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FINAL REPORT FOR CONTRACT N00014-75-C-0451(U) CLEMSON
UNIV SC DEPT OF MATHEMATICAL SCIENCES K T WALLENTUS
16 APR 86 N00014-75-C-0451

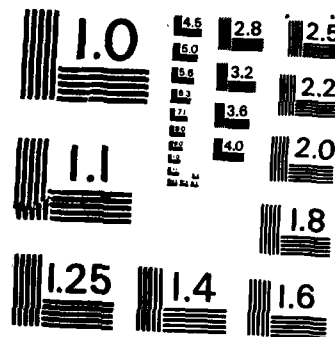
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This Final Report lists project personnel, catalogues 158 Technical Reports by Number, title, and author and cites bibliographic reference for the 71 reports which have been published in professional literature during the course of the contract. <i>Keywords: mathematical sciences, naval research</i>		

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Enclosure (1): Project Personnel

1. Participants. As can be seen from the list of authors in Enclosure (2), many research associates and assistants have contributed significantly over the course of the project. Colleagues who have contributed and received support include: K. Alam, J. V. Brawley, P. T. Holmes, A. Lemoine, R. F. Ling, D. L. Minh, F. Morgan, C. B. Russell, K. M. Lal Saxena, and N. K. Womer. Of particular importance are the many valuable contributions of K. Alam and R. F. Ling. Numerous research assistants played important roles in providing computational support.

2. Honors Awards, and Other Recognition Accorded Project Personnel:

K. T. Wallenius, Project Director

- ASA Fellow 1977
- Sigma Xi "Outstanding Research Scientist" 1980 (First annual award of Clemson Chapter of Sigma Xi)

R. F. Ling

- ASA Fellow 1984
- Frank Wilcoxon Prize for the Best Practical Applications Paper in Technometrics, 1984 (With coauthor Brian Gray who was supported under the contract as a research assistant to Dr. Ling.)

Accession For	
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Enclosure (2): Technical Reports

The technical reports and working papers listed below resulted from research either fully or partially supported by the contract during the period it was in effect. (A number in parenthesis following the report title refers to an internal indexing system covering all reports of the Department of Mathematical Sciences at Clemson University. Reports marked with an * are working papers and not given general distribution.)

Technical Reports Completed

<u>Report</u>	<u>Title</u>	<u>Author</u>
N1	Confidence Region for the Parameters of the Multinomial Distribution (42)	Kursheed Alam
N2	A Problem of Ranking and Estimation with Poisson Process (43)	Kursheed Alam James R. Thompson
N3	A Note on the Asyptotic Distribution of the Inter-Record Times (57)	Kursheed Alam
N4	Decision Theory for Averaged Risk	David Albert Ott
N5	Unimodality of the Distribution of the Order Statistic (63)	Khursheed Alam
N6*	On Statistical Methods in Contract Negotiation	Capt. F. Bellar, Jr. USN K. T. Wallenius
N7	Confidence Interval for the Largest Parameter (65)	Khursheed Alam
N8	Quasi-Stationary Distributions for Absorbing Continuous-Time Denumerable Markov Chains (67)	David C. Flaspohler

N9	Additional Quasi-Stationary Distributions for Semi-Markov Processes (69)	David C. Flaspohler Paul T. Holmes
N10	On a Multiple Decision Rule (71)	Khursheed Alam
N11	Estimation of a Location Parameter (72)	Khursheed Alam
N12	On Poisson Counts (91)	Paul T. Holmes David C. Flashpohler
N13	Asymptotic Value of the Means of a Function of a Normal Random Variable (73)	Khursheed Alam
N14	Sample Size Considerations in Estimating Population Percentiles	K. T. Wallenius
N15	On the Distribution of a Product of Two Random Variables (76)	Khursheed Alam
N16	A Random Walk (86)	Khursheed Alam
N17	Identity Maintenance Tracking: The n-Body, 1-Step Problem (90)	Khursheed Alam K. T. Wallenius
N18	A Nonparametric Test for Trend Alternatives (85)	Khursheed Alam
N19	On Statistical Methods in Contract Negotiations (Part I: Revised)	Capt. F. Bellar, Jr. USN K. T. Wallenius
N20	A Note on the Generalized Variance (84)	Khursheed Alam
N21	On Statistical Methods in Contract Negotiations (Part II)	K. T. Wallenius
N22	Peak Rate of Occurrence of a Poisson Process (101)	Khursheed Alam
N23	Another Characterization of the Poisson Process (101)	Paul T. Holmes
N24	Bounds on Error Probabilities in Nonparametric Location Estimation (105)	Khursheed Alam W. R. Boland

