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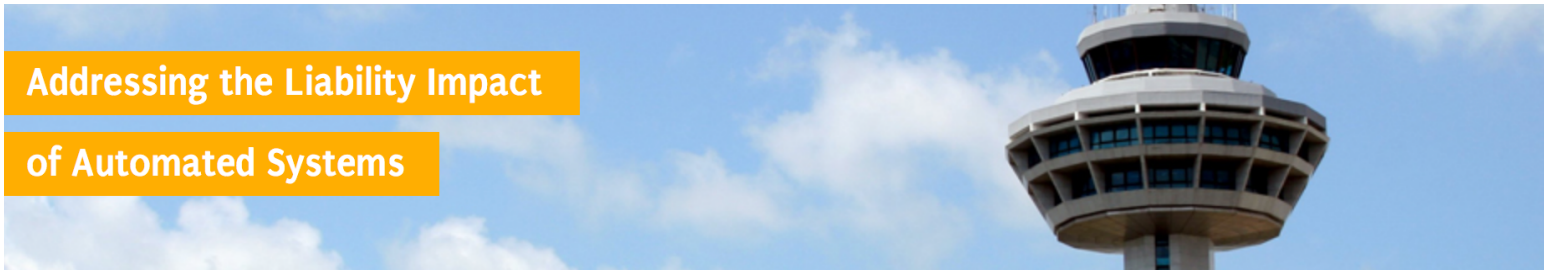

3rd ALIAS Conference on

Liabilities and Automation in Aviation: The case of RPAS and Collision Avoidance Systems

RPAS Industry Perspective: Who's in Charge?

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Liability Impact of Automated Systems: Who's in charge?

This paper neither attempts to address the issue of probability of a reportable event taking place, nor quantify or offer methodology for qualification of an impact. Will suffice to say, that there are a lot of cases of "dramatization" in the media: many regulators, among them UK CAA, are of an opinion that the RPAS systems commercially available today pose risks identical to those of bird strikes, and the design of modern airliners already provides required safety nets. However, the emphasis here is put on "today": since aviation is based on proactive risks management paradigm, it is critical to engage the industry, regulators and academia already at this stage, in an attempt to foresee the trends and developments: a UKG Health & Safety Executive office' analysis shows, that the cost of a fatality to British Economy is in the region of £1,558,000 – through the loss of productivity, admin/legal costs, compensations and non-financial costs. But, when it comes to drones, it is not only about fatalities, but also, because of their versatility, there's a whole range of civil and criminal cases which could potentially be brought against UAV operators, triggering the question of liability.

The issue of Liability Impact is of course not unique to Drones. With the advancement in information collection and processing methods, the principles of "highly automated" and "autonomous" are awarded to more and more systems: the aim is to increase labour productivity and minimise the use of finite resources. To begin with, we need to highlight the difference between the two terms: quite often, even in scholar articles and among professionals, the words "autonomous" and "automated" are used interchangeably; that is, of course, incorrect: the former suggests the system is operated within a closed environment, and as such is capable of interacting with the said environment without any inputs from outside the environment. The latter, however, is a system, which at a certain stage of its cycle, does receive inputs from outside the system, and is somewhat limited in its decision-making abilities.

Why is this important? Because drones compete for the use of airspace with already well-established stakeholders, some suggest that the way forward in the search of Drones' integration strategy is to apply rules of the air already in existence. This argument, in our opinion, is flawed: taking an example of Commercial Air Traffic – the rules under which aircrafts are operated today have been largely borrowed from the maritime law. The concept of Pilot-in-Command (PIC) is the ultimate attestation of that fact: regardless of a set of "advisory" systems, such as TCAS, Terrain Awareness Systems and so on, it is the captain who is the owner of all the risks, and, while operating an aircraft, it remains his decision whether to accept advise of certain auxiliary systems, or other third parties. To illustrate this further, let's consider a boat, sailing through an open ocean few hundreds years ago (or, for that matter, first airmen crossing bodies of water): without any means of communicating with the environment beyond the one they are operating in and limited abilities to collect and process information about the operating environment, the captain is the only decision-making authority, who has to rely on his experience, and sometimes intuition, to achieve the goal. Therefore, we can consider such a system an autonomous system. The core benefit of an Autonomous Systems is that the issue of liability is the well-researched one. Of course, it is constantly challenged, and not without its flaws, but we will not be addressing it here in details.

