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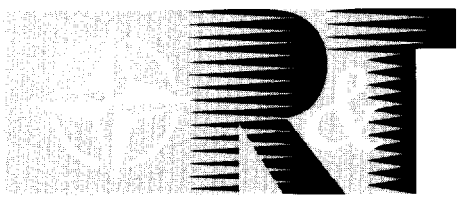

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(Problèmes actuels de médecine aéronautique posés par les opérations utilisant des voilures tournantes)

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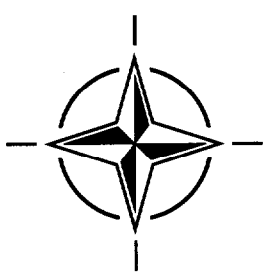

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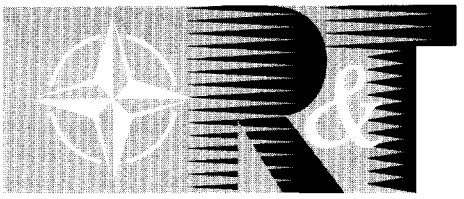

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The total spectrum of R&T activities is covered by 7 Panels, dealing with:

- 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
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Current Aeromedical Issues in Rotary Wing Operations

(RTO MP-19)

Executive Summary

The Human Factors and Medicine Panel held a Symposium on current aeromedical problems arising from helicopter operations, in San Diego, in the United States from 19th to 21st October 1998.

The use of helicopters is not restricted to a single branch of the armed forces, as they are deployed by Navies, Armies and Air Forces. Their use may be specific to one of the Services but many of the problems encountered are common to all users. Moreover, there has been an expansion of the civilian helicopter fleet, which means that military users will increasingly be able to benefit from the experience acquired in this domain. We can summarise this type of use as follows: standard means of transport, or for medical evacuation, land or sea surveillance, ground attack and, more recently, for air defence. However, the performances achieved by helicopters and their flight control equipment enable crews to operate in more hostile conditions (poor weather) or to carry out low-level night combat operations (use of night vision goggles or helmet mounted displays). Given its characteristics and the complexity of its use and its environment, the helicopter is exposed to damage and a whole series of measures can be previewed to alienate this risk. The presentations concentrated on five main topics: 1) Crew training, 2) The different conditions of use, 3) The psycho-physiological component, 4) Survival equipment and methods, 5) Accidents and their prevention.

This symposium was of great interest to the military, owing to the inclusion of the following subjects:

- a summary assessment of the constraints specific to missions carried out by helicopter crews and the means of dealing with them,
- crew selection and training,
- the highlighting of accident-producing factors such as spatial disorientation and the usefulness of preventive measures such as tactile stimulators and simulators,
- the use of CRM (crew resource management) for dealing with critical situations,
- indications as to the use of the helicopter, its equipment and the type of crew, depending on the type of evacuation to be performed as part of integrated medical relief operations and the measures to be taken in the event of accidents involving large numbers of wounded and, as a result, varied and complementary evacuation facilities,
- the complexity of combat RESCO,
- dynamic (vibration) and psycho-physiological stress and the pathological consequences such as fear and dorsalgia,
- the use of new head-mounted equipment (visor display) or NBC equipment with their benefits but also the additional constraints which they impose,
- the limits of personal flight and safety equipment, the need to improve it and to train aircrew in its use,
- the epidemiological analysis of accidents, of their causes and of the ways of limiting injuries (absorbent structure, fuel tank protection systems, anti-crash seats) "airbags" or even special devices for use when the helmet is weighted by equipment).

A careful reading of the papers presented at the symposium will enable both specialists and decision-makers to make a summary assessment of the constraints of the missions on the one hand, and on the other, of the new methods of protection and training and the new technologies which will enable aircrew to carry out their missions in a safer environment. In addition, they will perhaps discover that helicopter operation can be optimised by a series of different devices and above all by judicious matching of "type of helicopter - type of aircrew training - type of additional on-board equipment".

Problèmes actuels de médecine aéronautique posés par les opérations utilisant des voilures tournantes

(RTO MP-19)

Synthèse

Le panel de médecine et des facteurs humains a organisé un symposium sur les problèmes actuels de médecine aéronautique posés par les opérations utilisant des voilures tournantes à San Diego, Etats-Unis du 19 au 21 octobre 1998.

L'utilisation de l'hélicoptère n'est pas propre à une seule arme puisqu'on le retrouve aussi bien dans l'armée de l'air que dans la marine et l'armée de terre. Son utilisation peut être spécifique à l'arme mais de nombreux problèmes sont communs. De plus, on assiste à une expansion de la flotte d'hélicoptères dans le milieu civil qui permettra de plus en plus au milieu militaire de bénéficier de cette expérience. Cette utilisation peut être schématiquement présentée de façon suivante : moyen de transport standard ou dans le cadre d'évacuation sanitaire, surveillance terrestre ou maritime, attaque au sol et depuis peu défense aérienne. Par contre, les performances des hélicoptères et des équipements pilotes permettent aux équipages d'intervenir dans des conditions de vol plus hostile (météo dégradée) ou d'assurer des missions de nuit en vol basse altitude et dans le cadre du combat (utilisation de jumelles de vision nocturne ou viseur visuel de casque). Par ses caractéristiques et la complexité de son utilisation ou de son environnement, l'hélicoptère peut être accidenté et toute une série de mesures peut être envisagée pour reculer ce risque. Les présentations ont porté sur cinq thèmes principaux : 1) L'entraînement des équipages, 2) les différentes conditions d'utilisation, 3) la composante psycho-physiologique, 4) les équipements ou les méthodes de survie, 5) les accidents et leur prévention.

