



# Aeronautics Research & Development Board

## Research opportunities with AR&DB

[Dr. S. K. Pandey, Scientist, `F`](#)

Additional Director & Member Secy (ARP, M&M and GTMAP)

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Metcalfe House, Delhi – 110 011

Proposal to be submitted - [aradb.hqr@gov.in](mailto:aradb.hqr@gov.in)

# Aeronautics Research & Development Board (AR&DB)

Aeronautics R&D Board is a national body to cater the present and futuristic needs of the country through various R&D projects in the area of aeronautics, missiles and associated weapon systems, civil aviation. It provides a forum for discussions on policy issues and evolving aeronautical perspectives suitable recommendations to Government of India if necessary.



## THE MANDATE

- Formulate R&D Programs for maximum self sufficiency
- Civil and Military Aviation including Carrier Aircraft.
- Create Basic and National facilities
- Consider R&D studies with industries in collaboration with academia
- Initiation of various promotional activities through education, training, workshop, conferences, awards scholarship to create a

# COMPOSITION OF AERONAUTICS R&D BOARD

1. SA to RM, DRDO	Chairman
2. Secretary, Defence	Member
3. Secretary, Defence Production	Member
4. ISRO, Chairman	Member
5. DG R&D (Aeronautical Systems)	Member
6. Deputy Chief of Air Staff	Member
7. DG (Technology Management)	Member
8. Addl. FA (R&D) & JS	Member
9. Programme Director ADA	Member
10. Director, DRDL/RCI/ASL	Member
11. Director ADE	Member
12. Director, GTRE	Member
13. Director, NAL	Member
14. Director, VSSC	Member
15. President, Aeronautical Society of India	Member
16. Director (Design & Development) Hindustan Aeronautics Ltd., Bangalore	Member
17. Secretary, AR&DB	Member Secretary

## COMPOSITION OF AR&DB STEERING COMMITTEE

1.	<b>Dr Vikas Kumar, Ex Director, DMRL</b> <b>Dr (Mrs.) Tessy Thomas, DG (Aero Systems)</b> <b>Sh. Hari Babu Srivastava, DG(Technology Management)</b>	<b>CHAIRMAN</b> <b>Co-Chairperson</b> <b>Co-Chairman</b>
2.	Director, NAL, Bangalore	Member
3.	Director, GTRE, Bangalore	Member
4.	Director, DRDL, Hyderabad	Member
5.	Director, ADE, Bangalore	Member
6.	Director, Air Staff Requirement, New Delhi	Member
7.	General Manager (Design/ARDC), HAL, Bangalore	Member
8.	Director, DMRL, Hyderabad	Member
9.	Director General, Civil Aviation, R&D Centre, New Delhi	Member
10.	Director, Directorate of Special Project, Dept. of Space Antariksh Bhawan, ISRO, Bangalore	Member
11.	Secretary, AR&DB	Member Secretary



# Summary of Work Done (FY 2022-till date)

S.N o.	Description	Total No's	Remarks
1.	Panel Meetings held	19	New Panel Chairman took over the charge in Meetings held in Sep 2022
2.	Proposals Received	63	Total Cost Rs 54.4 crores
3.	Proposals Reviewed	49	
4.	Proposals Recommended	19	
5.	Proposals Rejected	08	
6.	Projects Reviewed	73	
7.	Projects recommended for closure	13	
8.	Detailed Database of Projects Prepared	250	Forwarded to ERIPR
9.	Participated in Def Expo 2022 and Displayed AR&DB Posters and Movie at Research Boards Exhibition Stall		

# THRUST AREAS OF SPECIALIST PANELS

## Aerodynamics Panel

- Optimization of aerodynamics designs
- Experimental gas flows
- Layering and stabilization of flows
- Shock tubing
- Optical flow diagnostics, Vortex and computational fluid dynamics
- Algorithm development
- Coding for numeracy in gas dynamics

## Aerospace Resources Panel

- Institution of awards for Innovative design & projects
- Invited Lectures
- Information Technology for Aerospace Applications
- Rapid Information flow systems
- Organizing Workshops, Seminars, training in aeronautics

## Materials & Manufacturing Panel

- Composite and hybrid composites
- Aero elasticity
- Smart materials
- Self healing materials
- Stealth Materials
- Sensor Materials
- Functionally Gradient Materials and Laminated Structures
- Intermetallics and Refractory Metals and Alloys

## Structures Panel

- Active/Adaptive Aero elastic surfaces
- Hybrid structures for improved durability and damage tolerance
- FEM Structural Modeling to include composite sandwich, smart structures and strength, stiffness and life of bonded repairs
- Onboard Health Monitoring and crack growth measurements



## THRUST AREAS OF SPECIALIST PANELS

### Systems & Systems Engineering Panel

- Control systems
- RF and Microwave Engineering
- Navigation systems
- Communication Engineering

### Unmanned Aero Systems Panel

- Micro and other UAV's for civil / defence, aerospace application
- Remotely Piloted Vehicle (RPV)

### Propulsion Panel

- Air breathing Jet Engines
- Rocket Propulsion
- Pulse Jet
- Scramjet engines
- Supersonic mixing and combustion

### NATIONAL INITIATIVES

#### GAS TURBINE MATERIALS AND PROCESSES (GTMAP)

- High temp sensor materials
- Lifing science and technology
- Advanced manufacturing
- Structure materials and Processing
- Coating
- Modeling and Simulation

## AR&DB's High Temperature Materials Initiative With Focus on Gas Turbine Materials (GTMAP)

- GTMAP programme is an effort to execute multiple research projects connected by a common theme of high temperature Gas Turbine Materials And Processes (GTMAP) using funds available for AR&DB.
- In view of the common objective and to ensure better linkage of research deliverables to gas turbine requirements, the projects under GTMAP umbrella are assessed and reviewed from a technical stand point by Project Assessment & Review Committees (PARCs) specifically constituted for the purpose by drawing up members from GTRE and DMRL and recommended finally by Apex Programme Reviewing Team (APRT).

