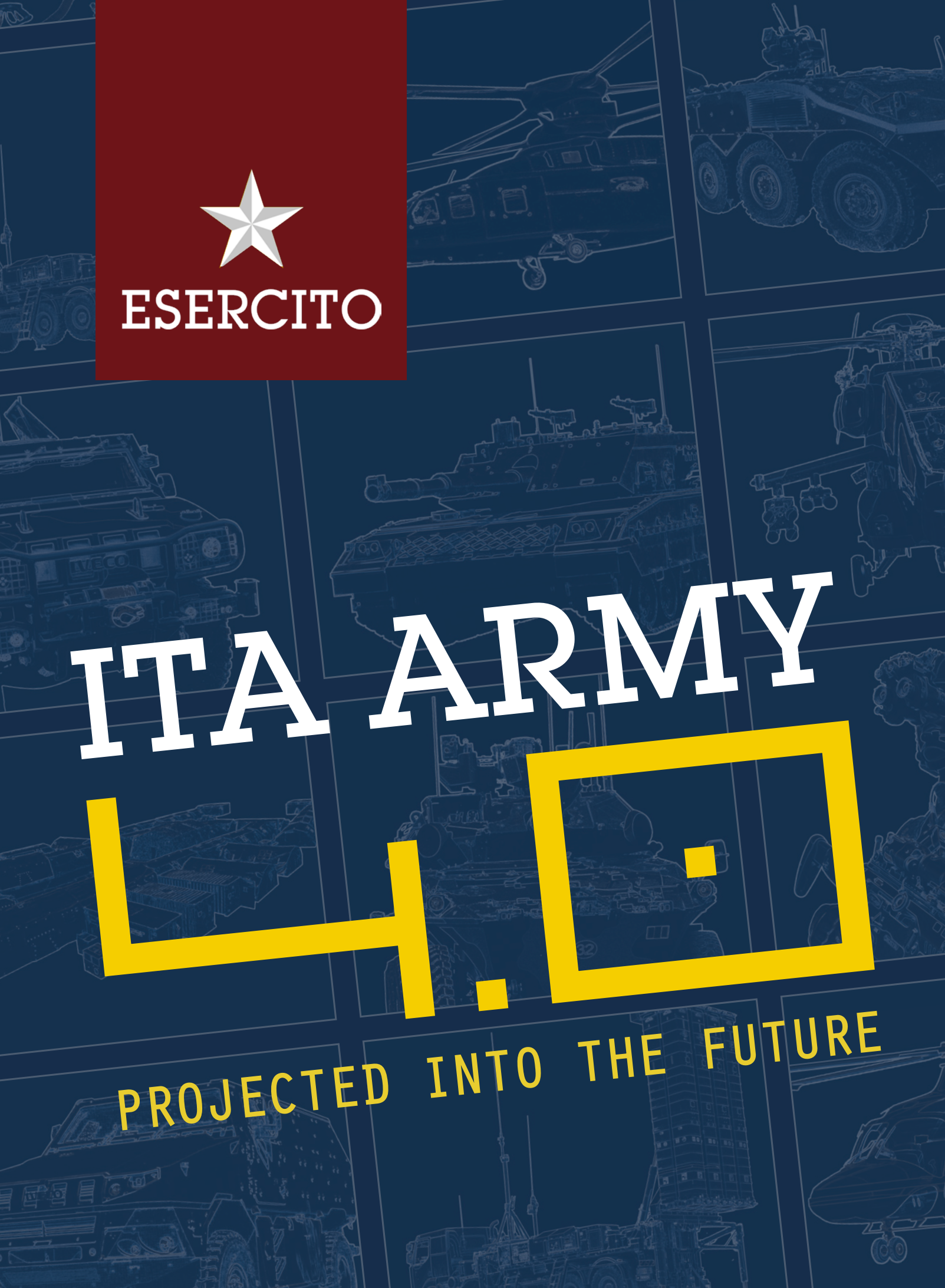
ESERCITO
ITA ARMY
4.0
PROJECTED INTO THE FUTURE

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PROJECTED INTO THE FUTURE

The outbreak of a conventional war just a few hundred kilometres from our borders has brought to the publicís attention the renewed need for a credible, effective Land Force that is ready and, if necessary, able to fight in changing environments:

"Wars are fought and won by applying ancient principles but using innovative methods, procedures and tools".

