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Sticks, Bricks, Bytes & Drones - Opportunities and Challenges at the New Frontiers of Construction Law

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> It is, of course, an indispensable part of a scrivener's business to verify the accuracy of his copy, word by word. Where there are two or more scriveners in an office, they assist each other in this examination, one reading from the copy, the other holding the original. It is a very dull, wearisome, and lethargic affair. I can readily imagine that to some sanguine temperaments it would be altogether intolerable. For example, I cannot credit that the mettlesome poet Byron would have contentedly sat down with Bartleby to examine a law document of, say five hundred pages, closely written in a crimpy hand.
>
> -- Herman Melville, "Bartleby, the Scrivener: A Story Of Wall Street" (1853)[2]

I. INTRODUCTION

The law (and lawyers) are sometimes accused of impeding rapid ("disruptive") technological change.[3] Whether the charge should be taken as insult or praise[4], it is true that change doesn't always align perfectly with existing law.[5] New technologies arrive before their impact is understood by courts, legislators and lawyers, and lacking an adequate legal framework to guide their development. A knowledge gap can complicate this. Engineers and lawyers speak different technical languages and serve different functions. (Gutenberg probably didn't consult with counsel while inventing the printing press). And the law may need time to adjust, and function properly, as experience guides legislatures and courts.[6]

Construction lawyers have borne witness to the impact of legal change on the construction industry and their law practices, both in the past and present. Safety elevators and tower cranes helped make the modern skyscraper possible. Licensing, inspection and code requirements needed to develop and adjust, along with specialized insurance requirements, government agencies tasked with their safe operation; lawyers charged with helping guide their clients in rapidly changing and not always certain legal territory had to develop and adjust as well. More recently, we have also benefited from software that has long since automated Bartleby's "very dull, wearisome, and lethargic" task of manually comparing two documents.[7]

Thank goodness for automated document comparison and spell checking in modern word-processing software! But these same innovations created new legal quandaries, forcing lawyers to learn about such things as meta-data and grapple with discovery requests related to electronic data using civil procedure rules that pre-dated widespread use of computer technology.

We focus specifically on two areas of technological change in the construction industry and their potential significance to construction lawyers, as of this writing in early 2015: (1) the availability of inexpensive drones with on-board video and camera capabilities and (2) cloud-based version control and contract drafting and management systems. These are still broad areas of inquiry, and we do not hope to offer definitive treatments of either. Rather, we provide a window into current uses of these technologies and some of their stated benefits. We then identify some of the legal issues construction lawyers may consider when clients use such tools. Section II focuses on drone technology. Section III focuses on innovations in the contract drafting process used by many in the construction industry currently, including sophisticated version control functionality. We conclude with a discussion suggesting how what we call "payment and performance drones" might be used to create with self-executing smart construction contracts that can enforce contractual obligations with little or no human intervention.

II. Enter the Drones

Once the topic of dystopian Science Fiction[8], construction industry drone use is now fact, not fantasy, so much so that some in the industry seek to create their own in-house drone programs, and seek FAA approval for their use and insurance companies have started to write endorsements to standard CGL policies to address drone related-risks. (Some insurance companies have also requested FAA approval for their own drone programs)[9]. Drones offer tantalizing benefits: a $1,500 device can provide functionality that until recently might require hiring a helicopter service for a higher price and the promise of less data. But under existing law,

a five (5) pound drone is nonetheless is treated as an “aircraft” under federal law that was written long before this technology was available, and its use may come with many requirements. Drone use may also not fit neatly into existing insurance policies or construction contracts. And the fact that they can capture vast amounts of information, or be programmed to act autonomously, and act without human intervention, raises questions (and risks) to consider and balance against their many stated benefits.

Our treatment of drones begins by attempting to provide a working definition of “drone”, accompanied by common drone use cases that demonstrate some of the many stated benefits that they may offer construction industry participants. We follow that by focusing on three specific legal issues that their use may implicate: licensing, insurance, and data security and privacy.

A. What exactly is a "Drone"?

The generic term “drone” means many things in the popular imagination. As one commentator notes: "It is nearly impossible to differentiate between the $17 million ‘Reaper’ surveillance attack drone used by the military, from a $1,500 commercially available, camera-equipped, hand launched drone available at retail stores and online."[10]

A Drone may be defined generically as: "a. an unmanned aircraft or ship that can navigate autonomously, without human control or beyond line of sight: the GPS of a U.S. spy drone. B. (loosely) any unmanned aircraft or ship that is guided remotely: a radio-controlled drone.[11] (The term “unmanned aircraft system” or “UAS” is often used interchangeably with the word “drone.”) As we’ll see below, using the word “aircraft” to define “drone” creates a legal wrinkle that anyone considering using a drone for commercial purposes will want to think through. Cost or use aside, drones are mechanical devices that fly without an on-board human pilot.

1. Types of Drones

Like aircraft with on-board human pilots, drones fall generally into categories. Some drones use a fixed-wing design[12] and others use rotors, like a helicopter. A "quadcopter" falls into the latter category. Frequently used in construction projects, such drones use a helicopter-like design, with four rotors.[13] Smaller lightweight drones are typically battery powered, limiting flight time to the amount of available charge but removing risks associated with flammable fuel.[14]

In addition to their physical features, drones can be distinguished by the amount of control a human operator has over their flight. Three general categories can be identified: (1) human operated (by remote control); (2) automated; and (3) autonomous.[15] A human operated (or "piloted") drone is what it sounds like – a human operator is in complete control of the drone's flight operation. "Automated" or "automatic" drones and "autonomous" drones can be distinguished by the kind and quantity of "independent" judgment the device is able to exercise. As these commentators explain:

> In the unmanned aircraft context, an automated or automatic system is one that, in response to inputs from one or more sensors, is programmed to logically follow a pre-defined set of rules in order to provide an outcome. Knowing the set of rules under which it is operating means that its output is predictable.
>
> An autonomous system is capable of understanding higher level intent and direction. From this understanding and its perception of its environment, such a system is able to take appropriate action to bring about a desired state. It is capable of deciding a course of action, from a number of alternatives, without depending on human oversight and control, although these may still be present. Although the overall activity of an autonomous unmanned aircraft will be predictable, individual actions may not be.[16]

Flight automation is a well-established technology and available in commercial drones. Whether or not current drone technology incorporates truly "autonomous" functionality is beyond the scope of this essay. These authors say no. They distinguish between a system that acts based on instructions (automatic, but not autonomous) and one capable of acting on its own with "human

levels of situational awareness" (autonomous). Others, perhaps overstating their case, have described drones that integrating "artificial intelligence" that provide for semi-autonomous flight.[17]

This may seem of little practical use of interest to a construction lawyer or their clients, but new laws being written may distinguish between these autonomous and automatic drones – in fact, recently proposed Colorado legislation (discussed below in Section II.C.1 would ban the use of "autonomous" drones.)

B. Drone Use in Construction and Related Operations

Aerial photography is not a new invention. Neither is the use of "unmanned aircraft" for remote aerial observation or engagement. As 2011 U.K. Ministry of Defense report observes:

> Unmanned aircraft have been around since the early days of aviation, exemplified by such systems as the World War II German Fritz X Glide Bomb and the proliferation of US systems such as the Firebee that played a major role during the conflict in Vietnam. In the last 5 years, the packaging of satellite positioning systems with advanced sensors, communication links and computer processors, have given Unmanned Aircraft Systems (UAS) a capability that previously existed only in the realm of science fiction.[18]

Until recently, drone technology has been largely out of reach for commercial applications. This has changed, allowing for some of the applications discussed below.

1. <u>Remote Site Access</u>

Drones fitted with cameras now make it possible (and economical) to see remote or difficult to view areas in and on construction sites. Lifts and aerial photography from conventional piloted aircraft can provide similar functionality but cost more and are harder to implement.