**- Launched in June 2014**

**- Funding started in September 2015**



**Prof Amol Anant Gokhale**  
IIT, Bombay  
**Chairman**



**Shri Hari Babu Srivastava**  
DG (TM) & OS  
**Co-Chairman**



**Dr K Gopinath**  
Scientist, DMRL  
**Programme  
Coordinator**



# GTMAP - Focus Areas of Sanctioned Projects

36 projects

## High Temp Intermetallics (1)

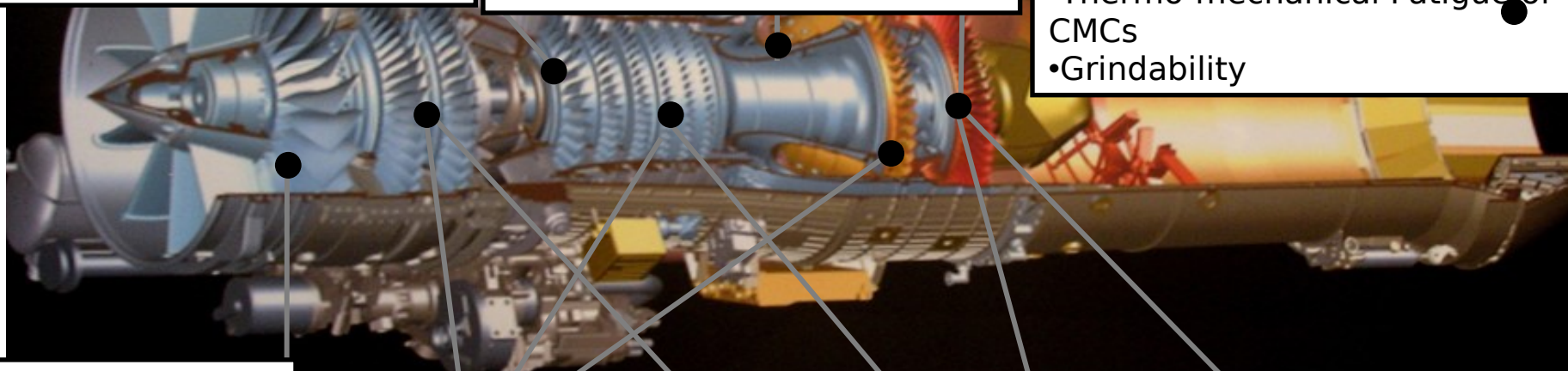
- Str & Props. of Gamma TiAl

## High Temp Metallic Alloys (3)

- Tungsten Free Co-based Superalloy
- Crystal plasticity models for creep-fatigue deformation
- Life prediction of coated and uncoated turbine blades

## Ceramic Matrix Composites (5)

- Dev. of Robust C<sub>f</sub>-SiC composites
- 3D Reinforcements for CMCs
- Structure-prop. correlations in CMCs
- Thermo-mechanical Fatigue of CMCs
- Grindability



## Low Temperature Coatings (3)

- CNT reinforced WC-Co Coatings
- Nano layered erosion resistant coatings
- Fretting wear of

## Mfg. Aspects of HT Materials (7)

- Hybrid m/cing of micro holes
- High speed deep grinding, EC milling
- LFW, SPF&DB

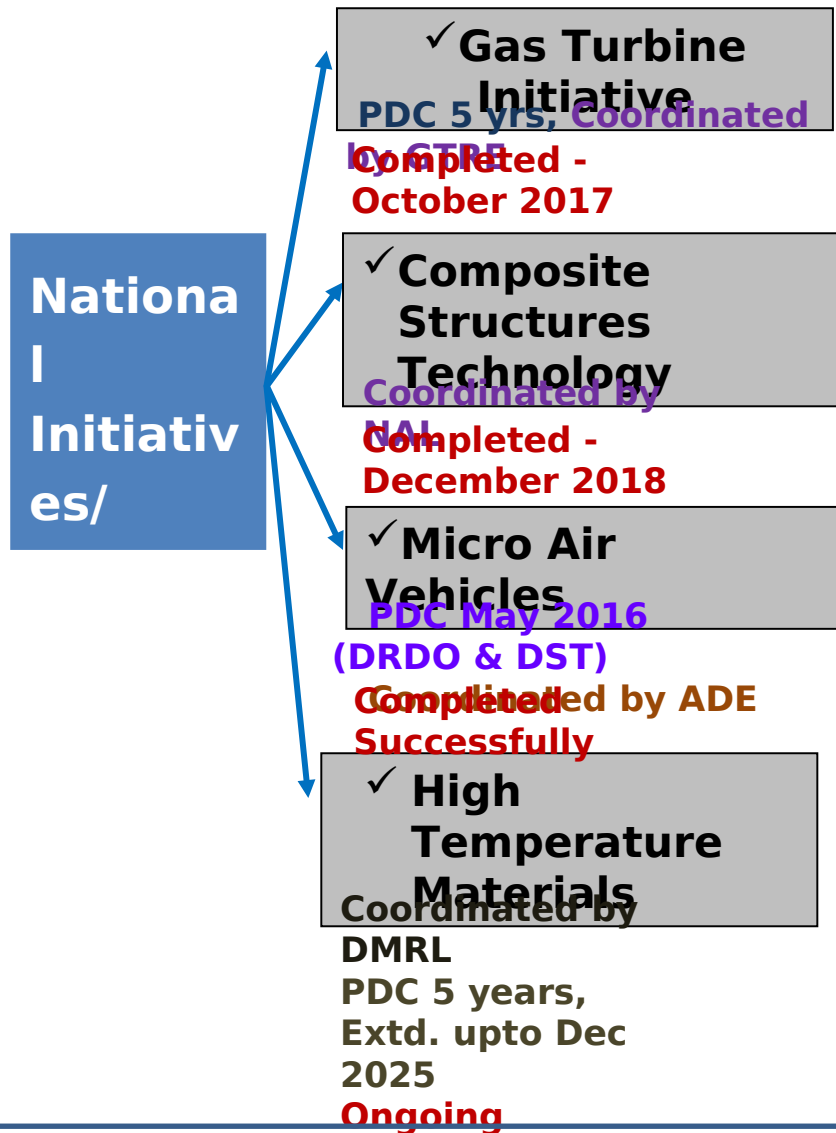
## Mtls. for HT Sensors (7)

