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RESEARCH MEMORANDUM

PRELIMINARY INTERNAL PERFORMANCE DATA FOR A VARIABLE-EJECTOR ASSEMBLY ON THE XJ79-GE-1 TURBOJET ENGINE

I - NONAFTERBURNING CONFIGURATIONS

By William K. Greathouse and Harry E. Bloomer

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Cleveland, Ohio

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

WASHINGTON

AUG 30 1956

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SUMMARY

Internal performance of an XJ79-GE-1 variable ejector was experimentally determined with the primary nozzle in a representative nonafterburning position. Jet-thrust and air-handling data were obtained in quiescent air for 11 selected ejector configurations over a wide range of operation. Additional data, at specific operating conditions, were obtained which indicate the ejector diameter ratio for peak jet-thrust performance. The experimental ejector data are presented in both graphical and tabulated form.

INTRODUCTION

An experimental performance investigation of the XJ79-GE-1 variable-ejector assembly was made in an NACA altitude test chamber. The ejector assembly utilized independent control of the ejector nozzle diameter, the primary exhaust-nozzle diameter, and the spacing between the two nozzles. In this investigation the internal ejector performance was determined over a range of ejector geometry and operating conditions with the variable primary nozzle in a representative nonafterburning position.

Jet-thrust and air-handling data were obtained (1) while varying the ejector operating conditions for 11 selected ejector configurations and (2) while varying the ejector geometry for various ejector operating conditions. By both methods a range of ejector diameter ratios from 1.01 to 1.70 (with spacing ratios between 0.77 and 0.97) were investigated. Primary pressure ratio ranged from 2 to 9, and weight-flow ratio ranged from 0.03 to about 0.20. Throughout the investigation engine exhaust-gas temperature was maintained at about 1410° R (950° F) and secondary air was supplied at 500° R (40° F).

Conventional internal performance maps of jet-thrust ratio and total-pressure ratio are presented herein for the 11 ejector configurations investigated. Performance curves, obtained with the ejector geometry variable, are also shown to indicate the diameter ratio for peak jet-thrust performance. In addition, all ejector data from the investigation are presented in tabulated form.

APPARATUS

Installation

The XJ79-GE-1 ejector installation in the altitude test chamber is shown by photograph in figure 1 and schematically in figure 2. In this investigation the engine was used as a gas generator for the ejector and was operated below rated conditions to produce an exhaust-gas flow of about 80 pounds per second. Secondary air entered the test setup at an angle of 90° to the engine axis so as not to impose an extraneous axial force. The entire assembly was mounted on a bedplate supported by flexure plates, as indicated in figure 2. Jet thrust was obtained from a calibrated null-type thrust cell after accounting for forces due to a pressure differential acting across the front bulkhead labyrinth seal. The over-all thrust system is accurate to within $\pm 1\frac{1}{2}$ percent for the operating conditions of this investigation.

Ejector System

The variable-geometry ejector assembly is schematically represented in figure 3. Separate sets of actuators permitted independent control of primary-nozzle diameter, secondary-nozzle diameter, and axial spacing between the two nozzles. These dimensions were transmitted to the control room by a calibrated electromechanical system with an accuracy of ± 0.15 inch. Secondary air entered the plenum chamber from a single 8-inch pipe, and a perforated sheet-metal baffle (shown in fig. 2) served to equalize the flow around the ejector annulus. A photograph is shown of the primary nozzle in figure 4 and of the ejector shroud in figure 5. A rear view of the assembly is given in figure 6.

Instrumentation

Basic ejector instrumentation is indicated in figure 7. Total pressure P_p and total temperature T_p in the primary stream (station p) were computed as arithmetic averages, since the probes were located

in equal annular flow areas. (Symbols are defined in the appendix.) Arithmetic averages were also used for P_s and T_s of the secondary stream, because there were essentially no radial or circumferential profiles at station s. Engine air flow and secondary air flow were determined from conventional pressure and temperature surveys at the engine inlet and in the secondary supply line as indicated in figure 2. Primary gas flow was taken as engine-inlet air plus fuel flow minus leakage air. Secondary air was taken as that entering the plenum chamber, since very little leakage was found to occur between the plenum and station s. Ambient exhaust pressure was measured by four trailing static probes equally spaced around and 1 inch away from the ejector exit.

PROCEDURE

Throughout the investigation the engine was operated at a speed of about 6770 rpm, an inlet pressure of 1145 pounds per square foot absolute, and an inlet temperature of 500° R (40° F). Primary-nozzle diameter was held at about 21.5 inches, which produced an exhaust-gas temperature of approximately 1410° R (950° F). At these conditions the primary gas flow was approximately 80 pounds per second.

Ejector weight-flow ratios were set by changing only the secondary flow, which was supplied at a constant temperature of about 500° R (40° F). Secondary flow was maintained almost constant for a desired number of data points by operating so as to choke both the secondary labyrinth seal leakage and a supply valve upstream of the labyrinth seal. Primary pressure ratio was varied by changing only ambient exhaust pressure.

Data for conventional performance maps were obtained by setting a certain ejector geometry and operating over a range of primary pressure ratios (2 to about 9) at several constant weight-flow ratios (0.03 to about 0.20). The 11 ejector configurations investigated in this manner are listed in table I along with the range of operation for each.

Additional data were obtained over a range of ejector diameter ratios by varying the shroud diameter while maintaining certain combinations of primary pressure ratio (2.2 to 6) and weight-flow ratio (0.043 to 0.176). Spacing ratio varied systematically with diameter ratio as described later.

RESULTS

Performance Data

Performance maps of 11 specific ejector configurations are presented in figures 8 to 18, and tabulated data are given in table II. The performance maps exhibit typical ejector characteristics.

Jet-thrust ratio F_{ej}/F_{ip} peaked within the range of primary pressure ratios investigated for the smaller diameter ratio ejectors (figs. 8 to 14), indicating that the combined flow was fully expanded with respect to exhaust pressure. For the large diameter ratio ejectors (figs. 15 to 18) peak jet thrust was, of course, not reached within the range of pressure ratios investigated. Minimum jet-thrust ratio (as can be noted on each large-ejector thrust curve) represents an operating region in which internal overexpansion losses were greatest with respect to ambient exhaust pressure.

The pumping curves for each ejector configuration indicate the usual "choking" of the secondary stream within the ejector shroud for high primary pressure ratios. "Choking" means essentially that the secondary stream has been accelerated to at least sonic velocity, and thus its total pressure (at station s) is no longer influenced by downstream conditions. Such a condition is indicated on the ejector performance maps when ejector total-pressure ratio becomes almost independent of primary pressure ratio. As should be expected, "choking" was indicated at lower primary pressure ratios for (1) smaller diameter ratios and (2) higher weight-flow ratios.

Performance data obtained by varying the ejector shroud geometry are presented in figures 19 to 23 grouped in order of increasing weight-flow ratio. Tabulated data are given in table III. The spacing ratio increased slightly for these data as diameter ratio was increased and is described by figure 24.

Jet-thrust curves (parts (a)) indicate the diameter ratio for peak jet thrust at all primary pressure ratios investigated above about 4. As should be expected, the peaks occurred at larger diameter ratios as either primary pressure ratio or weight-flow ratio were increased. At primary pressure ratios less than 4, the jet thrust did not maximize, but continued to increase with decreasing diameter ratio.

Pumping curves (parts (b)) indicate the operating requirements for the existing ejector configuration to handle a specific weight-flow ratio at various primary pressure ratios.

Temperature rise of the secondary air shown in figure 25 can be used to evaluate ejector temperature ratio T_p/T_s for all ejector configurations and operating conditions investigated. Since primary weight flow, primary temperature, and secondary air-supply temperature were almost constant throughout the investigation, the secondary temperature rise was directly related only to the amount of secondary air for this particular test installation.

A calibration of the primary nozzle with the ejector shroud removed is shown in figure 26 to indicate nozzle thrust performance and effective flow area. It should be noted, however, that the flow coefficient of the primary nozzle is somewhat different when operating within the ejector assembly. Primary flow coefficient is influenced by the velocity of the secondary stream, as shown in figure 27, which is representative of all the ejectors investigated for primary pressure ratios above 3. Figure 27 indicates that primary flow coefficient is changed by the speed ($C_{D,ej}$ varies with W_s/W_p) and the direction ($C_{D,ej}$ varies with D_e/D_p) of the secondary flow entering the ejector. At primary pressure ratios below 2.5 the effect of secondary flow on primary flow coefficient is somewhat greater than shown here.

Application of Data

All data contained in this report apply directly to only specific ejector configurations operating at specific primary and secondary supply temperatures. However, the data can be interpolated for systematic variations in geometry, weight-flow ratio, and pressure ratio.

To apply these data to the same ejector system operating at other primary gas temperatures (nonafterburning) up to about 1700° R, the conventional corrected weight-flow parameter $\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$ should be used. This parameter should also be used to account for different secondary-air temperatures. The assumptions involved by this method are that

$$\left(\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}\right)_{test} = \left(\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}\right)_{flight} \quad \text{and} \quad \left(\frac{F_{ej}}{F_{ip}}\right)_{test} = \left(\frac{F_{ej}}{F_{ip}}\right)_{flight}$$

These assumptions, however, are not sufficiently accurate to permit extrapolation of the data herein to afterburning gas temperatures.

Ejector jet-thrust values herein are based on internal jet thrust of the ejector system in quiescent air. Internal net thrust may be

found by simply subtracting the inlet momentum of the primary and secondary mass flow chargeable to the propulsion system. The data do not include any effect of base drag nor any effect of the free stream on internal ejector performance. It can be noted that ejector base drag is influenced by the fuselage or nacelle configuration preceding an ejector installation. The effect of the free stream on internal ejector performance should be negligible when the ejector is operating at "choked" conditions.

The data herein is, in general, quite consistent and can be used to predict which ejector configuration would be best for specific operating conditions. However, care should be exercised in predicting the absolute performance of a specific ejector installation.

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio, May 25, 1956

APPENDIX - SYMBOLS

A_{eff} effective flow area, $A_p \times \frac{W_p}{(W_p)_{cr}}$, sq ft

A_p measured flow area of primary nozzle, sq ft

C_D flow coefficient for primary nozzle; $C_D = \frac{W_p}{(W_p)_{cr}} = \frac{A_{eff}}{A_p}$

$C_{D,ej}$ flow coefficient for choked primary nozzle in ejector assembly, $\frac{W_p}{(W_p)_{cr}}$.

D_e measured diameter of ejector exit, in.

D_p measured diameter of primary-nozzle exit, in.

F_{ej} measured jet thrust of ejector system, lb

F_{ep} effective jet thrust ideally available from primary flow, $\frac{W_f}{g} V_{eff}$, lb

F_{ip} jet thrust ideally available from complete isentropic expansion of primary flow, $\frac{W_p}{g} V_{ip}$, lb

F_p measured jet thrust of primary nozzle, lb

g acceleration due to gravity, 32.17 ft/sec^2

L spacing, distance between primary- and secondary-nozzle exits, in.

P_p average total pressure of primary stream at station p, lb/sq ft abs

P_s average total pressure of secondary stream at station s, lb/sq ft abs

p_o ambient exhaust pressure, lb/sq ft abs

T_c total temperature of secondary air entering plenum chamber, $^{\circ}R$

T_p average total temperature of primary stream at station p, $^{\circ}R$

T_s average total temperature of secondary stream at station s, $^{\circ}R$

V_{eff} effective velocity of ideal convergent nozzle, ft/sec

V_{ip} ideal velocity of complete isentropic expansion from P_p and T_p to p_0, ft/sec

W_p measured primary gas flow, lb/sec

$(W_p)_{cr}$ critical one-dimensional primary flow, computed from A_p, P_p, T_p, and γ_p, lb/sec

W_s measured secondary air flow, lb/sec

α_p half-cone angle of primary nozzle, $\sin^{-1}\left(1.79 - \frac{D_p}{17.2}\right)-3$, deg

α_s half-cone angle of ejector shroud, $\sin^{-1}\left(1.29 - \frac{D_s}{26.8}\right)+5$, deg

γ_p ratio of specific heats for primary stream, 1.34

γ_s ratio of specific heats for secondary stream, 1.40

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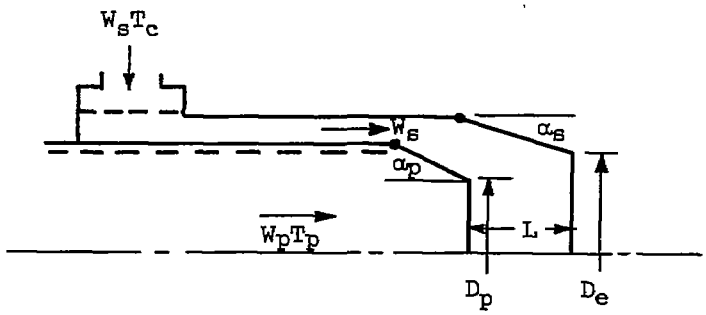
TABLE I. - EJECTOR CONFIGURATIONS AND TEST CONDITIONS

[Primary-nozzle-exit diameter D_p, 21.5 in.; primary-nozzle half-cone angle α_p, 30°; primary-stream average total temperature at station p T_p, 1410° R; total temperature of secondary air entering plenum chamber T_c, 500° R; measured primary gas flow W_p, 80 lb/sec.]



Ejector configuration	Diameter ratio, D_e/D_p	Spacing ratio, L/D_p	Secondary half-cone angle, α_s, deg	Range of primary pressure ratio, P_p/p_0	Range of weight-flow ratio, W_s/W_p	Data in figure -
1	1.02	0.77	33	2 to 7	0.043 to 0.111	8
2	1.02	.84	33	2 to 7	.059 to .179	9
3	1.09	.82	30	2 to 8	.035 to .179	10
4	1.09	.95	30	2 to 8	.036 to .145	11
5	1.16	.85	26	2 to 8	.035 to .143	12
6	1.16	.96	26	2 to 8	.032 to .137	13
7	1.23	.86	23	2 to 6	.047 to .126	14
8	1.43	.87	13	2 to 8	.034 to .139	15
9	1.42	.97	14	2 to 8	.037 to .128	16
10	1.62	.84	4	2 to 7	.030 to .139	17
11	1.70	.85	1	2 to 9	.039 to .212	18

TABLE II. - DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(a) Configuration 1. Diameter ratio D_e/D_p, 1.02; spacing ratio L/D_p, 0.77; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{sj}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, $\frac{\text{lb}}{\text{sq ft abs}}$	Secondary total pressure, P_s, $\frac{\text{lb}}{\text{sq ft abs}}$	Ambient exhaust pressure, p_0, $\frac{\text{lb}}{\text{sq ft abs}}$	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_c, $^\circ R$	
1	0.043	2.23	0.469	0.930	2.45	0.027	82.93	3.57	2462	1157	1104	1453	592	497	4506
2	.045	2.43	.447	.922	2.43	.029	82.83	3.79	2439	1092	1103	1446	594	497	4709
3	.042	2.98	.425	.921	2.39	.027	82.85	3.52	2428	1032	813	1441	603	497	5251
4	.041	3.85	.414	.937	2.37	.026	82.80	3.42	2418	1003	628	1439	605	497	5727
5	.042	4.88	.411	.941	2.37	.027	82.86	3.48	2422	997	517	1440	607	497	6090
6	.041	5.75	.411	.932	2.37	.026	82.88	3.39	2422	996	421	1442	608	497	6345
7	.041	6.94	.406	.923	2.37	.027	82.78	3.45	2417	983	348	1441	608	497	6540
8	.056	2.21	.490	.926	2.50	.035	82.27	4.63	2457	1206	1111	1460	582	497	4492
9	.056	2.97	.443	.948	2.45	.036	82.52	4.67	2385	1057	802	1445	589	497	5275
10	.055	3.85	.431	.945	2.43	.035	82.58	4.56	2413	1040	628	1441	593	497	5764
11	.054	4.74	.426	.943	2.43	.035	82.77	4.54	2413	1029	509	1442	593	497	6121
12	.055	5.73	.423	.937	2.44	.036	82.46	4.54	2418	1024	422	1443	591	497	6355
13	.054	6.85	.421	.935	2.44	.035	82.26	4.52	2417	1018	363	1445	592	497	6533
14	.074	2.23	.515	.933	2.59	.046	82.34	6.18	2483	1274	1113	1467	566	497	4567
15	.074	3.02	.464	.949	2.54	.046	82.52	6.12	2447	1136	810	1450	569	496	5330
16	.074	3.87	.452	.954	2.54	.046	82.57	6.13	2444	1106	630	1450	570	496	5913
17	.073	4.75	.446	.951	2.53	.046	82.67	6.06	2439	1090	513	1448	571	496	6183
18	.072	5.73	.446	.947	2.53	.045	82.77	5.99	2436	1088	425	1450	571	496	6461
19	.072	6.42	.447	.936	2.53	.045	82.48	5.97	2438	1089	379	1450	572	496	6524
20	.091	3.02	.497	.957	2.60	.056	82.33	7.52	2485	1225	815	1458	560	496	5378
21	.091	3.91	.481	.957	2.59	.056	82.38	7.52	2455	1185	627	1453	561	496	5882
22	.090	4.76	.477	.961	2.59	.056	82.54	7.49	2450	1172	515	1453	560	496	6254
23	.090	5.72	.475	.954	2.59	.056	82.52	7.45	2450	1164	428	1453	560	496	6487
24	.090	6.68	.473	.949	2.59	.056	82.21	7.43	2448	1157	367	1455	560	496	6649
25	.111	3.09	.522	.968	2.66	.068	82.28	9.20	2494	1302	805	1469	552	495	5499
26	.111	3.98	.513	.975	2.65	.068	82.20	9.18	2484	1275	623	1466	552	495	6033
27	.110	4.79	.511	.971	2.65	.068	82.32	9.12	2481	1270	517	1466	552	495	6341
28	.110	5.78	.509	.963	2.65	.067	82.02	9.07	2482	1264	429	1467	553	495	6565
29	.109	6.70	.503	.957	2.65	.067	82.59	9.05	2482	1250	370	1468	553	495	6776

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(b) Configuration 2. Diameter ratio D_e/D_p, 1.02; spacing ratio L/D_p, 0.84; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, p_0, lb/sq ft abs	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_e, $^\circ R$	
1	0.060	2.23	0.496	0.931	2.51	0.038	82.83	5.01	2480	1231	1111	1483	581	497	4564
2	.058	3.19	.440	.945	2.46	.037	82.53	4.83	2434	1071	761	1445	587	497	5413
3	.060	4.57	.426	.942	2.39	.039	82.74	5.00	2429	1035	531	1444	604	497	6059
4	.058	5.83	.423	.941	2.43	.037	82.52	4.84	2425	1028	416	1445	594	497	6412
5	.058	6.65	.424	.928	2.45	.037	82.38	4.83	2422	1029	364	1446	589	497	6516
6	.087	3.19	.493	.959	2.55	.054	82.48	7.21	2466	1218	772	1460	571	496	5508
7	.087	3.72	.485	.959	2.58	.054	82.40	7.20	2461	1194	661	1455	563	496	5795
8	.087	4.56	.479	.961	2.59	.054	82.44	7.22	2459	1179	539	1458	563	496	6180
9	.086	5.75	.474	.957	2.58	.053	82.35	7.14	2467	1171	429	1458	564	496	6516
10	.086	6.97	.471	.943	2.58	.053	82.78	7.13	2457	1158	352	1459	565	496	6731
11	.092	3.04	.503	.963	2.60	.057	82.16	7.57	2464	1241	810	1461	561	496	5419
12	.091	3.85	.492	.960	2.59	.057	81.98	7.53	2485	1215	640	1458	561	496	5849
13	.091	4.78	.490	.961	2.59	.056	82.27	7.54	2456	1205	513	1459	563	496	6254
14	.092	5.72	.487	.958	2.60	.057	82.22	7.62	2462	1199	430	1460	563	496	6509
15	.092	6.72	.488	.950	2.60	.057	82.22	7.59	2462	1202	386	1461	561	496	6679
16	.111	3.13	.526	.975	2.66	.068	82.42	9.19	2509	1322	801	1472	561	496	5586
17	.111	3.95	.521	.969	2.66	.068	82.31	9.17	2493	1301	650	1469	552	496	5998
18	.111	4.92	.517	.970	2.65	.068	82.26	9.14	2491	1290	508	1469	553	496	6380
19	.110	5.76	.516	.966	2.66	.067	82.31	9.10	2490	1287	432	1470	552	496	6603
20	.108	6.72	.512	.961	2.65	.066	82.44	8.98	2482	1272	389	1470	553	495	6805

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(c) Configuration 3. Diameter ratio D_e/D_p, 1.09; spacing ratio L/D_p, 0.82; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/P_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, $\frac{\text{lb}}{\text{sq ft abs}}$	Secondary total pressure, P_s, $\frac{\text{lb}}{\text{sq ft abs}}$	Ambient exhaust pressure, P_0, $\frac{\text{lb}}{\text{sq ft abs}}$	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_e, $^\circ R$	
1	0.036	2.17	0.424	0.920	2.26	0.024	81.61	2.99	2401	1018	1102	1430	631	504	4348
2	.034	3.09	.346	.943	2.24	.023	81.59	2.85	2366	819	485	1416	630	504	5222
3	.033	4.58	.329	.943	3.09	.018	81.76	2.72	2387	779	516	1416	457	504	5942
4	.035	5.84	.329	.944	2.16	.024	81.60	2.88	2367	779	405	1418	655	504	6305
5	.034	7.36	.328	.935	2.12	.023	81.88	2.79	2366	777	321	1420	667	502	6582
6	.032	8.76	.327	.931	2.13	.022	81.82	2.69	2367	778	270	1421	667	502	6768
7	.053	2.16	.445	.935	2.42	.034	81.62	4.58	2398	1068	1115	1434	591	503	4395
8	.051	3.07	.359	.948	2.38	.033	81.95	3.52	2359	847	788	1417	594	503	5262
9	.050	4.80	.343	.949	2.37	.032	81.77	2.80	2372	815	516	1417	598	503	5990
10	.051	5.88	.340	.950	2.36	.033	81.59	1.96	2368	807	402	1418	600	503	6355
11	.049	7.99	.339	.942	2.36	.032	81.87	2.82	2374	806	297	1421	601	501	6739
12	.085	2.14	.468	.938	2.53	.053	81.69	6.40	2427	1136	1131	1449	571	501	4427
13	.082	3.10	.384	.961	2.50	.052	81.78	5.72	2387	917	770	1428	570	501	5359
14	.082	4.67	.369	.988	2.54	.051	81.73	5.65	2384	880	510	1425	560	501	6131
15	.082	5.94	.369	.962	2.50	.052	81.85	5.60	2380	880	400	1425	570	501	6468
16	.082	7.63	.367	.955	2.50	.052	81.73	5.61	2384	876	312	1425	570	500	6765
17	.112	2.18	.489	.961	2.49	.071	81.47	8.30	2438	1183	1117	1452	559	500	4576
18	.110	3.16	.403	.972	2.56	.069	81.65	8.41	2397	968	758	1430	557	499	5464
19	.110	4.60	.395	.975	2.56	.069	81.60	7.98	2385	942	518	1430	557	499	6168
20	.110	6.05	.388	.976	2.53	.069	81.80	8.22	2388	929	395	1416	558	499	6562
21	.110	7.61	.388	.964	2.53	.069	81.51	7.92	2390	928	314	1431	558	499	6807
22	.147	2.24	.508	.980	2.65	.090	81.28	11.17	2466	1254	1101	1463	551	500	4743
23	.148	3.12	.457	.993	2.62	.090	81.51	11.01	2405	1051	769	1439	548	499	5580
24	.145	4.68	.422	.990	2.62	.089	81.62	10.82	2405	1014	513	1457	548	499	6305
25	.145	5.99	.416	.982	2.62	.089	81.87	10.75	2403	1001	401	1438	548	499	6663
26	.143	7.80	.413	.971	2.62	.088	81.79	10.48	2411	996	309	1457	548	499	6944
27	.179	3.22	.463	1.007	2.66	.110	81.31	13.50	2417	1121	749	1446	543	499	5706
28	.179	4.78	.450	1.006	2.66	.109	81.41	13.33	2414	1088	505	1444	542	499	6443
29	.178	6.87	.448	.997	2.66	.109	81.52	13.31	2420	1085	412	1443	542	498	6721
30	.179	7.40	.448	.987	2.66	.109	81.79	13.29	2421	1082	321	1444	541	498	7002

