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THE STRUCTURE OF COMBAT INTELLIGENCE RATINGS

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and

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U. S. Army

Research Institute for the Behavioral and Social Sciences

September, 1978

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Previous research has indicated that ratings of tactical intelligence data on the dimensions of accuracy and reliability are inadequate to convey the analysts' perception of the quality of the data. Forty messages derived from 28th Infantry Division files for the Battle of the Bulge were rated by 55 enlisted intelligence analysts on each of 50 scales, including the current Accuracy/Reliability scales. These ratings were factor-analyzed to determine the underlying judgment structure. Three basic dimensions emerged, tentatively

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labeled Accuracy, Relevance, and Directness. Both the current scales are closely related to the Accuracy dimension. The stability of these three dimensions remains to be evaluated. The implications of this judgment structure for quality ratings of combat intelligence data merit further exploration.

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FOREWORD

One of the primary concerns of the Battlefield Information Systems Technical Area of the Army Research Institute for the Behavioral and Social Sciences (ARI) is with intelligence systems--improved tactical intelligence information processing to aid command decisions. The effective integration and utilization of fragments of intelligence data from many sources requires that the intelligence analyst evaluate the quality of available data appropriately and communicate the evaluation accurately to others. The research reported in the present Technical Paper investigated analysts' use of a variety of rating scales, including the standard 6-point Reliability and Accuracy scales, and explored the basic judgmental dimensions on which analysts appeared to evaluate the quality of data. Previous work has been reported in ARI Technical Paper 260, "Subjective Interpretation of Reliability and Accuracy Scales for Evaluating Military Intelligence," and ARI Research Memorandum 74-14, "An Inductive Taxonomy of Combat Intelligence Data."

Research in this area is conducted as an in-house effort augmented by conracts with organizations selected for their unique capabilities and facilities for research in intelligence systems. The present research was conducted jointly by personnel of ARI and Syracuse University Research Corporation, Syracuse, New York, under contract DAHC 19-73-C-0018. Work was done in response to requirements of Army Project 20062101A754,"Intelligence Information Processing," with the cooperation of the U. S. Army Intelligence Center and School, Fort Huachuca, AZ.

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THE STRUCTURE OF COMBAT INTELLIGENCE RATINGS

BRIEF

Requirement:

To explore and establish the concepts that underlie an intelligence analyst's judgments of intelligence information quality, and to develop rating scales that permit accurate and uniformly understandable ratings of information quality.

Combat intelligence is seldom derived in a simple, straightforward manner from information available to an intelligence staff; it must be produced through careful analysis of many fragmentary and frequently contradictory pieces of data. An indispensable aid for such analysis is a knowledge of the quality of the data. Either the source of the data, or someone close to the source, must evaluate the data to enable the analyst to focus on the implications of high quality data and discount low quality data. The evaluation of the quality of intelligence data is currently reported on two 6-point scales: a source reliability scale and an information accuracy scale, as defined in Field Manual 30-5, "Combat Intelligence." Evidence suggests that these scales are not an effective vehicle for assignment or communication of quality ratings. As a consequence, the ratings are frequently misused or omitted, and information of potential value to the analyst-a realistic rating of information quality be someone close to the data source-has been lost.

Procedure:

Two groups of Army Intelligence personnel evaluated a set of intelligence reports, using 50 different ratings scales that included the current 6-point Reliability and Accuracy scales. One group of 21 enlisted personnel had just completed the U. S. Army Intelligence School course for intelligence analysts (96B), and the other group of 34 enlisted personnel were just starting the same course. Most of the reports were from the files of the 28th Infantry Division for 10-15 December 1944 before the German Ardennes counteroffensive began 16 December 1944. Participants' responses were analyzed to determine the characteristics of the judgments made in evaluating the reports and the relationships among the scales, and to derive a taxonomy of reports based on the rating scale interrelations.

Findings:

Analysts did not successfully discriminate between information Accuracy and information Reliability; both ratings are used to represent some idea of Accuracy. Furthermore, this underlying concept of information Accuracy may be better represented by the 0-100 scale of Global Validity than by either of the two standard scales.

Analysis of the participants' ratings shows three basic factors or dimensions in the psychological space which determined the way these intelligence messages were evaluated; that is, the analysts (both trained and untrained) judged each message on three independent factors. The primary factor deals with the ACCURACY or truthfulness of the message. In evaluating this aspect of message quality, the analysts made use of the standard Accuracy and Reliability scales, the Global validity scales, and bipolar scales such as True/False, Probable/Improbable, and Acceptable/Unacceptable. The ratings which defined the second factor suggest that the analysts held a concept of information RELEVANCE or importance. In evaluating this aspect of message quality, they used bipolar scales such as Heavy/Light, Many/Few, Large-scale/Small-scale, and Risky/Routine. The third factor in message quality was tentatively identified as DIRECTNESS; here the analysts used bipolar scales such as Interpreted/Uninterpreted, Implied/Unimplied, and Understandable/Confusing.

Utilization of Findings:

The findings can be used to guide the development of scales which will more explicitly communicate analyst's evaluation of the quality of intelligence. Several modifications in procedures are suggested by the obtained Accuracy/Relevance/Directness structure of ratings. In particular, unambiguous scales to evaluate these aspects of information quality may be developed to replace the current 6-point scales of Accuracy and Reliability. The present findings and the usefulness of any new scales should be validated with a sample of more experienced intelligence personnel and with a different scenario.

THE STRUCTURE OF COMBAT INTELLIGENCE RATINGS

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THE STRUCTURE OF COMBAT INTELLIGENCE RATINGS

INTRODUCTION

Improvements in the technology and techniques of intelligence data collection have imposed additional burdens on both the intelligence analysts and the decisionmaker. Analysts must deal with the increased volume of information. The decisionmaker is increasingly remote from raw unprocessed information and therefore is forced to rely on others for evaluating the quality of data. To assist users of intelligence data in discriminating the valuable from the worthless, a system for evaluating the quality of intelligence data was developed during World War II.

The system, described in DA Field Manual 30-5, Combat Intelligence, requires an examination of incoming information for pertinence and timeliness and provides for explicit ratings of source reliability and information accuracy.

Considerable anecdotal evidence and some experimental evidence show these procedures as inadequate. Present research examines the underlying conceptual structure characterizing analysts' ratings of tactical intelligence data. The research also examines the role of the current Reliability and Accuracy ratings. An alternative approach to rating the quality of intelligence data is suggested.

Current Ratings of Information Quality

Upon receipt of an intelligence report, the analyst must first determine whether the information contained in the message or report is pertinent to his unit, and whether it is timely or has been overtaken by events. The analyst must also evaluate the reputation of the source or reporting agency for submitting factual reports (reliability) as well as the factual nature (accuracy) of the data being processed.

Evaluations of pertinence and timeliness presumably are reflected in the analyst's decision to continue an examination of the data. Accuracy and reliability evaluations result in explicit judgments on two standard rating scales. These ratings are attached to the data; other users of the data determine the quality and usefulness of the data, at least in part, on the basis of these ratings.

Reliability is judged on the basis of a 6-letter system and Accuracy is judged on the basis of a 6-number system, as follows:

Reliability of Source and/or Agency	Accuracy of Information
A = Completely reliable	1 = Confirmed by other sources
B = Usually reliable	2 = Probably true
C = Fairly reliable	3 = Possibly true
D = Not usually reliable	4 = Doubtfully true
E = Unreliable	5 = Improbable
F = Reliability cannot be judged	6 = Truth cannot be judged

There are several problems with the present system of evaluation. Analysts seldom agree on the precise meaning of the descriptive words and terms. Possibly because of the confusion, ratings are frequently omitted (Baker, McKendry, and Mace, 1968).*

In addition, although analysts are specifically instructed to rate reliability and accuracy as separate items, individual analysts consistently use either reliability or accuracy as the basic criterion of message quality and correlate the other ratings with it (Meeland and Rhyne, 1967; Samet, 1975).**

As a result, ratings tend to be A-1, B-2, C-3, etc. Furthermore, most analysts use the Accuracy scale as their basic criterion and may tend to inflate their ratings or not report items of low accuracy/reliability. Nearly three-fourths of all reports are rated B-2 (Baker et al., 1968; Samet, 1975).

Research Approach

The approach taken to uncover the psychological bases for quality judgments was to ask a number of trained and untrained intelligence analysts to make many ratings of quality of each of 40 intelligence messages. These ratings were examined for patterns that would

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*Baker, J. D., McKendry, J. M. and Mace, D. J. Certitude Judgments in an Operational Environment. ARI Technical Research Note 200. November 1968. (AD 681 232)

**Meeland, T., and Rhyne, R. F. A Confidence Scale for Intelligence Reports: An Application of Magnitude Estimation Scaling. Menlo Park, Calif.: Stanford Research Institute Technical Note 4923-31. June 1967.

Samet, M. G. Subjective Interpretation of Reliability and Accuracy Scales for Evaluating Military Intelligence. ARI Technical Paper 260. January 1975. (AD A003 260)

indicate the underlying criteria being used by the analysts. An initial conceptual analysis of the information evaluation task identified six types of judgments that might be made: These judgments concerned (1) data source, (2) message content, (3) situation, (4) action reported considering the overall tactical situation, (5) inferences drawn from the data, and (6) characteristics of the message itself. Forty-six bipolar scales (e.g., Direct/Indirect; Widespread/Local; Garbled/Clear) were generated to represent these general concepts; these 46 scales, the standard Reliability and Accuracy scales, and two 0-100 "Global validity" scales were used by the analysts to evaluate the 40 messages.

The message set consisted of 33 messages from the files of the 28th Infantry Division for the period 10-15 December 1944 (just before the German Ardennes Counteroffensive of 16 December 1944) and an additional 7 fictitious and misleading messages generated for the experiment. The raters were 21 "trained" enlisted personnel who had just completed the U.S. Army Intelligence Center and School (USAICS) course for intelligence analysts (96B) and 34 "untrained" enlisted personnel who were just entering the same course. Most of the participating personnel had had little Army experience beyond Basic Training and, in the case of the trained group, the USAICS course.

Objectives of the Present Research

The present experiment sought (1) to establish the underlying conceptual structure which determines the way analysts evaluate the quality of intelligence data, (2) to examine the relationship of current Reliability/Accuracy ratings to the dimensions of the underlying conceptual structure, and (3) to examine the utility of the conceptual structure used to organize intelligence data. The question of the amount and type of information needed to make an accurate assessment of the quality of intelligence data was not addressed.

METHOD

The approach is based in techniques and procedures of numerical taxonomy (Sneath and Sokal, 1973)*, which have been used widely in biological analysis to identify natural grouping of species empirically. Here, these techniques identify natural groupings or families of messages and determine the characteristics considered important by observers in evaluating the messages.

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*Sneath, P. H., and Sokal, R. R. Numerical Taxonomy. San Francisco; W. H. Freeman & Co., 1973.

The intelligence analyst's task was subdivided into basic judgments about the:

(1) reliability of the data source (or agency);

(2) accuracy of the information;

(3) situation (its stability, and the magnitude of the action or size of forces involved);

(4) action reported (feasibility of the action, and risks for the rater's unit inherent in such action);

(5) inferences to be drawn ultimately from the information (the value or utility of the information, and the nature of the inferences which can be attributed to it); and

(6) characteristics of the message itself (clarity, timeliness, comprehensiveness).

Taken together, the aspects of incoming information define an a priori conceptual framework that describes the data supplied to analysts. These aspects also suggested specific bipolar measurement scales or features, shown in Table 1.

The discriminatory power of the taxonomic characteristics, their mutual independence, and their adequacy in representing the judgmental process is, of course, subject to empirical test. These scale dimensions do not exhaust the ways in which intelligence information might be evaluated.

However, the aspects of intelligence evaluation chosen for measurement were judged to be sufficiently extensive to enable participants to make a comprehensive evaluation of a selected set of tactical messages while keeping the rating task within reasonable and practicable bounds.

The 46 characteristics or qualities shown in Table 1 represent judgments that depend on an interpretation of the content of the messages. As such, they cannot be considered strictly as characteristics of the stimulus. Instead, they represent in abstract terms the manner in which the analysts make their judgments of message content.

Thus, the rating scales serve as the operational definition of the conceptual framework of the structure of intelligence messages; the empirical analyses serve to test this framework and thereby provide a more precise understanding of an analyst's message ratings.

Table 1. Judgmental Aspects of Intelligence Analysis

Basis for Judgment	Elements of Judgment	Qualities Rated by Bipolar Scales
Source/Agency	Reliability	Reliable-Variable Dependable-Undependable Truthful-Deceptive Acceptable-Unacceptable Faultless-Faulty
Information	Accuracy	Accurate-Erroneous True-False Confirmed-Unconfirmed Consistent-Inconsistent Substantiated-Contradicted
Situation	Stability	Stable-Unstable Constant-Changing Precarious-Imprecarious Inert-Volatile Active-Inactive
	Magnitude	Large Scale-Small Scale Widespread-Local Massive-Insignificant Many-Few Heavy-Light
Action	Feasibility	Feasible-Infeasible Possible-Impossible Probable-Improbable Likely-Unlikely Expected-Unexpected
	Risk	Routine-Risky Ordinary-Extraordinary Safe-Dangerous Secure-Insecure Unhazardous-Hazardous
Inference	Utility	Useful-Useless Relevant-Irrelevant Pertinent-Extraneous Analyzable-Unanalyzable Appropriate-Inappropriate
	Attribution	Observed-Inferred Unimplied-Implied Uninterpreted-Interpreted Factual-Theoretical Direct-Indirect
Report	Comprehension	Specific-Vague Clear-Garbled Intelligible-Unintelligible Understandable-Confusing
	Timeliness	Timely-Untimely
	Comprehensiveness	Fragmented-Complete

Model for Data Collection

Ordinarily, in biology or linguistic semantics, the presence or absence of a particular trait or characteristic is tabulated in a matrix which takes the form of Figure 1 where the F_i represents groupings of characteristics, f_j, and each datum is described by a pattern of f_j occurrences, +, or absences, -.

DATA ELEMENTS

		1	2	3	4	5
F_1	f_1	+	-	+	-	-
	f_2	-	+	+	+	-
F_2	f_3	-	+	+	-	+
	f_4	+	-	+	+	+

Figure 1. Two-dimensional Taxonomic Data Matrix

In order to provide for greater refinement of measurement, the bipolar qualities have been scaled in seven steps indicating degrees of intensity. Thus, the feature matrix becomes three-dimensional (Figure 2).

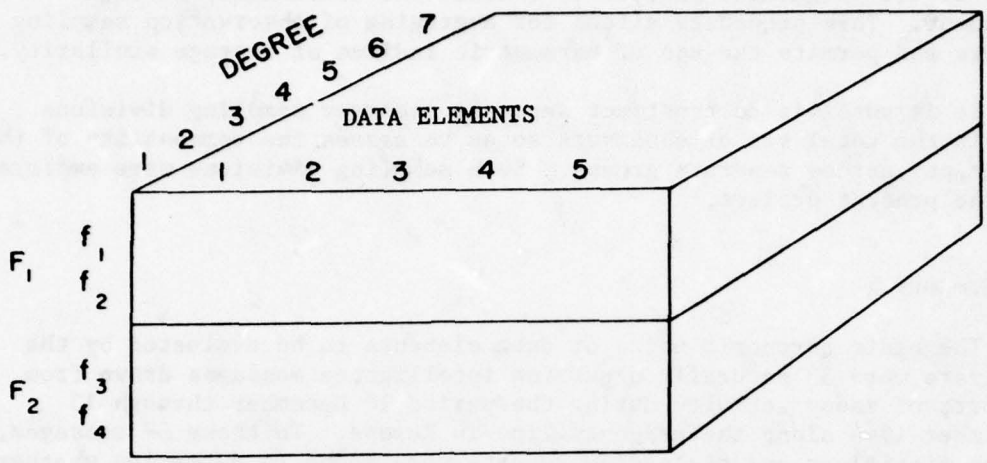

Figure 2. Three-dimensional Taxonomic Data Matrix

If we now add multiple observers as judges of each feature of each datum, the matrix becomes four-dimensional. Collapsing the structure over degrees of intensity (d_i) of quality scales, for the purpose of illustration, produces the taxonomic data matrix shown in Figure 3 where $1 \leq d_i \leq 7$ represents the scalar degree of each set of bipolar qualities for each datum (message).

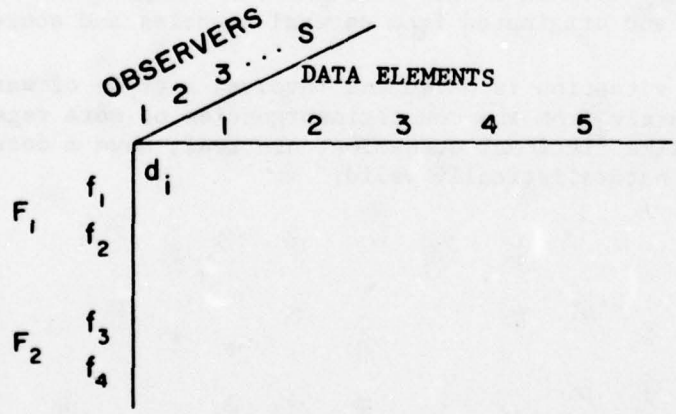

Figure 3. Four-dimensional Taxonomic Data Matrix

The use of multiple observers in this model represents the repetition of the judgmental process to enhance the reliability of each judgment. This procedure allows for averaging of observation sampling errors and permits the use of parametric indices of message similarity.

It is possible to construct separate observer sampling divisions within the total set of observers so as to assess the commonality of the judgments across separate groups. Such sampling divisions were employed in the present project.

Data Elements

The basic taxonomic units or data elements to be evaluated by the analysts were 33 naturally occurring intelligence messages drawn from reports of enemy activity during the period 10 December through 15 December 1944 along the Ardennes line in Europe. To these 33 messages, seven fictitious and misleading reports were added to determine whether analysts would detect them. Thus, each subject would evaluate 40 messages.

These messages (Appendix A) depicted the buildup of the defending German Army which eventually culminated in an aggressive, large scale counteroffensive and breakthrough of the Allied lines on 16 December, known familiarly as the Battle of the Bulge. After the fact, it is possible to deduce the significance of the intelligence messages.

At the time, however, the strength of the attack by a presumably defeated, demoralized and hard-pressed enemy caught the Allies by surprise. The messages vary from trivial sightings of horse-drawn carts to reports of massive troop movements, POW interrogations, and G2 summaries. They vary in length from short to long, differ in degree of completeness, and originated from several agencies and sources.

Although the situation is dated and involves a style of warfare which differs sharply from the counterinsurgencies of more recent times, the messages, unlike fictional scenarios, are real, have a documented outcome, and are naturalistically valid.

Taxomonic Analysis

A clear definition of the data elements or "operational taxonomic units" of interest and a conceptual framework specifying which characteristics of the data elements should be measured provide the basic elements for a taxonomic analysis. The present analyses focused on the relationships among the characteristics of the messages.

Any consistent patterns in the use of the rating scales across observers and across messages gave clues about the nature of the underlying judgment space. Thus, if observers consistently rated as "probable" and "likely" messages which they had also said were "possible," then one dimension of their perceptual framework was some concept of the likelihood of the event reported.

In a similar fashion, similarities among messages were examined. Some messages were consistently rated as "likely," others as "unlikely," some as "routine," others as "risky." By grouping together messages which received similar ratings, natural families of messages were identified.

The same data were used to examine both the judgment space (the grouping of characteristics) and the report space (the grouping of messages). If our original conceptual framework was valid, then we would expect that the grouping of messages would be maaningful to intelligence analysts.

However, complete validation of the framework would require a revision of the rating scales followed by data collection and examination of the message groupings using the revised scales.

Rating Scales

The subjects rated each of the 40 messages on the 46 quality scales chosen to represent the elements of judgment identified in the concept of the rater's task, as shown in Table 1. In addition, the traditional Reliability and Accuracy rating scales and a Global or overall validity scale were included in the rating task.

This latter scale, suggested by Samet (1975), was used twice, at the beginning and end of the rating task for each message. Figure 4 shows the scales as presented on the subjects' response form; the second Global rating was on the reverse side of the form.

1.	ACTIVE	___:___:___:___:___:___:___	INACTIVE
2.	FALSE	___:___:___:___:___:___:___	TRUE
3.	UNTIMELY	___:___:___:___:___:___:___	TIMELY
4.	SPECIFIC	___:___:___:___:___:___:___	VAGUE
5.	PRECARIOUS	___:___:___:___:___:___:___	IMPRECARIOUS
6.	EXTRAORDINARY	___:___:___:___:___:___:___	ORDINARY
7.	INTELLIGIBLE	___:___:___:___:___:___:___	UNINTELLIGIBLE
8.	INFEASIBLE	___:___:___:___:___:___:___	FEASIBLE
9.	FACTUAL	___:___:___:___:___:___:___	THEORETICAL
10.	UNSTABLE	___:___:___:___:___:___:___	STABLE
11.	DIRECT	___:___:___:___:___:___:___	INDIRECT
12.	VARIABLE	___:___:___:___:___:___:___	RELIABLE
13.	UNDERSTANDABLE	___:___:___:___:___:___:___	CONFUSING
14.	LIKELY	___:___:___:___:___:___:___	UNLIKELY
15.	MASSIVE	___:___:___:___:___:___:___	INSIGNIFICANT
16.	CONTRADICTED	___:___:___:___:___:___:___	SUBSTANTIATED
17.	DEPENDABLE	___:___:___:___:___:___:___	UNDEPENDABLE
18.	USELESS	___:___:___:___:___:___:___	USEFUL
19.	INERT	___:___:___:___:___:___:___	VOLATILE
20.	INAPPROPRIATE	___:___:___:___:___:___:___	APPROPRIATE
21.	TRUTHFUL	___:___:___:___:___:___:___	DECEPTIVE
22.	UNHAZARDOUS	___:___:___:___:___:___:___	HAZARDOUS
23.	EXPECTED	___:___:___:___:___:___:___	UNEXPECTED
24.	UNIMPLIED	___:___:___:___:___:___:___	IMPLIED
25.	HEAVY	___:___:___:___:___:___:___	LIGHT
26.	POSSIBLE	___:___:___:___:___:___:___	IMPOSSIBLE
27.	OBSERVED	___:___:___:___:___:___:___	INFERRED
28.	GARBLED	___:___:___:___:___:___:___	CLEAR
29.	FAULTLESS	___:___:___:___:___:___:___	FAULTY
30.	WIDESPREAD	___:___:___:___:___:___:___	LOCAL
31.	ACCURATE	___:___:___:___:___:___:___	ERRONEOUS
32.	UNINTERPRETED	___:___:___:___:___:___:___	INTERPRETED
33.	RELEVANT	___:___:___:___:___:___:___	IRRELEVANT
34.	INSECURE	___:___:___:___:___:___:___	SECURE
35.	ANALYZABLE	___:___:___:___:___:___:___	UNANALYZABLE
36.	RISKY	___:___:___:___:___:___:___	ROUTINE
37.	FRAGMENTED	___:___:___:___:___:___:___	COMPLETED
38.	ACCEPTABLE	___:___:___:___:___:___:___	UNACCEPTABLE
39.	MANY	___:___:___:___:___:___:___	FEW
40.	CONFIRMED	___:___:___:___:___:___:___	UNCONFIRMED
41.	CHANGING	___:___:___:___:___:___:___	CONSTANT
42.	LARGE SCALE	___:___:___:___:___:___:___	SMALL SCALE
43.	IMPROBABLE	___:___:___:___:___:___:___	PROBABLE
44.	EXTRANEOUS	___:___:___:___:___:___:___	PERTINENT
45.	CONSISTENT	___:___:___:___:___:___:___	INCONSISTENT
46.	DANGEROUS	___:___:___:___:___:___:___	SAFE

47. RELIABILITY:

COMPLETELY RELIABLE	USUALLY RELIABLE	FAIRLY RELIABLE	NOT USUALLY RELIABLE	UNRELIABLE	RELIABILITY CANNOT BE JUDGED
A ____	B ____	C ____	D ____	E ____	F ____

48. ACCURACY:

CONFIRMED BY OTHER SOURCES	PROBABLY TRUE	POSSIBLY TRUE	DOUBTFULLY TRUE	IMPROBABLE	TRUTH CANNOT BE JUDGED
1 ____	2 ____	3 ____	4 ____	5 ____	6 ____

GLOBAL 1

49. 0 10 20 30 40 50 60 70 80 90 100

GLOBAL 2

50. 0 10 20 30 40 50 60 70 80 90 100

Figure 4. Rating Scales Used in the Experiment

Subjects

The sample employed in this project consisted of a school-trained group, hereafter referred to as "trained," and one designated as "untrained." Subjects were 59 enlisted personnel assigned to the course for intelligence analysts (96B) at the U.S. Army Intelligence Center and School (USAICS), Fort Huachuca, Arizona.

