Arab Civil Aviation Commission - ACAC/ICAO MID GNSS Workshop

Cybersecurity, safety and resilience - Airline perspective

Rabat,
November, 2017

Presented by

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Advisory, Audit and Training –
Information Security, Business Continuity & Risk Management

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Outline

1. Vulnerabilities, Cybersecurity recent incidents
2. Aviation Cybersecurity: A New Security Landscape
3. Cybersecurity best pratices: ISO and NIST approaches
4. ICAO/ACAC Recommendations

Main sources of GNSS Vulnerabilities

- Ionospheric delay
- Tropospheric delay
- Satellite clock error
- Ephemeris error
- Signal error
- LOS Blockage
- Receiver noise
- Dilution of precision
- Jamming
- Spoofing

Cybersecurity and the airline industry

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Cybersecurity has become an elevated risk that is among the most pressing issues affecting businesses.

Today's cyber adversaries are more persistent, skilled, and technologically savvy than just a year ago, and leaders across all industries are taking notice.

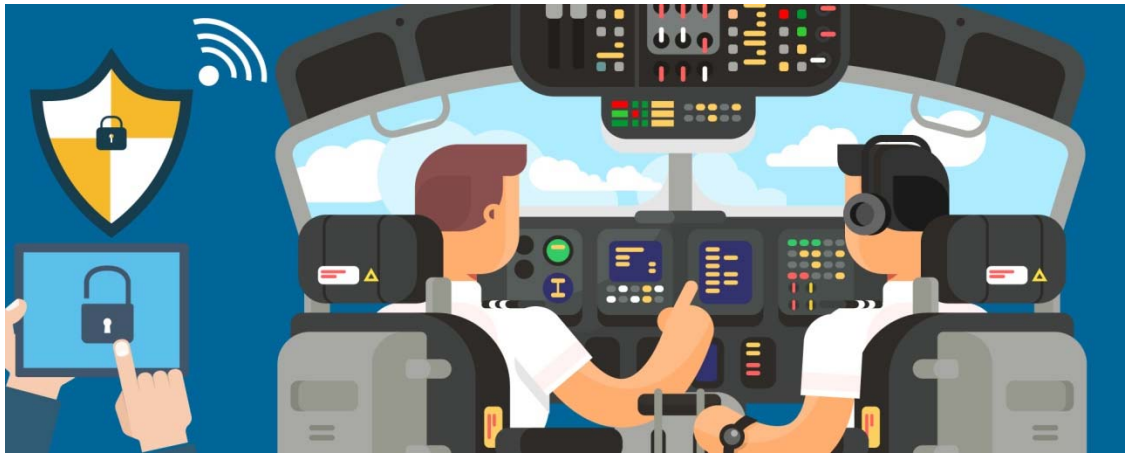
pwc

According to PwC's 2015 Global Airline CEO Survey, **85 percent of airline CEOs view cybersecurity as a significant risk**, likely reflecting the highly sensitive nature of flight systems and passenger data.

→ Online attacks are on the rise,

→ For the airline industry, cybersecurity risk is top of mind.

Cybersecurity &Airplane recent incidents



Hackers bombard aviation sector with over 1,000 attacks per month

By Jorge Valero | EURACTIV.com

11 juil. 2016

www.telegraph.co.uk/technology/2016/12/20/hackers-could-take-control-plane-using-in-flight-entertainment/

Hackers could take control of a plane using in-flight entertainment system

4

Exploiting the problem, researcher Ruben Santamarta said hackers could "hijack" in-flight displays to change information such as altitude and location, control the cabin lighting and hack into the announcements system.

MORE

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2 G n

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5 V t

Malaysia suffered cyber-attack after MH370 disappeared

FMT Reporters | April 21, 2015

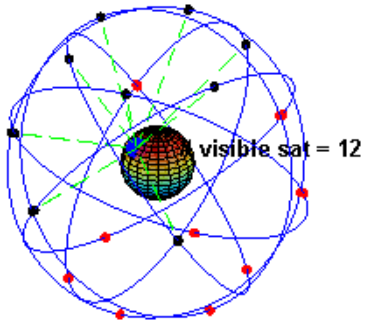
Cyber security expert claims phishing e-mails were used to infiltrate navy, police and civil aviation departments

Cybersecurity and the Aviation sector: recent incidents highlight unique risks

On June 21, 2015

LOT Polish Airlines had its flight operations system hacked, resulting in disruption or cancellation of 22 flights. While there is little public information, and indeed there are some conflicting reports as to whether this was an actual cyber security attack, it is reported to have been a Distributed Denial of Service (DDoS) attack on a private network responsible for issuing flight plans, showing the scope for penetration into the inner workings of an airline's IT estate;

Aviation Cyber Security: A New Security Landscape



What's Cybersecurity ?

