2016 CAMPAIGN: AIRPORT GROUND ACCUMULATION AND AVIATION RISK COLLECTION

Russell

SOFT MARKET IS THE MOST LIKELY CAUSE OF THE SKY FALLING IN ON AVIATION UNDERWRITERS HEADS

"Cyber terror, business interruption/supply chain disruption and concerns over the economy all help to heighten aviation (re)insurers anxiety levels while the "new normal" soft market depresses rates and underwriters alike."

Russell Group reported these concerns in a recent white paper that formed a small part of our 2016 Aviation and Airport Ground Accumulation campaign.

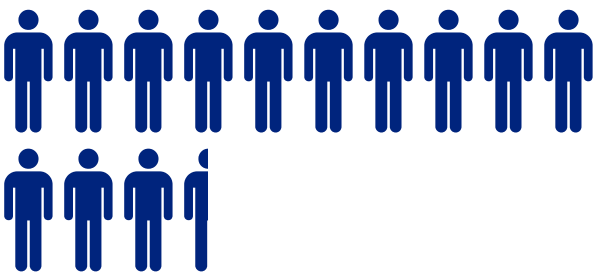
Our qualitative research on the latest geo-political strains, airport ground accumulation risks post-Tripoli, cyber disruption and emerging aerospace risks has been extensive.

We decided, however, to find out what really concerned stakeholders in the aviation (re) insurance community when we engaged in a social media-led short survey to more than 400 senior underwriters and risk experts.

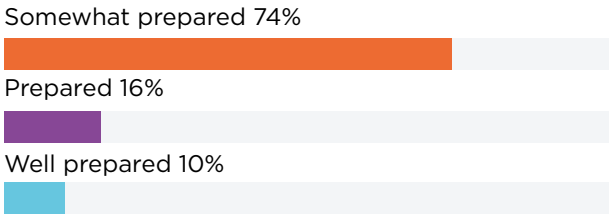
As might have been expected though, the perennial soft rating environment features highest on aviation underwriters' risk radars. In response to the question: "Do you agree the soft market is the biggest challenge facing aviation (re)insurers today?" this was affirmed by 100% of respondents.

Another major focus of this year's Russell Group campaign has centred on the theme of airport ground accumulation risks.

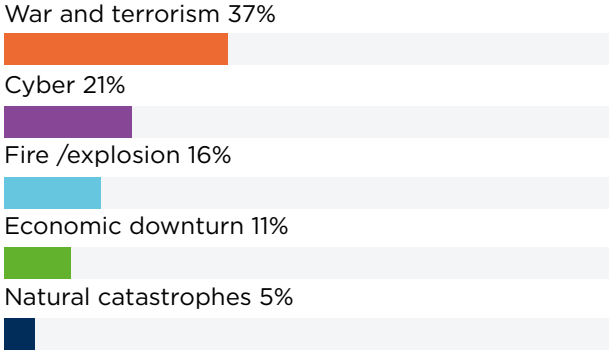
In response to the question "Are you concerned with airport ground accumulation exposures?" this was affirmed by 63% of respondents.



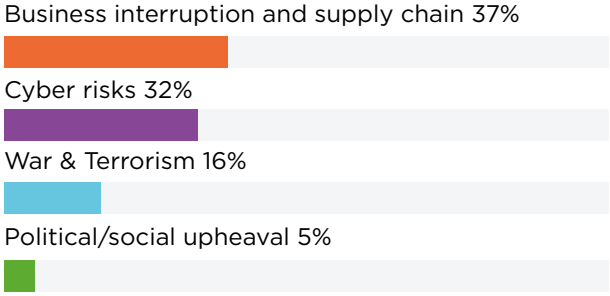
Then we quizzed aviation underwriters as to how prepared their clients are to deal with the consequences of a terrorist attack at an airport? We found that 74% replied that their clients are "somewhat prepared", while 16% were "prepared" and 10% were "well prepared."



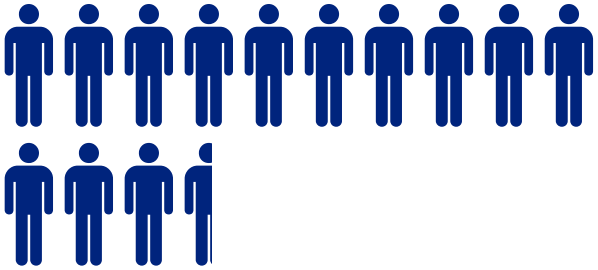
Going into a more granular level of questioning we asked what are the risks that underwriters fear the most? War and terrorism with 37% came top while Cyber (21%), Fire /explosion (16%), fears of an economic downturn (11%) and Natural catastrophes (5%) followed in descending order.



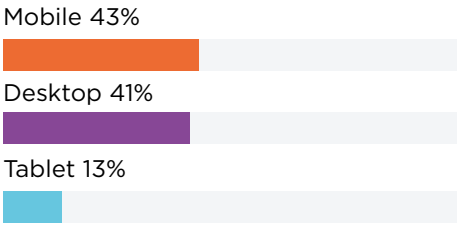
In response to the survey question which is the top risk, for which aerospace firms in your view are least prepared for? the split was as follows:



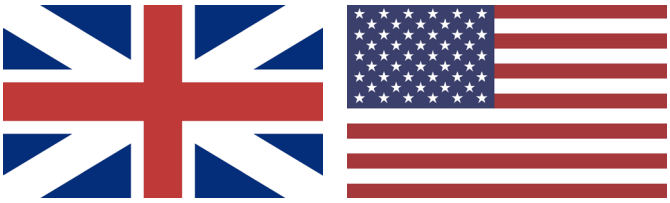
Concluding the survey, more than two thirds (68%) of aviation underwriters agreed that risk modelling and analytics could offer the best opportunity to manage their aggregate exposures better.



The methods that Russell Group employed to gauge the aviation market's views in 2016 have relied heavily on social media engagement and the response has been very encouraging. In terms of Devices used to access our Risk Lounge thought leadership portal (risklounge.co.uk) we were somewhat surprised to learn that 43% of underwriters used their Mobile to read white papers while tablets were used by 13% and 41% on desktop.



In terms of Geography, underwriters that accessed data came from all over the world though the UK and U.S. clearly features most prominently.



To conclude the Russell Group 2016 Airport Ground Accumulation and Aviation Campaign - we have compiled a complete record of the campaign, which you can browse in its entirety and at your leisure perhaps in the serene environment of an airport waiting lounge sometime.

Thanks for reading and spending some time in our Risk Lounge!

100% agree the soft market is the biggest challenge facing aviation (re)insurers today.

AIRPORT GROUND ACCUMULATION

MANAGING GROUND ACCUMULATION RISKS POST TRIPOLI!

In this white paper, Russell Group Limited focuses on Airport Ground Accumulation hazards and risks, which we believe are rising significantly due to a range of emerging social, environmental, economic and political factors.

In today's increasingly complex aerospace environment the paper starts by focusing on the most granular airport hazards and concludes with an overview of the challenging Political Risks environment and natural perils facing aviation, aviation, hull war and political risk underwriters in 2016.

It all Started on a Grassy Field!

The earliest aircraft take-off and landing sites were grassy fields. Later, concrete surfaces would allow landings 24/7. The title of "world's oldest airport" is disputed, but College Park Airport in Maryland, US, established in 1909 by Wilbur Wright, is generally agreed to be the world's oldest continually operating airfield.

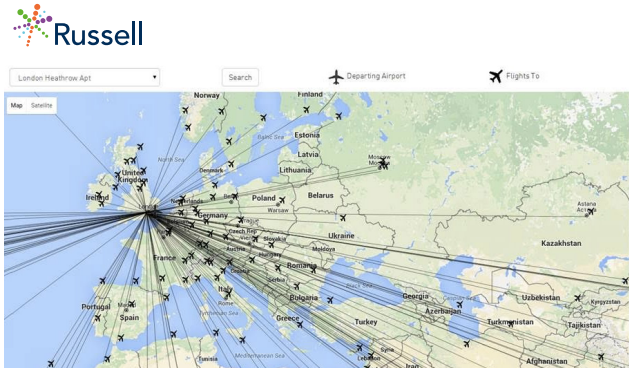
It's safe to say that Airports have moved on since then!

For example, Incheon International Airport, is the largest airport in South Korea, the primary airport serving the Seoul Capital Area, and one of the largest and busiest airports in the world. The airport has a golf course, spa, private sleeping rooms, ice skating rink, a casino, indoor gardens and a Museum of Korean Culture.

Rank 2014	Rank 2013	City	Total Flights	Percent Change
1	2	Chicago	881,933	-0.2%
2	1	Atlanta	868,359	-4.7%
3	3	Los Angeles	708,674	1.7%
4	4	Dallas/Fort Worth	679,820	0.3%
5	6	Beijing	581,953	2.5%
6	5	Denver	565,525	-2.9%
7	7	Charlotte	545,178	-2.3%
8	8	Las Vegas	522,399	0.3%
9	9	Houston	499,802	0.6%
10	12	London	472,817	0.2%

Top 10 Busiest Airports by Flights

The Airport's authorities claim that average departure and arrival takes 19 minutes and 12 minutes respectively, as compared to worldwide average of 60 minutes and 45 minutes respectively, ranking it among of the fastest airports in the world for customs processing.



Airports route map

An airport like Incheon International Airport is clearly a complex and potentially hazardous environment but all airports - large and small - share increasingly complex risks that underwriters need to understand, as we will learn in this white paper.

The need to understand exposures is becoming more pressing as international regulators take a closer look at airport safety management strategies – potentially a threat but also a major marketing opportunity for client-focused underwriters.