- Thin film strain gauges and temperature sensors
- Photopatternable thick film temperature sensors
- High T<sub>c</sub> Piezoelectric and Piezoresistive Sensor materials

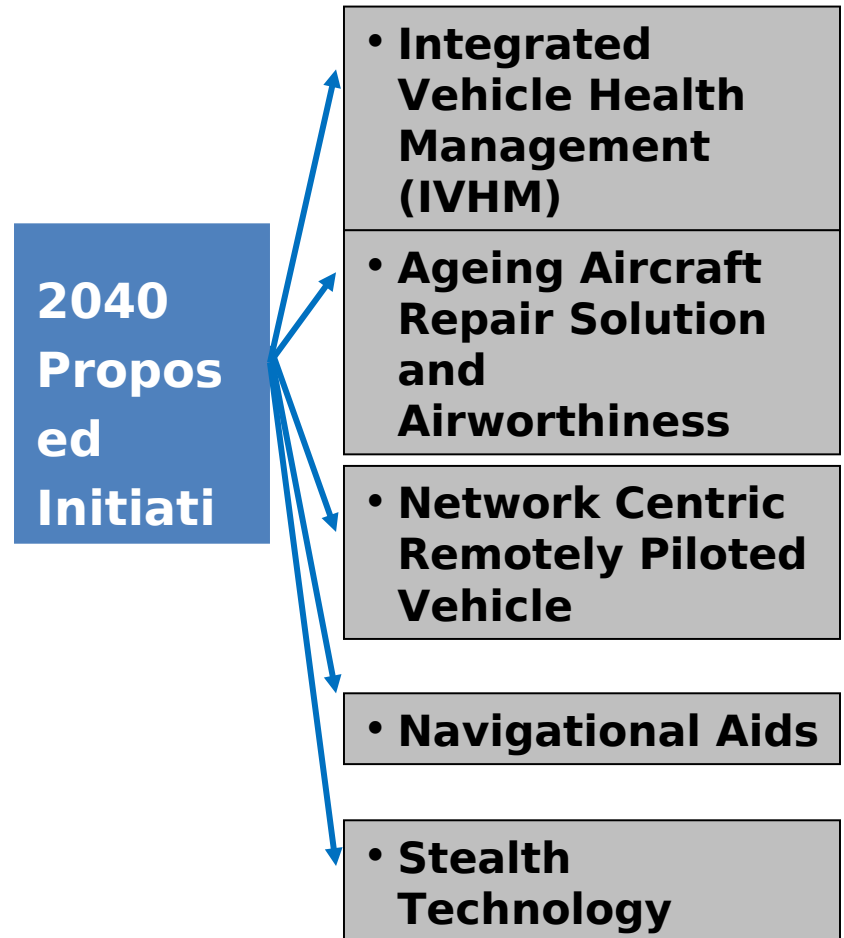
## High Temp. Coatings (6)

- HT Mech behaviour of bond and top coats at small length scales
- High entropy alloy coatings
- New bond coats
- TBCs through suspension plasma spray process