- Cybersecurity is :
  - The collection of technologies, policies, security concepts, processes and best practices designed to protect networks, computers, cyber environment, programs, data and organization from attack, damage or unauthorized,
  - Preservation of Confidentiality, Integrity and Availability of information in the Cyberspace. (ISO 27032, Clause 4.20)

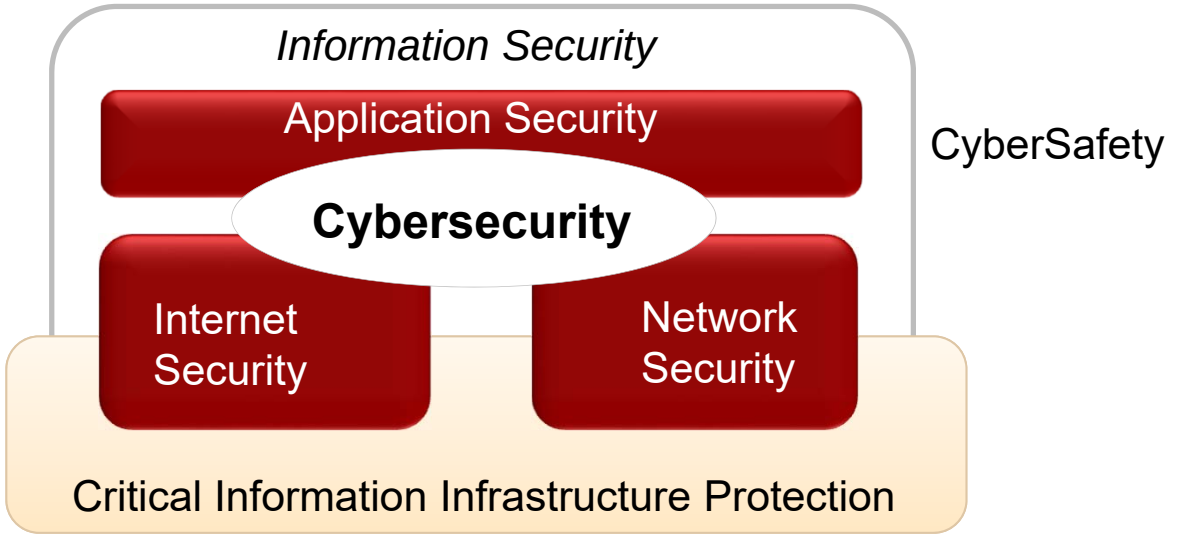
Cyber Attack

- Can cause business high level costs. Despite the financial cost, there can also be reputational damage, causing decrease in level of business or sometimes segment specific or total disruption.

Cybercrime

- Cyber crime encompasses: any criminal act dealing with computers and networks (called hacking). Additionally, cyber crime also includes traditional crimes conducted through the Internet.

- Cybercrime includes:
  - Illegal Access, illegal interception,
  - System and data interference,
  - Misuse of devises
  - Fraud



Infiltration attack vulnerabilities

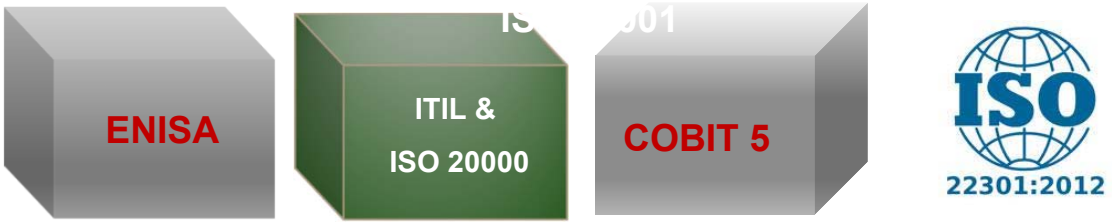
Categorised according to the ISO27005:2011 Annex D

Types	Vulnerabilities
Hardware	Lack of periodic replacement schemes
Software	Well-known flaws in the software
Software	Poor password management
Network	Unprotected communication lines
Personnel	Insufficient security training
Personnel	Lack of security awareness
Organization	Lack of formal process for access right review (supervision)
Organization	Lack of fault reports recorded in administrator and operator logs
Organization	Lack of records in administrator and operator logs

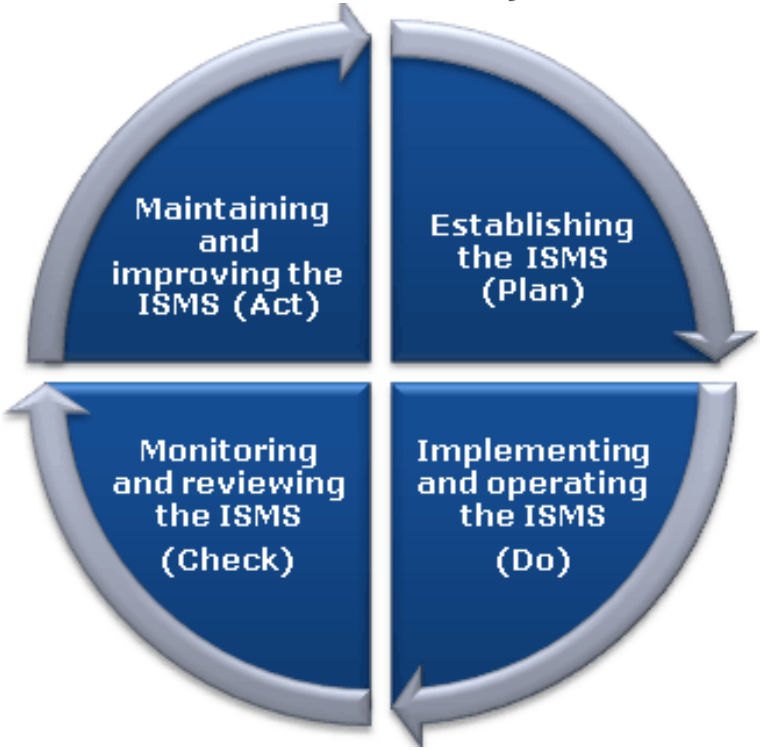
Cybersecurity best practices : ISO Standards and NIST approach