	Code	Airport	Country	Aircraft Total	Exposure
1	DXB	Dubai International	United Arab Emirates	252	$37,039,243,930
2	PEK	Beijing Capital Intl Apt	China	346	$34,692,819,653
3	PVG	Shanghai Pudong International Apt	China	311	$32,167,914,178
4	HKG	Hong Kong International Apt	Hong Kong (sar) China	226	$30,874,177,783
5	ICN	Seoul Incheon International Airport	Korea Republic of	225	$29,455,875,855
6	LHR	London Heathrow Apt	United Kingdom	337	$27,946,260,274
7	MIA	Miami International Apt	USA	296	$25,906,085,494
8	KMG	Kunming	China	419	$24,991,524,555
9	FRA	Frankfurt International Apt	Germany	230	$23,063,384,621
10	LAX	Los Angeles International Apt	USA	222	$20,519,789,564

Airport Exposure

Airport Safety Risk Management

The Airport Cooperative Research Programme (ACRP) recently published its ACRP Report 131: A Guidebook for Safety Risk Management for Airports (referred to from now on as ACRP Report), which provides guidance on conducting the safety risk management (SRM) process, one of the four components of a Safety Management System (SMS).

According to the 2015 ACRP Report's authors, with traffic growth, the number of accidents tends to increase if the level of safety remains constant. In such an environment there is a more pressing need to preserve public confidence so the aviation industry, using new technologies and approaches like SMS, needs to further reduce the chances of accidents.

The ACRP notes that: "As the industry becomes more complex and aircraft become more sophisticated, demands on airports will increase. The FAA is developing regulations to require 14 CFR Part 139 certificated airports to develop and implement SMS. This is a result of the International Civil Aviation Organization (ICAO) requirement for all member states (the United States being one) to develop and implement SMS for the regulator and the international airports of member states."

Safety Management Systems: A regulatory Requirement?

A key point that underwriters will note is that "The airport industry knows that SMS will become a regulatory requirement. SMS will require more knowledge and training for airport staff and stakeholders."

This point appears to be backed up by Joseph Strickland, global head of aviation for Allianz Global Corporate and Specialty Americas, one of the largest insurers in the world with operations in 14 countries, who is quoted in AIN online as saying: "The invitation for an insurer to visit the insured doesn't happen as often as it should, especially with single-aircraft operations, said Strickland.

Sometimes dubbed "safety engineering visits," these onsite meetings are typically reserved for the larger operations. But one reason to invite the insurer out is when a flight department wants to implement a safety management system (SMS). Insurers often have experienced people who can walk the flight departments through the SMS process.

"A growing number of flight departments are implementing SMS," said Strickland. "It's becoming another key area where pilots can enhance their operations through standardization and best practices. It's important, and it should be seen that SMS is a path toward safer operations."

The Federal Aviation Authority (FAA) recommends a 5-Step Safety Risk Management (SRM) process used by many airports carrying out an SMS. The 5-Step SRM process follows this sequence:

1. Describe the System
2. Identify Hazards
3. Analyze Risks
4. Assess Risks
5. Mitigate Risk

At a very granular level, airports are subject to numerous hazards and risks that require large Checklists on a risk register: checklists prepared for self-inspections may include the presence of Foreign Object Damage (FOD), pavement deterioration, and faults in the lighting system and signs.

An airport operations inspector is continuously searching for anything that may pose a safety risk to airport operations. Examples of hazards in this category include vehicles speeding on the ramp and equipment parked outside designated areas. For example, an airside driver striking an aircraft and causing minor damage during a ground handling operation.

Or take another example (ACRP report) - an airport decides to build a new terminal. "During the planning and design phases, the location and the size of the terminal are defined, and any impacts to the airfield. Many potentially, permanent hazard conditions can be avoided through an effective planning phase SRM—line-of-sight limits on the Air Traffic Control Tower (ATCT) personnel, airspace impacts, potential interference with existing and/or proposed surveillance equipment are just a few."

Often it is important to analyze a range of outcomes. For example, when dealing with bird strikes, control actions to address large birds causing damage to aircraft may not mitigate risks associated with smaller species.

Smaller airports may find the National Transportation Safety Board (NTSB) database useful. The NTSB keeps records for all aircraft accidents investigated in the United States and its territories and for aircraft registered in the United States. From January 2008 to April 2014, there were more than 7,800 General Aviation (GA) aircraft accidents in the United States; presumably, most of the aircraft involved were operating to and from GA airports. (NTSB aircraft accident database)

Micro Ground Accumulation Risks

These ACRP Report examples highlight a number of potential hazards including foreign Object Damage (debris) and even faded or removed pavement markings.

Having many workers and much equipment in a confined area, often under substantial time pressure, creates an environment in which injuries and aircraft damage may occur. Major system changes at the airport are sources of risks.

Some typical examples of such changes include: airfield improvements: runway rehabilitation and extension, construction of new taxiway, renovation of terminals, operation of a new large aircraft: B747-800, A380, changes to airport management, and rapid airport growth as aircraft operations and passenger numbers increase.

According to one white paper - The Wingman – A Portable Wingtip Collision Avoidance System – "Wingtip collisions have a wide variety of causes as well as levels of severity. They occur in taxi, hangar, and runway areas, and are a problem in both GA and Commercial Aviation. The causes of these incidents, although varying, can often be traced back to a loss of situational awareness by the operator in either of these situations."

The cost of even a small number of significant wingtip collisions can be enormous for an airline. Other indirect costs such as the cost of cancellations, loss of public image, and investigations can be far greater or more impactful than the direct physical damage. (Source: Vandel, 2004)

The cost for GA pilots is also a significant burden on the industry. Smaller scale incidents such as hangar rash are frequent but also more likely to go unreported in hopes of avoiding responsibility. Hangar rash is an aviation term that refers to minor incidents involving damage to aircraft that typically originate due to improper ground handling in and around a hangar, other aircraft or objects on the ground. Such aircraft are typically considered as good as new once repaired or re-skinned. Nevertheless, the occurrence of such incidents can cost thousands of dollars due to various replacement fees.

Wingtip collisions are very frequent. Each incident results in a loss of time and money for customers, operators, and owners. Presently, there are 27,000 recorded ramp incidents annually in commercial aviation, equal to approximately 1 for every 1,000 departures (Flightcom, 2013). Collisions on a small scale between aircraft and hangar walls occur daily and incur large costs for repairs as stated previously.

The direct costs of ramp damage to a Boeing 737 wingtip, for example, are estimated to be circa $256,000.

Hangar Losses

The total insured loss from a hangar that collapsed under the weight of snow at Dulles airport in 2010, crushing the aircraft inside, was estimated at up to $440mn at the time. The collapsed building was condemned following the incident.

The extreme weather conditions in 2010 caused a string of further hangar collapses across the eastern US and prompted catastrophe modelling firm Equecat to estimate the total insured cost of the storms at over $2bn.

The storms also took out Dulles Aviation's hangar at Manassas Regional Airport, but there were no people or planes in the 24,000 square foot building. Meanwhile, according to an Insurance Insider report from 2010, the landmark hangar at Salisbury airport in Maryland was destroyed by the snow. About 85 percent of the roof on the wooden building - the central piece of the area's first full-service airport - caved in.

Jonathan Stern of Schnader Harrison Segal & Lewis discussed the insurance ramifications of the Dulles Hangar incident in AIR Online remarking that several aircraft were insured at stated values higher than the actual market value of the aircraft. While this provided windfalls in the millions of dollars to some owners whose aircraft were totalled in the hangar collapse–and caused at least one other owner to sue his insurer when the insurer refused to total the aircraft–this practice could have insurers looking more closely at bringing stated values closer to market values.

"The stated value is intended to be an estimate of the aircraft's fair market value in used condition," said Stern. "[Stated values] tend to be overstated, creating a moral hazard because the aircraft owner actually stands to gain by a total loss of his or her airplane...This was a lesson learned for the

insurance companies, which might pay out $45 million on a given airplane because of the stated value, but only have a potential right of recovery of $32 million against the responsible parties because they're entitled only to fair market value in a tort suit."

Macro Ground Accumulation Risks

As we have seen, the role of the modern day underwriter is becoming more complex as the increasing relevancy of systemic risk focuses attention on more sophisticated exposure management techniques.

Globalisation, interconnectedness of economic, environmental, social and political factors, and new technologies and aircraft designs place the onus on underwriting professionals to be better informed.

War and Terror Risks

Looking at the wider picture, in Libya two years ago, militias armed with shoulder-launched missiles battled for control of the country's main airport. In Africa, the entire Sahel region is awash with weapons that include portable air defence systems leftover from the ousting of Moammar Gadhafi.

Before Tripoli, underwriters had not been thinking too much about ground accumulation, there had been very few events that had involved aircraft in the same place. There was an event in Jordan in the 1970s where three planes were high jacked and destroyed, Sri Lanka in 2001, and 9/11 but very few airport attacks so Tripoli has been a game changer.

Mitiga International Airport in Tripoli is still closed – there are aircraft in the airport that are reparable but deteriorating because they can't be maintained. Tripoli showed underwriters that they did not have a good understanding of their accumulation.

Then there's Syria's civil war, in which thousands of soldiers have defected and set up new battalions that have shot down military helicopters and jets. Volatile territories stretching from West Africa to Central Asia are putting at risk both commercial and light GA flights from ground-based weapons. The destruction of Malaysian Airlines Flight 17 demonstrates the dangers of flight across unstable territory where sophisticated weapons might be available to militants.

When it comes to airport ground exposures, the Aviation specialty insurance class is confronted with the emergence of new political and terror risks, which are increasingly volatile and often connect a range of different event scenarios.

What these risks have in common is that hostile states, terror groups and individuals frequently employ terror tactics that disrupt transport hubs, lines of communication and methods of travel, which is why airlines and airports are often a target, as happened in Tripoli recently.

