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PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINES

by Albert F. Kascak

Lewis Research Center

Cleveland, Ohio

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16. Abstract
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SUMMARY

This report presents some performance estimates of a high-speed peripheral-jet nuclear powered surface effects machine. Conclusions reached differ from previous studies in the literature because the new model uses a recently proposed nuclear airplane reactor concept. This high-temperature reactor reduces shield weight and eliminates a heavy preheater previously required to obtain good thermodynamic efficiency. Payload fraction and reactor power are presented for various gross weights as a function of forward velocity and clearance height.

The parameters were varied over the following ranges: gross weight from 1000 to 5000 tons (9.07×10^5 to 45.6×10^5 kg); forward velocity from 0 to 250 knots (0 to 129 m/sec); and obstacle clearing height from 10 to 50 feet (3.05 to 15.2 m). For these ranges, the payload varied from 0 to about 60 percent of the gross weight. The total reactor power varied from 400 to 10 000 megawatts. The study indicates that a 3000-ton (27.2×10^5-kg) nuclear surface effects machine could travel at speeds up to 250 knots (129 m/sec) at a 10-foot (3.05-m) clearance height, or as high as 50 feet (15.2 m) at reduced forward velocity.

In conclusion, a nuclear powered surface effects machine appears to be feasible for weights of 1000 to 5000 tons (9.07×10^5 to 45.6×10^5 kg) with payloads as high as 30 to 60 percent of the gross weight. Although reasonable performance potential has been shown by this study, some important problems have not been considered. Aerodynamic stability and maneuverability remain to be investigated.

INTRODUCTION

A nuclear surface effects machine is not a new concept. It was looked at in great detail in reference 1 where the authors used several General Electric Company 630-A gas cooled reactors. Reference 1 concluded that the nuclear powered surface effects machines would have a small payload. It is the object of this study to update this analysis to include a nuclear airplane reactor concept that is proposed in reference 2. This analysis differs from reference 1 in that it uses this high-temperature reactor, thus reducing shielding weights and eliminating a need for a heavy preheater to obtain a good thermodynamic efficiency. This analysis uses a model of a high-speed peripheral-jet surface effects machine. The analysis includes a structural weight correlation given in reference 1, and a reactor-plus-shield weight correlation given in reference 2. The total power required (and therefore the powerplant weight) was determined by calculating the total vehicle drag and lift power.

Payload fraction and reactor power are calculated as a function of gross weight, forward velocity, and clearance height. These parameters were varied over the following ranges: gross weight from 1000 to 5000 tons (9.07×10^5 to 45.6×10^5 kg); forward velocity from 0 to 250 knots (0 to 129 m/sec); and an obstacle clearing height from 10 to 50 feet (3.05 to 15.2 m).

SYMBOLS

A	area, ft^2; m^2
C	cushion length, ft; m
C_D	drag coefficient, D/SCq_A
C_j	jet reaction coefficient
C_L	lift coefficient, lift/SCq_A
C_P	specific heat at constant pressure
D	drag, lb; kg
D_C	cushion discharge coefficient, $Q\Big/CH\sqrt{2g\Delta P/\rho_A}$
$\overline{D}_C$	cushion discharge coefficient when $X \to \infty$
DP_{com}	pressure difference across compressor
F_j	jet reaction force
FR	Froude number, $\sqrt{V_o^2\Big/(gC)}$
FR_{12}	constant used in curve fit
g	acceleration due to gravity
H	height of jet

m	constant used in curve fit
P_o	ambient pressure, lb/ft^2; N/m^2
P_t	pressure in nozzle above ambient, lb/ft^2; N/m^2
Q	air volume flow rate, ft^3/sec; m^3/sec
q_A	air dynamic head, $\rho_A V_o^2/(2g)$, lb/ft^2; N/m^2
S	cushion beam, ft; m
t	nozzle thickness, ft; m
V_o	craft velocity, ft/sec; m/sec
V_T	exit velocity of thrust jet
W	weight, lb; kg
X	nondimensional jet thickness, $(t/h)(1 + \sin\theta)$
ΔP	pressure difference across jet, lb/ft^2; N/m^2
ΔP_b	base pressure, lb/ft^2; N/m^2
ΔT	temperature rise of jet, ^oF; K
η	efficiency
η_{12}	constant used in curve fit
ρ_A	density of air
ρ_W	density of water
θ	jet angle

Subscripts:

1	front jet
2	rear jet
3	side jet
T	thrust jet
TH	thermal

ANALYSIS

A conceptual layout of a nuclear powered surface effects machine is shown in figure 1. The plan view of the machine shows the machine as a square platform. The pressure below this platform, the base pressure, is above ambient. Thus, the pressure

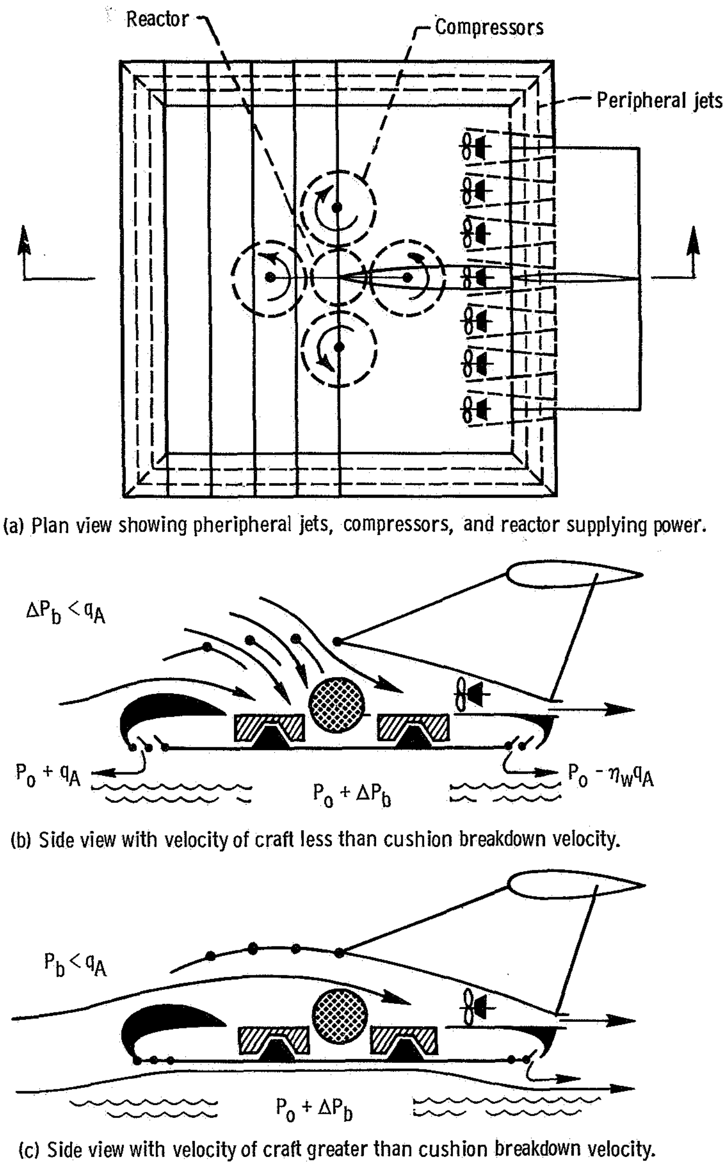


Figure 1. - Conceptual design of nuclear powered surface effect machine.

difference between the bottom and the top of the platform results in a lift. To maintain the base pressure above ambient, a jet of air is directed downward below the platform and inward toward the center of the platform. This jet of air completely surrounds the periphery of the machine. Lift is produced by a pressure difference between the bottom and top surfaces of the platform rather than through the thrust produced by the peripheral jet. The air jet prevents the loss of the higher pressure base air from escaping to the outside.

An analysis of a stationary surface effects machine is given in reference 3. The object of the present analysis is to modify the stationary analysis of reference 3 to be applicable to a moving, nuclear powered surface effects machine. The method by which this is done is shown in figure 1 (side view).

The surface effects machine operates in two distinct aerodynamic modes. The forward velocity of the craft can be either less than or greater than a critical velocity which is just enough to "blow" the air cushion out from under the craft. This physical phenomenon is known as "cushion breakdown." It occurs when the dynamic pressure of the incoming air is approximately equal to the base pressure minus the ambient pressure. This study includes both regimes of operation.

The actual pressure distribution around the base of the craft is a function of the specific design of the craft; and therefore, is out of the scope of this report. A simplified model of the pressure distribution around the base of the craft was assumed which considered a constant, but different average pressure at the front, sides, and rear of the craft. The values of these average pressures were chosen so that they approximated the pressure distribution around a rectangular solid (which simulated the rectangular air cushion under the craft).

At velocities for which cushion breakdown does not occur, there are three distinct jets at the front, rear, and sides of the craft. Each of these jets must maintain a different pressure difference between the base platform region and the regions exterior to the craft. The region exterior to the front of the craft is assumed to be at ambient pressure plus the dynamic pressure. In other words, the incoming air is stagnated at the front of the craft. At the rear of the craft, a wake is produced; therefore, the region exterior to the rear of the craft is assumed to be at ambient pressure minus some fraction of the dynamic pressure. This fraction η_W is a complicated function of the geometry and the Reynolds number. In this analysis, $_W$ was assumed to be 0.5, which is a representative value for flow around a flat plate. The region exterior to the sides of the craft was assumed to be at ambient pressure.

At velocities high enough to cause cushion breakdown, the front jet is turned off. The side jets are then used to "guide" the flow, and the rear jet is used to control the amount of flow under the craft. There is no total pressure difference between the base platform region and the region exterior to the front of the craft. Incoming air slows under the craft, increasing the static pressure to the required base pressure. The rear jet acts to produce a "blown nozzle," with the nozzle walls being formed by the rear jet and the ground. The nozzle constricts the flow, causing the flow to slow under the craft. The pressure exterior to the rear and to the sides of the craft is the same as in the operating mode existing before cushion breakdown, but at a higher dynamic pressure.

Figure 2 shows some of the fundamental parameters of a stationary surfaces effects machine. Reference 3 gives the following relations between these parameters:

$$X \equiv \frac{t}{H}(1 + \sin \theta) \tag{1}$$

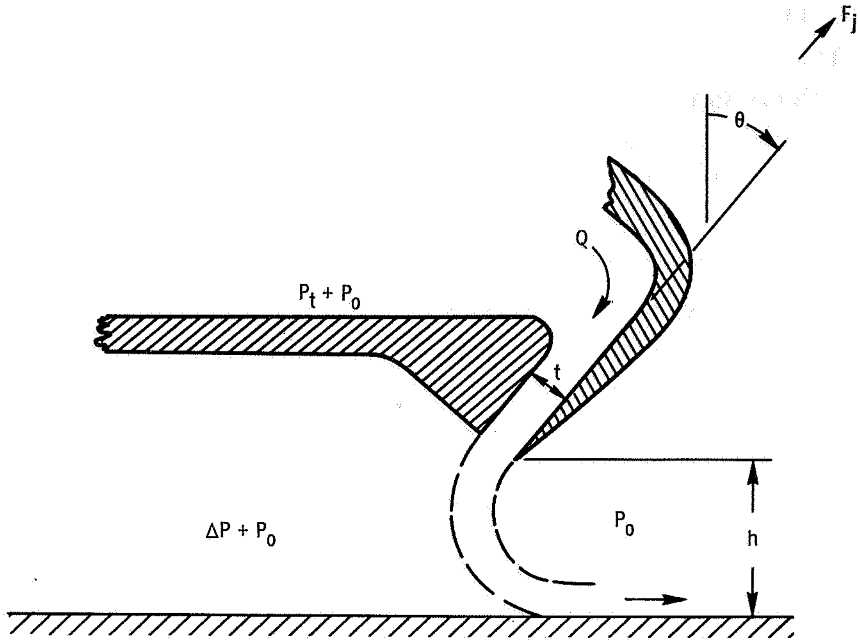


Figure 2. - Parameters of stationary annular jet surface effect machine.

$$\frac{\Delta P}{P_t} = 1 - e^{-2X} \tag{2}$$

$$Q = D_C C H \sqrt{\frac{2g\Delta P}{\rho_A}} \tag{3a}$$

where

$$D_C = \overline{D}_C \tanh \sqrt{\frac{X}{2\left[\overline{D}_C (1 + \sin\theta)\right]^2}} \tag{3b}$$

and

$$\overline{D}_C \equiv \lim_{X \to \infty} D_C = \frac{1}{2}\left[1 + \frac{\cos\theta}{\frac{\pi + 2}{\pi - 2}(1 + \sin\theta) - \sin\theta \cos\theta}\right] \tag{3c}$$

$$F_j = C_j C t \, \Delta P \tag{4a}$$

where

$$C_j = \frac{1}{1 - e^{-2X}} + \frac{1}{2X} \tag{4b}$$

Applying these stationary results (eqs. (1) to (4)) to the dynamic model leads to the following sets of equations. Consider the front jet (subscript 1) operating at speeds below cushion breakdown:

$$t_1 = \frac{X_1 H}{1 + \sin \theta_1} \tag{5a}$$

$$\Delta P_1 = \Delta P_b - q_A \tag{5b}$$

$$P_{t1} = \frac{\Delta P_1}{\left(1 - e^{-2X_1}\right)} + q_A \tag{5c}$$

$$Q_1 = D_C(X_1)SH\sqrt{\frac{2g\ \Delta P_1}{\rho_A}} \tag{5d}$$

$$F_{j1} = C_j(X_1)St_1\ \Delta P_1 \tag{5e}$$

For speeds above cushion breakdown, the front jet is turned off:

$$t_1 = 0 \tag{6a}$$

$$\Delta P_1 = 0 \tag{6b}$$

$$P_{t1} = \text{Not defined} \tag{6c}$$

$$Q_1 = 0 \tag{6d}$$

$$F_{j1} = 0 \tag{6e}$$

Consider the rear jet (subscript 2) operating at speeds below cushion breakdown:

$$t_2 = \frac{X_2 H}{1 + \sin \theta_2} \tag{7a}$$

$$\Delta P_2 = \Delta P_b + \eta_W q_A \tag{7b}$$

$$P_{t2} = \frac{\Delta P_2}{\left(1 - e^{-2X_2}\right)} - \eta_W q_A \tag{7c}$$

$$Q_2 = D_C(X_2)SH \sqrt{\frac{2g\ \Delta P_2}{\rho_A}} \tag{7d}$$

$$F_{j2} = C_j(X_2)St_2\ \Delta P_2 \tag{7e}$$

For speeds above cushion breakdown, the rear jet acts as the top surface of a blown nozzle. The height of the rear jet is less than the clearance height of the craft and can be calculated from Bernoulli's Law:

$$H_2 = \left[1 - \sqrt{\frac{q_A - \Delta P_b}{(1 + \eta_W)q_A}}\right] H$$

If H_2 is substituted in place of H, the preceding equations describe the condition after cushion breakdown.

The side jets (subscript 3) can be considered the same as in the stationary analysis of reference 3. Therefore, they are described by equations (1) to (4).

To propel the craft forward, a thrust jet (subscript T) is included in the configuration shown in figure 1. The analysis of this jet follows directly from mass and momentum conservation:

$$V_T = \frac{V_o}{2}\left(1 + \sqrt{1 + \frac{2D}{A_T q_A}}\right) \tag{8a}$$

$$Q_T = A_T V_T \tag{8b}$$

$$P_{tT} = \frac{\rho_A V_T^2}{2g} \tag{8c}$$

To drive these four jets (front, rear, side, and thrust), incoming air is compressed to a value above the jet total pressure. It is assumed that a fraction of the incoming dynamic pressure $\eta_{ram} q_A$ can be converted to ram pressure, and if a duct loss is assumed to be some fraction of the jet total pressure, the compressor pressure difference is

$$DP_{com} = \frac{P_T}{\eta_{duct}} - \eta_{ram} q_A \tag{9}$$

The power necessary to drive the compressor is

$$\text{Power} = \frac{Q \times DP_{com}}{\eta_{com}} \tag{10}$$

when η_{com} is the efficiency of the compressor. If the engine that is driving this compressor has a thermal efficiency of η_{TH}, then the rate of heat transferred to the jet is

$$q_j = \frac{(1 - \eta_{TH})\text{Power}}{\eta_{TH}} \tag{11}$$

and the temperature rise of the air jet is $\Delta T = q_j / C_P \rho_A Q$. The total reactor power is the sum of the individual powers divided by the thermal efficiency:

$$\text{Reactor power} = \frac{\text{Power}_1 + \text{Power}_2 + \text{Power}_3 + \text{Power}_T}{\eta_{TH}} \tag{12}$$

The forces on the craft can be categorized in two classics - those producing lift and those producing drag. The lift forces on the craft are as follows: aerodynamic lift; the jet reaction force from the front, rear, and side jets; and the lift due to the increased base pressure. These lift forces must be equal to the gross weight of the craft:

$$W_G = St_1 \cos \theta_1 (C_{j1} - 1) DP_1 + St_2 \cos \theta_2 (C_{j2} - 1) DP_2 + 2Ct_3 \cos \theta_3 (C_{j3} - 1) DP_3 + (\Delta P_b + C_L q_A) SC \tag{13}$$

For a given aspect ratio, equation (13) can be solved for the length of the craft.

