January 29, 2014

Sharing Public Safety Helicopters

Henry H. Perritt, Jr., *Chicago-Kent College of Law*

Sharing Public Safety Helicopters

Henry H. Perritt, Jr.,[1]
Eliot O. Sprague,[2]
and
Christopher L. Cue[3]

Contents

---

[1] Professor of Law and former Dean, Chicago-Kent College of Law, Illinois Institute of Technology; author of Digital Communications Law, and some 80 law review articles addressing, among other things, law and technology; led team that investigated the FBI's Carnivore system for the Attorney General of the United States; Bachelor of Science in Aeronautics and Astronautics, MIT; Masters Of Science In Management, MIT's Sloan School of Management; Juris Doctor, Georgetown University Law Center. Member of the bar: Virginia (inactive), Pennsylvania (inactive), District of Columbia, Maryland, Illinois, Supreme Court of the United States; private helicopter and airplane pilot.
The authors appreciate the cooperation of Mike Bitton, Dan Bitton, Mark Curran, Sheriff of Lake County, IL; Cole Burdette, Kevin Means, Dave Faulkner, Ken Pyatt, Carl Garlick, Dan Barron, Michael G. Masters, Director of Cook County Homeland Security; Raymond XXX, Deputy Director of Cook County Homeland Security; Sergeant Fred Harnisch, head of the Chicago Police Department Aviation Unit; Mike Wienke, Senior Tactical Flight Officer; Garret Kaminiskis, Senior Tactical Flight Officer; Dan Ferguson, claims adjuster,USAIG; Jim Swartz;
[2] Commercial helicopter pilot and CFII; ENG pilot and camera operator; Director of Market Development and Pilot, AM Air Service; graduate of Hillsboro Aviation. Mr. Sprague taught Mr. Perritt how to fly helicopters.
[3] Captain, USMC;; Adjunct Professor, Chicago-Kent College of Law; former Special Assistant U. S. Attorney; member of the bar, Illinois, 2008.

I. Introduction

Helicopters can provide unique support for various kinds of public safety activities. Best practices from California and other states raise the specter of liability for public-safety agencies do not use helicopter support. Yet most public safety agencies cannot afford them.[4] Deploying helicopters to support multiple agencies on a shared basis would help fill the gap, as would overcoming a cultural bias in the pilot community against smaller helicopters.

As in most areas of human endeavor, the law does not determine how helicopter technology can enhance public safety; imagination, creativity, entrepreneurship, and politically astute pragmatism are the engines of integrating technology with reality. The law, however, shapes the result by providing mechanisms for cooperation and, when it is well-conceived, incentives to use best available technology. This precept is true with

[4] Some 18,000 state and local law enforcement agencies exist in the United States. Half employ ten or fewer sworn officers. United States Department of Justice Bureau of Justice Statistics, Local Police, http://www.bjs.gov/index.cfm?ty=tp&tid=71 (summarizing statistics). Communities with smaller populations obviously have less tax revenue to support any of their operations.

respect to helicopter support for public safety activities. The law offers structures for sharing expensive aviation assets, and it may provide incentives for using helicopters.

Air-One Emergency Response Coalition, a volunteer organization that provides helicopter support for public safety agencies in northern Illinois and southern Wisconsin, represents an attractive model for making helicopter assets more widely available. It demonstrates what is possible when proponents of enhanced public safety are willing to consider new approaches, and when passionate, effective advocates educate the public and the public safety community.

This article begins by explaining how helicopters aid tactical public-safety operations, including law enforcement, search and rescue, and disaster response management. It evaluates organizational alternatives for making helicopters available on a shared basis and suggests ways to lower perceived barriers—in Illinois and elsewhere. It concludes that sharing is possible almost anywhere, that smaller, cheaper, helicopters can do the job, and that flexibility is necessary to assure a continuing supply of pilots.

The authors, two of whom are helicopter pilots, and one of whom is a Marine Corps reservist drilling with individuals trained in ground control of air assets, have had several discussions with the leadership of Air-One and have participated in Air-One tactical training missions. They have met or talked on the telephone with law enforcement and EMS personnel all over the country and with helicopter manufacturers, and have ridden on airborne patrol missions with the Los Angeles and the Fontana, California, police departments.

II. Comparison of alternative means for managing public safety incidents

Helicopters play a supporting role to ground resources. Public Safety ground forces offer the advantage of physical proximity. Police personnel can effect physical restraint and apprehend suspects when they get close enough. They can immediately administer medical treatment to a victim of an accident, criminal attack, or natural disaster. Helicopters can do none of these things.

But ground forces have limited mobility. Police officers on foot may or may not be able to outrun a fleeing individual; they may lose sight of their target as the target runs around corners, jumps over fences, or hides behind walls or bushes.[5] On foot, they cannot chase down vehicles.

Ground vehicles offer the advantage of faster speeds, compared with personnel on foot, but they are seriously limited in their mobility, being confined to streets and alleys and able to operate off-road only in terrain relatively free of obstacles. Their visual field is only slightly better than personnel on foot. Pursuing fleeing vehicles creates risks to police officers and to the general public.

Helicopters[6] easily overcome these limitations. Helicopters can fly at 130 miles per hour over traffic jams, or they can fly slowly to keep pace with a suspect fleeing on foot. They can land and take off from any place slightly larger than the dimensions of the helicopter. Helicopters are, however, expensive.[7]

Ultimately, drones may displace manned helicopters for some law enforcement patrol support because of their lower cost,[8] but this is unlikely to happen any time soon.[9] Use

---

[5] See generally Jack H. Schonely, Apprehending Fleeting Suspects (2005) [hereinafter "Fleeing Suspects"].

[6] Both fixed wing aircraft (airplanes) and helicopters can be invaluable adjuncts to ground-based public-safety operations, but their characteristics make them useful for different purposes. Airplanes fly faster and are better for longer-range missions. Helicopters can fly slower, down to a speed of zero (a phenomenon known as "hovering"), and are better for missions that require staying close to a scene. Airplanes stay in the air because their wings generate lift proportional to their forward speed. Below of speed of about sixty-five miles per hour, an airplane wing "stalls." When a wing stalls air stops flowing smoothly over it, and it no longer generates lift. A stall has nothing to do with the engine quitting. Helicopters depend, not on forward speed, but spinning of their rotors to generate lift. They thus can fly at any speed and hover (remain stationary while flying) as long as the engine is turning the rotor.

[7] Their operating costs are high. See § IV.A for a chart showing helicopter operating costs. Costs for fixed-wing aircraft used in public safety missions range from $140-190 per hour. See https://www.conklindd.com/CDALibrary/ACCostSummary.aspx (table of values computed by commercial aircraft evaluation service). Fuel costs alone are $325-$965 per hour. Using the fuel consumption figures from the comparison chart in and a Jet A fuel price of $6.78. They have high acquisition and maintenance costs. The State of Ohio estimates the cost of a 100-hour inspection for an AS350 at $4,541, and the cost of a 500-hour inspection at $10,180. www.dot.state.oh.us/Divisions/ContractAdmin/Contracts/.../092-13a.xls. This represents an additional $65.77 per hour in direct operating costs.

[8] The general perception is that drones will be much cheaper to purchase and to operate than manned aircraft. Identifying credible prices is difficult, however, because the civilian drone industry is in its infancy. One vendor of very small rotary-wing drones with payload capability less than 1.5 kg and

of law-enforcement drones raises vigorously debated questions about safety of flight,[10] privacy, and security.[11]

Lower cost[12] will always be offset by inherent limitations. For one thing, their safety and utility requires maintaining the integrity of a line-of-sight wireless link.[13] It is one thing if the ground controller loses communication with a military drone flying well over contested enemy or ungoverned territory. The drone simply crashes, and property damage or injuries resulting from the crash can be chalked up to "collateral damage" in an armed conflict.[14] That would hardly be the case if a law-enforcement drone were

---

endurance times on the order of 30 minutes publishes prices from €20,000 to €40,000 for complete systems, including the ground control console. http://www.microdrones.com/purchase/purchase-a-microdrone-platform-at-microdrones.php. A U.S.-based vendor of a roughly equivalent machine prices it at $1,200, but it aims at the hobbyist/consumer market. http://www.dji.com/product/phantom-2-vision/. Another U.S. vendor, aiming at the industrial market, belittles hobbyist competitors and quotes prices of $55,000 for a fixed-wing vehicle. http://www.falcon-uav.com/pricing/.

Any estimate of operating cost would be entirely speculative, because too little is known about regulatory requirements, operator qualifications, and labor markets.

[9] See FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11 (2012) (requiring FAA to speed up certification of drone use by law enforcement). The FAA released its first five-year unmanned aircraft systems (UAS) "roadmap"—a preliminary first step to regulatory action-- on 8 November 2013. Federal Aviation Administration, Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap (1st ed. 2013), http://www.faa.gov/about/initiatives/uas/media/UAS_Roadmap_2013.pdf See also Villansenor, 36 Harv. J. L. & Pub. Pol'y at 470-471 (reviewing FAA regulatory framework for drones).

[10] Villansenor, 36 Harv. J. L. & Pub. Pol'y at 473-475 (explaing unique safety concerns associated with drone operations).

[11] See John Villasenor, *Observations From Above: Unmanned Aircraft Systems and Privacy*, 36 Harv. J. L. & Pub. Pol'y 457 (2013) [hereinafter "Villasenor"] (predicting that drones will "dominate the future of aviation and analyzing safety and privacy issues"); id. at 461-468 (reviewing unmanned aircraft systems technology and its history)

[12] See Villansenor, 36 Harv. J. L. & Pub. Pol'y at 467 (claiming law enforcement drone operating costs of $25 per hour). It is too early to tell whether their acquisition cost will be lower. Section XXX discusses helicopter costs.

[13] See Micah Zenko, Ten Things You Didn't Know About Drones, Foreign Policy, item #2 (March/April 2012), http://www.cfr.org/drones/ten-things-you-didnt-know-drones/p27497 (reporting that drones tend to crash frequently, often due to lost data links). "Line of sight" means that a drone' radio antenna must be within a straight line from the ground station antenna. Over-the horizon communications is not possible.

[14] See Idyli Tsakiri Karatzaferi, Collateral damage caused by drones: Crime or accident? (Feb. 14, 2013), http://news.medill.northwestern.edu/chicago/news.aspx?id=215895 (quoting DOD official on collateral damage resulting from drone mishaps).

flying over a congested area of New York, Dallas, or Chicago when communication is lost. It is very difficult to assure 100% integrity of wireless links with moving aircraft. [15]

Moreover, maintaining traffic separation from other drones and from manned aircraft is a problem that has not been solved yet.

Use of manned helicopters by public safety agencies is well accepted;[16] public controversy and the difficulty of developing an appropriate regulatory framework for drones are likely to delay their widespread deployment in public-safety applications.

Eventually, however, the FAA will permit drone operations from relatively low heights when they are kept within the view of the operator, and when line-of-sight radio communication is maintained. Under those restrictions, a ground-based law enforcement unit to which a skilled drone operator is attached could launch a rotary-wing drone to operate in the immediate area of a barricade situation. Such a drone equipped with color and infrared imaging could search an area obscured by structures, foliage, or terrain, or hazardous for ground personnel to penetrate. But this is a far cry from drones' flying patrol over a major part of Lake County Illinois[17] or the northern half of Los Angeles.[18] Drones are incapable of missions requiring insertion or extraction of personnel and cargo.

For now, drones are irrelevant to most public safety missions, although this will change over the next five-to-ten years.

---

[15] Anyone who flies electronic news gathering ("ENG") helicopters can attest to that. Co-author Sprague regularly operates the camera and downlink equipment on EGN helicopters, and deals with lost links often.

Radio control links can be made more robust. Communications designs used for space-system control can be adapted to drone control, although two major challenges would need to be addressed. First, the data rate required to control space systems is small, compared to data rate to transmit the necessary signals to control an aircraft – particularly a rotary wing aircraft. The data rate for image transmission back to the control station is similar; it depends, not on whether the system is flying in space or the atmosphere, but rather on the desired image resolution and frame rate. The line of sight restriction for most aircraft communication is not a problem for spacecraft, because the line of sight is virtually infinite

[16] See Jay Stanley, We Already Have Police Helicopters, So What's the Big Deal Over Drones?, https://www.aclu.org/blog/technology-and-liberty-criminal-law-reform/we-already-have-police-helicopters-so-whats-big-deal (explaining why drones raise more public policy concerns than law-enforcement helicopters).

[17] Lake County comprises 1368 square miles.

[18] The city of Los Angeles comprises 503 square miles.

III. Mission profiles

Three basic types of public safety activities can benefit from helicopter support: law enforcement, search-and-rescue, and disaster relief.[19] Equipment and flight profiles differ according to the mission type, although some common themes exist.

This section analyzes the most common types of public safety operations in which helicopter support may be useful. In each case, the analysis offers guidance on best practice and illustrates details of how helicopters can provide support. In all cases, air crew familiarity with ground features is essential. When advance planning for a specific mission is infeasible, the TFO[20] and pilot use enroute time to familiarize themselves with street names and major features on the ground.[21] Inbound aircrews can get much of the geographic information they need from listening carefully to tactical ground communications while they are inbound.[22]

1. Law enforcement

Law-enforcement missions comprise three broad types: patrol, incident response, and barricade situations. Only barricade- and some incident-response situations involve military-style hierarchical command-and-control.[23] In most law-enforcement operations, the first responder unit is in charge.

a) Patrol

The best helicopter support for routine law-enforcement support is for the helicopter to be airborne and participating more or less as if it were a patrol car. This provides

---

[19] Emergency medical services helicopter support is usually provided by non-governmental hospitals in cooperation with private contractors. See § V.B.

[20] As section XXX explains, virtually all missions require both a pilot and a Tactical Flight Officer ("TFO").

[21] Means at 40, 55 (suggesting familiarity with street names before helicopter arrives on station).

[22] Schonely at 46.

[23] While the civilian public-safety context is significantly different from military contexts, what the Army and Marine Corps have learned can be given weight and adapted to certain civilian contexts. Good police officers work on their own or in pairs and must utilize a wider range of discretion than individual soldiers. See Kevin Means, Tactical Helicopter Missions: How to Fly Safe, Effective Airborne Law Enforcement Missions (2007) [hereinafter "Means"] (detailing various law enforcement operations, few of them depending on "incident commanders" and command posts). Some public safety missions, however, such as search and rescue, fire suppression, mass shooter incidents, and natural disaster relief do benefit from hierarchical organization. There, Army and Martine Corps doctrine can teach important lessons about effective deployment of civilian helicopters.

immediate availability to detect suspicious persons, to aid ground-based units in stopping and questioning them, or to catch someone who is fleeing from a crime just committed. When helicopters are not already in the air, utility of helicopter patrol support depends on readiness of the crew and the time it takes them to get the helicopter airborne.[24]

Kevin Means[25] articulates basic rules of thumb for helicopter patrol:

- Don't hover; it impairs sightlines for TFO and pilot, makes the activities of the helicopter more obvious to subjects, and raises safety concerns
- Fly at or above 500 feet AGL, and at speeds of 50 to 60 knots
- Adjust orbits so that legs[26] from which the subject is obscured by buildings or other obstacles are flown faster, maximizing dwell time on the legs from which the subject can be seen.
- Set up orbits so that they have an appropriate horizontal offset: typically one- to one-and-a-half blocks. Appropriate offsets, combined with the right speed and altitude result in an ideal sight angle of about 60 degrees.[27]

Actually flying airborne patrols in Los Angeles and Fontana, California, validates most of Means' precepts, although it calls into question his more ambitious assertions about reliance on infrared imagery.[28]

---

[24] On 20 December, 2013, co-author Perritt, Faulkner, and four other members of the Fontana, California, helicopter team, three flight officers and two pilots, were discussing the air support operation in the small suite of offices adjoining the hanger. A radio call came over the hailing channel requesting helicopter support for ground units responding to an armed robbery of a retail store. The R66 parked on the ramp had already been preflighted. The helicopter was in the air in less than six minutes, and over the scene in another five, beginning to orbit to gain an understanding of what kind of perimeter had been set up and to get a better description of the getaway car.

[25] Kevin Means, Tactical Helicopter Missions: How to Fly Safe, Effective Airborne Law Enforcement Missions (2007) [hereinafter "Means"].

[26] The "leg" of an orbit is one side; e.g. the upwind side.

[27] Means also offers detailed protocols for effective helicopter use in vehicle chases, both high-speed and low-speed. See Means chap.7 (vehicle pursuits).

[28] On 19 December, 2013, co-author Perritt flew an airborne patrol in an LAPD AS350B2, equipped with a FLIR camera, NightSun, moving map display, and binoculars. The helicopter launched at its usual time of

The Los Angeles Police Department ("LAPD") is an exemplar of using helicopters as airborne patrol cars. It has nineteen helicopters.[29] They serve as force multipliers.[30] The LAPD has two helicopters in the air twenty hours a day, with one on standby for the remaining four hours: 4 AM to 8 AM. The aircrew, comprising a pilot and a TFO, monitors the citywide "K-9" frequency and the dispatch and car-to-car frequencies of each division[31] it flies over. Calls for a burglary in progress, reports of shots fired, or any other kind of call that might be aided by helicopter support causes the aircrew to respond on its own initiative. In some cases, the dispatcher for a division relays a request for helicopter support; more often a patrolman in a ground unit simply says over his car-to-car frequency, "Airship, can you come and search some rooftops?" and gives the location.[32]

---

4 PM with its pilot, TFO, and Perritt aboard. Monitoring both the city-wide "hailing" radio channel and discrete division frequencies as the helicopter flew across division boundaries,

During the 19 December mission, the helicopter responded to a reported burglary in progress of an occupied house, assisted in setting up a perimeter, and searched the neighborhood. It assisted with a rooftop search in another part of the city. It flew the high part of a high-low mission over a barricaded suspect. It monitored traffic stops.

On 20 December 2013, co-author Perritt flew a mission with the Fontana, CA Police Department, during which the helicopter searched for a vehicle fleeing the scene of an armed robbery, monitored ground officer safety during traffic stops and watched for suspicious activity by pedestrians and vehicles.

[29] 14 Eurocopter AS350B2s and five Bell Jet Ranger B3s
http://www.lapdonline.org/air_support_division/content_basic_view/1179

[30] LAPD has a total of 8,000 sworn officers: 17.1 per square-mile and 2.1 per thousand population. Chicago has 13,000 sworn officers: 57.3 per square mile and 4.6 per thousand population. New York has 36,000: 118.8 per square mile and 4.3 per thousand population. In 2008, New York had 36,000 sworn officers, Chicago had 13,000, and LA had 8,000. DOJ 2008 Law Enforcement Census at p14 (Appendix Table 5). In 2008, the population of New York was 8.3 million, of LA 3.8 million, and Chicago 2.8 million. http://www.biggestuscities.com/2008. New York's area is 303 square miles, LA's is 469, and Chicago's is 227. http://www.census.gov/statab/ccdb/cit1010r.txt

[31] An LAPD division is a geographic area that might be called a "precinct" in New York or Boston and "district" in Chicago.

[32] The Chicago Police Department follows the LA model but on a much smaller scale. – Chicago has only two helicopters. Chicago also does not have crews on duty 24 hours/7-days. It operates two shifts on weekdays, from 8 AM to 4 PM and 8 PM to 2 AM, and 8 PM to 2 AM on Saturday and Sundays.
The goal is to have one of the helicopters in the air during peak prime activity. Six of Chicago's 25 police districts account for 85% of the crime. Typically one of the CPD Helicopters patrols one of these high

When a more serious crime requires support, another helicopter diverts from its usual patrol area, and the two helicopters fly a high/low pattern, both using searchlights if it is at night, one flying at 300 to 400 feet AGL, while the other flies at 1000 feet AGL.

When not involved in a particular call, the helicopter crew decides, just like a ground patrol unit would, where it should patrol: “Let's see what's going on down Crenshaw," or "let's check out the projects." When the helicopter sees a traffic stop, it orbits to determine that the officer involved is not in jeopardy.

