MEDICAL STANDARDS OF FITNESS

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Introduction:

Some are of the opinion that the medical standards we are now following were intended for the British and hence a little too strict and unsuitable for the average Indian. Even in the RAF it would appear there is laxity in the application of the standards laid down. We know of pilots who have flown aircraft effectively in spite of defects and disabilities. An extreme example is that of Bader, the famous RAF pilot with artificial legs who distinguished himself in the last War. This example is an example of exception. In practice, most cripples are really crippled for any work either on the ground or in the air. It should not be our intention to have decrepits and cripples flying aircraft in the Indian Air Force. We are trying to develop an Air Force and not a convalescent home for the diseased and disabled. At the same time, we cannot lightly ignore the fact that no less an Air Force than the Royal Air Force, with their years of experience have allowed persons to fly when we would have advised them to lead a retired life.

The time has come when we should have a comprehensive publication of our own dealing with medical standards and methods of examination. The material for this publication should be drawn from experience of the past, both ours as well as others, and based on scientific reasoning. There should be no question of watering down the existing standards merely in deference to an imaginary feeling that the average Indian is sub-standard. If the average Indian is indeed sub-standard then we will have no option, but to go in for pilots who are above the average Indian standard. Conditions of modern aerial warfare do not allow of compromise or concessions. In formulating our standards we could introduce an element of flexibility to ensure that the services of experienced pilots with disabilities are utilised in the air to the fullest possible extent. There can be a little compromise when there is experience to cover a disability.

Having defined the medical standards for our pilots, we will have to standardise our medical examination. The literature abounds with various tests, some complicated, some simple. In standardising our tests, we will have to temper scientific knowledge with practical wisdom. It is futile having a series of precision tests if the medical officer has neither the time nor the patience to carry them out with exactitude. We are dealing with men not machines and passing them through a test bench as in a factory will not bring the desired results.

What exactly is the meaning of the term fitness? There is a term called 'total fitness' a comprehensive term which includes within its orbit physical fitness, mental fitness, emotional fitness and social fitness. As far as the Air Force is concerned, the term physical fitness can be interpreted to mean organic and functional soundness of the various systems of the body and the ability of these systems to work in co-ordination and help the body to carry out the task in hand whether it be on the ground or in the air. This work-co-ordina-

tion is vital to our concept of physical fitness in the Air Force. Afferent impulses, thought processes and motor actions have to be almost simultaneous and so automatic on occasions that none but the fittest can hope to survive in the air. The fitness we want is something peculiar to the Air Force. Pilots are expected to have the poise of ballet dancer, the alertness of a swordsman and be as cool as a cucumber when under fire.

We have also to ensure that the candidates we take are capable of working under conditions of prolonged and severe physical and mental stress and would serve the Air Force for long periods of time. The latter is of importance in peace time when candidates come in with the object of getting a P.C. and making a career in the Air Force.

Personal & Family History.

History taking, except in cases of disabilities, is a tiresome task with no variety and is often rushed through as a mere formality. The importance of history taking cannot be over emphasised. It would be worthwhile remembering that history is given by interested candidates and as such should be taken at its face value. Candidates in peace time are volunteers keen on entering Service, whereas in time of war when there is conscription there may not be the same keenness. Depending on the history given, we have to undertake the necessary investigations e. g. a history of Diabetes in the family calls for a G. T. T., a family history of Epilepsy would warrant an electro-encephalogram in modern times. The diseases listed in the forms in current use are not particulary appropriate to a tropical country like India. Scarlet fever and Haemophilia are not as important to us as Typhoid, Measles, Small pox, Kalazar, Filarisis, etc. These diseases must be remembered while taking history in this country.

Physique :

The obvious first impression due to appearance is helpful and the following points have to be looked for :—

(1) Whether the candidate appears healthy or unhealthy, whether he is well-nourished and energetic, lean and hungry looking or over-nourished and flabby.

(2) Whether he carries his body well.

(3) Whether he is adequately clothed with muscles and fat. Physique should be recorded to denote the actual impression given namely 'thin', 'flabby', 'healthy', 'robust' etc. Terms like 'average' and 'below average' are not quite satisfactory specially for comparative study though convenient in completing documents.

Body Marks, Scars and Deformities :

These are essentially intended for identification purposes. This is often lost sight of while recording findings. Indentification assumes great importance during war on at least two occasions. Firstly, to indentify an unknown dead body and secondly to detect

impersonators. Therefore, natural birth mark should be selected in preference, to scars because the latter can be imitated by a clever enemy. In fact, the Germans were adept at this game in the last War. Always choose at least two identification marks as far removed from each other as possible so that in the event of burns at least one might be preserved. An anatomical area which is likely to be least effected by burns is better. Exposed parts of the body are best avoided.

