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Flying and Expressive Self-Testing: An Exploratory Consideration

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It has long been assumed by naval aviators that there are distinctive personality differences between patrol, attack, helicopter, and fighter pilots. In this research project the authors document those differences and suggest how they might apply to future air safety programs. (The authors gratefully acknowledge the help of Comdr. Quentin S. Meeker, U.S. Navy, and they are also indebted to the following for suggestions and criticisms: David R. Abel, James C. Aller, Gordon H. De Friese, Donald P. Hayes, William W. Lambert, William J. O'Connor, Phillip J. Scott, Everett Vernon, and Thomas H. Williams.)

FLYING AND EXPRESSIVE SELF-TESTING:

AN EXPLORATORY CONSIDERATION

An article prepared

by

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INTRODUCTION

While no one would doubt the seriousness of the occupational roles within the field of military aviation, it can be argued that the expressive attitudes held by military aviators must be given explicit consideration whenever the attempt is made to deal with such problems of command as recruitment, assignment, retention, and safety. The present study reviews expressive self-testing attitudes held by 60 naval aviators drawn from four military aviation specialties, and it shows that expressive self-testing attitudes vary with the specialties of pilots. Furthermore, it suggests that further research in this area would be useful in developing a new attack on problems of safety.

It is probably the case that many of the expressive attitudes displayed by military aviators are not greatly different from those held by participants in various forms of expressive travel. The expressive travel complex has high salience in American culture, and future culture historians may well note the remarkable florescence in expressive travel which began in the 19th century and which may not yet have reached its climax. Expressive travel includes all forms of travel employed by persons in moving from one place to another for nonutilitarian and recreational reasons, and the list of current patterns is almost endless with motorcycle riding, hiking, skiing, mountain climbing, skating, horseback riding, swimming, surfing, water skiing, sailing, gliding, and many other forms as well. Expressive travel, however, also includes trips made for utilitarian purposes when an expressive element is plainly discernible as when a man uses an expensive sports car in making the routine trip from home to office through suburban and city traffic. Some forms of expressive travel are also spectator sports as is the case with automobile racing, skiing competitions, and boat races. There are other aspects to expressive travel as well, but it is enough here to say that the total American involvement in expressive travel is a mass phenomenon entailing the expenditure of vast resources.

The numerous forms of expressive travel seem to have many features in common. All appear to involve physical skill on the part of participants, although the degree of skill may vary from slight to great. Most of the popular activities, such as skiing, require the development of great competence before the highest standards of excellence can be reached. Very importantly, virtually all forms of expressive travel entail some physical risk, if nothing more than the sprained ankle which has plagued many an ice skater, and some forms of expressive travel are plainly dangerous. There is always a complex interaction between physical competence and danger in expressive travel, for highly competent travelers can often cope with environmental hazards (such as steep rock faces for the climber) which would defeat the beginning amateur.

Specific travel patterns in the larger travel complex, however, are not equally available to everyone. Economic, health, and other reasons prevent people from being the yachtsmen, the mountain climbers, or the skin divers that they might like to be. Furthermore, the way in which the traveler functions within a specific pattern may be regulated by law or by rules enforced by private individuals or organizations. There are, then, constraints to participation in expressive travel. This last circumstance may contribute to the recruitment of individuals to occupations which are essentially nonexpressive but which have expressive components such as the occupations of guide, aviator, ski instructor, and so on. Such occupations may provide expressive outlets for persons who could not otherwise satisfy their tastes for specific forms of expressive travel.

Many forms of travel have testing, contesting, and self-testing modes. Ordinarily *testing* is not an expressive activity, but it frequently is used in determining the qualifications of individuals to participate in more expressive patterns as is the case with the conventional driver's test for automobile drivers or with the usual qualification test for swimmers who wish to go into a pool alone. Most of the major forms of travel have *contesting* modes as with automobile races, yacht races, horse races, ski races, and so on, and these are heavily expressive in character for both participants and spectators. Finally, there is a "*self-testing*" mode in which a traveler voluntarily tests his competence at meeting the challenges and risks of the traveling environment as when a driver deliberately uses his skill to pass another car while traveling at a high speed in a situation where there is no real emergency or other requirement forcing him to travel at that speed. In a sense, the "high self-tester" plays with the travel pattern. Perhaps it should be noted that there are other forms of self-testing as well. The person engaged in completing a crossword puzzle is involved in strategic self-testing in contrast to the man who is determining the number of pool lengths he can swim and who is thus involved in physical self-testing. This paper, however, is only concerned with self-testing of the physical type in situations where there is genuine physical risk or danger.

