure: Legend aviation chart

The AIP, at ENR 1.4: ATS AIRSPACE CLASSIFICATION, states what the restrictions are for each airspace classification.

Further Reading Section

- [A7.2] Aeronautical Information Publication (AIP) Introduction

[A7.4] Uniform Daylight Period (UDP)

For the time being, a UAS is only allowed to fly during the day in the Netherlands. The uniform daylight period (UDP) applies to this. These times change during the year. The table in GEN 2.7 of the AIP (www.ais-netherlands.nl) shows UTC (coordinated universal time, letters of the abbreviation in French order). For Dutch local time, you must add 1 hour in winter and 2 hours in summer to the time on the table.

Further Reading Section

- [A7.2] Aeronautical Information Publication (AIP) Introduction

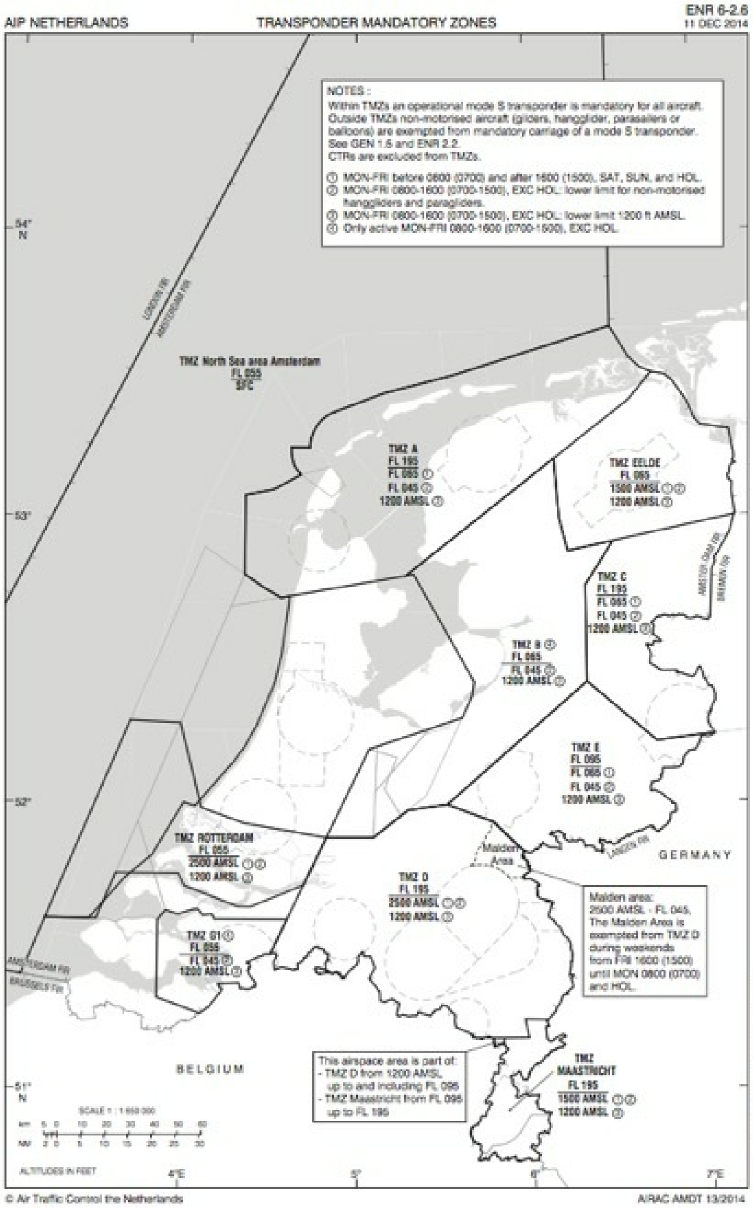
[A7.5] Transponder Mandatory Zone (TMZ) Chart

Transponder Mandatory Zone (TMZ) means that air space of defined dimensions wherein the carriage and operation of transponder equipment are mandatory.

In the Netherlands, a transponder obligation applies in the entire airspace, except in Class G below 365 meters (1200 ft) AMSL. All the flight operations designated as a TMZ shall carry and operate Secondary Surveillance Radar (SSR) transponders capable of operating on Mode S (Mode S SSR-transponder).

Most TMZs start at an altitude where no UAS flights are allowed. A TMZ that may be important for UAS flights is the TMZ North Sea Area Amsterdam. UAS flights above the North Sea are only permitted if only a working transponder is used and two-way radio contact can be maintained with the air traffic service.

A TMZ is active from Monday to Friday during office hours (09:00 - 17:00) with a lower limit of 1200ft AMSL. Outside these times and on Saturdays, Sundays and public holidays, the lower limit will be raised. Also, it will differ per TMZ. So for these days, it is required for those who are concerning the lower limit to check it during the flight preparation.



Use of Radio

The obligation for two-way radio contact can be determined by:

- The airspace classification,
- Setting up a radio mandatory zone (RMZ)

In the CTRs, the obligation for two-way radio contact is established by airspace classification C or D. To comply with the obligation for two-way radio contact, you must have the correct equipment (antenna of at least 10 meters height, radio set) and personnel who have the ability of radiotelephony. RMZ and TMZ are listed in the AIP ENR 2.2.

Further Reading Section

- [A7.2] Aeronautical Information Publication (AIP) Introduction

[A7.6] Chart Prohibited, Restricted and Danger (PDR) Areas and Temporary Reserved Airspace (TRA)

In section ENR 5.1. of the AIP, it is stated that the areas in the Netherlands where are not or only partially accessible. On the ICAO aviation chart 1: 500 000, those areas where long-term restrictions are applied are recognized with the following abbreviations.

- EHP (Prohibited) with a number
- EHR (Restricted) with a number
- EHD (Danger) with a number
- ATZ (Aerodrome Traffic Zone) with a name

(EH is the nationality prefix of the Netherlands)

If you encounter such an area on the map, you can find this in the AIP in section ENR 5.1. The restrictions are stated in the right column (www.ais-netherlands.nl). You use these restrictions when preparing for flight in such an area and include them in the briefing, for example when applying for or checking a NOTAM or when contacting the manager of this area and/or requesting an exemption.

		Gunfiring. Vertical limits may be changed by NOTAM. MON-THU 0700-2300 (0600-2200), FRI 0700-1600 (0600-1500), or activated by NOTAM.
EHR9 (Harskamp) 52°11'30.00"N 005°47'00.00"E; 52°09'30.00"N 005°52'50.00"E; 52°07'30.00"N 005°52'50.00"E; 52°06'40.00"N 005°45'45.00"E; 52°09'20.00"N 005°44'00.00"E; to point of origin.	5900 ft AMSL GND	Prohibited, unless permission from AOCS Nieuw Milligen. Gunfiring. Vertical limits may be changed by NOTAM. MON-THU 0700-2300 (0600-2200), FRI 0700-1600 (0600-1500), or activated by NOTAM.
EHR61 (Arnhemse heide) Circle, radius 300 m, centre 52°02'29.00"N 005°55'04.00"E.	1000 ft AMSL GND	Prohibited, unless permission from AOCS Nieuw Milligen. Detonation of explosives. Vertical limits may be changed by NOTAM. MON-THU 0700-2300 (0600-2200), FRI 0700-1600 (0600-1500), or activated by NOTAM.

Figure: Example of ENR 5.1 Section in the AIP

Please note that it only concerns areas with long-term restrictions. Also consult the NOTAMs for temporary restricted, prohibited or dangerous areas.

Further Reading Section

- [A7.2] Aeronautical Information Publication (AIP) Introduction

[A7.7] Operational and Technical Limitations

Based on the customer request, the pilot, together with the payload operator, investigates the possibilities and which payload can be set to process the customer request.

Check the technical and operational limitations in Chapter B1: Technical Description UAS.

[A7.8] Natura 2000

According to the European Commission, Natura 2000 is a network of core breeding and resting sites for rare and threatened species and some rare natural habitat types which are protected in their own right. It stretches across all 27 EU countries, both on land and at sea. The network aims to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the Birds, Birds Directive and the Habitats Directive.

For the Netherlands, this concerns more than 160 areas. All Natura 2000 areas are within the National Ecological Network. Part of the Natura 2000 areas have presently been definitively assigned by Dutch nature conservation law. For more information, please read 'Wet Natuurbescherming' (Dutch language only).

You can find the areas on the following webpages.

- Natura 2000 in Nederland
- Natura 2000 Network Viewer

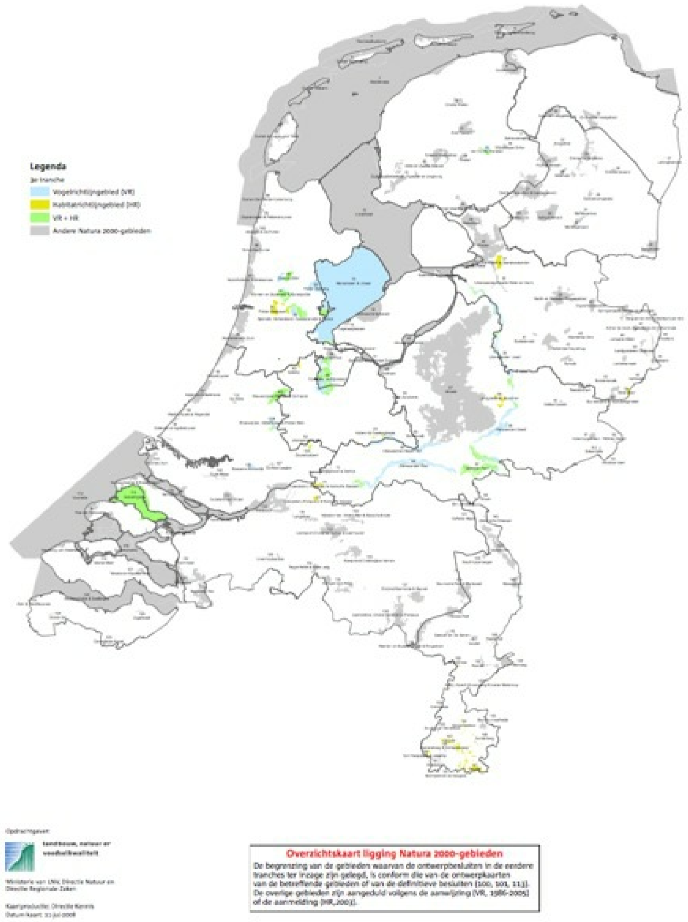


Figure: Example of Natura2000 Chart

If your flight operation has to be flown above the Natura 2000 area, special permission is required. The criteria of this permission depend on local legislation. For more information, please visit [Natura2000.nl] or Natura 2000 management plans at [Bij12].

<u>Further Reading Section</u>

- [A10.1] Guidelines

[A7.9] Bird Nesting Area

Bird nesting areas are sometimes partially and/or completely closed off for activities at certain times of the year. Flying in these areas is risky for both the UAS and the birds.

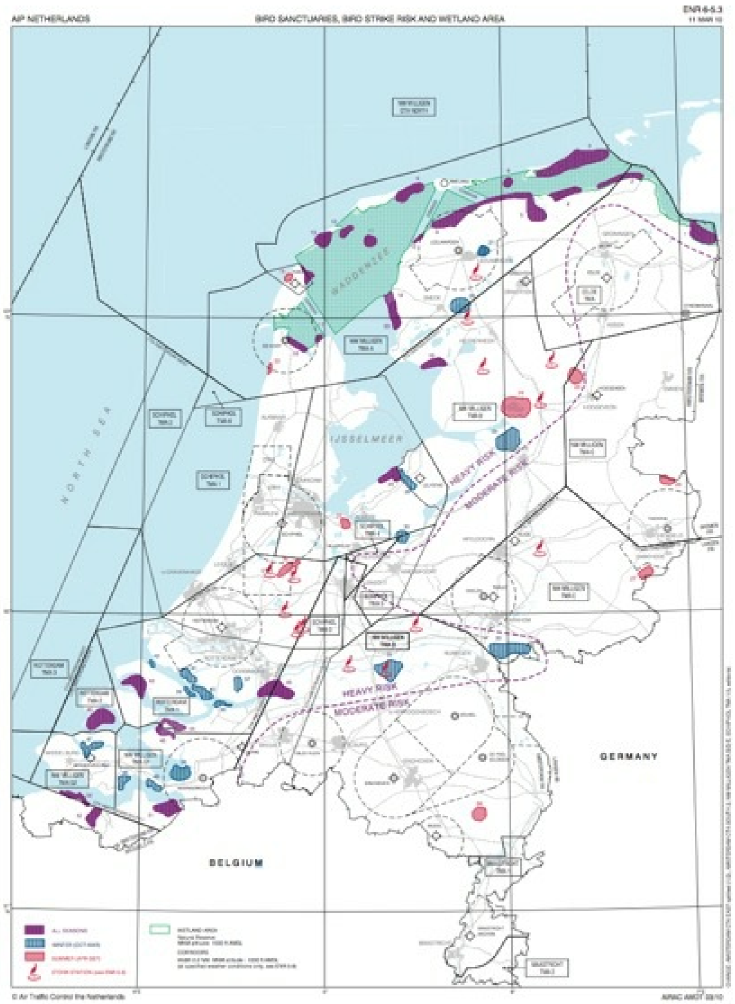


Figure: Bird Nesting Area Chart

The shaded areas are not allowed to fly below 1500ft AGL.
If flying in these areas is nevertheless necessary, an exemption must be applied for (lead time 6 weeks).

See below for the contact information.
Human Environment and Transport Inspectorate (ILT) / Aviation
P.O. Box 90653
2509 LR Den Haag
tel: +31 (0) 70 456 2260
email: aviation-approvals@ILT.nl

Further Reading Section

- [A10.1] Guidelines

[A7.10] Military and Civil Low-flying Areas

The low flying areas and routes were established in the 1950s. Their utilisation is regulated by aviation law. Both sports and military aircraft make use of low-flying areas. In the latter case, you could think of military exercises or training flights that are carried out at low altitude (below 300 meters/1000 ft). A military low-flight route is 3,700 meters wide, and a minimum of 75 meters (250 ft) height shall be maintained. Helicopters are even allowed to fly 30 meters (100 ft) or lower in some areas. Military low-flying areas can be identified by the code GLV.
Section ENR 5.2 of the AIP contains information about low-flying areas: eAIP

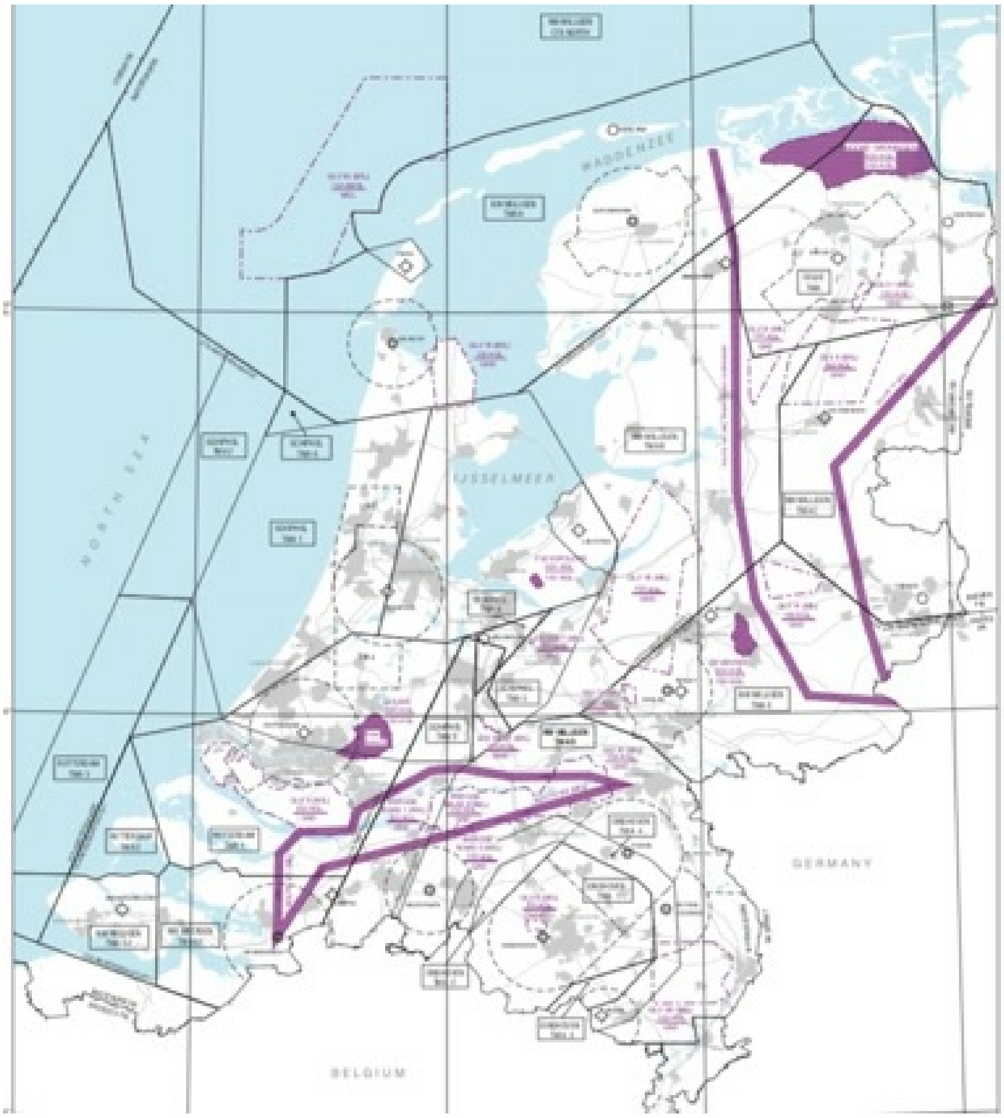


Figure: Chart of military low-flying areas in the Netherlands (indication)

If the flight is performed above a height of 40 metres, permission is required for this operation. And a NOTAM must be requested and published no later than 24 hours before the flight in which the operation with the UAS is announced. During these flights, it is mandatory to fly together with an observer.

An indicative chart of these areas (for recreational use) can also be found on [Dronemap] at Godrone and [AERET].

Further Reading Section

- [A7.2] Aeronautical Information Publication (AIP) Introduction

[A7.11] Simulated forced landing areas

The AIP on map ENR 6-5.2 also lists areas where the manned aircraft are allowed to fly low to practice an emergency landing. This must be taken into account during flight preparations. Flying in this area is carried out with at least 1 observer and this is included in the risk analysis (flight preparation) per flight and the briefing.

Permission from the air traffic controller is also required for these areas. Furthermore, a NOTAM must be published no later than 24 hours before the flight. In the NOTAM, the flight with the UAS is announced if it concerns flights that take place above an altitude of 40 meters within this airspace in which low flying is allowed.

[A7.12] Sports and Recreational Flying Activities

Flights near uncontrolled airports are allowed. The airport operator is contacted for this. Use a limit of 3 km for this. This also applies to glider airfields, hang glider fields, heliports, parachuting locations. This information can be found at LVNL (eAIP), ENR 5.5 AERIAL SPORTING AND RECREATIONAL ACTIVITIES.

Further Reading Section

- [A7.2] Aeronautical Information Publication (AIP) Introduction

[A7.13] Flying Near an Uncontrolled Airport

Dutch Aviation Act (Wet Luchtvaart), Article 5.3 says:
It is prohibited to participate in air traffic or to provide air traffic control services in such a way that persons or property are or may be endangered as a result.
This article applies to all air traffic, including UAS operators. To fly in the vicinity of uncontrolled airports, you should coordinate with the owner/operator of the airport concerned. The distance to which coordination is required from the uncontrolled airport remains arbitrary.
Chapter 7: Flight Preparation provides more information about flying in the vicinity of uncontrolled airports (such as military and civilian CTRs).

Further Reading Section

[A7.14] Flying in or near an Aerodrome Traffic Zone (ATZ)

ATZ is an air traffic area designated around an airport that has been established to protect airport traffic. For civil ATZs, the following text is therefore included in the AIP:
'An ATZ has been established around the following aerodromes. The activities conducted at these aerodromes make it undesirable for other aircraft, not engaged in these activities, to penetrate or otherwise disturb the traffic pattern. In this case, the ATZ is primarily reserved for use by aircraft participating in the activities of the aerodrome. Overflying aircraft are strongly recommended to stay clear of the ATZ.'
For military ATZ this text is included in the AIP:
'Outside the published operating hours of controlled military aerodromes, general aviation (glider and motor flying) activities may take place in the CTR under a special exemption. For the protection of these activities, ATZs (a circular area around the aerodrome with a radius of 2 NM from GND to 1500 ft AAL) has been established within the relevant military CTRs. Aircraft, crossing a military CTR outside the normal operating hours of the aerodrome with the permission of the relevant Flight Information Centre, shall keep clear of the ATZ. '

For professional flying with a UAS in or in the vicinity of an ATZ, the same applies to flying in the vicinity of uncontrolled airports. See chapter VVE13; coordination with the operator of the airport, or the manager of the airspace within which the ATZ is located, is necessary. Preferably, the flight could be scheduled outside the activities of the ATZ.

Please note that the military CTR becomes an RMZ outside opening hours (see ENR 2.2.4).

[A7.15] Special Airspace Activities / Closures

In addition to the fixed airspace restrictions and closures included in the AIP, airspace measures are also taken that occur occasionally. These measures are made available by the Minister of Defense or by the Minister of Infrastructure and the Environment and made known to airmen by NOTAM. This concerns, for example, the establishment of temporary areas with restrictions to protect air traffic between themselves (for example, when dismantling bombs, large events, shooting model missiles, etc.).
This concerns, for example, the establishment of temporary areas with restrictions to protect air traffic between themselves (for example, when dismantling bombs, large events, shooting model missiles, etc.)

As an extra service, LVNL places the drawings associated with the temporarily set restricted or closed areas on the site of the operational helpdesk at LVNL temporary airspace closures (tijdelijke luchtruimsluitingen, Dutch only).

[A7.16] Controlling Mass and Balance

To guarantee a stable flight, the mass and balance of the UAS must be always following the supplier's specifications. The UAS performance is affected not only by the weight of the payload but also by the position of that weight on the UAS. Determining the centre of gravity (CoG) is necessary for this. The CoG is the theoretical point where the entire weight of the UAS resides. If the UAS is attached from a cable at exactly that point, it would hang perfectly balanced. Usually, the manufacturer supplies software to determine this. The CoG is described (if known) in the technical section of the OM, i.e., Chapter B1: Technical Description UAS.

[A7.17] The Maximum Acceptable Total Mass

In aviation, the quantity of 'mass' is used and not 'weight'. Nevertheless, the quantity of weight is widely used in the technical documentation on UAS.

- MTOM = Maximum Take-off Mass
- BEM = Basic Empty Mass

There are many more terms in use that have to do with the mass in aviation, however, these two are sufficient for the UAS. UAS are aircraft that almost always transport something, such as a camera. The bare device is called a platform and the camera - or whatever you want to transport - is called payload. With few exceptions, the payload is replaceable/interchangeable, certainly with the more expensive UAS for professional use. If the payload is not interchangeable, only 1 mass (including battery/accumulator) is specified by the manufacturer, which is also the MTOM. If the payload is interchangeable, the manufacturer specifies the mass of the platform including battery/accumulator (BEM). Additionally, an MTOM or the maximum mass of the payload are specified.

MTOM = BEM + maximum mass of the payload

The manufacturer determines this MTOM based on, among other things, design, structure/material, balance, thrust and ultimately testing.

The values of the mass must always remain within the specifications of the supplier of the UAS.

[A7.18] Reading and Submitting Notice to Airmen (NOTAM)

NOTAM messages contain information that is also essential for a safe flight operation but cannot (yet) be included in the AIP. NOTAM messages are:

1. No permanent nature (less than three months)
2. Important in the short term (AIP is only updated periodically)

A NOTAM is issued in the Netherlands by LVNL or Air Operations Control Station (AOCS) Nieuw Milligen. NOTAM messages can be obtained at LVNL Homebriefing (registration required).

It is necessary to submit a NOTAM application for the following drone flights outside the CTR:

- under or in regulated airspace areas (low-flight routes, GLVs, parachute jumping areas, etc.)
- higher than 400 ft AMSL

For the NOTAM application form, click this link. The Operational Helpdesk assesses the application. If it turns out that it is not necessary to issue a NOTAM, they will inform the applicant.

NOTAMS can be found on the official website www.homebriefing.nl

Below, the example of NOTAM is shown.

NOTAM for EHLW

V0086 / 17 -

[US DOD PROCEDURAL NOTAM] STANDARD INSTRUMENT DEPARTURE (SID) AMENDMENT LEE 3 DEP MSA LWD TAC CHANGED, MIL AIP EHLW FROM AD 2-11 TO 2-30. READ 1700FT INSTEAD OF 1500FT. 05 APR 15:48 2017 UNTIL 21 JUN 23:59 CREATED: 05 APR 15:48 2017

Station: EHLW is the 4-letter code for the entire Dutch airspace (Leeuwarden airport)
Notam id: the reference code.

This is a "date/time group". The time is always UTC.
In the summer the Dutch local time is UTC +2 and in the winter UTC +1.

[A7.19] Weather METAR / TAF GA weather chart (Weather observations)

A METAR (Meteorological Aerodrome Report) is a meteorological message consisting of a snapshot of the local weather at an airport or a weather station. This message is compiled every half hour (: 25 and: 55). A METAR always has the same construction.

The significant difference between a METAR and TAF (Terminal Aerodrome Forecast) is that the METAR is a weather report and the TAF is a weather forecast. A METAR is therefore always 'old news'.

Both the METAR and TAF start with a date-time group. The TAF also indicates for which time it is valid. Note, as with NOTAMs, the UTC is used (Dutch winter time is UTC +1 and Dutch summer time is UTC +2. So convert to Dutch local time).

Below you can see the two examples of the aerodrome weather observation data, META and TAF.

METAR Schiphol

METAR EHAM 280925Z 23010KT 9999 VCSH FEW015 FEW022TCU 18/14 Q1016 NOSIG=

EHAM4	letter code for Schiphol
280925Z	the 28th of the month at 9:25 am "Z". Zulu time is UTC. In the Netherlands, we have 'A' or 'Alpha' time
23010KT	230: wind direction. 10kt: wind speed in knots
9999	Reported in a four figure group (e.g. 0400 = 400 metres; 8000 = 8 km) up to but excluding 10 km; 9999 = 10km or more; 0000 = less than 50 metres visibility
VCSH	Special codes for it are displayed in this block. Here it says VCSH. SH stands for showers. VC stands for vicinity, or 'in the environment. There are more codes like RA (rain), FG (fog), BR (haze). There may also be a '-' or '+' in front of the weather. It only concerns precipitation or thunderstorms. The minus sign means 'light' and the plus sign means heavy. ++TSSHRA means 'very heavy rain with thunderstorms (TS)'.
FEW015	The cloud cover is always in 'eighths'. FEW means 'a little' or 1/8 to 3/8 sunshade cover
FEW022TCU	The addition TCU indicates the type of cloud. CU means Cumulus. The 'T' indicates 'Towering', or 'Constructive'
18/14	Temperature: 18 Celsius. Dew point (DP) temperature: 14 Celsius. If these two temperatures are close together, the air is humid. They can also be equal. Then it is normally rainy weather. The DP can never be more than the temperature
Q1016	The QNH is the atmospheric pressure corrected to mean sea level. The pressure is 1016 hPa
NOSIG	'No Significant changes' or no changes expected in the next two hours after the observation time

TAF Schiphol

The TAF uses the same codes as the METAR. It is, however, a forecast. Below the typical TAF, codes are explained with the above TAF as an example.

TAF EHAM 280438Z 2806/2912 21008KT 9999 FEW020 SCT040 BECMG 2807/2810 25015KT BECMG 2817/2820 19005KT CAVOK PROB30 2902/2906 6000 SCT005=

2806/2912	Validity period: from the 28th at 06:00 UTC to the 29th at 12:00 UTC. For this example, the period is 30 hours. This can be longer and shorter
BECMG	'Becoming', in other words, the change to come. You also often see the code 'FM', from ... with a specific time or time block (2617/2820). It is therefore very important here that you look at the correct date/time group and also convert to the Dutch time
PROB30	PROB30, PROB40 or indicate the probability that certain weather will come. PROM stands for 'probability'

The pilot checks the weather forecast on the intended date and no later than 24 hours in advance at KNMI: For METAR, for TAF.

The KNMI Aviation weather site is an alternative.

The local wind force and wind direction are measured with a handheld wind speed meter.

Operating UAS is strictly prohibited in the following weather conditions.

No flying conditions Drone Chiefs*

- Ice formation in the air (hail, snow, sleet);
- Wind force 5 Bft (10 m/s) or higher;
- Temperature is lower than minus 10 Celsius or higher than 40 Celsius;
- Cloud coverage (fog, haze);
- When the rules of a specific type of airspace cannot be complied with (distance from clouds);
- In rain or drizzle;
- Near CB cloud cover (thunderstorm);
- High risk of turbulence.

* These parameters depend on the type of drone. You should therefore check the specific usage restrictions for the drone(s) to be used in the user manual as soon as a drone is deployed to fly safely outside these restrictions.

[A7.20] Operations in Open Category

This Operations Manual describes all procedures and regulations relating to operations in the Specific Category. However, depending on the situation, it may also be the case that flights in the Open Category are carried out.

When can a flight be operated under the Open Category?

- The UA weighs (at take-off) a maximum of 25 kg;
- Maximum altitude of 120 metres;
- Not carrying hazardous substances;
- Not letting anything fall out of the drone;
- Visual line of sight (VLOS).

Source: Dutch Government Site

In addition, the following preconditions apply that depend on the type of drone:

UAS	Operation		Drone operator/pilot		
Max weight	**Subcategory**	**Operational restrictions**	**Drone operator registration**	**Remote pilot competence**	**Remote pilot minimum age**
< 250 g	A1 (can also fly in subcategory A3)	— No flight expected over uninvolved people (if it happens, overflight should be minimised) — No flight over assemblies of people	No, unless camera / sensor on board **and** the drone is not a toy	— No training required	No minimum age
< 500 g			Yes	— Read carefully the user manual — Complete the training and pass the exam defined by your national competent authority or have a 'Proof of completion for online training' for A1/A3 'open' subcategory	16*
< 2 kg	A2 (can also fly in subcategory A3)	— No flying over uninvolved people — Keep a horizontal distance of 50 m from uninvolved people	Yes	— Read carefully the user manual — Complete the training and pass the exam defined by your national competent authority or have a 'Remote pilot certificate of competency' for A2 'open' subcategory	16*
< 25 kg	A3	— Do not fly near or over people — Fly at least 150 m away from residential, commercial or industrial areas	Yes	— Read carefully the user manual — Complete the training and pass the exam defined by your national competent authority or have a 'Proof of completion for online training' for A1/A3 'open' subcategory	16*

Figure: Source EASA 2022

Please note that in addition to the EU regulations, there are additional national regulations that should be included. Please refer to the sources in chapter [D1.1.1] Regulations in EU and the Netherlands.

[A7.22] Mandatory documents on flight location

The following documents must be present at the flight location:

- Operational Authorisation
- A (digital) copy of the Operations Manual

Several documents are not required but are strongly recommended to take with you to the flight location. Refer section [APPENDIX C] Flight Plan and Check Lists for this.

[A7.23] Declaration procedure for new pilots and/or UAS

For some operations, the use of a different type of drone is desirable. In other operations additional drone pilots are needed. This procedure describes the declaration process. Declaration means that the accountable manager (the applicant) declares that the pilot/UAS is safe for the intended operation (ConOps).

Pilot declaration

For each pilot, Drone Chiefs states that the pilot has a theoretical and practical training that is sufficient for the intended operation and includes the following elements:

1. knowledge of European UAS regulations (EU- 2019/947) and other relevant European and national regulations
2. rules related to the type of airspace (SERA & SORA)
3. airmanship and airspace safety
4. human performance limits
5. meteorology
6. navigation & maps
7. the UAS
8. operational procedures

The declaration for the new pilot (name, date of birth and certificate) is send to ILT: iltdocumentmanagement@ilent.nl

UAS declaration

For each UAS, Drone Chiefs verifies and states that:

- The RDW 'exploitantnummer' of Drone Chiefs NLDxxx is placed visible on each UAS which is operated.
- The UAS is insured and is covered by the covering conditions of the policy of Drone Chiefs;
- The UAS complies with the same category and class as that for which the pilot is authorized and as described in this Operations Manual and the operating license.
- Characteristics and limitations of the C3 links, RF spectrum and environmental factors are sufficient for safe intended operation.*
- For the type and model in question, the desired information is displayed on the display of the GCS, including the alarm.
- The UAS supplier has published a EU ***declaration of conformity*****

*AS-RPAS2 and/or an additional type assessment by a competent third party may support the declaration.

**If no declaration of conformity is available, contact CAA-NL.

The declaration for the new UAS is send to ILT: iltdocumentmanagement@ilent.nl

[A7.24] Cross-border Operations

Cross-border operations or operations according to Article 13 - Regulation (EU) 2020/639):

Send an application to the competent authority of the Member State with the following information:

a. a copy of the operating licence granted to the UAS operator in accordance with Article 12; and
b. the location(s) of the proposed operation, including the updated mitigation measures, where necessary, to address the risks identified in accordance with point (b) of Article 11(2) that are specific to local airspace, terrain and population characteristics and climatic conditions. According to OSO #23, environmental factors for a safe flight, an evaluation of the environmental factors in that particular EU country is necessary. Think, for example, of flying in a mountainous environment. For this, a specific addition to the handbook is necessary. These measures are added to the handbook in section C3.13 (if applicable).

Upon receipt of the application, the competent authority shall assess the intended operation and shall provide confirmation to the competent authority of the Member State of registry (CAA-NL = ILT) and the Drone Chiefs that the updated mitigating measures referred to in point (b) of paragraph 1 are satisfactory for the operation at the intended site.

