European Special Alloy Market: Main Directions, Dynamics and Observations for Potential Suppliers

Organization and Development of Cooperation between Russian and European Companies in the Field of Special Alloy Materials, Semis and Products Manufacturing

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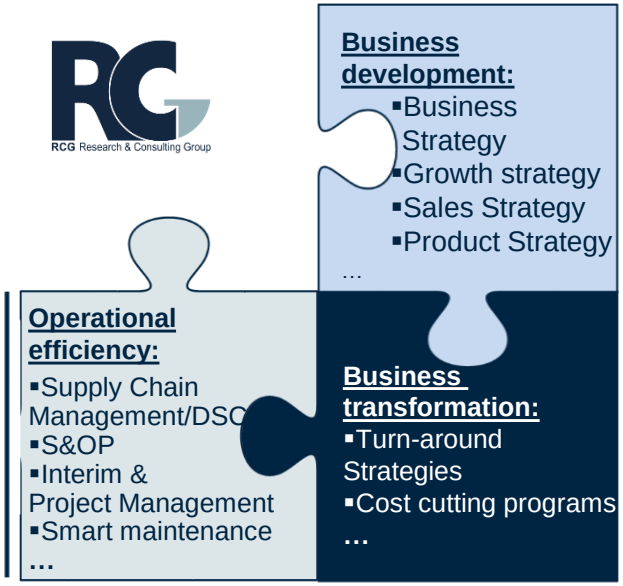
Agenda

1. **Short introduction of Research & Consulting Group**
2. Macro trends and drivers of Ni-alloys market
3. Approaches for the European aerospace value chain entrance

Comprehensive project experience in the field of business transformation

Our operations in brief:

- Specialized in consulting of steel & metals industry (including non-ferrous metals, high performance alloys etc.)
- More than 20 years of expert knowledge in the team
- Focused on management consultancy, restructuring programs and evaluation of strategies
- More than 100 projects in this area
- Worldwide presence with offices in Pfaeffikon (CH), Dusseldorf (DE), Kiev (UA), Mumbai (IN), Saõ Paulo (BR)



Source: RCG

Worldwide expertise in the different segments of the steel & metals industry

	Raw materials/ Semi finished	Flat products	Long products	Tubes and pipes	High quality / Stainless steel	Steel processing and distribution
Europe	■	■	■	■	■	■
North America	■	■	■	■	■	
South America	■	■	■		■	
CIS	■	■	■	■	■	■
Asia / Middle East	■	■	■	■	■	■
Africa		■	■			