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(d) Configuration 4. Diameter ratio D_e/D_p, 1.09; spacing ratio L/D_p, 0.95; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/P_0	Ejector total-pressure ratio, P_e/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, $\frac{\text{lb}}{\text{sq ft abs}}$	Secondary total pressure, P_s, $\frac{\text{lb}}{\text{sq ft abs}}$	Ambient exhaust pressure, P_0, $\frac{\text{lb}}{\text{sq ft abs}}$	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_e, $^\circ R$	
1	0.038	2.17	0.423	0.915	2.34	0.024	81.55	3.11	2401	1016	1102	1457	613	505	4330
2	.036	3.04	.344	.932	2.33	.023	81.74	2.97	2351	810	772	1419	608	505	5145
3	.036	4.43	.329	.933	2.30	.023	81.88	2.25	2350	774	530	1413	612	504	5827
4	.035	5.78	.328	.937	2.30	.023	81.85	2.92	2355	772	407	1416	615	504	6259
5	.035	7.57	.324	.932	2.30	.023	81.89	2.92	2364	768	312	1417	615	502	8874
6	.035	8.60	.325	.926	2.31	.023	81.78	2.90	2358	788	274	1420	614	502	8883
7	.056	2.16	.446	.927	2.43	.035	81.54	4.57	2389	1071	1109	1440	592	504	4377
8	.055	3.10	.355	.939	2.41	.038	81.67	4.50	2364	841	761	1422	590	504	5223
9	.054	4.57	.341	.946	2.40	.034	81.56	4.40	2383	807	517	1423	592	504	5953
10	.053	6.06	.336	.942	2.40	.034	81.78	4.38	2366	796	390	1424	592	504	8377
11	.053	7.70	.336	.933	2.40	.034	81.74	4.37	2366	797	307	1424	593	504	8822
12	.085	2.15	.471	.940	2.62	.053	81.40	6.94	2408	1135	1120	1445	573	504	4418
13	.084	3.07	.380	.953	2.49	.053	81.84	6.88	2367	801	770	1424	571	502	5283
14	.083	4.58	.362	.958	2.49	.052	81.48	6.79	2367	857	518	1424	571	502	8033
15	.081	5.94	.361	.949	2.49	.051	81.42	6.67	2366	855	398	1425	571	502	8361
16	.082	7.92	.360	.944	2.48	.052	81.84	6.75	2370	854	298	1426	572	502	8728
17	.113	2.18	.488	.956	2.61	.070	81.50	9.28	2427	1185	1112	1451	564	502	4548
18	.113	3.12	.404	.968	2.56	.070	81.71	9.24	2381	964	782	1431	558	502	5419
19	.112	4.67	.385	.978	2.56	.070	81.83	9.24	2382	919	509	1429	558	502	8228
20	.110	5.81	.388	.962	2.55	.069	81.85	9.04	2388	927	411	1430	559	502	8469
21	.110	7.77	.384	.955	2.55	.068	81.73	9.01	2377	915	308	1426	558	501	8790
22	.112	8.33	.385	.955	2.55	.070	81.73	9.16	2383	913	286	1430	559	501	8891
23	.146	2.20	.511	.966	2.64	.090	81.48	11.95	2453	1254	1112	1456	551	501	4631
24	.145	3.11	.439	.986	2.61	.090	81.71	11.91	2398	1054	771	1434	548	501	5516
25	.145	4.62	.417	.987	2.60	.089	81.60	11.83	2400	1002	519	1432	549	500	8247
26	.143	5.99	.416	.978	2.61	.088	81.52	11.68	2398	999	400	1434	549	501	8602
27	.144	8.13	.412	.961	2.58	.090	81.64	11.78	2393	988	294	1433	558	500	8904

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(e) Configuration 5. Diameter ratio D_e/D_p, 1.16; spacing ratio L/D_p, 0.85; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, p_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_c, °R	
1	0.035	2.12	0.436	0.919	2.20	0.023	81.27	2.86	2368	1033	1117	1419	643	508	4240
2	.034	3.01	.312	.934	2.20	.023	81.13	2.81	2312	723	768	1398	633	505	5064
3	.032	4.56	.275	.946	2.20	.022	81.35	2.68	2311	636	508	1398	634	504	5883
4	.034	6.25	.283	.954	2.20	.022	81.20	2.76	2313	810	570	1401	635	504	6390
5	.055	2.14	.439	.942	2.39	.035	80.95	4.46	2373	1043	1105	1408	589	504	4342
6	.054	3.05	.325	.944	2.37	.035	81.03	4.44	2328	754	761	1408	593	503	5155
7	.053	4.66	.285	.956	2.38	.034	81.56	4.40	2329	664	499	1406	590	503	6014
8	.056	4.84	.287	.959	2.38	.036	81.23	4.57	2327	670	501	1405	590	503	5993
9	.055	8.43	.278	.957	2.43	.035	81.40	4.52	2330	643	276	1410	579	502	6840
10	.055	8.17	.282	.964	2.38	.036	81.51	4.55	2328	657	377	1400	587	503	6472
11	.088	2.13	.458	.935	2.51	.055	80.73	7.11	2362	1083	1108	1431	568	504	4321
12	.085	2.54	.398	.952	2.49	.054	80.77	6.89	2335	903	917	1412	567	502	4783
13	.087	2.99	.344	.957	2.47	.055	80.66	7.04	2303	794	789	1407	568	503	5155
14	.086	4.08	.318	.968	2.48	.055	80.67	7.01	2305	735	563	1409	567	503	5805
15	.086	5.10	.312	.974	2.47	.055	80.52	6.98	2301	719	451	1408	568	504	6198
16	.086	6.02	.309	.977	2.47	.056	80.28	6.97	2288	709	380	1409	569	505	6444
17	.118	2.16	.462	.948	2.58	.075	81.16	9.65	2427	1122	1122	1448	560	501	4486
18	.117	3.11	.350	.968	2.55	.073	81.14	9.55	2387	829	759	1424	558	501	5361
19	.116	4.69	.335	.983	2.54	.073	81.33	9.51	2386	793	504	1420	557	501	6207
20	.115	7.73	.324	.977	2.55	.072	81.42	9.43	2386	768	306	1423	557	501	6911
21	.116	5.95	.328	.982	2.55	.072	81.15	9.45	2385	773	397	1423	556	501	6563
22	.115	9.18	.321	.976	2.55	.072	81.23	9.37	2389	762	258	1423	557	501	7092
23	.145	2.18	.474	.954	2.62	.089	81.60	11.86	2426	1150	1123	1445	---	500	4512
24	.143	3.11	.370	.979	2.59	.089	81.88	11.76	2372	878	762	1423	550	500	5464
25	.143	4.69	.356	.989	2.60	.088	81.69	11.70	2383	849	507	1427	548	499	6291
26	.142	6.12	.344	.987	2.60	.088	81.74	11.65	2384	822	389	1427	548	499	6700
27	.142	7.42	.343	.979	2.60	.088	81.53	11.60	2377	816	320	1427	548	499	6888

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(f) Configuration 8. Diameter ratio D_e/D_p, 1.16; spacing ratio L/D_p, 0.96; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/P_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, P_0, lb/sq ft abs	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_0, $^\circ R$	
1	0.033	2.12	0.425	0.909	2.22	0.022	81.57	2.69	2382	1014	1121	1432	643	494	4240
2	.032	3.00	.308	.923	2.25	.021	81.79	2.63	2348	724	782	1414	626	489	5058
3	.030	4.02	.285	.928	2.21	.020	81.76	2.48	2337	644	580	1411	637	496	5624
4	.031	4.96	.278	.941	2.19	.021	81.75	2.58	2341	651	472	1412	642	496	6043
5	.030	5.98	.273	.947	2.18	.020	81.40	2.48	2344	642	393	1412	645	490	6325
6	.031	8.05	.269	.945	2.26	.020	81.58	2.55	2329	627	289	1415	624	494	6729
7	.050	2.12	.433	.916	2.40	.032	80.94	4.10	2381	1024	1111	1433	595	501	4239
8	.050	2.98	.320	.930	2.38	.032	80.86	4.08	2309	739	774	1407	590	498	5018
9	.050	4.07	.295	.946	2.38	.032	80.91	4.05	2357	694	578	1404	588	500	5683
10	.048	5.11	.286	.956	2.40	.031	80.97	3.95	2347	672	459	1422	591	498	6150
11	.050	6.01	.284	.955	2.39	.032	80.75	4.04	2338	668	389	1422	595	495	6366
12	.049	8.29	.280	.949	2.40	.032	80.47	3.99	2332	654	281	1424	593	500	6725
13	.078	2.13	.447	.933	2.48	.049	80.85	6.34	2373	1061	1110	1431	576	498	4320
14	.077	2.96	.338	.941	2.57	.048	81.51	6.28	2328	787	784	1415	550	495	5125
15	.077	3.97	.309	.958	2.70	.047	81.00	6.25	2313	715	582	1410	---	495	5723
16	.076	4.99	.301	.963	2.58	.047	80.82	6.19	2301	694	461	1407	---	493	6113
17	.075	5.96	.297	.970	2.48	.047	80.80	6.11	2308	687	387	1408	565	495	6422
18	.076	8.09	.294	.961	2.53	.048	80.49	6.14	2307	679	285	1418	560	496	6768
19	.111	2.17	.462	.949	2.67	.068	81.45	9.08	2396	1107	1102	1439	539	489	4486
20	.110	3.01	.348	.958	2.72	.067	81.51	8.92	2343	816	776	1412	---	494	5236
21	.109	4.13	.330	.972	2.64	.067	81.12	8.90	2325	769	562	1414	534	495	5892
22	.110	5.01	.321	.974	2.55	.068	81.42	8.87	2332	760	465	1410	551	493	6239
23	.109	6.04	.317	.983	2.62	.067	81.06	8.84	2332	741	386	1411	538	492	6550
24	.109	8.56	.311	.973	2.61	.067	81.25	8.87	2338	728	273	1404	540	491	6988
25	.137	2.18	.472	.949	2.79	.082	81.55	11.21	2418	1143	1108	1443	---	492	4510
26	.138	3.03	.361	.968	2.84	.081	81.37	11.23	2361	854	778	1422	---	---	5318
27	.135	4.16	.344	.981	2.59	.084	81.15	11.02	2358	813	586	1419	546	497	5975
28	.135	5.19	.334	.985	2.84	.080	81.43	11.05	2353	788	453	1418	---	492	6389
29	.137	6.46	.331	.993	2.70	.083	81.07	11.14	2361	782	385	1419	---	---	6738
30	.136	8.36	.328	.989	2.70	.083	81.45	11.10	2367	777	283	1415	---	495	7078

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(g) Configuration 7. Diameter ratio D_e/D_p, 1.23; spacing ratio L/D_p, 0.86; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	Primary total pressure, P_p, $\frac{\text{lb}}{\text{sq ft abs}}$	Secondary total pressure, P_s, $\frac{\text{lb}}{\text{sq ft abs}}$	Ambient exhaust pressure, p_0, $\frac{\text{lb}}{\text{sq ft abs}}$	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_o, $^\circ R$	
1	0.048	2.07	0.455	0.937	2.25	0.032	80.78	3.92	2286	1041	1100	1404	624	504	4222
2	.047	2.55	.357	.943	2.26	.031	80.87	3.82	2297	821	898	1406	620	505	4762
3	.048	3.05	.297	.944	2.30	.031	80.89	3.89	2279	678	745	1403	608	505	5137
4	.047	4.04	.256	.951	2.30	.031	80.92	3.87	2279	584	563	1398	606	505	5673
5	.047	5.18	.242	.958	2.31	.031	80.94	3.84	2272	550	438	1398	604	505	6118
6	.047	5.98	.239	.953	2.32	.031	80.83	3.83	2264	541	378	1399	602	505	6267
7	.046	6.80	.238	.955	2.29	.030	80.25	3.76	2253	537	341	1381	601	505	6346
8	.070	2.12	.454	.938	2.44	.045	80.18	5.68	2324	1057	1095	1415	578	504	4267
9	.070	2.53	.374	.947	2.44	.044	79.67	5.59	2289	856	903	1406	575	504	4690
10	.071	3.08	.309	.959	2.43	.045	79.56	5.70	2279	705	743	1400	574	504	5133
11	.070	4.10	.265	.963	2.42	.045	79.53	5.61	2264	600	552	1397	577	505	5671
12	.071	5.07	.253	.971	2.41	.045	79.57	5.67	2264	574	446	1398	578	505	6069
13	.070	6.17	.248	.973	2.40	.045	79.72	5.66	2285	562	367	1397	580	505	6360
14	.097	2.05	.476	.959	2.45	.062	80.28	7.85	2277	1086	1107	1405	571	505	4265
15	.097	2.48	.382	.958	2.42	.062	80.48	7.82	2242	880	901	1385	571	505	4716
16	.097	3.00	.331	.967	2.42	.062	80.47	7.84	2227	739	741	1379	569	505	5156
17	.096	4.08	.286	.975	2.43	.061	80.44	7.70	2217	634	548	1379	567	506	5750
18	.096	5.01	.273	.985	2.43	.061	80.40	7.74	2224	609	444	1379	567	505	6180
19	.095	6.01	.270	.981	2.43	.060	80.43	7.84	2219	600	369	1379	568	505	6389
20	.126	2.05	.487	.964	2.50	.080	80.33	10.19	2273	1108	1107	1402	559	504	4283
21	.126	2.48	.405	.980	2.49	.079	80.90	10.20	2237	908	901	1388	556	502	4745
22	.128	2.98	.348	.971	2.49	.079	81.01	10.19	2215	772	739	1378	552	502	5195
23	.125	4.04	.308	.981	2.49	.079	81.01	10.13	2214	678	547	1375	551	502	5857
24	.125	4.91	.295	.995	2.49	.079	80.78	10.14	2212	654	450	1378	552	500	6203
25	.125	5.60	.292	1.00	2.48	.079	80.79	10.15	2214	647	395	1378	553	502	6449

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(h) Configuration 8. Diameter ratio D_e/D_p, 1.43; spacing ratio L/D_p, 0.87; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/P_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary flow, W_s, lb/sec	Primary total pressure, P_p, $\frac{\text{lb}}{\text{sq ft abs}}$	Secondary total pressure, P_s, $\frac{\text{lb}}{\text{sq ft abs}}$	Ambient exhaust pressure, P_0, $\frac{\text{lb}}{\text{sq ft abs}}$	Primary total temperature, T_p, $^\circ R$	Secondary total temperature, T_s, $^\circ R$	Ejector supply air temperature, T_c, $^\circ R$	
1	0.035	2.16	0.461	0.922	2.18	0.023	80.81	2.85	2589	1102	1104	1446	661	502	4525
2	.034	2.86	.344	.920	2.23	.023	80.83	2.77	2350	803	814	1422	635	502	4886
3	.033	3.83	.232	.907	2.29	.022	80.98	2.74	2344	544	612	1418	617	502	5367
4	.033	4.95	.175	.915	2.31	.022	81.12	2.73	2340	410	472	1421	614	502	5838
5	.033	5.86	.162	.925	2.30	.021	80.97	2.70	2346	382	400	1420	615	502	6137
6	.032	7.17	.154	.930	2.30	.021	81.29	2.60	2346	362	329	1419	617	503	6465
7	.048	2.18	.456	.934	2.42	.031	80.66	3.94	2405	1097	1099	1442	594	503	4387
8	.048	2.97	.334	.947	2.39	.031	80.48	3.88	2349	785	790	1417	591	503	5085
9	.047	3.88	.243	.924	2.38	.031	80.23	3.84	2333	567	600	1414	594	505	5437
10	.048	4.94	.186	.931	2.37	.030	80.64	3.74	2330	435	471	1414	595	506	5891
11	.047	5.93	.171	.938	2.36	.030	80.41	3.80	2325	399	392	1418	600	510	6197
12	.047	7.77	.161	.952	2.36	.030	80.21	3.80	2317	375	298	1414	598	508	6615
13	.079	2.16	.462	.945	2.50	.050	80.27	6.38	2400	1111	1109	1432	572	501	4375
14	.079	2.19	.456	.946	2.51	.050	80.73	6.40	2414	1101	1098	1438	571	501	4458
15	.077	3.00	.334	.947	2.48	.048	81.01	6.24	2368	788	785	1419	571	501	5157
16	.076	3.98	.248	.947	2.48	.048	80.60	6.19	2347	584	589	1412	569	504	5835
17	.078	4.96	.202	.948	2.48	.048	80.98	6.17	2338	473	471	1410	571	502	6031
18	.077	5.93	.183	.950	2.48	.049	80.32	6.22	2322	426	391	1413	569	503	6257
19	.075	7.89	.175	.966	2.48	.048	80.43	6.10	2322	408	294	1411	569	502	8743
20	.112	2.17	.464	.941	2.60	.089	80.23	9.00	2390	1110	1100	1438	552	502	4375
21	.110	2.99	.339	.949	2.53	.089	80.37	8.90	2349	797	784	1418	560	502	5122
22	.111	3.94	.261	.949	2.55	.089	80.24	8.92	2321	606	589	1410	553	500	5803
23	.110	4.85	.220	.964	2.54	.089	80.24	8.87	2323	513	478	1407	554	502	8036
24	.109	5.99	.201	.968	2.55	.088	80.14	8.80	2301	464	384	1405	549	500	8347
25	.109	7.84	.194	.974	2.55	.088	79.99	8.78	2299	446	293	1405	550	501	6746
26	.139	2.18	.465	.959	2.65	.085	81.54	11.34	2396	1116	1099	1448	548	499	4412
27	.139	2.98	.346	.961	2.61	.088	80.87	11.26	2360	817	792	1429	547	501	5220
28	.138	3.87	.273	.952	2.62	.085	80.86	11.22	2355	643	608	1424	543	502	5859
29	.138	4.99	.230	.969	2.64	.085	81.16	11.22	2360	545	473	1427	540	500	6216
30	.137	6.08	.217	.982	2.64	.084	80.66	11.12	2343	510	385	1425	538	502	6549
31	.137	7.78	.212	.994	2.66	.084	80.72	11.08	2351	500	302	1425	534	501	6973

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(i) Configuration 9. Diameter ratio D_s/D_p, 1.42; spacing ratio L/D_p, 0.97; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary flow, W_s, lb/sec	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, p_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_o, °R	
1	0.036	2.11	0.468	0.932	2.27	0.023	80.93	2.91	2379	1115	1123	1436	630	501	4302
2	.054	2.93	.335	.945	2.26	.023	81.15	2.83	2315	777	789	1410	622	501	5081
3	.056	3.97	.210	.893	2.26	.024	81.22	3.00	2314	486	582	1405	621	500	5339
4	.059	4.97	.176	.899	2.27	.026	81.42	3.24	2312	409	465	1408	618	500	5447
5	.040	5.89	.167	.913	2.29	.026	81.54	3.32	2316	387	393	1408	614	496	6080
6	.054	7.96	.158	.930	2.29	.022	81.33	2.80	2311	386	290	1409	615	493	6573
7	.050	2.13	.467	.935	2.48	.032	81.18	4.09	2396	1121	1124	1446	585	501	4365
8	.048	2.91	.359	.927	2.42	.031	82.10	3.96	2329	791	800	1418	586	501	5046
9	.048	3.96	.222	.908	2.39	.031	81.67	3.99	2329	519	587	1414	591	501	5471
10	.048	4.89	.187	.904	2.40	.031	81.49	3.88	2329	437	476	1415	588	500	5970
11	.049	5.97	.173	.924	2.40	.031	81.41	3.99	2322	402	388	1412	588	495	6173
12	.048	8.05	.165	.939	2.39	.031	82.04	3.98	2345	389	291	1414	591	494	6714
13	.084	2.10	.477	.940	2.53	.050	80.66	6.82	2396	1142	1138	1439	567	496	4312
14	.083	2.90	.345	.950	2.48	.052	80.72	6.70	2322	802	800	1405	563	495	5058
15	.082	3.91	.248	.940	2.54	.051	81.19	6.70	2320	577	592	1403	552	498	5590
16	.082	4.90	.205	.929	2.54	.051	81.07	6.71	2321	476	473	1407	559	498	5884
17	.082	5.75	.193	.941	2.51	.052	81.13	6.69	2323	450	404	1407	559	498	6205
18	.081	7.48	.190	.959	2.51	.051	81.09	6.57	2320	443	310	1403	559	496	6664
19	.102	2.15	.467	.947	2.54	.064	80.91	8.31	2408	1126	1118	1442	567	500	4429
20	.103	2.96	.342	.961	2.53	.064	80.87	8.33	2343	802	790	1415	559	500	5185
21	.102	3.95	.254	.947	2.54	.064	80.60	8.27	2321	591	587	1411	555	500	5626
22	.102	4.82	.216	.938	2.56	.064	80.59	8.26	2323	503	481	1412	551	500	5893
23	.101	5.63	.203	.949	2.57	.063	80.71	8.21	2320	473	412	1418	550	500	6223
24	.103	5.71	.205	.956	2.49	.065	78.54	8.16	2210	454	387	1386	555	505	6042
25	.105	6.97	.202	.964	2.49	.066	78.03	8.22	2198	444	315	1387	556	508	6325
26	.102	7.60	.194	.976	2.57	.063	80.14	8.18	2319	452	305	1419	551	500	6758
27	.123	2.12	.478	.957	2.61	.076	81.07	9.98	2408	1160	1135	1440	550	499	4435
28	.128	2.91	.352	.964	2.57	.079	80.86	10.36	2338	825	805	1410	547	497	5155
29	.128	3.88	.268	.958	2.60	.079	80.97	10.40	2325	825	598	1412	542	496	5685
30	.128	4.78	.250	.941	2.60	.079	81.42	10.43	2344	541	490	1410	541	498	6018
31	.128	5.60	.218	.960	2.61	.079	81.16	10.40	2344	513	418	1412	540	498	6305
32	.133	7.28	.214	.987	2.61	.082	80.93	10.84	2353	501	320	1409	539	498	6829

TABLE II. - Continued. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(j) Configuration 10. Diameter ratio D_e/D_p, 1.62; spacing ratio L/D_p, 0.84; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary flow, W_s, lb/sec	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, p_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_o, °R	
1	0.030	2.07	0.481	-----	2.15	0.020	80.46	2.46	2338	1126	1129	1418	658	493	-----
2	.031	2.87	.346	-----	2.12	.021	81.27	2.53	2282	791	794	1392	654	494	-----
3	.028	3.82	.280	-----	2.10	.020	81.49	2.40	2284	596	598	1389	660	496	-----
4	.029	4.89	.209	0.923	2.19	.019	81.43	2.40	2287	478	487	1394	636	495	5782
5	.030	5.61	.160	.895	2.20	.020	81.35	2.50	2295	367	409	1393	632	498	5856
6	.029	7.29	.122	.887	2.20	.019	81.60	2.38	2297	281	315	1394	633	496	6156
7	.028	10.01	.107	.896	2.25	.019	81.69	2.35	2293	246	229	1398	618	495	6589
8	.051	2.09	.478	-----	2.32	.033	80.72	4.16	2347	1122	1122	1397	602	498	-----
9	.050	2.91	.343	-----	2.35	.032	81.01	4.10	2300	791	789	1401	594	495	-----
10	.049	3.81	.282	-----	2.36	.032	81.41	4.06	2298	604	602	1400	593	499	-----
11	.049	4.71	.212	.932	2.36	.032	81.51	4.01	2303	488	489	1400	593	498	5863
12	.048	5.52	.175	.931	2.37	.031	81.54	3.99	2304	404	417	1401	590	496	6096
13	.049	6.95	.137	.907	2.38	.032	81.38	4.04	2302	317	331	1400	586	497	6227
14	.049	10.47	.108	.913	2.44	.031	81.58	4.02	2304	281	220	1401	572	496	6786
15	.079	2.10	.477	-----	2.53	.049	80.97	6.44	2367	1129	1125	1430	564	495	-----
16	.077	2.90	.347	-----	2.50	.049	81.42	6.32	2323	807	801	1409	562	496	-----
17	.077	3.90	.260	-----	2.49	.048	81.75	6.33	2325	605	596	1410	565	495	-----
18	.077	4.78	.215	.943	2.52	.048	81.58	6.28	2328	498	487	1411	559	496	5984
19	.076	6.97	.153	.925	2.58	.047	82.12	6.27	2336	358	335	1415	547	499	6436
20	.077	9.67	.134	.930	2.59	.047	82.50	6.38	2340	315	242	1419	548	495	6920
21	.110	2.13	.473	-----	2.71	.067	81.75	9.07	2411	1142	1132	1443	532	495	-----
22	.109	2.92	.348	-----	2.67	.067	81.86	8.99	2357	821	805	1422	531	495	-----
23	.109	3.83	.270	-----	2.61	.067	81.89	8.94	2352	636	613	1418	542	495	-----
24	.107	4.68	.225	.950	2.64	.066	82.27	8.88	2347	529	501	1421	537	496	6070
25	.108	5.64	.191	.942	2.66	.066	82.16	8.88	2357	451	418	1421	534	491	6294
26	.108	6.83	.157	.942	2.64	.065	82.38	8.75	2356	393	345	1418	536	494	6544
27	.140	2.15	.471	-----	2.69	.085	82.10	11.49	2412	1138	1118	1443	536	492	-----
28	.138	2.93	.352	-----	2.64	.084	82.32	11.37	2358	851	803	1422	537	495	-----
29	.140	3.85	.274	-----	2.63	.086	82.28	11.34	2360	648	812	1420	538	494	-----
30	.137	4.80	.228	.962	2.65	.084	82.52	11.31	2360	538	491	1416	534	494	6189
31	.139	5.64	.202	.951	2.65	.085	82.31	11.22	2359	478	418	1422	536	495	6366
32	.139	6.99	.183	.956	2.69	.084	82.28	11.22	2364	433	338	1422	528	495	6701

TABLE II. - Concluded. DATA FOR VARIOUS XJ-79-GE-1 EJECTOR CONFIGURATIONS

(k) Configuration 11. Diameter ratio D_e/D_p, 1.70; spacing ratio L/D_p, 0.85; primary-nozzle-exit diameter D_p, 21.5 inches

