National Aeronautics and Space Administration

International Space Agency CIO Forum
Industrial Control Systems (ICS) and Cyber

Office of the Chief Information Officer

Robert Powell,
CISSP / CISM
Senior Advisor, Cybersecurity
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Office of the
Chief Information Officer

Discussion Areas

- Definition of OT
- NASA OIG Findings
- OCIO Focus
- Integrated Approach
- Top Weaknesses (ICS-CERT)
- Defense-in-Depth (Best Practices)
- NIST References
- ICS-CERT References

What is OT?

Operational Technology (OT) is hardware and software that detects or causes a change through the direct monitoring and / or control of physical devices and processes.

-Based on NIST & Gartner OT Definitions

OT Systems Include*:

- ICS (Industrial Control System)
- SCADA (Supervisory Control and Data Acquisition) System
- Distributed Control System
- Process Control System
- Building Automation/Control System
- Safety Instrumented System
- Logic Controllers

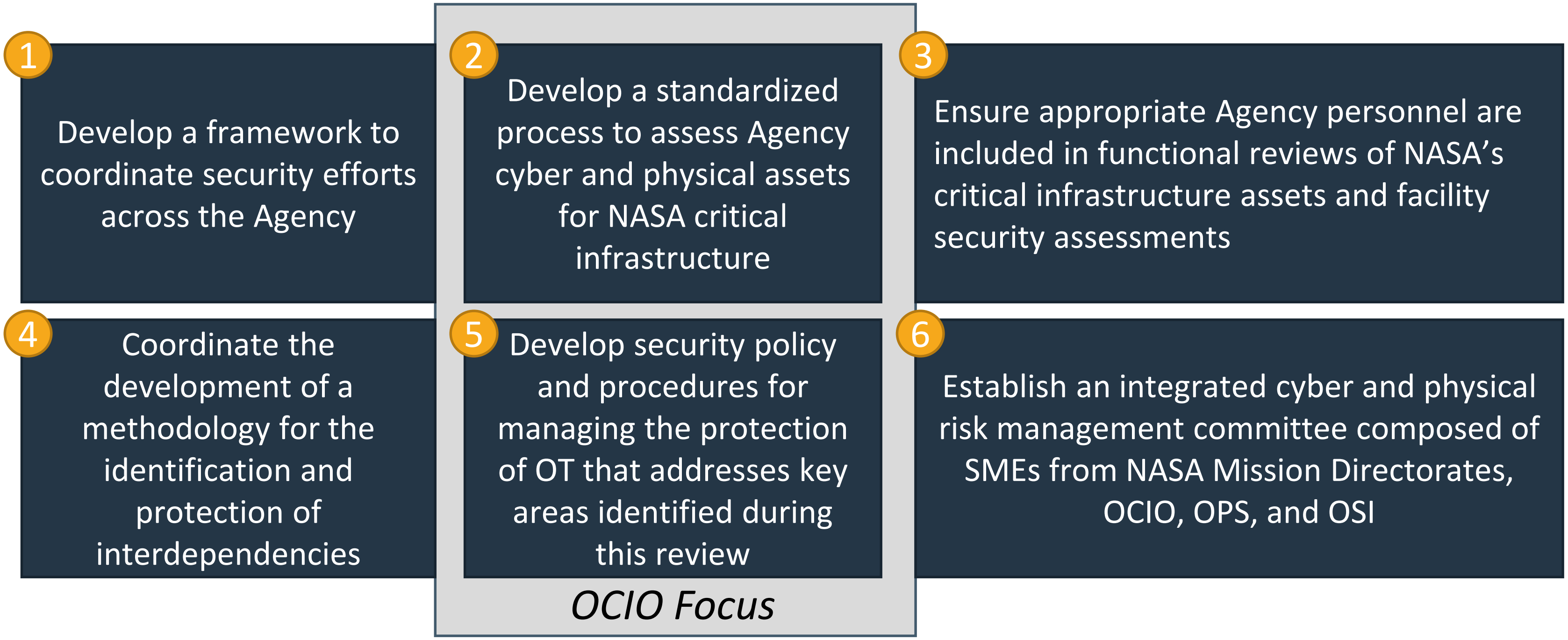
* Systems that do not qualify as OT include: Email systems, HR systems, SAP, etc.

