Jetstream

2017 AND BEYOND

GLOBAL AEROSPACE

INSURE WITH CONFIDENCE

LETTER FROM THE CEO

The Ongoing Evolution of Aviation Insurance:

From Pricing Dynamics to Space Tourism

Welcome to the third edition of Jetstream, our annual roundup of topical developments in the worlds of aerospace and insurance.

Nick Brown
CEO, Group Chief Executive

The big topic of 2017 for insurers, of course, has been the succession of devastating Atlantic storms during September, followed by the earthquake in Mexico and the catastrophic fires in California. The total financial impact of these events is still being assessed, but there has already been a palpable change in mood amongst underwriters in most sectors of the industry, including aviation.

With this in mind, we asked Rod Mezzina, former Chairman of Marsh's aerospace practice in New York, to reflect on his experience in the market and to see what lessons can be learned from those periods in the past when capacity was in particularly short supply.

Rod was also a pioneer in the Space insurance sector and we have three pieces in this edition looking at Space-related subjects where we see new or emerging risk factors: in-orbit debris, space tourism and space "war."

Back down to earth, we take a look at Crisis Communication—an increasingly important thing to get right in a world where information, and misinformation, is being disseminated in real time across social media.

Finally, with analysts predicting that the new wave of automation will replace up to 30% of current jobs in the developed economies by 2030, we ask whether AI is likely to replace the human pilot anytime soon.

I hope that you find Jetstream to be an interesting and thought-provoking read, and wish you all every success in 2018.

The Race to Space:
Considerations for Insuring a New Category of Tourists

Elon Musk, CEO of SpaceX, recently announced a manned space flight to the Moon and back scheduled for 2018. This will be the first manned mission to the Moon for some 45 years.

The flight will include two space tourists, the first private individuals to orbit the Moon. They will be onboard the Dragon 2 spacecraft to be launched on SpaceX's Falcon Heavy rocket.

The idea of space tourism has been around for decades. Virgin Galactic came about in October 2004 when SpaceShipOne successfully won the XPRIZE, delivering the weight of three people to space and back via a privately funded vehicle. Since then, people from more than 50 nations have signed up with Virgin Galactic, paying $250,000 to fly to space on SpaceShipTwo (SS2) via WhiteKnightTwo. Despite the long lead-in time, the first commercial passenger flight is still a ways off. The company suffered a setback in October 2014 when SS2 was lost during its fourth powered test flight.

VIRGIN GALACTIC is not alone in hitting bumps in the road. XCOR, founded in 2008, was proposing to fly one passenger and one flight crew in the Lynx Mark 1. The starting price was to be $100,000. Unfortunately, XCOR laid off staff in May 2016 and despite working on other space projects, it has put the Lynx on hold.

Another high profile space tourism company is Blue Origin, set up by Amazon founder Jeff Bezos. Blue Origin is using a fully reusable launch vehicle known as New Shepard that will take off and land vertically. Its first test flight was in April 2015, and the first successful vertical landing was in November 2015. Target for the first manned flight is 2018 with the first paying customers to follow.

SPACE ADVENTURES, founded in 1998, is the first, and the only, private space flight company. They have sent clients via the Russian Soyuz spacecraft to the International Space Station a total of eight times to date.

So how is the insurance community responding to this exciting, new exposure? Is this an aviation risk or a space risk? Most underwriters employ space engineers to provide expert knowledge on the launch vehicles and their payloads and satellites. However this knowledge does not extend to issues of passenger liability for space tourists, which many brokers and underwriters believe is more akin to aircraft passenger liability. The fact that the customers are purchasing tickets at prices in excess of $200,000, coupled with the dangers of space flight, creates a unique risk profile. Space Adventures addresses the exposure by purchasing personal accident (PA) insurance for their clients.

To complicate matters, liability standards remain uncertain. Commercial passenger aircraft operations are subject to international conventions and established liability standards in states where they operate. However, space liability conventions only address damage caused by space objects. The United Nations' Outer Space Treaty addresses the need to protect astronauts but does not define astronauts or consider space tourists.

