רשות החדשנות
Israel Innovation Authority

07.10.2020

Attn.: _____

Ref.: The Playground – “Close Encounters of the Third Kind”

Appendix A: Preliminary characterization of the subject of coordination between the companies - from the ATM Tender/Technical Appendix.

Appendix B: The Playground for the first meeting, which is expected to begin on March 14, 2021 and last for two weeks.

Appendix C: Defining the Sharon Cluster.

Appendix D: Preliminary characterization of the Control Center/provision of services

Appendix E: Debriefing Form.

Appendix F: Flight Operations and Mandatory Reports.

1 Background

1.1 The purpose of this initiative is to increase the use of drones (multirotor) and small UAVs.

1.2 The activity of delivery by drones, in Israel, commercially, began in mid-July 2020

1.3 The subject gained "momentum" against the background of urbanization around the world, traffic jams and especially the "Corona" (COVID-19) pandemic.

1.4 In Israel, the delivery drones are operated for the benefit of the medical sector (and in the future – for governmental entities), under the guidance of the "Na’ama Steering Committee" - a steering committee that includes the Ayalon Highways company, the Ministry of Transport, the Civil Aviation Authority, the Innovation Authority and the Prime Minister's Office through the Smart Transport Administration.

1.5 The Innovation Authority issued the “Close Encounters of the Third Kind” call for proposals, which is opened to the following companies:

1.5.1 Companies that operate delivery drones (hopefully at least three companies to win this pilot licensing).

1.5.2 A company that will provide services (USP[1]) to coordinate between the various companies (drone operators) and the Air Control Units, the Divisional Control Center, the ACC, identifying conflicts at planning and at the operation stages.

1.5.3 A company that will centralize the registration of aircraft ("registration") and the ability to identify them electronically (RID[2])

1.5.4 A company that will develop and implement the technological application that enables the coordination between the various companies and the provision of services (UTM[3]).

1.6 The capabilities will be promoted, among other things, by concentrating the efforts around a "Common Playground" - every last two weeks in each

[1] UAV Service Provider
[2] Remote Identification
[3] UAV Traffic Management

quarter - starting in March 2021, in order to make sure that all systems require coordination among themselves.

2 Goal:

2.1 The purpose of this paper is to characterize the "Playground" and chart a path that will allow it to evolve from a "Specific Playground" - to the establishment of a "National Network of Delivery Drones" - for all it entails, including identifying knowledge gaps and ways to close them, creating innovative knowledge, creating the required organizational structures, regulation and trial runs (pilot programs) - all with the aim of forming such a national network, cultivating companies that can develop into profitable companies and export and provide transportation services to various industries in the market, as well as to end consumers.

3 Assumptions:

3.1 The activity will continue to be carried out under the guidance of the "Na'ama Steering Committee" and in cooperation with the Civil Aviation Authority (CAAI).

4 Details:

4.1 The various companies will apply to the Innovation Authority - according to existing procedures. An action plan must be presented for the entire year of 2021+2022 - beyond the financial support, the activity will be supported by the Na'ama Steering Committee, as far as the resources allow.

4.2 The decision as to which companies will participate in the project will be made according to the general work procedures of the Innovation Authority - through auditors, a public committee, etc.

4.3 The Na'ama Steering Committee will allocate a "Playground" at least four months prior to each meeting of the "Close Encounters of the Third Kind".

4.4 For the first meeting - the Playground will be in the "Na'ama Hadera Bubble" as detailed in the appendix.

4.5 Each company will strive to reach a situation where up to ***a month before the date of the meeting*** (14.2.2021) - it will be able to:

4.5.1 For companies operating the drones:

4.5.1.1 Operate delivery drones that can carry at least 2 kg of useful cargo - preferably at least 3 kg.

4.5.1.2 To the extent possible – obtain a ***license to operate drones over urban areas*** located within the defined bubble and/or from/to medical institutions that are part of the "Central Cluster" - provided that it has a permit to fly on these routes from the CAAI.

4.5.1.3 To the extent possible, fly BVLOS (Beyond Visual Line of Sight) – in compliance with CAAI conditions.

4.5.1.4 From landing strips/ package drop-off points to package drop-off points which make commercial sense, and to the extent possible, where the customer-forwarder will be paying.

4.5.1.5 In the framework of each meeting, the companies will be measured in accordance with the following parameters:

4.5.1.5.1 Safety and Safety Culture, Documentation. The storage quality of the recorded information and its storage.

4.5.1.5.2 The level of service, including the availability of aircraft and compliance with flight times.

4.5.1.5.3 Perform at least 7 successful documented sorties[4] each flight day included in the "Playground" operation.

4.5.2 UTM Companies

4.5.2.1 Ability to perform “deconfliction” ***at the planning stage***.

4.5.2.2 Ability to warn about safety spacing – ***in real time***.

4.5.2.3 Ability to respond to "***priority aircraft***".

4.5.2.4 Ability to locate and recommend solutions for heavy traffic situations in general and in the take-off / landing / drop-off area in particular - both at the planning stage and at the execution stage.

4.5.3 RID and Registration Companies

4.5.3.1 Reflect the identification image in a reliable and accessible way to all in interested parties

4.5.3.2 Support integration to UTM systems and aircraft.

4.5.4 USP Companies:

4.5.4.1 Staff participating in the pilot - from four hours before the start of flights to two hours after the last landing.

4.5.4.2 Provide a high quality of service - according to the opinions of drones' companies and Air Control Units.

4.5.4.3 Ability to provide a solution for the various services (as defined in the attached appendix, from the Ayalon Highways tender) - both for the benefit of the drones’ companies and for the Air Control Units / ACC / Ben Gurion Airport / Police.

4.5.5 Each aircraft will be registered according to the rules to be determined.

4.5.6 Each aircraft will be marked according to the rules to be determined (with a marking plate that includes the type of aircraft, its registration number and the name of the operating company).

4.5.7 ***The company will operate an "Operations/Operational Center"*** that will be staffed from four hours before the start of flights to two hours after the last landing on the same day.

4.5.8 Display its flights planning, in an automated way, to the UTM application as it will be created prior to that meeting, including installations and integrations, as required.

4.5.9 Display the location of the aircraft and the planned route, in real time - to the UTM application, including the implementation of installations and integrations, as required. These data will be reflected, among other things, by RID as dictated by Na’ama's Administration.

[4] With no failures or safety events/accidents, fully documented in accordance with the Debriefing Appendix.

4.5.10 ***Select for themselves - and coordinate - the "landing strip" in which they are interested - in coordination with the person responsible for the land.***

4.5.11 Plan routes from the landing strip to the drop-off points - where the "Financially Qualifying Route" must be longer than 300 meters - and shorter than 5000 meters – with some exceptions (such as flights to medical institutions in the Central Cluster).

4.5.12 ***A route that is longer than 1000 meters - requires the preparation of an emergency landing site every thousand meters - and the transfer of the emergency landing site to Ayalon Highways.***

4.5.13 For routes planned to be carried out at an altitude of less than 50 meters above ground level - coordination with the person responsible for the activity on the ground and obtaining his approval.

