



## Centre for Air Power Studies

### **REPORT ON THE 21ST SUBROTO MUKERJEE INTERNATIONAL SEMINAR**

#### **ATMANIRBHARTA IN AEROSPACE: WAY AHEAD**

(Organised by the Centre for Air Power Studies (CAPS) on January 07, 2025, at the Air Force Auditorium, Subroto Park, New Delhi)

#### **SESSION I: INAUGURAL SESSION**

1. The 21st Subroto Mukerjee Seminar, held on January 07, 2025, at the Air Force Auditorium, Subroto Park, New Delhi, explored the theme “**Atmanirbharta in Aerospace: Way Ahead**”. With a focus on advancing India’s self-reliance in aerospace, the seminar brought together key personnel of the Indian Air Force (IAF), Ministry of Defence (MoD), Defence Research and Development Organisation (DRDO) and industry leaders to discuss the challenges, opportunities, and actionable strategies for expeditiously achieving this goal.

#### **Welcome Address**

**Air Vice Marshal Anil Golani (Retd), Director General, Centre for Air Power Studies (CAPS)**

2. The session opened with Air Vice Marshal Anil Golani acknowledging the legacy of Subroto Mukerjee, the first Chief of the Indian Air Force, whose vision and leadership laid the foundation for the modern IAF. He highlighted the pivotal role of the aerospace sector in national security, pointed to gaps in current capabilities and underscored the importance of fostering collaboration among public institutions, private enterprises, and academia. His remarks set the stage for an engaging and solutions-oriented discussion.

#### **Opening Address**

**Mr. Rajinder Singh Bhatia, President, Society of Indian Defence Manufacturers (SIDM)**

3. Mr. Rajinder Singh Bhatia delivered an address emphasising the intersection of technology and strategy as the backbone of self-reliance. Drawing on historical examples, including the transformative impact of air power in global conflicts, he explained how technological advancements have consistently shaped the dynamics of warfare. Bhatia acknowledged India’s recent strides in aerospace, citing the indigenous production of the C-295 aircraft as a significant milestone.

4. However, he cautioned against complacency, as success in individual programmes must translate into a broad-based ecosystem for sustained innovation.



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“We cannot win a cricket match if half the team is sitting outside,” he remarked, calling for a collective approach to harnessing India’s potential. He also highlighted the urgent need to bridge public and private sectors through shared resources and seamless interaction, which would create a robust framework for indigenisation and technological development.

### **Special Address**

**Dr Samir V. Kamat, Secretary of the Department of Defence Research and Development (R&D) and Chairman of DRDO**

5. Dr Samir V. Kamat began by underlining the importance of system design, integration, and the indigenous development of critical technologies such as sensors, materials, and advanced weaponry. According to Dr Kamat, a holistic approach is required to build a sustainable aerospace ecosystem, and that innovation must remain at the heart of India’s defence strategy, particularly given the rapid pace of technological advancements globally. To this end, he called for a significant increase in R&D investment, proposing that the defence budget allocation for R&D be raised from 5 per cent to at least 10-15 per cent over the next decade. This, he argued, would enable India to develop capabilities in niche areas like high-power jet aeroengines, hypersonics, and artificial intelligence.

6. He also highlighted the need for a whole-of-nation approach, requiring collaboration across sectors, bringing together academia, private industry, and government research bodies. Dr Kamat further highlighted the importance of establishing dedicated testing facilities for aero-engines and not remaining dependent on other countries for aero-engine testing facilities. He further emphasised the need to build our manufacturing capabilities to ensure that India’s aerospace ambitions are realised.

### **Keynote Address**

**Shri Rajesh Kumar Singh, Defence Secretary, MoD, Government of India**

7. Shri Rajesh Kumar Singh offered an incisive critique of India’s aerospace landscape while charting a path. Opening with an acknowledgement of India’s robust economic growth, he dismissed the notion that resource constraints were hindering progress. Instead, he identified inefficiencies in procurement and decision-making processes as major obstacles to achieving Atmanirbharta. Mr Singh elaborated on the historical weakness of India’s manufacturing sector, describing how the lack of a broad industrial base and reliance on imports had stymied growth in critical technologies like radars, aero engines, and advanced avionics.



