



Medical Evaluation of Cosmonauts : Psychological Testing

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Psychological evaluation of the cosmonauts was done at two levels : One was personality evaluation and secondly assessment of their performance on a vigilance task. Both projective and objective tests were used. Twelve pilots were thus evaluated. Stress tolerance of all the subjects was found to be adequate. On the vigilance task the accuracy of spotting the correct signal ranged from 69% to 94% with an average of 87%. No rank rating of the subjects was made, the only criterion was psychological fitness, and none of the subjects was found to be psychologically unfit.

Introduction

Man in Terra-Firma is thought to be a diurnal, sea level, 1'g' being. In other words, he is 'normal' when he is on the surface of the earth. Man in space faces a rapidly changing stimulus pattern, even the daynight cycle has not the same meaning he used to attach during his terrestrial existence. Only a healthy resilient human, devoid of any mental pathology can operate successfully in such an environ; hence the emphasis upon personality. Psychological evaluation of the prospective cosmonauts, was therefore, restricted mainly to personality evaluation, in addition to an assessment of their performance on a vigilance task.

In the assessment of personality our approach was one of eclectic rather than dogmatic. Both objective type personality questionnaires and projective tests were used. In the quest for objectivity and quantification, subjective qualitative assessment was not given a go by. Our goal was to get a total picture of the man, viewed from any angle.

Materials

Following tests were employed in the study :

(a) *Sixteen personality factor (16 PF) test* : A well known objective personality test, it assesses individual's personality on 16 personality scales or traits that according to the test's author (R.B. Cattell, 1950)¹ constitutes the total personality. Each trait is a bipolar factor constituting a continuum, the extremes of which are qualitatively different from each other.

For this project two parallel forms C & D (IPAT Edition, 1969)⁷ each consisting of 105 questions were used. The combination was thought to enhance the reliability of the test. One of the important properties of this test is its unusual comprehensiveness of coverage of personality dimensions. A highly reliable and valid test, it enthused the subject quite a bit as had happened in another study on pilots conducted at the Institute of Aviation Medicine, Bangalore.⁸

Scoring : The scoring was done on the basis of the Tabular Supplement No. 2 to the Handbook

IPAT (1972).⁹ These were American norms. The tests had some items that would indicate cultural bias. However, in another study, it was revealed that our highly rated pilot population closely resembled to the American general population (men) and as such application of the American norm on the Indian sample was fully justified. The raw score on the basis of the norms were converted into normalised standard ten (Sten) scores. Figure 1 shows the list of Primary factors. The 'sten' placements for each individual are then converted into a profile for easy understanding.

A	RESERVED	—	OUTGOING
B	LESS INTELLIGENT	—	MORE INTELLIGENT
C	AFFECTED BY FEELINGS	—	EMOTIONALLY STABLE
E	HUMBLE	—	ASSERTIVE
F	SO BER	—	HAPPY-GO-LUCKY
G	EXPEDIENT	—	CONSCIENTIOUS
H	SHY	—	VENTURE SOME
I	TOUGH-MINDED	—	TENDER-MINDED
L	TRUSTING	—	SUSPICIOUS
M	PRACTICAL	—	IMAGINATIVE
N	FORTHRIGHT	—	SHREWD
O	PLACID	—	APPREHENSIVE
Q ₁	CONSERVATIVE	—	EXPERIMENTING
Q ₂	GROUP-DEPENDENT	—	SELF-SUFFICIENT
Q ₃	UNDISCIPLINED SELF CONFLICT	—	CONTROLLED
Q ₄	RELAXED	—	TENSE

Fig. 1 List of factors

In addition to the 16 Primary factors four second order factors : also were drawn for each subject. They were :-

(i) Adjustment-vs-anxiety

(ii) Introversiion-vs-Extroversiion

(iii) Pathemia-vs-Cortesia
[dependence—(dependence on cognition)
on Feeling]