Without a doubt, the first major innovation is the overbearing entry of the new cyber and space domains into the conduct of operations. Exploiting the opportunities that they offer in terms of information and decision-making superiority, and knowing how to defend against the pitfalls they conceal, has become a fundamental requirement for the land component, which remains pivotal, even in multi-domain contexts. Acquiring familiarity with these new domains, where the meaning of time and space is different from the traditional meaning, is crucial in imposing high operational tempo and achieving strategic objectives. To make a historical parallel, which can help us to interpret the considerations just made and their epochal significance it can be argued that the combined use of cyber-native combat assets flanked by drones and satellite capabilities mirrors the capability leap experienced by German armoured units in the early stages of World War II. These units, equipped with state-of-the-art communication systems and provided with air support, enabled the Germans to have the speed of decision-making and action that ensured, in the early stages of World War II, the initiative and dominance of operations.

1 IMPLICATION FOR LAND FORCES: THE FIVE DEVELOPMENT PATHS

To face these scenarios and new challenges, attention must be paid to the following five development paths which represent real macro-areas of integrated capability development.

Close Manoeuvre

It is almost trite to point out, but close manoeuvre remains the decisive element in a conflict. Armoured forces are the key component for the development of close manoeuvre, and today they represent a criticality in terms of Army capability.

Since 'to win the wars of the future, we need to win the wars of today first', the Army's short-term effort will focus on extending the operational life of existing platforms, in particular the 'Ariete' battle tank, and on restoring the efficiency of the legacy component by improving its performance in terms of mobility, target acquisition and engagement, and communications.

Significant capacity increases will come with the acquisition of the new armoured infantry combat system (AICS)[1] and the new main battle tanks (MBT)[2], which will equip the combat support units. These acquisition programmes must have a European scope in order to consolidate the national defence industry on the continent, also under the auspices of

ARIETE
Main Battle Tank

Prototype of
Main Battle Tank

economies of scale, and they must possess high growth potential in order to be able to integrate emerging technologies of the future as add-ons. In addition, preserving common logistical features with other Army platforms will be important. The necessary resilience can be achieved via an industrial partner that has the land sector as its core business (e.g. the Land Hub of the Defence Industry), and an Italian design entity.

When conducting close manoeuvre, combat forces are exposed to heterogeneous and unpredictable threats. In addition to traditional threats such as explosive ordnance, anti-tank weapons, direct or indirect fire and air support fire, new threats from the third dimension such as drones, kamikaze drones or loitering munitions, and the new space/cyber domains shall be taken into account.

