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OF LOW FLYING AIRCRAFT TRAJECTORIES

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ABSTRACT

The problem of deriving an analytic expression which would relate low flying aircraft trajectories to terrain cross-section has not been solved. A computer simulation has been devised which generates synthetic flight paths which are coupled to a terrain input and are dependent on the values of five input parameters. Simulations have been generated which best match a series of actual test flights. The input parameters which generated the best fit to actual flights are examined to determine their statistical properties. Tests of hypotheses are conducted to determine goodness of fit and equality of means and variances among parameter sets related to specific terrains and speeds. A sampling procedure is suggested whereby a random series of flights might be generated over an arbitrary terrain cross-section subject to speed restrictions.

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1. INTRODUCTION.

As part of an overall study of the operational characteristics, limitations and techniques of low level flight, Joint Task Force Two conducted Test 1.0, a series of carefully monitored flights over pre-selected terrain segments. Flights were made by a large variety of aircraft, currently in the Air Force, Army, and Navy operational inventories and flown by operational squadron personnel. Telemetry data of general flight parameters and, in particular, aircraft-to-terrain clearances were collected.

One test objective was to determine a means of predicting aircraft trajectory over any given terrain. In support of this objective, Mr. E. A. Aronson of Sandia Corporation designed the Computer Flight Simulation Model described in detail in Appendix I. This model, using only five input parameters, has been found to give remarkably good approximations to actual flight paths, when appropriate values of the input parameters are selected. Mr. Aronson also designed and incorporated in his model a computer search procedure whereby the simulated flight may be compared with an actual flight and set of parameter values derived which minimize the sum of squared deviations between real flight and simulated ground clearances. A set of numbers may thus be derived which best describes any given flight in terms of the model.

The purpose of this study is to estimate the probability distribution of such sets of parameters derived from flights of four different aircraft models, flown over four courses at various speeds during the course of Test 1.0.

A further objective is to determine the general applicability of the model to prediction of low flying aircraft trajectories over more general terrain cross-sections and speeds. In addition, a sampling procedure is suggested whereby a random series of flight paths might be generated over a given terrain cross-section which could reasonably be expected to conform in distribution to those which would be observed were the flights actually flown.

2. GENERAL CONCEPT OF STUDY.

Evaluation of the descriptive and predictive capacity of the model required three, essentially distinct, investigations. First, simulations were generated to correspond to the flight records of the four aircraft models considered. The resulting synthetic trajectories were then examined to determine the capacity of the model to simulate an actual flight path in terms of root mean square error between actual and simulated flight. RMS errors derived were then tested for dependence on the specific speed and terrain combination over which the actual flight, to which each simulation was related, was conducted. Tests for correlation with derived parameter values were also conducted.

Secondly, parameter values were examined by means of a goodness of fit test to determine the appropriateness of the choice of postulated distribution. The Multivariate Normal distribution was first investigated because of its mathematical tractibility. Where parameters were not normally distributed, simple functions of the parameter values were sought, which might be so distributed.

Thirdly, several tests of hypotheses were conducted to determine whether parameter values were related to specific terrains, speeds or aircraft models, and if so, the degree of the dependence. Where such dependence existed, simple transformations, dependent on indices, determined only by the conditioning environment, were sought, whereby the dependence might be removed and a more general distribution derived. In this regard it was clear that among the environmental factors which might affect parameter values, the most limiting, both in terms of the general applicability of the model and in difficulty of characterization, would be that imposed by specific terrain cross-section. There does not exist, to the authors' knowledge, at this time, any convenient index of terrain variability.

Throughout the study the authors drew on their own experiences in low level flight and on that of many other Naval Aviators of their acquaintance. It was the objective to maintain mathematical rigor throughout, nonetheless, findings were examined for their intuitive appeal and where it appeared useful in the exposition, such considerations are presented as the personal opinion of the authors.

3. MODEL DESCRIPTION.

A detailed description of the model, written by Mr. Aronson, and presented by him to the Military Operations Research Symposium at Monterey in May 1966, has been reproduced in Appendix I by kind permission of the author.

In brief, the model considers an initial, preassigned set of values of the following parameters:

(1) Gu - The maximum simulated "g" load allowed in an "up" maneuver.

(2) Gd - The maximum simulated "g" load allowed in a down maneuver.

(3) k - A factor which determines the degree to which a pilot will anticipate, in pulling up to avoid an obstruction, in excess of that which would be required for the absolute minimum of safety, subject to the limitation imposed by Gu.

(4) P - A peak anticipation factor. P measures the degree to which the pilot adjusts his flight path to avoid overshooting or over-anticipating passage over terrain peaks.

(5) S - Mean shift. The amount of upward shift necessary to adjust the mean simulation terrain clearance to the mean terrain clearance of the actual flight considered.

A simplified, piecewise linear, terrain cross-section is considered which retains the significant features of the test terrain while disregarding minor fluctuations.

A synthetic flight path is generated by successively examining the terrain which is within the line of sight of the simulated aircraft based on its current position and attitude. At each step of the simulation a decision is made, based on the current parameter values, whether to continue ahead, go up or go down. When a decision is made the aircraft position and attitude is adjusted and the process is repeated. When a synthetic flight path has been generated the discrepancies between simulated terrain clearances and those generated by an actual flight are calculated and the root mean square error for the particular set of parameters is derived. By iterative procedures various values of the parameters are examined until a set has been derived which minimizes RMS error. The program reports parameter values and associated RMS error for each iteration.

Figures 1 and 2 portray two particularly successful runs. Plots are compressed longitudinally. Thus actual terrain fluctuation was considerably less than the plot would suggest. The actual course length was approximately 255,000 feet. Total terrain elevation varied approximately 3,300 feet over the course length.

4. PROCEDURE.

Computer simulations were conducted both by the authors and by Mr. Aronson on the Control Data 3600 Computer at Sandia Corporation and the Control Data 1604 at the U.S. Naval Postgraduate School, Monterey. Data was generated on four test series involving four different aircraft models designated as follows:

Type 3: A medium performance light attack aircraft.

Type 4: A multi-place, high performance interceptor.

Type 6: A high performance fighter-bomber.

Type 7: A heavy bomber.

Raw test data for use at Monterey was processed into a form suitable for use in the simulation by Sandia Corporation programmers.

Three computer programs were utilized to reduce the data output from the simulations. Programs ONE A and ONE B, reproduced and described in some detail in Appendix II, were written by the authors. A linear regression program designated BIMED 3R was also used and is one of a series of library programs designed by the Health Sciences Computing Facility, UCLA (1).

In general, program ONE A sorts input data in increasing order of RMS error. It then proceeds with the analysis of as many subsets as are desired on the basis of an upper RMS error limit. Data is further sorted into appropriate categories by terrain segment and speed flown. Sample means, variances, covariances and the various test statistics described below are then calculated and reported, by individual category and cumulatively by terrain, by speed and overall. Facilities are included in the program for selective transformation of any or all of the variables considered and for sequential processing of as many sets of data as are desired.

Program ONE B shares most of the major features of ONE A and was separated from it only because of computer memory limitations. After selection of a subsample, limited, as before, by a preselected value of RMS, subsequent sorting is by the order in which sorties were flown. Thus, each category contains one flight for each of the pilots considered and consists of all first flights, second flights, etc., regardless of terrain or speed involved. In addition to the calculations reported in ONE A, the sequential differences in parameter values generated by each pilot in his sequence of flights is reported.

All flights examined were conducted over some or all of four courses, numbered, for identification only, as terrains 1, 2, 3, and 4. Terrains 1 and 2 are actually the same terrain cross-section flown in opposite directions, as are terrains 3 and 4. Figures 1, 2 and 3 display runs conducted over terrain 2. Figure 4 shows terrain 4. Data was collected on flights of aircraft types 3 and 4 at three speeds. Aircraft type 6 flew at two test speeds and aircraft type 7 at one. Speeds are identified in ascending order as speeds 1, 2 or 3 for each aircraft type. This limited identification of speeds is used to avoid difficulties of security classification and does not imply anything other than a relative ordering of speeds within one aircraft type. No implication of relative magnitude within one type category or equality between aircraft types is intended.

To examine the effects of terrain and speed on the derived parameters, the simulation output data was sorted into terrain and speed categories. Estimation of population moments was then conducted on each subsample so derived and on cumulative subsamples derived both by terrain and by speed. The tests of hypotheses of identity of population, described below, were conducted between individual and between cumulative subsamples.

For each subsample considered, Maximum Likelihood Estimators of population means were calculated, i.e.

$$\overline{Gu} = \frac{1}{N} \sum_{i=1}^{N} Gu_i \approx \text{mean } Gu$$

Unbiased estimators of variance and covariance were used, i.e.

$$S^2(Gu) \equiv \frac{1}{N-1} \sum_{i=1}^{N} (Gu_i)^2 - \frac{N}{N-1} \cdot (\overline{Gu})^2 \approx Var(Gu)$$

$$Cov(Gu,Gd) \equiv \frac{1}{N-1} \sum_{i-1}^{N} (Gu_i - \overline{Gu})(Gd_i - \overline{Gd}) \approx \text{covariance } Gu/Gd$$

Estimates for samples analysed are presented in variance/covariance matrices in Appendices III through VI.

To test the hypotheses that the observed parameters were normally distributed over the population of pilots the Kolmogorov-Smirnov Goodness of Fit test as described by Lindgren (2) was employed. This test provides a direct measurement of the maximum departure of the sample distribution from the postulated distribution function. Thus, while all tests of hypotheses were conducted at a 5% level of significance, it was of some interest to examine the level at which this particular hypothesis would have been rejected, particularly in the case of those parameters which generated the larger values of the test statistic.

The value of the test statistic is printed in the appropriate appendix for each subsample of data considered.

The procedure employed, of examining samples limited by a preassigned RMS level, resulted in considerably different subsample sizes when the data was further subdivided into terrain and speed categories. This precluded direct analysis of variance of all of the data available. Instead, the Scheffé multiple comparison procedure was employed to test hypotheses of equality of means among the various subsamples. The procedure is outlined below and it is that described by Brownlee (3).

To test hypotheses of equality of variances, a necessary condition for the Scheffé test, Bartlett's test, also described in Brownlee (3) and is Ostle (4), was employed. In addition, a two way analysis of variance was conducted on samples of equal size produced by rejecting excess data in the larger samples on the basis of high RMS error. The general features of the analyses were as follows:

(1) <u>Bartlett's Test For Equality of Several Variances:</u>

Bartlett's result is that the ratio B/C, where

$$B = -\sum_{i=1}^{K} f_i \log_e\left(\frac{s_i^2}{s^2}\right)$$

$$C = 1 + \frac{1}{3(k-1)}\left(\sum_{i=1}^{K} \frac{1}{f_i} - \frac{1}{f}\right)$$

s_i^2 is an unbiased estimate of the variance of the ith sample, estimated with $f_i = n_i - 1$ degrees of freedom,

$$s^2 = \left(\sum_{i=1}^{K} f_i s_i^2\right) \Big/ \sum_{i=1}^{K} f_i$$

$$f = \sum_{i=1}^{K} f_i$$

is distributed, under the null hypothesis of equality of the K variances, as X^2 with K-1 degrees of freedom. Thus the decision rule is:

Reject the null hypotheses at the α significance level if

$$B/C > X^2(1-\alpha, K-1)$$

Bartlett's test statistic is computed for each sample grouping by program ONE A and is printed with each set of cumulative results in Appendices III through VI.

(2) Scheffé's Test.

Contrasts were defined as:

$$C = \sum_{i=1}^{K} C_i M_i$$

where M_i is the population parameter under consideration in the ith sample and C_i are constants such that

$$\sum_{i=1}^{K} C_i = 0$$

K = number of samples under consideration. C was estimated by

$$\overline{C} = \sum_{i=1}^{K} C_i \overline{x}_i$$

where:

$\overline{X}i$ is the sample mean of the ith sample. The variance of $\overline{C}$ was estimated by

$$V[\overline{C}] = s^2 \sum_{i=1}^{K} \frac{C_i^2}{n_i}$$

where s^2 is the unbiased estimate of the population variance estimated with

$$f = \sum_{i=1}^{K} n_i - K \quad \text{degrees of freedom.}$$

n_i is the number of data points in the ith sample.

Scheffé's result is that,

$$\bar{C} \pm R\sqrt{V[\bar{C}]} \quad \text{where}$$

$$R = A(k-1)$$

A is the 100 (1 $-\alpha$) percentile of the F distribution with (K-1) and f degrees of freedom is a 100 (1-α)% confidence interval for all such contrast estimates. Thus, a confidence interval so determined, which includes zero, permits one to accept the hypothesis that the estimated contrast is not significant at the α significance level.

The confidence limits were found to be readily calculable by hand and the procedure was not included in the computer program.

(3) Two Way Analysis of Variance.

To conduct a two way analysis of variance it was necessary to construct samples of equal size, n, grouped in a two by four array indexed by two speeds and four terrains. Since flights were conducted at three speeds over only two of the four terrains, this test was necessarily restricted to two speeds. To construct samples of equal size it seemed most natural to reject those sample points with the highest value of RMS error.

The following sample mean squares were constructed:

$$S_1^2 = \sum_{i=1}^{r} \sum_{j=1}^{t} \sum_{\nu=1}^{n} (x_{ij\nu} - \bar{x}_{ij.})^2 / rt(n-1)$$

$$S_2^2 = n \sum_{i=1}^{r} \sum_{j=1}^{t} (x_{ij.} - \bar{x}_{i..} - \bar{x}_{.j.} + \bar{x}_{...})^2 / (r-1)(t-1)$$

$$S_3^2 = nr \sum_{j=1}^{t} (x_{.j.} - \bar{x}_{...})^2 / (t-1)$$

$$S_4^2 = nr \sum_{i=1}^{r} (\bar{x}_{i..} - \bar{x}_{...})^2 / (r-1)$$

where:

$\bar{x}_{ij\nu}$ = parameter value of νth observation in sample observed at speed j on terrain i.

$\bar{x}_{ij.}$ = sample mean speed j terrain i.

$\bar{x}_{.j.}$ = mean of cumulative sample over all terrains at speed j.

$\bar{x}_{i..}$ = mean of cumulative sample over all speeds, terrain i.

$\bar{x}_{...}$ = sample grand mean over all samples.

Brownlee (3) proves that under the null hypothesis of no interaction

$$\frac{S_2^{\,2}}{S_1^{\,2}} \text{ is distributed as } F((r-1)(t-1),\ rt(n-1)).$$

If the null hypothesis is accepted row and column effects may be tested. Under the null hypothesis of no row effects

$$\frac{S_4^{\,2}}{S_1^{\,2}} \text{ is distributed as } F((r-1),\ rt(n-1))$$

Under the null hypothesis of no column effects

$$\frac{S_3^{\,2}}{S_1^{\,2}} \text{ is distributed as } F((t-1),\ rt(n-1)).$$

(4) <u>Test for Significance of Correlation.</u>

The t test described in Anderson (5) was used to test for significance of correlation. The statistic

$$T = \frac{\sqrt{n-2}\,|r_{ij}|}{\sqrt{1-r_{ij}^{2}}}$$

where;

N = sample size

r_{ij} = sample correlation coefficient was derived for each pair of parameters and is printed with other sample statistics in Appendices III through VI. Anderson (5) shows that the statistic has the "t" distribution with N - 2 degrees of freedom. To test the hypothesis

$H_o : r_{ij} \neq o$

$H_a : r_{ij} \neq o$

the decision rule is; reject H_o if $T > t\,\alpha/2, (N - 2)$

(5) Learning.

Program ONE B was written to facilitate determination of any learning trend which might have biased the test results. Sequential differences between the parameters generated by individual pilots on successive sorties were tabulated by the program and subjected to analysis for correlation with the sortie order and various indices of pilot experience. No significant correllation was found.

5. RESULTS.

Of the four aircraft models considered, type four, a multi-place high performance interceptor, was considered first and in the greatest detail. More test data had been generated for this model than for the others and flights had been conducted at three speed levels. In addition, access to high speed computing and plotting equipment at Sandia Corporation permitted initial screening of the data to eliminate flights for which telemetry data was excessively noisy or missing over extended portions of the flight path. Detailed results of the analysis for this model aircraft are contained in Appendix III. General results are as follows.

(1) RMS Correlation.

Examination of computer generated plots, similar to those displayed in figures 1 through 3, shows two sources of RMS error which would be extremely difficult to quantify. "Noise" in the telemetry data resulting from poor registration of aircraft position causes "spikes" in the plot which contribute to the error. Also, because of the piecewise linearity of the plot, missing data can cause long intervals of the flight to be represented by straight line segments. A further factor contributing to the error is pilot inconsistency in terrain following. The model assigns one set of parameter values to an entire flight. If the pilot is inconsistent, the resultant "optimum" fit will be, at best, a compromise. Figure 3 displays an example of both sources of error.

Prior to commencing the analysis computer plots of the flights to be considered were examined and those considered excessively noisy were rejected. A total of 117 flights was retained out of an initial total of 160.

Scatter diagrams and linear correlation techniques were then applied to determine the relationship of RMS error to the simulation parameter values, flight speed, terrain and average real flight aircraft to ground clearance. Only clearance appeared to be significantly correlated with RMS error. Simple and multiple regression analysis tended to confirm this finding and the following model was derived with a Coefficient of Determination of .5467 and F value of 138.68.

$$RMS = 41.38 + .1539C$$

where C = clearance in feet.

The apparent relationship is not surprising in that the model flight path is entirely responsive to terrain, whereas, the higher an aircraft flies, the less responsive it will be to terrain fluctuations.

(2) <u>Parameter Distributions and Analysis of Variance</u>.

Data was processed by computer program ONE A at three levels of RMS; 200 feet, 160 feet and 120 feet. Details of the output are contained in Appendix III.

It was clear from the outset that the parameter "p" displayed a non-normal distribution. The transformed variable

$$X = \sqrt{P}$$

however, displayed normal characteristics. Inspection of the computer output also showed that while the hypotheses of normality were acceptable for all variables within individual subsamples taken over specific terrains and speeds, cumulative samples of the parameters Gu and K were distinctly non-normal at the higher levels of RMS error. The supremum acceptable difference between sample and postulated distribution function at the .05 level of significance is approximately .1055 for samples of size 117, .13 for samples of size 108 and .146 for samples of size 87.

Thus, at RMS levels above 120 feet, the hypothesis of normality was rejected for Gu and K.

At the 120 feet RMS level the hypothesis of normality for all parameters was accepted at the .05 level and could, in fact, be accepted at the .2 level of significance for the parameters Gd, S and X. The hypothesis was acceptable for Gu and K at the .2 level within each of the subsamples considered, regardless of the RMS level, which indicated the possibility of the presence in the cumulative sample of more than one parent population for these two variables. This possibility was borne out by the analysis of variance.

Prior to analysis of variance, however, the individual subsample means and variances were examined for obvious evidence of trend. It was immediately clear that sample means of Gu and K are consistently increasing functions of speed. The sample variances, however, are less consistent. Over terrains 1 and 2, the variance is a minimum at speed 2 and increases at the higher and lower speeds. Over terrains 3 and 4, it increases with speed. It was apparent that it would not be possible to correct for the mean trend by means of some linear transformation based on speed differences. Any such transformation which would tend to reduce the higher mean values would be achieved at the expense of expanding the variances at speed 1 over terrains 1 and 2 by a quadratic factor.

Bartlett's test confirmed these intuitive observations. The 95th percentiles of the X^2 distribution with 9 and 3 degrees of freedom respectively are 16.9 and 7.81. The hypotheses of equality of variances between all samples and between terrains were accepted for Gd, S and X but rejected for Gu and K.

The following transformations were applied to the values of Gu and

K.

$$Gu_i = \sqrt{A}\, Gu_i + \overline{Gu_2} - \sqrt{A}\, \overline{Gu_i} \qquad i \neq 2$$

$$K_i = \sqrt{1-A}\, K_1 + \overline{K}_2 - \sqrt{1-A}\, \overline{K}_1$$

Gu_i = Value of Gu at speed i

$\overline{Gu_2}$ = Sample mean of all values of Gu observed at speed 2.

$$A = \frac{|Vi - V_2|}{V_2}$$

Vi = Speed i

The computer output for the transformed variables is contained in Appendix III. After transformation, the hypothesis of equality of variance of K between terrains was acceptable, but was rejected for Gu, although the value of the statistic was somewhat reduced. Transformation did, however, reveal something of the nature of the discrepancy in the value of the variables over terrain. Examination of the sample means and variances showed that those generated over terrains 1 and 2 were quite close, as were those generated over terrains 3 and 4, and that the major discrepancy was between these two groupings. Cumulative sample statistics were generated for the two groupings of un-transformed variables on the basis of this observation and again the Bartlett test confirmed the results of inspection. The 95th percentiles of the X^2 distribution with 4 and 1 degrees of freedom are 9.49 and 3.48 respectively and the hypothesis of equality of variance is clearly acceptable for all variables over terrain 1 and 2 and, with one exception, over terrains 3 and 4. The difficulty with K would appear to arise from the unusually high variance at speed 3.

In view of the foregoing, separate transformations were introduced for each of the terrain groupings. Data from terrains 1 and 2 was transformed as before, that from terrains 3 and 4 as follows:

$$K_i = \frac{V_2}{V_i} K_i$$

Gu was not transformed over terrains 3 and 4.

The resulting sample statistics are listed in Appendix III and the very great smoothing of data which resulted is apparent.

Finally, since the maximum smoothing of data was achieved when the two variables Gu and K were adjusted to speed 2, it was decided to investigate results at speed 2 alone. The output is displayed in Appendix III.

Contrast tests were conducted to test hypotheses of equality of means between parameter values generated at the various speeds and over individual terrains and terrain groupings. Results are tabulated in Appendix III. In all cases investigated, 95% confidence intervals for the estimated contrasts include zero and thus the hypotheses of equality of means were accepted. Contrasts were also calculated for the uncorrected values of Gu and K and are included for completeness in the knowledge that the results are, at best, suspect in view of the demonstrated inequality of variance among the various samples.

The two way analysis of variance was of limited interest in view of the restrictions necessarily placed on sample size and the possible bias introduced by the method used in cutting down the larger samples. The results, nonetheless, tend to confirm those derived by the combined Bartlett, Scheffé tests.

Mean squares are listed in Appendix III. The null hypothesis of zero interaction was accepted for all variables and, thus, speed and terrain effects could be analysed individually. Neither speed nor terrain effects are significant for Gd, S or X. For Gu and K, speed effects are not significant but terrain effects are. Analysis of all transformed variables showed zero speed and terrain effects.

The t statistics for testing significance of correlation between all pairs of variables are printed, for each subsample considered, in Appendix III. The sample correlation is in many instances significant. There does not, however, appear to be any pattern as to which variables will prove to be significantly correlated in the various speed and terrain categories or in any given category, when samples are truncated by elimination of those with the higher RMS levels.

Thus, the sample correlations between Gu and S, Gu and X, Gd and K, K and S, S and X are all significant at the .05 level when derived for the cumulative sample of all data below the 200 foot RMS level. When the sample is truncated at the 120 foot RMS level Gu and X and S and X are significant. For the cumulative sample of data at speed 2 only, also truncated at the 120 foot RMS level, only Gd and S are significant. This effect is not simply a function of reduced RMS. At the 160 foot RMS level, K and S are significantly correlated while Gu and X are not.

Of all aircraft models considered, the type 3, medium performance light attack, provided the most satisfactory results in terms of the ability of the simulation to fit actual flights. Flights over two terrains at three speeds were available. Of the 105 sorties considered, 90 had RMS values below 120 feet and all were below 160 feet. Average clearances were generally low, only 4 exceeded 500 feet.

The data was not screened prior to analysis for this or the remaining two models considered. The investigation of correlation of RMS with speeds, terrains and parameter values produced results, essentially similar to those of the type 4, i.e., significant correlation exists only with actual flight mean clearance. The failure to screen the data was reflected in the reduced value of the coefficient of determination when the data was fitted to a linear regression model. The model derived was

$$RMS = 57.38 + .124C$$

with an F value of 27.23 and coefficient of determination of .2091.

Analysis of variance also revealed a pattern similar to that of type 4. The hypotheses of equality of variances for the parameters K, S and X were rejected at the .05 level. However, the sample variances of X are extremely small, the maximum value derived is .005. Noting that the value of X is actually the square root of the simulation parameter P and that the simulation is insensitive to changes in parameter values beyond the second significant figure, it is clear that while statistically significant, the inequality of variances is of no practical concern in terms of the applicability of the model. The changes in both sample means and variances of S are a simple function of speed and may be readily eliminated by means of transformation of the data.

The variance of K is, however, as in the case of the type 4, a function of both terrain and speed and thus presents the same difficulty. Again, as in the case of the type 4, the data at speed 2 was analysed separately and again the hypotheses of equality of means and variances between the terrains was accepted for this subsample.

Sample moments and the various statistics used in the analysis are contained in Appendix IV.

The type 6 data illustrates a situation where the model is clearly not applicable. There is very little consistency in the data and clearances range to over 1,000 feet. If analysis is restricted to those flights which could reasonably be considered low flyers, i.e., below 450 feet, the sample size is reduced from 93 to 42. Even in this group, there is apparently very little consistency in pilot technique and RMS values range as high as 433 feet. Scatter diagrams show no apparent correlation between RMS and the various other factors considered in the analysis. The sample data is displayed in Appendix VI.

The quantity of available data for the type 7, the heavy bomber, was small, 38 records in all. Nonetheless, while some individual clearances were high there was sufficient consistency in the results to permit analysis of a sample of 20 at the 160 foot RMS level. Again, there was no prior screening of the data. The regression of RMS on clearance was:

$$RMS = 39.22 + .231C$$

with F value of 15.317 and coefficient of determination .2985.

Examination of scatter diagrams would indicate that, as in the case of the type 3 aircraft, this result could be refined and the coefficient of determination improved by elimination of some outliers, induced apparently by some or all of the unmeasured factors affecting RMS.

Details of the analysis are contained in Appendix V. Flights were conducted at only one speed and hypotheses of equality of means and variances and of the normality of the parameters were all accepted at the .05 level. This again tends to confirm the belief that, for the terrain segments considered, the model is independent of terrain for flights conducted at normal operating speeds. Prediction of trajectories over other terrains which in general conform to the characteristics of the two cross-sections considered would thus appear justified when restricted to that speed for the particular aircraft considered.

6. CONCLUSIONS.

The full potential of the simulation model is best realized by examining computer plots such as those in figures 1 and 2. In studies of survivability, detectability etc., it is apparent that meaningful values of the parameters P and K and the degree of short term exposure they imply, provide a considerable extension of the useful information provided by average clearance alone. The strong correlation between RMS and clearance provides some measure of confidence which can be placed in the results obtained. As a rough measure of the applicability of the model, the RMS upper limit of 120 feet, used in the type 4 aircraft, analysis may be considered.

If the linear regression model is assumed to hold, an upper clearance limit of 350-400 feet would be quite conservative in determining the useful region for the model. Above this level it would also appear reasonable to assume that considerations of terrain masking would be somewhat academic.

The probability distribution of average clearances is not considered in this study but is currently under evaluation at Sandia Corporation. When derived, it should provide a measure of the percentage of sorties which would be expected to fall within the scope of the model.

The most severe limitation of the model is the complex interaction of speed and terrain on the parameters Gu and K. As was shown in Section 5, departures from the median speed introduce changes which are a function of the terrain over which they occur. A possible explanation of this phenomenon is suggested by the concept of a normal operating speed. All aircraft habitually cruise within a relatively narrow range of speeds and, while operational necessity may impose differing speed requirements, the control pressures and aircraft responses within the cruise regime are those to which pilots become most accustomed. One would, therefore, expect that departure from the accustomed mode would lead to a wider range of responses.

The selective transformations of the data in the case of aircraft type 4 were introduced to illustrate the nature and extent of the terrain/speed interaction. The choice of transformations was suggested by the data and has, therefore, no general applicability. However, the fact that the response to speed change is essentially the same over terrains 1 and 2 and also over terrains 3 and 4 and that the major difference occurs between these two groupings would suggest that the dependence on terrain may be a relatively simple one. As was pointed out earlier, terrains 1 and 2 are identical, as are 3 and 4. They are listed separately to indicate the direction of flight over the particular cross-section. Thus, the apparently similar reactions would appear to indicate dependence on some common feature of the cross-section when viewed from either direction. Simple features such as peak frequency would thus appear to be more influential than would more complex features such as gradient etc.

In the absence of a terrain index, the model may still be considered terrain independent at the median speeds considered in the analysis for terrains roughly comparable to those considered. The sample means, variances and covariances calculated at that speed provide an estimate of the parent multivariate normal population which can be sampled to obtain representative sets of trajectories. Further application to more general speeds should be undertaken only after examination of the sensitivity of the model to departures from the mean values of the parameters Gu and K.

Examination of the estimated distributions indicates, also, that the distribution of parameters for each aircraft model is quite distinct.

A Multi-dimensional confidence region could conceivably be estimated for each aircraft type. The calculation would, however, be somewhat unwieldy and its operational interpretation obscure. As a practical matter, a meaningful procedure would be to generate a series of flights over the desired terrain cross-section utilizing mean values of the parameters and sets of values removed either one standard deviation or some other convenient measure from the mean. In this way an envelope of trajectories could be generated which would in large measure reflect the characteristics of the underlying population.

The following sampling procedure is suggested as a means of generating random trajectories from the estimated parameter distributions over arbitrary terrain cross-section.

The appropriate covariance matrix is first diagonalized by an orthogonal transformation and the mean vector is multiplied by the matrix of the transformation. Samples may then be drawn independently by standard random sampling procedures from each of the five independent univariate normal distributions so derived. Each sample vector is multiplied by the inverse of the matrix of the orthogonal transformation. The resulting vector is a random sample from the desired multivariate distribution.

The justification of this procedure is as follows:

Let V be the covariance matrix and M the mean vector of the multivariate normal distribution of interest. Let C be an orthogonal matrix such that

$$C'VC \text{ is diagonal}$$

where C' is the transpose of C.

Then, if X is a random vector distributed as N(M,V), Y = CX is distributed as N(CM, C'VC). C'VC is diagonal and therefore the marginal distributions of y_i, the components of Y are independent and normal.

If, then, a random sample is drawn from the distribution of each of the y_i and the vector so formed is multiplied by C^{-1}, the inverse of C, the resulting vector will be a random sample from the multivariate normal distribution with parameters

$$(C^{-1}CM,\ (C')^{-1}C'VCC^{-1}) = (M,V).$$

ACKNOWLEDGMENT

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Inquiries as to aircraft model designations, actual speeds and telemetry data should be addressed to:

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Albuquerque, New Mexico

BIBLIOGRAPHY

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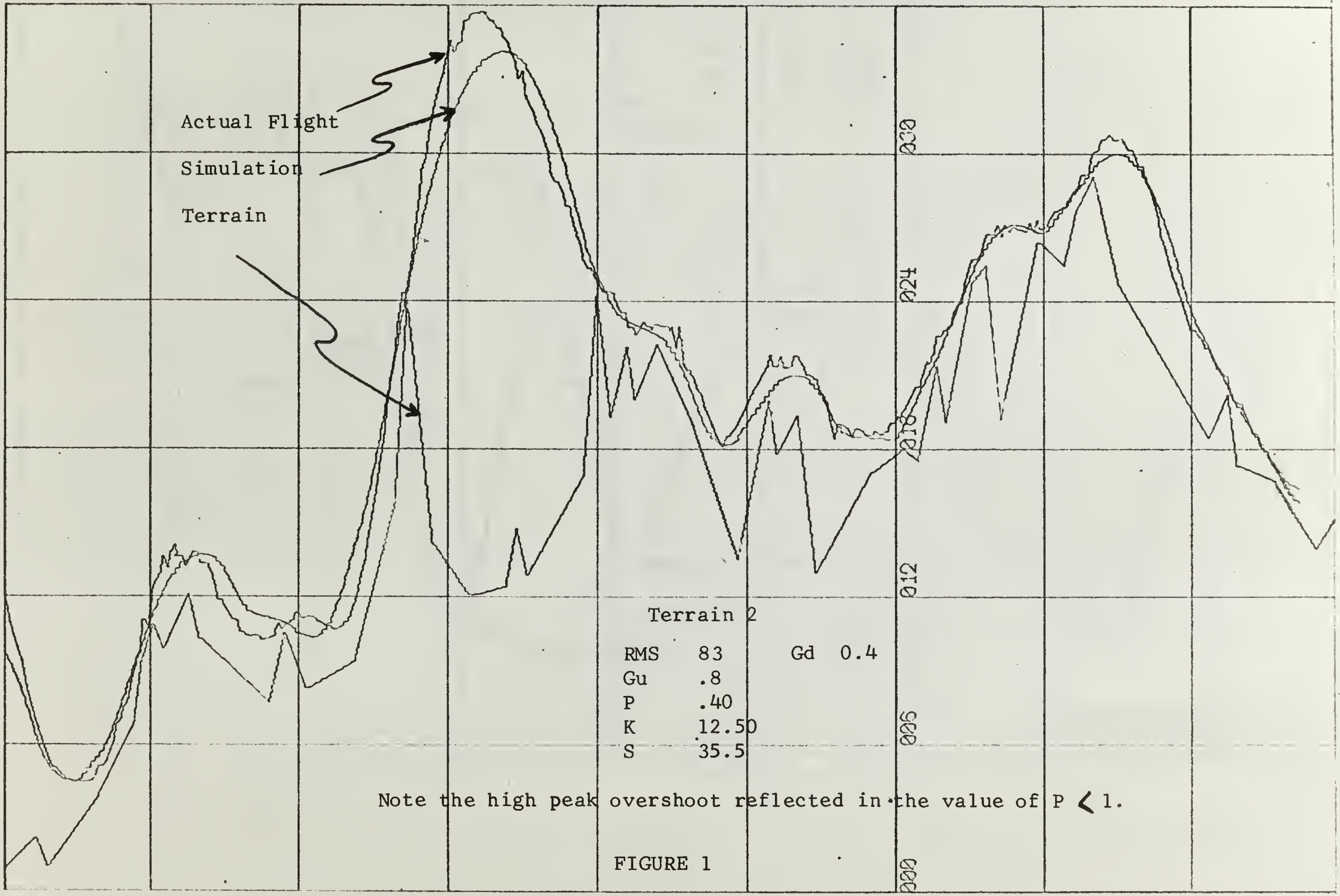


Note the high peak overshoot reflected in the value of P < 1.

FIGURE 1

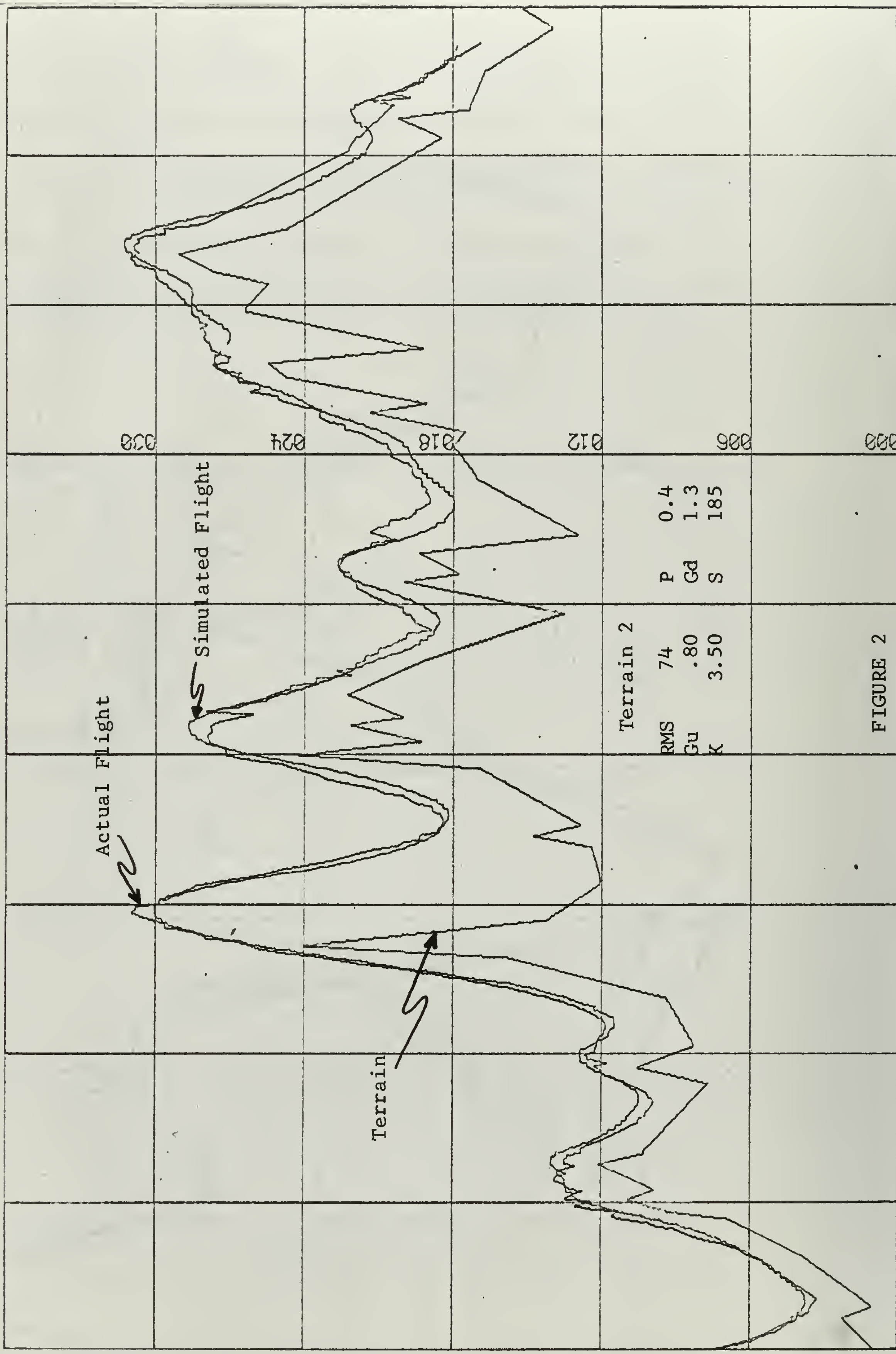
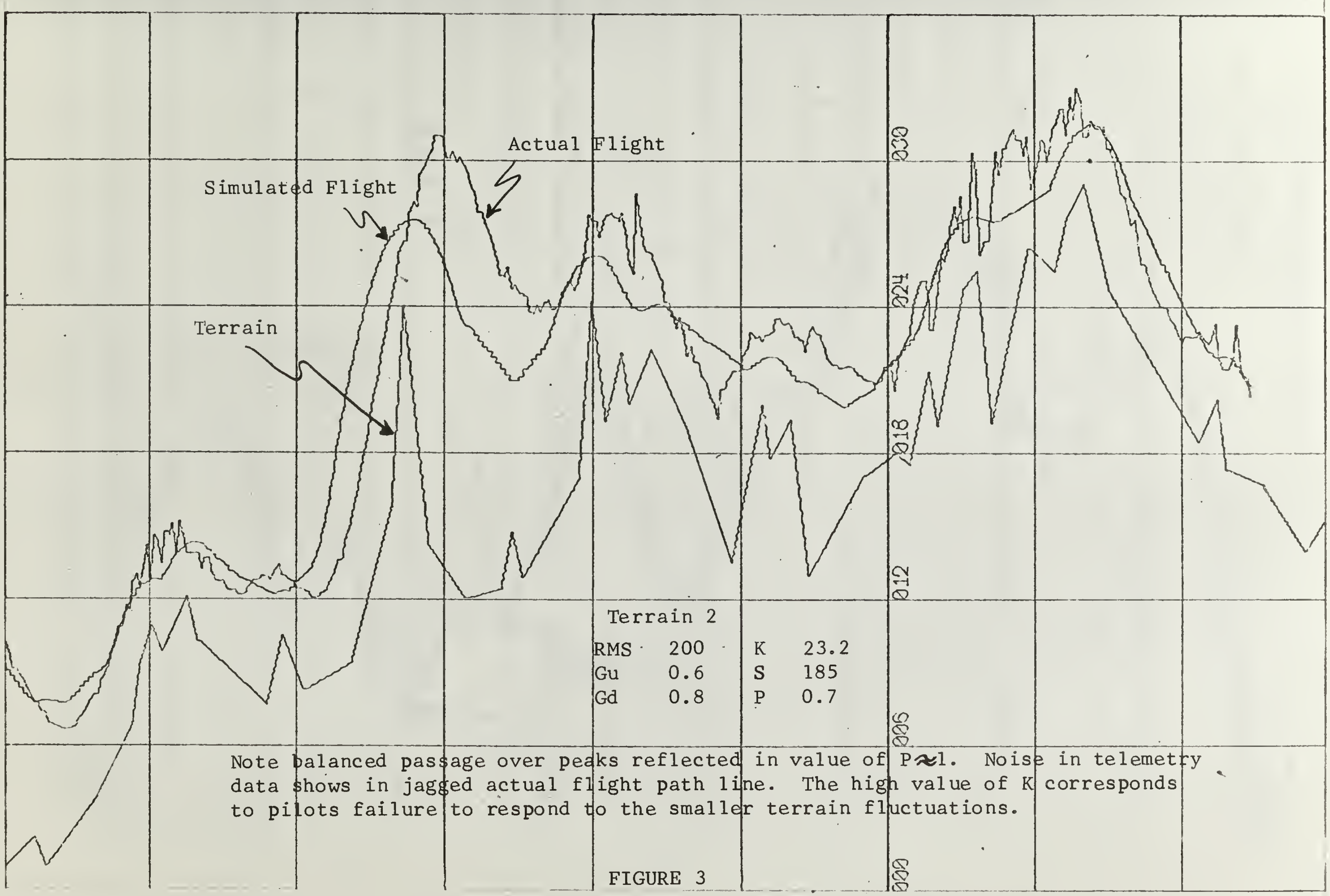

Actual Flight
Simulated Flight
Terrain
Terrain 2
RMS 74 P 0.4
Gu .80 Gd 1.3
K 3.50 S 185
030
024
018
012
006
000

FIGURE 2



Note balanced passage over peaks reflected in value of P≈1. Noise in telemetry data shows in jagged actual flight path line. The high value of K corresponds to pilots failure to respond to the smaller terrain fluctuations.