Source: RCG

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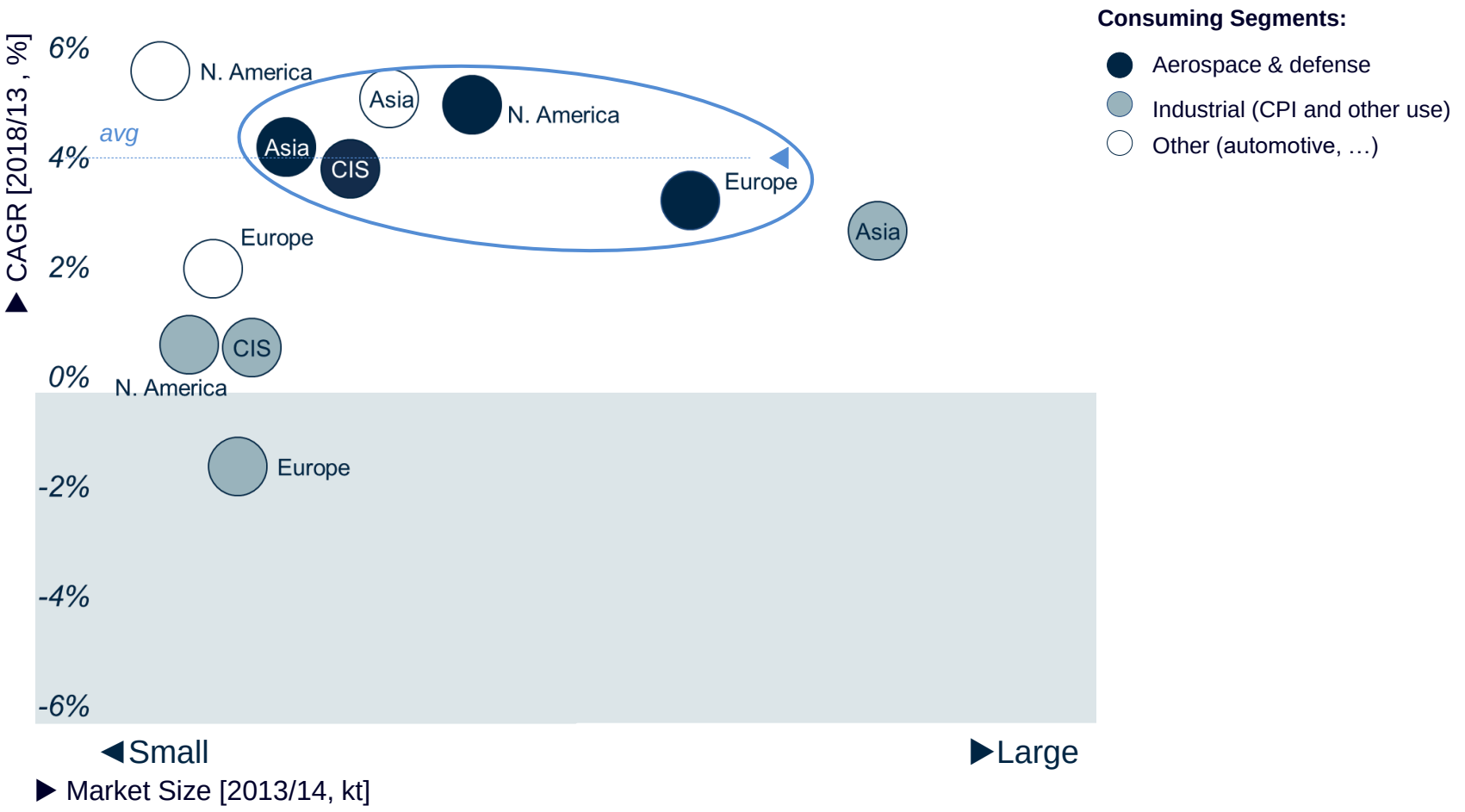
Application in aerospace industry is a major driver for Ni-alloys markets

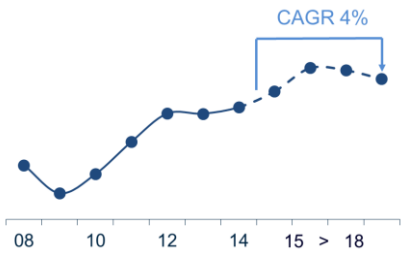
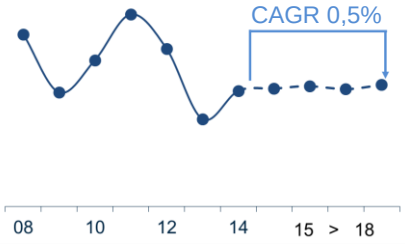
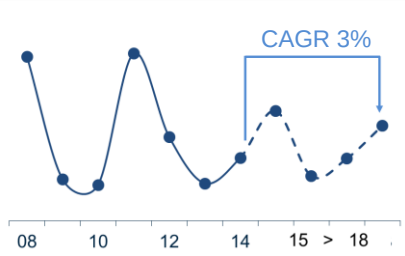
Segmentation of the global super alloys market in 2013/14 and growth perspective 2018



Market estimation contemplating apparent consumption and available data
Source: RCG Analysis, industrial reports and forecasts

Large segments of the Ni-alloys market are in contrary trends

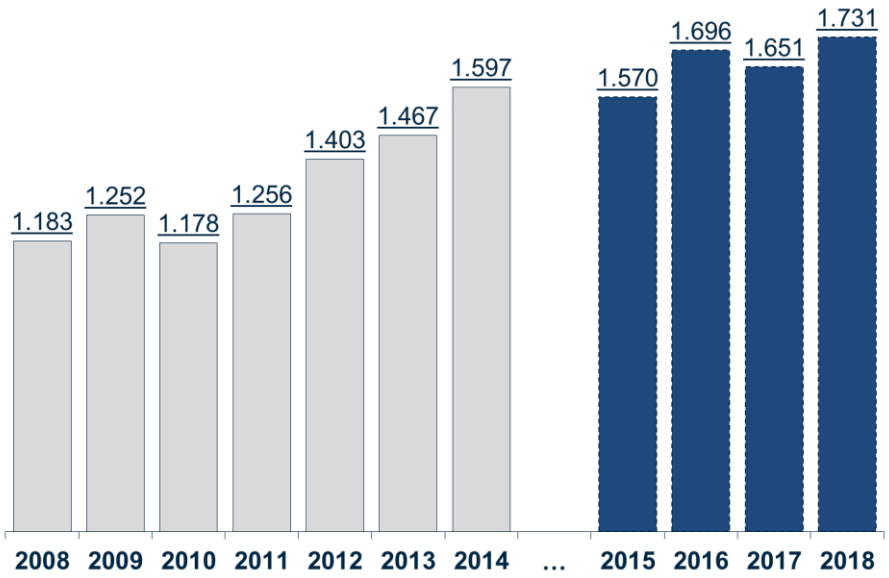
Key nickel alloys products consuming segments dynamics and trends

