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**STATISTICAL REPORT OF THE MANUFACTURING  
DATA OF M30A1 PROPELLANT**



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**Note**

This report is the first in a planned series of the study of high pressure-temperature coefficient propellant for the M203 charge. Contained in this report is propellant data for FY77 and FY79 production. As data for FY80 and subsequent years becomes available, this report will be updated and continued until the high pressure-temperature coefficient problem is resolved.

### Acknowledgments

The authors wish to express appreciation to Radford AAP for furnishing all manufacturing data, and to MISD for providing computer programs for speeding up the analysis.

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Abstract

The M203 propelling charge had exhibited a high lot to lot variability of gun pressure (at hot firings) in the recent production lots. A statistical analysis was conducted to search for possible cause of the variability.

A computer data file was generated for storing the data. Two computer programs provided by MISD were used for speeding up the analysis. In addition several computer programs were written to retrieve data for the plotting routine and for the stepwise regression analysis.

Two types of trends were observed from the plots and were summarized in Appendix 1. Results of the stepwise regression indicated that the pH value (Nitroguanidine) and % Total Volatile (composition) show a relatively high correlation to the gun pressure (at hot firings), also, the % Graphite (composition) and the combination of % Total Volatile (composition) and % Moisture (Potassium Sulfate) exhibit a functional relationship with the DP/DT (70 to 145)<sup>°F</sup> (difference in pressure/at different temperature range). A summary of the final regression results is presented in Appendix 2.

Some major changes in the source of ingredients and process conditions were observed from Radford Manufacturing data. In FY79, the supplier of the Ethyl Centralite was switched from Chemische Werke, West Germany to Van de Mark, New York. The source of Potassium Sulfate was also changed from Naval Ammo Depot Crane, Ind. to Mellinekrodt Inc. In the same year, the amount of graphite added to the process of blending/glazing was reduced from 5 lb 6.4 oz to 3 lb per 5400 pounds of propellant.

- V -

### Introduction

M30A1 propellant produced in FY77 for the 155MM M203 propelling charge exhibited a pressure - temperature coefficient of approximately 60 psi/°F at the temperature range from 70°F (ambient) to 145°F (hot). All the hot firings of these particular M203 prop charges resulted in relatively low pressures. The same type of propellant manufactured in FY79 has exhibited a pressure temperature coefficient of about double the coefficient observed in FY77 production. The hot firings in this case have resulted in higher pressures. These high pressures have significantly reduced the safety margin between the service pressure and maximum pressure requirements, which were enjoyed from FY77 production.

To investigate the cause of variability of the pressure - temperature coefficient, Radford AAP was requested to furnish all manufacturing data including those acceptance test results of all ingredients.

This report is a statistical analysis of all the data provided by Radford AAP.

### Discussion

A statistical analysis of all manufacturing data including the acceptance test results of all ingredients was conducted. The purpose of this analysis is to search for any functional relationships between the manufacturing data and pressure - temperature coefficient. Besides the pressure - temperature coefficient, other output results, such as the closed bomb and peak chamber pressure, were also considered during the analysis. Since the output results depend highly on the manufacturing data (purity of the ingredient, process, etc) therefore, the output results in this case are defined as dependent (or response) variables and the manufacturing data defined as independent variable. The dependent and independent variables which were considered in this analysis are summarized in Table 1 and Table 2, respectively.

Two types of approach have been utilized in this analysis. The first approach is to plot the manufacturing data against the pressure - temperature coefficient or other output results. By plotting, a decreasing or increasing trend could be easily identified. The second approach is to conduct a stepwise regression analysis on those variables.

This stepwise regression is a statistical procedure of selecting the best correlated independent variables for a particular dependent variable, and fit them into a regression equation. A preselected F value,  $F(1, n-2, \alpha)$ , is required in this stepwise procedure and is highly dependent on the degrees of freedom ( $n-2$ ; where  $n$  is the number of observation) and the specified percent of confident level ( $\alpha$ ) of the entering independent variable. The preselected F value in this particular analysis is 5.12 and was obtained from the F distribution table at  $F(1, 7, 0.95)$ . The process of selecting is based on the partial F value calculated at each stage. If the calculated F value of a entering independent variable is greater than the preselected F value, the variable will be retained into the regression equation; otherwise, the variable will be rejected and another variable will be entered. This process is continued until no more variables will be entered and no more are rejected.

After selecting the best variables through comparison of the F values, a correlation coefficient ( $R^2$ ) will be calculated. This correlation coefficient is an indicator of measuring the degree of correlation of the variables. As the correlation coefficient approaches to unity, the regression equation obtained from the stepwise procedure will become a precise model representing the relationship between the independent and dependent variables. This equation will be further used to predict the outcome of the dependent variable with a given value of the independent variable.

Because of a large amount of data involved, a computer data file was then generated to store them. Two computer programs provided by MISD were utilized to speed up the analysis. One program is used to plot graphs and the other one is used to conduct the stepwise regression analysis. Several computer programs were also prepared to retrieve data for plotting and as well as for the stepwise regression analysis.

After plotting all the manufacturing data against the pressure data or other output tested results, two types of trends were actually observed with the following classification (a) strong trend (b) slight trend. Both of these trends are summarized in appendix 1.

Four independent variables which belong to the strong trend category have been retrieved for the stepwise regression analysis. The dependent variables which are used in the regression are the pressure data (fired at 145°F) and DP/DT (70 to 145°F, difference of pressure data at the temperature range from 70 to 145°F). The result of the regression has indicated that the pH value (nitroguanidine), contained F value equal to 15.837, and graphite, contained F value equal to 30.90, show a relatively high correlation to the pressure at 145°F and DP/DT (70 to 145)°F, respectively. A summary of the final result of regression analysis is presented in Appendix 2.

One major problem noted during the analysis was that some data represented the ingredients at time of purchase rather than when it was utilized. For example, all the average particle diameters of the nitroguanidine were measured at the source. This material was then stored for several years before use. Because of inadequate storage conditions, the crystal structure is believed to have grown. Although this report showed no correlation of nitroguanidine size with pressure obtained, analysis of particle size at the time of use might correlate. But this additional data was not available at the time of this analysis. Also some parameters upon review showed little to no variation in recorded values and were not utilized in this analysis. In addition, some major changes which were noted from the Radford manufacturing data are important enough to be mentioned in this report. These changes are as follows:

1. Changes in source of ingredients:

a. In 1977, the original supplier of Ethyl Centralite was Chemische Werke, West Germany. In FY79, Van De Mark, New York has become the new supplier of this ingredient.

b. Potassium Sulfate was originally obtained from Naval Ammo Depot Crane (manufacturer unknown) and is currently obtained from Mallinckrodt.

2. Changes in process conditions: In FY79 the amount of graphite added to the process of blending/glazing was reduced from 5 lb 6.4 oz to 3 lb per 5400 pounds of propellant.

### Conclusions

1. The analysis of data showed the following:

a. Data plottings of independent variables (e.g. % Total Volatile, % Ethyl Centralite, etc.) vs dependent variables (e.g. pressure at 145°F, DP/DT (70 to 145)°F, RQ, etc) indicates the existance of strong and slight trends (see Appendix 1). For example, several independent variables (e.g. % Graphite, % Total Volatile, pH of Nitroguanidine, etc.) appear strongly to increase the pressure (145°F) of the propellant.

b. Results of stepwise regression analysis indicated that the pH of Nitroguanidine and % Graphite in the propellant show a relatively high correlation to the pressure at 145°F and DP/DT (70 to 145)°F (difference of pressure at temperature range from 70 to 145°F), respectively. A summary of the final results is presented in Apendix 2.

2. There was insufficient data available to determine the following:

a. If changes in physical data of a constituent material from time of manufacture to the time of incorporation into the propellant affect the pressures obtained.

b. If changes in sources of supply of constituent materials affect pressures obtained.

c. If changes in process conditions affect pressures obtained.

### Recommendations

Based on the preliminary results obtained, it is recommended that the study be continued to:

a. Evaluate those parameters which appear to cause pressure increase.

b. Determine if the following factors affect the pressure observed:

1. Aging /storage conditions of constituent materials.
2. Changes in source of supply of constituent materials.
3. Changes in propellant processing conditions.

### References

N.R. Draper, H. Smith, "Applied Regression Analysis". Wiley

Table 1:  
Summary of the dependent variables used in the plotting: Explanation

|                                                     |                                                                                                                     |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 1. Pressure -65                                     | Fired at -65°F                                                                                                      |
| 2. Pressure 70                                      | Fired at 70°F                                                                                                       |
| 3. Pressure 145                                     | Fired at 145°F                                                                                                      |
| 4. $DP/DT_1$ . (-65 -145)°F                         | (Pressure 145°F minus Pressure -65°F)/(210 x100)                                                                    |
| 5. $DP/DT_2$ (70 -145)°F                            | (Pressure 145°F minus Pressure 70°F)/(75 x100)                                                                      |
| 6. $DP/DT_3$ (-65 -70)°F                            | (Pressure 70°F minus Pressure -65°F)/(135 x 100)                                                                    |
| 7. RQ90 -(RQ-40)                                    | Relative Quickness 90°F minus Relative Quickness -40°F                                                              |
| 8. RF90 -(RF-40)                                    | Relative Force 90°F minus Relative Force -40°F                                                                      |
| 9. $\frac{DP(TEST)}{DP(CALI)} / DT_1$ (-65 -145)°F  | $\frac{\text{Test RD (Pressure 145°F minus Pressure -65°F)}}{\text{CALI RD (Pressure 145°F minus Pressure -65°F)}}$ |
| 10. $\frac{DP(TEST)}{DP(CALI)} / DT_2$ (70 - 145)°F | $\frac{\text{Test RD (Pressure 145°F minus Pressure 70°F)}}{\text{CALI RD (Pressure 145°F minus Pressure 70°F)}}$   |

Table 2

Summary of Independent Variables Used In The Plotting

/ Short Title Used in The Plots

|                             |                    |           |
|-----------------------------|--------------------|-----------|
| 1. % Nitrogen               | (Nitrocellulose)   |           |
| 2. Fineness                 | ( " )              |           |
| 3. % Ash                    | ( " )              |           |
| 4. Viscosity                | ( " )              |           |
| 5. Freeness                 | ( " )              | Free (NC) |
| 6. % Water                  | (Nitroglycerine)   |           |
| 7. % Nitrogen               | ( " )              |           |
| 8. Average Particle Size    | (Nitroguanidine)   |           |
| 9. % Ash                    | ( " )              |           |
| 10. pH Value                | ( " )              | pH (NGU)  |
| 11. Total Volatiles         | ( " )              |           |
| 12. % Sulfates              | ( " )              |           |
| 13. Solidification Point °C | (Ethyl Centralyte) |           |

|                       |                     |            |
|-----------------------|---------------------|------------|
| 14. Volatile Content  | ( " )               | V.C. (ETH) |
| 15. % Ash Content     | ( " )               |            |
| 16. Sum of Amines     | ( " )               |            |
| 17. % Moisture        | (Potassium Sulfate) | Mois (PS)  |
| 18. % Moisture        | (Graphite, Grade 4) |            |
| 19. % Ash             | ( " )               | % Ash (G4) |
| 20. Granulation       | ( " )               |            |
| 21. Nitrocellulose    | (% Composition)     |            |
| 22. Nitroglycerine    | ( " )               |            |
| 23. Nitroguanidine    | ( " )               |            |
| 24. Ethyl Centralite  | ( " )               | E.C. (NC)  |
| 25. Potassium Sulfate | (% Composition)     |            |
| 26. Total Volatiles   | (% Composition)     | T.V. (NC)  |

|                                   |                     |                  |
|-----------------------------------|---------------------|------------------|
| 27. Graphite, Grade 4             | ( " )               | G4 (\$C)         |
| 28. Length                        | ( Grain Dimensions) |                  |
| 29. Diameter                      | ( " )               |                  |
| 30. Perforation                   | ( " )               |                  |
| 31. Inner Web                     | ( " )               |                  |
| 32. Outer Web                     | ( " )               |                  |
| 33. Avg Web                       | ( " )               |                  |
| 34. Web Difference                | ( " )               |                  |
| 35. L/D                           | ( " )               |                  |
| 36. L/d                           | ( " )               |                  |
| 37. L Uniformity                  | ( " )               | L UNI (GD)       |
| 38. D Uniformity                  | ( " )               | D UNI (GD)       |
| 39. Year Storage of Nitroguandine |                     | Yr (STORAGE) NGU |

Table 3:  
Result of plots with strong trends  
and slight trends

| Independent Variable                | Pressure -65 | Pressure 70 | Pressure 145 | DP/DT <sub>1</sub> (-65-145) <sup>°F</sup> | DP/DT <sub>2</sub> (70-145) <sup>°F</sup> | DP/DT <sub>3</sub> DT <sub>3</sub> - (-65-70) <sup>°F</sup> | RQ 90 - (RQ-40) | RF 90 - (RF-40) | DP (TEST) (-65-145) <sup>°F</sup> | CP (CALI) (-65-145) <sup>°F</sup> | DP (TEST) (-70-145) <sup>°F</sup> |
|-------------------------------------|--------------|-------------|--------------|--------------------------------------------|-------------------------------------------|-------------------------------------------------------------|-----------------|-----------------|-----------------------------------|-----------------------------------|-----------------------------------|
| pH Value (Nitroguanidine)           | N            | N           | S            | N                                          | S                                         | S                                                           | S               | S               | S                                 | S                                 | S                                 |
| % Moisture (Potassium Sul)          | N            | N           | N            | S                                          | S                                         | S                                                           | S               | S               | S                                 | S                                 | S                                 |
| % Ash (Graphite)                    | N            | N           | N            | S                                          | S                                         | S                                                           | S               | S               | S                                 | S                                 | S                                 |
| Volatile Content (Ethyl Centralite) | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| % Nitrogen (Nitrocellulose)         | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Viscosity (Nitrocellulose)          | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Freeness (Nitrocellulose)           | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Total Volatile (% Comp)             | N            | N           | S            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Ethyl Centralite (% Comp)           | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Graphite (% Comp)                   | N            | N           | N            | S                                          | S                                         | N                                                           | S               | S               | S                                 | S                                 | S                                 |
| Nitroglycerine (Comp)               | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Length of Grain                     | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Perforation Diameter                | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| D/d                                 | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Length Uniformity of Grain          | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Diameter Uniformity of Grain        | N            | N           | N            | N                                          | N                                         | N                                                           | N               | N               | N                                 | N                                 | N                                 |
| Year Storage of Nitroguanidine      | N            | N           | N            | S                                          | N                                         | N                                                           | S               | S               | S                                 | S                                 | S                                 |

S = Strong trend  
N = Slight trend

# Appendix 1: Evaluation of Computer Graph Output

As previously mentioned all plots were generated by a computer program. A title and a table of data appear on every plots. The values listed at the left side of the table are the values of the independent variable and were plotted on the X coordinate; likewise, the values at the right side are belonged to the dependent variable and were designated on Y coordinate. These pairs of X,Y values are arranged in a chronological order. A symbol X on the plot is an indication of the first pair of X, Y value being plotted. The rest of data was then plotted and connected by the lines in a chronological order.

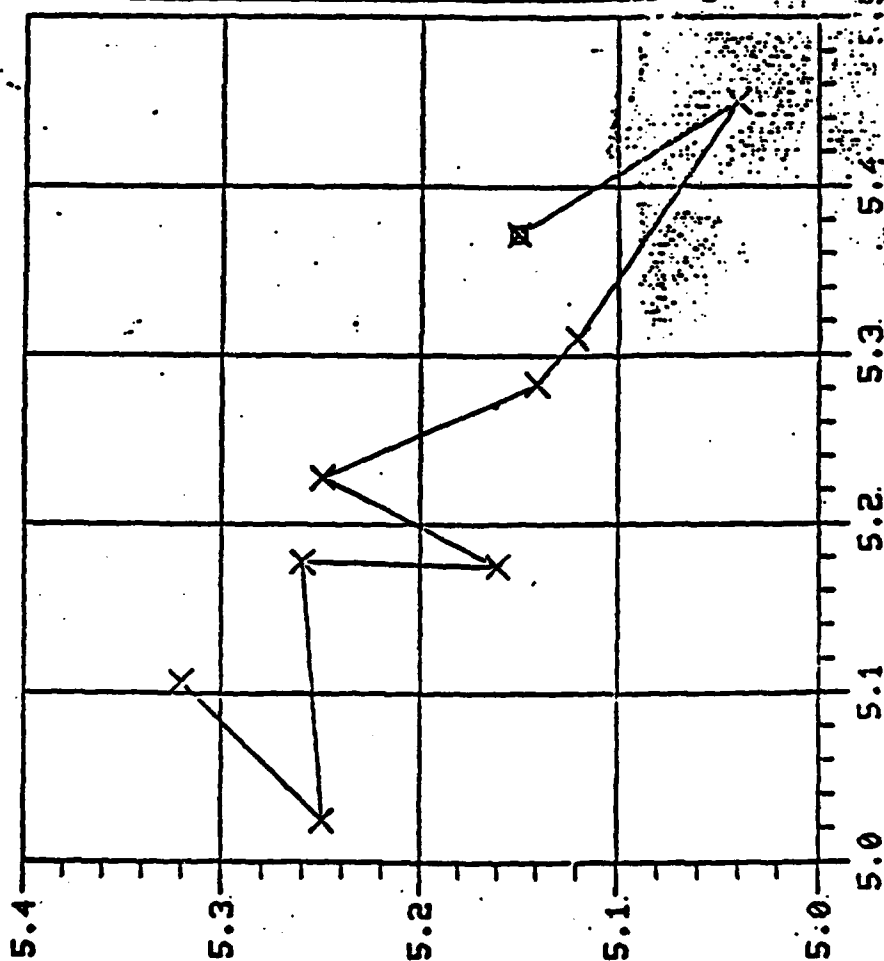
Types of trends observed from the plots are summarized below.

## A. Summary of The Strong Trend Plots

| <u>Fig #</u> | <u>Independent Variable</u>        | <u>Vs.</u> | <u>Dependent Variable</u>                                                 |
|--------------|------------------------------------|------------|---------------------------------------------------------------------------|
| 1            | pH Value (Nitroguanidine)          |            | Pressure at 145°F                                                         |
| 2            | Total Volatile (X Composition)     |            | Pressure at 145°F                                                         |
| 3            | X Ethyl Centralite (X Composition) |            | Pressure at 145°F                                                         |
| 4-7          | X Moisture (Potassium Sulfate)     |            | $\frac{DP}{DT_2} (70 - 145)^{\circ}F$                                     |
| 8-11         | Total Volatile (X Composition)     |            | $\frac{DP \text{ TEST}}{DP \text{ CALI}} / DT_2 (70 - 145)^{\circ}F$      |
|              |                                    |            | $\frac{DP \text{ TEST}}{DP \text{ CALI}} / DT_1 (-65 - 145)^{\circ}F$     |
|              |                                    |            | RQ90 - (RQ -40)                                                           |
|              |                                    |            | $\frac{DP}{DT_1} (-65 - 145)^{\circ}F$                                    |
|              |                                    |            | $\frac{DP}{DT_2} (70 - 145)^{\circ}F$                                     |
| 12-16        | X Graphite (X Composition)         |            | $\frac{DP \text{ (TEST)}}{DP \text{ (CALI)}} / DT_1 (70 - 145)^{\circ}F$  |
| 17-21        | X ASH (in Graphite)                |            | $\frac{DP \text{ (TEST)}}{DP \text{ (CALI)}} / DT_2 (-65 - 145)^{\circ}F$ |
|              |                                    |            | RQ90 - (RQ -40)                                                           |
|              |                                    |            | $\frac{DP}{DT_2} (70 - 145)^{\circ}F$                                     |
| 22-24        | Yr (Storage) Nitroguanidine        |            | $\frac{DP \text{ TEST}}{DP \text{ CALI}} / DT_2 (70 - 145)^{\circ}F$      |
|              |                                    |            | $\frac{DP \text{ TEST}}{DP \text{ CALI}} / DT_1 (-65 - 145)^{\circ}F$     |

PRESSURE VS. PH VALUE

TEMP = 145.



DATA

5.3720, 5.1500  
 5.4500, 5.0400  
 5.3103, 5.1200  
 5.2333, 5.1400  
 5.1067, 5.3200  
 5.0250, 5.2500  
 5.1778, 5.2600  
 5.1750, 5.1600  
 5.2278, 5.2500

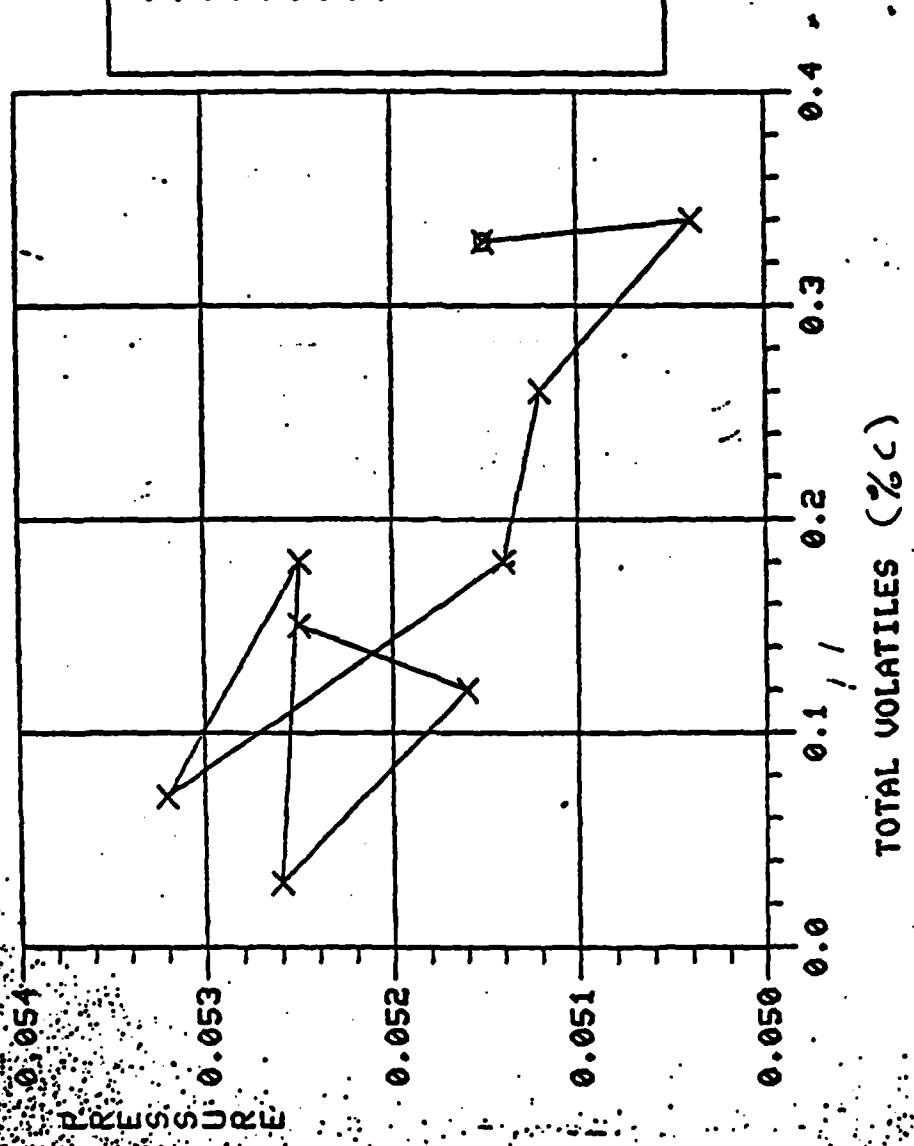
PH VALUE (NGU)

Fig. 1

PRESSURE

TEMP - 145.

PRESSURE VS. TOTAL VOLATILES, C106



DATA

|        |       |
|--------|-------|
| .3300, | .0515 |
| .3400, | .0504 |
| .2500, | .0512 |
| .1800, | .0514 |
| .0700, | .0532 |
| .1800, | .0525 |
| .0300, | .0526 |
| .1200, | .0516 |
| .1500, | .0525 |

Fig. 2

PRESSURE VS. ETHYL CENTRAL ,C104 TEMP - 145.

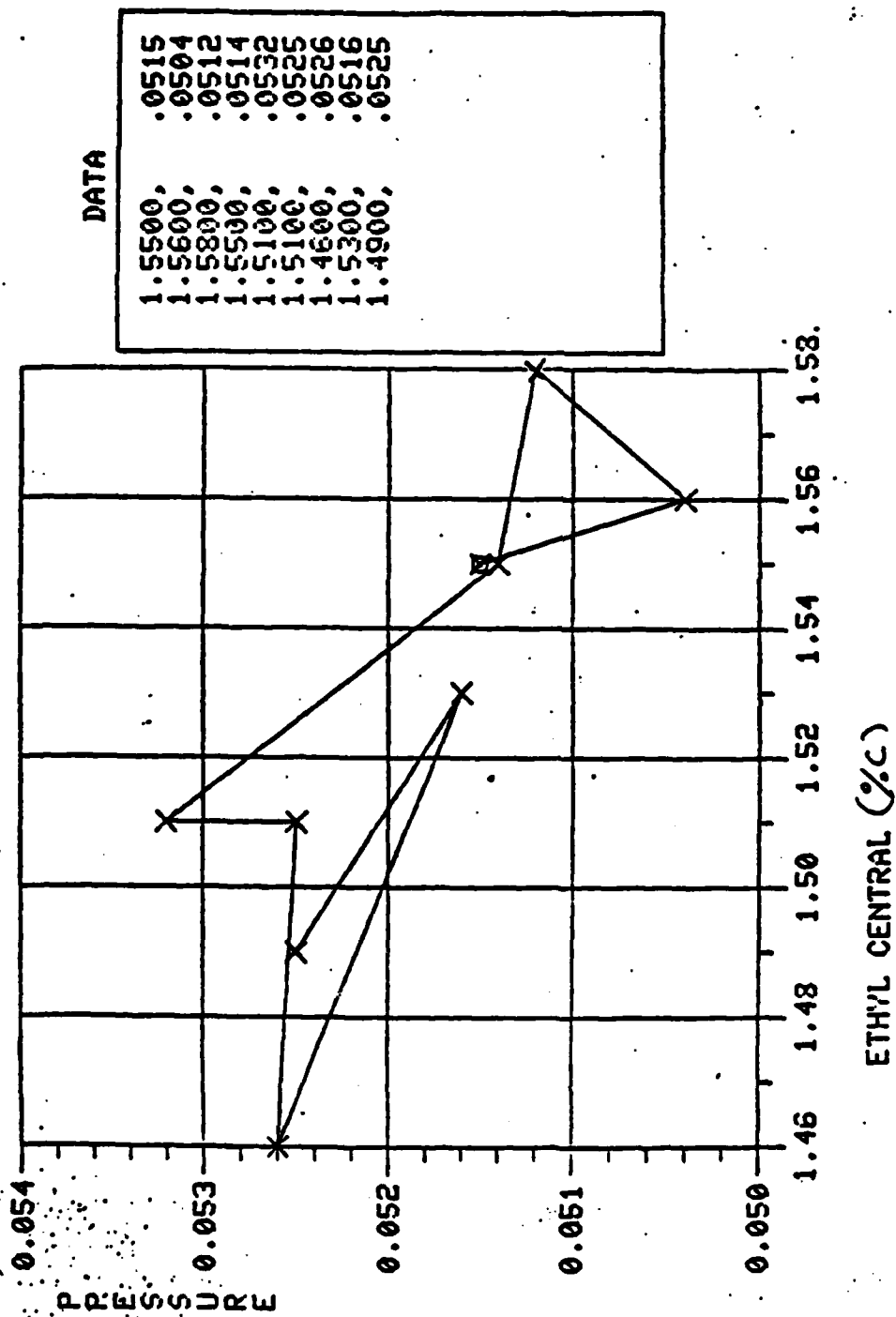
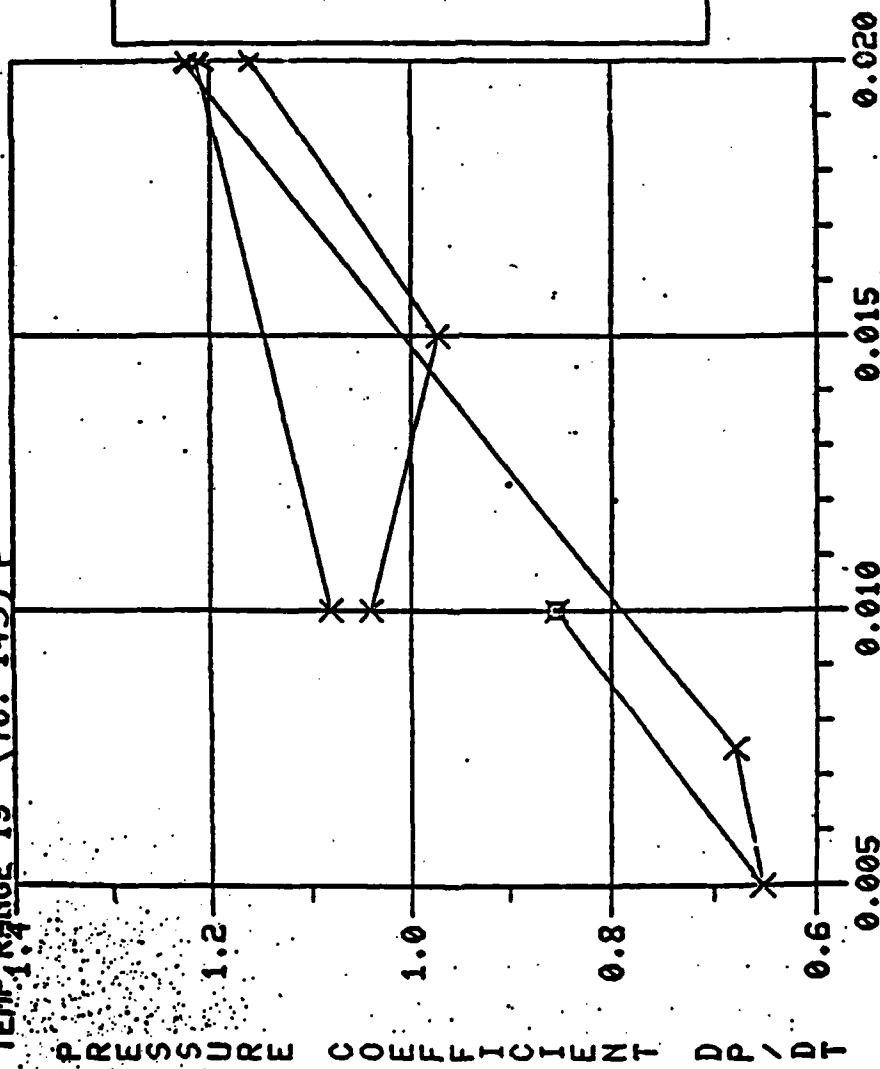


Fig. 3.

PRESSURE COEFFICIENT, DP/DT US. % MOISTURE : .C051

TEMP RANGE IS (70.-145)°F

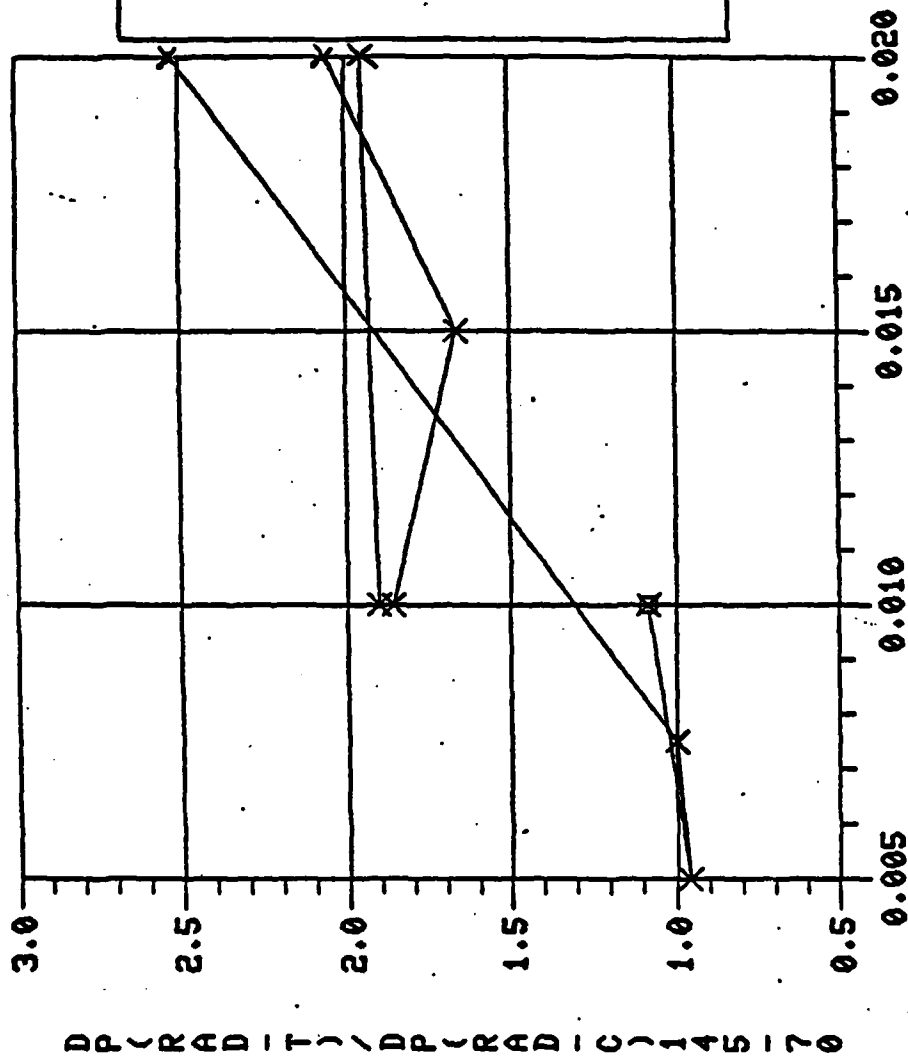


DATA

|        |        |
|--------|--------|
| .0100, | .8533  |
| .0050, | .6533  |
| .0075, | .6800  |
| .0200, | 1.2267 |
| .0200, | 1.1600 |
| .0150, | .9733  |
| .0100, | 1.0400 |
| .0100, | 1.0800 |
| .0200, | 1.2133 |

% MOISTURE (PS) Fig. 4

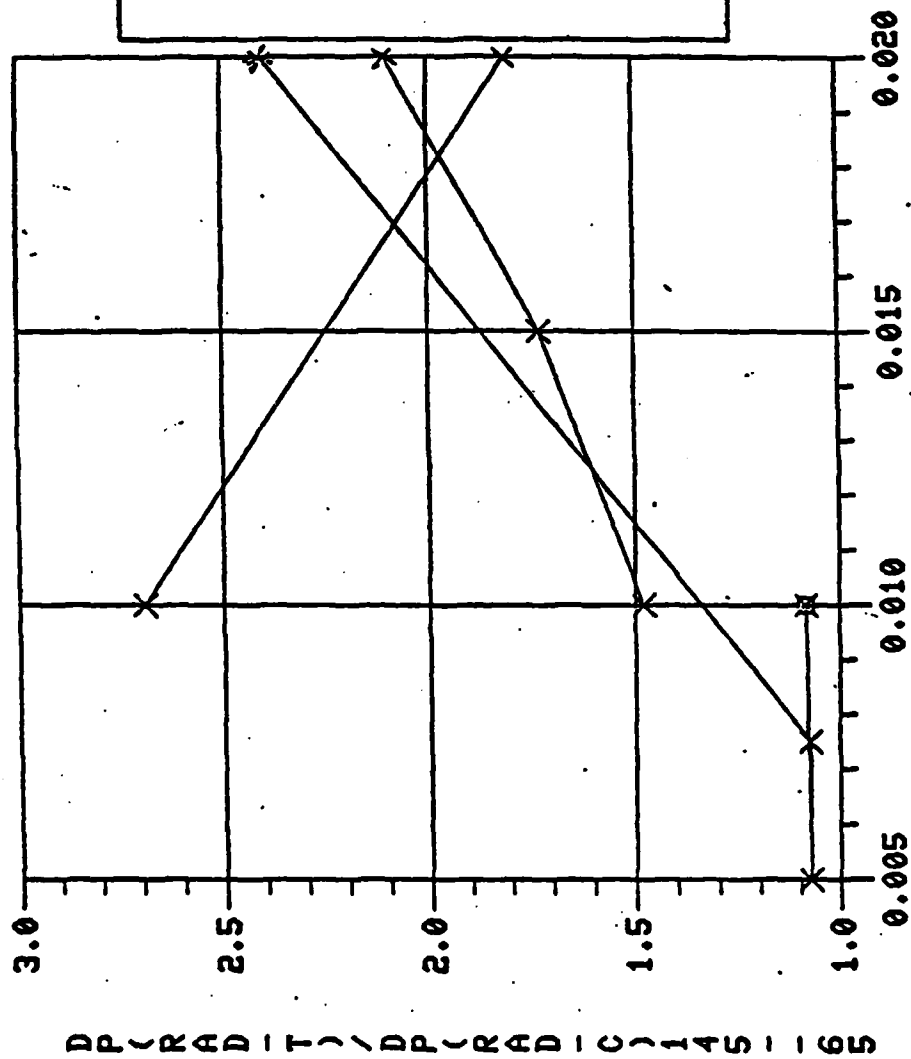
DP(RAD-T)/DP(RAD-C)145-70 VS MOIS(PS)



MOIS(PS)

Fig. 5

DP(RAD-T)/DP(RAD-C)145--65 USMOIS(PS)



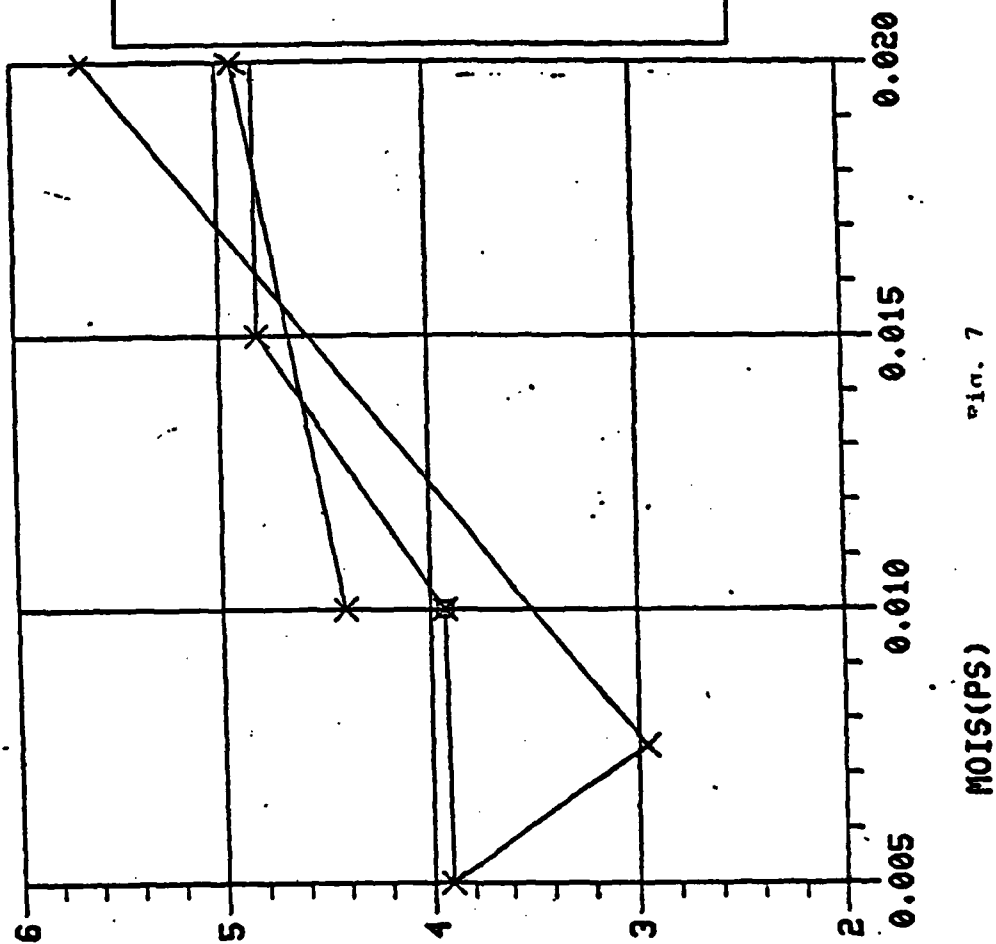
DATA

|        |        |
|--------|--------|
| .0100, | 1.0847 |
| .0050, | 1.0755 |
| .0075, | 1.0755 |
| .0200, | 2.4043 |
| .0200, | 2.1042 |
| .0150, | 1.7292 |
| .0100, | 1.4792 |
| .0100, | 2.6905 |
| .0200, | 1.8103 |

MOIS(PS)

Fig. 6

RQ90-RQ-40 USMOIS(PS)

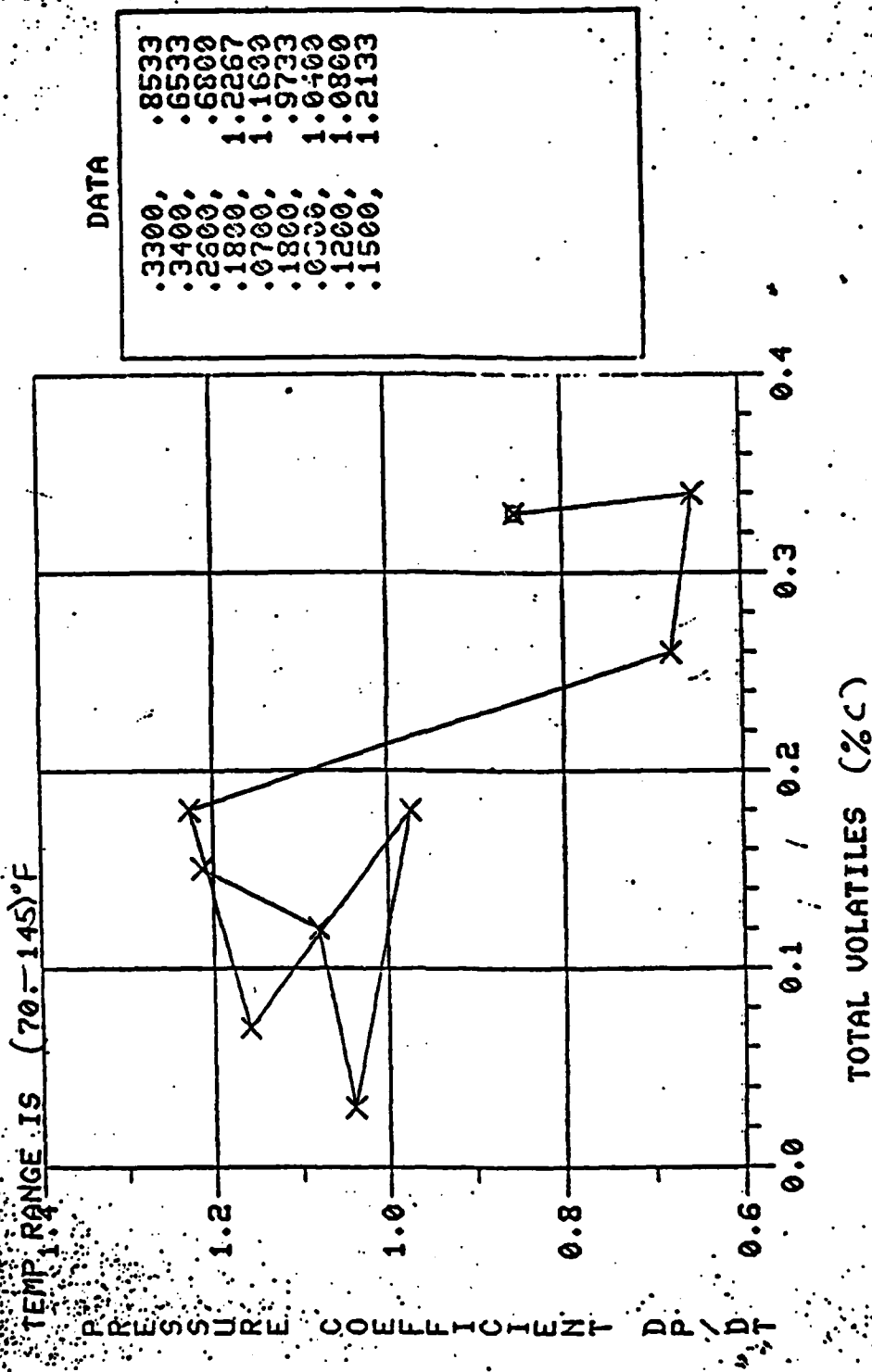


DATA

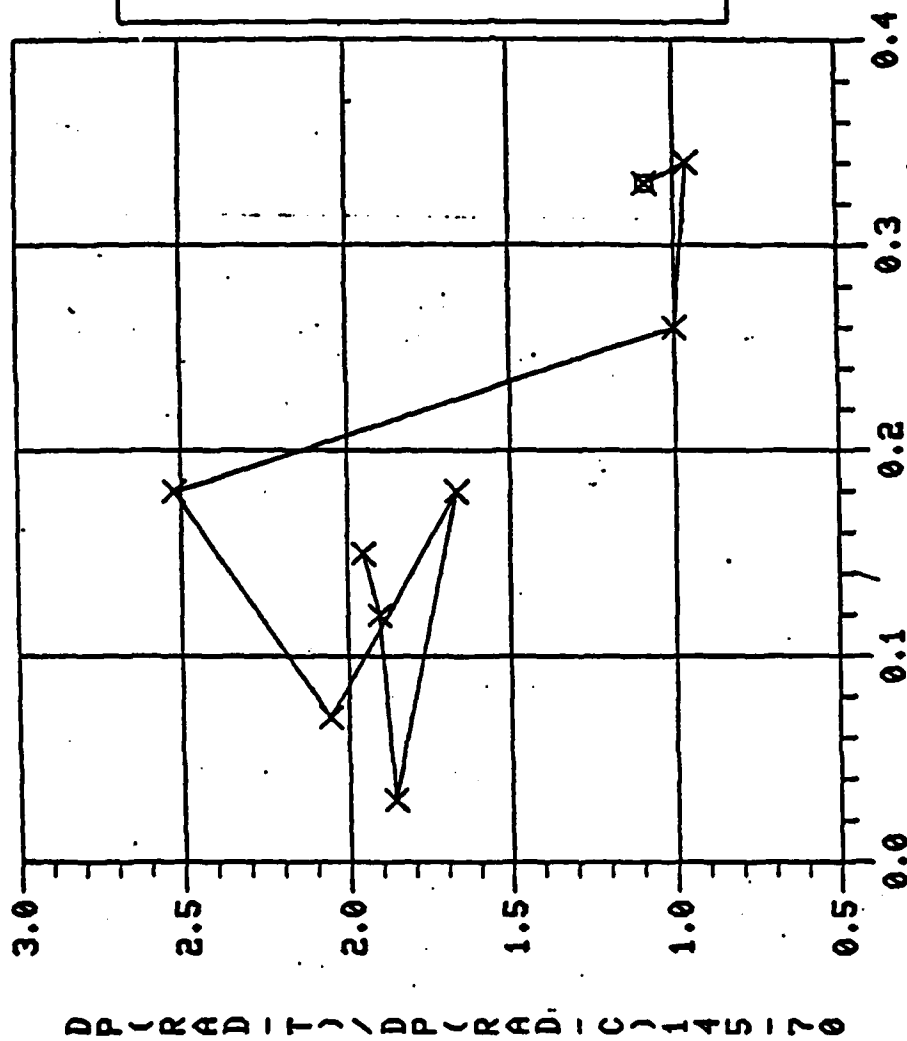
|        |        |
|--------|--------|
| .0100, | 3.9300 |
| .0050, | 3.9100 |
| .0075, | 3.9600 |
| .0200, | 5.6500 |
| .0200, | 4.8300 |
| .0150, | 4.8200 |
| .0100, | 3.9300 |
| .0100, | 4.4100 |
| .0200, | 4.9300 |