This description illustrates the use of drone technology to monitor material and equipment in connection with new road construction at a remote location:

> Tricky terrain (small hills with thick forests) meant that flight heights had to be defined with high precision in order to obtain a homogenous image resolution

> and comply with safety regulations. We were able to deliver a rapid response in terms of the time that takes between the assignment of the project and the delivery of the final product. . . . The final outcome consisted of an orthomosaic and a 3D model of the site, enabling fill & cut volume control. Finally we posted this data on a GIS platform we developed ourselves.[19]

Even where site access is not difficult, drones might also be used to access difficult or dangerous to access areas on a construction site (discussed below, in section 4). In addition, miniaturized drones might enter and access building components themselves and perform interior inspection, including such things as interior HVAC components.

2. Photogrammetry -- Better Design and Estimating

Using "photogrammetry", drone-provided photographs can be combined to quickly and inexpensively create detailed 3-D models. There are many potential benefits here – from providing greater accuracy in quantity estimating or in building conceptual designs.

A recent FAA Exemption Request (The FAA Exemption process is covered later in this paper) by Rose Paving Company supports its request by explaining how drone provided photogrammetry might help identify needed areas of road repair, citing cost and safety benefits among the reasons for granting its exemption requests:

> The requested exemption would support an application for a commercial Certificate of Authorization to use the system to support asphalt paving and ground utilization. The DJI Phantom 2 Vision+ system consists of a lightweight (2.73 pounds) battery operated aircraft, based on a small hand-held remote control operating on 5.8 GHz and is CE and FCC compliant. In addition to the remote control, the DJI Phantom 2 Vision + offers the pilot with First Person Viewing "FPV" via WiFi connection and ground control receiver independent of the main remote control device. The aircraft carries an onboard geo-referenced still camera that allows it to conduct precision photogrammetry and videography at the resolutions necessary for accurate isolation of necessary safety repair areas for private property only. This high-resolution data can provide owners of large parcels the ability to direct necessary funding to safety and nonsafety areas of concern on paved surfaces, thus eliminating wasteful spending and maintaining a proactive safe environment for the general public.[20]

Image data from drones can also make it possible to create "virtually built" concepts and design pre-construction, and early in the design phase of a project. Accurate and inexpensive site

surveys may offer benefits throughout the construction process – from early conceptual design through final completion, assisting in decision-making and communication among all involved parties.

3. Verifying Contract Performance

Drone technology can be used to help verify contract progress and performance needed to process and approve (or reject) a contractor's payment application. Instead of relying solely on human verification, drone data could allow real-time visual verification, and can incorporate a variety of photographic techniques and technologies. (As we'll see in a concluding section, such technology might be coupled with a smart contract and used to partially automate the construction contract payment application process).

Approving a payment application for an elevated concrete pour illustrates the cost benefit a drone might provide. Assume it's necessary to provide overhead photography to document reinforcement of post-tensioning cables or rebar at a high elevation. A helicopter photography service could be hired to provide aerial photography on a scheduled basis. Alternatively, a drone operator using an iPhone might use a $1,500 inspection drone – owned by the prime contractor, and also available for use on multiple jobs.

4. Enhancing Site Safety

A January 2015 Exemption Petition from a North Dakota coal mining operator describes safety benefits it says using a fixed-wing drone would provide, many of which would apply to a wide range of construction operations:

> a. The UAV's bring safety to daily survey operations: there is no need for the humans to access dangerous working areas anymore (mining pits, spoil piles, or rough uneven areas). The missions can be programmed and reproduced reliably as often as needed for regularly updated maps.
>
> b. The UAV's are a cost-effective solution. It is cheaper to operate a UAS rather than an aircraft or other ground systems for the same results

> c. Users can save time and work more efficiently by using a UAV. A mission does not need a long preparation time or long deployment constraints, or long waiting time for perfect weather conditions unlike, for example, the use of satellites and aerial photography. Initial results are accessible directly on-site, which is impossible with images provided by satellites or manned aircrafts.
>
> d. Lastly, but most importantly, is the safety factor of allowing a visual view of the minesite while keeping the employee a safe distance away. The ability of UAV to remotely gather data in a safe manner cannot be completed as safe or timely with any other current technology.

These are compelling and undeniable benefits and factors that the FAA has taken into account in granting recent exemption requests.[21]

C. Legal Issues Raised By Drone Use

What's the catch? Like any part of the construction process, drone benefits that must be balanced with operational risks and legal requirements. True – it is possible to spend $1,500 on a quadcopter and use it on a construction site. But doing so is by no means a risk-free proposition. Several of those considerations are addressed below.

1. <u>Regulatory Considerations – FAA Requirements for Commercial Drone Use</u>

If a Drone is, in fact, an "aircraft" it falls within the Federal Aviation Administration ("FAA") jurisdiction, and its use is circumscribed and regulated by Federal law. There has been and continues to be much uncertainty in this area. Briefly, under a 2012 law, the FAA is under a statutory mandate to provide an updated regulatory framework by September 2015, which would more easily accommodate drone usage, and account for use cases not anticipated by current law.[22] That process has been delayed and it's doubtful that the deadline will be met.[23] In the interim, drone operators seeking exemption from FAA requirements have filed Exemption Requests, several of which we discuss in the preceding section, and below.

As this paper was being finalized, the FAA issued a Notice of Proposed Rulemaking for "The Operation and Certification of Small Unmanned Aircraft Systems." Per the FAA, the Exemption process remains in place during the rulemaking process, prior to the rules' adoption:

> If the proposed rule were adopted, operators would be permitted to participate in certain commercial activities from which they are currently prohibited. The proposed requirements are intended to enable the opportunity for the private sector to develop commercial small UAS businesses and facilitate legal and safe operations. Currently commercial activity using a small UAS is prohibited by federal regulation unless the civil aircraft has an airworthiness certificate in effect and operations are approved by the FAA on a case by case basis via an exemption from the pertinent regulations. [24]

The rules have not been implemented as of February 2015, and the FAA is receiving public comments.

On January 8, 2015, the FAA issued guidance to U.S. Law enforcement about the unauthorized use of "Unmanned Aircraft Systems", which provides the following statutory definition of aircraft and distinguishes between hobby/recreational and other drone uses:

> A UAS is an “aircraft” as defined in the FAA’s authorizing statutes and is therefore subject to regulation by the FAA. 49 U.S.C. § 40102(a)(6) defines an “aircraft” as “any contrivance invented, used, or designed to navigate or fly in the air.” The FAA’s regulations (14 C.F.R. § 1.1) similarly define an “aircraft” as “a device that is used or intended to be used for flight in the air.” Because an unmanned aircraft is a contrivance/device that is invented, used, and designed to fly in the air, it meets the definition of “aircraft.” The FAA has promulgated regulations that apply to the operation of all aircraft, whether manned or unmanned, and irrespective of the altitude at which the aircraft is operating. For example, 14 C.F.R. § 91.13 prohibits any person from operating an aircraft in a careless or reckless manner so as to endanger the life or property of another.
>
> An important distinction to be aware of is whether the UAS is being operated for hobby or recreational purposes or for some other purpose. This distinction is important because there are specific requirements in the FAA Modernization and Reform Act of 2012, Public Law 112-95, (the Act) that pertain to “Model Aircraft” operations, which are conducted solely for hobby or recreational purposes. While flying model aircraft for hobby or recreational purposes does not require FAA approval, all model aircraft operators must operate safely and in accordance with the law . . . [25]

In short, the fact that a drone is small doesn’t mean it’s not an aircraft. And it it’s used for commercial purposes (which would include many of the construction use cases described below) the FAA takes the position that it’s an aircraft subject to FAA regulations requirements.

