Raw materials for Europe's defence industry

5th annual High Level Conference of the EIP on Raw Materials

Brussels – 8 November 2017

Paul Anciaux

European Commission, Directorate General for Internal Market, Industry, Entrepreneurship & SMEs
Defence, Aeronautics and Maritime Industries Unit

Challenges

Security Threats

- **To our borders**
- **Increasing complexity – hybrid**

Markets & Industry

- **Declined defence and R&D budgets**
- **Fragmented**
- **Increasing global competition**

European Defence Action Plan

- Focus on defence capability needs and support to the European defence industry

- Three main pillars
  - ✓ **Launching a European Defence Fund**
  - ✓ **Fostering investments in defence supply chains**
  - ✓ **Reinforcing the single market for defence**

Raw materials

- Security of supply is essential for single market for defence

- Commission will - *within the framework of the EU Raw Materials Strategy* – identify bottlenecks and supply risks linked to materials necessary for the development of key capabilities

- Future EU research programmes could be used to mitigate supply risks, incl. substitution of CRM, building on the work in area of KETs

https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/raw-materials-european-defence-industry

European defence industry in brief

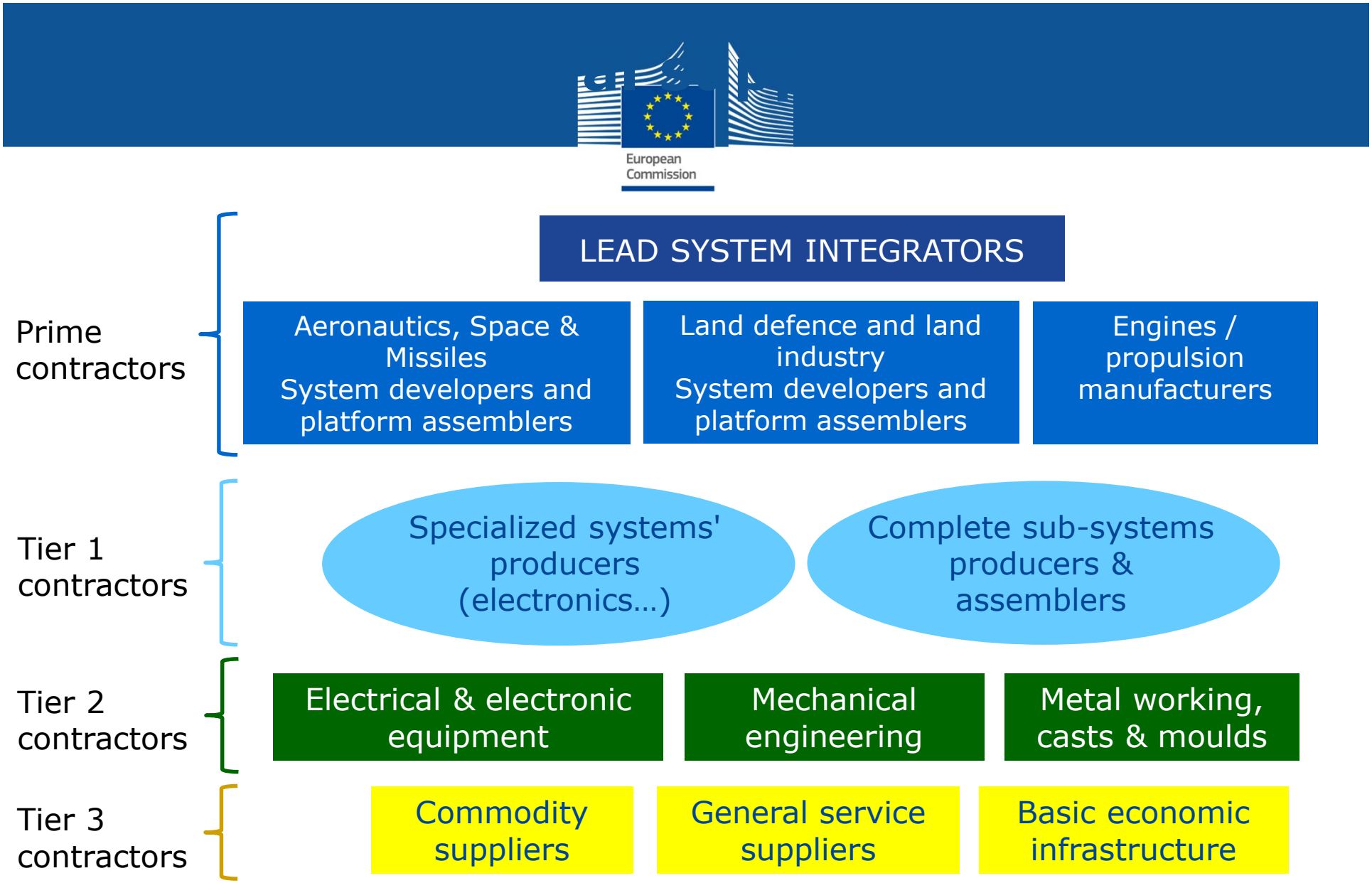
Facts & Figures

A major industrial sector in Europe

- Large number of stakeholders (system integrators, producers, suppliers)
- At least **1,400 companies**
- About **1,400,000 (in)directly employed**
- Annual sales revenue of almost **€ 100 billion**

