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Unmanned Aerial Exposure: Civil Liability Concerns Arising from Domestic Law Enforcement Employment of Unmanned Aerial Systems

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UNMANNED AERIAL EXPOSURE: CIVIL LIABILITY CONCERNS ARISING FROM DOMESTIC LAW ENFORCEMENT EMPLOYMENT OF UNMANNED AERIAL SYSTEMS

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I. INTRODUCTION

Unmanned Aerial Vehicles (UAVs) have proven their worth on the battlefields of Iraq, Afghanistan, and Lebanon.[1] UAVs offer a relatively low-cost, low-risk alternative to manned aircraft in the military setting.[2] The same advantages have led many to see natural applications for UAVs in a domestic setting.[3]

Technological advances in communications, control, and optics in recent decades will no doubt increase pressure to introduce UAV systems for a host of domestic applications.[4] In the coming years, law enforcement agencies will seek to use UAVs[5] to police borders, control crowds, track

1. P.W. SINGER, WIRED FOR WAR: THE ROBOTICS REVOLUTION AND CONFLICT IN THE 21ST CENTURY 37 (2009). According to P.W. Singer, a "veritable menagerie of unmanned drones now circles above the soldier in Iraq, reporting back to all sorts of units." *Id.* Although the U.S. military's operation of Predator and Reaper drones in Afghanistan and Iraq has been well publicized, Israel has also used UAVs extensively, including its 2006 conflict with Hezbollah in Lebanon. *See* Larry Dickerson, *New Respect for UAVs*, AVIATION WEEK & SPACE TECH., Jan. 26, 2009, at 94 (noting Israel deployed the largest number of UAVs during the 2006 conflict). UAVs also saw action in the 2008 conflict between Russian and Georgia in the South Ossetia region. *Id.*

2. Mark Edward Peterson, *The UAV and the Current and Future Regulatory Construct for Integration into the National Airspace System*, 71 J. AIR L. & COM. 521, 523 (2006).

3. *See* Ron Chambers, *Policing's New Eye in the Sky: The Use of Unmanned Aerial Vehicles in Law Enforcement*, J. OF CAL. L. ENFORCEMENT, Jan. 1, 2006, at 7 ("UAVs provide a cost-effective solution to safe and speedy response to crime scenes without endangering the lives of the innocent who might otherwise be in the path of a hurried officer or deputy trying to catch up with the demand for their services.").

4. To date, a number of civilian law enforcement agencies have begun to explore the domestic use of UAVs. *See, e.g., Sacramento Police Exploring Unmanned Aerial Vehicle Technology*, US STATE NEWS, Dec. 5, 2007, *available at* 2007 WL 25932296; *An idea that may not fly*, KAN. CITY STAR, Feb. 6, 2008, at B8 (noting that a Topeka politician proposed purchasing UAVs in lieu of police helicopter); Ben Reed, Jr., *Future Technology in Law Enforcement*, FBI L. ENFORCEMENT BULL., May 1, 2008, at 16-17 ("At least one large U.S. metropolitan police agency is experimenting with UAVs . . . .").

5. UAV optical feeds could replace video feeds from helicopters for law enforcement agencies. Rob Margetta, *Protecting Planes, Spotting Liars and Diverting Hurricanes: A Peek at S&T's Research,* CQ HOMELAND SECURITY, June 4, 2008, *available at* 2008 WL 10887939.

criminals, detect illegal narcotics activities,[6] and spot crime.[7] Farmers will employ UAVs to conduct soil studies, seed fields, and dust crops.[8] The U.S. Forest Service and local fire departments will use UAVs to track the spread of dangerous wildfires.[9] Telecommunications companies may use UAVs to provide rapid mobile and fixed site communications relays.[10] Mineral and energy companies may use UAVs to survey terrain and check pipelines for leaks or damage.[11] The revolution is coming.[12]

Significant administrative and regulatory hurdles will confront policy-makers as they seek to integrate UAVs into the domestic airspace system.[13] Those obstacles have been the subject of some scholarship[14] and are addressed by other contributions to this symposium. This article explores the narrower issue of civil liability arising from the operation of UAVs by law enforcement authorities. Tort law has a well established body of rules and doctrines dealing with civil liability surrounding traditional aviation. The extent to which such rules can accommodate the coming UAV revolution is the focus of this article. This article assumes that the legal hurdles to operating UAVs in the national airspace system are surmounted, and then

6. UAVs could be used to aid law enforcement personnel in locating marijuana fields. William Matthews, *Simply Complex*, NATIONAL GUARD, Sept. 1, 2007, at 35.

7. UAV producers in Israel and South Africa have clearly demonstrated an intention to market UAVs for law enforcement applications. *See, e.g.*, Israel Aerospace Industries, Ltd., *Bird Eye -Mini UAV*, http://www.iai.co.il/32947-33738-en/default.aspx (last visited Mar. 8, 2010) (describing the use of Israeli Aerospace Industries UAV for "law-enforcement" squads); Mahesh Acharya, *UAVs—In Civil Service*, http://www.spsairbuz net/story.asp?Article=112 (last visited Mar. 8, 2010) ("Seeker, a tactical UAV system, is reportedly already in use in South Africa for the purposes of monitoring crowds and carrying out urban surveillance activities.").

8. *See generally* David Hyunchul Shim et al., *A Development of Unmanned Helicopters for Industrial Applications,* 54 J. INTELLIGENCE ROBOT SYSTEMS 407, 409 (2009) (discussing agricultural applications for VTOL UAVs).

9. Jeff Wise, *No Pilot, No Problem: Unmanned Planes—Already Critical to the Military—Are Poised to Soar in Civilian Skies,* POPULAR MECHANICS, Apr. 2007, *available at* http://www.popularmechanics.com/science/air_space/4213464 html.

10. Peterson, *supra* note 2, at 550.

11. Brad Kelly, *Unmanned Aircraft Helps Soldiers See Where the Enemy is Hiding*, INVESTOR'S BUS. DAILY, Aug. 21, 2008, *available at* 2008 WL 15717120.

12. The British government's home office produced a science and innovation strategy paper which identified UAVs as the "future" of law enforcement. Maurice Fitzmaurice, *PSNI's Newest Recruit . . . The Robocopter: Uni Building Pounds 2.2.m "Spy in the Sky"*, DAILY MIRROR (UK), Mar. 3, 2009, at 17. According to the report, "UAVs are likely to be an increasingly useful tool for police in the future, potentially reducing the number of dangerous situations the police may have to enter. They may also provide evidence for prosecutions and support police operations in real time." *Id.* Most aviation experts predict tremendous growth in the use of UAVs for nonmilitary applications. Dave Hirschman, *Georgian Teaches Pilots Who Never Leave Ground*, ATLANTA J. & CONST., July 2, 2006, at F1.

13. The FAA has formed a program office to develop UAV regulations, but expects the process to take several years. Hirschman, *supra* note 12, at F1.

14. *See generally* Peterson, *supra* note 2, at 561-65.

speculates about potential civil liability concerns should things, as they always do, go wrong.

Part II provides worst-case scenarios in various contexts. Assuming UAVs are integrated into the national airspace system and employed by law enforcement authorities, what worst-case results can be imagined that would produce potential civil lawsuits? Part III provides an overview of existing aviation liability law and considers the special doctrines of governmental immunity that protect, to a greater or lesser degree, law enforcement authorities from civil litigation. In discussing each applicable legal doctrine, part III considers any special considerations likely to arise from the introduction of UAVs into the national airspace and the integration of UAV-related civil claims into the existing body of aviation tort law. Part IV addresses selected additional legal concerns.

Aviation law is big business for plaintiffs' attorneys. The magnitude of damages associated with aviation accidents—including personal injury to passengers, loss of aircraft, and ground damage—has made millionaires out of more than a few members of the plaintiffs' bar.[15] Inevitably, civil litigation will follow the coming UAV revolution. This article seeks to prepare law enforcement authorities to handle the budgetary and tactical implications of altered liability exposure.

II. WHAT MIGHT GO WRONG?

UAVs integrated into the national airspace system for law enforcement applications would carry several types of risk of injury to persons, property, and other protected interests. It is safe to assume that any domestic UAVs would be limited to "unweaponed" surveillance and/or communications relay models. Although some law enforcement applications might be envisioned for weaponized UAVs—a Predator-launched Hellfire missile would be a great way to stop a high speed chase—the risks associated with domestic deployment of high explosives will likely lead to a more cautious approach to UAV integration.