Corruption

Can corporate and institutional corruption be an airport/aerospace risk? The answer is yes, potentially. We are currently witnessing a global interplay of risk drivers overlaid by corruption. In markets globally - whether you call them emerging markets, growth markets, the N11 and so on - we see medium or extreme risks of corruption. Systemic corruption drives societal and political risk, which can often lead to civil unrest. This is obviously something that for every sector, including the aviation sector, is a major risk.

How might this manifest itself as an airport hazard? Corruption and fraud divert essential resources and capital away from infrastructure and investment. Whether the investment is in the tools and assets needed to maintain an aircraft or training required to maintain ground crew quality standards the impact is potentially the same. If essential resources are therefore diverted away from an airport's infrastructure or people the results could be potentially catastrophic, which is why more underwriters are becoming interested in local social, economic and political changes – often represented by risk maps - on the ground.

Airports are complex and increasingly stressful environments not just for the passengers that pass through them but also for the workers that work there 24/7. Physiological Stressors can include early shifts, night shifts, weekend shifts, changing working hours, long working hours, and very intensive work conditions.

Airports in Areas of Political Risk

Corruption alone is not solely responsible for poor working conditions – other economic factors, including inequality and political strife play their part but alert underwriters will need to factor such hazards into their global risk map.

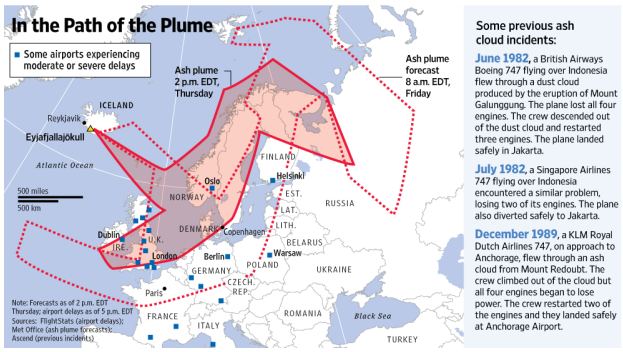
Connected World, Connected Risk

In today's increasingly connected world, technological disruptions have the potential to cause major Business Interruption issues. Insurers will need to factor IT disruption event scenarios into their risk and exposure models. As digitalization continues apace and global networks insinuate their way into all walks of commercial life, the threats and damage caused by deliberate or mistaken breakdowns in Information Technology systems are likely to increase exponentially.

From an airport operator's point of view, they might want to consider the use of augmented cyber insurance products to safeguard against such risks. The key word here for Underwriters is "connected." There is a wider concern about cyber exposures more generally and the impact on business interruption. A UK Cabinet Office spokesman has said that cyber-attacks are one of the "top four" threats to the UK's national security.

Natural Perils

According to the 2014 book Volcanic Hazards, Risks and Disasters, volcanic activity also has caused significant adverse effects to numerous airports worldwide with local to far reaching effects on travellers and commerce. The most common effect is temporary operational disruption ranging from flight cancellations to airport closures for periods of hours to weeks.

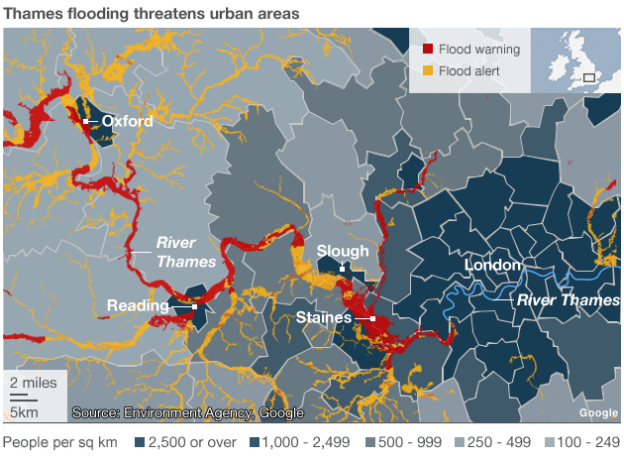


Icelandic Volcanic Activity

The main hazard is ash fall. The accumulation of only a few millimetres of ash on runways is sufficient to force temporary closure of an airport although disruptions have also been caused by air-born ash in the vicinity of airports without the deposition of ash on the ground. The accumulation of more than a trace amount requires removal of the ash in a manner that prevents it being remobilised by wind and aircraft.

More than 300 people were killed when devastating floods hit the Indian state of Tamil Nadu in December 2015. The rains have now stopped but businesses have been decimated, with factories, shops and offices destroyed. Photographs of Chennai's airport showed planes grounded by floodwater with many passengers stranded. The airport was closed with flights cancelled and diverted. The estimated insurance bill is $30 million caused by the floods.

Lloyd's has tested the scenario where Heathrow airport is flooded. This scenario is based on a heavy rainfall event moving from west to east across south-east England resulting in extensive flooding of the River Thames from Oxford to Teddington with secondary flooding on the River Colne from Ruislip south and surface flooding on the western and southern edges of Heathrow. The total flood extent covers 194 km2 and would cause significant impact on the major populated areas of Oxford, Reading, Slough, and the Henley areas of western London.



Heathrow and South West Floods

Surface flooding will cause disruption to Heathrow Airport with flooding from the west encroaching into Terminal 5 and the end of both runways. Further flooding from the south will affect cargo transit and handling facilities. The impact of pollutants should also be considered for indirect losses at London Heathrow airport, however, the Liability associated with potential pollution episodes will be difficult to calculate.

The other point to make here is that as demand for international air travel grows, Governments come under increasing pressure to build new terminals, runways (Heathrow) or even new airports (Thames Estuary aka Boris Island). Political pressures do not always lend themselves to good policymaking particularly when it comes to environmental decisions about airports.

A New Peak Aggregate Exposures Solution

Many of the issues that we have raised above require an integrated approach to underwriting risk management. It will become more important to have real-time knowledge of underlying accumulated exposure at the time of risk pricing, to encourage more informed risk selection decisions.

Russell Group is currently developing a cloud-based Ground Accumulation service that caters to the requirements of Aviation and Political Risks underwriters concerned about their Ground Accumulation war and natural perils peak aggregate exposures. The Aviation Hull War market is written by both Aviation and Political Risk teams and it is for them to understand where their peak accumulation exposures exist.

The data that underpins this new Ground Accumulation service shows where underwriters' peak exposure accumulations lie.

63% are concerned with airport ground accumulation exposures.

IS IT A BIRD, IS IT A PLANE, NO IT'S A FRIGHTENING FACT!

10 DANGEROUS AIRPORTS FROM AROUND THE WORLD

Pour yourself a large one, strap yourself in and prepare for landing ...if you're lucky!

fly BOARDING PASS **GIB** ECONOMY FRIGHTENING FACT

Gibraltar International

Planes using Gibraltar's sole 5500-foot runway (09/27) must cross the street—Winston Churchill Avenue!

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
GIB978	Y	30JUL	1515

GATE	BOARDING TIME	SEAT
G01	1445	09L

043 OFN
RS01245368

fly BOARDING PASS **TGU** ECONOMY FRIGHTENING FACT

Toncontin Airport, Honduras

Boeing 757s make a 45-degree bank to effectively reach the 7000-foot runway.

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
TGU258	Y	29JUL	1155

GATE	BOARDING TIME	SEAT
G05	1125	07L

043 OFN
RS01245368

fly BOARDING PASS **SAB** ECONOMY FRIGHTENING FACT

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
SAB290	Y	29JUL	0955

GATE	BOARDING TIME	SEAT
A04	0900	10A

043 OFN
RS01245368

Juancho E. Yrausquin,
Saba Island

Located in the Caribbean, the airport has the world's shortest commercial airport runway at about a quarter mile.

fly BOARDING PASS **NZIR** ECONOMY FRIGHTENING FACT

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
NZIR88	Y	10JAN	0925

GATE	BOARDING TIME	SEAT
G05	0845	01B

043 OFN
RS01245368

McMurdo Air Station,
Antarctica

Its 10,000-foot blue ice airstrip is named after Pegasus, a Lockheed plane that crashed here in bad weather in 1970!

fly BOARDING PASS **UAK** ECONOMY FRIGHTENING FACT

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
UAK345	Y	19OCT	1755

GATE	BOARDING TIME	SEAT
Z03	1625	22D

043 OFN
RS01245368

Narsarsuaq, Greenland

One of the most difficult approaches in the world requires flying up to a Fjord with severe turbulence and wind shear.

fly BOARDING PASS **ROTM** FRIGHTENING FACT — ECONOMY

MCAS Futenma, Okinawa

Described as "the most dangerous air station in the world" by the Navy and Marine Corps passing over 16 schools, hospitals, and city offices, plus 3,000 people in the "clear zone" around the base.

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
ROTM22	Y	29JUL	1355

GATE	BOARDING TIME	SEAT
G05	1255	16L

043 OFN
RS01245368

fly BOARDING PASS **DAM** FRIGHTENING FACT — ECONOMY

Damascus International

In territory surrounded by the Syrian Army, various rebel factions, and ISIS, planes face potential surface-to-air missiles and risk being shot at by fighter aircraft once they're in the sky.

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
DAM118	Y	17JUN	1155

GATE	BOARDING TIME	SEAT
G05	1125	08L

043 OFN
RS01245368

fly BOARDING PASS **PBH** FRIGHTENING FACT — ECONOMY

Paro, Bhutan

Only 25 pilots are qualified to land at Paro Airport in Bhutan in the Himalayan Mountains, flights are allowed only under visual meteorological conditions restricted to daylight hours.

