

PRINCETON UNIVERSITY
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
PRINCETON, NEW JERSEY 08540

September 22, 1965.

Case File
6.7
1152-3000
467

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.

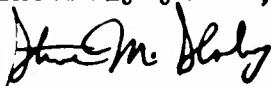
Four-Dimensional Descriptive Geometry Metric Problems:
Distances, June 1965.

Four-Dimensional Descriptive Geometry Proposed Problems,
July 1965.

These reports have been published as part of our continuing
Engineering Graphics Technical Seminar Series.

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.

AD621291

ENGINEERING GRAPHICS SEMINAR
FOUR-DIMENSIONAL DESCRIPTIVE GEOMETRY
PROPOSITION OF A PROBLEM

C. Ernesto S. Lindgren
Visiting Research Engineer
United States Steel Corporation

June 1965

CLEARINGHOUSE FOR FEDERAL, STATE AND TECHNICAL INFORMATION	
Hardcopy	Microfilm
\$1.00	\$0.50
9 pp	
PROCESSING COPY	

ARCHIVE COPY

TECHNICAL SEMINAR SERIES

Special Report No. 7

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

© 1965 C. Ernesto S. Lindgren

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 reference¹⁾.

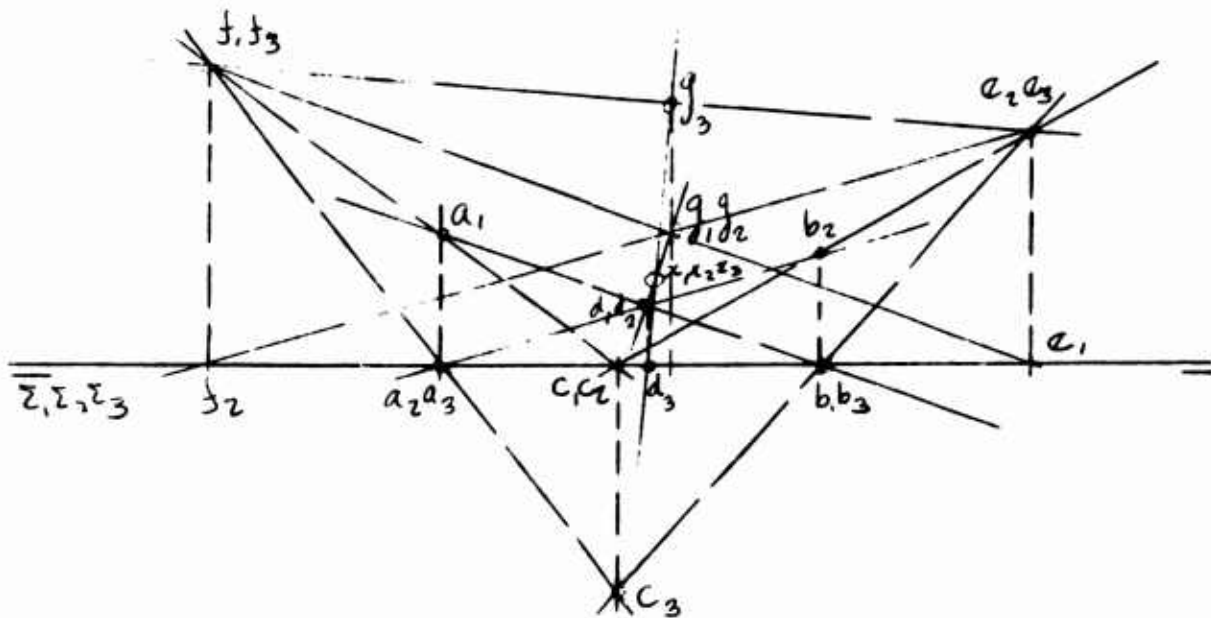


Figure 1

1) See also the author's "Descriptive Geometry of Four Dimensions", Engineering Graphics Seminar, Technical Seminar Series, Report No. 9, Department of Graphics and Engineering Drawing, Princeton University, December 5, 1963, pp. 31-35.

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 $\sum_1$, $\sum_2$, $\sum_3$.

