



30th Annual **INCOSE**
international symposium

Virtual Event
July 20 - 22, 2020

Integrating Process Standards for System Safety Analysis to Enhance Efficiency in Initial Airworthiness Certification of Military Aircraft

A Systems Engineering Perspective

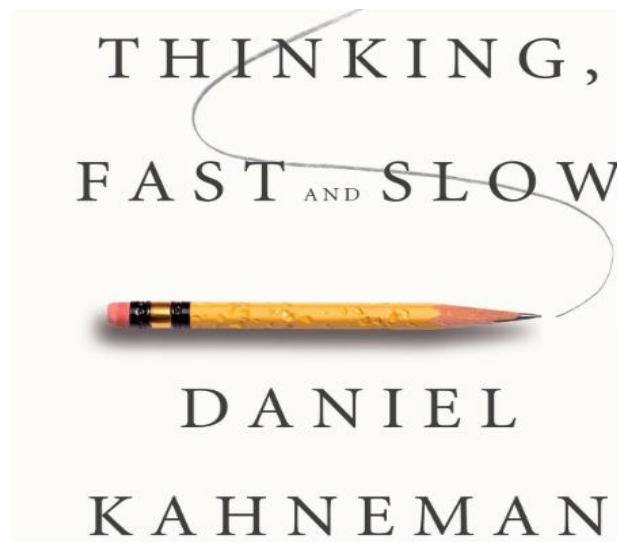
Morten Reinfjord Guldal



Overview

- Introduction
- Research question
- System Safety Standards
- Integrating System Safety and Systems Engineering
- Conclusion

Introduction



EUROPEAN
DEFENCE
AGENCY

EMAR 21

CERTIFICATION OF MILITARY AIRCRAFT AND
RELATED PRODUCTS, PARTS AND APPLIANCES,
AND DESIGN AND PRODUCTION ORGANISATIONS

**EUROPEAN MILITARY AIRWORTHINESS
CERTIFICATION CRITERIA (EMACC)**

EMACC Handbook



Research question

MIL-STD-882

SAE ARP4754
SAE ARP4761



**ISO/IEC/
IEEE
15288**





System Safety Standards

MIL-STD-882E
11 May 2012

SUPERSEDING
MIL-STD-882D
10 February 2000

DEPARTMENT OF DEFENSE
STANDARD PRACTICE

SYSTEM SAFETY



AEROSPACE RECOMMENDED PRACTICE

SAE	ARP4754	REV. A
Issued	1996-11	
Revised	2010-12	

Superseding ARP4754

(R) Guidelines for Development of Civil Aircraft and Systems

Tool/method
Scope: based on phase

www.incosymp2020.org

- Goal-based approach
- Processes – SE-ish
- Scope: based on severity



AEROSPACE RECOMMENDED PRACTICE

SAE ARP4761

Issued 1996-12

GUIDELINES AND METHODS FOR CONDUCTING THE SAFETY ASSESSMENT
PROCESS ON CIVIL AIRBORNE SYSTEMS AND EQUIPMENT



Integrating System Safety and Systems Engineering

ARP4754

- 1.0 Planning
- 2.0 Development and Requirements capture
- 3.0 Safety Assessment
- 4.0 Requirements Validation
- 5.0 Implementation Verification
- 6.0 Configuration Management
- 7.0 Process Assurance
- 8.0 Certification and Regulatory Authority Coordination

ISO 15288

- 6.1 Agreement
- 6.2 Organization project-enabling
- 6.3 Technical management
- 6.4 Technical processes