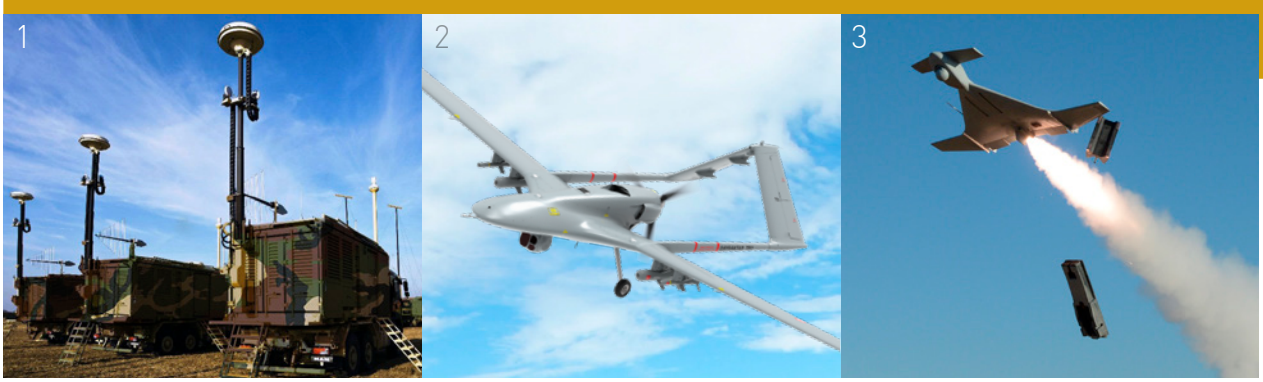
Per For these reasons, next-generation platforms and weapon systems must be equipped with active protection systems, counter unmanned aerial systems (C-UAS)[3] and counter rocket, artillery, mortar (C/RAM)[4], threat capabilities. They need to be cyber-native, securely and safely connected to a network, and make use of complementary robotic and autonomous swarms/ systems (RAS)[5]. The latter, while loitering around the main platform, will scout, escort, sense and alert. In order to achieve clear situational awareness, hopefully within a short timeframe, Army units will be equipped with Mini/ Micro Remotely Piloted Aircraft (RPA)[6], to extend reconnaissance capability beyond the range of the current systems and to perform specific functions. In addition, equipment will be acquired to fight in what is increasingly becoming a conceivable future domain, i.e. the underground.

Land vehicle with remote control and integrated APR

Deep Manoeuvre

The second axis of development concerns deep manoeuvre that occurs farther and farther from the front – i.e. 70 to 150 km. It also involves non-contiguous and non-linear areas of operation to engage and destroy enemy forces in depth. The Army will need to use newly developed units at Brigade level or above in which all systems capable of generating effects in depth, both kinetic and non-kinetic, are integrated through the combined use of Electronic Warfare (EW)[7], armed and unarmed drones, and precision

1. Electronic Warfare System of wiretapping
2. Armed drone
3. Loitering munition



munitions. The Army should widen its multiple launch rocket system (MLRS)[8], capability and equip all conventional artillery units with 'Vulcan'

precision ballistic extended range (BER)[9] and GPS/laser-guided long-range (GLR)[10] ammunition. It should also promote the development of similar ammunition in other calibres and assess the feasibility of employing a wider range of weapon systems as a means to deliver long-range precision. In this regard, capability enhancement has become necessary, which will be achieved through loitering munitions, armed drones, drones with battle damage assessment capability and laser designation of targets for terminal fire guidance. An increase is therefore expected in the number of tactical level platforms, delivery means and fire actuators operating in the land environment up to 150 km in depth, on the surface, and above it. The increase is so pronounced as to make the implementation of a Command and Control capability an imperative, with streamlined and rapid operational and procedural arrangements to coordinate those operating in the expanded land dimension.

Multiple Launch Rocket System MLRS

VULCANO precision munition

Manoeuvre from the Third Dimension

The third dimension serves as the link between contact and deep manoeuvre. It exploits the great mobility of future vertical take-off platforms and airborne units to facilitate ground manoeuvre and to ensure the control/management of key terrain and critical infrastructure.

In this regard, the Army is completing a renewal programme for its helicopter fleet. The New Attack Helicopter (AH)[12] and the Light Utility Helicopter (LUH)[13], are expected to enter into service and replace the Combat Support Helicopters (CSH)[14] that are currently on the line.

Regarding the next generation of aircraft and with a view to renewing part

New Attack Helicopter

of the current fleet, the Army is looking closely at the US Future Vertical Lift (FVL)[15] programme for the exploitation of innovative helicopter technologies, namely:

- the counter-rotating rotor and pusher propeller developed by Sikorsky known as Next Generation Fast Helicopter (NGFH)[16];
- the new frontiers of tiltrotors developed by Bell.

