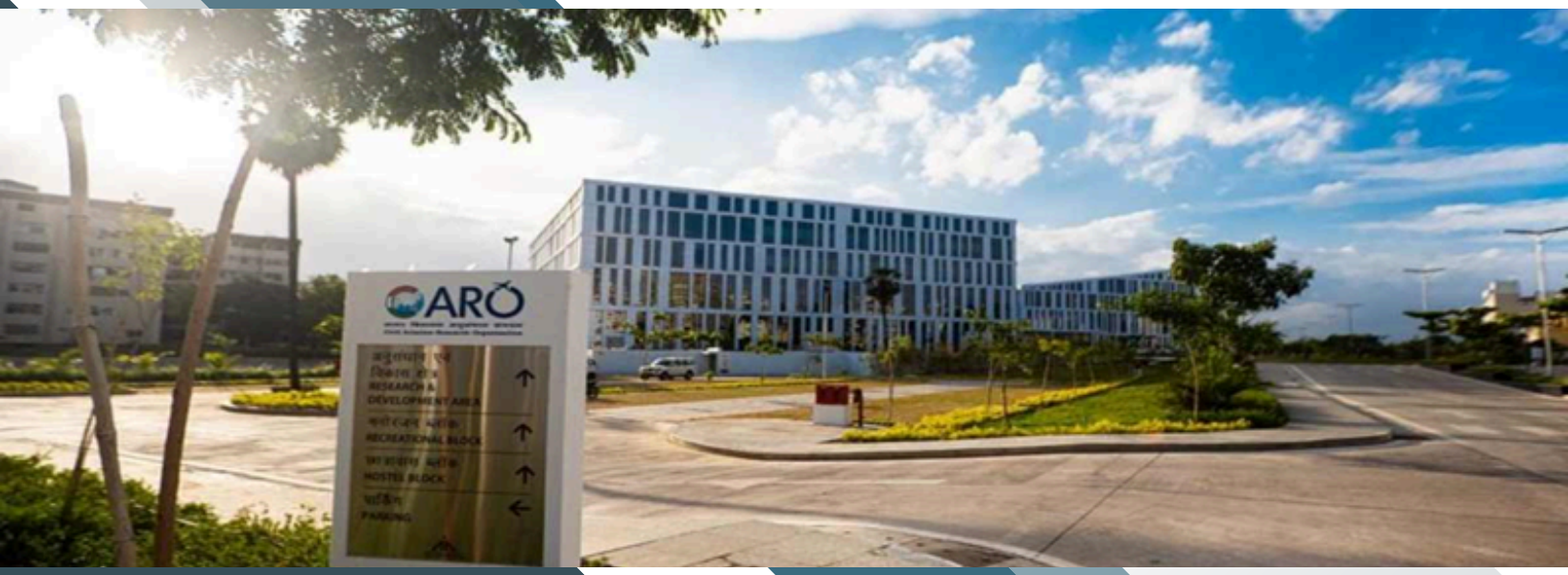
Policy for Research & Development and Manual for Civil Aviation Research Organization (CARO)



VERSION-1.0

March-2025

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

CARO
Civil Aviation Research Organisation

POLICY FOR RESEARCH & DEVELOPMENT

AND

MANUAL FOR

CIVIL AVIATION RESEARCH ORGANISATION (CARO)

Version 1.0

March 2025

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Document Approving Authority: AAI Board
Airports Authority of India
Rajiv Gandhi Bhawan, Safdarjung Airport
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भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

Foreword

The civil aviation industry in India and the Asia-Pacific region has witnessed remarkable growth over the past decade. Increasing air travel, expanding airport infrastructure, and technological advancements have transformed the way we connect globally. This growth brings opportunities that demand innovative solutions and we shall seize the opportunities with both hands.

The challenges are multifaceted: from enhancing safety and optimizing air traffic management to minimizing environmental impact. Simultaneously, challenges get converted into immense opportunities to create sustainable, efficient, and cost-effective solutions that benefit both passengers and the industry and help indigenization of the solution hitherto provided by foreign vendors.

At AAI, we want to have unwavering commitment to research and development as we believe that we have talent and know-how to play meaningful role in providing solutions to civil aviation sectors. Leveraging on the considerable experience and expertise, capability and confidence in the technological research and innovation among the research institutes and academia within India, AAI has initiated its Research and Development efforts by establishing Civil aviation research organisation (CARO) with state-of-the-art facility in Hyderabad at Begumpet Airport.

CARO will serve as a world-class research platform, bringing together aviation stakeholders, industry experts, academia and the start-ups. Our goal is to develop indigenous solutions that address the needs of aviation ecosystem and significantly reduce dependency on foreign technological organisations for technical assistance and give impetus to Government of India's mission of "Atma Nirbhar Bharat". CARO will actively explore cutting-edge technologies using data analytics through collaborative research to drive advancements. By nurturing our own intellectual property and fostering partnerships, we aim to contribute significantly in aviation research.

I am very confident that this document containing AAI's R&D policy and Manual for CARO will be a huge enabler for AAI to aggressively and fruitfully pursue its R&D efforts and pave way for path-breaking solutions for the challenges confronting the Aviation Industry. With our continuous endeavours and efforts AAI is poised to emerge as the Global leader in Aviation R&D in collaboration with all employees, stakeholders, Start-up companies, research institutes and academia

As we embark on this journey, I wish all the very best to all the stakeholders who join AAI towards the goal of self-reliance and excellence in the field of civil aviation and contribute to CARO's success. Together, we will shape the future of civil aviation with enhanced safety, efficiency and sustainability.

(Vipin Kumar)
Chairman, AAI

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PREFACE

India is one of the fastest-growing aviation markets globally, with a continuous surge in both passenger and cargo traffic. In this dynamic environment, R&D plays a pivotal role in expanding infrastructure, enhancing operational efficiency, and adopting advanced technologies for airport management, passenger experience, and security systems.