Exemption requests allow parties seeking to use drones for commercial purposes to receive relief from requirements that the FAA determines are inappropriate or inapplicable to drones, given their smaller size (and depending on their intended purpose). For example, St. Louis based Clayco Construction sought and received an exemption from certain FAA regulations to "allow commercial operation of small Unmanned Aircraft Systems ('sUAS') for aerial imagining to monitor and ensure safety of construction site."[26] The FAA Grant of Exemption summarizes Clayco's description of the device thus:

> The petitioner states the unmanned aircraft (UA) it seeks to operate weigh no more than 10 pounds when fully loaded, operate, under normal conditions, at speeds no greater than 50 mph/ 43.4 knots, carry no explosive materials or flammable liquid fuels, and operate exclusively within a secured area detailed in the Manual, without any pilots or passengers on board. Additionally, the petitioner states that in the event of Global Positioning System (GPS) or communication signal loss, the UA possesses the ability to return to a pre-determined location within the security perimeter, as defined in the Manual, and land. The petitioner states the UA have the capability to abort a flight in case of emergency, facilitated in part by on-board parachutes that can be deployed in the event of motor loss or other emergency. Parachute deployment deactivates the aircraft's motors and enables the vehicle to float to the ground.

Among other things, Clayco sought exemption from regulations applicable to products and parts and certifications; marking and registration materials; pilot licensure and training requirements; flight manual requirements; pre-flight pilot preparation requirements; dual control requirements for flight-instruction aircraft; altitude restrictions & limitations; rules applicable to flying over congested areas.

The FAA granted Clayco most of its exemption requests, subject to a variety of requirements, finding it "in the public interest"[27]. However, it denied Clayco's request to operate the drone "without an FAA certified pilot . . . The FAA does not possess the authority to exempt from the statutory requirement to hold an airman certificate, as prescribed in 49 UC § 44711." Instead of imposing a requirement that a drone operator hold a current FAA commercial pilot

certificate, it concluded that a private pilot license and third class medical certificate would be "appropriate for the proposed operations." (A full discussion of FAA conditions for granting the Exemption, including a 100 hour training program for the drone operator can be found in the Exemption's conclusion).

The FAA has taken enforcement action and issued fines in other cases in which it has alleged involve dangerous or unapproved drone operations. For example, in *Huerta v. Pirker*[28], the FAA took enforcement action against an individual who the FAA alleged used a drone to take video and photographs in exchange for compensation and did so in a dangerous fashion. According to the FAA's Complaint:

> respondent operated the aircraft, inter alia, directly towards an individual standing on a sidewalk causing the individual to take immediate evasive maneuvers so as to avoid being struck by [the] aircraft; through a tunnel containing moving vehicles; under a crane; below tree top level over a tree lined walkway; under an elevated pedestrian walkway; and within approximately 100 feet of an active heliport. Respondent allegedly conducted these maneuvers as part of flights for compensation, as the aircraft was equipped with a camera and respondent was being paid by [a third party] to supply aerial photographs and video of the UVA campus and medical center.[29]

An initial decision by an ALJ dismissed the FAA's complaint, holding that the UAS was a model aircraft and thus not subject to the regulation the FAA relied upon in its complaint. Reversing and remanding, the full NTSB held that a UAS falls squarely within the statutory definition of aircraft: "An aircraft is 'any' 'device' that is 'used for flight.' We acknowledge that the definitions are as broad as they are clear, but they are clear nonetheless."[30] The FAA and Pirker settled on January 22, 2015, with the amount of the fine reduced to $1,100.[31] The FAA has investigated and issued subpoenas in other recent cases involving commercial drone.[32]

State laws are also developing to address Drones. In Colorado, for example, a bill before the State Legislature (Senate Bill 15-059 (2015) would imposed a number of restriction on drone usage: "including but not limited to flying the unmanned aerial vehicle within the operator's

sight, for no farther than three miles, for no more than four hundred feet above the ground, during daylight, inside uncontrolled airspace, and at least five miles from an airport or other location with aviation activities. **An unmanned aerial vehicle that is used for recreational purposes shall not use autonomous operations.**" (Emphasis added: defining 'autonomous operation' may prove a more challenging task that legislators realize). Several other states have enacted or are considering drone related legislation.[33]

2. Insurance Issues

Assume that while using a drone to monitor site safety, something goes terribly wrong and an errant drone causes property damage or bodily injury. Would a standard CGL policy maintained by a contractor (or provided in an OCIP or CCIP) apply? Maybe; maybe not.

One of the ISO[34] CGL forms excludes coverage for: " 'Bodily injury' or 'property damage' arising out of the ownership, maintenance, use or entrustment to others of any aircraft, 'auto' or watercraft owned or operated by or rented or loaned to any insured. Use includes operation and "loading or unloading"'. This exclusion is subject to an exception for "Liability assumed under any 'insured contract' for the ownership, maintenance or use of aircraft or watercraft[.]"[35] If a construction contract contains no such assumption of liability, an insurer would likely argue that the exception does not apply.

An enterprise that decides to incorporate an in-house drone operation might decide to procure stand-alone aviation coverage, such as the policy discussed below. Such policies may provide first party property and third party coverage. See, for example, this coverage grant from a Lloyds' Aviation policy in which the insurer agrees:

> To pay on behalf of the Insured all sums which the Insured shall become legally obligated to pay as damages, including damages for care and loss of services, because of bodily injury, sickness or disease, including death at any time resulting therefrom, sustained by any person, excluding any passenger, caused by an occurrence and arising out of the ownership, maintenance or use of the Aircraft.[36]

But standard aviation policies may themselves need to be tailored to drone-related risks, particularly if they include exclusions applicable to significant areas of drone-related risk. Noting this potential mismatch, one major international insurer offers stand-alone drone coverage, offering as potential benefits policy language drafted specifically to respond to the exposures of unmanned aircraft, including coverage encompassing operators and other non-pilot crew, no exclusions for "loss arising from electronic malfunctions and failure of electronic components, accessories and power equipment" present in standard aviation policies, and "optional coverage for hi-jacking or any unlawful seizure or wrongful exercise of control by means of 'spoofing'".[37] This may be the first time that the word "spoofing" has appeared in an insurance policy, but reflects a new kind of risk that a construction company contemplating drone operations may have never conceived of before -- the possibility a third party could take over control of its equipment, remotely.

In lieu of aviation or stand-alone drone coverage, it may be possible to cover some of that risk under available endorsements modifying the CGL. Perhaps recognizing a market opportunity, some insurers have responded by issuing Drone Endorsements, like the following, which replaces the standard exclusion set forth above:

> This exclusion does not apply to “bodily injury” or “property damage” arising out of the operation of “unmanned aircraft systems” owned or operated by or rented or loaned to any insured when used in your operations for:
>
> 1. Aerial reconnaissance including the collection of photographic, video, radar, infrared and ultraviolet images;
>
> 2. Data collection;
>
> 3. Crop monitoring;
>
> 4. Mapping; or
>
> 5. Additional operations as described in the SCHEDULE of this endorsement.

> "Unmanned aircraft systems " (UAS) means a robotic aircraft weighing less than 26 pounds, unless another weight limit is shown in the SCHEDULE, without a human pilot on board and with its flight controlled by an onboard computer or remote human operator.[38]

Thus, using drone technology may necessitate review of applicable insurance programs to evaluate adequacy and availability of coverage. Existing policies may need to be modified to provide greater assurance of coverage, and additional policies put into place, and new types of coverage considered.

3. Other Legal Considerations

It would be a tall order to cover every other potential legal issue that drone use implicates. We offer several other areas where a drone's stated benefits raise simultaneous legal risks.