N25	Tables of Shortest Span Nonparametric Confidence Intervals for Population Percentiles	K. T. Wallenius
N26	A Note on the x^2 Distribution	Khursheed Alam
N27*	Formula Pricing of Replenishment Spares	K. T. Wallenius
N28	A Note on the Covariance of the Order Statistics (112)	Khursheed Alam
N29	Parameter Estimation in Ocean Current Models	K. A. Hall K. T. Wallenius
N30	Bounds on a Multivariate Normal Integral (114)	Khursheed Alam
N31	A Semi-Markov Model for the Particle in Motion on the Line	Paul T. Holmes D. Turner
N32	Estimation of Variance Components in a Linear Model Based on a Wiener Process (125)	Khursheed Alam
N33	A Class of Nonparametric Statistics Based on Sequential Ranks (126)	Khursheed Alam
N34	The Generalized Variance as a Measure of Dispersion (128)	Khursheed Alam
N35	Selection of a Multiple Correlation Coefficients (137)	Khursheed Alam
N36	Scalar Polynomial Function on the $n \times n$ Matrices Over a Finite Field (140)	J. Brawley L. Carlitz Jack Levine
N37	Vigenere Systems Over a Finite Field (140)	J. Brawley Jack Levine
N38	Power Sums of Matrices Over A Finite Field, I (141)	J. Brawley L. Carlitz Jack Levine

N39	Minimax estimators of the Mean of a Multivariate Normal Distribution (142)	Khursheed Alam
N40	Power Sums of Matrices Over a Finite Field, II (143)	J. Brawley L. Carlitz Jack Levine
N41	Admissible Minimax Estimators of the Mean of a Multivariate Normal Distribution for Unknown Covariance Matrix (144)	Khursheed Alam
N42	Translation and Scale Multiplication of the Normal Probability Integral (146)	Khursheed Alam D. Russell
N43	Ambushing Random Walks, I. Finite Models (151)	W. Ruckle R. Fennell C. Fennemore P. T. Holmes
N44	On Record and Inter-Record Times for a Sequence of Random Variables Defined on a Markov Chain (154)	G. Guthrie P. T. Holmes
N45	On Statistical Methods in Contract Negotiation, Part III	K. T. Wallenius
N46	A Model for a Particle in Motion on the Line (162)	P. T. Holmes D. Turner
N47	An Inequality Similar to Schwartz's Inequality	Khursheed Alam
N48	Comparison of Several Algorithms for Computing Sample Means and Variances (161)	R. Ling
N49	A Monotonicity Property of the Multivariate Normal Distribution (164)	Khursheed Alam
N50	Some Results on Matrix Algebra (165)	Khursheed Alam
N51	Consistency of a Least Squares Solution (166)	Khursheed Alam Kenzo Seo
N52	An Exact Probability Distribution of the Connectivity of Random Graphs (169)	R. Ling

N53	Least Squares Computation, Ill-Condition, and Sweep (176)	R. Ling
N54	Probability Tables for Cluster Analysis Based on a Theory of Random Graphs (183)	R. Ling G. Killough
N55	Monotonicity Property of a Conditional Distribution (184)	Khursheed Alam
N56	A Bayesian Approach to a Nonparametric Problem of Selecting the Population with the Largest p-Quantile (190)	Khursheed Alam
N57	The Estimation of Selected Parameters in a Non-Homogeneous Poisson Process	P. T. Holmes D. Huffman
N58	Finite 2 Person Evasion/Intercept Games with Applications	W. Ruckle F. Fennell C. Fennemore P. T. Holmes
N59	Estimation of the Peak Rate and Related Parameters in Non-Homogeneous Poisson Process (196)	P. T. Holmes D. Huffman
N60	On the Tail of the Exponential Series and and Some Tauberian Results (198)	Khursheed Alam
N61*	On the Method of Proportional Variation (Point Paper Prepared for Nailsc [Not Distributed])	K. T. Wallenius
N62	Estimation of Multinomial Cell Probabilities (193)	Khursheed Alam
N63	On Random Walks and Stable GI/G/1 Queues (197)	A. Lemoine
N64	On the Simulation of Some Stable Stochastic Systems (199)	A. Lemoine A. Mitra F. Newruck
N65	A Sample of Results From Simulating Some Stable Stochastic Systems (200)	A. Lemoine A. Mitra F. Newruck