Segment		Consumption dynamics and forecast	Trends
Aerospace & Defense			▪ Increasing activities to support production of B787 and B737, A320 and A350 ramp ▪ Lower A330 activity ▪ Governmental expenses stimulate consumption in defense ▪ Stable spare part segment
Industrial application	Power and CPI		▪ Stagnating consumption in CPI applications due to lack of investments ▪ Ramp-up on H-class and upgrade programs ▪ Shift of production to N. America and China, week performance in EU
	Oil&Gas, other Industries		▪ High volatility coming from largely project-driven businesses ▪ Week pricing for oil & gas limits investments in new projects and pushing demand by >30% down

Market estimation contemplating apparent consumption and available data
Source: RCG Analysis, companies data, others

Record-high order intake of Airbus and Boeing in the last years are supporting the demand in aerospace-related clusters

Deliveries and forecast of commercial aircrafts 2010-2018 [Units]



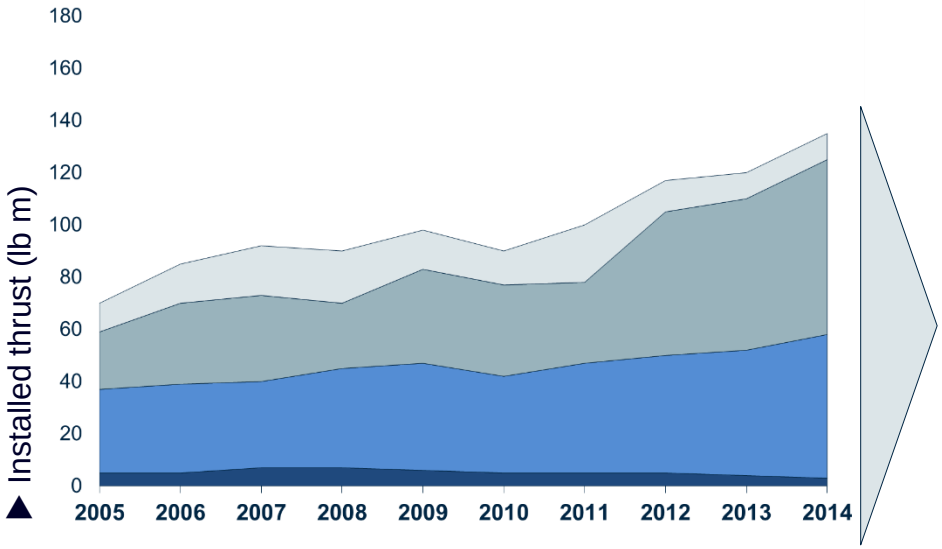
Observations:

- After a slightly decrease in 2015, there is an expected increase of the production.
- About 40% - 42% of new aircraft in the market will be used as a replacement for old machines
- Traffic demand also will increase in almost all regions, specially in Asia, Middle East and Latin America.
- Commercial aircraft industry may be affected by the entrance of new players in the market.

Source: Airbus; Boeing; GAMA; Oxford Economics; Speed News; RCG Analysis

Aero engines production follows the trend – production is continuously increasing since 2010

Engine deliveries 2005-2014
[установленная тяга,]