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8. Mr Singh emphasised the role of Micro, Small and Medium Enterprises (MSME) and start-ups in fostering innovation, urging policies that create a level playing field for new entrants. “We need to give them visibility and support,” he said, pointing to India’s burgeoning start-up ecosystem as a potential game-changer in the aerospace sector. On a broader level, Singh argued for breaking down monopolistic structures within the defence industry, suggesting that fostering competition would drive innovation and efficiency. He concluded by expressing optimism about the ongoing reforms, stating that India is well positioned to make transformative advancements in aerospace technology.

### **Inaugural Address**

#### **Air Chief Marshal A.P. Singh PVSM AVSM, Chief of the Air Staff, IAF**

9. In his inaugural address, Air Chief Marshal A.P. Singh candidly assessed the Indian Air Force’s challenges and opportunities. Acknowledging the rapid advancements of our adversarial neighbours, he stressed the urgency of developing indigenous capabilities to safeguard India’s strategic interests. Air Chief Marshal AP Singh pointed to the unfortunate extended timelines of the indigenous development programmes, such as the Tejas aircraft, as lessons in the need for accountability and adherence to production schedules. He emphasised that the aerospace sector would be central to achieving India’s vision for 2047, describing it as one of the pillars of national development.

10. The Air Chief also outlined areas requiring immediate attention, including the development of advanced jet aeroengines, network-centric warfare capabilities, and long-range weaponry. He reiterated the importance of fostering innovation and collaboration, urging all stakeholders to effectively align their efforts toward meeting user requirements. He emphasised the need to embrace a culture of risk-taking and learning from failures. “We cannot afford to be scared of failures,” he remarked, calling for bold and decisive action to propel India toward aerospace self-reliance.

### **Vote of Thanks**

#### **Shri K. Ramesh, Director General, SIDM**

11. Shri K. Ramesh delivered the vote of thanks, expressing gratitude to the dignitaries, attendees and organisers for their contributions to the seminar. He acknowledged the insightful addresses delivered during the inaugural session and highlighted the importance of translating these discussions into actionable outcomes. Mr Ramesh also emphasised the significance of the seminar in fostering dialogue and collaboration among all stakeholders, describing it as a vital platform for shaping India’s aerospace future.

### **Book Release**



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12. The inaugural session concluded with the release of the book “**Deterrence from Depth: SSBNs in India’s Nuclear Strategy**” by Anubhav Shankar Goswami, a former Research Associate at CAPS. The book explores the strategic importance of ballistic missile submarines in enhancing India’s nuclear deterrence capabilities. The release underscored the seminar’s broader theme of self-reliance and strategic autonomy, providing a scholarly contribution to India’s defence discourse.

### **SESSION II: AEROSPACE INDIGENISATION: WAY AHEAD**

13. Session II of the 21st Subroto Mukerjee Seminar focused on strategies for advancing aerospace indigenisation and fostering self-reliance in India. The session brought together distinguished speakers, each offering a unique perspective on the challenges and opportunities in achieving this critical objective.

**Chair: Air Chief Marshal N.A.K. Browne PVSM AVSM VM (Retd)**

14. The session was chaired by Air Chief Marshal N.A.K. Browne, who set the tone by highlighting the urgency of building an indigenous aerospace ecosystem. He underscored the geopolitical implications of aerospace indigenisation and the criticality of addressing longstanding gaps in India's defence manufacturing and technological capabilities. He pointed out that while several programmes, such as the LCA Tejas and C-295 transport aircraft symbolise progress, these successes must be scaled up to create a robust indigenous aerospace ecosystem.

**Air Marshal M. Matheswaran AVSM VM (Retd), Founder Chairman and President of The Peninsula Foundation - ‘Strategy for Pursuit of Indigenous Aerospace Capability’**

15. Air Marshal M. Matheswaran laid out a detailed strategy for achieving self-reliance in aerospace. He began by examining the historical trajectory of India’s defence production, pointing to recurring delays in critical projects such as the Tejas Light Combat Aircraft (LCA) and Advanced Medium Combat Aircraft (AMCA).