N66	Measures of Spurious Correlation In Best Subset Selection Regression Problems (210)	Khursheed Alam K. T. Wallenius
N67	Estimation of the Intensity and Mean Value Functions of Non-Homogenous Poisson Processes (195)	P. T. Holmes D. Huffman
N68	On the Distribution of the Max of a Random Walk (211)	Khursheed Alam
N69	Regression Analysis in Parametric Costing and Pricing: Pitfalls, Problems, and Potentials (208)	K. T. Wallenius
N70	Positive Dependence and Monotonicity in Conditional Distributions (207)	Khursheed Alam K. T. Wallenius
N71*	Net Benefits of Inspection Analysis (Point Paper Prepared for NAILSC [Not Distributed])	C. B. Russell
N72	Statistical Sampling in Field Level Pricing Actions: Manual and Computer Programs	K. T. Wallenius
N73	A Class of Multiple Decision Rules (224)	Khursheed Alam K. T. Wallenius
N74	A Bivariate Failure Model (226)	P. T. Holmes T. J. Tosch
N75	On Stein's Estimation (228)	Khursheed Alam James Hawkes
N76	On an Equivalence Between Ridge Type Estimators (231)	R. F. Ling A. Mitra
N77	A Distribution of the Sum of the k Largest Gamma Order Statistics (233)	Khursheed Alam K. T. Wallenius
N78	Statistical Inference in a New Bivariate Failure Model (234)	P. T. Holmes T. J. Tosch

N79	Selection of Largest Multiple Correlation Coefficients	Khursheed Alam M. H. Rizvi H. Solomon
N80	Ridge Estimation in Linear Regression (232)	James Hawkes
N81	Multivariate Stepwise Regression (225)	R. F. Ling
N82	Replacement Policies in a Bivariate Failure Model (238)	T. Tosch P. T. Holmes
N83	A Natural Approach for Detecting Causal Relationships in Times Series	F. W. Morgan M. E. Ireland
N84	Constraints in the Design and Implementation of Interactive Statistical Systems for Minicomputers (251)	R. F. Ling
N85	TSA: Statistical Programs for Interactive Time Series Analysis (268)	K. T. Wallenius
N86	In a Generalization of Freund's Bivariate Failure Model	T. Tosch P. T. Holmes
N87	Component-Wise Minimax Property of Stein's Rule(255)	Khursheed Alam
N88	Distribution of Sample Correlation Coefficients (266)	Khursheed Alam
N89	Approximation of a Completely Monotone Function (270)	Khursheed Alam K. Walker
N90	On the Estimation of Autoregressive Parameters	K. T. Wallenius
N91	A Study of the Accuracy of Approximations for T, X^2 and F Tail Probabilities (246)	R. F. Ling
N92	Ridge Estimation for the Linear Regression Model (240)	Khursheed Alam J. S. Hawkes, III
N93	General Considerations on the Design of an Interactive System for Data Analysis (269)	R. F. Ling

