Presented by

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Indian Civil Aerospace Research

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UK TRADE & INVESTMENT

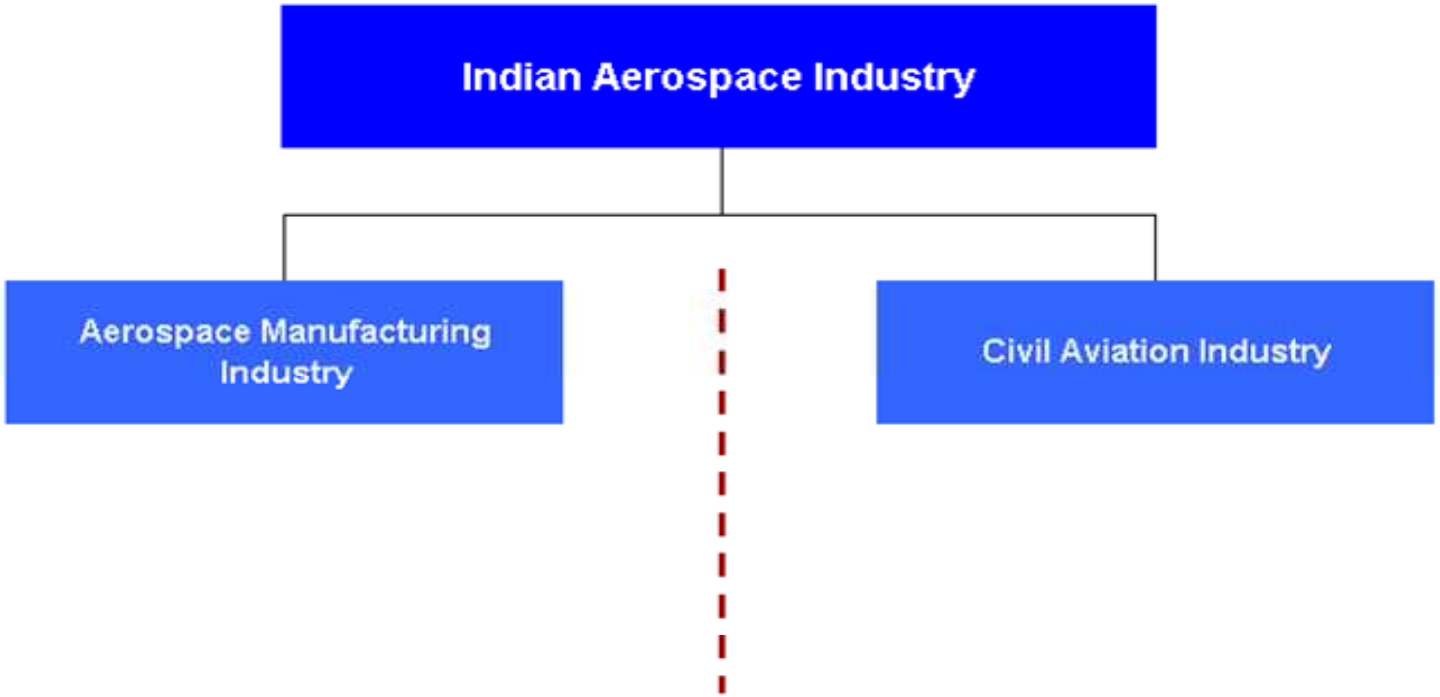
Introduction

- **Who am I?**
  - **10 years aerospace, engineering experience working for Airbus UK and BAE Systems:**
    - **Currently an Engineering Lead on A400M Military Transporter Certification Activities**
    - **6 month Short term business attachment to UKTI as Special Advisor – Aerospace Sector – India May to Oct 2007**
      - **Improve UK companies awareness of the Indian Aerospace Industry and its capabilities.**
      - **Identify the main routes into the market and any current opportunities**
      - **Promote the UK Aerospace Industry in India and increase their awareness of UK capabilities**
    - **A380 Wing – Engineering Operations Manager**