1. **Privacy**. A drone's ability to see and store significant amounts of data raises privacy and data security issues. It's not hard to imagine an eye in the sky that is intended to document site conditions being used for unauthorized or unlawful observation of people, places and things. Sexual harassment, trespass, and invasion of privacy claims are a few of the potential risks that improper drone use might present. Think this far-fetched? It's not, as this December 2014 report on privacy policies for drone usage notes (while noting the muddled state of the law):

> Last month, an Australian woman sunbathing topless in her back yard was accidentally captured in a photograph by a drone snapping pictures for a real estate listing. The picture was placed in online ads and billboards before the mistake was caught. With the U.S. working on regulations for commercial drones, you might think that cases like this would be part of the conversation. But so far, both Congress and the FAA have passed the buck on creating privacy protections for domestic drones. Some of the little work that has been done on privacy protections has fallen to the FAA's six drone test sites across the country.[39]

Though regulations may be in flux, but common law remedies – including claims for invasion of privacy, trespass – are well established and potentially applicable. State and Federal civil and

criminal statues may also be implicated, if the wrong kinds of images or data are captured and distributed. The fact that drones are inexpensive and can be easier to operate than conventional aircraft does not make decisions about access to their use any less important. A compelling case can be made that the contrary's true.

2. **Knowledge.** Pre-site access may impact arguments about knowledge of and awareness of site conditions. Consider Section 3.2.1 of the AIA 201(2007), which states that "Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated person observations with requirements of the Contract Documents." What impact, if any, does a drone's ability to provide easier and inexpensive access detailed site data and information do to contractor arguments about knowledge of site conditions? One might argue that greater knowledge will reduce the number of disputes involving differing site conditions. But does the availability of such information and easier access to the technology change what it means to "visit" a site before commence construction?

In other words, the benefit that increased knowledge provides may also impact expectations and obligations that the law imposes on the observer. Just as pre-construction drone inspection may impact contract claims, ongoing monitoring may also create or impose new kinds of liability on their users. Assume that a weekly drone inspection documents a site condition that later has a role in an employee or third party injury, but that previously would have been extremely difficult to observe or record. The knowledge that the drone's observation provides may create a concomitant obligation to fix problems the user would never have known about before. This may be a perfectly fair trade-off – at the same time, it means that data being recorded for one purposes (confirming proper rebar installation in a concrete pour) may capture data with vastly different significance (a missing safety rail).

3. **Ownership.** Who owns a drone used for a construction project? Who owns the data that the drone creates or visual models derived from its use?

4. **Discovery.** In connection with litigation/disputes, one more set of data that must be kept/maintained and for which destruction creates a variety of new risk. We discuss this in greater detail in Section B(1)(ii), below.

B. Construction Contract Drafting Tools

1. Introduction

The elements of a contract may be more or less the same now as 150 years ago. How a contract is created, transmitted, stored and managed has changed dramatically in that time.[40] Complex construction contracts can now be drafted, negotiated and maintained in cloud-based platforms. Among other things, such platforms offer "version control" features that allow for all changes to be tracked and easily seen, and our primary focus here.

Contract drafting software may seem less sexy than drones, but its increasing prevalence portends change that may have more long-term impact on the day-to-day life of construction lawyers than drones. In addition to benefits that they present, they create issues to which construction lawyers must be attentive, including document ownership, privacy, and the role of a lawyer in technology assisted contract creation.

1. Version Control and Cloud Based Collaboration Platforms

"Collaborative" contract drafting and management systems can exist on enterprise networks, but frequently rely on cloud-based software and storage that reside on third party computer systems.[41] (And even where a third party cloud-server is not used, versions of the same document(s) will (in most cases) exist on each of the parties' computers.)

By now, even the Supreme Court has had a chance to weigh in on "the cloud." As Justice Roberts writes in the 2014 *Riley* case (dealing with warrantless searches of cell phones): "Cloud

computing is the capacity of Internet-connected devices to display data stored on remote servers rather than on the device itself."[42] Cloud storage is ubiquitous, and by no means limited to business applications.[43] Many lawyers will be familiar with the storage and collaboration features provided by cloud storage platforms such as Box, DropBox, and GoogleDocs,[44] (Our focus here is not "the cloud" per se. But contract collaboration software frequently relies on it, and its functionality is often tied to cloud systems.)

Version control systems use database technology to store and provide access to each version of an edited file in a single electronic file system.[45] A version control system can be used to establish a work-flow in which there is only one "final" version of a document or a jointly created document. As a leading resource on the topic explains:

> Version control is a system that records changes to a file or set of files over time so that you can recall specific versions later . . . It allows you to revert files back to a previous state, revert the entire project back to a previous state, compare changes over time, see who last modified something that might be causing a problem, who introduced an issue and when, and more. Using a VCS also generally means that if you screw things up or lose files, you can easily recover.[46]

As the examples provided below, in Section ii, show, this feature is often emphasized as a key benefit in construction industry specific platforms.

i. Origins of Version Control in Software Development

Computer programmers developed version control (also known as source control) for very practical reasons: software development is typically a collaborative process and can involve dozens, sometimes hundreds or more programmers, each working on different but potentially overlapping pieces of code. If this collaboration is not very carefully orchestrated, things break. In this respect and others, software development bears surprisingly similarity to creation of a complex construction contract. The parallel is not perfect, but construction contracts are frequently multi-part agreements, including a base agreement, general conditions, exhibits, specification, and external documents incorporated by reference (e.g., incorporation by

reference of a prime contract, an obligation to secure (and in some instances comply with) third party contracts such as insurance policies.) Similarly, program code is often comprised of multiple files, including references to external libraries providing components that are (to use a lawyer's terminology) "incorporated by reference." [47] In both cases, multiple parties may be involved in creating documents subject to revision, change, and management.

A good version control system can help manage a complex drafting process in a number of ways. First, one can establish a workflow in which there is only one current version of the "final" document.[48] A document may be available for editing by multiple parties at the same time. In this approach, when edits are made to the "contract", the edited version becomes the final version of the document when checked back in the file system. A simplified example illustrates:

Assume A, B, and C are each working on contract X

- Contract X is contained in a repository ("repo"), containing an Agreement, General Conditions, Exhibits, Specifications, Change Orders, Payment Application, RFIs, design drawings, inspection reports, and a variety of other documents.
- A, B & C each check out a copy of the contract from the repo to their local computers.
- A, B & C simultaneously makes changes to Sections 2, 3 & 4 of Exhibit 7.
- A checks her version in first.
- A's version is now the final version of Exhibit 7.
- 5 minutes later, B checks his version of Exhibit 7 in.
- B's version is now the final version of the document, but A's changes remain in the common repository and the difference between A's final document and B's final document can easily be viewed.
- 10 minutes later, C checks her version in.

In this example, C's version is now the final version of the document (though it may remain subject to agreement before integrated). However, the A & B changes remain in the common repository. The difference between A, B & C can each be easily viewed. There is no ambiguity, however, about which document is the current final version. Though C's document may not be agreed upon, it is the only final version of that particular document. Furthermore, because all of the changes can be view in a single location, not a single e-mail (with attachment or otherwise) needs to be sent when edits are made or proposed.