In the US, legislation addresses three categories of people onboard space vehicles: crew, government astronauts, and space flight participants (SFP). The Commercial Space Launch Act (CSLA) uses the term "SFP" rather than "passenger" to avoid confusion with use of passenger in conventional aviation law. The amended CSLA (CSLCA 2014) now provides for cross-party waivers for SFP, an issue that was not addressed in the earlier version.

THE INSURANCE MARKET is certainly up to the challenge and companies from the aviation, PA, and space markets will no doubt be vying for a place in the market. But there is still a great deal of uncertainty, not just in the performance of these new commercial spaceflight operators, but also the status of the space tourist in the evolving areas of government regulation and international law.

Based on an article by Simon Abbott, Global Aerospace, appearing in The London Journal, 2017.

An Independent Perspective:
Historical and Current Pricing Dynamics in the Aviation Products Liability Market

Several key issues in the current aviation products liability (APL) market have created pricing challenges for underwriters. How do we improve trading conditions so the market can continue to provide its clients with the capacity and coverages needed to protect their balance sheets?

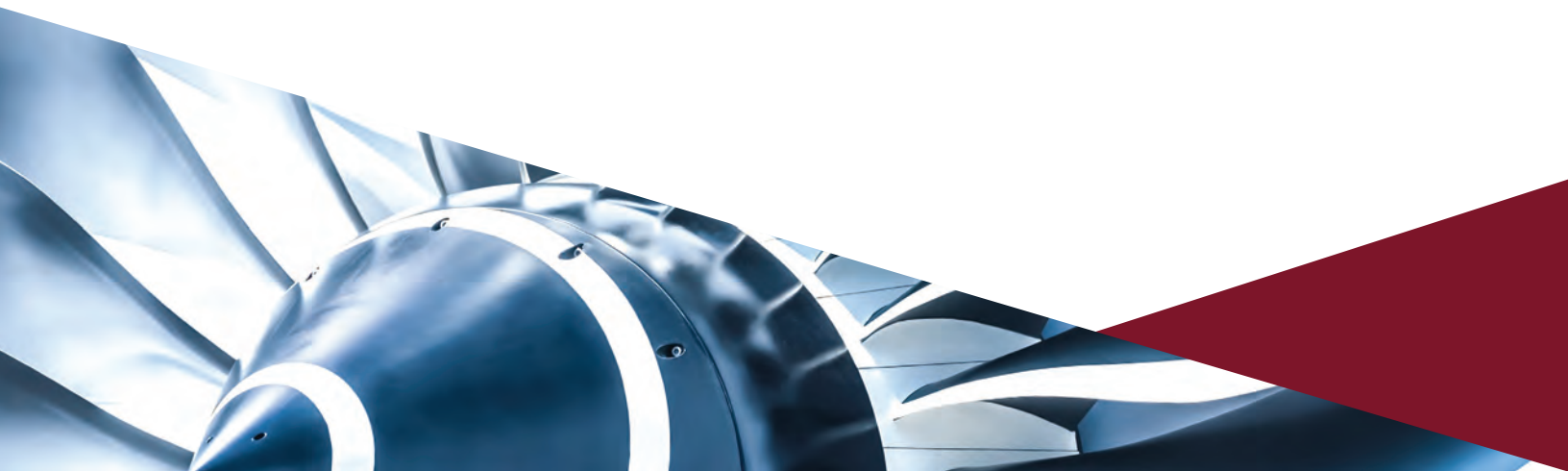
HISTORICAL BACKGROUND The APL market has had only two substantive hard markets since 1972. In 1985–1986, APL premiums increased six-fold in a matter of 12 months. As an example, one major client's premium went from $12 million per year to over $70 million. Product liability losses in the aviation market, and non-aviation losses as well, were off the charts.

Reinsurers had negative results because of these losses and withheld capacity as a result, causing premiums to increase dramatically. Three airframe manufacturers in the mid-1980s shut down, ostensibly because they could no longer afford APL insurance.

