Schnader ATTORNEYS AT LAW
Aviation Group

# AVIATION HAPPENINGS

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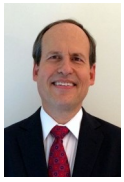
**In this issue:**



## 3D Printing: Not Your Old Dot Matrix Printer!



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3D printers continue to make huge strides in the aviation industry. By using 3D printers, manufacturers are able to "print" aircraft and engine parts that are stronger and lighter than traditionally-manufactured parts. Because the manufacturers avoid traditional manufacturing methodologies, they can make parts with complex geometries without screws, bolts, and other components used to hold the traditional pieces of a part together.

In recent weeks, General Electric announced that it has developed a scalable 3D metal laser printer capable of printing aircraft parts as large as one meter in diameter. GE's 3D printing capabilities include GE's most advanced "additive technology," which uses an electron beam to print and fuse layers of material twice as thick as that of a laser. They also can "print" parts from titanium aluminate, which is half the weight of steel. Whether laser or electron beam, the 3D printers fuse fine layers of powdered metal into three-dimensional objects described by CAD files on a computer.

While GE has made huge investments in 3D printing technologies, other manufacturers, as well as airline customers, are using the technology. Emirates has used 3D printing capability to produce cabin interior parts, such as video monitor shrouds. Silicon Valley 3D startup Made In Space is developing metal fabrication capability for production on the International Space Station of aluminum, stainless steel, and titanium components.

Because the design data is coded on a computer, cybersecurity of 3D printed parts is, or according to the Atlantic Council should be, a concern. A recent report by the Council suggests three ways in which cybersecurity could be an issue for additive technology: impairment of production capability, design theft, and product impairment. Additive technology definitely is not your old dot matrix printer.

## Aviation Group News

- **Lee Schmeer**, a Major and C-17 pilot in the USAF Reserve, was recognized for his relief efforts in the piece "Air Force Reservists Deliver Humanitarian Aid to Haiti," a story published by the U.S. Department of Defense News Service.
- *Who's Who Legal* named Schnader in its latest directory of the world's leading aviation lawyers.
- *Benchmark Litigation* recommends Schnader in its 2018 edition. The publication recognizes Aviation attorneys **Denny Shupe** and **Ralph Wellington** as "State Litigation Stars," among other Schnader attorneys.
- **William Janicki** appeared in *The Wall Street Journal's* Best Lawyers in Northern California.
- **Robert Williams** and **Barry Alexander** presented at the International Air Transport Association Cargo Claims & Loss Prevention Conference in Barcelona, Spain. Williams participated in a panel discussion titled, "So You Want to Fly a Drone?" and spoke on the panel "Passenger and Cargo – Cross Cutting Topics" while Alexander moderated a panel called "Judges Corner."
- Schnader is proud to welcome new associates **David Struwe** and **Brittany Wakim** to the Aviation Group.
- **Julie Randolph** authored the cover story in DRI's *For the Defense*, "Fly Me to the Moon and Let Me Mine an Asteroid: A Primer on Private Entities' Rights to Outer Space Resources."
- **Lee Schmeer** authored the article "Why Pilots Take to the Skies, Despite the Risks," featured in the *Philadelphia Inquirer*.
- Thirty-nine Schnader attorneys were selected for inclusion in the 2017 edition of *Super Lawyers*. **Barry Alexander, Richard Barkasy, Bruce Merenstein, Lisa Rodriguez, Carl Schaerf, Ed Sholinsky, Denny Shupe, Jonathan Stern**, and **Ralph Wellington** of the Aviation Group were all named.
- Schnader's Aviation Group was named the winner of the Lawyer Monthly Legal Awards 2017 in the category of Aviation Law Firm of the Year – USA.
- Schnader was named an Insurance Services Law Firm of the Year (USA) by Worldwide Financial Advisor Awards Magazine.