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 ($0_1 0_2 - 0'_1 0'_2$)
 - Figure 3, ($s_1 s_3 - s'_1 s'_3$) - Figure 4, ($1_2 1_3 - 1'_2 1'_3$)
 - 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.

R_2 - the anharmonic ratio for the involution,
on the reference line, in Figure 4

R_3 - the anharmonic ratio for the involution,
on the reference line, in Figure 5.

check if:

$$\varphi_1 = \frac{R_1 R_3}{R_2} = (m' m'' n n')$$

$$\varphi_2 = R_1 R_2 R_3 = (n' n'' m m')$$

- 4) Derive a relation among the three anharmonic ratios, indicating that the point (x) is unique.

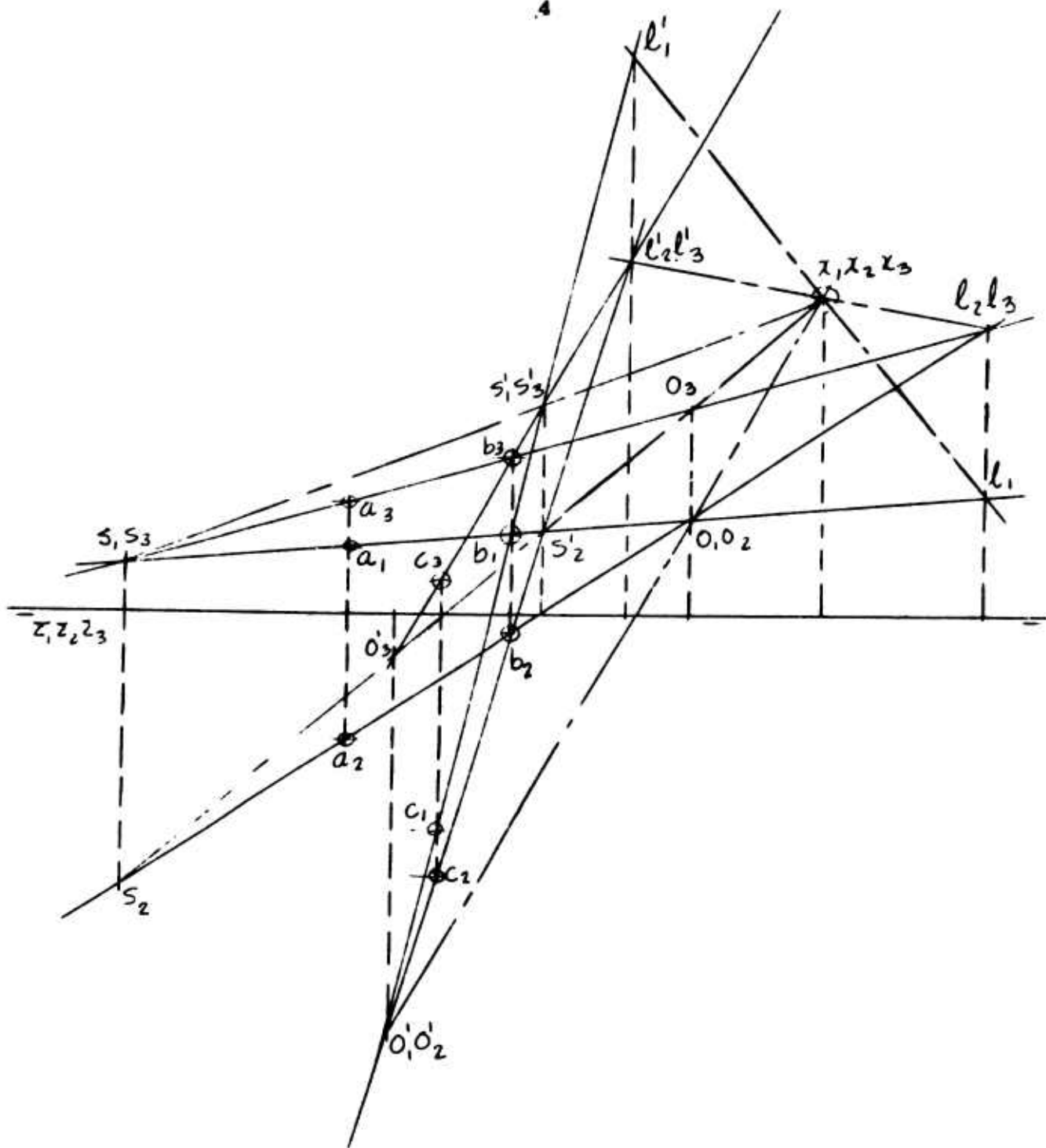


Figure 2

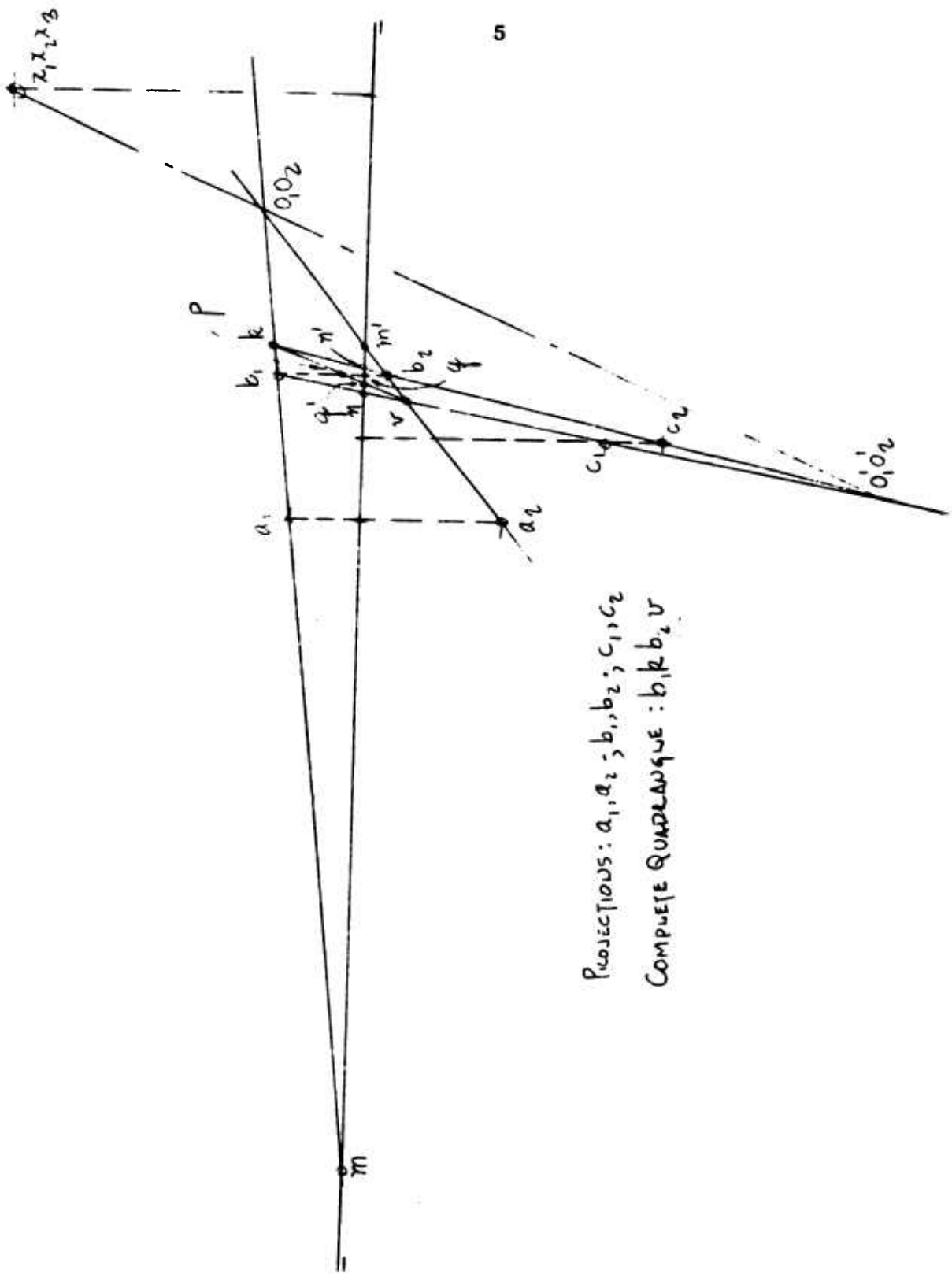


Figure 3

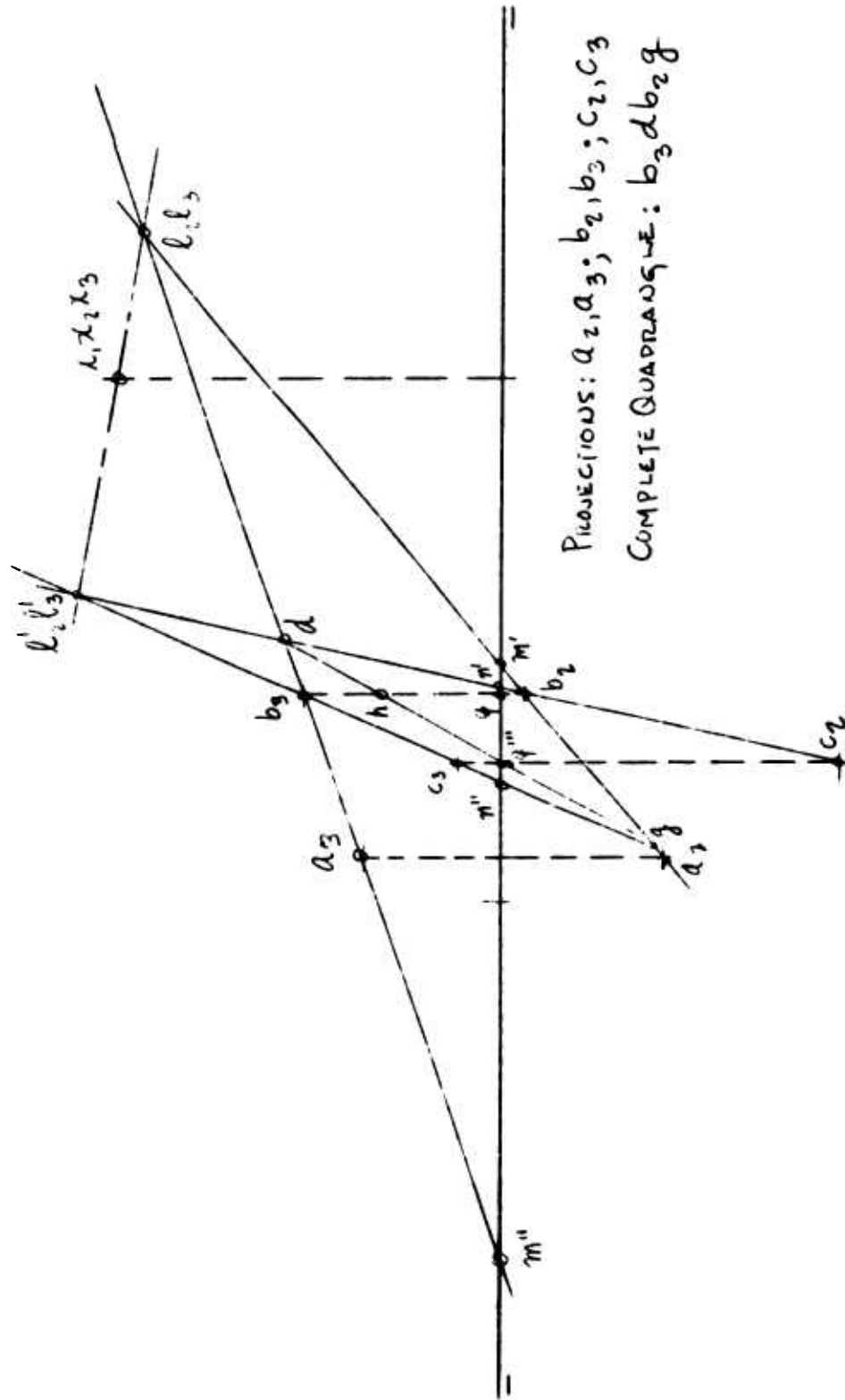


Figure 5