15. Corboy & Demetrio, Aviation Litigation, http://www.corboydementrio.com/assets/pdf/area_4.pdf. The Chicago plaintiff's firm of Corboy & Demetrio, for instance, has netted two settlements in aviation law cases that each exceeded $25 million.

A. GROUND DAMAGE

Aircraft crash. UAVs are certainly no exception.[16] Operating overseas in sparsely populated regions, UAVs have crashed periodically but presumably rarely caused civilian casualties or property damage.[17] Integrating UAVs into the domestic airspace system, even if such platforms are limited to law enforcement use, will eventually lead to ground damage. Crafts themselves could crash or component parts could fall from platforms causing ground damage.

To date, UAVs have had a higher mishap rate than traditional manned aircraft.[18] The Air Force's RQ-1 Predator had 32 times as many mishaps per flight-hour when compared to general, manned aviation, the Navy's RQ-2 Pioneer more than 300 times as many mishaps, and the Army's RQ-5 Hunter nearly 60 times as many.[19] Advances in technology, training, and operation in a peacetime climate will likely reduce these accident rates, but UAV safety "needs to improve by one to two orders of magnitude to reach the equivalent level of safety of manned aircraft."[20] UAVs, for instance, lack the de-icing systems available on manned aircraft, and without a pilot capable of observing ice on the craft's wings, UAVs may be more suscep-

16. Matthew Hickley, *Spies in the Sky that Could Watch our Every Move,* DAILY MAIL (UK), May 15, 2007, at 19, *available at* http://www.dailymail.co.ud/sciencetech/article-454945/spies-sky-watch-move html ("For all their successes, military UAVs are prone to crashes on takeoff and landing and many have been lost over battlefields.").

17. C.W. Johnson, *Insights from the Nogales Predator Crash for the Integration of UAVs into the US National Airspace System Under FAA Interim Operational Approval Guidance 08-01,* (Feb. 2 2009), at 7, *available at* http://www.dcs.gla.ac.uk/~johnson/papers/ISSC09/UAV_FAA_Integration.pdf ("[T]here is a growing number of accident reports describing mishaps involving military UVAs in both Iraq and Afghanistan."). The UK has reported losing 33 UAVs in Iraq. Craig Hoyle, *UK MoD Reveals UAV Losses in Iraq, Afghanistan*, FLIGHTGLOBAL, June 6, 2007, *available at* http://www flightglobal.com/articles/2007/06/06/214485/uk-mod-reveals-uav-losses-in-iraq-afghanistan html.

18. William T. Thompson et al., *U.S. Military Unmanned Aerial Vehicle Mishaps: Assessment of the Role of Human Factors Using Human Factors Analysis and Classification System* (HFACS), USAF 311TH HUMAN SYSTEMS WING, Mar. 2005, at vi, http://www.dtic mil/cgi-bin/GetTRDoc?AD=ADA435063&Location=U2&doc=GetTRDoc.pdf (last visited Mar. 8, 2010). Mishaps include Class A mishaps—destruction of $1 million in property, loss of a Department of Defense aircraft, or a human casualty resulting in loss of life or permanent disability; Class B mishaps—$200,000-$1 million in property damage, human casualty leading to partial disability or three or more hospitalized personnel; and Class C mishaps—$20,000-$200,000 in property damage or non-fatal injury leading to loss of time at work. *Id.* at 6.

19. *Id.* at 1; William T. Thompson, *U.S. Military Unmanned Aerial Vehicle Mishaps: Assessment of the Role of Human Factors Using Human Factors Analysis and Classification System (HFACS),* USAF 311TH HUMAN SYSTEMS WING, Mar. 2005, at 1, *available at* http://www.wpafb.af mil/shared/media/document/AFD-090226-154.pdf.

20. *Id.*

tible than manned craft to ice-related mishaps when operated in cold weather.[21]

The National Transportation Safety Board (NTSB) has conducted three inquiries concerning domestic UAV crashes. In April 2006, a Predator UAV used by the United States Customs and Border Protection Service crashed into the Arizona desert when its operators turned off its engine.[22] When one of the Predator's two ground control stations locked up during flight, its operator switched to the other station but neglected to "align the consoles," inadvertently cutting off the platform's fuel supply.[23] As the UAV lost power during flight, it began to "shed electrical equipment to conserve electrical power."[24]

Although no one on the ground was injured, "the accident didn't help the [UAV] industry's reputation."[25] The UAV glided as close to 100 feet from two homes before striking the ground; homeowners heard the crash and thought a bomb had exploded.[26] The NTSB attributed the crash to inadequate surveillance of the program, pilot error, and inadequate maintenance procedures performed by the manufacturer.[27]

In November 2008, another Predator crashed while performing touch-and-go landings near Fort Huachuca, Arizona.[28] The aircraft slid 1500 feet along a runway on its main gear and optical payload ball after its nosewheel assembly failed on landing.[29] There were no injuries.[30]

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21. Matthew L. Wald, *Safety Fears on No-Pilot Airplanes,* N.Y. TIMES, Oct. 17, 2007, at C1, C9.

22. Kim Sengupta, *Unmanned Spy Planes to Police Britain*, INDEPENDENT (UK), Aug. 6, 2008, at 4.

23. David Collogan, *UAVs on the Horizon: The FAA is Facing Mounting Pressure to Allow More UAVs in Civil Airspace*, BUS. & COM. AVIATION, July 1, 2006, at 92.

24. NTSB PROBABLE CAUSE REPORT CHI06MA121, *available at* http://www ntsb.gov/ntsb/brief.asp?ev_id=20060509X00531&key=1.

25. Stew Magnuson, *FAA Takes Slow Flight Path to Domestic UAV Approval*, NATIONAL DEFENSE, Apr. 1, 2007, at 12.

26. *UAV Crash Stirs Debate on Drone Safety,* UNMANNED AERIAL VEHICLES, Aug. 8, 2006, *available at* http://www.livingroom.org.au/uavblog/archives/uav_crash_stirs_debate_on_drone_safety.php.

27. NTSB PROBABLE CAUSE REPORT CHI06MA121, *available at* http://www ntsb.gov/ntsb/brief.asp?ev_id=20060509X00531&key=1.

28. NTSB PRELIMINARY REPORT DCA09FA009, *available at* http://www ntsb.gov/ntsb/brief.asp?ev_id=20081107X13829&key=1.

29. *Id.* A UAV's optical payload is typically included in a "ball" or "turret" that hangs below the front end of the nose of UAV's fuselage. *See Background—Canadian Forces JUSTAS MALE UAV—Hermes 1500*, CANADIAN AMERICAN STRATEGIC REVIEW, http://www.casr.ca/bg-uav-justas-hermes-1500 htm (last visited Feb. 5, 2010). While some UAVs are designed to land using parachutes or by skidding along the ground, the Predator is equipped with a fixed forward landing gear containing a nose-wheel that, if functional, allows the UAV to land like a conventional aircraft. S*ee* Tim Wyllie, *Parachute Recovery for UAV Systems*, *available at* http://www.emeraldinsight.com/Insight/ViewContentServlet?Filename=Published/EmeraldFullTextArticle/Articles/1270730602 html (last visited Mar. 8, 2010); Designation-Systems net,

In 2008, an experimental Raytheon Cobra collided with a stadium light pole at the United States Air Force Academy while conducting a pre-programmed landing near Colorado Springs.[31] No one was injured. Accidents like these have thankfully caused no injuries to date, but widespread use of UAVs in the domestic setting would inevitably produce casualties and property loss as a result of crashes or objects falling from airborne UAVs.

B. AIR-TO-AIR COLLISIONS

A second potential accident associated with UAV use in the domestic airspace system would be air-to-air collisions. At present, UAVs lack the "collision avoidance systems that are required on airliners"[32] or have, at best, "primitive systems for sensing and avoiding other aircraft."[33] Presumably, such craft would only be employed domestically if technology advanced sufficiently to equip UAVs with de-confliction and anti-collision capabilities.[34] Still, the lack of an on-board pilot who can watch for other aircraft exacerbates the risk that a UAV would be involved in a mid-air collision.[35] Moreover, the small size and radar profile of UAVs create significant risk that such craft would damage civilian aircraft, causing both property loss and human casualties.

