



**MINISTÈRE
DES ARMÉES**

*Liberté
Égalité
Fraternité*

Lets's scale it up in quantum!

TQCI Seminar
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The scale is the limit – really ?

Eva Crück
Special deputy for innovation,
Defense Digital Agency,
Direction Générale de l'Armement (DGA)
Ministère des Armées

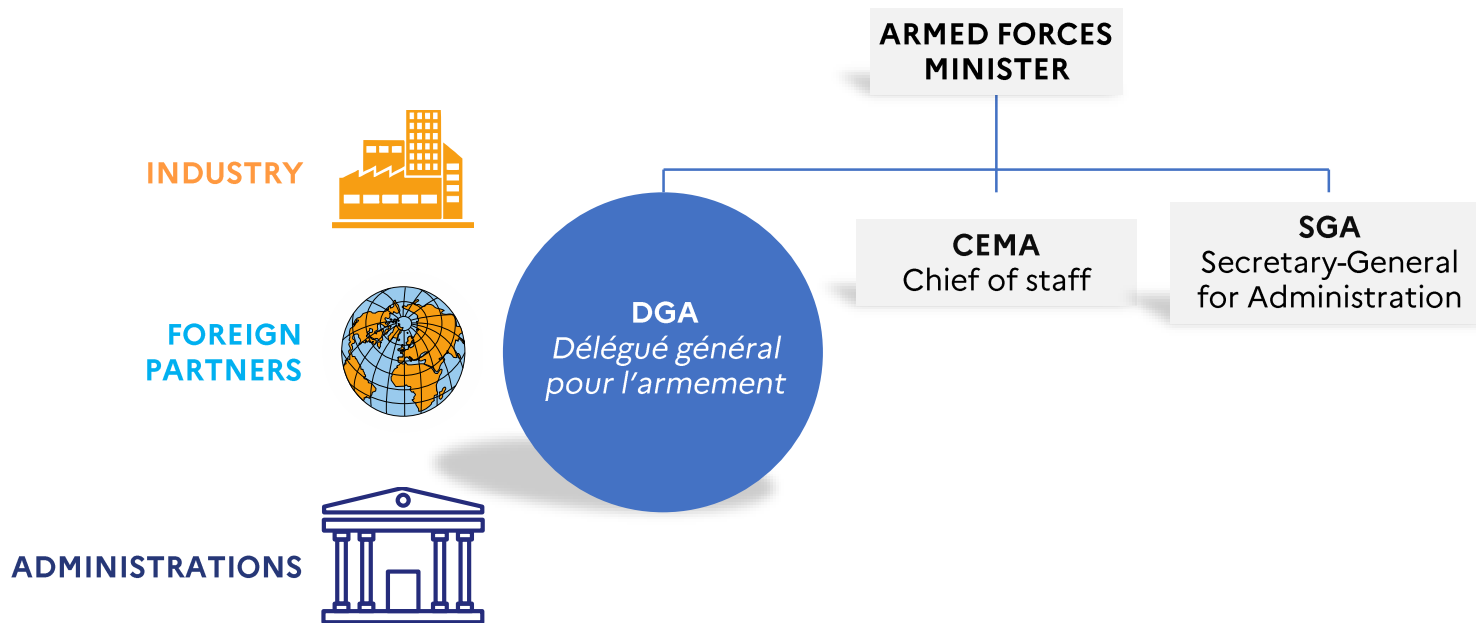




**DIRECTION
GÉNÉRALE
DE L'ARMEMENT**

Crafting France's defense technologies

WHERE WE BELONG



OUR PURPOSE AND OUR MISSIONS



OUR
PURPOSE :

EQUIP THE FRENCH ARMED FORCES AND PREPARE THE FUTURE



OUR MISSIONS :

1

Equip and support the armed forces in a sovereign way by being the state defense system architect

2

Provide a strategic, technological and industrial anticipation capability contributing to national defense and security

3

Promote a pragmatic approach for **cooperation and export support**

4

Guide and support defense industry in a logic of national sovereignty

5

Maintain the foundation of nuclear deterrence and develop the ministry's cyber capability for the benefit of national security

WHO ARE WE AND WHERE ARE WE ?