RQ90-RQ-40

# TEMP. RANGE IS (70.-145)°F PRESSURE COEFFICIENT, DP/DT VS. TOTAL VOLATILES, C106



DP(RAD-T)/DP(RAD-C)145-70 VS T.U.(XC)



T.U.(XC)

Fig. 9

DP(RAD-T)/DP(RAD-C)145--65 VST.V.(XC)

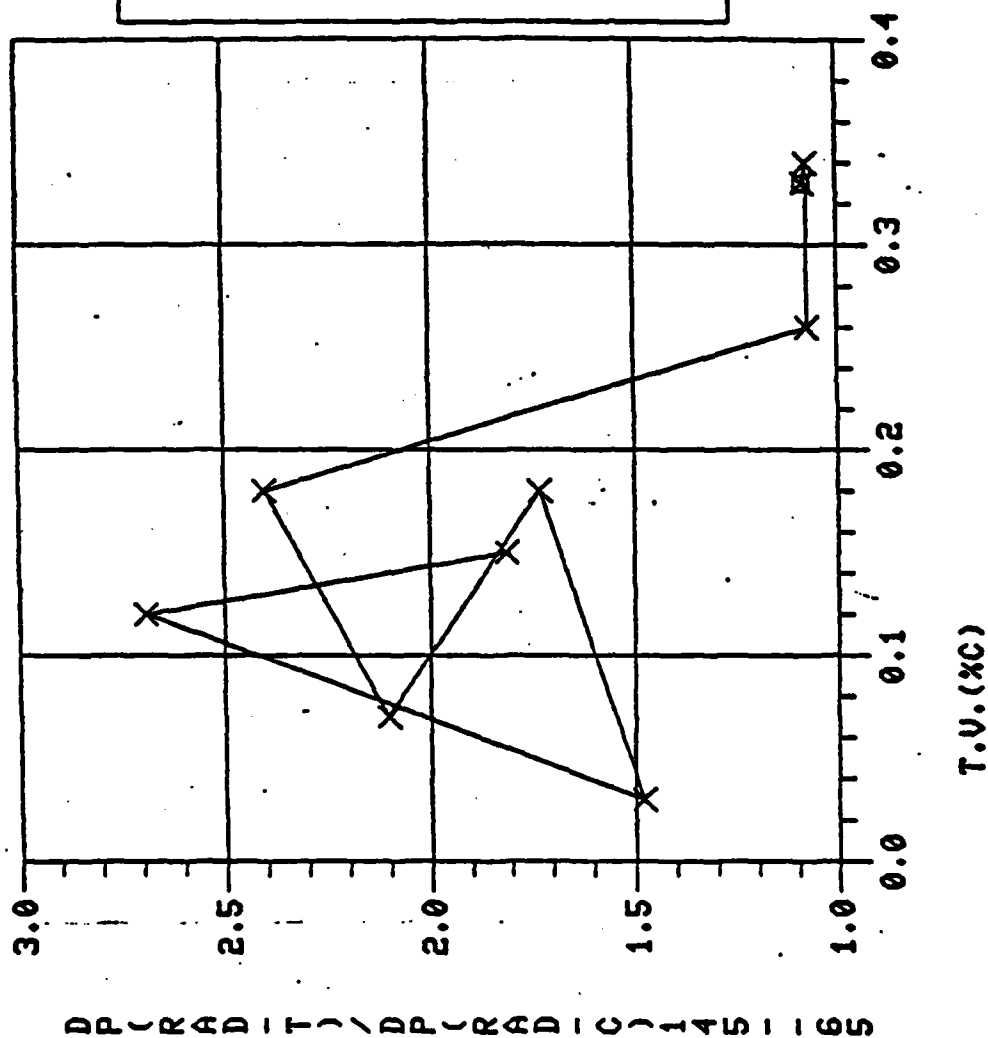
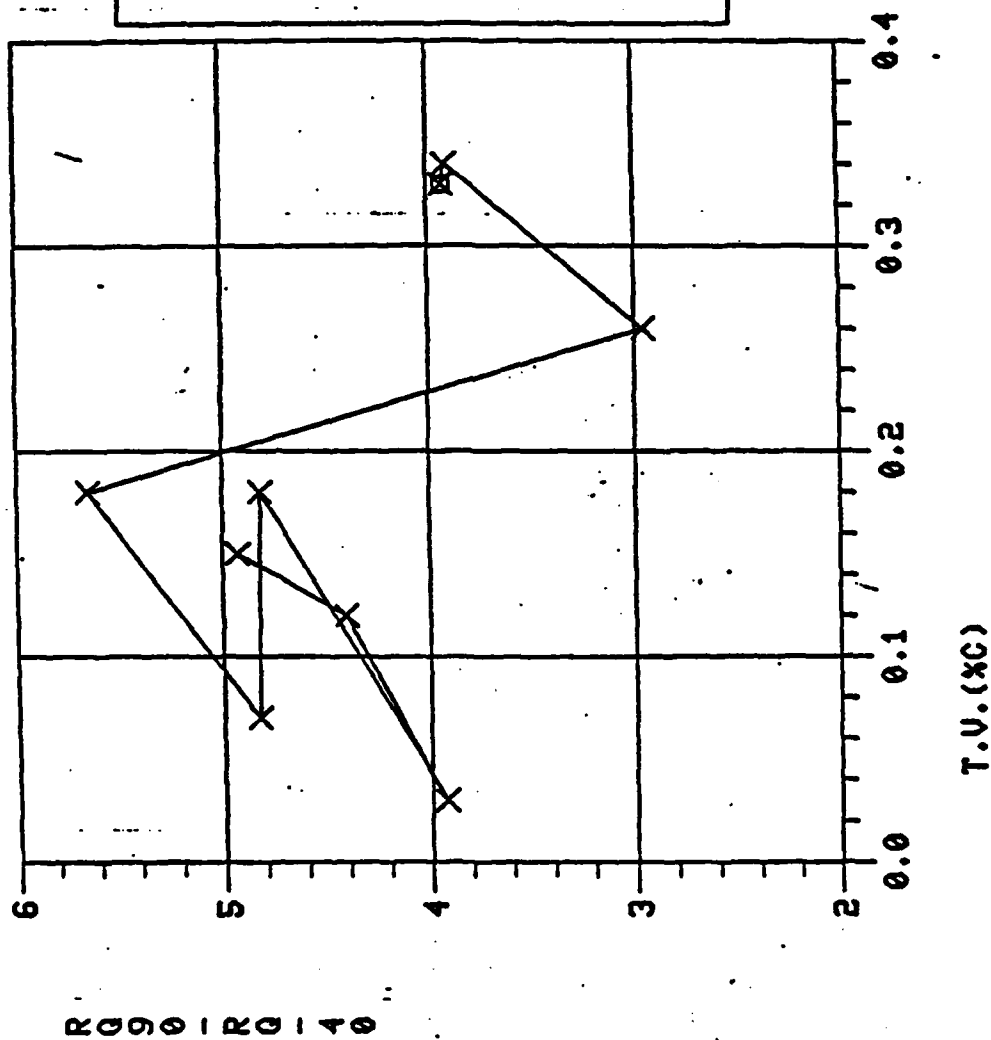


Fig. 19

R090-R0-40 UST.V.(XC)



DATA

|        |        |
|--------|--------|
| .3300, | 3.9300 |
| .3400, | 3.9100 |
| .2600, | 2.9600 |
| .1800, | 5.6500 |
| .0700, | 4.8300 |
| .1800, | 4.8200 |
| .0300, | 3.9300 |
| .1200, | 4.4100 |
| .1500, | 4.9300 |

Fig. 11

C107

PRESSURE COEFFICIENT, DP/DT VS. GRAPHITE

TEMP. RANGE IS (-65-145)°F

PRESSURE COEFFICIENT DP/DT

DATA

|        |       |
|--------|-------|
| .0800, | .3238 |
| .1000, | .2714 |
| .1200, | .2714 |
| .0500, | .5429 |
| .0700, | .4810 |
| .0600, | .3952 |
| .0700, | .3286 |
| .0700, | .5381 |
| .0500, | .5000 |

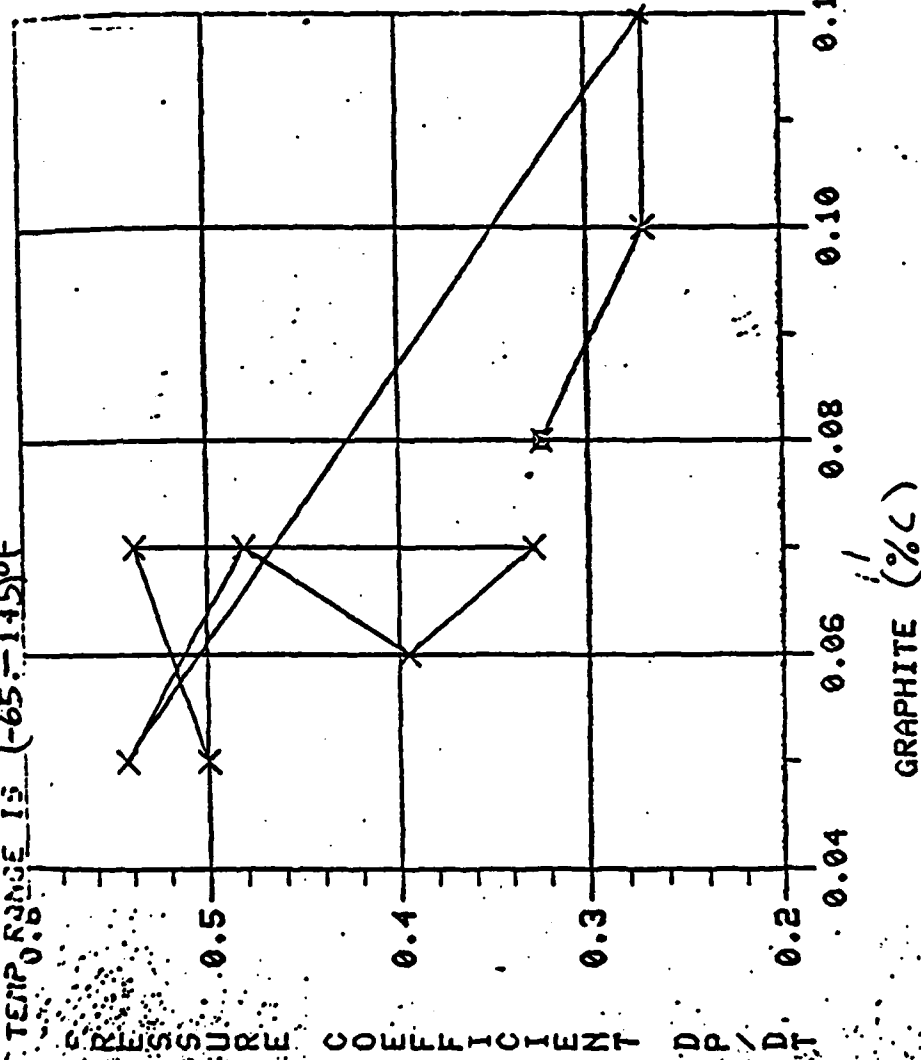


Fig. 12

C107

PRESSURE COEFFICIENT, DP/DT US. GRAPHITE

TEMP. RANGE IS (70.-145)°F

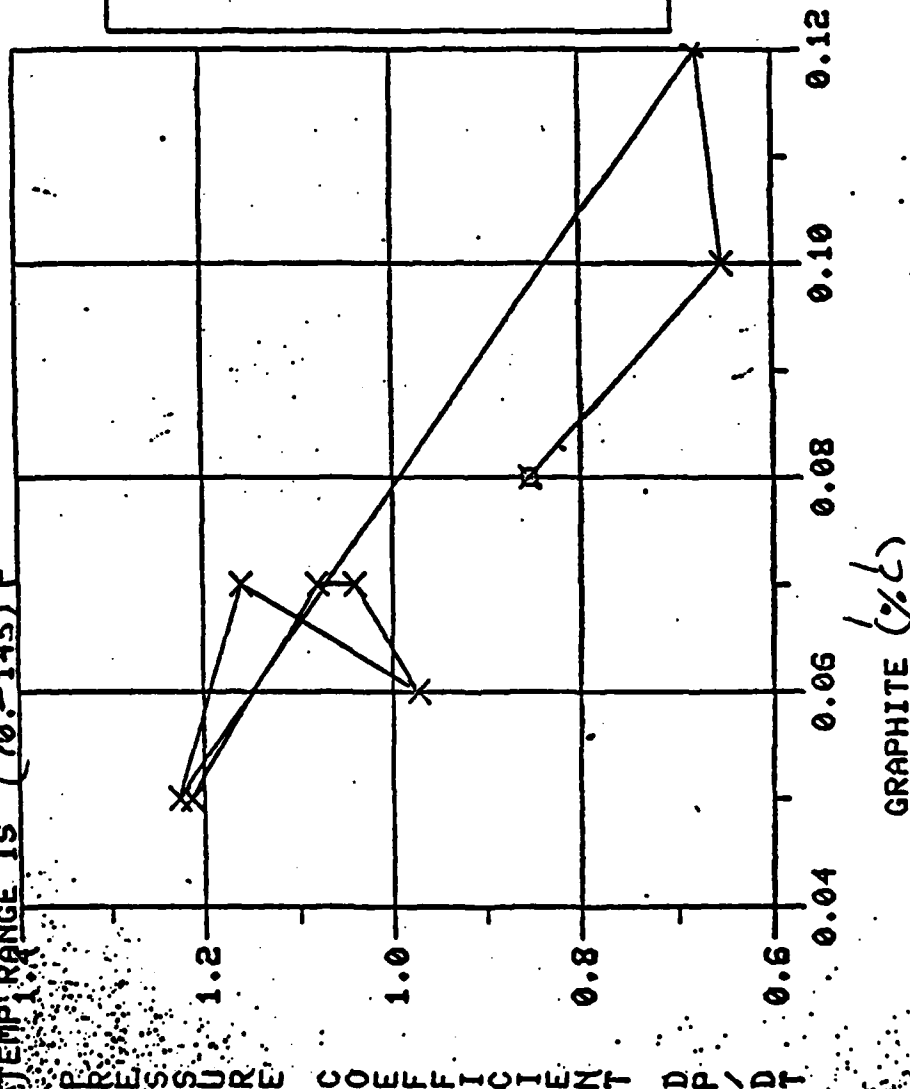


Fig. 13

DP(RAD-T)/DP(RAD-C) 145-70 US G4(XC)

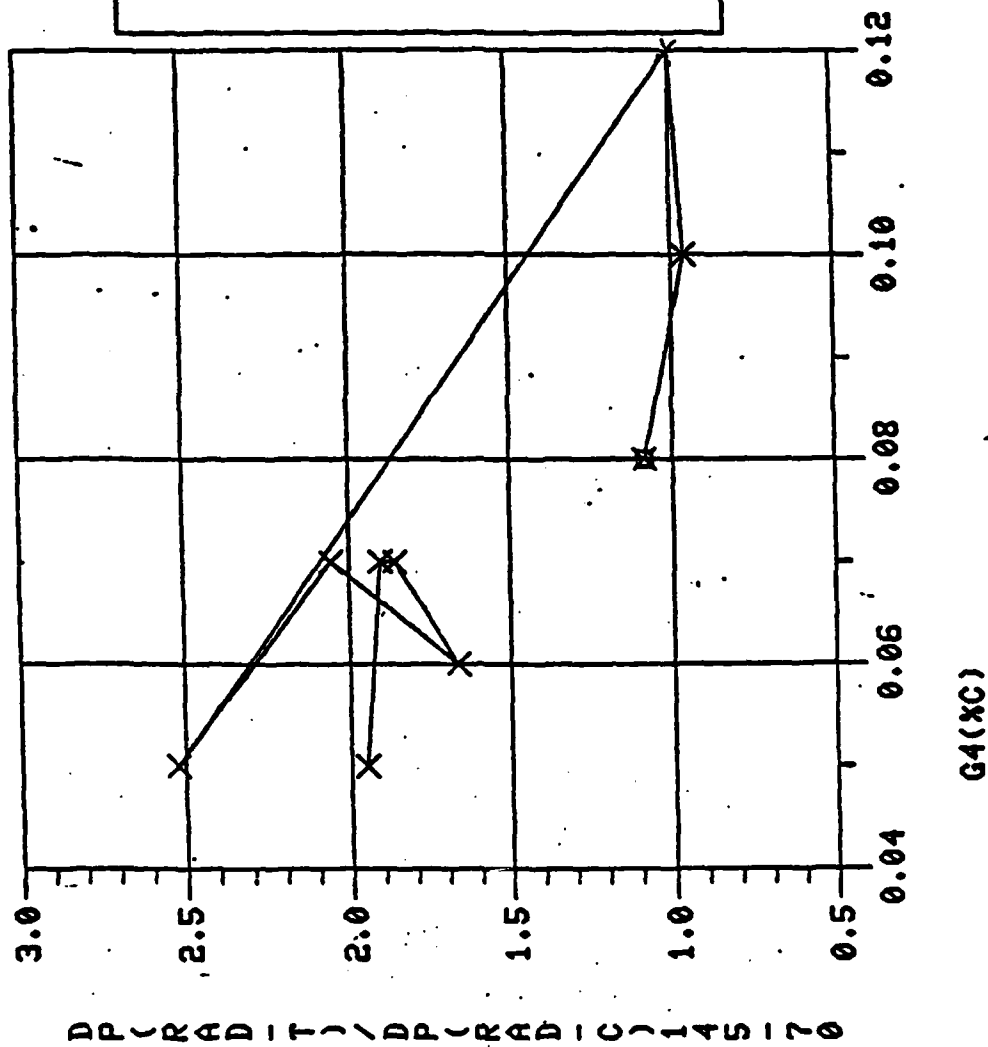


Fig. 14

DP(RAD-T)/DP(RAD-C)145--65 USG4(XC)

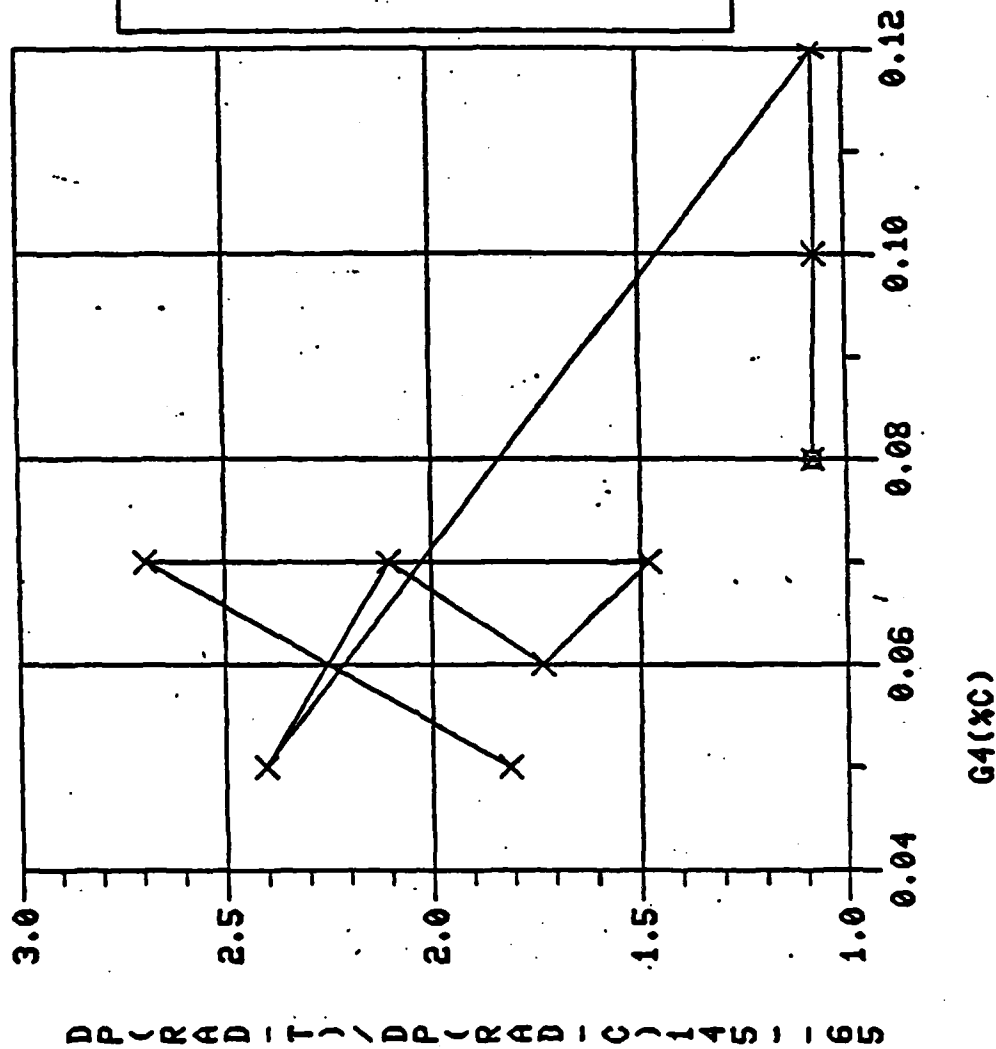
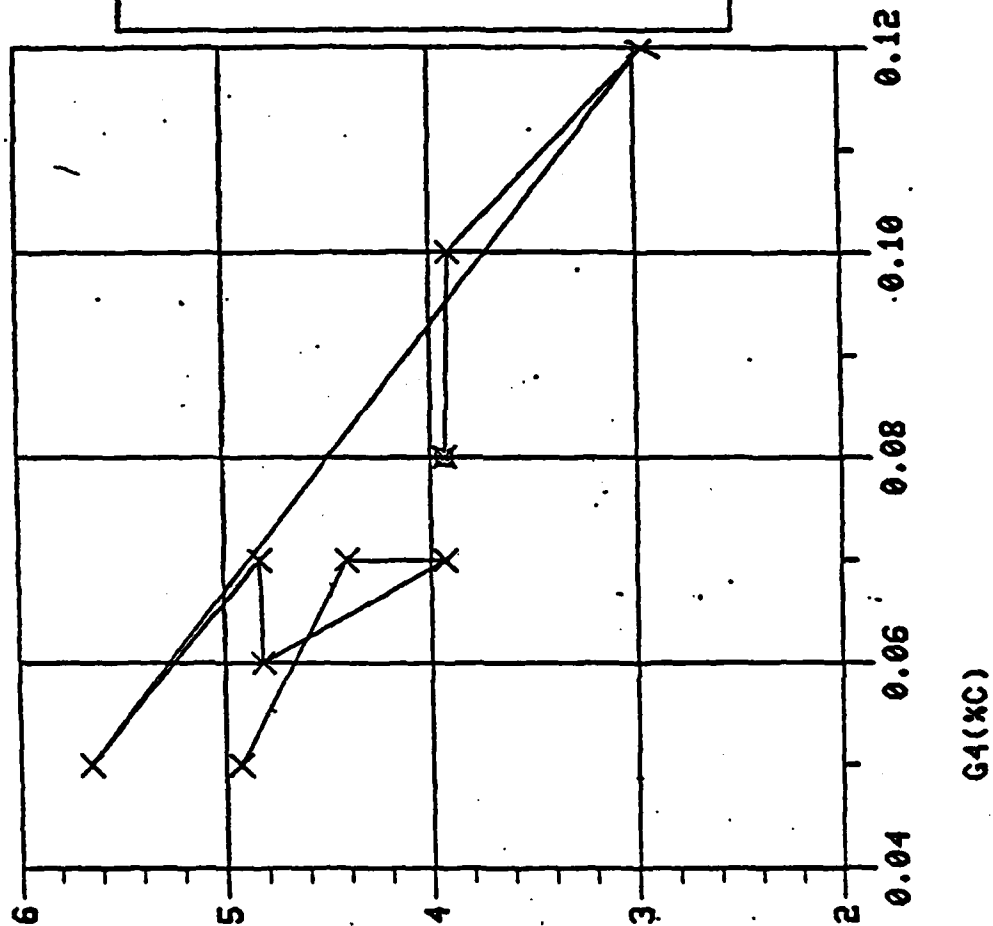


Fig. 15

R090-R0-40 U5G4(XC)



DATA

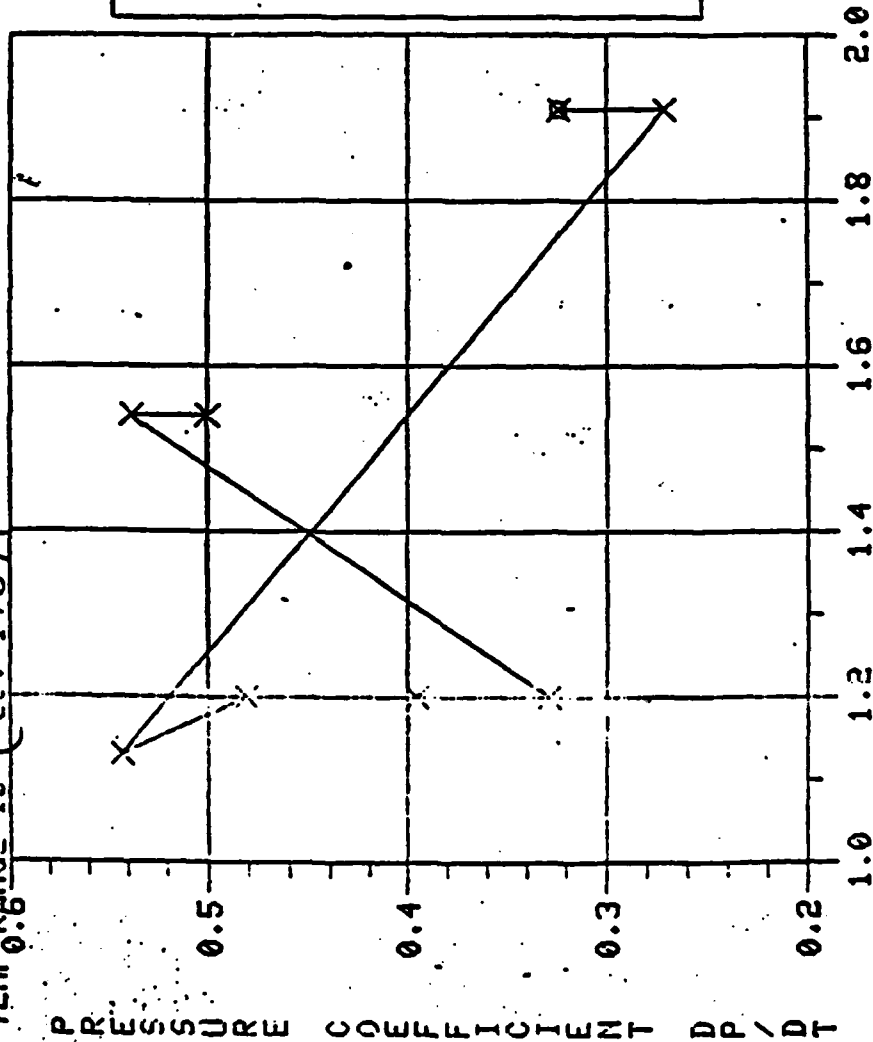
|        |        |
|--------|--------|
| .0800, | 3.9300 |
| .1000, | 3.9100 |
| .1200, | 3.9600 |
| .0500, | 5.6500 |
| .0700, | 4.8300 |
| .0600, | 4.8200 |
| .0700, | 3.9300 |
| .0700, | 4.4100 |
| .0500, | 4.9300 |

Fig. 16

,C062

PRESSURE COEFFICIENT, DP/DT VS. % ASH

TEMP RANGE IS (-65-145)°F



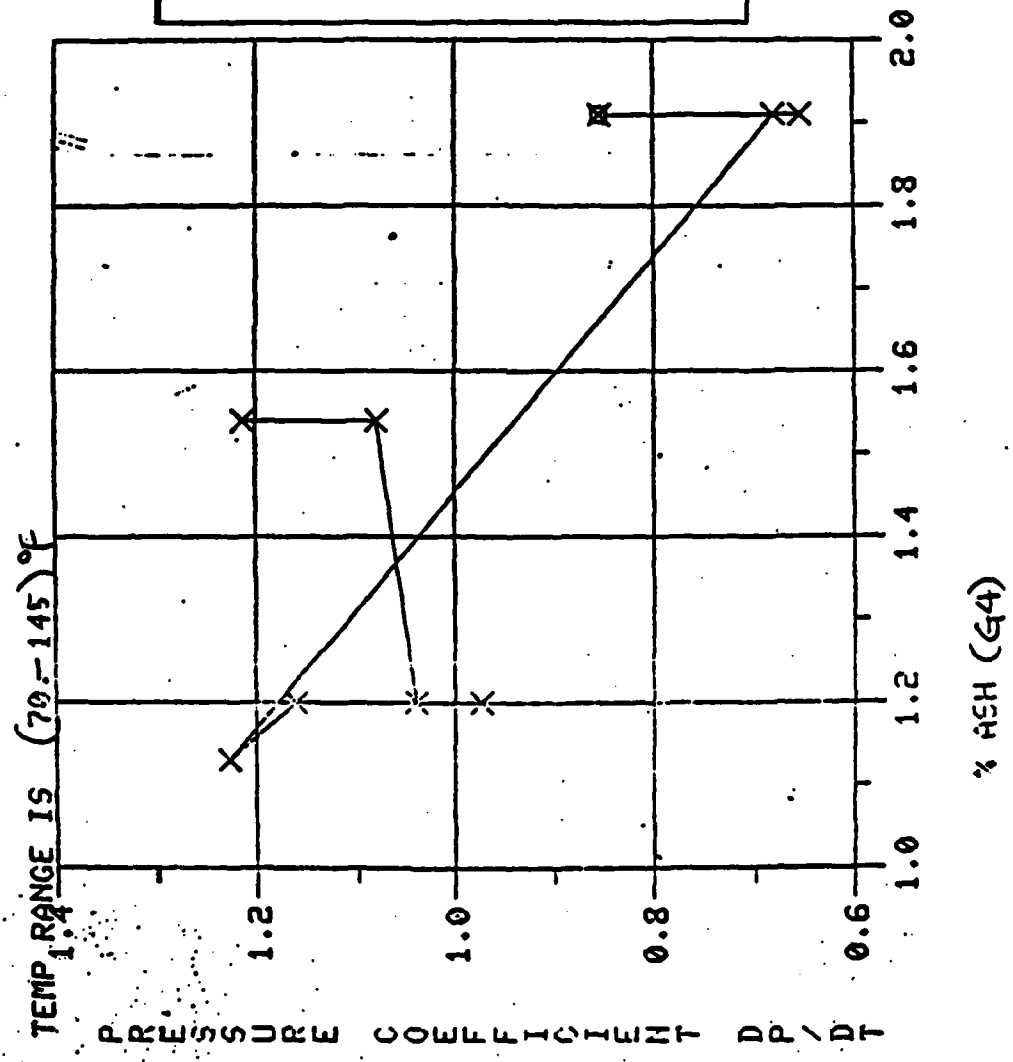
DATA

|         |       |
|---------|-------|
| 1.9100, | .3238 |
| 1.9100, | .2714 |
| 1.9100, | .2714 |
| 1.1300, | .5429 |
| 1.2000, | .4810 |
| 1.2000, | .3952 |
| 1.2000, | .3226 |
| 1.5400, | .5381 |
| 1.5400, | .5000 |

Fig. 17

.C062

PRESSURE COEFFICIENT, DP/DT VS. % ASH



DATA

|         |        |
|---------|--------|
| 1.9100, | .8533  |
| 1.9100, | .6533  |
| 1.9100, | .6800  |
| 1.1300, | 1.2267 |
| 1.2000, | 1.1600 |
| 1.2000, | .9733  |
| 1.2000, | 1.0400 |
| 1.5400, | 1.0300 |
| 1.5400, | 1.2133 |

Fig. 18

DP(RAD-T)/DP(RAD-C)145--65 VS XASH(G4)

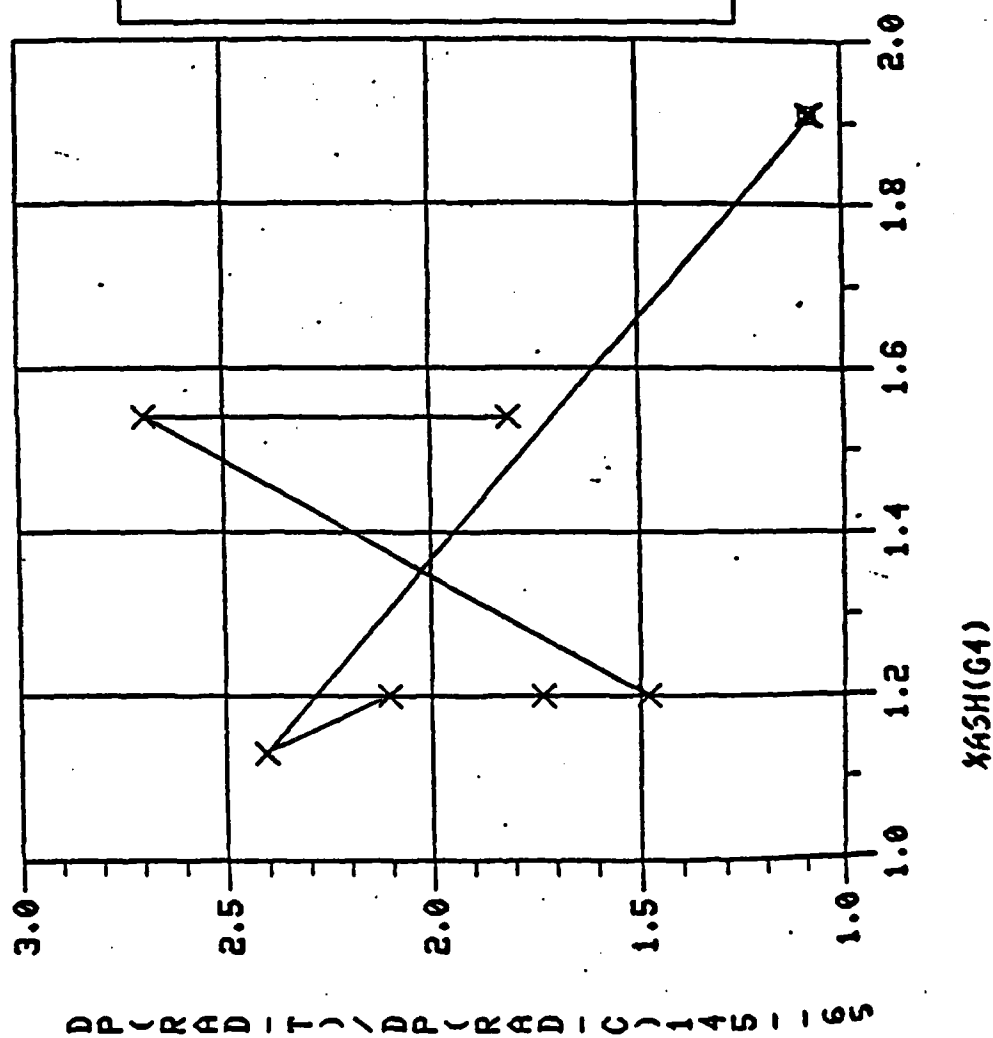


Fig. 19

DP(RAD-T)/DP(RAD-C)145-70 US XASH(G4)

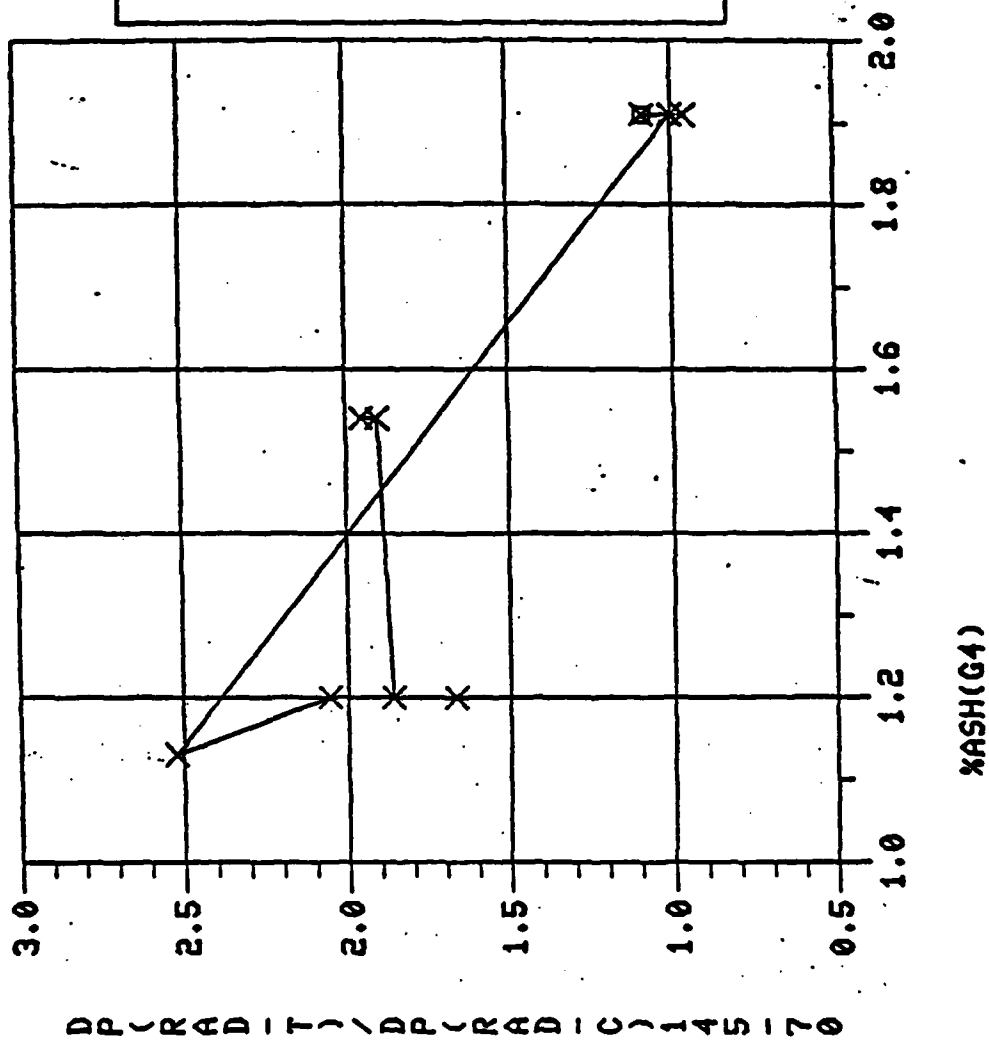


Fig. 20

RQ90-RQ-40 USXASH(G4)