UAVs operated in Iraq and Afghanistan have nearly collided with passenger aircraft on several occasions, including one incident "involving an Afghan Airlines jet carrying 100 passengers and a German Army UAV over Kabul in August 2004."[36] When the Border Patrol's Predator UAV crashed in 2006, it could have easily hit an aircraft passing under its restricted operating area if such aircraft had been there at "just the right moment."[37] An Indian UAV crashed with fighter aircraft during a test

General Atomics RQ/MQ-1 Predator, http://www.designation-systems net/dusrm/app2/q-1 html (last visited Mar. 8, 2010) ("With its fully retractable tricycle landing gear, the *Predator* takes off and lands like a conventional aeroplane.").

30. *Id.*

31. NTSB FACTUAL REPORT DEN08FA130, *available at* http://www ntsb.gov/ntsb/brief.asp?ev_id=20080729X01124&key=1.

32. Wald, *supra* note 21, at C9.

33. Ben Webster, *This is Your Pilot. You Don't Need Me*, TIMES (UK), Apr. 2, 2007, at 8.

34. One domestic UAV producer is seeking to develop collision avoidance systems for its UAVs. *Global Aerial Surveillance to Implement Collision Avoidance on UAVs*, HELICOPTER NEWS, Sept. 6, 2005, *available at* 2005 WL 14023581.

35. Wald, *supra* note 21, at C9.

36. Webster, *supra* note 33, at 8.

37. Collogan, *supra* note 23, at 92.

flight.[38] It is hard to imagine widespread integration of UAVs into populated airspace without some level of air-to-air accidents arising.

C. COMMUNICATIONS INTERFERENCE

Although most modern aircraft employ communications technologies, UAVs, piloted remotely or by a pre-programmed flight, are particularly dependent on quality communications connections.[39] Several types of harm could result from the communications-dependent nature of such platforms if employed for law enforcement use.

First, UAV communications signals could interfere or disrupt existing civilian communications bands. One can imagine interference with cell phones, satellite TV signals, and other civilian communications networks. Those who lose service as a result of law enforcement use of UAVs might seek compensation for damage done. Similarly, communications providers might claim business losses should UAV signals interfere with their protected or licensed channels of communication.

Second, communication between UAVs and their ground control stations could fail, resulting in air-to-air collisions or ground damage. If such interference resulted from the actions of ground controllers, then such cases would likely be analyzed under the same principles as air-to-air collision and ground damage cases. However, an additional potential target for civil litigation could be a third party whose communications signals cause a breakdown in the ground control of UAV communications, resulting in a platform veering off course or crashing to the ground.

D. CONSTITUTIONAL RIGHTS AND PRIVACY

UAVs used for law enforcement purposes create potential claims for invasion of constitutionally privacy[40] and for unlawful search and seizure. Overhead imagery and surveillance have long raised privacy concerns under the Fourth Amendment. Particular types of imaging from UAVs, such as thermal imaging, could raise the most significant privacy concerns because they are capable of penetrating ceilings and capturing images of acti-

38. Sanjiv Sharma & D. Chakravarti, *UAV Operations: An Analysis of Incidents and Accidents with Human Factors and Crew Resource Management Perspective,* 49 IND. J. AIRSPACE MED. 29, 33 (2005), *available at* http://medind nic.in/iab/t05/i1/iabt05i1p29.pdf.

39. Andre J. Clot, *Communications Command & Control: The Crowded Spectrum*, at 1 (last visited Mar. 8, 2010), http://ftp rta nato.int/public//PubFulltext/RTO/EN/RTO-EN-009///EN-009-02B.pdf ("Communications plays a much more important part in the overall operation of a UAV than it does for manned aircraft because the men-in-the-loop are on the ground.").

40. Sengupta, s*upra* note 22, at 4. UAV use by law enforcement will inevitably lead to concern over privacy implications. *Id.*

vities and heat sources inside a building.[41] In addition, unencrypted video feeds captured by UAV optical sensors could be intercepted by private parties, who might seek to view the downloaded video or other imagery that exposes the targets of a UAV's sensor package to a loss of privacy.

E. LANDOWNER'S RIGHTS: NUISANCE AND TRESPASS

Though perhaps quieter than traditional manned platforms, UAVs would make noise. Such noise pollution—as well as the visual "pollution" associated with a flying UAV—could be claimed as damage by property owners who had previously enjoyed quiet and unblemished skies. Homeowners in the past have successfully brought nuisance actions against municipalities and others based on injuries caused by aircraft noise.[42] To be successful, a plaintiff must show that aircraft noise constitutes "a substantial and unreasonable interference" with the "use and enjoyment" of property.[43] If civilian UAVs were launched noisily, for instance, from police stations or private property, neighbors might bring inverse condemnation claims based on nuisance.[44] Since UAVs might be operating at lower flight levels than traditional manned aircraft, such claims could be more successful. In many cases, courts have focused on the altitude of aircraft in deciding whether plaintiffs had stated a valid nuisance claim.[45] Low level flights can also constitute trespass, since they invade a landowner's exclusive right to control the airspace above her property.[46] To be actionable in trespass, however, aircraft flights would have to interfere with the landowner's actual use of her land.[47]

F. ENVIRONMENTAL CONCERNS

UAV use in the domestic airspace system could also produce "spillover" effects having potential environmental consequences.[48] System components such as batteries and circuitry contain hazardous chemicals that could leach into ground water supplies in the event of crash or mishap.

41. *See* Kyllo v. United States, 533 U.S. 27, 27 (2001) (explaining that police use of thermal imaging device to detect heat within a home is an unlawful search).

42. *See, e.g.,* Greater Westchester Homeowners Assn' v. City of Los Angeles, 603 P.2d 1329, 1330 (Cal. 1979).

43. *See* 58 AM. JUR. 2D, *Nuisances*, §§ 1 *et seq*.; Jack L. Litwin, *Airport Operations or Flight of Aircraft as Nuisance*, 79 A.L.R.3d 253, § 2 (1977).

44. *See Greater Westchester Homeowners Assn',* 603 P.2d at 1330.

45. *See* Litwin, *supra* note 43, § 10 (collecting cases).

46. Pueblo of Sandia v. Smith, 497 F.2d 1043, 1045 (10th Cir. 1974).

47. *Id.*

48. Carol M. Rose, *Planning and Dealing: Piecemeal Land Controls as Problem of Local Legitimacy*, 71 CAL. L. REV. 837, 910-911 (1983) (discussing spillover effects).

Moreover, UAVs could be flown into the flight patterns of migratory birds, and could cause noise or disruption in other wildlife habitats.

Environmentalists have long maintained "that aircraft noise adversely effects [sic] wildlife, and it has been reported that grizzly bears, bighorn sheep, and migratory birds can be harassed and stressed by low-flying aircraft."[49] Noise pollution may interfere "with feeding, nesting and resting of birds, and can lead to higher mortality rates and abandonment of the habitat by both birds and animals."[50] Civil litigation by environmental activists would therefore be a distinct possibility.

G. PIRACY

A final consideration is the physical security of the UAV. A UAV flown for law enforcement purposes might be intentionally pirated or hijacked by a third party. Either the UAV itself or its ground operations control center could be the target of such an attack.[51] Were such an attack successful, the UAV could cause significant human injury or property loss. Inadequate safeguards by law enforcement agencies operating UAVs could provide the basis for a potential legal claim where the failure to institute safeguards presented a foreseeable risk of a UAV being pirated and used to cause injury.[52]

II. LEGAL FRAMEWORK

The types of accidents and injuries imagined above could lead to lawsuits against a number of potential defendants: UAV operators, manufacturers, maintenance and safety contractors, contracting parties, and air traffic controllers. Various kinds of civil suits could potentially provide a remedy for injured persons and should be considered in managing the risk of integrating UAVs into law enforcement roles.

A. MUNICIPAL AND GOVERNMENTAL IMMUNITY

The starting point of any consideration of law enforcement liability for the kinds of UAV accidents and harms imagined above is the diverse and complicated set of doctrines providing immunity to municipalities and other

49. Ann E. Lane, *Scenic Air Tours Over Our National Parks: Exploitation of Our National Resources or Environmental Solution?,* 62 J. AIR L. & COM. 523, 541 (1996).