16. Highlighting a key paradox, he noted that while India excelled in space and nuclear technologies, the defence aerospace sector lagged due to fragmented policies and insufficient investments in R&D. To overcome these challenges, he proposed the creation of a National Aerospace Commission, which would unify and streamline efforts across sectors. Air Marshal Matheswaran emphasised the importance of aligning India's industrial and technological policies with global standards to ensure competitiveness. He also advocated for leveraging public-



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private partnerships to foster innovation and suggested that India study the models adopted by countries like France, which established integrated frameworks for defence production after World War II.

### **Air Marshal Tejinder Singh, AVSM VM, Deputy Chief of the Air Staff - 'IAF's Atmanirbharta-Based Capability-Building Action Plan'**

17. Air Marshal Tejinder Singh presented a comprehensive action plan for the IAF's role in achieving Atmanirbharta. He highlighted ongoing initiatives, including the Tejas Mk-1A programme, the indigenous fighter aircraft pipeline, and the C-295 transport aircraft project, involving significant private sector participation.

18. Air Marshal Tejinder Singh highlighted the Indian Air Force's proactive role in advancing aerospace self-reliance through initiatives such as the C-295 transport aircraft project, which involves over 35 Indian companies, and the induction of indigenous systems like the Akash Surface-to-Air Missile (SAM) and its upgraded variant, Akash-NG. He also detailed the establishment of Design Directorates in Bengaluru and Gandhinagar to support innovation in stealth technology, avionics, and advanced weaponry. Air Marshal Singh emphasised the IAF's critical involvement in programmes like Tejas Mk-1A, ensuring operational readiness and production efficiency while fostering partnerships to build a sustainable and robust aerospace ecosystem in India. However, he acknowledged persistent challenges, such as dependency on foreign original equipment manufacturers (OEM) for critical components like aeroengines and delays in production timelines. He stressed the importance of adopting cutting-edge digital manufacturing techniques to improve production efficiency and reduce reliance on outdated methods. He also emphasised the need to integrate advanced sensor and weapon systems into indigenous platforms to ensure operational advantage.

19. Air Marshal Tejinder Singh concluded by urging stakeholders to adopt a collaborative approach, integrating private and public sector efforts to meet the IAF's evolving requirements while focusing on quality and timeliness.

### **Group Captain (Dr.) R.K. Narang (Retd), Senior Fellow, MP IDSA - 'Advancing Domestic R&D Capacity in Defence'**

20. Group Captain R.K. Narang provided a granular analysis of India's R&D ecosystem in the defence sector. He highlighted a glaring disparity in R&D investment, noting that India allocates only 0.7 per cent of its GDP to research, compared to over 2 per cent in countries like the United States and China. This underinvestment, he argued, has hindered technological innovation and indigenous capability building. Dr Narang stressed the necessity of bridging the gap between



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academic research and industry requirements. He proposed the establishment of Centers of Excellence focused on aerospace technologies to facilitate targeted research and innovation. He also highlighted the potential of creating a Defence Technology Fund to support high-risk projects that private players may otherwise avoid. He elaborated on the importance of fostering a culture of innovation, particularly in emerging areas such as AI-driven design and manufacturing. According to Dr Narang, India's success in indigenisation depends on the effective collaboration of public institutions, private enterprises, and academic bodies.

### **Mr Amit Cowshish, Ex-Financial Advisor (Acquisitions) - '*Collaboration with Foreign Partners for Self-Reliance*'**

21. Mr. Amit Cowshish discussed the legal and financial implications of foreign collaborations. He began by critiquing India's regulatory framework, describing it as highly restrictive and counterproductive to attracting foreign investments. He pointed out that despite significant policy revisions, foreign direct investment (FDI) inflow in the defence sector has been minimal, amounting to less than USD 22 million. Mr Cowshish attributed this to the ambiguous nature of FDI policies, particularly clauses that allow retrospective scrutiny on national security grounds. He argued that such uncertainties deter foreign investors and hinder India's goal of achieving self-reliance. To address these issues, Mr Cowshish proposed revising the regulatory framework to clarify key terms like "national security" and establish predictable guidelines for joint ventures. He also stressed the need for long-term partnerships with foreign entities to bridge immediate capability gaps while simultaneously building indigenous expertise. Mr Cowshish concluded by emphasising that true self-reliance cannot be achieved solely through acquisitions but requires substantial investments in R&D and technology development.

