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PITTSBURGH 36, PENNSYLVANIA

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TEST SERIES C 1
AN EXPERIMENTAL DETERMINATION OF THE
PRESSURE LOSS COEFFICIENTS FOR THE
INNER REFLECTOR-OUTER REFLECTOR ANNULUS

USING AIR

(Title Unclassified)

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INTRODUCTION

The inner impedance ring primarily meters the flow in the annulus between the inner and outer reflector and permits the flow in the annulus to be balanced with the rest of the entire reflector system. The impedance ring minimizes the problems of temperature distribution and mixing of non-isothermal hydrogen from the various parallel flows in the reflector system.

The purpose of this memo is to summarize the results of air flow tests on a model of a 10° sector of the inner impedance ring. The areas which were investigated were:

1. The variation of the loss coefficient (C_{1-6}) from the inlet plenum to the annulus as a function of Reynolds number. (Figures 11, 12, 13)
2. The variation of the inlet loss coefficient (C_{1-6}) as a function of annulus clearance. (Figures 14, 15)
3. The variation in annulus friction factor (f_{6-8}) as a function of Reynolds number. (Figures 16, 17)
4. The variation in metering ring loss coefficient (C_{8-4}) as a function of Reynolds number. (Figures 18, 19)
5. The variation in metering ring loss coefficient (C_{8-4}) (based on annulus area) as a function of Reynolds number. (Figures 20, 21)
6. The variation in metering ring loss coefficient (C_{8-4}) (based on annulus area) as a function of annulus clearance. (Figure 22)

Tests were conducted using air at ambient temperature and 120 psig inlet pressure.

TEST APPARATUS AND INSTRUMENTATION

The flow loop is shown in Figure 1. Air leaves the compressor, passes through the after cooler, the water separator, then the air flows into the receiver. From the receiver, air flows through the pressure reducing valve, the test fixture, the flow control valve and the flow measuring nozzle to atmosphere.

The test fixture shown on Figure 2 was constructed according to Drawing NT576F056. This fixture was connected to the variable flow air supply capable of 600 scfm at 125 psig. Air was introduced into two inlet ports and then entered the inlet plenum through a series of ten 3/16-inch diameter holes to provide a uniform pressure distribution in the inlet plenum. From the inlet plenum the flow passes through the simulated inner reflector-outer reflector annulus, over the metering ring, and then into the outlet plenum. This test fixture simulates a 10° sector of the entire inner impedance ring. Metering ring configurations A, B, and C were tested with an axial segment of the spacer (Figure 2). During the testing of metering ring configurations D, E, and F, the spacer was removed from the fixture and a blank spacer plate was inserted.

The following sketches show the metering ring configurations used in the testing of the impedance ring fixture. Dimension "x" was varied in order to obtain various flow areas. The table shows the values for Dimension "x".

<u>Metering Ring Type</u>	<u>"x" Dimension (in)</u>
A and D	1.7435
B and E	2.000
C and F	1.500

Ten (10) pressure taps were placed at different locations as indicated on Figures 2, 3, 4, and 5, and were connected to pressure gauges and manometers. Thermocouples were located in the inlet and exhaust plenums.

The inlet pressure was taken to be the average of taps P_1 , P_{1A} , P_{1B} , located at the inlet plenum. The pressure in the annulus just downstream of the inlet plenum was the average of taps P_{6A} and P_{6B} . The pressure differential between these areas was measured from taps P_1 and P_{6A} . The pressure in the

annulus upstream of the metering ring was the average of taps P_{8A} and P_{8B} . The differential pressure in the 3-inch annular section was read as $P_{6A} - P_{8A}$. The pressure in the exhaust plenum was the average of taps P_4 , P_{4A} and P_{4B} , and the differential pressure across the metering ring to the exhaust plenum was read as $P_{8A} - P_4$. Flow through the model was measured by a calibrated nozzle made to ASME specifications. In addition to using two (2) design metering ring configurations (A and D), four (4) off-design metering ring configurations (B, C, E, and F) yielding flow areas larger and smaller than the two design conditions were tested. Also, annular clearances greater and less than the design clearance of 80 mils were tested (65, 95, and 130 mils). These various tests were run with the following parameters:

Inlet pressure	120 psig
Inlet Temperature	530°R
Mass Flow	.045 to .545 lbs/sec
Outlet Pressure	50 to 120 psig

Method of Data Reduction

Using the pressure and temperature measurements mentioned above, values for mass flow rate loss coefficient, friction factor, and Reynolds number were calculated in the following manner.

Mass Flow

$$W = CA \left[\frac{2kg \rho P_{5A} (R^{2/k} - R^{k+1/k})}{(k-1) (1 - \beta^2 R^{2/k})} \right]^{1/2}$$

where

W = mass flow (lb/sec)

C = nozzle discharge coefficient (0.98)

A = nozzle area (1 in. diam.)

β = area ratio (nozzle area to pipe area) (0.49421)

g = gravitational constant (32.17 ft/sec²)

k = specific heat ratio (1.4 for air)

R = pressure ratio = P_A/P_{5A}

P_A = atmospheric pressure (psi)

P_{5A} = absolute pressure at inlet of the flow measuring nozzle (psia)

T = air temperature °R

ρ = density at P_{5A} and T (lb/cu ft)

therefore

$$W = \frac{0.96295 \sqrt{(R^{1.4286} - R^{1.7143}) P_{5A} \rho}}{\sqrt{1 - 0.2442 R^{1.4286}}}$$

Loss Coefficient

$$C = 0.44686 \frac{\Delta P_{avg} \rho_s A^2}{W^2}$$

where $\rho_s = 2.6997 \frac{P_s}{T}$

where P_s = absolute pressure upstream of the section being considered (psia)

P_{avg} = pressure drop across the component (psi)

C = loss coefficient (dimensionless)

A = flow area (square inches)

ρ_s = density at the P_s and T (lb/cu ft)

Friction Factor

$$f = 0.44686 \frac{D_E}{L} \frac{\Delta P_{avg} \rho_s A^2}{W^2}$$

where f = friction factor (dimensionless)

D_E = equivalent diameter (inches)

L = length of annulus over which the frictional pressure drop was measured (3.000 inches)

$$\text{where } D_E = \frac{4 A}{W_p}$$

where W_p = wetted perimeter (inches)

$$\text{but } D_E = 4 \frac{wt}{2(t+w)}$$

where w = channel width (3.487 inches)

t = annulus clearance (inches)

therefore

$$D_E = \frac{2 w t}{(t+w)}$$

Reynolds Number

Reynolds number based on equivalent diameter is defined as follows:

$$Re = \frac{\rho_s V D_E}{\mu g} \left[\frac{1 \text{ ft}}{12 \text{ in}} \right]$$

where V = fluid velocity (ft/sec)

μ = viscosity (lb sec/ft²)

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$$\text{but } \rho_s V = \frac{W}{t w} \frac{144 \text{ in}^2}{\text{ft}^2}$$

therefore

$$\text{Re} = \frac{2 W t w}{\mu g(t+w)t w} \frac{12 \text{ in}}{\text{ft}}$$

therefore

$$\text{Re} = 0.746 \frac{W}{\mu (t+w)}$$

The computer program used for data reduction is presented in Appendix A.

DISCUSSION

Tests were conducted to determine the location of pressure taps that would not be located in areas where velocity fields vary with metering ring configurations. Figure 6 presents curves of relative pressure drop vs distance upstream of the metering ring. As shown on this figure, the pressure drop vs length is linear until the vicinity of pressure taps 8A and 8B is reached.

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These curves show that (1) metering rings A, B, and C will cause a higher pressure to be read at taps 2A and 2B and (2) metering rings D, E, and F will cause a lower pressure to be read at taps 2A and 2B. Figures 7 thru 10 inclusive are photographs of the test fixture and cover plate taken after these tests were run. Figures 7 and 8 show the fixture and cover plate after a test using Type D metering ring. These photos show that pressure taps 2A and 2B are in an area of flow contraction or increased velocity. Since these taps are in an area of flow contraction, they will read a lower pressure. Figures 9 and 10 show the fixture and cover plate after a test using Type A metering ring. These photos show that pressure taps 2A and 2B are in an area of flow expansion or decreasing velocity. Therefore, these taps will yield a higher pressure than the static upstream of the metering ring.

As a result of these tests it was decided that the correct location for the pressure taps would be stations 8A and 8B. Data and results from the tests are presented in Appendix B.

Figures 11 and 12 present curves of the inlet loss coefficient C_{1-6} vs Reynolds number for metering rings A, B, C (Figure 11) and D, E, F (Figure 12) for the 80 mil annulus clearance. As shown on these graphs, the loss coefficient is relatively constant with Reynolds number, showing only a slight rise at high Reynolds numbers which is due to compressibility effects. By comparing these figures it is seen that metering rings A, B, and C yield a higher loss coefficient than metering rings D, E, and F. Figure 13 illustrates this difference for metering rings A and D with the 80 mil annulus clearance. These curves show that the loss coefficient C_{1-6} is about 25%

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higher for metering ring A. During the testing of metering rings D, E, and F, a blank spacer plate is inserted into the fixture (see Figure 7). This blank spacer results in a flow passage that is a rectangular duct. However, during the testing of metering rings A, B, and C, a spacer plate with a raised rib at the center of the flow passage (see Figure 4) was inserted. This raised spacer plate will cause a greater pressure drop due to the fact that this spacer yields a lower flow area and a greater wetted perimeter. Since the type A spacer causes a higher pressure drop than the type D spacer for the same Reynolds number, the loss coefficient will be higher for tests on Type A, B, and C metering rings over the same Reynolds number range.

Similar results were obtained for the 65, 95, and 130 mil annuli. Figures 14 and 15 present loss coefficient C_{1-6} vs Reynolds number for the four annulus clearances for metering rings A and D respectively. As shown on these figures, the loss coefficient is relatively constant with the exception of higher Reynolds numbers when compressibility effects cause an increase in loss coefficient. As would be expected the loss coefficient decreases as the annulus increases.¹ By comparing these two figures it can be seen that the effect of the spacer plate as noted in Figure 13 decreases as the annulus clearance increases. These results are typical of those obtained for the remaining metering rings.

Figures 16 and 17 present curves of friction factor f_{6-8} vs Reynolds number for the 80 mil annulus clearance for metering rings A, B, C, and D, E, F respectively. These curves show that friction factor is constant with Reynolds

¹ Hunsacker, J. C. and Rightmire, B. G., "Engineering Applications of Fluid Mechanics", p. 153

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number,² and shows the effect of the raised spacer plate, namely that the friction factor with spacer plate A is higher than that obtained with spacer plate B.

Figures 18 and 19 present metering ring loss coefficient C_{8-4} based on metering ring area vs Reynolds number for the 80 mil annulus clearance as measured with metering rings A, B, C and D, E, F. These curves show that the loss coefficient is constant over the lower Reynolds number range and becomes a function of compressibility at higher Reynolds numbers. For metering rings A, B, and C (Figure 19) the loss coefficient increases as metering ring area decreases. However, for metering rings D, E, and F, the results are not as would be expected. By basing the loss coefficient on the annulus area, the effect of changing of metering ring on the loss coefficient can be explained. Figures 20 and 21 present the loss coefficient C_{8-4} based on annulus area. As shown on these curves the loss coefficients behave as would be expected, namely that as flow area decreases the loss coefficient increases.³ By comparing Figures 20 and 21 it is seen that for the same metering ring flow area, (metering rings A and D) a greater loss coefficient is realized from the D configuration. This difference in loss coefficient is due to the fact that the spacer plate essentially divides the flow into two rectangular ducts for type A, B, and C metering rings. As the flow approaches the metering ring, it is forced to accelerate into two smaller passages at the extremes of the metering ring and a much smaller flow passage over the center of the metering ring. During the testing of metering rings D, E, and F, the flow approaches the metering ring in one rectangular duct and suddenly accelerates into a smaller rectangular duct.

² Ibid

³ Ibid

Figure 22 presents loss coefficient C_{g-4} (based on annulus area) vs annulus clearance for metering rings A, B, and C. As shown on these curves loss coefficient decreases as annulus clearance increases. This decrease in loss coefficient is due to the fact that the metering ring flow area increases with an increase in annulus clearance, and therefore for the same flow rate, less pressure drop is realized across the metering ring. These curves can be used to determine a loss coefficient range for a given annulus clearance range. Similar curves are obtained for metering rings D, E, and F.

CONCLUSIONS

1. Over the operating Reynolds number range the inlet loss coefficient C_{1-6} is constant.
2. For high flow rates, the loss coefficient C_{1-6} increases with increasing Reynolds number due to compressibility.
3. Inserting the raised spacer plate into the annulus causes an increase in the loss coefficient C_{1-6} and removing this spacer plate decreases the loss coefficient.
4. Increasing the annulus clearance decreases the loss coefficient C_{1-6} and decreasing the annulus clearance increases the loss coefficient C_{1-6} .
5. Increasing the annulus clearance decreases the effect of the raised spacer plate on the loss coefficient C_{1-6} .
6. Over the operating Reynolds number range the annulus friction factor f_{6-8} is essentially constant.

7. Varying the annulus clearance has little or no effect on the friction factor f_{6-8} .
8. Inserting the raised spacer plate into the annulus causes an increase in friction factor f_{6-8} over the operating Reynolds number range.
9. Increasing the annulus clearance decreases the effect of the raised spacer plate on the friction factor.
10. Over the operating Reynolds number range the metering ring loss coefficient C_{8-4} is constant.
11. For high flow rates, the loss coefficient increases with increasing Reynolds numbers due to compressibility.
12. Basing the loss coefficient C_{8-4} on annulus area results in a loss coefficient which increases with a decrease in metering ring flow area as would be expected.
13. Pressure taps 2A, 2B, 3A, and 3B used in WANL-TME-523 were located in areas where flow acceleration and deceleration occur; therefore, these pressure measurements did not describe the pressure field.

RECOMMENDATIONS

- Further investigation should be conducted into the following:
1. Testing the fixture using hydrogen to correlate the air data.
 2. The effect of changing the spacer plate geometry on the loss coefficients and friction factors. This would involve testing using a series of spacer plates having different geometries.

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3. The effect of location of the spacer plate on the metering ring loss coefficient.
4. The effect of changing the location of the metering ring on the metering ring loss coefficients.

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Figure 1 Inner Impedance Ring Test Flow Loop

Figure 2 Fixture Inner Impedance Ring Assembly

Figure 3 Inner Impedance Ring Fixture

Figure 4 Inner Impedance Ring Fixture

Figure 5

Inner Impedance Ring Fixture Cover Plates and Metering Rings

Figure 6

Pressure Drop Relative to Station 6 Taps vs Distance Upstream
of Metering Ring

Figure 7
Inner Impedance Ring Fixture After Testing
of Metering Ring D

Figure 8

Inner Impedance Ring Fixture Cover Plate
After Testing of Metering Ring D

Figure 9

Inner Impedance Ring Fixture After Testing
of Metering Ring A

Figure 10

Inner Impedance Ring Fixture Cover Plate
After Testing of Metering Ring A

Figure 11

Loss Coefficient C 1-6 vs Reynolds Number
 For 0.080 Annulus Clearance for Metering Rings A, B, C

Figure 12

Loss Coefficient C 1-6 vs Reynolds Number
 For 0.080 Annulus Clearance for Metering Rings D, E, F

Figure 13

Loss Coefficient C l-6 vs Reynolds Number
 For 0.808 Annulus Clearance for Metering Rings A & D

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Figure 14

Loss Coefficient C_{l-6} vs Reynolds Number
for the 65, 80, 95, & 130 mil
Annulus Clearances & Metering Ring A

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Figure 15

Loss Coefficient C 1-6 vs Reynolds Number
 for the 65, 80, 95, & 130 mil
 Annulus Clearances & Metering Ring D

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Figure 16

Friction Factor f_{6-8} vs Reynolds Number
 for 0.080 Annulus Clearance
 for Metering Ring A, B, C

Figure 17

Friction Factor f_{6-8} vs Reynolds Number
 for 0.080 Annulus Clearance
 for Metering Ring D, E, F

Figure 18

Loss Coefficient C 8-4 vs Reynolds Number
 for 0.080 Annulus Clearance
 for Metering Ring A, B, C

Figure 19

Loss Coefficient C 8-4 vs Reynolds Number
 for 0.080 Annulus Clearance
 for Metering Ring D, E, F

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Figure 20

Loss Coefficient C 8-4 (Based on Annulus Area)
vs Reynolds Number for the 0.080 Annulus Clearance
for Metering Ring A, B, C

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Figure 21

Loss Coefficient C 8-4 (Based on Annulus Area)
vs Reynolds Number for the 0.080 Annulus Clearance
for Metering Ring D, E, F

Figure 22

Loss Coefficient C_{8-4} (Based on Annulus Area)
vs Annulus Clearance

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APPENDIX "A"

COMPUTER PROGRAM INPUT TAPE

A	Width of annulus (3.487 inches)
B	Length of raised portion of metering ring
CMR	Metering Ring Clearance
D	Annulus clearance
DE	Equivalent diameter of annulus
DIS	Distance between P6 and P8 (3.0 inches)
DP11A	Differential pressure between P1 and P1A
DP11B	Differential pressure between P1 and P1B
DP16A	Differential pressure between P1 and P6A
DP6A6B	Differential pressure between P6A and P6B
DP6A8A	Differential pressure between P6A and P8A
DP8A8B	Differential pressure between P8A and P8B
DP8A3A	Differential pressure across metering ring measured from P8A to P3A
DP8A4	Differential pressure across metering ring measured from P8A to P4
DP3A4	Differential pressure measured from P3A to P4
DP44A	Differential pressure between P4 and P4A
DP44B	Differential pressure between P4 and P4B
E	Height of step in metering ring (0.038 inches)
PA	Atmospheric pressure
P1	Pressure at inlet plenum
P3A	Pressure just downstream of metering ring

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APPENDIX "A"

COMPUTER PROGRAM INPUT TAPE (CONTINUED)

P4	Pressure in exhaust plenum
P5	Pressure at the inlet of the flow measuring nozzle
P5A	Absolute pressure at the inlet of flow measuring nozzle
P6A	Pressure in annulus downstream of the inlet plenum
P8A	Pressure just upstream of the metering ring
VM1	Millivolt reading inlet plenum thermocouple
VM2	Millivolt reading exhaust plenum thermocouple

OUTPUT TAPE

DP16AV	Average differential pressure measured from P1 to P6
DP68AV	Average differential pressure measured from P6 to P8
DP83AV	Average differential pressure measured from P8 to P3
DP84AV	Average differential pressure measured from P8 to P4
DP34AV	Average differential pressure measured from P3 to P4
FLOW	Flow rate
F68	Annulus friction factor
P1AB	Absolute pressure at inlet plenum
P3AB	Absolute pressure just downstream of metering ring
P6AB	Absolute pressure downstream of inlet plenum
P8AB	Absolute pressure upstream of metering ring
R	Pressure ratio - atmospheric to absolute pressure at flow measuring nozzle inlet

APPENDIX "A"

COMPUTER PROGRAM INPUT TAPE (CONTINUED)

RE1668	Reynolds number in the annulus, based on the equivalent diameter of the annulus
RE8384	Reynolds number at the metering ring, based on the equivalent diameter of the metering ring
RO16	Air density at the inlet plenum, based on P1AB
RO34	Air density downstream of the metering ring, based on P3AB
RO5	Air density at the inlet of the flow measuring nozzle, based on P5A
RO68	Air density in the annulus, based on P6AB
RO834	Air density upstream of metering ring, based on P8AB
TR	Average air temperature in the test fixture
TRI	Air temperature at the inlet plenum
TR2	Air temperature at the exhaust plenum
VL5	Average viscosity of the air flowing through the test fixture

