34th Annual INCOSE international symposium

hybrid event

Dublin, Ireland
July 2 - 6, 2024

Trainings framework - Safran retex

Part 0

Introduction

Introduction - Speakers

- Nicolas Gueit

  - 40 years old
  - Centrale Lille (Mechanics) + ENSAM (MS Systems Engineering & Project Management)
  - 6 years in Aircraft Engines Control Systems Architectures
  - 10 years in Systems Engineering methods & tools, unit manager & expert

- Julien Castex

  - 36 years old
  - EISTI/Supmeca (Mechatronics)
  - 13 years in SE-MBSE
    - System Architecture Methods & tools development for Safran Aircraft Engines
    - MBSE Framework deployment for Safran Landing Systems and Safran Aerosystems
    - Digital Transformation – Eng 4.0 – PLM as required (ALM) and MBSE group domain leader for Safran

Safran, a world leader in aerospace

SAFRAN

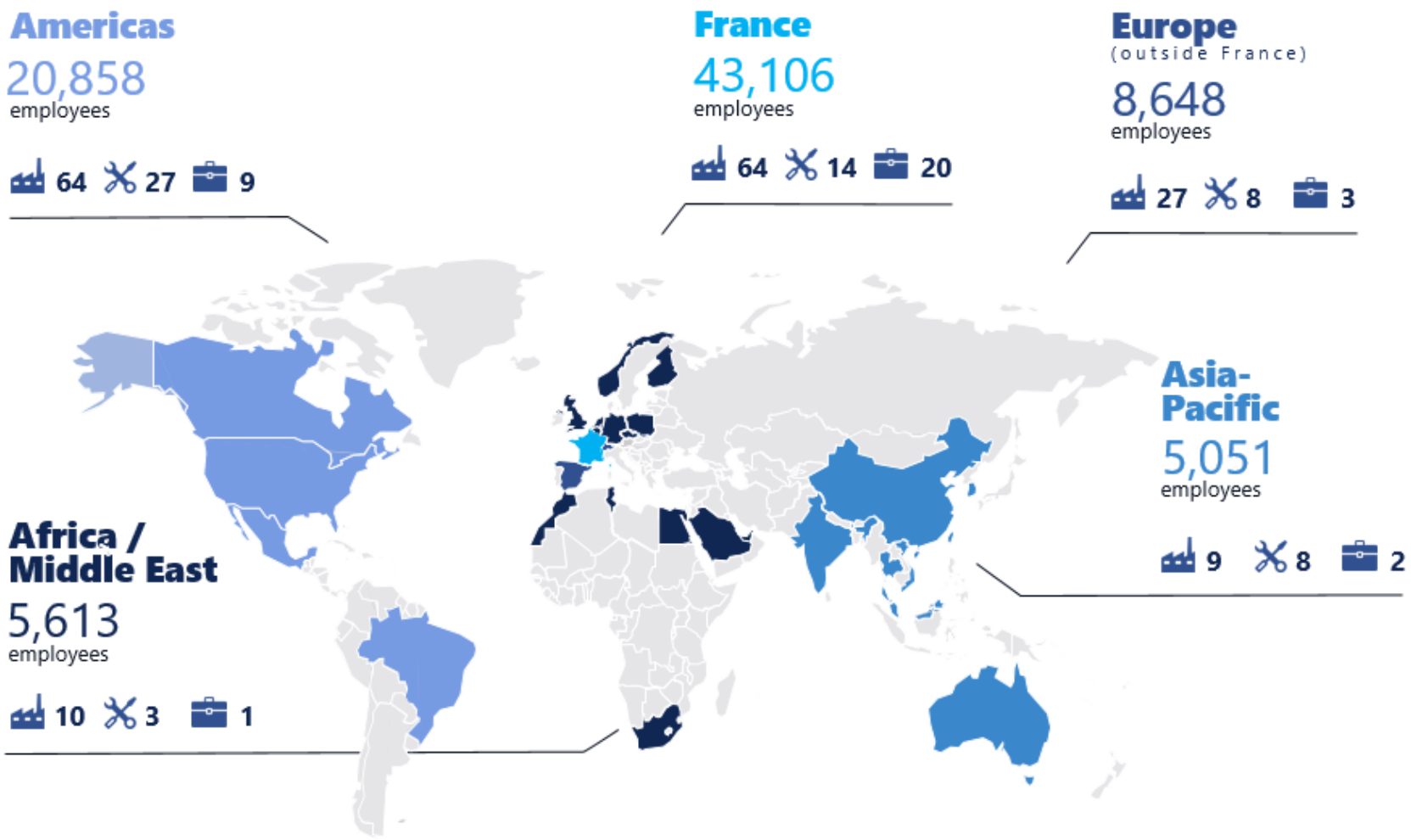
A worldwide presence

At year end 2022

83,000
employees
in **27** countries

Facilities

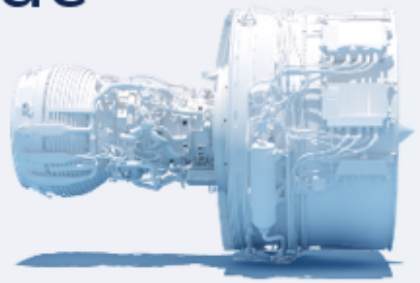
- R&D and production
- Support and services
- Offices