FIGURE 3

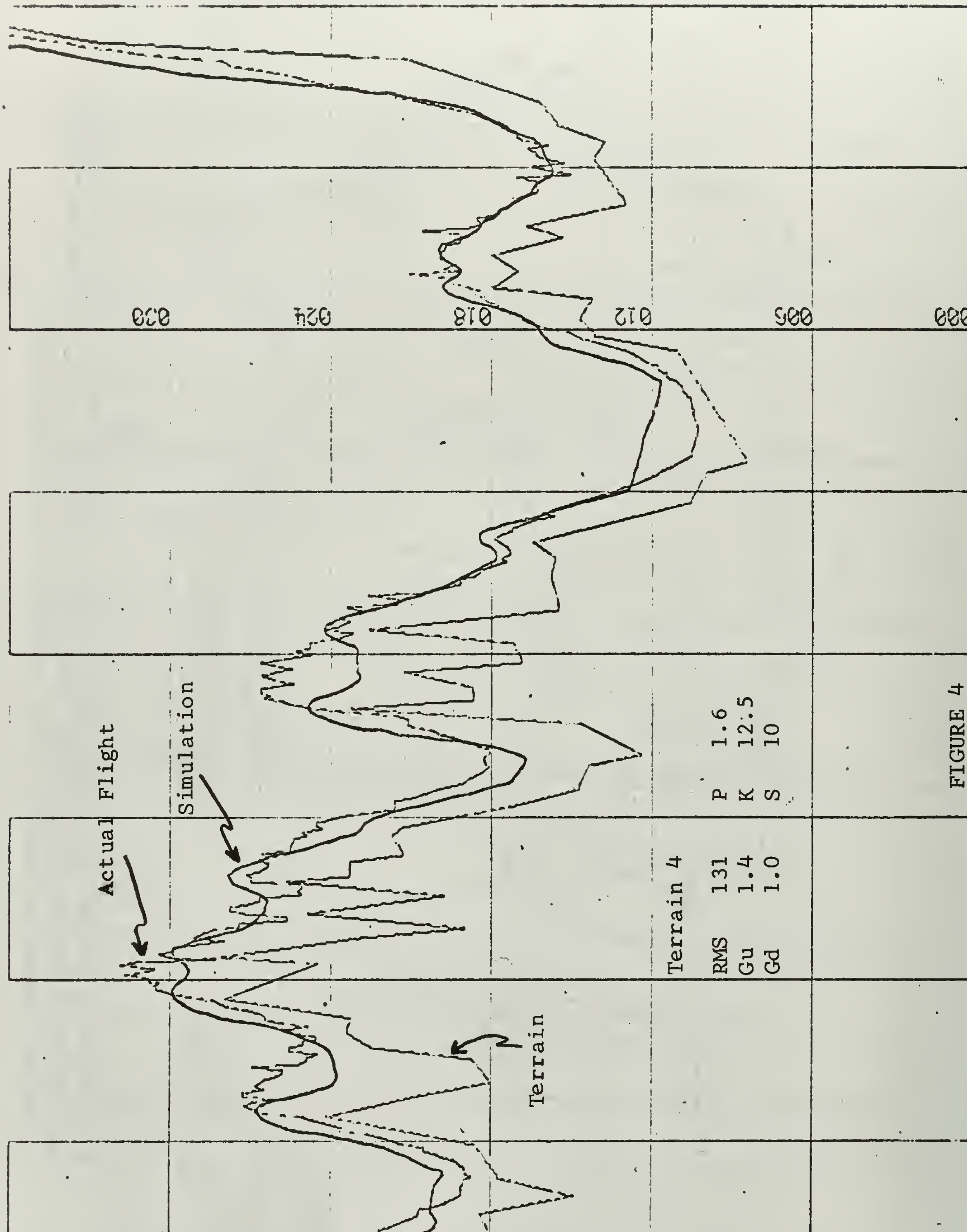

Actual Flight
Simulation
Terrain
030
024
018
012
006
000
Terrain 4
RMS 131
Gu 1.4
Gd 1.0
P 1.6
K 12.5
S 10

FIGURE 4

APPENDIX I

FLIGHT SIMULATION MODEL

I. General Discussion.

A. Assumptions

An attempt to describe the important characteristics of low level flying has led to the development of a low level flight simulator. This model uses only five intuitively reasonable parameters and is easily implemented on any high speed digital computer. Comparison of simulated flights and actual ones has shown that the simulation gives a realistic description of low level flying. This simulation is only two dimensional, that is, the flight is restricted to a predetermined course and hence the A/C can make only up and down maneuvers.

The basic problem in low level flight is to follow terrain as closely as possible to avoid detection while maintaining safe clearances and relatively constant air speed. Also, the A/C must stay within the reasonable g load limits imposed by the pilot and A/C combination. The philosophy of the simulation adheres to this tradeoff. Also, the simulated A/C will react only to those terrain features which can be seen (line of sight) from the A/C at any given time.

The simulation is a discrete process. Given that the A/C is at a certain position and attitude, the terrain ahead of the A/C is examined. It is then determined whether the A/C must pull up in order to avoid a crash while maintaining constant air speed and staying within specified g limits. If the A/C must pull up, it does. If safety does not require the A/C to pull up, the possibility of going downward is examined. If this maneuver can be safely executed, i.e., a downward maneuver will not cause a crash later in the flight, the A/C goes down. If a downward maneuver is not safe, the A/C must maintain its current attitude. The A/C then moves along a length of arc specified by the discretization step size of the simulation in a direction given by the resultant choice of "up", "straight" or "down" and the choices are examined again from the new position and attitude.

Considerable simplification is obtained by having the A/C always make its maneuvers with only the full g loads allowed. If the simulation step size is sufficiently small the resultant trajectory will be correspondingly smooth. The simulation that was made to allow both full and half g load maneuvers showed that the half g maneuvers were rarely used.

Additional simplification is obtained by ignoring the dynamic response of the A/C. This is not as serious an omission as might be supposed. The output of the simulation is a flight path over a terrain. The only requirement of this path is that the particular A/C in question indeed be capable of following it. Aerodynamics enters when it is necessary to relate the time when a maneuver is initiated by a pilot and the time when the A/C responds. The simulation does not assume this time difference to be zero, but it does assume that the A/C response is instantaneous when it is begun.

B. Parameters

The five parameters used in the flight are briefly described here. More exactdefinitions are found in Section II-B.

(1) Gu - The maximum g load allowed in an up maneuver.

(2) Gd - The maximum g load allowed in a down maneuver.

The simulation takes these g's to be relative to earth gravity. Their direction is normal to the velocity vector of the A/C at all times, hence all non-zero g maneuvers are on circular arcs since the airspeed is taken as constant.

(3) K - Look ahead safety factor.

Although safe flight is presumably possible by always pulling up at the last moment (without exceeding g limits), it is apparent that pilots pull up sooner than minimum safety requirements would require. The parameter K essentially describes how much extra safety margin pilots allow themselves.

(4) P - Peak anticipation factor.

When relatively severe peaks occur on the terrain, the limitation of downward g load will generally cause severe overshoot beyond the peak if pull up before the peak is based on safety (K). The parameter P describes the amount of anticipation the pilot uses to avoid severe overshoot. Results obtained from g limited "optimal" trajectories have indicated that mean clearances tend to be reduced if the pilot flies horizontally over peaks. The parameter P is taken such that if P = 1, the simulation will anticipate in such a fashion that the A/C will be horizontal over significant peaks. If $P < 1$, the anticipation will not be soon enough and the A/C will usually overshoot beyond a peak. If $P > 1$, anticipation will be too soon and overshoot will usually occur before a peak.

(5) S - Mean shift

The simulator will allow near zero clearances. In actual flight a pilot will tend to keep above a certain nominal clearance for safety. For instance, while flying over a long flat plain, a pilot will maintain some nominal altitude while the simulator will essentially stay on the ground. The parameter S indicates the amount of (upward) shift necessary to make the mean value of a simulated flight equal to the mean value of a simulated flight equal to the mean value of an actual flight.

II. Description of the Simulator.

A. Terrain

The simulator uses terrain described as piecewise linear segments. Fine structure terrain data is available for the Tonopah courses, but simplified terrain profiles were used for the simulations. The moderate and rough courses contained 1251 and 2500 terrain segments respectively. To require the simulator to use all of these segments would have entailed prohibitive computer time since at each step in the simulation the model must examine each terrain segment in front of the A/C for considerable distance down range. The simplified terrains (86 and 120 segments) were created by straight lines from significant peak and valley points. Only the fine structure of the profiles was changed. It is felt that using the simplified terrain has had a negligible effect on the simulation results, even at the lowest speeds. The simulation essentially filters fine structure in much the same manner as would a pilot.

The profile is assumed to extend to infinity at zero slope from the end of the given piece of terrain.

B. Notation

The following quantities are used:

v - air speed (fps) - assumed constant throughout flight.

Gu - maximum incremental g allowed in pull up maneuver.

Gd - maximum incremental g allowed in push over maneuver.

K - non-dimensional "look ahead" factor, $K > 1$.

P - non-dimensional "peak anticipation" factor, $P \geq 0$

(u_{i-1}, h_{i-1}), (u_i, h_i) - The end points of the ith terrain segment $u_i > u_{i-1}$.

The distance down range is given by u and the altitude by h. The index i increases down range (ahead of the A/C).

s_i - Slope of the i^{th} terrain segment. $s_i < \infty$. $s_i = \frac{h_i - h_{i-1}}{u_i - u_{i-1}}$

b_i - Intercept of i^{th} terrain segment. $b_i = h_i - s_i u_i$

vt - Distance traveled in one step of simulation. It is possible to consider t as the time between decisions, but caution should be used in thinking of t as a pilot reaction time since such phenomena is likely lost by ignoring the A/C dynamics.

The following notation is used:

(x,y) - Location of the A/C.

α - Attitude of A/C $-\frac{\pi}{2} < \alpha < \frac{\pi}{2}$

R_u - Radius of up turn circle $R_u = \frac{v^2}{(32.2)G_u}$

R_d - Radius of down turn circle $R_d = \frac{v^2}{(32.2)G_d}$

R_s - Radius of sense circle $R_s = \sqrt{R_u^2 + (K\ vt)^2}$

β_u - Change in A/C attitude with up turn $\beta_u = vt/R_u$

β_d - Change in attitude with down turn $\beta_d = vt/R_d$

R_k - Maximum examination ahead distance. For efficiency it is not necessary that <u>all</u> terrain segments ahead of the A/C be examined at every step. Only those segments which can affect the simulation need be examined. Those segments which have an endpoint in the range $x \leq u_i \leq x + R_k$ are examined. R_k is computed as follows: Let h_m be the total altitude deviation of the terrain; i.e. $h_m = \max(h_i) - \min(h_i)$, for all i. If $h_m > R_d$, then let

$R_k' = 2R_u + R_d$. If $h_m \leq R_d$, then let $R_k' = \sqrt{h_m(2R_u + 2R_d - h_m)}$.

Now, let R_k be $R_k = \max\left\{R_k', 2R_s\right\}$.

(x_c, y_c) - Center of up turn circle. If A/C is at position (x,y) and attitude α, then

$x_c = x - R_u \sin\alpha$

$y_c = y 2 R_u \cos\alpha$

C. Maneuvers

Three maneuvers are possible. Let the A/C be at position (x,y) with attitude α. After completing one of the three maneuvers, the A/C position and attitude will be:

1. Up maneuver

$x \rightarrow x + 2R_u \sin(\beta_u/2) \cos(\alpha + \beta_u/2)$

$y \rightarrow y + 2R_u \sin(\beta_u/2) \sin(\alpha + \beta_u/2)$

$\alpha \rightarrow \alpha + \beta_u$

2. Down maneuver

$x \rightarrow x + 2R_d \sin(\beta_d/2) \cos(\alpha - \beta_d/2)$

$y \rightarrow y + 2R_d \sin(\beta_d/2) \sin(\alpha - \beta_d/2)$

$\alpha \rightarrow \alpha - \beta_d$

3. Straight maneuver

$x \rightarrow x + vt \cos\alpha$

$y \rightarrow y + vt \sin\alpha$

$\alpha \rightarrow \alpha$

Note that the A/C flies on straight lines or arcs of circles.

D. Simulation logic without peak anticipation

We shall temporarily ignore peak anticipation. Let the A/C be at point A (Figure 1) with coordinates (x,y) and attitude α. The up turn circle (center C_u, radius R_u) and down turn circle (center C_d, radius R_d) are both tangent to the velocity vector of the A/C (QA) at the point A. The points S and S' are on QA extended. The points U and D are placed such that the arc lengths AU = vt and AD = vt. The point S is placed such that the length AS = vt. If the A/C makes an up (down) maneuver it will next be at point U (D) and its attitude will be the slope of a line tangent to the up (down) circle at point U (D). If the A/C flies straight it will be at S with attitude unchanged.

First, it must be decided whether safety requires a pull up. The A/C is temporarily placed at point S and a new up circle is drawn (center C_{us}, radius R_u, see Figure 2) tangent to AS at S. The point S' is placed on AS extended such that the distance SS' = K vt (K 1). A sense circle with radius R_s is drawn with center C_{us}. If any terrain is found inside the sense circle down range from the original A/C (point A) and "above" the line AS', the A/C must go up.

If no terrain is in the sense circle "above" AS' it is always safe for the A/C to fly straight and, it may be safe to make a downward maneuver. Examination of the downward possibility is made as follows: The A/C is temporarily placed at point D with a temporary attitude of the slope of a line thru D tangent to the down turn circle. A temporary up turn circle (center C_u', radius R_u, see Figure 3) is drawn tangent to the down circle at D. A new sense circle is drawn with center at C_u' and radius $R_s(\overline{DS}'' = K\ vt)$. If any terrain is in the new sense circle "above" the line DS" then a down maneuver is not to be considered safe and a straight maneuver is made. If no terrain is in the new sense circle "above" DS", a down maneuver is made.

Define

$$z_c = x_c^2 + y_c^2 - R_k^2$$

$$z_i = x_c + s_i(y_c - b_i)$$

$$z_i' = z_i^2 - (1 + s_i^2)(z_c + b_i^2 - 2y_c\, b_i)$$

The i^{th} terrain segment will be inside the sense circle and "above" the velocity vector if all the conditions below hold and the segments are examined in order down range from the A/C

(1) $s_i - \tan\alpha > 0$, and

(2) $\dfrac{y - x\tan\alpha - b_i}{s_i - \tan\alpha} - u_i \leq 0$, and

(3) $\dfrac{y - x\tan\alpha - b_i}{s_i - \tan\alpha} - x \geq 0$, and

(4) $z_i' \geq 0$, and

(5) $\dfrac{z_i + \sqrt{z_i'}}{1 + s_i^2} - u_{i-1} \geq 0$, and (6) $\dfrac{z_i - \sqrt{z_i'}}{1 + s_i^2} - u_{i-1} \geq 0$.

When the A/C is placed at U, S, or D, the process just described is repeated.

E. Peak anticipation logic

If P 0, the following procedure is used before the procedure described immediately above. Let the coordinates of a "peak" be (u_p, h_p) (Figure 4). The circle D of radius R_d is drawn with center $(u_p, h_p - R_d)$. In order for an A/C which is below the peak to fly level over the peak, the A/C must be on, and tangent to, the circle D. Once the A/C is inside D, it is impossible to fly level over the peak.

As the A/C approaches the peak, the up turn circle U (center C_u, radius R_u) moves along with the A/C. When the circle U impinges on the circle D, the A/C cannot get on the D circle if it is anywhere on the arc AA' unless it pulls up immediately and continues to pull up until the point A' is reached. At this point the A/C is released from anticipation and will usually follow circle D, with the technique of the last section, over the peak unless some higher peak becomes important.

The simulation proceeds as follows: At each step quantities $X_i = u_i - x_c$ and $Y_i = y_c - h_i + R_d$ are computed for all visible (line of sight) terrain points within the examination region. If, at any step, a terrain point is found such that

$$X_i^2 = Y_i^2 \leq (R_u + R_d)^2 \quad \text{i.e. } i = p$$

then the circles have impinged. Now, if the A/C is on arc AA'; i.e., if $\alpha < \alpha_p$, the A/C will be forced to make up maneuvers until $\alpha \geq \alpha_p$. Then the A/C will be allowed to fly free of the anticipation.

The actual quantities examined are

$$(1) \quad (X_i)^2 + Y_i^2 \leq (.99 + .01P)^2 (R_u + R_d)^2$$

$$(2) \quad \alpha \leq \alpha_p \qquad \alpha_p = \tan^{-1}\left(\frac{X_p}{Y_p}\right)$$

If P = 1, equation (1) is the same as above and "perfect" anticipation is accomplished. If $P < 1$, the left side of (1) is larger than necessary for "perfect" anticipation and the simulation will sense impingement later than it has actually occurred. In this case the A/C will pull up late and will overshoot beyond the peak. If $P > 1$, anticipation will be early and "overshoot" will occur before the peak. It must be remembered that the techniques of the last section are always used, except when both (1) and (2) hold. In this case an up maneuver is mandatory and the safety conditions need not be examined.

Due to the possibility of a "peak" being immediately in front of a much larger peak, the actual procedure is a bit more complicated than the above. The essential features have been described. The remainder of this section contains the details of the peak anticipation technique.

As before, all terrain segments are examined which have end points in the range $x \leq u_i \leq x + R_k$. All visible terrain points are examined, i.e. all segments such that

$$(*) \qquad \frac{h_i - y}{u_i - x} > \frac{h_n - y}{u_n - x} \qquad i > n$$

All segments which satisfy (*) and also satisfy

$$(**) \qquad (u_i - x_i)^2 + (y_c + R_d - y_i)^2 \leq (R_u + R_d)^2(.99 + .01P)^2$$

will be called "possible peaks". If there are no "possible peaks" use the technique of Section II-D. If one point satisfies (*) and (**), then it is the peak (i = p). If more than one point satisfies (*) and (**) choose the nearest (nearest to the A/C) possible peak (u_p, h_p) for which

$$(***) \qquad (u_j - u_p)^2 + (h_p + R_u + R_d - h_j)^2 > (R_u + R_d)^2$$

for all possible peaks with $j > p$. At least one possible peak satisfies (***).

Now, if

$$(****) \qquad \alpha < \alpha_p \qquad \alpha_p = \arctan\left(\frac{X}{Y}\right)$$

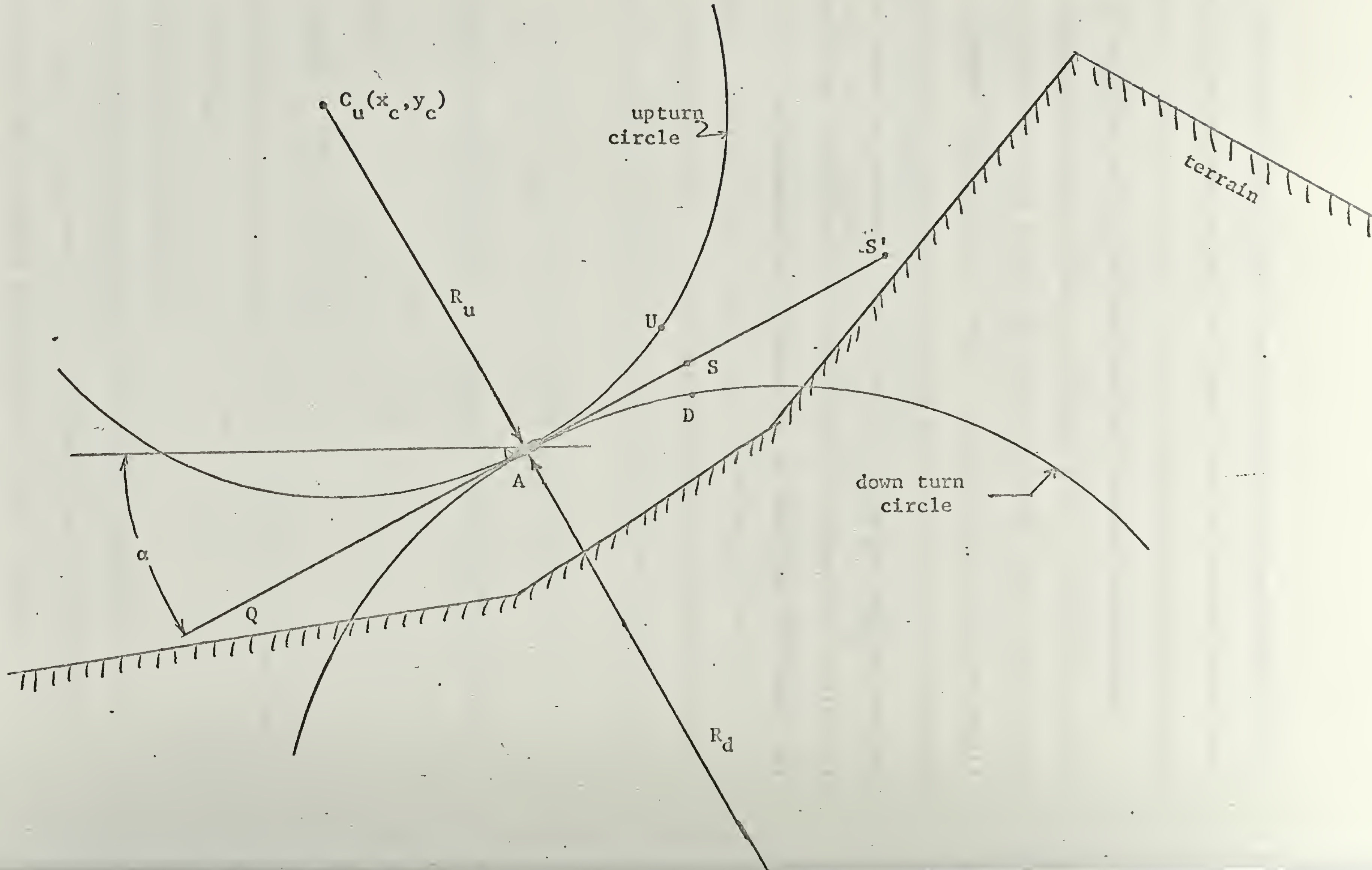
then the A/C must make an up maneuver, if (****) is not satisfied then Section II-D is used.

III. Flight-Simulation Comparison

In order to show the usefulness of the flight simulator, it is necessary to show that parameters Gu, Gd, P and K can be found which yield simulations which compare favorably with actual flights. The technique used was to find a set of parameters for each trial examined which yielded a simulation which was "close" to the flight flown. In the material to follow the word "flight" is used to mean an actual trial to which a simulation is fitted.

A collection of about 2000 smoothed data points were used to describe each flight. A four-dimensional search procedure was used to find the Gu, Gd, P and K which minimized the sum of squared deviations between flight and simulation altitudes. These deviations were computed at each data point of the flight after the altitudes of the simulation had been adjusted so that the mean altitude of the simulation was equal to that of the flight. The amount of adjustment in the simulation associated with the "best" fit was taken as the value of the parameter S.

Figure 1



$C_u(x_c, y_c)$
upturn circle
terrain
S'
R_u
U
S
D
A
down turn circle
α
Q
R_d

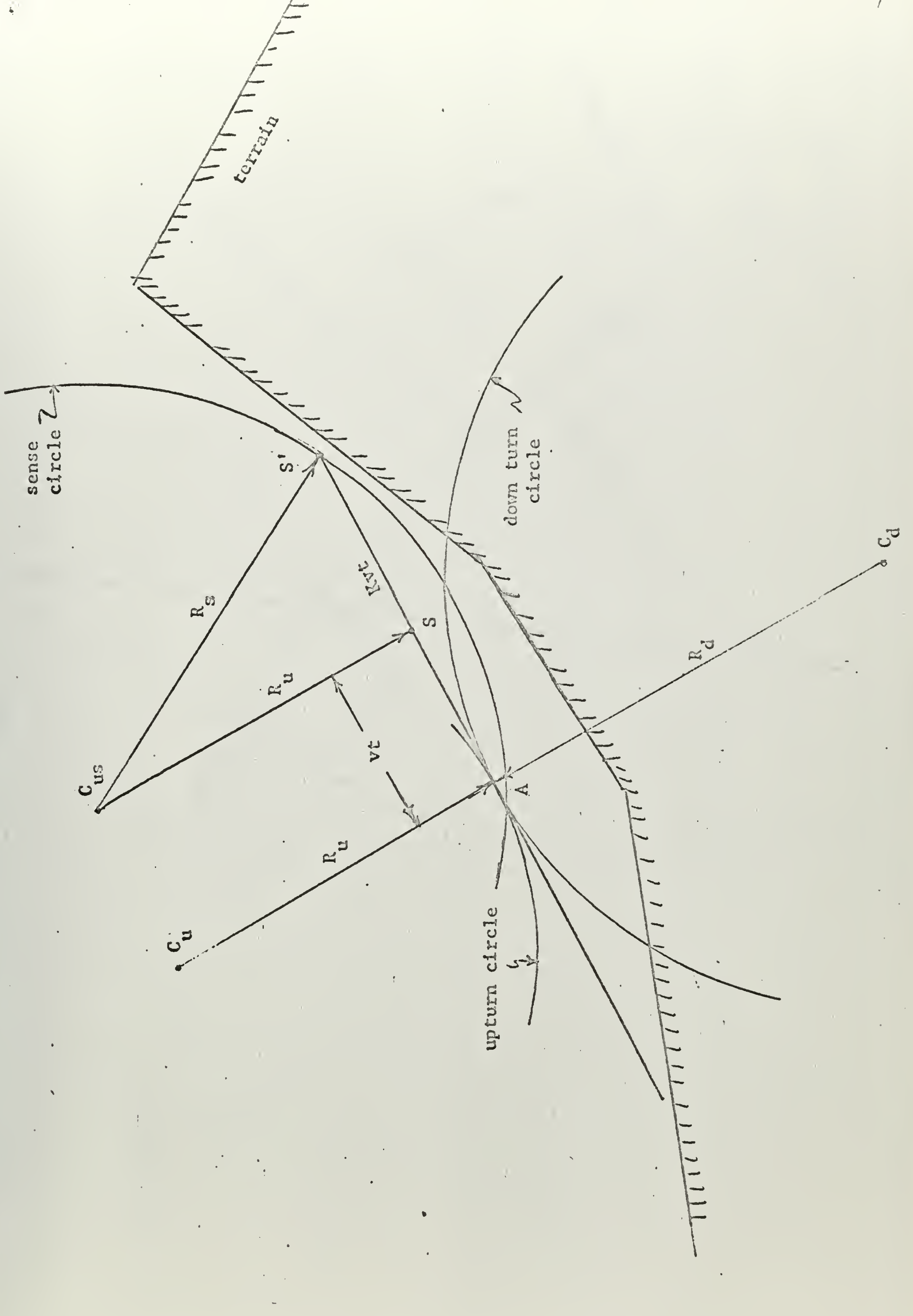

terrain
sense circle
down turn circle
S'
R_s
Kvt
S
R_u
R_d
C_d
C_{us}
vt
A
R_u
C_u
upturn circle

Figure 3

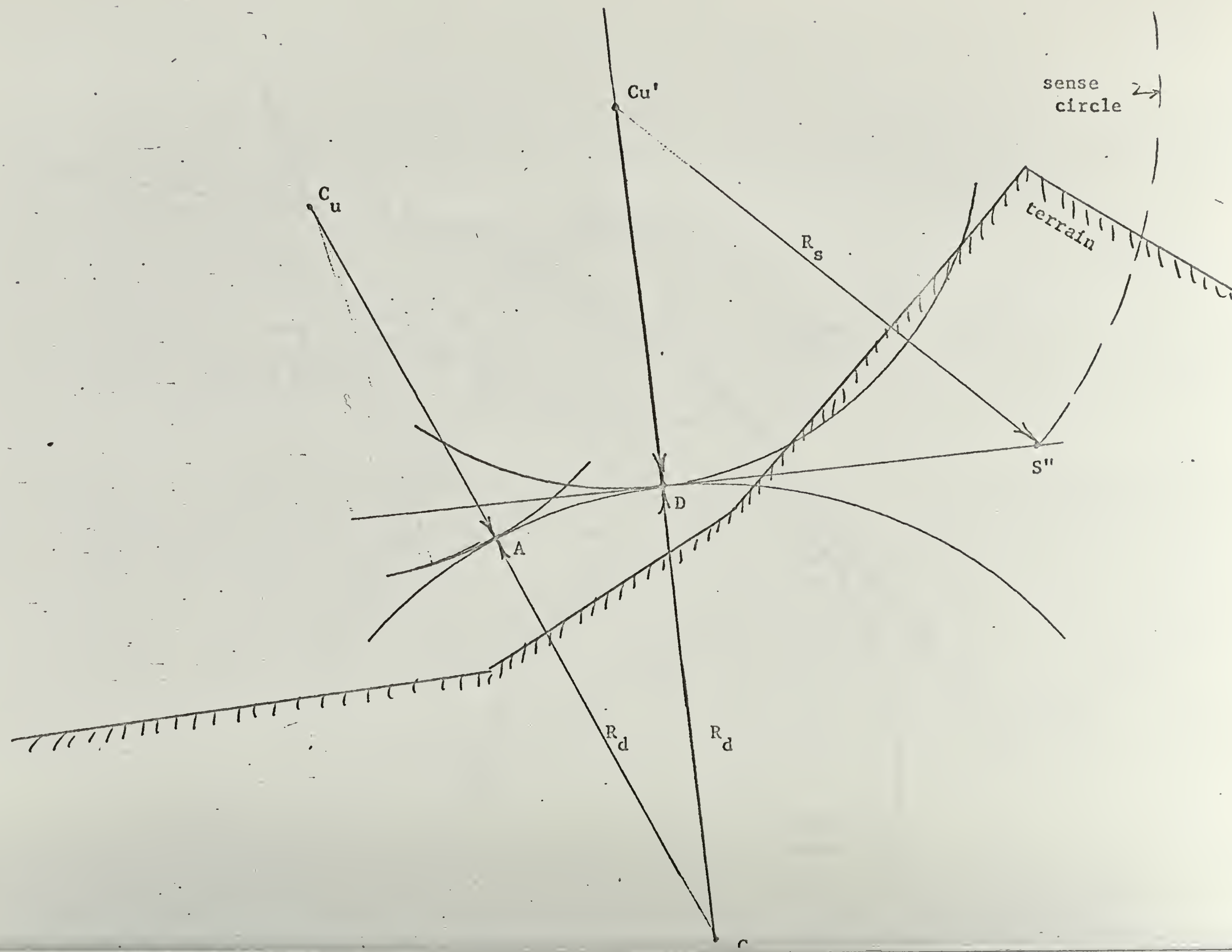
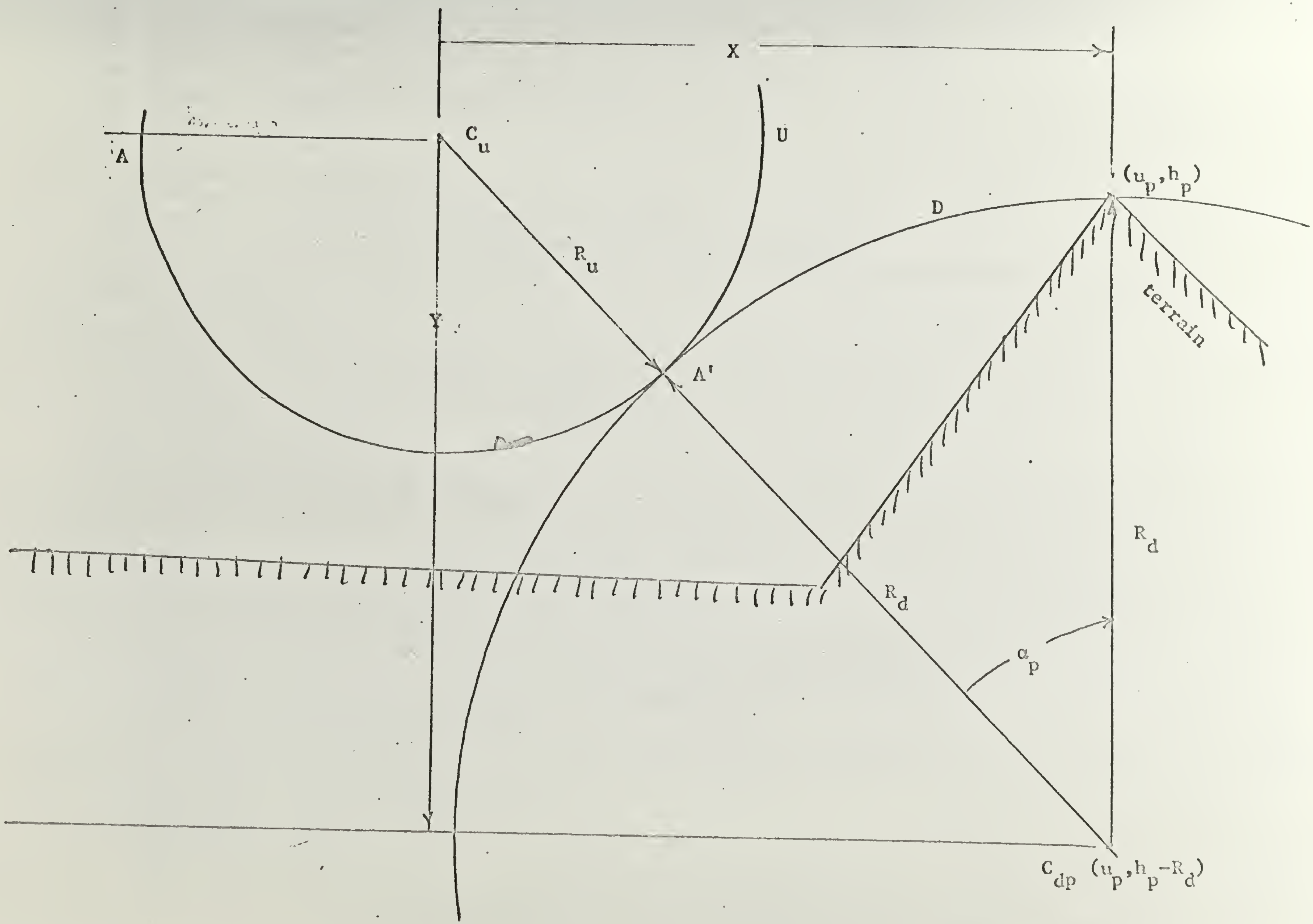