Alignment with Best Practices

- ISO/IEC 27001 — Information security management systems — Requirements.
- ISO/IEC ISO 22301 — Guidelines for information and communication technology readiness for business continuity
- SO/IEC 27032 — Guideline for Cybersecurity
- NIST : National Institute of Standards and Technology



ISO 27001:2013
Information Security Management System



Sécurisé | https://www.sita.aero/pressroom/news-releases/sita-completes-iso-certification-for-information-security-at-changi-airport

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Pressroom

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News releases

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SITA completes ISO certification for information security at Changi Airport

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Location: Singapore

Steve Lee, Chief Information Officer/Senior Vice President, Technology, Changi Airport Group, said: "We congratulate SITA on achieving the ISO 27001 certification. CAG values our partner's commitment to

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back

GHIAL in the news

GHIAL obtains ISO 27001 2005 certification

Hyderabad | 12 March, 2009

One of the first airports in South and South East Asia

Hyderabad, 12th March, 2009: The auditors of BSI (British Standards Institute) have awarded GMR Hyderabad International Airport Limited (GHIAL)and the Rajiv Gandhi International Airport an ISO 27001:2005 (Information Security Management System) certification. This is the highest certification from BSI for Information Security, which not only consists of IT but also Information

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ISO 27001:2013 ISMS

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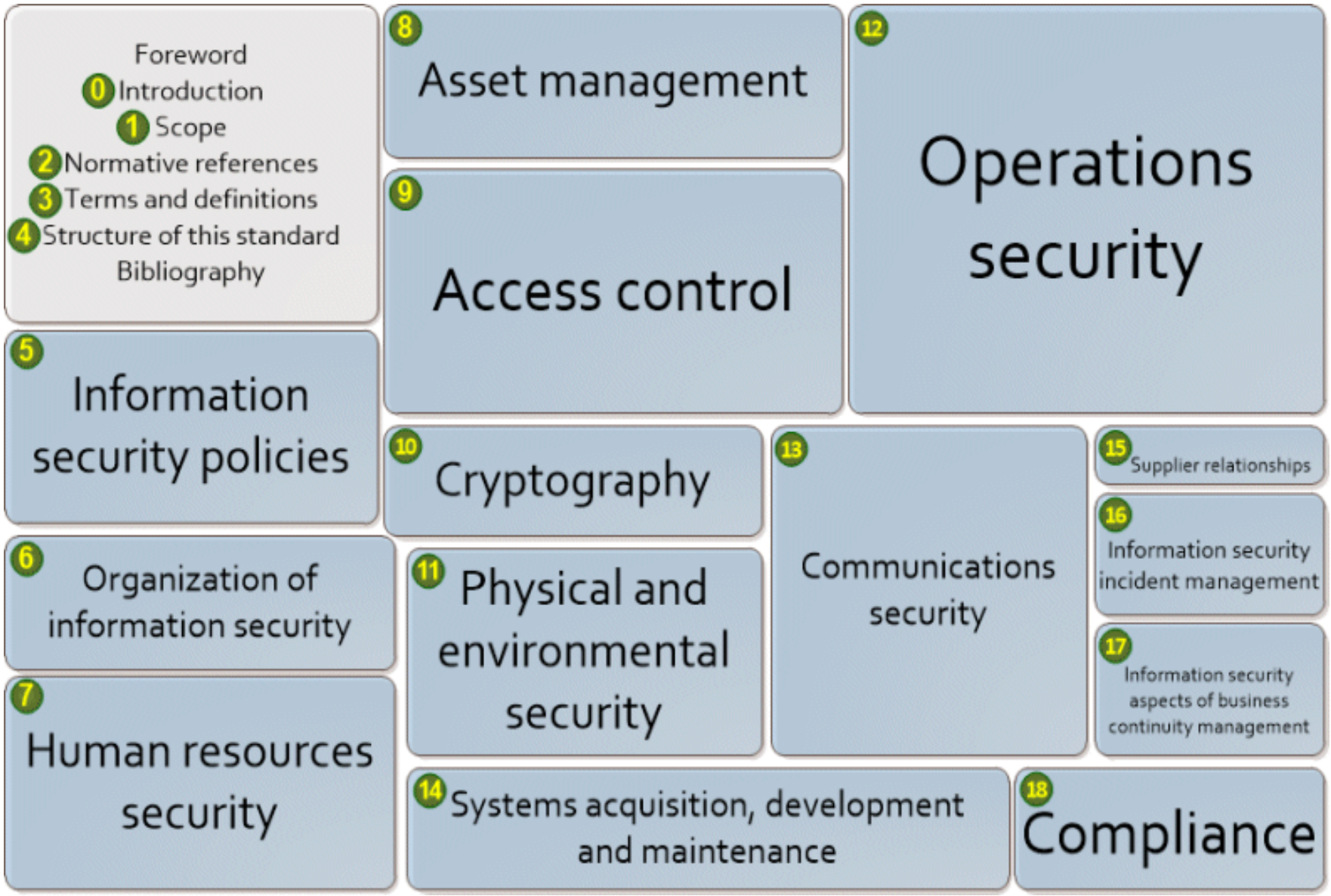
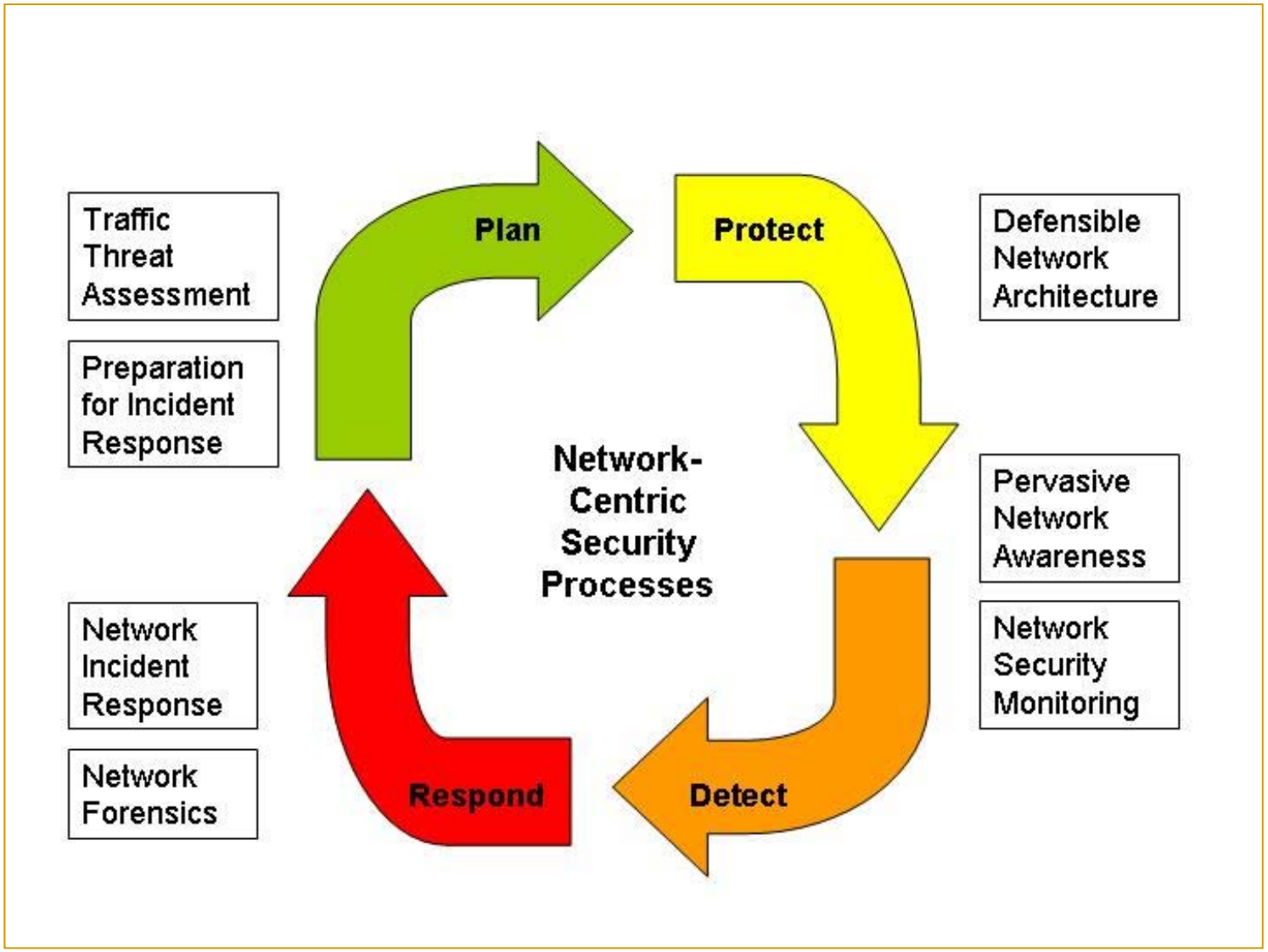


