STANDARD SCENARIO FOR REDNINGSBEREDSKABETS FLYVNING MED DRONER I DANMARK, DK-BER-2

SUBPART A

A.1 – Scenario DK-BER-2, local rescue operation with BVLOS behind buildings or other obstructions

A.1.1 Scope

This **standard scenario** is intended to cover UAS operations performed in accordance with paragraph A.1 with the following main limitations**:**

- unmanned aircraft with a maximum characteristic dimension (e.g. wingspan or rotor diameter/area) **up to 3 m** and a maximum impact kinetic energy **up to 34 kJ**,
- operated **visual line of sight (VLOS) of the remote pilot**, however **beyond visual line of sight (BVLOS) behind buildings, forest, smoke plumes and similar** are allowed. BVLOS shall not be performed at distances higher than drone being VLOS without the obscuring element
- over **controlled area inside a populated area**
- **under 120 m** above the overflown surface in built-up area, under 100 m in rural area
- All airspace in Denmark with the following limitations specified in B1.3
    - At least 5 km away from public airports or max 40 m above runway surface in the range 2-5 km from the airport, unless specific procedure for operations approved
    - At least 8 km away from military airstations or max 40 m above runway surface in the range 2-8 km from the airstation, unless specific procedure for operations approved
    - At least 2 km fra HEMS fields or max 50 m above HEMS field elevation surface in the range 1-2 km from the HEMS field, unless specific procedure for operations are approved
    - Outside of active restriction areas, unless specific procedure for operations are approved.

A.1.2 Operations approval and conditions

This **standard scenario** is subject to an **authorisation** by the Danish Transport, Construction and Housing Authority (DTCA).

A.1.3. Specific limitations and provisions

Unless otherwise specified in the following the limitations and provisions of Bydronebekendtgørelsen apply. The following specific limitations and provisions apply for this scenario.

Table A.1-3: Summary of main provisions and limitations for DK-BER-2

Specific limitations and provisions	
1. Operational limitations	

Level of human intervention	• **No autonomous operations**: the remote pilot shall always be able to intervene in normal operation.
	• The remote pilot should operate **only one UA at a time.**
	• The remote pilot may **operate from a moving surface vehicle** as long as:
	  o the remote pilot is not operating that vehicle at the same time;
	  o it is ensured that no obstacle will interfere the C2 Link
	  o vehicle speed allows keeping situational awareness of UA in space and respect other traffics
	• **Hand-over between RPS** may be performed

Range limit from remote flight crew	• Launch / recovery: **VLOS from the remote pilot, maximum 1 km from the remote pilot**
	• In flight**:**
	  o Within VLOS range of remote pilot
	  o Allowed to operate BVLOS when UAS is flown behind buildings, smoke, trees etc**.** but always at a distance were VLOS is re-established once UAS is back above the object having obscured the vision of the UAS.

Overflown areas	**Controlled area inside a populated area**· An area where an emergency rescue operation is taking place with the following characteristics: • The inner area is the area where the emergency is located • The outer area is the area includes the inner area plus safety zone around the inner area and area needed for the rescue operation The controlled area includes both the inner and outer area.

	There shall be a designated manager (indsatsleder) in the controlled area. A prior notification to the police 24 hours in advance of drone operations within built-up area is not required for operations under this scenario.
UA MTOM limit	• Max. characteristic dimension (e.g. wingspan or rotor diameter/area): **up to 3 m** • Max. impact kinetic energy: **up to 34 kJ**
Flight height limit (AGL)	The maximum height of the **operation volume** should **not be higher than 120 m above the overflown surface in built-up area and not higher than 100 m above the overflown surface in rural area.** When the operation involves flying the UA in close proximity to a fixed obstacle that is taller than above mentioned maximum flight height, such height may be increased **up to 25 m above the height of the obstacle**, for the portion of the flight in close proximity to it
Airspace	All airspace in Denmark with the following limitations specified in B1.3 • At least 5 km away from public airports unless specific procedure for operations approved • At least 8 km away from military airstations unless specific procedure for operations approved • At least 2 km fra HEMS fields unless specific procedure for operations approved • Outside of active restriction areas unless specific procedure for operations approved.
Dangerous goods[1]	The use of the UA to drop material or carry dangerous goods is **forbidden**.
2. Operational mitigations	
Ground risk buffer	• When establishing the controlled area for emergency operation, a ground risk buffer should if possible be established to protect third parties on the ground. The controlled area should at least be established such that any third party people cannot enter the area without knowing they are entering an area where a rescue operation is taking place with the risk this may involve. • Training operation shall not be initiated unless a controlled area has been established. No third party people shall be within the controlled area unless a safety representative responsible for the safety of third parties is designated and accepted such party being inside the controlled area.