4.5.14 ***Measure and mark the landing strip and the drop-off points with an accuracy better than five cm – in relation to the WGS84 Earth and Datum model - using RTK technology or similar.***

4.5.15 Obligation to inspect the route, at least once every day.

4.5.16 Obligation to visually the landing strip/drop-off points - before each landing / dropping off a package.

4.5.17 The companies must be familiar with the document "Parameters for BVLOS flights operated by Ayalon Highways" and the CAAI document on this matter[5].

4.5.18 Criteria for the company that will develop the UTM application:

- 4.5.18.1 Conflict resolution support - at the planning stage.
- 4.5.18.2 Conflict resolution support - in the implementation stage.
- 4.5.18.3 Ability to respond to priority aircraft.
- 4.5.18.4 Load management.
- 4.5.18.5 Recording - at least a three-month cyclic recording.
- 4.5.18.6 Traffic management in the area of landing strips / package drop-off points (AMAN - DMAN).

4.5.19 Criteria for the company that will operate the UAV flight management service - USP:

- 4.5.19.1 Answering phone calls in up to half a minute.
- 4.5.19.2 Acquaintance with the Air Control Units, HQ of Control Units, Airports Authority, Ben Gurion Airport, ACC North and South, main control towers, Police.

4.5.20 For Ayalon Highways - which provides the control room - within the "Metropolitan Service Center" - the "Mishmar":

- 4.5.20.1 Two controller workstations and one shift supervisor workstation (according to initial characterization)

4.5.21 All activities will be carried out solely in accordance with the "Flight Operating Document" issued under the responsibility of the Air Traffic Management, at least one week before the start of the meeting (i.e., no later than March 7, 2021).

[5] https://www.gov.il/BlobFolder/dynamiccollectorresultitem/1-4-051a/he/APs_1-4-051a.pdf

Appendix A:

4.5.2 Preliminary characterization of the subject of coordination between the companies – based on Ayalon Highways tender No. 53/20 Document D' - Principles for Composing the Technical Response

Link to Tender website

Request for Information (RFI) and Request for Demonstration (RFD) and examination of suppliers for the purpose of selecting suppliers (PQ)– In the subject of "Definition of the "Operational Concept", establishment and operation of a "Smart Airspace", an airspace that can support UAV / multicopter drone flights in conjunction with the other users of the space and all interested parties". Preparations for development and equipping with C2 (Command & Control) components to support capability.

1 Background

1.1 The number of multicopter drones and UAVs in general, in Israel, whose maximum takeoff weight is less than 25 kg, is expected to increase to tens of thousands- as a hobby, many thousands - for military use, and many hundreds for a variety of commercial uses.

1.2 Both the military items and those used as a hobby - in principle, are not intended for operation in urban areas.

1.3 It is likely that over the next few decades, the need to operate a UAV/multicopter drone in the urban space will increase greatly.

1.4 The ability to operate small UAVs/multicopter drones without endangering airspace users, on the one hand, without endangering the population on the ground - on the other hand, and without being a nuisance to air defense systems as well as without posing a terrorist threat - has not yet been regulated, neither in Israel nor in the world, except for local initiatives.

1.5 In parallel, the airspace in Israel is required to support large passenger planes, amounting to up to about 1000 movements per day, crop duster planes, helicopters, small aircraft, paragliders, a large scope of Air Force activity and more.

1.6 UTM[6] operations in the US (FAA[7], NASA) and U-Space[8] in the European Union. (EASA[9], EuroControl, CORUS[10]).

2 Goal -

2.1 Gather information and knowledge in the context of the definition, establishment and operation of a "Smart Airspace" - that is: "***The set of infrastructure and services that will enable the combined operation of all airspace users today, in the activity volumes expected decades ahead - together with***

[6] Unmanned Aircraft System (UAS) Traffic Management (*UTM*)
[7] Federal Aviation Administration (*FAA*)
[8] The SESAR Joint Undertaking, which is a public-private partnership supported and funded by the European Union, Eurocontrol and a number of industry partners, has defined the U-Space Blueprint. U-space is a set of new services relying on a high level of digitalization and automation of functions and specific procedures designed to support safe, efficient and secure access to airspace for large numbers of drones.
[9] European Union Aviation Safety Agency (*EASA*)
[10] CORUS stands for Concept of Operation for European UTM systems

small UAV/Multicopter Drones, for a variety of uses, while continuously supporting industry/civil companies and encouraging innovation and without posing a risk in terms of safety, air defense, terrorism or public nuisance "

2.2 Define and execute demo flights in favor of proof of capability.

3 General Schedule:

3.1 Publication of the Tender – 29/09/2020

3.2 Bidders conference – 13/10/2013

3.3 Responses - until 19/11/2020

4 For whom is this RFI/RFD intended?

4.1 Companies that see themselves as a main contractor of the UNMANNED AERIAL SYSTEM SERVICE PROVIDER (USP) - which by default is planned to be located in the Metropolitan Control Center.

4.2 Companies that see themselves as subcontractors of the above (including in the field of air traffic control, providing aviation forecasts and meteorological warnings, companies that specialize in connection with the Airports Authority and the CAAI, in rules and regulations of “EuroControl”, EASA, FAA, NASA and other relevant bodies, in the investigation of aviation accidents, technical interfaces for the Air Force/Headquarters of Control Units, training of inspectors, etc.)

4.3 Simulation companies at different "Fidelity" levels - which can support trial runs of different scenarios, in the Israeli environment, mainly for the benefit of verification trials, loads and evaluation. These companies need to know how to work even with system providers, both with the USP and with the various UAV operators.

4.4 Companies operating UAVs that see themselves as being able to provide the services listed below in the first years of operation. (Prior to the establishment of the USP, the dedicated simulation companies, etc.)

4.5 Technology companies interested in starting R&D processes and/or providing innovative solutions in the following areas:

4.5.1 Automated information sharing system - on civilian Internet communication infrastructures, in aviation standards, including information push capabilities, information sharing, information security, cyber protection, accepted protocols in the world of aviation, etc.

4.5.2 Algorithmics for managing flight routes planning - taking into account the level of risk to the ground as well as the level of risk in aspects of air traffic (according to the rules of Airspace Assessment).

4.5.3 Algorithmics for the design of flight routes - including for the purpose of creating required safety separations.

4.5.4 Algorithmics for managing several aircrafts from the same operating station/with a single human operator.

4.5.5 UI for the presenting the aerial image to all interested parties.

4.5.6 Development of a transceiver in the aircraft - for work points supporting MASH TOPOLOGY - including collision prevention algorithms "on the

aircraft". Including aspects of energy, heat dissipation, compliance with the environmental conditions, reliability, and cost of ~ a few tens of dollars.

4.5.7 Development of BVLOS[12] capabilities

4.5.8 Development of simple, lightweight civilian remote identification (RID) capabilities, consuming little energy, taking up limited space and costing up to ~ $10 (by default – by means of a SIM card and based on cellular networks).

5 Assumptions:

5.1 There is a demand for enabling UAV activity to be profitable over time (and if it does not currently exist, it will exist in the next decade).

5.2 For many years, the bulk of the companies' business potential has been abroad and accordingly, there is an interest in building the smart space so that it is also suitable for operation in the US and EU countries, as much as possible.