The untrained group had just enrolled in the school and the school-trained group had just completed the training course. Of the 59 subjects tested, the data from four were discarded on grounds of incompleteness or obvious pattern checking behavior (e.g., rating all messages haphazardly). The final complement of 55 subjects consisted of 34 untrained and 21 trained analysts (Table 2). Both groups had only minimal Army experience.

Test Procedure

Subjects were provided a 1:100,000 map of the area in which the action took place, with troop deployments as of 10 December 1944 overprinted on the map.* An acetate overlay and grease pencil were provided each subject for making notes and changing deployments as each intelligence report was examined.

In addition, the subjects were given a book of instructions on the task, a book of answer forms, and the set of sequentially ordered intelligence reports covering the period from 10 December through 15 December.

Each group was tested in a session of approximately three and one-half hours. Two monitors were present during the sessions to give instructions, answer questions, and check on progress throughout the data collection.

ANALYSIS

Data Reduction

The data comprised 110,000 observations collected from the 55 subjects who rated each of the 40 reports on the 50 scales. The resulting raw data matrix was examined from a number of viewpoints (Figure 5). All data were transferred to punch cards, and the analyses proceeded according to the five steps indicated in the figure.

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*A USAICS Practical Exercise for nonresident instruction is based on the same area. Prepared maps were thus available and provided by the Intelligence School.

Table 2. Characteristics of the Sample
(n = 55)

Characteristics	Trained	Untrained
Total	21	34
Men	16	27
Women	5	7
Grade:		
E1-E5	17	33
E6-E9	4	1
Length of Service:		
1-6 months	13	28
7-12 months	2	3
13-18 months	1	0
19-24 months	0	0
25 + months	5	3
Previous Intelligence training:		
School	0	0
On-the-Job training	0	3

The analyses compared the trained and untrained subjects using data averaged over the separate reports to obtain mean scale ratings for each subject, or averaged over scales to obtain mean report ratings for each subject. Each type of analysis is interpreted in the following sections. Only summary tables of these analyses are presented.*

These analyses were designed to answer the following questions, which are keyed to the analysis steps of Figure 5:

(I) Is the pattern of quality ratings employed by the trained and untrained analysts discriminably different? In what ways, if any, does the school training make a difference in the conceptual framework used?

(II) What is the nature of the conceptual framework underlying the evaluation of intelligence reports? Is there an aggregate structure common to trained and untrained subjects?

(III) What is the nature of the resulting report classification? How were reports grouped by the subjects when the scale qualities are analyzed? Is the report structure meaningful? Does it imply measurement attributes for which there is no current measurement or training?

(IV) What are the determinants of the currently employed Reliability and Accuracy judgments? Are these judgments independent across differing reports and subject groups? Can they be assessed by different and perhaps purer methods?

(V) What is the predictive validity of the Accuracy and Reliability ratings with respect to individual subjects? Is the validity of these scale ratings influenced by subject training? Does the predictability of the ratings differ with respect to subject or report variation.

Discriminant Function Analysis--Subject Groups

The untrained group of students were included in the experiment to provide data which would facilitate by contrast the interpretation of results from the trained group. Given the two groups, their use of the rating scales could be directly compared.

For this analysis, averages of each rating by all subjects were taken over the 40 intelligence reports and examined to determine whether the trained and untrained subjects could be discriminated by a linear discriminant function based on the patterns of their respective uses of the individual rating scales.

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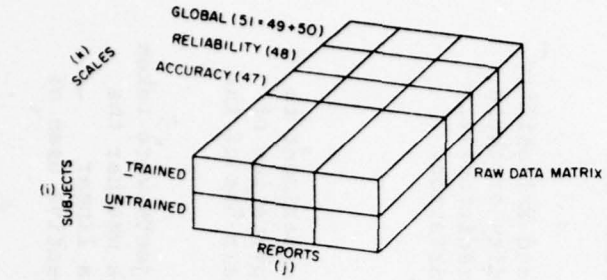
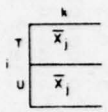
*Full data printouts of each analysis may be examined at ARI.

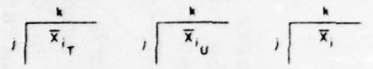


I SUBJECT GROUP DISCRIMINANT FUNCTION ANALYSIS



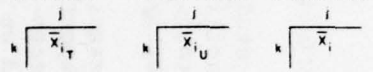
II SCALE STRUCTURES

A. TRAINED B. UNTRAINED C. COMBINED



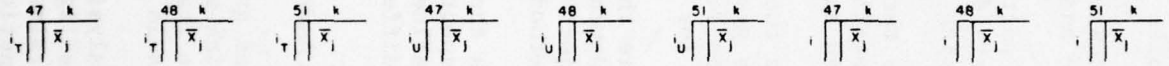
III REPORT STRUCTURES

A. TRAINED B. UNTRAINED C. COMBINED



IV STEP MULTIPLE REGRESSION ANALYSES AND CRITERION BY K ZERO-ORDER CORRELATIONS USING SUBJECTS (i) AS OBSERVATIONS

A.1 TRAINED C = 47 A.2 TRAINED C = 48 A.3 TRAINED C = 51 B.1 UNTRAINED C = 47 B.2 UNTRAINED C = 48 B.3 UNTRAINED C = 51 C.1 COMBINED C = 47 C.2 COMBINED C = 48 C.3 COMBINED C = 51



V STEP MULTIPLE REGRESSION ANALYSES AND CRITERION BY K ZERO-ORDER CORRELATIONS USING REPORTS (j) AS OBSERVATIONS

A.1 TRAINED C = 47 A.2 TRAINED C = 48 A.3 TRAINED C = 51 B.1 UNTRAINED C = 47 B.2 UNTRAINED C = 48 B.3 UNTRAINED C = 51 C.1 COMBINED C = 47 C.2 COMBINED C = 48 C.3 COMBINED C = 51

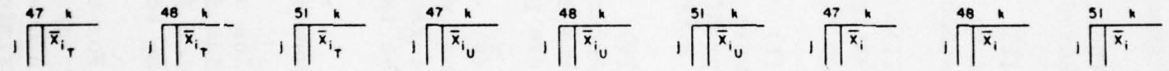


Figure 5. Data Analysis Procedures

On the average, across all reports, if any given individual tended to employ rating scales so as to produce a pattern of ratings like that of other subjects in his designated group and different from that of subjects in the contrasting group, discrimination would be achieved.

The test of discrimination is made on the basis of the a posteriori assignment of the subject to one or the other group on the basis of the calculated regressions. The two groups discriminant case is equivalent in all regards to a multiple regression analysis using a dummy dichotomous variable as the criterion.

Table 3 details the 15 steps required to achieve 100% discrimination between the two groups of subjects. Each step of the discriminant analysis represents the addition of a new rating-scale variable to the linear discriminant or regression equation.

The choice of scale variable at each successive step is made on the basis of the maximum amount of discrimination which can be achieved from the data supplied. Thus, at the first step, the average rating-scale judgments of the two groups for the message quality PRECARIOUS-IMPRECARIOUS provided the greatest amount of discrimination between the two groups.

At this step, 21 of the 34 untrained subjects were correctly classified as members of that group and 18 of the 21 trained subjects were correctly classified as members of the trained group. At step 2, the next scale quality, ANALYZABLE-UNANALYZABLE, discriminatively moved three additional subjects from misclassification as trained subjects to the correct classification of untrained. However, five of the previously correctly classified trained subjects were lost to misclassification as untrained. However, by the time the regression equation contained the 15 rating scales shown in Table 3, all subjects had been correctly classified.

On the basis of these variables, a consistent picture emerged of the difference between these groups. The trained analysts judged the reports with much less alarm and as more routine than did the untrained analysts, at the same time making finer judgments of the form of the report. The trained analyst was better able to analyze the content and import of the reports and make better judgments of threat potential and accuracy. Additionally, there was much wider variation in the average judgments of the accuracy and truthfulness of these reports among the trained subjects, indicating a greater degree of discrimination.

Table 3. Discriminants of Quality Judgments between Trained and Untrained Analysts

Step	Scale Number	Message Quality	Untrained Mean[a]	Untrained SD	Trained Mean[a]	Trained SD	Mean Diff.[b]
1	5	PRECARIOUS-IMPRECARIOUS	3.51	.37	4.05	.29	- .54
2	35	ANALYZABLE-UNANLYZABLE	2.75	.49	2.26	.42	.49
3	48	ACCURACY	2.47	.50	2.70	1.09	- .23
4	36	RISKY-ROUTINE	3.33	.56	3.86	.46	- .53
5	33	RELEVANT-IRRELEVANT	2.87	.49	2.44	.51	.43
6	28	GARBLED-CLEAR	5.30	.45	5.24	.49	.06
7	7	INTELLIGLBLE-UNINTELLIGIBLE	2.77	.39	2.41	.40	.36
8	13	UNDERSTANDABLE-CONFUSING	2.77	.44	2.64	.53	.13
9	25	HEAVY-LIGHT	3.58	.76	3.85	.47	- .27
10	24	UNIMPLIED-IMPLIED	4.48	.29	4.37	.34	.11
11	16	CONTRADICTED-SUBSTANTIATED	4.73	.44	4.65	.48	.08
12	21	TRUTHFUL-DECEPTIVE	3.79	.61	2.65	.83	1.14
13	2	TRUE-FALSE	2.55	.57	2.29	.83	.26
14	32	UNINTERPRETED-INTERPRETED	4.37	.37	4.31	.44	.06
15	11	DIRECT-INDIRECT	2.95	.48	2.93	.46	.02

[a]Lower mean values indicate ratings toward the left-hand side of the bipolar pair; a mean of 4.0 is midway between pair ratings.

[b]Mean difference equals signed difference of untrained mean minus trained mean.

There are implications for training in the differences between groups. The trained and untrained groups were discriminably different in their use of the rating scales, and the pattern of these differences is consistent with that which should result from an effective training course in intelligence analysis. However, as will be seen below, the rating scales that were prominent in the discriminant function were generally not those which are an important part of the subjects' judgment space. These results alone do not provide a sufficient basis either for the evaluation of the 96B training course or for changes in instruction relative to the evaluation of intelligence data. However, the differences noted suggest areas where current training does have an impact. Thus, the trained subjects were much more aware of the significance of messages (or the lack of significance), presumably through their exposure to a number of practical exercises where they had to deal with such messages in the context of tactical situations. However, this awareness may reflect amount of experience more than amount of intelligence training per se. The trained subjects also were different (although not necessarily better) in their use of the standard Accuracy rating.

Factor Structure of the 50 Basic Scales

Average values for ratings by the trained, untrained, and combined groups on each quality scale were obtained for each report. These means factor, on the average, cannot be used to predict the size of its ratings with respect to other factors. These means can be considered to be the best overall assessment of each of the reports with respect to each characteristic. The structure of the patterns of similar scale usage derived from these averages provided an assessment of the implicit conceptual space within which each of the subject groups evaluated the reports, reflecting the resolving power of the analysts and the qualities to which they are responsive. The conceptual structure can be compared to the discrimination and bandwidth capabilities of a special purpose radio receiver. Since the qualities were chosen to span the range of all abstract potential qualities of intelligence reports, the resultant structure can be said to indicate the selective tuning which characterizes the analyst receiver.

Principal components factor analysis was the specific technique used to describe the underlying dimensions in the judgments. Subsequent varimax rotation of the structure used in these analyses had the effect of relocating the factor dimensions in the judgmental space so as to spread the factor variance more evenly across the separate factors. This technique also maximizes the within-factor variance and discards small, specific, or error factors. Each separate dimension must conform to the constraint, after rotation, that it be perpendicular to every other dimension. That is, the resultant factor space represents a cartesian space of independent dimensions. Variation within one factor is independent of variation in every other factor; the judgmental ratings of a variable with respect to one factor, on the average, cannot be used to predict the size of its ratings with respect to other factors.

Table 4 displays the mean values, for the three subject groups, of the 50 qualities used as the variables in these analyses. Scales 1 through 46 vary from 1 through 7, the Reliability and Accuracy ratings (scales 47 and 48) vary between 1 and 6, and the two Global ratings (scales 49 and 50) vary from 0 through 1.00

Untrained Subjects. Table 5 displays the scale factor structure for untrained subjects. The "factor coefficients" listed are the "loadings" of the scales on their respective factors. The absolute values of the loadings reflect the relative importance of the scales as representatives of the underlying judgment dimension being used by the subjects.

All scales have some loading on all factors; listing of scales by factors as in Table 5 involves a somewhat arbitrary cutoff at the point where it appears that any additional scales, because of their relatively low loadings on the factor, would contribute little to an understanding of the underlying judgment dimension represented by the factor.

Some scales are "reflected" to be parallel with other scales on a factor; thus a score of 1 on the False-True scale may be represented as a 7 on the True-False scale, a score of 2 as a 5 on the reflected scale, and so on. This procedure minimizes the number of minus signs, simplifies interpretation, and in no way affects the meaning of the results.

Note that the Global Validity scales have not been reflected; a high number on these scales represents a rating of high Global Validity, while a low number on the traditional Accuracy and Reliability scales represents high Accuracy or Reliability.

The four rotated factors of the structure in Table 5 account for 85% of the total report variance in ratings. Factor I accounts for 54% of the variance, consists of scales representing judgments of accuracy, reliability, and truth, and is labeled ACCURACY.

Factor II accounts for 21% of the variance and involves the threat potential and tactical relevance of reports. Factor II includes aspects of the subjects' evaluations of the reports dealing with the magnitude and import of the developing tactical situation and is labeled RELEVANCE.

Factor II is very similar to factors that have emerged in other research involving quality judgments of action stimuli. Therein, this factor represented a combination of the activity and potency of the stimuli and was labeled Dynamism.

Table 4. Group Means and Standard Deviations of Combined Reports, by Rating Scale
(Page 1 of 2)

Scale	Untrained Mean	Untrained SD	Trained Mean	Trained SD	Combined Mean	Combined SD
1 (Active)	2.84	0.68	2.58	0.67	2.74	0.63
2 (False)	5.45	0.57	5.71	0.83	5.55	0.63
3 (Untimely)	5.09	0.56	5.33	0.50	5.18	0.50
4 (Specific)	3.00	0.55	3.06	0.67	3.02	0.52
5 (Precarious)	3.51	0.37	4.05	0.29	3.72	0.29
6 (Extraordinary)	3.79	0.54	4.35	0.60	4.01	0.52
7 (Intelligible)	2.77	0.39	2.41	0.40	2.63	0.34
8 (Infeasible)	5.21	0.43	5.61	0.61	5.36	0.44
9 (Factual)	2.98	0.46	2.67	0.64	2.86	0.48
10 (Unstable)	4.72	0.50	4.72	0.59	4.72	0.48
11 (Direct)	2.95	0.48	2.93	0.46	2.94	0.43
12 (Variable)	4.67	0.54	5.12	0.88	4.84	0.62
13 (Understandable)	2.77	0.44	2.64	0.53	2.72	0.41
14 (Likely)	2.67	0.48	2.43	0.66	2.58	0.50
15 (Massive)	3.28	0.70	3.23	0.58	3.26	0.62
16 (Contradicted)	4.73	0.44	4.65	0.48	4.70	0.41
17 (Dependable)	2.83	0.65	2.64	0.96	2.76	0.73
18 (Useless)	5.17	0.57	5.53	0.46	5.31	0.48
19 (Inert)	4.08	0.36	4.02	0.33	4.05	0.28
20 (Inappropriate)	5.00	0.44	5.23	0.43	5.09	0.38
21 (Truthful)	3.79	0.61	2.65	0.83	2.74	0.66
22 (Unhazardous)	4.74	0.47	4.48	0.38	4.64	0.39
23 (Expected)	3.91	0.37	3.52	0.46	3.76	0.37
24 (Unimplied)	4.48	0.29	4.37	0.34	4.44	0.23
25 (Heavy)	3.58	0.76	3.85	0.47	3.68	0.61
26 (Possible)	2.42	0.42	2.10	0.48	2.30	0.40
27 (Observed)	2.96	0.87	2.93	0.99	2.95	0.87
28 (Garbled)	5.30	0.45	5.24	0.49	5.28	0.43

Table 4
(Page 2 of 2)

Scale	Untrained Mean	Untrained SD	Trained Mean	Trained SD	Combined Mean	Combined SD
29 (Faultless)	3.39	0.51	3.42	0.63	3.40	0.51
30 (Widespread)	3.87	0.69	4.15	0.57	3.98	0.62
31 (Accurate)	2.86	0.57	2.69	0.74	2.80	0.60
32 (Uninterrupted)	4.37	0.37	4.31	0.44	4.35	0.28
33 (Relevant)	2.87	0.49	2.44	0.51	2.71	0.46
34 (Insecure)	4.34	0.43	4.63	0.50	4.45	0.41
35 (Analyzable)	2.75	0.49	2.26	0.42	2.56	0.42
36 (Risky)	3.33	0.56	3.86	0.46	3.53	0.48
37 (Fragmented)	4.42	0.44	4.55	0.48	4.47	0.40
38 (Acceptable)	2.78	0.52	2.64	0.66	2.73	0.53
39 (Many)	3.58	0.73	3.83	0.72	3.68	0.70
40 (Confirmed)	3.37	0.66	3.68	0.93	3.49	0.73
41 (Changing)	3.89	0.31	3.76	0.36	3.84	0.27
42 (Large Scale)	3.57	0.87	3.87	0.81	3.68	0.82
43 (Improbable)	5.13	0.47	5.43	0.66	5.25	0.49
44 (Extraneous)	4.58	0.33	5.34	0.46	4.87	0.34
45 (Consistent)	3.24	0.46	3.15	0.49	3.12	0.41
46 (Dangerous)	3.28	0.50	3.54	0.39	3.38	0.42
47 (Reliability)	2.53	0.57	2.48	1.52	2.51	0.89
48 (Accuracy)	2.47	0.50	2.70	1.09	2.56	0.69
49 (Global-1)	0.74	0.08	0.80	0.14	0.77	0.10
50 (Global-2)	0.75	0.11	0.81	0.14	0.77	0.11

Note. The label for the bipolar scales indicates the low end of the 1-7 scale.

Table 5. Rating Scale Factor Structure: Untrained Subjects

UNTRAINED SUBJECTS

Factor I (54%) ACCURACY		Factor II (21%) RELEVANCE		Factor III (7%) DIRECTNESS		Factor IV (3%)	
Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient
Accuracy	.97	Heavy – Light	.95	Implied – Unimplied	.71	Unexpected – Expected	.45
Dependable – Undependable	.96	Large Scale – Small Scale	.93	Interpreted – Uninterpreted	.64		
Reliability	.95	Many – Few	.93	Feasible – Infeasible	.41		
True – False	.95	Dangerous – Safe	.92				
Accurate – Erroneous	.94	Risky – Routine	.92				
Truthful – Deceptive	.94	Massive – Insignificant	.90				
Faultless – Faulty	.93	Extraordinary – Ordinary	.86				
Acceptable – Unacceptable	.93	Widespread – Local	.85				
Global 1	– .92	Hazardous – Unhazardous	.81				
Confirmed – Unconfirmed	.91	Precarious – Imprecarious	.72				
Reliable – Variable	.91	Volatile – Inert	.70				
Clear – Garbled	.89						
Possible – Impossible	.88						
Factual – Theoretical	.87						
Global 2	– .87						
Direct – Indirect	.87						
Completed – Fragmented	.87						

Factor III accounts for 7% of the variance and seems to reflect a judgment about applicability of message content, a determination whether the content could be used directly or required drawing some inference. This factor was tentatively labeled DIRECTNESS. Factor IV is a relatively unimportant specific factor, accounting for only 3% of the variance, and will be omitted in subsequent discussion.

Trained Subjects. Table 6 presents the rotated structure for the trained subjects. The structure accounts for 73% of the total report rating variance. The distribution of the variance across the four factors is more uniform than that found for untrained subjects, implying that the trained subjects were using finer discriminations in their judgments of the attributes of the 40 reports.

Whereas the untrained subjects showed a strong tendency to confine their evaluations to judgments of the accuracy of the reports, the trained subjects found other discriminable qualities on which to base their judgments. As before, the most crucial judgmental dimension was ACCURACY; RELEVANCE slipped down in importance from second to a close third.

The third factor extracted is best labeled DIRECTNESS because of the scales contributing to it (Expected, Ordinary, Feasible), although for trained subjects it includes INTELLIGIBILITY AND USEFULNESS as correlated attributes. Nonetheless, the factor is essentially similar to that found for the untrained subjects.

Factor IV does not provide the basis for straightforward interpretation. Although the inference-contributing determinant of IMPLIED has the greatest influence on this factor, the miscellaneous nature of other qualities such as specificity and fragmentation makes it difficult to assign an appropriate label. Since it contributes only 6% to the total structure and is heterogeneous in nature, it was dropped from consideration.