There are four drag forces on the craft: aerodynamic drag, jet reaction drag from an unbalance of the front and rear jet reaction forces, wave drag, and a momentum drag. The aerodynamic drag is given by

$$D_{aero} = C_D S C q_A \tag{14a}$$

The jet drag is given by

$$D_{jet} = St_2 \sin \theta_2 C_{j2} DP_2 - St_1 \sin \theta_1 C_{j1} DP_1 \tag{14b}$$

Reference 4 gives a method for calculating the wave drag of a rectangular craft moving over water in terms of the Froude Number:

$$Fr = \sqrt{\frac{V_o^2}{gC}}$$

$$D_{wave} \; 4 \; \eta_{12} \left(\frac{Fr}{Fr_{12}}\right)^m \left(\frac{4 \Delta P_b^2 S}{\rho_W}\right) \tag{14c}$$

For an aspect ratio of 1, the following curve-fitting constants gave the best results.

$$\eta_{12} = 0.815$$

$$Fr_{12} = 0.59$$

For $Fr < Fr_{12}$,

$$m = 1.45$$

and for $Fr > Fr_{12}$,

$$m = -1.82$$

The momentum drag is the result of stagnating air under the craft and is given by

$$D_{mom} = \frac{\rho_A}{g} (Q_1 + Q_2 + Q_3) V_o \tag{14d}$$

The payload is the weight of the disposable load, that is, the gross weight minus the weight of the structure, the weight of the powerplant, and the weight of the reactor shield. The weight of the structure was given in reference 1 as

$$W_{struct} = 2.36\, W_{gross}\, \Delta P_b^{-0.481} \tag{15a}$$

The weight of the powerplant was assumed to be 2 pounds per shaft horsepower (1.22 g/W). The weight of the shield was given in reference 2 as

$$W_{shield} = 220\,000\ (\text{lb}) \sqrt{\frac{\text{Total reactor power (MW)}}{300\ (\text{MW})}}$$

$$W_{shield} = 0.066\times10^4\ (\text{kg}) \sqrt{\frac{\text{Total reactor power (MW)}}{300\ (\text{MW})}}$$

These equations along with the following assumed quaniities allow solution for the payload and total reactor power as a function of forward velocity, obstacle clearing height, and gross weight:

Thermal efficiency	0.20
Compressor efficiency	0.85
Ram recovery efficiency	0.90
Duct efficiency	0.90
Lift coefficient	0.01
Drag coefficient	0.01
Aspect ratio	1.00
Thrust area to platform area ratio	0.03

RESULTS AND DISCUSSION

The objective of this study was to determine the payload fraction and the reactor power required to fly a specified gross weight surface effects machine over a given height obstacle at a given forward velocity. The parameters were varied over the following ranges: gross weight from 1000 to 5000 tons (9.07×10^5 to 45.6×10^5 kg); forward velocity from 0 to 250 knots (0 to 129 m/sec); and an obstacle clearing height from 10 to 50 feet (3.05 to 15.2 m).

Besides these three primary parameters, there are three secondary variables in the analysis: jet angle, jet thickness, and base pressure. Before the three primary variables can be examined in detail, these secondary parameters must be fixed in some manner. Reference 3 showed that as the jet angle was increased from 0° to 90°, the hover power continually decreased; but at the same time jet mixing increased. The theory of reference 3 is not valid for large amounts of jet mixing; therefore, a compromise jet angle of 60° was chosen for this study.

Reference 3 showed that a nondimensional jet thickness X equal to 0.7 minimized the hover power, as the result of a compromise between the increased pressure necessary to maintain the jet and the jet reduction of the discharge coefficient. In the dynamic case, two other factors must be considered: the momentum drag and jet drag. Figure 3 shows the optimum nondimensional jet thickness for the front, rear, and side jets against velocity of the craft for a typical thrust efficiency of 0.5. It can be seen that the front nozzle requires a very large jet thickness. The front nozzle thickness was arbitrarily limited to X equal to 0.7. The rear and side nozzle thickness generally decreased with increasing velocity.

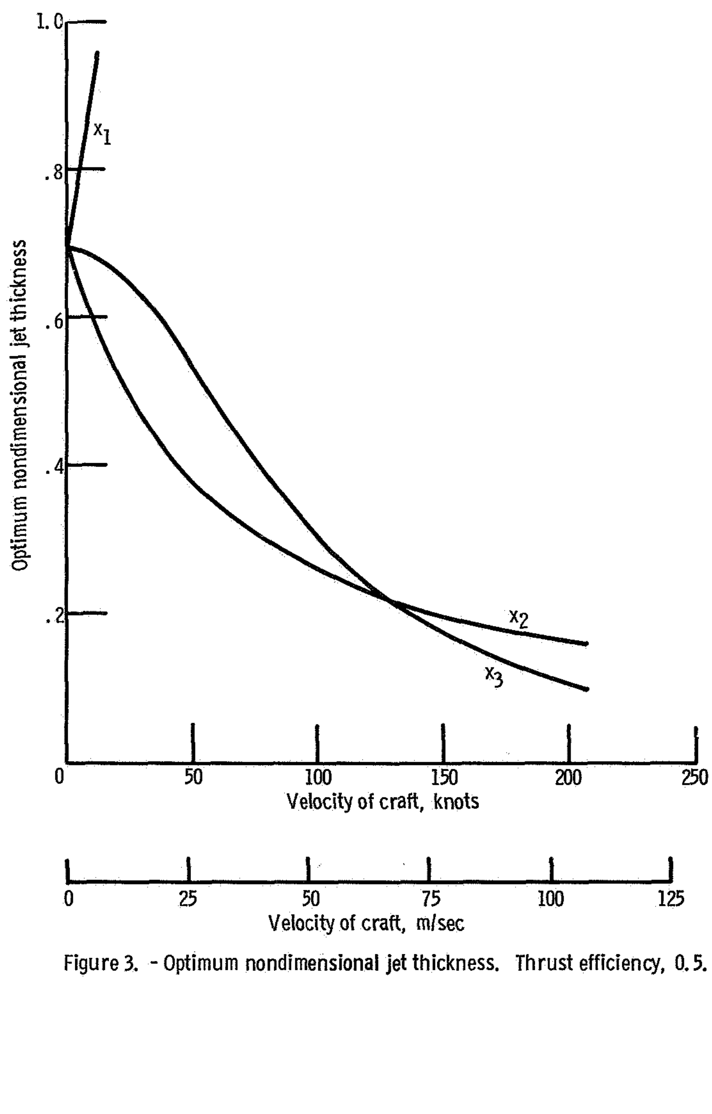


Figure 3. - Optimum nondimensional jet thickness. Thrust efficiency, 0.5.

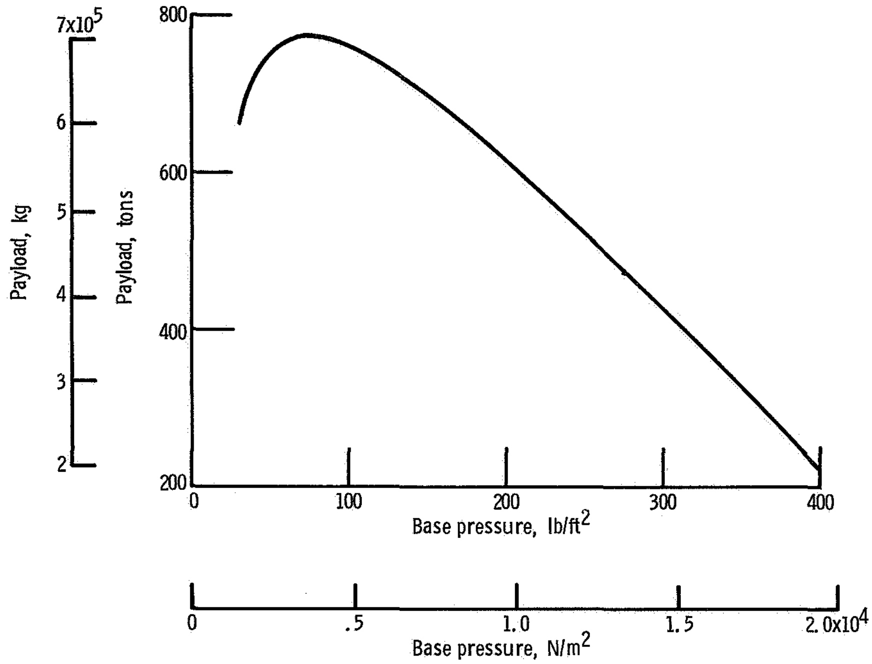


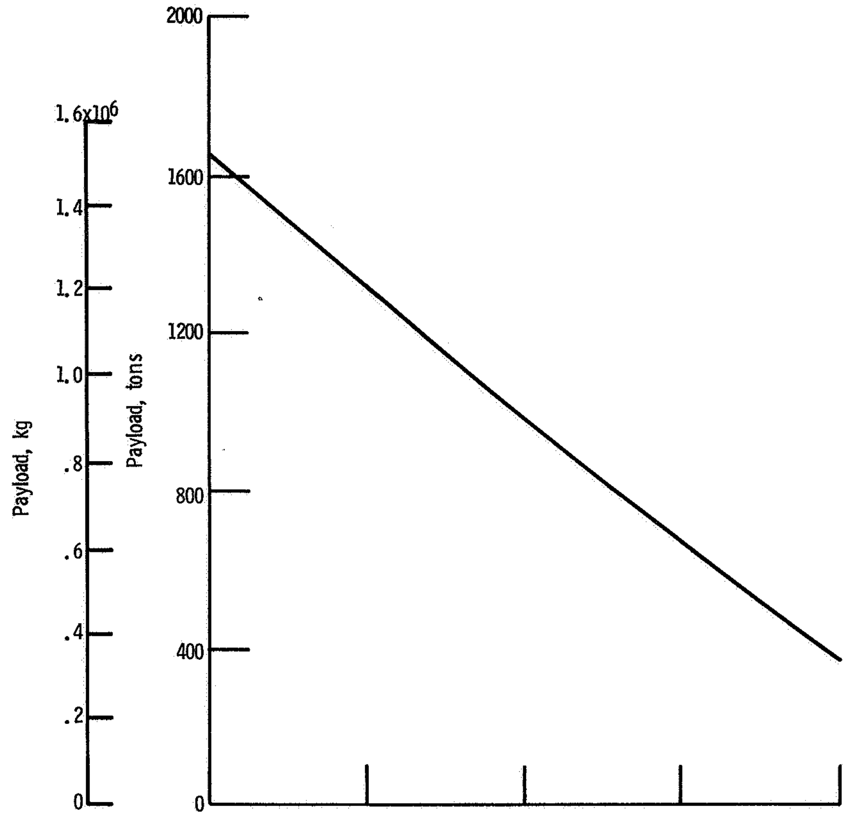
Figure 4. - Payload as function of base pressure. Gross weight, 1500 tons (13.6×10^5 kg); velocity of craft, 0; clearance height, 10 feet (3.05 m).

The last of the secondary parameters is the cushion base pressure. Figure 4 shows the payload against base pressure for a typical nuclear powered surface effects machine. It can be seen that the payload has a maximum at about 75 pounds per square foot (3.585×10^3 N/m^2). This is the result of a compromise between structural weight and powerplant weight. For the rest of the calculations, the base pressure was assumed to be 75 pounds per square foot (3.585×10^3 N/m^2).

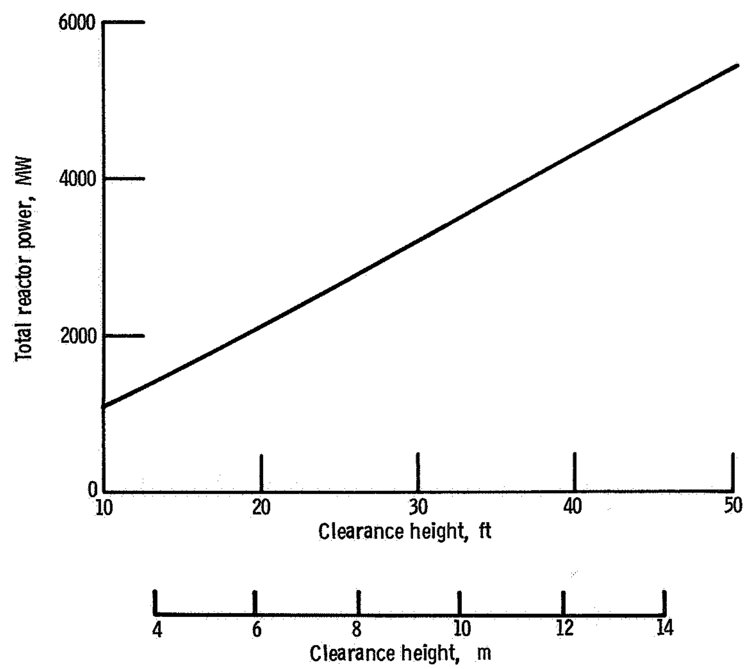
With the secondary parameters specified, the three primary variables can be examined in detail. This was done in the calculations by varying one parameter and holding the other two parameters constant. The numerical value of the parameters held fixed was chosen so as to represent typical results.

Figure 5 shows the variation of the payload and total reactor power against obstacle clearing height for a gross weight of 3000 tons (27.2×10^5 kg) and a forward velocity of 50 knots (129 m/sec). Figure 5(a) shows that as the height increases from 10 to 50 feet (3.05 to 15.2 m), the payload drops from about 60 to about 10 percent of the gross weight. Figure 5(b) shows that as the height increases from 10 to 50 feet (3.05 to 15.2 m), the total reactor power increases from about 1000 to about 5000 megawatts.

Figure 6 shows the variation of the payload and total reactor power against forward velocity for gross weight of 3000 tons (27.2×10^5 kg) and an obstacle clearing height of 10 feet (3.05 m). Figure 6(a) shows that as the velocity increases from 0 to 250 knots (0 to 129 m/sec), the payload decreases from 60 to 30 percent of the gross weight. At

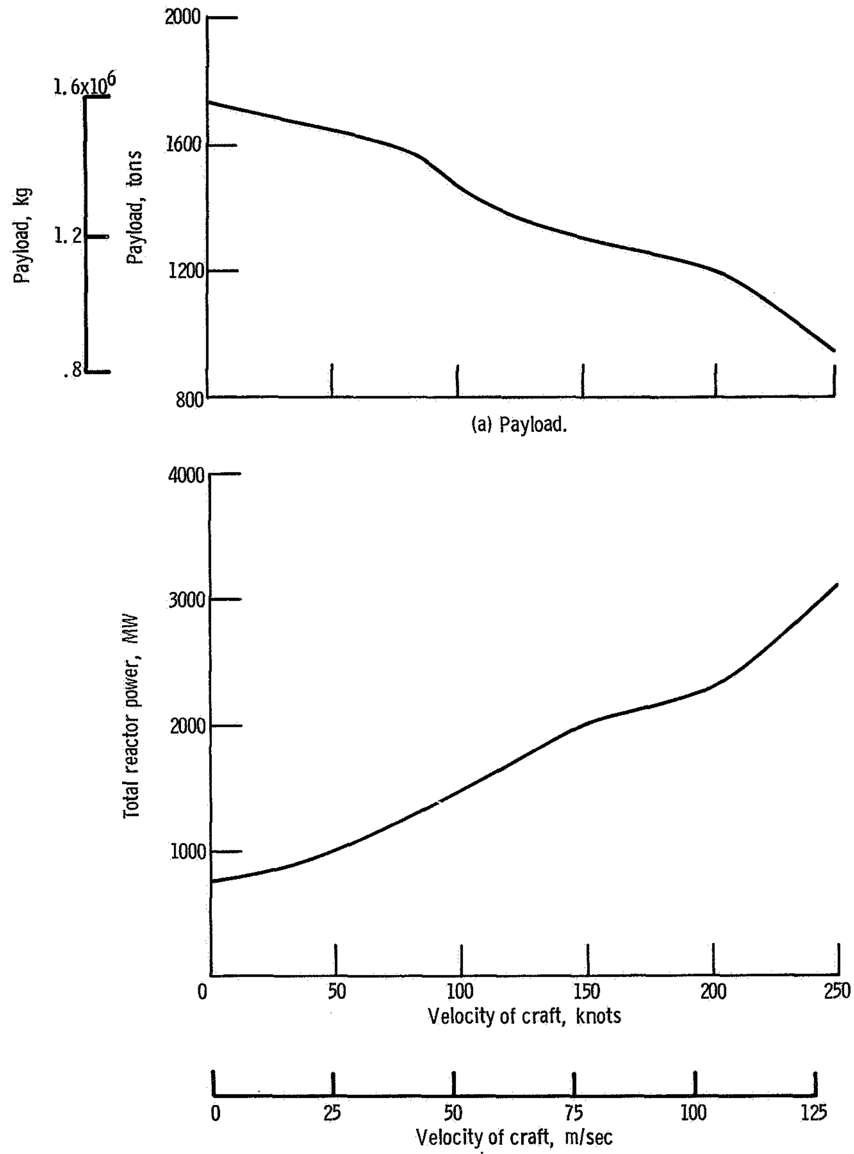


(a) Payload.