WORKFORCE: 10 500 people

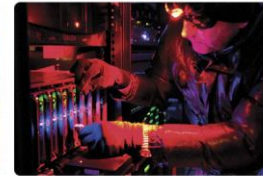
2 500 in Paris (Balard)

Engineer / executive: **60 %**

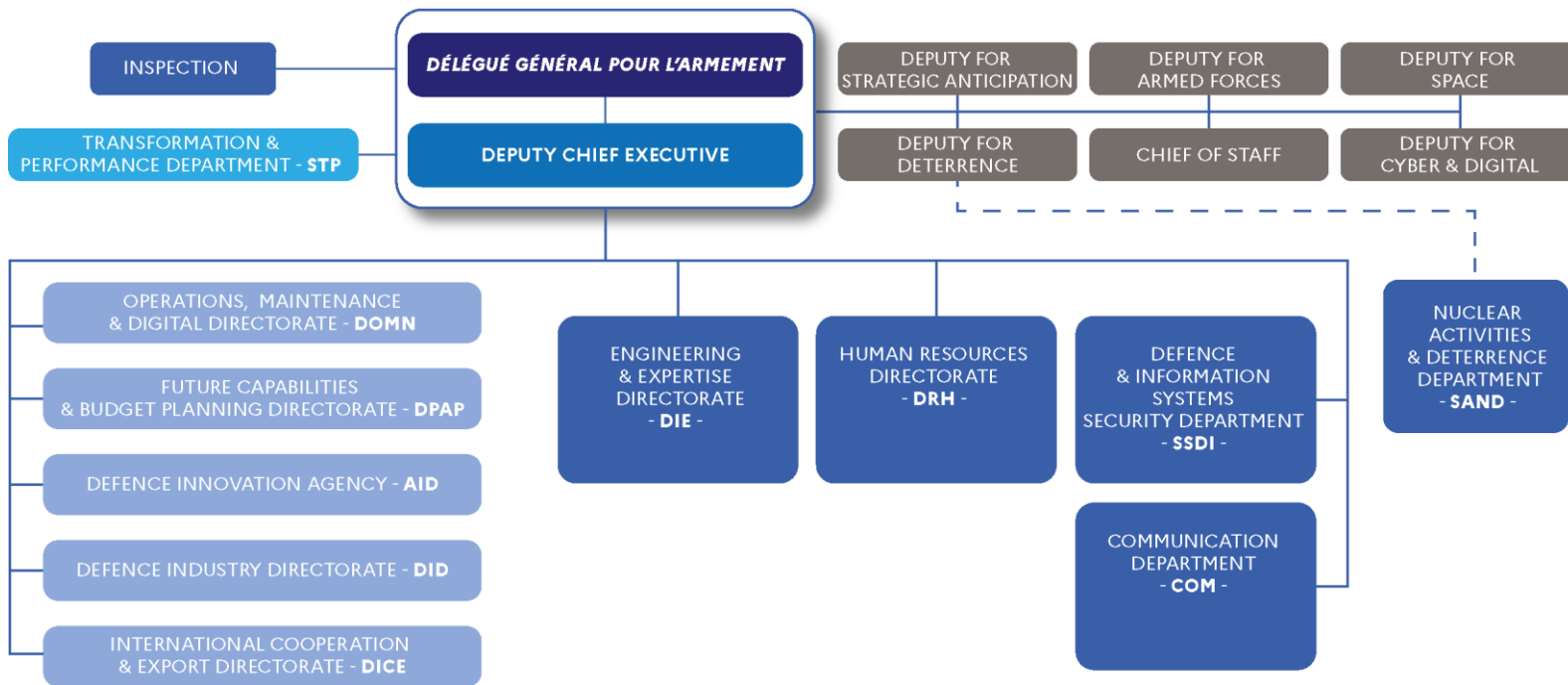
Military personnel: **20 %**

Proportion of women: **30 %**

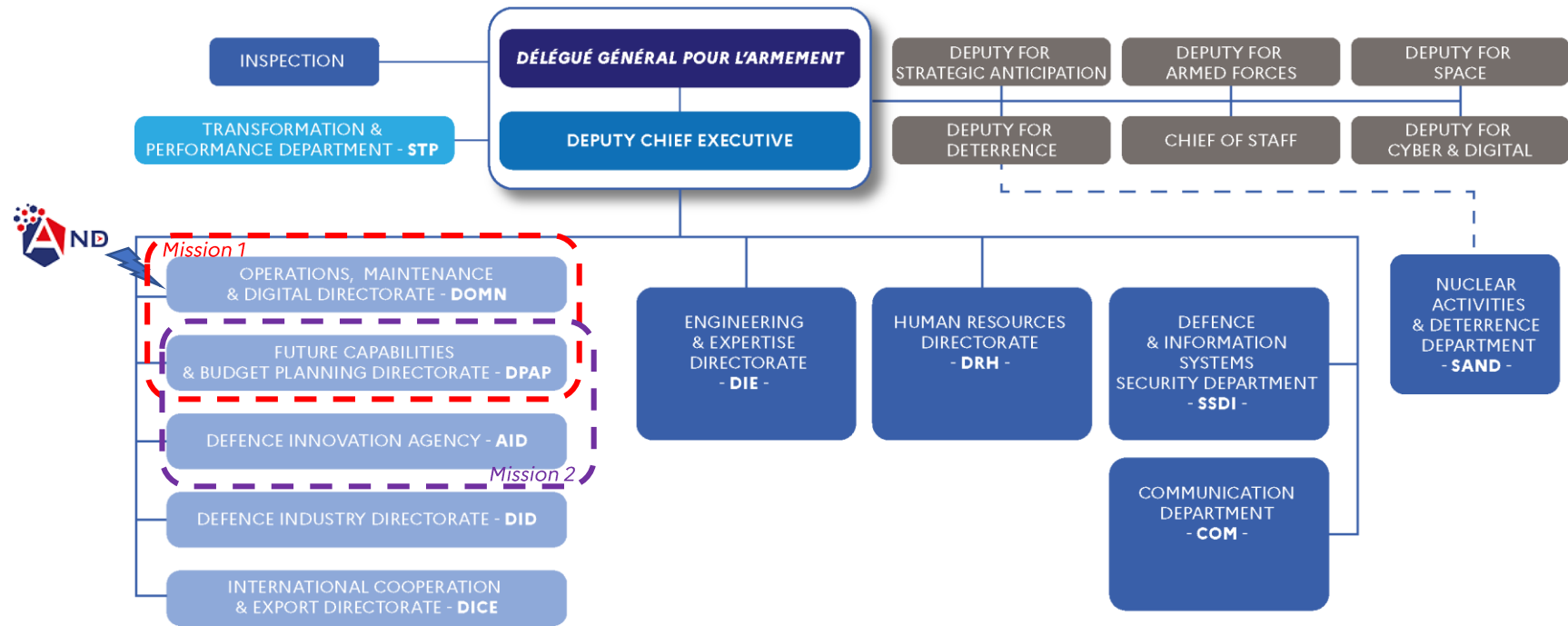
+overseas network (embassy
attaché, EU, NATO)



OUR ORGANISATION



OUR ORGANISATION



PROVIDE A STRATEGIC, TECHNOLOGICAL AND INDUSTRIAL ANTICIPATION CAPABILITY CONTRIBUTING TO NATIONAL DEFENCE AND SECURITY



Imagine

- Build the **technological and programmatic roadmaps** that will shape our future defence system
- Rely on a robust capacity for **studies and simulation**



Anticipate

- **Prevent strategic surprise** in the field of science and technology with the « Horizon de combat » program
- **Anticipate** the effects of breakthrough technologies both in terms of threat and opportunity



Innovate

- Deploy our resources to **capture innovation**
- **Deliver innovation** to the Armed Forces as quickly and efficiently as possible
- Sustain and deepen the actions of the **Defence Innovation Agency (AID)**