Run	Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/p_0	Ejector total-pressure ratio, P_s/P_p	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary to secondary temperature ratio, T_p/T_s	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary gas flow, W_p, lb/sec	Secondary flow, W_s, lb/sec	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, p_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_c, °R	
1	0.040	2.13	0.466	0.937	2.41	0.026	81.93	3.32	2414	1127	1130	1446	600	498	4414
2	.039	3.80	.261	.933	2.35	.025	82.37	3.22	2366	618	622	1424	606	498	5817
3	.039	5.54	.177	.906	2.35	.025	82.15	3.20	2361	419	426	1429	608	497	6041
4	.038	7.40	.122	.881	2.36	.025	81.89	3.18	2363	290	319	1429	605	499	6225
5	.038	8.99	.104	.883	2.42	.025	82.01	3.19	2365	247	263	1432	591	499	6478
6	.061	2.17	.460	.942	2.50	.038	82.18	5.06	2428	1117	1119	1449	579	498	4500
7	.060	3.73	.268	.934	2.48	.038	82.43	4.97	2376	637	638	1425	574	496	5698
8	.059	5.64	.178	.912	2.48	.037	82.80	4.89	2383	425	422	1426	575	496	6133
9	.058	8.27	.120	.897	2.48	.037	82.62	4.86	2375	285	287	1427	574	498	6527
10	.057	9.15	.117	.894	2.49	.036	82.69	4.74	2380	279	280	1429	572	495	6636
11	.089	2.16	.463	.940	2.57	.055	82.38	7.35	2425	1123	1118	1447	562	495	4493
12	.088	3.83	.264	.935	2.53	.055	82.40	7.26	2376	629	619	1424	561	495	5650
13	.088	5.72	.182	.916	2.60	.054	82.59	7.29	2382	435	416	1425	548	494	6185
14	.087	7.31	.149	.908	2.59	.054	82.59	7.19	2389	353	324	1425	549	494	6445
15	.087	8.58	.134	.911	2.59	.054	82.47	7.18	2378	320	277	1425	549	494	6654
16	.150	2.94	.348	.947	2.63	.080	82.68	10.76	2389	852	810	1430	543	494	5245
17	.129	4.12	.256	.935	2.64	.079	82.44	10.71	2385	612	578	1426	540	493	5783
18	.129	5.52	.201	.930	2.65	.079	82.56	10.70	2382	479	431	1428	538	493	6227
19	.129	7.59	.163	.918	2.67	.079	82.43	10.68	2386	390	314	1428	534	493	6585
20	.129	8.88	.157	.928	2.68	.078	82.48	10.67	2382	376	268	1430	532	493	6830
21	.169	2.88	.384	.946	2.68	.103	82.91	14.07	2376	868	825	1427	532	493	5195
22	.170	4.17	.265	.953	2.68	.104	82.75	14.11	2373	630	569	1425	530	493	5952
23	.171	5.50	.219	.938	2.70	.104	82.39	14.12	2371	520	431	1427	527	494	6262
24	.171	7.15	.193	.933	2.71	.103	82.25	14.07	2369	459	351	1426	525	493	6578
25	.171	8.22	.187	.944	2.72	.103	82.40	14.12	2388	443	288	1427	524	493	6846
26	.212	2.92	.368	.963	2.73	.128	82.84	17.58	2392	882	819	1428	525	493	5304
27	.211	4.22	.276	.961	2.74	.127	82.86	17.50	2390	661	566	1427	520	492	6018
28	.211	5.72	.233	.949	2.74	.127	82.88	17.54	2386	558	417	1428	520	492	6431
29	.210	7.03	.220	.948	2.75	.126	82.86	17.40	2385	528	339	1429	519	492	6693
30	.210	8.09	.216	.958	2.74	.127	82.52	17.40	2387	517	295	1428	521	492	6933

TABLE III. - DATA FOR XJ-79-GE-1 VARIABLE EJECTOR

(a) Nominal weight-flow ratio W_s/W_p, 0.043

Run	Nominal primary pressure ratio, $\frac{P_p}{P_0}$	Ejector geometry			Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
		Diameter ratio, $\frac{D_e}{D_p}$	Spacing ratio, $\frac{L}{D_p}$	Primary nozzle-exit diameter, D_p, in.	Ejector weight-flow ratio, $\frac{W_s}{W_p}$	Primary pressure ratio, $\frac{P_p}{P_0}$	Ejector total-pressure ratio, $\frac{P_s}{P_p}$	Primary to secondary temperature ratio, $\frac{T_p}{T_s}$	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary gas weight flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, P_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_e, °R	
1	2.18	1.011	0.83	21.54	0.045	2.20	0.512	2.36	0.941	81.49	3.74	0.029	2444	1252	1110	1458	617	494	4510
2		1.032	.84		.044	2.18	.477	-----	.934	81.52	3.65	.029	2418	1154	1108	-----	---	---	4458
3		1.057	.84		.043	2.15	.460	-----	.929	81.43	3.53	.028	2406	1107	1116	-----	---	---	4398
4		1.091	.85		.043	2.17	.431	-----	.923	81.28	3.53	.028	2395	1054	1099	-----	---	---	4383
5		1.191	.86		.042	2.18	.423	-----	.919	81.54	3.44	.027	2387	1011	1095	-----	---	---	4384
6	2.98	1.043	.84	21.52	.043	2.99	.401	2.32	.948	81.47	3.56	.028	2364	940	790	1424	613	490	5193
7		1.064	.85		.043	2.95	.378	-----	.941	81.55	3.58	.028	2356	894	798	-----	---	---	5128
8		1.086	.85		.043	2.93	.360	-----	.943	81.58	3.57	.028	2353	848	801	-----	---	---	5131
9		1.148	.86		.043	2.85	.329	-----	.934	81.73	3.57	.028	2342	772	792	-----	---	---	5108
10		1.214	.87		.042	2.88	.300	-----	.929	81.58	3.49	.028	2343	705	786	-----	---	---	5061
11	4.01	1.085	.85	21.50	.043	4.01	.345	2.31	.952	81.65	3.53	.028	2359	814	587	1418	611	492	5762
12		1.116	.86		.043	4.02	.318	-----	.954	81.74	3.55	.028	2352	749	584	-----	---	---	5783
13		1.147	.86		.043	4.00	.294	-----	.951	81.79	3.56	.028	2345	691	586	-----	---	---	5765
14		1.182	.87		.044	4.00	.271	-----	.945	81.80	3.64	.029	2345	636	585	-----	---	---	5759
15		1.262	.87		.043	3.99	.245	-----	.937	81.82	3.66	.029	2343	574	587	-----	---	---	5672
16	5.06	1.055	.84	21.52	.041	5.01	.370	2.31	.944	81.84	3.41	.027	2357	872	470	1419	613	498	6100
17		1.115	.86		.043	5.07	.315	-----	.948	81.88	3.52	.028	2348	737	483	-----	---	---	6144
18		1.146	.88		.042	5.08	.288	-----	.950	82.15	3.52	.028	2350	673	484	-----	---	---	6174
19		1.183	.87	21.48	.042	5.01	.263	-----	.946	81.98	3.52	.028	2345	617	488	-----	---	---	6111
20		1.218	.87		.042	5.01	.243	-----	.943	82.15	3.52	.028	2345	571	488	-----	---	---	6112
21		1.291	.88		.041	5.12	.211	-----	.932	82.00	3.42	.027	2344	498	487	-----	---	---	6070
22		1.372	.89		.042	5.02	.191	-----	.920	82.00	3.52	.028	2344	448	487	-----	---	---	5958
23	6.05	1.092	.85	21.52	.042	6.11	.328	2.32	.951	81.87	3.51	.028	2341	770	383	1415	609	493	6429
24		1.137	.86	21.48	.043	6.11	.296	-----	.955	81.74	3.52	.028	2342	695	383	-----	---	---	6447
25		1.182	.87		.043	6.08	.262	-----	.953	81.89	3.52	.028	2343	614	386	-----	---	---	6438
26		1.235	.88		.043	6.07	.232	-----	.954	81.74	3.52	.028	2344	544	386	-----	---	---	6431
27		1.291	.89		.043	5.98	.208	-----	.947	82.07	3.53	.028	2340	488	390	-----	---	---	6398
28		1.351	.89		.042	6.02	.185	-----	.935	82.12	3.52	.028	2347	436	391	-----	---	---	6318
29		1.414	.90		.044	5.98	.171	-----	.928	81.83	3.60	.028	2339	401	391	-----	---	---	6258

TABLE III. - Continued. DATA FOR XJ-79-GE-1 VARIABLE EJECTOR

(b) Nominal weight-flow ratio W_s/W_p, 0.078

Run	Nominal primary pressure ratio, $\frac{P_p}{P_0}$	Ejector geometry			Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
		Diameter ratio, $\frac{D_e}{D_p}$	Spacing ratio, $\frac{L}{D_p}$	Primary nozzle-exit diameter, D_p, in.	Ejector weight-flow ratio, $\frac{W_s}{W_p}$	Primary pressure ratio, $\frac{P_p}{P_0}$	Ejector total-pressure ratio, $\frac{P_s}{P_p}$	Primary to secondary temperature ratio, $\frac{T_p}{T_s}$	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary gas weight flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, P_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_0, °R	
1	2.18	1.045	0.85	21.58	0.078	2.18	0.503	2.48	0.956	79.48	6.22	0.049	2587	1206	1098	1436	577	504	4417
2	↓	1.059	.84	↓	.077	2.17	.475	-----	.946	79.85	6.21	.049	2585	1154	1098	-----	---	---	4375
3		1.066	.85		.078	2.13	.465	-----	.941	80.10	6.28	.049	2589	1111	1121	-----	---	---	4317
4	3.06	1.067	.84	21.54	.078	3.06	.400	2.45	.970	79.24	6.20	.049	2317	929	758	1408	574	505	5187
5	↓	1.075	.85	↓	.077	3.03	.386	-----	.968	79.89	6.14	.049	2306	892	780	-----	---	---	5184
6		1.093	.85		.077	3.06	.367	-----	.975	79.81	6.14	.049	2306	847	747	-----	---	---	5241
7		1.122	.86		.077	3.06	.351	-----	.970	79.80	6.09	.048	2295	807	750	-----	---	---	5199
8	4.15	1.064	.84	21.55	.077	4.15	.383	2.44	.980	78.91	6.19	.049	2586	891	580	1406	574	508	5841
9	↓	1.097	.85	↓	.077	4.14	.353	-----	.979	79.70	6.16	.049	2312	817	556	-----	---	---	5818
10		1.143	.81		.077	4.14	.318	-----	.975	79.58	6.14	.049	2296	732	558	-----	---	---	5789
11		1.189	.82		.077	4.13	.291	-----	.970	79.58	6.14	.049	2295	669	555	-----	---	---	5745
12		1.254	.83		.077	4.09	.283	-----	.965	79.71	6.18	.049	2297	605	561	-----	---	---	5700
13	5.15	1.099	.85	21.52	.077	5.11	.332	2.43	.978	78.92	6.11	.049	2280	805	448	1401	575	507	6056
14	↓	1.138	.86	↓	.078	5.25	.318	-----	.978	78.94	6.18	.050	2271	724	434	-----	---	---	6090
15		1.173	.86		.077	5.17	.296	-----	.977	78.88	6.11	.049	2278	675	440	-----	---	---	6077
16		1.235	.87		.077	5.11	.289	-----	.972	78.84	6.11	.049	2279	615	448	-----	---	---	6060
17		1.288	.85	21.53	.077	5.16	.243	-----	.971	79.07	6.11	.049	2281	556	442	-----	---	---	6052
18		1.357	.89	21.54	.077	5.13	.212	-----	.955	79.58	6.16	.049	2277	484	443	-----	---	---	5870
19	6.23	1.125	.86	21.52	.078	6.29	.331	2.43	.982	78.89	6.16	.050	2286	752	380	1412	579	510	6283
20	↓	1.158	.86	↓	.079	6.19	.309	-----	.967	79.00	6.25	.050	2284	701	368	-----	---	---	6304
21		1.191	.87		.077	6.31	.281	-----	.971	78.84	6.10	.049	2261	638	358	-----	---	---	6343
22		1.252	.87		.077	6.15	.288	-----	.964	78.82	6.10	.049	2259	600	368	-----	---	---	6249
23		1.286	.88		.076	6.38	.252	-----	.961	78.58	6.10	.049	2265	526	358	-----	---	---	6336
24		1.373	.89		.077	6.06	.202	-----	.949	78.05	6.10	.049	2285	458	374	-----	---	---	6159
25		1.445	.89		.077	6.23	.178	-----	.928	78.97	6.18	.049	2301	410	369	-----	---	---	6137
26	↓	1.623	.90	↓	.078	6.06	.171	-----	.916	79.48	6.08	.048	2270	390	378	-----	---	---	5981

TABLE III. - Continued. DATA FOR XJ-79-GE-1 VARIABLE EJECTOR

(c) Nominal weight-flow ratio W_s/W_p, 0.116

Run	Nominal primary pressure ratio, $\frac{P_p}{P_0}$	Ejector geometry			Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
		Diameter ratio, $\frac{D_e}{D_p}$	Spacing ratio, $\frac{L}{D_p}$	Primary nozzle-exit diameter, D_p, in.	Ejector weight-flow ratio, $\frac{W_s}{W_p}$	Primary pressure ratio, $\frac{P_p}{P_0}$	Ejector total-pressure ratio, $\frac{P_s}{P_p}$	Primary to secondary temperature ratio, $\frac{T_p}{T_s}$	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary gas weight flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, P_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_o, °R	
1	2.24	1.011	0.83	21.56	0.116	2.32	0.585	2.67	0.978	81.20	9.608	0.072	2557	1493	1102	1498	559	492	4888
2		1.031	.84		.117	2.27	.543	-----	.956	81.40	9.584	.071	2509	1383	1105	-----	---	---	4722
3		1.056	.84		.117	2.25	.510	-----	.951	81.35	9.573	.071	2482	1257	1092	-----	---	---	4673
4		1.090	.85		.117	2.20	.485	-----	.936	81.57	9.584	.071	2480	1189	1109	-----	---	---	4559
5		1.127	.86		.117	2.21	.459	-----	.931	81.73	9.587	.071	2439	1121	1102	-----	---	---	4555
6	2.89	1.030	.84		.117	3.07	.521	2.62	.969	81.50	9.541	.072	2473	1289	804	1466	559	495	5842
7		1.084	.85		.116	2.88	.416	-----	.948	81.71	9.555	.072	2404	1001	806	-----	---	---	5542
8		1.142	.86	21.58	.117	2.84	.371	-----	.940	81.87	9.590	.072	2384	885	809	-----	---	---	5278
9		1.208	.87	21.58	.116	2.94	.347	-----	.933	81.72	9.539	.072	2379	828	807	-----	---	---	5231
10	4.02	1.056	.88	21.56	.115	4.03	.446	2.58	.976	81.88	9.415	.071	2419	1080	599	1437	555	495	5986
11		1.114	.88	21.54	.115	4.03	.389	-----	.975	81.74	9.412	.071	2395	884	594	-----	---	---	5989
12		1.145	.87	21.54	.114	4.02	.344	-----	.971	81.98	9.421	.071	2380	823	594	-----	---	---	5951
13		1.179	.87	21.53	.115	4.02	.315	-----	.969	81.87	9.418	.071	2390	765	594	-----	---	---	5927
14		1.250	.88	21.53	.115	3.98	.284	-----	.957	82.00	9.454	.071	2363	678	601	-----	---	---	5841
15	5.05	1.070	.85	21.56	.115	5.09	.414	2.59	.972	81.70	9.406	.071	2397	994	470	1432	552	485	6326
16		1.117	.86	21.53	.115	5.06	.385	-----	.978	81.70	9.422	.071	2385	872	471	-----	---	---	6358
17		1.146	.87		.115	5.00	.340	-----	.975	81.66	9.450	.071	2385	812	469	-----	---	---	6334
18		1.179	.87		.116	5.06	.310	-----	.972	81.70	9.408	.071	2380	758	470	-----	---	---	6314
19		1.214	.88		.114	5.01	.289	-----	.973	81.75	9.371	.071	2378	688	474	-----	---	---	6308
20		1.288	.89		.115	4.98	.254	-----	.962	81.76	9.482	.071	2379	608	477	-----	---	---	6228
21	5.91	1.114	.86	21.56	.114	6.14	.384	2.58	.977	82.06	9.355	.071	2389	871	389	1427	553	492	6660
22		1.150	.87	21.53	.113	6.08	.335	-----	.982	81.93	9.318	.070	2385	800	392	-----	---	---	6663
23		1.181	.87		.116	6.00	.307	-----	.980	81.86	9.381	.071	2377	750	396	-----	---	---	6614
24		1.214	.88		.113	5.98	.287	-----	.981	81.93	9.316	.070	2388	681	400	-----	---	---	6627
25		1.251	.88	21.52	.115	5.77	.268	-----	.980	81.68	9.391	.071	2372	636	411	-----	---	---	6560
26		1.289	.89		.114	5.75	.251	-----	.976	81.91	9.357	.071	2370	596	412	-----	---	---	6549
27		1.369	.90		.114	5.71	.224	-----	.964	81.85	9.388	.071	2373	533	415	-----	---	---	6447

TABLE III. - Continued. DATA FOR XJ-79-GE-1 VARIABLE EJECTOR

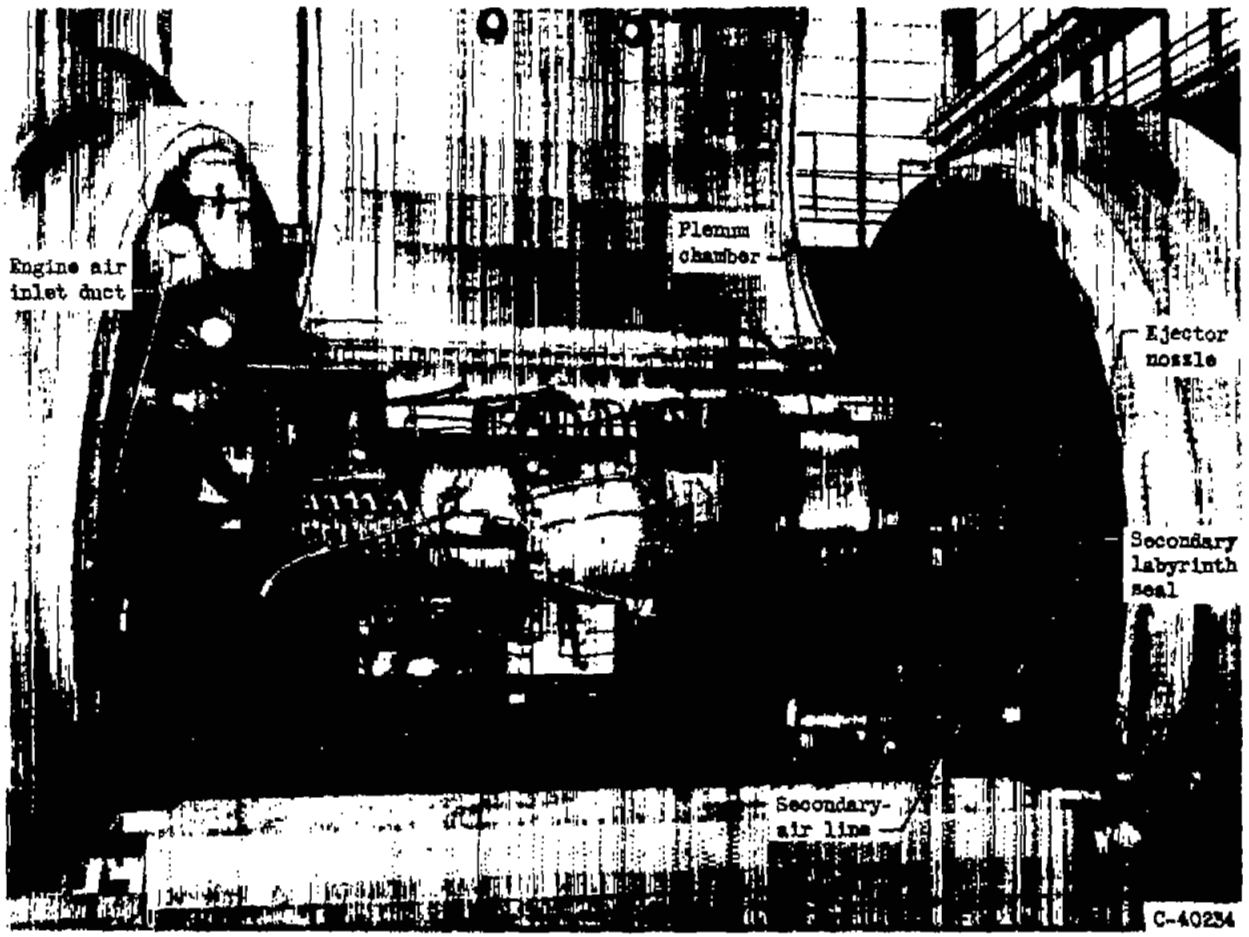
(d) Nominal weight-flow ratio W_s/W_p, 0.149

Run	Nominal primary pressure ratio, $\frac{P_p}{P_0}$	Ejector geometry			Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
		Diameter ratio, $\frac{D_e}{D_p}$	Spacing ratio, $\frac{L}{D_p}$	Primary nozzle-exit diameter, D_p, in.	Ejector weight-flow ratio, $\frac{W_s}{W_p}$	Primary pressure ratio, $\frac{P_p}{P_0}$	Ejector total-pressure ratio, $\frac{P_s}{P_p}$	Primary to secondary temperature ratio, $\frac{T_p}{T_s}$	Ejector jet-thrust ratio, $\frac{F_{ej}}{F_{ip}}$	Primary gas weight flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, P_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_0, °R	
1	2.2	1.129	0.86	21.59	0.150	2.17	0.478	2.66	0.951	82.37	12.17	0.092	2455	1164	1118	1442	541	495	4555
2	↓	1.166	.86	21.71	.151	2.15	.472	-----	.941	82.34	12.20	.092	2456	1150	1130	-----	-----	-----	4479
3		1.227	.87	21.82	.150	2.14	.471	-----	.941	82.37	12.17	.092	2455	1149	1133	-----	-----	-----	4477
4	3.0	1.068	.85	21.80	.148	3.10	.481	2.88	.990	81.98	12.21	.091	2429	1193	782	1442	541	495	5886
5		1.091	.88	21.89	.148	3.06	.432	-----	.984	82.08	12.27	.091	2389	1054	781	-----	-----	-----	5503
6		1.143	.86		.149	2.98	.592	-----	.969	81.97	12.28	.091	2331	915	787	-----	-----	-----	5351
7		1.148	.87		.143	3.04	.581	-----	.975	82.45	11.79	.087	2370	906	778	-----	-----	-----	5489
8		1.148	.87	↓	.151	3.04	.586	-----	.974	82.59	12.48	.092	2377	919	781	-----	-----	-----	5457
9	↓	1.206	.87	21.66	.154	3.04	.555	-----	.981	87.37	12.43	.094	2389	880	785	-----	-----	-----	5585
10	4.9	1.167	.87	21.58	.148	5.04	.547	2.82	.993	81.68	12.15	.091	2348	814	485	1416	539	495	8480
11		1.213	.88	21.54	.150	5.13	.515	-----	1.008	81.99	12.32	.092	2351	741	458	-----	-----	-----	8551
12		1.252	.89		.149	4.95	.298	-----	.999	82.40	12.22	.092	2350	897	474	-----	-----	-----	8473
13		1.288	.88		.149	4.92	.279	-----	.997	82.07	12.30	.092	2350	856	477	-----	-----	-----	8418
14		1.308	.90	↓	.149	4.88	.254	-----	.981	81.91	12.25	.092	2347	598	482	-----	-----	-----	8291
15		1.094	.86	21.56	.149	5.29	.412	-----	1.006	81.79	12.22	.092	2385	983	450	-----	-----	-----	8585
16		1.094	.88	21.55	.150	4.97	.417	2.85	1.002	81.70	12.27	.092	2378	992	478	1426	538	494	8483
17		1.121	.87	21.54	.149	4.97	.384	-----	1.005	81.92	12.27	.092	2372	913	477	-----	-----	-----	8498
18		1.150	.87		.149	5.00	.358	-----	1.003	82.16	12.31	.092	2366	848	475	-----	-----	-----	8518
19		1.182	.87		.150	4.89	.336	-----	1.006	81.95	12.30	.092	2356	798	481	-----	-----	-----	8473
20		1.213	.88		.149	4.91	.316	-----	1.001	82.01	12.28	.092	2360	747	480	-----	-----	-----	8457
21	↓	1.287	.89	↓	.148	4.88	.279	-----	.991	82.21	12.28	.091	2357	659	485	-----	-----	-----	8400
22	5.5	1.280	.89		.149	5.64	.280	2.82	.996	82.21	12.26	.091	2354	681	417	1422	541	497	8715
23		1.338	.89		.147	5.49	.259	-----	.991	82.54	12.15	.091	2350	610	428	-----	-----	-----	8598
24	↓	1.389	.90		.147	5.45	.241	-----	.985	82.87	12.18	.090	2356	570	432	-----	-----	-----	8560
25	6.0	1.186	.87		.148	6.02	.345	2.69	1.008	82.05	12.14	.091	2357	815	391	1422	541	497	8825
26		1.198	.88		.148	5.98	.322	-----	1.005	81.91	12.18	.091	2367	761	395	-----	-----	-----	8780
27	↓	1.239	.88	↓	.148	6.00	.298	-----	1.005	82.10	12.17	.091	2360	704	395	-----	-----	-----	8808