Upon receipt of that confirmation, Drone Chiefs may commence the intended operation and ILT shall record the updated mitigation measures to be applied by the UAS operator in the operating licence issued in accordance with Article 12.

Check the EASA website for information of flying in other member states:
https://www.easa.europa.eu/en/domains/civil-drones/naa

Chapter A8: GENERAL MAINTENANCE [OAE]

[A8.0] Introduction Maintenance

Under EU regulations, requirements are set for maintenance and for the people who carry out the maintenance. In OSO #03 it is stated that:

- UAS maintenance instructions are prepared and, where applicable, contain the relevant instructions and conditions of the manufacturer.
- The maintenance personnel will carry out maintenance in accordance with the maintenance instructions.

Drone Chiefs distinguishes between minor routine maintenance and major non-routine maintenance.

1. Routine minor Maintenance
At Drone Chiefs, the Maintenance Manager and pilot will perform routine maintenance, as described in the UAS manual. In all cases, the maintenance log must be updated with all work completed and a flight test performed (in which all functions are tested).

2. Non-routine major maintenance
Drone Chiefs carries out major maintenance as follows:

[A8.1] Maintenance Manager

Maintenance is essential for safe operation with a UAS. To be able to guarantee this responsibility, one person responsible is appointed within Drone Chiefs for the maintenance of the UAS. The maintenance manager is responsible for the optimal condition of the UAS. For this, the maintenance manager uses the maintenance documentation supplied by the producer of the UAS.

[A8.2] General Maintenance Program

To be able to guarantee safety and reliability when using the UAS, it is necessary to carry out maintenance on the UAS at a fixed interval or after incidents.

Two parameters have been defined for regular maintenance:

- After a certain number of flying hours;
- After a certain number of flights.

Both parameters are UAS dependent and are determined by the Maintenance manager. These parameters are also registered in the log of the relevant UAS.

UAS	Flight hours for small maitenance	Flight hours for major maintenance

[A8.3] Performing Maintenance

Minor maintenance is carried out at the maintenance location of the UAS in the head office of Drone Chiefs. In order to perform the maintenance, specific tools are available at this location. See APPENDIX A for the name(s) of authorized service personnel.

Major maintenance is carried out with competent and authorized maintenance personnel by the following location:

[A8.4] Firmware Updates

Software and firmware are part of this configuration. Some important points are described below.

- The Maintenance manager knows the purpose of the update and which systems this update will affect before the software or firmware is executed.
- The Maintenance manager conducts further research through the internet into possible reports about the reliability of the update. There are some forums available for doing that.
- Only if there are no indications from which the Maintenance manager can conclude that an unsafe situation will arise due to the update, he performs the update.
- Before the Maintenance manager releases the UAS operationally after a software or firmware update, he ensures that the control over the UAS is functioning properly using a Functional Check Flight (FCF) in a safe location. The Maintenance manager pays particular attention to the proper functioning of the fail-safe properties of the UAS as described in AS-RPAS2 at the Dutch Civil Aviation Authority (NLR).

- The Maintenance manager processes the update and execution of the FCF including the successful outcome of the FCF in the technical administration and the logbook.

[A8.5] Conduct Test Flight After Maintenance

In case of major maintenance and/or damage, the UAS will have to undergo several tests showing that airworthiness is assured. By performing the tests below, the UAS can be declared airworthy and troubleshooting:

- All functions in the system must be thoroughly tested;
- A test flight of at least 10 minutes to be made to rule out any particularities. Any details must be recorded in the operation log;
- When the Maintenance Manager considers the UAS suitable to be used for operations, he/she will release the UAS and write it down in the logbook.

During that test flight, the following systems must be checked:

- GNSS functionalities;
- Connectivity of the UAS with the ground station;
- The operating system of the UAS;
- Flight characteristics of the UAS;
- The functioning of the propulsion system;
- Fail-safe and emergency procedures should be checked;
- The functioning of the batteries and power supply.

The location where the test flight is performed meets the following conditions:

- Obstacles, buildings, vehicles, vessels, roads, railway lines, people, animals, electricity pylons, etc. at least > 25 meters from the take-off and landing site;
- Airspace class G;
- Quiet, preferably in a rural location (few people).

[A8.6] Administration Maintenance

All maintenance work performed is immediately updated in the technical logbook available per UAS. See for an example at APPENDIX D. Detailed maintenance records must be stored. See chapter [A12.1] Record Keeping Procedures for more information.

[A8.7] Investigation and Reporting of Defects and Losses

If technical defects and losses are found, the Accountable Manager should be contacted. The detection of the defect must be recorded in the technical log available per UAS. In consultation with the Accountable Manager, it is decided what action should be taken to make the UAS operational again.

[A8.8] Battery Management

The batteries used in the UA are usually of the type LiPo (Li-Polymer) or Li-ion. These high-capacity batteries are a fire hazard when overloaded (This phenomenon is not yet identified regarding Li-Metal).

The batteries come with instructions for handling and it is important to follow these carefully to prevent fire on the UAS or in the storage area.

Follow the instructions regarding:

Storage

LiPos can be safely stored in a fireproof bag (LIPO bag) or suitcase;

Check the best temperature for storage;

Transport

You transport the batteries in the appropriate suitcase or bag;

Make sure the batteries are not damaged during transport or use. This can cause an internal short circuit (and fire);

Usage

Follow the instructions carefully from the supplied specifications. Most batteries are automatically charged and discharged correctly;

- The batteries should not be used if they are swelling or are already warm;
- In case of damage or bulging during use, the battery must be handed in as soon as possible as small chemical waste (KCA). Caution in case of fire: <u>Do not inhale the toxic smoke</u> and let the battery burn out for at least 20 minutes

Chapter A9: SECURITY[VS]

[A9.0] Security

In this chapter, the security requirements are described. This is a broad concept that broadly covers the following topics:

- Security of data and documents;
- Security of the area where the operation takes place.

The Drone Chiefs ensures that security requirements applicable to the area of operations comply with the intended operation.

Section 9.1 deals with the security of data and documents. Paragraph 9.2 deals with the security of the area where the operation takes place.

[A9.1] Security of data and documents

Data and documents of both involved and uninvolved persons must be protected against unauthorized access and/or interference. The following topics have been cited:

- Security of personal data;
- Security of the UAS and the online working environment;
- Security of confidential documents;
- Protection against fraud and embezzlement.

9.1.1 Security of personal data

Since 25 May 2018, the General Data Protection Regulation (GDPR) applies. Since then, the same rules apply throughout Europe for the processing of personal data. Personal data is any information about an identified or identifiable natural person.

There is a good chance that personal data will be processed during flights in inhabited areas where images are taken. These can be images and/or sound recordings of persons, license plates or address details.

There are several bases that justify the processing of personal data:

- Consent of the person in question;
- Necessary for the execution of an agreement;
- Necessary because this results from a legal obligation;
- Necessary for the protection of vital interests;
- Necessary for the performance of a task carried out in the public interest or in the public authority;

- Necessary to represent one's own legitimate interest.

Typically, consent or necessity for the performance of an agreement with a customer will be the applicable basis.

Personal data of third parties that are processed during the flight must be handled with the utmost care:

- Every personal data is made unrecognizable by means of a blurring tool;
- Images and/or recordings that are not (or no longer) used must be deleted immediately;
- Images are stored at all times in a secure environment.

9.1.2 Security of the UAS and the online work environment

Measures must be taken to protect the UA system and the online working environment against unauthorized modification and/or unlawful access to data streams.

9.1.2.1 Modification

UAS are stored in an enclosed area, to which only authorized personnel have access. It is strictly forbidden to make modifications to the hardware and software of the UAS. Only the Maintenance Manager and the maintenance staff are authorised to do so.

When an update needs to take place, the Maintenance Manager will be notified. It will also perform the update if necessary.

After each use of a UAS, the type of use and the user are recorded in the UAS journal of the relevant UAS. In this way, any (unwanted) modification or damage can be traced.

9.1.2.2 Data streams

UAS and the online working environment are protected against unlawful access to data (flows). Some measures are taken that contribute to security:

- Use of strong passwords (possibly two-factor authentication);
- Regularly updating firmware/software/computer programs;
- Only use official/original systems;
- Set limit on the number of devices that connect to the GCS;
- Functioning RTH mode.

9.1.3 Security of confidential documents

- Both digital and paper versions of confidential documents must be stored securely.

- Paper versions of confidential documents are kept in a locked room, to which only authorized personnel have access.
- Digital versions of confidential documents are stored in a secure folder, to which only authorized personnel have access.

9.1.4 Fraud and embezzlement protection

To prevent (parts of) UAS or confidential documents from being unlawfully removed, all UAS, the online working environment and the confidential documents must be secured in accordance with the measures in the previous paragraphs.

[A9.2] Implementing Area Security

In the training of the crew, it is important to recognize deficiencies in the UAS, especially strange behaviour. Even though it is caused by the EM field, awareness of the crew member in this area is crucial. Moreover, UAS to be used could apply an encrypted radio frequency to prevent unlawful interference and unauthorised modification.

Chapter A10: ENVIRONMENT[GU]

[A10.1] Guidelines Nuisance

All UAS operations are to be carried out in line with applicable environmental and nature protection obligations as outlined in national and EU law.

As outlined in the ConOps, it is allowed to fly above (sparsely) populated areas (e.g. urban areas and villages), in the vicinity of homes and other buildings. There are a number of factors that can cause nuisance, such as invasion of privacy (UA with camera flies close to homes / gardens, etc.) and the sound of the propellers.

Therefore the following guidelines are followed by Drone Chiefs.

Privacy Guidelines

To ensure the privacy of third parties, the following guidelines are used during operations within or nearby populated areas:

- Choosing time brackets for the operation when its normally quiet in the area (e.g. outside peak hours in residential areas and at night in industrial areas);
- If required by the ConOps, each resident/company receives a letter with information about the

operation;

- Before the start of the flight, if possible and necessary, residents are informed that the flight will start;
- It is indicated that privacy is respected and that closing curtains can contribute to this;
- Persons who have questions during the flight are clearly informed by the UA observer.

Noise guidelines

The noise of the propellers of the UA can cause nuisance if flying near people. The sound can also trigger startle reactions in animals. Persons living near the operation are advised to close the windows and doors during the operation to minimize noise.

Flights that take place in the vicinity of/above Natura 2000 sites must always be coordinated with the manager of that site. In some cases, guidelines regarding drones have been included in the management plan of the area in question. This indicates whether it is permitted to fly a drone in that area and, if so, how permission can be obtained. If this is not laid down in the management plan, the "lead" of the area must always be contacted in advance. Often this is the province in question.

For a list of Natura 2000 sites, see [A7.8] Natura2000

https://www.bij12.nl/onderwerpen/natuur-en-landschap/natura-2000-beheerplannen/

Of course, in all other cases, the natural habitat of animals must be respected.

[A10.2] Environmental Guidelines

Drone Chiefs contributes to the maintenance of a healthy and safe (living) environment. Therefore, the following guidelines are used:

- Flight documents shall, if possible, be consulted and stored digitally as much as possible;
- The area where the operation takes place is cleaned up afterwards. Waste such as food and drink packaging or broken parts of the UA are thrown away/taken away by the UAS team;
- Defective LiPo batteries are not thrown in the bulky waste. These are periodically brought to the waste disposal;
- The environment of people and animals is respected at all times.

Chapter A11: OCCURRENCE REPORTING PROCEDURES[RP]

[A11.1] Reporting Procedures

This chapter describes how to act in the event of an incident with the UAS or system parts of the UAS. The aim is to improve aviation safety by ensuring that relevant safety information related to the UAS operation is reported, collected, stored, protected, exchanged, disseminated and analysed.

The European Union and its Member States are committed to ensure a high level of aviation safety and to protect European citizens by better-preventing aircraft accidents (Regulation (EU) No 376/2014). The regulation deals with the reporting, analysis and follow-up of occurrences in civil aviation.

On the basis of Regulation (EU) 376/2014, occurrences in civil aviation are subject to a reporting obligation. This also includes events with a UA. A report shall be made if:

- Endangers or could endanger an aircraft, its occupants or other persons;
- Includes an accident or a serious incident.

Accident

An accident is an event related to the use of a UAS and occurs between the time when the PIC intends to perform a flight and the time when the flight is (un)intended to end, where:

- A person is fatally or seriously injured as a result of direct contact with (a part of) the UAS, including parts that have become detached from the UAS;
- The UAS is missing or completely unreachable;
- The UAS suffers damage or a structural defect, causing:
    - Its solidity, performance or flight characteristics are impaired; and
    - Which would normally require major repairs or replacement of the affected component;

Incident

An incident is an event related to the functioning of a UAS that impairs or could impair safe operation, with the exception of an accident.

Serious incident

A serious incident is an incident that occurs under circumstances that indicate that an accident has almost occurred.

[A11.2] Occurrence Registration and Reporting

All events are registered in the Occurrence Register. This register is maintained by the Safety Manager and has been developed to facilitate the management of occurrences and the resulting risk mitigation measures.

All incidents are reported to the Safety Manager. The purpose of reporting incidents is to prevent accidents and (serious) incidents and not to establish guilt or liability.

The following list is a non-exhaustive list of events that need to be reported:

- Loss of control over the UAS (loss of C2 link);
- Technical defects that occur during the flight;
- Problems during operation affecting the safety of the flight;
- Fire or smoke in the UAS;
- Problems with UAS batteries;
- Incidents at the take-off/landing site;
- Emergency or precautionary landing;
- Incorrect documentation or procedures;
- Unwell of a UAS crew member during the service period;
- Application of IMSAFE with negative outcome;
- Damage to the UAS and/or damage to others due to contact with the UAS;
- Injuries (UAS team/third parties);
- Bird/animal collisions;
- AIRPROX (near collision with another aircraft);
- Airspace violation.

Anyone within the UAS organization can report incidents. When several people are involved in an incident, it may be useful to make mutual agreements about who will report it. However, this is not a requirement.

The reporter must in any case provide the following elements about the event:

- Brief description of the incident;
- Injury and/or damage (if applicable);
- The location of the incident;
- The date and time of the occurrence;
- The measures that have already been taken;
- How to reach the reporter.

Notification form

The forms for reporting occurrences can be found on the ECCAIRS 2 website: https://aviationreporting.eu/. For events with UAS, this can be done via the menu "Report an Occurrence" > "I report on behalf of my Organisation" > "Netherlands ILT" > "Report an occurrence without registration" > "General Aviation".

Always make a (digital) copy and send it to the Safety Manager.

Procedure after receipt of the report

After the Pilot has reported the incident to the Safety Manager and the Safety Manager has sent the form, if applicable, to the external authorities, the Safety Manager (or the person he appoints for this purpose) will investigate the incident, answering at least the following questions:

- What happened?
- How could this happen or what is the source cause of the incident?
- How can the incident be prevented in the future?

The Accountable Manager ensures the implementation of the established corrective measures.

The Safety Manager always gives feedback to the person who made the report and informs about the actions taken in response to the report.

External reporting and notification:

Notification of aviation incidents analysis bureau (ABL)

The ABL is informed by the Safety Manager of any incident. This can be done via the following e-mail address: abl@ilent.nl. The Safety Manager will provide as much relevant information as possible to the ABL.

Notification of the Dutch Safety Board (OVV)

Accidents with injury or death of a person must, after medical assistance has been provided and/or the emergency services have been alerted, be reported immediately to the OVV by or on behalf of the Operational Manager. This can be done on the following telephone number: 0800-6353688.

Notification of the Human Environment and Transport Inspectorate (ILT)

Accidents with injury or death of a person must also be reported immediately to the ILT. This can be done on the following telephone number: 070-4563434.

Notification to UAS manufacturer

If the event is due to a technical defect, the UAS manufacturer will be informed.

Chapter A12: RECORD KEEPING PROCEDURES[RPE]

[A12.1] Record Keeping Procedures and logs

Qualifications, certificates, flight information and other logs must be kept according to the retention periods mentioned in EU Regulation 2019/947.

UAS. SPEC.050 (1) (g) (i), (ii) and (iii) Responsibilities of the UAS Operator) requires a retention period of at least 3 years for:

- qualifications and training courses for crew members and maintenance personnel after these persons have terminated their employment with the organisation or changed positions in the organisation;
- The maintenance activities carried out on the UAS;
- The information about UAS activities, including unusual technical or operational events and other data as required by the operating licence (OA).

Logging flight information according to AMC1 UAS. SPEC.050 (1)(g) point c

The UAS pilot records all his flights in a Pilot logbook and records the following points according to AMC1 UAS. SPEC.050(1)(g):

Name PIC	Date	Flight location	Start time	Landing time	Flight duration	UAS ID nr.	Total flight hours	Activity / authorization reference	Incident / Accident	Defect	Repair or change

This flight information must be kept for at least 2 years in a way that protects against unauthorized access, damage, alteration and theft.

PART B: UAS OPERATING INFORMATION

This part contains all type-related instructions and procedures needed for a safe operation. It takes account of any differences between types, variants or individual UAS used by the operator.

Chapter B1: TECHNICAL DESCRIPTION UAS[ARPSE]

This chapter contains specific information on the UAS used and classified by Drone Chiefs for this UAS operation authorisation.

Drone Chiefs can use other types of drones under the conditions stated in [A7.23] Operations with third-party UAS.

1. [B1.1] Technical Information Mavic 2 Enterprise Dual

The DJI™ MAVIC™ 2 Enterprise Dual features omnidirectional Vision Systems and Infrared Sensing Systems and comes with a fully stabilized 3-axis gimbal camera with a FLIR longwave infrared thermal camera and a visual camera, providing both infrared and visual images simultaneously. DJI signature technologies such as Obstacle Sensing help you fly and capture complex shots effortlessly. Additional features like the built-in AirSense makes you aware of your surrounding airspace and password protection helps you maintain secure access to your aircraft and protect your data. The Mavic 2 Enterprise also has attachable modular accessories like the M2E Spotlight. M2E Beacon and M2E speaker are purpose build for various applications. The Mavic 2 Enterprise boasts a maximum flight speed of 44.7 mph and a maximum flight time of 31 minutes.

N.B.: Further detailed information can be obtained at DJI Mavic 2 Enterprise Dual.

1. [B1.1.1] Software and Serial Numbers

Copy & Paste this chapter directly to the default OM, so that we will be able to fill in the information for each customer.

Software version	
UAS operator registration number	NL......
Software / Firmware Version Aircraft	V...
Camera serial/model	
Remote Control model	
Remote Control Serial Number	n/a
GNSS Mobile station	n/a

	Dimensions without the propellers attached
Width	91 mm
Height	84 mm
Length	214 mm

2. [B1.2] 3-sided image Mavic 2 Enterprise Dual

3. [B1.3] Mass and Balance Data

The maximum mass with which the aircraft can take off is described in the technical data. The weight of a sensor must be weighed in complete condition before configuration and mounting under the UAS. The total weight of the UAS including the sensor must never exceed the maximum allowed mass at take-off as stated in the technical data of the UAS. The sensor of the DJI Mavic 2 Enterprise Dual is not interchangeable. The weight is 899 grams.

4. [B1.4] Technical and Operational Restrictions

The technical and operational restrictions of the Drone Chiefs UAS:

Operational Ceiling	6000 meter (software max 120 meter 400 ft)
Operational Endurance	29 minuten (zonder accessoires)
Maximum Permissible Airspeed	20m/s (S-stand) 13,88 m/s (N-stand) 5 m/s (T-stand)
Maximum Outside air temperature	40°C
Minimum Outside air temperature	0°C
Maximum Permissible wind speed	10m/s (36km/h),
Broadcast Frequency signal strength	2.4 GHz @ 100 mW, 5,8 GHz@20mW
Maximum Ascent speed	4m/s (N-stand)
Maximum Descent speed	3 m/s (N-stand)
Maximum height (by software)	120 meter
Maximum distance (by software)	500 meter

Note:

- The maximum flight time was tested in a wind-free environment during a flight at a constant speed of 18 km / h and the maximum flight speed was tested at sea level without wind. These values are for reference only.
- The remote control achieves the maximum transmission distance (FCC) in a wide-open area without electromagnetic interference at a height of approximately 120 meters.
- The maximum flight time was tested in a laboratory environment and without charging the mobile device. This value is for reference only.
- 5.8 GHz is not supported in some regions. Comply with local laws and regulations.

The obstacle sensors may not work properly in the following situations:

- When flying over surfaces of only one colour (e.g., all black, all white, all red, all green) or that have no apparent texture;
- When flying over highly reflective surfaces;
- When flying over water or transparent surfaces;
- When flying over moving surfaces or objects (e.g., over moving people, waving reeds, bushes and crops);
- Flying in an area where the lighting changes frequently or drastically, or in an area with direct strong lighting;
- When flying over extremely dark (<15 lux) or bright (> 10,000 lux) surfaces;
- Flying at high speeds (more than 14 m / s at 2 meters or more than 5 m / s at 1 meter;
- Small obstacles;
- The lens is dirty (e.g. raindrops, fingerprints, etc);
- Scenes with little visibility (eg heavy fog).

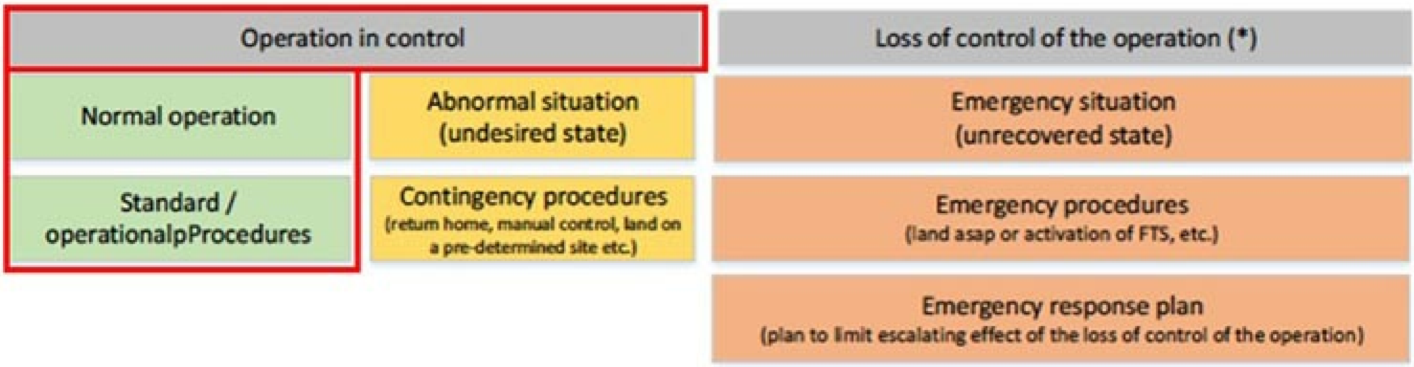
Chapter B2: NORMAL PROCEDURES (UAS RELATED)

[NPE]

[B2.0] Introduction Normal Procedures

Normal operational procedures are the guideline for planning safe UAS operations. In this chapter, Drone Chiefs's normal operations are described. For the specific operations, see Chapter C3: Specific Flight Procedures. For both these cases, the operations are considered ‘under control’ of the pilot.

The contingency and emergency procedures are described respectively in Chapter C4 and C5.



[B2.1] Assignment of Duties and its Distribution

To minimize human errors, a clear distribution and assignment of tasks are required.

Distribution and Assignment of Duties

See [APPENDIX C] Flight Plan and Check Lists and [A1.2] Responsibilities and Duties.

Internal checklists

For an internal checklist to control that crew members are properly performing their assigned tasks, the checklist can be conducted. See [APPENDIX C] Flight Plan and Check Lists.

[B2.2] External System

The external systems such as GNSS, DAD (Detect and Avoid) support UAS flight operations. Some possibilities of the deterioration modes of these external systems which would prevent the operator from maintaining a safe operation of the UAS are:

- Loss of datalink communications
- (Complete) loss of GNSS
- Drift of the GNSS

The pilot must have a manner to detect the deterioration of an external system. The procedure(s) in place once a deterioration mode of one of the external systems is detected are described in the following sections:

- [D1.9] Disruption of GNSS signal
- [A5.3] Communication Failure Pilot/Observer

Please be noticed that each UAS type has (slightly) different procedures for its system failure. The crew member should read and understand the manual which is provided by the manufacture before any flight operations.

When the deterioration of the external systems would be expected? Read the following sections, [D1.8] Kp-index (Solar Activity) and [D1.10] Electromagnetic (EM) fields.

[B2.3] Coordination between the remote pilot and other personnel

See the following chapter: [A1.4] Crew Formation

[B2.4] Methods to Exercise Operational Control

There is simulator software available on the market. The crew member could utilise this to exercise operational control. Furthermore, see the Chapter D2: TRAINING.

[B2.5] Pre-flight Preparation and Checklists VLOS flights

(1) The site of the operation

The following points should be thoroughly considered when the flight operation is planned:

- The assessment of the area of operation and the surrounding area.
- The assessment of the surrounding environment and airspace.
- The compliance between visibility and planned range when the (Visual) Observer is used for the flight operation.
- The class of airspace and other aircraft operations such as local aerodromes or operating sites.
- The type of UA, including any details regarding inaccuracies, speed and range.

See Chapter A7: FLIGHT PREPARATION for further details to include those points. For the checklists for the flight preparation, see [APPENDIX C] Flight Plan and Check Lists.

(2) Environmental and Weather Conditions

The crew member studies the environmental and weather conditions adequate to conduct the UAS operations. See the following sections in Chapter D1: GENERAL INSTRUCTION OF FLIGHT OPERATIONS.

- [D1.3] VFR Regulations
- [D1.4] General Meteorology

- [D1.5] Icing Conditions
- [D1.6] Turbulence
- [D1.7] Wind Shear and Wind Gusts
- [D1.8] Kp-index (Solar Activity)

To obtain the weather forecasts or conditions, please refer to the following sections in Chapter A7: FLIGHT PREPARATION.

- [A7.1] Information Resources
- [A7.2] Aeronautical Information Publication (AIP) Introduction
- [A7.4] Uniform Daylight Period (UDP)
- [A7.19] Weather METAR/TAF GA weather chart (Weather observations)

(3) Coordination with third parties if applicable

For Drone Chiefs, coordination with third parties is not applicable.

(4) Crew Formation

Assignments can be categorised by their complexity. Depending on the complexity, an assignment can be performed alone or as a team. The complexity is linked to the flying situation and the type of operation. See section [A1.4] Crew Formation for further details.

For their responsibilities are described in section [A1.2] Responsibilities and Duties.

(5) Crew Communication

The required communication procedures between the personnel in charge of duties essential to the UAS operation is described in Chapter A5:Crew Communication. See the following sections:

- [A5.1] Cooperation in General
- [A5.2.1] Cooperation Pilot/Observer under VLOS

(6) Compliance with any Specific requirement from the authority

See the section [D1.1.1] Regulations in EU and the Netherlands.

(7) The Risk Mitigations

For the risk mitigations for the general procedures, see below.

Risk related to	Explanation of risk	Proposed mitigation measures

Collision with other air traffic	Trauma/police helicopter	Max flying height 45m, 2-way radio contact with LVL. Observer.
Collision with ground or obstacles	Buildings	Keep distance
Collision with vehicles, vessels, people or animals	traffic	> keep distance, slow speed, observer
Disturbance / Loss of GNSS signal	Few buildings, hardly any chance of reflection	Switch to ATTI
Control signal disturbance	n/a	Max. distance PIC / UAS 200m,
Meteorological influences	Possibly Wind	Regular check, landing too strong wind
Personal/environmental hazards	n/a	Shielded LT, Observer keeps them away
Physiological aspects	n/a	Remote TOL (LT), short communication

(8) Pre-flight Preparation

Procedures to verify that the UAS is in a condition to safely conduct the intended operations are described below.

Preparation UAS

The UAS is prepared before departure to the flight location.

- The configuration of the UAS is controlled in the logbook;
- The structural integrity of the UAS is checked and, where necessary, repaired and/or prepared before departure to the operation site.

Flight Preparation

The flight preparation also consists of the

- Check and prepare chargers/power supply for the batteries.
- Compile the correct configuration of the sensor and UAS combination.

Pre-flight Procedures

The pre-flight check takes place in the vicinity of the take-off location. For the pre-flight checklist, see Appendix C.

Before the flight can commence, it is ensured that all persons on site (involved in the operation)
a. are informed about the risks of the operation;
b. are aware of the safety measures for the crew members;
c. have explicitly agreed to participate in the operation.

The person who performs the pre-flight check brings the UAS to the take-off location, thereby ensuring the validity of the pre-flight check. The UAS check should follow the manufacturer's manual. When all items on the checklist have been approved, the take-off procedure can be started.

6. [B2.6] Launch and Recovery Procedures

Those procedures are described below.

Before Take-off Procedures

The starting procedure is carried out by the pilot, (possibly in consultation with the payload operator).

- Place the UAS on the designated landing pad
- The crew keeps a minimum safety distance of 5 meters from the UAS;
- The pilot places the batteries in the UAS;
- The pilot checks the functions of the control sticks, trim, switches, throttle neutral, etc.
- The pilot activates the UAS's transmitter(s);
- The pilot checks the functions and settings of the sensor in consultation with the payload operator;
- The pilot (in consultation with the payload operator) activates the sensor transmitter;
- The pilot turns on the UAS and connects the transmitters;
- Monitor the LED indicators and audio alerts;
- Checking GNSS reception;
- Set and check home point and altitude for automatic return;
- Checking that the take-off area is still free and unoccupied;

Communicate "platform free"

- Start engines and check for detectable vibrations and/or noises.

Gradually increase engine speed and be alert to any abnormal noises or irregularities.

[B2.7] In-flight Procedures

Those procedures are described below.

After Take-off Procedures

The take-off procedure is performed by the pilot.

- Check that the take-off area is clear;
- Test the flight controls: left, right, forward, backwards;
- Take off and bring the UAS into the holding area for 20 to 30 seconds at a height of 2-3 meters to check for unusual vibrations or noises;
- Centre all "sticks" to control GNSS "position hold" functionality;
- Check battery voltage;
- The landing gear is being retrieved.

Communicate "ready for flight" to the crew.

The pilot flies the UAS to flight altitude and communicates with the observer to which direction the UAS is moving.

- The pilot keeps an eye on both the instruments and the UAS.
- The observer monitors the environment of the operation, both on the ground and in the air.

Points of Attention During the Flight Operation

At any time after take-off of the UAS and throughout the flight, the pilot of a UAS must comply with the following minimum instructions. The pilot:

- Indicates verbally in which direction he will manoeuvre the UAS;
- Always keep the transmitter and the operation of the UAS in your own hands;
- Do not lose sight of the UAS;
- Manoeuvre the UAS in such a way that there is an opportunity to respond quickly to unexpected situations;
- Position the UAS at a sufficiently safe distance from persons and goods on the ground.
- To be able to send the UAS away from other (manned) air traffic.

Before Landing Procedures

Descending procedure

- The pilot verbally indicates that he wants to start the descent and to what height;
- Observer keeps an overview of the situation in the air and indicates whether the descent is possible;
- The pilot manoeuvres the UAS to the indicated altitude and acknowledges when it has been reached.

Pre-landing check procedure

- The UAS is positioned in the holding area;
- The pilot verbally indicates that he wishes to initiate the landing;
- Observer monitors the situation of the landing area and landing pad;
- Observer indicates that the landing is possible;
- The pilot verbally confirms the start of the landing procedure.

Landing procedure

- The landing procedure is confirmed verbally by the pilot;
- The landing gear is deployed;
- The UAS is landed by the pilot at the appropriate landing location;
- After a stable landing, the engines of the UAS are switched off;
- After switching off the UAS, the transmitter sticks are placed on "neutral";
- The landing is confirmed verbally by the pilot;
- The flight is logged.

8. [B2.8] Post-flight Procedures

The procedures are described below including the inspections to verify the conditions of the UAS.

After landing procedure

After landing, the pilot of a UAS must perform the following minimum actions:

- The pilot turns off the power to the UAS;
- The pilot switches off the power supply to the transmitter and possibly the payload transmitter;
- The pilot switches off the power to the payload in consultation with the payload operator;
- The pilot visually checks the UAS for deviations and/or damage;
- The pilot removes the batteries from the UAS.

Removal procedure UAS

- Do the UAS post-flight check according to the post-flight checklist (link);
- The post-flight check is signed off in the logbook;
- The UAS is stored in the designated flight case.

UA motor shutdown

- The propellers are removed, folded and/or covered.
- The UAS is stored in a flight case

Post-flight

All flights are recorded in the logbook;

After the flight, a debriefing is held with all crew involved.

[B2.9] Procedures for the Detection of Potentially Conflicting Aircraft

The procedures are described below.

Aborting the Flight Operation

If it appears that the flight has to be cancelled due to an unforeseen circumstance, the observer checks whether the predetermined alternative landing location is still free of obstacles, people and animals. If necessary, the observer clears the site or - if that is not possible - looks for an alternative.

Procedure for other air traffic in the area

- The observer identifies the air traffic and transmits information to the pilot;
- The observer informs the pilot from which direction and, if possible, what height the other air traffic is coming from;
- Let the UAS drop quickly, preferably to the holding area and/or on the landing pad;
- If on the same course and no possibility of going down; swerve to the right;
- Pause or stop the operation until other air traffic has passed.

PART C: SPECIFIC OPERATING PROCEDURES

This part contains all instructions and information needed for the area of operation.

Chapter C1: PDRA[PDRA]

[C1.0] Introduction PDRA

A Pre-Defined Risk Assessment (PDRA) assists operators when applying for an operational authorisation in the specific category. Even though the CAA (ILT in the Netherlands) will still need to validate the risk assessment and mitigating measures, significant time savings are achieved by providing these documents in a standardised format.

CAA applies the SORA methodology to define “Pre-Defined Risk Assessments” for a growing number of identified types of ConOps with known threats and acceptable risk mitigations. Pre-Defined Risk Assessments limit the administrative burden for both UAS operators and the authorities and stimulates innovation by lowering the entry level for certain types of operation.

Drone-operators in de Specific category declare the PDRA's in combinations with a ConOps and an Operations Manual.