5.3 Israel has unique needs in everything related to air defense, the need to operate in an airspace controlled by the military, in everything related to cyber threats in general and GNSS[13] blockages in particular, as well as in various aspects of security and the need to prevent the use of small UAVs/multicopter drones for crime and terrorism.

6 Basic Policy and Program Principles:

6.1 The development of this field will enable, as much as possible, the developments of the industries to be suitable for activity abroad as well.

6.2 All developments will be carried out, as far as possible, on the basis of "open source" software, open architecture and protocols that allow different systems to be connected - so that at least three different industries can be integrated in each implementation component and no component shall depend on a single vendor. The "information sharing system", by default, will be a web application in acceptable/aviation formats so that anyone who has a "subscription" can get the information required by them - by pull/push as long as they have internet access (including wired, WI-FI or cellular infrastructure or any other infrastructure).

6.3 In the coming years most of the activity, in the context of the current document, will focus on aircraft with a maximum take-off weight of less than 25 kg.

6.4 In the coming years most of the activity, in the context of the current document, will focus on tasks where the task execution phase can be delimited - either to a defined area (polygon, geo-fencing), or to defined routes (pre-authorized routes). This definition is intended to allow a reduction in risk to the population on the ground.

6.5 The development of this field will be done in an effort to meet the engineering safety target of less than one person killed per decade and the LARA[14] principle.

[12] Beyond Visual Line of Sight (beyond the range where it is possible to see the UAV with your eyes, without any visual aids except regular glasses or contact lenses).
[13] Global Navigation Satellite System (*GNSS*)
[14] According to this principle, regardless of binding regulation or engineering calculations, each player should choose a way in which the risk is as low as he can reasonably accept (for instance, if a trial can be carried

6.6 The development of the field will be done in stages and under the "from easy to difficult" policy - day flights before night flights, flights on missions that allow defined routes before flights "in free operation" and the like - except for the following reservations:

6.6.1 From the very first stage - it is necessary to address BVLOS flights.

6.6.2 From the first stage - it is necessary to address GNSS blockages.

6.6.3 From the very first stage - it is necessary to address the challenges of air defense.

6.6.4 From the very first stage - it is necessary to address the prevention of crime and terrorism risks.

6.7 ***First stage***: Flights in existing "UAV bubbles" and/or in Na'ama bubbles - when a designated closure is made for the flights and only one company operates in each bubble, according to existing procedures and according to the Na'ama Project RFI/RFD and/or to Tender 29/20 of the Ayalon Highways (Corona route) This phase has already been started and is not part of the current RFI/RFD.

6.8 ***Second Stage***: This phase will define and demonstrate the full range of infrastructure and services listed below. This stage is the core of the current document:

6.8.1 ***Mission planning and request for ATC Clearance – Prior to a flight.*** This stage will include information dissemination/reception, including:

6.8.1.1 "Operation areas" and all air infrastructures in Israel – including methods for ensuring updatedness.

6.8.1.2 NOTAMS[15]

6.8.1.3 Aviation weather information.

6.8.1.4 Ability to upload requested operation areas/routes.

6.8.1.5 Warning about conflicts with the planning of third parties.

6.8.1.6 A proposal for automated conflict resolution.

6.8.1.7 Information regarding the level of risk to the ground, including:

6.8.1.7.1 Taking into consideration population density maps

6.8.1.7.2 Taking into considerations sensitive facilities (universities, schools, kindergartens, hazmat storage sites, etc.)

6.8.1.7.3 Planned crowd gatherings.

6.8.1.8 Bringing to light routes/operation areas where operation is planned to take place.

6.8.1.9 ATC Clearance for the planned activity.

6.8.2 Aircraft details, including performance data and an automated registration and identification mechanism.

6.8.3 Reporting "Request for commencement of activity"/Reporting "End of activity", to the bodies responsible for air volume control (Air Control Units, control towers, TMA[16], CTR, etc.). Reporting can be performed

out above an uninhabited area, it will be preferable to a trial over an urban area - regardless of any meticulous calculation, assuming that the two options are priced similarly).

[15] Notices to air crews/flight forwarders - Anyone who is an air worker must be familiar with these messages before boarding a flight/or forwarding a flight.

[16] The airspace volume controlled by Ben Gurion Airport's control tower – including the space over Jerusalem and Tel-Aviv (Details in the Aeronautical Information Publication).

through "information sharing" mechanisms - with or without the need of an approval by a supervising entity (Acknowledge).

6.8.4 Receiving alerts about aerial conflicts and appropriate response capability.

6.8.5 Ability to display routes that others are planned to carry out.

6.8.6 During the flight:

6.8.6.1 Ability to see "aerial images" in real time[17].

6.8.6.2 Ability to present an aerial image (self-location, altitude, velocity vector, planned route, identification/registration, etc.) to all interested parties.

6.8.6.3 Ability to detect situations of dangerous approach - and avoid collision (TCAS-like mechanisms or, even, collision prevention maneuver based on direct communication between aircraft units)

6.8.6.4 Ability to receive a "***Land ASAP***" instruction - from an external source and perform an "immediate" safe landing - in a pre-defined "Emergency Landing Site"[18] category.

6.8.7 Ability to communicate with emergency forces including the Fire Department, Magen David Adom (*Israeli Red Cross*), Search and Rescue teams, Air Control Units and Ben Gurion Airport (communication with the ground station/ground operator must also be considered, in which case it is possible to make do with redundant cellular telephony - including cases and responses, when the aircraft is flying BVLOS, ***it must be shown how all the company's aircrafts are landed - or all the aircrafts in a particular area, or one specific aircraft - within three minutes from receiving a warning from the ATM unit - according to CAAI definition - the message about the need to land will arrive to the operator/pilot and will be in charge of landing the aircraft in order to maintain the principle of accountability.***

6.8.8 Infrastructure, procedures, methods and means for reporting accidents.

6.8.9 Infrastructure, procedures, methods and means for recording flights and storing information - as similar as possible to the world of civil aviation and at the very least, the ability to keep cyclic recordings for three months.

6.9 Systems for training, certification and maintaining competency for all professions dealing with the subject should be taken into consideration.

6.10 <u>Third Stage:</u>

6.10.1 The third stage will include addressing situations where collision routes are created - when both aircraft are in BVLOS and/or within ranges where action delays through the ground station are too long - and Mash Topology communication is required between the aircraft themselves V2V[19], including mutual sensing and maneuvering to prevent collision.

[17] It is not possible to ensure that the image will be available to all subscribers, and the ability to control distribution is required.
[18] Acronym in Hebrew in the original.
[19] Direct communication between aircraft units

6.10.2 At this stage, all NCT[20] aspects must be addressed- including a description of the information flow processes and the prevention of collisions with aircraft that are not part of the smart airspace (for example - manned aircraft, without IFF/RID that accidentally enter the operation area of a multicopter drone in the smart airspace) .

6.10.3 Ability to agglomerate as much traffic as possible - with "mission commands" being delivered "all at once" to a large group of aircraft - and the entire group flying in a packed and coordinated manner (such as: the way huge light shows by drones are performed - but for delivery missions).