Combined Subject Groups. Table 7 presents the composite structure for the total subject sample. Since the separate group structures are highly similar in factor content and prominence, this structure reflects the common perceptual space within which analysts in general can be expected to perform.

Synthesis of scales contributing to the factors confirmed ACCURACY as an appropriate label for Factor I, RELEVANCE for Factor II, and DIRECTNESS for Factor III. A fourth factor contributing only 3% to the variance was not considered further.

Table 6. Rating Scale Factor Structure: Trained Subjects

UNTRAINED SUBJECTS

Factor I (42%) ACCURACY		Factor II (11%) RELEVANCE		Factor III (14%) DIRECTNESS		Factor IV (6%)	
Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient
Global 2	– .96	Many – Few	.92	Expected – Unexpected	.74	Unimplied – Implied	.70
Global 1	– .96	Large Scale – Small Scale	.91	Intelligible – Unintelligible	.67	Specific – Vague	.63
Reliability	.95	Widespread – Local	.88	Understandable – Confusing	.66	Fragmented – Complete	.50
Accuracy	.94	Heavy – Light	.83	Ordinary – Extraordinary	.64	Active – Inactive	.48
True – False	.93	Massive – Insignificant	.76	Substantiated – Contradicted	.64		
Truthful – Deceptive	.90	Precarious – Imprecarious	.42	Appropriate – Inappropriate	.56		
Dependable – Undependable	.90	Volatile – Inert	.41	Useful – Useless	.56		
Accurate – Erroneous	.89			Analyzable – Unanalyzable	.52		
Faultless – Faulty	.88			Feasible – Infeasible	.51		
Reliable – Variable	.84						
Secure – Insecure	.82						
Probable – Improbable	.82						
Acceptable – Unacceptable	.81						
Likely – Unlikely	.80						

Table 7. Rating Scale Factor Structure: Combined Subject Groups

COMBINED SUBJECTS

Factor I (57%) ACCURACY		Factor II (19%) RELEVANCE		Factor III (6%) DIRECTNESS	
Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient	Scale Component Attribute	Factor Coefficient
Accurate – Erroneous	.98	Heavy – Light	.96	Interpreted – Uninterpreted	.76
Truthful – Deceptive	.97	Many – Few	.92	Implied – Unimplied	.75
True – False	.97	Large Scale – Small Scale	.92	Understandable – Confusing	.45
Acceptable – Unacceptable	.97	Dangerous – Safe	.90	Constant – Changing	.37
Accuracy	.96	Risky – Routine	.89		
Global 1	– .96	Massive – Insignificant	.88		
Dependable – Undependable	.95	Widespread – Local	.84		
Faultless – Faulty	.95	Precarious – Imprecarious	.80		
Probable – Improbable	.94	Extraordinary – Ordinary	.80		
Reliable – Variable	.92	Hazardous – Unhazardous	.78		
Possible – Impossible	.92	Volatile – Inert	.70		
Global 2	– .92	Active – Inactive	.48		
Likely – Unlikely	.92				
Direct – Indirect	.92				
Factual – Theoretical	.91				
Reliability	.90				
Confirmed – Unconfirmed	.90				
Pertinent – Extraneous	.89				
Consistent – Inconsistent	.89				

The dimensions of the factor structure represent independent aspects of the judgmental process involved in intelligence analysis. They are the critical underlying determinants of the judgment space in which the analyst makes his discriminations among the message he is asked to evaluate.

Neither the Reliability nor the Accuracy rating scales as currently employed adequately captures the dimensionality of this space. Both these rating procedures assess only the first axis of that space--ACCURACY; other scales are more representative of the underlying ACCURACY dimension. Considerably greater discriminating variability in the reports is left entirely unassessed by current measures.

Although the judgment space for the two groups of subjects is nearly identical in composition, this similarity does not imply that the two groups evaluated the reports identically. It is the structural space within which those evaluations were made that is the same.

Thus, both groups considered important the information qualities of accuracy, relevance, and directness. Specific evaluations of the quality of a given message by the two groups are, however, discriminably different, as has been established.

The situation is analogous to that of two observers who can see the same visual stimulus but who differ as to the significance or interpretation of that stimulus. No matter how much training an observer is given, he cannot make accurate discriminations among stimulus objects to which his perceptual makeup is insensitive.

The significance of these findings concerning the scale factor structure is that the analyst comes to his task with an implicit perceptual structure. To be maximally effective, training instructors must understand and capitalize upon that implicit structure. Findings of the present analysis strongly suggest that this structure is not modified by the Army Intelligence School training procedures.

In fact, what is known of such implicit perceptual structures indicates that it would be extremely difficult to modify that structure. What is required is that the training use the underlying conceptual structure to best advantage.

Factor Structure of Intelligence Reports

For the analyses of the structure of the report space, the mean subject data matrices of the preceding analyses were transposed so that the pattern of intercorrelations among reports could be examined with respect to scale means. Analyses of the report groupings, as determined by the analysts' judgments, reflect the degree to which the subjects' judgment space served to differentiate the intelligence reports.

The analyses represent a form of internal validity test of the scale structure obtained. If this grouping of reports, this taxonomy, is judged meaningful, significance of the scale structure from which derived would be confirmed. The report structure was included for this purpose.

Table 8 shows the report means for the three subject groups across all scales. All the means are substantially equivalent, and the variance about those means is substantially higher than that found for the scale means of Table 4. The explanation is that these analyses have taken averages over what is already known to be a factorially diverse and independent set of scales. The averages displayed reflect only the average positional biases.

Lack of discriminability in the report averages, however, does not indicate sameness among the reports with respect to individual scale ratings to be factored. On the contrary, the high variances about these means indicate considerable differences in scale ratings from report to report.

Analyses have a distinct mathematical dependency on those previously done. The report structures necessarily cannot contain greater discriminability than emerges from analyses of the scale structure. Technically, that is, the rank of the report structure matrix is determined by the rank of the judgment space, which has been found not to exceed 3. The reports grouped together on the factors described below are combined in terms of a common variance on ACCURACY, RELEVANCE and DIRECTNESS. Later displays make this picture clearer by modeling the report distribution within the perceptual space.

Tables 9 through 11 detail the report groupings by factors that emerge from these analyses. Structures for the three groups of untrained, trained, and combined subjects are quite similar, and discussion is focused on the combined structures shown in Table 11.

However, some differences between the groups were noted: The trained subjects used only a two-dimensional structure to group the messages. The report structure for the trained subjects in Table 10 shows that all messages deriving from friendly and reliable sources have high loadings on Factor I, and all messages based on POW, civilian, and deserter sources have high loadings on Factor II.

Considering the fact that ACCURACY is the most prominent feature of the subjects' judgment space, and considering that Accuracy and Reliability are intertwined, it is not surprising that the subjects' primary distinction between reports depends on the source, i.e., reliability and accuracy of the reports. However, it is somewhat puzzling to find no systematic grouping of reports on the basis of RELEVANCE or DIRECTNESS. The structure for the combined subjects shows a three-factor space which is apparently due to one discrimination on the basis of ACCURACY and a second on the basis of RELEVANCE.

Table 8. Group Means and Standard Deviations of Overall Qualities, by Reports

	Untrained		Trained		Combined			Untrained		Trained		Combined	
Report	Mean	SD	Mean	SD	Mean	SD	Report	Mean	SD	Mean	SD	Mean	SD
1	3.82	1.26	3.84	1.40	3.83	1.28	21	3.75	0.82	3.85	0.94	3.79	0.79
2	3.68	1.40	3.59	1.61	3.65	1.46	22	3.64	1.03	3.67	1.34	3.65	1.13
3	3.82	0.83	3.68	1.24	3.76	0.93	23	3.85	0.93	3.92	1.04	3.88	0.93
4	3.70	1.15	3.66	1.57	3.69	1.29	24	3.53	1.45	3.60	1.55	3.56	1.46
5	3.62	1.07	3.71	1.21	3.66	1.09	25	3.41	1.37	3.56	1.47	3.47	1.39
6	3.82	1.00	3.85	1.05	3.83	0.98	26	3.46	1.37	3.67	1.23	3.54	1.30
7	3.67	1.02	3.62	1.75	3.65	1.27	27	3.40	1.41	3.44	1.60	3.41	1.46
8	3.69	1.10	3.64	1.58	3.67	1.27	28	3.50	1.33	3.70	1.40	3.58	1.34
9	3.63	1.28	3.63	1.56	3.63	1.37	29	3.76	1.22	3.75	1.07	3.76	1.14
10	3.52	1.35	3.52	1.41	3.52	1.36	30	3.49	1.33	3.45	1.65	3.48	1.44
11	3.56	1.01	3.51	1.41	3.54	1.13	31	3.71	0.84	3.73	0.98	3.72	0.87
12	3.56	1.27	3.59	1.47	3.58	1.33	32	3.52	1.10	3.55	1.37	3.52	1.18
13	3.53	0.99	3.52	1.36	3.53	1.09	33	3.47	1.24	3.52	1.35	3.49	1.26
14	3.73	1.14	3.59	1.68	3.68	1.32	34	3.60	1.11	3.58	1.14	3.60	1.10
15	3.85	0.97	3.88	1.21	3.86	1.04	35	3.68	0.76	3.78	0.93	3.72	0.78
16	3.67	0.92	3.78	1.00	3.71	0.91	36	3.52	1.29	3.56	1.27	3.54	1.26
17	3.44	1.34	3.60	1.35	3.50	1.32	37	3.42	1.19	3.54	1.35	3.47	1.24
18	3.33	1.50	3.52	1.50	3.41	1.48	38	3.48	0.95	3.69	1.07	3.56	0.96
19	3.53	1.30	3.72	1.09	3.60	1.20	39	3.39	1.34	3.54	1.40	3.44	1.35
20	3.66	1.20	3.77	1.33	3.70	1.24	40	3.44	1.33	3.51	1.39	3.47	1.34

Table 9. Report Factor Structure: Untrained Subjects

UNTRAINED SUBJECTS

Factor I (41%)

Message Number	Message Precis	Factor Coefficient
18	106th Inf Div Summary: small arms fire during darkness; usual enemy motor activity; aggressive enemy patrols.	.91
28	28th Inf Div IPW team report: civilian states German troop concentrations, artillery, SS troops, and river-crossing equipment moving west from Bitburg.	.91
26	110th Inf Regt reports large concentration of Germans in Gemund 10 Dec; road preparation suspected; artillery fire requested.	.90
27	Air Force reconnaissance reveals enemy trains moving south, cars on sidings, and activity in marshalling yard at Trier.	.90
40	106th Inf Div Summary: enemy vehicles, patrols and planes active; POW reports big attack coming before Christmas.	.89
17	112th Inf Regt reports hearing enemy vehicles including trucks and tanks.	.89
39	9th Armored Div Summary: enemy outpost personnel more confident and have abruptly changed their routine.	.89
19	VIII Corps Summary: POW reports 116th Panzer Div moving south to Trier.	.87
33	106th Inf Div Summary: listening posts report unusual enemy motor movements; three enemy patrols reported; harassing fire light; new enemy battalion reported.	.85
28	112th Inf Regt OP personnel heard three enemy vehicles.	.82
30	112th Inf Regt Summary: unusual enemy harassing small arms fire during hours of darkness.	.82
37	28th Div Arty Summary: much enemy activity, guards more military and wearing overcoats, first time overcoats noted.	.82
24	112th Inf Regt reports enemy vehicles heard again.	.81
10	110th Inf Regt reports varied enemy traffic moving southeast.	.81
5	28th Inf Div IPW Team reports civilians state two towns across river full of German soldiers; some mines being laid.	.80
38	4th Inf Div Summary: POW's report being told that three divisions in their rear areas were getting ready for a big attack.	.79
13	First Army reports train movements indicate enemy buildup on west side of Moselle; estimate two VG and one Panzer division; units not using radios.	.77
36	All regiments, 28th Inf Div indicate increased early morning small arms fire; otherwise very quiet.	.76
11	Air Force bomber pilots sighted 40 – truck convoy moving southeast towards Bitburg.	.76
12	112th Inf Regt reports occasional enemy small arms fire, sounds of vehicles, and two single enemy aircraft overhead after dark.	.75
32	28th Div Arty Summary: enemy artillery kept in rear areas; little firing.	.74
9	106th Inf Regt OP personnel reported sighting three Tiger Tanks.	.72
22	110th Inf Regt reports hearing enemy vehicles between 0745–0810.	.72

Factor II (19%)

Message Number	Message Precis	Factor Coefficient
6	106th Inf Div reports deserter says German 15th Army moved to Cologne area and Von Rundstedt has ordered a withdrawal across the Rhine.	.96
21	112th Inf Regt reports POW states Hq 26th VG Div has moved close to the front lines.	.77
35	4th Inf Div IPW team reports German civilian picked up in Luxembourg states explosion in marshalling yards in Zweibrucken tied up traffic for six hours.	.67
16	4th Inf Division reports enemy deserter states 600 men recalled to 212th VG Div to take part in forthcoming attack. Mo. de good to very good.	.66
31	V Corps G2 reports POW says Hq 352d Artillery Regt probably near Bettingen.	.57
13	First Army reports train movements indicate enemy buildup on west side of Moselle; estimates two VG and one Panzer Div; units not using radios.	.54
23	110th Inf Regt reports enemy deserter says machine gun relocated to cover ruined bridge better.	.52
5	28th Inf Div IPW Team reports civilians state two towns across river full of German soldiers; some mines being laid.	.48
38	4th Inf Div Summary: POW's report three divisions in rear area getting ready for big attack.	.48
3	110th Inf Regt reports seeing enemy vehicles in late morning.	.47

Factor III (25%)

Message Number	Message Precis	Factor Coefficient
15	110th Inf Regt reports patrol saw little activity in Rush.	.90
14	28th Div Artillery reports enemy patrol vicinity OP 229th FA Bn.	.82
3	110th Inf Regt reports seeing enemy vehicles in late morning.	.82
8	All units 28th Inf Div report quiet day with scattered small arms, mortar, and 11 rounds of artillery fire.	.79
4	110th Inf Regt reports German patrol on friendly side of river recrossed to own side. River swift and swollen.	.77
1	109th Inf Regt reports deserter says his company is near Bessdorf.	.75
29	110th Inf Regt patrol found dead German with map of Dasburg, marked 2d Co, 78th Inf Regt.	.74
2	110th Inf Regt reports German patrol on friendly side of river recrossed to own side in rubber boat.	.72
34	4th Inf Div reports enemy vehicular activity opposite 12th Inf Regt during evening, otherwise quiet.	.72
23	110th Inf Regt reports enemy deserter says machine gun relocated to cover ruined bridge better.	.72
20	112th Inf Regt Observation Post (OP) personnel heard two enemy trucks before daylight.	.71
7	4th Inf Div reports small arms fire north of Echternacht, also mortar fire received.	.70
9	106th Inf Regt OP personnel reported sighting three Tiger Tanks.	.66
12	112th Inf Regt reports occasional enemy small arms fire, sounds of vehicles, and two single enemy aircraft after dark.	.64
36	All regiments 28th Inf Div indicate increased early morning enemy small arms fire, otherwise very quiet.	.62

Table 10. Report Factor Structure: Trained Subjects

TRAINED SUBJECTS

Factor I (58%)		
Message Number	Message Precis	Factor Coefficient
7	4th Inf Div reports small arms fire north of Echternach; also mortar fire received.	.98
8	All units 28th Inf Div report quiet day with scattered small arms, mortar, and 11 rounds of artillery fire.	.97
27	Air Force reconnaissance reveals enemy trains moving south, cars on sidings and activity in marshalling yards in Trier.	.96
30	112th Inf Regt Summary: unusual enemy harassing small arms fire during hours of darkness.	.96
14	28th Div Arty Reports enemy patrol vicinity CP 229th FA Bn.	.96
24	112th Inf Regt reports enemy vehicles heard again.	.96
10	110th Inf Regt reports varied enemy traffic moving southeast.	.96
9	109th Inf Regt OP personnel report sighting three Tiger Tanks.	.96
4	110th Inf Regt reports German patrol on friendly side of river recrossed to own side; river swollen and swift.	.96
11	Air Force bomber pilots sighted 40 – truck convoy *moving southeast towards Bitburg.*	.95
32	28th Division Summary: enemy artillery kept in rear areas; little firing.	.95
36	All regts, 28th Inf Div indicate increased early morning small arms fire; otherwise very quiet.	.95
33	106th Inf Div summary: listening posts report unusual motor movements, three enemy patrols reported, harassing fires light; new enemy battalion reported.	.95
2	110th Inf reports German patrol on friendly side of river recrossed to own side in rubber boat.	.95
28	112th Inf Regt OP personnel heard three enemy vehicles.	.94
18	106th Inf Div Summary: small arms fired during darkness; unusual enemy motor activity, aggressive enemy patrols.	.93
20	112th Inf Regt OP personnel heard two enemy trucks before daylight.	.93
22	110th Inf Regt reports hearing enemy vehicles between 0745–0910.	.93
34	4th Inf Div reports enemy vehicular activity opposite 12 Inf Regt during evening, otherwise quiet.	.92
37	28th Div Artillery Summary: much enemy activity; guards much more military and wearing overcoats; first time overcoats noted.	.93
39	9th Armored Div Summary: enemy outpost personnel more confident and have abruptly changed their routine.	.92

Factor II (16%)		
Message Number	Message Precis	Factor Coefficient
6	106th Inf Div reports deserter says German 15th Army moved to Cologne and Von Rundstedt has *ordered a withdrawal across* the Rhine.	.95
16	4th Inf Div reports enemy deserter says 600 men recalled to 212th VG Div to take part in forthcoming attack; morale good to very good.	.95
21	112th Inf Regt reports POW states Hq 26th VG Div has moved close to front lines.	.93
31	V Corps reports POW says Hq 352d Artillery Regt probably near Bettingen.	.82
35	4th Inf Div IPW Team reports German civilian picked up in Luxembourg states explosion in marshalling yards at Zweibruecken tied up traffic for six hours.	.78
23	110th Inf Regt reports enemy deserter says machine gun relocated to cover ruined bridge better.	.75
38	4th Inf Div Summary: POW's report three divisions *in their rear area getting ready for big attack.*	.74
5	28th Inf Div IPW Team reports civilians state two towns across river are full of German soldiers; *some mines being laid.*	.59
19	VIII Corps Summary: POW reports 116th Panzer Div moving south to Trier.	.58
26	28th Inf Div IPW Team reports: civilian states German troop concentrations, artillery, SS troops, and river–crossing equipment moving west from Bitburg.	.48
1	109th Inf Regt reports deserter says his company is near Biesdorf.	.41

Table 11. Report Factor Structure: Combined Subject Group

COMBINED SUBJECTS

Factor I (39%)

Message Number	Message Précis	Factor Coefficient
18	106th Inf Div Summary: small arms fire during darkness, unusual enemy motor activity; aggressive enemy patrols.	.88
40	106th Inf Div Summary: enemy vehicles, patrols and planes active; POW reports a big attack coming before Christmas.	.87
25	110th Inf Regt reports large concentration of Germans in Gemuend 10 Dec; raid preparations suspected; artillery fire requested.	.87
27	Air Force reconnaissance reveals enemy trains moving south; cars on sidings and activity in marshalling yards at Trier.	.87
39	9th Armored Div Summary: enemy outpost personnel more confident and have abruptly changed their routine.	.87
26	28th Inf Div IPW Team report: civilian states German troops concentrations, artillery, SS troops, and river-crossing equipment moving west from Bitburg.	.85
17	112th Inf Regt reports hearing enemy vehicles including trucks and tanks.	.84
19	VIII Corps Summary: POW reports 116th Panzer Div moving south to Trier.	.83
33	106th Inf Div Summary: listening posts report unusual enemy motor movements; three enemy patrols reported; harassing fires light; new enemy battalion reported.	.82
30	112th Inf Regt Summary: unusual enemy harassing small arms fire during hours of darkness.	.82
13	First Army reports train movements indicate enemy buildup on west side of the Moselle; estimate two VG and one Panzer Div; units not using radios.	.81
37	28th Div Arty Summary: much enemy activity; guards much more military and wearing overcoats; first time overcoats noted.	.80
24	112th Inf Regt reports enemy vehicles heard again.	.80
10	110th Inf Regt reports varied enemy traffic moving southeast.	.78
28	112th Inf Regt OP personnel heard three enemy vehicles.	.78
36	All regiments, 28th Inf Div indicate increased early morning small arms fire; otherwise very quiet.	.76
11	Air Force Bomber pilots sighted 40-truck convoy moving southeast towards Bitburg.	.76

Factor II (13%)

Message Number	Message Précis	Factor Coefficient
6	106th Inf Div reports deserter says German 15th Army moved to Cologne and Von Rundstedt has ordered a withdrawal across the Rhine.	.96
21	112th Inf Regt reports POW states Hq 26th VG Div has moved close to the front lines.	.93
16	4th Inf Div reports enemy deserter states 600 men recalled to 212th VG Div to take part in forthcoming attack; morale good to very good.	.84
35	4th Inf Div IPW Team reports German civilian picked up in Luxembourg states explosion in marshalling yards in Zweibruecken tied up traffic for six hours.	.73
31	V Corps G2 reports POW says Hq 352d Artillery Regt probably near Bettingen.	.69
23	110th Inf Regt reports enemy deserter says machine gun relocated to cover ruined bridge better.	.62
38	4th Inf Div Summary: POW's report being told three divisions in their rear area getting ready for big attack.	.60
5	28th Inf Div IPW Team reports civilians state two towns across river full of German soldiers; some mines being laid.	.54

Factor III (26%)

Message Number	Message Précis	Factor Coefficient
15	110th Inf Regt reports patrol saw little activity in Roth.	.88
3	110th Inf Regt reports seeing enemy vehicles in late morning.	.85
14	28th Inf Div Artillery reports enemy patrol vicinity CP 229th FA Bn.	
4	112th Inf Regt reports German patrol on friendly side of river recrossed to own side; river swift and swollen.	.78
8	All units, 28th Inf Div report quiet day with scattered small arms, mortar, and 11 rounds of artillery fire.	.76
20	112th Inf Regt OP personnel heard two enemy trucks before daylight.	.73
29	110th Inf Regt patrol found dead German with map of Dasburg area; marked 2d Co, 78th Inf Regt.	.72
34	4th Inf Div reports enemy vehicular activity opposite 12th Inf Div during evening; otherwise quiet.	.72
2	110th Inf Regt reports German patrol on friendly side of the river recrossed to own side in a rubber boat.	.71
1	109th Inf Regt reports deserter says his company is near Biesdorf.	.70
7	4th Inf Div reports small arms fire north of Echternach; also mortar fire received.	.68
9	109th Inf Regt OP personnel report sighting three Tiger tanks.	.65
12	112th Inf Regt reports occasional enemy small arms fire; sounds of vehicles, and two single enemy aircraft overhead after dark.	.65
23	110th Inf Regt reports enemy deserter says machine gun relocated to cover ruined bridge better.	.65
36	All regiments 28th Inf Div indicate increased early morning small arms fire; otherwise very quiet.	.62
32	28th Inf Div Artillery Summary: enemy artillery kept in rear areas; little firing.	.61

The three report factors for the combined subject groups (Table 11) account for 78% of the total scale variance in the ratings of these reports. Factor III accounts for more of this total variance than Factor II. The display reverses the normal ordering of factors from greater to least total variance to indicate the order of the unrotated factors. This is, Factor II was more prominent than Factor III in the unrotated structure but accounted for less variance than Factor III after rotation.