TABLE III. - Concluded. DATA FOR XJ-79-GE-1 VARIABLE EJECTOR

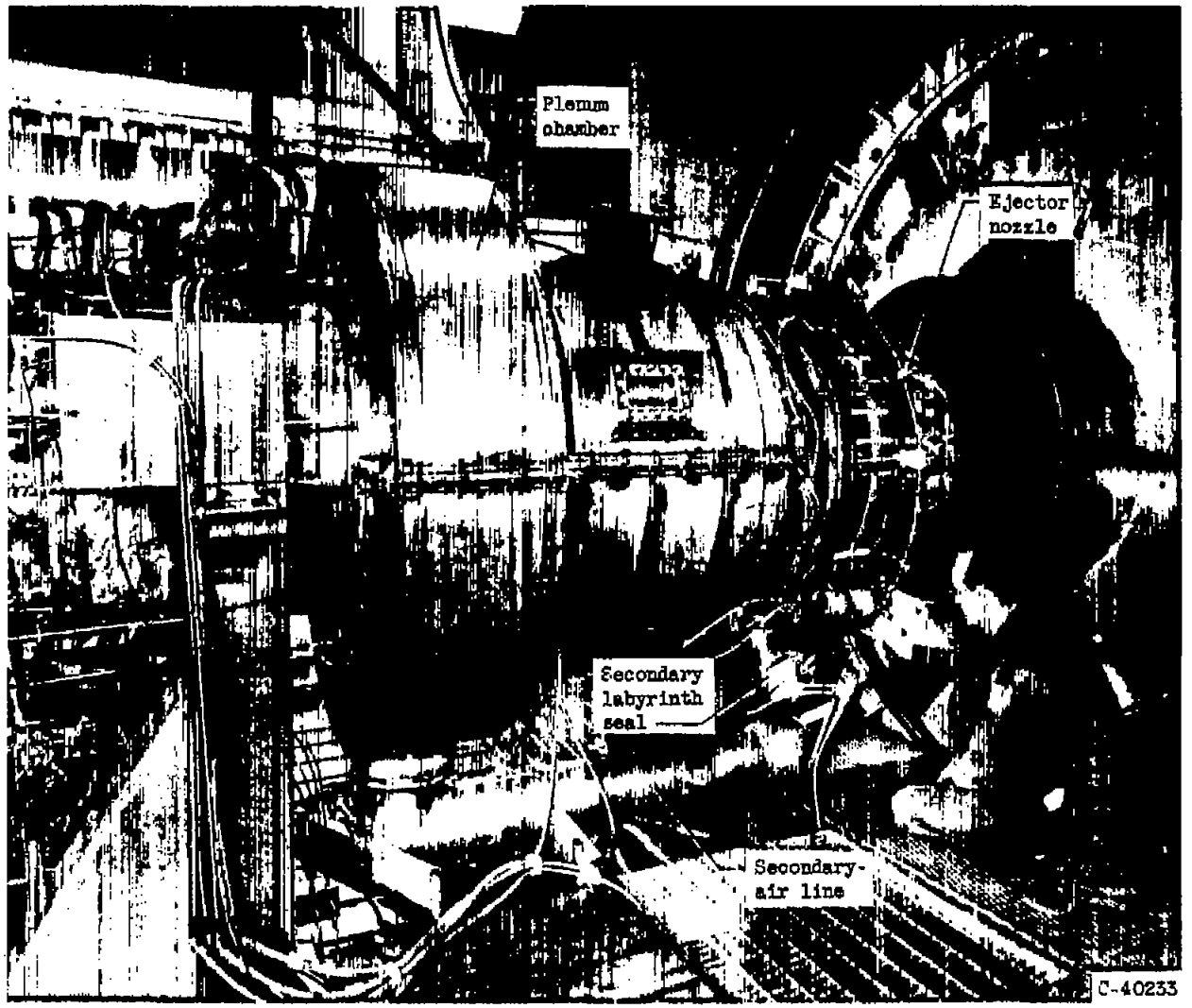
(e) Nominal weight-flow ratio W_s/W_p, 0.176

Run	Nominal primary pressure ratio, P_p/P_0	Ejector geometry			Performance parameters					Weight flow			Pressure			Temperature			Measured ejector jet thrust, F_{ej}, lb
		Diameter ratio, D_e/D_p	Spacing ratio, L/D_p	Primary nozzle-exit diameter, D_p, in.	Ejector weight-flow ratio, W_s/W_p	Primary pressure ratio, P_p/P_0	Ejector total-pressure ratio, P_s/P_p	Primary to secondary temperature ratio, T_p/T_s	Ejector jet-thrust ratio, F_{ej}/F_{ip}	Primary gas weight flow, W_p, lb/sec	Secondary air flow, W_s, lb/sec	$\frac{W_s}{W_p}\sqrt{\frac{T_s}{T_p}}$	Primary total pressure, P_p, lb/sq ft abs	Secondary total pressure, P_s, lb/sq ft abs	Ambient exhaust pressure, P_0, lb/sq ft abs	Primary total temperature, T_p, °R	Secondary total temperature, T_s, °R	Ejector supply air temperature, T_0, °R	
1	2.26	1.074	0.85	21.56	0.180	2.28	0.553	2.735	0.991	81.11	14.67	0.109	2495	1332	1093	1477	540	493	4855
2	2.26	1.145	.86	21.55	.180	2.22	.482	-----	.958	81.20	14.66	.109	2432	1173	1098	-----	---	---	4832
3	3.04	1.059	.85	21.55	.178	3.13	.525	2.717	1.012	81.23	14.46	.108	2478	1297	792	1467	540	490	5898
4	↓	1.099	.85	21.50	.178	3.03	.455	-----	.993	81.42	14.38	.107	2425	1103	798	-----	---	---	5540
5		1.146	.86	21.49	.175	3.00	.402	-----	.983	81.83	14.34	.106	2399	966	799	-----	---	---	5480
6		1.216	.88	21.48	.177	2.99	.389	-----	.986	81.36	14.43	.107	2392	883	801	-----	---	---	5563
7	4.08	1.056	.85	21.52	.175	4.23	.516	2.709	1.012	81.15	14.27	.106	3475	1278	585	1463	540	492	8281
8	↓	1.089	.85	21.48	.176	4.18	.442	-----	1.000	81.22	14.29	.106	2427	1075	580	-----	---	---	6195
9		1.117	.86	21.48	.174	4.10	.408	-----	.998	81.48	14.19	.105	2409	984	588	-----	---	---	6151
10		1.149	.87	21.47	.175	4.00	.380	-----	.994	81.50	14.26	.106	2393	911	598	-----	---	---	6098
11		1.183	.87	21.45	.174	4.03	.351	-----	.992	81.51	14.18	.105	2390	859	593	-----	---	---	6098
12		1.218	.88	21.45	.173	3.97	.333	-----	.982	81.82	14.23	.105	2387	797	602	-----	---	---	6057
13	↓	1.295	.89	21.48	.173	3.94	.304	-----	.970	81.80	14.14	.105	2380	724	604	-----	---	---	5835
14	4.81	1.102	.86	21.49	.173	5.11	.420	2.676	1.003	81.58	14.19	.106	2416	1016	473	1457	537	492	8531
15	↓	1.143	.87	21.47	.174	4.96	.381	-----	1.000	81.73	14.22	.106	2385	913	484	-----	---	---	8466
16		1.187	.87	↓	.172	4.94	.344	-----	1.000	81.85	14.13	.106	2393	825	484	-----	---	---	8474
17		1.243	.88		.173	4.89	.313	-----	.992	81.82	14.19	.106	2385	748	487	-----	---	---	8389
18		1.292	.89		.174	4.75	.290	-----	.986	81.84	14.31	.106	2378	691	501	-----	---	---	8320
19	↓	1.372	.90	↓	.174	4.81	.268	-----	.978	81.55	14.25	.106	2361	631	495	-----	---	---	8263
20	5.70	1.148	.87	21.48	.174	6.04	.370	2.667	1.006	81.69	14.24	.106	2402	891	398	1452	537	493	8801
21	↓	1.187	.88	21.45	.173	6.01	.341	-----	1.007	81.79	14.15	.105	2400	819	399	-----	---	---	8815
22		1.236	.88	↓	.173	5.74	.311	-----	1.006	81.95	14.18	.105	2393	748	417	-----	---	---	8746
23		1.295	.89		.173	5.41	.298	-----	1.005	82.02	14.19	.105	2391	690	431	-----	---	---	8664
24		1.341	.89		.173	5.51	.268	-----	.989	81.71	14.19	.106	2390	642	434	-----	---	---	8585
25	↓	1.394	.90	↓	.173	5.51	.253	-----	.979	81.90	14.19	.106	2390	605	434	-----	---	---	8506



(a) Side view.

Figure 1. - Photographs of XJ79-GE-1 engine ejector installation.



(b) Three-quarter view.

Figure 1. - Concluded. Photographs of XJ79-GE-1 engine ejector installation.

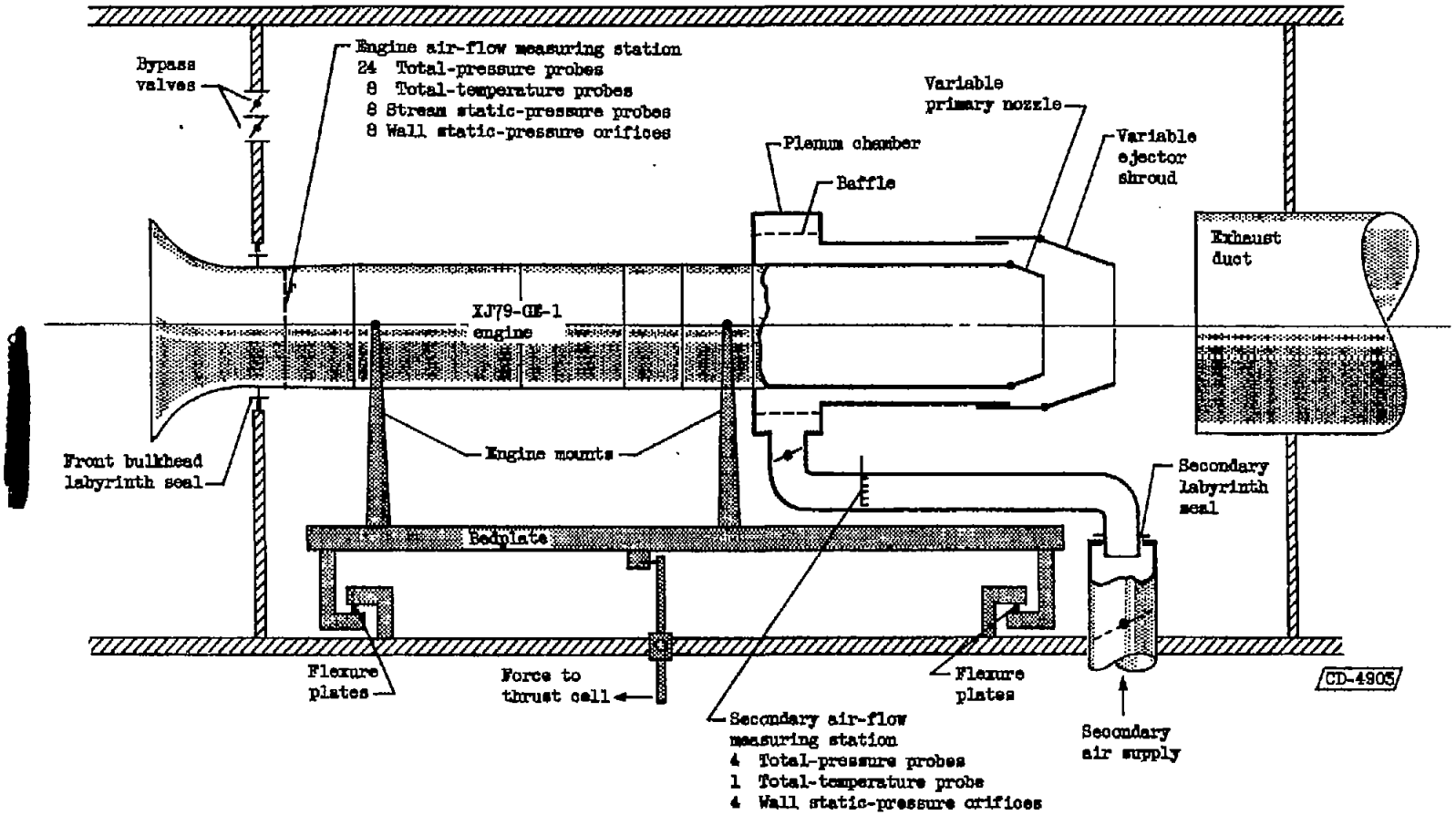


Figure 2. - Schematic drawing of test installation for XJ79-GE-1 engine installation.

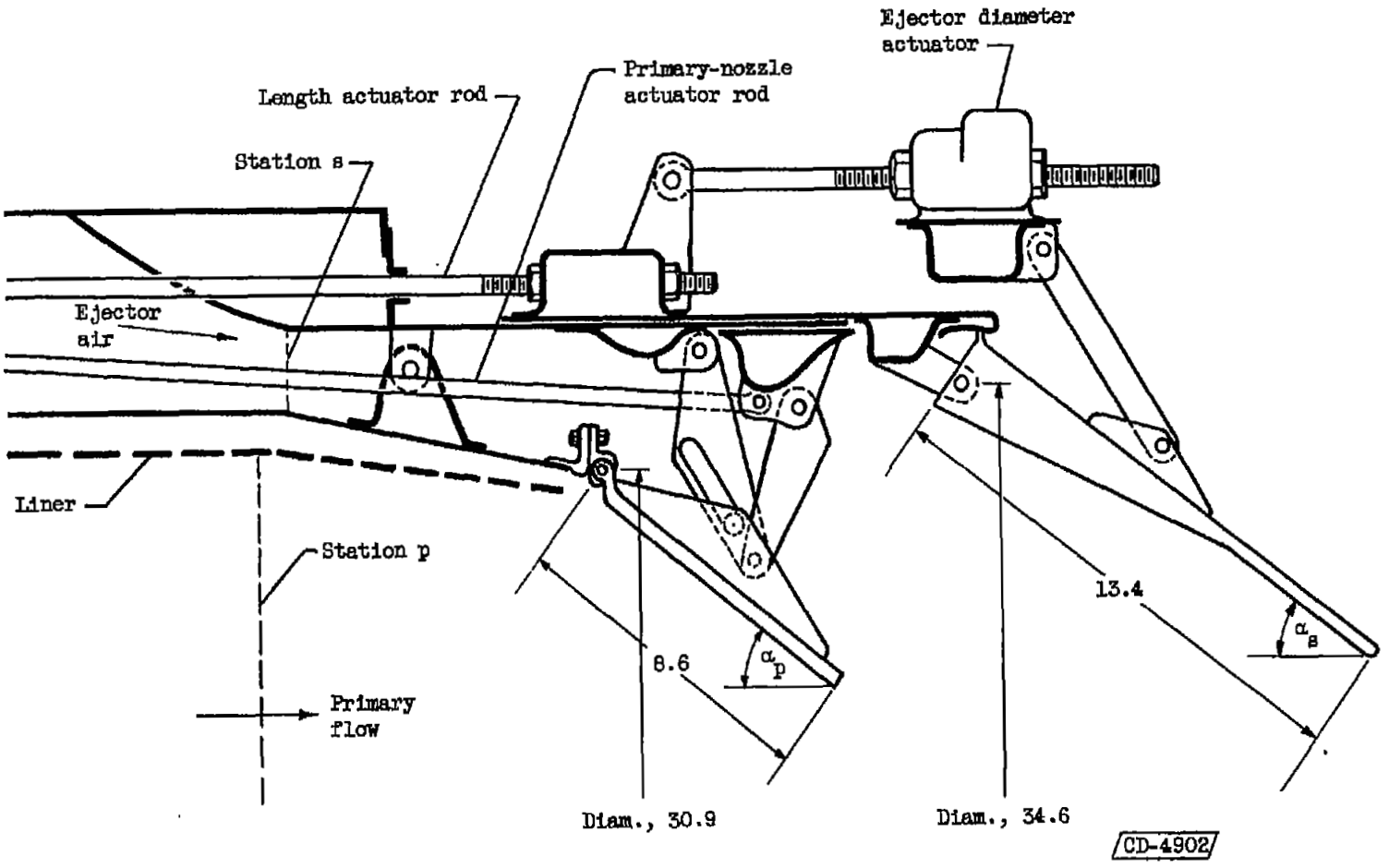
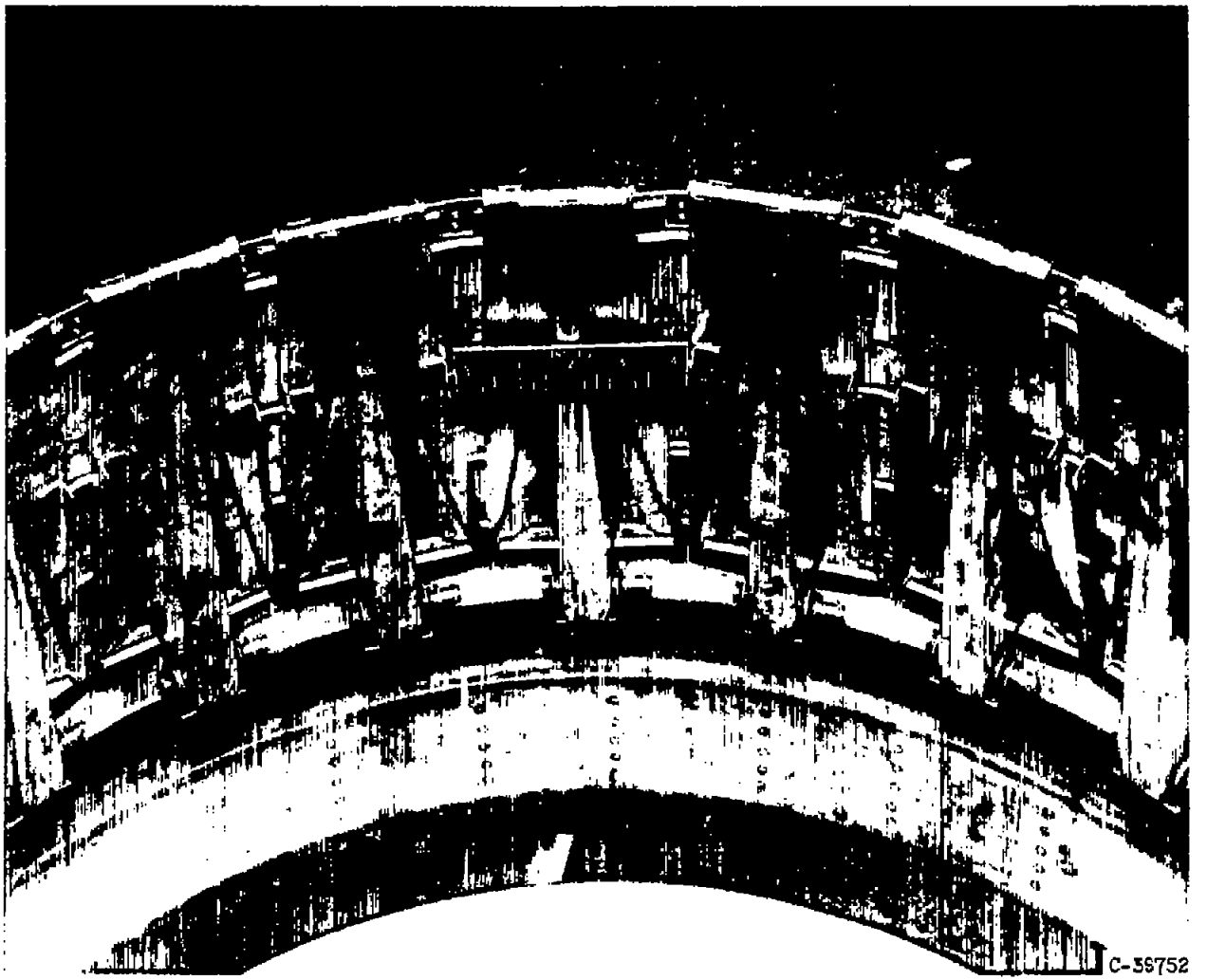


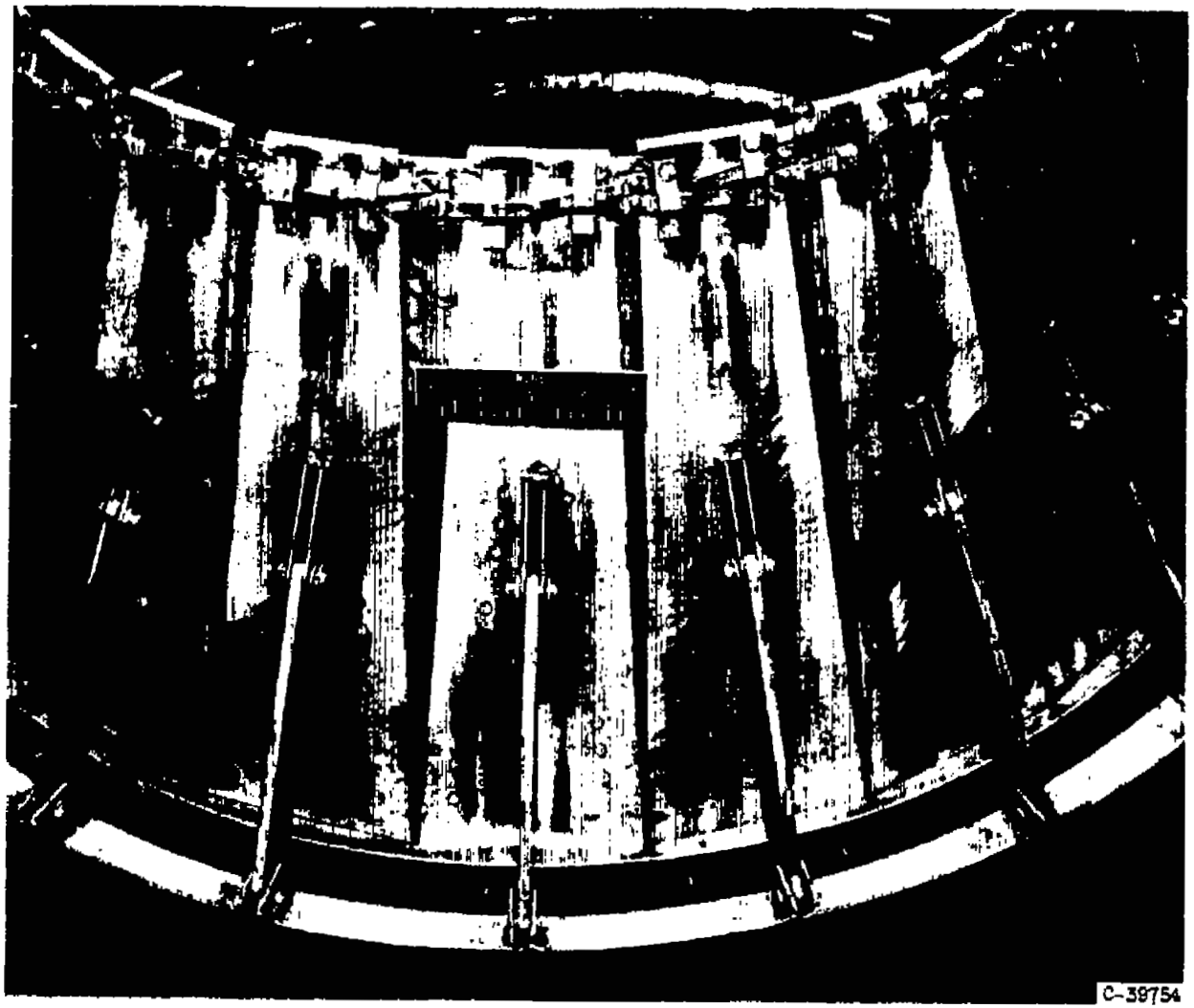
Figure 3. - Schematic diagram of XJ79-GE-1 variable-ejector assembly. (Dimensions are approximate and in inches.)

Figure 4. - Photograph of XJ79-GE-1 variable primary nozzle.



(a) Inside view.

Figure 5. - Photograph of XJ79-GE-1 variable-ejector shroud.



(b) Outside view.

Figure 5. - Concluded. Photograph of XJ79-GE-1 variable-ejector shroud.

