Annex 1: Resources to be committed to the 3rd RAWFIE Open Call

The following tables describe the resources, which will be made available to the 3rd Open Call by each testbed.

The actual testbeds that will host the successfully evaluated experiments will be decided by the RAWFIE Consortium taking into account the needs of the experiments and the availability of RAWFIE testbeds and resources. Hence, the testbed indicated by the proposer in the proposal is only an indication and it is not restrictive for the RAWFIE consortium.

Table 1: Testbeds to be made available for the 3rd Open Call and their existing synthesis in terms of UxVs. Over the next months, ALTU, DOGMA and IGMAC devices will be integrated with RAWFIE testbeds.

Testbed	Resources Available	UxV/activity type	Does your experiment require the testbed (Y/N)?
HAI	HAI's industrial complex is located in Tanagra around 65 km North of city of Athens. The test-bed facility consists of a runway of around 500m which can be used for takeoff of wing UAVs. The available area will be appropriate for launching up to 10 UAVs (wing or helicopter)	(UAV Outdoor) 5 VENAC	
HMOD	Salamina straits, a narrow passage between Attica and the island of Salamina, in which the naval traffic is heavily regulated. The neighboring Naval Base of Skaramagkas is able to receive, inspect, launch and store USVs. It provides military grade emergency services (i.e. crash, fire or rescue) and has the appropriate radar facilities and systems for tracking and surveillance. In the context of the project, extra telemetry and control facilities will be set in order to accommodate the needs of the experiments.	(Mixed environment) 10 FLEXUS 3 Pladyfleet 7 NIRIIS 2 VENAC	
CATUAV	CATUAV / BCN DRONE CENTER provides testbed facilities consisting in a segregated air space of 25 square km, an airfield, a bioclimatic building and rural terrain of 14 Ha ready to install and deploy a wide diversity of components and infrastructures, with no restrictions or limitations, that can cover a wide diversity of experiments related to UAVs and UGVs.	(UAV Outdoor) CATUAV /BCN DRONE CENTER include the exclusive use of 2 UAVs for RAWFIE as UAV nodes.	
RT-ART	The testbed is ETOPIA, a center for Art and Technology, (16,000 m2) located in Zaragoza, Spain, and consists of three buildings linked together. There are five testbed options:	(UGV Indoor) The testbed includes 4 TurtleBot2 devices	

	• S1 - Entrance Hall of ETOPIA building (425.91 m2). • S2 - Experimental gallery (around 800 m2). • S3 - Residence. Two floors of total area around 375 m2. • S4 - Showroom (390 m2). • S5 - Building terrace (600 m2)		
MarEH4EU	DFKI RIC Maritime Exploration Hall (MarEH) in Bremen, Germany. This large (23x19x8m) basin is filled with salt water and allows to test surface and underwater vehicles	(USV Indoor) 7 PlaDyFleet 3 NIRIIS	
CESA DRONES	CESA provides 4 outdoor aerial testing sites : 1. Camp de Souge and HERM The main and permanent flight test area is located in Souge, near Bordeaux. It’s a flexible restricted area with protection from industrial spying: 2800 ha reserved airspace, 2 000 feet above mean sea level and 800m paved runway. 2. HERM An access to this test area is given on demand, located in Herm (near Dax). 3. Vendays-Montalivet The third flight test area is located at VENDAYS Montalivet. It’s a restricted military area, located on the Atlantic coast line, typically used for the training of Defense Ministry's General Delegation for Armaments (DGA) : 50 km of elongation and 7 km large allow long flight out of sight, 3 000 feet above mean sea and 600m x 15 m paved runway. 4. Biscarrosse The last testbed area is located at 85km S/W of Bordeaux, on a civil air area, under security of civil aviation, and allows 15 km of elongation, and 5 km large, 600m x 30 m paved runway and 800 m x 30 m grass runway.	(UAV Outdoor) 5 VENAC	
Aeroloop	UAV simulation infrastructure based on a hardware-in-the-loop and software-inthe-loop approach, which will allow users to perform experiments in a flexible way, 24x7, without requiring any human on-site support	UAV virtual facility / emulator	