The summarized reports shown in Table 11 reveal that the three factors have relatively clear identifications. Factor I groups those reports containing UNUSUAL, LARGE SCALE or THREATENING ACTIVITY. Factor II is largely determined by DESERTER and CIVILIAN REPORTS. Factor III groups reports of PATROLS, TRANSPORT and SMALL ARMS ACTIVITY. As a taxonomy of these reports, the structure is reasonably coherent and significant.

Supplementary Analyses

Several additional ways of examining the data help clarify relationships among the rating scales and among the reports in the message set. These analyses and their conclusions are discussed briefly here and presented in more detail in Appendixes B-D.

As previously established, the subjects used three basic factors or concepts in judging the 40 messages--ACCURACY, RELEVANCE, AND DIRECTNESS. The subjects' approach to the message ratings led to two or three clusters of related messages, messages which were given not only a similar pattern of ratings but which had definite similarities of message source and content.

Another way to describe relationships among the messages as rated by the subjects is to assign factor scores to the messages and to locate the messages in the three-dimensional space defined by the rating factors. The factor score for a given report was obtained by taking a weighted sum of all the ratings on that report, the weights being proportional to the loadings on the factor.

Thus, in computing the ACCURACY factor score for a report, the ratings given on the True-False scale, the Reliable-Variable scale, etc., were given high weights. Once the location of each report in the judgment space had been determined, it was possible to examine, for example, the types of messages identified by high ACCURACY, low RELEVANCE, and low DIRECTNESS.

A detailed examination of the report factor scores, and figures showing the geometric relationships among reports, is presented in Appendix B. The ACCURACY factor clearly played a major role in the subjects' evaluation of the reports; the RELEVANCE and DIRECTNESS factors were of lesser value.

This result was not surprising considering the relative percentages of rating variance accounted for by the three factors: ACCURACY is clearly the dominant factor, and reports would be expected to group principally on the basis of their ACCURACY factor scores. However, the composite factor scores do provide meaningful groupings of the messages. If single rating scales are developed to represent these factors, ratings on the new scales may be valuable for structuring or organizing data to facilitate its use.

Appendix C presents a more detailed analysis of the ACCURACY dimension and of the relationships among the ratings on this dimension and the traditional Accuracy and Reliability ratings.

From examination of the inter-rating correlation in Appendix C, it is clear that the Accuracy and Reliability ratings are highly related, despite the doctrinal definition of these ratings as independent.

Apparently, for the 40 messages used in the experiment, Accuracy and Reliability were indeed highly related. That is, all accurate reports might have come from reliable sources, and subjects may have shown good judgment in tying the two closely together.

However, examination of the messages (Appendix A) and discussion of some messages (Appendix B) show instances where unreliable sources produced accurate information and reliable sources provided inaccurate information. This fact, combined with the data in Appendix C, strongly suggests that subjects were using the Reliability rating inappropriately by tying it too closely to their judgment of Accuracy.

In addition, it appears that the Global Validity ratings may provide a more straightforward representation of subjects' estimates of information accuracy than the standard Accuracy rating does.

The multiple regression analyses in Appendix D support this conclusion but suggest that the trained subjects indeed may have been differentiating between Accuracy and Reliability. Trained subjects apparently based their judgments of Accuracy in part on the Reliability of the source, but they did not seem to judge Reliability on the basis of the Accuracy of the information in a given message.

The supplementary analyses, then, confirmed the finding of a dominant concept of information ACCURACY. However, relationships of the standard ratings of Accuracy and Reliability to this concept and to each other remain somewhat unclear. It is apparent that these standard ratings do not capture the full meaning of the ACCURACY dimension as derived from the subject data. To explore more fully the interrelationships among the various ratings, the following steps need to be taken:

1. Replicate the present experiment using a different sample of analysts with more extensive military experience and Intelligence training.

2. Replicate the present experiment using a different sample of messages.

3. Develop rating scales specifically designed to capture the meaning of the principal judgment factors identified in the present experiment.

The data from these experiments should verify the stability and generality of judgment factors appropriate for the evaluation of combat intelligence data. In addition, some insight would be obtained about the potential usefulness of new rating scales specifically designed to tap these factors.

SUMMARY AND CONCLUSIONS

The present experiment was an exploration of the structure of combat intelligence data as seen through the eyes of intelligence analysts. A selection of 40 messages was used as representative of intelligence information received at division level.

Ratings were requested from 34 enlisted personnel just beginning an intelligence analyst course at the U.S. Army Intelligence Center and School. An additional 21 enlisted personnel, just finishing the course, were asked for similar ratings. Members of both groups were relatively inexperienced in intelligence analysis. Attributes of the reports to be rated included specific qualities of content as well as the traditional Accuracy and Reliability ratings and ratings of the overall validity or credibility of the report.

The purpose was twofold, (1) to ascertain the underlying conceptual structure employed by the subjects in evaluating typical messages containing intelligence information, and (2) to assess the role of the traditionally employed reliability and accuracy ratings prescribed for the intelligence analyst.

With respect to the conceptual structure, it was found that analysts had an implicit judgmental structure within which they evaluated the attributes, qualities, or characteristics of the reports upon which they were called to pass judgment.

The dimensions of this judgmental space, determined by multivariate analyses, were Accuracy, Relevance, and Directness. In combination, these independent dimensions accounted for more than 82% of the total variance of the combined evaluations of the report sample as made by the 55 analysts (Accuracy, 57%; Relevance, 19%; Directness, 6%).

With regard to the traditionally used Accuracy and Reliability scales, the evidence of prior studies was verified that the scales are, in fact, not independent. Findings also indicated that the judgments of Accuracy as traditionally measured were significantly contaminated by apparently unfounded judgments of source reliability, particularly on the part of the trained analysts.

For the untrained subjects, however, the two measurements were completely interchanged. In contrast, a specially devised Global scale of report validity was found less contaminated and to have generally better measurement validity for report Accuracy.

These findings imply that scales for evaluating quality of intelligence data could be derived to provide a more effective vehicle for rating of data quality and transmission of ratings.

Scales more closely paralleling the analysts' conceptual framework would permit a more natural judgment process, and the ratings given would more accurately reflect the rater's feelings about the data being rated. The use of 0-100 rather than 1-6 scales might also contribute to more effective communication between the person rating the information and the analyst or decisionmaker utilizing the information.

Before development of new scales and procedures, however, the results obtained in the present experiment need to be validated by (1) replicating the study using a sample of trained intelligence officers with combat experience and (2) repeating the study using a different message set and associated scenario.

APPENDIX A

MESSAGES RATED BY SUBJECTS

BATTLE of the BULGE

28th Infantry Division

Selected Messages for 10-15 December 1944

Alignment of Units in VIII Corps
from North to South

106 Infantry Division with 4th Cavalry
Regiment attached on North Flank

28th Infantry Division
112th Infantry Regiment
110th Infantry Regiment
109th Infantry Regiment

9th Armored Division (60th Armored Infantry)
Battalion of Combat Command A on line

4th Infantry Division

Message Nr 1

10 December 1944 28th Infantry Division

1000 hours

The 3d Battalion, 109th Infantry Regiment reports that a deserter captured in the vicinity of coordinates 9241 at 0540 hours is from the 1st Battalion, 915th Regiment, 352d Volksgrenadier Division. The prisoner of war stated his company is located in the vicinity of BIESDORF (9743).

Message Nr 2

10 December 1944 28th Infantry Division

1500 hours

3d Battalion, 110th Infantry Regiment reports it observed an 8-man enemy patrol in the vicinity of coordinates 851581 at 1115 hours. Enemy withdrew eastward and crossed river in a rubber boat which was found in the vicinity of 854584.

Message Nr 3

10 December 1944 28th Infantry Division

1200 hours

3d Battalion, 110th Infantry Regiment reports that between 0900-1130 hours it sighted 15 horse-drawn vehicles and 1 staff car between coordinates 890570 and 897562.

Message Nr 1

11 December 1944 28th Infantry Division

1500 hours

3d Battalion, 110th Infantry Regiment reports seeing a 6-man German patrol walking towards the Our River in the vicinity of coordinates 871541 at 1100 hours. Observers did not fire, but followed the enemy patrol. Tracks led to the river in the vicinity of coordinates 875543. They could not determine whether the enemy patrol used a boat to re-cross the river or waded. They kept watch in the area until 1300 hours, but did not see any more activity. The current in the river was swift and the water was level with the banks. Observers returned to their unit at 1400 hours.

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Message Nr 2

11 December 1944 28th Infantry Division

1200 hours

28th Infantry Division Interrogation of Prisoner of War Team reports reliable civilians state that as of 10 December:

1. NIEDERGECKLER (9753) and GEICHLINGEN (9451) were full of German soldiers.

2. Many mines were being laid in the vicinity of BAULER (9052).

Message Nr 3

11 December 1944 28th Infantry Division

1200 hours

106th Infantry Division reports a deserter who surrendered 9 December says he is from Headquarters 15th Army which recently moved from the Rotterdam area to a location in the Cologne-Bonn-Dueren area. Rumor at his Headquarters is that Field Marshal von Rundstedt has ordered withdrawal to the East bank of the Rhine because shortage of reserves will make defense west of the Rhine no longer feasible after the first of the year.

Message Nr 4

11 December 1944 28th Infantry Division

2400 hours

4th Infantry Division reports enemy rifle and pistol fire in northern part of sector (north of ECHTERNACH) at 1400 hours. About 50 rounds each of 80 mm and 120 mm mortar fire were received during the day.

Message Nr 5

11 December 1944 28th Infantry Division

2400 hours

Summary of Enemy activity along 28th Infantry Division front for 11 December.

1. All units reported a quiet day.

2. Scattered rifle, pistol and mortar fire were received all along the front.

3. 11 rounds of light artillery fire were also received.

Message Nr 1

12 December 1944 28th Infantry Division

1000 hours

3d Battalion, 109th Infantry Regiment reports observation post personnel sighted three(3) TIGER Tanks in the vicinity of Road Junction at coordinates 952458 south of NIEDERSGEGEN at 0905 hours.

Message Nr 2

12 December 1944 28th Infantry Division

1200 hours

110th Infantry Regiment reports.

1. Four(4) horse-drawn vehicles observed moving southeast in the vicinity of 88875 at 1019 hours.
2. One(1) half-track*, several horse-drawn vehicles carrying troops and one(1) horse-drawn artillery piece (weapon) observed moving southwest in the vicinity 930602 at 1100 hours.

*Vehicle with wheels in front and tank-like tracks in back.

Message Nr 3

12 December 1944 28th Infantry Division

1400 hours

VIII Corps G2 Air reports pilots of heavy bombers returning from mission sighted a 40-truck convoy moving southeast from WAXWEILER (0167) to BITBURG (1454) at 1100 hours.

Message Nr 4

12 December 1944 28th Infantry Division

2400 hours

112th Infantry Regiment reports:

1. Occasional rifle and pistol fire and flares all along front during hours of darkness.
2. Sound of several vehicles heard in the vicinity of ROSCHEID (8970) at 1950 hours.
3. Single enemy planes flew over regimental area at 2015 and 2113 hours.

Message Nr 5

12 December 1944

2000 hours

VIII Corps relayed following message from First Army: "Train movements indicate that the buildup of enemy forces on the western slope of the MOSELLE Valley continues. The Gross Deutschland Division* has again been reported in the area by a prisoner of war. A conservative estimate would place at least two(2) Volksgrenadier Divisions and one(1) Panzer Division in the enemy's rear area opposite VIII Corps. These units maintaining have not used their radios."

*A Panzer (armored) division.

Message Nr 1

13 December 1944 28th Infantry Division

0400 hours

28th Division Artillery reports that at 0300 hours the 229th Field Artillery Battalion detected a two(2) man enemy patrol in the vicinity of its CP. The patrol withdrew when fired on.

Message Nr 2

13 December 1944 28th Infantry Division

1550 hours

3d Battalion, 110th Infantry Regiment reports that Patrol Nr. 6 saw little activity in the vicinity of ROTH (915482) at 2000 hours on 12 December.

Message Nr 3

13 December 1944 28th Infantry Division

2100 hours

4th Infantry Division reports that a deserter from the 2d Battalion, 316th Regiment, 212th Volksgrenadier Division stated:

a. The 230th Regiment of the Division was on line for about two weeks but is now in reserve.

b. Approximately 600 men on special types of duty in rear areas were called back to the 316th and 423rd regiments of the 212th Volksgrenadier Division by a secret order on 11 December. They were told to return to their regiments immediately because they were needed for an upcoming attack against the thinly held American line. These men for the most part had been attending noncommissioned officer schools.

c. Morale of German Troops in his division is good to very good.

Message Nr 4

13 December 1944 28th Infantry Division

2400 hours

112th Infantry Regiment reports that troops along the front heard sounds of enemy vehicles during the evening.

1. Tracked vehicles in the vicinity of coordinates 9272 at 2130 hours.
2. Trucks, motorcycles and possibly tanks in town of ROSCHEID(8970) at 2200 hours.
3. Motors in the vicinity of coordinates 874693 from 2215-2245 hours.

Message Nr 5

13 December 1944 28th Infantry Division

2400 hours

106th Infantry Division Summary stated:

1. Indiscriminate rifle and pistol firing along entire front during hours of darkness.
2. Unusual motor activity in the vicinity of SCHEID (064963) and BERG(908750) in the past 24 hours suggests presence of new troops in the area.
3. Aggressive enemy patrols displayed increased activity along entire front during past 24 hours.

Message Nr 6

13 December 1974 28th Infantry Division

2400 hours

VIII Corps Intelligence Summary reports that a message forwarded from First Army at 2000 hours states that a prisoner of war says the 116th Panzer Division has moved south to the Trier(2129) area. Its rear echelon including division headquarters left MUENCHEN-GLADBACK on 6 December. First Army notes this report seems to confirm a southward movement earlier reported on the 116th Panzer Division.

Message Nr 1

14 December 1944 28th Infantry Division

0600 hours

112th Infantry Regiment reports that observation post personnel heard two (2) trucks on Hill at coordinates 878698*. Time sounds were heard was 0405 hours.

*SE of ROSCHEID (8970) and opposite the boundary of the 2d and 3d Battalion 112th Infantry.

Message Nr 2

14 December 1944 28th Infantry Division

0630 hours

2d Battalion, 112th Infantry Regiment reports wounded POW captured near LIELER (838705) at 132345 hours while on patrol states he heard the headquarters of the 26th Volksgrenadier Division moved up to ESCHFELD (902692)-ROSCHEID (8970) area on 5 December.

Message Nr 3

14 December 1944 28th Infantry Division

1000 hours

110th Infantry Regiment reports that vehicular movements have been heard in the vicinity of coordinates 854680 at 0745, 0830, and 0910 hours. Direction and volume undetermined.

Message Nr 4

14 December 1944 28th Infantry Division

1015 hours

1st Battalion, 110th Infantry Regiment reports that an enemy deserter picked up at 132300 hours in TINTESMUEHLE, a small village at coordinates 850673 at the bend in the river East of HEINERSCHEID (821675) and SE of KALBORN (840682) says he was born in STRASBOURG.* He stated that the machine gun covering the ruins of the bridge at coordinates 850672 was moved on 7 December to a better location 100 meters from its former position where it can fire directly down the center line of the old bridge.

*On west back of the Rhine, Southeast of the VIII Corps sector.

Message Nr 5

14 December 1944 28th Infantry Division

1400 hours

112th Infantry Regiment reports that vehicular movements were heard again behind hill at coordinates 878698 and vicinity 873687 at 1300 hours.

Message Nr 6

14 December 1944 28th Infantry Division

1200 hours

3d Battalion, 110th Infantry Regiment reported that a large formation of Enemy Infantry was heard in GEMUEND (871557) at 102200 December. Suspects assembly area for raid into 110th sector. Requests Corps Artillery bring all possible fire on the area as soon as possible.

Message Nr 7

14 December 1944 28th Infantry Division

1600 hours

The 28th Division Interrogation of Prisoner of War Team reported that a woman who crossed into Germany on 10 December was arrested and taken to BITBURG(1353). She escaped and walked back into Luxembourg where she reported to police this morning. She is vouched for by the Luxembourg police as thoroughly reliable. Her statement follows: "I saw many horsedrawn vehicles, pontoons, small boats, and other river-crossing equipment coming from the direction of BITBURG and moving west through GEICHLINGEN (9451). In BITBURG, I overhead some military personnel saying it had taken three weeks to get there from Italy. There were also some troops in the town with gray uniforms with black collar patches.* I also saw many artillery pieces, both horse-drawn and carried on trucks."

*Uniform of SS(Elite Nazi) troops.

Message Nr 8

14 December 1944 28th Infantry Division
1930 hours

VIII Corps G2 Air reported that an Air Force visual reconnaissance mission this afternoon made the following observations:

1. Train consisting of 50 small freight cars was moving south in the vicinity of coordinates 2050.
2. 20 more small freight cars were on siding in the same general area.
3. Considerable activity in the marshalling yard at TRIER(2129).

Message Nr 9

14 December 1944 28th Infantry Division

2000 hours

112th Infantry Regiment reports that observation post personnel heard three(3) vehicles headed west at 1840 hours. It sounded as if they were pulling heavy loads up a hill in the vicinity of coordinates 880696.

Message Nr 10

14 December 1944 28th Infantry Division

2130 hours

3d Battalion, 110th Infantry Regiment reports that a patrol found a dead German in the vicinity of coordinates 847594 at 2000 hours. Only item of military value found was a map stamped 2d Company, 78th Infantry Regiment.* The map was DASBURG, Sheet 5902. Man appeared to have died about 24 hours ago from a bullet wound.

*This would indicate the map came from the 1st Battalion, 78th Infantry Regiment, 26th Volksgrenadier Division.

Message Nr 11

14 December 1944 28th Infantry Division

2400 hours

112th Infantry Summary stated that there was unusual intermittent harassing small arms fire from 140001 hours until dawn. It started again at 1810 hours. At 2000 hours there was a marked increase in volume. At least one burst of automatic pistol or machine gun fire was reported at different points along the front and extending to the south of the 112th sector, at an average rate of one burst every five minutes. This activity was still continuing at 142400 hours.

Message Nr 12

14 December 1944 28th Infantry Division

0600 hours

V Corps G2 Periodic Report for 13 December had a significant item under "Enemy Dispositions." It stated that a prisoner of war from the 2d Company, 942d Infantry Regiment, 353d Volksgrenadier Division who was captured in the V Corps sector reported that the former Command Post of the 353d Artillery Regiment while opposite the VIII Corps was in the vicinity of BETTINGEN (0450). He stated that it is customary for relieving units to occupy the same positions as those of the relieved unit. This points to the possibility that the same Command Post is now occupied by the headquarter of the 352d Artillery Regiment.

Message Nr 13

14 December 1944 28th Infantry Division

2400 hours

28th Division Artillery Summary:

1. During the past week the enemy has kept his artillery well back from the front.
2. No enemy firing has been reported at night.
3. No counterbattery* fire has been reported.
4. Enemy artillery activity for 14 December:
   a. 11 rounds, reportedly all 75mm, were fired into the sector of the 112th Infantry Regiment.
   b. Approximately six(6) rocket projectiles believed fired from near coordinates 950440 heard and seen at 1940 hours.

*Firing at our artillery

Message Nr 14

14 December 1944 28th Infantry Division

2400 hours

106th Infantry Division Summary:

1. Listening post personnel reported heavy increase in motor vehicle movement particularly vic ORMONT(0892), SCHEID(0696), and BRANDSCHEID(9881) before dawn and after dark. They heard sounds suggesting unloading of troops.
2. Harassing fires very light.
3. At least three(3) Enemy patrols reported in 106th sector.

4. Two(2) Prisoner of War, from 3d Company, 295th Regiment, 18th Volksgrenadier Division report 1st Battalion, 295th Regiment in the ORMONT area.

Message Nr 15

14 December 1944 28th Infantry Division

2400 hours

4th Infantry Division Summary stated that vehicular traffic was reported on the 12th Infantry Regiment's front during the evening. Otherwise it was a quiet day.

(Note: 12th Infantry occupies the northern regimental sector of the 4th Infantry Division from ECHTERNACH north to the 9th Armored Division's sector.)

Message Nr 1

15 December 1944 28th Infantry Division

0600 hours

4th Infantry Division Interrogation of Prisoner of War Team report states that a German national from SAARBRUECKEN* was picked up while visiting relatives vicinity Luxembourg City on 6 December. He claims he is an employee of the German Railroad System. He further states that on 30 November the marshalling yards in ZWEIBRUECKEN* were tied up for six hours when two carloads of explosives collided and exploded.

*Opposite Third Army zone to the southeast.

Message Nr 2

15 December 1944 28th Infantry Division

2400 hours

109th, 110th, and 112th Infantry Regiments Summaries all indicate marked increase of small arms harassing fire between 0400 and 0800 hours, followed by a very quiet afternoon and evening.

Message Nr 3

15 December 1944 28th Infantry Division

2400 hours

28th Division Artillery Summary:

1. Observation Post 101 (964414) observers reported at 1040 hours that enemy in front of them were equipped with overcoats for the first time.

2. During the day when guards were changed, enemy soldiers double-timed to and from their posts and did quite a bit of saluting not observed before.

3. Vicinity 963436 and 958435 enemy did a lot of moving to and from pillboxes.

4. There was also quite a bit of foot traffic vicinity 965439 all day.

Message Nr 4

15 December 1944 28th Infantry Division

2400 hours

4th Infantry Division Summary states that two(2) POW from the 44th Fortress Machine Gun Battalion were captured at 995196 at 1830 hours. They said they were told two days ago that a Panzer Division and two(2) Infantry Divisions were in the rear of their area and that those units would soon launch an offensive of major proportions.

Message Nr 5

15 December 1944 28th Infantry Division

2400 hours

9th Armored Division Summary states:

1. Enemy outpost personnel were more in evidence than usual during the day and appeared more confident.

2. Abrupt change of routine of personnel on the other side of the river strongly suggests new troops may have arrived on the front.

Message Nr 6

15 December 1944

28th Infantry Division

2400 hours

106th Infantry Division Summary:

1. Considerable vehicular activity was heard in the vicinity of coordinates 996806 at 0045 hours and all along the front from 1800 hours to the time of this report.

