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UNMANNED AIRCRAFT SYSTEMS: A CHALLENGE TO GLOBAL REGULATORS

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Introduction—Preparing for International Drone Operations

Society's exposure to a consequential new invention, such as the airplane or the Internet, is often succeeded by a significant period of time before governmental bodies are able to respond with rules to regulate (and often constrain) society's use of the new technology. Drones, more formally known as Unmanned Aircraft Systems (UAS), are among the newest inventions to capture the public's imagination. Regulators are now scrambling to catch up with the potentially benevolent and menacing implications of drone technology.

In prior eras ruled by a much smaller and more limited administrative state, the gap between a technological advance and its integration into society was often left to the technological pioneers, such as the early aviators. Those pioneers engaged in relatively unfettered experimentation intended to reveal the new technology's uses and possibilities for humankind. In today's much more highly regulated society, the use of new technologies (and the imaginative applications of these new technologies), such as ride-sharing services[1] or decentralized solar energy installations,[2] are more likely to be curtailed until society's existing stock of rules adapts to fit the new developments. UAS are no exception. Indeed, there is growing frustration with the extent to which regulatory barriers, some of which appeared quite quickly, are

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1. *See, e.g.*, Douglas MacMillan, *Ride-Sharing Services Face Legal Threat from San Francisco, L.A.: Uber, Lyft and Sidecar Are Accused of Violating California Business Law & Misleading Consumers*, Wall St. J., http://www.wsj.com/articles/sidecar-faces-legal-threat-from-san-francisco-los-angeles-1411699355 (last updated Sept. 26, 2014, 6:03 PM).

2. *See, e.g.*, Joby Warrick, *Utilities Wage Campaign Against Rooftop Solar*, Wash. Post, Mar. 7, 2015, http://www.washingtonpost.com/national/health-science/utilities-sensing-threat-put-squeeze-on-booming-solar-roof-industry/2015/03/07/2d916f88-c1c9-11e4-ad5c-3b8ce89f1b89_story.html.

stifling the development of commercial UAS applications.[3] Proponents of the new technology often find these rules antiquated, thereby undermining the legitimacy of the rules in the public eye. As a result, norms that are perceived to be out-of-step with the new technology can cause negative consequences if they are routinely disregarded. We already see this scofflaw tendency among small drone users who flout prohibitions on operations in populated areas by posting videos to YouTube,[4] uploading photographs to a photo-sharing site dedicated specifically to pictures taken by drones,[5] or participating in unlawful drone-racing leagues.[6]

Therefore, it is imperative for legislatures, administrative agencies, and scholars to expedite their response time and to construct a legal framework that allows safe UAS experimentation while the law works to evolve into a full regulatory regime. National regulators in many countries are struggling with how best to achieve these twin objectives. Law review articles about drones are becoming scarcely less ubiquitous than the devices themselves.[7]

The difficulties faced by national regulators are amplified at the international level. International rules tend to be adopted much more slowly given the lack of centralized legislative and enforcement institutions, the plurality of cultural perspectives, and competition for scarce space on the diplomatic agenda. As this Essay discusses, despite these obstacles, the international aviation law community has been noticeably proactive in preparing for the regulatory integration of drones into the international airspace.

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3. *See, e.g.*, Ed Pilkington, *What's Keeping America's Private Drone Industry Grounded*, GUARDIAN (Sept. 30, 2014, 11:18), http://www.theguardian.com/world/2014/sep/29/drone-testers-faa-aviation-frustration-grows.

4. *See, e.g.*, DronedOut, *Top 5 Drone Fails*, YOUTUBE (Aug. 28, 2015), https://www.youtube.com/watch?v=0rhIMfjcwbE.

5. *See* DRONESTAGRAM, http://www.dronestagr.am/ (last visited Aug. 10, 2015).

6. *See, e.g.*, Jenni Ryall, *The Underground World of Drone Racing in Australia*, MASHABLE (June 11, 2015), http://mashable.com/2015/06/11/drone-racing-australia/.