N94	A Monte Carlo Comparison of Some Ridge and Other Biased Estimators (272)	R. F. Ling A. Mitra
N95	A Sequential Procedure for Selecting the Most Probable Multinomial Event (277)	Khursheed Alam J. T. Ramey
N96	Minimax Estimators of a Multivariate Normal Mean (Reprint)	Khursheed Alam
N97	Measurement Error in Regression Analysis (281)	Khursheed Alam A. Mitra
N98	Mahalanobis Distance as a Measure of Analog in Parametric Cost Estimation	K. T. Wallenius
N99	A Property of the Gamma Distribution (285)	Khursheed Alam
N100	A Bayes Sequential Procedure for Selecting the Most Probable Multinomial Event (293)	J. T. Ramey Khursheed Alam
N101	On Sums of Gamma Order Statistics with Application to the Distribution of R^2 in Best Subset Multiple Regression (305)	K. T. Wallenius Khursheed Alam
N102	Estimation of Multinomial Probabilities (294)	Khursheed Alam
N103	Estimation of the Mean of a Normal Distribution with Singular Covariance Matrix (295)	Khursheed Alam
N104	Chi-Square Tests for the Multinomial Distribution (296)	Khursheed Alam
N105	Polarization Tests for the Multinomial Distribution (299)	Khursheed Alam A. Mitra
N106	Analysis of the Single-Server Queue With Uniformly Limited Actual Waiting Times	D. L. Minh
N107	A Note on the Incomplete Beta Function	Khursheed Alam
N108	The GI/G/1 Queue with Uniformly Limited Virtual Waiting Times: The Finite Dam	D. L. Minh

N109	Distribution Free Tolerance Bounds for the Lifetime of an M-out-of-K System of Components	K. M. Lal Saxena
N110	The Initial Busy Cycle of a Discrete Time GI/G/1 in Which the Interarrival Times Are Not Identically Distributed	D. L. Minh
N111	Statistical Methods in Sole Source Contract Negotiation	K. T. Wallenius
N112	Estimation of the Noncentrality Parameter of a Chi-Square Distribution	Khursheed Alam K. M. Lal Saxena
N113	Tukey Smoothers as Preprocessors for AR(1) Parameter Estimation in the Presence of Additive Contamination	C. D. Fiskeaux R. F. Ling
N114	Empirical Model Building and Subsequent Inferences Using the Same Data	K. T. Wallenius
N115	A Monte Carlo Comparison of Some AR(1) Estimators Under Several Performance Criteria	H. S. Hill R. F. Ling
N116	Positive Dependence in Multivariate Distributions	Khursheed Alam K. M. Lal Saxena
N117	An Empirical Model Building Criterion Based on Prediction with Applications in Parametric Cost Estimation	A. S. Korkotsides K. T. Wallenius
N118	Component Risk in Multiparameter Estimation	Khursheed Alam A. Mitra
N119	A Goodness of Fit Test Based on Spacings	Khursheed Alam K. M. Lal Saxena
N120	On the Degree of Inflation of Measures of Fit Induced by Empirical Model Building	T. B. Edwards K. T. Wallenius
N121	Parametric Cost Methodology	A. S. Korkotsides K. T. Wallenius
N122	A Cost Function For Military Airframes	N. K. Womer

N123*	Planning for Navy Ship Acquisition: A Critique [Limited Distribution]	N. K. Womer
N124	Some Propositions on Cost Functions	N. K. Womer
N125	A Cost Function for an Airframe Production Program	T. R. Gulledge N. K. Womer
N126	The Accuracy of a Modified Peizer Approximation to the Hypergeometric Distribution	R. F. Ling John Pratt
N127	A Bayes Rule for Selecting the Largest Component (365)	Khursheed Alam
N128	A Bayes Rule for Selecting the Largest Mean (367)	Khursheed Alam
N129	The Basket Method for Selecting Balanced Samples Part I: Theory	K. T. Wallenius
N130	A Bayes Procedure for Selecting the Population with the Largest pth Quantile (368)	Khursheed Alam
N131	Learning and Costs in Airframe Production	N. K. Womer T. R. Gulledge
N132	The Basket Method for Selecting Balanced Samples Part II: Applications to Price Estimation (377)	K. T. Wallenius
N133	Learning and the Cost of Production	N. K. Womer T. R. Gulledge
N134	The Basket Method for Selecting Balanced Samples Part III: Computer Source Programs (374)	K. T. Wallenius S. Benz
N135	Specification and Estimation of Dynamic Cost Functions for Airframe Production Programs	N. K. Womer T. R. Gulledge