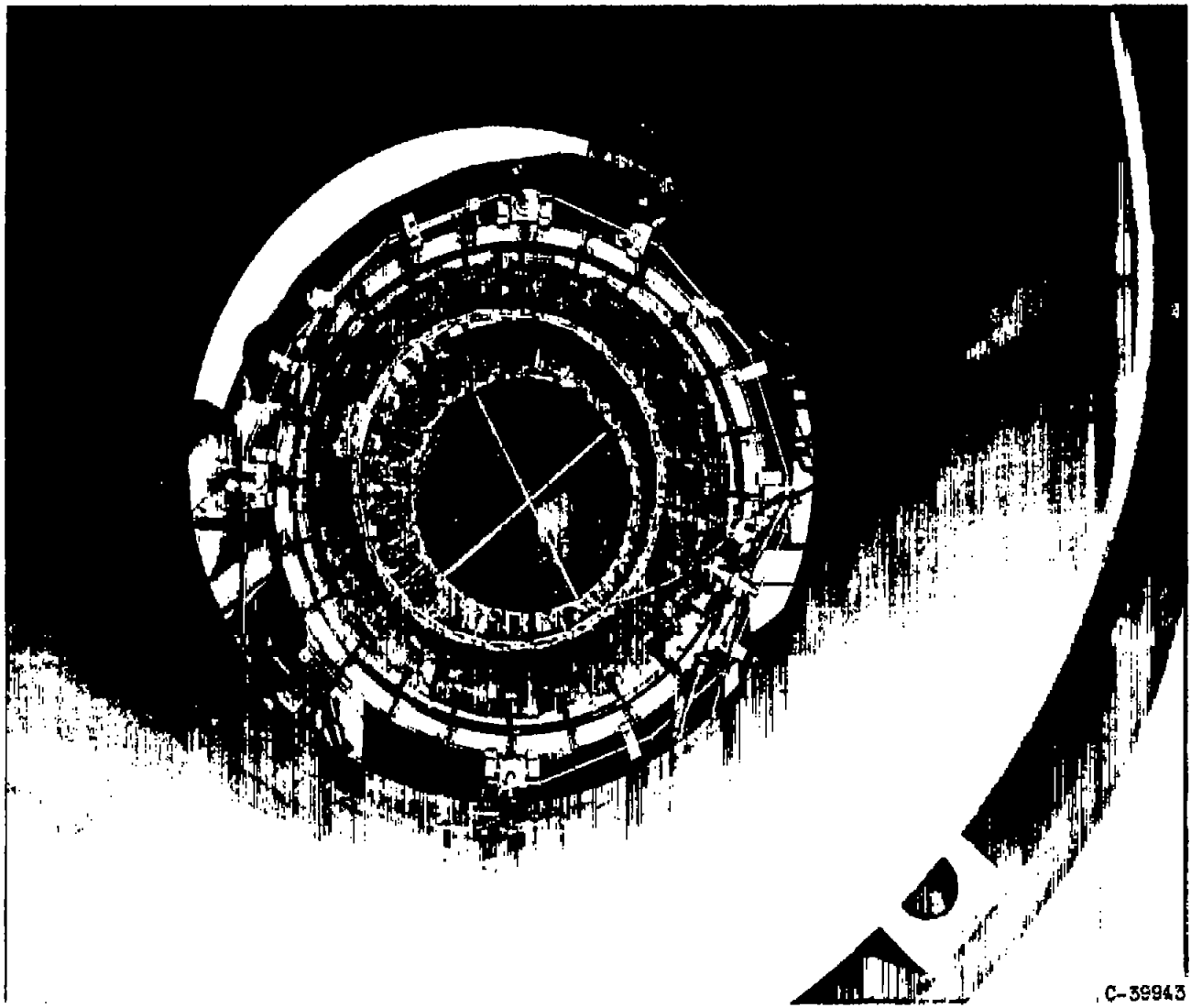


Figure 6. - Photograph of XJ79-GE-1 variable-ejector assembly, rear view.

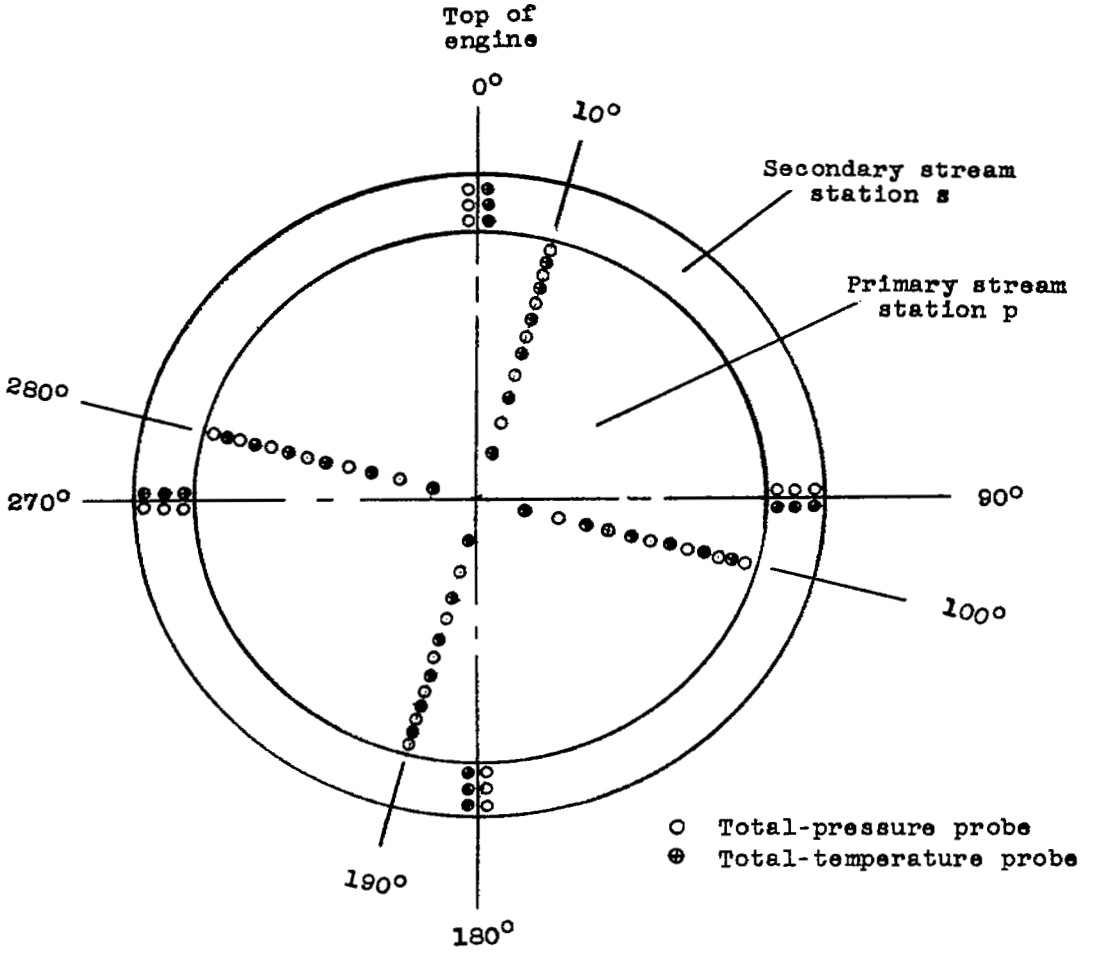


Figure 7. - Schematic diagram of basic ejector instrumentation, looking downstream.

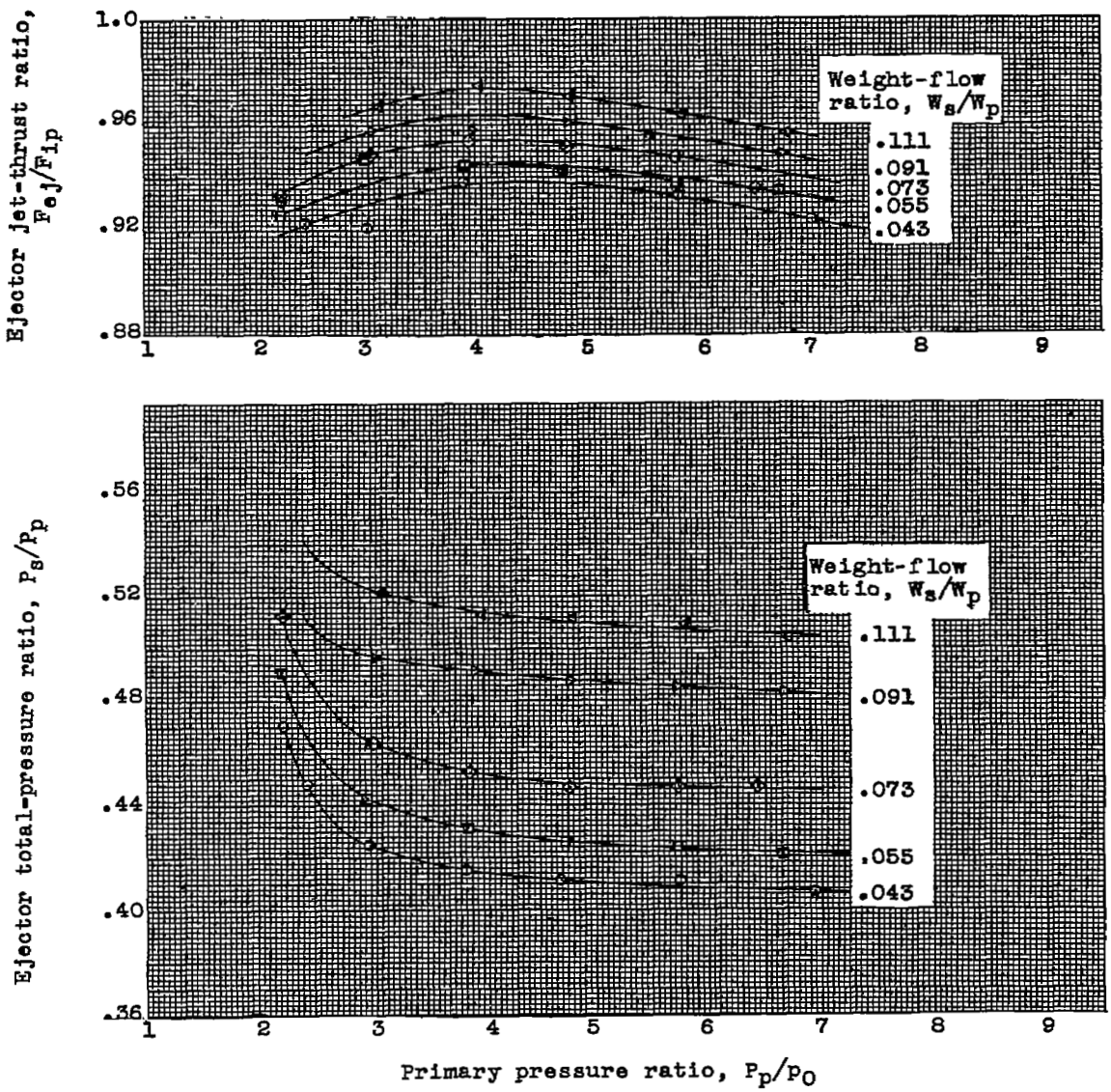


Figure 8. - Thrust and air handling performance data for ejector configuration 1; D_e/D_p = 1.02, and L/D_p = .77.

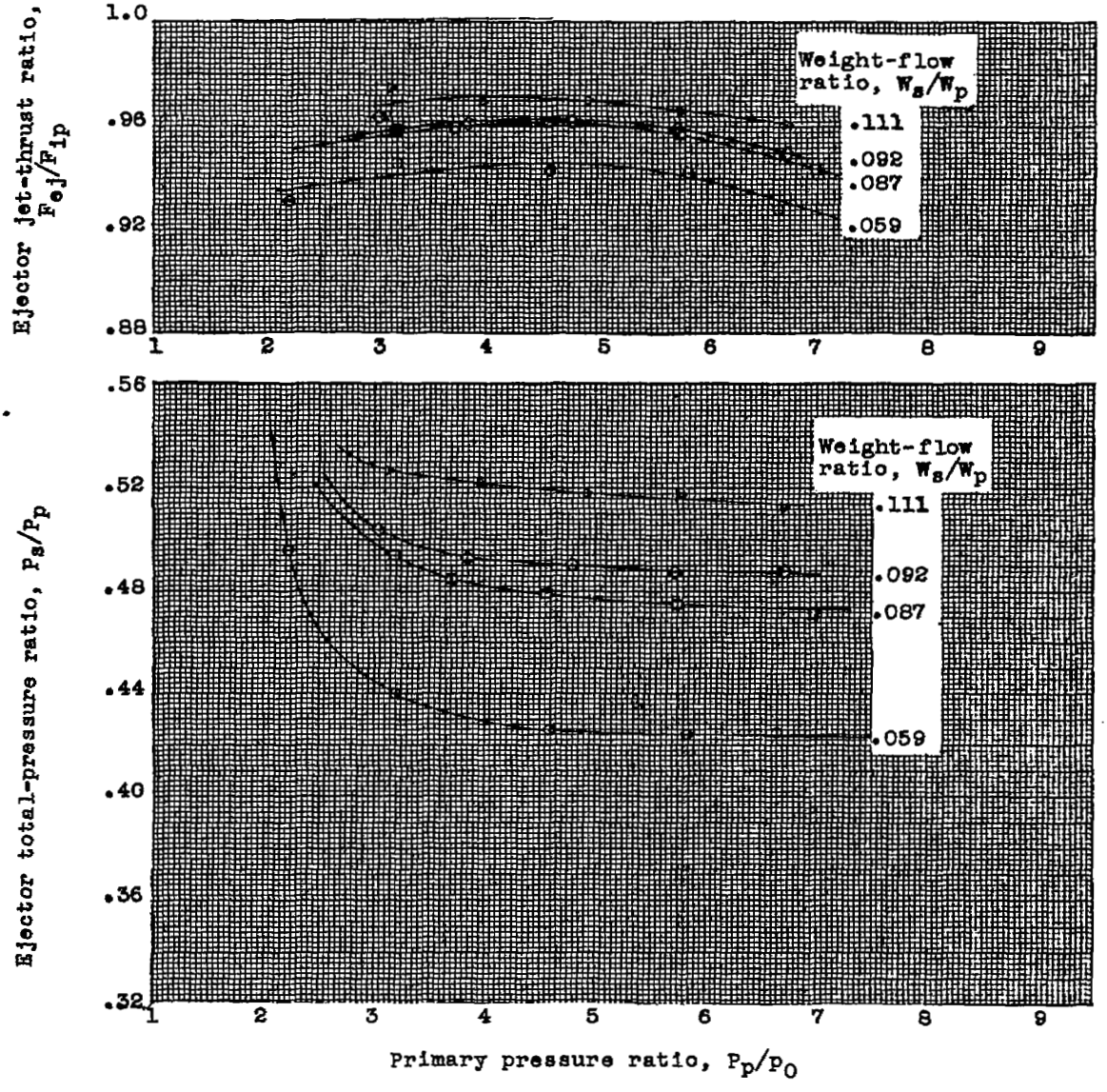


Figure 9. - Thrust and air handling performance data for ejector configuration 2; D_e/D_p = 1.02, and L/D_p = .84.

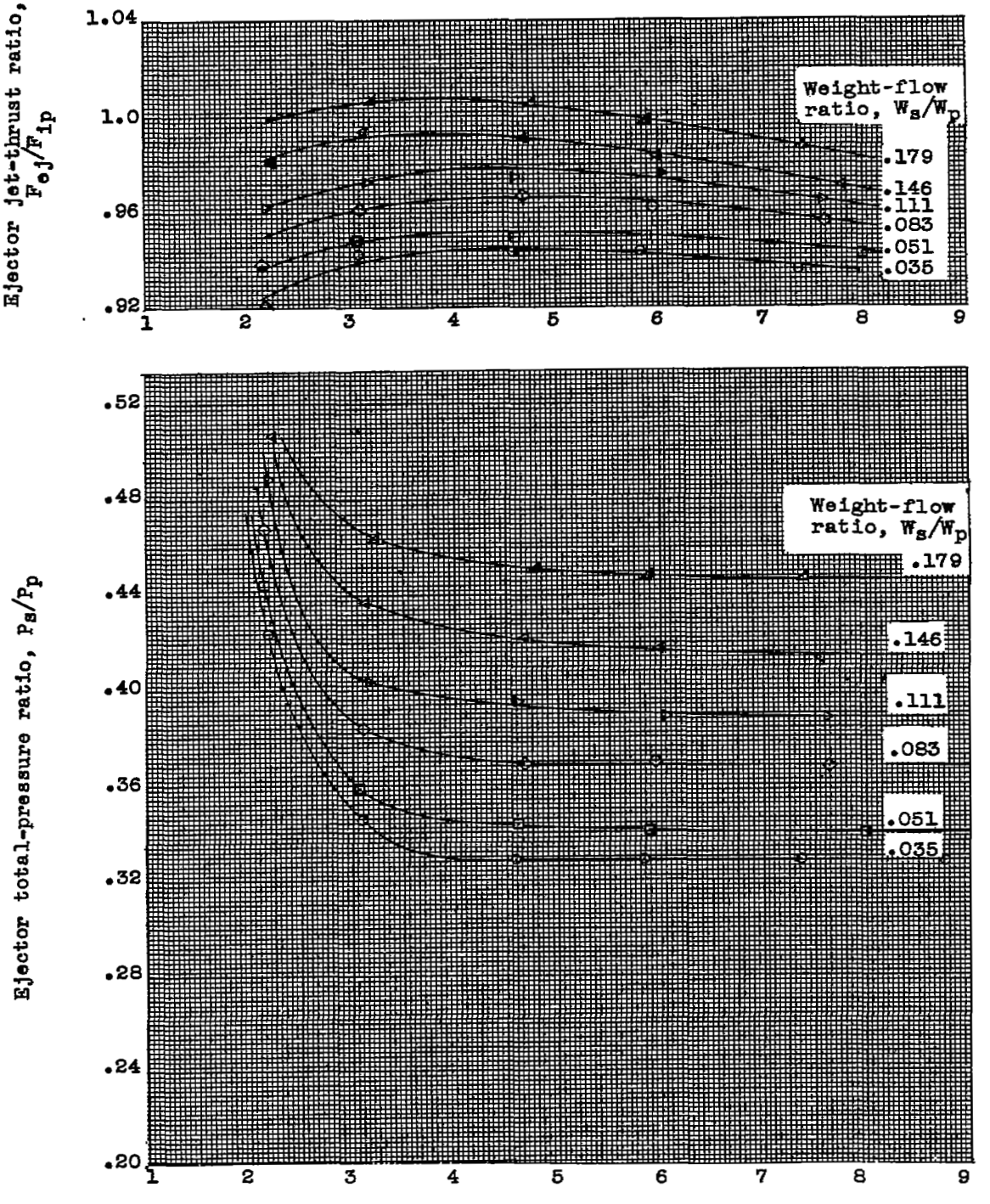


Figure 10. - Thrust and air handling performance data for ejector configuration 3; D_e/D_p = 1.09, and L/D_p = .82.

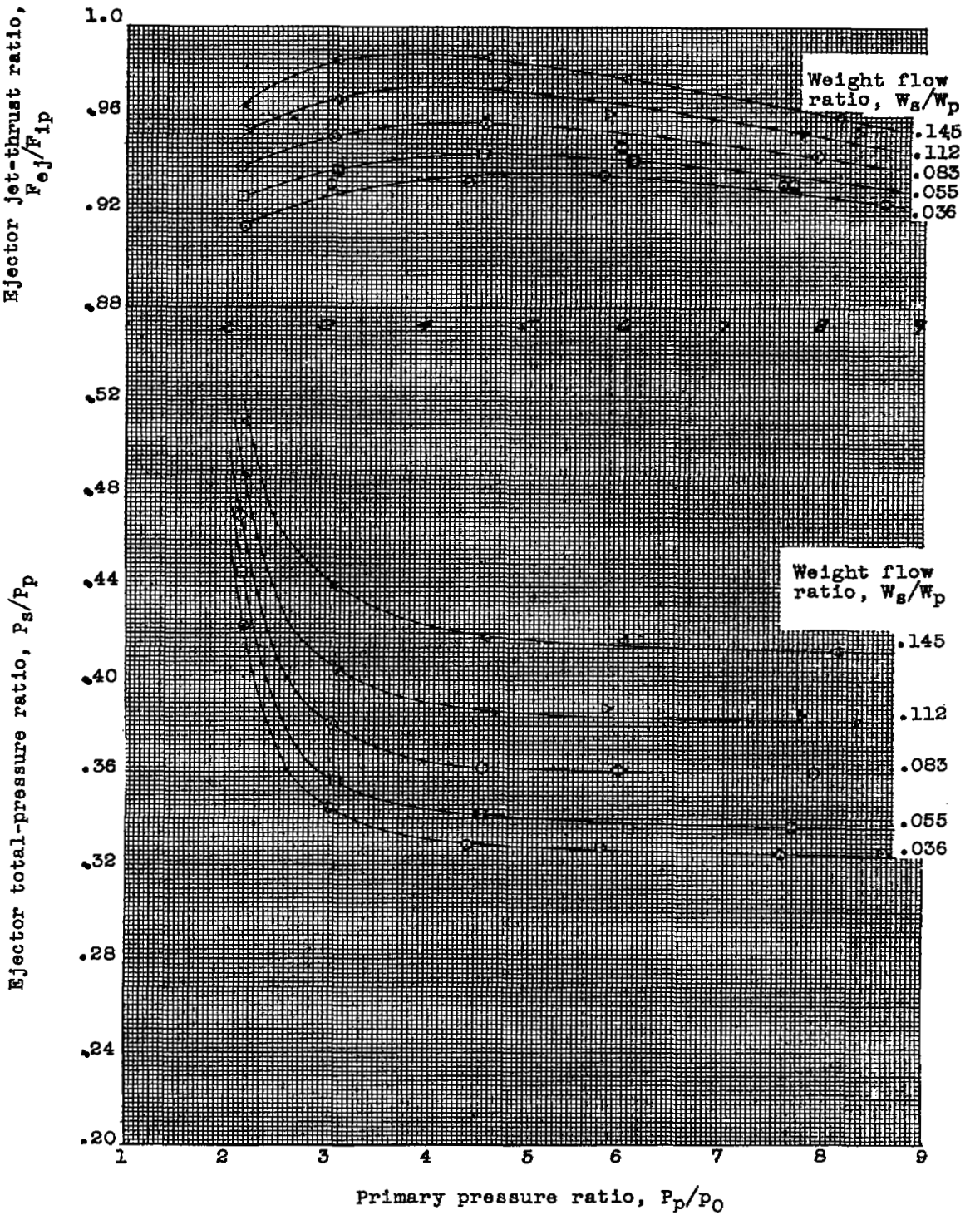


Figure 11. - Thrust and air handling performance data for ejector configuration 4; D_e/D_p = 1.09, and L/D_p = .95.

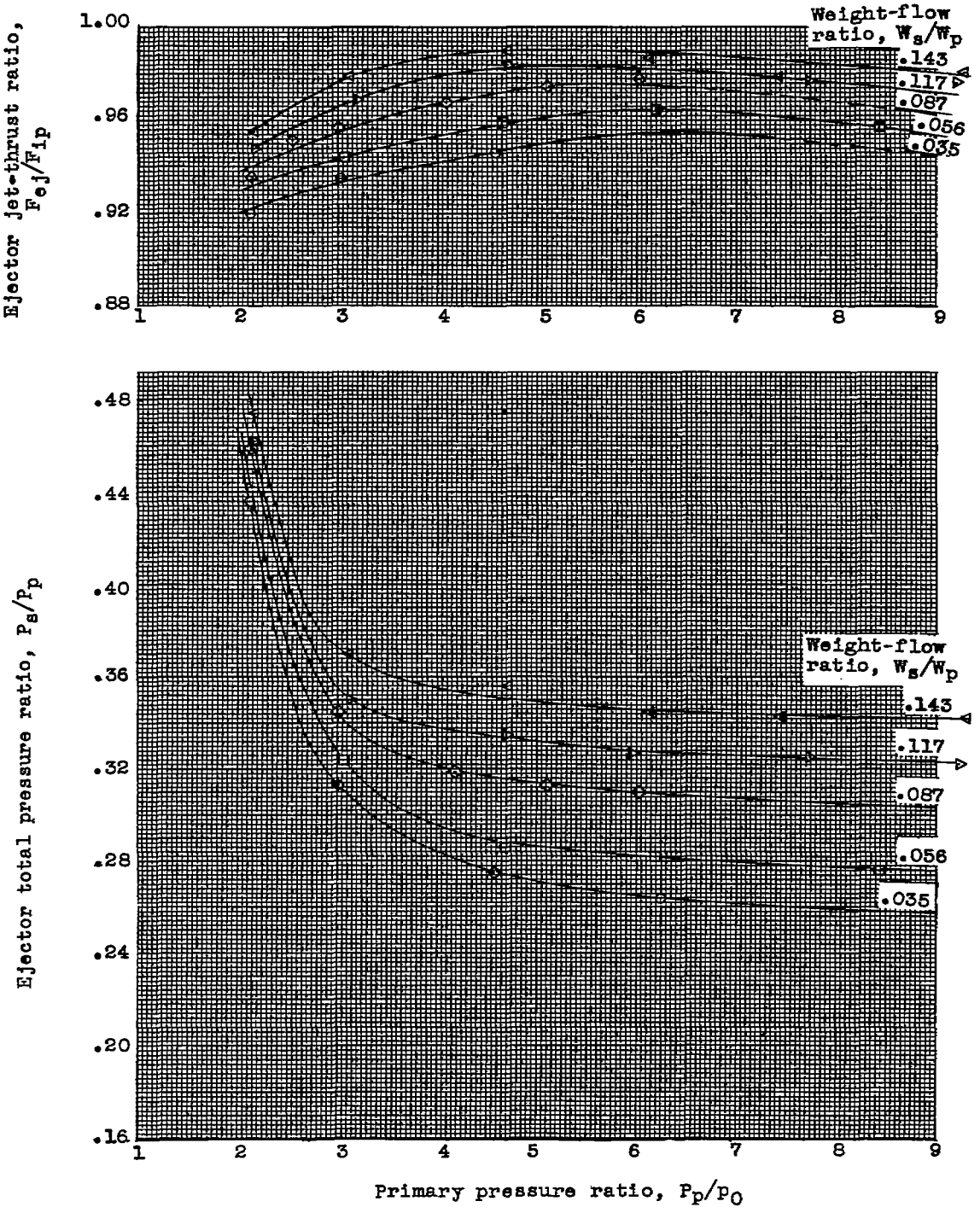


Figure 12. - Thrust and air handling performance data for ejector configuration 5; D_e/D_p = 1.16, and L/D_p = .85.