(iv) Subduedness-vs-Independence

(b) *Minnesota Multiphasic Personality Inventory (MMPI)*: A popular test used the world over by clinicians, it has several forms. For this project the group form of MMPI consisting of 566 items was used. The test tries to assess the relative standing of the individual vis-a-vis the general population along eight pathological scales viz, hypochondriasis, depression, hysteria, psychopathic deviates, psychosthenia, paranoid, schizophrenic and social introversion. In addition a masculinity-femininity score also was assessed. Four validity scales were added to check the dependability of the scores. Individuals could exaggerate themselves to be shown in socially favourable light; or they could be over-strict in assessing themselves; they may have some anxious self-doubts about themselves and may, therefore, not answer some questions. Although these are basically validity scores, the individual's score on these scales themselves

could throw meaningful flashes on his personality pattern.

The norms used for the assessment was American norms. The test is not completely culture free; at the same time it cannot be branded a culturally biased one particularly in the context of the nature of the sample on whom the test was administered.

Scoring: Standard procedure (manual scoring), was adopted for scoring purpose.⁹ Profiles were drawn on standard profile sheets. K correction was used while drawing up the profiles.

(c) *Thematic Apperception Test (TAT)*: Uma Choudhury's Indian version of the TAT was used.⁸ Only ten pictures were selected. The reported cross-cultural differences in the identification with the pictures by the test taking subject was the prompting factor in selecting the Indian adaptation the background and the physical features of the characters depicted were Indian, although the situations as such had an universal flavour. Fig. 2 shows a sample item.



Fig. 2 Sample Item—TAT

Each subject was instructed to look carefully at each picture for about half a minute, then to

imagine and write down a story around what had been seen. The story was to be a conventional

one where a beginning, a main plot and a conclusion were there. In other words the subjects could write, what led to the situation he had seen, what was happening then, and what would be the probable outcome in the future. No time limit was given; yet for practical purposes, subjects were advised on the desirability of finishing each story within about ten minutes (most of the subjects complied with the instruction).

Scoring : The standard scoring procedure of this famous projective test was not adopted in this project. The parameters adopted by our AFSB's for selection formed the criteria for scoring here as well.⁶

The main criteria were—planning and organising ability, social adjustment, social effectiveness and factor dynamic. Subsumed under these four major criteria were the subjects imagination, grasp, reasoning ability, cooperation, liveliness, decision making, determination, courage etc. A major factor looked for was the general motivation of the subject. No premium was given for the subjects ability to handle English language.

(d) *Rosensweig's Personal Questionnaire* : This was the 1979 Leningrad version of the "Picture-Association study for assessing reactions to frustration" by Rosensweig. The Leningrad version we used, was not substantially different from the original. It consisted of 24 contour like pictures, each depicting a frustrating situation of common occurrence. One person in each picture is represented as making a statement which either helps describe the frustration of the second individual or is itself actually frustrating to the latter. The balloon box above the second person was blank where the subject was instructed to put down his responses. The features and expression in all pictures were omitted. Fig. 3 shows a sample picture.

The task of the subject was to examine each picture carefully and to write down the first reaction that strikes him, in the blank. Since it was a projective test, the rationale was that the subjects reactions, consciously or unconsciously would represent his own actual reactions, if he were put in a real life situation. Frustrations are common experiences of every individual and if one knows how the individual adjusts to these

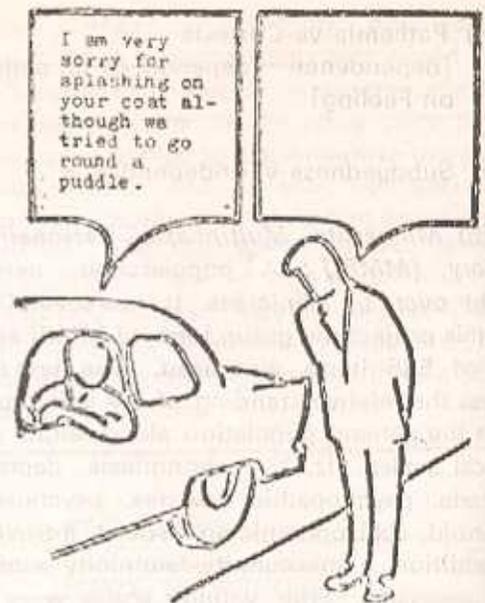


Fig. 3 Sample—RPQ—(Leningrad)