6.10.4 Traffic management of multiple aircraft in the landing area and/or at package drop-off points.

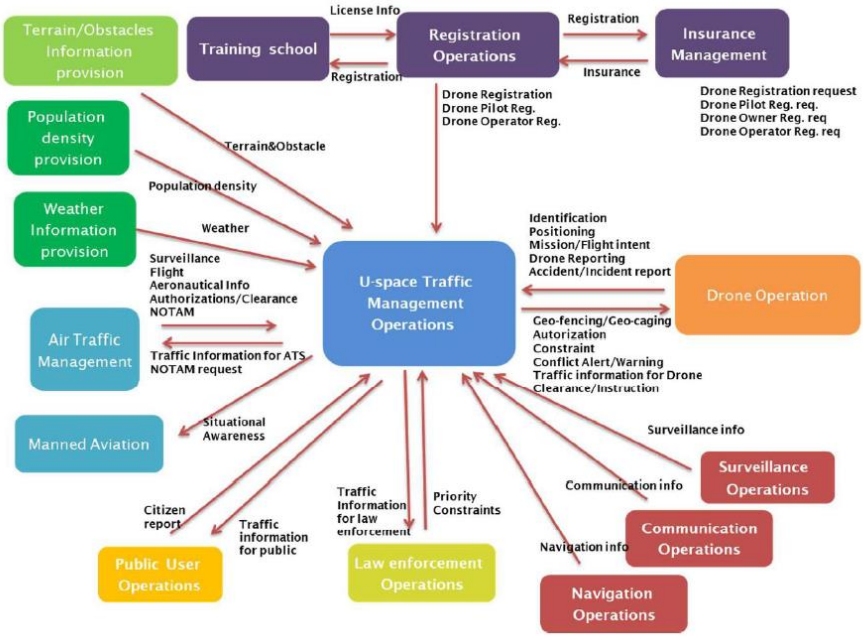
6.11 Simulation capability.

6.12 Aspects of information security and cyber defense.

6.13 Aspects of air defense and the prevention of crime and terrorism.

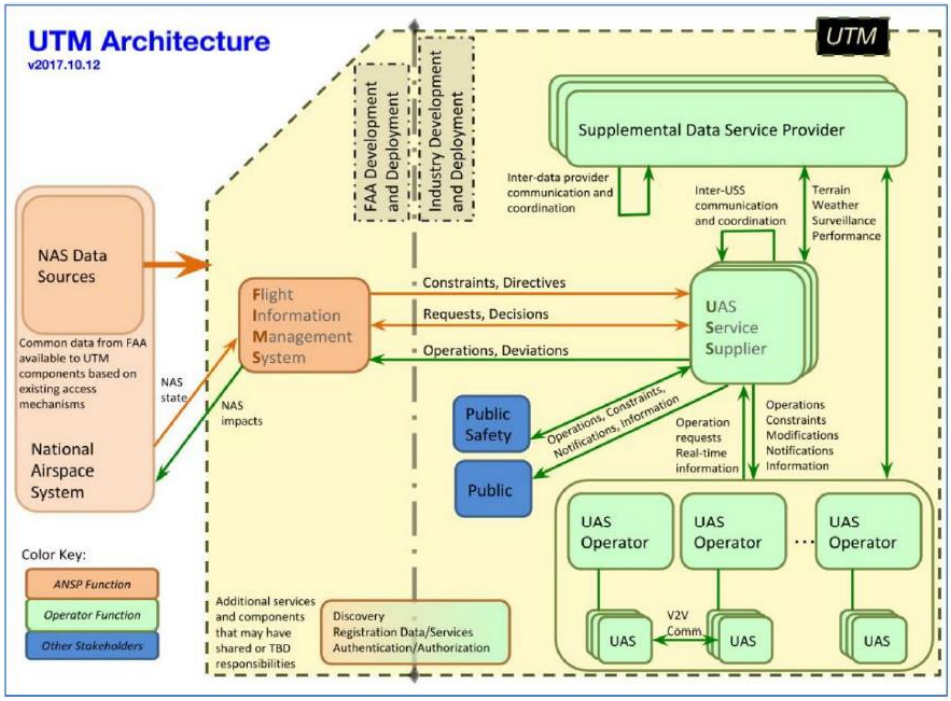
7 Logical Description of Concept Components:

A preliminary logical description of the information entities is shown in the following figure, from the USPACE documents of the European Union:



8 Illustrative, possible Response Architecture (from USA/FAA UTM documents)

[20] Non Cooperative Aircraft (Target), that is, they do not have IFF, or other electronic identification means and the “Smart Airspace” is unable to know about them, except for an alert by the control systems of the Airports Authority of the Israeli Air Force/IDF.



Possible mapping of response components, based on UTM/FAA:

8.1 National Airspace (NAS) Management

8.1.1 Under the responsibility of the Airports Authority, and through ACC North/ACC South and the various control towers (in the volume supervised by the civil authorities)

8.1.2 Under the responsibility of the Air Control Units, the military control towers (in the volume supervised by the Army/Air Force).

8.1.3 All subject to the regulation of the Civil Aviation Authority and ICAO.

8.1.4 This component is not related to current RFI/RFD.

8.2 Unmanned Aerial System Service Provider:

8.2.1 <u>For the default alternative, the USP will be physically located in the Metropolitan Control Center.</u>

8.2.2 The control center is the entity that provides information to UAV operators. By default – it is the entity receiving the required information from both the UAV operators and from secondary information providers, both before and during the flight.

8.2.3 The control center is the entity that reflects the relevant information - both from and to the Airport Authority and Air Control Units[21].

8.3 UAS Operator:

8.3.1 The traditional UAV operator (preferably, it should be possible to have multiple UAVs operated by a single operator/pilot).

[21] It would be preferable not to establish voice/telephony communication between UAV operators and Air Control Units at all (but only through the USP)

9 Possible Avionics Architecture, within the aircraft (this chapter is written for the sake of completing the picture only - the RFI refers only to the interfacing components of the "Smart Airspace" including the various communication components):

9.1 The communication within the aircraft will be performed by Mux Bus in a well known hardware, firmware and protocol configuration.

9.2 ***Autopilot***: The avionics system that knows how to "fly" the aircraft safely - is the system responsible for flying at the low/physical layer - that is, compensating for turbulences/wind blows, maintaining flight within the allowed performance and safety envelope, etc. This is usually the system including gyroscopes (using the micro-electro-mechanics technique for example), accelerometers, INS systems that know how to calculate the angles of the aircraft in space and the like.

9.3 ***Mission computer***: The avionics system that knows how to calculate the route, the turning radii, the battery status/volume of fuel in the aircraft, can "understand" what is the navigation point in the navigator, what is the drop-off point, what is a landing strip, what is the desired flight altitude, where are the "closures" "or what is the limit of the polygon where the aircraft is allowed to be, where are emergency landing sites and the like. If there is a system that knows how to calculate collision avoidance routes it can be implemented in this system. This is the system that receives the flight plan, the current position from the INS, etc. If there are sensors on the aircraft (to prevent collisions with obstacles, for example), this will usually be the system receiving data from the sensor.

9.4 ***RF communication system to the pilot and/or the USP***: This system contains transceivers, modems, antennas, etc. and is the one enabling the transfer of information between the operator and the USP to and from the aircraft.

