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Astronauts; Reflections on Current Selection Methodology, Astronaut Personality, and the Space Station.

Part One

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Including the selection of the initial seven astronauts by NASA in April 1959, there have been a total of twelve NASA selection cycles and a total of 172 astronauts have been brought aboard. Of that 172, 108 have had space flights, forty-four have experienced extra-vehicular activity in space (three of them twice), and twelve have walked on the moon. Fourteen have died on active duty: three in the ground-test Apollo capsule fire, five in the Challenger shuttle explosion, five in aircraft accidents, and one in an auto accident. Sixty-one have resigned, been reassigned or have retired; all but seven of these had space flight experience. A peak number of ninety-eight active astronauts was reached with the 1987 selection group, since reduced by one resignation. Of the 172 selected, fifty-eight (33.7%) came in as civilians; the other two-thirds entered directly from the military. Fifteen women have been selected since 1978; one has resigned (Sally Ride) and one has died on active duty (Judy Resnik). Seven of the fifteen women selected have flown. Women represent 13% of today's active force. The ages of the current astronaut corps range from twenty-eight to fifty-eight, with thirty-nine being the mean.

There are two categories of astronaut and two categories of additional crew that might go aloft on a "one-shot" basis. The astronaut sub-groups are those of pilot and mission specialist. Though there are overlaps between

the two groups, in general, pilot astronauts have responsibility for controlling and operating the vehicle, for safety and for the general conduct of the mission. Mission specialist astronauts coordinate payload operations, do experiments, and generally carry out the scientific or technical work for which the mission was planned. The non-astronaut crew categories are those of payload specialist and observer. Payload specialists are usually professionals in the physical and life sciences, or technicians skilled in the operation of unique equipment, selected by the payload sponsor or customer but also subject to both physical and psychiatric screening by NASA. Observers are individuals assigned to the crew primarily for reasons deemed in the national interest; Christa McAuliffe was such an individual. Twenty-two non-astronaut crew have flown, one of them three times (Charles Walker of McDonnell-Douglas); two died (Greg Jarvis of Hughes and Christa McAuliffe of the Teacher in Space program) in the Challenger explosion.

The Pre-Medical Screening Process:

Those seen for physical and psychiatric evaluation as astronaut applicants are but a small fraction of those who have applied. For instance, in 1984, 4760 civilians applied to become astronauts and 174 military were nominated by the military services after their own internal screening procedures. 429 of those applied as pilots and 4505 as mission specialists. This large group of applicants was screened for qualifying educational degrees and experience. The minimal educational requirement is at least a bachelor's degree with major study in engineering, biological science, physical science or math from an accredited college or university. Mission specialist applicants must also have at least three years of professional related

experience. Pilots were expected to have at least 1000 hours of pilot-in-control time in high performance jets. All applicants must meet physical requirements and pass NASA's space physical exam, roughly comparable to military flying standards for the job qualification category. Qualified applicants numbered 3388 of the original 4934, roughly 69%; all the cuts were in the civilians, the military having been pre-screened by their individual services. The files on the qualified applicants were then evaluated by NASA discipline panels, looking at such factors as:

pilots:

- demonstrated performance
- apparent motivation and potential
- stressful environment experience
- responsibility
- breadth and quality of experience
- relatedness of education and training

mission specialists:

- breadth and applicability of education
- breadth and applicability of experience
- demonstrated performance
- responsibility and potential
- unique qualifications or skills

This process reduced the numbers to 575 "most likely's", 91 pilots and 484 mission specialists. The files of these highly qualified applicants were then ranked by discipline panels, many of the screeners being active astronauts, taking into account the following:

pilots:

a) flying experience
   - quantity and quality
   - variety
   - test pilot school
   - recency of training

b) academics
   - advanced degree
   - applicability and quality

c) references

mission specialists:

a) academics
   - advanced degree
   - applicability and quality
   - diversity
   - recency of training

b) related experience
   - quantity
   - quality and diversity

c) other unique skills or experience

d) references

It is appropriate to add a note on pilot applicants and academics. With only very rare exceptions, all pilot applicants are graduates of military test pilot school. Entry to TPS is highly competitive. It should be remembered that it is a difficult and demanding course of engineering study, equivalent to a master's degree in science and directly applicable to NASA's interests.

This next-to-last screening level dropped the applicant number from 484 at the previous level to a total of 128 who were invited to NASA's Johnson Space Center in Houston for interview and for medical evaluation. At this stage, surviving applicants could be eliminated by failure to meet medical standards (including psychiatric), by withdrawal at their own request, or by not attaining a passing score from the interview panel made up of NASA personnel with operational awareness, many of them active duty astronauts. The prime interview criteria revolved around:

- experience and potential
- motivation
- ability to function as a team member
- communicative ability
- adaptability

The interview scores were combined with the previously assigned scores, the interview being factored at 60%. A veteran's preference also carried a small impact in cases of close comparability. This lengthy multi-filter process resulted in 80 of the 128 being medically qualified, most of those cut being mission specialist applicants, and a total of seventeen being selected. Of the seventeen, seven were pilots, all of them military, and ten were mission specialists, with a half and half civilian military mix. Thus, 1.6% of the original pilot applicants and 0.2% of the mission specialist applicants were selected by NASA. If we go more realistically to the pool of those surviving the first major NASA screening on basic qualifications, (210 pilots and 3388 mission specialist applicants), the probability figures change upward to 3.3% for qualified pilots and 0.3% for mission specialists. These are, indeed, hard won positions.

The psychiatric input for the selection of the initial seven astronauts in 1959 was provided by George Ruff, now Professor of Psychiatry at the University of Pennsylvania, and Edwin Levy, in private practice in Topeka. Then, as now, the psychiatrist's officially assigned role was more one of screening out than of providing a rank-ordering of desirability in terms of the man-job match. Don E. Flinn, former Chief Military Consultant in Psychiatry to the USAF Surgeon General and now Chairman of Psychiatry at Texas Tech, succeeded Ruff and Levy for several selection cycles. I had become attached to the program before the first selections, initially as a stress physiologist/flight surgeon, and later as an internist/psychiatrist. Over the last two-plus decades, I have followed in the very large footsteps of Ruff, Levy and Flinn as the only continuing behavioral presence working with the selection and maintenance of the astronaut corps, though three others

have participated as independent second opinions during past selection cycles, Patricia Santy, M.D., for one cycle and Lynn Gardiner, Ph.D., and Eddie Harris, M.D. for two. The evaluation approach each of these people used was different from my own and based upon their individual clinical backgrounds.

Psychiatric training does much to prepare you to separate the psychologically healthy from the ill, and to treat the disordered. It does little to prepare you to select among the basically healthy for environments with unique stress potential. Unlike clinical practice, wherein the majority of patients readily acquaint you with their problems, applicants for prized opportunities are not notable for their candor as regards vulnerabilities or negative past history; to that extent, you are dealing with a hostile witness. Those who have served with military flying units are familiar with the need for trust and mutual respect to exist between air crew, especially pilots, and the medical arm. If you or I were subject to an annual medical /psychological review, the results of which would determine whether we could pursue our chosen professions, could either of us guarantee to be fully candid if we did not feel a compelling major health threat and did not have good rapport with our examiner? So it was that initially I, like my predecessors, utilized a formidable battery of psychological testing to help find significant separation points among these healthy normals. But I found myself disappointed with the yield. In addition, after the ten year selection hiatus ending in 1978, there was also strong administrative resistance to psychological testing of any kind. In the interval, I had become interested in the study of "process" as a source of useful diagnostic information and began seriously to apply this data with the 1978 selection cycle. As you probably already know, "content" relates to the data bits people give you, while "process" concerns itself with how that data is delivered, with close attention to

the words, tones, postures, gestures and facial expressions that are part of communication. Additionally, clothing choices, grooming habits, entertainment electives, type of humor enjoyed, and many other reflections of behavioral choice fall under the broad umbrella of process. Process can be a gold mine of information for serious students of its complexities. One of the major purposes of this paper is to acquaint you with an organized approach to process and to demonstrate its applicability to a specific program.

Methodology:

Over the years of working with stress research and with special flying programs in the Air Force, many of them classified, I evolved a highly structured psychiatric interview that takes approximately two hours to give. Part of it is devoted exclusively to factors related to tolerance to the threat of mutilation or annihilation, acutely or chronically applied. The correlates for acute versus chronic exposure appear to be different; it also makes a difference whether it is a first exposure or whether that stress has been experienced in the past. I will leave this area, with its psychophysiologic correlates, for another time and concentrate instead on the process data. The interview content provides not only the usual pertinent data bits of historical significance, but also is used as a cross check on the findings from the unguarded process channel. Now to some background data on the process approach I have been using.

In the late 1960's, Taibi Kahler, Ph.D.,[1] studied a group of 1200 subjects and identified a series of subtle behaviors linked to the onset of miscommunication sequences and to distress sequences people imposed on self or others. The five clearly primary behaviors or mind sets were called

"drivers". They centered on the following needs: 1) be perfect, 2) please others (or be pleased by others), 3) be strong, or emotionally invulnerable, 4) try hard, and 5) hurry up. Each of these can be aimed at the self or directed primarily at others. They can be at a conditional level, as in "I am OK if I am perfect", from which it follows that if I manifest my lack of perfection some way I am, by my own definition, "not OK", rather than being an OK person who made a potentially correctable error today. Perfectionism at a conditional level is a marvelous invitation to both acute and chronic depression. There are other vulnerabilities associated with each driver functioning at a conditional level, such as the myth that one cannot both be emotionally "strong" and be open and sensitive. There is no obligatory link between these two areas, and I have known my share of 14-carat heroes who clearly disprove that assumed relationship. Each of us has a rank ordering of these drivers that does not seem to change throughout life; the sequence is behaviorily important. Though the rank order itself does not change, with personality growth will come predictable shifts in the driver the individual uses as his primary channel into bad feelings. We reveal much about our driver order via process...the word choices, tones, postures, gestures and facial expressions I mentioned earlier.

In 1972, Kahler correlated drivers with seventy-eight personality variables. There was a good correlation between drivers and unconscious self-limiting life patterns, or "scripts", >0.25. "Script" patterns aside, roughly a third had high correlation patterns across the board, but the group taken as whole was statistically disappointing. Kahler set the data aside. He later went on to identify six primary personality types with associated behavioral clusters. But many of us experience a gradual, or occasionally

acute, personality evolution, growing sometimes by inspiration and sometimes by desperation. With the solidity of the six structural-behavioral clusters demonstrated, Kahler pursued the question of whether personality phase changes represented movement from one of the six clusters to another, however far through the sequence of six, and in whatever order one might migrate during life. With the concept of phase change in mind, he returned to the original 1200 subject sample and was able to identify not only the foundation layer, but also the phase, or currently active mode, in 982. Re-examining the drivers and the seventy-eight personality variables for correlation at active mode level rather than only at foundation level, the significance at active mode was found to be >.01. The third who had correlated well in the initial evaluation were subjects who had not changed from their original foundation level and had remained active in that same mode.

Inter-rater reliability was tested using three professionals thoroughly familiar with Kahler's construct. Each did blind evaluations of 100 subjects. Interjudge reliability both at foundation and active mode levels, using Kendall's coefficient of concordance and testing this significance with the critical values of chi-square, was >.001. Beyond the one hundred subjects in the aforementioned study, an additional number of individuals was independently evaluated by these same judges until a test group of thirty for each basic personality type was unanimously identified. These known personality types were then administered questionaires that contained extractions of the original seventy-eight personality variables studied, plus an additional one hundred thirty-five correlation items. Those items that correlated at sufficiently high significance were then included in one of two forms of inventory. From these studies, Dr. Kahler has evolved a

test instrument for identifying the evolutionary sequence from base or foundation mode to the current active mode, and for designating many of the important behavioral correlates; this instrument, the Personality Pattern Inventory, continues to undergo refinement as experience grows. Currently it is being used primarily for industrial application, dealing with management issues such as personnel selection and placement, and as a base to resolve a variety of personnel problems. It is also undergoing clinical usage with non-psychotics by myself and others, though that was not the inventory's initial purpose. I find it especially useful on marital problems, helping clients identify important differences in their needs, defenses and communication systems. Dr. Kahler's subject pool now exceeds twenty thousand. In terms of NASA's more complex selection needs, I use the PPI as a "lab test" primarily to confirm process data extracted in interview. Any major disparity between interview and inventory findings warrants further evaluation.

The concept of base or foundation mode versus current active mode is an important one for many reasons, not the least of which is its relationship to distress response patterns. When mildly to moderately distressed, expect the individual to respond out of his active mode orientation; when severely pressed, it is much more likely the response will follow patterns dependent on the base or foundation mode. Thus, individuals who have progressed beyond their base mode will show you two major stress response patterns, dependent upon the perceived intensity of stress.

Each of the past personality modes through which an individual has passed will modify the current active mode in predictable ways, but the most influential remain the base and the current active mode. For each phase we master, we acquire new understandings of a major population subgroup,

new sets of viable defenses, new ways to have our psychological needs met, new communication skills, new character strengths. I believe that the number of phases or modes we experience and the sequencing of them are major contributors to what we call maturity.