NASA ICS Improvements

Six Focus Areas:

1. **Develop a framework to coordinate security efforts**
2. **Develop a standardized process to assess Agency cyber and physical assets** for NASA critical infrastructure
3. **OPS will include OCIO and OSI in assessments** of critical infrastructure and facility security to appropriately address interdependencies
4. **Coordinate development of a methodology** for identification and protection of interdependencies
5. **Develop security policy based on NIST guidance** (800-53 and 800-82) for managing the protection of OT. At a minimum, this should include (subset listed below):
   a. Definition for ICS
   b. Strategy for segmenting OT from IT
   c. Develop system security plans and assessment methodologies
   d. Develop training for responsible security personnel
6. **Establish an integrated cyber and physical risk management committee** composed of subject matter experts from NASA Mission Directorates and Mission Support Offices (**OCIO** – Office of the Chief Information Officer, **OPS** – Office of Protective Services, **OSI** – Office of Strategic Infrastructure, **OCE** – Office of Chief Engineer)

OCIO Focus Areas



1 Develop a framework to coordinate security efforts across the Agency

2 Develop a standardized process to assess Agency cyber and physical assets for NASA critical infrastructure

3 Ensure appropriate Agency personnel are included in functional reviews of NASA’s critical infrastructure assets and facility security assessments

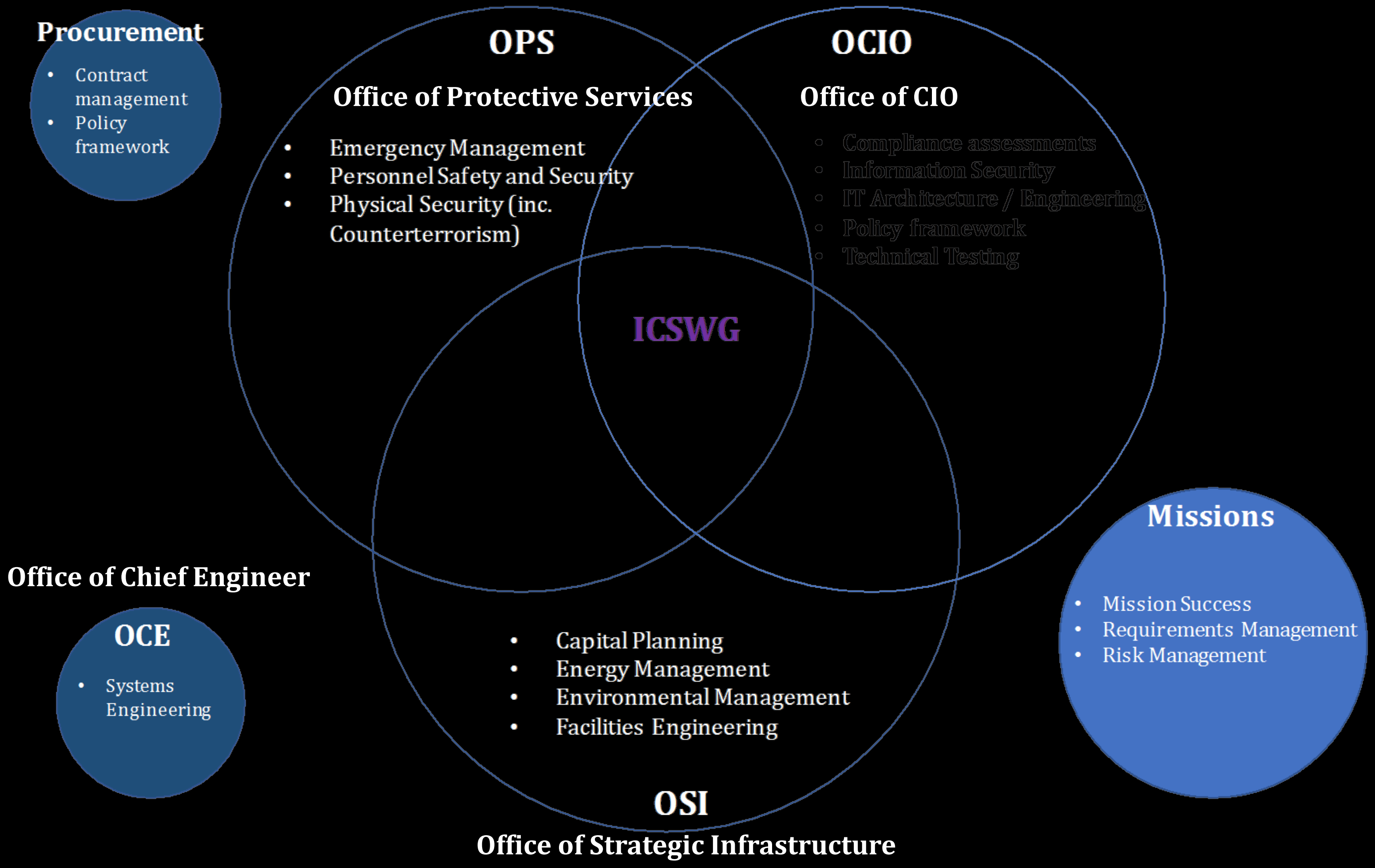
4 Coordinate the development of a methodology for the identification and protection of interdependencies