situations, this knowledge would help in understanding the personality and behaviour. The Rosensweig's pictures are intended to evaluate an individual's tendency to blame the source of his frustration (extro punitive) or himself (intro-punitive) or to treat the situation impersonally (impunitive).

Two questions come to the fore, with regard to the interpretation (Freeman, 1965).⁴ They are:

- (a) Are the responses (assuming that they are typical of the subject's) to these mildly frustrating situations, of significance to his personality?
- (b) "Do the subject's response indicate what he actually would do, or what he thinks he should do or feels he would like to do, but would not actually do?"

These questions have not been fully or satisfactorily answered. Yet it is safe to assume that the responses would throw some light on the subject's personality, for it brings out the awareness of social norms he is supposed to adopt in a socially frustrating situation. The test is essentially projective yet more structured than many of the other projective tests.

Scoring : Although the test maker has made out an elaborate scoring procedure, the assess-

ment essentially remains qualitative and subjective. The intention was to know how the subject tackles these situations i.e. if he is extropunitive, impunitive, or intropunitive. Other clinical connections of the scoring procedure was omitted for obvious reasons. This test is generally used as a supplementary instrument in personality assessment.

(e) *Correction Test*: This was basically a vigilance task i.e. looking for the appropriate signal in a high noise environment. A paper and pencil test, it consisted of a series of rings printed closely one after the other. The rings had opening at eight clock time positions i.e. 1500, 1800, 2100 and 2400 hours; in addition either or positions of 1300 and 1400, 1600 and 1700, 1900 and 2000 and 2200 and 2300 hours positions also were given. Figures 4 and 5 show the test and the respective clockhand positions. The tests consisted of eight short test taking sessions one for each clock hand position. At each session the subject was instructed to cancel out the stipulated clock hand position (e.g. 1200 or 1300 and 1400) as fast as possible, avoiding all other unwanted rings. The time taken for the completion of each session was noted. Between session rests were given to the subjects.

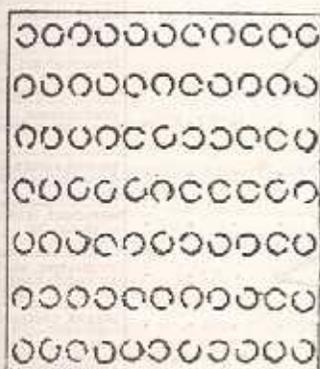


Fig. 4 Sample Items Correction Test

Scoring: Number of correct markings were taken as the score. Omissions and errors were also noted. It is a perennial question whether speed or accuracy, which is more important? Those selected would be doing jobs after a lot of practice where reaction to a particular stimulus could become almost a reflex. Under stress speed of this reflex action might not be affected as

much as its accuracy. With this hypothesis, accuracy was given a premium. It was possible to make a combined index. But it was thought to be prudent to avoid any experimentation, for, these subjects would be taking part in certain very sensitive operations. In any case, the essence of vigilance is to pick out the correct signal.

The above tests were administered on a relatively homogenous group of test pilots. The total test protocol was followed in the cases of 12 pilots. These 12 included some of the medically unfit cases also. Some of the tests were administered on some other pilots who could not complete the protocol as they were found medically unfit in between.

