

**NORTH ATLANTIC TREATY ORGANIZATION**



**RESEARCH AND TECHNOLOGY ORGANIZATION**

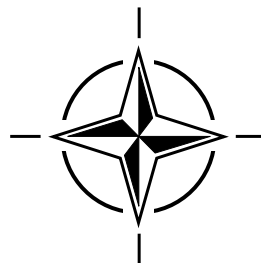
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**RTO MEETING PROCEEDINGS 62**

# **Operational Medical Issues in Hypo- and Hyperbaric Conditions**

(les Questions médicales à caractère opérationnel liées aux conditions hypobares ou hyperbares)

*Papers presented at the RTO Human Factors and Medicine Panel (HFM) Symposium held in Toronto, Canada, 16-19 October 2000.*



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# The Research and Technology Organization (RTO) of NATO

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 the following 7 bodies:

- AVT Applied Vehicle Technology Panel
- HFM Human Factors and Medicine Panel
- 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

These bodies are made up of national representatives as well as generally recognised 'world class' scientists. They 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.

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# **Operational Medical Issues in Hypo- and Hyperbaric Conditions**

**(RTO MP-062 / HFM-050)**

## **Executive Summary**

On 16-19 October 2000, NATO, Partnership for Peace, and Non-NATO nationals from 24 countries met in Toronto, Canada to discuss baromedical issues relevant to alliance operations. This was a symposium, not a consensus conference. Accordingly, the speeches and discussions presented the state-of-the-art, rather than arriving at definite conclusions or unanimous recommendations for all alliance nations.

Hypo- and hyperbaric exposures are encountered regularly in routine military operations, and require a high level of operational and medical expertise to avoid acute and long-term injury, or even mission failure.

In spite of more than 100 years of experience and research on decompression illness (DCI) in diving and aviation, this is still a major problem in alliance operations. Relevant research regarding improvement of operational and treatment procedures are in progress in several alliance nations. NATO/RTA/RTO/HFM should form a group of experts in baromedicine to follow closely research regarding DCI, breathing gas composition and possible long-term health damage from diving. The group should promote co-operation between relevant centres, and encourage exchange of research data. The group members should meet annually to discuss what should be recommended for implementation in technical and operational manuals, and which projects should be supported by the alliance.

Hyperbaric oxygen therapy (HBO) has proved valuable also on a number of indications other than dysbaric conditions, like typical battlefield injuries on sea and land. Accordingly, the alliance should see to that this treatment modality becomes available in or near theatres of operations, in order to save limbs and lives.

Alternobaric vertigo is encountered regularly, especially during diving. In aviation it may prove dangerous, especially in agile fighter aircraft. HFM should make sure that knowledge about how to tackle this type of dizziness becomes available in all alliance nations.

Selection, training and adaptation of personnel for special operations in hypo- and hyperbaric conditions are crucial for mission success. Several interesting and promising aspects on these issues were presented. HFM should follow up the ongoing research in this area, and recommend implication of relevant new knowledge into operational procedures. That could be done by arranging small consensus conferences on selected topics.

Eventually, in a few years another state-of-the-art symposium like the present one should be arranged.

# **les Questions médicales à caractère opérationnel liées aux conditions hypobares ou hyperbares**

**(RTO MP-062 / HFM-050)**

## **Synthèse**

Des représentants des pays membres de l'OTAN, des pays du Partenariat pour la Paix (PpP) et de 24 pays non-membres de l'OTAN se sont réunis du 16 au 19 octobre 2000 à Toronto au Canada pour aborder différentes questions baromédicales liées aux opérations de l'Alliance. Il s'agissait d'un symposium et non pas d'une conférence consensuelle. De ce fait, les présentations et les discussions n'ont présenté que l'état actuel des connaissances dans ce domaine et ne cherchaient donc pas à établir des conclusions ou des recommandations unanimes pour l'ensemble des pays de l'Alliance.

L'exposition aux conditions hypobares et hyperbares est fréquente lors des opérations militaires courantes et exige un haut niveau d'expertise médicale et opérationnelle pour empêcher toute lésion aigüe et de longue durée, voire même l'échec de la mission.

En dépit de plus de 100 ans d'expérience et de recherches sur les barotraumatismes (DCI) dans les domaines de la plongée et de l'aviation, ce type d'exposition pose toujours des problèmes considérables pour les opérations de l'Alliance. Des travaux de recherche sur l'amélioration des procédures de traitement et des procédures opérationnelles sont en cours dans plusieurs pays de l'Alliance. NATO/RTO/RTA/HFM devrait prochainement créer un groupe de spécialistes en baromédecine avec pour mandat de suivre de très près les travaux de recherche sur la DCI, la composition du mélange respiratoire et la dégradation possible de la santé à long terme liée à l'activité de plongée. Le groupe devra chercher à promouvoir la coopération entre les différents centres concernés et encourager l'échange de données résultant des recherches menées. Les membres du groupe devront se réunir une fois par an pour discuter d'éventuelles recommandations en ce qui concerne les manuels techniques et opérationnels et les projets qui devraient être soutenus par l'Alliance.

L'oxythérapie hyperbare (HBO) s'est avérée efficace dans un certain nombre de cas autres que dysbariques, comme les lésions de champ de bataille à terre ou en mer. Par conséquent, l'Alliance doit assurer la présence d'une telle capacité de traitement sur ou à proximité des théâtres d'opérations afin d'épargner des vies.

Le vertige alternobare est rencontré régulièrement, surtout lors des opérations de plongée sous-marine. En aviation il peut s'avérer dangereux, en particulier pour les pilotes d'avions de combat très manoeuvrants; HFM devra s'assurer que les informations concernant le traitement de ce type de vertige sont diffusées à l'ensemble des pays de l'Alliance.

La sélection, l'entraînement et l'adaptation des personnels devant exécuter des missions dans des conditions hypobares et hyperbares sont décisifs pour la réussite des missions. Différents aspects intéressants et prometteurs de ces questions ont été présentés. HFM devra suivre les travaux de recherche actuellement en cours dans ce domaine et faire des recommandations concernant l'intégration de ces nouvelles connaissances dans les procédures opérationnelles. Pour cela, il suffirait d'organiser des conférences consensuelles à petite échelle sur des sujets particuliers.

Ensuite, dans quelques années, un autre symposium résumant l'état des connaissances dans ce domaine pourrait être envisagé.

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