

Symposium Paper
AEROMEDICAL ASSESSMENT OF FLYING PERSONNEL

Ophthalmological Problems

Sqn Ldr RK GUPTA*

VISUAL apparatus plays a vital role since the eye is the most important sensory organ for the flyer. The possession of high visual acuity has been considered to be of paramount importance since the earliest days of Aviation.

Smith¹ in 1948 reported the graphic relationship between the speed of the nerve impulse and increasing speed of flight. Accepting the figures of Byrnes and Moseley¹, it can be seen that a pilot flying at 3153 ft. per second would travel at least 17, 169 ft. (approximately 3.5 miles) in the time between first sighting an object and changing his flight path to avoid it. For two such aircraft flying at this speed, on head collision course double the distance, i. e. approximately 7 miles is required to avoid an accident. At this distance a visual acuity of 6/6 requires an object size of 51.45 ft. to subtend the requisite angle of 5 minutes at the nodal point of the eye. Realising this, one can appreciate the difficulties with which the modern pilot has to contend.

It will be interesting to note that visual defects and medical ophthalmic conditions are among the major cause of rejection. Table I compares the rejection rate of candidates for aircrew including NDA candidates for aircrew selection with the other conditions for the last three years at IAM.

TABLE I
Rejection rate of candidates for aircrew including NDA candidates at IAM

Year	Eye	ENT	Medical	Surgical	Total
1979	4.5%	6.3%	6.5%	2.0%	19.2%
1978	11.0%	6.7%	8.6%	7.4%	33.7%
1977	16.2%	4.4%	19.6%	—	40.2%

In Ophthalmic examinations following parameters are examined :-

- Visual acuity
- Ocular muscle balance including BSV anomalies
- Field of vision
- Colour vision
- Disease of the eye and its adnexa

Since aircrew are selected out of already scrutinised and medically fit persons, the last three parameters have invariably not posed problems in the aeromedical assessment. The most important parameters where problems are encountered are visual acuity and ocular muscle balance along with BSV anomalies which have been discussed.

Visual Acuity: The permitted visual acuity for the flyer is 6/6 and 6/9 correctable to 6/6. The problem arises only in borderline cases at the time of initial entry to the flying college or at the level of conversion to high performance aircraft or rarely on annual examinations.

Out of the refractive errors myopia is not permitted. Hypermetropia is not a serious problem because in younger age group the accommodation is quite active to cope up with the permitted amount of hypermetropia of +2.5D. This becomes a problem in higher age group when the accommodation starts receding but recently relaxation has been permitted for serving hypermetropes upto +3.00 Dsph as per latest amendment to IAP 4303.

Astigmatism poses serious problems in younger ages and to improve the visual acuity glasses have to be used. Since many individuals are borderline

* Classified Specialist in Ophthalmology, Institute of Aviation Medicine, IAF, Bangalore - 560 017.

cases with vision 6/9 or 6/12, they usually avoid glasses and somehow clear the annual medical examination at SSQ level in the absence of requisite facilities for proper examination and are detected at IAM/CME or at the time of medical examination for conversion to high performance aircraft. The other alternative is contact lenses. Contact lenses have been well accepted in civilian practice but its acceptance in Military Aviation may be affected by important factors like motivation, environment

or occupation of Aviation Personnel. Presently contact lenses are not permitted in Military Aviation.

Ocular Muscle Balance: The next important problem is ocular muscle imbalance along with BSV anomalies. In spite of controversies, binocularity along with strong muscle balance is considered essential for flying. Singha³ stressed the importance of BSV in aircrew and analysed the BSV defects in aircrew. (Table II)

TABLE II
Analysis of BSV defects in Aircrew (Singha³)

Age group and number of cases	Total BSV defects	Amblyopia	Micro-squint	Constant manifest squint	Intermittent squint	Convergence insufficiency	Misc.
Below 30 years 789	18	11%	5.6%	22.2%	33.3%	22.2%	5.7%
Above 30 years 300	12	—	9%	—	25%	66%	—

Table II shows a high incidence of convergence insufficiency and decompensated heterophorias going into intermittent squints. Both these conditions are well known to undergo decompensation under conditions of stress and strain whether physical or mental. Both these conditions produce symptoms of visual fatigue leading to inability to perform precision tasks. Needless to emphasize that phoria changing to tropia disqualifies a person from flying. Early detection and treatment of these conditions is of paramount importance in order to avoid wastage of trained personnel which can be done on frequent examinations at SSQ level.

Microstrabismus or monofixation syndrome is a relatively recent entity. The above table shows incidence of 5.6% and 8.6% in below and above 30 years age groups respectively. Tredici⁵ studied 15 cases of microstrabismus and discussed the problems as to how this condition interfaces with aerospace medicine. These individuals have good binocular vision with partial stereopsis and it is simply not of high order.

Musculo-fascial anomalies, though of congenital origin, may manifest themselves at a later age or may be precipitated by ageing, metabolic disorders or head injury. Head injury acts as an aggravating cause and it specifically interferes with stereo-acuity which fails to recover if the injury is severe.

Field of Vision and Colour Vision: Other two parameters viz. field of vision and colour vision are also liable to change after diseases or injuries. Therefore ophthalmic examination should be carried out after any major disease or injury to assess any change in the eye condition.

Unilocularity is considered absolute contraindication for flying due to loss of stereopsis and reduction of the field of vision.

Having considered the problems one appreciates that though individual problems will remain, yet the general trend can certainly be curtailed by raising the standard of ophthalmic evaluation based on modern techniques. The borderline cases of sub-standard visual acuity should be eliminated after careful objective examination keeping in mind any possibility of likelihood of refractive errors in future.

Decompensated heterophorias gradually change to constant squint if untreated. Degeneration of binocular functions does not take place till the squint becomes constant. Therefore it promises therapeutically good prognosis. Thus early detection of such conditions is of utmost importance. It is stressed that the medical officers working at SSQs should realise the importance of early detection and treatment of these conditions. SSQs must be equipped with

minimum required ophthalmic gadgets to detect ESV anomalies. The indoctrination, education and motivation of flying personnel with regard to such remediable ophthalmic disabilities will go a long way in avoiding the occurrence of such ophthalmic problems in future.

References

1. Byrnes, V.A. and Moseley, H.G. Cited by Price, T.J.G. Visual standards in the selection of flying personnel. In: *Visual Problems in Aviation*. Pergamon Press, Oxford, 1962.
2. Singha, J.N. Incidence of binocular single vision anomalies amongst aircrew in IAF. *Aviat. Med.* 21: 49-53, 1977.
3. Smith, H. Cited by Price, T.J.G. Visual standards in the selection of flying personnel. In: *Visual Problems in Aviation*. Pergamon Press, Oxford, 1962.
4. Stanworth, A. Defects of ocular movements and fusion after head injury. *Brit. J. Ophthalmol.* 58: 266, 1974.
5. Tradici, T.G. Microstrabismus in flying personnel. Diagnosis in Medical Requirement and Examinations Procedures in Relation to the Tasks of Today's Aircrew: Evaluation of the Special senses for Flying Duties. AGARD Conference Proceedings No. 152, A 11-1 to A 11-6, 1975.