A world leader in our core markets

No.1 worldwide

- Narrowbody commercial jet engines (in partnership with GE)
- Helicopter turbine engines



No.1 worldwide

- Interiors for regional and business aircraft
- Aircraft water and waste management systems

No.1 worldwide

- Landing gear
- Wheels and carbon brakes (mainline commercial jets with more than 100 seats)
- Aircraft wiring
- Evacuation slides

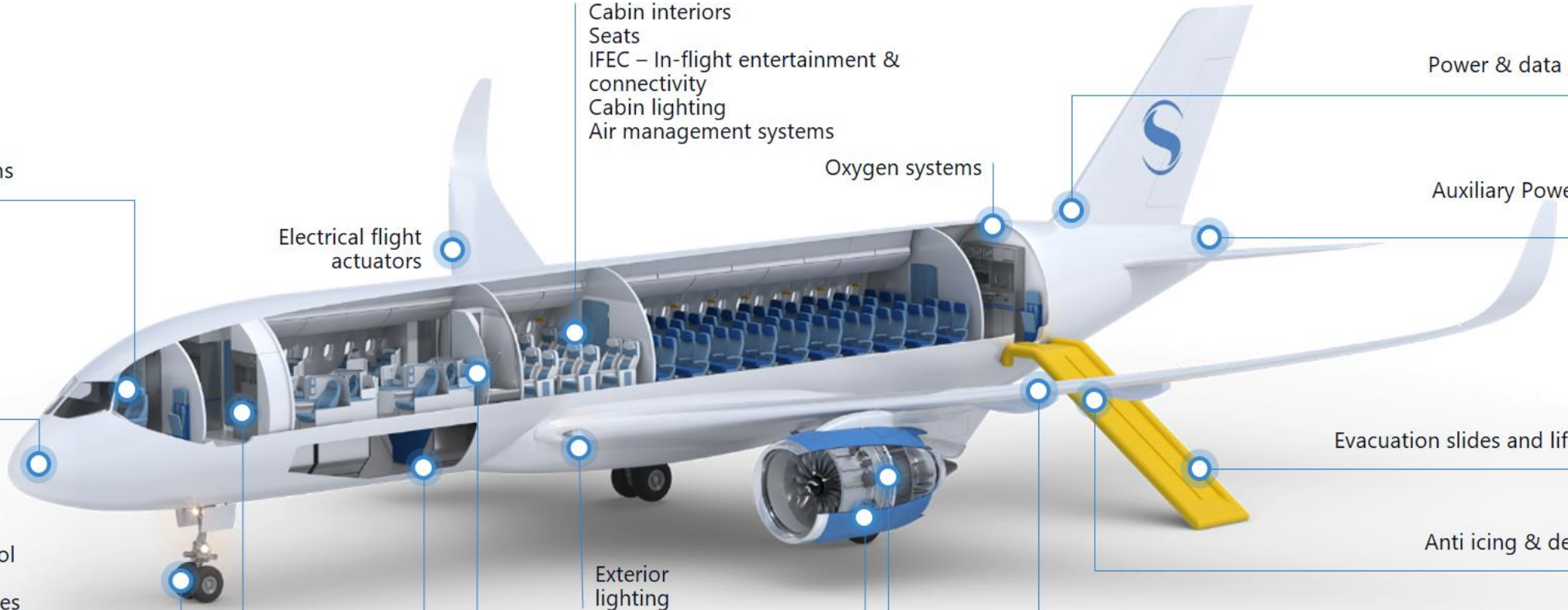
No.1 in Europe

- Tactical drones
- Inertial navigation systems
- Optronic (electro-optical) systems

No.1 worldwide

- Space surveillance via RF sensors
- Modems for satellite station keeping and space probe control
- High-performance space optics

A comprehensive range of aircraft systems and equipment



Pilot control systems
Panel & displays
Seats
Windshield wiper systems

Avionics
Inertial navigation systems
Flight data acquisition unit

Landing gears
Braking & landing control systems
Wheels and carbon brakes

Galleys and equipment

Cargo equipment and compartments

Electrical flight actuators

Cabin interiors
Seats
IFEC – In-flight entertainment & connectivity
Cabin lighting
Air management systems

Exterior lighting

Lavatories, water & waste

Oxygen systems

Power & data wiring

Auxiliary Power Unit (APU)