ECONOMY BOARDING PASS fly

PASSENGER
FROM
TO

FLIGHT	CLASS	DATE	DEP. TIME
PBH158	Y	29JUL	0745

GATE	BOARDING TIME	SEAT
E03	0645	03D

043 OFN
RS01245368

fly BOARDING PASS **FNC** ECONOMY FRIGHTENING FACT

Madeira

The airport's short runway, was extended, almost doubling in size...built on a platform partly over the ocean, supported by 180 columns (each about 230 feet tall).

ECONOMY BOARDING PASS fly

PASSENGER

FROM

TO

FLIGHT	CLASS	DATE	DEP. TIME
FNC258	Y	16NOV	1155

GATE	BOARDING TIME	SEAT
B56	1125	27F

043 OFN

RS01245368

fly BOARDING PASS **BRR** ECONOMY FRIGHTENING FACT

Barra, Scotland

Landing on the world's only beach runway with scheduled airline service, the Airport sits on the wide shallow bay of Traigh Mhòr in the Outer Hebrides.

ECONOMY BOARDING PASS fly

PASSENGER

FROM

TO

FLIGHT	CLASS	DATE	DEP. TIME
BRR998	Y	29JUL	0355

GATE	BOARDING TIME	SEAT
G35	0300	28D

043 OFN

RS01245368

Source: http://bit.ly/1mYkoRC

Russell

www.russell.co.uk

74% of clients are somewhat prepared to deal with the consequences of a terrorist attack at an airport.

16% prepared

10% well prepared

RISK LOUNGE THOUGHT ARTICLE

THE TALE OF THE ANTI-WHALING ACTIVIST AND AN AIRPORT'S LOST WEEKEND

No longer limited to academic or philosophical thinking, the idea of six degrees of separation has become influential in popular culture. Further advances in technology – particularly the Internet – have drawn increasing attention to social networks and human interconnectedness.

More and more things are connected whether we like it – or know it – or not. That's why it was interesting to read a recent report which basically outlined how the hunting of whales far out at sea could directly lead to the shut-down and disruption of a major inland airport.

Hacktivist group Anonymous claimed responsibility for a cyberattack on the website of Tokyo's Narita airport which went offline between 22 and 23 January, after a Distributed Denial of Service (DDoS) attack caused it to collapse under the strain of too much traffic. But why would it do that, you ask?

According to The Independent newspaper, Twitter accounts associated with Anonymous claimed the cyberattack was in retaliation for the detention of Ric O'Barry, an American dolphin trainer turned animal rights activist, who has been a vocal critic of Japanese whale and dolphin hunting.

In a recently released white paper Managing Ground Accumulation Risks Post Tripoli, Russell Group Limited focused on Airport Ground Accumulation hazards and risks, which we believe are rising significantly due to a range of emerging social, environmental, economic and political factors.

The Anonymous cyberattack in retaliation for a whale hunt covers all four of these factors. Underwriters can be forgiven for thinking "Well I could hardly have factored in whale hunting into my airport safety risk management system!"

Of course not but the episode highlights a central point of global connected risks and hazards today, which is that airport risk management, for example, is not simply about the measurement of "micro" or "on the ground" risks such as hanger collapse, wing tip collisions or other aircraft accidents.

No, a modern, holistic underwriting approach needs to factor in political risks (Tripoli), environmental (floods, and maybe whales!), social (the IoT, cyber) and economic (inequality or corruption, for example).

Two recent episodes highlight the social factor – the IoT and cyber hazards.

The news that hackers allegedly stole $55 million from a Boeing supplier has potential ramifications for aviation underwriters that are concerned for their cyber and supply chain exposures.

It was reported by Aerospace parts manufacturer FACC that its financial accounting department

has been attacked by hackers. In a mea culpa published on its website the Austrian firm confirmed that:

"On January 19, 2016 FACC AG announced that it became a victim of fraudulent activities involving communication- an information technologies. To the current state of the forensic and criminal investigations, the financial accounting department of FACC Operations GmbH was the target of cyber fraud. FACC's IT infrastructure, data security, IP rights as well as the operational business of the group are not affected by the criminal activities. The damage is an outflow of approx. EUR 50 mio of liquid funds."

The markets responded badly in the wake of the news. As a result, FACC's stock price closed 17% lower by the end of trading. The news is a reminder that in today's connected cyber environment it is incumbent on companies to keep a closer eye on their suppliers' digital vulnerabilities as well as their own.

Increasingly, however, the airlines themselves are the victim of an attack as Ryanair discovered to its cost in 2015. The airline reportedly fell victim to hackers who managed to steal €4.6 million (almost US $5 million) via a fraudulent electronic transfer to a Chinese bank. Subsequently it seems that the money was recovered when Ryanair released this statement

"Ryanair confirms that it has investigated a fraudulent electronic transfer via a Chinese bank last week. The airline has been working with its banks and the relevant authorities and understands that the funds – less than $5 million – have now been frozen. The airline expects these funds to be repaid shortly, and has taken steps to ensure that this type of transfer cannot recur."

So it seems that there was a relatively successful conclusion to this particular cyber episode though it is still hard to put an estimate on the cost of the man hours lost, the fees paid to recover the sum, not to mention the damage to reputation incurred.

Six degrees of separation. You don't need to be Kevin Bacon or a connoisseur of the movie Footloose to marvel at the perverse outcomes causes by interconnected risks today.

The Hungarian author Frigyes Karinthy, believed that the modern world was 'shrinking' due to the ever-increasing connectedness of human beings. He posited that despite great physical distances between the globe's individuals, the growing density of human networks made the actual social distance far smaller.

Underwriters could draw similar conclusions to the nature of risk in 2016. So as our "virtual" world merges with the "real" world today it becomes increasingly important that the insurance community absorbs these abstract concepts and turns them into measurable analysis that can mitigate the risks between things.

37% fear War & Terrorism risks the most?

21% Cyber

16% Fire/explosion

11% Economic downturn

10% Other

5% Natural catastrophes

RISK LOUNGE THOUGHT ARTICLE

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AVIATION RISKS: THINKING OUTSIDE THE BLACK BOX

The Lloyd's of London Aviation Realistic Disaster Scenario is well known. It asks us to assume a collision between two aircraft over a major city, anywhere in the world, using the syndicate's two highest airline exposures. The Aviation RDS states:

"Assume a total liability loss of up to USD4bn: comprising up to USD2bn per airline and any balance up to USD1bn from a major product manufacturer's product liability policy(ies) and/or an air traffic control liability policy(ies), where applicable. Consideration should be given to other exposures on the ground."

So far so good, it's safe to say that underwriters understand the risk here and have made the correct risk management or reinsurance provisions to reduce their exposures. This is what is known in the trade as a known risk. What about the known unknown aviation risk scenarios though?

New Aviation Realistic Disaster Scenarios

We thought it would be interesting to explore the latest thinking on emerging aviation perils and posit a few new aviation Realistic Disaster Scenarios, which we outline in this article.

Prospects for the aviation industry look good, with growth in passenger numbers expected to reach 16 billion by 2050, a 384% increase on today's numbers. Air freight is expected to increase to 400 million tons from just 50 million today, according to the International Air Transport Association (IATA).

That is good news for the aviation industry but it does bring with it a number of risks. As the aviation industry explores more revolutionary forms of technology, for example, Underwriters will need to keep up with latest developments in composite materials and digital technology.

At the same time the airlines need to address the high financial and environmental cost of traditional fossil fuels, which will likely bring about a wave of experimentation with potentially hazardous consequences.

Technology Problems That Ground an Entire Fleet

Henning Haagen, Global Head of Aviation, AGCS says: "A problem with a component, engine or airframe can now lead to the grounding of an entire fleet." For example, the latest Boeing 787 Dreamliner experienced on-board technology problems that led to the entire fleet grounded for three months until a solution was found.

Increasing business interruption risks, new technologies such as composite materials, human factors, increasing cockpit automation and information, growing demand for air travel, pilot training – it is estimated that 498,000 new commercial airline pilots will be required over the next two decades – and pilot lapses and automation are all major causes for concern.

Pilot Mismanagement

Pilot mismanagement and confusion caused Asiana Flight 214 to crash in San Francisco in 2014, for example, US accident investigators concluded. The Asiana flight crew "over-relied on automated systems that they did not fully understand", said Chris Hart, the National Transportation Safety Board (NTSB's) acting chairman.

"In their efforts to compensate for the unreliability of human performance, the designers of automated control systems have unwittingly created opportunities for new error types that can be even more serious than those they were seeking to avoid," Hart said.

Unmanned Aerial Vehicles (UAVs) and cyber-related disruption are other emerging risk areas for aviation likely to have appeared on underwriters' risk radars. Russell Group Limited has written at some length on the subject of cyber disruption, for example, our 2015 report Does 8,000 iPads = 8,000 Cyber Headaches for Airline Companies? where we reported that an error in an iPad navigation application used by airline pilots caused 74 flight delays at American Airlines.

Aviation Interconnectedness

A US supervisory body warned of the possibility of in-flight Wi-Fi being used to hack into the avionics system of a plane. The Government Accountability Office (GAO) warned that: "Modern aircraft are increasingly connected to the internet. This interconnectedness can potentially provide unauthorized remote access to aircraft avionics systems."

UAVs or drones (as they are more commonly known) are also causing a big buzz. The US' Federal Aviation Administration (FAA) has predicted the number of UAVs in the US will rise to approximately 15,000 units by 2020. The Teal Group's 2012 market study forecasts that total spending for unmanned aircraft systems (UAS) – another acronym for drones - is expected to reach $89.1 billion over the next 10 years worldwide.

Drones are a real worry. The British Airline Pilots' Association (BALPA) reports that a drone was flown within 20ft of an A320 landing at Heathrow. This certainly gives some pause for thought. If a drone can be flown within 20ft of a large aircraft at Heathrow – with thankfully no apparent malicious intent on this occasion, what other similar scenarios can we envisage?