N136	A Finite URN Model for Selecting the Population with the Largest α -Quantile (378)	Khursheed Alam H. Rizvi
N137	An Empirical Bayes Estimate of Multinomial Probabilities (381)	Khursheed Alam A. Mitra
N138	K-Clustering as a Detection Tool for Influential Subsets in Regression (394)	Brian Gray R. F. Ling
N139	The Accuracy of Peizer Approximations to the Hypergeometric Distributions (395)	R. F. Ling
N140	Analysis of Grouped Data from the Multinomial Distribution (392)	Khursheed Alam
N141	Cost Realism (400)	R. F. Ling K. T. Wallenius
N142	The Sampling Distribution of Two Measures of Diversity (405)	Khursheed Alam S. Taneja
N143	Bias in the Least Squares Estimation of a First Order Autoregressive Process (409)	Khursheed Alam Walter Walker
N144	The Basket Method of its Role in Design and Model Oriented Approaches to Survey Sampling (408)	R. J. Domangue K. T. Wallenius
N145	Tukey Smoothers as Preprocessors for AR(1) Parameters Estimation in the Presence of Additive Contamination (347)	C. D. Fiskeaux R. F. Ling
N147	On Admissibility Criteria for Cost Realism Scoring Rules (413)	K. T. Wallenius
N148	A Note on the Limiting Behavior of Skewness for the Weibull Distribution (411)	K. T. Wallenius
N149	K-Clustering Techniques for Detecting Influential Subsets in Regression (394)	J. Brian Gray R. F. Ling
N150	The L-R Plot: A Graphical Tool for Assessing Influence (432)	J. Brian Gray

N151	Some Observation on a Subjective Probability Estimation Technique (437)	K. T. Wallenius
N152	On Estimating Parameters of a Noncentral Wishart Distribution (439)	Khursheed Alam
N153	Cost Realism Scoring Rules: The Contractor's Point of View	N. K. Womer
N155	On Some Balancing Algorithms for the Implementation of Robust Sampling Designs (459)	R. J. Domangue K. T. Wallenius
N156	Cost Uncertainty Assessment Methodology: A Critical Overview (491)	K. T. Wallenius
N157	Cost Uncertainty Assessment Methodology: New Initiatives (492)	K. T. Wallenius
N158	Cost Realism in Defense Contracting (503)	K. T. Wallenius N. K. Womer

Enclosure (3): Publication Status

The following list indicates the publication status of technical reports listed in Enclosure (2).

- N2: Technometrics, Vol. 15, pp. 801-8, 1973.
- N5: Annals of Math. Stat., Vol. 23, pp. 2041-44, 1972.
- N7: JASA, Vol. 68, pp. 720-25, 1973.
- N8: Annals of the Institute of Statistical Mathematics, Vol. 26, pp. 351-56, 1974.
- N9: Journal of Applied prob., Vol. 9, pp. 671-76, 1972.
- N10: Annals of Statistics, Vol. 1, pp. 750-55, 1973.
- N13: SIAM J. of Applied Math., Vol. 23, pp. 495-98, 1972.
- N19: Proceedings of the Second DOD Procurement Research Symposium, 1973.
- N22: NRLQ, Vol. 20, pp. 269-75, 1973.
- N23: Sankhya, Series A, Dec. 1974.
- N32: Communications in Statistics, Vol. 3, p. 843-52, 1974.
- N33: JASA, Vol. 69, pp. 738-39, 1974.
- N36: Linear Algebra and Applications, Vol. 10, pp. 199-217, Jan. 1975.
- N37: Cryptologia, Vol. 1, No. 4, 338-61, 1977.
- N38 and N40 combined: Duke Mathematical Journal, Vol. 41, pp. 9-24, 1974.
- N39: Annals of Statistics, Vol. 1, pp. 517-25, 1973.
- N41: Journal of Multivariate Analysis, Vol. 4, No. 1, 1975.
- N44: Advances in Applied Probability, Vol. 7, pp. 195-214, March, 1975.
- N48: JASA, Vol. 69, pp. 859-66, Dec. 1974.
- N50: SIAM J. of Applied Mth., 1975.
- N51: JRSS, Vol. 36, pp. 277-83, 1974.
- N52: Journal of Mathematical Psychology, Vol. 12, No. 1, pp. 90-6, Feb. 1975.
- N54: JASA, Vol. 71, No. 34, pp. 2930-300, June 1976.
- N56: Annals of Math. Stat., pp. 51-8, 1984.
- N58: JORSA, Vol. 24, No. 2, March-April 1976.
- N59: NRLQ, Vol. 31, pp. 335-44, 1984.
- N62: Annals of Statistics, Vol. 7, No. 2, pp. 282,3, March 1979.
- N63: Math. of Op. Res., Vol. 1, No. 2, pp. 159-64, May 1976.