Evacuation slides and life rafts

Anti icing & de-icing

Inerting & fuel systems
Fluid management systems

Nacelles and components
Power transmission system

Engines
Engine control systems (FADEC)
Power distribution and generation

Safran, a key player onboard civil helicopters

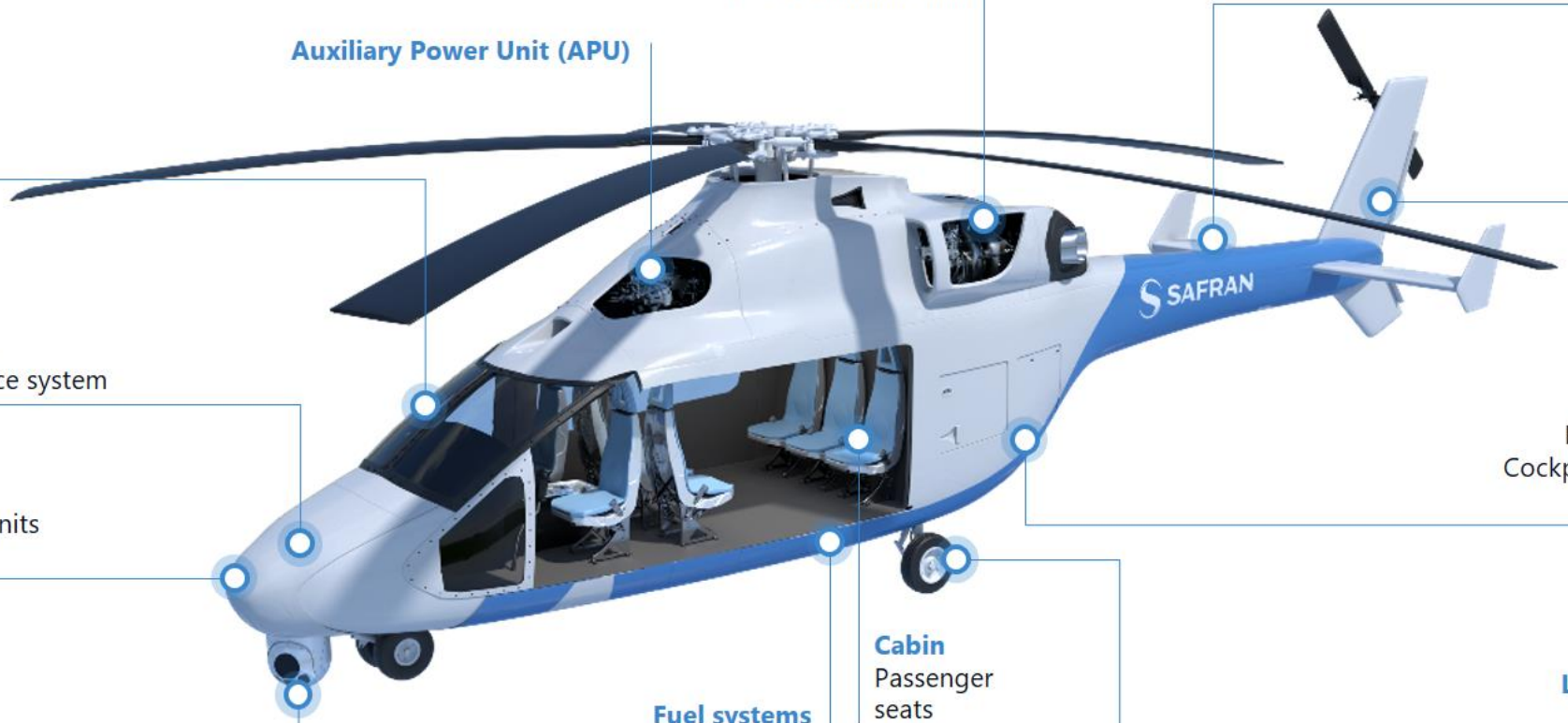
Cockpit
Pilot seats
Autopilot
Cockpit controls
Cockpit panels
Flight control computer
Windshield wiper systems
Oxygen equipment

Propulsion
Engines from 500 to 3,000 shp
Engine control unit
Power transmission

Electrical systems
Wiring
Electrical distribution
Electrical generation
Power electronics & conversion

Auxiliary Power Unit (APU)

Flight control systems
Electromechanical actuators



Navigation systems
Inertial navigation systems
Attitude & heading reference system

Safety systems
Floats and rafts
Life vests
De-icing
Pilot and passenger protection
Cockpit voice & flight data recorder
Ventilation systems

Flight data management
Recording & transmitting units
Analysis services

Cabin
Passenger seats

Fuel systems
Flexible tanks
Gauging systems
Fuel circulation systems

Landing and braking systems
Landing gear
Wheels and brakes
Landing and braking control systems
Braking and landing control units and actuators