Figure 4



FORTRAN 63 FLIGHT SIMULATION PROGRAM LISTING

```
      PROGRAM JTESFC4
C     ARONSON
      DIMENSION DUMMY(7),JCODE(8)
      DIMENSION ALIMS(8),GS(4),ANS(4)
      DIMENSION IDL(20),ID(23),STA(1000)
      DIMENSION PLARAY(25),               JPLARAY(25),CL(5001)
      EQUIVALENCE (PLARAY,JPLARAY)
      COMMON/D4/GD1,GD2,XK1,XK2,PK1,PK2 ,GU1,GU2
      COMMON AS,GU,GD,XK,V,VT,PK,XF,NT,NF,HM,XP(5001),YP(5001),
     1TX(120),TY(120),TS(120),TB(120),F(3,1001),ND,FAV,CM,NDS
      DATA(JPLARAY(19)=11,1),(JPLARAY(24)=4,1)
      DATA(PLARAY(16)=0.,330000.,30.),(PLARAY(23)=10.)
      DATA(DSTA=5.),(DSTA1=50.)
      DATA                 (IRQ1=7HJTFTSSK),(IBL=1H )
10000 VT=300. $ REWIND 1
      BUFFERIN(1,0)(DUMMY(1),DUMMY(7))
  586 IF(UNIT,1)586,502,502,502
  502 IKNOW = LENGTHF(1)
   20 READ1,(IDL(I),I=1,20)    $ IREW=0
      ALIMS(1)=ALIMS(2)=ALIMS(3)=ALIMS(4)=0.
      ALIMS(7)=ALIMS(5)=ALIMS(6)=ALIMS(8)=1.
       IF(IDL(1)-IBL) 22,21,22
    1 FORMAT(10A8)
 5     FORMAT(7F8.0,2A2,4X,8F8.0,I2)
   21 GO TO 199
   22 PRINT2,(IDL(I),I=1,20) $ DECODE(144,5,IDL(3))V,GU,GD,PK,XK,XST,
     1XEND,IPL,ISV,GU1,GU2,GD1,GD2,PK1,PK2,XK1,XK2,NITER
    2 FORMAT(25HSIMULATION-FLIGHT COMPARE/1X,
     163HSORTIE  TERRAIN   V     GU      GD      P      K        START
     23HEND/1X,10A8/1X,10A8)
       IF(GD) 24,23,25
   23 PRINT990 $ GO TO 20
  990 FORMAT(14H REQUEST ERROR)
   24 GD=-GD
   25 IF(GU) 23,23,26
   26 IF(PK) 27,28,28
```

```
   27 PK=0.
   28 IF(V -100.) 23,29,29
   29 IF(UNIT,1) 29,30
   30 BUFFERIN(1,1)(ID(1),ID(22))
   31 IF(UNIT,1) 31,34,43,33
  43    IF(IREW) 44,44,32
   44 REWIND 1
  504 IF (UNIT,1) 504,505
  505 BUFFERIN (1,0) (DUMMY(1),DUMMY(7))
      IREW=1
      GO TO 29
   32 PRINT991 $ GO TO 20
  991 FORMAT(15H CANNOT FIND ID)
   33 PRINT992 $ GO TO 34
  992 FORMAT(10H ID PARITY)
   34 IKNOW= LENGTHF(1)
C     THE 534 LOOP CONVERTS ZEROS AND BLANKS FROM IBM TAPE CODE TO
C     1604 INTERNAL CODE
      DO 534 I=1,21
      DECODE(8,535,ID(I))JCODE
      DO 536 J=1,8
      IF(JCODE(J) - 1H+ ) 600,601,600
  601 JCODE(J) = 1H
      GO TO 536
  600 IF(JCODE(J) - 0020202020202020B)536,602,536
  602 JCODE(J) = 1H0
  536 CONTINUE
      ENCODE(8,535,ID(I))JCODE
  534 CONTINUE
  535 FORMAT(8A1)
      PRINT 600,(ID(J),J=1,22)
  600 FORMAT(1X,10A8/11A8,I5)
  501 FORMAT(1X,O16)
  500 FORMAT (I15)
      IF(LENGTHF(1)-22) 35,36,35
   35 PRINT993 $ GO TO 199
```

```
  993 FORMAT(10H ID LENGTH)
C  36 IF(ID(1)-IRQ1) 40,38,40
   36 CONTINUE
   38 IF(ID(7) - IDL(1)) 40,42,40
C  39 IF(ID(14)-IDL(2)) 40,42,40
   39 CONTINUE
   40 BUFFERIN(1,1)(ID(1),ID(2))
       GO TO 29
   42 PRINT3,(ID(I),I=1,19),ID(22)     $ IREW=0
    3 FORMAT(12H DATA FOUND 10A8/12X,9A8,I8//)
   50 CALL TERSET(ID(14),PLARAY(21))
C     FILLS TX,TY,TS,TB,NT,HM,PLARAY
      ND=ID(22) $ IF(ND-20) 51,51,52
   51 PRINT995 $ GO TO 20
  995 FORMAT(12H DATA LENGTH)
   52 IF(ND-1000) 53,53,51
   53 MANY = 3*ND
      BUFFERIN(1,1)(F(1),F(MANY))
   54 IF(UNIT,1) 54,56,32,55
   55 PRINT996 $ GO TO 20
  996 FORMAT(12H DATA PARITY)
   56 IKNOW = LENGTHF(1)
      PRINT 500,IKNOW
      IF(3*ND-LENGTHF(1)) 577,57,577
  577 IF(LENGTHF(1)-22) 51,51,578
  578 ND = LENGTHF(1)/3
      PRINT 892,ND
  892 FORMAT(1H0,21HPROGRAM WILL USE ND =I5)
 57    CONTINUE      $ DO 119 J=1,ND
 119   F(1,J)=F(1,J)*6080.2  $ IF(XEND-XST) 121,121,122
 121    PRINT997 $ GO TO 20
  997 FORMAT(16H START-END ERROR)
 122   DO 130 NDS=1,ND $ IF(XST-F(1,NDS)) 131,131,130
 130   CONTINUE $ GO TO 121
 131   DO 132 J=NDS,ND $ IF(XEND-F(1,J)) 133,132,132
 132   CONTINUE $ J=ND+1
```

```
133    ND=J-1  $ IF(ND-NDS-10) 121,123,123
123    NDPL=NDS+4 $ Z=Z1=Z2=Z3=0. $ DO 124 J=NDS,NDPL
       Z=Z+F(1,J) $ Z1=Z1+F(1,J)**2 $ Z2=Z2+F(2,J)
124    Z3=Z3+F(1,J)*F(2,J) $ NDPL=NDPL+1-NDS
       AS=ATANF((Z3*NDPL-Z2*Z)/(Z1*NDPL-Z*Z))
      M=2 $ DO 62 J=NDS,ND
   58 IF(F(1,J)-TX(M)) 60,59,59
   59 M=M+1 $ GO TO 58
   60 Z=TS(M)*F(1,J)+TB(M)
      F(3,J)=F(2,J)-Z
      IF(F(3,J)) 61,62,62
   61 F(2,J)=Z $ F(3,J)=0.
   62 CONTINUE
      Z=F(1,NDS) $ DO 63 J=1,1000
   63 STA(J)=0. $ XE=F(1,ND) $ FAV=0.  $ SSAVS=0
      M=NDS $ Z1=(F(3,M+1)-F(3,M))/(F(1,M+1)-F(1,M))
      Z2=F(3,M)-Z1*F(1,M) $ IZ=0   $  K=2
   64 IF(Z-XE) 65,65,76
   65 IF(Z-F(1,M)) 67,67,66
   66 M=M+1 $ Z1=(F(3,M)-F(3,M-1))/(F(1,M)-F(1,M-1))
      Z2=F(3,M)-Z1*F(1,M) $ GO TO 65
   67 Z3=Z1*Z+Z2                          $ IF(Z3) 68,69,69
   68 Z3=0.
   69 I=Z3/DSTA+1. $ IF(I-1000) 71,71,70
   70 I=1
   71 STA(I)=STA(I)+1.
      IF(I-IZ) 73,73,72
   72 IZ=I
73     IF(Z-TX(K)) 111,111,110
110    K=K+1 $ GO TO 73
111    FAV=FAV+TS(K)*Z+TB(K)+Z3 $ Z=Z+DSTA1 $ SSAVS=SSAVS+Z3 $ GO TO 64
   76 DO 74 J=2,IZ
   74 STA(J)=STA(J)+STA(J-1) $ Z=STA(IZ) $ FAV=FAV/Z $ SSAVS=SSAVS/Z
      DO 75 J=1,IZ
   75 STA(J)=STA(J)/Z
      PRINT6,FAV,SSAVS
```

```
    6 FORMAT(///36H FLIGHT DATA WITH SIMPLIFIED TERRAIN/13H FLIGHT MEAN=
     1F10.1,12H MEAN CLEAR=F10.1
     2     /4(10X,1HS4X,3HALT4X,3HCLR)/(4(1X,F10.0,2F7.0)))
      PRINT7,DSTA,DSTA
    7 FORMAT(65H CUMULATIVE DIST. OF FLIGHT CLEARANCES OVER SIMPLIFIED T
     1ERRAIN ATF4.0,16HFT. INTERVALS  (F6.0,1H)/1X,10F9.6)
      IF(GD1) 200,23,201
  200 GD1=-GD1
  201 IF(GD2) 202,23,203
  202 GD2=-GD2
 203  GD2=GD2-GD1 $ GS(1)=(GD-GD1)/GD2 $ IF(GD2) 204,224,204
 224   GS(1)=0. $ ALIMS(5)=0. $ GD1=GD
  204                       IF(PK1) 23,205,205
  205 IF(PK2) 23,206,206
 206  PK2=PK2-PK1 $ GS(2)=(PK-PK1)/PK2 $ IF(PK2) 207,227,207
 227   GS(2)=0. $ ALIMS(6)=0. $ PK1=PK
 207   IF(XK1-1.05) 23,208,208
  208 IF(XK2-1.05) 23,209,209
 209   XK2=XK2-XK1 $ GS(3)=(XK-XK1)/XK2 $ IF(XK2) 210,229,210
 229   GS(3)=0. $ ALIMS(7)=0. $ XK1=XK
 210   IF(GU1) 23,23,220
 220   IF(GU2) 23,23,221
 221   GU2=GU2-GU1 $ GS(4)=(GU-GU1)/GU2 $ IF(GU2) 223,222,223
 222   GS(4)=0. $ ALIMS(8)=0. $ GU1=GU
 223   DO 212 J=1,4 $ IF(GS(J)) 23,211,211
  211 IF(GS(J)-1.) 212,212,23
  212 CONTINUE $ IF(NITER) 23,225,225
 225   DO 226 K=5,8 $ IF(ALIMS(K)) 213,226,213
 226   CONTINUE $ GO TO 228
 213   CALL JTMIN(4,NITER,ALIMS,GS,ANS,Z)
      GD=ANS(1)*GD2+GD1 $ PK=ANS(2)*PK2+PK1 $ XK=ANS(3)*XK2+XK1
       GU=ANS(4)*GU2+GU1
 228   XP(1)=F(1,NDS) $ YP(1)=F(2,NDS)
      CALL JTDEC3A $ CALL SMSTA(AV,Z)
       PRINT232,(IDL(J),J=1,20)
  232 FORMAT(1H 10A8/1X,10A8)
```

```
      ENCODE( 96,8,PLARAY)ID(14),ID(3),ID(7),ID(10),ID(13),IDL(3)
     1 ,GU,GD,PK,XK,AV,Z
8     FORMAT(9H           A3,3A8,A4,A8,4F8.3,2F8.0)
                 M=2 $ DO 89 J=1,NF
      YP(J) = YP(J)+AV
 88   IF(XP(J)-TX(M)) 89,89,87
 87   M=M+1 $ GO TO 88
 89   CL(J)=YP(J)-TS(M)*XP(J)-TB(M)
      PRINT9,(PLARAY(J),J=1,15),FAV,AV
  9   FORMAT(8H MIN RMS/1X,10A8/1X,5A8,11H FLIGHT AV=F10.0,8H SIM S =
     1F10.0//4(10X,1HS,4X,3HALT,4X,3HCLR)/(4(1X,F10.0,2F7.0)))
      IF(ISV-IBL) 90,91,90
 90   WRITE OUTPUT TAPE3,10,(PLARAY(J),J=1,15),(XP(K),YP(K),K=1,NF)
 10   FORMAT(10A8/5A8,40X/(8(F6.0,F4.0)))
 91   DO 92 J=1,1000
 92   STA(J)=0. $ M=2 $ Z1=(CL(2)-CL(1))/(XP(2)-XP(1))
      ZS=XP(NF) $ Z=XP(1) $ Z2=CL(2)-XP(2)*Z1 $ IZ=0
 93   IF(Z-ZS) 94,102,102
 94   IF(Z-XP(M)) 96,96,95
 95   M=M+1 $ Z1=(CL(M)-CL(M-1))/(XP(M)-XP(M-1))
      Z2=CL(M)-Z1*XP(M) $ GO TO 94
 96   Z3=Z1*Z+Z2 $ K=Z3/DSTA+2. $ IF(K) 97,97,98
 97   K=1
 98   IF(K-1000) 100,100,99
 99   K=1
100   STA(K)=STA(K)+1. $ Z=Z+DSTA1
      IF(K-IZ) 93,93,101
101   IZ=K $ GO TO 93
102   DO 103 J=2,IZ
103   STA(J)=STA(J)+STA(J-1) $ Z=STA(IZ)
      DO 104 J=1,IZ
104   STA(J)=STA(J)/Z
      PRINT11,DSTA,DSTA1
 11   FORMAT(34H CUMULATIVE DIST. OF SIMULATION ATF4.0,14HFT INTERVALS (
     1F6.0,1H)/1X,10A8/1X,5A8,10H NEGATIVE=F9.6/(1X,10F9.6))
      IF(IPL-IBL) 105,20,105
```

```
105    CALL JTFPL1(PLARAY,PLARAY,0,-1)
       CALL JTFPL1(TX(2),TY(2),NT-2,1)
      CALL JTFPL1(XP,YP,NF,2)
       DO 106 J=NDS,ND
      XP(J)=F(1,J)
  106 YP(J)=F(2,J)
       CALL JTFPL1(XP(NDS),YP(NDS),ND-NDS+1,3)
      GO TO 20
199    STOP
      END
```

```
      SUBROUTINE SMSTA(AV,RM)
      COMMON AS,GU,GD,XK,V,VT,PK,XF,NT,NF,HM,XP(5001),YP(5001),
     1TX(120),TY(120),TS(120),TB(120),F(3,1001),ND,FAV,CM,NDS
      Z=0. $ DO 10 J=1,NF
   10 Z=Z+YP(J) $ Z=FAV-Z/NF $ XP(NF+1)=1.E20 $ YP(NF+1)=YP(NF) $ R=0
      M=2 $ Z1=(YP(2)-YP(1))/(XP(2)-XP(1))
      Z2=YP(2)-Z1*XP(2) $ DO 13 J=NDS,ND
   11 IF(F(1,J)-XP(M)) 13,13,12
   12 M=M+1 $ Z1=(YP(M)-YP(M-1))/(XP(M)-XP(M-1))
      Z2=YP(M)-Z1*XP(M) $ GO TO 11
   13 R =R +(Z1*F(1,J)+Z2-F(2,J)+Z)**2
      R =SQRTF(R /(ND-NDS+1))      $ AV=Z $ RM=R
      PRINT1,GU,GD,  PK,XK,Z,R
1     FORMAT(9H SIM  GU=F8.3,4H GD=F8.3,4H P =F8.3,3H K=F8.3,4H S =F10.1
     1,5H RMS=F10.1)
      END


      FUNCTION FOX(AN)
      DIMENSION AN(4)
      COMMON/D4/GD1,GD2,XK1,XK2,PK1,PK2 ,GU1,GU2
      COMMON AS,GU,GD,XK,V,VT,PK,XF,NT,NF,HM,XP(5001),YP(5001),
     1TX(120),TY(120),TS(120),TB(120),F(3,1001),ND,FAV,CM,NDS
       XP(1)=F(1,NDS) $ YP(1)=F(2,NDS)
      GD=AN(1)*GD2+GD1 $ PK=AN(2)*PK2+PK1 $ XK=AN(3)*XK2+XK1
       GU=AN(4)*GU2+GU1
      CALL JTDEC3A $ CALL SMSTA(AV,Z)
      FOX=Z
      END
```

```
      SUBROUTINE JTMIN(NV,KK,     A, GUESS, X, FOFX)
C     H2 SAND MIN
C  THIS DECK DIFFERS FROM THE MIN WRITEUP--DEL IS A DIMENSIONED VARIABLE AND
C  MUST BE DIMENSIONED IN CALLING PROGRAM--DEL(I) MUST NOT = 0.
      DIMENSION DEL(5), DELTA(5 )  ,DM(5)
      DIMENSION A(1), GUESS(1), XNEW(5 ), XNOW(5 ), X(1)
      DATA(DEL=.25,.25,.25,.25,.25),(DM=.5,.5,.5,.5,.5)
      NK = KK
      NX = NV
      DO 5 I = 1, NX
      DELTA(I) = DEL(I)
      XNOW(I) = GUESS(I)
 5    XNEW(I) = XNOW(I)
 20   FNOW = FOX(XNOW)
 201  FOLD = FNOW
 200  DO 40 I = 1, NX  $ NA=NX+I $ IF(A(NA)-A(I)) 202,34,202
 202  XNEW(I) = XNEW(I) + DELTA(I)
      IF(XNEW(I) - A(NA)) 22, 22, 21
 21   XNEW(I) = A(NA)
 22   FNEW = FOX(XNEW)
      IF(FNEW - FNOW) 25, 26, 26
 25   FNOW = FNEW
      GO TO 40
 26   XNEW(I) = XNOW(I) - DELTA(I)
      IF(XNEW(I) - A(I)) 28, 30, 30
 28   XNEW(I) = A(I)
 30   FNEW = FOX(XNEW)
      IF(FNEW - FNOW) 25, 34, 34
 34   XNEW(I) = XNOW(I)
 40   CONTINUE
      IF(FNOW - FOLD) 50, 45, 45
 45   IF(NK) 46, 46, 47
47    DO 48 I=1,NX
48    DELTA(I) = DELTA(I)*DM(I)
      NK = NK - 1
      GO TO 200
```

```
50    DO 60 I = 1, NX
      T = XNOW(I)
      XNOW(I) = XNEW(I)
      XNEW(I) = 2.*XNEW(I) - T
      NA = NX+I
      IF(XNEW(I) - A(NA)) 52, 60, 51
51    XNEW(I) = A(NA)
      GO TO 60
52    IF(XNEW(I) - A(I)) 53, 60, 60
53    XNEW(I) = A(I)
60    CONTINUE
      FNEW = FOX(XNEW)
      IF(FNEW - FNOW) 65, 70, 70
65    FNOW = FNEW
      GO TO 50
70    DO 71 I = 1, NX
71    XNEW(I) = XNOW(I)
      GO TO 201
 46   FOFX = FNOW
      DO 80 I = 1, NX
80    X(I) = XNOW(I)
      RETURN
      END
```

```
      SUBROUTINE JTDFC3A
C       ARONSON
      COMMON AS,GU,GD,XK,V,VT,PK,XF,NT,NF,HM,XP(5001),YP(5001),
     1TX(120),TY(120),TS(120),TB(120),F(3,1001),ND,FAV,CM ,NDS
       DIMENSION TP(120),JS(100)
      DATA(PI2=1.57079633)
       I=2  $ NS=2 $ NE=2      $ A=AS
       DO 10 J=2,NT
10     TP(J)=1.+TS(J)**2
                RU=V*V/GU/32.2 $ RD=V*V/GD/32.2
      RL2=RU*RU+(VT*XK)**2 $ RL=SQRTF(RL2)
      X=XP(1) $ Y=YP(1)
      RD2=RD*RD
      BU=VT/RU $ BU2=BU/2.
      BD=VT/RD $ BD2=BD/2.
      DVU=2.*RU*SINF(BU2)
      DVD=2.*RD*SINF(BD2)     $ RUPRD=RU+RD
       RUPRD2=(RU+RD)**2 $ PKRR=RUPRD2*((.99+.01*PK)**2)
                           RR=RU+RU+RD $ IF(HM-RD) 14,15,15
14     RR=RU+SQRTF(HM*(2.*(RU+RD)-HM))
15     IF(RL+RL-RR)17,17,16
16     RR=RL+RL
17    SA=SINF(A) $ CA=COSF(A) $ TA=SA/CA $ AB=Y-TA*X
   19 Z=X+.2 $ DO 20 N=NS,NT
      IF(TX(N)-Z) 20,21,21
   20 CONTINUE $ N=NT
   21 NS=N $ Z=X+RR $ DO 22 N=NF,NT
      IF (TX(N)-Z) 22,22,23
   22 CONTINUF $ N=NT
   23 NF=N
      XC=X-RU*SA $ YC=Y+RU*CA
      IF(PK  ) 35,35,24
   24 Z=-1.E50 $ JS(1)=0 $ K=1 $ YCPRD=YC+RD
      DO 27 N=NS,NE $ ZC=(TY(N)-Y)/(TX(N)-X)
      IF(ZC-Z) 27,27,25
   25 Z=ZC
```

```
      IF((TX(N)-XC)**2+(YCPRD-TY(N))**2-PKRR) 26,26,27
   26 JS(K)=N $ K=K+1 $ IF(K-101) 27,28,28
   27 CONTINUE
   28 IF(JS(1)) 35,35,29
   29 NK=K-1 $ NK1=K-2.$ KP=JS(1) $ IF(NK1) 33,33,30
   30 DO 32 K=1,NK1 $ K1=K+1 $ KP=JS(K)
      DO 31 J=K1,NK $ M=JS(J)
      IF((TX(M)-TX(KP) )**2+(TY(KP)+RUPRD-TY(M))**2-RUPRD2) 32,32,31
   31 CONTINUE $ GO TO 33
   32 CONTINUE $ KP=JS(NK)
33    IF((TX(KP)-XC)/(YCPRD-TY(KP))     - TA) 35,35,34
   34 IF(A+BU-1.56905) 57,43,43
   35 IF(A+BU-1.56905) 36,43,43
36     XC=XC+VT*CA $ YC=YC+VT*SA
      ZC=XC**2+YC**2-RL2       $ YC2=YC+YC
      DO 42 J=NS,NE $ Z=TS(J)-TA
      IF(Z) 42,42,37
   37 Z1=(AB-TB(J))/Z
      IF(Z1-TX(J)) 38,38,42
   38 IF(Z1-X) 42,39,39
   39 ZB=XC+TS(J)*(YC-TB(J))
      ZT=ZB**2-TP(J)*(ZC+TB(J)*(TB(J)-YC2))
      IF(ZT) 42,40,40
   40 ZT=SQRTF(ZT) $ Z2=(ZB-ZT)/TP(J)
      IF(Z2-TX(J)) 41,41,42
   41 Z2=(ZB+ZT)/TP(J) $ IF(Z2-TX(J-1)) 42,57,57
   42 CONTINUE
   43 IF(A-BD+1.56905) 56,56,44
   44 CAD=COSF(A-BD) $ SAD=SINF(A-BD)
      XD=X+DVD*COSF(A-BD2) $ YD=Y+DVD*SINF(A-BD2)
      TAD=SAD/CAD $ ABD=YD-TAD*XD
      XC=XD-RU*SAD $ YC=YD+RU*CAD $ YC2=2*YC
      ZC=XC**2+YC**2-RL2
      DO 52 J=NS,NE $ Z=TS(J)-TAD
      IF(Z) 52,52,47
   47 Z1=(ABD-TB(J))/Z
```

```
      IF(Z1-TX(J)) 48,48,52
   48 IF(Z1-X) 52,49,49
   49 ZB=XC+TS(J)*(YC-TB(J))
      ZT=ZB**2-TP(J)*(ZC+TB(J)*(TB(J)-YC2))
      IF(ZT) 52,50,50
   50 ZT=SQRTF(ZT) $ Z2=(ZB-ZT)/TP(J)
      IF(Z2-TX(J)) 51,51,52
   51 Z2=(ZB+ZT)/TP(J) $ IF(Z2-TX(J-1))52,56,56
   52 CONTINUE
C     GO DOWN
      X=XD $ Y=YD $ TA=TAD $ AB=ABD
      SA=SAD $ CA=CAD $ A=A-BD
   53 XP(I)=X $ YP(I)=Y $ I=I+1
        IF(X-XE) 54,55,55
   54 IF(I-5001) 19,55,55
 55     NF=I-1 $ RETURN
C     STRAIGHT
   56 X=X+VT*CA $ Y=Y+VT*SA $ GO TO 53
C     GO UP
   57 A=A+BU $ X=X+DVU*COSF(A+BU2) $ Y=Y+DVU*SINF(A+BU2)
      CA=COSF(A) $ SA=SINF(A) $ TA=SA/CA
      AB=Y-TA*X $ GO TO 53
      END
```

```
      SUBROUTINE TERSET(IL,PL)
      COMMON AS,GU,GD,XK,V,VT,PK,XF,NT,NF,HM,XP(5001),YP(5001),
     1TX(120),TY(120),TS(120),TB(120),F(3,1001),ND,FAV,CM,NDS
      DATA(TXL(1,1)=-1.E50,
     1     0.,  6706.,  9078., 19087., 30000., 48854., 52714., 56446.,
     1 58837., 60886., 62200., 65245., 68374., 72325., 78000., 84023.,
     1 85762., 92782., 97683., 98753.,100321.,101633.,105080.,106600.,
     1115811.,118118.,120900.,127540.,132802.,134531.,137891.,142800.,
     1147709.,149151.,150589.,158059.,159925.,161609.,163974.,165000.,
     1167890.,172800.,178700.,182901.,184000.,186736.,189200.,196703.,
     1200620.,202852.,205523.,206652.,210233.,212183.,214161.,219152.,
     1222800.,224400.,226653.,230139.,242244.,244997.,246100.,251296.,
     1257179.,259793.,262358.,264328.,265230.,265927.,268257.,275105.,
     1279714.,281700.,285209.,286963.,288463.,290001.,291700.,294290.,
     1295721.,297609.,300001.,302107.,1.E50)
      DATA(TYL(1,1)=6066.,
     16066.,6123.,5757.,5426.,5258.,5310.,5556.,5978.,6097.,6075.,5890.,
     16048.,5819.,6374.,5450.,5630.,5504.,5793.,6096.,6342.,6494.,6389.,
     16617.,6430.,6164.,6461.,6230.,6353.,6980.,7806.,6821.,6610.,6649.,
     16880.,6685.,7098.,7826.,7328.,7618.,7400.,7628.,7300.,6750.,7403.,
     17180.,7342.,6700.,7114.,7202.,7150.,7539.,7309.,7883.,7950.,7324.,
     18045.,7940.,8160.,8312.,7868.,7244.,7423.,7130.,7068.,6792.,6919.,
     16750.,7021.,7460.,7496.,7028.,6983.,7203.,7300.,8045.,8012.,7770.,
     17265.,7162.,7363.,7773.,7534.,7600.,7627.,7627.)
      DATA(TXL(1,2)=-1.E50,
     1     0.,  2106.,  4498.,  6386.,  7817., 10407., 12106., 13644.,
     1 15144., 16898., 20407., 22393., 27002., 33850., 36180., 36877.,
     1 37779., 39749., 42314., 44928., 50811., 56007., 57110., 59863.,
     1 71968., 75454., 77707., 79307., 82955., 87946., 89924., 91874.,
     1 95455., 96584., 99255.,101487.,105404.,112907.,115371.,118107.,
     1119206.,123407.,129307.,134217.,137107.,138133.,140498.,142182.,
     1144048.,151518.,152956.,154398.,159307.,164216.,167576.,169305.,
     1174567.,181207.,183989.,186296.,195507.,197027.,200474.,201786.,
     1203354.,204424.,209325.,216345.,218084.,224107.,229782.,233733.,
     1236862.,239907.,241221.,243270.,245661.,249393.,253253.,272107.,
     1283020.,293029.,295401.,302107.,1.E50)
```

```
  DATA(TYL(1,2)=7627.,
 17627.,7600.,7534.,7773.,7363.,7162.,7265.,7770.,8012.,8045.,7300.,
 17203.,6983.,7028.,7496.,7460.,7021.,6750.,6919.,6792.,7068.,7130.,
 17423.,7244.,7868.,8312.,8160.,7940.,8045.,7324.,7950.,7883.,7309.,
 17539.,7150.,7202.,7114.,6700.,7342.,7180.,7403.,6750.,7300.,7628.,
 17400.,7618.,7328.,7826.,7098.,6685.,6880.,6649.,6610.,6821.,7806.,
 16980.,6353.,6230.,6461.,6164.,6430.,6617.,6389.,6494.,6342.,6096.,
 15793.,5504.,5630.,5450.,6374.,5819.,6048.,5890.,6075.,6097.,5978.,
 15556.,5310.,5258.,5426.,5757.,6123.,6066.,6066.)
  DIMENSION TXL(120,2),TYL(120,2),IDLL(2),PL(2)
   DATA(IDLL=1H1,1H2)
   DO 10 I=1,2 $ IF(IL-IDLL(I))10,11,10
10  CONTINUE $   CALL TERSFT1(IL,PL) $ RETURN
11   NT=86 $ HM=3054. $ PL(1)=5000. $ PL(2)=9000.
     TX(1)=TXL(1,I) $ TY(1)=TYL(1,I)
     DO 12 J=2,NT  $ TX(J)=TXL(J,I) $ TY(J)=TYL(J,I)
    TS(J)=(TY(J)-TY(J-1))/(TX(J)-TX(J-1))
12   TB(J)=TY(J)-TX(J)*TS(J)
      END
```

55

```
      SUBROUTINE TERSET1(IL,PL)
      COMMON AS,GU,GD,XK,V,VT,PK,XF,NT,NF,HM,XP(5001),YP(5001),
     1TX(120),TY(120),TS(120),TB(120),F(3,1001),ND,FAV,CM,NDS
      DATA(TXL(1,1)=-1.E50,
     1     0., 21800., 24200., 28800., 30600., 32500., 34700., 36700.,
     1 40500., 41200., 43900., 44800., 46300., 48600., 49300., 50400.,
     1 52800., 53700., 55400., 57400., 59900., 61500., 63400., 65600.,
     1 66700., 67900., 69900., 73400., 76700., 79000., 81800., 84000.,
     1 89100., 92200., 94200., 96500.,101900.,104600.,106000.,108200.,
     1110200.,112100.,113600.,116300.,118200.,120000.,133800.,134900.,
     1138700.,143600.,145600.,148500.,151900.,154400.,156000.,158400.,
     1159600.,161400.,162900.,164000.,166000.,169800.,171000.,174000.,
     1176200.,178500.,179800.,181900.,182800.,184500.,185200.,186900.,
     1189100.,191000.,192200.,194500.,195400.,199800.,202200.,204000.,
     1205800.,207200.,210200.,211800.,214300.,217700.,221900.,224100.,
     1226400.,228700.,233100.,237600.,239900.,243300.,246900.,250000.,
     1252900.,255000.,258500.,260400.,262000.,267900.,269300.,272200.,
     1274900.,276800.,278800.,280300.,281900.,283300.,285100.,289400.,
     1293900.,294900.,298500.,301500.,305400.,317213.,1.E50)
      DATA(TYL(1,1)=6000.,
     16000.,6410.,6840.,7010.,6920.,7150.,7550.,6960.,7080.,7290.,7400.,
     17140.,7420.,7550.,7840.,7680.,8370.,9160.,9180.,8450.,9290.,9050.,
     18940.,8440.,9010.,8780.,9070.,9030.,9200.,9150.,8680.,7520.,7030.,
     16960.,6770.,6820.,6700.,7070.,6930.,7200.,7100.,7200.,6820.,6870.,
     16820.,6510.,6250.,6390.,6450.,7050.,6960.,6980.,6950.,7660.,7130.,
     17090.,7530.,7280.,7270.,7730.,6860.,6640.,6830.,6870.,7140.,7530.,
     17580.,7530.,7730.,7730.,7970.,7380.,7890.,7300.,7690.,8210.,7850.,
     18200.,7720.,7740.,7650.,7280.,7210.,7470.,7820.,7270.,7180.,6890.,
     17250.,7210.,7590.,7080.,7340.,7190.,8260.,7390.,8070.,8150.,7720.,
     17160.,7570.,6020.,6000.,6930.,6830.,6610.,7050.,6960.,7510.,7680.,
     16840.,8000.,7450.,7670.,7130.,7290.,6900.,6723.,6723.)
      DATA(TXL(1,2)=-1.E50,
     1     0., 11813., 15713., 18713., 22313., 23313., 27813., 32113.,
     1 33913., 35313., 36913., 38413., 40413., 42313., 45013., 47913.,
     1 49313., 55213., 56813., 58713., 62213., 64313., 67213., 70313.,
     1 73913., 77313., 79613., 84113., 88513., 90813., 93113., 95313.,
```

```
     1 99513.,102913.,105413.,107013.,110013.,111413.,113213.,115013.,
     1117413.,121813.,122713.,125013.,126213.,128113.,130313.,132013.,
     1132713.,134413.,135313.,137413.,138713.,141013.,143213.,146213.,
     1147413.,151213.,153213.,154313.,155813.,157613.,158813.,161213.,
     1162813.,165313.,168713.,171613.,173613.,178513.,182313.,183413.,
     1197213.,199013.,200913.,203613.,205113.,207013.,209013.,211213.,
     1212613.,215313.,220713.,223013.,225013.,228113.,233213.,235413.,
     1238213.,240513.,243813.,247313.,249313.,250513.,251613.,253813.,
     1255713.,257313.,259813.,261813.,263513.,264413.,266813.,267913.,
     1268613.,270913.,272413.,273313.,276013.,276713.,280513.,282513.,
     1284713.,286613.,288413.,293013.,295413.,317213.,1.E50)
      DATA(TYL(I,2)=6723.,
     16723.,6900.,7290.,7130.,7670.,7450.,8000.,6840.,7680.,7510.,6960.,
     17050.,6610.,6830.,6930.,6000.,6020.,7570.,7160.,7720.,8150.,8070.,
     17390.,8260.,7190.,7340.,7080.,7590.,7210.,7250.,6890.,7180.,7270.,
     17820.,7470.,7210.,7280.,7650.,7740.,7720.,8200.,7850.,8210.,7690.,
     17300.,7890.,7380.,7970.,7730.,7730.,7530.,7580.,7530.,7140.,6870.,
     16830.,6640.,6860.,7730.,7270.,7280.,7530.,7090.,7130.,7660.,6950.,
     16980.,6960.,7050.,6450.,6390.,6250.,6510.,6820.,6870.,6820.,7200.,
     17100.,7200.,6930.,7070.,6700.,6820.,6770.,6960.,7030.,7520.,8680.,
     19150.,9200.,9030.,9070.,8780.,9010.,8440.,8940.,9050.,9290.,8450.,
     19180.,9160.,8370.,7680.,7840.,7550.,7420.,7140.,7400.,7290.,7080.,
     16960.,7550.,7150.,6920.,7010.,6840.,6410.,6000.,6000.)
      DIMENSION TXL(120,2),TYL(120,2),IDLL(15),PL(2)
      DATA(IDLL=1H5,1H6) ,(IBL=1H )
      DO 10 I=1,2 $ IF(IL-IDLL(I))10,11,10
10    CONTINUE $ PRINT1 $ GO TO 13
1     FORMAT(19H TERRAIN CODE ERROR)
11     NT=120 $ HM=3200. $ PL(1)=6000. $ PL(2)=10000.
       TX(1)=TXL(1,I) $ TY(1)=TYL(1,I)
       DO 12 J=2,NT  $ TX(J)=TXL(J,I) $ TY(J)=TYL(J,I)
      TS(J)=(TY(J)-TY(J-1))/(TX(J)-TX(J-1))
12     TB(J)=TY(J)-TX(J)*TS(J)
       RETURN
13     DO 14 I=1,15
14     IDLL(I)=IBL $ CALL JTEPL1(IDLL,IDLL,0,0,-1)
```

```
      SUBROUTINE JTFPL1(Y,X,N,I)
      DIMENSION X(1),Y(1),TITLE(12),M(3)
      TYPE INTFGER TITLE
      DATA(LABFL=4H    .),(M=0,0,0)
      L=-1 $ IF(I) 10,98,12
   10 DO 11 J=1,12
   11 TITLE(J) = 8H
      TITLE(1) = 8HC F HILL
      TITLE(2) = 8H  BOX H
16     RETURN
12    L=-1 $ IF(N) 98,98,13
   13 IF (I-3) 14,14,98
14    DO 15 J=1,N $ X(J)=X(J)-5000.
15    Y(J)=230000.-Y(J)
      CALL DRAW(N,X,Y,I,M(I),LABFL,TITLE,600.,20000.,0,0,0,0,6,9,1,L)
      IF(L) 98,16,98
98     PRINT99,L $ STOP
  99  FORMAT(21H PLOTTER ERROR  LAST=I6)
      END
```

APPENDIX II

PROGRAM DESCRIPTION

Program ONE A is a Fortran 63 program which sorts data and calculates sample means, variances, covariances, and the Kolmogorov-Smirnov, Bartlett, Scheffe and T statistics. Data is first sorted in increasing order of RMS error and the sample is truncated at a predetermined upper level of RMS. The remaining data is then resorted by terrain and into speed categories within each terrain grouping. The analysis is conducted on each subsample and on cumulative groupings by terrain and overall. Upon completion of this phase the data is again sorted by order of speeds and the analysis repeated.

Data is read in as follows. Each data card contains one record consisting of: sortie number, terrain number, speed number, pilot number, clearance, Gu, Gd, P, K, S, RMS. Format (4I6, 7F6.0) is used.

One control card is required, preceding each data deck and is punched as follows:

Columns

1 - 3 1 If no transformation of data is desired on first run. Transformations may be inserted at statements 11 and 12 in the main program. If 1 is punched, the program will automatically repeat, transforming variables on the second run.

2 If no transformation is incorporated or if one run with only transformed variables is desired.

4 - 6 1 If KVT output is selected from the simulation. If 1 is punched KVT is divided by VT x 10, S is divided by 100.

2 K is divided 10, S by 100.

7 - 9	Total sample size
10 - 12	Number of terrains considered
13 - 15	Number of terrain speed combinations
16 - 18	Number of speeds
19 - 21	Number of pilots
22 - 24	Number of speeds flown terrain 1
25 - 27	Number of speeds flown terrain 2
28 - 30	Number of speeds flown terrain 3
31 - 33	Number of speeds flown terrain 4
34 - 39	Speed 1 in feet per second
40 - 45	Speed 2 in feet per second
46 - 51	Speed 3 in feet per second
52 - 54	Appendix number (optional)
55 - 57	Aircraft model number (optional)
58 - 60	Upper limit of RMS
61 - 63	Decrements by which RMS is to be reduced on successive iterations
64 - 66	Number of data sets to be considered (required on first data set only)

Format for the control card is (11I3, 3F6.0, 5I3)

The program is listed with its subroutines on the following pages. Subroutine NPOA, a U.S.N.P.G. School library subroutine, calculates the value of the upper half of the cumulative normal integral. Values derived must be adjusted appropriately depending on the sign of the standardized variable. This is accomplished in subroutine KOLSMIR.

Subroutine SHLSORT is also a library subroutine. It sorts the data supplied to it in ascending order of magnitude. An array named KEYS provides a listing of the order of the rearranged variables prior to sorting which permits appropriate realignment of the remaining variables.

The statement PRINT 800, (   ) with an appropriate listing of the variables desired may be inserted at any point in the program to obtain a print out of the current status of the variables.

Limitations:

Number of data points in any terrain or speed category must be greater than three.