2. An enemy patrol consisting of 34 men was reported in ALLMUTHUN (040948) during the early morning.

3. Enemy observation planes were active over throughout the division sector early this evening.

4. A prisoner of war from the 2d Battalion 295th Regiment, 18th Volksgrenadier Division who was captured this afternoon says his unit arrived in this area on the afternoon of 14 December relieving an unknown unit which was to be pulled out for an attack along the entire front between the 17th and Christmas. POW had heard that SS* troops were to be used and that they would employ infiltration tactics. He further stated that in the area of his unit there were large generators and 40 large searchlight reflectors.

*Elite Nazi

APPENDIX B

REPORT FACTOR SCORES OF THE SCALE STRUCTURE

One way to depict the taxonomy resulting from the scale structure obtained, as applied to these reports, is to display the factor scores of the 40 reports in the calculated judgmental space.

Such displays have been produced by creating three dimensional models (Figures B1 through B3). For each model, the three axes of ACCURACY, RELEVANCE and DIRECTNESS form a coordinate system for displaying the location of each report in the subjects' judgment space.

Locations of each report in this factor space are based on the linear equation of the weighted combinations of each of the scale ratings, i.e., the factor scores of the reports calculated from their weighted scale averages. For the purposes of the display, the factor scores have been scaled relative to their maxima in each dimension.

Although this produces some distortion, the distortion is constant in all dimensions. Thus, relativized, the report locations are merely spread out more than they would be if not so scaled, but their positions relative to each other are as found in the analyses.

For purposes of the following discussion, the three dimensional (continuous) structure of the scale factor space for combined subjects is cut into eight discrete compartments (or octants). The reports falling into each of the compartments of the space are then analyzed.

The three factorial dimensions of the judgmental space depicted by Figure B3 for combined subjects can be envisioned as shown in Figure B4. In Figure B4a, for example, the three dimensions are shown as intersecting axes with each dimension extending from the origin or 0-point one unit measurement in both positive and negative directions. The Accuracy and Relevance axes define a horizontal plane. Accuracy and Directness dimensions define a vertical plane as do the Relevance and Directness axes. If each of the dimensions of the structure is considered to have a positive (+) and a negative (-) end or pole, the octants formed by the various combinations of the poles of the three dimensions can be defined, in order, by the

+ + + poles of the Accuracy, Relevance, and Directness factors (Octant 1), by the + + - (Octant 2), + - + (Octant 3), + - - (Octant 4), - + + (Octant 5), - + - (Octant 6), - - + (Octant 7) and - - - (Octant 8). The order of poles is Accuracy, Relevance, and Directness.

The three planes intersect along lines passing through the point of origin of the axes. Octant 1 is formed by the positive axes of all

three dimensions, as shown in Figure B4b, i.e., it has cubic form and lies in the upper far right hand corner of the judgmental space.

Octant 2 lies directly below Octant 1 and forms the lower far right hand compartment of the judgmental space, as shown in Figure B4c. In a similar manner, Octants 3-8 may be envisioned from their polar definitions. Figure B4d shows Figure B3 subdivided into octants but without the report positions being depicted.

There is high face (content) validity for the classification of each of the reports contained within each octant as described below. The reports falling within each octant are enumerated and their collective identity summarized. In addition, a typical report is cited to provide an appreciation for the type of report falling within that part of the judgmental space identified by the octant specified.

Octant 1: + Accuracy + Relevance + Directness. Reports 10, 18, 19, 24 26, 28 and 40 have values greater than zero on each of the three scalar factors. The common characteristic of these reports is enemy activity seen or heard by U. S. military forces, local friendly observers, and POWs.

The reports came from subordinate units of the 28th Infantry Division, including the Interrogation of Prisoner of War Team; adjacent divisions, and from local police units friendly to the Allied cause. The activity consisted of movements of supplies, troops, artillery, and river crossing equipment by trucks and horse-drawn vehicles; small arms firing and enemy reconnaissance in the form of patrols and observation aircraft.

The troop movements varied in size from patrols of small numbers of men to the entry into the area opposite the VIIIth Corps of a whole Panzer (Tank) division and the appearance of elite SS Troops. POW reports indicated preparations for an enemy attack, and those of friendly units described enemy actions as unusual and aggressive.

Report 40 (coordinate values of .17, .50 and .21) is among the highest rated reports in this octant. The text of the report was as follows:

15 December 1944 28th Infantry Division
24 hours
106th Infantry Division Summary:

1. Considerable vehicular activity was heard in the vicinity of coordinates 996806 at 0045 hours and all along the front from 1800 hours to the time of this report.

2. An enemy patrol consisting of 34 men was reported in ALLMUTHUN (040948) during the early morning.

3. Enemy observation planes were active overhead throughout the division sector early this evening.

4. A prisoner of war from the 2d Battalion 295th Regiment, 18th Volksgrenadier Division who was captured this afternoon says his unit arrived in this area on the afternoon of 14 December relieving an unknown unit which was to be pulled out for an attack along the entire front between the 17th and Christmas. POW had heard that SS troops were to be used and that they would employ infiltration tactics. He further stated that in the area of his unit there were large generators and 40 large searchlight reflectors.

Octant 2: + Accuracy + Relevance - Directness. Reports 11, 17, 27, 30, 33, 37 and 39 are located in this octant.

The common element of these reports is enemy changes all along the FEBA of the VII Corps from the 106th Infantry Division on the North of the 28th Infantry Division through the 28th and continuing into the 9th Armored Division on the South of the 28th, together with sizeable truck convoy and train movements carrying supplies and possible troops from the North into the enemy rear areas opposite the VIII Corps.

Four of the seven reports in this octant came from units other than the 28th Infantry Division. There was one each from the 106th Division and 9th Armored Division and two from VIII Corps G2.

Specifics other than truck convoy and train movements included increased small arms fire during hours of darkness and increased motor vehicle movements, both opposite the northern part of the VIII Corps sector, and obvious changes in enemy front line units such as increased activity, better discipline, better clothing for winter weather, greater self-confidence, and a different schedule of daily operations.

The text of Report 37, as representative of the octant, was as follows:

15 December 1944 28th Infantry Division
2400 Hours
28th Division Artillery Summary:

1. Observation Post 101 (964414) observers reported at 1040 hours the enemy in front of them were equipped with overcoats for the first time.

2. During the day when guards were changed, enemy soldiers double-timed to and from their posts and did quite a bit of saluting not observed before.

3. Vicinity 936436 and 958435 enemy did a lot of moving to and from pillboxes.

4. There was also quite a bit of foot traffic vicinity 965439 all day.

Octant 3: + Accuracy - Relevance + Directness. Reports 2, 7, 9, and 20 are in this octant. These reports in the 3d Octant are characterized by friendly front line troops seeing or hearing minor enemy activity such as small enemy patrols, small numbers of tanks and trucks and small arms, mortar and artillery fire.

Most analysts apparently failed to note that Report 9 is a false report, it being impossible to see the location at which the tanks were reported from the observation post whose personnel made the report.

In addition, the analysts failed to appreciate the fact that the appearance of TIGER tanks close to the front was unusual, and if they believed the report true they should have perceived a relevant threat since the opposing Volksgrenadier Divisions were not normally equipped with any tanks, much less the heavy TIGERS.

Report 2 is representative:

10 December 1944 28th Infantry Division
1500 Hours

3d Battalion, 110th Infantry Regiment reports it observed an 8-man enemy patrol in the vicinity of coordinates 851581 at 1115 hours. Enemy withdrew eastward and crossed river in a rubber boat which was found in the vicinity of 854584.

Octant 4: + Accuracy - Relevance - Directness. Reports 4, 8, 12, 14, 29, 32, 34, and 36 are located in this octant. The commonality of these reports is that the analyst-subjects regarded them as accurate but of such minor nature along the 28th and 4th Division fronts as not to constitute a relevant threat.

The activity consisted of small patrols which were not aggressive, light small arms and artillery fire, occasional aerial reconnaissance, one dead German with a map, and a report that enemy artillery had been kept well back from the front during the week and had not even been firing at usual targets.

Subjects apparently analyzed the reports in much the same way as the actual ones did in December 1944.

They missed the point that the dead German soldier (Report 29) had a map of the area in which he was found but that his unit was last reported much farther north, which should have led them to question whether his unit had moved south, which, in turn, could have been associated with other southward movements farther back in the enemy rear areas reported by aerial observers.

In addition, the subjects were apparently taken in by the artillery positions and relatively small amount of enemy artillery fire in the past week (Report 32).

This is understandable since it fitted the general Allied impression of the time that the Germans were in a defensive posture and short of ammunition. However, in this case it was part of German deception built on a past reality and our continuing belief in it abetted by German efforts to preserve the impression.

The text of Report 14 is typical:

13 December 1944 28th Infantry Division
0400 Hours

28th Division Artillery reports that at 0300 hours the 229th Field Artillery Battalion detected a two (2) man enemy patrol in the vicinity of its CP. The patrol withdrew when fired on.

Octant 5: - Accuracy + Relevance + Directness. Reports 5, 16, 21, 31, and 38 are located in this octant. Analysts correctly evaluated the relevant and dangerous nature of these reports, if true: increased numbers of troops in towns near the front lines, recall of men from rear area schools to front line units for an attack; forward moves of a division CP; units shifting along the front, and three new reserve divisions in the enemy rear area.

However, they placed no credence in POW reports, nor even in those of civilians characterized by local police as reliable. Additionally, many may have recognized Report 21 as really false. If they checked their maps and knew their tactics they realized that the place reported as the new location of the 26th VG Division Command Post was entirely too close to the FEBA.

The text of Report 16 is representative:

13 December 1944 28th Infantry Division
2100 Hours

4th Infantry Division reports that a deserter from the 2d Battalion, 316th Regiment, 212th Volksgrenadier Division stated:

a. The 320th Regiment of the Division was on line for about two weeks but is now in reserve.

b. Approximately 600 men on special types of duty in rear areas were called back to the 316th and 423rd Regiments of the 212th Volksgrenadier Division by a secret order on 11 December. They were told to return to their regiments immediately because they were needed for an upcoming attack against the thinly held American line. These men for the most part had been attending non-commissioned officer schools.

c. Morale of German troops in his division is good to very good.

Octant 6: - Accuracy + Relevance - Directness. Reports 6, 13, and 22 are within this octant. The rationale for this grouping is hard to explain. Two reports (#6 and #13) are of major importance. The third report (#22) is rather minor and seems out of place.

Move of an Army Headquarters southward (Report #6) is significant even though the withdrawal across the Rhine appears unlikely for the reasons stated. The relevant threat was recognized if the report were true. The POW was probably not considered reliable, and rightly the withdrawal across the Rhine was not believed.

Report #13 also represents a relevant threat since it indicates a buildup of at least three divisions opposite VIII Corps and First Army. However, at least part of the report originated with a POW, and from the position on the west bank of the Moselle, the three divisions could be used against the north flank of the Third Army to the south as well as against First Army.

Apparently, for that reason, the subjects did not believe the report accurate or infer much from it.

On the other hand, Report #22 is a straightforward front line report of hearing enemy vehicles three times in the early morning, although conditions were such that the direction or size of the movement could not be determined. One would have expected such a report to fall into Octants 3 (+ - +) or 4 (+ - -) rather than into Octant 6 (- + -).

The text of Report 6 which is a false message added to the data set was:

11 December 1944 28th Infantry Division
1200 Hours

106th Infantry Division reports a deserter who surrendered 9 December says he is from Headquarters 15th Army which recently moved from the Rotterdam area to a location in the Cologne-Bonn-Dueren area. Rumor at his Headquarters is that Field Marshal von Rundstedt has ordered withdrawal to the East bank of the Rhine because shortage of reserves will make defense west of the Rhine no longer feasible after the first of the year.

Octant 7: - Accuracy - Relevance + Directness. Reports 1 and 23 are located in this octant. Both of these reports originated with deserters, whom the subjects apparently do not trust, and the information reported consists of minor locations of only local interest.

Report #23 is false because the deserter says he was born in Strasbourg which is in the Franco-German border area and all such soldiers had been screened out of the German front line units during November and December 1944 to prevent just such desertions.

The test of Report 23 was as follows:

14 December 1944 28th Infantry Division
1015 Hours

1st Battalion, 110th Infantry Regiment reports that an enemy deserter picked up at 132300 hours in TINTESMUEHLE, a small village at coordinates 850673 at the bend in the river east of HEINERSCHEID (821675) and SE of KALBORN (840682) says he was born in STRASBOURG.* He stated that the machine gun covering the ruins of the bridge at coordinates 850672 was moved on 7 December to a better location 100 meters from its former position where it can fire directly down the center line of the old bridge.

Octant 8: - Accuracy - Relevance - Directness. Reports 3, 15, and 35 are located in this octant. In content, all of these messages have information which is of minor importance or irrelevant to the 28th Division. In two out of three cases, it is one day to 15 days late.

Report #15 is false, since a patrol from the 3d Battalion, 110th Infantry Regiment would not have been that far south without an explanation having been given, and Report #35 is false since it is unlikely that the Germans would have let a railroad employee visit relatives behind Allied lines just before the counteroffensive.

It appears that the subjects correctly analyzed these reports except for #3, with respect to Accuracy. They had no apparent basis for calling the report from the 3d Battalion, 110th Infantry Regiment inaccurate.

The text of Report 35, still another fake message, was as follows:

15 December 1944 28th Infantry Division
0600 Hours

4th Infantry Division Interrogation of Prisoner of War Team report states that a German national from SAARBRUECKEN** was picked up while

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*On West Bank of the Rhine, Southeast of the VII Corps sector.

**Opposite Third Army Zone to the Southeast.

visiting relatives vicinity Luxembourg City on 6 December. He claims he is an employee of the German Railroad System. He further states that on 30 November the marshalling yards in ZWEIBRUECKEN* were tied up for six hours when two carloads of explosives collided and exploded.

To this point, it has been established that the judgmental space employed by the subjects in evaluating the sample of intelligence reports is coherent and produces groupings of the reports which reflect the nature of the content of the judgmental spaces.

Although the examination of the reports in each of the octants of the combined judgment space may have raised some questions about the value of the RELEVANCE and DIRECTNESS dimensions, it is clear that the ACCURACY dimension plays a major role in the subjects' evaluation of the reports.

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*Opposite Third Army Zone to the Southeast.

