NASA Technical Memorandum 86361

Investigation of a Supersonic Cruise Fighter Model Flow Field

David E. Reubush and E. Ann Bare

NOVEMBER 1985

NASA

NASA Technical Memorandum 86361

Investigation of a Supersonic Cruise Fighter Model Flow Field

David E. Reubush and E. Ann Bare
Langley Research Center
Hampton, Virginia

NASA
National Aeronautics
and Space Administration

Scientific and Technical
Information Branch

1985

ABSTRACT

An investigation was conducted in the Langley 16-Foot Transonic Tunnel to survey the flow field around a model of a supersonic cruise fighter configuration. Local values of angle of attack, side flow, Mach number, and total pressure ratio were measured with a single multi-holed probe in three survey areas on a model previously used for nacelle/nozzle integration investigations. The investigation was conducted at Mach numbers of 0.6, 0.9, and 1.2, and at angles of attack from 0° to 10°. The purpose of the investigation was to provide a base of experimental data with which theoretically determined data can be compared. To that end the data are presented in tables as well as graphically, and a complete description of the model geometry is included as fuselage cross sections and wing span stations. Measured local angles of attack were generally greater than free stream angle of attack above the wing and generally smaller below. There were large spanwise local angle-of-attack and side flow gradients above the wing at the higher free stream angles of attack.

INTRODUCTION

The next generation of high performance aircraft will be required to operate over a wide range of flight conditions. The designers of these aircraft will be faced with a multitude of design options particularly with regard to the aircraft propulsion system and its integration with the airframe. These options will include such variables as engine location, inlet location and type, nozzle location and type, etc. The effects of all these variables on configuration performance must be evaluated, and performance trades must be made, in order to arrive at the optimum configuration to meet the mission requirements. Since the construction and testing of wind tunnel models to evaluate all the configuration variables would be physically as well as financially impossible, most performance trade studies involving variations in aircraft configuration are made using theoretical techniques, with only the most promising configurations being wind tunnel tested. In order to develop confidence in the theoretical techniques, sufficient comparisons between theoretical predictions and good experimental data must be made.

As part of a cooperative NASA-Boeing program to provide an experimental data base suitable for theory verification, a flow field investigation was conducted on a wind tunnel model of a supersonic cruise fighter. The investigation took place in the Langley 16-Foot Transonic Tunnel at Mach numbers of 0.6, 0.9, and 1.2, and at angles of attack of 0°, 5°, and 10° (7.5° maximum at $M = 1.2$). Flow field data for three survey areas were obtained by use of a single multi-holed probe mounted on a survey apparatus. Some limited static pressure data were also obtained on the fuselage and wing.

The model simulated a Mach 2.0 design, 49 000-lb aircraft and was originally designed as a research model for advanced exhaust nozzle concepts (refs. 1 to 5). Results from these investigations are being utilized in the development and verification of theoretical techniques for nacelle/nozzle performance prediction. The objective of the current investigation was to survey the model flow field to provide local values of angle of attack, side flow, Mach number, and total pressure ratio, for use in the development and verification of theoretical techniques useful for trade studies.

The purpose of this paper is to present the investigation results comprehensively, not only through contour plots and discussion (similarly to refs. 6 and 7), but additionally through the tabulations of configuration geometry and experimental data necessary for theory verification. Comparisons of these experimental data with the results of currently available theoretical methods can be found in reference 8.

SYMBOLS

BL	butt line, in.
C_p	pressure coefficient
$\bar{c}$	mean aerodynamic chord, in.
M	Mach number
MS	model station, measured from nose, in.
PTL/PTINF	ratio of local total pressure to free stream
p_1	pressure measured by outer probe (top) orifice, psi
p_2	pressure measured by center probe orifice, psi
p_3	pressure measured by outer probe (bottom) orifice, psi
QM	local Mach number parameter
QP	local flow angle parameter
WL	water line, in.
x/c	fraction of wing local chord
α	angle of attack, deg
β	side flow angle, positive outboard, deg

APPARATUS AND PROCEDURE

Wind Tunnel

The investigation was conducted in the Langley 16-Foot Transonic Tunnel, a continuous flow, single return, atmospheric wind tunnel with capability of continuously variable Mach numbers from 0.0 to 1.3. Nominally, tunnel total pressure is atmospheric, while tunnel total temperature will vary with outside ambient temperature and Mach number. Reference 9 contains a plot of observed variations in both total pressure and temperature. References 9 and 10 describe the tunnel in detail.

Tests

The investigation was conducted at nine combinations of Mach number and angle of attack. Mach number was set at 0.6, 0.9, and 1.2. Angle of attack was set at 0°, 5°, and 10° at the two subsonic Mach numbers and at 0°, 5°, and 7.5° at $M = 1.2$. Reynolds number based on mean geometric chord varied from 3.1 million to 3.9 million. All tests were conducted with 0.1-in-wide boundary layer transition strips of No. 100 silicon carbide. Transition strips were located 2.0 in. aft of the nose and at 0.20 in. normal to the leading edge on both the upper and lower surfaces of the wings. Although the supersonic cruise fighter configuration included a canard for control purposes, this investigation was conducted with the canard removed. The nacelles were also removed.

Model and Support System

The investigation was conducted with a 10.5-percent-scale model of a fighter aircraft designed for supersonic cruise. The model simulated a Mach 2.0 design, 49 000-lb aircraft. Figure 1 shows a sketch of the model, and figure 2 is a photograph of the model installed in the wind tunnel. The model was supported in the tunnel by a sting-strut support in which the strut replaced the vertical tail. The strut has an NACA 0006 airfoil section with a 60° sweep, a chord of 29.17 in., and a maximum thickness of 1.75 in. Note that the model support strut had a built-in 4.0° angle of attack that had to be accounted for in the data reduction.

The configuration had a delta wing with 68° leading-edge sweep and an aspect ratio of 1.5. (See fig. 3.) The model had a wing span of 37.8 in. and an overall length of 100.5 in. The fighter configuration was designed for a cruise speed of Mach 2, at a trimmed lift coefficient of 0.10. The trim condition for the vehicle was established from the criterion that the vehicle be 5 percent unstable subsonically, which resulted in the vehicle being 4 percent stable supersonically. The aerodynamic design of the lifting surfaces was accomplished by the use of the FLEXSTAB code (ref. 11). This code used the aerodynamic influence coefficient method and includes the effects of nonplanar surfaces such as a canard above the wing plane. The method is based on linearized potential flow theory with constant pressure panels. The twist and camber of both the canard and wing surfaces are determined simultaneously such that the induced drag is minimized. Conventional aerodynamic area ruling design techniques were employed to establish the fuselage cross-sectional area distribution. Computerized lofting procedures provided geometry definition for the wind tunnel model design.

To facilitate use of data from this investigation in the development of theoretical methods, numerical descriptions of the model in the form of cross sections of the fuselage and spanwise cuts of the wing are given in tables I and II.

Survey Probe and Translating Mechanism

A three-orifice prism probe was used for the flow field measurements. A sketch of the probe is shown in figure 4. The probe was constructed of three stainless steel tubes with inside diameters of 0.020-in. The tips of the two outer tubes were cut at an angle of 45° with respect to the probe centerline. The local flow angle is proportional to the difference in pressure measured by the outer two orifices normalized by the difference in pressure between the center orifice and the average of the outer two; that is,

$$QP = \frac{p_1 - p_3}{p_2 - (p_1 + p_3)/2} \tag{1}$$

The local Mach number is proportional to the average of the outer pressures normalized by the center pressure; that is,

$$QM = \frac{p_1 + p_3}{2p_2} \tag{2}$$

The variation of these two parameters with Mach number and flow angle was determined by an in-tunnel calibration. Calibration tests were made at Mach numbers from 0.4 to 1.28 at angles of attack from -10° to 10° (limited to ±7.5° at Mach numbers above 1.05 due to loads on the survey apparatus) utilizing the survey apparatus with no model in the tunnel. (See fig. 5.) These calibrations were extended to ±15° after the test by sting-mounting the probe on the front of the tunnel support strut (no survey apparatus installed). Typical sets of calibration data for QP and QM are shown in figures 6 and 7, respectively. (Since QP is essentially independent of Mach number, the data are plotted with shifted zeros for clarity.) Data for QP were curve fit as a function of angle of attack and the coefficient tabulated. Data for QM were tabulated and a two-way interpolation routine was used to determine a local flow angle and Mach number simultaneously until a value for the flow angle was converged upon. An additional 4.0° was then added to the computed flow angle to account for the built-in 4.0° difference in angle between model and probe due to the model support system.

The survey probe was moved through the flow field by a translating mechanism mounted on the tunnel angle-of-attack strut. (See figs. 2 and 5.) The probe was attached to the mechanism by a support sting 1.00 in. in diameter. The translating mechanism allowed the survey probe to be positioned within a cylindrical volume approximately 4 ft in length and 4 ft in diameter. The probe could be translated in both the longitudinal and lateral directions and could be rolled about the axis of the probe support sting. The actual longitudinal location of the survey region was determined by the length of the probe support sting.

Procedure

Flow field measurements were obtained in three survey areas. Areas 1 and 2 were below and above the wing, respectively, at model station 60.0. (See figs. 8(a) and 8(b).) Area 3 was forward and above the wing at model station 47.8. (See figs. 8(a) and 8(c).) The survey areas were as close as practical to the wing and fuselage given the constraints imposed by the geometry of the translating mechanism and model. Surveys were made for each area in separate tunnel runs. The survey probe was positioned at the desired model station before tunnel start-up. Flow field surveys were then performed by systematically varying the support blade roll angle and survey sting radial position. The data were initially taken with the survey probe in an upright configuration. The probe was then rolled 90° and the run repeated. To compute the side flows at positions coincident with the local angle-of-attack locations, the measured QP values were tabulated as a function of Mach number, angle of attack, and probe position. Values of QP were then interpolated for the same locations and the local side flows computed using the previously computed local Mach number.

RESULTS AND DISCUSSION

The flow field data obtained from this investigation are presented as table III and the wing and fuselage static pressure data as table IV to facilitate the use of the data in theory development. It is estimated that the local angles of attack and side flow angles are within $\pm 0.05^{\circ}$ and that the local Mach numbers are within ± 0.005. Free stream Mach numbers are estimated to be within ± 0.003 and model angles of attack within $\pm 0.03^{\circ}$. The data are additionally presented as contours of local angle of attack, local side flow, local Mach number, and local total pressure ratio. In general, there is little effect of Mach number on any of the local contours. This is probably a result of the domination of the flow field by the leading-edge vortex.

Figure 9 presents local angle-of-attack contours for survey areas 1 and 2 at all nine investigated combinations of Mach number and angle of attack. At 0° free stream angle of attack the local angle-of-attack contours are somewhat aligned with the wing surfaces, and the largest local angle of attack for any Mach number is 2°, with that occurring near the upper surface of the wing. This is not unexpected since at 0° the flow only has to be displaced slightly to pass over the wing. At lifting conditions ($\alpha > 0^{\circ}$) the contours shift such that the constant angel-of-attack contours are roughly perpendicular to the wing with the lowest angles of attack being inboard both above and below the wing and increasing outboard as the leading edge of the highly swept delta is approached. It must also be noted that the local angles of attack below the wing are always lower than free stream, as would be expected to result from the shielding effect of the wing. Those above the wing range from below free stream inboard to considerably above free stream outboard. Again this demonstrates the influence of the leading-edge vortex.

Figure 10 presents contours of constant local side flow for survey areas 1 and 2. (The sign convention for this report has β positive outboard.) As with the local angle-of-attack contours for 0° free stream angle of attack, the local side flow angles are generally small. For lifting conditions ($\alpha > 0^{\circ}$) the flow below the wing is generally directed spanwise away from the fuselage, and this spanwise flow increases in magnitude as the leading edge is approached. (For this highly swept delta wing, going outboard is, in effect, moving toward the wing leading edge.) An increase in angle of attack (e.g., from 5° to 10°) results in an increase in the local side flow as well as an increase in the magnitude of the side flow gradient across the survey area below the wing. For lifting conditions the flow above the wing is directed more toward the body as the wing and body are approached. Also the magnitude of the side flow and side flow gradients across the measurement area increased with angle of attack. Again, these results are consistent with the formation of an upper surface leading-edge vortex which increases in strength with increasing angle of attack.

Figure 11 presents the contours of constant local Mach number in survey areas 1 and 2. For 0° free stream angle of attack the local Mach numbers below the wing are higher than any found above the wing; however, none of the Mach numbers found above or below the wing are significantly higher than free stream, and there are only small Mach number gradients across either survey region. For lifting conditions the Mach numbers found below the wing are always lower than free stream, as would be expected for the region of positive pressure coefficients, while those found above the wing are always greater than free stream, as would be expected for the region of negative pressure coefficients. Similarly, as would be expected for lifting conditions, the higher the angle of attack the higher the Mach numbers above the wing, the higher the gradients across the survey area, and the lower the Mach numbers below the wing. Regions of supersonic flow occurred above the wing at $M = 0.9$ and 10° angle of attack. (See the contours closest to the body in figure 11(f).)

Local total pressure ratio contours at conditions of at least 2-percent loss in total pressure at some point in the survey area are presented in figure 12. These conditions occur at subsonic speeds only above the wing at 10° angle of attack (at both $M = 0.6$ and 0.9), where the leading-edge vortex is very well developed. At $M = 1.2$ this condition occurs at angles of attack of both 5.0° and 7.5°. (The maximum loss at $\alpha = 5.0^{\circ}$ is, however, only 2 percent.) This, again, is a result of the upper surface leading-edge vortex.

Data obtained in survey area 3, which is forward of the wing, are presented in figures 13 through 16. Here the dominant flow phenomena are due to the flow passing around the body. Figure 13 presents the contours of constant local angle of attack for survey area 3. As would be expected, the local angle of attack is above model angle of attack near the body and decreases away from the body. At lifting conditions the peak local angles of attack are typically more than twice the free stream angle of attack near the body.

Figure 14 presents the contours of constant local side flow for area 3. Again, as would be expected from visualizing the flow being forced to pass around the body at 0° angle of attack, the side flow (which is directed outboard) is greatest near the body and decreases in an outboard direction. At angle of attack, the side flow contours indicate an inboard flow near the body. Slightly away from the body the flow then changes direction to outboard. This flow toward the body is probably due to the flow trying to fill in the low pressure region created near the body.

Local Mach number contours for survey area 3 are shown in figure 15. At an angle of attack of 0° the local Mach numbers are very near the free stream value. At angles of attack of 5° and 10° at $M = 0.6$ and 0.9 the local Mach numbers are generally greater than free stream, as would be expected since the flow must accelerate to move around the fuselage. At angles of attack of 5.0° and 7.5° at $M = 1.2$ the local Mach numbers are somewhat lower than free stream, probably as a result of an upstream shock.

Local total pressure ratio contours for conditions of at least 2-percent loss in total pressure for survey area 3 are shown in figure 16. As with survey area 2 (above the wing) this condition only occurs at 10° angle of attack at $M = 0.6$ and 0.9 and at 5.0° and 7.5° at $M = 1.2$. However, in all instances, the losses are not nearly as great as those found above the wing, the largest loss in total pressure being 5 percent at $M = 1.2$ and $\alpha = 7.5^{\circ}$.

In addition to the flow field survey, a few static pressure taps were available on the fuselage and wing. The data obtained from these taps are presented in figures 17 and 18 without discussion.

CONCLUDING REMARKS

The flow field investigation of a supersonic cruise fighter configuration in the Langley 16-Foot Transonic Tunnel has produced a number of results. Most importantly, it has yielded a substantial data base of flow field characteristics such as local angle of attack, local side flow, local Mach number, and local total pressure ratio, which can be utilized in the development and verification of advanced theoretical techniques. Results from this investigation show that local angles of attack were generally greater than free stream angle of attack above the wing and generally smaller than free stream below the wing. Also, there were large spanwise local angle-of-attack and side flow gradients above the wing at the higher free stream angles of attack. In other words, as would be expected for this type of configuration, the flow under the wing is more benign, being shielded by the wing, while the flow above the wing is more complex, being dominated by the leading-edge vortex.

NASA Langley Research Center
Hampton, VA 23665-5225
July 1, 1985

REFERENCES

1. Hutchinson, R. A.; Petit, J. E.; Capone, F. J.; and Whittaker, R. W.: Investigation of Advanced Thrust Vectoring Exhaust Systems for High Speed Propulsive Lift. AIAA-80-1159, June/July 1980.

2. Capone, Francis J.; Reubush, David E.; Petit, John E.; and Hutchinson, Robert A.: Nacelle/Nozzle Integration for Supersonic Fighter Aircraft. Tactical Aircraft Research and Technology - Volume I, NASA CP-2162, Part 2, 1981, pp. 655-694.

3. Paulson, John W., Jr.: Thrust-Induced Aerodynamics of STOL Fighter Configurations. Tactical Aircraft Research and Technology - Volume I, NASA CP-2162, Part 2, 1981, pp. 695-712.

4. Capone, Francis J.; and Reubush, David E.: Effect of Thrust Vectoring and Wing Maneuver Devices on Transonic Aeropropulsive Characteristics of a Supersonic Fighter Aircraft. NASA TP-2119, 1983.

5. Capone, Francis J.; and Reubush, David E.: Effects of Varying Podded Nacelle-Nozzle Installations on Transonic Aeropropulsive Chracteristics of a Supersonic Fighter Aircraft. NASA TP-2120, 1983.

6. Yetter, J. A.; Salemann, V.; and Sussman, M. B.: Inlet Flow Field Investigation, Part I - Transonic Flow Field Survey. NASA CR-172239, 1984.

7. Reubush, David E.; Bare, E. Ann; Yaros, Steven F.; and Yetter, Jeffery A.: Flow-Field Investigation of a Supercruise Fighter Model. AIAA-84-1331, June 1984.

8. Yaros, Steven F.: Theoretical and Experimental Flow Fields for a Supercruiser Forebody. NASA TM-86450, 1985.

9. Peddrew, Kathryn H., compiler: A User's Guide to the Langley 16-Foot Transonic Tunnel. NASA TM-83186, 1981.

10. Corson, Blake W., Jr.; Runckel, Jack F.; and Igoe, William B.: Calibration of the Langley 16-Foot Transonic Tunnel With Test Section Air Removal. NASA TR R-423, 1974.

11. Tinoco, E. N.; and Mercer, J. E.: FLEXSTAB - A Summary of the Functions and Capabilities of the NASA Flexible Airplane Analysis Computer System. NASA CR-2564, 1975.

TABLE I.- FUSELAGE GEOMETRY

MODEL STATION .4725		MODEL STATION 1.4175		MODEL STATION 2.3625	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	-.24087	-.00000	-.03754	-.00000	.16202
.00818	-.24110	.02424	-.03822	.03991	.16089
.01640	-.24179	.04858	-.04027	.07998	.15748
.02469	-.24295	.07314	-.04375	.12039	.15170
.03309	-.24461	.09801	-.04871	.16128	.14343
.04164	-.24680	.12329	-.05529	.20282	.13248
.05038	-.24959	.14910	-.06362	.24515	.11861
.05935	-.25302	.17553	-.07389	.28840	.10148
.06859	-.25717	.20267	-.08635	.33267	.08072
.07814	-.26216	.23062	-.10129	.37804	.05585
.08861	-.26777	.26141	-.11791	.42753	.02802
.10198	-.27353	.29713	-.13655	.48064	-.00482
.11584	-.28129	.33249	-.16081	.53125	-.04620
.12880	-.29155	.36393	-.19148	.57446	-.09671
.13848	-.30438	.38630	-.22824	.60415	-.15532
.14213	-.31893	.39450	-.26884	.61480	-.21881
.13888	-.33353	.38650	-.30946	.60359	-.28225
.13042	-.34665	.36529	-.34649	.57342	-.34070
.11929	-.35769	.33660	-.37821	.53169	-.39157
.10741	-.36675	.30522	-.40473	.48499	-.43475
.09405	-.37323	.27179	-.42576	.43735	-.47132
.08087	-.37769	.23503	-.43960	.38031	-.49513
.06930	-.38133	.20229	-.45098	.32859	-.51468
.05889	-.38434	.17249	-.46041	.28101	-.53090
.04933	-.38683	.14486	-.46822	.23650	-.54433
.04038	-.38888	.11881	-.47463	.19428	-.55531
.03187	-.39052	.09391	-.47976	.15373	-.56409
.02367	-.39179	.06981	-.48370	.11437	-.57081
.01568	-.39269	.04627	-.48650	.07583	-.57556
.00781	-.39323	.02305	-.48818	.03779	-.57840
.00000	-.39341	.00000	-.48874	.00000	-.57934

TABLE I.- Continued

MODEL STATION 3.3075		MODEL STATION 4.2525		MODEL STATION 5.1975	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	.35798	-.00000	.55048	-.00000	.73965
.05521	.35640	.07015	.54844	.08475	.73715
.11063	.35162	.14056	.54228	.16979	.72958
.16648	.34353	.21147	.53185	.25538	.71677
.22297	.33194	.28312	.51692	.34177	.69843
.28028	.31660	.35571	.49713	.42915	.67412
.33857	.29714	.42940	.47204	.51766	.64330
.39798	.27314	.50429	.44108	.60731	.60529
.45857	.24404	.58037	.40359	.69801	.55929
.52038	.20922	.65757	.35877	.78948	.50439
.58624	.16961	.73707	.30656	.87975	.43872
.65276	.12177	.81383	.24336	.96430	.36013
.71413	.06317	.88279	.16785	1.03860	.26826
.76489	-.00628	.93840	.08048	1.09735	.16405
.79886	-.08490	.97487	-.01652	1.13528	.05012
.81086	-.16886	.98761	-.11899	1.14842	-.06920
.79741	-.25267	.97259	-.22121	1.13228	-.18821
.76078	-.33057	.93123	-.31693	1.08743	-.30034
.70914	-.39928	.87196	-.40230	1.02222	-.40134
.65021	-.45835	.80311	-.47655	.94526	-.49006
.58903	-.50894	.73050	-.54074	.86292	-.56741
.51771	-.54500	.64785	-.58968	.77117	-.62949
.44884	-.57300	.56345	-.62632	.67271	-.67491
.38482	-.59625	.48420	-.65674	.57930	-.71258
.32448	-.61546	.40893	-.68183	.48996	-.74357
.26690	-.63114	.33674	-.70224	.40385	-.76869
.21138	-.64362	.26689	-.71843	.32027	-.78853
.15735	-.65314	.19877	-.73072	.23860	-.80355
.10436	-.65985	.13187	-.73936	.15832	-.81406
.05203	-.66385	.06574	-.74449	.07894	-.82028
.00000	-.66517	.00000	-.74619	.00000	-.82235

TABLE I.- Continued

MODEL STATION 6.1425		MODEL STATION 7.0875		MODEL STATION 8.0325	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	.92563	-.00000	1.10853	-.00000	1.28846
.09903	.92265	.11299	1.10505	.12665	1.28447
.19835	.91364	.22626	1.09455	.25355	1.27239
.29824	.89839	.34009	1.07676	.38095	1.25195
.39895	.87654	.45468	1.05129	.50897	1.22269
.50062	.84759	.57013	1.01755	.63765	1.18396
.60334	.81091	.68641	.97483	.76683	1.13496
.70702	.76571	.80332	.92224	.89610	1.07473
.81139	.71107	.92037	.85876	1.02473	1.00219
.91575	.64582	1.03531	.78226	1.14790	.91351
1.01414	.56600	1.14025	.68838	1.25815	.80591
1.10462	.47230	1.23531	.58006	1.35683	.68361
1.18275	.36479	1.31622	.45773	1.43988	.54736
1.24355	.24481	1.37842	.32306	1.50312	.39901
1.28233	.11527	1.41774	.17907	1.54281	.24167
1.29568	-.01951	1.43120	.03006	1.55636	.07951
1.27875	-.15391	1.41371	-.11852	1.53849	-.08219
1.23133	-.28124	1.36440	-.25995	1.48779	-.23673
1.16147	-.39690	1.29088	-.38937	1.41140	-.37908
1.07783	-.49939	1.20171	-.50497	1.31760	-.50712
.98713	-.58943	1.10378	-.60721	1.21338	-.62103
.88797	-.66466	.99843	-.69534	1.10269	-.72164
.77679	-.71894	.87582	-.75853	.96987	-.79376
.67024	-.76389	.75708	-.81076	.83985	-.85324
.56761	-.80077	.64192	-.85346	.71287	-.90166
.46824	-.83053	.52992	-.88778	.58886	-.94042
.37151	-.85395	.42062	-.91466	.46757	-.97066
.27686	-.87160	.31352	-.93485	.34857	-.99328
.18373	-.88391	.20808	-.94889	.23136	-1.00896
.09162	-.89119	.10376	-.95717	.11537	-1.01818
.00000	-.89360	.00000	-.95990	.00000	-1.02122

TABLE I.- Continued

MODEL STATION 8.9775		MODEL STATION 9.9225		MODEL STATION 10.8675	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	1.46553	-.00000	1.63984	-.00000	1.81147
.14002	1.46099	.15311	1.63470	.16593	1.80568
.28024	1.44724	.30633	1.61916	.33185	1.78818
.42082	1.42399	.45973	1.59288	.49767	1.75862
.56183	1.39072	.61324	1.55533	.66316	1.71642
.70317	1.34674	.76660	1.50576	.82785	1.66081
.84449	1.29117	.91926	1.44323	.99094	1.59084
.98518	1.22298	1.07033	1.36669	1.15122	1.50549
1.12421	1.14107	1.21844	1.27505	1.30693	1.40369
1.25335	1.03944	1.35159	1.15996	1.44257	1.27502
1.36801	.91864	1.46999	1.02667	1.56427	1.13007
1.46965	.78315	1.57418	.87884	1.67082	.97083
1.55445	.63389	1.66057	.71752	1.75877	.79839
1.61857	.47286	1.72555	.54475	1.82470	.61478
1.65861	.30315	1.76599	.36358	1.86563	.42302
1.67224	.12882	1.77972	.17797	1.87952	.22693
1.65412	-.04503	1.76145	-.00717	1.86117	.03131
1.60242	-.21178	1.70904	-.18530	1.80828	-.15743
1.52376	-.36628	1.62860	-.35119	1.72641	-.33401
1.42608	-.50611	1.52762	-.50217	1.62262	-.49551
1.31633	-.63116	1.41297	-.63781	1.50360	-.64117
1.19956	-.74271	1.28985	-.75916	1.37462	-.77178
1.05898	-.82469	1.14316	-.85134	1.22241	-.87373
.91855	-.89133	.99317	-.92506	1.06369	-.95441
.78045	-.94538	.84465	-.98460	.90543	-1.01928
.64506	-.98845	.69848	-1.03183	.74909	-1.07053
.51234	-1.02191	.55491	-1.06837	.59525	-1.11001
.38200	-1.04684	.41378	-1.09550	.44389	-1.13923
.25356	-1.06407	.27466	-1.11420	.29466	-1.15932
.12644	-1.07419	.13696	-1.12516	.14694	-1.17106
.00000	-1.07752	.00000	-1.12877	.00000	-1.17493