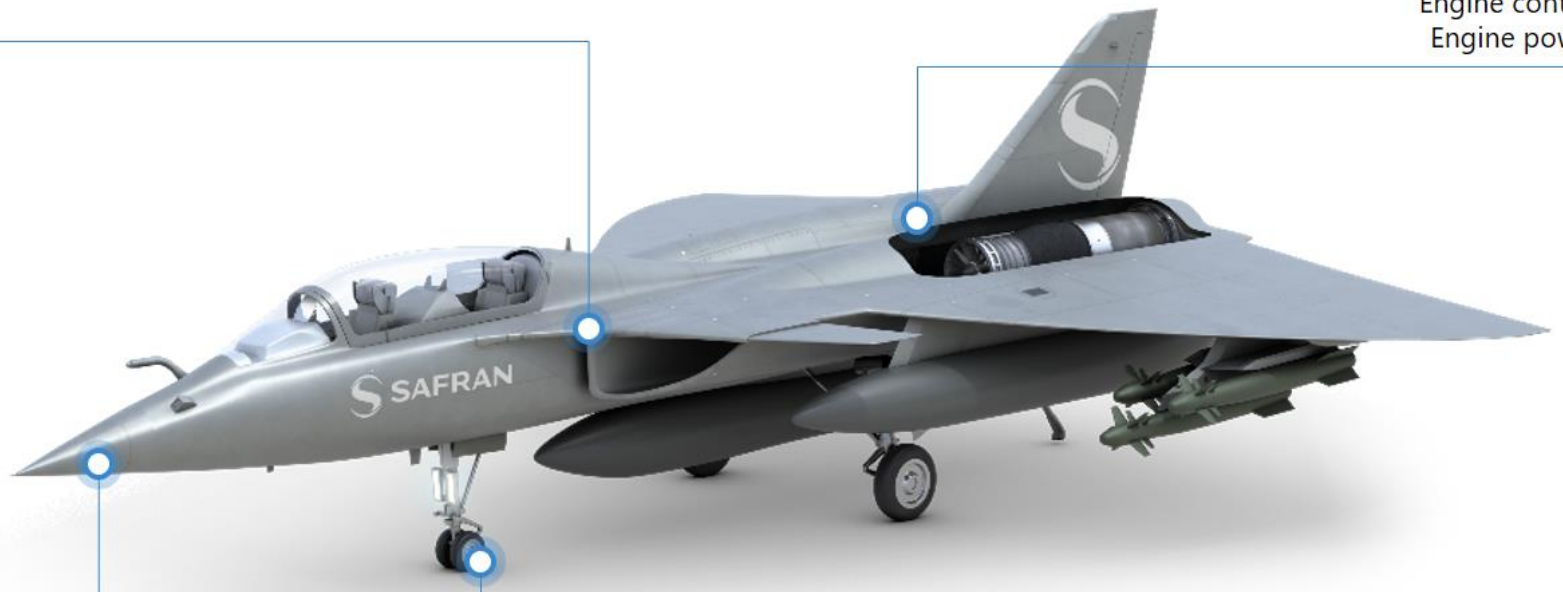
Vision
Electro-optical systems
External lighting

Safran's contribution to military aircraft

Electrical systems
Wiring
Auxiliary power units (APU)
Primary & secondary electrical distribution systems
Emergency electric power generation system (ram air turbine)
Electrical system integration rig

Engines
TP400 turboprop, via Europrop International Gmbh
M88 engine

Engine equipment
Engine control unit (FADEC)
Engine power transmission



Aircraft equipment
Ejection seats, via SEMMB
Aircraft condition & monitoring system (ACMS)
Navigation system
Avionics equipment
Horizontal stabilizer trim control system
Ventilation systems
Mission planning systems
AASM modular air-to-ground weapon
IR seeker of MICA air-to-air missile
Fuel systems
Oxygen systems
Life rafts
Aircraft power transmission

Landing systems
Landing gear
Landing gear hydraulic components
Wheels and carbon brakes
Landing and braking control systems

Part 1

Transformation process history

Transformation process history
Past – Step 1: Genesis (1999 to 2010)

Sponsoring

Local

Trainings organization

MAP système

INCOSE

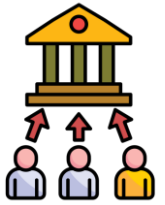
AFIS Association Française d'Ingénierie Système

Local with external help

Internal competencies

Acquisition

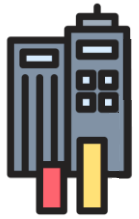
Trainings format & tools



Slideware + external trainings

Transformation process history
Past – Step 2: Progress (2011 to 2020)