(b) Total reactor power.

Figure 5. - Payload and total reactor power as function of clearance height. Gross weight, 3000 tons (27.2×10^5 kg); velocity of craft, 50 knots (25.7 m/sec).



(b) Total reactor power.

Figure 6. - Payload and total reactor power as function of velocity of craft. Gross weight, 3000 tons ($27.2\times10^{+5}$ kg); clearance height, 10 feet (3.05 m).

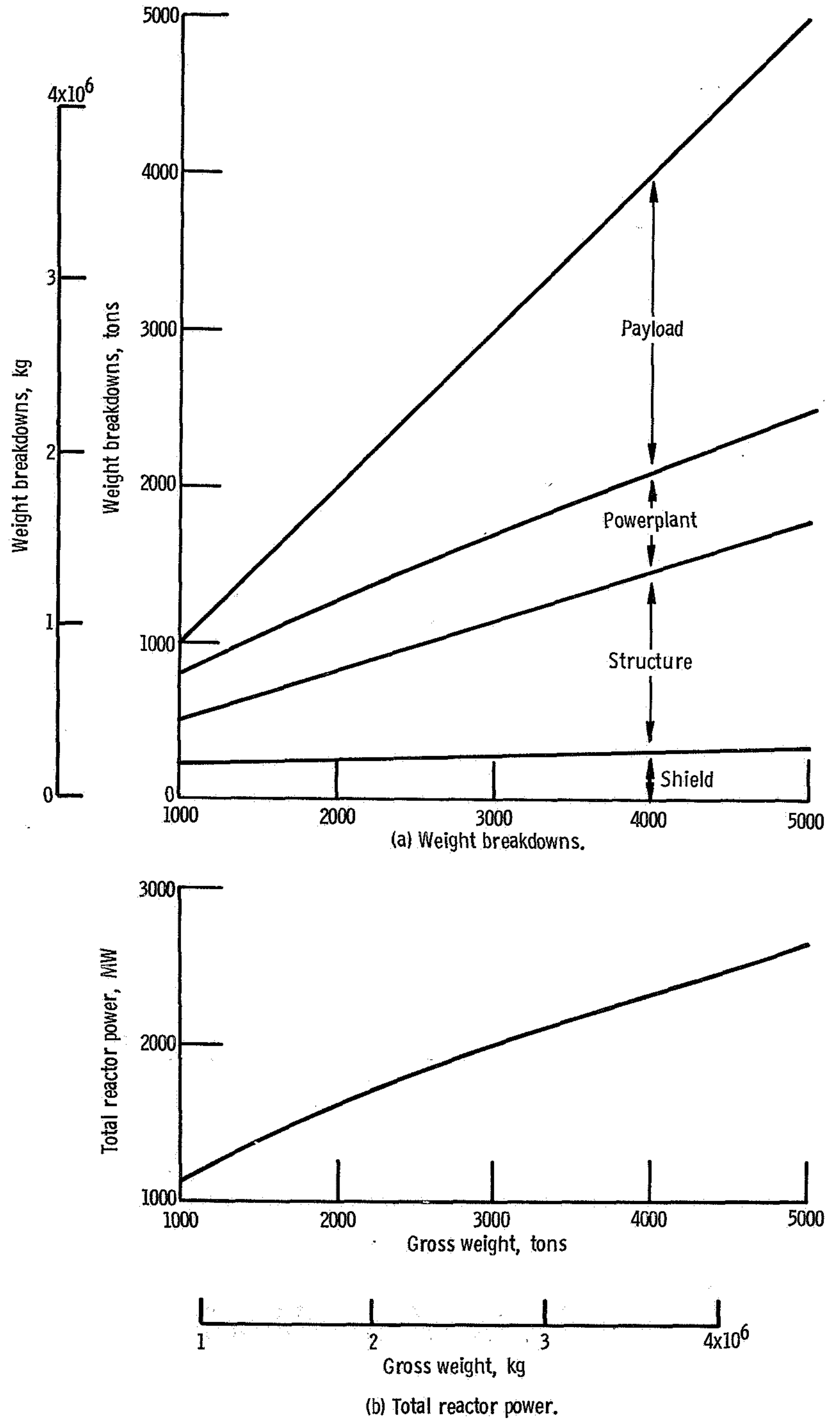


Figure 7. - Weight breakdowns and total reactor power as function of gross weight. Clearance height, 10 feet (3.05 m); velocity of craft, 150 knots (77.2 m/sec).

150 knots (77.2 m/sec) the payload is about 45 percent of the gross weight. Figure 6(b) shows that as the velocity increases from 0 to 250 knots (0 to 129 m/sec), the total reactor power increases from about 750 to 3000 megawatts. The sharpest increase takes place above 200 knots (103 m/sec). At 150 knots (77.2 m/sec) the power is about 2000

Figure 7 shows the variations weight breakdowns and total reactor power against gross weight for a forward velocity of 150 knots (77.2 m/sec) and an obstacle clearing height of 10 feet (3.05 m). Figure 7(a) shows that as the gross weight increases from 1000 to 5000 tons (9.07×10^5 to 45.6×10^5 kg), the payload increases from 20 to about 50 percent of the gross weight. At a gross weight of 3000 tons (27.2×10^5 kg), the reactor shield weighed 285 tons (2.56×10^5 kg), the structure weighed 875 tons (7.94×10^5 kg), the powerplant weighed 540 tons (4.90×10^5 kg), and the remaining payload was 1310 tons (11.9×10^5 kg). Figure 7(b) shows that as the gross weight increased from 1000 to 5000 tons (90.7×10^5 to 45.6×10^5 kg), the total reactor power increased from about 1100 to 2600 megawatts. At a gross weight of 3000 tons (27.2×10^5 kg), the total reactor power was about 2000 megawatts.

Many variables were calculated besides the ones discussed. Table I (p. 19) gives the detailed results of the calculations. This table presents the various pressures, flow rates, shaft horsepowers, drags, etc. For the range of parameters given, the payload varied from 0 to about 60 percent of the gross weight and the total reactor power varied from 400 to about 10 000 megawatts.

CONCLUSIONS

The objective of this study was to present some performance characteristics of a high velocity, nuclear powered surface effects machine. Payload fraction and reactor power were calculated as a function of gross weight, forward velocity, and clearance height. These parameters were varied over the following ranges: gross weight from 1000 to 5000 tons (9.07×10^5 to 45.6×10^5 kg); forward velocity from 0 to 250 knots (0 to 129 m/sec); and an obstacle clearing height from 10 to 50 feet (3.05 to 15.2 m).

For the range of parameters given, the payload varied from 0 to about 60 percent of the gross weight. The total reactor power varied from 400 to 10 000 megawatts. A 3000-ton (27.2×10^5-kg) nuclear surface effects machine could travel at speeds up to 250 knots (129 m/sec) at a 10-foot (3.05-m) clearance height, or as high as a 50-foot (15.2-m) clearance height at a reduced velocity.

A nuclear powered surface effects machine appears feasible for gross weights between 1000 and 5000 tons (9.07×10^5 and 45.6×10^5 kg). Payloads as high as 30 to 60 percent of the gross weight appear possible. Vehicle forward velocities up to 250 knots

(129 m/sec), and obstacle clearing heights of 50 feet (15.2 m) do not require excessive reactor powers. In short, the indicated performance characteristics are attractive. Obviously, some important problems remain to be investigated such as aerodynamic stability and vehicle maneuverability.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, July 7, 1969,
122-28.

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TABLE I. - PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	1000.	1000.	1000.	1000.	1000.	1000.
CLEARANCE HEIGHT, FT	10.	10.	10.	10.	10.	10.
LENGTH, FT	159.	159.	159.	159.	158.	158.
WIDTH, FT	159.	159.	159.	159.	158.	158.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	462.	403.	290.	192.	166.	50.
WEIGHT OF POWER PLANT, TONS	117.	156.	235.	306.	326.	414.
WEIGHT OF REACTOR SHIELD, TONS	133.	153.	188.	215.	221.	250.
WEIGHT OF STRUCTURE, TONS	289.	288.	288.	287.	287.	286.
FRONT COMPRESSOR S.H.P.	29200.	24700.	13000.	0.	0.	0.
REAR COMPRESSOR S.H.P.	29200.	32300.	38600.	41900.	28700.	29800.
SIDE COMPRESSOR S.H.P.	58400.	56200.	56000.	58200.	61700.	68400.
THRUST COMPRESSOR S.H.P.	0.	42400.	127000.	206000.	235000.	316000.
TOTAL S.H.P.	117000.	156000.	235000.	306000.	326000.	414000.
TOTAL REACTOR POWER, MEG-W	435.	580.	876.	1140.	1210.	1550.
AERO DYNAMIC DRAG, LB	0.	2180.	8660.	19400.	34500.	53400.
WAVE DRAG, LB	0.	12900.	3650.	1740.	1030.	680.
JET DRAG, LB	-165.	-1080.	33600.	78900.	51800.	49200.
MOMENTUM DRAG, LB	0.	83100.	133000.	117000.	113000.	116000.
TOTAL DRAG, LB	-165.	97100.	179000.	217000.	201000.	219000.
AERO DYNAMIC LIFT, LB	0.	2180.	8660.	19400.	34500.	53400.
FRONT JET LIFT, LB	23400.	20600.	12600.	0.	0.	0.
REAR JET LIFT, LB	23400.	28900.	35000.	37600.	25200.	24300.
SIDE JET LIFT, LB	46800.	51200.	55900.	58700.	60200.	60900.
CUSHION LIFT, LB	1910000.	1900000.	1890000.	1880000.	1880000.	1860000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	123000.	116000.	90300.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	123000.	87200.	79700.	68900.	38500.	31100.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	246000.	204000.	155000.	123000.	101000.	82900.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	210000.	308000.	373000.	407000.	461000.
TOTAL AIR FLOW, FT**3/SEC	493000.	617000.	634000.	564000.	546000.	575000.
FRONT JET AREA, FT*FT	598.	597.	595.	0.	0.	0.
REAR JET AREA, FT*FT	595.	274.	197.	139.	65.	45.
SIDE JET AREA, FT*FT	1190.	805.	460.	286.	193.	131.
THRUST JET AREA, FT*FT	763.	759.	755.	754.	752.	745.
TOTAL AREA, FT*FT	25400.	25300.	25200.	25100.	25100.	24800.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	173.	226.	284.	349.	448.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	129.	168.	222.	287.	386.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	95.	193.	258.	270.	321.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	163.	232.	319.	425.	577.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	123.	179.	263.	369.	522.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	92.	202.	295.	354.	463.
FRONT JET HEAT TRANSFER, BTU	82500.	69900.	36700.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	82500.	91300.	109000.	119000.	81300.	84300.
SIDE JET HEAT TRANSFER, BTU	165000.	159000.	158000.	165000.	174000.	193000.
THRUST JET HEAT TRANSFER, BTU	0.	120000.	360000.	582000.	665000.	894000.
TOTAL JET HEAT TRANSFER, BTU	330000.	440000.	664000.	866000.	920000.	1170000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	56.	73.	92.	113.	145.
SIDE JET TEMPERATURE RISE, DEG. F	36.	42.	54.	72.	93.	125.
THRUST JET TEMPERATURE RISE, DEG. F	0.	31.	62.	84.	87.	104.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	38.	56.	82.	90.	109.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	18.	36.	54.	72.	90.
GROSS WEIGHT, TONS	1000.	1000.	1000.	1000.	1000.	1000.
CLEARANCE HEIGHT, FT	20.	20.	20.	20.	20.	20.
LENGTH, FT	156.	155.	155.	155.	155.	154.
WIDTH, FT	156.	155.	155.	155.	155.	154.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	304.	273.	229.	176.	103.	14.
WEIGHT OF POWER PLANT, TONS	228.	251.	283.	322.	378.	447.
WEIGHT OF REACTOR SHIELD, TONS	185.	194.	206.	220.	238.	259.
WEIGHT OF STRUCTURE, TONS	282.	282.	281.	281.	281.	280.
FRONT COMPRESSOR S.H.P.	57000.	55700.	52300.	46700.	39400.	30600.
REAR COMPRESSOR S.H.P.	57000.	59600.	62200.	65600.	70100.	75900.
SIDE COMPRESSOR S.H.P.	114000.	113000.	112000.	111000.	112000.	114000.
THRUST COMPRESSOR S.H.P.	0.	22300.	56800.	99100.	156000.	226000.
TOTAL S.H.P.	228000.	251000.	283000.	322000.	378000.	447000.
TOTAL REACTOR POWER, MEG-W	850.	935.	1060.	1200.	1410.	1670.
AERO DYNAMIC DRAG, LB	0.	269.	1070.	2410.	4260.	6650.
WAVE DRAG, LB	0.	28100.	22400.	10700.	6320.	4200.
JET DRAG, LB	-323.	-18500.	-13700.	-765.	19100.	45700.
MOMENTUM DRAG, LB	0.	64400.	120000.	166000.	204000.	233000.
TOTAL DRAG, LB	-323.	74200.	130000.	179000.	234000.	290000.
AERO DYNAMIC LIFT, LB	0.	269.	1070.	2410.	4260.	6650.
FRONT JET LIFT, LB	45600.	44800.	42700.	39300.	34500.	28400.
REAR JET LIFT, LB	45700.	51900.	54800.	57900.	61700.	66200.
SIDE JET LIFT, LB	91400.	94000.	98100.	102000.	106000.	109000.
CUSHION LIFT, LB	1820000.	1810000.	1800000.	1800000.	1790000.	1790000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	241000.	239000.	233000.	223000.	209000.	190000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	240000.	185000.	170000.	160000.	152000.	147000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	481000.	454000.	414000.	373000.	334000.	299000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	160000.	220000.	266000.	311000.	352000.
TOTAL AIR FLOW, FT**3/SEC	962000.	1040000.	1040000.	1020000.	1010000.	988000.
FRONT JET AREA, FT*FT	1170.	1170.	1160.	1160.	1160.	1160.
REAR JET AREA, FT*FT	1160.	668.	547.	467.	405.	358.
SIDE JET AREA, FT*FT	2320.	2060.	1700.	1370.	1090.	875.
THRUST JET AREA, FT*FT	727.	724.	721.	719.	717.	716.
TOTAL AREA, FT*FT	24200.	24100.	24000.	24000.	23900.	23900.
DYNAMIC PRESSURE, LB/FT*FT	0.	1.	4.	10.	18.	28.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	109.	105.	98.	88.	75.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	151.	171.	192.	215.	241.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	116.	126.	139.	157.	178.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	65.	121.	174.	236.	300.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	98.	96.	94.	90.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	136.	158.	181.	208.	239.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	106.	117.	133.	155.	183.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	59.	112.	165.	226.	293.
FRONT JET HEAT TRANSFER, BTU	161000.	158000.	148000.	132000.	111000.	86400.
REAR JET HEAT TRANSFER, BTU	161000.	169000.	176000.	185000.	198000.	215000.
SIDE JET HEAT TRANSFER, BTU	322000.	320000.	316000.	314000.	316000.	322000.
THRUST JET HEAT TRANSFER, BTU	0.	63100.	161000.	280000.	442000.	640000.
TOTAL JET HEAT TRANSFER, BTU	645000.	709000.	800000.	912000.	1070000.	1260000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	35.	34.	32.	28.	24.
REAR JET TEMPERATURE RISE, DEG. F	36.	49.	55.	62.	70.	78.
SIDE JET TEMPERATURE RISE, DEG. F	36.	38.	41.	45.	51.	58.
THRUST JET TEMPERATURE RISE, DEG. F	0.	21.	39.	56.	76.	97.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	37.	41.	48.	57.	68.