The need for focused Research and Development (R&D) in the civil aviation sector—especially through the Civil Aviation Research Organization (CARO)—is vital for driving growth, enhancing competitiveness, and ensuring long-term sustainability.

Key areas demanding focused innovation include: Integration of drones and urban air mobility into national airspace, Development of indigenous technologies for flight safety, surveillance, and navigation and Strengthening cybersecurity to safeguard aviation systems from digital threats.

Aligned with the Government's "Make in India" initiative, CARO is positioned to lead the development of critical technologies, reduce reliance on imports, and bolster domestic manufacturing capabilities.

Efficient and scalable air traffic management systems are fundamental to managing India's growing airspace needs. Developing homegrown solutions not only enhances self-reliance but also paves the way for India to emerge as a global exporter of advanced aviation technologies.

Furthermore, CARO's commitment to energy-efficient and eco-friendly airport infrastructure will contribute to sustainable aviation and position India as a leader in aviation innovation. By addressing indigenous challenges while keeping pace with international advancements, CARO has the potential to reshape the future of Indian aviation.

Through collaboration and innovation, Airports Authority of India and its stakeholders can collectively achieve excellence, self-reliance, and sustainability, setting new benchmarks for the global aviation industry.

(M Suresh)

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Amendment/Corrigendum Record

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Table of Contents

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Chapter 1 : Document Identification and Control

1.1 Title of the Document

1.1.1 This document is identified as "Policy for Research & Development and Manual for Civil Aviation Research Organization (CARO)".

1.2 Purpose of this Chapter

1.2.1 This chapter details the procedures for preparing, controlling and amending the "Policy for Research & Development and Manual for Civil Aviation Research Organization (CARO)"

1.3 Purpose of the Document

1.3.1 The purpose of this document is to establish a corporate policy for research and development in Airports Authority of India and broadly define the process and procedures to be followed for R&D at CARO complex in Begumpet, Hyderabad.

1.4 Responsibility for Documentation and Publication

1.4.1 This "Policy for Research & Development and Manual for Civil Aviation Research Organization (CARO)" has been prepared by Executive Director (CARO) and approved by the AAI Board. The Executive Director (CARO) is responsible to publish and maintain this document.

1.5 Authority/ Responsibility for Changes

1.5.1 The Executive Director (CARO) is responsible for incorporating amendments to the Policy for Research & Development and Manual for Civil Aviation Research Organization (CARO)".

1.6 Review

1.6.1 The General Manager (CARO) will conduct a yearly review of this document to ensure accuracy and updating of all its contents. The results of such review and action taken for any amendment will be documented and presented to Executive Director (CARO) for approval.

1.6.2 **Incorporating changes:** The General Manager (CARO) on behalf of the Executive Director (CARO) will ensure that:

- changes being incorporated are duly approved by competent authority;
- relevant pages in the manual are revised as amendments/corrigenda;

1.7 Effective Date

1.7.1 Effective date of an instruction is indicated at the footer of the page.

1.7.2 New version will be indicated with version number and effective date at the footer of the page.

1.8 **Change History**

1.8.1 Any amendment/correction will be indicated with the effective date on 'Record of Amendments and Corrigenda' page.

1.9 **Controlling the Manual**

1.9.1 The Executive Director (CARO) will be the controlling authority for this document. The current version of the document will be made available on AAI web site www.aai.aero.

1.10 **Master Copy**

1.10.1 An electronic and a paper format master copy of the document will be maintained by the Executive Director (CARO) at CHQ.

1.11 **Enquiries**

1.11.1 Enquiries/clarifications/suggestions, if any, should be addressed to:

The Executive Director (CARO),

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Chapter 2 : Introduction

2.1 AAI is the sole Civil Air Navigation Service Provider (ANSP) and the largest airport operator in India. Air traffic in India and Southeast Asia is growing rapidly. India is also the third largest-domestic civil aviation market and is poised to become the largest civil aviation market. Anticipated growth potential of air traffic within the country and across the airspace of the country requires not only increasing the number of airports, but also continuous addition and upgradation of the technology for the Air Navigation Service Provider. However, we are largely dependent on foreign technology and service providers for the integration of such technology in ATM and CNS equipment. It is understood that continuous efforts are required by Government PSUs like AAI, private players and the other stakeholders to attain self-reliance by contributing to manufacturing and development of new equipment and technologies.

2.2 This remarkable growth has created numerous opportunities for research and development within the Civil Aviation Sector in India. The aviation industry, academia and research & development institutions need to join hands to contribute meaningfully for the development of new technology, new products and innovative use of existing technologies. The collaboration for research and development in the field of civil aviation will give impetus to the Government of India's initiative of Make in India i.e. "Atma Nirbhar Bharat" and will lead the country to self-reliance in developing innovative and cost-effective solutions.

2.3 Considering the criticality of R&D needs of an organization, Department of Public Enterprises (DPE) vide their D.O. letter No. 3(9)/2010-DPE(MoU) dated 23.09.2011 has issued guidelines for R&D activities in central PSUs, which envisages central PSUs to form their R&D policy. Moreover, Government of India also provides various incentives to promote R&D activities in the corporate sector, including writing off revenue and capital expenditure on R&D etc.

2.4 Considering the importance of R&D in AAI and the civil aviation sector, AAI prepared a policy for research and development with an objective to provide a global R&D platform for aviation community through in-house and collaborative research. R&D programme will also create promotional framework for providing opportunities to the emerging start-ups to innovate, develop and make their place in the world of civil aviation.

Chapter 3 : R&D Policy of AAI

3.1 AAI's Research and Development initiatives:

3.1.1 AAI has initiated need based R&D activities from 2012-13 through its R&D centre in Hyderabad. In 2018, the AAI board in the Agenda Item No. 179.10 of 179th Board meeting, approved the establishment of a world class Civil Aviation Research Organisation (CARO) at Begumpet Airport, Hyderabad, to cater to its ANS/Airport challenges. In the meeting, AAI board approved the R&D Policy, R&D Plan & R&D manual and also approved setting apart considerable funds for R&D.

