

Project **CivilFinDrones** “**Civilians Finding system based on Drones Squads of Civil Protection Teams**”

a.k.a. Progetto “Squadra Droni ANA – Prot. Civile”

Abstract

In 2014 the ANA-PC (Italian Alpines National Association – Department of Civil Protection) signed an agreement with DIBRIS – University of Genoa to realize together an ambitious project, very relevant from the social point of view:

*To setup a **Civilians Finding system based on Drones Squads of Civil Protection Teams**, in charge to address both the SAR (Search and Rescue) problem and the real-time monitoring of rural and urban areas during critical events, to **foster the disaster resilience** of the population involved in such dramatic events.*

The faced problem is an actual problem for large portion of Italy and EU, with a dramatic evidence in the last period both in urban as well as rural and alpine spaces (Genoa floods, Emilia earthquakes, Sardinia fires, landslides, etc.). The number of missing people in both rural and urban areas represents a social emergence, with a relevant impact to Civil Protection bodies involved (government representatives, local bodies, ANA and Red-Cross and non-profit associations volunteers, firemans, policemen, forestry guardians, Armed Forces, etc.). In addition, first, **responsiveness and readiness in emergency save lives**, while ICT-based **communication and organization increase disaster resilience** of the population.

Search and Rescue operations can greatly benefit from the use of current “drones”, namely UAVs (Unmanned Aerial Vehicles), to survey the environment and collect evidence about localizing missing persons.

The aim of the project is to address the problem from both the regulatory framework and the 2020 technological perspective, helping involved bodies in facing situations, facilitating communications and real-time monitoring to let Civil Protection decision makers to be capable

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of set-up, organize and rule “Drones Squads” composed by trained, ad-hoc volunteers and professionals.

The issues to be faced within the project are several:

1. What kind of drones are well-suited for Civil Protection scenarios?
2. What technical features should they have it? Payload, Redundance, Autonomy, Battery duration, etc.
3. In which critical situations drones can be used and for what tasks?
4. Which level of robotic autonomy should exhibit such drones in performing tasks?
5. What skills and what certifications must possess the drone pilots and co-operators for the aerial shots?
6. What and how many sensors and tools should be equipped (as payload) on such drones? Depending on special mission, scenarios or general-purpose tasks?
7. How long and how far drones should operate away from humans depending on the critical scenario?
8. What "gold standard" and operating procedures should be followed from either regulatory or technical point of view?
9. ...

In our opinion such a modular and complex project will have at least a three years duration, in order to have enough time to address the scientific problems related to:

- **efficacy in critic situations**: humans and drones must **cooperate** to solve in an efficient way first the **searching** phase of missing persons, **working in critic scenarios**, and then drones must help humans in **reaching and rescuing** the localized persons, contributing in the whole **health status assessment** and first aid.

- **autonomy, communication and coordination**: new generation of power batteries should be tested in order to permits a longer duration and a larger searching area, on-board computing power should allow more functionalities as well as responsiveness (e.g. SLAM, opportunistic localization and communication, ad-hoc autonomous behaviours); coordination of multiple drones as well as data communication issues will be studied in order to permit smarter collective behaviours of the drones squad.

- **robustness and reliability**: hardware, software as well as sensors and other technologies of each drone, the complete architecture of the system (drones squad, the special pair pilot-drone, the complete search and rescue team) should be supported by robust and reliable equipments.

- **modularity and scalability**: depending on scenarios the selection of the “size” of the drones, as well as the types of sensors and equipment to be mounted on-board, will be addressed preferring **modular approaches** and a **medium-long term** scalability and economic **sustainability**.

- **respect of rules and procedures vs. first-aid mission commitment**: volunteers and professionals involved with drones in finding missing persons must comply with specific

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mandatory rules and procedures, in order to ensure safety and efficiency. Nevertheless, in many critical situations, timing and readiness save lives.

The specific objectives of project will be 4, described below, and each matched to a specific sub-project (SubProject #). Each sub-project could be considered for a separate funding procedure with respect to the whole complete project:

1. design and realizzazione of a prototype operating CivilFinDrones squad (consisting, at least, of 3 UAVs (multi-rotor coaxial N-copter), semi – autonomous, two operational and one master communication;
2. design and implementation of an operational prototype of **smart wearable equipment** for volunteer composed by a special **smart jacket** and a **companion backpack** (both, jacket and "backpack " with sensors and tools for volunteers pilots - operators ANA)
3. design and implementation of a **mobile base station** , capable of functioning as a logistics base, first-aid ambulance, communication link and mobile workshop for the drone squad
4. specific training courses for volunteers involved (pilots, video operators, military troops, practitioners, professionals and students) to obtain RPAS and first-aid certifications, both in critical and non- critical situations.

Funding

There are several current open and forthcoming calls of H2020 European Programme available for submission on topics related in some way to our aims.

Now applying also for INTERREG ALCOTRA (with Piedmont) and Italia-France Maritime (Liguria).