50. *Id.* at 542 (quoting Don Hopey, *Helicopters Wreak Havoc*, PITT. POST-GAZETTE, Jan. 30, 1995, at A7).

51. Peterson, *supra* note 2, at 576.

52. *See, e.g.*, Finnigan v. Blanco County, 670 S.W.2d 313, 314-15 (Tex. App. 1984). By comparison, where police vehicles have been stolen and personal injuries to third parties have resulted, plaintiffs have successfully brought claims to hold police departments liable. *Id.*

governmental actors. Most of these rules have developed in the context of far-more-common motor vehicle accidents involving law enforcement personnel.[53]

The principle of sovereign immunity was a component of English common law, and although it has been repealed or waived by the "federal government and many states . . . [,] the doctrine persists today through a host of codified or judge-made exceptions that continue to immunize certain defined categories of governmental action or inaction from civil redress."[54] Governmental actors are also protected by special procedural restrictions on civil suits, such as pre-suit notice, exhaustion of administrative remedies, and short time limits for filing actions.[55]

The precise contours of such immunity—and its application to UAV operation by law enforcement agencies—are complex. The Federal Tort Claims Act (FTCA), for instance, bars lawsuits involving discretionary function, actions under statutes later found invalid, and various kinds of intentional torts.[56] It also bars suits against federal authorities premised on strict liability theories.[57] In general, many states provide "qualified immunity" to law enforcement authorities for claims arising from injuries caused by governmental employees in the exercise of their official duties.[58] Law enforcement officers are protected from civil rights claims so long as their conduct did not violate a clearly established statutory or constitutional right,[59] and from tort claims, in many cases, so long as the officer acted free of willful negligence, malice, or corruption.[60] In some cases, injuries caused by vehicles operated by law enforcement officers are actionable based on simple negligence, while a heightened standard of fault may be required at other times.[61]

Not all UAV-related lawsuits will be filed against cities and other entities enjoying these protections. It is quite likely that most early UAV

53. *See, e.g.*, Horta v. Sullivan, 638 N.E.2d 33 (Mass. 1994); Williams v. Crook, 741 So.2d 1074 (Ala. 1999); Nguyen v. City of Westminster, 103 Cal. App. 4th 1161 (Cal. App. 2002).

54. Jack M. Sabatino, *Privatization and Punitives: Should Government Contractors Share the Sovereign's Immunities from Exemplary Damages?*, 58 OHIO ST. L.J. 175, 195-96 (1997).

55. *See id.* at 198 n.65 (citing 28 U.S.C. § 2401(b) (1994); N.J. STAT ANN. §59:8-8 (West 1992); and Meyers v. Bethlehem Shipbuilding Corp., 303 U.S. 41, 50-51 (1938)).

56. *See id.* at 196 n.59 (citing 28 U.S.C. § 2680(a) (1994)).

57. William K. Jones, *Strict Liability for Hazardous Enterprise*, 92 COLUM. L. REV. 1705, 1747 n.220 (1992) (citing Laird v. Nelms, 406 U.S. 797, 802-03, *reh'g denied*, 409 U.S. 902 (1972)).

58. *See* Eve Brensike Primus, *Structural Reform in Criminal Defense: Relocating Ineffective Assitance of Counsel Claims*, 92 CORNELL L. REV. 679, 700 (2007).

59. *See* Eugene McQuillin, THE LAW OF MUNICIPAL CORPORATIONS § 45.20 (3d ed. 2006); 18 U.S.C. § 1983 (2010).

60. McQuillin, *supra* note 59, at § 45.27; 18 U.S.C. § 1983.

61. McQuillin, *supra* note 59, at § 45.30.

operations by law enforcement agencies will be conducted by private contractors—in the employ of the government—who operate and maintain the actual systems involved.[62] Israeli UAV firms, leaders in export and commercial UAV applications, have frequently provided system operators along with actual platforms,[63] and it would not be surprising if most law enforcement users, at least initially, contracted for such services. Even the U.S. military has employed contractors to operate its UAVs.[64] Those contractors, rather than the government agencies themselves, would likely be held legally responsible for most UAV-related mishaps.[65] Actions against those contractors would not face the precise set of obstacles as actions against a government entity itself would face. The FTCA, for instance, expressly excludes federal contractors from its protections.[66] Similarly, more than half of the state statutes providing governmental immunity in one form or another exempt independent contractors "from the definition of public employees" protected by statute.[67]

In addition, products liability claims could be asserted against UAV system and component manufacturers and designers. Although most aircraft product liability claims involve suits against manufacturers filed by aircraft operators or injured passengers and pilots,[68] such claims could be brought by those on the ground, or in other aircraft, who claim that faulty manufacture led to a UAV crash or collision. Strict liability for defective manufacture and design claims are available in most states for "bystanders" injured as a result of such product defects so long as injury to bystanders is reasonably foreseeable.[69]

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62. *See* Michael J. Guidry & Guy J. Willis, *Future UAV Pilots: Are Contractors the Solution?*, AIR FORCE JOURNAL OF LOGISTICS, Winter 2004, at 4. The military has relied heavily on contractors to operate its UAV systems. *Id.* Though law enforcement agencies could seek to train their own employees to pilot UAVs, the costs and delays of such training likely make contractors a more immediate prospect. *Id.*

63. *See Hermes 450*, ISRAELI-WEAPONS.COM, *available at* http://www.israeli-weapons.com/weapons/aircraft/uav/hermes_450/Hermes_450 html.

64. P.W. Singer, *War, Profits, and the Vacuum of Law: Privatized Military Firms and International Law*, 42 COLUM. J. TRANSNAT'L L. 521, 534 (2004) (discussing civilian operators of the Global Hawk and Predator UAV systems).

65. Rich Smith, *Say it Ain't So, Boeing*, THE MOTLEY FOOL, May 29, 2009, *available at* http://www fool.com/investing/general/2009/05/29/say-it-aint-so-boeing.aspx ("Boeing owns the UAVs and employs the pilots who 'fly' them. In a very real sense, it is responsible for what these UAVs do in the service of its clients.").

66. *See* Sabatino, *supra* note 54, at 201 n.71 (citing 28 U.S.C. § 2671 (1994)).

67. *Id.* at 201 n.71.

68. *See* Sonja A. Soehnel, *Products Liability: personal injury or death allegedly caused by defect in aircraft or its parts, supplies, or equipment*, 97 A.L.R.3rd 637 (1980) (collecting cases).

69. *See* Mary J. Davis, *Design Defect Liability: In Search of a Standard of Responsibility*, 39 WAYNE L. REV. 1217, 1236 (1993) (describing bystander actions under various products liability theories as "widely recognized"); *see also* Elmore v. American Motors Corp., 451 P.2d 84, 89

B. BASIC LIABILITY RULES

Two sources of potential legal rules apply to the UAV-caused accident. First, existing aviation law governs civil cases concerning manned aircraft. Second, some case law exists on torts involving remote-controlled-aircraft, typically operated by hobbyists for recreational purposes.[70] In addition, those accidents and harms concerning communication interference would be governed by established principles of communications law.

In general, actions involving manned aircraft accidents are pursued under one of the two dominant tort doctrines: negligence or strict liability. Negligence claims involving aircraft disasters are asserted against operators, including air carriers, pilots, and manufacturers, and occasionally against air traffic controllers.[71] Strict liability claims can be asserted in situations involving ground damage and in connection with product liability actions against "aircraft manufacturers and manufacturers or suppliers of component parts."[72]

1. *Ground Damage*

Ground damage caused by aircraft can be the basis for an action in either negligence or strict liability. In the early part of the twentieth century, the legal community viewed aviation as an "ultrahazardous activity" and actionable by way of strict liability, that is, without proof of a deviation from the standard of care.[73] Even as safety improved, the authors of the *Restatement of Torts,* in 1965, continued to favor strict liability for ground damage claims, perhaps because of the non-reciprocal[74] nature of the risk imposed on persons, land, and property on the ground by an

(Cal. 1969) (arguing that bystanders should have stronger claims even in the absence of privity because they lack the opportunity to inspect a product and discover dangerous defects).