3.1.2 AAI's R&D Policy Version 1.0 was designed to outline the organization's approach to Research and Development in ANS and AAI's R&D activities were structured in two other documents i.e. the R&D Manual and the R&D Plan. The R&D Policy defined the objectives and scope of research for both ANS and engineering, while the R&D Plan detailed specific ANS projects AAI intended to pursue. Additionally, the R&D Manual included the proposed organizational structure of the CARO, roles and responsibilities, Delegation of Powers (DoP), and project management processes. The Board also envisaged a Version 2.0 of R&D Policy, which would expand the policy to include AAI's broader R&D objectives, along with a roadmap for non-ANS operations, such as Airport Operations, Engineering & Planning.

3.1.3 AAI in its 185th Board Meeting (Agenda item No. 185.12) held on 06.12.2018 approved construction of Civil Aviation Research Organisation complex at Begumpet, Hyderabad at an estimated cost of Rs. 402 crores for Phase I. However, because of Covid and its adverse impact on financial condition of AAI, the project was curtailed from five storeys of R&D and Recreation buildings to three storeys, at a total construction cost of Rs 354 Crores. The CARO complex was inaugurated by Hon'ble PM on 05th March 2024.

3.1.4 In between, AAI Board also approved the Start-up Policy in its 183rd Board Meeting (Agenda item No. 183.9) held on 24.08.2018. Under the policy, few projects addressing the problem statements provided by AAI employees from the Engineering, ANS and Operations Directorates were awarded to start-up companies and successfully executed. The nature and character of initiatives taken under the Start-up Policy is akin to R&D with a view to develop indigenous solution for solving problems faced by AAI, though not in our research premises, i.e. CARO but at own premises of Start-up companies. Subsequently, the Start-up Policy got revised by AAI in its 219th Board Meeting (Agenda item No. 219.16) dated 12.01.2024 and is under further revision to expedite decision making.

3.1.5 Due to the rapidly changing scenario in the Civil Aviation Sector in terms of advancement of avionics, communication, navigation, surveillance technology, the need of improved and efficient ATM and airport operations, it is imperative to review the R&D Policy. Also, as envisaged in the Board meeting, it is time to include R&D in non-ANS operations and other areas of aviation in the current version of the R&D

Policy.

3.1.6 In light of the above requirements and CARO Complex being completed, R&D policy was reviewed and a fresh document amalgamating the R&D policy & operational manual for R&D, namely 'Policy for R&D and the Manual for CARO" is prepared to supersede the existing R&D policy, R&D Manual and R&D Plan.

3.2 Research and Development Policy:

3.2.1 The R&D policy would encourage research and development by AAI's own employees, Start-up companies, research institutes, academic institutes and other stakeholders in civil aviation sector mostly for ANS, airport operations, security and planning which are functional domains of AAI. So, the objective of R&D policy would be to collect and collate problems being faced by AAI in these sectors including day to day problems, problems related to medium-term time frame & long-term time frame and then invite solutions, research proposals from academic institutes, Start-up companies, OEMs etc. Selected research agencies can undertake research work or part of it in CARO complex and/or in their own premises.

3.2.2 **AAI Corporate Policy Statement on Research & Development is:**

i. AAI would set-up a Civil Aviation Research Organization to provide a scalable research platform for research & development in civil aviation in India through enhanced in-house and collaborative research to develop indigenous and innovative solution.

ii. AAI would encourage research & development by AAI employees, external stakeholders like Start-up Companies, Academic institutes, Research Organizations, OEMs and civil aviation stakeholders like Airlines, Cargo, Ground Handling Agencies etc.

iii. AAI would procure equipment and set-up the labs for the research and development activities. The facilities established at CARO can be provided to the prospective researcher(s) drawn from different stakeholders on the problems faced either by AAI or other stakeholders in the civil aviation sector.

iv. AAI would promote research & development through mobilization of cross-functionalities by different stakeholders to reduce cost & time for understanding and developing ideas and solutions.

v. AAI would not undertake permanent or temporary recruitment of staff for research activities so that Research and Development does not become a separate department. AAI would promote research & development by AAI employees actively working in different areas by permitting them to take time off from regular work for short-term to medium-term projects and after completing their research & development work, they would go back to their active work area.

vi. AAI will explore collaboration with other national and international organisations whether Government or Non-Government for setting up research

facilities in CARO Complex. It will be AAI's endeavour to encourage publishing research papers in various research journals and forums.

vii. A separate budget on the approval of AAI Board will be allocated for R&D activities every-year. The budget for R&D activities need not be wholly utilized for research programmes at CARO but can also be utilised for R&D activities undertaken by AAI with other research organisations outside CARO. All the R & D activities by other research organisations proposed to be undertaken with AAI, shall be submitted to AAI through ED (CARO).

viii. Other than the AAI R&D fund, CARO will also explore to arrange funds for Research and Development from other organisations such as Department of Science and Technology (DST) or other aviation stakeholders.

ix. A separate Delegation of Powers (DoP) would be prepared for R&D activities by AAI.

3.2.3 During the implementation of the policy, if any changes are proposed or are felt to be included, for better implementation of the policy, the Chairman AAI will be the competent authority for approval of any such modifications in the policy

3.3 Research Areas:

The research can be in the field of aviation which may include but not limited to:

i. Air Traffic Management: Airspace Capacity study and improvement, Air Traffic Flow Management, ATM Procedures, Human Factors
ii. Communication/Navigation/Surveillance: Improvement, augmentation, maintenance and testing of CNS equipment. Development of new technologies in CNS.
iii. Airport Operations: Airports capacity, airport operations, technical innovation, improvement, augmentation of airport infrastructure,
iv. UAS: Unmanned Aerial Vehicles, Unmanned Traffic management
v. Environment: Sustainability, procedures conforming to Net-zero Carbon emission
vi. System Development: Simulation Tools, Software, Automation systems
vii. Engineering: Projects related to airport infrastructure and operations
viii. Management: Human resources, Operations research,
ix. Aviation Security: Research and development in security equipment
x. Aviation Meteorology.

