RISK INSIGHTS

The Jamaica Civil Aviation Authority's Risk Management Newsletter

VOLUME 3 | APRIL 2021

The Jamaica Civil Aviation Authority and its team members recall the Lightning Strike that hit its Headquarters in *September 2017.*

INSIDE

A CLOSER LOOK

Lightning Risks to Aviation

Let's explore...

CONTENTS

FOREWORD

September 8, 2017 will forever be etched in JCAA lore as "the day the lightning struck". A harrowing and singular event, the impact was devastating for our critical CNS/ATM infrastructure and systems, destructive for our information, communication and technology (ICT) structures and traumatizing for our team members.

Mr. Nari Williams-Singh
Director General,
Jamaica Civil Aviation Authority

Our response was exhaustive. Even with our aggressive repair effort however, disruptions to incoming and outgoing flights at our international airports, and overflights traversing the Kingston Flight Information Region (KIN FIR) were prolonged, and impeded Jamaica's primary industry, tourism. The repair costs were substantial, and the Authority's reputation diminished. Mercifully, although shaken, all team members were unharmed.

Lightning can, and likely will, strike more than once in the same location, particularly if the conditions in which it appeared in the first place remain unchanged and sympathetic to lightning activity. The 2017 Strike clawed through our buildings. We are however, also keenly aware that many of our team members, Inspectors conducting ramp inspections, Property Management and Office Management teams, and Engineers and Electricians among others, also frequently work outdoors and lightning strikes would be a hazard to them in that environment. We are required therefore, to balance the safety of our team members and the flying public, against the operational efficiency upon which the air transport industry and Jamaica's tourism industry depend. We must ensure safety while minimizing disruptions to

our operations; optimising resilience and redundancies all the while.

Risk management can help us to improve our continuity management approach. The process gives us information that will help us to identify the risks that will threaten our achievement of key objectives and require immediate attention while facilitating the selection of appropriate measures for mitigation.

Lightning protection and grounding systems for instance, may be critical tactics, however, we know from our risk assessments that procedures for warning team members about hospitable conditions for lightning strikes and protecting them must also be a part of our toolbox. Training is also necessary to increase the usefulness of our preparations for the damage that may be caused by lightning, lightning protection measures, inspection practices and repair procedures.

In this edition of Risk Insights, we will explore the lessons we have learned on lightning strikes and how to decrease our susceptibility and recover from their effects quickly when they do occur. The key risks for aviation in general and for the Authority specifically and control measures we have deployed to tackle this natural hazard will also be discussed. We will look to our key partner in the provision of aviation meteorology services, Meteorological Service Jamaica for its informative perspective in this area.

News from the archives

AS REPORTED SEPT 8 2017

SEPTEMBER 8

JCAA IN THE MEDIA

On Friday (September 8), the radar and communications systems at the Kingston Air Traffic Control Centre in Kingston were struck by lightning, causing a disruption in activities in Jamaica's airspace, the Kingston, Flight Information Region. The Authority's Deputy Director General of Air Navigation Services at the time, Mr. Carl Gaynair, said that a contingency plan has been put in place to enable the re-opening of the airspace on a limited basis.

Minister Mike Henry C.D., M.P, pointed out that while the incident was beyond human control, he would be looking at measures to prevent a recurrence. "It is impossible to prevent a lightning strike, and I will be looking into strategies, such as installing lightning arresters," the Minister said. (Jamaica Information Service)

HAPPENINGS IN JAMAICA ON AND AROUND SEPTEMBER 8

AUGUST 25 2017 | REGIONAL CONDITIONS

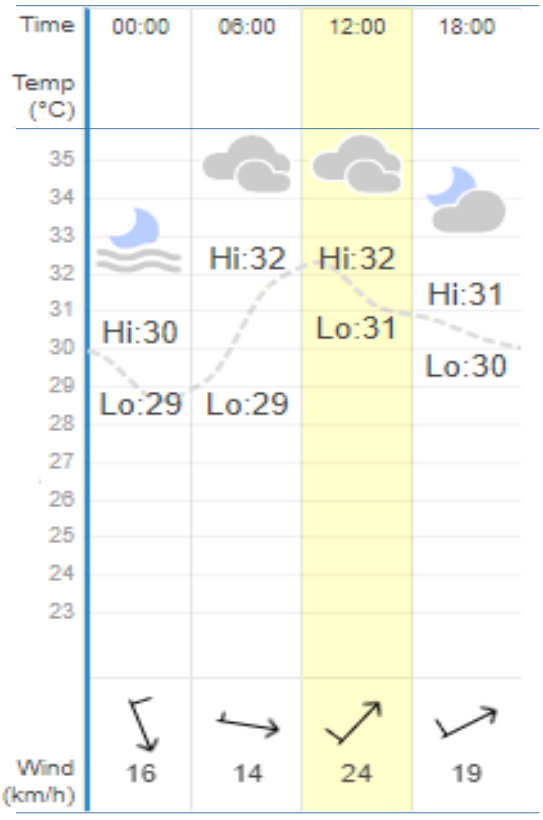
Hurricane Irma, a Category 5 Hurricane formed in the Atlantic during the week of August 25th 2017. It rapidly grew from a tropical disturbance to a major Hurricane that created an unprecedented multi-state threat to potentially nine (9) of the 18 States that participate in the Caribbean Disaster Emergency Management Agency (CDEMA) (JIS).

SEPTEMBER 8, 2017 | LOCAL CONDIITIONS

A trough induced by Hurricane Irma was forecast to linger across the island up to Sept. 10, 2017. The morning forecast was for partly cloudy with isolated showers across sections of northern parishes. The afternoon forecast was for widely scattered showers and isolated thunderstorms across sections of most parishes.

ACTUAL WEATHER CONDITIONS

September 8, 2017



Lightning monitoring, detection and warning

Are WE prepared for the next lightning strike?

Contributed by the Metrological Service

Lightning is one of the most frequently occurring geophysical phenomena. However, despite lightning being a familiar and researched phenomenon, it remains poorly understood, primarily due to the spontaneous spatial and temporal occurrence of lightning.