ISO 27001:2013 ISMS



Benefits of ISO/IEC 27001

- Identify critical assets via the Business Risk Assessment
- Improved understanding of business aspects
- Provide a structure for continuous improvement
- Be a confidence factor internally as well as externally
- Systematic approach
- Ensure that ”knowledge capital” will be ”stored” in a business management system
- Reductions in adverse publicity
- Reductions in security breaches and/or claims

Security awareness, training and education programs provide many benefits to organizations: (1) Improving employee behavior, (2) increasing employee accountability, (3) mitigating liability for employee behavior, (4) complying with regulations and contractual obligations

ISO 22301:2011

Business Continuity Management System

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ISO 22301 Business continuity management systems. Requirements

ISO 22301 Business Continuity Management

24 FEBRUARY 2016

Abu Dhabi International Airport receives ISO 22301 certification

By **Lopamudra Roy**

SHARE

UAE's Abu Dhabi International Airport has received the ISO 22301 Management System Certificate for Business Continuity Management.

It becomes the first airport in the Middle East to be ISO 22301 certified, and among the few cities in the world to have achieved this.

Le département Comptabilité du grou

Delhi airport acquires ISO-22301:2012

Source : IBNS

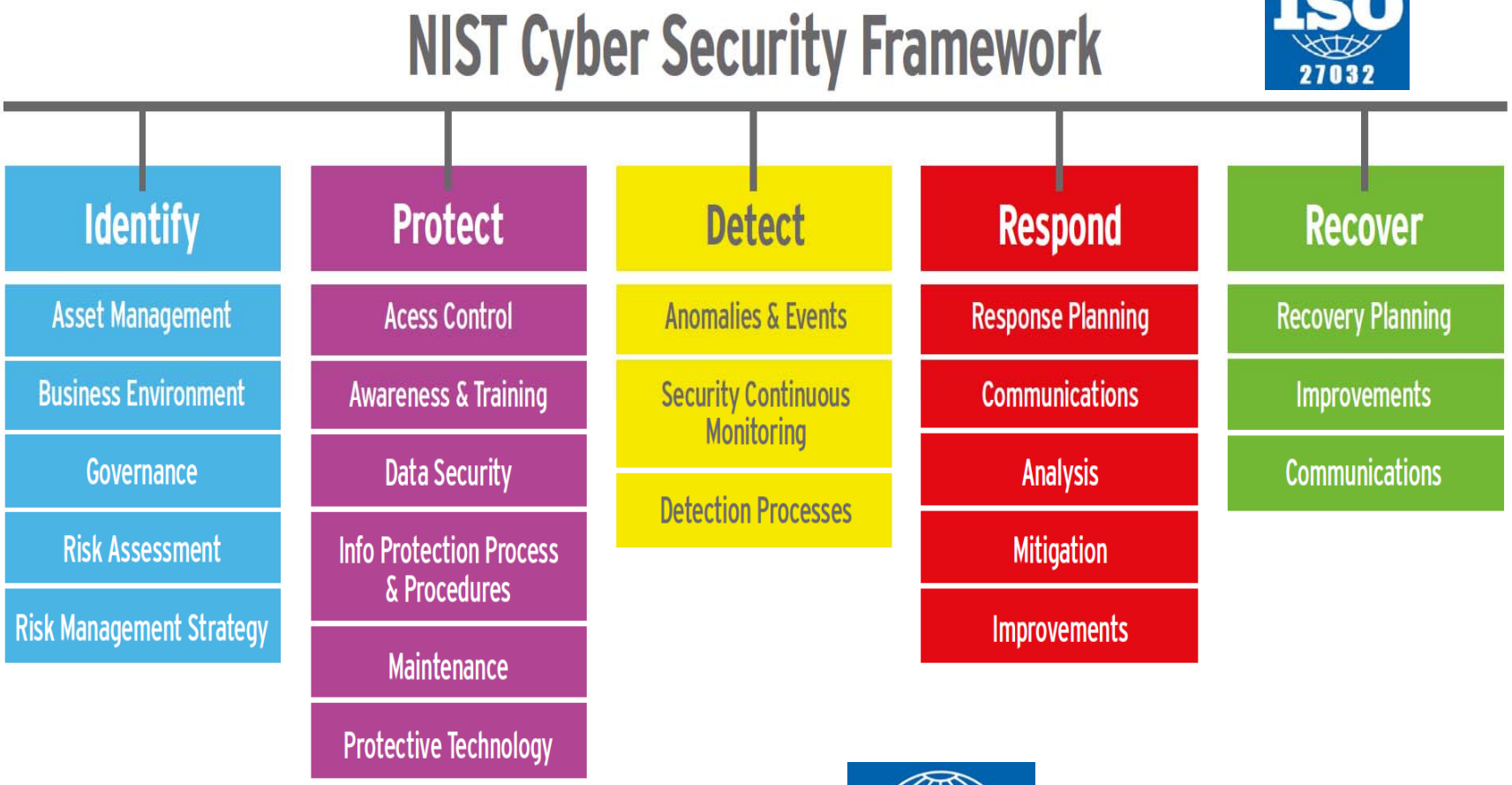
Last Updated: Wed, Feb 06, 2013 11:39 hrs

The operator of India's busiest airport, Delhi International Airport (P) Ltd (DIAL) announced that it has become the first airport in the world to achieve ISO 22301:2012 certification.

Benefits to an Organization for Implementing a Business Continuity Management System

- Identify and manage current and future threats to your business
- Take a proactive approach to minimizing the impact of incidents
- Keep critical functions up and running during times of crises
- Minimize downtime during incidents and improve recovery time
- Demonstrate resilience to customers, suppliers and for tender requests

NIST Cybersecurity Framework (1/2)



NIST National Institute of Standards and Technology U.S. Department of Commerce

ISO 27032

NIST Cybersecurity Framework (2/2)

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What processes and assets need protection?

What safeguards are available?