3.4 Scope of Research & Development

The scope of research and development activities in CARO may include but is not limited to the following areas / activities:

3.4.1 Scope of R&D in ANS:

a) **Capacity study:** Airspace and Airport related safety, capacity and efficiency improvement programs considering the growth in Air Traffic with focus on

i. Addressing the major airspace challenges arising due to anticipated growth in, aircraft operations and UAS operations.
ii. Addressing the major airport infrastructure challenges with focus on enhancing airport throughput.
iii. Developing technologies and products in identified fields for the futuristic airspace/airport needs.

b) **Modelling & Simulation Tools:** Development and use of computer-based Modelling and Simulation techniques, tools for the concept design and development for enhancement of ANS and Airports related procedures, processes, and improved systems incorporating emerging technologies.
c) **Procedures and Practices:** Conducting studies to address problems, challenges of ANS and Airports regarding current operational procedures, practices and processes.
d) **Data collection & Analysis:** Establishing Data Centre to support aviation related modelling and research and to perform ANS and Airport benchmarking with performance measurement.
e) **Improving ANS Systems and their reliability**: Improving availability, reliability and safety of ANS equipment and systems.
f) **Cyber security:** Explore strategies to protect ANS systems from cyber threats, ensuring the safety and security of data and operations.
g) **User need analysis for ANS systems:** Developing comprehensive user requirements for ANS/Airport systems using scientific methods/user needs analysis/emerging technologies survey and research on existing system deficiencies.
h) **Interoperability of ANS Systems**: Addressing Interoperability issues of ANS/Airport Systems
i) **Environmental impact:** Conducting studies for reduction in environmental impact with introduction of new technology/procedures or suggesting improvement in existing procedures/systems.
j) **Human Behaviour and Fatigue:** Conducting studies on human behaviour and suggest measures to mitigate stress and fatigue and improve human performance.

3.4.2 Scope of R&D in Operations:

a) **Safety protocols:** Studying and implementing safety protocols and procedures to minimise risks during airport operations, including runway incursions, bird strikes and ground handling incidents
b) **Efficiency enhancement:** Researching ways to optimise airport operations to reduce delays, enhance passenger experience and improve overall efficiency. This could involve studying queue management, gate assignments and baggage handling processes.
c) **Environmental impact:** Researching sustainable practices and technologies to mitigate the environmental impact of airport operations, including reducing emissions, noise pollution and energy consumption.

d) **Infrastructure development:** Examining strategies for infrastructure development and capacity expansion to accommodate growing air traffic demand while ensuring safety and operational efficiency.

e) **Technology integration:** Exploring the integration of emerging technologies such as artificial intelligence, Internet of Things (IoT) and automation to streamline airport operations and enhance decision making processes.

f) **Human factors:** Understanding human factors involved in airport operations, including workforce training, fatigue management and human machine interface design to optimise performance and safety.

g) **Regulatory compliance:** keeping abreast of regulatory requirements and standards governing airport operations and conducting research to ensure compliance and best practices.

3.4.3 Scope of R&D in Engineering & Planning:

a) **Sustainable airport design**: Investigate the use of sustainable materials and energy efficient designs to reduce environmental impact of airport construction and operations.

b) **Renewable energy integration:** Explorer the implementation of renewable energy sources at airports.

c) **Smart airports:** Examine the use of Internet of Things (IoT) and artificial intelligence to enhance passenger experiences through smart-gates, baggage handling and personalised services.

d) **Infrastructure resilience:** Investigate strategies for making airport infrastructure more resilient to natural disasters and other emergencies. Explore the use of technology including AI for predictive maintenance.

e) **Environmental impact and mitigation:** Research methods to minimise noise pollution from airport operations and ways to reduce the carbon footprint of airports through innovative technologies and practices.

f) **Innovative construction techniques:** investigate the use of modular construction techniques to speed up airport development and reduce costs. Include the use of new materials that offer better durability and sustainability for airport infrastructure.

g) **Capacity planning:** Study methods to optimise airport capacity and reduce congestion.

h) **Waste Management:** Studies to suggest measures to conserve energy and water and efficient waste management.

3.4.4 Scope of Research in other Civil Aviation sectors:

a) **Airport collaborative decision making (A-CDM):** Study the implementation of A-CDM to improve coordination and decision making among airlines, airport operators, ground handlers and air traffic control.

b) **Cyber security:** Explore strategies to protect airport and airline systems from cyber threats, ensuring the safety and security of data and operations.

c) **Personalised services:** Explore how data analytics and AI can be used to provide personalized services to passengers improving their overall travel experience.

d) **Economic and financial planning:** Study advanced revenue management techniques for airlines including dynamic pricing and overbooking strategies. Research better to reduce operational cost for airlines and ground handlers without compromising service quality.

e) **Workforce automation:** Explore the impact of automation on the workforce and how to manage the transition to more automated processes.

f) **Ground handling optimization:** research ways to enhance the efficiency of ground handling operations including the use of automated systems and better resource management.

Chapter 4 : Civil Aviation Research Organization

4.1 Objectives of Civil Aviation Research Organisation:

The objectives of CARO would be to undertake research work or facilitate research work as per the R&D Policy of AAI.

4.1.1 Provide an ecosystem for cost effective and affordable research infrastructure for promoting research and development in the field of civil aviation.

4.1.2 Promote cross-fertilisation of ideas, synergise competencies with different categories of stakeholders and create a vibrant and cooperative R&D environment to foster excellence and attract best talent including start-ups.

4.1.3 Promote collaboration between Government and Private organizations in the country to facilitate research in aviation and develop indigenous technologies and products including in niche areas.

4.1.4 To identify, procure, establish and operate common facilities, simulators, research libraries etc. to be used by researcher(s) in CARO complex.