[1] As per ICAO Doc 9284 - Technical Instructions for the Safe Transport of Dangerous Goods by Air

	• The ground risk buffer should if possible be sized as specified in Bydronebekendgørelsen (1x1 rule, min. 15 m, max 50 m)
Air risk buffer	• No Air Risk buffer is required.
Containment	**Loss of containment** (the UA deviating out of the controlled area) shuld **not happen more than 1 event per 100 flight hours** (1E-2/FH)
3. Operator provisions	

Organisation and procedures	• An **Emergency Response Plan (ERP)** should be in place.
	• At least the following should be **documented**:
	  ○ **operational procedures**
	  ○ **environmental conditions** required for a safe operation, and
	  ○ **limitations of the external systems** supporting UAS for safe operations.
	• The **Standard Operating Procedures (SOP)** should be included in an **Operations Manual or equivalent document**.
	• Specific operational procedures for simultaneous drone and rescue helicopter in the same rescue operation shall be documented
	• Operational procedures shall be validated through testing.
	• The **adequacy** of the **contingency and emergency procedures** should be proved through:
	  ○ Dedicated **flight tests**, or
	  ○ **Simulations**, provided that the representativeness of the simulation means is proven for the intended purpose with positive results.

External services	If external services are used that are necessary for the safety of operations, substantiation of adequacy and role/responsibilties should at least include a **declaration** by the UAS operator that the required level of performance of those services is achieved.
4. Training provisions	
Remote flight crew	• Training should be documented (at least the training syllabus should be available) • Training shall cover all personnel involved in intended operations • The training of the remote pilot should be adequate to the operation and as a minimum consider the following objectives: (a) understand the safety risks linked with a UAS operation in close proximity to uninvolved people or with a heavier UA;

	(b) be able to assess the ground risk related to the environment where the operation takes place, as well as to flying in proximity to uninvolved people; (c) have a basic knowledge of how to plan a flight and define contingency procedures; (d) understand how environmental conditions may affect the operation; and (e) be able to maintain control of the UA at all times in a manner that ensures the successful outcome of a procedure or manoeuvre (f) have basic understanding of emergency rescue operations.
5. Technical provisions	
UAS and supporting means	• A **design and installation appraisal** should be made available, highlighting the design features (such as redundant components, independent back-up systems, etc.) for a "safe design". • **Means to monitor critical parameters** for a safe flight should be available, in particular: o UA position, height or altitude, ground speed or airspeed, attitude and trajectory); o UAS energy status (fuel, batteries …); o status of critical functions and systems (e.g. C2 Link, GNSS …); as a minimum, for services based on RF signals (e.g. C2 Link, GNSS …) means should be provided to monitor the signal strength and triggering an alert if level is becoming too low. • The UA should have the performance capability to descend from its operating altitude to the **'safe altitude' in less than a minute or have a descend rate of ≥ 2.5 m/s (500 fpm)** • The UAS should **comply with the requirements for radio equipment** and the **use of RF spectrum**. • **Protection mechanisms against interference should be used,** especially if unlicensed bands (e.g. ISM) are used for C2 Link (mechanisms like Frequency Hopping Spread Spectrum – FHSS, technology or frequency deconfliction by procedure) • The **UAS design** should be adequate to ensure that the **time required** between a command is given by the remote pilot and the UA executes it **does not exceed 5 seconds.** (TBC) • The UA design should incorporate measures to **increase its conspicuity**.

	• Where an **electronic means is used to assist the remote pilot and/or VOs in being aware of UA position in relation to potential "airspace intruders"**, the information is provided with a latency and update rate for intruder data (e.g. position, speed, altitude, track) that support the decision criteria.