

The Threats of Dual-use Drones and the Implications for Italy: Executive Summary

by Ester Sabatino and Francesco Pettinari

ABSTRACT

In recent years, the proliferation of dual-use drones has increased the intensity of the hybrid and asymmetric threat these products may pose. This threat – exacerbated by the high level of technology achieved by dual-use drones – affects both national security and that of personnel employed in out-of-area missions. In this context, the constant technological development of dual-use drones has not been accompanied by the definition of a legal framework governing their use and clearly establishing the procedures that can be used in order to counter any illegal employment of dual-use drones. It is therefore necessary to define a comprehensive regulatory framework to protect both users and operators in charge of countering this type of drones. In this context, the definition of the operational requirements and the development of systems for countering these products – constantly at the forefront of the technological frontier – are among the primary needs that Italy must face in order to ensure an effective defence. Moreover, such systems must be able to guarantee high security standards, also taking into account the specificities of the environments where the threat arises. Italy has so far distinguished itself by its willingness to lead the development of such capabilities at the European level. To strengthen this position further, synergistic and coordinated action between policy makers, the Armed and Security Forces, and the defence industry appears both necessary and potentially fruitful.

*Drones | Security | Transports | Infrastructures | Defence industry | Italy's
Military policy | Military missions*

keywords

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Following a first phase of development that took place exclusively in the military domain, remotely piloted aircrafts (RPA), also called unmanned aerial vehicles (UAV) or drones,¹ began to be used also for civilian purposes. An increasing number of companies and private individuals started to use these products for commercial or recreational purposes. Drones used for non-military purposes fall, to a large extent, in the mini and micro categories. Moreover, they have gradually become more easily available on the market, also through online purchases.

Although cost-efficiency benefits deriving from the use of drones for the aforementioned purposes are manifold, the proliferation of these technologies brings with it profound implications regarding the safety of the overflown. Any malfunction of the aircraft or misbehaviour by the operator that causes its fall, as well as involuntary intrusions in no-fly areas, may generate substantial damage in physical, economic and reputational terms.

By virtue of their intrinsic features, drones with reduced dimensions are characterised by their dual nature, in that it is possible to use them also for illicit purposes of various kinds. Thus, dual-use drones are included among the means through which it is possible to realise a hybrid threat characterised by profound asymmetry concerning the security of people, property, conventional air traffic, critical infrastructures, sites of strategic interest, and civil and military missions in operational theatres.

Dual-use off-the-shelf UAS – UAS that have not undergone any modification of the characteristics provided by the manufacturer – can be used for illicit purposes.

¹ The term “unmanned aerial systems” (UAS) is preferred in this study.

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This executive summary presents the main results of the study “La minaccia dei droni duali e le sfide per l’Italia”, curated by Ester Sabatino and Francesco Pettinari and published in the Documenti IAI series. For useful and constructive exchange of views, the curators thank the Centre of Excellence C-M/M RPAS, the Anti-aircraft Artillery Command, the High Command of the Italian Carabinieri – 2nd Section, the Air Staff – 3rd and 4th departments, and the Italian Civil Aviation Authority. Curators also thank Gaia Ravazzolo, former trainee at IAI, for her valuable contribution in the initial phase of the research. The study has been released with the support of Leonardo, and it was completed on 22 January 2020.

And indeed, there are also relatively simple contrast techniques that can already be implemented by the same manufacturers in order to combat these drones. If however they are modified ad hoc by sophisticated operators, dual-use drones represent a threat that is much more difficult to counter.

Among the various implications of using dual-use drones on the national territory for illicit purposes, the main concern is represented by the possible use of these technologies by single individuals or terrorist organisations, particularly if UAS were modified and armed on purpose. These circumstances could affect civil aviation, critical infrastructures of various kinds, or events characterised by large gatherings of people, by means of chemical, biological, radiological or nuclear (CBRN) materials.

Dual-use drones are a tool particularly suitable for conducting criminal and terrorist activities, for several reasons. First, compared to the use of other measures, there are greater guarantees of maintaining the anonymity of the operator, both during the carrying out of the illegal act and with regard to the planning of the attack. Second, dual-use drones are characterised by great flexibility regarding the take-off or launch area, and they can move at high speeds within considerable perimeters. In addition, these technologies are able to totally circumvent physical barriers or other preventive security measures adopted to protect places of strategic interest. Finally, the contrast to threats conveyed through UAS of reduced dimensions is particularly complex due to the lack of appropriate instruments for such a purpose, as demonstrated by some recent news events.