Considerable detail can be observed from 400-500 feet above ground level. Even an untrained person would have no difficulty spotting anomalous behavior by vehicle or pedestrian.

As the helicopter patrols, moving between particular missions, the pilot varies the helicopter’s height AGL and speed as necessary to enhance safety and mission effectiveness, typically flying faster at lower altitudes and increasing height when lower speeds are appropriate.

Little hovering is necessary; as Means argues, orbiting enhances perception of ground-based targets and reduces the likelihood that a structure or a terrain feature would obstruct visibility of a target[33]

The Los Angeles and Fontana missions provided an opportunity to bracket the operating environment—Los Angeles is obviously much bigger than Fontana, and has a considerably larger air support operation. Los Angeles flies larger turbine helicopters; Fontana flies one of the smallest turbine helicopters and a piston-engine helicopter. Nevertheless, only modest differences between the Fontana mission and the LAPD mission were apparent. For example, the Fontana TFO's intimate familiarity with the local geography made reliance on the moving map displays less necessary. He almost never referred to it. Otherwise, the Fontana and LAPD missions were flown similarly,

---

crime areas, plugged into the frequencies that serve the relevant police districts. The Chicago Police Department groups its radio frequencies geographically, with two adjacent districts typically sharing the same frequencies and dispatcher. Conversation with SGT Fred Harnisch.

[33] As the sergeant in charge of the Chicago Police Department helicopters said, “We don’t need to hover. Everything is in the camera.”Conversation with Fred Harnisch.

with respect to the use of the onboard equipment, and the flight profiles of the helicopters.

In neither city was formalized, military style, command-and-control necessary. Street officers, as they usually do, worked quickly as individuals, coordinating as necessary, without having to take the time to deploy command centers and designate incident commanders. Ground units on the scene and the helicopter aircrew communicated directly, understood each others' needs and capabilities, and took appropriate action. The same technique worked well even when multiple ground units were on the scene—as for the burglary situation in Los Angeles and for the robbery in Fontana. In all three, the helicopter crew assisted in coordinating their placement and activities quickly, efficiently, and without argument. By tradition, the first responding unit remained in charge of directing backup units.

Philosophies also differ on mission altitudes. The LA Police Department prefers flying low: 500 feet AGL or lower. Chicago, Air-One, and San Diego prefer to fly higher: at least 1000 feet AGL for Chicago,[34] and 600-1000 feet AGL for Air-One.[35] The dominant considerations are greater exposure to ground fire and higher risks if an engine fails at lower altitudes, and generally better visibility and situational awareness at higher altitudes. With FLIR equipment and a skilled operator, heights of 700 AGL or greater and horizontal offsets of a mile or more still allow acquisition of very detailed images.[36]

b) Barricaded subjects

Situations in which the subject is stationary and has barricaded himself, as in an active shooter or hostage situation requires a higher degree of organization than patrol functions. A larger number of ground forces must be deployed effectively and

---

[34] Harnish.

[35] AIR-ONE Emergency Response Coalition, Inc., PIC Transition Syllabus at pages 11-13 (Aug. 26, 2009, rev. Sept. 29, 2011) [hereinafter "PIC Syllabus"]. 600-1000 feet for FLIR searches for stationary objects, PIC Syllabus at 11; 500-600 feet for vehicle pursuits, PIC syllabus at 12; and 400-600 feet AGL for foot pursuits, PIC Syllabus at 13.

[36] Air-One directs certain lateral offsets and 40-60 knots orbit speed, and cautions against hovering. 1.5-2 blocks offset for non-urgent calls and 0.75 to 1.5 blocks offset and "proportionate airspeed" for FLIR searches for stationary objects, PIC Syllabus at 11; lateral offset to the right or left of a vehicle being pursued and behind the vehicle at a speed matching the vehicle's; the caveat "all turns to the left and no hovering unless necessary" is repeated for both vehicle and foot pursuits. PIC Syllabus at 12-13

helicopter operations must be integrated with the ground operation. It is here that effective command-and-control is important.

Well defined perimeters are important in many law-enforcement-support operations, but especially in barricade situations.[37] Perimeters limit the movement of fleeing suspects or vehicles; they provide a means for excluding civilians from areas of high risk where a shooter or bomber is located. Both ground forces and aircrews must understand the fundamentals of perimeter establishment and maintenance: solid facts must exist to place the suspect within the perimeter; it should be large enough to reflect the suspect's speed and last-known direction of travel; it must be tight enough to exclude the possibility that the suspect crossed it without detection.[38] Any perimeter should be defined by how far the subject could have travelled in the time elapsed since the last contact. Identifying the boundaries of an appropriate perimeter depends on someone--the incident commander if he has been identified and is functioning, or the TFO otherwise--thinking quickly to estimate reasonable speeds, to multiply them by time, and determine distance expressed in miles or blocks. Boundaries of the perimeter should be chosen, to the extent possible, to permit unobstructed lines of sight, either from the ground or from the air. Either air or ground personnel must be able to spot anyone attempting to cross it.

Once the perimeter is established, the helicopter can search from house to house in the nearby neighborhood to ensure the perpetrator has not escaped and to view other possibile strategies for ingress, for the police, and egress for the perpetrator. Situational awareness in this regard is greater from the air than from the ground: the personnel in the helicopter easily see the big picture.

c) Surveillance

Surveillance, in comparison to *search*, comprises an activity once a target has been acquired: A lost or injured person, or criminal subject the authorities are trying to apprehend.[39] The most appropriate flight profiles are whatever is necessary to keep the

---

[37] Jack H. Schonely, Apprehending Fleeing Suspects: Suspect Tactics and Perimeter Containment (2005) [hereinafter "Schonely"]

[38] Schonely at 14-18.

[39] Surveillance also can refer to the monitoring of an area to detect suspicious activity. In this sense, it has the same meaning as patrol, considered in §III.1.a).

target in sight. If he is moving in a vehicle, the helicopter needs to keep pace, flying at the same speed as the vehicle. If he is still, as an injured person might be on the ground, or criminal suspect who has barricaded himself with or without hostages, the helicopter needs to be able to hover or fly in a tight circle to watch his movements.

The Boston Marathon bombing increased interest in effective surveillance of high-risk events where large crowds assemble. Aerial surveillance has unique advantages for such missions. Overhead, observers can spot unusual movements of vehicles or individuals quickly—anything that does not match the prevailing flow of participants or audience, such as an attacker dropping a backpack and walking quickly away.

The challenge, however, is where to look. Means enumerates a number of things to watch for in any surveillance or search for a criminal suspect:

- A vehicle driving much slower (on an expressway) or much faster (on residential streets) than the rest of the traffic
- A vehicle disregarding stop signs and traffic signals
- A vehicle stopping occasionally midblock with no one getting out.[40]
- He offers charts illustrating how far behind a target vehicle the helicopter should be flown, varying with vehicle speed, suggests flying an offset of about two blocks to the ride side of the target vehicle (on a helicopter flown from the right seat, and shows how to deal with situations in which the helicopter overruns the target vehicle or when it makes an abrupt turn.[41]

d) Collecting evidence

The fact that most public safety helicopters have sophisticated camera equipment means that they easily can record the images captured. This provides a potentially rich trove of evidence of criminal activity and police conduct.[42] Things must be done, however, to make this evidence practically useful. First, well-understood chain of

---

[40] Means at 47 (noting that aircrew should be especially alert when a vehicle stops in a dark area for no apparent reason).

[41] See e.g. Means at 101 (Figure 41) (suggesting a 270-degree turn to the left to permit the TFO to keep in sight a vehicle making a 90-degree right turn). Co-author Perritt's flight with the Fontana Police Department validates this guidance.

[42] See Kosakoff v. City of San Diego, No. 08–CV–1819–IEG (NLS), 2010 WL 1759455 at *2 (S.D. Cal. Apr. 29, 2010) (referring to helicopter video as evidence of confrontation between police and decedent).

custody requirements[43] must be satisfied. Second, the high definition images actually captured are far more useful than substantially compressed versions of the same imagery or only periodic frames. Yet the amount of data involved in a full-motion high-definition video image is enormous, and if the public safety helicopter operation tries to save everything, any conceivable level of storage will soon be overwhelmed. Accordingly, some protocol is appropriate to decide what should be retained and what safely can be erased.

2. Search and rescue

Search and rescue missions can be divided into two types: those involving search only, and those involving rescue. Rescue operations may involve human-load operations,[44] considered in § III.4.

Search, as contrasted with *surveillance*, is used in this analysis to refer to efforts to locate the subject before he has been sighted. Search over a large geographic area is often conducted according to a grid superimposed on a map. Systematic searching according to established protocols is more important than in law-enforcement support, because because SAR operations take more time than the typical law-enforcement incident, and because SAR traditionally employs more formal command and control. In other circumstances, however, it is more useful to search according to ground features. The particular search needs to be defined effectively. For example, "Search Memorial Drive eastbound to the on ramp for I-95," or "Search from the fishhook bend in the Fox River just east of Wilmot to the large quarry south of Route 173."

Lower altitudes are more helpful for surveillance, while somewhat higher altitudes, around 2000 feet, may be more appropriate for search, because it enables the helicopter to see more territory.

Containment is an important part of search strategy. It is the same idea as establishing a perimeter in searching for a fleeing felon:

---

[43] CITE, summarizing the rules

[44] Also known as "long-line," signifying that the human load is carried for a significant distance, and "short-line," signifying that the human load is carried for only a short distance. The article uses the regulatory terms "load," "external load," "external human load."

"For example, you might have two or three people positioned along on a long straight road. If the search subject crosses the road, they'll spot him. Bridges, wide creeks and open fields often offer the same confinement ability with a minimum of manpower. By confining the search subject, even if you only have the manpower to confine them on one or two sides, you immediately limit the area which needs to be searched."[45]

3. Natural disaster relief

Helicopters are especially well-suited for providing natural disaster relief. Often, ground-based infrastructure, such as roads and airports, is destroyed. Helicopters are the only way to get supplies in quickly. Victims stranded by floodwaters or blizzards may not survive unless they get food and water without long delays. And, of course, in some cases, they need to be rescued, or they will perish.

Intelligence collection also is crucial: locating victims, assessing damage, viable inroads, possible delays for relief, and other disaster management issues.

Smaller helicopters with only basic equipment can be useful for intelligence collection in natural disasters; however, larger helicopters with more elaborate equipment are necessary for inserting relief supplies or for rescuing victims.

4. Personnel insertion and extraction

An occasional law enforcement mission, and many search and rescue missions, require helicopters to insert or extract personnel. The most straightforward way to do this is to land and have the personnel get on or off the helicopter. Many rescue situations provide no place to land, however, such as water and high-rise fire rescues. In these situations, there must be some way for the rescuers to exit the helicopter and descend to the ground or for victims or rescuers to be picked up off the ground by the helicopter, without landing.

Classified as human external load operations ("HEL"), these operations require a high degree of aircrew training.[46] Pilots must to be able to insert and to extract a load gently into or from a one-square-meter area on the ground and to hover and maintain altitude

---

[45] Id.

[46] Co-authors Perritt and Cue flew on a training mission with Air-One on 20 November 2013, and rode as mock victims on the end of a 100-foot load line. They observed aircrew coordination. The maneuvers, when properly performed, are more gentle than one might expect.

precisely. A subcategory of external load operations, they operate under distinct FAA flight rules.[47]

Many different equipment configurations exist for extraction, including baskets, stretchers, and various kinds of slings. Load lines can be fixed in length, ranging from 50 to 150 feet, typically 100 feet. Or, they can be configured so that the load can be reeled into the helicopter while it is still in flight. The type of extraction equipment best for a particular mission depends on the condition of the person to be extracted.[48]

The level of aircrew skill required for HEL is significant. The pilot must be able to control the helicopter precisely in order to avoid sudden pickups or hard setdowns that might injure the human load and maintain sufficient altitude to avoid smacking the load into trees or other obstacles on the ground. In most parts of an HEL operation, the pilot cannot see the load or the load line. A TFO riding in the back must lean out, often sitting on the skids and keep the load line and load always in sight.

The TFO communicates with the pilot through the aircraft intercom, using precise terminology to direct the pilot, typically counting down before the execution of a command or until a maneuver should cease; e.g., "come up with the load slowly for five; 5-4-3-2-1," signifying that the pilot should begin a climb immediately and level off when the countdown ends.

Personnel being inserted assist the TFO in the helicopter by giving hand and leg signals; e.g., a hand motion upward to signify that the helicopter should climb, a horizontal motion with the hand to signify that it should hover, and clicking heels together with legs extended to signify that the load is ten feet above the ground on a descent. The TFO

---

[47] 14 C.F.R. Pt 133. Part 133 does not, however, directly address operations or flight profiles for human loads. Accord Human Factors at 8 (noting that FAR Part 133 contains no explicit provisions relating to HEL operations and procedures). The FAA amended the FARs in 1999 to add provisions relating to external loads, but did not impose significantly different operating requirements. 64 Fed.Reg. 43016, 43017 (no special procedures or piloting techniques required by 14 C.F.R. § 29.865(c)(5) or Id. § 133.45 for human external cargo as opposed to other external cargo). See also See FAA, proposed Rules, Rotorcraft Load Combination Safety Requirements, 63 Fed.Reg. 37746 (July 13, 1998) (reviewing history of HEL regulations and revising airworthiness rules for "Class D"--HEL--operations).

[48] See Randa L. Shehab et al, A Human Factors Perspective on Human External Loads, DOT/FSS/AM-98/13 at 17 (May, 1998) [hereinafter "Human Factors"].

in the helicopter watches the load and relays instructions to the pilot over the intercom.[49]

A number of largely unavoidable hazards exist in HEL operations. A failure by the helicopter pilot to maneuver the helicopter precisely enough, or a failure by other crew members to pass signals quickly and unambiguously, may result in a collision between the human load and ground obstacles. The load line or the attachment points may break or disconnect. A slack load line may entangle the main or tail rotor. The engine on the helicopter may fail during pick up, transit, or set down. The flight regime for long line operations requires prolonged hovering and other maneuvers at relatively low altitudes. At these altitudes and speeds, if the engine fails in a single-engine helicopter,[50] the pilot needs to maneuver so as to set the load down gently and safely and then to enter an autorotation to land the helicopter safely. Even the most skilled

---

[49] Human Factors at 17 (recommending passive device, maintianing upright posture, with separate spotter to monitor HEL).

[50] In a twin engine helicopter losing one engine, autorotation is not necessary. Rather, the helicopter could continue in a normal flight profile until it could safely release the load and land. Worst case, depending on gross weight and atmospheric conditions, the helicopter would enter a controlled descent, release the load and then land. In the worst case, the rate of descent would be in the low hundreds of feet per minute as compared with a thousand or more feet per minute in a single-engine helicopter with its engine out.

The FARs require multi-engine helicopters for most civilian SAR missions. "The use of SAR modes in civil operations requires special airworthiness standards (special conditions) to ensure . . . a level of safety consistent with Category A and Instrument Flight Rules (IFR) . . . ." 77 Fed.Reg. 60883 (Oct. 5, 2012) (imposing autopilot requirements on EC225LP helicopters). 14 C.F.R. § 133.45(e)(1) prohibits Class D operations 14 C.F.R. Part 27 (for rotorcraft with gross weights less than 7,000 pounds) and 14 C.F.R. Part 29 for "transport category rotorcraft" impose special airworthiness requirements for Class D operations. Part 27 allows only multiengine rotorcraft meeting the requirements of Appendix C to Part 127 to be type certified. 14 C.F.R. § 27.1(c). Appendix C incorporates Category A requirements. "Category A, with respect to transport category rotorcraft, means multiengine rotorcraft designed with engine and system isolation features specified in Part 29 and utilizing scheduled takeoff and landing operations under a critical engine failure concept which assures adequate designated surface area and adequate performance capability for continued safe flight in the event of engine failure." 14 C.F.R. § 1.1(2).

pilot would be hard pressed to do this without injury to the load or the crew, probably both.[51]

Search and rescue missions involving HEL require not only higher level of proficiency; they also require a larger helicopter and larger team. The frequency of HEL operations is low for any particular agency. The best coverage for the range of public safety missions results from larger fleets of smaller helicopters, with smaller numbers of SAR helicopters available on a more-widely shared basis.

5. Limitations on flight profiles

For any of these mission types, helicopters have limitations. They are not likely to be helpful, for example, when activities of concern are certain to take place entirely inside structures, and thus are not visible from the air. Even if an incident begins inside a structure, however, the possibility always exists that a person of interest may exit the structure. It may be useful to have helicopter assets in the air to detect such an exit.

It also is problematic for helicopters to hover 50-100 feet above the ground—a posture often seen in action movies and video games. In any helicopter operation, the most urgent emergency is an engine failure. Aircraft engines rarely fail in flight—when was the last time your automobile engine suddenly quit while you were driving on an expressway? When they do quit, the pilot must immediately establish an "autorotation," a flight regime in which the rotor spins and continues to generate lift because it is being driven by an upflow of air as the helicopter descends rather than by

[51] In a human external load operation, the pilot of a single-engine helicopter experiencing an engine failure would have little choice: he would have to establish an autorotation as soon as possible and then perform a two-stage flare maneuver. The pilot would immediately lower the collective to enter an autorotation. As the helicopter begins to descend, he would immediately enter a flare to slow down. At this point, the helicopter is travelling about 60 knots horizontally, and 20 knots vertically (1500-1800 feet per minute). As the helicopter decelerates and the load gets closer to the ground, he would flare more aggressively. He must take into account the fact that the load will swing forward with more aggressive deceleration, increasing its distance from the helicopter as the line extends. He would hold the flair until he judged that the ground speed was low enough for the human load to tolerate touching the ground at that speed. He would release the load as soon as he judged that the load had reached the ground, and immediately drop the nose to pick up more air speed. He cannot drop the nose too aggressively or rotor RPM will decay so much that the rotor blades stall. He would then enter another flare to exchange the remaining airspeed for rotor RPM, and then use the remaining RPM to cushion his landing as much as possible. The best he could hope for would be a survivable crash for the aircrew and survivable impact between the load and the ground.

the engine. At heights of 500 feet or less above the ground, the pilot about 30 seconds to establish the autorotation, select a safe landing spot within a very small glide range, maneuver the helicopter to it, and to cushion the landing as best he can.

Heights below 500 feet and speeds of less than 60 knots make it difficult for even the most skilled pilot to perform a successful rotation even if he practices them regularly. The challenge is complicated in urban areas, where landing spots free of powerlines, other obstacles, and people are few and far between.[52]

These flight profile limitations, however, do not negate the fact that helicopters are extremely helpful in various helicopter support scenarios, and their inefficient use is evident across many spectrums. One law enforcement scenario where their capability was not fully utilized was in Watertown, Massachusetts.

6. Watertown, MA: a case study

Anyone who has seen the video of the apprehension of Dzhokhar Tsarnaev after the Boston Marathon attacks[53] can appreciate how essential the Massachusetts State Police helicopter and its infrared imaging was in obtaining a successful outcome--without injury to law-enforcement personnel and with non-fatal injuries to the suspect. It is not clear why helicopters were not involved earlier in coordinating the law-enforcement response to the confrontation that occurred in Watertown after Dzhokhar and his brother Tamerlan killed an MIT policeman and carjacked a Mercedes-Benz SUV. Video and witness accounts used in reconstructing the scene afterwards show great confusion.[54] Had a helicopter been involved in the law-enforcement response, Dzhokhar might not have escaped, and Tamerlan might not have been killed. In any event, the

---

[52] See FAA, Helicopter Instructor's Handbook figure 8-2 at p.8-4 (FAA-H-8083-4 2012) (showing hazardous area below 60 knots and 500 feet, determined by test pilot's ability to establish autorotation); FAA Helicopter Flying Handbook figure 11-3 at p. 11-8 (FAA-H-8083-21A 2012) (same).

[53] See http://www.youtube.com/watch?v=YkzvMf3tigw (vid of boat taken from helicopter equipped with night-vision equipment).