EQUIP AND SUPPORT THE ARMED FORCES IN A SOVEREIGN WAY BY BEING THE STATE DEFENSE SYSTEM ARCHITECT



A capability engineering approach

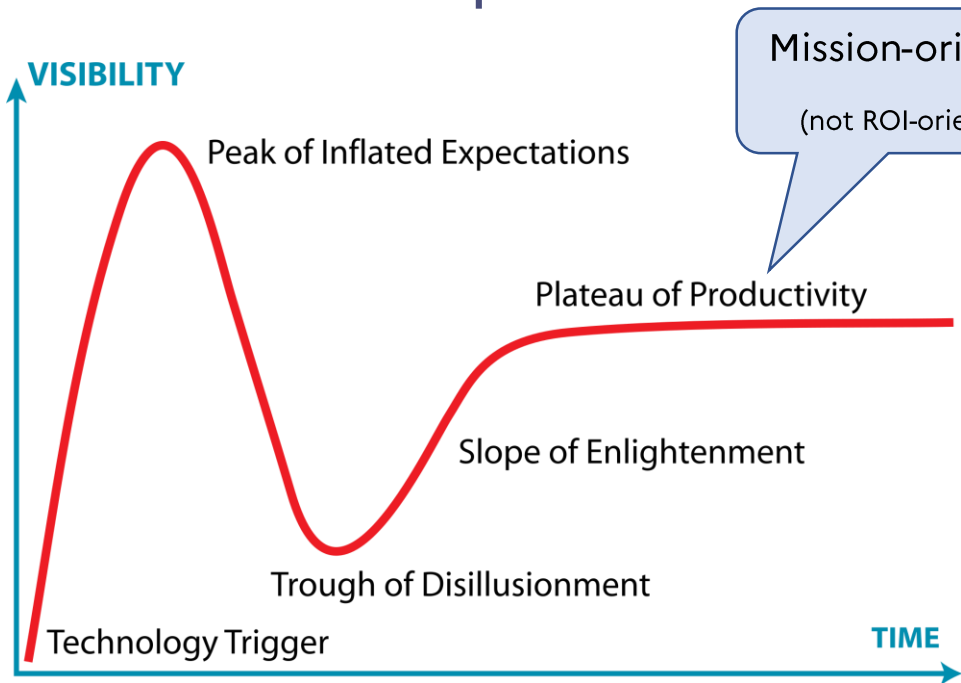
- **Design systems** based on a global vision shared with the French armed Forces and industry, including maintenance and training.
- **Assess** the value of the need and how to meet it by working with the armed forces.
- **Buy rapidly** to respond to the french armed force's needs.
- **Adapt the equipment** to the evolution of the needs and technological innovations
- Dare innovative ways in **contract engineering**
- Participate in major operational exercises to test and evaluate new equipments, innovations and methods.



Act as the defence system architect

- Beyond our core mission of project owner, also partly act as part a project manager to ensure high-level global technical coherency
- As defence system architect, DGA applies its engineering expertise to coordinate the various industrial contractors' systems, aiming towards a seamless integration and interconnection

From innovation to capabilities



Gartner hype cycle

A capability is based on

- **D**octrine
- **O**rganization
- **T**raining
- **M**aterial
- **L**eadership and education
- **P**ersonnel
- **F**acilities,
- ...

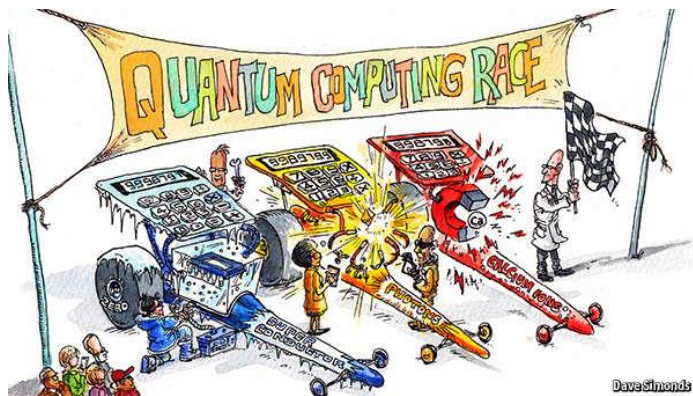
Questions for a capability approach in quantum computing

- **Which** capabilities can be served? For each:
 - => Is quantum technology
 - the only solution?
 - the best solution?
 - a solution among others?
- What are the **risks** of choosing QC as a future building block for a given capability?
 - The performances may not be sufficient at the required time
 - The addressed problem may become irrelevant
 - Some dimensions of the capability may not be addressed efficiently

Challenges from a programmatic point of view:

- Quantum computing has *too many* potential applications (general purpose technology)
- The « killer app » may turn out to be something nobody has imagined yet

PROQCIMA: let's innovate with quantum!



Objectives : by 2032

- ✓ 128 logical qubits
- ✓ 2 prototypes ready for upscaling

- A program of the *French National Strategy for Quantum Technologies*, with additional defense funding
- Operated by DGA as a partnership for innovation, with
 - Five start-up companies as leading partners
 - 15 years, 500 M€
 - Parallel development of technological solutions
 - Support for collaborative design of future capabilities



ALICE & BOÉ

C12



PASQAL



QUANDELA

quobly

Back to scale!

- Operational scaling up is about going from technology development to capability development

Objective : *A system using quantum computing is used routinely by operational users*

- Scale remains **a** limit:
 - Number of qubits to address real-world problems
 - Number of users
 - Number of applications
 - ...

Let's make it happen in quantum!



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www.defense.gouv.fr/dga