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Belge: Interpilot 2018 – Issue 1	Tarih: 27.11.2018
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Kaynak: IFALPA haberleri · talpa.org

ISSUE 1 | 2018

InterPilot The Safety and Technical Journal of IFALPA www.ifalpa.org

IFALPA Conference 2018 Luxembourg 73rd IFALPA Conference 16-19 March

Volcanic Eruptions and Aviation Captain Klaus Sievers on the dangers posed by volcanic ash

Space Weather101 Captain James Gaskell on the relevance of space weather to aviation

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InterPilot is the quarterly digital safety and technical journal of IFALPA. It is produced by Members, for Members.

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safety worldwide and to be the global advocate of the piloting profession; providing representation, services and support to

both our members and the aviation industry. www.ifalpa.org

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IFALPA

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Captain Ron Abel IFALPA President

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IFALPA'S FIRST 70 YEARS

In 2018, the International Federation of Air Line Pilots' Associations (IFALPA) celebrates 70 years of promoting the highest level of aviation safety worldwide and serving as the global advocate of the piloting profession. Our Federation looks back on seven decades of accomplishment and forward to a future of opportunity to make air transportation safer and assist our members in advancing their careers.

IFALPA was founded in 1948 to make certain that pilots had a voice in the newly formed United Nations International Civil Aviation Organization (ICAO). In the decades since, IFALPA has been deeply involved in global policy through our technical committees, which ensure that ICAO's discussions are informed by pilots' perspectives. Nationally and locally, we also support our Member States' safety, security, and pilot assistance work as well as their collective bargaining efforts when appropriate. At all of these levels, IFALPA has succeeded solely because of the dedication of our members and commitment to our strategic goals.

In 2018, our priority on maintaining the highest level of safety will take on even greater importance with the growing number of aircraft in our global airspace. At the same time, we expect that airline management will continue to try to exploit the gap between local labor law and the global nature of capital to gain an unfair advantage over labor.

One example of incredible progress is the Ryanair pilots' success at the end of 2017. After years of struggle, Ryanair pilots stood together and prevailed in gaining a public commitment from management to acknowledge and work with representative employee unions. The words from management are encouraging, but actions need to match the rhetoric and IFALPA will continue to monitor the outcome.

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Significant representation issues exist for some IFALPA pilots, and our ability to resolve them depends on our unity. In one example, our Member Associations have expressed firm solidarity with ALPA Canada WestJet pilots, who are bargaining to obtain their first collective agreement. During negotiations, their management launched a wholly owned, ultra-low-cost subsidiary to which it is transferring aircraft currently flown by WestJet pilots so that it can operate them with non-union pilots at much lower compensation.

As we begin IFALPA's 70th year, our technical standing committees have achieved remarkable progress in the areas of safety, security, and pilot assistance. At ICAO, our Federation has been and continues to be involved in issues from safety data protection and airborne image recorder restrictions, to pilot assistance programs and remotely piloted aircraft systems.

A recent example at the national level is the New Zealand Air Line Pilots' Association's (NZALPA) success in ensuring appropriate runway safety areas are in place at Wellington International Airport. In 2017, the airport and the Civil Aviation Authority appealed a court decision that found international civil aviation law applied in New Zealand and required 240-metre-long safety areas or such shorter distance as "practicable." The appeals court ruled that the "practicable" distance could not be based solely on cost, which supported NZALPA's position that safety benefits must also be considered.

While IFALPA has been remarkably effective over the past 70 years, pilots will continue to face safety and security challenges, such as the threat of a cyber-attack. IFALPA recently released guidance for our members

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as we all work to guard against cyber threats. This cyber-security guidance is just one example of IFALPA's work to provide tools and training for our members and make aviation safer.

While we reflect on our progress, we also anticipate new opportunities to achieve our mission and promote the highest level of safety worldwide. Thanks to our dedicated pilot volunteers and professional staff, even as IFALPA celebrates 70 years, we're truly just getting started as the global advocate of pilots.

Captain Ron Abel IFALPA President

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6 NEWS, NOTES & EVENTS NOTES

Security & Dangerous Goods Committee Meetings in 2017 The 2017 IFALPA Security Committee meeting was held in Abu Dhabi, United Arab Emirates, 12-14 November. The Chairman was Captain Agustin Guzman from SEPLA, and Captain Ishtiaque Hossain, Executive Vice-President Asia-Pacific, attended on behalf of the IFALPA Executive Board. The event was attended by 25 delegates representing 14 Member Associations as well as observers from the security threat assessment company Osprey Flight Solutions.

There were discussions on a variety of subjects including laser attacks, cybersecurity, insider threat, unruly passengers and related ratification of the Montreal Protocol MP-14, the flying of drones in the vicinity of airports, MANPADS attacks, landside security, flights into and over conflict zones and the recent US and UK bans on PEDs in the cabin for specific flights. In addition, the Committee conducted a full review of ICAO's Global Aviation Security Plan (GASp) which has just been approved by the ICAO Council. The 2017 IFALPA Security Committee meeting in Abu Dhabi was attended by 25 delegates representing 14 Member Associations. The Committee also finalized an amendment to the IFALPA

Position Paper on Cyber Threats with new provisions on Electro-Magnetic Interference (EMI), and started working on IFALPA Position Papers related to unescorted passengers on the apron, identification checks for domestic flights, flight deck security and secondary barriers, all expected to be published next year.