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APPENDIX "A" SECTION 2

AIR TEST DATA

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    DIMENSION P1(50),P3A(50),P4(50),P6A(50),P8A(50),P5(50),DP11A(50),
    1DP11B(50),DP16A(50),DP6A6B(50),DP6A8A(50),DP8A8B(50),DP8A3A(50),
    2DP3A3B(50),DP8A4(50),DP3A4(50),DP44A(50),DP44B(50),FLOW(50),DP16AV
    3(50),DP68AV(50),DP83AV(50),DP84AV(50),DP34AV(50),C16(50),RE16(50),
    4RE68(50),RE834(50),P5A(50),RE34(50),F68(50),C83(50),C84(50),C34(50
    5),VM1(50),VM2(50),P1AVG(50),RD(4),TR1(50),TR2(50),TR(50),VIS(50)
30 RIPT 5,2,J,PA,TNO,RNO,RD,CMR,ARMR,A,B,D,E,MRT,SPT,DEF,OIS
2  FORMAT (I6,E12.8,2(I8),4A6,2E11.8,/4E12.8,2A3,2E11.8)
    PA = PA * 0.4912
    DO 200 I=1,J
    RIPT 5,3,P1(I),P3A(I),P4(I),P6A(I),P8A(I),DP11A(I),DP11B(I),DP16A(
    1I),DP6A6B(I),DP6A8A(I),DP8A8B(I),DP8A3A(I),DP3A3B(I),DP8A4(I),DP3A
    24(I),DP44A(I),DP44B(I),P5(I),VM1(I),VM2(I)
3  FORMAT (6E12.8,/6E12.8,/6E12.8,/2E12.8)
    DP11A(I)= DP11A(I) * 0.03613
    DP11B(I)= DP11B(I) * 0.03613
    DP16A(I)= DP16A(I) * 0.4912
    DP6A6B(I)=DP6A6B(I)* 0.03613
    DP6A8A(I)=DP6A8A(I)* 0.4912
    DP8A8B(I)=DP8A8B(I)* 0.03613
    DP8A3A(I)=DP8A3A(I)* 0.4912
    DP3A3B(I)=DP3A3B(I)* 0.03613
    DP8A4(I)= DP8A4(I) * 0.4912
    DP3A4(I)= DP3A4(I) * 0.4912
    DP44A(I)= DP44A(I) * 0.03613
    DP44B(I)= DP44B(I) * 0.03613
    TR1(I)=537.066+44.229*(LOGF(VM1(I)))+20.836*(LOGF(VM1(I)))**2.+6.0
    142*(LOGF(VM1(I)))**3.+1.1089*(LOGF(VM1(I)))**4.+0.12*(LOGF(VM1(I))
    2)**5.+0.0062*(LOGF(VM1(I)))**6.
    TR2(I)=537.066+44.229*(LOGF(VM2(I)))+20.836*(LOGF(VM2(I)))**2.+6.0
    142*(LOGF(VM2(I)))**3.+1.1089*(LOGF(VM2(I)))**4.+0.12*(LOGF(VM2(I))
    2)**5.+0.0062*(LOGF(VM2(I)))**6.
    TR(I)=(TR1(I)+TR2(I))/2.
    R05 = 2.6997 * ((P5(I)*(0.03613))+PA)/TR(I)
    P5A(I) = (P5(I) * (0.03613 )) + PA
    R = PA / P5A(I)
    FLOW(I) =0.96295*SQRTF((R**1.4286)*(1.0-(R**0.2857)))*P5A(I)*R05)
    1 /SQRTF(1.0-0.2442*(R**1.4286))
    DP16AV(I) = DP16A(I)+DP6A6B(I)-DP11A(I)/3.- DP11B(I)/3.
    DP68AV(I) = DP6A8A(I) - DP6A6B(I)/2. + DP8A8B/2.
    DP83AV(I) = DP8A3A(I) + DP3A3B(I)/2. - DP8A8B(I)/2.
    DP84AV(I) = DP8A4(I) - DP8A8B(I)/2.+(DP44A(I)+DP44B(I))/3.

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APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

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DP34AV(I) = DP3A4(I) - DP3A3B(I)/2.+(DP44A(I)+DP44B(I))/3. 40
P1AB = P1(I) -(DP11A(I)+DP11B(I))/3. +PA 41
P6AB = P1AB - DP16AV(I) 42
P8AB = P6AB - DP68AV(I) 43
P3AB = P8AB - DP83AV(I) 44
R016 = 2.6997 * (P1AB)/TR(I) 45
R068 = 2.6997 * (P6AB)/TR(I) 46
R0834 = 2.6997 * (P8AB)/TR(I) 47
R034 = 2.6997 * (P3AB)/TR(I) 48
C16(I) = 0.44686* R016 * DP16AV(I) * (A*D)**2./FLOW(I)**2. 49
DE = 2.* (A*D)/(A+D) 50
F68(I) = 0.44686* R068 * DP68AV(I) * DE/DIS *(A*D)**2./FLOW(I)**2. 51
C83(I) = 0.44686* R0834* DP83AV(I)*((CMR+E)*A-(E*B))**2./FLOW(I)**2. 52
C84(I) = 0.44686*R0834*DP84AV(I)*((CMR+E)*A-(E*B))**2./FLOW(I)**2. 53
C34(I) = 0.44686*R034*DP34AV(I)*(A*D)**2./FLOW(I)**2. 54
VIS(I) = 3.669 E-07 +5.56E-10 *(TR(I)-509.6) 55
RE16(I) = 1.4921*FLOW(I)/(VIS(I)*2.*(A+D)) 56
RE68(I) = RE16(I) 57
IF(CMR) 40,40,22 58
40 IF(DEF) 31,31,32 59
31 RE834(I) = 1.4921*FLOW(I)/(VIS(I)*(4.*E+2.*(A-B))) 60
GOTO 21 61
32 RE834(I) = 1.4921*FLOW(I)/(VIS(I)*(2.*E+2.*(A-B))) 62
GOTO 21 63
22 RE834(I) = 1.4912*FLOW(I)/(VIS(I)*(2.*A+2.*(2.*E+CMR))) 64
21 RE34(I) = RE16(I) 65
200 CONTINUE 66
PA = PA /0.4912 67
AA = A *D 67A
AMR = (B*CMR) + (CMR+E) * (A-B) 67B
LINES = 1 68
DO 300 I=1,J 69
IF(LINES-1) 4,5,4 70
5 WOT 6,1,TNO,RNO,RD,PA,MRT,SPT,CMR,D,ARMR,DE,AA,AMR 71 NON-STANDARD
1 FORMAT (1H1 /// 22B,64HMASS FLOW VS PRESSURE DROP AND LOSS COEFFI 72
1CIENT VS RE FOR REV- 5 ///47B,15HTEST CONDITIONS ///,5B,11HTEST NUMB 73
2ER 18 ,21B,11HRUN NUMBER 18 ,11B,9HDATE RUN 4A6,/5B,22HBAROMETRIC 74
3PRESSURE = F6.3,6H IN HG,6B,4HTYPE A3,13HMETERING RING,10B,4HTYPE 75
4A3,12HSPACER PLATE /5B,26HMETERING RING CLEARANCE = ,F5.3,9B,20HAN 76
5NULUS CLEARANCE = ,F5.3,5B,26HMETERING RING AREA RATIO = ,F4.3/,5B 77
6,21HEQUIVALENT DIAMETER = ,F7.4,12B,15HANNULUS AREA = ,F6. 77A
74,1B,5HSQ IN,3B,21HMETERING RING AREA = ,F6.4,1B,5HSQ IN ///) 77B
WOT 6,6 78 NON-STANDARD
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~~Atomic Energy Act of 1954~~

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

6	FORMAT (2B,2HP1,5B,3HP3A,4B,2HP4,5B,3HP6A,4B,3HP8A,3B,5HDP16A,2B,6	79	
	1HDP6A6B,2B,6HDP6A8A,2B,6HDP8A8B,2B,6HDP3A3B,2B,5HDP8A4,2B,5HDP3A4,	80	
	22B,6HDP8A3A,2B,5HDP44A,3B,2HTR,72B,3HPS1,6(4B,3HPSI),4(5B,3HPSI),3	81	
	3(4B,3HPSI),5B,1HR//)	82	
4	WOT 6,7,P1(I),P3A(I),P4(I),P6A(I),P8A(I),DP16A(I),DP6A6B(I),DP6A8A	83	NON-STANDARD
	1(I),DP8A8B(I),DP3A3B(I),DP8A4(I),DP3A4(I),DP8A3A(I),DP44A(I),TR(I)	84	NON-STANDARD
7	FORMAT (1B,5(F5.1,2B),F5.2,2B,4(F6.3,2B),F5.2,2B,F5.3,2B,F6.3,1B,F	85	
	15.3,2B,F6.2 /)	86	
	LINES = LINES +1	87	
	IF(LINES - 30) 300,8,300	88	
8	LINES = 1	89	
	GO TO 5	90	
300	CONTINUE	91	
	LINES = 1	92	
	DO 400 I=1,J	93	
	IF(LINES-1) 9,10,9	94	
10	WOT 6,20,TNO,RNO,RD,PA,MRT,SPT,CMR,D,ARMR,DE,AA,AMR	95	NON-STANDARD
20	FORMAT (1H1 //// 22B,64HMASS FLOW VS PRESSURE DROP AND LOSS COEFFI	96	
	ICIENT VS RE FOR REV- 5 //47B,15HTEST CONDITIONS //,5B,11HTEST NUMB	97	
	2ER 1B ,21B,11HRUN NUMBER 1B ,11B,9HDATE RUN 4A6,/5B,22HBAROMETRIC	98	
	3PRESSURE = F6.3,6H IN HG,6B,4HTYPE A3,13HMETERING RING,10B,4HTYPE	99	
	4A3,12HSPACER PLATE /5B,26HMETERING RING CLEARANCE = ,F5.3,9B,20HAN	100	
	SNULUS CLEARANCE = ,F5.3,5B,26HMETERING RING AREA RATIO = ,F4.3/,5B	101	
	6,21HEQUIVALENT DIAMETER = ,F7.4,12B,15HANNULUS AREA = ,F6.	101A	
	74,1B,5HSQ IN,3B,21HMETERING RING AREA = ,F6.4,1B,5HSQ IN ///	101B	
	WOT 6,11	102	NON-STANDARD
11	FORMAT (2B,6HDP16AV,2B,6HDP68AV,2B,6HDP83AV,2B,6HDP84AV,2B,6HDP34A	103	
	1V,3B,3HC16,4B,6HRE166B,5B,3HF68,5B,3HC83,4B,6HRE8384,5B,3HC84,4B,3	104	
	2HC34,3B,4HFLOW / 4B,3HPSI,4(5B,3HPSI),61B,6HLB/SEC ///	105	
9	WOT 6,12,DP16AV(I),DP68AV(I),DP83AV(I),DP84AV(I),DP34AV(I),C16(I),	106	NON-STANDARD
	1RE16(I),F68(I),C83(I),RE834(I),C84(I),C34(I),FLOW(I)	107	NON-STANDARD
12	FORMAT (2B,F6.3,4(2B,F6.3),2B,F5.3,1B,1PE10.3,2B,OPF5.4,2B,F5.3,1B	108	
	1,1PE10.3,2B,OPF5.3,3B,F5.3,2B,F6.4 /)	109	
	LINES = LINES +1	110	
	IF (LINES -30) 400,13,400	111	
13	LINES =1	112	
	GO TO 10	113	
400	CONTINUE	114	
	GO TO 30	115	
	END	116	

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~~RESTRICTED DATA~~
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~~RESTRICTED DATA~~
~~Atomic Energy Act, 1954~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2400
BAROMETRIC PRESSURE = 29.840 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 2
TYPE D METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN DECEMBER 19, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1186 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.0	119.0	120.0	120.0	0.27	0.	0.049	0.	0.007	0.87	0.049	0.835	0.016	517.82
119.5	118.0	117.5	119.8	119.5	0.56	-0.002	0.098	-0.002	-0.047	1.79	0.123	1.695	0.022	517.36
120.0	117.9	117.3	120.0	119.8	0.78	0.	0.147	0.005	-0.070	2.48	0.098	2.333	0.033	516.91
120.0	116.5	116.0	119.5	119.4	0.98	-0.002	0.206	0.011	-0.091	3.24	0.172	3.119	0.043	516.00
120.0	115.3	114.8	119.3	119.0	1.28	-0.002	0.270	0.010	-0.126	4.20	0.295	3.930	0.054	515.55
120.0	114.0	113.5	119.0	118.7	1.47	-0.003	0.319	0.013	-0.108	5.07	0.295	4.765	0.051	515.10
120.0	112.8	112.1	118.9	118.2	1.82	-0.003	0.393	0.013	-0.126	6.09	0.344	5.722	0.061	514.87
120.0	111.2	110.5	118.2	117.5	2.11	-0.002	0.442	0.020	-0.145	7.20	0.393	6.779	0.072	514.19
120.0	110.0	109.0	118.0	117.2	2.43	0.	0.516	0.022	-0.172	8.40	0.481	7.884	0.090	514.19
120.0	108.0	107.0	118.0	117.0	2.87	0.004	0.614	0.023	-0.179	10.07	0.589	9.456	0.108	513.96
120.5	105.0	104.5	118.0	117.2	3.41	0.004	0.712	0.027	-0.204	12.62	0.663	11.887	0.148	513.73
120.0	101.7	100.5	116.9	115.8	4.00	0.	0.835	0.036	-0.204	15.25	0.835	14.368	0.168	513.50
120.0	97.5	96.5	116.5	115.2	4.62	0.	1.007	0.047	-0.098	18.91	1.007	17.831	0.181	513.96
118.0	90.0	88.5	113.2	112.0	5.40	0.005	1.154	0.061	-0.074	23.82	1.277	22.595	0.220	513.73
118.0	83.5	82.0	112.5	111.0	5.99	0.013	1.302	0.058	0.069	29.32	1.488	27.527	0.289	513.50
118.0	76.0	74.5	112.5	111.0	6.58	0.011	1.424	0.076	0.338	36.15	1.646	35.037	0.379	513.28
118.0	64.0	62.5	111.8	110.5	6.99	0.009	1.498	0.067	0.840	48.05	0.884	46.551	0.600	513.28
118.0	59.0	59.0	111.5	110.0	7.00	0.013	1.523	0.061	0.929	51.06	0.196	51.055	0.643	513.50

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

CONFIDENTIAL
RESTRICTED DATA
A-37-101-1954

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RESTRICTED DATA
A-37-101-1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2400
BAROMETRIC PRESSURE = 29.840 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 2
TYPE D METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN DECEMBER 19, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1186 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.270	0.049	0.839	0.886	0.057	1.507	3.725E 04	.0143	0.843	3.712E 04	0.890	0.315	0.0662
0.563	0.099	1.672	1.808	0.160	1.556	5.288E 04	.0142	0.831	5.268E 04	0.898	0.435	0.0938
0.776	0.147	2.295	2.498	0.154	1.579	6.182E 04	.0155	0.838	6.159E 04	0.912	0.306	0.1096
0.981	0.207	3.068	3.263	0.244	1.530	7.073E 04	.0167	0.857	7.047E 04	0.912	0.369	0.1253
1.275	0.271	3.861	4.230	0.393	1.558	8.005E 04	.0171	0.842	7.975E 04	0.922	0.461	0.1417
1.471	0.321	4.704	5.099	0.380	1.507	8.751E 04	.0169	0.859	8.718E 04	0.931	0.371	0.1548
1.815	0.394	5.653	6.124	0.447	1.572	9.521E 04	.0176	0.870	9.486E 04	0.942	0.364	0.1684
2.110	0.443	6.696	7.232	0.511	1.575	1.028E 05	.0170	0.885	1.024E 05	0.956	0.355	0.1815
2.431	0.516	7.787	8.443	0.621	1.590	1.098E 05	.0173	0.900	1.094E 05	0.975	0.374	0.1939
2.877	0.612	9.354	10.128	0.749	1.601	1.191E 05	.0174	0.916	1.186E 05	0.991	0.377	0.2103
3.417	0.710	11.771	12.699	0.854	1.592	1.304E 05	.0168	0.960	1.300E 05	1.036	0.361	0.2303
4.003	0.835	14.247	15.331	1.034	1.599	1.407E 05	.0169	0.991	1.402E 05	1.067	0.355	0.2482
4.617	1.007	17.758	18.999	1.167	1.592	1.512E 05	.0175	1.060	1.507E 05	1.134	0.332	0.2671
5.433	1.152	22.527	23.925	1.447	1.639	1.606E 05	.0174	1.166	1.600E 05	1.239	0.341	0.2835
6.029	1.295	27.532	29.463	1.621	1.628	1.698E 05	.0174	1.269	1.692E 05	1.358	0.323	0.2997
6.619	1.419	35.168	36.337	1.699	1.640	1.774E 05	.0174	1.479	1.767E 05	1.528	0.284	0.3129
7.025	1.494	46.938	48.381	0.829	1.640	1.828E 05	.0172	1.852	1.821E 05	1.909	0.113	0.3224
7.039	1.516	51.489	51.420	0.127	1.643	1.827E 05	.0175	2.031	1.820E 05	2.028	0.016	0.3224

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act, 1954

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act, 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2500
BAROMETRIC PRESSURE = 29.380 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 3
TYPE E METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 16, 1964
TYPE B SPACER PLATE
METERING RING AREA RATIO = 0.250
METERING RING AREA = 0.1278 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
119.0	117.5	116.8	119.0	118.5	0.65	0.	0.147	-0.018	0.005	1.72	0.108	1.596	0.058	520.08
120.0	117.0	116.5	119.5	119.0	1.03	-0.002	0.246	-0.022	0.085	2.82	0.172	2.628	0.087	516.91
120.0	115.5	115.0	119.0	118.5	1.40	-0.004	0.344	-0.033	0.130	3.86	0.270	3.610	0.119	515.10
120.0	114.0	113.5	119.0	118.2	1.77	-0.002	0.418	-0.040	0.116	4.94	0.295	4.617	0.173	513.74
119.8	112.0	111.5	118.5	117.3	2.11	-0.002	0.491	-0.043	0.083	6.07	0.319	5.722	0.228	512.14
120.0	110.8	110.0	118.0	117.0	2.48	-0.007	0.589	-0.056	-0.195	7.29	0.373	7.000	0.278	508.95
119.8	108.0	107.2	117.2	116.3	3.05	-0.002	0.688	-0.060	-0.228	9.19	0.393	8.842	0.343	506.44
120.0	104.5	103.5	117.0	115.5	3.78	-0.007	0.884	-0.079	-0.280	12.26	0.467	11.789	0.441	505.52
119.9	102.0	101.0	116.2	115.0	4.18	-0.007	0.982	-0.076	-0.264	13.95	0.540	13.434	0.477	505.06
120.0	99.8	99.0	116.0	114.5	4.57	-0.004	1.056	-0.087	-0.264	15.87	0.589	15.227	0.524	503.68
120.1	97.3	96.8	116.0	114.8	5.05	-0.004	1.179	-0.108	-0.313	18.22	0.639	17.536	0.553	503.22
119.5	93.0	92.8	114.8	113.0	5.55	-0.004	1.277	-0.101	-0.495	20.95	0.614	20.336	0.650	502.76
118.0	87.9	87.0	113.0	111.1	6.02	-0.007	1.375	-0.110	-0.609	24.39	0.639	23.725	0.752	502.99
118.5	83.0	82.2	112.8	111.0	6.61	-0.007	1.523	-0.125	-0.696	28.91	0.688	27.998	0.824	502.53
117.5	75.2	74.0	111.0	109.2	7.00	0.	1.621	-0.072	-0.137	35.42	0.909	33.996	0.730	502.07
115.0	54.0	56.5	108.5	106.5	7.44	-0.007	1.695	-0.094	-1.843	50.05	2.407	52.558	1.203	500.92

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
JAN 16 1964

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2500
BAROMETRIC PRESSURE = 29.380 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 3
TYPE E METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 16, 1964
TYPE B SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.1278 SQ IN