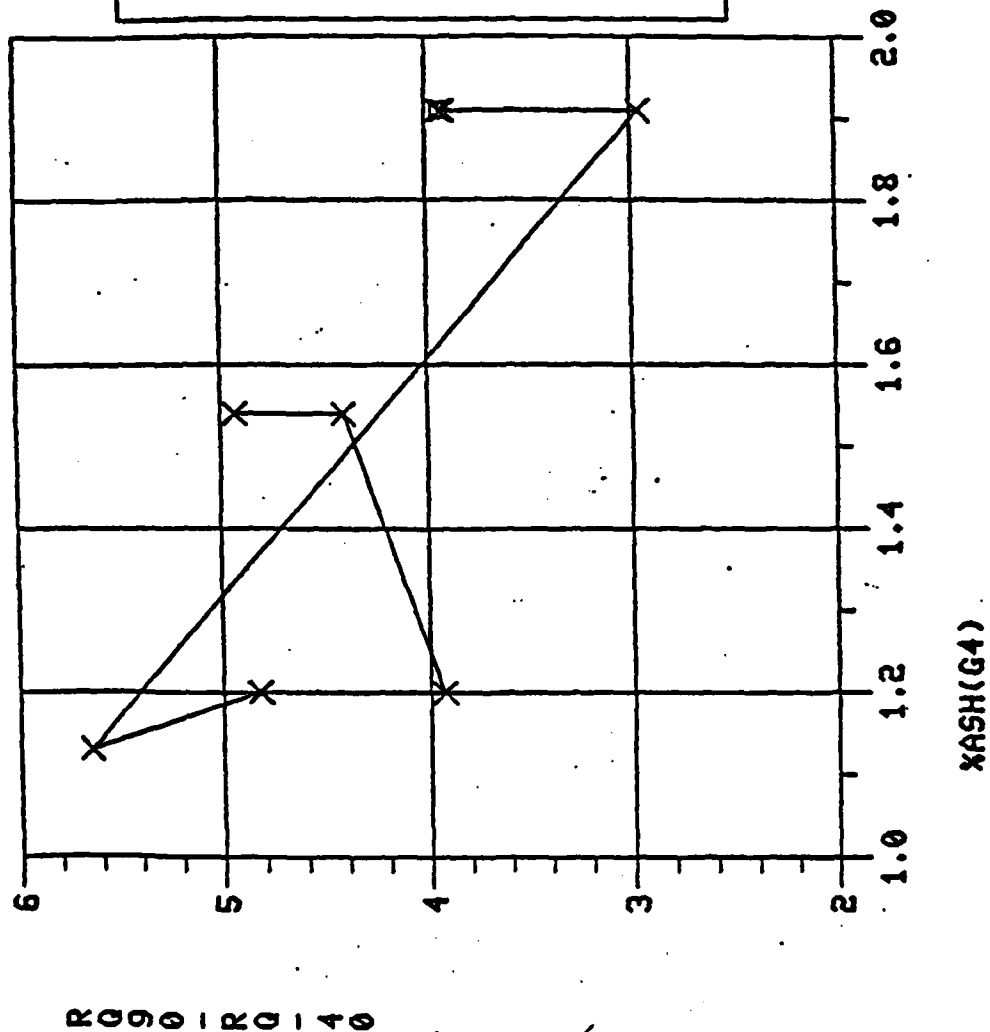


Fig. 21

# TEMP RANGE IS 70-145 F PRESSURE COEFFICIENT, DP/DT VS. YR(STORAGE NGU) ,C191

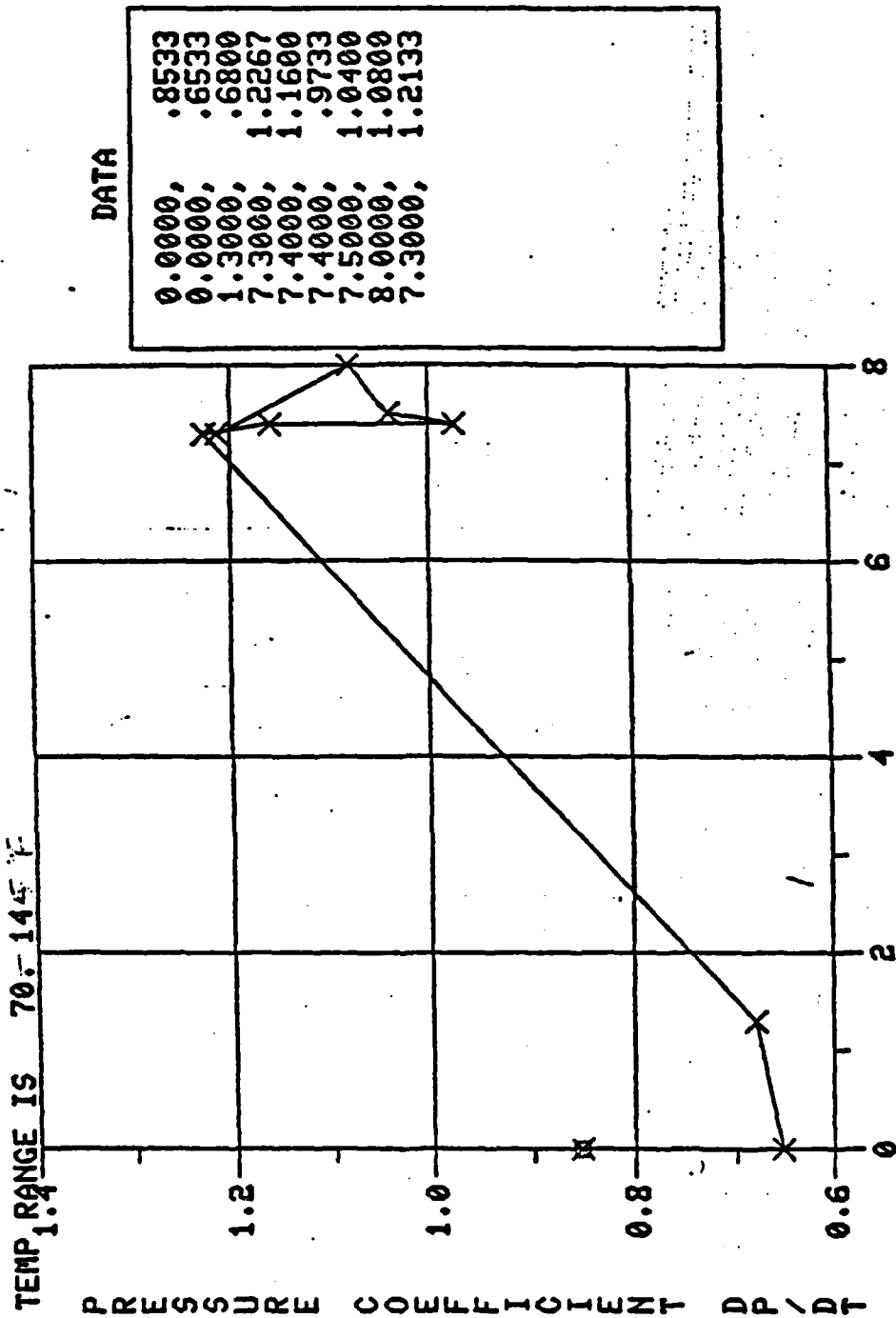
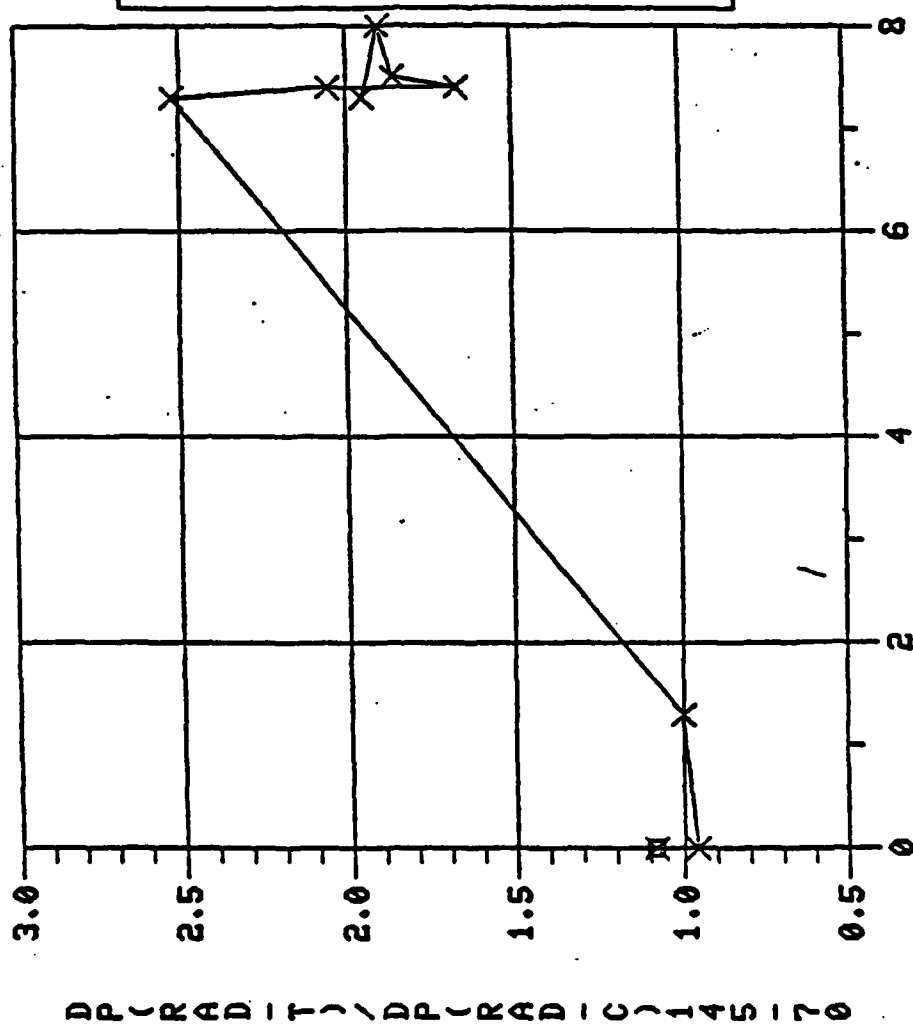


Fig. 12

DP(RAD-T)/DP(RAD-C)145-70 US YR(STORA(E)

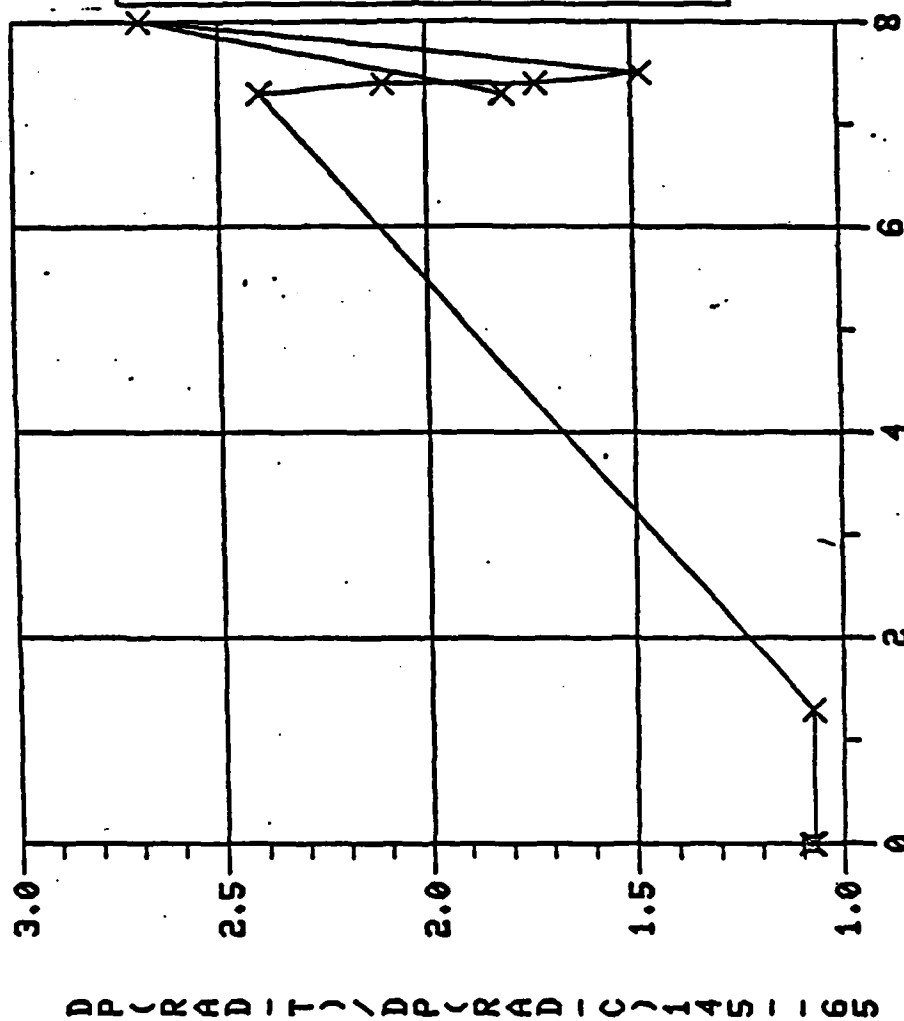


DATA

|         |        |
|---------|--------|
| 0.0000, | 1.0847 |
| 0.0000, | .9608  |
| 1.3000, | 1.0000 |
| 7.3000, | 2.5227 |
| 7.4000, | 2.0556 |
| 7.4000, | 1.6667 |
| 7.5000, | 1.8611 |
| 8.0000, | 1.9048 |
| 7.3000, | 1.9512 |

YR(STORA(E) Nitroquawline Fig. 23

DP(RAD-T)/DP(RAD-C)145--65 USYR(STORAGE)



DATA

|         |        |
|---------|--------|
| 0.0000, | 1.0847 |
| 0.0000, | 1.0755 |
| 1.3000, | 1.0755 |
| 7.3000, | 2.4043 |
| 7.4000, | 2.1042 |
| 7.4000, | 1.7292 |
| 7.5000, | 1.4792 |
| 8.0000, | 2.6905 |
| 7.3000, | 1.8103 |

YR(STORAGE) Nitrogen  
Fig. 24

# B. Summary of weak or slight trend

## Plots

| Fig # | Independent Variable                   | vs. | Dependent Variable                             |
|-------|----------------------------------------|-----|------------------------------------------------|
| 25    | % N <sub>2</sub> in Nitrocellulose     |     | Pressure at 145 °F                             |
| 26    | Viscosity                              |     | DP/DT <sub>2</sub> (70 -145) °F                |
| 27-30 | Freezess (Nitrocellulose)              |     | Pressure at 70 °F                              |
|       |                                        |     | DP/DT <sub>2</sub> (70 -145) °F                |
|       |                                        |     | $\frac{DP(TEST)}{DP(CALI)} DT_2 (70 -145) °F$  |
|       |                                        |     | RQ90 - (RQ -40)                                |
|       |                                        |     | DP/DT <sub>2</sub> (70 -145) °F                |
|       |                                        |     | $\frac{DP(TEST)}{DP(CALI)} DT_2 (70 -145) °F$  |
| 31-34 | PH Value (Nitroguanidine)              |     | $\frac{DP(TEST)}{DP(CALI)} DT_1 (65 -145) °F$  |
|       |                                        |     | RQ90 - (RQ -40)                                |
| 35-38 | % Ethyl Centralite (% Composition)     |     | DP/DT <sub>2</sub> (70 -145) °F                |
|       |                                        |     | $\frac{DP(TEST)}{DP(CALI)} DT_2 (70 -145) °F$  |
|       |                                        |     | $\frac{DP(TEST)}{DP(CALI)} DT_1 (-65 -145) °F$ |
|       |                                        |     | RQ90 - (RQ -40)                                |
| 39-44 | Volatile Content (in Ethyl Centralite) |     | RQ90 - RQ -40                                  |
|       |                                        |     | Pressure at 70 °F                              |
|       |                                        |     | Pressure at 145 °F                             |
|       |                                        |     | DP/DT <sub>2</sub> (70 -145) °F                |
|       |                                        |     | $\frac{DP(TEST)}{DP(CALI)} DT_1 (-65 -145) °F$ |
|       |                                        |     | $\frac{DP(TEST)}{DP(CALI)} DT_2 (70 -145) °F$  |
| 45-48 | % Moisture (in Potassium Sulfate)      |     | Pressure at -65 °F                             |
|       |                                        |     | Pressure at 70 °F                              |
|       |                                        |     | Pressure at 145 °F                             |
|       |                                        |     | DP/DT <sub>1</sub> (-65 -145) °F               |
| 49-50 | % Nitroglycerine (% Composition)       |     | Pressure at -65                                |
|       |                                        |     | DP/DT <sub>3</sub> (-65 -70) °F                |

51 Length of Grain  
52 Perforation Diameter  
53  $D/d$

Pressure at 145°F  
Pressure at -65°F  
 $DP/DT_2$  (70 -145)°F

54-57 Length uniformity of grain

RQ90-RQ -40  
Pressure at 70°F  
 $DP/DT_2$  (70 -145)°F

$\frac{DP(TEST)}{DP(CAL)} / DT_2$  (70 -145)°F

58-61 Diameter uniformity of grain

Pressure at 145°F  
 $DP/DT_2$  (70 -145)°F

RQ90-RQ -40

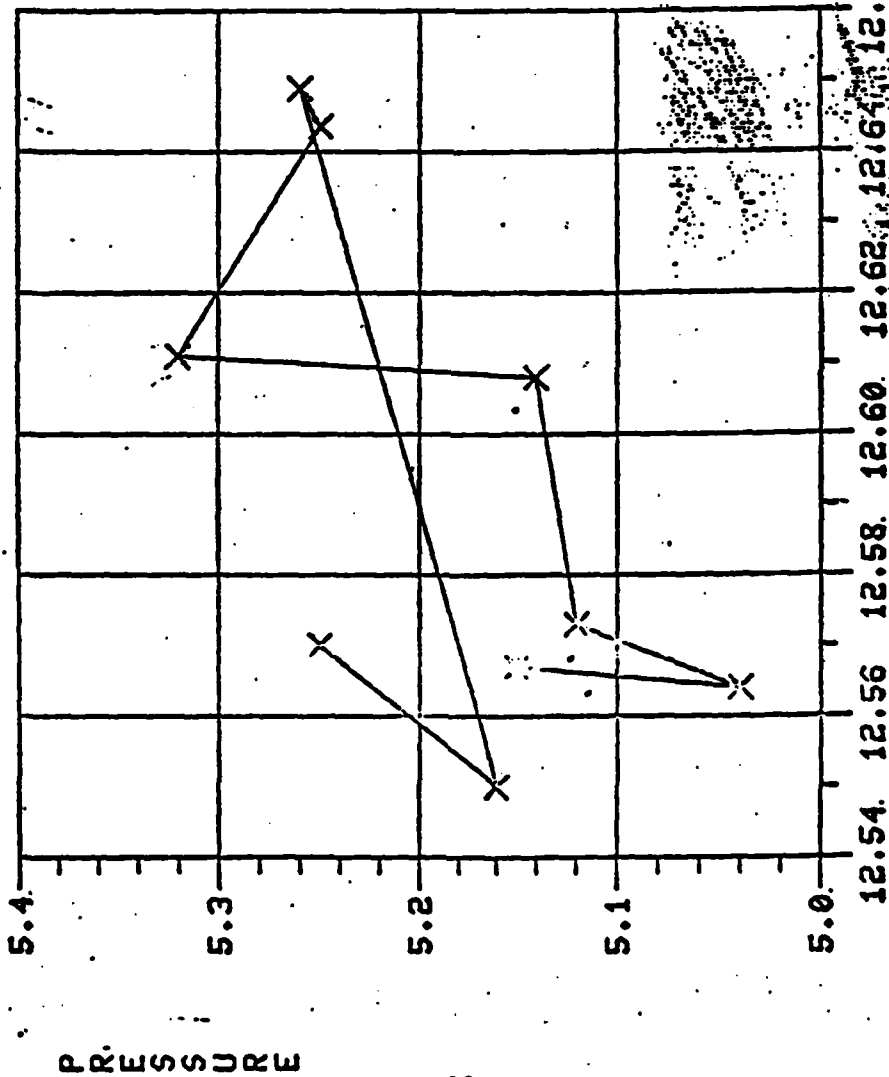
$\frac{DP(TEST)}{DP(CAL)} / DT_2$  (70 -145)°F

62-63 Yr (Storage) Nitroguanidine

Pressure at 145°F  
RQ90-(RQ -40)

TEMP - 145.

PRESSURE VS. PERCENT NITRO



PERCENT NITRO (NC)

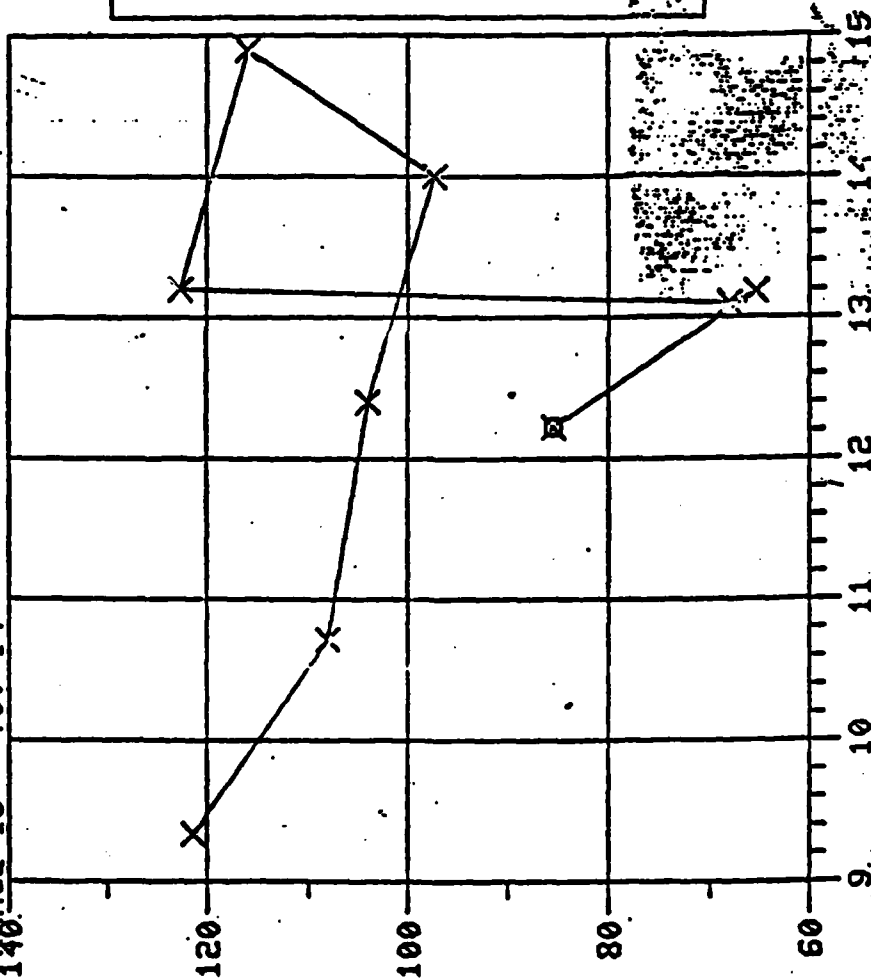
Fig. 25

.C014

PRESSURE COEFFICIENT, DP/DT, VS. VISCOSITY

TEMP RANGE IS 79. 14

PRESSURE COEFFICIENT DP/DT



DATA

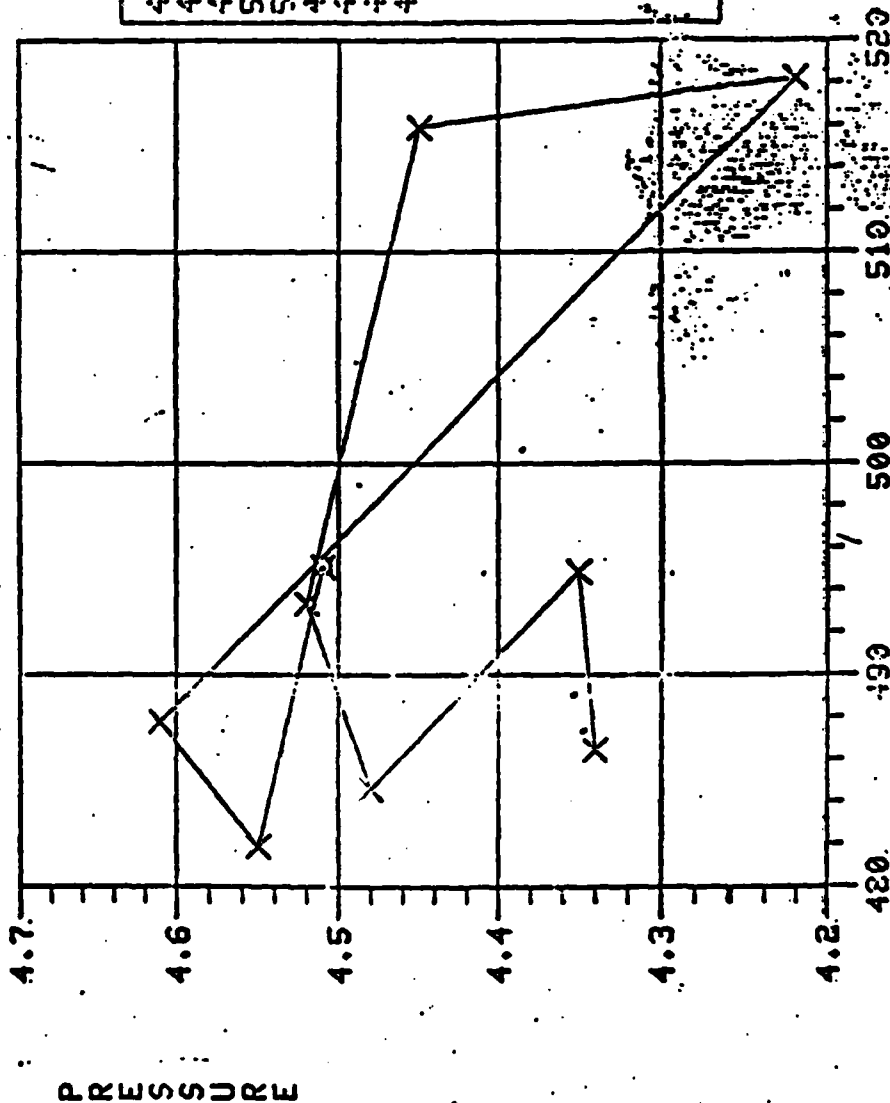
12.2222, 85.3333  
13.1818, 65.3333  
13.1000, 63.0000  
13.2000, 122.6667  
14.5000, 116.0000  
14.0000, 97.3333  
12.4000, 104.0000  
10.7143, 108.0000  
9.3333, 121.3333

VISCOSITY (NC)

Fig. 26

TEMP = 70.

PRESSURE US. FREENESS



FREENESS (NC)

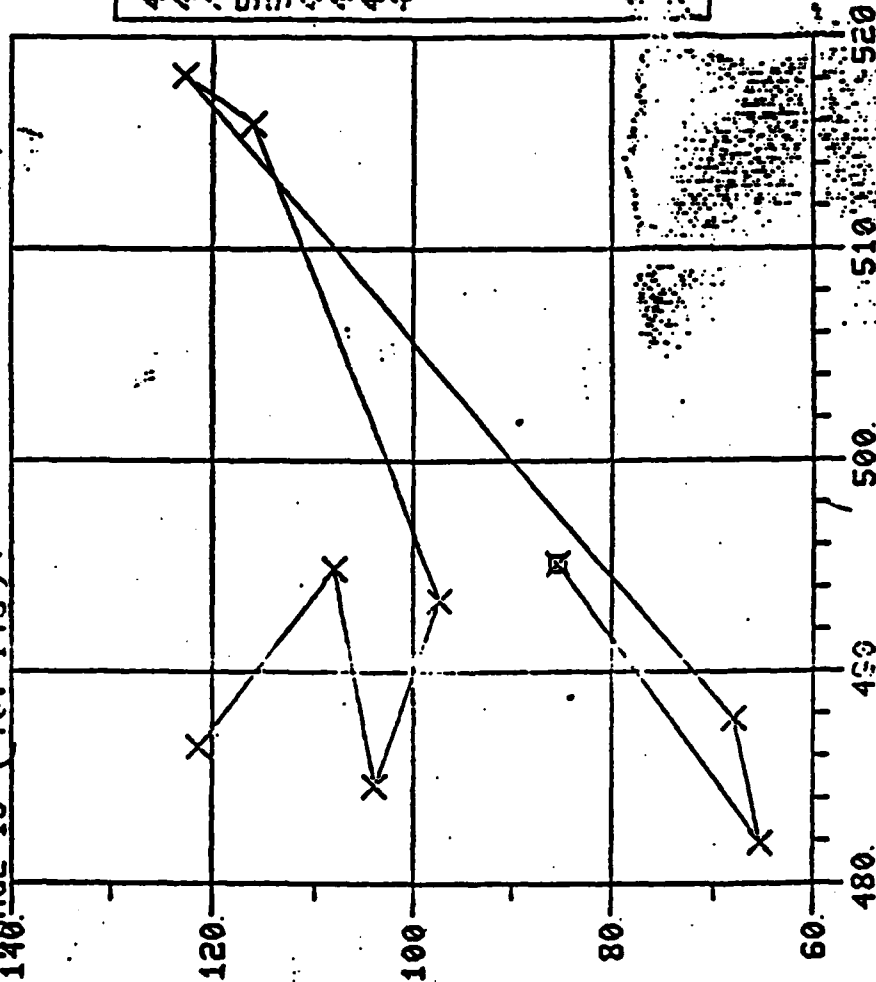
Fig. 27

.C015

PRESSURE COEFFICIENT, DP/DT VS FREENESS

TEMP RANGE IS (70.-145)°F

PRESSURE COEFFICIENT DP/DT



DATA

|           |          |
|-----------|----------|
| 495.1000, | 85.3333  |
| 481.9000, | 65.3333  |
| 487.2000, | 68.0000  |
| 516.2000, | 122.6667 |
| 515.3000, | 116.0000 |
| 499.3636, | 97.3333  |
| 434.6000, | 104.0000 |
| 494.8571, | 108.0000 |
| 486.4444, | 121.3333 |

FREENESS (NC)

Fig. 23

DP(RAD-T)/DP(RAD-C)145-70 US FREE(NC)

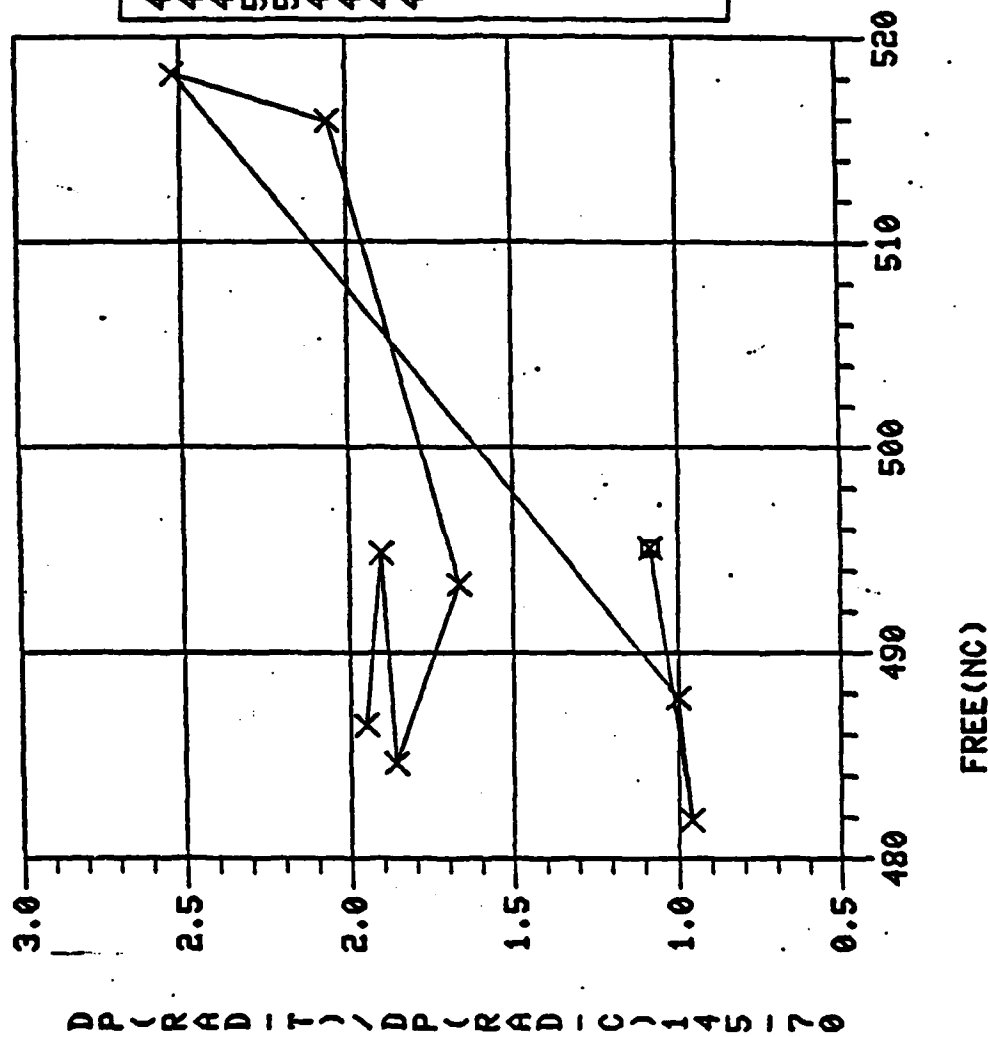
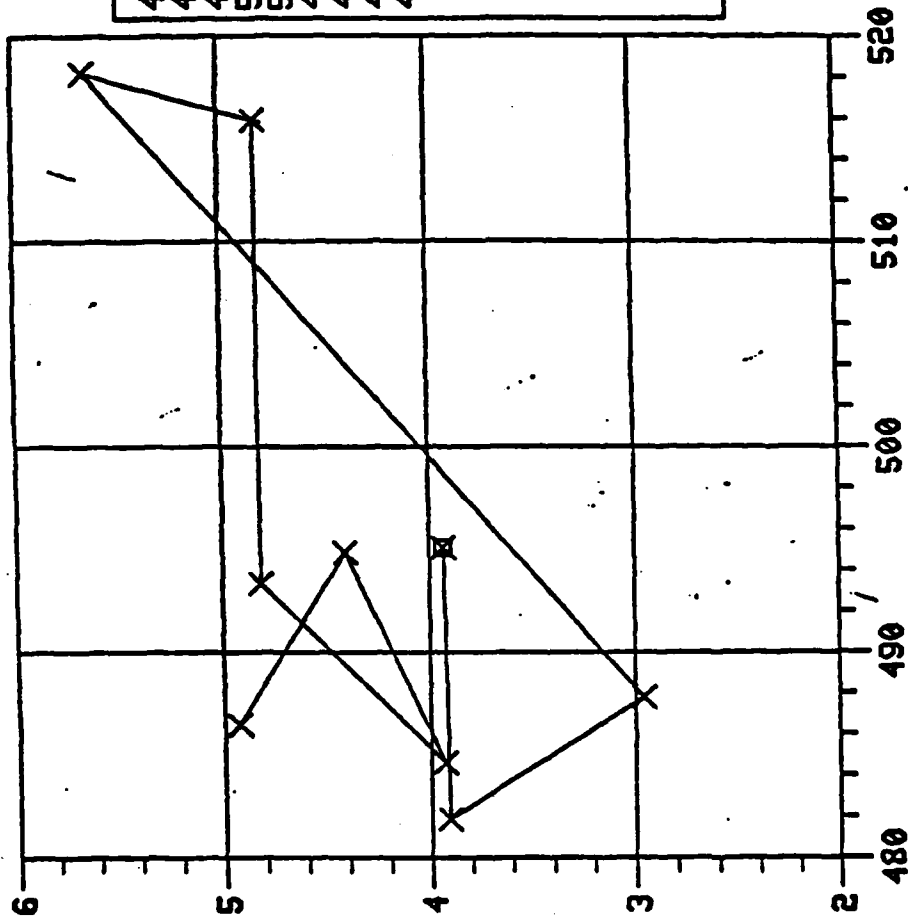


Fig. 29

RQ90-RQ-40 USFREE(NC)



RQ90-RQ-40

DATA

|           |        |
|-----------|--------|
| 495.1000, | 3.9300 |
| 481.9000, | 3.9100 |
| 487.8000, | 3.9600 |
| 518.2000, | 5.6500 |
| 515.9000, | 4.8300 |
| 493.3636, | 4.8200 |
| 484.6000, | 3.9300 |
| 494.8571, | 4.4100 |
| 486.4444, | 4.9300 |

Fig. 30

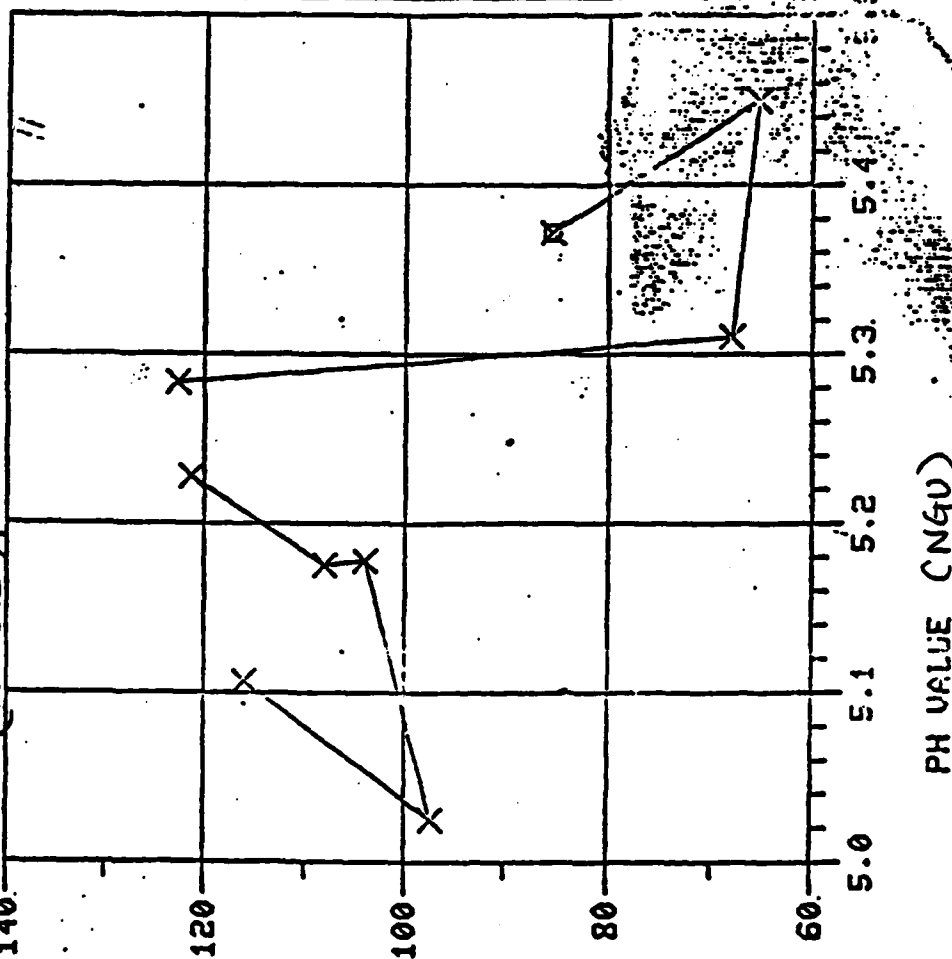
FREE(NC)

.C034

PRESSURE COEFFICIENT, DP/DT US. PH VALUE

TEMP RANGE IS (70-145)°F

PRESSURE COEFFICIENT DP/DT

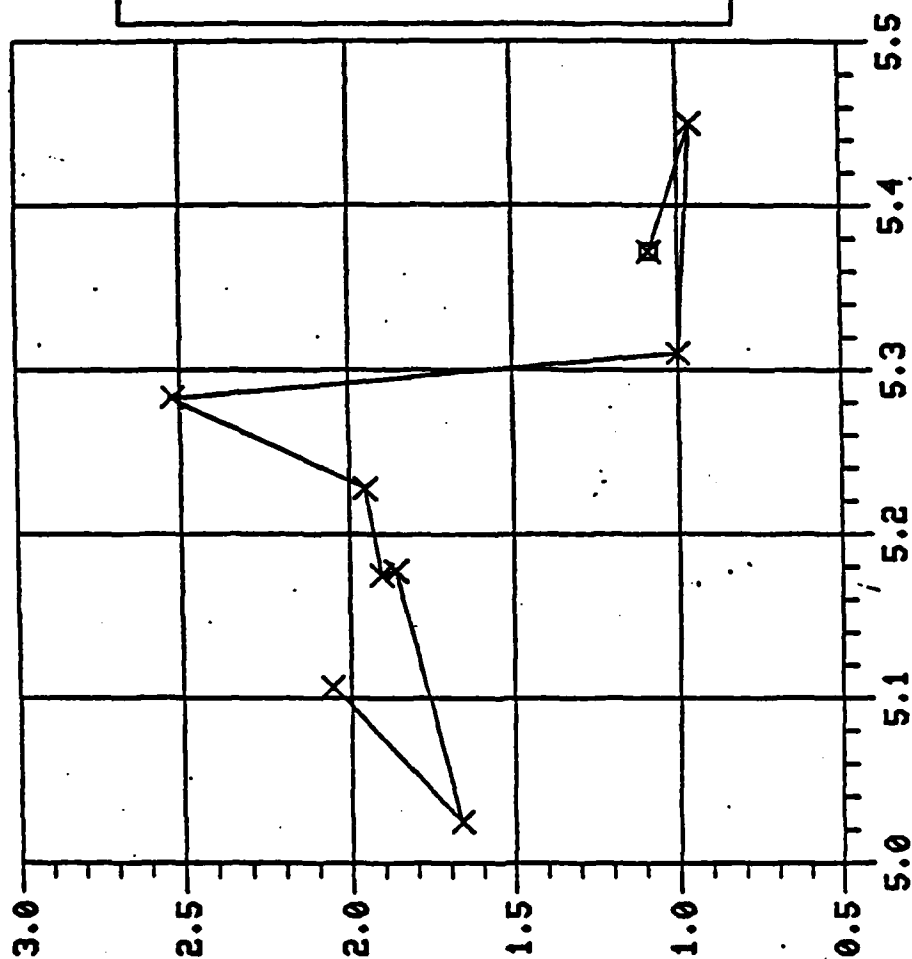


DATA

5.3720, 85.3333  
5.4500, 65.3333  
5.3103, 68.0000  
5.2833, 122.6667  
5.1067, 116.0000  
5.0250, 97.3333  
5.1778, 104.0000  
5.1750, 108.0000  
5.2278, 121.3333

Fig. 31

DP(RAD-T)/DP(RAD-C)145-70 VS PH(NGU)



DATA

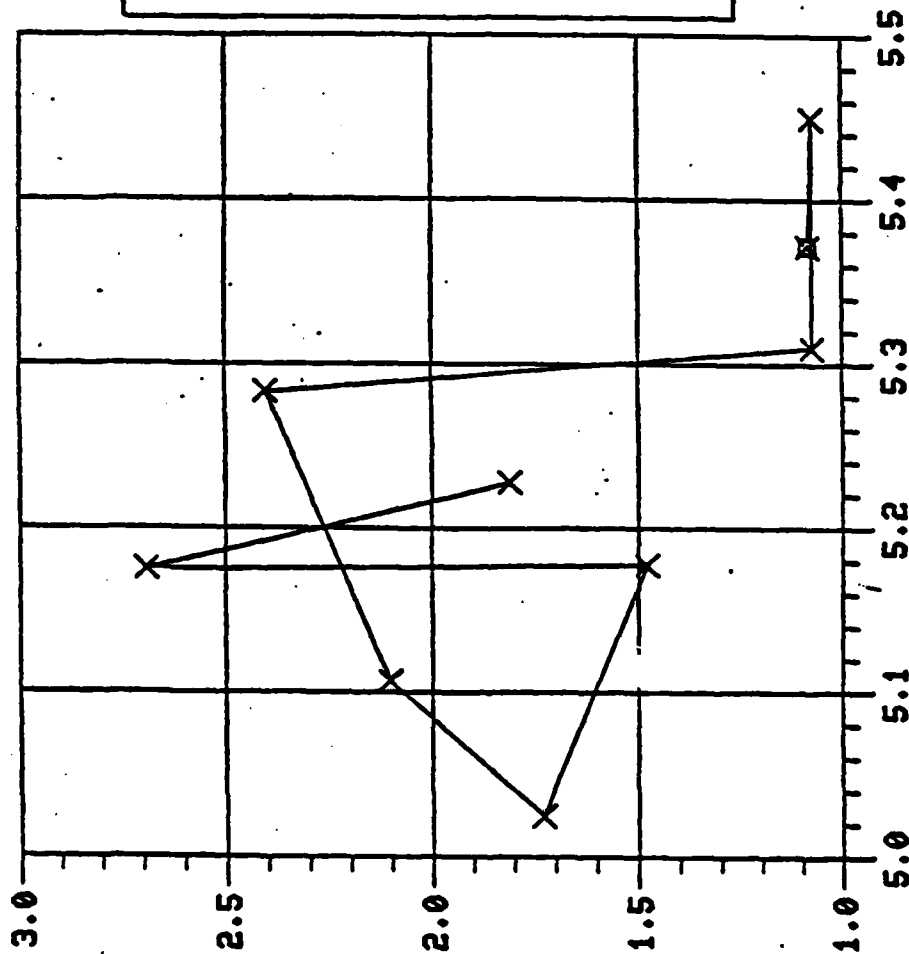
|         |        |
|---------|--------|
| 5.3720, | 1.0847 |
| 5.4500, | .9608  |
| 5.3103, | 1.0000 |
| 5.2833, | 2.5227 |
| 5.1067, | 2.0556 |
| 5.0250, | 1.6667 |
| 5.1778, | 1.8611 |
| 5.1750, | 1.9048 |
| 5.2278, | 1.9512 |

DP(RAD-T)/DP(RAD-C)145-70

PH(NGU)

Fig. 32

DP(RAD-T)/DP(RAD-C)145--65 USPH(NGU)



DATA

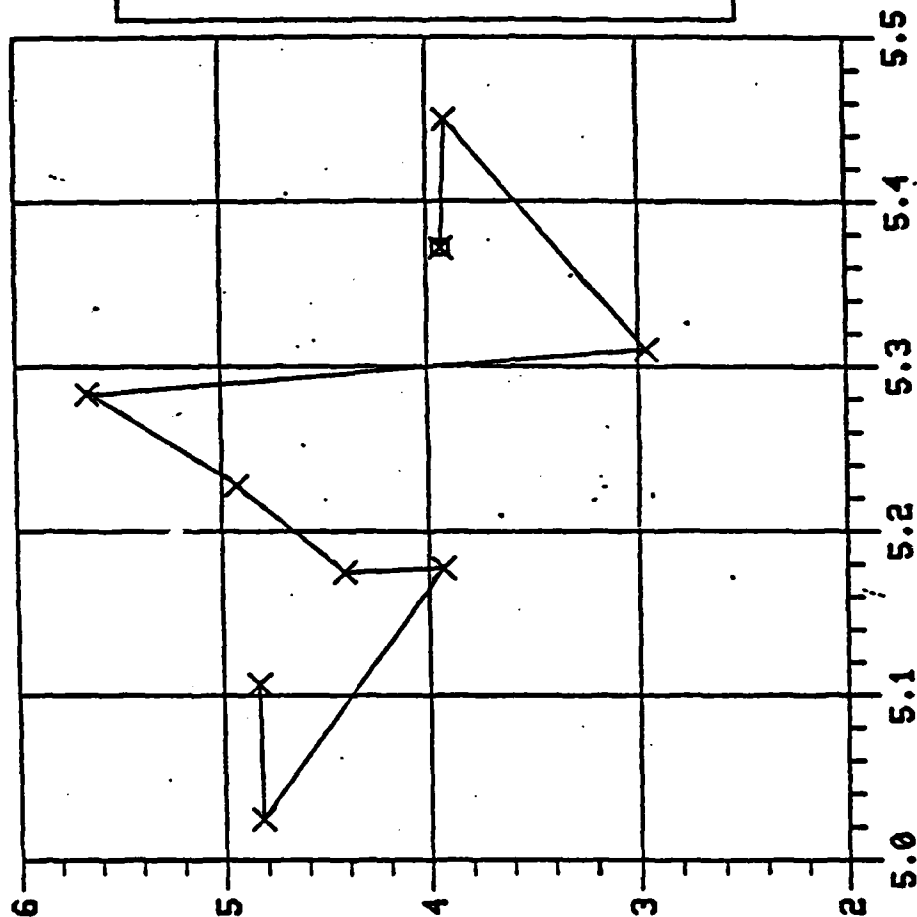
5.3720, 1.0847  
 5.4500, 1.0755  
 5.5103, 1.0755  
 5.5283, 2.4043  
 5.5106, 2.1042  
 5.5025, 1.7292  
 5.5177, 1.4792  
 5.5175, 2.6905  
 5.5278, 1.8103