The Dangerous Goods Committee meeting was held in Bangkok, Thailand, 2-4 October. The Chairman was Captain Scott Schwartz from US ALPA, and Captain Ben Mansumitchai, Deputy President, and Captain Ishtiaque Hoassain, Executive Vice-President Asia-Pacific attended on behalf of the Executive Board. The event was kindly hosted by THAIPA, and was attended by 20 delegates representing 10 Member Associations as well as Thailand's Civil Aviation Authority.

Discussions focused primarily on the transport of Lithium batteries by air and the temporary US and UK bans on the carriage of Personal Electronic Devices (PEDs) in the cabin on specific flights. Ongoing issues of undeclared Dangerous Goods The 2017 IFALPA Dangerous Goods Committee meeting in Bangkok was attended and NOTOCs were also discussed. The Committee conducted a by 20 delegates representing 10 Member Associations. full review of IFALPA Annex 18 and updated its Position Paper on the use of emergency kits provided by airlines to handle PEDs subject to thermal runaways in the flight deck.

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IFALPA at ICAO Wildlife Hazard Mitigation Expert Group

The Wildlife Hazard Mitigation Expert Group (WHMEG) was held at ICAO, 5-7 December 2017. The group met to work to improve guidance material for wildlife control at aerodromes. IFALPA provided the pilot perspective, particularly on the topic of communicating the hazards to crews. Work will continue into 2018 with the goal of updating ICAO's Wildlife Control guidance material.

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CAR/SAM Regional Meeting Veracruz, Mexico

UPCOMING MEETINGS

73rd IFALPA Conference 16-19 March 2018 Luxembourg

Air Traffic Services Committee Meeting 22-24 May 2018 Ottawa, Canada

Aircraft Design & Operation Committee Meeting 19-21 June 2018 Toulouse, France

Africa/Middle East Photos from the CAR/SAM Regional Meeting held in Veracruz, Mexico. Regional Meeting Top: Osvaldo Neto (right), EVP CAR/SAM presenting a small gift of appreciation to Captain 25-27 September 2018 Eduardo Chacin, Regional Officer Flight Safety, ICAO NACC Regional Office, Mexico City. Mombasa, Kenya Below: Group photo showing representatives from, Brazil, Mexico, Panama, Uruguay, EVP CAR/ SAM, RVP CAR/East, and IFALPA staff. Security Committee Meeting 26-28 September 2018 Kiev, Ukraine

Dangrous Goods Committee Meeting 2-4 October 2018 Lille, France

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IFALPA's Technical Committees develop Policies and Positions to enhance and improve aviation safety. In addition to promoting the adoption of such Policies and Positions by ICAO, IFALPA asks that its Member Associations work with their authorities to implement those Policies and Positions within their State.

New Zealand ALPA have been working for over 10 years for the adoption of the IFALPA policy on Runway End Safety Areas (RESA), whereby the RESA shall extend to from the end of a runway strip to a distance of at least 240m where the code number is 3 or 4, and 120m where the code number is 1 or 2. Currently, this is only an ICAO recommendation, the ICAO standard is for "the RESA shall extend to from the end of a runway strip to a distance of at least 90m".

On the 21 December, NZALPA had some very good news. This is their press release:

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PILOTS DELIGHTED AT SUPREME COURT DECISION ON WELLINGTON AIRPORT SAFETY