5 Develop security policy and procedures for managing the protection of OT that addresses key areas identified during this review

6 Establish an integrated cyber and physical risk management committee composed of SMEs from NASA Mission Directorates, OCIO, OPS, and OSI

OCIO Focus

Integrated Approach



Procurement

- Contract management
- Policy framework

OPS

Office of Protective Services

- Emergency Management
- Personnel Safety and Security
- Physical Security (inc. Counterterrorism)

OCIO

Office of CIO

- Compliance assessments
- Information Security
- IT Architecture / Engineering
- Policy framework
- Technical Testing

ICSWG

Office of Chief Engineer

OCE

- Systems Engineering

- Capital Planning
- Energy Management
- Environmental Management
- Facilities Engineering

OSI

Office of Strategic Infrastructure

Missions

- Mission Success
- Requirements Management
- Risk Management

NASA ICS Examples

OCIO:

- Data Center Management Systems
- Land Mobile Radio
- Internet of Things
- Telephone systems

OSI:

- Building Automation / Management Systems
- Elevator Control Systems
- Energy Management Systems
- Fire Alarm / Sprinkler Systems
- Renewable Energy Control Systems

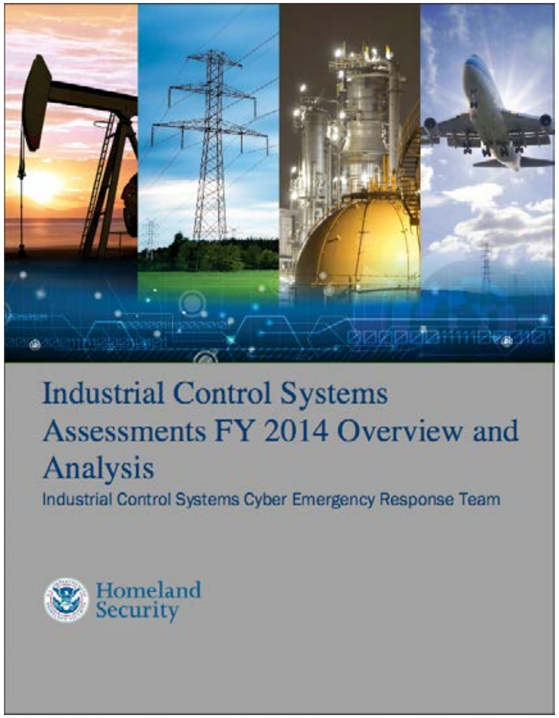
OPS:

- Intrusion Detection Systems
- Physical Access Control Systems
- Personnel Safety Support Systems
  - Emergency Alert Systems
- Surveillance Systems (e.g., CCTV)

Mission:

- Antenna Control Systems
- Integration and Test Systems
- Laboratory and Research Chambers
- Range Safety and Launch Support
- Sensor networks

ICS-CERT Assessment Summaries



Industrial Control Systems Assessments FY 2014 Overview and Analysis

Industrial Control Systems Cyber Emergency Response Team

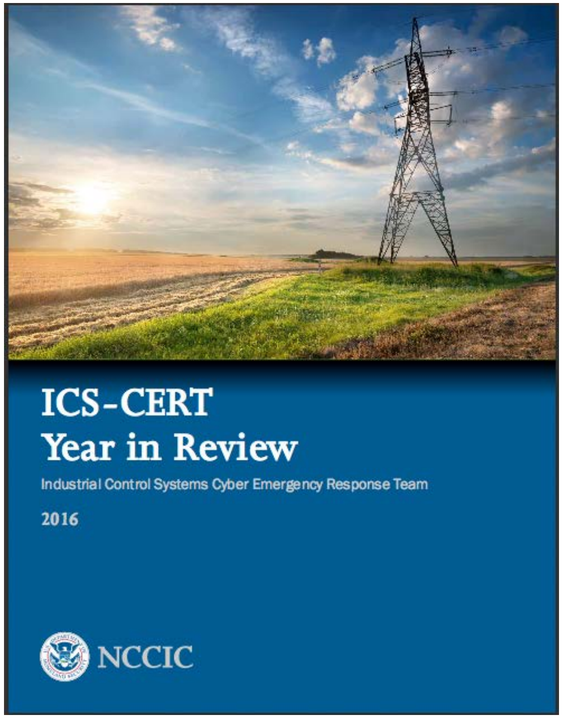
Homeland Security

NCCIC/ICS-CERT Industrial Control Systems Assessment Summary Report

National Cybersecurity and Communications Integration Center/ Industrial Control Systems Cyber Emergency Response Team

