

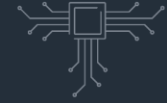


## MSG-189 report on innovative technologies as opportunity or challenge for M&S

Agatino Mursia – Technology & Innovation, Leonardo Spa

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Electronics



Helicopters



Aircraft



Cyber &  
Security



Space



Unmanned  
Systems



Aerostructures

# OUR GROUP

Leonardo is a global company in the Aerospace, Defence and Security sector with an integrated offer of high-tech solutions for both military requirements and civil applications.



## Helicopters

Helicopters Division  
Kopter (100%)



## Defence Electronics & Security

Electronics Division  
Cyber Security Division  
Leonardo DRS (100%)  
Vitrociset (100%)  
Elettronica (31.33%)  
MBDA\* (25%)



## Aeronautics

Aircraft Division  
Aerostructures Division  
ATR\* (50%)



## Space

Telespazio\* (67%)  
Thales Alenia Space\* (33%)  
AMO (29.63%)

\* Joint ventures | % Leonardo's share



# INNOVATION, TECHNOLOGY AND SUSTAINABILITY

An integrated approach to innovation, technology and sustainability underpins Leonardo's strategy, fuelling competitiveness and future growth.

As a **driver of innovation** at a systemic level, Leonardo is committed to:

- enhancing technological research
- strengthening an extensive open innovation approach
- accelerating digitalisation processes and the development of enabling technologies
- fostering innovation to encourage decarbonisation and a circular economy

12% OF REVENUES  
SPENT ON R&D ACTIVITIES

DAVINCI-1  
A SUPERCOMPUTER OF MORE  
THAN 5PFLOPS, THE 3<sup>RD</sup> MOST  
POWERFUL IN THE WORLD  
IN THE AD&S SECTOR

> 400 TECHNOLOGIES  
IN LEONARDO'S PORTFOLIO

8,800 PEOPLE  
INVOLVED IN R&D  
AND ENGINEERING

COOPERATION WITH MORE THAN  
70 UNIVERSITIES  
AND RESEARCH CENTRES

10 LEONARDO LABS  
IN ITALY AND US, ACROSS  
ALL BUSINESS SECTORS



MSG-189 Specialist Team on ***AI augmented  
immersive simulation in Training and Decision  
Making Course of Actions Analysis***

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# Introduction

## Background and Rationale

MSG-189 ST looked at emerging technologies that in recent years have had a remarkable development and have shown a good degree of maturity. The main enabling technologies (partial list) identified are:

- Artificial intelligence (AI) and Big Data
- Augmented/Virtual/Mixed Reality
- Live-Virtual-Constructive simulation systems
- New generation communications (5G)

The integration and proper use of these technologies into the evaluation of current M&S systems has been done through the specification of a new M&S Ecosystem based on a Reference Architecture enabling the requested support for the decision makers and the proper advanced training.

## Military Relevance

Both tactical and strategic scenarios have shown an urgent need for an efficient and effective support in the decision-making process. A characteristic of these scenarios is the huge quantity, heterogeneity, speed and obsolescence of the information available to personnel (both civil and military) called to manage them and act rapidly at various levels of engagement.