## AEROSPACE PERSPECTIVE-2025



## AEROSPACE PERSPECTIVE-2040





# AR&DB Road Ahead

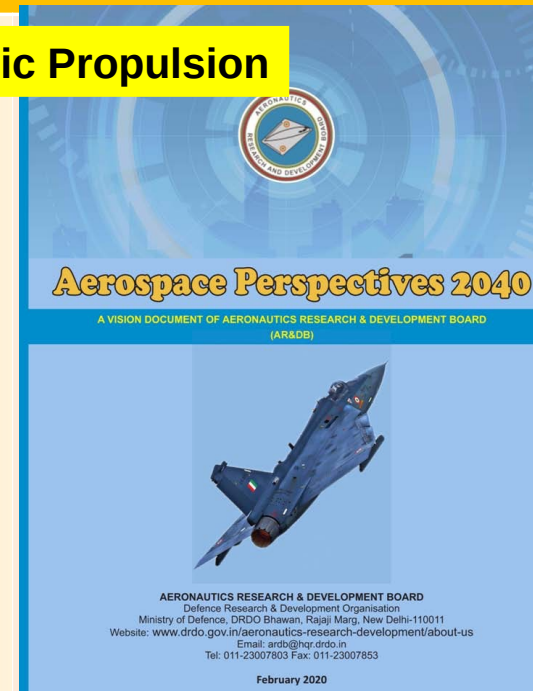


- The thrust areas for development of Advanced Medium Combat Aircraft (AMCA) have been identified for taking up with academia for research.
- National Programme – Aircraft Health Monitoring coordinated by ADA is under augmentation.
- Recently the board with its foresight and opinions of a committee with experts from the aeronautical community, prepared a vision document - Aerospace Perspectives 2040, which outlays the roadmap for future thrust

## FUTURE THRUST AREAS

1. Next Gen. Fighter Aircraft
2. Aircraft Health Management
3. Hypersonic Vehicles
4. Space Defence Technologies
5. Stealth Technology
6. Drones & Swarms Technology
7. Alternate Propulsion Technologies
8. Advanced Materials and Manufacturing
9. Transport Aircraft – Military, Civil

## 10. Electric Propulsion



## Challenges:

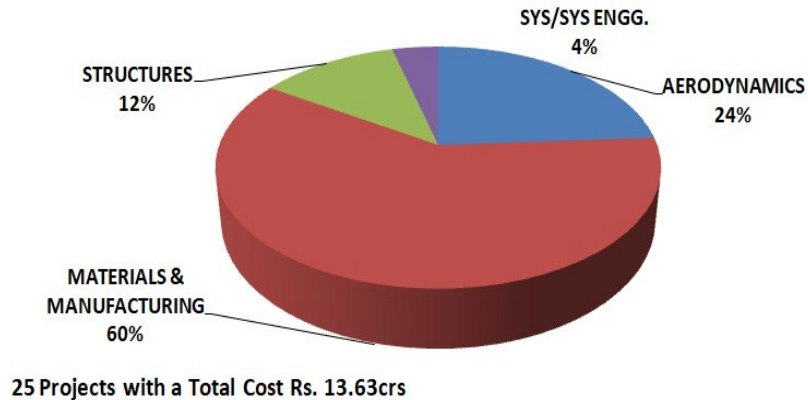
- **Additive manufacturing processes/techniques for High Temperature Materials in Gas Turbines, which opens up a new design philosophy for turbine parts or components**
- **Research areas for repair and refurbish**
- **Innovation for weight saving and value addition**

• **Underlying characteristics and properties of many metal powders, especially HT superalloys not well understood and tested to industry's standards**

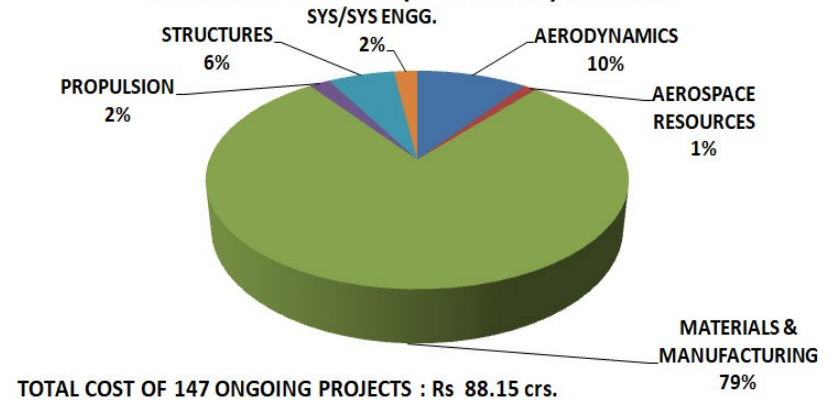
• **Reliability of the Build characteristics produced by different additive manufacturing. Machines with same model and manufacturer remains a challenge**

# AR&DB PROJECTS DETAILS SANCTIONED DURING THE FINANCIAL YEAR 2020-21

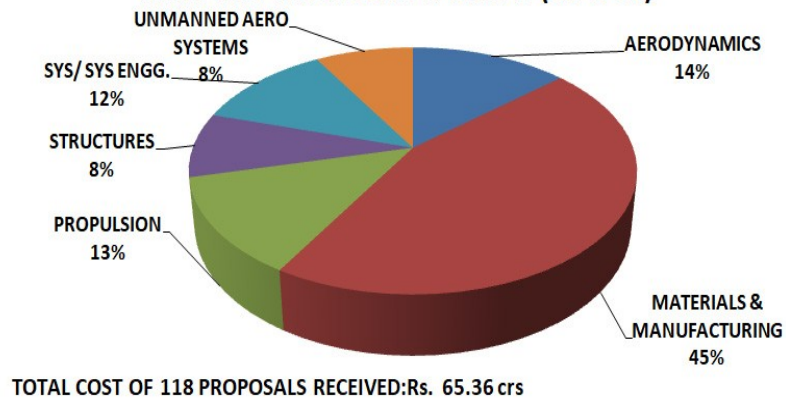
## NEW PROJECTS SANCTIONED PANELWISE (2020-21)