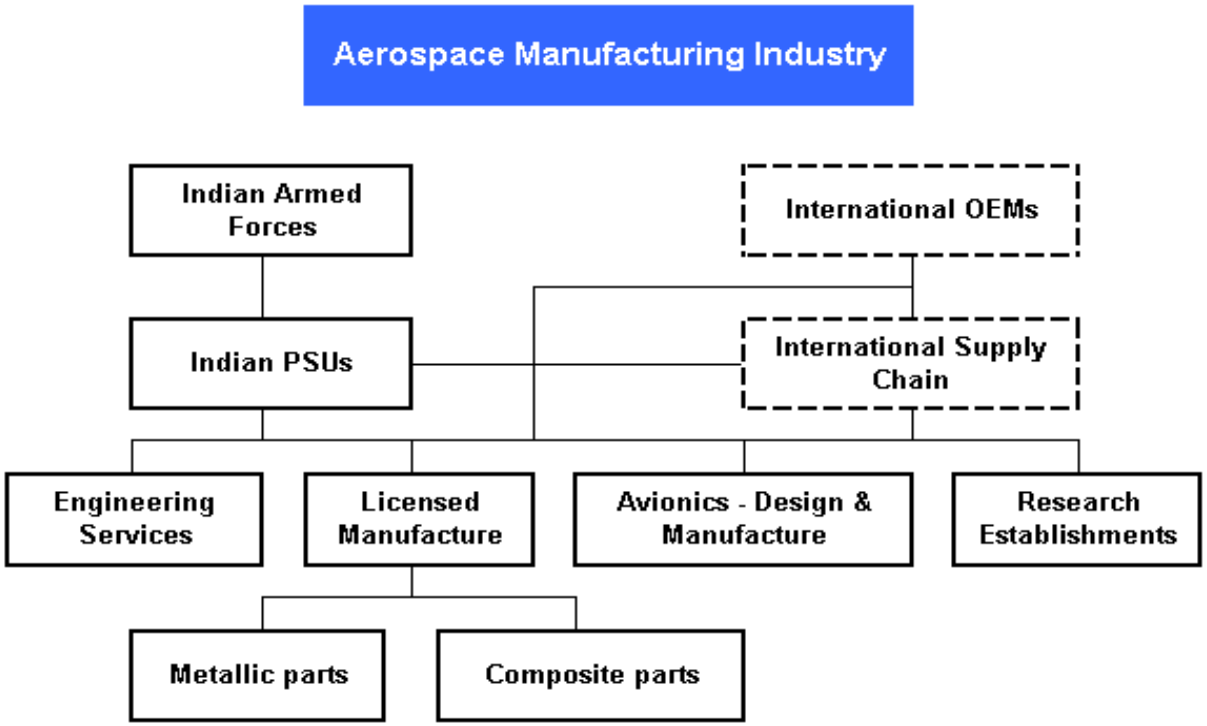
Introduction

- **What are we trying to achieve with this presentation:**
  - **A high level breakdown of the Indian Aerospace Industry**
  - **An overview of 'research' in India**
  - **Civil Research**

Structure of the Indian Aerospace Industry



Structure of the Indian Aerospace Industry



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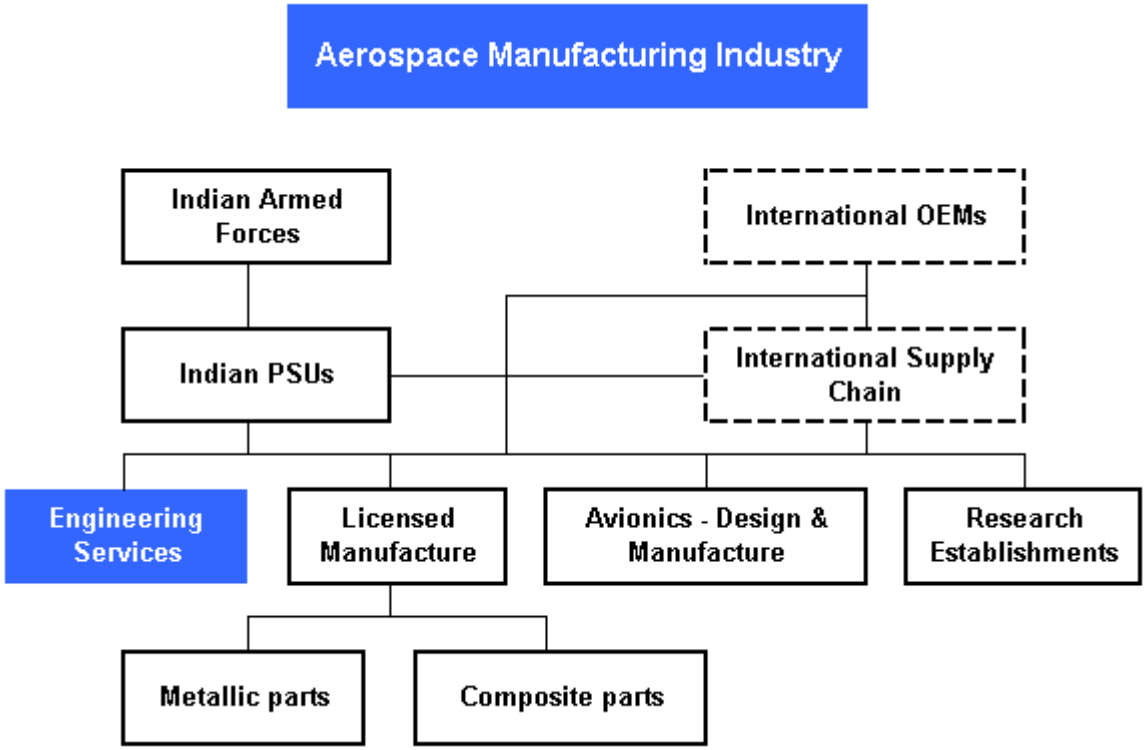
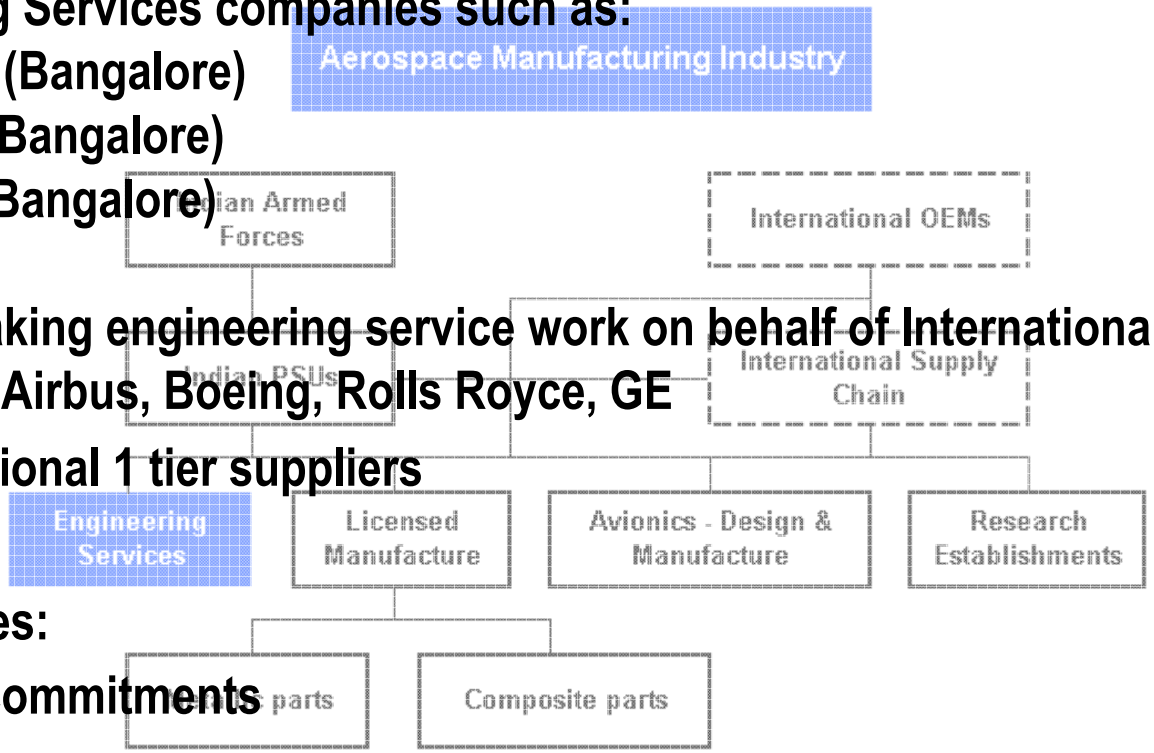
Contracted Research