Version control may also make it possible to determine whether a particular version of a document has been altered or if it is in fact the "authentic" or true version of a document; a cryptographic audit trail makes it difficult if not impossible for all practical purposes for B to alter his revision after the fact:

> Everything in Git is check-summed before it is stored and is then referred to by that checksum. This means it's impossible to change the contents of any file or directory without Git knowing about it. This functionality is built into Git at the lowest levels and is integral to its philosophy. You can't lose information in transit or get file corruption without Git being able to detect it.[49]

The document's authenticity – to use that term in in its Federal Rule of Evidence 901 meaning – may also be easier to establish in later litigation, with cryptographic certainty. As we'll see below, this approach to contract drafting and management has been and is being deployed in the construction industry.

ii. Version Control as Implemented in Construction Industry Specific Contract Drafting and Management Tools

Newforma Project Cloud's marketing materials describe the platform as "Web-Based Submittal and Construction Administration Software," and emphasizes stated time-saving benefits the platform's use affords, including integration of cloud based version control similar to the description above:

> Newforma® Project Cloud web-hosted construction collaboration software

> recaptures time you can use to create more value for clients. It integrates information from the design, construction and owner's teams and automates workflows related to document approval, PDF markup and general communication.
>
> * * *
>
> Newforma® Project Cloud provides a hosted, secure storage solution for all project documents. Team members know the Newforma Project Cloud host always has the latest versions of documents. Plus, it is radically less expensive than in-house storage, and professional management provides greater security. Collaborative documents are initiated by the design and construction team, and grow as team members add information, make comments, revise documents and build references. **Documents are socialized throughout the project.**
>
> With Newforma Project Cloud the document is not duplicated because it lives in a central repository. Each user retrieves the file, which assures they are working with current plans and specs. And if changes are made to that document in the meantime, they can quickly see the progression of how that change was made.[50]

In short, this Platform captures and stores a range of contact communication and interaction that in the past might have taken place on paper (or in person) and been transmitted in person, by horseback, wireless, telegram, facsimile, or email. Instead, storage of and access to such things in one place, with full drafting history of every document related to a project, from early design, through each phase of construction, following completion, for as long as the data is allowed to survive.

Bluebeam Solution's website says that its "Revu" product "is used by 74% of top US contractors."[51] It describes a suite of solutions, including "real-time collaborative review", and describes its use in a project involving construction of a "$298M 13-story patient tower addition." According to the case study, unforeseen conditions led to design and sequencing changes that, in turn, led to rebar fabrication schedule acceleration. According to Bluebeam, disputes were avoided, time saved, and a benefit was seen by all, after initial objections were overcome:

> The Engineer of Record . . . was initially hesitant to accept the idea of an online review where markups were visible, and potentially editable, by [the Contractor]

> and the subcontractor before their review was complete. What gave them confidence in the process was the fact that comments made by attendees within a Studio session cannot be edited by anyone except the person who added the comment - this includes the Studio session administrator . . . Additionally, it was understood by all parties that any comments within the Studio session were not considered final until the engineer's electronic stamp of approval was placed on the drawing within the Studio session.
>
> The subcontractor [ ] enjoyed being able to interact with the engineer during the review process. Any design questions or clarifications that had not already been answered by RFI could be asked directly on the shop drawing using Bluebeam markup tools before the start of the Studio session. Much of the time savings that [the subcontractor] saw through this process was during the engineer's review, because they could begin correcting their shop drawings before the review was ever complete. Normally, they would not be able to see the markups and begin corrections until after the entire shop drawing was reviewed, stamped, and returned.
>
> * * *
>
> Bluebeam Studio . . . facilitated a lean process in which . . . review, structural review, shop drawing review, and structural re-review can all occur within a 10-12 day window, which is a potential schedule savings of up to 10 days per review. A typical review cycle from finalized design to release for fabrication is between 25 and 30 work days. By utilizing Bluebeam Studio to communicate in real time, the same review cycle has been reduced by over 33%! This process also eliminates the need to print a new set of shop drawings for each reviewer.[52]

As these descriptions suggest, streamlined drafting and review processes facilitated by collaborative drafting environments can offer significant benefits. As with drone technology, the benefits create risks that can only be managed if understood.

B. Legal Considerations

1. Confidentiality/Privilege

Lawyers asked to participate in negotiation using cloud-based version control systems may have privilege and confidentiality concerns. The ease with which email communication can be forwarded already makes “don’t forward lawyer emails” a common admonition for many lawyers.[53] Similarly, potentially privileged communication may be stored on third party servers, at unknown locations, for an undetermined period of time.

For example, assume that a lawyer edits a branch of a construction contract contained in or on a cloud-based server, and in doing so provides comments that are intended to be viewed only by the client. (The revisions themselves might be intended as privileged before discussed or approved). As opposed to mail (or e-mail for that matter) where a lawyer's comments can be sent to a particular address and particular defined recipients, in a cloud-based version control system, the lawyer is asked to provide edits and comments in repository that may be available to multiple parties (many of whom are not clients).

Unintended disclosure may be easily addressed using: fenced-off sections of repositories, imposing strict limitations on access, or using documents that can only be read using from specific computers or software. Or one might respond to such a concern by saying, in effect, that lawyers should simply avoid participating in cloud-based contract drafting or negotiation. The problem with this approach is that clients will use such systems with or without lawyer participation. In order to be part of the process -- and provide needed guidance -- one must find a way to work with the technology in a manner that is consistent with both professional obligations and client needs. Arguably, well-implemented systems could prove less risky that using e-mail or fax transmission, because all access can be tracked and limited, and (potentially) harder to hack than email. Furthermore, a well-designed platform may integrate security procedures beyond those which many lawyers are able to provide in-house – just as one keeps money in a bank, because banks are good at storing it, perhaps data is more safely stored using a secure third party server.

In situations where a breach occurs, and there is a disclosure, well-established case-law[54] can be applied to show that a disclosure was inadvertent or acquired by misconduct. In other words, the risk that such systems present to lawyers may be cancelled out or even overcome by the benefits presented by its well-considered application. Our task is not to decide which of

these positions is correct but, rather, to observe that such issues must be considered when an invitation to participate in cloud based contract negotiation is made, or a lawyer is asked to make edits to a document contained in a shared repository.

2. Does More Data Create Discovery Nightmares?

Construction projects already generate an enormous amount of documentation, both paper and electronic. In addition to email and digital copies of documents, electronic scheduling and other files already makes discovery in a complex construction dispute a massive and expensive undertaking.

On the one hand, being able to see every version of a contract may help resolve ambiguity (depending on rules of evidence and admissibility in a particular jurisdiction) and discern drafting intent. On the other hand, when presented with a Request to Produce "all versions" of a particular document in its original form, deciding what to produce and how much to produce may require programming and technical expertise that a construction lawyer or construction company may not have in-house.

While construction lawyers may not yet be familiar with discovery and version control, some lessons can be learned from litigation involving software. As one commentator notes, one of the risks that version control presents in discovery is that lawyers don't always understand what it is they are asking for:

> While many types of ESI have multiple versions, versioning is crucial to source code. Source code is generally kept in a "version control" repository (e.g., Perforce, Git, SVN). The other side will often vaguely ask for "the code" without a clear idea of what code they mean: which specific product/service, version, for which platform. While overbroad requests are common (see e.g. Symantec v. McAfee, 1998 U.S. Dist. LEXIS 22591 (ND Cal.), seeking all source code for 3.5 years), when there is a publicly-accessible product or service, the requestor could often be quite specific. Sometimes source code for long-defunct, unreleased, or future products is requested (see BigBand v. Imagine, 2010 WL 2898288).[55]

What does this have to do construction contract drafting and construction dispute resolution? While not a perfect analogy – at least not yet – placing all constriction contract documents in digital form in a repository creates a similar volume of data and "monumental opportunities to screw up" as the court wrote, ruling on a discovery motion involving production of software source code in patent litigation between Apple and Samsung.[56]

True, a well-implemented version control system, particularly where available to all parties to a contract, may reduce discovery disputes, because all parties will have access to the same documents and an agreement about which ones are "authentic." Greater difficulty may be posed where (as in the Apple example) a dispute is between parties who are strangers to a contract and did not draft it together. A construction project that results in litigation with third party adjacent property owners might not enjoy the same benefit, but expose project participants to some of the discovery burden and risk that the persistent storage on a cloud server creates.

Conclusion: The Future of Construction Contracts — Smart Contracts and Payment Drones?