High **economic and social importance**

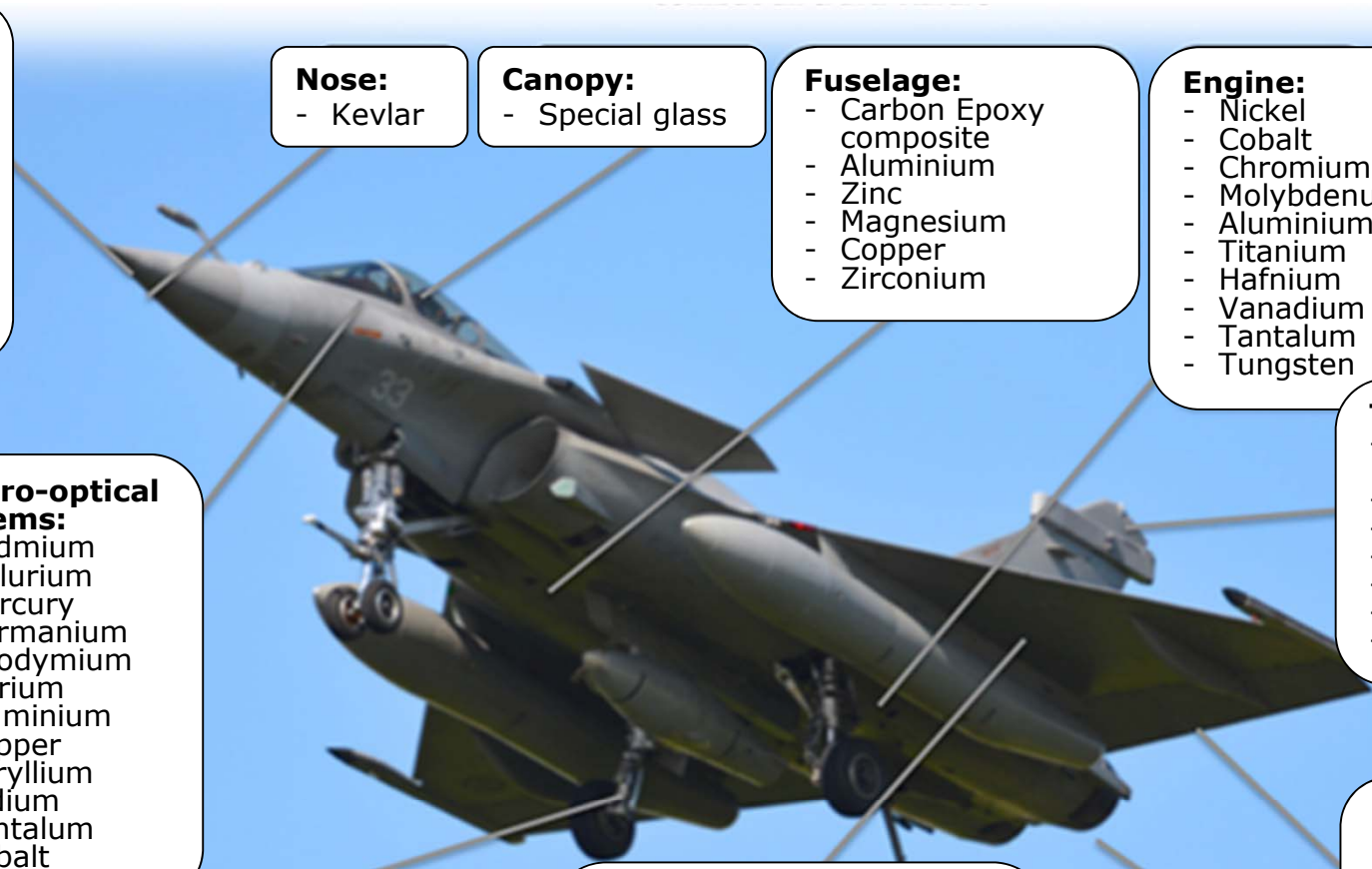
Crucial **political and strategic implications**


European Commission
LEAD SYSTEM INTEGRATORS
Prime contractors
Aeronautics, Space & Missiles System developers and platform assemblers
Land defence and land industry System developers and platform assemblers
Engines / propulsion manufacturers
Tier 1 contractors
Specialized systems' producers (electronics…)
Complete sub-systems producers & assemblers
Tier 2 contractors
Electrical & electronic equipment
Mechanical engineering
Metal working, casts & moulds
Tier 3 contractors
Commodity suppliers
General service suppliers
Basic economic infrastructure

Air sector: JRC analysis

European Commission

Example – raw materials in a jet aircraft



Sensors and electronics:
- Gallium
- Cadmium
- Tellurium
- Mercury
- Rare earths
- Beryllium
- Silver

Nose:
- Kevlar

Canopy:
- Special glass

Fuselage:
- Carbon Epoxy composite
- Aluminium
- Zinc
- Magnesium
- Copper
- Zirconium

Engine:
- Nickel
- Cobalt
- Chromium
- Molybdenum
- Aluminium
- Titanium
- Hafnium
- Vanadium
- Tantalum
- Tungsten

Tail:
- Carbon Epoxy composite
- Titanium
- Aluminium
- Vanadium
- Copper
- Magnesium
- Manganese

Electro-optical systems:
- Cadmium
- Tellurium
- Mercury
- Germanium
- Neodymium
- Yttrium
- Aluminium
- Copper
- Beryllium
- Indium
- Tantalum
- Cobalt