The frequent occurrences of lightning in Jamaica are not currently being tracked by local scientists as there are simply not enough data for scientists to work with. The fact is, the general safety measures and precautions against lightning strikes do not receive as much publicity as other natural hazards such as hurricanes and earthquakes.

Based on media reports and observations from local meteorological observing stations, the frequency of lightning strikes has seemingly increased over the past several years. In the United States alone, lightning kills an average of 49 people each year with hundreds being injured from these strikes. In recent years there has been an increase in the number of reported lightning strikes in Jamaica. The Jamaica Civil Aviation Authority (JCAA) will not forget the disruption in services and closure of airspace associated with a lightning strike a few years ago. As recently as 2019, several schoolboy footballers were struck by lightning and had to be hospitalized after a very powerful bolt of lightning hit the open field during the middle of the game. Since then, there have been a number of other occurrences, some of which resulted in death. Although it would require significant research to know whether or not there is a spike in lightning strikes in Jamaica, this underscores the importance of having proper lightning monitoring, detection and warning systems for the island.

LIGHTNING BOLTS

Based on the definition from the National Geographic website, lightning is an electrical discharge caused by imbalances between storm clouds and the ground, or within the clouds themselves. Although most lightning strikes occur within the clouds, there are times when the electrical discharge from the clouds comes in contact with objects on the ground. In Jamaica, lightning storms generally develop after a long day of high temperatures or during periods of unstable weather in which thunderstorm clouds develop. Lightning is most frequent during the summer months where you would normally receive warm and humid days and increased development of cumulonimbus clouds, which are responsible for lightning generation. In Jamaica, lightning tends to strike over more mountainous areas; however, during severe weather events lightning can strike almost anywhere.

CLIMATE CHANGE IMPACT

Despite various studies reporting diverse lightning-related fatalities, the actual number may be higher as many injuries and deaths often go unreported. It is expected that extreme weather and the occurrence of lightning will also increase with climate change. Jamaica has already experienced a warming trend, which is likely to continue in the future. These climate change projections become an added concern for developing countries like Jamaica that are already prone to lightning occurrences and severe weather events.

Climate models support a positive correlation between lightning and global temperatures. A study by Romps, et al, modelled the frequency of lightning strikes across the continental USA and predicted that lightning strike rates will increase significantly due to increases in global average air temperature.

There is, however, uncertainty regarding the expected changes in the spatial distribution of lightning with climate change. Because climate change is intricately linked to all facets of life and society, developing countries are more likely to face the brunt of climate change due to their low adaptive capacity. Thus, monitoring and prediction of lightning incidences on a local scale for developing countries like Jamaica require attention.

LIGHTNING MONITORING AND DETECTION TECHNIQUES

Existing lightning detection systems vary in terms of their spatial and temporal characteristics, and identifying a suitable system for an application can, therefore, be complex. Detection systems have different capabilities in terms of warning dissemination. For instance, manual observation and detection systems that are used by most meteorological offices in developing countries have little or no dissemination capabilities and are somewhat restricted, while national network systems used in most developed countries have been integrated with global warning systems of the World-Wide Lightning Detection Network. This allows for coverage over large areas with real-time warning capabilities.

Radiation that is emitted from lightning forms the basis of lightning detection and monitoring. During the lightning process, electromagnetic and acoustic radiation is generated in various forms, which include radio emission, optical radiation and acoustical radiation.

Tracking thunderstorms and assessing intensification becomes important challenges in weather prediction especially in remote areas where surface observations and radar systems are not available. in weather prediction especially in remote areas where surface observations and radar systems are not available.

DEVELOPING A LIGHTNING DETECTION NETWORK SYSTEM FOR JAMAICA

Before the development of weather radars and the national lightning detection network systems, meteorological offices primary means of identifying and mapping thunderstorms were done using medium and long-range forecast systems. Although this remains the primary means of monitoring and detecting lightning in Jamaica, this could change in the near future. Jamaica is currently upgrading the national weather radar to help in the monitoring and detection of lightning. Secondly, the Meteorological Service is currently in preliminary discussions with stakeholders about the establishment of a lightning detection network on the island.

Despite these advances, however, more needs to be done especially in respect of the vulnerability of rural communities whose residents continue to live without a timely lightning early-warning system. Some of the ways in which we can improve lightning detection on a local scale are through systems with monitoring and predictive capacity to improve the anticipation and detection of lightning occurrences. This will also greatly assist communities in preparing for lightning through risk knowledge and near-real-time early warning systems. This can be achieved through the communication and dissemination of alerts in a timely and comprehensible manner in languages that are understood within specific communities.

Finally, Jamaica's community infrastructure, including the national school education and disaster preparedness systems need to include lightning safety and the role of cultural beliefs associated with lightning in their educational programs to build awareness of lightning strikes at all applicable levels.

The Meteorological Service is a Division within the Ministry of Housing, Urban Renewal, Environment and Climate Change. It is concerned with the observation and forecasting of weather conditions over and around the island and maintains a continuous Hurricane Watch during the hurricane season.