Once base mode and current active mode have been identified from the process observations, you have available to you a number of high percentage behavioral probabilities. These include such practical considerations as:

- major character strengths
- most effective "contact area" to use initially
  (i.e., thoughts/feelings/actions)
- managerial style to which (s)he is most likely responsive
- level of communication skill
- most compatible personality patterns for the important
  others around her
- most likely success and failure dynamics
- positive traits
- most compelling psychological needs
- favorite "gamey" behaviors
- most prominent negative injunctions in his life, such as
  "don't be close", "don't enjoy", or "don't feel sensitive emotions"

As noted above, we are talking high percentage probabilities and not absolutes, but a surprisingly cohesive and detailed picture emerges of important general behavioral tendencies. A book detailing this method is underway, written by the Kahlers (Taibi and Sandra), with whom I have had a long and joyful working relationship, and myself. But let me share with you the following brief overview.

Figure 1 is a diagram with two major axes, one reflecting people involvement and the other representing goal or event involvement. With people

involvement, for example, those on the withdrawing side are generally more comfortable working with smaller numbers of people or alone, while those on the involving side are basically people-persons.

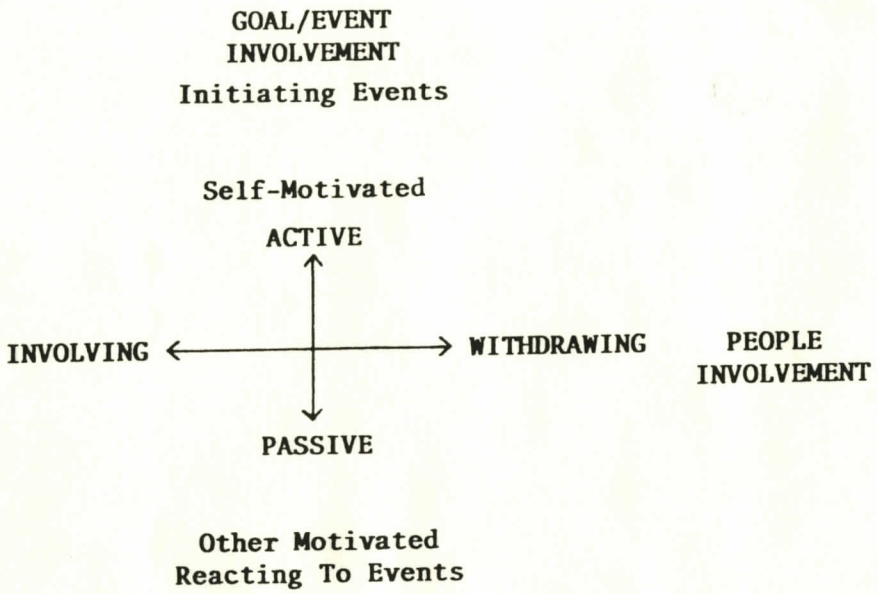


Fig. 1

Figure 2 takes those same two axes and adds the primary perceptual pattern of individuals who fall cleanly within that quadrant, per Kahler's studies.

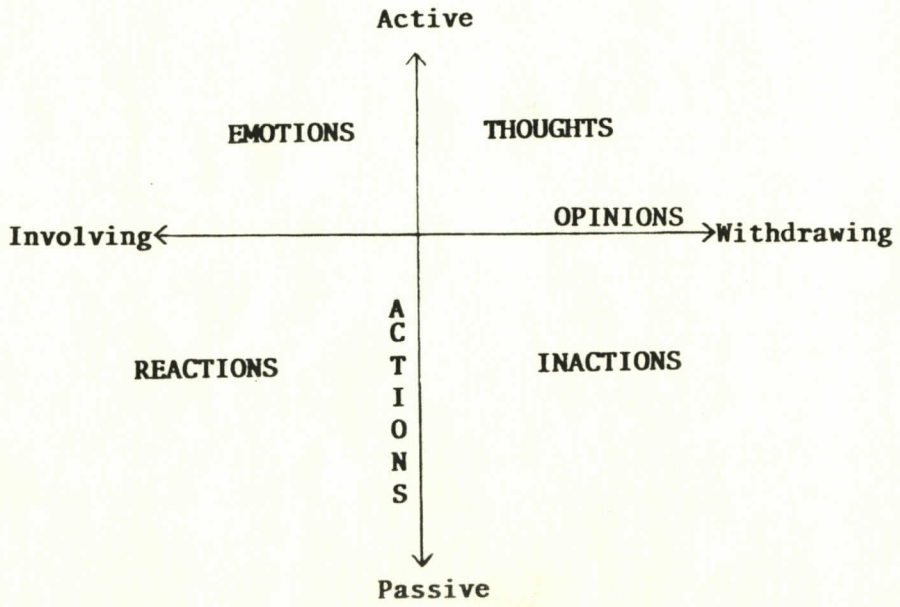
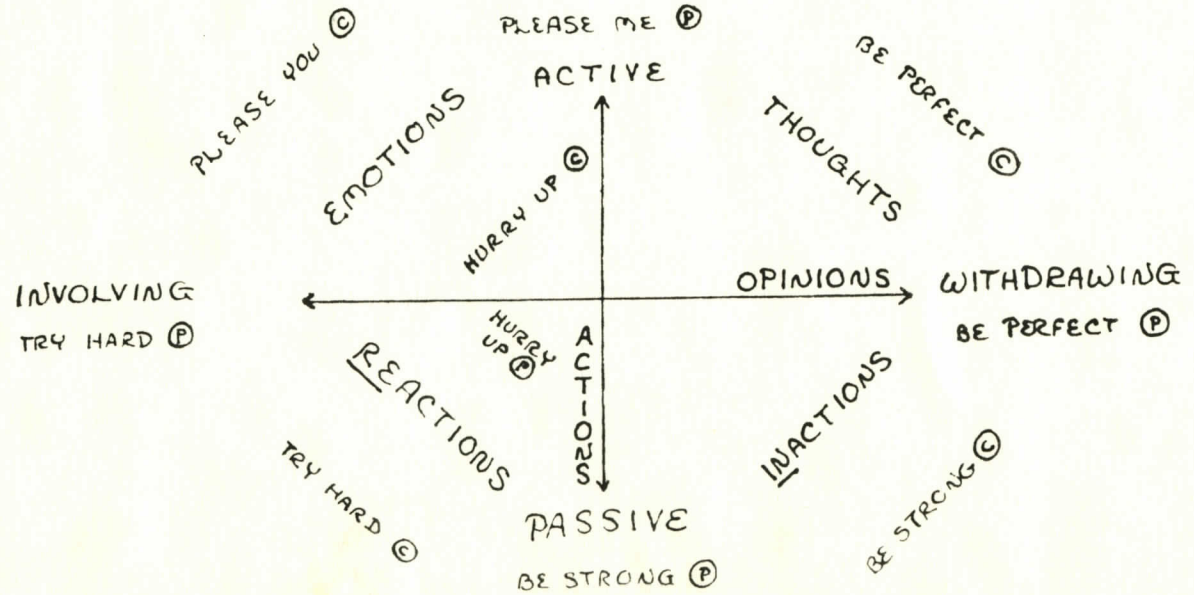


Fig. 2

Those above the horizontal axis perceive the world primarily via emotions, thoughts or opinions, depending on quadrant. Those below the horizontal have an action oriented perceptive pattern, whether it be via reactions, inactions or actions per se. The "actions" cluster falls almost on the vertical axis, but in the left lower quadrant, just as the "opinions" cluster rests almost on the horizontal axis but within the right upper quadrant. Each of us has an order in which we are most likely to respond if stimulated. My order, for instance, is to think first, feel second, and act third. There are some significant implications to this order in terms both of communication theory and of behavior. Figure 3 adds in the data on driver predominance. Those well within a quadrant utilize those drivers more from a "child" position, wanting to please important others, or personally to be more perfect, for instance. Thus, the encircled "c" for child position, follows the identified driver. Those whose structural-behavioral clusters fall on or close to the axes themselves are oriented much more toward using that driver from a "parent" position, directing the need outward and asking others to be more pleasing or expecting them to be more perfect, for example - thus the encircled "p".



Note that the "hurry up" driver is the only one of the basic five that is not a primary driver, but invariably secondary. As I noted earlier, each of us has a rank ordering of these drivers, and it is the first two in that order that carry the greatest significance, when the individual is still in the original foundation, or base, mode. The preeminent position of the prime driver in influencing behavior is beyond question, but the secondary driver can follow an inter-related path. As an example, many "pure culture" pleasers, those who have not evolved on to other modes, do not demonstrate the fullness of their intelligence because one of the common messages in their programming is that they are more acceptable if they let others do the thinking for them. But those whose secondary driver is "be perfect" often do well academically because they please important others by being more perfect, including thinking well. Once the base mode has been fully acquired and the individual moves into additional modes, the two most influential drivers are the driver associated with the current active mode and the original driver from the base mode. This will be true no matter how many modes have been experienced by the individual.

One can then place the six basic structural-behavioral clusters within the same diagram, as in Figure 4.

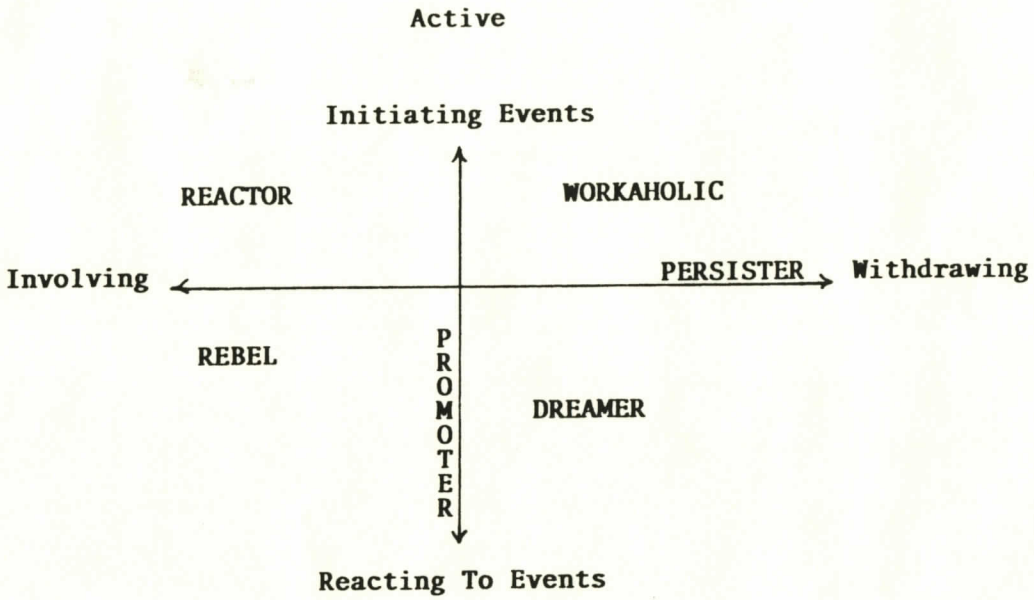


Fig. 4

As an example of placement, the Persister group is perfectionistic both toward self and others, but the greater proportion of that perfectionism is directed outward, whether given voice or not. The Rebel group often "tries hard", has many balls in the air, but fails to finish a significant number of tasks undertaken or fails to get closure on issues. Do you have any acquaintances who have had a partially dissembled automobile gathering dust in their garage for the last two years? Or, a student may turn in an exceptional essay, but, since it was turned in a week late, (s)he receives an obligatory "c". ....close but no cigar... Sometimes in their conversations they leave sentences unfinished and ideas uncompleted. But they also have a great penchant for

inviting you or me to try hard, as in the following dialogue: "What kinds of work experience have you?" "Gee, I've done a lot of different things." This non-answer requires you to ask other questions; it invites you to try harder. Or, there is the time-honored, "Where are you going?" "Out". "What are you going to do?" "Nothing". "When will you be back?" "Later".

An interesting consequence of the group placement in Figure 4 is that the pure-culture group most antithetical is ordinarily to be found on the opposite side of the diagram. Pure baseline Workaholics and Persisters, who are into perfectionism as a credo, do not meld well with Rebels and Promoters who do not view the rules, regulations, shoulds, oughts and musts of this world as being as sacrosanct as the perfectionists do. Or, the Reactor who is a warm and sensitive people-person often creates unrest in the more withdrawn Dreamer who is uncomfortable with the level of openness and emotional tone of which a Reactor is capable. Those to either side of the baseline group, however, are likely to be compatible. As an illustration, Reactors and Workaholics are often attracted as marital partners. Usually the Reactor admires the organization, logic and perceived strength of the Workaholic, while the Workaholic responds to the warmth, sensitivity and compassion of the Reactor. In such a diad, each can give the other permission and encouragement to grow in areas of self-perceived deficiency if neither is in an overdetermined position. However, if each is in "overkill", the Reactor may come to view the Workaholic as cold and unfeeling, while the Workaholic may see the Reactor as illogical.