DP(RAD-T)/DP(RAD-C)145--65

PH(NGU)

Fig. 33

R090-RQ-40 USPH(NGU)



DATA

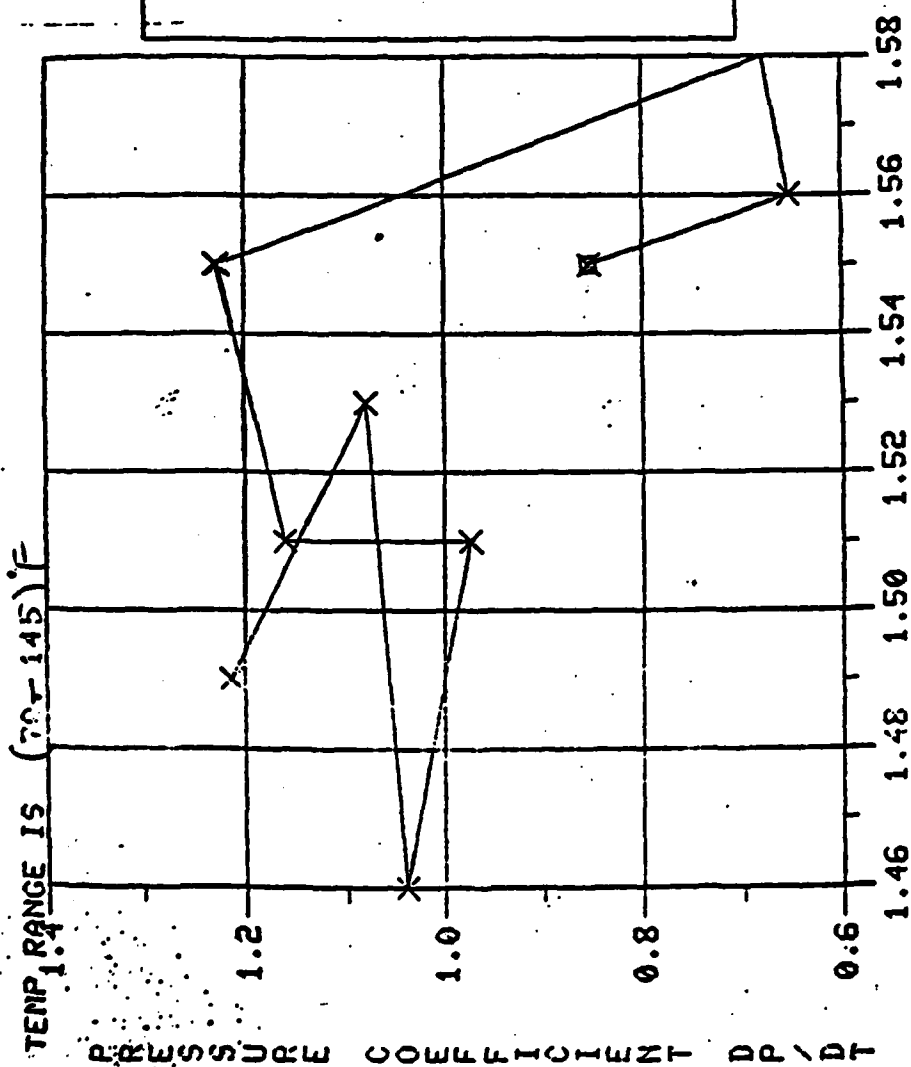
5.3720, 3.9300  
 5.4500, 3.9100  
 5.5103, 3.9600  
 5.5283, 5.6500  
 5.5106, 4.8300  
 5.5025, 4.8200  
 5.5177, 3.9300  
 5.5175, 4.4100  
 5.5227, 4.9300

R090-RQ-40

PH(NGU)

Fig. 34

TEMP. RANGE IS (70-145)°F PRESSURE COEFFICIENT, DP/DT US. ETHYL CENTRAL .C104



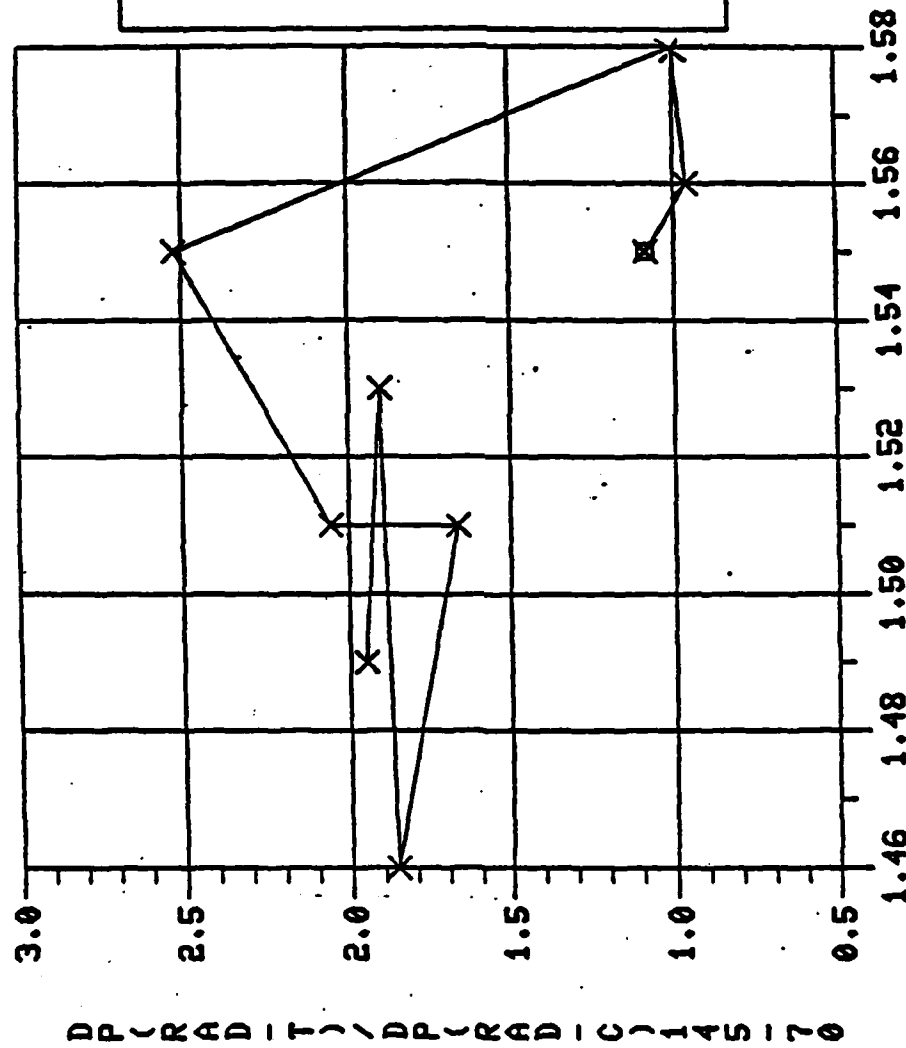
DATA

1.5500, .8533  
 1.5600, .6533  
 1.5800, .6200  
 1.5900, 1.2267  
 1.5100, 1.1600  
 1.5100, .9733  
 1.4600, 1.0400  
 1.5300, 1.0800  
 1.4900, 1.2133

ETHYL CENTRAL (%C)

Fig. 35

DP(RAD-T)/DP(RAD-C)145-70 VS E.C.(XC)

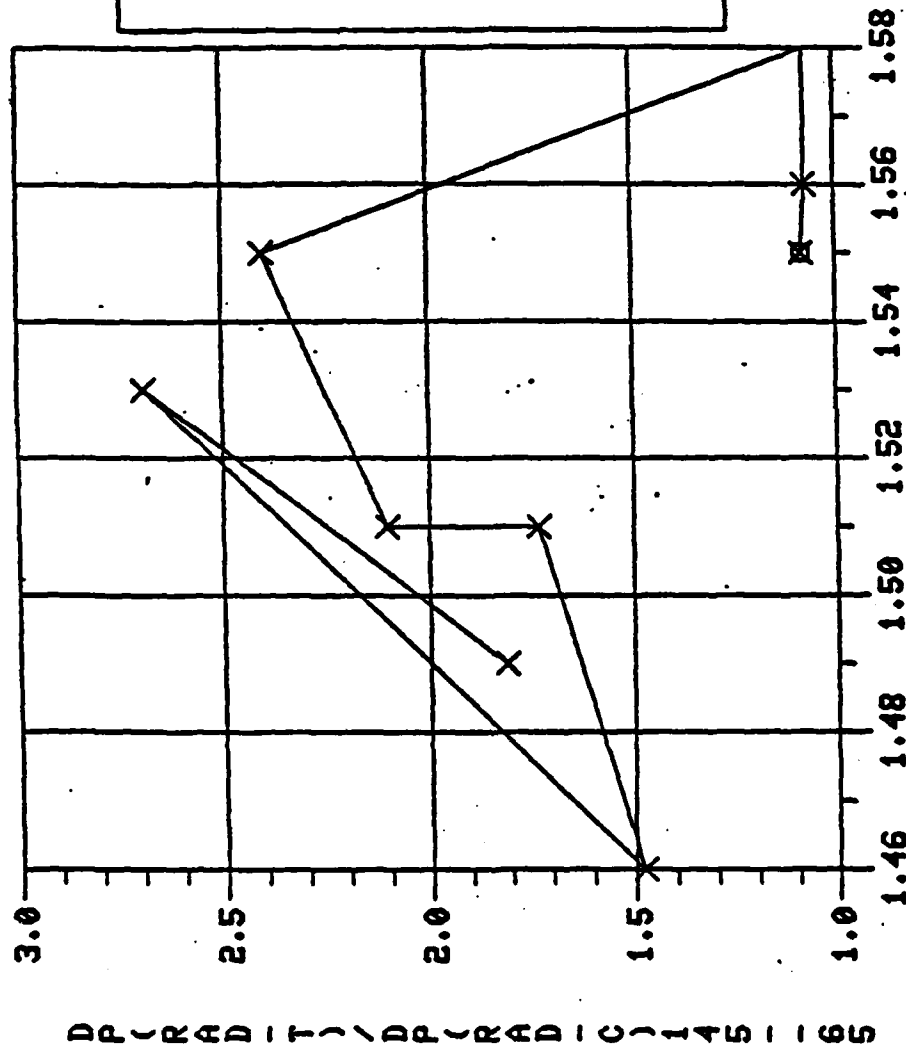


DATA

|         |        |
|---------|--------|
| 1.5500, | 1.0847 |
| 1.5600, | .9608  |
| 1.5800, | 1.0000 |
| 1.5500, | 2.5227 |
| 1.5100, | 2.0556 |
| 1.5100, | 1.6667 |
| 1.4600, | 1.8611 |
| 1.5300, | 1.9048 |
| 1.4900, | 1.9512 |

Fig. 36

DP(RAD-T)/DP(RAD-C)145--65 USE.C.(XC)



DATA

1.5500, 1.0847  
 1.5600, 1.0755  
 1.5800, 1.0755  
 1.5500, 2.4043  
 1.5100, 2.1042  
 1.5100, 1.7292  
 1.4600, 1.4792  
 1.5300, 2.6905  
 1.4900, 1.8103

Fig. 37

RQ90-RQ-40 USE.C.(XC)

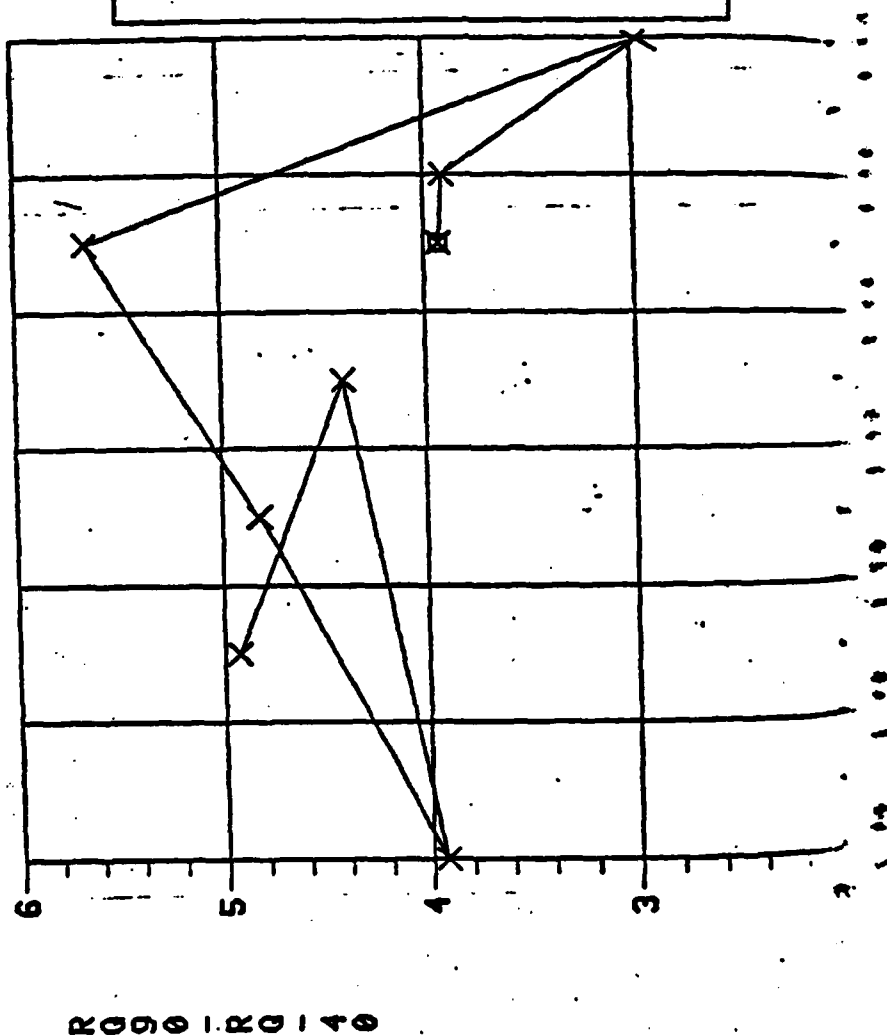
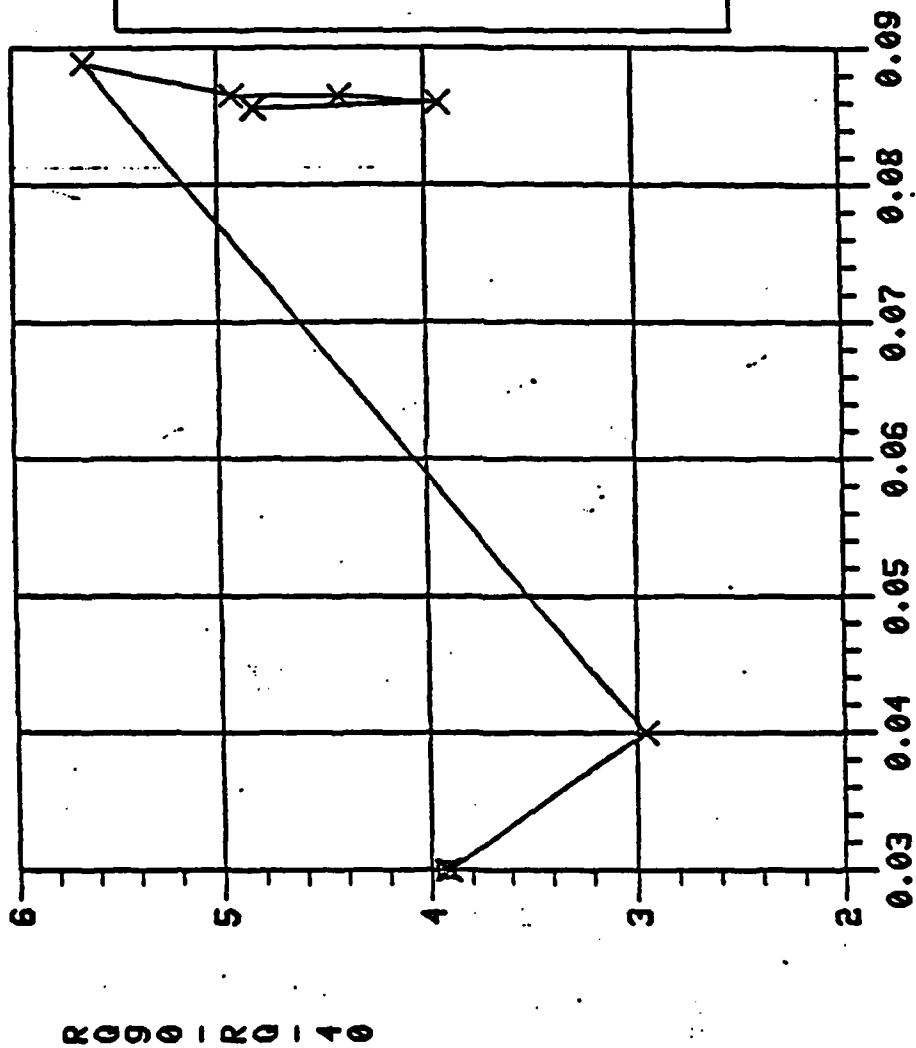


Fig. 38

RQ90-RQ-40 USU.C.(ETH)



DATA

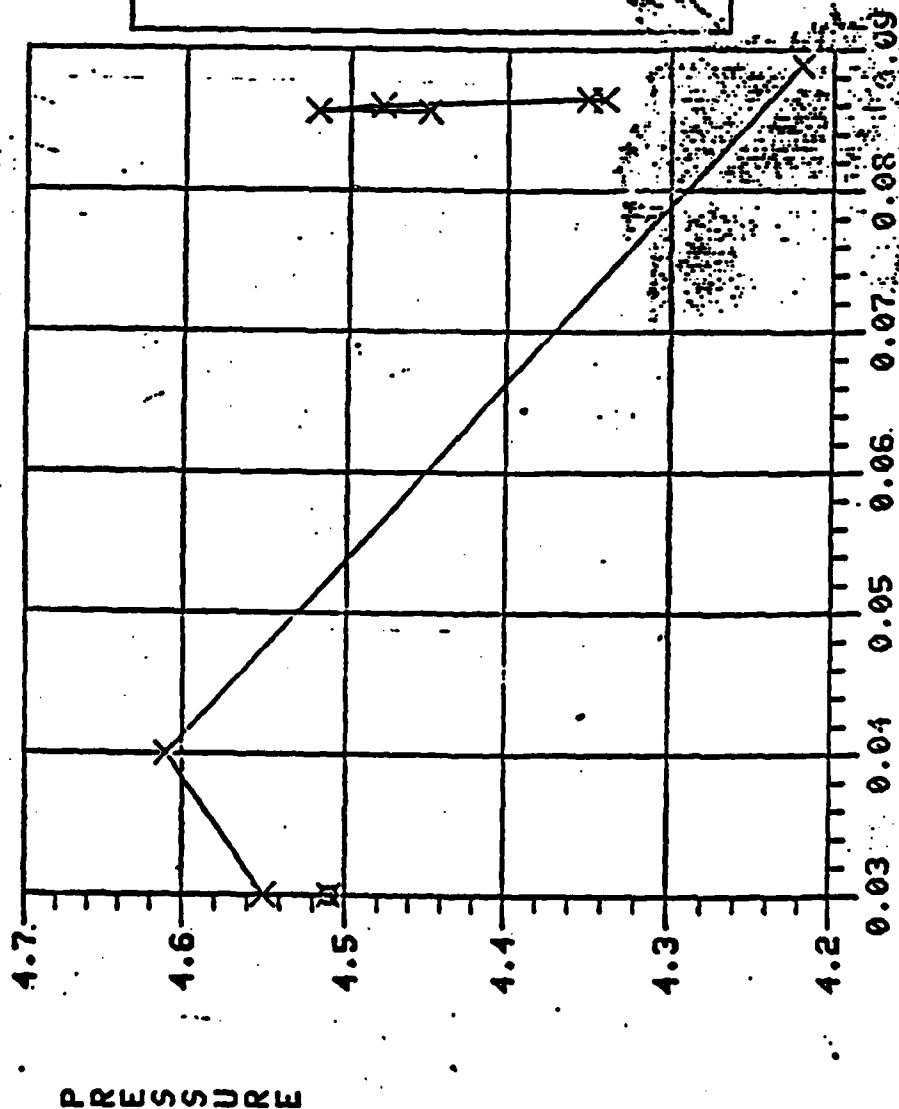
|        |        |
|--------|--------|
| .0300, | 3.9300 |
| .0300, | 3.9100 |
| .0400, | 2.9600 |
| .0889, | 5.6500 |
| .0856, | 4.8300 |
| .0856, | 4.8200 |
| .0860, | 3.9300 |
| .0865, | 4.4100 |
| .0865, | 4.9300 |

U.C.(ETH)

Fig. 39

TEMP = 70.

PRESSURE VS. VOLATILE CONTENT (C042)



DATA

.0300, 4.5100  
 .0300, 4.5500  
 .0400, 4.6100  
 .0289, 4.2200  
 .0256, 4.4500  
 .0356, 4.5200  
 .0360, 4.4800  
 .0365, 4.3500  
 .0265, 4.3400

VOLATILE CONTENT (ETH)

Fig. 40

TEMP. - 145.

PRESSURE VS. VOLATILE CONTENT, C04B

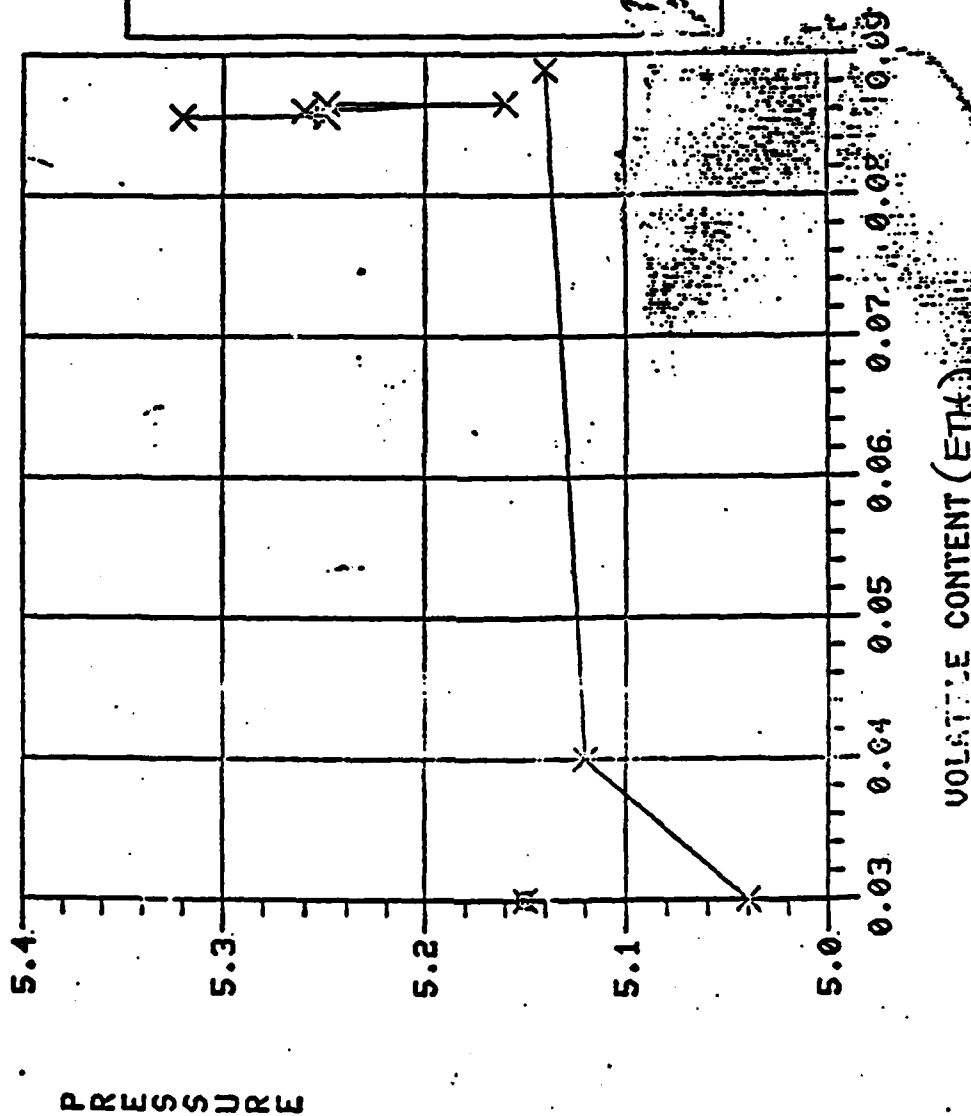
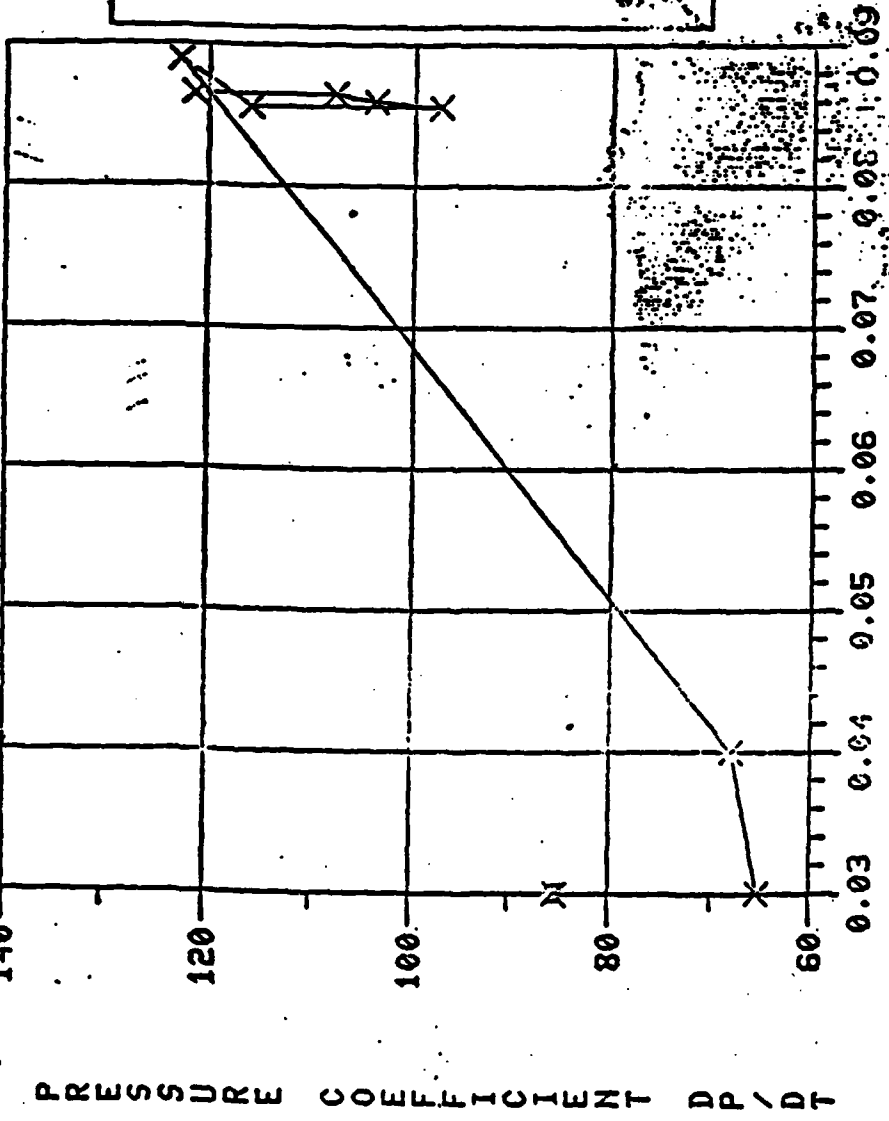


Fig. 41

PRESSURE COEFFICIENT,  $DP/DT$ , VS. VOLATILE CONTENT, C042

TEMP RANGE IS (70-145)°F



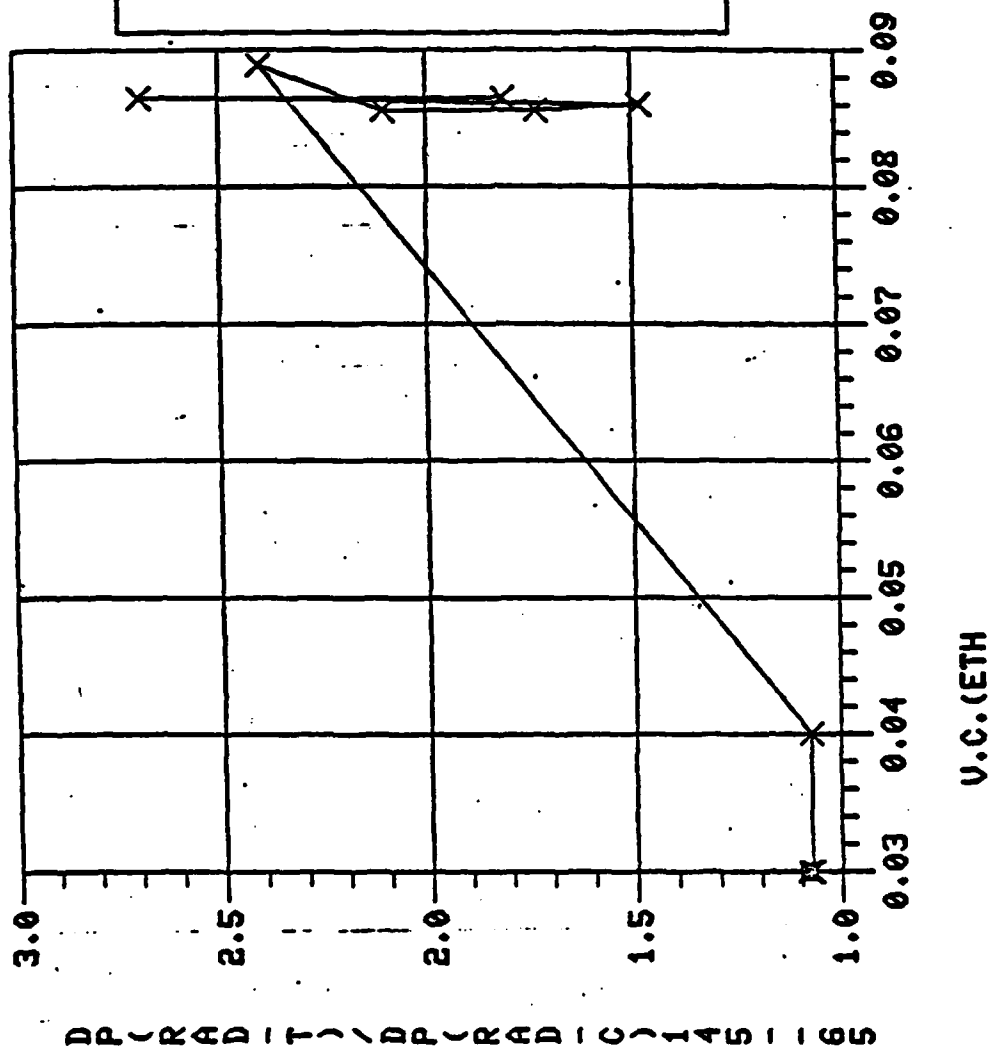
DATA

.0300, 85.3333  
 .0300, 65.3333  
 .0400, 62.0000  
 .0889, 122.6667  
 .0856, 116.0000  
 .0856, 97.3333  
 .0850, 104.0000  
 .0855, 103.0000  
 .0865, 121.3333

VOLATILE CONTENT (ETH)

Fig. 42

DP(RAD-T)/DP(RAD-C)145--65 USV.C.(ETH)

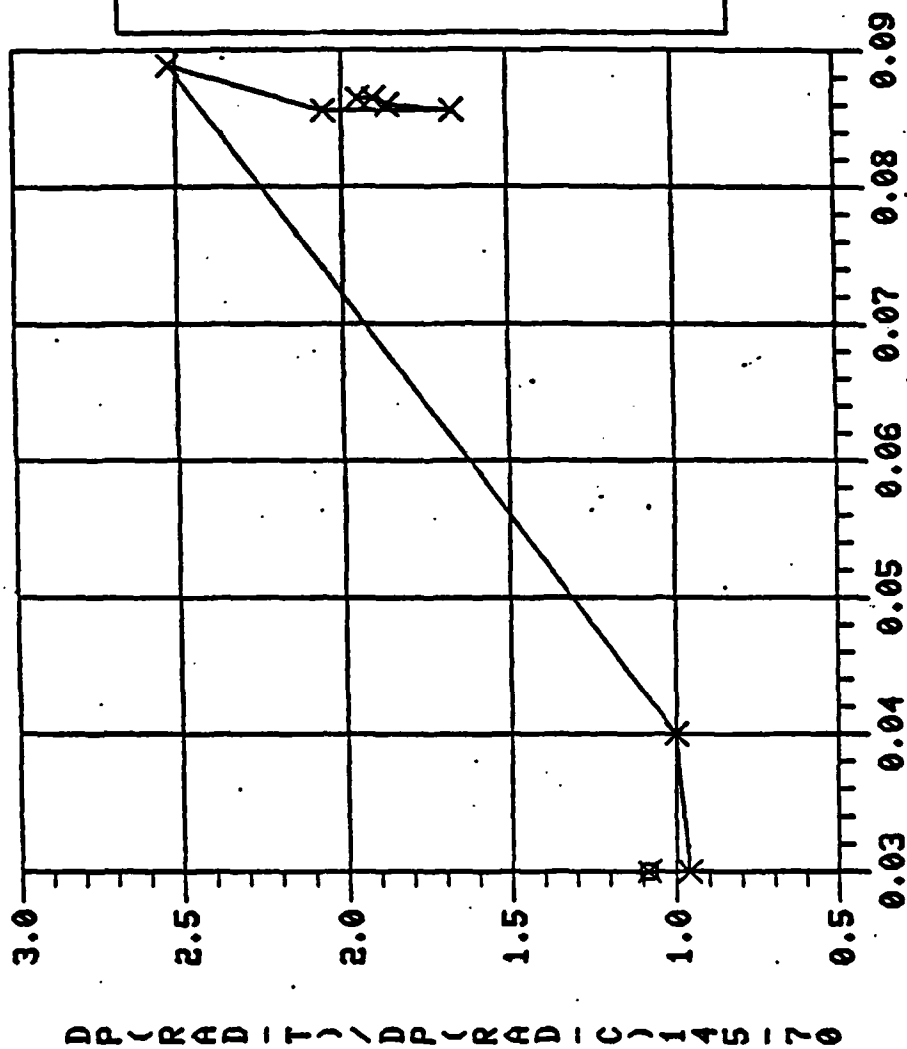


DATA

|        |        |
|--------|--------|
| .0300, | 1.0847 |
| .0300, | 1.0755 |
| .0400, | 1.0755 |
| .0889, | 2.4043 |
| .0856, | 2.1042 |
| .0856, | 1.7292 |
| .0860, | 1.4792 |
| .0865, | 2.6905 |
| .0865, | 1.8103 |

Fig. 43

DP(RAD-T)/DP(RAD-C)145-70 US V.C.(ETH)



DATA

|        |        |
|--------|--------|
| .0300, | 1.0847 |
| .0300, | .9608  |
| .0400, | 1.0000 |
| .0889, | 2.5227 |
| .0856, | 2.0556 |
| .0856, | 1.6667 |
| .0860, | 1.8611 |
| .0865, | 1.9048 |
| .0865, | 1.9512 |

U.C.(ETH)

Fig. 44

TEMP = -65.

PRESSURE VS. % MOISTURE .C051

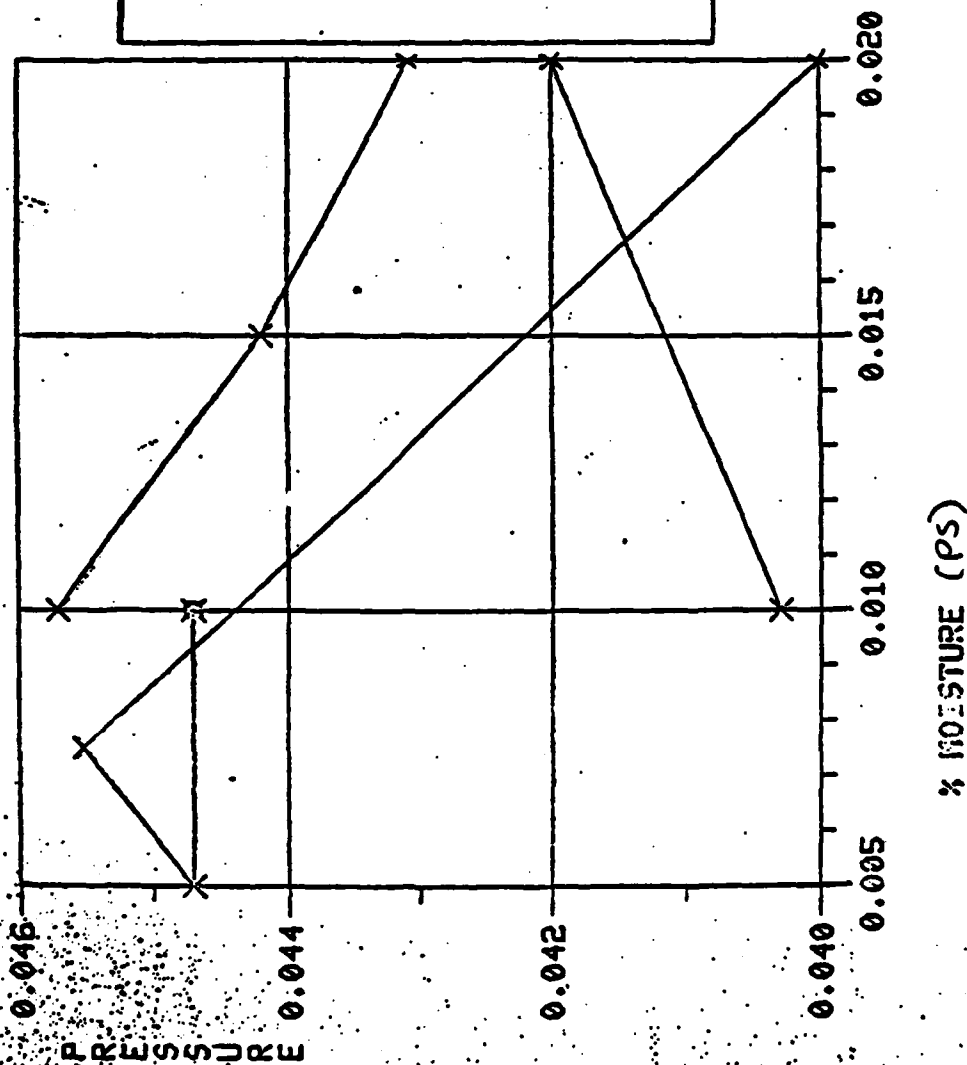
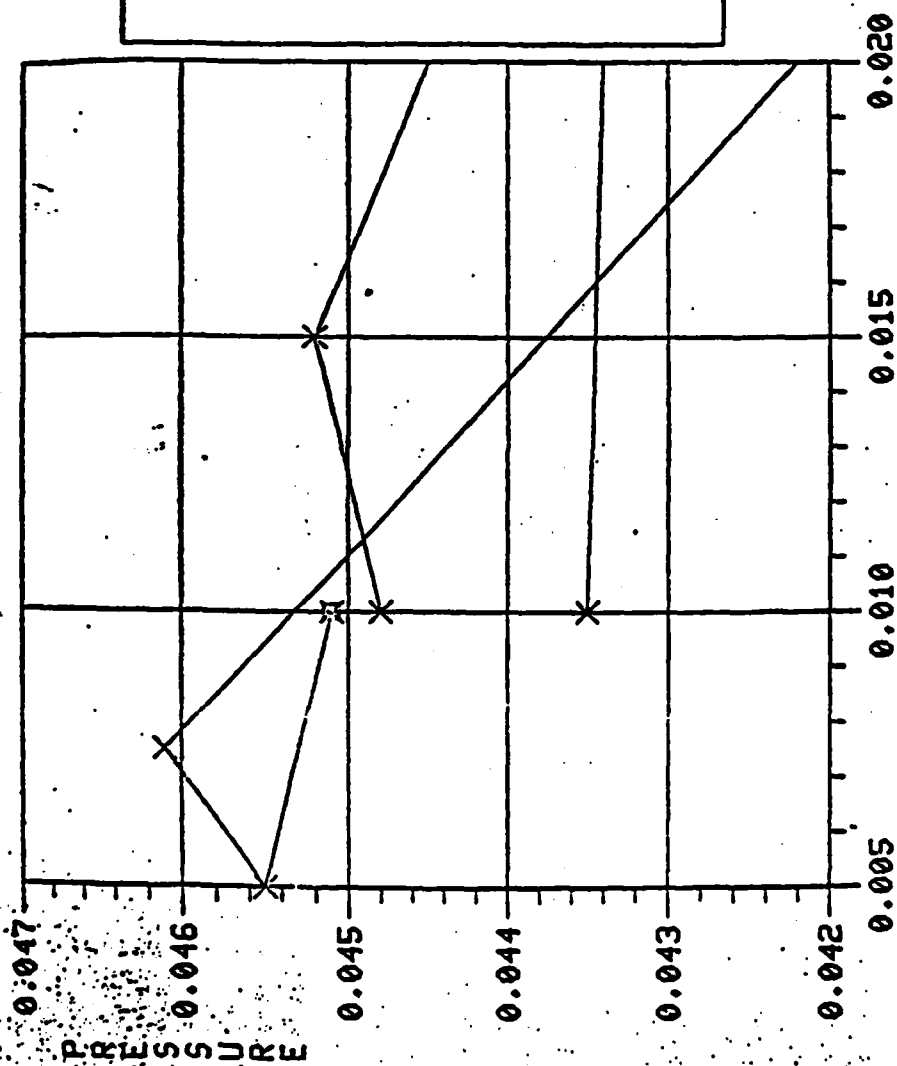


Fig. 45

TEMP = 70.

PRESSURE VS. % MOISTURE ,0051



DATA

.0100, .0451  
 .0050, .0455  
 .0075, .0461  
 .0200, .0422  
 .0200, .0445  
 .0150, .0452  
 .0100, .0448  
 .0100, .0435  
 .0200, .0434

Fig 46

TEMP - 145.