MET OFFICE

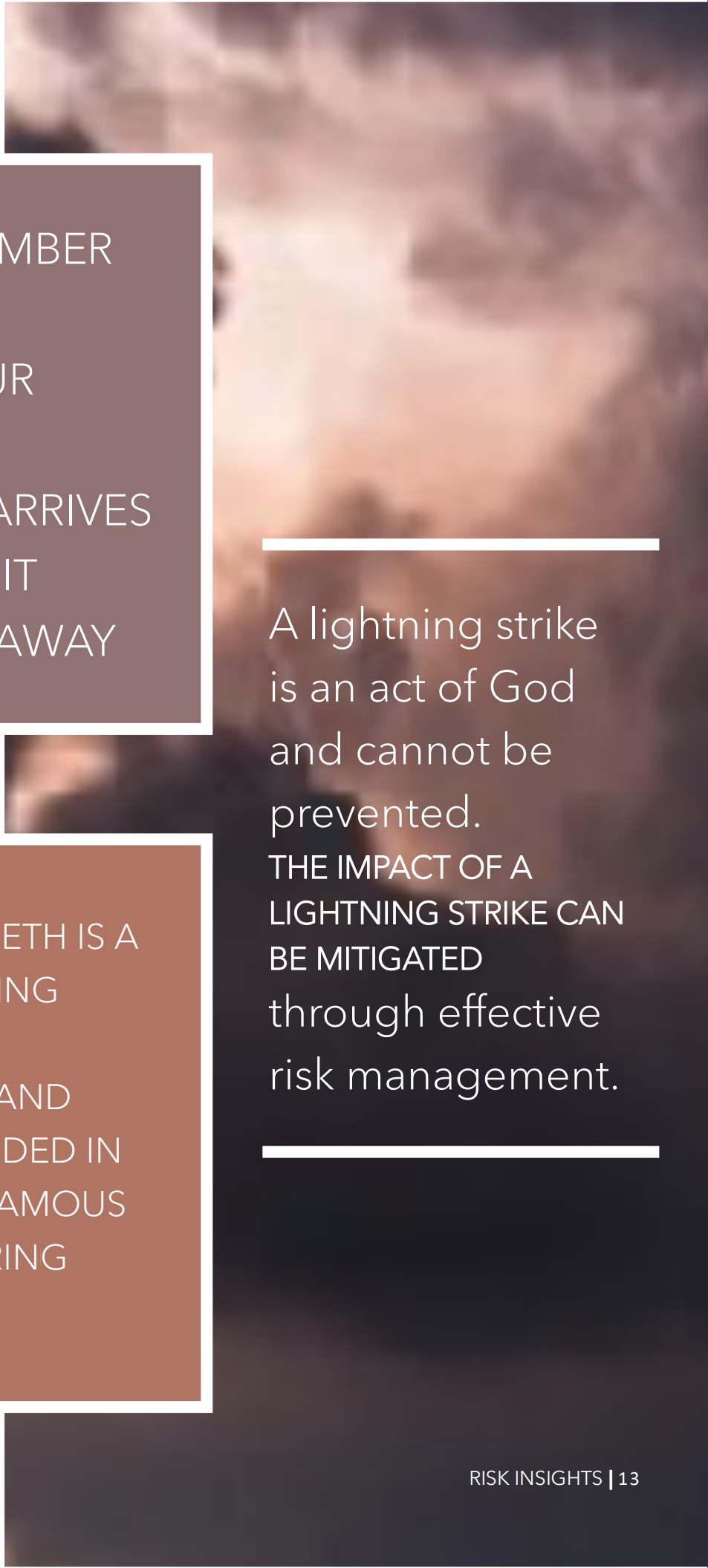
Lightning Myths and Facts

Myths and beliefs regarding lightning especially in rural areas continue to remain a challenge to the Meteorological Service and sometimes hinder necessary precautionary measures.

MYTHS	FACTS
If you're caught outside during a thunderstorm, you should crouch down to reduce your risk of being struck.	Crouching doesn't make you any safer outdoors. Run to a substantial building or hard-topped vehicle as you are not safe anywhere outdoors.
Lightning never strikes the same place twice.	Lightning often strikes the same place repeatedly, especially if it's a tall, pointy, isolated object.
If it’s not raining or there aren’t clouds overhead, you’re safe from lightning.	Lightning often strikes more than three miles from the centre of the thunderstorm, far outside the rain or thunderstorm cloud. Thunderbolts can strike 10-15 miles from the thunderstorm.
Rubber tires on a car protect you from lightning by insulating you from the ground.	Most cars are safe from lightning, but it is the metal roof and metal sides that protect you, not the rubber tires. When lightning strikes a vehicle, it goes through the metal frame into the ground. Don't lean on doors during a thunderstorm.
A lightning victim is electrified. If you touch them, you’ll be electrocuted.	The human body does not store electricity. It is perfectly safe to touch a lightning victim to give them first aid

Thunderstorms mean lightning, whether or not you can actually see it. This hazardous form of severe weather is a threat to people inside and up to 10 miles away.