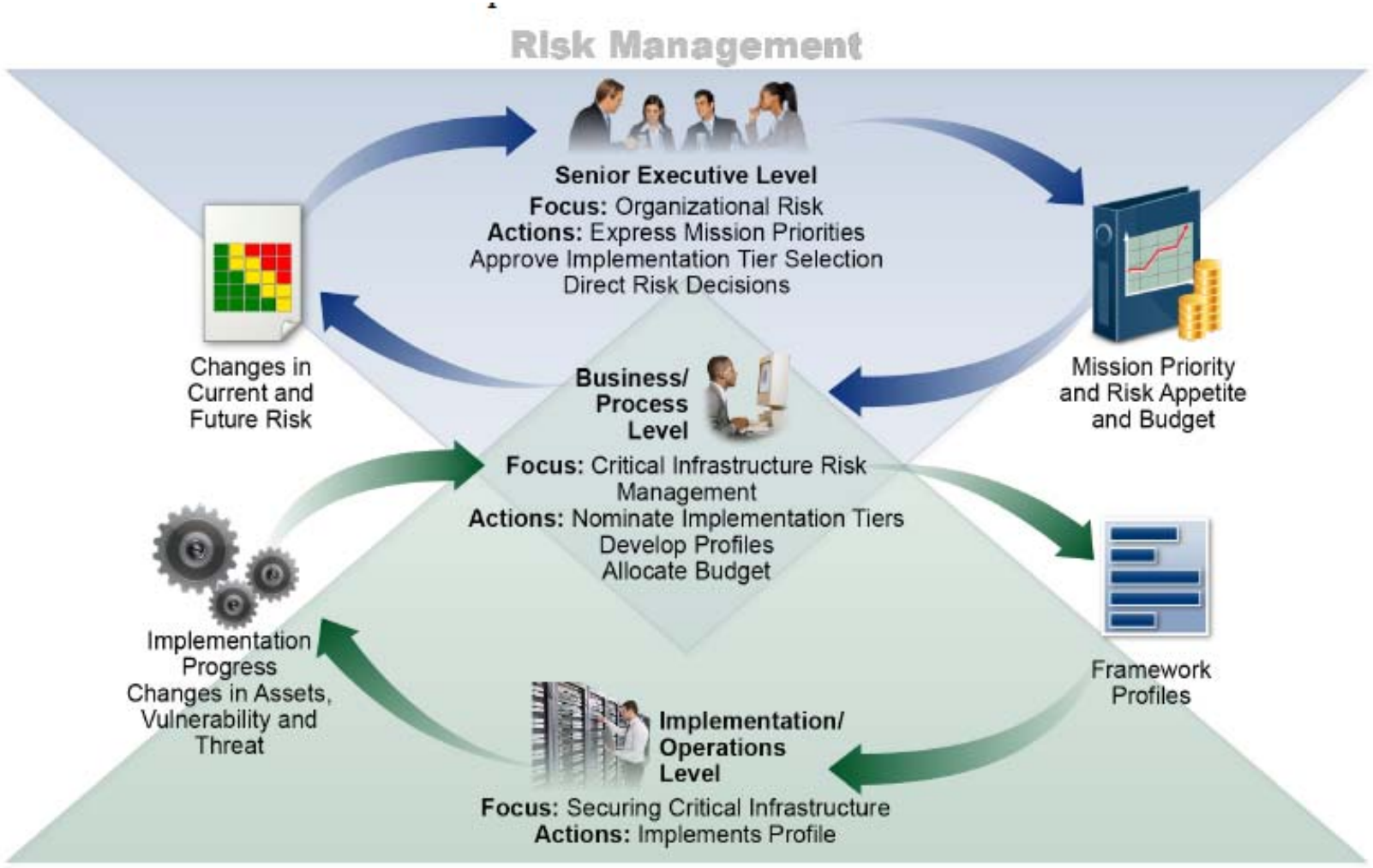
What techniques can identify incidents?

What techniques can contain impacts of incidents?

What techniques can restore capabilities?

Function	Category
Identify	Asset Management
	Business Environment
	Governance
	Risk Assessment
	Risk Management Strategy
Protect	Access Control
	Awareness and Training
	Data Security
	Information Protection Processes & Procedures
	Maintenance
	Protective Technology
Detect	Anomalies and Events
	Security Continuous Monitoring
	Detection Processes
Respond	Response Planning
	Communications
	Analysis
	Mitigation
	Improvements
Recover	Recovery Planning
	Improvements
	Communications

Risk Management Process



National Institute of Standards and Technology
U.S. Department of Commerce

ISO 27032

9 Basic steps of Cybersecurity

These are the guidelines to follow while drawing up a comprehensive **Cybersecurity program** in an Organisation

- #1 : Explore the Legislation and other requirements
- #2: Define the Business benefits and get top Management support (**Very Important**)
- #3: Setting the Cybersecurity requirements
- #4: Choosing the framework for Cybersecurity Implementation
- #5:Organizing the Implementation(Setting up Teams,PM Resources,Project Charter,Budget etc)
- #6: Risk Assessment & Mitigation (Applying Controls)
- #7: Implementation of Controls
- #8: Training & Awareness
- #9: Continuous Monitoring and Checks and **Reporting to Senior Management (C Level Executives)**