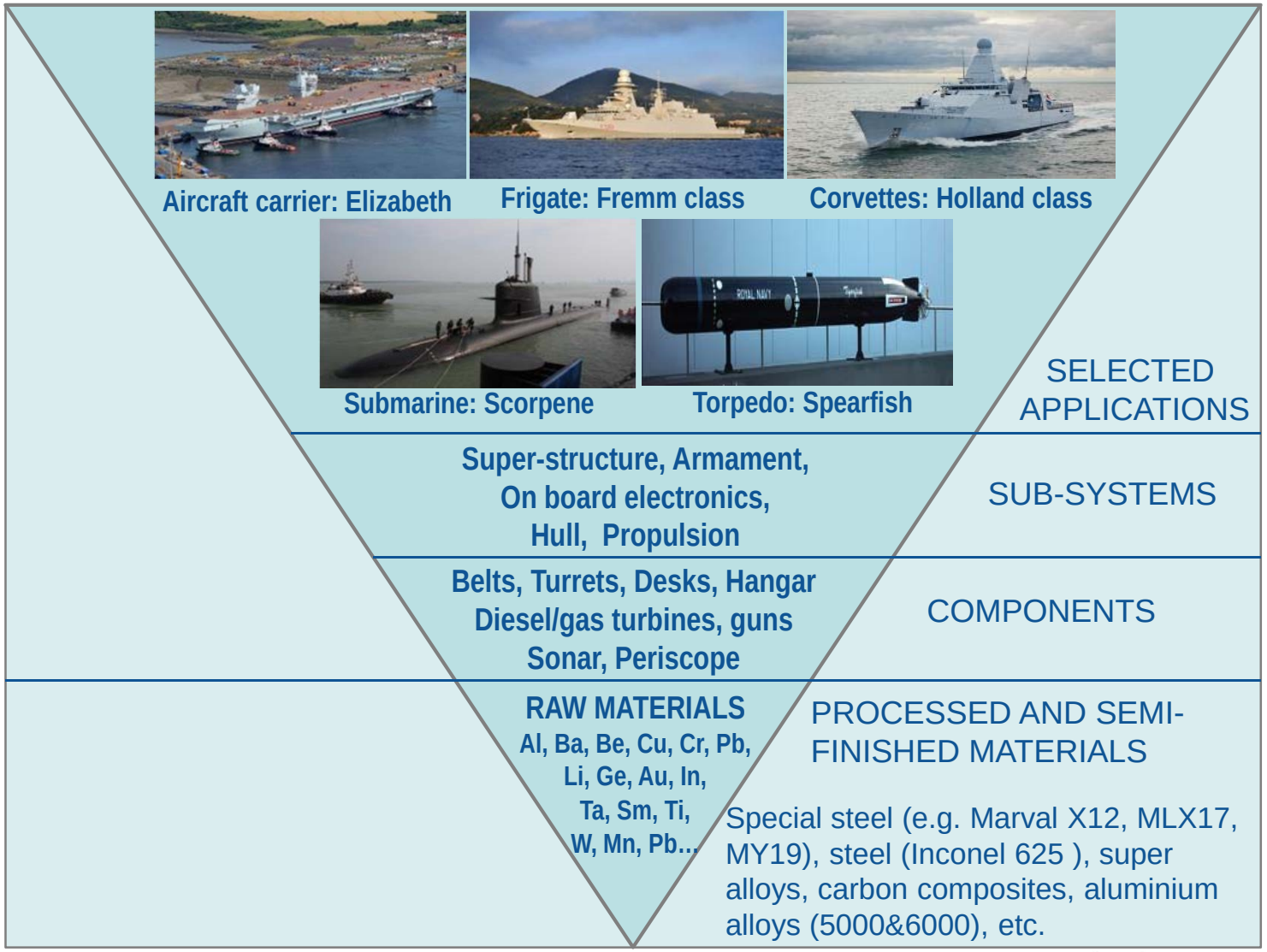
Landing gear:
- Aluminium
- Titanium
- Vanadium
- Rubbers
- Composites

Wings:
- Carbon Epoxy composites
- Titanium
- Aluminium
- Vanadium
- Copper
- Magnesium
- Manganese

Nozzle and post-combustion:
- Carbon carbon composite

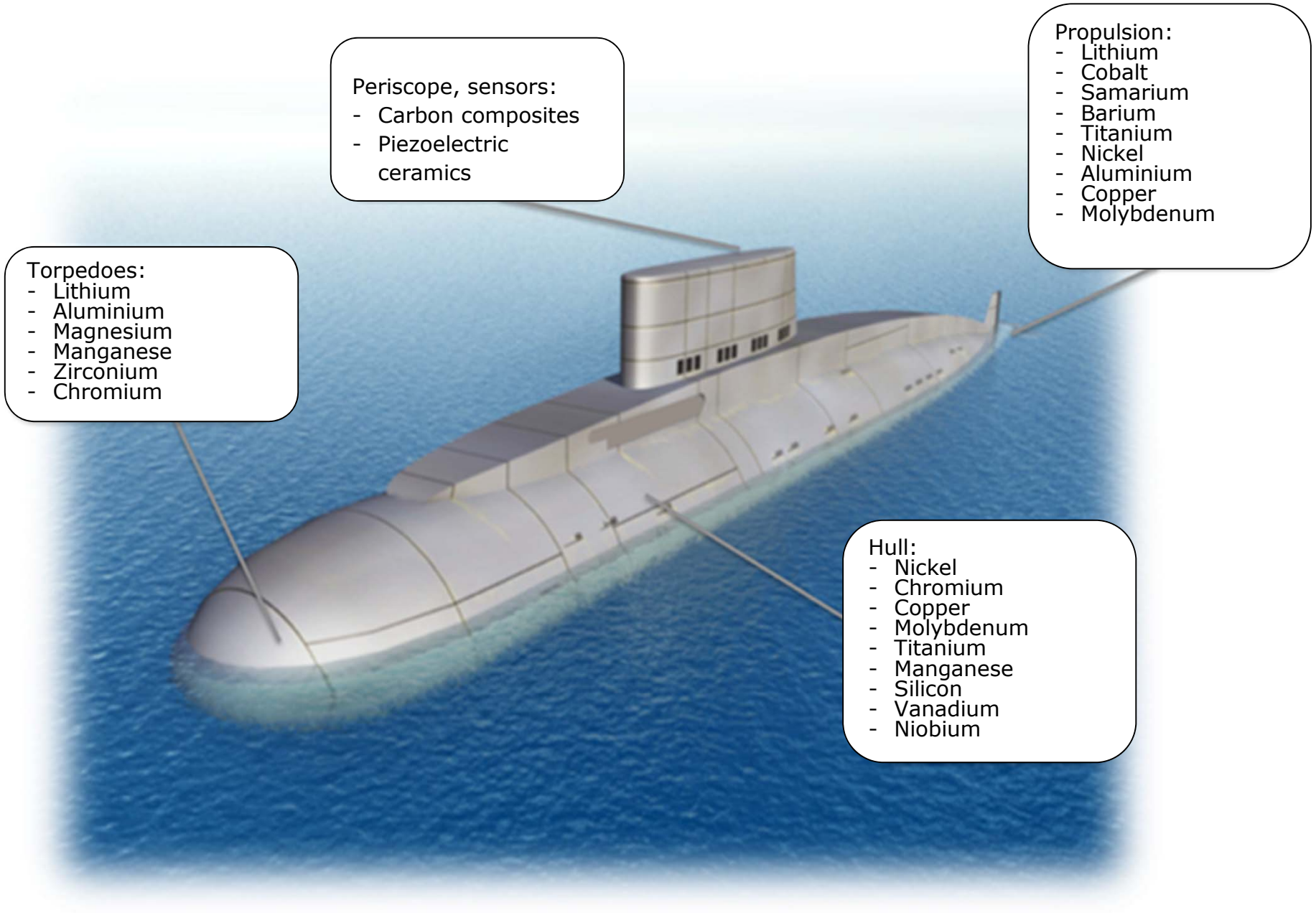
Flaps:
- Iron
- Chromium
- Nickel
- Molybdenum
- Aluminium
- Titanium