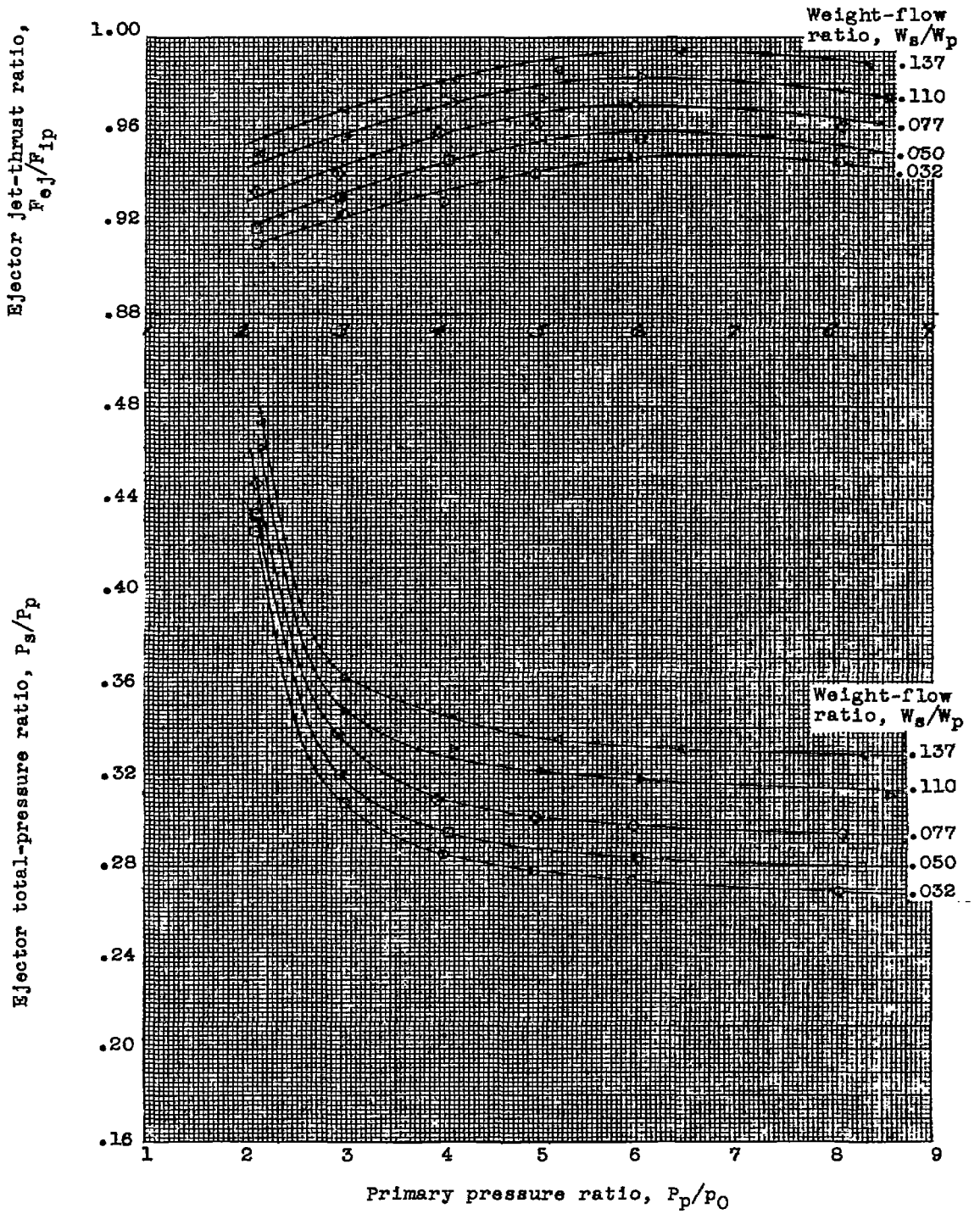


Figure 13. - Thrust and air handling performance data for ejector configuration 6; D_e/D_p = 1.16, and L/D_p = .96.

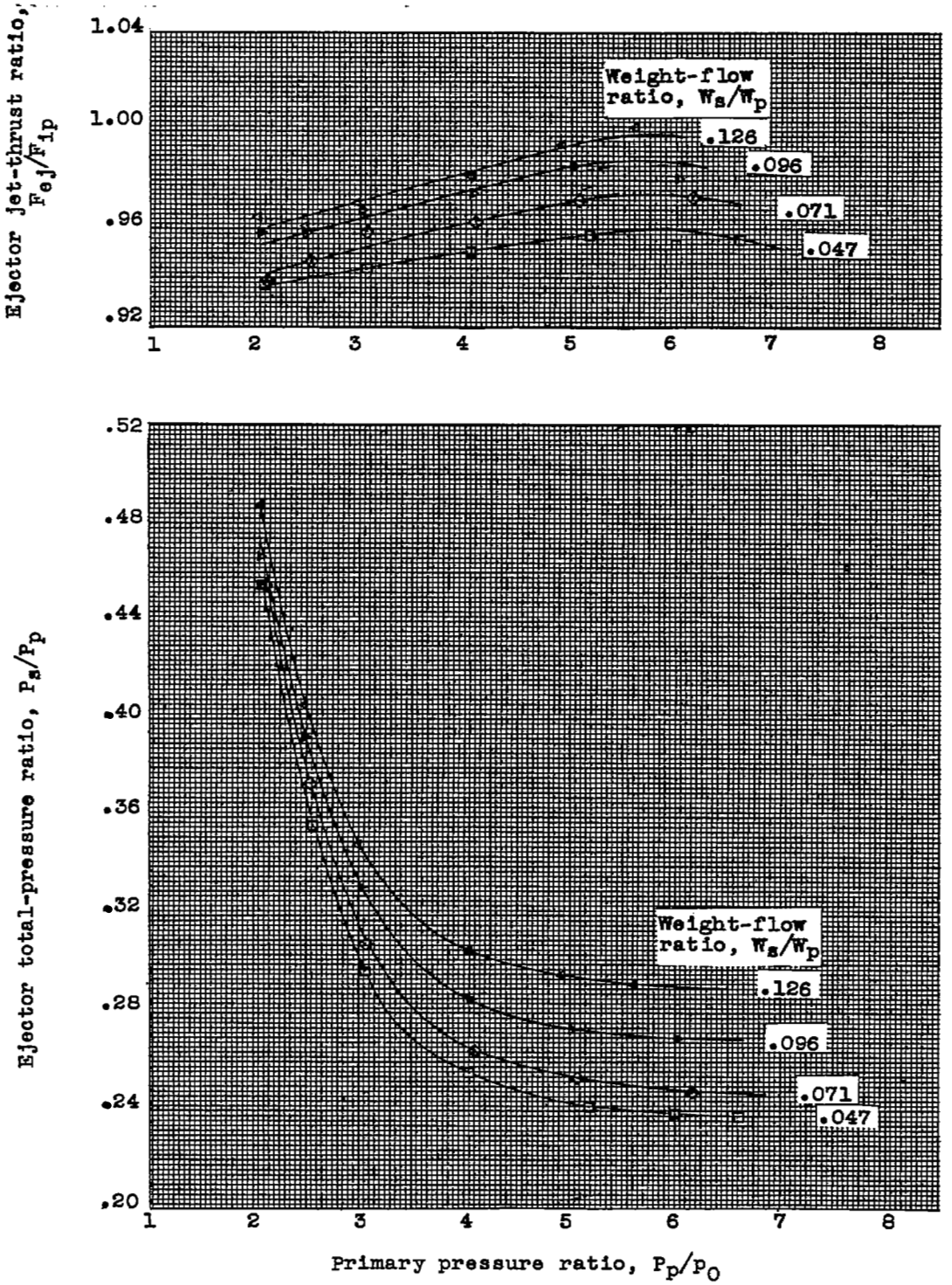


Figure 14. - Thrust and air handling performance data for ejector configuration 7; D_e/D_p = 1.23, and L/D_p = .86.

[redacted]

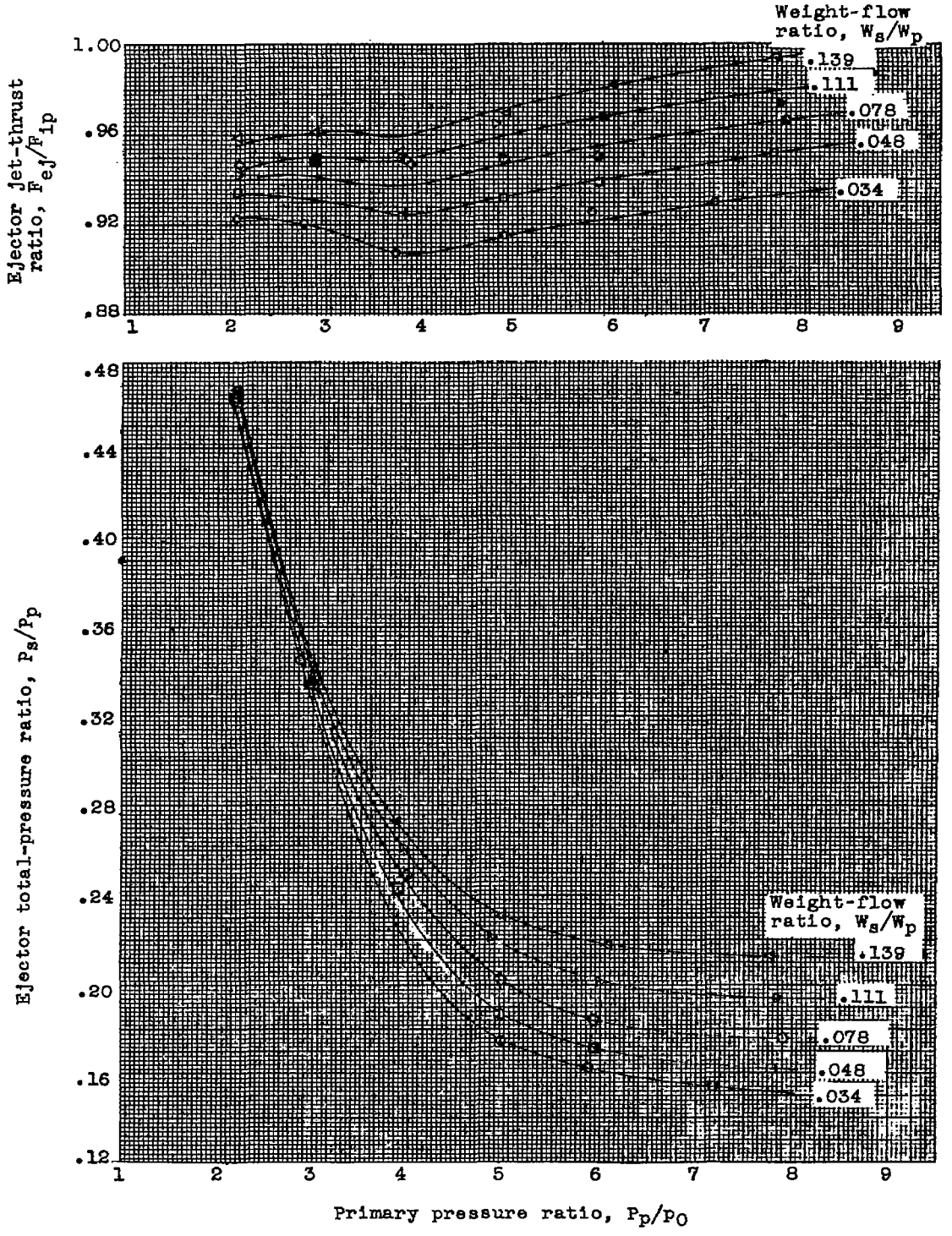


Figure 15. - Thrust and air handling performance data for ejector configuration 8; D_e/D_p = 1.43, and L/D_p = .87.

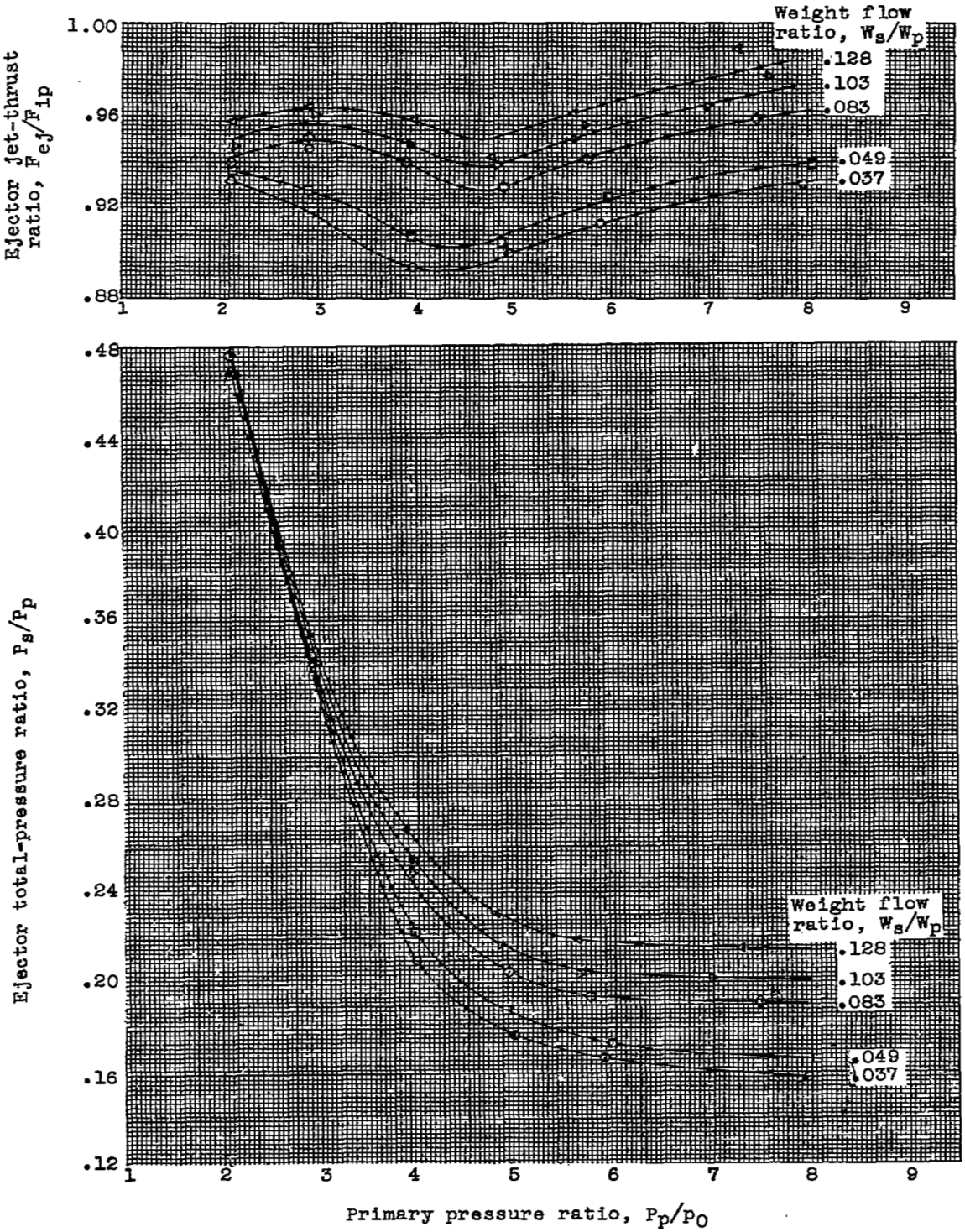


Figure 16. - Thrust and air handling performance data for ejector configuration 9; D_e/D_p = 1.42, and L/D_p = .97.

[redacted]

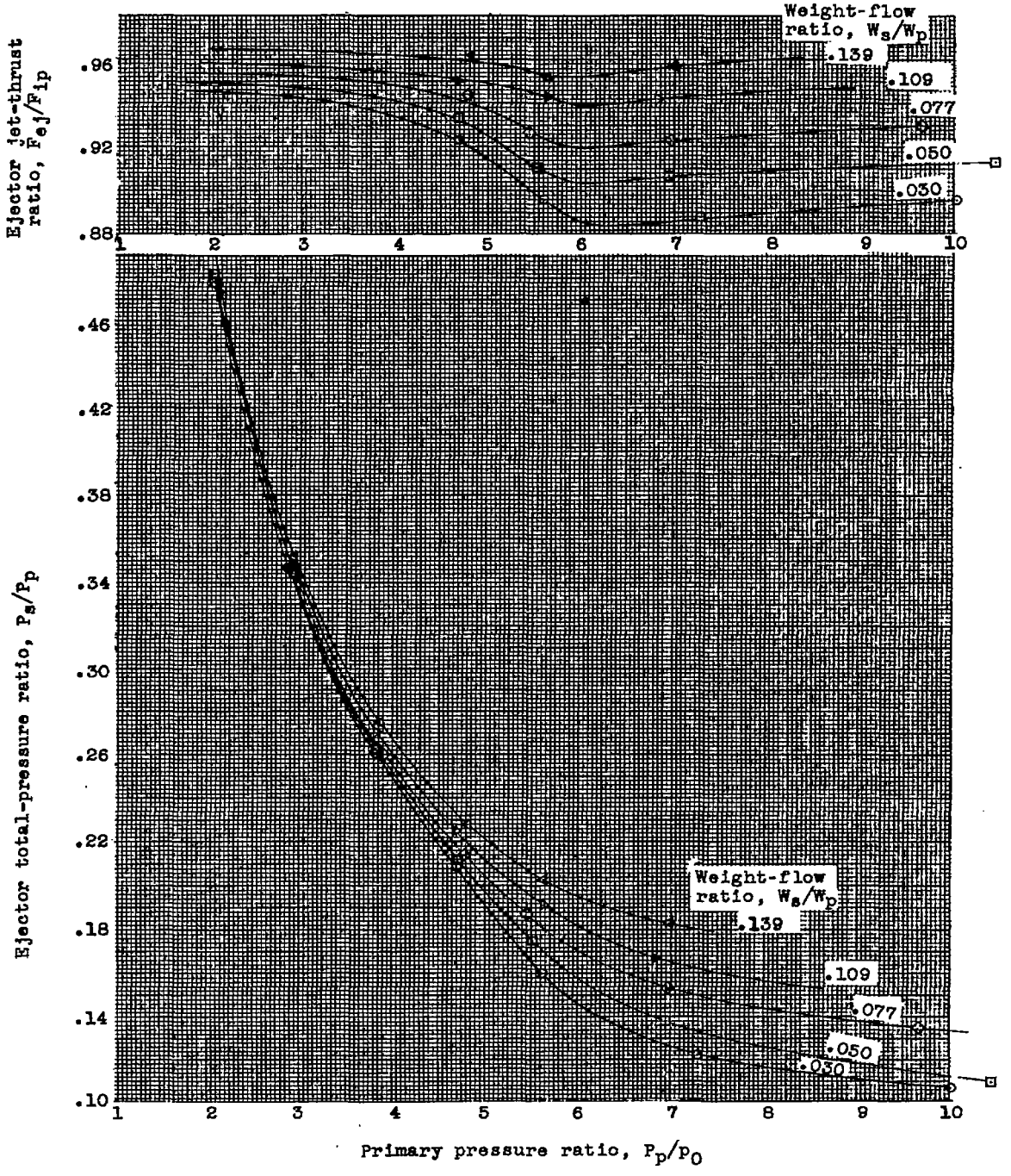


Figure 17. - Thrust and air handling performance data for ejector configuration 10; $D_e/D_p = 1.62$, and $L/D_p = .84$.

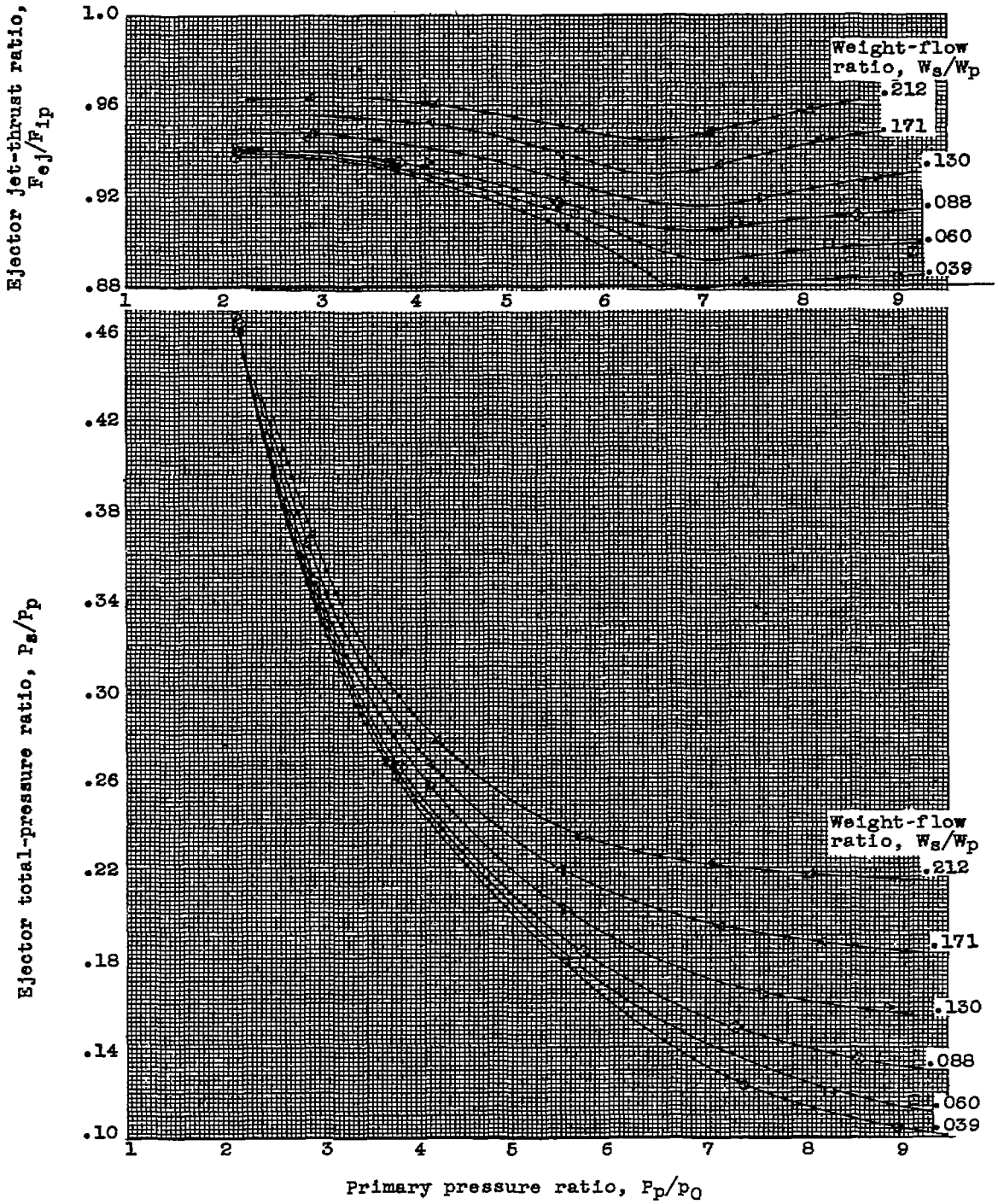
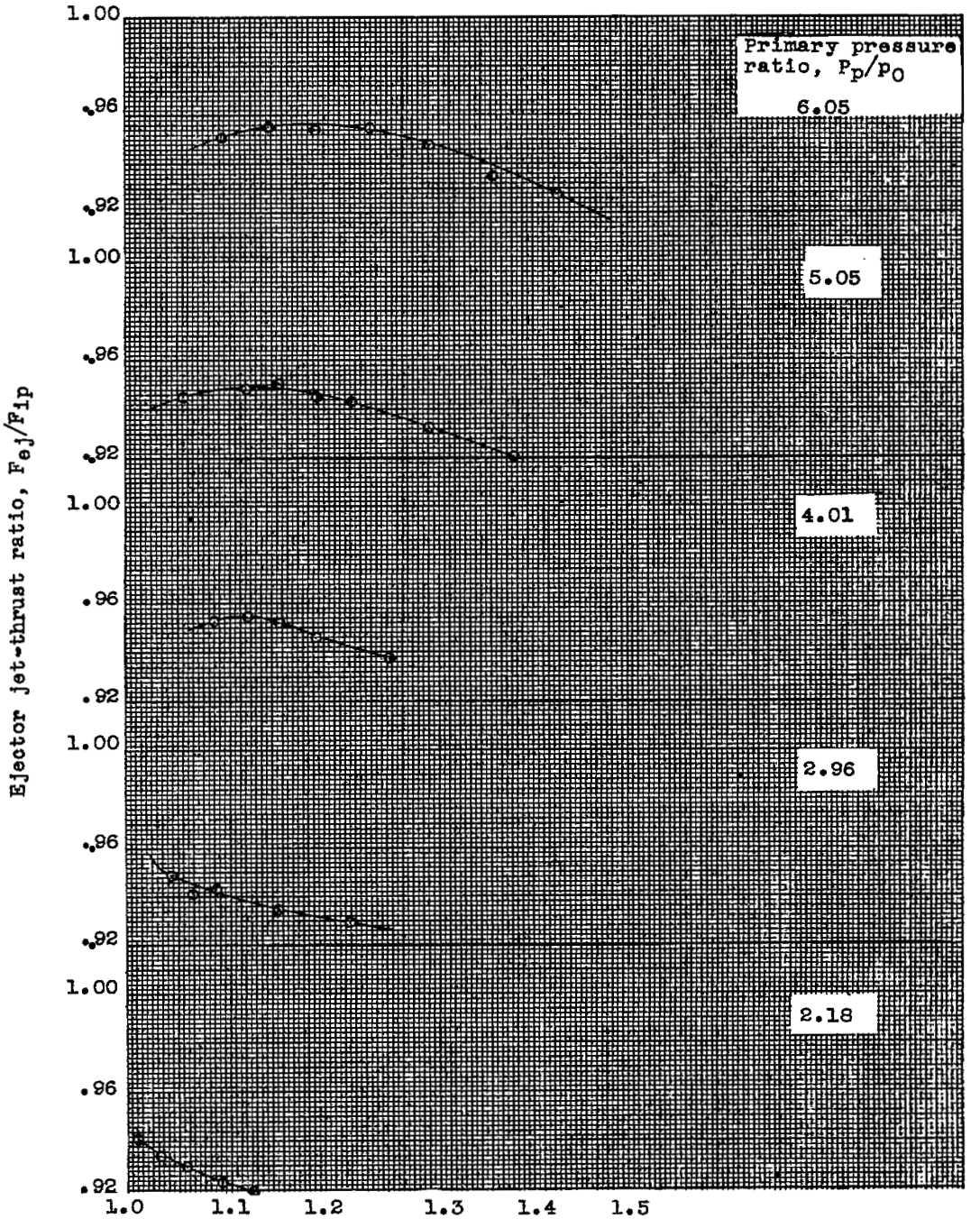


Figure 18. - Thrust and air handling performance data for ejector configuration 11; D_e/D_p = 1.70, and L/D_p = .85.