Height.

According to our present standards, candidates who are found to have a leg length less then 39" and a height less then 64" may be given a practical test in a Service aircraft to ascertain :

(1) That they have an unobstructed view from the cockpit

(2) Their ability to manipulate rudder bar and brakes.

Candidates with 62" ht and 37½" leg length have passed the cockpit test with the help of cushions. In the USAF, candidates below 64" are not accepted. This could not be merely because they can get sufficient number of candidates above this height.

Given a standard aircraft it should be possible to work out the minimum measurements for pilots and eliminate the cockpit test. Our problem is what is the shortest candidate we should take into Service as a pilot. With the seat well forward the distance from the back of the seat to the pedals when they are pressed fully forward can be measured ; this should be the minimum permissible leg length. Given the data about the requirements of field of vision from inside the cockpit, the minimum desirable height could be worked out. The point to remember here is that as far as unobstructed view is concerned the height of the pilot above the level of the eyes plays no useful part. The cockpit test is unsatisfactory because an individual can get through a test lasting a few minutes very satisfactorily and yet be handicapped in actual flying lasting a few hours. We cannot expect the pilot to be sitting bolt upright and to attention all the time. In deciding on the minimum measurements we have to allow for pilots slouching and taking a comfortable position.

Weight :

Weight has always been regarded as an index to fitness, but there is hardly a real index anywhere as to what is the correct weight for a particular age and height. We do have tabular forms co-relating age, height and weight, but unfortunately the figures in these tables are averages obtained from a cross section of the population and not quite what we want in the Service. What we do want to know is whether the weight of an individual is correct or near correct to his age and height and not whether it conforms to the weight of the fellow population. Statistical averages of height and weight in an admittedly undernourished country like ours do not help the Medical Officer who has to enlist sturdy persons for the Armed Forces. One should not attach too much importance

to figures in weight tables. More faith should be placed on clinical examinations which include tests for muscular power.

There is a purpose in giving due consideration for weight and we are unlikely to go wrong if we remember the following points:-

(1) An individual needs sufficient musculature to manipulate the body skeleton with its entire body weight.

(2) A moderate amount of adipose tissue is needed for protection against sudden changes of temperature. The fat serves as an energy reserve and also as a cloak to retain the body heat. Extracts from an American book given below makes interesting reading:

"The danger of being under-weight: Proneness to respiratory ailments including Tuberculosis, Bronchial catarrh, Influenza and Colds; when the adipose cloak gets too thin the body is susceptible to changes in temperature from outside environment. The under-weight type frequently shows marked signs of malnutrition such as dark circles under the eyes, pale mucous membranes, pot-belly, winged scapulas, hollows beneath clavicles, dull eyes and expression and a worried anxious look. Associated health disabilities include Conjunctivitis, Keratitis, Eczema, and rough skin. Most prominent are postural diseases due to lack of muscular energy to resist the gravitational pull on the various segments."

"The danger of Obesity: Fat puts over-load on the heart due to the fact that every lb. of fat requires about 4,500 feet of blood vessels. Obesity calls for a great expansion of the capillary beds and nutritive requirements. Excessive proportion of ill-nesses and death among over-weights is due to premature development of chronic degenera-tive diseases of the heart, kidney and circulatory system in general. A disproportionate number of over-weights die of cerebral haemorrhage, cirrhosis of the liver and even by accident and suicide.',

It is interesting to note that the R.A.F. Publication A.P.130 does not lay down *the maximum weight for pilots whereas it does limit the weight for other aircrew (exclud-ing Observers) to 175 lbs. The reason for this is* not clear. In the American Air Force individuals above 200 lbs. are rejected.

Pulse Rate

The counting of pules rate in five second periods is theoretically scientific, but not very satisfactory in actual practice. The five second period is too short and it has to be an alert M.O. who can keep track of the count including half beats. The task becomes a little more complicated with Sinus arrhythmia when there would be gross difference between the rates recorded in the different five second periods. Counting pulse in five second periods can be simple when medical examinations are few and far between, but when large numbers have to be examined in short periods this method is likely to fail in accuracy and provide records which diverge considerably from the actual state of affairs. We should base our tests to allow of counting pulse rates over long periods, say fifteen seconds.