A New Aviation RDS?

Is it unrealistic to envisage a scenario where terrorists or perhaps participants in an overseas conflict attack a major airport hub somewhere else in the world using drones? What if some of the drones are launched at the cockpit of a large aircraft taking off or landing while other drones simultaneously target air traffic control? Is this a new RDS?

Meanwhile, Lloyd's is already on the case when it comes to a Cyber RDS. The Lloyd's Market Bulletin Ref: Y4938 recently stated:

"For present purposes, Lloyd's focus is on exposures arising from a malicious electronic act which for the purpose of this bulletin we label as 'cyber-attack'. Cyber-attack is therefore the proximate cause of loss, although the consequences may include property damage, bodily injury, financial loss or other forms of damage."

According to the Bulletin: "Syndicates are required to adopt a scenario-based approach for considering gross aggregate exposure to cyber-attack. Each syndicate must conceive and design at least three internal scenarios for this purpose. This is a minimum – the number and type of internal scenarios is otherwise entirely at syndicates' discretion. Having created the internal scenarios, syndicates must then estimate their aggregate potential exposures to each, across all affected lines of business and report aggregate exposures to Lloyd's by 1 April 2016."

Terrorist Aircraft Spectaculars

In the wake of 9/11 and terrorists apparent obsession with aircraft "spectaculars" one imagines that there is every chance that a cyber aviation attack will make it into the top three scenarios. A 2013 AIAA Decision Paper: A Framework for Aviation Cybersecurity outlines the cyber challenge, as follows:

"Understand the threat actors and their intent: The aviation community must have a common understanding of these actors, their motivations, and intents to efficiently plan our defences. Think about the unthinkable: Our adversaries are thinking outside the box to plan cyber-attacks and we must do the same to stop them."

The paper's conclusion is chilling: "However, the global aviation system is at a crossroads. Implementing ICT (Information Communications Technology) across the aviation system increasingly connects the global aviation system. The full implications of the increased connectivity and dependency on ICT need to be understood in light of evolving cyber threats to ensure continued confidence in aviation."

Business interruption and supply chain is the top risk that aerospace firms are least prepared for according to 37%.

32% Cyber risks

16% War & Terrorism

10% Other

5% Political/social upheaval

CREDIT, FINANCE AND LEASING Q&A

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2016: A CHALLENGING TIME TO BE AN UNDERWRITER OR INSURANCE BROKER!

Russell Group launched 2016 with an aviation thought leadership campaign that started with its ground breaking Ground Accumulation Hazards paper published on the 26th January (www.risklounge.co.uk). Since then we have turned our attention to the subject of emerging aviation risks this year with a focus on the real risks that could be caused by drones or major cyber incident.

In this new white paper Q&A we focus on the current aerospace credit, finance and leasing, and the wider geo-political environment that affects the sector. Russell Group MD Suki Basi caught up with AVOCET Insurance Consultants, which provides the Airfinance market with specialist aviation insurance consultancy and product placement services, to speak to one of the firm's consultants Barry Moss.

The following is a thoroughly enlightening questions and answer session that provides information that will be of interest to aviation industry professionals and insurance practitioners alike.

The current soft market has seen continued rate reductions however the $ impact has been offset by growth, so generally the airlines are paying the same amount of premium. If there was a wide spread adjustment of aircraft values, is it right to say that the impact on the hull premium basis could be substantial?

Not necessarily. Investors currently see aviation as an industry with good returns in the current low oil price environment. At an airline economic conference in Dublin in January 2016, aircraft lessors and financiers continued to talk up the market, however it is an industry highly susceptible to global economic impacts and the current demand for new aircraft appears to be counter-cyclical which may indicate that the demand for new aircraft is reaching its peak. In fact 2015 was the first year in many years where year on year orders for new aircraft declined.

The first A320neo was delivered to Lufthansa in January this year and Airbus are gearing up to deliver up to 60 A320 ceo/neo models per month. Boeing made their first test flight of the 737 max this month and will also ramp up production over time to around 57 aircraft a month by 2020. The neo/max models will sell at a premium compared to current generation models and are generally expected to obtain a 15% improved fuel efficiency over the aircraft they are designed to replace.

The introduction of the neo/max models will not necessarily hit residual values of current aircraft models in the short term as Airbus and Boeing have full order books for the next three to five years or more and therefore there is still a strong demand for new and used 'classic'/"next gen" narrow body aircraft because the passenger demand is there. Airline earnings per RPK have

increased considerably due to improved load factors, economics and the reduction in oil price which may stay at its current low level for the foreseeable future, with increased oil supply taking effect due to sanctions having been lifted against Iran.

How substantial would that adjustment be?

We do not envisage an imminent collapse in aircraft values for the following reasons. The value of aircraft is determined by purchase price, cost of capital over a prolonged period and airline demand for certain aircraft types. Whilst there has been some decease in lease rentals of certain types, the cost of capital is currently very low and therefore any reductions in lease rentals are somewhat factored in.

Current aircraft models generally have an economic life of around 25 years in what is pretty much a duopoly between Airbus and Boeing on mid to large aircraft types. This lack of competition is restricting technological improvements, particularly in the narrow-body sector because the A320 and B737 types are the manufacturers 'cash cows' and therefore there is little manufacturing appetite to invest large R&D cost in developing clean sheet designs. Boeing has recently said that it has no intention of producing a 'clean sheet' aircraft design until after production of the first B777-8X and B777-9X aircraft enter the market in 2022 or shortly thereafter.

With up to 80% or more commonality between the A320 neo and ceo types the A320 and a similar percentage commonality between the B737 next gen and max models, these aircraft will no doubt have an extended production run for at least another 15-25 years unless business as usual factors change considerably during that period. Therefore we can expect to see A320/B737 operating well beyond 2030 on a BAU projection.

Considering the first B737 was developed in the mid-1960s and the A320 in the early 1980s, this is a pretty impressive production run and therefore there is a strong investor appetite for these narrow-body models of later vintages (up to 10-12 years old). Some later build models are being parted out earlier where there continues to be a strong secondary market for original aircraft manufactured parts. The increased fuel and maintenance costs of operating older equipment is being more than offset by the current low oil prices which is keeping values relatively high and stable.

The wide-body sector is a different scenario. Operating cost per seat remains a determining factor and therefore the secondary market for less fuel efficient types has had an effect on airline demand and apropos lease rentals and aircraft residual values. The market for A340s had plummeted but is seeing a slight resurgence due to low oil prices. The B777 market has been affected due to a number of aircraft coming to market around the same time.

It is a buyers' market for these types with Delta just paying $7.7m for a used B777 whereas a new B777-300ER model would presently be valued at around USD200m. The difference between values of similar aircraft covers an awful lot of additional fuel and maintenance costs for older models. However, there does not appear to be a rush to used models for other reasons such as reconfiguration costs and also the B777 has 2/3 engine types which may make fleet commonality a problem.

Whilst the demand for new B777 and A330 ceo types remains pretty buoyant, these aircraft will also be replaced by the B777-X and A330 neo and A350 types and therefore residual values of present types may erode pretty quickly once the newer models take control of the market. The manufacturers are also having to play a juggling act in the winding down of production of existing types and the ramping up of manufacturing of their replacement types which is likely to restrict supply in the short term.

The large wide-body sector has become a niche market. BA continues to operate very old B747s, mainly on transatlantic routes, because they are financially unencumbered and economic to operate in a low fuel cost environment, providing they have a high load factor. The B747-8 is unlikely to continue in passenger production for long due to poor airline appetite for the type. The production line will I expect be kept open for freighter versions and will probably come to an end once the current US Presidential aircraft are replaced with two or possibly three of the latest B747 models. This will have an impact on values although the world B747 fleet is now so small that it will have little effect on insurance premium income.

Therefore in summary, we expect that unless airlines and aircraft lessors make large write-downs of aircraft asset values on their books, Agreed Values are unlikely to depreciate much in the current BAU environment. Where we do see an impact on premiums is for older types where most of the residual value will remain in the engines rather than the airframes.

In the current environment for the leasing companies, the credit risk should be a major concern. If we see a downturn as CAPA forecast, is it true to say that aircraft being returned early, particularly wide bodied aircraft would create a major issue in addition to the write downs associated with aircraft value realignment?

No lessor wants to have to repossess aircraft which can be a long and difficult process. Therefore the

credit rating and risk management of the aircraft operator has to be factored into lease rentals and performance obligations etc. The established aircraft leasing market is capable of managing this. What concerns us however is new entrant demand due to surplus capital looking for good yields.

We are concerned that there appears to be a fair amount of naïve equity investors entering the market where yields are the determining factor rather than what we consider to be the utmost priority of any aircraft owner being the safety of their airline lessee's passengers. This has the potential to go horribly wrong for many new market entrants and could put pressure on existing lessors to cut costs and take greater risk.

Banks are inclined to take a haircut on non-performing aircraft assets rather than incur the cost on continuous maintenance, storage, insurance etc. and this would therefore have an impact on distressed aircraft values, particularly in a difficult market. What the market does not need right now is the collapse of a major airline or lessor where numerous aircraft will come to market at the same time depressing lease rentals and values even further. We see further consolidation in the leasing market and increased participation from deep pocket investors, particularly from the US and China.

More generally what are the major economic and finance issues affecting credit counter-parties? Presumably the low oil price and low interest rates but what else?

Whilst the airline market is currently pretty robust, it would not take much to reverse the sector's fortunes such as if large scale terrorist attacks take place, increased risk of regional conflict and health pandemics result in a collapse in passenger demand. We are also concerned that insurers/reinsurers have increasingly concentrated risk at certain home/hub airports where fleet values can easily run into billions of dollars.