### District Court Again Upholds $2.8 Million Verdict Against Engine Manufacturer in Plane Crash Litigation

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Earlier this year, in *Snider v. Sterling Airways, Inc.*, a case arising from the 2010 crash of a Cessna T210L that killed plaintiffs' decedent and two others, a jury in the Eastern District of Pennsylvania found engine manufacturer Continental Motors, Inc. liable for nearly $2.8 million. The jury also found that defendant Sterling Airways, which owned, operated, and maintained the Cessna, was not liable for the accident. Continental subsequently filed a Rule 50(b) renewed motion for judgment as a matter of law, which the federal district court denied (as reported in the Fall 2017 *Aviation Happenings*), holding that there was sufficient evidence to support the jury's verdict in favor of the plaintiffs against Continental.

At the same time as it filed its renewed Rule 50(b) motion, Continental filed a Motion for New Trial and to Alter or Amend the Judgment under Rule 59, which the court now has denied as well. Specifically, the court found sufficient evidence to show that the engine exhaust valve guide did not meet Continental's minimum hardness specifications, and that this insufficient hardness caused the accident. The court also found that sufficient evidence existed for the jury to find that Continental's negligence (not Sterling's) was the proximate cause of the crash and,

as a result, causation was shown under the General Aviation Revitalization Act. Continental's other arguments in its motion concerning the use of the term "cylinder assembly"; the jury instructions regarding failure to warn; and the court's evidentiary rulings, including rulings excluding portions of government agency reports, all failed. Accordingly, the court found that Continental is not entitled to a new trial and remains liable for the full amount of the jury award.

Shider v. Sterling Airways, Inc., **No. 13-CV-2949, 2017 U.S. Dist. LEXIS 142799 (E.D. Pa. Aug. 29, 2017).**

## Nebraska Supreme Court Upholds Defense Jury Verdict for Cessna Aircraft in Caravan Icing Case Rejecting Unspecified "Malfunction Theory"

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Patrick O'Brien was seriously injured when he crashed a Cessna Caravan 208B into the roof of a metal building and slid into a utility pole while flying a non-precision approach into the airport at Alliance, Nebraska. The accident occurred in February 2007 while Mr. O'Brien was flying in heavy fog and below freezing temperatures at night. O'Brien sued the aircraft manufacturer, Cessna Aircraft Company, and the manufacturer of the aircraft's pneumatic deicing system, Goodrich Aerospace Company, under theories of strict liability, negligence, and fraudulent representation alleging the aircraft could not operate safely in icing conditions. O'Brien claimed design defects in the deicing system caused the aircraft to suffer an ice-contaminated tailplane stall ("ICTS"). The defendants presented evidence that the deicing system played no role in the accident and that the accident was the result of O'Brien's negligent operation and misuse of the aircraft. After a four week trial, the jury returned a verdict for the defendants.

O'Brien appealed asserting numerous errors in the trial court. O'Brien argued that the court's evidentiary rulings, excluding certain documents and testimony, prevented him from showing the Caravan was "susceptible to ICTS" through circumstantial evidence. At trial, however, O'Brien had alleged that specific components in the aircraft's deicing system were defective and caused an ICTS. Defendants had countered with evidence that the aircraft's flight path through the metal building indicated the aircraft was under control at the time of impact and that the deicing system had never been used.

O'Brien's appeal focused on the application of an unspecified "malfunction theory" recognized under Nebraska state law. Nebraska law allows a plaintiff in an implied warranty case to plead and prove, through circumstantial evidence, an unspecified defect in a product in lieu of proving a specific defect in what is known as the "malfunction theory." This theory permits the fact finder to infer negligence from the circumstances of the incident, without resorting to direct evidence of the wrongful act, similar to the principle underlying the theory of *res ipsa loquiter*. The malfunction theory may be applied when (1) the incident causing the harm was of a kind that would ordinarily occur only as a result of a product defect, and (2) the incident was not solely the result of causes other than a product defect existing at the time of sale. The malfunction theory is narrow in scope and simply provides that it is not necessary for plaintiff to establish a specific defect when circumstantial evidence of an unspecified dangerous condition allows a defect to be inferred.