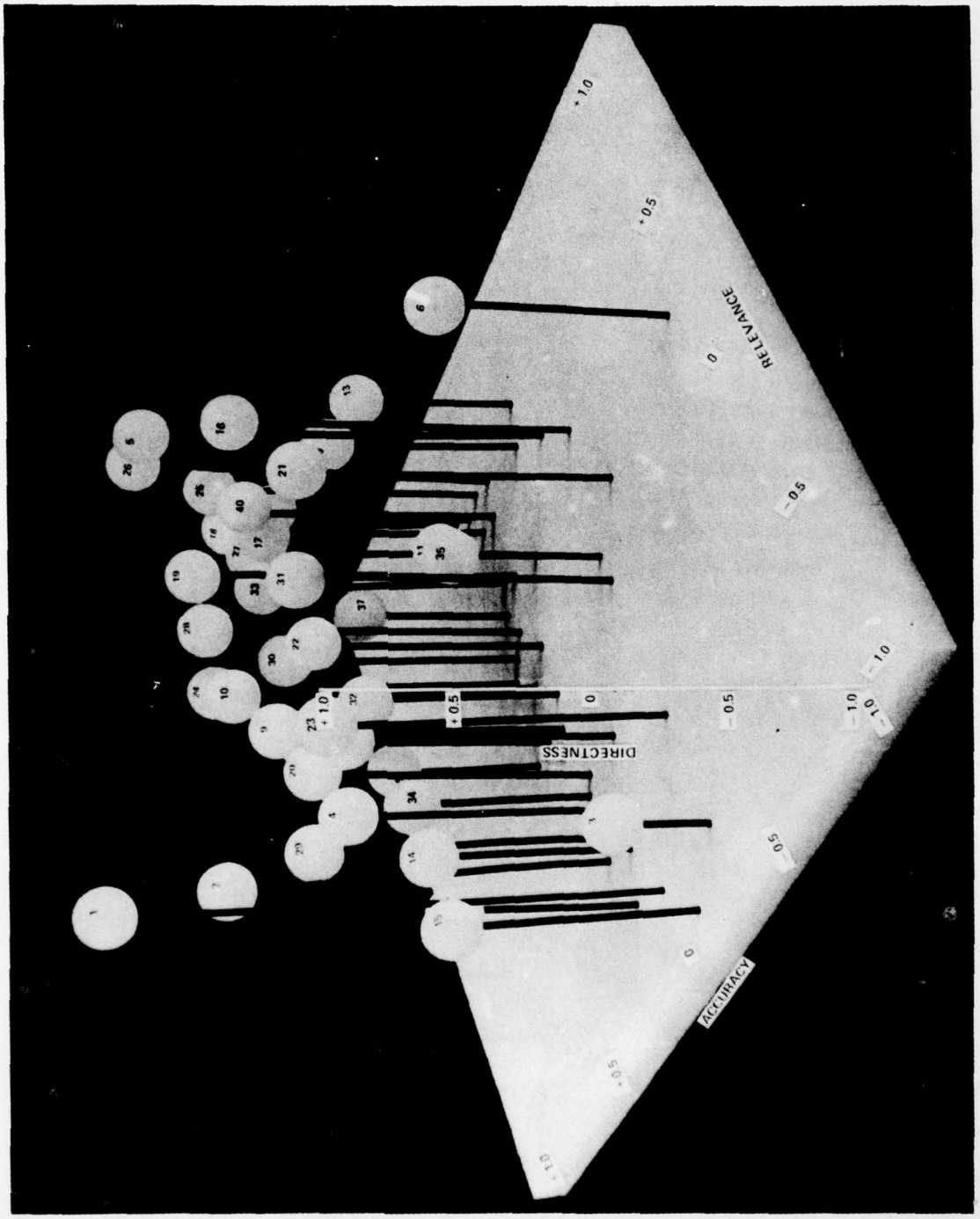

Figure B-1. Report Attribute Structure: Untrained Subjects

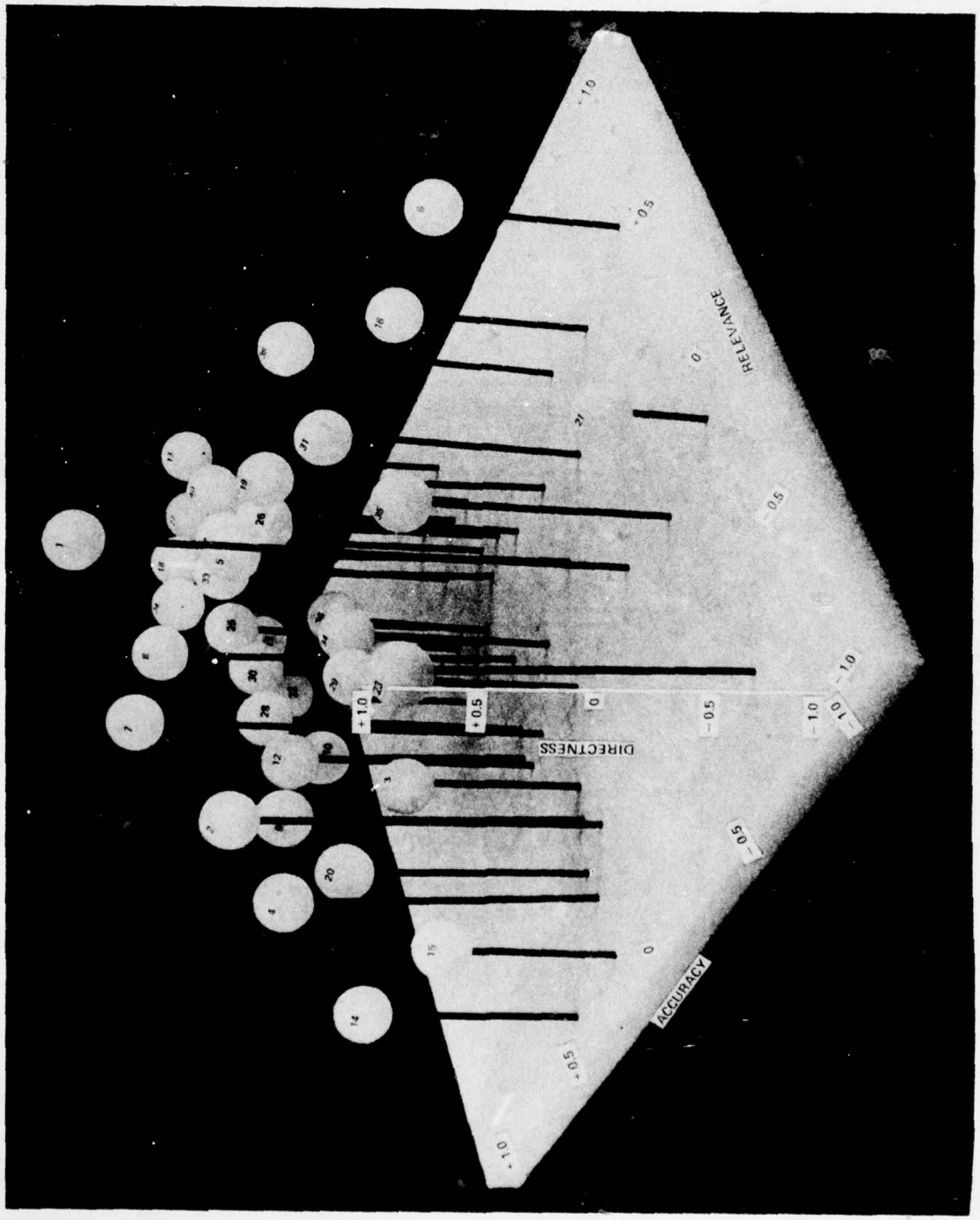

Figure B-2. Report Attribute Structure: Trained Subjects

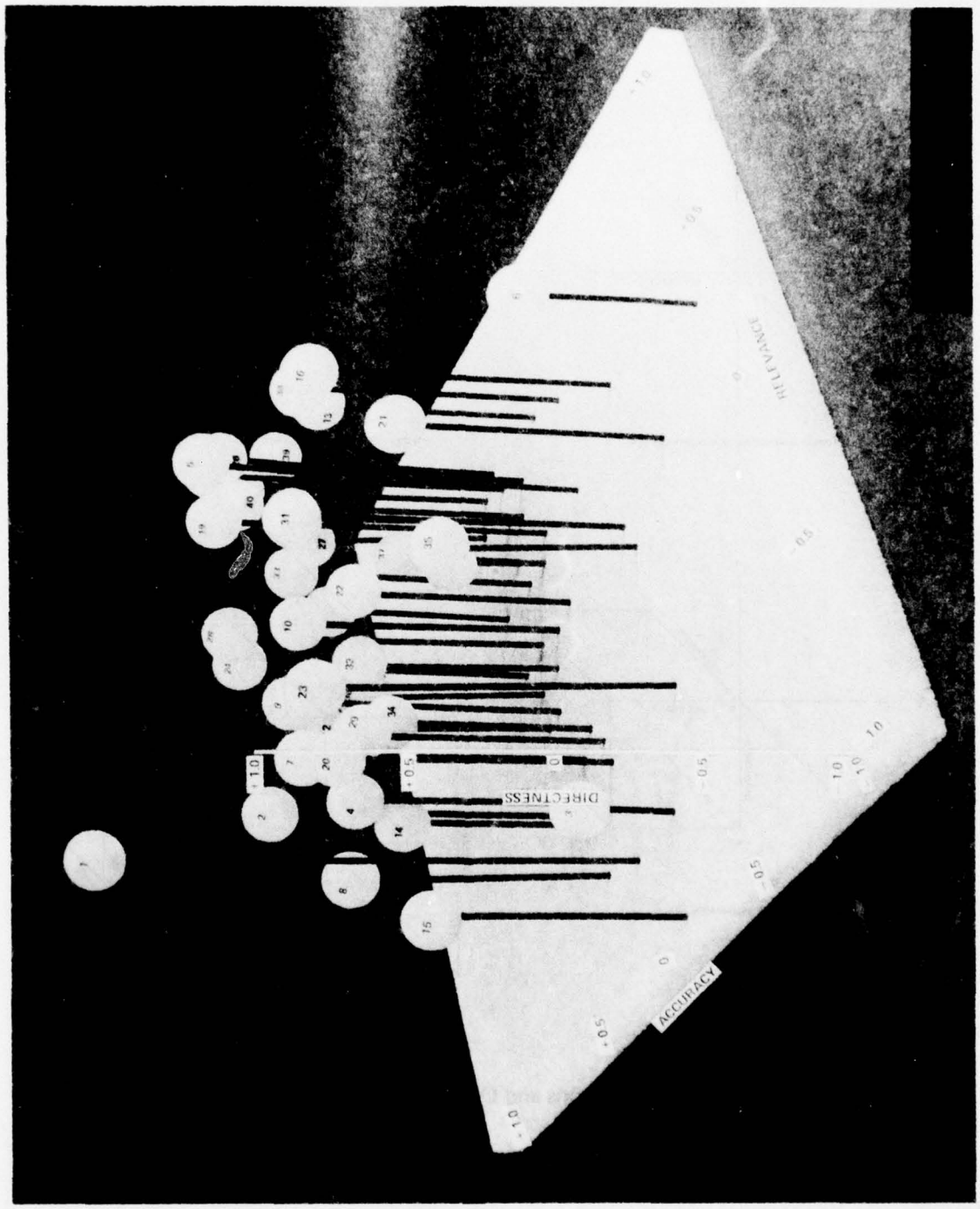

Figure B-3. Report Attribute Structure: Combined Subject Groups

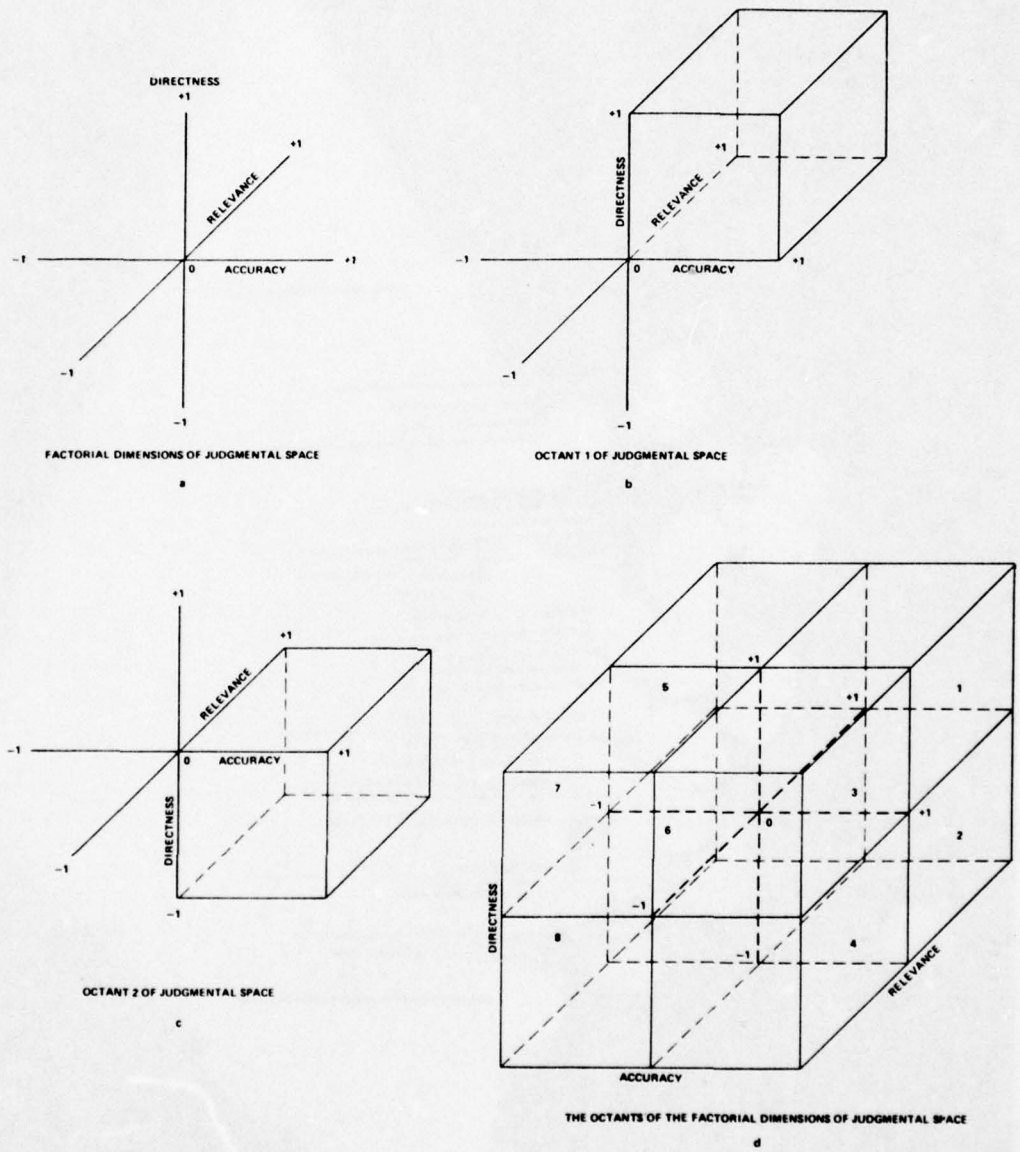

Figure B-4. Factorial Dimensions and Octants of Judgmental Space

APPENDIX C

ANALYSIS OF RELATIONSHIPS AMONG ACCURACY, RELIABILITY, AND OTHER SCALES

The polar coordinate plots of Figures C-1 through C-9 in which the correlations of the Reliability (Scale 47), Accuracy (Scale 48)*, and combined Global ratings (Scale 51) with all other report characteristics are depicted, are designed to display the patterns of zero-order relationships for these particular scales.

Each 5-degree radius of the plots, starting at zero degrees (center, top) through 255 degrees, represents, in order, the 50 scales plus a derived 51st scale which is the average of the two separate global ratings (Nos. 49 and 50). The center of the plot represents either the Reliability (Scale 47), the Accuracy (Scale 48), or Combined (average) Global (Scale 51) ratings.

The length of the polar vector outward from the scale used as the basis of comparison expresses the degree of relationship to that base scale as indexed by the Pearson Product Moment correlation coefficient. The farther the end of the scale vector from the center of the figure, the greater the relationship between the scales.

The plots display only correlations accounting for more than half of the correlating variance. No vectors have been drawn for scales whose correlation with the base scale is less than an absolute value of .70. This value was arbitrarily chosen so as to select only those scales with the greatest predictive relationships.

The correlations displayed in these plots have been derived by using subject averages as entries and thus reflect the degree of relationship between each scale with respect to the similarity of dissimilarity in the ratings of the 40 reports.

Thus, a high correlation between two scales indicated that the average subject of his particular group tended to rate the reports as being similar with respect to those qualities.

For example, if Reports 1, 6, 10, and 30 were rated by the average subject as being very accurate and these same reports were also rated as being highly reliable, then the correlation between Accuracy and Reliability would be high.

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*See Figure 4 for the scales corresponding to the numbered identifications.

Reliability Relationships. Figures C-1 through C-3 display the relationships between the Reliability (Scale 47) and all other scales.

Inspection of the figures reveals that scales rating True-False (Scale 2), Dependable-Undependable (Scale 17), Truthful-Deceptive (Scale 21), Accurate-Erroneous (Scale 31), and Accuracy (Scale 48)* all have correlations in excess of .90 for the untrained subject group.

The trained subjects produced highest correlations with reliability for the scales rating True-False (Scale 2), Dependable-Undependable (Scale 17), Accuracy (Scale 48), Global-1 (Scale 49), Global-2 (Scale 50). For the combined subjects, Reliability was most closely associated with the ratings of Dependable-Undependable and Accuracy.

Accuracy Relationships. Figures C-4 through C-6 display the relationships between Accuracy (Scale 48) ratings and all other scalar qualities.

Inspection of the figures indicates that Accuracy correlates beyond .90 with True (Scale 2) (opposites henceforth dropped), Dependable (Scale 17), Truthful (Scale 21), Faultless (Scale 29), Acceptable (Scale 38), Reliability (Scale 47), and all Global scales (49, 50 and 51).

The trained subjects also displayed highest relationships between Accuracy and the above scales excepting Dependable, Faultless (Scale 29), and Acceptable (Scale 38).

The combined groups produced highest relationships between Accuracy and True, Dependable, Truthful, Faultless (Scale 29), Accurate (Scale 31), Confirmed (Scale 40), Reliability, and all Global ratings (Scales 49, 50, and 51).

Global Relationships. Figures C-7 through C-9 display the Combined Global (Scale 51) relationships. The untrained subject group rated True (Scale 2), Accuracy (Scale 48), Global-1 (Scale 49) and Global-2 (Scale 50) as most closely associated with the Combined Global variable.

Obviously the high correlations between the separate and combined global ratings are considered as instrument relationships and should be discounted.

The trained subject group correlations indicate highest relationships between the Combined Global score and True, Truthful, Accurate, Reliability, Accuracy and the separate Global ratings.

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*Note that the intelligence ratings as traditionally employed are referred to as Accuracy and Reliability. The quality scales, on the other hand, are referred to as Accurate-Erroneous and Reliable-Variable. See Figure 4.

The combined subject groups display highest relationships with True, Dependable, Truthful, Faultless, Accurate, Confirmed, Accuracy, and the separate Globals.

Cluster Relationships. Figure C-10 displays the cluster groupings around the Accuracy, Reliability and Global variables of the scalar qualities for each of the subject groupings.

For the purposes of this display, that scale having the highest correlation with each of the primary variables is identified by the arrow from it to the next variable.

The correlation matrix is then searched for that variable which has the highest relationship with this second variable and so on until one of the subsequent variables has its highest correlation with one of the previously identified variables already displayed.

Such clusters can be interpreted as the most conservative ordering of the scale relationships since, at each successive step, only the highest correlation with each variable is considered.

All correlations of these clusters excepting that for the untrained subjects with respect to the correlation between Scales 51 (Combined Global) and 49 (Global-1) (its value being .91), are in fact, in excess of .94.

These analyses of the zero-order relationships indicate quite clearly that the Reliability and Accuracy ratings are highly correlated in both the trained and untrained analyst groups. For the total subject group, the correlation is in excess of .95.

Reliability is being assessed by these subjects as if it were a measure of the truthfulness, acceptability and accuracy of the intelligence message. The training of these subjects does not change the pattern significantly.

Also, with respect to the traditionally employed scales Reliability and Accuracy, Accuracy is the better single measure. The judged Reliability of the message is being determined by the judged Accuracy rather than vice versa.

To some estent, this result was inherent in the test given the subjects. Accuracy is a one-time evaluation of each report, but Reliability of source or agency, if determined correctly, can be built up only over a period of time as the analyst works with the reports of each source or agency and develops an appreciation of their reliability from opportunities which arise to check on the information as reported.

This fact in itself indicates how dependent Reliability is on the average Accuracy of reports from any given source or agency submitted over a period of time.

In the test situation, the subjects were initially forced to infer Reliability from other qualities of each report or to make assumptions about it based on the nature of the source or agency, e.g., patrols, subordinate units G2s and S2s, the Divisional IPW team, G2s of adjacent divisions or higher headquarters, Air Corps pilots, friendly and enemy civilians (except in those cases in which local police made an evaluation), friendly local police, POWs and deserters.

However, despite this difficulty, findings of this study correspond to those of earlier studies of the traditional Accuracy and Reliability Scales by indicating a high degree of inter-correlation in their use (see Samet, 1975).

Accuracy ratings are apparently well assessed by the Global scale ratings. Significantly, the Global Scale rating appears to be a purer measure of the accuracy of the messages than is the standard Accuracy measurement.

Examination of Figure C-10 indicates that the cluster chains for the Global ratings do not extend beyond their own sub-components.

Although Reliability does correlate with the average Global ratings in the combined, trained and untrained subject samples, the A-F Reliability ratings are not as highly correlated with the Global ratings as they are with the 1-6 Accuracy judgments.

The conclusion is straightforward. The Reliability ratings, as taken from this sample of subjects with this set of messages, were nearly useless and the accuracy ratings are more purely and thus better measured by the Global rating.

Considering that fewer instructions are required for use of the Global scale compared to those required for use of the Accuracy scale, the use of Global ratings instead of the present Reliability and Accuracy ratings might improve the quality of the initial ratings of information accuracy as well as subsequent understanding of the meaning of the ratings (Samet, 1975).

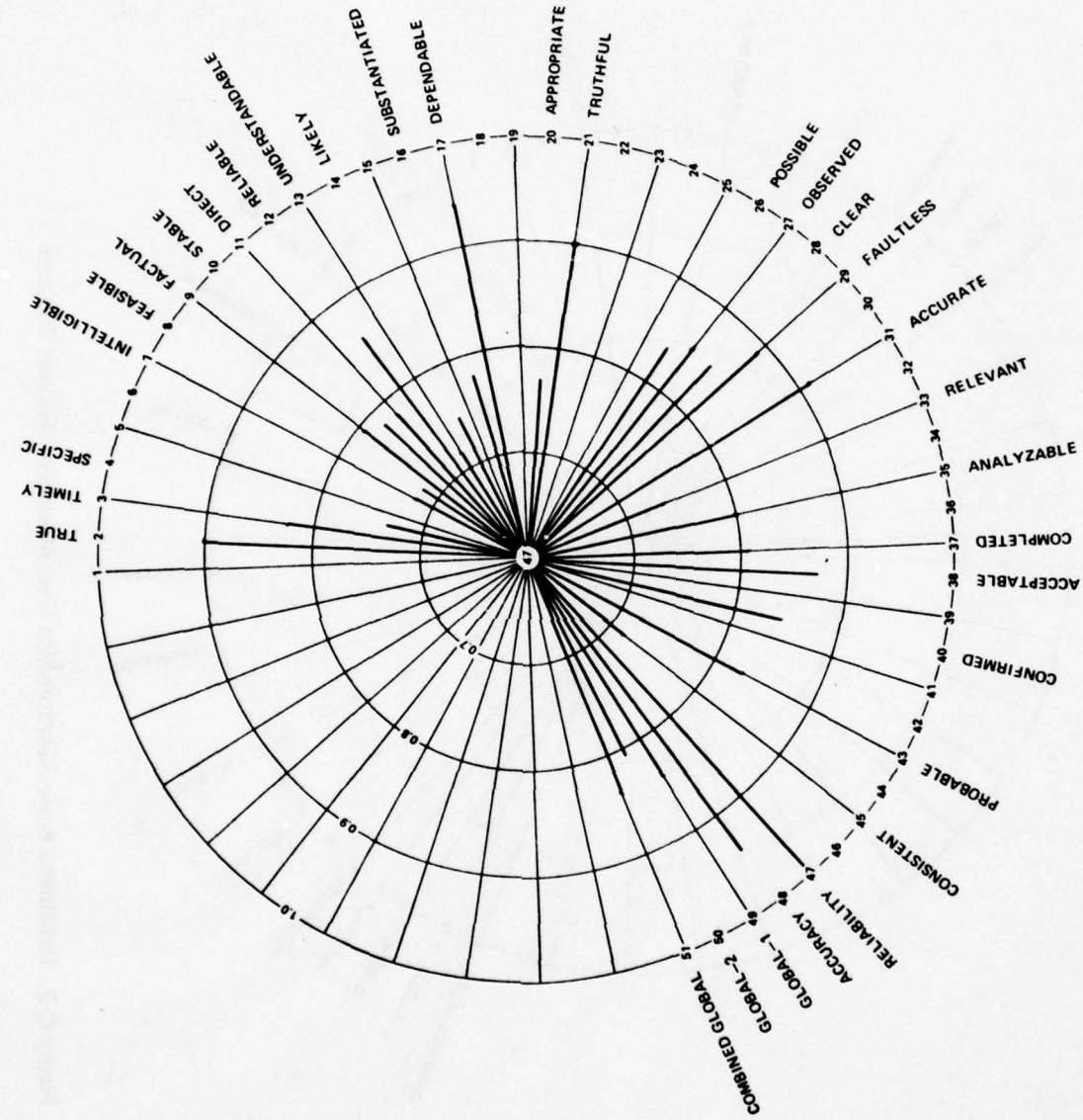

Figure C-1. Reliability Scale Relationships Over Messages: Untrained Subjects

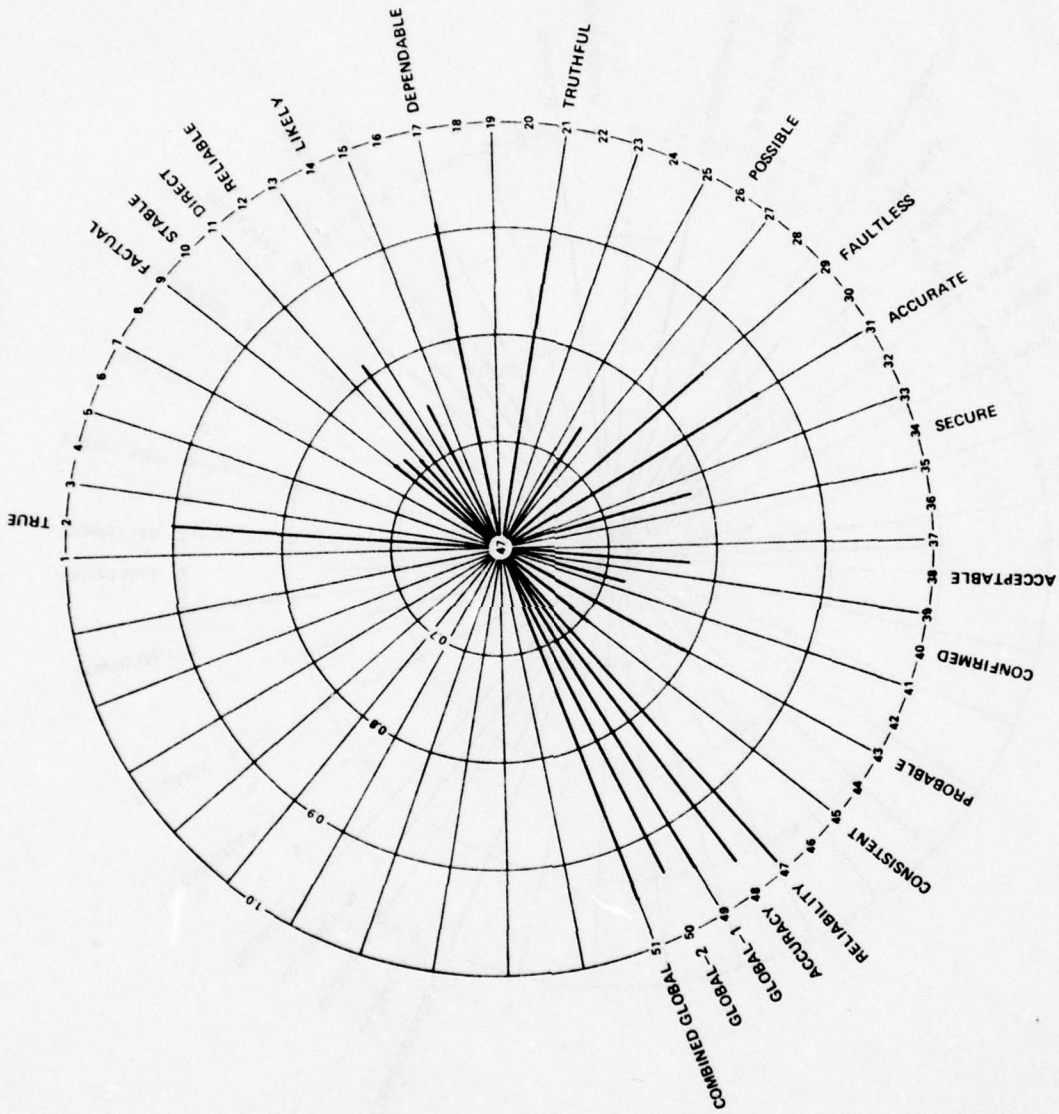

Figure C-2. Reliability Scale Relationships Over Messages: Trained Subjects

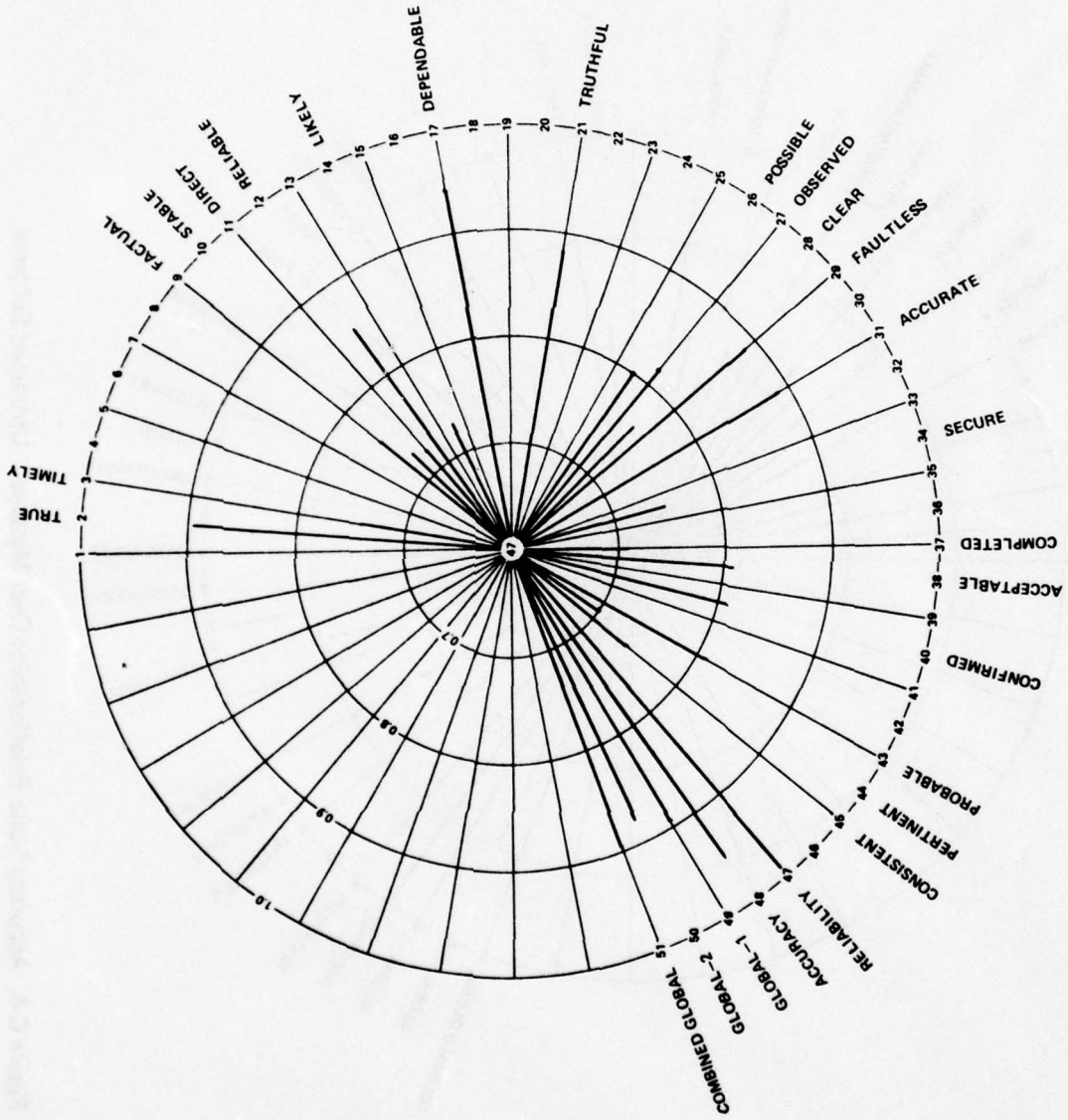

Figure C-3. Reliability Scale Relationships Over Messages: Combined Subject Groups