PRESSURE US. % MOISTURE ,C051

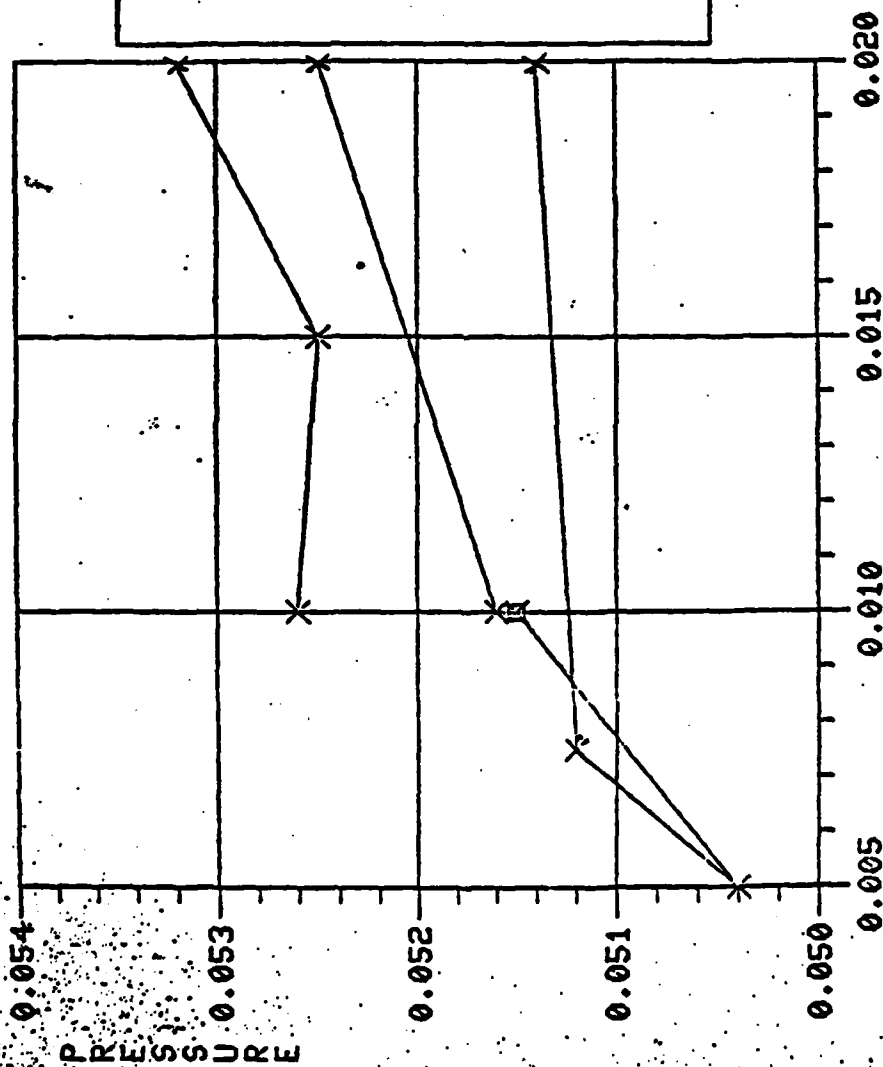


Fig. 47

.C051

PRESSURE COEFFICIENT, DP/DT VS. X MOISTURE

TEMP RANGE IS (-65-145)°F

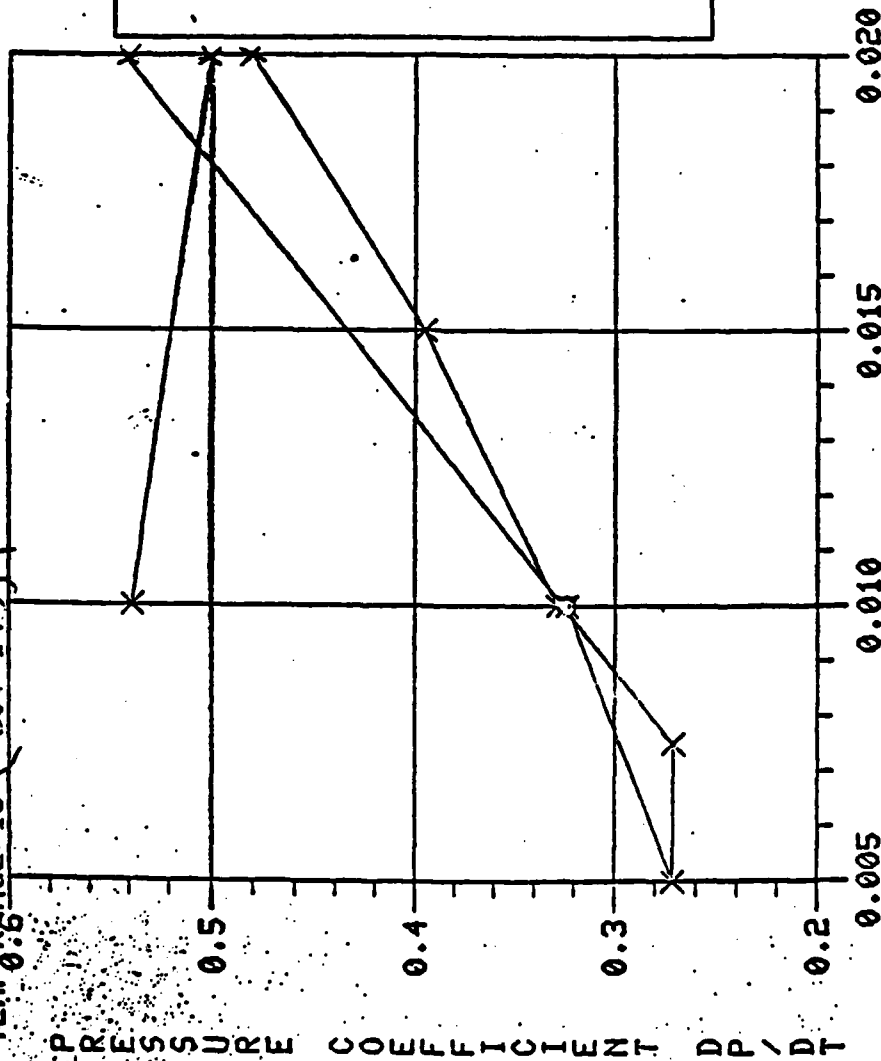
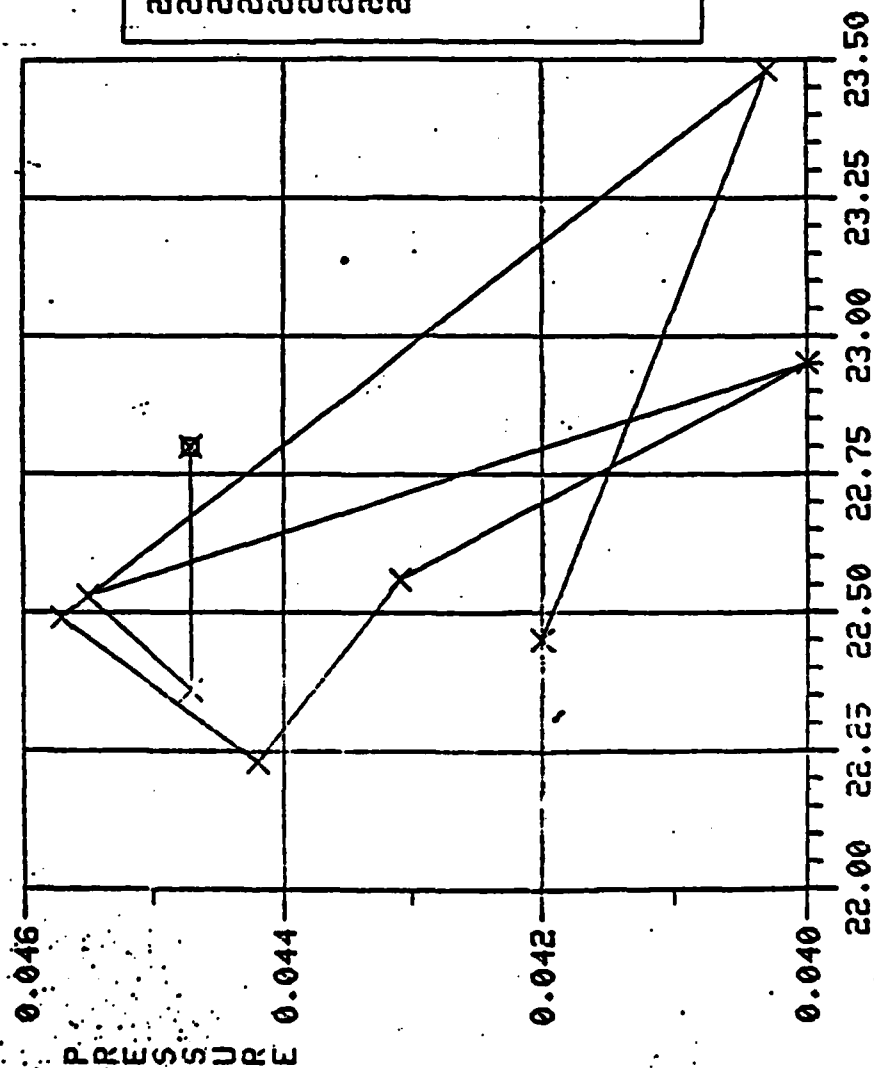


Fig. 48

PRESSURE VS. % NITROGLY ,C102 TEMP = -65.



DATA

|          |       |
|----------|-------|
| 22.8000, | .0447 |
| 22.3600, | .0447 |
| 22.5300, | .0455 |
| 22.5500, | .0460 |
| 22.5600, | .0431 |
| 22.2300, | .0442 |
| 22.4900, | .0457 |
| 23.4200, | .0403 |
| 22.4500, | .0420 |

% NITROGLY (%C)

Fig. 49

TEMP RANGE IS (-65 -- 70)°F PRESSURE COEFFICIENT, DP/DT VS. % NITROGLY. ,C102

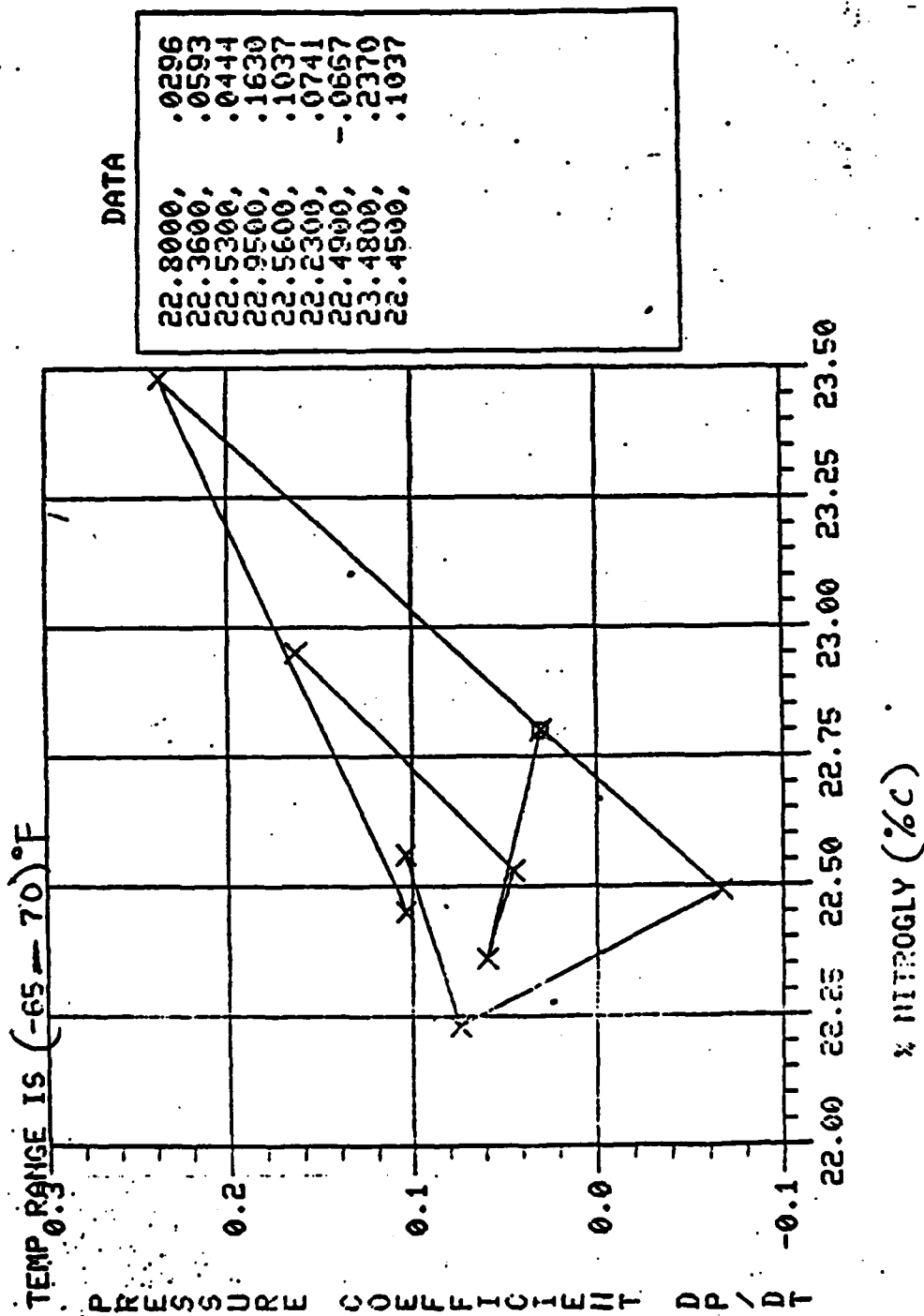


Fig. 50

TEMP. = 145.

,C111

PRESSURE VS. LENGTH

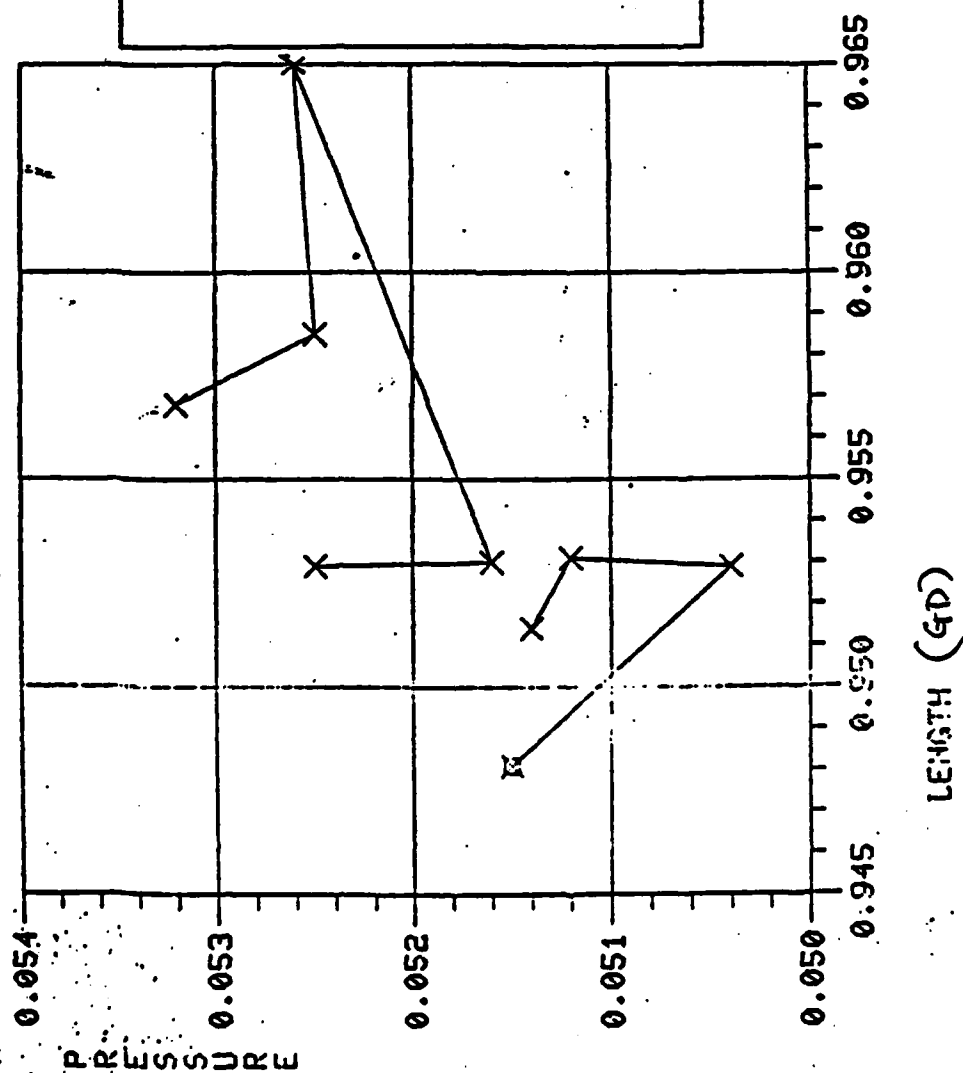


Fig. 51

PRESSURE VS. PERFOR DIAM, C113 TEMP = -65.

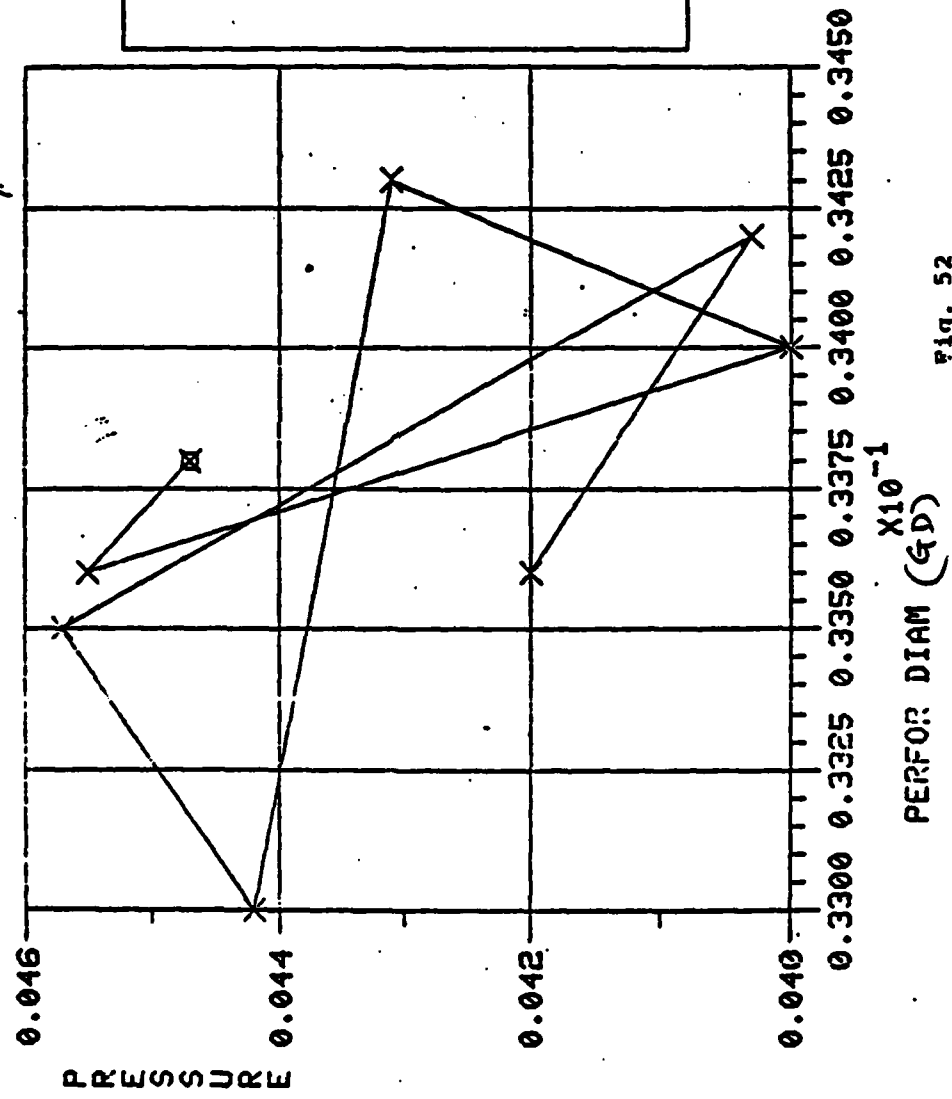
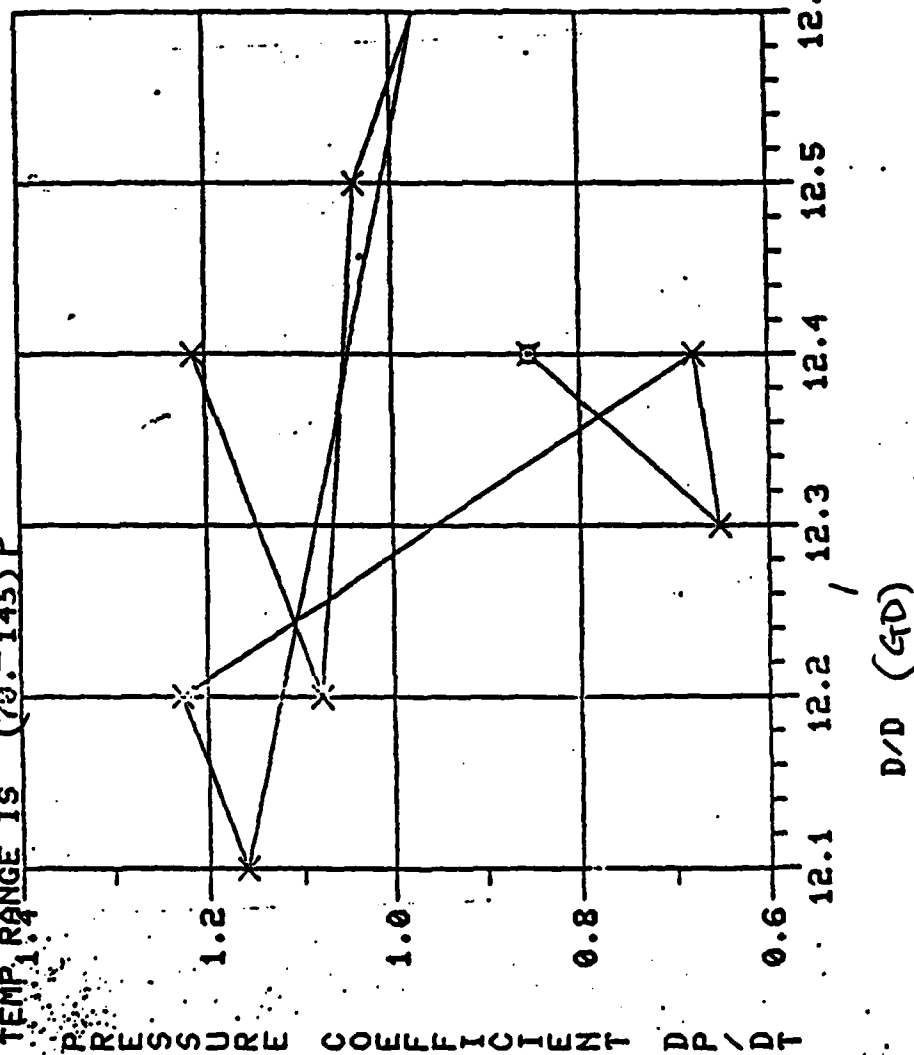


Fig. 52

C119

PRESSURE COEFFICIENT, DP/DT VS. D/D

TEMP RANGE IS (70.-145)°F

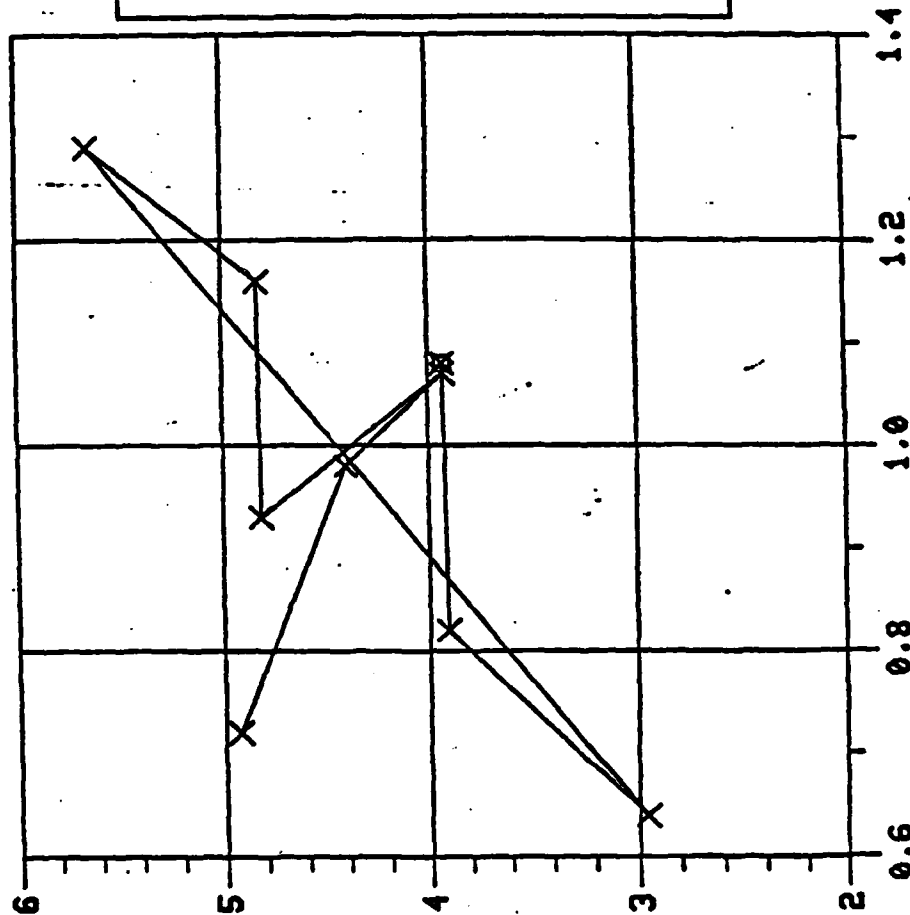


DATA

|          |        |
|----------|--------|
| 12.4000, | .8533  |
| 12.3000, | .6533  |
| 12.4000, | .6800  |
| 12.2000, | 1.2267 |
| 12.1000, | 1.1600 |
| 12.6000, | .9733  |
| 12.5000, | 1.0400 |
| 12.2000, | 1.0800 |
| 12.4000, | 1.2133 |

Fig. 53

RQ90-RQ-40 VSL UNI(GD)



RQ90-RQ-40

DATA

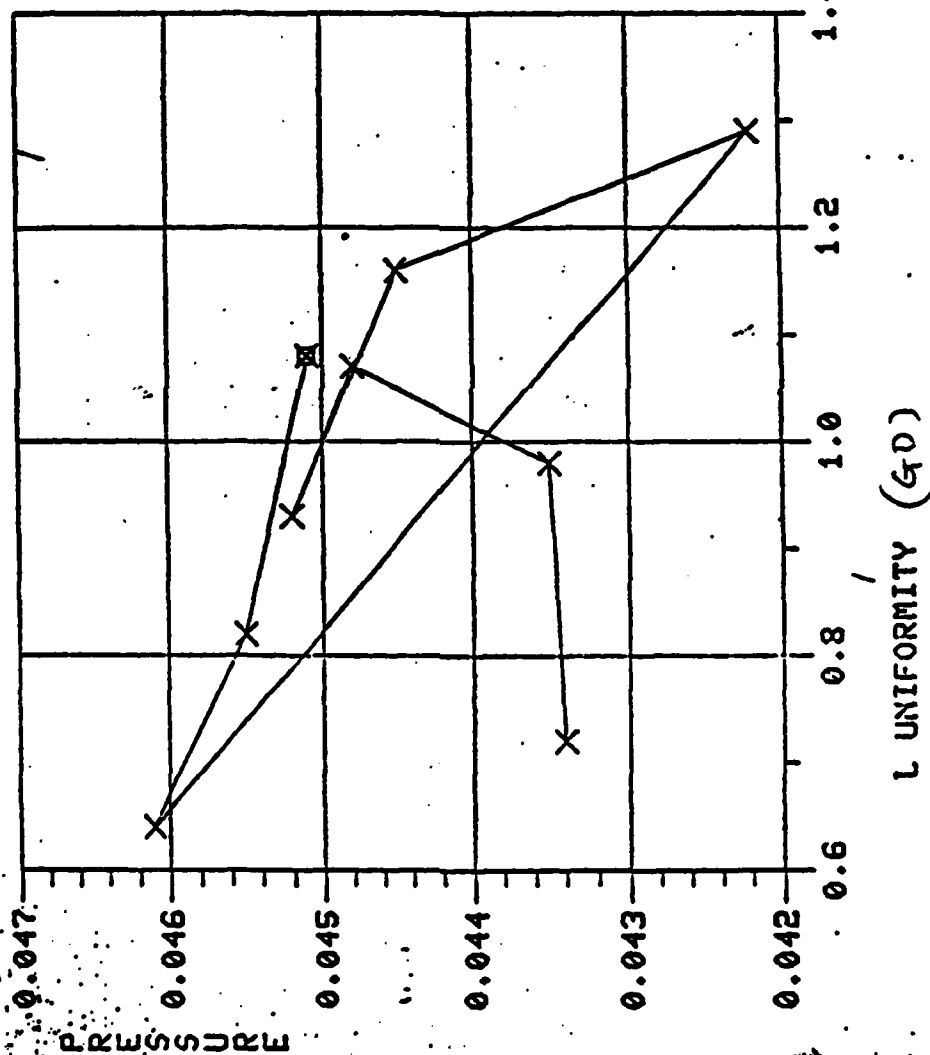
|         |        |
|---------|--------|
| 1.0800, | 3.9300 |
| .8200,  | 3.9100 |
| .6400,  | 2.9600 |
| 1.2900, | 5.6500 |
| 1.1600, | 4.8300 |
| .9300,  | 4.8200 |
| 1.0700, | 3.9300 |
| .9800,  | 4.4100 |
| .7200,  | 4.9300 |

L UNI(GD)

Fig. 54

TEMP - 70.

PRESSURE VS. L UNIFORMITY ,C121



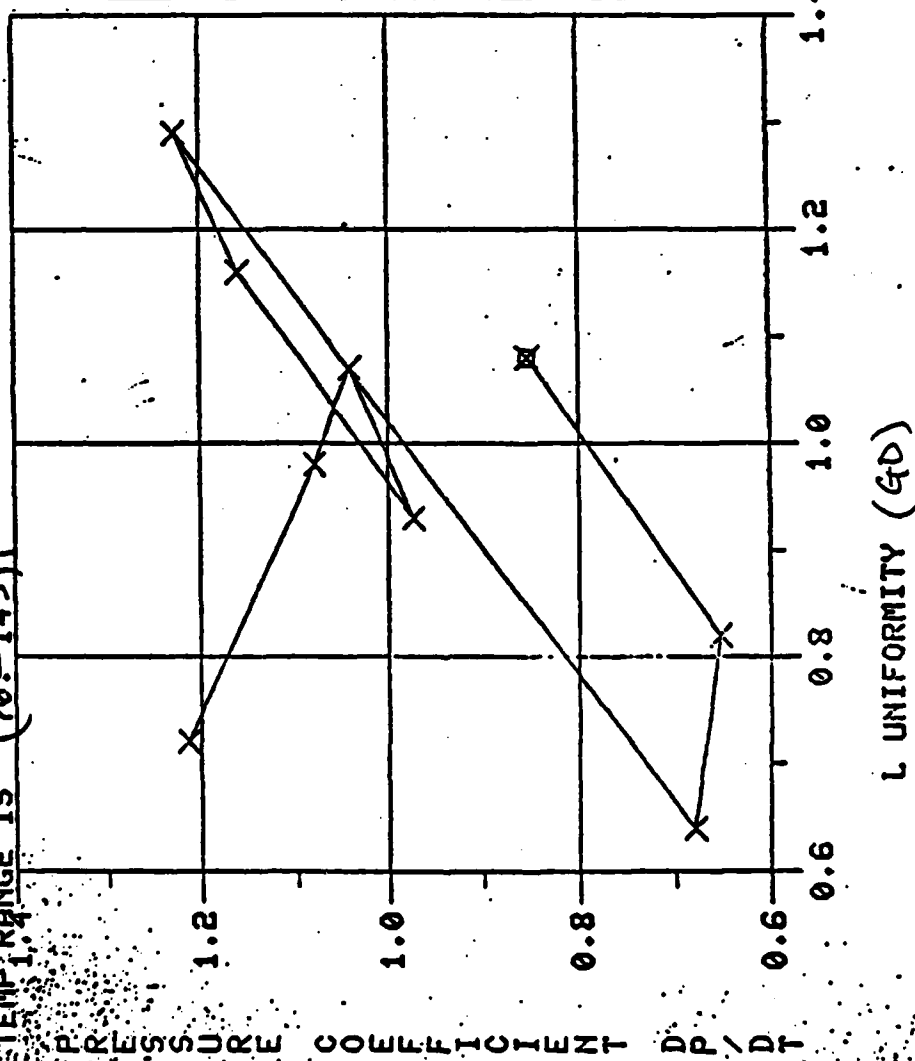
DATA

|         |       |
|---------|-------|
| 1.0800, | .0451 |
| .8300,  | .0455 |
| .6100,  | .0461 |
| 1.2020, | .0422 |
| 1.1600, | .0445 |
| .9300,  | .0453 |
| 1.0700, | .0435 |
| .9300,  | .0435 |
| .7200,  | .0434 |

Fig. 55

PRESSURE COEFFICIENT, DP/DT VS. L UNIFORMITY .C121

TEMP RANGE IS (70-145)°F

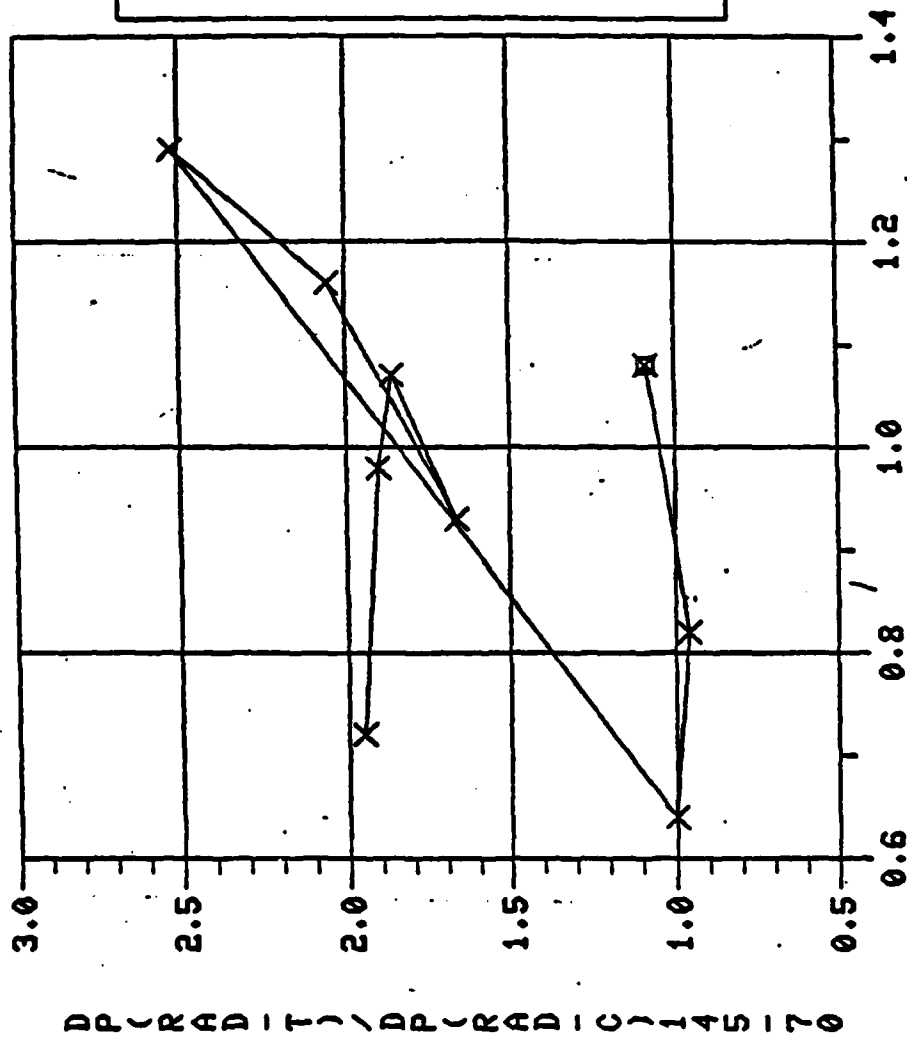


DATA

|         |        |
|---------|--------|
| 1.0800, | .8533  |
| .8200,  | .6533  |
| .6400,  | .6800  |
| 1.2900, | 1.2267 |
| 1.1600, | 1.1600 |
| .9300,  | .9733  |
| 1.0700, | 1.0433 |
| .9800,  | 1.0800 |
| .7200,  | 1.2133 |

Fig. 56

DP(RAD-T)/DP(RAD-C)145-70 VS L UNI(GD)



DATA

|         |        |
|---------|--------|
| 1.0800, | 1.0847 |
| .8200,  | .9608  |
| .6400,  | 1.0000 |
| 1.2900, | 2.5227 |
| 1.1600, | 2.0556 |
| .9300,  | 1.6667 |
| 1.0700, | 1.8611 |
| .9800,  | 1.9048 |
| .7200,  | 1.9512 |

L UNI(GD)

Fig. 57

TEMP - 145.

PRESSURE VS. D UNIFORMITY .C122

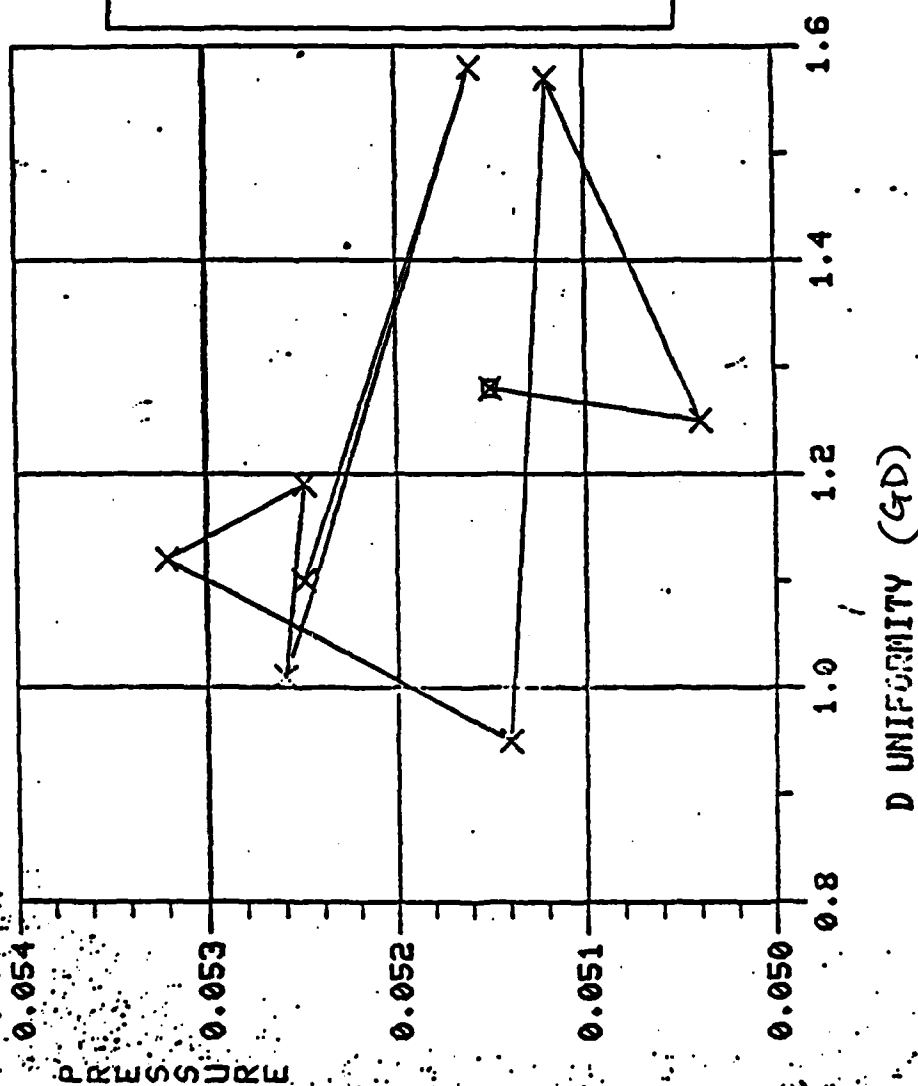
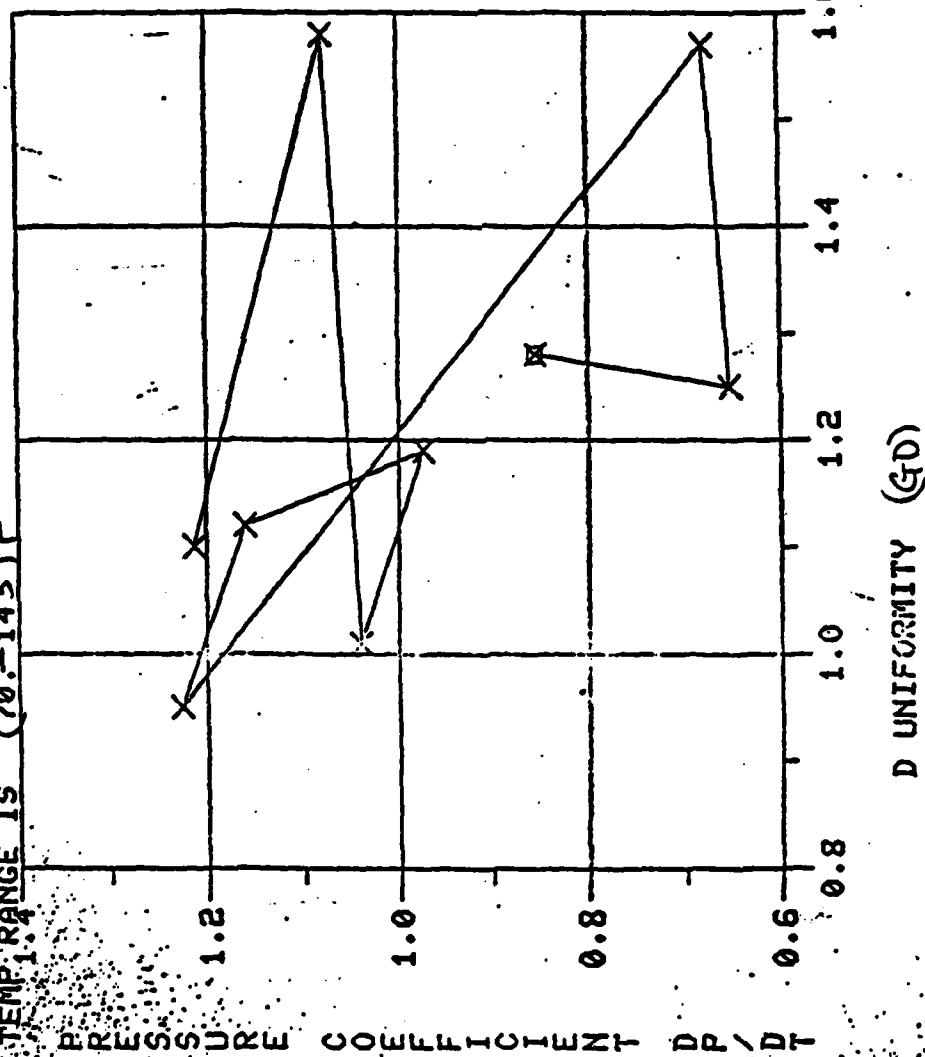


Fig. 58

# PRESSURE COEFFICIENT, DP/DT VS. D UNIFORMITY .C122

TEMP. RANGE IS (70.-145) F

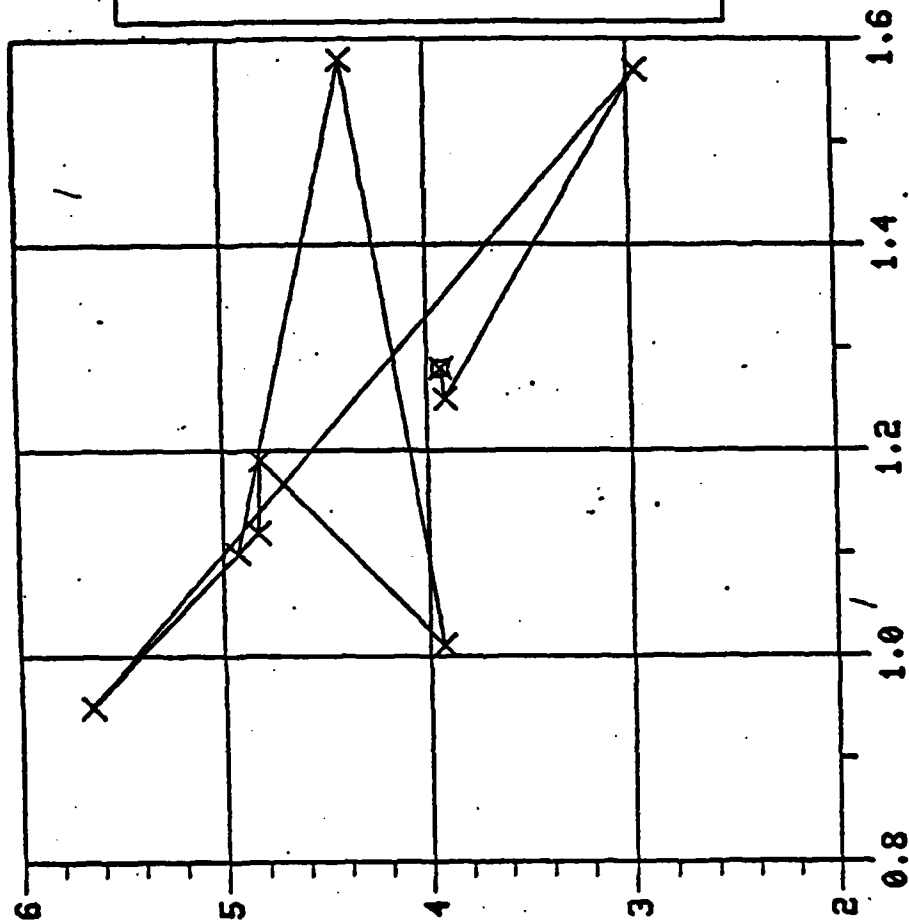


DATA

|         |        |
|---------|--------|
| 1.2800, | .8533  |
| 1.2500, | .6533  |
| 1.1200, | .6800  |
| .9500,  | 1.2267 |
| 1.1200, | 1.1600 |
| 1.1900, | .9733  |
| 1.0400, | 1.0400 |
| 1.5800, | 1.0800 |
| 1.1000, | 1.2133 |