What does the future hold for Construction Lawyers? One developing area of computer technology that may have an impact is in the area of "Smart Contracts", which allow parties to reach agreements that can be enforced without human intervention, by computer code. "Nick Szabo" (consider the "father" of Bitcoin, the name is in quotes because there's some controversy about his identity) first coined the term "Smart Contracts" in 1997 in his essay "The Idea of Smart Contracts".

Szabo describes the integration of contract clauses and requirements into property:

> Many kinds of contractual clauses (such as collateral, bonding, delineation of property rights, etc.) can be embedded in the hardware and software we deal with, in such a way as to make breach of contract expensive (if desired, sometimes prohibitively so) for the breacher. A canonical real-life example, which we might consider to be the primitive ancestor of smart contracts, is the

> humble vending machine. Within a limited amount of potential loss (the amount in the till should be less than the cost of breaching the mechanism), the machine takes in coins, and via a simple mechanism, which makes a freshman computer science problem in design with finite automata, dispense change and product according to the displayed price. The vending machine is a contract with bearer: anybody with coins can participate in an exchange with the vendor. The lockbox and other security mechanisms protect the stored coins and contents from attackers, sufficiently to allow profitable deployment of vending machines in a wide variety of area . . .
>
> As another example, consider a hypothetical digital security system for automobiles. The smart contract design strategy suggests that we successively refine security protocols to more fully embed in a property the contractual terms which deal with it. These protocols would give control of the cryptographic keys for operating the property to the person who rightfully owns that property, based on the terms of the contract. In the most straightforward implementation, the car can be rendered inoperable unless the proper challenge-response protocol is completed with its rightful owner, preventing theft.
>
> If the car is being used to secure credit, strong security implemented in this traditional way would create a headache for the creditor - the repo man would no longer be able to confiscate a deadbeat's car. To redress this problem, we can create a smart lien protocol: if the owner fails to make payments, the smart contract invokes the lien protocol, which returns control of the car keys to the bank. This protocol might be much cheaper and more effective than a repo man. A further reification would provably remove the lien when the loan has been paid off, as well as account for hardship and operational exceptions. For example, it would be rude to revoke operation of the car while it's doing 75 down the freeway.

Szabo's description of self-enforcing or self-executing agreement may be familiar to most construction lawyers, and include pre-computer ink and paper antecedents. A bond, letter of credit or escrow agreement each offer some measure of self-execution. Assuming a certain set of events specified in a contract happens -- a date passes, a default takes place, a third party holding funds receives a required notification -- money that A promised to B, which is held by C, is transferred to C.

Since Szabo wrote in 1997, technology has advanced to the point where some basic smart contract systems have been implemented. Using a digital ledger system and crypto-currency, agreements can be created that (at least in theory) are automated and enforceable

without post-agreement human interaction. The Ethereum platform is an example,[57] offering the promise of simplified contract creation and automating contract performance. In slightly overheated prose, one new report explained that:

> With Ethereum, one could code a constitution for a nongeographic country that people can choose to join, pay taxes to, receive benefits from and cast votes in — and whose rules they would then have to obey. One could design a transnational microlending program or a scheme for universal basic income or a new kind of credit score. In one online video two Ethereum pioneers demonstrate how to code a simple marriage contract. The world's next social contracts, the successors to the Declaration of the Rights of Man and the U.S. Constitution, could be written in Ethereum's programming language.[1].

Another post on the Ethereum web-site reported that in the future we will be able to use the platform to build "unbreakable contracts."

This is considerably harder than it sounds, of course, as lawyers know and programmers are (perhaps reluctantly) starting to accept. Automating a payment guarantee is one thing. Selecting, defining and determining what events trigger payment ("completion", "substantial completion", "delivery" etc.) and how they can be verified is much more complicated, and will take time (and, yes, lots of lawyers).

How might an automated self-executing construction contract operate in the not too distant future? Let's end where we started, and fly a drone back into the picture. Assume a construction project using drone technology to monitor and record delivery of materials to a construction site, here's one potential implementation:

1. Contract specifies that when subcontractor delivers material meeting a required specification on a specific date, contractor will be paid X, within Y days.

2. Prior to delivering materials, subcontractor receives confirmation that funds have set aside for payment if materials are delivered as agreed.

3. Payment and inspection drone capture time-stamped photo and video information sufficient to verify delivery.

4. Drone sends message to contract confirming delivery in compliance with subcontract requirement.

5. Contractor receives notice subject to an agreed upon time-period to lodge objection, which might over-ride automatic payment.

6. Assuming no manual over-ride or objection is received by contract, payment is automatically transferred to subcontractor within specified time period. Payment accompanied by any agreed upon lien release or other language typically contained in Contractor payment application, which is deemed fully executed on receipt of payment.

One may object that this glosses over technical complexity and legal issues. True. But this is a simple illustration, not a technical specification. More to the point, none of this is science fiction – the technology for each of the elements described above currently exists, and such systems can be built, as laws and regulations develop to govern their use. In short, the future is here – while Bartleby's scrivener colleagues might be in trouble, there will be more than enough work for construction lawyers open to the opportunities and challenges that such new technologies present.

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[1] Stephen Palley is an attorney with Palley Law, PLLC in Washington, D.C. Grant Hagen is VDC Manager with the Beck Group, based in Dallas Texas.

[2] Herman Melville, "Bartleby the Scrivener: A Story of Wall Street" (Putnam's Monthly, 1853) available at http://www.gutenberg.org/ebooks/11231 (last visited, February 1, 2015).

[3] For a thoughtful rejoinder to the mantra that disruption (technological or otherwise) is always a good thing, see Justin Fox's "The Disruption Myth", The Atlantic Monthly (September 2014), available at http://www.theatlantic.com/magazine/archive/2014/10/the-disruption-myth/379348/ (last visited January 27, 2015) and Jaron Lanier's Who Owns the Future? (Simon & Schuster, 2014).

[4] Most will agree that technological change in and of itself isn't a good thing – drone technology can be incredibly useful, as the discussion that follows suggests. If law slows development in order to prevent drones from crashing into each other (or peeking into our windows), one could just as easily conclude that it's doing just fine, thank you very much. These are hardly new arguments, of course. As Emerson points out in his 'Self-Reliance' (1841), just as the industrial revolution was gaining steam: "the civilized man has built a coach, but has lost the use of his feet . . . The arts and inventions of each period are only its costume, and do not invigorate men. The harm of the improved machinery may compensate its good. Hudson and Behring accomplished so much in their fishing-boats, as to astonish Parry and Franklin, whose equipment exhausted the resources of science and

art. Galileo, with an opera-glass, discovered a more splendid series of celestial phenomena than any one since. Columbus found the New World in an undecked boat. It is curious to see the periodical disuse and perishing of means and machinery, which were introduced with loud laudation a few years or centuries before. The great genius returns to essential man. We reckoned the improvements of the art of war among the triumphs of science, and yet Napoleon conquered Europe by the bivouac, which consisted of falling back on naked valor, and disencumbering it of all aids. The Emperor held it impossible to make a perfect army, says Las Casas, 'without abolishing our arms, magazines, commissaries, and carriages, until, in imitation of the Roman custom, the soldier should receive his supply of corn, grind it in his hand-mill, and bake his bread himself.'" Emerson wasn't a Luddite; he was a humanist. But the point is that new technology isn't good, or bad, in and of itself. It's what you make of it, and the impact its has on human lives.

[5] The authors of a 2010 analysis of the military use of autonomous drones describe "two approaches to aligning technology and the law: 1. Finding ways to fit emerging technologies into the law as a program evolves. 2. Expressing the legal and ethical constraints as requirements to drive system design." *See* Tony Gillespie & Robin West, "Requirements for Autonomous Unmanned Air Systems Set by Legal Issues.", 4 THE INTERNATIONAL C2 JOURNAL (2010), p. 6.