7. The following articles are only a sample of those that have been published this year alone. *E.g.*, Robert H. Gruber, *Commercial Drones & Privacy, Can We Trust States with "Drone Federalism"?*, RICH. J.L. & TECH. (2015), http://jolt.richmond.edu/index.php/commercial-drones-and-privacy-can-we-trust-states-with-drone-federalism/; Robert A. Heverly, *The State of Drones: State Authority to Regulate Drones*, 8 ALB. GOV'T L. REV. 29 (2015); Henry H. Perritt & Eliot O. Sprague, *Drones*, 17 VAND. J. ENT. & TECH. L. 673 (2015); Troy A. Rule, *Airspace in an Age of Drones*, 95 B.U. L. REV. 155 (2015); Timothy T. Takahashi, *The Rise of Drones—The Need for Comprehensive Federal Regulation of Robot Aircraft*, 8 ALB. GOV'T L. REV. 63 (2015); Benjamin D. Mathews, Comment, *Potential Tort Liability for Personal Use of Drone Aircraft*, 46 ST. MARY'S L. J. 573 (2015); Taly Matiteyahu, Note, *Drone Regulations and Fourth Amendment Rights: The Interaction of State Drone Statutes and Reasonable Expectations of Privac*y, 48 COLUM. J. L. & SOC. PROBS. 265, 266–69 (2015); Daniel North, Note, *Private Drones: Regulation & Ins.*, 27 LOY. CONSUMER L. REV. 334 (2015).

Until now, there has been little scholarship that discusses the regulatory governance of civilian drones across national boundaries. This Essay begins to fill that void by summarizing the current work of international aviation's principal regulatory body, the International Civil Aviation Organization (ICAO).[8] This Essay goes on to identify areas in need of further study and offers a mild critique of the international aviation law community's current focus with regard to UAS devices.[9]

II. Fitting New Technology into an Old Regime

This Essay refers to drones as UAS except when discussing a specific subset of UAS known as Remotely Piloted Aircraft Systems (RPAS). At present, the overwhelming majority of drones in operation are RPAS because the technology necessary to allow sustained autonomous flights has not been perfected. The UAS currently in use by civilians or commercial enterprises are most typically referred to as "small UAS,"[10] although size classifications are far from standardized among states.[11] The most commonly used models weigh only a few pounds and are rotor-powered.[12] Larger UAS are flown almost exclusively by governments either as a part of military missions or for monitoring border security and have yet to enter the civilian market. The work done by the international civil aviation law community on international drone usage has largely focused on preparing for the eventuality that these larger RPAS will enter the commercial market and share airspace with manned aircraft.[13]

Since the end of World War II, international civil aviation traffic has operated within the framework established by the Convention on International Civil Aviation (the Chicago Convention or Convention).[14] Under this framework, each state maintains exclusive sovereignty over access to the airspace above its territory[15] but is encouraged to

8. *See infra* notes 10–43 and accompanying text.

9. *See infra* notes 44–70 and accompanying text.

10. Some use the term "microdrones." *See, e.g.*, Henry H. Perritt, Jr. & Eliot O. Sprague, *Law Abiding Drones*, 16 Colum. Sci. & Tech. L. Rev. 385, 387 (2015).

11. The FAA defines a small UAS as weighing less than fifty-five pounds, whereas the United Kingdom uses the term to cover vehicles up to twenty kilograms (44.09 pounds). The FAA contemplated creating a new categorization for vehicles weighing only a few pounds as is the case with most of the popular models available today.

12. *See, e.g.*, DJI, http://www.dji.com/product/phantom-3/spec.

13. Int'l Civil Aviation Org., Doc. 10019/AN/507, Manual on Remotely Piloted Aircraft Systems (RPAS) (2015), http://www.wyvernltd.com/wp-content/uploads/2015/05/ICAO-10019-RPAS.pdf [hereinafter RPAS Manual].

14. Convention on International Civil Aviation, Dec. 7, 1944, 15 U.N.T.S. 295.

15. *Id.* at 296.

extend that access to foreign carriers through mutual recognition of aircraft certification and crew licensing. States do not need to verify the competency of foreign pilots or the safety of foreign aircraft before allowing them to operate to, from, or in their national airspace.[16] For this system of mutual recognition to work, each state must be confident that other states are competently administering licensing and certification. Thus, the Convention requires that national standards and procedures meet the minimally acceptable international standards.[17] ICAO was established under the Convention to promulgate those standards.[18] The system has been largely successful despite the occasional struggles of some states to meet international expectations.[19]

It might come as a surprise to learn that the Chicago Convention, a product of the mid-twentieth century, anticipated the need for legal regulation of unmanned aircraft. But, UAS are very much a part of the Convention's framework. Article 8 of the Chicago Convention prohibits "aircraft capable of being flown without a pilot" from operating "over the territory of a contracting State without special authorization by that State."[20] Consequently, ICAO's authority over unmanned aircraft—as opposed to, for example, suborbital flights[21]—is not in doubt. In 2004, ICAO formally interpreted Article 8 to cover all aircraft operated without an onboard in-command pilot, including both remotely piloted and autonomous aircraft.[22]

Given that the law—both domestic and international—has historically responded to, rather than anticipated, technological innovations, it is refreshing to contemplate the proactive response of the international aviation community to the future of unmanned flight. UAS technology is rapidly advancing, which presents huge challenges for a large and diverse organization, such as ICAO, to respond in real time.

