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## The role of the Defence sector in the European Aeronautics Industry

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## Brexit as a (regrettable) complication

- UK as part of Europe if not the EU
  - The continental links of BAE Systems and Rolls Royce
  - The UK presence of
    - MBDA, Leonardo, Thales, Airbus
    - Rheinmetall & Krauss Maffei
  - Extant collaborative projects including A400M
  - The weight of UK R&D and procurement spending and industrial capability

## Basic point

- The defence sector does not exist to enable or support the civil sector
  - has its own justifications
    - Operational independence/strategic autonomy
      - An international and national perspective
    - Reducing the economic burden of defence provision
- But historically civil and military have been closely linked
- Opportunities for synergies and mutual support should be seized

# Military and civil priorities as diverging?

## Civil

- Low cost operations
- Continuous use
- Focused functionality
  - Range
  - Capacity
  - Comfort
  - Speed as settled
- Key sub-system
  - The entertainment system?
- Pilots roles?
- Production
  - thousands



## Military

- Speed, agility, range
- 'Occasional' use
- 'Low' observability
- Surveillance systems
  - Infrared
  - Radar
  - Optical
- Defensive aids
- Weapons
  - Kinetic
  - Directed energy
- Pilot roles?
- Production
  - hundreds

Rotary wing sector as closer civil-military links  
Can/should Europe sustain Airbus & Leonardo?

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Future exploitation of quantum, AI, materials, hypersonics etc?

Dealing with the climate change agenda

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# Military and civil priorities as diverging?

Civil

Military

- Low
- Con
- Foc
- S
- Key
- Pilots
- Produc
- thou

- Speed, agility, range
- 'Occasion
- Infrared systems
- hunder

The significance of civil and military aerospace being counter-cyclical, as during Covid

Materials, hypersonics etc?

Dealing

Rotary wing sector as closer civil-military links  
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# The military aeronautics sector

## Uninhabited platforms

- Remote control and Autonomous
  - Surveillance
    - Civil sector as less demanding
  - Combat
- The enemy beginning to vote re defensive systems

Across the world, marked by new suppliers as the entry barriers are lower

But no European General Atomics

## European defence companies in the world

Rank	Company	Defence revenues 2020 in b.	Defence % of total revenues
1	Lockheed-M	\$62.6	96
2	Raytheon	\$42.0	65
3	Boeing	\$32.4	56
4	Northrop-G	\$31.4	85
5	General Dynamics	\$29.8	79
6	Aviation AIC	\$25.5	38
7	BAE Systems	\$23.5	95
8	China North IG	\$15.2	22
9	L3Harris	\$14.2	82
10	China st ship	\$13.4	20

Rank	Company	Defence revenues 2020 in b	Defence % of total revenues
11	China Aero SIC	\$12.0	32
12	Airbus	\$12.0	21
13	Leonardo	\$11.1	73
14	China South SIGC	\$10.7	31
15	China Electron TG	\$10.5	31
16	Thales	\$9.2	48
17	Huntingdon Ingalls	\$8.7	92
18	China Aero STC	\$7.7	21
19	Leidos	\$7.3	60
20	Almaz-Antey (R)	\$6.0	92



## Gas turbine sector

Rank	Company	Defence revenues in \$b 2020	Defence % of total revenues
25	Rolls Royce	4.8	32
26	Safran	4.7	25
27	General Electric	3.4	6
2	Raytheon (inc United Technologies /P&W)	42.0	65

# Industrial and technical logic: there should be one European programme across crewed and uninhabited combat systems: BUT

- French carrier requirement
- Time scales
- Dassault



- Brexit
- German prevention of BAE Systems-EADS merger in 2012
- [How Germany killed the merger of BAE and EADS - BBC News](#)



## First of all, FCAS is progressing well as planned!

The very first decision to develop a joint European Air Defence System of the next generation was taken by Chancellor Merkel and President Macron, in summer 2017.

[Future Combat Air System \(FCAS\) | Airbus, accessed 29 March 2022](#)

## Combat air: two ambitious rival collaborative programmes

- Franco-German-Spanish **programme**
  - Next Generation Fighter (NGF)
  - Eurodrone (European Medium Altitude, Long Endurance (MALE) Remotely Piloted Aircraft System (RPAS) or EuroMALE
  - An ultra low-observable unmanned combat air vehicle
  - Future cruise missiles
  - Legacy platform updates
- Dogged by limited urgency in military terms
  - Germany now to buy F.35
- Dassault has never done a collaborative project
  - Rafale survived despite being national
  - NGF suspended in March 2022 by Dassault

## Combat air: two ambitious rival collaborative programmes

- Tempest **programme**
- Teamed with Lanca UAV
  - Offers major promise and challenges
    - Advanced radar and avionics
    - Stealth
    - Digital engineering
    - Affordability?
  - The Tempest team
    - UK (MoD, RAF & Industry)
    - Italy
    - Sweden
    - Japan?

