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On RANKING PROBLEMS IN MULTIVARIATE NORMAL (STATISTICAL) POPULATIONS

For the period 1 July 1966 - 31 December 1966

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Progress Report of NASA Grant No. SC-NG36-008-040
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Subject: Selection from Multivariate Normal Populations
Supervisor: Dr. M. Haseeb Rizvi, Dept. of Mathematics

The major problem posed in the proposal has been solved by the Principal Investigator (Supervisor) and a co-author. These results are reported in the enclosed preprint of the paper entitled "Selection from Multivariate Normal Populations", accepted for publication in 1967 in the Annals of Statistical Mathematics, Tokyo. Five copies of the preprint and a copy of the letter of the Editor of the Annals concerning acceptance of the article are enclosed. Some interesting differential difference equations involving noncentral chi-square (noncentral F) distribution and density functions were obtained for solving the minimization problem in the above mentioned paper. These equations deserve attention in their own right and can be of great use in problems of obtaining extrema of functions involving noncentral chi-square (noncentral F) distribution and density functions. Consequently, the principal investigator and his co-author have written a classroom note entitled "On noncentral chi-square and noncentral F distributions" and have submitted it for publication. Five copies of the preprint of this note are also enclosed.

The work on numerical computations for making suitable tables to be used in conjunction with the above paper is in progress. The quadrature techniques for the evaluation of the ranking integral involving noncentral chi-square (non-central F) distribution and density functions are being studied.

The principal investigator is investigating some problems of ranking and selection after dropping the assumption of normality or of any other specific distribution form. This relaxation increases the applicability of the selection procedures to a wider range of problems but, simultaneously, requires use of some other techniques for solution. The

selection procedures required for these problems are nonparametric. The principal investigator has obtained some preliminary results for the nonparametric selection procedures for the problem of comparison of several univariate distributions (with unknown forms of distributions) with a control; these results were presented by the principal investigator at the International Congress of Mathematicians held at Moscow, U.S.S.R. during August 16-26, 1966. The principal investigator is presently engaged in the study of the optimal characteristics and the asymptotic relative efficiencies of these procedures. There are several problems of great value in this phase of investigation, for example, the multivariate analogues of the univariate nonparametric selection procedures. Any coherent development of the theory for univariate and multivariate nonparametric selection procedures would require more time and efforts. Consequently, a request for renewal and extension of the present grant is being submitted separately to the National Aeronautical and Space Administration.