The New Zealand Air Line Pilots Association (NZALPA) was today delighted at the Supreme Court ruling to uphold the Court of Appeal decision on the safety areas required at major airports in New Zealand. Having earlier landed a 777 Boeing plane from Los Angeles, NZALPA President and international pilot Tim Robinson declared this “a great day for pilots, air crew, and the wider travelling public.” Earlier this year, the Court of Appeal determined that international civil aviation law, as applied in New Zealand law, requires 240 metre long safety areas, or such shorter distance as is practicable, and not less than 90 metres. Alternatively, a shorter distance can be used if specialised arrestor systems are also installed. These are commonly known as an EMAS (engineered materials arrestor system). This Supreme Court appeal was brought by both Wellington International Airport Limited (WIAL) and the Civil Aviation Authority (CAA). In a unanimous decision, the Supreme Court dismissed the appeal and found that the CAA Director “erred in law in finding that a 90m RESA would be acceptable if WIAL’s extension plans go ahead.” NZALPA successfully argued that the Court of Appeal’s decision was correctly decided, that the appeal should be dismissed, and the Director be directed to reconsider his March 2015 decision should WIAL maintain that application. Most aircraft accidents occur during landing and take-off. These include incidents where the aircraft ‘undershoots’ (lands or takes-off short of) or ‘overruns’ the end of the runway. “The risk of such an incident can be likened to the chance of a severe earthquake. Although the likelihood of an ‘undershoot’ or overrun is low when compared to the total volume of air traffic, the consequences can be catastrophic, Robinson said. The original decision made by the Court of Appeal considered evidence that a landing overshoot incident at Wellington Airport would likely result in the death of all on board. At the northern end, the presence of State Highway 1 lanes and traffic could cause further loss. “International aviation authorities including the International Civil Aviation Organisation (ICAO), the Federal Bureau of Air Safety, the Flight Safety Foundation, and other organisations in the UK and EU say that one critical safety measure to mitigate the risk of an overrun or undershoot incident is to provide a RESA of suitable length. “In the RESA, an overrunning or undershooting aircraft can come to a stop in safe off runway space, thus reducing damage to the aircraft and maximising the safety of those on board. RESAs must be a cleared and graded area but do not have to be constructed to the same specifications as a runway. Wellington Airport already has exemptions from the CAA for non-compliant Movement Air Guidance (MAG) signage (to prevent aircraft ‘straying’ on to the runway) and non-complaint runway width for international aerodromes. “A Non-compliant RESA will increase the risk of accident even further under Professor James Reason’s internationally recognised ‘Swiss Cheese’ model, Robinson said. “In the Swiss Cheese model, an organization’s defences against failure are modeled as a series of barriers, represented as slices of cheese. The holes in the slices represent weaknesses in individual parts of the system and are continually varying in size and position across the slices. “The system produces failures when a hole in each slice momentarily aligns, permitting (in Reason’s words) “‘a trajectory of accident opportunity’”. “Even though airline pilots have the most to gain from extended runways and the extra international flights they encourage, safety will always be our first priority and this should also be so for both New Zealand’s airport companies and especially for the CAA,” said Robinson.

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Flight Safety Spotlight

DON'T PUT YOURSELF IN THE FRAME

This article was originally published by the BALPA Flight Safety Department, December 2017

Don't put yourself in the frame. There's nothing more impressive than saying to your kids "look here's a video of Daddy/Mummy landing their aeroplane". This often works quite well with slightly older people as well apparently, but do you know how vulnerable you are leaving yourself when you introduce your personal camera into the cockpit? Firstly, you could be introducing a flight safety hazard; the Daily Mail reported earlier this year on an incident where 33 passengers were injured after a pilot's personal camera interfered with the controls and caused a rapid descent. Secondly, you may be contravening company rules – that won't be a pleasant phone call.

Finally, and really importantly, you may find any images you take (or are taken of you) being used against you or your colleagues in the event of something going wrong. In a recent fatal accident investigation the police asked for all AAIB material to be released to them but a judge opined that nothing could be released as that could prove detrimental to future flight safety reporting. Nothing, that is, except for the personal video camera that the pilot had installed to film his flying. That's gold dust to some people.

Of course, you may find that your "David Bailey/Spielberg" worshiping colleague posts his imagery on social media and some eagle-eyed member of the public may just notice something that you appear to have missed. Even if nothing is actually amiss this could generate some undesirable attention and remember, these pictures and videos will be there forever. So the next time you are tempted to capture the amazing sights that this job exposes us to, or your fellow aviator says "it's OK to take some pictures/take a video isn't it?" can we suggest that you think very carefully about all the possible ramifications. As we begin to see aircraft being delivered from factories with cameras fitted as standard we need to make sure any images from the "office" are dealt with in a sensible, legal and agreed way, and we need your help to make sure that happens.

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In Fond Remembrance of Past IFALPA President

CAPTAIN BART BAKKER

It was with great sadness that we learned of the passing of Captain Bart Bakker on 1 January 2018. Captain Bakker served with the Royal Netherlands Air Force and began his commercial career with the UK carrier, Autair of Luton in 1961. He then went to Africa in 1962, flying for several companies in Botswana, Rhodesia, and Namibia on DC-5, DC-4, DC-6 and Lockheed Lodestar aircraft.

In 1964, Captain Bakker moved to Italy, flying for ATI on F-27s in Naples, and in 1965 joined Lufthansa flying CV 340s and B-727s where he stayed until 1968 at which time he joined KLM flying DC-3, DC7, DC-9, DC-10 and MD-11 aircraft. In 1974 he became a Board member for Technical Affairs with the Dutch Air Line Pilots' Association, VNV. He was first elected onto the IFALPA Executive Board in 1985, as Principal Vice President (PVP) for Technical Standards. He was elected President of IFALPA in 1989, and was one of the Federations' longest serving Presidents, completing his role in 1995. Captain Bakker received the Clarence Sayen Award in 1996. The award is only given to those whose personal contribution towards the achievement of the Federation's aims and objectives has been outstanding. A fitting award for such an outstanding and dedicated pilot and colleague.

In Fond Remembrance of

CAPTAIN DAVID PHILLIPS

It was with great sadness that we learned of the passing of a long-standing member of the ADO and AGE Committees, Captain David Phillips from BALPA.

Many within IFALPA have fond memories of Captain Phillips, his extreme kindness and his very British sense of humour. He never wanted to be called "Dave", finding it "too American". For more than 15 years he was very active, especially within ADO, and represented IFALPA in several Working Groups of the then Joint Aviation Authorities (JAA).