9.5 ***Navigation system***: A system that provides the position of the aircraft in space (attitude), its self-position over an acceptable datum (usually WGS84) and the direction with respect to the north. Usually, the system also provides velocity vector accelerations.

9.6 Remote Electronic Identification System - RID.

9.7 ***The mapping system***. Topography details (DTM) and digital surface model (DSM) - including a layer of flight obstacles.

9.8 Conflict Detection and Collision Avoidance System:

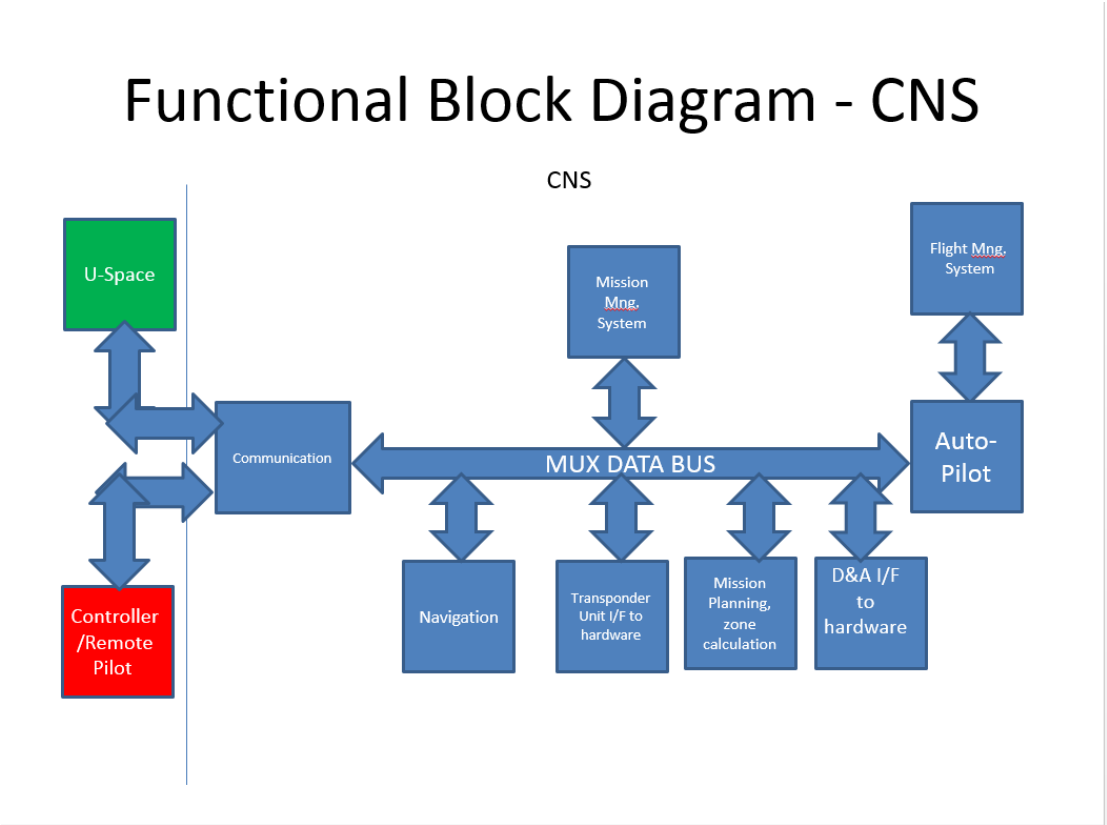
9.8.1 At the planning level (avoiding routes which by definition may result in a reduction of safety margins - in the sense that planning is done to be in the same place and altitude, at the same time as someone else's planning)

9.8.2 At real time level - an algorithm that is integrated "at the ground station", in the aircraft and/or in the USP - but does not include direct communication between aircraft units.

9.8.3 At real time level - while relying on direct communication between aircraft units (such as TCAS and/or future dedicated developments)

9.8.4 In this RFI/RFD there is no requirement for a Sense & Avoid system capable of handling aircraft which are not “in the network” (no dedicated radar on the aircraft or an electro-optical system on the aircraft is required - one that can detect collision routes with aircraft not “in the network”, and the current RFI does not apply to national radar and/or ELINT arrays). This component will be addressed through coverage of a national radar by the IAF and/or under the responsibility of the non-networked aircraft.

9.9 A possible illustration of "Functional Blocks" in the aircraft is detailed below:



10 Submission requirements from the bidders (I-M, request for information – mandatory response, I-O, request for optional information, D - must include a proposal for demonstrations):

Numbering	Subject	Response Content	Response Format	Remarks	Requirement Type
Regulation – 1	Mapping of existing players and standards	Details of who is responsible for providing which service/information - is there a binding regulation for the field in the US or in Europe and if so, what is it. A comparison should be made with the UTM CONOPS responsibility tables of the FAA and CORUS	Document	For example: what standards should the planning/information sharing system meet (software development standards for example). For example - what requirements is provided by the land cover data supplier, etc. Adhere to RFI as much as possible and in case you present a completely different solution - explain the reasons and the method of proving the answer	I-M
Metropolitan C2 – 1	Preliminary characterization of the automated system supporting the planning stage, information sharing and provision of services in the Smart Airspace	A document including a list of all the concrete interested parties in Israel, a list of the information entities that are supposed to be transferred among all interested parties, information protection measures, protocols, initial access to the UI, SLA, technical support, maintenance throughout the life cycle of the system and all other relevant information. Possible interfaces with the other functions of the metropolitan control center planned for Gush Dan should be considered (in terms of normal ground transportation)		To the extent possible - the solution offered must address "thin" terminals that are suitable in their characteristics (Look and Feel), to what is acceptable in the world of flight control/supervision. The architecture of servers/terminals/data storage capabilities should be specified for continuous recording (cyclic for the last three months as a minimum). Examples of suitable operating screens and/or videos must be attached The proposal should include gradual development and deployment - from a situation of "one	I-O

		The architecture should support small UAV operators - based on the simplicity of the system and an interface that will be "almost exclusively" between the operator and the USP (i.e., free, as much as possible, the operator from the need to keep in touch with multiple entities - for example- Air Control Units)		controller operating one drone", through a situation in which a few dozen drones are operated, without the USP component (the tender for the control of the metropolitan control center) up to a situation where there are dozens of drones over Israeli cities - and the control center works at full scale A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	
Metropolitan C2 – 2	Characterization of interfaces for the control units of the Air Force, for the Air Force towers for the Central Control Unit, for Ben Gurion Airport, for ACC North, for ACC South	The proposal shall include how will the system be deployed - including the aspects of human engineering, the costs and who bears them, how the installations are carried out in the various places (or - how to coordinate the process and with whom). The preferred situation would be the one where the connection between the operators and the Air Control Units will be only through the USP - so that both parties will have a single POC		A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Metropolitan C2 – 3	Characterization of mission planning components, and the manner of distributing planning, including a response to maintaining			Proposal should include the manner in which the aircraft displays performance - including the planning aspects (for example - range/autonomy) - and the manner in which the data is displayed to the various system users.	I-O

	commercial confidentiality				
Metropolitan C2 – 4	Users management, verifications, identification, preventing use by unauthorized parties, etc.				I-M
C2 – Features and Services - 1	Geofencing capabilities			Information must be provided both about the technological aspect and about the organizational aspect - who provides the closed areas, who is responsible for their up-to-datedness, etc. The time dimension (Dynamic Geo-Fencing) must be addressed	I-M
C2 – Features and Services – 2	Routes implementation method, safety separations, etc.			Both the design and the flight stages must be addressed, where the algorithmics is performed “at the ground station” of the UAV operator and/or the USP. Consider the possibility of implementation inside or adjacent to the communication transceiver between the aircraft units (V2V).	I-M for the ground station components and the USP at design and flight stages I-O for the airborne transceiver
Information Supplier - 1	Aviation meteorology	List of standards		A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Information Supplier - 2	Land cover data – including details of relevant facilities for up-to-datedness and accuracy			It is proposed to examine the possibility of interfacing with the GIS systems of municipalities/existing suppliers A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O