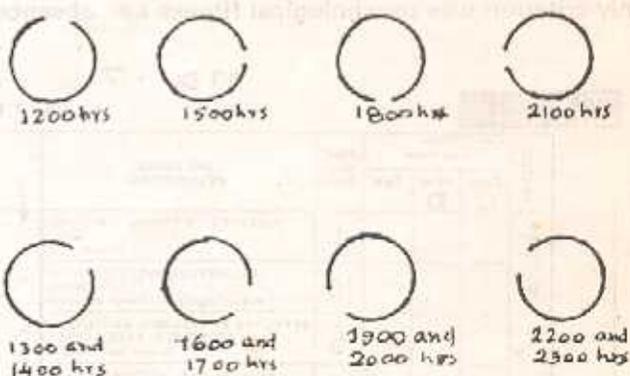


Fig. 5. CLOCK HAND POSITIONS

Results

In this group of highly rated pilots who had a proven track record (aerial) of standing upto various aviation stresses to a commendable degree, evidence of mental pathology was neither expected nor found. However, despite having similar working background all were not expected to be equal in all respects. The awareness that the first Indian cosmonaut would be a celebrity was a highly motivating factor. Yet, it appears that at least in some cases, this motivation was reduced to a wishful level. It could not be attributed to any lack of understanding of the instruction; not it could be due to any language handicap. In any procedure of selection for arduous tasks, interest evinced in the test taking situation is a fair indicant of the subject's general motivation and this indicant did not show itself upto a satisfactory level in certain subjects.

By and large all subjects responded honestly to

the questionnaire tests. Exceptions were there, these might not be due to any lack of frankness. Lack of insight into themselves could be a more probable cause. In either case the subjects would go lower down in the suitability criterion scale.

Above cases of moderate motivation and insight were exceptions only and it is natural to expect such cases even in a highly selected group. Stress tolerance of all the subjects was found to be adequate, although in a rating scale it could range from fair to high. On the vigilance task the accuracy of spotting the correct signal ranged from 69% to 94% with an average of 87%.

No rank rating of the subjects was made. The only criterion was psychological fitness i.e. absence

of mental pathology and none of the subjects was psychologically unfit.

As an example two personality profiles are presented through two tests from the same individual. Fig. 6 shows the 16 PF profile. One point to be noted during interpretation of the profile is that the positions below sten point 3 and above sten point 7 are significant. The sten points 4 to 7 roughly form the average with a mean at 5.5. With that in mind the most salient points from the profile show that the subject is quite good in abstract thinking, forthright, and is a respecter of established ideas, shows a tendency to be serene, imaginative, he is conscientious to a fair degree. On all other factors, nothing specifically striking. No negative points have emerged.