The drones, in turn, could in theory operate as autonomous systems, but more often than not, they are/will be operated as highly automated systems: that is, internal processing capacity by definition will always have limited number of scenarios it can work with, and for the drones to be integrated into a National Airspace System, they will have to rely heavily on inputs from the Operator, interaction with other aerial and terrestrial systems and so on. That, of course, does not imply there can't be a degree of autonomy, but that will only be limited by the advances in Artificial Intelligence and laws of physics.

What it does imply, however, is that the issue of liability is not as clear as in the case of autonomous systems. The fundamental question is *who is in charge*? Who becomes liable, if a drone causes harm or losses to members of public, private property, or another type of

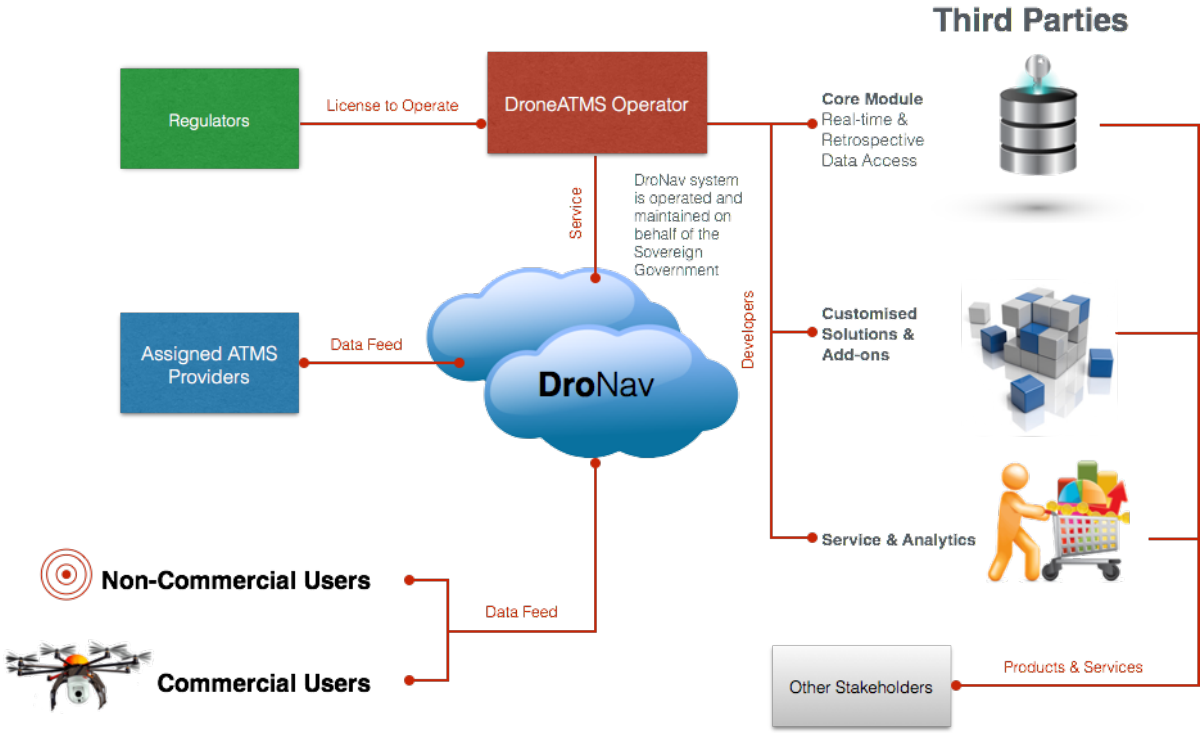
crime has taken place with the use of a UAS? While certain articles indeed could and should be borrowed from the existing Aviation Law, the nature of drones is such that the process of transfer of responsibility cannot be as complicated as the one used in aviation today: bringing forward an example of even a simple Cirrus, from the purchase of an aircraft to regular maintenance, pilot training to medical certification[1], the amount of paperwork involved guarantees that the chance of misuse (or abuse) is minimal.