70. FAA Order 1110.150, Apr. 10, 2008, *available at* http://rgl.faa.gov/regulatory_and_guidance_library/rgOrders.nsf/0/8616600949dcc4b78625742c004c52b0/$FILE/1110.150.pdf. The FAA has clarified that its 1981 rules regulating model aircraft do not govern UAV operation: "The law enforcement and aerial photography industries, plus others conducting remote sensing activities, have mistakenly interpreted FAA advisory circular (AC) 91-57, *Model Aircraft Operating Standards*, for permission to operate small UAVs for research or compensation or hire purposes." *Id.*

71. Michael C. Mineiro, *Assessing the Risks: Tort Liability and Risk Management in the Event of a Commercial Human Space Flight Vehicle Accident*, 74 J. AIR L. & COM. 371, 376 (2009).

72. *Id.*

73. AMERICAN LAW INSTITUTE, RESTATEMENT OF TORTS § 520 cmt. b ("[A]viation in its present state of development is ultrahazardous.") (1938).

74. *See* George P. Fletcher, *Fairness and Utility in Tort Theory,* 85 HARV. L. REV. 537, 542 (1972).

overflying aircraft.[75] Section 520A of the *Restatement* (Second) *of Torts* imposed strict liability on operators and owners whenever "physical harm to land or to persons or chattels on the ground is caused by the ascent, descent, or flight of aircraft, or by the dropping or falling of an object from the aircraft."[76] Several states, including Delaware, Hawaii, Minnesota, New Jersey, South Carolina, and Vermont, have adopted the strict liability doctrine for ground damage by statute.[77] Some courts, however, have rejected the strict liability approach to ground damage, instead allowing suits only upon a showing of aircraft operator negligence.[78] And it may be that the general rule has shifted in favor of the negligence approach.[79] The *Proposed Third Restatement of Torts* recognizes this issue as a difficult one, and leaves open the question of whether ground damage caused by aircraft should be subject to strict liability or negligence.[80]

The first question concerning the scope of liability for UAV operators in ground damage cases would be whether strict liability applied or whether the injured person would have to show the traditional elements of negligence. In a jurisdiction that follows the *Restatement* (Second) *of Torts*, this question would likely depend on whether a UAV is considered an "aircraft."

Interestingly, the *Restatement* does not define "aircraft." Is the UAV considered to be an aircraft? The typical moniker—UAV—uses the term *vehicle*, but some have argued that *system* is a more appropriate description, given that the actual airframe is but a small part of the overall machinery required to operate a UAV.[81] If one chose to conceptualize surveillance drones as "unmanned aerial *systems*" (UASs), the *Restatement* language imposing strict liability might not apply because a "system" does not fit neatly into ordinary definitions of the term "aircraft."

The FAA has used the term "Unmanned Aircraft (UA)," since its regulatory authority is limited to aircraft and does not include "vehicles."[82]

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75. AMERICAN LAW INSTITUTE, RESTATEMENT (SECOND) OF TORTS § 520A, § 520A cmt. c (1977).

76. *Id.* at § 520A.

77. AMERICAN LAW INSTITUTE, RESTATEMENT (THIRD) OF TORTS § 20 cmt. k (special note on eviction ground damage) (Proposed Final Draft No. 1, 2005).

78. The Restatement lists California, Nebraska, and Arkansas as rejecting the proposed rule of strict liability. AMERICAN LAW INSTITUTE, RESTATEMENT (SECOND) OF TORTS, Reporter's Note (1977). Washington also rejects the strict liability approach in favor of negligence. Crosby v. Cox Aircraft Co., 746 P.2d 1198, 1202 (Wash. 1987).

79. Jones, *supra* note 57, at 1747.

80. AMERICAN LAW INSTITUTE, RESTATEMENT (THIRD) OF TORTS § 20 cmt. j (2005).

81. Peterson, *supra* note 2, at 528.

82. Fed. Aviation Admin., Memorandum, Unmanned Aircraft Systems Operations in the U.S. National Air Space System—Interim Operational Guidance, AFS-400 UAS Policy 05-01

To the FAA, an unmanned aircraft is "a device that is used or intended to be used for flight in the air that has no onboard pilot. This includes all classes of airplanes, helicopters, airships, and translational lift aircraft that have no onboard pilot. A UA is an aircraft as defined in 14 CFR 1.1."[83] Adopting the FAA's definition, a court following the *Restatement* or parallel state statutory approach might impose strict liability in the event of ground damage caused by UAV mishaps because the FAA has incorporated the term "aircraft"—the same term used in the *Restatement*—in its description of UAVs.

Even where strict liability is not available, or where courts conclude that UAVs are not "aircraft" subject to section 520A, it is possible that operation of UAVs would nevertheless be considered an abnormally dangerous activity subject to strict liability. The following subsection concerning air-to-air collisions analyzes this issue.

Under the FAA's developing guidance, many larger UAVs would likely be considered "aircraft" but small or micro-UAVs might not be so classified because of the significant size difference between typical micro-UAVs and the unmanned "airplanes, helicopters, [and] airships" referred to in the FAA's definition.[84] Actions involving micro-UAVs would likely be governed by case law on injuries caused by radio-controlled aircraft. Persons injured when radio-controlled model aircraft crashed into the ground have brought suit under negligence principles.[85]

Injuries caused by UAVs crashing to the ground might also be pursued under products liability theories, including negligence, "special" or strict liability,[86] and various warranty claims. Generally speaking, plaintiffs could point either to defects in the design of a product that rendered it unreasonably dangerous, or to defects in the manufacture of the UAV. To some extent, the "government contractor" doctrine could shield UAV manufacturers from liability for design defects if they produced their products according to government specifications,[87] although that defense would be unavailable in manufacturing defect claims and where the private

(Sept. 16, 2005), *available at* http:// www.uavm.com/images/AFS-400_05-01_faa_uas_policy.pdf [hereinafter AFS-400 UAS Policy].

83. *Id.* An "aircraft" is defined as a "device that is used or intended to be used for flight in the air." 14 C.F.R. § 1.1 (2009).

84. Peterson, *supra* note 2, at 529.

85. *See, e.g.,* Rowe v. Striker, No. 07CA009296, 2008 WL 4901702 (Ohio Ct. App.); Klein v. Acad. of Model Aeronautics, 667 N.Y.S.2d 311, 311 (N.Y. App. Div. 1998).

86. AMERICAN LAW INSTITUTE, RESTATEMENT (SECOND) OF TORTS § 402A (1977).

87. J. SCOTT HAMILTON, PRACTICAL AVIATION LAW 70 (2d ed. 1996).

party designed the UAV outside the scope of the government contracting process.[88]

Actions involving ground damage might also focus on the "airworthiness" certificate granted by the FAA to aircraft. The FAA has recently promulgated standards for assessing the airworthiness of a UAV.[89] Negligence on the part of federal authorities at any stage in the certification process could trigger liability if it contributes to a UAV crash.[90]

2. *Air-to-Air Collisions*

Aircraft operators owe a duty of ordinary care to the owners, operators, and passengers on other aircraft.[91] Negligence provides the cause of action for careless maintenance and operation of aircraft leading to in-flight collisions.[92] In addition, violations of FAA operating rules can help prove the necessary breach of the standard of care.

UAV operators could face a heightened level of liability for air-to-air collisions if courts classify the operation of UAVs as an "abnormally dangerous activity." Strict liability follows from the conclusion that an activity is "not one of common usage" and is one that "creates a foreseeable and highly significant risk of physical harm even when reasonable care is exercised by all actors."[93] UAVs, in their early integration into law enforcement settings, would likely be considered highly unusual. The *Restatement's* "common usage" test imposes strict liability based on analysis of "the number of people who take part in" a particular activity.[94] The more flexible approach endorsed by the *Third Restatement of Torts* considers activities in common usage "if . . . widely carried on by many persons, or if it is a widespread and accepted practice, or if 'nearly everyone does it or expect to have it done for him.'"[95]

Traditional aviation is now considered a matter of common usage,[96] but the operation of UAVs is something new. Even if law enforcement

88. Charles E. Cantu & Randy W. Young, *The Government Contractor Defense: Breaking Down the Boyle Barrier*, 62 ALBANY L. REV. 403, 425 (1998).

89. FAA Order 8130.34, March 27, 2008, *available at* http://www faa.gov/aircraft/air_cert/design_approvals/uas/reg (follow order 8130.34 hyperlink).

