




LUMASKY
DRONE SHOW

TECHNICAL RIDER

THE REQUIREMENTS STATED IN THE
RIDER HAVE BEEN SET TO ACHIEVE A
SUCCESSFUL TECHNICAL PERFORMANCE
AT A HIGH ARTISTIC LEVEL



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DRONE SHOW

Lumasky drone show is a continuous synchronized flight of group drones operated by the pilot.

The show crew consists of 4 to 15 people depending on the scale and complexity of the show.

Duration of the show is 10 – 12 minutes* (subject to launch pad, to display zone distance and complexity of the transitions between formations).

The preparation of each show is preceded by a technical inspection of the venue by the show pilot. The offline site scouting, includes a visual, technical scouting and a test flight with one drone.

LAUNCH PAD

The dimensions of the takeoff area are calculated based on from the matrix: each drone is placed into a 1x1m square.

The launch pad dimensions for 500 drones:

minimum width: 30 m

minimum length: 50 m

The launchpad should have:

- Tent with AC;
- 3 tables and one chair per team member;
- Lighting (preferably controlled);
- Electricity (220V extension cord at the pilots' table and in the tent);
- 3-pin XLR cable from the control room to the pilot's table (in case of using timecode);
- Walkie talkies: 2-5 pcs on a separate channel (if possible).
- Accreditations for all team members with full access to all areas, including spectator area, technical area (to the control room), stage area, etc.

If intercoms are used at the event, we ask that you provide one (set up for a channel to communicate with the director or show caller).

The requirements for different types of sites are summarized below:

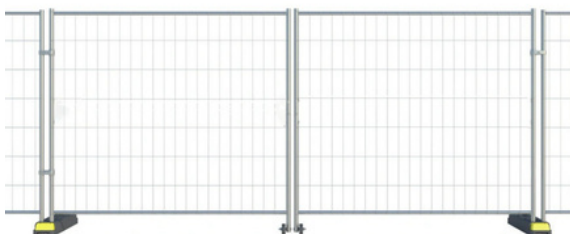
Grass	Lawn — no more than 5 mm. grass without any stiff grass branches, flat ground with no holes or hills
Carpet	Hard fixed to the ground on all sides, also additionally hammered into the ground at the joint points and around the perimeter. The edges are forced with additional structures
Podium	Depending on the site: height of at least 20 cm above the ground. It can be a wooden podium fixed on top with MDF sheets (width 10 mm). It is important that the sheets are fixed to the frame securely with large nails to avoid breakage
Other	Hard surfaces (asphalt, cement, sport court surface, etc.) shall be washed and cleaned of small trash, sand and stones. The surface shall be ready for making special marks with chalk or special water-soluble paint.

[previous practice](#)



FENCING

All the flight area (including animation zone + 50 m safety zone) must be blocked off from unauthorized persons or any vehicles. The working area (including drones launch pad, pilots tables, ground station) must be fenced with “crowd barriers”. No access for unauthorized persons to the working area and flight zone.



Example

WEATHER CONDITIONS

The drone show is performed in the dark time of the day, no direct sunshine is allowed during the preparations.

Wind: not stronger than 7 m/s.

Temperature: not more than +35C, the lowest operational temperature is -10C. Relative air humidity: not more than 70%, no atmosphere precipitations during rehearsals and show.

FREQUENCIES

The drones are operated in the following radio range:

A. NAVIGATION

- GPS L1: 1574 – 1577 MHz;
- GPS L2: 1227.6 MHz;
- GLONASS L1: 1596 – 1606 MHz;
- BEIDOU L1: 1560 - 1562 MHz;
- BEIDOU L2: 1205 - 1209 MHz.

B.RTK-SYSTEM:

- 868 MHz RTK-system: 863 – 870 MHz, 250 KHz bandwidth;
- **OR** 915 MHz RTK-system: 902 – 928 MHz, 250 kHz bandwidth.

C.RC-SYSTEM:

- 2400-2484 MHz

If powerful radio equipment is operating in the event area, it is necessary to carry out additional coordination. If there is a stage or venues for other shows near the takeoff area, mandatory RF management is required.

FLIGHTS

This information will help with requesting permission to fly.

Test flights time*: 18:00 to 01:00 (local time)

Altitude (up to): 400 meters / 1312 feet

Maximum time specified. Subject to confirmation of animation dimensions.

STORAGE OF THE EQUIPMENT



Example

Big tent with door, lock, etc. can be installed on site and used as a storage and workspace

The drones are transported and stored in flight boxes (525x525x960 mm or 780x525x960 mm incl. ball corners and wheels).

Sufficient area to store the drones and carry out maintenance: 10x5m.

Air temperature for the storage: not more than 25C.
Relative humidity not higher than 70%.

No access for unauthorized persons to the equipment.

Round-the-clock security of the equipment is required.

The crew must have 24/7 access to the equipment.

WORKING AREA / TENT

A separate room is required to support the team's work. This can be a warehouse with the necessary supplies or a separate tent on the site.

The working area (storage/tent on site) must be well lit and equipped with:

- power outlets 220V/50Hz type F — 10 units per tent or room;
- power extensions — 5 units;
- at least 5 square tables, 6 chairs;
- A/C — 2 units (average outdoor temperature is higher than +30C);
- high speed internet connection;
- WC on site or close to the launchpad;
- fire extinguisher;
- bottles of still and sparkling beverages (coke & others), fruit juice, tea and coffee with milk and sugar, for set-up and show days.

PROPOSED SETTING SCHEDULE

The show crew consists up to 15 crew members. In general the preparations on site begin 5–6 days before the show.

Example of the regular show preparations routine:

Day 1 — Crew arrival, equipment checking, launch pad & storage checking, test flights.

Day 2 — Test flights with small amounts of drones.

Day 3 — Test flights, synchronization check (timecode, music etc).

Day 4 — Dress rehearsal — full fleet (if needed).

Day 5 — Reserve day with possibility to make test flights.

Day 6 — Show day.

Normally the preparations on site start in 5 hours before the first flights.

Steps of animation preparation:

1. Storyboard — description of the concept with examples.
2. Examples of static images
3. Animation

Final approval of animation is no later than the date the team arrives.

ACCOMMODATION & CREW LOGISTICS

1. Twin or single rooms (with own toilet and shower) in a hotel with breakfast and free WiFi. The hotel must be not very far from the event site (no more than a 30 min drive).
2. Transfer from the airport to the hotel.
3. Transfers within the city (hotel-site-hotel)
 - minivan (with sufficient number of seats for whole team) with the driver OR
 - rented cars: 1 minivan + 1 sedan (the crew have international driver license).

SAFETY REQUIREMENTS

- Disable all UAV detection and suppression systems (jamming systems).
- Completely fenced take-off area (launchpad dimensions + 3-5 meters on each side)
- Security at the site to prevent access by unauthorized persons.
- Blocking the drone flight area from any vehicles and unauthorized persons.
- A secured storage for the drones.