Fig. 59

R090-R0-40 USD UNI(GD



R090-R0-40

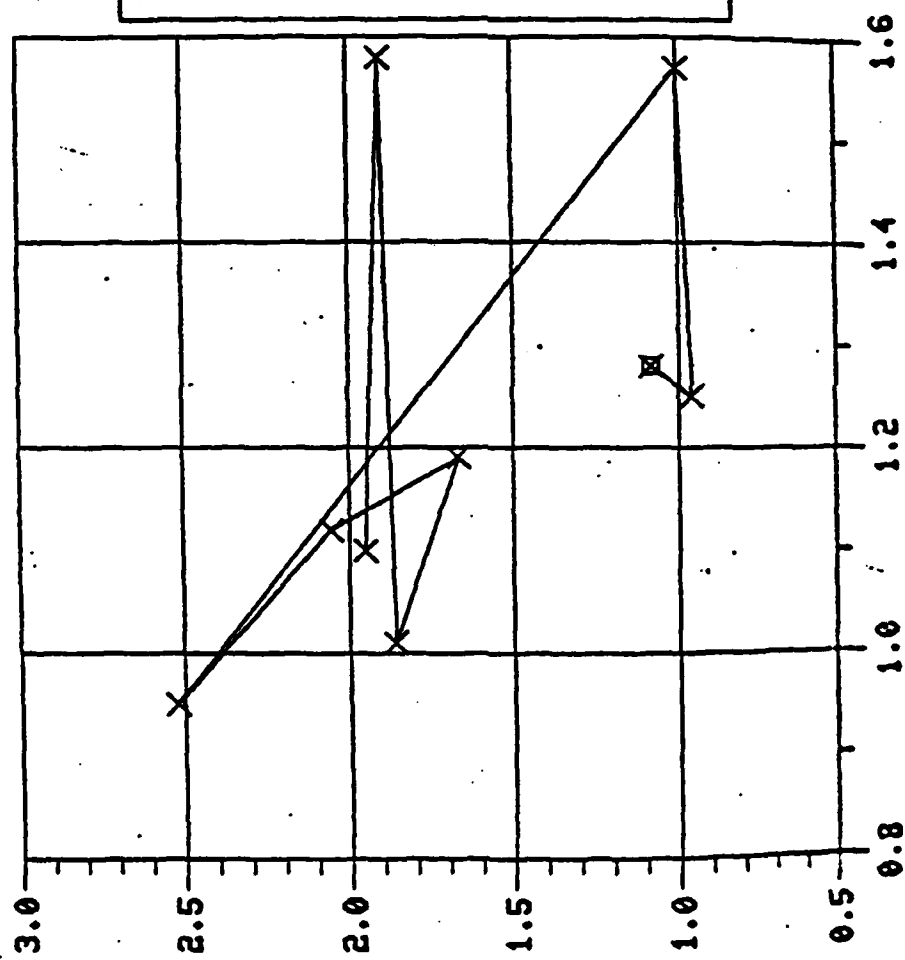
DATA

|         |        |
|---------|--------|
| 1.2800, | 3.9300 |
| 1.2500, | 3.9100 |
| 1.5700, | 2.9600 |
| .9500,  | 5.6500 |
| 1.1200, | 4.8300 |
| 1.1900, | 4.8200 |
| 1.0100, | 3.9300 |
| 1.5800, | 4.4100 |
| 1.1000, | 4.9300 |

D UNI(GD

Fig. 60

DP(RAD-T)/DP(RAD-C)145-70 VS D UNI(GD)



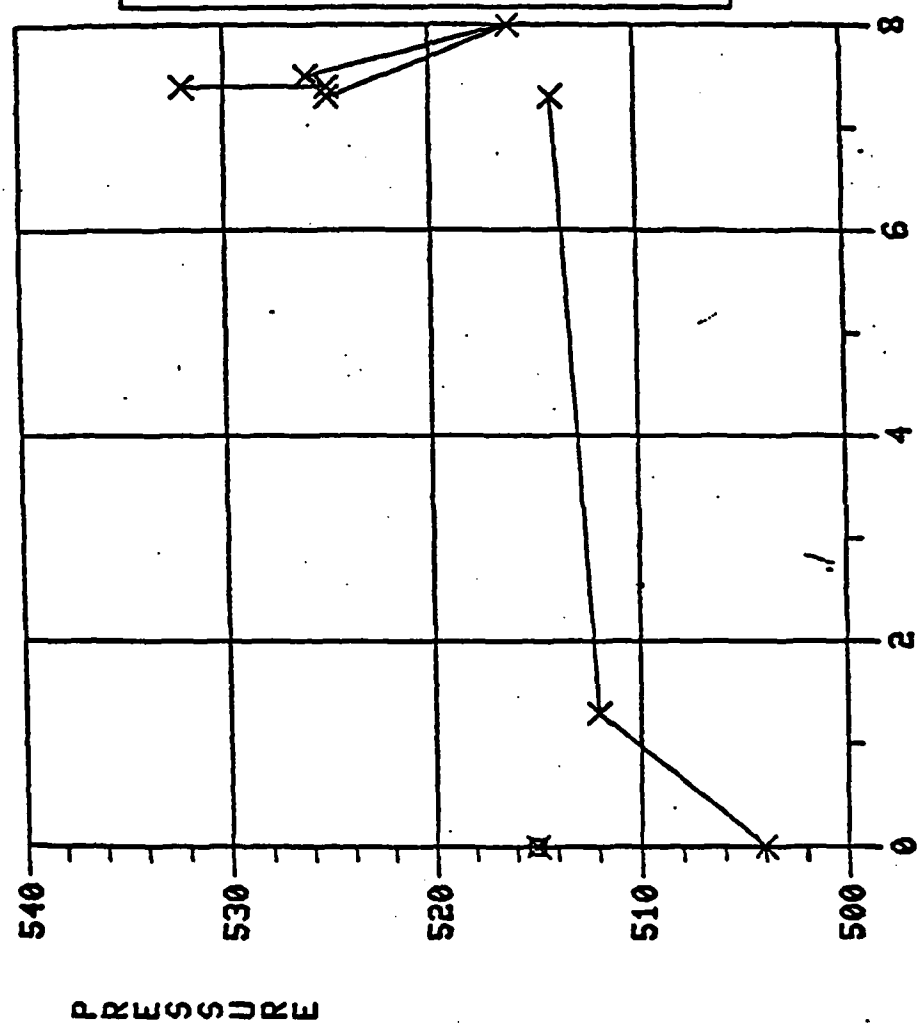
DATA

|         |        |
|---------|--------|
| 1.2800, | 1.0847 |
| 1.2500, | .9608  |
| 1.5700, | 1.0000 |
| .9500,  | 2.5227 |
| 1.1200, | 2.0556 |
| 1.1900, | 1.6667 |
| 1.0100, | 1.8611 |
| 1.5800, | 1.9048 |
| 1.1000, | 1.9512 |

D UNI(GD)

Fig. 61

PRESSURE VS. YR(STORAGE NGU) ,C191      TEMP = 145.

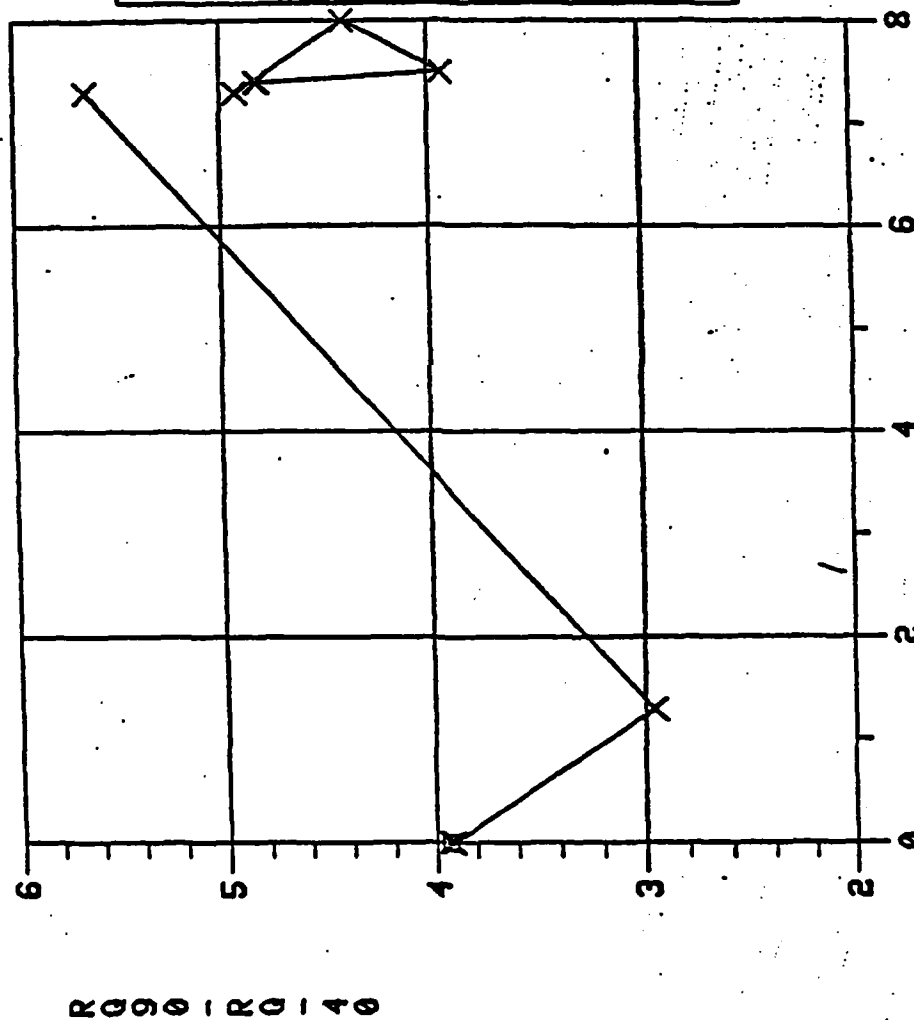


DATA

0.0000,515.0000  
 0.0000,504.0000  
 1.3000,512.0000  
 7.3000,514.0000  
 7.4000,532.0000  
 7.4000,525.0000  
 7.5000,526.0000  
 8.0000,516.0000  
 7.3000,525.0000

YR(STORAGE NGU)      Fig. 62

RQ90-RQ-40 USYR(STORA



DATA

0.0000, 3.9300  
 0.0000, 3.9100  
 1.3000, 2.9600  
 7.3000, 5.6500  
 7.4000, 4.8300  
 7.4000, 4.8200  
 7.5000, 3.9300  
 8.0000, 4.4100  
 7.3000, 4.9300

YR(STORAGE) Nitroquandive FIG. 63

## Appendix 2 - Stepwise Regression Analysis

The regression equation used in this analysis is described as follows:

$$Y = B_0 + B_1X_1 + B_2X_2 + \dots + B_iX_i + \epsilon$$

where

Y represents the dependent variable

$X_1, X_2, \dots, X_i$  are the independent variables

$B_1, B_2, \dots, B_i$  are the coefficient constants of the independent variables

$\epsilon$  is the random error in each production lots

$B_0$  is the constant of the equation

The entering independent variables are:

1. % Total volatile (composition)
2. % Graphite ( " )
3. % Moisture ( " )
4. pH Value (Nitroguandine)

The entering dependent variables are:

1. Pressure fired at 145°F
2. DP/DT (70 - 145)°F

Table 4

Definition of the regression result:

| Parameter      | Explanation                                                                                                                                                                                                                                                                    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $R^2$          | Correlation coefficient; as the $R^2$ approaching 1.0, the equation obtained will explain 100% of the variation about the mean $\bar{Y}$                                                                                                                                       |
| Std Error Est. | Standard error of estimate; STD error approaching to 0.0, the calculated values from the regression equation will be approaching to the actual observed values                                                                                                                 |
| F Value        | F distribution value is calculated for each entering independent variable. If the calculated F value is equal or greater than the predicted of F value (5.12), the independent variable will be retained in the regression equation; otherwise, the variable will be rejected. |

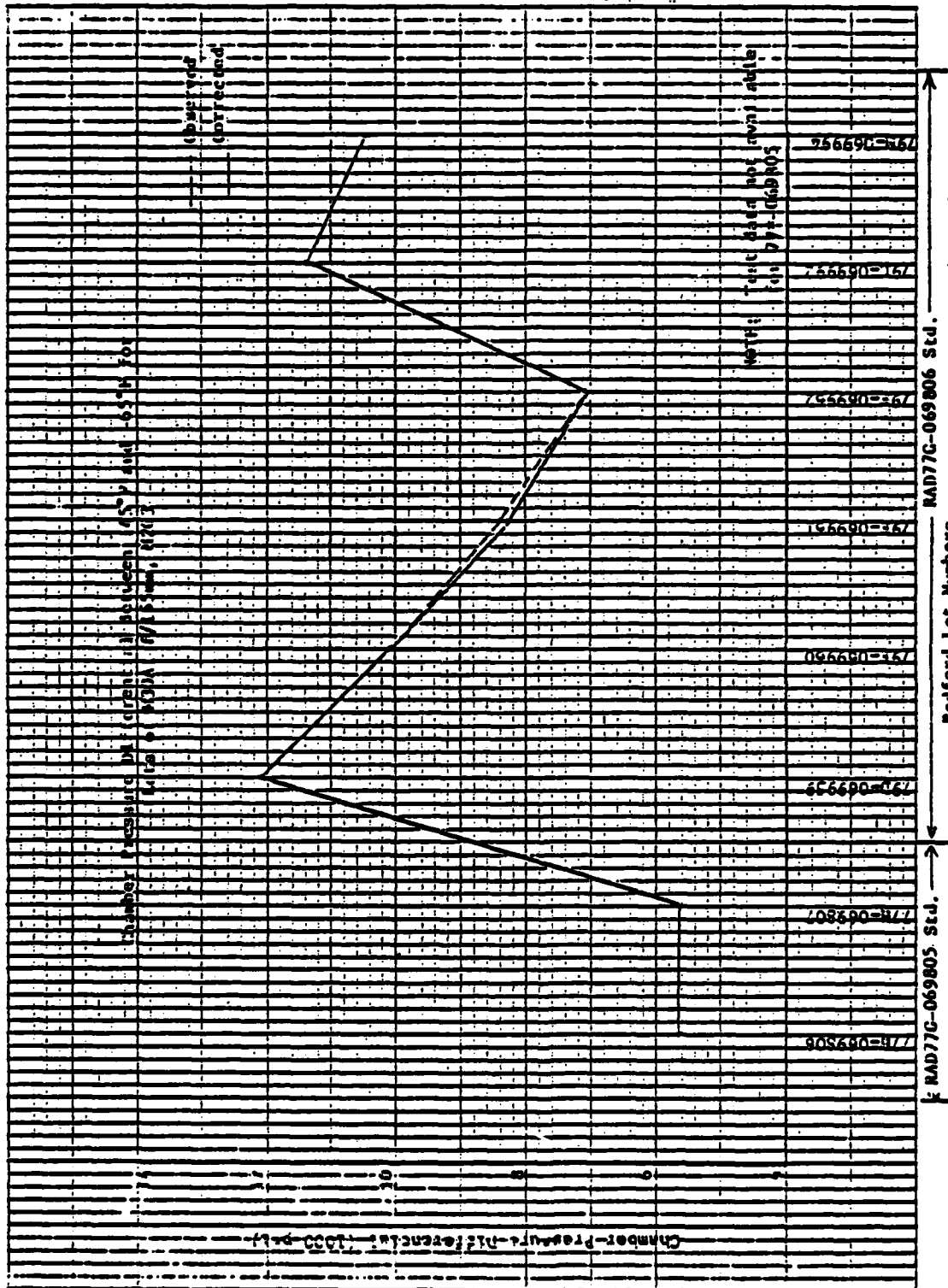
Table 5: Final Result of Stepwise Regression Analysis

| Depend Var<br>(Y)             | Indep Vars<br>Entering                                                                                               | Variables<br>Reject                                                                           | Variables<br>Retain                                           |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Pressure (145)°F              | X <sub>1</sub> = % Total Volatiles<br>X <sub>2</sub> = % Graphite<br>X <sub>3</sub> = % Moist<br>X <sub>4</sub> = pH | X <sub>1</sub> = % Total Volatiles<br>X <sub>2</sub> = % Graphite<br>X <sub>3</sub> = % Moist | X <sub>4</sub> = pH                                           |
| Pressure (145)°F              | X <sub>1</sub> = % Total Volatile<br>X <sub>2</sub> = % Graphite<br>X <sub>3</sub> = % Moist                         | X <sub>2</sub> = % Graphite<br>X <sub>3</sub> = % Moist                                       | X <sub>1</sub> = % Total Volatile                             |
| DP/DT <sub>2</sub> (70-145)°F | X <sub>1</sub> = % Total Volatile<br>X <sub>2</sub> = % Graphite<br>X <sub>3</sub> = % Moist<br>X <sub>4</sub> = pH  | X <sub>1</sub> = % Total Volatile<br>X <sub>3</sub> = % Moist<br>X <sub>4</sub> = pH          | X <sub>2</sub> = % Graphite                                   |
| DP/DT <sub>2</sub> (70-145)°F | X <sub>1</sub> = % Total Volatile<br>X <sub>2</sub> = % Graphite<br>X <sub>3</sub> = % Moist<br>X <sub>4</sub> = pH  |                                                                                               | X <sub>1</sub> = % Total Volatile<br>X <sub>3</sub> = % Moist |

Table 5 Continues

| Y                 | Variables<br>retain                  | R <sup>2</sup> for<br>Retain Var(s) | STD<br>Error Est<br>of Retain Var | F Value<br>less than 5.12<br>less than 5.12<br>less than 5.12<br>15.837 | Final<br>Regression<br>Equation                   |
|-------------------|--------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------------------------------------------|---------------------------------------------------|
| Pressure (145°F)  | X <sub>4</sub> = pH                  | 0.6935                              | 5.183                             | 12.56<br>less than 5.12<br>less than 5.12                               | Y = 806.96 - 55.03X <sub>4</sub>                  |
| Pressure (145°F)  | X <sub>1</sub> - X Total<br>Volatile | 0.6346                              | 5.659                             | 16.20<br>less than 5.12                                                 | Y = 530.68 - 64.56X <sub>1</sub>                  |
| DP/DT2 (70-145)°F | X <sub>2</sub> - X<br>Graphite       | 0.815                               | 0.0993                            | less than 5.12                                                          | Y = 1.619 - 8.49X <sub>2</sub>                    |
| DP/DT2 (70-145)°F | X <sub>1</sub> - X Total<br>Volatile | 0.8758                              | 0.088                             | less than 5.12                                                          | Y = 0.81 - 0.8X <sub>1</sub> + 24.8X <sub>3</sub> |
|                   | X <sub>3</sub> - X Moist             |                                     |                                   |                                                                         |                                                   |

# APPENDIX 3: MANUFACTURING DATA OF M30A1 propellant





— Characterized by  
— Excessive

~~(79-0001) - [unclear] . [unclear]~~

82

Radford Lot Numbers

← RAD77C-069805 Std. → | → RAD77C-069806 Std. →

Attachment 2  
Page 1 of 1

LABORATORY REPORT

FOR THE UNITED STATES OF AMERICA

M30A1 Propellant for 155mm, M203 Source of Ingredients

| Ingredient        | Ingredient Source - By Lot                                |       |                                                                                      |                                    |       |       |                            |       |
|-------------------|-----------------------------------------------------------|-------|--------------------------------------------------------------------------------------|------------------------------------|-------|-------|----------------------------|-------|
|                   | 69805                                                     | 69806 | 69807                                                                                | 69959                              | 69960 | 69961 | 69962                      | 69994 |
| Nitrocellulose    | Hercules<br>RAAP                                          | Same  | Same                                                                                 | Same                               | Same  | Same  | Same                       | Same  |
| Nitroglycerin     | Hercules<br>RAAP                                          | Same  | Same                                                                                 | Same                               | Same  | Same  | Same                       | Same  |
| Nitroguanidine    | GPH<br>Cyanamid<br>of Canada<br>Ltd.<br>(Shipper)         | Same  | GPH<br>Cyanamid<br>of Canada<br>AAP<br>Ltd.<br>(Shipper)<br>Ravenna<br>AAP (Shipper) | GPH<br>Ravenna<br>AAP<br>(Shipper) | Same  | Same  | Same                       | Same  |
| Ethyl Centralite  | Chemische<br>Werke. Low<br>West<br>Germany                | Same  | Same                                                                                 | Van de<br>Mark<br>New York         | Same  | Same  | Same                       | Same  |
|                   | GPH<br>Naval<br>Ammo<br>Depot<br>Crane, Ind.<br>(Shipper) | Same  | Same                                                                                 | Same                               | Same  | Same  | Mallin-<br>ckrodt,<br>Inc. | Same  |
| Potassium Sulfate | Joseph<br>Dixon<br>Crucible<br>Company                    | Same  | Same                                                                                 | Same                               | Same  | Same  | Same                       | Same  |
| Graphite          |                                                           |       |                                                                                      |                                    |       |       |                            |       |

NITROCELLULOSE  
M30A1 E/15SM, M203 Propellant

| Lot No.<br>Requirements<br>HIL-II 244A | N. C.<br>Blend | Percent<br>N <sub>2</sub> | Ether-Alcohol<br>Solubility<br>Percent | Fineness<br>ML | KI Starch<br>Time/Min | German<br>Time/Min | Acetones |         | Ash<br>Percent | Vis<br>Sec. | Freeness<br>ML. |
|----------------------------------------|----------------|---------------------------|----------------------------------------|----------------|-----------------------|--------------------|----------|---------|----------------|-------------|-----------------|
|                                        |                |                           |                                        |                |                       |                    | Insol.   | Percent |                |             |                 |
|                                        |                | 12.6 ± 0.10               | 99 min.                                | --             | 35' min.              | 30' min            | 0.4 max  | 0.4 max | 0.4 max        | --          | --              |
| RAD77G-069805                          | C35,556        | 12.58                     | 99+                                    | 84             | N/A                   | 30                 | 7R       | N/A     | N/A            | 12          | 502             |
|                                        | 557            | 12.59                     | "                                      | 86             | 45+                   | 30+                | "        | .04     | .04            | 13          | 480             |
|                                        | 558            | 12.60                     | "                                      | 86             | "                     | 30                 | "        | .06     | .06            | 9           | 486             |
|                                        | 565            | 12.53                     | "                                      | 90             | "                     | 30+                | "        | .05     | .05            | 14          | 522             |
|                                        | 566            | 12.52                     | "                                      | 90             | "                     | 30+                | "        | N/A     | N/A            | 14          | 512             |
|                                        | 570            | 12.59                     | "                                      | 90             | N/A                   | 30+                | "        | N/A     | N/A            | 14          | 512             |
|                                        | 573            | 12.62                     | "                                      | 82             | N/A                   | 30+                | "        | N/A     | N/A            | 13          | 453             |
|                                        | 576            | 12.58                     | "                                      | 74             | N/A                   | 30                 | "        | N/A     | N/A            | 11          | 507             |
|                                        | 577            | 12.50                     | "                                      | 82             | N/A                   | 30                 | "        | N/A     | N/A            | 11          | 510             |
|                                        | 579            | 12.56                     | "                                      | 82             | 45+                   | 30+                | "        | .02     | .02            | 10          | 467             |
| RAD77H-069806                          | C35,571        | 12.61                     | "                                      | 88             | 45+                   | 30+                | "        | .03     | .03            | 10          | 470             |
|                                        | 572            | 12.59                     | "                                      | 88             | N/A                   | 30+                | "        | N/A     | N/A            | 14          | 490             |
|                                        | 573            | 12.60                     | "                                      | 82             | N/A                   | 30+                | "        | N/A     | N/A            | 13          | 453             |
|                                        | 579            | 12.56                     | "                                      | 82             | 45+                   | 30+                | "        | .02     | .02            | 10          | 467             |
|                                        | 581            | 12.51                     | "                                      | 88             | N/A                   | 30                 | "        | N/A     | N/A            | 11          | 507             |
|                                        | 583            | 12.52                     | "                                      | 78             | 45+                   | 30+                | "        | .15     | .15            | 13          | 501             |
|                                        | 585            | 12.55                     | "                                      | 82             | N/A                   | 30                 | "        | N/A     | N/A            | 13          | 515             |
|                                        | 586            | 12.50                     | "                                      | 79             | 45+                   | 30+                | "        | .05     | .05            | 14          | 483             |
|                                        | 591            | 12.60                     | "                                      | 94             | N/A                   | 30                 | "        | N/A     | N/A            | 14          | 451             |
|                                        | 592            | 12.60                     | "                                      | 94             | 45+                   | 30                 | "        | .04     | .04            | 19          | 482             |
| RAD77H-069807                          | C35,591        | 12.60                     | "                                      | 94             | N/A                   | 30                 | "        | N/A     | N/A            | 14          | 451             |
|                                        | 592            | 12.60                     | "                                      | 94             | 45+                   | 30                 | "        | .04     | .04            | 19          | 482             |
|                                        | 593            | 12.61                     | "                                      | 94             | N/A                   | 30                 | "        | N/A     | N/A            | 19          | 491             |
|                                        | 594            | 12.59                     | "                                      | 92             | 45+                   | 30                 | "        | .04     | .04            | 17          | 487             |
|                                        | 598            | 12.52                     | "                                      | 86             | N/A                   | 30                 | "        | N/A     | N/A            | 10          | 502             |
|                                        | 603            | 12.56                     | "                                      | 78             | 45+                   | 30                 | "        | .04     | .04            | 11          | 485             |
|                                        | 604            | 12.57                     | "                                      | 78             | N/A                   | 30                 | "        | N/A     | N/A            | 9           | 502             |
|                                        | 607            | 12.57                     | "                                      | 80             | N/A                   | 30+                | "        | N/A     | N/A            | 10          | 480             |
|                                        | 610            | 12.56                     | "                                      | 82             | N/A                   | 30                 | "        | N/A     | N/A            | 11          | 519             |
|                                        | 611            | 12.55                     | "                                      | 86             | N/A                   | 30+                | "        | N/A     | N/A            | 11          | 479             |

**NITROCELLULOSE**  
**N30A1 F/15SM, H203 Propellant**

| Int No.                 | M. C. Blend | Percent N <sub>2</sub> | Ether-Alcohol      |        | Fineness HL | KI Starch Time/Min | German Time/Min | Acetones       |         | Ash Percent | Vis Sec. | Freeness HL. |
|-------------------------|-------------|------------------------|--------------------|--------|-------------|--------------------|-----------------|----------------|---------|-------------|----------|--------------|
|                         |             |                        | Solubility Percent | 99 min |             |                    |                 | Insol. Percent | 0.4 max |             |          |              |
| Requirements MIL-N-244A |             | 12.6 + 0.10            |                    |        | --          | 35' min.           | 30' min         | 0.4 max        |         | 0.4 max     | --       | --           |
| RAD79D-069959           | C36, 275    | 12.59                  | 99+                |        | 94          | 45+                | 30              | TR             |         | .01         | 13       | 498          |
|                         | 277         | 12.55                  | "                  |        | 94          | 45+                | 30+             | "              |         | .02         | 13       | 556          |
|                         | 281         | 12.62                  | "                  |        | 96          | 45+                | 30              | "              |         | .03         | 13       | 480          |
|                         | 284         | 12.66                  | "                  |        | 92          | 45+                | 30+             | "              |         | .01         | 14       | 534          |
|                         | 286         | 12.62                  | "                  |        | 92          | 45+                | 30              | "              |         | .03         | 13       | 523          |
| RAD79E-069960           | C36, 275    | 12.59                  | "                  |        | 94          | 45+                | 30              | "              |         | .01         | 13       | 498          |
|                         | 277         | 12.55                  | "                  |        | 94          | 45+                | 30+             | "              |         | .02         | 13       | 556          |
|                         | 281         | 12.62                  | "                  |        | 96          | 45+                | 30              | "              |         | .03         | 13       | 480          |
|                         | 286         | 12.62                  | "                  |        | 92          | 45+                | 30              | "              |         | .03         | 13       | 523          |
|                         | 290         | 12.62                  | "                  |        | 90          | 45+                | 30              | "              |         | .02         | 15       | 547          |
|                         | 291         | 12.63                  | "                  |        | 98          | 45+                | 30+             | "              |         | .03         | 17       | 503          |
|                         | 294         | 12.64                  | "                  |        | 92          | 45+                | 30+             | "              |         | .02         | 19       | 510          |
|                         | 300         | 12.59                  | "                  |        | 88          | 45+                | 30              | "              |         | .04         | 16       | 515          |
|                         | 302         | 12.62                  | "                  |        | 92          | 45+                | 30+             | "              |         | .04         | 15       | 527          |
|                         | 303         | 12.63                  | "                  |        | 94          | 45+                | 30+             | "              |         | .03         | 15       | 500          |
| RAD79E-069961           | C36, 302    | 12.62                  | "                  |        | 92          | 45+                | 30+             | "              |         | .04         | 15       | 527          |
|                         | 303         | 12.63                  | "                  |        | 94          | 45+                | 30+             | "              |         | .03         | 15       | 500          |
|                         | 305         | 12.70                  | "                  |        | 90          | 45+                | 30+             | "              |         | .05         | 15       | 455          |
|                         | 306         | 12.62                  | "                  |        | 94          | 45+                | 30+             | "              |         | .04         | 13       | 487          |
|                         | 307         | 12.60                  | "                  |        | 94          | 45+                | 30+             | "              |         | .06         | 15       | 480          |
|                         | 308         | 12.66                  | "                  |        | 94          | 45+                | 30              | "              |         | .02         | 16       | 450          |
|                         | 311         | 12.69                  | "                  |        | 93          | 45+                | 30              | "              |         | .04         | 15       | 496          |
|                         | 312         | 12.69                  | "                  |        | 95          | 45+                | 30+             | "              |         | .02         | 13       | 504          |
|                         | 313         | 12.60                  | "                  |        | 86          | 45+                | 30              | "              |         | .01         | 12       | 498          |
|                         | 314         | 12.60                  | "                  |        | 86          | 45+                | 30+             | "              |         | .04         | 12       | 538          |
|                         | 315         | 12.67                  | "                  |        | 92          | 45+                | 30              | "              |         | .04         | 13       | 492          |

NITROCELLULOSE  
M30A1 f/155M, H203 Propellant

| Lot No.       | Requirement | N. C. Blend | Percent N <sub>2</sub> | Ether-Alcohol      |        | Fineness ML | KI Starch Time/Min | German Time/Min | Acetones       |         | Ash Percent | Vis Sec. | Freeness Ml. |
|---------------|-------------|-------------|------------------------|--------------------|--------|-------------|--------------------|-----------------|----------------|---------|-------------|----------|--------------|
|               |             |             |                        | Solubility Percent | 99 min |             |                    |                 | Insol. Percent | 0.4 max |             |          |              |
|               |             |             | 12.6 ± 0.10            |                    |        | --          | 35' min            | 30' min         |                | 0.4 max | --          | --       |              |
| RAD79E-069962 | HIL-H-246A  | C36,317     | 12.69                  | 99+                | 92     | 45+         | 30                 | TR              | .02            | 11      | 476         |          |              |
|               |             | 318         | 12.69                  | "                  | 82     | 45+         | 30                 | "               | .02            | 13      | 488         |          |              |
|               |             | 319         | 12.68                  | "                  | 94     | 45+         | 30                 | "               | .01            | 15      | 505         |          |              |
|               |             | 320         | 12.65                  | "                  | 94     | 45+         | 30                 | "               | .05            | 17      | 472         |          |              |
|               |             | 321         | 12.65                  | "                  | 90     | 45+         | 30                 | "               | .01            | 15      | 525         |          |              |
|               |             | 322         | 12.66                  | "                  | 90     | 45+         | 30                 | "               | .03            | 11      | 450         |          |              |
|               |             | 323         | 12.65                  | "                  | 84     | 45+         | 30                 | "               | .05            | 12      | 467         |          |              |
|               |             | 325         | 12.61                  | "                  | 84     | 45+         | 30                 | "               | .02            | 10      | 485         |          |              |
|               |             | 327         | 12.60                  | "                  | 86     | 45+         | 30                 | "               | .02            | 10      | 480         |          |              |
|               |             | 328         | 12.61                  | "                  | 86     | 45+         | 30                 | "               | .06            | 10      | 496         |          |              |
| RAD79L-069992 |             | C36,423     | 12.53                  | "                  | 90     | 45+         | 30                 | "               | .04            | 11      | 482         |          |              |
|               |             | 426         | 12.53                  | "                  | 98     | 45+         | 30                 | "               | .04            | 12      | 470         |          |              |
|               |             | 433         | 12.60                  | "                  | 76     | 45+         | 30+                | "               | .02            | 14      | 536         |          |              |
|               |             | 434         | 12.59                  | "                  | 78     | 45+         | 30+                | "               | .03            | 9       | 529         |          |              |
|               |             | 436         | 12.58                  | "                  | 78     | 45+         | 30+                | "               | .03            | 11      | 492         |          |              |
|               |             | 440         | 12.53                  | "                  | 82     | 45+         | 30+                | "               | .03            | 10      | 490         |          |              |
|               |             | 444         | 12.55                  | "                  | 70     | 45+         | 30+                | "               | .03            | 8       | 465         |          |              |
|               |             | C36,436     | 12.58                  | "                  | 78     | 45+         | 30+                | "               | .03            | 11      | 492         |          |              |
|               |             | 437         | 12.61                  | "                  | 76     | 45+         | 30+                | "               | .02            | 9       | 498         |          |              |
|               |             | 438         | 12.58                  | "                  | 76     | 45+         | 30+                | "               | .02            | 10      | 539         |          |              |
| RAD79H-069994 |             | 440         | 12.53                  | "                  | 82     | 45+         | 30+                | "               | .03            | 10      | 490         |          |              |
|               |             | 442         | 12.62                  | "                  | 78     | 45+         | 30+                | "               | .02            | 9       | 458         |          |              |
|               |             | 444         | 12.55                  | "                  | 70     | 45+         | 30+                | "               | .03            | 8       | 465         |          |              |
|               |             | 445         | 12.52                  | "                  | 78     | 45+         | 30+                | "               | .02            | 9       | 501         |          |              |
|               |             | 450         | 12.56                  | "                  | 82     | 45+         | 30+                | "               | .02            | 9       | 462         |          |              |
|               |             | 452         | 12.58                  | "                  | 72     | 45+         | 30                 | "               | .03            | 9       | 473         |          |              |

**NITROGLYCERIN**  
**H30A1 E/155NM, H203 PROPELLANT**

| <u>Lot No.</u>      | <u>Charge No.</u> | <u>KI (Min.)</u> | <u>Alk.</u>       | <u>Acidity</u> | <u>H<sub>2</sub>O</u> | <u>N<sub>2</sub></u> |
|---------------------|-------------------|------------------|-------------------|----------------|-----------------------|----------------------|
| <b>Requirements</b> |                   | <b>10 min</b>    | <b>0.002% Max</b> |                | <b>0.5% Max</b>       | <b>18.40% Min</b>    |
| <b>HIL-N-2468</b>   |                   |                  |                   |                |                       |                      |
| <b>RAD77G-69805</b> | 149, 151          | 15               |                   |                |                       |                      |
|                     | 154, 155          | 15               |                   |                |                       |                      |
|                     | 166, 171          | 15               |                   |                |                       |                      |
|                     | 166, 162          | 15               |                   |                |                       |                      |
|                     | 169, 163          | 15               |                   |                |                       |                      |
|                     | 164, 159, 158     | 15               |                   |                |                       |                      |
|                     | 170-              | 15               | None              |                | .38                   | 18.45                |
|                     | 178, 173          | 15               |                   |                |                       |                      |
|                     | 172, 179          | 15               |                   |                |                       |                      |
|                     | 174, 175          | 15               |                   |                |                       |                      |
|                     | 176, 186          | 15               |                   |                |                       |                      |
|                     | 185, 183          | 15               |                   |                |                       |                      |
|                     | 182, 181          | 15               |                   |                |                       |                      |
|                     | 180-              | 15               | None              |                | .34                   | 18.44                |
|                     | 2, 1, 4           | 15               |                   |                |                       |                      |
|                     | 13, 12, 6         | 15               |                   |                |                       |                      |
|                     | 5, 11, 8          | 15               |                   |                |                       |                      |
|                     | 7, 15             | 15               |                   |                |                       |                      |
|                     | 20-               | 15               | None              |                | .22                   | 18.45                |
|                     | 19, 17            | 15               |                   |                |                       |                      |
|                     | 21                | 15               |                   |                | .26                   |                      |
|                     | 16, 14, 10-       | 15               |                   |                |                       |                      |

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**NITROGLYCERIN  
M30A1 E/155M, M203 PROPELLANT**

| <u>Lot No.</u>             | <u>Charge No.</u> | <u>KI (Min.)</u><br>10 min | <u>Alk.</u><br>0.002% Max | <u>Acidity</u> | <u>H<sub>2</sub>O</u><br>0.5% Max | <u>N<sub>2</sub></u><br>18.40% Min |
|----------------------------|-------------------|----------------------------|---------------------------|----------------|-----------------------------------|------------------------------------|
| Requirements<br>NIL-N-2468 | 9, 33, 32         | 15                         |                           |                |                                   |                                    |
|                            | 28, 27, 23        | 15                         |                           |                |                                   |                                    |
|                            | 18, 26, 25        | 15                         |                           |                |                                   |                                    |
|                            | 24, 22, 36, 21    | 15                         |                           |                |                                   |                                    |
|                            | 37, 42, 46        | 15                         |                           |                |                                   |                                    |
| RAD77G-69805<br>(Cont d)   | 40-               | 15                         |                           |                |                                   |                                    |
|                            | 45, 44, 48        | 15                         |                           |                |                                   |                                    |
|                            | 47, 51, 52        | 15                         |                           |                |                                   |                                    |
|                            | 58, 56, 53        | 15                         |                           |                |                                   |                                    |
|                            | 55, 39, 38        | 15                         |                           |                |                                   |                                    |
|                            | 38, 41, 54        | 15                         |                           |                |                                   |                                    |
|                            | 61, 62, 68        | 15                         |                           |                |                                   |                                    |
|                            | 67, 71            | 15                         |                           |                |                                   |                                    |
|                            | 60-               | 15                         | None                      | None           | .35                               | 18.45                              |
|                            | 59, 63, 64        | 15                         |                           |                |                                   |                                    |
| RAD77H-069806              | 78, 69, 70-       | 15                         |                           |                |                                   |                                    |
|                            | 79, 73, 75        | 15                         |                           |                |                                   |                                    |
|                            | 77, 74, 85        | 15                         |                           |                |                                   |                                    |
|                            | 86, 87, 94        | 15                         |                           |                |                                   |                                    |
|                            | 84, 82, 81, 80-   | 15                         |                           |                |                                   |                                    |
|                            | 76, 88, 72        | 15                         |                           |                |                                   |                                    |

**NITROGLYCERIN**  
**M30A1 f/15MM, M203 PROPELLANT**

| <u>Lot No.</u> | <u>Charge No.</u> | <u>KI (Min.)</u> | <u>Alk.</u> | <u>Acidity</u> | <u>H<sub>2</sub>O</u> | <u>N<sub>2</sub></u> |
|----------------|-------------------|------------------|-------------|----------------|-----------------------|----------------------|
|                |                   | 10 min           | 0.002% Max  |                | 0.5% Max              | 18.40% Min           |
|                | 91, 92, 98        | 15               |             |                |                       |                      |
|                | 99, 93, 96        | 15               |             |                |                       |                      |
|                | 115, 114, 109     | 15               |             |                |                       |                      |
|                | 107, 108, 106     | 15               |             |                |                       |                      |
|                | 100-              | 15               | None        | None           | .25                   | 18.46                |
|                | 95, 102, 103      | 15               |             |                |                       |                      |
|                | 110               | 15               | None        | None           | .35                   | 18.48                |
|                | 111, 101, 113     | 15               |             |                |                       |                      |
|                | 116, 117, 118     | 15               |             |                |                       |                      |
|                | 119, 121, 127     | 15               |             |                |                       |                      |
|                | 122, 120-, 126    | 15               |             |                |                       |                      |
|                | 124, 132, 126     | 15               |             |                |                       |                      |
|                | 146, 150-, 149    | 15               |             |                |                       |                      |
|                | 144, 147, 148     | 15               |             |                |                       |                      |
|                | 143, 142, 141     | 15               |             |                |                       |                      |
|                | 136, 135, 139     | 15               |             |                |                       |                      |
|                | 140-              | 15               | None        | None           | .36                   | 18.46                |
|                | 138, 134, 130     | 15               |             |                |                       |                      |
|                | 131, 129, 133     | 15               |             |                |                       |                      |

**NITROGLYCERIN**  
H30A1 f/155MM, H203 PROPELLANT

| Lot No.<br>Requirements<br>HIL-N-2468 | Charge No. | KI (Min.) |  | Alk.       |  | Acidity |  | H <sub>2</sub> O |  | H <sub>2</sub> |  |
|---------------------------------------|------------|-----------|--|------------|--|---------|--|------------------|--|----------------|--|
|                                       |            | 10 Min    |  | 0.002% Max |  |         |  | 0.5 % Max        |  | 18.40% Min     |  |
| RAD79D-069959                         | 39         | 17        |  |            |  |         |  |                  |  |                |  |
|                                       | 40         | 17        |  | --         |  |         |  | .28              |  | 18.43          |  |
|                                       | 41         | --        |  |            |  |         |  |                  |  |                |  |
|                                       | 42         | 17        |  |            |  |         |  |                  |  |                |  |
|                                       | 43         | --        |  |            |  |         |  |                  |  |                |  |
|                                       | 44         | 16        |  |            |  |         |  |                  |  |                |  |
|                                       | 45         | 17        |  |            |  |         |  |                  |  |                |  |
|                                       | 46         | 17        |  |            |  |         |  |                  |  |                |  |
|                                       | 47         | 15        |  |            |  |         |  |                  |  |                |  |
|                                       | 49         | --        |  |            |  |         |  |                  |  |                |  |
|                                       | 51         | 16        |  |            |  |         |  |                  |  |                |  |
|                                       | 52         | 16        |  |            |  |         |  |                  |  |                |  |
|                                       | 53         | --        |  |            |  |         |  |                  |  |                |  |
| RAD79E-069960                         | 54         | 16        |  |            |  |         |  |                  |  |                |  |
|                                       | 55         | 17        |  |            |  |         |  |                  |  |                |  |
|                                       | 56         | --        |  |            |  |         |  |                  |  |                |  |
|                                       | 57         | 16        |  |            |  |         |  |                  |  |                |  |
|                                       | 58         | 17        |  |            |  |         |  |                  |  |                |  |
|                                       | 59         | 18        |  |            |  |         |  |                  |  |                |  |
|                                       | 60         | --        |  |            |  | None    |  | .20              |  | 18.44          |  |
|                                       | 61         | 16        |  |            |  |         |  |                  |  |                |  |

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**NITROGLYCERIN**  
**M30A1 f/155MM, M203 PROPELLANT**

| <u>Lot No.</u><br>Requirements<br>Mil-N-2468<br><br>MAN79E-069960<br>(Cont'd) | <u>Charge No.</u> | <u>KI (Min.)</u> |     | <u>Alk.</u><br>0.002% Max | <u>Acidity</u> | <u>H<sub>2</sub>O</u> |  | <u>H<sub>2</sub></u><br>18.40% Min |
|-------------------------------------------------------------------------------|-------------------|------------------|-----|---------------------------|----------------|-----------------------|--|------------------------------------|
|                                                                               |                   | 10               | Min |                           |                | 0.5% Max              |  |                                    |
|                                                                               | 1, 2              | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 3                 | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 4, 5, 6           | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 7, 8, 9, 10       | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 11                | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 12, 13, 14        | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 15                | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 16                | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 17                | --               |     |                           |                |                       |  |                                    |
|                                                                               | 18                | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 19                | 15               |     |                           |                |                       |  |                                    |
|                                                                               | 20                | --               |     | None                      |                | .39                   |  | 18.44                              |
|                                                                               | 21                | 18               |     |                           |                |                       |  |                                    |
|                                                                               | 23                | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 25                | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 26                | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 27, 28            | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 29                | 18               |     |                           |                |                       |  |                                    |
|                                                                               | 30, 31, 32        | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 33, 34,           | 17               |     |                           |                |                       |  |                                    |
|                                                                               | 35, 36            | 16               |     |                           |                |                       |  |                                    |
|                                                                               | 37, 38, 39        | 17               |     |                           |                |                       |  |                                    |