### **Questions & Answers**

22. The interactive Q&A session offered a platform for further exploration of key themes, including:

(a) Policy Revisions - Revising the Defence Acquisition Procedure (DAP) to enhance flexibility and responsiveness.

(b) Private Sector Involvement- Encouraging private companies to participate in niche areas previously dominated by public sector undertakings.

(c) Global Partnerships- Balancing self-reliance with strategic collaborations to accelerate technology acquisition and develop manufacturing skills.

(d) R&D Investments- Increasing budget allocations for defence research to foster innovation and reduce dependency on imports.



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### **SESSION III: STRENGTHENING THE AEROSPACE ECOSYSTEM**

**Chair: Air Chief Marshal RKS Bhadauria PVSM AVSM VM (Retd), Former Chief of the Air Staff**

The chair commenced the session by briefly introducing the eminent panelists.

**Mr Sukaran Singh, CEO/Managing Director, Tata Advanced Systems Ltd - 'Nurturing Indigenisation of Transport and Unmanned Aircraft Ecosystem in India'**

23. The speaker began by highlighting the contributions of Tata Advanced Systems Ltd in the aerospace domain and discussing its future plans and collaborations. He acknowledged India's successes in the field while emphasising the gaps that need to be addressed, especially given the advancements in technology. To bridge these gaps, Mr Singh opined that India needs to ask itself what the objective of "Make in India" is, besides creating employment opportunities. He answered that the goal must be to attain strategic control over key technologies, enabling India to secure its place in the world while bolstering national security. The speaker concluded by stressing India's need to recalibrate policies, since it is only making incremental progress, while the region and geopolitics demand progress through leaps and bounds.

**Shri JS Gavankar, CEO and Country Head, Safran-India - 'Joint Development of Aero Engine'**

24. The speaker commenced by remarking that LCA Mark 1A, Mark 2, and AMCA, among other things, is going to be the cornerstone of the Indian Air Force and Navy. The problem with this, however, is that there are no indigenous jet engines to power the ambition of supporting the above-mentioned aircraft fleets, which India needs to address. Shri Gavankar suggested that the IAF take lessons from the Navy's recent policy of sanctioning the joint design and development of a diesel engine for maritime purposes.

25. If the aeroengine is to be developed, it needs to be a national mission, with organisations like Hindustan Aeronautics Limited (HAL), Bharat Heavy Electricals Limited (BHEL) and DRDO coming together, along with academia, continued the speaker. The speaker highlighted key areas where Safran India invests: developing the aeroengine industrial ecosystem, setting up a helicopter engine MRO in Goa with HAL and civil aeroengine MRO facility in Hyderabad, and aeroengine design and development capabilities. Shri Gavankar concluded his talk by highlighting that since aircraft are not designed for aero engines per se, the challenge thus here is to design an aero engine to fit an aircraft.



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### **Dr. S.V. Ramana Murty, Director, Gas Turbine Research Establishment (GTRE) - 'Aero-Engine Development for Indigenous Fighter Programme'**

26. The speaker opened his talk by highlighting the current indigenous aero engines, especially those developed by HAL, and shed light on the nine Kaveri and four core engines built to date. The speaker laid down the various academic initiatives in this sector, including offering courses on gas turbine enabling technology led by DRDO and Gas Turbine Research Establishment (GTRE), establishing the bi-nodal Centre of Propulsion Technology, and initiating the Contract for Acquisition of Research Services. Additionally, Dr Murty emphasised on future aero engine programmes for indigenous platforms, such as engines for fighter aircraft (LCA Mark-2, AMCA, etc.), the Indian Multi Role Helicopter, High-Altitude Long-Endurance Unmanned Aerial Vehicles (HALE UAV), and small engines for cruise vehicles applications. He also discussed the indigenous development of advanced high-thrust class engines and technologies developed by GTRE, such as, among other products, powder metallurgy discs, large structural castings, damage tolerant disc design, and blisk forging technologies.