90. HAMILTON, *supra* note 87, at 129.

91. *See* Mineiro, *supra* note 71, at 387.

92. Abdullah v. American Airlines, Inc., 181 F.3d 363, 371-72 (3d Cir. 1999).

93. AMERICAN LAW INSTITUTE, RESTATEMENT (THIRD) OF TORTS § 20 (2005).

94. Indiana Harbor Belt R.R. Co. v. Am. Cyanimd Co., 662 F.Supp. 635, 643 (N.D. Ill. 1987) (citing New Meadows Holding Co. v. Washington Water Power Co., 687 P.2d 212, 216 (Wash. 1984)), *rev'd*, 916 F.2d 1174 (7th Cir. 1990).

95. AMERICAN LAW INSTITUTE, RESTATEMENT (THIRD) OF TORTS § 20 cmt. J (2005) (quoting Koos v. Roth, 652 P.2d 1255, 1263 (Or. 1982)).

96. Crosby v. Cox Aircraft Co. of Washington, 746 P.2d 1198, 1201 (Wash. 1987).

agencies come to employ UAVs in a wide variety of settings, it is likely that only a few contracting companies will actually engage in the operation of UAV platforms because of the high costs of entry to the UAV field and the complexities of the systems involved. Given the existing uncertainty over the scope of the "common usage" analysis,[97] it is somewhat difficult to predict what legal standard would apply to UAV cases in the courts.

However, in order to impose strict liability on a UAV operator under the "abnormally dangerous activities" doctrine, a court would also need to determine whether operation of a UAV can be made safe by the exercise of reasonable care. At first blush, some observers might conclude that pilotless air systems are by definition inherently risky, since there is no pilot in a cockpit capable of interceding to avert disaster. Moreover, one of the selling points of UAVs is that they are more "expendable" than manned aircraft; this notion evinces a vision of UAVs as more likely to crash than safer manned aircraft equipped with redundant safety systems that are subject to rigorous maintenance requirements. On the other hand, it is arguable that the exercise of care could greatly minimize the risk of personal injury in connection with UAV operations.

Even if ordinary negligence principles apply, courts confronting UAV-related air collision cases would have to instruct juries on what is "reasonable" in regards to the operation of a UAV. Some of the legal rules that apply in cases involving piloted aircraft might not be applicable in UAV accidents.

For instance, negligence claims involving piloted aircraft often seek to establish a breach of the duty of due care by reference to a pilot's responsibility to "see and avoid" other traffic.[98] It is a fundamental maxim of aviation negligence law, "referred to over and over in the reported cases involving air carrier crashes and other accidents," that "the pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of the aircraft."[99] To the extent that a UAV *has* a pilot, of course, she may be located far from the actual platform.

Pilots of manned aircraft are expected to scan an area sixty degrees to the right and left of center and ten degrees up and down from the flight path.[100] Where evidence suggests that a pilot could have seen another air-

97. Gerald W. Boston, *Strict Liability for Abnormally Dangerous Activities: The Negligence Barrier*, 36 SAN DIEGO L. REV. 597, 662 (1999) ("Liability does not rise or fall on common usage or locational suitability; rather the cases are 'all over the map' with regard to these factors.").

98. Rodriguez v. U.S., 823 F.2d 735, 742 (3rd Cir. 1987).

99. *See* STUART M. SPEISER & CHARLES F. KRAUSE, AVIATION TORT LAW § 8:3 at 473 (1978).

100. *Rodriguez*, 823 F.2d at 742.

craft within those angles, *res ipsa loquitor* might authorize the conclusion that a breach occurred.[101] Since UAV optical sensors have limited fields of view,[102] courts would have to confront what kinds of failures in "seeing" would be deemed unreasonable for UAV operators. A new "duty of vigilance"[103] would need to be crafted to determine the potential liability of the UAV operator.

Even under a negligence standard, many juries might be suspicious of UAV operations and unlikely to blame the pilots of other craft involved in midair collisions with UAVs. According to one Royal Air Force officer, "People will ask why there wasn't someone in the cockpit, even it turns out to be the fault of the pilot in the other aircraft."[104] Air to air collisions could also lead to lawsuits against either government-employed or private air traffic controllers. Under the FTCA, the negligence of an air traffic controller that contributes to an accident would remain actionable because the general rule is that courts "may entertain claims under the FTCA against government air traffic controllers for negligence in the performance of their duties."[105]

3. *Communications Interference*

UAVs depend upon signals—operating at various points in the electromagnetic spectrum—for both operational control and mission effectiveness. To date, UAV users have been forced to operate on unlicensed or unregulated frequencies to transmit information between the UAV and its ground control,[106] or have operated on experimental frequencies in the aviation spectrum as authorized by the FCC.[107] Unregulated signals may interfere with civilians' use of various wireless and telecommunications devices.[108]

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101. O'Connor v. United States, 251 F.2d 939, 941 (2d Cir. 1958); Irwin v. Pacific Southwest Airlines, 133 Cal. App. 3d 709, 716 (1982).

102. *Israel and Russia in UAV Deal,* DEFENSE INDUSTRY DAILY, June 23, 2009, *available at* http://www.defenseindustrydaily.com/Israel-and-Russia-in-UAV-Deal-05459/ ("UAVs have a much smaller field of view than manned aircraft . . . .").

103. *Rodriguez*, 823 F.2d at 742.

104. Ben Webster, *This is Your Pilot. You Don't Need Me,* TIMES (UK), April 2, 2007, at 8 (quoting Squadron Leader Rich Wells).

105. *See* HAMILTON, *supra* note 87, at 126; R. Daniel Truitt, *Hints of an Uneven Playing Field in Aviation Torts: Is there Proof?*, 61 J. AIR L. & COMM. 577, 582 (1996) (citing Eastern Air Lines v. Union Trust Co., 221 F.2d 62 (D.C. Cir.), *rev'd* 350 U.S. 907 (1956) (per curium)).

106. *UAV Impacts on NAS Discussed in Paris*, MITRE CAASD, Sept. 22, 2005, *available at* http://www mitrecaasd.org/comm/news_details.cfm?item_id=440.

107. *See, e.g.,* FCC Pub. Not. Rept. No. 418, EXPERIMENTAL ACTIONS, 2009 WL 196282 (allocation of frequencies for Sacramento UAV testing).

108. *See* Larry Greenemeier, *Receive Between the Lines: FCC Mulls Signal "White Space" as Part of National Broadband Plan*, SCIENTIFIC AMERICAN, Jan. 18, 2010, *available at* http://www.scientificamerican.com/article.cfm?id=fcc-white-space-sensing (last visited Mar. 8,

Common law nuisance claims, however, would be prohibited by the application of federal preemption doctrine.[109]

Presumably, integration into the national airspace system would involve allocation of specific frequencies to UAV operators, but potential for signal interference might still remain.[110] UAV integration into the national airspace system would have a significant "impact on overall aviation spectrum requirements."[111] UAV signals might interfere with existing uses of aviation band frequencies. Private citizens and businesses might seek administrative remedies, petitioning the FCC to revoke the spectrum allotment of a UAV operator. Should ground-control stations indeed cause "blanketing" interference, the FCC Enforcement Bureau's Spectrum Enforcement Division would require that the operator address such concerns at no cost to the complainant within one year of complaint.[112]

Given that UAV control will likely take place over assigned frequencies in the aviation band (with care taken by the FCC to avoid potential interference), it is likely that more serious sources of signal interference would arise if commercial radio and telecommunications firms deployed UAVs for communications relay purposes. A UAV control signal might not disrupt civilian communications networks, but the signal broadcast from a UAV—playing the role traditionally occupied by a cellular relay tower—certainly could.[113]

4. *Constitutional Rights & Privacy*

The United States Constitution's Fourth Amendment protects citizens against "unreasonable searches and seizures."[114] In order to offend that right, law enforcement must conduct a "search"—a legal concept that has

2010) ("[C]ritics fear that a flood of unregulated wireless devices will interfere with one another or with licensed users . . . .").

109. Broyde v. Gotham Tower, Inc., 13 F.3d 994 (6th Cir. 1994).

110. *See, e.g.,* In re Aviation Data Systems (AUST) Pty. Ltd., 47 COMMUNICATIONS REG. 1411, at *2 (2009) (stating that aircraft data-link services can raise communications interference concerns).