The investigation reported here is part of a more general inquiry into expressive culture, games, power, and related phenomena.[1] It is also related to a more general study of travel. This particular inquiry, however, is based on an earlier study of expressive self-testing and driving and on an unpublished study of expressive self-testing and skiing.[2] Taken together, these last two studies suggest that within the domain of expressive travel, high and low self-testing attitudes appear to be similar across specific travel patterns. Thus, the boy who was a high self-testing tree climber may be, as an adult, both a high self-testing skier and a high self-testing driver. The simple research design used in this study presumes that there is some generality of self-testing attitudes across expressive travel media.

Any major pattern of expressive travel, however, may be divided into a number of subpatterns, and these may vary in terms of physical risk—ski jumping, for example, may be more dangerous than cross-country skiing. Within any major pattern, those expressive self-testers who must court risk should also be involved in the high-risk subpatterns. When there is freedom of choice, expressive self-testers may sort themselves within major patterns on the basis of preference for challenges involving high or low risk.

This circumstance may hold for occupational fields, such as military aviation, as well. Without considering combat losses, current accident statistics and free interviews suggest that fighter pilots are subject to more risks than attack pilots who, in turn, have a more risky occupation than helicopter pilots and that all three are confronted by more danger of accident than patrol pilots. These four military aviation specialties, therefore, can be arranged ordinarily in terms of risk into the following scale: (1) fighter pilot, (2) attack pilot, (3) helicopter pilot, and (4) patrol pilot. The first three categories, of course, are carrier based, while the last is land based. It is the major hypothesis of this exploratory study that this same scale is also associated with appropriate expressive self-testing attitudes with fighter pilots displaying the highest and patrol pilots the lowest self-testing attitudes. In other words, the pilot scale of physical risk should be positively associated with other self-testing scales.

Military assignment is often involuntary and arbitrary. Yet it can be argued that those pilots who were initially selected for a specialty, who have been socialized for a substantial number of years within the specialty, and who have had successful careers within the specialty are likely to have expressive attitudes which are congruent with the natural and social environment defined by the specialty. Thus, the pilot scale already defined should hold as an expressive self-testing scale for mature pilots who have constructed professional careers for themselves within their specialties. These relationships, of course, need only be statistical, and any given individual might display quite variant attitudes.

It was decided to test the hypothesis that the pilot scale is also an expressive self-testing scale by administering an instrument designed to elicit expressive self-testing attitudes to *all* of the naval pilots in each of the four categories who were present in a single class at the Command and Staff School of the Naval War College. Sixty pilots were interviewed—10 fighter pilots, 21 attack pilots, six helicopter pilots, and 23 patrol pilots. This is a small sample, and the distribution among categories is not all that might be desired. Its characteristics, however, are those of the population of pilots in the four categories existing in the class, and they are not the result of bias on the part of the investigators.

Certainly the respondents were well schooled in their specialties. These pilots were either junior commanders or senior lieutenant commanders with 12 to 14 years' service, and they were in their mid-30's in age. They were part of a highly selected group of officers destined, at least on a statistical basis, for higher command. In a general way, they could be said to be matched as far as the attributes of intelligence and competence were concerned, an important consideration for this study. In anthropological language, each of the 60 respondents was a highly qualified key informant on his own subculture, and each would, in the future, help shape the military environments experienced by yet younger aviators.

The survey instrument employed in this research is too long to be reproduced here. Basically it was divided into three sections: (1) questions related to expressive self-testing and to expressive culture, (2) questions pertaining to judgmental accentuation (to be defined), and (3) questions related to flying situations in which expressive attitudes might be mobilized. Since the flying experience of the pilots in the four specialties was actually quite diverse, it was difficult to frame questions about flying which were equally meaningful for each of the four specialties. The automobile, however, represented a common denominator, for all of the respondents were drivers and all were familiar with American driving culture. For this reason, many, but not all, of the questions in the instrument dealt with driving or automobiles in one way or another. Properly speaking, other features of the instrument should be explained in this introductory section as well, but it is easier to provide additional information and to explain the analysis of the data in the discussion of the results of the study which appears in the next section.

The instrument was administered early in 1970 to each respondent individually by a patrol pilot who was also a fellow student. The lengths of the interviews varied from approximately 20 to 45 minutes. All of the respondents were cooperative, and the quality of the interviews appears to be high.