TABLE I.- Continued

MODEL STATION 11.8125		MODEL STATION 12.7575		MODEL STATION 13.7025	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	1.98052	-.00000	2.14706	-.00000	2.31118
.17850	1.97400	.19082	2.13972	.20290	2.30288
.35681	1.95432	.38119	2.11756	.40502	2.27785
.53463	1.92111	.57058	2.08024	.60545	2.23579
.71153	1.87380	.75823	2.02720	.80311	2.17621
.88676	1.81160	.94311	1.95770	.99656	2.09850
1.05924	1.73360	1.12377	1.87092	1.18397	2.00200
1.22739	1.63883	1.29824	1.76603	1.36300	1.88617
1.38858	1.52596	1.46134	1.63998	1.52684	1.74718
1.52626	1.38458	1.60263	1.48857	1.67159	1.58688
1.65102	1.22890	1.73036	1.32321	1.80233	1.41298
1.75988	1.05923	1.84162	1.14413	1.91622	1.22556
1.84950	.87662	1.93313	.95230	2.00993	1.02547
1.91656	.68306	2.00155	.74963	2.08005	.81453
1.95813	.48149	2.04397	.53902	2.12354	.59560
1.97223	.27568	2.05835	.32419	2.13829	.37241
1.95385	.07032	2.03997	.10978	2.11995	.14959
1.90063	-.12831	1.98655	-.09807	2.06641	-.06682
1.81764	-.31490	1.90264	-.29402	1.98174	-.27150
1.71142	-.48629	1.79430	-.47469	1.87151	-.46084
1.58844	-.64141	1.66770	-.63866	1.74156	-.63309
1.45400	-.78071	1.52814	-.78607	1.59713	-.78798
1.29675	-.89192	1.36619	-.90593	1.43076	-.91586
1.13008	-.97939	1.19232	-1.00002	1.25040	-1.01631
.96275	-1.04943	1.01658	-1.07502	1.06689	-1.09604
.79686	-1.10452	.84175	-1.13377	.88373	-1.15827
.63333	-1.14680	.66913	-1.17870	.70262	-1.20570
.47233	-1.17799	.49906	-1.21175	.52406	-1.24050
.31353	-1.19938	.33128	-1.23437	.34789	-1.26427
.15635	-1.21187	.16520	-1.24756	.17348	-1.27810
.00000	-1.21598	.00000	-1.25189	.00000	-1.28265

TABLE I.- Continued

MODEL STATION 14.6475		MODEL STATION 15.5925		MODEL STATION 16.5375	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	2.47294	-.00000	2.63242	-.00000	2.78967
.21475	2.46349	.22637	2.62157	.23777	2.77705
.42825	2.43506	.45088	2.58899	.47283	2.73928
.63916	2.38743	.67156	2.53462	.70241	2.67659
.84592	2.32024	.88629	2.45841	.92370	2.58944
1.04665	2.23313	1.09270	2.36038	1.13379	2.47856
1.23910	2.12576	1.28813	2.24074	1.32970	2.34496
1.42059	1.99801	1.46965	2.09999	1.50846	2.19010
1.58473	1.84719	1.63450	1.93949	1.67538	2.02330
1.73293	1.67933	1.78630	1.76560	1.83110	1.84516
1.86690	1.49814	1.92384	1.57850	1.97276	1.65376
1.98376	1.30351	2.04418	1.37790	2.09727	1.44855
2.08010	1.09615	2.14372	1.16431	2.20076	1.22985
2.15232	.87778	2.21859	.93935	2.27895	.99919
2.19720	.65122	2.26522	.70586	2.32782	.75945
2.21243	.42029	2.28107	.46777	2.34447	.51478
2.19412	.18968	2.26279	.22994	2.32622	.27029
2.14050	-.03469	2.20911	-.00179	2.27246	.03176
2.05519	-.24748	2.12323	-.22211	2.18600	-.19549
1.94324	-.44490	2.00970	-.42700	2.07098	-.40728
1.81016	-.62481	1.87368	-.61400	1.93218	-.60076
1.66108	-.78656	1.72017	-.78200	1.77444	-.77443
1.49053	-.92179	1.54568	-.92396	1.59629	-.92253
1.30433	-1.02832	1.35418	-1.03620	1.39998	-1.04005
1.11366	-1.11254	1.15692	-1.12459	1.19664	-1.13226
.92278	-1.17802	.95889	-1.19308	.99204	-1.20348
.73377	-1.22778	.76257	-1.24499	.78899	-1.25732
.54733	-1.26421	.56883	-1.28289	.58854	-1.29656
.36333	-1.28904	.37760	-1.30870	.39068	-1.32323
.18118	-1.30349	.18829	-1.32369	.19481	-1.33871
.00000	-1.30822	.00000	-1.32861	.00000	-1.34379

TABLE I.- Continued

MODEL STATION 17.4825

BUTT LINE	WATER LINE
-.00000	3.13596
.26828	3.11378
.52873	3.04871
.77449	2.94486
1.00039	2.80814
1.20323	2.64527
1.38159	2.46282
1.53553	2.26661
1.70618	2.09748
1.86636	1.91721
2.01291	1.72338
2.14254	1.51514
2.25100	1.29262
2.33343	1.05721
2.38519	.81192
2.40287	.56122
2.38459	.31059
2.33063	.06583
2.24350	-.16773
2.12694	-.38575
1.98541	-.58505
1.82360	-.76370
1.64214	-.91737
1.44150	-1.03973
1.23268	-1.13541
1.02210	-1.20911
.81295	-1.26470
.60642	-1.30515
.40255	-1.33261
.20072	-1.34853
.00000	-1.35375

MODEL STATION 18.4275

BUTT LINE	WATER LINE
-.00000	3.50541
.30074	3.46834
.58570	3.36249
.84310	3.20176
1.06696	3.00339
1.25650	2.78330
1.41431	2.55359
1.54927	2.32760
1.72525	2.16039
1.89063	1.98060
2.04313	1.78657
2.17918	1.57720
2.29396	1.35232
2.38189	1.11326
2.43743	.86315
2.45646	.60697
2.43804	.35072
2.38359	.10032
2.29540	-.13885
2.17697	-.36228
2.03257	-.56654
1.86678	-.74933
1.68259	-.90804
1.47826	-1.03480
1.26466	-1.13369
1.04886	-1.20971
.83432	-1.26695
.62239	-1.30855
.41316	-1.33677
.20601	-1.35313
.00000	-1.35849

MODEL STATION 19.3725

BUTT LINE	WATER LINE
-.00000	3.87487
.33355	3.82533
.64477	3.68527
.91773	3.47635
1.14548	3.22466
1.32862	2.95311
1.47213	2.67808
1.58253	2.40944
1.75753	2.23435
1.92657	2.05160
2.08250	1.85420
2.22166	1.64101
2.33911	1.41189
2.42910	1.16818
2.48595	.91315
2.50543	.65186
2.48674	.39050
2.43141	.13505
2.34160	-.10897
2.22062	-.33682
2.07261	-.54476
1.90213	-.73012
1.71609	-.89331
1.50910	-1.02416
1.29186	-1.12623
1.07187	-1.20467
.85288	-1.26374
.63636	-1.30666
.42249	-1.33578
.21068	-1.35265
.00000	-1.35818

TABLE I.- Continued

MODEL STATION 20.3175		MODEL STATION 21.2625		MODEL STATION 22.2075	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	4.24433	-.00000	4.61379	-.00000	4.96460
.36694	4.18687	.40021	4.54595	.43164	4.88583
.70749	4.02420	.76878	4.35505	.82617	4.66587
1.00254	3.78122	1.08353	4.07296	1.15872	4.34519
1.24343	3.48849	1.33549	3.73776	1.42086	3.97033
1.43060	3.17358	1.52670	3.38252	1.61689	3.57957
1.57003	2.85666	1.66529	3.03029	1.75734	3.19780
1.66979	2.55019	1.76129	2.69432	1.85398	2.83808
1.80507	2.32099	1.83993	2.39488	1.91724	2.50532
1.97630	2.13157	2.01514	2.20229	2.04801	2.26699
2.13304	1.92721	2.17442	1.99361	2.21081	2.05544
2.27169	1.70712	2.31414	1.76853	2.35217	1.82628
2.38766	1.47150	2.42996	1.52775	2.46807	1.58095
2.47576	1.22194	2.51720	1.27325	2.55447	1.32200
2.53105	.96172	2.57159	1.00849	2.60792	1.05313
2.54993	.69570	2.59008	.73821	2.62601	.77903
2.53097	.42968	2.57110	.46797	2.60723	.50500
2.47469	.16969	2.51461	.20371	2.55116	.23676
2.38286	-.07854	2.42193	-.04873	2.45875	-.01987
2.25830	-.30976	2.29533	-.28374	2.33160	-.25906
2.10473	-.51947	2.13792	-.49612	2.17216	-.47507
1.92657	-.70404	1.95373	-.68126	1.98384	-.66231
1.74042	-.87138	1.76689	-.85271	1.79465	-.83688
1.53226	-1.00604	1.55573	-.98961	1.57884	-.97445
1.31297	-1.11145	1.33304	-1.09657	1.35156	-1.08123
1.09027	-1.19270	1.10684	-1.17889	1.12123	-1.16300
.86806	-1.25400	.88117	-1.24094	.89197	-1.22438
.64799	-1.29862	.65772	-1.28605	.66541	-1.26888
.43035	-1.32892	.43678	-1.31667	.44170	-1.29902
.21464	-1.34649	.21784	-1.33442	.22025	-1.31647
.00000	-1.35225	.00000	-1.34024	.00000	-1.32218

TABLE I.- Continued

MODEL STATION 23.1525		MODEL STATION 24.0975		MODEL STATION 25.0425	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.26621	-.00000	5.52643	-.00000	5.75117
.45908	5.18558	.48272	5.44632	.50285	5.67012
.88030	4.95916	.92816	5.22023	.96813	5.44053
1.23736	4.62589	1.30971	4.88445	1.36840	5.09735
1.52013	4.23197	1.61595	4.48306	1.69101	4.68391
1.73165	3.81700	1.84846	4.05519	1.93640	4.23978
1.88208	3.40815	2.01639	3.62889	2.11315	3.79433
1.98358	3.02068	2.13155	3.22089	2.23306	3.36590
2.04738	2.66116	2.20529	2.83922	2.30792	2.96389
2.17947	2.40117	2.31713	2.53706	2.40891	2.63601
2.31577	2.15470	2.42463	2.25343	2.49720	2.32760
2.43275	1.90082	2.51511	1.97337	2.57094	2.03049
2.52810	1.63912	2.58782	1.69440	2.62999	1.74037
2.59905	1.37014	2.64144	1.41502	2.67350	1.45411
2.64294	1.09548	2.67443	1.13466	2.70030	1.16965
2.65781	.81769	2.68558	.85357	2.70937	.88584
2.63938	.54028	2.66761	.57319	2.69193	.60290
2.58424	.26839	2.61373	.29800	2.63954	.32479
2.49292	.00769	2.52413	.03343	2.55209	.05661
2.36643	-.23591	2.39926	-.21465	2.42955	-.19587
2.20649	-.45622	2.24010	-.43976	2.27224	-.42604
2.01616	-.64714	2.04913	-.63521	2.08167	-.62659
1.82421	-.82483	1.85472	-.81643	1.88491	-.81134
1.60387	-.96359	1.63008	-.95682	1.65584	-.95316
1.37193	-1.07061	1.39350	-1.06443	1.41456	-1.06114
1.13728	-1.15214	1.15446	-1.14603	1.17111	-1.14259
.90417	-1.21311	.91735	-1.20683	.93004	-1.20306
.67417	-1.25720	.68371	-1.25068	.69285	-1.24654
.44736	-1.28699	.45356	-1.28027	.45947	-1.27581
.22302	-1.30422	.22607	-1.29735	.22897	-1.29270
.00000	-1.30986	.00000	-1.30294	.00000	-1.29822

TABLE I.- Continued

MODEL STATION 25.9875		MODEL STATION 26.9325		MODEL STATION 27.8775	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.94464	-.00000	6.10998	-.00000	6.24949
.52016	5.86249	.53514	6.02677	.54816	6.16533
1.00233	5.62908	1.03186	5.78977	1.05750	5.92511
1.41823	5.27835	1.46111	5.43211	1.49829	5.56123
1.75406	4.85316	1.80805	4.99622	1.85473	5.11575
2.00924	4.39358	2.07115	4.52260	2.12441	4.62955
2.19182	3.93026	2.25795	4.04308	2.31439	4.13544
2.31366	3.48306	2.38031	3.57887	2.43647	3.65593
2.39039	3.06579	2.45780	3.14829	2.51311	3.21278
2.47810	2.71392	2.53495	2.77702	2.58334	2.82686
2.55219	2.38698	2.59979	2.43626	2.64215	2.47540
2.61377	2.07720	2.65356	2.11671	2.69082	2.14799
2.66299	1.77873	2.69652	1.81142	2.72970	1.83689
2.69928	1.48723	2.72825	1.51518	2.75842	1.53628
2.72168	1.19953	2.74786	1.22408	2.77620	1.24175
2.72926	.91348	2.75452	.93527	2.78224	.94996
2.71237	.62839	2.73781	.64751	2.76540	.65930
2.66157	.34774	2.68752	.36402	2.71477	.37292
2.57652	.07631	2.60326	.08942	2.62999	.09542
2.45679	-.18036	2.48449	-.17090	2.51065	-.16785
2.30218	-.41569	2.33086	-.41045	2.35653	-.41058
2.11310	-.62178	2.14257	-.62140	2.16800	-.62519
1.91388	-.80979	1.94039	-.81187	1.96285	-.81740
1.68022	-.95259	1.70200	-.95499	1.71978	-.96005
1.43416	-1.06047	1.45126	-1.06221	1.46469	-1.06602
1.18638	-1.14139	1.19940	-1.14215	1.20926	-1.14454
.94152	-1.20121	.95112	-1.20097	.95815	-1.20208
.70103	-1.24409	.70777	-1.24301	.71256	-1.24307
.46473	-1.27290	.46900	-1.27119	.47197	-1.27049
.23154	-1.28950	.23361	-1.28740	.23503	-1.28624
.00000	-1.29492	.00000	-1.29269	.00000	-1.29138

TABLE I.- Continued

MODEL STATION 28.8225

BUTT LINE	WATER LINE
-.00000	6.36498
.55952	6.27995
1.07986	6.03683
1.53067	5.66740
1.89529	5.21338
2.17053	4.71594
2.36292	4.20877
2.48424	3.71551
2.55949	3.26106
2.62499	2.86365
2.67965	2.50358
2.72476	2.16963
2.76073	1.85350
2.78727	1.54894
2.80368	1.25116
2.80926	.95648
2.79209	.66302
2.74051	.37397
2.65434	.09404
2.53345	-.17148
2.37799	-.41645
2.18912	-.63400
1.98047	-.82674
1.73275	-.96793
1.47375	-1.07195
1.21536	-1.14859
.96213	-1.20450
.71505	-1.24422
.47341	-1.27073
.23569	-1.28594
.00000	-1.29090

MODEL STATION 29.7675

BUTT LINE	WATER LINE
-.00000	6.45777
.56942	6.37196
1.09933	6.12625
1.55883	5.75191
1.93052	5.29033
2.21045	4.78293
2.40474	4.26415
2.52504	3.75865
2.59902	3.29448
2.66149	2.88800
2.71342	2.52090
2.75611	2.18141
2.79003	1.86085
2.81497	1.55265
2.83036	1.25179
2.83558	.95431
2.81784	.65814
2.76464	.36667
2.67611	.08479
2.55259	-.18218
2.39489	-.42838
2.20586	-.64834
1.99262	-.83985
1.74027	-.97845
1.47783	-1.07975
1.21720	-1.15395
.96267	-1.20788
.71495	-1.24607
.47311	-1.27152
.23548	-1.28610
.00000	-1.29085

MODEL STATION 30.7125

BUTT LINE	WATER LINE
-.00000	6.52888
.57794	6.44239
1.11609	6.19443
1.58307	5.81582
1.96082	5.34769
2.24476	4.83166
2.44058	4.30279
2.55985	3.78662
2.63308	3.31446
2.69387	2.90083
2.74416	2.52796
2.78531	2.18372
2.81784	1.85919
2.84164	1.54763
2.85627	1.24383
2.86121	.94362
2.84264	.64485
2.78709	.35121
2.69517	.06791
2.56794	-.19970
2.40715	-.44614
2.21787	-.66775
1.99900	-.85629
1.74207	-.99114
1.47673	-1.08892
1.21462	-1.16017
.95963	-1.21174
.71216	-1.24817
.47103	-1.27240
.23437	-1.28627
.00000	-1.29078

TABLE I.- Continued

MODEL STATION 31.6575		MODEL STATION 32.6025		MODEL STATION 33.5475	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	6.57905	-.00000	6.60877	-.00000	6.61833
.58490	6.49207	.58908	6.52215	.59114	6.53282
1.12982	6.24245	1.13841	6.27322	1.14317	6.28668
1.60300	5.86060	1.61620	5.89154	1.62446	5.90805
1.98586	5.38740	2.00339	5.41708	2.01553	5.43543
2.27328	4.86452	2.29422	4.89110	2.30977	4.90910
2.47055	4.32751	2.49339	4.34925	2.51098	4.36453
2.58914	3.80261	2.61199	3.81831	2.62969	3.82904
2.66239	3.32431	2.68612	3.33599	2.70565	3.34465
2.72259	2.90516	2.74683	2.91309	2.76776	2.91936
2.77217	2.52760	2.79668	2.53206	2.81865	2.53581
2.81252	2.17930	2.83712	2.18056	2.85981	2.18174
2.84423	1.85123	2.86878	1.84952	2.89194	1.84811
2.86730	1.53655	2.89173	1.53205	2.91516	1.52810
2.88140	1.22993	2.90571	1.22280	2.92927	1.21634
2.88616	.92708	2.91042	.91740	2.93401	.90846
2.86652	.62580	2.88991	.61366	2.91262	.60234
2.80803	.33022	2.82901	.31607	2.84933	.30282
2.71192	.04593	2.72957	.03051	2.74663	.01603
2.58026	-.22172	2.59451	-.23775	2.60834	-.25284
2.41591	-.46774	2.42762	-.48419	2.43913	-.49977
2.22617	-.69032	2.23731	-.70810	2.24813	-.72490
2.00102	-.87464	2.00695	-.88967	2.01283	-.90390
1.73964	-1.00499	1.74128	-1.01649	1.74302	-1.02735
1.47189	-1.09880	1.47085	-1.10706	1.47002	-1.11484
1.20890	-1.16680	1.20652	-1.17236	1.20438	-1.17759
.95409	-1.21585	.95131	-1.21929	.94877	-1.22252
.70751	-1.25040	.70497	-1.25226	.70263	-1.25400
.46771	-1.27334	.46582	-1.27411	.46408	-1.27484
.23265	-1.28645	.23165	-1.28659	.23072	-1.28672
.00000	-1.29072	.00000	-1.29065	.00000	-1.29059

TABLE I.- Continued

MODEL STATION 34.4925		MODEL STATION 35.4375		MODEL STATION 36.3825	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	6.61133	-.00000	6.59470	-.00000	6.56911
.59145	6.52748	.59071	6.51264	.58901	6.48927
1.14471	6.28562	1.14420	6.27544	1.14204	6.25807
1.62850	5.91219	1.62961	5.90784	1.62891	5.89844
2.02293	5.44374	2.02667	5.44441	2.02920	5.44283
2.32040	4.91922	2.32684	4.92264	2.33353	4.92696
2.52363	4.37365	2.53168	4.37698	2.54230	4.38435
2.64266	3.83514	2.65118	3.83687	2.66469	3.84461
2.72137	3.35050	2.73351	3.35369	2.74943	3.36078
2.78567	2.92408	2.80077	2.92731	2.81857	2.93299
2.83829	2.53886	2.85575	2.54119	2.87496	2.54504
2.88076	2.18277	2.90005	2.18361	2.92027	2.18536
2.91381	1.84692	2.93445	1.84589	2.95535	1.84543
2.93763	1.52458	2.95918	1.52142	2.98049	1.51870
2.95207	1.21045	2.97414	1.20502	2.99566	1.20003
2.95692	.90017	2.97916	.89243	3.00074	.88518
2.93465	.59173	2.95600	.58174	2.97669	.57231
2.86897	.29035	2.88795	.27858	2.90626	.26743
2.76308	.00239	2.77892	-.01050	2.79413	-.02269
2.62169	-.26708	2.63454	-.28054	2.64685	-.29328
2.45032	-.51453	2.46112	-.52850	2.47145	-.54172
2.25856	-.74077	2.26854	-.75576	2.27802	-.76990
2.01860	-.91739	2.02421	-.93017	2.02962	-.94230
1.74480	-1.03762	1.74657	-1.04733	1.74831	-1.05652
1.46931	-1.12217	1.46871	-1.12907	1.46817	-1.13559
1.20243	-1.18249	1.20062	-1.18711	1.19894	-1.19145
.94643	-1.22554	.94424	-1.22837	.94220	-1.23103
.70046	-1.25563	.69844	-1.25716	.69655	-1.25858
.46246	-1.27551	.46094	-1.27614	.45953	-1.27672
.22986	-1.28684	.22906	-1.28694	.22831	-1.28704
.00000	-1.29052	.00000	-1.29045	.00000	-1.29039

TABLE I.- Continued

MODEL STATION 37.3275		MODEL STATION 38.2725		MODEL STATION 39.2175	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	6.53533	-.00000	6.49426	-.00000	6.44683
.58644	6.45793	.58206	6.41936	.57897	6.37441
1.13824	6.23334	1.13287	6.20167	1.12607	6.16362
1.62604	5.88278	1.62097	5.86076	1.61378	5.83256
2.02944	5.43655	2.02709	5.42485	2.02210	5.40757
2.33834	4.92848	2.34057	4.92592	2.33998	4.91882
2.55208	4.39099	2.55974	4.39510	2.56491	4.39615
2.67843	3.85305	2.69079	3.86036	2.70150	3.86617
2.76544	3.36837	2.78029	3.37531	2.79379	3.38139
2.83631	2.93905	2.85305	2.94479	2.86867	2.95006
2.89396	2.54918	2.91209	2.55322	2.92926	2.55707
2.94014	2.18739	2.95922	2.18946	2.97747	2.19151
2.97577	1.84524	2.99546	1.84521	3.01440	1.84529
3.00121	1.51628	3.02125	1.51412	3.04059	1.51215
3.01653	1.19541	3.03674	1.19110	3.05627	1.18708
3.02165	.87836	3.04190	.87193	3.06150	.86586
2.99670	.56339	3.01606	.55493	3.03475	.54689
2.92390	.25686	2.94089	.24682	2.95723	.23728
2.80873	-.03425	2.82270	-.04522	2.83605	-.05563
2.65861	-.30533	2.66979	-.31674	2.68040	-.32753
2.48127	-.55420	2.49053	-.56598	2.49921	-.57706
2.28697	-.78322	2.29535	-.79574	2.30314	-.80747
2.03483	-.95381	2.03983	-.96474	2.04460	-.97511
1.74999	-1.06521	1.75162	-1.07344	1.75319	-1.08125
1.46768	-1.14173	1.46723	-1.14754	1.46681	-1.15304
1.19736	-1.19553	1.19587	-1.19938	1.19446	-1.20302
.94027	-1.23353	.93846	-1.23588	.93674	-1.23809
.69477	-1.25992	.69309	-1.26117	.69150	-1.26235
.45819	-1.27727	.45693	-1.27777	.45574	-1.27825
.22760	-1.28712	.22693	-1.28720	.22630	-1.28727
.00000	-1.29032	.00000	-1.29026	.00000	-1.29019

TABLE I.- Continued

MODEL STATION 40.1625		MODEL STATION 41.1075		MODEL STATION 42.0525	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	6.39392	-.00000	6.33633	-.00000	6.27478
.57426	6.32385	.56901	6.26844	.56329	6.20886
1.11795	6.11964	1.10864	6.07043	1.09828	6.01652
1.60449	5.79822	1.59327	5.75826	1.58026	5.71304
2.01430	5.38430	2.00383	5.35535	1.99076	5.32083
2.33616	4.90647	2.32917	4.88890	2.31891	4.86597
2.56699	4.39327	2.56585	4.38626	2.56121	4.37471
2.71006	3.86994	2.71633	3.87146	2.71992	3.87028
2.80559	3.38628	2.81560	3.38985	2.82358	3.39187
2.88294	2.95469	2.89580	2.95859	2.90711	2.96164
2.94533	2.56060	2.96028	2.56379	2.97402	2.56655
2.99480	2.19348	3.01121	2.19534	3.02663	2.19705
3.03255	1.84545	3.04990	1.84564	3.06643	1.84585
3.05922	1.51037	3.07714	1.50873	3.09433	1.50722
3.07515	1.18332	3.09335	1.17979	3.11089	1.17647
3.08044	.86011	3.09874	.85467	3.11639	.84950
3.05280	.53925	3.07019	.53198	3.08693	.52505
2.97293	.22820	2.98797	.21955	3.00239	.21133
2.84879	-.06552	2.86090	-.07490	2.87240	-.08379
2.69042	-.33774	2.69983	-.34737	2.70864	-.35646
2.50729	-.58747	2.51474	-.59722	2.52157	-.60633
2.31029	-.81841	2.31674	-.82854	2.32244	-.83785
2.04917	-.98497	2.05353	-.99434	2.05769	-1.00325
1.75469	-1.08867	1.75613	-1.09571	1.75751	-1.10241
1.46642	-1.15824	1.46605	-1.16317	1.46570	-1.16786
1.19313	-1.20645	1.19186	-1.20970	1.19066	-1.21278
.93511	-1.24018	.93356	-1.24215	.93209	-1.24401
.68999	-1.26345	.68856	-1.26450	.68720	-1.26548
.45462	-1.27869	.45355	-1.27910	.45253	-1.27949
.22570	-1.28733	.22514	-1.28738	.22460	-1.28742
.00000	-1.29013	.00000	-1.29006	.00000	-1.28999

TABLE I.- Continued

MODEL STATION 42.9975		MODEL STATION 43.9425		MODEL STATION 44.8875	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	6.20985	-.00000	6.14208	-.00000	6.07189
.55716	6.14567	.55068	6.07936	.54389	6.01032
1.08697	5.95839	1.07479	5.89643	1.06181	5.83094
1.56555	5.66286	1.54923	5.60798	1.53136	5.54856
1.97514	5.28084	1.95699	5.23542	1.93633	5.18458
2.30531	4.83752	2.28828	4.80337	2.26772	4.76332
2.55278	4.35820	2.54024	4.33628	2.52328	4.30852
2.72016	3.86565	2.71561	3.85593	2.70611	3.84096
2.82918	3.39200	2.83188	3.38978	2.83092	3.38449
2.91664	2.96366	2.92409	2.96442	2.92900	2.96356
2.98642	2.56881	2.99729	2.57043	3.00638	2.57125
3.04101	2.19855	3.05425	2.19978	3.06620	2.20068
3.08211	1.84604	3.09689	1.84618	3.11070	1.84624
3.11080	1.50582	3.12651	1.50451	3.14146	1.50326
3.12777	1.17334	3.14398	1.17039	3.15952	1.16760
3.13339	.84460	3.14975	.83994	3.16547	.83552
3.10304	.51846	3.11853	.51217	3.13340	.50618
3.01620	.20349	3.02944	.19602	3.04211	.18890
2.88336	-.09226	2.89380	-.10031	2.90374	-.10796
2.71698	-.36508	2.72484	-.37323	2.73222	-.38094
2.52795	-.61491	2.53383	-.62296	2.53920	-.63049
2.32750	-.84642	2.33169	-.85413	2.33485	-.86085
2.06185	-1.01190	2.06582	-1.02013	2.06960	-1.02796
1.75897	-1.10893	1.76036	-1.11513	1.76170	-1.12104
1.46544	-1.17241	1.46520	-1.17673	1.46497	-1.18084
1.18955	-1.21576	1.18850	-1.21859	1.18749	-1.22128
.93071	-1.24582	.92940	-1.24752	.92815	-1.24914
.68592	-1.26643	.68469	-1.26732	.68353	-1.26817
.45157	-1.27987	.45065	-1.28022	.44978	-1.28055
.22409	-1.28747	.22360	-1.28750	.22314	-1.28754
.00000	-1.28993	.00000	-1.28986	.00000	-1.28980