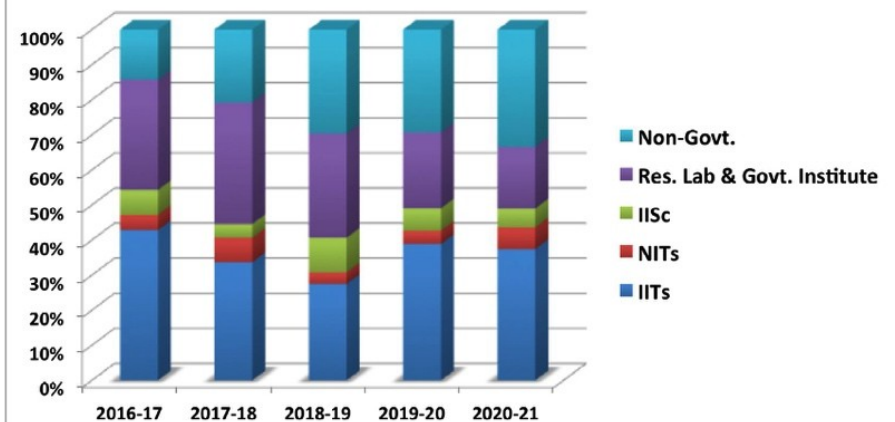
## ONGOING PROJECTS (PANELWISE)- 2020-21