In this study the hypotheses have been stated in advance. These are, in general terms, the following: (1) a high position on the four-level pilot scale will be associated with a high involvement in general expressive self-testing, while a low position will be associated with low involvement; (2) a low position on the pilot scale will be associated with high judgmental accentuation in response to stimuli indicating threat while a high position will be associated with a low judgmental accentuation; and (3) a high position on the pilot scale will be associated with an expressed willingness to crowd or press regulations in a hypothetical flying situation, and a low position will be associated with the opposite. In other words, high-risk pilots should contrast with low-risk pilots in engaging in expressive self-testing, seeing little threat in situations where others see a great deal, taking chances, and crowding regulations.

RESULTS

Expressive Self-Testing. The instrument contained two questions about automobile driving (the common denominator for the pilots) which had been tested in earlier research. Respondents were asked to circle numbers reflecting their choices on seven-point scales ranging from −3 (unhappy) through 0 (neither) to +3 (happy). The explanatory material also equated happiness with enjoyment. The first scale was described as applying to "Passing other cars while driving at moderately high speeds," and the second pertained to "Driving at very high speeds." It was predicted that there would be a positive association between the pilot scale and each of these expressive driving scales. The association was measured by the Goodman-Kruskal coefficient of ordinal association, since in each case the association between ordinal scales was being determined. Table 1 presents the distribution of responses to these

TABLE I–PILOT SCALE AND EXPRESSIVE DRIVING SCALES

Pilot Scale	Happy +3	+2	+1	Neither 0	−1	Unhappy −2	−3	G	p one-tailed
Passing at Moderately High Speeds									
1. Fighter	2	3	3	2	0	0	0		
2. Attack	0	7	4	7	2	1	0		
3. Helicopter	0	0	3	2	0	1	0		
4. Patrol	0	1	3	13	3	1	2	+.560	.00007
Driving at Very High Speeds									
1. Fighter	2	3	1	3	0	1	0		
2. Attack	2	2	4	6	3	4	0		
3. Helicopter	0	1	1	0	2	1	1		
4. Patrol	0	3	1	6	2	5	6	+.450	.0007

questions, and it shows that the predictions were confirmed.

A third question which had also been used in earlier research dealt with an attitude toward life:

> Assume that you are approaching retirement after 20 years of military service. "Thinking ahead to my future, would I be happiest if I were the master of an occupation which might at times involve physical hazards?" Unhappy −3 −2 −1 0 +1 +2 +3 Happy.

Once again it was predicted that this scale would be positively associated with the pilot scale. This was confirmed by a coefficient of ordinal association of .348 (p = .0071, one-tailed). The coefficients are higher, of course, if the pilot scale is collapsed into high risk (fighter + attack) and low risk (helicopter + patrol): passing at moderately high speeds, G = .603; driving at very high speeds, G = .508, and future physical hazards, G = .439. The prediction, then, that the pilot scale would be positively associated with expressive self-testing scales was confirmed.

Although collateral research has linked game preferences with self-testing attitudes, inquiry in this direction was not rewarding. High-risk pilots, however, manifested more of a preference for fortunism or chance than did low-risk pilots. Respondents were asked to indicate their liking for games of each of the three major types by circling the appropriate number on each of three eight-point scales ranging from 0 to 8 (high liking). The physical skill scale and the strategy scale had no significant ordinal association with the pilot scale, but there was one with the chance scale (G = +.275, p < .05 two-tailed). When the upper third (approximately) of the respondents were compared with the lower two-thirds, a pattern emerged. High liking for games of physical skill was defined as 7 and low liking as (0 − 6) with the result that this scale had a directional negative ordinal association with the pilot scale (G = −.396, p < .10). High liking for games of strategy was defined as (6 − 7) and low was (0 − 5). Here there was a positive association with the pilot scale (G = .386, p < .05). Finally, high liking for games of chance was (5 − 7) and low was (0 − 4). Here there was a positive association of liking for games of chance with the pilot scale (G = +.523, p < .01 two-tailed). Since other evidence suggests that the games of strategy preferred by the total group were games of strategy with chance rather than games of pure strategy, the principal conclusion is that the high-risk pilots manifested higher liking for furtunism in games than did the low-risk pilots. There was, however, only a directional indication that low-risk pilots preferred games of physical skill, and actually 45 of the respondents listed such games as their favorite games. Relatively little should be made of all of this, but in the future the relationship between fortunism and high self-testing should be explored.

A question about interest in safety lectures yielded no significant association, but the low-risk pilots were somewhat more interested in careers in safety. The respondents were asked,

> Assume that being a Safety Officer offered a career pattern that was as successful as others in the services, how much would you like being a safety officer? Low 1, 2, 3, 4, 5, 6, 7 High.

When the respondents were grouped into high liking (5 - 7) as against low interest (1 - 4), this ordinal scale was negatively associated with the pilot scale ($G = -.377$, $p < .05$ two-tailed). Again, like fortunism, this relationship constitutes more of a hint for future research than a finding for the present.