Captain Phillips leaves behind his wife Liz and their children Graham and Fiona. In Liz's words, "IFALPA was a huge help to David coming to terms with not being able to fly, for which I am eternally grateful. It made him feel he had some purpose in life."

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Volcanic Eruptions and Aviation

BY KLAUS SIEVERS

VOLCANIC ERUPTIONS IN GENERAL instruments on the ground, or even by future behavior of a volcano, if possible. Volcanic eruptions have been going on sensitive instruments on satellites. Despite their measurement capabilities, it is since the formation of the Earth, and there is VOLCANIC CLOUDS AND AVIATION still beyond the present state of the art to no end in sight. They are perfectly natural Useful information on the dangers posed provide accurate predictions months or weeks phenomena and the gases, aerosols, and solid

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by volcanic clouds can be found in ICAO before an eruption. components that are brought up to the surface documents such as ICAO Doc 9974, Flight If circumstances are right and the volcano and atmosphere are 100% natural. Eruptions Safety and Volcanic Ash. This document has been monitored with the right instrument cannot be influenced by humans. You cannot includes a description of dangers caused by tation, a short-term eruption prediction may stop an eruption by placing a “cork” into the volcanic eruptions and provides information be possible. However, due to the limited opening (caldera) of a volcano. on the safety risk assessment process with budgets of most volcano observatories, not all The science of forecasting if and when an emphasis on volcanic ash aspects. Further volcanos are monitored that extensively. If a eruption will occur or how strong it will be, is details on volcanic clouds and their impact on prediction can be made, it will not be precise based upon indications and measurements. aircraft systems can be found in the ICAO Doc as to the hour or the nearest 1000 feet of Tremors underground can be measured and 9691, Manual on Volcanic Ash, Radioactive eruption height. Precision predictions are the build-up of pressure inside a volcano can Material and Toxic Chemical Clouds. This something we may expect only in the distant sometimes be inferred from the expansion of document also contains information about ash future. In practice, there are still surprise its flanks by a few centimeters. Other encounters and their effects on aircraft. Finally, eruptions of sparsely monitored volcanos, as observable indications may be the rising of ICAO DOC 9766, Handbook on the with the 2011 eruption of Nabro in Eritrea, parts of the earth near a volcano, changes in International Airways Volcano Watch (IAVW), near the Ethiopian Border. the salinity of a stream, or a rise in the explains the entire system of volcano The World Organization of Volcano temperature of lakes and hot springs. observatories and Volcanic Ash Advisory Observatories can be found here: In Iceland, cauldrons form in old, deep Centers (VAAC) in detail. www.wovo.org/observatories/ glaciers because they experience heating from VOLCANO OBSERVATORIES Besides monitoring volcanos, another below; presumably by magma that has moved Volcano observatories perform the important task of volcano observatories is to closer to the surface. Surface heating can be measurements and observations at a volcano. report on eruptions. They may take different observed in some volcanos through the use of They provide reports and opinions on the forms, like lava oozing to the surface, with little

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Far left: Mount Etna, Italy. Middle and right: Popocatepetl, Mexico. All photos by Klaus Sievers

or very large amounts of gas (SO₂), or they VOLCANIC ASH ADVISORY CENTERS blades. may reach very high, 20km or more, and form The task of the 9 Volcanic Ash Advisory • Adherence of molten or partially molten a mushroom-shaped cloud. The details of the Centers is to collect information on eruptions ash particles to parts of the hot section of the eruption are highly important as input to from all available sources. This includes, for engine, which can lead to engine failure as the models that follow the dispersion of volcanic example, reports from aircraft, observers on flow of air through the engine is disturbed or ash and gas clouds. At some volcanos, a high the ground, satellite images, infrasound blocked when air passages are restricted by the amount of investment has flowed into the observations, and lightning detection network accumulating molten ash. Additionally, cooling determination of eruption-cloud properties, information. The information is then reviewed, systems inside engine blades may get blocked, into measurement devices like lidar and special and the dispersion of ash is modelled. finally, leading to temperatures beyond the design radar, infrared SO₂ cameras or aircraft/UAV volcanic ash advisories are issued on the point with resultant failures of blades. Note with air sampling capability. Examples are the websites of the Ash Advisory Centers, but that an engine failure will lead to loss of European Supersites in Iceland and Sicily, as primarily to the Meteorological Watch Offices, systems