111. *See* Pub. Notice, 22 F.C.C.R. 127, 169 (Jan. 9, 2007).

112. MASS MEDIA BUREAU, FED, COMMC'N., THE PUBLIC AND BROADCASTING 10 (1999), 1999 WL 391297.

113. Cell phone tower signals have the potential to cause radio frequency interference with other wireless devices operating at similar frequencies along the communications spectrum. *See* Mohan R. Akella et al., *Cellular network configuration with co-channel and adjacent channel interference constraints*, 35 COMPUTERS & OPERATIONS RESEARCH 3738, 3739 (2008) ("Interference has been recognized as a major bottleneck in increasing capacity . . . ."). UAVs used as cellular relays could interfere with other cellular signals, causing, for instance, more frequent dropped calls. *Id.* Because of their mobility, UAVs used as relays could raise greater risks of co-channel and adjacent channel interference. *Id.*

114. U.S. CONST. amend. IV.

evolved over time and escaped precise definition.[115] In general, when government actors encroach on a person, effect, or object, as to which a citizen has a reasonable expectation of privacy, a search has occurred.[116]

Random aerial searches have been held to constitute invasions of protected privacy rights.[117] However, under existing law, where an ordinary passerby on the "highway of the sky" could observe what officers observe, no privacy rights are implicated.[118] Society is not willing to protect the privacy of "open fields" or activities "in plain view."[119] Where police used a helicopter and high-powered binoculars to observe marijuana plants through slats in a person's greenhouse, no constitutional violation was found.[120] The government's use of routine technology does not infringe on the Constitutional right to privacy.[121] Homeowners have no expectation to privacy with respect to that which can be viewed "from above during legal passage by aircraft."[122] Where a UAV captures images that could have been obtained from civilian aircraft travelling in a legally authorized manner, privacy claims are limited. Consumers lack a reasonable expectation of privacy with respect to areas already exposed to civilian overflights.

Advanced imaging capabilities, such as thermal sensing and infrared imaging, would raise particular privacy concerns. In *Kyllo v. United States*,[123] the Supreme Court held that the warrantless use of thermal-imaging violated a person's Fourth Amendment rights because such technology was not in widespread use.[124] Although the court might revisit that holding were advanced imaging technology to enter more widespread use, at present, *Kyllo* limits law enforcement's ability to exploit thermal and infrared imaging using UAVs.

The rationale behind *Kyllo* might lead some courts to conclude that any UAV-related search offends the Fourth Amendment. *Kyllo* linked Fourth Amendment protections to the status of the technology used for surveil-

115. Gregory S. Fisher, *Cracking Down on Soccer Moms and Other Urban Legends on the Frontier of the Fourth Amendment: is it Finally Time to Re-define Searches and Seizures?*, 38 WILLAMETTE L. REV. 137, 141-42 (2002).

116. *Id.* at 142.

117. People v. Agee, 200 Cal. Rptr. 827, 837 (Cal. App. 1984).

118. *See* California v. Ciraolo, 476 U.S. 207, 213-14 (1986).

119. *See id.*; United States v. DeBacker, 493 F.Supp. 1078, 1080-81 (W.D. Mich. 1980).

120. Florida v. Riley, 488 U.S. 445, 445 (1989).

121. Jeffrey W. Childers, Kyllo v. United States*: A Temporary Reprieve From Technology—Enhanced Surveillance of the Home*, 81 N.C. L. REV. 728, 759 (2003).

122. Christian M. Halliburton, *How Privacy Killed* Katz*: A tale of cognitive freedom and the property of personhood as Fourth Amendment norm,* 42 AKRON L. REV. 803, 877 (2009).

123. 533 U.S. 27 (2001).

124. *Kyllo,* 533 U.S. at 34.

lance, finding that the use of surveillance devices "not in general public use" was a presumptive violation of the Constitution.[125] Arguably, in the early years of UAV use by law enforcement, any UAV surveillance would meet this test. Even as law enforcement use becomes more prevalent, UAVs are unlikely to become widely available to the public for both economic and safety reasons. The Court's decision in *Kyllo* has left open how to decide when a technology is sufficiently "in the public use" or overlaps with related technologies in general use so as to render a search using that technology permissible.[126]

Claims of Fourth Amendment violations would be most likely to arise in defense to criminal charges against suspects using evidence gathered from aerial UAV surveillance. However, civil rights lawsuits could also be filed even where no charges are brought.[127] A section 1983 claim can be stated where the (1) conduct complained of was committed by a person acting under color of state law; and (2) the conduct deprived the plaintiff of a federal constitutional or statutory right.[128] Plaintiffs would still need to prove "actual injury" in order to recover damages, but such injury could potentially be shown, particularly if the imagery obtained from UAV flights is made public—either intentionally, inadvertently, or as a result of third party interception of UAV signals.[129] Injunctive relief would also be available to civil plaintiffs who might seek to stop UAV overflights found to violate the Fourth Amendment.

Common law actions for intrusion on seclusion might also be available,[130] but again, a victim would need to show damages.[131] Even in the absence of physical trespass, aerial surveillance could constitute tortious conduct in the majority of states.[132] The exact contours of this tort action have not been well developed, and clear outcomes of such cases are hard to

125. *Id*. at 40; Casey Holland, *Neither Big Brother nor Dead Brother: The Need for a New Fourth Amendment Standard for Emerging Technologies,* 94 KY. L. J. 393, 399 (2005-2006).

126. Fisher, *supra* note 115, at 169 ("The Court's reliance on whether a sense-enhancing device was 'in general public use' is regrettable because the Court made no effort to explain or define this concept or to relate it to technology use.").

127. 42 U.S.C. § 1983 (2006).

128. *Id.*

129. *See* Memphis Comm. Sch. Dist. v. Stachura, 477 U.S. 299, 308 (1986) (explaining that actual injury is required to recover damages in a section 1983 claim).

130. AMERICAN LAW INSTITUTE, RESTATEMENT (SECOND) OF TORTS § 652B (1977) (explaining that intrusion must be "highly offensive to a reasonable person" to be actionable under the common law).

131. *See* Brian Craig, *Online Satellite and Aerial Images: Issues and Analysis*, 83 N.D. L. REV. 547, 570 (2007).

132. *See* Jeremy Friedman, Note, *Prying Eyes in the Sky: Visual Aerial Surveillance of Private Residences as a Tort*, 4 COLUM. SCI. & TECH. L. REV. 1, 25 (2002-2003).

predict, in part because of uncertainty concerning when intrusion is so "highly offensive to a reasonable person" as to be actionable.[133]

One question that such claims would confront is why UAV aerial surveillance differed from generally permissible aerial surveillance conducted by helicopters, airplanes, or commercial satellites. Several lines of argument would be available to plaintiffs seeking to advance this point. Many UAVs, for instance, are capable of flying for long periods of time, staying in the "air for 30 hours at a time with pilots switching off very few hours."[134]

Helicopter surveillance of open fields from an altitude of just 300 feet has been held permissible,[135] while helicopter surveillance from 20-25 feet above a person's property has been identified as a likely illegal invasion of privacy.[136] Courts would likely be called on to evaluate the altitudes at which UAVs operate, the frequency and duration of aerial surveillance, and the imaging capabilities of unmanned platforms in determining the reasonableness (and thus legality) of any search.[137] In many of the permissible instances of aerial surveillance, investigators used the naked eye,[138] standard and widely available commercial cameras, and the like, to view their targets.[139] By contrast, more advanced imaging techniques that reveal "intimate details" of a property owner's activity have been held unconstitutional.[140] Analysis of the reasonableness of UAV aerial surveillance will depend on how similar the data obtained by UAV operation is to data already available to the public.[141] If UAV imagery proves far more revealing than existing commercially-produced data, then it is more likely that UAV-obtained imagery could be the basis for a claim of illegal search.

133. *Id.* at 37.

134. Wald, *supra* note 21, at 61.

135. State v. Stachler, 570 P.2d 1323, 1328-29 (Haw. 1977).

136. People v. Sneed, 108 Cal. Rptr. 146, 151 (Cal. Ct. App. 1973).

137. *See* Anita K. Modak-Truran, *Warrantless Aerial Surveillance After* Ciraolo *and* Dow Chemical*: The Omniscient Eye in the Sky*, 18 LOY. U. CHI. L.J. 285, 294 (1986).