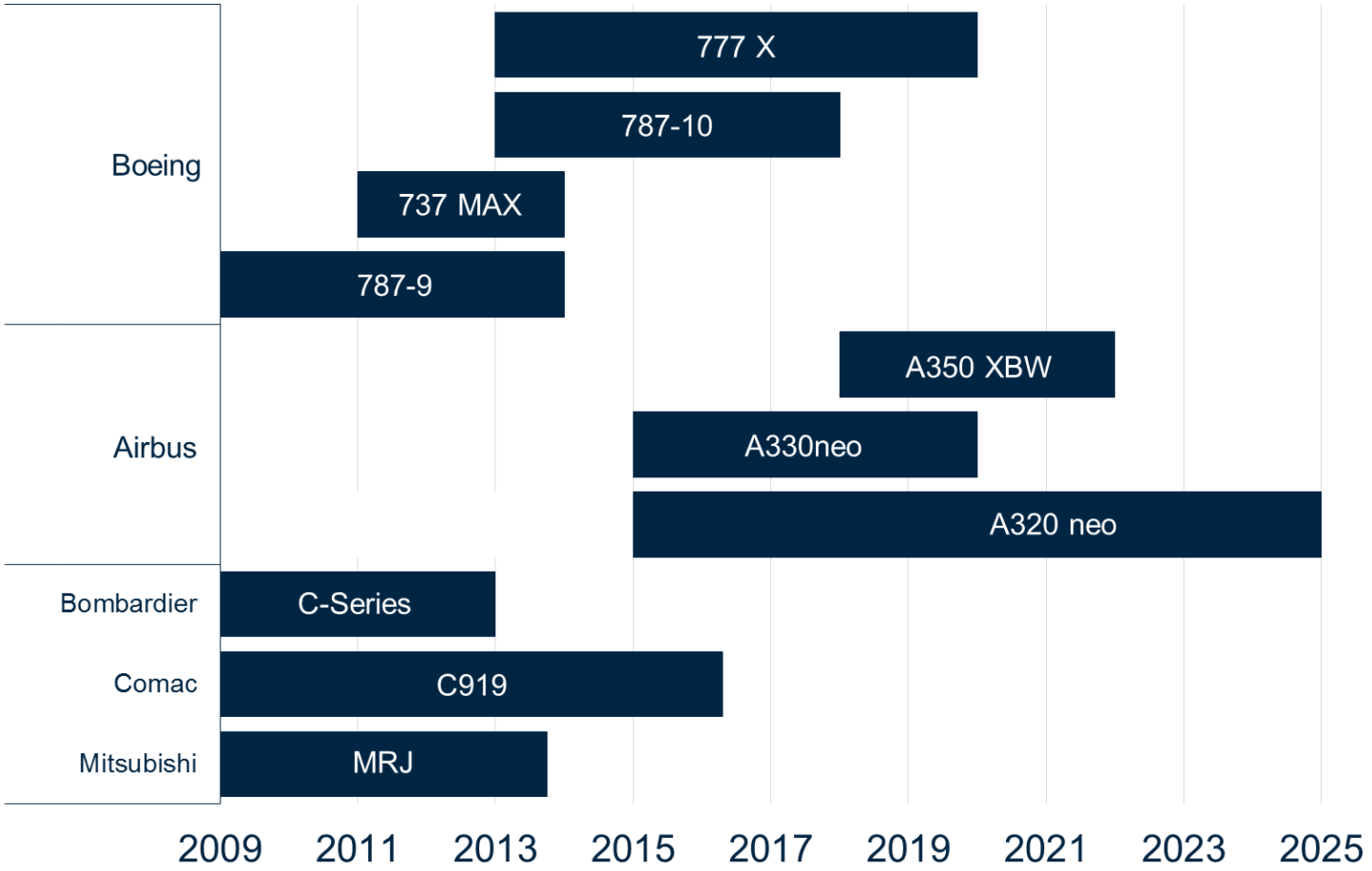


Business jets	Wide-bodies
	
eg. Embraer legacy 650, ACJ380	eg. Boeing 747; A310; A340
Narrow-bodies	**Regional Aircrafts**
	
eg. Boeing 737; A320	eg. Bombardier CRJ700; Airbus 319

Installed thrust refers to the force installed in the engine – depending of purpose and type of engine, this measure changes
Source: Rolls Royce, RCG Analysis

Production ramp-up programs for new models with a large use of high performance materials have started or are planned to start within next years