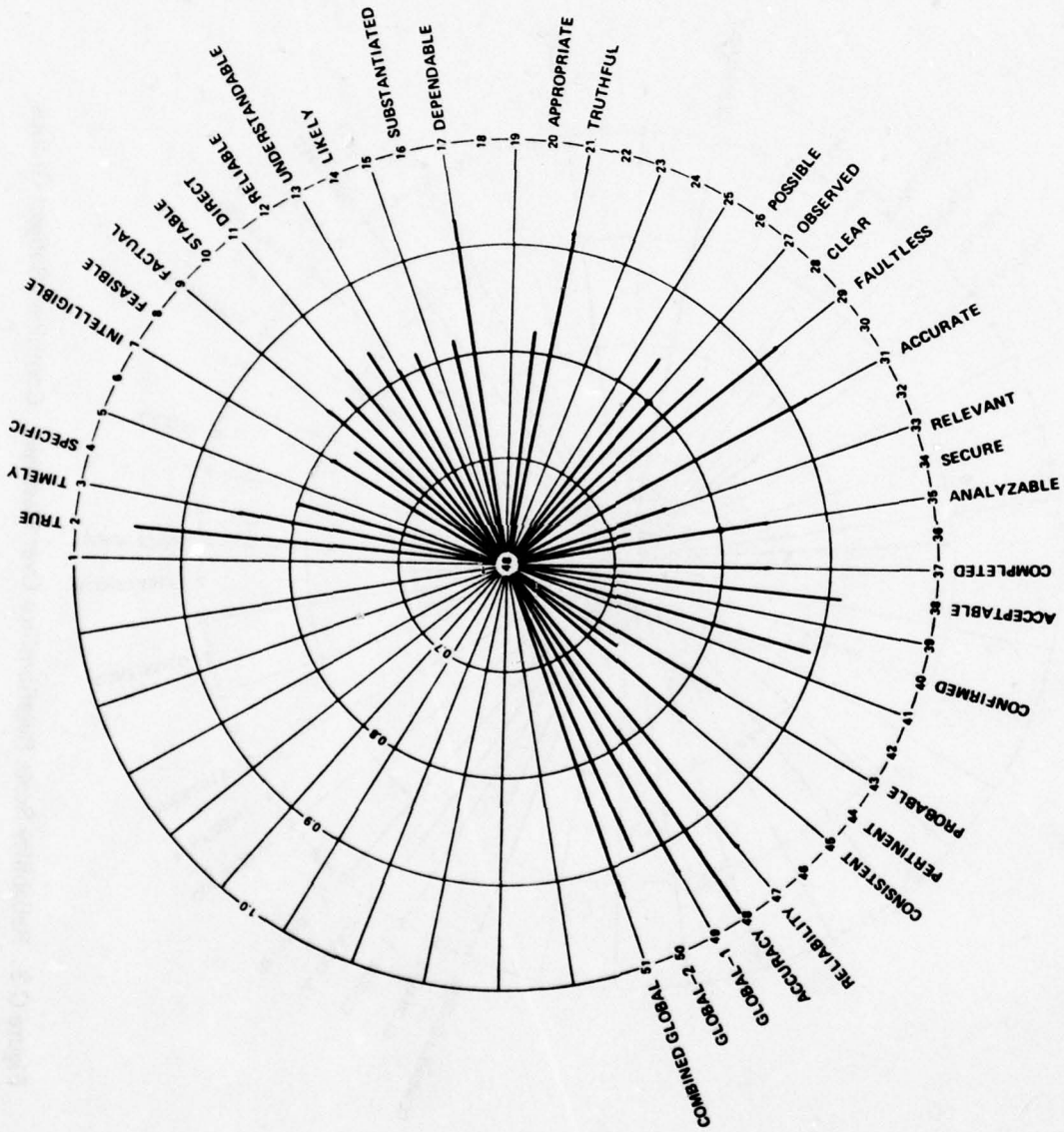

Figure C-4. Accuracy Scale Relationships Over Messages: Untrained Subjects

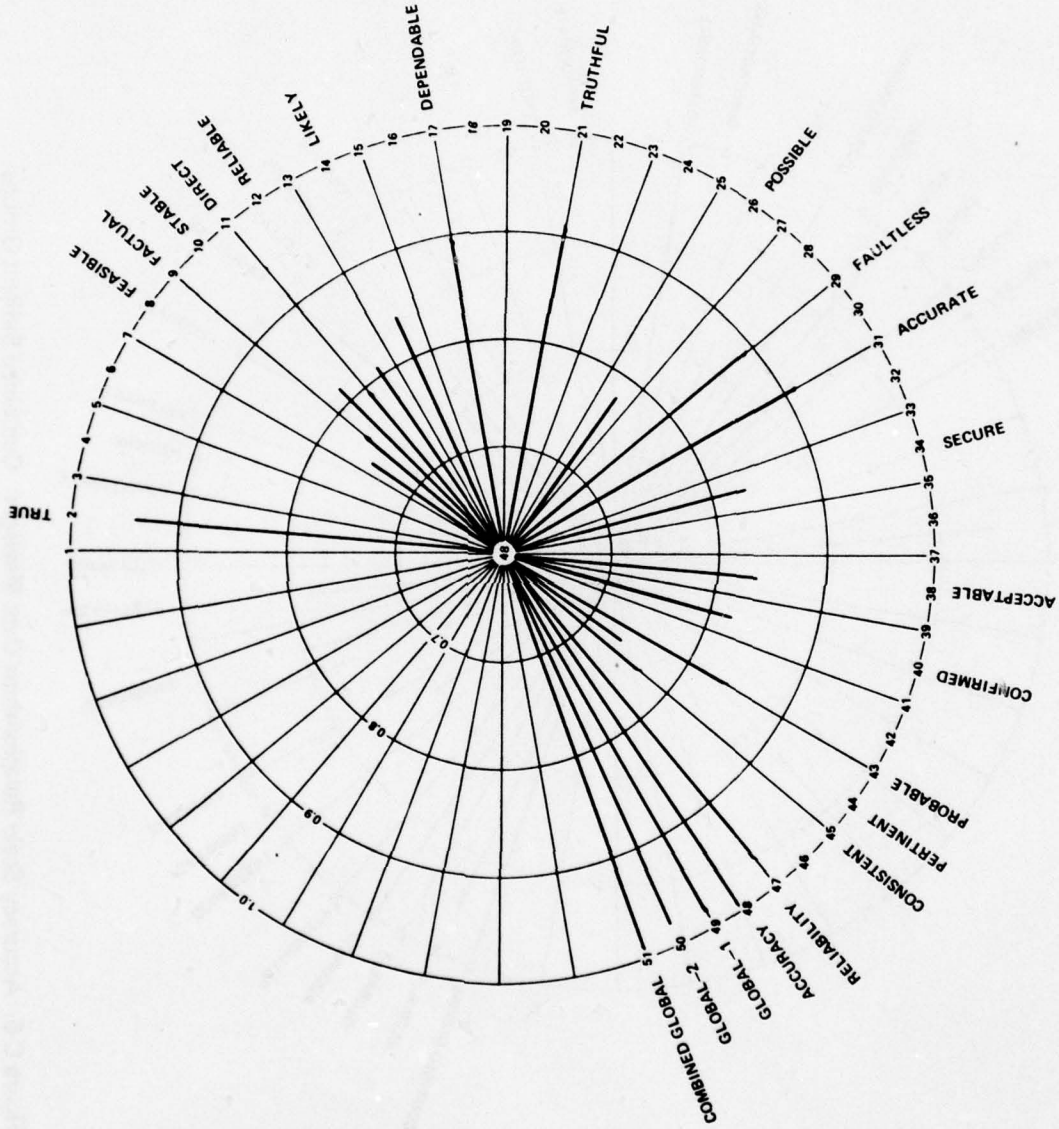

Figure C-5. Accuracy Scale Relationships Over Messages: Trained Subjects

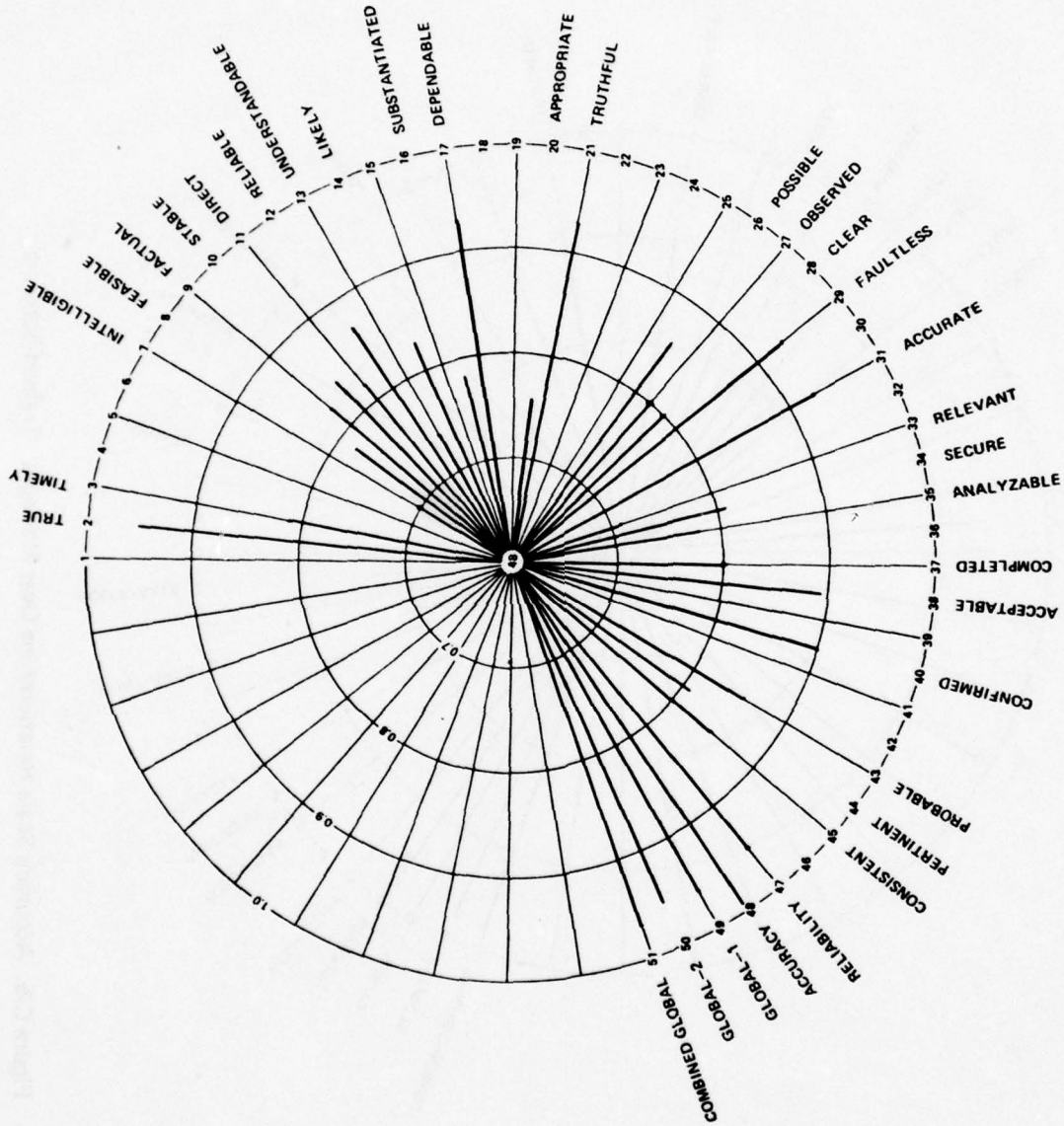

Figure C-6. Accuracy Scale Relationships Over Messages: Combined Subject Groups

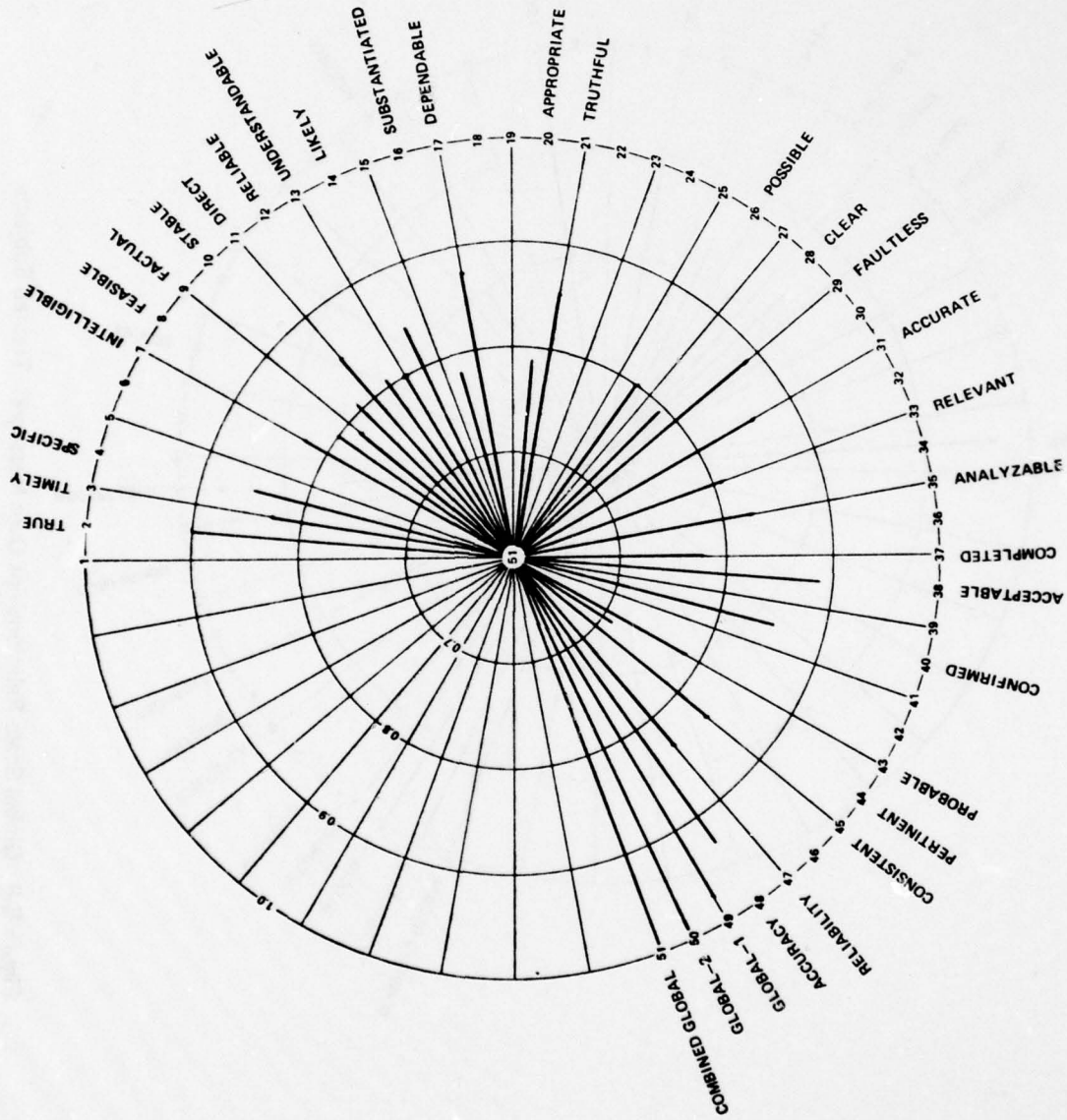

Figure C-7. Global Scale Relationships Over Messages: Untrained Subjects

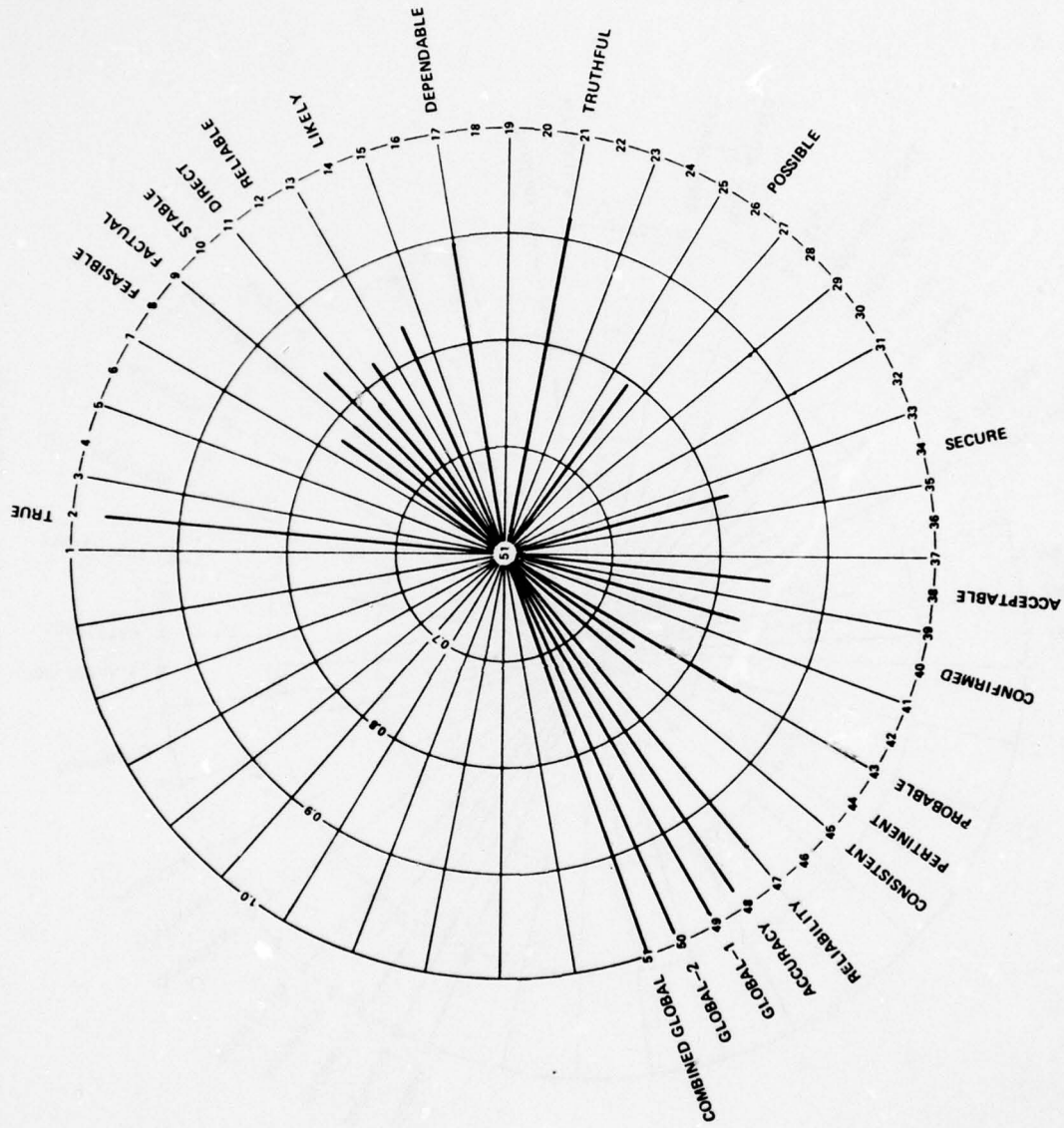

Figure C-8. Global Scale Relationships Over Messages: Trained Subjects

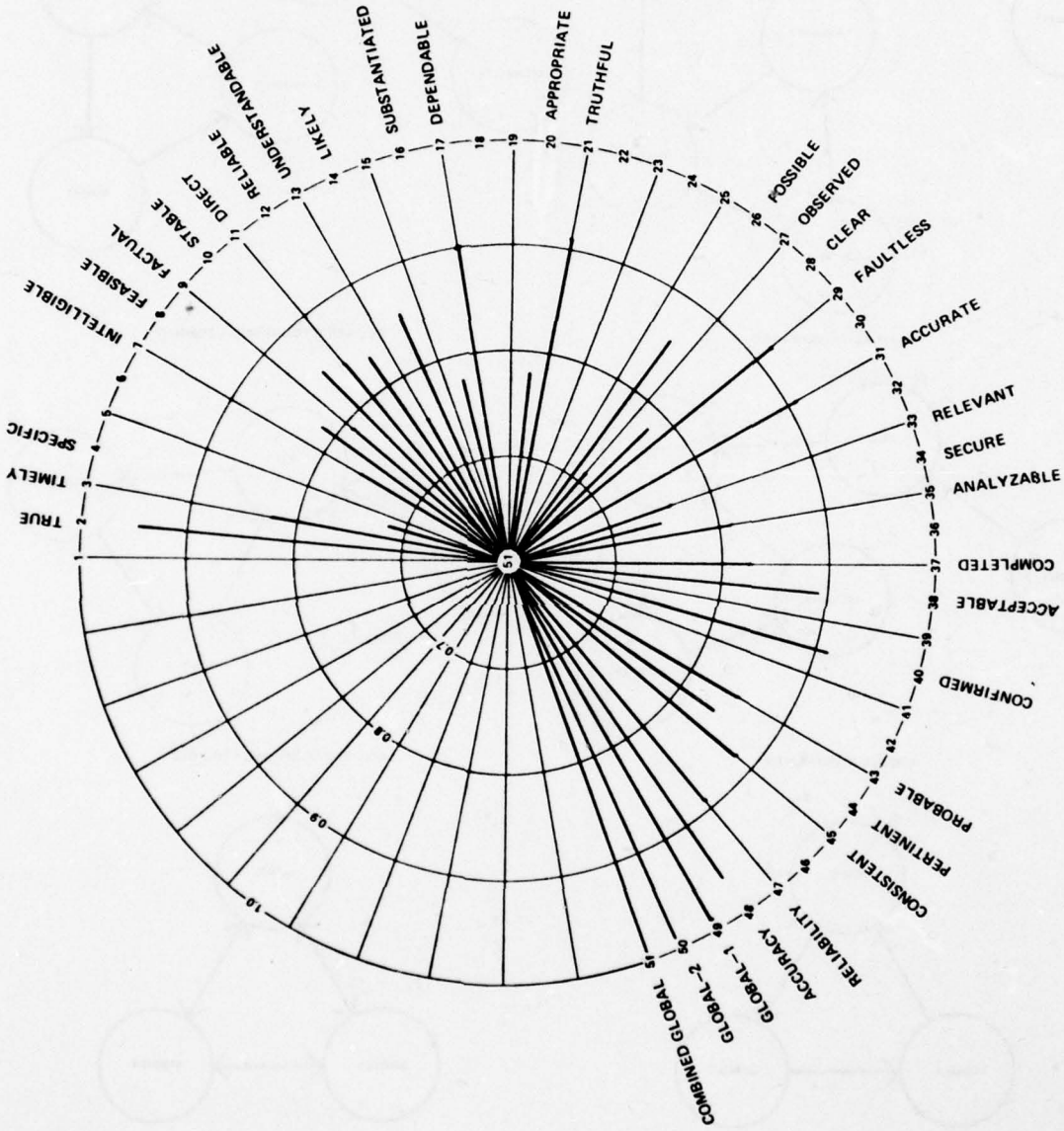

Figure C-9. Global Scale Relationships Over Messages: Combined Subject Groups

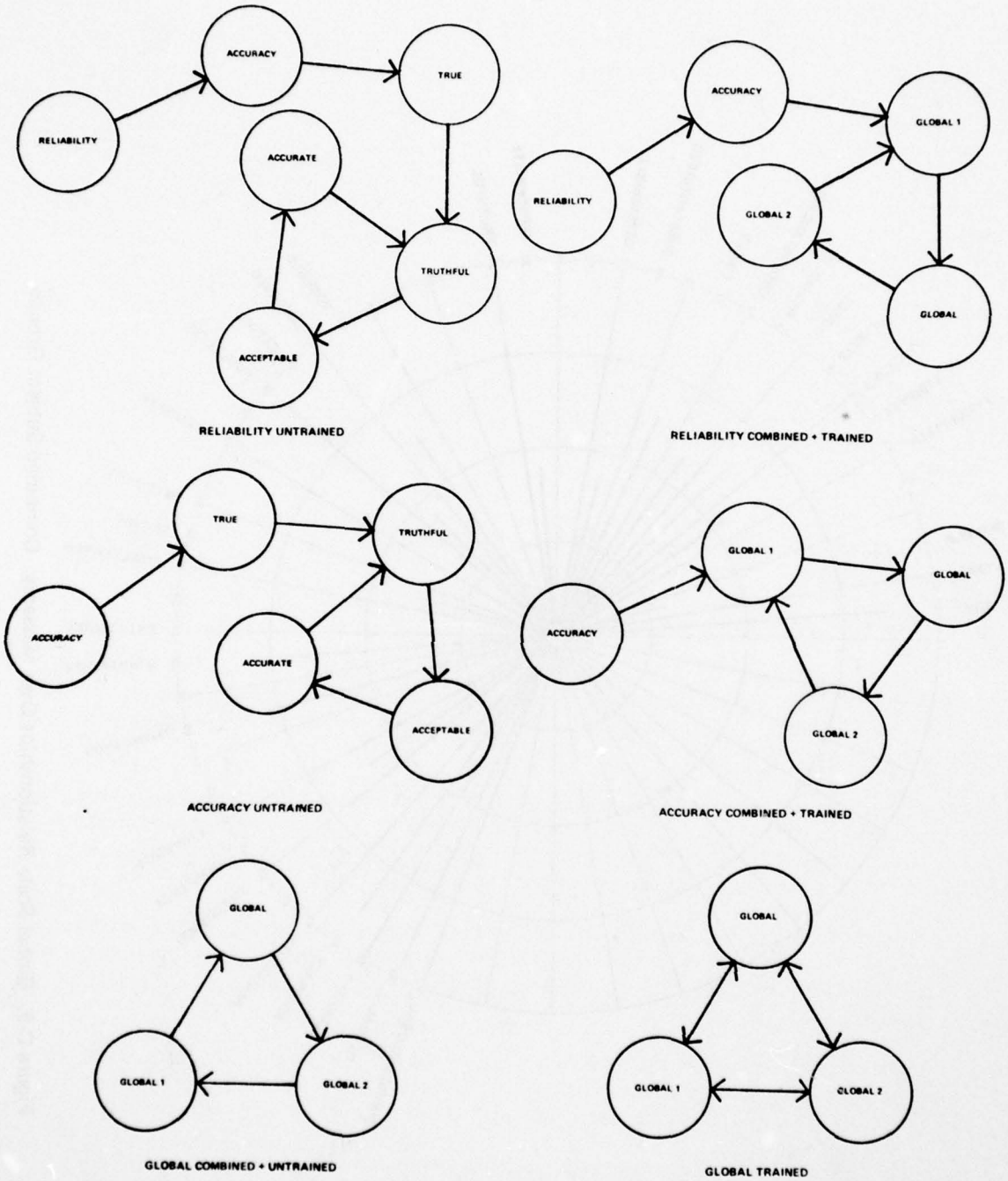

Figure C-10. Cluster Groupings of Reliability, Accuracy and Global Ratings

APPENDIX D

STEP MULTIPLE REGRESSION ANALYSES

The following discussion presents still another way of assessing the judgmental characteristics of the Accuracy and Reliability ratings. In what follows, we shall be concerned with the degree and quality of the Accuracy and Reliability ratings as predicted by their multiple relationships with the other scales employed.

In these analyses, we shall consider the patterns of ratings which mutually predict the two forms of ratings as criteria with respect to both subject and report averages.

Analyses Employing Subjects as Observations. As indicated in the statistical procedures of Figure 3 (Analyses IV: A through C), these analyses were made by averaging over the individual reports for each subject's scale judgments.

These mean report observations on each subject and scale were multiply intercorrelated over the subject scores against the successively isolated criterion variables of Reliability (Scale 47), Accuracy (Scale 48), and Combined Global (Scale 51)* ratings for each of the separately considered subject groupings.

These combinations produced a total of nine separate scale analyses; three subject groupings by three criterion variables. The summary results of each of these multiple regression analyses are displayed in Tables D1 through D3.

All displays record the order in which each new variable was added to the criterion predictive set and the resultant multiple correlation of the total predictive set after each step. Variables are added to the equation at each step so as to maximize the multiple R.

The first step of each display records that zero-order relationship between the criterion and the single predictor variable with greatest correlation. Subsequent steps are multiple correlations between the criterion and the cumulative set of predictors.

When subjects are used as observations for the correlations among scale quailties, the interpretation of these multiple Rs is different from that when reports are used as observations, as discussed below.

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*In all of the following regression analyses, the two separate Global ratings have been combined into a single variable by averaging their separate values. The new variable is numbered Scale 51 (see also discussion above), and Scales 49 and 50 corresponding to Global-1 and Global-2 have been dropped.

Here, the correlations reflect the degree to which each subject, without regard to report ratings, tends to use the scale attributes in the same manner. We have to ask "Is there a consistent pattern of scale usage across differing subjects?" and "Do differing subjects use the scale attributes similarly or differently?"

The answer to these questions is expressed by the maximum value of the multiple R achieved at the final step of the analysis. If subjects tend to have report-averaged ratings on one scale which multiply covary with other scales, the multiple R will be high.

An inspection of the results indicates that the maximum multiple R achieved after entering 15 variables is uniformly equal to or greater than .90 for all analyses.

That means that something more than 80% of the total subject rating variance in the criterion variables can be accounted for by on 15 of the scalar qualities. It remains to determine only the particular scalar qualities in each analysis which are determining that variance.

With Reliability as criterion variable and considering only the combined subject sample, more than half the obtained subject variability in the reliability ratings is accounted for by the Accuracy and Global scales. The remaining variance of the Reliability ratings is accounted for by the scales:

Appropriate (20), Accurate (31), Possible (26), Active (1), Hazardous (22), Timely (3), Dependable (17), Expected (23), Extraordinary (6), Widespread (30), Heavy (25), Truthful (21), and Massive (15)* in that order, in short, by the determinants of Threat Potential, Accuracy, Expectedness and Dependability.

With Accuracy as the criterion variable, more than 80% of the total variance of the combined subject sample is accounted for by the qualities of Reliability, Acceptableness, Accuracy, Activeness, and Probableness (Table D2).

The scales, in order, are Reliability (47), Acceptable (38), Confirmed (40), Accurate (31), Faultless (29), Massive (15) Useful (18), Active (1), Probable (43), Possible (26), True (2), Dependable (17), Extraordinary (6), Direct (11) and Relevant (33).

*Only one pole of the bipolar pairs is used and it has been reflected to common direction (see Figure 4).

With the average Global rating (Scale 51) as the criterion variable, more than 80% of the total variance of the combined subject sample is accounted for by the characteristics of Accuracy, Intelligibility, Massiveness, Consistency, and Usefulness (Table D-3).

The scales, in order, are: True (2), Intelligible (7), Reliability (47), Probable (43), Direct (11), Clear (28), Interpreted (32), Widespread (30), Extraordinary (6), Consistent (45), Useful (18), Massive (15), Precarious (5), Faultless (29), and Truthful (21).

Analyses Employing Reports as Observations. For the purposes of these analyses each report was treated as a separate observation by taking means across the appropriate subject groupings on each of the rating scales (see Tables D-4 through D-6).

Such analyses assess the multiple correlations of the scale qualities with respect to the separately considered reports. Thus, patterns of inter-relationships indicate the degree to which the characteristics of the reports tend to covary.

These analyses are in a sense more conservative explanations of the scalar structure than the previous subject analyses. Only the report variance in scale usage need be accounted for instead of the larger subject variance.

Reports which are judged by the averaged subject sample to have high ratings on more than one attribute will show high correlation with those other attributes.

The multiple Rs of these analyses are uniformly higher than in the previous analyses. The 15 variables for each of the criterion variables across the separate and combined subject groupings account for either all (R = 1.00) or very nearly all (R = .99) of the report variance obtained with respect to these attributes.

In point of fact, the zero-order correlations of the first step of each of these analyses contribute more than 81% of the criterion variance alone.

For the trained, untrained, and combined subject groupings, the single best predictor of the reliability ratings is Accuracy (Scale 48) (Table D-4). Dependable (Scale 17) and Consistent (Scale 45) improve the determination for the combined subjects, with Dependable being the second highest determinant in the separate groupings.

All subject groupings indicate that Reliability (Scale 47) and Global (Scales 49 and 50 or 51) ratings are the two highest determinants of the Accuracy ratings when considered with respect to report variance.

The single best predictor of the Combined Global rating is Accuracy (Scale 48) for all subject groupings, with percent of accounted variance in excess of 81%.

In summary of these multiple Regression Analyses, it can be said that they are consistent with, confirm, and extend the earlier conclusions regarding the traditionally employed scales of Accuracy and Reliability.