Running Time:

Two complete runs of three iterations each with transformation of all variables prior to the second run has been found to take approximately 6 minutes on the C.D.C. 1604.

```
      PROGRAM ONE A
      DIMENSION M(30),M1(30),M2(30),GU(200),GD(200),P(200),CH(200),S(200
     1),X(200),RMS(200),NSPD(4),V(3),VSQ(3),R(200),IR(200),KEYS(200),KEY
     2S1(200),KEYS2(200),KEYS3(200),KEYS4(200),RC(200),RCALC(200),R1(200
     3),R2(200),R11(200),R21(200),COVAR(5,6),NSORT(200),NTER(200),NV(200
     4),NAV(200),CLNC(200),DIFF(80),CD(20,6),TEMP(300),TEMP1(200),TEMP2(
     5200),TEMP6(200),TEMP7(200),TEMP8(200),TEMP9(200),TEMP10(200),TEMP1
     61(200),TEMP12(200),TEMP3(200),TEMP4(200),TEMP5(200)
      IREDO=4
100020READ 13,KCODE,LCODE,JTOT,JTER,JSAM,JSPD,JAV,(NSPD(I),I=1,JTER)
   13 FORMAT(7I3/(4I3))
      READ 17,(V(I),I=1,JSPD)
   17 FORMAT(3F6.0)
      READ 13,IRUN,IAPX
      READ 1,(NSORT(I),NTER(I),NV(I),NAV(I),CLNC(I),GU(I),GD(I),P(I),CH(
     1I),S(I),RMS(I),I=1,JTOT)
    1 FORMAT(4I6,7F6.0)
      LIMIT=120
      MTL=0
      DO 4 K=1,JTOT
      CH(K)=CH(K)/10.
      IF(LCODE-1)9413,9413,9414
 9413 CH(K)=CH(K)/300.
 9414 S(K)=S(K)/100.
    4 X(K)=SQRTF(P(K))
      PRINT 10000
      PRINT 1375
 1375 FORMAT(24X,3HTER,4H SPD,5X,2HGU,6X,2HGD,6X,1HK,7X,1HP,7X,1HS//)
      PRINT800,(NTER(I),NV(I),GU(I),GD(I),CH(I),P(I),S(I),I=1,JTOT)
  800 FORMAT(24X,I2,I4,F9.3,4F8.3)
      JTOT2=JTOT
      PRINT 5000,IAPX,IRUN
 50000FORMAT(1H1,///42X,8HAPPENDIX,I2,////////////24X,13HAIRCRAFT TYPE,I
     13)
 1300 CALL SHLSUB2(JTOT,RMS,KEYS,0)
        NB=1
```

```
      DO 1100 I=1,JTOT
      TEMP1(I)=NSORT(I)
      TEMP2(I)=NTER(I)
      TEMP3(I)=NV(I)
      TEMP4(I)=NAV(I)
      TEMP5(I)=GU(I)
      TEMP6(I)=GD(I)
      TEMP7(I)=P(I)
      TEMP8(I)=CH(I)
      TEMP9(I)=S(I)
      TEMP10(I)=RMS(I)
      TEMP11(I)=CLNC(I)
      TEMP12(I)=X(I)
 1100 CONTINUE
      JTOT1=JTOT
      DO 510 I=1,JTOT1
      J=KEYS(I)
      NSORT(I)=TEMP1(J)
      NTER(I)=TEMP2(J)
      NV(I)=TEMP3(J)
      NAV(I)=TEMP4(J)
      GU(I)=TEMP5(J)
      GD(I)=TEMP6(J)
      P(I)=TEMP7(J)
      CH(I)=TEMP8(J)
      S(I)=TEMP9(J)
      CLNC(I)=TEMP11(J)
      X(I)=TEMP12(J)
      IF(RMS(I)-LIMIT)510,510,511
  511 JTOT=JTOT-1
  510 CONTINUE
      INCR=0
      MTS=0$NINS=0
      CALL SHLSUB(JTOT,NTER,KEYS,MTS,JTER,M)
      DO 1101 I=1,JTOT
      TEMP1(I)=NSORT(I)
```

```
      TEMP2(I)=NTER(I)
      TEMP3(I)=NV(I)
      TEMP4(I)=NAV(I)
      TEMP5(I)=GU(I)
      TEMP6(I)=GD(I)
      TEMP7(I)=P(I)
      TEMP8(I)=CH(I)
      TEMP9(I)=S(I)
      TEMP10(I)=RMS(I)
      TEMP11(I)=CLNC(I)
      TEMP12(I)=X(I)
 1101 CONTINUE
      DO 7 I=1,JTOT
      J=KEYS(I)
      CLNC(I)=TEMP11(J)
      RMS(I)=TEMP10(J)
      S(I)=TEMP9(J)
      CH(I)=TEMP8(J)
      P(I)=TEMP7(J)
      GD(I)=TEMP6(J)
      GU(I)=TEMP5(J)
      NAV(I)=TEMP4(J)
      NV(I)=TEMP3(J)
      NSORT(I)=TEMP1(J)
      X(I)=TEMP12(J)
    7 CONTINUE
      DO1102 I=1,JTOT
      TEMP1(I)=NSORT(I)
      TEMP2(I)=NTER(I)
      TEMP3(I)=NV(I)
      TEMP4(I)=NAV(I)
      TEMP5(I)=GU(I)
      TEMP6(I)=GD(I)
      TEMP7(I)=P(I)
      TEMP8(I)=CH(I)
      TEMP9(I)=S(I)
```

```
      TEMP10(I)=RMS(I)
      TEMP11(I)=CLNC(I)
      TEMP12(I)=X(I)
 1102 CONTINUE
      PRINT 5001,LIMIT,JTOT,JTER,JSPD
 5001 FORMAT(//24X,35HUPPER LIMIT OF RMS ERROR CONSIDERED,8X,I3/24X,23HN
     1UMBER OF SAMPLE POINTS,20X,I3,/24X,37HNUMBER OF TERRAIN SEGMENTS C
     2ONSIDERED,6X,I3,/24X,16HNUMBER OF SPEEDS,27X,I3)
      PRINT 5040
 5040 FORMAT(/24X,46HNUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT//54X
     1,16HTERRAIN   SPEEDS)
      DO 5002 I=1,JTER
 5002 PRINT 5003,I,NSPD(I)
 5003 FORMAT(/48X,2I9)
      IF(LCODE-2)5005,9415,5006
 5005 PRINT 5004
 5004 FORMAT(/24X,24HDATA ADJUSTED AS FOLLOWS/24X,12HK = KVT/3000/24X,9H
     1S = S/100)
      GO TO 9431
 9415 PRINT 9416
 9416 FORMAT(/24X,24HDATA ADJUSTED AS FOLLOWS/24X,8HK = K/10/24X,9HS = S
     1/100)
 9431 PRINT 5007
 5007 FORMAT(/24X,23HNO CORRECTION FOR SPEED)
      GO TO 9432
 5006 PRINT 5008
 5008 FORMAT(/24X,37HDATA ADJUSTED AS BEFORE AND CORRECTED/24X,9HFOR SPE
     1ED)
 9432 IF(JSPD-2)3,5030,5030
 5030 DO 3 K=1,JTER
      MOTS=MTS+1
      NINS=M(K)
      MTSUM=MOTS+NINS-1
      CALL SHLSUB(NINS,NV,KEYS1,MTS,JSPD,M1)
      DO 82 I=MOTS,MTSUM
      J=KEYS1(I)
```

```
      CLNC(I)=TEMP11(J)
      RMS(I)=TEMP10(J)
      X(I)=TEMP12(J)
      S(I)=TEMP9(J)
      CH(I)=TEMP8(J)
      P(I)=TEMP7(J)
      GD(I)=TEMP6(J)
      GU(I)=TEMP5(J)
      NAV(I)=TEMP4(J)
      NTER(I)=TEMP2(J)
      NSORT(I)=TEMP1(J)
   82 CONTINUE
      NJSPD=NSPD(K)
      DO 803 I=1,NJSPD
  803 M2(I+INCR)=M1(I)
      MTS=NINS+MTS
      INCR=INCR+NJSPD
    3 CONTINUE
      PRINT 1310
 1310 FORMAT(/24X,22HINDIVIDUAL SAMPLE SIZE//33X,7HTERRAIN,16X,5HSPEED/4
     17X,2H 1,7X,2H 2,7X,2H 3/)
      N=0
      J=1
      DO 1311 I=1,JTER
      N=NSPD(I)+N
      PRINT 1312,I,(M2(K),K=J,N)
 1311 J=N+1
 1312 FORMAT(36X,I1,I12,2I9)
 1401 INCR=1
      MTS=0
      NTS=0
      MTSUM=MTS
      TTOGU=0$TTOGD=0$TTOP=0$TTOCH=0$TTOS=0$TTOX=0
      TAGD=0. $TAGU=0. $ TAP=0. $ TACH=0. $ TAS=0. $ TAX=0. $ TDGSUM=0.
      SAGU=0. $ SDGSUM=0. $ SAGD=0. $ SAP=0. $ SACH=0. $ SAS=0. $ SAX=0.
      DGSUM=0 $ TSQGU=0 $ TSQGD=0 $ TSQP=0 $ TSQCH=0 $ TSQS=0 $ TSQX=0
```

```
      AGU=0 $ AGD=0 $ AP=0 $ ACH=0 $ AS=0 $ AX=0
  719 DO 9,I=1,JTER
      SPGU=0. $ SPGD=0. $ SPP=0. $SPCH=0. $ SPS=0. $ SPX=0.
      IF(I-2)89,89,88
   89 IF(I-1)70,70,80
 9500 MTL=0
   80 NTS=0
   88 GO TO 120
  121 IF(NTS)69,69,9500
   69 NTS=MTS
      IF(I-JTER)70,70,999
   70 NJSPD=NSPD(I)
  710 DO 8 J=1,NJSPD
      PRINT 5009,I,J
 5009 FORMAT(1H1,51X,7HTERRAIN,I2,7H  SPEED,I2)
      IF(JSPD-2)9300,9301,9301
 9300 NINS=M(INCR)
      GO TO 9302
 9301 NINS=M2(INCR)
 9302 MTSUM=NINS+MTSUM
      MQTS=MTS+1
      VSQ(J)=V(J)*V(J)
      GO TO (10,11,12,12),KCODE
   11 IF(I-2)2937,2937,12
 2937 DIV1=ABSF(V(J)-V(2))
      IF(DIV1)9412,10,9412
 9412 DIV1=DIV1/V(2)
      DIV12=1-DIV1
      DIV12=SQRTF(DIV12)
      DIV1=SQRTF(DIV1)
      DO 1110,L=MQTS,MTSUM
      GU(L)=DIV1*GU(L)+CD(1,2)-DIV1*CD(1,J)
 1110 CH(L)=DIV12*CH(L)+CD(3,2)-DIV12*CD(3,J)
      GO TO 10
   12 DIV1=V(2)/V(J)
      DO 2938 L=MQTS,MTSUM
```

```
2938 CH(L)=DIVI*CH(L)
  10 GO TO(20,21,22,23),LCODE
  21 CONTINUE
  22 CONTINUE
  20 CONTINUE
  23 CONTINUE
     GO TO 122
 120 MTSTMP=MTS
     MTS=NTS
 122 DO 6 L=1,6
     GO TO (37,47,57,67,77,87),L
  37 CALL VARSUB(GU,GUM,GUSIG,MTS,MTSUM,SUP,GUSQ,ESGU)
     GO TO 51
  47 CALL VARSUB(GD,GDM,GDSIG,MTS,MTSUM,SUP,GDSQ,ESGD)
     GO TO 51
  57 CALL VARSUB(CH,CHM,CHSIG,MTS,MTSUM,SUP,CHSQ,ESCH)
     GO TO 51
  67 CALL VARSUB(S,SM,SSIG,MTS,MTSUM,SUP,SSQ,ESS)
     GO TO 51
  77 CALL VARSUB(X,XM,XSIG,MTS,MTSUM,SUP,XSQ,ESX)
     GO TO 51
  87 CALL VARSUB(P,PM,PSIG,MTS,MTSUM,SUP,PSQ,ESP)
  51 TEMP1(L)=SUP
   6 CONTINUE
     MTD=MTSUM-MTS
     DO 40 L=1,5
     NT=
     DO 30 N=1,5
     IF(L-N)41,42,49
  42 GO TO (43,44,45,46,48)L
  43 COVAR(L,N)=GUSIG$COVAR(L,6)=GUM
     GO TO 30
  44 COVAR(L,N)=GDSIG$COVAR(L,6)=GDM
     GO TO 30
  45 COVAR(L,N)=CHSIG$COVAR(L,6)=CHM
     GO TO 30
```

```
46 COVAR(L,N)=SSIG$COVAR(L,6)=SM
   GO TO 30
48 COVAR(L,N)=XSIG$COVAR(L,6)=XM
   GO TO 30
41 NT=N-L
   GO TO (31,32,33,34)L
31 GO TO (35,36,38,39)NT
35 CALL COV(GU,GD,GUM,GDM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
36 CALL COV(GU,CH,GUM,CHM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
38 CALL COV(GU,S,GUM,SM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
39 CALL COV(GU,X,GUM,XM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
49 COVAR(L,N)=COVAR(N,L)
   GO TO 30
32 GO TO (90,91,93)NT
90 CALL COV(GD,CH,GDM,CHM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
91 CALL COV(GD,S,GDM,SM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
93 CALL COV(GD,X,GDM,XM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
33 GO TO (94,95)NT
94 CALL COV(CH,S,CHM,SM,MTS,MTSUM,CO)
   COVAR(L,N)=CO
   GO TO 30
95 CALL COV(CH,X,CHM,XM,MTS,MTSUM,CO)
```

```
      COVAR(L,N)=CO
      GO TO 30
   34 CALL COV(S,X,SM,XM,MTS,MTSUM,CO)
      COVAR(L,N)=CO
   30 CONTINUE
   40 CONTINUE
      PRINT 96
   96 FORMAT(///42X,26HVARIANCE COVARIANCE MATRIX,12X,11HMEAN VECTOR//36
     1X,2HGU,7X,2HGD,7X,1HK,8X,1HS,8X,1HX)
      DO 97 L=1,5
   97 PRINT 98,(COVAR(L,N),N=1,6)
   98 FORMAT(/30X,5F9.3,F12.3)
      PRINT 5014,MTD
 5014 FORMAT(//30X,18HKOLMOGOROF-SMIRNOV/30X,14HTEST STATISTIC/30X,11HSA
     1MPLE SIZE,I7)
      PRINT 5019
 5019 FORMAT(/35X,2HGU,7X,2HGD,7X,1HK,8X,1HS,8X,1HX)
      PRINT 98,(TEMP1(N),N=1,5)
      ARG1=MTSUM-MTS-2
      MR=2
      PRINT 5016,ARG1
 5016 FORMAT(//30X,26HT TEST FOR SIGNIFICANCE OF/30X,11HCORRELATION/30X,
     118HDEGREES OF FREEDOM,F5.0)
      DO 997 L=1,4
      DO 4000 N=1,5
      RT1=SQRTF(ARG1)
      GO TO(991,992,993,994)L
  991 GOTO(4000,891,892,893,894)N
  891 RT2=SQRTF(GUSIG*GDSIG)
      GO TO 4002
  892 RT2=SQRTF(GUSIG*CHSIG)
      GO TO 4002
  893 RT2=SQRTF(GUSIG*SSIG)
      GO TO 4002
  894 RT2=SQRTF(GUSIG*XSIG)
      GO TO 4002
```

```
 992 GO TO(4001,4000,896,897,898)N
 896 RT2=SQRTF(GDSIG*CHSIG)
     GO TO 4002
 897 RT2=SQRTF(GDSIG*SSIG)
     GO TO 4002
 898 RT2=SQRTF(GDSIG*XSIG)
     GO TO 4002
 993 GO TO(4001,4001,4000,878,879)N
 878 RT2=SQRTF(CHSIG*SSIG)
     GO TO 4002
 879 RT2=SQRTF(CHSIG*XSIG)
     GO TO 4002
 994 GO TO(4001,4001,4001,4000,876)N
 876 RT2=SQRTF(SSIG*XSIG)
     GO TO 4002
4002 COR=COVAR(L,N)/RT2
     ARG9=1.-(COR*COR)
     RT3=SQRTF(ARG9)
     COR=ABSF(COR)
     COVAR(L,N)=RT1*COR/RT3
4001 CONTINUE
4000 CONTINUE
     GO TO(9417,9418,9419,9420)L
9417 PRINT 9421
9421 FORMAT(/43X,5HGU/GD,4X,4HGU/K,5X,4HGU/S,5X,4HGU/X)
     GO TO 9425
9418 PRINT 9422
9422 FORMAT(/43X,4HGD/K,5X,4HGD/S,5X,4HGD/X)
     GO TO 9425
9419 PRINT 9423
9423 FORMAT(/44X,3HK/S,6X,3HK/X)
     GO TO 9425
9420 PRINT 9424
9424 FORMAT(/44X,3HS/X)
9425 PRINT 5017,(COVAR(L,K),K=MR,5)
5017 FORMAT(39X,4F9.3)
```

```
      MR=MR+1
  997 CONTINUE
      IF(NB-10)9410,9410,9411
 9411 CD(1,I)=GUM
      CD(2,I)=GDM
      CD(3,I)=CHM
      CD(4,I)=SM
      CD(5,I)=XM
      GO TO 123
 9410 IF(J-NJSPD)123,5012,124
  124 IF(MTL)723,723,724
  724 TAGU=TAGU+ESGU
      TAGD=TAGD+ESGD
      TAP=TAP+ESP
      TACH=TACH+ESCH
      TAS=TAS+ESS
      TAX=TAX+ESX
      TTQGU=TTQGU+GUSQ
      TTQGD=TTQGD+GDSQ
      TTQP=TTQP+PSQ
      TTQCH=TTQCH+CHSQ
      TTQS=TTQS+SSQ
      TTQX=TTQX+XSQ
      L=I-1
      IF(JSPD-2)9386,9387,9387
 9387 PRINT 5018,L
 5018 FORMAT(//30X,37HBARTLETTS TEST STATISTIC FOR EQUALITY/30X,12HOF VA
     1RIANCES/30X,7HTERRAIN,I3,11H ALL SPEEDS)
      PRINT 1101,Z
      PRINT 5020,STATGU,STATGD,STATCH,STATS,STATX
 5020 FORMAT(/30X,5F9.3)
 9386 IF(I-JTER)723,723,5013
 5013 PRINT 5011
 5011 FORMAT(1H1,45X,30HCUMULATIVE RESULTS ALL SAMPLES)
      NTS=MTS
      GO TO 121
```

```
 723 MTS=MTSTMP
     NTS=0
     GO TO 121
5012 L=I
     PRINT 5010,L
5010 FORMAT(1H1,47X,26HCUMULATIVE RESULTS TERRAIN,I2)
 123 INCR=1+INCR
     AGU=AGU+ESGU
     AGD=AGD+ESGD
     AP=AP+ESP
     ACH=ACH+ESCH
     AS=AS+ESS
     AX=AX+ESX
     TSQGU=TSQGU+GUSQ
     TSQGD=TSQGD+GDSQ
     TSQP=TSQP+PSQ
     TSQCH=TSQCH+CHSQ
     TSQS=TSQS+SSQ
     TSQX=TSQX+XSQ
     AMTD=MTSUM-MTS-1
     SPGU=SPGU+GUSIG*AMTD
     SPGD=SPGD+GDSIG*AMTD
     SPP=SPP+PSIG*AMTD
     SPCH=SPCH+CHSIG*AMTD
     SPS=SPS+SSIG*AMTD $ SPX=SPX+XSIG*AMTD
     DG=1./AMTD
     DGSUM=DGSUM+DG
     MTS=NINS+MTS
     IF(NB-JTOT)9380,9381,9381
9380 IF(NB-10)8,9371,9371
   8 CONTINUE
     MTL=1
     SAGU=AGU-SAGU
     SAGD=AGD-SAGD
     SAP=AP-SAP
     SACH=ACH-SACH
```

```
      SAS=AS-SAS
      SAX=AX-SAX
      SDGSUM=DGSUM-SDGSUM
      SDGFR=M(I)-NJSPD
      SSGU=SPGU/SDGFR
      SSGD=SPGD/SDGFR
      SSP=SPP/SDGFR
      SSCH=SPCH/SDGFR
      SSS=SPS/SDGFR
      SSX=SPX/SDGFR
      SBGU=SDGFR*(LOGF(SSGU))
      SBGD=SDGFR*(LOGF(SSGD))
      SBP=SDGFR*(LOGF(SSP))
      SBCH=SDGFR*(LOGF(SSCH))
      SBS=SDGFR*(LOGF(SSS))
      SBX=SDGFR*(LOGF(SSX))
      Z=NJSPD-1
      C=1.+((1./(3.*Z))*(SDGSUM-(1./SDGFR)))
      STATGU=(SBGU-SAGU)/C
      STATGD=(SBGD-SAGD)/C
      STATP=(SBP-SAP)/C
      STATCH=(SBCH-SACH)/C
      STATS=(SBS-SAS)/C
      STATX=(SBX-SAX)/C
      SAGU=AGU
      SAGD=AGD
      SACH=ACH
      SAP=AP
      SAS=AS
      SAX=AX
      SDGSUM=DGSUM
  711 J=9
      TAMTD=M(I)-1
      TDG=1./TAMTD
      TDGSUM=TDGSUM+TDG
    9 CONTINUE
```

```
      MTS=NTS
      I=JTER+1
      MTSTMP=MTS
      MTSUM=JTOT
      GO TO 122
  999 CONTINUE
      IF(NB-10)9382,9381,9381
 9381 DGFR=JTOT-JSPD
      Z=JSPD-1
      GO TO 9383
 9382 IF(JSPD-2)9390,9391,9391
 9391 DGFR=JTOT-JSAM
      Z=JSAM-1
 9383 DNFR=1./DGFR
      PAREN=DGSUM-DNFR
      DENOM=1./(3.*Z)
      C=1.+DENOM*PAREN
      Z=1
      GO TO 3000
 3001 PRINT 5021
 5021 FORMAT(//30X,37HBARTLETTS TEST STATISTIC FOR EQUALITY/30X,12HOF VA
     1RIANCES/30X,19HBETWEEN ALL SAMPLES)
      Z=JSAM-1
      PRINT 1101,Z
      PRINT 5019
      PRINT 5020,STATGU,STATGD,STATCH,STATS,STATX
 9390 DGFR=JTOT-JTER
      DNFR=1./DGFR
      PAREN=TDGSUM-DNFR
      Z=JTER-1
      DENOM=1./(3.*Z)
      C=1.+DENOM*PAREN
 3000 ESSQGU=TSQGU/DGFR
      ESSQGD=TSQGD/DGFR
      ESSQP=TSQP/DGFR
      ESSQCH=TSQCH/DGFR
```

```
      FSSQS=TSQS/DGFR
      FSSQX=TSQX/DGFR
      BGU=DGFR*(LOGF(FSSQGU))
      BGD=DGFR*(LOGF(FSSQGD))
      BP=DGFR*(LOGF(FSSQP))
      BCH=DGFR*(LOGF(FSSQCH))
      BS=DGFR*(LOGF(FSSQS))
      BX=DGFR*(LOGF(FSSQX))
      STATGU=(BGU-AGU)/C
      STATGD=(BGD-AGD)/C
      STATP=(BP-AP)/C
      STATCH=(BCH-ACH)/C
      STATS=(BS-AS)/C
      STATX=(BX-AX)/C
      AGU=TAGU
      AGD=TAGD
      AP=TAP
      ACH=TACH
      AS=TAS
      AX=TAX
      TSQGU=TTQGU
      TSQGD=TTQGD
      TSQP=TTQP
      TSQCH=TTQCH
      TSQS=TTQS
      TSQX=TTQX
      IF(NB-10)9384,9350,9350
 9384 IF(JSPD-2)3002,9392,9392
 9392 IF(Z-JTER)3002,3002,3001
 3002 PRINT 5022
 5022 FORMAT(//30X,37HBARTLETTS TEST STATISTIC FOR EQUALITY/30X,12HOF VA
     1RIANCES/30X,27HBETWEEN INDIVIDUAL TERRAINS)
      PRINT 1101,Z
 1101 FORMAT(/30X,18HDEGREES OF FREEDOM,F3.0)
      PRINT 5019
      PRINT 5020,STATGU,STATGD,STATCH,STATS,STATX
```

```
      IF(NSPD(1)-2)9393,9393,3743
 3743 IF(JSPD-2)9393,9388,9388
 9388 DO 9360 I=1,JTOT
      TEMP1(I)=NSORT(I)
      TEMP2(I)=NTER(I)
      TEMP3(I)=NV(I)
      TEMP4(I)=NAV(I)
      TEMP5(I)=CLNC(I)
      TEMP6(I)=GU(I)
      TEMP7(I)=GD(I)
      TEMP8(I)=P(I)
      TEMP9(I)=CH(I)
      TEMP10(I)=S(I)
      TEMP11(I)=X(I)
      TEMP12(I)=RMS(I)
 9360 CONTINUE
      TTQGU=0$TTQGD=0$TTQP=0$TTQCH=0$TTQS=0$TTQX=0
      TAGD=0. $TAGU=0. $ TAP=0. $ TACH=0. $ TAS=0. $ TAX=0. $ TDGSUM=0.
      SAGU=0. $ SDGSUM=0. $ SAGD=0. $ SAP=0. $ SACH=0. $ SAS=0. $ SAX=0.
      DGSUM=0 $ TSQGU=0 $ TSQGD=0 $ TSQP=0 $ TSQCH=0 $ TSQS=0 $ TSQX=0
      AGU=0 $ AGD=0 $ AP=0 $ ACH=0 $ AS=0 $ AX=0
      NJTER=JTER
      MTS=0
      NI=
      L=1
      NINS=0
      DO 9350 I=1,JSPD
      DO 9351 J=1,NJTER
      MQTS=MTS+1
      MTSUM=MTS+M2(L)
      DO 9352 K=MQTS,MTSUM
      NSORT(NB)=TEMP1(K)
      NTER(NB)=TEMP2(K)
      NV(NB)=TEMP3(K)
      NAV(NB)=TEMP4(K)
      CLNC(NB)=TEMP5(K)
```

```
      GU(NB)=TEMP6(K)
      GD(NB)=TEMP7(K)
      P(NB)=TEMP8(K)
      CH(NB)=TEMP9(K)
      S(NB)=TEMP10(K)
      X(NB)=TEMP11(K)
      RMS(NB)=TEMP12(K)
      NB=NB+1
      NINS=NINS+1
 9352 CONTINUE
      IF(J-NJTER)9351,9351,1329
 1329 GO TO(9353,9353,9354)I
 9353 MTS=0
      NI=NSPD(J)+NI
      L=NI+1
      DO 9756 N=1,NI
 9756 MTS=MTS+M2(N)
      GO TO 9351
 9354 IF(JTER-2)9353,9353,4907
 4907 MTS=JTOT-M2(10)
      L=1
 9351 CONTINUE
      PRINT 5050,I
 5050 FORMAT(1H1,40X,24HCUMULATIVE RESULTS SPEED,I3,13H ALL TERRAINS)
      MTSUM=NB-1
      MTS=MTSUM-NINS
      GO TO 122
 9371 NINS=0
      GO TO (9356,9357,9357)I
 9356 MTS=M2(I)
      L=2
      NI=1
      GO TO 9350
 9357 IF(JTER-2)4908,4908,4909
 4908 MTS=M2(1)+M2(2)
      L=3
```

```
      NI=2
      GO TO 9350
 4909 NJTER=2
      MTS=M(1)+M2(3)+M2(4)
      L=5
 9350 CONTINUE
 9385 PRINT 5051
 5051 FORMAT(//30X,37HBARTLETTS TEST STATISTIC FOR EQUALITY/30X,12HOF VA
     1RIANCES/30X,14HBETWEEN SPEEDS)
      Z=JSPD-1
      PRINT 1101,Z
      PRINT 5019
      PRINT 5020,STATGU,STATGD,STATCH,STATS,STATX
 9393 IF(LIMIT-120)2001,2001,2000
 2000 LIMIT=LIMIT-40
      PRINT 10000
10000 FORMAT(1H1/////////////)
      KCODE=1
      GO TO 1300
 2001 CONTINUE
      IF(JSPD-2)1000,9394,9394
 9394 KCODE=2
      IF(LCODE-2)700,700,1000
  700 LCODE=3
      JTOT=JTOT2
      LIMIT=200
      PRINT 10000
      GO TO 1300
 1000 CONTINUE
      IREDO=IREDO-1
      IF(IREDO)10001,10001,10002
10001 CONTINUE
      STOP
      END
```

```
      SUBROUTINE SHLSUB(NINS,IR,KEYS,MTS,JAV,M)
      DIMENSION IR(200),R(200),KEYS(200),M(30),KEYS1(200)
      MQTS=MTS+1
      MTSUM=MTS+NINS
      DO 1 I=1,NINS
      K=MTS+I
    1 R(I)=FLOATF(IR(K))
      CALL SHLSORT(NINS,R,KEYS,0)
      DO 7 I=1,NINS
    7 KEYS1(I)=KEYS(I)
      DO 2 I=1,NINS
      K=I+MTS
      IR(K)=R(I)
    2 KEYS(K)=KEYS1(I)+MTS
      IF(JAV)3,3,4
    4 K=1
      NFLS=1
      DO 604 J=1,JAV
      M(J)=0
      DO 603 I=NFLS,NINS
      IF(R(K)-R(I))603,602,602
  602 M(J)=M(J)+1
  603 CONTINUE
      NFLS=NFLS+M(J)
      K=NFLS
  604 CONTINUE
    3 CONTINUE
      RETURN
      END
```

29

```
      SUBROUTINE SHLSUB2(NINS,RC,KEYS,MTS)
      DIMENSION RC(200),R(200),KEYS(200)
      DO 1 I=1,NINS
      K=I+MTS
    1 R(I)=RC(K)
      CALL SHLSORT(NINS,R,KEYS,0)
      DO 2 I=1,NINS
      K=I+MTS
      RC(K)=R(I)
    2 KEYS(K)=KEYS(I)
      RETURN
      END
```

12

```
         IDENT      SHLSORT
         ENTRY      SHLSORT
SHLSORT  SLJ        SHLSORT              INIT SET UP 3 ARGUMENTS
         LDA        *
         ALS        24
         SAU        ARG
         INA        1
         SAU        ARG1
         INA        1
         SAU        SHLSORT
ARG      LDA        *
         INA        -1
         SAU        ADDR5
         SAU        ADDR6
         SAU        ADDR7
         SAL        ADDR7
         SAU        ADDR8
         SAL        ADDR8
         ALS        24
         SAL        ADDR1
         SAL        ADDR2
         SAU        ADDR4
ARG1     LDA        *
         SAL        ADDR9
         ALS        24
         SAL        ADDR10
         INA        -1
         SAU        ADDR11
         SAL        ADDR11
         SAU        ADDR12
         SAL        ADDR12
         SIU    3   S110                 SAVE INDEX
         SIL    4   S110
ADDR9    SIU    1   S100
         LDA        *                    *= IK
ADDR1    AJP    1   ADDR2                IF IK  =1,NO KEY ARRAY REQUESTED
```

```
         LIL    1  *                  *=NN
         INI    1  -1                      B1 HAS NN-1
ADDR10   ENA    1  1
         STA    1  *                  *=KEYS
         IJP    1  ADDR10
         ENA       -1
ADDR2    STA       IC
         LIL    1  *                  *=NN
ADDR3    ENQ    1  0                  B1 HAS VALUE OF NN
         ENA       1
S2       QRS       1
         QJP       S6
         ALS       1
         IJP    1  S2
         SLJ       S99                S99 ERROR,DEBUG
S6       INA       -1
         STA       MM
S20      ARS       1
         STA       MM
         AJP       S100
         AJP    3  S99
ADDR4    LDA       **                   **=N
         SUB       MM
         AJP    3  S99
         SAU       S30
         SIL    2  S100
         ENI    2  1
S40      ENA    2  0
         STA       II
S42      LIL    3  II
         ADD       MM
         STA       TEMP
         LIL    4  TEMP
ADDR5    ENA    3  *                  *=X -1
         SAU       S201
ADDR6    LDA    4  *                  *=X-1
```

```
S201      THS        *                                          00000720
          SLJ        S30                                        00000730
ADDR7     LDA    3   *              *=X -1                      00000740
          LDQ    4   *              *=X -1                      00000750
ADDR8     STA    4   *              *=X  -1                     00000760
          STQ    3   *              *=X -1                      00000770
+         SSK        IC                                         00000780
          SLJ        S202                                       00000790
ADDR11    LDA    4   *              *=KEYS -1                   00000800
          LDQ    3   *              *=KEYS -1                   00000810
ADDR12    STA    3   *              *=KEYS -1                   00000820
          STQ    4   *              *=KEYS -1                   00000830
S202      LDA        II                                         00000840
          SUB        MM                                         00000850
          AJP        S30                                        00000860
          AJP    2   S41                                        00000870
S30       ISK    2   *                                          00000880
          SLJ        S40                                        00000890
          LDA        MM                                         00000900
          SLJ        S20                                        00000910
S41       STA        II                                         00000920
          SLJ        S42                                        00000930
S99       SLS        S99            ERROR STOP MAY BE ILLEGAL   00000940
S100      ENI    1   **                                         00000950
          ENI    2   **                                         00000960
S110      ENI    3   **                                         00000970
          ENI    4   **                                         00000980
          SLJ        SHLSORT                                    00000990
IC        BSS        1                                          00001000
II        BSS        1                                          00001010
MM        BSS        1                                          00001020
TEMP      BSS        1                                          00001030
          END                                                   0000104
```

```
      SUBROUTINE VARSUB(RCALC,RM,RSIG,MTS,MTSUM,SUP,RSMSQ,ESR)
      DIMENSION RCALC(200),R(200),KEYS(200)
      MTD=MTSUM-MTS
      RSUM=0.
      RSMSQ=0.
      AMTD=MTD-1
   40 DO 30 L=1,MTD
      K=L+MTS
      R(L)=RCALC(K)
   29 RSUM=RSUM+R(L)
   30 RSMSQ=RSMSQ+R(L)*R(L)
      RM=RSUM/(AMTD+1)
      RMSQ=RM*RM
      RSIG=(RSMSQ/AMTD)-(RMSQ*((AMTD+1.)/AMTD))
      RSIGM=SQRTF(RSIG)
      ESR=(LOGF(RSIG))*AMTD
      CALL KOLSMIR(R,RM,RSIGM,MTD,SUP)
      RSMSQ=RSIG*AMTD
      RETURN
      END
```

20

```
      SUBROUTINE KOLSMIR(R,RM,RSIG,NINS,SUP)
      DIMENSION R(200),DIFF(80),KEYS(200)
      CALL SHLSORT(NINS,R,KEYS,1)
      DO 5 L=1,NINS
      XARG=(R(L)-RM)/RSIG
      CALL NPOA(XARG,5,ORD,AREA,ERR)
      IF (XARG)60,62,61
   60 AREA=1.-AREA
      GO TO 61
   62 AREA=.5
   61 CONTINUE
      DODGE1=L
      DODGE2=NINS
      DIFF(L)=DODGE1/DODGE2
      DIFF(L)=DIFF(L)-AREA
    5 CONTINUE
      DO 63 L=1,NINS
   63 DIFF(L)=ABSF(DIFF(L))
      CALL SHLSORT(NINS,DIFF,KEYS,1)
      SUP =DIFF(NINS)
      RETURN
      END
```

```
      SUBROUTINE NPOA (XARG,ITYPE,ORD,AREA,ERR)                             000000
C     C3 UCSD NPOA                                                           000010
      IF (XABSF(ITYPE)-6)7,7,16                                             NP000020
 7    ERR=ABSF(XARG)                                                        NP000030
      AREA=0.0                                                              NP000040
      IF(ITYPE)9,16,8                                                       NP000050
 8    ERR=0.707106781*ERR                                                   NP000060
 9    KTYPE=XABSF(ITYPE)                                                    NP000070
      IF((ERR**2)-88.028)15,15,10                                           NP000080
 10   ORD=0.0                                                               NP000090
      IF(XABSF(ITYPE)-6)11,17,11                                            NP000100
 11   AREA=1.0                                                              NP000110
      GO TO 19                                                              NP000120
 15   ORD=1.12837917*EXPF(-(ERR**2))                                        NP000130
      IF(XABSF(ITYPE)-6)12,6,12                                             NP000140
 12   AREA=1.0/(1.0+0.3275911*ERR)                                          NP000150
      AREA=1.0-((((0.94064607*AREA-1.287822453)*AREA+1.25969513)            NP000160
     1*AREA-0.252128668)*AREA+0.225836846)*AREA*ORD                         NP000170
 19   GO TO(6,2,3,4,5),KTYPE                                                NP000180
 2    AREA=AREA/2.0                                                         NP000190
      GO TO 6                                                               NP000200
 3    AREA=1.0-AREA                                                         NP000210
      GO TO 6                                                               NP000220
 4    AREA=(1.0-AREA)/2.0                                                   NP000230
      GO TO 6                                                               NP000240
 5    AREA=(1.0+AREA)/2.0                                                   NP000250
 6    IF(ITYPE)17,16,14                                                     NP000260
 14   ORD=0.3535533905*ORD                                                  NP000270
 17   ERR=0.0                                                               NP000280
      GO TO 18                                                              NP000290
 16   ERR=1.0                                                               NP000300
 18   RETURN                                                                NP000310
      END                                                                   NP000320
```

```
      SUBROUTINE COV(R1,R2,R1M,R2M,MTS,MTSUM,CO)
      DIMENSION R1(200),R2(200),R11(200),R21(200)
      MTD=MTSUM-MTS
      RPROD=0.
      AMTD=MTD-1
      CO=0.
   43 DO 1 I=1,MTD
      K=I+MTS
      R11(I)=R1(K)
    1 R21(I)=R2(K)
      DO 2 I=1,MTD
    2 RPROD=RPROD+((R11(I)-R1M)*(R21(I)-R2M))
      CO=RPROD/AMTD
      RETURN
      END
```

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APPENDIX 3

AIRCRAFT TYPE 4

UPPER LIMIT OF RMS ERRCR CONSIDERED	200
NUMBER OF SAMPLE POINTS	116
NUMBER OF TERRAIN SEGMENTS CONSIDERED	4
NUMBER CF SPEEDS	3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3
3	2
4	3

DATA ACJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVICUAL SAMPLE SIZE

TERRAIN	SPEED 1	2	3
1	12	12	
2	8	12	9
3	14	15	
4	13	10	11

TER	SPC	GU	GD	K	P	S
1	1	.350	.650	1.233	1.200	-.070
1	1	.450	.800	.333	.900	.940
1	1	.900	.800	.262	.975	.480
1	1	.550	.650	.467	.650	1.190
1	1	.200	1.150	.667	.850	1.200
1	1	1.000	.475	.883	.937	.670
1	1	.950	1.150	.118	1.050	.520
1	1	1.125	1.550	.093	.850	.770
1	1	.400	1.050	.110	.800	1.330
1	1	.200	1.300	1.167	.900	1.290
1	1	.200	.500	1.083	1.025	1.540
2	1	.250	.750	.750	.750	.850
2	1	.300	.650	.200	1.300	-.080
2	1	1.400	.650	.233	.700	.540
2	1	.250	.700	1.667	1.125	1.210
2	1	.650	1.300	.363	.950	.570
2	1	.400	.600	.667	.875	.460
2	1	.200	.900	.833	.800	.840
2	1	.200	.750	.267	1.250	.360
3	1	.300	.450	.983	.850	.650
3	1	.350	.900	1.000	1.000	1.230
3	1	.600	1.300	.817	1.025	.210
3	1	.400	1.000	.733	.775	.640
3	1	.500	1.200	.667	.700	.340
3	1	.400	.750	1.250	1.050	0
3	1	.700	1.400	.667	.850	.460
3	1	.600	1.400	.833	.800	.310
3	1	.400	1.300	.833	.750	1.390
3	1	.200	1.400	.500	.800	1.040
3	1	.400	1.100	1.167	.800	1.930
4	1	.400	1.050	.833	.775	.770
4	1	.800	1.200	.333	.600	.960
4	1	.300	1.100	1.000	.900	1.630
4	1	.650	1.350	.667	.900	.470
4	1	.350	.350	1.000	.775	.410
4	1	.200	1.400	.417	1.000	1.350
4	1	.400	1.100	.833	.900	1.740
4	1	.600	1.100	.833	.850	.970
4	1	.200	1.250	.667	1.000	1.410
4	1	.600	.900	.833	.800	.890
4	1	.650	1.350	.833	.875	.530
4	1	.550	.900	.750	.850	1.820
3	2	.600	1.400	1.167	.750	.580
3	2	.500	.700	1.117	.600	1.610
3	2	.600	.650	1.667	.875	1.220
3	2	.600	.800	.583	.650	1.500
3	2	.500	1.050	1.750	.850	1.560
3	2	.200	.800	.667	.950	.730
3	2	.600	1.450	1.500	.875	.590
3	2	.500	.850	1.000	.750	1.400
3	2	.500	1.200	.833	.800	.860
3	2	.700	1.150	.667	.825	.810
2	2	.550	1.400	1.000	.950	.770
2	2	.250	1.100	.933	.900	1.060
2	2	.750	.650	.600	.725	1.400
2	2	.600	.700	1.467	.850	1.700
2	2	.950	.800	.667	.700	1.580
2	2	.800	.650	1.167	.525	1.110
2	2	.600	1.000	1.000	.850	.830