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16. *Id.* at 316–18.

17. *See id*. at 318, 320–21.

18. *Id.* at 320–21, 326. See BRIAN F. HAVEL & GABRIEL S. SANCHEZ, THE PRINCIPLES AND PRACTICE OF INTERNATIONAL AVIATION LAW 74–75 (2014), for a thorough explanation of the legal obligations ICAO standards impose on states.

19. *See, e.g.*, Nopparat Chaichalearmmongkol & James Hookway, *U.N. Agency Warns Thailand over Aviation Standards*, WALL ST. J., June 18, 2015, http://www.wsj.com/articles/un-agency-warns-thailand-over-aviation-standards-1434645922.

20. Convention on International Civil Aviation, *supra* note 14, at 300.

21. *See* Paul Stephen Dempsey & Michael Mineiro, *The ICAO's Legal Authority To Regulate Aerospace Vehicles*, *in* SPACE SAFETY REGULATIONS AND STANDARDS 245 (Joseph N. Pelton & Ram S. Jakhu, eds., 2010).

22. INT'L CIVIL AVIATION ORG., DOC. 9854/AN/458, GLOBAL AIR TRAFFIC MANAGEMENT OPERATIONAL CONCEPT B-6 (2005), http://www.icao.int/airnavigation/IMP/Documents/Doc%209854%20-%20Global%20ATM%20Operational%20Concept.pdf.

National authorities, such as the FAA, have found the challenges to be just as formidable.

Nevertheless, ICAO recognized a "unique opportunity to ensure harmonization and uniformity at an early stage" with regard to this "newly emerging technology."[23] ICAO held its first exploratory meeting on UAS in 2006 and established the Unmanned Aircraft Systems Study Group (UASSG) in 2007.[24] The UASSG is working on a "UAS Gap Analysis" to identify linguistic and substantive shortcomings in those provisions of the Chicago Convention and in ICAO's draft of regulatory "standards and recommended practices" (so-called SARPs[25] that are adopted in the form of enumerated annexes to the Convention) that could pertain to unmanned aircraft. The UASSG is charged with drafting amendments to update existing provisions to cover UAS.[26] ICAO hopes to complete this work by 2018. For now, ICAO has primarily concerned itself with RPA, as opposed to autonomous UAS, and with instrument flight rules, as opposed to visual line-of-sight operations.[27] In 2011, the UASSG published Circular 328[28] to offer more comprehensive guidance on portions of the annexes to the Chicago Convention[29] that needed to be updated to account for RPAS. The UASSG's work culminated with the introduction of the first significant package of SARPs for RPAS in 2012.[30]

In 2014, the UASSG gave way to the establishment of a Remotely Piloted Aircraft Systems Panel (RPASP). The first major work product of that panel was the completion and publication of the manual on RPAS,[31] which was made publicly available in May 2015 (just after *The UAS Dilemma: Unlimited Potential, Unresolved Concerns*, a Symposium hosted by the *DePaul Law Review*). The manual is an impres-

23. RPAS MANUAL, *supra* note 13, at 1-2.

24. *Id.* at 1-3.

25. SARPs is the abbreviation for "Standards and Recommended Practices" that ICAO issues as directed by Article 37 of the Chicago Convention. The standards are the technical specifications for which ICAO deems compliance necessary for the safety and regularity of civil aviation, but compliance with recommended practices is merely considered to be desirable. All SARPs are collected in a series of annexes to the Chicago Convention.

26. Filippo De Florio, AIRWORTHINESS: AN INTRODUCTION TO AIRCRAFT CERTIFICATION 91 (2d ed. 2011); RPAS MANUAL, *supra* note 13, at 1-3.

27. RPAS MANUAL, *supra* note 13, at 1-3.

28. INT'L CIVIL AVIATION ORG., CIR. 328/AN/190, UNMANNED AIRCRAFT SYSTEMS (UAS) (2011), http://www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf.