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	2000.	2000.	2000.	2000.	2000.	2000.
CLEARANCE HEIGHT, FT	10.	10.	10.	10.	10.	10.
LENGTH, FT	227.	227.	226.	226.	225.	224.
WIDTH, FT	227.	227.	226.	226.	225.	224.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1090.	1020.	870.	730.	669.	480.
WEIGHT OF POWER PLANT, TONS	166.	220.	328.	435.	483.	637.
WEIGHT OF REACTOR SHIELD, TONS	158.	182.	222.	256.	270.	309.
WEIGHT OF STRUCTURE, TONS	582.	581.	580.	579.	578.	574.
FRONT COMPRESSOR S.H.P.	41600.	35200.	18500.	0.	0.	0.
REAR COMPRESSOR S.H.P.	41600.	45500.	53800.	58200.	40400.	42500.
SIDE COMPRESSOR S.H.P.	83200.	79800.	78000.	80700.	86600.	97500.
THRUST COMPRESSOR S.H.P.	0.	60000.	178000.	296000.	356000.	497000.
TOTAL S.H.P.	166000.	220000.	328000.	435000.	483000.	637000.
TOTAL REACTOR POWER, MEG-W	620.	822.	1220.	1620.	1800.	2370.
AERO DYNAMIC DRAG, LB	0.	4420.	17600.	39500.	69900.	108000.
WAVE DRAG, LB	0.	25400.	7180.	3430.	2020.	1330.
JET DRAG, LB	-235.	-855.	48600.	113000.	73800.	70000.
MOMENTUM DRAG, LB	0.	120000.	193000.	171000.	163000.	165000.
TOTAL DRAG, LB	-235.	149000.	266000.	326000.	309000.	344000.
AERO DYNAMIC LIFT, LB	0.	4420.	17600.	39500.	69900.	108000.
FRONT JET LIFT, LB	33300.	29400.	17900.	0.	0.	0.
REAR JET LIFT, LB	33300.	41000.	49600.	53400.	35800.	34600.
SIDE JET LIFT, LB	66600.	72400.	79100.	83200.	85500.	86600.
CUSHION LIFT, LB	3870000.	3850000.	3840000.	3820000.	3810000.	3760000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	176000.	165000.	129000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	175000.	127000.	117000.	100000.	55200.	44200.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	350000.	296000.	228000.	179000.	144000.	118000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	380000.	560000.	688000.	768000.	879000.
TOTAL AIR FLOW, FT**3/SEC	701000.	968000.	1030000.	966000.	967000.	1040000.
FRONT JET AREA, FT*FT	852.	850.	848.	0.	0.	0.
REAR JET AREA, FT*FT	847.	408.	295.	207.	95.	63.
SIDE JET AREA, FT*FT	1690.	1190.	693.	426.	279.	186.
THRUST JET AREA, FT*FT	1550.	1540.	1530.	1530.	1520.	1500.
TOTAL AREA, FT*FT	51600.	51400.	51100.	51000.	50800.	50200.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	168.	216.	272.	342.	449.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	126.	160.	211.	280.	387.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	74.	148.	202.	217.	264.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	158.	222.	307.	419.	578.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	120.	172.	253.	364.	523.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	73.	161.	244.	307.	412.
FRONT JET HEAT TRANSFER, BTU	118000.	99600.	52300.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	118000.	129000.	152000.	165000.	114000.	120000.
SIDE JET HEAT TRANSFER, BTU	235000.	226000.	221000.	228000.	245000.	276000.
THRUST JET HEAT TRANSFER, BTU	0.	170000.	502000.	838000.	1010000.	1400000.
TOTAL JET HEAT TRANSFER, BTU	470000.	623000.	927000.	1230000.	1370000.	1800000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	54.	70.	88.	111.	145.
SIDE JET TEMPERATURE RISE, DEG. F	36.	41.	52.	68.	91.	125.
THRUST JET TEMPERATURE RISE, DEG. F	0.	24.	48.	65.	70.	86.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	34.	48.	68.	76.	93.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	46.	92.	138.	184.	230.
GROSS WEIGHT, TONS	2000.	2000.	2000.	2000.	2000.	2000.
CLEARANCE HEIGHT, FT	20.	20.	20.	20.	20.	20.
LENGTH, FT	223.	223.	222.	221.	222.	221.
WIDTH, FT	223.	223.	222.	221.	222.	221.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	879.	747.	494.	128.	222.	33.
WEIGHT OF POWER PLANT, TONS	327.	428.	629.	930.	851.	1010.
WEIGHT OF REACTOR SHIELD, TONS	222.	254.	308.	374.	358.	390.
WEIGHT OF STRUCTURE, TONS	573.	571.	569.	568.	570.	568.
FRONT COMPRESSOR S.H.P.	81800.	71000.	42400.	7250.	0.	0.
REAR COMPRESSOR S.H.P.	81800.	90500.	107000.	135000.	86000.	82000.
SIDE COMPRESSOR S.H.P.	164000.	159000.	159000.	169000.	173000.	187000.
THRUST COMPRESSOR S.H.P.	0.	108000.	320000.	619000.	591000.	741000.
TOTAL S.H.P.	327000.	428000.	629000.	930000.	851000.	1010000.
TOTAL REACTOR POWER, MEG-W	1220.	1600.	2350.	3470.	3170.	3760.
AERO DYNAMIC DRAG, LB	0.	3600.	14300.	32100.	57500.	89100.
WAVE DRAG, LB	0.	28600.	8060.	3840.	2290.	1510.
JET DRAG, LB	-463.	-8970.	72100.	215000.	154000.	138000.
MOMENTUM DRAG, LB	0.	214000.	348000.	384000.	311000.	319000.
TOTAL DRAG, LB	-463.	238000.	442000.	635000.	524000.	548000.
AERO DYNAMIC LIFT, LB	0.	3600.	14300.	32100.	57500.	89100.
FRONT JET LIFT, LB	65400.	58900.	39800.	8210.	0.	0.
REAR JET LIFT, LB	65500.	80500.	95300.	117000.	74700.	68100.
SIDE JET LIFT, LB	131000.	143000.	156000.	164000.	168000.	170000.
CUSHION LIFT, LB	3740000.	3710000.	3690000.	3680000.	3700000.	3670000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	346000.	327000.	269000.	122000.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	345000.	241000.	218000.	215000.	119000.	92400.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	689000.	574000.	440000.	346000.	295000.	248000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	444000.	647000.	816000.	841000.	929000.
TOTAL AIR FLOW, FT**3/SEC	1380000.	1590000.	1570000.	1500000.	1260000.	1270000.
FRONT JET AREA, FT*FT	1670.	1670.	1670.	1660.	0.	0.
REAR JET AREA, FT*FT	1670.	757.	544.	437.	210.	140.
SIDE JET AREA, FT*FT	3330.	2270.	1320.	812.	590.	418.
THRUST JET AREA, FT*FT	1500.	1490.	1480.	1470.	1480.	1470.
TOTAL AREA, FT*FT	49800.	49500.	49300.	49100.	49300.	49000.
DYNAMIC PRESSURE, LB/FT*FT	0.	7.	29.	65.	116.	182.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	101.	74.	28.	25.	38.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	175.	229.	294.	338.	415.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	129.	169.	229.	275.	352.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	113.	231.	354.	329.	373.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	90.	78.	116.	182.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	164.	230.	317.	399.	521.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	122.	176.	259.	342.	464.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	108.	232.	372.	390.	483.
FRONT JET HEAT TRANSFER, BTU	231000.	201000.	120000.	20500.	0.	0.
REAR JET HEAT TRANSFER, BTU	231000.	256000.	302000.	381000.	243000.	232000.
SIDE JET HEAT TRANSFER, BTU	462000.	449000.	451000.	478000.	490000.	528000.
THRUST JET HEAT TRANSFER, BTU	0.	305000.	906000.	1750000.	1670000.	2090000.
TOTAL JET HEAT TRANSFER, BTU	925000.	1210000.	1780000.	2630000.	2410000.	2850000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	33.	24.	9.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	57.	74.	95.	110.	134.
SIDE JET TEMPERATURE RISE, DEG. F	36.	42.	55.	74.	89.	114.
THRUST JET TEMPERATURE RISE, DEG. F	0.	37.	75.	115.	106.	121.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	41.	60.	94.	103.	120.

VELOCITY, KNOTS	0.	20.	40.	60.	80.	100.
GROSS WEIGHT, TONS	2000.	2000.	2000.	2000.	2000.	2000.
CLEARANCE HEIGHT, FT	30.	30.	30.	30.	30.	30.
LENGTH, FT	220.	219.	219.	218.	218.	218.
WIDTH, FT	220.	219.	219.	218.	218.	218.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	685.	628.	521.	390.	214.	0.
WEIGHT OF POWER PLANT, TONS	482.	528.	614.	720.	865.	1040.
WEIGHT OF REACTOR SHIELD, TONS	269.	282.	304.	329.	361.	396.
WEIGHT OF STRUCTURE, TONS	563.	562.	561.	560.	559.	559.
FRONT COMPRESSOR S.H.P.	121000.	117000.	108000.	94000.	75300.	53400.
REAR COMPRESSOR S.H.P.	121000.	126000.	133000.	142000.	154000.	170000.
SIDE COMPRESSOR S.H.P.	241000.	239000.	236000.	236000.	239000.	245000.
THRUST COMPRESSOR S.H.P.	0.	45900.	137000.	249000.	397000.	576000.
TOTAL S.H.P.	482000.	528000.	614000.	720000.	865000.	1040000.
TOTAL REACTOR POWER, MEG-W	1800.	1970.	2290.	2690.	3230.	3890.
AERO DYNAMIC DRAG, LB	0.	660.	2630.	5890.	10400.	16300.
WAVE DRAG, LB	0.	35900.	35600.	17000.	10000.	6670.
JET DRAG, LB	-683.	-38400.	-24500.	10300.	63200.	134000.
MOMENTUM DRAG, LB	0.	151000.	277000.	379000.	459000.	518000.
TOTAL DRAG, LB	-683.	149000.	290000.	412000.	543000.	674000.
AERO DYNAMIC LIFT, LB	0.	660.	2630.	5890.	10400.	16300.
FRONT JET LIFT, LB	96500.	94500.	89000.	80100.	67600.	51800.
REAR JET LIFT, LB	96600.	110000.	117000.	125000.	135000.	146000.
SIDE JET LIFT, LB	193000.	199000.	210000.	219000.	228000.	234000.
CUSHION LIFT, LB	3610000.	3600000.	3580000.	3570000.	3560000.	3550000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	510000.	504000.	488000.	463000.	425000.	372000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	508000.	389000.	352000.	330000.	315000.	306000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1020000.	954000.	855000.	757000.	667000.	592000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	323000.	466000.	571000.	670000.	761000.
TOTAL AIR FLOW, FT**3/SEC	2030000.	2170000.	2160000.	2120000.	2080000.	2030000.
FRONT JET AREA, FT*FT	2470.	2460.	2460.	2460.	2450.	2450.
REAR JET AREA, FT*FT	2460.	1390.	1110.	929.	799.	704.
SIDE JET AREA, FT*FT	4910.	4290.	3420.	2660.	2060.	1620.
THRUST JET AREA, FT*FT	1450.	1440.	1430.	1430.	1420.	1420.
TOTAL AREA, FT*FT	48200.	47900.	47800.	47600.	47500.	47400.
DYNAMIC PRESSURE, LB/FT*FT	0.	1.	5.	12.	22.	34.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	109.	104.	95.	83.	67.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	152.	177.	201.	229.	259.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	117.	129.	145.	167.	194.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	.0.	66.	137.	204.	277.	354.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	98.	95.	92.	88.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	138.	164.	191.	224.	261.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	106.	121.	141.	168.	202.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	61.	128.	193.	267.	346.
FRONT JET HEAT TRANSFER, BTU	341000.	332000.	306000.	266000.	213000.	151000.
REAR JET HEAT TRANSFER, BTU	341000.	357000.	377000.	402000.	436000.	480000.
SIDE JET HEAT TRANSFER, BTU	682000.	675000.	667000.	666000.	675000.	694000.
THRUST JET HEAT TRANSFER, BTU	0.	130000.	386000.	703000.	1120000.	1630000.
TOTAL JET HEAT TRANSFER, BTU	1360000.	1490000.	1740000.	2040000.	2450000.	2950000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	35.	34.	31.	27.	22.
REAR JET TEMPERATURE RISE, DEG. F	36.	49.	57.	65.	74.	84.
SIDE JET TEMPERATURE RISE, DEG. F	36.	38.	42.	47.	54.	63.
THRUST JET TEMPERATURE RISE, DEG. F	0.	21.	44.	66.	90.	115.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	37.	43.	51.	63.	78.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	12.	24.	36.	48.	60.
GROSS WEIGHT, TONS	2000.	2000.	2000.	2000.	2000.	2000.
CLEARANCE HEIGHT, FT	40.	40.	40.	40.	40.	40.
LENGTH, FT	216.	215.	215.	215.	214.	214.
WIDTH, FT	216.	215.	215.	215.	214.	214.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	505.	479.	400.	314.	219.	101.
WEIGHT OF POWER PLANT, TONS	632.	655.	719.	790.	869.	968.
WEIGHT OF REACTOR SHIELD, TONS	308.	314.	329.	345.	361.	381.
WEIGHT OF STRUCTURE, TONS	554.	553.	552.	551.	551.	550.
FRONT COMPRESSOR S.H.P.	158000.	156000.	152000.	145000.	135000.	123000.
REAR COMPRESSOR S.H.P.	158000.	163000.	169000.	174000.	181000.	189000.
SIDE COMPRESSOR S.H.P.	316000.	314000.	312000.	310000.	310000.	312000.
THRUST COMPRESSOR S.H.P.	0.	21100.	86600.	161000.	242000.	343000.
TOTAL S.H.P.	632000.	655000.	719000.	790000.	869000.	968000.
TOTAL REACTOR POWER, MEG-W	2360.	2440.	2680.	2950.	3240.	3610.
AERO DYNAMIC DRAG, LB	0.	230.	915.	2050.	3640.	5670.
WAVE DRAG, LB	0.	17000.	46600.	41700.	24600.	16400.
JET DRAG, LB	-894.	-48400.	-52200.	-40800.	-19400.	10800.
MOMENTUM DRAG, LB	0.	122000.	231000.	327000.	413000.	487000.
TOTAL DRAG, LB	-894.	90900.	226000.	330000.	422000.	519000.
AERO DYNAMIC LIFT, LB	0.	230.	915.	2050.	3640.	5670.
FRONT JET LIFT, LB	126000.	125000.	123000.	118000.	112000.	105000.
REAR JET LIFT, LB	127000.	141000.	147000.	153000.	158000.	165000.
SIDE JET LIFT, LB	253000.	257000.	265000.	274000.	282000.	290000.
CUSHION LIFT, LB	3490000.	3480000.	3460000.	3450000.	3440000.	3440000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	668000.	664000.	656000.	644000.	627000.	605000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	666000.	538000.	487000.	458000.	437000.	420000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1330000.	1290000.	1210000.	1130000.	1040000.	964000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	243000.	389000.	478000.	549000.	618000.
TOTAL AIR FLOW, FT**3/SEC	2670000.	2740000.	2750000.	2710000.	2660000.	2610000.
FRONT JET AREA, FT*FT	3240.	3230.	3220.	3220.	3220.	3210.
REAR JET AREA, FT*FT	3220.	2050.	1660.	1440.	1280.	1150.
SIDE JET AREA, FT*FT	6440.	6030.	5290.	4550.	3890.	3300.
THRUST JET AREA, FT*FT	1400.	1390.	1390.	1380.	1380.	1370.
TOTAL AREA, FT*FT	46600.	46400.	46200.	46000.	45900.	45800.
DYNAMIC PRESSURE, LB/FT*FT	0.	0.	2.	4.	8.	12.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	110.	108.	105.	101.	95.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	141.	162.	178.	194.	211.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	114.	120.	129.	139.	151.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	41.	104.	157.	206.	260.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	99.	98.	97.	95.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	128.	147.	164.	181.	200.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	103.	110.	119.	131.	146.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	37.	95.	145.	192.	244.
FRONT JET HEAT TRANSFER, BTU	447000.	442000.	429000.	409000.	382000.	348000.
REAR JET HEAT TRANSFER, BTU	447000.	460000.	477000.	493000.	512000.	535000.
SIDE JET HEAT TRANSFER, BTU	894000.	889000.	882000.	878000.	877000.	882000.
THRUST JET HEAT TRANSFER, BTU	0.	59800.	245000.	454000.	685000.	971000.
TOTAL JET HEAT TRANSFER, BTU	1790000.	1850000.	2030000.	2230000.	2460000.	2740000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	36.	35.	34.	33.	31.
REAR JET TEMPERATURE RISE, DEG. F	36.	46.	52.	58.	63.	68.
SIDE JET TEMPERATURE RISE, DEG. F	36.	37.	39.	42.	45.	49.
THRUST JET TEMPERATURE RISE, DEG. F	0.	13.	34.	51.	67.	84.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	36.	40.	44.	49.	56.