It can be seen that the Global rating is a purer assessment of what is being measured by the Accuracy rating; Accuracy judgments being heavily influenced by the subjects' Reliability assessments. Reliability, on the other hand, is influenced by other attributes.

The Reliability assessments of the reports employed is significantly based on an assessment of the internal consistency of the messages and the likelihood of their content.

With respect to report variance, Accuracy and Reliability ratings are each predicted by the other, for both trained and untrained subjects. For the Reliability ratings, the single best predictor (R = .94) is Accuracy in both groups of subjects.

Accuracy is also predicted by Reliability in both subject groups with R = .94. On the other hand, the multiple predictions of Reliability and Accuracy analyzed with respect to subject differences indicate that Reliability judgments are predicted only by the Accuracy ratings given by the untrained subjects and not by the trained subjects.

For the trained subjects, the individual ratings of Accuracy can be predicted from their ratings of Reliability, while Reliability ratings are not predicted by the Accuracy ratings of the trained subjects.

Because of the nature of the simulation of battlefield conditions, or for that matter any simulation, the subjects could not have had any direct data on which to base their Reliability assessments. Nonetheless, two paradoxical findings emerge.

First, the school-trained subjects' judgments of report Accuracy can be predicted with high precision from their judgments of the Reliability of the sources and agencies, second, the assessments of Reliability, as made by all subjects, indicated that on the average the reports were judged to be highly Reliable (see Table 4).

It appears clear that the two scales are at least partly contaminated by one or both of their other measurements and are susceptible to misinterpretation and misuse.

Table D-1. Step Multiple Correlations Using Subjects as Observations with Reliability as Criterion

RELIABILITY (47): SUBJECT MEANS

	Subject Sample					
	Combined		Trained		Untrained	
Step	Scale	R	Scale	R	Scale	R
1	48 (Accuracy)	.64	1 (Active)	.47	48 (Accuracy)	.82
2	51 (Combined Global)	.71	43 (Probable)	.61	31 (Accurate)	.84
3	20 (Appropriate)	.74	31 (Accurate)	.73	3 (Timely)	.88
4	31 (Accurate)	.78	15 (Massive)	.81	23 (Expected)	.90
5	26 (Possible)	.80	35 (Analyzable)	.85	21 (Truthful)	.91
6	1 (Active)	.82	36 (Routine)	.89	18 (Useful)	.92
7	22 (Hazardous)	.84	24 (Implied)	.93	37 (Completed)	.93
8	3 (Timely)	.85	41 (Constant)	.95	16 (Substantiated)	.94
9	17 (Dependable)	.86	12 (Variable)	.96	26 (Possible)	.94
10	23 (Expected)	.88	5 (Precarious)	.97	46 (Dangerous)	.95
11	6 (Extra-ordinary)	.89	11 (Direct)	.98	11 (Direct)	.96
12	30 (Widespread)	.90	28 (Clear)	.99	51 (Combined Global)	.96
13	25 (Heavy)	.91	21 (Truthful)	1.00	7 (Intelligible)	.97
14	21 (Truthful)	.93	8 (Feasible)	1.00	17 (Dependable)	.97
15	15 (Massive)	.93	29 (Faultless)	1.00	29 (Faultless)	.98

Table D-2. Step Multiple Correlations Using Subjects as Observations with Accuracy as Criterion

ACCURACY (48): SUBJECT MEANS

Step	Combined Scale	R	Subject Sample Trained Scale	R	Untrained Scale	R
1	47 (Reliability)	.64	29 (Faultless)	.58	47 (Reliability)	.82
2	38 (Acceptable)	.74	47 (Reliability)	.66	3 (Timely)	.88
3	40 (Confirmed)	.76	1 (Active)	.73	40 (Confirmed)	.89
4	31 (Accurate)	.79	31 (Accurate)	.79	15 (Massive)	.91
5	29 (Faultless)	.81	18 (Useful)	.89	7 (Intelligible)	.92
6	15 (Massive)	.82	22 (Hazardous)	.93	21 (Truthful)	.93
7	18 (Useful)	.83	38 (Acceptable)	.94	35 (Analyzable)	.94
8	1 (Active)	.84	43 (Probable)	.98	46 (Safe)	.95
9	43 (Probable)	.85	23 (Expected)	.98	22 (Hazardous)	.95
10	26 (Possible)	.86	20 (Appropriate)	.99	13 (Understandable)	.96
11	2 (True)	.87	15 (Massive)	.99	14 (Likely)	.96
12	17 (Dependable)	.88	13 (Understand-able)	1.00	33 (Relevant)	.96
13	6 (Extra-ordinary)	.89	41 (Constant)	1.00	37 (Completed)	.97
14	11 (Direct)	.89	51 (Combined Global)	1.00	51 (Combined Global)	.97
15	33 (Relevant)	.90	44 (Pertinent)	1.00	5 (Precarious)	.98

Table D-3. Step Multiple Correlations Using Subjects as Observations with Combined Global Ratings as Criterion

COMBINED GLOBAL 51 (49-50): SUBJECT MEANS

Step	Combined Scale	R	Subject Sample Trained Scale	R	Untrained Scale	R
1	2 (True	.72	2 (True)	.74	21 (Truthful	.71
2	7 (Intelligible)	.76	32 (Interpreted)	.81	43 (Probable)	.77
3	47 (Reliability)	.78	8 (Feasible)	.84	6 (Ordinary)	.80
4	43 (Probable)	.80	9 (Factual)	.86	47 (Reliability)	.83
5	11 (Direct)	.82	43 (Probable)	.89	37 (Completed)	.86
6	28 (Clear)	.83	37 (Completed)	.92	1 (Active)	.87
7	32 (Interpreted)	.84	29 (Faultless)	.94	39 (Many)	.88
8	30 (Widespread)	.85	16 (Substan-tiated)	.97	11 (Direct)	.89
9	6 (Extra-ordinary)	.87	38 (Acceptable)	.98	15 (Massive)	.90
10	45 (Consistent)	.87	13 (Understand-able)	.99	24 (Implied)	.92
11	18 (Useful)	.88	17 (Dependable)	.99	3 (Timely)	.93
12	15 (Massive)	.89	10 (Stable)	.99	28 (Clear)	.94
13	5 (Precarious)	.90	12 (Reliable)	1.00	34 (Secure)	.94
14	29 (Faultless)	.90	30 (Widespread)	1.00	42 (Large Scale)	.95
15	21 (Truthful)	.91	31 (Accurate)	1.00	13 (Understandable)	.96

Table D-4. Step Multiple Correlations Using Reports as Observations with Reliability as Criterion

RELIABILITY (47): REPORT MEANS

Step	Combined Scale	R	Subject Sample Trained Scale	R	Untrained Scale	R
1	48 (Accuracy)	.95	48 (Accuracy)	.96	48 (Accuracy)	.94
2	45 (Consistent)	.96	17 (Dependable)	.97	17 (Dependable)	.95
3	17 (Dependable)	.98	7 (Intelligible)	.98	23 (Expected)	.96
4	14 (Likely)	.98	22 (Hazardous)	.99	51 (Combined Global)	.97
5	16 (Substantiated)	.99	14 (Likely)	.99	44 (Pertinent)	.97
6	26 (Possible)	.99	27 (Observed)	.99	10 (Stable)	.97
7	23 (Expected)	.99	9 (Factual)	.99	14 (Likely)	.98
8	38 (Acceptable)	.99	19 (Volatile)	.99	31 (Accurate)	.98
9	51 (Combined Global)	.99	43 (Probable)	.99	32 (Interpreted)	.98
10	30 (Widespread)	.99	11 (Direct)	.99	34 (Secure)	.98
11	28 (Clear)	.99	38 (Acceptable)	1.00	3 (Timely)	.99
12	7 (Intelligible)	.99	31 (Accurate)	1.00	6 (Ordinary)	.99
13	22 (Hazardous)	.99	40 (Confirmed)	1.00	41 (Constant)	.99
14	19 (Volatile)	.99	8 (Feasible)	1.00	9 (Factual)	.99
15	13 (Understandable)	.99	20 (Appropriate)	1.00	37 (Completed)	.99

Table D-5. Step Multiple Correlations Using Reports as Observations with Accuracy as Criterion

ACCURACY (48): REPORT MEANS

Step	Combined Scale	R	Subject Sample Trained Scale	R	Untrained Scale	R
1	51 (Combined Global)	.96	51 (Combined Global)	.98	47 (Reliability)	.94
2	47 (Reliability)	.99	47 (Reliability)	.98	51 (Combined Global)	.97
3	34 (Secure)	.99	36 (Routine)	.98	34 (Secure)	.98
4	22 (Hazardous)	.99	30 (Widespread)	.99	23 (Expected)	.98
5	3 (Timely)	.99	11 (Direct)	.99	12 (Reliable)	.98
6	40 (Confirmed)	.99	14 (Likely)	.99	32 (Interpreted)	.98
7	23 (Expected)	.99	20 (Appropriate)	.99	27 (Observed)	.99
8	12 (Reliable)	.99	34 (Secure)	.99	31 (Accurate)	.99
9	43 (Probable)	1.00	8 (Feasible)	.99	2 (True)	.99
10	5 (Precarious)	1.00	19 (Volatile)	.99	1 (Active)	.99
11	7 (Intelligible)	1.00	46 (Safe)	1.00	30 (Widespread)	.99
12	28 (Clear)	1.00	27 (Observed)	1.00	3 (Timely)	.99
13	35 (Analyzable)	1.00	16 (Substantiated)	1.00	43 (Probable)	.99
14	17 (Dependable)	1.00	45 (Consistent)	1.00	42 (Large Scale)	.99
15	9 (Factual)	1.00	10 (Stable)	1.00	35 (Analyzable)	.99

Table D-6. Step Multiple Correlations Using Reports as Observations with Combined Global Ratings as Criterion

COMBINED GLOBAL 51 (49-50): REPORT MEANS

Step	Combined Scale	R	Subject Sample Trained Scale	R	Untrained Scale	R
1	48 (Accuracy)	.96	48 (Accuracy)	.98	48 (Accuracy)	.93
2	5 (Precarious)	.97	2 (True)	.99	6 (Ordinary)	.95
3	47 (Reliability)	.98	13 (Understandable)	.99	14 (Likely)	.95
4	2 (True)	.98	40 (Confirmed)	.99	20 (Appropriate)	.96
5	16 (Substantiated)	.98	19 (Volatile)	.99	8 (Feasible)	.97
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*Variable dropped from predictor set. Such variables have all of their reliable variance accounted for by the preceding predictors.

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