Helicopter Air Ambulance Association, LLC ("H3A")
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Testing and Evaluation (T&E) Summary Report For The Use of Protective Masks During Air Ambulance Flight Operations

The **Helicopter Air Ambulance Association** ("H3A") performed testing on the use and effectiveness of surgical and respirator masks for air ambulance operations during day, night, and night vision goggle (NVG) operations, and in variable weather conditions. Testing was also conducted utilizing various safety glasses, safety goggles, prescription style glasses, and the helmet visor. Testing was completed in western New York State during the Spring months. Temperatures ranged from lows of fourteen degrees and highs of seventy-three degrees. Conditions included clear and cloudy conditions both during day and night with associated precipitation in the form of rain, snow, and fog. Total flight and non-fight testing times was approximately twenty (20) hours. Testing was conducted while wearing three variants of helmets used in the air ambulance field that included the MSA Gallet style helmet (with and without face shield), Gentex SPH style helmet, and Alpha Eagle Style helmet; whereas all helmets were equipped and configured for the use of NVG's. This report reflects the ***summary*** of this testing and H3A's recommendation for the use of these safety devices based on their use and effectiveness while conducting air ambulance flight operations.

MEDICAL ISOLATION/SURGICAL MASK:

Donning/Doffing: The wear of the surgical is simple and easy to don and dof when the masks are fitted with the behind the ear loops. Utilization of masks with tie systems proved to be problematic when putting on or taking off the flight helmet. The tie system was uncomfortable for wear and resulted in pressure points on the back of the head where the ties were made. Both masks did not provide near adequate facial protection or cover when wearing the helmet and would tend to bunch up and slip repeatedly.

Flight testing: Under all modes of flight the medical isolation/surgical mask was a distraction. When wearing any type of eye protection to include glasses, goggles, or the helmet visor the wearing of the mask resulted in the fogging of the lenses and the obstruction of vision and visual fields. Communications were below average and were severely muffled or impeded requiring constant adjustment to the helmet microphone. Breathing is highly obstructed and is a serious concern for flights with long duration and in high temperatures.

Recommendation: The use of the medical isolation/surgical is not recommended for flight operations due to the amount of safety concerns presented during the testing that include but are not limited to obstruction of vision from fogging, reduced communications, and the reduced breathability of the mask itself.

N95 RESPIRATOR SYSTEMS:

Donning/Doffing: The wear of the respirator mask is simple, as is the donning and doffing of the mask itself. With variable size and fitments, proper fit testing must be completed to ensure the efficiency and integrity of the mask and its purpose are maintained. The only way to effectively complete this is through the use of an approved fit test machine and procedure while wearing ones flight gear to include the flight helmet and chin strap.

Flight Testing: Similar to the surgical mask, the respirator mask had difficulty maintaining the integrity of its seal while wearing the flight helmet and having to make even the smallest of head movements. The behind the ear retention systems tended to roll and pull on the ears making it uncomfortable and requiring constant adjustment. During flight with any form of eye protection or when wearing the NVG's, the result was a repeated fogging of the visual platform and subsequent impeding of the visual field. Communications were more heavily impeded than with the use of the surgical mask and it became necessary to push the microphone closer to the mouth in order to make transmission clear and understandable. This resulted in the mic contacting the mask, causing the mask to be indented inwards and further reducing its effectiveness and seal.

Recommendation: The use of the respirator mask is only recommended if the use of a half-face or full-face respirator mask is not available, or is impractical for use. The N95 respirator mask provides a higher level of protection, but comes with all of the increased safety concerns and issues presented with that of a medical isolation/surgical mask.

Half-Face Respirator Mask Fitted with two (2) P100 Screw On HEPA Filters

Donning/Doffing: Variable methods and products were tested that included the use of a head harness retention system and/or a button-snap retention system that attached directly to the helmet. Donning and doffing of both the head harness and button-snap systems were simple. The advantage of the head harness system was the ability to maintain a protected state while also being able to remove the flight helmet; such as times where a crewmember had exited the aircraft to load/unload a patient or equipment, or was required to exit the immediate vicinity to either make patient contact or enter a controlled environment such as a hospital facility.

Flight Testing: The wear of the Half-face Respirator mask presented no safety risk during testing. Wear of the half-face respirator eliminated all of the identified safety concerns that were discovered during the testing of the medical isolation/surgical mask and N95 respirator mask. All modes of flight were tested that included the use of safety and prescription glasses, safety goggles, and NVG's. At no time did the wear of the half-face respirator result in the fogging of any of these devices. Communications were actually improved with the use of the half-face respirator, as outside noise and impedance was eliminated by its design. The integrity of the masks seal was maintained through all modes of flight and breathing was not affected because of its inherit and intended design features.

Recommendation: The use of a half-face respirator is our recommended industry standard for air ambulance operations above that of a medical isolation/surgical mask or the N95 respirator mask; due to its ease of use, effectiveness of preserving the integrity of seal, improved communications, reduced or eliminated visual impairments due to fogging, ease of decontamination, comfort, while providing the highest level of protections available of the devices tested.

SUMMARY FINDINGS AND RECOMMENDATIONS:

It is our recommendation that the primary industry standard be the wear and use of a half-face respirator for all air medical operations, whereas the use of such protections would be operationally required or medically necessary. The use of medical/surgical masks and N95 style masks yielded the discovery of several safety concerns, most of which derived from their nature to fog up with any form of eye protection, resulting in impeded vision and visual field. Also, of equally high importance and concern are the lack of breathability of the masks that results in reduced oxygen levels and difficulty breathing, increased fatigue and stress, and its inability to maintain structural integrity for absolute or near absolute seal and protection(s). If circumstances required an air ambulance operation to be completed and the use of a true half-face respirator was not available or impractical, the use of an N95 respirator mask would be recommended as a substandard and secondary option over that of the use of a medical isolation/surgical mask.

Disclaimer: This testing did not test the medical grade efficiency of each of the style mask tested, as this study was geared specifically for the operator level use of the devices themselves and how they directly related to and impacted aviation operations. For specific medical specifications and recommendations please refer to the manufacturer data source(s). This organization will not be recommending any one brand or configuration over the other, as this specific T&E process was isolated to the identifying the device "type" that would be the most conducive to air ambulance operations, while providing the highest levels of safety and efficiency to its crewmembers and patients.

Devices Tested:
Medical Isolation/Surgical Mask in three (3) variations
N95 Rated Respirator Mask in three (3) variations
Honeywell North 8500 Half-Face Respirator in three (3) variations
Honeywell North 5500 Half-Face Respirator in two (2) variations
Gentex SOTR in one (1) variation
3M Half Face Piece Respirator in one (1) variation

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