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	3000.	3000.	3000.	3000.	3000.	3000.
CLEARANCE HEIGHT, FT	10.	10.	10.	10.	10.	10.
LENGTH, FT	279.	279.	278.	277.	277.	275.
WIDTH, FT	279.	279.	278.	277.	277.	275.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1740.	1650.	1480.	1310.	1210.	950.
WEIGHT OF POWER PLANT, TONS	204.	271.	400.	539.	616.	831.
WEIGHT OF REACTOR SHIELD, TONS	175.	202.	245.	285.	304.	354.
WEIGHT OF STRUCTURE, TONS	876.	874.	873.	871.	869.	865.
FRONT COMPRESSOR S.H.P.	51100.	43300.	22700.	0.	0.	0.
REAR COMPRESSOR S.H.P.	51100.	55600.	65300.	70700.	49500.	52600.
SIDE COMPRESSOR S.H.P.	102000.	97800.	94900.	97900.	106000.	121000.
THRUST COMPRESSOR S.H.P.	0.	74200.	217000.	370000.	460000.	658000.
TOTAL S.H.P.	204000.	271000.	400000.	539000.	616000.	831000.
TOTAL REACTOR POWER, MEG-W	762.	1010.	1490.	2010.	2300.	3100.
AERO DYNAMIC DRAG, LB	0.	6670.	26600.	59600.	105000.	163000.
WAVE DRAG, LB	0.	37700.	10600.	5080.	2990.	1980.
JET DRAG, LB	-289.	-600.	60200.	139000.	90700.	86000.
MOMENTUM DRAG, LB	0.	148000.	239000.	212000.	200000.	202000.
TOTAL DRAG, LB	-289.	192000.	337000.	415000.	399000.	453000.
AERO DYNAMIC LIFT, LB	0.	6670.	26600.	59600.	105000.	163000.
FRONT JET LIFT, LB	40900.	36100.	22000.	0.	0.	0.
REAR JET LIFT, LB	40900.	50200.	60800.	65500.	44000.	42600.
SIDE JET LIFT, LB	81900.	88700.	96900.	102000.	105000.	107000.
CUSHION LIFT, LB	5840000.	5820000.	5790000.	5770000.	5750000.	5690000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	216000.	203000.	158000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	215000.	158000.	145000.	124000.	67900.	54200.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	431000.	367000.	283000.	222000.	178000.	144000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	539000.	796000.	987000.	1120000.	1290000.
TOTAL AIR FLOW, FT**3/SEC	862000.	1270000.	1380000.	1330000.	1360000.	1490000.
FRONT JET AREA, FT*FT	1050.	1040.	1040.	0.	0.	0.
REAR JET AREA, FT*FT	1040.	512.	372.	258.	117.	77.
SIDE JET AREA, FT*FT	2080.	1480.	875.	534.	343.	227.
THRUST JET AREA, FT*FT	2330.	2330.	2320.	2310.	2300.	2280.
TOTAL AREA, FT*FT	77800.	77600.	77300.	77000.	76600.	75800.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	165.	211.	266.	341.	453.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	125.	157.	206.	279.	391.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	64.	128.	175.	193.	238.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	156.	218.	302.	419.	582.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	119.	169.	248.	363.	526.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	65.	143.	221.	285.	389.
FRONT JET HEAT TRANSFER, BTU	144000.	122000.	64300.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	144000.	157000.	185000.	200000.	140000.	149000.
SIDE JET HEAT TRANSFER, BTU	289000.	276000.	268000.	277000.	300000.	341000.
THRUST JET HEAT TRANSFER, BTU	0.	210000.	614000.	1050000.	1300000.	1860000.
TOTAL JET HEAT TRANSFER, BTU	578000.	766000.	1130000.	1520000.	1740000.	2350000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	53.	68.	86.	111.	147.
SIDE JET TEMPERATURE RISE, DEG. F	36.	40.	51.	67.	90.	127.
THRUST JET TEMPERATURE RISE, DEG. F	0.	21.	41.	57.	62.	77.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	32.	44.	61.	68.	84.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	3000.	3000.	3000.	3000.	3000.	3000.
CLEARANCE HEIGHT, FT	20.	20.	20.	20.	20.	20.
LENGTH, FT	275.	274.	274.	273.	273.	272.
WIDTH, FT	275.	274.	274.	273.	273.	272.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1490.	1320.	970.	679.	621.	290.
WEIGHT OF POWER PLANT, TONS	403.	538.	819.	1060.	1110.	1400.
WEIGHT OF REACTOR SHIELD, TONS	246.	284.	351.	400.	409.	458.
WEIGHT OF STRUCTURE, TONS	864.	862.	860.	859.	859.	854.
FRONT COMPRESSOR S.H.P.	101000.	85200.	44800.	0.	0.	0.
REAR COMPRESSOR S.H.P.	101000.	112000.	135000.	147000.	100000.	103000.
SIDE COMPRESSOR S.H.P.	202000.	194000.	195000.	204000.	215000.	237000.
THRUST COMPRESSOR S.H.P.	0.	146000.	445000.	711000.	797000.	1060000.
TOTAL S.H.P.	403000.	538000.	819000.	1060000.	1110000.	1400000.
TOTAL REACTOR POWER, MEG-W	1500.	2010.	3050.	3960.	4140.	5210.
AERO DYNAMIC DRAG, LB	0.	6470.	25800.	57900.	103000.	159000.
WAVE DRAG, LB	0.	36600.	10300.	4940.	2920.	1930.
JET DRAG, LB	-570.	-4420.	115000.	272000.	179000.	170000.
MOMENTUM DRAG, LB	0.	285000.	454000.	400000.	390000.	400000.
TOTAL DRAG, LB	-570.	324000.	605000.	734000.	674000.	731000.
AERO DYNAMIC LIFT, LB	0.	6470.	25800.	57900.	103000.	159000.
FRONT JET LIFT, LB	80600.	71200.	43400.	0.	0.	0.
REAR JET LIFT, LB	80800.	100000.	121000.	130000.	87000.	84100.
SIDE JET LIFT, LB	162000.	177000.	193000.	203000.	208000.	210000.
CUSHION LIFT, LB	5680000.	5650000.	5620000.	5610000.	5600000.	5550000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	426000.	400000.	312000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	425000.	298000.	272000.	236000.	132000.	107000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	849000.	701000.	529000.	418000.	345000.	286000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	654000.	963000.	1160000.	1250000.	1410000.
TOTAL AIR FLOW, FT**3/SEC	1700000.	2050000.	2080000.	1810000.	1730000.	1800000.
FRONT JET AREA, FT*FT	2060.	2060.	2050.	0.	0.	0.
REAR JET AREA, FT*FT	2050.	930.	664.	471.	224.	154.
SIDE JET AREA, FT*FT	4100.	2740.	1550.	963.	657.	451.
THRUST JET AREA, FT*FT	2270.	2260.	2250.	2240.	2240.	2220.
TOTAL AREA, FT*FT	75700.	75300.	74900.	74800.	74700.	73900.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	175.	231.	291.	354.	450.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	130.	172.	228.	291.	388.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	105.	216.	287.	297.	350.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	165.	236.	324.	430.	579.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	124.	183.	268.	373.	523.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	101.	222.	321.	379.	489.
FRONT JET HEAT TRANSFER, BTU	285000.	241000.	127000.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	285000.	317000.	381000.	414000.	283000.	292000.
SIDE JET HEAT TRANSFER, BTU	570000.	550000.	551000.	576000.	608000.	670000.
THRUST JET HEAT TRANSFER, BTU	0.	414000.	1260000.	2010000.	2250000.	2990000.
TOTAL JET HEAT TRANSFER, BTU	1140000.	1520000.	2320000.	3000000.	3140000.	3950000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	57.	75.	94.	115.	146.
SIDE JET TEMPERATURE RISE, DEG. F	36.	42.	56.	74.	94.	126.
THRUST JET TEMPERATURE RISE, DEG. F	0.	34.	70.	93.	96.	113.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	40.	60.	89.	97.	117.

VELOCITY, KNOTS	0.	40.	80.	120.	160.	200.
GROSS WEIGHT, TONS	3000.	3000.	3000.	3000.	3000.	3000.
CLEARANCE HEIGHT, FT	30.	30.	30.	30.	30.	30.
LENGTH, FT	271.	270.	270.	269.	270.	270.
WIDTH, FT	271.	270.	270.	269.	270.	270.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1250.	1060.	708.	171.	143.	29.
WEIGHT OF POWER PLANT, TONS	596.	754.	1050.	1510.	1530.	1630.
WEIGHT OF REACTOR SHIELD, TONS	299.	337.	397.	476.	479.	495.
WEIGHT OF STRUCTURE, TONS	853.	850.	848.	846.	849.	848.
FRONT COMPRESSOR S.H.P.	149000.	134000.	93200.	37400.	0.	0.
REAR COMPRESSOR S.H.P.	149000.	164000.	188000.	228000.	189000.	153000.
SIDE COMPRESSOR S.H.P.	298000.	291000.	292000.	307000.	316000.	330000.
THRUST COMPRESSOR S.H.P.	0.	166000.	475000.	935000.	1020000.	1140000.
TOTAL S.H.P.	596000.	754000.	1050000.	1510000.	1530000.	1630000.
TOTAL REACTOR POWER, MEG-W	2220.	2810.	3910.	5620.	5700.	6070.
AERO DYNAMIC DRAG, LB	0.	4020.	16000.	35900.	64200.	100000.
WAVE DRAG, LB	0.	53500.	15100.	7190.	4290.	2850.
JET DRAG, LB	-844.	-28600.	80000.	275000.	335000.	264000.
MOMENTUM DRAG, LB	0.	345000.	577000.	694000.	557000.	564000.
TOTAL DRAG, LB	-844.	374000.	688000.	1010000.	961000.	931000.
AERO DYNAMIC LIFT, LB	0.	4020.	16000.	35900.	64200.	100000.
FRONT JET LIFT, LB	119000.	110000.	83700.	40200.	0.	0.
REAR JET LIFT, LB	119000.	145000.	166000.	197000.	163000.	129000.
SIDE JET LIFT, LB	239000.	258000.	280000.	295000.	303000.	309000.
CUSHION LIFT, LB	5520000.	5480000.	5450000.	5430000.	5470000.	5460000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	630000.	604000.	526000.	364000.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	628000.	442000.	398000.	382000.	276000.	192000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1260000.	1070000.	844000.	672000.	578000.	500000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	661000.	949000.	1200000.	1270000.	1360000.
TOTAL AIR FLOW, FT**3/SEC	2510000.	2780000.	2720000.	2620000.	2130000.	2050000.
FRONT JET AREA, FT*FT	3050.	3040.	3030.	3030.	0.	0.
REAR JET AREA, FT*FT	3040.	1410.	1030.	821.	519.	318.
SIDE JET AREA, FT*FT	6070.	4320.	2670.	1690.	1240.	928.
THRUST JET AREA, FT*FT	2210.	2190.	2180.	2170.	2190.	2180.
TOTAL AREA, FT*FT	73600.	73100.	72700.	72400.	72900.	72800.
DYNAMIC PRESSURE, LB/FT*FT	0.	5.	22.	49.	88.	138.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	104.	83.	48.	19.	29.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	173.	221.	279.	321.	373.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	127.	162.	213.	256.	309.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	117.	234.	364.	376.	394.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	98.	92.	83.	88.	138.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	160.	217.	291.	360.	447.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	119.	163.	232.	301.	390.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	110.	229.	368.	409.	466.
FRONT JET HEAT TRANSFER, BTU	421000.	379000.	263000.	106000.	0.	0.
REAR JET HEAT TRANSFER, BTU	421000.	462000.	531000.	645000.	535000.	433000.
SIDE JET HEAT TRANSFER, BTU	843000.	823000.	825000.	867000.	894000.	934000.
THRUST JET HEAT TRANSFER, BTU	0.	468000.	1340000.	2640000.	2890000.	3240000.
TOTAL JET HEAT TRANSFER, BTU	1690000.	2130000.	2960000.	4260000.	4320000.	4600000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	34.	27.	15.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	56.	71.	90.	104.	121.
SIDE JET TEMPERATURE RISE, DEG. F	36.	41.	52.	69.	83.	100.
THRUST JET TEMPERATURE RISE, DEG. F	0.	38.	76.	118.	122.	128.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	41.	58.	87.	109.	120.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	18.	36.	54.	72.	90.
GROSS WEIGHT, TONS	3000.	3000.	3000.	3000.	3000.	3000.
CLEARANCE HEIGHT, FT	40.	40.	40.	40.	40.	40.
LENGTH, FT	268.	267.	266.	266.	266.	265.
WIDTH, FT	268.	267.	266.	266.	266.	265.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1030.	966.	806.	635.	403.	119.
WEIGHT OF POWER PLANT, TONS	784.	840.	974.	1120.	1320.	1560.
WEIGHT OF REACTOR SHIELD, TONS	343.	355.	383.	410.	445.	485.
WEIGHT OF STRUCTURE, TONS	841.	839.	838.	836.	835.	834.
FRONT COMPRESSOR S.H.P.	196000.	192000.	180000.	161000.	135000.	105000.
REAR COMPRESSOR S.H.P.	196000.	204000.	215000.	227000.	243000.	264000.
SIDE COMPRESSOR S.H.P.	392000.	388000.	384000.	383000.	387000.	396000.
THRUST COMPRESSOR S.H.P.	0.	55400.	195000.	347000.	551000.	797000.
TOTAL S.H.P.	784000.	840000.	974000.	1120000.	1320000.	1560000.
TOTAL REACTOR POWER, MEG-W	2920.	3130.	3630.	4170.	4910.	5820.
AERO DYNAMIC DRAG, LB	0.	794.	3160.	7100.	12600.	19600.
WAVE DRAG, LB	0.	32600.	63000.	30000.	17700.	11800.
JET DRAG, LB	-1110.	-62000.	-48400.	-4260.	63900.	155000.
MOMENTUM DRAG, LB	0.	222000.	410000.	567000.	694000.	793000.
TOTAL DRAG, LB	-1110.	194000.	428000.	600000.	788000.	979000.
AERO DYNAMIC LIFT, LB	0.	794.	3160.	7100.	12600.	19600.
FRONT JET LIFT, LB	157000.	154000.	147000.	135000.	119000.	97700.
REAR JET LIFT, LB	157000.	178000.	189000.	200000.	213000.	228000.
SIDE JET LIFT, LB	314000.	323000.	338000.	353000.	366000.	377000.
CUSHION LIFT, LB	5370000.	5340000.	5320000.	5310000.	5290000.	5280000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	828000.	820000.	800000.	766000.	718000.	651000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	826000.	642000.	578000.	542000.	516000.	499000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1650000.	1570000.	1420000.	1270000.	1130000.	1010000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	448000.	682000.	829000.	969000.	1100000.
TOTAL AIR FLOW, FT**3/SEC	3310000.	3480000.	3470000.	3410000.	3330000.	3260000.
FRONT JET AREA, FT*FT	4020.	4010.	4000.	3990.	3990.	3980.
REAR JET AREA, FT*FT	3990.	2340.	1840.	1560.	1350.	1190.
SIDE JET AREA, FT*FT	7980.	7130.	5770.	4610.	3650.	2910.
THRUST JET AREA, FT*FT	2150.	2140.	2130.	2120.	2120.	2110.
TOTAL AREA, FT*FT	71600.	71300.	71000.	70700.	70500.	70400.
DYNAMIC PRESSURE, LB/FT*FT	0.	1.	4.	10.	18.	28.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	109.	105.	98.	88.	75.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	149.	174.	196.	221.	248.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	116.	127.	141.	160.	183.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	58.	134.	196.	266.	339.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	98.	96.	94.	90.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	135.	160.	185.	213.	246.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	105.	118.	135.	159.	187.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	53.	124.	184.	253.	327.
FRONT JET HEAT TRANSFER, BTU	554000.	542000.	508000.	454000.	382000.	297000.
REAR JET HEAT TRANSFER, BTU	554000.	578000.	607000.	642000.	688000.	747000.
SIDE JET HEAT TRANSFER, BTU	1110000.	1100000.	1090000.	1080000.	1090000.	1120000.
THRUST JET HEAT TRANSFER, BTU	0.	157000.	551000.	982000.	1560000.	2250000.
TOTAL JET HEAT TRANSFER, BTU	2220000.	2370000.	2750000.	3160000.	3720000.	4420000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	35.	34.	32.	28.	24.
REAR JET TEMPERATURE RISE, DEG. F	36.	48.	56.	63.	71.	80.
SIDE JET TEMPERATURE RISE, DEG. F	36.	38.	41.	46.	52.	59.
THRUST JET TEMPERATURE RISE, DEG. F	0.	19.	43.	63.	86.	110.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	37.	42.	50.	60.	73.