In this case, the Nebraska Supreme Court noted, without deciding the issue, that the "malfunction theory" has not yet been extended to strict liability product defect claims. However, even if the theory could be used in a strict liability case, it was not available to O'Brien on appeal for two reasons: (1) O'Brien did not plead the "malfunction theory," and (2) the applicability of such a theory is negated by O'Brien's assertion of specific product defects presented at trial.

Product liability defendants in Nebraska should be keenly aware of the "malfunction theory" under Nebraska law. Although the theory has not yet been applied to strict liability product defect claims, defendants should guard against its application to such claims. If a plaintiff fails to plead such a theory, or proffers evidence of a specific product defect, the "malfunction theory" is not available.

O'Brien et al. v. Cessna Aircraft Co. et al., **No. S-15-1212, 2017 Neb. LEXIS 196 (Neb. Nov. 3, 2017).**

## Preemptive Effect of Montreal Convention Affirmed by District Court

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The U.S. District Court for the District of Massachusetts recently affirmed the preemptive effect of the Montreal Convention on state-law claims relating to flight delay and damage to baggage. Plaintiff brought state-law claims against American Airlines and Arik Air for intentional and negligent infliction of emotional distress and for breach of contract as a result of a delayed and damaged bag and a delayed flight. The district court adopted the magistrate judge's recommendation and granted summary judgment to the defendant airlines.

The court determined that Article 17(2) of the Montreal Convention, concerning damage to baggage, and Article 19, concerning delay in the carriage of passengers and baggage, governed plaintiff's claims concerning this international flight. The court observed that the Montreal Convention affords the exclusive remedy for claims within its substantive scope. Because plaintiff's state-law claims implicated the liability provisions in Articles 17 and 19, the court found that the Convention preempted plaintiff's state-law claims. Consequently, the court granted summary judgment to the airline defendants based on the Convention's preemptive effect.

The court further ruled that the claims would have failed even if plaintiff had pleaded his claims under the Montreal Convention. With regard to plaintiff's baggage delay and damage claims, governed by Articles 17(2) and 19, the court determined that plaintiff failed to comply with the written notice prerequisites under Article 31. With regard to plaintiff's claims concerning the delayed Arik flight, the court found plaintiff offered no evidence that Arik had failed to take reasonable measures to avoid or minimize the delay. Accordingly, summary judgment was proper because Arik could not be held liable for delay under Article 19. Finally, with regard to plaintiff's delay claims, the court observed that courts routinely dismiss claims for emotional distress not accompanied by physical injury to the plaintiff. Plaintiff was not physically injured by the delay, so his claims for emotional distress damages under the Convention were subject to dismissal.

Nwokeji v. Arik Air, **Civ. A. No. 15-10802, 2017 U.S. Dist. LEXIS 153477 (D. Mass. Sept. 20, 2017) (report and recommendation available at 2017 U.S. Dist. LEXIS 153479).**

## Montreal Convention Accident Inquiry Recently Addressed in Three Federal Cases, with Varying Results

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It has been more than thirty years since the United State Supreme Court first enunciated its definition of the term "accident," as used in Article 17 of the Warsaw Convention. Since then, courts have applied that definition to all kinds of incidents, including falls on the jetway, falls on an escalator, falls over items on the floor of the aircraft, passenger-on-passenger assaults, accidental passenger-on-passenger contact causing injury, coffee/tea spills, falling overhead bags, Deep Vein Thrombosis, turbulence, etc. Notwithstanding the bevy of decisions applying the Supreme Court's definition, including a subsequent Supreme Court case involving the failure to remove a passenger allergic to smoke upon which this author worked, there remain gray areas where the determination of whether an accident occurred is not so simple.

Within the last few months, three notable federal court decisions applied the Montreal Convention accident inquiry, with varying results.