4.1.5 To operate the CARO Complex.

4.2 Organizational Structure of CARO

4.2.1 AAI board will be overall In-Charge of R&D policy of AAI. Chairman assisted by Member (ANS) and ED (CARO), would decide operations of CARO as per the DoP approved by AAI Board.

4.2.2 ED (CARO) will be the Operations and administrative head of CARO and will report to the Member (ANS).

4.2.3 GM (CARO) will be responsible for day-to-day operations of CARO which includes cost-effective utilisation of resources and manpower at CARO and will report to ED (CARO).

4.2.4 A Research Advisor, if required, may be appointed by AAI, who will preferably be a retired person from a reputed research organisation having prior experience in research and innovation.

4.2.5 Subject Matter Experts (SMEs) from ATM, CNS, OPS and Engg, Directorates familiar with the Research Tools and project management may be posted at CARO to assist ED (CARO) and Research Advisor in evaluating, monitoring and coordinating research projects and common facilities at CARO. When required, they may be nominated as Project managers for AAI projects.

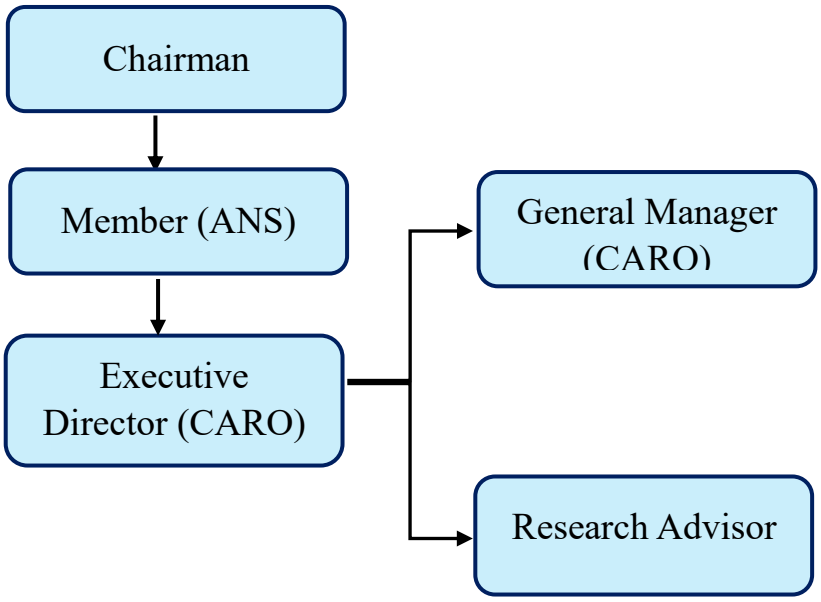

Figure 1: Organisational Structure of CARO

4.3 Duties and Responsibilities

4.3.1 Duties and Responsibilities of Executive Director- CARO

The duty and responsibilities of ED (CARO) are to:

i. prepare the budget requirements in consultation with GM (CARO) and Research Advisor for operations and management of CARO and submit the budget proposal for approval to the Member (ANS). This budget requirement would be only for operation & management and for common facilities, lab etc. and not for specific research project.

ii. execute "Agreement" for research and development in CARO on behalf of Airports Authority of India with research organisations for long term collaboration.

iii. to prioritise the Research Project in view of the available Resources, Timelines and the funding requirement and submit comments/recommendations to the Member concerned for acceptance along with allocation of space in CARO complex as per the R&D Policy of AAI.

iv. allocate and manage resources, including budget, personnel, and equipment, to support research projects effectively.

v. Ensure optimum usage of all resources including common tools, spaces etc.

vi. identify opportunities for collaboration with external partners, such as universities, industry, and other research institutions.

vii. evaluate the recommendation of the project from Research Advisor from the

perspective of CARO's scope and objective's and present to the Member concerned with recommendations.

viii. evaluate the Project monitoring report from Research Advisor and assess the utilisation of funds and resources as per the progress of project.

ix. submit Quarterly Reports on the ongoing Projects at CARO to the Member (ANS).

x. ED (CARO) would also fix-up rent, fee, etc. to be taken from the research entities for utilizing the facilities in CARO as per the policy of AAI for renting of space in CARO.

xi. perform any other task assigned by AAI Management in connection with the activities of CARO.

4.3.2 Duties and Responsibilities of GM (CARO):

The duty and Responsibility of GM (CARO) is to:

i. look after day-to day operations of CARO.

ii. invite problem statements and proposed research projects in the field of Civil Aviation from AAI employees.

iii. Invite or receive Project proposals from research organisations, stakeholders or individuals and submit to Research Advisor for evaluation.

iv. allot space and allocate other resources available at CARO and arrange access to Begumpet Airport for the purpose of research.

v. execute "Leave and licence agreement" for renting out the space and resources for research at CARO on behalf of Airports Authority of India.

vi. execute "Agreement" with research stakeholders on behalf of Airports Authority of India, for Research and Development at CARO.

vii. recover applicable charges/rent from the stakeholders for use of CARO resources.

viii. ensure that the resources/facilities available at CARO are maintained in working condition or are attended to promptly in case of any trouble/non-functionality.

ix. issue Notices to the stakeholders for any inappropriate or undesirable use of any facility/resources at CARO or violations of any clause of "leave and Licence Agreement" and submit report to ED (CARO) with suggested penalty/punitive action.

x. ensure that the policies and processes of CARO are implemented effectively and report any deviation from policy and processes to Research Advisor or ED (CARO) as appropriate and submit action taken report to ED (CARO)

xi. assist ED (CARO) in preparation of Annual Budgetary requirement for operations and management of CARO.

xii. consult with Research Advisor for assessing the utilisation of resources including manpower at CARO and act as appropriate for smooth and effective

functioning of CARO.

xiii. perform any other task assigned by ED (CARO)/AAI Management in connection with the activities of CARO.