In addition to significantly increased speed – a feature that would solve some of the critical issues that have emerged in the Ukrainian conflict – the advantages of these technologies are increased manoeuvrability, stability, substantially increased range, reduced hour/flight costs and simplified logistical support. Associated with these features are the capabilities of Command and Control, Communication, Cyber, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C5-ISTAR)[17], that make the new helicopters the nodes of a system of systems required to operate in the joint operation area (JOA)[18] of the future. Furthermore, as far as the heavy component is concerned, future helicopters will have to be cyber-native,

Helicopter with counter-rotating rotor and pusher propeller

Helicopter with tiltrotor

securely connected to a network, and capable of launching and operating drones according to the concept of manned-unmanned teaming (MUM-T)[19].

Integrated Defence

Force protection has always been a priority for the Army. In the new context described above, a further major challenge arises, as sensors and actuators not integrated into a single system that involves semi-permanent and mobile assets, mainly those against threats from the third dimension, will be ineffective.

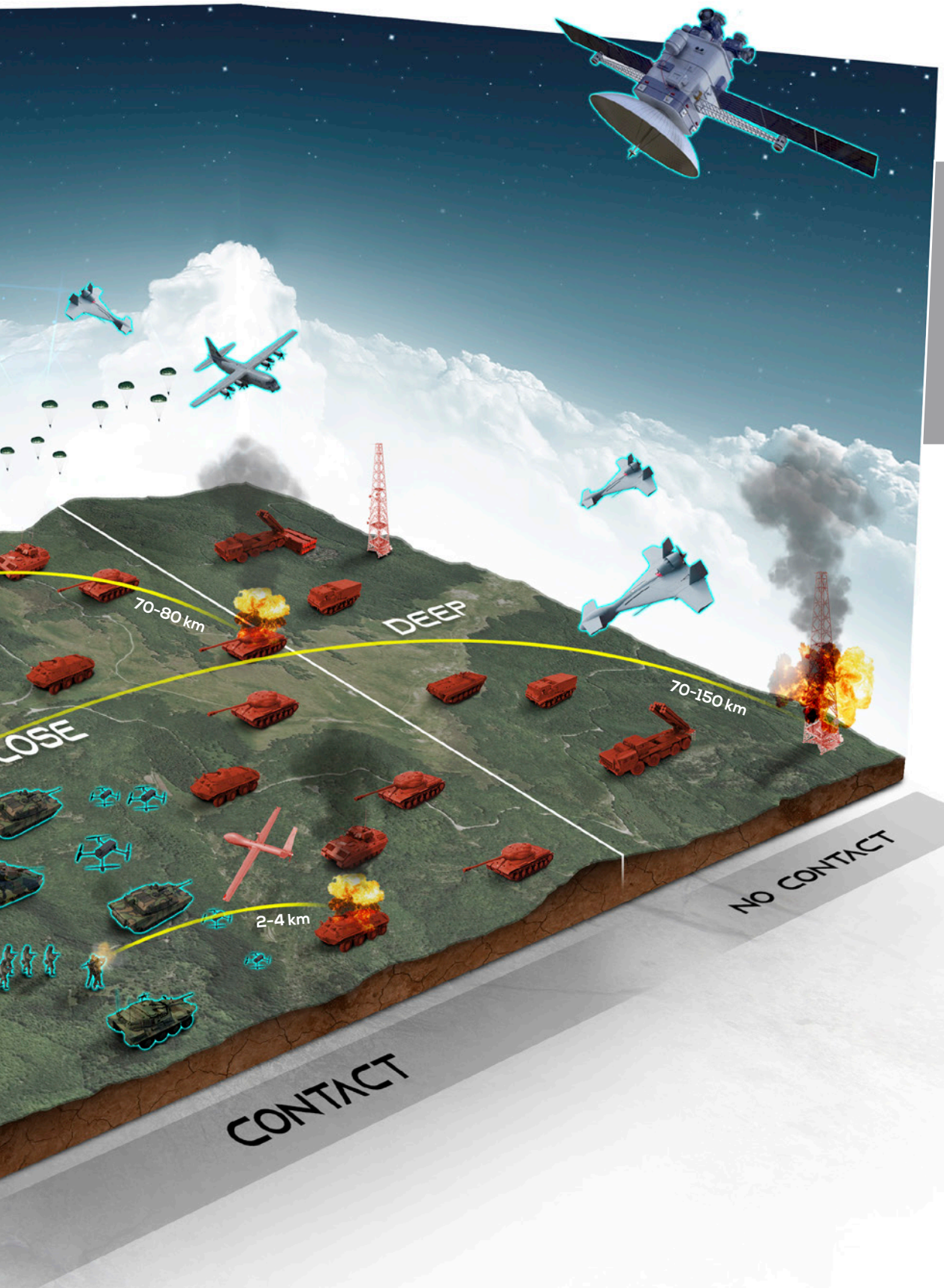
The Army urgently needs to create a continuum among the available counter-aircraft defence systems, and in particular between:

- medium range surface air missile (MRSAM)[20], systems to counter attacks at medium altitudes, i.e. targets at distances between 15 and 50 km and effective up to an altitude of 15,000 m;
- short range air defence (SHORAD)[21], systems that are effective up to about 3,000m altitude and with a useful range of between 5 and 15km;
- very short range air defence (VSHORAD)[22], systems that are effective up to about 1,500m altitude and with a range of about 5km.

In the medium-range sector, the Army will implement a capability augmentation plan aimed at increasing the performance of Sol-Aire Moyenne Portée Terrestre (SAMP-T)[23] batteries and initiate a research and development programme to counter the hypersonic threat. For the short-range sector, the Army will continue to acquire the 'Grifo' system, a national missile defence system developed by MBDA Italy in cooperation with MBDA UK. In the ultra-short-range sector, the Army will have to define the requirements for the development of a new family of systems with national industry. Such a family would include both man-portable and vehicle-borne variants and will be integrated into the system that exercises Command and Control over all the capabilities that defend against threats in the third-dimension.

1. SAMP-T battery
2. Missile of "Grifo" system
3. Very short range air defence


CYBER & ELECTRONIC WARFARE
REAR
NO CONTACT



SPACE OF MANOEUVRE

Distributed Logistics

A radical change of approach is needed to ensure distributed combat service support, i.e. widespread and capable of providing support to the entire force, down to the individual platform. For packing, routing and delivery of loads, automation processes will be used. Here, too, Robotic and Autonomous Systems can support units through autonomous replenishment and transport in the so-called 'last mile' of the battlefield.

It will be possible to:

1. shorten support times;
2. increase the thinning of the logistical organisation, whose storage nodes will be spread out on the ground as required, and not static;
3. reduce the number of personnel involved in replenishment and transport activities, thus optimising the use of human resources and reducing exposure to threats.

All new platforms will need to be equipped with predictive systems that optimise and simplify maintenance activities and reduce the time and logistical burden of downtime. They should be self-diagnostic in the event of faults, and stimulate the intervention of logistics teams whose personnel, equipment and spare parts are commensurate with the need to restore the efficiency of failed platforms

Land vehicle with remote control in Cargo version

2 Enabling capabilities

All of the above will only be implemented if all Army assets are equipped with a resilient digital capability and if information and decision-making superiority is achieved. These requirements must be reinforced by enabling factors, which enable the integration of the potential inherent in new operational domains and new technologies: Space and Satellites, Command and Control, Electronic Warfare, Cyber and Robotics..