Before giving you a brief thumb-nail sketch of each of these six primary structural-behavioral clusters, I should underline that what I will describe is the unadulterated pure-culture picture...the individual whose active mode and base mode are the same. The general description remains accurate when

any one of these is the current active mode, but the picture will have predictable modifications resulting from lessons learned in previous active modes. And, as a generality, when the individual has traversed multiple modes in the course of his or her evolution, the active mode is less likely to exhibit extremes.

Reactors are notable for their warmth, compassion and sensitivity. They are conspicuous for their ability to nurture and for their willingness to give of themselves for others. They are cooperative and tend to promote harmony. Their primary perceptive style is through emotions first; they take in people, situations and things by feeling about them. The usual sequence for them is to feel first, think second and act third. These are sensory people, usually being very responsive to soothing or pleasant sensations in any sensory channel. They like things that smell good or taste good, or that feel good tactily, or that are pleasing to gaze upon. In their homes or in their office (if the choice is theirs) they are apt to have pictures of people they love, soft and soothing background music, lights that can be dimmed, comfortable furniture, plants and flowers at home and probably at the office if it can be done without drawing adverse attention (sometimes a problem for males in more "macho" settings), and the use of warm soft color both in decoration and in clothing. Female Reactors are likely to enjoy candles, both for subdued light and for odor. They create comfortable and personalized "nests" when left to their own devices. They are more likely than most to physically touch others they enjoy. In their love making, they get more mileage from holding and being held than most others experience. Even more important than the pleasure of soothing sensory inputs is their need for unconditional acceptance, for being recognized and

appreciated as a person. They enjoy personal attention and people who are warm, friendly and honestly complimentary. They are basically people persons. Their prime driver is to please others. They are usually well-groomed, wear coordinated colors and complimentary accents, and look well put together. Some of their greater conflicts center around the handling of anger, guilt vulnerability, and with respecting themselves and placing their own needs in some position of reasonable equity with the needs of others. There is usually a vulnerability to missing some of the joy of today because of catastrophizing about possible future misadventures. Rejection and loneliness are major areas of sensitivity. At moderate levels of distress they are predisposed to get into anxiety, confusion and inadequacy. Examples of Reactors taken from the world of movies and TV would be Krystal Carrington of Dynasty, Ms. Ellie Ewing of Dallas, Mr. Rogers, Mary Tyler Moore in the Mary Tyler Moore show and the Dick Van Dyke show, Michael Landon in Little House on the Prairie and Highway to Heaven, Dr. Marcus Welby or Dr. "Bones" McCoy. Reactors comprise about thirty percent of the general population in this country; three quarters of them are female.

Workaholics comprise one of the two major groups of perfectionists. They are characterized by logic, responsibility and organization. They have the ability to reason clearly, to absorb facts and ideas and to synthesize with them. They perceive the world in terms of thoughts. They identify and categorize. They think first, feel second and act third. Generally they dress in a neat and tidy fashion appropriate for the job or situation. Similarly, their homes and offices tend to reflect functional utility, the contemporary and are organized with "a place for everything and everything

in its place". This does not mean their desks are always neat and uncluttered, but if there does appear to be disorder, there is likely some cognitively organized way things are grouped and the workaholic knows where to find what he wants. Awards and certificates will likely be displayed. Their prime driver is perfectionism, with the major thrust aimed at themselves rather than others. They have a greater tendency than most of us to use larger words, more detailed explanations, and to punctuate their sentences with parenthetical insertions "for greater clarity". The work ethic is strong and there is a major tendency for any play to be postponed until all the work is done...and for many it never gets done. Do not expect to see a major capacity for playfulness in the pure workaholic. Their greatest psychological need is recognition for work and the quality of thinking. Time structure is also important. A scheduled day, time lines on projects, and both authority and responsibility lines on organizational tables have great significance. If they get into a distress sequence at moderate level, they are inclined to get into triumphant anger, and sometimes into guilt. They can become frustrated with those who don't think as clearly as they. Examples include Thomas Paine, De Cartes, Mr. Spock, HAL the computer in "2001", and Emily Bronte. Workaholics constitute about twenty five percent of the US population, with three quarters being males.

Persisters are another shade of perfectionist. They differ from the Workaholic in that theirs is an "equal opportunity" type of perfectionism aimed not only at self but more strongly at the people, things and situations that surround them. Major character strengths include dedication and conscientiousness. They are remarkably observant and aware of detail. The name Persister has been appended to the group not only because they have remarkable persistence in pursuit of goals, but also because they have very

strong value and belief systems that are resistant to change unless the presented information is very compelling. They perceive the world via their opinions and value systems, and they make strong judgments based on those beliefs and values. They are not reluctant to share those opinions. They usually dress conservatively and for the organization. Though they want their office and home functional, they usually favor traditional furniture, antiques, oriental, or period pieces. In terms of primary psychological needs, they would like to have their convictions validated by others, if not totally accepted then at least appreciated, and most certainly not denigrated. Recognition for accomplishment is important. If they "get into a bad place", they can become righteous and judgmental, or may push their beliefs beyond the tolerance of those around them. Guilt, jealousy, and fears sensitized from early life can also appear. They can be overly sensitive to negative feedback. Humor is usually not a strong feature and their distrust of others can be greater than most other "pure" categories. If their value systems agree with those of the company, you are hard pressed to find a more loyal employee; if they are at important divergence, you may then see a crusader from within, because they have strong beliefs and the courage of their convictions. In their pure form, neither Workaholics nor Persisters are notable for their emotional sensitivity or warmth. But both are prodigious producers and are more likely to demonstrate their love and commitment to family by furnishing a good income, guaranteeing security, planning for the children's education, and by providing a good example of long-term planning, of the work ethic, of achievement, and of solid values. Examples might be Moses, Mother Theresa, Madam Curie, Sherlock Holmes, Jimmy Swaggart, Archie Bunker, Father Flannigan, Sam Donaldson, Lyndon LaRouche, Admiral Hyman

Rickover, Martin Luther King, and probably the Grand Dragon of the Ku Klux Klan. Persisters constitute roughly ten percent of the population, and three quarters of them are males.

Dreamers are a quieter and more withdrawn segment of the population. Their character strengths are related to being reflective, imaginative and calm. Their faces reflect less of the emotional content of whatever is going on and, as a result, may show fewer lines with the passing years if the individual remains in his or her foundation mode. Female Dreamers wear little or no make-up or jewelry and their hair is done in some natural fashion rather than being styled. Clothes colors and styles are subdued and do not ordinarily draw attention. Usually they dress for the weather or for comfort. They are clearly not people persons and often are almost anonymous within a group. Their personal environment is not that important to them, in high contrast to Reactors; they are satisfied with what others might consider plain or rustic. They have the ability to be introspective, but not necessarily insightful. They often do very well with routinous jobs that bore others. They can apply the attention necessary to do well at some routine task but can also simultaneously let their mind ricochet from one area of interest to another. It is because of this quality of easy distractability and of seeming to be pre-occupied at times that they have been called Dreamers. They are often skilled with their hands and do marvelously on assembly lines or some other more solitary or repetitive manual task. As a group they are more passive and less inclined to create problems for an employer. Under clear direction, but not necessarily close supervision, they can do an imaginative job on an assigned task. Under moderate pressure their withdrawal is likely to increase and become sustained, they may evidence recurrent

physical illness, or not finish projects they had begun. In the same period they might feel embarrassed, inadequate, scared, confused, or hurt. Their major psychological need is solitude, to have their own private time and personal space. Examples of Dreamers would include most Trappist monks and ascetics, Greta Garbo, Gary Cooper movie characters, or Radar O'Riley. Only about ten percent of Americans are Dreamers, sixty percent of them female.

Promoters are especially noted for their persuasive ways. They are adaptable to their environment and can be very charming. They are usually not personally insightful, but they have an unusual focused type of awareness of what it takes to get you or me to do something they desire. They are better at short-term high-intensity than they are at long haul. They are not big on rules and regulations, not necessarily because they have some malfeasance in mind but rather because they find them unnecessarily constraining. Most would rather work on commission than straight salary, believing they will do better, and if they are effective Promoters they're probably right. It's obvious that the difference between a sociopath or a con man and someone who is an honest, persuasive salesman of items, ideas, or of himself is where they draw their moral-ethical line. They have the ability to be firm and direct; similarly, they usually respond to firmness and directness from others, to a drawing of lines without personal put-down, even though they may not always be pleased with the directional content. They are action-oriented, enjoying doing exciting things and making things happen. In those a little harder over, unbuttoned shirts with gold chains and flashy jewelry are not an uncommon presentation; quality clothes and powerful cars, big homes, thick carpets, expensive furnishings, decorative women, trophies, and displayed pictures with the movers and shakers form

another related path, if the financial credit is available. The saying "If you've got it, flaunt it", probably originated with a Promoter. The above is a more exaggerated picture than usually seen, but the general behavioral tone is accurate. While the Reactor is more into warm soft colors like pastels or earth tones, Promoters and Rebels enjoy brighter, sharper colors like blacks, reds and whites. As noted earlier, they are action oriented and one of their dominant psychological needs is incidence, or bursts of excitement. Racing fast cars, sky diving, buying stocks on margin, motorcycle motorcross, hang gliding, white water canoeing, brawling, having affairs, and gambling all can fulfill incident needs; though I have known only a few, the only automobile repossessors I have known had high incident needs; the law is on their side, but they will likely need to steal it back. On the basis of brief TV interviews I have seen, a few of the electronic media evangelists and some of the publishers of the more prominent "girlie" magazines fulfill the process criteria for the more pronounced Promoter stance. Persisters in a Promoter mode are disproportionately represented in the ranks of politicians, being drawn not only by strong belief systems but also by the excitement, the power, the manipulative challenge. The Promoter group also encompasses some of the most superb salesmen, most persuasive orators, and many of the world's respected movers and shakers. Being drawn to bursts of excitement does not necessarily mean being impulsive or reckless; many people who engage in risk activities do so with exquisite care...but the risk, excitement or challenge is indeed still part of the draw. If they are being moderately stressed, watch for the emergence of the negative side of their incidence needs, for the setting up of arguments, for ignoring or bending rules, for dishonest manipulation, or for setting others up to be

made to look like fools. When frustrated, their greater tendency is to externalize blame and perhaps to be vengeful in response, enjoying the "gotcha" if successful. They can be very difficult people from whom to collect legitimate debts. Promoters make up only about five percent of our population, sixty percent of them men.

Rebels are a fascinating group. Unfortunately, the very term "Rebel" is considered a pejorative by many. Yet mild, or controlled, Rebels have a great deal to offer. They are spontaneous, have lots of energy and enthusiasm, and their playfulness often adds to the general morale of a working unit. Very important is their creativity. Because they include in their thinking patterns many possibilities that others unconsciously and automatically reject, and because they are not so restricted by convention, they often come up with the unconventional but highly workable answer. There is usually some creative outlet, music being a common one; learning to play a musical instrument while in a Rebel mode is a recurrent finding. That same creativity could be turned instead into writing, or into computer programs, or poured into such activities as marketing. They don't usually do well under autocratic control, especially if there are subtle discounts by the controller; the hair on the back of the Rebel's neck rises under such circumstances. But if the boss will make contact with such an employee a bit more frequently, talks across rather than down, and is a bit playful in his approach, a good Rebel will usually work his buns off for him. Rebels have an ability to play and to enjoy the present; movement toward a Rebel mode often helps Reactors and Workaholics break out of various unnecessary limitations on their lives...helps them to re-decide some important issues, not the least of which is that one can enjoy each day while still attending to realistic long term goals. Though I am now long past my own Rebel mode,

part of the residue is that I feel each day is to be enjoyed; after all, I gave up twenty four hours of my life for it. Humor is a high quality defense, and Rebels generally are better at it than any other pure-culture group. Rebels often dress for attention, wearing the unique or unusual, perhaps with hair styling that is an eye-catcher. The colors they choose are more likely to be bright. Their perceptive mode is primarily via reactions. They react to people and things with likes and dislikes. They are in many ways like parabolic mirrors, repaying you in the same emotional currency they perceived you as offering. If you are brusque with them, they will likely be brusque with you; if you have a bit of a twinkle and are playful and pleasantly teasing with them, expect them to return the favor. Their greatest psychological need is what we call "contact", the need for stimulating sensory inputs, for an environment that "turns them on". They like games, toys, lights, excitement. If there are a few more decibels of noise at the disco, they can comfortably deal with that, just as they can a few more lumens of light. ..."The smell of the greasepaint and the roar of the crowd".... They respond to being contacted playfully. In their moderate distress sequence, they can get negative and complaining, play "yes, but..."games, or blame others/circumstances/things/the phase of the moon. At this point they may be feeling anger, possibly vengeance, jealousy, blamelessness, or be bored. Many of our finest comedians are Rebels, as were James Dean, Scarlett O'Hara, Hawkeye Pierce (though I suspect Allen Alda himself is a healthy Reactor from bits of interviews I have seen.), Janis Joplin, Bette Midler, activist Abbie Hoffman or quarterback Jim McMahon. Rebels constitute twenty percent of our population, sixty percent of them female.