[54] See http://www.youtube.com/watch?v=NI0F5rm37-w (showing video of Watertown confrontation); http://www.youtube.com/watch?v=G_pQXcqA6Ag (news broadcast about the confrontation). Even though the news footage in the YouTube video shows a helicopter in flight, the helicopter shot is in the daytime, while the Watertown confrontation occurred at night.

scene would have been illuminated by high-power helicopter-mounted searchlights and spotlights.[55]

In considering the possibility of earlier helicopter support, one must make some assumptions about when a helicopter would have been available. The Massachusetts State Police has five turbine-powered helicopters, primarily twin-engine Eurocopter AS-355Ns equipped with FLIR cameras, GPS synchronized mapping, interoperable communications equipment, and digital video downlink systems. The helicopters are based in Lawrence, Plymouth, and Westover.[56] During the search for the Tsarnev brothers, it would have been reasonable to keep one or more of the helicopters airborne. If they were on the ground, ready to launch, one must make assumptions as to when they would have been called out.

The murder of the MIT police officer might have triggered an opportunity for helicopter support, although the initial reports regarding the murder were quite confused. There was a crime scene to which the helicopter could have begun to lay out a pattern of surveillance. But it was not immediately clear that the Tsarnaev brothers were responsible. The initial carjacking of the Mercedes did not generate an opportunity for helicopter support because no one knew about it until the owner of the Mercedes escaped and called the police.

After that, however, the need for helicopter support was obvious. The authorities had a precise description of the car, and they knew the precise location for beginning a search.

The ground scene was chaotic. Watertown had only five or six officers on duty, so the Boston Police and the Massachusetts State Police took control of the search. "[A]ctually trying to get control of the number of people, the mass of people that showed up, proved to be a challenge for the people who were trying to organize that event."[57]

Law enforcement from outside of Watertown — about 2,000 altogether — had trouble navigating the neighborhood, a labyrinth of winding streets. They got lost. "They had

---

[55] find video showing helicopter using high intensity spot and search lights and CITE

[56] State Police Airwing Section, http://www.mass.gov/eopss/home-sec-emerg-resp/response/etrt/airwing.html

[57] Phillip Martin, et al, Watertown Manhunt For Tsarnaevs Offers Lessons For Law Enforcement (Oct. 18, 2013), http://wgbhnews.org/post/watertown-manhunt-tsarnaevs-offers-lessons-law-enforcement.

no idea where Dexter or Laurel Ave was and they had trouble finding us," Watertown Police Chief Ed Deveau said.

The Lawrence airport is 19.4 nautical miles from Watertown. Assuming aircrew was at the Lawrence airport, and that the helicopter had been postflighted and was ready to go, it could have been overhead Watertown ten-to-fifteen minutes from being called out.[58] If it were already airborne, as would have been reasonable in the aftermath of the bombing, it could have been there much more quickly.

Even if there were no incident commander yet designated and no command post, the helicopter aircrew, using its FLIR camera, could have helped ground units navigate the dark streets through which Dzhokhar was fleeting.

[insert map]

The first contact with the brothers was when the carjack victim called 911—point A on the map. The first step for the helicopter aircrew would be to check nearby interchanges with limited access highways—if they were not already roadblocked. One familiar with the area would pinpoint the entry ramps to I-95 in Charlestown, and entry ramps to the Mass. Pike at Western Avenue. Quick dispatch of ground units to cover these escape chokepoints would relieve the helicopter of trying to monitor multiple exit points. Such assignment of ground units would depend on the availablility of realtime data about their location from software such as Spidertracks,[59] integrated with the geospatial mapping software operating on the video displays in the helicopter. Map imagery available from software such as Churchill would facilitate identifying the likely exit points.

Once the long-distance escape routes were identified and monitored, the outlines of a perimeter would be obvious, relieving the helicopter to search inside the perimeter. If that did not turn up anything, the subjects might be fleeing along other routes, or they might be hiding. That suggests, first, checking other likely exit routes, and, then, checking densely populated neighborhoods and areas of dense foliage that might conceal a vehicle.

---

[58] It takes 14.5 minutes to fly 19.4 nautical miles at 80 knots.

[59] http://us.spidertracks.com/.

The helicopter would come inside the implied perimeter and work up and down with its FLIR system according to a grid, from the outside in. Additionally, the noise of the helicopter might have spooked the brothers, which would have aided the search. If the brothers were hiding and ran when they heard the helicopter, it would have made them easy to spot. If they were fleeing and sped up, it would have made them stand out as well. A car on a freeway travelling even 10 miles per hour faster than the other traffic is easy to distinguish.

Once the shootout was over and only Dhzarnov was on the run, the same strategy would be adapted to this last point of contact—point B on the map.

Thus, the use of helicopter support earlier in the Watertown case could have greatly assisted the ground patrol officers in capturing the Tsarnaev brothers.

The potential for helicopter support of public safety operations, in Watertown-like scenarios and more broadly, depends on the particular resources available. That is the subject of the next Part.

IV. Resource requirements

A. Aircraft

The types of helicopters involved in public safety support activities span a range from relatively small helicopters such as the Robinson R44 to the UH-1 Huey. The following table provides a comparison of the most popular types.

Type	**Price**	**Useful load (pounds)**	**Cruise speed (knots)***	**Direct operating cost per hour** [60]	**Fuel consumption gal per hour**	
Single engine:						
Robinson R44	$700-900,000[61]	1,000	113	$217	16	
AStar AS350B2 or	$2	2,270	133-155	$736	48[62]	

[60] https://www.conklindd.com/CDALibrary/ACCostSummary.aspx

[61] Robinson Helicopter Company price list, http://www.robinsonheli.com/price_lists_eocs/r44_police_pricelist.pdf

B3	million					
MD500e	$1.5 million	1,519	135-155	$585	64	
Bell Long Ranger L4	$1.2 million	2,176	124-125	$722	40	
Twin engine:						
EC135/145	$3.9 million	3,296	137-140	$1094	61	
AW139	$10 million	5,886-6,768	165-167	$2167	142	
Bell 212	$3.7 million#	4,500	107-120	$1635	108	

- "fast cruise" and V_{NE}
- # Price for late model used; no longer sold new

An unfortunate tendency exists for public safety agencies to convince themselves that they need larger and more complex helicopters than is actually the case. This drives up costs, complicates insurance coverage limitations, and makes it more difficult to recruit personnel. Two beliefs in this regard are worth evaluating.

A deeply embedded belief in the law-enforcement pilot community holds that smaller helicopters do not have sufficient useful load for necessary equipment or necessary performance capabilities. A parallel belief is that nothing less than a turbine helicopter such as a Bell 407, an MD500, or an AS 350 is adequate for law-enforcement support.[63] Neither belief is valid. As airborne surveillance and navigation technologies and helicopter design have evolved, specialized police and ENG versions of the Robinson R44 and R66 helicopters have the same equipment and have essentially the same performance capabilities as those used by ENG operators and law enforcement agencies flying AS350s. The Textron-Bell Bell SLS model, expected to be certificated by the FAA

[62] Eurocopter, Technical Data at p37, http://www.eurocopter.com/site/docs_wsw/RUB_494/350B2-09-101-02.pdf.

[63] Turbine power's main advantages over reciprocating engine power are: greater power output for a given engine weight and considerably simpler machinery.

in 2014, will provide another small-helicopter option.[64] The SLS offers performance comparable to the Robinson R66, and Bell expects to price it competitively with the R66.[65]

The argument is not that the R44 or the R66 has the same capabilities as an AS350; they don't. The chart shows that. Pilots with ENG experience in both prefer the AS350. The point is that the smaller helicopters have capabilities *adequate* for police operations, at much lower cost.

Furthermore, empirical studies call into question the validity of the belief that piston engine helicopters are less reliable than turbine helicopters.[66]

Co-author Perritt has flown with law-enforcement agencies flying AS350s and with agencies flying the Robinson R66. Flight crew activities, equipment, and flight profiles were identical, with the differences in aircraft making no material difference in mission performance.

The acquisition and operating costs of the smaller helicopters are dramatically lower. Fontana acquired and maintains its fleet of three Robinson helicopters for less than the $3.8 million that the Ontario, CA, police department just paid to purchase one equipped AS 350B2.

To support law enforcement patrol functions, the search part of search and rescue, and the surveillance part of disaster relief, a smaller helicopter such as the Robinson R44, Robinson R66, Bell 206B3, or its military equipment the OH 58, is suitable. For rescue, SWAT, and rescue operations, a larger helicopter is necessary, on the order of an AS350 on the lower end, or a UH-1 Huey on the higher end.

The higher costs of the larger helicopters means that their capability is more likely to be available through acquisition of government-surplus helicopters than by purchasing the open market.

---

[64] See http://www.bellhelicopter.com/en_US/Commercial/BellShortLightSingleSLS/1192991422596.html#/?tab=highlights-tab.

[65] *Compare* id. *with* http://www.robinsonheli.com/rhc_r66_turbine.html.

[66] Cite JPL study.

On the other hand, the capabilities provided by the smaller helicopters represents a more equal trade-off between market transactions and government donations, and between purchase of new and used aircraft. A Robinson R66 has a basic price of $800,000. Used Bell 206B3s in reasonably good condition can be obtained for $600-$800,000. The operating costs and performance of the Bells are not as attractive as those of the Robinsons, so that the choice between them is basically a tossup. If an agency can get an OH-58 through the Defense Logistics Agency Disposition Services program,[67] that would seem to be obviously preferable, but the costs associated with reconditioning a surplus helicopter and with getting parts for an older version can equalize the cost difference. Actual maintenance hours per flight hour are not likely to vary much with age because of the nearly universal requirement that parts be replaced as they reach service lives predefined by the manufacturer.[68]

Load carrying capability is important for disaster relief, EMS, and search and rescue, depending on whether personnel extraction is likely to be part of a search and rescue mission. It may not be when ground personnel are nearby in land searches. Personnel extraction is central to EMS missions. Even if personal insertion or extraction is not part of a disaster relief mission, helicopters are likely to be called upon to drop relief supplies. On the other hand, load carrying capability is less important for law-enforcement support and fire suppression missions-- of the wildfire context.

Bigger helicopters have to be bigger than Jet Rangers, or MD500s; even AS350s have obvious size limitations on those kinds of missions.

A belief also exists in some quarters that twin-engine helicopters are better. This is also questionable, except for HEL operations.

In a twin-engine helicopter, the two engines are interconnected through a single gearbox and control mechanisms to drive a single main and tail rotor. Their interconnections are such that if one of engine fails, the pilot only notices a diminution in the amount of power (torque) available to drive the rotor. This is quite different from an engine failure in a single-engine helicopter, in which the pilot has no choice but to

[67] See § V.F (explaining source of Air-One helicopters).

[68] See e.g. 14 C.F.R. § 33.70 (requiring operating limitations for life limited engine parts).

initiate autorotation and land wherever he can within a radius of about a mile (depending on altitude) within 60 seconds if the engine fails.

Engine failures are quite rare, however. Safety can be improved more by having two crew members than by operating only twin-engine helicopters.[69]

B. Equipment

The equipment list for any particular helicopter should depend on the range of missions is intended to fly.

Any conceivable public safety mission requires good geospatial mapping software and appropriate radio communications. Most law-enforcement missions also require a high-intensity searchlight. Video and infrared imaging also enhances most missions. Search and rescue missions require some of the same equipment as law-enforcement support: good imaging capability and good geospatial referencing systems.

1. VHF and UHF radios capable of communicating on public-safety-agency frequencies

Appropriate radio communication is essential for effective coordination of helicopter operations with ground forces and vehicles. There must be agreement at the outset of a mission as to what frequencies will be used for command-and-control and, when appropriate, for more direct communication with ground forces. Typically more than one frequency will be required.[70] Frequencies must be available, not only in vehicles such a squad cars, they must be available on portable handsets, as well. Often, in a tactical operation, the most important coordination occurs between airborne assets and individual personnel on foot in the field.

Air-One, like LAPD, the El Monte Police Department, and the Fontana Police Department, has the capability to operate on several hundred public safety frequencies. and the Illinois Law Enforcement Alarm System ("LEAS")[71] has worked with IEMA and local agencies to establish common frequencies for tactical communication involving resources from multiple agencies.[72] IEMA has published an Illinois Tactical

---

[69] 10 December 2013 conversation between co-author Perritt and Kevin Sprague.

[70] See Tactical Primer at 49 (explaining need for tactical, command, and logistics radio channels).

[71] See 30 ILCS 105/6z-91 (establishing Illinois Law Enforcement Alarm System fund)

[72] CITE

Interoperability Field Operations Guide (2012), which provides detailed lists of common frequencies, and establishes procedures for coordinating communications.[73] The Illinois State Police maintains an emergency radio network for inter-agency law enforcement communication.[74]

Everyone must use a common language to communicate with each other with respect to movements and location.[75]

2. Geospatial mapping software

As Jack Schonely puts it, "Always know where you are." (And communicate it clearly to the air unit).[76] A means for referencing places and objects on the ground is essential if air and ground assets are to complement each other. The SAR community has developed methods based on map grids[77]

But for this to work effectively, ground units also must know their positions. Basic GPS capability is an efficient way to achieve this. Then, helicopter aircrew and ground forces can communicate by references to street names and compass directions.[78]

Sophisticated proprietary hardware and software exists for public safety missions. It is increasingly questionable, however, as GPS-based products improve, whether systems costing in the hundreds of thousands of dollars are necessary.

The Churchill 37 FLIR Star Safire product illustrates the high end of the market. It shows latitude, longitude, elevation and range at the top of the display screen, the exact address at which the camera is pointed at the bottom of the screen, and superimposes street names and numerical street addresses over the live full-screen image.[79] The operator can select ground features to be displayed or suppressed, such as school and business names. The usual capability to zoom in and out is preserved, and the operator can trigger an inset with a zoomed image superimposed over a larger zoomed out

---

[73] See http://www.state.il.us/iema/SCIP/IIFOG-2012-corrected.pdf

[74] Illinois State Police Radio Network ("ISPERN"), http://directives.chicagopolice.org/directives-mobile/data/a7a57be2-128ff3f0-ae912-8ff7-45100ca39f167dfe.html?ownapi=1.

[75] Tactical Primer at 45 (stressing essentiality of common terminology and procedures)

[76] Schonely at 42

[77] See § *XXX*.

[78] CITE

[79] http://www.churchillnavigation.com/media/vid/37-flir-star-safire. Camera azimuth and elevation are shown at the bottom of the screen.

image. A graphical image of the helicopter's heading and orientation and the camera elevation can be shown in a corner of the screen.[80] The operator can enter an address on the touchscreen and cause the camera to slew to the targeted address.[81]

Augmented Reality Mapping System ("ARS") gives the operator access to the physical camera mounted to the helicopter and a virtual camera linked to geospatial data. The operator can link the images generated by the two cameras, or he can select and zoom them independently.[82]

At the low end of the market, commonly available aviation navigation systems costing a few hundred dollars or less superimpose maps, e.g. from Google maps, on aeronautical charts, and show the position of the aircraft on map displays as the helicopter moves around.[83] A variety of grids exist for ground-based[84] and aerial searches. ForeFlight,[85] the market leader in aviation cockpit navigation systems for iPads and other tablet computers, offers built-in search-and-rescue grids. It offers seven different search patterns[86] that can be overlaid on regular aviation charts and ground maps.[87] The Aerocomputer software on the LAPD helicopter causes the display to show the distance, the magnetic track to the target, the ETE, and the ETA.

LAPD, Fontana, and Chicago personnel take their iPads with them and refer to geospatial software and images on the iPad as often as they do the more sophisticated Aerocomputers system installed on the helicopter.[88]

---

[80] Id.

[81] http://www.churchillnavigation.com/media/vid/26-touchscreen-in-operation.

[82] See http://www.churchillnavigation.com/products/ars.

[83] See Pilot's Guide to ForeFlight Mobile, http://cloudfront.foreflight.com/pilots-guide-to-foreflight-mobile-4.4.pdf, at 21 (showing how use can select street map or aviation chart for display).

[84] See http://kyem.ky.gov/teams/Documents/SAR%20Field%20Search%20Methods.pdf (Kentucky government document explaining grids, search methods, and terminology) [hereinafter "Kentucky Guide"].

[85] www.foreflight.com.

[86] Grid-aligned, circle, creeping line, expanding square, parallel, route search, and sector. http://blog.foreflight.com/2013/09/17/foreflight-adds-annotations-comprehensive-search-rescue-functionality/.

[87] http://blog.foreflight.com/2013/09/17/foreflight-adds-annotations-comprehensive-search-rescue-functionality/.

[88] See, e.g. Aerocomputers' UC-5100 systems designed for law-enforcement, other public safety, and military applications. http://aerocomputers.com/products/ultichart/

The TFO wore an iPad mini strapped to his thigh. He referred to GoogleMaps on it periodically. The TFOs said that they found Google maps easier to use than the Aerocomputer mapping software, although Aerocomputer's computation of track to the target, ETA and ETE were occasionally useful.

The need for sophisticated geospatial software and grid construction should not be exaggerated. In most cases, the following kind of exchange between your ground forces and aircrew is sufficient:

"Where did you last see him?"[89]

"He ran into the parking lot behind the Jack-in-the-Box

The pilot and TFO confer. The pilot slows to a hover briefly as they try to spot the Jack-in-the-Box take-out restaurant.

"We see it. We're checking the back."

No special equipment preplanning is necessary; only commonsense identification of landmarks and an aircrew whose attention is directed outside the helicopter.

On the other hand, moving map displays with street addresses is of considerable assistance in finding the location of an assignment initially.

3. High intensity searchlight

Helicopter law enforcement patrols depend on high intensity searchlights at night. NightSun[90] is so common that it is used as a generic term.

In the Fontana vehicle search, the helicopter first orbited in the vicinity of the holdup, looking for the car. Not finding it, the aircrew concluded that the car had gotten on the freeway. The helicopter then searched the nearby freeways, using visual inspection outside the aircraft, aided by the NightSun searchlight, and binoculars. The FLIR was on, but was not particularly useful, because what mattered was not heat signature but visual characteristics of the target.

---

[89] This exchange is adapted from actual radio and intercom conversations during co-author Perritt's helicopter patrol with LAPD.

[90] See http://www.spectrolab.com/searchlights/

4. High-resolution color and infrared cameras, gimbled, and attached to the nose of the helicopter

Most public-safety helicopters, like ENG helicopters, are equipped with sophisticated imaging systems comprising both color video and infrared capability. Such equipment is useful in a variety of missions, but it is not necessary all the time.

The FLIR UltraMedia HD[91] is an example of a system in common use for public safety and electronic-news-gathering helicopters.[92] It permits an operator on the helicopter to zoom and pan the camera while watching the image captured by the camera on a high-resolution video monitor.[93] Typically, the TFO uses the monitor to examine detail not discernible to his naked eye, or to get the enhanced images available from infrared heat signatures of vehicles and individuals. Standard FLIR video displays allow split screen presentation, with a map on one side of the screen, and either the infrared or color video image on the other. Alternatively, the infrared image can appear on one side and the color video image on the other.

Disagreement exists on how much airborne patrol TFOs should rely on imagery technology as compared with looking out the window.[94] Means overemphasizes use of infrared imaging, however, and underrates the value of unaided visual reference

---

[91] The FLIR UltraMedia HD is an imaging gyrostabilizer that houses a Sony 1500 digital camera system capable of a 1040mm zoom.

[92] The photographic equipment in public safety helicopters is quite similar to that installed in ENG Helicopters, with two significant differences: newsgatherers are less likely to be interested in infrared images, while law-enforcement is likely to find infrared imagery more useful than color images in many cases; pristine image quality is important for newsgathering, so it can be broadcast with the same aesthetic levels as viewers are accustomed to in the regular programming; that level of quality is less important for public safety operations. What matters for public safety operations is resolution and level of detail, not so much lighting and color balance. Conversation with Erich Schmid, 10 November 2013.

[93] When ground commanders want to see live imagery, an appropriate microwave link must be established from the helicopter to the ground. To enable this, the helicopter this must be equipped with an appropriate antenna system capable of locking onto a downlink frequency and automatically tracking the ground station antenna regardless of helicopter position or orientation. The Troll Skylink HD system is an example of what is available. See http://www.trollsystems.com/index.php/antenna-design-2/airborne-antennas/skylink-hd-directional-antennas. Although ENG almost always involves downlink, it is rarely used in law-enforcement, even when the helicopter is equipped with the capability.