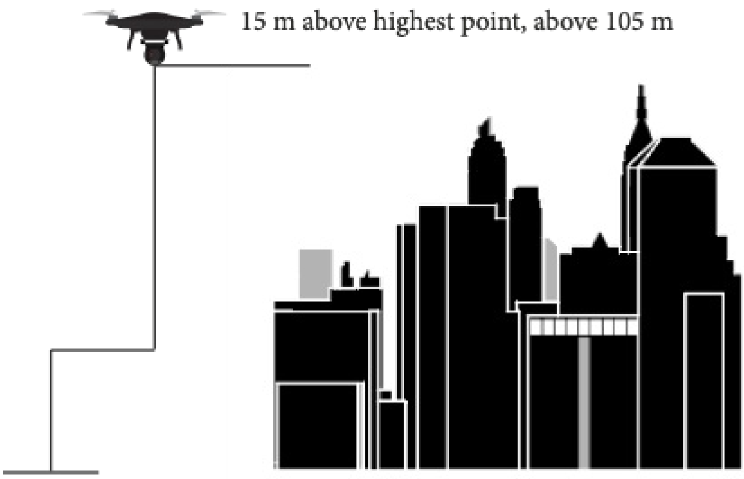
[C1.1] PDRA-S01

See the table below for the overview of PDRA-S01.

PDRA #	Version/date	UAS characteristics	BVLOS/VLOS	Overflown area	Max. range from remote pilot	Max. height	Airspace
PDRA-S01	1.1/Jan 2022	Maximum characteristic dimension of up to 3 m and take-off mass of up to 25 kg	VLOS	Controlled ground area that might be located in a populated are	VLOS	150 m (120 m in the Netherlands)	Controlled or uncontrolled, with low risk of encounter with manned aircraft

Operational characteristics (scope and limitations) summary

- VLOS at all times
- No autonomous operations
- Maximum weight of the UAS <25kg
- Maximum span width 3 meter
- Maximum flight speed 5 m/s
- Controlled Ground Area
- Maximum 150 meter height (N.B. 120 meter height in the Netherlands)



- When flying nearby an artificial obstacle that is taller than 105 meter, maximum height = obstacle height + 15 meter

Refer for details to section PDRA-S01

Operational Mitigations

Operational Volume

The UAS operator should define the operational volume for the intended operation, including:

- the flight geography; and
- the contingency volume, with its external limit(s) at least 10 m beyond the limit(s) of the flight geography if the operation is conducted with untethered UA.
- To determine the operational volume, the UAS operator should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height, and time)

The procedure for defining the Operational Volume is described in chapter A6.

Ground Risk

When determined the operational volume, the accuracy of the navigation solution, the flight technical error of the UAS and the flight path definition error and latencies should be considered.

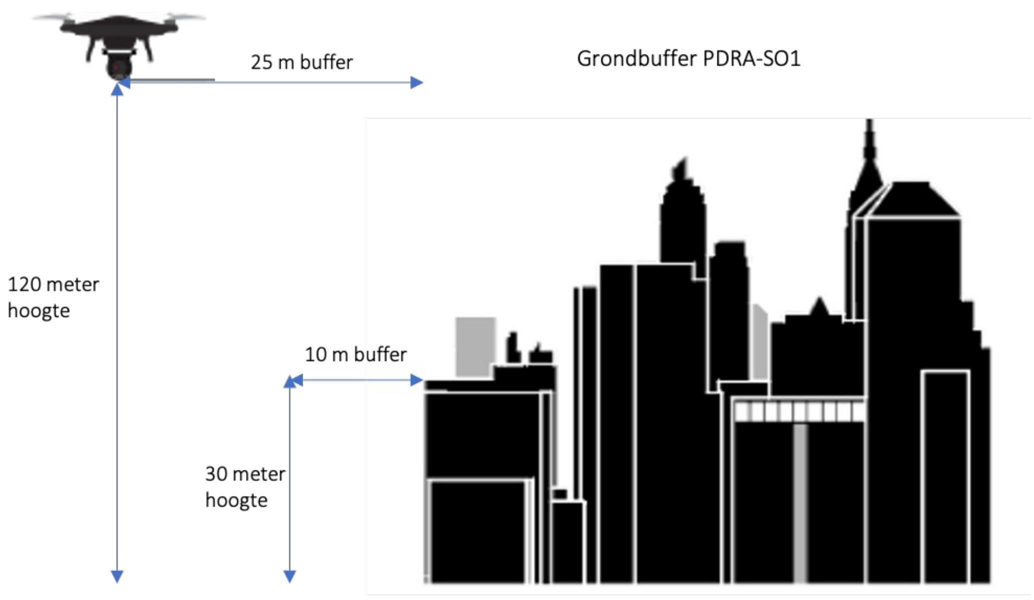
The UAS pilot should apply emergency procedures immediately if there is an indication that the UA may exceed the limits of the operational volume. See the following sections;

- [C4.4.1] Loss of Link (to fly away)
- [C4.4.2] Autopilot Failure
- [C4.4.4] Navigation Failure
- [C5.4] Fatal Error

The operator should establish a ground risk buffer to protect third parties on the ground outside the operational volume.

For the operation of untethered UA, the ground risk buffer should cover a distance beyond the external limit(s) of the contingency area. The distance should be at least as defined below:

Maximum height above ground	Minimum distance to be covered by the ground risk buffer for untethered UA	
	with an MTOM of up to 10 kg	with an MTOM of more than 10 kg
30 m	10 m	20 m
60 m	15 m	30 m
90 m	20 m	45 m
120 m	25 m	60 m



Air Risk

The operational volume should be outside any geographical zone corresponding to a flight restriction zone unless the operator has been granted the appropriate permission.

Before the flight operation, the operator should assess the proximity of the planned operation to manned aircraft activity.

Observers

Airspace observes are not necessary. UA observers might be useful for some types of operation.

UAS Operations

- dedicated flight tests
- simulations provided that the representativeness of the simulation means is proven for the intended purpose with positive results
- upload updated information into the geo-awareness function
- ensure that the controlled ground area is in place, effective and compliant with the above mentioned mitigated measures at Ground Risk
- VLOS
- at a ground speed of less than 5 m/s in case of untethered UA

UAS Maintenance

See chapter A8: GENERAL MENTENANCE.

External Services

See [B2.2] External System

Provisions for the personnel in charge of duties essential to the UAS operation

UAS pilot

In addition to his responsibility and duties ([A1.2] Responsibilities and Duties), the UAS pilot, who is engaged in operations under this PDRA-S01 should;

- hold a certificate of remote-pilot theoretical knowledge
- hold an accreditation of completion of a practical-skill training course for this PDRA
- before starting the UAS operation, verify that the means to terminate the flight of the UA, as well as the remote identification system, are operational and during the flight:

  (a) keep the UA in VLOS and maintain a thorough visual scan of the airspace that is surrounding the UA to avoid any risk of collision with manned aircraft; the remote pilot should discontinue the flight if the operation poses a risk to other aircraft, people, animals, environment or property;

(b) for point (a) above, be possibly assisted by a UA observer; clear and effective communication should be established between the remote pilot and the UA observer (see also section [A5.2.1] Cooperation Pilot/Observer under VLOS;

(c) use the contingency procedures that are defined by the UAS operator for abnormal situations, including situations where the remote pilot indicates that the UA may exceed the limits of the flight geography; and

(d) use the emergency procedures that are defined by the UAS operator for emergencies, including triggering the means to terminate the flight when the remote pilot indicates that the UA may exceed the limits of the operational volume; the means to terminate the flight should be triggered at least 10 m before the UA reaches the limits of the operational volume (See section [C4.4.1] Loss of link) or [C4.4.4] Navigation Failure or [C5.4] Fatal Error).

Chapter C2: SORA[RA]

1. [C2.1] SORA Method

The Specific Operations Risk Assessment (SORA) is the methodology developed by JARUS. It presents a concept on how to create, evaluate and conduct a UAS flight operation safely.

When the SORA is applied for an intended UAS flight operation, it is used as an acceptable means to demonstrate compliance with Article 11 of the Regulation. The SORA can show how the risks for the intended operation are evaluated and how the operational mitigation measures are proposed. In addition, the SORA supports to assess the risks systematically and define the limits required for a safe operation. The SORA is used for a UAS operation within the specific category.

The outline of the SORA process is summarised below:
1. Concept of operations description
2. Determination of the intrinsic GRC (Ground Risk Class).
3. Final GRC determination
4. Determination of the initial ARC (Air Risk Class).
5. Application of strategic mitigations to determine the residual ARC (optional).
6. TMPR and robustness levels
7. SAIL determination
8. Identification of the operational safety objectives (OSOs)
9. Adjacent area/airspace considerations.
10. Comprehensive safety portfolio

For more information regards to the SORA, please refer to the EASA Easy Access Rules for Unmanned Aircraft Systems (Regulation (EU) 2019/947 and Regulation (EU) 2019/945) or Droneconsultancy.

[C2.1ROC] SORA Roabl (ROC)

A SORA has been developed specifically for the former ROC holders for the conversion to the EU operating license. This is an overview of the mitigating measures:

- Intrinsic Value GRC = 2 or 3 for VLOS and 4 for EVLOS;
- M1 = low, M2 = none, M3 = low for VLOS and medium for EVLOS;
- Final GRC = 3 (VLOS and EVLOS);
- Intrinsic ARC = ARC-A (Atypical), ARC-b (Class G-airspace/Rural area) and ARC-D (airport environment in class C and D airspace);
- Final ARC = ARC-B (reduction form ARC-D by local density/controlled airspace/SERA) or for Atypical airspace (ARC-A);
- OSOs at SAIL II level;
- Step 9 (SORA) requirements have to be met.

Chapter C3: SPECIFIC OPERATIONAL PROCEDURES[NPES]

The normal procedures and standard working methods from this manual apply to all types of operations. There is an increased risk in some operations of Drone Chiefs. These meet the conditions of the ConOps. Additional conditions are set for these specific missions. These conditions are described by Drone Chiefs in the following procedures:

Specific Procedure	Sub Procedure	Applicable for Drone Chiefs
C3.1 VLOS flights outside adjacent buildings (sparsely populated)	A. for Controlled Ground Area B. for Uncontrolled Ground Area	Yes, C3.1A or C3.B
C3.2 Flying > 120 meters AGL (up to 25 meters)		No
C3.3 Outer ring of civilian CTRs (STS-CAA-NL1-OR-CTR), including CTR Niederrhein Weeze (4.3.b)		Yes

C3.4 Flying in Military CTRs (4.3.c)		Yes
C3.5 Flying nearby	C3.5.1 Flying nearby an industrial area and port area	Yes
	C3.5.2 Flying nearby vessels	Yes
	C3.5.3 Flying nearby vehicles	Yes
	C3.5.4 Flying nearby of objects/infra structures	Yes
	C3.5.5. Flying nearby railways	Yes
	C3.5.6 Flying nearby adjacent buildings	Yes
	C3.5.7 Flying nearby assemblies of people	Yes
	C3.5.8 Flying nearby roads up to 80km/h	Yes
	C3.5.9 Flying nearby ≥ 80 km/h (motorways) roads	Yes
	C.3.5.10 Flying over road/waterway	Yes
C3.6 Cinematography and nearby people and buildings on a film set above controlled ground area		Yes
C3.7 Off shore North Sea Area Amsterdam	Within Atypical Airspace	Yes
C3.8 Flying in EM fields		Yes
C3.9 Flying outside UDP hours (night flights)		Yes

C3.10 EVLOS (4.3.a) outside adjacent buildings or controlled ground area		Yes
C3.11 Flying near and over buildings in densely populated areas in controlled ground area		Yes
C3.12 Flying near/above railway in accordance with Dutch Prorail procedure		No
C3.13 Flying in other EU countries		Yes

Additional conditions are set for these missions in the standard working method that arise from the SORA for ConOps Roabl (former ROC).

0. [C3.0] Introduction Specific Flight Procedures

In this section, specific procedures for a single operation are described.

[C3.1A] Procedure for flying in sparsely populated area over controlled ground area

 UAS can be used for various applications in agriculture, for inspections and security in and around industrial sites and in other areas where in sparsely populated areas, but where uninvolved people are or may be present.

This procedure concerns flying in Sparsely Populated Area, for example within built-up areas where a Controlled Ground Area can be created. The condition for this procedure is that no not involved people are present within the Operational Volume. Uninvolved persons have not agreed with the risks associated with drone operations and should therefore be kept out of the Operational Volume. Examples of this are people in cars, trams, buildings, train etc.

The risks to these operations

1. Injuries to people and animals

2. Collision with other air traffic

Mitigating measures

1. Mapping the obstacles (and distances) and other risks in the terrain during flight preparation;
2. Drone Chiefs shall use additional observers and deposits (barriers) to ensure that no uninvolved persons can enter the Operational Volume;
3. The deposits and observers shall be recorded in the Operational Plan;
4. Use a flat terrain or platform for the take-off and landing area (or choose a UAS with landing gear);
5. Before the flight starts, the RTH function is tested, so that if the direct view is lost, the UAS pilot can give the RTH command so that the UA returns to the take-off area;
6. During the flight, consider animals/birds that can make an unexpected entrance within the Operational Volume. If there is 'interaction', shorten flight duration and abort operation;
7. Configure Geofence with a max radius and height.

[C3.1B] Procedure for flying over Sparsely Populated Area without controlled ground area

 UAS can be used for various applications in agriculture, for inspections and security in and around industrial sites and in other areas where in sparsely populated areas, but where uninvolved people are or may be present.

This procedure concerns flying in Sparsely Populated Area without a Controlled Ground Area. During this operation, (some) uninvolved people may be in the ground area within the Operational Volume which the operation takes place. Uninvolved persons have not agreed with the risks associated with drone operations. Examples of this are people in cars, trams, buildings, train etc. Additional mitigating measures are in place that Drone Chiefs uses during flight preparation and during operation.

The risks to these operations

1. Injuries to people and animals
2. Collision with other air traffic

Mitigating measures

1. During the flight preparation mapping of the obstacles (and distances) and other risks in the terrain.
2. Drone Chiefs evaluates the working area through on-site inspections or appropriate assessments to achieve a reduction in the number of persons not involved in the flight area (e.g. a residential area during the day when some people may not be present at night or an industrial area for the same

reason). This evaluation follows from the flight preparation and Drone Chiefs considers:
    1. Time of the flight and the expected crowds at the location: choose a quiet moment (time and day). (E.g. a beach is sometimes empty, but on certain days completely crowded).
    2. Estimate the number of people expected in the Operational Volume during the time of the flight.
3. To warn non-involved parties, a cordon can be set using signs, cones, and action ribbon. If necessary, an additional observer can be used to stop and inform people.
4. Drone Chiefs puts up one or more signs to make it clear who is flying and where non-involved parties with questions should be.
5. Find a flat terrain or platform for the take-off and landing area (or choose a UAS with landing gear).
6. Before the flight starts, the RTH function is tested, so that if the direct view is lost, the UAS pilot can give the RTH command so that the UA returns to the take-off area.
7. During the flight, consider animals/birds that can make unexpected entrance in the Operational Volume. If there is 'interaction', shorten flight duration and abort operation.
8. Configure Geofence with a max radius and height.

[C3.2] Procedure > 120 meters AGL Flying Around Object

 Drone Chiefs wants to perform operations higher than 120 meters (400ft) AGL under certain circumstances. These flights are possible if the object that is part of the aerial work is higher than 120 meters (400ft) AGL within Atypical Airspace. If Drone Chiefs flies a maximum of 30 meters from a building or object today, that is called Atypical Airspace.

Risks during this operation

1. Collision with other air traffic
2. Uncontrollability due to gusts of wind at height

Measures

1. Permission of the owner of the object to operate the flight;
2. Check whether the object and its height are displayed on the ICAO map 1:500,000;
3. Calculate the exact height of the AGL object.
4. Even with 1000 ft (≈300 meters) separation between manned aviation and the object, the crew must be alert and monitor the airspace;
5. Calculate the wind speed at altitude, see the section[D1.7] Gusts.
6. An additional risk assessment must be carried out for the site, which is recorded in the flight plan (and is part of it).
7. The maximum height of the UAS is never higher than 30 meters above the object to be inspected;
8. Flying above 120 meters (400ft) AGL should be done within 30 meters horizontally of the object to be

inspected.

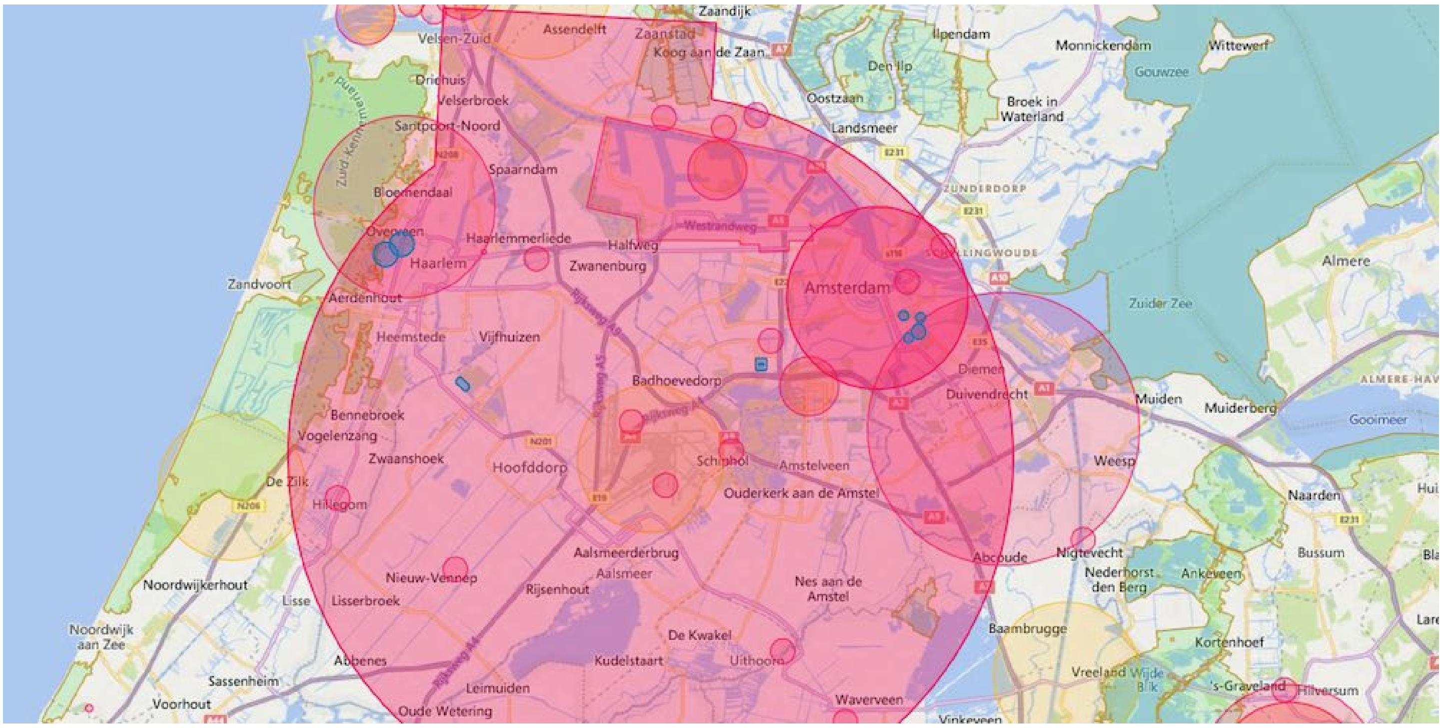
9. The pilot shall be in such a position that he always maintains visual contact with the UAS and that visibility is not obstructed by sunlight or the object;
10. The observer shall be in such a position that he stands between the object and the UAS and has a view of the surroundings and whether the UAS maintains sufficient distance from the object.
11. The pilot must take special account of the RTH function. This function ensures that the UAS can return to the home-point (often - but not always - the starting position). There must be no obstacle in the flight path when RTH is activated, whereby the pilot is cleared that when activating RTH, the UAS is first flown to the preset RTH altitude. The RTH height must therefore be at least 10 meters (30ft) above the highest point of the object that is part of the inspection. There should also be no obstacles in the RTH flight path. The pilot ensures that the landing site is free of obstacles and safe to land.

[C3.3] Procedure flying in Civil CTRs

This particular procedure describes operations in civilian operated CTRs as described in Drone Chiefs's ConOps and SORA. Any part of the operation performed outside of the described ConOps and SORA is not covered by the acquired privilege associated with this situation.

Conditions for UAS flights

- For the most up-to-date information, see https://www.lvnl.nl/ohd/bijzondere-vluchten/drones.
- For this specific scenario, it has been assumed that the flight will not take place over a populated area or assemblies of people, unless Drone Chiefs also has a procedure for this in the OM and this is part of the operating authorisation.
- An exception is made for flying over industrial and port areas in the CTR. These industrial and port areas are mostly sparsely populated. Drone Chiefs also flies over industrial and port areas, so may, under the conditions of this scenario, also fly within the CTR.
- This section describes the elements of the manual that according to SORA should be included with regard to flying within civil CTRs (Aerodromes) without the UA having a transponder.



Example CTR Amsterdam, source www.godrone.nl

Conditions for flights in civil CTRs

Flights with a UA may operate in civil CTRs:

- Not above 120 meters AGL above the ground or water, unless nearby an obstacle or object within 30 meters horizontal and maximum of 30 meters above the object (A-typical airspace);
- Within visual line of sight (VLOS);
- Within the Uniform daylight period (see AIP GEN 2.7), unless a permit has been required by Drone Chiefs;
- Flights are conducted under Visual Flight Rules (VFR), which means that there must be a minimum horizontal visibility of 5000 meters, a horizontal distance to cloud cover of at least 1500 meters and a vertical distance of at least 300 meters to cloud cover;
- Special VFR is only possible if a specific clearance has been received for this from the air traffic control responsible in the relevant CTR. Special VFR: minimum 800 m horizontal view and ground view, cloud base at minimum 600 ft;
- the flight remains within the area authorized by the LVNL operational helpdesk.

Separation in airspace class C and D

Within civil CTRs, the following responsibilities with regard to separation apply:

- All flights receive air traffic control service;
- IFR flights are separated by air traffic control from other IFR flights and from VFR flights, including UA;
- VFR flights are separated from IFR flights by air traffic control;
- VFR flights receive information about other VFR traffic and traffic avoidance advice if requested;
- VFR traffic (including UA) is itself responsible for separation from other VFR traffic (both manned and unmanned);

Team composition for flights in civil CTRs

Flights within civil CTRs are operated with:

- At least 1 pilot who has a valid EU pilot license A1/A2/A3 and/or additional training for the Specific category and;
- At least 1 observer and;
- Pilot and/or observer has a valid radiotelephony rating. Drone Chiefs's R/T carries proof of the theory, practical and LPE (Language) exams with him.

Required equipment

To establish two-way radio contact during a flight in the CTR, use is made of:

- An approved (Telecom) radio transmitting and receiving station with channel spacing 8.33 kHz;
- Permit by EZ telecom for use of the transmitter (Evidence Designation Radio Station - BAR).

Required pre-flight actions

Before a flight is executed, the following actions are performed:

- No later than 24 hours prior to the flight, Drone Chiefs requests permission (PPR = Prior Permission Required) from the Operational Helpdesk (OHD) via Godrone;
- The UAS Operator submits a flight plan for each series of consecutive flights in one flight area (for multiple flight areas: one request and flight plan per flight area);
- Within one clearance, all take-offs and landings that take place within the allocated time block and flight area can be made. These do not have to be individually registered and logged off with traffic control over the radio.
- The flight cannot start until clearance from air traffic control has been obtained via the R/T;
- If the flight is cancelled, Drone Chiefs will inform the operational helpdesk.

Submit flight plan (FPL)

Drone Chiefs submits a flight plan via www.godrone.nl.

For assistance in completing the flight plan, the FSC can be reached by telephone at the number below. If the flight is cancelled, the flight plan must be canceled by telephone with the FSC of LVNL: 020 – 406 2315.

VFR and special VFR rules in class C and D airspace

The following VFR rules apply in this class of airspace:

- Minimum horizontal visibility of 5000 meters.
- Horizontal distance to clouds of at least 1500 meters.
- Vertical distance of at least 300 meters to cloud cover.
- Special VFR is only possible if a specific clearance has been received for this from the air traffic control responsible in the relevant CTR.

Special VFR: minimum 800 m horizontal view and ground view, cloud base at minimum 600 ft.

Units and Conversion

In communication with ATC, the units used in aviation for flight direction (heading), altitude (altitude in feet, AMSL), speed in knots must be used.

Flight direction (heading)

To indicate the heading of the UA, the cardinal points or compass points are used, such as north, northeast, south, southwest, etc.

Drone Chiefs uses compass headings for this. The UA heading must be readily available during the flight. Working with compass headings is regularly trained, see chapter NT.

Altitude

Height is always indicated in relation to what is being measured. In communication with ATC, the LVNL wants the UAS operator to state the height of the UA in relation to the mean sea level, calculated in feet. This is called 'altitude'.

If the ground station does not provide this information but does provide the height in meters from the ground, convert this to the height in feet above the ground using the rule of thumb “meters to feet = number in meters times 3 plus 10%.”

Speed

In aviation, speed is usually expressed in knots. For a UA, the speed used is usually in meters/second. The speed in knots can be obtained by multiplying the speed in meters/sec by the number 1.9438. This will be the number 2 for convenience.

When the speed is given in communication with air traffic control, the following formula is used: speed in m/s x 2 = speed in knots

Contingency procedures

See chapter C4 Abnormal or Contingency Procedures.

Emergency Procedures

A CTR is a piece of airspace established around a controlled airport. The purpose of the CTR is to protect air traffic to and from the airport against other air traffic. In the CTR there is a real chance of lower air traffic. One of the risks with UA is a fly away. The chance of a fly away must therefore be reduced as much as possible.

Drone Chiefs takes operational and technical mitigating measures for this. It is important here that a 'single point of failure' should never be the cause of a fly away.

Flight area

When determining the flight area, in addition to the standard procedure, the location of the flight area in relation to the airport area must be taken into account. Drone Chiefs makes every effort to prevent the flight from flying into the airport in the event of a small deviation in the flight profile or a fly away. This can be achieved by:

- Choosing a flight direction, for example, parallel to or downstream of the CTR;
- Turns directed down the CTR;
- Emergency response plan (ERP), see chapter C6: EMERGENCY RESPONSE PLAN

Training (internal)

See for this [D2.1] Training General. Additional training is provided for this specific R/T procedure.

Flight Process

- The person who conducts radio communication with air traffic control (provided a valid R/T) does a radio check on the relevant Delivery frequency just before the UAS activity at the relevant flight location.
- After the radio check, Delivery refers the observer to the relevant Tower frequency. At this frequency,

the observer makes a clearance request for the flight.

- The tower controller provides the clearance based on the current situation in the control zone (CTR). A clearance authorizes the pilot to perform the UAS activity with the UA in accordance with the flight plan and any additional conditions of the air traffic controller. The UA does not start from an airport where local air traffic control is provided. As a result, no take-off and/or landing clearance is provided, but only clearance for the flight.
- Within the same clearance, all take-offs and landings that occur within the allocated time block and flight area can be made. These do not have to be registered and deregistered individually over the radio with traffic control. During the flight, the RT'er monitors the frequency and specified telephone for any indications or adjustments or cancellation of clearance.
- The flight is canceled by the RT operator via radiotelephony to the air traffic controller as soon as the entire UAS activity within the relevant flight area has ended and no more flights will be made in the time block that was reserved for this.

Radiotelephony (RT)

Communication by radiotelephony takes place according to strict rules. This is to keep communication short and clear. The RT'er calls the traffic control within the reserved time block, and is referred to the TWR traffic control if the signal is good. Drone Chiefs creates its own call-sign (PH number is not valid) and uses this in the communication/request with LVNL. For example: UNMANNED-DDO.

Radio Check

Radio operator	*Airport Delivery*
[Airport] delivery, UNMANNED [call sign], radio check on [frequency]	
	[Call sign], [airport] Delivery, Readability [1-5]. Contact [Airport] TWR on [frequency]
[Airport] TWR, [frequency] [call sign]	

Clearance Request

Radio Operator	TWR
[Airport] Tower, UNMANNED [call sign]	
	[Call sign] [Airport] TWR
[call sign] [location], ready for local flight	
	[call sign] cleared for local flight, remain 150 ft or below
Cleared for local flight [call sign]	

In-flight air traffic information

The traffic controller informs the observer about other traffic in the area in case the traffic situation requires it.

Radio Operator	TWR
	[Call sign] Traffic [bearing and distance from UAS location]
Looking out [Call sign]; OR Traffic in sight [Call sign]	

Ending the flight

When the flight is completed, the RT member reports the flight to the TWR controller. If the entire UAS activity has to be terminated due to an uncontrolled landing (crash) of the UAS, the same radiotelephony is used as at the conclusion of the flight. It is also possible that the flight has to be temporarily interrupted or terminated entirely on the instructions of air traffic control.

Completing flight

Radio Operator	TWR
[call sign] flight completed, switching off	
	[call sign] Roger

Contingency procedure or emergency situations

Uncontrolled landing (crash)

Radio Operator	TWR
[call sign] flight completed, switching off	
	[call sign] Roger

Instruction to land (temporary)

Radio Operator	TWR
	[call sign] land immediately
Wilco [call sign]	
[call sign] on the ground	
	[call sign] Roger, stand-by

Withdraw clearance

Radio Operator	TWR
	[call sign] CANCEL flight, land immediately
Wilco [call sign]	
[call sign] on the ground	
	[call sign] clearance is cancelled [further instructions]
Roger, clearance cancelled [call sign]	

Loss of control over the UAS
If control over the UAS is lost, air traffic control should be informed as soon as possible.

Radio Operator	TWR
[Airport] Tower, [call sign]: Uncontrolled fly away, (and/or) Flying [heading] , (and/or) Speed [knots] + Altitude [feet] , (and/or) Flight time left [number of minutes] minutes, (and/or) • distance left [number of miles] miles	
	Roger [any further information]

Loss of communication
In the event of loss of communication with the tower during the flight, the pilot lands the UA as soon as possible and immediately informs the TWR unit by telephone.

After the flight
Completing flight plan at OHD. It is not necessary to conclude a flight plan with the FSC.

[C3.3.3] Flying without a transponder within the outer ring of the CTR

Loss of VLOS

If the flight is out of sight of the pilot, he will immediately hover the UAS at a height of 10 meters until it is back in sight. To prevent the loss of VLOS from leading to a dangerous situation, the flight direction is chosen as far as possible away from the airport.

Flight area

When determining the flight area, in addition to the standard procedure, the location of the flight area in relation to the prohibited inner circle of the CTR must be taken into account. Drone Chiefs makes every effort

to prevent the flight from flying into the prohibited part of the CTR (horizontal or above the max height in the outer circle) in the event of a small deviation in the flight profile or a fly away.
This can be achieved by:

- Choosing a flight direction, for example, parallel to or downstream of the CTR;
- Turns directed down the CTR;
- Emergency response plan (ERP)

See chapters:
C4: CONTINGENCY PROCEDURES or C5: EMERGENCY PROCEDURES and/or C6: EMERGENCY RESPONSE PLAN.

Training (internal)

See for this [D2.1] Training General. Additional training is provided for this specific R/T procedure.

Flight Process

- The person who conducts radio communication with air traffic control (provided a valid R/T) does a radio check on the relevant Delivery frequency just before the UAS activity at the relevant flight location.
- After the radio check, Delivery refers the observer to the relevant Tower frequency. At this frequency, the observer makes a clearance request for the flight.
- The tower controller provides the clearance based on the current situation in the control zone (CTR). A clearance authorizes the pilot to perform the UAS activity with the UA in accordance with the flight plan and any additional conditions of the air traffic controller. The UA does not start from an airport where local air traffic control is provided. As a result, no take-off and/or landing clearance is provided, but only clearance for the flight.
- Within the same clearance, all take-offs and landings that occur within the allocated time block and flight area can be made. These do not have to be registered and deregistered individually over the radio with traffic control. During the flight, the RT'er monitors the frequency and specified telephone for any indications or adjustments or cancellation of clearance.
- The flight is canceled by the RT operator via radiotelephony to the air traffic controller as soon as the entire UAS activity within the relevant flight area has ended and no more flights will be made in the time block that was reserved for this.

Radiotelephony (RT)

Communication by radiotelephony takes place according to strict rules. This is to keep communication short and clear. The RT'er calls the traffic control within the reserved time block, and is referred to the TWR traffic control if the signal is good.
Drone Chiefs creates its own call-sign of 5 characters (PH number is not valid) and uses this in the communication/request with LVNL.

Radio Check

Radio operator	*Airport Delivery*
[Airport] delivery, UNMANNED [call sign], radiocheck on [frequency]	
	[Call sign], [airport] Delivery, Readability [1-5]. Contact [Airport] TWR on [frequency]
[Airport] TWR, [frequency] [call sign]	

Clearance Request

Radio Operator	TWR
[Airport] Tower, UNMANNED [call sign]	
	[Call sign] [Airport] TWR
[call sign] [locatie], ready for local flight	
	[call sign] cleared for local flight, remain 150 ft or below
Cleared for local flight [call sign]	

In-flight air traffic information

The traffic controller informs the observer about other traffic in the area in case the traffic situation requires it.

Radio Operator	TWR
	[Call sign] Traffic [bearing and distance from UAS location]
Looking out [Call sign]; OR Traffic in sight [Call sign]	

Ending the flight

When the flight is completed, the RT member reports the flight to the TWR controller. If the entire UAS activity has to be terminated due to an uncontrolled landing (crash) of the UAS, the same radiotelephony is used as at the conclusion of the flight. It is also possible that the flight has to be temporarily interrupted or terminated entirely on the instructions of air traffic control.