I underline once more that what I have been describing is pure

unadulterated baseline behavior, unmodified by the addition of subsequent operational modes. In that sense, they may seem like caricatures of some people you have known. But the intensity of any mode is modified not only by what has preceded it, but also by such factors as choice of secondary driver and environmental pressures. For example, some people are clearly roaring overkill Rebels from very early, while others who are also in their baseline phase are playful energetic folks who may be inclined at worst to tell jokes that poke fun at the authority structure. Yet the key underlying dynamics remain the same, differing more in degree than quality.

Figure 5 reflects the strengths of each mode, along with those behavioral manifestations seen if the picture is more extreme. No baseline mode is inherently superior, except in the eye of individual perceivers. Each has positive characteristics and talents to offer. Some growth sequences facilitate smooth integration into our society and the probability of earlier "success" (again, depending upon the perceiver's definitions), but there are advantages and disadvantages to each. Is it better to have a turbulent youth with less academic success, mellowing out later into a creative producer, or to hit Rebel as a second mode in mid-life after a long hard Workaholic siege and suffer "the middle age crazies" after community respect is already in hand?

Each of these modes has preferential communication channels, managerial styles to which they most readily respond, different psychological needs, different success and failure patterns with associated warning signs if they are threatening to malfunction, and a host of other correlates. In terms of malfunction, awareness of the psychological needs is important. If an individual is drifting into "stroke deficit", if you will, he or she initially becomes vulnerable to seeking unconsciously the negative side of those same

PERSONALITY TYPE	STRENGTHS	AT EXTREME
REACTOR	Compassionate Sensitive Warm Nurturing	Over-reactive Dramatic Dependent Egocentric Doesn't Think Clearly
WORKAHOLIC	Responsible Logical Organized Time-Oriented	Rigid Over-conscientious Humorless Routinous Ritualistic Controlling
PERSISTER	Dedicated Observant Conscientious Tenacious	Jealous Righteous Judgmental Opinionated Hypersensitive to Neg. Feedback Suspicious
DREAMER	Reflective Imaginative Directable Calm	Shy Sensitive Introverted "Loner" Non-Competitive Seclusive
PROMOTERS	Resourceful Adaptable Charming Persuasive	Don't Learn From Mistakes Impulsive Irresponsible Explosive Vengeful
REBELS	Spontaneous Creative Playful Energetic	Negative Stubborn "Hostile" "Frustrating" Procrastinative Blameful

Fig. 5

needs - as if negative attention were better than no attention at all. Then there is a shift in mind set to more self-limiting patterns, differing for each of the operational modes. Following this, individual failure mechanisms may be engaged. For instance, Reactors tend to make foolish mistakes, Workaholics get into over-control, Persisters are vulnerable to pushing their belief systems beyond the tolerance of those around them, Dreamers become excessively passive, Promoters get into over-manipulation and Rebels shoot themselves in the foot by externalizing blame and possibly becoming vengeful. Persisters can get vengeful, too, but out of a much more righteous position.

How far do most of us progress through the series, and are there "standard" sequences of progression? Figure 6 gives the mode progression data for an age band appropriate for the astronaut group. You will note that one third are still in their base or foundation mode by age forty (mixed population of males and females). Thirty-nine percent have answered the problems of a second mode and are working on a third. Less than one in one hundred have experienced all six. In a sense, it is like the educational process. Those who answer the academic problems of grade school move on to junior high...and so forth up through doctoral training and post-doctoral fellowships or various forms of sub-specialty training. If someone drops out at grade school level, it does not necessarily mean they are inadequate and cannot succeed in life. But there will be many more doors open to those who have advanced education and special skills. I used to listen to a radio/TV evangelist on Sunday mornings while shaving before church. Though I did not agree with his religious views, I found it fascinating to listen to a ninety-plus year old preacher, intellectually clear, who showed me none of the markers of having ever functioned out of any mode other than his hard-over

MODE PROGRESSION BY AGE 40
(USA, GENERAL POPULATION MIX)

IN BASE MODE.....33%		
EXPERIENCING SECOND MODE.....28%	39%	have assimilated a 2nd mode
EXPERIENCING THIRD MODE.....20%	19%	have assimilated a 3rd mode
EXPERIENCING FOURTH MODE.....15%	4%	have assimilated 3 4th mode
EXPERIENCING FIFTH MODE..... 3%	1%	have assimilated a 5th mode
EXPERIENCING SIXTH MODE..... 1%		

Fig. 6

baseline Persister orientation. In the years that I listened to him, I never heard any humor; I heard concern but not true warmth. Yet he accomplished much in terms of establishing a church and having worldwide evangelical involvements. I remember him preaching once about the impending end of the world. Among the biblical preconditions for this event was the true Word of God having been made available to the entire world. The evangelist allowed as how that had been taken care of, since he was now being carried on a worldwide satellite system. Though I admire the surety of his position, I suspect the Pope and the Billy Graham's of this world would not share his conviction about the absolutes of his biblical interpretations. I would not give this man a diagnosis and I believe he was justified in the eyes of God in terms of the honesty of his position, but I do see such an individual as being more narrow and as missing many of the joys of life. People such as this pour enormous energy into such endeavors as building institutions to care for children and the ill, but they hire healthy Reactors to do the actual nurturing.

In terms of the usual sequence of progression, Figure seven presents the sequences that roughly two thirds of people take, depending on their mode of origin. The sequence is logical and non-random in terms of needs; these are natural progressions. In that third which deviates from the norm, the variances are not usually great. In terms of psychotherapy, it does not appear that you can force a mode of choice if it is not the next natural mode for that individual. Clinical experience suggests that you can indeed provide insights and permissions for change, but what is most effective is to help them through the tiger traps of the mode in which they are operating, to facilitate their movement into the next mode dictated by their natural sequencing. Kahler has evolved techniques to predict the individual's probable

future order of evolution; the preliminary data looks excellent, but it will take years of people-watching to assure validation.

You will note some of the modes in Figure 7 at levels 1-3 are in parentheses. This indicates the person may skip that mode in his sequence, at least for the present. But you will notice as well that the mode that may or may not be skipped is preceded by a closely related mode. For instance, Workaholics and Persisters share common roots in perfectionism and work through related problem areas. Though there may be a soft segue from one to the other developmentally, the desirable cognitive underpinnings can be supplied by either. Similarly, Rebels and Promoters share many traits, hear each other well and, once healthily absorbed, can accomplish related functions for the individual's development. There are three levels designated because each reflects a clear difference in the dominant perceptive pattern of the individual, building upon their own previous evolution. Acquiring a new level is an important broadening experience. I will return to the question of acquiring new levels after reviewing the astronaut selection data..

Astronaut Selection Data:

To demonstrate the utility of process data, I have chosen to use the last three astronaut selection cycles, those of 1984/'85/'87, upon which I have kept more complete and orderly records of process. For those three cycles a total of 288 individuals were brought to NASA's Johnson Space Center in Houston for medical evaluation and interview. The records of one individual were not included because I was less positive about the sequencing of his modes. I believe his base mode and his active mode were one in the same, Persister, but that he was right on the cusp of transitioning to a Promoter mode...not the usual sequencing. I could not identify any active Reactor

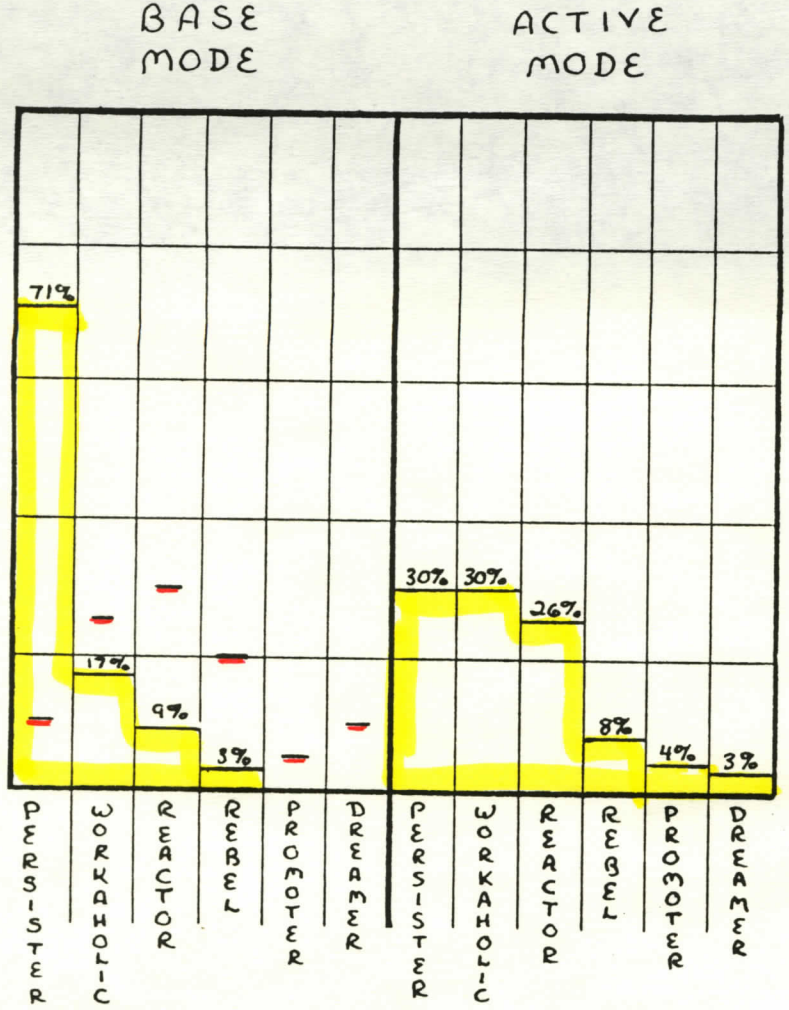
DOMINANT PERCEPTIVE MODE		Level 1	Level 2	Level 3
Persister:	thoughts	+ opinions (-)	persister (workaholic)	
	feelings	+ reactions (+ actions)		reactor rebel (promoter)
	actions	(inactions)		dreamer
Workaholic:	thoughts	(+ opinions)	workaholic (persister)	
	feelings	(+ reactions) (+ actions) -		rebel (promoter) reactor
	actions	(inactions)		dreamer
Reactor:	feelings	+ reactions (+ actions)	reactor rebel (promoter)	
	thoughts	(+ opinions)		workaholic (persister)
	actions	(inactions)		dreamer
Rebel:	actions	(reactions) (-)	rebel (promoter)	
	feelings			reactor
	thoughts	(+ opinions) + inactions		workaholic (persister) dreamer
Promoter:	actions	+ reactions (inactions)	promoter rebel (dreamer)	
	feelings			reactor
	thoughts	+ opinions (-)		persister (workaholic)
Dreamer:	actions	(inactions)	dreamer	
	thoughts	+ opinions (-)		persister (workholic)
	feelings	+ reactions (+ actions) -		rebel (promoter) reactor

Fig. 7

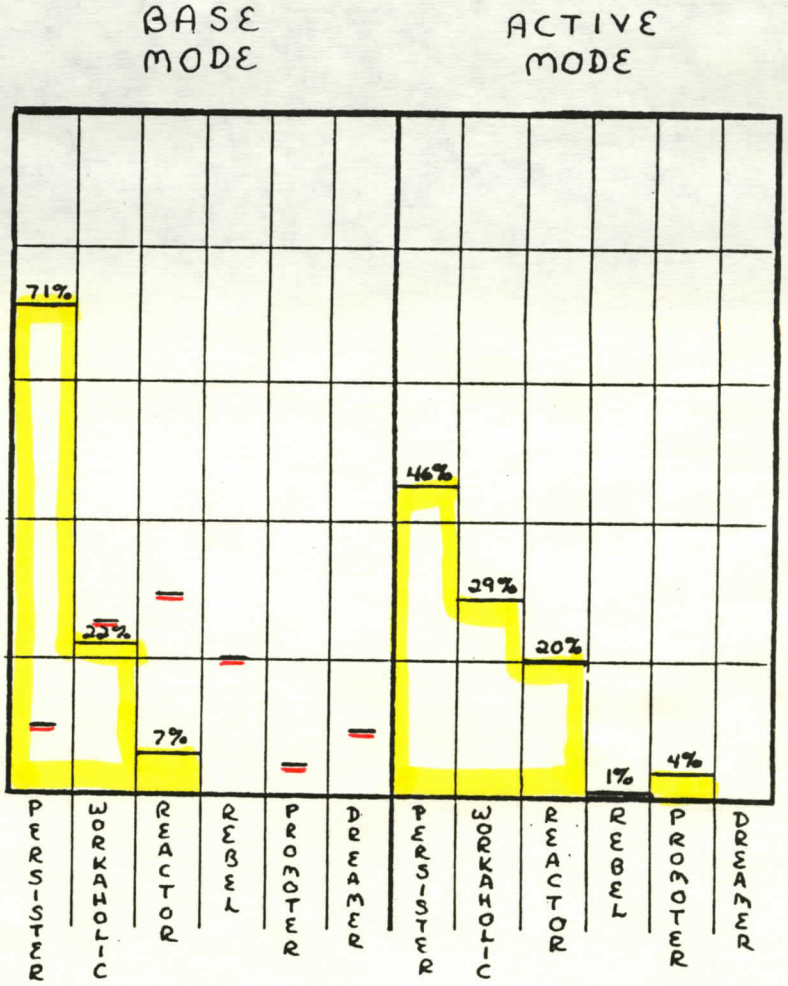
input, which I would ordinarily have expected as an intervening mode (see Figure 7). The individual made considerable effort to distort the data toward a picture he presumed was most desirable. With his manipulative efforts he shot himself in the foot, not only with me but presumably also with the interview board. In any event, he was not selected. You might experience some surprise that a Persister might manipulate, bearing in mind their devotion to value systems and ideals, and their penchant for righteousness under pressure. On the other hand, Promoters, if hard-over, find that manipulation comes easily and over-manipulation is a danger if in a distress sequence. But bear in mind that recognition and achievement are also major psychological needs for Persisters and that it is around this hinge-pin that manipulation can take place. Like most applicants, this man very much wanted the recognition that comes with being an astronaut. In this case, having a strong upcoming Promoter mode facilitated such a move. The applicant would have done himself a favor to have been genuine and honest both with the psychiatric evaluation and board interview, for he truly did "have the tickets" that would have recommended him to the program.

