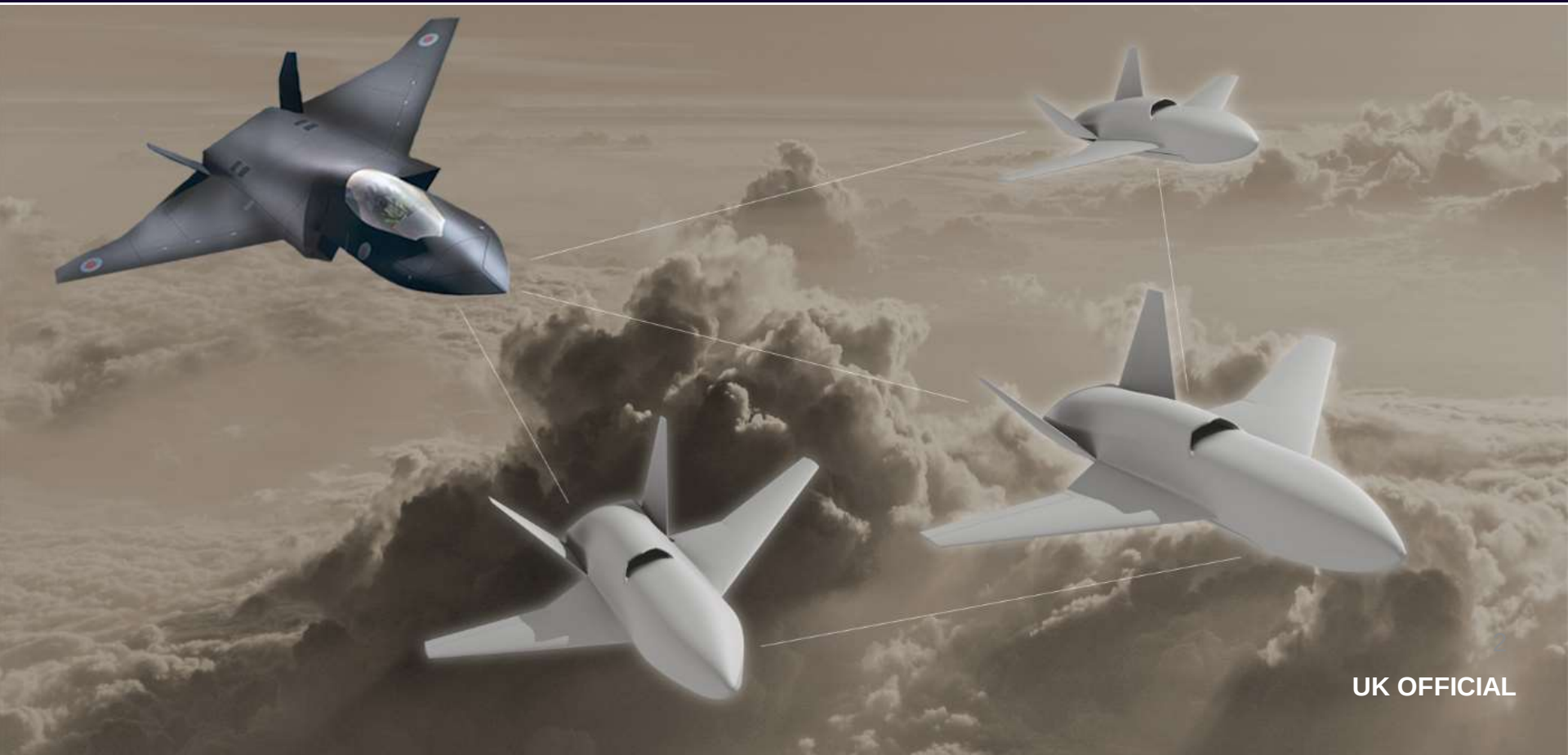
Advanced Design of Composite Structures for Future Combat Aircraft (ADCoSCA)

Supporting information for expressions of interest

Ministry of Defence

ADCoSCA: Supporting information for Expressions of Interest



ADCoSCA Announcement

- The National Composites Centre (NCC) and Dstl join forces to facilitate innovative R&D in combat aircraft composite structures
- This exciting new partnership will explore the art of the possible for composite structures of future combat aircraft
- The emphasis is on engaging the wider community to explore revolutionary design and innovative technologies, reducing mass and through-life cost, and increasing performance, availability, adaptability and modularity
- This ranges from innovative approaches to overall structural-layout, manufacturing and assembly to the optimal combination of detail features and material selection