Space

Through the provision of services, space should be considered as an 'effectiveness amplifier'. The Army supports the acquisition of an autonomous national capability to exploit the lower orbit through a constellation of mini-satellites that are interoperable with 5G networks. The aim is to meet the growing need for connectivity, which is no longer sustainable with the current satellite communications (SATCOM)[24] architecture of Defence alone. Space and satellites are also crucial to secure navigation systems with selective availability anti-spoofing mode (SAASM)[25] and to secure intelligence capabilities in the areas of remote sensing, surveillance, tracking, and electronic intelligence (ELINT)[26] gathering.

1. Very small satellite
2. Secure browsing system

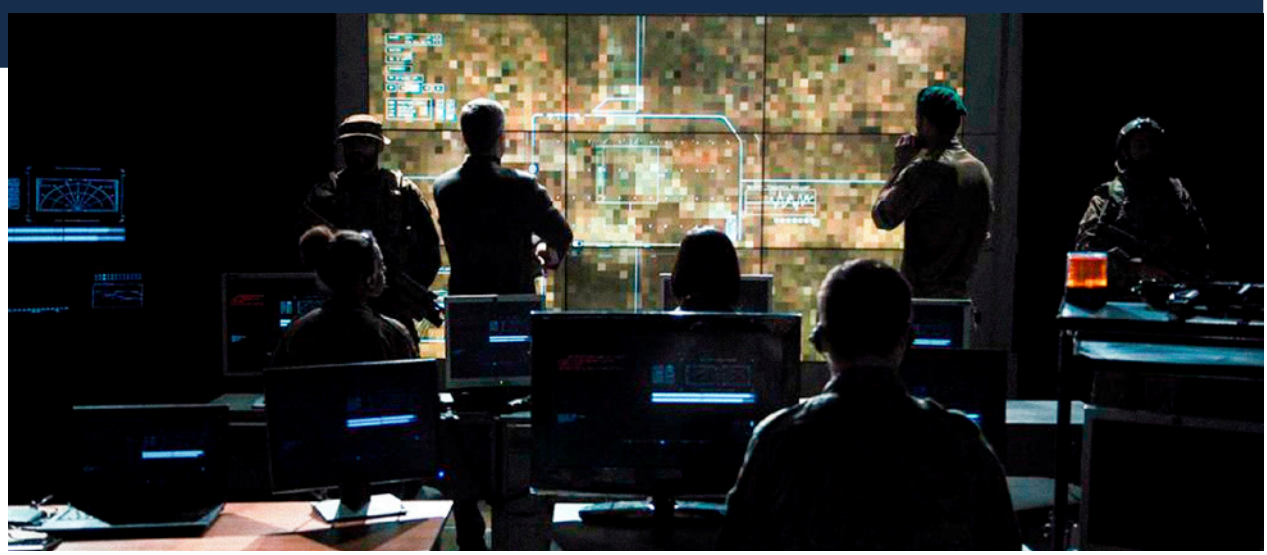

1


2

Command and Control

Within this framework, Digitized Command Posts will be set up for each level, from Corps to Regiment. They will benefit from modular, cyber-protected and interconnected structures capable of relaying traffic among platforms and system nodes.

The goal is to have an integrated, redundant, multi-domain broadband communications network capable of rapidly handling large volumes of data, including through the use of artificial intelligence, gathered from the information flows of the multiple actors in the wider ground dimension.



"Imperio" Command and Control system

Electronic Warfare

Supremacy in the electromagnetic environment requires a mindset change. A culture must be created among personnel, and specialised assets assigned to units. Increasing capabilities also means acquiring systems to provide electromagnetic support and counteraction. Moreover, in view of the growing relevance of cyber and electromagnetic activities, procedures are being studied to integrate the two domains and combine their effects in the other domains.