2	2	.500	.500	1.333	1.000	1.260
1	2	.950	1.550	1.550	1.100	.510
1	2	.200	1.250	.833	.900	.920
1	2	.400	1.200	1.000	1.000	1.700
1	2	.700	.950	1.033	.625	2.310
1	2	.500	1.100	1.667	.650	1.700
1	2	.600	.500	.833	.900	1.170
1	2	.950	1.000	1.250	1.025	.430
1	2	.450	1.050	1.233	.800	1.430
1	2	.750	1.300	.833	.800	1.430
4	2	.350	1.250	.750	.925	1.810
4	2	.600	.900	.750	.875	1.620
4	2	.550	1.150	1.000	.600	.710
4	2	.800	1.450	1.083	.675	.750
4	2	.600	1.300	1.000	.900	1.290
4	2	.850	1.400	1.250	.750	.720
4	2	.500	.950	1.333	.800	1.460
2	3	.400	.900	2.333	1.100	-.170
2	3	1.050	.900	.667	.900	1.660
2	3	1.050	1.250	1.467	.700	.960
2	3	.850	1.850	.833	.850	1.350
4	3	.700	1.350	.833	.725	1.100
4	3	.800	1.350	1.167	.650	1.270
4	3	.800	1.500	.833	.725	.930
4	3	.650	1.450	.667	.800	1.510
4	3	.600	.900	1.667	.950	1.880
4	3	.500	.800	2.250	.950	2.180
4	3	.400	1.050	2.000	1.100	.360
1	1	.350	.250	1.183	.425	2.020
1	2	.450	.900	1.333	.662	2.560
2	2	.600	1.300	.833	1.000	.520
2	2	.200	.550	.667	.950	3.100
4	2	.400	.850	.833	.650	1.380
3	2	.300	1.500	1.000	.925	3.410
4	3	.450	1.250	1.250	.700	2.160
4	3	.450	1.000	2.083	.700	2.550
2	3	.200	.500	.833	.900	1.390
2	3	.350	1.450	2.833	1.125	1.260
2	3	1.550	1.550	1.450	.900	1.560
4	1	.250	.150	2.500	1.050	2.290
3	1	1.300	.200	2.167	.975	2.200
3	1	.600	.850	1.067	.800	1.370
3	1	.300	.350	1.233	.875	1.600
4	2	.550	.850	.583	.350	3.100
3	2	.400	.400	1.167	.600	.950
3	2	.800	1.050	2.083	.850	2.220
3	2	.250	.500	1.000	.800	3.400
3	2	.600	.900	1.167	.900	2.560
4	2	.250	.750	2.083	.825	4.430
1	2	.800	.350	2.267	.600	3.060
2	2	.200	.900	.833	.900	1.720
2	2	.600	.800	1.000	.850	2.730
1	2	1.200	.550	.733	.725	1.350
4	3	.200	1.300	2.167	.900	5.190
4	3	.400	.650	2.667	.875	3.340
2	3	.350	3.725	.102	.800	2.360
2	3	.200	.550	.833	.900	4.030
4	3	.200	.750	2.833	.875	4.390

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.118	.030	-.092	-.095	.006	.556
.030	.147	-.093	-.047	.012	.860
-.092	-.093	.209	.056	-.003	.633
-.095	-.047	.056	.310	-.049	.990
.006	.012	-.003	-.049	.013	.932

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.205	.146	.161	.104	.132

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .741	GU/K 2.287	GU/S 1.819	GU/X .474
GD/K 1.973	GD/S .717	GD/X .911	
K/S .717	K/X .163		
S/X 3.774			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.081	-.026	.010	-.040	.001	.662
-.026	.126	-.027	-.143	.018	.975
.010	-.027	.199	.158	-.013	1.214
-.040	-.143	.158	.624	-.062	1.547
.001	.018	-.013	-.062	.009	.899

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.133	.134	.157	.173	.152

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 10

GU/GD .861	GU/K .242	GU/S .574	GU/X .110
GD/K .556	GD/S 1.864	GD/X 2.006	
K/S 1.592	K/X 1.048		
S/X 4.800			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.098	.005	-.023	-.049	.002	.609
.005	.134	-.040	-.074	.013	.918
-.023	-.040	.283	.187	-.013	.924
-.049	-.074	.187	.528	-.058	1.269
.002	.013	-.013	-.058	.011	.915

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 24

GU	GD	K	S	X
.153	.101	.103	.121	.088

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 22

GU/GD	GU/K	GU/S	GU/X
.200	.663	1.042	.334
GD/K	GD/S	GD/X	
.988	1.359	1.761	
K/S	K/X		
2.595	1.103		
S/X			
5.606			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 1

.378	.063	.007	1.263	.412

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.167	.001	-.080	-.018	-.024	.456
.001	.051	-.013	.012	-.002	.788
-.080	-.013	.240	.160	-.001	.622
-.018	.012	.160	.148	-.018	.594
-.024	-.002	-.001	-.018	.013	.978

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.305	.316	.208	.150	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .031	GU/K 1.064	GU/S .281	GU/X 1.407
GD/K .282	GD/S .349	GD/X .191	
K/S 3.912	K/X .061		
S/X 1.090			

TERRAIN 2 SPEED 2

	VARIANCE	COVARIANCE	MATRIX		MEAN VECTOR
GU	GD	K	S	X	
.055	-.006	.002	-.054	-.012	.550
-.006	.083	-.011	-.130	.008	.863
.002	-.011	.071	-.039	.001	.958
-.054	-.130	-.039	.593	.002	1.482
-.012	.008	.001	.002	.006	.919

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.167	.169	.188	.212	.183

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .265	GU/K .110	GU/S .981	GU/X 2.650
GD/K .444	GD/S 2.299	GD/X 1.163	
K/S .607	K/X .153		
S/X .099			

TERRAIN 2 SPEED 3

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.227	.020	-.010	-.125	-.012	.667
.020	.961	-.288	.088	-.021	1.408
-.010	-.288	.743	-.541	.042	1.261
-.125	.088	-.541	1.282	-.022	1.600
-.012	-.021	.042	-.022	.005	.951

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.268	.220	.246	.257	.290

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD .116	GU/K .063	GU/S .631	GU/X .989
GD/K .958	GD/S .211	GD/X .845	
K/S 1.764	K/X 2.575		
S/X .780			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.135	.025	-.002	-.031	-.015	.561
.025	.394	-.029	.049	-.003	1.011
-.002	-.029	.362	-.033	.009	.960
-.031	.049	-.033	.821	-.018	1.273
-.015	-.003	.009	-.018	.008	.945

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 29

GU	GD	K	S	X
.152	.225	.197	.173	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 27

GU/GD .561	GU/K .036	GU/S .483	GU/X 2.611
GD/K .406	GD/S .449	GD/X .283	
K/S .315	K/X .927		
S/X 1.217			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 2

4.528	19.760	11.526	6.934	2.125

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.072	-.030	.073	.050	.004	.504
-.030	.166	-.131	-.126	-.009	.971
.073	-.131	.165	.165	.012	.994
.050	-.126	.165	.466	-.003	.955
.004	-.009	.012	-.003	.003	.926

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 14

GU	GD	K	S	X
.221	.146	.193	.172	.206

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 12

GU/GD .967	GU/K 3.097	GU/S .980	GU/X .909
GD/K 4.511	GD/S 1.761	GD/X 1.465	
K/S 2.562	K/X 1.928		
S/X .238			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.027	.015	.030	-.043	-.001	.510
.015	.114	.011	-.034	.010	.960
.030	.011	.184	.041	.006	1.158
-.043	-.034	.041	.886	.012	1.560
-.001	.010	.006	.012	.004	.892

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 15

GU	GD	K	S	X
.159	.104	.225	.212	.113

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 13

GU/GD 1.041	GU/K 1.718	GU/S 1.048	GU/X .301
GD/K .285	GD/S .384	GD/X 1.862	
K/S .371	K/X .760		
S/X .749			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.047	-.006	.049	.003	.001	.507
-.006	.134	-.056	-.077	.001	.966
.049	-.056	.176	.123	.007	1.079
.003	-.077	.123	.754	-.000	1.268
.001	.001	.007	-.000	.004	.909

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 29

GU	GD	K	S	X
.196	.072	.175	.140	.100

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 27

GU/GD .393	GU/K 3.346	GU/S .071	GU/X .521
GD/K 2.026	GD/S 1.300	GD/X .168	
K/S 1.864	K/X 1.384		
S/X .042			

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 3 ALL SPEEDS

CEGREES OF FREEDCM 1

3.036	.467	.040	1.309	.105

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.038	.021	-.038	-.057	-.009	.458
.021	.142	-.156	-.068	-.002	1.015
-.038	-.156	.274	.156	.016	.885
-.057	-.068	.156	.342	.020	1.172
-.009	-.002	.016	.020	.004	.929

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.154	.154	.336	.174	.151

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 11

GU/GD .971	GU/K 1.309	GU/S 1.889	GU/X 3.291
GD/K 4.328	GD/S 1.070	GD/X .232	
K/S 1.960	K/X 1.725		
S/X 2.002			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.035	.033	-.020	-.148	-.003	.545
.033	.065	-.017	-.212	.007	1.085
-.020	-.017	.182	.222	.016	1.067
-.148	-.212	.222	1.399	-.017	1.727
-.003	.007	.016	-.017	.012	.851

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.184	.202	.184	.272	.158

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 2.728	GU/K .736	GU/S 2.577	GU/X .440
GD/K .459	GD/S 2.802	GD/X .677	
K/S 1.386	K/X 1.024		
S/X .359			

TERRAIN 4 SPEED 3

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.035	.043	-.120	-.151	-.007	.541
.043	.090	-.217	-.243	-.013	1.095
-.120	-.217	.580	.634	.030	1.659
-.151	-.243	.634	1.329	.002	1.970
-.007	-.013	.030	.002	.006	.904

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.141	.111	.159	.155	.212

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD 3.643	GU/K 4.665	GU/S 2.967	GU/X 1.723
GD/K 9.322	GD/S 2.964	GD/X 2.177	
K/S 3.136	K/X 1.862		
S/X .054			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.036	.031	-.046	-.093	-.007	.510
.031	.098	-.117	-.143	-.004	1.062
-.046	-.117	.440	.414	.018	1.189
-.093	-.143	.414	1.031	-.003	1.594
-.007	-.004	.018	-.003	.008	.898

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 34

GU	GD	K	S	X
.103	.081	.230	.154	.078

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 32

GU/GD 3.508	GU/K 2.208	GU/S 3.132	GU/X 2.790
GD/K 3.886	GD/S 2.856	GD/X .769	
K/S 4.410	K/X 1.872		
S/X .205			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 2

.032	1.530	3.277	5.730	3.112

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.076	.013	-.010	-.046	-.005	.543
.013	.186	-.058	-.056	.001	.995
-.010	-.058	.325	.191	.005	1.049
-.046	-.056	.191	.807	-.019	1.365
-.005	.001	.005	-.019	.008	.916

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 116

GU	GD	K	S	X
.141	.086	.147	.123	.100

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 114

GU/GD 1.184	GU/K .671	GU/S 2.042	GU/X 2.057
GD/K 2.602	GD/S 1.568	GD/X .249	
K/S 4.303	K/X 1.132		
S/X 2.637			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 9

GU	GD	K	S	X
23.130	34.280	19.391	18.641	12.466

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
16.366	18.052	6.316	2.907	6.365

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GC	K	S	X	MEAN VECTOR
.086	.003	-.025	-.025	-.004	.496
.003	.134	-.090	-.049	-.002	.924
-.025	-.090	.231	.140	.005	.808
-.025	-.049	.140	.354	-.013	.963
-.004	-.002	.005	-.013	.008	.937

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 47

GU	GD	K	S	X
.203	.089	.139	.093	.107

T TEST FOR SIGNIFICANCE OF
CCRRELATION
CEGREES OF FREEDOM 45

GU/GD .218	GU/K 1.222	GU/S .990	GU/X .991
GD/K 3.996	GD/S 1.551	GD/X .365	
K/S 3.760	K/X .742		
S/X 1.766			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.049	.004	.010	-.063	-.003	.564
.004	.099	-.006	-.106	.008	.965
.010	-.006	.159	.082	.001	1.104
-.063	-.106	.082	.807	-.015	1.572
-.003	.008	.001	-.015	.007	.892

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 49

GU	GD	K	S	X
.171	.072	.154	.190	.124

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 47

GU/GD .347	GU/K .804	GU/S 2.275	GU/X 1.152
GD/K .310	GD/S 2.775	GD/X 2.196	
K/S 1.619	K/X .284		
S/X 1.365			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX — MEAN VECTO

GU	GD	K	S	X	MEAN VECTO
.118	.042	-.080	-.144	-.007	.597
.042	.477	-.268	-.121	-.012	1.236
-.080	-.268	.659	.144	.029	1.480
-.144	-.121	.144	1.275	-.013	1.803
-.007	-.012	.029	-.013	.006	.925

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.166	.225	.187	.151	.137

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .755	GU/K 1.272	GU/S 1.703	GU/X 1.210
GD/K 2.306	GD/S .665	GD/X 1.005	
K/S .676	K/X 2.276		
S/X .662			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 2

GU	GD	K	S	X
6.397	21.450	16.415	13.162	.626

```
UPPER LIMIT OF RMS ERROR CONSIDERED            160
NUMBER OF SAMPLE POINTS                        108
NUMBER OF TERRAIN SEGMENTS CONSIDERED            4
NUMBER OF SPEEDS                                 3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

                               TERRAIN   SPEEDS

                                  1        2

                                  2        3

                                  3        2

                                  4        3

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

        TERRAIN                SPEED
                       1         2        3

           1          12        11
           2           8        11        8
           3          14        13
           4          12        10        9
```

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.118	.030	-.092	-.095	.006	.556
.030	.147	-.093	-.047	.012	.860
-.092	-.093	.209	.056	-.003	.633
-.095	-.047	.056	.310	-.049	.990
.006	.012	-.003	-.049	.013	.932

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.205	.146	.161	.104	.132

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .741	GU/K 2.287	GU/S 1.819	GU/X .474
GD/K 1.973	GD/S .717	GD/X .911	
K/S .717	K/X .163		
S/X 3.774			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.087	-.020	-.005	-.067	.003	.650
-.020	.096	.042	-.054	.011	1.032
-.005	.042	.098	.001	-.000	1.118
-.067	-.054	.001	.437	-.047	1.410
.003	.011	-.000	-.047	.008	.910

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.150	.122	.183	.149	.133

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD .666	GU/K .169	GU/S 1.096	GU/X .332
GD/K 1.426	GD/S .813	GD/X 1.317	
K/S .008	K/X .017		
S/X 4.060			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.100	.010	-.036	-.068	.004	.601
.010	.125	-.006	-.029	.010	.942
-.036	-.006	.210	.082	-.004	.865
-.068	-.029	.082	.400	-.048	1.191
.004	.010	-.004	-.048	.010	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 23

GU	GD	K	S	X
.161	.100	.094	.092	.091

T TEST FOR SIGNIFICANCE OF
CORRELATICN
CEGREES OF FREEDOM 21

GU/GD .420	GU/K 1.188	GU/S 1.645	GU/X .529
GD/K .165	GD/S .604	GD/X 1.352	
K/S 1.343	K/X .415		
S/X 5.270			

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 1 ALL SPEEDS

CEGREES OF FREEDOM 1

.236	.447	1.397	.296	.599

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.167	.001	-.080	-.018	-.024	.456
.001	.051	-.013	.012	-.002	.788
-.080	-.013	.240	.160	-.001	.622
-.018	.012	.160	.148	-.018	.594
-.024	-.002	-.001	-.018	.013	.978

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.305	.316	.208	.150	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6.

GU/GD .031	GU/K 1.064	GU/S .281	GU/X 1.407
GD/K .282	GD/S .349	GD/X .191	
K/S 3.912	K/X .061		
S/X 1.090			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.048	-.005	-.002	-.050	-.012	.582
-.005	.091	-.011	-.144	.009	.859
-.002	-.011	.076	-.039	.002	.970
-.050	-.144	-.039	.646	.001	1.460
-.012	.009	.002	.001	.007	.916

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.195	.214	.184	.201	.165

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD .219	GU/K .119	GU/S .893	GU/X 2.702
GD/K .408	GD/S 2.223	GD/X 1.096	
K/S .539	K/X .202		
S/X .061			

TERRAIN 2 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.243	.141	-.070	-.104	-.016	.706
.141	.236	.103	-.182	-.003	1.119
-.070	.103	.633	-.477	.037	1.406
-.104	-.182	-.477	1.372	-.019	1.505
-.016	-.003	.037	-.019	.005	.958

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.233	.174	.264	.322	.301

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD 1.791	GU/K .445	GU/S .450	GU/X 1.274
GD/K .676	GD/S .828	GD/X .194	
K/S 1.459	K/X 2.161		
S/X .562			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.138	.049	-.011	-.017	-.016	.582
.049	.131	.061	-.064	.002	.915
-.011	.061	.359	.005	.008	.996
-.017	-.064	.005	.828	-.018	1.217
-.016	.002	.008	-.018	.008	.947

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 27

GU	GD	K	S	X
.147	.183	.201	.186	.122

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 25

GU/GD 1.961	GU/K .250	GU/S .251	GU/X 2.699
GD/K 1.462	GD/S .997	GD/X .335	
K/S .043	K/X .773		
S/X 1.080			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 2

5.305	4.084	8.455	6.993	1.765

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.072	-.030	.073	.050	.004	.504
-.030	.166	-.131	-.126	-.009	.971
.073	-.131	.165	.165	.012	.994
.050	-.126	.165	.466	-.003	.955
.004	-.009	.012	-.003	.003	.926

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 14

GU	GD	K	S	X
.221	.146	.193	.172	.206

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 12

GU/GD .967	GU/K 3.097	GU/S .980	GU/X .909
GD/K 4.511	GD/S 1.761	GD/X 1.465	
K/S 2.562	K/X 1.928		
S/X .238			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.024	.000	.032	-.013	-.002	.538
.000	.082	.007	.011	.005	1.038
.032	.007	.213	.074	.007	1.169
-.013	.011	.074	.711	.009	1.465
-.002	.005	.007	.009	.004	.901

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.192	.147	.195	.201	.107

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 11

GU/GD .036	GU/K 1.642	GU/S .340	GU/X .865
GD/K .168	GD/S .149	GD/X 1.101	
K/S .644	K/X .825		
S/X .597			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.048	-.014	.053	.023	.001	.520
-.014	.122	-.059	-.049	-.003	1.004
.053	-.059	.188	.140	.008	1.078
.023	-.049	.140	.629	-.001	1.201
.001	-.003	.008	-.001	.003	.914

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 27

GU	GD	K	S	X
.210	.078	.161	.118	.100

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 25

GU/GD .927	GU/K 3.341	GU/S .683	GU/X .269
GD/K 2.131	GD/S .901	GD/X .633	
K/S 2.222	K/X 1.570		
S/X .060			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 3 ALL SPEEDS

DEGREES OF FREEDOM 1

3.389	1.443	.194	.534	.003

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.037	.005	-.008	-.039	-.008	.475
.005	.081	-.033	.021	.006	1.088
-.008	-.033	.042	-.008	.002	.750
-.039	.021	-.008	.250	.011	1.079
-.008	.006	.002	.011	.004	.921

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.151	.136	.175	.170	.159

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .282	GU/K .650	GU/S 1.387	GU/X 2.798
GD/K 2.179	GD/S .483	GD/X 1.237	
K/S .250	K/X .482		
S/X 1.210			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.035	.033	-.020	-.148	-.003	.545
.033	.065	-.017	-.212	.007	1.085
-.020	-.017	.182	.222	.016	1.067
-.148	-.212	.222	1.399	-.017	1.727
-.003	.007	.016	-.017	.012	.851

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.184	.202	.184	.272	.158

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 2.728	GU/K .736	GU/S 2.577	GU/X .440
GD/K .459	GD/S 2.802	GD/X .677	
K/S 1.386	K/X 1.024		
S/X .359			

TERRAIN 4 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.023	.026	-.067	-.037	-.006	.594
.026	.064	-.141	-.081	-.013	1.183
-.067	-.141	.359	.150	.028	1.417
-.037	-.081	.150	.495	-.016	1.549
-.006	-.013	.028	-.016	.007	.897

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.176	.146	.168	.099	.265

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD 2.433	GU/K 2.848	GU/S .959	GU/X 1.581
GD/K 6.645	GD/S 1.354	GD/X 2.064	
K/S 1.009	K/X 1.765		
S/X .762			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.033	.020	-.013	-.057	-.006	.532
.020	.068	-.044	-.074	.001	1.115
-.013	-.044	.242	.161	.010	1.046
-.057	-.074	.161	.726	-.013	1.425
-.006	.001	.010	-.013	.008	.892

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 31

GU	GD	K	S	X
.090	.085	.215	.135	.077

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 29

GU/GD 2.574	GU/K .796	GU/S 2.137	GU/X 2.301
GD/K 1.971	GD/S 1.901	GD/X .245	
K/S 2.232	K/X 1.234		
S/X .967			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 2

.501	.169	9.614	7.095	3.385

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.076	.014	-.003	-.030	-.004	.556
.014	.113	-.010	-.047	.001	1.000
-.003	-.010	.250	.100	.005	1.003
-.030	-.047	.100	.650	-.020	1.267
-.004	.001	.005	-.020	.008	.917

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 108

GU	GD	K	S	X
.150	.071	.133	.110	.091

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 106

GU/GD	GU/K	GU/S	GU/X
1.628	.254	1.395	1.887
GD/K	GD/S	GD/X	
.606	1.823	.260	
K/S	K/X		
2.633	1.240		
S/X			
2.995			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 9

GU	GD	K	S	X
25.198	8.941	22.392	17.759	12.892

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
16.937	3.647	3.157	3.192	7.224

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.086	-.001	-.016	-.019	-.003	.502
-.001	.124	-.062	-.027	-.000	.941
-.016	-.062	.171	.092	.001	.772
-.019	-.027	.092	.322	-.016	.934
-.003	-.000	.001	-.016	.008	.935

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 46

GU	GD	K	S	X
.201	.088	.115	.092	.113

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 44

GU/GD	GU/K	GU/S	GU/X
.049	.900	.744	.868

GD/K	GD/S	GD/X
3.150	.901	.050

K/S	K/X
2.824	.247

S/X
2.292

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.046	.001	.003	-.063	-.003	.578
.001	.086	.010	-.081	.006	1.003
.003	.010	.140	.055	.005	1.085
-.063	-.081	.055	.741	-.014	1.509
-.003	.006	.005	-.014	.007	.896

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 45

GU	GD	K	S	X
.192	.083	.145	.190	.116

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 43

GU/GD .066	GU/K .204	GU/S 2.397	GU/X 1.015
GD/K .607	GD/S 2.223	GD/X 1.568	
K/S 1.144	K/X 1.079		
S/X 1.285			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.121	.073	-.065	-.065	-.009	.647
.073	.136	-.025	-.119	-.009	1.153
-.065	-.025	.457	-.133	.030	1.412
-.065	-.119	-.133	.848	-.017	1.528
-.009	-.009	.030	-.017	.007	.926

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.134	.106	.216	.149	.173

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD 2.671	GU/K 1.105	GU/S .804	GU/X 1.221
GD/K .393	GD/S 1.454	GD/X 1.169	
K/S .850	K/X 2.519		
S/X .898			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 2

GU	GD	K	S	X
6.973	1.963	10.148	9.078	.110

UPPER LIMIT OF RMS ERROR CONSIDERED	120
NUMBER OF SAMPLE POINTS	87
NUMBER OF TERRAIN SEGMENTS CONSIDERED	4
NUMBER OF SPEEDS	3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3
3	2
4	3

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	2	3
1	11	9	
2	8	8	4
3	11	10	
4	12	7	7

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.125	.019	-.089	-.082	.000	.575
.019	.121	-.066	.017	-.005	.916
-.089	-.066	.197	.000	.014	.583
-.082	.017	.000	.225	-.022	.896
.000	-.005	.014	-.022	.006	.957

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.184	.176	.168	.096	.095

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD .477	GU/K 2.060	GU/S 1.671	GU/X .008
GD/K 1.404	GD/S .303	GD/X .621	
K/S .002	K/X 1.359		
S/X 2.329			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.064	.008	.026	-.056	.006	.611
.008	.084	.031	-.042	.007	1.100
.026	.031	.097	-.031	-.001	1.137
-.056	-.042	-.031	.364	-.043	1.289
.006	.007	-.001	-.043	.008	.927

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.115	.134	.186	.137	.134

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 7

GU/GD .296	GU/K .934	GU/S 1.044	GU/X .726
GD/K .965	GD/S .663	GD/X .794	
K/S .435	K/X .075		
S/X 3.590			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.093	.015	-.030	-.063	.002	.591
.015	.108	.005	.010	-.001	.999
-.030	.005	.225	.044	.003	.832
-.063	.010	.044	.312	-.033	1.073
.002	-.001	.003	-.033	.007	.944

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.129	.106	.104	.089	.105

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .657	GU/K .916	GU/S 1.683	GU/X .390
GD/K .139	GD/S .225	GD/X .179	
K/S .712	K/X .288		
S/X 4.472			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 1

.917	.283	.997	.490	.235

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.167	.001	-.080	-.018	-.024	.456
.001	.051	-.013	.012	-.002	.787
-.080	-.013	.240	.160	-.001	.622
-.018	.012	.160	.148	-.018	.594
-.024	-.002	-.001	-.018	.013	.978

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.305	.316	.208	.150	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .031	GU/K 1.064	GU/S .281	GU/X 1.407
GD/K .282	GD/S .349	GD/X .191	
K/S 3.912	K/X .061		
S/X 1.090			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.045	-.024	-.022	.030	-.013	.626
-.024	.088	-.020	-.066	.009	.850
-.022	-.020	.090	.006	.007	1.021
.030	-.066	.006	.112	-.007	1.214
-.013	.009	.007	-.007	.008	.897

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.173	.194	.153	.124	.126

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD 1.026	GU/K .917	GU/S 1.124	GU/X 2.475
GD/K .566	GD/S 2.195	GD/X .935	
K/S .135	K/X .707		
S/X .573			

TERRAIN 2 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.094	.029	-.186	.216	-.023	.837
.029	.201	-.139	.128	-.017	1.225
-.186	-.139	.571	-.597	.033	1.325
.216	.128	-.597	.640	-.041	.950
-.023	-.017	.033	-.041	.008	.939

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 4

GU	GD	K	S	X
.244	.266	.242	.187	.206

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 2

GU/GD .303	GU/K 1.898	GU/S 2.636	GU/X 2.238
GD/K .638	GD/S .540	GD/X .699	
K/S 9.362	K/X .808		
S/X 1.037			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.114	.019	-.028	.063	-.020	.600
.019	.112	.006	.012	-.001	.900
-.028	.006	.288	.022	.001	.922
.063	.012	.022	.278	-.026	.913
-.020	-.001	.001	-.026	.010	.938

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.124	.200	.142	.070	.110

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .708	GU/K .654	GU/S 1.600	GU/X 3.027
GD/K .135	GD/S .280	GD/X .123	
K/S .338	K/X .055		
S/X 2.361			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 2

2.619	2.020	3.688	3.919	.546

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.021	.021	-.004	-.039	.001	.441
.021	.095	-.044	.009	-.007	1.109
-.004	-.044	.050	.019	.007	.859
-.039	.009	.019	.344	-.011	.745
.001	-.007	.007	-.011	.004	.922

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.246	.173	.182	.201	.231

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD 1.583	GU/K .352	GU/S 1.551	GU/X .178
GD/K 2.453	GD/S .149	GD/X 1.081	
K/S .431	K/X 1.805		
S/X .970			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.018	.013	.011	.001	-.003	.530
.013	.082	.014	-.083	.004	1.005
.011	.014	.181	.028	.007	1.095
.001	-.083	.028	.171	-.014	1.086
-.003	.004	.007	-.014	.004	.888

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.211	.205	.143	.207	.122

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 1.032	GU/K .542	GU/S .035	GU/X .920
GD/K .317	GD/S 2.788	GD/X .701	
K/S .450	K/X .756		
S/X 1.902			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.021	.014	.008	-.011	-.002	.483
.014	.088	-.022	-.042	-.000	1.060
.008	-.022	.121	.043	.005	.971
-.011	-.042	.043	.279	-.015	.908
-.002	-.000	.005	-.015	.004	.906

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 21

GU	GD	K	S	X
.124	.095	.178	.116	.131

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 19

GU/GD 1.516	GU/K .740	GU/S .661	GU/X .815
GD/K .963	GD/S 1.225	GD/X .101	
K/S 1.043	K/X .926		
S/X 2.216			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 3 ALL SPEEDS

DEGREES OF FREEDOM 1

.072	.048	3.525	1.055	.003

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.037	.005	-.008	-.039	-.008	.475
.005	.081	-.033	.021	.006	1.088
-.008	-.033	.042	-.008	.002	.750
-.039	.021	-.008	.250	.011	1.079
-.008	.006	.002	.011	.004	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.151	.136	.175	.170	.159

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .282	GU/K .650	GU/S 1.387	GU/X 2.798
GD/K 2.179	GD/S .483	GD/X 1.237	
K/S .250	K/X .482		
S/X 1.210			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.030	.019	.018	-.061	-.005	.607
.019	.045	.008	-.056	-.004	1.200
.018	.008	.050	-.055	-.006	1.024
-.061	-.056	-.055	.216	.028	1.194
-.005	-.004	-.006	.028	.005	.886

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.231	.166	.175	.259	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD 1.382	GU/K 1.170	GU/S 2.605	GU/X 1.116
GD/K .398	GD/S 1.539	GD/X .556	
K/S 1.374	K/X 1.019		
S/X 3.837			

TERRAIN 4 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.022	.031	-.074	.001	-.012	.636
.031	.078	-.164	-.080	-.019	1.200
-.074	-.164	.395	.087	.043	1.345
.001	-.080	.087	.369	-.001	1.319
-.012	-.019	.043	-.001	.008	.915

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.135	.144	.221	.103	.194

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD 2.523	GU/K 2.889	GU/S .024	GU/X 7.342
GD/K 5.763	GD/S 1.186	GD/X 2.668	
K/S .523	K/X 2.892		
S/X .024			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.035	.019	.001	-.024	-.008	.554
.019	.068	-.039	-.018	-.003	1.148
.001	-.039	.188	.030	.009	.984
-.024	-.018	.030	.261	.011	1.175
-.008	-.003	.009	.011	.005	.910

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 26

GU	GD	K	S	X
.104	.089	.216	.117	.068

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 24

GU/GD	GU/K	GU/S	GU/X
2.014	.044	1.292	4.163

GD/K	GD/S	GD/X
1.801	.663	.869

K/S	K/X
.664	1.451

S/X
1.580

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 2

.482	.628	11.836	.465	1.001

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.063	.014	-.012	-.008	-.006	.556
.014	.097	-.011	-.003	-.003	1.035
-.012	-.011	.200	.034	.003	.932
-.008	-.003	.034	.285	-.014	1.027
-.006	-.003	.003	-.014	.006	.923

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 87

GU	GD	K	S	X
.120	.074	.128	.053	.088

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 85

GU/GD 1.672	GU/K 1.021	GU/S .586	GU/X 2.968
GD/K .732	GD/S .157	GD/X 1.000	
K/S 1.313	K/X .884		
S/X 3.130			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 9

GU	GD	K	S	X
21.197	3.829	22.957	6.399	6.425

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
17.829	1.612	3.635	.175	5.490

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.077	.009	-.043	-.040	-.006	.489
.009	.099	-.026	.027	-.005	.991
-.043	-.026	.125	.031	.003	.711
-.040	.027	.031	.263	-.011	.851
-.006	-.005	.003	-.011	.006	.942

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 42

GU	GD	K	S	X
.197	.088	.117	.091	.132

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 40

GU/GD .654	GU/K 3.066	GU/S 1.845	GU/X 1.650
GD/K 1.508	GD/S 1.052	GD/X 1.172	
K/S 1.099	K/X .744		
S/X 1.756			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.037	.004	.007	-.015	-.003	.590
.004	.085	.010	-.055	.005	1.034
.007	.010	.104	-.008	.003	1.074
-.015	-.055	-.008	.204	-.010	1.192
-.003	.005	.003	-.010	.006	.900

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 34

GU	GD	K	S	X
.185	.083	.120	.122	.087

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 32

GU/GD .388	GU/K .659	GU/S 1.023	GU/X 1.094
GD/K .608	GD/S 2.624	GD/X 1.175	
K/S .308	K/X .608		
S/X 1.653			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.052	.029	-.101	.046	-.013	.709
.029	.107	-.140	-.012	-.016	1.209
-.101	-.140	.408	-.125	.036	1.338
.046	-.012	-.125	.448	-.015	1.185
-.013	-.016	.036	-.015	.007	.923

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.094	.191	.240	.079	.169

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD	GU/K	GU/S	GU/X
1.247	2.904	.960	2.798
GD/K	GD/S	GD/X	
2.706	.162	2.210	
K/S	K/X		
.918	2.689		
S/X			
.838			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 2

GU	GD	K	S	X
4.760	.306	9.622	2.611	.127

```
UPPER LIMIT OF RMS ERROR CONSIDERED          200
NUMBER OF SAMPLE POINTS                      116
NUMBER OF TERRAIN SEGMENTS CONSIDERED          4
NUMBER OF SPEEDS                               3
```

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3
3	2
4	3

DATA ADJUSTED AS BEFORE AND CORRECTED FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	12	12	
2	8	12	9
3	14	15	
4	13	10	11

Terrains 1 and 2

$$GU_i = \sqrt{A}\,GU_i + \overline{GU}_2 - \sqrt{A}\;GU_i \qquad i \neq 2$$

$$K_i = \sqrt{1 - A}\;K_i + \overline{K}_2 - \sqrt{1 - A}\;\overline{K}_i \qquad i \neq 2$$

Terrains 3 and 4

$$K_i = \frac{V_2}{V_i}\;K_i$$

$$A = \frac{|V_i - V_2|}{V_2}$$

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.035	.016	-.042	-.052	.003	.627
.016	.147	-.078	-.047	.012	.860
-.042	-.078	.146	.047	-.002	1.009
-.052	-.047	.047	.310	-.049	.990
.003	.012	-.002	-.049	.013	.932

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.205	.146	.161	.104	.132

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .741	GU/K 2.287	GU/S 1.819	GU/X .474
GD/K 1.973	GD/S .717	GD/X .911	
K/S .717	K/X .163		
S/X 3.774			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX | | | | | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.081	-.026	.010	-.040	.001	.662
-.026	.126	-.027	-.143	.018	.975
.010	-.027	.199	.158	-.013	1.214
-.040	-.143	.158	.624	-.062	1.547
.001	.018	-.013	-.062	.009	.899

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.133	.134	.157	.173	.152

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .861	GU/K .242	GU/S .574	GU/X .110
GD/K .556	GD/S 1.864	GD/X 2.006	
K/S 1.592	K/X 1.048		
S/X 4.800			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.056	-.004	-.014	-.039	.002	.645
-.004	.134	-.044	-.074	.013	.918
-.014	-.044	.176	.128	-.009	1.112
-.039	-.074	.128	.528	-.058	1.269
.002	.013	-.009	-.058	.011	.915

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 24

GU	GD	K	S	X
.128	.101	.134	.121	.088

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 22

GU/GD	GU/K	GU/S	GU/X
.202	.652	1.093	.319
GD/K	GD/S	GD/X	
1.408	1.359	1.761	
K/S	K/X		
2.171	1.009		
S/X			
5.606			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 1

1.736	.063	.246	1.263	.412

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.050	.001	-.037	-.010	-.013	.572
.001	.051	-.011	.012	-.002	.788
-.037	-.011	.168	.134	-.001	1.000
-.010	.012	.134	.148	-.018	.594
-.013	-.002	-.001	-.018	.013	.978

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.305	.316	.208	.150	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .031	GU/K 1.064	GU/S .281	GU/X 1.407
GD/K .282	GD/S .349	GD/X .191	
K/S 3.912	K/X .061		
S/X 1.090			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.055	-.006	.002	-.054	-.012	.550
-.006	.083	-.011	-.130	.008	.863
.002	-.011	.071	-.039	.001	.958
-.054	-.130	-.039	.593	.002	1.482
-.012	.008	.001	.002	.006	.919

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.167	.169	.188	.212	.183

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .265	GU/K .110	GU/S .981	GU/X 2.650
GD/K .444	GD/S 2.299	GD/X 1.163	
K/S .607	K/X .153		
S/X .099			

TERRAIN 2 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.066	.011	-.004	-.067	-.006	.567
.011	.961	-.242	.088	-.021	1.408
-.004	-.242	.527	-.456	.035	1.010
-.067	.088	-.456	1.282	-.022	1.600
-.006	-.021	.035	-.022	.005	.951

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.268	.220	.246	.257	.290

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD .116	GU/K .063	GU/S .631	GU/X .989
GD/K .958	GD/S .211	GD/X .845	
K/S 1.764	K/X 2.575		
S/X .780			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.053	.002	-.009	-.045	-.010	.562
.002	.394	-.072	.049	-.003	1.011
-.009	-.072	.221	-.115	.011	.986
-.045	.049	-.115	.821	-.018	1.273
-.010	-.003	.011	-.018	.008	.945

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 29

GU	GD	K	S	X
.124	.225	.165	.173	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 27

GU/GD .065	GU/K .449	GU/S 1.153	GU/X 2.733
GD/K 1.311	GD/S .449	GD/X .283	
K/S 1.455	K/X 1.375		
S/X 1.217			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 2

.141	19.760	8.877	6.934	2.125

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.072	-.030	.104	.050	.004	.504
-.030	.166	-.187	-.126	-.009	.971
.104	-.187	.336	.235	.016	1.420
.050	-.126	.235	.466	-.003	.955
.004	-.009	.016	-.003	.003	.926

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 14

GU	GD	K	S	X
.221	.146	.193	.172	.206

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 12

GU/GD .967	GU/K 3.097	GU/S .980	GU/X .909
GD/K 4.511	GD/S 1.761	GD/X 1.465	
K/S 2.562	K/X 1.928		
S/X .238			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.027	.015	.030	-.043	-.001	.510
.015	.114	.011	-.034	.010	.960
.030	.011	.184	.041	.006	1.158
-.043	-.034	.041	.886	.012	1.560
-.001	.010	.006	.012	.004	.892

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 15

GU	GD	K	S	X
.159	.104	.225	.212	.113

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 13

GU/GD 1.041	GU/K 1.718	GU/S 1.048	GU/X .301
GD/K .285	GD/S .384	GD/X 1.862	
K/S .371	K/X .760		
S/X .749			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.047	-.006	.063	.003	.001	.507
-.006	.134	-.081	-.077	.001	.966
.063	-.081	.266	.089	.013	1.284
.003	-.077	.089	.754	-.000	1.268
.001	.001	.013	-.000	.004	.909