[94] Among other things, the temperatures in San Diego make FLIR more useful, because hotter objects like human beings stand out more clearly from the background. This is less true when ambient temperatures are higher, as in Los Angeles. Discussion with LAPD pilot and TFO, 29 Dec. 2013.

outside, searchlights for night operations, and low flight heights—on the order of 300-500 feet AGL. The airborne patrol missions in Los Angeles and Fontana showed the superiority of outside observation with the naked eye instead of relegating the aircrew to being mere camera operators.

What was important in both the LAPD and Fontana missions was skilled human observation of the ground with the naked eye aided occasionally by binoculars and searchlight. The FLIR added nothing. For most of the LAPD flight, the TFO monitored the moving map display, into which he easily entered a particular address.

Infrared imagery was used more as a backup than for primary reference. It was obvious, flying in the LAPD and Fontana patrol helicopters, that inspection with the unaided eye out the TFO's side window[95] was superior to the perspective available if the TFO had fixed his attention only on the display.

As in the LAPD operation's roof inspection, there was no need for infrared imagery; it was obvious from the search-light illuminated roof in LA whether anyone was on the roofs that were inspected, and the SUV was obvious in traffic, with or without the searchlight.

C. Personnel

All public safety support operations require at least two skilled members in the aircrew: a pilot, and a Tactical Flight Officer ("TFO"). The pilot's job is to fly the helicopter safely; this preempts any other duties he may undertake to support the mission. He must be capable of understanding instructions provided to him by the TFO and translating them promptly into flight maneuvers, while at the same time exercising judgment as to when a request would be unsafe to execute.

The TFO must understand the capabilities and limitations of the helicopter so that he does not give instructions to the pilot that would result in unsafe operations.

1. Aircrew

The minimum aircrew comprises a pilot and a TFO. The pilot flies the helicopter; he must be able to go where he is told by the TFO and incident commanders and to fly

[95] The specially modified door on the port side of the helicopter has a floor-to-ceiling window for its full width.

flight profiles that will be effective in accomplishing a particular task. In doing these things, he must be able to exercise judgment as to what is safe and what is not. He must be attentive to his altitude, airspeed, and rotor RPM. He must look out for other traffic, likely to be a particular problem because public safety incidents requiring helicopter support are also likely to draw ENG helicopters. The pilot also is responsible for communicating with FAA air traffic control, which may be more or less burdensome depending on whether the mission takes the helicopter into congested and controlled airspace.

The pilot is going to be busy enough with these essential tasks that distractions by what is happening on the ground, where the camera is pointed, and communications with ground personnel would crowd his bandwidth.

That's why the TFO is essential as a second crewmember; observes the ground, cross checks the moving map display, handles radio calls with ground units and suggests directions of flight to the pilot. He is primarily responsible for operating the camera and the searchlight. There is no question that having street-cop skills in the cockpit is necessary to do the job well. Geographic knowledge of the patrol area, knowledge of what constitutes suspicious activity, experience with how someone might flee or hide, and the likely behavior of responding officers is essential.

For the most part, the TFO makes the decision about where to go, but sometimes the pilot says, "Do you think we ought to go check that out?" He and the pilot communicate over the aircraft intercom and do not need many words to fly the mission in the right way. Both are likely to have access to the same moving map display, either on separate video displays or one they both can see. The TFO may say, "they want us to leave Sector A and go over head the southwest corner of sector B," or, "they want us to orbit the McDonald's," or, " fly a heading of 300° and drop-down a hundred feet." Intercrew communications in Los Angeles and Fontana were succinct. As with any two-member aircraft crew, the two members assisted each other in targets on the ground: "see that high school football field. It's just to the north and a bit west of that, the house with the solar cells on the roof in the swimming pool of the backyard." "Slow down at this off ramp." "Right pedal," from the TFO when he wanted the Helicopters slewed so that he could get a better view out the side window with binoculars. Once or twice, "can you come down a little bit?" when the TFO needed a closer view available from the lower height. In general, throughout this part of the mission, the helicopter remained at 500 to

600 feet AGL at a speed matching that of the traffic on the freeway. At one point, the pilot told the TFO that he was climbing a few hundred feet to remain well above some electric transmission line towers that were hard to see in the dark.

The distinction between the roles of pilot and TFO does not mean, however, that they do not constantly back each other up; the TFO is constantly helping with navigation anyway. He must be aware of the basic capabilities and limitations of the helicopter. He should supplement the pilot's lookout for other traffic. Similarly, the pilot must understand the mission tasks and be able to make competent suggestions about where and how to fly best to support them.

A larger crew is necessary for load operations, especially those involving personnel insertion or extraction. Pilots must be able to fly precise altitudes and speeds and control the helicopter so that the load does not swing. The pilot also must be able to follow intercom instructions immediately and precisely. Especially in a single-engine helicopter, the pilot must have a strategy for managing the extremely demanding situation that would result from an engine failure.

TFOs for load operations also must have carefully honed and frequently practiced skill sets, involving monitoring the load, immediately translating their observations into commands to the pilot giving interpreting hand signals, and securing load lines, tethers, and personnel vests securely.

Other crew members for load operations include a copilot to reduce pilot workload and additional crewmembers in the back to monitor the load and relay signals to the through the crew chief or directly to the pilot. Rescue personnel, who may themselves become human loads, also may be necessary.

Recruitment and training of pilots and TFOs are considered in § ___.

2. Training of TFOs and ground personnel

Public safety agencies must have an appreciation of when and how helicopter assets can be helpful. Air-One's current training program[96] is a good model.

[96] Co-authors Perritt and Cue participated in TFO and GSO training on 20 November 2013, involving personnel insertion and extraction via human load operations. See § III.4. Co-author Perritt participated

Participants in the Air-One training session included some 25 officers from northern Illinois police departments, including several from NIPAS and its Emergency Services Team and Mobile Field Force,[97] and the Illinois State Police. A representative from the FBI also participated.

The training session began with a two-hour PowerPoint presentation covering basic helicopter operations, helicopter safety and survival[98] and:

- Tactical team mobilization
- Insertion of personnel through hover step-off, hoist, rapeling, and spy rigging.[99]
- Rapid extraction of injured persons
- Tactical emergency medical operations
- Unstable platform sniper
- Logistical support via cargo haul
- FLIR and Night Sun
- K-9 support[100]

Safety was emphasized as the paramount value. Air-One never launches without the final signoff by its Safety Officer.

The session included an overview of procedures for mission coordination, including availability of suitable electronic or paper maps, communications plans and frequencies, designation of one mission coordinator for ground forces.

---

in an indoor training activity on 10 December. 2013. The details presented in this subsection are based on that participation.

[97] See § V.C

[98] The presentation included guidance on how on-board personnel can position themselves to minimize injury in the event of a crash resulting from an engine failure or loss of tail rotor control. The presenters noted that, although two Air-One Huey helicopters are equipped for long line operations, the organization prefers its twin-engine UH-1N to its single-engine UH-1V helicopter for human-external load operations and training.

[99] The FBI cautioned against use of or training on fast-rope operations, because of its risks. Long-line and short-line human-load operations can meet almost all of the needs addressed by fast-rope operations at less risk.

[100] A number of K-9 dogs have flown in Air-One training missions. They usually exited the helicopter with their tails wagging. Careful preparation is necessary, however, to prepare the dogs for the noise and movement of the helicopter.

The training included basic practical tips such as "avoid the tail rotor," and "don't shoot through the rotor discs," and reviewed common errors such as tensing up when the helicopter banks thereby increasing the risk of sliding free of restraints and falling out of the helicopter, losing situational awareness and thus knowledge of where a victim is when the helicopter lands, and various sources of distraction such as the "the lights and siren are so cool!" syndrome, remembered by every law enforcement officer from the first time he participated in an emergency response in a squad car.

Static drills in the Air-One helicopters followed, with the officers armed and dressed in their tactical gear. The purpose of the exercises was to build muscle memory on basic procedures and to make safety and effective deployment instinctive.

Although this particular training activity obviously was aimed at larger scale operations, its basic coverage of helicopter safety and capabilities and coordination between ground personnel and aircrews is appropriate for a broad spectrum of public safety personnel. Two components of a training initiative are appropriate, one aimed at current personnel, the other aimed at new officers. A similar training segment also should be added to police academy curricula so that all law-enforcement officers appreciate how helicopters complement conventional forces in various kinds of tactical situations.

The theme of the article is that helicopter support for public safety operations can be available more widely if mechanisms exist for sharing. That is true of aircraft, equipment installed on them, personnel, and training. The next Part considers organizations structures the law makes available for sharing.

V. Organizational alternatives

The thesis of this article is that more communities could benefit from helicopter support of public safety operations if helicopters were shared among multiple agencies. A variety of ways exist to accomplish such sharing. One agency may own air assets and enter into agreements with other agencies; multiple agencies may contract with a single private operator; a separate organization like Air-One can be established as a kind of mutual aid pact. Or, the Civil Air Patrol can be adapted to cover all or part of the need.

A. Owning and contracting

Public safety agencies can get access to helicopter support in four basic ways: they can buy[101] one or more new helicopters; they can buy one or more used helicopters; they can obtain surplus government helicopters through the Defense Logistics Agency program;[102] or they can contract for services from a private operator.

With any of these options, the agency may unbundle the responsibility for keeping the helicopter well-maintained, safe and for flying it effectively. For example, it could own the helicopter and contract with a private operator for maintenance; it could own the helicopter and contract with a private operator for pilots and TFOs; or it could do everything itself.

Much, but not all, of the choice among the four options ordinarily is driven by cost: if contracting costs less than owning a helicopter, it is an attractive option.

As important as cost, however, especially in the law-enforcement community, is culture and experience. As § VI.C.3 explains, it is far easier for a TFO who has significant on-the-ground law enforcement experience to do a good job flying a mission and coordinating with ground forces. That also may be true of the pilot, but less so. Not only does an experienced law-enforcement officer instinctively know how to provide good support; ground personnel are more likely to trust him.

Public-safety organization with sufficient budgets can buy one or more helicopters and perform all operational functions themselves. Examples are the Los Angeles Police Department, the Chicago Police Department, the Federal Bureau of Investigation, [103] the Maryland State Police, [104] and the California Highway Patrol,[105] and some smaller

---

[101] Leasing is another possibility, but this section does not consider leasing separately because a lease can be structure to be almost indistinguishable from a purchase, such as a 20-year dry lease for a helicopter alone, without associated services. Or it can be structured to be almost indistinguishable from the contract for services, say a six-month lease for a helicopter with crew and maintenance support.

[102] See § V.F

[103] http://www.fbi.gov/about-us/cirg/surveillance-and-aviation

[104]https://www.mdsp.org/Organization/SpecialOperationsBureau/AviationCommand/TheCommand.aspx

[105] http://www.chp.ca.gov/depts_divs_offs/airops.html

departments such as the El Monte, and Fontana, California, police departments. But most agencies cannot afford to own helicopters.[106]

Nor is it easy for them to contract for helicopter support. Some functions are so specialized that public-safety departments are unlikely to find the requisite capability in the marketplace. Economies of scale[107] that might exist for flight activities such as rides and tours, executive charter, and flight training, do not exist as between these activities and law-enforcement support. A fair amount of specialized equipment is necessary for effective law-enforcement support. Installation of such equipment in a helicopter makes it less suitable for the other flight activities that most local operators want to use their helicopters for.

Moreover, a private operator is less likely to have access to a labor market from which the most desirable TFOs and pilots should be recruited. A law-enforcement agency that organizes helicopter support internally has more options for integrating the helicopter support with its regular law enforcement activities.

On the other hand, it is not inconceivable that a national, more specialized operator might emerge. Such an operator would have a better understanding of best practices and good examples from other jurisdictions and could have a pool of seasoned TFOs and pilots who have the requisite law enforcement experience and have worked in similar functions elsewhere. The reason may have less to do with economics, considered more broadly in § V.B, than with law-enforcement culture that is skeptical of commercial operators' capacity to understand public-safety, particularly law-enforcement, needs.

Fontana, California, provides an example of the internalization of a helicopter support operation formerly performed by a contractor.

---

[106] In 2007, the United States had some 13,000 local police departments, 3,000 sheriffs' offices with primary law enforcement jurisdiction, and 49 state police agencies. DOJ Sheriff Statistics at p.6 (Table 1). Only seven percent of sheriffs' offices used aviation assets, although the number rose to 59% for offices serving populations of one million or more, and 41% for populations of 500,000 to one million. The percent drops to twelve percent and continues to decline in proportion to size for populations of 250,000 or less. DOJ Sheriff Statistics at p.10 (Table 21). Those using aviation assets use helicopters more than fixed-wing aircraft. DOJ Sheriff Statistics at p.13 (Table 26).

[107] § V.B explains economies of scale and scope.

Fontana contracted with a private operator to fly dedicated helicopter support for Fontana with one R44. The private operator was owned by an airline pilot who managed the operation remotely. It flew with part-time pilot, each one assigned a day of the week. Over time, the contract operation was increasingly unsatisfactory, largely manifested in poor housekeeping of hanger space and of the helicopters, although no threats to safety were evident. The problem seemed to be that no one involved with the private operator had sufficient personal involvement in the operation to take any real pride.

Faulker had unsuccessfully lobbied two previous chiefs to make a change in the private operator. He finally went to the third chief, himself an airplane pilot, and said, "We're paying $500,000 a year to the private operator. Make the $500,000 available to me, and I'll show you that we can set up our own operation, and that it will meet our needs much better.

The chief, with some trepidation, agreed, and allowed Faulkner to sell the idea to the city council. After he gained approval, Faulker shopped aggressively for used R44s; he knew that he could not set up operation with his $500,000 and use a larger helicopter. He was familiar with the R44 capabilities from his flying with El Monte, and the city was familiar with the aircraft because of this relationship with the contract operator.

He found an R44-law enforcement version with only 140 hours on it that had been bought by an Australian agency that had never flown it on a mission because of local personnel hostility to Robinson helicopters. It was sitting at the Long Beach airport, not flying. He made a deal for it, and put another $100,000 into refurbishing it and adding appropriate radio equipment

The aircraft flew some 1300 hours in its first year of operation and was down for maintenance for only three days of promised availability. During the first year, the air support unit was under-budget.

Now, the Department flies the R44, an R66 turbine model, and has another R66 on order. Section VI.D recounts Faulkner's leadership.

B. Market structure and contract operators

Whether public-safety contract services are available depends on the market structure of the helicopter industry. The structure of the helicopter industry, as for any industry,

is determined by economies of scale,[108] economies of scope,[109] and economic barriers to entry.[110] These are not entirely independent concepts. If one market can be served effectively only with a $3 million helicopter, the cost of that asset represents a barrier to entry. Its cost also suggests economies of scale. If the market supports only ten flight hours per month, and the helicopter is too specialized to be useful in other market segments, the rate of return will be far too low to justify investment. On the other hand, if the market supports one hundred flight hours per month, the investment can be justified.[111] The larger scale of the hundred-hour market drives the economics into positive territory.

Whether economies of scale can be captured by an enterprise is a question different from whether they exist. An operator might have a helicopter that needs one-hundred flight hours per month to break even, but lack the number of pilots needed to fly it that much, or lack the marketing capacity to pull in that many customers. Another firm with the same helicopter, more marketing muscle, and a more robust stable of pilots could realize the economies of scale.

---

[108] Economies of scale exist when a larger seller is more efficient than a smaller seller because of its size. When economies of scale exist in an industry, one expects to see consolidation: fewer, larger sellers, reflecting concentration. When economies of scale do not exist or if diseconomies of scale exist, one expects to see more, smaller operators, reflecting fragmentation.

[109] Economies of scope exist when sellers with a wider range of products are more efficient than sellers with a more limited range. Economies of scope exist when a seller can lower his per-unit costs by offering more than one product line. For example if the seller of peanut butter also sells jelly and bread, its costs per unit sold are lower than if it sells peanut butter alone. Peanut butter, jelly, bread are complementary products, and are usually sold together. One sales call and one delivery trip can provide all three products to retailers at the same cost for providing peanut butter alone. When economies of scope exist, diversification is the norm. When economies of scope do not exist, specialization is the norm.

[110] Barriers to entry can be direct and monetary in nature or they can be indirect and involve time or psychological values. For example, a person might be choosing between earning a living as a newspaper route deliveryman or starting up a helicopter service, say by buying a helicopter and offering rides and tours. The barriers to entry are vastly different. If he chooses the aviation option, he has to buy or lease a helicopter and get trained as a pilot, which requires both substantial time and substantial money. If he chooses the newspaper delivery option the barriers to entry are close to zero, especially if he already has a car.

[111] Depending, of course, on what price per flight hour buyers are willing to pay.

The industry structures of different segments of the helicopter services market illustrate these economic considerations. EMS is dominated by large national operators[112] Air Methods[113] has more than 400 Helicopters, deployed at some 300 operating bases. Most of its helicopters serve more than one healthcare institution.[114] Air Evac is only a little smaller and performs a similar role.[115] In some cases, EMS helicopters are shared through a non-profit organized by healthcare providers.[116] For example, CareFlite is a Texas, nonprofit 501(c)(3) controlled by five Dallas-area hospital systems.[117] CareFlite responds to requests from hospitals, fire departments, EMS agencies and law enforcement within a service area of more than 100 counties in a 150-mile radius of the Dallas/Fort Worth Metroplex.[118]

Some large regional or national operators serve the EMS market as well as other markets. Large oil-and-gas operators, for example, also have a presence in the EMS market. PHI, Inc.[119] bills itself as the "total helicopter company," flying offshore oil and gas, air medical, and onshore mining missions.[120] Based in Lafayette, LA, it flies 165 helicopters for offshore oil and gas missions out of 45 PHI heliports around the world.[121]

---

[112] Air Methods and Air Evac are dominant national operators. Hospital Wing is a non-profit air medical transport partnership with local hospitals, in the vicinity of Memphis. https://www.hospitalwing.com/ (describing availability of seven helicopters--six Eurocopter Astar AS350B3's and one Eurocopter EC130B4--to provides inter-hospital transfers as well as emergency scene calls within 150 mile radius of Memphis, including West Tennessee, Arkansas, Mississippi, Missouri, Alabama, and Kentucky).

[113] http://www.airmethods.com/.

[114] Air Methods, 2012 Annual Report, http://www.airmethods.com/airmethods/investors/financial-reports/detail/2013/03/01/air-methods-2012-annual-report#.Uoja9vmkra1 [hereinafter "Air Methods 2012 Report"].

[115] CITE

[116] The FAA reports that there are 74 air ambulance companies that operate about 850 helicopters in the United States. Fact Sheet – FAA Initiatives to Improve Helicopter Air Ambulance Safety, http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=11957 (Oct. 7, 2010).

[117] Texas Health Resources (Harris Methodist, Presbyterian and Arlington Memorial Hospitals), Methodist Health System, Baylor Health Care System, Parkland Health and Hospital System, and the JPS Health Network.

[118] http://www.careflite.org/AboutUs.aspx.

[119] www.phihelico.com.

[120] Id.

[121] Id. It flies a fleet of Bell 206Ls, Bell 407s, AS350B2s, BK117s, EC-145s, EC135s, Bells 222s, Bell 430s, Bell 212s, Bell 412s, Sikorsky S-76As, AW 139s, and Sikorsky S-92s. Id. See also PHI Annual Report at 16 (detailing numbers of specific types).

Oil and gas is its strategic focus.[122] Era Helicopters, LLC [123] is a somewhat smaller operator--170 helicopters--serving the offshore oil and gas transport, air medical services, search and rescue operations (SAR), firefighting, flightseeing, and disaster relief markets. Most of its revenue comes from oil and gas activities, with only seven percent from air medical services.[124]

Helicopter ENG is another segment where concentration is high. U.S. helicopters, based in North Carolina,[125] and Helicopters, Inc., based in St. Louis, dominate this market. Both provide full-service, turnkey, contracts to local stations. Although ENG Helicopters typically are branded to one station, wearing the livery of that station, resources are shared, in the sense that the contractor is responsible for recruiting, training, and dispatching pilots and equipment operators and for maintaining the helicopters.[126]

Industrial helicopter operations also are concentrated, although operators tend to be regional rather than national. Haverfield[127]and Air 2[128] are examples.