Complex collaborative patterns possible at system and sub-systems level

## In European combat air there are two ambitious rival collaborative programmes

- Tempest programme
- Franco-German-Spanish programme

Delivery challenges for both programmes in terms of

- Money
- Workforce sizes and skills
- Corporate attitudes, structures & behaviours

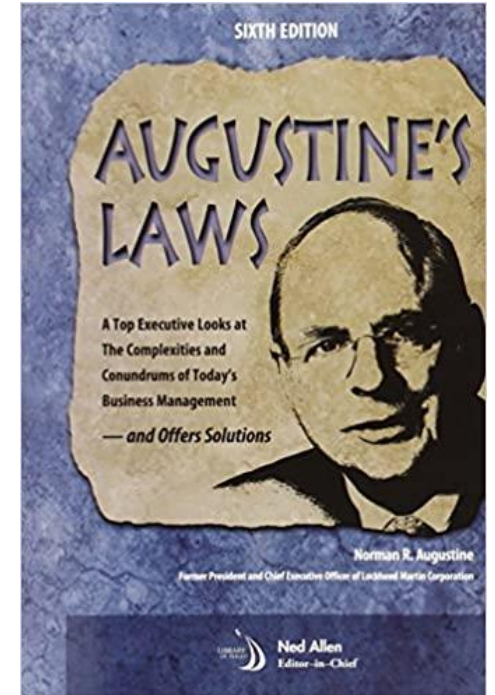
## A significant question: the driving elements of the requirements?

- Provide clear superiority over what Russia will present?
- Provide clear superiority over what China will present?
  - A more significant calculation?
- Comparable with what US will market and want allies to use?
- Exportability and modularity
- Procurement and in-service costs
- Time scales demanded
- Technology risk appetites of the users and suppliers

Also options in acquisition strategies for optimism containment??

## The challenge across European (and US) programmes?

- To level out the problem identified by Norman Augustine in the early 1980s
- If current trends continue, in 2054 the entire US defence budget will be devoted to a single aircraft
- 4<sup>th</sup> industrial revolution as the possible answer
  - Simulate operations
  - Simulate aircraft
  - Design
  - Test
  - Build, including additive manufacture
  - Support
  - Modify



Industrial personnel  
Skills and attitudes

## Visible features in the global aerospace sector

- Customers aspirations to be developers, manufacturers or at least contributors
  - Japan
  - Turkey
  - Korea
  - Indonesia
  - Taiwan
  - Brazil
  - UAE
  - Saudi
- Drone developments proliferate
  - Aerodynamics widely understood

Industrial policy, technology transfer, countertrade and offsets are playing an ever greater role in procurement decisions in Southeast Asia ... as countries look to leverage defence acquisitions to sustain and develop their own aerospace industries

JDW



## The civil/commercial market

- Airbus
  - Bad
    - A380
      - Great for passengers
      - Bad for costs
    - A400M
      - Underestimated challenges
      - Slowly emerging
        - No longer an ugly duckling
        - Not yet a swan
  - Good
    - A320 global winner
    - Manufacturing capability

- Boeing
  - US tanker experience and contract
  - Late etc 787
  - Disastrous 737 MAX

Uncertain future  
Interaction of  
Covid recovery behaviours  
Climate change impact  
The prospects for green fuels  
Civil sector to lead and defence to  
support  
Both Boeing and Airbus as too big and  
important to be allowed to fail??

## The military-civil overlap

- Large military aircraft increasingly expected to be multi-role
  - Troop transport
    - Including parachute troops
  - Cargo transport
  - Tankers
  - Communications hubs
  - Sensor platforms
  - Communications relays
  - Weapons or UAV delivery



Modular and digital design value

- Propellers, gas turbines and landing strips

## The military-civil overlap

- Electronics-intensive airframes
  - The airframe manufacturer may be the sub-contractor not the prime
    - Leidos Special Mission Aircraft
    - UK Shadow Mark 1
      - Raytheon
      - Beechcraft



## Conclusion

- Military sector
  - Collaborate and cooperate or lose operational independence
    - Which is different from commercial viability
  - Value any partner who brings
    - Low level of (managed) political risk
    - Plus an appealing but possibly varied mix of
      - Technology
      - Finance capital
      - Market access
- Commercial sector
  - Pursue the green agenda
    - Environmental impact considerations
    - Resilience and global politics
  - Monitor extended term impact of Covid on business travel