Table 2: UxV devices to be made available for the 3rd Open Call

UxV Devices	Specification
NIRIIS	• Boat size (L x W x H): 1,3mm x 40mm x 30mm

	• Gross Weight: 9kg • Material: epoxy resin fiberglass • Power: High Power Lithium Polymer Battery • Motor: Water-cooled brushless • Operational range: 1000m • Endurance: Up to 2 hours • Speed: Up to 30km/h (8m/s) • Payload capacity: Up to 10kg • Steering: Off-set Rudder • Main Communication Frequencies: Main link:433MHz • Video Downlink: 1.2GHz • EO/Day Camera • IR Thermal Camera
PlaDyFleet	• Processing capabilities and data storage: NUC Intel Core i5, 1.6-2.7 GHz dual core, 3MB cache; SSD 120GB • Size and dimensions: 756x756x280 mm • Weight: 25 kg • Payload: 5 kg + water displacement • Battery: 12 V 600Wh AGM gel battery • Minimum and maximum autonomy: 2 -8 hours • Sensors: - Navigation – GNSS: Real Time Kinematic Global Positioning System (RTK GPS) - Navigation – Inertial: Inertial Measurement Unit (IMU) • Camera: Above water HD camera installed on all USVs • Underwater camera: Installed on one USV • Echo sounder: Single beam echo-sounder installed on one USV • Control software: ROS Indigo running Linux Ubuntu 14.04 • Compatibility with Apache Kafka architecture
VENAC	• Processing capabilities - Model: Raspberry Pi 3 Model B - CPU: ARMv8 Cortex-A53 BCM2837 64bit - Cores: quad-core - Speed: 1.2GHz - RAM: 1GB - Co-Processor: Dual Core VideoCore IV Multimedia 3D • Sensor types - GPS GNSS: U-blox M8N GPS - Dual IMU: 2 x Inertial Measurement Units, MPU9250 9DOF and LSM9DS1 9DOF - Barometer: 1 x MS5611 altitude sensing with 10cm resolution - Variometer: 1x-700~10000m with 0.1m (high precision version) resolution - Temperature sensor: FrSky TEMS-01 for system temperature

FLEXUS	• Processing capabilities (type of processors, number of cores, speed): 1.2GHz quad-core ARMv8 CPU or 2GHz quad-core ARM A15 + 1.5GHz quad-core ARM v7 + single board computer for communications • Size and dimensions: 1m long, 0.5m wide • Weight: 10kg (approx., depending on WiFi solution) • Payload capability: 10kg • Battery: 200 Wh, lithium polymer • Number and type or sensors: GPS receiver, IMU, video camera • Number and type of integrated network components and supported communication interfaces: 2 WiFi interface cards + 2 omni-directional antennas • Minimum and maximum autonomy of the device: 1.2 hours @ 2m/s (typical), 4.5 hours @ 1m/s (typical) • Auto-return capability (return to the base station automatically) • Ability of the vehicle to operate as an access point • (Remote) Control interface: QGroundControl, MAVLINK protocol • Operating Systems Linux / OpenWRT • Over-the-air programming capabilities: Yes, through Wi-Fi • Provision of collision avoidance mechanism: Optional • Compatibility with Apache Kafka architecture • Data storage of the vehicle: Minimum 16GB storage, extendable via USB drive • Support of “safe mode” operation • Localization capabilities (e.g., GNSS): GPS • Ability to operate in indoor/outdoor/mixed • environments • Compliance with standards: MAVLINK, JAUS, ROS • Operational conditions (e.g., day/night) and temperature limitations: Night and day. Recommended maximum external temperature is 40 degrees Celsius
ALTU	10 UGVs • long range (>10Km) and short range (max 1.5Km) Remote Control systems and First Person View Audio/Video feeds, simultaneously over IP streaming and Analogue RF transmission to the Ground Control Stations • gimbal controlled HD and SD cameras with 0.0001 LUX minimum illumination capability • static and 360_o long range Laser rangefinders and mapping scanners/radars for simultaneous localization, mapping and multi-directional collision avoidance • dual sensor (FLIR DUO) compact thermal and visible