TABLE I.- Continued

MODEL STATION 45.8325		MODEL STATION 46.7775		MODEL STATION 47.7225	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.99963	-.00000	5.92562	-.00000	5.85009
.53683	5.93890	.52952	5.86533	.52217	5.79160
1.04809	5.76218	1.03366	5.69030	1.01989	5.62169
1.51199	5.48473	1.49112	5.41651	1.47259	5.35569
1.91314	5.12830	1.88739	5.06645	1.86622	5.01510
2.24349	4.71715	2.21544	4.66457	2.19387	4.62341
2.50159	4.27446	2.47482	4.23361	2.45493	4.20243
2.69102	3.81999	2.66969	3.79230	2.65325	3.77025
2.82509	3.37503	2.81231	3.35953	2.80097	3.34551
2.93066	2.96056	2.92792	2.95457	2.92550	2.94901
3.01329	2.57104	3.01740	2.56941	3.02159	2.56802
3.07665	2.20113	3.08529	2.20097	3.09424	2.20116
3.12344	1.84618	3.13496	1.84592	3.14725	1.84611
3.15558	1.50205	3.16884	1.50087	3.18333	1.50015
3.17438	1.16495	3.18854	1.16244	3.20428	1.16029
3.18056	.83131	3.19501	.82731	3.21115	.82351
3.14765	.50048	3.16130	.49505	3.17652	.48964
3.05423	.18212	3.06579	.17566	3.07864	.16913
2.91318	-.11524	2.92214	-.12215	2.93196	-.12914
2.73913	-.38823	2.74559	-.39510	2.75245	-.40196
2.54409	-.63752	2.54850	-.64407	2.55284	-.65038
2.33676	-.86644	2.33904	-.87210	2.34142	-.87763
2.07321	-1.03541	2.07664	-1.04250	2.07989	-1.04923
1.76298	-1.12668	1.76422	-1.13205	1.76541	-1.13718
1.46475	-1.18475	1.46455	-1.18847	1.46437	-1.19202
1.18653	-1.22382	1.18562	-1.22625	1.18476	-1.22855
.92696	-1.25067	.92582	-1.25212	.92474	-1.25350
.68242	-1.26897	.68137	-1.26972	.68037	-1.27044
.44895	-1.28086	.44817	-1.28114	.44742	-1.28142
.22270	-1.28756	.22228	-1.28758	.22189	-1.28760
.00000	-1.28973	.00000	-1.28966	.00000	-1.28960

TABLE I.- Continued

MODEL STATION 48.6675		MODEL STATION 49.6125		MODEL STATION 50.5575	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.77326	-.00000	5.69530	-.00000	5.61636
.51483	5.71816	.50734	5.64351	.49972	5.56778
1.00702	5.55755	.99382	5.49202	.98031	5.42519
1.45712	5.30445	1.44111	5.25175	1.42457	5.19760
1.85112	4.97758	1.83534	4.93872	1.81888	4.89848
2.18127	4.59797	2.16799	4.57154	2.15398	4.54402
2.44559	4.18597	2.43571	4.16893	2.42521	4.15123
2.64655	3.75920	2.63947	3.74790	2.63196	3.73630
2.79860	3.33977	2.79624	3.33421	2.79362	3.32860
2.92778	2.94705	2.92975	2.94506	2.93121	2.94286
3.02828	2.56828	3.03449	2.56843	3.03999	2.56835
3.10481	2.20225	3.11478	2.20326	3.12395	2.20409
3.16095	1.84695	3.17399	1.84776	3.18621	1.84847
3.19930	1.49993	3.21461	1.49975	3.22908	1.49958
3.22164	1.15851	3.23832	1.15683	3.25419	1.15524
3.22897	.81990	3.24612	.81647	3.26245	.81321
3.19332	.48427	3.20948	.47914	3.22487	.47427
3.09277	.16251	3.10634	.15619	3.11926	.15019
2.94266	-.13623	2.95289	-.14298	2.96259	-.14939
2.75973	-.40881	2.76660	-.41530	2.77302	-.42141
2.55715	-.65647	2.56105	-.66216	2.56453	-.66742
2.34335	-.88264	2.34482	-.88715	2.34587	-.89116
2.08297	-1.05562	2.08588	-1.06166	2.08859	-1.06737
1.76657	-1.14208	1.76770	-1.14676	1.76879	-1.15122
1.46421	-1.19541	1.46407	-1.19864	1.46394	-1.20173
1.18394	-1.23075	1.18317	-1.23285	1.18245	-1.23485
.92372	-1.25481	.92275	-1.25606	.92183	-1.25725
.67941	-1.27112	.67851	-1.27176	.67765	-1.27237
.44670	-1.28167	.44602	-1.28191	.44538	-1.28214
.22151	-1.28761	.22115	-1.28762	.22081	-1.28763
.00000	-1.28953	.00000	-1.28947	.00000	-1.28940

TABLE I.- Continued

MODEL STATION 51.5025		MODEL STATION 52.4475		MODEL STATION 53.3925	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.53655	-.00000	5.45600	-.00000	5.35839
.49199	5.49107	.48414	5.41349	.47454	5.31938
.96650	5.35715	.95241	5.28794	.93509	5.20368
1.40752	5.14202	1.38994	5.08499	1.36819	5.01530
1.80170	4.85680	1.78377	4.81361	1.76148	4.76078
2.13920	4.51533	2.12356	4.48531	2.10416	4.44895
2.41402	4.13274	2.40204	4.11333	2.38756	4.09063
2.62392	3.72428	2.61525	3.71173	2.60555	3.69819
2.79049	3.32269	2.78659	3.31625	2.78174	3.30912
2.93191	2.94028	2.93162	2.93715	2.93025	2.93339
3.04459	2.56792	3.04805	2.56699	3.05029	2.56552
3.13213	2.20464	3.13910	2.20482	3.14474	2.20456
3.19740	1.84902	3.20737	1.84934	3.21592	1.84935
3.24255	1.49935	3.25478	1.49902	3.26555	1.49855
3.26905	1.15372	3.28269	1.15222	3.29486	1.15074
3.27779	.81013	3.29191	.80720	3.30454	.80443
3.23932	.46966	3.25263	.46533	3.26457	.46131
3.13139	.14453	3.14258	.13922	3.15263	.13432
2.97166	-.15543	2.98001	-.16106	2.98749	-.16626
2.77893	-.42714	2.78429	-.43245	2.78901	-.43731
2.56758	-.67227	2.57016	-.67668	2.57225	-.68065
2.34648	-.89469	2.34668	-.89776	2.34644	-.90036
2.09111	-1.07272	2.09341	-1.07771	2.09540	-1.08227
1.76985	-1.15549	1.77087	-1.15955	1.77182	-1.16337
1.46384	-1.20468	1.46376	-1.20750	1.46368	-1.21015
1.18177	-1.23675	1.18113	-1.23857	1.18051	-1.24028
.92096	-1.25838	.92013	-1.25946	.91935	-1.26047
.67683	-1.27295	.67606	-1.27350	.67533	-1.27402
.44477	-1.28235	.44419	-1.28255	.44364	-1.28274
.22048	-1.28763	.22018	-1.28763	.21988	-1.28763
.00000	-1.28933	.00000	-1.28927	.00000	-1.28920

TABLE I.- Continued

MODEL STATION 54.3375		MODEL STATION 55.2825		MODEL STATION 56.2275	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.26448	-.00000	5.17505	-.00000	5.08983
.46527	5.22861	.45643	5.14195	.44797	5.05917
.91825	5.12184	.90205	5.04314	.88644	4.96740
1.34680	4.94684	1.32595	4.88019	1.30560	4.81525
1.73919	4.70809	1.71706	4.65593	1.69505	4.60417
2.08436	4.41204	2.06423	4.37470	2.04367	4.33677
2.37242	4.06717	2.35652	4.04282	2.33971	4.01737
2.59511	3.68397	2.58372	3.66886	2.57117	3.65261
2.77574	3.30110	2.76834	3.29197	2.75932	3.28154
2.92759	2.92884	2.92340	2.92333	2.91744	2.91667
3.05110	2.56337	3.05022	2.56039	3.04740	2.55644
3.14883	2.20376	3.15107	2.20230	3.15121	2.20004
3.22282	1.84897	3.22775	1.84811	3.23045	1.84666
3.27460	1.49786	3.28160	1.49688	3.28626	1.49554
3.30525	1.14921	3.31355	1.14762	3.31943	1.14591
3.31540	.80182	3.32414	.79935	3.33044	.79703
3.27484	.45762	3.28315	.45428	3.28918	.45132
3.16132	.12986	3.16839	.12589	3.17360	.12246
2.99394	-.17097	2.99919	-.17515	3.00306	-.17873
2.79298	-.44170	2.79609	-.44555	2.79824	-.44883
2.57378	-.68416	2.57471	-.68716	2.57496	-.68962
2.34577	-.90249	2.34464	-.90413	2.34302	-.90528
2.09697	-1.08630	2.09807	-1.08976	2.09865	-1.09261
1.77264	-1.16690	1.77333	-1.17013	1.77389	-1.17307
1.46356	-1.21261	1.46342	-1.21487	1.46324	-1.21695
1.17992	-1.24186	1.17934	-1.24333	1.17877	-1.24467
.91860	-1.26140	.91789	-1.26226	.91721	-1.26305
.67463	-1.27449	.67397	-1.27493	.67335	-1.27532
.44312	-1.28290	.44263	-1.28305	.44216	-1.28319
.21961	-1.28762	.21935	-1.28760	.21910	-1.28759
.00000	-1.28914	.00000	-1.28907	.00000	-1.28900

TABLE I.- Continued

MODEL STATION 57.1725		MODEL STATION 58.1175		MODEL STATION 59.0625	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	5.00860	-.00000	4.93116	-.00000	4.85733
.43988	4.98007	.43216	4.90448	.42476	4.83225
.87141	4.89450	.85692	4.82430	.84297	4.75673
1.28573	4.75193	1.26633	4.69018	1.24740	4.62998
1.67313	4.55276	1.65129	4.50167	1.62954	4.45091
2.02262	4.29813	2.00105	4.25872	1.97896	4.21855
2.32185	3.99060	2.30285	3.96240	2.28266	3.93271
2.55726	3.63498	2.54200	3.61598	2.52510	3.59530
2.74853	3.26963	2.73574	3.25607	2.72124	3.24111
2.90953	2.90874	2.89936	2.89931	2.88751	2.88879
3.04243	2.55140	3.03492	2.54502	3.02575	2.53781
3.14903	2.19688	3.14401	2.19261	3.13732	2.18772
3.23065	1.84455	3.22778	1.84157	3.22322	1.83818
3.28830	1.49380	3.28707	1.49149	3.28414	1.48896
3.32262	1.14407	3.32243	1.14200	3.32053	1.13989
3.33403	.79485	3.33418	.79280	3.33263	.79089
3.29268	.44877	3.29298	.44670	3.29167	.44492
3.17673	.11961	3.17722	.11746	3.17641	.11573
3.00538	-.18166	3.00574	-.18382	3.00512	-.18553
2.79930	-.45148	2.79901	-.45340	2.79801	-.45486
2.57446	-.69152	2.57307	-.69276	2.57114	-.69355
2.34088	-.90590	2.33813	-.90595	2.33490	-.90551
2.09861	-1.09475	2.09781	-1.09607	2.09604	-1.09639
1.77430	-1.17571	1.77454	-1.17803	1.77460	-1.18000
1.46303	-1.21884	1.46277	-1.22052	1.46245	-1.22200
1.17822	-1.24589	1.17767	-1.24698	1.17712	-1.24794
.91655	-1.26377	.91593	-1.26441	.91533	-1.26497
.67275	-1.27568	.67219	-1.27599	.67166	-1.27627
.44172	-1.28330	.44131	-1.28340	.44092	-1.28348
.21887	-1.28757	.21865	-1.28754	.21845	-1.28751
.00000	-1.28894	.00000	-1.28887	.00000	-1.28881

TABLE I.- Continued

MODEL STATION 60.0075		MODEL STATION 60.9525		MODEL STATION 61.8975	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	4.78695	-.00000	4.71989	-.00000	4.65600
.41770	4.76324	.41094	4.69732	.40449	4.63439
.82952	4.69172	.81658	4.62919	.80414	4.56911
1.22892	4.57134	1.21091	4.51427	1.19338	4.45879
1.60791	4.40055	1.58644	4.35067	1.56517	4.30137
1.95639	4.17768	1.93340	4.13622	1.91008	4.09431
2.26131	3.90154	2.23885	3.86899	2.21538	3.83516
2.50647	3.57284	2.48623	3.54870	2.46446	3.52301
2.70534	3.22501	2.68809	3.20784	2.66956	3.18963
2.87458	2.87762	2.86060	2.86581	2.84558	2.85339
3.01579	2.53028	3.00506	2.52244	2.99356	2.51428
3.13012	2.18273	3.12239	2.17765	3.11415	2.17246
3.21837	1.83483	3.21321	1.83150	3.20775	1.82821
3.28108	1.48653	3.27788	1.48420	3.27454	1.48197
3.31859	1.13791	3.31662	1.13606	3.31461	1.13433
3.33107	.78912	3.32952	.78747	3.32796	.78595
3.29039	.44328	3.28913	.44177	3.28790	.44038
3.17565	.11411	3.17496	.11261	3.17437	.11122
3.00457	-.18713	3.00411	-.18863	3.00379	-.19004
2.79701	-.45619	2.79606	-.45742	2.79520	-.45855
2.56906	-.69413	2.56688	-.69452	2.56467	-.69477
2.33133	-.90469	2.32745	-.90353	2.32333	-.90205
2.09299	-1.09542	2.08810	-1.09266	2.08024	-1.08711
1.77443	-1.18159	1.77399	-1.18275	1.77322	-1.18341
1.46206	-1.22324	1.46158	-1.22423	1.46099	-1.22493
1.17657	-1.24876	1.17600	-1.24943	1.17540	-1.24991
.91475	-1.26545	.91419	-1.26584	.91364	-1.26612
.67116	-1.27650	.67068	-1.27668	.67023	-1.27680
.44056	-1.28354	.44022	-1.28358	.43990	-1.28360
.21826	-1.28748	.21808	-1.28744	.21792	-1.28739
.00000	-1.28874	.00000	-1.28868	.00000	-1.28861

TABLE I.- Continued

MODEL STATION 62.8425		MODEL STATION 63.7875		MODEL STATION 64.7325	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	4.59518	-.00000	4.53731	-.00000	4.48231
.39832	4.57436	.39244	4.51712	.38683	4.46260
.79217	4.51141	.78067	4.45607	.76964	4.40302
1.17634	4.40494	1.15978	4.35273	1.14373	4.30216
1.54414	4.25275	1.52339	4.20487	1.50295	4.15782
1.88651	4.05208	1.86276	4.00967	1.83890	3.96720
2.19099	3.80019	2.16579	3.76423	2.13987	3.72741
2.44129	3.49588	2.41681	3.46743	2.39112	3.43774
2.64981	3.17045	2.62890	3.15035	2.60687	3.12937
2.82958	2.84036	2.81260	2.82675	2.79468	2.81258
2.98131	2.50581	2.96831	2.49704	2.95457	2.48796
3.10540	2.16716	3.09612	2.16176	3.08632	2.15625
3.20198	1.82494	3.19590	1.82169	3.18951	1.81847
3.27106	1.47984	3.26744	1.47780	3.26366	1.47585
3.31256	1.13272	3.31048	1.13123	3.30836	1.12986
3.32640	.78455	3.32485	.78328	3.32329	.78213
3.28671	.43911	3.28556	.43796	3.28449	.43692
3.17389	.10992	3.17358	.10872	3.17352	.10758
3.00365	-.19139	3.00379	-.19271	3.00436	-.19404
2.79451	-.45964	2.79411	-.46074	2.79420	-.46193
2.56250	-.69491	2.56049	-.69502	2.55884	-.69521
2.31901	-.90031	2.31459	-.89837	2.31023	-.89635
2.07097	-1.08016	2.06379	-1.07496	2.05622	-1.06930
1.77204	-1.18350	1.77037	-1.18291	1.76809	-1.18153
1.46023	-1.22529	1.45929	-1.22526	1.45811	-1.22478
1.17476	-1.25019	1.17405	-1.25023	1.17326	-1.25001
.91309	-1.26628	.91254	-1.26631	.91196	-1.26617
.66980	-1.27687	.66938	-1.27686	.66898	-1.27676
.43960	-1.28359	.43932	-1.28355	.43906	-1.28348
.21776	-1.28734	.21762	-1.28728	.21750	-1.28721
.00000	-1.28854	.00000	-1.28848	.00000	-1.28841

TABLE I.- Continued

MODEL STATION 65.6775		MODEL STATION 66.6225		MODEL STATION 67.5675	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	4.43007	-.00000	4.38053	-.00000	4.33360
.38149	4.41072	.37640	4.36141	.37156	4.31460
.75907	4.35223	.74893	4.30363	.73923	4.25719
1.12816	4.25324	1.11309	4.20593	1.09850	4.16023
1.48284	4.11163	1.46308	4.06633	1.44367	4.02194
1.81498	3.92474	1.79105	3.88239	1.76714	3.84018
2.11333	3.68986	2.08624	3.65166	2.05865	3.61290
2.36430	3.40693	2.33643	3.37506	2.30756	3.34221
2.58378	3.10755	2.55966	3.08493	2.53455	3.06153
2.77582	2.79786	2.75605	2.78259	2.73537	2.76677
2.94009	2.47857	2.92486	2.46886	2.90888	2.45885
3.07599	2.15062	3.06511	2.14487	3.05368	2.13899
3.18278	1.81525	3.17573	1.81205	3.16832	1.80885
3.25974	1.47398	3.25565	1.47221	3.25139	1.47051
3.30620	1.12860	3.30400	1.12746	3.30175	1.12643
3.32174	.78110	3.32018	.78020	3.31862	.77941
3.28333	.43601	3.28208	.43524	3.28075	.43459
3.17319	.10662	3.17256	.10585	3.17163	.10526
3.00447	-.19511	3.00409	-.19589	3.00318	-.19639
2.79375	-.46275	2.79269	-.46319	2.79096	-.46321
2.55664	-.69497	2.55381	-.69425	2.55028	-.69300
2.30536	-.89384	2.29991	-.89079	2.29381	-.88715
2.04822	-1.06312	2.03972	-1.05638	2.03069	-1.04903
1.76507	-1.17920	1.76117	-1.17578	1.75624	-1.17109
1.45663	-1.22377	1.45479	-1.22216	1.45254	-1.21984
1.17235	-1.24946	1.17130	-1.24855	1.17007	-1.24722
.91137	-1.26586	.91073	-1.26533	.91003	-1.26456
.66858	-1.27657	.66819	-1.27627	.66779	-1.27584
.43882	-1.28336	.43859	-1.28320	.43837	-1.28298
.21738	-1.28713	.21728	-1.28704	.21718	-1.28694
.00000	-1.28835	.00000	-1.28828	.00000	-1.28821

TABLE I.- Continued

MODEL STATION 68.5125		MODEL STATION 69.4575		MODEL STATION 70.4025	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	4.28478	-.00000	4.22501	-.00000	4.16492
.36652	4.26591	.36034	4.20657	.35411	4.14689
.72911	4.20893	.71690	4.15091	.70457	4.09249
1.08331	4.11281	1.06537	4.05705	1.04724	4.00080
1.42351	3.97599	1.40040	3.92352	1.37697	3.87046
1.74237	3.79660	1.71497	3.74859	1.68709	3.69986
2.03016	3.57300	1.99985	3.53073	1.96888	3.48766
2.27756	3.30822	2.24619	3.27282	2.21396	3.23659
2.50686	3.03592	2.47403	3.00580	2.44017	2.97488
2.71052	2.74804	2.67611	2.72248	2.64049	2.69616
2.88706	2.44558	2.85096	2.42418	2.81346	2.40209
3.03482	2.12992	2.99700	2.11253	2.95759	2.09454
3.15207	1.80290	3.11264	1.78953	3.07146	1.77571
3.23718	1.46682	3.19643	1.45760	3.15381	1.44810
3.28884	1.12440	3.24721	1.11947	3.20364	1.11445
3.30616	.77873	3.26423	.77818	3.22032	.77774
3.26893	.43515	3.22893	.43880	3.18686	.44278
3.16142	.10675	3.12657	.11360	3.08946	.12105
2.99474	-.19432	2.96669	-.18576	2.93630	-.17632
2.78364	-.46062	2.76230	-.45168	2.73881	-.44166
2.54304	-.68949	2.52705	-.68082	2.50939	-.67106
2.28560	-.88185	2.27305	-.87329	2.25950	-.86389
2.02078	-1.04079	2.00983	-1.03149	1.99859	-1.02181
1.75016	-1.16501	1.74337	-1.15804	1.73580	-1.15007
1.44982	-1.21678	1.44692	-1.21333	1.44382	-1.20951
1.16866	-1.24545	1.16720	-1.24347	1.16568	-1.24128
.90927	-1.26353	.90852	-1.26239	.90776	-1.26113
.66739	-1.27528	.66701	-1.27466	.66664	-1.27398
.43817	-1.28271	.43799	-1.28241	.43783	-1.28208
.21710	-1.28683	.21703	-1.28670	.21697	-1.28657
.00000	-1.28815	.00000	-1.28808	.00000	-1.28802

TABLE I.- Continued

MODEL STATION 71.3475		MODEL STATION 72.2925		MODEL STATION 73.2375	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	4.10450	-.00000	4.04375	-.00000	3.98265
.34784	4.08687	.34151	4.02650	.33514	3.96576
.69214	4.03368	.67960	3.97446	.66695	3.91484
1.02891	3.94408	1.01040	3.88689	.99169	3.82923
1.35323	3.81682	1.32920	3.76264	1.30488	3.70791
1.65876	3.65047	1.63000	3.60044	1.60081	3.54979
1.93728	3.44385	1.90507	3.39931	1.87228	3.35408
2.18092	3.19956	2.14708	3.16178	2.11248	3.12325
2.40532	2.94317	2.36948	2.91069	2.33266	2.87745
2.60367	2.66909	2.56565	2.64125	2.52640	2.61265
2.77454	2.37929	2.73420	2.35579	2.69239	2.33156
2.91657	2.07595	2.87391	2.05675	2.82957	2.03691
3.02850	1.76143	2.98373	1.74667	2.93709	1.73143
3.10928	1.43831	3.06280	1.42822	3.01433	1.41782
3.15808	1.10934	3.11050	1.10413	3.06085	1.09881
3.17441	.77741	3.12645	.77720	3.07638	.77711
3.14267	.44710	3.09629	.45177	3.04767	.45678
3.04998	.12912	3.00801	.13783	2.96343	.14721
2.90337	-.16595	2.86770	-.15457	2.82906	-.14211
2.71289	-.43044	2.68420	-.41788	2.65243	-.40383
2.48973	-.66003	2.46765	-.64750	2.44273	-.63321
2.24463	-.85341	2.22804	-.84157	2.20927	-.82802
1.98685	-1.01155	1.97429	-1.00046	1.96053	-.98817
1.72725	-1.14090	1.71743	-1.13019	1.70589	-1.11748
1.44049	-1.20526	1.43690	-1.20052	1.43298	-1.19522
1.16409	-1.23886	1.16242	-1.23617	1.16065	-1.23320
.90700	-1.25974	.90622	-1.25821	.90543	-1.25652
.66630	-1.27323	.66596	-1.27241	.66564	-1.27151
.43768	-1.28173	.43756	-1.28135	.43745	-1.28093
.21692	-1.28644	.21688	-1.28630	.21686	-1.28615
.00000	-1.28795	.00000	-1.28788	.00000	-1.28782

TABLE I.- Continued

MODEL STATION 74.1825

BUTT LINE	WATER LINE
-.00000	3.92118
.32856	3.90466
.65387	3.85488
.97236	3.77125
1.27970	3.65290
1.57056	3.49893
1.83823	3.30875
2.07640	3.08472
2.29417	2.84433
2.48532	2.58433
2.64862	2.30782
2.78317	2.01779
2.88835	1.71712
2.96373	1.40860
3.00905	1.09491
3.02417	.77864
2.99671	.46368
2.91605	.15882
2.78707	-.12693
2.61696	-.38650
2.41418	-.61519
2.18741	-.81060
1.94468	-.97236
1.69291	-1.10153
1.42812	-1.18700
1.15823	-1.22747
.90416	-1.25214
.66498	-1.26796
.43713	-1.27789
.21673	-1.28338
.00000	-1.28514

MODEL STATION 75.1275

BUTT LINE	WATER LINE
-.00000	3.85934
.32133	3.84323
.63954	3.79473
.95116	3.71332
1.25214	3.59830
1.53748	3.44894
1.80102	3.26484
2.03686	3.04811
2.25210	2.81374
2.44071	2.55922
2.60151	2.28793
2.73372	2.00308
2.83686	1.70770
2.91066	1.40462
2.95498	1.09653
2.96976	.78594
2.94344	.47658
2.86608	.17674
2.74212	-.10502
2.57820	-.36195
2.38217	-.58940
2.16212	-.78493
1.92565	-.94792
1.67938	-1.07920
1.42063	-1.16939
1.15373	-1.21238
.90130	-1.23841
.66316	-1.25506
.43605	-1.26550
.21622	-1.27127
.00000	-1.27312

MODEL STATION 76.0725

BUTT LINE	WATER LINE
-.00000	3.79711
.31348	3.78147
.62395	3.73438
.92815	3.65544
1.22223	3.54408
1.50160	3.39975
1.76066	3.22224
1.99386	3.01330
2.20644	2.78559
2.39257	2.53720
2.55107	2.27176
2.68122	1.99266
2.78262	1.70303
2.85510	1.40577
2.89859	1.10356
2.91309	.79890
2.88784	.49538
2.81353	.20087
2.69430	-.07653
2.53627	-.33032
2.34676	-.55600
2.13336	-.75107
1.90325	-.91479
1.66274	-1.04775
1.41020	-1.14208
1.14692	-1.18762
.89665	-1.21501
.66004	-1.23251
.43412	-1.24346
.21530	-1.24951
.00000	-1.25145

TABLE I.- Continued

MODEL STATION 77.0175		MODEL STATION 77.9625		MODEL STATION 78.9075	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	3.73448	-.00000	3.67142	-.00000	3.60793
.30504	3.71934	.29607	3.65682	.28663	3.59391
.60722	3.67380	.58943	3.61294	.57071	3.55177
.90343	3.59754	.87717	3.53954	.84954	3.48138
1.19012	3.49013	1.15601	3.43633	1.12010	3.38257
1.46308	3.35120	1.42214	3.30311	1.37900	3.25528
1.71728	3.18070	1.67109	3.13996	1.62232	3.09971
1.94753	2.98002	1.89807	2.94792	1.84571	2.91665
2.15732	2.75953	2.10493	2.73518	2.04945	2.71212
2.34101	2.51791	2.28619	2.50090	2.22824	2.48569
2.49738	2.25893	2.44054	2.24894	2.38066	2.24125
2.62570	1.98611	2.56724	1.98290	2.50587	1.98246
2.72563	1.70268	2.66590	1.70609	2.60342	1.71268
2.79701	1.41159	2.73637	1.42152	2.67313	1.43497
2.83983	1.11555	2.77864	1.13194	2.71495	1.15213
2.85410	.81707	2.79272	.83989	2.72889	.86678
2.82983	.51964	2.76935	.54882	2.70632	.58233
2.75836	.23076	2.70049	.26588	2.63984	.30566
2.64353	-.04187	2.58976	-.00157	2.53288	.04380
2.49109	-.29203	2.44256	-.24761	2.39058	-.19758
2.30786	-.51538	2.26535	-.46801	2.21909	-.41441
2.10100	-.70940	2.06488	-.66033	2.02483	-.60435
1.87730	-.87326	1.84760	-.82370	1.81393	-.76650
1.64276	-1.00741	1.61921	-.95842	1.59183	-.90113
1.39661	-1.10520	1.37960	-1.05896	1.35891	-1.00359
1.13758	-1.15328	1.12549	-1.10952	1.11041	-1.05651
.89007	-1.18205	.88136	-1.13967	.87035	-1.08806
.65551	-1.20040	.64944	-1.15888	.64170	-1.10816
.43127	-1.21187	.42741	-1.17090	.42246	-1.12074
.21392	-1.21822	.21204	-1.17754	.20963	-1.12769
.00000	-1.22025	.00000	-1.17967	.00000	-1.12992