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 29

GU	GD	K	S	X
.196	.072	.193	.140	.100

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 27

GU/GD .393	GU/K 3.537	GU/S .071	GU/X .521
GD/K 2.452	GD/S 1.300	GD/X .168	
K/S 1.053	K/X 2.237		
S/X .042			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 3 ALL SPEEDS

DEGREES OF FREEDOM 1

3.036	.467	1.172	1.309	.105

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.038	.021	-.054	-.057	-.009	.458
.021	.142	-.223	-.068	-.002	1.015
-.054	-.223	.559	.222	.022	1.264
-.057	-.068	.222	.342	.020	1.172
-.009	-.002	.022	.020	.004	.929

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.154	.154	.336	.174	.151

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 11

GU/GD .971	GU/K 1.309	GU/S 1.889	GU/X 3.291
GD/K 4.328	GD/S 1.070	GD/X .232	
K/S 1.960	K/X 1.725		
S/X 2.002			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.035	.033	-.020	-.148	-.003	.545
.033	.065	-.017	-.212	.007	1.085
-.020	-.017	.182	.222	.016	1.067
-.148	-.212	.222	1.399	-.017	1.727
-.003	.007	.016	-.017	.012	.851

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.184	.202	.184	.272	.158

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 2.728	GU/K .736	GU/S 2.577	GU/X .440
GD/K .459	GD/S 2.802	GD/X .677	
K/S 1.386	K/X 1.024		
S/X .359			

TERRAIN 4 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.035	.043	-.093	-.151	-.007	.541
.043	.090	-.168	-.243	-.013	1.095
-.093	-.168	.348	.491	.024	1.285
-.151	-.243	.491	1.329	.002	1.970
-.007	-.013	.024	.002	.006	.904

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.141	.111	.159	.155	.212

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD 3.643	GU/K 4.665	GU/S 2.967	GU/X 1.723
GD/K 9.322	GD/S 2.964	GD/X 2.177	
K/S 3.136	K/X 1.862		
S/X .054			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.036	.031	-.055	-.093	-.007	.510
.031	.098	-.138	-.143	-.004	1.062
-.055	-.138	.367	.285	.022	1.213
-.093	-.143	.285	1.031	-.003	1.594
-.007	-.004	.022	-.003	.008	.898

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 34

GU	GD	K	S	X
.103	.081	.162	.154	.078

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 32

GU/GD 3.508	GU/K 3.090	GU/S 3.132	GU/X 2.790
GD/K 6.012	GD/S 2.856	GD/X .769	
K/S 2.954	K/X 2.647		
S/X .205			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 2

.032	1.530	2.873	5.730	3.112

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.049	.005	-.009	-.049	-.003	.550
.005	.186	-.085	-.056	.001	.995
-.009	-.085	.272	.107	.009	1.153
-.049	-.056	.107	.807	-.019	1.365
-.003	.001	.009	-.019	.008	.916

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 116

GU	GD	K	S	X
.126	.086	.135	.123	.100

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 114

GU/GD .587	GU/K .821	GU/S 2.704	GU/X 1.927
GD/K 4.381	GD/S 1.568	GD/X .249	
K/S 2.495	K/X 2.056		
S/X 2.637			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 9

GU	GD	K	S	X
6.859	34.280	17.422	18.641	12.466

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
1.695	18.052	4.039	2.907	6.365

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.051	-.004	-.010	-.021	-.002	.534
-.004	.134	-.119	-.049	-.002	.924
-.010	-.119	.334	.171	.008	1.201
-.021	-.049	.171	.354	-.013	.963
-.002	-.002	.008	-.013	.008	.937

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 47

GU	GD	K	S	X
.130	.089	.169	.093	.107

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 45

GU/GD .305	GU/K .495	GU/S 1.053	GU/X .685
GD/K 4.545	GD/S 1.551	GD/X .365	
K/S 3.844	K/X 1.042		
S/X 1.766			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.049	.004	.010	-.063	-.003	.564
.004	.099	-.006	-.106	.008	.965
.010	-.006	.159	.082	.001	1.104
-.063	-.106	.082	.807	-.015	1.572
-.003	.008	.001	-.015	.007	.892

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 49

GU	GD	K	S	X
.171	.072	.154	.190	.124

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 47

GU/GD .347	GU/K .804	GU/S 2.275	GU/X 1.152
GD/K .310	GD/S 2.775	GD/X 2.196	
K/S 1.619	K/X .284		
S/X 1.365			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.046	.030	-.053	-.111	-.006	.553
.030	.477	-.213	-.121	-.012	1.236
-.053	-.213	.425	.093	.024	1.161
-.111	-.121	.093	1.275	-.013	1.803
-.006	-.012	.024	-.013	.006	.925

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.183	.225	.184	.151	.137

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .859	GU/K 1.712	GU/S 2.168	GU/X 1.707
GD/K 2.278	GD/S .665	GD/X 1.005	
K/S .542	K/X 2.377		
S/X .662			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 2

GU	GD	K	S	X
.061	21.450	8.917	13.162	.626

UPPER LIMIT OF RMS ERROR CONSIDERED	160
NUMBER OF SAMPLE POINTS	108
NUMBER OF TERRAIN SEGMENTS CONSIDERED	4
NUMBER OF SPEEDS	3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3
3	2
4	3

DATA ADJUSTED AS BEFORE AND CORRECTED FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	12	11	
2	8	11	8
3	14	13	
4	12	10	9

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.035	.016	-.042	-.052	.003	.627
.016	.147	-.078	-.047	.012	.860
-.042	-.078	.146	.047	-.002	1.009
-.052	-.047	.047	.310	-.049	.990
.003	.012	-.002	-.049	.013	.932

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.205	.146	.161	.104	.132

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .741	GU/K 2.287	GU/S 1.819	GU/X .474
GD/K 1.973	GD/S .717	GD/X .911	
K/S .717	K/X .163		
S/X 3.774			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.087	-.020	-.005	-.067	.003	.650
-.020	.096	.042	-.054	.011	1.032
-.005	.042	.098	.001	-.000	1.118
-.067	-.054	.001	.437	-.047	1.410
.003	.011	-.000	-.047	.008	.910

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.150	.122	.183	.149	.133

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD .666	GU/K .169	GU/S 1.096	GU/X .332
GD/K 1.426	GD/S .813	GD/X 1.317	
K/S .008	K/X .017		
S/X 4.060			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.057	.000	-.023	-.054	.003	.638
.000	.125	-.015	-.029	.010	.942
-.023	-.015	.121	.036	-.002	1.061
-.054	-.029	.036	.400	-.048	1.191
.003	.010	-.002	-.048	.010	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 23

GU	GD	K	S	X
.136	.100	.144	.092	.091

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 21

GU/GD .015	GU/K 1.306	GU/S 1.750	GU/X .528
GD/K .566	GD/S .604	GD/X 1.352	
K/S .755	K/X .237		
S/X 5.270			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 1

1.967	.447	.403	.296	.599

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.050	.001	-.037	-.010	-.013	.572
.001	.051	-.011	.012	-.002	.788
-.037	-.011	.168	.134	-.001	1.000
-.010	.012	.134	.148	-.018	.594
-.013	-.002	-.001	-.018	.013	.978

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.305	.316	.208	.150	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .031	GU/K 1.064	GU/S .281	GU/X 1.407
GD/K .282	GD/S .349	GD/X .191	
K/S 3.912	K/X .061		
S/X 1.090			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.048	-.005	-.002	-.050	-.012	.582
-.005	.091	-.011	-.144	.009	.859
-.002	-.011	.076	-.039	.002	.970
-.050	-.144	-.039	.646	.001	1.460
-.012	.009	.002	.001	.007	.916

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.195	.214	.184	.201	.165

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD .219	GU/K .119	GU/S .893	GU/X 2.702
GD/K .408	GD/S 2.223	GD/X 1.096	
K/S .539	K/X .202		
S/X .061			

TERRAIN 2 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.071	.076	-.032	-.056	-.009	.588
.076	.236	.087	-.182	-.003	1.119
-.032	.087	.449	-.402	.031	1.132
-.056	-.182	-.402	1.372	-.019	1.505
-.009	-.003	.031	-.019	.005	.958

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.233	.174	.264	.322	.301

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD 1.791	GU/K .445	GU/S .450	GU/X 1.274
GD/K .676	GD/S .828	GD/X .194	
K/S 1.459	K/X 2.161		
S/X .562			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.051	.020	-.019	-.035	-.011	.581
.020	.131	.025	-.064	.002	.915
-.019	.025	.200	-.079	.010	1.027
-.035	-.064	-.079	.828	-.018	1.217
-.011	.002	.010	-.018	.008	.947

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 27

GU	GD	K	S	X
.133	.183	.179	.186	.122

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 25

GU/GD 1.237	GU/K .961	GU/S .853	GU/X 2.982
GD/K .784	GD/S .997	GD/X .335	
K/S .986	K/X 1.202		
S/X 1.080			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 2

.352	4.084	6.227	6.993	1.765

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.072	-.030	.104	.050	.004	.504
-.030	.166	-.187	-.126	-.009	.971
.104	-.187	.336	.235	.016	1.420
.050	-.126	.235	.466	-.003	.955
.004	-.009	.016	-.003	.003	.926

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 14

GU	GD	K	S	X
.221	.146	.193	.172	.206

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 12

GU/GD .967	GU/K 3.097	GU/S .980	GU/X .909
GD/K 4.511	GD/S 1.761	GD/X 1.465	
K/S 2.562	K/X 1.928		
S/X .238			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.024	.000	.032	-.013	-.002	.538
.000	.082	.007	.011	.005	1.038
.032	.007	.213	.074	.007	1.169
-.013	.011	.074	.711	.009	1.465
-.002	.005	.007	.009	.004	.901

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.192	.147	.195	.201	.107

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 11

GU/GD .036	GU/K 1.642	GU/S .340	GU/X .865
GD/K .168	GD/S .149	GD/X 1.101	
K/S .644	K/X .825		
S/X .597			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.048	-.014	.064	.023	.001	.520
-.014	.122	-.095	-.049	-.003	1.004
.064	-.095	.283	.119	.013	1.299
.023	-.049	.119	.629	-.001	1.201
.001	-.003	.013	-.001	.003	.914

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 27

GU	GD	K	S	X
.210	.078	.174	.118	.100

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 25

GU/GD .927	GU/K 3.335	GU/S .683	GU/X .269
GD/K 2.975	GD/S .901	GD/X .633	
K/S 1.467	K/X 2.253		
S/X .060			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 3 ALL SPEEDS

DEGREES OF FREEDOM 1

3.389	1.443	.623	.534	.003

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.038	.005	-.011	-.039	-.008	.475
.005	.081	-.047	.021	.006	1.087
-.011	-.047	.085	-.011	.003	1.072
-.039	.021	-.011	.250	.011	1.079
-.008	.006	.003	.011	.004	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.151	.136	.175	.170	.159

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .282	GU/K .650	GU/S 1.387	GU/X 2.798
GD/K 2.179	GD/S .483	GD/X 1.237	
K/S .250	K/X .482		
S/X 1.210			

TERRAIN 4 SPEED 2

	VARIANCE	COVARIANCE	MATRIX		MEAN VECTOR
GU	GD	K	S	X	
.035	.033	-.020	-.148	-.003	.545
.033	.065	-.017	-.212	.007	1.085
-.020	-.017	.182	.222	.016	1.067
-.148	-.212	.222	1.399	-.017	1.727
-.003	.007	.016	-.017	.012	.851

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.184	.202	.184	.272	.158

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 2.728	GU/K .736	GU/S 2.577	GU/X .440
GD/K .459	GD/S 2.802	GD/X .677	
K/S 1.386	K/X 1.024		
S/X .359			

TERRAIN 4 SPEED 3

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.023	.026	-.052	-.037	-.006	.594
.026	.064	-.109	-.081	-.013	1.183
-.052	-.109	.216	.116	.021	1.097
-.037	-.081	.116	.495	-.016	1.549
-.006	-.013	.021	-.016	.007	.897

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.176	.146	.168	.099	.265

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD 2.433	GU/K 2.848	GU/S .959	GU/X 1.581
GD/K 6.645	GD/S 1.354	GD/X 2.064	
K/S 1.009	K/X 1.765		
S/X .762			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.033	.020	-.024	-.057	-.006	.532
.020	.068	-.051	-.074	.001	1.115
-.024	-.051	.143	.094	.012	1.077
-.057	-.074	.094	.726	-.013	1.425
-.006	.001	.012	-.013	.008	.892

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 31

GU	GD	K	S	X
.090	.085	.092	.135	.077

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 29

GU/GD 2.574	GU/K 1.968	GU/S 2.137	GU/X 2.301
GD/K 3.238	GD/S 1.901	GD/X .245	
K/S 1.638	K/X 1.996		
S/X .967			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 4 ALL SPEEDS

CEGREES OF FREEDCM 2

.501	.169	2.140	7.095	3.385

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.047	.005	-.003	-.032	-.003	.564
.005	.113	-.033	-.047	.001	1.000
-.003	-.033	.194	.041	.008	1.117
-.032	-.047	.041	.650	-.020	1.267
-.003	.001	.008	-.020	.008	.917

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 108

GU	GD	K	S	X
.138	.171	.109	.110	.091

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 106

GU/GD	GU/K	GU/S	GU/X
.680	.343	1.913	1.733
GD/K	GD/S	GD/X	
2.348	1.823	.260	
K/S	K/X		
1.184	2.129		
S/X			
2.995			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 9

GU	GD	K	S	X
8.785	8.941	13.827	17.759	12.892

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
2.181	3.647	5.340	3.192	7.224

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.050	-.009	.005	-.013	-.001	.540
-.009	.124	-.080	-.027	-.000	.941
.005	-.080	.213	.103	.003	1.149
-.013	-.027	.103	.322	-.016	.934
-.001	-.000	.003	-.016	.008	.935

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 46

GU	GD	K	S	X
.134	.088	.138	.092	.113

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 44

GU/GD .748	GU/K .351	GU/S .667	GU/X .504
GD/K 3.734	GD/S .901	GD/X .050	
K/S 2.841	K/X .526		
S/X 2.292			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.046	.001	.003	-.063	-.003	.578
.001	.086	.010	-.081	.006	1.003
.003	.010	.140	.055	.005	1.085
-.063	-.081	.055	.741	-.014	1.509
-.003	.006	.005	-.014	.007	.896

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 45

GU	GD	K	S	X
.192	.083	.145	.190	.116

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 43

GU/GD .066	GU/K .204	GU/S 2.397	GU/X 1.015
GD/K .607	GD/S 2.223	GD/X 1.568	
K/S 1.144	K/X 1.079		
S/X 1.285			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.043	.047	-.040	-.043	-.007	.592
.047	.136	-.017	-.119	-.009	1.153
-.040	-.017	.304	-.118	.025	1.113
-.043	-.119	-.118	.848	-.017	1.528
-.007	-.009	.025	-.017	.007	.926

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.165	.106	.212	.149	.173

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 15

GU/GD 2.986	GU/K 1.452	GU/S .896	GU/X 1.825
GD/K .328	GD/S 1.454	GD/X 1.169	
K/S .924	K/X 2.597		
S/X .898			

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
EETWEEN SPEEDS

CEGREES OF FREEDOM 2

GU	GD	K	S	X
.177	1.963	4.103	9.078	.110

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UPPER LIMIT OF RMS ERROR CONSIDERED          . 120
NUMBER OF SAMPLE POINTS                         87
NUMBER OF TERRAIN SEGMENTS CONSIDERED            4
NUMBER OF SPEEDS                                 3
```

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3
3	2
4	3

DATA ADJUSTED AS BEFORE AND CORRECTED FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	11	9	
2	8	8	4
3	11	10	
4	12	7	7

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.037	.011	-.041	-.045	.000	.637
.011	.121	-.055	.017	-.005	.916
-.041	-.055	.138	.000	.012	.968
-.045	.017	.000	.225	-.022	.896
.000	-.005	.012	-.022	.006	.957

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.184	.176	.168	.096	.095

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD .477	GU/K 2.060	GU/S 1.671	GU/X .008
GD/K 1.404	GD/S .303	GD/X .621	
K/S .002	K/X 1.359		
S/X 2.329			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.064	.008	.026	-.056	.006	.611
.008	.084	.031	-.042	.007	1.100
.026	.031	.097	-.031	-.001	1.137
-.056	-.042	-.031	.364	-.043	1.289
.006	.007	-.001	-.043	.008	.927

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.115	.134	.186	.137	.134

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD .296	GU/K .934	GU/S 1.044	GU/X .726
GD/K .965	GD/S .663	GD/X .794	
K/S .435	K/X .075		
S/X 3.590			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.047	.008	-.012	-.050	.003	.625
.008	.108	-.008	.010	-.001	.999
-.012	-.008	.121	.005	.004	1.044
-.050	.010	.005	.312	-.033	1.073
.003	-.001	.004	-.033	.007	.944

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.104	.106	.141	.089	.105

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .465	GU/K .658	GU/S 1.917	GU/X .670
GD/K .286	GD/S .225	GD/X .179	
K/S .099	K/X .674		
S/X 4.472			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 1

.594	.283	.249	.490	.235

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.050	.001	-.037	-.010	-.013	.572
.001	.051	-.011	.012	-.002	.787
-.037	-.011	.168	.134	-.001	1.000
-.010	.012	.134	.148	-.018	.594
-.013	-.002	-.001	-.018	.013	.978

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.305	.316	.208	.150	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .031	GU/K 1.064	GU/S .281	GU/X 1.407
GD/K .282	GD/S .349	GD/X .191	
K/S 3.912	K/X .061		
S/X 1.090			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTO

GU	GD	K	S	X	MEAN VECTO
.045	-.024	-.022	.030	-.013	.626
-.024	.088	-.020	-.066	.009	.850
-.022	-.020	.090	.006	.007	1.021
.030	-.066	.006	.112	-.007	1.214
-.013	.009	.007	-.007	.008	.897

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.173	.194	.153	.124	.126

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD	GU/K	GU/S	GU/X
1.026	.917	1.124	2.475

GD/K	GD/S	GD/X
.566	2.195	.935

K/S	K/X
.135	.707

S/X
.573

TERRAIN 2 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.027	.016	-.084	.117	-.012	.659
.016	.201	-.117	.128	-.017	1.225
-.084	-.117	.404	-.503	.028	1.063
.117	.128	-.503	.640	-.041	.950
-.012	-.017	.028	-.041	.008	.939

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 4

GU	GD	K	S	X
.244	.266	.242	.187	.206

T TEST FOR SIGNIFICANCE OF
CORRELATICN
CEGREES OF FREEDOM 2

GU/GD .303	GU/K 1.898	GU/S 2.636	GU/X 2.238
GD/K .638	GD/S .540	GD/X .699	
K/S 9.362	K/X .808		
S/X 1.037			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.041	-.001	-.034	.033	-.013	.611
-.001	.112	-.026	.012	-.001	.900
-.034	-.026	.159	-.025	.006	1.021
.033	.012	-.025	.278	-.026	.913
-.013	-.001	.006	-.026	.010	.938

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.122	.200	.143	.070	.110

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .089	GU/K 1.996	GU/S 1.394	GU/X 3.259
GD/K .840	GD/S .280	GD/X .123	
K/S .509	K/X .664		
S/X 2.361			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 2

.326	2.020	2.457	3.919	.546

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.021	.021	-.005	-.039	.001	.441
.021	.095	-.063	.009	-.007	1.109
-.005	-.063	.103	.027	.010	1.227
-.039	.009	.027	.344	-.011	.745
.001	-.007	.010	-.011	.004	.922

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.246	.173	.182	.201	.231

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD 1.583	GU/K .352	GU/S 1.551	GU/X .178
GD/K 2.453	GD/S .149	GD/X 1.081	
K/S .431	K/X 1.805		
S/X .970			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.018	.013	.011	.001	-.003	.530
.013	.082	.014	-.083	.004	1.005
.011	.014	.181	.028	.007	1.095
.001	-.083	.028	.171	-.014	1.086
-.003	.004	.007	-.014	.004	.888

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.211	.205	.143	.207	.122

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 1.032	GU/K .542	GU/S .035	GU/X .920
GD/K .317	GD/S 2.788	GD/X .701	
K/S .450	K/X .756		
S/X 1.902			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.021	.014	-.001	-.011	-.002	.483
.014	.088	-.022	-.042	-.000	1.060
-.001	-.022	.138	.014	.009	1.164
-.011	-.042	.014	.279	-.015	.908
-.002	-.000	.009	-.015	.004	.936

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 21

GU	GD	K	S	X
.124	.095	.138	.116	.131

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 19

GU/GD 1.516	GU/K .081	GU/S .661	GU/X .815
GD/K .875	GD/S 1.225	GD/X .101	
K/S .313	K/X 1.916		
S/X 2.216			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 3 ALL SPEEDS

DEGREES OF FREEDOM 1

.072	.048	.716	1.055	.003

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.038	.005	-.011	-.039	-.008	.475
.005	.081	-.047	.021	.006	1.087
-.011	-.047	.085	-.011	.003	1.072
-.039	.021	-.011	.250	.011	1.079
-.008	.006	.003	.011	.004	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.151	.136	.175	.170	.159

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .282	GU/K .650	GU/S 1.387	GU/X 2.798
GD/K 2.179	GD/S .483	GD/X 1.237	
K/S .250	K/X .482		
S/X 1.210			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.030	.019	.018	-.061	-.005	.607
.019	.045	.008	-.056	-.004	1.200
.018	.008	.050	-.055	-.006	1.024
-.061	-.056	-.055	.216	.028	1.194
-.005	-.004	-.006	.028	.005	.886

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.231	.166	.175	.259	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD 1.382	GU/K 1.170	GU/S 2.605	GU/X 1.116
GD/K .398	GD/S 1.539	GD/X .556	
K/S 1.374	K/X 1.019		
S/X 3.837			

TERRAIN 4 SPEED 3

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.022	.031	-.057	.001	-.012	.636
.031	.078	-.127	-.080	-.019	1.200
-.057	-.127	.237	.067	.033	1.042
.001	-.080	.067	.369	-.001	1.319
-.012	-.019	.033	-.001	.008	.915

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.135	.144	.221	.103	.194

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD 2.523	GU/K 2.889	GU/S .024	GU/X 7.342
GD/K 5.763	GD/S 1.186	GD/X 2.668	
K/S .523	K/X 2.892		
S/X .024			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.035	.019	-.016	-.024	-.008	.554
.019	.068	-.050	-.018	-.003	1.148
-.016	-.050	.107	-.003	.008	1.051
-.024	-.018	-.003	.261	.011	1.175
-.008	-.003	.008	.011	.005	.910

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 26

GU	GD	K	S	X
.104	.089	.091	.117	.068

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 24

GU/GD 2.014	GU/K 1.327	GU/S 1.292	GU/X 4.163
GD/K 3.565	GD/S .663	GD/X .869	
K/S .101	K/X 1.828		
S/X 1.580			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 2

.482	.628	3.816	.465	1.001

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.037	.007	-.018	-.012	-.004	.566
.007	.097	-.025	-.003	-.003	1.035
-.018	-.025	.128	-.005	.006	1.070
-.012	-.003	-.005	.285	-.014	1.027
-.004	-.003	.006	-.014	.006	.923

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 87

GU	GD	K	S	X
.109	.074	.072	.053	.088

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 85

GU/GD 1.114	GU/K 2.442	GU/S 1.087	GU/X 2.588
GD/K 2.156	GD/S .157	GD/X 1.000	
K/S .236	K/X 2.072		
S/X 3.130			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 9

GU	GD	K	S	X
5.619	3.829	8.399	6.399	6.425

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
3.296	1.612	.937	.175	5.490

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.039	.001	-.028	-.035	-.003	.527
.001	.099	-.033	.027	-.005	.991
-.028	-.033	.121	.024	.004	1.072
-.035	.027	.024	.263	-.011	.851
-.003	-.005	.004	-.011	.006	.942

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 42

GU	GD	K	S	X
.113	.088	.104	.091	.132

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 40

GU/GD .095	GU/K 2.792	GU/S 2.284	GU/X 1.076
GD/K 2.016	GD/S 1.052	GD/X 1.172	
K/S .866	K/X .965		
S/X 1.756			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.037	.004	.007	-.015	-.003	.590
.004	.085	.010	-.055	.005	1.034
.007	.010	.104	-.008	.003	1.074
-.015	-.055	-.008	.204	-.010	1.192
-.003	.005	.003	-.010	.006	.900

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 34

GU	GD	K	S	X
.185	.083	.120	.122	.087

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 32

GU/GD .388	GU/K .659	GU/S 1.023	GU/X 1.094
GD/K .608	GD/S 2.624	GD/X 1.175	
K/S .308	K/X .608		
S/X 1.653			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.022	.024	-.060	.033	-.011	.644
.024	.107	-.111	-.012	-.016	1.209
-.060	-.111	.263	-.112	.028	1.050
.033	-.012	-.112	.448	-.015	1.185
-.011	-.016	.028	-.015	.007	.923

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.145	.191	.237	.079	.169

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD 1.676	GU/K 3.845	GU/S 1.078	GU/X 5.885
GD/K 2.642	GD/S .162	GD/X 2.210	
K/S 1.040	K/X 2.665		
S/X .838			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 2

GU	GD	K	S	X
1.240	.306	4.000	2.611	.127

AIRCRAFT TYPE 4

UPPER LIMIT OF RMS ERROR CONSIDERED	200
NUMBER OF SAMPLE POINTS	53
NUMBER CF TERRAIN SEGMENTS CONSIDERED	2
NUMBER OF SPEEDS	3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	12	12	
2	8	12	9

TER	SPD	GU	GD	K	P	S
2	1	.400	.600	.667	.875	.460
2	1	.200	.900	.833	.800	.840
2	1	.200	.750	.267	1.250	.360
2	1	.650	1.300	.363	.950	.570
2	1	.250	.700	1.667	1.125	1.210
2	1	1.400	.650	.233	.700	.540
2	1	.300	.650	.200	1.300	-.080
2	1	.250	.750	.750	.750	.850
1	1	.200	.500	1.083	1.025	1.540
1	1	.200	1.300	1.167	.900	1.290
1	1	.400	1.050	.110	.800	1.330
1	1	1.125	1.550	.093	.850	.770
1	1	.950	1.150	.118	1.050	.520
1	1	1.000	.475	.883	.937	.670
1	1	.200	1.150	.667	.850	1.200
1	1	.550	.650	.467	.650	1.190
1	1	.900	.800	.262	.975	.480
1	1	.450	.800	.333	.900	.940
1	1	.350	.650	1.233	1.200	-.070
1	2	.750	1.300	.833	.800	1.430
1	2	.450	1.050	1.233	.800	1.430
1	2	.950	1.000	1.250	1.025	.430
1	2	.600	.500	.833	.900	1.170
1	2	.500	1.100	1.667	.650	1.700
1	2	.700	.950	1.033	.625	2.310
1	2	.400	1.200	1.000	1.000	1.700
1	2	.200	1.250	.833	.900	.920
1	2	.950	1.550	1.550	1.100	.510
2	2	.506	.500	1.333	1.000	1.260
2	2	.600	1.000	1.000	.850	.830
2	2	.800	.650	1.167	.525	1.110
2	2	.950	.800	.667	.700	1.580
2	2	.600	.700	1.467	.850	1.700
2	2	.750	.650	.600	.725	1.400
2	2	.250	1.100	.933	.900	1.060
2	2	.550	1.400	1.000	.950	.770
2	3	.850	1.850	.833	.850	1.350
2	3	1.050	1.250	1.467	.700	.960
2	3	1.050	.900	.667	.900	1.660
2	3	.400	.900	2.333	1.100	-.170
2	2	.200	.550	.667	.950	3.100
2	2	.600	1.300	.833	1.000	.520
1	2	.450	.900	1.333	.662	2.560
1	1	.350	.250	1.183	.425	2.020
2	3	1.550	1.550	1.450	.900	1.560
2	3	.350	1.450	2.833	1.125	1.260
2	3	.200	.500	.833	.900	1.390
1	2	1.200	.550	.733	.725	1.350
2	2	.600	.800	1.000	.850	2.730
2	2	.200	.900	.833	.900	1.720
1	2	.800	.350	2.267	.600	3.060
2	3	.200	.550	.833	.900	4.030
2	3	.350	3.725	.102	.800	2.360

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.117	.014	-.012	-.038	-.007	.583
.014	.274	-.033	-.006	.005	.969
-.012	-.033	.320	.065	-.000	.943
-.038	-.006	.065	.676	-.035	1.271
-.007	.005	-.000	-.035	.009	.932

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 53

GU	GD	K	S	X
.123	.131	.105	.142	.101

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 51

GU/GD .575	GU/K .428	GU/S .987	GU/X 1.621
GD/K .795	GD/S .104	GD/X .709	
K/S 1.009	K/X .031		
S/X 3.579			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
5.576	24.618	12.829	9.088	3.175

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
.642	6.655	.370	1.179	.570

```
UPPER LIMIT OF RMS ERROR CONSIDERED          160
NUMBER OF SAMPLE POINTS                       50
NUMBER OF TERRAIN SEGMENTS CONSIDERED          2
NUMBER OF SPEEDS                               3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

                                  TERRAIN   SPEEDS

                                     1         2

                                     2         3

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

        TERRAIN                  SPEED
                           1       2       3

           1              12      11
           2               8      11       8
```

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.119	.031	-.023	-.040	-.007	.591
.031	.126	.029	-.047	.006	.927
-.023	.029	.289	.040	.003	.936
-.040	-.047	.040	.619	-.031	1.205
-.007	.006	.003	-.031	.009	.935

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 50

GU	GD	K	S	X
.129	.120	.096	.145	.105

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 48

GU/GD 1.807	GU/K .864	GU/S 1.021	GU/X 1.516
GD/K 1.058	GD/S 1.196	GC/X 1.142	
K/S .657	K/X .460		
S/X 3.100			

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
BETWEEN ALL SAMPLES

CEGREES OF FREEDOM 4

GU	GD	K	S	X
6.091	4.576	11.862	9.576	2.704

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

CEGREES OF FREEDOM 1

GU	GD	K	S	X
.592	.014	1.631	2.964	.227

```
UPPER LIMIT OF RMS ERRCR CONSIDERED          120
NUMBER OF SAMPLE POINTS                       40
NUMBER OF TERRAIN SEGMENTS CONSIDERED          2
NUMBER OF SPEEDS                               3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

                                 TERRAIN   SPEEDS

                                    1         2

                                    2         3

DATA ACJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVICUAL SAMPLE SIZE

          TERRAIN                 SPEED
                         1          2          3

             1          11          9
             2           8          8          4
```

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.101	.016	-.028	-.000	-.009	.596
.016	.109	.003	.014	-.001	.949
-.028	.003	.252	.029	.001	.877
-.000	.014	.029	.294	-.029	.993
-.009	-.001	.001	-.029	.008	.941

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 40

GU	GD	K	S	X
.106	.124	.072	.071	.091

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 38

GU/GD	GU/K	GU/S	GU/X
.967	1.104	.013	1.937
GD/K	GD/S	GD/X	
.110	.498	.182	
K/S	K/X		
.652	.201		
S/X			
4.365			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
3.604	2.407	5.539	4.785	1.497

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
.193	.005	.282	.062	.983

AIRCRAFT TYPE 4
TERRAINS 3 AND 4 ONLY

UPPER LIMIT OF RMS ERROR CONSIDERED 200
NUMBER OF SAMPLE POINTS 63
NUMBER OF TERRAIN SEGMENTS CONSIDERED 2
NUMBER OF SPEEDS 3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	2	3
3	14	15	
4	13	10	11

TER	SPC	GU	GD	K	P	S
4	3	.200	.750	2.833	.875	4.390
4	3	.200	1.300	2.167	.900	5.190
4	3	.400	.650	2.667	.875	3.340
4	1	.250	.150	2.500	1.050	2.290
3	1	1.300	.200	2.167	.975	2.200
3	1	.600	.850	1.067	.800	1.370
3	1	.300	.350	1.233	.875	1.600
4	2	.550	.850	.583	.350	3.100
3	2	.400	.400	1.167	.600	.950
3	2	.800	1.050	2.083	.850	2.220
3	2	.250	.500	1.000	.800	3.400
3	2	.600	.900	1.167	.900	2.560
4	2	.250	.750	2.083	.825	4.430
4	2	.400	.850	.833	.650	1.380
3	2	.300	1.500	1.000	.925	3.410
4	3	.450	1.250	1.250	.700	2.160
4	3	.450	1.000	2.083	.700	2.550
4	3	.700	1.350	.833	.725	1.100
4	3	.800	1.350	1.167	.650	1.270
4	3	.800	1.500	.833	.725	.930
4	3	.650	1.450	.667	.800	1.510
4	3	.600	.900	1.667	.950	1.880
4	3	.500	.800	2.250	.950	2.180
4	3	.400	1.050	2.000	1.100	.360
4	2	.350	1.250	.750	.925	1.810
4	2	.600	.900	.750	.875	1.620
4	2	.550	1.150	1.000	.600	.710
4	2	.800	1.450	1.083	.675	.750
4	2	.600	1.300	1.000	.900	1.290
4	2	.850	1.400	1.250	.750	.720
4	2	.500	.950	1.333	.800	1.460
3	1	.300	.450	.983	.850	.650
3	1	.350	.900	1.000	1.000	1.230
3	1	.600	1.300	.817	1.025	.210
3	1	.400	1.000	.733	.775	.640
3	1	.500	1.200	.667	.700	.340
3	1	.400	.750	1.250	1.050	0
3	1	.700	1.400	.667	.850	.460
3	1	.600	1.400	.833	.800	.310
3	1	.400	1.300	.833	.750	1.390
3	1	.200	1.400	.500	.800	1.040
3	1	.400	1.100	1.167	.800	1.930
4	1	.400	1.050	.833	.775	.770
4	1	.800	1.200	.333	.600	.960
4	1	.300	1.100	1.000	.900	1.630
4	1	.650	1.350	.667	.900	.470
4	1	.350	.350	1.000	.775	.410
4	1	.200	1.400	.417	1.000	1.350
4	1	.400	1.100	.833	.900	1.740
4	1	.600	1.100	.833	.850	.970
4	1	.200	1.250	.667	1.000	1.410
4	1	.600	.900	.833	.800	.890
4	1	.650	1.350	.833	.875	.530
4	1	.550	.900	.750	.850	1.820
3	2	.600	1.400	1.167	.750	.580
3	2	.500	.700	1.117	.600	1.610
3	2	.600	.650	1.667	.875	1.220
3	2	.600	.800	.583	.650	1.500
3	2	.500	1.050	1.750	.850	1.560
3	2	.200	.800	.667	.950	.730
3	2	.600	1.450	1.500	.875	.590
3	2	.500	.850	1.000	.750	1.400
3	2	.500	1.200	.833	.800	.860
3	2	.700	1.150	.667	.825	.810

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.040	.014	-.002	-.048	-.003	.509
.014	.115	-.085	-.103	-.002	1.017
-.002	-.085	.316	.285	.012	1.138
-.048	-.103	.285	.916	-.003	1.444
-.003	-.002	.012	-.003	.006	.903

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 63

GU	GD	K	S	X
.118	.077	.199	.137	.107

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 61

GU/GD 1.635	GU/K .130	GU/S 2.015	GU/X 1.709
GD/K 3.890	GD/S 2.618	GD/X .568	
K/S 4.870	K/X 2.358		
S/X .296			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
3.721	2.645	6.476	7.914	5.906

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
.587	.736	5.928	.721	3.260

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UPPER LIMIT OF RMS ERROR CONSIDERED           160
NUMBER OF SAMPLE POINTS                        58
NUMBER OF TERRAIN SEGMENTS CONSIDERED           2
NUMBER OF SPEEDS                                3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

                                TERRAIN   SPEEDS

                                   1        2

                                   2        3

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

          TERRAIN                   SPEED
                          1           2           3

             3           14          13
             4           12          10           9
```

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.039	.005	.017	-.019	-.003	.527
.005	.095	-.051	-.055	-.001	1.063
.017	-.051	.214	.146	.009	1.061
-.019	-.055	.146	.682	-.009	1.320
-.003	-.001	.009	-.009	.006	.902

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 58

GU	GD	K	S	X
.131	.078	.173	.112	.098

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 56

GU/GD .584	GU/K 1.422	GU/S .860	GU/X 1.551
GD/K 2.893	GD/S 1.663	GD/X .404	
K/S 3.108	K/X 1.927		
S/X 1.023			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
4.993	3.695	9.917	7.870	6.899

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
.948	2.320	.425	.142	4.211

UPPER LIMIT OF RMS ERRCR CONSIDERED 120
NUMBER OF SAMPLE POINTS 47
NUMBER OF TERRAIN SEGMENTS CONSIDERED 2
NUMBER OF SPEEDS 3

NUMBER CF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3

DATA ACJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

NO CORRECTION FCR SPEED

INDIVICUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
3	11	10	
4	12	7	7

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.029	.018	.004	-.013	-.005	.522
.018	.077	-.031	-.022	-.002	1.109
.004	-.031	.155	.036	.007	.978
-.013	-.022	.036	.281	-.000	1.055
-.005	-.002	.007	-.000	.004	.908

KOLMOGCROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 47

GU	GD	K	S	X
.122	.095	.197	.088	.073

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 45

GU/GD 2.705	GU/K .428	GU/S 1.003	GU/X 3.499
GD/K 1.959	GD/S 1.021	GD/X .673	
K/S 1.162	K/X 1.775		
S/X .076			

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
1.608	.948	15.686	1.535	1.341

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
1.356	.333	1.023	.026	.202

UPPER LIMIT OF RMS ERROR CONSIDERED 200
NUMBER OF SAMPLE POINTS 63
NUMBER OF TERRAIN SEGMENTS CONSIDERED 2
NUMBER OF SPEEDS 3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3

DATA ADJUSTED AS BEFORE AND CORRECTED FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
3	14	15	
4	13	10	11

$$K_i = \frac{V_2}{V_i} K_i$$

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.040	.014	-.001	-.048	-.003	.509
.014	.115	-.112	-.103	-.002	1.017
-.001	-.112	.317	.186	.018	1.246
-.048	-.103	.186	.916	-.003	1.444
-.003	-.002	.018	-.003	.006	.903

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 63

GU	GD	K	S	X
.118	.077	.174	.137	.107

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 61

GU/GD 1.635	GU/K .055	GU/S 2.015	GU/X 1.709
GD/K 5.632	GD/S 2.618	GD/X .568	
K/S 2.870	K/X 3.565		
S/X .296			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
3.721	2.645	5.129	7.914	5.906

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
.587	.736	.766	.721	3.260

```
UPPER LIMIT CF RMS ERRCR CONSIDERED          160
NUMBER CF SAMPLE POINTS                       58
NUMBER CF TERRAIN SEGMENTS CONSIDERED          2
NUMBER CF SPEEDS                               3

NUMBER OF SPEEDS FLCWN CN EACH TERRAIN SEGMENT

                                 TERRAIN   SPEEDS

                                    1        2

                                    2        3

DATA ACJUSTED AS BEFORE AND CCRRECTED
FOR SPEED

INDIVICUAL SAMPLE SIZE

        TERRAIN                      SPEED
                          1            2           3

           3             14           13
           4             12           10           9
```

$$K_i = \frac{V_2}{V_i} K_i$$

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.039	.005	.016	-.019	-.003	.527
.005	.095	-.076	-.055	-.001	1.063
.016	-.076	.217	.091	.013	1.181
-.019	-.055	.091	.682	-.009	1.320
-.003	-.001	.013	-.009	.006	.902