Pulse Response to Change of Posture:

There is no real change of posture in the test now followed by us. The basic object of this test is to get an idea of the vaso-motor tone of the individual, whether the same is good enough to offset the effects of gravity. We know that blood pressure is related to peripheral resistance and that the maximum peripheral resistance is provided by the arteriolar bed in the splanchnic area. We are also familiar with the clinical conditions of postural giddiness, the result of splanchnic pooling. In our present test the candidate is instructed to stand up slowly from the sitting posture, so slowly that the transition from sitting to standing takes five seconds. It would appear that there is no change of posture in this test. The candidate remains erect throughout with no directional change in the splanchnic arterioles.

An idea of the vaso-motor control of our candidates is essential and a test where there is genuine change of posture should be adopted. For example, from the lying to the sitting position. In such a test, besides noting the difference in the pulse rate we should also note the difference in the blood pressure.

Pulse Response to Exercise.

There should be no serious objection to the test we are now following but there is an anamoly in the pulse rate increases allowed. An increase of 24 is allowed for just standing up slowly in the posture test just described whereas an increase of only 36 is allowed for the much more strenuous exercise test. My personal experience is that the pulse rate increase is more than 36, (nearly 38) in a large number of healthy boys. The exercise test should be replaced by a simpler one - viz. getting up and down a chair 20 times in 60 seconds and counting pulse rates for 15 seconds periods at certain intervals. We might even do away with the chair and ask the candidate to sit down and stand up 20 times.

Heart - its Size, Sound and Rhythm.

During the last three months at the CMB, an abnormal number of congenital hearts, mostly atrial septal defects, have been detected. There is no difficulty in recognising this defect when the heart itself murmurs the diagnosis. It is the silent case that might let down an unwary medical officer. We subject all our candidates to strenuous physical exercise and then auscultate the heart in different postures and during the various phases of respiration. This drill has proved useful and is well worth adoption as a routine by all medical officers.

Blood Pressure.

Blood Pressure is a confusing subject. This pressure is so sensitive that almos t everything affects it, tobacco, alcohol, food, exercise, posture, phases of respiration, temperature of the room etc. It varies from place to place. It is only rarely that the figures of the CMB, the Station Sick Quarters, and the local Military Hospital agree. The posture of the candidate is probably responsible to an extent for these varying figures. No two doctors insist on the same position. Some have their patients sitting,

some lying and some in the intermediate reclining position. Temperature of the room plays its part especially during winter in North India. A cold room with no heating arrangements will produce peripheral vaso-constriction and put up the blood pressure. This has been observed at the Station Sick Quarters at New Delhi. This may be one reason for the high B. P. discovered during annual medical examinations. Recently it has been suggested that blood pressure readings change from one sphygmomanometer to another, If this is true, the quality of the mercury in use and bore of the tube have probaly got something to do with it. It might be worthwhile occasionally checking and calibrating our sphygmomanometers.

With all this confusion, it is necessary for us to standardise the technique and conditions under which B. P. is taken in the I.A.F. We have also to face the problem of what are the normal B. P. figures for any individual. Just for interest a few figures for some Marathon runners are quoted below :

	One week before marathon race	10 minutes after race	10 days after race	One year after race
	4-12-24	4-19-24	4-29-24	5-10-25
Systolic Pressure Lying	110	114	150	114
Systolic Pressure Standing.	113	95	162	96

55 Marathon runners just before Pittsberg marathon race of 1909.

	Average Lying	Range	Av. Standing	Range
Systolic Blood Pressure	127	105—162	125	100—150
Diastolic Blood Pressure	93	85—130	95	80—118

The Marathon race is run over 26 miles and 385 yards. When we consider the person with 130 diastolic who ran this race we will have to hesitate before condemning anyone as hypertensive In the Service, however, especially the I. A. F., we have to rule out any underlying pathology when we get readings which are considered high as per our present day conception. The usual tests, investigation of the heart, kidney etc., have to be carried out. In case no underlying pathology is detected we can make a candidate fit, but it is worth remembering that a cardio - vascular system under high pressure would give way in course of time. The cardiac musculature and arterial walls cannot be expected to withstand the effects of continuous strain over unrestricted periods. In my opinion, even slight Hypertension should not be condoned in new entrants especially if they are to be considered for P. C. later. Serving personnel can continue to serve and fly provided periodic investigations are carried out to ensure that the high pressure continues

to remain innocuous. It would also be worthwhile remembering in this connection that the knowledge of reducing B. P. by drugs is no longer the exclusive privilege of doctors.

Nervous System : Self Balancing Test.