TABLE I.- Continued

MODEL STATION 79.8525		MODEL STATION 80.7975		MODEL STATION 81.7425	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	3.54399	-.00000	3.47957	-.00000	3.41466
.27678	3.53056	.26657	3.46676	.25605	3.40248
.55118	3.49024	.53093	3.42832	.51005	3.36596
.82069	3.42298	.79078	3.36427	.75994	3.30519
1.08260	3.32872	1.04369	3.27467	1.00353	3.22031
1.33389	3.20753	1.28702	3.15968	1.23856	3.11158
1.57119	3.05971	1.51789	3.01970	1.46261	2.97946
1.79074	2.88598	1.73320	2.85541	1.67318	2.82460
1.99107	2.68993	1.92994	2.66823	1.86621	2.64669
2.16731	2.47180	2.10352	2.45880	2.03696	2.44628
2.31782	2.23535	2.25210	2.23075	2.18353	2.22701
2.44163	1.98424	2.37454	1.98772	2.30461	1.99243
2.53819	1.72187	2.47019	1.73311	2.39938	1.74595
2.60725	1.45134	2.53867	1.47011	2.46733	1.49079
2.64870	1.17555	2.57981	1.20165	2.50819	1.22997
2.66252	.89716	2.59353	.93050	2.52182	.96634
2.64068	.61961	2.57234	.66014	2.50120	.70346
2.57635	.34954	2.50992	.39700	2.44047	.44761
2.47282	.09369	2.40950	.14760	2.34284	.20511
2.33506	-.14248	2.27592	-.08281	2.21307	-.01898
2.16897	-.35510	2.11490	-.29054	2.05679	-.22114
1.98071	-.54191	1.93239	-.47346	1.87979	-.39940
1.77612	-.70207	1.73402	-.63082	1.68751	-.55309
1.56040	-.83584	1.52473	-.76289	1.48469	-.68257
1.33430	-.93935	1.30559	-.86649	1.27264	-.78529
1.09212	-.99445	1.07044	-.92355	1.04522	-.84402
.85687	-1.02740	.84078	-.95793	.82199	-.87987
.63216	-1.04843	.62074	-.97995	.60738	-.90297
.41635	-1.06161	.40902	-.99378	.40043	-.91752
.20664	-1.06890	.20305	-1.00143	.19885	-.92559
.00000	-1.07123	.00000	-1.00389	.00000	-.92818

TABLE I.- Continued

MODEL STATION 82.6875		MODEL STATION 83.6325		MODEL STATION 84.5775	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	3.34923	-.00000	3.28327	-.00000	3.21674
.24525	3.33769	.23421	3.27238	.22296	3.20651
.48863	3.30313	.46672	3.23978	.44438	3.17589
.72827	3.24567	.69586	3.18566	.66280	3.12510
.96225	3.16555	.91997	3.11031	.87678	3.05451
1.18866	3.06311	1.13745	3.01414	1.08504	2.96456
1.40552	2.93882	1.34673	2.89763	1.28635	2.85573
1.61083	2.79330	1.54628	2.76134	1.47963	2.72852
1.79997	2.62499	1.73130	2.60288	1.66025	2.58012
1.96769	2.43391	1.89575	2.42136	1.82115	2.40837
2.11214	2.22374	2.03793	2.22061	1.96087	2.21733
2.23182	1.99796	2.15612	2.00398	2.07746	2.01017
2.32571	1.75996	2.24910	1.77479	2.16947	1.79013
2.39315	1.51297	2.31603	1.53630	2.23587	1.56048
2.43375	1.26009	2.35639	1.29168	2.27598	1.32444
2.44731	1.00429	2.36987	1.04401	2.28939	1.08523
2.42717	.74919	2.35014	.79700	2.26984	.84666
2.36791	.50098	2.29214	.55680	2.21242	.61496
2.27275	.26583	2.19912	.32948	2.12052	.39622
2.14643	.04864	2.07591	.11976	1.99913	.19516
1.99455	-.14726	1.92810	-.06917	1.85397	.01484
1.82280	-.32005	1.76134	-.23568	1.69082	-.14323
1.63648	-.46920	1.58084	-.37939	1.51491	-.27881
1.44015	-.59515	1.39100	-.50085	1.33065	-.39261
1.23533	-.69599	1.19360	-.59883	1.14188	-.48644
1.01636	-.75610	.98383	-.66003	.94455	-.55078
.80042	-.79348	.77604	-.69901	.74738	-.59342
.59202	-.81777	.57466	-.72462	.55472	-.62202
.39056	-.83314	.37940	-.74094	.36680	-.64045
.19402	-.84168	.18856	-.75004	.18246	-.65080
.00000	-.84443	.00000	-.75297	.00000	-.65415

TABLE I.- Continued

MODEL STATION 85.5225		MODEL STATION 86.4675		MODEL STATION 87.4125	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	3.14963	-.00000	3.08191	-.00000	3.01353
.21151	3.14005	.19988	3.07298	.18809	3.00526
.42165	3.11141	.39856	3.04631	.37513	2.98054
.62913	3.06396	.59490	3.00217	.56016	2.93969
.83275	2.99810	.78794	2.94099	.74239	2.88313
1.03149	2.91430	.97688	2.86325	.92124	2.81135
1.22446	2.81303	1.16113	2.76941	1.09639	2.72476
1.41095	2.69472	1.34030	2.65980	1.26772	2.62365
1.58683	2.55649	1.51105	2.53180	1.43285	2.50585
1.74387	2.39469	1.66385	2.38011	1.58103	2.36439
1.88089	2.21363	1.79792	2.20928	1.71184	2.20404
1.99574	2.01626	1.91085	2.02201	1.82266	2.02721
2.08671	1.80571	2.00069	1.82131	1.91126	1.83671
2.15255	1.58524	2.06593	1.61037	1.97584	1.63568
2.19239	1.35813	2.10550	1.39254	2.01512	1.42750
2.20573	1.12770	2.11876	1.17125	2.02830	1.21571
2.18627	.89791	2.09940	.95059	2.00909	1.00454
2.12916	.67513	2.04270	.73706	1.95290	.80060
2.03799	.46551	1.95245	.53686	1.86378	.61013
1.91797	.27377	1.83411	.35465	1.74749	.43767
1.77504	.10288	1.69388	.19328	1.61048	.28589
1.61517	-.04579	1.53787	.05392	1.45896	.15571
1.44367	-.17219	1.37145	-.06361	1.29832	.04669
1.26496	-.27718	1.19899	-.16037	1.13281	-.04241
1.08593	-.36696	1.02995	-.24636	.97372	-.12451
.90159	-.43390	.85741	-.31383	.81205	-.19081
.71587	-.48017	.68274	-.36221	.64808	-.23990
.53276	-.51195	.50930	-.39621	.48441	-.27515
.35293	-.53273	.33796	-.41874	.32193	-.29886
.17575	-.54450	.16847	-.43162	.16062	-.31253
.00000	-.54831	.00000	-.43581	.00000	-.31700

TABLE I.- Continued

MODEL STATION 88.3575 BUTT LINE	WATER LINE	MODEL STATION 89.3025 BUTT LINE	WATER LINE	MODEL STATION 90.2475 BUTT LINE	WATER LINE
-.00000	2.94449	-.00000	2.87473	-.00000	2.80422
.17615	2.93686	.16405	2.86774	.15182	2.79786
.35138	2.91408	.32734	2.84688	.30300	2.77888
.52491	2.87647	.48919	2.81245	.45301	2.74758
.69612	2.82445	.64915	2.76489	.60150	2.70437
.86461	2.75850	.80700	2.70463	.74840	2.64965
1.03027	2.67900	.96278	2.63202	.89389	2.58371
1.19323	2.58616	1.11680	2.54721	1.03842	2.50666
1.35217	2.47845	1.26888	2.44938	1.18268	2.41827
1.49527	2.34733	1.40641	2.32869	1.31423	2.30822
1.62249	2.19770	1.52967	2.19003	1.43312	2.18079
1.73098	2.03163	1.63560	2.03509	1.53623	2.03735
1.81822	1.85173	1.72136	1.86617	1.62040	1.87987
1.88211	1.66101	1.78451	1.68618	1.68280	1.71107
1.92109	1.46287	1.82320	1.49850	1.72121	1.53428
1.93419	1.26095	1.83622	1.30687	1.73418	1.35337
1.91516	1.05966	1.81742	1.11585	1.71566	1.17305
1.85962	.86568	1.76270	.93220	1.66195	1.00012
1.77190	.68522	1.67669	.76208	1.57802	.84065
1.65808	.52273	1.56581	.60973	1.47064	.69860
1.52484	.38058	1.43698	.47723	1.34692	.57573
1.37849	.25942	1.29653	.36489	1.21315	.47197
1.22435	.15854	1.14963	.27174	1.07427	.38609
1.06649	.07649	1.00011	.19613	.93379	.31630
.91708	-.00130	.85989	.12334	.80296	.24820
.76555	-.06501	.71791	.06341	.67017	.19261
.61197	-.11356	.57449	.01656	.53638	.14865
.45817	-.14914	.43064	-.01850	.40224	.11542
.30489	-.17343	.28688	-.04279	.26807	.09222
.15225	-.18757	.14336	-.05707	.13399	.07851
.00000	-.19221	.00000	-.06178	.00000	.07397

TABLE I.- Continued

MODEL STATION 91.1925		MODEL STATION 92.1375		MODEL STATION 93.0825	
BUTT LINE	WATER LINE	BUTT LINE	WATER LINE	BUTT LINE	WATER LINE
-.00000	2.73293	-.00000	2.66080	-.00000	2.58778
.13945	2.72718	.12695	2.65565	.11430	2.58322
.27838	2.71005	.25347	2.64031	.22827	2.56961
.41636	2.68180	.37924	2.61502	.34164	2.54715
.55316	2.64281	.50411	2.58011	.45433	2.51614
.68881	2.59344	.62818	2.53589	.56645	2.47682
.82358	2.53395	.75177	2.48257	.67834	2.42935
.95802	2.46437	.87546	2.42014	.79056	2.37370
1.09290	2.38444	1.00008	2.34832	.90389	2.30956
1.21843	2.28563	1.11857	2.26054	1.01409	2.23247
1.33248	2.16969	1.22727	2.15641	1.11685	2.14051
1.43250	2.03818	1.32392	2.03729	1.20982	2.03434
1.51498	1.89264	1.40467	1.90425	1.28884	1.91446
1.57667	1.73552	1.46574	1.75940	1.34951	1.78254
1.61487	1.57012	1.50386	1.60591	1.38781	1.64156
1.62781	1.40039	1.51683	1.44785	1.40093	1.49569
1.60965	1.23121	1.49912	1.29028	1.38375	1.35026
1.55718	1.06940	1.44817	1.14003	1.33466	1.21200
1.47576	.92088	1.36978	1.00278	1.25993	1.08632
1.37253	.78930	1.27144	.88176	1.16737	.97595
1.25471	.67598	1.16043	.77787	1.06417	.88129
1.12847	.58051	1.04263	.69033	.95583	.80124
.99842	.50141	.92224	.61745	.84598	.73397
.86868	.43562	.80356	.55540	.73816	.67588
.74629	.37320	.68928	.49913	.63152	.62648
.62233	.32248	.57379	.45402	.52417	.58780
.49773	.28246	.45814	.41884	.41739	.55823
.37304	.25229	.34288	.39258	.31166	.53649
.24851	.23125	.22817	.37440	.20705	.52162
.12419	.21884	.11395	.36372	.10329	.51296
.00000	.21473	.00000	.36021	.00000	.51011

TABLE I.- Concluded

MODEL STATION 94.0275

BUTT LINE	WATER LINE
-.00000	2.51384
.10152	2.50983
.20277	2.49786
.30354	2.47808
.40375	2.45072
.50350	2.41598
.60308	2.37395
.70295	2.32459
.80378	2.26761
.90414	2.20078
1.00028	2.12140
1.08925	2.02885
1.16664	1.92295
1.22732	1.80476
1.26627	1.67698
1.27972	1.54389
1.26320	1.41112
1.21637	1.28534
1.14606	1.17151
1.06033	1.07180
.96613	.98609
.86835	.91299
.76995	.85062
.67210	.79744
.57252	.75588
.47310	.72445
.37525	.70106
.27932	.68423
.18514	.67288
.09224	.66632
.00000	.66418

TABLE II.- WING GEOMETRY

BUTT LINE 0.00000
LEADING EDGE 34.18000
TRAILING EDGE 81.60400
TWIST (DEG.) 4.00000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.35189	-.25514
.05000	.49653	-.33529
.07500	.59802	-.41496
.10000	.67200	-.48704
.15000	.77254	-.61983
.20000	.83751	-.73128
.25000	.87497	-.82470
.30000	.89110	-.90248
.35000	.88967	-.96555
.40000	.87355	-1.01582
.45000	.84035	-1.06135
.50000	.81949	-1.07842
.55000	.80289	-1.06846
.60000	.77965	-1.03574
.65000	.74124	-.98215
.70000	.69002	-.90153
.75000	.62505	-.79577
.80000	.54206	-.67010
.85000	.43820	-.52735
.90000	.31300	-.36896
.95000	.16646	-.19302
1.00000	0.00000	0.00000

BUTT LINE 3.99700
LEADING EDGE 44.07300
TRAILING EDGE 81.92000
TWIST (DEG.) .23000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.28082	-.20362
.05000	.39626	-.26758
.07500	.47725	-.33116
.10000	.53629	-.38869
.15000	.61653	-.49466
.20000	.66838	-.58360
.25000	.69828	-.65816
.30000	.71115	-.72023
.35000	.71001	-.77056
.40000	.69714	-.81068
.45000	.67065	-.84702
.50000	.65400	-.86064
.55000	.64075	-.85269
.60000	.62220	-.82658
.65000	.59155	-.78381
.70000	.55067	-.71947
.75000	.49882	-.63507
.80000	.43259	-.53478
.85000	.34971	-.42086
.90000	.24979	-.29445
.95000	.13284	-.15404
1.00000	0.00000	0.00000

TABLE II.- Continued

BUTT LINE 6.04400
LEADING EDGE 48.77500
TRAILING EDGE 82.08100
TWIST (DEG.) -1.19000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.24713	-.17919
.05000	.34871	-.23547
.07500	.41999	-.29143
.10000	.47195	-.34205
.15000	.54255	-.43531
.20000	.58818	-.51358
.25000	.61450	-.57919
.30000	.62582	-.63381
.35000	.62482	-.67811
.40000	.61350	-.71341
.45000	.59018	-.74539
.50000	.57553	-.75738
.55000	.56387	-.75038
.60000	.54755	-.72740
.65000	.52057	-.68977
.70000	.48460	-.63315
.75000	.43897	-.55887
.80000	.38069	-.47061
.85000	.30775	-.37036
.90000	.21982	-.25912
.95000	.11690	-.13556
1.00000	0.00000	0.00000

BUTT LINE 8.07800
LEADING EDGE 54.17400
TRAILING EDGE 82.24100
TWIST (DEG.) -2.05000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.21387	-.14539
.05000	.30453	-.18777
.07500	.37048	-.22903
.10000	.41960	-.26636
.15000	.49145	-.33259
.20000	.54197	-.38648
.25000	.57565	-.43027
.30000	.59446	-.46703
.35000	.60091	-.49707
.40000	.59783	-.52036
.45000	.58688	-.53861
.50000	.57060	-.55264
.55000	.55264	-.55488
.60000	.52906	-.54534
.65000	.49622	-.52373
.70000	.45440	-.48752
.75000	.40445	-.43644
.80000	.34607	-.37133
.85000	.27534	-.29611
.90000	.19507	-.20854
.95000	.10301	-.10974
1.00000	0.00000	0.00000

TABLE II.- Continued

BUTT LINE 10.18300
LEADING EDGE 59.38400
TRAILING EDGE 82.40700
TWIST (DEG.) -2.63000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.17912	-.11558
.05000	.25618	-.14435
.07500	.31772	-.17405
.10000	.36376	-.19892
.15000	.43490	-.24105
.20000	.48532	-.27628
.25000	.51963	-.30552
.30000	.54012	-.33061
.35000	.55117	-.34949
.40000	.54956	-.36768
.45000	.54426	-.37896
.50000	.53229	-.38909
.55000	.51502	-.39346
.60000	.49108	-.39024
.65000	.45931	-.37735
.70000	.41741	-.35524
.75000	.36906	-.32071
.80000	.31219	-.27628
.85000	.24704	-.22171
.90000	.17428	-.15679
.95000	.08219	-.09232
1.00000	0.00000	0.00000

BUTT LINE 12.24500
LEADING EDGE 64.48700
TRAILING EDGE 82.57000
TWIST (DEG.) -3.00000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.14720	-.08427
.05000	.21501	-.10217
.07500	.26853	-.11772
.10000	.31067	-.13128
.15000	.37251	-.15841
.20000	.41302	-.18517
.25000	.44303	-.20506
.30000	.46021	-.22369
.35000	.46925	-.23815
.40000	.47142	-.24900
.45000	.46781	-.25732
.50000	.45949	-.26419
.55000	.44557	-.26799
.60000	.42513	-.26709
.65000	.39710	-.26003
.70000	.36166	-.24521
.75000	.31935	-.22242
.80000	.26926	-.19295
.85000	.21266	-.15551
.90000	.14900	-.11103
.95000	.07776	-.05931
1.00000	0.00000	0.00000

TABLE II.- Continued

BUTT LINE 14.39000
LEADING EDGE 69.79600
TRAILING EDGE 82.73900
TWIST (DEG.) -3.00000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.11105	-.05462
.05000	.16399	-.06303
.07500	.20515	-.07132
.10000	.23867	-.07766
.15000	.28630	-.09371
.20000	.32461	-.10354
.25000	.33988	-.12399
.30000	.35347	-.13603
.35000	.36033	-.14600
.40000	.36227	-.15337
.45000	.35956	-.15946
.50000	.35399	-.16399
.55000	.34377	-.16696
.60000	.32823	-.16722
.65000	.30675	-.16360
.70000	.27931	-.15506
.75000	.24618	-.14160
.80000	.20786	-.12296
.85000	.16386	-.09966
.90000	.11442	-.07170
.95000	.05980	-.03831
1.00000	0.00000	0.00000

BUTT LINE 16.98900
LEADING EDGE 76.22900
TRAILING EDGE 82.94300
TWIST (DEG.) -3.00000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.06123	-.02471
.05000	.09178	-.02598
.07500	.11582	-.02759
.10000	.13482	-.02927
.15000	.16167	-.03545
.20000	.17819	-.04391
.25000	.18907	-.05156
.30000	.19591	-.05801
.35000	.19954	-.06311
.40000	.20041	-.06707
.45000	.19853	-.07070
.50000	.19424	-.07446
.55000	.18873	-.07620
.60000	.18034	-.07667
.65000	.16899	-.07500
.70000	.15415	-.07117
.75000	.13603	-.06513
.80000	.11474	-.05687
.85000	.09050	-.04619
.90000	.06345	-.03310
.95000	.03337	-.01752
1.00000	0.00000	0.00000

TABLE II.- Concluded

BUTT LINE 18.90000
LEADING EDGE 80.95900
TRAILING EDGE 83.09400
TWIST (DEG.) -3.00000

X/C	UPPER SURF WL	LOWER SURF WL
0.00000	0.00000	0.00000
.02500	.02013	-.00719
.05000	.03068	-.00677
.07500	.03911	-.00649
.10000	.04545	-.00673
.15000	.05414	-.00854
.20000	.05922	-.01140
.25000	.06264	-.01388
.30000	.06471	-.01603
.35000	.06557	-.01796
.40000	.06574	-.01932
.45000	.06503	-.02058
.50000	.06371	-.02173
.55000	.06170	-.02255
.60000	.05890	-.02282
.65000	.05523	-.02235
.70000	.05047	-.02118
.75000	.04471	-.01926
.80000	.03785	-.01672
.85000	.03000	-.01347
.90000	.02109	-.00961
.95000	.01102	-.00517
1.00000	0.00000	0.00000

TABLE III.- FLOW FIELD DATA

(a) $M = 0.6$; $\alpha = 0°$; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.45972	-4.66512	.99945	-1.16265	.78141	.62226
3.48810	-3.65031	.99946	-1.23696	.72184	.62459
4.42494	-4.73371	.99946	-1.19486	.62156	.62393
4.47793	-3.71249	.99945	-1.29316	.51377	.62269
4.59073	-2.73611	.99938	-1.37225	.58047	.62110
5.54362	-4.75514	.99941	-1.21340	.33269	.62081
5.51281	-3.73390	.99936	-1.28681	.29551	.62149
5.54001	-2.76655	.99931	-1.38225	.32384	.62560
6.54111	-4.72935	.99941	-1.23286	.13008	.62082
6.51142	-3.71100	.99936	-1.30875	.07944	.62017
6.47581	-2.74432	.99931	-1.35616	.03081	.62435
7.62718	-4.65755	.99935	-1.29280	-.08127	.62101
7.53696	-3.64288	.99940	-1.31990	-.24167	.62188
7.43725	-2.67799	.99929	-1.37186	-.32510	.62347
8.69390	-4.53863	.99938	-1.29477	-.29794	.61874
8.52974	-3.53283	.99935	-1.37179	-.47687	.61987
8.38798	-2.57126	.99933	-1.46099	-.56471	.61940
9.69471	-4.38280	.99928	-1.32540	-.53065	.61502
9.54543	-3.37535	.99924	-1.50605	-.59826	.61869
9.33980	-2.42150	.99918	-1.74191	-.92008	.61848

(b) $M = 0.6$; $\alpha = 5°$; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.36159	-4.65916	.99974	1.14218	2.26216	.60097
3.47368	-3.64904	.99979	.64348	2.53624	.60080
4.42497	-4.73306	.99982	1.26176	2.50645	.59850
4.48516	-3.71281	.99979	.79592	2.84789	.59864
4.48669	-2.73546	.99969	.19619	3.07755	.60295
5.54362	-4.75449	.99975	1.49290	2.77651	.59823
5.51281	-3.73325	.99982	1.00598	3.13696	.59802
5.54694	-2.76654	.99974	.36445	3.51709	.60086
6.54872	-4.73032	.99986	1.76971	3.07710	.59839
6.51865	-3.71069	.99984	1.26861	3.48190	.59600
6.47578	-2.74367	.99977	.59764	3.96443	.59876
7.63471	-4.65688	.99984	2.13385	3.38927	.59860
7.53696	-3.64268	.99984	1.62617	3.86167	.59693
7.43720	-2.67735	.99982	.95320	4.50210	.59544
8.68641	-4.53963	.99986	2.57541	3.62020	.59818
8.52265	-3.53443	.99986	2.15941	4.19800	.59521
8.38781	-2.56997	.99986	1.49010	5.19454	.59001
9.68715	-4.36346	.99986	3.06231	3.68728	.59514
9.54531	-3.37471	.99989	2.90278	4.55342	.59514
9.33297	-2.42271	.99989	2.43289	5.74093	.58896

TABLE III.- Continued

(c) M = 0.6; α = 10°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.35383	-4.66107	.99979	3.22608	3.68067	.57581
3.48827	-3.64637	.99982	2.38631	4.14654	.57118
4.43255	-4.73275	.99977	3.58626	4.34720	.57445
4.47796	-3.71184	.99989	2.72416	4.96576	.57135
4.51413	-2.74257	.99975	1.68845	5.39773	.57305
5.55874	-4.75380	.99980	3.98180	5.12554	.57395
5.51281	-3.73390	.99979	3.06282	5.78131	.57038
5.55388	-2.76652	.99986	1.96078	6.47916	.57075
6.55622	-4.72869	.99982	4.42389	5.78585	.57475
6.51865	-3.71069	.99984	3.49292	6.61057	.56939
6.46190	-2.74363	.99982	2.28044	7.49095	.56865
7.63465	-4.65623	.99980	5.02416	6.55886	.57572
7.52981	-3.64416	.99987	4.06290	7.64151	.57024
7.44405	-2.67609	.99986	2.75756	8.74593	.56597
8.67142	-4.54163	.99974	5.72256	7.22312	.57480
8.53709	-3.53317	.99979	4.92549	8.59327	.56948
8.38772	-2.56932	.99991	3.61999	10.18191	.56162
9.67971	-4.38480	.99969	6.58553	7.65912	.57981
9.51703	-3.38107	.99969	6.11447	9.39951	.57548
9.32592	-2.42263	.99972	5.19002	11.64297	.56447

(d) M = 0.9; α = 0°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.41447	-4.66187	.99921	-1.21500	.90996	.92745
3.51740	-3.64764	.99924	-1.28974	.94843	.93047
4.50833	-4.73014	.99921	-1.21212	.69958	.92893
4.52188	-3.70139	.99924	-1.24964	.68319	.92907
4.48618	-2.74650	.99914	-1.41567	.83104	.92872
5.55116	-4.74537	.99923	-1.20217	.47736	.92854
5.51280	-3.72415	.99923	-1.22756	.51337	.92815
5.60242	-2.76570	.99917	-1.30740	.58564	.92969
6.59374	-4.72181	.99914	-1.17440	.25323	.92563
6.51833	-3.70354	.99917	-1.18209	.31067	.92666
6.51027	-2.73886	.99919	-1.27343	.27857	.92990
7.67188	-4.64831	.99907	-1.15568	.11107	.92489
7.56540	-3.63576	.99907	-1.20670	-.04554	.92602
7.44307	-2.66508	.99916	-1.24102	-.09792	.92672
8.62595	-4.54371	.99909	-1.19166	-.05719	.92372
8.52197	-3.52927	.99907	-1.21752	-.15307	.92579
8.38644	-2.55965	.99899	-1.35556	-.29759	.92604
9.68658	-4.38028	.99907	-1.11638	-.24411	.92039
9.54463	-3.37087	.99906	-1.31455	-.28309	.92034
9.33855	-2.41446	.99894	-1.51375	-.21794	.92224

TABLE III.- Continued

(e) M = 0.9; α = 5°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.48204	-4.67027	.99960	1.07403	2.62691	.89430
3.48901	-3.63995	.99965	.61700	2.96310	.89435
4.60599	-4.74829	.99965	1.28848	2.94111	.89323
4.51468	-3.70042	.99965	.81842	3.29280	.89291
4.71419	-2.77468	.99962	.15736	3.55971	.89353
5.51337	-4.74542	.99969	1.49534	3.20064	.89346
5.49833	-3.72545	.99970	1.01753	3.60489	.89186
5.99889	-2.81621	.99965	.36917	4.19831	.89077
6.58625	-4.72344	.99962	1.83487	3.53415	.88984
6.51842	-3.70549	.99969	1.36332	3.97963	.88908
6.51009	-2.73496	.99974	.66538	4.46300	.88923
7.64936	-4.65100	.99963	2.20427	3.76958	.89158
7.57255	-3.63446	.99967	1.75572	4.37845	.88740
7.44307	-2.66508	.99967	1.03948	5.10577	.88329
8.62603	-4.54435	.99963	2.66923	3.91130	.89107
8.49327	-3.53306	.99970	2.28775	4.69709	.86602
8.37983	-2.56249	.99969	1.67985	5.82832	.87599
9.66414	-4.38358	.99963	3.24679	3.92773	.89067
9.54463	-3.37087	.99967	3.15639	4.90079	.88670
9.33889	-2.41639	.99970	2.85086	6.27385	.87959

(f) M = 0.9; α = 10°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.73653	-4.71448	.99965	3.30156	4.37251	.85278
3.46790	-3.63221	.99967	2.41908	4.61934	.84990
4.72670	-4.75964	.99965	3.65605	4.99387	.85187
4.51468	-3.70042	.99975	2.72638	5.57279	.84933
5.60244	-2.77090	.99968	2.00219	7.08004	.84684
5.51337	-4.74607	.99969	4.08538	5.61919	.85188
5.49110	-3.72610	.99970	3.11147	6.37508	.84865
6.29656	-2.97010	.99974	1.69517	7.50198	.85164
6.58619	-4.72215	.99965	4.58983	6.32547	.85114
6.50393	-3.70547	.99974	3.61021	7.30798	.84661
6.47532	-2.73328	.99974	2.45345	7.93396	.84253
7.64942	-4.65164	.99962	5.27221	7.07530	.85493
7.56534	-3.63512	.99974	4.30032	8.23950	.84615
7.45693	-2.66450	.99970	3.04430	9.50742	.83763
8.62595	-4.54371	.99952	5.99224	7.65202	.86189
8.52205	-3.52991	.99962	5.22443	9.07671	.84919
8.39365	-2.56133	.99965	4.11156	10.92943	.83557
11.14009	-4.22210	.99943	6.85306	8.19797	.86969
9.76951	-3.35269	.99943	6.58572	9.57788	.85968
9.35265	-2.41460	.99940	5.95959	11.94626	.84447