Figure 8 reflects the 287 "highly qualified" applicants brought to NASA/Houston, and also the 45 selectees as a subgroup of the "highly qualified" troupe. For both the total "highly qualified" group and the selectee subgroup, the original base mode and the current active mode are displayed. These are the two most pertinent modes operationally, no matter whatever intervening modes might exist. The normative data from an unselected U.S. population is reflected by the free-floating horizontal lines for each personality category in the two base mode sections of the diagram. Kahler's data suggests, in rounded-off numbers, that ten percent of the general population has a

"HIGHLY QUALIFIED" LEVEL APPLICANT POOL (287)



SELECTEES (45)



SELECTION CYCLES OF '84, '85, '87

FIG. 8

Persister base, but seventy-one percent of the applicants who earned their way to NASA/Houston presented with that base mode. If one stops to consider what it takes in terms of hard work and endurance to pass through the many educational and experiential filters that prepare one to be an astronaut candidate, perhaps the Persister preponderance may be less of a surprise. Next, note the Workaholic percentage; at seventeen percent it is less than the general populations' twenty-five percent. But if we add the Workaholic and Persister percentages, we end up with eighty-eight percent of the applicants and ninety-three percent of those selected who began their pursuit of life as perfectionists, achievement and work oriented, as opposed to thirty-five percent of the general population. Bearing in mind that the perfectionists are thought oriented rather than feeling oriented, that astronauts and other NASA achievers who are perfectionistic make both a heavy contribution to the earlier levels of screening and also the final interview board, it is possible that the heavy cognitive loading also influences evaluation of applicants and how the selector values various personality traits. Back in the days when Admiral Rickover selected the captains for all the nuclear submarines, the ongoing joke was that he selected "a series of little Rickovers"; true or not, the fact is that most people in similar circumstances select others who share some of the same behavior and value systems they themselves have chosen to enshrine.

Keeping the above in mind, the Reactor representation at base mode at nine percent in applicants and only seven percent in selectees, as opposed to a thirty percent representation in the real world, is no great surprise for several reasons. Reactors, unless they have Be Perfect as a secondary driver, are not as commonly scholars, and their self-confidence and competitiveness is not usually as high as the Persister. The academic pathways

they choose are often humanistic rather than the scientific areas NASA wants. Every base mode Reactor chosen had either moved on to an active cognitive mode (Workaholic or Persister) or was right on the cusp of transition to an active perfectionistic mode. In the three selection cycles, a total of only three base mode Reactors were chosen; all had secondary Be Perfect drivers and showed heavy cognitive influence, though only one of the three had fully shifted the active mode to a pre-eminence of perfectionism.

Though three percent of the "highly qualified" category from the applicant pool began as Rebels, none of the eight were selected and, of the selectees, only one percent had a Rebel active mode. One active mode Rebel out of forty-five should round out to two percent; for those of my readers who are perfectionists and who are highly observant of detail, most likely you active mode Persisters, one percent registers because the one active mode Rebel chosen was at an unusual evolutionary spot wherein the Rebel and Promoter elements were mathmatically equally powerful. Therefore, in the statistics a value of one-half was given to each. These two modes share a number of tendencies in common and neither had yet assumed the dominant role in terms of my data. The absence of Rebels is not surprising on several counts. Rebels as a group are not notable scholars, again, unless there is a strong secondary Be Perfect driver. Most institutions of higher learning are set up by perfectionists for perfectionists; the Rebels do better where there is greater flexibility. As I said, there are exceptions; it is my impression that Cal Tech has both a greater tolerance for and does a better job of nurturing the Rebel, appreciating that it is a worthwhile trade-off to encourage the group's inherent creativity while accepting (or smiling upon) a reduced level of conformity. Secondly, an active mode Rebel is less likely

to rest comfortably upon an interview committee skewed toward perfectionists.

The absence of base mode Promoters and Dreamers in both the pool group and the selectee group is also no surprise. Promoters are geared more for short-term high-intensity activity and are not much for rules and regulations. Also, they often are drawn away from academic pursuits by the need for bursts of excitement. This orientation is not likely to get them heavily into the type of single-focus endurance activity that will get them over the hurdles necessary both to leave an appropriate track record and still be within the age envelope that NASA considers. Though the concept of space flight doubtless has great appeal to a Promoter's incidence need, base mode Promoters usually have not accumulated the tickets necessary to get them that chance. Dreamers, on the other hand, are both more passive and also are vulnerable to a "never" type of mind-set when under pressure. This mind set allows for the reality of the opportunity, i.e., to be an astronaut, but assumes that "people like me" "never" get selected, "so why bend my pittard on that windmill. It is better that I Be Strong (Be strong driver) and accept my lot in life". With this mind set active, their options become constricted.

Figure 9 subdivides the selectee group by the two major classifications, pilots and mission specialists. The fascinating observation that emerges here is one hundred percent of the mission specialists began in one or the other perfectionistic mode and ninety-two percent remain in one of those two perfectionistic modes, though they may have swapped the two modes in terms of which is the more dominant...the active mode. An eight percent active-mode readout at Promoter takes up the rest of the percentage. Because the road to astronaut status for mission specialists is primarily an academic one, this overwhelming perfectionistic orientation is not outside of logical reason.

ASTRONAUT SELECTEES, '84/'85/'87 N=45

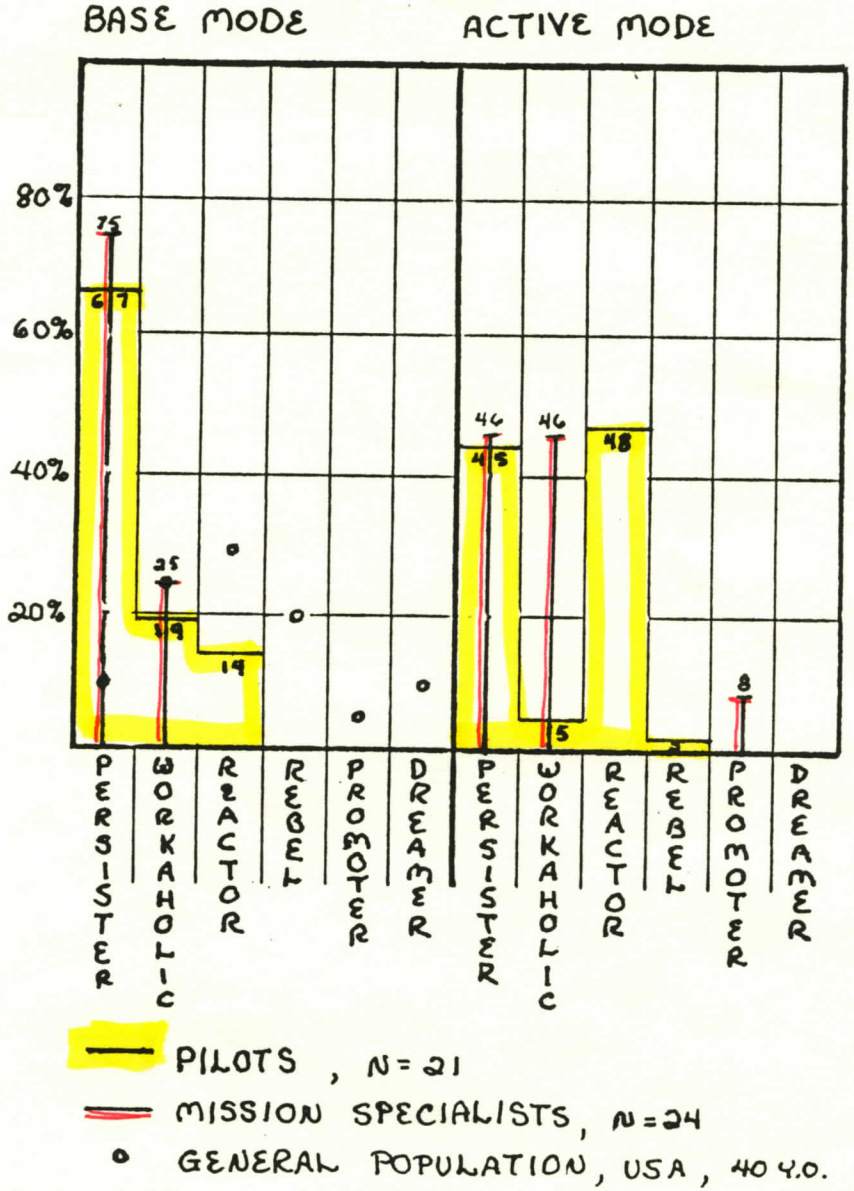


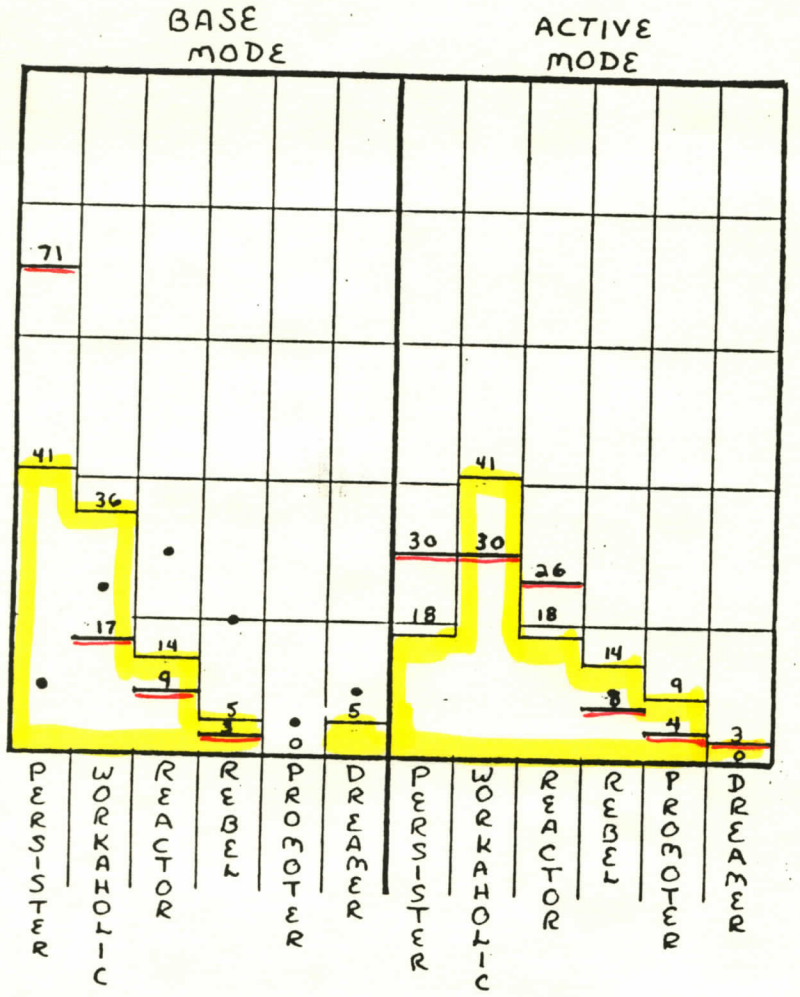
FIG. 9

Pilots, on the other hand, pass through an entirely different filter system. With very few exceptions, the NASA pilots over the years have come from the active-duty, military, flying population, or those who have very recently terminated such military service. Virtually all are products of military test pilot school, pre-requisites for which include extensive pilot in-charge experience with high performance jets. Until more recent times, most had combat experience. Their tolerance to life threat had been tested by combat and by such repetitive experience as carrier landings for Navy and Marine pilots, or the hazards of routine all-weather air operations for the Air Force. Their military careers had given many of them broad experience in different cultures. Generally, their life experience at time of application has been a broader and more "real world" experience than the more sheltered academic channels in which most mission specialists have labored so hard and so long. The greater breadth of the pilot group both in base mode and active mode, I suspect is a reflection of the very different channels from which the two groups spring. Having said that, I must add that the growth rate of the mission specialist group, once aboard, does not appear startlingly different from that of the pilots, though my data is quite incomplete. In terms of my clinical envolvements with the astronauts, however, the Be Strong driver element is generally lower in the mission specialist group, as a result of which they will more readily seek counseling if unsettled over some problem area and are frequently more open to insight-oriented therapy that may accellerate their evolution.