ADCoSCA Announcement

- Richard Oldfield, Chief Executive of the NCC, said: “We’re delighted to work closely with Dstl to increase the UK’s capabilities and innovation in the use of composites technologies for combat aircraft. As a world-leader in advanced composites design and manufacture, the NCC is uniquely placed to help enhance Dstl’s know-how for future combat aircraft composite structures. That’s why today, we are launching an open call for the brightest and most innovative ideas from a range of organisations so we can work together to equip our Armed Forces with the next generation of high tech, resilient and efficient defence capabilities. This will play a crucial role in how the UK responds to the most complex challenges and threats to national security that our country may face.”

ADCoSCA Announcement

- Steve Simm, Air Systems Programme Manager at Dstl, said: “Dstl is the science inside UK defence and security. To perform its role, Dstl must identify and harness the most advanced technologies, and working with the NCC and the wider UK community provides an exciting opportunity to explore the art of the possible in the design and manufacture of composite structures for the next generation of UK combat air systems. The emphasis of this work is the exploration of innovative technologies and approaches to reduce mass and through-life cost, and to increase performance, availability, adaptability and modularity.”

ADCoSCA Announcement

- The project is committed to run until March 2022
- The project kicks off with an open competition, inviting organisations to pitch designs, research proposals, and data
- Thus, organisations have an opportunity to influence the direction of the project and to obtain funding for their ideas
- The project comprises a combination of intramural (NCC) and extramural work
- The community has an opportunity to influence both these work streams
- A further extension of up to 2 years is being considered by Dstl; subject to contract. There is currently no commitment to do so

Rationale

- The UK needs to be at the forefront of cutting-edge technology with its defence and combat capabilities to support our national security interests, to protect our people, and to safeguard our prosperity
- Investing in advanced research across the range of potential combat aircraft concepts is essential to ensure the defence and security needs of our front-line commands are met

The National Composites Centre (NCC)

The National Composites Centre is a world-class research centre, where companies of any size and across industry sectors can access cutting-edge technology and specialist engineers. It focuses on accelerating the adoption of high-value, sustainable engineering solutions in composites, in order to stimulate growth, and enhance capability for the benefit of the UK.

The NCC has over 350 composite specialists based at its Bristol facility and offers open access to cutting-edge digital manufacturing technology for the design, and development of new composite products pulling through technology from the lab to large-scale production.

Visit www.nccuk.com

Dstl - The Science Inside

Dstl - The science inside UK defence and security

- The Defence Science and Technology Laboratory (Dstl) delivers high-impact science and technology (S&T) for the UK's defence, security and prosperity
- Dstl is an Executive Agency of the MOD with around 4,500 staff working across four sites; Porton Down, near Salisbury, Portsdown West, near Portsmouth, Fort Halstead, near Sevenoaks, and Alverstoke, near Gosport
- What we do:
  - Research – original research and concepts, creating new capabilities for defence and security
  - Requirements and Evaluation – Dstl S&T support to assess, evaluate and deliver current and next generation capabilities
  - Specialist Advice & Services – our knowledge and facilities are ready to meet priority needs
  - Operational Support – rapid and deployed S&T to meet the urgency of operations
- Dstl is a proven national asset, giving the UK clear advantage across science, technology, cyber and information.

Visit www.gov.uk/government/organisations/defence-science-and-technology-laboratory

ADCoSCA Steering Group and IP

- The National Composites Centre (NCC) and the Defence Science and Technology Laboratory (Dstl) are leading the ADCoSCA project through their joint Steering Group
- The Steering Group manages technical engagement with the wider community, and decides on the down-selection of technical tasks; ensuring a coherent overall project
- Its membership is limited to NCC and Dstl, which simplifies the receipt and protection of IP from the community, providing confidence to organisations to come forward with their ideas
- **The Steering Group will ensure that all intellectual property owned by individual organisations will be protected and tracked**

