



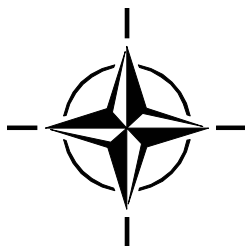
RTO MEETING PROCEEDINGS

MP-SET-080

Target Identification and Recognition using RF Systems

(Reconnaissance et identification de cibles
à l'aide des systèmes RF)

Papers presented at the RTO Sensors and Electronics Technology
Panel (SET) Symposium held in the Banner Hall at the Defence Museum,
Akershus Fortress in Oslo, Norway on 11-13 October 2004.



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RTO is the single focus in NATO for Defence Research and Technology activities. Its mission is to conduct and promote co-operative 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 co-ordination with other NATO bodies involved in R&T activities.

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- AVT Applied Vehicle Technology Panel
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- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS Studies, Analysis and Simulation Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

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Target Identification and Recognition using RF Systems (RTO-MP-SET-080)

Executive Summary

The goal of this symposium was to describe the current and projected capability of RF systems for Non-Cooperative Target Identification/Recognition (NCTI/NCTR) at long range and in all weather conditions. Specific objectives were to review NCTI/NCTR R&D efforts available to NATO nations, suggest how and when this technology may contribute to an operational Combat Identification (CID) capability, and address coalition interoperability issues. The symposium was organized along the following themes: NCTI/NCTR of air targets, surface targets, passive RF systems & technology, and countermeasures against NCTI/NCTR.

The first half of this three-day symposium was classified NATO (S) and consisted of twenty-three oral presentations; these papers are available in a classified supplement to Symposium Proceedings. The second-half consisted of eighteen unclassified oral presentations and sixteen unclassified posters that were open to Partnership-for-Peace (PfP) nations.

The symposium started with overview presentations of three active SET TGs: SET-053 "Ground Target Recognition by Radar", SET-068 "Modeling, Analysis and Recognition of Radar Signatures for Non-Cooperative Aircraft Identification", and SET-069 "Advanced mmW Techniques for Ground Target Acquisition". Chairmen of these TGs described their Programmes of Work and presented major results; much of the work discussed was later elaborated by other oral and poster presentations.

Most of the contributed papers discussed the state-of-the-art and problems associated with non-cooperative aircraft and ground vehicle recognition. Target classifiers were based mostly on analysis of high range resolution (HRR) profiles and synthetic aperture radar (SAR) or inverse synthetic aperture radar (ISAR) image analysis. A recurrent theme was the comparison of classification results based on real data with results obtained from synthetic (model) data. Numerous presentations described and compared the relative merits of various computational electromagnetic codes for predicting synthetic target signatures and imagery. Various target classification algorithms and/or systems were described and compared. One general observation is that each classifier described performs about as well as another; there is no compelling reason to chose a particular classifier. This conclusion seems to be independent of target type. A few fielded systems consisting of sensor and classifier were described.

Other topics included the contribution of RF polarimetry to target ID, the application of joint time-frequency analysis for improving radar imagery, and passive bi/multi-static sensor systems for covertly obtaining target data. The capability of NCTI/NCTR using HF radar was described in a contribution from Australia.

Reconnaissance et identification de cibles à l'aide des systèmes RF (RTO-MP-SET-080)

Synthèse

Ce symposium avait pour objectif de présenter la capacité actuelle et projetée en systèmes RF pour l'identification/reconnaissance de cibles non coopératives (NCTI/NCTR) à grande distance et tous temps. Les organisateurs ont voulu entre autres faire le point sur les activités de R&D en cours au sein de l'OTAN dans ce domaine, prévoir à quelle échéance et de quelle manière ces technologies pourraient être mises à contribution dans la réalisation d'une capacité d'identification de cibles non coopératives (CID), et examiner la question de l'interopérabilité des coalitions. Il était organisé autour des thèmes suivants : le NCTI/NCTR de cibles aériennes et de cibles de surface, les technologies et les systèmes RF passifs, ainsi que les contre-mesures contre le NCIT/NCTR.

La première partie de ce symposium de trois jours était classifiée NATO (S) et consistait en vingt-trois présentations orales. Ces communications sont disponibles sous forme d'un supplément classifié au compte rendu du symposium. La deuxième partie était composée de dix-huit communications orales non classifiées, ainsi que de seize présentations données lors des séances d'affiches, ouvertes aux membres des pays du Partenariat pour la paix (PPP).

Le symposium a débuté par des présentations résumant l'état d'avancement des trois TG actifs, à savoir : SET-053 « La reconnaissance radar des cibles au sol », SET-068 « La modélisation, l'analyse et la reconnaissance des signatures radar pour la reconnaissance de signatures radar aux fins d'identification d'aéronefs non coopératifs », et SET-069 « Les techniques mmW avancées de reconnaissance de cibles au sol ». Le président des TG a décrit leurs programmes de travail et a présenté les principales conclusions ; bon nombre des sujets évoqués ont été développés plus avant lors d'autres présentations orales et de séances d'affiches ultérieures.

La plupart des communications reçues ont porté sur l'état actuel des connaissances dans le domaine ainsi que sur les problèmes associés aux aéronefs non coopératifs et la reconnaissance des véhicules au sol. Les classificateurs de cibles étaient basés sur l'analyse de profils de haute résolution en distance (HRR), ainsi que sur l'analyse d'imagerie obtenue par des systèmes radar à ouverture synthétique (SAR) et à ouverture synthétique inverse (ISAR). La comparaison des résultats de classification basés sur des données réelles avec des résultats obtenus à partir de données synthétiques (modèles) est revenue souvent dans les discussions. De nombreuses communications présentaient et comparaient les avantages relatifs de différents codes de calcul électromagnétiques pour la prévision de signatures et de l'imagerie de cible synthétiques. Différents algorithmes et/ou systèmes de classification de cibles ont été présentés et comparés. Il est apparu de façon générale que les performances des différents classificateurs étaient plus ou moins égales et que, par conséquent, il n'y avait pas de raison impérieuse de choisir tel classificateur plutôt que tel autre. Cette conclusion semble être indépendante du type de cible. Un certain nombre de systèmes mis en service, composés de capteurs et de classificateurs, ont été présentés.

Les autres questions examinées comprenaient la contribution de la polarimétrie RF à l'identification des cibles, la mise en application de l'analyse temps-fréquence pour l'amélioration de l'imagerie radar et les systèmes bi/multistatiques passifs pour la recherche furtive de données de cible. Enfin, l'Australie a présenté les possibilités de NCTI/NCTR à l'aide de radars HF.

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‡ No papers were submitted for the Overview presentations.

* Paper published in Classified Supplement RTO-MP-SET-080(S).

+ Associated presentation is NATO Restricted, therefore is published in Classified Supplement RTO-MP-SET-080(S).

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* Paper published in Classified Supplement RTO-MP-SET-080(S).

† Paper not presented.

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Integrated systems		Target recognition	
NCTI (Non-Cooperative Target Identification)		Target signatures	
Non-Cooperative Target Recognition			
14. Abstract			
<p>The purpose of this symposium was to review Non-Cooperative Target Identification/Recognition (NCTI/NCTR) R&D efforts available to NATO nations, suggest how and when this technology may contribute to an operational Combat Identification (CID) capability, and address coalition interoperability issues.</p> <p>The symposium was organized along the following themes: NCTI/NCTR of air targets, surface targets, passive RF systems & technology, and countermeasures against NCTI/NCTR. There were twenty-three oral presentations in the classified sessions, eighteen unclassified oral presentations and sixteen unclassified posters open to Partnership-for-Peace (PfP) nations presentations.</p>			





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