It is often forgotten that this test is to be done with the candidates wearing shoes or boots. This is an important point since the test is primarily intended to study higher nervous control and not the stability of the lower limbs. Persons who fail or are unsteady with-out shoes very often improve with shoes on; this has a bearing on fitness since unsteadiness is regarded as unfavourable even in the absence of other signs of instability. Wearing shoes in this test might make a difference of 6 marks out of a maximum total of 44 if assessment is made in accordance with Flack's Physical Efficieny Index.

Albuminuria & Glycosuria.

According to our present practice all cases showing albuminuria or glycosuria undergo renal efficiency or glucose test prior to final assessment.

As far as albuminuria is concerned, we have to make a difference between transient albuminuria and persistent albuminuria. The former, can be condoned but the latter cannot. Cases of persistent albuminuria do turn out to be Chronic Nephritis in the long run.

Glycosuria—Modern trend is that cases of renal glycosuria ultimately turn out to be Diabetes. Renal glycosuria also produces hypoglycaemia and on this account alone no case of glycosuria should be entertained in the Service as a pilot.

Colour Vision

A point to remember is that not all cases of colour blindness are congenital. Acquired colour blindness is a definite condition. Hence it would be a good practice to examine candidates for colour vision every time they come up for a routine examination even though our current medical forms do not require this to be done. The test is simple, not time consuming and may occasionally be the means of detecting diseases and degenerations of the choroid and retina for the first time.

Bishop Harman Test.

This test has given widely varying results in the same candidate mainly due to difference in the inter-pupillary distance recorded by M. Os. The inter-pupillary distance cannot change, but with the methods now available, the personal factors come in and there is bound to be some differences between the findings of the different medical officers. In fact this measurement has been recorded by the same eye specialist differently in the same candidate in a number of instances. We should have one constant figure for this say the first one recorded at the C. M. B. or elsewhere. This will at least enable us to get a relative idea at the various medical examinations. If this suggestion is not agreed to for any reason, we will have to abolish this test and replace it by another suitable test.

Perforated Tympanic Membrane.

Serving pilots who are left with a perforated tympanum, the result of either Otitis Barotrauma or C. S. O. M., have in the past always been grounded or boarded out. There would appear to be no scientific arguments for this. Provided there is no active disease in the ear and the hearing standard is satisfactory, there is no reason why a person with a perforated drum cannot fly. In fact he would appear to be in an advantageous position in that his ear drum cannot burst again.

Medical Categories :-

At present, we have four categories under A - A1, A2, A3, and A4, and none under B. It is our experience that we do have officers who are not one hundred percent fit for ground duties. We might think in terms of sub-dividing B into B1, B2, B3, & B4, to correspond to Army Categories A, B, C, D. etc. This classification would be useful for pilots also. Occasionally we do have pilots who are fit for full flying duties but not for full ground duties.

Medical Standards for Combatant Passenger Duties in A3B Category.

We have as combatant passengers Air Gunners, Signallers Air, Flight Engineers and Navigators and it is a little anamolous that according to our present regulations they should all conform to one common standard. Standards will have to be laid down for each type of aircrew so that they are consistent with the duties carried out by them. To cite an example, the ocular muscle balance tests are now omitted for A3B category. It has been suggested that ocular muscle balance should be tested in Navigators because their duties, which sometimes involve prolonged near work might give rise to symptoms of ocular distress in cases of convergence deficiency and poor ocular muscle balance.

Visual Acuity laid down for aircrew other than pilots is now 6/6, 6/9, without any reference to relaxations as in the case of pilots. We do not know whether this omission is intentional or accidental but we do feel that the standards could be relaxed for this category of personnel also.

Conclusion.

The opinions expressed in this article have not been based on facts and figures, but on theoretical considerations. Drawing conclusions from figures recorded in the medical documents over the last three or four years may not reveal anything conclusive because they have not been prepared with the specific object of enabling inferences to be drawn at a later date. In fact, there is a danger of these figures supporting our existing standards and methods of examination and leading us into a state of complacency. At the same time, we have to remember that the present standards - as laid down in A. P. 130 have stood the test of time and it would be unwise to scrub them for purely whimsical reasons.

The purpose of this article is to provide a little food for thought; to instil the habit of not taking anything for granted and to stimulate and keep alive the ability to think for ourselves. The main question is "who is a normal human being and how do we diagnose him ?" The answer can be provided by a team of workers who can devote their undivided attention to this problem. In other countries Physical Fitness Research Committees exist for this purpose. In the I. A. F. until such a Committee is formed, each medical officer can pursue his own line of thought and make his contribution on one or more aspects of the problem.