Integrating System Safety and Systems Engineering

6.1 Agreement

6.1.1
Acquisition

6.1.2
Supply

ISO 15288 mention safety

Link with ARP4754

No link with ARP4754

ISO 15288 does not mention safety

Link with ARP4754

6.2 Organization project-enabling

6.2.1
Life cycle model
management

6.2.2
Infrastructure
management

6.2.3
Portfolio
management

6.2.4
HR management

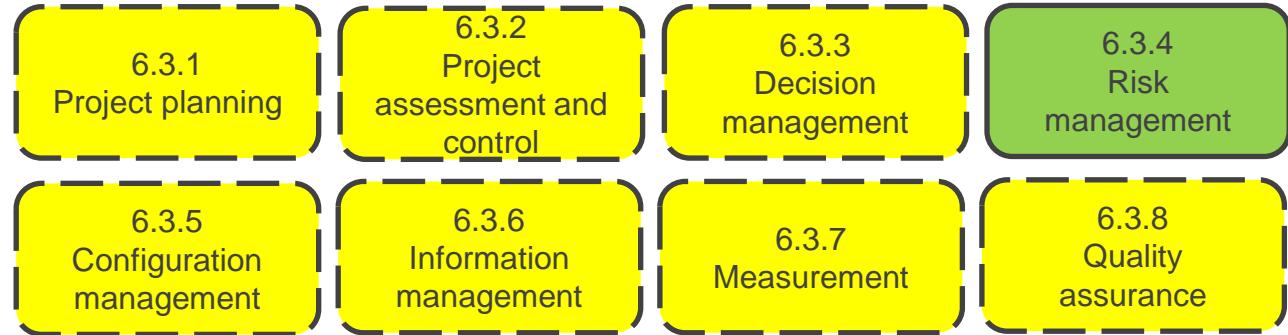
6.2.5
Quality
management

6.2.6
Knowledge
management