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.653	0.138	1.608	1.770	0.148	1.705	5.390E 04	.0187	0.876	5.370E 04	0.964	0.378	0.0961
1.030	0.237	2.681	2.903	0.197	1.660	6.939E 04	.0198	0.899	6.914E 04	0.973	0.308	0.1231
1.396	0.337	3.692	3.965	0.298	1.665	8.104E 04	.0207	0.912	8.074E 04	0.980	0.341	0.1433
1.767	0.409	4.695	5.086	0.367	1.659	9.163E 04	.0198	0.910	9.129E 04	0.986	0.327	0.1617
2.110	0.483	5.786	6.257	0.446	1.656	1.005E 05	.0195	0.935	1.002E 05	1.011	0.328	0.1771
2.473	0.584	6.930	7.507	0.655	1.651	1.100E 05	.0199	0.949	1.096E 05	1.028	0.405	0.1928
3.044	0.680	8.758	9.453	0.744	1.669	1.220E 05	.0190	0.980	1.216E 05	1.058	0.370	0.2130
3.775	0.879	11.689	12.589	0.901	1.657	1.368E 05	.0195	1.040	1.363E 05	1.120	0.347	0.2385
4.168	0.977	13.340	14.313	0.997	1.664	1.436E 05	.0197	1.075	1.430E 05	1.153	0.343	0.2501
4.565	1.049	15.139	16.260	1.072	1.668	1.506E 05	.0193	1.113	1.501E 05	1.195	0.331	0.2618
5.046	1.172	17.434	18.658	1.175	1.676	1.582E 05	.0195	1.159	1.577E 05	1.241	0.322	0.2749
5.571	1.270	20.139	21.434	1.295	1.738	1.631E 05	.0198	1.252	1.625E 05	1.332	0.323	0.2831
6.039	1.370	23.476	24.943	1.443	1.686	1.713E 05	.0190	1.299	1.707E 05	1.380	0.309	0.2976
6.631	1.517	27.713	29.521	1.587	1.724	1.781E 05	.0195	1.420	1.774E 05	1.513	0.301	0.3091
7.032	1.612	33.963	36.020	1.546	1.770	1.805E 05	.0200	1.677	1.799E 05	1.779	0.263	0.3131
7.468	1.689	51.684	50.925	-0.661	1.728	1.870E 05	.0192	2.333	1.863E 05	2.299	0.081	0.3238

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2600
BAROMETRIC PRESSURE = 29.250 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 2
TYPE F METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 16, 1964
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.1088 SQ IN

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.8	119.0	120.0	119.8	0.25	0.	0.039	0.	0.	0.87	0.039	0.835	0.011	521.88
119.0	117.0	116.0	118.8	118.0	0.64	0.	0.147	0.004	-0.056	2.30	0.196	2.137	0.016	519.63
118.0	114.5	113.8	117.6	117.0	1.01	0.	0.221	0.004	-0.125	3.71	0.221	3.488	0.027	517.59
119.8	114.0	113.2	119.0	118.0	1.40	0.	0.319	0.007	-0.168	5.16	0.295	4.863	0.025	517.37
120.5	113.0	112.8	119.5	119.0	1.72	0.004	0.393	0.009	-0.191	6.68	0.295	6.361	0.023	516.91
120.1	111.0	110.5	119.0	118.5	2.06	0.007	0.467	0.014	-0.215	8.03	0.393	7.589	0.033	516.46
120.0	109.0	108.2	118.8	117.5	2.43	0.009	0.540	0.014	-0.231	9.58	0.521	9.038	0.033	516.23
119.6	106.5	105.5	117.5	116.8	2.80	0.009	0.614	0.016	-0.298	11.20	0.614	10.585	0.051	516.01
119.8	103.3	102.0	117.0	115.7	3.39	0.009	0.761	0.023	-0.369	14.12	0.786	13.361	0.072	515.33
120.2	101.0	100.4	117.5	116.5	3.73	0.009	0.810	0.018	-0.426	16.28	0.860	15.350	0.083	515.10
120.0	98.0	96.5	116.8	115.2	4.20	0.004	0.958	0.025	-0.520	19.13	1.056	18.052	0.108	514.64
120.0	94.0	92.5	116.0	114.5	4.69	0.004	1.056	0.036	-0.603	22.15	1.253	21.097	0.134	514.42
120.1	90.5	89.0	116.0	114.5	5.13	0.007	1.154	0.025	-0.670	25.96	1.498	24.413	0.166	514.42
119.9	86.2	84.2	115.0	113.2	5.53	0.004	1.228	0.029	-0.761	29.64	1.842	27.006	0.195	514.42
118.6	79.5	77.0	113.5	111.8	5.89	0.	1.326	0.036	-0.715	34.92	2.235	32.296	0.260	513.74
118.5	62.5	59.5	113.0	111.0	6.36	0.007	1.424	0.043	-1.239	51.56	2.923	48.550	0.481	513.28

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
of 1754

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2600
BAROMETRIC PRESSURE = 29.250 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 2
TYPE F METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 16, 1964
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.1088 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.246	0.039	0.835	0.883	0.048	1.626	3.382E 04	.0135	0.839	3.370E 04	0.887	0.313	0.0604
0.639	0.147	2.107	2.310	0.237	1.657	5.411E 04	.0198	0.827	5.391E 04	0.907	0.602	0.0964
1.007	0.221	3.423	3.725	0.302	1.645	6.828E 04	.0187	0.843	6.803E 04	0.917	0.476	0.1212
1.405	0.319	4.775	5.172	0.397	1.668	8.067E 04	.0196	0.852	8.037E 04	0.923	0.448	0.1432
1.723	0.391	6.261	6.694	0.409	1.571	9.240E 04	.0184	0.855	9.206E 04	0.914	0.350	0.1639
2.070	0.463	7.474	8.047	0.523	1.601	1.003E 05	.0184	0.863	9.993E 04	0.929	0.375	0.1778
2.440	0.536	8.915	9.594	0.659	1.618	1.083E 05	.0182	0.879	1.079E 05	0.946	0.398	0.1920
2.809	0.609	10.429	11.229	0.800	1.640	1.154E 05	.0182	0.903	1.149E 05	0.972	0.419	0.2043
3.398	0.757	13.165	14.163	1.023	1.645	1.270E 05	.0186	0.940	1.265E 05	1.011	0.431	0.2247
3.742	0.806	15.128	16.334	1.133	1.629	1.342E 05	.0178	0.968	1.337E 05	1.045	0.421	0.2374
4.203	0.956	17.779	19.203	1.399	1.633	1.421E 05	.0188	1.011	1.416E 05	1.092	0.451	0.2512
4.695	1.054	20.777	22.242	1.661	1.638	1.500E 05	.0185	1.056	1.495E 05	1.130	0.465	0.2651
5.163	1.151	24.065	26.075	1.961	1.646	1.570E 05	.0184	1.113	1.564E 05	1.206	0.484	0.2774
5.556	1.226	26.611	29.787	2.380	1.661	1.620E 05	.0183	1.149	1.614E 05	1.286	0.535	0.2863
5.921	1.326	31.921	35.123	2.809	1.680	1.658E 05	.0187	1.303	1.652E 05	1.433	0.562	0.2927
6.397	1.421	47.909	51.948	3.955	1.685	1.722E 05	.0186	1.807	1.716E 05	1.959	0.605	0.3038

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

CONFIDENTIAL
RESTRICTED DATA
Atomic Energy 1754

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2700
BAROMETRIC PRESSURE = 28.820 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 3
TYPE A METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 9, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1186 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.0	118.0	119.5	119.5	0.88	0.004	0.196	-0.007	0.007	1.67	0.172	1.817	0.007	524.58
120.0	115.5	115.8	119.0	118.5	1.47	0.007	0.295	-0.014	0.004	2.80	0.295	3.095	0.018	521.43
120.2	114.1	114.8	119.0	118.1	2.06	0.005	0.442	-0.018	0.018	4.03	0.403	4.411	0.036	520.31
119.9	111.4	111.7	117.5	116.5	2.63	0.	0.585	-0.020	0.042	5.30	0.491	5.747	0.049	518.50
120.0	109.8	110.0	117.2	116.4	3.19	0.	0.688	-0.025	0.072	6.53	0.589	7.122	0.061	517.59
120.0	106.8	107.1	116.5	115.0	3.93	0.007	0.845	-0.042	0.108	8.30	0.737	8.989	0.079	516.46
120.0	103.0	103.5	115.5	114.0	4.86	0.011	1.056	-0.047	0.119	10.86	0.933	11.789	0.108	515.78
119.6	100.5	101.5	115.0	113.5	5.35	0.009	1.130	-0.061	0.145	12.23	1.032	13.262	0.112	515.10
120.0	97.5	99.0	114.5	113.0	6.09	0.011	1.277	-0.076	0.181	14.61	1.228	15.807	0.123	514.64
120.1	94.2	95.6	114.3	112.5	6.75	0.022	1.449	-0.098	0.202	17.19	1.474	18.656	0.145	514.64
117.0	84.0	86.0	110.0	108.0	7.69	0.027	1.646	-0.076	0.287	22.72	1.867	24.462	0.217	514.42
117.0	79.1	81.0	109.5	107.5	8.23	0.014	1.768	-0.090	0.361	26.62	2.137	28.406	0.217	513.51
117.0	72.2	74.8	109.0	106.8	8.72	0.018	1.867	-0.137	0.535	32.39	2.554	34.580	0.314	513.51
118.0	53.0	58.0	109.5	107.0	9.01	0.018	1.891	-0.143	0.708	49.05	5.182	54.057	0.267	513.28

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act - 1954

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act - 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2700
BAROMETRIC PRESSURE = 28.820 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 3
TYPE A METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 9, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1186 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.888	0.191	1.825	1.675	-0.174	1.956	5.819E 04	.0218	0.720	5.798E 04	0.661	0.376	0.1044
1.481	0.287	3.104	2.801	-0.303	1.972	7.542E 04	.0197	0.737	7.515E 04	0.665	0.388	0.1347
2.068	0.436	4.429	4.028	-0.420	1.960	8.973E 04	.0212	0.744	8.940E 04	0.677	0.378	0.1600
2.628	0.581	5.778	5.296	-0.531	1.960	1.015E 05	.0221	0.760	1.011E 05	0.696	0.369	0.1804
3.193	0.684	7.171	6.518	-0.653	1.944	1.126E 05	.0212	0.766	1.122E 05	0.696	0.365	0.1999
3.937	0.838	9.064	8.291	-0.822	2.006	1.234E 05	.0216	0.805	1.230E 05	0.736	0.376	0.2188
4.874	1.047	11.872	10.838	-1.034	1.992	1.380E 05	.0215	0.838	1.375E 05	0.765	0.367	0.2444
5.363	1.122	13.365	12.222	-1.144	2.015	1.440E 05	.0211	0.863	1.435E 05	0.789	0.366	0.2547
6.102	1.268	15.935	14.605	-1.364	2.003	1.544E 05	.0207	0.893	1.539E 05	0.819	0.370	0.2730
6.776	1.435	18.806	17.188	-1.628	1.995	1.632E 05	.0209	0.939	1.626E 05	0.858	0.383	0.2884
7.714	1.628	24.643	22.660	-2.107	2.015	1.713E 05	.0209	1.080	1.707E 05	0.993	0.408	0.3027
8.242	1.757	28.632	26.580	-2.405	2.021	1.772E 05	.0211	1.172	1.766E 05	1.088	0.416	0.3127
8.737	1.854	34.916	32.316	-2.969	2.050	1.812E 05	.0212	1.360	1.805E 05	1.259	0.455	0.3197
9.032	1.878	54.482	48.971	-5.688	2.043	1.853E 05	.0206	2.042	1.846E 05	1.835	0.650	0.3269

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	2800	RUN NUMBER	3	DATE RUN	JANUARY 10, 1964
BAROMETRIC PRESSURE	= 29.335 IN HG	TYPE B METERING RING		TYPE A SPACER PLATE	
METERING RING CLEARANCE	= 0.015	ANNULUS CLEARANCE	= 0.080	METERING RING AREA RATIO	= .750
EQUIVALENT DIAMETER	= 0.1564	ANNULUS AREA	= 0.2790 SQ IN	METERING RING AREA	= 0.1088 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.3	118.3	120.0	119.5	0.61	0.	0.123	-0.004	0.033	1.60	0.147	1.729	0.004	515.33
120.1	117.0	117.2	120.0	119.5	0.96	0.004	0.196	-0.007	0.036	2.60	0.295	2.874	0.007	515.55
120.0	115.4	115.2	119.1	118.9	1.35	0.	0.295	-0.011	0.083	3.66	0.368	4.003	0.018	516.01
120.0	113.4	113.3	118.6	118.0	1.74	0.	0.344	-0.013	0.089	4.81	0.467	5.280	0.031	515.55
120.0	111.5	112.0	118.0	117.2	2.09	0.004	0.442	-0.013	0.110	6.04	0.550	6.558	0.025	516.01
120.2	110.0	110.5	118.1	117.3	2.46	0.	0.491	-0.014	0.163	7.39	0.639	8.007	0.029	516.46
120.0	108.0	108.5	117.5	116.8	2.79	0.007	0.565	-0.031	0.217	8.62	0.712	9.333	0.036	516.91
120.0	106.0	106.5	117.5	116.5	3.19	0.	0.639	-0.025	0.251	10.36	0.860	11.175	0.007	516.01
120.1	104.5	105.0	117.5	116.3	3.44	0.	0.712	-0.033	0.284	11.74	0.958	12.648	0.007	514.87
120.1	98.5	99.7	116.8	115.5	4.30	0.	0.884	-0.040	0.387	16.11	1.326	17.428	0.072	513.96
120.0	94.3	95.5	115.5	114.5	4.76	0.	0.958	-0.043	0.453	19.11	1.533	20.704	0.116	513.96
120.1	90.0	91.5	115.5	114.5	5.23	0.007	1.056	-0.054	0.457	23.26	1.867	24.879	0.145	512.83
120.5	83.0	85.2	115.5	114.0	5.77	0.004	1.154	-0.061	0.477	29.42	2.309	30.995	0.217	512.60
119.7	74.5	77.0	114.0	112.5	6.19	0.007	1.253	-0.069	0.607	35.83	2.751	38.039	0.296	511.69
120.5	53.0	57.5	115.0	113.5	6.39	0.	1.302	-0.072	0.499	56.06	4.593	60.565	0.361	511.00

APPENDIX "A" SECTION 2
 AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2800
BAROMETRIC PRESSURE = 29.335 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 3
TYPE B METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 10, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.1088 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.614	0.121	1.747	1.597	-0.165	1.938	4.977E 04	.0198	0.835	4.959E 04	0.763	0.511	0.0881
0.961	0.193	2.895	2.605	-0.315	1.885	6.315E 04	.0196	0.856	6.292E 04	0.770	0.599	0.1118
1.351	0.293	4.050	3.655	-0.420	1.935	7.377E 04	.0217	0.872	7.350E 04	0.787	0.576	0.1307
1.744	0.342	5.331	4.806	-0.525	1.982	8.291E 04	.0200	0.907	8.261E 04	0.818	0.563	0.1468
2.091	0.438	6.619	6.044	-0.609	1.977	9.081E 04	.0213	0.934	9.048E 04	0.853	0.536	0.1608
2.456	0.489	8.095	7.390	-0.729	1.944	9.918E 04	.0198	0.954	9.882E 04	0.871	0.530	0.1758
2.797	0.559	9.457	8.624	-0.833	1.971	1.050E 05	.0201	0.988	1.046E 05	0.901	0.531	0.1861
3.193	0.637	11.313	10.384	-0.978	1.964	1.126E 05	.0199	1.028	1.122E 05	0.944	0.534	0.1994
3.438	0.710	12.806	11.766	-1.090	1.932	1.182E 05	.0203	1.061	1.177E 05	0.975	0.535	0.2089
4.298	0.882	17.641	16.124	-1.527	1.949	1.318E 05	.0202	1.171	1.313E 05	1.070	0.575	0.2327
4.765	0.956	20.952	19.096	-1.793	1.976	1.378E 05	.0199	1.266	1.373E 05	1.154	0.596	0.2433
5.239	1.051	25.135	23.255	-2.125	1.965	1.454E 05	.0197	1.367	1.448E 05	1.265	0.611	0.2562
5.775	1.151	31.264	29.399	-2.601	1.971	1.527E 05	.0196	1.540	1.521E 05	1.448	0.636	0.2691
6.196	1.247	38.376	35.783	-3.139	1.995	1.571E 05	.0200	1.776	1.565E 05	1.656	0.665	0.2764
6.386	1.300	60.850	55.947	-4.991	1.955	1.619E 05	.0198	2.672	1.613E 05	2.457	0.752	0.2846

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 2900
BAROMETRIC PRESSURE = 29.360 IN HG
METERING RING CLEARANCE = 0.015
EQUIVALENT DIAMETER = 0.1564

RUN NUMBER 3
TYPE C METERING RING
ANNULUS CLEARANCE = 0.080
ANNULUS AREA = 0.2790 SQ IN

DATE RUN JANUARY 10, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.1278 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.2	119.2	120.0	120.0	0.61	-0.002	0.138	-0.014	0.014	0.93	0.074	0.982	0.004	515.10
120.0	118.0	118.0	119.5	119.2	1.13	0.	0.246	-0.022	0.029	1.72	0.088	1.768	0.007	515.10
119.5	115.8	115.5	118.2	117.2	1.65	0.	0.368	-0.034	0.034	2.51	0.123	2.603	0.011	514.64
120.0	115.0	115.0	118.5	117.5	2.09	0.009	0.467	-0.047	0.034	3.24	0.147	3.340	0.018	515.33
120.0	113.0	113.5	118.0	117.0	2.68	0.004	0.589	-0.065	0.025	4.22	0.196	4.421	0.033	516.01
120.0	111.0	111.2	117.5	116.5	3.39	0.	0.747	-0.085	0.022	5.58	0.270	5.796	0.054	516.01
120.0	108.5	108.0	116.7	115.3	4.10	0.	0.884	-0.108	0.011	6.98	0.295	7.260	0.069	515.33
119.9	106.5	106.7	115.5	114.5	4.67	0.	1.032	-0.119	-0.011	8.15	0.393	8.498	0.094	515.10
119.0	104.0	104.0	114.5	112.7	5.21	0.009	1.130	-0.137	-0.022	9.28	0.442	9.701	0.108	514.42
119.7	101.0	101.5	114.2	112.5	6.02	0.004	1.302	-0.163	-0.054	11.32	0.540	11.838	0.145	514.87
120.0	99.5	100.0	114.5	112.8	6.48	-0.004	1.449	-0.186	-0.069	12.77	0.639	13.312	0.173	514.64
120.5	97.0	98.0	114.0	112.1	7.17	-0.011	1.562	-0.206	-0.090	14.69	0.737	15.375	0.220	514.87
119.5	93.5	94.5	112.5	110.3	7.71	-0.014	1.695	-0.217	-0.119	16.41	0.786	17.167	0.235	514.19
116.5	85.5	86.5	108.6	106.5	8.55	-0.004	1.867	-0.238	-0.148	20.31	1.007	21.220	0.303	514.19
116.5	78.0	79.5	107.5	105.3	9.43	0.004	2.088	-0.285	-0.141	26.38	1.277	27.296	0.459	513.74
115.2	63.0	65.0	105.5	103.0	10.14	0.014	2.260	-0.296	0.224	38.04	1.965	40.043	0.477	511.92

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

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AIR TEST DATA
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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	2900	RUN NUMBER	3	DATE RUN	JANUARY 10, 1964
BAROMETRIC PRESSURE =	29.360 IN HG	TYPE C METERING RING		TYPE A SPACER PLATE	
METERING RING CLEARANCE =	0.015	ANNULUS CLEARANCE =	0.080	METERING RING AREA RATIO =	0.250
EQUIVALENT DIAMETER =	0.1564	ANNULUS AREA =	0.2790 SQ IN	METERING RING AREA =	0.1278 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.612	0.131	0.997	0.941	-0.081	1.931	4.982E 04	.0215	0.656	4.964E 04	0.619	0.252	0.0881
1.130	0.238	1.794	1.731	-0.102	1.946	6.743E 04	.0212	0.642	6.718E 04	0.620	0.171	0.1193
1.646	0.361	2.638	2.522	-0.140	1.960	8.101E 04	.0222	0.650	8.071E 04	0.621	0.161	0.1432
2.097	0.455	3.381	3.264	-0.166	1.970	9.124E 04	.0219	0.654	9.090E 04	0.632	0.149	0.1614
2.681	0.580	4.466	4.248	-0.218	1.948	1.036E 05	.0216	0.665	1.032E 05	0.633	0.149	0.1834
3.389	0.739	5.849	5.598	-0.300	1.932	1.169E 05	.0214	0.678	1.165E 05	0.649	0.158	0.2071
4.102	0.877	7.320	7.002	-0.328	1.942	1.285E 05	.0210	0.701	1.280E 05	0.670	0.141	0.2274
4.666	1.024	8.552	8.175	-0.426	1.967	1.363E 05	.0217	0.725	1.357E 05	0.693	0.161	0.2410
5.216	1.118	9.759	9.304	-0.479	1.991	1.429E 05	.0214	0.745	1.424E 05	0.710	0.161	0.2525
6.021	1.293	11.892	11.338	-0.578	1.980	1.542E 05	.0212	0.776	1.537E 05	0.740	0.163	0.2727
6.480	1.444	13.370	12.790	-0.679	1.947	1.616E 05	.0215	0.794	1.610E 05	0.759	0.172	0.2857
7.161	1.560	15.432	14.695	-0.787	1.966	1.693E 05	.0211	0.832	1.687E 05	0.792	0.177	0.2993
7.697	1.695	17.216	16.412	-0.829	1.984	1.744E 05	.0215	0.866	1.737E 05	0.826	0.171	0.3080
8.543	1.861	21.265	20.287	-1.076	2.000	1.809E 05	.0212	0.962	1.803E 05	0.918	0.191	0.3196
9.435	2.079	27.368	26.290	-1.437	1.994	1.906E 05	.0213	1.108	1.899E 05	1.064	0.213	0.3364
10.158	2.245	40.303	37.914	-2.349	2.050	1.950E 05	.0218	1.544	1.943E 05	1.452	0.281	0.3432