VELOCITY, KNOTS	0.	13.	26.	39.	52.	65.
GROSS WEIGHT, TONS	3000.	3000.	3000.	3000.	3000.	3000.
CLEARANCE HEIGHT, FT	50.	50.	50.	50.	50.	50.
LENGTH, FT	264.	263.	263.	262.	262.	262.
WIDTH, FT	264.	263.	263.	262.	262.	262.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	822.	779.	656.	509.	344.	140.
WEIGHT OF POWER PLANT, TONS	967.	1000.	1110.	1240.	1380.	1550.
WEIGHT OF REACTOR SHIELD, TONS	381.	389.	408.	431.	455.	483.
WEIGHT OF STRUCTURE, TONS	830.	828.	827.	825.	824.	823.
FRONT COMPRESSOR S.H.P.	242000.	239000.	231000.	218000.	201000.	179000.
REAR COMPRESSOR S.H.P.	242000.	249000.	259000.	269000.	281000.	296000.
SIDE COMPRESSOR S.H.P.	483000.	480000.	476000.	474000.	475000.	480000.
THRUST COMPRESSOR S.H.P.	0.	35700.	143000.	274000.	420000.	599000.
TOTAL S.H.P.	967000.	1000000.	1110000.	1240000.	1380000.	1550000.
TOTAL REACTOR POWER, MEG-W	3600.	3740.	4130.	4600.	5130.	5790.
AERO DYNAMIC DRAG, LB	0.	403.	1610.	3600.	6380.	9940.
WAVE DRAG, LB	0.	20200.	55300.	52800.	31200.	20800.
JET DRAG, LB	-1370.	-75000.	-77700.	-55800.	-16000.	39300.
MOMENTUM DRAG, LB	0.	201000.	379000.	534000.	670000.	785000.
TOTAL DRAG, LB	-1370.	147000.	358000.	535000.	691000.	855000.
AERO DYNAMIC LIFT, LB	0.	403.	1610.	3600.	6380.	9940.
FRONT JET LIFT, LB	193000.	191000.	187000.	179000.	168000.	154000.
REAR JET LIFT, LB	194000.	216000.	226000.	236000.	245000.	257000.
SIDE JET LIFT, LB	387000.	394000.	407000.	421000.	435000.	447000.
CUSHION LIFT, LB	5230000.	5200000.	5180000.	5160000.	5140000.	5130000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	1020000.	1010000.	1000000.	979000.	949000.	909000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	1020000.	816000.	738000.	690000.	657000.	631000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	2040000.	1970000.	1830000.	1690000.	1550000.	1420000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	379000.	601000.	747000.	863000.	972000.
TOTAL AIR FLOW, FT**3/SEC	4080000.	4180000.	4170000.	4110000.	4020000.	3930000.
FRONT JET AREA, FT*FT	4950.	4940.	4930.	4920.	4910.	4910.
REAR JET AREA, FT*FT	4920.	3080.	2480.	2130.	1880.	1680.
SIDE JET AREA, FT*FT	9840.	9150.	7900.	6680.	5610.	4690.
THRUST JET AREA, FT*FT	2090.	2080.	2070.	2060.	2060.	2050.
TOTAL AREA, FT*FT	69700.	69300.	69000.	68800.	68600.	68400.
DYNAMIC PRESSURE, LB/FT*FT	0.	1.	2.	5.	9.	14.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	110.	108.	104.	99.	92.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	143.	164.	182.	200.	219.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	114.	121.	131.	143.	158.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	44.	111.	171.	228.	288.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	99.	98.	96.	95.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	129.	150.	168.	188.	209.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	103.	111.	122.	136.	154.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	40.	102.	158.	212.	271.
FRONT JET HEAT TRANSFER, BTU	683000.	674000.	652000.	616000.	567000.	507000.
REAR JET HEAT TRANSFER, BTU	683000.	705000.	732000.	761000.	795000.	837000.
SIDE JET HEAT TRANSFER, BTU	1370000.	1360000.	1350000.	1340000.	1340000.	1360000.
THRUST JET HEAT TRANSFER, BTU	0.	101000.	404000.	774000.	1190000.	1690000.
TOTAL JET HEAT TRANSFER, BTU	2730000.	2840000.	3130000.	3490000.	3890000.	4390000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	36.	35.	34.	32.	30.
REAR JET TEMPERATURE RISE, DEG. F	36.	46.	53.	59.	65.	71.
SIDE JET TEMPERATURE RISE, DEG. F	36.	37.	39.	42.	46.	51.
THRUST JET TEMPERATURE RISE, DEG. F	0.	14.	36.	55.	74.	93.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	36.	40.	45.	52.	60.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	4000.	4000.	4000.	4000.	4000.	4000.
CLEARANCE HEIGHT, FT	10.	10.	10.	10.	10.	10.
LENGTH, FT	323.	322.	322.	321.	320.	319.
WIDTH, FT	323.	322.	322.	321.	320.	319.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	2410.	2300.	2110.	1900.	1770.	1450.
WEIGHT OF POWER PLANT, TONS	236.	314.	462.	629.	735.	1010.
WEIGHT OF REACTOR SHIELD, TONS	189.	217.	264.	308.	333.	390.
WEIGHT OF STRUCTURE, TONS	1170.	1170.	1170.	1160.	1160.	1160.
FRONT COMPRESSOR S.H.P.	59100.	50100.	26300.	0.	0.	0.
REAR COMPRESSOR S.H.P.	59100.	64100.	75100.	81200.	57300.	61200.
SIDE COMPRESSOR S.H.P.	118000.	113000.	109000.	112000.	123000.	140000.
THRUST COMPRESSOR S.H.P.	0.	86700.	252000.	435000.	555000.	808000.
TOTAL S.H.P.	236000.	314000.	462000.	629000.	735000.	1010000.
TOTAL REACTOR POWER, MEG-W	881.	1170.	1720.	2340.	2740.	3760.
AERO DYNAMIC DRAG, LB	0.	8930.	35600.	79700.	141000.	218000.
WAVE DRAG, LB	0.	49800.	14100.	6700.	3950.	2610.
JET DRAG, LB	-334.	-349.	69900.	161000.	105000.	99400.
MOMENTUM DRAG, LB	0.	172000.	278000.	246000.	232000.	233000.
TOTAL DRAG, LB	-334.	231000.	398000.	493000.	481000.	553000.
AERO DYNAMIC LIFT, LB	0.	8930.	35600.	79700.	141000.	218000.
FRONT JET LIFT, LB	47300.	41800.	25500.	0.	0.	0.
REAR JET LIFT, LB	47400.	57900.	70200.	75700.	50900.	49300.
SIDE JET LIFT, LB	94700.	102000.	112000.	118000.	122000.	123000.
CUSHION LIFT, LB	7810000.	7790000.	7760000.	7730000.	7690000.	7610000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	250000.	235000.	183000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	249000.	183000.	169000.	144000.	78500.	62500.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	498000.	426000.	331000.	258000.	205000.	166000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	692000.	1020000.	1280000.	1460000.	1700000.
TOTAL AIR FLOW, FT**3/SEC	997000.	1540000.	1710000.	1680000.	1740000.	1920000.
FRONT JET AREA, FT*FT	1210.	1210.	1210.	0.	0.	0.
REAR JET AREA, FT*FT	1200.	600.	437.	302.	135.	89.
SIDE JET AREA, FT*FT	2410.	1730.	1030.	625.	397.	260.
THRUST JET AREA, FT*FT	3120.	3120.	3100.	3090.	3070.	3040.
TOTAL AREA, FT*FT	104000.	104000.	103000.	103000.	102000.	101000.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	163.	208.	263.	342.	458.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	124.	154.	204.	280.	395.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	58.	115.	159.	178.	223.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	154.	215.	299.	419.	586.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	118.	167.	246.	363.	530.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	60.	131.	206.	272.	375.
FRONT JET HEAT TRANSFER, BTU	167000.	142000.	74300.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	167000.	181000.	212000.	230000.	162000.	173000.
SIDE JET HEAT TRANSFER, BTU	334000.	319000.	308000.	318000.	348000.	397000.
THRUST JET HEAT TRANSFER, BTU	0.	245000.	712000.	1230000.	1570000.	2280000.
TOTAL JET HEAT TRANSFER, BTU	668000.	887000.	1310000.	1780000.	2080000.	2850000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	53.	67.	85.	111.	148.
SIDE JET TEMPERATURE RISE, DEG. F	36.	40.	50.	66.	91.	128.
THRUST JET TEMPERATURE RISE, DEG. F	0.	19.	37.	52.	58.	72.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	31.	41.	57.	64.	79.

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	4000.	4000.	4000.	4000.	4000.	4000.
CLEARANCE HEIGHT, FT	20.	20.	20.	20.	20.	20.
LENGTH, FT	319.	318.	317.	317.	317.	315.
WIDTH, FT	319.	318.	317.	317.	317.	315.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	2110.	1920.	1530.	1200.	1110.	700.
WEIGHT OF POWER PLANT, TONS	467.	621.	939.	1220.	1300.	1660.
WEIGHT OF REACTOR SHIELD, TONS	265.	306.	376.	429.	442.	499.
WEIGHT OF STRUCTURE, TONS	1160.	1150.	1150.	1150.	1150.	1140.
FRONT COMPRESSOR S.H.P.	117000.	98800.	51900.	0.	0.	0.
REAR COMPRESSOR S.H.P.	117000.	129000.	154000.	168000.	115000.	119000.
SIDE COMPRESSOR S.H.P.	234000.	225000.	224000.	233000.	247000.	274000.
THRUST COMPRESSOR S.H.P.	0.	168000.	509000.	824000.	940000.	1260000.
TOTAL S.H.P.	467000.	621000.	939000.	1220000.	1300000.	1660000.
TOTAL REACTOR POWER, MEG-W	1740.	2310.	3500.	4560.	4850.	6180.
AERO DYNAMIC DRAG, LB	0.	8700.	34600.	77800.	138000.	213000.
WAVE DRAG, LB	0.	48600.	13700.	6550.	3870.	2560.
JET DRAG, LB	-661.	-4260.	135000.	316000.	207000.	197000.
MOMENTUM DRAG, LB	0.	332000.	531000.	469000.	454000.	465000.
TOTAL DRAG, LB	-661.	385000.	714000.	869000.	803000.	878000.
AERO DYNAMIC LIFT, LB	0.	8700.	34600.	77800.	138000.	213000.
FRONT JET LIFT, LB	93400.	82500.	50300.	0.	0.	0.
REAR JET LIFT, LB	93600.	116000.	140000.	151000.	101000.	97400.
SIDE JET LIFT, LB	187000.	205000.	224000.	235000.	241000.	244000.
CUSHION LIFT, LB	7630000.	7590000.	7550000.	7540000.	7520000.	7450000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	494000.	463000.	361000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	492000.	349000.	319000.	276000.	154000.	125000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	984000.	818000.	622000.	490000.	403000.	331000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	836000.	1230000.	1490000.	1630000.	1840000.
TOTAL AIR FLOW, FT**3/SEC	1970000.	2470000.	2540000.	2260000.	2190000.	2300000.
FRONT JET AREA, FT*FT	2390.	2390.	2380.	0.	0.	0.
REAR JET AREA, FT*FT	2380.	1100.	788.	557.	262.	179.
SIDE JET AREA, FT*FT	4760.	3220.	1840.	1140.	770.	524.
THRUST JET AREA, FT*FT	3050.	3040.	3020.	3010.	3010.	2980.
TOTAL AREA, FT*FT	102000.	101000.	101000.	100000.	100000.	99300.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	173.	226.	284.	349.	448.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	129.	168.	222.	287.	386.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	94.	193.	258.	270.	321.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	163.	231.	318.	425.	577.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	123.	179.	263.	369.	522.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	92.	201.	295.	354.	463.
FRONT JET HEAT TRANSFER, BTU	330000.	279000.	147000.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	330000.	365000.	436000.	474000.	325000.	337000.
SIDE JET HEAT TRANSFER, BTU	660000.	636000.	633000.	659000.	698000.	774000.
THRUST JET HEAT TRANSFER, BTU	0.	475000.	1440000.	2330000.	2660000.	3570000.
TOTAL JET HEAT TRANSFER, BTU	1320000.	1760000.	2650000.	3460000.	3680000.	4690000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	56.	73.	92.	113.	145.
SIDE JET TEMPERATURE RISE, DEG. F	36.	42.	54.	72.	93.	125.
THRUST JET TEMPERATURE RISE, DEG. F	0.	30.	62.	84.	87.	104.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	38.	56.	82.	90.	109.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	48.	96.	144.	192.	240.
GROSS WEIGHT, TONS	4000.	4000.	4000.	4000.	4000.	4000.
CLEARANCE HEIGHT, FT	30.	30.	30.	30.	30.	30.
LENGTH, FT	315.	314.	313.	312.	313.	312.
WIDTH, FT	315.	314.	313.	312.	313.	312.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1840.	1570.	1020.	271.	494.	66.
WEIGHT OF POWER PLANT, TONS	692.	919.	1390.	2040.	1840.	2220.
WEIGHT OF REACTOR SHIELD, TONS	323.	372.	457.	554.	526.	578.
WEIGHT OF STRUCTURE, TONS	1140.	1140.	1140.	1130.	1140.	1130.
FRONT COMPRESSOR S.H.P.	173000.	148000.	83300.	7020.	0.	0.
REAR COMPRESSOR S.H.P.	173000.	193000.	232000.	296000.	178000.	176000.
SIDE COMPRESSOR S.H.P.	346000.	336000.	340000.	363000.	373000.	405000.
THRUST COMPRESSOR S.H.P.	0.	242000.	734000.	1370000.	1290000.	1640000.
TOTAL S.H.P.	692000.	919000.	1390000.	2040000.	1840000.	2220000.
TOTAL REACTOR POWER, MEG-W	2580.	3430.	5180.	7610.	6870.	8290.
AERO DYNAMIC DRAG, LB	0.	7810.	31100.	69600.	125000.	193000.
WAVE DRAG, LB	0.	51100.	14400.	6860.	4090.	2700.
JET DRAG, LB	-980.	-14900.	173000.	504000.	314000.	291000.
MOMENTUM DRAG, LB	0.	468000.	750000.	776000.	658000.	679000.
TOTAL DRAG, LB	-980.	512000.	969000.	1360000.	1100000.	1170000.
AERO DYNAMIC LIFT, LB	0.	7810.	31100.	69600.	125000.	193000.
FRONT JET LIFT, LB	138000.	123000.	79400.	6710.	0.	0.
REAR JET LIFT, LB	139000.	172000.	205000.	255000.	153000.	144000.
SIDE JET LIFT, LB	277000.	304000.	332000.	348000.	357000.	361000.
CUSHION LIFT, LB	7450000.	7390000.	7350000.	7320000.	7370000.	7300000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	732000.	689000.	552000.	160000.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	730000.	506000.	458000.	454000.	236000.	189000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1460000.	1200000.	906000.	708000.	604000.	505000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	921000.	1350000.	1690000.	1730000.	1920000.
TOTAL AIR FLOW, FT**3/SEC	2920000.	3310000.	3270000.	3010000.	2570000.	2610000.
FRONT JET AREA, FT*FT	3550.	3530.	3520.	3520.	0.	0.
REAR JET AREA, FT*FT	3520.	1560.	1110.	898.	406.	277.
SIDE JET AREA, FT*FT	7050.	4670.	2640.	1610.	1170.	820.
THRUST JET AREA, FT*FT	2980.	2960.	2940.	2930.	2950.	2920.
TOTAL AREA, FT*FT	99300.	98600.	98000.	97600.	98200.	97400.
DYNAMIC PRESSURE, LB/FT*FT	0.	8.	32.	71.	127.	198.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	101.	70.	20.	27.	42.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	178.	237.	305.	353.	437.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	131.	176.	240.	289.	375.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	123.	254.	381.	349.	400.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	89.	76.	127.	198.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	167.	239.	333.	420.	554.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	124.	184.	273.	363.	498.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	117.	255.	401.	417.	521.
FRONT JET HEAT TRANSFER, BTU	489000.	419000.	236000.	19800.	0.	0.
REAR JET HEAT TRANSFER, BTU	489000.	546000.	655000.	838000.	504000.	499000.
SIDE JET HEAT TRANSFER, BTU	979000.	949000.	962000.	1030000.	1060000.	1140000.
THRUST JET HEAT TRANSFER, BTU	0.	685000.	2080000.	3890000.	3650000.	4640000.
TOTAL JET HEAT TRANSFER, BTU	1960000.	2600000.	3930000.	5770000.	5210000.	6290000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	33.	23.	7.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	58.	77.	99.	114.	142.
SIDE JET TEMPERATURE RISE, DEG. F	36.	42.	57.	78.	94.	121.
THRUST JET TEMPERATURE RISE, DEG. F	0.	40.	82.	123.	113.	130.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	42.	64.	103.	109.	129.