Sponsoring



Central medium

Trainings organization

SAFRAN University

CESAMES

Central with external help

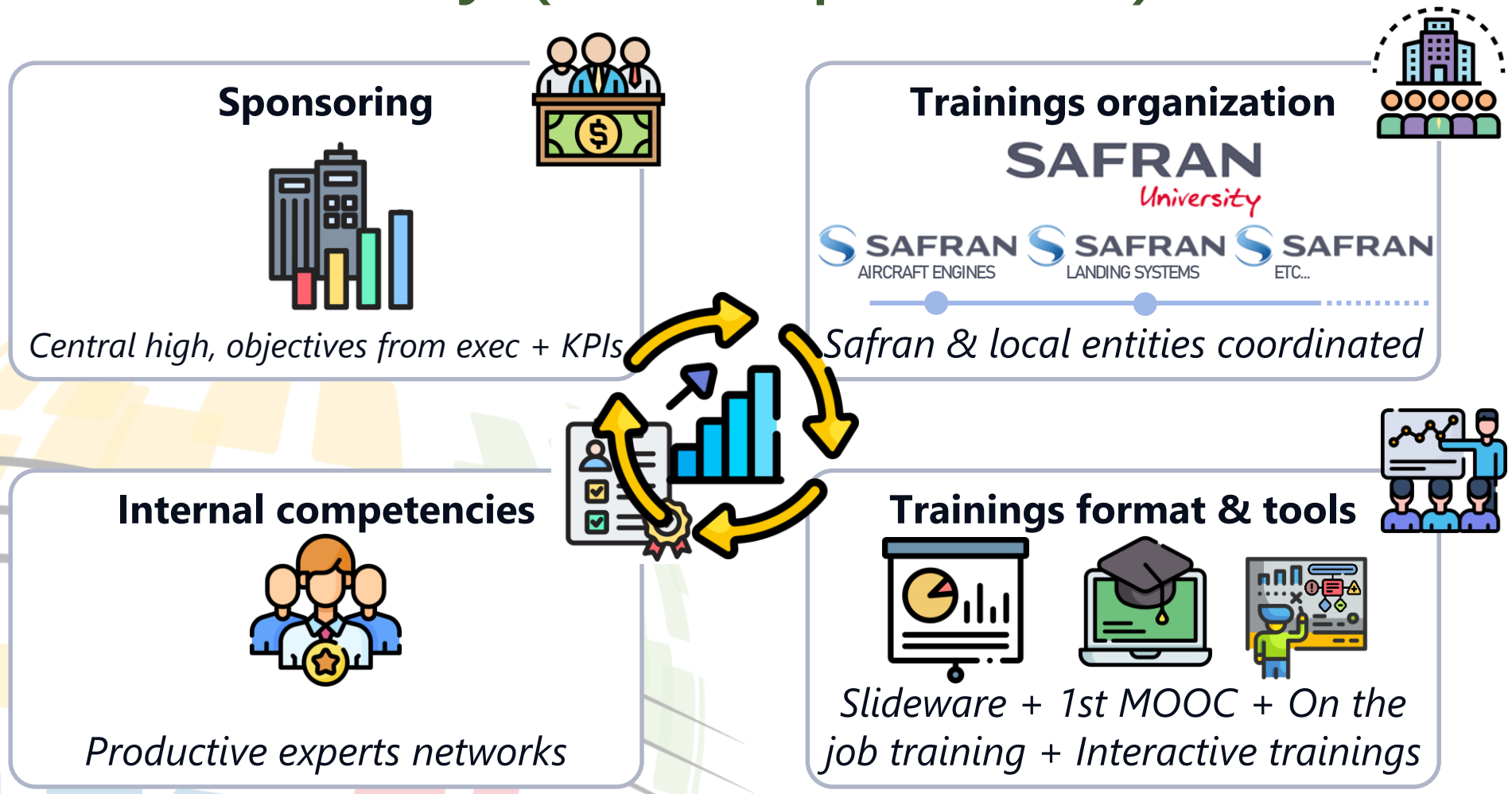
Internal competencies

Experts network creation, Trainers trainings, etc.

Trainings format & tools

Slideware + 1st MOOC + On the job training + Interactive trainings

Transformation process history
Present: Maturity (2020 up to now)



Part 2

Feedbacks & lessons learnt

Feedbacks & lessons learnt Management

- Training definition process (from idea to 1st operational session)

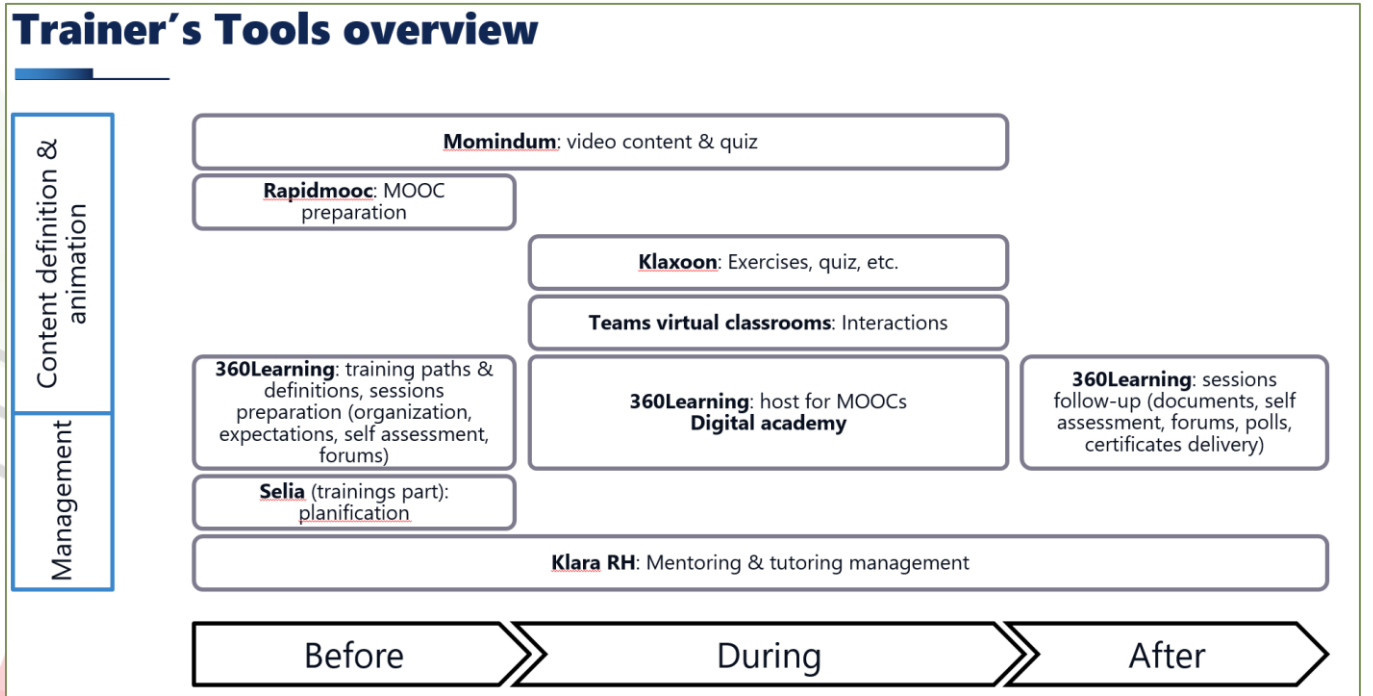
  - Systems thinking for the training framework: prepare it with a systemic mindset in its environment (people, company, maturities of departments)