Airline perspective & Recommendations

Addressing airport cyber-security

Final report

International Civil Aviation Organization

WORKING PAPER

AIRCRAFT CERTIFICATION CYBERSECURITY REGULATORY EFFORTS

ASSEMBLY — 39TH SESSION

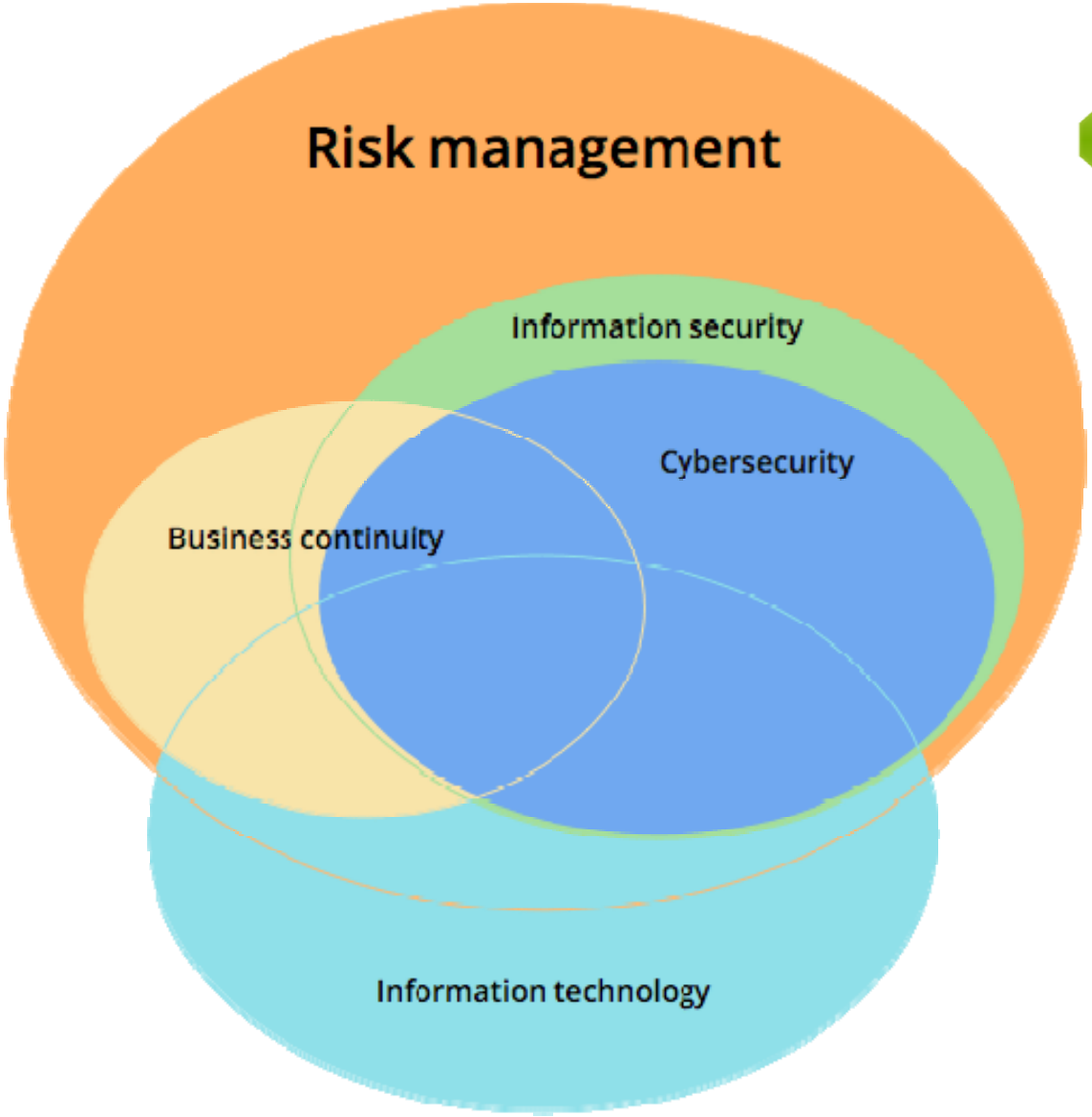
EXECUTIVE COMMITTEE AND TECHNICAL COMMISSION