4.3.3 Duties and responsibilities of Research Advisor

The duty and responsibility of the Research Advisor is to:

i. develop and implement a strategic R&D plan aligned with the AAI's R&D Policy, CARO's objectives and research plan in consultation with GM (CARO) and ED (CARO).

ii. convene the Research Steering Committee as and when required. Prepare a report of the meeting and submit it to ED (CARO)

iii. help in transforming the identified problem statement into research project and identify required resources, research procedure and methodology. Research Advisor will play key role in guiding the research project.

iv. suggest consultation and collaboration partners to AAI to address a specific problem statement. Research Advisor will coordinate with these AAI collaborative partners and evaluate their findings/accomplishment.

v. advise GM (CARO) on allocation of resources, budget, personnel, and equipment appropriate to the project.

vi. audit the project budgets, expenditures to assess the performances and guide the research teams along with project managers for any corrective measures.

vii. coordinate projects being developed by various internal and external agencies.

viii. maintain project oversight and supervise and guide research teams and project managers to ensure projects stay on track and meet established milestones and timelines.

ix. develop key performance indicators (KPIs) and metrics to assess the success and impact of AAI R&D efforts at CARO. Regularly evaluate the performance of R&D projects and teams against these metrics.

x. prepare annual research report on the research activities conducted at CARO and project future requirements of common tools and labs etc.

xi. perform any other task assigned by ED (CARO)/GM (CARO) in connection with the activities of CARO.

4.4 Research Steering Committee:

A Research Steering Committee will be constituted to monitor, evaluate, and review the progress of the Projects. The Steering committee may comprise the following members:

i. Research Advisor, CARO / ED(CARO)- Convener
ii. General Manager of the Concerned Directorate Nominated by the ED/Member of the Directorate
iii. General Manager (Finance), Nominated by the Member of the Finance

Directorate, for the projects funded by AAI either fully or partially.

iv. Any other member co-opted from industry, academia etc. having expertise in the subject matter.

Chapter 5 : Civil Aviation Research Organization (CARO) complex

5.1 The CARO complex in Begumpet, Hyderabad is built on an area of 39080 Sq. Mtr. at a cost of Rs 354 Cr. The complex consists of R&D building, Recreation Building and the Hostel blocks. The R&D building and Recreation building houses space for establishing laboratories, Simulators, working space, resource rooms, conference halls, meeting rooms, auditoriums (60-seater and 240-seater) and cafeteria. The Hostel block contains total 120 rooms out of which 72 rooms are single Occupancy and 48 rooms are double occupancy & kitchen and dining area. The complex has an Amphitheatre with a seating capacity of 150 persons.

5.2 Above facility is intended to provide a comprehensive ecosystem to support and encourage research, development and innovation in civil aviation sector and would be made available to AAI employees and other research stakeholders.

5.3 To keep the CARO Complex at Hyderabad vibrant and habitated by different stakeholders, the facilities created there would be used by different stakeholders viz. AAI employees, Start-up Companies, Research Institutes, Educational Institutes, External Research Institutes and other stakeholders in civil aviation sector. At all times, it should be the endeavour to select and house projects from these different stakeholders so that an appropriate mix of different stakeholders is always available in CARO campus. To foster cross-fertilization of idea and to promote all stakeholders, it is decided that the distribution of the space for research and accommodation among the research Stakeholders will be as follows:

i. 50% of the space will be kept for research activities at CARO by AAI. The distribution of these resources will be used as follows:
   a) 25% for AAI employees
   b) 25% for Start-up companies

ii. The remaining space and accommodation will be utilized as follows:
   a) 20% for AAI's trusted partners/OEMs for research in the field of civil aviation.
   b) 15% for academia/research institutes
   c) 15% for any other research Stakeholders.

Note: The unutilized space from the reserved space may be allotted to the other research stakeholders for a limited period or temporarily as per the need of that stakeholder.

Chapter 6 : Operational Guidelines for usage of CARO Complex

6.1 No staff should be recruited by AAI for research activities at CARO on temporary, permanent or on outsource basis, except manpower required for operationalization of CARO Complex, common facilities, lab simulator etc.

6.2 AAI personnel are permitted to conduct research on self-identified problem statements, subject to approval by the competent authority in AAI and completion within the specified timeframe. The timeframe for the research personnel from AAI may range from six-months to one year or as approved in the project proposal. Once, the Research objective is complete or the timeframe is completed, the AAI personnel will go back to their concerned posting.

6.3 The External stakeholders may be allowed to carry out research activities for a limited period on commercial basis as approved by the competent authority including any concessional rates.

6.4 Routine activities of AAI which can be done in normal office/existing office would be avoided in CARO.

6.5 CARO will not be an Operations and Maintenance office of AAI and it will purely be used for Research and Development activities. Operational and maintenance machines, therefore, will not be housed-in at CARO. Activities related to the manufacturing, assembly and testing of equipment and machinery will not be carried out at CARO.

6.6 The CARO Complex is open to all who have the potential to contribute in the field of aviation research, development and innovation. The research Stakeholders may be any of the following:

i. AAI Employees
ii. Academia: Government, Autonomous or Private, whether Indian or Foreign
iii. Aviation Industry: Government, Autonomous or Private, whether Indian or Foreign
iv. Research agencies: Government, Autonomous or Private, whether Indian or Foreign
v. Start-ups
vi. AAI R&D partners through MoU, whether Indian or Foreign
vii. Original Equipment Manufacturers (OEMs), whether Indian or Foreign.
viii. International Agencies engaged in Civil Aviation
ix. Foreign ANSPs
x. Airport Operators, whether Indian or Foreign
xi. Airlines Operators, whether Indian or Foreign
xii. Ground Handlers
xiii. Any other stakeholders

Chapter 7 : Resources available at CARO

7.1 The proposals for usage of the CARO resources should be submitted in a preformatted application by the interested stakeholders for conduct of research, development and innovation project.