Our view is that there is, particularly in the Middle East, Europe and to some lesser degree the US, China, Russia and certain Islamic states, increased terrorist ground risk exposure. Relatively poor airport security in some territories (e.g. the recent planting of small explosive devices on aircraft with the complicity of ground staff in Egypt and Somalia) and the availability of cheap drone technologies that can deliver reasonable payloads accurately over short/medium distances cannot be dismissed as a potential threat.

Whilst many commercial drones contain software limiting their GPS capabilities around airports, this technology, so we have been informed can be easily overridden with little technical expertise. We believe the development and adaptation of low cost commercial drones as highly capable potential terrorist munition platforms poses a threat to aviation insurers/reinsurers and the Airfinance and aircraft leasing communities.

Security is an issue that will continue to face territories where fundamentalists and extremists will try to threaten moderate and liberal regimes which are counter to the ideals of those who perpetrate such crimes. Recent comments from the French Prime Minister Manuel Valls, for example, that Europe will undoubtedly suffer further 'hyper-terrorist' attack is obviously based on intelligence gathering.

The French PM told the Munich Security Conference the terrorist threat had increased because the ideology driving terrorists was "at the heart of our societies". He said: "We have entered - we all feel it - a new era characterised by the lasting presence of 'hyper-terrorism'.

"We must be fully conscious of the threat, and react with a very great force and great lucidity. There will be attacks. Large-scale attacks. It's a certainty. This hyper-terrorism is here to stay. The force of the ideological fascination is formidable, and if we have changed era it is because this hyper-terrorism is in the heart of our societies."

Most Aviation Hull War Risk and Allied Perils coverages provided by insurers/reinsurers to airlines are subject to aggregate annual limits. The combined value of any one airline's assets at risk at a single location often far exceeds the aggregate limit. The design of airports means that passenger gates are tightly compacted and if each of these gates is occupied by new (and particularly wide-bodied) or high value aircraft, then this poses a primary target for terrorist or other insurgents.

It would not be inconceivable for a value at risk to exceed $1bn – $3bn or more whereas the annual policy aggregate may be as little as $750m or less. Therefore aircraft owners and lessors are at risk as their assets may only be partially insured in the event of a large-scale war risk or terrorist attack event. Increasing aggregate limits or waiving them altogether would result in insurers/reinsurers assuming additional catastrophic risk and to price such risk may be beyond what airlines are willing to pay as an annual premium. It is therefore important that insurers and owners monitor fleet values/aircraft portfolio values when determining direct and contingent hull war and liability war risk coverages.

The loss of the Russian Metrojet A321 in October 2015 over the Northern Sinai and the substantial damage caused to the recent Daallo Airlines A321 flight from Mogadishu indicates complicity of airport/airline employees in aviation terrorist attacks. Surveillance video footage taken at

Mogadishu airport recorded two men handing what appears to be a laptop computer to a suspected suicide bomber after he passed through a security checkpoint. At least one of the men delivering the hand held device was an airport employee according to a Somali government spokesman.

Investigators also suspect the bomber was able to bypass rigorous security screening at the airport by boarding the flight in a wheelchair. The bomber fell from a hole blown in the fuselage of the aircraft. The bomber and many others aboard the Airbus had originally been checked in with Turkish Airlines, which cancelled its inbound flight due to bad weather. The plan was for these passengers to transfer at Djibouti and therefore it would appear that the THY flight was probably the intended target of the al-Shabab claimed attack.

My understanding is that values of aircraft have been driven by cheap debt, not demand and the leasing companies are about to go through a tricky period. All the aircraft types discussed are seeing reductions in value due to a variety of factors including over supply and aircraft dynamics. For example, the secondary market for the 777 is almost zero because the aircraft is a little too big and costs too much for the secondary market. How does that affect insurers and their clients?

We believe your assumption is probably correct with a few exceptions. We have yet to see the impact on values of A380s for example in the secondary market as the first of these types will start coming off lease in the next 18 months or so. Interestingly Willie Walsh said last month that BA is keen to acquire 5/6 second hand A380s as they will not be taking up the options they currently have for additional new aircraft.

Walsh says new A380s are too expensive but BA are only interested in RR powered aircraft which will restrict acquisition to Singapore and MAS aircraft. It will not include any of the Emirates aircraft which comprise 50% of the world's A380 fleet. There are currently three specialist German KG A380 investors who must be concerned about the long term prospects of those aircraft they have on lease to Emirates in particular.

Converting A380s into freighters as happened with B747s, B767s and B757s etc. (mainly for the parcel courier market) is a non-starter. The secondary B777 market is also difficult as the economic cost and returns of operating such equipment would be difficult for second and third tier airlines. The US domestic as well as other high capacity regional markets may be interested in these aircraft as may charter operators.

You mentioned that a Boeing 777 was recently sold to Delta - for $7m I think you said it was. An aviation underwriter I spoke to recently explained to me that this causes problems for underwriters because they are then forced to underwrite the total loss of a 2nd plane for this sum or whatever the agreed value is at a low rate but if the plane experiences, for example, a nasty wing tip collision or accident on the ramp it can rack up attritional losses very quickly. So loss exposures are going up while rates are falling off a cliff. Is that an accurate assessment? If so, presumably such an underwriting environment is unsustainable?

I expect aviation insurers are concerned at the repair and maintenance cost of older wide body types where asset values have depreciated considerably. It would not take much of an incident to make such repairs uneconomic and to declare a total loss. The cost of a C check and replacement of technical records could exceed the asset value of an older used wide-body and therefore the insurance market may decide to either take date of manufacture and maintenance cycles into underwriting rating consideration or increase the market deductibles for such types. As previously mentioned most of the residual value for older types will be wrapped up in the engines.

Moving onto slightly different ground I was interested to read the blog section of your company website. One article in particular stood out from last year: Saudi Arabian Airlines has paid a €1.4 million fine levied by a Belgian regional government for not complying with the EU's aviation emissions trading system (ETS)

We have real concerns that non-compliance with the European Emissions Trading Scheme (EU ETS) is a factor that is not fully understood by aircraft owners and their lawyers. I could write a book on this subject but unless international aviation (together with shipping) is included within national/international emissions reduction targets then reaching the 1.5ºC aspirational global warming limit goal set at Paris COP21 this year will be impossible to meet.

Presumably this is going to be a growing problem with major implications for the liability/casualty market, which are?

Yes. The EU has so far played softly-softly but unless ICAO comes up with a meaningful global aviation emissions reduction scheme to be introduced from 2020 then the EU may take a more stringent approach by reintroducing all international flights within EU ETS. This would result in even more airlines defaults and where some EU Member States have statutory legal powers to detain and sell aircraft. If this were to

happen then lessors would have little option but to forcibly repossess aircraft which could lead to oversupply on the market.

All eyes are on whether ICAO will agree on a scheme in October this year (which has now been under consideration for over 16 years). Our view is that the probability of reaching agreement is no more than 50/50 unless major concessions are made to developing countries and that would probably undermine the effectiveness and integrity of any such scheme.

Also, in the wake of the VW emissions scandal, it occurred me that it probably wouldn't be out of the bounds of possibility for something similar to occur in the aviation market! What are your thoughts on that?

Aircraft emissions are regularly tested and ICAO has an emissions matrix but this is now woefully out of date. ICAO are revising emissions criteria but only for new types that have not yet entered into service. Therefore most current aircraft types are not presently nor are they likely to have to comply with stricter regulations that are presently being proposed to come into effect between 2023 and 2028. There is a direct ratio between CO2 emissions and fuel burn therefore it is in airlines economic interest to operate more fuel efficient aircraft, although any such incentive is currently marginal with the oil price where it is. Fuel efficiency and environmental impact had much more CFO attention when oil prices were over $100 per barrel.

In 2014, geopolitical tensions left the aviation market in a fragile state. As lenders and financiers become increasingly wary of investing in a market where aviation insurance products are cancellable, it must be a good time to be a buyer but is there any light at the end of the tunnel for underwriters?

The aviation market has only been really profitable for short periods following major events such as 9/11. As long as airlines continue to maintain an exceptionally high safety record then the aviation insurance market will continue to attract new and additional capacity. In 2015 terrorism, war risk and unforeseen crew action (i.e. suicide) continues to have a far greater impact than airline safety and therefore is more susceptible to major catastrophic events.

Maybe some insurers/brokers will consider that aviation is not economically attractive or will look to develop new aviation risk mitigation products that have a higher rate of return within a highly regulated market. I don't think I would want to be an aviation underwriter or broker right now.

What other counter party credit issues are out there right now?

They are what they have always been, predominately default risk. The next major incident whether it be war, terrorism, pandemic or technical issues that results in a collapse in passenger demand will once again change the landscape of the airline and aviation insurance industry.

Is the cyber threat something that concerns you at all?

Yes it is. As aircraft increasingly rely on computer and information technology then systems are liable to remain vulnerable to cyber-attack. Recent claims that hackers have been able to compromise flight control activities through in-flight entertainment systems have been taken seriously by national aviation authorities, OEMs and airlines. Whilst firewalls can be strengthened around existing systems and software can be upgraded, the internet age poses a potential threat to aircraft security.

The fact that individual aircraft can be identified in real time from freely available web-based information services means that would be terrorists can now potentially identify an aircraft from its flight path long before it reaches its destination. Likewise with the introduction of Wi-Fi services on many flights, it is now potentially possible to coordinate in-flight terrorist attacks from the ground and to give orders to terrorists posing as ordinary passengers. To counter this threat it is also potentially possible for authorities to take command of aircraft and fly them away from major areas of population in the event of another co-ordinated terrorist attack.

However, such measures would not necessarily provide safety to passengers aboard commandeered flights where the control of the aircraft could potentially be maintained from the ground. Those airlines that currently offer free or paid Wi-Fi connectivity may be more vulnerable to terrorist or cyber-attack compared to those airlines that have been slow to introduce such technology.