Lightning Facts

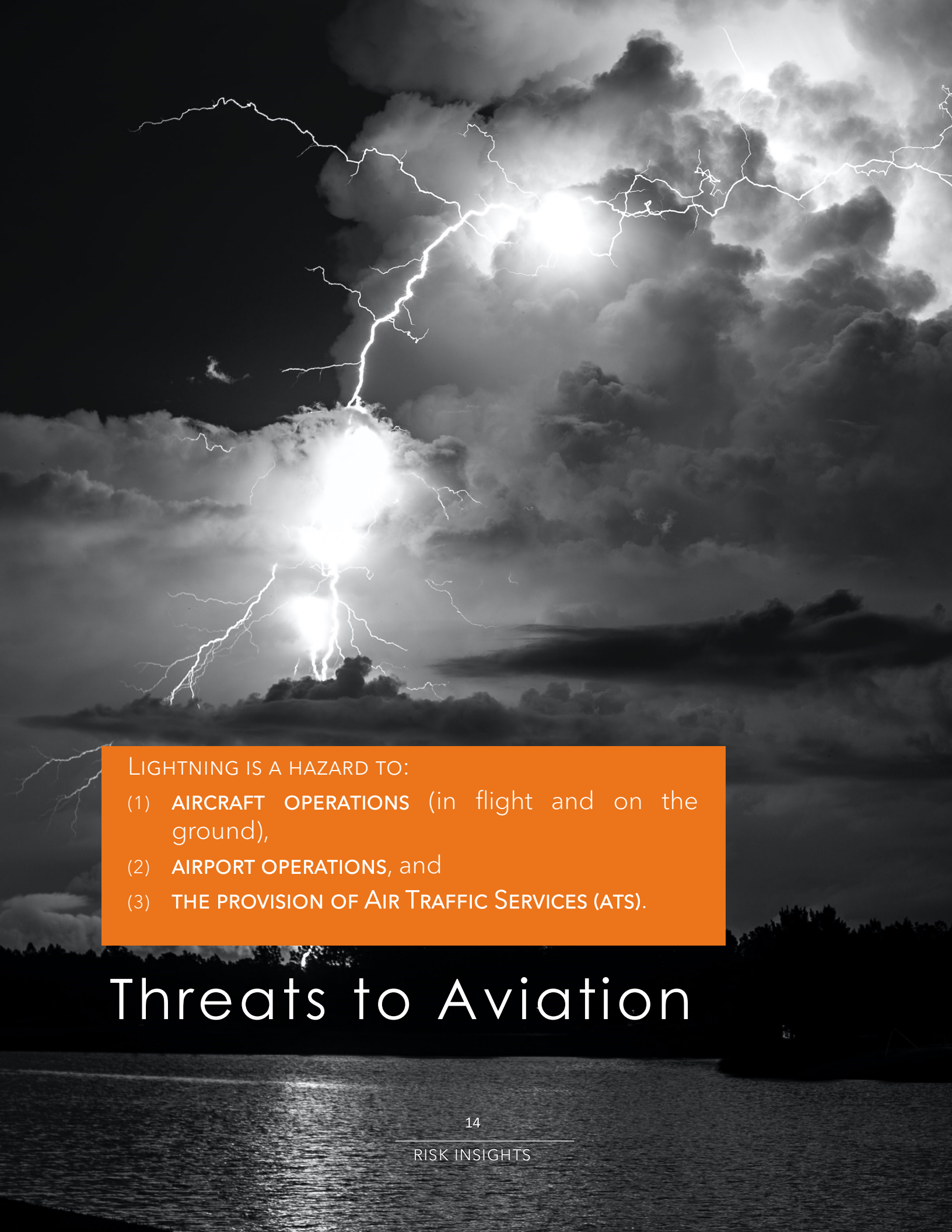


THE GREATEST NUMBER OF LIGHTNING CASUALTIES OCCUR **RIGHT BEFORE A THUNDERSTORM** ARRIVES AND **RIGHT AFTER** IT BEGINS TO MOVE AWAY

IN JAMAICA, ST. ELIZABETH IS A HOTSPOT FOR LIGHTNING STRIKES. 100% OF THE REPORTED FATALITIES AND MOST INJURIES RECORDED IN JAMAICA SINCE THE FAMOUS 1943 EVENT WERE DURING OUTDOOR EVENTS.

A lightning strike is an act of God and cannot be prevented.

THE IMPACT OF A LIGHTNING STRIKE CAN BE MITIGATED through effective risk management.



LIGHTNING IS A HAZARD TO:

(1) **AIRCRAFT OPERATIONS** (in flight and on the ground),

(2) **AIRPORT OPERATIONS**, and

(3) **THE PROVISION OF AIR TRAFFIC SERVICES (ATS)**.

Threats to Aviation

AIRCRAFT OPERATIONS

It has been more than 50 years since the last major accident caused by a lightning strike.

Lightning strikes rarely cause a major concern to an aircraft. Minor damage has been reported where incidents of lightning strikes leave puncture holes in the radomes and tail fins of aircraft. Interference with avionics may also occur. It can also impact the crew. Pilots report experiencing flickering of lights and a short period of blindness.

AIRPORT OPERATIONS

Airport operations and ground-flight procedures are put on hold when lightning is close by. Thunderstorms can delay flights which can have a ripple effect on flight schedules. Lightning poses a high safety risk to all ground support workers and equipment. Outdoor activities may have to stop during thunderstorms and this has implications for flights. Affected activities include: baggage handling, food services, refueling, guiding aircraft from/to gates, and repairing runway lighting.

AIR TRAFFIC SERVICES

Lightning has an impact on "usable" en-route airspace. Air Traffic Controllers depend on reliable (timely and accurate) metrological information to navigate aircrafts around areas of bad weather and to issue severe weather warnings to pilots.

Lightning can present a direct threat to the power supply for an Air Traffic Management Systems. There is also a significant threat to communication, navigation and, surveillance infrastructure and systems.

JCAA RISK PROCESS

RISK MANAGEMENT

Risk Management (RM) is the coordinated activities to direct and control the organization with regard to risk (ISO).

The main objective of the RM process is to monitor for, eliminate and mitigate hazards and risks.

RISK MANAGEMENT PROCESS

The risk management process is a cycle through which key risk activities are performed. The process is iterative which ensures that the assessment of risk considers:

1. changes within the business context,
2. lessons learnt from the monitoring and review of risk and risk events, and
3. consultation with stakeholders and subject matter experts

JCAA's Risk Management Process

Through the risk process the JCAA has identified certain lightning-related threats to the safety of its team members and to its operations.

The process incorporated information from:

1. Industry;
2. Environmental trends;
3. Expert recommendations; and
4. JCAA's experience of Sept. 2017

Key Lightning Risks Identified

This list captures the key threats, and is therefore not exhaustive

HAZARD: FIRE

Risk:

1. PEOPLE
2. EQUIPMENT DAMAGE
3. STRUCTURAL DAMAGE

Potential impact:

1. Death and/or serious injury
2. Service disruption (inability or diminished ability to offer air navigation services or regulatory oversight)
3. Loss of core ICT services

HAZARD: SHOCK WAVE

Risk:

1. EQUIPMENT DAMAGE
2. STRUTURAL DAMAGE

Potential impact:

1. Loss of stakeholder confidence (*Equipment damage)*
2. Inability to provide air navigation services (*Equipment damage*)
3. Loss of core ICT services (*Power loss*)

HAZARD: HUMAN FACTORS: PSYCHOLOGICAL STATE

Risk:

1. ADVERSE PSYCOLOGICAL STATE

Potential impact:

1. Pre-conditions for unsafe acts– adverse mental state of human operators (team members)
2. Reduced performance

HAZARD: OUTDOOR ACTIVITY DURING A STORM

Risk:

1. ELECTROCUTION

Potential impact:

1. Loss of life or serious injury key team members

HAZARD: POWER SURGE

Risk:

1. EQUIPMENT DAMAGE
2. POWER LOSS

Potential impact:

1. Loss of stakeholder confidence (Equipment damage)
2. Inability to provide air navigation services (Power loss)
3. Loss of core ICT services (Power loss)
4. Inability to provide regulatory services
5. Loss of stakeholder confidence

RISK MANAGEMENT

REGULATORY AFFAIRS

SAFETY & COMPLIANCE

OSH

ENTERPRISE RISK MANAGEMENT

Risk Management is a shared responsibility between management, designated teams and members.