Contracted Research

- Engineering Services companies such as:
  - Infosys (Bangalore)
  - Cades (Bangalore)
  - Quest (Bangalore)
- Are undertaking engineering service work on behalf of International Companies:
  - OEMs - Airbus, Boeing, Rolls Royce, GE
  - International 1 tier suppliers
- Main motives:
  - Offset commitments
  - Perceived cost benefit



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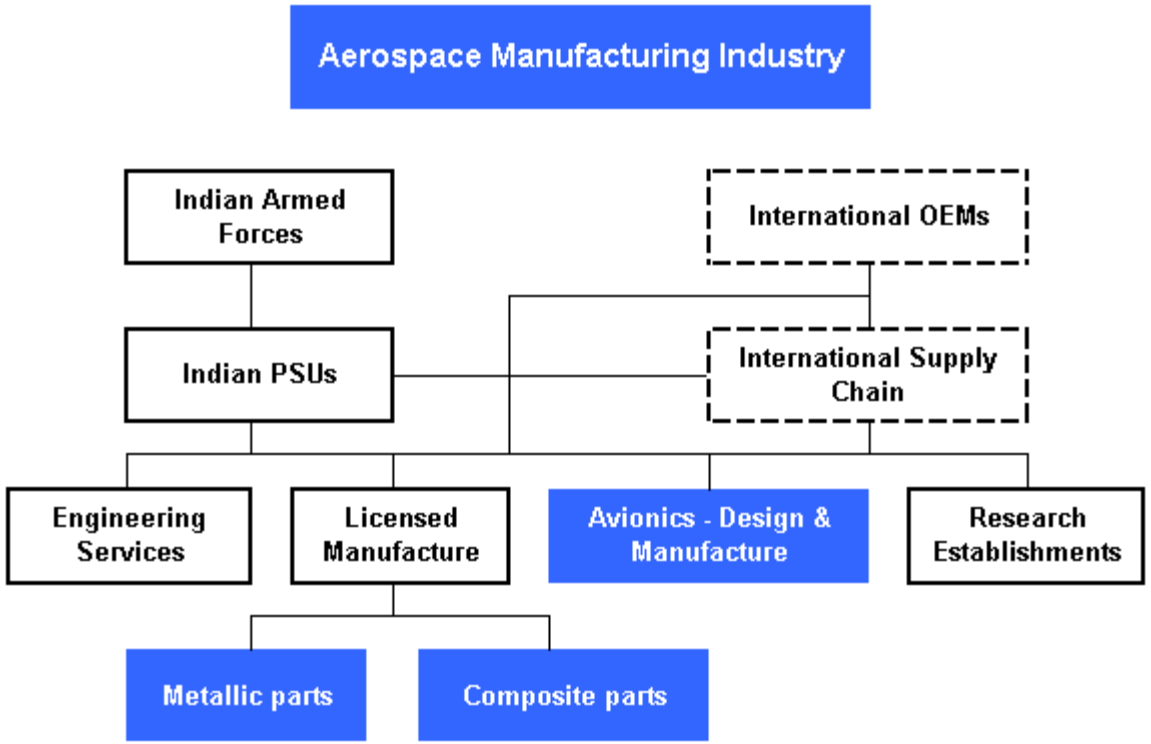
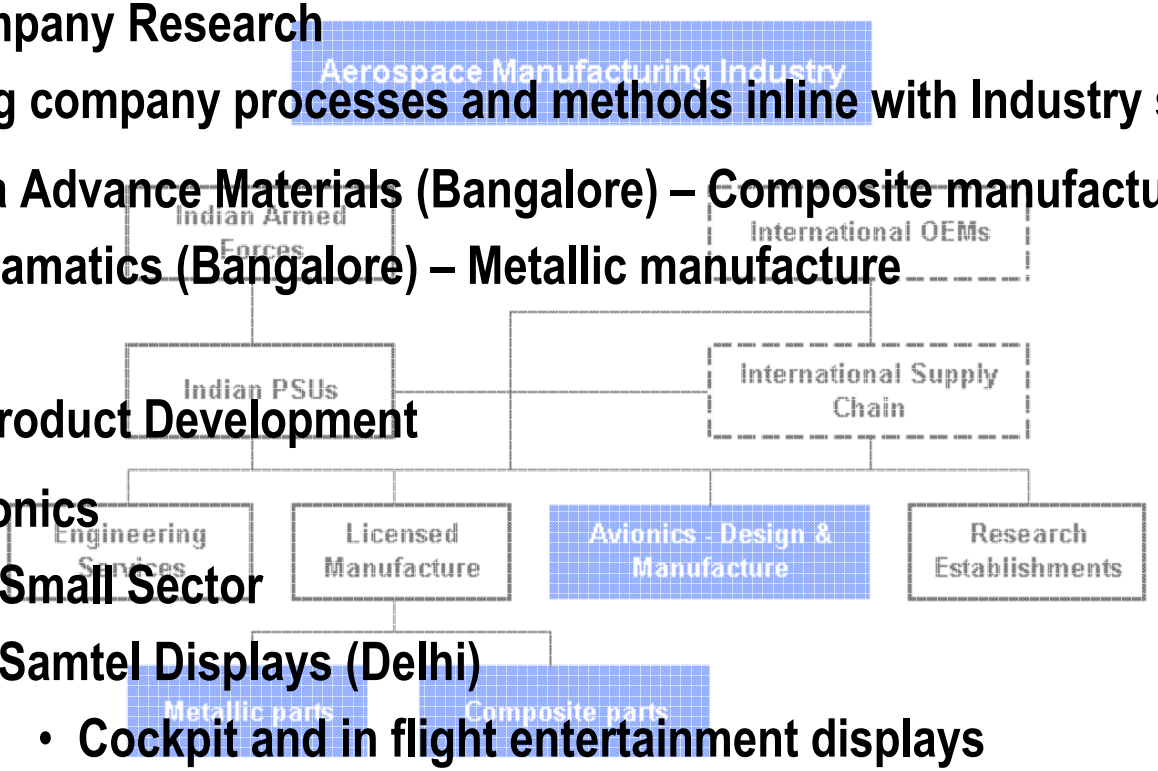
Private Company R & D