At the other end of the size spectrum, hundreds of air-taxi and flight-training operators exist, typically having two or three helicopters.[129] Most of these operators offer rides and tours; executive-charter; and aerial photography.

This industry prompts two questions: (1) Why are some parts of the industry fragmented while other parts are consolidated, and (2) Why do not public safety agencies contract for helicopter support, like hospitals and television stations?

---

[122] PHI, Inc. Annual Report at 2 (2012), http://www.phihelico.com/docs/Investor%20Relations/2012/2012%20Annual%20Report.pdf [hereinafter "PHI Annual Report"].

[123] http://www.erahelicopters.com/content; Era Helicopters, LLC, Annual Report (2012), http://ir.stockpr.com/eragroupinc/annual-reports/content/0001525221-13-000046/0001525221-13-000046.pdf [hereinafter "Era Annual Report"].

[124] Era Annual Report at 37.

[125] See http://www.ushelicoptersinc.com/

[126] The pictures on the homepage of U.S. Helicopters website all are of helicopters painted with a local TV station's logo.

[127] http://www.haverfield.com/ (electric power lines).

[128] http://air2.com/ (electric power lines)

[129] Some, like Hillsboro Aviation, www.**hillsboroaviation**.com/; and Bristow Academy, http://www.heli.com/, have much larger fleets.

In a perfect market, users of helicopter services—including public safety agencies--would contract out—purchase the services in the marketplace—if it is more efficient to do so than to perform the services internally.

Several factors inhibit contracting with private operators for public safety helicopter support. Diseconomies of scope discourage operators from seeking to penetrate this market. A small commercial operator does not need a FLIR camera, a searchlight, or radio communications on public safety frequencies to conduct its rides-and-tours and executive charter business. It does not need tactical flight officers. It could, of course, invest in these additional items of physical and human capital, but it is not clear that it would achieve advantages in the marketplace from doing so. The equipment and skills useful for public safety support would go unutilized in its original line of business.

But that accounts for the absence only of the smaller operators. Why do not larger national or regional EMS, industrial, ENG, or oil-and-gas operators have a piece of the public-safety market? Why is a private-contract sharing model so robust for ENG and EMS, and almost entirely absent for search and rescue, natural disaster, counter-terrorism, and law-enforcement support? The economies of scale are substantial for all of them. For example, Air Methods dispatches most of its community-based locations and some hospital-based locations from a centralized dispatch facility in Omaha.[130] Maintenance for a larger fleet can be organized more efficiently than for one or two helicopters.

One answer is that the elasticity of demand in the healthcare, commercial broadcasting, and oil-and-gas exploration is lower—customers find it easier to justify paying the full cost of helicopter support. The debate over health care reform long has recognized that price resistance is almost entirely absent in the market for healthcare services. Eighty percent of Air Methods revenue involves fixed monthly fees and twenty percent hourly flight fees, and does not depend on when or if customers are reimbursed by patients, healthcare insurers, or the federal government.[131] Indeed, most of the reforms over the last twenty years have focused on trying to introduce incentives to control price and quantity of services consumed.

---

[130] Air Methods 2012 Report at 2.

[131] Air Methods 2012 Report at 1.

As with other medical services, when a healthcare provider decides that helicopter transport is necessary to save a life or to avoid greater morbidity, he simply orders the service, and it is provided, with reimbursement details to be worked out later. Similarly, an ongoing ratings war drives the behavior of broadcasters. If one station in a market flies helicopter to provide viewers with overhead photography of traffic congestion and emergency incidents, every other station in the market is likely to follow suit.

These forces do not operate in the broader market for public safety support. Law-enforcement budgets are controlled at the local level where helicopters often are perceived as an expensive toy and budgets are tight. A contract with even a small operator is likely to cost an agency $500-700,000 per year. The agency can buy a Robinson R44 for that, as the Fontana, CA, story, recounted in §§ V.A and VI.D shows.

There is less resistance, however, to devoting resources to homeland security and natural disaster relief. Accordingly, to the extent that helicopter assets can be useful for these purposes, it is more likely that support can be obtained for them.

This analysis of industry structure suggests that the market is unlikely to provide the level of public safety helicopter support that would be optimal from a public interest standpoint, and as § V.A observes, law-enforcement culture militates against contracting out law-enforcement support services.

C. ENG and Public Safety

Journalism and public safety have an uneasy relationship in a free society. On the hand, both are attentive to threats to public safety: law enforcement, firefighters, emergency preparedness agencies, and paramedics seek to reduce the threats; news gathering organizations cover the threats and governmental responses. Public safety and ENG helicopters often are overhead the same incidents.

Moreover, ENG helicopters are well-equipped for police support. Both use FLIR cameras, downlink and uplink radio equipment, and sophisticated geospatial mapping capability. ENG flight crews have quite similar capabilities to those of police helicopter aircrews. Police and ENG helicopters often are interested in the same incidents.

Explicit sharing arrangements between police and ENG operators are unlikely, however; too much mistrust exists between the media and law enforcement. Few law-enforcement agencies would be willing to share all of their video with news

organizations. They are too worried about security of operations and potential liability. ENG operators are flying to do a job (to gather news in video form for a TV broadcast) for which they are getting paid. They are not getting paid to aid in public safety or assist law enforcement helicopters. Sometimes in certain scenarios the station will relay messages about a scene to law enforcement. But ENG operators are not likely go out of the way to assist.

On the other hand, *cooperation* already exists. Both sides understand the need to share the sky. ENG operators yield right of way to law enforcement helicopters, so law enforcement does not establish a TFR that would impede helicopter news gathering. An unwritten code exists between pilots and operators. If ENG operators are first on the scene and a law enforcement helicopter comes in, the ENG helicopter will back off or climb higher. Typically, law-enforcement helicopters need to fly lower than do properly equipped ENG helicopters, which can use their zoom lenses to get the video they need. The ENG pilot communicates with the police pilot—usually over a CTAF frequency—and provides basic details about the scene and the ENG pilot's intentions, and everyone is happy. If ENG is second on the scene, the ENG pilot does not expect details from the police pilot; he simply does what he does best: capture the moment without the help of law enforcement. As long as the ENG pilot stays out of the way, there is no friction between the two.

On occasion, cooperation is deeper. ENG helicopters have supplemented surveillance or search, kept alert for a fleeing vehicle or suspect, plugged holes in a perimeter, or stayed on station while the law enforcement helicopter refuels. Such assists are spontaneous. The possibility of formalizing them is remote.

Certain sensitive missions, such as barricade situations, are endangered by contemporaneous broadcasts of news imagery. Law enforcement agencies and ENG operators could agree on a protocol for designating certain situations in which broadcast would be delayed. In exchange, the public safety operator might provide video imagery and recorded radio communications, after-the-fact, to news organizations.

D. Mutual aid pacts

Given the small size of most municipalities, local units cooperate on many public-safety matters.[132] Since the early 1970s local governments have explored mechanisms for coordinating the resources and activities of local law enforcement, firefighting, public health, public works, and private-sector actors.[133]

They often do so via a legal structure of long standing, known as a "mutual aid pact." Mutual aid pacts, sometimes authorized by ordinance or statute,[134] sometimes expressed in intergovernmental contracts,[135] and sometimes completely informal, permit or obligate public safety agencies to come to one another's assistance upon request.[136] Usually, the responding personnel work under the command of the requesting agency.[137] In larger incidents, the state police and the FBI may get involved as well.[138]

In Illinois for example, law enforcement agency interest in mutual aid agreements grew after MABAS,[139] a system for statewide mutual aid for fire, emergency medical services (EMS) and associated special operational services,[140] proved successful. Concretely, the Illinois Law Enforcement Alarm System requires member agencies to maintain data on numbers of officers and supervisors, types and number of vehicles and specialty

---

[132] See generally William C. Nicholson, Seeking Consensus on Homeland Security Standards: Adopting the National Response Plan and the National Incident Management System, 12 Widener L. Rev. 491 (2006) [hereinafter "Nicholson"] (analyzing "incident management" initiative to deploy and coordinate resources from multiple agencies).

133 Nicholson at 491. (describing early efforts in California relating to major wildland fires).

[134] HHP CITE

[135] ILEAS has published a standard mutual aid agreement on its website. https://www.ileas.org/sites/default/files/main/Member%20Services/mutualaidagreement.pdf.

[136] The Illinois agreement gives law enforcement agencies the option to respond to requests with "personnel, equipment, facilities, or services," that are "available." Id. § 3.

[137] "Law enforcement personnel from the aiding agencies shall report to and shall work under the direction and supervision of the stricken agency," and are to be made available without reimbursement. Illinois Agreeement § 3.

[138] Federal Bureau of Investigation, http://www.justice.gov/jmd/mps/manual/fbi.htm (listing as a major priority "Support[ing] federal, state, county, municipal, and international partners"); United States Department of Justice ATF, Explosives, http://www.atf.gov/content/explosives (describing "national and international response teams"--who assist local and state law enforcement).

[139] Mutual Aid Box Alarm System-Illinois, State Illinois Fire Service Emergency Response Plan (July 2008), http://www.iafc.org/files/mtlAid_StatePlanIL.pdf

[140] MABAS Description at p.7.

equipment, and translators in an ILEAS database. When a member agency requests assistance through the ILEAS dispatch center, the dispatcher enters it into the database, which creates an "alarm card" that forms the basis of requests for assistance.[141] LEAS is based on the success of the Northern Illinois Police Alarm System ("NIPAS") which was formed in 1983 and now comprises some 93 municipalities in five northern-Illinois counties cooperating under NIPAS bylaws and a formal mutual aid agreement. [142]

In 2002, the Congress mandated nationwide adoption of "incident management systems,"[143] and charged the Department of Homeland Security with the responsibility of developing a National Response Plan and National Incident Management System,[144] which was issued on 16 November 2004.[145] The plan requires the establishment of local, state, and Federal Emergency Prevention and Preparedness Councils ("PPCs").[146] Both NFPA 1600 and state law require local emergency management agencies to maintain

---

[141] ILEAS, Mutual Aid, https://www.ileas.org/main/mutual-aid.

[142] See http://www.nipas.org/. See also http://www.militaryphotos.net/forums/showthread.php?71843-Nipas-Est (2006 article on NIPAS recruitment, training, and equipment). "The requesting agency's incident commander contacts the system's dispatching center, Northwest Central Dispatch System, a consortiium of 16 police and fire departments in northwest Cook County. http://www.nwcds.org/, and identifies the level of response needed. There are ten levels, each one calling for an additional five officers to respond according to a pre-determined alarm plan. Thus, Level 1 requires five officers to respond; Level 10 requires fifty.

"The dispatch center quickly sends the appropriate number of fully equipped officers to a pre-selected mobilization point within the requesting agency's jurisdiction. The incident commander also deploys a personnel officer, who records each officer's arrival and assigns each one as required." http://www.nipas.org/ ("Activating the System").

[143] 6 U.S.C. § 314(a)(5) (giving Secretary of Homeland Security and FEMA Administrator responsibility for "building a comprehensive national incident management system with Federal, State, and local government personnel, agencies, and authorities"). See http://www.fema.gov/national-incident-management-system (providing links to NIMS resources)

[144] See 6 U.S.C. § 320 (requiring "compacts" with local authorities to develop and publish standards for deployment capabilities and personnel). See generally FEMA, National Response Framework (2d ed. 2013), http://www.fema.gov/media-library-data/20130726-1914-25045-1246/final_national_response_framework_20130501.pdf.

[145] Nicholson at 494.

[146] Nicholson at 501-502.

local disaster emergency plans.[147] Mutual aid agreements are an essential part of these plans.[148] FEMA assists local agencies with training.[149]

The Incident Command System (ICS)[150] is part of NIMS and provides a method of unified command in which all responders operate under the direction of the person in charge of the incident. It has a brief section on organization of air operations.[151]

The Illinois Emergency Management Agency Act,[152] authorizes the establishment of an Illinois Emergency Management Agency (IEMA)[153]

E. State and county helicopter units

One obvious institutional mechanism for providing shared helicopter assets to smaller public safety agencies is to have the state or county provide them. The Maryland State Police is an example. The Masschusetts State Police is more modest example.

The Massachusetts State Police makes available one of its helicopters to fly overhead patrols for the Boston Police Department.[154]

The limitation on this approach is uncertain availability to meet local demands, as the Fontana, CA experience with the San Bernadino Sheriff's Department, shows.[155]

F. The Air-One model

Air-One[156] operations are headquartered at the Waukegan airport, in the northeast corner of Illinois. It uses volunteers[157] to pilot a fleet of some seven helicopters[158]

---

147 Nicholson at 540.
148 Nicholson at 541.
149 44 CFR § 360.2 (detailing process for applying for FEMA assistance)
150 http://www.fema.gov/pdf/emergency/nims/NIMS_AppendixB.pdf.
151 Id. at 101-102.
152 20 ILCS 3305/1,
153 http://www.state.il.us/iema/. See also Advisory Legal Opinion - AGO 99-22 (April 28, 1999), http://www.myfloridalegal.com/ago.nsf/Opinions/1DFC2FBB064AB97D85256761006D4C6D; http://www.ncsheriffs.org/documents/Mutual-Aid-Agreement-Oct2008.pdf.
154 http://www.policeone.com/news/1231356-Boston-patrols-troopers-team-up-in-copters/ (2007)
155 See § ___.
156 Air-One is a 501(c)(3) non-profit corporation organized under the laws of Illinois. http://www.airsupport.org/
157 http://www.airsupport.org/ (describing volunteer pilots, tactical flight officers, and ground support officers)

donated to Air-One by the Defense Department surplus program for law enforcement.[159] Air-One resources are dispatched by the Winthrop Harbor Police Department.

Air-One's helicopters formally are registered to police and sheriff's departments in Illinois and Wisconsin. Air-One provides the operational infrastructure. This arrangement is to allow Air-One's helicopters to qualify as "public aircraft."[160]

---

[158] Bell OH-58C N79PD (received 2006; operational; registered to Winthrop Harbor Police Department); Bell OH-58C N92PD (received 2007; operational; registered to Byron, Illinois Police Department); OH-58C N62PD (received 2007; Refurbishment and equipment additions underway; registered to Stephenson County, Illinois Sheriff's Office. It was received from the DoD in January, 2007); OH-58C N381WC (received 2012; refurbishment and equipment additional underway; registered to Winthrop Harbor Police Department); Bell UH-1V N67PD (received 2009; refurbishment and equipment additional underway; registered to Winthrop Harbor Police Department); Bell HH-1N N88SD (received 2011; refurbishment and equipment additions underway; registered to Kenosha County, Wisconsin Sheriff's Office);
Its operations began with the donation of a Eurocopter EC135 by a private owner. The EC135 was sold in 2007. www.airsupport.org (About Air-One: Aircraft).

[159] 10 USC § 2576a (authorizing transfer of excess property on as-is basis); Defense Logistics Agency Disposition Services, https://www.dispositionservices.dla.mil/rtd03/leso/index.shtml (describing authorization for disposition of excess DOD property to federal, state, and local law enforcement agencies) Defense Logistics Agency. A Defense Logistics Agency video, http://www.dla.mil/DLA_Media_Center/Pages/newsarticle201301151140.aspx (explaining transfer of surplus helicopters).

[160] "Public aircraft" is statutorily defined as:

"(C) An aircraft owned and operated by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments, except as provided in section 40125(b)." 49 U.S.C. § 40102(41). 49 U.S.C. § 40125(b) divests an aircraft of its public aircraft status if it is used for commercial purposes or to carry an individual other than a crewmember of qualified non-crewmember. 49 U.S.C. § 40125(a) allows aircraft to be used by one governmental entity on behalf of another with reimbursement without losing its public aircraft status. This is subject to a proviso that "that no service by a private operator is reasonably available to meet the threat." 49 U.S.C. § 40125(a)(1). The Federal Aviation Regulations ("FARs") define "civil aircraft" to exclude "public aircraft," 14 C.F.R. § 1.1 (definitions). and define "public aircraft" as:

"an aircraft owned and operated by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments; or an aircraft exclusively leased for at least 90 continuous days by the government of a State, the District of Columbia, or a territory or possession of the United States or a political subdivision of one of these governments," but only when such aircraft are "not being used for a commercial purpose or to carry an individual other than a crewmember or qualified non-crewmember" 14 C.F.R. § 1.1 (definitions). In addition, the

Air-One flies public safety missions throughout northern Illinois and southern Wisconsin. Local departments are not charged for these operations. Air-One covers its operating costs through a combination of private donations, grants from government agencies, and the flow of equipment donations from the federal government. Its organization and personnel are closely integrated with law enforcement and public safety departments.

The Air-One model offers significant advantages over the alternatives considered in this part. It also has some shortcomings, analyzed in Part VI. Because Air-One uses volunteer aircrew personnel, it reduces personnel costs. Because the availability of Air-One's support does not obligate public-safety agencies to enter into contracts, it provides flexibility to the agencies.Because Air-One helicopter services are available on-demand without requiring public safety agencies to own their own helicopters, it significantly reduces political barriers to use.

The relationship between Air-One and public-safety agencies is not, however, entirely arms-length, and this provides another advantage. Most of the members of Air-One's board of directors are public safety personnel, ranging from the sheriffs of Lake County, Illinois and Kenosha County, Wisconsin to police chiefs and other senior law-enforcement personnel from the two states. Air-One's operational supervision also is conducted mainly by people holding positions in the municipal law enforcement agencies. Beyond this means of integration between service provider and service user, the integration is strengthened further by the policies of some public safety agencies

---

FAA Administrator may exempt a federal, state, or local government from any regulation if he finds that the exemption is necessary to prevent an undue economic burden and that the unit of government has an effective and appropriate aviation safety program. 14 C.F.R. § 11.103.
"The distinction between civil and public aircraft is that public aircraft are excepted from many FAA regulations. " 68 Fed. Reg. 25486-02 (May 13, 2003). For example, airworthiness, flight manual, and placard requirements only apply to "civil aircraft." 14 C.F.R. §§ 91.7, 91.8. The same is true of the prohibition against dropping objects that may create a hazard to persons or property. 14 C.F.R. § 91.15. The maintenance requirements in Subpart E apply only to "civil aircraft." 14 C.F.R. § 91.401(a). On the other hand, basic flight rules apply to all aircraft. See 14 C.F.R. § 91.101. This includes VFR weather minimums. See 14 C.F.R. § 91.155 ("no person may operate an *aircraft*") [emphasis added].

who are making their on-duty sworn personnel available to serve on Air-One aircrews. Also, some public safety agencies pay the cost of fuel for specific missions.

The Air-One model offers the same advantages as contract provision of helicopter services for EMS and ENG, while avoiding the barriers for use of these private sector models for broad spectrum of public safety support, by relieving the public safety users of the cost of helicopter acquisition, wages, and maintenance costs.

The question, of course, as §VI.C.1 considers, is whether this volunteer model is sustainable. It is for volunteer fire department and for the CAP, but both them receive substantial subsidies from different levels of government.

VI. Extending the air one model and overcoming obstacles

Despite the attractive nature of the Air-One model, its services are not being used as intensively by Illinois and Wisconsin public-safety agencies as they could be. This part identifies the barriers that stand in the way of greater utilization and suggests ways to overcome them, in light of the achievements of other public-safety helicopter operations involving shared resources.

The major barriers to wider use of the Air-One model, both in its existing service area and in other states, relate to educating potential requesting agencies about the utility of helicopter support and the way to use it most effectively. Otherwise any operator like Air-One will be either ignored or besieged with unsuitable requests that lead to disappointment. Illinois and Wisconsin are not like California, where helicopter support of public safety has been well-accepted for years.

The place to start is to make sure everyone understands the determinants of success. In some cases, Air-One exemplifies these determinants; in other cases, it has more work to do.