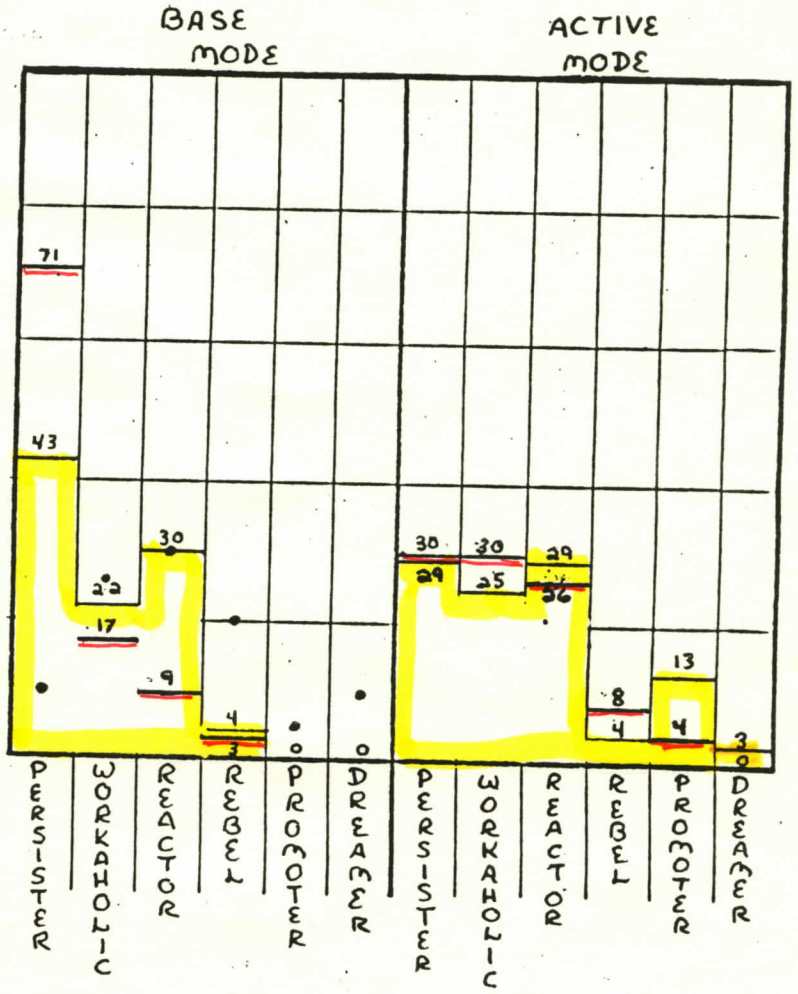
Figure 10 looks instead at the payload specialist pool, those individuals from outside the formal NASA structure who are selected by interests outside NASA, both American and foreign, to go aloft for some special technical role

PAYLOAD SPECIALIST POOL '84-'87

FOREIGN (22)



AMERICAN (23)



ASTRONAUT APPLICANT POOL

PAYLOAD SPECIALIST POOL

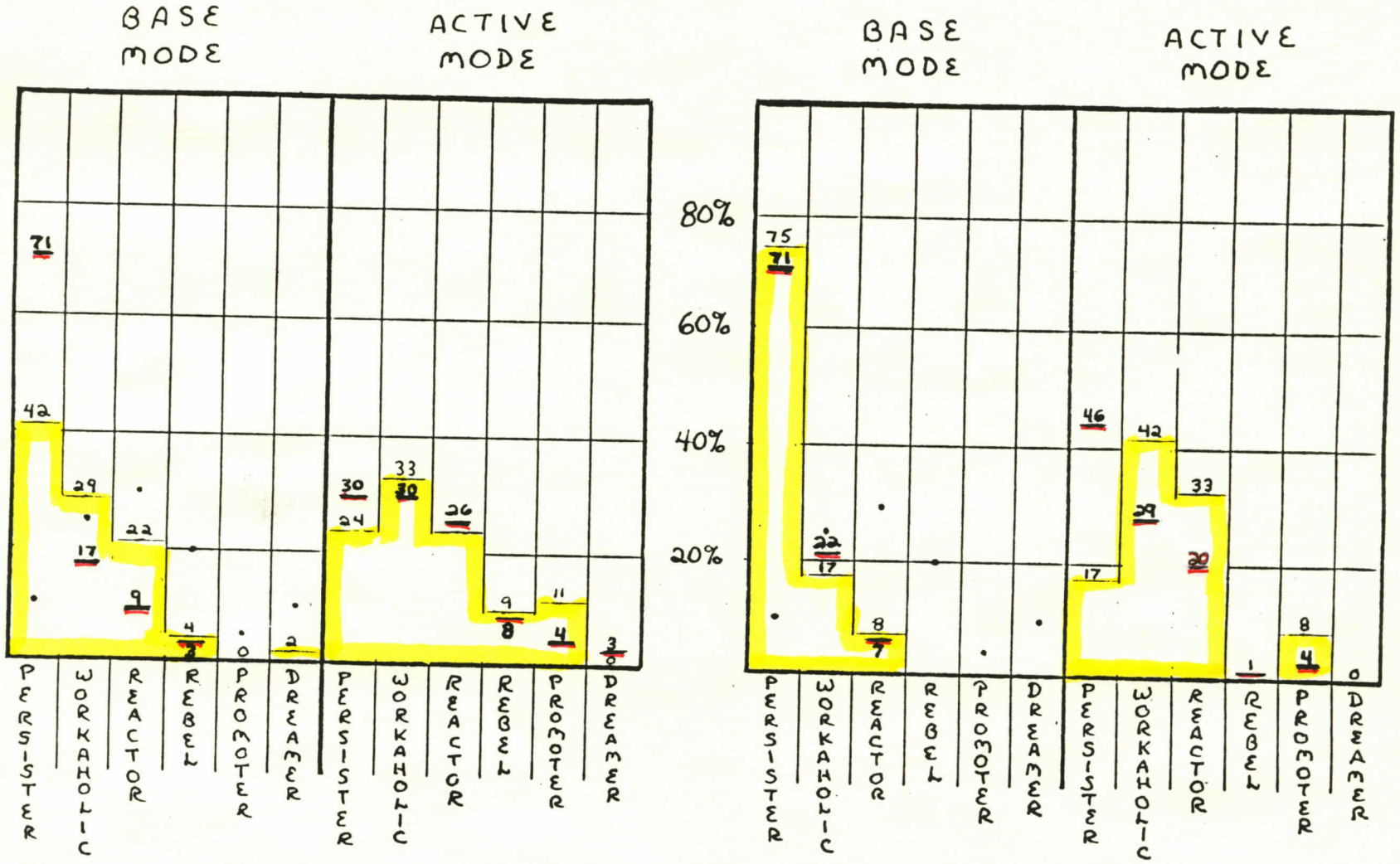
• GENERAL POPULATION, USA

FIG. 10

or for a purpose deemed in the national interest. Their experience, in all but one case, has been for one flight only. They are selected outside NASA, but must meet NASA medical standards. They are of interest because their selection process is so varied. Unfortunately, we do not have normative personality distribution data for the foreign countries involved. The references on the figure remain the U.S. experience. The foreign data also does not contain all the foreign designees and back-ups; those whose limited command of English presented major communication difficulties were eliminated from my statistics because of process problems. Lest the above statement generate some concern about their ability to function adequately as part of an international flight crew, a) each of these individuals was enrolled in intensive studies in English that would hopefully correct that deficiency pre-flight, b) communication was sufficient to rule out major psychiatric disorder, and c) each was reportedly functioning at a high level within their own society and profession. Both the American and foreign pools are notably different in the base mode distribution, compared to the NASA applicant pool. The active mode distribution for the American payload specialist pool approaches the astronaut applicant pool more closely than does the foreign distribution. The level of perfectionism in the astronaut applicant pool's base mode adds up to eighty-eight percent as either Workaholics or Persisters, to seventy-seven percent in the foreign pool and sixty-five percent in the American pool. But if I go to the data on the payload specialists who have actually flown, as shown in Figure 11, the base mode of that group much more closely approximates NASA's applicant pool data, though the active mode reflects a reversal of the Persister-Workaholic ratio. Perhaps some of the back-up personnel are selected with other motivations playing a larger part

PAYLOAD SPECIALIST POOL '84-'87
N = 45 (23 USA, 22 FOREIGN)

FLOWN P.S.' WITH ADEQUATE DATA
N = 12 (9 USA, 3 FOREIGN)

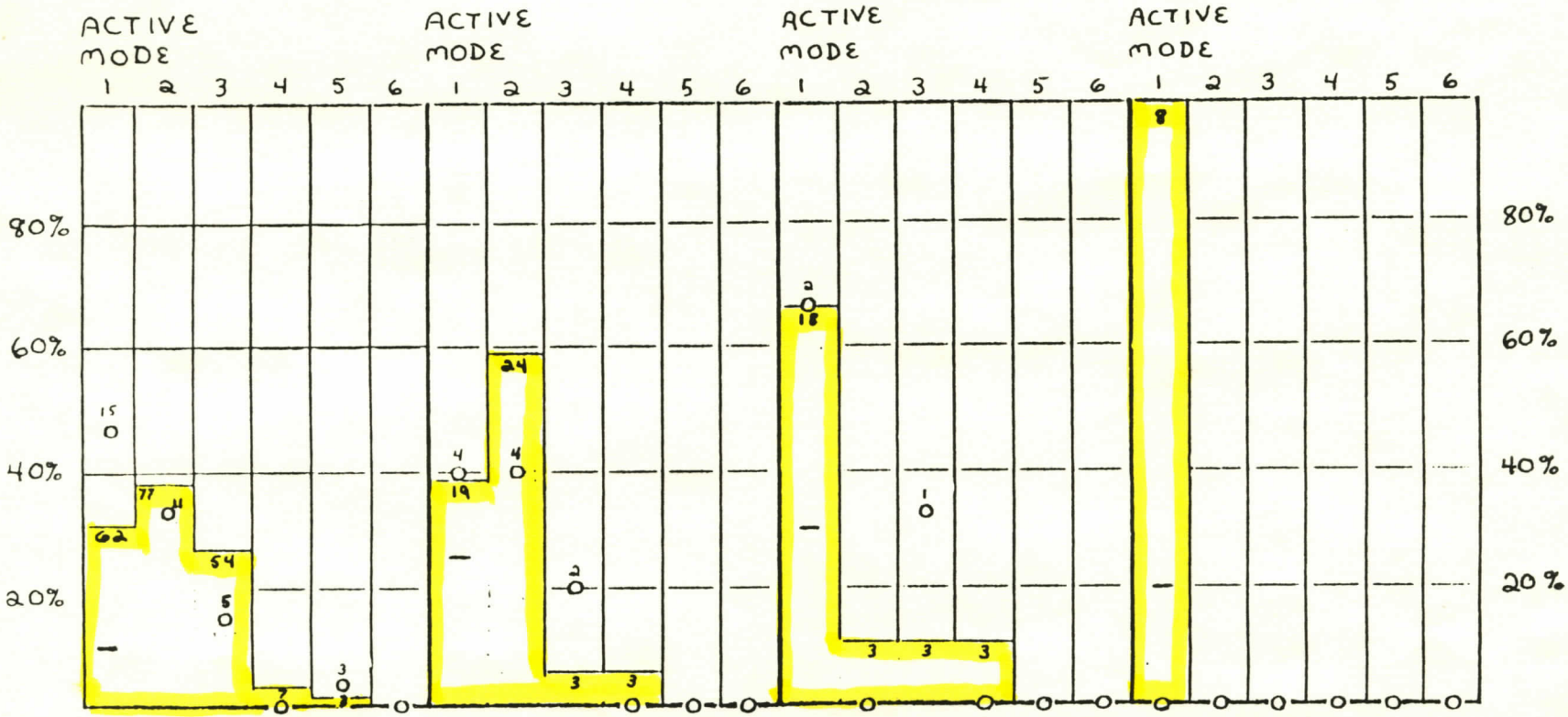


PAYLOAD SPECIALIST DATA
ASTRONAUT APPLICANT DATA
• NORMATIVE DATA, USA.