Pour les militaires, ce symposium a représenté un grand intérêt en raison des sujets suivants :

- un bilan des contraintes spécifiques aux missions menées par les équipages d'hélicoptères et les moyens d'y faire face,
- la sélection et l'entraînement des équipages,
- la mise en évidence des facteurs accidentogènes tel que la désorientation spatiale et l'intérêt de mesures préventives pour y remédier tel que des stimulateurs tactiles et l'utilisation de simulateur,
- l'intérêt de la CRM (crew resource management) pour faire face aux situations critiques,
- l'indication de l'utilisation de l'hélicoptère, de son équipement et du type d'équipage en fonction du type d'évacuation dans le cadre de secours médicaux intégrés et les mesures à prendre dans le cas d'accidents impliquant de très nombreux blessés et donc des moyens d'évacuation variés et complémentaires,
- la complexité de la RESCO de combat,
- la contrainte dynamique (vibration) et psycho-physiologique et les conséquences pathologiques telles que la peur et les dorsalgies,
- l'utilisation des nouveaux équipements de tête (viseur visuel de casque) ou d'équipements NBC avec leur intérêt mais aussi les contraintes supplémentaires qu'ils imposent,
- les limites des équipements personnels de vol et de secours, la nécessité de les améliorer et d'entraîner les équipages à leur utilisation,
- l'analyse épidémiologique des accidents, des causes, des moyens pour limiter les blessures (structure absorbante, système de protection des réservoirs, siège anti-crash, «airbags» voire même dispositifs spéciaux lors de l'utilisation de casques alourdis par les équipements).

Une lecture attentive des communications du symposium permettra aussi bien aux décideurs qu'aux experts de faire un bilan concernant les contraintes des missions, des nouvelles méthodes de protection ou d'entraînement ou des nouvelles technologies permettant aux équipages d'assurer leurs missions dans un environnement plus sécurisé. Par ailleurs, cette lecture leur permettra peut-être de découvrir que l'utilisation de l'hélicoptère peut être optimisée par une série de dispositifs et surtout par l'adéquation «type d'hélicoptère - type d'entraînement de l'équipage - type d'installation complémentaire à bord».

Contents

Preface

Rotary wing operations include transport of passengers and wounded in the military and civilian arenas, as well as combat mission. New equipment and new technologies are increasingly permitting to expand the domain of rotary wing activities, and numerous new types of helicopters may be used in a wide range of flying conditions (overcast, night,...). This report focuses on aeromedical aspects of human factors, flight medicine, standardization and interoperability issues. Analysis of past experiences permits to better design emerging technologies for improving crew safety and efficiency. Specialists working in the domain will find this report the most up-to-date information concerning:

- Crew training for helicopters operations
- The use of helicopters in extreme mission environments
- Human factors and psychophysiology
- Life support equipment, accident and crashworthiness.

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Aviation accidents	Fear	Goggles
Flight crews	Protective equipment	Design
Pilot training	Helmet mounted displays	Psychophysiology
Constraints	Safety devices	Military operations
Spatial orientation	Human factors engineering	Ear protectors
Prevention	Survival training	Situational awareness
Stimulus (psychophysiology)	Life support systems	Cockpits

14. Abstract

These proceedings include the Technical Evaluation Report, Keynote Address, and 41 papers from the Symposium sponsored by the NATO/RTO Human Factors and Medicine Panel, which was held in San Diego, California, USA from 19-21 October 1998.

Rotary wing operations include military or civilian missions such as transport, medevac, and combat. A range of human factors problems may be implicated in helicopter mishaps, such as spatial disorientation or excessive workload. Furthermore, flying a helicopter can contribute to various specific pathologies, ranging from lower back pain to flight phobias. In several helicopter accidents, it has been suggested that injuries could have been avoided if adequate safety and protection technologies had been used. Although helicopters can be used for medevac involving large numbers of wounded, the use of helicopters has to be fully integrated with other transport systems and their equipment should be adapted for this type of mission. New training methods, such as crew resource management or spatial disorientation training, and new technologies, such as the "tactile situation awareness system" (TSAS) may, when fully implemented, help to avoid accidents. Utilization of swimming pools with specific tools for helicopter evacuation training can greatly reduce the risk of death by immersion. On the other hand, more effort is needed to improve the personal flight equipment. Although epidemiological data suggest that the risk of accidents and injuries is already low in certain air forces, the introduction of new protection technologies may help to further reduce the numbers of wounded. This symposium provided a review of the state-of-the-art concerning the various human factors implicated in helicopter operations, new methods and systems for increasing safety and efficiency of the helicopter operations, and new methods and systems for increasing safety and efficiency of the helicopter crew.

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