# CNN, RTI and Vantage Robotics Meeting with OIRA Regarding Proposed Operations of Small Unmanned Aircraft Over People Rule
## December 19, 2016

Cable News Network, Inc. (CNN), RTI Group, LLC (RTI) and Vantage Robotics appreciate this opportunity to meet and discuss the FAA's proposed rulemaking on Operations of Small Unmanned Aircraft Over People, which will create a regulatory framework for permitting the operation of small unmanned aircraft systems (UAS) over people not directly participating in the operation (OOP Rule). The FAA's proposed OOP Rule, which is based on the recommendations developed by an industry stakeholder committee earlier this year, will provide important relief from certain operational restrictions implemented in the FAA's Small UAS Rule (Part 107), and expand the scope of many beneficial uses of UAS.

CNN is a global leader in news reporting and breaking-news coverage. Domestically, CNN reaches more individuals on television, the web and mobile devices than any other cable TV news organization in the United States. Internationally, CNN is the most widely distributed news channel reaching more than 271 million households abroad. CNN is also a participant in the FAA's Pathfinder Program, through which CNN entered into a joint a Cooperative Research and Development Agreement (CRDA) with the FAA to advance integration of UAS into the NAS for newsgathering and reporting purposes. CNN was issued the first, and to date, the only Part 107 waiver authorizing a UAS to be operated over people not directly participating in the operation of the UAS and not under a covered structure.

RTI is a pioneering, global accident and failure investigation and safety management consultancy serving the legal and insurance markets. With origins dating back to 1975, their forensic engineering services span comprehensive high-risk industries and transportation operations disciplines, including aviation, marine, rail, utilities, nuclear, explosion, and construction. RTI was among one of the first applicants for a section 333 exemption with the addition of the closed set amendment in order to utilize UAS over accident scenes to preserve the evidence. RTI's background in failure analysis and safety management in the aviation industry along with its knowledge of UAS technology led to the forming of RTI's UAS Laboratory services where testing is conducted on UAS airframes to determine their level of risk and any necessary mitigation in preparation for a Part 107 waiver application to permit flights over people.

Vantage Robotics manufacturers a variety of small UAS, including the Vantage Robotics Snap, which we brought to this meeting.

## I. UAS INDUSTRY: HUGE POTENTIAL FOR U.S. ECONOMY

We are in the very early days of deploying UAS commercially on a broad scale. Regulatory barriers still stand in the way of our ability to unlock the full potential of UAS. Estimates vary, but by all measures, the economic impact will be enormous: a recent PricewaterhouseCoopers report estimated the global market value of UAS-powered solutions at more than $127 billion by 2020. Others have predicted that the U.S. share of the UAS industry will grow to be an estimated $82 billion market in four years, and create more than 100,000 new jobs here at home.

In particular, the benefits of UAS for the newsgathering and filmmaking industry as a whole are significant. UAS will expand the possibilities for capturing informative and engaging images, delivering both vital information and captivating entertainment to millions of Americans. The use of UAS will permit safer, less expensive, and better journalism. UAS will provide television stations in smaller markets otherwise constrained by more limited budgets and resources with an unprecedented opportunity to offer aerial coverage while also allowing stations in larger markets to supplement, or even replace, their current aerial capabilities, better enabling journalists to inform the public and alert government first responders. And the safety case for flying UAS on movie sets is obvious: small UAS are much safer to fly over people than helicopters, which weigh thousands of pounds and carry highly flammable and combustible fuel.

## II. Flights Over People: Essential to Unlocking the Full Potential of UAS

The implementation of Part 107 marked an important step forward for the UAS community. However, the operational limitations of Part 107 are quite strict. In order to be able to take advantage of the full safety and efficiency capabilities of drones, companies need to be able to fly in populated suburban areas and more densely populated urban environments. To use UAS for disaster response, newsgathering, filmmaking, real estate, inspections, and more, it is critical that the government enact UAS operations that enable a real-world operating envelope. Regulations that are unduly strict will have the counter-effect of encouraging businesses to flout the rules; safety will suffer as a result. The FAA's OOP Rule must enable real-world operations while protecting safety.

## III. Flights Over People: A Proper Risk-Based Analysis

As the FAA crafts the OOP Rule, the agency must consider all types of risk factors, including those that are mitigated by the use of UAS. For example, in addition to considering the kinetic energy of a small UAS impacting a person, regulators must consider the risks inherent in the dangerous tasks that UAS operations would otherwise replace.