FY 2015

Homeland Security



ICS-CERT Year in Review

Industrial Control Systems Cyber Emergency Response Team

2016

NCCIC

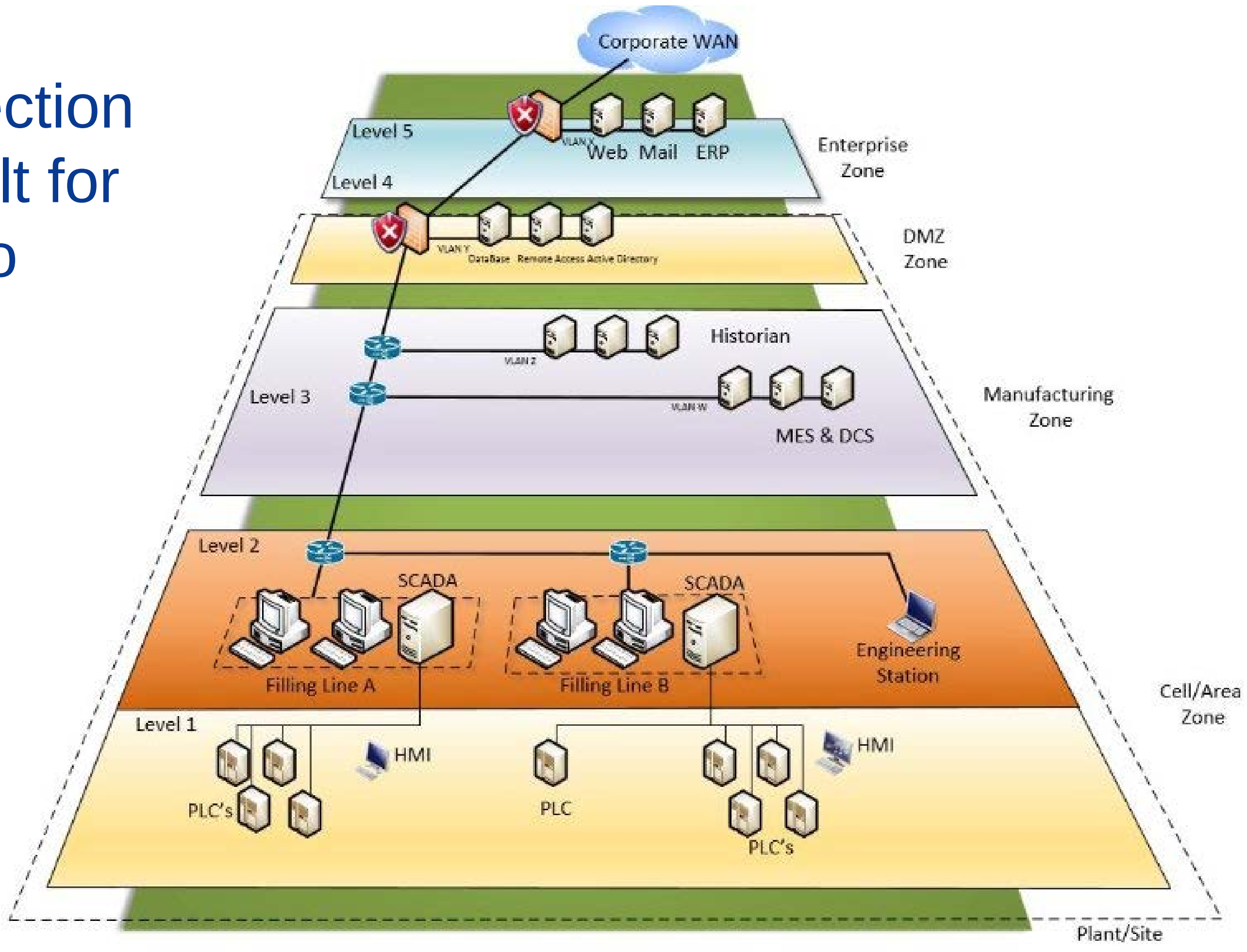
#1 Recommendation – **Boundary Protection**

- **Monitor and control** of ICS communications at external and key internal boundaries
- Implement **subnetworks** to separate critical systems
- Implement **managed protective interfaces** for external connectivity to critical systems

Best Practice: Defense-in-Depth

Layers of protection makes it difficult for an adversary to penetrate into critical assets

Network segmentation avoids one big flat network



NIST References

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  - » http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-82r2.pdf
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ICS-CERT References

- DHS Recommended Practice*: Improving Industrial Control System Cybersecurity with* ***Defense-in-Depth Strategies*** (September 2016)
  - » https://ics-cert.us-cert.gov/sites/default/files/recommended_practices/NCCIC_ICS-CERT_Defense_in_Depth_2016_S508C.pdf

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- DHS Presentation: ***Common Cybersecurity Vulnerabilities*** *in Industrial Control Systems* (May 2011)
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Questions?