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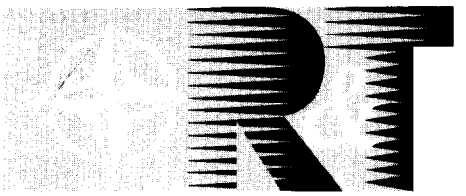

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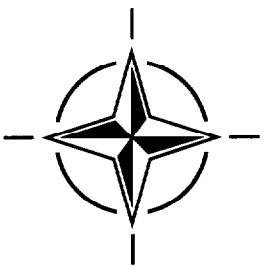
Aircraft Weapon System Compatibility and Integration

(Compatibilité et intégration des systèmes d'armes aéroportés)

Papers presented at the Systems Concepts and Integration Panel (SCI) Symposium held in Chester, United Kingdom, 28-30 September 1998.



Published April 1999

Distribution and Availability on Back Cover

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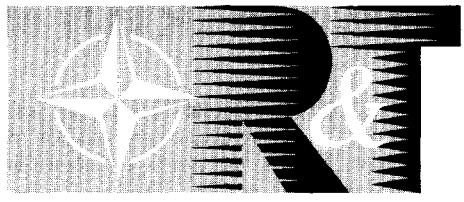

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RTO is the single focus in NATO for Defence Research and Technology activities. Its mission is to conduct and promote cooperative research and information exchange. The objective is to support the development and effective use of national defence research and technology and to meet the military needs of the Alliance, to maintain a technological lead, and to provide advice to NATO and national decision makers. The RTO performs its mission with the support of an extensive network of national experts. It also ensures effective coordination with other NATO bodies involved in R&T activities.

RTO reports both to the Military Committee of NATO and to the Conference of National Armament Directors. It comprises a Research and Technology Board (RTB) as the highest level of national representation and the Research and Technology Agency (RTA), a dedicated staff with its headquarters in Neuilly, near Paris, France. In order to facilitate contacts with the military users and other NATO activities, a small part of the RTA staff is located in NATO Headquarters in Brussels. The Brussels staff also coordinates RTO's cooperation with nations in Middle and Eastern Europe, to which RTO attaches particular importance especially as working together in the field of research is one of the more promising areas of initial cooperation.

The total spectrum of R&T activities is covered by 7 Panels, dealing with:

- SAS Studies, Analysis and Simulation
- SCI Systems Concepts and Integration
- SET Sensors and Electronics Technology
- IST Information Systems Technology
- AVT Applied Vehicle Technology
- HFM Human Factors and Medicine
- NSPG NATO Simulation Policy Group (Modelling and Simulation)

These Panels are made up of national representatives as well as generally recognised 'world class' scientists. The Panels also provide a communication link to military users and other NATO bodies. RTO's scientific and technological work is carried out by Technical Teams, created for specific activities and with a specific duration. Such Technical Teams can organise workshops, symposia, field trials, lecture series and training courses. An important function of these Technical Teams is to ensure the continuity of the expert networks.

RTO builds upon earlier cooperation in defence research and technology as set-up under the Advisory Group for Aerospace Research and Development (AGARD) and the Defence Research Group (DRG). AGARD and the DRG share common roots in that they were both established at the initiative of Dr Theodore von Kármán, a leading aerospace scientist, who early on recognised the importance of scientific support for the Allied Armed Forces. RTO is capitalising on these common roots in order to provide the Alliance and the NATO nations with a strong scientific and technological basis that will guarantee a solid base for the future.

Printed on recycled paper

Published April 1999

ISBN 92-837-0007-4

Printed by Canada Communication Group Inc.
(A St. Joseph Corporation Company)
45 Sacré-Cœur Blvd., Hull (Québec), Canada K1A 0S7

Aircraft Weapon System Compatibility and Integration

(RTO MP-16)

Executive Summary

Weaponry is a central factor in any kind of military activity. The incorporation of weapon systems into aircraft and their integration and satisfactory operation is a topic of major importance to armed forces and manufacturers of weapons and aircraft alike. The scope of this symposium was to critically review the overall state-of-the-art in aircraft weapon system compatibility and integration and to illuminate possible paths for future development and provide beneficial ideas and experience. Sessions dealt with the following topics:

- Theoretical methods and modelling techniques
- Experimental and flight test techniques
- Integration processes and programmes
- Addressing future challenges

This symposium produced many excellent papers providing broad coverage of the weapons integration issues. There were many common threads with regard to the analysis, wind tunnel testing, and flight testing. Computational fluid dynamics (CFD) is proving to be a useful technique; wind tunnel testing is very important in the weapons integration process; but, flight testing has to be the final phase of the weapons integration process. This symposium produced a level of cohesiveness between the analysts and testers; however, full agreement as to the mix of analysis and testing did not evolve. In order to reduce the cost of weapon integration, certification, clearance, and flight testing, weapon integration analytical techniques, including CFD and wind tunnel testing, and flight testing need to become more of an integrated process. The knowledge gained and information shared at this symposium should assist the participants in developing a more integrated process in order to provide NATO nations with fully integrated weapon systems at an affordable price.