About AVOCET

AVOCET Insurance Consultants provides the Airfinance market with specialist aviation insurance consultancy and risk management services.

Our aviation insurance opinions are continually relied on by Governments, investment banks, specialist fund managers and aircraft lessors. We provide our clients with independent assurance concerning the adequacy of the aviation insurances provided by their airline and aircraft operator clients.

AVOCET is also retained by investment banks and lessors to provide independent advice on their contingent hull and liability insurances.

AVOCET Risk Management also provides aircraft owners such as operating lessors, investment banks and fund managers with independent aviation European Emissions Trading (EU ETS) compliance reports in respect of statutory compliance obligations of airlines and other aircraft lessees.

68% agree that risk modelling and analytics could offer the best opportunity to manage their aggregate exposures better.

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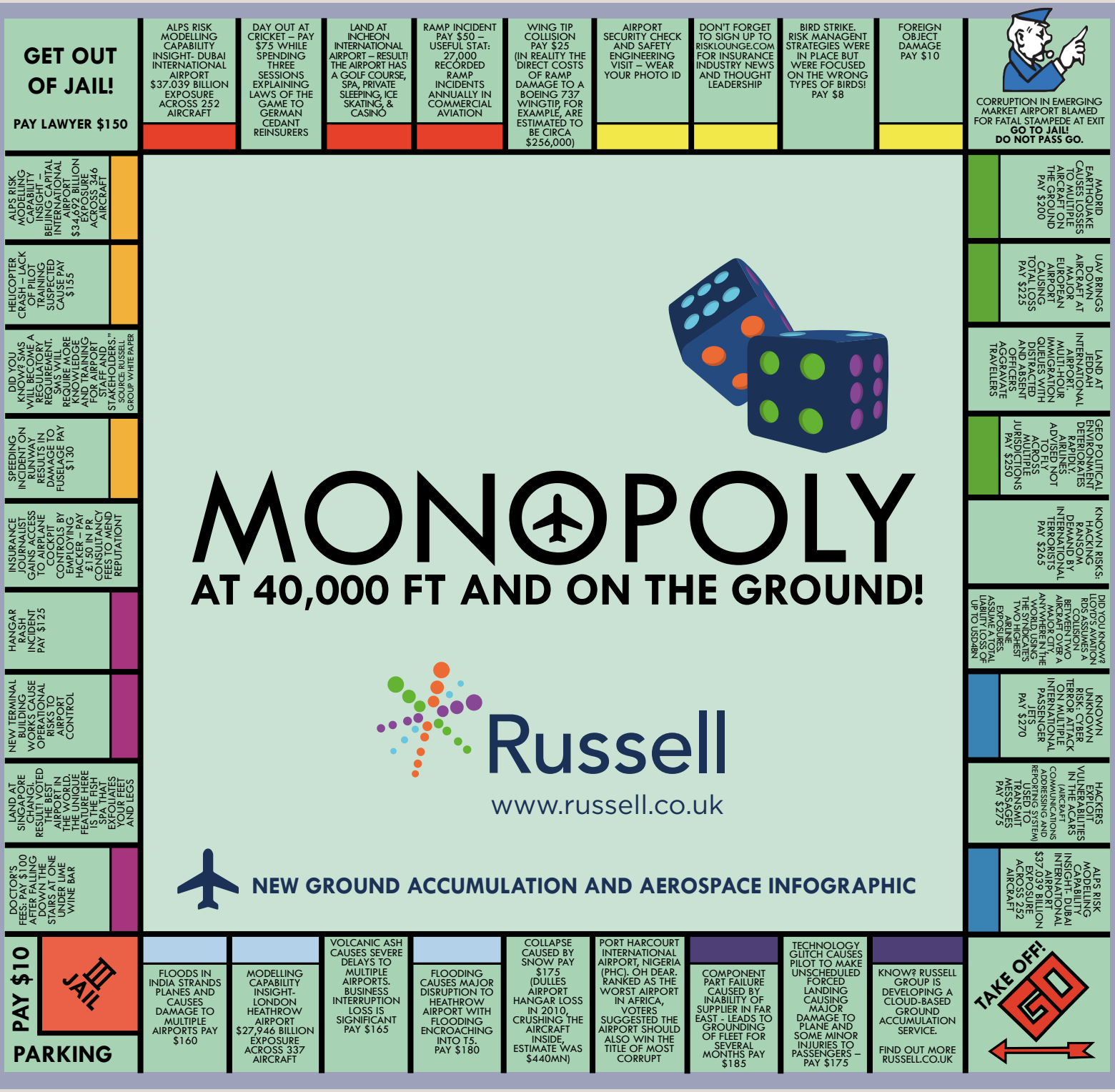
NEW GROUND ACCUMULATION AND AEROSPACE INFOGRAPHIC



43% of recipients interacted on Mobile phone.

41% Desktop

13% Tablet

3% Unknown

FLIGHT SAFETY DURING AUSTERITY

MAINTAINING FLIGHT SAFETY DURING A TIME OF AUSTERITY

THE CHALLENGE FOR AIRLINES, REGULATORS AND UNDERWRITERS IN 2016

In the next 20 years or so (2014-2033), according to Airbus' Global Market Forecast, passenger traffic will grow annually at 4.7% driving a need for around 31,400 new passenger and freighter aircraft (100 seats and above) worth US$4.6 trillion. The passenger and freighter fleet will increase from today's 18,500 aircraft to 37,500 by 2033, an increase of nearly 19,000 aircraft. Some 12,400 older less fuel efficient passenger and freighter aircraft will be retired.

The economic growth rates in emerging markets such as Asia, Latin America, Africa and the Middle East, are outstripping more economically developed regions. One significant effect is that the middle classes in Asia are expected to quadruple in size by 2033 whereas globally they will double from 33% to 63% of world population. As a result of increased urbanisation and concentration of wealth, the number of aviation mega-cities worldwide will double to 91. These cities will be centres of world wealth creation with 35% of World GDP centred there, with more than 95% of all long haul traffic going to, from or through them.

A Confused Picture?

It is tempting to say that the world of aerospace has never had it so good. Yet the same thing, clearly, cannot be said of the global economic environment, which is as volatile as the airspace over the Middle East at the moment. From an underwriting perspective, the picture is confused. Aviation risk is proliferating as political and economic risks (some fuelled by concerns surrounding corruption), business interruption, supply chain exposures, lack of sufficient regulatory oversight and new competition pressures are eclipsing the well understood risk of a major hull and liability incident.

Cuts to Government budgets caused by austerity programmes also have the potential to transfer economic risk to the private sector, as we outline later. Other political factors also come into play: corruption, for example. In this white paper we also ask the question: does the aviation market need more transparency over the insureds - and even their Governments and regulators - that are ultimately being insured and reinsured to properly enforce good accumulation controls?

Meeting international aviation standards in today's complex aviation environment is particularly important and increasingly critical given the recent dramatic growth in airlines and fleets and the ever increasing numbers of people flying between cities, countries and regions around the globe.

Meeting International Standards

That's why insurers were interested to read the – not entirely unexpected - announcement in December 2015 from the Federal Aviation Administration (FAA) that Thailand does not comply with International Civil Aviation Organization (ICAO) safety standards and has been assigned a Category 2 rating based on a reassessment of the country's civil aviation authority.

As aviation underwriters will know, a Category 2 International Aviation Safety Assessment (IASA) rating means that the country either lacks laws or regulations necessary to oversee air carriers in accordance with minimum international standards, or its civil aviation authority – a body equivalent to the FAA for aviation safety matters – is deficient in one or more areas, such as technical expertise, trained personnel, record-keeping, or inspection procedures.

According to the FAA, the International Civil Aviation Organization ("ICAO") conducted an audit of the Thai Department of Civil Aviation ("DCA") as part of its Universal Safety Oversight Audit Programme ("USOAP"). This Programme is intended to ensure a consistent global standard for aviation safety and the civil aviation authorities of ICAO member states are subject to regular audits under the USOAP by ICAO. The audit covers a broad range of areas relevant to aviation safety and airline operations but is intended to assess the performance and expertise of the civil aviation authority and not of individual airlines. Some of the key areas considered are personnel licensing and training, airworthiness assessment and certification, accident investigation and airline operations oversight and licensing.

Supervising the Growth of the Booming Aviation Business

With a Category 2 rating, Thailand's carriers can continue existing services to the United States. They will not, however, be allowed to establish new services to the United States.
The FAA cut Thailand's safety rating to category 2 from the top-tier category 1 rating because of its concerns about the country's ability to properly supervise the growth of the booming aviation business. Its announcement in Washington put Thailand alongside six other category 2 countries, including Ghana and Indonesia.

As a recent Bloomberg Business article reported: "Indonesian carriers, air traffic controllers, and Indonesian airspace in general have become notorious for weak safety regulations."

In an age of global airline alliances and networks, which integrate the services of multiple carriers, each member airline plays a significant and critical role in the alliance and its network. A downgrading of Thailand and blacklisting of Thai carriers would be the first time this will have affected a major aviation and alliance hub in South East Asia and may have global repercussions. [Source AN ICAO DOWNGRADE: IMPLICATIONS AND ISSUES FOR THAI AVIATION – Watson Farley & Williams]

A downgrade may result in higher insurance premiums and Thai carriers may find it more difficult to acquire and lease aircraft given the potential operating restrictions. If the impact is limited to the US and EU, the majority of Thai operators should be able to continue to operate as they currently do.

The FAA's downgrade comes amid growing concerns over airline safety in parts of Asia.
A crash investigation report into the loss of AirAsia Flight 8501 in the waters between Surabaya, Indonesia, and Singapore last December, found that system malfunctions and improper pilot responses were to blame. All 162 people on board were killed.