Still, it was the case that significant associations existed between the pilot scale and three rather obvious questions relating to self-testing. Rather than confirming this result by the additional use of such questions, a much less obvious measure was employed, that of judgmental accentuation to be described below.

Judgmental Accentuation. The technique used in determining judgmental accentuation is simple, but it requires some explanation. Basically it involves nothing more than the conversion of ordinal scales to interval scales and an interpretation of the resulting interval differences. In this instance, three sets of photographs of damaged automobiles representing three levels of severity of damage were used to provide three ordinal scales. It was then expected that the low-risk pilots judge the intervals between the levels to be larger than would the high-risk pilots. In other words, the low-risk pilots would accentuate the differences between strong and weak symbols of threat and disaster.

The point has already been made that automobiles constituted a common denominator for the pilots from the different specialties and that all were familiar with American driving culture. It was thus possible to substitute visual symbols of automobile accidents for visual symbols of airplane accidents in eliciting a set of attitudes linked with accidents. The stimulus photographs used were the first three sets of photographs presented in the *Vehicle Damage Scale for Traffic Accident Investigators* under "Index to Damage Scale."[3] These were the photographs illustrating:

> 1. Severity Scale FC - Front-End Damage: Concentrated Impact. This scale is applicable to damage to midsection of front of subject vehicle resulting from a collision with a tree, utility pole, or other narrow object.
>
> 2. Severity Scale FD - Front-End Damage: Distributed Impact. This scale is applicable to damage to front of subject vehicle due to distributed impact resulting from full contact with any other vehicle or broad object.
>
> 3. Severity Scale FL/FR - Front-End Damage: Partial Contact. This scale is applicable to damage resulting from partial contact of front end (left front corner or right front corner) of subject vehicle with another vehicle or object.

All of the scales, then, pertained to front-end damage, but there was a scale for concentrated impact, another for distributed impact, and one for partial contact.

Each scale, in turn, was represented on a single page by three two-view sets of photographs showing automobiles damaged in traffic accidents. Each of the two-view sets represented a single automobile which had suffered a level of damage which fitted one of the following descriptions:[4]

> Damage in the top photographs, or sets of photographs, is minor and is generally limited to dents and gouges in body sheet metal and trim. The damage rating corresponding to these photographs is "2."
>
> The second photographs, or sets of photographs, show automobiles that have been moderately damaged, with considerable crumpling of body sheet metal, but little or no distortion of the basic structure or frame. The damage rating in this case is "4."
>
> In the photographs at the bottom of each sheet, vehicles are severely, but not totally, damaged. Sheet metal is severely distorted, torn or crumpled; the basic structure of the car is distorted somewhat; and there is usually some penetration of the passenger compartment. The damage rating is "6."

By using "1, 3, 5, or 7" ratings for damge less or greater than that shown in the photographs (rated "2, 4, and 6"), a user of the scale could select any one of seven degrees of severity to describe how badly a car was damaged, but in this study only the photographs illustrating three levels of severity of damage were used.

It was predicted that high-risk pilots would judge the intervals between positions 2, 4, and 6 to be smaller than would the low-risk pilots. The respondents, then, were asked to use a simple constant-sum ratio scale technique developed by Dudek and Baker to convert the ordinal scale of the photographic levels into an interval scale. This scaling technique had already been used in the measurement of expressive attitudes.[5]

Each respondent was presented with the page containing the photographs for each of the three scales. Cardboard masks were employed to restrict the respondent's view to the two sets of photographs he was being asked to compare. Comparisons were made in response to four questions. With the first question for each comparison he was asked to give the ratio which reflected the comparable levels of damage in the following way:

> 1. You are asked to estimate the relative degree of material damage in the accidents. In other words, how bad was each accident in comparison with the others on the same page. In comparing the cars assume that you have a total of 10 severity votes in noting the damage. The following combinations, therefore, are permissible: 9/1, 8/2, 7/3, 6/4, 5/5; 4/6, 3/7, 2/8, 1/9. The higher the number, the greater degree of damage, the lower the number, the lesser the degree of damage.

The comparisons were always elicited in the following order: (1) set "4" and set "6"; set "2" and set "6"; and set "2" and set "4." Each ratio was recorded as each comparison was made.

The constant-sum ratio scaling technique was then used in computing the score for each of the three sets of three comparisons for each respondent (the geometric mean rather than the arithmetic mean was used in this computation). In all instances the least damaged automobile (scale value "2") was given a scale value of "1." Then the values for each level ("2" "4," or "6") were averaged across the three different impact sets so that there was an average value for "2" (which was always "1"), "4," and "6."