Cyber

The role of the cyber domain is becoming bigger and bigger. It is more and more directly related to use of and dependence of land forces on information and telecommunication technologies. Its increasing pervasiveness calls for

centralised and direct management of operations. While making it a priority to invest in the education and training of a growing number of personnel who will have to familiarise themselves with these issues, it is essential to allocate adequate resources to experimentation that combines cyber and electronic warfare capabilities. More Army units will have to acquire capabilities in this area and specialise in operations aimed at inhibiting the use of networks and degrading the processing capacity of enemy digital systems

Cyber Defence exercise

Use of drone swarm in training activities

Robotics

All new generation programmes will have to make provision for integrating the new features introduced from time to time by RAS technologies.
In order to facilitate their integration into the capabilities of the future (e.g. swarms of drones or robots moving systemically with platforms, automated systems for logistics, etc.), the Army has already started long-term experimentation that also involves industry, research and universities. The aim is to promptly identify and field solutions that can be technologically advantageous in solving and simplifying operational problems, and to replace humans in repetitive activities that do not require decision-making.

CONCLUSIONS

3

In order to implement Army 4.0, resources are needed for research, development and acquisition, and a new system for recruiting and training personnel will need to be implemented. In such a system, the balance between duties to be fulfilled and rights to be recognised must be safeguarded.

The challenges of the future require the Army to have more engineers, specialists and technicians than it has today. The ratio between leaders and wingmen will also have to change, with a decisive increase in the number of NCOs, who will fill staff roles in decision-making hubs, lead more operational teams than today, and perform specialised and technical functions, the growth of which will be exponential.

Composite training will achieve the amalgamation between men and systems; although simulation and virtual technologies represent an advantage, such training will not work without live range sessions. While the national administration must make these ranges available, the Army will take care of their environmental protection. Acquisition and support costs, as well as training costs, will grow.

They will come closer to those of other components that have long dealt with complexity. Renewed attention towards Defence will be required by and held high on the agenda of political leaders to ensure adequate regulations and resources are approved over time.

The technological capacity described above is already part of our present and must be planned and systematised in the years to come. There is no shortage of ideas and many more will be forthcoming for our planners to generate concrete and effective capability solutions.

"Tomorrow's wars will be fought in multidimensional space, but in the end the decision will still be in the land dimension".

It is worth recalling a fact that Soldiers know very well: historically, conflicts have been won or lost on the ground, for air or naval supremacy alone never ended a war. Only the intervention of armies has proved to be decisive.

INDEX OF ACRONYMS

1	**AICS**	*Armored Infantry Combat System*
2	**MBT**	*Main Battle Tank*
3	**C-UAS**	*Counter Unmanned Aerial System*
4	**C-RAM**	*Counter Rocket Artillery Mortar*
5	**RAS**	*Robotic and Autonomous System*
6	**APR**	*Aeromobili a Pilotaggio Remoto*
7	**EW**	*Electronic Warfare*
8	**MLRS**	*Multiple Launch Rocket System*
9	**BER**	*Ballistic Extended Range*
10	**GLR**	*Guided Long Range*
11	**BDA**	*Battle Damage Assessment*
12	**AH**	*Attack Helicopter*
13	**LUH**	*Light Utility Helicopter*
14	**CSH**	*Combat Support Helicopters*
15	**FVL**	*Future Vertical Lift*
16	**NGFH**	*Next Generation Fast Helicopter*
17	**C5-ISTAR**	*Command, Control, Communications, Computer, Cyber, Intelligence, Surveillance, Target Acquisition, Reconnaissance*
18	**JOA**	*Joint Operations Area*
19	**MUM-T**	*Manned-Unmanned Teaming*
20	**MRSAM**	*Medium Range Surface Air Missile*
21	**SHORAD**	*Short Range Air Defence*
22	**V-SHORAD**	*Very Short Range Air Defence*
23	**SAMP-T**	*Sol-Air Moyenne Portée Terrestre*
24	**SATCOM**	*Satellite Communication*
25	**SAASM**	*Selective Availability Anti-spoofing Module*
26	**ELINT**	*Electronic Intelligence*

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