As concerns operational theatres, the use of dual-use drones by non-state entities and irregular militias represents a relatively recent innovation, but one which is consolidating substantially. In this sense, the main uses of dual-use drones can concern direct attacks on moving contingents or military bases and various assets deployed throughout the territory, as well as Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) activities. In addition to entailing an increase in the risks for the civilian and military personnel deployed, the use of dual-use drones could also provide irregular militias with tools capable of reducing their technological gap, thus jeopardising the success of regular missions.

Regardless of the context in which they may occur, threats related to the illicit employment of dual-use drones are exacerbated by the high technological level they are equipped with, which makes them particularly high performing and versatile. The increase in the technological characteristics of the UAS has been accompanied by a tendency to reduce their price on the market and has developed mainly around three trends: miniaturisation of the components, autonomy of the drone with respect to the operator, and the possibility of acting in swarms. Thanks to the miniaturisation process, it is currently possible to mount technologically advanced components on the drone without affecting its potential. The determination of increasing the autonomy of the drone with respect to the operator has led to the development of hardware and software components through which it is possible to limit the role of the operator to the stages preliminary to take-off. Indeed, it is

possible to plan the route of drones on the basis of the autonomous processing of GPS signals, or on visual inertial odometry (VIO) systems that guarantee the functioning of the drone even in the absence of satellite signals. Lastly, the possibility of a large-scale use of swarms, that is groups of UAS controlled by artificial intelligence (AI) and able to react in a coordinated or cooperative way to any unexpected external stimuli, seems to be getting closer.

Given the considerable implications on national security and on the contingents deployed in out-of-area missions, there is an urgent need to regulate the usage of dual-use drones at the national, European and international level. This necessity is made even more pressing by the delay with which legislators have moved in relation to the proliferation of these products.

The Commission Implementing Regulation (EU) 2019/947 of 24 May 2019, as well as the subsequent Remotely Piloted Aerial Vehicles Regulation, Issue No. 3 of 11 November 2019 issued by the Italian Civil Aviation Authority (*Ente Nazionale per l'Aviazione Civile* – ENAC) to implement what is regulated by the EU, represents an initial contribution for the mitigation of threats. By establishing parameters for a lawful employment of dual-use drones, these regulations could substantially reduce the number of involuntary intrusions in no-fly areas or in the proximity of sites of strategic interest. At the same time, by setting the obligation for manufacturers and operators to insert special devices that allow the identification of the aircraft or that prevent encroachment into forbidden areas, it would be easier to distinguish between drones authorised for flight operations and those that are not.

However, while it is possible to categorise a UAS that does not respect these parameters as potentially threatening, there is no guarantee that products which are compliant with the requirements do not pose a threat. Furthermore, as already widely demonstrated, there are numerous possibilities to circumvent these rules and systems. Therefore, it should be clarified which authorities are responsible for fighting hostile or potentially hostile drones. Moreover, with particular reference to the national context, it is necessary to define the ways in which the Armed Forces can support the authorities responsible for maintaining public security. The particular skills acquired in the military domain can indeed be decisive in countering a threat conveyed by using dual-use drones, especially in the event that such a threat might be posed by ad hoc modified products.

Similarly, it is necessary to conduct an analysis of the national and international legislative framework relating to attribution of responsibility in the event of damage to third parties incurred during an operation to contrast dual-use drones, as well as the exonerating circumstances for the authorities or individual operators. The existing differences in the current regulatory framework deriving from the context in which law enforcement operations are carried out, being it national or related to the operational theatres, open up partially different scenarios. Nonetheless, if the actions of the operators responsible for combating dual-use UAS respected the set parameters, the exemption of liability would be provided for by the current legislation.

However, the introduction of rules aimed at limiting the realisation of a threat is not enough to prevent it. It is therefore necessary to develop systems and procedures that make it possible to counter the threats posed by a dual-use UAS both through kinetic means and technical tools.

The law enforcement activities that can be conducted are particularly influenced by the context in which they are implemented. In an urban context, the shooting down of a drone with kinetic means is poorly indicated since a ground crash would risk causing impacts similar to those intended by the agents conducting the illegal activity. The creation of instruments capable of contrasting the drone without causing it to fall and to subsequently crash to the ground is therefore fundamental.