In *Baillie v. MedAire Inc*., the plaintiff was the widow of a passenger who suffered a heart attack on board a British Airways flight from London, England to Phoenix, Arizona and died after surgery performed at a hospital in Phoenix. The plaintiff argued that MedAire, which provided medical advice to the flight crew remotely, was liable for her husband's death under the Montreal Convention based on its failure to recommend that the flight be diverted prior to landing. The plaintiff argued that the failure to recommend diversion was in violation of MedAire's own policies and, accordingly, constituted an "unusual and unexpected event." The court rejected the plaintiff's argument and dismissed the claims against MedAire, finding that (1) MedAire provided advice to the flight crew as required by its Service Agreement with British Airways, (2) the policies upon which the plaintiff relied were advisory, not mandatory and (3) an inquiry by the court into the reasonableness of the emergency medical services provided by MedAire would employ a negligence

inquiry specifically rejected by the United States Supreme Court in *Olympic Airways v. Husain*, 540 U.S. 644 (2004).

In *Lynn v. United Airlines*, the plaintiff was injured during a United Airlines flight from Frankfurt, Germany to Chicago, Illinois when she got up during landing to close an overhead bin that had popped open unexpectedly. While doing so, she wrenched her arm as the plane landed and fractured her shoulder. According to the plaintiff, she got up to close the bin because none of the flight crew did and the overhead bin was above a mother with a small child. As an initial matter, the court rejected United's argument that nothing about the descent or landing was unusual or unexpected, finding that a jury might hold that the spontaneous opening of the overhead bin constitutes the required "unusual or unexpected event." The court similarly rejected United's argument that the plaintiff's decision to get up during landing was an "'internal response'" to the normal conditions of transportation similar to the ear injury caused by normal cabin pressure found not to constitute an accident by the Supreme Court in *Air France v. Saks*, 470 U.S. 392 (1985). Finally, the Court rejected United's argument that the plaintiff's decision to stand up despite having been told not to during landing constituted an intervening and superseding cause, thus precluding liability. In light of the foregoing analysis, the court denied United's motion for summary judgment.

Finally, in *Yang v. Air China Ltd*., the plaintiff was the son of a passenger who collapsed and died on the jet bridge while exiting an Air China flight from Boston, Massachusetts to Beijing, China. No one witnessed the passenger's collapse. Rather, he was found nonresponsive by two members of the flight staff after a passenger told them someone had fainted on the jet bridge. Attempts to resuscitate were unsuccessful. Air China and Boeing moved to strike the plaintiff's expert (Dr. Harris), who opined that the plaintiff was injured and died as the result of a fall from the airplane door to the jet bridge below, and both moved for summary judgment. The motions to strike were granted in part and the motions for summary judgment were granted in their entirety. The court first held that even if it accepted Dr. Harris' conclusion that the passenger died as the result of a fall – a conclusion that generously would be described as speculative based on the complete lack of evidence to support it – he still could not establish that the fall was caused by a defective condition. As a result, the plaintiff could not establish a Montreal Convention accident as against Air China or liability for a manufacturing defect against Boeing, and the claims against each defendant were dismissed.

The above cases, all decided within a three-week period, remind us that the determination of whether a Montreal Convention accident has occurred is not as black and white as we sometimes tend to think. Interested readers may wish to keep their eyes on the appellate courts , as the decision in *Baillie* is being appealed and a motion to reconsider the decision in *Lynn* was denied at the end of October (though it is unlikely that an appeal of this interlocutory order would be permitted at this time). If you would like our impression of the decisions/ viability of appeals in any or all of these cases, please contact us directly.

**Baillie v. MedAire, Inc., 2017 U.S. Dist. LEXIS 150160 (D. Az. Sept. 14, 2017); Lynn v. United Airlines, Inc., 2017 U.S. Dist. LEXIS 162075 (N.D. Ill. Oct. 2, 2017); Yang v. Air China Ltd., 2017 U.S. Dist. LEXIS 158507 (N.D. Ill. Sept. 27, 2017).**

## NY Federal Court Reiterates that Federal Regulations Preempt State Law Standards for Pilot Conduct and Certification

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A New York district court granted partial summary judgment for a helicopter owner after concluding that the Federal Aviation Act of 1958 ("FAA") regulates air safety, preempting state and industry standards regarding the standard of care for a pilot's conduct and the standard for certifying, hiring, and training pilots.