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which are vital for the operation of an well as other locations: Area Control Centers, and aircraft operators. aircraft such as electric, hydraulic or <http://supersites.earthobservations.org/> The VAAC London maintains links to all other pneumatic systems. Volcano Observatories generally VAACs on their website: • A more long-term but no less costly effect communicate the status of a volcano to www.metoffice.gov.uk/aviation/vaac on engines is due to the aggressive chemical aviation by means of the Aviation Volcano Complicating matters is the fact that properties of heated volcanic ash and aerosols. Alert Status Colour Code. It should be besides ash, volcanic SO₂ aerosol can be These substances diffuse, infiltrate into the included in ASHTAMs or NOTAMs issued for emitted by volcanoes in large quantities. No extremely heat-resistant protective layers of volcanic activity. According to ICAO DOC information from VAACs is presently available special metal covering turbine blades. At first, 9766, the Handbook on the International on this, although the smell can disturb only tiny areas are affected, but after the Airways Volcano Watch (IAVW), this code passengers, play a role in long-term engine protective layer of “thermal barrier coatings” is should be used: damage, and in larger concentrations, may breached, damage to the turbine blade itself even pose a health risk. ICAO is in the process may occur. Maintenance checks can identify GREEN of considering the inclusion of SO₂ the early signs and repairs can be initiated in Volcano is in a typical background, measurements and forecasts into the official time, however, some engine failures have been non-eruptive state. documents. A good source of near real-time connected to this failure mechanism. information on SO₂ in the atmosphere, as well Contamination of the air inside an aircraft, YELLOW as ash clouds, can be found at: which can be due to volcanic ash as well as Volcano is exhibiting signs of elevated unrest <http://sacs.aeronomie.be/> aerosol/gas may lead to use of oxygen masks by above known background level. the crew, nuisance smell events in the cabin, DANGERS OF VOLCANIC CLOUDS and can also cause health effects. The volcanic ORANGE • Purely mechanical, due to the abrasive material can settle on electronics, reduce Volcano shows heightened or escalating properties of the volcanic ash. Effects may cooling efficiency and potentially induce unrest with increased potential for eruption. include completely opaque windshields, failures in electronic components due to blocking of pitot and static sensors, with corrosion. RED secondary effects, like unreliable airspeed • Contamination of the air system of an Eruption is imminent or in progress. Signifiinformation, loss of efficiency or decrease in aircraft, which may be very difficult to clean. cant emission of ash into atmosphere is likely. engine-stall margins due ot abrasion of turbine

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- If volcanic ash is deposited on an operating runway, decreased SOURCES OF INFORMATION braking efficiency can be expected in addition to the generally Volcanic eruptions will cause a great amount of information to detrimental effects of ash which will get sucked into the operating be produced, but not all of it will necessarily be consistent. engines. Operators and pilots are advised to carefully review the available information and to plan and perform flight operations with great OPERATIONAL MATTERS TODAY caution. What follows is a selection of sources for detailed and The ICAO procedures developed after 2010 follow the principle authoritative information. This list is not exhaustive, and represents that the general assurance of safety of flight operations is the some examples of source information. responsibility of the operators. Pilots do have this responsibility for their flight. Meteorology and Air Traffic Services shall provide VAAC London, with links to all other VAACs, information and support and should follow the (rather restrictive) <https://www.metoffice.gov.uk/aviation/vaac> text on establishing danger areas. See, for example, the Volcanic Ash Contingency Plan – European and North Atlantic Regions Information for a specific area or volcano can be found here, for (EUR/NAT VACP, July 2016). example: According to ICAO regulations, the official information Icelandic Met Office, products on volcanic ash are SIGMETs and NOTAMs. Volcanic <http://en.vedur.is/earthquakes-and-volcanism/volcanic-eruptions/> Ash Advisories (VAA, or in graphic form, VAG) are to be produced Alaska Volcano Observatory, by the Volcanic Ash Advisory Centers (VAACs) and are intended <https://www.avo.alaska.edu/> as input for the generation of SIGMETs and NOTAMs. Nowadays, Kamchatka Volcanic Eruption Response Team, they are widely used as planning tools by airspace users. National http://www.kscnet.ru/ivs/kvert/index_eng.php Meteorological Watch Offices might edit the information contained in the charts based on their own measurements. The Ash ATM organizations may have information on ash impacts. Concentration Charts of the Volcanic Ash Advisory Centers One example is the Eurocontrol Network Ops Portal, (VAACs) London and Toulouse that are provided since 2010 as https://www.public.nm.eurocontrol.int/PUBPORTAL/gateway/supplementary_information/serve_as_guidelines_during_flight_spec/index.html planning. They show areas of low/medium/high ash concentration for the benefit of enabling flight planning into these areas, based on General information on volcanic ash: a Safety Risk Assessment. Eurocontrol Skybrary, http://www.skybrary.aero/index.php/Volcanic_Ash

STRIVING TOWARD SAFE FLIGHTS

The overall responsibility for flight safety rests with the IFALPA POSITIONS operator, who should have a Safety Risk Assessment, within the IFALPA has considered the problems in aviation that are caused airlines' Safety Management System, to the satisfaction of their by volcanic ash, aerosol and gas emissions. Guided by the principle supervisory authority. These SRAs are the prerequisite for flight that flight operations in the presence of volcanic ash should only be planning. Operators are responsible to brief their flight crews on conducted when they are safe, our requirements are given below. the conditions taken account of in the SRA and provide them with Noting that the present system is already developed quite far, specific operational instructions, in particular for situations that nevertheless some improvements should be considered. IFALPA deviate from the SRA conditions. pilots consider the items below to be important building blocks for SRAs of individual airlines may prescribe consideration of safer flights when volcanic clouds are present: additional sources of information such as satellite pictures, or even the consideration of "all" sources of information. Some airlines 1. Contingency Plans have a contract with specialized scientific institutes for advice. 1.a) Contingency Plans shall cater for reasonable worst-case Others may have a contract with a commercial weather scenarios (e.g. Eyjafjallajökull, 2010) so that flight operations in information provider, which can include volcanic ash information. contingency situations can be planned. The details contained in an SRA are different