29. The annexes to the Chicago Convention contain the various standards and recommended practices ICAO adopted.

30. RPAS MANUAL, *supra* note 13, at 1-3.

31. *See generally* RPAS MANUAL, *supra* note 13 (providing guidance on the regulatory changes that may accompany the integration of remotely piloted aircraft systems into the airspace currently utilized for international civil aviation).

sive document. It includes a discussion of the Chicago Convention provisions that will likely be relevant to the integration of RPAS into the international aviation regulatory system over the next decade, as well as technical guidance on issues such as special authorization to operate in a state's airspace, aircraft registration, type certification, airworthiness approvals, licensing, and operations. The manual also provides some early guidance on those technical issues that are unique to RPAS and that national authorities need to work through in the coming years, including technical standards for "detect and avoid" capabilities, command and control links, and RPAS pilot stations.

III. AREAS THAT ARE NOT ON ICAO'S RADAR

ICAO's work on drone regulation is not all-encompassing. First, under the Chicago Convention, ICAO has no authority over state or military aircraft.[32] The use of military drones raises numerous important questions of international law that have been widely discussed in law journals[33] and political forums,[34] but those questions are beyond ICAO's operating charter and the scope of this Essay.

Second, much of the public's wariness about the introduction of commercial drones is attributable to concerns best addressed by national and local authorities. For example, there is a blossoming body of scholarship analyzing what can loosely be categorized as rights-based issues related to the operation of drones.[35] Foremost among these issues is that of privacy—citizens' rights to be protected from drone surveillance by a private individual,[36] a commercial enter-

32. Convention on International Civil Aviation, *supra* note 14, at 298.

33. *See, e.g.*, Zora Ahmed, *Strengthening Standards for Consent: The Case of U.S. Drone Strikes in Pakistan*, 23 MICH. ST. U.C.L. INT'L L. REV. 459 (2015); Oren Gross, *The New Way of War: Is There a Duty To Use Drones?* 67 FLA. L. REV. 1 (2015); Thomas Michael McDonnell, *Sow What You Reap? Using Predator and Reaper Drones to Carry Out Assassinations or Targeted Killings of Suspected Islamic Terrorists*, 44 GEO. WASH. INT'L L. REV. 243 (2012); Hitomi Takemura, *Unmanned Aerial Vehicles: Humanization from International Humanitarian Law*, 32 WIS. INT'L L.J. 521 (2014).

34. *See, e.g.*, Philip Ewing, *Rand Paul Pulls Plug on Nearly 13-hour Filibuster on Drones*, POLITICO (Mar. 6, 2013, 12:33 PM), http://www.politico.com/story/2013/03/rand-paul-filibuster-john-brennan-cia-nominee-088507.html; Mark Mazzetti, *Killing of Americans Deepens Debate over Use of Drone Strikes*, N.Y. TIMES, Apr. 23, 2015, http://www.nytimes.com/2015/04/24/world/asia/killing-of-americans-deepens-debate-over-proper-use-of-drone-strikes.html.

35. *See supra* note 34; *see infra* notes 36–38.

36. *See generally* Arthur B. Macomber, *Trespass, Privacy, and Drones in Idaho: No Snooping Allowed!*, ADVOCATE, Mar.–Apr. 2015, at 45, 46–47 (discussing the possible actions victims would have against drone operators, including: (1) civil and criminal trespass; and (2) privacy right violations).

prise,[37] or a government agency.[38] One can also find discussions of the impact of drones on property rights,[39] tort liability,[40] and the rights of media organizations to make use of such devices in gathering and disseminating information.[41]

All of these rights-based issues are rightly thought of as within the purview of national and subnational governments, which can make policy determinations on these issues based on local, legal, cultural, and societal preferences. There is an added question of institutional competence. National aviation regulators are properly tasked with ensuring a safe and efficient air transport system. Indeed, many national civil aviation regulators still struggle with this task without having to worry about the deeper political and cultural ramifications of UAS.[42] Protecting privacy or freedom of speech is better left to those institutions of representative government that are better situated to respond to, and legislate for, the societal preferences of their respective polities. That is presumably why when the FAA issued its notice of proposed rulemaking on small UAS in February 2015,[43] a separate accompanying memorandum on privacy questions came from the White House and not from the agency itself. What is true of the FAA in this setting is even more germane to an intergovernmental organization like ICAO, which reflects a much broader range of cultural perspectives than any national regulator and whose institutional structure is not tailored to consideration of these types of issues. The role of international aviation law (especially that of ICAO) should and will continue to exclude taking positions on matters of sociopolitical importance that are better left to national legislatures and organizations focusing on human rights laws and policies.