TABLE III.- Continued

(g) M = 1.2; α = 0°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.53754	-3.66700	.99887	-1.28764	1.37116	1.23670
3.56089	-4.72701	1.00099	-1.16925	1.37925	1.24404
4.54325	-2.71132	.99530	-1.23551	1.41575	1.23458
4.48513	-3.71346	1.00036	-1.30587	1.09362	1.24338
4.93772	-4.79671	1.00240	-1.26092	1.17820	1.24710
5.40121	-2.79172	.99988	-1.47606	1.06073	1.23765
5.51281	-3.73585	1.00056	-1.31296	1.16552	1.24033
5.52093	-4.73957	1.00134	-1.44101	1.29723	1.23333
5.56762	-2.72553	.99794	-1.22868	1.03951	1.24241
6.52597	-3.71231	1.00086	-1.50694	1.26410	1.23113
6.58601	-4.71825	1.00181	-1.39373	1.18988	1.22995
7.50578	-2.66596	.99991	-1.54308	1.08638	1.23073
7.55173	-3.64547	1.00062	-1.54909	1.16805	1.22487
7.64907	-4.64776	1.00142	-1.33294	1.04960	1.23073
8.38593	-2.55579	.99960	-1.57238	1.05737	1.22306
8.67534	-3.52876	1.00096	-1.45030	.96327	1.22427
9.73370	-4.47227	1.00108	-1.45050	.64525	1.22381
9.37662	-2.39118	.99978	-1.68795	1.13116	1.21698
9.51070	-3.38681	1.00071	-1.43692	.82606	1.22148
9.81549	-4.37097	1.00106	-1.25025	.74063	1.22163

(h) M = 1.2; α = 5°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.51673	-3.65542	.99782	.54846	3.20025	1.17414
3.20251	-4.65485	.99905	.92935	2.88781	1.17923
4.51619	-2.69646	.99448	.23734	3.82404	1.16805
4.47805	-3.70988	.99841	.69306	3.51925	1.17277
4.92356	-4.75541	1.00038	1.35699	3.33425	1.18302
5.58144	-2.71963	.99634	.41552	4.32249	1.16866
5.48385	-3.73390	.99898	.95387	3.88957	1.18223
5.75543	-4.76617	.99969	1.34799	3.65050	1.18037
6.54320	-2.70153	.99790	.66597	4.75219	1.17989
6.51151	-3.71295	.99905	1.15529	4.37442	1.17499
6.58601	-4.71825	.99942	1.51373	3.94632	1.17160
7.24422	-2.78743	.99838	.88424	5.24802	1.17101
7.52993	-3.64546	.99836	-2.56061	4.69464	1.14962
7.37232	-4.69514	.99906	-1.84092	4.06137	1.14994
8.35668	-2.54587	.99840	1.33076	6.27307	1.16066
8.62344	-3.52346	.99947	2.03860	5.32403	1.16390
7.65648	-4.64579	.99894	1.85369	4.24387	1.16432
9.33594	-2.39974	.99820	2.38761	6.76643	1.15079
9.48897	-3.38666	.99829	2.68204	5.32292	1.14385
9.90895	-4.33587	.99805	2.89232	4.55540	1.14002

TABLE III.- Continued

(i) M = 1.2; α = 7.5°; area 1 (below wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
3.52450	-3.64956	.99716	1.35634	3.90915	1.13274
2.99329	-4.61945	.99843	1.95261	3.82633	1.13747
4.50937	-2.69420	.99500	.91858	4.75555	1.12643
4.49254	-3.70988	.99801	1.64605	4.40783	1.13831
4.13729	-4.73147	.99888	2.49603	3.97694	1.13729
5.57453	-2.72095	.99639	1.18009	5.46441	1.13368
5.49833	-3.73390	.99835	1.93661	5.00627	1.13992
4.57678	-4.72051	.99835	2.33118	4.06873	1.13658
6.52931	-2.70088	.99696	1.39415	6.27216	1.13286
6.50427	-3.71327	.99856	2.35614	5.56467	1.14072
6.60866	-4.71721	.99841	2.86453	5.02200	1.12957
7.38600	-2.64653	.99736	1.83322	6.99446	1.13740
7.53725	-3.64611	.99839	2.80155	6.21858	1.12911
7.64901	-4.64711	.99840	3.35249	5.56100	1.12132
8.35015	-2.54935	.99773	2.51600	8.02137	1.13174
8.62335	-3.52282	.99800	3.56361	6.87790	1.12124
8.67814	-4.53483	.99832	3.61916	5.89762	1.11642
9.32901	-2.40031	.99763	3.84461	8.82042	1.11583
9.47459	-3.39053	.99786	4.34667	7.19275	1.11562
9.90907	-4.33651	.99796	4.64792	6.35479	1.11459

TABLE III.- Continued

(j) M = 0.6; α = 0°; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.46425	1.03381	.99936	.27786	-1.86228	.60869
5.46292	2.97365	.99938	.09366	-.69623	.60671
5.51326	4.05659	.99942	.03311	-.47038	.60944
5.57513	5.03195	.99940	-.12680	-.25436	.60421
5.51449	7.05026	.99952	-.57778	-3.46259	.60325
5.50568	9.05965	.99945	-.58735	1.39545	.60427
7.06771	1.11695	.99955	1.58396	-1.39644	.60468
6.99230	2.11595	.99951	.95162	-.67219	.60588
6.91301	3.02716	.99943	.52548	-.48020	.60817
6.84811	4.10475	.99949	.16165	-.48059	.60256
6.75327	5.07006	.99943	.01064	-.34922	.60679
6.55824	7.10465	.99954	-.44303	-3.37147	.60179
6.37547	9.09399	.99942	-.50177	1.13799	.60324
8.66394	1.33019	.99977	2.04195	.23046	.59977
8.49515	2.31831	.99957	1.15012	-.01743	.60405
8.32621	3.21531	.99948	.60048	-.15468	.60659
8.14852	4.27976	.99952	.35682	-.37031	.60317
7.98358	5.23886	.99946	.03477	-.41245	.60247
7.64630	7.25413	.99957	-.31562	-3.18931	.60204
7.29246	9.21628	.99940	-.40962	.81479	.60366
10.23126	1.67447	.99958	.74153	.65184	.59928
9.92198	2.63681	.99957	.61403	.17889	.60520
9.72741	3.52821	.99945	.34701	-.08933	.60158
9.44235	4.57104	.99949	.21880	-.39196	.60326
9.19436	5.51277	.99948	.07631	-.53451	.60410
8.67278	7.48425	.99945	-.19330	-3.09628	.60094
8.17540	9.41785	.99945	-.33557	.49645	.60498
11.71780	2.12741	.99948	-.14137	-.05613	.60221
11.09044	3.96201	.99934	-.03042	-.38460	.60127
10.72425	4.97850	.99940	.07300	-.57875	.60322
10.38917	5.89494	.99941	-.02723	-.72497	.60432
9.68302	7.80393	.99945	-.12394	-2.44869	.60234
9.00446	9.68217	.99940	-.25033	.21971	.60518

TABLE III.- Continued

(k) M = 0.6; α = 5°; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.46999	1.03835	.99837	1.58111	-5.42399	.63095
5.47707	2.04336	.99869	2.02511	-4.48959	.63195
5.48343	2.96906	.99885	2.55591	-3.76655	.62979
5.51326	4.05274	.99905	2.88115	-3.15087	.62896
5.53463	5.02465	.99912	3.12652	-2.64862	.62355
5.51065	7.05156	.99939	2.97312	-5.85227	.61537
5.50569	9.05379	.99940	3.16886	.09696	.61647
7.07331	1.11674	.99769	3.93275	-6.42140	.63411
7.00304	2.11753	.99831	3.91177	-4.86643	.63352
6.90790	3.02672	.99864	3.96952	-3.96588	.63187
6.84328	4.10497	.99900	3.90678	-3.15880	.62459
6.74869	5.07096	.99905	3.90717	-2.63897	.61972
6.55790	7.10854	.99937	3.51553	-5.72840	.61800
6.37889	9.09168	.99940	3.55970	.12987	.61361
8.65819	1.32983	.99680	7.10027	-5.13373	.64055
8.50048	2.31925	.99792	6.02779	-3.73636	.63671
8.32610	3.21595	.99852	5.33141	-3.12904	.63197
8.14369	4.27957	.99884	4.98838	-2.65291	.62541
7.99230	5.24106	.99907	4.66426	-2.21217	.62184
7.64240	7.25410	.99937	4.08286	-5.15407	.61687
7.28918	9.21635	.99942	3.95027	.28198	.61532
10.17787	1.65213	.99697	8.89866	-2.59510	.63782
9.92198	2.63681	.99819	7.12818	-1.85502	.63477
9.71255	3.52423	.99856	6.20933	-1.84068	.62747
9.44252	4.57041	.99893	5.55274	-1.75944	.62467
9.18987	5.51223	.99914	5.14537	-1.58173	.62208
8.67295	7.46362	.99930	4.57518	-4.24605	.61554
8.16627	9.41470	.99935	4.18938	.43202	.61622
11.71241	2.12545	.99847	7.81728	-.04969	.62409
11.37859	3.09421	.99874	7.06982	-.48128	.62948
11.09066	3.96140	.99881	6.35604	-.78116	.62369
10.72425	4.97850	.99908	5.90200	-.88753	.62463
10.38474	5.89401	.99914	5.52544	-.92782	.62140
9.67963	7.80200	.99928	4.85999	-3.10627	.61586
9.00402	9.68339	.99940	4.42076	.63645	.61574

TABLE III.- Continued

(l) $M = 0.6$; $\alpha = 10°$; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.48147	1.04418	.99857	-1.14734	-1.89917	.65472
5.48249	2.04790	.99848	.35052	-4.93880	.66201
5.48343	2.96581	.99813	1.39520	-5.99018	.66171
5.51806	4.04560	.99813	3.50518	-5.98142	.65303
5.53036	5.01879	.99788	4.46265	-5.43879	.65096
5.50296	7.05480	.99814	5.62361	-8.19357	.63928
5.50890	9.05445	.99835	6.22561	-1.76528	.63949
7.06743	1.12019	.95788	-17.05172	-10.40685	.68404
7.00826	2.11995	.99237	-1.05065	-14.07908	.67591
6.93340	3.02960	.99472	2.79690	-10.31060	.66607
6.84316	4.10627	.99646	5.19291	-7.58401	.65634
6.74405	5.07252	.99657	6.06140	-6.11860	.65204
6.55013	7.10917	.99770	6.72094	-8.12642	.64375
6.38535	9.09159	.99802	7.01731	-1.51384	.63684
8.67500	1.33347	.88269	22.04520	-16.31599	.70803
8.51081	2.32307	.97570	11.15963	-12.21597	.68079
8.35112	3.22170	.98769	9.45462	-9.24602	.66949
8.13875	4.28002	.99349	8.75446	-7.07178	.65990
7.97860	5.24128	.99493	8.62885	-5.77201	.65576
7.63450	7.25467	.99705	8.13834	-7.24604	.64547
7.28918	9.21635	.99761	7.93933	-1.05315	.64156
10.20172	1.65175	.96121	23.96693	-3.98803	.72191
9.92721	2.63821	.97829	17.23511	-5.21704	.68372
9.72725	3.52884	.98562	14.19968	-5.22820	.66712
9.44218	4.57167	.99157	11.90593	-4.75407	.65890
9.18970	5.51286	.99364	10.87445	-4.26328	.65454
8.66823	7.48639	.99658	9.22476	-5.96995	.64451
8.12300	9.40242	.99744	8.57480	-1.18258	.64042
11.71241	2.12545	.98299	18.21067	.19663	.67951
11.37815	3.09543	.98611	16.38614	-1.19859	.67250
11.09066	3.96140	.98927	14.48343	-2.11851	.66155
10.71525	4.97521	.99249	12.83114	-2.45496	.65667
10.38873	5.89616	.99400	11.90595	-2.46460	.65239
9.67513	7.80313	.99646	9.94987	-4.21172	.64275
9.00055	9.68351	.99748	8.98287	-.46545	.63962

TABLE III.- Continued

(m) M = 0.9; $\alpha = 0°$; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.49868	1.05133	.99909	.82302	-2.16990	.91249
5.52040	2.06936	.99909	.67848	-1.32054	.91632
5.55496	3.05106	.99912	.54842	-1.04425	.91688
5.49890	4.09499	.99927	.31917	-.73688	.91078
5.50791	5.06751	.99934	.19473	-.53872	.90718
5.55681	7.04583	.99923	-.05956	.35333	.91020
5.45756	9.07403	.99920	-.23167	1.39623	.90561
7.10072	1.13419	.99921	2.26912	-1.36048	.90832
7.01303	2.12755	.99916	1.47377	-.81821	.91281
6.93214	3.10193	.99921	.96241	-.77988	.91430
6.83972	4.14512	.99928	.71407	-.70126	.90987
6.73821	5.13922	.99936	.46085	-.60611	.90830
6.51677	7.09329	.99922	.05016	.53504	.90866
6.45944	9.05913	.99920	-.08409	.99255	.90629
8.71900	1.34791	.99941	2.43203	.24383	.90059
8.51024	2.32627	.99930	1.66505	-.25348	.90677
8.31449	3.28190	.99934	1.11464	-.51252	.91413
8.14825	4.30876	.99925	.85408	-.61296	.90536
7.95714	5.26566	.99929	.64211	-.69640	.90560
7.65271	7.24009	.99920	.23793	.23659	.90830
7.37182	9.19373	.99916	.05200	.48117	.90578
10.26728	1.69498	.99943	1.02825	.41948	.89589
10.07810	2.66181	.99930	1.05125	-.13984	.90280
9.83358	3.62523	.99931	.91176	-.49516	.91296
9.41058	4.57870	.99923	.87947	-.68538	.90662
9.18789	5.55411	.99933	.63245	-.85487	.90509
8.62262	7.41641	.99918	.29599	-.08316	.90587
8.18188	9.39401	.99915	.18017	.18009	.90560
11.49483	3.13901	.99932	.62812	-.48163	.90273
11.08364	4.02526	.99915	.59007	-.76884	.91484
10.67505	4.97374	.99918	.73383	-.92947	.90234
10.36452	5.92331	.99929	.63221	-1.06070	.90436
9.74995	7.77796	.99916	.36269	-.38334	.90448
8.99169	9.66090	.99918	.23214	-.13236	.90487

TABLE III.- Continued

(n) M = 0.9; α = 5°; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.46430	1.05851	.99736	1.84141	-6.43205	.95021
5.52582	2.06417	.99778	2.92106	-5.22440	.94380
5.54988	3.04454	.99839	2.84816	-4.34733	.95006
5.47503	4.09696	.99862	3.14140	-3.60874	.93784
5.49004	5.07532	.99885	3.41035	-3.05132	.93385
5.56452	7.04262	.99898	3.50350	-1.60009	.93234
5.56055	9.01627	.99910	3.52507	-.16981	.92616
7.10061	1.13549	.99577	4.81078	-7.09206	.93016
7.02388	2.12786	.99716	4.78824	-5.43791	.93608
6.93740	3.10044	.99794	4.44490	-4.41447	.94144
6.82556	4.14257	.99833	4.41813	-3.56845	.93483
6.72042	5.13767	.99861	4.34485	-2.92092	.93023
6.57160	7.08429	.99887	4.07962	-1.44807	.92777
6.44080	9.08546	.99906	3.93338	-.09757	.92148
8.67399	1.33922	.99386	8.63489	-5.62904	.94239
8.50456	2.32724	.99643	7.14826	-4.13584	.94671
8.33438	3.28673	.99758	6.10934	-3.49924	.94197
8.13435	4.30499	.99804	5.58253	-2.95059	.93210
7.94405	5.28273	.99851	5.26289	-2.48821	.93015
7.65283	7.23945	.99884	4.71760	-1.04740	.92448
7.32556	9.19581	.99901	4.30791	-.07037	.92293
10.23997	1.68624	.99555	9.60282	-2.05117	.94367
10.03111	2.66891	.99687	8.10351	-2.37153	.94194
9.82849	3.62449	.99775	7.02218	-1.95835	.94291
9.43797	4.58737	.99802	6.40899	-1.96276	.93506
9.16232	5.54591	.99849	5.88093	-1.86111	.92923
8.75597	7.45705	.99879	5.14386	-.58432	.92319
8.10077	9.39855	.99903	4.62269	.11543	.92173
11.44404	3.12022	.99810	7.57427	-.56828	.93498
11.03587	4.00718	.99816	6.97498	-.92023	.94165
10.62103	4.95430	.99821	6.62243	-1.06594	.93452
10.36452	5.92331	.99858	6.12702	-1.11392	.92750
9.67407	7.77230	.99884	5.31772	-.12140	.92254
8.99885	9.66005	.99904	4.82812	.36662	.91998

TABLE III.- Continued

(o) $M = 0.9$; $\alpha = 10°$; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.44711	1.06160	.99374	-8.06918	3.95579	.95904
5.53124	2.06157	.99437	-4.42047	-6.76696	1.05869
5.54989	3.03999	.99635	-.15256	-8.30719	1.03663
5.46547	4.09373	.99647	2.43835	-7.53941	.96476
5.47665	5.08118	.99662	4.34452	-6.65970	.94525
5.54914	7.03995	.99686	6.04480	-4.33447	.95017
5.58313	9.01707	.99729	6.54443	-2.24122	.95353
7.06642	1.13185	.59517	-6.77322	11.75001	.85246
7.02388	2.12780	.95530	1.59616	-21.38728	.87520
6.92214	3.09909	.98616	3.19172	-13.66200	.92950
6.80674	4.13832	.99163	5.27108	-9.47121	.92658
6.74813	5.12634	.99358	6.64669	-7.45650	.94026
6.55231	7.08391	.99582	7.41869	-4.36696	.96844
6.52233	9.04629	.99676	7.54210	-2.11624	.96082
8.64024	1.33262	.86247	24.41164	-13.55976	.83504
8.51557	2.32722	.94215	18.57508	-12.57308	.87219
8.33964	3.26634	.97448	12.38017	-10.56422	.90959
8.12011	4.30315	.98538	10.34392	-8.39216	.92398
7.93107	5.27915	.99058	9.63393	-6.79402	.94142
7.68542	7.23212	.99461	8.94450	-3.90181	.96367
7.35098	8.83118	.99623	8.95965	-2.45868	.97661
9.98408	2.65614	.96247	20.15012	-4.71085	.89975
9.81406	3.61916	.97539	16.40252	-5.13847	.92511
9.43319	4.58675	.98299	13.75897	-5.26690	.93407
9.16664	5.54707	.98850	12.17329	-4.75725	.94745
8.74732	7.45940	.99374	10.19173	-2.67921	.97063
8.89911	9.63327	.99568	9.71212	-.71946	.97755
11.40292	3.10653	.97853	17.41259	-.77523	.94412
11.07885	4.02353	.98203	15.86413	-1.75857	.95147
10.68360	4.97823	.98497	14.55143	-2.49743	.94845
10.35612	5.92025	.98913	13.04111	-2.62354	.96237
9.65938	7.76767	.99352	10.95631	-1.41229	.98072
9.18492	9.32465	.99630	9.87900	-.71305	.98682

TABLE III.- Continued

(p) M = 1.2; α = 0°; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.41284	1.08274	.99357	.84822	-5.70192	1.23592
5.47716	2.11032	.99660	.79701	-1.95146	1.22445
5.46320	3.09586	.98609	.48435	-1.29394	1.22029
5.47026	4.10217	.98438	.00456	-.89414	1.18584
5.47217	5.07664	.99306	.32480	-.61304	1.21827
5.51445	7.08992	.99534	.22316	-2.04811	1.21474
5.49606	9.08890	.99753	.28361	1.49572	1.21658
7.12158	1.15823	.99262	2.59340	-2.05150	1.20076
7.03171	2.16184	.99370	1.76522	-1.35232	1.21876
6.91787	3.14766	.98709	1.10407	-1.03527	1.19270
6.87596	4.16861	.98859	.80009	-.86421	1.20474
6.72148	5.12536	.99584	.83930	-.68029	1.21708
6.54458	7.12892	.99791	.45596	-1.61834	1.22126
6.39792	9.13184	.99871	.34285	1.13619	1.22206
8.68072	1.36683	.99319	2.97258	2.13658	1.17423
8.61553	2.38233	.99519	2.18315	-.42168	1.20376
8.46734	3.35387	.99280	1.57002	-.47200	1.20512
8.20479	4.34531	.99097	1.03024	-.60491	1.19423
7.98771	5.29241	.99663	.98851	-.68581	1.21644
7.62044	7.26802	.99786	.71162	-1.79875	1.21516
7.26231	9.23933	.99888	.45515	.83550	1.22117
10.21932	1.69684	.99851	1.71494	.77990	1.20412
10.01366	2.69178	.99829	1.59892	.20728	1.20736
9.81861	3.66021	.99492	1.56605	-.16091	1.20465
9.47324	4.62179	.99458	1.27719	-.43068	1.19902
9.19821	5.55016	.99679	1.00845	-.74516	1.20869
8.71167	7.50220	.99868	.78140	-1.56721	1.21688
8.18163	9.44380	.99909	.45881	.51119	1.22000
11.04852	4.04705	.99576	1.24472	-.38366	1.20286
10.76486	5.03436	.99484	1.05753	-.58684	1.20264
10.40387	5.93287	.99663	1.01490	-.74497	1.20334
9.66636	7.80478	.99824	.81454	-1.12678	1.21163
8.98461	9.69914	.99915	.61663	.28760	1.21754

TABLE III.- Continued.

(q) M = 1.2; α = 5°; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.37851	1.08468	.98342	1.64888	-11.62457	1.26759
5.42855	2.10785	.98493	2.35759	-9.81708	1.24599
5.42755	3.09013	.97803	2.38838	-4.23892	1.21212
5.45118	4.10417	.97854	3.03338	-5.61794	1.19182
5.46324	5.07601	.98360	3.57180	-4.28386	1.19418
5.49912	7.08796	.98634	3.97568	-5.78631	1.16838
5.49606	9.09410	.98904	3.97383	2.53656	1.16585
7.13286	1.16056	.97113	5.91055	-10.97907	1.17535
7.00439	2.16399	.97747	5.48698	-8.26189	1.17313
6.88229	3.14522	.97734	4.71009	-6.58181	1.17554
6.84270	4.16562	.97662	4.27571	-5.32717	1.15437
6.70796	5.12616	.98285	4.88184	-4.01121	1.16317
6.55626	7.12732	.98700	4.64200	-5.21526	1.16188
6.40111	9.13213	.98885	4.34503	2.53169	1.16190
8.65210	1.36441	.96880	12.12577	-5.35703	1.13378
8.60490	2.38037	.97690	9.46723	-4.17935	1.13475
8.48713	3.35890	.97912	7.22155	-3.11019	1.14349
8.19494	4.34616	.98070	6.05324	-2.71905	1.14979
7.93548	5.27991	.98560	5.60873	-2.52190	1.15135
7.59100	7.25824	.98702	4.99471	-5.22495	1.15447
7.24248	9.24114	.98961	4.73911	2.89101	1.15506
10.20222	1.69428	.97990	11.89148	-1.14980	1.15193
9.96147	2.67765	.98201	9.93098	-2.43891	1.14645
9.79878	3.65541	.98085	8.89353	-2.42016	1.13192
9.42888	4.62127	.98111	7.25295	-1.91749	1.13737
9.15918	5.54036	.98326	6.20915	-1.69901	1.14033
8.65947	7.48942	.98646	5.46691	-2.57475	1.14761
8.13715	9.43647	.98906	4.95994	3.10359	1.15446
11.04329	4.04653	.98408	8.51509	-1.18372	1.13734
10.71422	5.01982	.98357	7.83492	-.79571	1.13256
10.36255	5.91566	.98498	6.49203	-.87628	1.13671
9.68417	7.81196	.98766	5.71779	-1.15661	1.14528
8.98717	9.70146	.98998	5.24966	.74397	1.14930

TABLE III.- Continued

(r) M = 1.2; α = 7.5°; area 2 (above wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.37281	1.08752	.70155	2.59371	-3.44627	.92741
5.41234	2.10532	.97678	2.43660	-12.00156	1.25674
5.39190	3.08638	.97298	2.62559	-5.53906	1.22262
5.44164	4.10551	.97120	3.71222	-8.04322	1.18461
5.44091	5.07609	.97716	5.04571	-6.87767	1.17626
5.50295	7.08796	.98999	1.45663	-9.76218	1.24460
5.49286	9.09410	.98861	3.09663	.50785	1.20012
7.12722	1.15940	.93157	1.36097	-23.40772	1.28461
6.97209	2.16117	.96570	4.51617	-13.70752	1.21263
6.86205	3.14285	.96758	5.63066	-10.52835	1.17691
6.85707	4.16560	.97609	1.38466	-10.21611	1.24489
6.71692	5.12628	.98378	2.40697	-4.30699	1.23427
6.56744	7.13156	.98147	6.44163	-4.58274	1.14972
6.40094	9.13407	.98493	6.36220	-.75588	1.14900
8.66337	1.36639	.91101	10.48213	-20.93914	1.17524
8.59427	2.37842	.95209	6.97517	-13.18874	1.18312
8.46711	3.35515	.96620	5.37164	-8.90914	1.17824
8.18543	4.34511	.97112	10.54538	-4.72813	1.13306
7.91897	5.27045	.97753	9.67867	-4.05676	1.13704
7.59134	7.25632	.98166	8.39639	-4.84771	1.13831
7.23922	9.24123	.98430	7.57712	-.49778	1.14149
10.19082	1.69258	.95309	19.67204	-3.25316	1.13622
9.96449	2.68722	.96479	16.02564	-3.73884	1.14983
9.78456	3.64948	.96803	13.95523	-3.67222	1.14459
9.43776	4.62500	.97274	12.11220	-3.51362	1.14271
9.17180	5.54508	.97854	10.76718	-3.12870	1.14476
8.65862	7.49256	.98185	9.29704	-3.55089	1.14039
8.14300	9.43939	.98540	8.35490	-.55282	1.13974
11.04830	4.04766	.97795	12.83673	1.10507	1.15542
10.70032	5.01613	.97920	11.78147	.52291	1.15186
10.35857	5.91352	.98136	10.78033	.19795	1.15041
9.68800	7.81267	.98484	9.36251	-1.74103	1.14767
8.98996	9.70317	.98623	8.50715	.02077	1.14324

TABLE III.- Continued

(s) M = 0.6; α = 0°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.52435	1.64978	.99961	1.36575	1.86834	.59947
5.45002	.66627	.99969	1.47967	2.66098	.59947
7.29311	1.74067	.99952	.25451	1.41708	.60371
6.95892	.72882	.99959	.16688	1.87916	.60134
8.37975	1.89818	.99945	.04146	1.02885	.60450
8.48245	.93195	.99950	-.09832	1.09492	.60447
9.72859	2.20658	.99943	-.14008	.52969	.60310
9.97733	1.26438	.99947	-.29855	.55414	.60591
11.09077	2.63951	.99931	-.10615	.11576	.60378
11.42102	1.72408	.99938	-.18508	.08404	.60497

(t) M = 0.6; α = 5°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.50393	1.64587	.99777	6.43741	-1.22547	.63221
5.51500	.66621	.99647	10.25742	-.89941	.63748
6.93734	1.70509	.99861	7.70388	.80033	.62708
6.93178	.72849	.99863	8.12082	.54220	.62401
8.22345	1.87277	.99899	6.85166	1.23835	.62165
8.51477	.93570	.99916	6.84787	1.66640	.61873
9.68930	2.19535	.99925	6.17771	1.49003	.61455
9.97733	1.26438	.99933	6.10902	1.71746	.61516
11.04236	2.62321	.99933	5.70485	1.67118	.61214
11.39605	1.71356	.99947	5.59565	1.75726	.61202