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
AIR TEST DATA
154

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3000
BAROMETRIC PRESSURE = 29.280 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 3
TYPE A METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN JANUARY 21, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1709 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.3	119.5	120.0	119.8	0.37	0.	0.074	-0.005	0.020	0.35	0.138	0.481	0.007	518.72
119.8	118.1	118.0	119.1	119.0	0.79	0.004	0.138	-0.010	0.038	0.74	0.246	0.958	0.005	517.14
119.9	115.5	117.0	119.0	118.5	1.45	0.005	0.270	-0.014	0.086	1.42	0.393	1.768	0.014	515.78
120.0	114.4	115.2	118.2	117.5	2.26	0.013	0.418	-0.022	0.108	2.28	0.663	2.947	0.033	514.87
120.5	113.0	114.1	118.0	117.0	3.14	0.023	0.589	-0.033	0.148	3.02	0.933	4.151	0.040	514.42
120.0	109.7	111.0	116.5	115.3	4.15	0.023	0.776	-0.043	0.206	4.37	1.179	5.526	0.061	512.83
114.8	101.2	103.0	110.0	108.8	5.33	0.029	0.982	-0.061	0.271	5.82	1.572	7.353	0.087	511.92
115.3	99.1	101.0	109.5	108.5	6.19	0.040	1.154	-0.065	0.293	7.07	1.916	8.964	0.134	511.23
115.5	97.0	99.3	109.0	107.5	6.93	0.076	1.302	-0.076	0.309	8.30	2.260	10.536	0.155	510.78
115.2	94.5	97.0	108.2	106.5	7.59	0.065	1.424	-0.090	0.329	9.38	2.530	11.912	0.181	510.09
112.5	88.5	91.0	104.0	102.2	8.67	0.101	1.670	-0.094	0.347	11.32	2.898	14.318	0.210	509.41
109.5	81.0	85.0	100.5	98.5	9.55	0.094	1.842	-0.096	0.390	13.68	3.635	17.290	0.220	508.95
109.8	76.5	81.0	99.5	97.5	10.46	0.103	2.014	-0.123	0.430	16.36	4.372	20.729	0.238	508.49
110.2	73.0	78.5	99.5	97.0	11.08	0.089	2.112	-0.134	0.468	18.74	5.035	23.750	0.267	508.04
110.0	70.0	75.5	99.0	96.7	11.44	0.094	2.210	-0.112	0.471	20.68	5.501	26.500	0.314	507.81
109.0	62.5	69.5	97.3	94.8	11.89	0.101	2.309	-0.141	0.399	25.59	6.680	32.301	0.397	507.35
109.0	55.0	63.5	97.0	95.0	12.01	0.090	2.309	-0.135	0.350	31.36	8.449	40.043	0.246	507.58

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

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APPENDIX "A" SECTION 2

AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3000
BAROMETRIC PRESSURE = 29.280 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 3
TYPE A METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN JANUARY 21, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1709 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.368	0.071	0.494	0.351	-0.153	1.653	4.895E 04	.0196	0.588	4.878E 04	0.418	0.681	0.0874
0.790	0.133	0.982	0.745	-0.262	1.755	6.977E 04	.0181	0.577	6.952E 04	0.437	0.573	0.1243
1.454	0.265	1.818	1.430	-0.437	1.759	9.494E 04	.0195	0.577	9.460E 04	0.454	0.515	0.1688
2.272	0.408	3.012	2.283	-0.729	1.741	1.196E 05	.0190	0.602	1.192E 05	0.456	0.535	0.2124
3.167	0.575	4.241	3.024	-1.021	1.726	1.422E 05	.0189	0.598	1.417E 05	0.426	0.523	0.2523
4.174	0.762	5.651	4.373	-1.302	1.774	1.614E 05	.0193	0.615	1.608E 05	0.476	0.510	0.2857
5.383	0.965	7.519	5.814	-1.745	1.836	1.770E 05	.0195	0.649	1.764E 05	0.502	0.531	0.3130
6.279	1.132	9.143	7.048	-2.120	1.829	1.923E 05	.0193	0.668	1.916E 05	0.515	0.539	0.3396
7.058	1.261	10.729	8.283	-2.471	1.836	2.039E 05	.0191	0.695	2.031E 05	0.536	0.548	0.3598
7.714	1.389	12.121	9.352	-2.769	1.838	2.132E 05	.0192	0.714	2.124E 05	0.551	0.552	0.3758
8.835	1.617	14.539	11.274	-3.167	1.897	2.226E 05	.0199	0.762	2.217E 05	0.591	0.546	0.3919
9.719	1.792	17.533	13.633	-3.925	1.892	2.313E 05	.0198	0.824	2.304E 05	0.640	0.585	0.4070
10.647	1.960	21.005	16.316	-4.689	1.917	2.411E 05	.0199	0.904	2.402E 05	0.702	0.616	0.4239
11.247	2.065	24.050	18.694	-5.381	1.910	2.488E 05	.0197	0.971	2.479E 05	0.755	0.640	0.4373
11.626	2.161	26.792	20.597	-5.876	1.928	2.518E 05	.0200	1.051	2.509E 05	0.808	0.657	0.4424
12.077	2.255	32.571	25.468	-7.074	1.935	2.555E 05	.0201	1.227	2.545E 05	0.959	0.703	0.4485
12.187	2.261	40.286	31.304	-8.750	1.930	2.568E 05	.0199	1.498	2.559E 05	1.164	0.771	0.4510

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~~RESTRICTED DATA~~
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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3100
BARGMETRIC PRESSURE = 29.295 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 2
TYPE A METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 4, 1963
TYPE A SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.2929 SQ IN

AIR TEST DATA (CONTINUED)
APPENDIX "A" SECTION 2

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	109.5	109.5	110.0	110.0	0.64	-0.007	0.098	-0.011	0.016	0.39	0.196	0.540	0.005	526.15
110.0	108.0	108.5	109.0	109.0	1.05	-0.007	0.147	-0.011	0.022	0.59	0.295	0.874	0.007	525.47
110.0	107.5	107.8	109.0	108.8	1.42	-0.013	0.196	0.014	0.022	0.84	0.467	1.326	0.011	525.47
110.0	106.5	107.0	108.5	108.2	1.87	-0.020	0.246	0.016	0.025	1.06	0.565	1.646	0.014	525.02
110.0	106.0	106.5	108.0	107.5	2.36	-0.029	0.295	0.022	0.034	1.33	0.688	2.038	0.018	525.02
110.0	105.0	105.5	107.5	107.1	2.90	-0.043	0.368	0.023	0.036	1.62	0.810	2.456	0.018	524.35
110.0	104.0	105.0	107.0	106.7	3.44	-0.096	0.393	0.036	0.045	1.99	0.982	2.962	0.029	524.35
110.0	103.0	103.5	106.5	106.0	3.93	-0.110	0.442	0.090	0.049	2.26	1.105	3.340	0.051	524.35
110.0	102.0	103.0	106.5	106.0	4.40	-0.126	0.516	-0.014	0.054	2.53	1.253	3.758	0.051	524.57
110.0	101.0	102.5	105.5	105.0	4.86	-0.125	0.639	-0.058	0.047	2.80	1.375	4.126	0.058	524.57
100.0	88.5	90.3	95.0	94.0	6.02	-0.090	0.933	-0.087	0.083	3.63	1.793	5.403	0.083	524.35
100.0	87.0	89.0	94.0	93.0	6.63	-0.087	1.056	-0.083	0.094	4.10	2.038	6.140	0.072	524.12
100.0	85.5	88.0	93.0	92.0	7.12	-0.101	1.007	-0.083	0.081	4.47	2.137	6.582	0.065	523.67
100.0	84.0	86.5	92.9	91.5	7.81	-0.145	0.761	-0.105	0.100	5.03	2.431	7.442	0.051	523.67
100.0	82.8	85.3	92.0	90.5	8.37	-0.087	1.277	-0.116	0.065	5.43	2.628	7.982	0.072	523.90
100.0	82.0	85.0	92.0	90.5	8.72	-0.087	1.375	-0.079	0.060	5.75	2.726	8.449	0.072	523.90
100.0	80.0	82.9	91.0	89.1	9.55	-0.072	1.670	-0.105	0.094	6.51	2.923	9.333	0.051	523.90
97.0	73.0	76.0	86.5	84.5	11.08	-0.108	1.940	-0.090	0.130	8.10	3.512	11.617	0.029	523.67

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3100
BAROMETRIC PRESSURE = 29.295 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 2
TYPE A METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 4, 1963
TYPE A SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.2929 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.631	0.096	0.554	0.407	-0.196	1.504	8.601E 04	.0191	0.548	8.569E 04	0.402	0.463	0.1568
1.039	0.146	0.891	0.606	-0.295	1.487	1.112E 05	.0173	0.527	1.108E 05	0.358	0.415	0.2025
1.412	0.197	1.330	0.846	-0.459	1.485	1.297E 05	.0172	0.577	1.292E 05	0.367	0.472	0.2362
1.847	0.250	1.650	1.074	-0.551	1.507	1.474E 05	.0168	0.553	1.468E 05	0.360	0.436	0.2683
2.329	0.304	2.045	1.349	-0.671	1.497	1.661E 05	.0160	0.537	1.654E 05	0.354	0.415	0.3023
2.879	0.385	2.462	1.649	-0.789	1.541	1.823E 05	.0168	0.536	1.816E 05	0.359	0.403	0.3315
3.372	0.435	2.966	2.021	-0.956	1.519	1.987E 05	.0159	0.541	1.980E 05	0.368	0.407	0.3614
3.853	0.492	3.319	2.277	-1.067	1.548	2.104E 05	.0160	0.537	2.097E 05	0.368	0.402	0.3827
4.306	0.574	3.792	2.606	-1.211	1.543	2.227E 05	.0166	0.545	2.219E 05	0.375	0.404	0.4051
4.779	0.695	4.178	2.899	-1.329	1.566	2.328E 05	.0183	0.547	2.320E 05	0.379	0.402	0.4236
5.975	0.973	5.488	3.761	-1.751	1.616	2.459E 05	.0208	0.582	2.450E 05	0.399	0.422	0.4472
6.593	1.094	6.229	4.218	-2.011	1.620	2.581E 05	.0212	0.596	2.572E 05	0.404	0.434	0.4693
7.079	1.052	6.664	4.592	-2.097	1.665	2.642E 05	.0194	0.608	2.632E 05	0.419	0.429	0.4800
7.731	0.828	7.544	5.157	-2.412	1.667	2.760E 05	.0139	0.628	2.750E 05	0.429	0.447	0.5013
8.353	1.315	8.072	5.582	-2.564	1.729	2.814E 05	.0211	0.639	2.804E 05	0.442	0.449	0.5115
8.697	1.413	8.518	5.888	-2.655	1.745	2.859E 05	.0219	0.650	2.849E 05	0.450	0.446	0.5196
9.547	1.701	9.432	6.684	-2.847	1.837	2.919E 05	.0251	0.683	2.909E 05	0.484	0.449	0.5305
11.040	1.989	11.727	8.244	-3.483	1.887	3.058E 05	.0256	0.739	3.047E 05	0.520	0.463	0.5556

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3200
 BAROMETRIC PRESSURE = 29.362 IN HG
 METERING RING CLEARANCE = 0.
 EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 1
 TYPE A METERING RING
 ANNULUS CLEARANCE = 0.065
 ANNULUS AREA = 0.2267 SQ IN

DATE RUN DECEMBER 4, 1963
 TYPE A SPACER PLATE
 METERING RING AREA RATIO = .500
 METERING RING AREA = 0.0663 SQ IN

APPENDIX "A" SECTION 2
 AIR TEST DATA (CONTINUED)

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	111.5	111.5	119.8	119.5	1.05	0.051	0.246	0.042	-0.007	8.01	0.088	7.957	0.022	525.70
120.0	109.5	109.0	119.5	119.0	1.28	0.061	0.295	0.049	-0.007	10.12	0.098	10.011	0.023	525.25
120.0	107.6	106.5	119.3	118.8	1.55	0.075	0.368	0.060	-0.007	12.30	0.147	12.182	0.025	524.80
120.0	104.0	104.0	118.5	118.0	1.77	0.094	0.418	0.074	-0.014	14.05	0.147	13.926	0.036	526.82
120.0	102.0	101.0	118.5	118.0	2.04	0.105	0.491	0.089	-0.014	16.68	0.162	16.504	0.043	525.70
120.0	99.5	99.0	118.0	117.5	2.28	0.116	0.516	0.094	-0.014	18.86	0.196	18.680	0.040	525.03
120.0	97.0	96.5	118.0	117.5	2.53	0.130	0.580	0.107	-0.014	21.32	0.196	21.097	0.043	523.90
120.0	93.8	93.2	118.0	117.0	2.73	0.137	0.639	0.117	-0.014	23.77	0.246	23.455	0.043	523.68
120.0	91.0	90.5	117.6	117.0	2.95	0.166	0.688	0.137	-0.016	26.13	0.270	26.029	0.047	523.68
120.0	87.5	87.0	117.5	116.8	3.29	0.173	0.737	0.145	-0.014	29.62	0.295	29.330	0.108	523.45
120.0	83.0	83.0	117.0	116.3	3.63	0.206	0.835	0.179	-0.016	33.40	0.319	33.338	0.087	523.00
120.0	78.5	78.0	117.0	116.0	3.98	0.240	0.933	0.211	-0.020	37.85	0.368	37.538	0.098	523.00
120.0	73.0	72.5	116.2	115.3	4.32	0.257	0.997	0.208	-0.015	42.85	0.418	42.346	0.119	523.00
120.0	61.0	60.5	116.0	115.0	4.67	0.249	1.081	0.188	-0.004	54.56	0.540	54.061	0.043	523.00
120.0	51.0	50.0	116.0	115.0	4.67	0.251	1.095	0.184	-0.031	65.07	0.639	64.067	0.025	523.23

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	3200	RUN NUMBER	1	DATE RUN	DECEMBER 4, 1963
BAROMETRIC PRESSURE	= 29.362 IN HG	TYPE A METERING RING		TYPE A SPACER PLATE	
METERING RING CLEARANCE	= 0.	ANNULUS CLEARANCE	= 0.065	METERING RING AREA RATIO	= .500
EQUIVALENT DIAMETER	= 0.1276	ANNULUS AREA	= 0.2267 SQ IN	METERING RING AREA	= 0.0663 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
1.097	0.241	7.933	8.006	0.113	2.284	4.875E 04	.0212	1.397	9.517E 04	1.410	0.218	0.0872
1.339	0.285	9.983	10.120	0.128	2.257	5.423E 04	.0202	1.421	1.059E 05	1.441	0.197	0.0970
1.622	0.352	12.148	12.305	0.182	2.292	5.932E 04	.0209	1.445	1.158E 05	1.463	0.230	0.1060
1.862	0.391	13.882	14.043	0.186	2.304	6.307E 04	.0203	1.443	1.231E 05	1.460	0.202	0.1131
2.143	0.460	16.453	16.671	0.207	2.268	6.839E 04	.0204	1.459	1.335E 05	1.478	0.188	0.1224
2.400	0.479	18.626	18.856	0.245	2.292	7.210E 04	.0191	1.487	1.408E 05	1.506	0.196	0.1289
2.660	0.535	21.037	21.307	0.245	2.287	7.619E 04	.0192	1.509	1.487E 05	1.528	0.173	0.1360
2.863	0.591	23.389	23.759	0.296	2.260	7.957E 04	.0194	1.537	1.553E 05	1.561	0.187	0.1420
3.113	0.625	25.952	26.113	0.327	2.272	8.276E 04	.0190	1.573	1.616E 05	1.583	0.186	0.1477
3.464	0.671	29.250	29.618	0.373	2.270	8.739E 04	.0182	1.587	1.706E 05	1.607	0.184	0.1559
3.841	0.753	33.240	33.381	0.396	2.296	9.160E 04	.0186	1.639	1.788E 05	1.646	0.170	0.1633
4.219	0.834	37.422	37.815	0.452	2.298	9.594E 04	.0187	1.676	1.873E 05	1.694	0.168	0.1710
4.579	0.890	42.235	42.827	0.508	2.321	9.945E 04	.0185	1.755	1.941E 05	1.780	0.166	0.1773
4.916	0.977	53.966	54.529	0.607	2.343	1.026E 05	.0191	2.102	2.002E 05	2.124	0.161	0.1828
4.918	0.991	63.960	65.005	0.682	2.271	1.042E 05	.0187	2.413	2.033E 05	2.452	0.151	0.1857

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3300
BAROMETRIC PRESSURE = 29.475 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 1
TYPE D METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN DECEMBER 5, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.0663 SQ IN

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	116.0	115.5	120.0	119.7	0.49	0.	0.123	0.	0.052	4.62	0.098	4.372	0.011	525.25
120.0	112.5	112.0	120.0	120.0	0.74	0.	0.196	0.	0.079	7.96	0.418	7.368	0.011	524.80
120.0	109.5	108.5	119.5	119.0	1.01	0.	0.295	0.	0.090	10.56	0.589	9.922	0.018	524.58
120.0	106.0	105.5	119.5	119.0	1.20	0.	0.344	0.004	0.121	13.41	0.761	12.648	0.036	523.68
120.0	103.5	102.5	119.5	119.0	1.50	0.	0.393	0.004	0.125	16.63	0.982	15.620	0.040	523.23
120.0	100.0	99.0	119.0	118.5	1.74	0.	0.442	0.004	0.121	19.55	1.105	18.420	0.061	522.78
120.0	96.0	94.5	119.0	118.0	2.06	-0.004	0.516	0.	0.107	23.70	1.154	22.472	0.079	522.33
120.0	93.0	91.5	118.5	117.5	2.21	-0.004	0.589	0.	0.114	26.21	1.302	24.526	0.083	522.33
120.0	90.5	89.0	118.0	117.3	2.46	-0.011	0.639	0.004	0.043	28.88	1.400	26.829	0.098	521.88
120.0	86.0	84.0	117.9	117.0	2.78	-0.002	0.712	0.007	0.074	33.57	1.842	31.034	0.101	521.65
120.0	80.0	79.5	117.5	116.2	3.05	0.023	0.835	0.014	0.034	36.74	2.603	36.241	0.105	521.65
120.0	74.5	71.0	117.0	115.8	3.63	0.	0.982	0.033	-0.155	44.85	3.266	41.344	0.101	521.42
120.0	66.0	63.0	117.0	115.5	4.00	0.	1.130	0.087	0.155	52.56	3.488	49.547	0.264	522.32
120.0	62.0	59.0	116.5	115.0	4.18	0.007	1.228	0.123	1.120	56.06	2.677	53.055	0.303	522.10
120.0	39.5	39.0	116.5	115.0	4.32	0.	1.375	0.014	-0.090	76.08	0.295	75.581	0.289	521.87

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3300
BAROMETRIC PRESSURE = 29.475 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 1
TYPE D METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN DECEMBER 5, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.0663 SQ IN