Information Supplier – 3	Data on flight obstacles such as power cables, electricity posts, cellular antennas, cranes, etc., including details on maintaining up-to-datedness at the relevant level			Where is information coming from? Who provides the information? How can accuracy and up-to-datedness levels be ensured? A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Information Supplier – 4	Population density maps			Address the design stage (“fixed” maps) A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Information Supplier – 5	Design and real time information related to crowd gatherings in the open			Who provides the information? How can accuracy and up-to-datedness levels be ensured? A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Information Supplier - 6	Sensitive facilities			Who provides the information? How can accuracy and up-to-datedness levels be ensured? A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Simulation – 1	Simulation system for the Metropolitan C2 level			Specify: What can be simulated? What is the simulation’s quality? What is it intended to be used for? What will be the output of each trial	I-O

				run? etc. Is the system designed for development/tests/loads design – or for training of officials? This section refers to the Metropolitan C2 A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	
Simulation – 2				As above, for the air operator level (the company operating the UAVs, the content world of the aircraft itself, communication with the ground station, etc. A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Simulation – 3	Simulation system – for the aircraft itself (aircraft algorithms, etc.)			A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
Air Operator – 1	Address aerial operators of the Na'ama Project and the way they will need to interface to the Metropolitan C2			Design target – the Metropolitan C2 must interface to workstations of the aerial operator, so that the operator will require minimum changes at his end.	I-O
Training – 1				Detail of all training for the various roles Is the creation of a dedicated school recommended? OJT? Integration with existing training mechanisms? A general work plan (SOW) must be specified as well as an estimate of the size of	I-O

				resources (ROM time and money)	
R&D 1	Transceiver for preventing collisions – airborne on the aircraft, based on communication between aircraft units, one with the other			Price target: Up to ~ US$20 Weight target Energy consumption target Reliability target A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
R&D 2	Aircraft Registration			Web App – including details on who holds the database, who are the users, aspects of accidents investigation, privacy, etc. Address existing international standards, including ASTM, and list examples of foreign countries Specify an alternative based on SIM cards and dissemination of information by means of a “regular” automated system. Address critical database standards (such as banks, insurance companies, IDF, medical institutions, etc.) A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	D
R&D 3	Cost-effective and reliable RID[22] system			The proposal should include an option according to which the	D

[22] Remote ID

				identification will be based on a regular commercial SIM, including the option to be based on the SIM that constitutes the communication channel for flying and providing a distribution service through the USP (and/or Air Control Units, towers and the Internet network for a public application). It is recommended to examine the possibility of leveraging an existing application such as Flightradar24 or similar.	
R&D 4	Technical response for BVLOS-backed flying capability			In any case, the possibility of "flying" through cellular networks should be considered. Refer to Ministry of Communications permits/licenses	I-O
R&D 5	Response to GPS blockages			Disruptions in the middle of a flight should be considered. For a situation of lack of continuous GNSS (including before take-off) and for accuracy capabilities in the drop-off points and return home. A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-M
R&D 6	Preparation of automated emergency landing sites			Detailed specification, including demonstration on the relevant area in Israel and details related to up-to-datedness and testing of a “clear area”	I-M
R&D 7	Proof of flight safety over railway tracks			A general work plan (SOW) must be specified as well as an	I-O

				estimate of the size of resources (ROM time and money)	
R&D 8	Proof of flight safety over roads			A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
R&D 9	Proof of flight safety over buildings			A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	I-O
R&D 11	Methods for sharing "plans and intentions" - including routes and mission – so as to enable an improved and shared aerial image for other operators and the USP - while ensuring a "balanced" service to all companies and avoiding preference for large and rich companies			The bidder will build an automated system that can receive its flight plan from each UAV operator - to perform "conflict checks" and offer a solution to all concerned + define a flight plan / binding restrictions in a way that does not require USP intervention but only notification. The USP will be able to intervene. A general work plan (SOW) must be specified as well as an estimate of the size of resources (ROM time and money)	D
R&D 12	The array of connections between USPs (assuming there will be up to three such providers in Israel)				I-O
R&D 13	Analysis of cases and responses				I-M
R&D 14	Preventing damage from flight obstacles				I-M
R&D 15	Information security and cyber defense, with emphasis on preventing				I-M

	unauthorized systems use				
R&D 16	Integration in the community, including enabling the public to file complaints by identifying the particular flight and aircraft involved in the complaint				I-M
R&D 17	Special VIP flights or the expected entrance of a manned airplane into the flight's airspace				I-M
R&D 18	Equal opportunities for accessing the volume of the Smart Airspace				I-M
R&D 19	Analysis in accordance with scenarios			As a minimum, address the scenarios indicated in the CONOPS document of the American UTM (FAA)	I-M
R&D 20	Management of "Requests for airspace closure"				I-M D
R&D 21	The set of interfaces with private (non-commercial) drones				I-O
R&D 22	The set of interfaces with manned aircraft and/or drones without RID				I-M

11 Demonstrations Program:

11.1 Metropolitan C2 - A developing three-year demonstration program should be proposed - including an analysis of which components can be demonstrated and when, as well as ROM pricing according to the following deadlines:

11.1.1 Information sharing at the level of "Flight log on Google Drive" - during 2020.

11.1.2 July 2021 - Demonstration of a system that can support at least three companies operating in parallel and the two military Air Control Units.

11.1.3 January 2022 - Demonstration of all the functions defined above.

11.2 RID and registration of the aircraft - with/without all the drones used for hobby (in the quantitative aspect – for a scope of up to 50,000 such units).

11.3 Simulations - at the bidder's discretion.

11.4 V2V Transceiver - including hardware analyses (weight, power consumption, volume, compliance with environmental conditions, RF performance including delays, etc.), ability to perform "automatic route separations", etc. - at the bidders' discretion.

11.4.1 Demonstration of "Hardware Calculation" and sample BOM during 2020.

11.4.2 Demonstration of RF components in a hardware lab - including aircraft-to-aircraft communication and back-reporting - first half of 2021.