(u) M = 0.6; α = 10°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.48861	1.64197	.98488	15.47164	-4.28011	.66986
5.46626	.66623	.97018	20.60344	-4.37400	.69180
6.92208	1.70374	.98909	15.24061	-.88761	.65714
7.01808	.73591	.98674	16.78527	.47764	.66264
8.40430	1.90594	.99298	13.81925	.71413	.65205
8.49345	.93191	.99300	14.04628	1.49426	.64388
9.67467	2.19078	.99532	12.57817	1.48131	.63401
9.97750	1.26375	.99544	12.50718	1.99278	.63636
11.05085	2.62976	.99668	11.58613	1.84356	.63423
11.38610	1.70924	.99678	11.50277	2.35519	.63269

TABLE III.- Continued

(v) M = 0.9; α = 0°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.42832	.65725	.99949	2.22030	2.43867	.89508
5.37632	1.65284	.99943	1.82971	1.56419	.90044
7.04116	.72100	.99942	.92760	1.48649	.89894
6.93665	1.71286	.99937	.92545	1.20049	.90719
8.52863	.91968	.99935	.49983	.76818	.90604
8.32251	1.89919	.99935	.60536	.70385	.90848
9.93546	1.23229	.99925	.40243	.21794	.90534
9.68763	2.20163	.99919	.32522	.19151	.90489
11.34692	1.67429	.99916	.41791	-.23080	.90801
11.26044	2.71051	.99925	.44294	-.32861	.90596

(w) M = 0.9; α = 5°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.39038	.65464	.99447	10.99002	-.47619	.94403
5.48351	1.65042	.99667	8.83426	-1.09808	.93790
6.95484	.71281	.99803	8.47724	.72639	.92580
6.88060	1.70928	.99803	8.00901	.03582	.93008
8.56597	.92639	.99883	7.10598	1.56375	.91813
8.33268	1.90033	.99866	7.04613	1.18863	.92488
10.04516	1.26259	.99906	6.37080	1.54440	.91581
9.80586	2.23371	.99894	6.38081	1.33582	.92007
11.38746	1.68967	.99916	5.93886	1.52488	.90997
11.04059	2.62810	.99904	5.95911	1.42952	.91637

(x) M = 0.9; α = 10°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.37953	.65297	.95027	23.17022	-3.46536	.86524
5.48861	1.64977	.97634	16.78419	-4.15732	.92683
7.09537	.72335	.98106	17.06758	1.03432	.93404
6.89083	1.70950	.98375	15.81839	-.47965	.94290
8.54997	.92350	.98989	14.21756	1.91659	.93827
8.31291	1.89486	.98973	13.99004	1.10567	.94061
9.98781	1.24633	.99358	12.68934	2.31179	.93977
9.75645	2.22087	.99335	12.61758	1.86723	.94295
11.35158	1.67735	.99540	11.71054	2.58221	.93827
11.04059	2.62810	.99517	11.68701	2.32873	.94251

TABLE III.- Concluded

(y) M = 1.2; α = 0°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.35023	.69796	.98604	2.85240	8.38815	1.17314
5.44281	1.69147	.99519	2.13528	1.75965	1.20318
6.98353	.75834	.99032	1.27586	1.71710	1.18957
6.95809	1.75917	.99706	1.40847	1.28222	1.22771
8.70318	.98616	.99198	.49923	.73451	1.18958
8.23578	1.92170	.99941	.78548	1.97704	1.23637
9.96097	1.26267	.99629	.21063	.21054	1.20661
9.62527	2.19787	1.00031	.37476	.15830	1.23192
11.44269	1.72768	.99677	.34300	-.38372	1.21295
11.07627	2.64943	1.00148	.12192	-.37556	1.22561

(z) M = 1.2; α = 5°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.40687	.69765	.97182	12.76483	-.46395	1.14216
5.41736	1.69288	.98034	10.63404	-1.12962	1.14296
6.92433	.75266	.98471	8.61578	.81241	1.13645
6.84138	1.74968	.98686	8.64658	.02253	1.13901
8.41625	.93362	.98787	6.66523	1.57926	1.12593
8.38973	1.92966	.98971	6.60118	1.13667	1.13332
9.92910	1.25616	.98854	6.16077	1.37329	1.13114
9.68410	2.21482	.99071	6.17132	1.26924	1.13924
11.42169	1.72224	.98907	5.83651	1.45808	1.13611
11.00892	2.62561	.99120	5.87580	1.36915	1.14430

(aa) M = 1.2; α = 7.5°; area 3 (forward of wing)

BUTT LINE	WATER LINE	PTL/PTINF	ALPHA	BETA	MACH
5.40146	.69638	.94684	18.97538	-1.64845	1.13316
5.40209	1.69362	.96995	14.92624	-2.39940	1.14935
6.87600	.74675	.97867	13.14150	6.34119	1.15561
6.98870	1.76001	.98192	12.35782	4.05836	1.15644
8.40614	.92859	.98587	10.46419	7.26251	1.15004
8.38015	1.92468	.98759	10.52745	6.10896	1.15717
9.88791	1.24255	.98827	9.53495	1.42035	1.14927
9.67951	2.21225	.98832	9.55732	6.56601	1.15263
11.41750	1.71795	.99044	8.59642	1.69035	1.14710
11.00870	2.62623	.99079	8.65062	7.19748	1.15057

TABLE IV.- WING AND FUSELAGE STATIC PRESSURE DATA

(a) Fuselage static pressure tap locations

Tap no.	Water line	Model station
1	Top	9.0
2	Top	29.0
3	Top	49.0
4	4.8	29.0
5	4.8	39.0
6	4.8	49.0
7	3.0	19.0
8	3.0	29.0
9	3.0	39.0
10	1.2	19.0
11	1.2	29.0
12	1.2	39.0
13	0.0	9.0
14	↓	19.0
15	↓	29.0
16	↓	39.0
17	-0.6	9.0
18	↓	19.0
19	↓	29.0
20	↓	39.0
21	Bottom	9.0
22	↓	19.0
23	↓	29.0
24	↓	39.0

TABLE IV.- Continued

(b) Fuselage static pressure coefficients

M	α, deg	Pressure coefficient at tap no. - 1	2	3	4	5	6	7	8
1.200	-0.024	0.1718	-0.1193	0.0013	-0.0840	-0.0707	-0.0066	-0.0492	-0.0672
1.201	4.965	.1147	-.1389	-.0232	-.0917	-.1004	-.0452	.0037	-.0648
1.201	7.486	.0882	-.1397	-.0387	-.1030	-.1317	-.0714	.0273	-.0670
.898	.085	.1097	-.1266	.0050	-.1034	-.0845	.0030	.0131	-.0932
.898	4.977	.0533	-.1342	-.0393	-.1188	-.1176	-.0592	.0414	-.0985
.899	9.988	.0152	-.1216	-.0783	-.1526	-.1590	-.1341	.0794	-.1123
.598	-.014	.0877	-.1143	-.0112	-.1000	-.0783	-.0077	-.0299	-.0887
.600	4.989	.0321	-.1210	-.0363	-.1106	-.1239	-.0639	.0129	-.0919
.601	9.973	-.0020	-.1187	-.0838	-.1486	-.1839	-.1392	.0437	-.1059

M	α, deg	Pressure coefficient at tap no. - 9	10	11	12	13	14	15	16
1.200	-0.024	-0.0857	-0.0146	-0.0293	-0.0499	0.0793	-0.0134	-0.0003	-0.0363
1.201	4.965	-.0868	.0093	-.0153	-.0552	.0997	-.0045	.0233	-.0475
1.201	7.486	-.1039	.0041	-.0137	-.0733	.0933	-.0244	.0201	-.0653
.898	.085	-.0790	.0044	-.0673	-.0322	.0242	-.0177	-.0476	-.0197
.898	4.977	-.0868	.0265	-.0671	-.0505	.0484	.0073	-.0464	-.0281
.899	9.988	-.1100	.0210	-.0940	-.0847	.0187	-.0211	-.0812	-.0789
.598	-.014	-.0749	-.0270	-.0512	-.0359	-.0023	-.0438	-.0359	-.0220
.600	4.989	-.0964	-.0043	-.0555	-.0526	.0287	-.0147	-.0349	-.0358
.601	9.973	-.1392	-.0147	-.0799	-.1088	-.0015	-.0422	-.0760	-.0887

M	α, deg	Pressure coefficient at tap no. - 17	18	19	20	21	22	23	24
1.200	-0.024	0.0121	-0.0155	0.0168	-0.0361	0.0449	-0.0267	0.0224	-0.0370
1.201	4.965	.0507	-.0192	.0468	-.0337	.0772	-.0256	.0615	-.0223
1.201	7.486	.0533	-.0319	.0589	-.0469	.1015	-.0181	.0828	-.0078
.898	.085	-.0458	-.0162	-.0400	-.0174	-.0081	-.0162	-.0438	-.0136
.898	4.977	.0056	-.0043	-.0287	-.0241	.0274	-.0107	-.0273	-.0066
.899	9.988	.0004	-.0156	-.0380	-.0429	.0788	.0175	.0111	.0358
.598	-.014	-.0600	-.0438	-.0299	-.0206	-.0240	-.0309	-.0329	-.0206
.600	4.989	-.0068	-.0147	-.0186	-.0206	.0124	-.0137	-.0181	-.0009
.601	9.973	-.0182	-.0422	-.0260	-.0436	.0624	.0093	.0177	.0457

TABLE IV.- Continued

(c) Wing static pressure tap locations

Tap no.	Model station	Butt line	Surface
1	51.79	6.581	Upper
2		3.997	Lower
3		4.800	Lower
4		6.100	Lower
5	59.09	7.295	Upper
6		7.900	Upper
7		9.811	Upper
8		6.600	Lower
9		7.900	Lower
10		9.308	Lower

TABLE IV.- Concluded

(d) Wing static pressure coefficients

M	α, deg	Pressure coefficient at tap no. -				
		1	2	3	4	5
1.200	-0.024	-0.0279	-0.0011	0.0243	-0.0526	-0.0289
1.201	4.965	-.1018	.0856	.1225	.0700	-.1297
1.201	7.486	-.2047	.1378	.1784	.1383	-.1603
.898	.085	-.0308	-.0338	.0007	-.0529	-.0411
.898	4.977	-.2971	.0471	.0870	.0597	-.1821
.899	9.988	-.7539	.1466	.1930	.1647	-.7911
.598	-.014	-.0056	-.0532	-.0340	-.0708	-.0368
.600	4.989	-.3004	.0234	.0542	.0542	-.1583
.601	9.973	-.9099	.1258	.1743	.1516	-.3622

M	α, deg	Pressure coefficient at tap no. -				
		6	7	8	9	10
1.200	-0.024	-0.0336	0.0545	0.0198	-0.0005	0.0164
1.201	4.965	-.1535	-.3805	.1029	.0954	.1333
1.201	7.486	-.2892	-.3980	.1433	.1417	.1784
.898	.085	-.0413	.0382	-.0369	-.0533	-.0279
.898	4.977	-.2025	-.3422	.0438	.0433	.0954
.899	9.988	-.9374	-.5841	.1323	.1398	.1757
.598	-.014	-.0372	.0510	-.0593	-.0772	-.0650
.600	4.989	-.1779	-.3261	.0255	.0255	.0889
.601	9.973	-.9787	-.6192	.1136	.1223	.1652

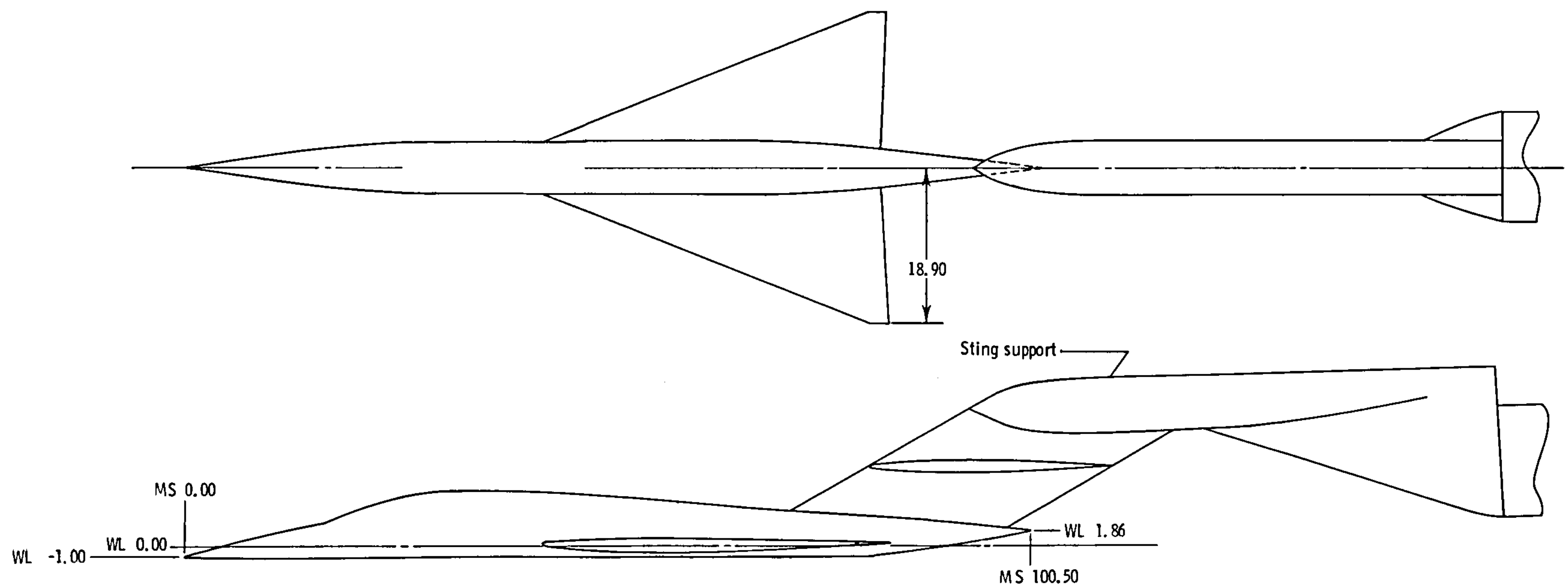
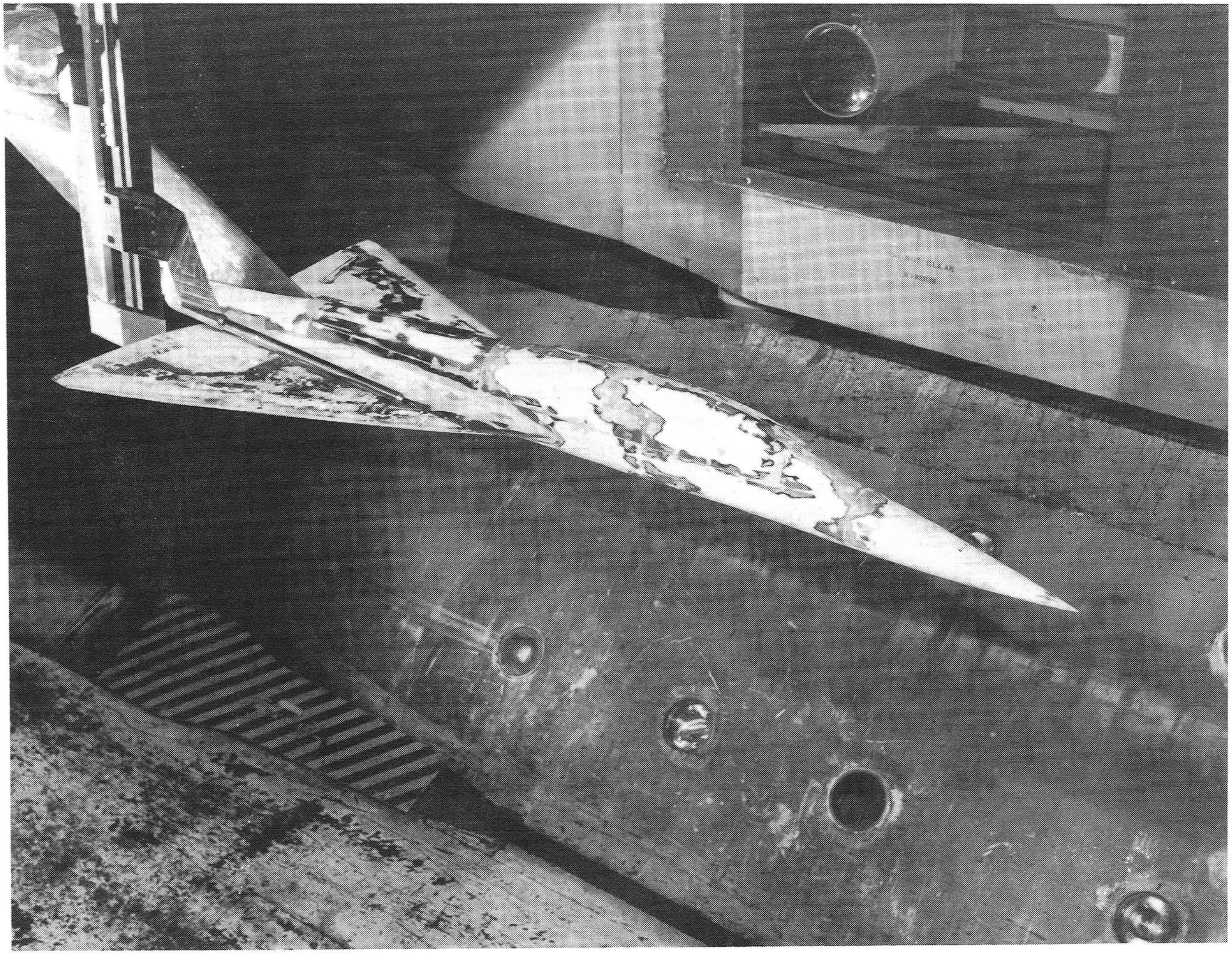


Figure 1.- General arrangement of model and support system. All dimensions in inches.



L-82-6,186

Figure 2.- Model with flow survey probe installed in the Langley 16-Foot Transonic Tunnel.

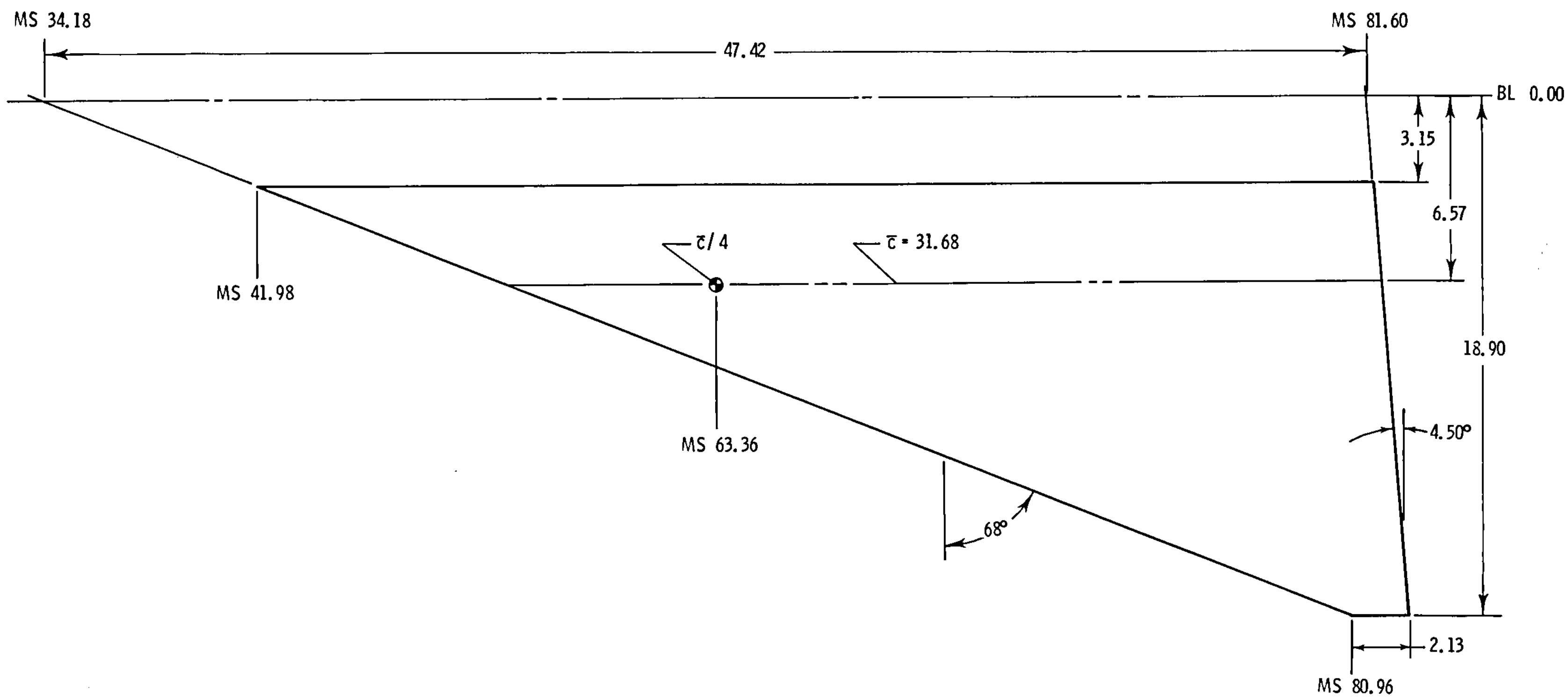


Figure 3.- Planform geometry of wing. All dimensions in inches unless otherwise noted.

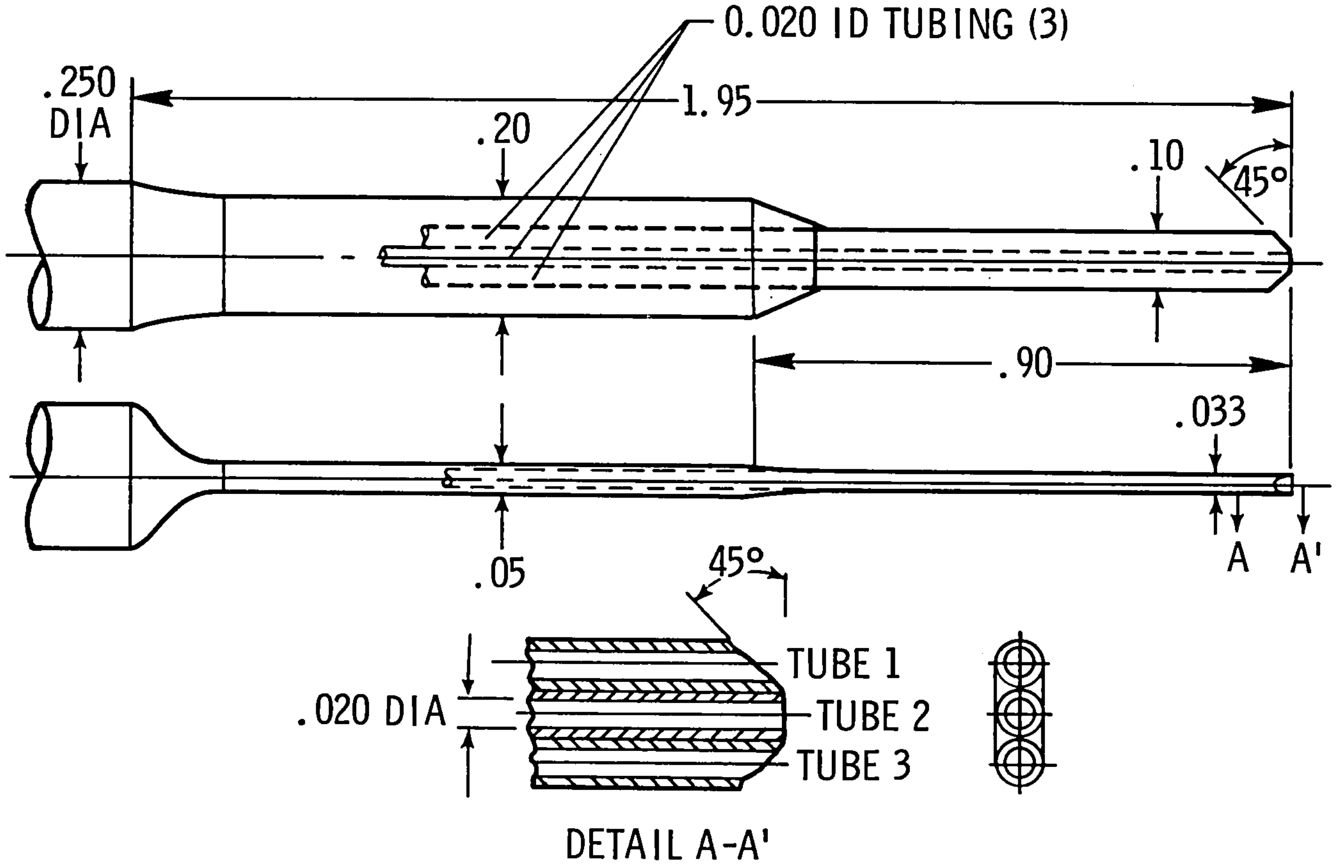
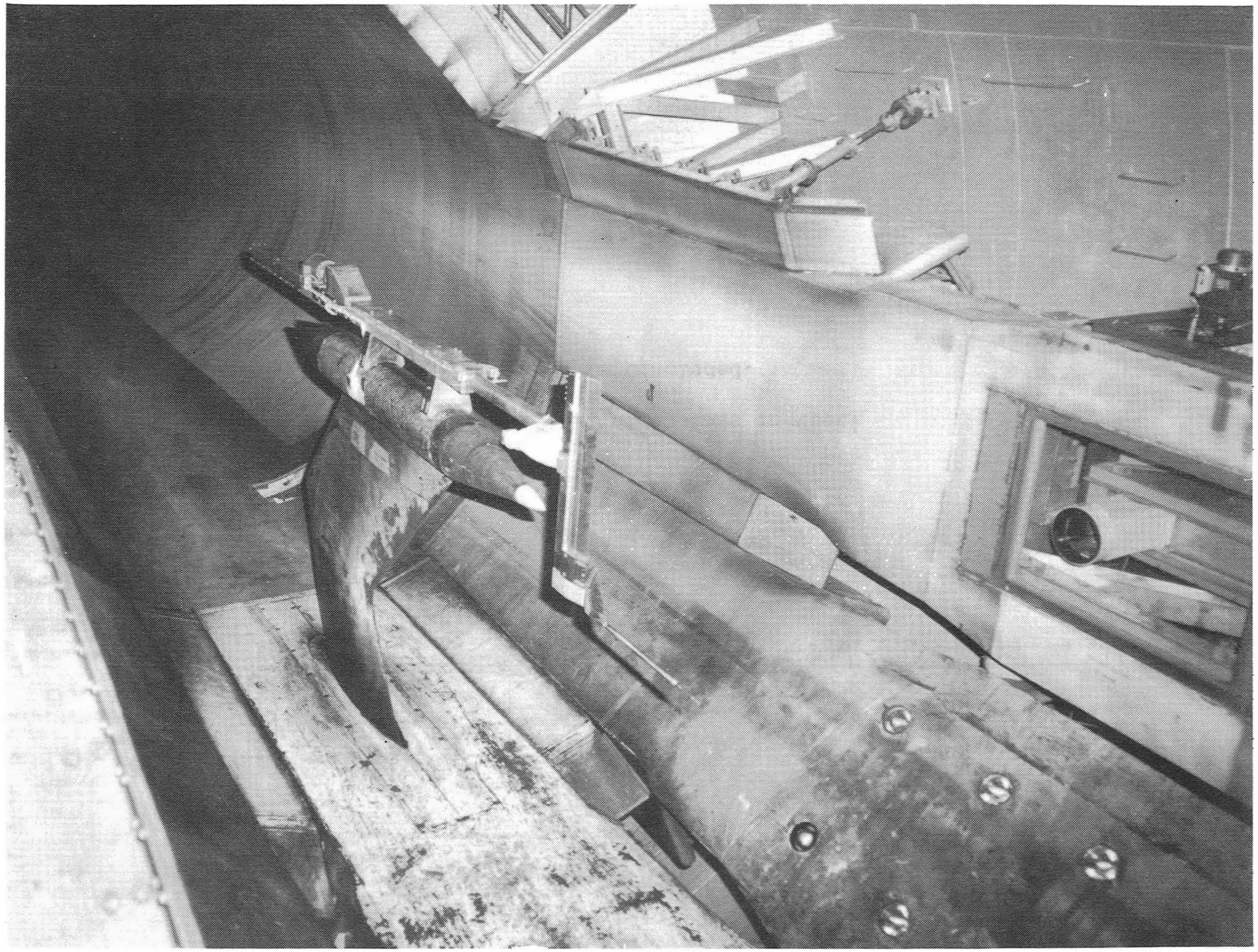


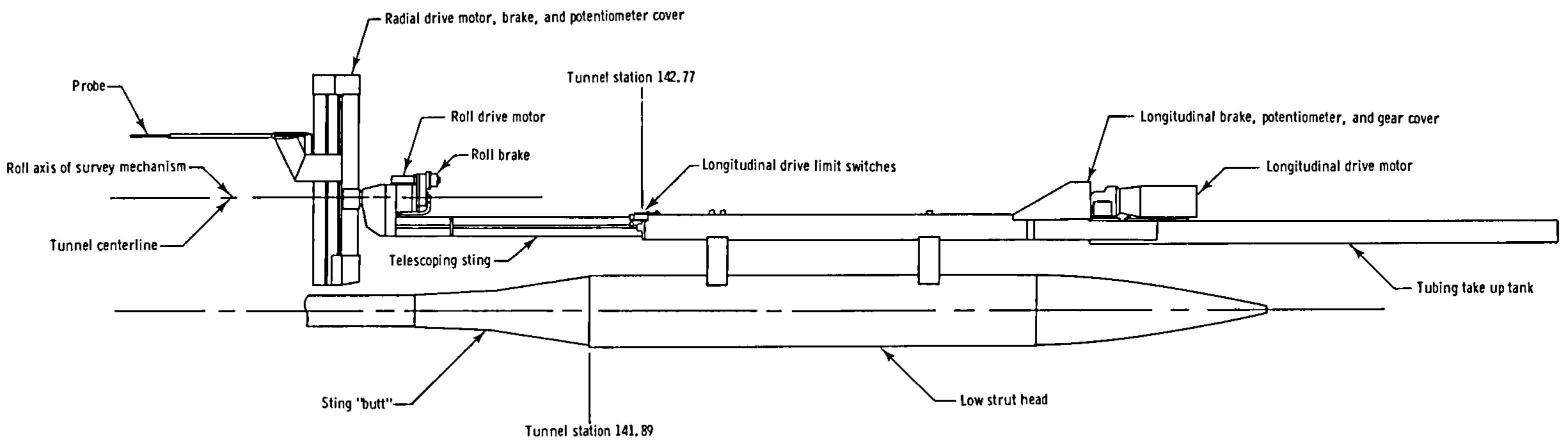
Figure 4.- Details of 3-orifice survey probe. All dimensions in inches.