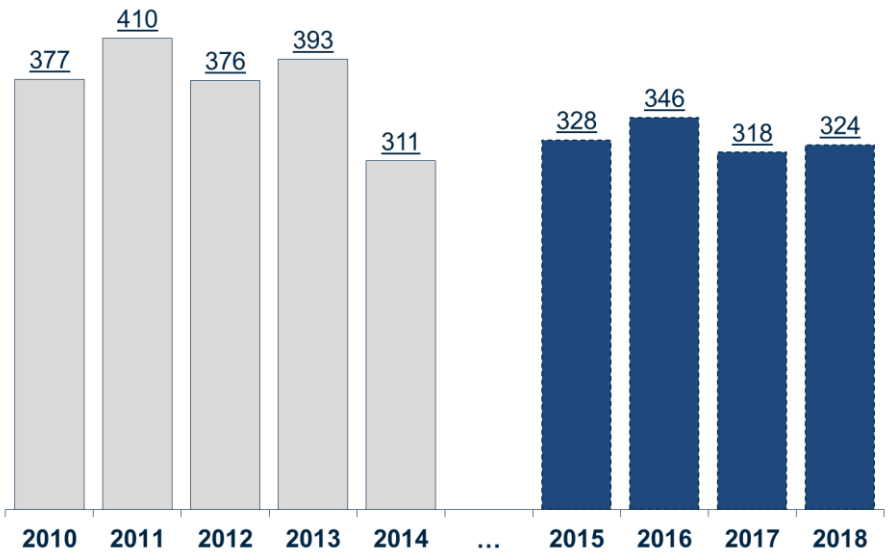
Announced commercial aircraft development programs



Source: RCG analysis, companies‘ data

Also production of military aircrafts is expected to pick-up from 2014's lows

Deliveries and forecast of military aircrafts 2010-2018 [Units]



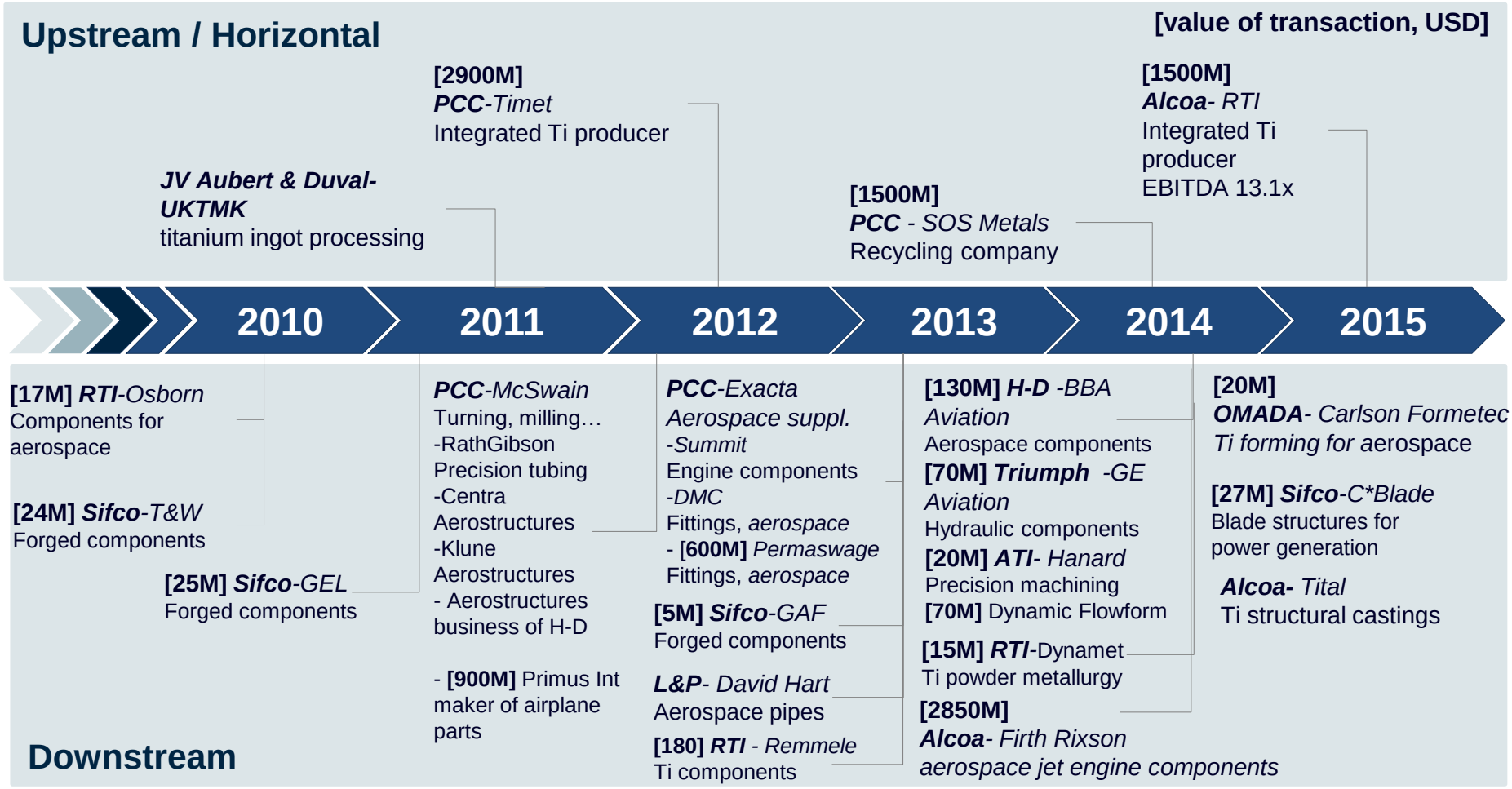
Observations:

- Due to super alloys characteristics, military equipment has an intensive consumption of the material, particularly in the military aircrafts.
- Reportedly most of NATO countries are not projected to meet the 2% spending threshold in 2015, while China has launched a military modernization program.

Source: RCG Analysis, SIPRI, companie's data

Huge number of M&A deals in the last years is focused on downstream processing and components production

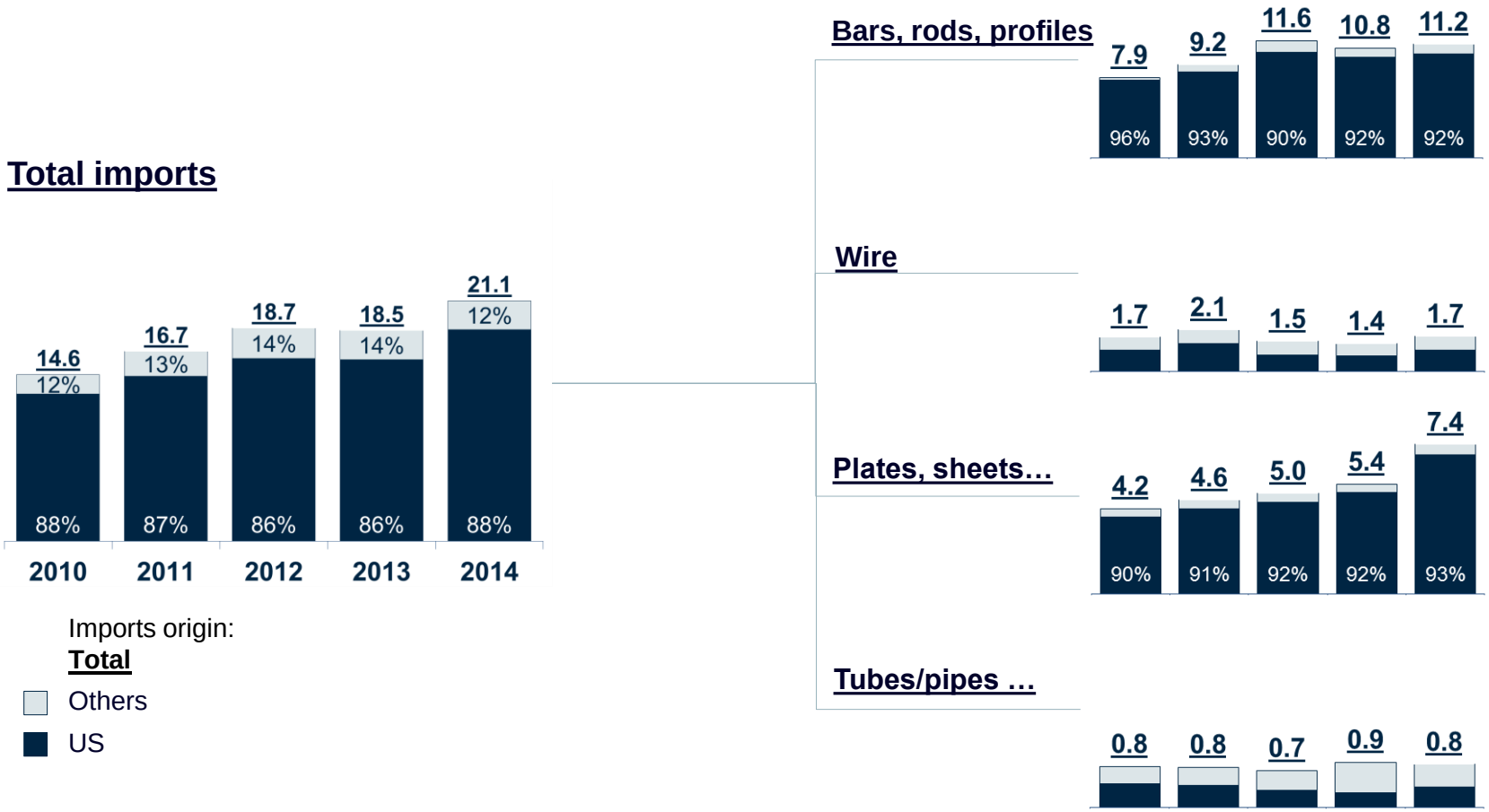
M&A deals in the super alloys and downstream industries