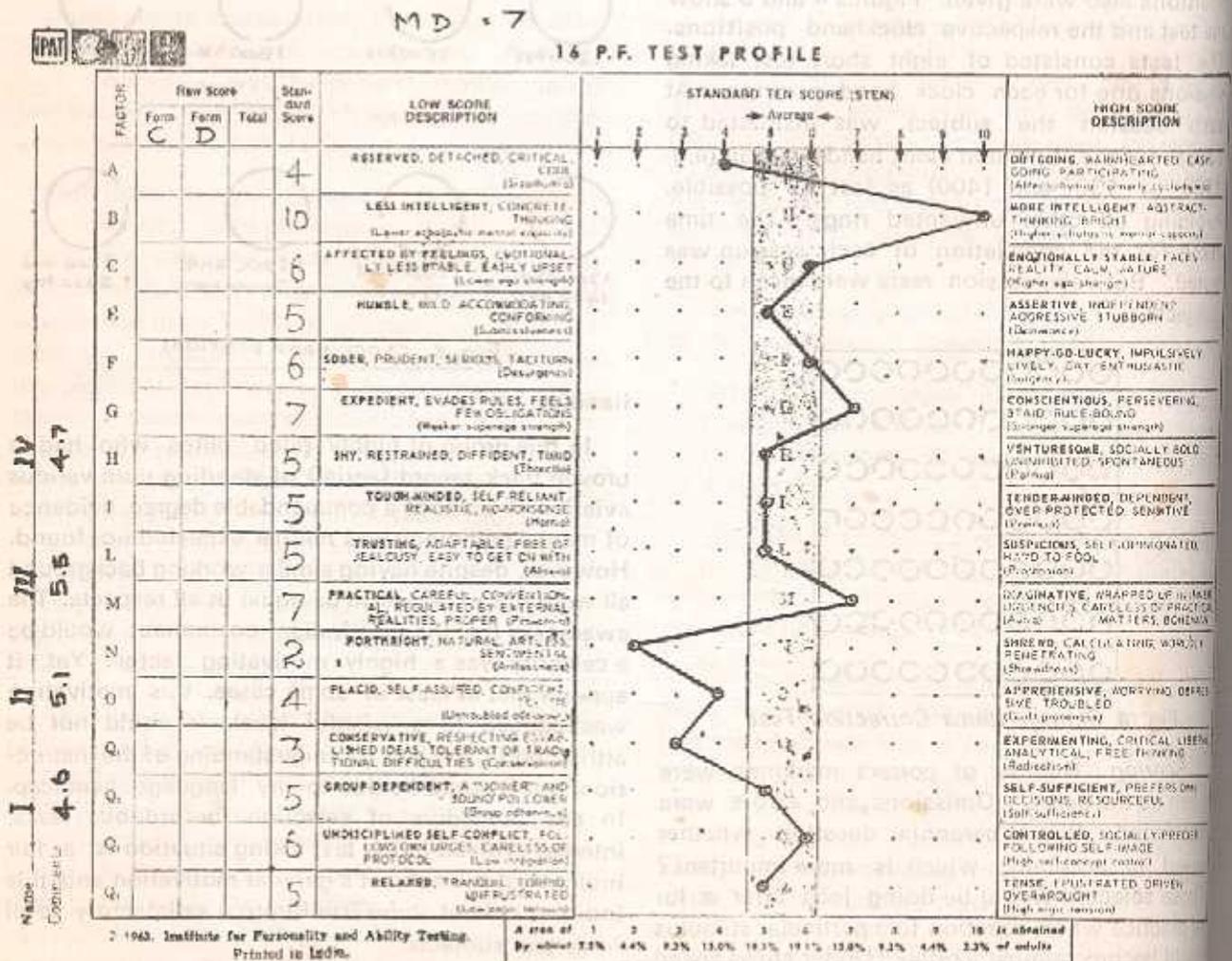


Fig. 6 Profile

Fig. 7 shows the MMPI profile. The upper line is indicative of standard score 70 and the lowest line 30. The middle line shows the mean position. If the profile points fall in between 30 and 70 it is normal. This individual, as can be seen from the profile, is within normal limits on all pathological scales. His scores are dependable as the validity scores also are within the normal limits.

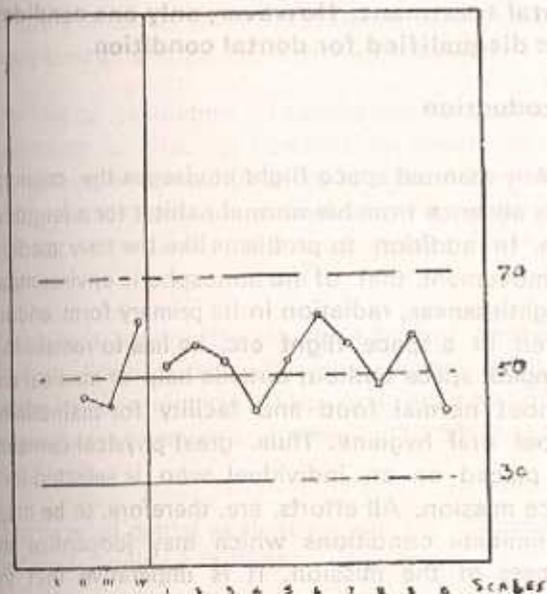


Fig. 7 MMPI Profile

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