L-82-5,975

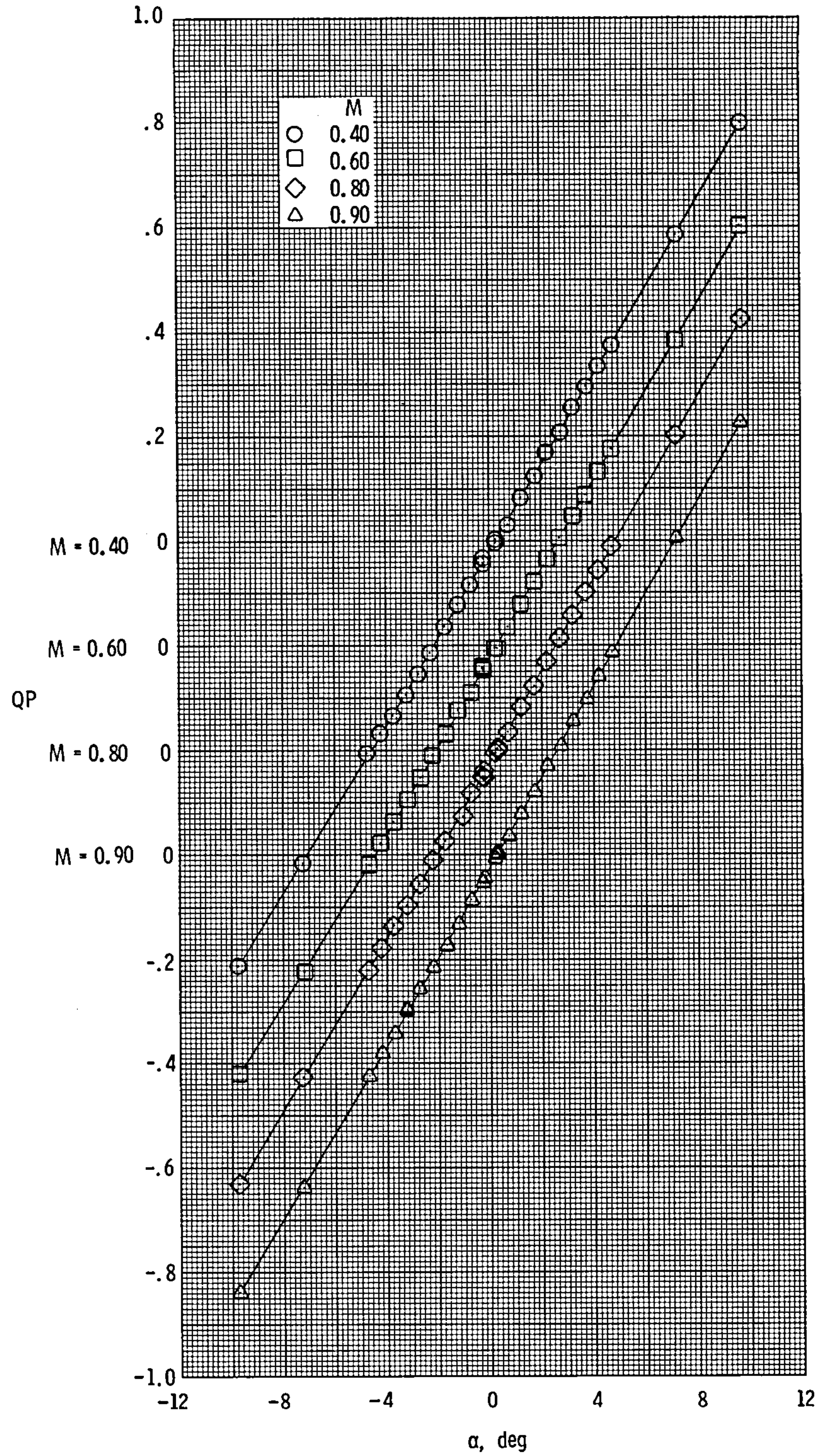
(a) Photograph.

Figure 5.- Flow survey mechanism installed in the Langley 16-Foot Transonic Tunnel.



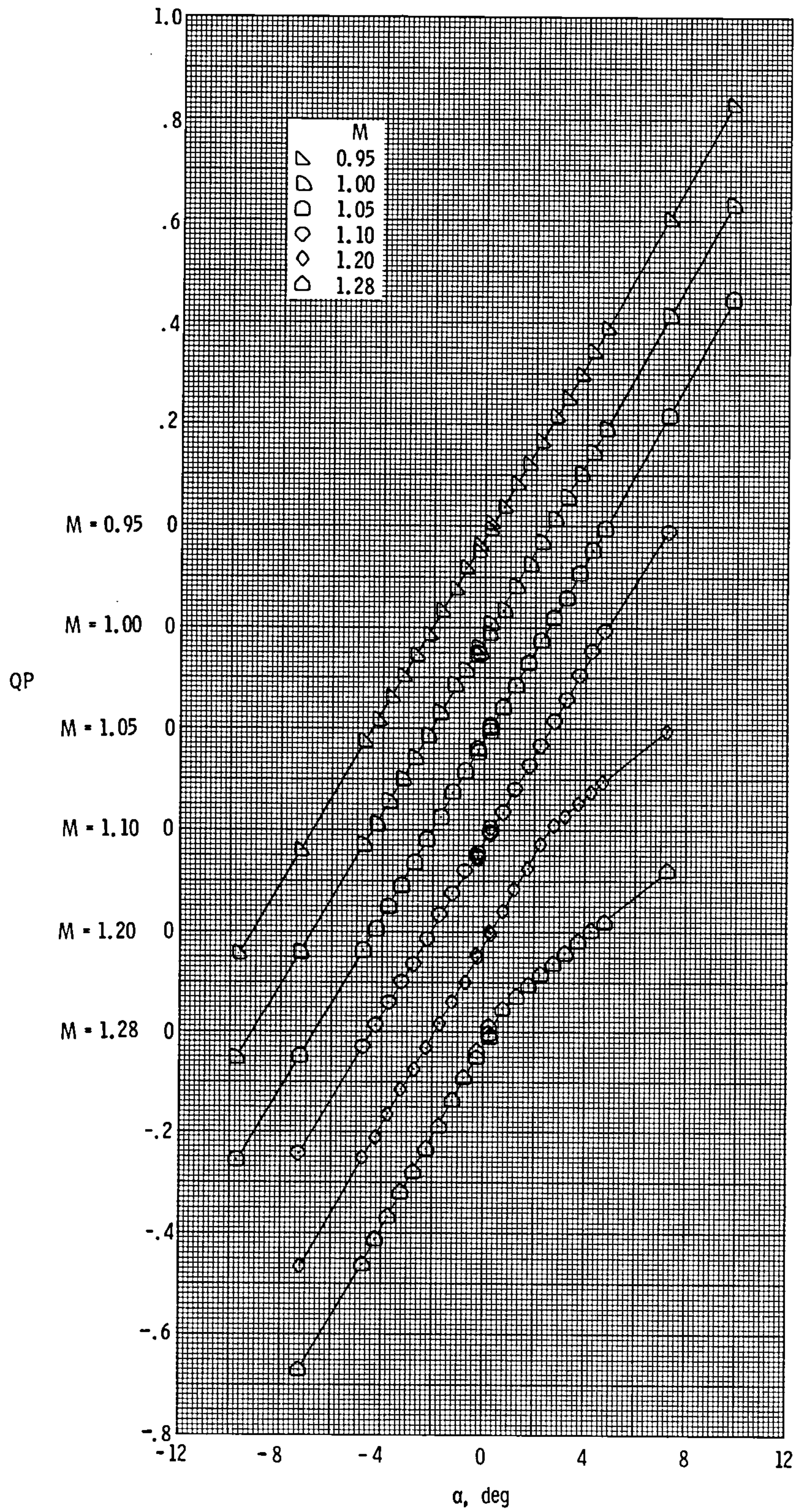
(b) Sketch. All dimensions in feet.

Figure 5.- Concluded.



(a) M = 0.40 to M = 0.90.

Figure 6.- Calibration for QP at various Mach numbers.



(b) M = 0.95 to M = 1.28.

Figure 6.- Concluded.

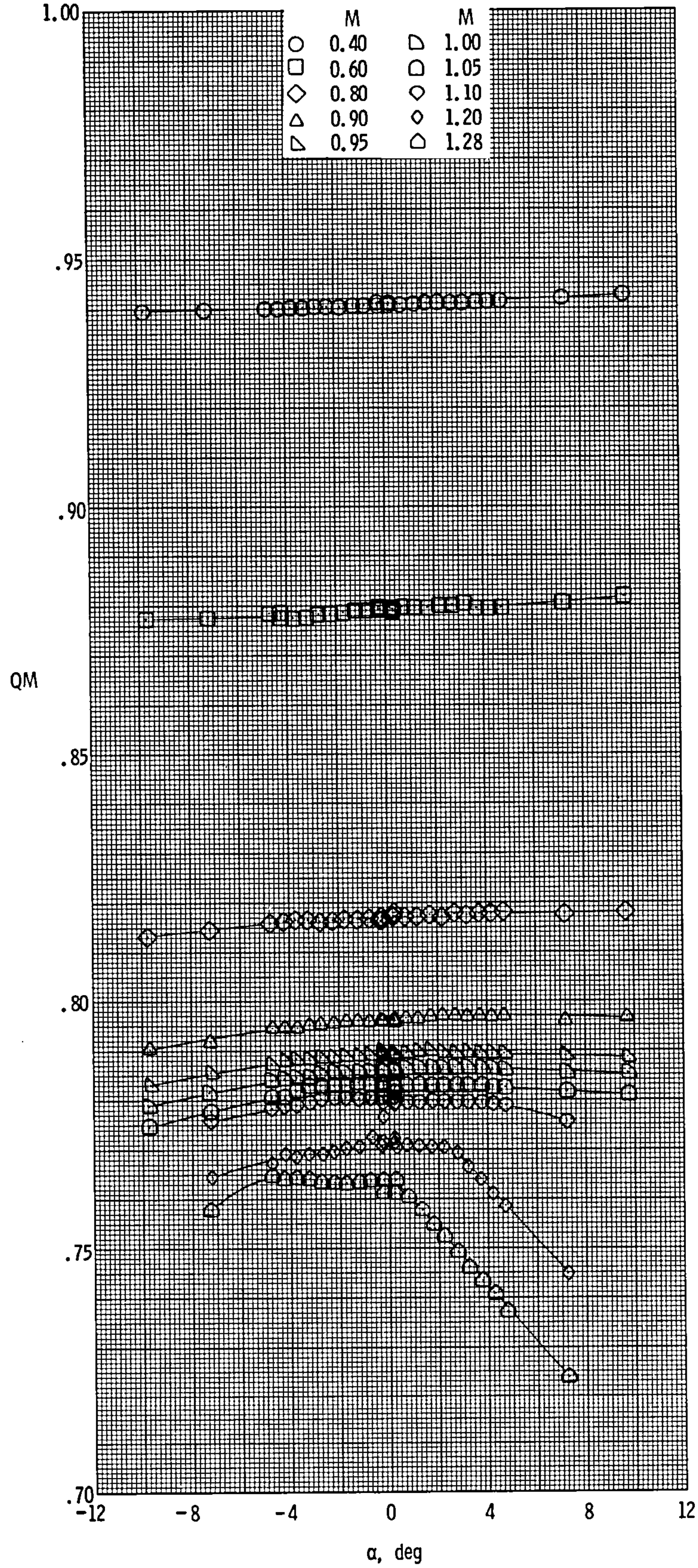
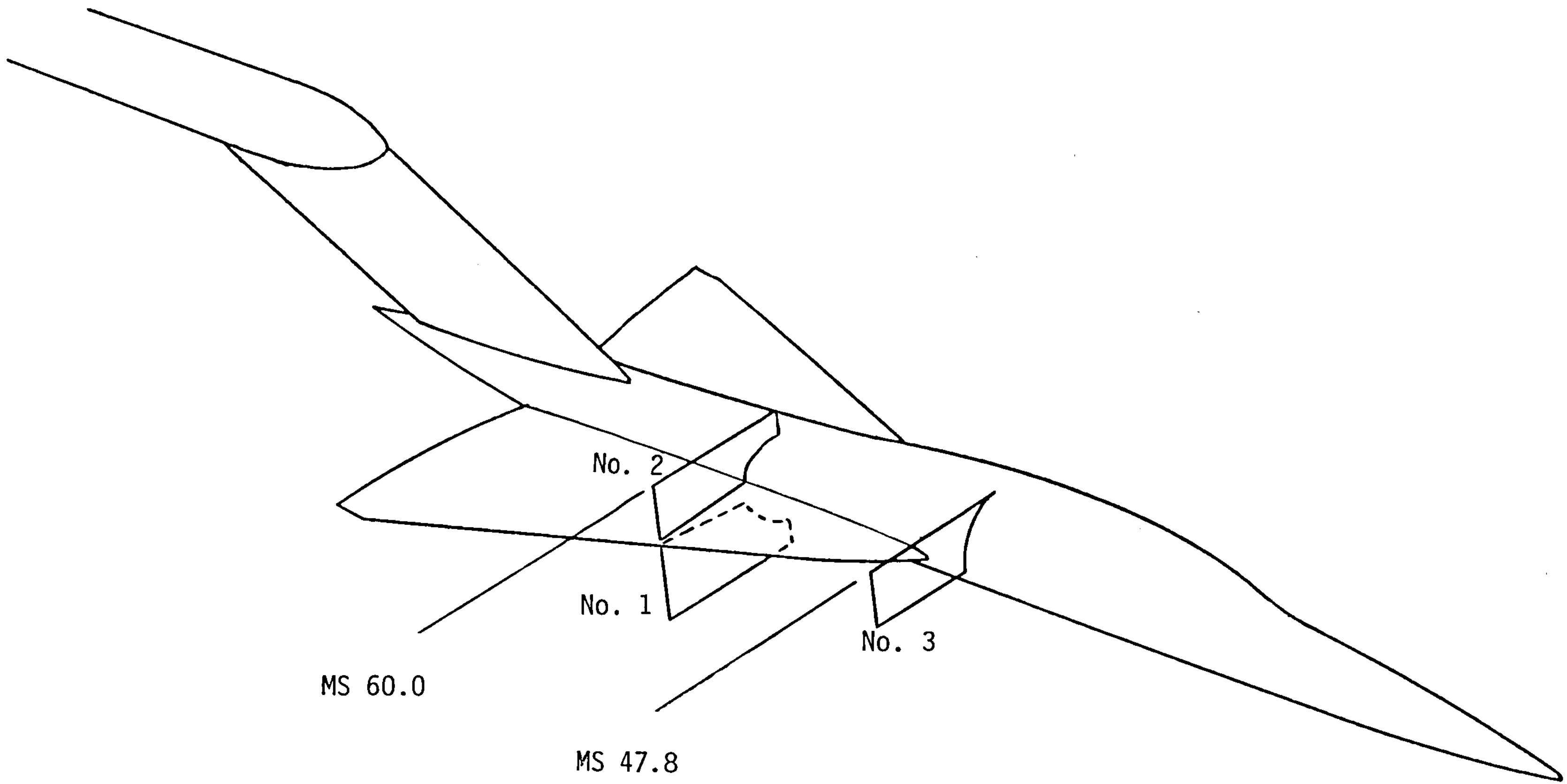
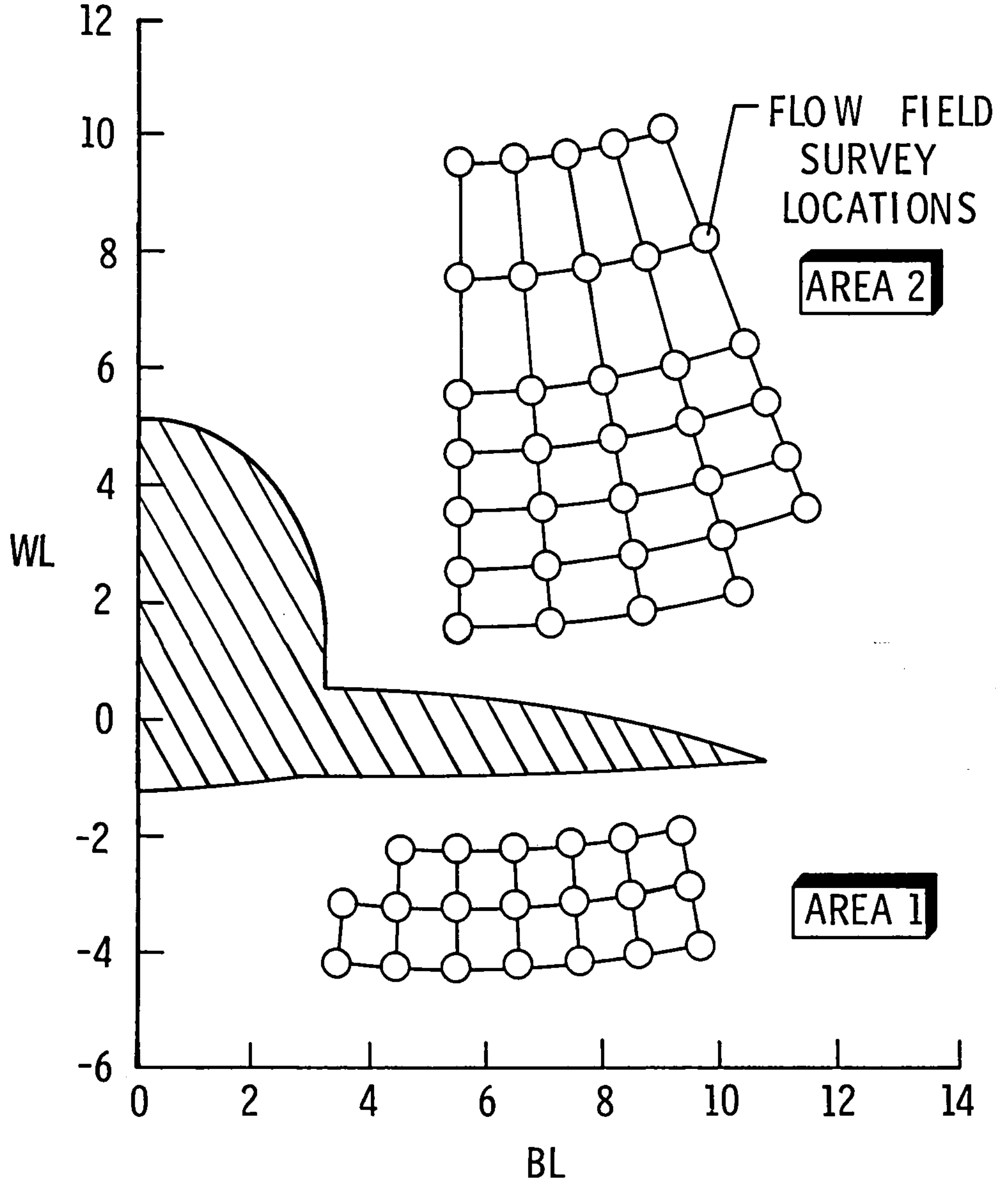


Figure 7.- Calibration for QM at various Mach numbers.



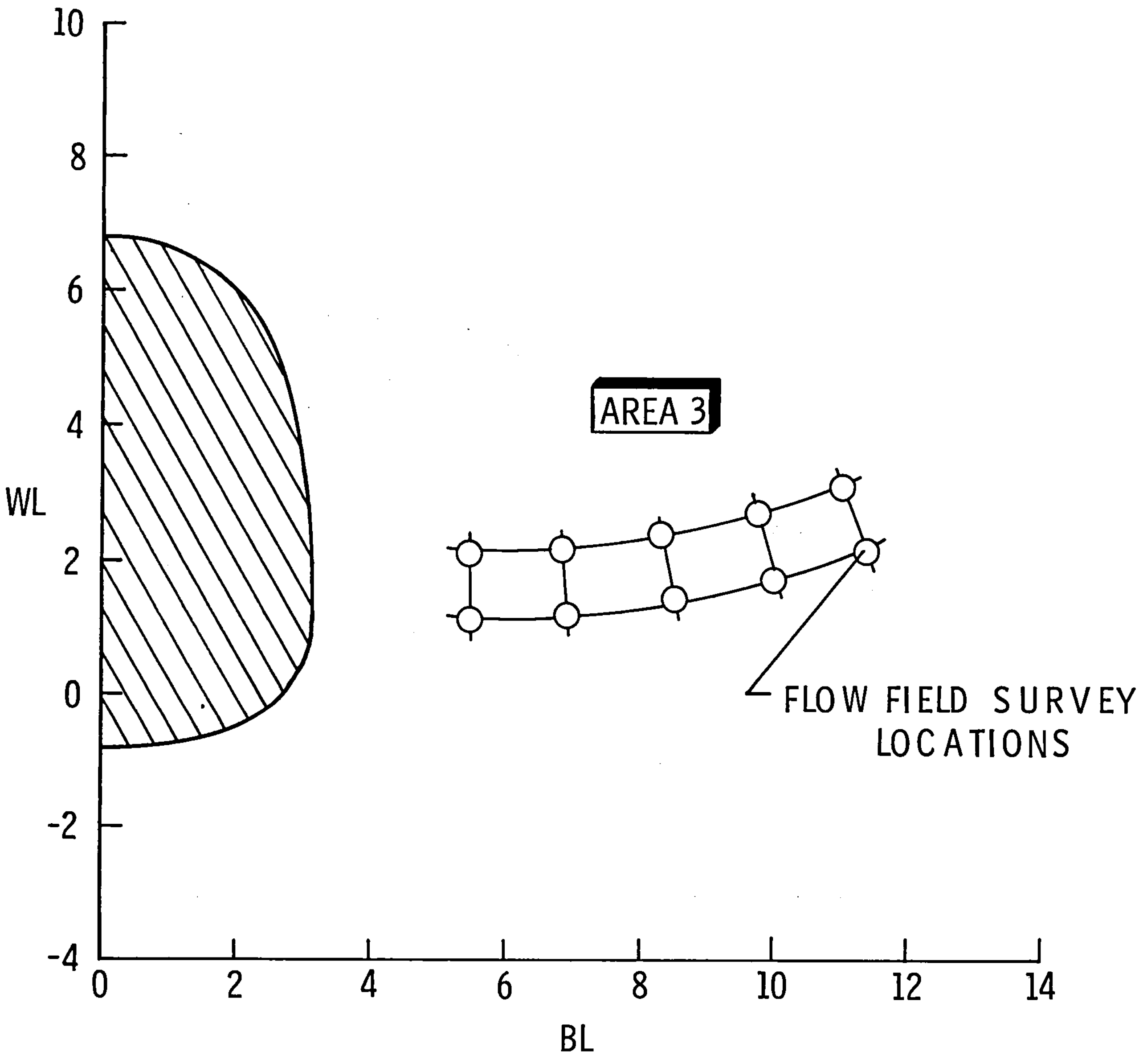
(a) Three survey locations.

Figure 8.- Flow field survey locations.



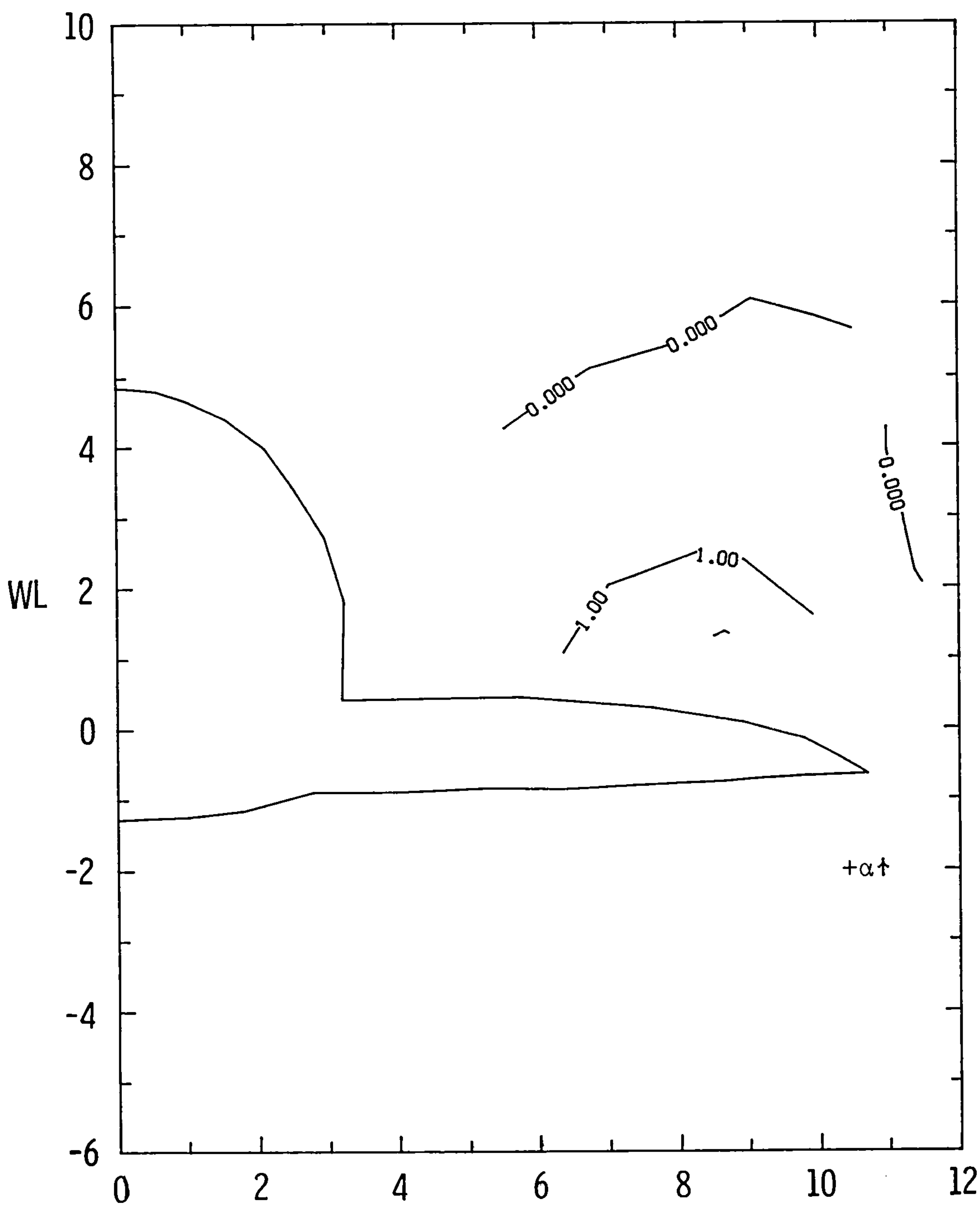
(b) Areas 1 and 2, model station 60.0.