Private Company R & D

- Private Company Research
  - Bringing company processes and methods inline with Industry standards:
    - Tata Advance Materials (Bangalore) – Composite manufacture
    - Dynamatics (Bangalore) – Metallic manufacture
  - ‘Real’ Product Development
    - Avionics
      - Small Sector
      - Samtel Displays (Delhi)
        - Cockpit and in flight entertainment displays
        - Looking at developing HuDs and HuMs
      - Larsen & Toubro
        - Currently mainly weapons development – rocket launchers
        - Some avionic development on LCA



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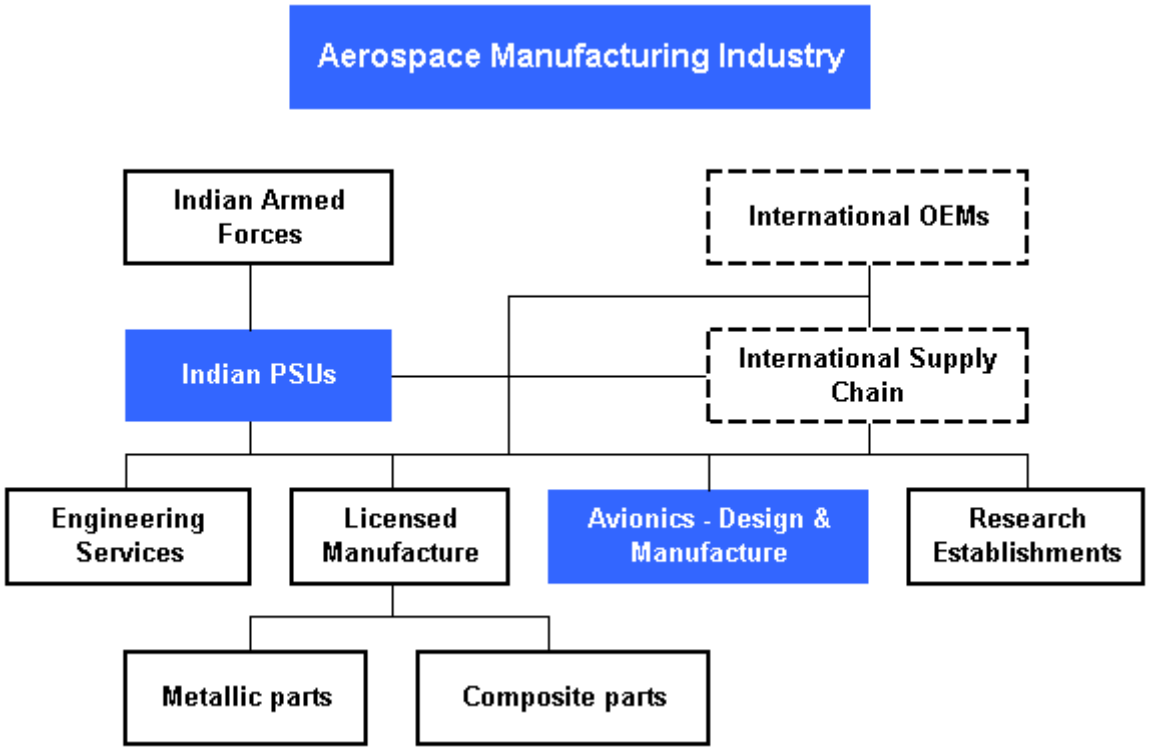
Indigenisation of Technology



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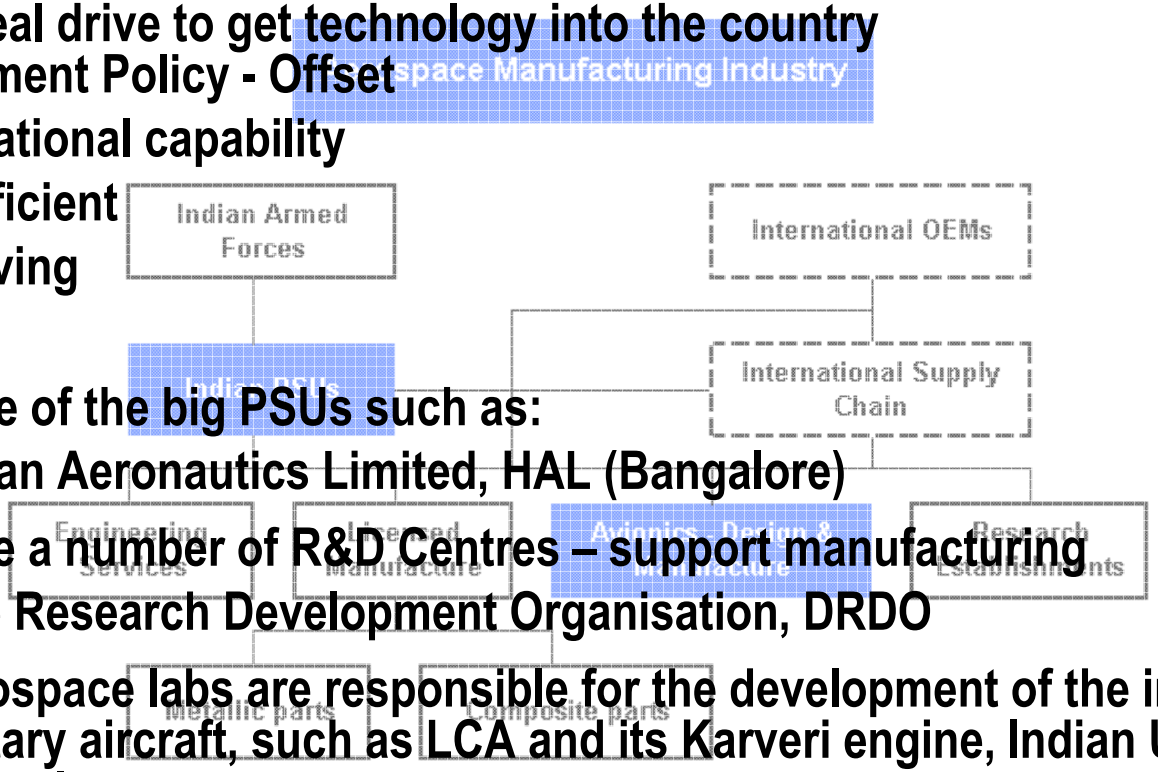
Indigenisation of Technology