L&P - Leggett & Platt; DMC – Designed Metal Connections; ADI - Aerospace Dynamics Int; H-D - Heroux-Devtek
Source: RCG research

European Ni-alloys market is largely supplied by international, particularly North American producers

European imports of Ni-alloys in 2010-2014 [kt]



Extra-regional imports (i.e. imports from outside of EU)
Source: RCG database

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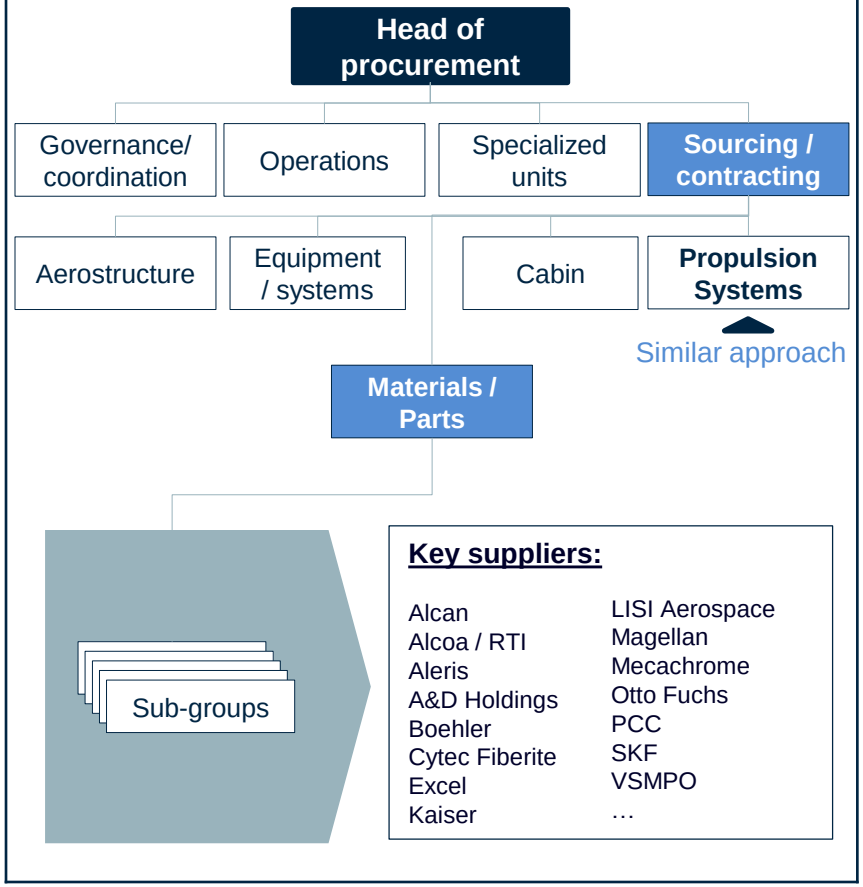
Europe is one of the leading aerospace hubs. Still production process involves global suppliers

Example: Production locations of Airbus in Europe

○ Airbus production facilities

Organization of procurement at Airbus



Listing procedures, required to serve end-users different from company to company