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**NITROGLYCERIN**  
**N30A1 E/155061, N203 PROPELLANT**

| <u>Lot No.</u>                                   | <u>Charge No.</u> | <u>KI (Min.)</u> | <u>Alka.</u> | <u>Acidity</u> | <u>H<sub>2</sub>O</u> | <u>N<sub>2</sub></u> |
|--------------------------------------------------|-------------------|------------------|--------------|----------------|-----------------------|----------------------|
|                                                  |                   | 10 Min           | 0.002% Max   |                | 0.5% Max              | 18.40% Min           |
| Requirements<br>III.-N-2468<br><br>RAD/9E-069961 | 40                | 17               |              |                | .28                   | 18.42                |
|                                                  | 41                | --               |              |                |                       |                      |
|                                                  | 42, 43,           | 17               |              |                |                       |                      |
|                                                  | 44                | 18               |              |                |                       |                      |
|                                                  | 45                | --               |              |                |                       |                      |
|                                                  | 46, 47, 48        | 17               |              |                |                       |                      |
|                                                  | 49,               | 17               |              |                |                       |                      |
|                                                  | 50                | 17               | None         |                | .31                   | 18.49                |
|                                                  | 51                | 17               |              |                |                       |                      |
|                                                  | 52                | 16               |              |                |                       |                      |
|                                                  | 53, 54            | 17               |              |                |                       |                      |
|                                                  | 55                | --               |              |                |                       |                      |
|                                                  | 56                | 18               |              |                |                       |                      |
|                                                  | 57                | 17               |              |                |                       |                      |
|                                                  | 58                | --               |              |                |                       |                      |
|                                                  | 59                | 17               |              |                |                       |                      |
| RAD79E069962                                     | 1, 2              | 17               |              |                |                       |                      |
|                                                  | 3                 | 16               |              |                |                       |                      |
|                                                  | 4, 5              | 17               |              |                |                       |                      |
|                                                  | 6                 | 16               |              |                |                       |                      |
|                                                  | 7                 | --               |              |                |                       |                      |
|                                                  | 8                 | 17               |              |                |                       |                      |

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**NITROGLYCERIN**  
**H30A1 F/155M, H203 PROPELLANT**

| Lot No.                    | Charge No. | KI (Min.) | Alka.      | Acidity | H <sub>2</sub> O | N <sub>2</sub> |
|----------------------------|------------|-----------|------------|---------|------------------|----------------|
| Requirements<br>HIL-N-2468 |            | 10 Min    | 0.002% Max |         | 0.5% Max         | 18.40% Min     |
| MAD79E069962<br>(Cont'd)   | 9          | --        |            |         |                  |                |
|                            | 10         | 17        |            |         |                  |                |
|                            | 11         | 16        |            |         |                  |                |
|                            | 12         | 17        |            |         |                  |                |
|                            | 13         | 15        |            |         |                  |                |
|                            | 14         | --        |            |         |                  |                |
|                            | 15         | 18        |            |         |                  |                |
|                            | 16         | 16        |            |         |                  |                |
|                            | 17         | 19        |            |         |                  |                |
|                            | 18         | 17        |            |         |                  |                |
|                            | 19         | 16        |            |         |                  |                |
|                            | 20         | 18        | None       |         | .55              | 18.40          |
|                            | 21         | 17        |            |         |                  |                |
|                            | 22         | 16        |            |         |                  |                |
|                            | 23         | --        |            |         |                  |                |
|                            | 24         | 17        |            |         |                  |                |
|                            | 25         | 15        |            |         |                  |                |
|                            | 26         | --        |            |         |                  |                |
|                            | 27         | 18        |            |         |                  |                |

**NITROGLYCERIN**  
**M30A1 f/155MM, M203 PROPELLANT**

| <u>Lot No.</u><br>Requirements<br>MIL-N-2468 | <u>Charge No.</u> | <u>KL (Min.)</u> |  |  |  | <u>Alka.</u> |  | <u>Acidity</u> |  | <u>H<sub>2</sub>O</u> |  | <u>H<sub>2</sub></u> |  |
|----------------------------------------------|-------------------|------------------|--|--|--|--------------|--|----------------|--|-----------------------|--|----------------------|--|
|                                              |                   | 10 Min           |  |  |  | 0.002% Max   |  |                |  | 0.5% Max              |  | 18.40% Min           |  |
| KAU79L-069992                                | 17                | 16               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 18                | 15               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 19, 20, 21        | 17               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 23                | --               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 24                | 16               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 25                | 17               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 26, 27            | 19               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 28                | --               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 29                | 18               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 30-               | 17               |  |  |  | None         |  |                |  | .27                   |  | 18.47                |  |
|                                              | 31                | 17               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 32                | --               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 1, 2, 3           | 17               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 4                 | 18               |  |  |  |              |  |                |  |                       |  |                      |  |
| KAU79L-069994                                | 5, 6              | 18               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 7, 8              | --               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 9                 | 16               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 10                | 17               |  |  |  | None         |  |                |  | .45                   |  | 18.42                |  |
|                                              | 11, 12            | 17               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 13, 14            | 16               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              | 15                | --               |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              |                   |                  |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              |                   |                  |  |  |  |              |  |                |  |                       |  |                      |  |
|                                              |                   |                  |  |  |  |              |  |                |  |                       |  |                      |  |

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**NITROGLYCERIN**  
**M30A1 E/155NH, M203 PROPELLANT**

| <u>Lot No.</u>                                              | <u>Charge No.</u> | <u>KI (Min.)</u><br>10 Min | <u>Alka.</u><br>0.002% Max | <u>Acidity</u> | <u>H<sub>2</sub>O</u><br>0.5% Max | <u>H<sub>2</sub></u><br>18.40% Min |
|-------------------------------------------------------------|-------------------|----------------------------|----------------------------|----------------|-----------------------------------|------------------------------------|
| Requirements<br>HIL-N-2468<br><br>RAD79H-069994<br>(Cont'd) | 16, 17, 18        | 17                         |                            |                |                                   |                                    |
|                                                             | 19                | 17                         |                            |                |                                   |                                    |
|                                                             | 20                | --                         | None                       |                | .36                               | 18.47                              |
|                                                             | 21, 22, 23        | 17                         |                            |                |                                   |                                    |
|                                                             | 24                | 17                         |                            |                |                                   |                                    |
|                                                             | 25                | --                         |                            |                |                                   |                                    |
|                                                             | 26, 27, 28        | 17                         |                            |                |                                   |                                    |

**METHOCHAMIDINE**  
**N1041 Propellant 6/155mm, N202**

| Propellant Lot No.<br>N1041 Lot (MFC No.)<br>CEL-Lot No. (MFC Lot No.) | 770-049003 |        |        |        | 770-049003 |        |        |        |
|------------------------------------------------------------------------|------------|--------|--------|--------|------------|--------|--------|--------|
|                                                                        | 12-033     | 12-034 | 12-032 | 12-038 | 12-033     | 12-033 | 12-034 | 12-032 |
| Parameters                                                             | Limits     |        |        |        |            |        |        |        |
| Avg. Particle Size, $\mu$                                              | 3.4 - 6.0  | 3.3    | 3.3    | 4.7    | 4.6        | 4.7    | 4.9    | 5.1    |
| Purity, %                                                              | 99.0 min   | 99.0   | 99.7   | 99.0   | 99.0       | 99.0   | 99.7   | 99.8   |
| Ash Content, %                                                         | 0.30 max   | 0.03   | 0.02   | 0.05   | 0.02       | 0.06   | 0.02   | 0.05   |
| pH Value                                                               | 4.5 - 7.0  | 5.0    | 5.0    | 5.7    | 5.0        | 5.9    | 5.2    | 5.1    |
| Acidity ( $H_2SO_4$ ), %                                               | 0.04 max   | 0.01   | 0.02   | 0.01   | 0.01       | 0.02   | 0.01   | 0.01   |
| Total Volatiles, %                                                     | 0.25 max   | 0.06   | 0.06   | 0.09   | 0.06       | 0.09   | 0.13   | 0.10   |
| Sulfates ( $Na_2SO_4$ ), %                                             | 0.20 max   | 0.05   | 0.03   | 0.04   | 0.04       | 0.07   | 0.09   | 0.06   |
| Water Insoluble, %                                                     | 0.20 max   | 0.03   | 0.01   | 0.02   | 0.02       | 0.05   | 0.02   | 0.05   |
| <b>SOURCE</b>                                                          |            |        |        |        |            |        |        |        |
| No/Yr of Manufacture                                                   | 5/77       | 5/77   | 5/77   | 5/77   | 5/77       | 5/77   | 5/77   | 5/77   |
| No/Yr Recalced at RAR                                                  | 6/77       | 6/77   | 6/77   | 6/77   | 6/77       | 6/77   | 6/77   | 6/77   |

**RETROGRADING  
H2001 Propellant (115mm, H101)**

| 770-060003                                                             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 770-060002 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 770-060001 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 770-060000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 770-060002 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 770-060003 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 770-060004 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  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**NITROGUANIDINE**  
**MS041 Propellant 1/13mm. MS02**

| Propellant Lot No.<br>MS041 Lot (MPC No.)<br>CCI-Lot No. (Inf. Lot No.) | 778-059803    |        |        |        |        | 778-059804 |        |        |        |        | 1533   |        |        |        |        | 1534   |        |        |        |        |
|-------------------------------------------------------------------------|---------------|--------|--------|--------|--------|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                                                                         | 13-093        | 13-094 | 13-097 | 13-098 | 13-099 | 13-900     | 13-901 | 13-902 | 13-903 | 13-904 | 13-092 | 13-093 | 13-094 | 13-095 | 13-096 | 13-905 | 13-906 | 13-907 | 13-908 | 13-909 |
| <b>Permitteds</b>                                                       | <b>Limit.</b> |        |        |        |        |            |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| Avg. Particle Dia...                                                    | 3.4 - 6.0     | 4.0    | 4.5    | 4.2    | 4.3    | 4.2        | 4.3    | 4.3    | 4.0    | 4.1    | 4.2    | 4.7    | 4.7    | 4.3    | 4.3    | 4.0    | 4.1    | 4.1    | 4.1    | 4.1    |
| Purity, %                                                               | 99.0 min      | 99.7   | 99.7   | 99.8   | 99.7   | 99.7       | 99.7   | 99.7   | 99.7   | 99.8   | 99.6   | 99.7   | 99.7   | 99.7   | 99.7   | 99.7   | 99.8   | 99.8   | 99.8   | 99.8   |
| Ash Content, %                                                          | 0.30 max      | 0.05   | 0.02   | 0.04   | 0.07   | 0.06       | 0.06   | 0.06   | 0.04   | 0.07   | 0.04   | 0.01   | 0.01   | 0.06   | 0.06   | 0.04   | 0.07   | 0.07   | 0.07   | 0.07   |
| pH Value                                                                | 4.3 - 7.0     | 5.9    | 5.6    | 5.4    | 5.8    | 5.2        | 5.2    | 5.2    | 5.9    | 5.7    | 5.9    | 6.0    | 6.0    | 6.5    | 6.5    | 5.7    | 5.1    | 5.1    | 5.1    | 5.1    |
| Acidity (H <sub>2</sub> SO <sub>4</sub> Eq), %                          | 0.06 max      | 0.01   | 0.01   | 0.01   | 0.01   | 0.01       | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   |
| Total Volatiles, %                                                      | 0.25 max      | 0.07   | 0.05   | 0.10   | 0.08   | 0.07       | 0.07   | 0.07   | 0.08   | 0.10   | 0.08   | 0.10   | 0.10   | 0.08   | 0.08   | 0.08   | 0.13   | 0.13   | 0.13   | 0.13   |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> Eq), %                         | 0.20 max      | 0.05   | 0.09   | 0.07   | 0.09   | 0.07       | 0.07   | 0.07   | 0.11   | 0.07   | 0.11   | 0.07   | 0.07   | 0.08   | 0.08   | 0.08   | 0.06   | 0.06   | 0.06   | 0.06   |
| Water Insoluble, %                                                      | 0.20 max      | 0.04   | 0.04   | 0.01   | 0.02   | 0.02       | 0.02   | 0.02   | 0.01   | 0.02   | 0.01   | 0.01   | 0.01   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   |

**STAMPED OF CANADA - DIRECT**

| SOURCE                  |  | STAMPED OF CANADA - DIRECT |      |      |      |      |      |      |      |      |      | STAMPED OF CANADA - DIRECT |      |      |      |      |      |      |      |      |      |
|-------------------------|--|----------------------------|------|------|------|------|------|------|------|------|------|----------------------------|------|------|------|------|------|------|------|------|------|
| No/Yr. of Manufacture   |  | 6/77                       | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77                       | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |
| No/Yr. Received at RAMP |  | 6/77                       | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77                       | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |

**MITROCHAMIDINE**  
**Propellant 6/112mm, R202**

| Propellant Lot No.<br>DAAP Lot (NPC No.)<br>CCI-Lot No. (Mfg. Lot No.) | 77H-069006 |        |        |        |        |        |        |        |        |        | 77H-069006 |        |        |        |        |        |        |        |        |        |
|------------------------------------------------------------------------|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                                                                        | 13-903     | 13-904 | 13-902 | 13-903 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902     | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 | 13-902 |
| <b>Parameters</b>                                                      | 1335       |        |        |        |        |        |        |        |        |        | 1335       |        |        |        |        |        |        |        |        |        |
| <b>Min/Max</b>                                                         | ---        |        |        |        |        |        |        |        |        |        | ---        |        |        |        |        |        |        |        |        |        |
| Avg. Particle Dia.,                                                    | 3.4 - 6.0  | 4.4    | 4.6    | 4.2    | 4.1    | 4.1    | 4.1    | 4.1    | 4.1    | 4.1    | 4.3        | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.6    |
| Purity, %                                                              | 99.0 min   | 99.3   | 99.9   | 99.0   | 99.9   | 99.9   | 99.9   | 99.9   | 99.9   | 99.9   | 99.8       | 99.8   | 99.7   | 99.7   | 99.7   | 99.8   | 99.8   | 99.7   | 99.7   | ---    |
| Ash Content, %                                                         | 0.30 max   | 0.05   | 0.03   | 0.05   | 0.04   | 0.04   | 0.04   | 0.04   | 0.04   | 0.04   | 0.02       | 0.02   | 0.05   | 0.10   | 0.01   | 0.01   | 0.01   | 0.06   | ---    | ---    |
| pH Value                                                               | 4.3 - 7.0  | 5.3    | 5.3    | 6.0    | 5.4    | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    | 6.0        | 6.0    | 5.3    | 5.3    | 5.2    | 5.2    | 5.2    | 5.0    | ---    | ---    |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                           | 0.04 max   | 0.02   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01       | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   | 0.02   | ---    | ---    |
| Total Volatiles, %                                                     | 0.25 max   | 0.10   | 0.13   | 0.07   | 0.13   | 0.06   | 0.06   | 0.06   | 0.06   | 0.06   | 0.09       | 0.09   | 0.10   | 0.05   | 0.10   | 0.10   | 0.10   | 0.13   | ---    | ---    |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> ), %                          | 0.20 max   | 0.04   | 0.04   | 0.04   | 0.03   | 0.03   | 0.03   | 0.03   | 0.03   | 0.03   | 0.06       | 0.06   | 0.06   | 0.11   | 0.09   | 0.09   | 0.09   | 0.09   | ---    | ---    |
| Water Insoluble, %                                                     | 0.20 max   | 0.02   | 0.01   | 0.02   | 0.01   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02       | 0.02   | 0.03   | 0.03   | 0.03   | 0.03   | 0.03   | 0.03   | ---    | ---    |

**STANDARD OF CANADA - DIRECT**

**STANDARD OF CANADA - DIRECT**

|                          |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| No./Yr. of Manufacture   | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |
| No./Yr. Received at DAAP | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |

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**NITROGUANIDINE**  
**RYOAI Propellant 6/13mm. R302**

| Propellant Lot No.<br>R302 Lot (MFC No.)<br>CCI-Lot No. QMG. Lot No.) | 17B-952804  |        |        |        |        | 17B-952807 |        |        |        |        |
|-----------------------------------------------------------------------|-------------|--------|--------|--------|--------|------------|--------|--------|--------|--------|
|                                                                       | 12-329      | 12-331 | 12-332 | 12-333 | 12-334 | 12-335     | 12-336 | 12-337 | 12-338 | 12-339 |
| <b>Examiners</b>                                                      | <b>1537</b> |        |        |        |        |            |        |        |        |        |
| <b>Av. Particle Size</b>                                              | 3.4 - 6.0   | 4.3    | 4.8    | 4.9    | 4.3    | 5.2        | 4.6    | 4.7    | 5.1    | 4.5    |
| <b>Purity, %</b>                                                      | 99.0 min    | 99.0   | 99.6   | 99.6   | 99.7   | 99.8       | 99.8   | 99.8   | 99.9   | 99.7   |
| <b>Ash Content, %</b>                                                 | 0.30 max    | 0.07   | 0.06   | 0.05   | 0.03   | 0.03       | 0.10   | 0.07   | 0.01   | 0.09   |
| <b>pH Value</b>                                                       | 4.5 - 7.0   | 5.3    | 5.3    | 4.7    | 4.8    | 5.3        | 4.8    | 5.4    | 5.3    | 4.9    |
| <b>Acidity (H<sub>2</sub>SO<sub>4</sub>)</b>                          | 0.04 max    | 0.01   | 0.01   | 0.01   | 0.02   | 0.01       | 0.02   | 0.01   | 0.01   | 0.02   |
| <b>Total Volatiles, %</b>                                             | 0.25 max    | 0.05   | 0.07   | 0.12   | 0.10   | 0.08       | 0.08   | 0.07   | 0.12   | 0.08   |
| <b>Sulfates (H<sub>2</sub>SO<sub>4</sub>)</b>                         | 0.20 max    | 0.06   | 0.13   | 0.07   | 0.04   | 0.04       | 0.08   | 0.06   | 0.04   | 0.08   |
| <b>Water Insoluble, %</b>                                             | 0.20 max    | 0.03   | 0.06   | 0.02   | 0.11   | 0.04       | 0.02   | 0.04   | 0.03   | 0.04   |

**STANDARD OF CANADA - DIRECT**

|                                |                                    |      |      |      |      |      |      |      |      |      |
|--------------------------------|------------------------------------|------|------|------|------|------|------|------|------|------|
| <b>Source</b>                  | <b>STANDARD OF CANADA - DIRECT</b> |      |      |      |      |      |      |      |      |      |
| <b>No/Yr. of Manufacture</b>   | 6/77                               | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |
| <b>No/Yr. Received at RAAF</b> | 6/77                               | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |

Attachment 6  
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**NITROGUANIDINE**  
**M30A1 Propellant 6/15mm. M103**

|                                               | 778-089807 |        |        |        |        | 778-089807 |        |        |        |        | 778-089807 |        |        |        |        |
|-----------------------------------------------|------------|--------|--------|--------|--------|------------|--------|--------|--------|--------|------------|--------|--------|--------|--------|
|                                               | 13-930     | 13-931 | 13-932 | 13-933 | 13-934 | 13-935     | 13-936 | 13-937 | 13-938 | 13-939 | 13-940     | 13-941 | 13-942 | 13-943 | 13-944 |
| Propellant Lot No.                            |            |        |        |        |        |            |        |        |        |        |            |        |        |        |        |
| BLAP Lot (MFC No.)                            |            |        |        |        |        |            |        |        |        |        |            |        |        |        |        |
| CEL Lot No. (MFC Lot No.)                     |            |        |        |        |        |            |        |        |        |        |            |        |        |        |        |
| Foramina                                      |            |        |        |        |        |            |        |        |        |        |            |        |        |        |        |
| Avg. Particle Size                            | 3.4 - 6.0  | 4.6    | 5.0    | 5.3    | 5.2    | 5.1        | 5.4    | 4.9    | 4.4    | 4.4    | 4.4        | 4.4    | 4.4    | 4.4    | 4.4    |
| Purity, %                                     | 99.0 min   | 99.0   | 99.0   | 99.0   | 99.0   | 99.0       | 99.0   | 99.0   | 99.0   | 99.0   | 99.0       | 99.0   | 99.0   | 99.0   | 99.0   |
| Ash Content, %                                | 0.30 max   | 0.03   | 0.03   | 0.01   | 0.04   | 0.05       | 0.01   | 0.00   | 0.07   | 0.03   | 0.03       | 0.03   | 0.03   | 0.04   | 0.06   |
| pH Value                                      | 4.5 - 7.0  | 4.7    | 4.9    | 4.9    | 5.9    | 6.0        | 5.4    | 5.4    | 5.3    | 5.0    | 5.0        | 4.7    | 5.20   | 5.20   | 5.20   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %  | 0.06 max   | 0.01   | 0.02   | 0.01   | 0.02   | 0.01       | 0.01   | 0.01   | 0.01   | 0.02   | 0.01       | 0.01   | 0.01   | 0.01   | 0.007  |
| Total Volatiles, %                            | 0.25 max   | 0.06   | 0.06   | 0.12   | 0.09   | 0.06       | 0.10   | 0.09   | 0.08   | 0.12   | 0.04       | 0.04   | 0.04   | 0.04   | 0.04   |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> ), % | 0.20 max   | 0.06   | 0.04   | 0.01   | 0.06   | 0.04       | 0.07   | 0.03   | 0.02   | 0.04   | 0.04       | 0.04   | 0.04   | 0.04   | 0.04   |
| Water Insoluble, %                            | 0.20 max   | 0.04   | 0.03   | 0.01   | 0.02   | 0.02       | 0.01   | 0.01   | 0.01   | 0.01   | 0.01       | 0.01   | 0.01   | 0.01   | 0.01   |

**STANDARD OF CANADA - DIRECT**

|                        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Mo/Tt. of Manufacture  | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |
| Mo/Tt. Received At BAA | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 |

**NITROCHAMIDINE**  
**NYOAL Presellant 1/155mm. H102**

| Presellant Lot No.<br>MMP Lot (MPC No.)<br>CCL-Lot No. (Mfg. Lot No.) | 77N-965007   |        |        |        | 77N-965007 |       |       |       |
|-----------------------------------------------------------------------|--------------|--------|--------|--------|------------|-------|-------|-------|
|                                                                       | 11-922       | 11-924 | 11-927 | 12-929 | 12-929     | 8-041 | 8-042 | 8-044 |
| <b>Parameters</b>                                                     | <b>Limit</b> |        |        |        |            |       |       |       |
| Avg. Particle Size                                                    | 3.4 - 6.0    | 4.9    | 4.6    | 5.0    | 4.3        | 4.4   | 5.3   | 4.7   |
| Purity, %                                                             | 99.6 min     | 99.7   | 99.8   | 99.8   | 99.8       | 99.7  | 99.8  | 99.8  |
| Ash Content, %                                                        | 0.20 max     | 0.04   | 0.04   | 0.04   | 0.02       | 0.03  | 0.16  | 0.11  |
| pH Value                                                              | 4.3 - 7.0    | 5.3    | 6.1    | 5.6    | 4.7        | 5.5   | 4.8   | 5.1   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                          | 0.04 max     | 0.01   | 0.01   | 0.01   | 0.02       | 0.01  | 0.01  | 0.01  |
| Total Volatiles, %                                                    | 0.25 max     | 0.07   | 0.10   | 0.10   | 0.06       | 0.03  | 0.01  | 0.06  |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> ), %                         | 0.20 max     | 0.06   | 0.01   | 0.06   | 0.06       | 0.10  | 0.07  | 0.09  |
| Water Insoluble, %                                                    | 0.20 max     | 0.02   | 0.02   | 0.01   | 0.02       | 0.02  | 0.06  | 0.01  |

**STANDARD OF CANADA - DIRECT**

**ALTERNATE**

|                          |      |      |      |      |      |       |       |       |
|--------------------------|------|------|------|------|------|-------|-------|-------|
| No./Tr. of Manufacture   | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 10/70 | 10/70 | 10/70 |
| No./Tr. Received At RAAF | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 8/77  | 8/77  | 8/77  |

**NITROCHAMBIUM**  
**H2001 Propellant (1/12mm, H202)**

| Propellant Lot No.<br>BAAP Lot (MPC No.)<br>CCL-Lot No. (MFG. Lot No.) | 77H-069007   |        |        |        | 77H-069029   |       |       |       |
|------------------------------------------------------------------------|--------------|--------|--------|--------|--------------|-------|-------|-------|
|                                                                        | 13-946       | 13-947 | 13-948 | 13-949 | 13-950       | 0-027 | 0-032 | 0-034 |
| <b>Parameters</b>                                                      | <b>Limit</b> |        |        |        | <b>Limit</b> |       |       |       |
| Avg. Particle Size                                                     | 3.4 - 6.0    | 5.4    | 4.3    | 4.4    | 4.3          | 5.1   | 5.4   | 4.3   |
| Flow, g/min                                                            | 99.0 min     | 99.8   | 99.7   | 99.7   | 99.7         | 99.9  | 99.9  | 99.6  |
| Ash Content, %                                                         | 0.20 max     | 0.06   | 0.04   | 0.07   | 0.07         | 5.4   | 4.6   | 5.2   |
| pH Value                                                               | 4.5 - 7.0    | 5.5    | 6.3    | 5.7    | 5.8          | 5.4   | 4.6   | 5.2   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                           | 0.06 max     | 0.01   | 0.01   | 0.01   | 0.01         | 0.01  | 0.01  | 0.01  |
| Total Volatiles, %                                                     | 0.25 max     | 0.11   | 0.10   | 0.06   | 0.12         | 0.15  | 0.10  | 0.12  |
| Sulfates (Na <sub>2</sub> SO <sub>4</sub> ), %                         | 0.20 max     | 0.06   | 0.07   | 0.04   | 0.07         | 0.05  | 0.05  | 0.07  |
| Water Insoluble, %                                                     | 0.20 max     | 0.03   | 0.02   | 0.01   | 0.04         | 0.01  | 0.01  | 0.02  |

**STANDARD OF CANADA - DIRECT**

**BAVENNA ACP**

|                         |      |      |      |      |      |      |      |      |
|-------------------------|------|------|------|------|------|------|------|------|
| Manufacturer            | 6/77 | 6/77 | 6/77 | 6/77 | 6/77 | 7/72 | 0/72 | 0/72 |
| Refir. Received At BAAP | 7/77 | 7/77 | 7/77 | 7/77 | 7/77 | 1/79 | 1/79 | 1/79 |

**NITROGUANIDINE**  
**MONAL Propellant 6/15mm, M302**

| Propellant Lot No.<br>MARP Lot (MPC No.)<br>CUA-Lot No. (Mfg. Lot No.) | 780-069959   |       |       | 780-069959 |       |       | 780-069959 |       |       |
|------------------------------------------------------------------------|--------------|-------|-------|------------|-------|-------|------------|-------|-------|
|                                                                        | 0-030        | 0-031 | 0-032 | 0-010      | 0-021 | 0-022 | 0-024      | 0-026 | 0-032 |
| <b>Parameters</b>                                                      | <b>Limit</b> |       |       |            |       |       |            |       |       |
| Avg. Particle Size                                                     | 3.4 - 6.0    | 4.3   | 4.6   | 5.7        | 5.7   | 5.1   | 5.0        | 4.8   | 4.1   |
| Purity, %                                                              | 99.0 min     | 99.9  | 99.9  | 99.9       | 99.9  | 99.9  | 99.9       | 99.9  | 99.11 |
| Ash Content, %                                                         | 0.30 max     | 0.03  | 0.03  | 0.03       | 0.04  | 0.04  | 0.04       | 0.01  | 0.03  |
| pH Value                                                               | 4.5 - 7.0    | 5.4   | 4.9   | 5.0        | 5.2   | 5.3   | 5.1        | 5.5   | 5.7   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                           | 0.04 max     | 0.01  | 0.01  | 0.01       | 0.01  | 0.01  | 0.01       | 0.01  | 0.01  |
| Total Volatiles, %                                                     | 0.25 max     | 0.04  | 0.03  | 0.14       | 0.13  | 0.07  | 0.09       | 0.06  | 0.10  |
| Sulfates (M <sub>2</sub> SO <sub>4</sub> ), %                          | 0.20 max     | 0.07  | 0.10  | 0.07       | 0.07  | 0.06  | 0.05       | 0.09  | 0.10  |
| Water Insoluble, %                                                     | 0.30 max     | 0.01  | 0.01  | 0.01       | 0.01  | 0.01  | 0.01       | 0.01  | 0.01  |

| SOURCE                | BAVENIA AAF |      |      | BAVENIA AAF |      |      | BAVENIA AAF |      |      |
|-----------------------|-------------|------|------|-------------|------|------|-------------|------|------|
|                       | 1/71        | 0/71 | 0/71 | 1/71        | 1/71 | 1/71 | 1/71        | 1/71 | 1/71 |
| Mfg. of Manufacture   |             |      |      |             |      |      |             |      |      |
| Mfg. Recalled At MARP | 1/79        | 1/79 | 1/79 | 1/79        | 1/79 | 1/79 | 1/79        | 1/79 | 1/79 |

Attachment 6  
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**NITROGUANIDINE**  
**NOVA1 Propellant 5/15-mm, R202**

| Propellant Lot No.<br>RXP Lot (MPC No.)<br>CCL-Lot No. (MFG. Lot No.) | 79E-049960 |       | 79E-049960 |       | 79E-049960 |       | 1701 | 79E-049960 |       | 1702 |
|-----------------------------------------------------------------------|------------|-------|------------|-------|------------|-------|------|------------|-------|------|
|                                                                       | 8-024      | 8-028 | 8-028      | 8-028 | 8-028      | 8-028 |      | 8-028      | 8-028 |      |
| Parameters                                                            | Limits     |       |            |       |            |       |      |            |       |      |
| Avg. Particle Size..                                                  | 3.4 - 6.0  |       |            |       |            |       |      |            |       |      |
| Purity, %                                                             | 99.0 min   |       |            |       |            |       |      |            |       |      |
| Ash Content, %                                                        | 0.30 max   |       |            |       |            |       |      |            |       |      |
| pH Value                                                              | 4.5 - 7.0  |       |            |       |            |       |      |            |       |      |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                          | 0.06 max   |       |            |       |            |       |      |            |       |      |
| Total Volatiles, %                                                    | 0.25 max   |       |            |       |            |       |      |            |       |      |
| Sulfates (BaSO <sub>4</sub> ), %                                      | 0.20 max   |       |            |       |            |       |      |            |       |      |
| Water Insoluble, %                                                    | 0.20 max   |       |            |       |            |       |      |            |       |      |

|                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 | Same as Lot 79E-049959 |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|

|      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|
| 5.3  | 5.6  | 5.8  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 99.9 | 99.9 | 99.9 | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 0.05 | 0.01 | 0.03 | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 5.5  | 4.9  | 5.1  | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 0.01 | 0.01 | 0.01 | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 0.06 | 0.07 | 0.16 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| 0.04 | 0.06 | 0.06 | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |
| 0.01 | 0.01 | 0.01 | ---  | ---  | ---  | ---  | ---  | ---  | ---  | ---  |

Same as Lot 79E-049959  
 Same as Lot 79E-049959  
 Same as Lot 79E-049959  
 Same as Lot 79E-049959

| Stage<br>No./Yr. of<br>Manufacture<br>No./Yr. Received<br>At RAMP | RAVENNA AAP |      | RAVENNA AAP |      | RAVENNA AAP |      | 7/71 | 7/71 |      | 8/71 |
|-------------------------------------------------------------------|-------------|------|-------------|------|-------------|------|------|------|------|------|
|                                                                   | 7/71        | 7/71 | 7/71        | 7/71 | 7/71        | 7/71 |      | 8/71 | 8/71 |      |
|                                                                   | 2/79        | 2/79 | 2/79        | 2/79 | 2/79        | 2/79 | 2/79 | 2/79 | 2/79 | 2/79 |

**MITROQUAMISINE**  
**N1001 Propellant (1122mm, N202)**

| Propellant Lot No.<br>RAAP Lot (MPC No.)<br>CCL-Lot No. (Hfg. Lot No.) | 798-069960 |       |       |       | 798-069960 |       |       |       | 798-069961 |       |       |       |
|------------------------------------------------------------------------|------------|-------|-------|-------|------------|-------|-------|-------|------------|-------|-------|-------|
|                                                                        | 8-921      | 8-921 | 8-921 | 8-921 | 8-921      | 8-921 | 8-921 | 8-921 | 8-921      | 8-921 | 8-921 | 8-921 |
| <b>Parameters</b>                                                      |            |       |       |       |            |       |       |       |            |       |       |       |
| <b>Limit</b>                                                           |            |       |       |       |            |       |       |       |            |       |       |       |
| Avg. Particle Size, $\mu$                                              | 3.4 - 6.0  | 4.6   | 4.7   | 5.1   | ---        | 5.4   | 5.2   | 5.1   | ---        | ---   | ---   | ---   |
| Porosity, %                                                            | 99.0 min   | 99.8  | 99.7  | 99.8  | ---        | 99.9  | 99.8  | 99.8  | ---        | ---   | ---   | ---   |
| Ash Content, %                                                         | 0.20 max   | 0.05  | 0.07  | 0.06  | ---        | 0.04  | 0.03  | 0.06  | ---        | ---   | ---   | ---   |
| pH Value                                                               | 4.5 - 7.0  | 4.6   | 5.1   | 5.0   | ---        | 4.9   | 5.0   | 5.0   | ---        | ---   | ---   | ---   |
| Acidity ( $H_2SO_4$ ), %                                               | 0.06 max   | 0.02  | 0.02  | 0.02  | ---        | 0.02  | 0.02  | 0.02  | ---        | ---   | ---   | ---   |
| Total Volatiles, %                                                     | 0.25 max   | 0.14  | 0.06  | 0.05  | 0.08       | 0.04  | 0.06  | 0.16  | 0.06       | ---   | ---   | ---   |
| Sulfates ( $Na_2SO_4$ ), %                                             | 0.20 max   | 0.05  | 0.07  | 0.11  | ---        | 0.10  | 0.08  | 0.08  | ---        | ---   | ---   | ---   |
| Water Insoluble, %                                                     | 0.20 max   | 0.01  | 0.01  | 0.01  | ---        | 0.01  | 0.01  | 0.01  | ---        | ---   | ---   | ---   |

| SOURCE                   | BAYENNA AAP |      |      |      | BAYENNA AAP |      |      |      | BAYENNA AAP |      |      |      |
|--------------------------|-------------|------|------|------|-------------|------|------|------|-------------|------|------|------|
|                          | 8/71        | 8/71 | 8/71 | 8/71 | 8/71        | 8/71 | 8/71 | 8/71 | 8/71        | 8/71 | 8/71 | 8/71 |
| No./Yr. of Manufacture   | 0/71        | 0/71 | 0/71 | 0/71 | 0/71        | 0/71 | 0/71 | 0/71 | 0/71        | 0/71 | 0/71 | 0/71 |
| No./Yr. Received At RAAP | 2/79        | 2/79 | 2/79 | 2/79 | 2/79        | 2/79 | 2/79 | 2/79 | 2/79        | 2/79 | 2/79 | 2/79 |

**NITROCHAMIDINE**  
**M2001 Propellant 6/15mm, M202**

|                            |            |            |            |            |       |
|----------------------------|------------|------------|------------|------------|-------|
| Propellant Lot No.         | 798-067961 | 798-067961 | 798-067961 | 798-067961 | 1767  |
| BAAP Lot (MPC No.)         | 8-042      | 8-042      | 8-042      | 8-042      | 8-042 |
| CCU-Lot No. (Mfg. Lot No.) | 8-042      | 8-042      | 8-042      | 8-042      | 8-042 |

| Parameters                                      | Limit     | 798-067961 | 798-067961 | 798-067961 | 798-067961 |
|-------------------------------------------------|-----------|------------|------------|------------|------------|
| Avg. Particle Dia.,                             | 3.4 - 6.0 | 4.0        | 4.0        | 4.0        | 4.0        |
| Purity, %                                       | 99.0 min  | 99.9       | 99.9       | 99.9       | 99.9       |
| Ash Content, %                                  | 0.30 max  | 0.04       | 0.04       | 0.04       | 0.04       |
| pH Value                                        | 4.5 - 7.0 | 5.2        | 5.0        | 5.1        | 5.2        |
| Acidity (N <sub>2</sub> SO <sub>4</sub> EQ), %  | 0.06 max  | 0.02       | 0.02       | 0.02       | 0.02       |
| Total Volatiles, %                              | 0.25 max  | 0.03       | 0.06       | 0.10       | 0.10       |
| Sulfates (N <sub>2</sub> SO <sub>4</sub> EQ), % | 0.20 max  | 0.09       | 0.15       | 0.11       | 0.12       |
| Water Insoluble, %                              | 0.20 max  | 0.01       | 0.01       | 0.01       | 0.01       |

| SOURCE                    | BAVERIA AAP | BAVERIA AAP | BAVERIA AAP | BAVERIA AAP |
|---------------------------|-------------|-------------|-------------|-------------|
| Mfg./Tr. of Manufacture   | 8/71        | 8/71        | 8/71        | 8/71        |
| Mfg./Tr. Received At BAAP | 2/79        | 2/79        | 2/79        | 2/79        |

Attachment 6  
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**NITROQUANTIBINE**  
**120011 Propellant 1/13mm, H202**

| Propellant Lot No.<br>BAP Lot (MPC No.)<br>CCL-Lot No. (Mfg. Lot No.) | 798-053961  |       | 798-053963  |       | 798-053965  |       |
|-----------------------------------------------------------------------|-------------|-------|-------------|-------|-------------|-------|
|                                                                       | 8-248       | 8-251 | 8-253       | 8-254 | 8-252       | 8-254 |
| Parameter                                                             | LIMIT       |       | LIMIT       |       | LIMIT       |       |
| Avg. Particle Dia.,                                                   | 3.4 - 6.0   | 4.3   | 4.7         | 5.1   | 4.7         | 5.4   |
| Purity, %                                                             | 99.0 min    | 99.0  | 99.0        | 99.9  | 99.0        | 99.9  |
| Ash Content, %                                                        | 0.30 max    | 0.05  | 0.02        | 0.04  | 0.04        | 0.05  |
| Acidity (H <sub>2</sub> SO <sub>4</sub> Eq), %                        | 0.06 max    | 0.01  | 0.01        | 0.01  | 0.02        | 0.01  |
| Total Volatiles, %                                                    | 0.25 max    | 0.06  | 0.10        | 0.05  | 0.04        | 0.07  |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> Eq), %                       | 0.20 max    | 0.09  | 0.06        | 0.07  | 0.02        | 0.06  |
| Water Insoluble, %                                                    | 0.20 max    | 0.01  | 0.01        | 0.06  | 0.03        | 0.02  |
| SOURCE                                                                | RAYONMA AAP |       | RAYONMA AAP |       | RAYONMA AAP |       |
| No./Yr. of Manufacture                                                | 9/71        | 9/71  | 9/71        | 9/71  | 10/71       | 10/71 |
| No./Yr. Received at BAP                                               | 2/79        | 2/79  | 2/79        | 3/79  | 3/79        | 3/79  |

**NITROCELLULOSE  
K2041 Propellant (113)mm, H202**

| Propellant Lot No.<br>BAAP Lot (MPC No.)<br>Cell-Lot No. (Mfg. Lot No.) | 198-061963   |       | 198-061963 |       | 198-061963 |       | 198-061963 |       | 198-061963 |       |
|-------------------------------------------------------------------------|--------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|                                                                         | 8-211        | 8-212 | 8-213      | 8-214 | 8-215      | 8-216 | 8-217      | 8-218 | 8-219      | 8-220 |
| <b>Parameters</b>                                                       | <b>Limit</b> |       |            |       |            |       |            |       |            |       |
| Avg. Particle Size                                                      | 3.4 - 6.0    | 5.0   | 4.6        | 4.3   | —          | 5.0   | 5.0        | 5.0   | —          | —     |
| Purity, %                                                               | 99.0 min     | 99.7  | 99.0       | 99.0  | —          | 99.7  | 99.0       | 99.7  | —          | —     |
| Ash Content, %                                                          | 0.30 max     | 0.05  | 0.05       | 0.05  | —          | 0.05  | 0.04       | 0.04  | —          | —     |
| pH Value                                                                | 4.5 - 7.0    | 5.3   | 5.4        | 5.2   | —          | 4.6   | 4.9        | 5.1   | —          | —     |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                            | 0.04 max     | 0.01  | 0.01       | 0.02  | —          | 0.02  | 0.02       | 0.02  | —          | —     |
| Total Volatiles, %                                                      | 0.25 max     | 0.10  | 0.10       | 0.05  | 0.04       | 0.10  | 0.09       | 0.10  | 0.03       | 0.02  |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> ), %                           | 0.20 max     | 0.07  | 0.05       | 0.06  | —          | 0.09  | 0.06       | 0.12  | —          | —     |
| Water Insoluble, %                                                      | 0.20 max     | 0.02  | 0.02       | 0.02  | —          | 0.01  | 0.01       | 0.01  | —          | —     |

| SOURCE                | DAVENIA AAF |      | DAVENIA AAF |      | DAVENIA AAF |      | DAVENIA AAF |      | DAVENIA AAF |      |
|-----------------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|
|                       | 9/71        | 9/71 | 9/71        | 9/71 | 9/71        | 9/71 | 9/71        | 9/71 | 9/71        | 9/71 |
| Mfg. of Manufacture   |             |      |             |      |             |      |             |      |             |      |
| Mfg. Received At BAAP | 3/71        | 3/71 | 3/71        | 3/71 | 3/71        | 3/71 | 3/71        | 3/71 | 3/71        | 3/71 |

**MITROCHAMISITRE**  
**NOMAL Propellant (155mm, R203)**

| Propellant Lot No.<br>NAIP Lot (MPC No.)<br>GIA-Lot No. (MFG. Lot No.) | 730-062222         |       |       | 730-062222         |       |       | 730-062222         |       |       |
|------------------------------------------------------------------------|--------------------|-------|-------|--------------------|-------|-------|--------------------|-------|-------|
|                                                                        | 8-223              | 8-222 | 8-228 | 8-215              | 8-226 | 8-228 | 8-204              | 8-208 | 8-619 |
| <b>Parameters</b>                                                      | <b>Limit</b>       |       |       | <b>Limit</b>       |       |       | <b>Limit</b>       |       |       |
| Aug. Particle Size                                                     | 3.4 - 6.0          | 4.4   | 4.6   | 4.3                | 4.2   | 4.7   | 4.6                | 4.4   | 5.0   |
| Purity, %                                                              | 99.0 min           | 99.7  | 99.8  | 99.9               | 99.8  | 99.9  | 99.8               | 99.9  | 99.8  |
| Ash Content, %                                                         | 0.20 max           | 0.01  | 0.06  | 0.04               | 0.01  | 0.05  | 0.03               | 0.08  | 0.04  |
| pH Value                                                               | 4.5 - 7.0          | 5.0   | 5.2   | 5.0                | 5.2   | 5.0   | 5.1                | 5.5   | 5.4   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> Eq), %                         | 0.06 max           | 0.01  | 0.01  | 0.04               | 0.02  | 0.04  | 0.01               | 0.01  | 0.01  |
| Total Volatiles, %                                                     | 0.25 max           | 0.10  | 0.10  | 0.05               | 0.05  | 0.08  | 0.06               | 0.10  | 0.06  |
| Sulfates (Ba <sub>2</sub> SO <sub>4</sub> Eq), %                       | 0.20 max           | 0.07  | 0.11  | 0.14               | 0.10  | 0.09  | 0.06               | 0.09  | 0.02  |
| Water Insoluble, %                                                     | 0.20 max           | 0.02  | 0.01  | 0.01               | 0.01  | 0.01  | 0.01               | 0.01  | 0.01  |
| <b>SOURCE</b>                                                          | <b>RAYMOND AAF</b> |       |       | <b>RAYMOND AAF</b> |       |       | <b>RAYMOND AAF</b> |       |       |
| No/Yr. of Manufacture                                                  | 4/71               | 4/71  | 4/71  | 4/71               | 4/71  | 4/71  | 4/71               | 5/71  | 5/71  |
| No/Yr. Received At NAIP                                                | 6/79               | 6/79  | 6/79  | 6/79               | 6/79  | 6/79  | 6/79               | 6/79  | 6/79  |