Specific designation for the management of all risk is assigned to four departments at the JCAA. This includes lightning risks. Execution of control measures resides with the operation team.

REGULATORY AFFAIRS DIVISION

Within the aviation context the Regulatory Affairs Division provides oversight to air transport in Jamaica. The team conducts surveillance of Aerodrome Operators, Aircraft Operators, and the ANS Division to encourage compliance to the regulations related to lightning risks.

SAFETY & COMPLIANCE

The ANS Division self monitors, also to encourage compliance to the regulations and ICAO standards through the work of the Safety and Compliance Department.

OCCUPATIONAL SAFETY AND HEALTH

Lightning is an occupational hazard. The Human Resource Department provides awareness about lightning hazards and implement policies to ensure safety of Team Members .

RESEARCH PLANNING & RISK ASSESSMENT

RPRA ensures that the risk processes are carried out. Risk Assessment (Risk identification, analysis and evaluation are critical areas) and the implementation of risk treatment measures.

REGULATORY OVERSIGHT

Mr. Noel Ellis
Director, Flight Safety

The Regulator through the Flight Safety Department, is committed to its regulatory oversight mandate; to ensure the safety of the civil aviation industry.

Whilst failures cannot be avoided 100%, our two focus areas to ensure safety in the face of lightning events and to reduce the likelihood of serious or catastrophic impact are:

1. Surveillance to ensure compliance with quality standards for CNS equipment (lightning arrestors and grounding systems), and
2. Ensure approval of a viable contingency plan which is critical to recovery from planned and unplanned incidents.

REGULATIONS FOR ANSPs

Contingency Planning

Schedule 24 JCARs

The ANSP must have a Regulator-approved contingency plan.

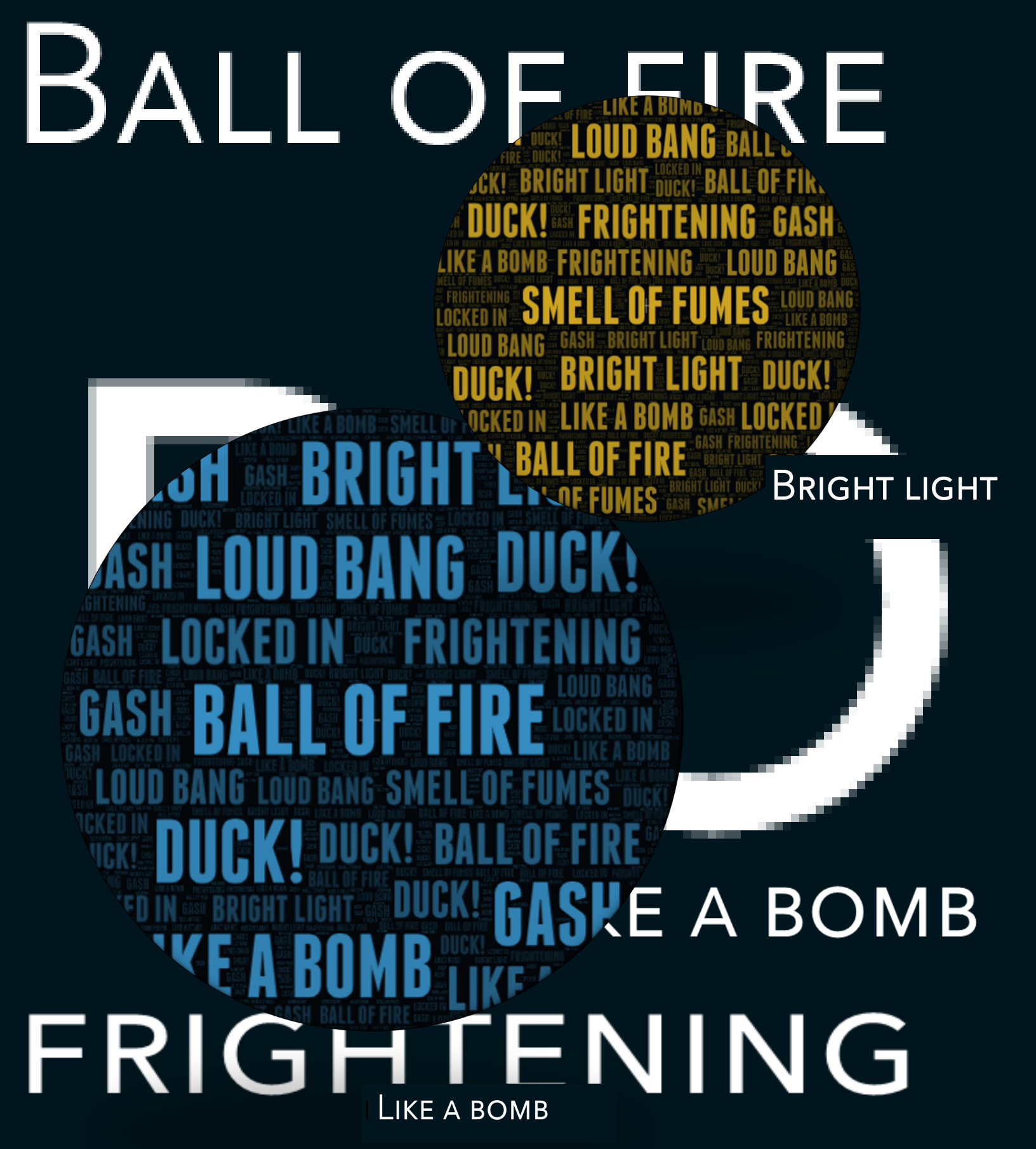
The ANSP informs the Regulator when there is a disruption to service. Within 48 hours, the ANSP must provide details of the nature of the disruption, if a contingency procedure will be invoked, the nature of the contingency, when they will move to a contingency procedure and when normal conditions will be restored.

Oversight - Equipment Maintenance

Ensure adequate maintenance of equipment. For lightning risks the maintenance schedule of grounding systems are reviewed. Deficiencies identified are raised with the ANSP for corrective action.