In addition to the first question dealing with severity, three additional questions were asked:

2. Assume that each accident is the result of carelessness on the part of the driver. Please estimate, again on the 10-point scale, the carelessness of each of the drivers in relation to the others.

3. In section C you are given the following facts:

(1) Each of the three automobiles was driven by a squadron commanding officer.

(2) The accidents were a result of the violation of some regulation conjoined with carelessness on the part of the driver.

(3) All three individuals walked away from the accident without sustaining any serious injury.

You are asked to give your preference, on a 10-point scale, as to which commanding officer you would prefer to lead you into combat in comparison with the others.

4. In section D you are given the following facts:

(1) You are the commanding officer of a squadron.

(2) Each of the three automobiles was driven by a new pilot reporting to your squadron.

(3) The accidents were a result of the violation of some regulation conjoined with carelessness on the part of the driver.

(4) All three individuals walked away from the accidents without sustaining any serious injury.

You are asked to give your preference, on a 10-point scale, as to which pilot you would prefer to have in your squadron in comparison with the others.

All in all, the respondents provided sets of judgments for each of the four questions, 48 paired comparisons in all. The nature of the judgment varied with the question, for the first question dealing with severity has no explicit projective features—it is simply a matter of judgment. The second question asking about carelessness is projective, but acceptably so. The last two questions pertaining to the commander and to the pilot are extremely projective, and they are largely valuable in that they point to directions for future research—a major case could not be based on the responses to these two questions.

It will be recalled that the scale value of the least damaged of the three cars in any of the scales is always "1." Since the scales have cardinal properties, a scale value of "2" for the next most damaged car means that, in the case of the severity question, it was judged to have suffered twice as much damage as the first, and a scale value of "4" for the most damaged car means that it was judged to have suffered four times as much damage as the least damaged car and twice as much damage as the intermediate car. When the scale values for each level of damage were averaged across the three impact situations, the resulting means provided an average judgment of the degrees of damage.

The average value of the least damaged car was always "1." The average value of the second most damaged car was always intermediate between that of the least damaged car and the most damaged car. The average value of the most damaged car was always the highest, and further discussion will be based on this value—it would have been possible, however, to have conducted the

TABLE II—MEDIAN VALUES FOR MOST DAMAGED CAR

Pilot Scale	Severity Question	Carelessness Question	Commander Question	Pilot Question
Fighter (n = 10)	4.76	2.36	.95	.80
Attack (n = 21)	5.20	2.97	.59	.60
Helicopter (n = 6)	5.26	3.93	.46	.42
Patrol (n = 23)	6.63	4.83	.35	.28

same analysis with the second most damaged car.

The average assessment of the relative damage of the third car for each of the four groups is used hereafter. Table II gives the medians for the distributions of the average values. For the severity and carelessness questions, the medians are above the value of the least damaged car, but for the commander and pilot questions, they are less than that of the least damaged car. Some additional statistics can be listed. The mean responses with the range of responses in parentheses are listed for each question below:

Severity Question:
- Fighter, 4.91 (3.25-6.87);
- Attack, 5.48 (2.90-10.00);
- Helicopter, 5.27 (3.88-6.65);
- Patrol, 6.57 (3.26-9.48).

Carelessness Question:
- Fighter, 2.91 (1.00-6.77);
- Attack, 3.15 (1.00-9.33);
- Helicopter, 4.23 (2.03-7.99);
- Patrol, 4.56 (1.00-7.95).

Commander Question:
- Fighter, .87 (.29-1.60);
- Attack, .83 (.08-2.37);
- Helicopter, .50 (.15-1.00);
- Patrol, .42 (.09-1.00).

Pilot Question:
- Fighter, .77 (.32-1.33);
- Attack, .87 (.15-5.39);
- Helicopter, .42 (.14-.67);
- Patrol, .39 (.10-1.00).

All of the median values fall in the predicted order. In two specific instances there is a reversal of the predicted mean values, but these discrepancies, as will be seen, are not a serious matter.

If the full distribution of scores for the severity question is ordered into ranks at .5 intervals, the resulting ordinal scale of 15 ranks is negatively associated with the pilot scale ($G = -.323$, $p = .0052$ one-tailed). If the same is done for the carelessness question, the ordinal scale of 15 ranks is also negatively associated with the pilot scale ($G = -.358$, $p < .003$ one-tailed). These two negative associations fit the predictions.