VELOCITY, KNOTS	0.	25.	50.	75.	100.	125.
GROSS WEIGHT, TONS	4000.	4000.	4000.	4000.	4000.	4000.
CLEARANCE HEIGHT, FT	40.	40.	40.	40.	40.	40.
LENGTH, FT	311.	310.	310.	309.	309.	308.
WIDTH, FT	311.	310.	310.	309.	309.	308.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1590.	1460.	1200.	842.	375.	-173.
WEIGHT OF POWER PLANT, TONS	912.	1020.	1250.	1550.	1960.	2450.
WEIGHT OF REACTOR SHIELD, TONS	370.	392.	433.	483.	543.	607.
WEIGHT OF STRUCTURE, TONS	1130.	1130.	1120.	1120.	1120.	1120.
FRONT COMPRESSOR S.H.P.	228000.	219000.	193000.	152000.	101000.	46400.
REAR COMPRESSOR S.H.P.	228000.	241000.	259000.	284000.	319000.	364000.
SIDE COMPRESSOR S.H.P.	456000.	450000.	444000.	448000.	461000.	481000.
THRUST COMPRESSOR S.H.P.	0.	115000.	351000.	668000.	1080000.	1550000.
TOTAL S.H.P.	912000.	1020000.	1250000.	1550000.	1960000.	2450000.
TOTAL REACTOR POWER, MEG-W	3400.	3820.	4650.	5790.	7310.	9120.
AERO DYNAMIC DRAG, LB	0.	2070.	8250.	18500.	32800.	51100.
WAVE DRAG, LB	0.	54700.	46200.	22000.	13000.	8660.
JET DRAG, LB	-1290.	-68700.	-16900.	92200.	253000.	465000.
MOMENTUM DRAG, LB	0.	350000.	628000.	838000.	984000.	1050000.
TOTAL DRAG, LB	-1290.	338000.	665000.	971000.	1280000.	1580000.
AERO DYNAMIC LIFT, LB	0.	2070.	8250.	18500.	32800.	51100.
FRONT JET LIFT, LB	182000.	177000.	161000.	134000.	98000.	51200.
REAR JET LIFT, LB	183000.	211000.	229000.	250000.	276000.	308000.
SIDE JET LIFT, LB	366000.	381000.	405000.	426000.	443000.	454000.
CUSHION LIFT, LB	7270000.	7230000.	7200000.	7170000.	7150000.	7140000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	964000.	947000.	902000.	825000.	703000.	508000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	961000.	721000.	647000.	605000.	583000.	575000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1920000.	1770000.	1530000.	1310000.	1130000.	984000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	700000.	1020000.	1270000.	1500000.	1700000.
TOTAL AIR FLOW, FT**3/SEC	3850000.	4130000.	4100000.	4010000.	3910000.	3770000.
FRONT JET AREA, FT*FT	4670.	4660.	4650.	4640.	4630.	4630.
REAR JET AREA, FT*FT	4640.	2510.	1930.	1580.	1350.	1190.
SIDE JET AREA, FT*FT	9290.	7770.	5770.	4210.	3110.	2370.
THRUST JET AREA, FT*FT	2910.	2890.	2880.	2870.	2860.	2850.
TOTAL AREA, FT*FT	96900.	96400.	96000.	95600.	95300.	95100.
DYNAMIC PRESSURE, LB/FT*FT	0.	2.	9.	19.	34.	54.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	108.	100.	86.	67.	43.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	157.	187.	219.	256.	296.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	119.	136.	160.	191.	228.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	77.	161.	246.	337.	428.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	97.	93.	88.	82.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	143.	175.	213.	258.	310.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	109.	129.	160.	200.	249.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	71.	152.	237.	331.	428.
FRONT JET HEAT TRANSFER, BTU	645000.	618000.	544000.	430000.	286000.	131000.
REAR JET HEAT TRANSFER, BTU	645000.	682000.	732000.	803000.	902000.	1030000.
SIDE JET HEAT TRANSFER, BTU	1290000.	1270000.	1260000.	1270000.	1300000.	1360000.
THRUST JET HEAT TRANSFER, BTU	0.	325000.	992000.	1890000.	3050000.	4390000.
TOTAL JET HEAT TRANSFER, BTU	2580000.	2900000.	3520000.	4390000.	5540000.	6920000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	35.	32.	28.	22.	14.
REAR JET TEMPERATURE RISE, DEG. F	36.	51.	61.	71.	83.	96.
SIDE JET TEMPERATURE RISE, DEG. F	36.	39.	44.	52.	62.	74.
THRUST JET TEMPERATURE RISE, DEG. F	0.	25.	52.	80.	109.	138.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	37.	46.	59.	76.	98.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	16.	32.	48.	64.	80.
GROSS WEIGHT, TONS	4000.	4000.	4000.	4000.	4000.	4000.
CLEARANCE HEIGHT, FT	50.	50.	50.	50.	50.	50.
LENGTH, FT	308.	307.	306.	306.	305.	305.
WIDTH, FT	308.	307.	306.	306.	305.	305.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1340.	1280.	1080.	875.	607.	278.
WEIGHT OF POWER PLANT, TONS	1130.	1190.	1350.	1530.	1770.	2060.
WEIGHT OF REACTOR SHIELD, TONS	412.	423.	451.	480.	516.	556.
WEIGHT OF STRUCTURE, TONS	1120.	1110.	1110.	1110.	1110.	1110.
FRONT COMPRESSOR S.H.P.	282000.	276000.	263000.	241000.	211000.	176000.
REAR COMPRESSOR S.H.P.	282000.	292000.	306000.	321000.	340000.	365000.
SIDE COMPRESSOR S.H.P.	563000.	559000.	553000.	551000.	555000.	564000.
THRUST COMPRESSOR S.H.P.	0.	60400.	231000.	422000.	662000.	954000.
TOTAL S.H.P.	1130000.	1190000.	1350000.	1530000.	1770000.	2060000.
TOTAL REACTOR POWER, MEG-W	4200.	4430.	5040.	5720.	6590.	7680.
AERO DYNAMIC DRAG, LB	0.	829.	3300.	7410.	13100.	20500.
WAVE DRAG, LB	0.	28500.	78000.	48500.	28700.	19100.
JET DRAG, LB	-1590.	-88400.	-79300.	-32400.	42700.	145000.
MOMENTUM DRAG, LB	0.	286000.	531000.	741000.	916000.	1060000.
TOTAL DRAG, LB	-1590.	227000.	533000.	765000.	1000000.	1240000.
AERO DYNAMIC LIFT, LB	0.	829.	3300.	7410.	13100.	20500.
FRONT JET LIFT, LB	225000.	222000.	214000.	200000.	182000.	158000.
REAR JET LIFT, LB	226000.	254000.	268000.	282000.	297000.	315000.
SIDE JET LIFT, LB	451000.	461000.	481000.	501000.	519000.	534000.
CUSHION LIFT, LB	7100000.	7060000.	7030000.	7010000.	6990000.	6970000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	1190000.	1180000.	1160000.	1120000.	1060000.	992000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	1190000.	935000.	841000.	788000.	749000.	722000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	2370000.	2270000.	2080000.	1880000.	1700000.	1530000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	555000.	868000.	1060000.	1240000.	1400000.
TOTAL AIR FLOW, FT**3/SEC	4750000.	4940000.	4940000.	4850000.	4750000.	4640000.
FRONT JET AREA, FT*FT	5770.	5760.	5740.	5730.	5730.	5720.
REAR JET AREA, FT*FT	5740.	3460.	2740.	2340.	2030.	1800.
SIDE JET AREA, FT*FT	11500.	10400.	8660.	7070.	5720.	4640.
THRUST JET AREA, FT*FT	2840.	2820.	2810.	2800.	2800.	2790.
TOTAL AREA, FT*FT	94600.	94200.	93800.	93500.	93200.	93000.
DYNAMIC PRESSURE, LB/FT*FT	0.	1.	4.	8.	14.	22.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	109.	106.	101.	93.	83.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	146.	170.	190.	212.	236.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	115.	125.	137.	153.	172.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	51.	125.	186.	250.	319.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	98.	97.	95.	92.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	132.	156.	178.	202.	230.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	104.	115.	130.	149.	173.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	47.	115.	173.	237.	305.
FRONT JET HEAT TRANSFER, BTU	796000.	782000.	743000.	681000.	597000.	496000.
REAR JET HEAT TRANSFER, BTU	796000.	826000.	864000.	907000.	962000.	1030000.
SIDE JET HEAT TRANSFER, BTU	1590000.	1580000.	1560000.	1560000.	1570000.	1590000.
THRUST JET HEAT TRANSFER, BTU	0.	171000.	654000.	1190000.	1870000.	2700000.
TOTAL JET HEAT TRANSFER, BTU	3190000.	3360000.	3830000.	4340000.	5000000.	5820000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	35.	34.	33.	30.	27.
REAR JET TEMPERATURE RISE, DEG. F	36.	47.	55.	62.	69.	76.
SIDE JET TEMPERATURE RISE, DEG. F	36.	37.	40.	44.	50.	56.
THRUST JET TEMPERATURE RISE, DEG. F	0.	16.	40.	60.	81.	103.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	36.	41.	48.	56.	67.

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	5000.	5000.	5000.	5000.	5000.	5000.
CLEARANCE HEIGHT, FT	10.	10.	10.	10.	10.	10.
LENGTH, FT	361.	361.	360.	359.	358.	357.
WIDTH, FT	361.	361.	360.	359.	358.	357.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	3070.	2960.	2740.	2510.	2340.	1960.
WEIGHT OF POWER PLANT, TONS	265.	352.	517.	711.	846.	1180.
WEIGHT OF REACTOR SHIELD, TONS	199.	230.	279.	327.	357.	421.
WEIGHT OF STRUCTURE, TONS	1460.	1460.	1460.	1460.	1450.	1450.
FRONT COMPRESSOR S.H.P.	66100.	56100.	29400.	0.	0.	0.
REAR COMPRESSOR S.H.P.	66100.	71600.	83600.	90600.	64300.	68900.
SIDE COMPRESSOR S.H.P.	132000.	126000.	122000.	125000.	138000.	158000.
THRUST COMPRESSOR S.H.P.	0.	98100.	283000.	495000.	644000.	951000.
TOTAL S.H.P.	265000.	352000.	517000.	711000.	846000.	1180000.
TOTAL REACTOR POWER, MEG-W	987.	1310.	1930.	2650.	3160.	4390.
AERO DYNAMIC DRAG, LB	0.	11200.	44600.	99900.	177000.	273000.
WAVE DRAG, LB	0.	61800.	17500.	8320.	4900.	3240.
JET DRAG, LB	-374.	-107.	78500.	180000.	117000.	111000.
MOMENTUM DRAG, LB	0.	193000.	313000.	276000.	259000.	260000.
TOTAL DRAG, LB	-374.	266000.	454000.	565000.	558000.	648000.
AERO DYNAMIC LIFT, LB	0.	11200.	44600.	99900.	177000.	273000.
FRONT JET LIFT, LB	52900.	46800.	28600.	0.	0.	0.
REAR JET LIFT, LB	53000.	64800.	78500.	84700.	56900.	55200.
SIDE JET LIFT, LB	106000.	114000.	125000.	132000.	136000.	138000.
CUSHION LIFT, LB	9790000.	9760000.	9720000.	9680000.	9630000.	9530000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	280000.	263000.	205000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	279000.	206000.	190000.	162000.	87800.	69700.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	558000.	479000.	373000.	290000.	230000.	185000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	841000.	1240000.	1560000.	1800000.	2100000.
TOTAL AIR FLOW, FT**3/SEC	1120000.	1790000.	2010000.	2010000.	2110000.	2350000.
FRONT JET AREA, FT*FT	1360.	1350.	1350.	0.	0.	0.
REAR JET AREA, FT*FT	1350.	679.	494.	340.	150.	99.
SIDE JET AREA, FT*FT	2690.	1950.	1170.	705.	443.	290.
THRUST JET AREA, FT*FT	3920.	3910.	3890.	3870.	3850.	3810.
TOTAL AREA, FT*FT	131000.	130000.	130000.	129000.	128000.	127000.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	162.	205.	261.	342.	462.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	123.	153.	202.	281.	399.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	54.	106.	148.	168.	212.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	153.	213.	298.	420.	590.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	118.	165.	245.	364.	533.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	56.	123.	196.	262.	365.
FRONT JET HEAT TRANSFER, BTU	187000.	158000.	83200.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	187000.	202000.	236000.	256000.	182000.	195000.
SIDE JET HEAT TRANSFER, BTU	374000.	357000.	344000.	354000.	390000.	447000.
THRUST JET HEAT TRANSFER, BTU	0.	277000.	799000.	1400000.	1820000.	2690000.
TOTAL JET HEAT TRANSFER, BTU	748000.	995000.	1460000.	2010000.	2390000.	3330000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	52.	66.	85.	111.	150.
SIDE JET TEMPERATURE RISE, DEG. F	36.	40.	49.	65.	91.	129.
THRUST JET TEMPERATURE RISE, DEG. F	0.	18.	34.	48.	54.	69.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	30.	39.	53.	61.	76.

TABLE I. - Continued. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	5000.	5000.	5000.	5000.	5000.	5000.
CLEARANCE HEIGHT, FT	20.	20.	20.	20.	20.	20.
LENGTH, FT	357.	357.	356.	355.	355.	353.
WIDTH, FT	357.	357.	356.	355.	355.	353.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	2750.	2540.	2120.	1740.	1620.	1140.
WEIGHT OF POWER PLANT, TONS	524.	694.	1040.	1370.	1470.	1900.
WEIGHT OF REACTOR SHIELD, TONS	281.	323.	396.	454.	471.	534.
WEIGHT OF STRUCTURE, TONS	1450.	1450.	1440.	1440.	1440.	1430.
FRONT COMPRESSOR S.H.P.	131000.	111000.	58200.	0.	0.	0.
REAR COMPRESSOR S.H.P.	131000.	144000.	172000.	186000.	128000.	134000.
SIDE COMPRESSOR S.H.P.	262000.	252000.	249000.	259000.	275000.	306000.
THRUST COMPRESSOR S.H.P.	0.	187000.	565000.	924000.	1070000.	1460000.
TOTAL S.H.P.	524000.	694000.	1040000.	1370000.	1470000.	1900000.
TOTAL REACTOR POWER, MEG-W	1950.	2590.	3890.	5100.	5500.	7080.
AERO DYNAMIC DRAG, LB	0.	10900.	43500.	97700.	173000.	268000.
WAVE DRAG, LB	0.	60500.	17100.	8140.	4810.	3180.
JET DRAG, LB	-741.	-4060.	152000.	354000.	232000.	221000.
MOMENTUM DRAG, LB	0.	374000.	599000.	529000.	510000.	521000.
TOTAL DRAG, LB	-741.	442000.	811000.	990000.	921000.	1010000.
AERO DYNAMIC LIFT, LB	0.	10900.	43500.	97700.	173000.	268000.
FRONT JET LIFT, LB	105000.	92500.	56400.	0.	0.	0.
REAR JET LIFT, LB	105000.	129000.	157000.	169000.	113000.	109000.
SIDE JET LIFT, LB	210000.	229000.	250000.	263000.	270000.	273000.
CUSHION LIFT, LB	9580000.	9540000.	9490000.	9470000.	9440000.	9350000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	553000.	519000.	405000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	552000.	394000.	361000.	311000.	173000.	140000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1100000.	922000.	704000.	554000.	453000.	372000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	1010000.	1490000.	1810000.	2000000.	2270000.
TOTAL AIR FLOW, FT**3/SEC	2210000.	2850000.	2960000.	2680000.	2620000.	2780000.
FRONT JET AREA, FT*FT	2680.	2680.	2670.	0.	0.	0.
REAR JET AREA, FT*FT	2670.	1250.	898.	634.	296.	200.
SIDE JET AREA, FT*FT	5330.	3660.	2100.	1300.	869.	588.
THRUST JET AREA, FT*FT	3830.	3820.	3800.	3790.	3780.	3740.
TOTAL AREA, FT*FT	128000.	127000.	127000.	126000.	126000.	125000.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	171.	223.	280.	346.	447.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	128.	166.	218.	284.	386.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	87.	177.	238.	251.	300.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	161.	228.	314.	423.	577.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	122.	177.	259.	367.	521.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	85.	187.	277.	337.	445.
FRONT JET HEAT TRANSFER, BTU	370000.	313000.	164000.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	370000.	408000.	486000.	526000.	362000.	378000.
SIDE JET HEAT TRANSFER, BTU	740000.	712000.	704000.	731000.	778000.	866000.
THRUST JET HEAT TRANSFER, BTU	0.	530000.	1600000.	2610000.	3030000.	4120000.
TOTAL JET HEAT TRANSFER, BTU	1480000.	1960000.	2950000.	3870000.	4170000.	5370000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	55.	72.	91.	112.	145.
SIDE JET TEMPERATURE RISE, DEG. F	36.	41.	54.	71.	92.	125.
THRUST JET TEMPERATURE RISE, DEG. F	0.	28.	57.	77.	81.	97.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	37.	53.	77.	85.	103.