It could take some time for Thailand to recover its top-tier ranking with the FAA, though.
It took Israel four years to regain its category 1 status after a downgrade, and the Philippines had to wait more than five after it was downgraded in 2008, although upgrades can happen sooner.

It took India just over a year to regain its category 1 status after a downgrade last year, enabling it to add additional flights to the U.S., while Mexico recovered its top-tier ranking after four months after those countries quickly addressed the FAA's concerns.

The Impact of Corruption on Efficiency

In their 2014 White Paper Effects of Government Quality and Institutional Choice on Efficiency of the U.S. Commercial Airports, the authors focus on the impact of corruption on airport efficiency. They write:

"In our analysis, corruption matters for airport efficiency by affecting airports' decision making. We explain such impacts based on the fact that the accountability of public policy outcomes in highly corrupt environments is low. As a result of low accountability of public policy outcomes, the board of an airport authority puts low efforts in monitoring. Therefore, transferring airport management from local governments to airport authorities cannot improve airport productivity in corrupt environments. Furthermore, airport authorities in corrupt environments tend to use outsourcing to replace in-house labor."

The authors of that paper were primarily interested in the efficiency/productivity gains and a debate surrounding a local Government as opposed to a private model of airport authority control, however, they do not explicitly refer to the impact of corruption on safety or risk management best practice.

In another paper focusing on the impact of corruption on European airports Effects of Corruption on Efficiency of the European Airports, the author's state:
"We find strong evidence that corruption has negative impacts on airport operating efficiency; and the effects depend on the ownership form of the airport. The results suggest that airports under mixed public-private ownership with private majority achieve lower levels of efficiency when located in more corrupt countries."

Airports are an intensely political risk. The seemingly never ending debate about a new runway for Heathrow confirms that airports will always

feature in the public consciousness and airports are indeed often symbols of national prestige. The other point to make about airports is that their governance structure has been until relatively recently, state-owned. But that all changed in the 1980s.

Since them, among a sample of 47 airports during the 2003-2009 period, 5 were fully private, 7 were owned and/or operated by mixed public-private enterprises with private majority, 9 were owned and/or operated by mixed public-private enterprises with government majority, and 21 were owned and/or operated or by 100% government (or public corporations).

Airports, their geographical environments, the people that work in them are defined by their political jurisdiction, which is important. Paulo Mauro argues in his 1995 white paper Corruption and Growth that "the efficiency of institutions is relevant for any firm operating in the country of interest, since they are assessed independently of macroeconomic variables. Therefore, we include government stability, quality of bureaucracy, internal and external conflict and law and order as indicators of institutional quality variables."

What of the rest of the world? As the authors of the Effects of Corruption on Efficiency of the European Airports, state, the impact of corruption may be heightened and you can also throw extra credit and surety risk into the equation. Although they do not explicitly mention credit and surety risk, they report that:

"This research, which is limited to Europe, can be extended to airports in other regions including Asia, Oceania and more specifically developing countries and highly corrupted regions. Major air infrastructures in developing countries are funded by the World Bank and/or funding agencies. If corruption not only causes misuse of resources but also impacts on airport operating efficiency, the recipient countries may not be able to pay back the loans. As such, the infrastructure projects lenders may want to retain a certain percentage of their loans, and use it for the country to set up clean project bidding and tendering processes with proper checks and balances, to educate and train officials and employees, and auditing during the project implementation period as well as ex-post auditing."

Suffice to say that many commentators have been scathing about standards in Asia, which has suffered a rash of accidents in the last couple of years. A 2014 Bloomberg Business article addresses the potential causes head on when it reports: "To some extent, the three Malaysian air disasters are just brutal bad luck. Still, they point to several disturbing trends that raise the question of whether flying in peninsular Southeast Asia is completely safe. The air market in the region has embraced low-cost carriers, leading to a proliferation of flights throughout Southeast Asia, stretching air traffic controllers, and possibly allowing some airlines to expand too rapidly. Indonesian carriers, air traffic controllers, and Indonesian airspace in general have become notorious for weak safety regulations."

Aerospace is now Fiercely Competitive

As we have seen, the rapidly growing world – particularly in emerging markets - of aerospace is now fiercely competitive and that brings a whole host of opportunities as well as threats to airline carriers as well as their insurers. Traditional "full service" carriers and low-cost budget operators alike are under pressure from their investors and regulators to deliver increasing value to passengers and stakeholders so how does that translate into customer safety? Is there an expectation that risk management standards could be compromised in the search for profitability?

It must be a concern, however, some aerospace commentators remain relatively sanguine.

Getting Away with Sub-standard Safety Practices?

"Low-cost carriers get their savings from efficiency and less money spent on customer service rather than by skimping on safety issues," said Max Leitschuh, a transportation analyst for iJET International. "In places like North America and Europe, where there's a well-regulated airline industry, they are not going to let any airlines get away with sub-standard safety practices. The major budget carriers have very good safety records. In fact, many of them have never had a crash before."

Asia, where regulatory standards vary widely and low-cost carriers are booming, is not as clear cut. Budget carrier AirAsia, for example, suffered a major crash in January but had a spotless record until then. But Indonesia's Lion Air -- with eight incidents since 2002 -- has an atrocious safety rating and has actually been banned by the EU.

"Asia is much more of a mixed bag, both in terms of the airlines and the regulatory authorities," said Leitschuh. Certain authorities like Singapore's are excellent. Malaysia's regulatory agency is mediocre, while Indonesia has major problems, he said. "But just because there's poor regulation still doesn't mean the carrier is unsafe -- it's just on the carrier to regulate itself."

Until recently, Lufthansa subsidiary Germanwings had an unblemished safety record in its 13-year history. While investigators have not yet determined the cause of its tragedy – the official investigation into German Wings Alps crash closes 13 March so until the report is released everything else must be based on assumption - it's unlikely that it had anything to do with Germanwings' low-cost status. The problem is not necessarily the carriers but more so the approach to their regulation.

Inspectors Not Qualified for the Job

According to the Flight Safety Foundation, "regulators across the world have always had a difficult time recruiting and retaining operations inspectors. It is very difficult to find someone who is

qualified for the job and who is not already flying for an airline that will pay a lot more money. If they find someone to take the job, the civil aviation authority (CAA) is lucky if these recruits stay in the government for five years, unlike typical young bureaucrats that stay for 30.

"The problem is that these inspectors are vital. Without them, the papers move through the bureaucracy and fees are paid, but the operators can do pretty much as they please. When there is a shortage of operations inspectors, airplanes tend to crash." It is a lesson that has been learned over and over again and the International Civil Aviation Organization (ICAO) reportedly has the facts to prove it.

Austerity: the Big Secret

As the Flight Safety Foundation reports: "This leads us to the big secret that many people know but few are willing to discuss. Many of the major regulators in Europe are desperately short of operations inspectors, and the government budget austerity measures being taken across Europe likely will take the situation from desperate to dangerous."

It is not just the regulators and lower cost budget carriers that are under pressure, however, as the example of Air France reveals. It was reported that a tense employee meeting at the French flag carrier turned violent when Xavier Broseta, the HR director, was descended on by an angry mob who tore off his shirt and forced him to flee half-naked over a fence.

With labour relations at a low point, analysts and some individuals close to the company worry that Air France could go ahead with inefficient reforms that do not improve its ability to compete sufficiently. This increases the risk that Air France becomes a second-tier player in the global aviation industry.

That is not to suggest in any shape or form that Air France is more of a safety hazard as a result but the company's travails do help to illustrate the pressures of operating an airline at, dare we say it, the highest level!

Proliferating Aviation Risks

As international air-fleets increase in size and scope in line with a growing and increasingly prosperous travel-hungry global population there may be a risk of not being able to see the wood for the trees. If it is difficult enough for increasingly stretched regulators to keep up with the growing demand for air travel, how complicated is it going to be for international insurers underwriting growing books of aerospace risks, which encompass the creation of new airports, new planes and technologies, and new dangerous flight routes across war torn territories and terrorist enclaves?

As Russell Group has written in previous white papers this year on the subject of airport ground accumulation risks and other aviation perils, we are confronted by a murky geo-political picture that shows few imminent signs of clearing up while new threats such as drone and cyber risks increasingly cause underwriters more concern.

Meanwhile, as an Allianz Global Corporate and Specialty Global Aviation Safety Study outlines:

"Every day the aviation sector faces a multitude of risks that can potentially jeopardize the success of their operations if they are not managed adequately. Business interruption (both physical and non-physical damage) and supply chain risks are currently the greatest concern for aviation practitioners." The AGCS study reports: "Intensified competition and market stagnation/decline, natural hazard risk, regulatory change and technological innovation also rank highly on this risk register."

According to the same AGCS survey of risk consultants and claims experts, business interruption, supply chain risks (for example, damage to machinery) features high on the risk register for 35% of respondents while intensified competition (35%), market stagnation or decline (30%) and our old friend changes in legislation and regulation (24%) also disrupted people's beauty sleep.

Risk Selection is Key

In such an environment, do we truly know our peak aggregate risks in the way that we probably did 20, 30 or 40 years ago? Furthermore, if we in the aviation risk management community are going to be honest with ourselves can we say 100% that we can actually name our – proliferating - risks?

In other words does the aviation market need more transparency over the insureds that are ultimately being insured and reinsured to properly enforce good accumulation controls? Is there now a need for expanding the aviation market questionnaire? Finally, is a more efficient naming convention required which (re)insurers could use with confidence knowing that they are talking about the same insured risk?

The key challenge that underlies this soft competitive environment is that underwriters need improved risk selection controls which allow capital to be smoothly diversified across the portfolio in order to achieve premium income targets. This in turn requires controls which enforce deeper knowledge of the portfolio's underlying risk and accumulating exposure.

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