If the full distribution for the commander question is ordered into ranks at .1 intervals, the ordinal scale of 15 ranks is positively associated with the pilot scale ($G = .443$, $p < .0003$ one-tailed). Finally, with the pilot question the same ordering results in an ordinal scale of 13 ranks which is positively associated with the pilot scale ($G = .425$, $p < .0007$ one-tailed). Again these two positive associations fit the predictions.

The results are equally interesting when the t-Test for independent means is used. The pilot scale can be partitioned into fighter ($n = 10$) vs. others ($n = 50$), fighter + attack ($n = 31$) vs. helicopter + patrol ($n = 29$), and others ($n = 37$) vs. patrol ($n = 23$). Finally, it is interesting to compare fighter vs. patrol (the two ends of the scale). These results are listed below (the means are given in parentheses, and p is always one-tailed).

Severity Question:
Fighter (4.91) vs. Others (5.95), t-ratio = 2.06, 17 df, $p < .05$.
Fighter + Attack (5.30) vs. Helicopter + Patrol (6.30), t-ratio = 2.14, 57 df, $p < .025$.
Others (5.29) vs. Patrol (6.57), t-ratio = 2.73, 49 df, $p < .005$.
Fighter (4.91) vs. Patrol (6.57), t-ratio = 2.97, 21 df, $p < .005$.
Carelessness Question:
Fighter (2.91) vs. Others (3.93), t-ratio = 1.40, 12 df, $p < .10$
Fighter + Attack (3.07) vs. Helicopter + Patrol (4.49), t-ratio = 2.75, 57 df, $p < .005$.
Others (3.26) vs. Patrol (4.56), t-ratio = 2.47, 50 df, $p < .01$.
Fighter (2.91) vs. Patrol (4.56), t-ratio = 2.13, 15 df, $p < .05$.
Commander Qnestion:
Fighter (.87) vs. Others (.60), t-ratio = 2.02, 16 df, $p < .05$.
Fighter + Attack (.84) vs. Helicopter + Patrol (.43), t-ratio = 3.66, 46 df, $p < .005$.
Others (.78) vs. Patrol (.41), t-ratio = 3.54, 57 df, $p < .005$.
Fighter (.87) vs. Patrol (.41), t-ratio = 3.53, 14 df, $p < .005$.
Pilot Question:
Fighter (.77) vs. Others (.60), t-ratio = 1.19, 33 df, $p < .10$.
Fighter + Attack (.84) vs. Helicopter + Patrol (.40), t-ratio = 2.61, 35 df, $p < .01$.
Others (.77) vs. Patrol (.39), t-ratio = 2.52, 46 df, $p < .01$.
Fighter (.77) vs. Patrol (.39), t-ratio = 3.29, 15 df, $p < .005$.

All of the above results fit the prediction with the exception of the two findings at the .10 level (one-tailed), but even these are in the correct direction. It would appear that the grouping of fighter and attack pilots into a high-risk group and the grouping of helicopter and patrol pilots into a low-risk group is the most acceptable grouping. In other respects, the patrol pilots appear to be markedly differeut from all of the others combined in their responses to these questions.

The overall findings are clear. Low-risk pilots accentuate the severity of damage of the third car, the attributed carelessness displayed by the hypothetical driver of the third car, and the inacceptability of the hypothetical driver as either a commander of their squadron or as a pilot in their squadron. It could be argued, however, that instead of accentuation on the part of low-risk pilots, it is really the case that high self-testers are minimizing their judgments, or both. If the accident scale is an interval scale rather than an ordinal one, the third car shonld be three times as damaged as the first cat. If this is the case, the high-risk pilots come closer to the mark of actual damage than do the low-risk ones. There is no proof of this, however, but it would appear that the differences between high- and low-risk pilots represent judgmental accentuation on the part of low-risk pilots as compared with high-risk pilots.

Conflict Situations in Flying. This third section attempts to deal with self-testing attitudes pertaining to hypothetical flying situations rather than to automobile driving or other matters. No single hypothetical situation could be found which would be equally meaningful to pilots in all of the specialties, but it was thought that the training of these pilots had been sufficiently broad to warrant the conclusion that they could respond to three conflict situations in similar ways if they so desired. These were situations where regulations or accepted procedures would favor caution, but where informal practice and small group norms might support daring.

Before the three situations were presented, the respondents were told:

> In the following three questions there is no correct answer. In fact, I realize that you may have contradictory attitudes toward a question at one and the same time. In other words, in the sense that yon may both be willing and

> simultaneously unwilling to engage in that activity.