FIG 11

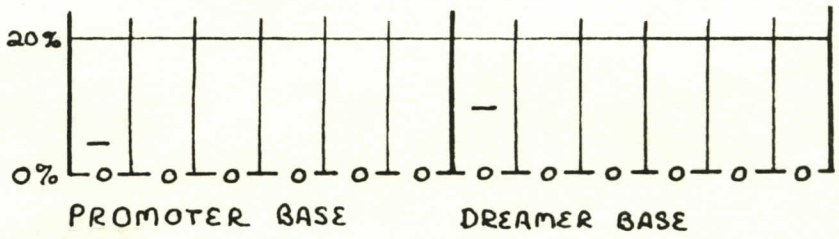
in their selection than in that of the prime crew member. Note also the flown payload specialist data is skewed heavily toward Americans, and that one of the foreign group was Canadian, with a closely allied cultural background. Many of the foreign payload specialists were selected for flights that were planned before the Challenger disaster and have been "on hold" ever since, so the pool is notably larger than data on those actually flown. Figures 10 and 11 do, however, point up the special attention needed to variance predicated upon widely differing selection systems outside of NASA and, even more importantly, to a greater tolerance for variability needed for international crews. These differences will be significantly augmented by the gross change in flight duration that the onset of space station operations will bring. We are already committed to international crews on space station. This will require a greater level of acceptance for cultural and interpersonal variability than the much briefer shuttle flights demand.

Figure 12 looks at the applicant pool in terms of the number to active modes the applicants have traversed. At this point, a distinction should be made between the implications of the number of modes experienced versus the number of levels engaged. I have described to you six different structural behavioral modes. As you may recall from Figure 7, the progression of modes was broken up into three different levels, each of which represents a major shift in the predominant perceptive orientation. Those differing perceptive orientations orbit around thoughts, feelings, and actions. Once you have acquired one of the cognitive modes, either Workaholic or Persister, you automatically have an enhanced appreciation of any other mode with a similar core. Workaholics and Persisters understand each other, though not quite as well as one Workaholic understands another Workaholic or one Persister



287 APPLICANT POOL

45 SELECTEES



PATTERN OF MODE PROGRESSION

FIG 12

understands another Persister. Therefore, traversing two modes can have a very different meaning from experiencing two differing levels. The person who has experienced two levels has working empathic knowlege of two of the three major perceptive orientations, and therefore can appreciate a much wider band of human variability, including being sensitive to their distress sequences and the early warning signs that usually precede malfunction.

Now first to Figure 12. In general, the Persisters and Workaholics have touched more modes than the Reactors. The data for the Reactor selectees is suspect, however, since the N is only three. Sixty-seven percent of the applicant pool Reactors have stayed in their base mode, while only thirty-nine percent of Workaholics and thirty-one percent of Persisters have done so. Among those selected, the figures remain virtually identical to the pool data. The Rebel group is of interest, because all the eight base mode Rebels in the pool were stuck in base, and none were selected. I suspect that Rebels have a harder time breaking out of their base mode because: a) in their distress sequence they move much more easily into "I'm OK and you're not" positions of exteriorized blame, thus experiencing less motivation for personal change, b) Rebels often have very strong egos to begin with and feel less incentive to alter their behavior, or even to think about it, when all is going smoothly and they are not distressed, and c) their principle perceptive mode is more reaction-related than it is cognitive or feeling, either one of which offers cleaner paths toward change.

Figure 13 restricts itself to the selected group in terms of mode progression, allowing a cleaner visual impression than that of the selectee data on Figure 12. But the implications are the same as noted in the paragraph above.

Figure 14 devotes itself to the question of progression from one perceptive level to another. The nugget from this figure is that only one

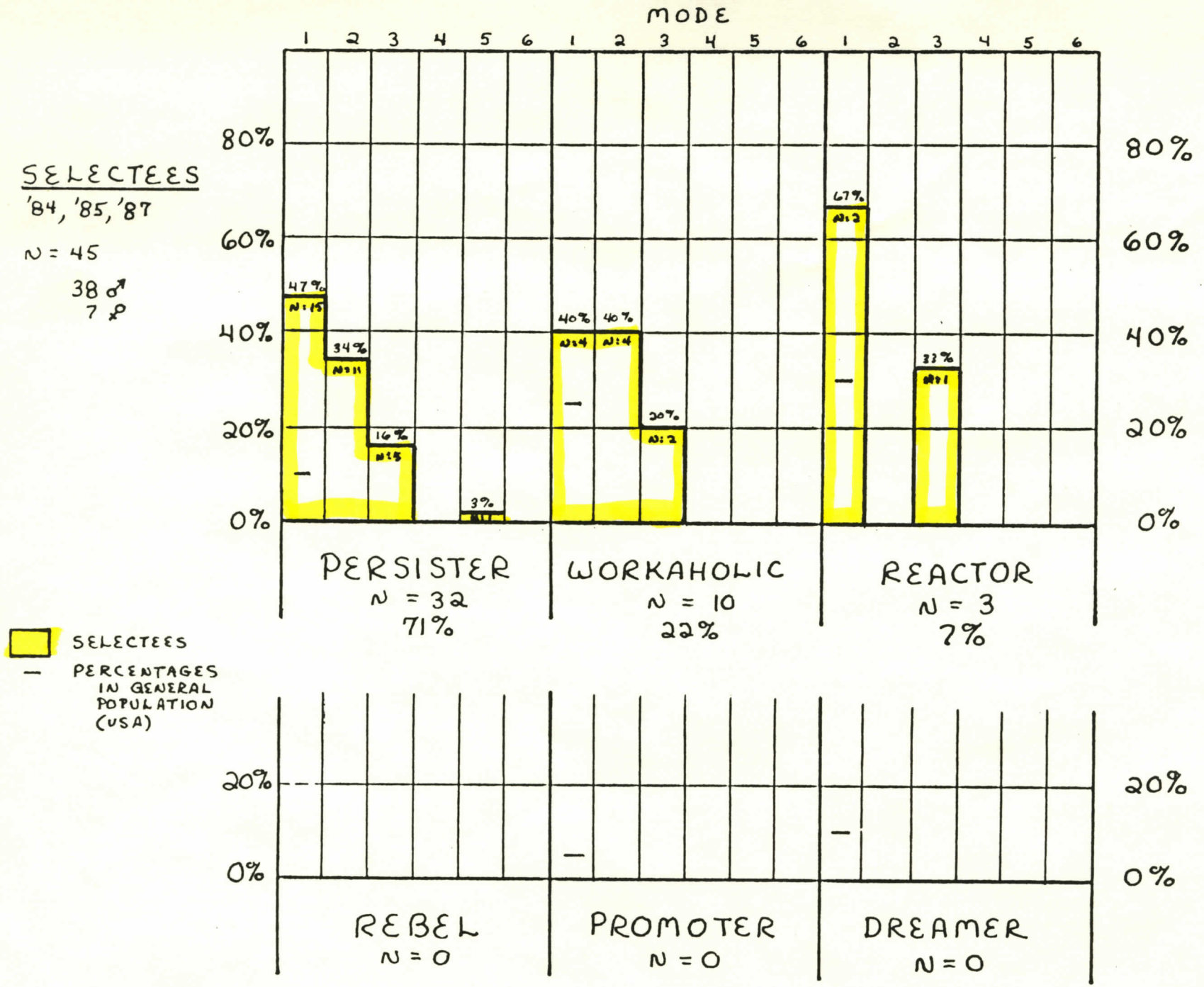
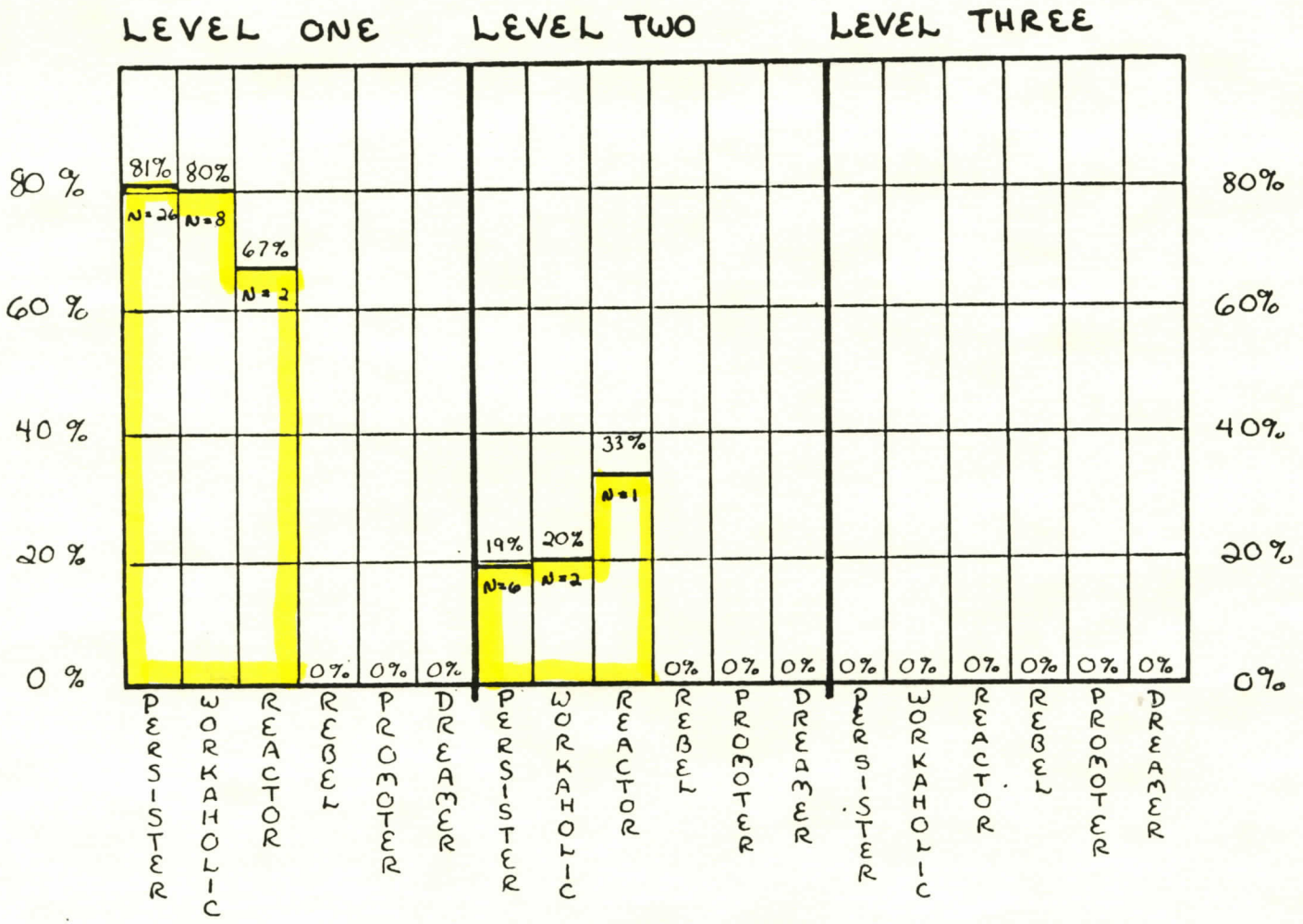

MODE
1 2 3 4 5 6
80%
60%
40%
20%
0%
47%
N:15
34%
N:11
16%
N:5
3%
N:1
40%
N:4
40%
N:4
20%
N:2
67%
N:2
33%
N:1
PERSISTER
N = 32
71%
WORKAHOLIC
N = 10
22%
REACTOR
N = 3
7%
SELECTEES
'84, '85, '87
N = 45
38 ♂
7 ♀
SELECTEES
PERCENTAGES IN GENERAL POPULATION (USA)
REBEL
N = 0
PROMOTER
N = 0
DREAMER
N = 0

FIG. 13

'84, '85, '87 SELECTEES

7♀
38♂
N = 45

MEAN AGE = 34 (26-41)



LEVEL PROGRESSION

FIG. 14

out of five of the Persisters and Workaholics selected have entered a second level of dominant perceptive style. Most of the Workaholics and Persisters exchange those two modes in sequence and it is usually not until a third mode is entered that a new level is engaged. The pertinence of this becomes much greater as we contemplate space station duty tours of at least six months and the reality of international crews with their greater personal and cultural variability. Virtually all astronaut selectees have strong cognitive bases, but it is a minority that have great awareness or sensitivity at a feeling level. Long-term confinement in crowded quarters is generally less stressful for those whose sensitivity and empathy allow them to recognize human problems earlier and to engage them effectively. Having closed out one level (in the prototypical astronaut's case it is the thinking level) and having strongly engaged a second level (usually a feeling level) offers stress protection not only to the individual but also to those around him. Antarctic winter-over experience, for instance, is repleat with examples reflecting the importance of sensitivity or awareness to group morale and effectiveness. As in most environments, to have sensitivity at command level is especially important.

The data I have presented restricts itself to selection cycles. It should be remembered that senior astronauts have had time to continue to evolve and to mature as multidimensional human beings. Presumably, it is from senior astronauts that the space station leaders, the Captain Kirk's, will be chosen. I believe it will be important that these men have closed at least their first level and be at a comfortable position in their second level if NASA is to expect the best from their crews. The more multilevel people aboard, the smoother should be the operations.

There is a way within Kahler's matrix to calculate interaction scores, roughly indicating the level of ability to communicate comfortably with all

members of a group that includes all basic personality types in typical proportions. High scores are rare. The interaction score averages for the three selection cycles examined were sixty-five, sixty-six and sixty-four respectively, averaging sixty-five for the total selectee group. The astronaut applicant pool averaged out a few points higher, at sixty-seven. The range between sixty and seventy suggests an ability to interact comfortably with their own type plus one additional mode; other active modes "cost more" transactionally. This is modestly better than the general population at age forty, the age span on the reported selectees being twenty-six to forty-one and averaging at thirty four.