Air Traffic Service Facility

The Air Traffic Facility: the contingent and permanent facility must be approved (certified) by the Regulator.


BALL OF FIRE
LOUD BANG
BRIGHT LIGHT
DUCK!
FRIGHTENING
GASH
LIKE A BOMB
SMELL OF FUMES
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LIKE A BOMB

Omar Annakie is a NOTAM Officer within the Aeronautical Information Management (AIM) Department

It was a Friday afternoon. It was almost at the end of the work day and we were winding down to start the weekend. I recall the weather was normal, sunny skies. It was peaceful.

I was at my station, at the time within the Information Technology (IT) Department. Between 3pm and 4pm **I heard an unusual sound, and saw a giant spark of light, like an electrical spark or gash** coming from the direction of the IT Server Room.

I did not know what happened, but it was evident that we had an issue. Not long after the calls started coming in from members who had lost connectivity and were seeking resolution. As I made the rounds it became evident that the problem was much more serious than a "normal" outage. Some Team Members appeared scared and confused about what had happened. One person mentioned seeing a ball of fire pass them and another experienced their desktop computer emitting smoke. The fear was compounded by the failure of the access system as some doors stayed shut.

The stress level was high following the event. That day, and for the next few days I might have worked up until 11pm trouble-shooting and supporting the recovery of systems. **I am now mindful of safety and about evacuation protocols**.

Mr. Howard Greaves

Deputy Director General,
Air Navigation Services Division

On September 8, 2017, Mr. Howard Greaves was the Director of Air Traffic Management. Having been in the very heart of the ANS emergency response to the 2017 lightning strike, and now crafting the strategic direction of the ANS Division, he is well-placed to share his experience and the strategy for engaging more resilient operations today and plans for an even stronger future.

BACKGROUND: At the time of the lightning strike the JCAA was implementing new systems as part of its ANS Modernisation Programme. Specifically at the time the team was transitioning from the legacy Air Traffic Management (ATM) system to the Thales Topsky Air Traffic Management System. The Topsky system was partially implemented and was functional within the training facility. Both legacy and new systems were being used in parallel, and ATCs were being trained (using live traffic) from the Kingston Air Traffic Control Centre (KATCC).

SETTING THE SCENE

SC: Where were you at the time of the lightning strike? Tell me what that experience was like?

HG: It was a Friday, I had just returned from lunch. I was in my office and heard a very loud noise. The lights went out, and normally when that happens I proceed to the Centre to check that everything is ok.

THE IMMEDIATE IMPACT

HG: There was no light in the Centre. All the communication was down and all the radar screens were down.

SC: So ANS was unable to provide approach and en route air traffic services?

HG: In a situation like that when all operations are lost, we have to transition to contingency mode.

EMERGENCY RESPONSE

Communicate with stakeholders

1. We immediately tried to contact the adjoining Flight Information Regions (FIRs) to advise them, and to

2. Have the Towers make contact with the aircraft in the airspace. It was an extremely busy Friday evening.

Invocation of Contingency Procedures

We moved to **ATC Zero** where the adjoining FIRs take over the traffic in our airspace and guide them through. We also implemented **contingency routes** so the adjoining FIRs could know exactly which routes aircraft were on and which flight level.

There were aircraft on the ground wanting to depart, we had to implement ground stops, those in the air landed. We could take no more aircraft inbound. Traffic to Jamaica therefore had to be diverted.

ICAO NACC Regional Office sent Notices to Air Men (NOTAMs) on our behalf.

DAMAGE ASSESSMENT

The Management and technical staff started our assessment of damages. We knew it was the lightning strike. We knew that it had hit our critical systems….. but we needed to figure out what was the extent of the damage and what systems could be brought back.

After our review we determined that it was too risky to maintain operations and therefore operations were suspended and the airspace was closed.

REDUCED OPERATIONS

SC: Operations were back up by Saturday night. Given the level of damage, how were you able to accomplish that?

HG: A feature of the new Topsky system facilitated the transition between simulation mode for testing, and live feed for live operations. Negotiating this feature into the contract provided a means for service continuity. Additionally, the Topsky system was not significantly affected in the strike. It was tested and assessed. The communication system was working, and we were able to see the aircraft. We subsequently determined that we would be able to re-start operations that night based on the functional elements.

SC: Was the transition back into operations a smooth and simple process?

HG: There were challenges. Because flights were suspended for approximately 24 hours, there were flights waiting to leave, flights coming in to pick up passengers, it was very busy. We also had to work with Flight Safety to ensure certification of CAATI facility as a temporary ATS facility. The system was new and therefore ATCs were not yet fully trained and consequently it was the management team that operated live traffic, leaning on their experience and training in radar and procedural separation. It took a lot of effort, however, when you consider the national interest, we had to find a way to get the planes in the air.

SC: What were the risks? How were they mitigated ?

HG: The traffic flow was considered to be a risk. It was a busy period. In order to reduce

the risk, we had to reduce flow. We had to implement traffic management initiatives and Air Traffic Flow Management.

The time between arrivals was increased and also the time between departures. This was done to control the flow of the fights and increase safety.

PLANNING FOR RESTORATION TO NORMAL OPERATIONS

SC: So Management was operating live traffic. What was the plan to transition to more sustainable normal operations?

HG: The focus was to get approximately 80 ATCs certified on the new system. It took us from mid-September to mid-November. With the legacy ATM system no longer functional, the equipment was removed from the KATCC to make room for the installation of the new Topsky equipment and to restore operations within the KATCC.

SC: How has the ANS Division grown from that experience?

LESSONS LEARNT FROM AN OPERATIONAL PERSPECTIVE AND THE WAY FORWARD

Improve redundancy to build resilience

HG: The CAATI facility was established as a redundant facility for the KATCC, where the team could seamlessly transition operations.

Since then, other redundant facilities have been established to improve our response capabilities in the event of other types of disasters which may threaten a single redundant facility.

Training

The work continues to ensure that we have trained and certified personnel to operate within the contingency facility in the event of a disaster. This will also improve our response capability and reduce the likelihood of airspace closure.

