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RTO AGARDograph 341

The Requirements for an Emergency Breathing System (EBS) in Over-Water Helicopter and Fixed Wing Aircraft Operations

(Spécification d'un respirateur de sauvetage pour aéronefs à voilure fixe et à voilure tournante en mission de survol maritime)

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The Requirements for an Emergency Breathing System (EBS) in Over-Water Helicopter and Fixed Wing Aircraft Operations

(RTO AG-341 / HFM-054)

Executive Summary

When a helicopter ditches, it commonly inverts and sinks rapidly. Even if the accident is survivable, the astonishing fact is that fifteen percent of the crew and occupants will perish. The basic reasons why occupants have difficulty making underwater escape, have already been extensively discussed in AGARDograph No 305 by one of the authors titled "The Human Factors Relating to Escape and Survival from Helicopters Ditching in Water" published in 1989.

Since this was completed, the two authors have conducted further research on the principal causes of this regrettably high fatality rate. The conclusion to be drawn is that the occupants simply cannot hold their breath long enough to make an escape, and the cause of death is drowning. The fatality rate does not appear to be diminishing.

In Chapter I, this AGARDograph describes the extent of the problem, provides the latest helicopter ditching statistics, the causes of the problem, the factors determining the time required to make an underwater escape, the factors determining the time available for escape and the rationale for the provision of an Emergency Breathing System. Chapter II describes (a) the development of Emergency Breathing Systems for underwater escape specifically citing progress in the Royal Navy; (b) progress in the U.K. Civilian North Sea Helicopter Operation with special reference to the introduction of a novel re-breathing system; (c) progress in the U.S. with the U.S. Coast Guard pioneering effort in introducing the first oxygen re-breather system into helicopter service, and the U.S. Navy progress with their first procurement of 8,200 compressed EBS units and reports of the first lives saved with this unit - HEED II; (d) the Canadian progress demonstrating the fact, which is very common among military organizations, that it took eight years to introduce a piece of already proven diving equipment, requiring only the tiniest modification into service; and (e) the introduction of EBS into the Italian, New Zealand and Singaporean Navies. Chapter III reviews the currently available emergency air supplies for underwater escape from helicopters on the market or potentially coming to market. This is followed with discussion on the choice of a re-breather or compressed air system in Chapter IV. Chapter V discusses the importance of producing a course-training package prior to the introduction of a system into service and describes a typical package example from the U.S. Coast Guard and a civilian training school at Survival Systems Ltd. in Canada. Finally, Chapter VI summarises the whole situation on EBS as we enter the Twenty-First Century.

Seventeen years ago, there were no EBS for crew or passengers in helicopters flying over water. There were basically three units produced by industry still undergoing evaluation. At the time of writing in the year 2000, there are at least four commercially available compressed air and one re-breathing systems on the market. Some NATO nations are now using them in service, but their use is not universal and it is still restricted to aircrew. Very recently, the re-breather system has been introduced for passengers in commercial helicopters flying over the North Sea, but still unresolved is the decision whether to provide dry or wet training. Going hand-in-hand with this is the fact that there are no regulations in existence not only for the requirements of a system, but also for the air certification and maintenance. Finally, until regulations are introduced, helicopter manufacturers will not consider designing a system into the basic helicopter fuselage.

Spécification d’un respirateur de sauvetage pour aéronefs à voilure fixe et à voilure tournante en mission de survol maritime

(RTO AG-341 / HFM-054)

Synthèse

Généralement, en cas d’amerrissage forcé, les hélicoptères se retournent et coulent rapidement. Même si l’accident n’est pas à priori mortel, il est étonnant de constater que 15% des équipages et des passagers périssent en cas d’amerrissage forcé. Les raisons essentielles des difficultés de l’évacuation sous-marine ont déjà été largement traitées dans l’AGARDographie No. 305 “Evacuation et survie en cas d’amerrissage forcé d’un hélicoptère. Le facteur humain”, publiée en 1989.