Actually there was no single answer, but rather responses to two approach questions and to two avoidance questions were elicited on the basis of "Low 1, 2, 3, 4, 5, 6, 7 High." The above instruction was followed by the first question:

> You are on a local training flight in a high-performance jet aircraft and an unexpected land fog has moved over your base. After commencing approach, GCA advises that weather is below field GCA minimums. You have not made an actual or practice GCA in three months. There is more than enough fuel to make an approach and proceed to a suitable alternate. You have only $1.15 in your pocket, no clothes, and have dinner guests scheduled to arrive at your home in 2 hours. The field is not forecast to come up until tomorrow morning.
>
> (1) To what extent would you be *willing* to continue the approach?
>
> (2) To what extent would you be *unwilling* to continue the approach?
>
> (3) To what extent would you be *willing* to proceed directly to your alternate?
>
> (4) To what extent would you be *unwilling* to proceed directly to your alternate?

Questions 1 and 4 were considered to deal with approach attitudes, while questions 2 and 3 dealt with avoidance attitudes.

When the two approach questions were averaged, the resulting 13-rank scale of approach was compared with the pilot scale. Here the coefficient of association was positive ($G = .372$, $p < .002$ one-tailed). In other words, as expected, the high-risk pilots displayed stronger approach attitudes than the low-risk pilots. The coefficient of association with avoidance attitudes was negative ($G = -.385$, $p < .002$). Here the low-risk pilots as expected, displayed the stronger avoidance attitudes.

When the distribution of the average approach scores was divided equally into high and low and the distribution of the average avoidance scores was treated in the same way, it was possible to develop four classes arranged in order of probable strength of approach (see table III). Table III shows again that high-risk rather than low-risk pilots display approach, but it also shows that the pilots tended to be either approachers or avoiders (only three pilots were in conflict about the matter). The second of the three questions was the following:

> Your commanding officer has announced that unauthorized aerial combat engagements are prohibited. You as operations officer realize that valuable training is received from this type of exercise and that it helps to bring out the aggressive spirit that is needed for combat pilots. The next day you and your section are returning from making practice bombing runs and are jumped by a sister squadron.
>
> (1) To what extent would you be *willing* to remain in formation?
>
> (2) To what extent would you be *unwilling* to remain in formation?
>
> (3) To what extent would you be *willing* to break and engage the other squadron?
>
> (4) To what extent would you be *unwilling* to break and engage the other squadron?

Here questions 2 and 3 were coded as approach, and questions 1 and 4 were treated as avoidance questions.

TABLE III—APPROACH-AVOIDANCE ATTITUDES AND THE FLYING SCALE

	Fighter	Attack	Helicopter	Patrol	G	p one-tailed
High Approach Low Avoidance	7	13	3	6		
High Approach High Avoidance	1	0	0	1		
Low Approach Low Avoidance	0	0	0	1		
Low Approach High Avoidance	2	8	3	15	.492	.004

With this question, the average of the responses to the two approach questions produced a scale which was positively associated with the pilot scale ($G = +.438$, $p < .0005$ one-tailed), whereas the average of the responses to the two avoidance questions scale was negatively associated with the pilot scale ($G = -.473$, $p < .0002$ one-tailed). Once again high risk was associated with approach and low risk with avoidance.

When the distributions of scores were divided as equally as possible into low and high for approach and again for avoidance, the association of the pilot scale with the resultant four-class scale was quite plain (see table IV). An eqnally acceptable division of the avoidance distribution would have yielded a stronger coefficient ($G = .628$) but it would only have shown three pilots in conflict (high-high and low-low). The above distribution, however, suggests that more pilots find themselves in conflict about this flying situation than they did in the previous situation.

The third question dealt with a conflict pertaining to a patrol flight where the respondent had to indicate his willingness and unwillingness to take off and to delay or abort the patrol. Here the resnlts were directionally as predicted, but the findings were essentially nonsignificant. It is probably the case, since the findings were directionally correct, that the question was poorly framed, and if it had been pretested it would have been eliminated in the regular instrument.

DISCUSSION

The foregoing results present a consistent picture. The four-class pilot scale is also a four-class self-testing scale. This statement is confirmed by the responses to the driving and hazards of live questions. Then it would appear that high self-testers are more likely to be involved in games of chance and less likely to be interested in careers in safety than low self-testers. With the photographs of damaged cars, high self-testers are less likely to accentuate the degree of damage, to attribute carelessness to the driver, or to reject the driver as a commander or as a pilot to the same degree as the low self-tester. In regard to the last statement, it may be that high self-testers are more accepting of commanders and pilots who have displayed some carelessness, a willingness to crowd regulations, and some luck (after all the hypothetical drivers walked away uninjured). Finally, it would appear from the flying situations that high self-testers are more likely to stretch approved procedures if their self-testing is challenged, particularly if the small group norms are not congruent with the regulations. Low self-testers, of course, are opposite to high self-testers on these variables.