Finally, as mentioned *supra*, ICAO appears to have targeted its guidance efforts at those larger RPAS that will eventually be subsumed

37. Melissa Barbee, Comment, *Uncharted Territory: The FAA and the Regulation of Privacy via Rulemaking for Domestic Drones*, 66 ADMIN. L. REV. 463, 468–70 (2014).

38. Philip J. Hiltner, Comment, *The Drones Are Coming: Use of Unmanned Aerial Vehicles for Police Surveillance and Its Fourth Amendment Implications*, 3 WAKE FOREST J.L. & POL'Y 397, 398–400 (2013).

39. *See, e.g.*, Rule, *supra* note 7.

40. *See, e.g.*, Mathews, *supra* note 7.

41. *See, e.g.*, Symposium, *Using Drones in the News and Entertainment Industry: Legal and Regulatory Issues*, 5 J. INT'L MEDIA & ENT. L. 265, 277–303 (2014–2015).

42. *See, e.g.*, Lawrence Agcaoili, *European Union Lifts Air Ban on All Philippine Carriers*, PHIL. STAR, http://www.philstar.com/headlines/2015/06/26/1470030/european-union-lifts-air-ban-all-philipine-carriers (last updated June 26, 2015, 12:00 AM); Matt Beardmore, Update, *Concerns over Safety of Air Travel in Asia*, N.Y. TIMES, Feb. 6, 2015, http://www.nytimes.com/2015/02/06/travel/concerns-over-safety-of-air-travel-in-asia.html.

43. Operation and Certification of Small Unmanned Aircraft Systems, 80 Fed. Reg. 9544 (proposed Feb. 23, 2015) (to be codified in scattered parts of 14 C.F.R.).

within non-segregated airspace. Initial commercial uses of drones, however, will involve small UAS flights taking place in segregated airspace within 500 feet of the earth's surface. ICAO's apparent preference for not disaggregating the regulatory treatment of large and small drones is understandable because regulation of segregated airspace historically has been, and will continue to be, the province of national and local regulatory authorities. Low-altitude flights by small UAS rarely cross international boundaries for two very good reasons: (1) it is considered unsafe to travel great distances so close to the earth's surface; and (2) aircraft powerful enough to travel for hundreds of miles are capable of reaching higher altitudes. Existing small UAS are no exception because most have a range of only a few miles and are unlikely to be regularly used in international activities. Instead, the larger RPAS (which appear to be ICAO's primary concern) are only being operated by governmental agencies over which ICAO has no authority.

IV. A MILD CRITIQUE OF ICAO'S FOCUS

ICAO looked at the great uncertainty involved in developing standards for an emerging technology with only limited international commercial operations and reasonably concluded that it should narrow the scope of its task to avoid being outpaced by all of the potential paths commercial drone development and use could take. It is still worth considering whether ICAO is inadequately responding to the initial wave of commercial drones, the so-called small RPAS. As for the larger RPAS for which ICAO is preparing a regulatory canopy, we must also ask whether ICAO is devoting too much time to a technology for which commercial application is uncertain.

A. The Uncertainty of a Significant Cost Advantage to Using RPAS in Non-segregated Airspace

ICAO's regulatory vision for the operation of RPAS in non-segregated airspace mirrors the regime currently guiding the operation of manned civil aircraft. States would be expected to seek authorization to operate unmanned vehicles in other states' airspace using procedures that are similar to those currently used to negotiate rights to operate manned scheduled flights abroad.[44] However, unlike in the case of manned flight, no distinction would be made between commercial and general aviation.[45] Unmanned vehicles would be re-

44. RPAS MANUAL, *supra* note 13, at 3-2.
45. *Id.* at 2-3, 3-2.

quired to obey the same rules of the air as manned aircraft and to meet technical standards with regard to "detect and avoid" capabilities to ensure they are able to do so.[46] ICAO envisions a certification process for unmanned vehicles that takes the other components of the UAS, including the command link, into consideration[47] but requires only the vehicle itself be registered on a national aircraft registry.[48]