27. The speaker concluded by designing a 'Way Forward', which would include strategic investment and pragmatic long-term policy and national will with regard to the development of aero gas turbine engines, joining hands with friendly nations, improving synergy between DRDO, Defence Public Sector Undertakings (DPSU), academia and R&D Institutes, skilled human resources in aero gas turbine engines, and the transformation of Indian industry which ought to be building to specification.

### **Air Vice Marshal Tejpal Singh, AVSM VM, ACAS Plans - 'The Future of Indigenous Aero Engines'**

28. The speaker opened his talk by highlighting that although India had developed aircraft, it had not been able to design and develop aero engines, a feat achieved by only five countries. Technological complexities associated with producing aero engines, coupled with the requirement of intensive infrastructure and testing facilities, are why India has found it difficult to do what is needed, remarked the speaker.

Air Vice Marshal Tejpal Singh stated that the bigger challenge here is to remain invested in this long-drawn process. This problem of developing technologies for





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high-powered jet engines should be tackled by collaborating with an international engine house.

29. The speaker emphasized the importance of increased funding, a priority that the government recognises and supports. Air Vice Marshal Tejpal Singh concluded by iterating on the importance of sustaining existing platforms and stated that India should also incorporate the same engines being used globally.

### **Questions & Answers**

30. During the Q&A session, an audience member inquired about the progress in electric propulsion for the aerospace sector. The panelist confirmed that work on this front has already begun. Another question focused on the prolonged timeline taken to develop the Kaveri engine and the subsequent lull in the sector following its development. The answer to this pointed to delays caused by insufficient funding and timeline shortfalls. The chair addressed the issue by lamenting that it was a government failure, as not enough money was dedicated toward the goal. However, the chair also stressed that the development of the Kaveri engine must not be labelled a failure because its dry engine performance was satisfactory. In addition, the chair highlighted the need for private players to enter the game. A notable suggestion from the audience proposed that the responsibility for engine development be brought under the Prime Minister's Office, arguing it could streamline efforts and secure the necessary resources.

### **SESSION IV: COLLABORATIVE PATHWAYS FOR INCLUSIVE GROWTH TOWARDS AEROSPACE ATMANIRBHARTA: BRIDGING PUBLIC, PRIVATE, AND INTERNATIONAL PARTNERSHIPS**

**Chair: Air Marshal Anil Chopra, PVSM, AVSM, VM, VSM (Retd), Strategic Advisor Aerospace, SIDM**

31. The session was chaired by Air Marshal Anil Chopra, who opened the session by highlighting the outcomes from the previous sessions and emphasised the importance of the aerospace sector by bringing to the fore that 40 per cent of the global defence budget is going toward aerospace. Air Marshal Chopra then briefly introduced the speakers.

**Mr Rajiv Roy Chaudhury, Former Strategy Director, BAE Systems Ltd -  
'Challenge of the 3'I's for Foreign Defence OEMs in India'**

32. The speaker started by describing how much of the critical technology for complex weapons systems is outside India and how the Ministry of Defence is attempting to bring this into India, but with limited progress. Mr Chaudhury noted that



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prior to September 2020, FDI in defence was capped at 49 per cent. Then, the government made a bold move by raising this to 74 per cent, which allowed foreign Original Equipment Manufacturers (OEMs) to have controlling stakes in their joint ventures in India. While the defence sector has seen an FDI inflow of USD 22 million since 2021, the cumulative amount from 2020 to 2022 can be put at USD 65 million. However, Mr Chaudhury pointed out that foreign defence OEMs remain hesitant to manufacture in India due to the 'three Is': Investment, Intellectual Property, and Indigenous Content. The speaker lamented that the 74 per cent cap may not be enough and should be raised to 100 per cent instead. Mr Chaudhury concluded that '**Make in India**' must be prioritised with certain policy changes because it is critical for attaining Atmanirbharta.