A. Determinants of success

1. Integration of air and ground forces

Effective coordination of helicopter and ground assets is essential for effectiveness.[161] This can be accomplished by direct communication between aircrew and individual ground units, as in patrol support, or it can be accomplished by more formal, military-style command and control protocols.[162]

The key to good coordination is well-trained and experienced TFOs, and an appreciation by ground personnel of the power of helicopter assets.

2. Building support in the public safety community

Training police personnel to utilize helicopter assets and adopting AirOne doctrine would greatly increase the effectiveness of helicopter assets.

What the public sees on television--the long automatic weapons, the armored vehicles, the helmets and vests--are less important than more mundane things relating to communication and coordination.[163]

To a considerable extent, good coordination of air and ground forces is a function of good basic training for public safety departments.[164]

Competition and game-playing exists in the public safety community, just like everywhere else. In one case, a helicopter support unit declined to respond to any calls after 11 PM, even though it had resources available. When the helicopter unit from an adjoining jurisdiction responded to a backup call after the first unit refused, a minor bureaucratic turf war ensued, because the first unit intended its unresponsiveness to

---

[161] Tony L. Jones, SWAT Leadership and Tactical Planning 31 (1996) 31 (stressing need for effective command to assure members work as a team) [hereinafter "SWAT"]; Tactical Primer ch. 4 ("Command and Control Architecture") (describing effective command-and-control structures for civilian law-enforcement). "[Helicopters] with [their] reconnaissance and security assets can assist the force commander by providing accurate information in virtually all environmental conditions and throughout the full spectrum of conflict." FM 1-100 at 1-11. See also See also U.S. Army, Utility and Cargo Helicopter Operations, FM 3-04.113 (FM1-113), http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/fm3_04x113.pdf [hereinafter "FM1-113"], at B-3 (specifying methods of coordinating air and ground assets).

[162]

[163] Charles "Sid" Heal, Field Command xxv (2012) [hereinafter "Field Command"].

[164] See SWAT 75 (explaining elements of tactical chain of command)

build pressure from political authorities to provide additional resources. Adopting the AirOne model would reduce such gamesmanship.

In addition to being a good framework for helicopter operations in support of public safety agencies, the Air-One model makes it more likely training will take place on a statewide basis. When public safety agencies own helicopter assets separately and use them only for their own missions, they have no incentive to train the personnel of other departments. Many public safety agencies protect their independence from each other, even to the point of the Chicago police[165] and fire departments maintaining separate helicopter operations.

The Air-One model also provides a stronger justification for state funding of training, less when individual departments own helicopter assets. Then, it is easy for state legislatures and executive agencies to say, "do, and pay for, your own training."

Public safety personnel must think of helicopters at the beginning of a crisis when they might be useful. It does little good not to call for helicopter support until twelve or so hours after a search has begun. Thinking, "We tried everything else and it hasn't worked. Let's see if the helicopter can help out," in not an effective approach.

In Air-One's case, its willingness to embrace new ideas for deploying and managing public safety resources increased, once it added persons from the firefighting community to its board.

B. Fear of liability

Concern about increased liability is a major barrier to sharing helicopter resources. Nearly every requesting agency already is concerned about liability and has insurance coverage to protect against the risk.[166]

---

[165] See Chicago Police Marine and Helicopter Units, https://portal.chicagopolice.org/portal/page/portal/ClearPath/About%20CPD/Specialized%20Units/Marine%20and%20Helecopter%20Unit (describing use of two helicopters).

[166] See Michael A. Brave & Steven D. Ashley, Law Enforcement Jurisdictional Issues, http://www.ecdlaw.info/outlines/Brave%20-%20Article%20-%20Managing%20the%20Risk%20of%20LE%20Jurisdictional%20Problems.pdf (discussing risk management and other issues when law-enforcement officers operate outside their primary geographic boundaries, pursuant to mutual aid pacts and otherwise).

1. Sources of liability from using helicopters and from failing to use them

Naturally, when an agency is presented with an idea for new capabilities, especially if they are to be shared, the question arises whether the assisted municipality might incur liability that would not be covered by insurance and/or whether the assisting entity would have insurance coverage. To some extent this may be a red herring; all public safety agencies face liability concerns, especially with respect to allegations of police violation of civil rights.[167] Liability associated with these missteps far exceed liability for a helicopter mishap. But careful economic analysis and quantification of risk may not matter. Municipal decision-makers, already worried about liability for police misconduct, may simply be risk-averse when it comes to any new source of liability.

There is little doubt that entities contracting for helicopter support may be liable for injuries resulting from crashes.[168] In Talbott v. Roswell Hospital Corp.,[169] for example, the New Mexico intermediate court affirmed judgment on a jury verdict for the victim of a helicopter crash during a public-safety training exercise. Among other things, the evidence showed that the hospital defendant failed to make inquiry that would have revealed "internal problems and leadership" issues in the operation of its independent contractor helicopter operator that would jeopardize safe operation.[170]

Conflicting demands on both sides need not prevent an agreement. Illinois law expressly permits local public entities to shift liability pursuant to agreement.[171] Such agreements are common in the context of mutual aid pacts. The relevant topic for negotiation is not speculation over liability exposure, but how it should be insured against, considered in § **Error! Reference source not found.**.

---

[167] See See, e.g. Garcia v. O'Keefe, 825 N.Y.S.2d 38 (N.Y. App. Div. 2006) (reversing $206 million judgment for plaintiff on police brutality claim); see generally Tactical Primer at 20-21 (reviewing indications of increasing liability exposure for civilian law enforcement).

[168] In re September 11 Litigation, 280 F. Supp.2d 279, 291-293 (S.D.N.Y. 2003) (extensively reviewing caselaw establishing duty to persons on the ground).

[169] 192 F.3d 267 (N.M. Ct. App. 2008).

[170] 192 P.3d at 274.

[171] 745 Ill. Cons. Stat. 10/7-101.

What should be in the spotlight of risk management is the possibility that public-safety-agency liability may be increased by *failure* to use helicopter assets.[172]

While it is plausible that a public safety agency may be liable for mishaps resulting from helicopter support of its operations, it is also plausible that it might be liable for *not* using helicopter support.

Sovereign immunity is not the barrier it once was. In Prough v. Madison County,[173] the estate of a victim sued for damages, claiming that the sheriff's department improperly released a shooter from custody. The court explained the demise of absolute common-law sovereign immunity in Illinois and its replacement by a limited statutory waiver.[174] Now, a unit of local government is liable in tort to the same extent as a private party unless it can establish an immunity under the state Tort Immunity Act.[175]

A plaintiff's argument would comprise three elements:

1. The public safety agency had a duty to avoid foreseeable risks of harm to the public;
2. Failure to employ helicopter support was a wanton and willful disregard of best practices;
3. Employment of best practices would have prevented the harm to the plaintiff.

Public safety agencies have the same duty that anyone has to avoid forseeable injury resulting from affirmative acts.

Whether an agency also has a duty to act—a duty to protect a potential victim—depends on whether defendant law-enforcement agencies have a "special relationship" with the victim.[176] Physicians and surgeons have a special relationship with their patients, resulting in a heightened standard of care. Similarly, in the law enforcement context, law enforcement agencies regularly avoid liability to members of the general

---

[172] See generally Field Command at 7-10 (describing law enforcement "fiascos" and their potential to lead to increased liability).

[173] 984 N.E.2d 1177 (Ill. App. Ct. 2013).

[174] 984 N.E.2d at 1182-1183.

[175] 984 N.E.2d at 1183.

[176] Beers v. Corporation of President of Church of Jesus Christ of Latter Day Saints, ___ P.3d ___, No. 39319, 2013 WS 6184050 hns 6-8 (Idaho Nov. 26, 2013) (explaining special relationship requirement in negligence law and finding that it did not exist between church and victim of church campout accident).

public under the "public duty" doctrine, which can be overcome, however, by showing that a public agency had a special relationship with the victim.[177]

A plaintiff seeking to base liability on failure to use helicopter support could establish a special relationship and premise breach on failure to use best practices to protect the public, of which the victim was a member.

Or the plaintiff could focus its breach argument on what the public-safety did instead—conducting a high-speed vehicle chase on the ground, for example. That would premise its breach theory on affirmative acts creating a foreseeable risk of harm.

Public safety agencies have a duty, circumscribed by sovereign immunity, to avoid foreseeable risks of harm arising from the affirmative conduct of their employees and contractors. That they also may have a duty to avoid foreseeable risks of harm arising from a *failure* to act is arguable.[178]

Plaintiffs in medical malpractice cases regularly recover based on evidence that the defendants failed to use best practices in providing care. In Rosa v. Lawrence and Memorial Hospital, [179]for example, the Connecticut intermediate court affirmed a multi-million dollar verdict for malpractice against an anesthesia provider for using the wrong device to administer anesthesia.[180] Medical malpractice caselaw can be extended to the public-safety context only by establishing a "special relationship" between public-safety agencies and members of the public who are injured by their practices.

Plaintiffs recover for law-enforcement "fiascos," with the courts evading an explicit decision on whether a special relationship was established. In such cases, avoiding sovereign immunity flows from establishing breach of duty under a heightened standard. In Rivera v. Garcia,[181] the Illinois intermediate court reinstated a jury verdict and held that the parents of a teenager were entitled to recover damages for injuries and

---

[177] See Gates v. United States, 928 F. Supp.2d 63, 69 (D.D.C. 2013) (explaining relationship between public duty doctrine and special relationship).

[178] Bracken v. Okura, ___ F. Supp.2 ___, Civil No. 11–00784 LEK–BMK, 2013 WL 3223873 hn 24 (D. Hawaii June 24, 2013) (distinguishing between failure to act and affirmative acts under section 1983; granting summary judgment to defendants).

[179] 74 A.3d 534 (Conn. Ct. App. 2013).

[180] 74 A.3d at 542 (summarizing expert testimony on the standard of care).

[181] 927 N.E.2d 1235 (Ill. App. Ct. 2010).

death resulting from a high-speed police chase. The evidence showed that police officers had used an unmarked vehicle, contrary to Chicago Police Department policy.[182] Gunfire ensued and intensified as other police vehicles responded.[183] At trial the plaintiff introduced police-department procedures on pursuits and the testimony of an expert to show that the defendants "reckless, dangerous and nonconforming with applicable police practices and that the overall management of the pursuit exhibited a conscious disregard for the safety of others" thereby constituting willful and wanton conduct--the standard necessary to overcome the statutory immunity.[184] On the outcome-determinative issue of proximate causation, the appellate court held that the harm to the victims was reasonably foreseeable.[185]

So, in the context of this article, the first question is when would a foreseeable risk of harm arise from failure to use helicopter assets, giving rise to a duty. The second question is the standard according to which facts would establish a breach of the duty under the willful-and-wanton standard--usually necessary to overcome sovereign immunity.

The basic standard is a familiar one: a duty to avoid foreseeable risks of harm. In Commonwealth v. Peterson,[186] the Virginia supreme court applied this standard and reversed a damages judgment in favor of the estates of victims of the 2007 Virginia Tech shootings. The administrators of the estates had filed actions under the Virginia Tort Claims Act[187] for breach of the duty to warn arising after a foreseeable risk of harm occurred because of initial shootings in a Virginia Tech dormitory. The jury, after being instructed "the jury was told that if they found that the university employees should have reasonably foreseen that injury arising from the criminal conduct of a third party might occur but failed to warn students, the Commonwealth should be found negligent,"[188] awarded $4 million to each plaintiff.

---

182 927 N.E.2d at 1238.
183 927 N.E.2d at 1239.
184 927 N.E.2d at 1240.
185 927 N.E.2d at 1242-1243.
186 ___ S.E.2d ___, Record No. 121717, 2013 WL 5833262 (Va. Oct. 31, 2013).
187 Va. Code§ 8.01-195.1
188 Id. at *3 (describing jury instruction).

The supreme court, without contesting the basic principle, found that the plaintiffs had not established breach of the duty. The court held that the university had no basis, after the dormitory shootings, to know or reasonably to have foreseen the possibility of harm to other students. The initial investigation indicated that the shooter had fled the area and posed no danger to others.[189]

A public safety agency would be in a different, and less favorable, situation if it claimed it had no reason to know that a high-speed car chase without helicopter support would risk injury to the public.

Litigation over the 1993 Branch Davidian conflict near Waco, Texas resulted in rejection of the plaintiff's claims that the government's decisions to use tear gas, tanks, its failure to plan for a fire, all fell within the discretionary function exception to the Federal Tort Claims Act.[190]

Two things are notable about the litigation. First, is the basis on which the district court rejected the claim that the absence of firefighting equipment should result in FTCA liability: the absence of proof that armored fire fighting vehicles that were available would have been effective.[191] Second, is the use of recordings from a FLIR camera mounted on an FBI helicopter to reject certain factual claims.[192]

By negative implication from the first finding, a tort plaintiff could recover if he could show that helicopter assets were available and if they had been used in a particular way, they would have prevented harm.

In a number of cases, plaintiffs have sought to recover under section 1983 or at common law based on evidence that public safety agencies failed to use best practices. In Ewans v. Wells Fargo Bank, N.A.,[193] the court of appeals, in an unpublished opinion, affirmed summary judgment for a bank that reported a suspicious (but innocent) customer to the police, resulting in a substantial overreaction by the police. The court held that the evidence did not show that bank employees had breached their duty of care. "[O]ur

---

189 Id. at hn 10.

190 Andrade v. Chojnacki, 338 F.3d 448, 452 (5th Cir. 2003).

191 Andrade v. United States, 111 F. Supp.2d 778, 785 (W.D. Tex. 2000).

192 116 F. Supp.2d at 785-786.

193 389 Fed. Appx. 383 (5th Cir. 2010),

holding is unaffected by either side's testimony of "best practices." Negligence law is concerned with reasonable practices, not best practices," it said.[194]

The results show how difficult it is to succeed on such claims, but they also show what the analytical framework is for recovery based on failure to use helicopter assets appropriately.

In Glass v. City of Philadelpha,[195] victims of alleged police brutality in Philadelphia sued under section 1983. They claimed that the son of one of the plaintiffs was beaten up and then that the police retaliated for a resulting lawsuit by harassing and intimidating the plaintiffs.[196] Among other things, the plaintiffs alleged a cover-up conspiracy and a failure by the police department to investigate their complaints.[197] To analyze the claims, the court detailed the internal organization and procedures of the police department.[198] Among other things, the court reviewed in detail procedures for handcuffing arrestees,[199] the steps taken to investigate complaints,[200] and the computerized system for tracking outstanding warrants.[201]

The court applied the familiar standard for determining municipal liability under section 1983: "[P]laintiffs must identify a municipal policy or custom that amounts to deliberate indifference to the rights of people with whom the police come into contact."[202] And, of course, they must establish causation. "[203] In the particular case, the plaintiffs' theory was premised on flaws in the "sufficiency and legitimacy of the process employed" by the police department to investigate complaints.[204] The court held that the system was "commensurate with the 'best practices' employed by other police departments of similar size."[205] The court found liability for certain constitutional

---

194 389 Fed. Appx. at 390.
195 455 F. Supp.2d 302 (E.D. Pa. 2006).
196 455 F. Supp.2d at 310-311 (reviewing allegations).
197 455 F. Supp.2d at 312.
198 455 F. Supp.2d at 312-315.
199 455 F. Supp.2d at 320 n.20.
200 See, e.g. 455 F. Supp.2d at 334 & n.53.
201 455 F. Supp.2d at 329-332.
202 455 F. Supp.2d at 341 (internal quotations and citations omitted).
203 455 F. Supp.2d at 342.
204 455 F. Supp.2d at 343.
205 455 F. Supp.2d at 344.

violations involving detention without probable cause and for common-law false arrest, but rejected the other claims.[206]

Establishing the breach-of-duty element would depend on evidence that sound practices established in the public-safety community involve effective deployment of helicopter assets in similar situations. Such evidence is abundant from California, where the use of helicopter assets and procedures for coordinating air and ground forces has been widely established.

Establishing causation is likely to be the greatest challenge.

In Kleisch v. Cleveland State University,[207] the Ohio intermediate court, in an unreported opinion, rejected a negligence claim by a victim of a rape on a university campus. The plaintiff claimed that an understaffed campus police department, and a failure to use available security technologies, breached the defendants' duty of care to her as a business invitee.[208] The court held that the evidence showed that the defendant "had acceptable standards and best practices in place at the time of plaintiff's rape,"[209] sufficient to support the trial court's judgment against the plaintiff.

This case also demonstrates the essentiality of testimony that failure to deploy helicopter assets effectively would be a failure to employ best practices.

In McCoy v. Hatmaker,[210] the Maryland intermediate court affirmed summary judgment for a municipality. A victim's estate sued for wrongful death, premised on the failure of paramedics to use CPR after the victim was stricken by an apparent heart attack. The evidence showed a delay in the arrival of an ambulance because of confusion related to the exact location of the victim's vehicle, and that the paramedic concluded that the victim was already dead and thus that resuscitation efforts were inappropriate.[211] The court found that the plaintiff had failed to establish the wanton

---

206 455 F. Supp.2d at 367.
207 No. 05AP–289, 2006 WL 701047 (Ohio Ct. App. Mar. 21, 2006).
208 Id. at *5 ¶ 21.
209 Id. at *7 ¶ 29.
210 763 A.2d 1233 (Md. Ct. App. 2000).
211 763 A.2d at 1237.

and reckless disregard conduct necessary to overcome the qualified immunity granted public safety personnel by a state statute."[212]

Negligence law does not hold anyone liable for failing to do the impossible. The cost of helicopter support is a factor that gets figured into the negligence calculus. But it gets figured in, not in terms of the most expensive way to provide helicopter support, but in terms of as reasonable way is to provide it, as through less expensive helicopters available on a shared basis.

2. Immunity

Common-law or statutory immunity for governmental entities reduces liability exposure, and public safety agencies may insure against liability. The caselaw on governmental liability, analyzed in § VI.B, explores the role of qualified immunity under federal and state law. Federal immunity and insurance coverage may be available for assisting personnel--"second responders"--under the Federal Volunteer Protection Act.[213] The statute exempts from its liability operation of an aircraft,[214] but it limits the exclusion for aircraft to those "for which the State requires the operator or the owner of the vehicle, craft, or vessel to--

"(A) possess an operator's license; or

"(B) maintain insurance."[215]

States are preempted from imposing such requirements by the Federal Aviation Act.

It preconditions the immunity on proper state licensing, certification, and authorization of the volunteer activities.[216] It limits the immunity to volunteers of 501(c)(3)

---

[212] 763 A.2d at 1244.

[213] Volunteer Protection Act of 1997, 111 Stat. 218; 42 U.S.C. § 14501; see Carol A. Rolf, Protecting the Protectors: Liability, Insurance, and Laws Pertaining to Volunteers Involved in Homeland Security and Emergency Management, 3 Rivier Acad. J. 1 (2007) http://www.rivier.edu/journal/RCOAJ-Spring-2007/J78-Rolf.pdf [hereinafter "Rolfe"] (discussing liability and insurance issues).

[214] 42 U.S.C. § 14503(a)(4).

[215] 42 U.S.C. sec. 145003(a)(4).

[216] 42 U.S.C. § 14503(a)(2).

organizations.[217] It preempts state law except to the extent it extends the immunity for volunteers, but allows states to opt out of the immunity if they do so explicitly.[218]

3. Insurance

Two concerns about insurance confront sharing operators, including Air-One. First, will Air-One or a requesting agency have uninsured liability exposure because of the joint nature of the missions? Second, will the use of safety pilots or pilots-in-training as described in § VI.C.1 jeopardize insurance coverage? The answer to both questions is "no."

Any insurance policy is a contract between the insurer and the insured which obligates the insurer to pay the insured if certain events occur. Insurance policies are *aleatory contracts*.[219] Any conceivable insurance policy limits the risks that it covers. For example, a policy might provide liability[220] and hull[221] coverage for mishaps that occur during search and rescue missions, while excluding mishaps that occur during personnel insertion or extraction even if they are incident to a rescue. Similarly, a policy might include mishaps that occur during operations within a certain geographic area, and exclude mishaps that occur during operations outside the area. Other limitations, particularly relevant in the helicopter-sharing context, might cover a specific helicopter only when it is being flown on missions for the agency to which it is registered and not when it is being flown on missions for other agencies.