ICAO's manual reflects an understanding of RPAS as essentially pilotless versions of the existing aircraft that comprise international civil aviation deployed in essentially the same manner. Is this a fair prediction of future international UAS operations? Demand for unmanned passenger or cargo aircraft will surely be contingent on the potential for operators of these vehicles to realize cost savings as compared to manned aircraft. Given that labor costs are one of the largest fixed costs for operators,[49] and that compensation for pilots represents a significant portion of these labor costs, there will undoubtedly be interest in automating crew positions. Yet, it is unclear how much money a carrier or operator would save by switching to an RPAS, which under current technology, still requires a pilot to operate the aircraft. It is conceivable that remote aircraft pilots will require significantly less training and will therefore earn lower incomes than manned aircraft pilots. But, that is not necessarily how the industry will develop. After all, the risks involved in operating a large aircraft over densely populated areas, in an airspace shared with other remotely piloted and manned aircraft, and with passengers on board, will undoubtedly require significant levels of advanced training. Moreover, ICAO's manual makes clear that it expects state authorities to subject remote pilots to a licensing regime that satisfies international standards.[50]

As we review ICAO's guidelines for operational rules,[51] certification,[52] security measures,[53] and the use of aerodromes,[54] we do not see that a remotely piloted aircraft system operating in non-segregated airspace is likely to provide significant savings in regulatory compliance costs as compared with the operation of manned aircraft. Thus,

46. *Id.* at 9-1, 10-1.
47. *Id.* at 4-2.
48. *Id.* at 5-1.
49. *See* Thad Moore, *How Airlines Decide How Much to Charge for a Plane Ticket*, WASH. POST: WONKBLOG (July 2, 2015), http://www.washingtonpost.com/news/wonk/wp/2015/07/02/how-airlines-decide-how-much-to-charge-for-a-plane-ticket/.
50. RPAS MANUAL, *supra* note 13, at 8-1 to 8-12.
51. *Id.* at 9-1 to 9-14.
52. *Id.* at 4-4.
53. *Id.* at 9-13.
54. *Id.* at 15-1 to 15-3.

it is entirely unclear how great the cost savings will be for an air transport company to switch from manned to remotely piloted aircraft.[55] The insurance sector will likely charge a premium to first movers in this area as well. This is not to say that unmanned vehicles will never be integrated into non-segregated airspace, but merely suggests that the specific future for which ICAO appears to be preparing for, one of larger remotely piloted vehicles operating in non-segregated airspace similar to the way large commercial jets operate today, is not necessarily the most plausible one. Major commercial carriers may be hesitant to make such a costly and dramatic transition away from aircraft operated by on-board pilots until fully autonomous aircraft, which would produce significant labor savings, are feasible.

As for the four pound quadcopters currently taking flight in segregated airspace around the globe, the purposes for which these aircraft are used would quickly diminish if their operators were required to follow the rules set out by ICAO. The FAA's recent notice of proposed rulemaking offers a number of departures from the regulations for non-segregated airspace, including significantly more lenient licensing requirements and no requirement for a type certification.[56] This class of extremely small RPAS is likely capable of fulfilling its purpose within segregated airspace and any business models deploying these units will avoid non-segregated airspace rather than absorb the significant increase in costs required to comply with more demanding regulatory requirements. For these reasons, we can postulate a future industry structure comprised of very small RPAS operating largely unencumbered in segregated airspace, and at some point in the distant future, the introduction of large, fully autonomous commercial jets performing many of the functions currently performed by the international civil aviation system. Neither of these scenarios is adequately reflected in the work represented by ICAO's RPAS manual, inviting the question: What should ICAO and the global regulatory community at large do in these circumstances?

B. Why ICAO Should Consider Regulating Small UAS

While it is unquestionably important to prepare for future uses of unmanned technology, ICAO may be missing an opportunity to lead the response to technology already in use. National regulators are

55. In the near future, large remotely piloted vehicles are unlikely to provide significant savings with respect to capital costs given that the technology is still in development far from the mass production stage and that switching to a fleet of remotely piloted vehicles will require additional technology investments in pilot command centers.

56. Operation and Certification of Small Unmanned Aircraft Systems, *supra* note 43.

currently undertaking the difficult process of developing policies for integrating small UAS. Once that work is complete, it will inevitably shape future regulation of unmanned aircraft before ICAO has a say. While on the surface the question of small UAS operations, being primarily local in nature, would seem to be a regulatory matter outside ICAO's scope of authority, the following reasons make clear that ICAO has justification to act in this area should it so desire.