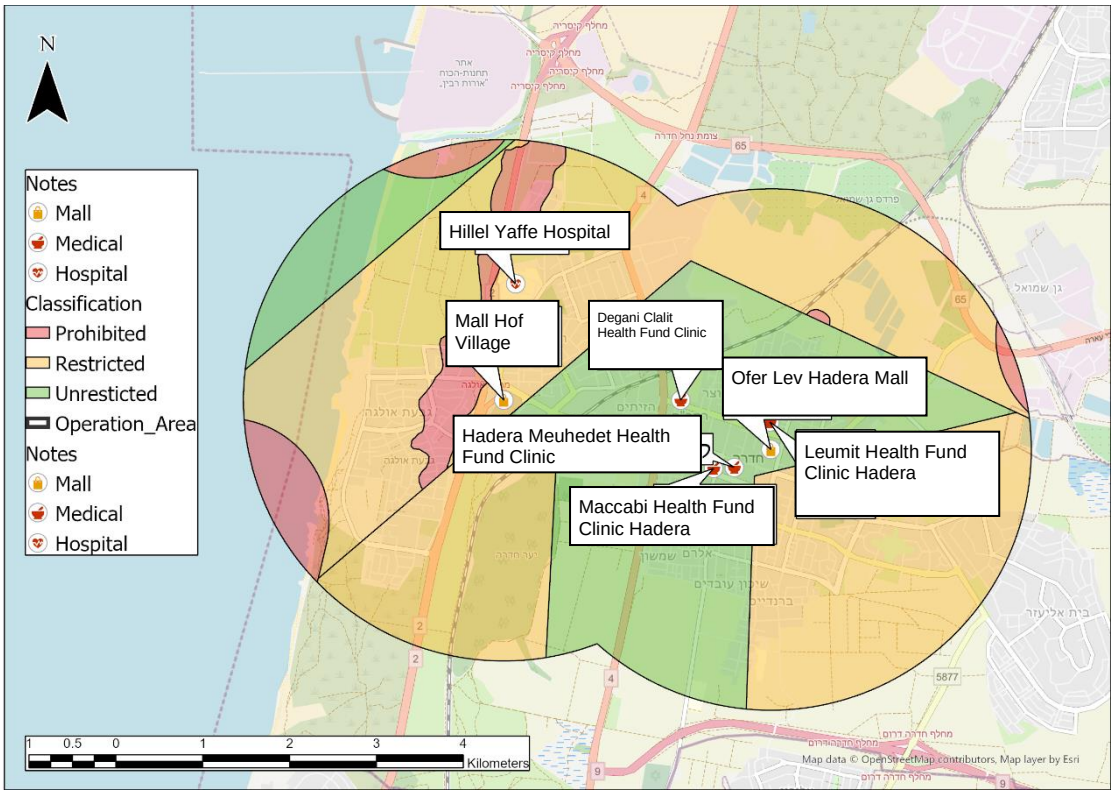
11.4.3 Systemic simulations - including routing to prevent approaches - until December 2021.

11.4.4 Proposed program to support flights on a drone with a maximum take-off weight of less than 25 kg - until December 2022.

Appendix B:

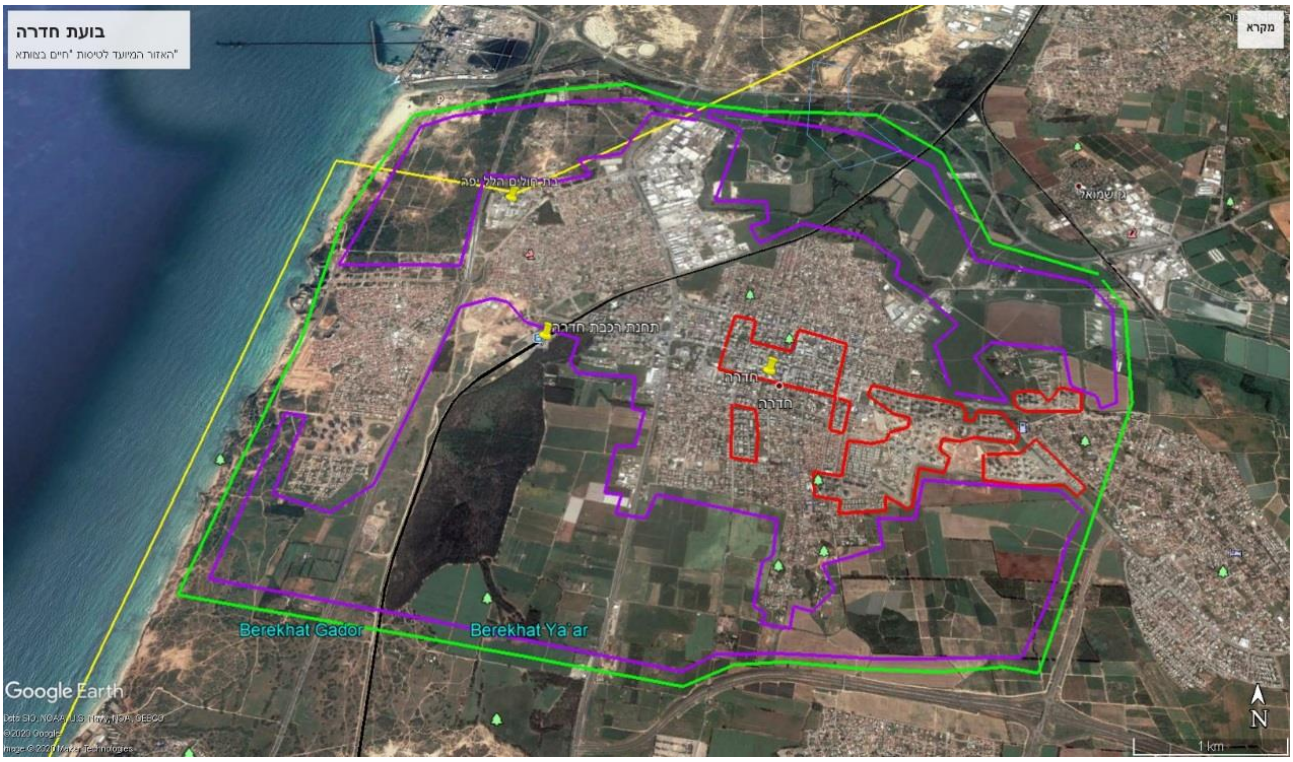
The Playground for the first meeting, which is expected to begin on March 14, 2021 and last for two weeks.

1. The Playground will include most of the area of the city of Hadera, so that companies which are licensed to fly over built-up areas will be able to do so.
2. In parallel, unoccupied agricultural fields occupy quite a significant part of the area, so that companies which drones are not sufficiently safe or those restricted by the CAAI may operate over unoccupied fields.
3. Most of the neighborhoods include houses with adjacent land, which will enable dropping off packages onto the lots of private individuals.
4. Within the city there are several health funds clinics and pharmacies.
5. Within the city there are several shopping malls.
6. The bubble contains the Hillel Yaffe Hospital - which provides services to the medical institutions of the Hasharon Cluster (Dorot Hospital, Lev Hasharon Hospital, Sha'ar Menashe Hospital, and Shoham Hospital).
7. Area in green – it is possible to fly at the relevant altitudes, while maintaining safety space from the manned traffic.
8. Area in red – it is prohibited to fly at the defined spaces, as also 40 m above the surface do not enable maintaining safety spaces as defined in the routes/populated areas.
9. Area in orange – at 40 m over the surface spaces are maintained.