2/19/2-16

Novembre 2016

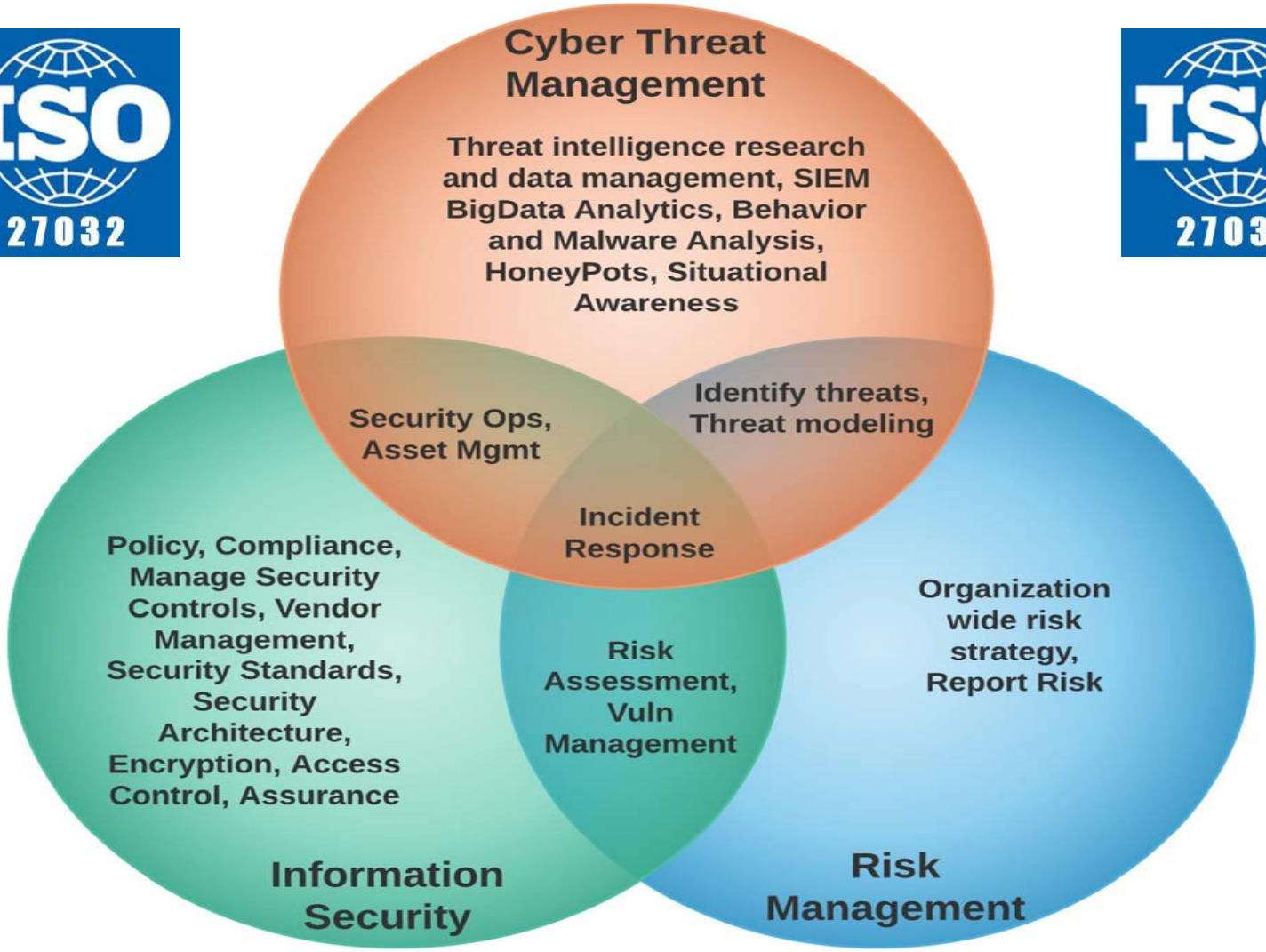
founding members

Guidelines & best Practices (1/2)



WHAT
Risk Management
Process?
ISO 31000
OR
ISO 27005

Guidelines & best Practices (2/2)



ASSEMBLY RESOLUTION ADDRESSING CYBERSECURITY IN CIVIL AVIATION (1/4)

1) Aviation sector is increasingly reliant on the :

- Availability of information and communications technology systems,
- Integrity and Confidentiality of data,
- Resilience of the global aviation system to cyber threats;

2) Threat posed by cyber incidents on civil aviation is rapidly and continuously evolving;

3) Cybersecurity issues should be addressed through the application of safety management systems;

4) The importance and urgency of protecting civil aviation's critical infrastructure systems and data against cyber threats;

ASSEMBLY RESOLUTION ADDRESSING CYBERSECURITY IN CIVIL AVIATION (2/4)

5) Define a shared vision, strategy and roadmap to strengthen the global aviation system's protection from and resilience to cyber threats; and

6) Recognizing the multi-faceted and multi-disciplinary nature of cybersecurity challenges and solutions;

Counter cyber threats to civil aviation:

a) **Identify the threats and risks from possible cyber incidents on civil aviation operations and critical systems, and the serious consequences that can arise from such incidents;**

b) **Define the Responsibilities of national agencies and industry stakeholders with regard to cybersecurity in civil aviation;**

ASSEMBLY RESOLUTION ADDRESSING CYBERSECURITY IN CIVIL AVIATION (3/4)

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c) Encourage the development of a common understanding among Member States of cyber threats and risks, and of common criteria to determine the criticality of the assets and systems that need to be protected;

d) Encourage government/industry coordination with regard to aviation cybersecurity strategies, policies, and plans, as well as sharing of information to help identify critical vulnerabilities that need to be addressed;

e) Systematic sharing of information on cyber threats, incidents, trends and mitigation efforts;

ASSEMBLY RESOLUTION ADDRESSING CYBERSECURITY IN CIVIL AVIATION (4/4)

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f) Adopt a risk-based approach to protecting critical aviation systems through the implementation of cybersecurity management systems;

g) Encourage a robust cybersecurity culture within national agencies and across the aviation sector;

h) Determine legal consequences for activities that compromise aviation safety by exploiting cyber vulnerabilities;

i) Promote the development and implementation of international standards, strategies and best practices on the protection of critical information and communications technology systems used for civil aviation purposes from interference that may jeopardize the safety of civil aviation;

Establish policies and allocate resources when needed to ensure that, for critical aviation systems: system architectures are secure by design; systems are resilient; methods for data transfer are secured, ensuring integrity and confidentiality of data; system monitoring, and incident detection and reporting, methods are implemented; and forensic analysis of cyber incidents is carried out;

PREVENTION	DETECTION	REACTION
The first line of defense is to prevent attacks that can corrupt or destroy data and interrupt operations. We presented key elements of attack prevention that include: • The critical role of boards of directors • A proactive approach that includes knowledge of global threats—current and prospective, people and places • Expanding and formalizing industry standards • Dealing with risks from supply chain, parts, and third-party vendors	Even with the best prevention systems, determined hackers will get through. It's essential to detect and isolate these attempts before they spread and do more damage. The key elements of a detection system include: • Monitoring network and IT systems • Protecting customer and operational data • Understanding and dealing with insider threats	Since no system is foolproof, airlines have to develop a methodology for responding quickly to an attack in order to limit reputational damage. And they need to use all details of the attack to enhance prevention. A good reaction plan includes: • Notifying customers and other stakeholders as soon as possible and managing press stories • Collecting forensic data to identify security weaknesses • Minimizing damage caused by security breaches • Closing the loop by using new information to improve prevention methods

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