The framework proposed by the Micro-UAS Aviation Rulemaking Committee (Micro-UAS ARC) for flights over people, which the FAA used as its starting point for the OOP Rule, focuses solely (or almost entirely) on kinetic energy. Focusing on kinetic energy alone as an indicator of overall risk is the wrong approach and will lead to an absurd rule that does not reflect real-world risks, and disincentivizes advancements in UAS technology that would otherwise increase safety.

### A. Consideration of Issues Other Than Kinetic Energy

An OOP Rule that focuses primarily on maximum theoretical kinetic energy overlooks several other serious risks or potential risk mitigation factors possible in the design to improve safety. For example, the risk of lacerations and contusions should be considered. Kinetic energy assessments do not do anything to mitigate these serious risks.

The FAA must therefore consider operational and technical mitigations in addition to kinetic energy. Adding safety equipment and technology to a UAS – for example, propeller guards, parachutes, or padding – inevitably adds some weight (and therefore the kinetic energy potential), but they also substantially minimize the prospect of injury.

Indeed, as we discuss in more detail below, controlling the intrinsic safety of the design has the potential for more reliable and scalable commercial operations near people. But under the Micro-ARC analysis, any additional weight is penalized, even if it results in a safer vehicle. As the industry evolves, we have an excellent opportunity to incentivize innovation, whether it is through parachutes, propeller guards, audible warning system, or some other new technology, that will make them safer. An OOP Rule that fails to provide these incentives will be considered a failure and will result in less safety, rather than more as intended.

### B. Kinetic Energy-Based Threshold Must be Reasonable

To the extent that the proposed OOP Rule *does* rely on kinetic energy as an indicator of risk, kinetic energy-based injury thresholds need to be reasonable, and the calculations must accurately reflect how UAS collisions happen. As related to the general physics of collisions between objects, the biomechanics of collisions of objects with the human body, and the severity of injuries that result from such collisions, a broad range of scientific literature discusses these subjects. Except in the most idealized academic thought experiments, these collisions always involve the transfer of energy between the colliding bodies. We rely on this accumulated knowledge on a daily basis in many aspects of life, ranging from safe motor vehicle operation to selection of sports equipment to the construction and manufacturing industries and even aviation.

The papers listed in the Appendices, and the references contained below, illustrate just a small fraction of the existing knowledge base – and add critical additional perspective to the threshold chosen by the Micro-ARC committee. Additionally, there are a variety of published standards that have been developed by ASTM and others that provide guidelines for testing and measuring various constituent parameters of collisions, as well as the manufacturing of products and systems that take advantage of these parameters and help mitigate injuries based on kinetic energy transfer at impact. The FAA should consider this existing literature and research, a representative list of which is attached as *Appendix A*.

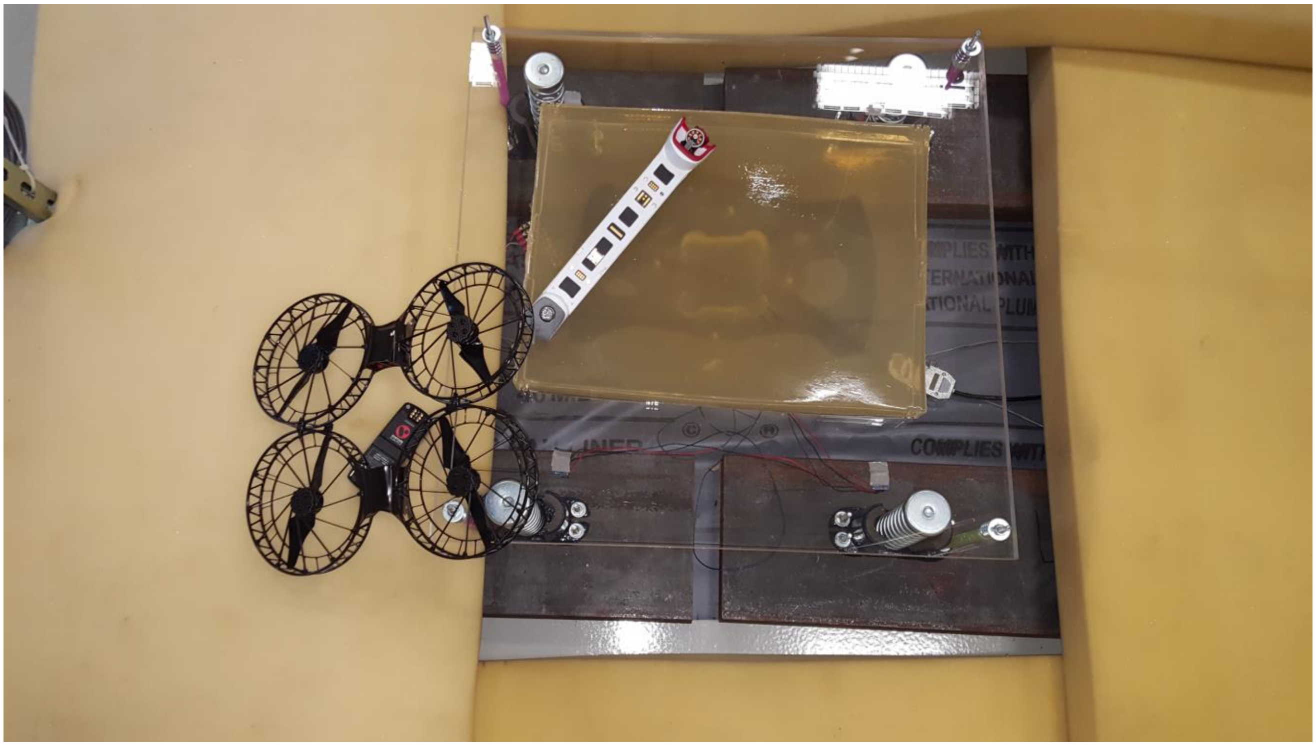
### C. Design Elements for Safety of OOP