Competition of ideas

- The first stage of the competition process is for organisations and interested parties to pitch their designs, research proposals and/or data through an Expression of Interest
- Parties with successful submissions through the Expressions of Interest stage will be invited to engage in further planning of the project, and to submit formal bids for funding
- Thus, interested parties have an opportunity to influence the work of project and the selection of those undertaking it, and potentially to undertake aspects of the programme themselves
- Identification of the relevant capabilities of interested parties might also enable the Steering Group to target tasks at those parties; subject to IP constraints
- If successful, funding will typically be awarded before the end of March 2021
- Before submitting Expressions of Interest, applicants are encouraged to consider the guidance on the aims and philosophy of the project
- Opportunities for gearing and wider collaboration are of interest

Community of Interest

- Applicants have the opportunity to join the Steering Group's wider 'Community Of Interest', which will bring together other Catapult centres, SMEs, academics, large defence primes and other third parties outside of the traditional defence sector

Aims

- There are two primary aims:
  - to develop airframe design concepts through trades studies and worked examples, and
  - to systematically collate and develop underpinning data upon which the airframe design trades are built, including the performance of composite materials and features, and to identify and mitigate those features that are constraining performance and cost
- The project will identify the scope for transformational design, and will develop a tree of design options
- Dstl would like this project to systematically identify those features and failure modes that are constraining designs, and to explore novel and/or radical approaches to the elimination or mitigation of the limiting features and failure modes. Priority will be given to transformational ideas

Aims

- Note that the emphasis is not on incremental progress on long-term research topics, it is on the understanding of those topics, the identification of those features that constrain design, and the exploration of mitigating approaches
- This is clearly a challenge, but the project will explore whether this is achievable through *combinations* of: platform-level configuration, structural layout, structural design philosophy, feature elimination, failure mitigation and material selection for example

Developing airframe design concepts through trade studies & worked examples

- The scope of work spans next generation manned fighters to unmanned adjuncts
- Applicants are free to make suggestions across this scope in their Expression of Interest
- As the project progresses, the intention is for trade-studies to become increasingly focused around generic worked examples
- As necessary, Dstl will supply GFX defining these worked examples, based on open-source data for a manned fighter and Dstl data for a generic unmanned adjunct
- In parallel, and with the aim of enhancing the project, Dstl is developing its own finite-element models of these example concepts, and aims to make them, and/or data generated using them, available to successful applicants if possible, and where necessary

Developing airframe design concepts through trade studies & worked examples

Indicative interests

- Platform and sub-assembly level
  - Alternative airframe configurations, structural concepts, manufacturing & assembly concepts
  - Rapid, low-cost manufacture and assembly, and airframe layouts that enable it
  - Rapid, low-cost qualification, and structural concepts that enable it
  - Modular / adaptable / reconfigurable / upgradable airframes
  - Through-life cost reduction
  - Alternative material selection
  - Fatigue insensitivity. Corrosion insensitivity
  - Part-count reduction
  - Mass reduction
  - Damage resistance and/or damage tolerance. Protection of structures.
  - Aeroelastic tailoring
- Taking advantage of the potential for increased design freedom for unmanned adjunct aircraft is of particular interest

Indicative interests

- Panel and part level
  - High-strain panels and parts
  - High-strain repairs. Interchangeable / replaceable parts
  - Highly damage-resistant and damage-tolerant panels. Crack arrest
  - Fatigue insensitivity. Corrosion insensitivity.
  - Increased reliability. Reduced through-life structural-integrity risk
  - Alternative materials
  - Elimination of joints and other features. Unitisation
  - High-strength, damage-resistant and damage-tolerant joints
  - Simplified inspection. Reduced inspection

Developing airframe design concepts through trade studies & worked examples

Indicative interests

- Feature and material level
  - Elimination of features
  - High-strain features
  - Crack-arrest features
  - Alternative materials
  - High damage-resistance and damage-tolerance
  - Fatigue insensitivity. Corrosion insensitivity
  - Low-risk structures. Robust design
  - Reduced qualification burden
  - Material interchangeability. Security of supply. Fewer material forms