1. Regulating Small UAS as an Extension of the Protection of Manned Aircraft

ICAO's mission is to promote the safe, efficient, and sustainable development of the international civil aviation system.[57] ICAO looks to: (1) external elements that could cause dangers in the international air transport system; (2) how states communicate high-risk areas to the world's airlines; (3) the risks small UAS pose to manned aircraft in the airspace; and (4) the need to distinguish between UAS that pose a risk to the airspace and those deemed harmless. To effectively fulfill this mission, ICAO takes an interest well beyond its core technical mandates in numerous aspects of national civil aviation systems, which include the in-flight operations of aircraft and licensing of pilots. For example, ICAO worked on standardizing machine-readable travel documents used by national border control agencies because of the important role these documents play in facilitating air transport and their use in screening air passengers.[58] ICAO is especially active with respect to external elements that may bear on the safety or security of the international air transport system and understands that a weak link anywhere in the global system poses dangers not only to users of that system but to anyone on the ground who could be endangered by an unsafe or unsecure aircraft—which is practically any person in any location. This vulnerability to external threats was most recently demonstrated by the attack on Malaysian Airlines Flight 17, which is believed to have been shot down by a surface-to-air missile while flying over a conflict zone in eastern Ukraine.[59] ICAO re-

57. Convention on International Civil Aviation, *supra* note 14, at 326.

58. INT'L CIVIL AVIATION ORG., ICAO DOC. 9303, MACHINE READABLE TRAVEL DOCUMENTS 1, 3 (7th ed. 2015), http://www.icao.int/publications/Documents/9303_p2_cons_en.pdf.

59. Sabrina Tavernise et al., *Jetliner Explodes over Ukraine; Struck by Missile, Officials Say*, N.Y. TIMES, July 14, 2014, http://www.nytimes.com/2014/07/18/world/europe/malaysian-airlines-plane-ukraine.html.

sponded by examining how states identify high-risk areas and how they share that information with the world's airlines.[60]

While small UAS operators would bristle at the implication that they represent a comparable threat to flights over conflict zones, our point is not to equate the risks but to emphasize that ICAO's first responsibility should be to scrutinize all risks to the safety of international civil aviation. If small UAS are the first wave of broadening commercial and civilian drone operations, then at a minimum, ICAO needs to assess the risks that these smaller aircraft pose to manned flights. Drone defenders believe that such concerns are exaggerated, asserting that standard four-pound quadcopters pose no more of a risk to passenger air travel than flocks of birds that frequently collide with aircraft engines without incident.[61] But, the infrequency of adverse events has never absolved ICAO or national regulators of the responsibility to assess the potential risks and provide guidance.

For example, there are regulatory protections in place to guard against safety risks posed by birds. A standard component of the certification process for new aircraft includes engine tests to ensure that a bird collision will not result in engine failure that would jeopardize passenger safety.[62] At a minimum, the certification process should be amended to also include tests for collisions with small UAS. Of greater concern is that the bird example actually loses salience when, instead of looking at the most popular small UAS models on the market, one considers the sizes of unmanned vehicles contemplated under current and proposed small UAS regulations in various countries. For example, the FAA's recently proposed guidelines for small UAS operating in segregated airspace extend to vehicles weighing up to fifty-five pounds.[63] Similarly, the United Kingdom's existing guidelines categorize anything up to twenty kilograms (44.09 pounds) as a small UAS.[64] At these sizes, the threat to manned aircraft increases considerably. While ICAO does not regularly concern itself with segregated airspace where manned aircraft are not operating, if the operation of larger aircraft became commonplace, safety and security risks would necessarily intrude. If licensing for the operation of such aircraft was

60. Andy Pasztor, *Conflict-Zone Site for Airlines Launches with Warnings on Egypt, Iraq, South Sudan*, WALL ST. J., Apr. 15, 2015, http://www.wsj.com/articles/conflict-zone-website-for-airlines-launches-with-warnings-on-egypt-iraq-south-sudan-1429072469.

61. *See, e.g.*, Henry H. Perritt & Eliot O. Sprague, *Law Abiding Drones*, 16 COLUM. SCI. & TECH. L. REV. 385, 424–25 (2015).

62. 14 C.F.R. § 33.76(b) (2014).

63. Operation and Certification of Small Unmanned Aircraft Systems, *supra* note 43.

64. *See Small Unmanned Aircraft (20kg or less): Specific Regulations*, CIVIL AVIATION AUTH., https://www.caa.co.uk/default.aspx?catid=1995&pageid=16012 (last visited Aug. 10, 2015).

too lenient, operational controls were inadequate, or if security threats from hacking or malicious operators were not adequately monitored, the line between legal activity and a threat to safety could quickly disappear. Returning to the Malaysian Airlines Flight 17 tragedy, ICAO responded to the incident's safety concerns by helping carriers and governments better identify high-risk regions with respect to which caution or avoidance are warranted.[65] A major challenge posed by light regulation of UAS activity in segregated airspace is that the threat will not be restricted to conflict zones.