Completing flight

Radio Operator	TWR
[call sign] flight completed, switching off	

	[call sign] Roger

Contingency procedure or emergency situations

Uncontrolled landing (crash)

Radio Operator	TWR
[call sign] flight completed, switching off	
	[call sign] Roger

Instruction to land (temporary)

Radio Operator	TWR
	[call sign] land immediately
Wilco [call sign]	
[call sign] on the ground	
	[call sign] Roger, stand-by

Withdraw clearance

Radio Operator	TWR
	[call sign] CANCEL flight, land immediately
Wilco [call sign]	
[call sign] on the ground	
	[call sign] clearance is cancelled [further instructions]
Roger, clearance cancelled [call sign]	

Loss of control over the UAS

If control over the UAS is lost, air traffic control should be informed as soon as possible.

Radio Operator	TWR
[Airport] Tower, [call sign]: Uncontrolled fly away, (and/or) Flying [heading] , (and/or) Speed [knots] + Altitude [feet] , (and/or) Flight time left [number of minutes] minutes, (and/or) • distance left [number of miles] miles	
	Roger [any further information]

Loss of communication

In the event of loss of communication during the flight, the pilot lands the UA as soon as possible and immediately informs the TWR unit by telephone.

After the flight

Completing flight plan at OHD. It is not necessary to conclude a flight plan with the FSC.

[C3.4] Procedure Flying within Military CTRs

The airspace of the military CTR is class D. If relevant, other traffic is informed about the drone operation by military air traffic control.

To fly missions within a military CTR, Drone Chiefs takes the following mitigating measures:

1. Obtain military air traffic control contact and clearance prior to the operation;
2. Submit by email from:
    - Flight Location (GNSS)
    - Flight altitude
    - Flight duration
    - Flight starting time and finishing time
3. Be aware of the current local weather information of the relevant CTR;
4. Maintained line of communication with CTR military air traffic control during operation;
5. Telephone registration and deregistration of an operation to military air traffic control CTR.

The most current application form is requested by Drone Chiefs from the relevant air base. The application must be submitted to this air base at least 24 hours prior to the flight. Mail is not read on weekends.
When determining the operational volume, the location of the flight area in relation to the CTR must be taken into account in addition to the standard procedure. This can be achieved by:

- Choosing a flight direction, for example, parallel to or downstream of the CTR;
- Turns down the CTR.

So if permission is required for operations on weekends or on Mondays, these must be submitted before 12:00 on Friday. On the day of the flight, military traffic control must be contacted (by telephone) at least 15 minutes before the start.

If you coordinate a NOTAM by yourself, then via ais@mindef.nl
In a civil CTR or in/under civil airspace ops_helpdesk@lvnl.nl
Outside the military CTR in/under military airspace aocs.amc@mindef.nl

Emergency procedure

In the event of a fly-away and/or crash, contact military traffic control immediately. Below is an overview of contact details:

Name	*Code*	*email address*
Airbase Gilze Rijen	EHGR	dhc.occ@mindef.nl
Airbase Leeuwarden	EHLW	ehlw@mindef.nl
Airbase Volkel	EHVK	vkl.atc@mindef.nl
Airbase Deelen	EHDL	dhc.occ@mindef.nl
Airbase Woensdrecht	EHWO	kmsl.lvl@mindef.nl
Airbase Eindhoven	EHEH	ehv.atc@mindef.nl
Airbase de Kooy	EHDK	P69068@mindef.nl

[C3.5] Procedures flying close to Objects, Roads, Buildings

Flying closer to buildings, roads, railways, etc. are subject to EU regulations in principle under the procedure flying outside adjacent buildings. Depending on around which object/road/building the drone operation would be conducted, the additional conditions are added. Therefore the procedures are separately mentioned in this section.

C3.5.1 Flying close to/within an industrial area and port area
C3.5.2 Flying close to vessels
C3.5.3 Flying close to vehicles
C3.5.4 Flying close to objects/infra structures
C3.5.5. Fly near (not-above) railways
C3.5.6 Flying close to adjacent buildings
C3.5.7 Flying close to assemblies of people
C3.5.8 Flying close to roads up to 80km/h
C3.5.9 Flying close to ≥ 80 km/h (highway) roads
C.3.5.10 Flying over road/water

[C3.5.1] Procedure for flying near/within Industrial area and Port area

Drone Chiefs wrote this procedure for conducting a safe drone operation in an industrial area or in a port area.

Specific risks in industrial and port areas

- Explosion hazard and fire hazard.
- Flying against people and objects, vehicles and vessels, see also [C3.5.2] Procedure flying near vessels and [C3.5.3] Procedure flying near vehicles.

Additional mitigating measures

In addition to the normal procedures, the following measures apply:

1. During the flight preparation, information is requested about the risks of explosion and fire.
2. Flight planning takes into account possible EM sources, buildings and wetlands for correct GNSS reception.
3. Flights are carried out when risky activities around the flight location are minimal.
4. Landowner permission has been obtained where the operation is to be performed (for take-off and landing).
5. No uninvolved people may be present in the flight area. The flight crew is aware of the risks of the operation.
6. Position the flight crew in such a way that a clear view can be kept of the distance to the object, in particular the positioning of the observer;
7. Analysis of wind current and probability of turbulence around object by analyzing the environment for indicators of the wind direction on location. See also the section on the venturi effect in [D1.6] Turbulence. If the wind force is greater than 3, choose to fly controlled slow in manual mode.
8. Flight crew has (if necessary) VCA certification (Dutch certificate for Safety, Health and Environment) and/or a responsible person from the client with knowledge about potential risks and measures.
9. Drivers of the vehicles or captains of the vessels, part of the flight operations are briefed about the safety risks (what can be expected, what can go wrong and what are the do's and don'ts);
10. If an operation has to take place in the vicinity or in a port, Drone Chiefs must obtain permission from the security officer of the port facility (Port Security Officer);

In addition, it can be decided in consultation with the manager of the area/building to take additional mitigating measures.

[C3.5.2] Procedure for flying close to Vessels

Drone Chiefs photographs, films or inspects specific construction objects around or in (industrial) construction areas, harbor areas and waterways. The greatest risk is damage to a vessel and/or injury to crew. Therefore, the following mitigating measures apply:

1. The pilot flies no closer than 10 meters or more depending on the required ground risk buffer horizontally in the vicinity of a vessel;
2. Maximum wind speed < 19 km/h (wind force up to 3). Higher than wind force 3: wind direction away from the object.
3. Position the flight crew in such a way that a clear view can be kept of the actual distance to the object, in particular the positioning of the observer;
4. Return to Home function is set in such a way that there is no risk of collision with the object, a clear consideration is made to choose dynamic or static home position;
5. Analysis of wind currents and probability of turbulence around object by analyzing the environment for indicators of the wind direction on location. See also the section on the venturi effect in [D1.6] Turbulence.
6. Informing people who are present in the immediate vicinity of the flight location.

[C3.5.3] Procedure flying close to Vehicles

 The greatest risk of this operation is damage to a vehicle or injury to people getting in/out/walking. Drone Chiefs takes the following measures to fly near vehicles:

1. Vehicles are stationary during the mission and no people are getting in/out of the vehicles.
2. Position the flight crew in such a way that a clear view can be kept of the distance to the object, especially the positioning of the observer.
3. Taking into account the required ground risk buffer as noted in the Operational Plan.
4. Analysis of wind flows and probability of turbulence around object by analyzing the environment for indicators of the wind direction on location. See also the section on the venturi effect in [D1.6] Turbulence.
5. Informing people who are present in the immediate vicinity of the flight location.
6. Observer(s) with experience flying on high-risk experience and briefed with all possible specific risks on site.

[C3.5.4] Procedure flying close to objects/civil engineering structures

 Drone Chiefs inspects, photographs or films objects/civil engineering structures.

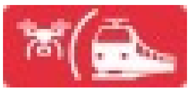
Risks for this type of operation are;

- Collision with object or artwork;
- Sudden wind turbulence effects around the artwork or object.

Mitigating measures

1. Position the flight crew in such a way that a clear view can be kept of the distance to the object, especially the positioning of the observer.
2. There should be no objects between the UAS and the flight crew.
3. In situations where there is a high probability of external influences, we use an additional observer. This can, for example, monitor traffic, people or vessels.
4. Return to Home function set in such a way that there is no risk of collision with the object, a clear consideration is made to choose dynamic or static home position. This also takes into account any overhanging parts of the object or civil engineering structures that could affect the return to home function.
5. Take into account the influence of the object on the operation of the compass. Drone Chiefs therefore flies a short distance from the pilot.
6. Keep a minimum distance to the object of more than 10 meters.
7. When flying over an object or start from or land on the object, the owner should have given permission.
8. Analysis of wind currents and probability of turbulence around object by analyzing the environment for indicators of the wind direction on location.
9. Influence of radiation from antennas on the object, electricity pylon etc. Flying close to this type of EMC-causing equipment is not allowed with Drone Chiefs. If necessary, equipment that causes the radiation can be turned off temporarily.
10. Informing persons who are present in the immediate vicinity of the operational volume.
11. Turn off operational volume and always keep the area under UAS clear of persons and/or vehicles, remove them immediately from operational volume if present.

[C3.5.5] Procedure flying close to railways


Drone Chiefs regularly records near railways. Many client's buildings are located right next to it. For the majority of these shots, it is not required to get closer than 10 meters (= outside the danger zone). Drone Chiefs must also take into account the ground risk buffer associated with the ConOps. This procedure concerns flying up to a maximum of 10 meters on railways, where in principle no coordination with Prorail is necessary.

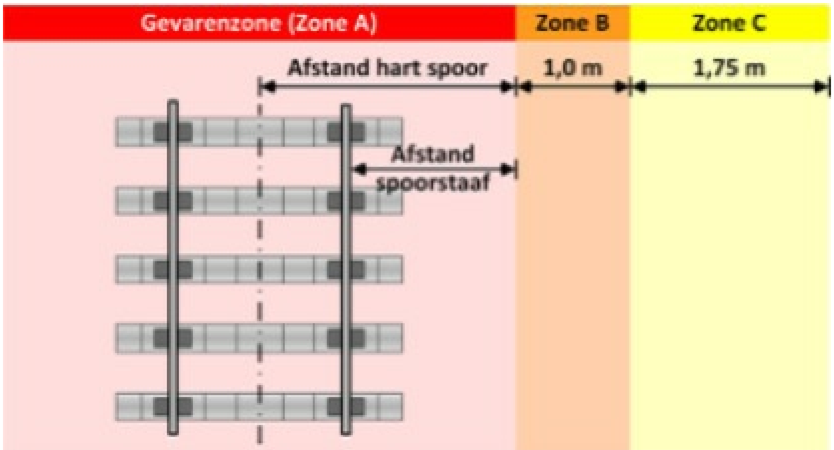
Risks

Safety when working near railways is determined by two risks:

1. The risk of collision with people and/or equipment by track-bound equipment (e.g. trains, work trains, maintenance equipment etc.);
2. The risk of electrocution due to contact with the UAS with electrically charged parts of the power supply installation or train protection installation.

Risk of collision

The danger zone (A) is the zone where there is a risk of collision. In this scenario, Drone Chiefs stays well outside of zones A,B and C.



The dimensions of this zone depend on the speed of the train or other track-related equipment. Outside the danger zone, there are two zones (B and C) which, due to their proximity to danger zone A, are exposed to side effects from passing track-bound equipment.

Dimensions

The boundary of danger zone A depends on the maximum permitted speed on the track. The table below defines the dimensions that apply to the different travel speeds.

Snelheid in km/h	Grens gevarenzone (zone A) t.o.v. hart spoor in meters	Afstand t.o.v. dichtstbijzijnde spoorstaaf in meters
0-140	2,25[10]	1,50
141-160	2,40	1,65
161-200	2,75	2,00
201-300	3,00	2,25

HSL
• Hanteert een vaste afstand t.o.v. dichtstbijzijnde spoorstaaf van 2,25 m in combinatie met een snelheidsbeperking tot 120 km/u.

Danger Zone B has a default size of 1 meter and starts at the boundary of Danger Zone A. Proximity Zone C has a default size of 1.75 meters and starts at the boundary of Proximity Zone B.

Risk of electrocution

Drone Chiefs flies no closer than 10 meters from the track in this scenario, so the chance of electrocution is nil.

Mitigating measures

The following measures are taken to mitigate the risks mentioned:

- Keep at least 10 meters (or more = depending on ground risk buffer) horizontal distance from the center from the track. That is well beyond the minimum safe distance of 5.75 m.
- If a safety fence is present, it is always flown from outside the fence and the drone remains outside the fence.
- To prevent electrocution of the UAS on contact with the track or cutting edge equipment, the flight planning takes into account as much as possible a flight plan in which the aircraft is flown off the track.
- When a train passes, the flight should be interrupted. This is possible in 3 ways:
  - The UAS is retrieved to the take-off and landing location and can idle there
  - The UAS will hover at a safe location at a height of 3 meters. These locations are marked as 'hover locations' in the operational
  - The UAS will land and idle at designated take-off and landing locations
- A minimum distance of 25 meters will be kept from passing trains.

[C3.5.6] Flying nearby populated areas

 This operation concerns flying closer to populated and urban areas. It covers UAS operations nearby villages and cities, but not for flying within these cities. This procedure is not the same as the procedure formerly known as STS2a, close proximity which is specifically written for inspections of buildings and objects in densely populated areas, such as residential areas and industry.

Assumptions for flights closer to adjacent buildings

Flights may take place near (not above) buildings under the following conditions/mitigating measures:

- flights are conducted under Visual Flight Rules (VFR), which means that there must be a minimum horizontal visibility of 5000 meters, a horizontal distance to cloud cover of at least 1500 meters and a vertical distance of at least 300 meters to cloud cover;
- at a low airspeed such that the UA cannot crash outside the control area in the event of an engine failure;
- with a maximum flight altitude above ground/water determined in the flight plan;
- without infringing on the privacy of people on the ground or in buildings;
- with an adequate ERP, should something go wrong. The standard emergency procedures of Drone Chiefs are used for this, see Chapter C5: Emergency procedures.

When selecting and organizing this ground area, the following must be taken into account (and be stated in the flight plan):

- Minimum and maximum height above the object.
- The set height of the RTH function
- Maximum height above ground/water.
- The horizontal speed (low speed).
- Wind speed and wind direction.
- Turbulence around the object and the 'venturi effect'.
- The proximity and number of “uninvolved” people to be expected.
- Number of required observers and any traffic controllers.

Reliable connection with C3 link

A malfunction must not lead to an incident. Drone Chiefs selects and tests the quality of the connection between the transmitter and the UA, paying attention to:

- Appropriate radio frequency (RF) for the local conditions
- Data security, spoofing and hacking

Design of the UAS and emergency measures

Drone Chiefs selects the following mitigating measures to prevent risks of collision with people and/or buildings.

The UAS that has been found to be airworthy and maintained according to established procedures must meet a number of minimum technical requirements, including loss of link procedure, return to home procedures, geofencing, possibility for manual flight in case of GNSS problems. The basic principle is that a single failure may not immediately lead to an incident.

If the connection fails, the UA automatically enters the Return to home procedure.

Use of external data sources, such as weather, air traffic

Drone Chiefs must verify during flight preparation and prior to flight whether the information presented on drone apps and flight management systems corresponds to government information such as KNMI and LVNL (notes, no fly zones).

Emergency Response Plan (ERP) - Emergency Plan

In addition to the standard emergency procedures in this manual, see chapter C5: Emergency procedures, an ERP is required for this type of operation. This ERP should limit crash-escalating effects. Drone Chiefs reviews this ERP with all relevant third parties identified in the ERP.

- The ERP is validated through a representative tabletop exercise (e.g. chronological discussion of steps during a possible incident or accident).
- The ERP must be consistent with the ERP training syllabus, see [D2.5] Practical Training for Emergency Procedures.
- An ERP training program (see [D2.5] Practical Training Emergency Procedures) is available. An administration of the ERP training followed by the relevant crew is prepared and updated. In addition, the competences of the relevant crew are verified by an authorized third party (ILT) through the approval of this manual, see [A1.2] Responsibilities and Duties.

Emergency services are called in the event of a crash, see Chapter C6: ERP (Emergency Response Plan).

VLOS Deconfliction Scheme – phraseology

During the operation, the phraseology from this manual is used, see Chapter A5: Crew Communication.

Maintenance UAS

The maintenance procedures in this manual are followed and the maintenance performed is recorded, see [A8.0] Introduction Maintenance.

Operational procedures, contingency and emergency procedures

Specific for this scenario, the contingency and emergency procedures are important, mitigating the greatest risks for flying within urban areas. Include the following points of attention in the Emergency Response Plan and in the flight plan:

- Wind turbulence in particular is a concern with the risk of loss of control and a crash.
- During flight preparation, conducting research into wind speeds and venturi effects in the flight area.
- In addition, there is the risk of injury due to uncontrollability. That is why the operational volume in which the aircraft is flown is secured with temporary barriers and/or traffic controllers.

- Information boards will be placed.
- An observer must be present in addition to the pilot. This observer has the task to communicate well to those involved in the environment and to keep people away.
- The aircraft is flown at a low speed to minimize the effects of a crash.
- The ERP/flight plan contains the current numbers of the emergency services in the vicinity of the flight operation. The ERP is present at the flight location.

Training

Until now, this scenario has not been flown in the Netherlands. Therefore, for this specific scenario, a so-called 'self-declaration' is required for a training containing the following additional components:

- Application and training of operational procedures
- Communication
- UA flight route planning
- Leadership, teamwork and self-direction
- Problem solving and decision making
- Situational Awareness
- Managing work
- Coordination and transfer of tasks.

These aspects have been added to the basic training program of Drone Chiefs in [D2.1] Training General. Self-declaration means that the operator can prove that the pilot has been trained in the above aspects.

Privacy aspects

If recordings are made of homes or business premises (for example for inspections), the residents will have to be informed in advance about the operation and, according to the GDPR, the operator must, among other things, make it clear for what purpose the recordings are made, how the data is processed. and who has access to the data. See also [A1.3] Privacy and laws and regulations.

[C3.5.7] Procedure flying close to assemblies of people (events)

Drone Chiefs flies two types of operations flying close to crowds:

1. For 'advertising/cineshoots'
2. For events

1. Drone Chiefs regularly stages certain 'shoots' such as a group that forms a name and is framed from above. Often for advertising purposes or specific promotion. Afterwards, these groups are sometimes digitally

multiplied so that they appear larger groups. To make these images 'shots from above', this group of 'involved' people is then flown over. These involved people are briefed and agree to the risks (= controlled ground area).

2. Drone Chiefs does not fly above people at events, but likes to map these events taking into account the ground risk buffer. These people are not involved – not aware of the risks and do not agree with them. (=uncontrolled ground area)

The main additional risk (compared to normal operations) for these two scenarios is:

Risk	Measure
Injury due to loss of control of the drone (mechanical or software).	Never fly directly over 'uninvolved people'

Specific for 'shoots':

- We always work with involved people: these people are familiar with the risks of the operation and have been briefed in advance and agree to these risks.
- Agreements are made with the group about commands and instructions that must be followed in the event of loss of control.
- Groups of a maximum of 20 people are allowed at the location of the shoots: please note – with image editing it is possible to virtually scale up this group to, for example, 100 people.

This procedure is very similar to the procedure for cinematography and will be merged in due course.

Specific for events:

- Maximum distance between pilot and UAS is 150 meters with the assumption that when the UAS flies closer to the crowd, the distance between UAS and pilot with the same factor will be reduced. In short: the closer to the people, the shorter the distance between pilot and UAS.
- Drone Chiefs uses the 1 to 1 ratio: 1 m height equals 1 m distance from the crowd. In ascending order 10 – 10 etc.). This distance applies up to 25 height.
- In addition, Drone Chiefs always maintains a minimum distance of 10 meters between the UAS and the crowd from the point of view of safety.
- Particularly with regard to flying at a distance of < 25 meters from crowds of people, at all times to be flown with “Prop Guards”, in order to minimize the risk of any injury in the event of a crash. At all times, a flight as referred to above will always be performed by 1 pilot and at least 1 observer. Under no circumstances are concessions made to this mandatory minimum for safety.
- Maximum wind speed is 3.3 m/s (wind force 2 Bft).
- Maximum flight speed is 4 m/s.
- Communication between all persons directly involved in this type of operation will only take place via an open direct connection (walkie-talkie) in order to act effectively in the event of an (imminent)

emergency situation where the ERP must be activated.

- The persons portrayed by Drone Chiefs are informed in advance about the operation. According to the GDPR, it will be made clear for what purpose recordings are made, how the data is processed and who has access to the data. To this end, Drone Chiefs takes care of:
    - A mailing via the organization coordinating the event and an address where people can make their objection known;
    - Using a board with telephone number and email address of Drone Chiefs;
    - Flyers in the area to be flown with telephone number and email address;
    - Presence from the organization where people can object verbally.

[C3.5.8] Procedure flying close to motorways (the speed limit is up to 80km/h)

 Due to their good accessibility, many clients have office and business premises built and managed near roads with a maximum speed of up to 80 km/h and have these inspected regularly.

Risks for this operation

Traffic collision and/or traffic distraction with the risk of an accident. This operation, therefore, requires more of the flight crew present.

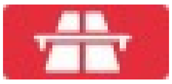
Mitigation Measures

The following mitigating measures are in force for this operation:

- Observer specifically monitoring the ground situation: clear view of road traffic;
- There must be no objects between the UA and the flight crew;
- Restrict off the flight location (pylons and/or restrict tapes) and keep the area under UA clear of persons and/or vehicles at all times. If they are present, immediately remove them from the flight location.
- Flying during quiet hours and outside rush hours;
- Return to Home function is set in such a way that there is no risk of collision with the object, a clear consideration is made to choose a dynamic or static home position;
- Maintain a minimum horizontal distance from the road of wider than 5 meters;
- Analysis of current wind and the possibility of turbulence around the object by analyzing the environment for indicators of the wind direction on location;
- Informing persons near the flight location.

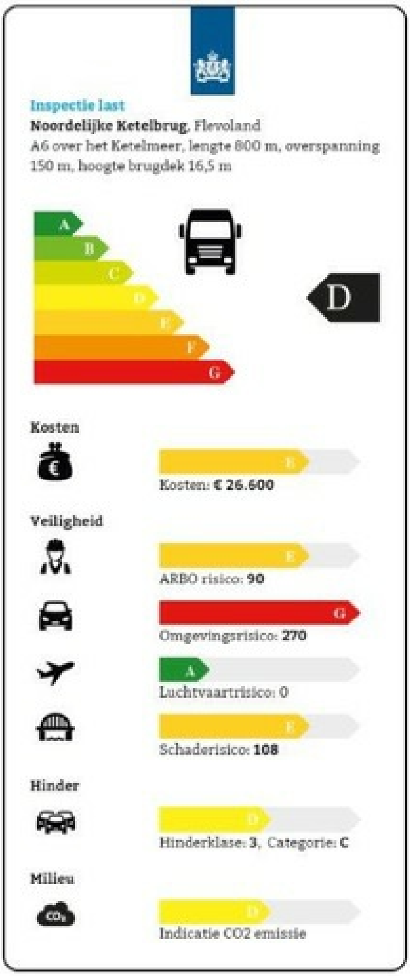
[C3.5.9] Procedure flying close to motorways (Speed limit is ≥ 80

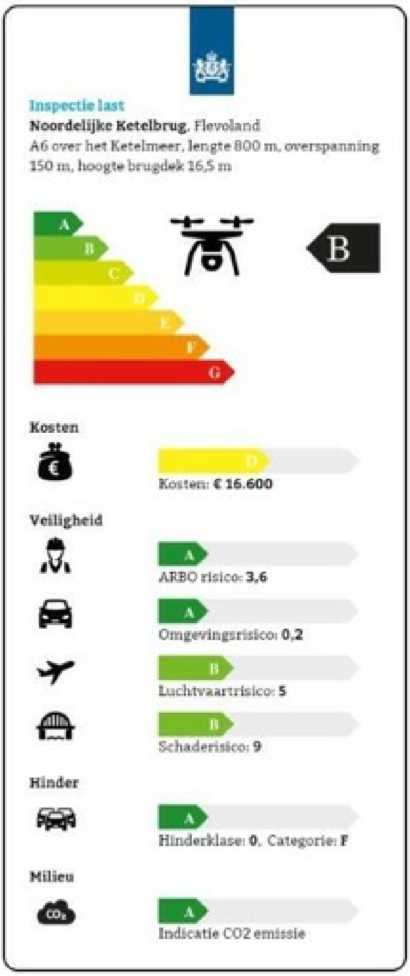
km/hour)

 Drone Chiefs performs the drone operation for various purposes for flying <25 meters in the vicinity of ≥ 80 km/h motorways (i.e. motorways and highways).

- To carry out inspections of bridges, viaducts and tunnels to develop 3D models and/or take high-quality inspection photos without hindering road/water traffic.
- For video productions of, among other things, billboards, but also commercials and documentaries where, for example, a car has to be followed.

Example: Safe Inspections of Works of Art
Subcontractors of ProRail and Rijkswaterstaat (RWS) are increasingly having inspections carried out with drones by Drone Chiefs. For example for the Ketelbrug. RWS made a drone label to provide insight into the benefits.





In addition to an enormous cost reduction, this increases safety during work and traffic flow. In addition, a 3D model can be generated for the BIM (Building Information Modeling (i.e. creating digital building models) or Building Information Model (the building information model) environment. With additional sensors it is detected early and accurately where small starting cracks arise. Drone Chiefs is investing heavily in this development.

Risks for this operation

1. Collision with traffic due to loss of control of the UAS
2. Traffic distraction with the risk of an accident.

Pre-flight measures

- Drone Chiefs coordinates the planned work with RWS (in the flight preparation phase). This will usually take place directly with the administrator of RWS, or through the contracting party. Alternative it is droneloket@rws.nl.

- Drone Chiefs provides a flight plan for this. See [B3.1] Flight preparation phase 1 and 2.
- RWS requires that an operator also coordinate sucn an operation with local authorities. If RWS sees no objections, they will issue a “declaration of no objection”.

Additional mitigating measures

In addition, the following additional mitigating measures apply to limit the risk for road users and the crew:

- Preferably, there is no flying directly above the road that is in use. If this is nevertheless necessary, a minimum flight height of at least 20 meters higher than the road is set.
- Minimum horizontal distance from the road is 10 meters. Experience shows that traffic users hardly see the drone, if at all. By flying in strips, the correct 3D and inspection images can still be collected.
- Approval from other managers, such as Natura2000 areas, see [A7.8] Natura 2000.
- When arranging the crew and the take-off and landing area, distraction from road users and the safety of the crew must be taken into account, preferably from a lower part, ashore or from the water. In any case, outside the obstacle-free zone of 13 meters next to the road.
- The wind direction and strength influence the size of the fall area in the event of a critical disturbance. This is taken into account during flight preparation. Flights are therefore flown in strips parallel to the highway, so that in the event of an engine failure, the chance of a crash on the road is small.

[C3.5.10] Flight over Road or Waterway

 The following additional measures must be taken for these operations:

- Several observers are deployed and correctly positioned to monitor the airspace and to keep an eye on traffic, so that they can inform the pilot in good time by shouting 'Traffic of Traffic'. This gives the pilot the opportunity to take timely action if traffic arrives. Crossing can be done by staying at a distance (hovering) from traffic (that is, uninvolved people). Use the minimum distance as described in the determination of the ground risk buffer, see [A6.4] Operational Volume determination.
- Only when the Observer gives the pilot the command 'Traffic clear', the pilot can fly over it. The pilot indicates when the UA is outside the ground risk buffer of the (water)way by shouting 'Clear or Free'.
- The drone must cross the surface of (water) road in such a way that the time spent above is minimized (if possible)

[C3.6] Cinematography - flying close to people and buildings on film sets over controlled ground

This procedure involves operations on a professional film set with involved persons and flying close to buildings and objects where uninvolved persons may be present inside.

Drones can be used for a variety of photography, film and video applications such as corporate movies, commercials, branding and all kinds of photography. Drone images are of great value to the commercial industry.

Also, the use of drones for marketing and event campaigns will greatly change the way of communication and reach the public. Due to the small size of drones, high quality cameras and flexibility, fun videos and photos can be taken for marketing campaigns. Even during public events, drones are used for live broadcasts from positions that were impossible to capture in the traditional way.

The biggest risks of this operation are:

1. Injure a person/animal on set (risk of collision)
2. Flying unusual maneuvers with sensor resulting in collision/crash.

The most important specific mitigation measures for this operation are:

1. Before the shooting starts, the film crew will receive:
   - A safety instruction
   - A communication protocol
   - Explanation about privacy legislation
2. UAS features obstacle detection to ensure distance between actors and UAS. Note: obstacle detection only works if there is sufficient ambient lighting. Check the technical specifications of the UAS.
3. During flight preparation, the mass of the UA is taken into account by design a flight path or trajectory in which as much as possible is flown away from people (i.e. not towards people).
4. It is flown at low speed and based on waypoints.
5. Set a geofence with max radius and max height to keep the drone within the controlled area.
6. UAS has 'motor stop' and can be switched off mid-air immediately.
7. Use of prop guards to prevent injury.
8. The minimum distance between UAS and actor is 5 meters.
9. Set up a cordon using plates, cones and red/white ribbon. If necessary, an extra observer can be deployed to stop uninvolved persons.
10. The pilot has specific knowledge of the technical limitations and of the flight behavior with specific sensors.
11. Inform payload operator in advance about flight scenarios so that communication during the flight is kept to a minimum.
12. The owner(s) of the film set provides pre-authorization before a flight is operated.
13. The pilot must have a good view of the set, if this is not possible, an additional observer must be

deployed.

14. Cables must be secured to the floor so that no one can fall over them.
15. The pilot is in a cable-free place.
16. Flight crew or film crew has first-aid (EHBO) certificate.

[C3.7] Procedure offshore NSAA without transponder in Atypical Airspace

North Sea Area Amsterdam (NSAA) concerns the area 1-2 miles outside the Dutch coastline. The area is located in uncontrolled airspace (class G) and it is an RMZ (radio required) and TMZ (transponder required). In this area, a submitted flight plan and the use of a transponder are normally mandatory for manned aviation. For UAS operations, an exception is made by means of the mitigating safety measures for the specific risks in this area. Since 2021, this procedure has been adapted and, due to additional risk mitigation, is only permitted within Atypical Airspace.

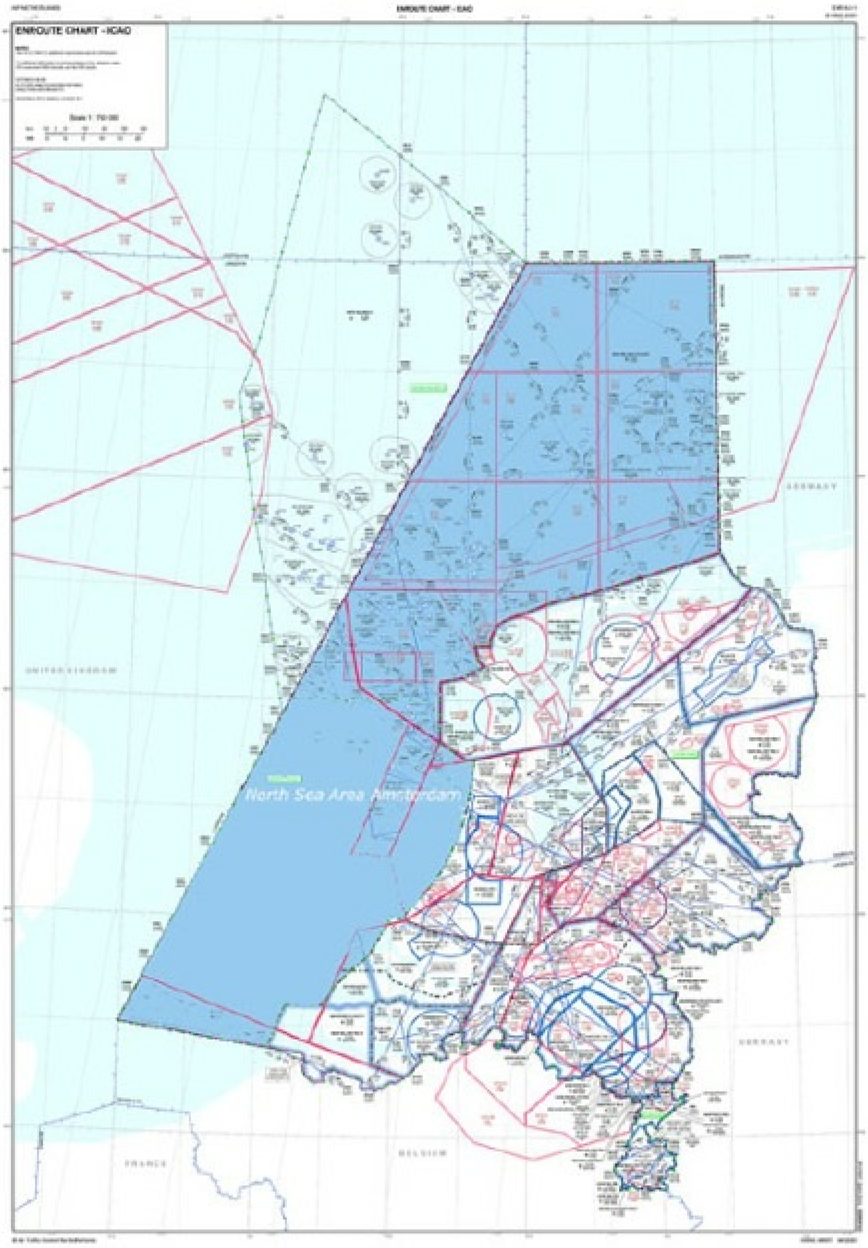


Image: overview NSAA (blue)

Airspace risks North Sea Area Amsterdam (NSAA)

North Sea Operational Regulations are described in:

1. NL AIP ENR 2.2.2 North Sea Area V & ENR 2.2.3 North Sea Operations;
2. UK AIP ENR 2.2-6, 1.2.1 North Sea Area V;
3. Enroute chart - ICAO (lower): EN AIP ENR 6-3.1. [Please note that this numbering is subject to change. Check lvnl.nl]

In the NSAA, the UAS operator can expect low-flying traffic, both military and civilian ranging from helicopters (SAR, police, coast guard etc.) to fighter aircraft. This traffic may, if necessary, fly lower than 400ft, up to 30 meters. That is why publishing a NOTAM message is necessary as soon as flying outside Atypical airspace.