It is obvious, that similar process cannot be implemented in case of drones: the complexity will make the use of UASs unduly taxing, thus stripping off any economic benefit. A simplified process, on the other hand, will not guarantee the efficient transfer of liability. As it stands today, where drones come as number one on many Christmas presents lists, the simplicity of the drones implies that any complex rules are simply ignored, or not well-understood by operators even with some knowledge of aviation law. Furthermore, a transfer of liability can even take place unbeknown to the owner or operator: a drone can be lent for a weekend to a relatively competent person, who in turn may allow minors or unfit persons to operate the UAV. Any harm caused by such a drone may result in a case of civil or criminal prosecution, which, in the absence of regulations, can become burdensome for both the offenders and the taxpayers; furthermore, in the world where DJI alone sold more than 500,000 units, the number of case can quickly lead to backlogs – and regulators will be inclined to ban the use of UAVs – as was the case in UAE.

It is clear, that the way forward is a combination of rulemaking and technology. A number of stakeholders argued, that any such combination shall put the liability on manufacturers; others suggested operators. However, we will advocate, that the ultimate risk owner should be the owner of the UAV, for a number of reasons. Coupled with the technology currently being developed by a number of companies, including DronSystems, and the rulemaking proposed, the linkage of liability to the owner will allow a seamless, regulated and traceable transfer of liability from one operator to another. The concept goes even further here: an

[1] The case of Germanwings' A320 has challenged the whole process: medical certification relied heavily on self-certification.

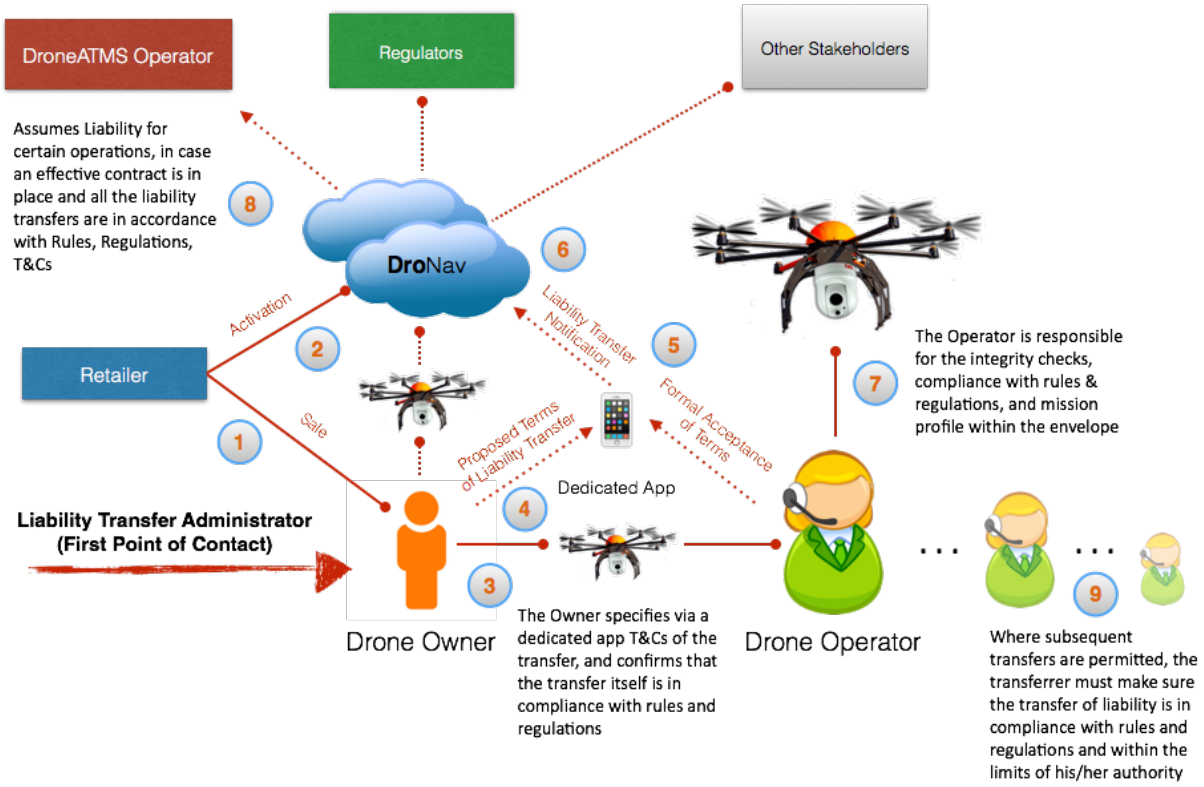
inclusion of other stakeholders, such as insurance brokers, into the process via a standardised set of tools.