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.491	0.123	4.398	4.624	0.079	1.891	3.591E 04	.0200	1.440	7.159E 04	1.514	0.291	0.0642
0.737	0.196	7.408	7.966	0.387	1.693	4.652E 04	.0191	1.444	9.276E 04	1.553	0.833	0.0831
1.007	0.295	9.967	10.575	0.559	1.770	5.322E 04	.0219	1.482	1.061E 05	1.573	0.900	0.0951
1.203	0.344	12.707	13.439	0.732	1.687	5.972E 04	.0203	1.505	1.191E 05	1.591	0.918	0.1066
1.498	0.393	15.681	16.657	0.951	1.743	6.564E 04	.0192	1.536	1.309E 05	1.632	0.962	0.1170
1.744	0.442	18.479	19.596	1.093	1.759	7.055E 04	.0187	1.567	1.407E 05	1.662	0.933	0.1257
2.059	0.518	22.526	23.759	1.160	1.744	7.710E 04	.0184	1.598	1.537E 05	1.686	0.799	0.1373
2.207	0.591	24.583	26.269	1.309	1.721	8.034E 04	.0193	1.604	1.602E 05	1.714	0.813	0.1431
2.445	0.644	26.849	28.957	1.455	1.774	8.337E 04	.0195	1.626	1.662E 05	1.754	0.821	0.1484
2.773	0.713	31.067	33.651	1.886	1.807	8.803E 04	.0194	1.685	1.755E 05	1.825	0.913	0.1566
3.069	0.823	36.251	36.813	2.669	1.834	9.193E 04	.0204	1.797	1.833E 05	1.825	1.119	0.1635
3.635	0.982	41.250	44.900	3.414	1.997	9.592E 04	.0223	1.870	1.913E 05	2.035	1.236	0.1706
4.003	1.130	49.582	52.715	3.610	2.028	9.968E 04	.0236	2.064	1.987E 05	2.195	1.085	0.1775
4.182	1.224	53.553	56.233	2.351	2.059	1.012E 05	.0248	2.162	2.017E 05	2.270	0.650	0.1801
4.323	1.375	75.529	76.316	0.581	1.994	1.046E 05	.0261	2.851	2.085E 05	2.880	0.106	0.1861

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APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	3400	RUN NUMBER	1	DATE RUN	DECEMBER 6, 1963
BAROMETRIC PRESSURE	= 29.410 IN HG	TYPE D METERING RING		TYPE B SPACER PLATE	
METERING RING CLEARANCE	= 0.030	ANNULUS CLEARANCE	= 0.095	METERING RING AREA RATIO	= .500
EQUIVALENT DIAMETER	= 0.1850	ANNULUS AREA	= 0.3313 SQ IN	METERING RING AREA	= 0.1709 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.8	120.0	120.0	120.0	0.32	0.002	0.039	0.	0.005	0.59	0.025	0.565	0.043	526.15
120.0	119.5	119.5	120.0	120.0	0.52	0.005	0.098	0.	0.004	1.11	0.025	1.081	0.083	526.15
120.0	118.0	118.0	119.8	119.8	0.83	0.005	0.147	0.	0.	1.74	0.039	1.719	0.132	525.92
120.0	117.5	117.0	119.8	119.5	1.13	0.011	0.196	0.	0.016	2.38	0.123	2.210	0.051	525.25
120.0	116.0	115.9	119.5	119.0	1.40	0.013	0.295	0.007	0.	3.05	0.147	2.898	0.244	524.80
120.0	115.5	115.0	119.0	118.5	1.69	0.007	0.319	0.007	0.023	3.63	0.196	3.438	0.289	524.57
119.5	115.5	115.0	117.8	117.2	2.11	0.	0.393	0.009	-0.014	4.32	0.196	4.077	0.350	524.12
120.5	111.0	111.0	118.0	117.5	3.22	-0.014	0.565	0.	-0.022	6.61	0.246	6.361	0.477	523.67
120.0	109.5	109.0	117.0	116.5	3.68	0.036	0.688	-0.036	-0.025	7.32	0.246	6.975	0.517	523.67
120.0	106.0	105.5	116.5	115.0	4.52	0.	0.982	0.	-0.087	9.36	0.319	8.989	0.650	523.23
110.5	90.0	89.5	105.0	103.5	6.19	0.069	1.523	-0.036	-0.300	13.95	0.295	13.483	0.903	522.55
110.0	86.0	85.5	104.0	102.0	6.88	0.014	1.695	0.022	-0.009	16.50	0.589	15.905	1.084	522.55
110.0	82.0	81.0	103.0	101.0	7.71	0.036	1.842	0.	-0.405	19.80	0.589	19.206	1.275	521.65
111.0	79.5	78.5	103.0	101.0	8.55	0.014	1.842	0.	-0.238	24.76	1.105	23.627	1.333	522.55
107.5	66.0	65.0	99.0	96.5	9.73	0.072	2.088	0.022	-0.258	31.14	0.786	30.533	1.843	522.32

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3400
BAROMETRIC PRESSURE = 29.410 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE D METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 6, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.1709 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.321	0.038	0.568	0.617	0.050	1.774	4.334E 04	.0130	0.832	4.318E 04	0.905	0.272	0.0783
0.521	0.096	1.082	1.158	0.076	1.527	5.951E 04	.0172	0.840	5.929E 04	0.899	0.219	0.1075
0.831	0.145	1.719	1.830	0.126	1.558	7.442E 04	.0166	0.851	7.415E 04	0.907	0.232	0.1343
1.141	0.191	2.219	2.426	0.159	1.623	8.556E 04	.0166	0.832	8.525E 04	0.910	0.220	0.1543
1.413	0.288	2.894	3.201	0.307	1.551	9.752E 04	.0193	0.835	9.716E 04	0.923	0.326	0.1757
1.702	0.316	3.447	3.819	0.373	1.579	1.061E 05	.0178	0.838	1.057E 05	0.929	0.332	0.1912
2.112	0.393	4.065	4.538	0.424	1.664	1.151E 05	.0188	0.836	1.147E 05	0.933	0.318	0.2072
3.203	0.572	6.350	6.900	0.550	1.709	1.405E 05	.0184	0.876	1.400E 05	0.952	0.272	0.2529
3.720	0.670	6.980	7.666	0.587	1.793	1.476E 05	.0193	0.866	1.471E 05	0.951	0.259	0.2656
4.546	0.982	8.946	9.760	0.765	1.827	1.618E 05	.0235	0.917	1.612E 05	1.001	0.274	0.2909
6.288	1.488	13.352	14.534	1.011	1.910	1.797E 05	.0265	1.012	1.791E 05	1.101	0.255	0.3228
6.927	1.687	15.890	17.180	1.280	1.891	1.893E 05	.0268	1.074	1.886E 05	1.161	0.281	0.3399
7.787	1.824	19.004	20.608	1.605	1.901	2.006E 05	.0257	1.139	1.998E 05	1.235	0.302	0.3598
8.607	1.835	23.507	25.610	2.078	1.939	2.092E 05	.0237	1.291	2.084E 05	1.407	0.341	0.3757
9.846	2.051	30.393	32.263	2.047	1.965	2.192E 05	.0232	1.456	2.184E 05	1.546	0.267	0.3936

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3500
BAROMETRIC PRESSURE = 29.400 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
TYPE D METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 6, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.2929 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.8	108.5	109.5	109.5	0.93	0.025	0.147	0.007	0.005	0.74	0.123	0.860	0.172	527.49
110.0	107.0	107.0	109.0	108.5	1.57	0.049	0.246	0.011	0.011	1.28	0.187	1.449	0.300	526.60
111.0	107.0	107.3	109.5	109.0	1.99	0.070	0.295	0.014	0.019	1.67	0.295	1.965	0.396	525.93
111.0	106.5	106.5	109.0	108.8	2.33	0.074	0.344	0.016	0.011	1.96	0.309	2.309	0.459	525.70
110.0	104.5	104.8	107.8	107.5	2.85	0.069	0.393	0.020	0.007	2.41	0.344	2.775	0.556	525.25
110.5	104.0	104.0	107.5	107.0	3.29	0.069	0.467	0.014	0.014	2.75	0.393	3.144	0.614	524.80
110.0	102.0	102.5	106.5	105.8	4.08	0.036	0.737	0.022	0.	3.24	0.491	3.723	0.621	524.58
110.0	100.8	101.0	105.5	105.0	4.59	0.051	0.860	0.007	0.	3.71	0.530	4.200	0.723	524.13
110.0	99.5	100.0	105.0	104.5	5.13	0.036	0.958	0.022	0.011	4.18	0.639	4.814	0.809	524.13
100.3	88.0	88.5	95.0	93.8	6.03	0.036	1.130	0.018	0.	5.13	0.810	5.845	0.957	524.13
100.3	86.0	87.0	94.5	93.0	6.73	0.043	1.228	0.014	0.	5.97	0.884	6.828	1.098	524.35
100.0	84.5	85.5	93.5	92.0	7.32	0.036	1.449	0.022	0.	6.58	0.958	7.564	1.207	524.13
100.0	83.0	84.0	93.0	91.0	7.69	0.058	1.523	0.022	0.	7.07	1.007	8.056	1.279	524.35
100.0	82.3	83.2	92.5	91.0	8.06	0.061	1.646	0.007	0.	7.52	1.081	8.596	1.355	524.12
100.0	80.5	82.0	91.5	90.0	8.60	0.029	1.719	0.036	0.	8.20	1.164	9.308	1.445	523.68
100.0	79.8	80.5	91.2	89.5	8.94	0.043	1.867	0.	0.013	8.74	1.302	9.996	1.554	523.90
98.5	76.5	78.0	89.5	87.0	9.31	0.045	1.940	0.018	0.005	9.38	1.366	10.684	1.626	523.90
95.5	72.5	74.0	86.2	84.0	9.87	0.045	2.053	0.014	0.	10.32	1.474	11.789	1.741	523.45

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

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AIR TEST DATA

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3500
BAROMETRIC PRESSURE = 29.400 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
TYPE D METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 6, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .500
METERING RING AREA = 0.2929 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.959	0.138	0.859	0.848	-0.011	1.367	1.108E 05	.0164	0.507	1.104E 05	0.500	0.016	0.2025
1.621	0.225	1.449	1.470	0.007	1.375	1.440E 05	.0157	0.506	1.435E 05	0.513	0.005	0.2627
2.060	0.263	1.967	1.924	-0.043	1.353	1.646E 05	.0142	0.530	1.640E 05	0.518	0.027	0.3000
2.434	0.310	2.306	2.260	-0.011	1.383	1.770E 05	.0145	0.535	1.764E 05	0.525	0.006	0.3226
2.948	0.362	2.769	2.768	0.023	1.391	1.938E 05	.0139	0.531	1.931E 05	0.531	0.011	0.3528
3.391	0.436	3.144	3.147	0.003	1.435	2.053E 05	.0150	0.538	2.045E 05	0.539	0.001	0.3735
4.149	0.722	3.712	3.639	-0.083	1.583	2.159E 05	.0223	0.568	2.151E 05	0.557	0.029	0.3927
4.684	0.838	4.196	4.177	-0.058	1.611	2.276E 05	.0232	0.576	2.267E 05	0.573	0.019	0.4137
5.215	0.943	4.808	4.689	-0.119	1.608	2.404E 05	.0233	0.588	2.395E 05	0.574	0.033	0.4370
6.123	1.115	5.836	5.749	-0.185	1.634	2.481E 05	.0235	0.609	2.472E 05	0.600	0.044	0.4511
6.831	1.210	6.820	6.676	-0.169	1.632	2.621E 05	.0227	0.633	2.611E 05	0.619	0.035	0.4766
7.414	1.435	7.554	7.353	-0.176	1.659	2.706E 05	.0251	0.651	2.697E 05	0.634	0.034	0.4920
7.805	1.497	8.045	7.891	-0.178	1.685	2.754E 05	.0252	0.666	2.744E 05	0.653	0.033	0.5008
8.181	1.618	8.592	8.390	-0.203	1.691	2.816E 05	.0260	0.678	2.806E 05	0.662	0.035	0.5119
8.695	1.708	9.290	9.115	-0.234	1.728	2.875E 05	.0262	0.701	2.864E 05	0.687	0.039	0.5223
9.053	1.848	10.002	9.741	-0.311	1.725	2.935E 05	.0271	0.720	2.924E 05	0.701	0.048	0.5333
9.426	1.921	10.677	10.419	-0.322	1.743	2.959E 05	.0272	0.742	2.948E 05	0.724	0.048	0.5378
9.993	2.034	11.782	11.418	-0.363	1.767	2.989E 05	.0273	0.775	2.978E 05	0.751	0.050	0.5428

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
AIR TEST DATA

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3600
BAROMETRIC PRESSURE = 28.865 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
TYPE E METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 9, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.3022 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
109.5	108.0	108.0	109.0	109.0	0.84	-0.004	0.123	0.	0.	0.61	0.098	0.712	0.154	520.30
109.5	107.0	107.0	108.5	108.3	1.35	0.	0.211	-0.005	0.	0.98	0.147	1.154	0.257	519.85
109.8	106.3	106.3	108.5	108.0	1.92	-0.011	0.295	-0.016	0.005	1.45	0.221	1.660	0.361	519.63
109.8	105.5	105.5	107.5	107.5	2.41	-0.007	0.368	-0.013	0.009	1.84	0.270	2.088	0.470	519.62
110.0	105.0	105.0	107.5	107.5	2.75	-0.014	0.418	-0.014	0.011	2.14	0.295	2.456	0.538	519.62
110.0	103.5	103.5	106.5	106.3	3.44	0.011	0.540	0.004	0.007	2.68	0.359	3.021	0.629	518.72
110.0	102.0	102.0	106.3	105.2	4.27	0.	0.786	0.016	0.007	3.24	0.418	3.625	0.650	518.72
110.0	100.3	100.5	105.5	104.9	4.79	-0.014	0.982	-0.014	0.031	3.86	0.491	4.323	0.788	518.27
110.0	99.8	100.0	105.5	104.5	5.38	-0.018	1.081	-0.043	0.020	4.25	0.580	4.804	0.842	519.61
101.5	90.0	90.5	96.5	95.5	5.54	0.	0.909	-0.036	0.031	5.03	0.712	5.713	1.149	520.98
100.0	87.5	88.0	94.5	93.5	6.02	-0.007	1.007	-0.054	0.027	5.48	0.712	6.179	1.265	520.52
101.0	87.0	87.5	95.0	93.5	6.51	-0.036	1.081	-0.043	0.022	6.18	0.810	6.926	1.373	520.07
99.5	84.5	85.2	93.0	92.0	6.93	-0.027	1.154	-0.040	0.013	6.73	0.860	7.540	1.481	518.49
100.0	83.5	84.5	93.2	91.8	7.34	-0.014	1.228	-0.033	0.025	7.29	0.933	8.154	1.554	519.16
99.5	82.5	83.5	92.0	90.5	7.59	-0.018	1.253	-0.014	0.011	7.54	0.973	8.473	1.604	517.59
96.0	77.3	78.0	88.5	86.5	8.18	-0.014	1.351	0.	0.007	8.60	1.081	9.603	1.749	519.16

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
~~Atomic Energy Act 1954~~

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	3600	RUN NUMBER	1	DATE RUN	DECEMBER 9, 1963
BAROMETRIC PRESSURE	= 28.865 IN HG	TYPE E METERING RING		TYPE B SPACER PLATE	
METERING RING CLEARANCE	= 0.065	ANNULUS CLEARANCE	= 0.130	METERING RING AREA RATIO	= .250
EQUIVALENT DIAMETER	= 0.2507	ANNULUS AREA	= 0.4533 SQ IN	METERING RING AREA	= 0.3022 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.831	0.125	0.712	0.716	0.004	1.333	1.061E 05	.0166	0.503	1.057E 05	0.506	0.006	0.1917
1.351	0.211	1.157	1.153	0.020	1.382	1.329E 05	.0179	0.519	1.324E 05	0.517	0.020	0.2401
1.905	0.300	1.671	1.694	0.014	1.357	1.595E 05	.0176	0.520	1.590E 05	0.527	0.009	0.2881
2.424	0.372	2.098	2.151	0.028	1.396	1.775E 05	.0175	0.525	1.769E 05	0.538	0.015	0.3205
2.762	0.425	2.469	2.492	0.048	1.377	1.909E 05	.0173	0.533	1.902E 05	0.538	0.023	0.3448
3.477	0.535	3.022	3.086	0.048	1.460	2.085E 05	.0182	0.546	2.077E 05	0.557	0.019	0.3760
4.307	0.786	3.621	3.655	0.000	1.600	2.216E 05	.0236	0.573	2.208E 05	0.579	0.000	0.3997
4.813	0.990	4.345	4.363	-0.007	1.586	2.356E 05	.0262	0.606	2.348E 05	0.609	0.002	0.4247
5.403	1.090	4.836	4.811	-0.049	1.597	2.480E 05	.0257	0.602	2.471E 05	0.599	0.013	0.4478
5.591	0.909	5.746	5.795	0.014	1.396	2.595E 05	.0180	0.602	2.586E 05	0.607	0.003	0.4696
6.069	1.011	6.220	6.318	0.088	1.436	2.652E 05	.0189	0.613	2.642E 05	0.623	0.018	0.4795
6.540	1.099	6.958	7.085	0.063	1.429	2.775E 05	.0189	0.631	2.765E 05	0.642	0.012	0.5015
6.970	1.168	7.566	7.698	0.083	1.455	2.832E 05	.0191	0.651	2.821E 05	0.663	0.015	0.5105
7.401	1.235	8.183	8.308	0.051	1.471	2.904E 05	.0192	0.668	2.893E 05	0.678	0.009	0.5240
7.643	1.262	8.486	8.565	0.040	1.495	2.931E 05	.0192	0.680	2.921E 05	0.686	0.007	0.5277
8.271	1.358	9.607	9.712	0.032	1.523	2.963E 05	.0193	0.718	2.952E 05	0.725	0.005	0.5347

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
~~Atomic Energy Act 1954~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3700
BAROMETRIC PRESSURE = 28.885 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
TYPE F METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 9, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.2832 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	109.0	109.0	109.5	109.5	0.61	0.	0.098	0.	0.004	0.52	0.098	0.614	0.116	522.10
110.0	107.5	107.5	109.0	109.0	1.20	0.	0.187	0.	0.004	1.06	0.177	1.203	0.231	521.65
109.5	106.3	106.3	108.3	108.0	1.57	0.	0.236	0.	0.004	1.45	0.221	1.646	0.311	520.97
111.0	107.0	107.0	109.5	109.0	2.06	-0.005	0.295	0.	0.011	1.92	0.344	2.210	0.372	519.40
110.0	105.0	105.0	108.0	107.5	2.60	0.	0.393	0.	0.	2.43	0.393	2.800	0.517	521.42
110.0	103.5	103.5	107.0	106.8	3.14	0.	0.491	0.	0.009	2.97	0.491	3.414	0.636	520.75
109.5	102.5	102.5	106.5	106.0	3.59	0.004	0.540	0.007	0.007	3.44	0.540	3.930	0.712	520.52
110.5	101.9	102.5	107.0	106.5	4.08	0.005	0.604	-0.007	0.011	3.98	0.639	4.593	0.824	520.29
110.0	100.5	101.0	106.5	105.5	4.40	0.014	0.589	-0.014	0.009	4.35	0.688	5.010	0.896	518.94
99.8	87.5	88.0	94.5	93.5	5.38	0.	0.835	0.007	0.	5.64	0.801	6.386	1.113	519.84
99.5	86.0	87.0	94.0	93.0	5.85	0.	0.909	-0.007	0.014	6.02	0.884	7.147	1.221	519.16
100.0	85.5	86.5	94.5	93.0	6.16	-0.014	0.958	-0.004	0.020	6.75	0.973	7.687	1.286	518.04
99.8	84.0	85.0	93.5	92.5	6.56	0.	1.032	-0.011	0.020	7.29	1.032	8.326	1.362	519.16
99.8	84.0	85.0	93.5	92.5	6.70	0.	1.081	-0.047	0.025	7.54	0.589	8.621	1.420	518.71
110.3	83.0	84.5	93.5	92.5	7.12	0.	1.130	-0.036	0.029	8.20	1.154	9.333	1.528	518.71
100.0	81.5	83.0	93.0	91.5	7.49	0.	1.179	-0.014	0.025	8.82	1.253	10.011	1.601	518.71
94.0	72.3	73.5	85.5	84.5	8.44	-0.022	1.326	-0.036	0.007	10.76	1.424	12.182	1.806	518.49

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act of 1954

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act of 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3700
BAROMETRIC PRESSURE = 28.885 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
TYPE F METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 9, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.2832 SQ IN