**MITOCOMARINE**  
**10001 Propellant 7/15mm, M303**

| Propellant Lot No.<br>BAP Lot (MPC No.)<br>CCI-Lot No. (Mfg. Lot No.) | 794-069922   |       | 794-069924 |       | 794-069925 |       |
|-----------------------------------------------------------------------|--------------|-------|------------|-------|------------|-------|
|                                                                       | 0-598        | 0-593 | 0-592      | 0-593 | 0-592      | 0-593 |
| <b>Parameters</b>                                                     | <b>Limit</b> |       |            |       |            |       |
| Avg. Particle Size                                                    | 3.4 - 6.0    | 4.4   | 4.6        | 4.5   | 4.4        | ---   |
| Purity, %                                                             | 99.0 min     | 99.9  | 99.9       | 99.9  | 99.9       | ---   |
| Ash Content, %                                                        | 0.20 max     | 0.04  | 0.03       | 0.01  | 0.03       | ---   |
| pH Value                                                              | 4.5 - 7.0    | 5.3   | 4.8        | 5.7   | 5.4        | ---   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                          | 0.05 max     | 0.01  | 0.02       | 0.01  | 0.01       | ---   |
| Total Volatiles, %                                                    | 0.25 max     | 0.02  | 0.05       | 0.06  | 0.04       | 0.14  |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> ), %                         | 0.20 max     | 0.07  | 0.06       | 0.10  | 0.09       | ---   |
| Water Insoluble, %                                                    | 0.20 max     | 0.01  | 0.01       | 0.01  | 0.01       | ---   |
| <b>SOURCE</b>                                                         |              |       |            |       |            |       |
| Mfg. of Manufacture                                                   | 4/71         | 4/71  | 4/71       | 5/71  | 5/71       | 5/71  |
| Mfg. Received At BAP                                                  | 0/79         | 0/79  | 0/79       | 0/79  | 0/79       | 0/79  |

**INTRODUCING  
H2O2 Precipitant 4/15/5m, M102**

| Propellant Lot No.<br>BAP Lot (MPC No.)<br>CU-Lot No. (Mfg. Lot No.) | 781-042224 |       | 781-042224 |       | 781-042224 |       | 781-042224 |       | 781-042224 |       |
|----------------------------------------------------------------------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|                                                                      | 8-247      | 8-248 | 8-249      | 8-250 | 8-251      | 8-252 | 8-253      | 8-254 | 8-255      | 8-256 |
| <b>Parameters</b>                                                    |            |       |            |       |            |       |            |       |            |       |
| <b>Unit</b>                                                          |            |       |            |       |            |       |            |       |            |       |
| Avg. Particle Size                                                   | 3.4 - 6.0  | 4.0   | 4.3        | 3.9   | ---        | 4.7   | 4.0        | 4.6   | ---        | 4.1   |
| Purity, %                                                            | 99.9 min   | 99.9  | 99.9       | 99.9  | ---        | 99.9  | 99.9       | 99.9  | ---        | 99.9  |
| Ash Content, %                                                       | 0.20 max   | 0.06  | 0.06       | 0.03  | ---        | 0.05  | 0.01       | 0.02  | ---        | 0.05  |
| pH Value                                                             | 4.3 - 7.0  | 3.0   | 3.2        | 3.1   | ---        | 3.4   | 3.4        | 3.3   | ---        | 3.0   |
| Acidity (H <sub>2</sub> SO <sub>4</sub> ), %                         | 0.06 max   | 0.01  | 0.01       | 0.01  | ---        | 0.01  | 0.01       | 0.01  | ---        | 0.01  |
| Total Volatiles, %                                                   | 0.25 max   | 0.04  | 0.06       | 0.04  | 0.12       | 0.00  | 0.06       | 0.05  | 0.17       | 0.04  |
| Sulfates (H <sub>2</sub> SO <sub>4</sub> ), %                        | 0.20 max   | 0.12  | 0.10       | 0.12  | ---        | 0.00  | 0.00       | 0.11  | ---        | 0.10  |
| Water Insoluble, %                                                   | 0.20 max   | 0.01  | 0.01       | 0.01  | ---        | 0.01  | 0.01       | 0.01  | ---        | 0.01  |

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| SOURCE                  | DAVIDSON AMP |      | DAVIDSON AMP |      | DAVIDSON AMP |      | DAVIDSON AMP |      | DAVIDSON AMP |      |
|-------------------------|--------------|------|--------------|------|--------------|------|--------------|------|--------------|------|
|                         | 4/71         | 4/71 | 3/71         | 3/71 | 3/71         | 3/71 | 4/71         | 4/71 | 4/71         | 4/71 |
| No./Tr. of Manufacture  | 4/71         | 4/71 | 3/71         | 3/71 | 3/71         | 3/71 | 4/71         | 4/71 | 4/71         | 4/71 |
| No./Tr. Received At BAP | 9/79         | 9/79 | 9/79         | 9/79 | 9/79         | 9/79 | 9/79         | 9/79 | 9/79         | 9/79 |

**NITROCHAMIZONE**  
**NDA#1 Supplement 1/13/99, N292**

Propellant Lot No. 7M-55374 1873  
 RAAP Lot (NFC No.) 11-221 11-226 11-232  
 CCL Lot No. (Mfg. Lot No.)

| Parameter                                       | Unit      |      |      |      |      |
|-------------------------------------------------|-----------|------|------|------|------|
| Avg. Particle Size                              | 3.4 - 6.0 | 4.4  | 5.0  | 4.6  | ---  |
| Purity, %                                       | 99.0 min  | 99.7 | 99.8 | 99.8 | ---  |
| Ash Content, %                                  | 0.20 max  | 0.06 | 0.01 | 0.05 | ---  |
| pH Value                                        | 4.5 - 7.0 | 5.8  | 4.6  | 5.4  | ---  |
| Acidity (N <sub>2</sub> SO <sub>4</sub> Eq), %  | 0.05 max  | 0.01 | 0.02 | 0.01 | ---  |
| Total Volatiles, %                              | 0.25 max  | 0.05 | 0.06 | 0.06 | 0.05 |
| Sulfates (N <sub>2</sub> SO <sub>4</sub> Eq), % | 0.20 max  | 0.02 | 0.05 | 0.05 | ---  |
| Water Insoluble, %                              | 0.20 max  | 0.09 | 0.01 | 0.05 | ---  |

| SOURCE                   | PANTHERA AAF |      |      |      |
|--------------------------|--------------|------|------|------|
| No./Tr. of Manufacture   | 5/75         | 5/75 | 5/75 | 5/75 |
| No./Tr. Received At RAAP | 9/79         | 9/79 | 9/79 | 9/79 |

**Ethyl Cellulosite**  
**Hydral Precipitant I/155mm, H203**

| Parameters                                              | Limits                                                         | 770-069805 |        | 770-069806 |        | 770-069807 |        | 770-069822 |        |        |        |        |                  |
|---------------------------------------------------------|----------------------------------------------------------------|------------|--------|------------|--------|------------|--------|------------|--------|--------|--------|--------|------------------|
|                                                         |                                                                | 20/77      | 1358   | 20/77      | 1358   | 20/77      | 1358   | 63         | 64     | 65     | 66     | 67     | 68               |
| Pre-plant Lot No.<br>B&P lot (MPC No.)<br>Mfg. Lot No.  |                                                                |            |        |            |        |            |        |            |        |        |        |        | 1350             |
| Solidification<br>Point, °C                             | 71.0-<br>72.5                                                  | 72.25      | 72.4   | 72.25      | 72.4   | 72.2       | 72.2   | 71.4       | 71.6   | 71.6   | 71.3   | 71.4   | 71.6 72.1        |
| Melted Material<br>(Appearance)                         | Bright<br>Clear<br>Liquid,<br>Free of<br>Scum &<br>Deposit     | Passes     | Passes | Passes     | Passes | Passes     | Passes | Passes     | Passes | Passes | Passes | Passes | Passes           |
| Volatiles Content, %                                    | 0.1 Max.                                                       | 0.05       | 0.01   | 0.07       | 0.03   | 0.07       | 0.03   | .007       | .001   | .002   | .009   | .001   | .000 .002 .1     |
| Ash Content, %                                          | 0.1 Max.                                                       | 0.01       | 0.04   | .002       | .005   | .002       | .005   | .002       | .005   | .002   | .004   | .005   | .002 .005        |
| Sum of<br>Acidities, %                                  | 0.20 Max.                                                      | 0.12       | 0.002  | 0.10       | .024   | .043       | .059   | .048       | .050   | .129   | .070   | .129   | .070             |
| Acidity, as<br>HCl, %                                   | 0.04 Max.                                                      | 0.001      | 0.0004 | 0.001      | .0001  | .0001      | .0001  | .0001      | .0001  | .0001  | .0001  | .0001  | .0001            |
| Hydrolyzable<br>Chlorine<br>Compound, %                 | 0.001 Max.                                                     | 0.0002     | None   | 0.0002     | .0001  | .0001      | .0001  | .0001      | .0001  | .0001  | .0001  | .0001  | .0001            |
| Particle Size,<br>% Passing through<br>#55 No. 30 Sieve | 99.9 Min.                                                      | 99.9       | 100    | 99.9       | 100    | 99.9       | 100    | 99.96      | 99.92  | 99.93  | 99.91  | 99.95  | 99.97 99.92 99.9 |
| Workmanship                                             | Free from<br>Grit,<br>visible<br>impurities,<br>foreign matter | Passes     | Passes | Passes     | Passes | Passes     | Passes | Passes     | Passes | Passes | Passes | Passes | Passes           |

Same as for Lot 770-069805

Same as for Lot 770-069805

Propellant Lot No.  
RAAP Lot (WPC No.)  
Mfg. Lot No.

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     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| 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 | 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 | 1480 | 1481 | 1482 | 1483 | 1484 | 1485 | 1486 | 1487 | 1488 | 1489 | 1490 | 1491 | 1492 | 1493 | 1494 | 1495 | 1496 | 1497 | 1498 | 1499 | 1500 | 1501 | 1502 | 1503 | 1504 | 1505 | 1506 | 1507 | 1508 | 1509 | 1510 | 1511 | 1512 | 1513 | 1514 | 1515 | 1516 | 1517 | 1518 | 1519 | 1520 | 1521 | 1522 | 1523 | 1524 | 1525 | 1526 | 1527 | 1528 | 1529 | 1530 | 1531 | 1532 | 1533 | 1534 | 1535 | 1536 | 1537 | 1538 | 1539 | 1540 | 1541 | 1542 | 1543 | 1544 | 1545 | 1546 | 1547 | 1548 | 1549 | 1550 | 1551 |  |
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**Ethyl Centralite**  
**M30A1 Propellant (155mm, M203)**

|                                                           |        | 79L-069992 |     |     |     |     |     |     |     |     |     |     |  | 1297-R |
|-----------------------------------------------------------|--------|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--------|
|                                                           |        | 46R        | 86R | 87R | 88R | 89R | 90R | 91R | 92R | 93R | 94R | 95R |  |        |
|                                                           |        | Limits     |     |     |     |     |     |     |     |     |     |     |  |        |
| Parameters                                                | Limits |            |     |     |     |     |     |     |     |     |     |     |  |        |
| Propellant Lot No.<br>M30A1 Lot (MPC No.)<br>Mfg. Lot No. |        |            |     |     |     |     |     |     |     |     |     |     |  |        |
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Attachment 7  
Page 3 of 3

**Potassium Sulfate**  
**M30A1 Propellant f/155mm, M203**

| Propellant Lot No.<br>RAAF Lot (NFC No.)<br>Hfg. Lot No. | 77C-069805<br>485R-1<br>CFM | 77H-069806<br>486R-1<br>CFM | 77H-069807<br>486R-1 487R-1<br>CFM CFM | 79D-069959<br>508R-1 509R-1<br>CFM CFM | 79E-069960<br>511R-1<br>CFM | 79E-069961<br>511R-1 512R-1<br>CFM CFM |
|----------------------------------------------------------|-----------------------------|-----------------------------|----------------------------------------|----------------------------------------|-----------------------------|----------------------------------------|
| Parameters                                               | Limits                      |                             |                                        |                                        |                             |                                        |
| Purity, %                                                | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| K content, %                                             | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| Moisture, %                                              | 0.01                        | 0.005                       | 0.005 0.01                             | 0.02                                   | 0.02                        | 0.01                                   |
| Insoluble Matter, %                                      | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| Grit, %                                                  | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| pH                                                       | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| Chlorides, as KCl, %                                     | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| Granulation, %                                           | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| Passing                                                  | -                           | -                           | -                                      | -                                      | -                           | -                                      |
| USS No. 50 Sieve                                         | 100 min.                    | -                           | -                                      | -                                      | -                           | -                                      |
| USS No. 70 Sieve                                         | 95 min.                     | -                           | -                                      | -                                      | -                           | -                                      |

**Potassium Sulfate**  
**M20A1 Propellant f/155mm, M203 (continued)**

| Propellant Lot No.<br>RAMP Lot (NPC No.)<br>Mfg. Lot No. | 79E-069962 |        | 79L-069992 |        | 79M-069994 |        |
|----------------------------------------------------------|------------|--------|------------|--------|------------|--------|
|                                                          | 5128-1     | 5138-1 | 530        | 530    | 532        | 532    |
|                                                          | CPH        | CPH    | 7153J5     | 7153J7 | 7153J7     | 7153J7 |
| Parameters                                               | Limits     |        |            |        |            |        |
| Purity, %                                                | -          | -      | 99.6       | 99.84  | 99.2       | -      |
| K Content, %                                             | -          | -      | 99.9       | 99.90  | 101.0      | -      |
| Moisture, %                                              | 0.01       | 0.01   | > 0.01     | None   | 0.0        | 0.02   |
| Insoluble Matter, %                                      | -          | -      | > 0.004    | 0.01   | < 0.1      | -      |
| Grit, %                                                  | -          | -      | None       | None   | None       | -      |
| pH                                                       | -          | -      | 6.3        | 7      | 6.5        | -      |
| Chlorides, as KCL, %                                     | -          | -      | > 0.02     | None   | < 0.02     | -      |
| Granulation, %                                           | -          | -      | 100        | 100    | 100        | 100    |
| Passing                                                  | -          | -      | 99.9       | 100    | 99         | 100    |
| USS No. 50 Sieve                                         | -          | -      | -          | -      | -          | -      |
| USS No. 70 Sieve                                         | -          | -      | -          | -      | -          | -      |

Graphite, Grade IV  
 M30A1 Propellant 8/115mm, M203

| Propellant Lot No.<br>RAP Lot (MPC No.)<br>Mfg. Lot No.          | 790-069803<br>127<br>3636 | 770-069806<br>127<br>3636 | 770-069807<br>127<br>3636 | 790-069809<br>134<br>1009 | 790-069810<br>135<br>2433 | 790-069811<br>135<br>2433 | 790-069812<br>135<br>2433 | 790-069813<br>135<br>2433 | 790-069814<br>136<br>2000 | 790-069815<br>136<br>2000 |
|------------------------------------------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Moisture, %                                                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      | 0.00                      |
| Ash, %                                                           | 1.91                      | 1.91                      | 1.91                      | 1.13                      | 1.20                      | 1.20                      | 1.20                      | 1.20                      | 1.20                      | 1.20                      |
| Silica, %                                                        | 0.50                      | 0.50                      | 0.50                      | 0.65                      | 0.58                      | 0.58                      | 0.58                      | 0.58                      | 0.58                      | 0.58                      |
| Other Grit, %                                                    | None                      | None                      | None                      | None                      | None                      | None                      | None                      | None                      | None                      | None                      |
| Acidity, %                                                       | None                      | None                      | None                      | None                      | None                      | None                      | None                      | None                      | None                      | None                      |
| Free Sulfur, %                                                   | 0.03                      | 0.03                      | 0.03                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      |
| Total Sulfur, %                                                  | 0.10                      | 0.10                      | 0.10                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      | 0.15                      |
| Granulation, %<br>Passing through<br>US No. 325<br>(44-75 Sieve) | 97.4                      | 97.4                      | 97.4                      | 97.0                      | 96.13                     | 96.13                     | 96.13                     | 96.13                     | 96.13                     | 96.13                     |

Same as for Lot 790-069812

Same as for Lot 790-069810

Same as for Lot 790-069810

Same as for Lot 790-069803

Same as for Lot 790-069803

Acetone  
H30A1 Propellant f/155mm, M203

| <u>H30A1 Lot No.</u>         | <u>MPC Lot No.</u> | <u>Car No.</u> | <u>Supplier</u>      | <u>Date</u> | <u>Hercules Analyses</u> |                    |
|------------------------------|--------------------|----------------|----------------------|-------------|--------------------------|--------------------|
|                              |                    |                |                      |             | <u>Specific Gravity</u>  | <u>Moisture, %</u> |
|                              |                    |                |                      |             | 0.7910 to 0.7930         | 0.50% Max.         |
| <u>SPECIFICATION LIMITS:</u> |                    |                |                      |             |                          |                    |
| 77C-069803                   | 1212               | GATX-75208     | Ashland Chemical Co. | 6-6-77      | 0.7917                   | 0.39               |
| 77N-069806                   | 1213               | GATX-95502     | "                    | 7-7-77      | 0.7919                   | 0.43               |
| 77N-069807                   | 1214               | GATX-78953     | "                    | 7-12-77     | 0.7915                   | 0.36               |
|                              | 1215               | GATX-85415     | "                    | 7-19-77     | 0.7923                   | 0.37               |
| 79D-069959                   | 1251               | GATX-17976     | Devon Chemicals, Inc | 2-26-79     | 0.7927                   | 0.06               |
| 79E-069960                   |                    |                |                      |             |                          |                    |
| 79E-069961                   |                    |                |                      |             |                          |                    |
| 79E-069962                   |                    |                |                      |             |                          |                    |
| 79L-069992                   | 1252               | ACFX-81881     | Ashland Chemical Co. | 9-24-79     | 0.7928                   | 0.42               |
| 79H-069994                   |                    |                |                      |             |                          |                    |

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Alcohol  
M30A1 Propellant f/155mm, M203

| <u>M30A1 Lot No.</u>         | <u>MPC Lot No.</u> | <u>Car No.</u> | <u>Supplier</u>          | <u>Date Rec'd.</u> | <u>Hercules Analysis</u> |                    |                    |
|------------------------------|--------------------|----------------|--------------------------|--------------------|--------------------------|--------------------|--------------------|
|                              |                    |                |                          |                    | <u>Sp.Gr.</u>            | <u>Toluene (Z)</u> | <u>Alcohol (Z)</u> |
|                              |                    |                |                          |                    | 0.8163<br>Max.           | 0.75Z<br>Max.      | 94.9Z<br>Min.      |
| <b>SPECIFICATION LIMITS:</b> |                    |                |                          |                    |                          |                    |                    |
| 77C-069805                   | 646                | CCBX-959       | Union Carbide Corp.      | 6-13-77            | 0.8151                   | 0.42               | 95.2               |
|                              | 647                | CCBX-1065      | " "                      | 6-20-77            | 0.8158                   | 0.75               | 95.0               |
|                              | 648                | GATX-87995     | IMC Chemical Group, Inc. | 6-28-77            | 0.8153                   | 0.75               | 95.13              |
|                              | 649                | CCBX-959       | Union Carbide Corp.      | 6-29-77            | 0.8148                   | 0.75               | 95.3               |
| 77H-069806                   | 650                | MATX-24805     | IMC Chemical Group, Inc. | 7-6-77             | 0.8152                   | 0.75               | 95.15              |
|                              | 651                | GATX-87993     | " "                      | 7-6-77             | 0.8147                   | 0.75               | 95.28              |
| 77H-069807                   | 652                | GATX-87997     | " "                      | 7-15-77            | 0.8162                   | 0.75               | 94.9               |
|                              | 653                | GATX-99118     | " "                      | 7-22-77            | 0.8157                   | 0.75               | 95.0               |
| 79D-069959                   | 703                | RAIX-6244      | Union Carbide Corp.      | 2-19-79            | 0.8157                   | 0.75               | 95.0               |
| 79E-069960                   | 704                | SCHX-2778      | Shell Chemical Co.       | 4-2-79             | 0.8141                   | 0.75               | 95.42              |
| 79E-069961                   | 705                | SCHX-2782      | " "                      | 4-9-79             | 0.8142                   | 0.75               | 95.41              |
|                              | 706                | SCHX-2235      | " "                      | 4-15-79            | 0.8135                   | 0.75               | 95.6               |
| 79E-069962                   | 707                | SCHX-2778      | " "                      | 5-3-79             | 0.8152                   | 0.75               | 95.15              |
| 79L-069992                   | 712                | SCHX-2538      | " "                      | 10-18-79           | 0.8150                   | 0.75               | 95.2               |
| 79H-069994                   | 714                | SCHX-2782      | " "                      | 11-7-79            | 0.8155                   | 0.75               | 95.08              |
|                              | 715                | SCHX-2778      | " "                      | 11-19-79           | 0.8163                   | 0.75               | 94.9               |

Process Conditions  
N2O41 Propellant (1155mm, M203)

| Process                        | 170-069003                                                      | 170-069005 | 170-069007 | 170-069009 | 170-069010 | 170-069011 | 170-069012 | 170-069013 | 170-069014 |
|--------------------------------|-----------------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| MC Nitration                   | CIN                                                             | CIN        | CIN        | CIN        | CIN        | CIN        | CIN        | CIN        | CIN        |
| <u>Hydration:</u>              |                                                                 |            |            |            |            |            |            |            |            |
| Quantity                       | 1 tub                                                           | Same       | Same       | Same       | Same       | Same       | Same       | Same       | Same       |
| Alcohol, gals.                 | 17 minutes                                                      |            |            |            |            |            |            |            |            |
| Boil Time, minutes             | 5                                                               |            |            |            |            |            |            |            |            |
| Block Breaker &<br>MC Weighing |                                                                 | Same       | Same       | Same       | Same       | Same       | Same       | Same       | Same       |
| Screen Opening                 | 1/2 x 3/4"                                                      |            |            |            |            |            |            |            |            |
| Mo. Tub/Fill                   | 4                                                               |            |            |            |            |            |            |            |            |
| Dry MC Weigh/tub, lb           | 37.0 ±0.5                                                       |            |            |            |            |            |            |            |            |
| Total MC Dry Weight/ln, lb     | 140.0 ±1.0                                                      |            |            |            |            |            |            |            |            |
| <u>Freezing</u>                |                                                                 |            |            |            |            |            |            |            |            |
| Type Freeze                    | Schroder Bowl                                                   | Same       | Same       | Same       | Same       | Same       | Same       | Same       | Same       |
| Mo. Chgs./Premin               | 2                                                               |            |            |            |            |            |            |            |            |
| Dry Wt. w/Charge, lb           | 74.0 ±1.0                                                       |            |            |            |            |            |            |            |            |
| Wt. w/Charge, lb               | 63.0 ±0.5                                                       |            |            |            |            |            |            |            |            |
| Mixing Time, minutes           | 2                                                               |            |            |            |            |            |            |            |            |
| <u>Final Mixing</u>            |                                                                 |            |            |            |            |            |            |            |            |
| Ingredients/Min:               |                                                                 |            |            |            |            |            |            |            |            |
| Nitrocellulose, lb             | 140.00                                                          | Same       |            |            |            |            |            |            |            |
| Nitroglycerin, lb              | 126.00                                                          |            |            |            |            |            |            |            |            |
| Nitroguanidine, lb             | 250.00                                                          |            |            |            |            |            |            |            |            |
| Ethyl Centralite, lb           | 6.00                                                            |            |            |            |            |            |            |            |            |
| Potassium Sulfate, lb          | 5.30                                                            |            |            |            |            |            |            |            |            |
| Total                          | 537.30                                                          |            |            |            |            |            |            |            |            |
| Solvents:                      |                                                                 |            |            |            |            |            |            |            |            |
| Alcohol, lb                    | 71.0                                                            |            |            |            |            |            |            |            |            |
| Acetone, lb                    | 47.0                                                            |            |            |            |            |            |            |            |            |
| Temperature at Freezer         | 110 to 120°                                                     |            |            |            |            |            |            |            |            |
| Total Mixing Time, hrs.        | 3                                                               |            |            |            |            |            |            |            |            |
| Drying                         | With inert gas                                                  |            |            |            |            |            |            |            |            |
| Chilling of Min                | Reduce water temperature to 45 ±10° and mix 15 minutes, minimum | Same       | Same       | Same       | Same       | Same       | Same       | Same       | Same       |
| <u>Blockling</u>               |                                                                 |            |            |            |            |            |            |            |            |
| Type Blocker                   | 12" Press                                                       | Same       | Same       | Same       | Same       | Same       | Same       | Same       | Same       |
| Boil Time, minutes             | 2 1/2                                                           |            |            |            |            |            |            |            |            |

**Process Conditions**  
H30A1 Propellant #/155mm, N203

770-049003    770-049006    770-049007    790-049019    770-049040    790-049041    790-049042    790-049044

**Extruding**

Type Frame  
No. dies/piece  
Die inserts

Same

Same

Same

Same

Same

Same

Same

Same

Same

Agate Size  
Pin Dia.

12"  
5  
Teflon or  
Delrin  
(2 1/2" barrel,  
80° approach  
angle)  
0.430  
Outer: 0.039  
Center: 0.037"

Same

Same

Same

Same

Same

Same

Same

Same

Same

Pin Circle  
No. Screws

0.262  
1 - 16 mesh,  
1 - 40 mesh,  
2000 to  
2600 psi

Same

Same

Same

Same

Same

Same

Same

Same

Same

Extrusion Pressure

Type Machine  
Length, inch  
U./Tray, lb  
Trays/Cabinet

Small Arms  
0.945 to 0.005  
25  
10

Same

Same

Same

Same

Same

Same

Same

Same

Same

**Drying**

Trays/Day  
Loading Temp.  
Build-up  
Cycle Temp.  
Cycle Time

376  
Ambient  
5°/hr  
160°  
72 hrs

Same

Same

Same

Same

Same

Same

Same

Same

Same

Blending/Grating

5400/ Prop.  
5 lb 6.4 oz  
Graphite  
90 minutes

Same

Same

Same

Same

Same

Same

Same

Same

Same

**Screening**

Acceptance Screen, inch  
Fine Screen, inch  
U./Fiber Drum, lb  
No. Drums/Batch

0.700-0.900  
0.315 Max.  
100  
54

Same

Same

Same

Same

Same

Same

Same

Same

Same

Final Blending Time

10 min.

Same

Same

Same

Same

Same

Same

Same

Same

Same

**Packing**

Type Containers  
Lb./Container

Fiber Drums  
160 lbs

Same

Same

Same

Same

Same

Same

Same

Same

Same

**Batch Data**  
**H30A1 Propellant f/155mm, M203**

|                  |       | <b>79C-069805</b>   |        |               |       | <b>77N-069806</b>   |        |                      |       |
|------------------|-------|---------------------|--------|---------------|-------|---------------------|--------|----------------------|-------|
| Batch Numbers    | TV, Z | Closed Bomb at 90°F |        | Batch Numbers | TV, Z | Closed Bomb at 90°F |        | Closed Bomb at -40°F |       |
|                  |       | RQ, Z               | RF, Z  |               |       | RQ, Z               | RF, Z  | RQ, Z                | RF, Z |
| 1-10             | 0.04  | 97.62               | 99.82  | 61-70         | 0.23  | 96.89               | 99.98  | 93.83                | 98.47 |
| 11-20            | 0.04  | 97.46               | 99.69  | 71-80         | 0.23  | 99.55               | 100.15 | --                   | --    |
| 21-30            | 0.21  | 98.20               | 100.15 | 81-90         | 0.14  | 96.70               | 99.65  | 91.83                | 97.69 |
| 31-40            | 0.31  | 98.29               | 99.79  | 91-100        | 0.16  | 95.97               | 99.80  | --                   | --    |
| 41-50            | 0.12  | 97.12               | 100.16 | 101-110       | 0.13  | 96.08               | 99.73  | 92.57                | 97.59 |
| 51-60            | 0.20  | 95.90               | 100.32 | 111-119       | 0.18  | 97.41               | 99.85  | --                   | --    |
| Weighted Average | 0.15  | 97.43               | 99.99  |               | 0.18  | 97.10               | 99.86  | 92.74                | 97.92 |
| Final Lot        | 0.33  | 96.51               | 99.74  |               | 0.34  | 96.35               | 99.44  | 92.44                | 97.93 |

|                  |       | <b>79D-069959</b>   |       |               |       |
|------------------|-------|---------------------|-------|---------------|-------|
| Batch Numbers    | TV, Z | Closed Bomb at 90°F |       | Batch Numbers | TV, Z |
|                  |       | RQ, Z               | RF, Z |               |       |
| 120              | 0.18  | 97.41               | 99.85 | 1-10          | 0.12  |
| 121-130          | 0.13  | 96.64               | 99.69 | 11-20         | 0.13  |
| 131-140          | 0.11  | 95.60               | 99.23 | 21-29         | 0.11  |
| 141-150          | 0.17  | 96.60               | 99.51 |               |       |
| 151-160          | 0.20  | 95.31               | 99.78 |               |       |
| 161-170          | 0.14  | 95.43               | 99.93 |               |       |
| 171-176          | --    | --                  | --    |               |       |
| Weighted Average | 0.15  | 95.94               | 99.63 |               |       |
| Final Lot        | 0.26  | 96.16               | 99.85 |               |       |

**Batch Data**  
**M20A1 Propellant f/155mm, M203**

| 79E-069960          |          |                        |        |                         |       |                  |          |                        |        |                         |       |
|---------------------|----------|------------------------|--------|-------------------------|-------|------------------|----------|------------------------|--------|-------------------------|-------|
| Batch<br>Numbers    | TV,<br>% | Closed Bomb<br>at 90°F |        | Closed Bomb<br>at -40°F |       | Batch<br>Numbers | TV,<br>% | Closed Bomb<br>at 90°F |        | Closed Bomb<br>at -40°F |       |
|                     |          | RQ, %                  | RF, %  | RQ, %                   | RF, % |                  |          | RQ, %                  | RF, %  | RQ, %                   | RF, % |
| 30                  | 0.11     | 96.80                  | 100.47 | 92.82                   | 98.49 | 100              | 0.15     | 96.86                  | 100.51 | --                      | --    |
| 31-40               | 0.15     | 96.61                  | 100.05 | --                      | --    | 101-110          | 0.12     | 97.04                  | 100.35 | 91.51                   | 98.23 |
| 41-50               | 0.16     | 95.55                  | 99.96  | 89.61                   | 97.64 | 111-120          | 0.27     | 97.05                  | 100.63 | --                      | --    |
| 51-60               | 0.10     | 95.71                  | 100.45 | --                      | --    | 121-130          | 0.19     | 97.03                  | 100.38 | 93.20                   | 99.05 |
| 61-70               | 0.12     | 95.63                  | 100.40 | 91.16                   | 98.55 | 131-140          | 0.15     | 97.59                  | 100.55 | --                      | --    |
| 71-80               | 0.13     | 97.82                  | 100.79 | --                      | --    | 141-150          | 0.22     | 95.42                  | 100.07 | 91.68                   | 98.19 |
| 81-90               | 0.19     | 97.08                  | 100.46 | 91.88                   | 98.42 | 151-160          | 0.11     | 96.10                  | 99.61  | --                      | --    |
| 91-99               | 0.15     | 96.86                  | 100.51 | --                      | --    | 161-168          | 0.13     | 97.38                  | 100.42 | 92.89                   | 98.48 |
| Weighted<br>Average | 0.16     | 96.48                  | 100.37 | 90.95                   | 98.21 |                  | 0.17     | 96.79                  | 100.29 | 92.29                   | 98.49 |
| Final Lot           | 0.07     | 96.45                  | 100.39 | 91.62                   | 98.91 |                  | 0.18     | 96.12                  | 100.16 | 91.30                   | 98.57 |
| 79E-069962          |          |                        |        |                         |       |                  |          |                        |        |                         |       |
| 169-170             | 0.13     | 97.38                  | 100.42 | 92.89                   | 98.48 | 231-240          | 0.12     | 95.05                  | 100.51 | 89.73                   | 98.59 |
| 171-180             | 0.10     | 98.09                  | 100.69 | --                      | --    | 241-250          | 0.13     | 93.96                  | 99.88  | --                      | --    |
| 181-190             | 0.17     | 96.64                  | 100.00 | 91.98                   | 98.19 | 251-260          | 0.13     | 94.38                  | 100.11 | 90.32                   | 97.61 |
| 191-200             | 0.14     | 95.56                  | 100.58 | --                      | --    |                  |          |                        |        |                         |       |
| 201-210             | 0.14     | 96.01                  | 100.16 | 91.65                   | 98.78 |                  |          |                        |        |                         |       |
| 211-220             | 0.10     | 96.09                  | 100.08 | --                      | --    |                  |          |                        |        |                         |       |
| 221-230             | 0.15     | 96.17                  | 100.08 | 92.17                   | 98.46 |                  |          |                        |        |                         |       |
| Weighted<br>Average | 0.13     | 96.47                  | 100.27 | 91.99                   | 98.48 |                  | 0.13     | 94.46                  | 100.17 | 90.03                   | 98.10 |
| Final Lot           | 0.13     | 96.17                  | 100.17 | 92.24                   | 98.43 |                  | 0.12     | 94.13                  | 99.63  | 89.72                   | 97.71 |

Attachment 13  
M20A1 Propellant f/155mm, M203

**Batch Data**  
**M30A1 Propellant F/155mm, M203**

| Batch<br>Numbers    | TV,<br>Z | 79M-069994             |        |                         |       |
|---------------------|----------|------------------------|--------|-------------------------|-------|
|                     |          | Closed Bomb<br>at 90°F |        | Closed Bomb<br>at -40°F |       |
|                     |          | RQ, Z                  | RF, Z  | RQ, Z                   | RF, Z |
| 268-270             | 0.10     | 94.18                  | 100.01 | --                      | --    |
| 271-280             | 0.11     | 93.33                  | 99.86  | 89.17                   | 98.16 |
| 281-290             | 0.13     | 93.94                  | 99.98  | --                      | --    |
| 291-300             | 0.13     | 94.67                  | 100.16 | 89.69                   | 98.09 |
| 301-310             | 0.09     | 94.07                  | 100.25 | --                      | --    |
| 311-316             | --       | --                     | --     | --                      | --    |
| Weighted<br>Average | 0.11     | 94.09                  | 100.02 | 89.43                   | 98.13 |
| Final Lot           | 0.15     | 94.33                  | 100.30 | 89.40                   | 98.25 |

PRODUCTION LOTS  
M30AL F/15SRM, M203

| COMPOSITION       | REQUIREMENTS | RAD77G-<br>069805 | RAD77H-<br>069806 | RAD77H-<br>069807 | RAD790-<br>069959 | RAD79E-<br>069960 | RAD79E-<br>069961 | RAD79E-<br>069962 | RAD79L-<br>069962 | RAD79M-<br>069954 |
|-------------------|--------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Nitrocellulose    | 28.00 ± 1.30 | 27.18             | 28.00             | 27.74             | 27.43             | 27.76             | 28.16             | 28.65             | 26.90             | 28.17             |
| Nitroglycerin     | 22.50 ± 1.00 | 22.80             | 22.36             | 22.53             | 22.95             | 22.56             | 22.23             | 22.49             | 23.48             | 22.45             |
| Nitroguanidine    | 47.00 ± 1.00 | 47.54             | 47.06             | 47.04             | 46.93             | 47.20             | 47.04             | 46.29             | 46.97             | 46.86             |
| Ethyl Centralite  | 1.50 ± 0.10  | 1.55              | 1.56              | 1.58              | 1.55              | 1.51              | 1.51              | 1.46              | 1.53              | 1.49              |
| Potassium Sulfate | 1.00 ± 0.30  | 0.93              | 1.02              | 1.11              | 1.14              | 0.97              | 1.06              | 1.11              | 1.12              | 1.03              |
| TOTAL             |              | 100.00            | 100.00            | 100.00            | 100.00            | 100.00            | 100.00            | 100.00            | 100.00            | 100.00            |
| Total Volatiles   | 0.05 Max     | 0.33              | 0.34              | 0.26              | 0.18              | 0.07              | 0.18              | 0.03              | 0.12              | 0.15              |
| Graphite (Claze)  |              | 0.08              | 0.10              | 0.12              | 0.05              | 0.07              | 0.06              | 0.07              | 0.07              | 0.05              |
| Stability         | 40" Min.     | 60"               | 60"               | 60"               | 60"               | 60"               | 60"               | 60"               | 60"               | 60"               |
| Bulk Density      |              | --                | --                | --                | --                | --                | --                | --                | --                | --                |

GRAIN DIMENSIONS

|                             |        |        |        |        |        |        |        |        |        |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Length (L)                  | 0.9481 | 0.9529 | 0.9531 | 0.9514 | 0.9568 | 0.9585 | 0.9695 | 0.953. | 0.9529 |
| Diameter (D)                | 0.4173 | 0.4170 | 0.4166 | 0.4143 | 0.4145 | 0.4145 | 0.4167 | 0.4170 | 0.4184 |
| Perforation Dia. (d)        | 0.0338 | 0.0338 | 0.0336 | 0.0340 | 0.0335 | 0.0330 | 0.0335 | 0.0342 | 0.0336 |
| Inner Web (W <sub>i</sub> ) | 0.0793 | 0.0776 | 0.0783 | 0.0771 | 0.0777 | 0.0792 | 0.0779 | 0.0776 | 0.0782 |
| Outer Web (W <sub>o</sub> ) | 0.0806 | 0.0817 | 0.0812 | 0.0814 | 0.0796 | 0.0813 | 0.0821 | 0.0811 | 0.0819 |
| Avg. Web (W <sub>a</sub> )  | 0.0800 | 0.0796 | 0.0797 | 0.0793 | 0.0786 | 0.0803 | 0.0800 | 0.0793 | 0.0801 |
| Web Diff.                   | 2      | 5      | 4      | 5      | 2      | 3      | 5      | 4      | 5      |
| L/D                         | 2.27   | 2.29   | 2.29   | 2.30   | 2.31   | 2.31   | 2.31   | 2.29   | 2.28   |
| D/d                         | 12.4   | 12.3   | 12.4   | 12.2   | 12.1   | 12.6   | 12.5   | 12.2   | 12.4   |
| L. Unif.                    | 1.08   | 0.82   | 0.64   | 1.29   | 1.16   | 0.93   | 1.07   | 0.98   | 0.72   |
| D. Unif.                    | 1.28   | 1.25   | 1.57   | 0.95   | 1.12   | 1.19   | 1.01   | 1.58   | 1.10   |

CLOSED BOXES

|           |       |       |       |        |        |        |        |       |        |
|-----------|-------|-------|-------|--------|--------|--------|--------|-------|--------|
| RQ, 90°F  | 96.51 | 96.35 | 96.16 | 96.57  | 96.45  | 96.12  | 96.17  | 94.13 | 94.33  |
| RF, 90°F  | 99.74 | 99.44 | 99.85 | 100.06 | 100.39 | 100.16 | 100.17 | 99.63 | 100.30 |
| RQ, -40°F | 92.58 | 92.44 | 93.20 | 90.92  | 91.62  | 91.30  | 92.24  | 89.72 | 89.40  |
| RF, -40°F | 98.16 | 97.93 | 98.04 | 97.93  | 98.91  | 98.57  | 98.43  | 97.71 | 98.25  |

DIE DIMENSIONS

|              |       |       |       |       |       |       |       |       |       |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Acate        | 0.470 | 0.470 | 0.470 | 0.470 | 0.470 | 0.470 | 0.470 | 0.470 | 0.470 |
| Pin (Center) | 0.037 | 0.037 | 0.037 | 0.037 | 0.037 | 0.037 | 0.037 | 0.037 | 0.037 |
| Pin (Outer)  | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 |
| Pin Circle   | 0.262 | 0.262 | 0.262 | 0.262 | 0.262 | 0.262 | 0.262 | 0.262 | 0.262 |

**SPECIAL TEST**  
**Annual Preposition 1/15/50, 1000**

| Chemical             | Formula           | RAB 170-010000    |         | RAB 100-100017                               |                   | RAB 100-000015 |                                              |
|----------------------|-------------------|-------------------|---------|----------------------------------------------|-------------------|----------------|----------------------------------------------|
|                      |                   | Description Sheet | In-Test | Conditioned @ 105° F/40 hrs in Closed Vessel | Description Sheet | In-Test        | Conditioned @ 105° F/40 hrs in Closed Vessel |
| Stearic Acid         | $C_{18}H_{36}O_2$ | 20.00 ± 1.20      | 22.34   | 22.34                                        | 20.17             | 20.01          | 20.01                                        |
| Stearic Acid         | $C_{18}H_{36}O_2$ | 22.50 ± 1.00      | 22.36   | 22.36                                        | 22.45             | 22.46          | 22.46                                        |
| Stearic Acid         | $C_{18}H_{36}O_2$ | 47.00 ± 1.00      | 47.00   | 47.00                                        | 46.06             | 47.00          | 47.00                                        |
| Ethyl Mercaptan      | $C_2H_5SH$        | 1.50 ± 0.10       | 1.56    | 1.56                                         | 1.50              | 1.53           | 1.53                                         |
| Potassium Sulfate    | $K_2SO_4$         | 1.00 ± 0.20       | 1.01    | 0.99                                         | 0.99              | 0.96           | 0.96                                         |
| Caustic Soda         | $NaOH$            | 0.10 Max          | 0.10    | 0.11                                         | 0.11              | 0.09           | 0.09                                         |
| Total Volatiles      |                   | 0.30 Max          | 0.34    | 0.33                                         | 0.10              | 0.14           | 0.14                                         |
| Heat Test (Cin)      |                   | 60° ±             | 60° ±   | 60° ±                                        | 60° ±             | 60° ±          | 60° ±                                        |
| Heat Test (Cin)      |                   | 20.00             | 21.00   | 21.00                                        | 20.46             | 20.43          | 20.43                                        |
| Heat Test (Cin)      |                   | 01.001            | 01.001  | 01.001                                       | 01.001            | 01.001         | 01.001                                       |
| Heat Test (Cin)      |                   | 1 hr              | 1 hr    | 1 hr                                         | 1 hr              | 1 hr           | 1 hr                                         |
| Salt Density (lb/lc) |                   |                   |         |                                              |                   |                |                                              |
| 0.5 (Salt/Gal)       |                   |                   |         |                                              |                   |                |                                              |
| No. 1000             |                   |                   |         |                                              |                   |                |                                              |
| <b>REMARKS</b>       |                   |                   |         |                                              |                   |                |                                              |
| Length (ft)          |                   | 0.000             | 0.000   | 0.000                                        | 0.000             | 0.000          | 0.000                                        |
| Perf. Diam (in)      |                   | 0.000             | 0.000   | 0.000                                        | 0.000             | 0.000          | 0.000                                        |
| Inner Tub (in)       |                   | 0.000             | 0.000   | 0.000                                        | 0.000             | 0.000          | 0.000                                        |
| Outer Tub (in)       |                   | 0.000             | 0.000   | 0.000                                        | 0.000             | 0.000          | 0.000                                        |
| Dr. Tub (in)         |                   | 0.000             | 0.000   | 0.000                                        | 0.000             | 0.000          | 0.000                                        |
| Sub Diff. - 1        |                   | 15 Max            | 15      | 15                                           | 15                | 15             | 15                                           |
| 1/2                  |                   | 2.10-2.30         | 2.25    | 2.25                                         | 2.25              | 2.25           | 2.25                                         |
| 3/4                  |                   | 3.0 to 15         | 12.5    | 12.5                                         | 12.5              | 12.5           | 12.5                                         |
| Mean Var. L          |                   | 6.25 Max          | 6.25    | 6.25                                         | 6.25              | 6.25           | 6.25                                         |
| Mean Var. B          |                   | 3.25 Max          | 3.25    | 3.25                                         | 3.25              | 3.25           | 3.25                                         |
| <b>10012 REE</b>     |                   |                   |         |                                              |                   |                |                                              |
| 105°                 |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 90°                  |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 75°                  |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 60°                  |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 45°                  |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 30°                  |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 15°                  |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |
| 0°                   |                   | 99.10             | 99.10   | 99.10                                        | 99.10             | 99.10          | 99.10                                        |

Attachment 15  
Page 1 of 1



Appendix 4

Pressure Data of  
M30A1 Propellant F/155mm, M203

| Lot Number     | Test Date | P-1450F, psi   | P-700F, psi    | P-650F, psi    | Calib/Test Rda |
|----------------|-----------|----------------|----------------|----------------|----------------|
| RAD-77G-069805 | 10/77     | 51500<br>49800 | 45100<br>43900 | -<br>-         | calib<br>test  |
| RAD-77H-069806 | 3/78      | 50400<br>51800 | 45500<br>46700 | 44700<br>46500 | test<br>calib  |
| RAD-77H-069807 | 3/78      | 51200<br>51800 | 46100<br>46700 | 45500<br>46500 | test<br>calib  |
| RAD-79D-069959 | 4/79      | 51400<br>49200 | 42200<br>44200 | 40000<br>44500 | test<br>calib  |
| RAD-79E-069960 | 9/79      | 53200<br>49800 | 44500<br>46200 | 43100<br>45000 | test<br>calib  |
| RAD-79E-069961 | 9/79      | 52500<br>49800 | 45200<br>46200 | 44200<br>45000 | test<br>calib  |
| RAD-79E-069962 | 9/79      | 52600<br>49800 | 44800<br>46200 | 45700<br>45000 | test<br>calib  |
| RAD-79L-069992 | 1/80      | 51800<br>-     | 43500<br>44900 | 40300<br>-     | test<br>calib  |
| RAD-79H-069994 | 5/80      | 52500<br>50000 | 43400<br>45900 | 42000<br>44200 | test<br>calib  |