- There is a real drive to get technology into the country
  - Government Policy - Offset
  - Prove national capability
  - Self sufficient
  - Cost saving



- Led by some of the big PSUs such as:
  - Hindustan Aeronautics Limited, HAL (Bangalore)
    - Have a number of R&D Centres – support manufacturing
  - Defence Research Development Organisation, DRDO
    - Aerospace labs are responsible for the development of the indigenous military aircraft, such as LCA and its Karveri engine, Indian UAV – technology provers

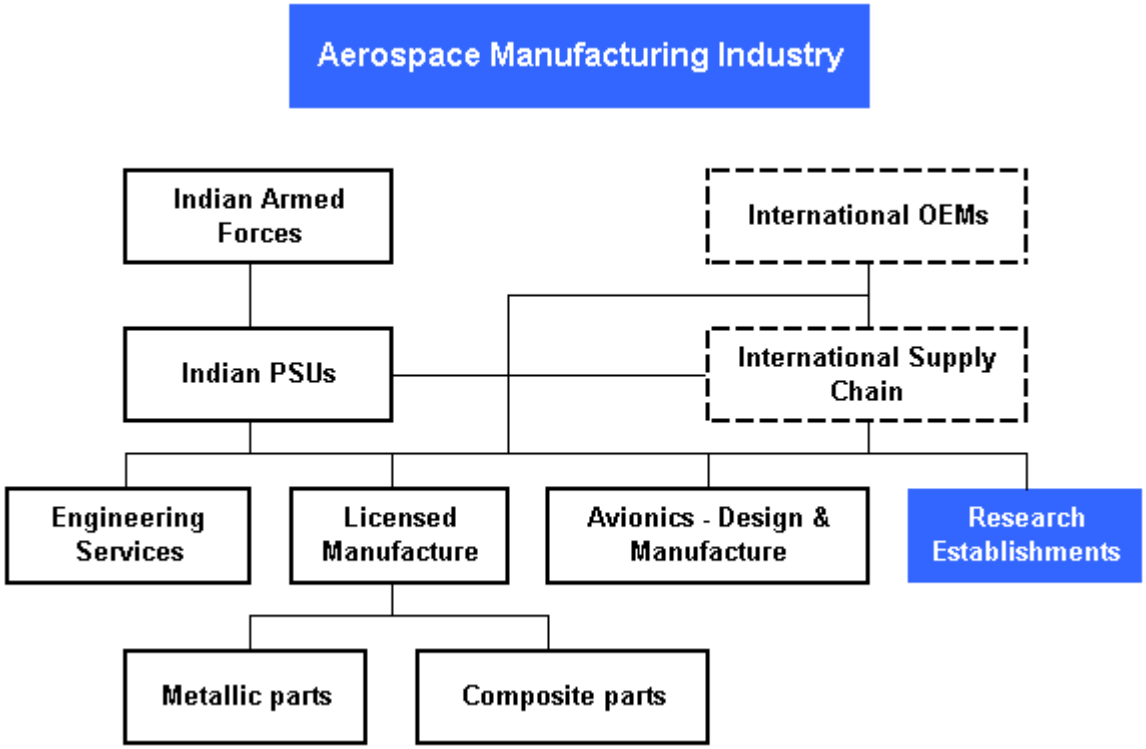
- See a number of smaller companies reverse engineering legacy components on A/C such as Jaguar