In addition, special flight routes for helicopters (HMR, Helicopter Main Route) have been defined in the area and specific areas have been designated for the oil and gas industry (HTZ and HPZ). In principle, helicopters fly in an HMR above 1500 ft, but captains are allowed to deviate from this if they have a good reason for doing so.

There are two prohibited pilotages areas where pilots are dropped off for the port of Rotterdam and near IJmuiden.

Other risks

Many drones are sensitive to the reflection of water surfaces. The GNSS reception can thus be disrupted (shift of location) with the risk of a fly away. DJI warns: 'avoid obstacles, crowds, high voltage power lines, trees and bodies of water'.

Operations on the North Sea usually involve inspections of platforms and wind turbines. These installations can cause EM fields. The large amount of metal in the structures pose a risk to the controlled control of the drone.

Mitigating measures during flight preparation

To mitigate the main risks to operations in NSAA, Drone Chiefs takes the following mitigating measures:

1. Location determination of the operation:
    a. UAS are not permitted if manned helicopters operate in the same Helicopter Protections Zone (HPZ) and/or Helicopter Traffic Zone (HTZ);
    b. UAS are not allowed in the pilotage areas (AIP ENR 2.2 - 3.3.2.2)
2. Flying in Atypical Airspace: to minimize the risk of a collision with low-flying air traffic, the operation is limited to a circumference of 30 meters around the object to be inspected.
3. Flying outside a 'fixed object' such as an oil rig is flown in A-typical airspace is currently not permitted without additional measures that may be published later in 2022.
4. In order to minimise the risk of mirror effect due to the reflection of the water surface, Drone Chiefs opts for the use of:
    a. UA with three GNSS receivers with which the chance of 'shifting' of location is very small;

    b. Or fly manually (without GNSS)
5. Coordination and communication is required with the RT'er of the off shore platform (or cluster of platforms) if flying in the HPZ and/or HTZ.
6. Drone Chiefs considers the planning of the take-off and landing area, taking into account wind, waves and obstacles;
7. If working on a moving platform, the RTH function is not used. There is a good chance that the landing site has shifted in relation to the RTH stored position, which means that the chance of landing in the water is high.
8. Visual Line of Sight (VLOS) only flights in daylight (UDP).
9. Drone Chiefs checks the latest status of any exercises of the Royal Dutch and/or Royal British Navy and/or NOTAM's with regard to NSAA.
10. Drone Chiefs will brief all persons (who are present on the platform during the flight and come within the Operational Volume). This can also be done via the responsible administrator / manager of the platform.
11. Drone Chiefs will pay special attention to the position of pilot and Observer(s), taking into account the effects of wind, waves, metal structure platform and clear view of the UAS during the operation.
12. Drone Chiefs always flies with an observer to keep an eye on the airspace and if it concerns a complex operation, a second observer is deployed.
13. Crew members must have followed basic safety training:
    a. GWO (Global Wind Organisation Safety Training)
    b. OPITO/BOSIET (Basic Offshore Safety Introduction Emergency Training)

Mitigating measures during flight operation

1. The GNSS status will be monitored continuously as large amount of metals (platforms) interfere with the proper functioning of the compass and the connection to the GNSS. Drone Chiefs will anticipate this by automatically switching to ATT mode as soon as GNSS becomes unreliable. After switching to ATT mode - manually or automatically - the following can be expected:
    a. the UAS will be affected by the wind;
    b. shorter response time after automatically switching to ATT mode;
    c. work pressure will increase;
    d. control of the UAS becomes more difficult;
2. In case the flight has to be aborted, the UAS must be flown to a safe landing location.

[C3.8] Flying in the Vicinity of EM fields

 Flying in the vicinity of EM fields involves specific risks. Read more about EM fields in section [D1.10] Electromagnetic (EM) Fields.

For most UA there are restrictions for EM fields. The basic mitigating measure is to keep the distance between these EM sources and the UA at least 25 meters which is regarded as a safe distance. In specific operational circumstances, i.e. inspections of high voltage towers, it is not functional for Drone Chiefs to fly more than 25 meters distance.

Scenario

This concerns, for example, an inspection of high-voltage transmission towers that require flying closer than 25 meters.

Specific risks of this scenario are:

- Possible loss of GNSS due to EM radiation or steel/concrete structures. It would result in a fly-way.
- Faster signal loss closer to the EM source as well as when the distance between the UAS pilot and smart controller increases. It would result in a loss of control.

Mitigating Measures

- The UAS pilot will position himself during the flight in such a way that he always has a good view of the distance from the UAS to the object. This can also mean that the UAS pilot is located between the UAS and the object. The observer assists;
- If necessary, a restriction area should be placed (traffic cones or restrict tapes) to restrict off the take-off location for any intruders. A possible third observer can be deployed in some cases. This can be determined per assignment whether this is necessary;
- On the UAS, a geofence is set to the size of the chosen flying area;
- A limiting flight altitude is set;
- The UAS pilot tests the sensitivity for the EM field concerned by making a short test flight at the minimum distance from the EM field;
- For EM fields with a high frequency, a minimum distance of 15 meters will always be kept from the EM source (high voltage cables);
- For EM fields with a low frequency, a minimum distance of 10 meters will always be kept.
- If the object is located in a low flying area, permission from the operator/representative is required, unless the area is closed for low flying.

[C3.9] Flight Outside UDP (Night Flight)

For all flights outside UDP, the additional procedures have been compiled. This is because there are additional risks, for which mitigating measures must be taken to reduce the risks to an acceptable level. In addition, all flights must be conducted in accordance with standard operating methods as described Chapter

A6: Normal Operation Strategy.

The additional risks and the associated mitigating measures are described in the table below and then further elaborated in this chapter.

	Human (crew)		machine (UA(S)		organisation (incl. procedures)	
	probability reduction	effect reduction	probability reduction	effect reduction	probability reduction	effect reduction
Loss of VLOS and proportions to objects (situational awareness) to fly away and loss of control with the risk of a crash or mid-air collision.	- Additional night training - Extra check in daylight-Operational Plan night flight - Extra lighting take-off/landing location - Taking into account physiological limitations crew members.	- Incidents are included in the retraining for analysis and discussion.	- UA equipped with additional lighting		- Additional flight preparation and additional training. - Specific UDP procedure and exemption from ILT	- Incident reporting

Trained pilots

Flights outside UDP are only performed by trained pilots. These pilots are listed in the organizational overview in Appendix A. They have successfully completed the training and test “Night-VLOS”. See [D2.6] Training Night-VLOS.

Night flight procedure

- Night flights are only operated under conditions normally considered to be VMC (Visual Meteorological Conditions). Preparation for each flight always includes a detailed assessment of the weather forecasts to ensure that the VMC conditions are addressed.
- Flight altitude is a maximum of 120 meters above the ground or water, unless a different maximum altitude applies at the location of the flight.
- In addition, there will also be an on-site surveillance by the PIC to ensure that the flight is conducted within VMC.
- All flights are flown in VLOS.
- The crew members are trained and briefed, see Appendix C5 Briefing for night flights.
- Flights are prepared and operated as in the Operational Plan for flights outside UDP, see format in

Appendix C5.

- Each flight preparation for a night flight includes an on-site survey within UDP and under VMC. This site survey is used to identify obstacles and hazards that might not be apparent to a pilot flying at night, e.g., high voltage cables, antennas on buildings and so on.
- The Operational Plan and the exemption are present and can be shown by Drone Chiefs during the drone flight.
- Approval from the local government (usually Municipality) if the location or time of the flight may cause inconvenience to local residents.
- The rules and restrictions of the operating statement, operational authorization.
- Register 24 hours before the flight with a NOTAM (Notice to Airman).
- Mandatory notification by email to the following organizations:

Inspectie Leefomgeving en Transport (ILT)	drones.toezicht@ilent.nl
Luchtvaartpolitie	luchtvaarttoezicht@politie.nl

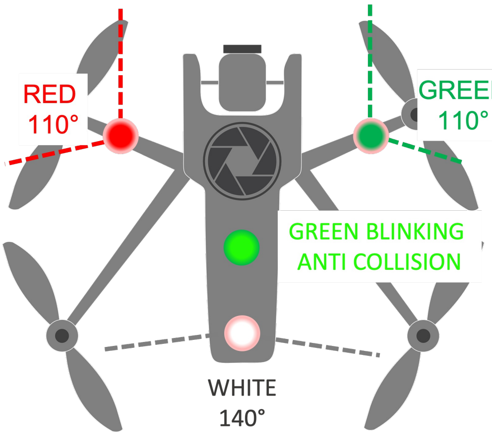
With the following content:

- In Subject: "Notification UAS flight outside UDP"
- In Body:
  - Name Operator
  - Document number from the flight authority regards to the exemption from UDP
  - Location of flights
  - Date and time of flights
  - Maximum flight heights

Night lighting of the UA

The UA shall be provided with adequate lighting to ensure both clear airborne recognition by the PIC as well as to allow proper assessment of orientation and direction of the UA by the PIC in a visual manner.

SERA.3215 requires the lights an aircraft must carry. In addition, EASA requires the use of a green flashing anti-collision light.



The UA has the following lighting for flying outside UDP:

1. Green and red navigation light.
2. White stern light for orientation.
3. An additional green circular flashing light to distinguish the drone from manned aircraft (anti-collision).

Adequate ground lighting

The PIC must ensure that all take-off and landing areas (primary and alternative) are sufficiently lit for the pilot to take off and land safely. For this, red LED beacon lights can be used to mark the take-off and landing zone. An alternate landing zone is also marked.

Safety in the air

Drone Chiefs shall take the following measures to reduce the air risk:

- The PIC ensures that the brightness of the UAS controller's screen is reduced to help maintain night vision.
- The UAS used in the night flight shall be equipped with the following facilities, which shall be checked as

part of any relevant pre-flight procedure and shall be included in the maintenance programme. The pre-flight check and the maintenance program has been adapted to this.
- The GPS unit must be serviceable, so that accurate data for GPS hold and RTH functionality can always be available
- Telemetry data that shows when a good GPS lock has been established. A minimum of 7 satellites is active, otherwise the flight will not be carried out.
- The PIC must have telemetry data at the place where it operates the UAS (base station) that shows the position of the UAS in 3D space. This means: distance from and course in relation to the PIC and the height AGL.
- The night flight is not performed when rain or thunderstorms are observed or predicted within 5 (five) kilometres of the Operational Volume limit (see Image Operational Volume).
- At least one observer is present.

Safety on the ground

Drone Chiefs takes the following measures to reduce the ground risk:

- Leave the UA and all ground equipment in the setup area so that it is not a hazard or damaged.
- If the area around the take-off/landing zone is easily accessible and passers-by can be expected, the area is cordoned off with a clearly visible barrier.
- Furthermore, a minimum crew of PIC, Payload operator and an observer is provided. This ensures that the public stays at a distance from the take-off/landing zone.
- When the recce / site survey within UDP gives rise to this, it can be decided to deploy an extra observer.

Personnel / Physiological aspects

Flights outside of UDP require more of the crew's physical and cognitive abilities. The pilot must be aware of the time it takes for the eyes to adjust to the dark. Therefore, the following points of attention are addressed during the training (Annex II to ED Decision 2022/002/R (Operation Specific Endorsement Module):

- General points of attention for night flying such as the definition of night, use of infrared and night lighting on the UA.
- Degradation of visual acuity caused by increasing pupil size
- Night illusion' and the blind spot (see image below).
    - Because other eye cells are used in darkness (the rods), this means that the part of the eye with which you see most sharply in daylight contributes less to vision at night. This creates a blind spot ('Night blind spot').
- Other visual scanning techniques
- Other identification of obstacles

Only a remote pilot authorized for night flights performs a night flight. (He has successfully completed the training and test "Night VLOS". See [D2.6] Training Night VLOS.

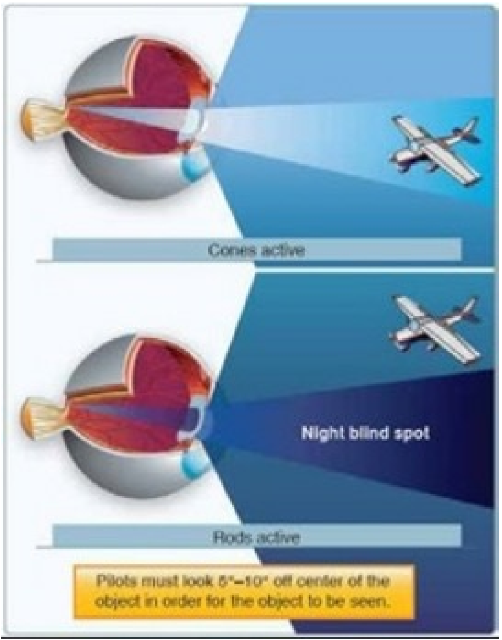


Image: blindspot at night

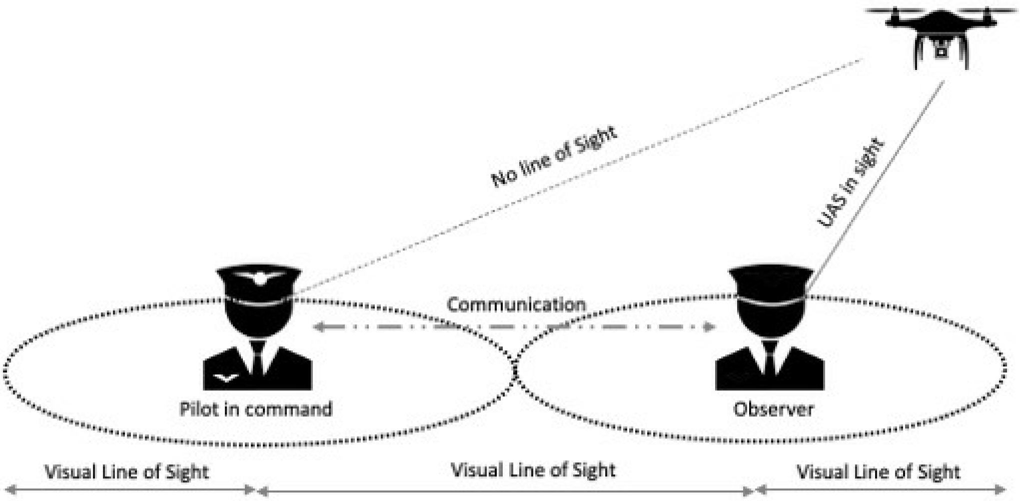
Source: https://www.ilent.nl/onderwerpen/drones/categorie-specifiek/ontheffingen/vliegen-buiten-de-uniforme-daglicht-periode-udp

Source: Annex II to ED Decision 2022/002/R (Operation Specific Endorsement Module)

[C3.10] Procedure EVLOS (Extended VLOS)

EVLOS means Extended Visual Line of Sight and makes it possible to perform operations over a longer distance. This procedure can be operated in Sparsely Populated Area with or without a Controlled Ground Area.

The pilot must have followed an EVLOS training. With 1 pilot and 1 observer, an area of 2000 meters can theoretically be covered. With each additional observer, 1000 meters are added.



In theory, just as many observers can be added as long as the communication between the UAS and the controller remains stable. The UAS can take off and/or land with both the pilot and an observer.

The latency between the pilot and the observer should be less than 15 seconds (source: step #6. TMPR and Robustness levels SORA Easy Access Rules For Unmanned Systems).

The communication protocols between pilot and observer regarding EVLOS is described in [A5.2.2] Pilot/observer EVLOS.

Risks for EVLOS operations

- Collision with object and/or human/animal due to loss of vision;
- GNSS and/or compass interference due to wi-fi, water, steel structures, concrete or EM fields;
- Communication link failure due to the greater distance between the drone and the transmitter;
- Communication loss between pilot and observer;
- Errors in communication between pilot and observer(s).

Mitigating measures

1. The position of the pilot and observer shall be chosen in such a way that one of them has a view of the UAS at all times;
2. At least 1 UAS pilot has followed an EVLOS training.
3. The pilot and observers have followed a joint internal EVLOS training.
4. Additional observers may be deployed for a longer distance;
5. Use of two-way radios. Mobile phone serves as backup;

6. Ground Risk Buffer distances are respected.

[C3.11] Procedure Flying near buildings/object within populated and controlled ground area

 For flying near/in/above populated area, Drone Chiefs uses the procedure that was known under Dutch regulations under the name STS2a.

Starting points for flights above buildings in urban areas

Flights may take place above buildings (compared to the normal procedures and standard working methods) when applying additional mitigations:

1. Low flight speed (= < 5m/s), such that the UA cannot crash outside the operational volume in the event of an engine failure;
2. Controlled Ground Area in the Operational Volume as valid for Drone Chiefs;
3. Maximum distance around the object to be measured/photographed of 30 meters (= Atypical Airspace). Flying further away is only allowed in controlled airspace (= regarded safe due to contact with ATC (LVNL));
4. with a maximum flight height above the ground/water set in the flight plan.
5. without invading the privacy of people on the ground or in buildings.
6. with an adequate ERP, should something go wrong. For this purpose, the standard emergency procedures of Drone Chiefs are used, see [NOP] emergency procedures.
7. Drone Chiefs ensures with deposition and/or additional observers that no uninvolved people can enter the Operational Volume.

Controlled Ground Area within Operational Volume

Within the controlled ground area (= Operational Volume, see chapter A6.4) there are <u>only persons actively involved in the operation</u> who:

1. are familiar with the risks of UAS operations;
2. have accepted these risks (in writing);
3. have been informed of the relevant emergency procedures;

Controlled areas also include roof terraces and balconies.

The controlled territory shall be separated from uncontrolled territory with:

1. Drop-off ribbons (red/white) and/or additional observers with tools to detect and warn non-involved persons not to enter the area in a timely manner.
2. Signs – with, for example, 'ATTENTION, DRONE OPERATION ACTIVE or other means of communication.

When selecting and setting up this area, the following shall be noted in the flight plan:

1. Minimum and maximum height above the object;
2. The set height of the RTH function;
3. The flight area containing the 30 meter zone of the controlled area;
4. Maximum height above ground/water;
5. The horizontal speed (low speed = < 5 m/s);
6. Wind speed and wind direction;
7. Turbulence around the object and the 'venturi effect'
8. The proximity and number of expected 'uninvolved' persons;
9. Number of required observers and any traffic controllers.

Ground Risk Buffer

If the UA has to operate at a height of 100 meters, the ground risk buffer must be at least 100 meters. The buffer shall apply in relation to the area with a higher risk than where the operation takes place; For operations over controlled area (this procedure), this buffer applies compared to uncontrolled ground area. For the determination of the Ground Risk Buffer, the ballistic method from section A6.4.3 can also be used.

Reliable connection with C3 link

A malfunction must not lead to an incident. Drone Chiefs selects and tests the quality of the connection between the transmitter and the UA, taking into account:

1. Correct radio frequency (RF) for local conditions
2. Data security, spoofing and hacking

The airworthy and maintained UAS that is flown above populated areas must meet a number of minimum technical requirements, including lost link management, return to home procedures, geofencing, possibility for manual flying in case of GNSS problems, et cetera. The starting point is that a malfunction may not immediately lead to an incident.

In the event of a failure of the transmitter, the RPA automatically chooses the set home position and flight altitude.

Use of external data sources, such as weather, air traffic, etc.

Drone Chiefs must verify during flight preparation and prior flight whether the information presented on drone apps and flight management systems corresponds to official information such as KNMI and LVNL (notams, no fly zones).

Emergency Response Plan (ERP)

In addition to the standard emergency procedures in this manual, see chapter C5: Emergency procedures, an emergency plan (ERP) is necessary for this type of operation. This plan is intended to limit crash-escalating effects by, for example, alerting emergency services. Drone Chiefs shall go through this contingency plan with all relevant third parties identified in the plan.

1. The ERP is validated by means of a representative exercise on the tabletop (e.g. chronological discussion of steps during a possible incident or accident);
2. The ERP must be consistent with the ERP training system, see section D2 Training;
3. An ERP training program is available. A record of the ERP training followed by the relevant staff is established and updated. In addition, the competences of the relevant personnel are verified by a competent third party (ILT) through the approval of this manual.

In the event of a crash or another emergency services are called in see ERP in chapter C6 and the example flight plan in chapter B3.

VLOS Deconfliction Scheme – phraseology

During the operation, the phraseology from this manual is used as described in chapter A5 Crew Communication.

UAS Maintenance

The maintenance procedures from this manual are used and the maintenance carried out is recorded, see chapter A8 General Maintenance.

Operational procedures, contingency and emergency procedures

Specifically for this scenario, the contingency and emergency procedures are important where the greatest risks to flying within urban areas are mitigated. Include the following considerations in the Emergency Response Plan and in the Flight Plan:

1. In particular, the wind turbulence is a point of attention with the risk of loss of control and a crash, see chapter [D1.6] Turbulence/Venturi effect. In flight preparation, conduct research into the wind speeds and venturi effects in the flight area.
2. In addition, there is the risk of injury due to ungovernability. Therefore, the area above which flown is secured with temporary deposits and /or traffic controllers.
3. Information boards will be placed.

4. In addition to the pilot, an observer must be present. This observer has the task of communicating well with those involved in the environment and keeping people away.
5. The UAS is flown at a low speed to minimize the effects of a crash.
6. The ERP/flight plan contains the current numbers of the emergency workers in the vicinity of the flight operation. The ERP is present at the flight location.

Training

For this specific scenario, a so-called 'self-declaration' is required for a training course containing the following additional components:

1. Application and training of operational procedures
2. Communication
3. UAS Flight Planning
4. Leadership, teamwork and self-management
5. Problem solving and decision-making
6. Situational Awareness
7. Managing work
8. Coordination and transfer of tasks.

These aspects have been added to Drone Chiefs's basic training program in D2 Training. Self-declaration means that the operator can prove that the pilot has been trained on the above aspects.

Privacy aspects

If recordings are made of homes or business premises (for example for inspections), the residents will have to be informed in advance about the operation and, according to the GDPR, the operator must make clear, among other things, for what purpose recordings are made, how the data is processed and who has access to the data. See also chapter D1.2 Privacy and laws and regulations.

[C3.12] Procedure flying near/above railway

UAS operations over railways and the associated infrastructure in both rural and populated areas in the Netherlands are desirable. Numerous innovative UAS applications will be made possible by allowing these operations, which serve not only the commercial interest of the operators, but also the public interest. An example of this are maintenance inspections of railway lines, railway bridges and trains.

Under EU regulations, people on trains are seen as 'not involved', but there are no formal requirements for flying near railways. However, the following procedure has been agreed with Prorail. These additional instructions are followed by Drone Chiefs.

Conditions:

- VLOS of EVLOS
- VFR: operations take place in visual meteorological conditions (VMC)
- During daytime (Uniform Daylight Period).
- Low flight speed to prevent the drone from getting outside the flight area if one or more engines fail.
- Atypical airspace: defined as airspace where manned aircraft normally cannot go. Therefore, operators keep the UAS within 30 meters of buildings or structures (objects) to sufficiently reduce the risk of a collision with manned aircraft.
- SERA: not in airspace C and D without additional permission.

Ground Area

Operations take place over railways in a densely populated area or sparsely populated area. There are currently two definitions of a populated area available:

1. A city, suburb, suburb, residential area, urban, subway, city, and/or gathering of people in the open air. Defined as a buffer of 1⁄2 nm (3038 ft.) around all urbanized areas. Urbanized areas are defined as an area with an average population of 500 people per square mile (1295 people per square kilometer).
2. A sparsely populated area is defined as: All areas that are not defined as populated areas and not within an airport environment.

Controlled Ground Area and active participants

In the Operational Volume, only active participants are present. Active participants are those individuals who are directly involved in the UAS operation or are fully aware that the UAS operation takes place near them performed and have accepted these risks. Active participants are informed about and can follow relevant effective emergency procedures and/or emergency plans.

Inactive participants are those individuals who are in the vicinity of a UAS operation and may or may not be aware that a UAS operation is taking place. Inactive participants are not aware of the risks associated with the surgery and have not accepted these risks.

Scenario's

UAS activities over railways and the associated infrastructure can be divided into two operational scenarios, with the second scenario having two sub-scenarios:

1. UAS operations with railway lines in use;
2. UAS activities with unused tracks:

   2.a UAS activities during a planned closure

   2b. UAS operations during a calamity

General working environment

The working environment when performing UAS operations over railways rural areas and populated areas is defined in the Voorschrift Veilig Werken (VVW). This document (available from ProRail and (sub)contractors) describes the applicable dimensions when working on or near railway infrastructure.

Workplace safety when working on or near railway infrastructure is determined by two risks:

1. The risk of a collision with people and/or equipment due to track-related equipment (e.g. trains, work trains, maintenance equipment, etc.);
2. The risk of electrocution by contact of persons and/or equipment with electrically charged parts of the power supply or train protection installation.

The VVW defines three zones (A - C) where these risks occur and determines rules and guidelines on how employees can safely set up their workplace.

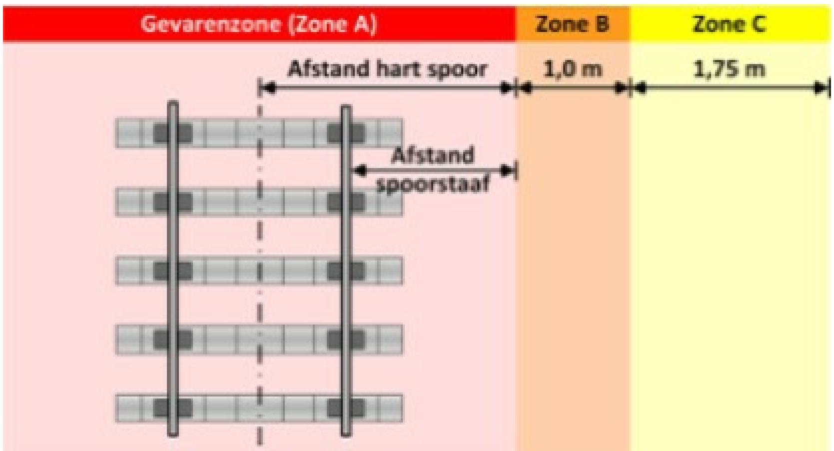


Image: danger zone around the track

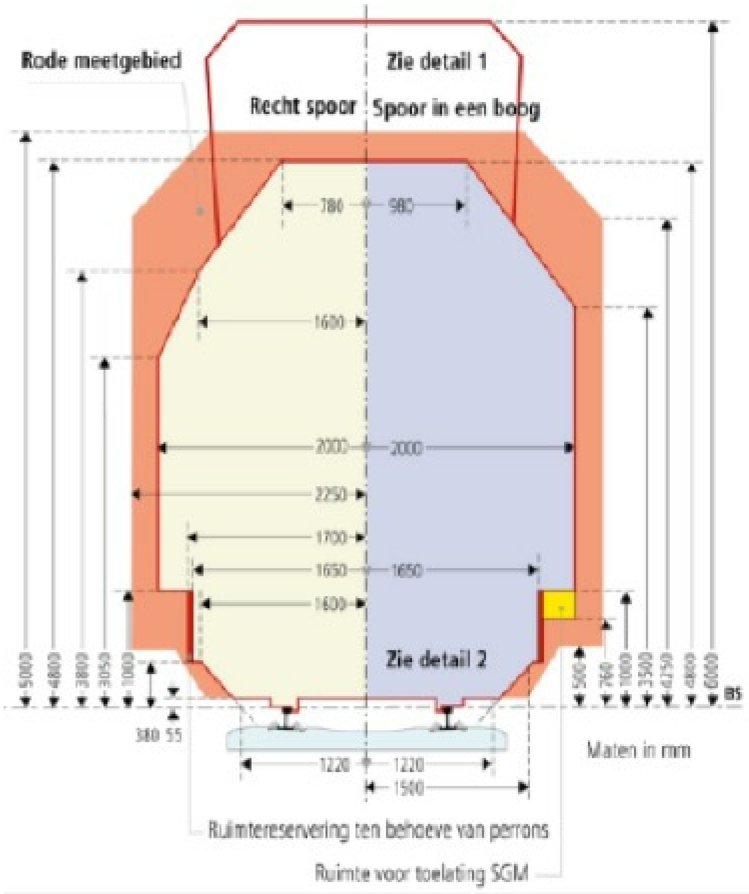


Image red measuring area

The danger zone (A) is the zone where there is a risk of collision. The dimensions of this zone depend on the speed of the train or other track-related equipment. Outside the danger zone, there are two zones (B and C) which, due to the proximity of danger zone A, are exposed to side effects of passing runway equipment. Requirements are imposed on these zones to control the risk of entering danger zone A. The requirements for zone B are stricter than for zone C. Furthermore, a safety zone (refuge) has been defined where workers can position themselves to avoid being exposed to the risk of a collision when trackside equipment passes by.

Dimensions

The limit of danger zone A depends on the maximum permitted speed on the track. The table below defines the dimensions that apply to the different travel speeds.

Snelheid in km/h	Grens gevarenzone (zone A) t.o.v. hart spoor in meters	Afstand t.o.v. dichtstbijzijnde spoorstaaf in meters
0-140	2,25[10]	1,50
141-160	2,40	1,65
161-200	2,75	2,00
201-300	3,00	2,25

HSL
• Hanteert een vaste afstand t.o.v. dichtstbijzijnde spoorstaaf van 2,25 m in combinatie met een snelheidsbeperking tot 120 km/u.

Danger zone B has a standard size of 1 meter and starts at the boundary of danger zone A. Proximity zone C has a standard size of 1.75 meters and starts at the boundary of proximity zone B. For all activities within the three zones, a separate risk inventory and evaluation (RI&E) must determine how the risks arising from the nearby danger zone A are managed.

The safety zone has a minimum size of 0.8 meters. This zone is an area where workers, with or without their materials and equipment, can position themselves to eliminate the risk of a collision. The safety zone must be accessible without passing obstacles (e.g. a fence or stairs). Furthermore, it is forbidden to pass an active track to reach the safety zone. The safety zone should always be placed outside the danger zone A and the dimensions depend on the number of people and equipment/materials in use.

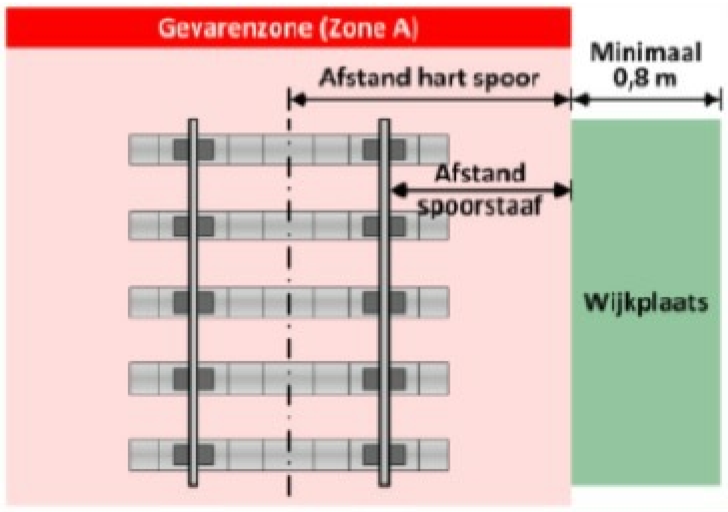


Image danger zone (Zone A)

High Voltage Risk

International standards describe the conditions under which it is permitted to operate on or near high-voltage components of the railway infrastructure. Working in danger zone A is only permitted if there is no voltage on the installation. When carrying out activities in proximity zones B and C, strict requirements apply to the minimum distances to be maintained. The table below shows for different voltages what the minimum distances are for people, vehicles and electrically charged objects.

	1500/1800 V		25 kV	
	Gevarenzone	Nabijheidszone	Gevarenzone	Nabijheidszone
Personen	Niet toegestaan	1,5 m [#1]	Niet toegestaan	1,5 m [#1]
Personen (inspecties en metingen [#2])	0,12 m	1,5 m/2m	Niet toegestaan	2 m [#1]
	1500/1800 V		25 kV	
	Begrensd	Onbegrensd	Begrensd	Onbegrensd
Mobiele railgebonden voertuigen	0,5 m	Niet toegestaan	1 m	Niet toegestaan
Mobiele niet-railgebonden voertuigen op een spoorwagon	0,5 m [#3]	Niet toegestaan	1,0 m [#6]	Niet toegestaan
Mobiele niet-railgebonden voertuigen	0,5 m [#3/#4] 1,5 m [#3/#5]	Niet toegestaan	1,5 m	Niet toegestaan

#1 Bij activiteiten aan de bovenleiding moet het vanuit een voertuig onmogelijk zijn om binnen de nabijheidszone van de aangrenzende spanningvoerende installatie te komen (bron: RLN00008).

#2 Bepalingen voor het werken onder spanning (bron: RLN00128).

#3 Als de werktuigen door uitvoering en/of oneffenheden in het spoor binnen de grenzen (kunnen) komen, dan mogen de activiteiten alleen worden uitgevoerd na toestemming van de installatieverantwoordelijke en na overleg tussen een werkverantwoordelijke en de werkgever van de personen die de activiteiten uitvoeren. In dit overleg komen aan de orde: de aard van de activiteiten, noodzakelijke veiligheidsmaatregelen, begintijd en tijdsduur van de activiteiten en het te houden toezicht (bron: RLN00128).

#4 0,5 meter als het betreffende werktuig door middel van een flexibele koperen leiding van ten minste 50 mm^2 verbonden is met de retourleiding, en als de hoogtebegrenzer zodanig is afgesteld dat het werktuig de contactleiding niet dichter nadert dan 0,5 meter. (bron: RLN00128).