Naval sector: JRC analysis

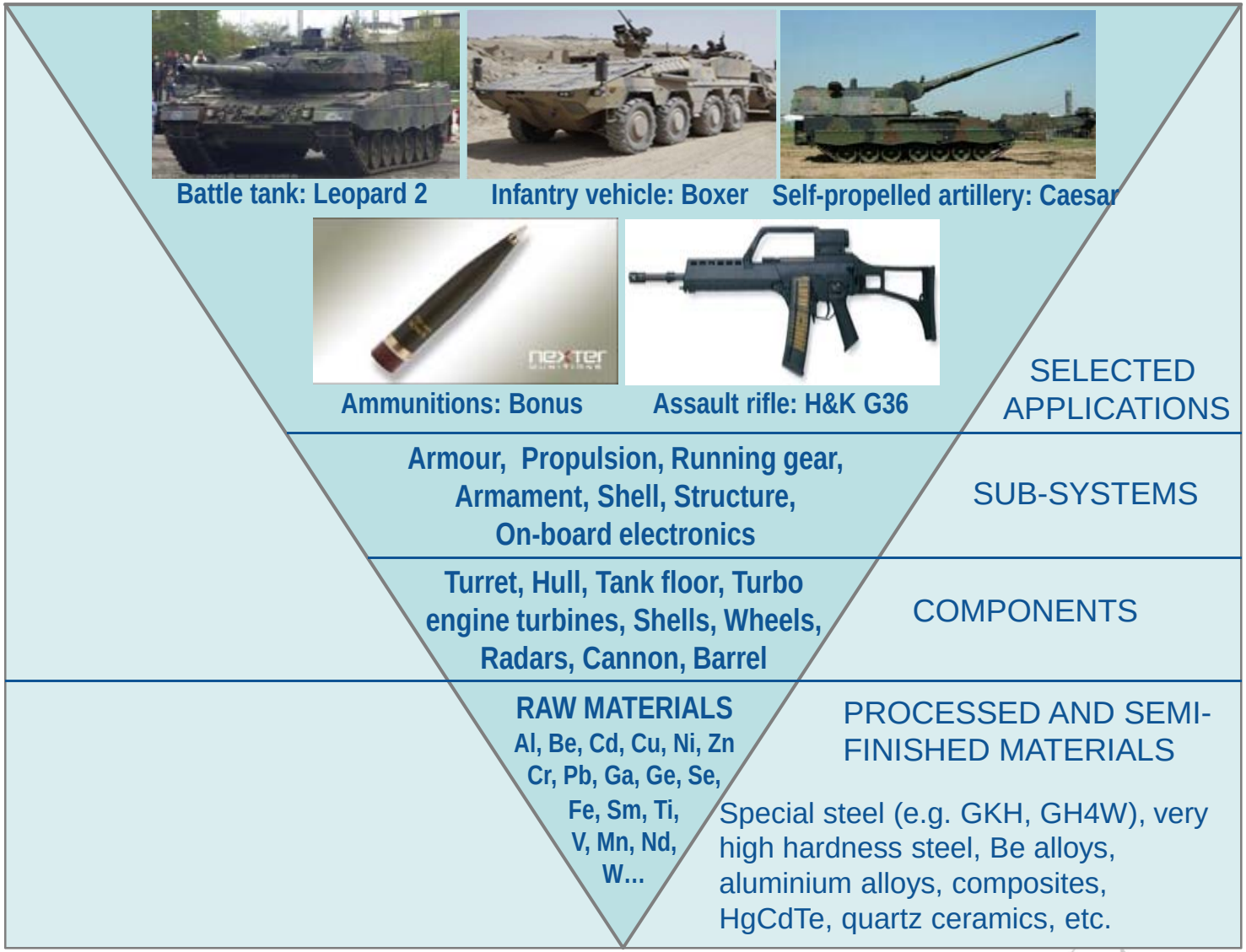


European Commission

Example 2 – raw materials in a military submarine

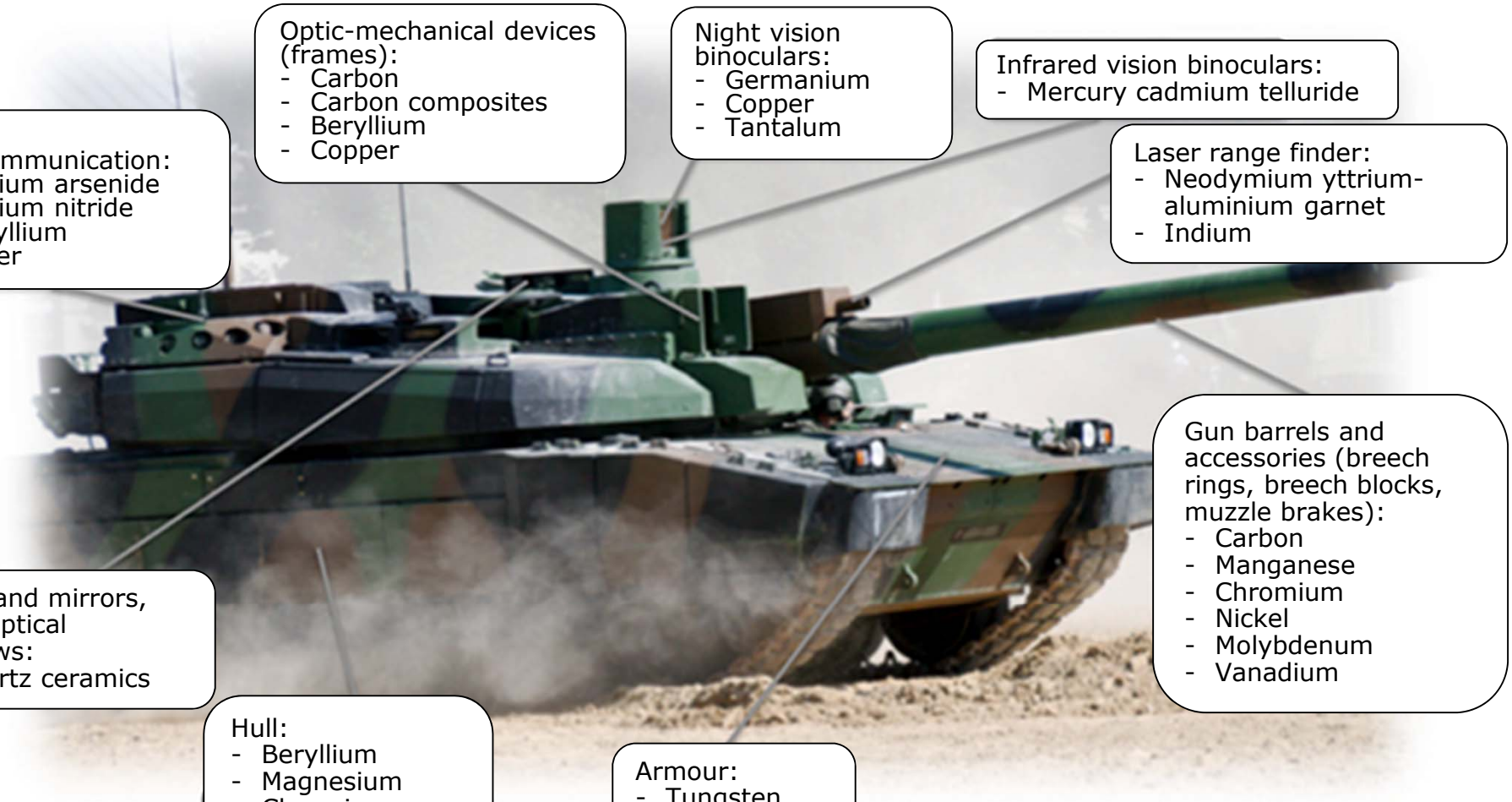


Land sector: JRC analysis



European Commission

Example 3 – raw materials in a main battle tank



Optic-mechanical devices (frames):
- Carbon
- Carbon composites
- Beryllium
- Copper

Night vision binoculars:
- Germanium
- Copper
- Tantalum

Infrared vision binoculars:
- Mercury cadmium telluride

SIT communication:
- Gallium arsenide
- Gallium nitride
- Beryllium
- Silver

Laser range finder:
- Neodymium yttrium-aluminium garnet
- Indium

Gun barrels and accessories (breech rings, breech blocks, muzzle brakes):
- Carbon
- Manganese
- Chromium
- Nickel
- Molybdenum
- Vanadium

Glass and mirrors, lens, optical windows:
- Quartz ceramics

Hull:
- Beryllium
- Magnesium
- Chromium
- Iron
- Titanium
- Zirconium

Armour:
- Tungsten
- Composites
- Titanium

European Commission

Raw materials used in the defence industry

↳Aggregated results: **39 raw materials**

28 'basic' metals

Aluminium	Barium	Beryllium	Cadmium	Chromium	Cobalt
Copper	Gallium	Germanium	Hafnium	Indium	Iron
Lead	Lithium	Magnesium	Manganese	Molybdenum	Nickel
Niobium	Rhenium	Tantalum	Thorium	Tin	Titanium
Tungsten	Vanadium	Zinc	Zirconium		