- Intellectual Property Rights
  - Public and Private Sectors

Indian Space Research Organisation

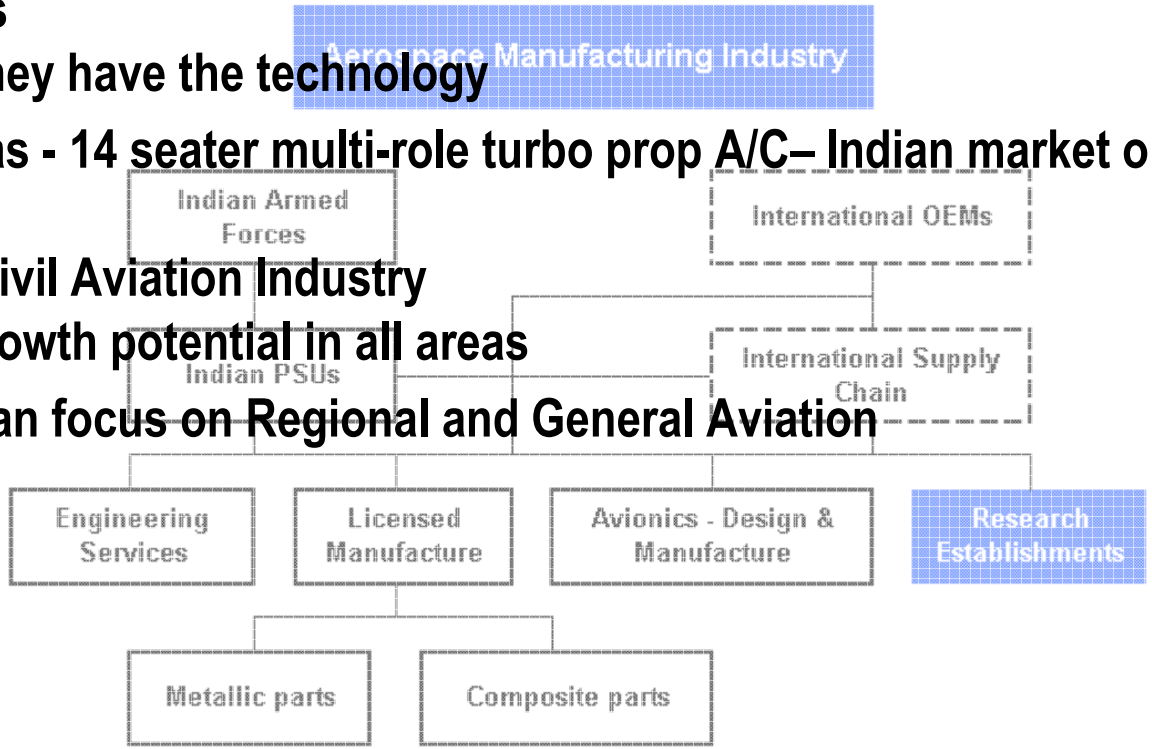
- **Has a 4th largest budget in the World and keeps India as one of the six major space powers**
- **Successful space programme launching their own satellites using their own launch vehicles. They are now offering these to the international market. Are planning an unmanned mission to the moon this year - Chandrayaan-1**
- **Do have a number of international collaborations but these are mainly for mission management – satellite tracking**
- **They have a major focus on developing indigenous technology**
- **Chandrayaan-2 mission, 2011 - Surrey University have started discussions on support ISRO with some of its micro technology for its lunar rover. This is also being done in partnership with the Russian Space Agency**
- **ISRO also have an MoU with NASA**
  - **Include 2 payloads on the Chandrayaan-1 mission**
  - **Outsourcing of work to ISRO**

Civil Research



Civil Research

- Main drivers
  - Prove they have the technology
    - Saras - 14 seater multi-role turbo prop A/C– Indian market only
- Growth in Civil Aviation Industry
  - Huge growth potential in all areas
    - Indian focus on Regional and General Aviation



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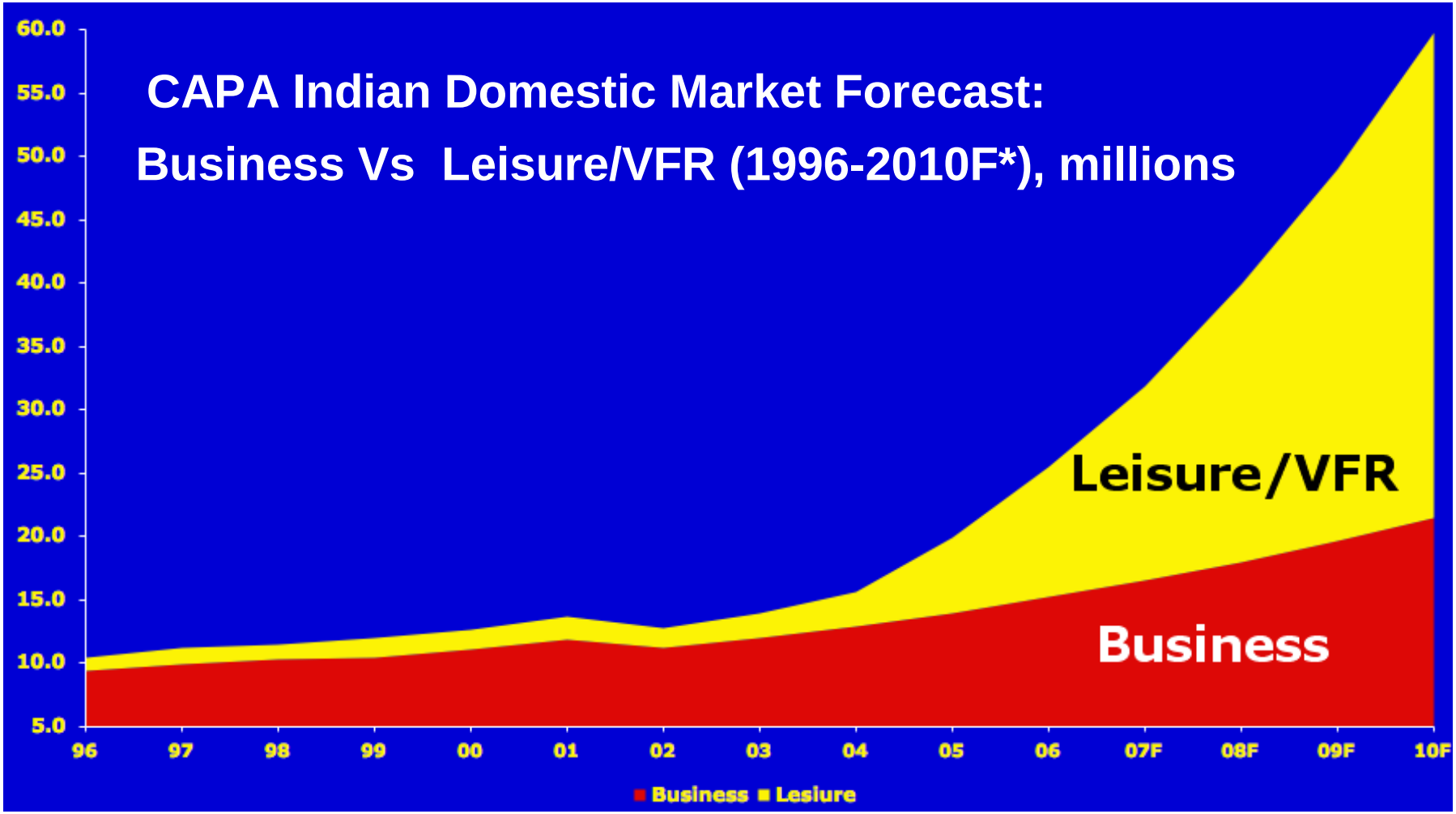
Indian Civil Aviation Growth