- N68: Stochastic Processes and Their Application, Vol. 7, No. 3, pp. 337-40, Aug. 1978.
- N69: Proceedings of the Fourth DOD Procurement Research Symposium, Oct. 1975.
- N70: Communications in Statistics, A5 (6), pp. 525-34, 1976.
- N73: Communications in Statistics, A6, (11), pp. 1091-1104, 1977.
- N74: JASA, Vol. 75, No. 370, pp. 415-17, June 1980.
- N75: Communications in Statistics, A8 (6), pp. 581-90, 1979.
- N79: Annals of Statistics, Vol. 4, No. 3, pp. 614-20, May 1976.
- N83: Proceedings, Business and Economic Statistics Section, Amer. Statistical Assc., pp. 492-7, 1976.
- N84: Proceedings, Conference on Computer Sciences and Statistics, National Bureau of Standards, pp. 26-34, 1977.
- N86 and N78 combined: JASA, Vol. 75, No. 370, pp. 415-417, June 1980.
- N88: NRLQ, Vol. 26, No. 2, pp. 327-30, June 1979.
- N89: Am. Math. Monthly, Vol. 87, No. 4, pp. 290-92, April 1980.
- N91: JASA, Vol. 73, No. 362, pp. 274-83, June 1978.
- N92: Scand. J. of Statistics, Vol. 5, pp. 169-72, 1978.
- N93: Comm. of ACM, Vol. 23, No. 3, pp. 147-54, March 1980.
- N94: J. of Stat. Comp. and Simulation, Vol. 9, pp. 195-215, 1979.
- N95: Biometrika, Vol. 66, No. 1, pp. 171-3, 1979.
- N96: Scand. J. of Statistics. A9 (7), pp. 171-3, 1979.
- N97: Comm. in Statist. A9 (7), pp. 717-23, 1980.
- N100: Comm. in Statistics, Vol. 4, pp. 125-30, 1977.
- N101: Scand J. of Statistics, Vol. 6, pp. 123-6, 1979.
- N105: JASA, Vol. 76, No. 373, pp. 107-109, March 1981.
- N106: Math. Operationsforsch. Ser. Optimization, Vol. 12, No. 4, pp. 607-21, 1981.
- N108: Advances in Appl. Prob., Vol. 12, pp. 501-16, June 1980.
- N109: Technometrics, Vol. 23, No. 1, pp. 97-103, Feb. 1981.
- N111: Journal of Undergrad. Math. and Applications, Prospectus, pp. 35-47, Dec. 1979 and Journal of Undergrad. Math. and Applications, Vol. 1, No. 2, pp. 113-23, July 1980.
- N112: Annals of Statistics, pp. 1012-16, 1982.
- N113: J. of Stat. Comp. and Simulation, Vol. 15, pp. 315-31.
- N116: Communications in Statistics, A10(12), pp. 1183-1196, 1981.
- N118: (combined with N87): to appear, Annals of Statistical Mathematics.

- N121: Proceedings, I.E.E.E. Annual R & M Symposium, pp. 346-52, January 1981.
- N122: Proceedings of the Ninth Annual DOD/FAI Acquisition Research Symposium, pp. 4.6-4.14, June 1980.
- N124: Southern Economic Journal, pp. 1111-1119, April 1981.
- N126: JASA, Vol. 29, No. 385, pp. 49-60, March 1984.
- N128: Communications in Statis., Vol. 13, pp. 2133-43, 1984.
- N130: Annals of Statistics, pp. 51-8, 1984.
- N136: Commun. Statis. - Theory, Methods, Vol. 12, No. 3, pp. 355-62, 1983.
- N140: JASA, pp. 132-5, 1983.
- N142: Submitted to Communications in Statis.
- N149: Technometrics, Vol. 26, No. 4, Nov. 1984.
- N156: Proceedings, 19th Annual DOD Ast Analysis Symposium, 1985.
- N157: Proceedings, 19th Annual DOD Ast Analysis Symposium, 1985.
- N158: Submitted to Decision Sciences.

END

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