At this point there is no harm in engaging in some speculation. It is

TABLE IV—APPROACH-AVOIDANCE ATTITUDES AND FLYING SCALE

	Fighter	Attack	Helicopter	Patrol	G	p one-tailed
High Approach Low Avoidance	7	12	2	5		
High Approach High Avoidance	1	2	1	1		
Low Approach Low Avoidance	1	1	0	0		
Low Approach High Avoidance	1	6	3	17	.592	.0002

probably the case that high self-testers court physical danger and risk. They may be in conflict about the social system, hence their willingness both to obey and to disobey regulations, which is congruent with their somewhat greater interest in games of strategy. Symbols of threat seem to have less meaning for them.

With fliers these findings may suggest, after further study, that high and low self-testers are sufficiently different to warrant different safety programs geared to each. If the pilots are also representative of high and low self-testing automobile drivers, as very well may be the case, safety and accident prevention programs must take these motivational and expressive differences into account. Certainly a program invented by low self-testers and designed for low self-testers is likely to be relatively ineffective with high self-testers who do not quail in the face of the dangers of the road or air and who may actually court them.

Other unpublished research suggests that the variable of competence should be considered in conjunction with self-testing in accident research. Low self-testers with low competence have their own special accidents (perhaps). Low self-testers with high competence may have relatively few accidents, and this may also be true with high self-testers with high competence. High self-testers, though, with low competence may produce a large percentage of the accidents which are due to driver or pilot error for expressive reasons. This particular approach will be explored in future research, but it had to be preceded by study of the self-testing variable (fortunately there are good measures of competence) before it could get very far.

In a sense, these findings go little beyond the wisdom of experienced fliers, but the self-testing variable may have more extensive and more subtle implications than even they had realized. On the other hand, the present research only deals with statistical tendencies—some patrol pilots, for example, have attitudes very similar to those of typical fighter pilots. Clearly, a great deal of additional work would have to be done before the self-testing variable could be used with individual cases. All the same, the present findings are interesting enough to warrant future investigation of a less exploratory character than the present research.

FOOTNOTES

1. The full list of publications would occupy too much space, but the citations to these studies appear on page 226 of the following source: John M. Roberts and Cecilia Ridgeway, "Musical Involvement and Talking," *Anthropological Linguistics*, v. II, no. 8, 1969, p. 223-246.

2. John M. Roberts, et al., "Expressive Self-Testing in Driving," *Human Organization*, Spring 1966, p. 54-63; John M. Roberts and John W. Fuller, "Competence and Expression in Skiing," (unpublished).

3. *Vehicle Damage Scale for Traffic Accident Investigators*, Traffic Accident Data Project Technical Bulletin No. 1 (Chicago: National Safety Council, 1968).

4. *Ibid*., p. 2.

5. Frank J. Dudek and Katherine E. Baker, "Weight Scales from Ratio Judgments and Comparisons of Existent Weight Scales," *Journal of Experimental Psychology*, v. L, no. 5, 1955, p. 296-297; John M. Roberts, "Kinsmen and Friend in Zuni Culture: a Terminological Note," *El Palacio*, v. LXXII, no. 2, 1965, p. 38-43; John M. Roberts and Fredrick Koenig, "Focused and Distributed Status Affinity," *The Sociological Quarterly*, v. IX, no. 2, 1968, p. 150-157; Roberts and Ridgeway, p. 223-246.

BIOGRAPHIC SUMMARY

Comdr. James O. Wicke, U.S. Navy, entered the naval service following his graduation from the U.S. Merchant Marine Academy in 1955. After serving a year aboard the U.S.S. *Taconic* (LCC 17), he entered flight training, received his wings in 1958, and subsequently served in several patrol plane squadrons and as a member of the staff of Commander U.S. Naval Forces Europe. During the academic year 1969-1970, he was student in the School of Naval Command and Staff at the Naval War College, where he participated in this research project. Commander Wicke is now assigned to Tactical Air Control Squadron 12.

BIOGRAPHIC SUMMARY

Professor John M. Roberts holds a doctoral degree in anthropology from Yale University (1947) and is a recognized authority on Navaho and Zuni cultures. He has published a variety of books, articles, and monographs and has taught at Harvard University, the University of Minnesota, and the University of Nebraska. He has served since 1958 as Professor of Anthropology at Cornell University. During the academic year 1969-1970, he took a year's leave of absence from Cornell to occupy the Chair of Comparative Cultures at the Naval War College.

There are old pilots, and bold pilots, but there are no old bold pilots.

Aviators' saying