### **Comde Jaideep Maolankar (Retd), Executive Vice-President, New Space Research and Technologies Pvt Ltd - '*Expanding the Private Sector's Role in Unmanned Drones Ecosystem*'**

33. The speaker began by observing that much of the discourse on this sector is prescriptive, lacking practical insights as to how to go about it, while noting the absence of clinical definitions for key terms, such as strategic autonomy and Atmanirbharta. "When you ask about innovation, you need to ask who is innovating", remarked Commodore Maolankar. He emphasised that determining military standards and deciding which to apply falls under the purview of the project management authority. Indigenous content, he argued, should be evaluated holistically across the entire system rather than being imposed on individual players, especially those driving innovation.

34. He criticised the tendency to hold OEMs solely accountable for the nation's broader failure to establish a robust industrial base, calling such an approach unfair and retrograde. The speaker stated that we are trying to disaggregate command forces with disruptive warfare while our requirements push us for aggregation. In conclusion, he stressed the importance of addressing India's fundamental cultural weaknesses and opined that the vastness of the term, ***whole-of-nation approach***, is often not understood correctly.

### **Air Vice Marshal Michael Fernandez VM VSM (Retd), Country Head, India GBD South Asia Director, Lockheed Martin India Pvt Ltd - '*Technology Transfer and Make in India: A Win-Win Approach*'**

35. The speaker highlighted certain hurdles with regard to technology transfer in India: regulatory hurdles, intellectual property rights, skill gaps, funding and investment, economic and political stability and the geopolitical environment. India needs to prefer a joint-venture set-up as it will foster partnerships, as they share



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investment costs and profits, and thereby enhance collaboration and investment, suggested Air Vice Marshal Fernandez. The speaker, referring to Mr Chaudhury, commented that, even if foreign OEMs invest 100 per cent, they will not be perceived as an Indian company. To overcome this challenge, the speaker concluded that foreign OEMs can hit certain benchmarks to be considered an Indian company, such as generating revenue and employment, generating millions of dollars, and creating an ecosystem.

### **Mr. Rajiv Sethi, Vice President, New Business Development, Samtel Avionics - *'Innovating at the Grassroots: The Role of MSMEs and Start-ups in Aerospace Technology Development'***

36. The speaker began by putting forth certain considerations drawn from experience, emphasising strategies for MSMEs to achieve success: staying close to one area of excellence; focusing on indigenisation programmes; establishing three separate segments, such as technology development, product development and manufacturing technology, and secure buy-in of the stakeholders. The speaker identified two major challenges faced by MSMEs. First, there is a lack of collaboration among MSMEs to jointly develop high-value products. Second, a recurring issue arises when MSMEs discover that their customers become competitors after receiving support in product development. The speaker concluded that the IAF must identify the technologies most relevant to its current goals.

### **Ms. Saraniya P, Agnikul Cosmos, Incubated Start-up of IIT-Madras - *'Education Powering India's Aerospace Ambitions: Prospects and Challenges'***

37. The speaker started by describing Agnikul's objectives of building a launch vehicle that can go to Low Earth Orbit (LEO) and carry a payload of 30-300 kilograms.

Ms Saraniya P emphasised on creating awareness regarding the aerospace industry by filling gaps in the education sector. She concluded that one of the biggest challenges is depending on other countries for raw materials for the space ecosystem.

### **Question & Answer**

38. Due to the paucity of time during the Q&A session, only one audience member was able to raise a question, expressing concern about whether the space industry might face the same fate as the drone industry, as the opening of the drone industry led to greater dependence on drone components. The response was that India imports raw materials, such as carbon fiber, for drones and launch vehicles. In addition, only a couple of local players have the capacity to make raw materials.



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### **Closing Remarks**

#### **Air Vice Marshal Anil Golani (Retd), DG CAPS**

39. In his closing remarks, the DG CAPS acknowledged the ambitious goals India is striving to achieve, including strategic autonomy, Atmanirbharta (self-reliance), job creation, revenue generation, and the development of critical technologies and manufacturing capabilities. He emphasised that it is unrealistic for any nation to accomplish all these objectives independently and stressed the need for global collaboration. AVM Anil Golani concluded by expressing his gratitude to the teams at CAPS and SIDM for their efforts and contributions.