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Short Communication

The need for a closer look

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ABSTRACT

A number of guidelines pertaining to training, standardization, and selection are laid down after going through considerable scientific data. Most of it is derived from our own experience and research. Some of it is also based on what is prevalent in other Air Forces. As is well known in any changing world, the guidelines need to be updated due to the ever-changing technology. The following information is presented to disseminate a pertinent finding during a recently concluded mishap investigation of an aircraft accident. It has unfolded the possibility of future research along with possible changes in the existing medical guidelines.

Keywords: Presbyopia, Bifocals, Accident investigation, Annual medical examination (AME)

INTRODUCTION

A medium-lift class of helicopter took off in a hilly terrain carrying construction load for a civil agency. The sortie was duly authorized and had a standard crew composition of pilot, copilot, flight engineer, and flight gunner. The pilot was fairly experienced with about 4500 h of accident and incident-free flying. The pilot had an exclusive 600 h experience of glacier flying. The co-pilot had about a 1000 h experience under him. The flight engineer (Flt Eng) was 48 years old with 20 years of experience in the same aircraft type as Flt Eng. The essence being that the crew was well experienced. After three successful sorties in the preceding few days and one on the same day, the aircraft crash-landed. The duration of the sortie was 12–15 min above 10,000 ft. The crew and three passengers on board escaped without any major injuries. The Board deliberated on the possible factors leading to the accident.

Hypoxia-related incapacitation was ruled out. Technical failure leading to the accident was ruled out too. It was noticed that the engine power called out in the cockpit voice recorder (CVR) was at variance with the milked flight data recorder (FDR) values. After confirming nil calibration issues, it was noticed that the flight engineer had gotten his lenses changed at the first available instance. That meant he was using incorrect prescription glasses at the time of accident. On further deliberation, it was noteworthy to find that he had been using reading glasses over 4 years and the same was not found in the medical records of annual medical examination (AME), which were carried out at two different Medicare Centers. It was a matter of concern to find that at the time of accident, the glasses used by the flight engineer to correct his deteriorated near vision (probably due to presbyopia) were inappropriate. His subsequent post-crash medical history has confirmed the use of bifocal lenses with an axis correction with additional power for near vision correction by the individual. However, from the input collected from the concerned authorities during the course of deliberations, the Board had delineated that the wrong prescription glasses

used by the flight engineer were neither the primary nor the major causal factor leading to crash. Nevertheless, few lessons could be drawn from the findings and recommended for application to prevent such medical issues related to the operators which can compromise the flight safety. Airmen aircrew should be sensitized about visual acuity standards. This will prevent them from concealing any change in medical issues. The Med staff can be sensitized further about the importance of conducting an AME. Although all are already in place, a reiteration is needed to avoid such an error again.

DISCUSSION

Presbyopia is a natural part of aging. About 25% of the world population has presbyopia.[1] It is the gradual loss of the eye's ability to focus on nearby objects. Although it is noticeable by the age of 40, the onset of a symptom of presbyopia is taken when the subjective amplitude of accommodation falls below 3D.[1] Usually, the objective amplitude is declined to zero at the age of about 52.

Correction for presbyopia can be with conventional bifocal lens or progressive lens.[2-4] Conventional bifocal lens has a clear discontinuity/ledge so as to produce two distinct zones of fixed-focus vision. In many cases, this discontinuity may produce an abrupt change in image size and location, known as "jump," as the line of sight passes through this segment.[2] A progressive addition lens (PAL) is a type of multifocal lens that employs a surface with a continuously smooth increase in addition (Plus) power.[2] The curvature of the surface increases from its minimum value in the distance zone to its maximum value in the near zone. The total increase in surface power between these two zones is equal to the specified Add power of the lens. This gradual increase in power also results in a variable focus intermediate zone. Progressive lenses provide the desired Add power without any breaks, ledges, or lines by "blending" the transition between the distance and near zones. The transition between these zones is "smooth" enough to prevent abrupt changes in prism and magnification or image jump as well.[2,3] This blending is achieved by incorporating varying amounts of cylinder power, oriented at an oblique axis, in the lateral region of the surface. The optical and cosmetic advantages of progressive lenses are well known. Progressive lenses provide a continuous range of focus from near to far without any visible lines of demarcation, which would otherwise result in visually disturbing changes in image size and location. Progressive lenses replicate natural, pre-presbyopic vision more effectively than conventional bifocal lenses by providing a continuous depth of field with no abrupt changes in vision.[2,3] The primary disadvantage of progressive lenses, however, is the blur and geometric distortion produced within the so-called "blending" regions of the progressive surface. For several decades, managing this blur and distortion has been a principal concern of progressive lens designers.[4]

Aeromedical concerns

Pilots and airmen aircrew of transport and helicopter stream in the Indian Air Force (IAF) are permitted to use bifocal glasses for correction of presbyopia. The International Civil Aviation Organization/Director General of Civil Aviation and several other aviation agencies permit the use of either bifocal or progressive glasses for presbyopic correction.[5] The pilots are required to view critical information at minimum of three accommodation distances (charts/maps – constituting near vision, instrument panel – constituting intermediate vision and infinity). Multifunctional displays are the mainstay of instrument panel in a modern aircraft.[6] Visualizing the multifunction device falls in the intermediate visual acuity.[5] The IAF permits the use of bifocal lenses for transport and helicopter aircrew for presbyopic correction. The bifocals, however, offer only two focal lengths (40 cm, a standard reading distance and 20 ft or beyond, infinity). Trifocals offer correction for three viewing distances but have an unacceptably small intermediate segment, which prevents a full view of the cockpit instruments.[7] PALs overcome some of the inherent shortcomings of many bifocal and trifocal lenses, but not without tradeoffs.[4,5] Vibration of cockpit instruments and printed material, especially in the 22–64 Hz range, may impair vision significantly. This is particularly troublesome in helicopters. Low-frequency vibrations of 2–10 Hz encountered in turbulence or on rough runways can also degrade vision.[6] In the early stages of presbyopia, bifocals work well in the cockpit.[6,8] The top part of the lens is used for distance as well as for viewing the instrument panel. The bottom part of the lens is used for reading and any other visual task at a near distance. As the presbyopia increases, the instrument panel is no longer visible through the top part of the bifocal lens, and therefore, appropriate correction is required for this intermediate distance.[4,5,8] The solution for this is a trifocal or a progressive add multifocal.[9]

CONCLUSION

A multitude of branches in the IAF, apart from aircrew, require the intermediate zone vision, such as air traffic controllers (ATC)/fighter controllers (FC)/navigators/flight engineer/flight gunner amongst others. More often than not, the age group of people manning these consoles is well within 40 years of age. There are no statistical data (of IAF) to corroborate this statement. A study to find the effectiveness of progressive lenses on people of this branch/trade may not be productive. The standard bifocals and trifocals usually work well in the cockpit. If there are problems with the required

focal distances, these distances should be measured in the aircraft or a simulator and the vision care specialist provided with the numbers so that appropriate corrections can be prescribed. Correct fitting of the multifocals is critical. If the segment is too high, it will interfere with distance vision. If too low, the wearer will have to raise his chin uncomfortably high to read. The suggestion is to conduct studies on the use of PALs as an alternative form of presbyopic correction for the aircrew. This is a good way forward. Because manufacturing technique influences the nature of non-spherical aberrations in PAL lenses,[2,3] future research should compare lenses from several manufacturers.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

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