#5 1,5 meter als er alleen sprake is van een hoogtebegrenzer die zodanig is afgesteld dat het werktuig de contactleiding niet dichter nadert dan 1,5 meter (bron: RLN00128).

#6 Indien (delen van) werktuigen geïsoleerd zijn opgesteld, dan dienen deze (delen van) werktuigen door een (zwak)geleidende verbinding (maximaal 100 Ohm) met de aarde verbonden te zijn (bron: RLN00128).

Scenario 1: UAS operations with used railway lines

During UAS operations with railway lines in use, the crew should be aware of the fact that trains may be present in the operational volume. These trains can have different speeds and can pass in both directions (depending on the number and configuration of the track surface(s)). During these operations, there will normally be a high voltage on the power lines of the railway infrastructure. The high voltage in combination with passing trains can cause fluctuations in the electromagnetic field. These fluctuations can affect the control and navigation of the UAS.

Therefore, operations within the red measurement zone (red measuring area, see figure 14) are not permitted when the track is in use. Operations above the track are permitted during automated flights (e.g. map flying), but the flight crew must be able to take over manual control at all times.

Over-track operations are not permitted during manual flights when a train passes (e.g. close-up inspections), therefore the UAS should be placed above proximity zone C (or beyond) and at a minimum distance or height of 25 meters from the railway infrastructure when a train passes by.

Operations in this scenario shall be performed at a minimum altitude of 5 meters (manual flights) or 25 meters (automated flights) above the highest point of the railway infrastructure, except where the UAS is protected from electromagnetic interference (EMI).

During these operations, the crew can reduce the risk of collision by:

- Controlled access of trains (Beheerste Toelating, BT)
- A physical barrier (Fysieke Afscherming, FA)
- A physical barrier (Gegarandeerde Waarschuwing, GW)
- A physical barrier (Persoonlijke Waarnemer PW, door Grenswachter (GRW) of Veiligheidsman (VHM))
- A personal safety instruction (Taak Eigen Veiligheid)

A detailed description of these measures is available in chapter 4.3.1 of the VVW. The function of ‘Grenswachter’ and ‘Veiligheidsman’ shall not be combined with the function of observer in the crew.

Before starting the operation, the person responsible for engineering workplace safety should be informed (V&G coordinator or workplace security guard). He is responsible for including the UAS operation in the instruction provided by the ‘leider werkplekbeveiliging’ (LWB) to the people who work in and around the workplace.

Operations in this scenario must be performed in accordance with the requirements, regulations, and guidelines in the Normenkader Veilig Werken (NVW), het Voorschrift Veilig Werken - Trein (VVW), de Life Saving Rules (LSR), Directive: rules of conduct on railway property (RLN00300). The NVW sets the framework for the organisation of a safe working environment in the railway infrastructure. The VVW translates this framework into concrete rules for the specific (sub) environments and installations.

Scenario 2: UAS activities with unused railway lines

Sub-scenario a: UAS operations during a scheduled shutdown

When performing UAS operations during a planned shutdown, there are no trains present in the operational volume. Please refer to the VVW (notification 2) for the two applicable safety scales that prevent trains from entering the track. However, there may be a high voltage on the power lines of the railway infrastructure. Therefore, it is only allowed to operate a UAS within the red measurement zone (red measuring area) with the permission of the local ‘veiligheidsleider’ (Leider Lokale Veiligheid) and when the UAS is protected from electromagnetic interference (EMI).

Before starting the operation, the person responsible for engineering workplace safety should be informed (V & G-coördinator of werkplekbeveiliger). He is responsible for including the UAS operation in the instruction that the ‘leider werkplekbeveiliging’ (LWB) to the people who work in and around the workplace. Operations in this scenario must be performed in accordance with the requirements, regulations, and guidelines in the Normenkader Veilig Werken (NVW), het Voorschrift Veilig Werken - Trein (VVW), de Life Saving Rules (LSR), Richtlijn: gedragsregels op spoorwegterrein (RLN00300).

Sub-scenario b: UAS operations during a calamity

When performing UAS operations during an emergency, there is no (normal) train traffic present in the Operational Volume. The treindienstleider (TRDL) takes the necessary measures to ensure the safety of emergency personnel and to prevent danger to passengers and road users (see VVW notification 4). However, there may be a high voltage on the power lines of the railway infrastructure. Therefore, it is only permitted to operate a UAS within the red measurement zone (red measuring area) with the permission of the officier van dienst (officier van Dienst, OvD) and when the UAS is protected from electromagnetic interference (EMI)

UAS operations during an emergency may only be carried out by ProRail (or parties contracted by ProRail) and emergency services (e.g. police, fire brigade, Rijkswaterstaat, etc.) in accordance with the applicable safety documentation (available from ProRail or prorail partners/contractors or from organisations carrying out activities in the vicinity of the railway site). Before the start of the operation (outside or inside the red measuring zone), permission must be obtained from the ‘officier van dienst’ (OvD). The OvD will inform the TRDL, which will inform the operators of other runway equipment that the UAS operation is taking place.

Operations in this scenario must be performed in accordance with the requirements, regulations, and guidelines in the Normenkader Veilig Werken (NVW), het Voorschrift Veilig Werken - Trein (VVW), de Life Saving Rules (LSR), Richtlijn: gedragsregels op spoorwegterrein (RLN00300). Permission is required from ProRail when processing data obtained from a UAS operation during an emergency.

Additional terms and conditions

The UAS must be protected against EM fields for operations within the red measurement zone. If not inspected, the Drone Chiefs automatically flies no closer than 25 meters near railway lines. Manually no closer than 5 meters.

During flight preparation, information shall be collected on:

1. Danger zone (A) and approach zones (B and C) at the intended flight location. Fill in the distances to be used in the operational plan;
2. Location of TAKE-OFF and landing area (zone C or further) on the location sketch in the plan.
3. Mapping (railway) infrastructure including high-voltage power lines

4. Trains and other trackside equipment.
5. Altitude above ground (or water): note in flight plan.
6. Horizontal maximum speed of UAS for the purpose of this mission.
7. Wind speed and direction on the day of execution.
8. The effects of turbulence and the Venturi effect.
9. Estimation of the proximity and the number of expected (un)involved parties.

Operational procedures

1. Emergency procedures (to cope with abnormal situations) are defined.
2. The limitations of the external systems that support UAS for safe operation are recorded in a operating manual.
3. The operational procedures can be tested by the applicant (for example in a simulated environment or in the Railcenter in Amersfoort).
4. Procedures for take-off and landing near railway lines are defined (e.g. Zone C or further, "always take-off with wind at the back").
5. Procedures to safely "hold" to the passage of a train during manual operations have been established.
6. Procedures for the coordination of operation with the person responsible for the applicable track (e.g. OvD) are laid down.
7. Procedures for informing inactive participants (e.g. signs and clothing) and checking controlled ground surface have been established.

Emergency Response Plan (ERP)

1. Drone Chiefs coordinates an Emergency Response Plan (ERP) with all relevant third parties (ProRail or (sub)contractors) identified in the plan.
2. The ERP is validated by means of a representative exercise on the tabletop (e.g. chronological discussion of steps during a possible incident or accident) between the operator and the contracting party.
3. The ERP must be in accordance with the contingency plan in the V&G plan of ProRail (or subcontractor of ProRail).
4. The representativeness of the table exercise is validated by a competent third party (ILT).
5. The ERP must be consistent with the ERP training system.
6. An ERP training program (explaining how and how often the crew is trained on the ERP) is available. A record of the ERP training followed by the relevant staff is established and updated. In addition, the competences of the relevant personnel are verified by a competent third party (ILT).

Education and training

Training elements related to drone operations over railways are included in a crew qualification schedule. This training contains all the details covered in this standard scenario (e.g. RailAlert requirements such as a

'Digital Safety Passport' or a 'Day Pass').

[C3.13] Procedure flying in other EU member states

This procedure shall include additional measures, which may slightly vary from one Member State to another. For the basic procedure for applying for an operation in another Member State, see [A7.24] flying in other EU countries.

First of all, a UAS operator that intends to conduct an operation, for which an operational authorisation is required, partially or fully in a Member State other than the State of registration, should already be in possess of any required authorisation (OA) for that operation from the State of registration.

In addition, the operator should research the applicable local conditions and national regulations where the operator intends to conduct an operation. If it is necessary, the operational procedures should be adapted. Moreover, update on the application of the mitigation means and local conditions. The identification of the location(s) should contain the full operational volume and ground risk buffer (see [A.6.4] Operational Volume Determination and [APPENDIX C3.1] Flight Preparation Phase 1 and 2 and ERP).

Finally, submit to the competent authority of the MS of operation (refer to https://www.easa.europa.eu/domains/civil-drones/naa for the links to the NAA websites) an application for a cross-border operation using the form[1] attaching the following documents:

1. a copy of the operational authorisation.
2. those chapter(s)/section(s) of the OM (or Operational Plan (OP) providing the operational procedures and the relevant information, amended as necessary, to comply with the local conditions and apply the mitigation measures to the intended location(s).

Once the competent authority in the member state of operation is satisfied, they will provide the competent authority (ILT) and the UAS operator with the confirmation of acceptability.

[1] See Appendix H for an example of an application for for cross-border operations.

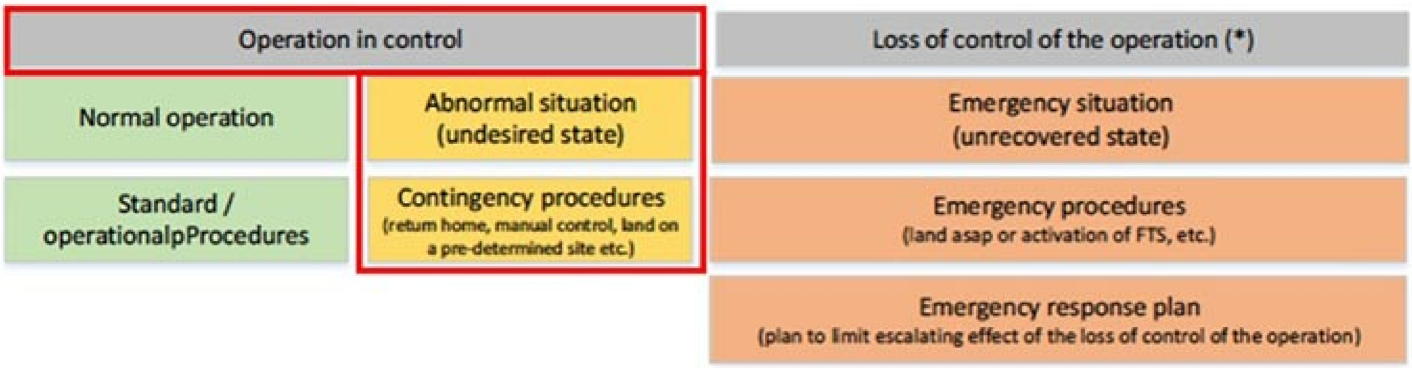
For specific member states, procedures are noted here if applicable.

Chapter C4: CONTINGENCY PROCEDURES [APE]

[C4.0] Introduction Contingency Procedures

Contingency Procedures are designed for unexpected or abnormal situations. The operation however is still under control. The objective for the Contingency Procedures is to return as quickly as possible to normal operations. For loss of control situations, the emergency procedures are described in chapter C5.

The difference between the procedures is explained in this picture:



1. [C4.1] Unmanned Aircraft leaves the Flight Geography

In case of (almost) leaving the Flight Geography, the following procedures should be used:

[C4.1.1] Return to Home (RtH)

1. Press home button on controller hold until confirmation is given on controller that the RTH procedure is active.
2. Pressing the RTH within 25 meters of the pre-programmed landing location (take-off point), the UAS will slowly land in a constant straight down.
3. Outside this 25m, the UAS will climb to set RTH height and then fly back in a straight line to the landing point, where the landing will be started.
4. The UAS also has a failsafe so that when the controller is switched off, the autonomous RTH procedure is automatically activated after 10 seconds.

Please note that it only works if there are no GNSS disruptions.

[C4.1.2] Mid-Air Stop DJI

In case the UAS is not responding and crossing the contingency volume, the motors are turned off remotely and the UAS will crash.

Actions:

1. Pay attention to the environment and ensure that there are no people underneath the UAS;
2. Stay calm and inform the crew;
3. Warn crewmembers;
4. Press RTH while pulling the left stick to the bottom inner corner.

[C4.2] Uninvolved persons enter the controlled area

The observer is responsible for keeping watchers (= Uninvolved persons) away so that the UAS pilot can maintain focus on the operation.

Actions:

1. The observer addresses uninvolved persons who are about to enter the flying area and kindly asks them to keep their distance.
2. The observer tries to operate in a de-escalating manner so that the pilot can remain focused on the operation.
3. The observer will remain between the pilot and the uninvolved persons in case of aggression.
4. Escalation? The pilot lands the UAS safely and clear it away.
5. Should this escalate further, the observer or pilot will contact the police.

3. [C4.3] Adverse operating conditions

During operations, the conditions can change unexpected. For example, weather conditions change rapidly, or an accident happens nearby. These procedures describe the steps to take.

[C4.3.1] Adverse weather conditions

Precipitation and fog can cause a short circuit in the UAS. When icing, the upward force and balance of the UAS is compromised.

Action:

1. Stay calm and inform the crew;
2. Land as soon as possible.

3. [C4.3.2] Turbulence or extreme windspeeds / venturi effect

In certain specific operations, such as near industry and/or urban areas, turbulence due to the venturi effect is to be expected. In addition, in these areas there is a greater chance of a loose off link due to EM disruption.

Signals:

- Notification on controller (High wind);
- The UAS does not fly stably in the air.

Actions:

1. Stay calm and inform the crew;
2. Fly with the airflow and keep your distance from objects;
3. Try to fly out of the turbulence in a safe location;
4. Land as soon as possible.

More about the Venturi-effect: Chapter D1.6 Turbulence

[C4.3.3] Bird Attack

Birds can certainly be aggressive against a UAS in the breeding season. Especially the larger birds will confront. Oystercatchers and crows are also known for their aggressive behavior.

Actions

1. Stay calm and inform the crew;
2. Rise as fast as possible;
3. With persistent aggressiveness back to landing site.

3. [C4.3.4] Accident in proximity or other distraction

An incident nearby can always happen. This can be both a stand-alone incident and the result of distraction from the operation.

Actions:

1. Stay calm and inform the crew;
2. Hover the UAS in a safe location;
3. Determines the severity of the incident;

Need first aid?

1. Abort mission;
2. Call first responds and emergency services (112);

Operation hamper for emergency services?

1. Yes, abort mission
2. No, continue mission;

Keep an eye on the situation.

[C4.4] Failure of external systems supporting the flight operations

Sometimes external systems fail (temporarily). The procedures for this failure are written here.

[C4.4.1] GNNS signal failure

If the GNSS signal is disturbed (see controller) and it is not recovered quick by the system via RTH itself, the UAS pilot proceeds as follows:

Actions

1. Stay calm and inform the crew;
2. Switch to ATTI mode on controller (if possible);
3. Pause the mission by hovering or returning to the home position
4. Resume mission after recovery.

No recovery?

1. Return home manually and land directly.

Note the autonomous RTH procedure of the UAS does not work without GNSS.

[C4.4.2] Autopilot Failure

Autopilot failure occurs during a flight in which the flight takes place using an intelligent flight mode where the UA system uses, for example, waypoints entered by the pilot. During this flight mode, a pilot will be present at all times with remote control in his hands. If the autopilot fails, he will immediately have to be able to manually take over control by activating the manual mode.

To minimize the chance of an autopilot failure occurring again, the UA will have to be landed to check all systems. Recheck the Kp-index as it may affect failure. When the mission is resumed, the analysis will have to be taken into account and an adjusted flight path and/or manual flight mode may have to be used.

Signals:

- LEDs on UAS flash yellow.

Actions:

1. Stay calm and inform the crew;
2. Interrupt program by touching the sticks;
3. Optionally, the program may need to be paused on the controller/tablet;
4. Optional short-term change of flight mode on controller;
5. Bring UAS back to landing site;
6. Check UAS.

[C4.4.3] Low Battery Voltage

In the event of a low battery voltage or low battery the following signals will appear:

- Controller shows low percentage;
- Controller gives audible signal;
- LEDs flash red (Low battery warning);
- LEDs flash red quickly (Critical battery warning).

Actions

Set the battery level warning threshold lower, so that UA can fly back to the location before the battery becomes empty.

Fly directly back to the take-off and landing location.

It can also happen that the battery voltage suddenly drops faster than expected. There are 3 options available:

- Fly back to the take-off and landing location
- Landing at an alternative take-off and landing location
- Land the UAS immediately.

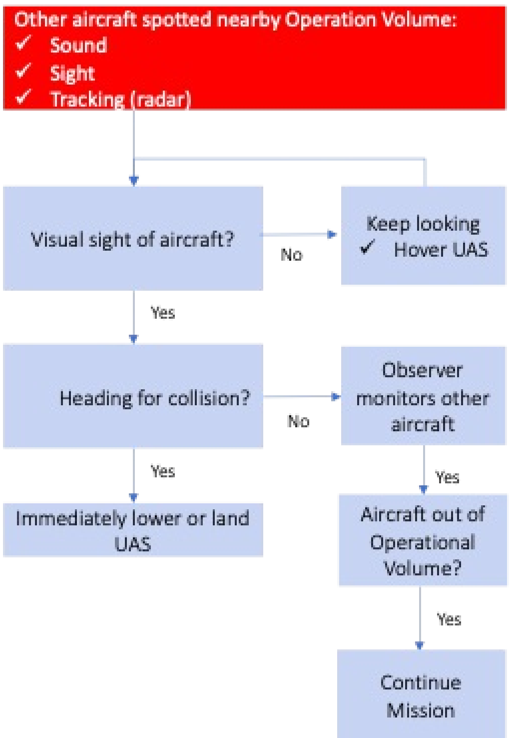
In this situation, the UAS pilot will decide the correct option, whether or not in consultation with the observer.

[C4.5] Avoid conflicts with other airspace users

Sometimes other aircraft enter the Operational Volume. Conflicts must be avoided.

[C4.5.1] Avoiding Other Air Traffic

An intruder is another aircraft that enters the operational volume. The deconfliction scheme contains all possible actions and considerations.



Actions:

1. The observer identifies air traffic and transmits information to the pilot;
2. The observer shall inform the pilot of the direction and, if possible, of the altitude of the other air traffic,
3. Lower the UAS quickly, preferably to the holding area and/or on the landing platform
4. If on the same course and no possibility to descend: swerve to the right;
5. Pause the operation until the other air traffic has passed or stop the entire operation.

[C4.5.2] Communication Problem with Air Traffic Control (LVNL)

Due to occupied frequencies by another parties, signals may deteriorate.

Signals:

- No contact with ATC;
- No clearly audible response ATC;
- Report of poor reception by ATC.

Mitigating measure

- Radio check in advance with Air Traffic Control;
- Telephone numbers in the Emergency Response Plan (enclosed in Operations Flight Plan)

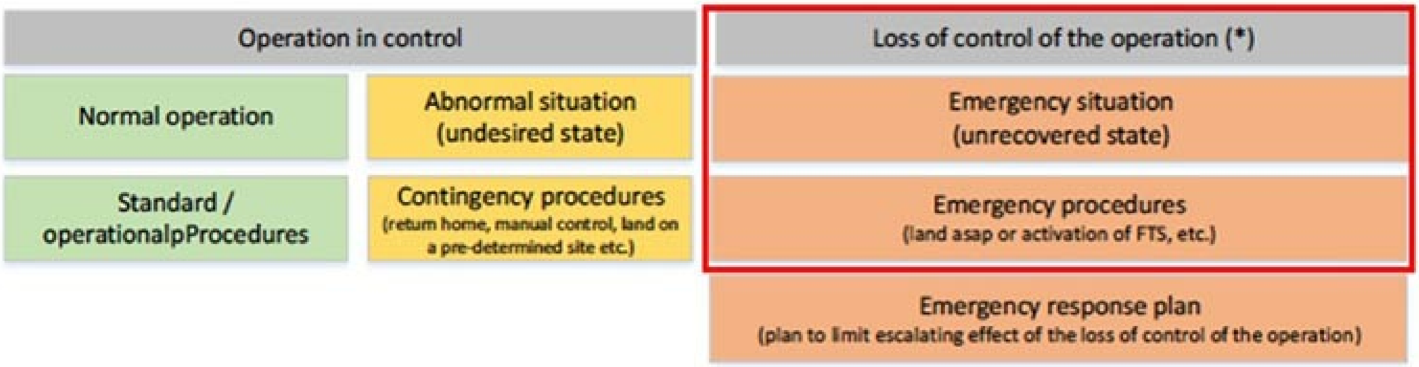
Action

Calling Air Traffic Control by mobile phone. The number is stated by default in the Operations Flight Plan.

PART C5: EMERGENCY PROCEDURES[NOPE]

[C5.0] Introduction Emergency Procedures

Operational control is lost. In this chapter several procedures to cope with loss of operational control are described.



Several scenarios can occur during an emergency. For each situation, it is be described how the pilot and observer of Drone Chiefs will act during these situations. These emergency procedures are regularly trained, see Chapter D2 Training.

[C5.1] Fly Away (Loss of Link)

A "fly away" is a situation in which the UAS no longer responds to input from the controller(s)/RTH function and flies away uncontrollably.

To support the safety situation in the event of a loss or link, a home position must be set by the ground station before the flight operation. The correct setting of the return to home function is necessary to be able to use the function safely during the loss of link.

When the communication between UAS and the remote controller is lost, the UAS will automatically activate the return to home function and the UAS will start the landing procedure.

1. Attempt to initiate RTH
2. Try and re-establish connection by turning off and rebooting remote
3. Since you are aware of your own aircrafts flight duration - Note battery level, bearing and altitude, speed and time the signal was lost. From this you will be able to approximate (with the help of maps) the rough area your aircraft will ditch/attempt to land. Give this information to your local police explaining the reasons etc - see ERP.

When the connection is restored, it may be possible to regain control, when the connection between the remote control and UAS is restored it will be visible on the ground station.

In any case, it is necessary to land the UAS and perform a technical check before the mission can continue.

In the event of Loss of Link due to hijacking, the authorities must be notified immediately as noted in the flight plan, see the section [APPENDIX C] Flight Plan and Check Lists.

Also, report the incident afterwards at ILT (https://www.ILT.nl/onderwerpen/voorvallen-luchtvaart). In the event of a fly-away during an operation near a CTR, the relevant operator is immediately notified.

2. [C5.2] Engine Failure

If an engine failure, the UAS will have to be grounded as soon as possible at a selected fall-back location, which will be stated in the flight plan.

When all engines fail, this must be immediately reported to the surroundings because the UAS can no longer be controlled in a standard procedure and that might result in an uncontrolled crash.

[C5.3] Pilot Unwell

When a pilot becomes unwell, other crew members must have options to safely ground the UAS. Part of the briefing to the observer is explaining how to activate a failsafe mode with a return to home function. This is also part of the practical training.

In the event of a pilot who has become unwell, the observer can then take over control and activate the return to home function of the UAS.

Should medical attention be required, the observer will call emergency services and manage the area. Should a safety risk arise during a flight, the observer will take control and perform the landing. This action will be practiced during practical training.

The Accountable Manager must be notified as soon as possible.

4. [C5.4] Fatal Error

In the event of a crash, the UA will have to be approached with caution and the fire and/or safety situation will have to be assessed by the PIC. Fire extinguishers must be taken to the location of the crash. Affected institutions or organisations must be warned in case of damage to the environment, people or animals, see section [A4.3] Reporting Accident [A11.1] Reporting Procedures and [C6.1] Emergency Response Plan (ERP). In particular, LiPo batteries from the UA can be in an unstable state after a crash with possible ignition hazard. If a crash or collision can be avoided by switching off the engines, the PIC must make a timely decision. In the event of a collision with air traffic, people or the environment, the UA and the engines must be switched off immediately.

5. [C5.5] UAS or Battery Fire

In the event of a fire at the UAS or LiPos, the pilot is responsible for assessing the situation and choosing an approach.

The pilot will perform the following actions:

- Shout “FIRE, FIRE”.
- Manoeuvre the UAS to a safe landing site.
- Switch "Fly" to "Land"
- Land the drone as soon as possible.

The observer will perform the following actions:

- Looking for a safe landing site.
- Informs the pilot about the area and keeps an eye on the UAS.
- Ensures that the area is safe and remains safe.

Once the UAS has landed, the crew will monitor the fire. This incident should be filled in the logbook later.

The surrounding fire will either be extinguished by using the CO_2 extinguisher or the authorities must be notified immediately. After a fire situation, all affected parts will have to be properly disposed of.

The Accountable Manager must be notified as soon as possible. If the fire becomes dangerous, the fire brigade must be informed.

CHAPTER C6: EMERGENCY RESPONSE PLAN (ERP) [ERPE]

[C6.1] Purpose of the ERP

Drone Chiefs should, in cooperation with other stakeholders, if applicable, develop, coordinate, and maintain an ERP that ensures orderly and safe transition from normal operation to emergency and return to normal operation. The ERP includes the actions to be taken by the UAS operator or specified individuals in an emergency, and indicate the size, nature, and complexity of the activities to be performed by the UAS operator.

This procedure has been updated according to ED Decision 2022-002 R.

As for emergency procedures, an ERP is implemented by Drone Chiefs to address emergency situations. However, an ERP is specifically developed to:

- limit any escalating effect of the emergency situation;
- meet the conditions to alert the relevant authorities and entities.
- The ERP should contain all the necessary information about the role of the relevant personnel in an emergency and about their response to it.

[C6.2M] Effectiveness of the ERP Medium level of Integrity

For M3 Emergency Response Plan at Medium Level, additional means of compliance have been issued in Annex II to ED Decision 2022/002/R.

AMC/GM to the annex to regulation EU 2019-947- issue 1 amendment 2 states that for medium level of integrity the following requirements should be met:

Level of Integrity, the ERP:	Proof / see OM chapter:
(a) be appropriate to the size, nature, and complexity of the	

UAS operation; (b) be readily accessible by all relevant personnel and by other entities, where applicable; (c) include procedures and checklists relevant to different or specific emergency situations; (d) clearly define the roles and responsibilities of the relevant personnel; (e) have quick-reference contact details of the relevant personnel; (f) be regularly tested through practical exercises involving the relevant personnel; and (g) be periodically reviewed and updated, when necessary, to maintain its effectiveness.	The ERP of Drone Chiefs is developed for our organisation, accessible for our personnel and includes a procedure and checklists. A quick reference card, procedure, roles and responsibility is part of the Operational (flight) Plan (OP) of Operator. See appendix C1 for a representative tabletop exercise including ERP.
Assurance criterion 1 (procedures):	
a) The ERP is developed to standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority.	This ERP is in accordance with the standards considered adequate by CAA-NL (ILT).
b) The ERP is validated through a representative tabletop exercise consistent with the ERP training syllabus. The tabletop exercise may or may not involve all third parties identified in the ERP.	See appendix C1 for a representative tabletop exercise including ERP.
Assurance criterion 2 (training):	
a) An ERP training syllabus is available.	See chapter training Emergency Procedures
b) A record of the ERP training completed by the relevant staff is established and kept up to date.	See chapter training General

[C6.3] Activation of ERP

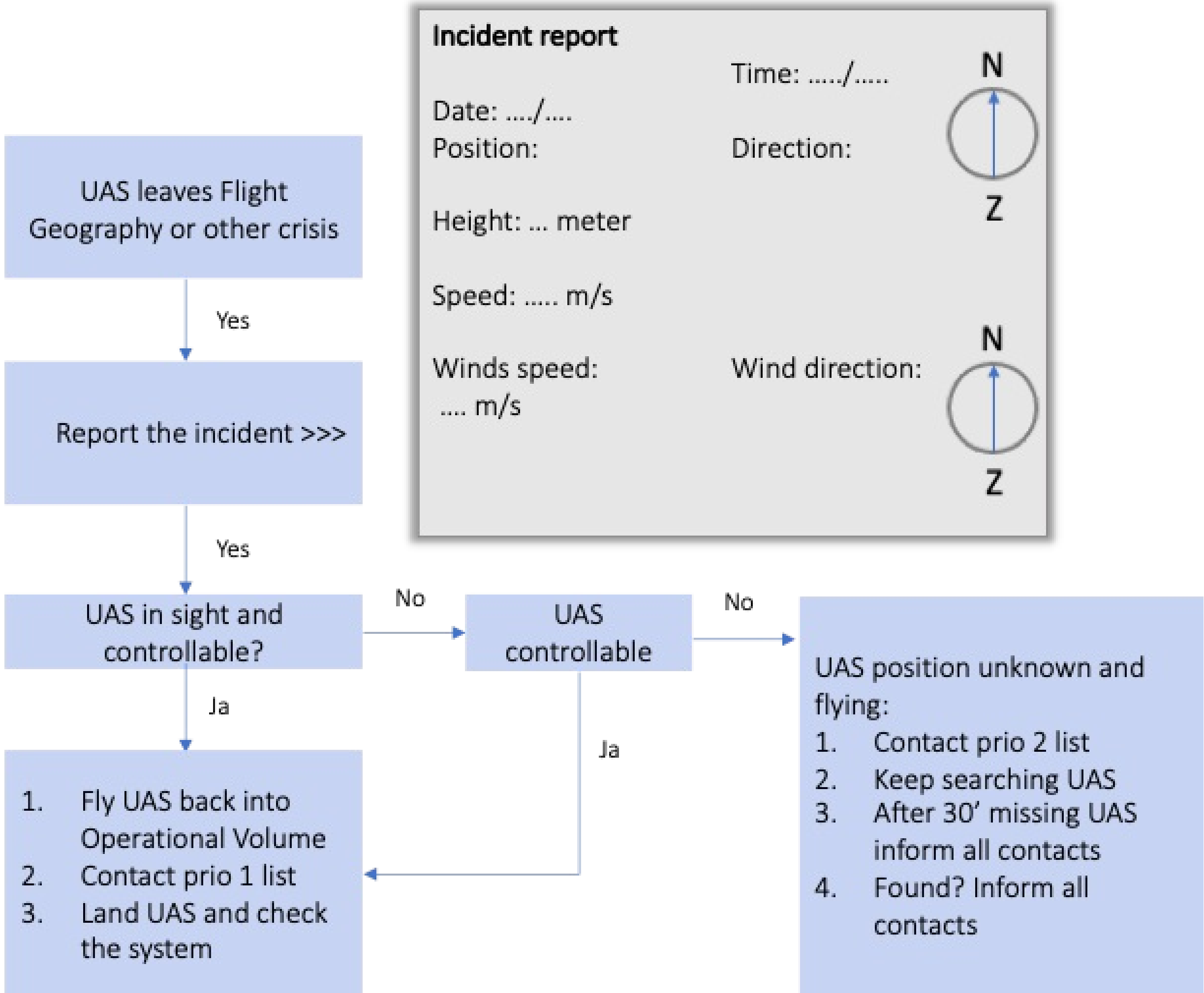
The following events may result in a crisis situation and activate the Emergency Response Plan:

Event	Crisis situation	Checklist(s)
1. Loss of Control due to	Crash, collision, injury, leaving the	[Appendix C6.1] Fly away (up to

technical issue	operational volume	crash)
2. Deterioration of external systems resulting a fly away	Mid-air collision (bird, plane etc.) or crash on ground	[Appendix C6.2] Mid-air collision
3. Human error (both in handling aircraft and safety problems in the operational volume)	Leaving operational volume, collisions manned aircraft, harm persons, animals, start fire	[Appendix C6.1] Fly away (up to crash) of [Appendix C6.2] Mid-air collision
4. Battery fire	Fire on ground that might propagate	[Appendix C6.3] Fire
5. Adverse operating conditions (weather, magnetic interference)	Loss of control which results in collision or crash	[Appendix C6.1] Fly away (up to crash) of [Appendix C6.2] Mid-air collision

4. [C6.4] ERP Procedure and checklist

The following procedure is used by Drone Chiefs. In this procedure differentiation is made between prio 1 and prio 2 group of people/parties to inform:



ERP organisation contact details (example)

Prio	Contact	Working hrs (GMT)	Telephone number	Address / Location/Email	Contacted by
1.1	Caretaker	0700 - 1500	xxxxxxxxxx		Observer
1.2	Supervisor	24/7	xxxxxxxxxx		Observer

1.3	Security	24/7	xxxxxxxxxx		Observer
1.4	Gate	0700 - 1500 24/7	Xxxxxxxxxx		Observer
1.5	Contact person 1 [NAAM]	var.	xxxxxxxxxx		Observer
1.6	Contact person 2 [NAAM]	var.			Observer
2.1	Nearby airfield (<25KM)	24/7	(0413) 27 66 01 (0413) 27 69 11	Example: Volkel	Remote Pilot
2.2	LVNL	24/7	(+31) 020 406 22 01		Remote Pilot
2.3	Dutch police	24/7	(+31) 0900 8844		Remote Pilot
2.4	AOCS Nieuw Milligen	24/7	(+31) 0577 45 87 05		Remote Pilot
3.	In case of Emergency		112		Remote Pilot

See for an example of an Operational Flight Plan, including ERP information in Appendix D.

Chapter C7. SAFETY EQUIPMENT[BVUE]

[C7.1] General Safety Equipment

Reference of this chapter: AMC3 UAS.SPEC.030(3)(e) Application for an operational authorisation

The ERP, for medium/high level of assurance, should indicate the means to be used by the UAS operator to respond to an emergency, which may include one or more of the following:

- facilities, infrastructure, and equipment;
- extinguishing means, e.g. fire extinguishers;
- personal protective equipment, e.g. protective clothing, high-visibility clothing, helmets, goggles, gloves;
- medical means, including first-aid kits;
- communication means, e.g. phones (landline and mobile), walkie-talkies, aviation radios, internet; and others.

The person(s) in charge of the emergency response means should have an updated record of the available means that are indicated in point, including their number and status (e.g. expiry date of perishable means).

In this chapter, the safety equipment in use by Drone Chiefs is described.