In 2001, the terrorist attacks on the United States on September 11 caused airline premiums to skyrocket and APL premiums followed suit, albeit to a lesser extent. Excess of Loss reinsurance is a key factor in writing cat risks and it became unavailable at attachment points generally below $300 million. Sophisticated reinsurers prior to 9/11 would not underwrite that low layer as pricing did not justify taking such risk. In fact, just one entity wrote a huge proportion of the Excess of Loss purchased at that level, and that organization is no longer operating. In the years following 2001, pure APL premiums declined from $800 million to approximately $450 million. Capacity grew rapidly after September 11, as insurers entered the market seeking to take advantage of higher premiums. Although some of these insurers have stopped writing the business and others have cut back line size, most are still in the market today with only 60% of the 2002 premium available.

Industry Factors that Reduce Premiums

AEROSPACE INDUSTRY CONSOLIDATION When a large company purchases a substantial competitor, it is likely that underwriters will receive only a fraction of the premium attributable to the acquired company. The amount often bears no relationship to the acquired company's loss and risk profile, especially if the acquiring company pays a large premium already. The clients, in general, correctly recognize that they have the leverage to put major pressure on their brokers to keep additional costs as low as possible when acquisitions take place to help meet the cost-cutting goals set by the acquiring company. The bottom line to insurers is less premium for the same exposure.



EXCESS CAPACITY Most aviation capacity is composed of “following markets” (as opposed to lead markets) who are naturally interested in maintaining their market position. Many of these insurers write the aviation book to introduce uncorrelated risk to their entire book of business. Since their costs are lower than lead markets they can usually write business for lower premiums. In addition, the reinsurance market enables them to de-risk the exposure, enabling them to remain in the market at lower premium levels. As the increases following September 11 have subsided, reinsurance costs have fallen considerably and Excess of Loss attachment points are lower again which allows capacity to remain at higher levels.

AEROSPACE TECHNOLOGY Technological strides in the aerospace sector over the past 20 years have contributed greatly to a reduction in accident rates and lower loss levels. Despite that, projected loss ratios for the last 4 or 5 years are marginal at best. When premium levels are this low, attritional loss levels may be closer to current premium levels than you think. A market trading close to attrition has inadequate funds to cover large and catastrophic losses or margin for profit. Such a market is unsustainable.

THE FUTURE It is important to begin conversations with clients and brokers regarding the dangers of an ever-dwindling premium base coupled with growth in catastrophic exposures. In the current environment, insurers cannot continue to offer the products, services and limits that clients have come to expect.

You can choose the status quo, but be fearful of the repercussions in doing so. Supply and demand are economic forces that cannot be ignored. Some may have already recognized the dangers of an unhealthy market. The solution is to persuade all the stakeholders to be mindful of what is at risk.

Author Rod Mezzina, Former Aerospace Practice Chairman, Marsh New York. Rod has been involved in APL business since 1972 as broker and underwriter.

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The New Frontier:
What to Do About In-Orbit Objects

Our lives are increasingly reliant on the use of satellites, from real-time communication to seeing the world from outer space. With many "constellations" of tens, hundreds, and even thousands of satellites being proposed over the next decade, Earth's orbit will become increasingly crowded. So how bad is this problem and how could it be solved?