Communication

There have been other technological improvements which will further improve communication for the redundant facilities. The programme to implement those improvements is on schedule for this Financial Year.

People

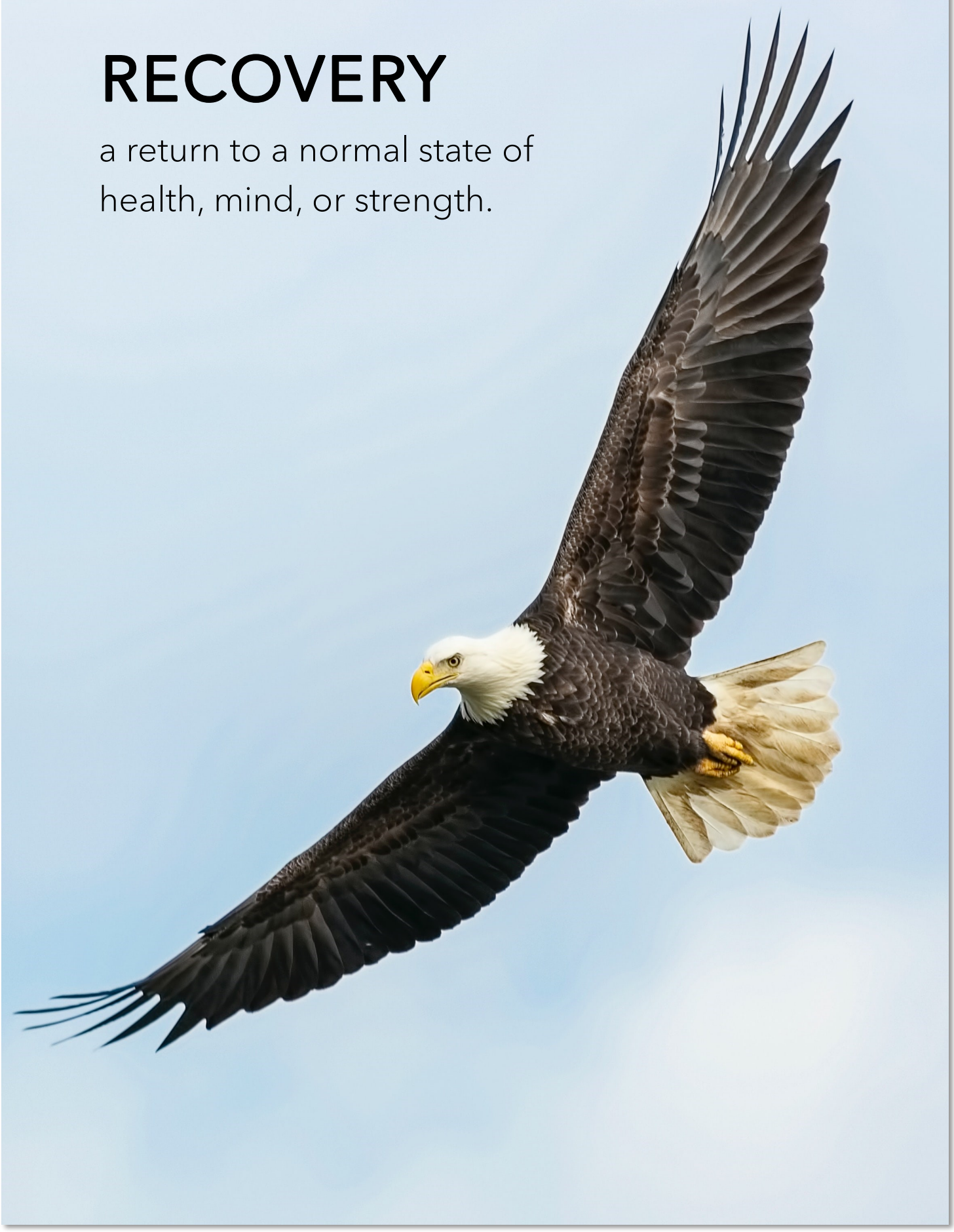
SC: With Management operating traffic for a couple of months, and with the intense ATC certification training, the stress levels for both Management and other members of the team must have increased?

HG: It was a very stressful time for all. The learning curve with the new systems was steep. The traffic flow initiatives helped to alleviate the stress. In the end our competence levels improved. Managers provided a buffer, extending the transition period after certification. Stepping into a completely new system with the level of responsibility induced anxiety for some. Once the ATCs were fully comfortable and took over traffic the stress levels normalized among all.

We would not have been able to overcome what we overcame without everyone fully immersed in the entire process. We had to work together as a team.

RECOVERY

a return to a normal state of health, mind, or strength.



1. AIR TRAFFIC & AERONAUTICAL INFORMATION MANAGEMENT

- ATCs should be trained and qualified to work 'No-Radar' procedures
- Improve alternative dissemination protocols for NOTAMs during disruptive events

2. COMMUNICATION, NAVIGATION & SURVEILLANCE
Infrastructure & Equipment

- Maintain a full backup Air Traffic Management (ATM) system
- Update telecommunications network to ensure that nodes are linked through fibre optics
- ATM facilities should be protected from other internal connected systems/devices.
- Lightning protection technology should be reviewed and updated regularly

3. ICT
Telecommunications Equipment

- Grounding standard of telecommunication systems must be verified once work is carried out by contractors

3. SECURITY - Access Control

- Electronic access control systems must fail open and consider first safety of Team Members and facilitate speedy evacuation
- Control over secured areas of the facility must be maintained. Response measures should be established

4. OCCUPATIONAL SAFETY & HEALTH

- Staff training and awareness programmes on lightning risks are critical
- Identify at-risk categories of workers and develop a specialized response strategy
- Consider support services to address the emotional trauma

5. COMMUNICATION & CRISIS MANAGEMENT

- Establish a crisis communication plan to ensure timely communication to Team Members and

6. BUSINESS CONTINUITY PLANNING

- Co-ordinate and test response and recovery procedures (this includes all areas of the organization and providers)
- Ensure that staff are trained and aware of the procedures and the role that they play in the process

LIGHTNING SAFETY TIPS

When Working Outdoors

1. **When thunder roars, go indoors!** If you hear thunder, even a distant rumble, get to a safe place immediately. Thunderstorms always include lightning. Any thunder you hear is caused by lightning! Nowhere outside is safe when thunderstorms are in your area.
2. **Check weather reports: Prior to beginning any outdoor work**
3. **Seek shelter in buildings** . Remain in the shelter for at least 30 minutes after hearing the last sound of thunder.
4. **Use a vehicle as shelter if a safe building structure is not accessible**. A hard-topped metal vehicle with rolled up windows can be used. Remain in the vehicle for at least 30 minutes after hearing the last sound of thunder.