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.614	0.098	0.616	0.593	-0.022	1.327	9.114E 04	.0176	0.516	9.081E 04	0.498	0.048	0.1652
1.203	0.187	1.205	1.210	-0.024	1.363	1.260E 05	.0175	0.527	1.256E 05	0.529	0.027	0.2282
1.572	0.236	1.647	1.657	-0.015	1.330	1.457E 05	.0165	0.536	1.452E 05	0.539	0.012	0.2637
2.081	0.297	2.216	2.164	-0.101	1.365	1.672E 05	.0160	0.556	1.666E 05	0.543	0.064	0.3018
2.632	0.393	2.800	2.776	-0.049	1.355	1.871E 05	.0165	0.549	1.864E 05	0.544	0.024	0.3387
3.175	0.491	3.418	3.398	-0.069	1.374	2.044E 05	.0173	0.560	2.036E 05	0.557	0.028	0.3697
3.628	0.539	3.930	3.907	-0.072	1.403	2.158E 05	.0169	0.573	2.151E 05	0.570	0.026	0.3903
4.127	0.601	4.602	4.530	-0.096	1.385	2.328E 05	.0163	0.580	2.319E 05	0.571	0.030	0.4208
4.459	0.582	5.022	4.949	-0.097	1.402	2.408E 05	.0147	0.591	2.400E 05	0.583	0.028	0.4345
5.435	0.835	6.382	6.365	-0.071	1.447	2.502E 05	.0177	0.627	2.493E 05	0.625	0.017	0.4520
5.905	0.909	7.158	6.813	-0.099	1.453	2.604E 05	.0177	0.646	2.595E 05	0.615	0.021	0.4699
6.236	0.965	7.699	7.592	-0.147	1.453	2.689E 05	.0178	0.656	2.679E 05	0.647	0.030	0.4844
6.650	1.032	8.341	8.185	-0.156	1.475	2.746E 05	.0180	0.673	2.736E 05	0.661	0.030	0.4956
6.798	1.081	8.657	8.479	0.313	1.470	2.784E 05	.0184	0.680	2.774E 05	0.666	0.058	0.5021
7.213	1.130	9.365	9.195	-0.194	1.608	2.866E 05	.0198	0.760	2.855E 05	0.746	0.037	0.5168
7.582	1.179	10.031	9.848	-0.242	1.498	2.915E 05	.0182	0.714	2.905E 05	0.701	0.040	0.5257
8.512	1.337	12.203	11.932	-0.272	1.552	2.956E 05	.0188	0.789	2.945E 05	0.772	0.039	0.5328

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3800
BAROMETRIC PRESSURE = 29.320 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE F METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 10, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.1611 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	108.5	110.0	110.0	0.54	0.	0.123	-0.007	-0.020	1.28	0.	1.253	0.070	524.35
110.5	107.0	107.0	109.8	109.6	1.08	0.	0.221	-0.011	-0.051	2.60	0.	2.628	0.132	523.23
110.0	104.5	104.0	108.5	108.3	1.67	0.005	0.344	-0.014	-0.108	4.09	0.049	4.003	0.206	522.10
110.0	102.0	102.0	108.3	107.5	2.19	0.009	0.467	-0.020	-0.190	5.62	0.074	5.541	0.264	521.43
109.9	100.0	99.8	107.5	107.0	2.75	0.014	0.565	-0.022	-0.237	7.17	0.123	6.990	0.325	521.65
110.0	98.8	98.5	107.5	106.5	3.09	0.016	0.639	-0.023	-0.269	8.30	0.138	8.154	0.376	520.30
110.0	95.5	95.3	106.5	106.0	3.78	0.016	0.786	-0.016	-0.289	10.49	0.147	10.315	0.495	519.84
109.3	92.8	92.5	105.5	104.5	4.27	0.023	0.884	-0.029	-0.350	12.03	0.172	11.862	0.537	518.72
110.5	91.0	91.0	106.5	105.5	4.85	0.029	1.007	-0.029	-0.448	14.49	0.172	14.245	0.643	520.07
110.0	88.0	87.5	105.0	103.7	5.30	0.036	1.130	-0.043	-0.520	16.28	0.221	16.038	0.701	518.94
110.0	83.5	83.0	104.0	103.0	6.01	0.043	1.277	-0.054	-0.547	19.65	0.309	19.402	0.820	518.71
110.5	80.5	80.0	104.5	103.0	6.53	0.049	1.375	-0.051	-0.643	23.04	0.540	22.325	0.921	518.49
110.0	76.8	75.8	103.5	102.0	7.00	0.045	1.474	-0.054	-0.674	25.71	0.702	25.228	1.004	518.48
110.0	70.8	70.2	102.8	101.0	7.56	0.040	1.572	-0.054	-1.060	30.99	0.516	30.233	1.120	517.80
109.5	60.2	60.2	102.0	100.0	8.01	0.040	1.670	-0.045	-1.853	39.84	0.393	39.841	1.373	518.93

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3800
BAROMETRIC PRESSURE = 29.320 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE F METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 10, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.1611 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.540	0.119	1.246	1.328	0.057	1.575	5.764E 04	.0213	0.855	5.743E 04	0.910	0.163	0.1038
1.081	0.217	2.608	2.697	0.113	1.548	8.260E 04	.0190	0.875	8.229E 04	0.905	0.157	0.1485
1.675	0.338	3.956	4.236	0.240	1.621	1.006E 05	.0199	0.891	1.002E 05	0.954	0.221	0.1806
2.195	0.459	5.456	5.812	0.347	1.587	1.165E 05	.0201	0.914	1.161E 05	0.973	0.234	0.2090
2.765	0.554	6.882	7.398	0.457	1.598	1.302E 05	.0193	0.916	1.298E 05	0.984	0.242	0.2336
3.111	0.627	8.031	8.565	0.524	1.606	1.383E 05	.0194	0.951	1.378E 05	1.014	0.245	0.2476
3.798	0.774	10.179	10.819	0.616	1.604	1.531E 05	.0195	0.980	1.525E 05	1.041	0.229	0.2739
4.318	0.869	11.702	12.401	0.699	1.643	1.613E 05	.0197	1.009	1.607E 05	1.069	0.230	0.2881
4.908	0.989	14.035	14.926	0.817	1.625	1.732E 05	.0194	1.047	1.725E 05	1.114	0.227	0.3099
5.369	1.108	15.799	16.759	0.935	1.654	1.797E 05	.0201	1.091	1.790E 05	1.158	0.237	0.3210
6.082	1.252	19.156	20.204	1.112	1.658	1.911E 05	.0200	1.163	1.904E 05	1.226	0.239	0.3413
6.615	1.347	22.029	23.654	1.453	1.652	2.002E 05	.0196	1.218	1.995E 05	1.308	0.276	0.3574
7.081	1.447	24.918	26.385	1.682	1.656	2.065E 05	.0197	1.284	2.057E 05	1.360	0.288	0.3686
7.643	1.548	29.730	31.732	1.757	1.689	2.127E 05	.0198	1.440	2.120E 05	1.536	0.267	0.3794
8.086	1.647	38.937	40.755	1.425	1.693	2.175E 05	.0199	1.777	2.167E 05	1.860	0.181	0.3886

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act - 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3900
BAROMETRIC PRESSURE = 29.360 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE E METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 10, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.1801 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	108.3	109.6	109.6	0.56	0.004	0.098	0.	0.	1.15	0.049	1.090	0.085	521.88
109.5	106.0	105.8	108.5	108.3	1.13	0.007	0.231	0.007	-0.056	2.33	0.123	2.260	0.072	521.88
109.3	104.5	104.0	108.0	107.5	1.72	0.011	0.319	0.011	-0.098	3.56	0.123	3.414	0.108	522.10
110.0	103.0	103.0	108.3	107.8	2.16	0.011	0.442	0.009	-0.137	4.72	0.123	4.593	0.166	521.88
110.0	102.0	101.3	107.5	107.0	2.51	0.016	0.491	0.011	-0.165	5.55	0.147	5.379	0.213	521.88
110.0	100.0	99.8	107.0	106.5	3.05	0.029	0.614	0.013	-0.173	6.88	0.196	6.656	0.282	521.20
110.0	98.0	97.5	107.0	106.0	3.63	0.042	0.737	0.023	-0.188	8.40	0.246	8.129	0.369	521.65
109.5	96.0	95.5	106.0	105.0	4.08	0.051	0.810	0.009	-0.210	9.63	0.295	9.308	0.405	521.43
110.0	93.5	92.3	105.2	104.5	4.91	0.034	0.982	0.007	-0.302	12.16	0.368	11.740	0.484	521.65
109.8	90.9	90.1	104.8	103.5	5.33	0.042	1.056	-0.004	-0.318	13.51	0.393	13.041	0.538	521.43
110.0	86.0	86.0	104.2	103.0	6.31	0.054	1.228	-0.014	-0.452	17.00	0.491	16.504	0.650	521.20
110.5	83.0	82.5	104.0	102.8	7.00	0.065	1.375	-0.016	-0.542	20.07	0.540	19.501	0.672	521.20
110.0	80.0	79.5	103.0	101.5	7.47	0.054	1.474	-0.004	-0.632	22.35	0.614	21.686	0.715	521.65
110.8	75.0	74.5	103.0	101.0	8.08	0.079	1.621	-0.029	-0.710	26.79	0.678	26.029	0.759	521.20
110.0	70.0	69.5	101.5	99.8	8.65	0.061	1.744	-0.031	-0.831	30.48	0.688	29.231	0.744	520.98

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
~~Atomic Energy Act of 1954~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 3900
BAROMETRIC PRESSURE = 29.360 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE E METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 10, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.1801 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.568	0.096	1.090	1.210	0.105	1.607	5.888E 04	.0167	0.907	5.867E 04	1.006	0.291	0.1057
1.137	0.227	2.228	2.383	0.204	1.595	8.343E 04	.0195	0.914	8.312E 04	0.977	0.278	0.1497
1.730	0.314	3.360	3.630	0.246	1.632	1.016E 05	.0180	0.922	1.012E 05	0.996	0.222	0.1824
2.172	0.437	4.520	4.824	0.305	1.557	1.169E 05	.0190	0.938	1.165E 05	1.001	0.206	0.2098
2.521	0.483	5.290	5.691	0.376	1.577	1.252E 05	.0182	0.954	1.247E 05	1.027	0.219	0.2247
3.074	0.600	6.563	7.061	0.473	1.585	1.381E 05	.0186	0.971	1.376E 05	1.044	0.224	0.2476
3.696	0.716	8.024	8.636	0.588	1.607	1.502E 05	.0186	0.995	1.497E 05	1.071	0.230	0.2695
4.149	0.785	9.199	9.901	0.677	1.612	1.587E 05	.0182	1.014	1.581E 05	1.092	0.233	0.2846
4.973	0.965	11.585	12.487	0.853	1.629	1.731E 05	.0187	1.068	1.725E 05	1.151	0.240	0.3105
5.401	1.035	12.864	13.875	0.917	1.634	1.800E 05	.0185	1.093	1.794E 05	1.177	0.234	0.3228
6.400	1.201	16.286	17.439	1.153	1.657	1.949E 05	.0182	1.171	1.942E 05	1.254	0.241	0.3494
7.101	1.343	19.238	20.536	1.274	1.660	2.056E 05	.0183	1.239	2.048E 05	1.323	0.232	0.3685
7.560	1.447	21.372	22.833	1.412	1.664	2.112E 05	.0184	1.290	2.104E 05	1.378	0.235	0.3789
8.199	1.581	25.688	27.320	1.543	1.654	2.216E 05	.0184	1.412	2.208E 05	1.502	0.223	0.3972
8.750	1.713	28.831	30.983	1.592	1.680	2.265E 05	.0189	1.499	2.257E 05	1.611	0.209	0.4059

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

Astronuclear
WANI-TME-669

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
~~Atomic Energy Act of 1954~~

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act - 1954

Astronuclear
WANI-TME-669

APPENDIX "A" SECTION 2

AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4000
BAROMETRIC PRESSURE = 29.300 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 3
TYPE E METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN JANUARY 17, 1964
TYPE B SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.0755 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
119.5	118.2	117.5	119.5	119.3	0.39	0.	0.098	0.011	0.074	1.92	0.221	1.719	0.011	523.01
119.8	117.0	116.3	119.5	119.3	0.66	0.	0.147	0.020	0.119	3.17	0.344	2.824	0.016	521.21
120.0	115.9	115.2	120.0	119.5	0.91	0.	0.196	0.028	0.197	4.59	0.476	4.087	0.027	520.08
120.0	114.0	113.1	119.5	119.0	1.18	0.	0.270	0.036	0.264	5.92	0.599	5.295	0.036	518.50
120.0	112.5	111.5	119.3	118.7	1.47	0.	0.344	0.047	0.331	7.49	0.747	6.705	0.054	517.59
120.0	110.6	109.5	119.0	118.2	1.74	0.	0.393	0.052	0.390	8.94	0.909	8.007	0.069	517.37
120.0	108.9	107.2	118.6	117.5	2.01	0.	0.467	0.061	0.452	10.56	1.081	9.480	0.079	517.82
120.0	106.0	104.5	118.0	117.2	2.36	0.	0.540	0.072	0.544	12.87	1.302	11.519	0.098	517.59
120.1	104.0	102.5	118.3	117.2	2.73	0.	0.639	0.079	0.659	15.23	1.523	13.680	0.108	517.37
120.0	101.5	99.6	117.5	116.6	3.08	-0.010	0.688	0.085	0.710	17.44	1.758	15.645	0.119	517.37
120.0	98.5	96.5	117.0	116.0	3.91	0.	0.810	0.094	0.777	20.11	1.989	18.076	0.126	518.72
120.0	95.2	93.0	117.0	115.5	3.78	0.	0.884	0.103	0.900	23.14	2.260	20.827	0.155	518.95
119.9	91.2	88.7	116.0	114.6	4.18	0.	0.982	0.108	0.961	26.52	2.554	23.946	0.145	518.50
120.0	88.0	85.5	116.1	115.0	4.52	0.011	1.032	0.110	1.050	30.01	2.849	27.011	0.159	519.40
120.0	83.1	79.9	115.9	114.5	4.91	0.014	1.169	0.116	1.106	34.95	3.144	31.398	0.159	518.50
120.1	76.8	73.5	115.5	114.0	5.34	0.018	1.277	0.116	0.988	40.54	3.193	37.238	0.166	517.59
120.0	56.0	56.5	115.0	113.0	5.80	0.022	1.400	0.107	-1.445	56.56	0.442	57.063	0.191	518.50

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act - 1954

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4000
BAROMETRIC PRESSURE = 29.300 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 3
TYPE E METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN JANUARY 17, 1964
TYPE B SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.0755 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.393	0.104	1.751	1.919	0.192	1.606	3.496E 04	.0180	0.791	6.133E 04	0.867	0.773	0.0623
0.663	0.153	2.874	3.171	0.297	1.639	4.520E 04	.0160	0.784	7.928E 04	0.865	0.714	0.0803
0.909	0.202	4.171	4.603	0.403	1.558	5.446E 04	.0146	0.787	9.552E 04	0.869	0.663	0.0966
1.179	0.276	5.409	5.935	0.501	1.579	6.186E 04	.0156	0.795	1.085E 05	0.872	0.637	0.1095
1.474	0.349	6.847	7.511	0.625	1.581	6.926E 04	.0158	0.804	1.215E 05	0.882	0.627	0.1225
1.744	0.398	8.175	8.967	0.767	1.591	7.515E 04	.0153	0.815	1.318E 05	0.894	0.646	0.1328
2.014	0.472	9.675	10.595	0.920	1.589	8.072E 04	.0156	0.832	1.416E 05	0.911	0.660	0.1428
2.358	0.546	11.754	12.909	1.106	1.573	8.783E 04	.0152	0.852	1.541E 05	0.935	0.657	0.1553
2.726	0.644	13.970	15.275	1.281	1.567	9.474E 04	.0154	0.869	1.662E 05	0.950	0.641	0.1674
3.075	0.698	15.957	17.487	1.495	1.591	9.981E 04	.0150	0.890	1.751E 05	0.976	0.660	0.1764
3.905	0.816	18.418	20.180	1.713	1.818	1.049E 05	.0157	0.918	1.839E 05	1.006	0.660	0.1857
3.782	0.890	21.225	23.219	1.945	1.582	1.106E 05	.0154	0.951	1.939E 05	1.040	0.657	0.1959
4.175	0.988	24.372	26.605	2.209	1.604	1.155E 05	.0156	0.999	2.025E 05	1.090	0.662	0.2044
4.530	1.032	27.481	30.119	2.486	1.598	1.203E 05	.0150	1.031	2.110E 05	1.130	0.661	0.2132
4.926	1.167	31.892	35.074	2.774	1.615	1.250E 05	.0157	1.107	2.193E 05	1.218	0.652	0.2214
5.362	1.274	37.674	40.706	2.919	1.619	1.306E 05	.0157	1.200	2.291E 05	1.296	0.591	0.2310
5.818	1.395	56.287	56.823	0.595	1.629	1.353E 05	.0159	1.655	2.373E 05	1.671	0.088	0.2395

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
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CONFIDENTIAL
RESTRICTED DATA

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4100
BAROMETRIC PRESSURE = 29.375 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 1
TYPE F METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN DECEMBER 13, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.0565 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	118.5	118.0	120.0	120.0	0.29	0.	0.074	0.	-0.043	1.96	0.098	1.817	0.007	531.96
120.0	116.5	116.0	120.0	120.0	0.56	0.004	0.123	0.004	-0.089	4.03	0.221	3.733	0.014	531.07
118.5	113.3	112.5	118.5	118.3	0.88	0.005	0.221	0.009	-0.085	5.87	0.393	5.403	0.020	532.18
119.5	112.5	112.0	119.5	119.0	1.06	0.005	0.270	0.011	-0.155	7.12	0.393	6.705	0.029	529.29
120.0	111.0	110.3	119.5	119.5	1.28	0.004	0.319	0.013	-0.072	8.79	0.442	8.301	0.029	528.17
120.0	108.2	107.3	119.0	118.5	1.60	0.	0.393	0.013	-0.007	11.17	0.688	10.512	0.043	528.39
120.0	105.5	104.0	119.0	118.5	1.92	0.	0.491	0.014	0.	13.80	0.860	12.869	0.054	528.17
120.0	103.8	102.2	118.3	117.6	2.11	0.	0.516	0.014	0.	15.60	1.081	14.515	0.065	527.50
120.0	101.0	100.0	118.5	117.8	2.36	-0.004	0.589	0.018	0.031	18.22	1.179	17.020	0.054	525.71
120.0	97.2	96.0	118.0	117.0	2.70	0.	0.688	0.018	-0.036	21.44	1.375	20.090	0.065	526.82
119.8	83.7	82.0	117.2	116.5	3.00	0.005	0.761	0.018	0.065	24.76	1.719	23.062	0.061	526.15
120.0	89.9	87.0	117.5	116.5	3.29	0.	0.835	0.016	0.144	28.71	2.137	26.628	0.069	526.82
120.0	85.5	82.8	117.0	116.5	3.63	-0.011	0.884	0.023	0.193	33.48	2.569	31.034	0.065	524.58
120.0	76.2	72.5	116.5	115.5	4.05	-0.011	1.007	0.016	0.181	43.04	3.659	39.340	0.051	526.60
120.0	66.0	61.0	116.5	115.5	4.27	-0.018	1.081	0.022	0.141	54.56	4.912	49.552	0.152	524.13
120.0	54.0	49.5	116.3	115.0	4.37	-0.009	1.081	0.036	0.379	65.57	4.421	61.066	0.036	525.03