138. *See, e.g.,* United States v. Warford, 439 F.3d 836, 843-44 (8th Cir. 2006) (holding an observation made with the naked eye within navigable air space did not constitute a Fourth Amendment search).

139. Melissa Deal, *Can Big Brother Watch You? The Implications of the Department of Homeland Security's Proposed National Applications Office for Fourth Amendment Protections*, 73 J. AIR L. & COM. 407, 426 (2008) (discussing the permissible use of camera equipment in case law).

140. *See id.* at 418.

141. *Id.* at 427.

5. *Landowner's Rights: Nuisance & Trespass*

Property owners may pursue claims for both nuisance and trespass against aircraft operators. A trespass to land claim may only be asserted when an aircraft "enters into the immediate reaches of the air space next to the land" and "interferes substantially with . . . use and enjoyment" of the property by the landowner.[142] In general, the navigable airways regulated by the FAA are considered a "public highway" outside of the landowner's property, and no trespass claims could be brought.[143] Five hundred feet above ground is outside of a landowner's territorial claim, while fifty feet and perhaps even 150 feet above ground could constitute unpermitted interference.[144]

Law enforcement may operate UAVs below the traditional flight paths of civil aviation, raising potential trespass claims. Low flying UAVs that cause noise, light, air pollution, or vibration might lead to valid nuisance claims by homeowners.[145]

6. *Environmental Concerns*

Various legal avenues exist by which local governments and preservation groups could bring civil actions seeking injunctions to stop law enforcement agencies from operating UAVs in ways that raise environmental concerns. Where federal agencies utilize UAVs in law enforcement roles, the National Environmental Policy Act (NEPA) requires agencies to consider the environmental consequences of their actions.[146] Private citizens may seek to compel a federal agency to comply with NEPA by seeking judicial review of agency decisions under the Administrative Procedure Act.[147]

Other environmental statutes also provide citizen-suit remedies. Where noise pollution from UAVs threatens human health, citizen actions would also be permitted under the Noise Control Act.[148] Where UAV use threatens wildlife, citizen-suits might be permitted under the Endangered Species Act.[149]

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142. AMERICAN LAW INSTITUTE, RESTATEMENT (SECOND) OF TORTS § 159 (1965).

143. *Id.* cmt. i.

144. *Id.*

145. *See* Craig, *supra* note 131, at 560-61.

146. S. REP. NO. 91-296, at 6-10, 21-22 (1969); 42 U.S.C. §4321 (2009).

147. 5 U.S.C. § 706(2) (2006); *see* National Audubon Soc'y v. Dept. of Navy, 422 F.3d 174, 183 (4th Cir. 2005) (providing examples of such actions); Crutchfield v. U.S. Army Corps of Engineers, 192 F.Supp.2d 444, 448 (E.D. Va. 2001).

148. 42 U.S.C. § 4911(a)(1) (2006).

149. 16 U.S.C. § 1540(g) (2000).

IV. ADDITIONAL LEGAL CONCERNS

A. CONFLICTS OF LAWS

One of the thornier aspects of aviation litigation has long been the determination of what law governs a particular aviation accident.[150] "Because of the speed, mobility and range of modern aircraft—especially modern high-speed, long-distance jets—and the resulting multistate or multi-country contracts with aircraft supply, operations, and accident . . . [,] aviation tort cases and litigation have furnished an important laboratory . . . and vexing problems as to choice-of-law."[151]

Courts have traditionally taken two approaches to choice of law issues in aviation liability claims. One approach is to apply the law of the place where the last event necessary to create liability occurred.[152] Alternatively, courts have focused on the "most significant relationship" test under the theory that the actual site of the crash may be "purely fortuitous."[153] Under this modern approach, a court "applies the law of the forum with the most significant contacts to the accident."[154] This will involve a consideration of "(1) crash site location; (2) residence of all defendants; (3) residence of the plaintiff; (4) nature and purpose of the flight; (5) where the negligence occurred; (6) where the product was designed and manufactured and (7) any other significant factors."[155]

UAVs introduce a new dynamic to choice of law issues in that aircraft are controlled not from the cockpit of the platform, but from a remote ground station. In a traditional aircraft case, the location of launch or of crash would likely determine the law applied.[156] But in UAV liability cases, it might be that the site of operation could be introduced as a third potential relational jurisdiction.

B. INSURANCE LAW

Private contractors operating UAVs in the service of law enforcement authorities will no doubt seek to protect themselves from property damage and potential liability by purchasing insurance; in many countries, such

150. SPEISER & KRAUSE, *supra* note 99, at 60.

151. *Id.*

152. *See* 8A AM.JUR. 2D *Aviation* § 109 (2009).

153. *Id.*

154. BARNES W. MCCORMICK & M.P. PAPADAKIS, AIRCRAFT ACCIDENT RECONSTRUCTION AND LITIGATION 246 (3d ed. 2003).

155. *Id.* at 247.

156. *See* James A.R. Nafzinger, *Choice of Law in Air Disaster Cases: Complex Litigation Rules and the Common Law*, 54 LA. L. REV. 1001, 1015 *et seq.* (1994) (surveying choice of law decisions in air disaster cases).

insurance is required by law.[157] UAV insurance will likely prove much more expensive than policies offered to operators of other kinds of airborne sensors, such as aerostats.[158] The cost of insurance for some UAVs operated for scientific purposes has been nearly 85% of the cost of operation per flight hour.[159] One commercial UAV imagery company, for example, carries $2 million in liability insurance and invites customers to request categorization as "Additional Insured" under its policy.[160] The aviation insurance industry will no doubt craft products to satisfy such customer demand, but existing insurance models will have to adjust to accommodate UAV operation. Some of the companies underwriting aviation insurance "may not know about the growing need for UAV insurance," and view UAV policies as a "niche market."[161]

Traditionally, aircraft are insured against property loss through "hull insurance" policies. Policies may specify who is authorized to pilot such aircraft and exclude certain risks and losses.[162] In particular, while traditional aircraft insurance policies focus on the platform itself, UAV insurance will have to cover associated system components such as ground control stations. The cost of such hull insurance policies has been estimated to reach 2% of UAV replacement value, plus .5% of ground station replacement value and $30,000 per UAV mission.[163]

Similarly, aircraft liability insurance policies would need to be adjusted to take into account the wide range of potential applications for law enforcement UAVs. While traditional liability policies have covered such categories of use as "limited commercial," "business or pleasure," or "industrial aid,"[164] UAV policies would need to be written in either an open-ended fashion or to explicitly account for potentially hazardous law enforcement mission areas.

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157. *Aeroscout Frequently Asked Questions*, AEROSCOUT, *available at* http://www.aeroscout.ch/faq html#FAQ05 ("When operating the UAV, in manual or in autonomous mode, most countries require aircraft liability insurance.").

158. *Aerial Surveillance*, AERIAL PRODUCTS, 2005-2009, *available at* http://www.aerialproducts.com/surveillance-systems/aerial-surveillance.html (stating that liability insurance for operation of an aerostat or mast is much cheaper than other UAVs).

159. Moire Incorporated, *Cost & Business Model Analysis for Civilian UAV Missions,* June 8, 2004, at 11, *available at* http://www moireinc.com/resources/documents/MoireUAVBusiness Models.pdf.

160. *About*, UAV IMAGERY, 2008, *available at* http://www.uavimagery.com/about html.

161. Moire Incorporated, *supra* note 159, at 12.

162. John D. Perovich, *Property Insurance on Aircraft: Risks and Losses Covered*, 48 A.L.R.3d 112g § 2 (1973).

163. Moire Incorporated, *supra* note 159, at 50.

164. Robert A. Brazener, *Risks and Causes of Loss Covered or Excluded by Aviation Liability Policy,* 86 A.L.R.3d 129 §§ 5-7 (1978).

V. CONCLUSION

UAVs will provide law enforcement with significant surveillance capabilities when the regulatory hurdles to the integration of such platforms into the national airspace system have been cleared. Although the fiscal and operational benefits of UAV integration seem clear, the road ahead is not free of risk and concerns. UAV accidents will prove a lucrative area for potential aviation litigation, and courts will be compelled to wrestle with a number of thorny issues in addressing the place of UAVs within established doctrines of aviation civil liability.