6 rare earths

Dysprosium	Samarium
Neodymium	Yttrium
Praseodymium	Other REE*

3 precious metals

- Gold
- Platinum
- Silver

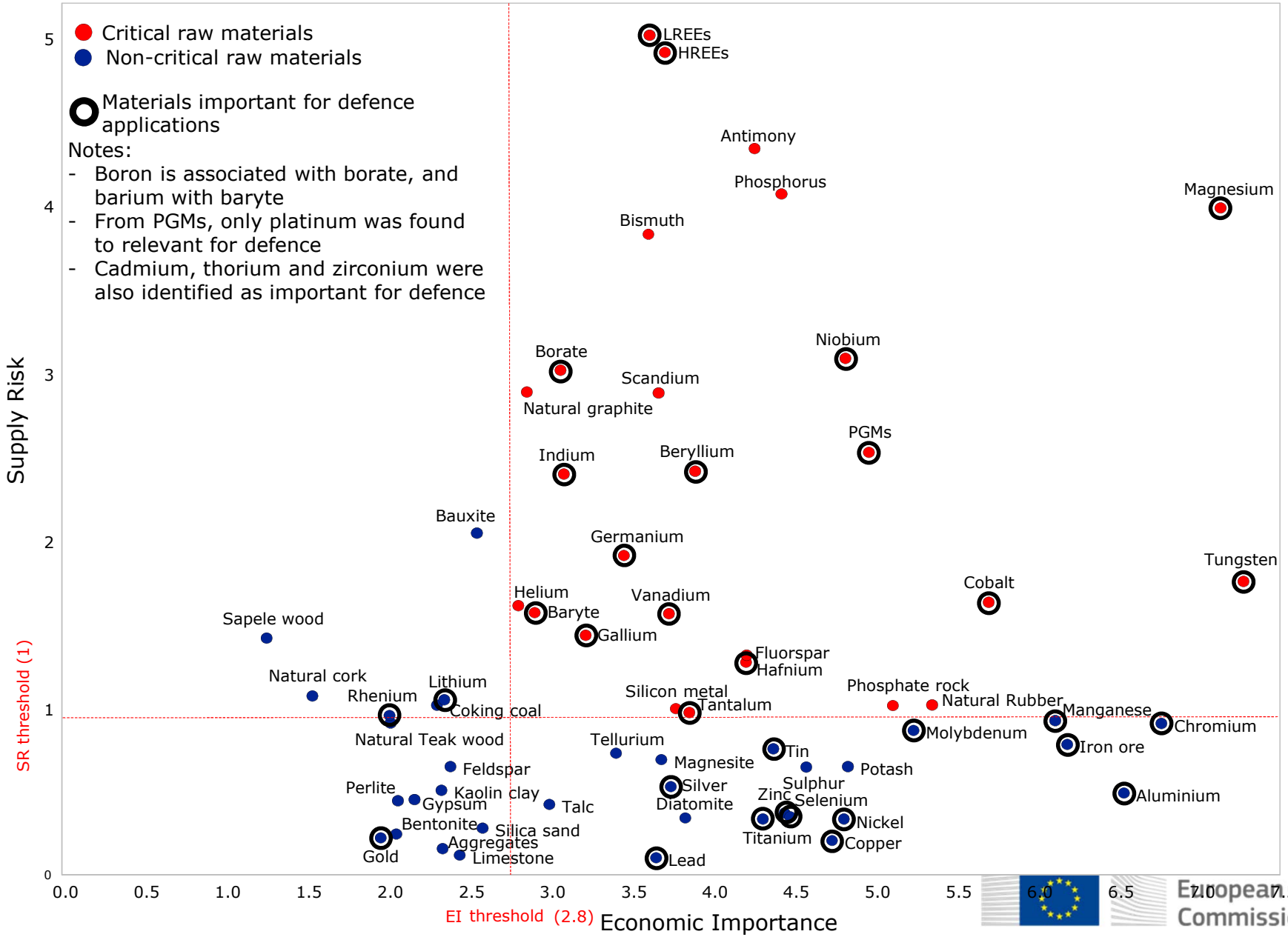
2 non-metals

- Boron
- Selenium

* A group of other 11 REEs

European Commission

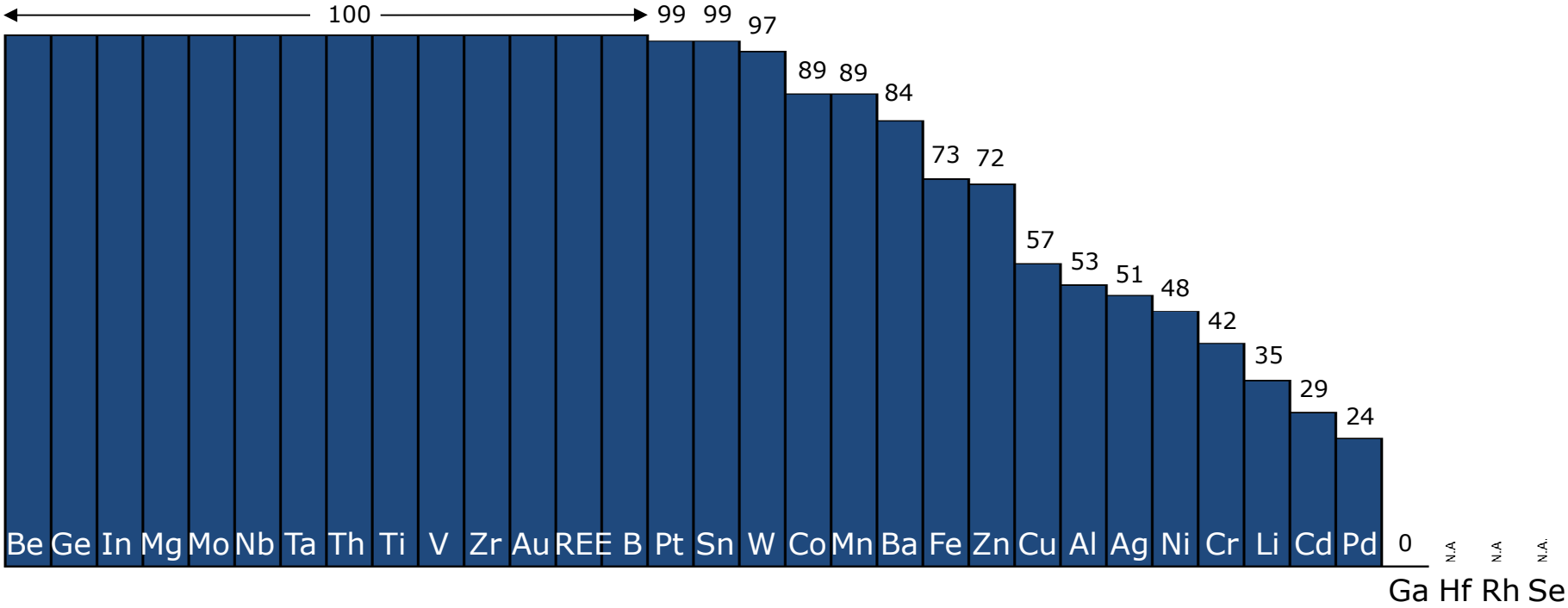
Raw materials in defence and critical materials
↳ 20 out of 39 materials are in the 2017 CRM list