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

CONFIDENTIAL
RESTRICTED DATA

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy 1954

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MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4100
BAROMETRIC PRESSURE = 29.375 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 1
TYPE F METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN DECEMBER 13, 1963
TYPE B SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.0565 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.295	0.074	1.796	1.968	0.124	1.515	3.056E 04	.0161	0.572	7.119E 04	0.627	0.625	0.0552
0.568	0.121	3.687	4.037	0.276	1.414	4.403E 04	.0127	0.567	1.025E 05	0.621	0.665	0.0794
0.890	0.218	5.356	5.878	0.448	1.528	5.256E 04	.0158	0.567	1.224E 05	0.622	0.732	0.0949
1.061	0.267	6.622	7.135	0.488	1.478	5.900E 04	.0157	0.567	1.374E 05	0.611	0.639	0.1061
1.281	0.317	8.259	8.811	0.504	1.446	6.581E 04	.0151	0.573	1.533E 05	0.611	0.527	0.1182
1.596	0.393	10.502	11.207	0.730	1.450	7.335E 04	.0150	0.584	1.708E 05	0.623	0.601	0.1318
1.916	0.491	12.862	13.826	0.890	1.448	8.045E 04	.0156	0.593	1.874E 05	0.638	0.596	0.1445
2.112	0.516	14.508	15.625	1.117	1.449	8.456E 04	.0148	0.607	1.970E 05	0.653	0.669	0.1517
2.354	0.591	17.026	18.272	1.221	1.423	9.049E 04	.0149	0.626	2.108E 05	0.671	0.629	0.1619
2.702	0.688	20.063	21.493	1.455	1.454	9.564E 04	.0154	0.654	2.228E 05	0.701	0.646	0.1714
3.002	0.759	23.085	24.806	1.746	1.466	1.005E 05	.0154	0.681	2.340E 05	0.732	0.682	0.1799
3.291	0.835	26.692	28.774	2.136	1.442	1.060E 05	.0152	0.704	2.469E 05	0.759	0.721	0.1900
3.624	0.890	31.119	33.538	2.547	1.468	1.108E 05	.0149	0.757	2.582E 05	0.816	0.758	0.1980
4.042	1.012	39.422	43.110	3.644	1.463	1.167E 05	.0151	0.854	2.717E 05	0.933	0.883	0.2091
4.255	1.090	49.612	54.708	5.003	1.457	1.207E 05	.0154	1.014	2.811E 05	1.118	1.012	0.2155
4.363	1.085	61.238	65.663	4.342	1.459	1.218E 05	.0149	1.221	2.838E 05	1.310	0.732	0.2178

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy 1954

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
Atomic Energy Act 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4200
BAROMETRIC PRESSURE = 29.690 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 3
TYPE B METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN JANUARY 20, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.0565 SQ IN

P1	P3A	P4	P6A	P8A	DP16A	DP6A6B	DP6A8A	DP8A8B	DP3A3B	DP8A4	DP3A4	DP8A3A	DP44A	TR
PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	R
120.0	118.0	117.9	120.0	120.0	0.35	0.007	0.074	0.011	0.	2.60	0.	2.603	0.009	522.11
119.8	114.0	113.9	119.5	119.0	0.74	0.011	0.172	0.020	-0.007	5.55	0.025	5.477	0.025	520.98
120.0	112.5	112.0	119.5	119.0	0.93	0.013	0.187	0.025	-0.004	7.10	0.	7.049	0.034	520.08
120.2	110.0	109.8	119.5	119.0	1.23	0.018	0.270	0.029	0.014	9.77	0.	9.677	0.047	520.08
120.0	106.0	105.0	118.9	118.0	1.57	0.025	0.354	0.034	0.036	12.94	0.074	12.845	0.056	519.63
120.1	102.5	102.0	119.0	118.0	1.92	0.027	0.418	0.051	0.060	16.46	0.074	16.406	0.065	519.63
120.0	98.8	98.2	118.7	117.5	2.23	0.032	0.491	0.058	0.078	19.97	0.098	19.869	0.083	519.40
120.0	95.2	95.0	118.2	117.0	2.43	0.032	0.516	0.065	0.087	22.69	0.098	22.546	0.087	519.63
120.0	90.0	89.6	118.0	117.0	2.82	0.025	0.589	0.081	0.094	27.83	0.108	27.006	0.108	518.05
120.0	84.5	84.2	117.3	116.5	3.12	0.029	0.639	0.096	0.099	32.74	0.157	32.002	0.123	517.14
120.0	80.9	80.5	117.2	116.4	3.29	0.029	0.663	0.098	0.092	36.30	0.172	35.504	0.130	516.69
120.2	73.4	72.8	117.3	116.5	3.54	0.045	0.761	0.105	0.052	43.75	0.196	43.343	0.163	516.01
120.0	55.2	55.0	117.0	115.5	3.78	0.052	0.786	0.112	-0.094	60.56	0.221	60.364	0.173	514.64
120.0	44.5	44.0	116.9	115.4	3.78	0.049	0.810	0.112	-0.163	71.47	0.452	70.973	0.033	514.42

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4200
BAROMETRIC PRESSURE = 29.690 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 3
TYPE B METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN JANUARY 20, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .750
METERING RING AREA = 0.0565 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.361	0.075	2.598	2.605	0.007	1.955	3.051E 04	.0174	0.872	6.933E 04	0.874	0.038	0.0543
0.748	0.172	5.463	5.558	0.046	1.923	4.437E 04	.0187	0.867	1.008E 05	0.882	0.112	0.0788
0.946	0.186	7.034	7.109	0.025	1.927	5.000E 04	.0160	0.883	1.136E 05	0.892	0.048	0.0887
1.246	0.267	9.669	9.792	0.024	1.908	5.772E 04	.0172	0.910	1.312E 05	0.921	0.034	0.1024
1.597	0.346	12.846	12.963	0.092	1.922	6.512E 04	.0175	0.947	1.480E 05	0.956	0.099	0.1155
1.943	0.409	16.411	16.473	0.087	1.910	7.207E 04	.0169	0.985	1.638E 05	0.989	0.074	0.1278
2.267	0.481	19.879	19.994	0.115	1.916	7.776E 04	.0170	1.023	1.767E 05	1.029	0.081	0.1378
2.463	0.505	22.557	22.724	0.118	1.904	8.127E 04	.0163	1.060	1.847E 05	1.067	0.074	0.1441
2.850	0.582	27.012	27.861	0.136	1.911	8.759E 04	.0163	1.097	1.991E 05	1.131	0.070	0.1550
3.148	0.630	32.003	32.781	0.198	1.916	9.214E 04	.0159	1.177	2.094E 05	1.205	0.088	0.1628
3.320	0.654	35.501	36.347	0.222	1.913	9.479E 04	.0156	1.234	2.154E 05	1.264	0.091	0.1674
3.582	0.744	43.317	43.814	0.291	1.897	9.911E 04	.0163	1.380	2.252E 05	1.396	0.100	0.1748
3.835	0.765	60.261	60.645	0.409	1.938	1.017E 05	.0160	1.828	2.312E 05	1.839	0.107	0.1791
3.831	0.792	70.836	71.490	0.604	1.925	1.021E 05	.0164	2.136	2.320E 05	2.156	0.133	0.1796

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
~~Atomic Energy Act - 1954~~

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
~~Atomic Energy Act - 1954~~

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4300
BAROMETRIC PRESSURE = 29.720 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 3
TYPE C METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN JANUARY 20, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.0755 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
120.0	119.2	119.0	120.0	119.6	0.37	0.005	0.088	0.014	0.005	1.28	0.	1.302	0.014	520.53
120.0	117.0	117.2	120.0	119.6	0.79	0.009	0.157	0.030	0.004	2.90	0.	2.898	0.029	519.18
120.0	115.5	115.5	119.7	119.2	1.13	0.014	0.246	0.038	0.007	4.22	0.025	4.151	0.036	517.14
119.9	114.0	113.8	119.0	118.5	1.33	0.018	0.295	0.045	0.014	4.99	0.059	4.912	0.043	515.78
120.0	113.0	113.0	119.0	118.5	1.57	0.018	0.344	0.052	0.014	5.97	0.069	5.894	0.054	515.10
120.0	112.0	111.9	119.0	118.3	1.77	0.022	0.393	0.060	0.018	6.83	0.093	6.729	0.067	514.42
120.1	110.0	109.9	119.0	118.0	2.19	0.023	0.467	0.072	0.023	8.60	0.098	8.498	0.079	514.42
120.0	107.5	107.0	118.0	117.0	2.53	0.025	0.516	0.085	0.034	10.12	0.108	10.011	0.090	513.51
120.2	106.0	105.8	118.3	117.3	2.85	0.016	0.589	0.098	0.043	11.79	0.123	11.641	0.108	513.05
120.0	103.1	102.8	117.5	116.3	3.27	0.022	0.688	0.110	0.043	13.85	0.172	13.655	0.119	512.60
120.1	100.0	99.0	117.3	116.2	3.68	0.029	0.786	0.130	0.049	16.58	0.187	16.357	0.137	512.37
120.0	96.7	96.2	116.5	115.0	4.13	0.033	0.884	0.152	0.050	19.67	0.196	18.911	0.164	511.92
120.1	91.3	91.0	116.2	114.9	4.81	0.060	1.032	0.170	0.049	24.17	0.221	23.799	0.188	512.14
120.0	86.5	86.0	115.3	114.0	5.26	0.078	1.154	0.184	0.049	28.44	0.295	27.497	0.220	512.37
119.5	75.6	75.0	114.0	112.5	6.12	0.083	1.302	0.228	0.051	37.54	0.418	36.904	0.191	512.37
119.9	57.8	57.0	113.5	112.0	6.58	0.108	1.375	0.253	-0.098	55.06	0.614	54.258	0.036	511.69

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
1734

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4300
BAROMETRIC PRESSURE = 29.720 IN HG
METERING RING CLEARANCE = 0.
EQUIVALENT DIAMETER = 0.1276

RUN NUMBER 3
TYPE C METERING RING
ANNULUS CLEARANCE = 0.065
ANNULUS AREA = 0.2267 SQ IN

DATE RUN JANUARY 20, 1964
TYPE A SPACER PLATE
METERING RING AREA RATIO = 0.250
METERING RING AREA = 0.0755 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.374	0.093	1.298	1.282	0.009	2.057	3.039E 04	.0216	0.789	5.233E 04	0.780	0.047	0.0540
0.795	0.160	2.885	2.907	0.022	1.902	4.624E 04	.0161	0.761	7.962E 04	0.766	0.052	0.0820
1.144	0.245	4.135	4.238	0.053	1.903	5.574E 04	.0172	0.755	9.597E 04	0.774	0.085	0.0985
1.344	0.293	4.897	5.002	0.090	1.908	6.053E 04	.0175	0.762	1.042E 05	0.778	0.122	0.1067
1.590	0.342	5.875	5.992	0.112	1.892	6.623E 04	.0171	0.765	1.140E 05	0.780	0.126	0.1167
1.790	0.389	6.709	6.855	0.142	1.885	7.053E 04	.0172	0.771	1.214E 05	0.788	0.139	0.1241
2.209	0.462	8.473	8.627	0.154	1.885	7.838E 04	.0165	0.786	1.350E 05	0.801	0.120	0.1379
2.554	0.510	9.985	10.156	0.170	1.909	8.389E 04	.0159	0.810	1.444E 05	0.823	0.115	0.1474
2.865	0.588	11.614	11.834	0.195	1.869	8.997E 04	.0160	0.819	1.549E 05	0.835	0.113	0.1580
3.288	0.684	13.622	13.903	0.256	1.896	9.573E 04	.0164	0.846	1.648E 05	0.864	0.128	0.1680
3.713	0.778	16.316	16.632	0.281	1.863	1.027E 05	.0162	0.878	1.769E 05	0.895	0.119	0.1802
4.159	0.875	18.860	19.734	0.309	1.894	1.079E 05	.0164	0.918	1.858E 05	0.960	0.116	0.1892
4.873	1.009	23.738	24.245	0.359	1.904	1.165E 05	.0162	0.984	2.005E 05	1.006	0.110	0.2042
5.334	1.122	27.430	28.532	0.454	8.070	3.952E 04	.1553	9.819	6.804E 04	0.213	1.151	0.0693
6.199	1.267	36.815	37.610	0.579	1.972	1.287E 05	.0164	1.227	2.217E 05	1.254	0.123	0.2258
6.690	1.328	54.083	55.041	0.771	1.976	1.340E 05	.0159	1.667	2.308E 05	1.696	0.123	0.2349

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	4400	RUN NUMBER	1	DATE RUN	DECEMBER	1963
BAROMETRIC PRESSURE	= 29.742 IN HG	TYPE C METERING RING		TYPE A SPACER PLATE		
METERING RING CLEARANCE	= 0.030	ANNULUS CLEARANCE	= 0.095	METERING RING AREA RATIO	= 0.250	
EQUIVALENT DIAMETER	= 0.1850	ANNULUS AREA	= 0.3313 SQ IN	METERING RING AREA	= 0.1801 SQ IN	

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.5	110.0	110.0	110.5	110.5	0.52	0.004	0.098	-0.009	0.051	0.54	0.172	0.639	0.004	523.46
110.5	108.9	108.9	110.2	110.0	1.03	0.009	0.196	-0.016	0.087	0.96	0.221	1.154	0.016	524.13
110.0	107.5	107.5	109.0	109.0	1.42	0.014	0.295	-0.022	0.117	1.28	0.221	1.498	0.025	524.36
110.0	106.0	106.0	108.5	108.0	1.87	0.016	0.368	-0.027	0.163	1.69	0.295	1.989	0.040	522.78
110.0	105.5	105.8	108.5	108.0	2.21	0.022	0.467	-0.029	0.182	2.06	0.393	2.456	0.049	523.23
110.8	105.2	105.8	109.0	108.4	2.51	0.020	0.516	-0.034	0.213	2.87	0.467	2.849	0.051	522.56
109.8	103.5	103.5	107.0	106.5	2.96	0.007	0.589	-0.025	0.248	2.82	0.516	3.340	0.043	524.58
110.0	102.2	102.5	107.0	106.5	3.59	0.014	0.712	-0.007	0.287	3.41	0.663	4.077	0.045	522.56
110.0	100.5	100.1	106.5	105.5	4.25	0.042	0.884	-0.051	0.370	4.22	0.810	4.986	0.051	523.68
110.0	99.0	99.8	105.2	104.7	4.75	0.052	0.982	-0.054	0.420	4.79	0.909	5.673	0.069	521.88
110.0	97.2	98.2	105.0	104.0	5.55	0.060	1.130	-0.067	0.423	5.76	1.056	6.793	0.098	521.66
110.0	94.2	95.5	104.0	103.0	6.61	0.067	1.366	-0.087	0.562	7.20	1.351	8.473	0.079	521.88
110.0	89.0	90.8	102.0	100.2	8.30	0.085	1.253	-0.098	0.737	9.75	1.867	11.592	0.137	522.33
109.5	85.5	87.5	100.5	99.0	9.23	0.065	1.940	-0.119	0.817	11.49	2.210	13.631	0.163	523.23
110.0	80.0	82.7	99.8	97.5	10.71	0.123	2.260	-0.155	0.898	14.83	2.898	17.732	0.224	522.56
109.0	74.4	77.5	98.0	95.5	11.72	0.116	2.456	-0.164	0.952	17.93	3.488	21.465	0.318	521.21
109.0	66.0	70.8	97.0	94.0	12.50	0.103	2.652	-0.258	0.945	22.45	4.666	28.028	0.423	520.53
108.0	55.5	62.0	95.6	93.0	12.92	0.081	2.751	-0.267	1.131	30.97	6.901	37.538	0.033	519.40

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~
1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4400
BAROMETRIC PRESSURE = 29.742 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE C METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 1963
TYPE A SPACER PLATE
METERING RING AREA RATIO = 0.250
METERING RING AREA = 0.1801 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.519	0.092	0.668	0.546	-0.196	1.617	5.605E 04	.0176	0.612	5.585E 04	0.500	0.604	0.1008
1.041	0.187	1.206	0.962	-0.269	1.722	7.674E 04	.0190	0.584	7.646E 04	0.466	0.436	0.1382
1.439	0.283	1.568	1.282	-0.286	1.754	8.920E 04	.0210	0.557	8.887E 04	0.456	0.339	0.1606
1.882	0.356	2.084	1.700	-0.384	1.798	1.012E 05	.0206	0.578	1.008E 05	0.471	0.354	0.1818
2.232	0.451	2.562	2.067	-0.494	1.802	1.099E 05	.0221	0.598	1.095E 05	0.483	0.382	0.1976
2.525	0.501	2.973	2.880	-0.584	1.754	1.191E 05	.0210	0.596	1.186E 05	0.577	0.386	0.2139
2.969	0.581	3.477	2.832	-0.645	1.801	1.263E 05	.0212	0.606	1.258E 05	0.494	0.369	0.2275
3.623	0.700	4.224	3.420	-0.804	1.826	1.394E 05	.0211	0.607	1.389E 05	0.492	0.377	0.2503
4.316	0.859	5.196	4.251	-0.994	1.800	1.527E 05	.0213	0.614	1.522E 05	0.502	0.380	0.2748
4.834	0.952	5.910	4.814	-1.121	1.828	1.611E 05	.0213	0.630	1.605E 05	0.513	0.384	0.2891
5.640	1.095	7.038	5.776	-1.282	1.826	1.743E 05	.0209	0.637	1.736E 05	0.523	0.369	0.3126
6.710	1.328	8.797	7.239	-1.632	1.828	1.899E 05	.0211	0.663	1.892E 05	0.545	0.384	0.3407
8.424	1.206	12.010	9.782	-2.252	1.868	2.102E 05	.0154	0.726	2.094E 05	0.592	0.413	0.3775
9.339	1.903	14.099	11.530	-2.643	1.892	2.190E 05	.0220	0.768	2.182E 05	0.628	0.426	0.3938
10.877	2.194	18.259	14.857	-3.402	1.917	2.356E 05	.0218	0.852	2.348E 05	0.693	0.449	0.4232
11.878	2.394	22.024	17.912	-4.062	1.936	2.449E 05	.0217	0.939	2.440E 05	0.764	0.468	0.4389
12.679	2.596	28.629	22.426	-5.289	1.922	2.544E 05	.0218	1.125	2.534E 05	0.881	0.517	0.4555
13.077	2.706	38.237	31.126	-7.445	1.945	2.565E 05	.0222	1.465	2.555E 05	1.193	0.620	0.4585

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

~~CONFIDENTIAL~~
~~RESTRICTED DATA~~

CONFIDENTIAL
RESTRICTED DATA
Atomic Energy Act - 1954

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RESTRICTED DATA
Atomic Energy Act - 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4500
BAROMETRIC PRESSURE = 29.730 IN HG
METERING RING CLEARANCE = 0.030
EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1
TYPE B METERING RING
ANNULUS CLEARANCE = 0.095
ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 18, 1963
TYPE A SPACER PLATE
METERING RING AREA RATIO = 0.750
METERING RING AREA = 0.1611 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	109.0	110.0	110.0	0.54	0.004	0.098	-0.011	0.034	0.81	0.196	0.982	0.009	527.50
110.0	107.5	107.5	109.5	109.3	1.03	0.007	0.196	-0.022	0.056	1.52	0.393	1.891	0.020	527.50
110.0	106.0	106.5	109.0	108.8	1.42	0.007	0.285	-0.029	0.083	2.14	0.565	2.677	0.031	527.05
110.3	105.0	105.8	109.0	108.8	1.78	0.007	0.344	-0.036	0.115	2.73	0.712	3.414	0.036	527.05
110.0	104.5	104.8	108.7	108.2	2.05	0.	0.393	-0.042	0.132	3.17	0.786	3.930	0.033	525.93
110.0	103.0	104.0	108.1	107.5	2.38	0.007	0.472	-0.058	0.152	3.71	0.903	4.593	0.022	523.91
110.0	102.0	102.8	108.0	107.2	2.80	0.010	0.540	-0.072	0.184	4.42	1.105	5.492	0.029	525.48
110.0	99.8	100.8	107.0	106.3	3.39	0.045	0.663	-0.083	0.228	5.45	1.351	6.769	0.011	524.13
110.0	97.0	98.5	106.5	105.5	4.19	0.025	0.786	-0.090	0.267	7.00	1.768	8.734	0.014	523.68
110.0	93.7	95.6	105.0	104.2	4.94	0.038	0.982	-0.125	0.302	8.60	2.137	10.733	0.018	523.01
110.0	90.2	92.7	104.5	103.5	5.75	0.054	1.179	-0.181	0.356	10.63	2.677	13.287	0.022	523.91
112.0	88.2	91.5	104.7	104.6	6.36	0.052	1.326	-0.220	0.412	12.98	3.316	16.136	0.033	524.81
110.0	84.2	87.5	103.5	102.5	6.90	0.058	1.424	-0.112	0.421	14.59	3.610	18.150	0.036	523.68
110.2	81.0	85.1	103.2	102.0	7.44	0.070	1.523	-0.199	0.439	16.73	4.126	20.768	0.025	523.91
110.5	78.0	82.5	103.0	101.0	7.96	0.038	1.646	-0.217	0.461	18.81	4.642	23.406	0.029	523.91
111.0	72.0	77.5	102.8	101.0	8.69	0.058	1.817	-0.238	0.490	23.14	5.747	29.030	0.069	524.58
109.8	64.2	71.0	100.8	99.0	9.26	0.051	1.916	-0.289	0.383	28.00	6.754	34.836	0.217	523.68
109.0	59.0	66.5	100.0	98.0	9.38	0.043	1.940	-0.294	0.325	31.73	7.515	39.041	0.314	523.46