	light imagers with live analogue and digital video output • simultaneous 2.4 GHz and 5 GHz WiFi 3x3 MIMO mesh networking Access Points with Mobile 4G/LTE Internet Connectivity and extended networking capabilities, like Firewall, Routing, VPN, etc.
DOGMA	10 UAVs • **The Blackbird UAV platform** combining the best from both worlds, featuring Flying wing type aircraft for agility and less failure points, with a fully composite construction usually met in larger airframes to ensure robustness and excellent flight characteristics that mostly refer to a trainer type aircraft, inspired the DOGMA constructing team to build the Blackbird • **Flir Duo – dual - sensor thermal imager** combines thermal imaging with 1080p color video, analog and digital HDMI live video outputs and real-time remote control of camera functions over PWM – plus MSX multi-spectral imaging enhancement (four units) • **Parrot Sequoia - multispectral sensor** that captures calibrated wavelength of Green, Red, Red-Edge and Near Infrared. (four units) • **UAV - Short Range communication equipment** (max 1500m from GCS) for Remote Control on the 2.4GHz band and Audio/Video transmition on the 5.8GHz band. With multipoint telemetry modem, capable of swarming. (four units) • **UAV - Long Range communication equipment** (>10000m from GCS) for Remote Control on the 800Mhz and Audio/Video transmition on the 1.3GHz band. With long range multipoint telemetry modem capable of swarming. (six units) • **Dual day & night vision cameras at 45_{o} angle view** for area patrolling & surveillance, fire protection, real time monitoring, natural disaster damage assessment. (two units) • **Provide fully configurable (open source) auto-pilot controller units** on all of the UAVs capable of determining position, control actuators, stream all telemetry data back to the operators and be fully compatible with the Apache Kafka architecture for RAWFIEs AVRO communication protocol.

	• **Offer highly dynamic architecture in all auto-pilot controller units that fully adapts to the IoT paradigm** by integrating 3G/4G LTE, 2.4GHz WiFi internet connectivity, as well as UHF 900MHz telemetry modem, Bluetooth connectivity and FrSky 2.4GHz R/C wireless telemetry where each one enables remote programing, control and data collection in real-time. **Supply of two (2) Ground Control Station units (GCS)**; ground-based portable station units where the control software application is running on and communicates with the UAVs via wired or wireless telemetry. The GCS units are also equipped with communication equipment for Audio/Video reception from the UAVs. **Supply of four (4) Power Store and two (2) Station units** for storing charging and discharging all batteries supplied for UAVs and GCS.
IGMAC	12 UAVs • Remote Control systems and First Person View Audio/Video feeds via IP streaming to the RAWFIE management systems and Analogue RF transmission to the Ground Control Stations simultaneously. • 360_o long range Laser rangefinders and mapping scanners/radars for simultaneous localization, mapping and multi-directional collision avoidance • dual sensor (FLIR DUO) compact thermal and visible light imagers with live analogue and digital video output • multispectral sensor (Parrot SEQUOIA) that captures calibrated wavelength of Green, Red, Red-Edge and Near Infrared. simultaneous 2.4 GHz 2x2 MIMO WiFi Access Points with Mobile 4G/LTE Internet Connectivity and extended networking capabilities, like Firewall, Routing, VPN, etc.

Annex 2: Experiment Work Plan and Timing

The submitted should sufficiently describe the experiment procedure, by covering the following sections:

1. Experiment design:
    - Description of the experiment

- Use of the RAWFIE offered facilities
- Why the RAWFIE testbed is needed for the experiment
- Description of test scenarios, measurements and expected results of the experiment.
- In the case of new testbed extensions, the proposer should take over any implementation and integration activities

2. Experiment Setup
   - Describe the experiment procedure.
   - Which components will be used
   - Implementation of the software to be used for the experiment
3. Experiment execution
   - Experiment running and evaluation of the results
4. Reporting
   - Reporting on the experiment outcome
   - Recommendations for improvements on the RAWFIE platform
5. Dissemination
   - Dissemination actions (conferences, workshops, FIRE events, etc.)
   - Set up of Demonstrations to be used for further promotion of the RAWFIE facilities

Timing:

- Duration: 10 months
- Major milestones:
  - Experiment design
  - Experiment set-up
  - Experiment execution
  - Experiment feedback
  - Dissemination, showcase

More information can be found on the project's website (http://www.rawfie.eu/).