In *Crout v. Haverfield International, Inc*., a helicopter crash killed the pilot and plaintiff passenger during a powerline patrol. The Crout estate sued helicopter owner Haverfield for the negligent hiring and training of the pilot, alleging that the pilot's negligence caused the fatal crash. It was the pilot's second day flying powerline patrol, a high-risk job that requires a helicopter to fly close to wires, towers, and utility structures.

Plaintiff sought summary judgment on the issue of the pilot's negligence (and thereby Haverfield's vicarious liability) and dismissal of Haverfield's

affirmative defense of Crout's comparative negligence. Haverfield moved for partial summary judgment on the applicable standard of care for the pilot and plaintiff's claim for Haverfield's negligent hiring and training of the pilot. Plaintiff's motion was denied and Haverfield's motion was granted.

Following Second Circuit precedent, the trial court found that the applicable standard of care for a pilot is codified in Federal Air Regulations ("FAR") and preempts New York's standard for negligence. The court held that a pilot is not automatically negligent as a matter of law solely because a crash occurs. Under the FARs, a pilot's actions must rise to a level of carelessness or recklessness to constitute a breach of the applicable standard of care. Using this standard, the court denied plaintiff's motion on the basis that there were issues of material fact that needed to be determined by a jury.

The court further held that Haverfield could not have been negligent in its hiring and training of the pilot, because the FAA's regulation of air safety entirely preempts state and industry standards. The court reasoned that although federal regulations do not require different or additional training for every scenario in which a helicopter pilot may fly (such as flying in a wire environment), federal regulations comprehensively detail training, licensing, and hiring requirements for commercial helicopter pilots. With no issue of material fact to decide and because the pilot was FAA-licensed and certified, Haverfield was not negligent in its hiring and training of the pilot.

Lastly, the court denied plaintiff's motion to dismiss Haverfield's affirmative defense of comparative negligence relating to a passenger's duty to avoid injury. New York law recognizes that a passenger in a vehicle has a duty to take care to avoid injury, such as taking reasonable measures to warn a driver to avoid an obstacle about which the passenger is aware. Although no court has yet suggested such a duty applies in the aviation context, the duty has evolved from passengers in horse-drawn carriages to motorcycles and other vehicles. Comparative negligence is almost always an issue for the jury, and given the paucity of legal authority in this area, the court exercised its discretion to deny plaintiff's motion on defendant's comparative negligence affirmative defense without prejudice.

Crout v. Haverfield, **2017 U.S. Dist. LEXIS 145051 (W.D. NY Sep. 7, 2017).**

## California Federal District Court Grants and Denies Manufacturers' Summary Judgment Motions Arising from Fatal Pre-Flight Collapse of Marine Corps CH-53 Helicopter Landing Gear

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On October 30, Judge Curiel of the United States District Court for the Southern District of California granted a motion for summary judgment filed by defendant E.I. du Pont de Nemours ("DuPont"), and denied a summary judgment motion filed by defendants Sikorsky Aircraft Corp. and United Technologies Corp. (collectively, "Sikorsky"), in litigation arising from a 2011 accident at Miramar Marine Corps Station where a CH-53E Super Stallion heavy lift helicopter collapsed on a maintenance technician before a training flight. Plaintiffs did not oppose the DuPont motion, although Sikorsky did oppose it. The Court found that Sikorsky was not entitled to summary judgment under the government contractor defense because of several factual disputes.

By way of brief background, a USMC maintenance technician, Sgt. Alexis Fontalvo, was killed after removing a safety pin from the helicopter's left landing gear before a training flight. He removed the landing gear pin after multiple attempts and after encountering "increased resistance" during the removal of the pin. The landing gear inadvertently retracted following removal of the pin, and the helicopter collapsed on top of Sgt. Fontalvo, due to damaged wiring in the landing gear's control system. There was a factual dispute whether the damaged wiring was Kapton wiring, which was manufactured by DuPont, or Spec-55 wiring, which was not manufactured by DuPont.