[6] Legal change can take time. Take the printing press, which made mass production of books possible. Gutenberg probably didn't consult with a copyright lawyer of consider how the printing press would impact publishers and authors. Over time, copyright laws developed to address what was a lesser risk in pre-printing press world, where books were hand-copied by scribes. Gutenberg's printing press dates to the late 1430's. The Statute of Anne, the first English Copyright law, is dated 1709. If you're Amazon and want to develop drones to deliver products to consumers and think the FAA is slowing you down, it's an irritation. (*See* Supplement to Amazon Petition for Exemption, Letter Dated December 7, 2014 to James Williams). There is a reason why people still quote Holmes' "The Common Law", though it may seem formulaic to the point of being trite. This observation is just as on point now as when he wrote these words in 1881: "The felt necessities of the time, the prevalent moral and political theories, intuitions of public policy, avowed or unconscious, even the prejudices which judges share with their fellow-men, have had a good deal more to do than the syllogism in determining the rules by which men should be governed. The law embodies the story of a nation's development through many centuries, and it cannot be dealt with as if it contained only the axioms and corollaries of a book of mathematics. In order to know what it is, we must know what it has been, and what it tends to become. We must alternately consult history and existing theories of legislation. But the most difficult labor will be to understand the combination of the two into new products at every stage. The substance of the law at any given time pretty nearly corresponds, so far as it goes, with what is then understood to be convenient; but its form and machinery, and the degree to which it is able to work out desired results, depend very much upon its past."

[7] Supra, n 2.

[8] The Terminator movies and Battlestar Galactica are common popular culture reference points.

[9] *See* Erie Insurance Petition for Exemption under Section 333 of the FAA Modernization and Reform Act of 2012, filed November 14, 2014.

[10] John Babel, "Up in the Air: The Emerging Risk of Drones in the Construction Industry", July 24, 2014, available at http://xlgroup.com/fast-fast-forward/articles/up-in-the-air-the-emerging-risk-of-drones-in-the-construction-industry, last visited January 24, 2015).

[11] http://dictionary.reference.com/browse/drone?s=t (last visited 1/15/2015). *See also*, *The New York Times Company v. U.S. Department of Justice*, 2013 WL 50209 (S.D.N.Y. Jan. 3, 2013).

[12] *See* Exemption 11110 at 6, "In the matter of the petition of Trimble Navigation Ltd," (December 10, 2014, Regulatory Docket FAA-2014-0367) ("the unmanned aircraft (UA) to be operated under this request is a fixed-wing aircraft, weighs less than 6 pounds fully loaded, flies at a maximum speed of no more than 74.5 knots indicated airspeed (KIAS), and a cruise speed of 49 KIAS, carries neither a pilot nor passenger, carries no flammable fuels, and operates exclusively within a pre-disclosed area.")

[13] *See* http://www.washingtonpost.com/politics/device-found-on-white-house-grounds-but-officials-say-it-posed-no-threat/2015/01/26/7accc156-a547-11e4-a2b2-776095f393b2_story.html?hpid=z1 (January 26, 2015) (describing "quad copter" as a "commercially available drone with four propellers").

[14] *See* Exemption 11109, "In the matter of the petition of Clayco, Inc." at 10, (December 10, 2014, Regulatory Docket FAA-2014-0367) ("Manned aircraft are at risk of fuel spillage and fire in the event of an incident or accident. The Skycatch UA carries no fuel, and therefore the risk of fire following an incident or accident due to fuel spillage is eliminated.")

[15] "Joint Doctrine Note 2/11: The U.K. Approach to Unmanned Aircraft Systems", (U.K. Ministry of Defense, 2011) (available at http://bit.ly/1A4DxGd, last visited January 25, 2015).

[16] *Id.* at p. 1-5.

[17] *See* Falkirk Mining's Petition for Exemption under Section 333 of the FAA Modernization and Reform Act of 2012, filed January 2, 2015. ("The artificial intelligence incorporated within the UAVs autopilot system continuously analyzes data from the Inertial Measurement Unit and from the onboard GPS and takes care of all the aspects of the flight under the supervision of the operator.") Whether this particular drone uses "artificial intelligence", is suspect, but requires speculation without seeing it in operation and understanding the code at issue. It probably does not fit the definition of "autonomous" suggested by the U.K. Ministry of Defense analysis. More to the point, if the system is under the supervision of the operator" the description is internally consistent.

[18] *Supra* n. 15, U.K. Ministry of Defense Report, at p. 1-1.

[19] *See e.g.* https://www.sensefly.com/user-cases/monitoring-material-usage-during-road-construction.html, last visited January 17, 2015)

[20] FAA Exemption Request of Rose Paving Company, Dated January 24, 2015, available at http://www.regulations.gov/#!documentDetail;D=FAA-2015-0215-0001.

[21] *See, e.g.*, Clayco Exemption, *supra* n. 14 at 10.

[22] Under the FAA Modernization and Reform Act of 2012, Congress directed the FAA to create an updated regulatory framework for drone usage in the United States by September

2015. Under Section 332 of the act, the FAA is supposed to create a "comprehensive plan to integrate non-governmental drones into the national airspace by Sep. 30, 2015." In a February 2014 report to the House Committed on Transportation and Infrastructure, the Department of Transportation's Inspection General stated that "While FAA has made progress meeting the act's UAS provisions, it has determined that it will not meet the September 2015 deadline for UAS integration due to a series of complex technological, regulatory, and managerial barriers." *See* "FAA's Implementation of the FAA Modernization and Reform Act of 2012 Remains Incomplete", Statement of D.O.T. Inspector General Calvin L. Scovel III); *FAA Faces Significant Barriers to Safely Integrate Unmanned Aircraft Systems into the National Airspace System*, (OIG Report Number AV-2014-061), June 26, 2014. While a comprehensive new regulatory framework remains under development (or unreasonably delayed, depending on one's position) the FAA has been accepting Exemption Requests from parties that wish to use drones without being subject to statutory and regulatory requirements that might otherwise apply.

[23] *Id.*

[24] A copy of the FAA Notice can can be found at https://www.faa.gov/regulations_policies/rulemaking/recently_published/media/2120-AJ60_NPRM_2-15-2015_joint_signature.pdf.

[25] "Law Enforcement Guidance for Suspected UAA Operations", U.S. Department of Transportation, Federal Aviation Administration, Jan. 8. 2015. (A Copy of that guidance is provided in the appendix to this essay).

[26] Exemption, p. 1.

[27] "The FAA finds that a grant of exemption is in the public interest. The enhanced safety and reduced environmental impact achieved using a UA with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest. The FAA also finds that UAS provide an additional tool for the aerial imagery industry, adding a greater degree of flexibility, which supplements the current capabilities offered by manned aircraft." (Exemption, p. 16)

[28] *Huerta v. Pirker*, NTSB Docket **CP-217** (November 18, 2014).

[29] *Id.*

[30] *Id.* at 9.

[31] *See* https://gigaom.com/2015/01/22/drone-pilot-and-faa-settle-for-1100-in-key-commercial-use-case/.

[32] The FAA has also aggressively investigated other uses of UAS. For example, New York City realtors "who use drones to take aerial property photos are being slapped with subpoenas by the FAA," according to recent news reports. New York Post, 7/1/14, "FAA Takes on City Realtors Using Drones", available at http://nypost.com/2014/07/01/faa-takes-on-city-realtors-using-drones/.

[33] Antonelli Law provides a survey of state drone laws, available here: https://docs.google.com/spreadsheets/d/1NJ9mxgmjxJsFLf6OvpHTubAxg45X16jzGGKHvj1Tydo/edit?pli=1#gid=1615393961.