[C7.2] CO2 Fire Extinguisher

Drone Chiefs owns a fire extinguisher of the following type:

CO_2 fire extinguisher (this is not suitable for extinguishing a LiPo fire)

The extinguisher has been approved by the Dutch Ministry of the Interior (Ministerie van Binnenlandse Zaken), Fire Service Department and must comply with the European Standard EN3. There must be a CE mark CE0879 on the extinguisher.

The fire extinguisher must also be inspected periodically (1 x every two years) by a recognized organization/institute. When purchasing the fire extinguisher, the production date of the extinguisher will be issued by the supplier. This date must be visibly written on the label of the extinguisher.

The fire extinguisher must be present at the take-off and landing site and be ready for immediate use.

What to do with a LiPo fire

With a UAS, the most fire-hazardous part is the LiPo battery. To understand how to act in the event of a fire caused by an ignition of a LiPo battery, it is good to know what causes such a fire. A LiPo can ignite thanks to; heat from the outside, overvoltage, under-voltage, short circuit, damage or perforation from outside and/or swelling. These are all possible causes or indicators that indicated a (future) LiPo fire. Upon detecting any of the above defects immediately;

- Determine the location of the nearest fire extinguisher.
- Informing colleagues present and informing the responsible person present.
- In the event of a fire with a risk to the environment, immediately notify colleagues and authorities such as the fire brigade. The nearest emergency services are listed in the flight plan.
- Leave the battery burning – 20 minutes is a safe margin – and if necessary use a fire extinguisher at the fire location for the environment, keep a safe distance and DO NOT inhale the smoke.

3. [C7.3] First Aid Kit

To be able to provide support in case of accidents, a first aid kit is always available at the office of Drone Chiefs and also during the operation on location. The first aid box is the type BHV (bedrijfshulpverlener, emergency response officer) and therefore complies with all guidelines. The crew and/or employees present should be aware of the location of the first aid box.

4. [C7.4] Safety Vests

To increase the visibility of the flight crew, it is mandatory to wear recognizable safety vests during the operation. Wearing the vests ensures mutual recognition, but also distinguishes them from uninvolved persons and any authorities present. The crew wear a safety vest. These vests are also mandatory on construction sites, along with other personal protective equipment. Site regulations will be met as prescribed.

PART D: TRAINING AND INSTRUCTIONS

Chapter D1: GENERAL INSTRUCTIONS FOR FLIGHT OPERATIONS [VUE]

[D1.1.1] Regulations in EU and the Netherlands

This Operations Manual is in accordance with the following Dutch Aviation Act (and the other Aviation Act) and European regulations:

- Besluit bewijzen van bevoegdheid voor de luchtvaart
- Besluit luchtvaartuigen 2008
- Besluit vluchtuitvoering
- Besluit luchtverkeer 2014
- Besluit burgerluchthavens
- (Besluit) RTL (Regeling toezicht luchtvaart)
- Regeling inschrijving burgerluchtvaartuigen
- Regeling erkenningen luchtwaardigheid 2008
- Regeling veilig gebruik luchthavens en andere terreinen
- Regeling vluchtuitvoering
- Regeling luchtverkeersdienstverlening
- Regeling Onbemande Luchtvaartuigen (ROL)
- Wetboek van Strafrecht
- SERA (Standard European Rules of the Air)
- Uitvoeringsverordening (EU) 2019/945 and 947 for unmanned systems

For UAS flights are especially important:
1. EU legislation, concerning EU 2019/947 and 2019/945
2. National legislation (different per EU member state, see A7.24 flying in other EU countries)

UAS EU Regulations

N.B. The regulations will be amended by the European Union occasionally. Check the section [D1.1.3] Amendment EU Regulations for the present regulations.

The UAS Regulations consists of two separate, but interlinked regulations as follows:

- “Commission Implementing Regulation (EU) 2019/947 on the procedures and rules for the operation of unmanned aircraft”.
- “Commission Delegated Regulation (EU) 2019/945 on unmanned aircraft and on third country operators of unmanned aircraft systems”.

In this chapter, the summary of the regulation regarding the specific category is described. The complete regulations are published at EUR-Lex for the implementing regulation and EUR-Lex for the delegated regulation.

Subject Matter

This Regulation lays down detailed provisions for the operation of unmanned aircraft systems as well as for personnel, including remote pilots and organisations involved in those operations.

Applicability of the Regulation

- The regulations are applicable throughout the EU and the Netherlands from 1 July 2019.
- The term 'operation of unmanned aircraft systems' does not include indoor UAS operations.

Summary

UAS Operations shall be performed in the 'open', 'specific' or 'certified' category defined respectively in Articles 4, 5, and 6, subject to the following conditions:

a. UAS operations in the 'open' category shall not be subject to any prior operational authorisation, nor to an operational declaration by the UAS operator before the operation takes place;
b. UAS operations in the 'specific' category shall require an operational authorisation issued by the competent authority pursuant to Article 12 or an authorisation received in accordance with Article 16, or, under circumstances defined in Article 5(5), a declaration to be made by a UAS operator.
c. UAS operations in the 'certified' category shall require the certification of the UAS pursuant to Delegated Regulation (EU) 2019/945 and the certification of the operator and, where applicable, the licensing of the remote pilot.

UAS operations in the 'open' category must comply with the operational limitations set out in Part A of the Annex to the implementing Regulation.

If the requirements for the' open' category cannot be met, the UAS operator must obtain an operational authorisation to operate in the 'specific' category from the competent authority in the Member State where it is registered. When applying for this, the operator must perform a risk assessment and if the competent authority considers that the operational risks are adequately mitigated it will issue an operational authorisation which may apply to a single operation or to a number of operations.

UAS operations in the 'specific' category must comply with the operational limitations set out in their authorisation.

See also: Easy Access Rules for Unmanned Aircraft Systems (Regulation (EU) 2019/947 and Regulation (EU) 2019/945)

UAS Regulations in the Netherlands

In the Netherlands, in addition to EU regulations, the following Aviation Act should be taken in account: Aviation Act: https://wetten.overheid.nl/BWBR0005555/. And more specifically the Air Traffic Decree: https://wetten.overheid.nl/BWBR0035899/. This decree regulates matters that are important for UAS flights, such as Article 10.

For flying with drones, it is important;

Regulations on Unmanned Aircraft (Regeling Onbemande Luchtvaarttuigen, ROL)

Regarts to Commission Implementing Regulation (EU) nr. 2019/947 van de Commissie of 24 May 2019 on rules and procedures for the operation of unmanned aircraft (PbEU 2019, L 152), the articles 1.5, 1.6, 1.7 and 5.10, first paragraph, section a, of the Aviation Act, the articles 4, 4a, 19, third paragraph, and 20 of the Air Traffic Decision 2014 and Section 13, subsections 4 and 5, of the Aviation Licences Decree;

Zoning Regulations for Unmanned Aircraft:

The GoDrone application made available by the government and LVNL for UAS flying in the Netherlands can be used for this purpose.

1. [D1.1.2] Privacy Laws and Regulations

The Dutch Criminal Code articles 139f and 139g states the following:

The following is punishable by imprisonment not exceeding six months or a fine of the fourth category:

1 °. He who, using a technical aid the presence of which has not been clearly communicated, creates an image intentionally and unlawfully of a person present in a dwelling or another place not accessible to the public;

2 °. He who has access to an image which he knows or should reasonably suspect has been obtained by or as a result of an act punishable under 1 °.

Article 139g

Anyone who publishes an image as referred to in the previous article, under 2 °, will be punished with imprisonment not exceeding six months or a fine of the fourth category.
Furthermore, the Personal Data Protection Act and the European Privacy Regulation are the most important laws and regulations that apply.

To comply with privacy legislation, Article 10 of the Constitution must be taken into account. The right to privacy is regulated here: 'Everyone has the right to respect for his privacy, subject to or the underlying restrictions to be set'. However, if permission is given to take and use the photo, there is no longer any question of a violation. The General Data Protection Regulation (GDPR) states that personal data is all information about an identified or identifiable natural person. This means that information is either directly about someone or can be traced back to this person. These can be example number plates of cars, but also addresses. Several reasons justify the processing of personal data.

A UAS operator may process personal data based on compliance with an agreement with customers. However, photos of persons can in certain cases fall under the category of biometric data and in that case are special personal data. Different rules apply for this. In that case, complying with an agreement is not a sufficient reason to be allowed to process this data. A UAS operator can use agreements with both the building owner and the building user. Consent is in all cases a valid reason to be allowed to process personal data. The use of a controlled territory prevents unauthorized people from entering the flying area. A blurring tool must be used on every photo taken to make windows, faces, license plates and other personal data unrecognizable. The removal of personal data also falls under the processing of personal data.

Drone Chiefs therefore deliberately prohibits their employees, including hired personnel, from making, possessing or distributing recordings of people in the house, garden (behind a fence or hedge) or other - not accessible to the public - place.

[D1.1.3] Amendment EU Regulations

Amendment Regulation 2020/639

The amendment of these regulations was made by Regulation 2020/639 on 12 May 2020. The main changes in regards to the specific category are:

- In order to improve the conspicuity of UAS flown at night and make it easily distinguishable from a manned aircraft, a green flashing light should be activated on the UAS. This requirement is applicable from 01.07.2022
- The responsibilities of the UAS operator in the specific category with respect to record-keeping are described in more detail. These include records for personnel, their qualification and the UAS operations performed, including unusual technical or operational occurrences.
- Added 2 standard scenarios for UAS operations in the specific category (Appendix 1 to the Annex. N.B.

these scenarios can be only used from December 2, 2023, in the Netherlands):
  - STS-01 – VLOS (visual line of sight) over a controlled ground area in a populated environment
  - STS-02 – BVLOS (beyond VLOS) with Airspace Observers over a controlled ground area in a sparsely populated environment

Amendment Regulation 2020/746

The amendment of these regulations was made by Regulation 2020/746 on 4 June 2020. The main changes in regards to the specific category are:

- Some UAS types are allowed to continue to be operated if they have been placed on the market before 1 January 2023.
- Deadlines for adaptation of authorisations, declarations and certificates.
- The applicability of Regulation 2019/947 is postponed to 31 December 2020.
- The deadlines for making information on UAS geographical zones publicly available is extended to 1 January 2022.

[D1.2] Classification of Airspace

The entire airspace in the Netherlands is divided into different airspaces. Each airspace has its qualification (class). Each airspace class has different rules and restrictions with which pilots shall bind. The rights and obligations associated with the 7 airspace classifications (Class A to G) have been established by the International Civil Aviation Organisation (ICAO) and are therefore used worldwide. In Europe, the Standardised European Rules of the Air (SERA) airspace classification system is applied. The SERA airspace classification is described in ENR 1.4, ATS Airspace Classification and Description. You will also find a map on the VFR chart The Netherlands.

In the AIP, at ENR 6, En Route Charts, you will find map ENR 6.3.1. which shows the geographical layout of the airspace including the lower limit and the upper limit of the different airspace classes. Certainly, only the lower airspace is applied for flying a UAS. Class G airspace is the rest of the area where no class has been assigned. In section ENR 1.4 of the AIP, you will find criteria for being permitted to conduct any flight operations at each class. Class G is particularly important for flying a UAS. If you are permitted to fly civilian or military CTRs, class C and D will be also of interest.

Any other aspects are also described in IVAO Netherlands, section Luchtruim (Dutch language only).

3. [D1.3] VFR regulations

Visual Flight Rules (VFR) are a set of regulations under which a pilot conducts a flight operation in weather conditions generally clear enough to allow the pilot to see where the UAS is flying. It is therefore that the operation is intended to be conducted in visual meteorological conditions (VMC). Under VFR it should be circumvented when the weather conditions cause low visibility such as thick clouds or heavy precipitation.

4. [D1.4] General Meteorology

The influence of weather and climate is very important to complete UAS operations safely. Especially a small object such as UAS is more affected by the weather conditions. It is, therefore, more crucial to be aware of the weather forecast surrounding the operation all the time.

The weather information around the UAS operation area shall be obtained from the Dutch national weather service, The Royal Netherlands Meteorological Institute (KNMI). On their website you can obtain the following information:

- Maximum temperature
- Minimum temperature
- Probability of precipitation
- Precipitation quantities
- Percentage of sunshine
- Probability of potential mist
- Wind speeds (Beaufort wind force scale)
- Wind directions

Additionally, a METAR weather report can be checked at this site. METAR is a format for reporting weather information. A typical METAR contains data for the temperature, dew point, wind direction and speed, precipitation, cloud cover and heights, visibility and barometric pressure. A METAR may also contain information on precipitation amounts, lighting and other information which would be of great interest to UAS pilots. The other meteorological information webpages are;

- Automatic Terminal Information Service (ATS)
- Buienradar (radar information)
- Terminal Aerodrome Forecast (TAF)

The PIC is responsible for checking the weather 24 hours before every scheduled flight operation. The weather conditions must be within the UAS limitations. Prior to the taking-off, both the weather condition and also the wind condition should be checked. The wind condition can be found at windfinder (www.windfinder.com) or windguru (www.windguru.com).

During the entire operation, the weather should be visually and continuously monitored. If a mobile phone with an internet connection is available, the current weather radar information could be obtained. The operator could also use a windmeter or a thermometer to measure the weather conditions.

5. [D1.5] Icing Conditions

Icing occurs due to a combination of cold temperatures and humidity in the air. The accreted ice layer causes many dangerous problems during the UAS flight such as reduced lift and increased drag forces, significantly decreased angle of attack, strong vibrations and structural imbalances of UAS, malfunction of control surfaces and air pressure sensors, reduced visibility and improper radio communication.

The bigger the water droplets, the more likely they will hit the drone. Small water droplets follow the airflow (downwash) more. As a result, they hit only the bottom of the side of the UAS. The faster the UAS flies, the more droplets hit the UAS.

The three main types of ice accretion, in order of their hazard to flying, are as follows:

- Clear ice: Often clear and smooth. Supercooled water droplets, or freezing rain, strike a surface but do not freeze instantly. Relatively large drops of water.
- Rime ice: Rough and opaque, formed by supercooled drops rapidly freezing on impact.
- Hoar frost: White ice crystals deposited on the ground or loosely attached to exposed objects. It forms from water vapour in an above freezing atmosphere coming in contact with a solid surface whose temperature is below zero Celsius.

Instruction for crew members

When the above-mentioned icing occurs, no flight operation shall be executed and is shall be rescheduled.

When the operation is conducted under cold weather condition, the UAS should be always flown as low as possible. Also, the UAS should be flown in short proximity to the pilot. Besides, the speed of the UAS should be kept lower. And every 5 minutes of the operation the UAS should be examined if any icing occurs to the UAS. Monitor the behaviour of the UAS in the air and immediately land the UAS and dry it, if there is any suspicion that icing occurs.

[D1.6] Turbulence

Turbulence is defined as the ‘irregular motion’ of the air from eddies and vertical airflows. It is different from wind that flows horizontally from different directions, a force that is easily measured by weather services. A turbulent flow can occur when the wind changes directions or a storm arrives at a locality.

A UAS operation could be disturbed by turbulence when the UAS is flown behind windmills or in the vicinity of buildings, or any other (man-made) obstructions.

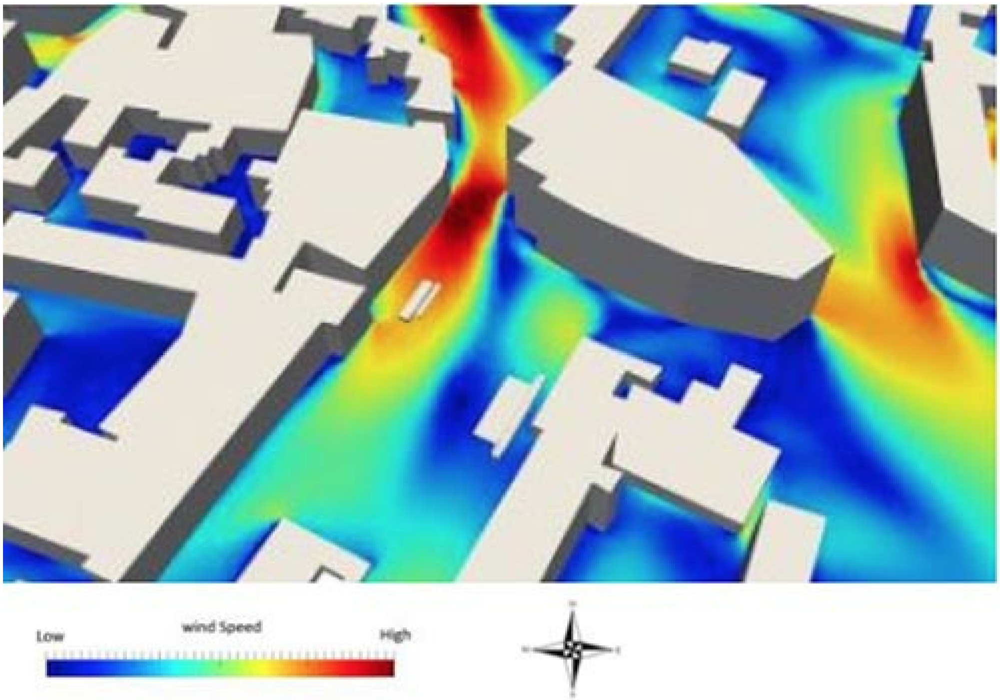
There are mainly three mechanisms which turbulence occurs:

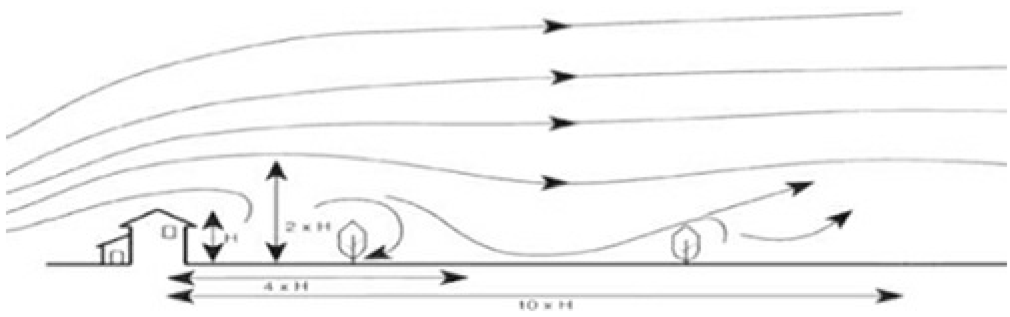
- Thermal Turbulence is caused by solar heating of the surface, which in turn heats the lower atmosphere resulting in unequal convective currents.
- Mechanical Turbulence results from wind flowing over or around irregular terrain or man-made obstructions.
- Orographic turbulence arises from the friction of the air when blowing against mountainous elevations.

The Venturi-effect

The Venturi effect is a case where fluid flows through a narrow tube. The velocity of the fluid increases as it flows through the narrower tube while the pressure decreases, due to the first law of thermodynamics.

When standing between high-rise buildings, you might feel that the wind blowing around you is faster and stronger. This accelerating wind, i.e., turbulence, is the result of squeezed air through narrow spaces when several high-rise buildings stand close to one another (See the schematic figure below).





Instruction for crew members

In specific UAS operations, such as in the vicinity of industry and/or urban areas, turbulence as a result of the venturi effect can be expected. Also, there is a strong possibility of a lost link in these areas as a result of EM disturbance. During the flight preparation, the Venturi-effect should be taken into account by properly mapping out the obstacles present in the vicinity and estimating the effect.

The UAS pilot should operate the UAS in manual mode and fly it slowly. The pilot should have been trained for this circumstance during his training.

[D1.7] Wind Shear and Wind Gusts

Wind shear is a change in wind speed and/or direction over a short distance. It can occur either horizontally or vertically and is most often associated with strong temperature inversions or density gradients. There are many causes of wind shear. In UAS flight operation, the common low-altitude wind shear includes frontal wind shear, topography-induced wind shear and micro downburst. To avoid wind shear conditions as much as possible, you could sometimes anticipate it from observing the type of clouds (see the below figure).

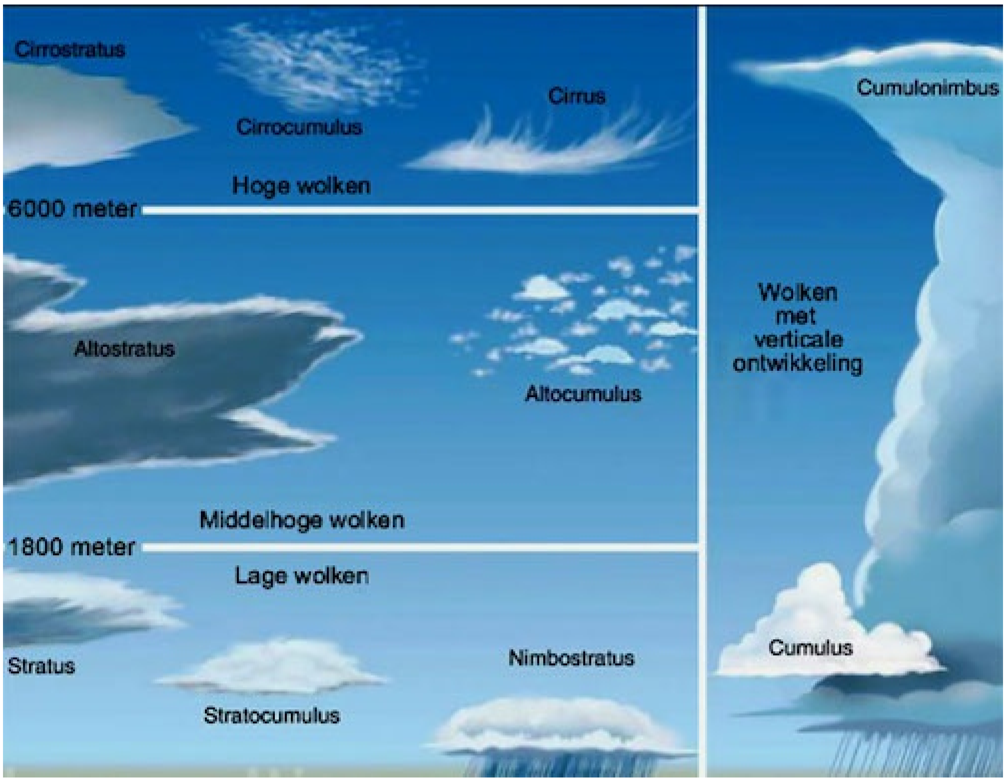


Figure: Classification of clouds

No.	Cloud Type	Abbr.	Description
1	Cirrus	Ci	High-altitude, thin, and wispy cloud streaks made of ice crystals
2	Cirrocumulus	Cc	Small, flakey and white high-altitude cumulus patches
3	Cirrostratus	Cs	Thin, transparent, high-altitude layer capable of producing a halo
4	Altocumulus	Ac	Middle-altitude cumuliform clouds arranged in heaps or rolls
5	Altostratus	As	Featureless, grey layer cloud capable of masking the sun
6	Stratocumulus	Sc	Thicker, dark grey and somewhat conjoined heaps of clouds
7	Stratus	St	Gray, featureless low-altitude cloud capable of ground contact
8	Nimbostratus	Ns	Dark and featureless layer cloud responsible for rain and snow
9	Cumulus	Cu	Low-altitude, fluffy heaps of clouds with cotton-like appearance
10	Cumulonimbus	Cb	Dark-based storm cloud capable of impressive vertical growth

Table: Cloud identification

The orange cloud types (5 and 6) shown are very unstable and hazardous variants, so it is not advisable to take off the UAS at all. The chance of wind gusts and rapid change in the atmosphere is very high.

Instructions for crew members

The red cloud types (7-10) are very dangerous and almost always bring rainfall, this could be led by drizzles to heavy showers and thunderstorms with flooding. It is highly expected that the wind could blow strongly. With these cloud types, no UAS operations should be executed.

High-Altitude Winds

The speed of high-altitude winds is proportional to height. A force imparted on air will cause the air to move more easily when the mass of the air is less. Dense air requires a greater force to move it at the same speed as less dense air. With air density decreasing with height, it is easier to move the less dense air at a higher wind speed. Therefore, the UAS may face difficulties to overcome wind resistance when the UAS operation is carried out at a higher height. The manufacturer sets a maximum wind speed at which the UAS can still hold the position in the air firmly. Bear also in mind that the wind frequently changes in direction as height increases as well.

Since wind strength plays an important role in the development of turbulence, this element will be included in the safety analysis for flying in the vicinity of an object.

There is a mathematical formula for calculating the wind at height and various tools have been developed. One of them can be found on the website of 'The Swiss Wind Power Data Website'.

8. [D1.8] Kp-index (Solar Activity)

The Kp-index is a measurement of the Earth's magnetic field caused by the solar wind. This type of interference is caused by things like solar activity and has a huge impact on your ability to safely operate the UAS via GNSS. Solar activity interferes with GNSS signals;

- It decreases the signal-to-noise ratio and affects carrier frequency, causing the receiver to lose lock on some satellites.
- It changes the propagation delay through the ionosphere, making GNSS positioning inaccurate.

So in the worst case, poor GNSS reception means that the UAS no longer knows where it is at all. And that could result in a fly-away.

To prevent poor GNSS reception, it is useful to always check the level of solar activity before each flight operation.

Kp-index is expressed on a scale of 1-9. It is considered that under the level of 3, the geomagnetic activity is 'quiet', while at 4 it is 'disturbed' and over 4 that we are under a magnetic storm.

Instruction for crew members

When the Kp-index is higher than 5, there is a magnetic storm. Under such a circumstance, it is strongly advised that no flight operation is executed.

You can download a free app (Hover - Drone&UAV pilot) to your smartphone. You can also check this webpage (SpaceWeatherLive.com) for real-time solar activity.

9. [D1.9] Disruption of GNSS signal

The GNSS receiver in the UAS receives signals from GNSS. With this, the GNSS computer determines the position of the UAS.

The GNSS position accuracy is decreased due to:

- Changing the satellite coverage.
- Changing in signal rate due to more/less free electrons in the ionosphere (influenced by sun activity).
- Changing by air pressure, humidity and temperature in the troposphere.
- Height deviation in connection with the height modulation of the earth's surface.
- Reflection of the GNSS signal on a water surface.

In addition to the GNSS's inaccuracy of 10 meters or less, other influences cause the inaccuracy to be taken (temporarily);

- Signal blockage; the GNSS signal is usually weak and is quickly blocked by trees in a forest or buildings in a city area.
- Multipath: a reflection of the signal, which makes finding the signal takes a long time or fails.
- Disturbance: the weak GNSS signal is easy to disrupt with a stronger signal. GNSS receivers are currently protected against jamming for this.

Instructions for crew members

In emergency procedures, mitigation measures have been taken to prevent the loss or weakening of the GNSS signal. Read the chapter 'Flight Preparation' for more information.

10. [D1.10] Electromagnetic (EM) Fields

Electromagnetic (EM) fields are a combination of invisible electric and magnetic fields of force. They are generated by natural phenomena, but also by human activities, mainly through the use of electricity. Mobile phones, power lines and transmitters are examples of equipment that generates EM fields.

The strength of EM fields is increased when you are in proximity to the source, i.e., EM filed. The strength of EM fields is decreased when you take a distance from the source. The conductor, device or transmitter that produces the EM fields is called the source. The number of waves that pass a fixed point in unit time is called, in physics, frequency. The hertz is the derived unit of frequency in the International System of Units (SI) and is defined as one cycle per second.

It is particularly important for conducting a UAS operation to realize that EM fields can interrupt the proper functioning of the compass in the UAS. Besides, strong electromagnetic fields can unfavourably affect working electrical parts of the UAS and cause a malfunction. It is advised that EM fields should be avoided for these reasons. Or a distance of 25 meters from the EM field should be continuously monitored to operate the UAS safely.

In the EM field generated by human activities, there are mainly two sources;

- As a by-product of the electricity generation, transport or use of electricity. Examples are high-voltage lines, electric motors and welding equipment.
- To heat materials or send information. Examples are induction heaters and transmission installations for mobile telecommunication.

Examples of objects that create a strong EM field

Low frequency	High frequency
Solar inverters	
High-voltage power pylons and supply cables	
Overhead lines for trains	
Stadium lights (High-intensity discharge lamps)	Transmission towers
Locations where electricity is generated	Distribution transformers
Incinerators	Moving trains
Areas with ranging fire	
Large electric motors	
Welding equipment	

The above-mentioned EM fields could disturb the GNSS signal of the UAS. As a result of that, A safe flight operation could not be executed. Possible phenomena are;

- No response to the smart controller
- Unexpected flight moves

- Fly-away due to disruption of UAS internal systems

Instruction for crew members

The UA should be away from the EM field as soon as possible.

Chapter D2: TRAINING[TE]

[D2.1] Introduction Training

The ‘specific’ category may cover a wide range of UAS operations with different levels of risk and a wide range of UAS designs, in particular in terms of level of automation. The following guidelines may, therefore, have to be adapted considering the level of automation and the level of involvement of the remote pilot in the management of the flight. The UAS operator is, therefore, required to identify the competency required for the remote pilot according to the outcome of the risk assessment.

To be part of an operation, the Drone Chiefs flight crew must have the required basic knowledge to work with UAS and be aware of current procedures, legislation, emergency procedures and technical possibilities. Also, the flight crew must be current at all times, this means; be able to provide evidence of recent practical experience and completed training modules. Training is also important for working on the "just culture". Safety issues of the past period are also discussed during the training.

To guarantee this level of knowledge within Drone Chiefs, we organize initial training courses when a flight crew member enters employment, followed by annual retraining.

The initial and annual training modules consist of 4 parts:

1. Theoretical training
2. Practical training on normal operational and contingency procedures
3. Practical training for specific endorsement modules
4. Practical training emergency procedures

Our pilots demonstrate that they are current by submitting a logbook. It contains the number of flight hours which are necessary to stay current, see chapter A3.2 Currency Requirements.

Retraining consists of elements from the initial training, supplemented with current events and any incidents and/or cases that are relevant from the own organization.

All training courses are concluded by processing the results in a written evaluation and discussing the results of the training with the flight crew.

[D2.2] Theoretical Training

Drone Chiefs proposes to the competent authority, as part of the application, a theoretical knowledge training course for the remote pilot based on the elements that are listed in AMC1 UAS.OPEN.020(4)(b), in UAS.OPEN.040(3), in AMC1 UAS.OPEN.030(2)(c) and in Attachment A to the Annex of the UAS Regulation, which are relevant for the intended operation, complemented by the elements listed below.

Aviation safety:

i. remote pilot records;
ii. logbooks and associated documentation;
iii. good airmanship principles;
iv. aeronautical decision-making;
v. ground safety;
vi. air safety;
vii. air proximity reporting; and
viii. advanced airmanship:
    A. manoeuvres and emergency procedures; and
    B. general information on unusual conditions (e.g. stalls, spins, vertical lift limitations, autorotation, vortex ring states);.

Aviation regulations:

i. introduction to the UAS Regulation with focus on the ‘specific’ category;
ii. risk assessment, introduction to the SORA; and
iii. overview of the STSs and the PDRA;.

Navigation:

i. navigational aids (e.g. GNSS) and their limitations
ii. reading maps and aeronautical charts (e.g. 1:500 000 and 1:250 000, interpretation, specialised charts, helicopter routes, U-space service areas, and understanding of basic terms); and
iii. vertical navigation (e.g. reference altitudes and heights, altimetry);.

Human performance limitations:

i. perception (situational awareness in BVLOS operations);
ii. fatigue:
    A. flight duration within work hours;
    B. circadian rhythm;
    C. work stress;

- D. vision problems; and
- E. commercial pressure; and

iii. attentiveness:
- A. eliminating distractions; and
- B. scan techniques;

iv. medical fitness (health precautions, alcohol, drugs, medication,); and
v. environmental factors such as vision changes from orientation to the sun.;

Airspace operating principles~~:~~

i. airspace classifications and operating principles;
ii. U-space;
iii. procedures for airspace reservation;
iv. (iv) aeronautical information publications (AIPs); and
v. NOTAMs.

General knowledge of UASs and external systems that support the operation of UASs:

i. differences between autonomy levels (e.g. automatic versus autonomous operations);
ii. loss of signal and system failure protocols — understanding the condition and planning for programmed responses such as returning to home, loiter, landing immediately;
iii. equipment to mitigate air and ground risks (e.g. flight termination systems);
iv. flight control modes;
v. the means to monitor the UA (its position, height, speed, C2 link, systems status,);
vi. the means of communication with the VOs; and
vii. the means to support air traffic

Meteorology:

i. obtaining and interpreting advanced weather information:
- A. weather reporting resources;
- B. reports;
- C. forecasts and meteorological conventions appropriate for typical UAS flight operations;
- D. local weather assessments (including sea breeze, sea breeze front, and urban heat island);
- E. low-level charts; and
- F. METAR, SPECI, TAF;

ii. regional weather effects — standard weather patterns in coastal, mountain or desert terrains; and
iii. weather effects on the UA (wind, storms, mist, variation of wind with altitude, wind shear,).~~;~~

Technical and operational mitigation measures for air risks:

i. operations for which airspace observers (AOs) are employed; and
ii. principles of detect and avoid (DAA).

Operational procedures:

i. mission planning, airspace considerations, and site risk assessment:
    A. measures to comply with the limitations and conditions applicable to the operational volume and to the ground risk buffer for the intended UAS operation;
    B. UAS operations over a controlled ground area;
    C. BVLOS operations;
    D. use of UA VOs;
    E. importance of on-site inspections, operation planning, pre-flight and operating procedures;
ii. multi-crew cooperation (MCC):
    A. coordination between the remote pilot and other personnel (e.g. AOs) in charge of duties essential to the UAS operation;
    B. crew resource management (CRM):
        a. effective leadership;
        b. working with
    C. Managing data sources regarding:
        i. where to obtain the data from;
        ii. the security of the data;
        iii. the quantity of the data needed; and
        iv. the impact on the storage of

Emergency response plan (ERP):

the UAS operator should provide its personnel with competency-based theoretical training covering the ERP that includes the related proficiency requirements and recurrent training.