Graph courtesy of Centre of Asia Pacific Aviation, (CAPA)

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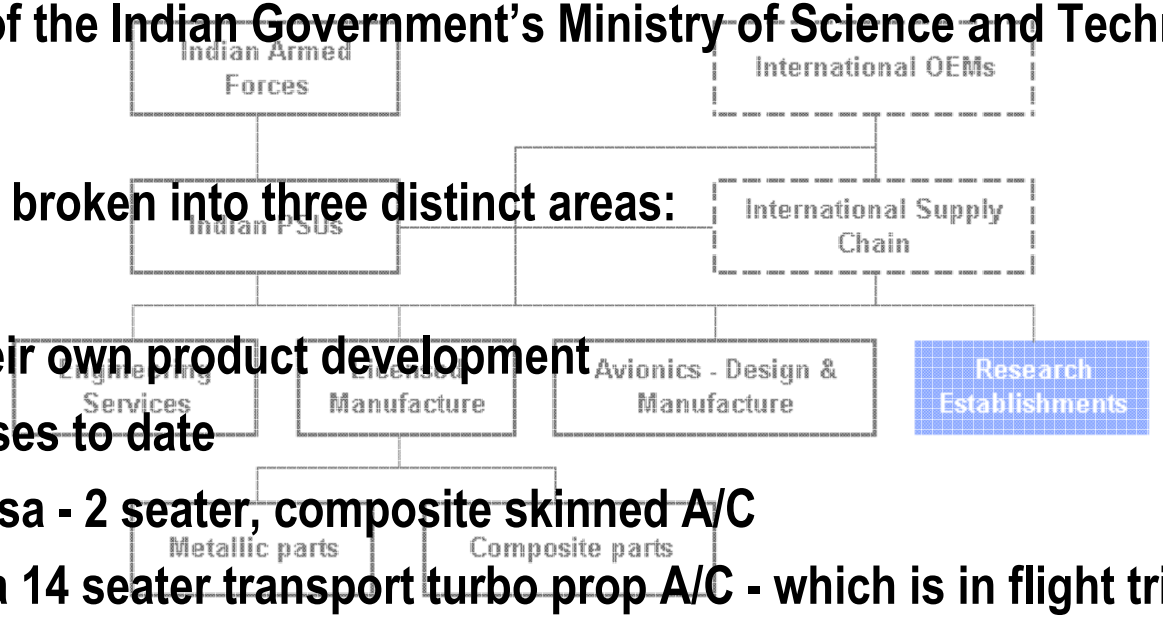
Civil Research - National Aerospace Laboratories

- National Aerospace Laboratories, NAL (Bangalore)
  - Is part of the Council of Science and Industrial Research, CSIR
  - Is Part of the Indian Government's Ministry of Science and Technology



- Research is broken into three distinct areas:

1 R&D for their own product development

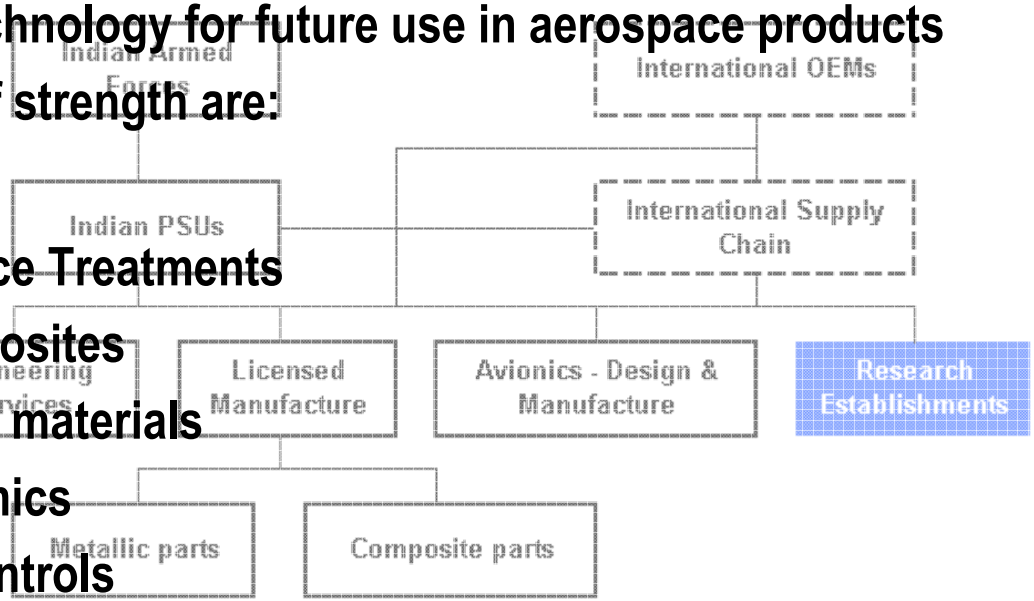
  - Successes to date
    - Hansa - 2 seater, composite skinned A/C
    - Sara 14 seater transport turbo prop A/C - which is in flight trials currently. Flight control system developed with Honeywell.
  - Future Planned Developments
    - A stretched 6 seater Hansa
    - A 19 seater Saras
    - A new 70-90 seat Regional Aircraft, RTA 70

Civil Research - National Aerospace Laboratories

2 R&D for customers such are HAL and ISRO.

3 R&D into new technology for future use in aerospace products

- **Their areas of strength are:**
  - **Materials**
    - **Surface Treatments**
    - **Composites**
    - **Smart materials**
    - **Ceramics**
  - **Flying Controls**
  - **Computational Fluid Dynamics**