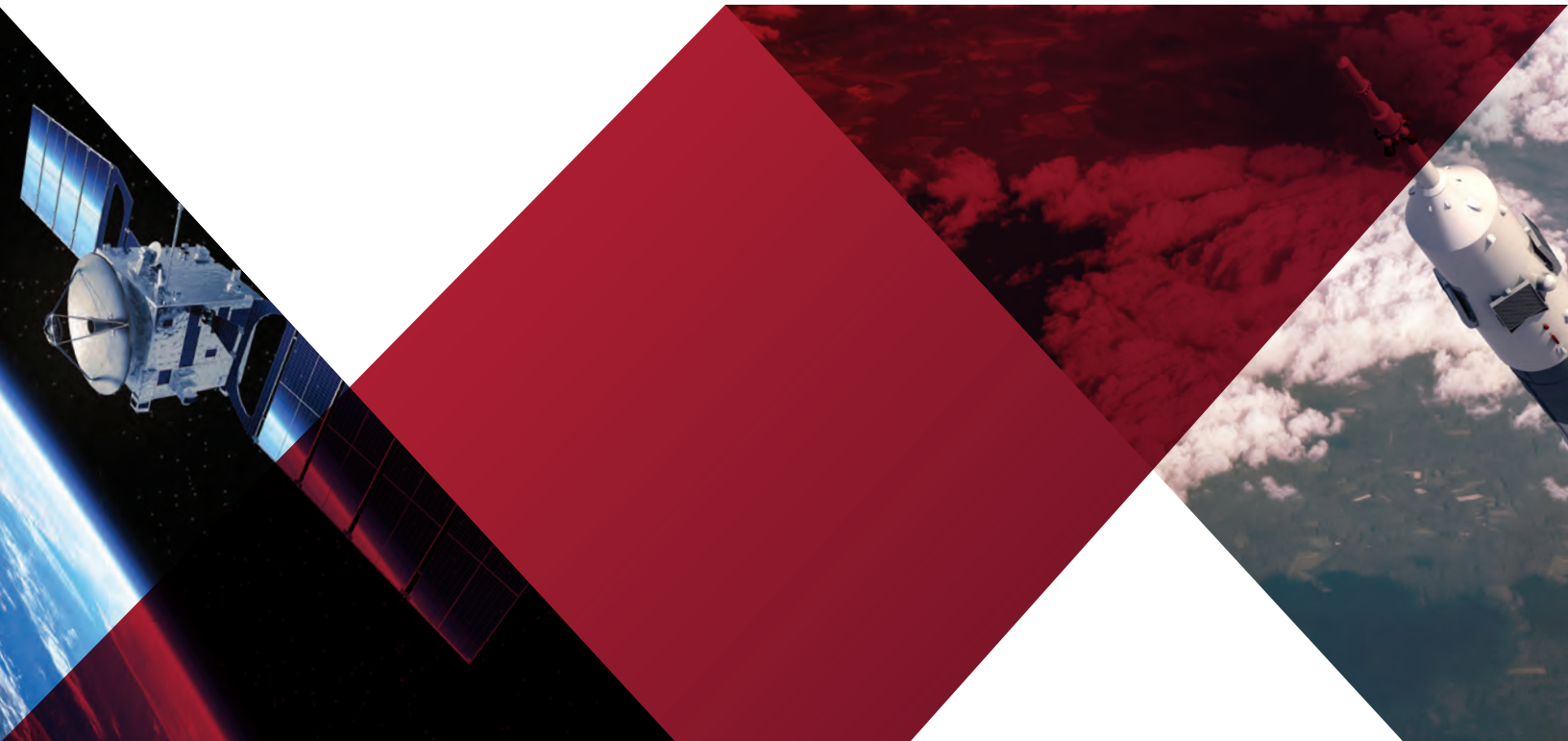
THE PROBLEM Over 7,200 satellites have been launched to date, but only 1,200 are still functioning. Of the rest, the vast majority are still in orbit and many have fragmented over time. Over 19,000 in-orbit objects are currently tracked and cataloged by the United States Space Surveillance Network, but this is only a small fraction of the estimated total: there are approximately 740,000 objects greater than 1cm in diameter in orbit.

In low Earth orbit, objects travel at about 10 km/s, which means even the smallest of objects carry enough energy to cause potentially catastrophic damage to working spacecraft, and worse, create more debris. While the threat from very small objects (<1 cm) can be prevented by shielding on a spacecraft, larger objects, especially those that cannot be tracked (>1 cm and <10 cm), pose the greatest threat.