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for each airline. If you have a question regarding timely ash information, ask your 1.b) The plans should be comprehensive and globally consistent, so own airline! SRAs are not published, but should be available to an that States, ANSPs, airlines, pilots, and all others engaged in airlines' pilots. To give an indication of the importance of Know aviation can follow their guidance. Your SRA, that document may even allow flight through danger areas established in connection with an eruption! 1.c) There should be no short-term amendments to regulations in Assurance of the safe execution of their flights is the responsicase of an eruption. bility of pilots. Useful recommendations can be found on the EASA At present, plans are laid out based on forecast volcanic ash clouds, website here: <https://tinyurl.com/y7zb5drm>. This site also contains and the overarching guidance is that pilots shall avoid visible ash. the latest edition of the EASA Safety Information Bulletin, SIB There is a discontinuity here, and it should be addressed in 2010-17/R7,, issued (corr. version) on 02. Jul 2015: <https://tinyurl.com/y7q4ts9x>. Contingency Plans by giving consideration to deviations of aircraft com/y7q4ts9x. from their cleared route due to ash clouds seen by pilots.

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Captain Klaus Sievers began flying commercial aircraft for Lufthansa in 1979. From 1995 to 2016 he was a Captain on Boeing 747. During his career, Klaus developed a deep respect for Mother Nature, and through practical experience and self-directed study, he has gained a profound understanding of aviation weather in all its forms, including space weather. Captain Sievers is in charge of the special interest group on Weather at Vereinigung Cockpit (German Airline Pilots' Association). He was the principal author of the ECA paper Pilots' Vision on Weather, represents IFALPA on the ICAO MET Panel.

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- Volcanic Contamination - Basic Considerations Charted information on volcanic ash and SO₂-clouds should Global standards for acceptable levels and amounts of ash and show airspace with defined amounts of ash or SO₂. The system volcanic SO₂ aerosol that humans in aircraft, aircraft, and aircraft should indicate at least three levels of ash or SO₂ contamination, systems such as engines, windshields, electronics, and air supply e.g. no relevant, low and high amounts of ash. Satellite pictures units can safely accept do not exist today. Aircraft manufacturers containing ash and SO₂ indications should be provided for every and aircraft system builders are known to be working on this flight in areas affected by volcanic clouds, and these pictures should subject in-house. We think that it may be time to consider show the planned flight track for easy reference. development of standards acceptable to certification agencies like Recent volcanic colour code information, satellite pictures, the FAA or EASA. This should extend to the aerosol/gas retrievals, and analysis of ash and SO₂ clouds, indicating the components of volcanic clouds, too, which consist primarily of SO₂ presence of discernible ash and SO₂ shall be part of the briefing and its reaction products like sulfuric acid. package, and should be updated as required during flight. As Aircraft should be equipped with sensors that indicate the modelling of ash and SO₂-clouds evolves, 3-d predictions of presence and amount of volcanic ash and SO₂-clouds both in the hazards and their evolution over time needs to be published. Thus air surrounding the aircraft and sufficiently far ahead of it to enable evolved, 4-d volcanic ash information to support 4-d trajectories pilots to take appropriate action, much like we have weather radar should then be generated and published. for water-type clouds. Visual identification by pilots should not be The volcanic ash and SO₂-cloud information used should be the main means to determine the extent of volcanic clouds for continuously validated and updated using ground, airborne, and safety of flight and ATM purposes. After all, flight of an aircraft is satellite measurements. The boundaries shown on published charts governed by reference to instruments; instruments for height, should accurately depict the boundary between charted values. If airspeed, temperature, and more. The same should apply to this is not achievable, it should be clearly indicated on the charts, volcanic clouds (ash, gas, aerosols). If a system is used that is based and areas should be enlarged to show the most conservative value. on some total permissible amounts of ingested ash over a certain It is understood that in-flight updates to this information span of time, a certain dose of ash, the current received dose should should be uplinked to aircraft as they become available. be indicated to pilots. Pilots need to be given training in volcanic cloud recognition, 4. Further Considerations flight planning with regards to volcanic clouds, and operation of Beyond what has been considered so far, enhanced resilience to aircraft when operating in a volcanic cloud. This should include volcanic eruptions can be achieved by the following considerations: in-depth instruction on the airlines' specific Safety Risk • Information on hypothetical eruptions should be published for Assessment, which should be easily accessible to pilots. Regular planning purposes practice of unexpected volcanic ash encounters in the simulator
- Dissimilar redundancy should be introduced in eruption helps to prepare pilots for multiple system failures to be expected alerting in a severe encounter.
- Information about ash and forecasts for ash clouds should be
- Volcanic Contamination Information for Flights published in modern electronic formats, like KML and Information on volcanic ash and SO₂-clouds for pilots shall be WXXM 2.0 displayed on charts or electronic systems in standardized, • A website powered by all VAACs should show all ash and easy-to-understand, graphical form, using colour to highlight SO₂-cloud related information, including valid advisories. important aspects of ash reports and forecasts.