Plaintiffs asserted claims for strict and negligent product liability (for design and manufacturing defects) against DuPont and Sikorsky. DuPont was sued as the manufacturer of Kapton wiring, and Sikorsky was sued as the manufacturer of the helicopter. Significantly, Sikorsky did not assert a cross-claim against DuPont. DuPont moved for summary judgment on various grounds, including: (1) that its actions did not cause the accident because the degraded wiring was Spec 55, not Kapton, wiring; and (2) that even if the damaged wiring was Kapton wire, DuPont was shielded from liability under the government contractor defense. Sikorsky also

moved for summary judgment on various grounds, including under the government contractor defense, which shields a manufacturer from liability for design defects in military equipment when: (1) the United States approved reasonably precise specifications; (2) the equipment conformed to those specifications; and (3) the manufacturer warned the United States about dangers associated with the use of the equipment that were known to the supplier but not known to the United States.

Plaintiffs took no position on DuPont's causation argument. In light of plaintiffs' non-opposition, the Court held that DuPont was entitled to summary judgment, and did not reach DuPont's government contractor defense arguments. Because Sikorsky had not filed a cross-claim, the Court held that Sikorsky (as an opposing co-defendant without a cross-claim asserted against DuPont) could not prevent DuPont from receiving summary judgment by opposing the motion when plaintiffs had not opposed the motion. In reaching this conclusion, Judge Curiel acknowledged that while district courts which previously decided the issue of whether an opposing co-defendant without a cross-claim could oppose and prevent summary judgment were split, no federal court of appeals had addressed the issue. Notably, in granting DuPont's motion, the Court stated the following in its opinion: "The Court emphasizes, however, that the dismissal of DuPont from this case does not amount to a finding of fact or a legal determination as to the merits of Plaintiffs' claims. The Court's decision on this issue is strictly procedural….At trial, Sikorsky will be free to argue that DuPont-manufactured Kapton insulation caused the accident…."

With respect to Sikorsky's motion under the government contractor defense, the Court denied the motion because it found that plaintiffs had offered sufficient evidence to create genuine issues of material fact on three subjects: (1) whether Spec-55 wire, and not Kapton wire, was the cause of the accident; (2) whether the military actually exercised its discretion in reviewing and approving the designs of the non-Kapton related portions of the landing gear control wiring configuration; and (3) whether Sikorsky complied with the applicable wiring specifications when it manufactured the accident helicopter.

With respect to Sikorsky's summary judgment motion arguments related to plaintiffs' failure to warn claims, the Court granted the motion. In granting the motion, the Court found there was no genuine dispute that prior to the accident Sgt. Fontalvo had been instructed (and knew) not to try to pull out a landing gear pin if the pin resisted being pulled.

Among other reasons, this decision should be considered by a defendant in deciding whether to assert a cross-claim against a co-defendant when answering a complaint in a case where alternative causation theories exist.

**Amador v. Sikorsky Aircraft Corp., No. 3:13-cv-00331, 2017 U.S. Dist. LEXIS 179651 (S.D. Ca. Oct. 30, 2017).**

## No Personal Jurisdiction in Cook County, Illinois Over Storage Company Despite Operating Warehouse and Registering to do Business in the State

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The Supreme Court of Illinois recently held that a warehousing company was not subject to general personal jurisdiction in Illinois where the company was incorporated and maintained its principal place of business in Indiana, and the event giving rise to the suit occurred in Michigan. In *Aspen Am. Ins. Co. v. Interstate Warehousing, Inc*., the subrogation plaintiff brought claims in Cook County, Illinois resulting from a roof collapse at defendant's Michigan facility that rendered the insured's product that was stored in the warehouse worthless. The defendant did maintain one of its eight nationwide warehouses in Illinois, and had been registered to do business in Illinois for more than 25 years when the accident occurred.

Reversing the Cook County Circuit Court and a divided appellate court, the Illinois Supreme Court held that *Daimler AG v. Bauman*, the groundbreaking 2014 U.S. Supreme Court case which held that a non-forum defendant must be "essentially at home" in the forum for general jurisdiction to lie, compelled dismissal of plaintiff's claims against the Indiana-based defendant. None of the conduct giving rise to the accident occurred in Illinois, so the court's sole inquiry was whether the exercise of general jurisdiction was proper. The court held that operating one of eight warehouses in Illinois was not so exceptional as to make the defendant "at home"

in Illinois, and noted that if general jurisdiction was appropriate in Illinois, then the defendant would be subject to general jurisdiction in every state in which it operated a warehouse, an impermissible result under *Daimler*.