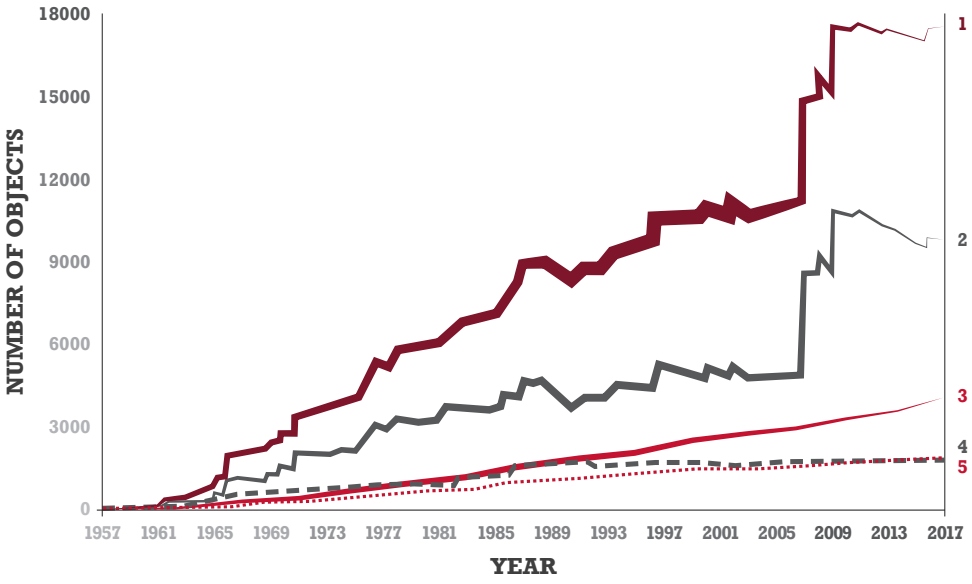
THE SOLUTION? The potential solution has two parts: debris mitigation for new objects launched into space and active debris removal (ADR) of existing objects.

Debris mitigation measures need to be considered when planning a space mission. Spacecraft should be designed to avoid any releases or break-ups in orbit and to have enough shielding as far as practicable. The mission should also be designed to take into account collision avoidance and end of life disposal of the spacecraft.

However, debris mitigation measures alone will not stabilize the number of objects. One study suggests that in order to do so, 90% of spacecraft will need to go through post-mission disposal and five large objects will need to be removed from orbit every year beginning in 2020.



Monthly Number of Objects in Earth Orbit by Object Type



Monthly Numbers of Cataloged Objects in Earth Orbit by Object Type: This chart displays a summary of all objects in Earth orbit officially cataloged by the U.S. Space Surveillance Network. "Fragmentation debris" includes satellite breakup debris and anomalous event debris, while "mission-related debris" includes all objects dispensed, separated, or released as part of the planned mission.

1 Total Objects
2 Fragmentation Debris
3 Spacecraft
4 Mission-related Debris
5 Rocket Bodies

Credit: NASA Orbital Debris Quarterly News

There are currently a few different technology concepts being developed for ADR, but with target objects of unknown shape traveling at very high speeds and likely to be rotating, capturing them in zero gravity is rather challenging, to say the least! Thus, an ADR vehicle will require accurate sensors, sophisticated guidance, and navigation and control systems that can carry out precise maneuvers as well as state-of-the-art robotics for capturing target objects. One would also need to carry out risk analysis into whether objects re-entering Earth's atmosphere would survive the re-entry and if so where the debris might fall.

There are also non-technical questions. Every space object is owned by somebody, so is the owner's permission needed to remove it? Who is responsible if an ADR mission goes wrong? Will these activities be regulated? If so, by whom? Do you need to warn others that you are carrying out such a mission? Is there a potential for ADR technology to be used for hostile action in orbit?

Despite all the challenges, organizations (new and existing) are working on ADR development and some already have missions planned. Just like the Earth's atmosphere, a sustainable Earth orbit environment will be important for our future.

Emergency Response:
Communicating Through a Crisis

An emergency response plan needs to be practiced to build confidence that will work should a real-life event happen.

In the aftermath of an aircraft accident, aviation operation employees are shocked, stressed, and often emotionally connected to the crew members and passengers. They are overwhelmed with requests for information—from management, families of possible flight crew and passenger victims, regulators, investigators, and media. Yet they need to respond calmly.

The best way to get through the tragic day and its aftermath is not only to have an emergency response plan (ERP) in place beforehand, but to have practiced its components regularly to build "muscle memory" of what steps to take, who to contact, and what information to put out (and what not to put out). There will be many events happening quickly and organizations will need to interpret the data accurately and make decisions promptly.