If it will not be possible to carry out the activity at the Na'ama Hadera bubble – the activity will take place at the Na'ama Netanya bubble.

In the illustrative illustration above - the airspace and points of interest are prominent in the bubble.



In the illustrative illustration above: the three polygons surrounded by a purple line - sparsely populated areas that allow for operation / obtaining a permit more easily.

The six polygons surrounded by a red line - include multi-story construction and by default, in the first show, there will be no flights. In any case, flying in such areas will require significant cumulative experience, redundancy for GNSS (at least three navigational satellite consoles), unlimited optical communication camera (LTE for example), parachute reduction / FTS. In all likelihood, CAAI will also find it more difficult to issue flight permits in these polygons, except after significant cumulative experience.

The areas between the purple and red polygons - a rural / suburban area and it is likely that companies with the right experience and tools - will be able to obtain a flight permit in them.

In any case, the coordination of the landing points - is the responsibility of the companies vis-à-vis the owners / operators of the land.

Appendix C:

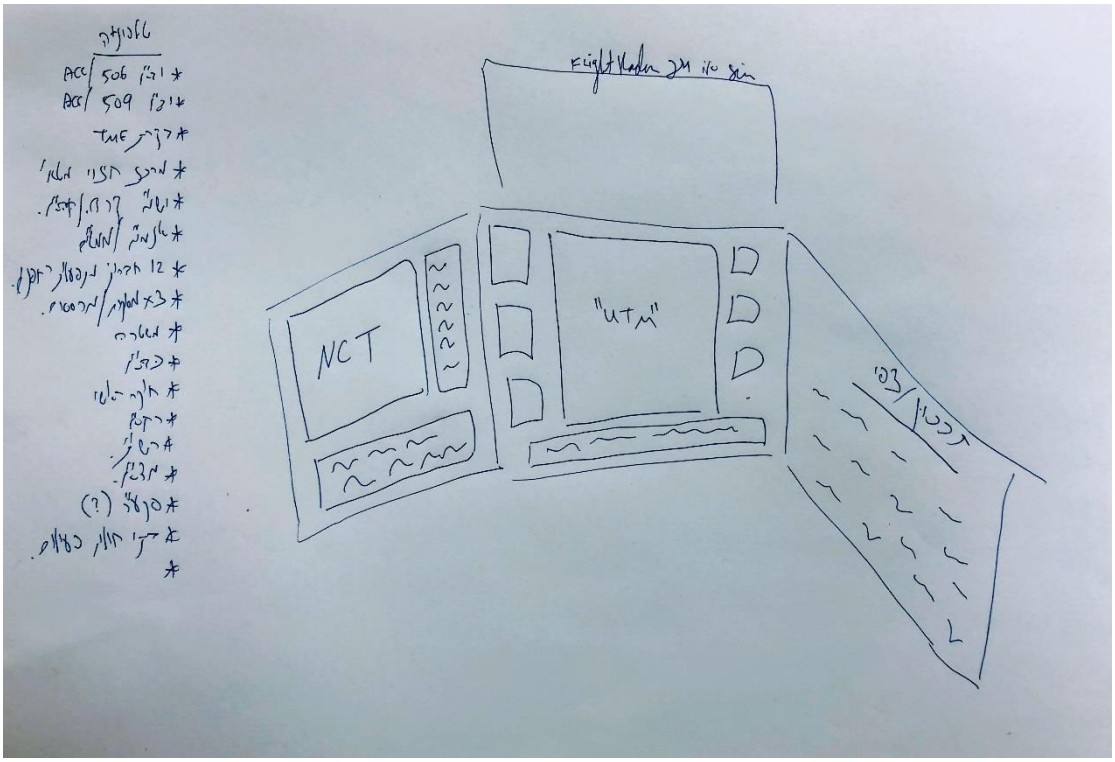
Defining the Sharon Cluster.

1. Dorot Geriatric Hospital, Lev Hasharon Psychiatric Hospital, Sha'ar Menashe Psychiatric Hospital, Shoham Hospital in Pardes Hanna, Hillel Yaffe General Hospital.
2. All pharmacies and health funds clinics and their surrounding area.
3. The "Israel" Company.
4. The routes between them – according to Airspace Assessment documents, to the extent approved by the CAAI and the Air Force respectively.

Appendix D:

Preliminary characterization of the Control Center/Provision of Services

1. Two controller workstations and a shift manager workstation behind them.
2. Telephony and screens – in accordance with the illustration.
3. “Guests’ Stage” enabling unobstructed viewing
4. Large frontal screen
5. Cyclic recording capability of at least three months.
6. The relevant servers’ farm.



Appendix E: Debriefing Form

Documented Flight Debriefing

1. Date: _____
2. Aircraft: _____
3. Operator Company:_____
4. Pilot/Operator Name:_____
5. Take-off time:_____
6. Number of sortie on that same day (first? second? etc.):_____
7. Take-off point: _____
8. Landing point:_____
9. Horizontal vision:_____
10. Cloud cover in take-off (type and oktas):_____
11. Wind in take-off: _____
12. Type of cargo, test/medication, others, specify:_____
13. Deviation in landing (in cm):_____
14. Number of satellites detected, before landing/drop-off:_____
15. DOP before landing:_____
16. Safety events:_____
17. Special events/remarks:_____
18. Pilot/Operator Signature:_____
19. Signature of cargo/medication/test deliverer: _____
20. If a flight was performed not for transporting customer's cargo - specify reason:_____
21. The flight was performed in response to “Flight Operation Document”:_____ dated: _____

Appendix F:

Flight Operations and Mandatory Reports

1. Flights within the framework of the Call for Bids will be performed only according to the "Flight Operation Document" which is the responsibility of the Air Traffic Management to publish at least one week prior to the start of flights in the Playground.
2. Any deviation from the operation conditions ***and/or special event and/or safety event*** shall be reported to the Ayalon Highways Company within two hours of the occurrence of the event, in addition to reporting ***to the CAAI and to the Chief Investigator***, if such reporting is required. Mandatory reporting shall include at least the following events:
   - 2.1. Fire in the aircraft and/or in the dedicated equipment required for its operation (including batteries).
   - 2.2. Power outage in the aircraft
   - 2.3. Any crash/contact with the ground that was not planned in advance
   - 2.4. Any landing and takeoff made not from/to a pre-approved landing strip/drop-off point.
   - 2.5. Any work accident related to the operator/pilot or any other employee directly related to the aircraft.
   - 2.6. Any injury to a person - to the extent caused as a result of the operation of the service.
   - 2.7. Any damage to equipment - to the extent caused as a result of the operation of the service.
   - 2.8. Any impact on an ***obstacle***, while flying, even if no damage was caused.
   - 2.9. Any operation of the ***FTS*** system - whether it was activated "rightly" or whether it was activated accidentally, on the ground or in the air.
   - 2.10. Any deviation from the route in general and in particular, if ***GNSS disruptions***/blockages are suspected.
   - 2.11. Any ***complaint***, whether it is an official complaint or just "verbal complaints" regarding the operation of the UAVs/drones, regardless of the complainant.
   - 2.12. Any incident of ***theft, sabotage of equipment, vandalism, disturbances*** caused in connection with the operation of the UAVs - whether the Police was called or not.