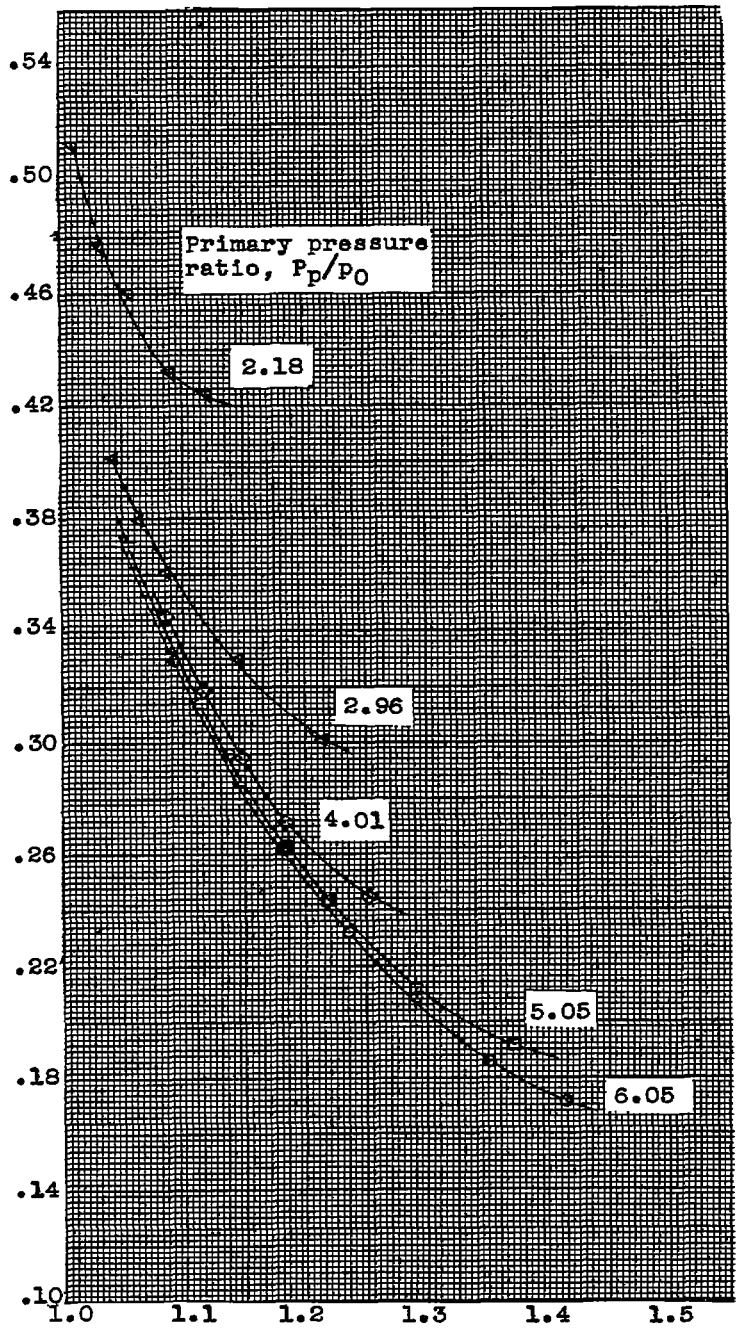
[redacted]



(a) Thrust data.

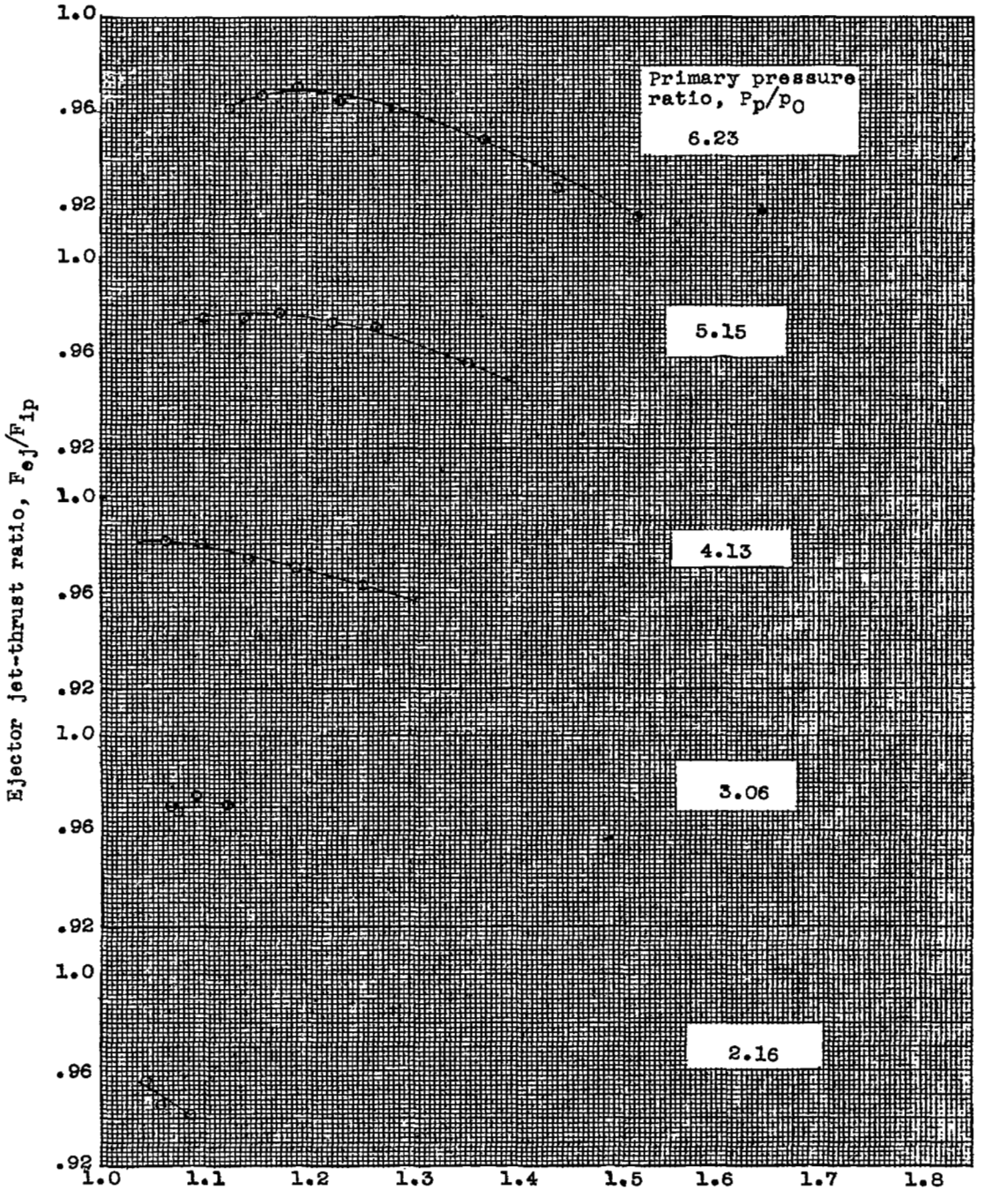
Figure 19. - Performance with variable ejector diameter at a weight-flow ratio of .043.

[redacted]



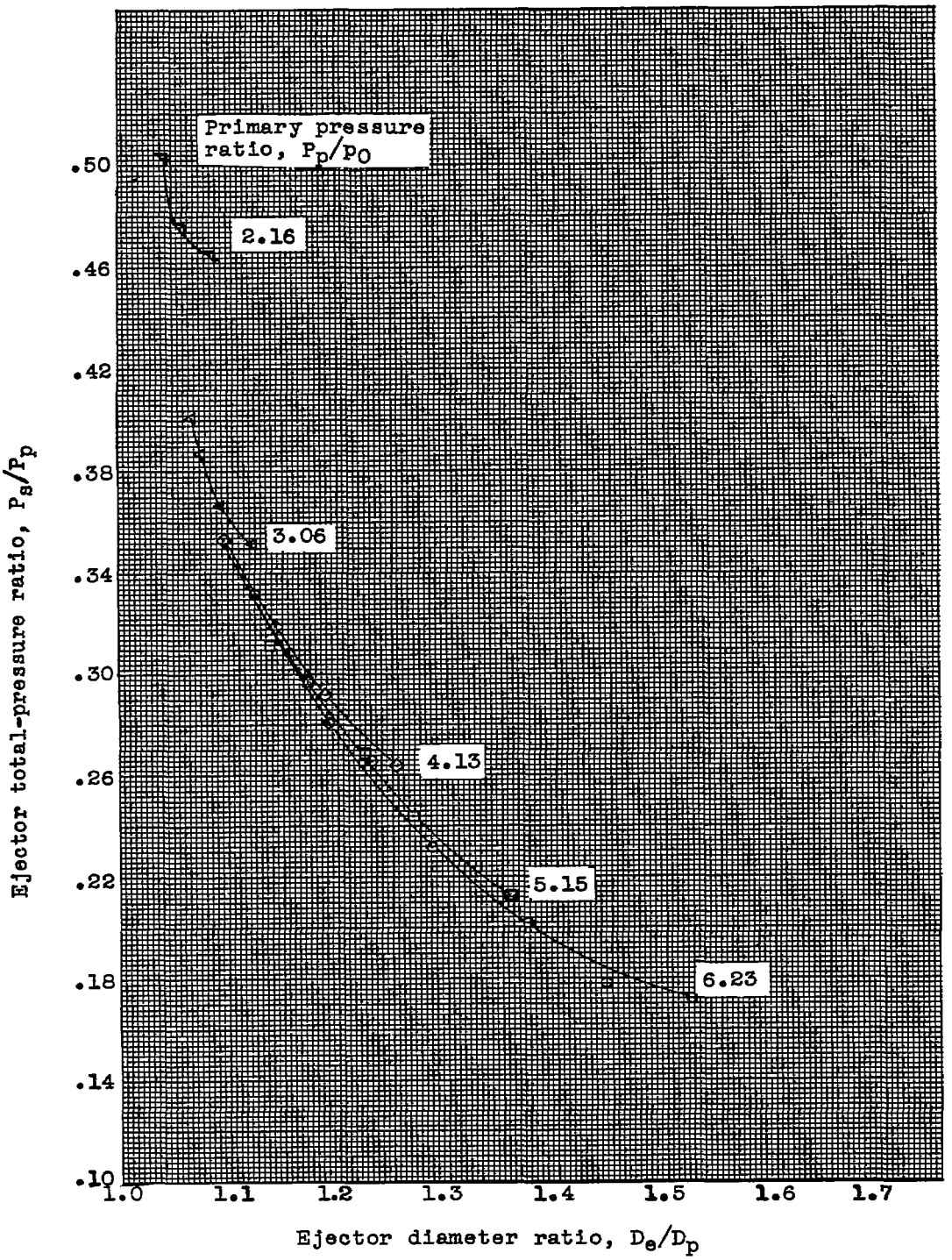
(b) Total-pressure ratio.

Figure 19. - Concluded. Performance with variable ejector diameter ratio at a weight-flow ratio of .043.



(a) Thrust data.

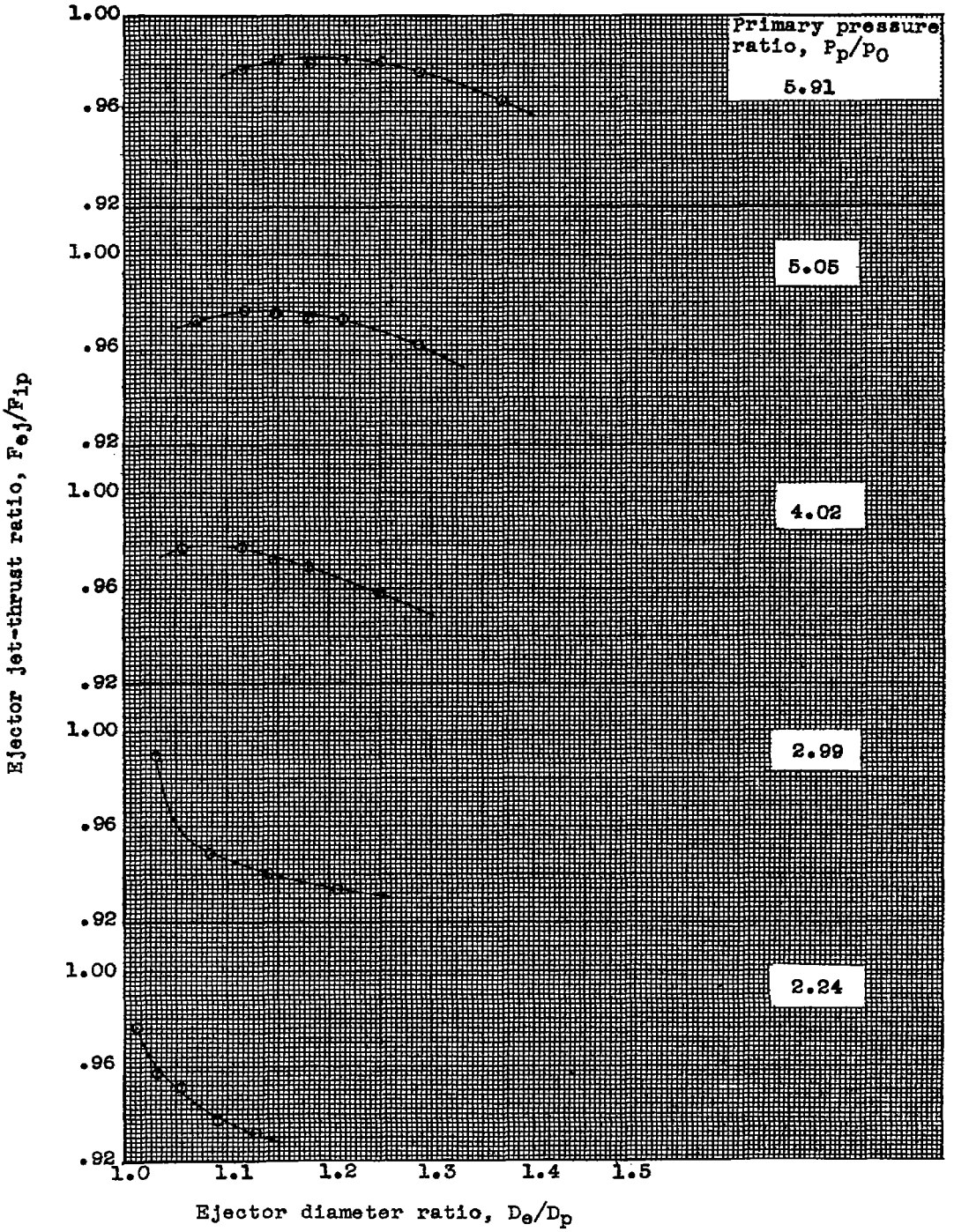
Figure 20. - Performance with variable ejector diameter at a weight-flow ratio of .078.



(b) Total-pressure ratio.

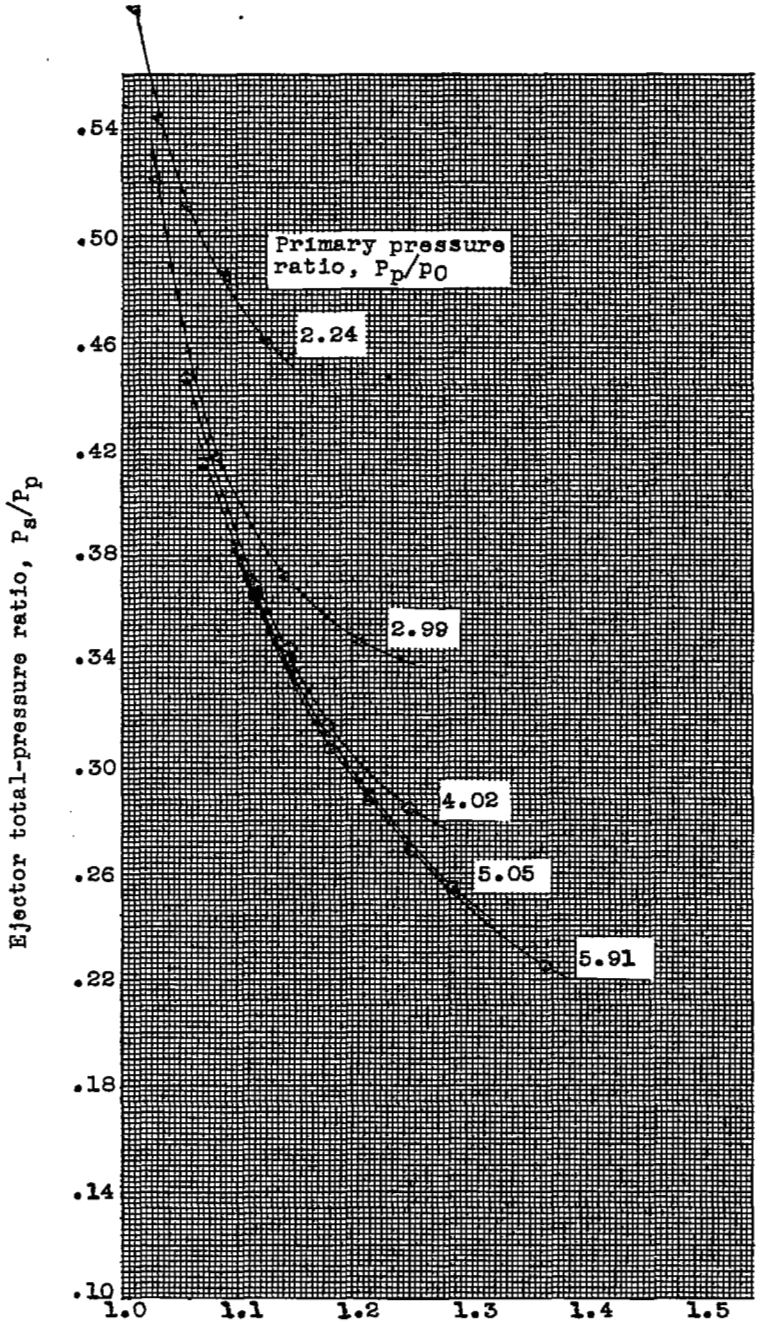
Figure 20. - Concluded. Performance with variable ejector diameter ratio at a weight-flow ratio of .078.

[redacted]



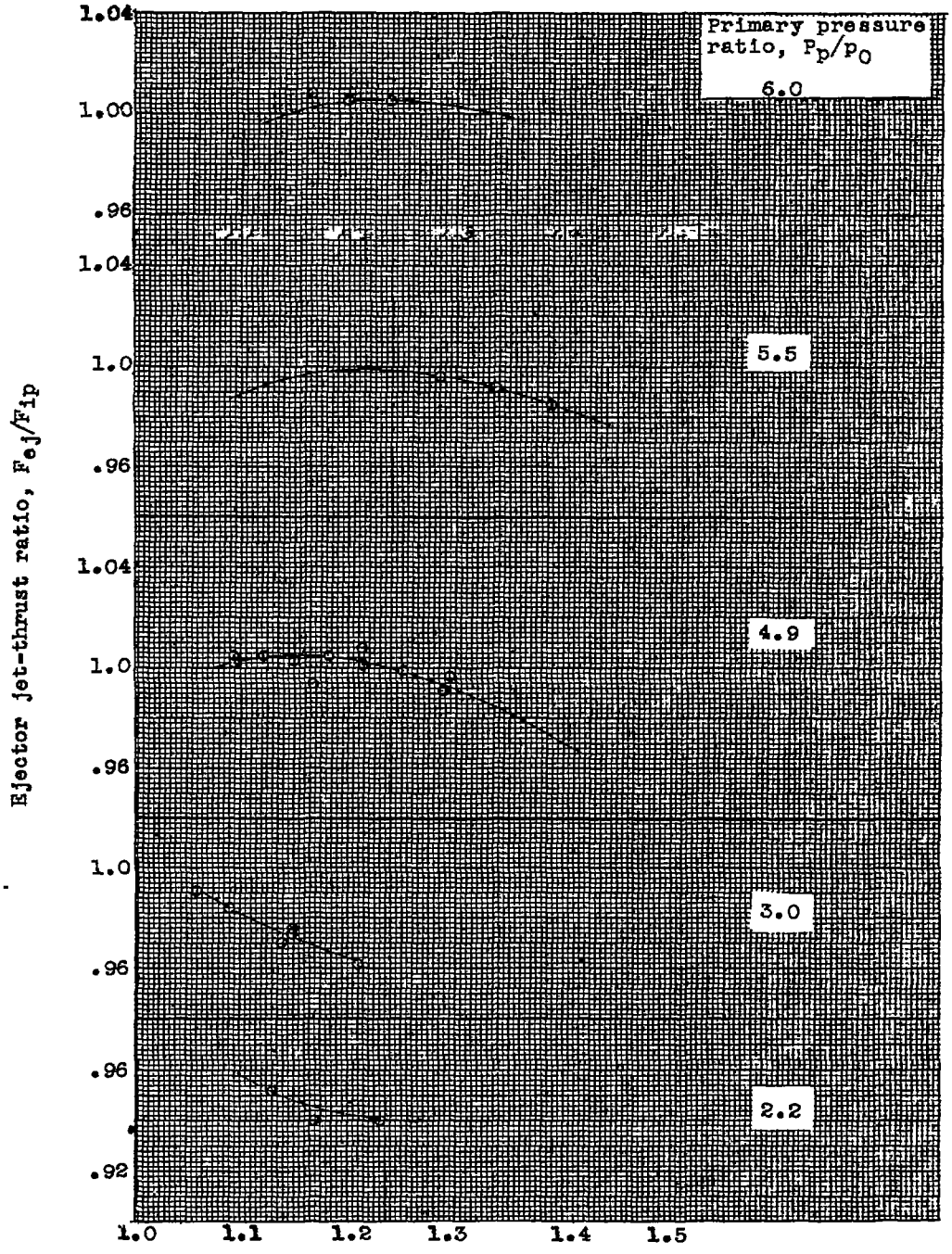
(a) Thrust data.

Figure 21. - Performance with variable ejector diameter at a weight-flow ratio of .116.