## PANELWISE PROPOSALS RECEIVED (2020-21)



## ONGOING PROJECTS INSTITUTE-WISE (2016-17 to 2020-21)





**STEERING COMMITTEE OF AR&DB**  
**DG (Aeronautical Systems)**  
**DG (Tech Management)**  
**SECRETARY, AR&DB**

**Discussion with Academia/ CSIR labs/ Research Institute in  
consultation with Labs**

**Presentation before Secretary D(R&D)/  
Chairman AR&DB**

**Initiation of Programme proposed by  
Secretary, AR&DB**

<50 Crores

**Addl. FA &  
JS**

**Secretary DD  
R&D**

>50 Crores

**Secretary, DD  
R&D**

**Addl. FA & JS**

**FA&DS**

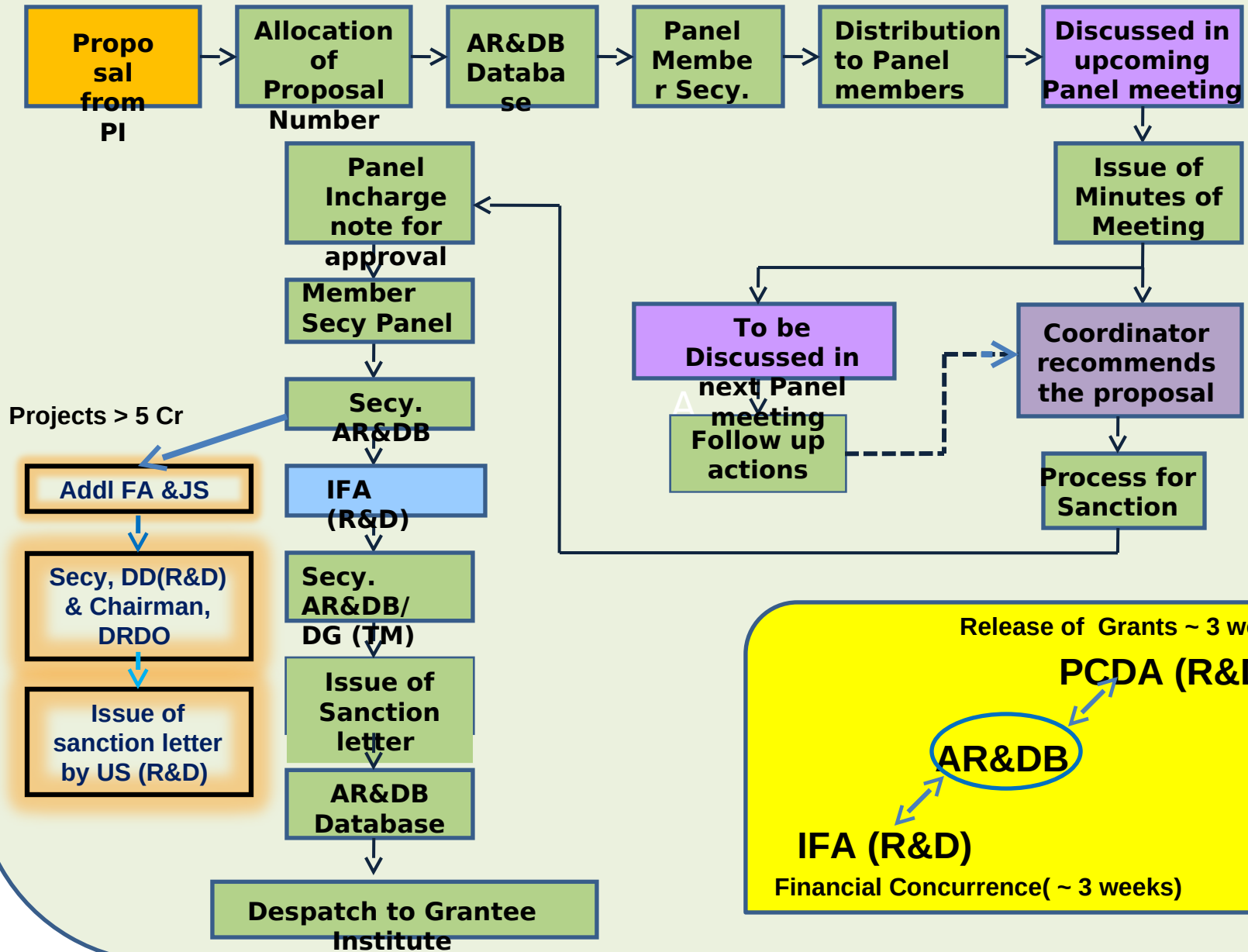
**Hon'ble RM**



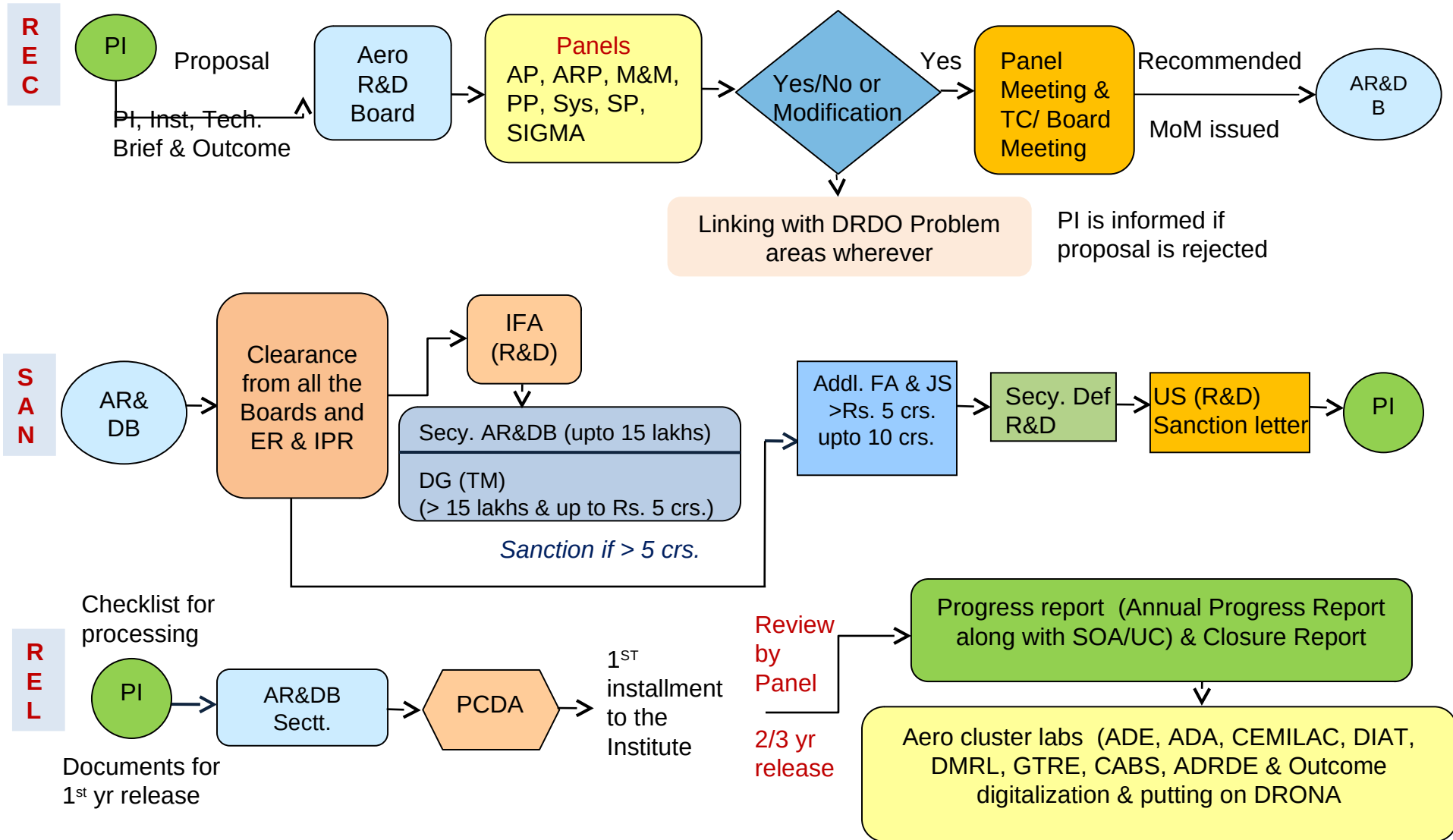
# AERONAUTICS RESEARCH & DEVELOPMENT BOARD

## SANCTION PROCESS FOR NEW PROJECTS

### GRANTS-IN-AID



# Aero R&D Board Funding Process & Review



**AERONAUTICS RESEARCH & DEVELOPMENT BOARD**  
**PROJECT AND IFA (R&D) REQUIREMENT**  
**GRANTS-IN-AID**

**New Proposals:**

- Value addition based on national and International Status.
- In the field of aeronautics.
- Preferably in line with DRDO problem areas.

**Staff :**

- Commensurate with project requirement and salary as per DST norms.
- Justification in terms of quantity of work to be defined.

**Equipment :**

- Not to exceed 30% of the project budget.
- Justification in detail if > 30 % of budget and is allowed only if the project so demands and is not available in the co-located lab. BQs with comparative sheet reqd.

**Contingency:**

- Upto 5% (only 3% is being concurred by finance at present).
- List of tentative items with cost required by IFA (R&D).

**Consumables:**

- Commensurate with project requirement.
- List of consumables to be attached with BQs [ required by IFA (R&D)].