Depuis lors, les deux auteurs ont entrepris d’autres recherches sur les principales causes de ce taux d’accidents mortels qui est à déplorer. Ils ont conclu qu’il est tout simplement impossible pour les occupants de retenir leur souffle suffisamment longtemps pour effectuer une évacuation, et que la mort s’ensuit par noyade. Le taux d’accidents mortels ne semble pas diminuer.

Le chapitre I de cette AGARDographie décrit l’étendue du problème, fournit les dernières statistiques sur l’amerrissage des hélicoptères, les causes du problème, les facteurs qui déterminent les délais nécessaires pour effectuer une évacuation sous-marine et la justification d’un respirateur de sauvetage. Le chapitre II donne la description (a) du développement de respirateurs de sauvetage (EBS) pour l’évacuation sous-marine, en citant en particulier les progrès réalisés dans ce domaine par la marine royale, (b) les avancées enregistrées par l’opération hélicoptère civil en mer du nord au Royaume-Uni, et plus spécialement la mise en service d’un respirateur novateur (c) l’état d’avancement de la mise en service par la garde côtière américaine du premier système à oxygène à circuit fermé pour hélicoptères, et le premier achat de 8 200 respirateurs de sauvetage à air comprimé par la marine américaine, avec des rapports sur les premières vies sauvées grâce à ces appareils - HEED II (d) les progrès réalisés au Canada, en soulignant le fait, qu’il a fallu huit ans pour mettre en service un matériel de plongée qui avait déjà fait ses preuves et qui ne nécessitait que des modifications mineures, situation qui n’est pas rare dans les organisations militaires, et (e) la mise en service d’appareils EBS dans les marines nationales de la Nouvelle-Zélande, de l’Italie et du Singapour. Le chapitre III examine les différentes alimentations d’air de secours pour l’évacuation sous-marine d’hélicoptères actuellement disponibles ou en cours de développement. Ce chapitre est suivi, au chapitre IV, d’une discussion du choix entre les appareils à circuit fermé et les systèmes à air comprimé. Le chapitre V évalue l’importance de la diffusion d’une documentation de formation avant de procéder à la mise en service d’un nouveau système. Il décrit un exemple type de trousse d’information fournie par la garde côtière américaine, et présente une école de formation civile créée par Survival Systems Ltd. au Canada. Enfin, le chapitre VI résume la situation globale de l’EBS à l’aube du 21ème siècle.

Il y a 17 ans, les hélicoptères effectuant des missions en survol maritime n’étaient pas équipés de systèmes EBS, ni pour les équipages, ni pour les passagers. Essentiellement, il existait trois modèles fabriqués par l’industrie et ils étaient en cours d’évaluation. A la date de cette publication, en l’an 2000, au moins quatre systèmes à air comprimé et un système à circuit fermé sont disponibles sur le marché. Ils sont en service dans certains pays de l’OTAN, mais leur utilisation n’est pas généralisée, celle-ci étant réservée aux équipages. Très récemment, le système à circuit fermé a été adopté pour les passagers d’hélicoptères en survol de la mer du nord, mais la question de savoir quel type d’entraînement à prévoir, c’est à dire hors de l’eau ou dans l’eau, reste à résoudre. Une question associée concerne le fait qu’aucun règlement n’existe ni pour la spécification du système, ni pour la certification de navigabilité ni pour la maintenance. Enfin, il est certain que les hélicoptéristes n’envisageront pas de concevoir des systèmes intégrables dans le fuselage de base d’un hélicoptère avant que des règlements ne soient promulgués dans ce domaine.

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14. Abstract

This AGARDograph provides the latest worldwide statistics on survivability from a helicopter ditching. It concludes that the persistent 15% fatality rate is basically caused by drowning. The principal cause of drowning is due to inability to breath-hold long enough to make an escape.

The provision of some form of Emergency Breathing System (EBS), whether a re-breather or compressed air unit, would extend the time underwater and hence improve survivability. The development of such units since the Second World War are described, and current available units are included to aid NATO and PfP Nations to review their choice. The importance of producing a course training package prior to the introduction of any new EBS into service is presented. Two examples are specifically cited. Finally, a summary is made of the current EBS situation as we enter into the 21st Century.

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