As noted above, controlling the intrinsic safety of the design has the potential for more reliable and scalable commercial operations near people. Existing technologically feasible measures for intrinsic safety include prop guards that minimize the chance of lacerations, energy absorbing deformable shapes and energy dissipating designs to minimize impact pressures and kinetic energy transfer, reducing the risk of contusions and blunt trauma. Software controls can be used as well to control minimum altitude, safe response to signal drops, and limit top speeds.

An example of a UAS that incorporates these design and technology features is the Vantage Robotics Snap:

**Figure 1: Vantage Robotics Snap**

The Vantage Robotics Snap weighs 1.37 lbs. (620 grams), including accessories and payloads, has fully enclosed prop guards, and is designed to break apart upon impact to minimize kinetic energy transfer. RTI conducted drop tests of the Snap at its lab facility. As depicted in the image below, preliminary drop testing on the Snap in the upright and upside down configurations yielded no punctures of the ballistic gel:



Effectiveness of design solutions can be tested inexpensively via instrumented drop tests onto ballistic gel and flight into ballistic gel. These tests are able to measure both the available kinetic energy of a moving UAS as well as the energy absorbed by a target, be it a ballistic gel slab at the bottom of a drop test or a ballistic gel replica of a human thorax. Further, through careful imaging of the resultant collision, useful data concerning the frangibility of a UAS can be collected. The sum total of this data can then be correlated to existing probabilistic injury models found in existing research literature. A sampling of this research literature is included in *Appendix B*.

## IV. SMALL UAS WEIGHING LESS THAN 250G ARE NOT SUITED FOR COMMERCIAL USE APPLICATIONS

The Micro-UAS ARC identified four small UAS categories, defined primarily by level of risk of injury posed, for operations over people. For each category, the ARC recommended a risk threshold that correlates to either a weight or an impact energy equivalent and, to the extent necessary to minimize the risks associated with that category, additional performance standards and operational restrictions. Category 1 small UAS included UAS weighing 250g (.55 lbs) or less. The ARC found that category 1 small UAS posed a level of risk that was so low that they were safe to operate over people without any additional restrictions beyond Part 107.

Through its Pathfinder/Part 107 Waiver efforts, CNN has spent a significant amount of time and resources testing and evaluating various small UAS to identify models that meet CNN's operational needs in terms of safety and ability to capture broadcast quality aerial imagery. CNN has found that no commercially available small UAS weighing 250g or less are suitable for its commercial use applications. The inherent limitations of a small UAS weighing 250g or less which make the craft useless for CNN also limit the commercial use viability of such crafts for other industries operating small UAS. Whether a company is inspecting infrastructure, filming real-estate, or conducting aerial surveys, the inherent limitations of a craft weighing 250g or less, be it poor picture quality, instability in flight, or a host of other issues, make them ill-suited for commercial use applications. An OOP Rule that broadly authorizes flights over people for category 1 small UAS, while imposing more restrictions on UAS weighing slightly more than that, has little, if any, value for commercial UAS operators. This is because UAS weighing 250g or less are not suited for commercial use applications.