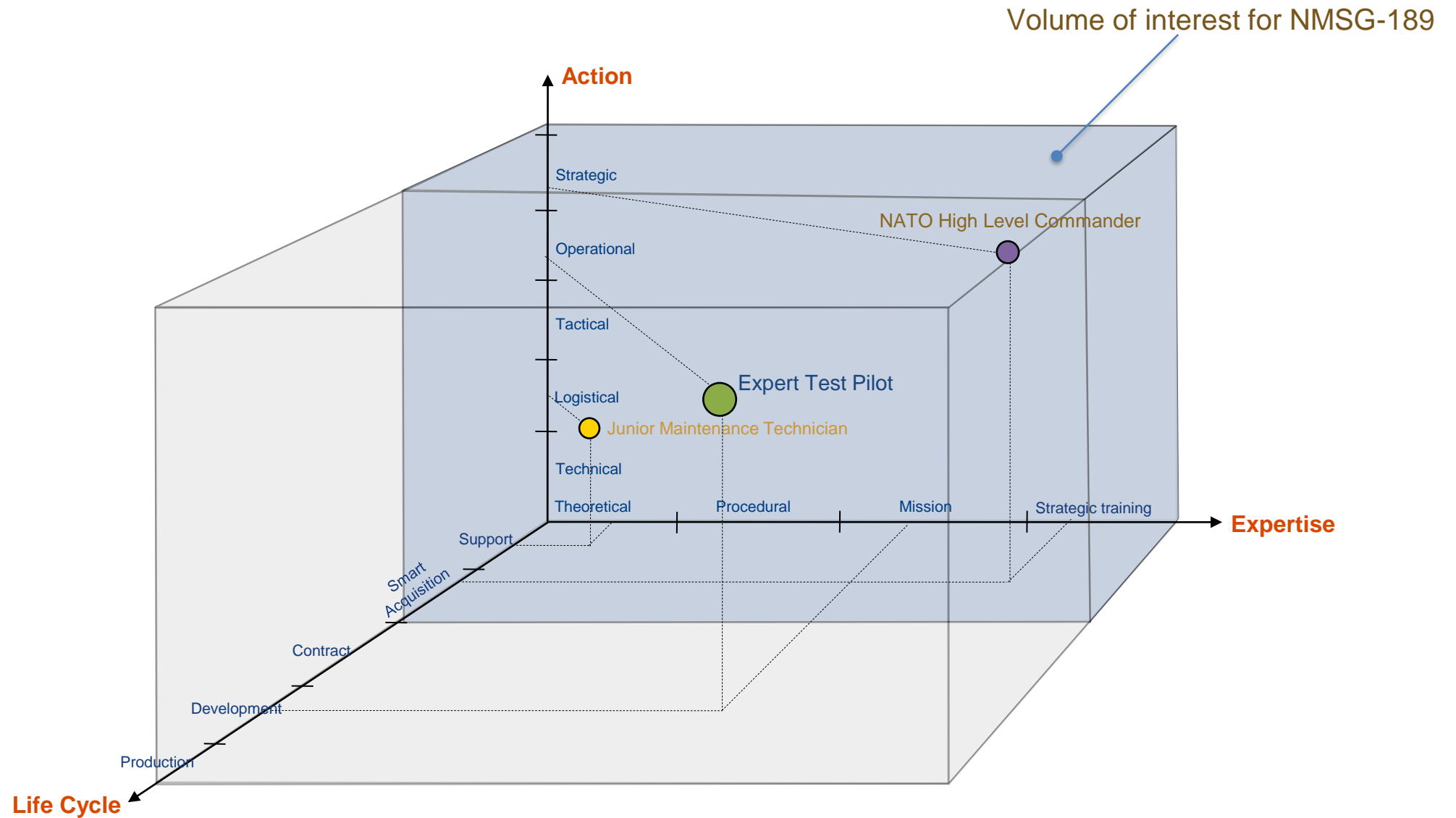
Advanced staff training is the key factor that allows to better face and resolve these situations using a proper decision making process.



## MSG-189 Line of Efforts

- An initial analysis of procedural, organizational and operational issues typical of training and decision-making was conducted
- A volume of interest for the MSG-189 ST and a relative M&S Space was defined to properly set the borders and constraints of the analysis the ST would have conducted
- Two different subgroups (Tech and Ops) were set in order to address the technological and operational aspects of the problem space
- The Tech subgroup explored the aspects related to using new emerging techs in the envisaged innovative simulation environment. A significant part of the work carried out by the MSG-189 Tech team was dedicated to the survey of innovative and disruptive technologies to identify those that could best integrate with the issues indicated.
- The Ops group activity purpose was to identify the gaps between the current training methods and those that could be achieved using the innovative technologies described above

# M&S Space





# Emerging Disruptive Technologies: Opportunities for M&S?

- Artificial intelligence (AI) and Big Data (BD) are among those disruptive technologies that will have a profound impact on the defence sector and will transform capability development and warfare itself in the long run
- AI can be considered as an enabler and a force multiplier and its application in the military domain will certainly results in strategic advantages on the battlefield (e.g. remote-sensing, situational awareness and a compressed decision-making loop)
- Technological areas such as:
  - Immersive Technologies and Human Enhancement
  - Enhanced Communications and network Architectureand the technologies related to them, were treated too in the document to complete the set of technologies that can be used in the system
- The technological areas analyzed do not include (at least explicitly) all the technologies that are of interest to the simulation system





# Opportunities and Gaps identified in the Report

## Opportunities

- AI for Decision-making: AI-enabled Wargaming, AI-generated COAs, AI-enabled advisors (leveraging past operations and lessons learned)
- Predictive analysis, to be distinguished between short- and long-term predictions
- Pattern recognition, including video/audio/image analysis, object detection and tracking, video analytics
- Synthetic Data Generation, Generative Adversarial Neural Networks (GANs) (e.g. for data augmentation)
- Digital Twin (virtual/live synchronization of environment, people and equipment)
- Extracting meaning from massive aggregations of data using predictive analytics and artificial intelligence (including machine learning and deep learning methodologies)
- Electronic medical records, which allow an up-to-date analysis of the health status of military population useful also to recognize personnel suitable for special mission