Both the training and the assessment should be appropriate to the level of automation of the intended UAS operation.

Source: Annex II to ED Decision 2022/002/R

Currency training (internally)

During the theoretical recurrency training, the emphasis will be on the required basic knowledge necessary to operate safely with a UA. Besides, the most up-to-date operational manual of Drone Chiefs is reviewed.

The theoretical training is also an opportunity to evaluate any incidents that have occurred in the past period.

[D2.3] Practical Training on Operational Procedures

Regarding the practical-skills training and assessment for the remote pilot, Drone Chiefs considered the competencies that are defined in AMC2 UAS.OPEN.030(2)(b), complemented by the items listed below. Drone Chiefs adapted the practical-skills training to the characteristics of the intended UAS operation and the functions available on the UAS. Drone Chiefs uses the same listed topics and may provide a practical training course also for all other personnel in charge of duties essential to the UAS operation. Appropriate simulators may be used to conduct some or all the tasks.

Appropriate simulators may be used to conduct some or all the tasks.

1. Preparation of the UAS operation:

   i. implement the necessary measures to comply with the limitations and conditions applicable to the operational volume and to the ground risk buffer for the intended UAS operation in accordance with the OM procedures;
   ii. follow the necessary procedures for UAS operations in controlled airspace, including a protocol to communicate with the ATC and obtain clearance and instructions, if necessary;
   iii. confirm that all necessary documents for the intended UAS operation are on-site;
   iv. brief all participants on the planned UAS operation;
   v. perform visual airspace scanning; and
   vi. if AOs are employed, place them appropriately and brief them on the deconfliction scheme that includes phraseology.

2. Preparation for the flight:

   i. ensure that all safety systems and functions, if installed on the UAS, including its height and speed limitation systems, flight termination system, and triggering system, are operational; and
   ii. know the basic actions to be taken in the event of an emergency, including issues with the UAS, or a mid-air collision hazard arising during the flight.

3. Flight under abnormal conditions:

   i. manage a partial or a complete power shortage of the UA propulsion system, while ensuring the safety of third parties on the ground;
   ii. manage a situation of a non-involved person entering the operational volume or the controlled ground area, and take appropriate measures to maintain safety; and
   iii. react to, and take the appropriate corrective actions for, a situation where the UA is likely to exceed the limits of both the flight geography (contingency procedures) and of the operational volume (emergency procedures) as they were defined during the flight preparation.

4. In general, emphasis should be placed on the following:

i. normal, contingency, and emergency procedures;
ii. skill tests combined with periodic proficiency checks;
iii. operational experience (with on-the-job training counting towards proficiency);
iv. pre-flight and post-flight procedures and documentation;
v. recurrent training (UAS / flight training device (FTD)); and
vi. remote pilot incapacitation.

The practical-skills training may be conducted with the UAS or on an Scenario-based training (SBT) with highly structured, real-world experience scripts for the intended UAS operation should be used to fortify personnel's learning in an operational environment and improve situational awareness. SBT should include realistic normal, abnormal, and emergency scenarios that are drafted considering specific learning objectives.

The practical-skills training is checked during the assessment and can be provided using the actual UAS or an FTD appropriate to the intended UAS operation.

Initial and recurrent training

Drone Chiefs ensures that specified minimum requirements regarding the time of the initial and recurrent training (e.g. duration and number of flight hours) are provided for in a manner that is acceptable and approved by the competent authority.

Depending on the training course, each of the topics shown in Table 1 below may require only overview training or in-depth training. In-depth training should be interactive and should include discussions, case-study reviews, and role play, as deemed necessary to enhance learning. In case of change or update of the software/hardware of the UAS, depending on the size of the changes, the UAS operator should define the level of training.

Topic	Initial training	Change of UAS	Change of remote pilot/crew	Recurrent training
Situational awareness and error management	In-depth	In-depth	Overview	Overview
Organisational safety culture, operational procedures, and organisational structure	In-depth	Not required	In-depth	Overview
Stress management, fatigue, and vigilance	In-depth	Not required	Not required	Overview
Decision-making	In-depth	Overview	Not required	Overview
Automation and philosophy of the	As required	In-depth	In-depth	As required

use of automation				
Specific UAS type-related differences	As required	In-depth	Not required for the same UAS type)	As required
Case-based studies	In-depth	In-depth	In-depth	As required

Table 1 — Level of the practical-skills training in several topics depending on initial training, recurrent training, or change of UAS / remote pilot / remote crew

Source: Annex II to ED Decision 2022/002/R

[D2.4] Practical Training for Contingency Operational Procedures

During the practical training, contingency operational procedures are discussed that deviate from the standard operating procedure at a safety level. These are specific procedures such as; flying in the vicinity of an object and other high-risk operations such as flying in the CTR. These operations require more of the flight crew than the standard operation, so it is important to train the flight crew to deal with these situations. Before each specific operation, that operation will be trained at least once during a practical simulation training to familiarize the flight crew with the additional procedures.

After the practical training for contingency operational procedures, the flight crew member has:

- Specific knowledge and experience in working with the deviating procedures such as flying in a CTR (compass, flight plan, etc.)
- Practical experience working with the UA under different circumstances
- Practical experience in executing additional safety measures

[D2.5] Practical Training for Emergency Procedures

Emergency situations are undesirable and unexpected. In such a situation, it is much more difficult for crew members to act correctly because experience and/or stress could strongly play a role in such a moment.

For the scenarios with an emergency response plan (ERP) the relevant crew of Drone Chiefs has training on making an ERP for a specific operation. During ERP training a possible accident will be simulated.

The training is a meeting where all relevant team members discuss a simulated emergency scenario. Review and discuss the actions they would take in a particular emergency.

A (simulated) test of the emergency plan in an informal, low-stress environment will be part of the training. Exercises are used to clarify roles and responsibilities and to identify additional mitigation and preparedness needs. The exercise result in action plans.

An operation may only take place if the crew has completed an ERP for that type of operation. This ERP may be completed during the ERP training. By this simulation, the emphasis will not be on the actual replication of an emergency situation, but mainly on the action if the situation arises. If an incident occurs during one of the operations of Drone Chiefs, this incident will be included in the next practical training.

The flight crew member learns:

- Preparation of an ERP
- Knowledge and experience of the emergency procedures
- Practical experience working with the UAS in an emergency situation
- Practical experience in carrying out an emergency procedure

An ERP training (syllabus) covers:

- Prio Levels;
- Action schedule's;
- Contactlist;
- Emergency prevention tools;
- Occurrence schedule;
- Media;

A record of the ERP training completed by the relevant staff is established and kept up to date. More information of the required level of ERP can be found in Chapter C6: EMERGENCY RESPONSE PLAN (ERP).

APPENDICES

[APPENDIX A] CONTACT INFORMATION OF CREW MEMBER

Function	Name	Telephone No.	Email address
Owner			
Accountable Manager			
Maintenance Manager			
Safety Manager			

Pilot			
Pilot			
Pilot			
Pilot			
Pilot			
Pilot			

Authorized Observers:

Date:

Signature Accountable Manager:

See also: [A1.2] Organisational Structure of Operator

[APPENDIX B] Compliance Check List

Template EU Specific	Paragraph in EU Operations Manual
0. Cover and contact.	[0.0] Introduction
0.1 Cover identifying the UAS operator with the title 'Operations Manual', contact information and OM revision number.	[0.0] Introduction

0.2 Table of contents.	Table of Contents
1. Introduction	[0.0] Introduction
1.1 Definitions, acronyms and abbreviations.	[0.5] Definitions, Abbreviations and Acronyms
1.2 System for amendment and revision of the OM (list the changes that require prior approval and the changes to be notified to the competent authority).	[0.3] Revision Number and Amendment List
1.3 Record of revisions with effectivity dates.	[0.3] Revision Number and Amendment List
1.4 List of effective pages (list of effective pages unless the entire manual is re-issued and the manual has an effective date on it).	[0.3] Revision Number and Amendment List
1.5 Purpose and scope of the OM with a brief description of the different parts of the documents.	[0.0] Introduction
1.6 Safety statement (include a statement that the OM complies with the relevant requirements of Regulation (EU) 2019/947 and with the authorisation or the terms of approval of the light UAS operator certificate (LUC), in the case of a LUC holder, and contains instructions that are to be complied with by the personnel involved in flight operations).	[0.1] Safety Statement
1.7 Approval signature (the accountable manager must sign this statement).	[0.1] Safety Statement
2. Description of the UAS operator's organisation (include the organigram and a brief description thereof).	Chapter A1: ORGANISATION OVERVIEW
3. Concept of operations (ConOps)	Chapter A2: CONCEPT OF OPERATIONS
For each operation, please describe the following: 3.1 Nature of the operation and associated risks (describe the nature of the activities performed and the associated risks).	[A2.1] Type of Operations

3.2 Operational environment and geographical area for the intended operations (in general terms, describe the characteristics of the area to be overflown, its topography, obstacles etc., and the characteristics of the airspace to be used, and the environmental conditions (i.e. the weather and electromagnetic environment); the definition of the required operation volume and risk buffers to address the ground and air risks).	• Appendix C: Flight Plan and Check Lists • Chapter A7: FLIGHT PREPARATION
3.3 Technical means used (in general terms, describe their main characteristics, performance and limitations, including UAS, external systems supporting the UAS operation, facilities, etc.)	Chapter B.1: SPECIFIC INFORMATION UAS
3.4 Competency, duties and responsibilities of personnel involved in the operations such as the remote pilot, UA observer, visual observer (VO), supervisor, controller, operations manager, etc. (initial qualifications; experience in operating UAS; experience in the particular operation; training and checking; compliance with the applicable regulations and guidance to crew members concerning health, fitness for duty and fatigue; guidance to staff on how to facilitate inspections by competent authority personnel).	• [A1.2] Responsibilities and Duties • [A1.3] The position of Safety Manager • [A1.4] Crew Formation • [A1.5] Role of the Pilot in Command (PIC) • [A3.1] Crew Qualifications • [A3.2] Currency Requirments for Flight crew • [A3.4] Physiological Aspects (IMSAFE)
3.5 Risk analysis and methods for reduction of identified risks (description of the methodology used; bow-tie presentation or other).	PDRA-S01 or SORA
3.6 Maintenance (provide maintenance instructions required to keep the UAS in a safe condition, covering the UAS manufacturer's maintenance instructions and requirements when applicable).	Chapter A8: GENERAL MAINTENANCE
4. Normal procedures;	

(The UAS operator should complete the following paragraphs considering the elements listed below. The procedures applicable to all UAS operations may be listed in paragraph 4.1.) 4.1 General procedures valid for all operations	• Chapter A6: NORMAL OPERATION STRATEGY • Chapter B2: NORMAL PROCEDURES (GENERAL)
4.2 Procedures peculiar to a single operation	Chapter C3: SPECIFIC OPERATIONAL PROCEDURES
5. Contingency procedures	
(The UAS operator should complete the following paragraphs considering the elements listed below. The procedures applicable to all UAS operations may be listed in paragraph 5.1). 5.1 General procedures valid for all operations	Chapter C4: CONTINGENCY PROCEDURE
5.2 Procedures peculiar to a single operation	Chapter C3: SPECIFIC OPERATIONAL PROCEDURES
6. Emergency procedures	
(The UAS operator should define procedures to cope with emergency situations.)	Chapter C5: EMERGENCY PROCEDURES
7. Emergency response plan (ERP) (optional)	Chapter C6: EMERGENCY RESPONSE PLAN (ERP)
8. Security (security procedures referred to in UAS.SPEC.050(a)(ii) and (iii); instructions, guidance, procedures, and responsibilities on how to implement security requirements and protect the UAS from unauthorised modification, interference, etc.]	Chapter A9: SECURITY
9. Guidelines to minimise nuisance and environmental impact referred to in UAS.SPEC.050(a)(v);	Chapter A10: ENVIRONMENT
10. Occurrence reporting procedures according to Regulation (EU) No 376/2014.	[A11.1] Reporting Procedures
11. Record-keeping procedures (instructions on logs and records of pilots and other data considered useful for the tracking and monitoring of the activity).	[A12.1] Procedures

[APPENDIX C] Flight Plan and Check Lists

This appendix contains the documents required for flight preparation and the necessary checklists.

[APPENDIX C.0] Introduction Check Lists

Working with checklists is quite a common practice in aviation. Mandatory and consistent use of the checklists reduces the risk of errors and makes an essential contribution to flight safety.

Checklist Methodologies

Name	Description
Challenge & Respond	The observer reads the item to be checked. The Pilot controls the item to be checked for the exact status. The Pilot responds with the status. The observer places a checkmark on the checklist.
Read & Do	A crew member reads out the item to be checked. Another crew member takes the action, after which the crew member who has read the item places a checkmark on the checklist.
Flow	A checklist is designed for independent use so that the user does not have to reference a manual.

Conducting Checklists

The following general rules for conducting checklists are used to support communication and understanding between the crew.

- The crew conducts the checklist at a fixed schedule when the workload is low. As a result, the crew is not distracted or rushed through the checklist.
- The Pilot is not distracted his attention from controlling the UAS by performing tasks assigned for the observer or payload operator.
- The "responding" crew member responds to the "challenge" when the configuration is checked or corrected if necessary.
- If the requested configuration is not possible, the "responding" crew member registers the current configuration.
- The "challenging" crew member waits until he receives a confirmation. After the confirmation, he places a checkmark on the checklist. After setting a checkmark, the next checklist item should be controlled. Do not call several challenge items together while the other member replies with a series of chunked responses.
- When conducting the checklists is interrupted, the crew should be able to show clearly which items are

already completed, which are not yet controlled.

Before conducting the checklists, make sure that the correct checklists are chosen.

[APPENDIX C3.1] Flight Preparation Phase 1 and 2 and ERP

An example of a flight plan of Drone Chiefs, including ERP (medium level):

[APPENDIX C.2] Flight Preparation Phase 3: day of the operation

CHECKLIST FLIGHT OPERATIONS
On the day of execution, check everything with the flight plan

DATE	[DATE]
PROJECT NAME	
PROJECT NUMBER	
TYPE DRONE	[TYPE]
DRONE OWNER NUMBER	
OPERATOR AUTHORISATION NUMBER	
IMSAFE? IS CREW HEALTHY?	
Report only deviations from the flight plan	
UAS READY TO START?	Flight hours deviations:
SOFTWARE VERSION (as in OM)	Deviations:
VISIBLE CONDITIONS	Deviations:
WIND STRENGTHS	Deviations:
WIND DIRECTION	Deviations:
TEMPERATURE	Deviations:
PRECIPITATION	Deviations:
AIRSPACE CLASSIFICATION and MAXIMUM FLYING HEIGHT	Deviations:
KP INDEX	Deviations:

CHECK AIRSPACE CLOSURES	Deviations:
REMOVAL of HUMAN/ANIMAL	Deviations:
LOCATION AS FROM FLIGHT PLAN ok?	Deviations:
Unobstructed view of UAS and Crew?	Deviations:
Write down unexpected ENVIRONMENTAL OBSTACLES	Unexpected obstacles:
Write down unexpected RISKS ON SITE	Unexpected risks:

APPROVAL

NAME PERSON IN CHARGE:

DATE

SIGNATURE

REMARKS

Further Reading Section

- [B2.1] Assignment of Duties and its Distribution
- [A7.21] Operational Plan (OP)

[APPENDIX C.3] Packing Check list

PACKING LIST

PROJECT NUMBER:

DATE:

To demonstrate that the UAS is "airworthy", maintained properly and that the PAS pilot is skilled in flying, the following documents shall be present during every operation:

PRESENT	DESCRIPTION ITEM
Yes/No	RDW registration
Yes/No	Operator Authorisation
Yes/No	Radio Station (BAR) Specification Documentation (if necessary for mission type)
Yes/No	The flight manual of the UAS manufacturer that is approved by ILT
Yes/No	Flight checklists
Yes/No	Operations Manual (OM)
Yes/No	A1/A2/A3 licenses (if necessary Specific certificates)
NOT MANDATORY BUT HIGHLY RECOMMENDED	
Yes/No	ICAO 1:500.000 chart
Yes/No	Logbook pilot
Yes/No	Logbook UAS
Yes/No	Insurance registration
Yes/No	Valid ID
Yes/No	Maintenance documentation
Yes/No	Briefing (operational plan)
Yes/No	Safety Barricade (traffic cones, barrier tapes)
Yes/No	Fire extinguishers
Yes/No	First aid kit
Yes/No	Safety vests
Yes/No	Mobile telephone
Yes/No	Windmeter
Yes/No	Sunglasses, cap
Yes/No	Helmets (possibly)
Yes/No	Shelter, tent
Yes/No	Table
Yes/No	Landing spot

- [B2.1] Assignment of Duties and its Distribution
- [A7.22] Mandatory documents on flight location

[APPENDIX C.4] Pre-flight and Post-flight check lists

FLIGHT CHECKLIST

Checklist for the flight phase

DATE

PROJECT NAME

PROJECT NUMBER

TYPE DRONE and Operator No.

-

STARTING UP (PRE- FLIGHT)

IMSAFE: llness, Medication, Stress, Alcohol, Fatigue, Emotion	Crewmembers Fit to Fly? Pilot, Observer, R/T, other (sign off)
SAFETY EQUIPMENT	FIRST AID, Fire extinguisher
MEANS OF COMMUNICATION	R/T resources, telephones charged?
BRIEFING CREW	Review risks and emergency procedures?
VISIBLE DAMAGE DRONE	No damage to legs, propellers, gimbal, camera
PROTECTION REMOVED	Gimbal/Camera
BATTERIES CHARGED	All drone batteries fully charged, controller charged
UA SETTINGS	Return To Home (RTH), Maximum height, Maximum distance, Low battery warning: 30%
DRONE SETTINGS	Gimbal/Compass /IMU calibrated
SETTING UP CONTROLLER	Antennas unfolded, telephone installed correctly
CTR FLIGHT PLAN	Flight plan parallel or down from CTR?
CTR MITIGATION MEASURE	Automatic landing set if GNSS fails?
CTR MITIGATION MEASURE	Geofencing with return to home set?

BEFORE THE FLIGHT

SETTING UP LOCATION	Clean surface, no chance of splashing gravel/soil/dirt
RADIO CHECK CTR	Observer contact with air traffic control

CLEARANCE CTR	Set tower frequency and request clearance	YES
CONNECTION STARTING DRONE	First controller on, then drone on (continuously connected to drone)	
STARTING UP DRONE	No unusual vibrations, indicators correct, satellite connection	NO
CONTROL DRONE ON TAKE OFF	Drone follows direction via controller as indicated	

AFTER THE FLIGHT (POST FLIGHT)

DISCONNECT DRONE CONNECTION	First drone off, then controller off (continuous connection with drone)
LOG OUT CTR	Log out with the air traffic controller via R/T
CHECK DRONE FOR DAMAGE	Safe flight, no damage, landing gear undamaged
STORAGE BATTERIES	Removed and back in LiPo guard. No damage to batteries, expanded batteries
STORAGE DRONE AND CONTROLLER	Put the protection back on and store the controller and drone tidy
LOGBOOK PILOT	Register hours of pilot
LOGBOOK DRONE	Register hours of drone until next maintenance. Write down problems or comments during flight

APPROVAL

NAME PERSON IN CHARGE

DATE

SIGNATURE

REMARKS

Further Reading Section

- [B2.1] Assignment of Duties and its Distribution

[APPENDIX C5] Proof of the adequacy of the contingency and emergency procedures of Drone Chiefs

In case of Drone Chiefss Risk Assessesment, Drone Chiefs needs to “ensure the adequacy of the contingency and emergency procedures and prove it through any of the following:

(a) dedicated flight tests; or

(b) simulations, provided that the representativeness of the simulation means is proven for the intended purpose with positive results; or

(c) any other means acceptable to the competent authority;”

Drone Chiefs proves this by:

Insert prove (test flights or... simulations.

[APPENDIX D] Maintenance Logbook

Drone Chiefs keeps a maintenance log in accordance with OSO#03.

Date	Reason for maintenance	Maintenance performed	Parts changed	System tested (Y/N)	Initials Maintenance Manager

[APPENDIX E] Format Operational Plan and Crew briefing flying night flight(s) (outside UDP)

Format Operational Plan night flights (outside UDP)

OA number:	Drone Chiefs		
Client:	Date:		

A. General flight details

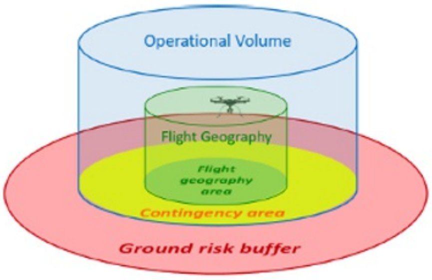
Purpose of flight(s)	*[DESCRIPTION PURPOSE OF MISSION, ACTIVITIES AND WHEN MISSION IS SUCCESSFUL]*		
Adress flight area			
Location flight area (***google earth***) *(DD°MM.mmm)*	52° 2'49.15"N	4°31'43.63"O	
Mitigating measures	*[FLIGHT PLAN/METHODS/MEASURES]*		
Other Peculiarities	VLOS Operation		
Uniform Daylight Period	Xx:xx LT	until	Xx:xx LT
Time of flight operation	xx:00	until	xx:00
Captain/pilot		Telefon number	+ 31 6 xxxxxx
Observer		Telefon number	+ 31 6 xxxx
RT operator		Telefon number	+ 31 6 xxxx
Payload Operator	n.a.	Telefon number	
Other crewmembers			
Exploitant number	NL-xxxxxx		
UAS 1 Type			
UAS 2 Type			

# Flights UAS 1		# Flights UAS 2	
Expected flight time	xx min per flight		
Max. flight altitude	.... *meter AGL*	Max. distance UAS-PIC	*VLOS*

Operational Volume and grond buffer

a. Overview map with location Operational Volume
b. Air risk / Airspace operational volume (Godrone)

c. Map showing dimensions of the Operational Volume (Flight area and Contingency Area)



Ground risk depends on a number of factors, such as wind, UAS used, flight speed and the expected number of people. Calculate the dimensions using the ballistic method or the 1:1 rule (see OM). Note in the chart:

- The dimensions of the Operational Volume (flight area as well as the Contingency Area)
- The dimensions of the Ground Risk Buffer
- The take-off and landing location

- Location of crew members
- Flight altitude (in relation to the Ground Risk Buffer)

Legend	
The take-off and landing location (min. 20 m^2)	
De Flight Geography (flight area)	
The Operational Volume including Contingency area minimal 10 meter from Flight Geography (1:1 of ballistic)	
Ground risk buffer: activation ERP	
The planned flight route (if known)	
The location of the pilot, observer and other crew	

Checklist airspace	Source	Result	Coordination/approval received?	
Airspace class?> *G / C / D*	*AIP ENR 6-3.1*	C		
Military/ Civil CTR?	*[Operationele Helpdesk LVLNL]()*	Civiel CTR EHRD	***Yes***	~~*n.a.*~~
Uncontrolled airport? *> Coordination required (<3KM)*	*[https://www.godrone.nl]()*		~~*Yes*~~	***n.a.***

Low flying area and > 40m AGL? *> NOTAM required*	*AIP ENR 6-5.2*		*~~Yes~~*	***n.a.***
Mil. Low flight path and >40m AGL? *> NOTAM required (<1NM)*		*> NOTAM required (<1NM)*		
North Sea NSAA area? *> Permission?*	*Check OM*	No permission = No flight possible	-	
EHP/ EHR/ EHD zone? *> Check openingstijden/ NOTAMs / procedures*	*AIP ENR 6-3.1* *AIP ENR 5.1* *NOTAMs*		*~~Yes~~*	***n.a.***
Aerodrome Traffic Zone? *> Coordination required*	*Regeling Luchtverkeer-dienstverlening*		*~~Yes~~*	***n.a.***
Airspace closures? ***> yearly/ Temporary/ Special***	*Operationele Helpdesk LVLNL*		*~~Yes~~*	***n.a.***
NOTAMs active? *> Within 5 km distance*	*Homebriefing LVNL*	Check again before the start of the flight, write down in Section A.	*~~Yes~~*	***n.a.***
NOTAM submitted? *> At LVNL or AOCS NM*			***~~Yes~~***	n.a.

Checklist ground (list measures)

Land owner:	[fill in]	Permission?	***Yes***
	Estimation of the amount of people in the Operational Volume (outside adjacent buildings)		
	Number of people within Operational Volume?		~~Yes~~/No, if yes, write down mitigation measures

	Adjacent buildings?	~~Yes~~/No, if yes, write down mitigation measures
	Roads (speed is more than 80 km/hour) in use?	~~Yes~~/No, if yes, write down mitigation measures
	Road and water traffic?	~~Yes~~/No, if yes, write down mitigation measures
Note measures from the handbook in the development under A.	*Vehicles/vessels?*	~~Yes~~/No, if yes, write down mitigation measures
	Infrastructures?	~~Yes~~/No, if yes, write down mitigation measures
	Railways?	~~Yes~~/No, if yes, write down mitigation measures
	Natura2000 area?	~~Yes~~/No, if yes, write down mitigation measures
	Industry or port area?	~~Yes~~/No, if yes, write down mitigation measures
	EM fields?	~~Yes~~/No, if yes, write down mitigation measures
Land use *Nature area/recreational area/agricultural land/project location/…*	Public	

Land's Surface *Flat/ Hilly/ Irregular/ …*	Flat
Surface covered by *Sand / Wild / Water / …*	Wild, swamp vegetation, beach zone
Access (public) *Highway/ Bicycle road/Side walk/ Fences/ …*	Not accessible
Hazards *Prison/ Nuclear power plant/ EM source/ …*	na
Other	na

G. Risk Analysis (***use the client's knowledge of risks***)

Danger related to	Explanation danger	Risk score = change * effect			Proposed mitigation measures	Risk score = change * effect		
		Chance	Effect	Total		Chance	Effect	Total
A. Collision with other air traffic	*Trauma / Police Helicopter*	*2*	*4*	*8*	*Max flight height 45m, 2-way radio contact with LVL. Deployment of Observer*	*1*	*4*	*4*
B. Collision with ground or obstacles	*Buildings*	*1*	*2*	*2*	*Keep distance*	*1*	*2*	*2*
C. ***Collision with vehicles, vessels, persons or animals***	*traffic*	*1*	*1*	*1*	*> keep distance, slow speed, observer*	*1*	*1*	*1*
D. ***Disruption/ Loss GPS signal***	*Few buildings, hardly any chance of reflection*	*3*	*2*	*6*	*Switch to ATTI*	*1*	*2*	*2*
E. ***Control signal interference***	*N/A*	*1*	*3*	*3*	*Max. distance PIC/UAS 500 m*	*1*	*2*	*2*

F. ***Meteorological influences***	*Possibly Wind*	*4*	*2*	*8*	*Regular check, landing with too strong wind*	*2*	*2*	*2*
G. ***Other failure/loss UA***	*N/A*	*1*	*1*	*1*	*N/A*	*1*	*1*	*1*
H. ***Danger third parties / distraction***	*N/A*	*1*	*1*	*1*	*N/A*	*1*	*1*	*1*
I. ***Dangers personal/environment***	*N/A*	*3*	*2*	*6*	*Shielded LT, Observer keeps them not enter the area*	*1*	*2*	*2*
J. ***Physiological aspects***	*N/A*	*1*	*1*	*1*	*TOLL (LT) remote, short communication*	*1*	*1*	*1*

Legend

RISK LIKELIHOOD	MEANING	VALUE
FREQUENT	Likely to occur many times. Has already occurred in the Company (Freq. > 3 times per year – indicative*). Has occurred frequently in the history of the aviation industry.	5
OCCASIONAL	Likely to occur sometimes. Has already occurred in the Company (Freq. < 3 times per year – indicative*). Has occurred infrequently in the history of the aviation industry.	4
REMOTE	Unlikely to occur, but possible. Has already occurred in the Company at least once or. Has seldom occurred in the history of the aviation industry.	3
IMPROBABLE	Very unlikely to occur. Not known to have occurred in the Company but has already occurred at least once in the history of the aviation industry.	2
EXTREMELY IMPROBABLE	Almost inconceivable that the event will occur. It has never occurred in the history of the aviation industry.[1]	1

[1] Note however that even extremely improbable events may occur.

SEVERITY OF OCCURRENCE	MEANING				VALUE
	PERSONNEL	ENVIRONMENT	MATERIAL VALUES & ASSETS	REPUTATION	
CATASTROPHIC	Multiple fatalities	Massive effects (pollution,	Catastrophic financial loss	International impact	5

		destruction, etc.)	Damage > 1 M€ (*)		
HAZARDOUS	Fatality	Effects difficult to repair	Severe financial loss with long term effects Damage < 1 M€ (*)	National impact	4
MAJOR	Serious injuries	Noteworthy local effects	Substantial financial loss Damage < 250K€ (*)	Considerable impact	3
MINOR	Light injuries	Little impact	Financial loss with little impact Damage < 50K€	Limited impact	2
NEGLIGIBLE	Superficial or no injuries	Negligible or no effects	Financial loss with negligible impact Damage < 10K€ (*)	Light or no impact	1

* Indicative: depends on the size of the Company and volume of business.

RISK LIKELIHOOD	**RISK SEVERITY (EFFECT)**				
	NEGLIGIBLE (1)	MINOR (2)	MAJOR (3)	HAZARDOUS (4)	CATASTROPHIC (5)
FREQUENT (5)	5	10	15	20	25
OCCASIONAL (4)	4	8	12	16	20
REMOTE (3)	3	6	9	12	15
IMPROBABLE (2)	2	4	6	8	10
EXTREMELY IMPROBABLE (1)	1	2	3	4	5

Source: EHEST-Safety Management Toolkit-Guidance-NCO - V.2 30 Sep

Unacceptable Risk Level - the **red** zone in the matrix: risk is too high to continue operating.

Action required: Prohibit/suspend the operation.

Tolerable Risk Level - the **yellow** zone in the matrix: the risk level can be tolerated for the operation, providing that appropriate mitigation measures are in place.

Action required: Introduce appropriate mitigation measures.

Acceptable Risk Level - the **green** zone in the matrix: risk is tolerable and can be accepted for the operation.

Crew briefing flying outside UDP

This briefing is conducted by the pilot with night flight experience and training according to the Syllabus.

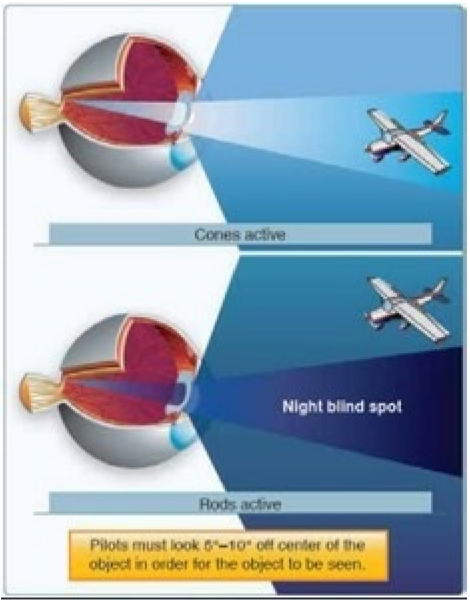
Night flying has a number of additional risks:

- More difficult to find reference points to control the drone or to see where you are. Certain landmarks that you would use during the day are not visible in the dark. And what you can see is different from what it looks like during the day.
- Decreased visual cues and increased likelihood of perceptual illusions and the resulting risk of spatial disorientation.
- In the case of an emergency or precautionary landing, there is an increased risk in the dark due to the lack of visual reference points. The outcome of an accident at night is often more serious than an accident that occurs during the day. For example, it is difficult to find an obstacle-free emergency landing field in the dark.

Other than during the day:

- The drone has extra lighting. In addition, the take-off and landing location is cordoned off (and illuminated);
- Your eyes can quickly become dazzled by bright lighting, for example from cars. It takes a while to get used to it. Should that happen: Should something like this occur and you can foresee it in time, cover one eye, or close one eye. Then that eye at least retains its adaptation to the dark;
- The pilot flies on instrument more than during the day and is even more dependent on the observer who:
    - Listens carefully to aircraft noise and look at a white flashing light which may be an aircraft;
    - Sees/hears aircraft, should shout “Aircraft, down” at once.

- Nighttime illusions can cause unwanted confusion and distraction. Flickering lights can cause vertigo (balance disorder). Cities, lanterns, illuminated wind farms are clearly visible and this often gives the feeling that you can see further;
- Cloud layers and light patterns on the ground can be mistaken for the horizon (false horizon);
- So an incipient fatigue is an absolute no-go for flying. Do not be pressured to continue the flight, for whatever the reason is;
- Because flying outside UDP requires more eyesight and concentration, a PIC flies a maximum of 2 hours outside UDP per 24 hours;
- When viewing, keep in mind that you have to look 5-10 degrees next to an object to see it. See image below:



FLIGHT CHECKLIST (NIGHT FLIGHT)

Supplement to the flight checklist especially for night flights

These questions are asked by the crew members

CREW

ILLNESS	Are you healthy?	Yes/No*
MEDICATION	Are you free of any drug that could affect your assessment?	Yes/No*
STRESS	Are you relaxed?	Yes/No*
ALCOHOL	Are you sober?	Yes/No*
FATIQUE	Are you awake and not tired?	Yes/No*
EMOTION	Have you eaten and drunk enough?	Yes/No*

DRONE

Is the location cordoned off and clearly visible to

LOCATION CLOSED	bystanders?	Yes/No*
LIGHTING ON THE DRONE	Is the lighting installed on the drone?	Yes/No*

SURROUNDINGS

		Differences:
ENVIRONMENTAL FACTORS	Was the environment as expected/examined during flight preparation?	
WEATHER CONDITIONS	Rain or thunderstorms observed or predicted within 5 (five) kilometers?	If so, don't make a flight

*If the answer is no, then the crew member is not allowed to participate in the night flight.

Author: Shyam Hajare

Handboek Content

Last Page