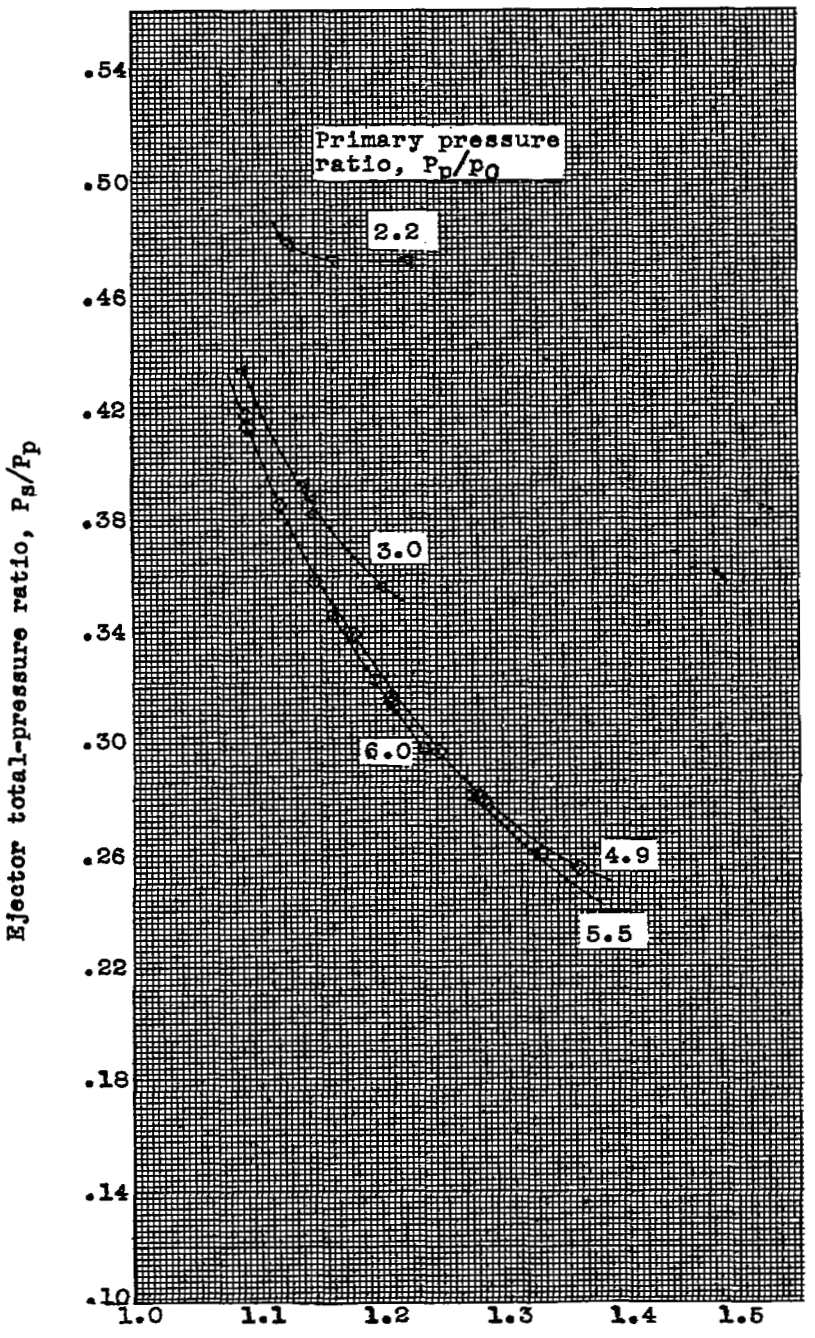
(b) Total-pressure ratio.

Figure 21. - Concluded. Performance with variable ejector diameter ratio at a weight-flow ratio of .116.



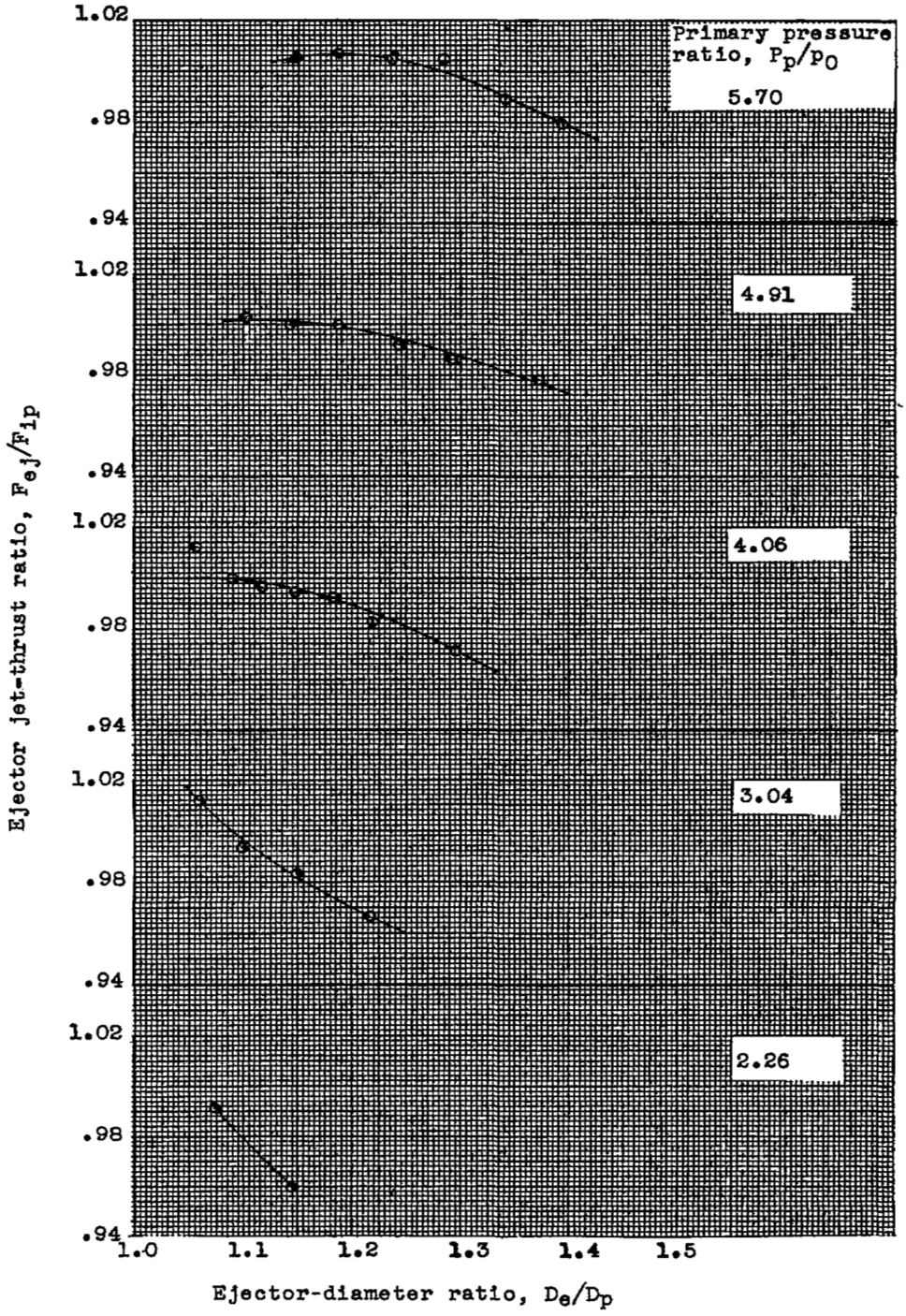
(a) Thrust data.

Figure 22. - Performance with variable ejector-diameter at a weight-flow ratio of .149.



(b) Total-pressure ratio.

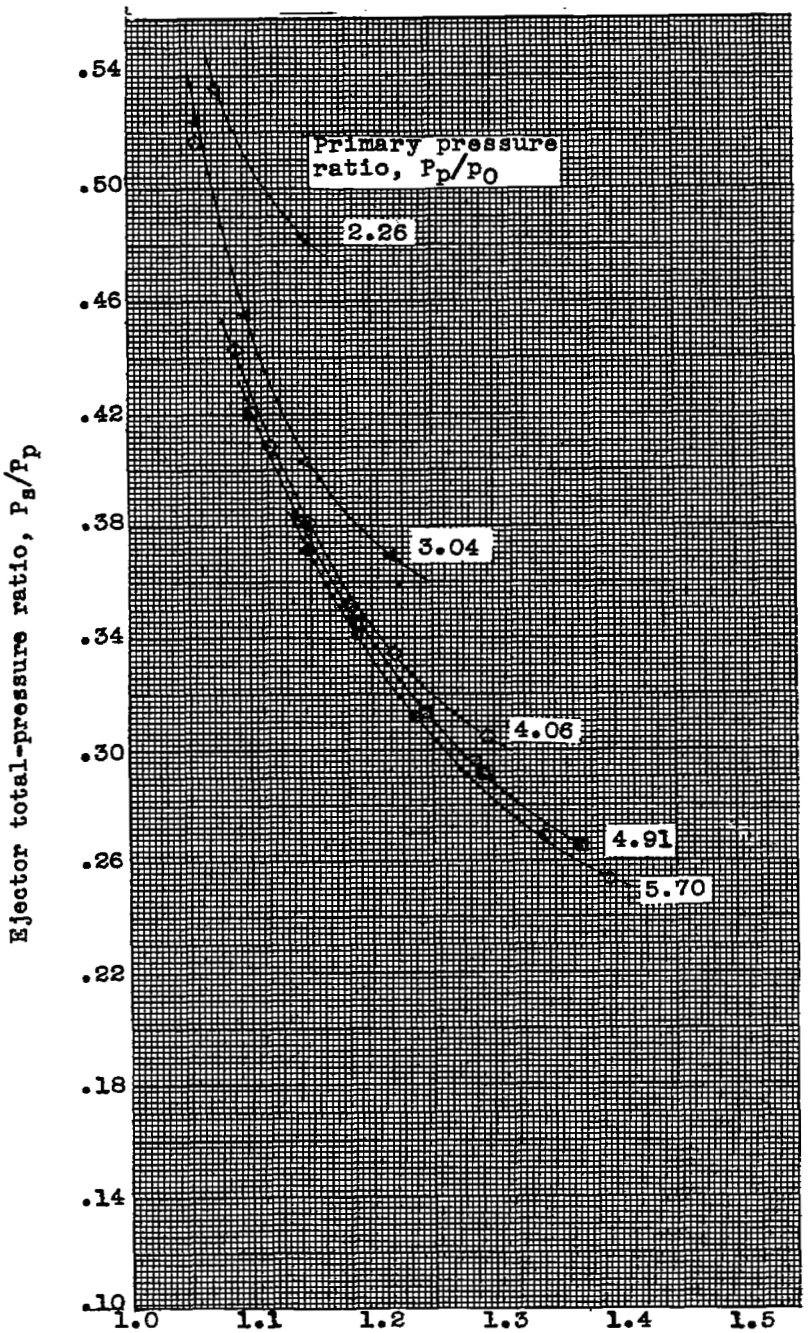
Figure 22. - Concluded. Performance with variable ejector-diameter ratio at a weight-flow ratio of .149.



(a) Thrust data.

Figure 23. - Performance with variable ejector diameter at a weight-flow ratio of .176.

[redacted]



(b) Total-pressure ratio.

Figure 23. - Concluded. Performance with variable ejector diameter ratio at a weight-flow ratio of .176.

[redacted]

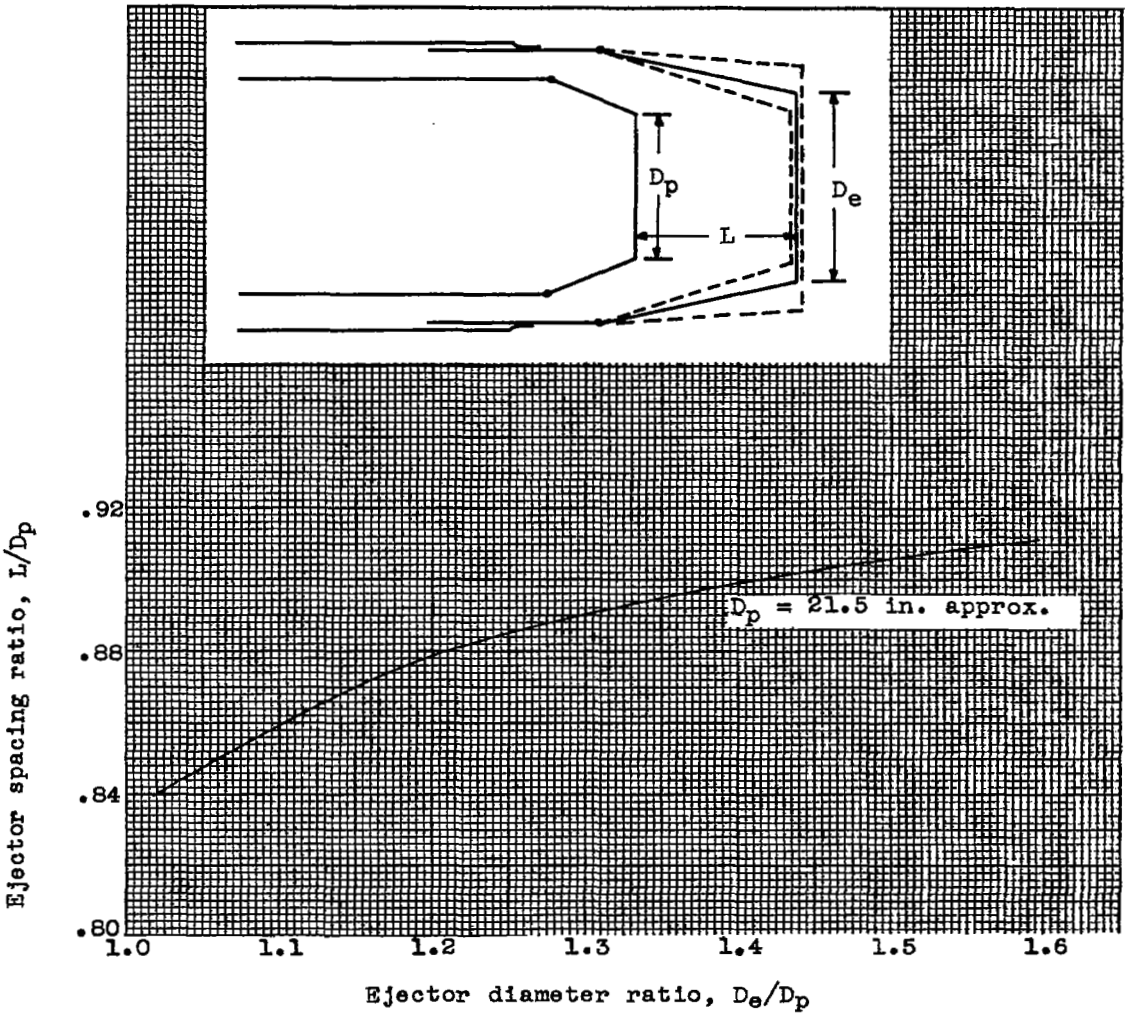


Figure 24. - Relationship between spacing ratio, L/D_p, and diameter ratio, D_e/D_p, for variable shroud tests.

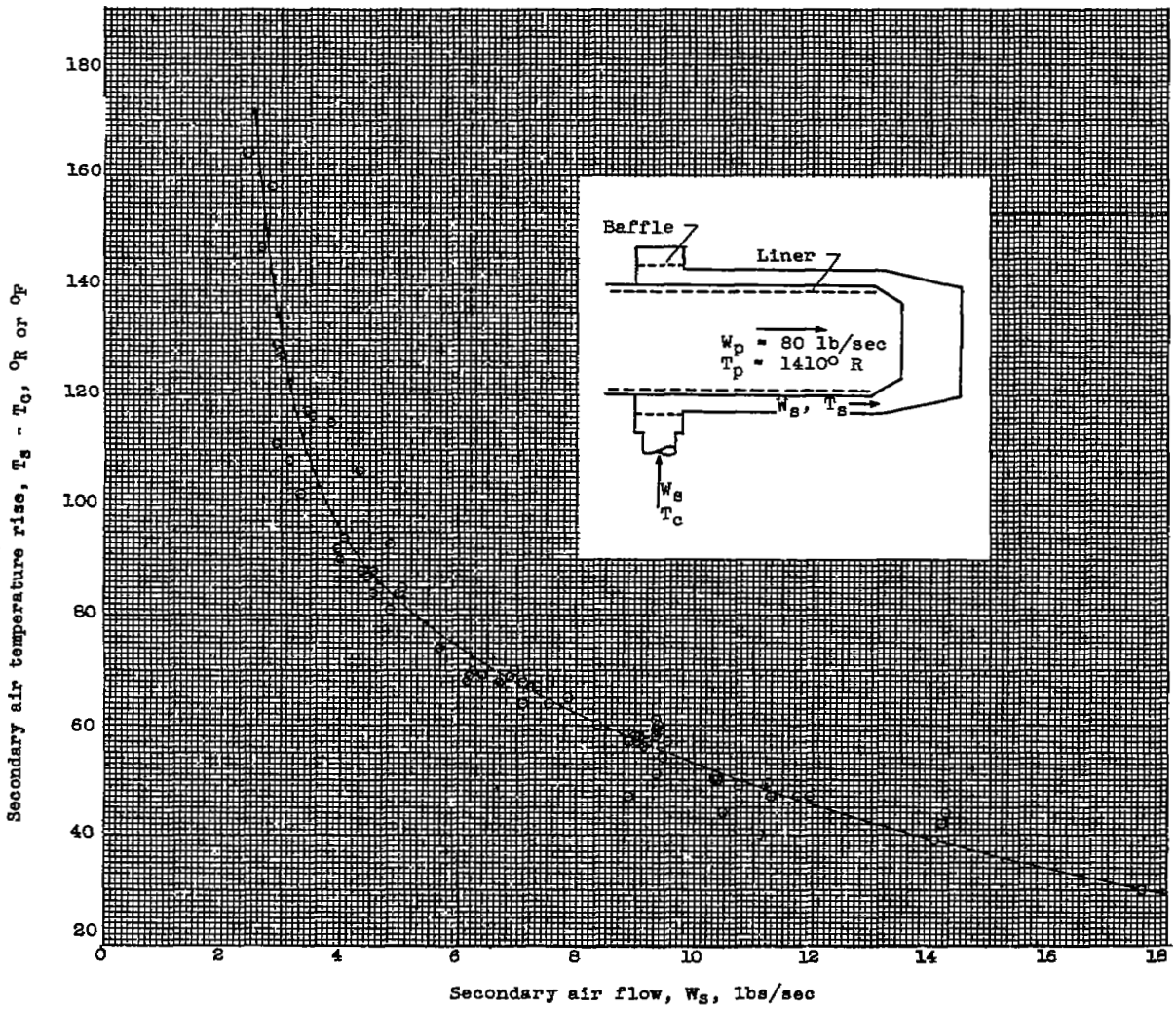
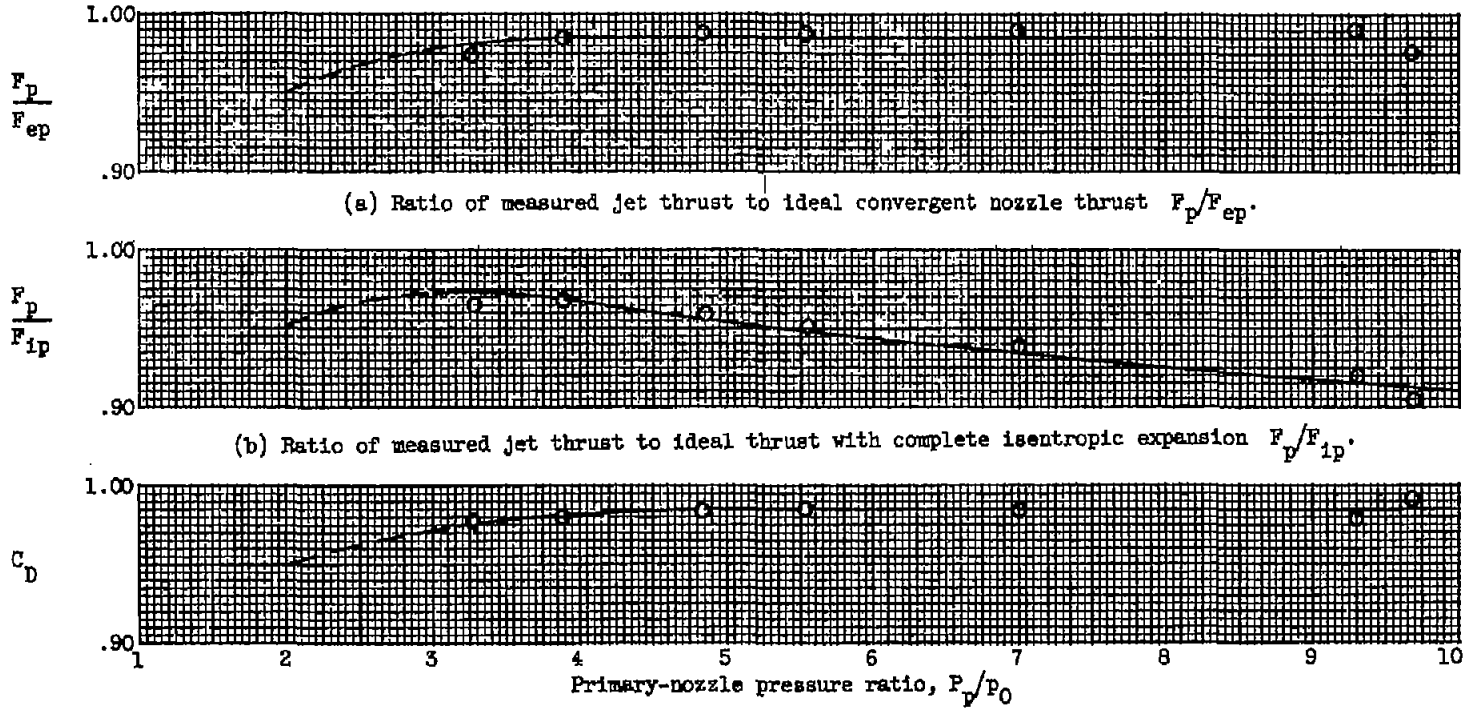


Figure 25. - Relationship between secondary temperature-rise and air-flow.



(a) Ratio of measured jet thrust to ideal convergent nozzle thrust F_p/F_{ep}.

(b) Ratio of measured jet thrust to ideal thrust with complete isentropic expansion F_p/F_{ip}.

(c) Primary-nozzle flow coefficient for choked nozzle C_D.

Figure 26. - Primary-nozzle calibration; exit diameter of 21.5 inches.

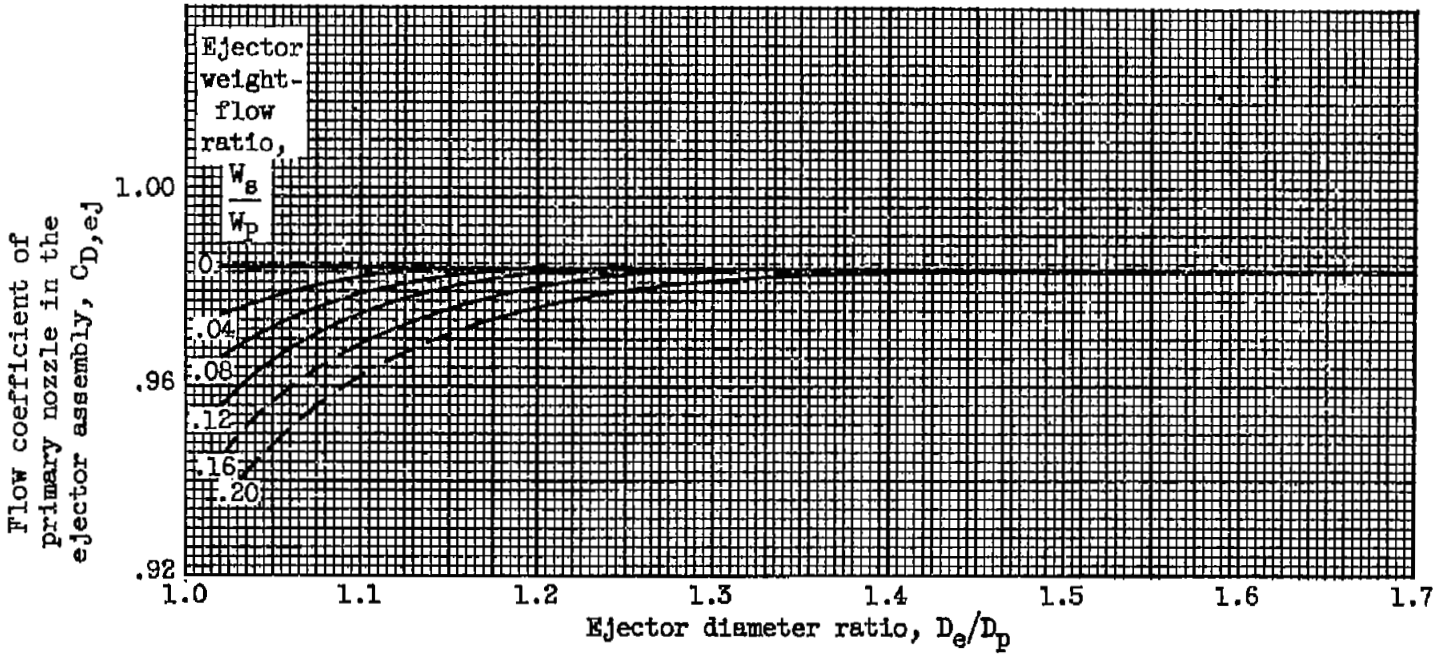


Figure 27. - Effect of weight-flow ratio and diameter ratio on primary-nozzle flow coefficient for XJ-79-GE-1 ejector assembly. For primary pressure ratios, P_p/p_0, above 3; D_p = 21.5 inches.

[redacted]

PRELIMINARY INTERNAL PERFORMANCE DATA FOR A VARIABLE-EJECTOR ASSEMBLY ON THE XJ79-GE-1 TURBOJET ENGINE

I - NONAFTERBURNING CONFIGURATIONS

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amk - 5/25/56

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Flow, Compressible	1.1.2
Flow, Jet Mixing	1.1.3.3
Aerodynamics with Heat	1.1.4
Heat Transfer, Aerodynamics	1.1.4.2
Bodies - Shape Variables	1.3.2
Nozzles	1.4.2.2
Pumps, Jet and Thrust Augmentors	1.4.4
Engines, Turbojet	3.1.3
Cooling - Gas Turbine Systems	3.10.2

Greathouse, William K., and Bloomer, Harry E.

Abstract

Internal performance of an XJ79-GE-1 variable ejector was experimentally determined with the primary nozzle in a representative nonafterburning position. Jet-thrust and air-handling data were obtained in quiescent air for 11 selected ejector configurations over a wide range of operation. Additional data, at specific operating conditions, were obtained which indicate the ejector diameter ratio for peak jet-thrust performance. The experimental ejector data are presented in both graphical and tabulated form.