[34] See, e.g. ISO CG 00 01 04 13

[35] *Id.*, Exclusion G.

[36] Form AVN 20 Lloyd's Aircraft Liability Policy (USA) ("Coverage A – Bodily Injury Liability (Excluding Passengers)).

[37] AIG Product Profile: "Right on Time: Introducing Unmanned Aircraft Insurance", at http://www.aig.com/Chartis/internet/US/en/Unmanned%20Aircraft%20Product%20Profile_tcm3171-602631.pdf (last visited, January 30, 2015).

[38] Penn Millers Insurance, LD-41526 (05 14), From Filing With Wisconsin Department of Insurance, available at https://ociaccess.oci.wi.gov/Companyfilings/document?docid=204467&filid=220561 (last visited February 2, 2015).

[39] Nathaniel Turner, "A Look at the Privacy Policies For the FAA's Six Drone Test Sites", December 10, 2014 (available at https://www.aclu.org/blog/technology-and-liberty/look-privacy-policies-faas-six-drone-test-sites) (last visited, February 2, 2015).

[40] If he hadn't lost his job, Bartleby would have had to retrain or find new work if he'd survived another 20 or 30 years. Typewriters and mimeograph technology, introduced in the late 19th century, marked the end of a widespread need for hand copying of documents by scriveners in the U.S. legal profession.

[41] See, also, Carole L. Bionda "On-Line Real Time Simultaneous Contract Drafting and Negotiation", Conference Paper, Presented at ABA Forum on the Construction's 2013 Annual Meeting.

[42] *See Riley v. California,* 134 S. Ct. 2473 (2014) ("Cloud computing is the capacity of Internet-connected devices to display data stored on remote servers rather than on the device itself. Cell phone users often may not know whether particular information is stored on the device or in the cloud, and it generally makes little difference. See Brief for Electronic Privacy Information Center in No. 13–132, at 12–14, 20. Moreover, the same type of data may be stored locally on the device for one user and in the cloud for another.") (Internal Citations Omitted). The "cloud" is a difficult term to define in simple terms, in part because the technology and its use continue to change. As this author observes: "The term 'cloud computing' (is notoriously difficult to define. The National Institute of Standards and Technology defines the phrase as '"'a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.' Comparisons to previous models of computing can be more illustrative. Personal computer users have traditionally accessed software or data installed or stored on a computer that they or their employers owned. Now similar applications and features reside online.'" Note: Clicking the "Export" Button: Cloud Data Storage and U.S. Dual-Use Export Controls", Joseph A. Schoorl, (80 GW Law Review 632, 2012).

[43] If you use a cell phones or have a Netflix account, you're relying on cloud storage. *See supra,* fn. 44; *see also* "The biggest cloud app of all: Netflix", available at http://www.zdnet.com/article/the-biggest-cloud-app-of-all-netflix/

[44] For example, GoogleDocs also gives parties the ability to synchronously and asynchronously edit and create a document (including a contract) using very basic version control concepts: "If you want to see all of the changes you and others have made to a document, spreadsheet, presentation, or drawing, you can check your revision history.

You can view and revert back to earlier versions of your file and see which person made specific edits." *See* https://support.google.com/docs/answer/190843?hl=en (last visited January 24, 2015).

[45] This definition might make a professional programmer wince, but it is intended for a non-technical audience and requires some simplification. Here is a slightly more technical (and still general definition) for an annoyed developer, perusing the footnotes, courtesy of Stack Exchange: "Git is an open-source distributed version control system (DVCS) with an emphasis on speed. git was initially designed and developed by Linus Torvalds for linux kernel development, now it is maintained by Junio Hamano. Every Git working directory contains a full-fledged repository with complete history and full revision tracking capabilities, not dependent on network access or a central server." ("About Git", available at http://stackoverflow.com/tags/git/info, last visited January 26, 2015). On a more rudimentary level, Lawyers may be familiar with simple version control features provided document management systems in which documents can be checked in and out of a firm system for editing or review.

[46] "Getting Started: Git Basics", *ProGit*, available at http://git-scm.com/book/en/v2/Getting-Started-Git-Basics, last visited January 28, 2015.

[47] And they may change over time using a variety of contractual mechanisms, just like program code. Another similarity appears in the drafting process – just as programmers rely on pre-built and test code, lawyers lean on forms, which may comprise a substantial portion of any construction (or other contract).

[48] This is not the only way to use a version control system, but we simplify for the sake of illustrating its use.

[49] *See* http://git-scm.com/book/en/v2/Getting-Started-Git-Basics (last visited February 15, 2015).

[50] *See* http://www.newforma.com/products-services/project-cloud/ (last visited January 28, 2015).

[51] http://www.bluebeam.com/us/solutions/construction.asp

[52] http://www.bluebeam.com/us/solutions/case-studies/dpr.asp

[53] Legal ethics are beyond the scope of this essay. Generally speaking, and although the law here is in flux (and the subject of a completely different presentation), according to a recent ABA Survey, (*see* http://www.americanbar.org/groups/departments_offices/legal_technology_resources/resources/charts_fyis/cloud-ethics-chart.html) each jurisdiction that has considered the issue has concluded that lawyers may use cloud-based storage systems, subject to a range or requirements and recommendations. As this Massachusetts opinion observes: "The Committee believes that . . . Lawyer [may] use Google docs or some other Internet based data storage service provider to store confidential client information, and to synchronize data using that provider over the Internet. More specifically, the Committee believes that the use of an Internet based service provider to store confidential client information would not violate Massachusetts Rule of Professional Conduct 1.6(a) in ordinary circumstances so long as Lawyer undertakes reasonable efforts to ensure that the provider's data privacy policies, practices and procedures are compatible with Lawyer's professional obligations, including the obligation to protect confidential client information reflected in Rule 1.6(a)." Although the technology is new, lawyers have long used third parties to store and transmit

client information. Lawyers regularly store client documents in offsite warehouses owned by third parties. They also keep funds in banks, because banks are good at keeping money safe. There should be nothing inherently wrong with a lawyer using cloud-storage or communicating on their own with a client on or via a client-provided platform, and bar opinions seem to be in accord here. However, as the opinion above notes, such usage must be "compatible with the Lawyer's professional obligations[.]" (Ethics Opinion 12-03, available at http://www.massbar.org/publications/ethics-opinions/2010-2019/2012/opinion-12-03.)

[54] See, e.g., Paula Schaefer, The Future of Inadvertent Disclosure: The Lingering Need to Revise Professional Conduct Rules, 69 MD. L. REV. 195 (2010).

[55] *See* Andrew Schulman's excellent "Computer software source code and e-discovery", available at http://www.softwarelitigationconsulting.com/articles/source-code-and-e-discovery/ (last visited January 29, 2015).

[56] *Apple v. Samsung Electronics Co, LTD*, Case No,: C-11-1846 LHK (PSG), Slip Op. (N.D. Cal July 25, 2012). Explaining the difficulty of discovery in cases involving software "source code", the court writes: "Counsel struggle to understand even exactly what code exists and exactly how it can be made available for reasonable inspection. All sorts of questions are immediately posed. Exactly who representing the plaintiff gets access—and does this list include patent prosecution counsel, undisclosed experts, and so-called "competitive decision makers"? Must requirements and specification documents that explain the functionality implemented by the code be included? What compilation, debugging and analysis tools are required? What about the test database and user manuals? Make files? Build files? Does the code have to produce in a native repository such as CVS or Perforce? Must daily builds in development be produced (and if so, in real-time or batch?) or is production limited only to copies in commercial release? Put simply, source code production is disruptive, expensive, and fraught with monumental opportunities to screw up."

[57] Some of the material in this Section first appeared, in a different form, as a blog post titled "Contracts, Cucumbers and Ethereum", by Stephen Palley, dated May 1, 2014.