These are not direct limitations on helicopter operations; they do not obligate the insured to use the helicopter in any particular way. Rather, they leave the helicopter operator exposed financially to potential liability when it operates outside the coverage limits of the policy.

The aviation insurance market right now is very competitive as to price and other policy terms. It is easier for a new operator or a long-term operator entering a new

---

[217] 42 U.S.C. § 14505(4)(A).

[218] 42 U.S.C. § 14502.

[219] In re Texas Ass'n of School Boards, Inc., 169 S.W.3d 653, 658 (Tex. 2005) (contract in which promise is conditioned on the happening of an "event of chance").

[220] Liability insurance obligates the insurer to pay civil judgments to which the insured may be subject and to pay the insured's costs of litigation.

[221] Hull Insurance obligates the insured to compensate the insured for the value or replacement cost of a helicopter that is damaged or destroyed.

market segment to get insurance coverage at a reasonable price. Then if the operator proves that it has a safe operation, the insurer will renew the policy without insisting on whatever restrictions it imposes on new customers after the market has become tighter. Insurers are hungry for business and therefore more willing to accommodate the plans of potential customers.[222]

A typical policy has a limitations-on-use section early in the policy language.[223] This section typically excludes coverage for certain operations and usually limits use of the covered aircraft to named pilots and other pilots within the scope of an Open Pilots Warranty ("OPW").[224]

A limitations-on-use section might exclude flight training, or it might exclude law-enforcement support missions. Or, it might limit law-enforcement support to support of particular agencies. It certainly is not feasible to add a requesting agency as a named insured after a request for support is received. On the other hand, a straightforward solution is within reach: an operator like Air-One can make certain that the named insureds cover all public safety agencies within the relevant territory. Air-One itself, for example could include all public safety agencies in northern Illinois and southern Wisconsin. There is no reason to suppose that this would cause a material increase in premium; the risk of a mishap is the same, and the damages and injuries likely to result from a mishap are the same.[225]

Most aviation insurance policies also limit coverage to flights commanded by named pilots[226] and other pilots meeting the requirements of an "Open Pilots Waiver"

---

[222] Conversation with Dan Ferguson.

[223] "Limitations on Use:

"To be covered under this policy the aircraft must be owned, maintained or used only for the purpose shown on the Coverage Summary page and described below and flown only by a pilot or pilots described on the Coverage Summary page." Schneider Leasing, Inc. v. U. S. Aviation Underwriters, Inc, 555 N.W.2d 838, 839 (Iowa 1996) (quoting language from policy and finding triable issues of fact).

[224] See Old Republic Ins. Co. v. Gormley, 77 F. Supp.2d 705, 707 (D.Md. 1999) (OPW covers all pilots meeting specifications rather that only named pilots).

[225] Conversation with Dan Ferguson.

[226] A typical insurance application requires each named pilot to indicate:

- Type of helicopter pilot certificate and rating
- Logged PIC hours:

("OPW"). In Old Republic Insurance Co. v. Gormley,[227] for example the district court granted declaratory judgment to a helicopter insurer. It held that the insurer was not liable under the policy because the pilot in command was not a named pilot in the policy and did not meet the requirements of the Open Pilot Warranty.[228]

Two interpretations of pilot limitations are of interest in public-safety support helicopter operations. One favors the insured. In some states, coverage extends beyond flights flown by named pilots and those meeting OPW requirements, unless the insurer can prove that the unqualified pilot caused the loss. In AIG Aviation, Inc. v. Holt Helicopters, Inc.,[229] the court refused to enforce the limitations of an open pilot warranty in the absence of proof that the pilot's lack of experience meeting the requirements of the warranty was the cause of the accident.[230]

The other is a trap that favors the insurer: the language of the policy, as in *Gormley*, may exclude coverage when anyone but a named insured or someone meeting the OPW requirements "manipulates the controls" or "operates" the aircraft.[231] There's no reason

---

- Total
- Total reciprocating
- Total turbine
- In model to be insured
- Total time last 12 months

Estimated helicopter time next 12 months. Global Aerospace, Application for Helicopter Hull and Liability Insurance, www.global-aero.com/.../helicopterhull_and_liability_insurance_applicat... ("Pilots" section)

[227] 77 F.Supp.2d 705 (D. Md. 1999).

[228] Gormley, 77 F. Supp.2d at 707 (quoting OPW; pilot of helicopter, killed in crash had total time of only 250 hours in helicopters).

[229] 198 S.W.3d 276 (Tex. Ct. App. 2006).

[230] The Open Pilot Warranty said:
"[a]ny commercial pilot with rotary wing ratings properly certificated by the FAA having a minimum of 1,000 logged flying hours in rotary wing aircraft, including 100 hours of which are in Robinson R22 model aircraft." 198 S.W.3d at 279 (quoting open pilot warranty language). Turbine qualification was irrelevant because the insured aircraft was a piston-engine Robinson R22.

[231] "Most policies state that the aircraft may only be OPERATED by a current and appropriately rated pilot who is either named on the policy or one who meets the Open Pilot Warranty." Insurance Facts and Observations, Helicopter Edition '08, http://www.aviationinsurance.com/images/uploads/FO-Facts%20and%20Observations%20Helicopter08.pdf (explaining named-pilot and OPW limitations may apply to any pilot operating the aircraft, not just to one serving as pilot in command); http://www.avioninsurance.com/faq.php#600 (asserting that named pilots is the preferred approach,

that an insurer should want such language; the only thing a rational insurer cares about is whether the PIC is qualified.[232] If, on the other hand, the language limits coverage to qualified pilots serving as "pilot in command," coverage would exist even if the pilot in command lets his unrated nephew fly straight-and-level and make gentle turns. If the language is "manipulates the controls," it would not.

Close attention to such policy language is necessary for any helicopter operation that establishes a pilot recruiting pipeline such as the one proposed in § VI.C.2.c)

The turbine-time requirement is likely to be the most significant barrier, at § VI.C.1 explains. The most effective way for an operation like Air-One to deal with its insurance concerns regarding pilot coverage is to recruit a limited number of well-qualified pilots who do not meet the turbine-time criterion and to list them on the policy as named pilots. The insurance carrier will reevaluate his underwriting decisions according to the detailed data submitted by the named pilot. The operator can expect a premium increase, but it may not be as great as anticipated, and the operator will not be confronted with the uncertainty of whether its coverage is valid.

Insurers are likely to have a benign attitude toward such an approach. First of all, requiring significant turbine time for helicopters makes little sense. Helicopter RPM is stabilized so, unlike with fixed-wing turbine aircraft, there is no significant engine spool-up time to be concerned about. It is a requirement that mindlessly got carried over from fixed wing insurance practices. [233]

"There is no reason that any insurer in its right mind would oppose letting a low-time guy fly in the left seat and log the time, whether as a safety pilot or second-in-command or a student. Having any kind of pilot there is always better than having an empty seat. At the very least, the left-seat guy can work the radios and perform other non-flying duties, thus reducing the load on the PIC.

"No one would increase the rates for this or deny coverage. Everyone in the industry knows this is how people build turbine time. The only issue would be if the left-seat

---

explaining that open pilot warranty covers pilots meeting certain defined requirements, and observing that most common reason for denying claims is that an unapproved pilot was flying the aircraft).

[232] Conversation with Dan Ferguson.

[233] Interview with Dan Ferguson, 21 November 2013.

guy is paying for dual instruction; that puts the operation in a different underwriting category. If he's not paying for it, and if it's even arguably mission related, there should be no impact on coverage or premiums." [234]

Fixed criteria as to the qualifications of named pilots do not exist. Commercial policies involve enough money that there are actual negotiations over the terms of the policy. It is less likely that an insurer will refuse coverage that that it would increase the premium if the insured wants more flexibility. "I could be a named pilot for a Huey even though I don't have a helicopter rating, but the premium would be astronomical."[235]

C. Labor markets: Establishing a pipeline for qualified personnel

Any helicopter operation depends on an adequate supply of skilled personnel, especially pilots and mechanics. Attention to the labor supply is particularly critical for a volunteer enterprise: what incentives exist for volunteers, despite the absence of compensation?

1. Engines and limits of volunteerism

Volunteerism has its limits. Volunteer fire departments are struggling all over the United States as lifestyles and work patterns change. When most people worked on farms or in small shops and businesses near where they lived, it was not difficult for a volunteer firefighter to put down his work to respond to a fire. Now, is more likely that one's job is remote from residential communities, increasing the distance to be traveled to respond. Moreover, employers are less likely to have a stake in ensuring emergency services in communities other than where they operate, and therefore are less likely to tolerate a sudden request for time off to go fight a fire.[236]

Any helicopter support that does not keep helicopters in the air and pilots until close on duty proximate to the helicopter a significant part of the time can provide only limited assistance to the patrol function and for incidents such as robberies, muggings, or shootings that emerge during patrol or as a result of 911 calls. It simply takes too long to round up a crew and get the helicopter to the scene. On the other hand, a volunteer

[234] Interview with Dan Ferguson, 21 November 2013.
[235] Dan Ferguson conversation, 6 December 2013.
[236] Interview with Jim Swartz, CEO of CareFlight, 29 November 2013.

operation has no significant limitations for assisting in barricade situations for law enforcement, search and rescue, and disaster relief. A degree of planning is inherent in such missions. The volunteer organization can train alongside other public safety personnel, participate in their planning, and coordinate deployment. Thirty-minutes or so to launch the helicopter makes little difference.

2. Pilots

As the availability of Vietnam era military-trained helicopter pilots diminishes, an organization like Air-One can reinforce its pipeline a pile of volunteers by taking advantage of certain plateaus in the career pathways for civilian helicopter pilots.

As the following subsections explain, the solution lies in maintaining high standards for PICs, while developing a pipeline for less experienced pilots to gain experience and training necessary to meet the PIC requirements.

a) Requirements

High standards for pilot qualifications are important for the demanding missions of public safety helicopter support. Many public safety support missions take place at night in rural areas where ground lighting is scarce. One cannot count on moonlight. Flight conditions in such circumstances are largely indistinguishable from instrument meteorological conditions ("IMC").[237] Moreover, effective utilization of helicopter capabilities require flying low and slow—flight regimes in which the skill level to effect a successful autorotation landing in the event of an engine failure are high. Sworn peace-officer status is necessary for pilots to be able to participate in classified anti-terrorism briefings.

At the same time, high standards diminish the supply of potential volunteer pilots. Setting and maintaining stringent standards for pilots in command, however, is not inconsistent with providing training and development opportunities for less experienced pilots to keep the pipeline a potential pilot volunteers flowing.

Air-One publishes two requirements for its volunteer pilots:

1. professional first-responders

[237] IMC is the category under the FARs during which VFR flight is prohibited.

2. minimum of 1,500 hours as PIC in rotorcraft and 250 hours as PIC in turbine powered rotorcraft, a Commercial rotorcraft certificate with Instrument-rotorcraft rating.[238]

Pilot recruitment poses somewhat different problems from recruitment of TFOs and other personnel. As the minimum number of hours increases, the pool of available pilots shrinks rapidly.

The pool of helicopter pilots with this level of experience who are sworn law-enforcement officers is even smaller. Accordingly, a program of pilot recruitment that does not dilute the standards for pilots-in-command, while opening up the field for more candidates is desirable.

Practices and philosophies about personnel vary widely, especially in the law-enforcement community, on the question of whether it's easier to "make a cop out of a pilot," or make a "pilot out of a cop."

The LAPD, for example, prefers to make pilots out of cops. So does the Fontana police Department. LAPD requires at least five years experience as a ground patrol officer, a private rating in either airplanes or helicopters, and 100 hours flight time before selection as a pilot. Once an officer is selected as a pilot, however, the department pays for his commercial flight training, and indeed conduct ground school and certain parts of his flight training.

The Maryland State police, in contrast, regularly advertises for civilian pilots. In 2010, most of its helicopter pilots were civilians.[239]

b) Career pathways

An organization like Air-One can benefit from a plateau that exists in the career development for professional helicopter pilots. It could offer well-trained but less

[238] airsupport.org ("People")

[239] CITE Maryland Legislature, Study of MSP helicopter maintenance (organization chart).

experienced pilots the opportunity to build turbine time by volunteering to fly in the left seat of Air-One helicopters.[240]

The goal of an aspiring helicopter pilot, typically, is to qualify for a flying job that pays $80,000 to $100,000 annually. Such salaries are available in jobs comparable to public safety support – emergency medical services and industrial operations such as transmission line patrols and oil and gas exploration. Such positions typically require 2,000 to 3,000 hours total time, and 1,000 hours turbine time.[241]

First, the pilot must obtain a rotorcraft rating. This requires total flight time of 40 hours[242]-- usually it takes 45 to 65 hours—of flight instruction and solo time. The result is a private pilot certificate. Then, the pilot must obtain a commercial rating, which requires total flight time of 150 hours.[243] These two steps are obtainable for civilians only by paying for a professional pilot training program.[244] The cost is comparable to that of a college education. The most popular primary helicopter trainer, a Robinson R22, costs on the order of $300 per hour for dual time and $250 for solo time.[245] So the aspiring pilot must have the means to pay $75,000 or more for flight training.[246]

During this phase, the pilot also would obtain an instrument rating, which requires another 40 hours of dual instruction,[247] some of which may be concurrent with the

---

[240] Most helicopters are flown from the right seat, although some are flown from the left seat. The discussion that follows assumes that the pilot in command is in the right seat and that the left seat is is the copilot position in the cockpit.

[241] See http://www.justhelicopters.com/tabid/255/category/1/Default.aspx [viewed 28 Nov 2013] (Air Medical Resource Group EC135 pilot requirements: 3,000 total, 1,000 turbine; MedTrans Bell 207 pilot requirements: 2,000 total, 1,000 turbine; PSEG electrical line patrol pilot requirements: 2,000 total, 1,000 turbine).

[242] 14 C.F.R. § 61.109(a) (setting aeronautical experience requirements).

[243] 14 C.F.R. § 61.129 (setting aeronautical experience requirements for commercial rating).

[244] Unless the aspiring pilot owns his own helicopter, which is unlikely.

[245] See http://www.hillsboroaviation.com/en/page/helicopter_flight_training_rates_and_fees; http://www.midwesternhelicopter.com/rates.htm (quoting $230 per hour for R22 solo time and $40 per hour for instructor); http://www.flymidwest.com/details.aspx?NavID=124 (quoting $295 per hour for dual instruction in R22); http://www.corporatehelicopters.com/staticpages/index.php?page=helicopter-instruction-rates (quoting $245 her hour for solo time and $275 per hour for dual instruction).

[246] See Helicopter Academy, http://www.helicopteracademy.com/ (quoting $75,125 for commercial rating and additional $5,000 for CFI rating). Loans are available to finance the costs. See http://www.hillsboroaviation.com/en/page/helicopter_flight_training_financing.

[247] 14 C.F.R. § 61.65 (specifying aeronautical experience for instrument rating).

requirements for the commercial rating. Now, the pilot has some 200 hours, all of it likely in piston-driven helicopters. From this point forward, the pilot can begin earning modest compensation for flying – maybe $25-$35,000 per year at first. His immediate goal is to build total time.

The opportunities at this stage for turbine helicopter jobs are few and far between, so most pilots get their certified flight instructor ("CFI") rating[248] and build time giving flight instruction, or fly rides and tours in piston driven helicopters, or a combination of the two. A flight instructor at a reasonably busy flight school can expect to fly 70-80 hours per month and acquire a thousand hours total time after a year to a year-and-a-half.

Then, the focus has to shift to building turbine time. This can be obtained mainly by flying with larger tour operators that fly turbine helicopters.[249] Once the pilot has, say 500 turbine hours and 1,500 to 2,000 total hours, jobs in other, more demanding, sectors become available, such as executive charter, ENG, [250] EMS, and industrial applications such as powerline and pipeline patrols and oil and gas drilling.

c) Safety pilots as recruitment pipeline

One possibility under discussion by Air-One's leadership is to establish a new position of "safety pilot,"–essentially a copilot, although none of Air-One's helicopters require two pilot operation. Helicopter pilots with several hundred hours and a commercial rating would qualify. They would be trained as TFOs and then allowed to build time in the public safety helicopters as copilots or safety pilots, building turbine hours while undergoing further Air-One tactical training.

---

[248] No additional flight time is required for a CFI rating, but a written and flight test are. 14 CFR § 61.183.
[249] See http://www.sundancehelicopters.com/about-us/employment/ (requiring 1,000 total hours). Sundance flies AS350 and EC130 helicopters, both turbine powered. http://www.sundancehelicopters.com/. See also http://www.temscoair.com/pilots.php (requiring 1,000 total hours; no turbine requirement). Temsco flies Hughes 500Ds and AS350s, both turbine powered. http://www.temscoair.com/aircraft.php. Once a pilot proves himself for a season flying rides and tours, Temsco offers him the opportunity to move to industrial assignments such as long line operations.
[250] See http://www.justhelicopters.com/tabid/255/category/1/Default.aspx [viewed 28 Nov 2013] (Helicopters Inc. ENG full-time and part-time pilot requirements: 1500 total and 250 turbine).

Once a safety pilot is selected, he she would be sworn in as a reserve deputy sheriff. Police academy training would ensue in due course, interleaved with tactical Air-One training, qualifying the pilot to be a sworn peace officer.

After a safety pilot completes an internal check ride, he or she would be available to fly ferry and demonstration missions in VFR conditions–relieving the fully qualified Air-One pilots from those missions. This approach has precedent. The Maryland State Police, for example, recruits civilian SIC pilots with a minimum requirement of 1200 helicopter hours, without a specific turbine time requirement.[251]

Even though Air-One is not subject to Part 135 of the Federal Aviation Regulations, applicable to commercial operators such as air charter and air taxi operators in the private sector, the Part 135 requirements for pilot training[252] would be a useful template for the details of Air-One's safety pilot program.

As § VI.B.3 explains, insurance limitations are not likely to be a barrier: a trained pilot in the left seat is better than a non-pilot.

In this scenario, Air-One would recruit helicopter pilots who have their commercial ratings, and who may be working as flight instructors, to volunteer for Air-One. In exchange for their time and undergoing training for flight duties and public safety responsibilities, pilots would have the opportunity to build turbine time without having to pay for it.

d) Reservations about civilian pilots

Some public-safety agencies deal with the pilot shortage problem and their preference for all aircrew members to have law enforcement experience by accepting relatively low-time pilots. Captain Faulkner, in Fontana, for example, is open to low time pilots. One TFO in December 2013 has a private helicopter rating that he earned on his own after be became a TFO. Now he has received Police Department support to work toward his commercial rating. He was about ready to take flight test at the time of the

---

[251] http://www.jsfirm.com/job/Pilot-Rotary+Wing+Maryland+State+Police+Civilian+Helicopter+Pilot+I,+Second-In-Command+(2271)/Middle+River-Maryland/jobID_64512 [visited 28 November 2013].

[252] 14 C.F.R. §§ 135.291-135.301 (crewmember testing requirements); 14 C.F.R. §§ 135.321-135.351 (imposing training requirements, and defining qualifications for check pilots).

visit. Another, younger, TFO working toward his private helicopter rating, has had a total of 25 hours.

Substantial experience as a street officer is necessary, in Faulkner's opinion, for TFOs and pilots. Four reasons exist:

First, only an experienced police officer can function effectively in an airborne patrol car. Only he can relate to the needs of the ground officers the helicopter is supporting and understand how to fly the mission to be most effective.

Second and at least as important, is the traditionally proud and insular law enforcement culture. "You put a kid in the cockpit who has had no experience or only a year or two of experience as the street officer, then you invite derision: 'pretty boys aviators.'"