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Space Weather 101

BY CAPTAIN JAMES GASKELL

The goal of this article is to familiarize flight crews with space weather and its relevancy on our working environment. This article includes information given on the National Oceanic and Atmospheric Administration (NOAA) Space Weather prediction Centre (SWPC) website: <http://www.swpc.noaa.gov/> and the United Kingdom Met Office Space Weather Operations Centre (MOSWOC) website: <https://www.metoffice.gov.uk/space-weather>. Space Weather describes changing environmental conditions in near-Earth space. Magnetic fields, radiation, particles and matter ejected from the Sun can interact with the upper atmosphere and the Earth's magnetic field to produce numerous effects. The very highest energy particles come from our Galaxy or even beyond, but are rare. Less energetic Galactic Cosmic Rays are the origin of the majority of our exposure whilst airborne. The NOAA SWPC of the United States, as well as the UK Met Office, produce warnings and forecasts of Radio Blackouts (R1-5), Solar Radiation Storms (S1-5) and Geomagnetic Storms (G1-5). These and their effects are defined by NOAA on their website. They can also be seen on the figure at right.

RADIO BLACKOUTS

NOAA SWPC receives information from Geostationary Orbit Environmental Satellites (GOES). The largest solar flare seen by GOES for ten years occurred at about 0600 UTC on 6th September 2017. The flux on the GOES satellite was 9.3 times the threshold for X flares. This gave an R3 warning and a limited radio blackout on the sun-lit side of the Earth for an hour. Flares are categorized in increasing flux of soft X rays received at a GOES satellite as A, B, C, M, and X. Only M and above trigger radio blackout warnings. The X-rays travel at the speed of light, so travel time is only about 81/2 minutes. Once the X-rays are detected, the effects are already here, so an alert is issued to notify the onset of an event and the duration of the effects on the Earth's Ionosphere can be predicted. These disturbances typically last an hour or so dependent on the flux received. The flares are associated with sunspots, which are regions with intense magnetic fields on the Sun often many times the size of the Earth.

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RECOMMENDED READING UK MET OFFICE:

<http://www.swpc.noaa.gov/communities/aviation-community-dashboard>

AUSTRALIA:

<http://www.sws.bom.gov.au/>

CHINA:

<http://eng.sepc.ac.cn/>

JAPAN:

http://swc.nict.go.jp/contents/index_e.php

RUSSIA:

<http://space-weather.ru/index.php?page=home-en>

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SPACE WEATHER 22

Captain James Gaskell retired from Thomson Airways (TUI Airways) in 2010 after 33 years, (30 years as a Captain) on B737, then B757 and B767. Previously, he served 8 years in the Royal Air Force. Gaskell has been a member of the British Airline Pilots' Air Traffic Services Study Group (BALPA ATS SG) for several decades and has attended many IFALPA ATS Committee meetings, most recently in Singapore. He wrote this article in consultation with Captain Klaus Sievers and Mark Gibbs, who is in charge of Space Weather at the UK Met Office. Kp Graph provided by NOAA SWPC

RADIATION STORMS The nearest satellite to the Sun is the Deep Space Climate One hundred billion neutrinos from nuclear reactions in the Observatory (DSCOVR), a million miles sunwards orbiting the core of the Sun pass through each square centimetre of our Lagrange 1 point. Although a CME might be observed heading bodies every second. They do us no harm whatsoever because in our direction, only when it passes DSCOVR, 20 to 60 minutes they are not stopped by our bodies. Radiation produces ill effects before arrival at Earth's orbit can there be certainty about its on us when it knocks electrons out of atoms or changes atomic details, particularly the magnetic polarity. The remaining Stereo nuclei. Radiation warnings from SWPC and MOSWOC are A satellites, (currently approximately 120 degrees behind the triggered by solar proton fluxes measured by GOES exceeding Earths orbital position) help forecasters determine the speed of certain levels and energies (>10 MeV and >100 MeV). A report CMEs, with the faster ones being of greater concern. published by the Royal Academy of Engineering assessed the Coronal Mass Ejections consist of plasma, the fourth state of modern-day impacts of a repeat Carrington Event (the largest matter, mainly ionised hydrogen which has strong magnetic space weather event in recorded history) that occurred in 1859. fields. If they impact the vicinity of the Earth they alter the Earth's The report suggests that a similar event today would likely induce