**Travel:**

- Commensurate with project requirement.
- Principal Investigator to mention no of person, no of conference, no of visits with approx cost.  
[ At the discretion of IFA (R&D) ]

# AERONAUTICS RESEARCH & DEVELOPMENT BOARD

## PROJECT AND IFA (R&D) REQUIREMENT

### GRANTS-IN-AID

ARDB-  
13

#### CHECKLIST FOR SANCTION OF PROJECT AFTER RECOMMENDATION FROM PANEL

1	HARD COPY OF PROJECT PROPOSAL AS PER AR&DB NORMS [INKSIGNED]	
2	PANEL RECOMMENDATIONS FOR EQUIPMENT [IF NOT AVAILABLE IN CO-LOCATED LAB ] AND BUDGET - LETTER FROM LAB FOR NOT SPARING IF YES	
3	LIST OF CONSUMABLES [IN EXCEL SHEET PREFERABLY] WITH QUANTITY AND COST WITH TOTAL COST[BQ's AS ANEXURES] - JUSTIFICATION REQD	
4	LIST OF EQUIPMENTS [IN EXCEL SHEET PREFERABLY] WITH QUANTITY AND COST WITH TOTAL COST[BQ's AS ANEXURES]-JUSTIFICATION REQD	
5	LIST OF CONTINGENCIES [IN EXCEL SHEET PREFERABLY] WITH QUANTITY AND COST WITH TOTAL COST[BQ's AS ANEXURES]-JUSTIFICATION REQD	
6	LIST OF CONFERENCES/WORKSHOPS WITH TRAVEL DETAILS {NO. OF TIMES , NO OF PERSONS, REGISTRATION CHATGES AND TRAVEL CHARGES	
7	COMPARATIVE STATEMENTS OF EQUIPMENTS/HIGH COST CONSUMABLES FROM THREE VENDORS [ LOWEST SHOULD BE HIGHLIGHTED]	
8	JUSTIFICATION FOR MANPOWER (FOR MANPOWER>1)	
9	COPY OF INSTITUTE SALARY AND QUALIFICATION NORMS	

**All checklist and forms available at AR&DB website-Grants-in-Aid scheme- All Forms**

**<https://www.drdo.gov.in/er-forms-for-projects>**



# AERONAUTICS RESEARCH & DEVELOPMENT BOARD

## FUND RELEASE

### GRANTS-IN-AID

ARDB-14

#### CHECK LIST FOR FIRST YEAR RELAESE OF FUNDS

1	CONTINGENT BILL [INK SIGNED BY PI AND REGISTRAR/DEAN/HEAD OF INSTITUTE] on revenue stamp	
2	ECS MANDATE [INK SIGNED BY PI AND REGISTRAR/DEAN/HEAD OF INSTITUTE]	
3	COPY OF SANCTION LETTER	

ARDB-15

#### CHECK LIST FOR SECOND AND SUBSEQUENT YEAR RELAESE OF FUNDS

1	ANNUAL PROGRESS REPORT (APR),SOA, SOE, Ucs, DD/MRO IN FAVOUR OF PCDA(R&D) NEW DELHI including committed	
2	REVIEW OF FIRST / SUBSEQUENT YEAR PROGRESS OF THE PROJECT	
3	CONTINGENT BILL [INK SIGNED BY PI AND REGISTRAR/DEAN/HEAD OF INSTITUTE]on revenue stamp	
4	ECS MANDATE [INK SIGNED BY PI AND REGISTRAR/DEAN/HEAD OF INSTITUTE]	
5	COPY OF SANCTION LETTER[TO BE ISSUED BY AR&DB FOR THAT YEAR]	
6	ACCRUED INTEREST FOR 1ST YEAR / ALL FYs TILL DATE-DD/MRO IN FAVOUR OF PCDA(R&D) NEW DELHI	

**All checklist and forms available at AR&DB website-Grants-in-Aid scheme- All Forms**

**<https://www.drdo.gov.in/er-forms-for-projects>**

**AERONAUTICS RESEARCH & DEVELOPMENT BOARD**  
**FUND RELEASE**  
**GRANTS-IN-AID**

**FIRST  
YEAR  
RELEASE**

Received  
Contingent  
Bill from  
Institute

AR&DB  
Databa  
se

Accounts Section  
(for processing bill,  
check list, counter  
signature etc.)

Fwd to  
PCDA for  
Funds  
release

Release  
of Funds  
from  
PCDA

**SUBSEQU  
ENT YEAR  
RELEASE**

Next yr  
release  
process by  
Member  
Secy., of  
Panel  
ensuring  
receipt of  
Progress  
Report, SOA ,

Member  
Secy. put  
up note for  
approval

Secy.  
AR&DB

Issue of  
Sanction  
letter

Receipt of  
Contingent  
bill

AR&DB  
Databa  
se

Accounts  
Section  
(for processing  
bill, counter  
signatures  
enclosing SOA,  
UC etc. as per  
checklist

