September 22, 1965.

Armed Services Technical
Information Agency
Arlington Hall Station
Arlington 2, Virginia.

Gentlemen:

Enclosed are copies of Special Reports #3, 4, 5, 6, 7, 8
and 9 prepared by Mr. C. Ernesto S. Lindgren, Visiting
Research Engineer to our department:

Four-Dimensional Descriptive Geometry Rotation
Descriptive Solution, March 1965.

Four-Dimensional Descriptive Geometry Problems on
3-D Spaces, March 1965.

Graphical Plotting of Data. An Application of Three
and Four Dimensional Theoretical Descriptive Geometries,
March 1965.

Four-Dimensional Descriptive Geometry Metric Problems:
Angles - Descriptive Solution, May 1965.

Four-Dimensional Descriptive Geometry Proposition of a
Problem, June 1965.

Four-Dimensional Descriptive Geometry Metric Problems:
Distances, June 1965.

Four-Dimensional Descriptive Geometry Proposed Problems,
July 1965.

These reports have been published as part of our continuing

I would appreciate it if you would consider including these
reports in your monthly bibliographic index.

Sincerely yours,

Steve M. Slaby, Chairman
Department of Graphics and
Engineering Drawing.

SMS: sf
Enclosures.
ENGINEERING GRAPHICS SEMINAR
FOUR-DIMENSIONAL DESCRIPTIVE GEOMETRY
PROPOSITION OF A PROBLEM

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Visiting Research Engineer
United States Steel Corporation

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TECHNICAL SEMINAR SERIES
Special Report No. 7

Department of Graphics and Engineering Drawing
School of Engineering and Applied Science
Princeton University

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ABSTRACT

The paper proposes the determination of the coordinates of the point of a plane, in a four-dimensional space, equidistant to three 3-D spaces of the system of reference for the Four-Dimensional Descriptive Geometry.
1.

GRAPHICAL DETERMINATION OF THE POINT

Given a plane by three of its points, (a), (b), and (c), Figure 1 shows the graphical determination of the point (t) of the plane equidistant to three 3-D spaces of the system of reference.

Figure 1

2.

To generalize the proposition, let (a), (b), and (c) be given as shown in Figure 2. Again (x) is the point of the plane, equidistant to $\Sigma_1, \Sigma_2, \Sigma_3$.

Let us now identify three complete plane quadrangles, by combining the projections of the lines (ab), (bc), and (ac), in pairs. See Figures 3, 4, and 5, noticing that we notate common points on the reference line, by the same letters.

The problem is proposed as follows:

1) Determine the coordinates of the point (x) with projections, $x_1, x_2, x_3$ in function of the anharmonic ratio of the three involutions (on the reference line) of figures 3, 4, and 5.

2) In determining these coordinates, determine also the equations of the lines $(0_10_2 - 0_1'0_2')$ - Figure 3, $(s_1s_3 - s_1's_3')$ - Figure 4, $(l_1l_3 - l_1'l_3')$ - Figure 5, in function of the corresponding anharmonic ratios.

3) Calling

$R_1$ - the anharmonic ratio for the involution, on the reference line, in Figure 3.
Derive a relation among the three anharmonic ratios, indicating that the point $(x)$ is unique.
Projections: $a_2, a_3; b_2, b_3; c_2, c_3$

Complete quadrangle: $b_3 d b_2 g$