In operational theatres, killing by kinetic means is more feasible, but the capability to detect and track the hostile drone is still required.

Having become aware of these needs, both the private sector as well as the national and international public sector have begun to invest copiously in the development of counter-drone systems, or Counter-Unmanned Aerial Systems (C-UAS), suitable for the purpose.

In order to be considered effective and to guarantee high protection standards, a C-UAS system should be modular, i.e., capable of performing all the actions necessary to effectively combat the threat by using the most appropriate tools depending on the context in which it occurs. C-UAS systems must be able to locate the drone, first detecting its presence and then identifying and categorising it as hostile. Subsequently, these systems must guarantee the possibility of tracking the aircraft in order to establish whether it is heading towards strategic sites of interest or no-fly areas. These skills are essential to be able to deploy the most appropriate tools to prevent the threat, among those with which the C-UAS system should be equipped, limiting as much as possible the role of the operator to the choice and implementation of the interdiction measures according to the surrounding environment.

The non-kinetic interdiction techniques already used by the C-UAS systems are manifold, but they risk being ineffective in the presence of technologically advanced drones or drones which have undergone modifications compared to the factory configuration. In fact, the disturbance of communications between the drone and the operator (jamming) has no effect on drones that move following pre-set routes, and the inhibition of GPS signals (spoofing) is not able to stop the advance of an aircraft that uses VIO navigation systems.

In order to create effective C-UAS systems and, more generally, to develop solutions and procedures capable of effectively countering the threat, several initiatives and projects have been launched within international organisations such as NATO and the EU. Currently, in fact, there is no standardisation of procedures and systems to be used in case of attack by dual-use drones, thus not only affecting the possibility of having interoperable systems, but also diversifying the efforts, which are not

always well coordinated.

At the NATO level, initiatives were developed mainly within the Science for Peace (SPS) programme, the Emerging Security Challenges Division (ESDC) and, especially at the level of preliminary studies, by the Joint Air Power Competence Centre (JAPCC). The inclusion of C-UAS capabilities within the NATO Defence Planning Process (NDPP), which has not yet taken place but is under study, is one of the main objectives that the Alliance has set itself in the C-UAS field. As far as the EU is concerned, the attention paid by the political establishment to threats posed by dual-use drones appears to be very high, both on the civil and military sides, and equally affects the definition of a complete regulatory framework and capacitive development. Through the Horizon 2020 programmes and those included in the European Defence Industrial Development Programme (EDIDP), the European Commission has allocated funds for the development of effective and shared counter-drone instruments and procedures.

In Italy, the willingness to acquire the necessary capabilities to defend against threats conveyed by dual-use drones has been clearly stated by the defence. Great attention has been paid to the C-UAS theme both in the modernisation priorities of the Armed Forces stated in 2018, and in the Multi-year Planning Document (*Documento Programmatico Pluriennale – DPP*) 2019–2021. This has resulted in allocation of funds for the acquisition of these capabilities, as well as establishment of the Centre of Excellence for Counter Mini/Micro RPAS (*Centro di Eccellenza Counter Mini/Micro Aeromobili a Pilotaggio Remoto – CDE CM/M APR*) with an interforce value at the Anti-aircraft Artillery Command (*Comando Artiglieria Contraerei – COMACA*) of Sabaudia. The collaboration of the Armed Forces is aimed at carrying out study and testing activities for counter-UAS systems, as well as the support of public safety authorities during public events held on the national territory. Italy aims at becoming the reference country in Europe as regards activities to combat dual-use drones, and it has therefore assumed the role of leader of two Permanent Structured Cooperation (PESCO) projects aimed at the development of C-UAS systems and procedures.

However, aspects of particular relevance still remain undefined at the Italian level. In order for the country to be able to ensure adequate levels of security at the national level and to present itself at the regional and international level as a significant interlocutor, Italy lacks a clear national strategy that indicates operational and numerical requirements, and operational procedures relating to the C-UAS capacities. To achieve this goal, a joint effort is needed, on the one hand, by the Ministries and Administrations involved in defining a shared position and in allocating the necessary financial resources; and on the other, by state actors and companies operating in the sector in order to maintain C-UAS capabilities at the technological frontier.

Updated 22 January 2020

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Istituto Affari Internazionali (IAI)

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