Fwd to  
PCDA for  
Funds  
release

Release  
of Funds  
from  
PCDA



**GRANTS-IN-AID SCHEME**

**AERONAUTICS RESEARCH & DEVELOPMENT BOARD**

**E-MAIL : [ardb.hqr@gov.in](mailto:ardb.hqr@gov.in)**

# AERONAUTICS RESEARCH & DEVELOPMENT

## FORMS REQUIRED

SUBMISSION OF PROPOSAL	RELEASE OF FUND (1st year grant)	NEXT YEAR GRANT
• Grants-in-Aid proposal form dully filled	• Contingent Bill	• Annual Progress Report
• Budgetary Quotation	• Electronic Clearing System (ECS) mandate	• Statement of Accounts
• Comparative Statement		• Statement of Expenditure
• Justification for TA/DA (No. of conference/visit/No. of times) X Cost		• Interest accrued (if any) to be deposited by e-MRO
• List of consumables & tentative contingencies with cost		• Unspent Balance (if any)
• Special Recommendation from Coordinator if Equipment cost is more than 30% of Total Cost		Utilization Certificate

## Existing Schemes of AR&DB

- Conducting workshops, conferences, brains-storming session in various demographic areas for creating awareness and importance of aeronautical research for the growth of aviation sector in the country.
- Conducting special courses for the advancement of aerospace research.
- Inviting experts from abroad for dissemination of knowledge to academia and scientists.

## AR&DB PROMOTIONAL ACTIVITIES- FINANCIAL YEAR 2018-19

**Annual meeting of ARDB panel and One day seminar on “Aeronautical Systems”**  
**8<sup>th</sup> Oct. 2018, School of Engineering, Tezpur University, Tezpur, Assam, Workshop on Advances in Aerospace Resources on 11<sup>th</sup> -12<sup>th</sup> Feb 2019 at SVNIT, Surat**

**Workshop on Sustainable Manufacturing on 19<sup>th</sup> March 2019 at IIT, Ropar**

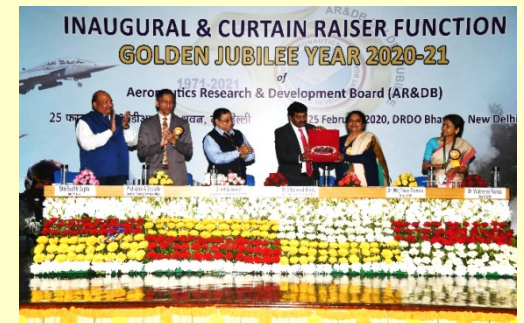
**National Workshop on Detonation Wave Engines, IIT MADRAS**





## AR&DB PROMOTIONAL ACTIVITIES

**AR&DB Golden Jubilee Inaugural Ceremony**  
**25<sup>th</sup> February 2020 held at Dr DS Kothari Auditorium, DRDO Hq., New Delhi**



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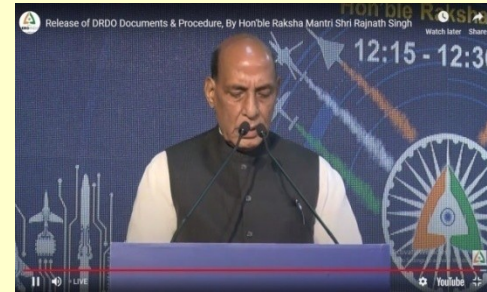
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## AR&DB PROMOTIONAL ACTIVITIES

### AR&DB Golden Jubilee Closing Ceremony 3<sup>rd</sup> February 2021 held during AERO INDIA at Bangalore





## AR&DB PROMOTIONAL ACTIVITIES

### AR&DB Golden Jubilee Closing Ceremony 3<sup>rd</sup> February 2021 held during AERO INDIA at Bangalore



वैमानिकी में अनुसंधान को बढ़ावा देते हुए भारत को आत्मनिर्भर बनाने के लिए 1971 में वैमानिकी अनुसंधान एवं विकास बोर्ड का गठन किया गया था। इस बोर्ड ने सैन्य वायुयान, हेलिकॉप्टर, मिसाइल तथा विभिन्न हवाई प्रणालियों के विकास में व्यापक योगदान दिया है। इस बोर्ड की स्वर्ण जयन्ती के अवसर पर यह विशेष आवरण को जारी किया जा रहा है।

Aeronautics Research and Development Board was constituted in 1971 to promote research to take India towards self-reliance in aeronautics. Since then, the Board has contributed immensely towards indigenous development of military aircraft, helicopters, missiles and various aero-systems. This special cover is being released to commemorate the Golden Jubilee of AR&DB.



जारीकर्ता : मुख्य पोस्टमास्टर जनरल, कर्नाटक डाक परिसर, बेंगलुरु  
Issued by : Chief Postmaster General, Karnataka Postal Circle, Bengaluru



KTK/12/2021



स्वर्ण जयंती के उपलक्ष्य में  
वैमानिकी अनुसंधान एवं विकास बोर्ड (AR&DB)  
On the occasion of Golden Jubilee  
Aeronautics Research & Development Board (AR&DB)

वैमानिकी में भारत को आत्मनिर्भर बनाने के लिए 1971 में वैमानिकी अनुसंधान एवं विकास बोर्ड का गठन किया गया था। इस बोर्ड ने सैन्य वायुयान, हेलिकॉप्टर, मिसाइल तथा विभिन्न हवाई प्रणालियों के विकास में व्यापक योगदान दिया है। इस बोर्ड की स्वर्ण जयन्ती मनाने के लिए इस डाक टिकट को जारी किया जा रहा है।

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### AR&DB Golden Jubilee Closing Ceremony 3<sup>rd</sup> February 2021 held during AERO INDIA at Bangalore







जय हिन्द

Proposal to be submitted : ardb.hqr@gov.in [only soft copy first)