Integrating System Safety and Systems Engineering

6.3 Technical management



ISO 15288 mention safety

Link with ARP4754

No link with ARP4754

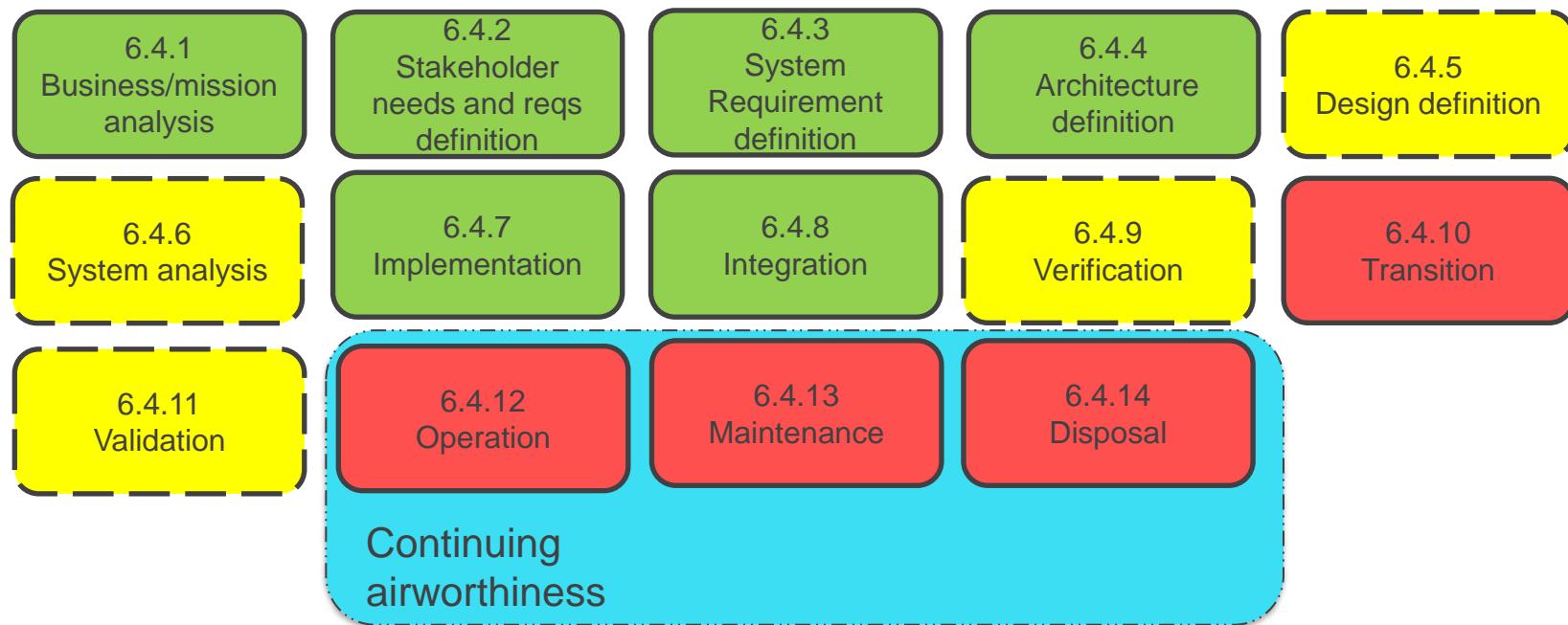
ISO 15288 does not mention safety

Link with ARP4754



Integrating System Safety and Systems Engineering

6.4 Technical processes



ISO 15288 mention safety

Link with ARP4754

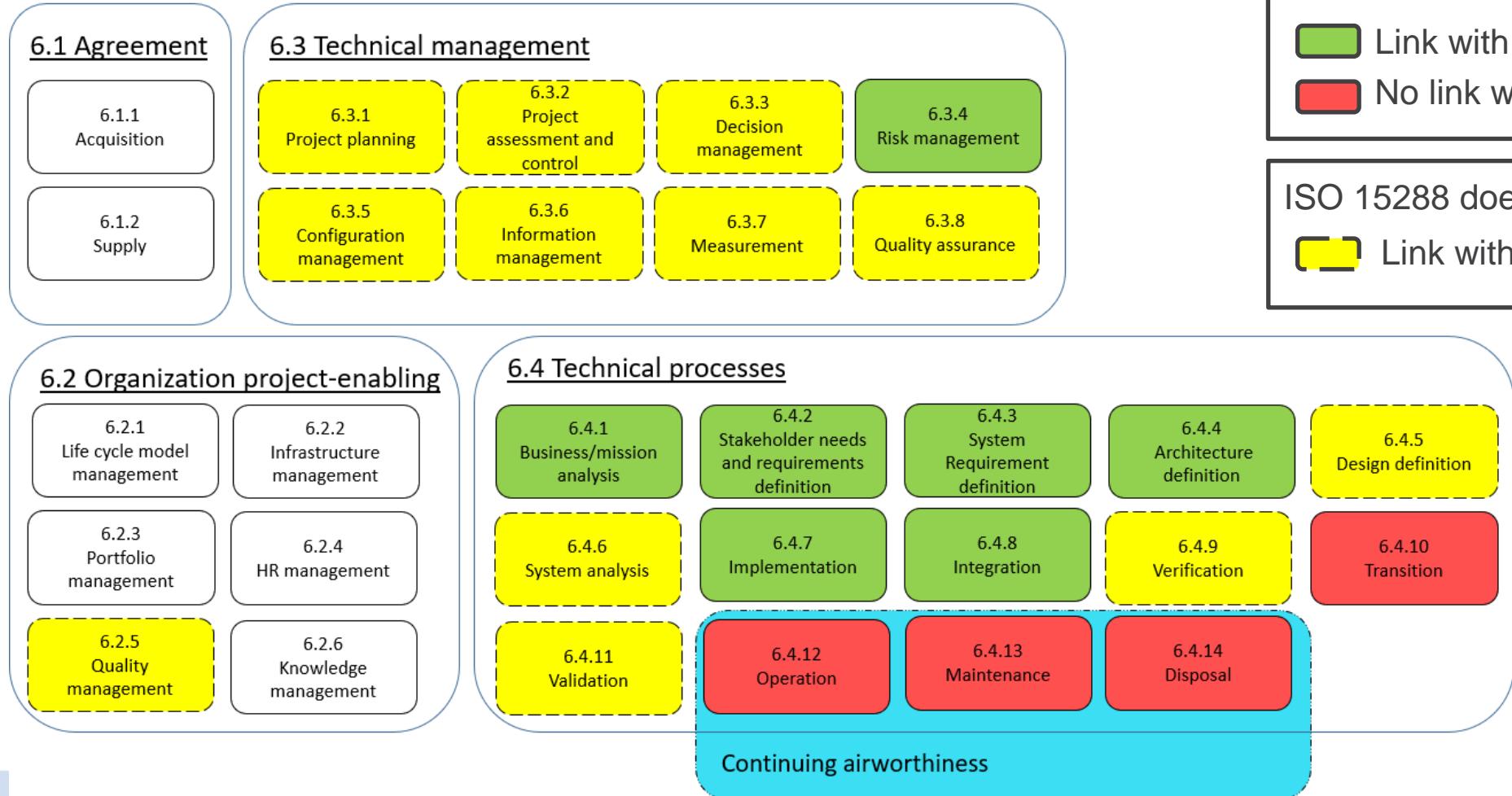
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Link with ARP4754