"Operators need to be prepared to take care of the three Ps—People, Perception (the company brand image), and Participation in the investigation," explains Carla Tirel, Fireside's Assistant Vice President for Operations.

"The ERP is a roadmap. But the experience of managing an emergency response is much more than a piece of paper. It's a holistic program. It involves a mindset and a culture, and the requisite resources to make your ERP a truth-telling document."

FAMILIES FIRST Fireside and other crisis experts strongly advocate that, before anyone else, the families of potential victims should be notified.

And, it's best to have a neutral party be the initial bearer of bad news. "The pilots thought they should be the ones to contact spouses," says Amber Finchum, an NBAA Committee Member who is a Flight Coordinator,

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>
> – CARLA TIREL, AVP Operations, Fireside Partners

FAA Licensed Dispatcher and Professional ERP Lead for a four-aircraft flight department. “You may think you’re being a good friend, but consider this: in telling someone their spouse has been killed in an accident, they will always look at you as the person who totally changed their life, and chances are, with little or no training, it will not go well.”

“After the families, you want employees to know before the press,” Tirel notes.

ONE MEDIA SPOKESPERSON Social media, of course, has dramatically altered the “news cycle,” enabling instantaneous posting of photos, videos, and eyewitness accounts of an event, adding to the pressure on managing accurate communications.

“The important thing in crisis response is speed,” emphasizes Martin Free, DuPont Aviation’s safety manager. “People with cameras want to have the story first, but their information is not verified. We have to be ahead of that wave.”

Company employees, including those in the aviation operation, should not provide information to the press or social media. Rather, there should be a single spokesperson, most likely the corporate communications leader, who disseminates periodic, fact-based reports, based on the data available at the time and after consultation with key leaders of the response team and investigators.

PRACTICE MAKES BETTER Fireside Partners provides a “Tactical ERP” that features a color-coded reference table to help quickly determine the magnitude of the response necessary. It is important that, in a stressful situation, anyone can open the ERP, work through the plan, complete the checklist and communicate effectively by following the color-coded system.

Fireside paces its clients through a series of escalating rehearsal scenarios, both to prepare the teams and individuals for a possible event and to identify weaknesses in the plan.

Training might include a “tabletop” exercise that gives you an idea of what’s going to happen in the first few hours, but without the pressure of a live event. The next phase is more experiential, adding real phone calls, but with pauses to discuss ERP adjustments.

The final drill is real time for three hours. If there is a mistake in the first 10 minutes, it will have a cascading effect. The purpose is to keep participants challenged and involved.

“Most business aviation companies have a plan,” Tirel acknowledges. “[But] most of the plans I’ve seen are either insufficient—they don’t address all the components—or they look stellar on paper, but the actual ability of the company to take action on the plan is lacking. For those who walk through these training sessions a few times and are able to iron out the wrinkles, it works very efficiently.”

DuPont’s Free emphasizes the importance of involving all stakeholders in the ERP drills. “A lot of eyes are opened by the drills,” he says. Participants “realize these events happen and we need to get out in front of them to protect the corporation.”

Finchum adds, “An aviation event is a completely different dynamic, even a different language from a traditional corporate crisis plan. Integration of the corporate crisis plan and aviation ERP is essential to the overall success of managing an event. It’s important to train the corporate team, get to know the players and build the relationships. The corporate team needs the understanding and confidence in our aviation department to be able to handle an aviation event, knowing they have an integral role in the team effort.”

Editor’s Note: Article modified from original published in Sept/Oct 2017 issue of NBAA Business Aviation Insider.

Conflict Aloft:

Is Space the New War Zone?

The idea of warfare in space raises some tricky issues. Attacks on satellites and other systems may be "invisible" to a person looking up into the sky and hard to track in general, but they can be just as devastating as attacks on terrestrial technology, as our digital world today is dependent on satellite networks that cover the globe.

The U.S. military is taking steps to increase space defense, particularly protection of satellites, but the creation of a new branch of military to oversee space defense remains questionable. Today more and more countries, even developing countries, are taking steps to go digital. For many nations, cyberspace is a critical part of their infrastructure. And now cyberwarfare has a new potential battlefront: low Earth orbit.