- Communicate on the trainings offer
  - Sponsor & management, newsletters, HRs, trainings catalogue, collective objectives, etc.
- Planning: don't train too soon, but when needed for operational use
  - Even more applicable for tools

- Tayloring on trainings for teams ➔ different levels & supports
  - Different levels at Safran
  - One frame & slide deck as a reference, adapted to needs & people

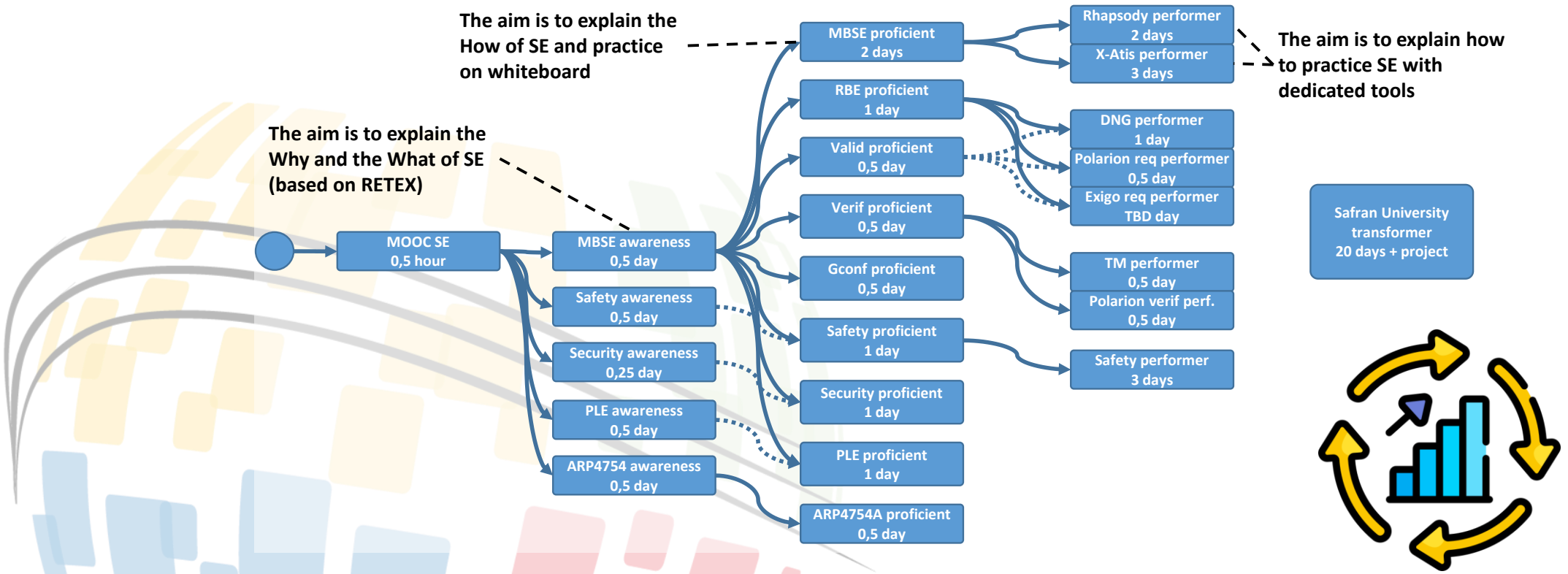
Feedbacks & lessons learnt
Design

- Format for better messages catch
  - ➔ transformation in progress from slideshows to more interactive trainings, videos, quiz, e-learnings, MOOCs, etc.
    - Huge improvement of Safran tools offer for trainers:



Feedbacks & lessons learnt
Design

- Continuous improvement & overall consistency
  - Continuous improvement: Feedbacks to gather after each session