## Gaps

- Explainable AI (trust)
- Lack of (validated) Training data
- Poisoned data
- Understanding and addressing Biases in Data
- Computational Power
- Adversarial Attack detection and countering
- Reinforcement Learning (e.g. for learning tactical Decision Making)
- Data availability from a sufficient broad range of scenarios
- Real time analysis of huge quantity of information



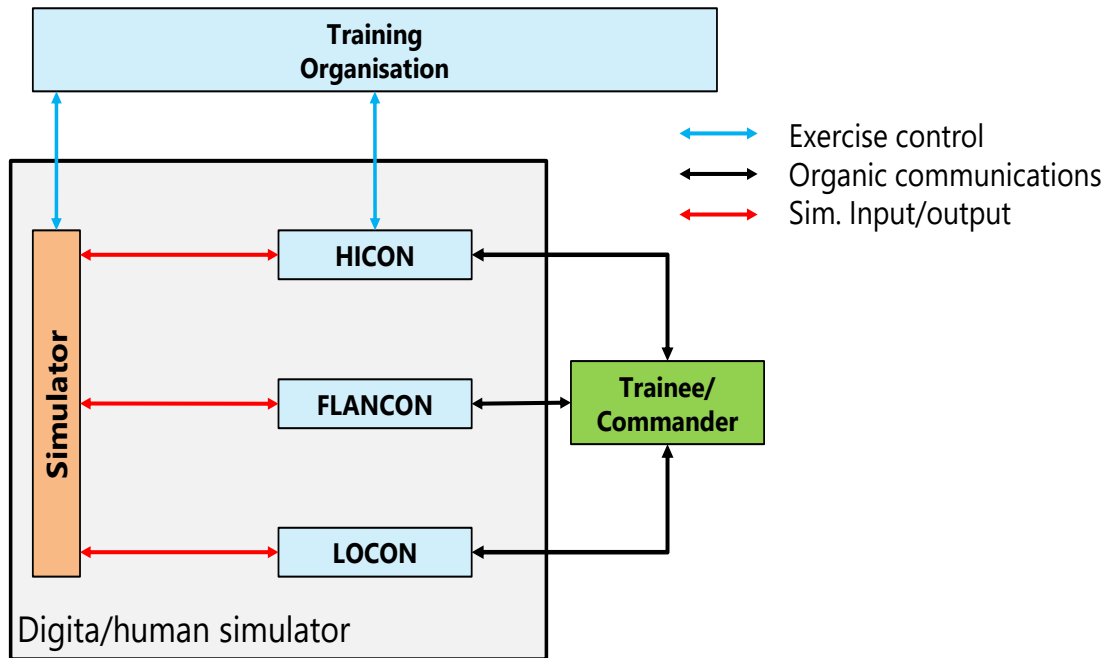
# Use of Advanced M&S support could be a challenge!

- Wargaming is almost exclusively manual
- Very few opportunities, 0-2 times a year
- The more senior the less opportunity
- Very expensive to arrange, lots of people and time and not scalable
- Risk of failure, peer pressure, dissuade experimentation
- M&S mainly involved in training applications for training of the lower military levels