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 58

GU	GD	K	S	X
.131	.078	.147	.112	.098

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 56

GU/GD .584	GU/K 1.347	GU/S .860	GU/X 1.551
GD/K 4.714	GD/S 1.663	GD/X .404	
K/S 1.823	K/X 3.012		
S/X 1.023			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
4.993	3.695	4.994	7.870	6.899

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
.948	2.320	3.144	.142	4.211

UPPER LIMIT CF RMS ERRCR CONSIDERED	120
NUMBER CF SAMPLE POINTS	47
NUMBER OF TERRAIN SEGMENTS CONSIDERED	2
NUMBER OF SPEEDS	3

NUMBER CF SPEEDS FLCWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	3

DATA ACJUSTED AS BEFCRE AND CORRECTED FOR SPEED

INDIVICUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
3	11	10	
4	12	7	7

$$K_i = \frac{V_2}{V_i} K_i$$

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.029	.018	-.011	-.013	-.005	.522
.018	.077	-.039	-.022	-.002	1.109
-.011	-.039	.121	-.003	.008	1.101
-.013	-.022	-.003	.281	-.000	1.055
-.005	-.002	.008	-.000	.004	.908

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 47

GU	GD	K	S	X
.122	.095	.101	.088	.073

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 45

GU/GD 2.705	GU/K 1.275	GU/S 1.003	GU/X 3.499
GD/K 2.980	GD/S 1.021	GD/X .673	
K/S .125	K/X 2.599		
S/X .076			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 4

GU	GD	K	S	X
1.608	.948	4.764	1.535	1.341

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
1.356	.333	.355	.026	.202

AIRCRAFT TYPE 4

UPPER LIMIT OF RMS ERROR CONSIDERED	12
NUMBER OF SAMPLE POINTS	34
NUMBER OF TERRAIN SEGMENTS CONSIDERED	4
NUMBER OF SPEEDS	1

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	1
2	1
3	1
4	1

DATA ADJUSTED AS FOLLOWS
K = KVT/3000
S = S/100

No Correction for Speed
Speed 2 Only
Individual Sample Size

Terrain	
1	9
2	8
3	10
4	7

TER	SPC	GU	GD	K	P	S
1	2	.700	.950	1.033	.625	2.310
1	2	.500	1.100	1.667	.650	1.700
1	2	.600	.500	.833	.900	1.170
1	2	.950	1.000	1.250	1.025	.430
1	2	.750	1.300	.833	.800	1.430
1	2	.450	1.050	1.233	.800	1.430
1	2	.950	1.550	1.550	1.100	.510
1	2	.450	.900	1.333	.662	2.560
1	2	.800	.350	2.267	.600	3.060
1	2	1.200	.550	.733	.725	1.350
2	2	.550	1.400	1.000	.950	.770
2	2	.250	1.100	.933	.900	1.060
2	2	.600	.700	1.467	.850	1.700
2	2	.950	.800	.667	.700	1.580
2	2	.800	.650	1.167	.525	1.110
2	2	.600	1.000	1.000	.850	.830
2	2	.506	.500	1.333	1.000	1.260
2	2	.750	.650	.600	.725	1.400
2	2	.600	.800	1.000	.850	2.750
2	2	.200	.900	.833	.900	1.720
2	2	.600	1.300	.833	1.000	.520
2	2	.200	.550	.667	.950	3.100
3	2	.600	1.400	1.167	.750	.580
3	2	.700	1.150	.667	.825	.810
3	2	.500	1.200	.833	.800	.860
3	2	.500	.850	1.000	.750	1.400
3	2	.600	1.450	1.500	.875	.590
3	2	.200	.800	.667	.950	.730
3	2	.600	.650	1.667	.875	1.220
3	2	.500	.700	1.117	.600	1.610
3	2	.800	1.050	2.083	.850	2.220
3	2	.250	.500	1.000	.800	3.400
3	2	.600	.900	1.167	.900	2.560
3	2	.600	.800	.583	.650	1.500
3	2	.500	1.050	1.750	.850	1.560
3	2	.400	.400	1.167	.600	.950
3	2	.300	1.500	1.000	.925	3.410
4	2	.400	.850	.833	.650	1.380
4	2	.600	.900	.750	.875	1.620
4	2	.550	1.150	1.000	.600	.710
4	2	.800	1.450	1.083	.675	.750
4	2	.600	1.300	1.000	.900	1.290
4	2	.850	1.400	1.250	.750	.720
4	2	.500	.950	1.333	.800	1.460
4	2	.350	1.250	.750	.925	1.810
4	2	.550	.850	.583	.350	3.100
4	2	.250	.750	2.083	.825	4.430
1	2	.200	1.250	.833	.900	.920
1	2	.400	1.200	1.000	1.000	1.700

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TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.064	.008	.026	-.056	.006	.611
.008	.084	.031	-.042	.007	1.100
.026	.031	.097	-.031	-.001	1.137
-.056	-.042	-.031	.364	-.043	1.289
.006	.007	-.001	-.043	.008	.927

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.115	.134	.186	.137	.134

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD	GU/K	GU/S	GU/X
.296	.934	1.044	.726

GD/K	GD/S	GD/X
.965	.663	.794

S/X
3.590

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.045	-.024	-.022	.030	-.013	.626
-.024	.088	-.020	-.066	.009	.850
-.022	-.020	.090	.006	.007	1.021
.030	-.066	.006	.112	-.007	1.214
-.013	.009	.007	-.007	.008	.897

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.173	.194	.153	.124	.126

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD 1.026	GU/K .917	GU/S 1.124	GU/X 2.475
GD/K .566	GD/S 2.195	GD/X .935	
K/S .135	K/X .707		
S/X .573			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.018	.013	.011	.001	-.003	.530
.013	.082	.014	-.083	.004	1.005
.011	.014	.181	.028	.007	1.095
.001	-.083	.028	.171	-.014	1.086
-.003	.004	.007	-.014	.004	.888

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.211	.205	.143	.207	.122

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD 1.032	GU/K .542	GU/S .035	GU/X .920
GD/K .317	GD/S 2.788	GD/X .701	
K/S .450	K/X .756		
S/X 1.902			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.030	.019	.018	-.061	-.005	.607
.019	.045	.008	-.056	-.004	1.200
.018	.008	.050	-.055	-.006	1.024
-.061	-.056	-.055	.216	.028	1.194
-.005	-.004	-.006	.028	.005	.886

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.231	.166	.175	.259	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD 1.382	GU/K 1.170	GU/S 2.605	GU/X 1.116
GD/K .398	GD/S 1.539	GD/X .556	
K/S 1.374	K/X 1.019		
S/X 3.837			

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.037	.004	.007	-.015	-.003	.590
.004	.085	.010	-.055	.005	1.034
.007	.010	.104	-.008	.003	1.074
-.015	-.055	-.008	.204	-.010	1.192
-.003	.005	.003	-.010	.006	.900

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 34

GU	GD	K	S	X
.185	.083	.120	.122	.087

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 32

GU/GD .388	GU/K .659	GU/S 1.023	GU/X 1.094
GD/K .608	GD/S 2.624	GD/X 1.175	
K/S .308	K/X .608		
S/X 1.653			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
3.367	.798	2.806	2.604	1.525

COEFFICIENT OF DETERMINATION	.5467
MULTIPLE CORR. COEFFICIENT	.7394

SUM OF SQUARES ATTRIBUTABLE TO REGRESSION	68552.99763
SUM OF SQUARES OF DEVIATION FROM REGRESSION	56845.77163

VARIANCE OF ESTIMATE	494.31106
STD. ERROR OF ESTIMATE	22.23311

INTERCEPT (A VALUE)	41.38318

ANALYSIS OF VARIANCE FOR THE MULTIPLE LINEAR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION............	1	68552.99763	68552.99763	138.6839
DEVIATION ABOUT REGRESSION...	115	56845.77163	494.31106	
TOTAL...	116	125398.76926		

VARIABLE NO.	MEAN	STD. DEVIATION	REG. COEFF.	STD.ERROR OF REG.COE.	COMPUTED T VALUE	PARTIAL CORR. COE.	SUM OF SQ. ADDED
CLEARANCE	413.53846	158.28104	.15359	.01304	11.77641		68552.99763
RMS	104.89744	32.87893					

COMP. CHECK ON FINAL COEFF.	.15359

REGRESSION ANALYSIS

AIRCRAFT TYPE 4

REGRESSION OF CLEARANCE ON RMS

TWO WAY ANALYSIS OF VARIANCE

AIRCRAFT TYPE 4

(PARAMETERS UNCORRECTED FOR SPEED)

MEAN SQUARE DUE TO

	SPEEDS	TERRAIN	INTERACTION	ERROR
Gu	.05235	.01616	.04253	.0670
Gd	.1923	.3202	.1681	.0892
K	2.1120	.01984	.04693	.1136
S	3.1552	.2688	.0616	.1976
X	.02208	.00280	.00384	.00750
Deg. of Freedom	1	3	3	56

SCHEFFE CONTRAST INTERVAL
BETWEEN SPEEDS

AIRCRAFT TYPE 4

CONFIDENCE LEVEL .95

CONTRASTS BETWEEN SPEEDS

Aircraft Type 4 Confidence Level .95

Contrasted Speeds	Interval	
	Lower Bound	Upper Bound
1 and 2 Against 3		
Gu	-.478	+.090
Gd	-.892	+.106
K	-.614	+.384
S	-1.187	+.533
X	-.129	+.121
1 and 3 Against 2		
Gu	-.331	+.237
Gd	-.376	+.631
K	-.878	+.120
S	-1.208	+.512
X	-.060	+.190
2 and 3 Against 1		
Gu	-.043	+.525
Gd	-.238	+.760
K	-.005	+.993
S	-.185	+1.535
X	-.186	+.064

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
UNCORRECTED FOR SPEED
CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 2		
GU	-.143	.125
GD	-.067	.265
AK	-.329	.149
S	-.125	.445
X	-.035	.047
3 AGAINST 4		
GU	-.195	.053
GD	-.242	.066
AK	-.234	.208
S	-.530	-.004
X	-.042	.034

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
UNCORRECTED FOR SPEED

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.122	.430
GD	-.652	.034
AK	-.693	.291
S	-.685	.491
X	-.019	.151
1 AND 3 AGAINST 2 AND 4		
GU	-.356	.196
GD	-.332	.354
AK	-.595	.389
S	-.695	.481
X	-.083	.087

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
UNCORRECTED FOR SPEED

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-.214	.338
GD	-.156	.530
AK	-.569	.415
S	-.161	1.015
X	-.075	.095

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
UNCORRECTED FOR SPEED

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 2		
GU	-.170	.152
GD	-.100	.298
AK	-.376	.196
S	-.181	.501
X	-.044	.056
3 AGAINST 4		
GU	-.219	.077
GD	-.272	.096
AK	-.277	.251
S	-.583	.049
X	-.050	.042

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4

UNCORRECTED FOR SPEED

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.156	.464
GD	-.694	.076
AK	-.754	.352
S	-.757	.563
X	-.030	.162
1 AND 3 AGAINST 2 AND 4		
GU	-.390	.230
GD	-.374	.396
AK	-.656	.450
S	-.767	.553
X	-.094	.098

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
UNCORRECTED FOR SPEED

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-.248	.372
GD	-.198	.572
AK	-.630	.476
S	-.233	1.087
X	-.086	.106

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
CORRECTED FOR SPEED

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 2		
GU	-.089	.117
GD	-.067	.265
AK	-.168	.214
S	-.125	.445
X	-.035	.047
3 AGAINST 4		
GU	-.166	.024
GD	-.242	.066
AK	-.064	.290
S	-.530	-.004
X	-.042	.034

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
CORRECTED FOR SPEED

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.013	.411
GD	-.652	.034
AK	-.544	.244
S	-.685	.491
X	-.019	.151
1 AND 3 AGAINST 2 AND 4		
GU	-.269	.155
GD	-.332	.354
AK	-.258	.530
S	-.695	.481
X	-.083	.087

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
CORRECTED FOR SPEED
CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-.127	.297
GD	-.156	.530
AK	-.484	.304
S	-.161	1.015
X	-.075	.095

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
CORRECTED FOR SPEED

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 2		
GU	-.109	.137
GD	-.100	.298
AK	-.206	.252
S	-.181	.501
X	-.044	.056
3 AGAINST 4		
GU	-.185	.043
GD	-.272	.096
AK	-.099	.325
S	-.583	.049
X	-.050	.042

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
CORRECTED FOR SPEED

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.039	.437
GD	-.694	.076
AK	-.592	.292
S	-.757	.563
X	-.030	.162
1 AND 3 AGAINST 2 AND 4		
GU	-.295	.181
GD	-.374	.396
AK	-.306	.578
S	-.767	.553
X	-.094	.098

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
CORRECTED FOR SPEED

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-.153	.323
GD	-.198	.572
AK	-.532	.352
S	-.233	1.087
X	-.086	.106

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
SPEED 2 ONLY

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 2		
GU	-.043	.267
GD	-.108	.334
AK	-.024	.536
S	-.565	.695
X	-.079	.039
3 AGAINST 4		
GU	-.190	.120
GD	-.345	.095
AK	-.188	.370
S	-.796	.462
X	-.018	.100

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
SPEED 2 ONLY

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.173	.487
GD	-.677	.261
AK	-.647	.541
S	-1.596	1.080
X	-.050	.200
1 AND 3 AGAINST 2 AND 4		
GU	-.253	.407
GD	-.481	.457
AK	-.247	.941
S	-1.440	1.236
X	-.104	.146

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
SPEED 2 ONLY

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-.183	.477
GD	-.231	.707
AK	-.429	.759
S	-1.106	1.570
X	-.186	.064

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4

SPEED 2 ONLY

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 2		
GU	-.075	.299
GD	-.153	.379
AK	-.082	.594
S	-.695	.825
X	-.091	.051
3 AGAINST 4		
GU	-.222	.152
GD	-.391	.141
AK	-.246	.428
S	-.927	.593
X	-.030	.112

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4

SPEED 2 ONLY

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.215	.529
GD	-.736	.320
AK	-.723	.617
S	-1.767	1.251
X	-.065	.215
1 AND 3 AGAINST 2 AND 4		
GU	-.295	.449
GD	-.540	.516
AK	-.323	1.017
S	-1.611	1.407
X	-.119	.161

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 4
SPEED 2 ONLY

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-.225	.519
GD	-.290	.766
AK	-.505	.835
S	-1.277	1.741
X	-.201	.079

APPENDIX 4

AIRCRAFT TYPE 3

UPPER LIMIT OF RMS ERROR CONSIDERED	200
NUMBER OF SAMPLE POINTS	105
NUMBER OF TERRAIN SEGMENTS CONSIDERED	2
NUMBER OF SPEEDS	3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	3
2	3

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	17	20	19
3	13	19	17

TER	SPC	GU	GD	K	P	S
3	1	.295	.700	.110	.900	.640
3	1	.200	.600	.384	.900	.570
3	1	.200	1.000	.493	.800	.180
1	1	.200	.600	.548	.800	.660
3	1	.200	.550	.219	.850	.990
3	1	.342	1.450	.384	.850	.620
3	1	.200	.600	.164	.825	.750
3	1	.200	.600	.493	.900	.510
3	1	.153	.700	.110	.775	.840
1	1	.119	1.000	.329	1.100	.180
1	1	.390	1.600	.219	.800	.240
1	1	.200	.700	.548	.850	.310
1	1	.290	.850	.110	.825	.660
1	1	.295	.900	.329	1.100	.300
1	1	.200	1.050	.548	.800	-.290
1	1	.200	1.300	.548	.875	.590
3	1	.295	1.150	.329	.750	.930
3	1	.105	.400	.439	.850	.750
3	1	.390	1.100	.219	.800	.490
3	1	.152	.400	.603	.900	.690
1	2	.500	1.250	.329	.775	.680
1	2	.600	.700	.329	1.000	.950
1	2	.800	.600	.329	1.000	.380
1	2	.300	.800	.411	.850	.600
1	3	.400	.700	.355	.825	1.670
1	3	.400	.900	.326	.755	1.630
1	3	.500	.800	.296	.880	1.760
1	3	.850	1.300	.178	.780	1.420
1	2	.500	1.000	.288	.925	.750
1	2	.500	.800	.329	1.050	.560
1	3	.900	.800	.326	1.000	.700
1	3	.500	1.200	.296	1.050	.220
1	3	.295	1.100	.178	.750	1.810
1	2	.290	.800	.247	.800	.780
1	3	.295	.600	.237	.850	1.240
1	3	.500	1.300	.296	.975	1.210
1	2	.295	.600	.411	.800	.590
1	2	.450	1.400	.206	.975	.530
1	2	.600	.700	.329	.925	-.130
1	3	.650	1.250	.415	1.000	.320
1	3	.550	.850	.326	.750	.940
1	3	.247	1.250	.355	.875	1.770
1	3	.600	1.000	.296	.800	.190
1	3	.650	1.050	.415	.850	.740
1	3	1.000	1.200	.237	.800	.630
1	2	.400	1.200	.247	.800	.260
1	2	.295	.800	.206	.775	1.180
1	3	.800	1.500	.178	.800	1.590
1	2	.800	1.400	.247	1.050	.110
1	2	.400	1.100	.329	.850	1.110
1	2	.295	1.050	.288	1.100	.420
1	3	.600	.850	.237	.700	.780
1	2	.342	1.450	.288	1.025	.820
1	2	.390	.750	.164	.725	.740

1	3	1.000	1.550	.118	.925	.540
3	1	.390	1.400	.329	.650	.210
1	3	.600	1.300	.296	.775	.960
3	3	.200	1.100	.178	.850	2.160
3	3	.600	1.300	.296	.800	1.580
3	3	.500	1.400	.296	.800	1.290
3	2	.600	1.300	.329	.900	-.130
3	2	.247	1.300	.370	.800	.950
3	3	.550	1.150	.474	.800	1.250
3	3	.500	1.400	.296	.800	1.400
3	2	.295	1.350	.082	.600	1.270
3	2	.400	1.150	.164	.675	1.330
3	2	.600	1.400	.329	.800	.780
3	2	.500	1.400	.206	.750	.560
3	3	.295	.700	.089	.725	.580
3	3	.600	1.500	.296	.775	.860
3	2	.400	1.550	.237	.875	1.240
3	2	.200	.500	.370	.750	.650
3	3	.400	.950	.533	1.050	.540
3	2	.800	1.500	.247	.900	.600
3	2	.600	.900	.247	.800	1.140
3	2	.200	1.150	.247	.850	.630
3	3	.600	1.100	.444	.850	.550
3	2	.295	.900	.164	.775	1.010
3	2	.800	1.450	.247	.850	.740
3	2	.295	1.400	.329	.750	.860
3	3	.700	1.300	.296	.775	.230
3	2	.490	.800	.082	.600	1.010
3	2	.650	1.350	.247	.800	.290
3	2	.500	1.050	.288	.800	.310
1	2	.295	.500	.329	.650	.500
1	2	.600	1.000	.164	1.025	0
1	2	.600	1.300	.411	.750	.070
3	3	.450	1.050	.355	.800	.580
3	2	.152	.350	.493	.875	1.160
3	3	.350	1.100	.296	.755	1.000
3	3	.200	.550	.296	.775	1.400
3	2	.200	.600	.164	.825	1.090
3	3	.400	.650	.533	.800	.860
3	3	.600	1.300	.296	.725	1.050
3	3	.600	1.500	.474	.800	.380
3	3	.450	.750	.474	.750	1.510
1	1	.190	.900	.329	.950	.850
1	1	.700	.650	.329	1.100	-.050
1	1	.450	.850	.134	.825	.500
1	1	.123	.400	.493	1.125	.050
1	1	.200	1.300	.164	1.000	.280
1	1	.200	.700	.439	.850	.610
1	1	.295	.800	.329	1.050	-.030
1	1	.105	.800	.384	1.075	.460
1	1	.247	1.000	.439	.900	-.260

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.021	.001	-.009	-.009	-.000	.259
.001	.085	-.013	-.004	-.006	.906
-.009	-.013	.022	-.009	-.001	.366
-.009	-.004	-.009	.111	-.006	.298
-.000	-.006	-.001	-.006	.004	.969

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.246	.155	.128	.080	.179

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 15

GU/GD .115	GU/K 1.713	GU/S .767	GU/X .075
GD/K 1.262	GD/S .151	GD/X 1.208	
K/S .756	K/X .274		
S/X 1.067			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.027	.008	-.000	-.030	.005	.463
.008	.088	-.005	-.014	.006	.960
-.000	-.005	.006	-.001	-.001	.294
-.030	-.014	-.001	.127	-.005	.545
.005	.006	-.001	-.005	.005	.942

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.150	.205	.170	.089	.154

T TEST FOR SIGNIFICANCE OF
CCRRELATION
CEGREES OF FREEDOM 18

GU/GD .674	GU/K .044	GU/S 2.537	GU/X 2.092
GD/K .927	GD/S .548	GD/X 1.254	
K/S .206	K/X .581		
S/X .904			

TERRAIN 1 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.052	.028	-.006	-.062	.001	.597
.028	.073	-.008	-.023	.003	1.079
-.006	-.008	.007	-.006	.001	.282
-.062	-.023	-.006	.307	-.011	1.059
.001	.003	.001	-.011	.003	.920

KOLMOGOROF-SMIRNOV TEST STATISTIC
SAMPLE SIZE 19

GU	GD	K	S	X
.145	.118	.147	.114	.160

T TEST FOR SIGNIFICANCE OF CORRELATION
DEGREES OF FREEDOM 17

GU/GD 2.061	GU/K 1.503	GU/S 2.301	GU/X .511
GD/K 1.616	GD/S .651	GD/X .820	
K/S .596	K/X 1.214		
S/X 1.685			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GC	K	S	X	MEAN VECTOR
.051	.021	-.009	.008	-.001	.446
.021	.084	-.010	.009	-.000	.984
-.009	-.010	.012	-.015	.001	.312
.008	.009	-.015	.277	-.013	.644
-.001	-.000	.001	-.013	.004	.943

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 56

GU	GD	K	S	X
.152	.124	.169	.113	.144

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 54

GU/GD 2.525	GU/K 3.062	GU/S .482	GU/X .260
GD/K 2.535	GD/S .456	GD/X .022	
K/S 1.960	K/X .664		
S/X 3.063			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 1 ALL SPEEDS

CEGREES OF FREEDCM 2

3.900	.179	10.066	5.536	1.304

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.009	.028	-.004	-.008	-.002	.240
.028	.129	-.005	-.038	-.010	.819
-.004	-.005	.025	-.013	.001	.329
-.008	-.038	-.013	.059	.003	.628
-.002	-.010	.001	.003	.002	.908

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.283	.245	.143	.111	.165

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 11

GU/GD 5.296	GU/K .933	GU/S 1.343	GU/X 1.843
GD/K .284	GD/S 1.600	GD/X 2.868	
K/S 1.236	K/X .754		
S/X .988			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.042	.041	-.003	-.033	.002	.433
.041	.128	-.007	-.033	.002	1.126
-.003	-.007	.010	-.011	.003	.255
-.033	-.033	-.011	.147	-.008	.815
.002	.002	.003	-.008	.003	.886

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 19

GU	GD	K	S	X
.172	.160	.163	.090	.142

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 17

GU/GD 2.780	GU/K .646	GU/S 1.945	GU/X .888
GD/K .830	GD/S 1.019	GD/X .426	
K/S 1.202	K/X 3.103		
S/X 1.828			

TERRAIN 3 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.022	.031	.005	-.032	-.001	.470
.031	.090	-.003	-.012	-.000	1.106
.005	-.003	.015	-.017	.002	.348
-.032	-.012	-.017	.262	-.002	1.013
-.001	-.000	.002	-.002	.002	.895

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.130	.118	.252	.154	.325

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD 3.775	GU/K 1.211	GU/S 1.848	GU/X .368
GD/K .327	GD/S .303	GD/X .036	
K/S 1.078	K/X 2.012		
S/X .389			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.034	.045	-.001	-.012	-.001	.395
.045	.128	-.007	-.010	-.003	1.038
-.001	-.007	.017	-.011	.003	.307
-.012	-.010	-.011	.180	-.004	.834
-.001	-.003	.003	-.004	.002	.895

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 49

GU	GD	K	S	X
.140	.136	.107	.076	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 47

GU/GD 6.373	GU/K .280	GU/S 1.094	GU/X .446
GD/K 1.053	GD/S .453	GD/X 1.262	
K/S 1.432	K/X 3.314		
S/X 1.339			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 2 ALL SPEEDS

CEGREES OF FREECOM 2

7.611	.626	2.634	6.503	1.299

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.043	.031	-.005	-.004	.000	.422
.031	.104	-.009	.003	-.002	1.009
-.005	-.009	.014	-.013	.002	.310
-.004	.003	-.013	.239	-.011	.733
.000	-.002	.002	-.011	.004	.921

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 105

GU	GD	K	S	X
.140	.102	.140	.081	.152

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 103

GU/GD 5.334	GU/K 2.264	GU/S .403	GU/X .080
GD/K 2.384	GD/S .189	GD/X 1.040	
K/S 2.380	K/X 2.240		
S/X 3.992			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 5

GU	GD	K	S	X
12.341	2.202	14.463	12.226	8.158

BARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
2.079	2.236	1.722	2.288	6.917

UPPER LIMIT OF RMS ERROR CONSIDERED . 160
NUMBER OF SAMPLE POINTS 103
NUMBER OF TERRAIN SEGMENTS CONSIDERED 2
NUMBER OF SPEEDS 3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	3
2	3

DATA ACJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVICUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	17	20	18
3	13	19	16

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.021	.001	-.009	-.009	-.000	.259
.001	.085	-.013	-.004	-.006	.906
-.009	-.013	.022	-.009	-.001	.366
-.009	-.004	-.009	.111	-.006	.298
-.000	-.006	-.001	-.006	.004	.969

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.246	.155	.128	.080	.179

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD	GU/K	GU/S	GU/X
.115	1.713	.767	.075

GD/K	GD/S	GD/X
1.262	.151	1.208

K/S	K/X
.756	.274

S/X
1.067

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.027	.008	-.000	-.030	.005	.463
.008	.088	-.005	-.014	.006	.960
-.000	-.005	.006	-.001	-.001	.294
-.030	-.014	-.001	.127	-.005	.545
.005	.006	-.001	-.005	.005	.942

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.150	.205	.170	.089	.154

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .674	GU/K .044	GU/S 2.537	GU/X 2.092
GD/K .927	GD/S .548	GD/X 1.254	
K/S .206	K/X .581		
S/X .904			

TERRAIN 1 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.053	.025	-.006	-.058	.001	.608
.025	.068	-.007	-.010	.003	1.100
-.006	-.007	.007	-.010	.001	.278
-.058	-.010	-.010	.301	-.011	1.025
.001	.003	.001	-.011	.003	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 18

GU	GD	K	S	X
.149	.112	.143	.117	.186

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 16

GU/GD 1.794	GU/K 1.309	GU/S 2.061	GU/X .460
GD/K 1.334	GD/S .288	GD/X .766	
K/S .878	K/X 1.267		
S/X 1.633			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.052	.021	-.010	.009	-.001	.447
.021	.084	-.010	.015	-.000	.989
-.010	-.010	.012	-.016	.001	.311
.009	.015	-.016	.262	-.013	.626
-.001	-.000	.001	-.013	.004	.943

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 55

GU	GD	K	S	X
.159	.121	.180	.109	.139

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 53

GU/GD 2.495	GU/K 3.026	GU/S .552	GU/X .273
GD/K 2.477	GD/S .745	GD/X .093	
K/S 2.147	K/X .690		
S/X 2.991			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 2

3.907	.320	9.905	5.182	1.010

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.009	.028	-.004	-.008	-.002	.240
.028	.129	-.005	-.038	-.010	.819
-.004	-.005	.025	-.013	.001	.329
-.008	-.038	-.013	.059	.003	.628
-.002	-.010	.001	.003	.002	.908

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.283	.245	.143	.111	.165

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 11

GU/GD 5.296	GU/K .933	GU/S 1.343	GU/X 1.843
GD/K .284	GD/S 1.600	GD/X 2.868	
K/S 1.236	K/X .754		
S/X .988			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.042	.041	-.003	-.033	.002	.433
.041	.128	-.007	-.033	.002	1.126
-.003	-.007	.010	-.011	.003	.255
-.033	-.033	-.011	.147	-.008	.815
.002	.002	.003	-.008	.003	.886

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 19

GU	GD	K	S	X
.172	.160	.163	.090	.142

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 17

GU/GD 2.780	GU/K .646	GU/S 1.945	GU/X .888
GD/K .830	GD/S 1.019	GD/X .426	
K/S 1.202	K/X 3.103		
S/X 1.828			

TERRAIN 3 SPEED 3

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.022	.029	.006	-.033	-.000	.462
.029	.085	-.002	-.008	.000	1.081
.006	-.002	.016	-.019	.002	.352
-.033	-.008	-.019	.278	-.002	1.022
-.000	.000	.002	-.002	.002	.896

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 16

GU	GD	K	S	X
.114	.123	.232	.174	.323

T TEST FOR SIGNIFICANCE OF CORRELATION
DEGREES OF FREEDOM 14

GU/GD 3.450	GU/K 1.325	GU/S 1.759	GU/X .283
GD/K .189	GD/S .207	GD/X .091	
K/S 1.088	K/X 1.914		
S/X .406			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.034	.044	-.001	-.013	-.000	.390
.044	.126	-.007	-.010	-.003	1.028
-.001	-.007	.017	-.012	.003	.307
-.013	-.010	-.012	.184	-.004	.834
-.000	-.003	.003	-.004	.002	.895

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 48

GU	GD	K	S	X
.141	.132	.101	.082	.137

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 46

GU/GD 6.138	GU/K .268	GU/S 1.108	GU/X .393
GD/K 1.045	GD/S .468	GD/X 1.207	
K/S 1.416	K/X 3.278		
S/X 1.323			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 2 ALL SPEEDS

CEGREES OF FREEDCM 2

7.563	.799	2.616	6.915	1.085

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.044	.031	-.005	-.004	.000	.421
.031	.103	-.009	.005	-.002	1.007
-.005	-.009	.014	-.014	.002	.309
-.004	.005	-.014	.234	-.011	.723
.000	-.002	.002	-.011	.004	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 103

GU	GD	K	S	X
.145	.101	.143	.084	.154

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 101

GU/GD	GU/K	GU/S	GU/X
5.215	2.238	.412	.133

GD/K	GD/S	GD/X
2.345	.337	.967

K/S	K/X
2.483	2.226

S/X
3.979

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 5

GU	GD	K	S	X
12.219	2.544	14.329	12.198	7.512

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
2.273	2.032	1.739	1.526	6.680

AIRCRAFT TYPE 3

UPPER LIMIT OF RMS ERROR CONSIDERED	120
NUMBER OF SAMPLE POINTS	90
NUMBER OF TERRAIN SEGMENTS CONSIDERED	2
NUMBER OF SPEEDS	3

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	3
2	3

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	17	16	17
3	12	17	11

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.021	.001	-.009	-.009	-.000	.259
.001	.085	-.013	-.004	-.006	.906
-.009	-.013	.022	-.009	-.001	.366
-.009	-.004	-.009	.111	-.006	.298
-.000	-.006	-.001	-.006	.004	.969

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.246	.155	.128	.080	.179

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD .115	GU/K 1.713	GU/S .767	GU/X .075
GD/K 1.262	GD/S .151	GD/X 1.208	
K/S .756	K/X .274		
S/X 1.067			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.031	.008	.001	-.035	.006	.472
.008	.102	-.006	-.026	.009	.941
.001	-.006	.006	-.004	-.000	.283
-.035	-.026	-.004	.132	-.005	.485
.006	.009	-.000	-.005	.006	.947

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 16

GU	GD	K	S	X
.158	.233	.147	.099	.195

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 14

GU/GD .522	GU/K .361	GU/S 2.438	GU/X 1.905
GD/K .940	GD/S .869	GD/X 1.423	
K/S .592	K/X .305		
S/X .702			

TERRAIN 1 SPEED 3

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.050	.016	-.007	-.057	.002	.626
.016	.056	-.008	-.004	.003	1.129
-.007	-.008	.007	-.010	.001	.281
-.057	-.004	-.010	.317	-.012	1.012
.002	.003	.001	-.012	.003	.921

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.163	.129	.162	.131	.209

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD 1.213	GU/K 1.587	GU/S 1.972	GU/X .481
GD/K 1.858	GD/S .111	GD/X .860	
K/S .810	K/X 1.241		
S/X 1.593			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.056	.022	-.010	.012	-.001	.452
.022	.087	-.012	.020	-.000	.993
-.010	-.012	.013	-.017	.001	.310
.012	.020	-.017	.275	-.013	.601
-.001	-.000	.001	-.013	.005	.946

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 50

GU	GD	K	S	X
.166	.126	.174	.106	.156

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 48

GU/GD 2.253	GU/K 2.926	GU/S .669	GU/X .315
GD/K 2.558	GD/S .908	GD/X .051	
K/S 2.018	K/X .723		
S/X 2.836			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 2

2.826	1.410	8.380	5.187	1.357

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.008	.024	-.005	-.009	-.002	.232
.024	.102	-.009	-.041	-.011	.767
-.005	-.009	.026	-.015	.001	.324
-.009	-.041	-.015	.065	.003	.629
-.002	-.011	.001	.003	.002	.907

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.302	.249	.157	.117	.168

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD 4.886	GU/K 1.088	GU/S 1.356	GU/X 2.090
GD/K .533	GD/S 1.849	GD/X 4.787	
K/S 1.182	K/X .691		
S/X .951			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.040	.034	.001	-.035	.003	.440
.034	.099	.004	-.013	.005	1.185
.001	.004	.008	-.018	.003	.241
-.035	-.013	-.018	.150	-.010	.776
.003	.005	.003	-.010	.003	.883

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.177	.172	.123	.076	.137

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD 2.497	GU/K .161	GU/S 1.934	GU/X 1.267
GD/K .584	GD/S .423	GD/X 1.181	
K/S 2.336	K/X 2.793		
S/X 2.271			

TERRAIN 3 SPEED 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.021	.026	.006	-.044	-.001	.454
.026	.093	-.005	-.006	-.000	1.105
.006	-.005	.021	-.021	.003	.342
-.044	-.006	-.021	.324	-.002	1.000
-.001	-.000	.003	-.002	.002	.895

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.104	.151	.260	.133	.321

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 9

GU/GD 2.180	GU/K .930	GU/S 1.860	GU/X .618
GD/K .361	GD/S .110	GD/X .079	
K/S .800	K/X 1.512		
S/X .173			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.034	.045	-.001	-.017	-.001	.381
.045	.127	-.007	-.002	-.003	1.037
-.001	-.007	.018	-.015	.003	.294
-.017	-.002	-.015	.183	-.004	.793
-.001	-.003	.003	-.004	.002	.894

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 40

GU	GD	K	S	X
.155	.145	.123	.082	.118

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 38

GU/GD	GU/K	GU/S	GU/X
5.846	.298	1.329	.357

GD/K	GD/S	GD/X
.919	.087	1.152

K/S	K/X
1.679	2.836

S/X
1.298

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 2 ALL SPEECS

CEGREES OF FREEDOM 2

6.686	.024	4.893	6.285	.477

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.047	.031	-.006	-.004	.000	.420
.031	.104	-.010	.012	-.002	1.013
-.006	-.010	.015	-.017	.002	.303
-.004	.012	-.017	.241	-.012	.686
.000	-.002	.002	-.012	.004	.923

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 90

GU	GD	K	S	X
.163	.114	.150	.080	.156

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 88

GU/GD 4.622	GU/K 2.157	GU/S .364	GU/X .196
GD/K 2.356	GD/S .729	GD/X .921	
K/S 2.681	K/X 2.230		
S/X 3.726			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 5

GU	GD	K	S	X
10.396	1.836	14.775	11.605	5.456

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
2.615	1.504	1.382	1.735	4.589

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.016	.011	-.007	-.011	-.001	.248
.011	.093	-.010	-.030	-.006	.848
-.007	-.010	.023	-.015	.001	.349
-.011	-.030	-.015	.117	-.007	.435
-.001	-.006	.001	-.007	.004	.943

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 29

GU	GD	K	S	X
.270	.134	.112	.081	.191

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 27

GU/GD	GU/K	GU/S	GU/X
1.610	1.913	1.425	.347
GD/K	GD/S	GD/X	
1.088	1.552	1.543	
K/S	K/X		
1.510	.454		
S/X			
1.811			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.035	.019	.001	-.036	.005	.455
.019	.113	-.003	-.001	.002	1.067
.001	-.003	.007	-.014	.002	.261
-.036	-.001	-.014	.159	-.012	.635
.005	.002	.002	-.012	.005	.914

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 33

GU	GD	K	S	X
.168	.150	.121	.058	.155

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 31

GU/GD 1.734	GU/K .468	GU/S 3.095	GU/X 2.250
GD/K .649	GD/S .024	GD/X .554	
K/S 2.558	K/X 1.762		
S/X 2.666			

CUMULATIVE RESULTS SPEED 3 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.045	.020	-.004	-.050	.002	.558
.020	.067	-.007	-.005	.002	1.120
-.004	-.007	.013	-.014	.002	.305
-.050	-.005	-.014	.308	-.008	1.007
.002	.002	.002	-.008	.003	.911

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 28

GU	GD	K	S	X
.136	.100	.176	.088	.261

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 26

GU/GD 2.002	GU/K .969	GU/S 2.372	GU/X .677
GD/K 1.319	GD/S .160	GD/X .634	
K/S 1.143	K/X 1.397		
S/X 1.351			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 2

GU	GD	K	S	X
7.488	1.857	10.052	6.952	2.287

AIRCRAFT TYPE 3

UPPER LIMIT OF RMS ERROR CONSIDERED	120
NUMBER OF SAMPLE POINTS	33
NUMBER OF TERRAIN SEGMENTS CONSIDERED	2
NUMBER OF SPEEDS	1

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	1
2	1

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED
SPEED 2 ONLY
INDIVIDUAL SAMPLE SIZE

TERRAIN	
1	16
2	17

TERRAIN 1 , SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.031	.008	.001	-.035	.006	.472
.008	.102	-.006	-.026	.009	.941
.001	-.006	.006	-.004	-.000	.283
-.035	-.026	-.004	.132	-.005	.485
.006	.009	-.000	-.005	.006	.947

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 16

GU	GD	K	S	X
.158	.233	.147	.099	.195

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 14

GU/GD .522	GU/K .361	GU/S 2.438	GU/X 1.905
GD/K .940	GD/S .869	GD/X 1.423	
K/S .592	K/X .305		
S/X .702			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX | | | | | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.040	.034	.001	-.035	.003	.440
.034	.099	.004	-.013	.005	1.185
.001	.004	.008	-.018	.003	.241
-.035	-.013	-.018	.150	-.010	.776
.003	.005	.003	-.010	.003	.883