SPACE-BASED WARS Our early fears about space-based wars were allayed somewhat by the United Nations' 1967 Outer Space Treaty, which banned the use of nuclear weapons in space. The treaty was based on legal principles governing the activities of states in the exploration and use of outer space. The Russian Federation, the United Kingdom, and the United States signed the treaty and it became effective in October of that year. The Outer Space Treaty provides the basic framework for international space law.

However, it did not ban use of conventional weapons in space. Consequently, rocket attacks on satellites are an area of concern, as are electronic attacks. What's more, satellites can sabotage other satellites and ground systems can block GPS signals. And, as with terrestrial data storage and transmission systems, there is certainly a danger of hacking in space. Cyberattacks require no guns or explosives. All you need is a computer and an internet connection, and with the right skills, you can affect governments and millions or even billions of people worldwide. For that reason, the time is now for the international community to respond.

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Perhaps an organization like the United Nations should work to expand on the Outer Space Treaty to address the looming specter of conventional and cyberwarfare in low Earth orbit. One thing is clear, it is critical to virtually everyone on our planet that we collectively take steps to protect the world's rapidly growing collection of mission-critical satellites.

Taking Technology to New Heights:
Artificial Intelligence in Aviation

AI is poised to take on an expanded role in aircraft operations. How big a part it will play remains to be seen.

As defined by research firm Gartner, artificial intelligence (AI) is "technology that appears to emulate human performance typically by learning, coming to its own conclusions, appearing to understand complex content, engaging in natural dialogs with people, enhancing human cognitive performance (also known as cognitive computing) or replacing people on execution of nonroutine tasks." Many applications of AI, which would have been considered science fiction in the not too distant past, are becoming commonplace today—things like self-driving cars, digital home assistants, and autopilot systems that can manage an entire flight from takeoff, climb and cruise to descent, approach and landing, all without human intervention. However, as AI researchers around the world know, those simple tasks are just scratching the surface of what computer "neural networks" will one day handle.

The goal of creating machines that can think like humans has been pursued since the computer was first invented. Will this latest surge in interest be a passing fad? According to most experts, AI is here to stay, in large part because new technology like parallel processing, cloud computing, and advanced "learning algorithms" has removed the roadblocks that stymied many past initiatives.

SAFER FLIGHTS In its ongoing quest to make flight safer and more efficient, the aviation industry has always been an early adopter of new technology. A simple autopilot, that keeps an airplane flying straight and level is just one example, and already there are systems that make that impressive feat of engineering seem downright crude. For example, Garmin's Telligence Voice Command system can manage many basic cockpit tasks including reading wind forecasts, changing radio channels, and providing details on current position on demand. It's not hard to imagine a whole host of additional functions that systems like this will be taking on in the near future.

The big leap will come when we begin trusting AI not only to provide data or respond to simple commands, but to make decisions, and in particular, decisions in scenarios that fall outside the "norms" of aviation operations. We don't ask a great deal of today's autoflight systems (relative to what we believe they can achieve one day), but even at that they are quick to surrender and will return control to the flight crew in challenging situations like excessive turbulence.

> *The big leap will come when we begin trusting AI to make decisions.*

WATCHING TO LEARN But it appears that the "big leap" is just around the corner, and the ability of AI systems to learn will be the key. For example, researchers are creating systems that can develop skills for handling in-flight crises by "watching" how well-trained and experienced flight crews respond in similar scenarios. Soon, an autoflight system won't be switched off during an emergency, but instead will be actively assisting the crew precisely where and when its input is needed.

Will AI replace pilots? Not anytime soon. As observers point out, there are a number of fields in which AI is now playing an important role—everything from railways to healthcare—and in none of them have humans been displaced. Instead, all signs point to AI systems functioning as increasingly capable digital assistants that work in concert with their flesh and blood counterparts. With all its potential to improve aviation, the "rise of the machines," portrayed in fiction as something we would be wise to fear, is actually something we would be foolish not to embrace.

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