European Commission

Import dependency on raw materials used in defence industry

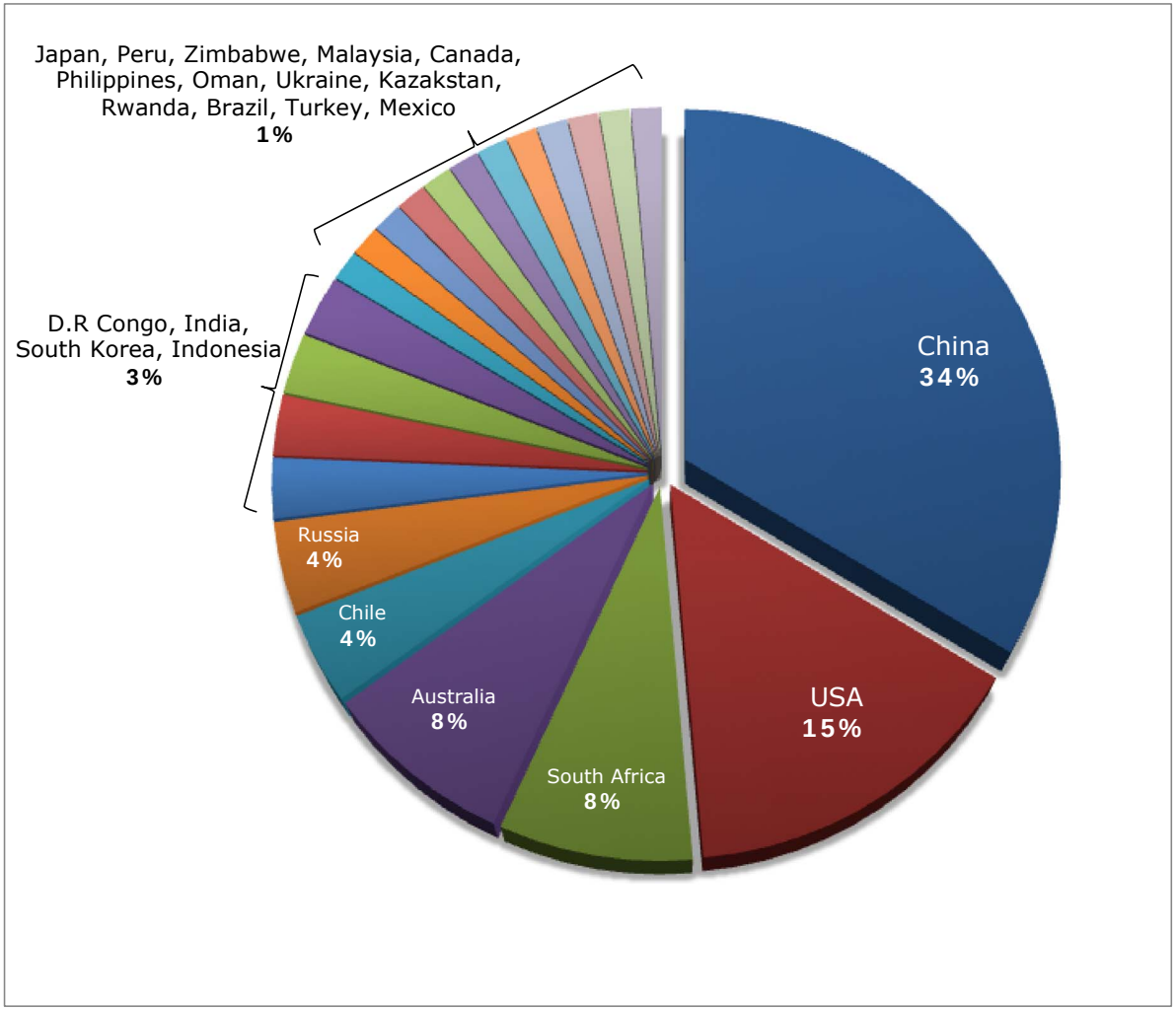
↳ EU - totally dependent on imports for 14 out of 31* raw materials
- more that 50% import reliant for circa ¾ of them



* the rare earth elements were considered as a single group; three elements were not assessed due to data unavailability

European Commission

Major supplier countries of the 39 raw materials



One-third of the raw materials used in the European defence industry are produced in **China**

N.B. the first two supplier countries were considered in this analysis (data from World Mining Data, 2015)

European Commission

Quantity vs quality

- Quantities of raw materials in defence applications tend to be relatively small compared to civil applications, with the exception of the naval sector
- The issue may be more the required quality in terms of material purity or even microstructure