VELOCITY, KNOTS	0.	50.	100.	150.	200.	250.
GROSS WEIGHT, TONS	5000.	5000.	5000.	5000.	5000.	5000.
CLEARANCE HEIGHT, FT	30.	30.	30.	30.	30.	30.
LENGTH, FT	354.	352.	351.	351.	351.	350.
WIDTH, FT	354.	352.	351.	351.	351.	350.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	2450.	2130.	1480.	954.	881.	311.
WEIGHT OF POWER PLANT, TONS	777.	1040.	1600.	2060.	2130.	2640.
WEIGHT OF REACTOR SHIELD, TONS	342.	396.	490.	557.	566.	630.
WEIGHT OF STRUCTURE, TONS	1430.	1430.	1430.	1430.	1430.	1420.
FRONT COMPRESSOR S.H.P.	194000.	164000.	86200.	0.	0.	0.
REAR COMPRESSOR S.H.P.	194000.	217000.	262000.	287000.	195000.	200000.
SIDE COMPRESSOR S.H.P.	388000.	376000.	380000.	399000.	419000.	460000.
THRUST COMPRESSOR S.H.P.	0.	285000.	871000.	1380000.	1510000.	1980000.
TOTAL S.H.P.	777000.	1040000.	1600000.	2060000.	2130000.	2640000.
TOTAL REACTOR POWER, MEG-W	2900.	3880.	5960.	7690.	7940.	9840.
AERO DYNAMIC DRAG, LB	0.	10700.	42500.	95600.	170000.	263000.
WAVE DRAG, LB	0.	59100.	16700.	7970.	4720.	3120.
JET DRAG, LB	-1100.	-10000.	221000.	523000.	344000.	328000.
MOMENTUM DRAG, LB	0.	546000.	866000.	761000.	746000.	770000.
TOTAL DRAG, LB	-1100.	606000.	1150000.	1390000.	1260000.	1360000.
AERO DYNAMIC LIFT, LB	0.	10700.	42500.	95600.	170000.	263000.
FRONT JET LIFT, LB	155000.	137000.	83600.	0.	0.	0.
REAR JET LIFT, LB	156000.	193000.	234000.	251000.	168000.	162000.
SIDE JET LIFT, LB	311000.	342000.	374000.	392000.	401000.	406000.
CUSHION LIFT, LB	9380000.	9320000.	9270000.	9260000.	9260000.	9170000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	821000.	770000.	600000.	0.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	819000.	569000.	517000.	449000.	253000.	206000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	1640000.	1340000.	1010000.	796000.	661000.	549000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	1140000.	1670000.	2000000.	2150000.	2410000.
TOTAL AIR FLOW, FT**3/SEC	3280000.	3810000.	3800000.	3250000.	3070000.	3160000.
FRONT JET AREA, FT*FT	3980.	3970.	3960.	0.	0.	0.
REAR JET AREA, FT*FT	3960.	1760.	1250.	888.	426.	295.
SIDE JET AREA, FT*FT	7910.	5190.	2900.	1810.	1250.	864.
THRUST JET AREA, FT*FT	3750.	3730.	3710.	3700.	3700.	3670.
TOTAL AREA, FT*FT	125000.	124000.	124000.	123000.	123000.	122000.
DYNAMIC PRESSURE, LB/FT*FT	0.	9.	34.	77.	138.	215.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	100.	67.	16.	29.	45.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	178.	237.	298.	360.	454.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	131.	177.	235.	297.	391.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	117.	243.	322.	329.	385.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	97.	88.	77.	138.	215.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	167.	241.	331.	435.	582.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	125.	187.	274.	378.	526.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	112.	247.	352.	407.	520.
FRONT JET HEAT TRANSFER, BTU	549000.	464000.	244000.	0.	0.	0.
REAR JET HEAT TRANSFER, BTU	549000.	613000.	742000.	810000.	551000.	566000.
SIDE JET HEAT TRANSFER, BTU	1100000.	1060000.	1070000.	1130000.	1190000.	1300000.
THRUST JET HEAT TRANSFER, BTU	0.	805000.	2460000.	3900000.	4280000.	5600000.
TOTAL JET HEAT TRANSFER, BTU	2200000.	2950000.	4520000.	5830000.	6020000.	7460000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	32.	22.	0.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	58.	77.	97.	117.	147.
SIDE JET TEMPERATURE RISE, DEG. F	36.	42.	57.	76.	96.	127.
THRUST JET TEMPERATURE RISE, DEG. F	0.	38.	79.	104.	107.	125.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	41.	64.	96.	105.	126.

TABLE I. - Concluded. PARAMETRIC STUDY OF LARGE NUCLEAR SURFACE EFFECTS MACHINE

VELOCITY, KNOTS	0.	40.	80.	120.	160.	200.
GROSS WEIGHT, TONS	5000.	5000.	5000.	5000.	5000.	5000.
CLEARANCE HEIGHT, FT	40.	40.	40.	40.	40.	40.
LENGTH, FT	350.	349.	348.	347.	348.	348.
WIDTH, FT	350.	349.	348.	347.	348.	348.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	2160.	1850.	1260.	367.	324.	140.
WEIGHT OF POWER PLANT, TONS	1020.	1300.	1810.	2600.	2630.	2800.
WEIGHT OF REACTOR SHIELD, TONS	393.	442.	521.	625.	629.	649.
WEIGHT OF STRUCTURE, TONS	1420.	1410.	1410.	1410.	1410.	1410.
FRONT COMPRESSOR S.H.P.	256000.	230000.	160000.	64300.	0.	0.
REAR COMPRESSOR S.H.P.	256000.	281000.	323000.	393000.	326000.	264000.
SIDE COMPRESSOR S.H.P.	512000.	500000.	502000.	529000.	546000.	570000.
THRUST COMPRESSOR S.H.P.	0.	284000.	820000.	1610000.	1760000.	1970000.
TOTAL S.H.P.	1020000.	1300000.	1810000.	2600000.	2630000.	2800000.
TOTAL REACTOR POWER, MEG-W	3820.	4830.	6730.	9690.	9820.	10400.
AERO DYNAMIC DRAG, LB	0.	6690.	26600.	59600.	107000.	167000.
WAVE DRAG, LB	0.	86800.	24500.	11700.	6960.	4640.
JET DRAG, LB	-1450.	-49500.	137000.	473000.	576000.	453000.
MOMENTUM DRAG, LB	0.	592000.	989000.	1190000.	955000.	967000.
TOTAL DRAG, LB	-1450.	636000.	1180000.	1730000.	1640000.	1590000.
AERO DYNAMIC LIFT, LB	0.	6690.	26600.	59600.	107000.	167000.
FRONT JET LIFT, LB	205000.	189000.	144000.	69000.	0.	0.
REAR JET LIFT, LB	205000.	249000.	286000.	338000.	280000.	222000.
SIDE JET LIFT, LB	411000.	444000.	482000.	507000.	522000.	531000.
CUSHION LIFT, LB	9180000.	9110000.	9060000.	9030000.	9090000.	9080000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	1080000.	1040000.	904000.	626000.	0.	0.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	1080000.	759000.	681000.	655000.	472000.	329000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	2160000.	1830000.	1450000.	1150000.	991000.	857000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	1110000.	1600000.	2020000.	2140000.	2280000.
TOTAL AIR FLOW, FT**3/SEC	4320000.	4740000.	4630000.	4450000.	3600000.	3460000.
FRONT JET AREA, FT*FT	5250.	5230.	5220.	5210.	0.	0.
REAR JET AREA, FT*FT	5220.	2420.	1760.	1400.	888.	545.
SIDE JET AREA, FT*FT	10400.	7410.	4550.	2880.	2120.	1590.
THRUST JET AREA, FT*FT	3670.	3640.	3620.	3610.	3640.	3630.
TOTAL AREA, FT*FT	122000.	121000.	121000.	120000.	121000.	121000.
DYNAMIC PRESSURE, LB/FT*FT	0.	5.	22.	49.	88.	138.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	104.	83.	48.	19.	29.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	173.	222.	281.	323.	375.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	128.	162.	215.	257.	311.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	120.	240.	374.	385.	404.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	98.	92.	83.	88.	138.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	161.	218.	293.	362.	449.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	119.	164.	234.	303.	391.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	112.	234.	377.	418.	475.
FRONT JET HEAT TRANSFER, BTU	724000.	651000.	453000.	182000.	0.	0.
REAR JET HEAT TRANSFER, BTU	724000.	796000.	915000.	1110000.	922000.	747000.
SIDE JET HEAT TRANSFER, BTU	1450000.	1410000.	1420000.	1500000.	1540000.	1610000.
THRUST JET HEAT TRANSFER, BTU	0.	804000.	2320000.	4560000.	4980000.	5560000.
TOTAL JET HEAT TRANSFER, BTU	2900000.	3670000.	5110000.	7350000.	7450000.	7910000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	34.	27.	15.	0.	0.
REAR JET TEMPERATURE RISE, DEG. F	36.	56.	72.	91.	105.	122.
SIDE JET TEMPERATURE RISE, DEG. F	36.	41.	53.	70.	83.	101.
THRUST JET TEMPERATURE RISE, DEG. F	0.	39.	78.	121.	125.	131.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	41.	59.	88.	111.	122.

VELOCITY, KNOTS	0.	20.	40.	60.	80.	100.
GROSS WEIGHT, TONS	5000.	5000.	5000.	5000.	5000.	5000.
CLEARANCE HEIGHT, FT	50.	50.	50.	50.	50.	50.
LENGTH, FT	346.	345.	344.	344.	343.	343.
WIDTH, FT	346.	345.	344.	344.	343.	343.
BASE PRESSURE, LB/FT*FT	75.	75.	75.	75.	75.	75.
WEIGHT OF PAYLOAD, TONS	1890.	1780.	1490.	1170.	733.	200.
WEIGHT OF POWER PLANT, TONS	1270.	1370.	1610.	1900.	2290.	2760.
WEIGHT OF REACTOR SHIELD, TONS	437.	454.	493.	535.	586.	645.
WEIGHT OF STRUCTURE, TONS	1400.	1400.	1400.	1400.	1390.	1390.
FRONT COMPRESSOR S.H.P.	317000.	308000.	284000.	247000.	198000.	140000.
REAR COMPRESSOR S.H.P.	317000.	331000.	351000.	374000.	407000.	448000.
SIDE COMPRESSOR S.H.P.	634000.	627000.	620000.	620000.	630000.	648000.
THRUST COMPRESSOR S.H.P.	0.	101000.	359000.	658000.	1050000.	1530000.
TOTAL S.H.P.	1270000.	1370000.	1610000.	1900000.	2290000.	2760000.
TOTAL REACTOR POWER, MEG-W	4730.	5100.	6020.	7080.	8530.	10300.
AERO DYNAMIC DRAG, LB	0.	1640.	6530.	14600.	26000.	40500.
WAVE DRAG, LB	0.	40700.	84900.	40500.	23900.	15900.
JET DRAG, LB	-1790.	-99000.	-65100.	26200.	165000.	350000.
MOMENTUM DRAG, LB	0.	397000.	725000.	993000.	1200000.	1350000.
TOTAL DRAG, LB	-1790.	340000.	751000.	1070000.	1420000.	1760000.
AERO DYNAMIC LIFT, LB	0.	1640.	6530.	14600.	26000.	40500.
FRONT JET LIFT, LB	254000.	248000.	234000.	210000.	178000.	136000.
REAR JET LIFT, LB	254000.	289000.	309000.	329000.	354000.	384000.
SIDE JET LIFT, LB	508000.	524000.	551000.	577000.	599000.	616000.
CUSHION LIFT, LB	8980000.	8940000.	8900000.	8870000.	8840000.	8820000.
FRONT COMPRESSOR AIR FLOW, FT**3/SEC	1340000.	1320000.	1280000.	1220000.	1120000.	976000.
REAR COMPRESSOR AIR FLOW, FT**3/SEC	1340000.	1030000.	922000.	863000.	823000.	799000.
SIDE COMPRESSOR AIR FLOW, FT**3/SEC	2670000.	2510000.	2240000.	1980000.	1740000.	1550000.
THRUST COMPRESSOR AIR FLOW, FT**3/SEC	0.	772000.	1180000.	1450000.	1700000.	1930000.
TOTAL AIR FLOW, FT**3/SEC	5350000.	5640000.	5620000.	5510000.	5380000.	5250000.
FRONT JET AREA, FT*FT	6490.	6470.	6460.	6450.	6440.	6430.
REAR JET AREA, FT*FT	6450.	3710.	2890.	2420.	2080.	1830.
SIDE JET AREA, FT*FT	12900.	11300.	8940.	6930.	5360.	4200.
THRUST JET AREA, FT*FT	3590.	3570.	3560.	3550.	3540.	3530.
TOTAL AREA, FT*FT	120000.	119000.	119000.	118000.	118000.	118000.
DYNAMIC PRESSURE, LB/FT*FT	0.	1.	5.	12.	22.	34.
FRONT COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	109.	104.	95.	83.	67.
REAR COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	151.	178.	203.	231.	262.
SIDE COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	111.	117.	129.	146.	169.	196.
THRUST COMPRESSOR PRESSURE DIFFERENCE, LB/FT*FT	0.	61.	142.	213.	290.	370.
FRONT NOZZLE PRESSURE, LB/FT*FT	99.	99.	98.	95.	92.	88.
REAR NOZZLE PRESSURE, LB/FT*FT	100.	137.	164.	193.	226.	264.
SIDE NOZZLE PRESSURE, LB/FT*FT	100.	106.	121.	142.	170.	204.
THRUST NOZZLE PRESSURE, LB/FT*FT	0.	56.	133.	201.	279.	361.
FRONT JET HEAT TRANSFER, BTU	896000.	871000.	804000.	698000.	559000.	396000.
REAR JET HEAT TRANSFER, BTU	896000.	937000.	991000.	1060000.	1150000.	1270000.
SIDE JET HEAT TRANSFER, BTU	1790000.	1770000.	1750000.	1750000.	1780000.	1830000.
THRUST JET HEAT TRANSFER, BTU	0.	287000.	1010000.	1860000.	2980000.	4320000.
TOTAL JET HEAT TRANSFER, BTU	3580000.	3870000.	4560000.	5370000.	6460000.	7810000.
FRONT JET TEMPERATURE RISE, DEG. F	36.	35.	34.	31.	27.	22.
REAR JET TEMPERATURE RISE, DEG. F	36.	49.	58.	66.	75.	85.
SIDE JET TEMPERATURE RISE, DEG. F	36.	38.	42.	47.	55.	63.
THRUST JET TEMPERATURE RISE, DEG. F	0.	20.	46.	69.	94.	120.
AVERAGE AIR TEMPERATURE RISE, DEG. F	36.	37.	43.	52.	64.	80.

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