General requirements and concepts for suppliers

Criteria	Trial	Contracting	Performance
▪ Competitiveness in quality, technology, service and cost. ▪ Defect-free products. ▪ Registered and maintained quality systems. ▪ Continual improvement initiatives. ▪ Cost advantages and attractions. ▪ Capability to validate products for specific applications. ▪ Delivery performance.	▪ Supplier's ability to provide support and resources for product approval processes and trials Typical requirements: ▪ Purchased material requirements ▪ Process flow diagram ▪ Failure mode effects analysis ▪ Control plan/ Capability studies ▪ Dimensional/grade results ▪ Material / performance test results ▪ Various submission requirements ▪ Inspections/audits/ homologations	▪ Short- and long-term supply agreements ▪ Payment / terms / conditions ▪ Formal requirements for handling documentation (invoices, uncover of costs and time schedules etc) ▪ Product and process changes ▪ Packaging/labeling requirements ▪ Delivery performance	Typically OEM and Tier I producers regularly monitor and track suppliers' performance for quality, delivery, cost and field disruptions. ▪ Prices ▪ Business review meetings and visits ▪ Yearly re-audits
➡ **Product offer and initial procurement assessment**	➡ **Supplier approval and purchase**	➡ **On-going business operations**	

Source: RCG

RCG offer and competences

1 Market / external assessment → 2 Internal Assessment → 3 Strategy evaluation → > Implementation

Product overview			
▪ I. Sales analysis: markets, products, segments/clients ▪ II. Business performance analysis ▪ III. Demand analysis ▪ IV. Supply analysis ▪ V. Supply-demand gaps ▪ VI. Prices, profitability and commercial conditions ▪ VII. Understanding of supply chain	▪ **Structure and processes** analysis in the following areas: – I. Sales – II. Production – III. Procurement – IV. Organizational structure ▪ **Methodology and systems** – Production & SCM – S&OP – ERP-Check – Smart maintenance – Digitalization – Simulation	▪ I. Market / sales strategy ▪ II. Production strategy ▪ III. Procurement strategy ▪ IV. Organizational structure development ▪ V. IT strategy ▪ VI. Maintenance strategy ▪ VII. Supply chain strategy	▪ I. Sales & Administration ▪ II. Production ▪ III. Procurement ▪ IV. Organizational structure development ▪ V. IT-Systems ▪ VI. Smart maintenance ▪ VII. Digital supply chain ▪ VIII. Cost-cutting programs ▪ IX. S&OP

Further RCG products*: feasibility studies, cooperation partners, simulation studies and trainings

*These products could be made without being in the RCG process
Source: RCG

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General requirements of the potential partners

General points for requirements

Technical requirements	▪ Competitive technologies, quality and service standards ▪ Defect-free products ▪ Maintained and registered quality systems, requirements for additional audits ▪ Meet of specifications and tolerances
Commercial requirements	▪ JIT (just in time) deliveries ▪ One-stop purchase (ability to supply complete required range) ▪ Price attractiveness and ▪ Payment conditions
Formal procedures	▪ Listing criteria and procedures ▪ Homologation process for certain parts ▪ Customer Audits for the supplier in general ▪ Certification of EN/AS/JISQ 9100 and NADCAP accreditation[1)]

[1] for special processes (heat treatment, non-destructive testing, material testing, etc.)
Source: RCG

The value chain also has other entrance opportunities

	Re-rollers / Producers	Subcontractors, Distributors	OEM and Tier I suppliers
Tech.	▪ External audits required ▪ Certification EN/ISO 9100	▪ External audits required ▪ Certification according to ISO 9001 and EN 1090 part 2	▪ external audit: technical requirements and processes ▪ separate internal audit
Commercial	▪ Minor sensitivity to price ▪ No sensitive JIT	▪ Price sensitive ▪ No sensitive JIT ▪ Limitations of product range ▪ Flexible payment conditions	▪ Stable volume and price, service requirements ▪ Typical supply period from 3 to 9 m ▪ Trusted suppliers ▪ Strict delivery compliance ▪ Extended warranty on products ▪ Payment upon delivery (30-60 days) ▪ Most products are shipped on preliminary order ▪ Preferred suppliers with a wide product range
Formal	▪ Not critical	▪ Not critical	▪ Formal listing procedures and requirements ▪ Procurement strategies
Exampls	▪ TK VDM	▪ Kloeckner, Hempel, Scholz, Knauf, Doerrenberg…	▪ Siemens, Alstom, Liebherr, MAN, MTU…
Notes	▪ Potential conflict of interest due to competitive positioning in the other segment and knowledge/know-how transfer risks	▪ Intention to more “commodity” segments (particularly for generalists) ▪ Patterns depends on the positioning of the players – 1) Generalist (KSM, Interfer) or 2) Specialist (Scholz, Hempel, Doerrenberg)	▪ Companies are interested in trusted European suppliers ▪ Many direct customers are running cost-cutting programs that also include reduction of procurement costs with consequent shortening of suppliers lists

Source: RCG