Feedbacks & lessons learnt
Pre-requisites

- Profile of trainers

motivated / caring

legitimate & humble

leader / good speaker

organized

- Train the trainers!
  - Trainings development
  - Trainings animation

Feedbacks & lessons learnt
Results

Training	Format	Already trained	Target Population (long term)	Current pace
Level 1: Starter	MOOC <3h or equivalent	~2k	~15k	~1k / year
Level 2: Proficient (method)	2 to 4 days	~1k	~5k	~400 / year
Level 3: Performer (tool)	2 to 4 days	~150	~0,5k	~75 / year
Level 4: Transformer	20 days + project	~200	~0,3k	~30 / year

~25 Group level experts
~60 Company level experts

Part 3

Way forward &conclusion

Way forward & conclusion
Conclusion

Provide trainings of good quality shall not be improvised

- **Requires a good approach**

Big picture

Open and humble mindset

Specific competencies

Profile of trainers

- **Requires a significant effort & time**

Initialization effort

Continuous improvement

Sponsoring

Way forward & conclusion
Future: Standardization

Sponsoring

Central high, objectives from exec + KPIs

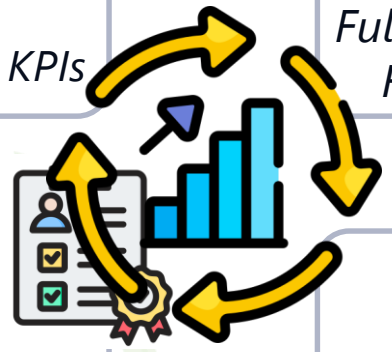
Trainings organization

INCOSE

SAFRAN University

DIGITAL ACADEMY

Full convergence, INCOSE Competency Framework coverage, cruise speed



Internal competencies

Productive experts networks

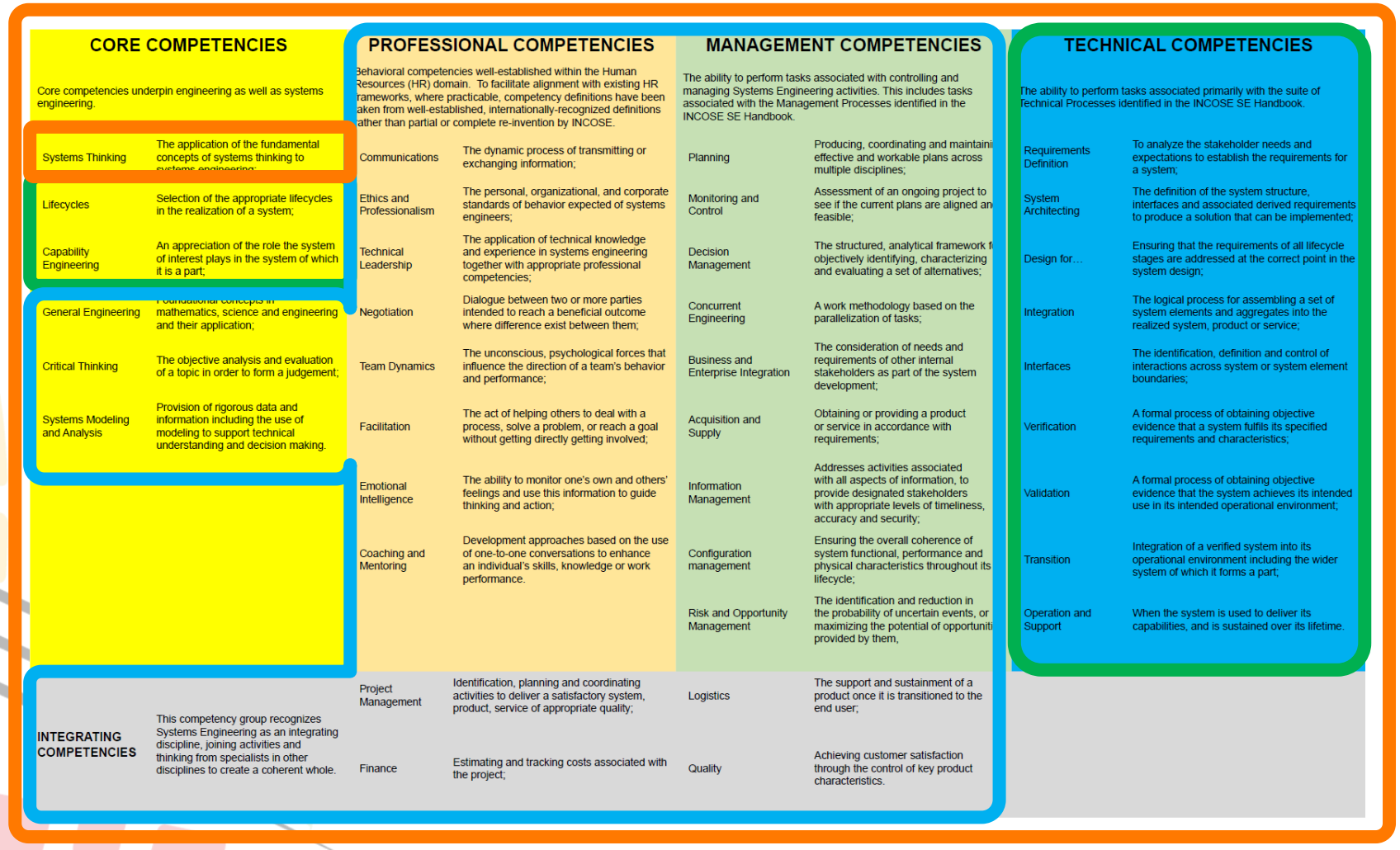
Trainings format & tools

e-learnings (digital academy) + On the job training + Interactive trainings

Way forward & conclusion

Future: Focus on INCOSE Competency Framework coverage

- Improvements required in Systems Thinking trainings
- Overall coverage & consistency to be addressed with a holistic approach, with:
  - HR
  - Exec
  - Safran University
  - Etc.



CORE COMPETENCIES

Core competencies underpin engineering as well as systems engineering.

Systems Thinking	The application of the fundamental concepts of systems thinking to systems engineering;
Lifecycles	Selection of the appropriate lifecycles in the realization of a system;
Capability Engineering	An appreciation of the role the system of interest plays in the system of which it is a part;
General Engineering	Foundational concepts in mathematics, science and engineering and their application;
Critical Thinking	The objective analysis and evaluation of a topic in order to form a judgement;
Systems Modeling and Analysis	Provision of rigorous data and information including the use of modeling to support technical understanding and decision making.

PROFESSIONAL COMPETENCIES

Behavioral competencies well-established within the Human Resources (HR) domain. To facilitate alignment with existing HR frameworks, where practicable, competency definitions have been taken from well-established, internationally-recognized definitions rather than partial or complete re-invention by INCOSE.

Communications	The dynamic process of transmitting or exchanging information;
Ethics and Professionalism	The personal, organizational, and corporate standards of behavior expected of systems engineers;
Technical Leadership	The application of technical knowledge and experience in systems engineering together with appropriate professional competencies;
Negotiation	Dialogue between two or more parties intended to reach a beneficial outcome where difference exist between them;
Team Dynamics	The unconscious, psychological forces that influence the direction of a team's behavior and performance;
Facilitation	The act of helping others to deal with a process, solve a problem, or reach a goal without getting directly getting involved;
Emotional Intelligence	The ability to monitor one's own and others' feelings and use this information to guide thinking and action;