7.2 Research related Resources: The following resources at CARO will be offered on dedicated basis to the researchers for carrying out research at CARO:

i. Space for research with furniture: The Space for research will be allotted on "Leave and Licence" basis to non-AAI research organisations for a limited period.
ii. Office peripherals
iii. Internet access
iv. Research Tools (simulation tools, simulators, prototypes)
v. Labs established by AAI or AAI Partners
vi. Accommodation: For non-AAI researchers, the accommodation will be allotted on rent basis. The space will be allotted for a period not exceeding the research period.
vii. Human Resources (Subject Matter experts, manpower for real time simulations etc.)
viii. Data from AAI (for the purpose of research)

7.3 Common labs/resources at CARO: Apart from the above stated dedicated resources for research, CARO will provide the following common resources:

i. Library
ii. Meeting/Conference rooms with projection equipment
iii. Auditoriums
iv. Pantry facilities
v. Cafeteria
vi. Sports and recreation facilities
vii. Access to Begumpet airport for research related activities as per SOP and licensing conditions at the discretion of AAI.

7.4 The resources at CARO will be available for use by stakeholders for the research period on chargeable basis. The research organisations wishing to use resources available at CARO for their research must meet one of the following conditions(s):

i. Have potential for development of new and innovative products /solutions in the field of aviation mentioned above.
ii. Have potential for collaborative research and development with AAI.
iii. Have potential for academic research in aviation.
iv. AAI appointed OEMs/Vendors/ Organizations engaged for development of Labs, common testing equipment and ecosystem for aviation research.

7.5 Resources available for research activities will be allocated among prospective researchers for its optimum usage.

7.6 The Resources would be allocated to the research stakeholders for limited period but in no case the resources would be allocated for a cumulative period exceeding three years. The Chairman AAI, only in exceptional cases, will be the final authority for approving the resource allocation beyond the period of three years on the requirement of project subject to the progress of the project and the project's viability at that stage.

7.7 No permanent research shall be housed-in at CARO except long-term partnership of AAI with research organisations, research institutes/academia or OEMs.

Chapter 8 : Fee and Charges for the CARO resources

8.1 Initially, for a period of five years of inception of CARO, the charges will be nominal which will be enough to recover the operational and maintenance cost of CARO. After period of 5 Years or once the CARO Complex is fully developed, the charges levied can be purely on commercial basis for which the rates will be decided by AAI subsequently.

8.2 No charges will be levied on AAI employees for using the CARO resources.

8.3 CARO resources for all other stakeholders will be on Chargeable basis for the period not exceeding the period of research.

8.4 CARO resources for use by Govt./ Govt. PSUs/ Central Universities/ Academia/ AAI's MoU partners/AAI's joint collaborators will be charged nominally to recover the operations and maintenance cost. However, these organisations may be exempted from levy of usage charges for the timeline of research, provided the research is solely for the purpose of AAI. For an extension in period beyond the timeline of the research, the charges will be levied as per the policy for renting of the resources.

8.5 The accommodation and the space for research will ordinarily be allotted on lease for a max. duration of 03 years except for the space allocated to research/academic institutes, AAI MoU partners involved in long-term projects with AAI. Extension beyond 03 years will be approved by the Chairman.

8.6 The other resources at CARO such as Conference rooms, meeting rooms and auditoriums will be allocated on chargeable basis for a limited period on requirement basis.

8.7 Charges will be calculated based on size (area) of space occupied and facilities available for each location. Common resources like Labs, simulators, access to the airport etc. will be charged on usage basis which will be decided by AAI from time-to-time.

8.8 The space to be provided on lease will be assessed and earmarked by a committee comprising of GM(CARO), Research advisor and Engg. In-charge of CARO. The committee will submit report containing the earmarked spaces, percentage of total space, suitability and resource availability in the earmarked space etc. to ED (CARO) for approval.

Note: The unutilized space from the reserved space may be allotted to the other research stakeholders for a limited period of time or temporarily as per the need of that stakeholder.

8.9 The charges for data provided by AAI for the purpose of research and development will be decided as per Data Sharing policy for AAI. For AAI's, problem statement, research data will be provided free of cost to the partner on the condition of non-disclosure or sharing or any other commercial use of the shared data.

Chapter 9 : Budgeting and Funding

9.1 Financial Empowerment and DOP:

9.1.1 There will be a separate Delegation of powers for CARO for smooth implementation of projects. The DOP for CARO should include powers to procure materials / components / equipment / software tools from Indian or foreign sources, engage consultants/consultancy, hiring contractual manpower. Funds for research projects would be approved as per policy under which project is being approved i.e. Start-up initiative, R&D etc.

9.1.2 A committee would be constituted by the Chairman, AAI to decide and acquire tools and common equipment for R&D at CARO.

9.2 CARO Budgeting and funding:

9.2.1 AAI in its annual budget would provide certain funds at the recommendations of Member (Fin) based on the Govt. policy, tax incentives etc. for R & D activities. That fund primarily be used by CARO for funding research projects as approved by Chairman and on the long-term partnerships with similar research organization within or outside India.

9.2.2 AAI's R&D fund need not be utilized entirely for Research and Development in CARO. AAI's R&D fund may be used for research projects in CARO or for projects with research entities outside of CARO.

9.2.3 CARO will be separately allocated annual budget for operations, maintenance and management of CARO and its resources.

9.2.4 CARO will also attract certain earnings by providing CARO Complex for research to be undertaken by other stakeholders by charging for CARO resources etc.

9.2.5 The Funds for specific research and development plans and the research projects beyond existing mechanism like Start-up etc. will be approved by the Chairman or AAI Board.

9.2.6 The Funds allocated for research activities will be subject to monitoring by the Research Steering Committee.

9.3 Research Funding:

The research projects funding

i. Fully funded by AAI for the problem statements given by AAI under Startup policy or otherwise.
ii. Partially funded by AAI for collaborative research and development of solutions/products as per the collaboration agreement.
iii. Self-funded by the research entity.
iv. Third party funding

9.4 Funds for specific research project would be provided by the concerned entity i.e. if research is being done on the behest of AAI, then AAI would provide that fund separately albeit in this case through CARO and if the research is being done on the

behest of some other stakeholder, then that fund may be provided directly by that entity to the research entity.