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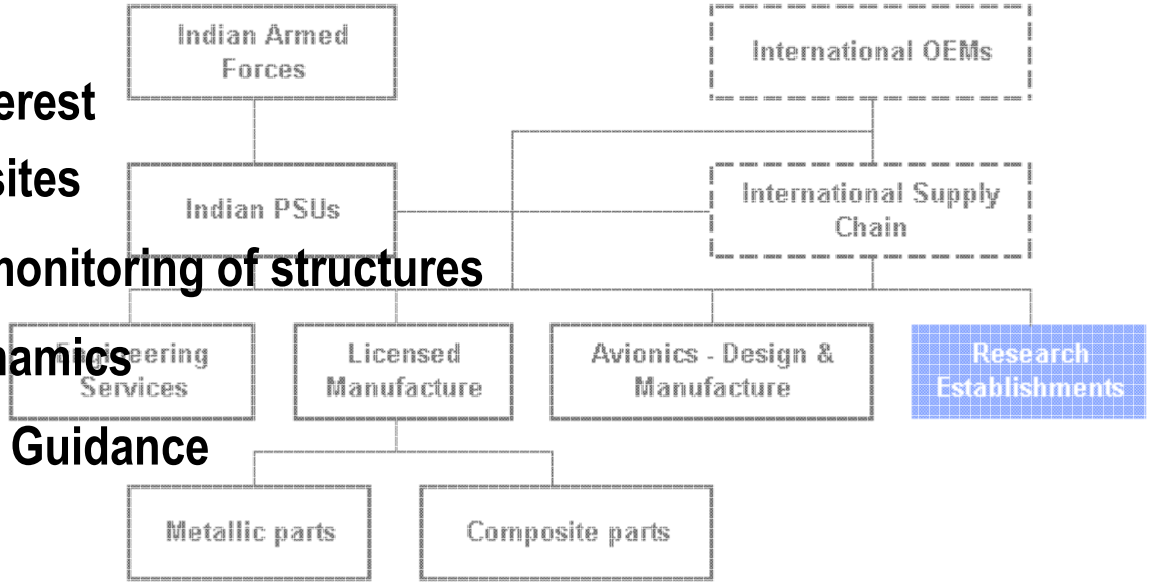
Civil Research - National Aerospace Laboratories

- **Current Collaborations**
  - **Boeing, CAA – UK**
  - **RMIT – Australia**
  - **Surrey Satellites – UK**
  - **DLR – Germany**
  - **Several of the Indian Aerospace Organisations: HAL, ISRO etc**

- **NAL are looking for collaborations with international organisations: academic or industrial.**
  - **Are not looking for contracted research**

Civil Research – IISc, Department of Aerospace

- Indian Institute of Science, Department of Aerospace
  - Academic institute undertaking research and post grad studies
- Areas of Interest
  - Composites
  - Health monitoring of structures
  - Aerodynamics
  - Control/ Guidance
- Have a centre of excellences for CFD and for Composites



Civil Research – IISc, Department of Aerospace

- Current Collaborations (never entirely clear how significant these are)
  - USA – Boeing, P&W
  - UK – Uni. of Leicester, Southampton, Cambridge
  - Japan – Uni. of Tohoku, Hosei, NAL, Jaxa
  - Australia – Uni. of Queensland
  - France – Toulouse
  - Germany – DLR
  - Korea – Kangwon National University
  - Canada – P&W
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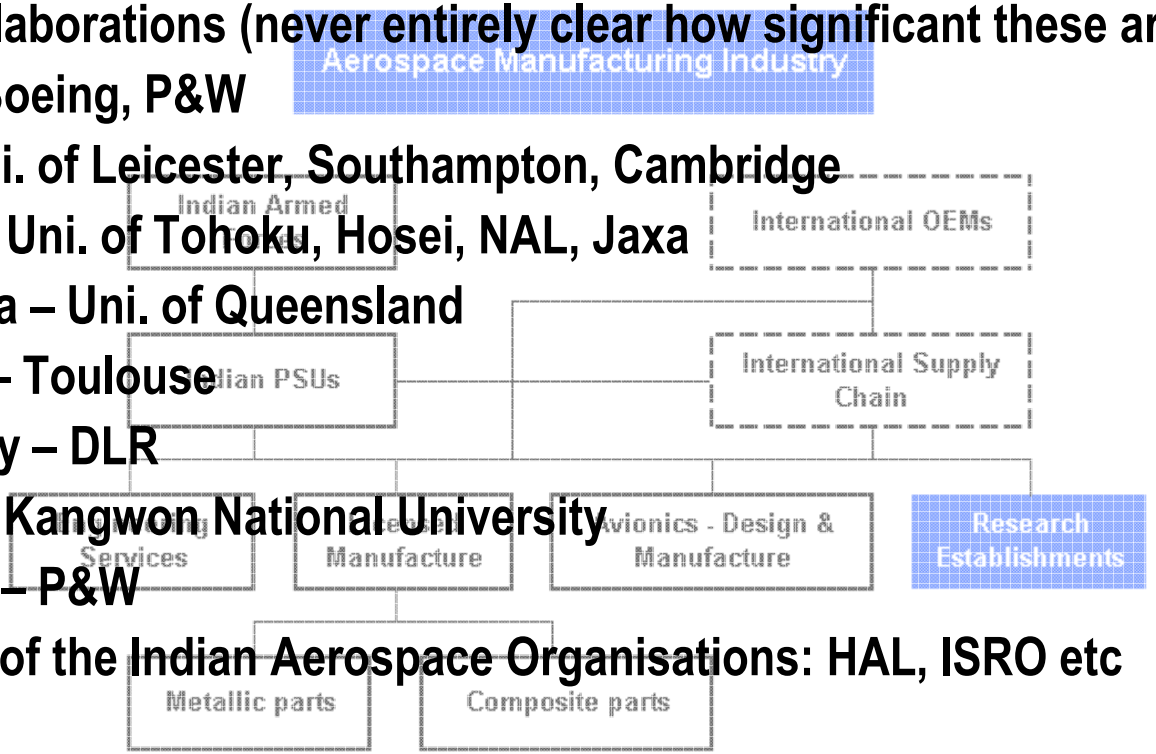

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Thank You

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