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magnetic field. The degree of change is measured by the Kp index flight cancellation for aircraft on the ground, diversion for which can be seen on the Geomagnetic Activity chart. Kp long-haul aircraft airborne and altitude reduction, where safe, for reached 8 (G4 severe storm) late on 7th September. This was the rest. Reducing altitude significantly reduces received caused by a CME associated with the earlier flare. radiation because of atmospheric absorption. Any change of magnetic field, by Maxwell's Laws, induces a Radiation exposure is governed by international agreement. voltage which can affect power supplies. Large areas around "As Low As Reasonably Achievable (ALARA) taking into account Montreal were put into darkness in 1989. Geomagnetic Storms social and economic factors," is the principle applied. To disturb the Ionosphere as do the Xrays from Solar Flares. GPS constantly fly 4,000 feet above optimum increases radiation position becomes less accurate when the Ionosphere is disturbed. exposure undesirably, particularly at high latitudes as well as The use of augmentation systems both local and wide area helps. reducing manoeuvre margin. To fly 10,000 feet below is A signal is sent to augmentation satellites which transmit a economically unreasonable. Radiation warnings need greater modification over a wide area. As an aside, relativistic corrections accuracy and specificity to be heeded routinely by pilots. to the GPS clocks have to be made to allow for their speed and GEOMAGNETIC STORMS height in Earth's gravitational field. Severe geomagnetic storms are caused by Coronal Mass When the magnetic fields on the Sun "break", releasing a Ejections (CMEs) which consist of billions of tons of plasma CME and then reconnect, producing a solar flare, a "radio burst" accelerated away from the Sun by magnetic energy freed by the is also produced from the same location. One such radio burst breaking and reconnection of magnetic fields on the Sun. caused the secondary radar in Sweden to be disabled for a time Forecasting the eruption of a CME is not yet possible and the on 4th November 2015 Near sunset, the Sun was in direct "line of orientation of the magnetic field within the CME is a major sight" of the secondary surveillance radar. challenge in space weather and at the cutting edge of research. The NOAA SWPC website will provide you with an email CMEs typically take between 2 and 5 days to travel the 93 million alerting service. Just sign up for it. Often little advanced notice of miles from the Sun to the Earth, with the fastest on record significant Space Weather is given. This is the nature of an, as yet, making the journey in approximately 15 hours. immature system.

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 - Unusual weather phenomena -Air Traffic Control challenges

*All submissions are subject to editorial discretion

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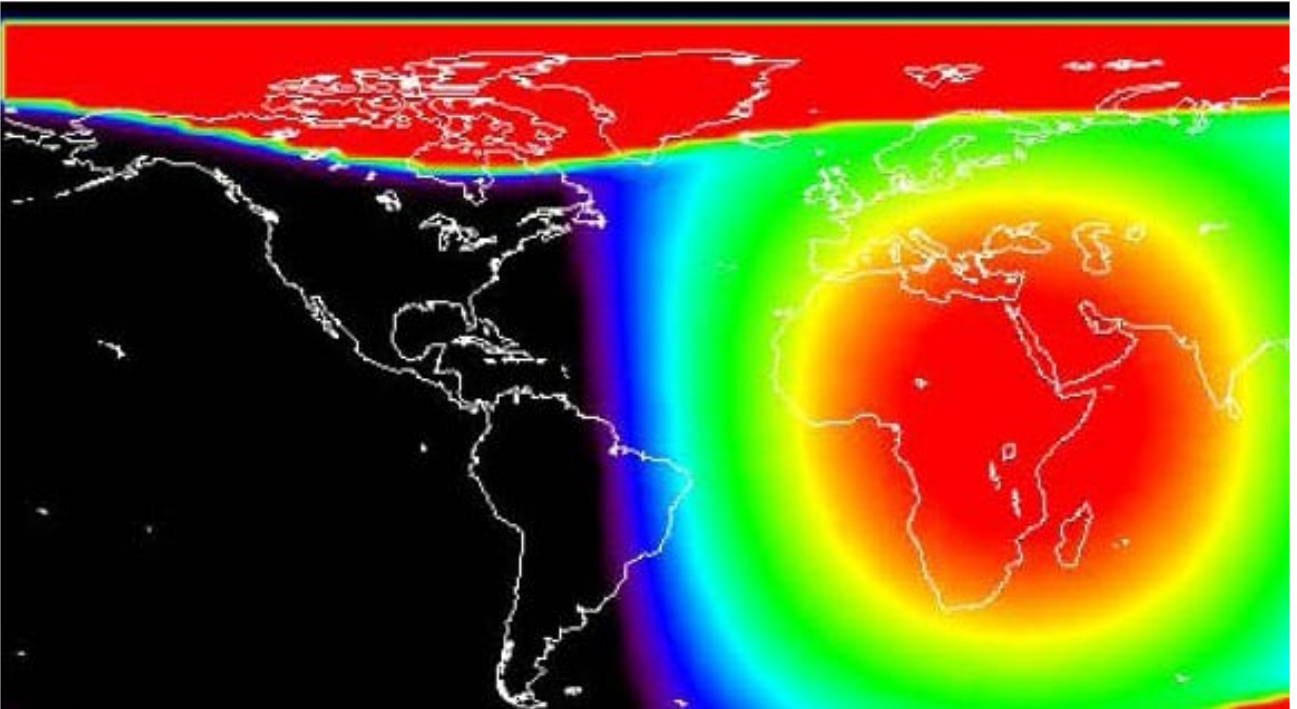
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