9.5 The Projects funded by AAI will be covered as per AAI's R & D Policy or Start-up policy or any other policy in vogue. The Chairman will be the final authority for approving the projects for funding by AAI.

9.6 Long term projects by AAI employees or projects by AAI's long-term research or aviation industry partners will be approved by the AAI board. This Project Specific funding will be covered as per AAI's R & D policy on the approval of the AAI board.

9.7 Funding to the Start-ups will be covered as per AAI's Start Up Policy.

Chapter 10 : Project Management

10.1 Submission and Approval of Problem Statement or Project Proposal

10.1.1 AAI has a policy through CHRM Circular 16/2023 to invite Problem Statement from their own employees, which is to be done twice in a year.

10.1.2 In addition to these problem statements collected from employees, internal committee of EDs of important Directorates i.e. ATM, CNS, Engineering, Operations, Security etc. shall be constituted to devise the problem statements based on their experience. Shortlisted problem statements gathered in this manner should also be evaluated & approved by concerned Member. Approved Problem statement should be forwarded to ED (CARO) through Member (ANS).

Note: *Problem statement which require specific agency to work, such agencies would be selected on the advice of concerned ED and their Member and approved by the Chairman.*

10.1.3 ED (CARO) will invite solution from the prospective research entities by floating EOI. The solution for the problem statement floated through EOI may be from Start-up company or research institute, academic institute etc.

10.1.4 Solutions received by ED (CARO) will be forwarded to the Member concerned for evaluation by the committee consisting of Research Advisor and the EDs nominated by the Member concerned. The committee may also consult a subject matter expert from the concerned field, if required. If the committee recommends the solution, then the same may be put up by the Member concerned to the Chairman for the approval of the funds.

10.1.5 The funding for the solutions received from the Start-ups will be dealt with in accordance with AAI's Start-up policy. A solution requiring more funds than prescribed in Start-up Policy may be recommended by the Chairman to the AAI Board for approval.

10.1.6 The funding for the solutions received from organisations other than the Start-ups will be dealt with in accordance with R&D policy or any other policy in vogue for that matter.

10.1.7 Approved Problem statement will then be undertaken as a Project and the fund (if required) will be assigned to the research entity under an agreement signed between AAI and the research entity.

10.2 Project Proposal & Selection:

10.2.1 In case of non-AAI project, GM(CARO) would invite application or directly receive applications from prospective researchers, research entities, start-ups etc. in different fields of civil aviation sectors for using the CARO Complex along with facilities like lab etc.

10.2.2 The Project Proposals should be related to Civil Aviation Sector only.

10.2.3 The Project proposal shall indicate the timeline of the project and estimate of fund required.

10.2.4 Proposal so received would be selected as per the process defined below:

10.2.5 **Process of Selection of project**

i. the Project proposal will be submitted to the Research Advisor for evaluation by Research Steering Committee for selection.
ii. the Research Steering Committee will evaluate the Project Proposal for the eligibility criteria of Research Area and the Scope of Research and Development mentioned in this document.
iii. The applicants may be invited for discussion/presentation with the selection committee for a preliminary assessment of the project.
iv. The selection committee after due diligence regarding the project's value proposition to AAI, resource requirement and funding needs, will submit the report to ED (CARO) for approval of Project.
v. If Research Steering Committee is not satisfied, it may return the proposal for review and re-submission as per the discussion during the presentation.
vi. ED (CARO) will prioritise the Research Project in view of the available Resources, Timelines and the funding requirement and will submit with comments/recommendations to the Member concerned for acceptance.
vii. After acceptance of the project proposal, the Member concerned will forward the project proposal with their recommendation to the Member (ANS) for submission to the Chairman AAI for approval by the AAI Board.

10.3 **Review and Monitoring of Projects:**

10.3.1 The review and monitoring of the R&D projects is very crucial and needs to be a periodic activity. Research Advisor will conduct periodic monitoring of R&D activities for each project at CARO through the Research Steering Committee.

10.3.2 The R&D projects undertaken by AAI will be monitored and reviewed at pre-determined intervals (monthly / quarterly / annually). The review of the project shall be done with respect to the target set at the beginning of the project. The project report submitted for the review shall contain both physical and financial progress of the project. This will not only help in getting valuable feedback but will also help in determining whether a particular project should be continued or may be abandoned.

10.3.3 Reviews may be concurrent or final, based on the activity chart of the project and its completion time. This may include:

i. Progress of Activities with-respect-to deliverables / Milestones
ii. Need for any course change.
iii. Need for financial or networking modifications.
iv. IPR feasibility

10.3.4 Research Advisor will develop mechanism and procedures for review, specific to the

project and documenting the same in the approval document of the project.

10.4 Continuation and Termination of Project:

10.4.1 The Research Steering Committee for Project Monitoring/Review will monitor the progress periodically and assess the outcomes of the projects. The result of the review process will decide the continuation or termination of Project subject to the conditions like Project objectives will not or cannot be met, or when the need for the Project no longer exists or when the Project is no more viable.

Chapter 11 : Intellectual property

11.1 Intellectual Property (IP) can be a patent, copyright, design registration, developed product, algorithm, software or computer program, technique, process, formulation or other such invention. AAI and partners may agree on sharing rights for any IP created during conduct of the project.

11.2 The sharing of intellectual property rights will be defined in the agreement between AAI and partner.

11.3 All IP's created prior to the project will remain the sole property of the respective partners. However, CARO may allow the use of the following:

i. Pre-existing IP already created at CARO or created in association with CARO.

ii. Improvements and derivative works carried out on pre-existing IP, whether from CARO or partners.

11.4 Certain percentage from the commercialisation of solutions, products resulting from the collaborative project or AAI funded project at CARO may be claimed by CARO as Royalty. The details will be stated in the contract or agreement signed between CARO and collaborating partners or agency receiving funds from CARO.

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AIRPORTS AUTHORITY OF INDIA

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