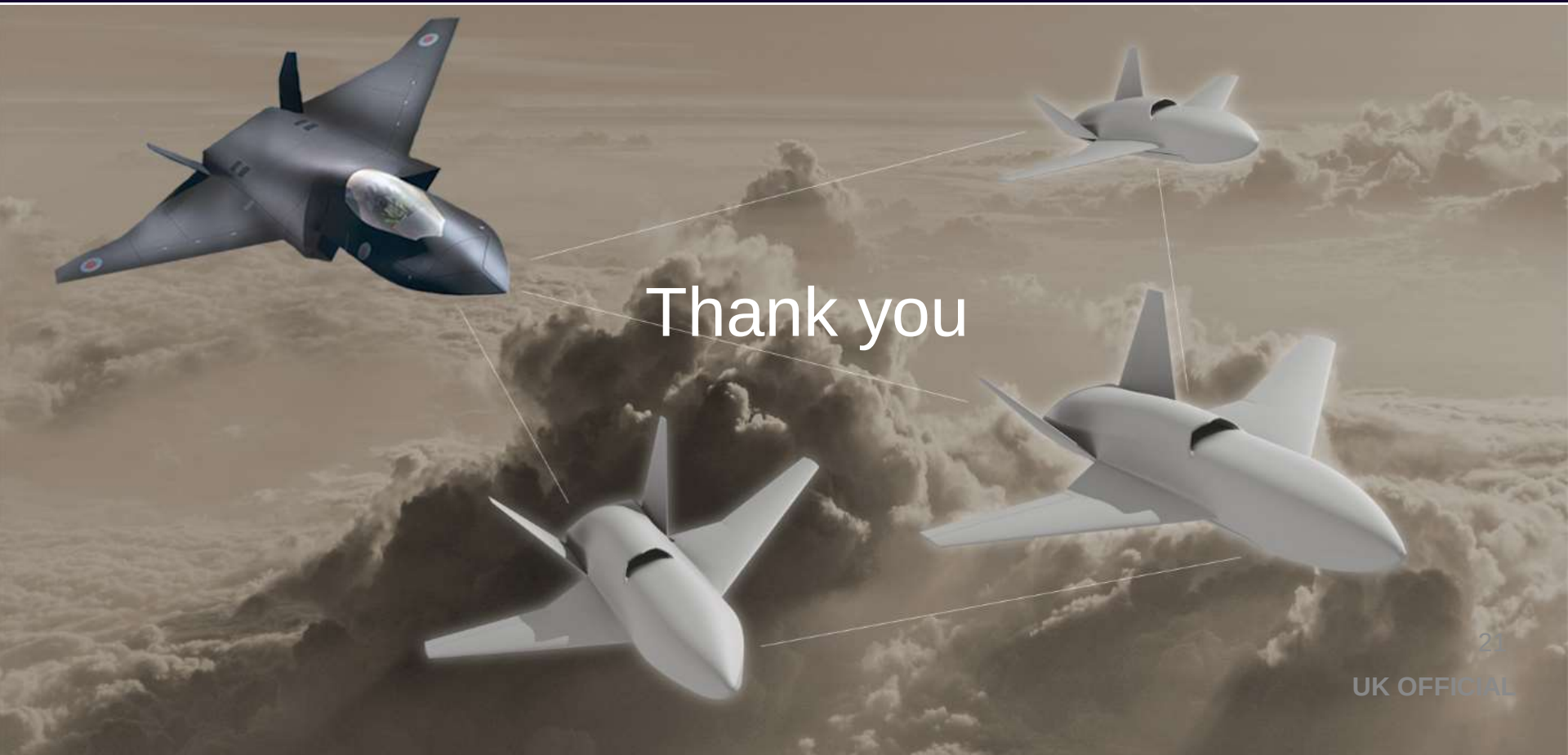
Mitigation of failure at features
Collation of supporting data

- Dstl's wider studies of future airframe concepts, and the airframe trade studies within this project must be founded on supporting data, such as design-allowables & failure-criteria, including that for innovative features. Help from the community in the provision or generation of such supporting data is welcome, and in return the project aims to provide insight into the exploitation potential of the related features and materials. Help in exploiting such data and methods in trade studies is also of interest
- Dstl would like this project to systematically identify those features and failure modes that are constraining designs, and to explore novel and/or radical approaches to the elimination or mitigation of the limiting features and failure modes. This is clearly a challenge. The project will explore whether this is achievable through combinations of: platform-level configuration, structural layout, structural design philosophy, feature elimination, failure mitigation and material selection for example

Find out more

- The Steering Group is holding a webinar for anyone interested in applying to find out more. This will take place on Wednesday 13th January 2021, 14:00 – 16:00. To reserve a place, you can sign up via the NCC website

- Anyone with questions or who would like to sign up to receive updates about this programme can email defence@nccuk.com



Thank you

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