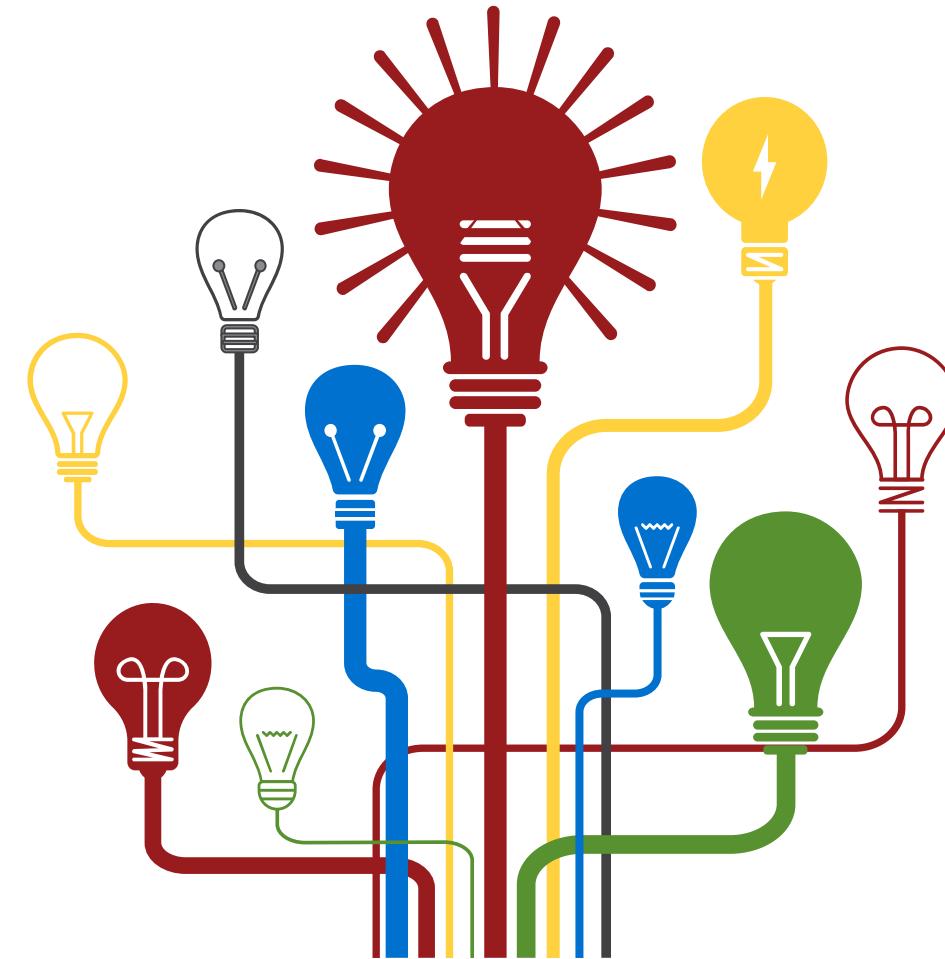
Integrating System Safety and Systems Engineering



Conclusion



Scoping
Combine civilian
and military system
safety standards



Balancing risk, cost and
needed capability
Integrated approach:
ISO 15288 + ARP4754

Benefits in operational life?
Yes!



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www.incos.org/symp2020

Thank you!