One last observation on selection statistics is pertinent, though not part of the process data. Prior to 1978, there were two selection cycles to bring aboard scientists; they were all Ph.D's in Science. They were given the designation of scientist-astronaut and were taught to fly high performance jets as part of their extensive training. By the 1978 selection, the category of mission specialist was created and those so-designated were no longer taught to fly as pilots, only as knowledgeable passengers who could assist the pilot. Shortly after, the job description of the scientist astronaut group was redefined and they were subsumed into the mission specialist group. Since that time the general academic level of the mission specialist group, as a percentage of the standing force of scientist astronaut/mission specialist, has declined. Some feel that the scenerio of the typical shuttle flight is so "canned" that additional scientific training was unnecessary, though a surfeit of doctorate trained applicants exists. The philosophy of training space generalists rather than beginning with someone whose generalist potential might be downgraded by a desire to stay current in a more restricted scientific area has also had its proponents. Others believe

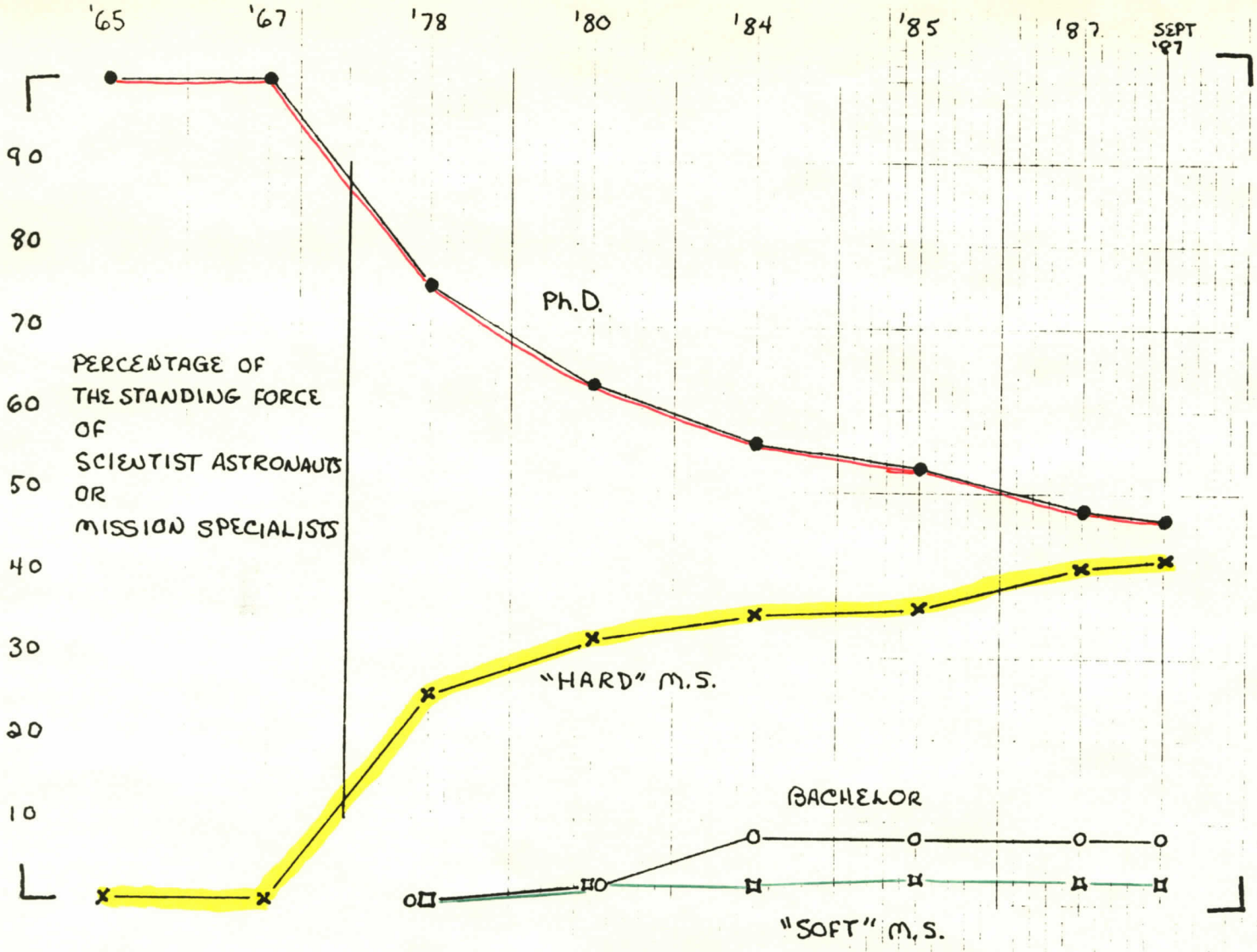

'65
'67
'78
'80
'84
'85
'87
SEPT '87
90
80
70
60
50
40
30
20
10
PERCENTAGE OF THE STANDING FORCE OF SCIENTIST ASTRONAUTS OR MISSION SPECIALISTS
Ph.D.
"HARD" M.S.
BACHELOR
"SOFT" M.S.

FIG. 15

in a mixture of generalists and scientists with highly refined areas of expertise. In any regard, Figure 15 reflects the changing academic background of the mission specialist group. The percentage of the current standing force of mission specialists that have formal doctorate level training has for the first time dropped below fifty percent. Most of the remainder of the group have "hard" M.S.'s, "hard" meaning degrees in a scientific discipline with space applicability. The designation "soft" M.S. refers to those degrees that are less scientific than they are administrative, or otherwise not space operations relevant. The B.S. designation indicates those with bachelor's degrees. This has nothing to do with the intelligence level of the astronaut corps, which remains uniformly high. The pilots and mission specialists that are selected today will likely be the heart of the space station crews a decade hence. Perhaps re-examination of personnel needs for station might do well to include consideration of the concept that an academically prepared mind may offer both a greater wealth of technical knowlege and an enhanced awareness of scientific "targets of opportunity" that can present during long space station tours.

Conclusions:

The process model of personality evaluation holds promise as a highly repeatable method that has many operationally significant correlates and lends itself well to statistical handling. It has proven useful in predicting crew incompatibilities and probable modes of malfunction.

Applied to astronaut selection, the process data indicates that the prototypical astronaut at time of selection is perfectionistic and is likely to turn some of that perfectionism not just on himself but also to focus a highly evaluative eye on his or her environment and its contents. (S)he

is cognitively oriented and keyed to thoughts and beliefs or value systems. He is not as strong in warmth and sensitivity as he is in organization, logic, responsibility, dedication, conscientiousness, observation of detail, and perseverence in pursuit of goals. (S)he has the ability to take in facts and ideas and to synthesize them; he is also more ready and able to render opinions and judgments without hesitation than most people. He does best under democratic participatory management in which the decision-maker solicits his opinion, honestly listens to it, and later gives feedback as to the "why" of the final decision. The most antithetical managerial form is a highly autocratic one that is not open, honest and relatively predictable. And, interestingly, he becomes at risk to use this same negatively administered autocratic style if he gets into a distress sequence while he is in charge. He communicates most effectively with fellow thinkers, on a computer to computer basis, dealing with factual data. Later in his evolution within the program, (s)he may acquire an increased awareness of the feeling side of his life and a growing ability both to give and receive nurturance. But at entry into the program, he is not much of a positive stroker of those around him. He interacts least smoothly with Rebels, Promoters, and the more passive Dreamers of life. His greatest psychological needs focus on recognition for his work and the quality of his thinking, on reinforcement of the merit of his opinions and value systems, and upon time structure. If his basic psychological needs are not met, (s)he is likely to increase in his tendency to postpone enjoyment until all work is done and may drift into over-control of self and particularly of others, or into pushing his belief systems beyond the tolerance of those about him. (S)he is very bright, at least several standard deviations above the population mean. He is not

usually a true people-person, preferring to interact with small groups or one-on-one. True intimacy does not come easily for most of the group. (S)he tends to initiate activities rather than merely respond to them; similarly, he will identify and actively pursue goals. The personality descriptives vary little between men and women selectees, with a few notable individual exceptions in the direction of increased personal warmth and emotional sensitivity for several of the ladies. The "be strong and emotionally invulnerable" ethic is more heavily valued than for the general population. There are group differences between the pilots and the mission specialists, just as there are differences in the general cultural groups from which they spring. They are bright and capable producers with an unusually high level of motivation.

The advent of space station, with minimal tours of six months in a crowded environment from which there is no respite, suggests the need for greater attention to personality factors than have been needed with the brief seven to ten day shuttle missions. Historically, flight crew has always respected technical ability and have been willing to accept personality deviations in order to bring that expertise aboard. But if you have to live with him, the expertise will buy him a month at most before tolerance is exceeded. With space station we are talking at least six times that duration of close quarters living. Some might suggest that if the entire crew were all near-identical personality types, they would be very compatible. There is truth to this in that most of us select our best friends from among those with key personality features much like our own. However, if NASA had a crew made up entirely of baseline Persisters, for instance, we would have a group composed of people with strong individual opinions and value systems.

Each of those Persisters would be looking for validation of their own opinions from within a group that is more likely to give negative than positive strokes; in addition, those negative strokes would be delivered in this case to individuals who are more sensitive to negative feed-back than most of us. Such a group would profit from at least one good positive stroker who strokes readily out of an honest position. I suggest that the original selection of astronauts give more consideration to the degree of personality development and especially to a healthy level of feeling awareness to go along with their predictable cognitive abilities. People who are at least open and non-hostile to learning more about the feeling side of life can be taught psychological self-defense and communication skills. I believe we should consider the crew as a subsystem of space station that needs at least equal attention to other systems if the station is to thrive. Those in business, industry, education, the military, or almost any form of group endeavor readily attest that personnel problems usually create more difficulty than the pure "business" decisions. When it comes to commanders, I strongly recommend that at a minimum the selectee has closed one level in his development and is comfortably situated in the second level. Almost surely the first level will be the thinking or cognitive modes. I also suggest strongly that the second level be the feeling level rather than an action level and that at least one mode in the second level be closed if you want a strong commander who is better able to deal effectively with the inevitable personnel problems from both home-grown and foreign crew.

Presumably another crew person will be a physician; it appears wise also to have the individual who is responsible for monitoring the physical and mental health of the crew be equally as well developed as the commander. Increased sensitivity can lead not only to move effective handling, but also

to earlier detection and engagement of problems before they balloon into crises. Ideally, all crew members would be at the second level, though only one fifth of new astronaut selectees present with that picture. In the past, no issue has been made of selecting individuals more appropriate for space station duty in terms of personality structure.

It also appears advisable to integrate payload specialist crew members into the crew before launch far more completely than has been done in the past with shuttle. The "outsider" mentality puts additional pressures on interpersonal relations that will amplify problems during prolonged space station tours, just as major group divisions between scientific personnel, the military, and civilian support personnel have caused difficulties during winter-overs in the Antarctic. It is imperitive to reduce to a minimum any them-against-us thinking and to support the integrated team approach with group goals.

In arranging off-duty diversions for space station crew, an awareness of the developmental path of the member could lead to tailoring diversional opportunities to the needs of the individual habitants. Many times individuals are only vaguely aware of what the key components are to their own needs. Both their base mode needs and those proceeding from the crew members current active mode are important. Bear in mind that meeting basic psychological needs will do much to prevent individual malfunctions.

Because the scientific work on station may present more "targets of opportunity" for observation and experimentation than has been the shuttle experience, re-evaluation of the trend toward decreased formal scientific background in mission specialists may be warranted. Doctorate level training often generates a different mind set toward the non-scheduled opportunity, with a sensitization toward the unusual or non-congruent, hopefully an

independence and increased flexibility of mind, and a willingness to deviate from immediate protocol to grasp the transient opportunity. I see this as an advantage even though there are experts on the ground available on short notice for almost any scientific area.

Consideration of evaluating the communication skills of ground-based communicators within the same process framework may also have value both in preventing ground-air conflicts and in picking up on subtle early indicators of incipient distress sequences. It is suggested that a closed-link air-ground communication channel be available for private communication between crew members and their ground-bound support system, or for communication between commander or crew and a counselor thoroughly familiar with the psychological self-defense and interpersonal sensitivity training given the crew in the months or years before tour assignment on station.

There are very real advantages to increasing the sensitivity of our selection procedures, with the individual and interpersonal stresses of long duration close-quarters confinement in mind. It also seems expedient to keep track of the evolutionary growth of the standing corps (and encourage its progress) as part of their annual medical examinations, and as part of pre and post-flight evaluations. In the pre and post-flight periods, warning signs of incipient distress sequences can be engaged and, hopefully, the problem dealt with.

NASA is basically an engineering institution and has in the past understandably been preoccupied with the engineering side of space exploration. To their credit, they have done well with these complex tasks. But the era of prolonged space tours is upon us and psychological factors are assuming an increasingly critical role as time duration extends.

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