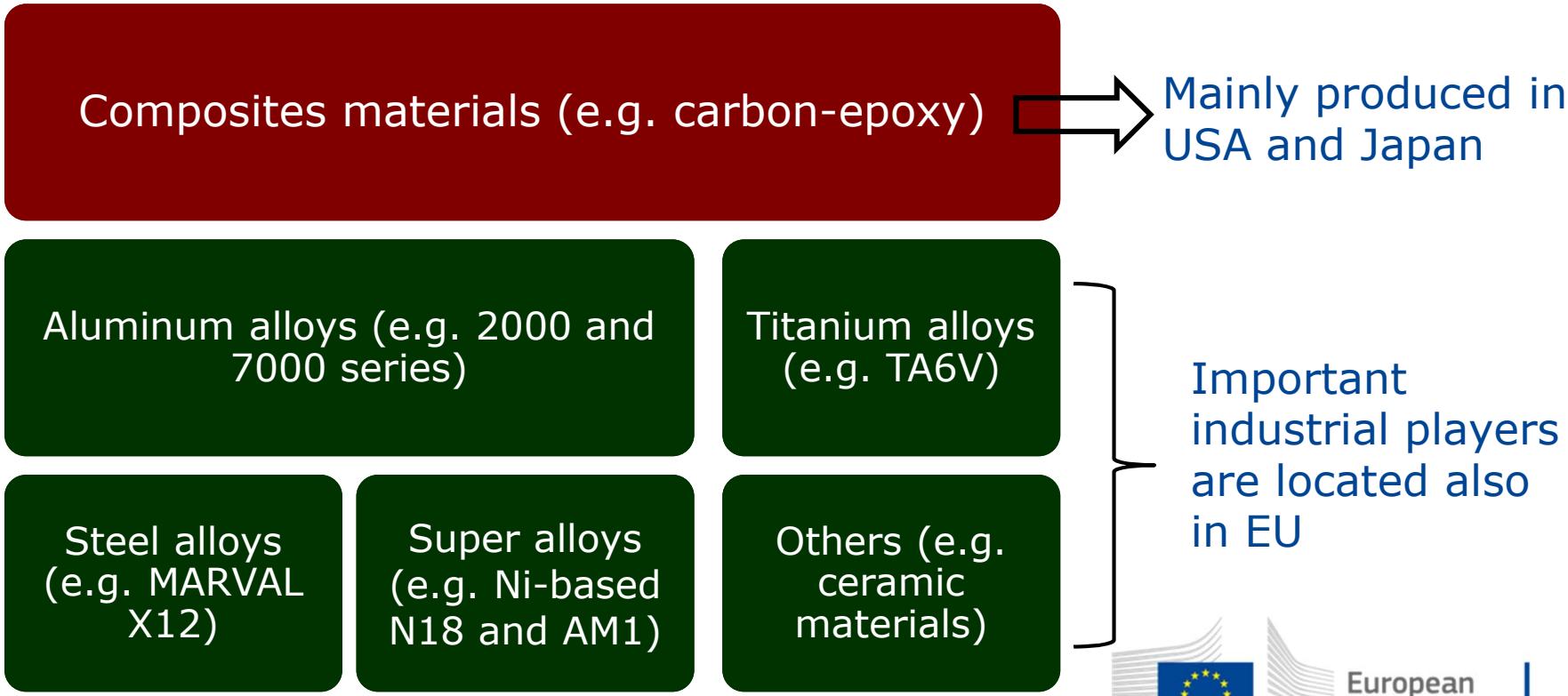
Examples

- **High-purity germanium for night-vision systems**
- **N5+ purities level gallium arsenide-based chips for defence applications**
- **Superalloys with single crystal microstructure, coated with thin zirconium layer in blades of high-performance jet engine**

Processed materials vs raw materials

- Most defence applications **integrate processed and semi-finished materials**
- **47 different alloys, compounds and compositeS** were identified

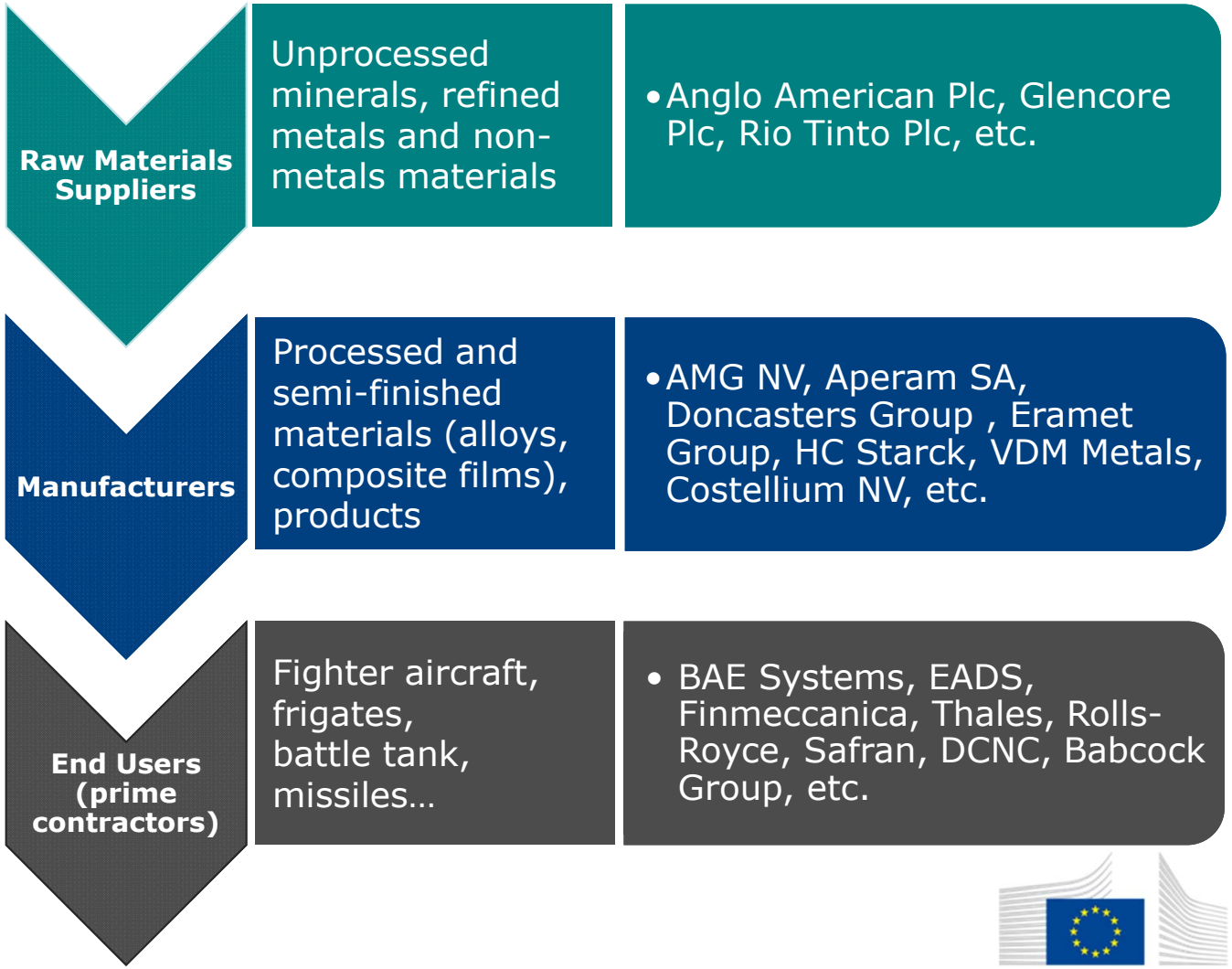
Example of processed materials used in fighter aircraft



European Commission

Value chain of materials for defence applications

↳ **Strength of downstream value chain**: an additional challenge related to security of supply of (raw) materials for defence industry



European Commission

Way forward

Need for further analysis

- **Study under COSME 2018 by JRC**
- **Inputs: KET4Dual study, Critical Technologies**

Expectations

- **Targeted policy actions (e.g. future research framework programmes)**
- **Increased awareness in the defence sector on the raw materials supply situation**

Thank you for your attention!