The court also held that registering to do business in Illinois was not enough for Illinois' courts to exercise general jurisdiction. The court reasoned that there was no explicit consent language in the state registration statute. In fact, the statute restricted service of process on the registered agent to only that "process, notice or demand that is 'required or permitted by law.'" The court noted that this implied a limitation restricting the courts from exerting personal jurisdiction solely by virtue of a defendant having registered to do business in the state.

The *Interstate Warehousing* opinion is significant because it provides further clarification of the *Daimler* "at home" standard and because it may serve to check the filing of jurisdictionally-improper cases in Cook County, a favorite venue for the aviation plaintiffs' bar.

Aspen Am. Ins. Co. v. Interstate Warehousing, Inc., **No. 121281, 2017 Ill. LEXIS 668 (Ill. Sep. 21, 2017).**

## FAA Drone Collision Study Concludes Current Aircraft Certification Standards are Inadequate

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On November 27, 2017, the Federal Aviation Administration's Alliance for System Safety of UAS through Research Excellence (ASSURE) released the results of Phase I of its UAS Airborne Collision Hazard Severity Evaluation. The study combined high-fidelity computer modeling with component-level testing to evaluate 140 different impact scenarios between two types of drones or Unmanned Aerial Systems (UAS)(2.7 lb. quadcopter and 4 lb. fixed-wing) and two types of manned fixed-wing passenger aircraft (a narrow body commercial aircraft of the Airbus 320 or Boeing 737 type, and a business jet of the Lear 30/40/50 type). The analysis took 14 months to complete, and was peer reviewed for 3 months prior to public release.

The study evaluated UAS impact at 8 different locations on the airframes of passenger aircraft, including the wing, horizontal stabilizer, vertical stabilizer and windscreen, at velocities ranging from 100 to 365 knots. It found, among other things, that a UAS motor weighing 2.268 ounces (64 grams) will penetrate an aluminum panel 1.6 millimeters thick at a velocity of 250 knots. At higher speeds, the lithium ion batteries used in most UAS disintegrate upon penetration of the airframe. At slower speeds, however, the batteries can remain in-tact and create an additional risk of fire from heat and arcing.

ASSURE also analyzed engine ingestion of UAS during three phases of flight: cruise, takeoff and landing. Using a "generic" turbofan model with a 40-inch blade diameter, it found that damage increases as the point of impact moves away from the center of the turbine. That phenomenon is caused by nose cone deflection of UAS impact and the higher rotational speed of the blades at their outer edges. Engine damage also is greater during takeoff, due to the higher overall turbine speed during that phase of flight. None of the impact scenarios resulted in loss of containment.

The study's most significant conclusion arguably is that current manned aircraft certification standards for bird strike resilience are inappropriate and inapplicable to UAS collisions. This is based upon the finding that UAS collisions inflict greater physical damage than a bird of equivalent mass and velocity. The difference is attributable mostly to the rigidity and density of metals and plastics used in most UAS. Thus, for example, a windscreen that is able to withstand impact with a 4-pound bird (i.e., the current certification standard) may not survive a collision with a 4-pound drone at the same speed.

Release of the ASSURE Phase I report follows in the wake of the recent collision between a drone and a U.S. Army Blackhawk helicopter in New York that resulted in damage to the helicopter's main rotor blade, window frame and transmission deck. Phase I of the study did not address rotorcraft, which along with general aviation aircraft are included in Phase II of the study (scheduled to being in 2018)." In the interim, existing data from Phase I will aid insurers in setting premiums and assessing risk, manufacturers with respect to design and safety considerations, operators with respect to safety practices and awareness, and regulators in the development of new aircraft certification standards and rules for UAS operation. A copy of the Phase I report is available at: www.assureuas.org/projects/deliverables/sUASAirborneCollisionReport.php ✈

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