When caught Outdoors with no cover

1. Avoid open areas, such as fields. Never lie flat on the ground.
2. Avoid water, and immediately get out of, and away from bodies of water .
3. Stay away from all metal objects, fences, equipment, and surfaces that can conduct electricity such as under or near motor vehicles, fuel tanks, metal pipes, umbrellas

REDUCING LIGHTNING HAZARDS

Many lightning victims are caught outside during a storm because they did not act promptly to get to a safe place, or they go back outside too soon after a storm has passed.

There is no safe place outside in a thunderstorm.

DO NOT USE CORDED TELEPHONES DURING A THUNDERSTORM

Lightning disproportionately kills men. According to the National Weather Service, 81% of the lightning-related fatalities between 2006 and 2013 were men .

Did you know?

1. Venezuela experiences more lightning than anywhere else on Earth. According to The Guinness Book of World Records, **Lake Maracaibo**, just off the Caribbean Sea, holds the record for "highest concentration of lightning,"

2. A single **lightning bolt can strike more than one place at the same time**. Double–or even triple–lightning strikes are not uncommon.

3. Some places (like tall buildings or areas with particularly conducive topography) can see dozens or even hundreds of lightning strikes. For instance, the **Empire State Building is reportedly struck by lightning roughly 23 times per year**.

4. Lightning is responsible for an estimated **24,000 deaths throughout the world in a given year**. Many of those are in poorer or more rural parts of the world.

5. On December 8, 1963, a lightning bolt hit the left wing of Pan American Flight 214, heading from Puerto Rico to Philadelphia. The bolt ignited the fuel stored in the plane's reserve tank, causing an explosion and part of the wing to separate from the plane. The whole thing came crashing down, and all **81 passengers were killed .**

6. A spherical ball of light, known as "**ball lightning**," has never been photographed,

7. An iPod saved a teenager who was struck by lightning. The gadget's wire **diverted the 300,000-volt charge away from her vital organs**. She suffered burns and was knocked unconscious, but lived to tell.

8. The **study of lightning has a name. It's known as "fulminology**."

1. How do lightning arrestors and grounding systems protect us?

Lightning arrestors are protective devices for limiting surge voltage due to lightning strikes or equipment faults or other events, to prevent damage to equipment and disruption of service.

Lightning arrestors are installed on many different pieces of equipment such as power poles and towers, power transformers, circuit breakers, bus structures, and steel superstructures in substations.

The typical lightning arrestor has a high-voltage terminal and a ground terminal.

When a lightning surge travels along the power line to the arrestor, the current from the surge is diverted through the arrestor, to earth.

Lightning Arrestors

A **grounding system** connects specific parts of an electric power system with the ground, typically the Earth's conductive surface, for safety and functional purposes.

System grounding is required for use in systems like utility distribution systems, telecommunications systems, and in commercial/residential buildings.

2. WHAT HAPPENS IF LIGHTNING STRIKES A PLANE?

Older aircrafts made of metal act as Faraday cages. While newer jets are made of a lighter weight carbon fibre reinforced plastic, airplane manufacturers use a special foil (Electrically Conductive Expanded Metal Foil) to get the Faraday cage effect. The lightning passes through the foil wrapped "tube" and along the wings and leaves the plane.

> Lightning passes harmlessly around the aircraft and continues on its way.

You are not likely to even be delayed.

> You might hear a bang and get a surprise but your plane will get you safely on the ground.

Once landed there are extra safety and security checks mandated by regulations, to ensure that all the electrical systems are working properly .

EVERY COMMERCIAL AIRCRAFT IS STRUCK BY LIGHTNING ONCE OR TWICE PER YEAR.
This is because the exterior charges redistribute such that the interior fields emanating from them cancel

A Faraday cage or Faraday shield is an enclosure used to block electromagnetic fields. Faraday cages are named after scientist Michael Faraday, who invented them in 1836.

Faraday Cage

CONCEPTS:

1. Charge resides only on the exterior of a charged conductor

2. Exterior charge has no influence on anything enclosed within a

August 25, 1943 lightning struck Vaughansfield Elementary School in St James, killing 7 children. Their class was a wooden structure which went up in flames after being struck. The building was replaced in 1945.

Risk Insights

JUMBLE

Unscramble the words below. One letter to each square to form five words or phrases

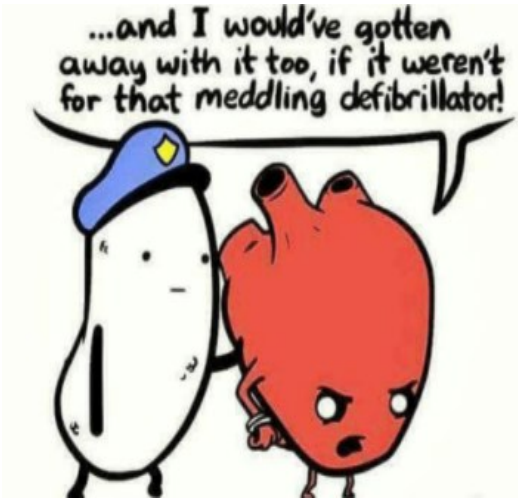
IGNGLINHT RERSTRSEA

NUGNGRIDO

ITKERS

MITAECL NAHEGC

SKRI EAMGMENNTA



Now arrange the circled letters to form the answer . The cartoon above is your clue.

YOUR ANSWER WILL FIT IN THE CIRCLES BELOW

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