Coaching and Mentoring	Development approaches based on the use of one-to-one conversations to enhance an individual's skills, knowledge or work performance.

MANAGEMENT COMPETENCIES

The ability to perform tasks associated with controlling and managing Systems Engineering activities. This includes tasks associated with the Management Processes identified in the INCOSE SE Handbook.

Planning	Producing, coordinating and maintaining effective and workable plans across multiple disciplines;
Monitoring and Control	Assessment of an ongoing project to see if the current plans are aligned and feasible;
Decision Management	The structured, analytical framework for objectively identifying, characterizing and evaluating a set of alternatives;
Concurrent Engineering	A work methodology based on the parallelization of tasks;
Business and Enterprise Integration	The consideration of needs and requirements of other internal stakeholders as part of the system development;
Acquisition and Supply	Obtaining or providing a product or service in accordance with requirements;
Information Management	Addresses activities associated with all aspects of information, to provide designated stakeholders with appropriate levels of timeliness, accuracy and security;
Configuration management	Ensuring the overall coherence of system functional, performance and physical characteristics throughout its lifecycle;
Risk and Opportunity Management	The identification and reduction in the probability of uncertain events, or maximizing the potential of opportunities provided by them;

TECHNICAL COMPETENCIES

The ability to perform tasks associated primarily with the suite of Technical Processes identified in the INCOSE SE Handbook.

Requirements Definition	To analyze the stakeholder needs and expectations to establish the requirements for a system;
System Architecting	The definition of the system structure, interfaces and associated derived requirements to produce a solution that can be implemented;
Design for…	Ensuring that the requirements of all lifecycle stages are addressed at the correct point in the system design;
Integration	The logical process for assembling a set of system elements and aggregates into the realized system, product or service;
Interfaces	The identification, definition and control of interactions across system or system element boundaries;
Verification	A formal process of obtaining objective evidence that a system fulfils its specified requirements and characteristics;
Validation	A formal process of obtaining objective evidence that the system achieves its intended use in its intended operational environment;
Transition	Integration of a verified system into its operational environment including the wider system of which it forms a part;
Operation and Support	When the system is used to deliver its capabilities, and is sustained over its lifetime.

INTEGRATING COMPETENCIES

This competency group recognizes Systems Engineering as an integrating discipline, joining activities and thinking from specialists in other disciplines to create a coherent whole.

Project Management	Identification, planning and coordinating activities to deliver a satisfactory system, product, service of appropriate quality;
Finance	Estimating and tracking costs associated with the project;
Logistics	The support and sustainment of a product once it is transitioned to the end user;
Quality	Achieving customer satisfaction through the control of key product characteristics.

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www.incose.org/symp2024
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