Basic principle of DroNav© system being developed by Dronsystems Limited

In a nutshell, the process is conducted through a distributed (or cloud-based) system, to which all stakeholders are connected. Where a purchase of a drone takes place, an activation of each device is required in order to render the drone ready for operations. The activation itself links the drone – which has a unique device ID, of course – to the owner. By activating the drone, the owner accepts Terms & Conditions, which regulate all operations and, most importantly for this venue, the transfer of liability process. The owner is ultimately liable for the safe operations of the UAV, unless he or she declares, via a dedicated application, that a transfer of liability took place. The transfer does not have to be formalised, but it will be recommended, especially if the operator intends to use the drone in the absence of the owner, or for a prolonged period of time. During such a transfer, the owner must make sure, that the operator is capable of operating the UAV, familiar with its limitations, and understands that he or she assumes any and all liabilities for the safe conduct of UAV

operations. In addition to that, the operator shall be informed, whether he or she is allowed to transfer the liability to any other third parties, and if so, must be made aware of the liability transfer process. Where (a) the UAV is connected to an ATMS, and (b) a contract is in place and effective, the transferor must confirm, whether the transferee is bound by the same terms and conditions of the contract as is the transferor. In such a case, the transferee must be familiarised with the contract, and the ATMS Provider should be made aware of the transferee becoming a Party to the contract.



Liability Transfer Method proposed by Dronsystems

The transfer process itself could be either formal, for example, with the use of technologies similar to those used by iConsent, or informal. The owners (and, equally, subsequent transferors) shall be encouraged to formalise the transfer – and this could even be a part of the insurance policy requirements; but it is also natural that a transferor will always wish himself to formalise the transfer, so to avoid any further legal problems.

When it comes to operators, before each and every mission, he or she must perform pre-flight checks, ensuring that the drone is in full working order, capable of carrying out the mission as intended, and by launching the UAV in the air, the operator confirms that he or she is capable and entitled to operate it, and understands the drone's limitations. In case the UAV is connected to an ATMS (such as the one being developed by DronSystems), and the drone is engaged in a BLOS operation, the operator and the ATM are understood to have entered into a contract, which is a formal instrument, delineating the roles and responsibilities of both the operator and the ATMS Provider. Thus, when ATMSP accepts a drone engaged in a BLOS operation, the UAV in question is confirmed as an airworthy vehicle, in full compliance with rules and regulations.

In case an unlucky event takes place, the investigation into the causes can be aided by an immediate access to the information on who was in control of the drone, and, ultimately, who bears the liability: the owner, the operator, the manufacturer, the ATMS Provider, a service organisation and so on.

In conclusion, the idea behind this proposal is that the issue of liability in automated systems actually lies in the process of a regulated transfer of liability. Unlike autonomous systems, where liability first and foremost is with the captain, who constantly remains in control of the aircraft (or a vessel, or a car), automated systems can experience a transfer of control during a mission, and, therefore, subjected to a transfer of liability. In such circumstances, there must be a dedicated person, who is responsible for the duly documented liability transfer process, conducted through a universal IT-based system, and which, in turn, can offer additional benefits to the stakeholders through auxiliary tools (such as insurance, compliance, mission planning, air traffic and assets management, service & maintenance records and so on). We are of a firm opinion, that the person making the acquisition decision shall be nominated as such a person.

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