Compatibilité et intégration des systèmes d'armes aéroportés

(RTO MP-16)

Synthèse

Les systèmes d'armes sont l'un des éléments clés de toute activité militaire. L'incorporation des systèmes d'armes dans les avions de combat, leur intégration et leur mise en œuvre est un sujet qui revêt une grande importance pour les forces armées, les fabricants de systèmes d'armes et les avionneurs. Ce symposium a eu pour ambition de faire le point de l'état actuel des connaissances dans le domaine de la compatibilité et de l'intégration des systèmes d'armes aéroportés, de mettre en lumière d'éventuelles voies de développement futures et de proposer des idées et de l'expérience susceptibles de faire avancer les travaux dans ce domaine. Les différentes sessions ont traité des sujets suivants :

- méthodes théoriques et techniques de modélisation
- techniques expérimentales et techniques d'essais en vol
- programmes et procédures d'intégration
- relèvement des défis de l'avenir

Ce symposium a permis la présentation de bon nombre de communications de haut niveau, couvrant une large gamme de questions relatives à l'intégration des systèmes d'armes. Beaucoup de préoccupations communes ont été évoquées en ce qui concerne l'analyse, les essais en soufflerie et les essais en vol. L'aérodynamique numérique (CFD) se révèle comme une technique intéressante; les essais en soufflerie sont très importants pour l'intégration des systèmes d'armes, mais les essais en vol restent la phase critique de cette intégration. Ce symposium a vu un bon niveau de cohésion entre les analystes et les responsables d'essais, mais aucun accord global n'a été trouvé sur le partage judicieux à faire entre l'analyse et les essais.

La diminution du coûts de l'intégration des systèmes d'armes, de la certification, de l'homologation et des essais en vol, passe par le regroupement des techniques analytiques d'intégration des systèmes d'armes, y compris le CFD et les essais en soufflerie, et les essais en vol en un véritable processus intégré. Les connaissances acquises et les informations échangées lors de ce symposium devraient aider aux participants de développer un processus plus intégré, afin de permettre de fournir aux pays membres de l'OTAN des systèmes d'armes totalement intégrés pour un coût abordable.

Contents

†Paper not available at time of printing.

†Paper not available at time of printing.

Systems Concepts and Integration Panel

Acknowledgements

The Systems Concepts and Integration Panel wishes to express its thanks to the National Authorities of the United Kingdom for the invitation to hold this symposium in their country.

REPORT DOCUMENTATION PAGE

1. Recipient's Reference	2. Originator's References	3. Further Reference	4. Security Classification of Document
	RTO-MP-16 AC/323(SCI)TP/8	ISBN 92-837-0007-4	UNCLASSIFIED/ UNLIMITED

5. Originator Research and Technology Organization
North Atlantic Treaty Organization
BP 25, 7 rue Ancelle, F-92201 Neuilly-sur-Seine Cedex, France

6. Title
Aircraft Weapon System Compatibility and Integration

7. Presented at/sponsored by
the Systems Concepts and Integration Panel (SCI) Symposium held in Chester, United Kingdom, 28-30 September 1998.

8. Author(s)/Editor(s)	9. Date
Multiple	April 1999
10. Author's/Editor's Address	**11. Pages**
Multiple	256

12. Distribution Statement There are no restrictions on the distribution of this document. Information about the availability of this and other RTO unclassified publications is given on the back cover.

13. Keywords/Descriptors

Weapon systems
Military aircraft
Integrated systems
Compatibility
Flight tests
Computational fluid dynamics
Wind tunnel tests
External stores
Trajectories
Mathematical models
Computerized simulation
Separation
Structural analysis
Aerodynamics
Aerodynamic loads

14. Abstract

Economic constraints dictate that the lives of existing aircraft must be stretched, making the incorporation of new weapons and weapon systems into existing airframes necessary. These same constraints dictate that the corollary is also true, i.e. that new aircraft must cope with existing weapons as well as their new systems. Along these lines, the goal of this symposium was to critically review the overall state-of-the-art in aircraft weapon system compatibility and integration for the benefit of researchers, RDT&E managers, engineers, and operational staff employed by both contractor and supplier organisations within NATO. Illuminating possible paths for future development and providing beneficial ideas and experience was achieved as part of the overall objective of the symposium. Also, the symposium explored both fixed and rotary wing applications as they related to the above mentioned session areas. Overall, the attendees were quite pleased with the presentations along with a very informative roundtable discussion.

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(accessible également en mode interactif dans la base de données bibliographiques en ligne du NTIS, et sur CD-ROM)

Imprimé par le Groupe Communication Canada Inc.
(membre de la Corporation St-Joseph)
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(also available online in the NTIS Bibliographic Database or on CD-ROM)

Printed by Canada Communication Group Inc.
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ISBN 92-837-0007-4