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4500

BAROMETRIC PRESSURE = 29.730 IN HG

METERING RING CLEARANCE = 0.030

EQUIVALENT DIAMETER = 0.1850

RUN NUMBER 1

TYPE B METERING RING

ANNULUS CLEARANCE = 0.095

ANNULUS AREA = 0.3313 SQ IN

DATE RUN DECEMBER 18, 1963

TYPE A SPACER PLATE

METERING RING AREA RATIO = 0.750

METERING RING AREA = 0.1611 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.544	0.091	1.005	0.813	-0.217	1.649	5.612E 04	.0169	0.717	5.592E 04	0.580	0.648	0.1016
1.039	0.187	1.930	1.527	-0.428	1.713	7.610E 04	.0189	0.746	7.582E 04	0.590	0.687	0.1377
1.432	0.276	2.733	2.143	-0.615	1.698	8.984E 04	.0199	0.756	8.951E 04	0.593	0.703	0.1625
1.785	0.335	3.489	2.735	-0.779	1.665	1.014E 05	.0190	0.757	1.011E 05	0.593	0.694	0.1834
2.053	0.388	4.016	3.185	-0.855	1.675	1.086E 05	.0192	0.760	1.082E 05	0.603	0.662	0.1961
2.390	0.463	4.697	3.742	-0.980	1.701	1.169E 05	.0199	0.773	1.164E 05	0.616	0.655	0.2103
2.810	0.530	5.620	4.470	-1.184	1.714	1.258E 05	.0195	0.789	1.253E 05	0.628	0.670	0.2269
3.434	0.635	6.924	5.520	-1.438	1.731	1.388E 05	.0192	0.798	1.383E 05	0.637	0.661	0.2499
4.215	0.768	8.912	7.076	-1.871	1.727	1.541E 05	.0187	0.829	1.535E 05	0.659	0.681	0.2772
4.996	0.958	10.946	8.703	-2.243	1.746	1.672E 05	.0198	0.861	1.666E 05	0.685	0.677	0.3005
5.823	1.146	13.555	10.771	-2.809	1.770	1.789E 05	.0205	0.920	1.782E 05	0.731	0.713	0.3219
6.439	1.295	16.452	13.154	-3.460	1.771	1.891E 05	.0208	1.005	1.884E 05	0.804	0.770	0.3408
6.987	1.390	18.416	14.710	-3.756	1.787	1.951E 05	.0207	1.039	1.943E 05	0.830	0.754	0.3510
7.542	1.482	21.087	16.893	-4.277	1.791	2.025E 05	.0204	1.099	2.018E 05	0.880	0.771	0.3645
8.029	1.621	23.744	18.995	-4.799	1.801	2.086E 05	.0210	1.163	2.078E 05	0.930	0.789	0.3754
8.788	1.783	29.394	23.304	-5.942	1.807	2.179E 05	.0210	1.310	2.171E 05	1.038	0.833	0.3926
9.348	1.885	35.172	28.119	-6.970	1.837	2.224E 05	.0211	1.488	2.216E 05	1.189	0.859	0.4001
9.464	1.913	39.350	31.793	-7.763	1.841	2.229E 05	.0212	1.644	2.221E 05	1.329	0.891	0.4009

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

CONFIDENTIAL
RESTRICTED DATA
Atomic Energy Act of 1954

CONFIDENTIAL
RESTRICTED DATA
Atomic Energy Act of 1954

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER	4600	RUN NUMBER	1	DATE RUN	DECEMBER 20, 1963
BAROMETRIC PRESSURE	= 29.525 IN HG	TYPE B METERING RING		TYPE A SPACER PLATE	
METERING RING CLEARANCE	= 0.065	ANNULUS CLEARANCE	= 0.130	METERING RING AREA RATIO	= .750
EQUIVALENT DIAMETER	= 0.2507	ANNULUS AREA	= 0.4533 SQ IN	METERING RING AREA	= 0.2832 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
109.5	108.0	108.0	109.0	109.0	0.91	0.007	0.147	-0.007	0.014	0.59	0.309	0.909	0.014	515.32
109.5	106.5	106.8	108.5	108.0	1.55	0.014	0.246	-0.011	0.022	1.03	0.516	1.533	0.014	514.19
110.0	106.3	106.8	108.8	108.5	1.96	0.011	0.295	-0.014	0.014	1.33	0.737	2.063	0.018	514.19
110.0	105.0	105.5	107.5	107.3	2.38	0.018	0.368	-0.014	0.014	1.67	0.835	2.515	0.022	513.28
109.5	104.0	104.5	107.2	106.8	2.73	0.101	0.530	-0.025	0.025	1.99	0.933	2.923	0.036	513.73
110.0	103.8	104.5	107.5	107.0	3.02	0.123	0.589	-0.023	0.029	2.23	1.105	3.340	0.051	513.50
111.0	103.2	104.2	108.0	107.1	3.53	0.137	0.737	-0.023	0.036	2.65	1.326	3.954	0.072	513.05
110.0	101.5	102.5	106.5	105.8	3.88	0.148	0.747	-0.040	0.036	2.95	1.351	4.323	0.072	512.59
110.0	100.0	101.0	105.5	105.0	4.45	0.145	0.835	-0.036	0.040	3.44	1.596	5.010	0.072	511.68
109.0	98.0	99.5	104.5	103.5	4.94	0.173	0.909	-0.047	0.049	3.88	1.817	5.698	0.094	511.68
100.0	86.8	88.8	95.0	93.5	5.77	0.173	1.071	-0.045	0.043	4.81	2.210	6.975	0.090	511.68
101.0	86.0	88.0	95.0	93.5	6.39	0.191	1.203	-0.043	0.051	3.56	2.063	7.982	0.094	511.46
100.0	83.5	86.0	93.5	92.2	6.95	0.195	1.302	-0.116	0.042	6.09	2.702	8.743	0.101	511.46
100.0	82.5	85.0	93.0	91.5	7.37	0.215	1.375	-0.112	0.051	6.57	2.898	9.406	0.087	511.68
99.5	80.5	81.5	92.0	90.5	7.81	0.237	1.474	-0.058	0.051	7.12	3.085	10.217	0.094	511.68
100.0	78.0	82.0	91.5	90.0	8.47	0.255	1.572	-0.049	0.047	8.18	3.488	11.568	0.094	511.68

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4600
 BAROMETRIC PRESSURE = 29.525 IN HG
 METERING RING CLEARANCE = 0.065
 EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
 TYPE B METERING RING
 ANNULUS CLEARANCE = 0.130
 ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 20, 1963
 TYPE A SPACER PLATE
 METERING RING AREA RATIO = 0.750
 METERING RING AREA = 0.2832 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE838%	C84	C34	FLOW LB/SEC
0.916	0.140	0.920	0.603	-0.307	1.389	1.105E 05	.0176	0.539	1.101E 05	0.354	0.458	0.1983
1.562	0.235	1.549	1.048	-0.516	1.427	1.428E 05	.0177	0.544	1.423E 05	0.368	0.458	0.2558
1.976	0.286	2.077	1.347	-0.731	1.401	1.624E 05	.0167	0.564	1.619E 05	0.366	0.500	0.2910
2.400	0.356	2.529	1.694	-0.825	1.411	1.788E 05	.0171	0.567	1.782E 05	0.380	0.465	0.3199
2.827	0.476	2.948	2.027	-0.921	1.435	1.918E 05	.0197	0.588	1.911E 05	0.391	0.444	0.3433
3.168	0.524	3.366	2.280	-1.086	1.426	2.042E 05	.0192	0.574	2.035E 05	0.389	0.461	0.3654
3.691	0.665	3.984	2.712	-1.296	1.435	2.209E 05	.0210	0.583	2.201E 05	0.397	0.470	0.3950
4.058	0.669	4.360	3.016	-1.319	1.452	2.295E 05	.0194	0.586	2.287E 05	0.405	0.438	0.4102
4.621	0.759	5.048	3.506	-1.567	1.469	2.442E 05	.0194	0.599	2.433E 05	0.416	0.456	0.4357
5.150	0.818	5.746	3.971	-1.774	1.466	2.570E 05	.0186	0.607	2.561E 05	0.420	0.457	0.4586
5.991	0.980	7.019	4.904	-2.165	1.490	2.647E 05	.0193	0.640	2.637E 05	0.447	0.473	0.4723
6.626	1.104	8.029	3.646	-2.026	1.478	2.809E 05	.0194	0.652	2.799E 05	0.296	0.390	0.5011
7.206	1.201	8.822	6.210	-2.661	1.522	2.875E 05	.0198	0.674	2.864E 05	0.474	0.477	0.5128
7.668	1.264	9.488	6.685	-2.867	1.550	2.937E 05	.0199	0.690	2.926E 05	0.486	0.488	0.5240
8.141	1.352	10.271	7.218	-3.044	1.572	2.998E 05	.0203	0.710	2.987E 05	0.499	0.486	0.5350
8.823	1.441	11.616	8.259	-3.454	1.588	3.112E 05	.0200	0.743	3.101E 05	0.528	0.503	0.5554

APPENDIX "A" SECTION 2
 AIR TEST DATA (CONTINUED)

CONFIDENTIAL
RESTRICTED DATA

MASS FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4700
BAROMETRIC PRESSURE = 29.470 IN HG
METERING RING CLEARANCE = 0.065
EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
TYPE C METERING RING
ANNULUS CLEARANCE = 0.130
ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 20, 1963
TYPE A SPACER PLATE
METERING RING AREA RATIO = .250
METERING RING AREA = 0.3022 SQ IN

P1 PSI	P3A PSI	P4 PSI	P6A PSI	P8A PSI	DP16A PSI	DP6A6B PSI	DP6A8A PSI	DP8A8B PSI	DP3A3B PSI	DP8A4 PSI	DP3A4 PSI	DP8A3A PSI	DP44A PSI	TR R
110.0	108.5	108.5	109.3	109.3	0.93	0.	0.147	-0.007	0.011	0.42	0.196	0.688	0.029	515.10
109.5	107.0	107.0	108.0	107.7	1.47	0.	0.236	-0.014	0.009	0.64	0.270	0.933	0.043	516.67
110.0	107.0	107.0	108.5	108.2	1.84	0.005	0.295	-0.018	0.011	0.81	0.393	1.253	0.058	516.00
110.0	106.2	106.5	108.0	107.5	2.36	0.013	0.363	-0.014	0.005	1.06	0.516	1.572	0.072	515.77
110.0	105.2	105.5	107.5	107.0	2.82	0.029	0.442	-0.018	0.004	1.28	0.639	1.891	0.094	514.86
110.0	104.5	105.0	107.0	106.8	3.32	0.036	0.516	-0.009	0.020	1.50	0.737	2.260	0.116	513.96
110.0	103.8	104.0	106.5	106.0	3.71	0.036	0.589	-0.022	0.036	1.69	0.835	2.530	0.116	515.09
110.0	103.0	103.5	106.0	105.5	4.13	0.033	0.639	-0.014	0.038	1.89	0.933	2.824	0.145	514.86
110.5	102.6	103.5	106.5	105.5	4.57	0.027	0.712	-0.022	0.045	2.11	1.081	3.193	0.148	514.63
100.9	90.8	92.0	95.8	95.0	5.67	0.036	0.884	-0.047	0.058	2.78	1.424	4.151	0.181	513.73
100.8	89.9	91.0	95.3	94.4	6.19	0.036	0.982	-0.033	0.069	3.12	1.547	4.617	0.191	513.27
100.0	87.8	89.0	93.5	92.5	6.51	0.036	1.056	-0.045	0.054	3.27	1.572	4.838	0.188	513.95
100.5	87.5	89.0	94.2	92.9	7.02	0.045	1.105	-0.042	0.081	3.63	1.768	5.354	0.220	513.50
100.5	86.5	88.0	93.5	92.3	7.59	0.033	1.203	-0.036	0.079	4.03	1.965	5.944	0.235	513.27
100.0	84.5	86.5	92.5	91.0	8.06	0.036	1.277	-0.022	0.058	4.35	2.112	6.361	0.238	513.27
97.0	79.5	81.5	88.5	87.0	8.99	0.040	1.449	-0.022	0.072	5.11	2.407	7.515	0.249	513.49
93.2	73.5	76.0	83.5	82.0	9.73	0.168	1.719	-0.036	0.065	5.87	2.652	8.522	0.282	512.81

APPENDIX "A" SECTION 2
AIR TEST DATA (CONTINUED)

CONFIDENTIAL
RESTRICTED DATA
Atomic Energy Act 1954

CONFIDENTIAL
~~RESTRICTED DATA~~
 Atomic Energy Act 1954

CONFIDENTIAL
~~RESTRICTED DATA~~
 Atomic Energy Act 1954

MA6S FLOW VS PRESSURE DROP AND LOSS COEFFICIENT VS RE FOR REV- 5

TEST CONDITIONS

TEST NUMBER 4700
 BAROMETRIC PRESSURE = 29.470 IN HG
 METERING RING CLEARANCE = 0.065
 EQUIVALENT DIAMETER = 0.2507

RUN NUMBER 1
 TYPE C METERING RING
 ANNULUS CLEARANCE = 0.130
 ANNULUS AREA = 0.4533 SQ IN

DATE RUN DECEMBER 20, 1963
 TYPE A SPACER PLATE
 METERING RING AREA RATIO = 0.250
 METERING RING AREA = 0.3022 SQ IN

DP16AV PSI	DP68AV PSI	DP83AV PSI	DP84AV PSI	DP34AV PSI	C16	RE1668	F68	C83	RE8384	C84	C34	FLOW LB/SEC
0.933	0.144	0.697	0.455	-0.168	1.408	1.111E 05	.0180	0.463	1.107E 05	0.302	0.250	0.1993
1.474	0.232	0.945	0.675	-0.246	1.437	1.374E 05	.0187	0.404	1.369E 05	0.288	0.234	0.2470
1.847	0.288	1.267	0.889	-0.329	1.396	1.566E 05	.0179	0.418	1.561E 05	0.293	0.241	0.2813
2.370	0.354	1.582	1.146	-0.435	1.433	1.752E 05	.0175	0.418	1.746E 05	0.301	0.254	0.3146
2.877	0.424	1.902	1.390	-0.537	1.462	1.918E 05	.0176	0.418	1.909E 05	0.306	0.261	0.3435
3.379	0.494	2.274	1.626	-0.624	1.462	2.081E 05	.0174	0.424	2.073E 05	0.303	0.257	0.3726
3.772	0.568	2.559	1.839	-0.719	1.473	2.184E 05	.0180	0.428	2.176E 05	0.308	0.265	0.3917
4.190	0.619	2.851	2.049	-0.802	1.480	2.298E 05	.0176	0.430	2.290E 05	0.309	0.266	0.4120
4.629	0.695	3.226	2.283	-0.943	1.462	2.438E 05	.0177	0.433	2.427E 05	0.307	0.277	0.4366
5.756	0.862	4.203	2.948	-1.304	1.487	2.594E 05	.0177	0.455	2.585E 05	0.319	0.305	0.4643
6.273	0.961	4.668	3.349	-1.368	1.494	2.704E 05	.0181	0.468	2.694E 05	0.332	0.292	0.4836
6.593	1.034	4.888	3.506	-1.382	1.414	2.834E 05	.0175	0.435	2.824E 05	0.312	0.264	0.5074
7.122	1.079	5.415	3.895	-1.569	1.516	2.855E 05	.0180	0.476	2.844E 05	0.342	0.294	0.5108
7.682	1.184	6.001	4.307	-1.743	1.530	2.953E 05	.0184	0.490	2.942E 05	0.352	0.302	0.5282
8.176	1.255	6.401	4.630	-1.869	1.564	3.007E 05	.0186	0.499	2.996E 05	0.361	0.308	0.5378
9.125	1.426	7.562	5.417	-2.146	1.598	3.100E 05	.0191	0.633	3.089E 05	0.382	0.315	0.6547
9.988	1.632	8.573	6.214	-2.359	1.644	3.147E 05	.0204	0.659	3.136E 05	0.406	0.316	0.5625

APPENDIX "A" SECTION 2
 AIR TEST DATA (CONTINUED)

APPENDIX B

PRESSURE TAP LOCATION TAPS

Test Number PT-1

Metering Ring D				Annulus Clearance 80 mils		
ΔP_{6A7A} (in.Hg)	ΔP_{6B7B} (in.Hg)	ΔP_{6A8A} (in.Hg)	ΔP_{6B8B} (in.Hg)	ΔP_{6A2A} (in.Hg)	ΔP_{6B2B} (in.Hg)	P_5 (in.H ₂ O)
1.15	1.05	1.30	1.50	6.25	5.75	4.30
5.15	4.85	7.80	7.60	22.26	22.14	15.85

Test Number PT-2

Metering Ring A				Annulus Clearance 80 mils		
ΔP_{6A7A} (in.Hg)	ΔP_{6B7B} (in.Hg)	ΔP_{6A8A} (in.Hg)	ΔP_{6B8B} (in.Hg)	ΔP_{6A2A} (in.Hg)	ΔP_{6B2B} (in.Hg)	P_5 (in.H ₂ O)
1.85	1.65	3.00	3.02	2.60	2.61	4.15
6.00	5.61	8.85	9.16	7.51	6.90	15.70

APPENDIX C INSTRUMENTATION CAPABILITY

Location	Instrument	Range	Graduation	Accuracy
P1	Pressure Gauge	0-160 psi	2 psi	$\pm 1\%$
P3A	Pressure Gauge	0-160 psi	2 psi	$\pm 1\%$
P4	Pressure Gauge	0-160 psi	2 psi	$\pm 1\%$
P6A	Pressure Gauge	0-160 psi	2 psi	$\pm 1\%$
P8A	Pressure Gauge	0-160 psi	2 psi	$\pm 1\%$
PA	Barometer	0-35" H _g	.001" H _g	
P1-1A	Manometer	0-50" H ₂ O	0.1" H ₂ O	
P1-1B	Manometer	0-50" H ₂ O	0.1" H ₂ O	
P1-6A	Manometer	0-50" H _g	0.1" H _g	
P3A3B	Manometer	0-50" H _g	0.1" H _g	
P3A4	Manometer	0-50" H _g	0.1" H _g	
P4-4A	Manometer	0-50" H ₂ O	0.1" H ₂ O	
P4-4B	Manometer	0-50" H ₂ O	0.1" H ₂ O	
P5	Manometer	0-30" H _g	0.1" H _g	
P6A6B	Manometer	0-50" H ₂ O	0.1" H ₂ O	
P6A8A	Manometer	0-50" H ₂ O	0.1" H ₂ O	
P8A3A	Manometer	0-50" H _g	0.1" H _g	
P8A4	Manometer	0-80" H _g	0.1" H _g	
P8A8B	Manometer	0-50" H ₂ O	0.1" H ₂ O	
T1	Potentiometer	0 $\pm$ 5.5 MV	.01 MV	
T2	Potentiometer	0 $\pm$ 5.5 MV	.01 MV	

Copper constantan thermocouples used for both temperatures

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APPENDIX C

Evaluation of Experimental Error

For loss coefficient C 1-6 the maximum experimental error occurs at low flow rates. Based on the absolute pressure at the inlet plenum (P1AB), the average differential pressure between P1 and P6, the absolute pressure at the inlet of the flow measuring nozzle P5A, and the differential pressure across the flow measuring nozzle P5, the errors can be as large as $\pm 6.26\%$. For the same loss coefficient C 1-6, the minimum error occurs at high flow rates. Based on the same conditions mentioned above the error can be $\pm 2.09\%$.

The maximum experimental error in friction f 6-8 occurs at low flow rates. Based on the absolute pressure just downstream of the inlet plenum P6AB, the average differential pressure between P6 and P8, the absolute pressure at the inlet of the flow measuring nozzle P5A, and the differential pressure across the flow measuring nozzle P5, the error can be as large as $\pm 23.36\%$. For the same friction factor f 6-8, the minimum error occurs at high flow rates. Based on the same conditions mentioned above, the error can be $\pm 3.05\%$.

For low flow rates the experimental error in loss coefficient C 8-4 is at its maximum. Based on the absolute pressure upstream of the metering ring P8AB, the average differential pressure across the metering ring, and the pressures connected with flow measurement (P5A & P5), the error can be as large as $\pm 9.31\%$. For high flow rates the experimental error in loss coefficient C 8-4 is at its minimum. Based on the same conditions mentioned above the error can be $\pm 1.95\%$.

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