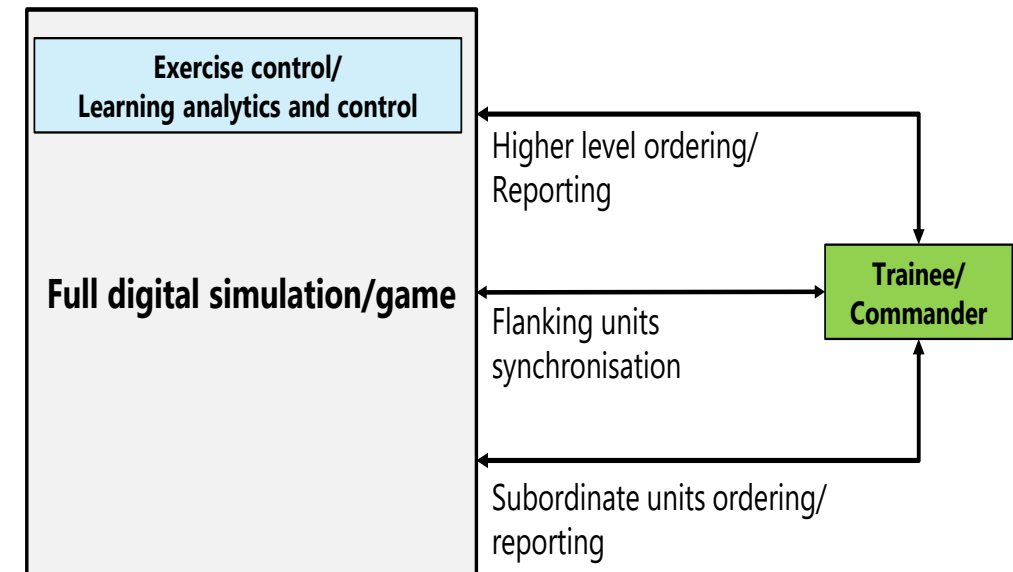


# Command and Staff Training with AI Use Case

## Actual Command and Staff Training



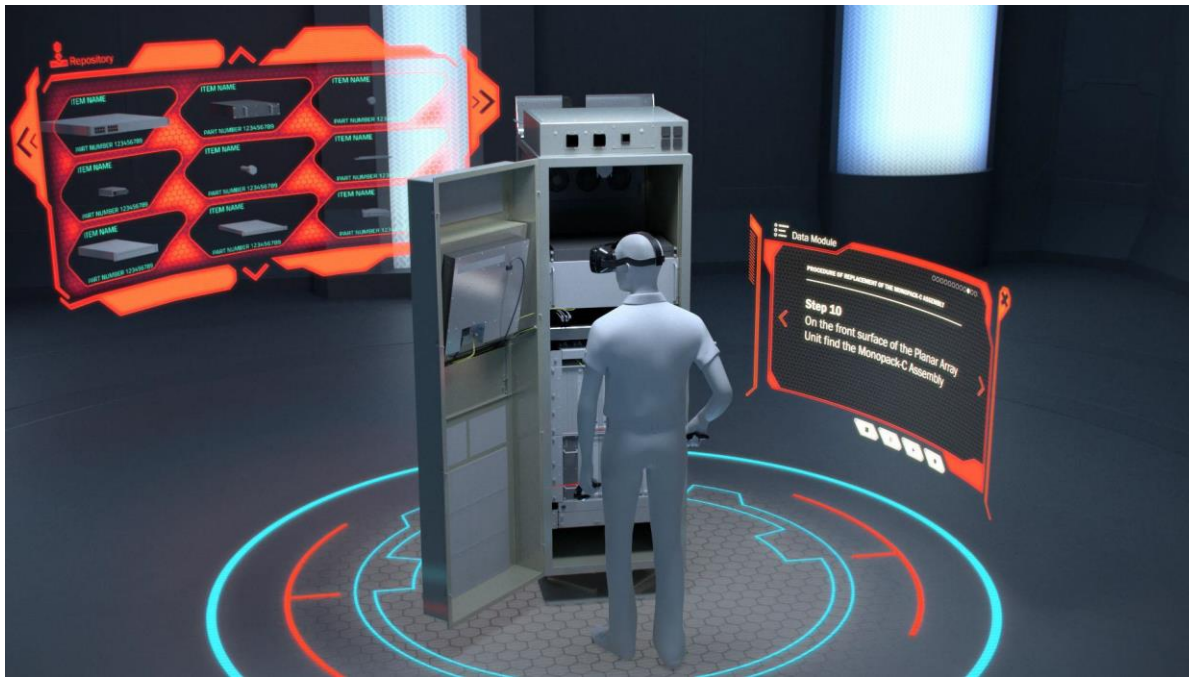
## Future Command and Staff Training





# Immersive Technology Use Case

## Virtual Maintenance Training



## JTAC Advanced Training



## Final Remarks

- MSG-189 has done a very good initial step to identify which ones among the most attracting EDT can have an important role into make M&S advance in a significant way
- At the same time the analysis conducted has shown that the use of such technologies can represent either an opportunity or a challenge
- The opportunities in many cases look very clear and ready to be exploited (as in the case of the Immersive Technologies or the Communications Standards as 5G). In other cases they have still to demonstrate on the field their effectiveness (like AI)
- Wargaming may be a way to assess the impact of potential new technologies
- To properly use them a big challenge is that of making operational people aware and confident that the Advanced Support they can get from M&S tools/environments enriched with such a technology are real and trustable



THANK YOU  
FOR YOUR ATTENTION

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