## V. FLIGHTS OVER PEOPLE: INCORPORATING CONSENT

When the FAA first began authorizing commercial UAS flights under the "Section 333" framework, the FAA correctly recognized that operations over people who have consented should be treated differently than operations over members of the public, and that different policy frameworks should govern each. This was an appropriate and appreciated approach. Under the FAA's Section 333 exemption framework, the FAA authorized nearly 500 companies to operate over people in a "closed set" filming context, where "participants" had consented to the risk of UAS over-flight. Participants were defined as people associated with the filming production that acknowledged and accepted the risks associated with the UAS operations. *See* FAA Order 8900.1, Volume 3, Chapter 8, Section 1, Issue a Certificate of Waiver for Motion Picture and Television Filming at ¶ 3-213(B)(1):

> B. Definitions.
> 1) Participating Person/Authorized Person. All persons associated with the filming production must be briefed on the potential risk of the proposed flight operation(s) and they must acknowledge and accept those risks. Nonparticipating persons are the public, spectators, media, etc., not associated with the filming production.

The first Section 333 exemption ever issued by the FAA authorized flights directly over consenting people on a film set. *See* Condition and Limitation No. 15 in the FAA's Section 333 exemption issued to Astraeus Aerial (Docket No. FAA-2014-0352) (Sept. 25, 2014):

> 15. The UA may not be operated directly over any person, except authorized and consenting production personnel, below an altitude that is hazardous to persons or property on the surface in the event of a UAS failure or emergency.

In this first-ever Section 333 exemption issued by the FAA, and in every other exemption issued thereafter, the FAA has never looked to kinetic energy as the sole indicator of overall risk posed by small UAS to people on the ground.

Key to this issue is the FAA's definition of "directly participating" under Part 107. Under § 107.39, a UAS may be operated over a person who is directly participating in the operation of the UAS. Also under Part 107, however, the category of individuals deemed to be "directly participating" is narrower than the category of persons which have historically qualified as participating persons in the context of Section 333 exemptions issued for closed-set filming. In the Preamble to Part 107, the FAA clarified that the term “directly participating” only extends to UAS crewmembers operating the UAS:

> The term ‘‘directly participating’’ refers to specific personnel that the remote pilot in command has deemed to be involved with the flight operation of the small unmanned aircraft. These include the remote pilot in command, the person manipulating the controls of the small UAS (if other than the remote pilot in command), and the visual observer. These personnel also include any person who is necessary for the safety of the small UAS flight operation. For example, if a small UAS operation employs a person whose duties are to maintain a perimeter to ensure that other people do not enter the area of operation, that person would be considered a direct participant in the flight operation of the small UAS. Anyone else would not be considered a direct participant in the small UAS operation. 81 FR 42128 (June 28, 2016).

Under this narrow definition of a “participant,” personnel engaged in related activities that the UAS is being used to assist in are nonparticipants, just as if they were any other member of the general public. For example, actors and actresses on a closed film set, where a UAS is being flown overhead in support of a film production, are considered “nonparticipants”, and the UAS cannot be operated over them. The same thing would be true for journalist and news production personnel operating UAS overhead in support of newsgathering activities.

The FAA’s OOP Rule should broaden the definition of a “direct participant” to include personnel engaged in related activities that the UAS is being used to assist. Similar to the approach taken by the FAA with the exemptions issued for closed-set filming, the OOP Rule must provide flexibility to permit flights over people that are aware of, and have consented to, the UAS flight. Under the Section 333 framework, those companies who took extra operational steps for safety – including preparing a special manual with company operating procedures to ensure safety – and were then allowed to fly any authorized vehicle under 55 pounds directly over participating people. The FAA’s OOP Rule must allow for the same operational flexibility in similar contexts, using the Section 333 exemption framework as a guide.

## Attendees

Emily Avant - CNN
Greg Agvent – CNN
Matthew Clark – Hogan Lovells
Lisa Ellman – Hogan Lovells
Tobin Fisher – Vantage Robotics
Josh Hurvitz – Time Warner
Jeremy Reynolds – RTI Group
Matthew Wagenhofer – RTI Group

## *Appendix A*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ASTM F1045-16 Standard Performance Specification for Ice Hockey Helmets

ASTM E680-79(2011)e1 Standard Test Method for Drop Weight Impact Sensitivity of Solid-Phase Hazardous Materials

ASTM F3016/F3016M-14 Standard Test Method for Surrogate Testing of Vehicle Impact Protective Devices at Low Speeds

ASTM F2781-15 Standard Practice for Testing Forced Entry, Ballistic and Low Impact Resistance of Security Fence Systems

ASTM F1887-14 Standard Test Method for Measuring the Coefficient of Restitution (COR) of Baseballs and Softballs

ASTM D4003-98(2015) Standard Test Methods for Programmable Horizontal Impact Test for Shipping Containers and Systems

ASTM D6537-00(2014) Standard Practice for Instrumented Package Shock Testing For Determination of Package Performance

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## *APPENDIX B*

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