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.177	.172	.123	.076	.137

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 15

GU/GD 2.497	GU/K .161	GU/S 1.934	GU/X 1.267
GD/K .584	GD/S .423	GD/X 1.181	
K/S 2.336	K/X 2.793		
S/X 2.271			

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.035	.019	.001	-.036	.005	.455
.019	.113	-.003	-.001	.002	1.067
.001	-.003	.007	-.014	.002	.261
-.036	-.001	-.014	.159	-.012	.635
.005	.002	.002	-.012	.005	.914

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 33

GU	GD	K	S	X
.168	.150	.121	.058	.155

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 31

GU/GD 1.734	GU/K .468	GU/S 3.095	GU/X 2.250
GD/K .649	GD/S .024	GD/X .554	
K/S 2.558	K/X 1.762		
S/X 2.666			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
EETWEEN INDIVIDUAL TERRAINS

CEGREES OF FREEDOM 1

GU	GD	K	S	X
.227	.004	.374	.065	2.074

COEFFICIENT OF DETERMINATION	.2091
MULTIPLE CORR. COEFFICIENT	.4573

SUM OF SQUARES ATTRIBUTABLE TO REGRESSION	12711.44055
SUM OF SQUARES OF DEVIATION FROM REGRESSION	48081.54993

VARIANCE OF ESTIMATE	466.81116
STD. ERROR OF ESTIMATE	21.60581

INTERCEPT (A VALUE) 57.38216

ANALYSIS OF VARIANCE FOR THE MULTIPLE LINEAR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION............	1	12711.44055	12711.44055	27.2304
DEVIATION ABOUT REGRESSION...	103	48081.54993	466.81116	
TOTAL...	104	60792.99048		

VARIABLE NO.	MEAN	STD DEVIATION	REG. COEFF.	STD.ERROR OF REG.COE.	COMPUTED T VALUE	PARTIAL CORR.COE.
1	245.69524	88.74381	.12458	.02387	5.21827	.45727
2	87.99048	24.17742				

COMP. CHECK ON FINAL COEFF. .12458

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 3

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 3		
GU	-.021	.163
GD	-.180	.092
AK	-.036	.068
S	-.399	.015
X	.025	.079

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 3

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AGAINST 3		
GU	-.006	.148
GD	-.158	.070
AK	-.027	.059
S	-.365	-.019
X	.030	.074

APPENDIX 5

AIRCRAFT TYPE 7

UPPER LIMIT OF RMS ERROR CONSIDERED	200
NUMBER OF SAMPLE POINTS	29
NUMBER OF TERRAIN SEGMENTS CONSIDERED	4
NUMBER OF SPEEDS	1

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	1
2	1
3	1
4	1

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	
1	6
2	8
3	10
4	5

TER	SPC	GU	GD	K	P	S
1	1	1.400	1.000	2.000	1.300	2.160
1	1	2.200	.400	1.625	1.300	.880
1	1	1.700	.475	1.750	1.375	1.220
1	1	1.800	.700	1.438	1.375	2.490
1	1	1.400	1.300	2.000	1.300	2.540
1	1	1.400	1.300	2.000	1.600	.990
1	1	1.800	.325	2.000	1.300	.210
1	1	1.800	.400	1.250	1.300	.450
2	1	2.000	1.600	2.750	1.600	3.680
2	1	.700	.250	.775	.700	2.280
2	1	1.800	.175	3.200	2.100	-6.720
2	1	2.100	.500	1.200	1.300	.770
2	1	2.400	.475	1.200	.700	2.140
2	1	1.500	1.500	1.500	1.300	1.970
2	1	1.400	.600	2.000	1.000	1.270
2	1	1.400	1.250	2.000	1.200	5.920
2	1	1.400	.325	2.000	.400	1.330
2	1	1.400	.437	2.562	1.375	.210
3	1	1.800	.250	3.000	1.800	-1.520
3	1	2.400	1.300	6.000	.400	3.710
3	1	2.800	.250	3.000	1.600	-2.250
3	1	1.400	.700	2.750	1.000	1.400
3	1	1.400	.850	2.500	2.100	.320
3	1	1.400	1.300	3.000	1.300	.950
3	1	1.000	.250	2.750	1.300	.520
3	1	.600	.700	2.000	1.300	1.650
3	1	1.800	.250	3.750	1.600	-1.170
3	1	.300	.400	4.000	1.550	-1.380
3	1	1.400	.400	3.875	1.600	-1.360
3	1	2.500	.250	2.000	1.300	.490
4	1	1.600	.700	2.938	1.450	1.540
4	1	1.800	1.300	2.000	1.080	2.540
4	1	1.400	1.300	1.250	1.300	1.560
4	1	.100	.250	3.500	1.300	-2.980
4	1	.600	1.600	2.000	1.900	0
4	1	2.200	.325	3.500	1.600	-.880
4	1	1.300	1.150	2.000	1.450	3.130
4	1	1.300	1.300	2.188	1.300	2.810

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.066	-.069	-.031	-.012	-.010	1.783
-.069	.134	.040	.093	.017	.600
-.031	.040	.091	-.071	.007	1.677
-.012	.093	-.071	.640	.009	1.040
-.010	.017	.007	.009	.002	1.172

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 6

GU	GD	K	S	X
.307	.300	.143	.244	.326

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 4

GU/GD 2.202	GU/K .890	GU/S .121	GU/X 2.736
GD/K .776	GD/S .670	GD/X 9.230	
K/S .619	K/X 1.088		
S/X .497			

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.284	.079	.046	.084	.031	1.612
.079	.280	.149	.342	.075	.711
.046	.149	.486	.030	.064	1.748
.084	.342	.030	1.133	.021	1.706
.031	.075	.064	.021	.047	1.003

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.209	.333	.159	.170	.154

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .712	GU/K .309	GU/S .366	GU/X .684
GD/K 1.078	GD/S 1.874	GD/X 2.122	
K/S .098	K/X 1.155		
S/X .220			

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.477	-.055	.012	-.474	.022	1.390
-.055	.122	-.084	.329	-.009	.535
.012	-.084	.407	-.618	.015	3.063
-.474	.329	-.618	1.961	-.100	-.284
.022	-.009	.015	-.100	.016	1.225

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.194	.250	.239	.237	.175

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD .664	GU/K .076	GU/S 1.591	GU/X .745
GD/K 1.156	GD/S 2.566	GD/X .627	
K/S 2.707	K/X .540		
S/X 1.973			

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.692	-.072	.035	.828	.004	1.180
-.072	.356	-.529	.677	.027	.835
.035	-.529	.977	-1.258	-.006	2.638
.828	.677	-1.258	3.586	.013	-.152
.004	.027	-.006	.013	.010	1.226

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 5

GU	GD	K	S	X
.157	.204	.192	.183	.204

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 3

GU/GD .253	GU/K .073	GU/S 1.070	GU/X .083
GD/K 3.539	GD/S 1.299	GD/X .901	
K/S 1.571	K/X .110		
S/X .123			

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.378	-.028	-.090	.125	.003	1.497
-.028	.197	-.081	.331	.019	.649
-.090	-.081	.805	-.901	.066	2.340
.125	.331	-.901	2.310	-.102	.562
.003	.019	.066	-.102	.028	1.153

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 29

GU	GD	K	S	X
.196	.218	.165	.098	.263

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 27

GU/GD .533	GU/K .858	GU/S .699	GU/X .150
GD/K 1.088	GD/S 2.927	GD/X 1.406	
K/S 4.577	K/X 2.569		
S/X 2.272			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
5.629	2.352	5.253	3.556	10.015

UPPER LIMIT OF RMS ERROR CONSIDERED 160
NUMBER OF SAMPLE POINTS 20
NUMBER OF TERRAIN SEGMENTS CONSIDERED 4
NUMBER OF SPEEDS 1

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	1
2	1
3	1
4	1

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	
1	6
2	5
3	5
4	4

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.066	-.069	-.031	-.012	-.010	1.783
-.069	.134	.040	.093	.017	.600
-.031	.040	.091	-.071	.007	1.677
-.012	.093	-.071	.640	.009	1.040
-.010	.017	.007	.009	.002	1.172

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 6

GU	GD	K	S	X
.307	.300	.143	.244	.326

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 4

GU/GD 2.202	GU/K .890	GU/S .121	GU/X 2.736
GD/K .776	GD/S .670	GD/X 9.230	
K/S .619	K/X 1.088		
S/X .497			

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.247	.065	.072	-.247	.055	1.420
.065	.238	.020	.123	.031	.657
.072	.020	.484	-.431	.057	1.607
-.247	.123	-.431	.720	-.082	1.300
.055	.031	.057	-.082	.020	1.058

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 5

GU	GD	K	S	X
.236	.347	.161	.134	.207

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 3

GU/GD .480	GU/K .367	GU/S 1.256	GU/X 2.231
GD/K .102	GD/S .537	GD/X .883	
K/S 1.852	K/X 1.248		
S/X 1.647			

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.362	-.060	.156	-.285	.017	1.020
-.060	.034	-.094	.148	-.005	.400
.156	-.094	.753	-1.187	.053	3.275
-.285	.148	-1.187	1.878	-.084	-.348
.017	-.005	.053	-.084	.004	1.211

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 5

GU	GD	K	S	X
.157	.300	.202	.326	.261

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 3

GU/GD 1.119	GU/K .541	GU/S .638	GU/X .852
GD/K 1.259	GD/S 1.261	GD/X .735	
K/S 30.715	K/X 4.325		
S/X 4.905			

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.849	-.072	-.006	.807	.009	1.075
-.072	.466	-.689	.998	.035	.869
-.006	-.689	1.266	-1.889	-.006	2.563
.807	.998	-1.889	3.589	.033	-.575
.009	.035	-.006	.033	.013	1.231

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 4

GU	GD	K	S	X
.197	.287	.202	.148	.286

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 2

GU/GD .163	GU/K .009	GU/S .738	GU/X .122
GD/K 2.868	GD/S 1.716	GD/X .719	
K/S 2.706	K/X .062		
S/X .217			

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.385	-.026	-.159	.237	.005	1.360
-.026	.192	-.160	.236	.015	.618
-.159	-.160	.993	-1.191	.058	2.236
.237	.236	-1.191	1.970	-.074	.435
.005	.015	.058	-.074	.012	1.165

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.176	.256	.244	.086	.261

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .406	GU/K 1.126	GU/S 1.202	GU/X .322
GD/K 1.662	GD/S 1.763	GD/X 1.421	
K/S 6.885	K/X 2.602		
S/X 2.297			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
5.526	5.110	5.823	3.535	5.242

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.385	-.026	-.159	.237	.005	1.360
-.026	.192	-.160	.236	.015	.618
-.159	-.160	.993	-1.191	.058	2.236
.237	.236	-1.191	1.970	-.074	.435
.005	.015	.058	-.074	.012	1.165

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.176	.256	.244	.086	.261

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .406	GU/K 1.126	GU/S 1.202	GU/X .322
GD/K 1.662	GD/S 1.763	GD/X 1.421	
K/S 6.885	K/X 2.602		
S/X 2.297			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
5.526	5.110	5.823	3.535	5.242

COEFFICIENT OF DETERMINATION .2985
MULTIPLE CORR. COEFFICIENT .5463

SUM OF SQUARES ATTRIBUTABLE TO REGRESSION 36642.26373
SUM OF SQUARES OF DEVIATION FROM REGRESSION 86120.71949

VARIANCE OF ESTIMATE 2392.24221
STD. ERROR OF ESTIMATE 48.91055

INTERCEPT (A VALUE) 39.22793

ANALYSIS OF VARIANCE FOR THE MULTIPLE LINEAR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION............	1	36642.26373	36642.26373	15.3171
DEVIATION ABOUT REGRESSION...	36	86120.71949	2392.24221	
TOTAL...	37	122762.98322		

VARIABLE NO.	MEAN	STD. DEVIATION	REG. COEFF.	STD. ERROR OF REG.COE.	COMPUTED T VALUE	PARTIAL CORR.COE.
1	564.18421	135.95366	.23147	.05914	3.91371	.54633
2	169.82105	57.60138				

COMP. CHECK ON FINAL COEFF. .23147

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 7

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	UPPER
1 AGAINST 2		
GU	-.396	.928
GD	-.700	.272
AK	-1.087	.845
S	-2.261	.947
X	-.044	.204
3 AGAINST 4		
GU	-.492	.806
GD	-.761	.191
AK	-.476	1.418
S	-1.760	1.384
X	-.108	.134

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 7

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-.740	2.306
GD	-1.089	1.147
AK	-4.495	-.049
S	-.462	6.920
X	-.486	.084
1 AND 3 AGAINST 2 AND 4		
GU	-1.100	1.946
GD	-1.617	.619
AK	-1.873	2.573
S	-4.536	2.846
X	-.192	.378

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 7

CONFIDENCE LEVEL .90

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-1.414	1.632
GD	-1.047	1.189
AK	-2.815	1.631
S	-4.160	3.222
X	-.218	.352

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 7

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	UPPER
1 AGAINST 2		
GU	-.548	1.080
GD	-.812	.384
AK	-1.309	1.067
S	-2.630	1.316
X	-.072	.232
3 AGAINST 4		
GU	-.637	.951
GD	-.868	.298
AK	-.688	1.630
S	-2.112	1.736
X	-.135	.161

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 7

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	UPPER
1 AND 2 AGAINST 3 AND 4		
GU	-1.054	2.620
GD	-1.319	1.377
AK	-4.953	.409
S	-1.221	7.679
X	-.544	.142
1 AND 3 AGAINST 2 AND 4		
GU	-1.414	2.260
GD	-1.847	.849
AK	-2.331	3.031
S	-5.295	3.605
X	-.250	.436

SCHEFFE CONTRAST INTERVAL
BETWEEN TERRAINS

AIRCRAFT TYPE 7

CONFIDENCE LEVEL .95

CONTRASTED TERRAIN	INTERVAL LOWER	INTERVAL UPPER
1 AND 4 AGAINST 2 AND 3		
GU	-1.728	1.946
GD	-1.277	1.419
AK	-3.273	2.089
S	-4.919	3.981
X	-.276	.410

APPENDIX 6

AIRCRAFT TYPE 6

UPPER LIMIT OF RMS ERROR CONSIDERED	240
NUMBER OF SAMPLE POINTS	76
NUMBER OF TERRAIN SEGMENTS CONSIDERED	4
NUMBER OF SPEEDS	2

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	2
3	2
4	2

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	SPEED 2	SPEED 3
1	8	12	
2	7	9	
3	10	9	
4	12	9	

TER	SPC	GU	GD	K	P	S
1	2	1.400	.550	1.875	.250	3.373
1	2	2.200	.700	3.000	1.850	-3.651
1	2	.800	1.300	.350	.400	1.852
1	2	.800	.400	1.250	.400	.355
1	2	.800	.400	1.500	.400	.898
1	2	1.000	.350	1.650	.100	2.268
1	2	1.800	.600	2.950	1.200	.377
1	2	2.500	.400	1.300	.250	1.333
1	2	1.400	.700	.200	.400	2.229
1	2	.600	.400	1.000	.400	1.625
1	2	1.000	.900	4.250	1.600	-.600
1	2	.600	.250	1.400	.700	2.125
1	2	.700	.400	1.450	.550	2.732
3	2	1.800	1.300	2.000	1.350	.088
4	2	.350	1.000	.425	.400	2.241
4	2	.350	.600	.700	.400	2.169
4	2	.350	1.450	.500	.600	2.408
4	2	.350	.620	.500	1.400	-1.669
4	2	.220	.480	1.250	1.300	-2.410
4	2	.600	.500	2.000	.400	2.410
4	2	1.800	1.600	1.250	1.300	1.534
4	2	1.000	.400	.800	.100	1.994
3	2	1.800	.700	1.250	1.300	-.057
4	2	.600	.700	.200	.180	1.710
3	2	.600	.800	.762	.500	1.524
3	2	1.800	.700	1.250	.700	1.736
3	2	.480	.700	1.600	.300	2.226
2	2	.400	.700	.200	.700	1.608
2	2	1.400	.700	2.000	.850	1.418
2	2	1.000	.480	1.200	.400	1.126
4	2	.350	2.050	.650	1.400	-1.056
3	2	.850	.320	4.625	.400	1.963
3	2	1.800	1.600	2.000	1.300	1.599
3	2	2.000	.400	2.000	.400	1.353
3	2	.600	.400	2.000	.400	2.927
3	2	1.800	.400	2.850	.600	3.400
3	2	1.600	1.600	2.000	.400	3.410
3	2	1.000	.400	1.300	.550	2.144
2	2	.350	.250	2.550	.400	2.157
2	2	1.000	1.300	2.750	1.000	3.548
2	2	2.400	.400	1.400	.400	3.491
2	2	1.400	.700	2.000	1.300	.070

2	3	1.800	.400	1.200	.480	1.479
2	3	2.350	.400	2.000	.400	2.049
2	1	1.100	.400	.800	1.000	[illegible]
2	1	1.400	.250	2.700	1.300	.137
2	1	1.200	.700	2.000	1.600	1.810
3	1	2.200	.100	3.500	.550	1.899
3	1	1.100	.100	3.125	.200	3.213
3	1	.600	.500	.900	.600	2.099
3	1	1.400	.320	3.300	1.550	-1.603
4	1	1.400	1.400	2.000	1.900	1.893
4	1	1.600	.180	3.875	1.650	-4.475
2	1	1.200	.850	2.375	1.600	-.122
2	1	1.950	.320	.900	.250	.733
2	1	1.800	1.000	2.000	1.300	-.489
2	1	1.400	.400	1.250	1.450	-.629
2	1	1.000	.400	.875	1.300	-.832
2	1	1.000	.400	2.000	1.300	-1.712
2	1	1.400	.400	1.250	1.450	-1.362
2	1	1.400	1.150	2.375	1.450	.501
3	1	1.400	1.300	1.312	1.000	.956
3	1	1.400	1.400	1.900	1.600	-.805
3	1	1.800	1.450	1.250	1.600	.556
3	1	1.600	1.300	1.250	1.450	.377
3	1	1.400	1.600	1.250	1.600	-.120
3	1	1.800	1.300	2.000	1.600	.176
4	1	1.600	1.600	1.250	1.250	1.119
4	1	1.000	1.100	2.000	1.900	-.230
2	1	1.000	.800	1.200	1.600	-.860
3	1	1.400	1.550	1.600	1.600	-.655
3	1	1.100	1.450	2.500	2.200	-.905
4	1	1.800	1.300	1.250	1.600	.817
4	1	1.350	.900	1.250	1.400	-.021
4	1	1.400	1.300	1.250	1.300	-.042
4	1	1.800	1.150	1.250	1.300	.205
4	1	1.400	.850	.875	1.300	.103
4	1	1.400	1.000	1.250	1.600	.097
4	1	.350	1.100	1.050	1.300	1.061
4	1	2.200	2.200	1.250	1.600	-.203
4	1	1.800	1.900	1.200	1.600	-.120
1	1	1.800	.700	2.000	1.300	2.965
1	1	1.400	.700	2.000	1.380	-1.428
1	1	1.350	.350	.800	.350	.199
1	1	1.400	.700	2.375	1.300	.197
1	1	1.600	.400	1.450	1.300	-1.667
1	1	1.400	.600	1.200	1.300	.971
1	1	1.400	.400	2.000	1.300	-.374
1	1	1.350	1.050	2.125	1.700	-1.543
1	1	2.200	.400	2.000	1.600	-1.867
1	1	1.000	.700	2.000	1.450	-.354
1	1	1.800	.580	1.900	1.100	.874
1	1	.800	.400	1.250	1.300	-.337

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.038	-.002	.027	.181	.005	1.512
-.002	.052	.066	-.029	.031	.598
.027	.066	.230	-.054	.078	1.684
.181	-.029	-.054	2.554	-.070	-.000
.005	.031	.078	-.070	.045	1.085

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.344	.202	.179	.189	.228

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .124	GU/K .737	GU/S 1.766	GU/X .278
GD/K 1.847	GD/S .192	GD/X 2.018	
K/S .174	K/X 2.980		
S/X .520			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.420	.009	.207	-.502	.043	1.217
.009	.084	.027	-.101	.021	.583
.207	.027	1.355	-1.320	.278	1.710
-.502	-.101	-1.320	3.419	-.430	1.054
.043	.021	.278	-.430	.086	.788

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.240	.237	.238	.105	.286

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD .159	GU/K .903	GU/S 1.459	GU/X .735
GD/K .255	GD/S .611	GD/X .819	
K/S 2.456	K/X 4.482		
S/X 4.137			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.279	.006	.128	-.303	.049	1.335
.006	.068	.040	-.073	.025	.589
.128	.040	.869	-.777	.188	1.700
-.303	-.073	-.777	3.201	-.354	.632
.049	.025	.188	-.354	.088	.907

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 20

GU	GD	K	S	X
.151	.216	.174	.075	.222

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 18

GU/GD .175	GU/K 1.140	GU/S 1.434	GU/X 1.386
GD/K .707	GD/S .673	GD/X 1.428	
K/S 2.234	K/X 3.921		
S/X 3.782			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 1 ALL SPEEDS

DEGREES OF FREEDOM 1

8.503	.433	5.089	.168	.798

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.124	-.030	-.009	.108	-.073	1.264
-.030	.031	-.039	-.070	.019	.424
-.009	-.039	.500	-.424	.061	1.389
.108	-.070	-.424	3.299	-.199	-.038
-.073	.019	.061	-.199	.067	1.056

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.251	.412	.292	.240	.209

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD 1.251	GU/K .083	GU/S .382	GU/X 3.068
GD/K .738	GD/S .503	GD/X 1.051	
K/S .783	K/X .787		
S/X 1.047			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.557	-.055	.022	.154	-.031	1.344
-.055	.097	.063	.079	.045	.592
.022	.063	.617	.232	.036	1.700
.154	.079	.232	1.222	-.065	1.883
-.031	.045	.036	-.065	.037	.791

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.137	.254	.129	.180	.251

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDCM 7

GU/GD .642	GU/K .097	GU/S .501	GU/X .585
GD/K .710	GD/S .623	GD/X 2.953	
K/S .735	K/X .652		
S/X .857			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.348	-.038	.014	.165	-.051	1.309
-.038	.071	.032	.099	.020	.519
.014	.032	.554	.111	.022	1.564
.165	.099	.111	2.940	-.248	1.042
-.051	.020	.022	-.248	.065	.907

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 16

GU	GD	K	S	X
.189	.297	.163	.113	.175

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 14

GU/GD .922	GU/K .122	GU/S .620	GU/X 1.365
GD/K .609	GD/S .826	GD/X 1.140	
K/S .326	K/X .436		
S/X 2.584			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 1

3.115	1.902	.070	1.586	.563

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.173	-.033	.199	.024	-.008	1.430
-.033	.306	-.284	-.277	.092	1.082
.199	-.284	.794	-.271	.001	1.951
.024	-.277	-.271	1.486	-.256	.142
-.008	.092	.001	-.256	.056	1.151

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 10

GU	GD	K	S	X
.229	.253	.178	.143	.215

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 8

GU/GD .413	GU/K 1.802	GU/S .133	GU/X .223
GD/K 2.001	GD/S 1.276	GD/X 2.759	
K/S .728	K/X .015		
S/X 5.379			

TERRAIN 3 ,SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.390	.033	.038	-.175	.063	1.214
.033	.099	-.141	-.225	.043	.602
.038	-.141	1.293	.214	-.026	2.043
-.175	-.225	.214	.898	-.105	1.932
.063	.043	-.026	-.105	.033	.741

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.190	.296	.293	.156	.204

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM, 7

GU/GD .455	GU/K .143	GU/S .819	GU/X 1.790
GD/K 1.138	GD/S 3.045	GD/X 3.097	
K/S .537	K/X .339		
S/X 2.054			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.272	.025	.112	-.167	.047	1.328
.025	.257	-.217	-.464	.117	.855
.112	-.217	.974	.003	-.021	1.995
-.167	-.464	.003	1.986	-.368	.990
.047	.117	-.021	-.368	.087	.957

KCLMCGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 19

GU	GD	K	S	X
.134	.183	.235	.089	.205

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 17

GU/GD .397	GU/K .915	GU/S .964	GU/X 1.338
GD/K 1.979	GC/S 3.525	GD/X 5.153	
K/S .010	K/X .298		
S/X 7.859			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 3 ALL SPEEDS

CEGREES OF FREEDOM 1

1.297	2.385	.475	.498	.577

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.208	.099	.024	-.163	.003	1.442
.099	.274	-.233	.452	.002	1.223
.024	-.233	.653	-.961	.039	1.542
-.163	.452	-.961	2.375	-.023	-.051
.003	.002	.039	-.023	.009	1.225

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.170	.139	.391	.287	.233

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 10

GU/GD 1.437	GU/K .211	GU/S .755	GU/X .231
GD/K 2.096	GD/S 2.141	GD/X .107	
K/S 3.835	K/X 1.919		
S/X .505			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.056	-.048	.014	.219	-.058	.463
-.048	.302	-.102	-.110	.073	.867
.014	-.102	.294	-.023	.011	.781
.219	-.110	-.023	3.898	-.554	.866
-.058	.073	.011	-.554	.108	.769

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.351	.286	.263	.221	.217

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 7

GU/GD 1.056	GU/K .288	GU/S 1.406	GU/X 2.949
GD/K .963	GD/S .269	GD/X 1.173	
K/S .058	K/X .162		
S/X 4.368			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.383	.125	.210	-.233	.093	1.022
.125	.304	-.099	.120	.072	1.070
.210	-.099	.625	-.717	.115	1.215
-.233	.120	-.717	3.082	-.342	.342
.093	.072	.115	-.342	.101	1.029

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 21

GU	GD	K	S	X
.195	.109	.292	.134	.276

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 19

GU/GD 1.710	GU/K 2.077	GU/S .956	GU/X 2.344
GD/K 1.020	GD/S .546	GD/X 1.959	
K/S 2.630	K/X 2.244		
S/X 3.367			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 1

3.313	.022	1.308	.548	12.402

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.326	.008	.152	-.114	.032	1.241
.008	.224	-.089	-.117	.069	.774
.152	-.089	.815	-.302	.069	1.611
-.114	-.117	-.302	2.780	-.328	.728
.032	.069	.069	-.328	.086	.953

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 76

GU	GD	K	S	X
.128	.193	.162	.063	.199

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 74

GU/GD .270	GU/K 2.659	GU/S 1.039	GU/X 1.671
GD/K 1.829	GD/S 1.293	GD/X 4.905	
K/S 1.764	K/X 2.323		
S/X 7.816			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 7

GU	GD	K	S	X
20.106	17.182	10.073	7.134	15.418

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
.772	15.746	1.770	1.213	.830

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.142	.027	.070	.010	-.010	1.420
.027	.284	-.111	.057	.054	.899
.070	-.111	.568	-.427	.039	1.654
.010	.057	-.427	2.150	-.118	.014
-.010	.054	.039	-.118	.041	1.143

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 37

GU	GD	K	S	X
.197	.150	.218	.124	.252

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 35

GU/GD .815	GU/K 1.499	GU/S .112	GU/X .803
GD/K 1.697	GD/S .432	GD/X 3.401	
K/S 2.476	K/X 1.577		
S/X 2.565			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.449	-.052	.220	.007	.008	1.072
-.052	.143	-.081	-.116	.040	.655
.220	-.081	1.067	-.134	.083	1.570
.007	-.116	-.134	2.484	-.280	1.405
.008	.040	.083	-.280	.062	.774

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 39

GU	GD	K	S	X
.184	.248	.159	.174	.227

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 37

GU/GD 1.265	GU/K 2.039	GU/S .038	GU/X .307
GD/K 1.282	GD/S 1.207	GD/X 2.805	
K/S .503	K/X 2.074		
S/X 6.148			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
11.434	4.227	3.538	.190	1.594

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UPPER LIMIT OF RMS ERROR CONSIDERED          200
NUMBER OF SAMPLE POINTS                       69
NUMBER OF TERRAIN SEGMENTS CONSIDERED          4
NUMBER OF SPEEDS                               2
```

NUMBER OF SPEEDS FLOWN ON EACH TERRAIN SEGMENT

TERRAIN	SPEEDS
1	2
2	2
3	2
4	2

DATA ADJUSTED AS FOLLOWS
K = K/10
S = S/100

NO CORRECTION FOR SPEED

INDIVIDUAL SAMPLE SIZE

TERRAIN	SPEED 1	2	3
1	7	11	
2	5	8	
3	9	8	
4	12	9	

TERRAIN 1 SPEED 1

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.028	-.008	.014	.049	.002	1.471
-.008	.059	.071	-.091	.035	.583
.014	.071	.250	-.242	.088	1.639
.049	-.091	-.242	1.304	-.113	-.424
.002	.035	.088	-.113	.052	1.077

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 7

GU	GD	K	S	X
.379	.203	.165	.239	.191

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 5

GU/GD .461	GU/K .379	GU/S .594	GU/X .139
GD/K 1.610	GD/S .779	GD/X 1.817	
K/S 1.045	K/X 2.756		
S/X 1.083			

TERRAIN 1 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.356	-.002	.089	-.047	-.014	1.127
-.002	.091	.013	-.052	.016	.573
.089	.013	1.309	-.790	.225	1.593
-.047	-.052	-.790	1.346	-.179	1.482
-.014	.016	.225	-.179	.058	.736

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 11

GU	GD	K	S	X
.254	.262	.260	.102	.303

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 9

GU/GD .036	GU/K .396	GU/S .205	GU/X .295
GD/K .117	GD/S .449	GD/X .679	
K/S 2.223	K/X 4.228		
S/X 2.491			

CUMULATIVE RESULTS TERRAIN 1

VARIANCE COVARIANCE MATRIX   MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.249	-.003	.062	-.175	.022	1.261
-.003	.074	.033	-.067	.023	.577
.062	.033	.858	-.572	.168	1.611
-.175	-.067	-.572	2.166	-.309	.741
.022	.023	.168	-.309	.082	.869

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 18

GU	GD	K	S	X
.168	.242	.178	.C96	.240

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDCM 16

GU/GD .098	GU/K .537	GU/S .984	GU/X .625
GD/K .528	GD/S .683	GD/X 1.213	
K/S 1.849	K/X 3.270		
S/X 4.315			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 1 ALL SPEEDS

CEGREES OF FREEDOM 1

7.899	.314	3.891	.002	.027

TERRAIN 2 SPEED 1

VARIANCE COVARIANCE MATRIX | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.163	-.046	-.047	.140	-.108	1.290
-.046	.046	-.064	-.123	.031	.434
-.047	-.064	.657	-.854	.114	1.520
.140	-.123	-.854	4.129	-.207	.385
-.108	.031	.114	-.207	.090	1.009

KCLMOGOROF-SMIRNCV
TEST STATISTIC
SAMPLE SIZE 5

GU	GD	K	S	X
.281	.363	.254	.232	.197

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 3

GU/GD 1.100	GU/K .253	GU/S .301	GU/X 3.436
GD/K .686	GD/S .511	GD/X .951	
K/S 1.050	K/X .926		
S/X .628			

TERRAIN 2 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.618	-.023	.083	.268	-.024	1.388
-.023	.030	-.047	-.099	.027	.504
.083	-.047	.528	-.016	.006	1.569
.268	-.099	-.016	.951	-.131	1.675
-.024	.027	.006	-.131	.035	.765

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.146	.224	.151	.185	.275

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .425	GU/K .359	GU/S .913	GU/X .401
GD/K .977	GD/S 1.761	GD/X 3.668	
K/S .054	K/X .108		
S/X 2.503			

CUMULATIVE RESULTS TERRAIN 2

VARIANCE COVARIANCE MATRIX | | | | | MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.417	-.027	.034	.235	-.056	1.350
-.027	.034	-.048	-.076	.022	.477
.034	-.048	.528	-.277	.039	1.550
.235	-.076	-.277	2.357	-.226	1.179
-.056	.022	.039	-.226	.066	.859

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 13

GU	GD	K	S	X
.161	.277	.147	.108	.203

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 11

GU/GD .781	GU/K .239	GU/S .810	GU/X 1.193
GD/K 1.262	GD/S .918	GD/X 1.715	
K/S .852	K/X .703		
S/X 2.327			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 2 ALL SPEEDS

DEGREES OF FREEDOM 1

1.728	.200	.056	2.613	1.069

TERRAIN 3 SPEED 1

VARIANCE COVARIANCE MATRIX — MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.176	-.049	.222	.025	-.015	1.389
-.049	.337	-.322	-.313	.100	1.058
.222	-.322	.893	-.305	.000	1.946
.025	-.313	-.305	1.672	-.288	.138
-.015	.100	.000	-.288	.061	1.138

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.267	.217	.198	.175	.193

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD .539	GU/K 1.786	GU/S .122	GU/X .375
GD/K 1.914	GD/S 1.212	GD/X 2.532	
K/S .681	K/X .005		
S/X 5.455			

TERRAIN 3 SPEED 2

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.424	.021	.195	-.198	.066	1.260
.021	.100	-.044	-.255	.044	.637
.195	-.044	.406	.232	.015	1.720
-.198	-.255	.232	1.026	-.119	1.928
.066	.044	.015	-.119	.035	.754

KCLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 8

GU	GD	K	S	X
.220	.274	.205	.134	.207

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 6

GU/GD .256	GU/K 1.304	GU/S .771	GU/X 1.561
GD/K .550	GD/S 3.238	GD/X 2.745	
K/S .945	K/X .310		
S/X 1.969			

CUMULATIVE RESULTS TERRAIN 3

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.278	-.001	.204	-.135	.035	1.328
-.001	.259	-.155	-.467	.112	.860
.204	-.155	.637	-.158	.030	1.840
-.135	-.467	-.158	2.133	-.378	.981
.035	.112	.030	-.378	.085	.958

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 17

GU	GD	K	S	X
.152	.172	.185	.104	.205

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 15

GU/GD .009	GU/K 2.144	GU/S .691	GU/X .894
GD/K 1.598	GD/S 3.130	GD/X 4.432	
K/S .528	K/X .498		
S/X 7.454			

EARTLETTS TEST STATISTIC FOR EQUALITY
CF VARIANCES
TERRAIN 3 ALL SPEEDS

CEGREES OF FREEDOM 1

1.336	2.387	1.042	.409	.517

TERRAIN 4 SPEED 1

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.208	.099	.024	-.163	.003	1.442
.099	.274	-.233	.452	.002	1.223
.024	-.233	.653	-.961	.039	1.542
-.163	.452	-.961	2.375	-.023	-.051
.003	.002	.039	-.023	.009	1.225

KCLMCGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 12

GU	GD	K	S	X
.170	.139	.391	.287	.233

T TEST FOR SIGNIFICANCE OF
CORRELATION
CEGREES OF FREEDOM 10

GU/GD 1.437	GU/K .211	GU/S .755	GU/X .231
GD/K 2.096	GD/S 2.141	GD/X .107	
K/S 3.835	K/X 1.919		
S/X .505			

TERRAIN 4 SPEED 2

VARIANCE COVARIANCE MATRIX					MEAN VECTOR
GU	GD	K	S	X	
.056	-.048	.014	.219	-.058	.463
-.048	.302	-.102	-.110	.073	.867
.014	-.102	.294	-.023	.011	.781
.219	-.110	-.023	3.898	-.554	.866
-.058	.073	.011	-.554	.108	.769

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 9

GU	GD	K	S	X
.351	.286	.263	.221	.217

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 7

GU/GD 1.056	GU/K .288	GU/S 1.406	GU/X 2.949
GD/K .963	GD/S .269	GD/X 1.173	
K/S .058	K/X .162		
S/X 4.368			

CUMULATIVE RESULTS TERRAIN 4

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.383	.125	.210	-.233	.093	1.022
.125	.304	-.099	.120	.072	1.070
.210	-.099	.625	-.717	.115	1.215
-.233	.120	-.717	3.082	-.342	.342
.093	.072	.115	-.342	.101	1.029

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 21

GU	GD	K	S	X
.195	.109	.292	.134	.276

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 19

GU/GD 1.710	GU/K 2.077	GU/S .956	GU/X 2.344
GD/K 1.020	GD/S .546	GD/X 1.959	
K/S 2.630	K/X 2.244		
S/X 3.367			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
TERRAIN 4 ALL SPEEDS

DEGREES OF FREEDOM 1

3.313	.022	1.308	.548	12.402

CUMULATIVE RESULTS ALL SAMPLES

VARIANCE COVARIANCE MATRIX

GU	GD	K	S	X	MEAN VECTOR
.333	.006	.160	-.061	.023	1.222
.006	.231	-.093	-.161	.074	.778
.160	-.093	.698	-.381	.080	1.535
-.061	-.161	-.381	2.466	-.323	.761
.023	.074	.080	-.323	.087	.938

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 69

GU	GD	K	S	X
.139	.188	.144	.062	.189

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 67

GU/GD .164	GU/K 2.885	GU/S .553	GU/X 1.139
GD/K 1.957	GD/S 1.787	GD/X 4.994	
K/S 2.486	K/X 2.828		
S/X 7.975			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN ALL SAMPLES

DEGREES OF FREEDOM 7

GU	GD	K	S	X
19.227	18.031	7.968	7.469	14.162

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN INDIVIDUAL TERRAINS

DEGREES OF FREEDOM 3

GU	GD	K	S	X
1.382	19.259	.927	.824	.689

CUMULATIVE RESULTS SPEED 1 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.145	.022	.060	-.037	-.013	1.411
.022	.297	-.146	.046	.060	.923
.060	-.146	.608	-.551	.044	1.669
-.037	.046	-.551	2.064	-.131	-.012
-.013	.060	.044	-.131	.046	1.137

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE 33

GU	GD	K	S	X
.208	.134	.222	.107	.233

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 31

GU/GD .588	GU/K 1.147	GU/S .382	GU/X .904
GD/K 2.032	GD/S .330	GD/X 3.355	
K/S 3.149	K/X 1.518		
S/X 2.629			

CUMULATIVE RESULTS SPEED 2 ALL TERRAINS

VARIANCE COVARIANCE MATRIX / MEAN VECTOR

GU	GD	K	S	X	MEAN VECTOR
.449	-.059	.211	.180	-.011	1.049
-.059	.140	-.083	-.153	.036	.645
.211	-.083	.768	-.049	.068	1.413
.180	-.153	-.049	1.822	-.230	1.470
-.011	.036	.068	-.230	.056	.755

KOLMOGOROF-SMIRNOV
TEST STATISTIC
SAMPLE SIZE ' 36

GU	GD	K	S	X
.172	.247	.140	.154	.226

T TEST FOR SIGNIFICANCE OF
CORRELATION
DEGREES OF FREEDOM 34

GU/GD 1.399	GU/K 2.242	GU/S 1.181	GU/X .393
GD/K 1.533	GD/S 1.852	GD/X 2.650	
K/S .244	K/X 2.037		
S/X 6.076			

BARTLETTS TEST STATISTIC FOR EQUALITY
OF VARIANCES
BETWEEN SPEEDS

DEGREES OF FREEDOM 1

GU	GD	K	S	X
9.906	4.595	.449	.128	.326

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The problem of deriving an analytic expression which would relate low flying aircraft trajectories to terrain cross-section has not been solved. A computer simulation has been devised which generates synthetic flight paths which are coupled to a terrain input and are dependent on the values of five input parameters. Simulations have been generated which best match a series of actual test flights. The input parameters which generated the best fit to actual flights are examined to determine their statistical properties. Tests of hypotheses are conducted to determine goodness of fit and equality of means and variances among parameter sets related to specific terrains and speeds. A sampling procedure is suggested whereby a random series of flights might be generated over an arbitrary terrain cross-section subject to speed restrictions.

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