Third, experience shows that some low-time civilian pilots without law enforcement experience demonstrate a lack of concern for police work. Despite his conviction that low-time pilots can do the job, Faulkner's experience convinces him that a model that recruits low-time civilian pilots cannot work. "It's well understood that what they really want–*all* they want—is to build flight time toward the magic thousand hours. We tried it once or twice, and found that such pilots were so eager to fly that they were willing to make safety compromises with the weather. When they got up, they could fly the flight profile requested by the TFO competently, but they were zoned out. They simply weren't interested in law enforcement; they were interested only in flying."

Finally, pilots without ground experience may lack peer respect necessary to integrate ground and air-support operations. It wouldn't do any good, Faulkner's opinion, to recruit low-time civilian pilots and send them to the police academy, because this would not earn the respect of the rank-and-file ground officers. Only street time earns that. "You have to earn it", is the mantra.

3. Tactical Flight Officers

More than pilots, TFOs must have intimate familiarity with the missions to be supported. Experience and training as a law-enforcement officer, an emergency medical technician, or a firefighter is essential for this job classification. Almost everyone agrees that relevant experience as a street cop, followed up by intensive TFO training is necessary for the aircrew member who is going to be most involved in coordinating with ground personnel and then suggesting appropriate flight profiles to the pilot.

Active-duty public safety personnel are ideal because that opens up the possibility of resource sharing by their employing agencies making them available to fly helicopter missions.

The supply of such personnel is ample because the qualifications they need are those of the requirements of their pre--helicopter jobs. Usually the novelty and excitement of flying helicopter support operations represents an adequate incentive for them to volunteer. If they are not assigned as a part of the regular duties, of course, the usual calculus as to whether someone wants to volunteer for any activity applies—weighing the excitement and novelty against family and educational obligations and other alternatives for spending leisure time.

4. Recruiting mechanics

Volunteer mechanics are desirable for the same reasons that volunteers are desirable to fill other positions. But mechanics do not have the same incentive to volunteer that pilots do, because pilots need to earn flight time to qualify for employment. If they cannot do it in paid positions, many are willing to do it by volunteering.

Mechanics, like those in any other skilled profession or trade, enhance their career prospects by gaining experience, but opportunities for mechanics to gain paid experience in entry-level positions abound.

One possibility is to explore with A&P mechanic schools[253] the possibility of internships, so that A&P students during the last part of their training would be placed in public safety helicopter support and work under the supervision of more senior already-qualified A&T mechanics.[254]

That would have the effect of extending the mechanic manpower available on a volunteer basis.

---

[253] See e.g. http://www.swic.edu/aviation-maintenance-technology/ (one-year program in southern Illinois); http://www.redstone.edu/about/whyredstone.asp (one-year program in Denver area). Neither program presently advertises an intern program.

[254] See Terry Palmer, High-Tech Economy Drives Demand for Technicians, Rotor, Fall 2013 at 22, 24 (urging helicopter operators to develop relationships with A&P students, including internships).

D. Leadership and marketing

Charismatic, resourceful leadership makes all the difference between success and failure. Faulkner is an example of the kind of leadership necessary when air support operations are first established.[255] Dan Bitton and the rest of the Air One leadership are others. Burdette is an example of leadership necessary to keep it going and to grow it. The job goes far beyond buying helicopters, recruiting personnel, and supervising them. Effective marketing and promotion to the right constituents is essential.

The most important constituency is the ground force to be supported by helicopters. The helicopter support operator must anticipate a natural reaction of an officer on the street: "You're going to steal my call." The operator must demonstrate—not just promise--that the first unit responding still remains in charge, while helicopter support functions as a special kind of backup.

Marketing is part of it. As with any marketing, it must begin with an identification of a unmet need and a matching of the actual capabilities of the helicopter operator with the need; if an operator is not capable, financially or in terms of human resources, to fly airborne patrol to support law-enforcement, it should focus on what else it can do to be helpful. Doing those things well will build support as it builds capability to broaden its missions, including airborne patrol if that's what it wants.

Helicopter support operators must resist an approach/avoidance conflict, lamenting the fact that too few agencies appreciate what helicopters can do, but being reluctant to undertake an aggressive public education and public-safety-training program because they fear that it will stimulate requests for support they cannot meet, given their limited resources and limited budget.

The problem, of course, is that public support for more resources, including financial resources, depends on the public and the public safety community's knowing about the operation, its capabilities, and wanting more.

As agencies are developing strengthening their understanding of what helicopter support can do, the helicopter support unit should be proactive instead of waiting to be called out. For example, when a natural disaster occurs, the helicopter unit should not

---

[255] The main question about the future of the Fontana operation is whether it is well enough established to survive Faulkner's retirement within about a year.

only increase its readiness to respond to a call; it should launch over to the site in order to offer intelligence, at least, and other types of support that it knows it can provide.

Effective marketing, however, does not mean seizing the limelight. It is far better if the usual ground personnel and their commanders get the credit for successful mission in the press and media and then say, "we couldn't of done it without the helicopter support," that if the helicopter unit is the first to give a press conference bragging about what it did.

The Fontana, California, Police Department Air Support Unit provides a good example of how resourceful leadership sells helicopter support and makes good decisions about affordability. It shows how effective public safety helicopter support can start. Its history illustrates some of the crucial ingredients: a passionate, charismatic, articulate, and resourceful advocate, good sense about cost, benefits, and how to create a win-win situation for crucial constituencies, and alignment of political stars.

Historically, Fontana had received air support from the San Bernardino County Sheriff's Department, which patrolled the whole county.[256] The availability of a helicopter for the western part of the county where Fontana is located was sporadic, because of a shortage of aircrews. Faulkner, a sergeant at the time, persuaded Fontana and several surrounding municipalities offered to observers in exchange for the Sheriff's department assigning a helicopter to the western part of the county. Each agency agreed to participate assigning an observer to fly one day p/week. The Sheriff's department agreed with alacrity. Faulkner was flying R44s as a part-time pilot with the El Monte Police Department's air support unit.

Because he was familiar with El Monte's sharing operation, he embarked on a campaign to enlist some surrounding municipalities, beginning with the senior officers he already knew. His pitch was that Fontana would provide helicopter support in exchange for in-kind contributions. Rialto contributed hanger space. Colton contributed $16,000 worth of gasoline. Redlands promised to fly its fixed-wing airplane over Fontana when the Fontana helicopter was not in the air. Everyone contributed at least one body—a pilot or TFO.

---

[256] The facts in this section results from a conversation between co-author Perritt and Capt. David Faulkner, Fontana Police Department, 20 December, 2013.

Faulkner's mantra from the beginning was that any air support operation must justify its existence by the quality of the services it provides to officers on the street. He was and remains convinced that the key to any support operation is the quality of the key of TFOs. If they are not enthusiastic and resourceful in making their experience as street policemen palpable to ground forces, success is impossible. It doesn't matter what kind of equipment is available.

Recruiting an initial team was not a problem. Faulkner had a robust network of pilots and TFOs who flew for El Monte.

Faulkner heard that Robinson was developing a turbine version of the R44, but was not yet sure whether it would offer a law-enforcement option. He went to see Kurt Robinson. Together they went to the factory floor to see the first R66, as it was being assembled. Faulkner turned to Robinson and said, "you're going to sell me that helicopter." Robinson protested and said that it was far too early to know who the first purchaser would be. "No," Faulkner repeated. "Listen to me. I'm telling you you're going to sell me that helicopter." Robinson was interested in having a police department to showcase the new model, and they made a deal.

In the experience of the Fontana unit, the first responding ground unit is perfectly happy to have the air support set up the perimeter; that relieves him of a difficult task and later criticism for doing it incorrectly. Also, intellectually, everyone understands that one can set up a better perimeter from the air than from the ground.

Marketing morphs into politics. Politics obviously will determine whether funding is available at all and, if it is, the functions it is available to support. It is well understood in political science that public policy decisions in a democratic society depend, not only on numbers in support and opposition, but also on how strongly members of one or the other camp feel about an issue and how focused they are. If one side is diffuse and the other concentrated, the concentrated side almost always wins.[257]

That is a particular problem for mobilizing governmental support for public safety helicopter operations. The opposition is concentrated and passionate; supporters are diffuse and relatively indifferent. Opponents fall into two roughly defined camps:

[257] CITE poli-sci literature.

residents of the area – who are concerned about noise and the risk of a crash; and those who are concerned about invasions of privacy and are instinctively wary of any increase in law-enforcement capability. The second camp is particularly concerned about the law-enforcement drone issue.[258]

It is not clear that anything can be done to reduce opposition from these two camps, but proponents can be proactive to reduce the persuasiveness of their opposing arguments, by explaining how tight procedures and intensive training reduce risks of accidents and reduces noise pollution over populated areas.[259]

On the favorable side, proponents of more robust helicopter support for safety operations can make sure that the public discourse over disaster relief, search and rescue, and counterterrorism includes accessible and evocative materials on what helicopters can do. In this regard, proponents should be opportunistic, press advisories supervisors whenever a disaster strikes, an active shooter incident occurs, or someone is rescued. Proponents also can be opportunistic with respect to mishaps, such as high-speed automobile chases and hostage situations that go wrong.

VII. Funding sources and mechanism

There is no such thing as a free lunch. Air-One is essentially a volunteer fire department, facing the usual challenges of any such volunteer-based operation. The Air-One leadership is forced to decline many less critical requests simply because it would cost too much to fly them.

Public or private funding for a full-time operation, staffed by a combination of volunteers and paid professionals is unlikely. An operation like Air-One must piece together support in cash and in kind from a variety of sources. It may be able to supplement this with a steady flow of grants from the federal government, especially if it links its training and operations to the Civil Air Patrol.

The main determinant for the level of funding required is whether the requisite capabilities can be sustained with funding only for equipment acquisition and training, or whether additional funding is necessary for operations.

---

[258] See § XXX (discussing opposition to drones).

[259] See Means at XXX (emphasizing flight profiles to reduce noise footprints).

If funding for operations is necessary, how much depends on whether volunteers are available to perform some or all of the necessary functions. An operation requiring paid pilots, mechanics, TFOs, GSOs, and dispatchers obviously is going to have a much bigger budget than one in which volunteers are available for some of all of these job classifications. Even when operations rely on volunteerism, as in the case of Air-One, the CAP, and volunteer fire departments, out-of-pocket expenditures for fuel, oil, and maintenance may be necessary.

Air-One's Jet Ranger helicopters burn about 40 gallons per hour, and its Huey helicopters burn about 85 gallons per hour. Fuel for turbine engines costs $6.77 per gallon. That means an out-of-pocket cost starting at $270-$575 for every Air-One mission.[260] In addition, Air-One incurs, as a variable cost,[261] whatever maintenance is largely dependent on the number of hours on each helicopter. All operators of helicopters for hire[262] must perform 100 hour inspections on each helicopter.[263] A typical 100-hour inspection on a Huey helicopter costs XXX. In addition, the age of the Helicopters makes parts hard-to-find, increasing maintenance costs further.

A. Local funding

No general impediments exist to funding public safety helicopter support organized in any of the ways considered in Part V. Funds can be made available to individual agencies to provide their own helicopter assets; they can be provided for agencies to enter into contractual relationships with commercial operators; they can be provided for agencies' contractual relationships with nonprofit operators, and they can be provided directly to non-profits like Air-One. Economies of scale for pilot recruitment and assignment, maintenance, and training suggest that helicopters can be utilized more efficiently if they are provided for through shared helicopter: support—that is the thesis of this article. In other words public-safety agencies would have less budget strain if they support Air-One than if they provide helicopter support for themselves.

---

260 Assuming that the average mission requires three hours of flight time.

261 A variable cost is one that varies depending on flight time, such as fuel costs. In contrast, fixed costs do not vary with flight time: hangar rental, helicopter purchase costs.

262 Uncertainty exists as to whether Air-One's operations meet this test.

263 14 C.F.R. § 91.409(b).

Restrictions exist, of course, in particularized appropriation legislation.[264]

In theory any one or more of several mechanisms could ensure basic funding to an operation like Air-One:

- Contracts and grants from local public safety agencies at the hundred thousand dollar level
- Grants from state or federal levels of government.

If contracts are the mechanism chosen, Air-One must be careful to avoid the tendency of people entering into long-term contracts for helicopter services to have unrealistic expectations about their availability.

One straightforward way to fund the direct operating costs of Air-One's operation is to have the public service agencies reimburse Air-One for its direct operating costs when it flies a mission for them. But that system raises concerns about Air-One losing its nonprofit status and the reimbursements constituting a commercial relationship that would violate the terms under which the helicopters were donated by the government.

An alternative is to have the agencies that might call on Air-One's services to make periodic grants, under contracts that define Air-One's obligations in exchange for the grants. This also might raise concerns about the nature of the revenues under the grant and compliance with the terms under which the helicopters were received from the Government.[265]

The Department of Homeland Security cannot make operating grants,[266] but there is no reason it cannot broker agreements between Air-One-like nonprofits and units of state, county, or local government wishing to contract for its services.

More creative funding models employed by some types of public safety support organizations are impracticable for an operation like Air-One. Many volunteer fire departments solicit subscriptions from area homeowners and businesses, who may have an incentive to pay it because of reduced insurance rates. Otherwise they rely on

---

264 CITE restrictions in Homeland Security appropriation act.

265 QUOTE and CITE grant restrictions.

266 CITE

donations and fundraisers such as pancake breakfasts and raffles.[267] Some EMS helicopter operations such as CareFlite and Air Evac substantially supplement their revenue streams with memberships – a kind of de facto insurance in which individuals in the service area pay relatively small amounts annually--$60 for CareFlite in exchange for a commitment to supplement their regular insurance coverage so that they do not have to pay any anything for an air evacuation.[268]

In both of these instances, it is not difficult to persuade an individual or a small business owner that his personal property may be directly at risk. For an operation like Air-One, the risk is more diffuse and indirect. It is much harder for an individual contributor to perceive that he personally or his business property might need helicopter support services in the event of a crime, a lost or distress person, or a natural disaster.

It might be feasible, however, to employ a subscription model in which the subscribers are the local public service agencies.

There is less resistance, however, to devoting resources to homeland security and natural disaster relief. Accordingly, to the extent that helicopter assets can be useful for these purposes, it is more likely that support can be obtained for them. Then, a good organizational concept will make sure that they could be used for a broader spectrum of public safety support. The same infrastructure of human and physical capital that supports natural disaster relief and antiterrorism efforts also supports law-enforcement and search-and- rescue missions.

As section VII.B suggests, the CAP funding model provides an interesting alternative for support.

---

[267] See Wayne L. Eder,How to Form a Volunteer Fire Department (Oct. 29, 2009), http://voices.yahoo.com/how-form-volunteer-fire-department-4753572.html (also reviewing training requirements and acquisition of surplus vehicles and other equipment). See also http://www.fema.gov/welcome-assistance-firefighters-grant-program (summarizing FEMA grants available for training and equipment acquisition).

[268] Swartz interview.

B. Federal funding: the Civil Air Patrol

The Civil Air Patrol ("CAP") is a nationwide organization, defined as the "U.S. Air Force auxiliary."[269] It uses volunteer pilots organized through a military hierarchy imitating that of the Air Force itself. It owns some of its own airplanes, but many volunteer pilot-members fly CAP missions in their own aircraft. An important part of its mission is recruiting young people into aviation careers and activities through its CA P cadet program.

The CAP is not an alternative to the Air-One model, because does not fly helicopters, and its mission is limited to search and rescue – mostly for downed aircraft. The authorizing statute says XXX.

But, the CAP *is* the Air-One model, writ large.

Most interesting for purposes of this article is the magnitude and breadth of financial support the CAP receives from the federal government. The CAP receives funding and a general kind of oversight from Air Force headquarters. The Air Force is authorized to provide aircraft and other equipment, to detail personnel, to pay travel expenses, and to pay staff at the CAP national headquarters.[270] It may use federal agency resources to "provide assistance requested by State or local governmental authorities to perform disaster relief missions and activities, other emergency missions and activities, and nonemergency missions and activities."[271]

Its members are entitled to federal workers compensation,[272] and the Air Force pays for liability insurance.[273]

---

[269] 10 U.S.C. § 9441 (defining CAP as a federally chartered nonprofit corporation, not an instrumentality of the federal government). But see 10 U.S.C. § 9442(b)(2) (making CAP an instrumentality of the United States when carrying out mission assigned by Secretary of the Air Force).

[270] 10 U.S.C. § 944 (b) (enumerating types of support authorized). The Secretary of the Air Force must prescribe regulations for administration of the CAP. 10 U.S.C. § 9448.

[271] 10 U.S.C. § 9443(a) (authorizing CAP to use federal agency resources, including aircraft, motor vehicle, computers, and communications equipment for purposes quoted in text).

[272] 5 U.S.C. § 8141 (authorizing federal workers compensation benefits to volunteer civilian members of the CAP).

[273] 10 U.S.C. § 9443(d) (obligating Secretary of the Air Force to provide funds for the cost of liability insurance).

According to its 2012 Annual Report,[274] in Fiscal year 2012, the CAP had 34,000 adult members and 26,000 cadets.[275] It flew 703 search and rescue missions with 382 finds and 32 lives saved, 191 counterdrug missions and 719 other state support missions. Most of its flight hours, however, were for orientation of CAP cadets and ROTC cadets.[276] It received $1.9 million in state funding and $27.8 million in federal operations and maintenance funding.[277]

A 2012 GAO report on the CAP, required by Congress,[278] urged greater use in Homeland Security missions.[279] It noted, however, that the Posse Comitatus Act may prevent deeper CAP involvement in law-enforcement support missions.[280]

"In providing support to civilian law enforcement agencies, CAP is precluded from participating in the interdiction of vehicles, vessels, or aircraft, or in search, seizure, arrest, apprehension, surveillance, pursuit, or similar activity. CAP is also unable to transport prisoners, contraband, and law enforcement officers in direct support of an ongoing mission, or when hostilities are imminent. CBP officials told us that because of these restrictions, CAP is unable to provide the type of support that is necessary for some law enforcement activities."[281]

Department of Defense regulations implementing the Posse Comitatus Act prohibits DoD personnel from:

"Evidence collection; security functions; crowd and traffic control; and operating, manning, or staffing checkpoints . . . ."[282] or from

---

[274] http://www.capmembers.com/media/cms/16874web1_689D49FCE91EF.pdf.
[275] CAP 2012 Report Statistical Overview.
[276] GAO Report at 10.
[277] CAP 2012 Annual Report Statistical Summary.
[278] See 155 Cong. Rec. H5428-01 (May 12, 2009) (Congressional debate and support for legislation requiring the GAO study).
[279] Civil Air Patrol Homeland Security Missions (2012) (GAO 13-56). The Coast Guard, in particular, expressed skepticism about the CAP's capability to assume an expanded role.

[280] Id. at 14.
[281] Id. at 15.
[282] 32 C.F.R. § 182.6(a)(1)(iii)(A)(5).

"Surveillance or pursuit of individuals, vehicles, items, transactions, or physical locations . . . ."[283]

It excepts "A member of the Civil Air Patrol, except when performing missions pursuant to 10 U.S.C. 9442(b)."[284]

The most serious CAP deficiency was not mentioned in the GAO report: the fact that it flies no helicopters. The CAP used to employ helicopters, but not since 1988.[285]

The Congress could provide additional support and resolve the liability question by enacting a new statute treating Air-One-like organizations like the CAP, but under the jurisdiction of the Department of Homeland Security. Or, it could amend the CAP statutes to encompass Air-One like organizations. Or it could authorize Air-One activities as activities of the CAP.

The disadvantage of this approach would be that it almost certainly would reduce likely flexibility to mold organization and operations to the differing needs of different regions of the country.

VIII. Conclusion

Unless the public safety community, particularly the law-enforcement community, becomes more open-minded and willing to share assets and to use lower-cost helicopters, it is likely to find expensive turbine helicopters dedicated to patrol missions gradually replaced by inexpensive drones. Helicopter support for search-and- rescue, SWAT team operations, and disaster relief, on the other hand, will continue to require larger helicopters.

---

283 32 C.F.R. § 182.6(a)(1)(iii)(A)(6).

284 32 C.F.R. § 182.6(a)(2)(v)

285 See http://captalk.net/index.php?topic=6167.0 (blog) (discussing no-helicopter policy and reasons for it).