ICAO and national regulators should address these risks by denominating the types of small UAS that could pose a genuine risk to commercial air transport and treating them as a distinct regulatory category from those vehicles deemed harmless. For example, ICAO could harmonize the different size classifications among its member states so that all "harmless" UAS are left entirely to the supervision of national authorities while vehicles with the potential to harm a commercial aircraft—even when operating in segregated airspace—are assessed with the same seriousness as official monitoring of other threats to civil aviation, such as airport security.[66] Therefore, in the future, no ICAO member state would meet ICAO's standards for safe operation of manned air transport unless it had policies in place to ensure safe UAS operations within its airspace.

2. Regulating Small UAS as a Matter of Compliance with International Law

A second reason why ICAO should consider merging small UAS operating in segregated airspace into the existing regulatory framework for international civil aviation is because the law requires it.

UAS may seem conceptually analogous to those aircraft that operate nonscheduled international air services, including: helicopters, balloons, and charter aircraft operations. All of these modes of flight could conceivably be operated internationally without the degree of complication or coordination required for the scheduling of commercial air services, but that is not how UAS are treated legally under the Chicago Convention.

As discussed earlier, Article 8 of the Convention specifically provides that "[n]o aircraft capable of being flown without a pilot shall be

65. *E.g.*, Pasztor, *supra* note 60.

66. *See generally* INT'L CIVIL AVIATION ORG., ANNEX 17 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION, SECURITY: SAFEGUARDING INTERNATIONAL CIVIL AVIATION AGAINST ACTS OF UNLAWFUL INTERFERENCE (7th ed. 2006) (listing the rules regarding threats to civil aviation in airport security).

flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization."[67] This language, supporting a concessionary system whereby states give permission to serve sovereign airspace, is quite similar to the prohibition in Article 6 of the Convention, which governs the operation of scheduled air services in a state's territory without authorization by that state.[68] It is also quite unlike the rules for nonscheduled services set out in Article 5 of the Convention, which permits entry into another state's territory without prior permission (but subject to considerations of safety).[69]

This need to obtain permission is grounded in the fundamental principle of international aviation law (encased in Article 1 of the Chicago Convention) that each state has complete and exclusive sovereignty over its own airspace.[70] This principle has profound consequences for the development of international UAS flights. For example, concessionary permissions to serve a state's airspace are the object of thousands of bilateral air services agreements among states exchanging these privileges. We are not aware of any such agreements (or components of existing agreements) that currently include a grant of rights for the operation of unmanned aircraft. At present, ICAO seems to be directing potential transactional drone operators to use its suggested interstate authorization process for unmanned balloons, but that is surely no more than an interim solution. For international UAS operations to become a reality, fresh agreements need to be negotiated or existing agreements amended.

In sum, the text of the Chicago Convention does not allow ICAO to ignore categories of small UAS used in segregated airspace unless ICAO reinterpreted Article 8 to exclude all responsibility for these aircraft. In our view, such a reinterpretation would open up another species of regulatory segregation in the UAS industry—this time between small UAS and all other forms of unmanned vehicles. It would introduce a potentially dangerous categorization that would sit uncomfortably with ICAO's primary mission: ensuring the safety and security of international civil aviation.

V. Conclusion

Unmanned aircraft systems present extraordinary challenges to the international regulatory regime for international aviation. ICAO and

67. Convention on International Civil Aviation, *supra* note 14, at 300.
68. *Id.*
69. *Id.* at 299–300.
70. *See generally id.* at 296.

national regulators are caught in the maelstrom of this evolving technology and must determine their respective areas of responsibility. This Essay explained ICAO's current regulatory focus and attempted to raise concerns as to how ICAO may need to reach beyond the assumption that UAS vehicles in international commercial air transportation will evolve in a single direction toward direct competition with manned passenger and cargo jetliners. The reality may prove more complex both as a commercial matter and in terms of the types of vehicles that will impinge on the international sphere's safety and security. Therefore, ICAO needs to be flexible in the tempo and reach of its regulatory activities. That flexibility has been a hallmark of ICAO in the past and should not be abandoned as the organization considers its approach to one of the most exciting, but also potentially fraught, advances in modern air transport.