Figure 8.- Continued.



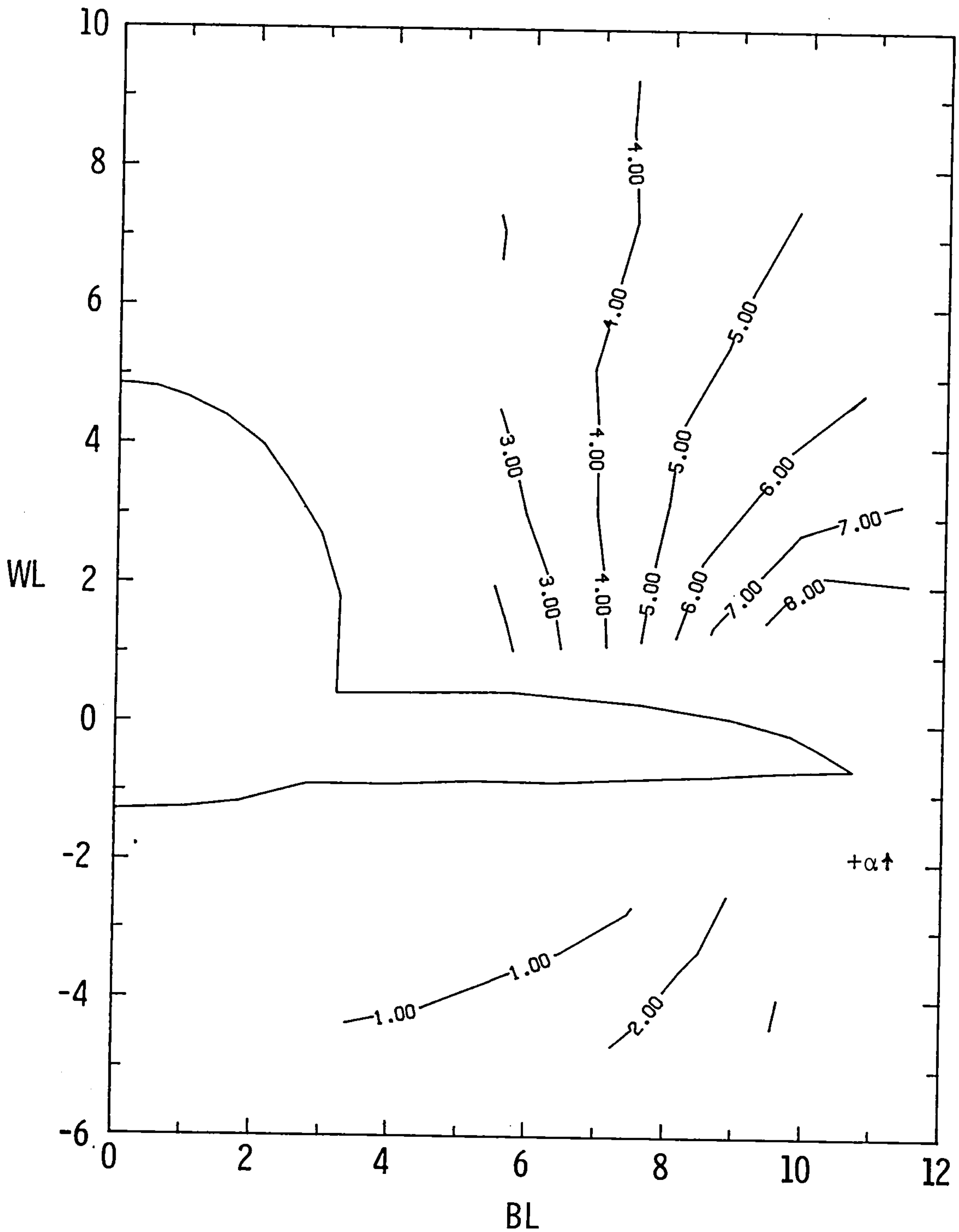
(c) Area 3, model station 47.8.

Figure 8.- Concluded.



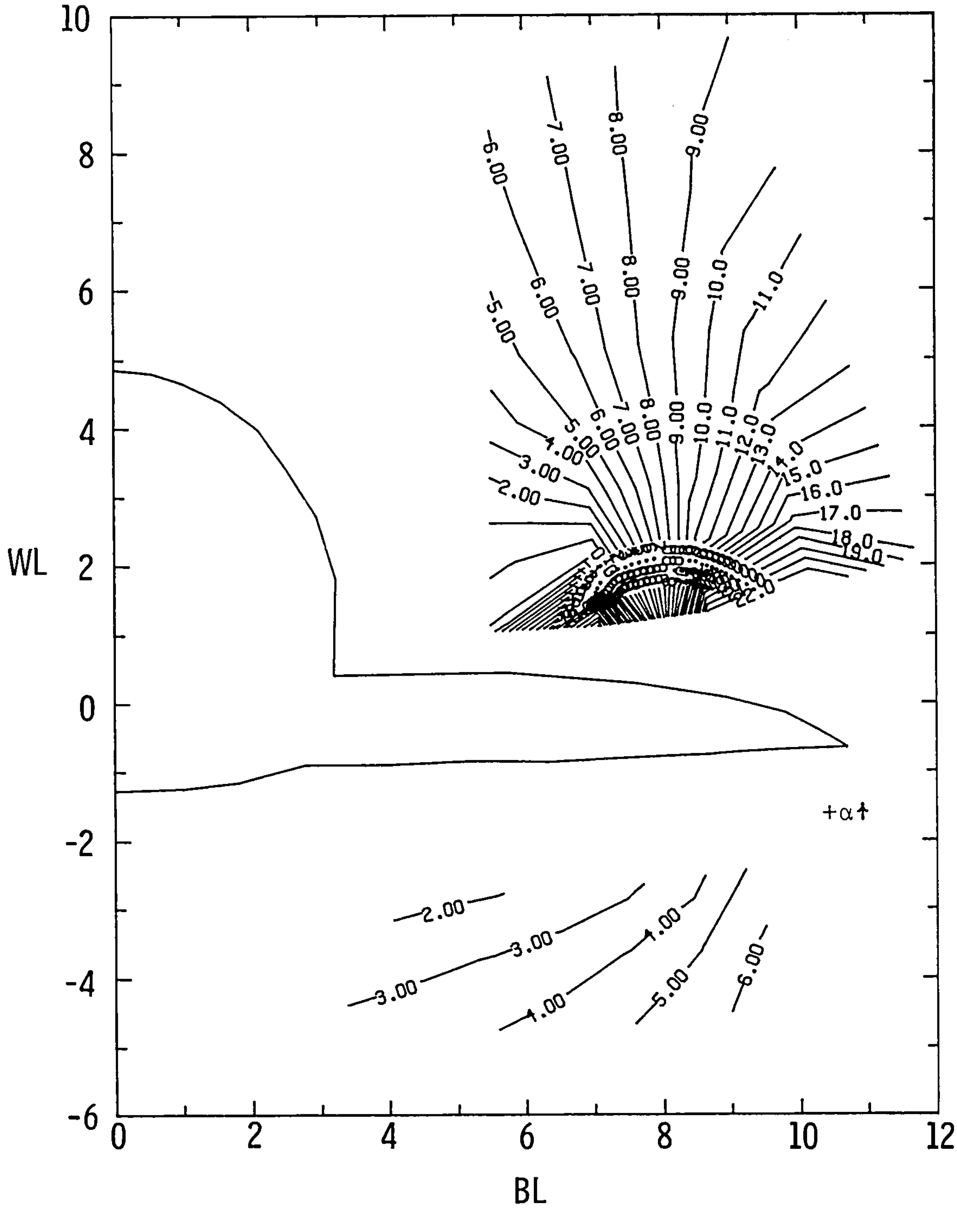
(a) M = 0.6; α = 0°.

Figure 9.- Local angle of attack contours for areas 1 and 2 (model station 60.0) at various Mach numbers and angles of attack.



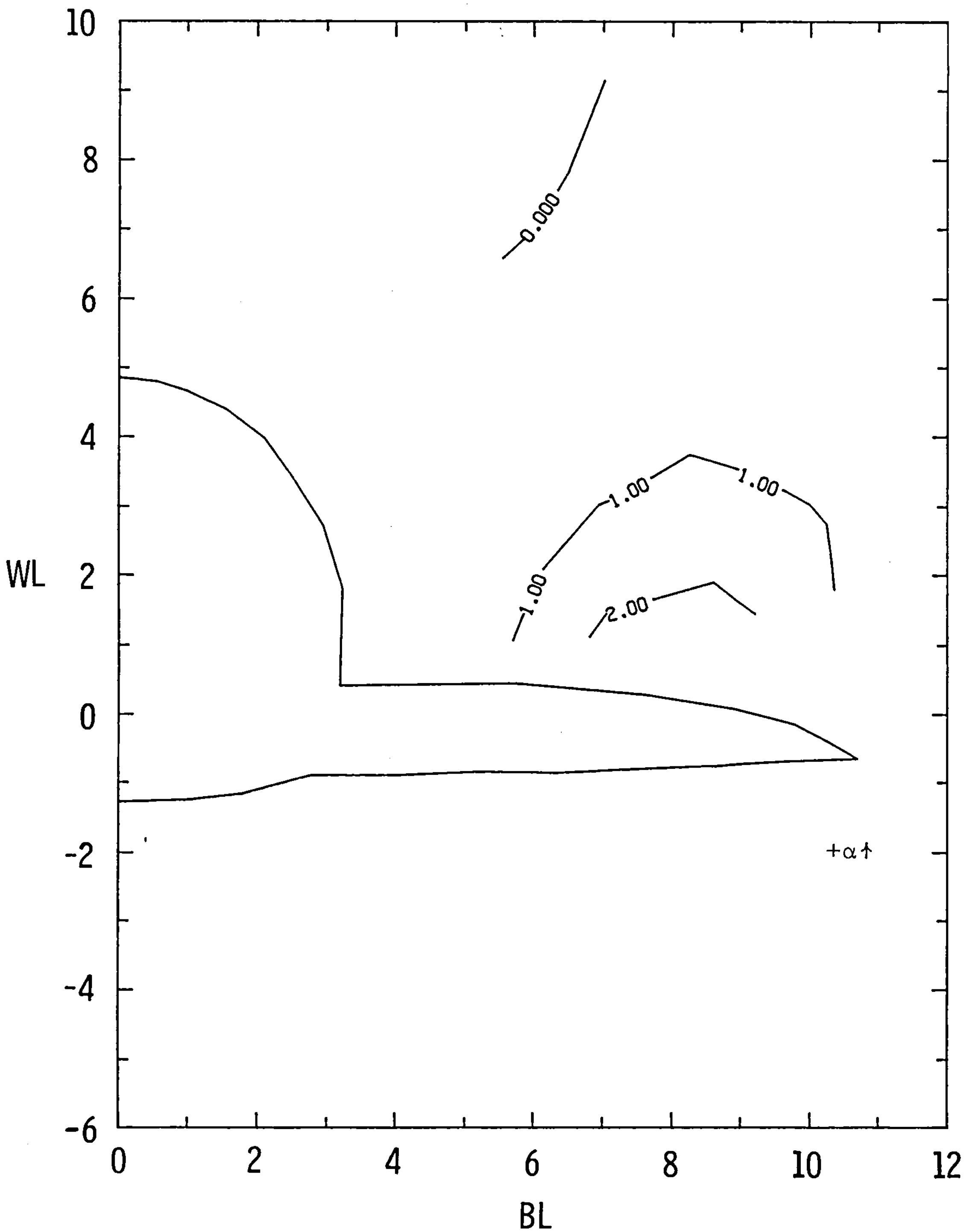
(b) M = 0.6; α = 5°.

Figure 9.- Continued.



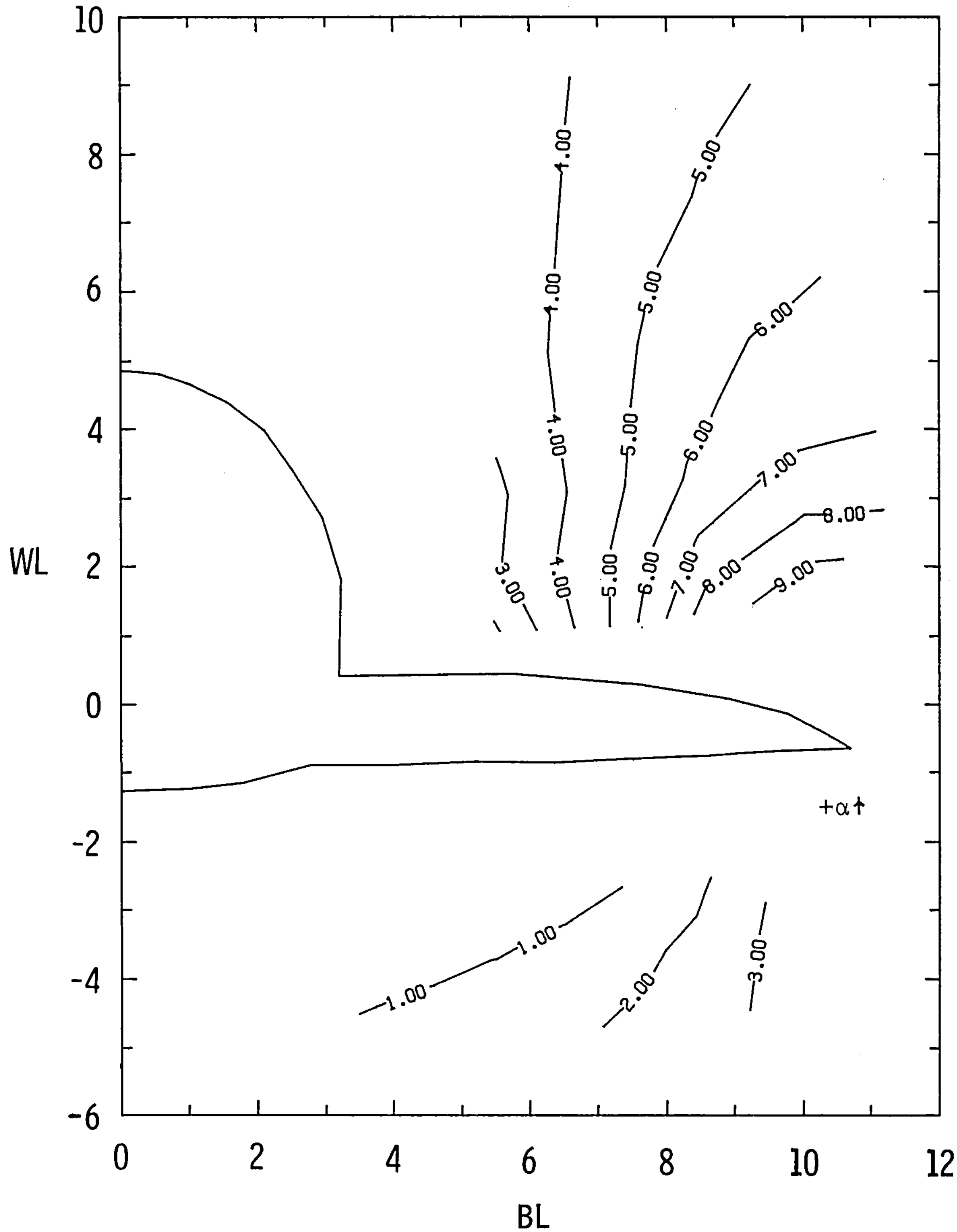
(c) M = 0.6; α = 10°.

Figure 9.- Continued.



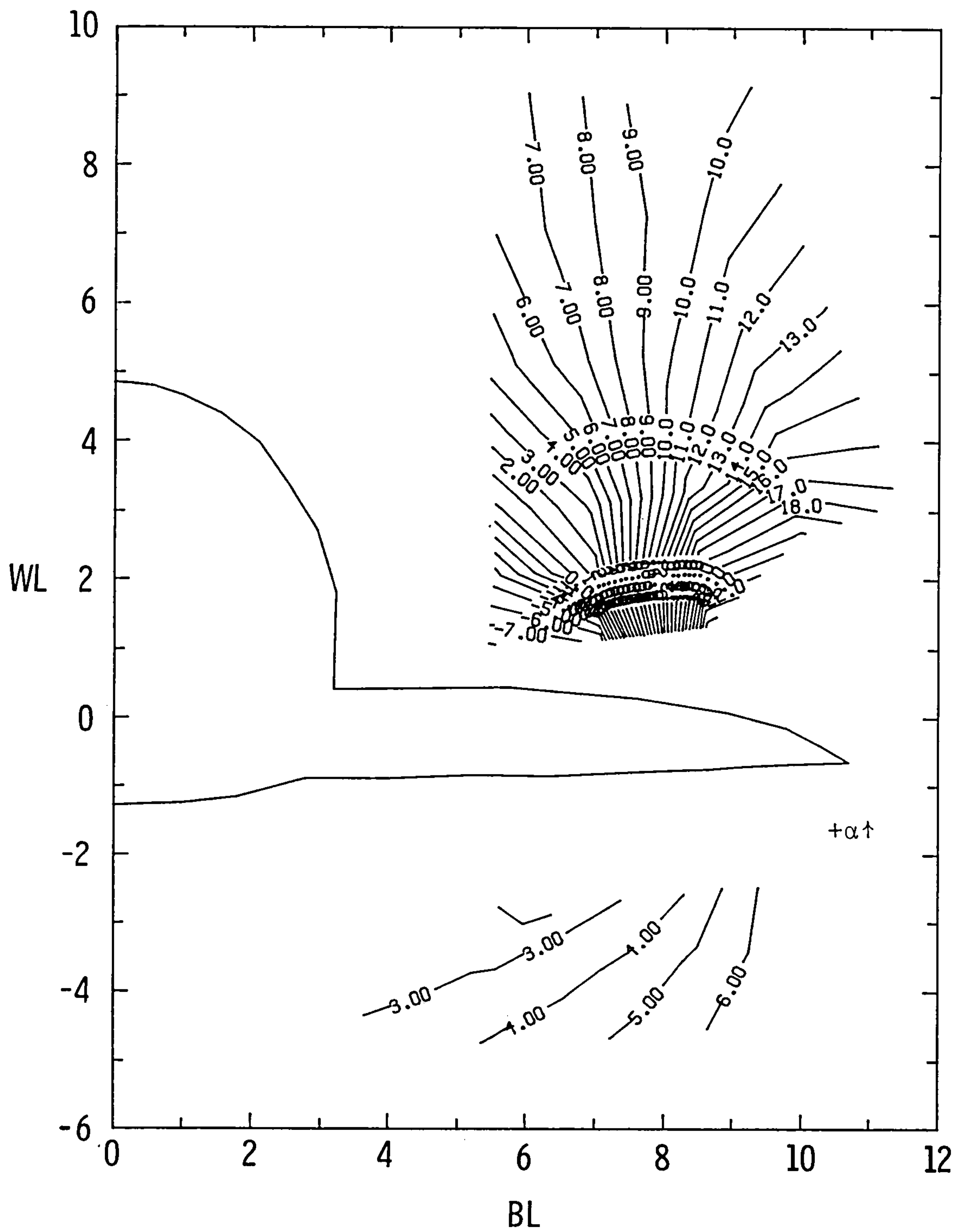
(d) M = 0.9; α = 0°.

Figure 9.- Continued.



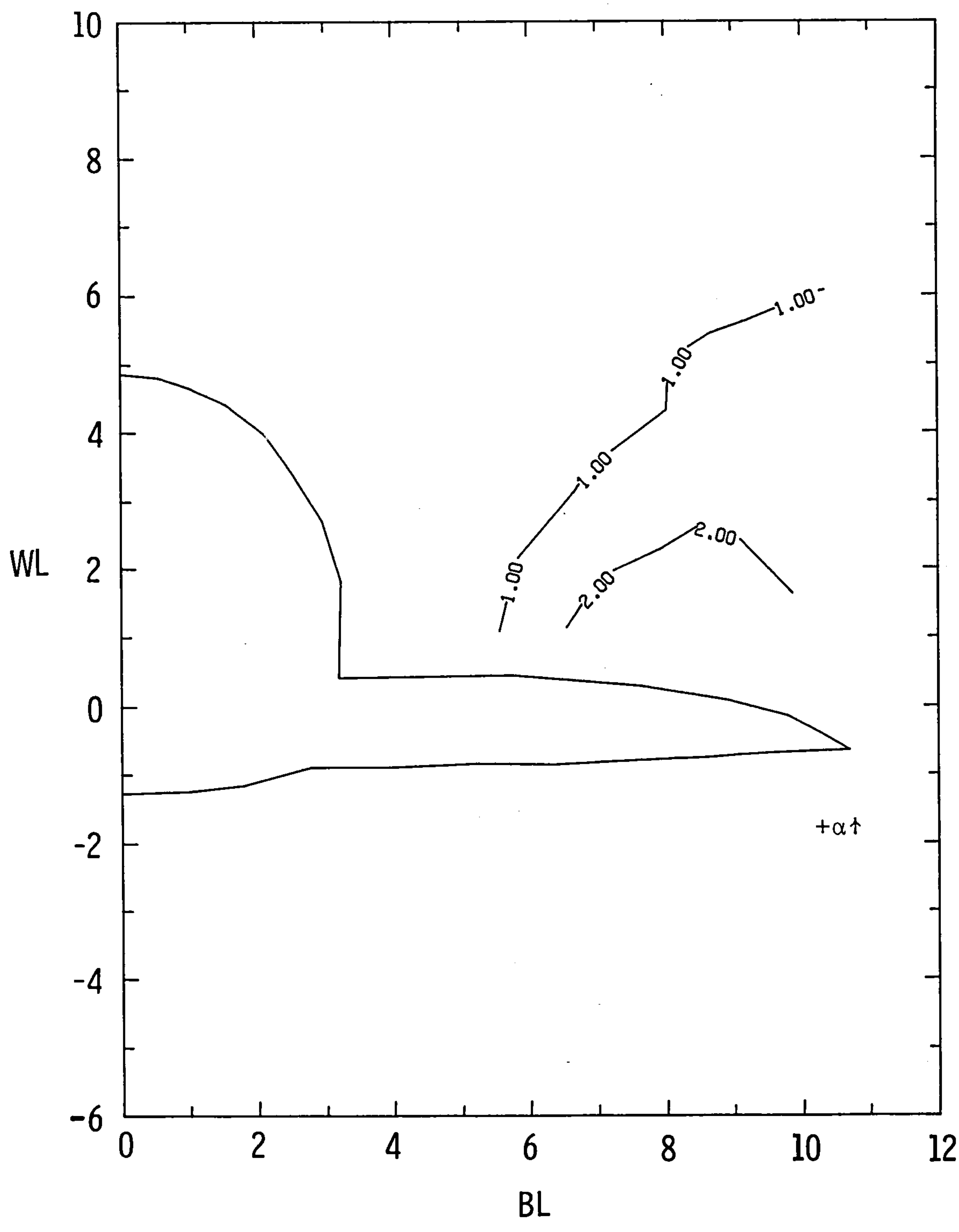
(e) M = 0.9; α = 5°.

Figure 9.- Continued.



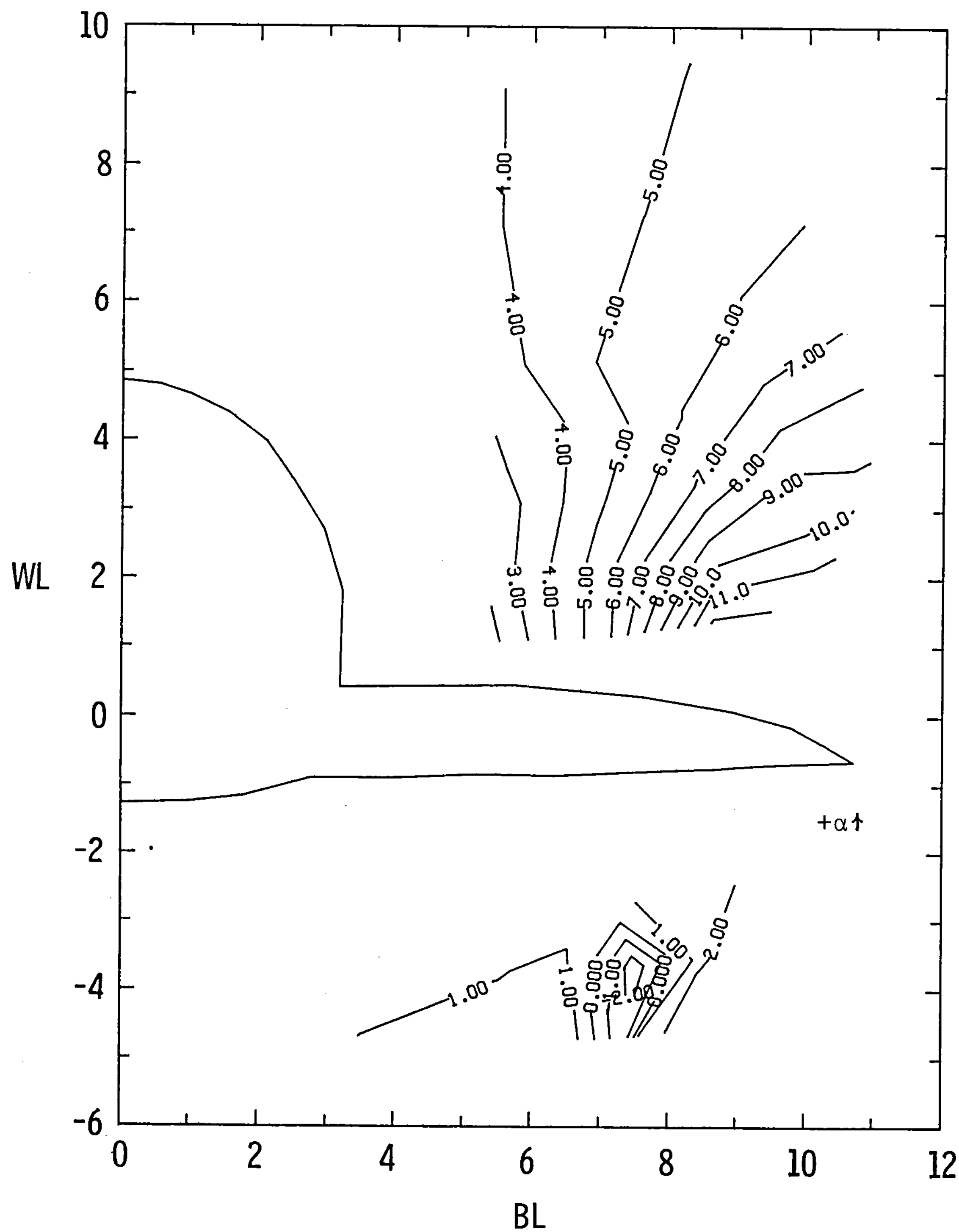
(f) M = 0.9; α = 10°.

Figure 9.- Continued.



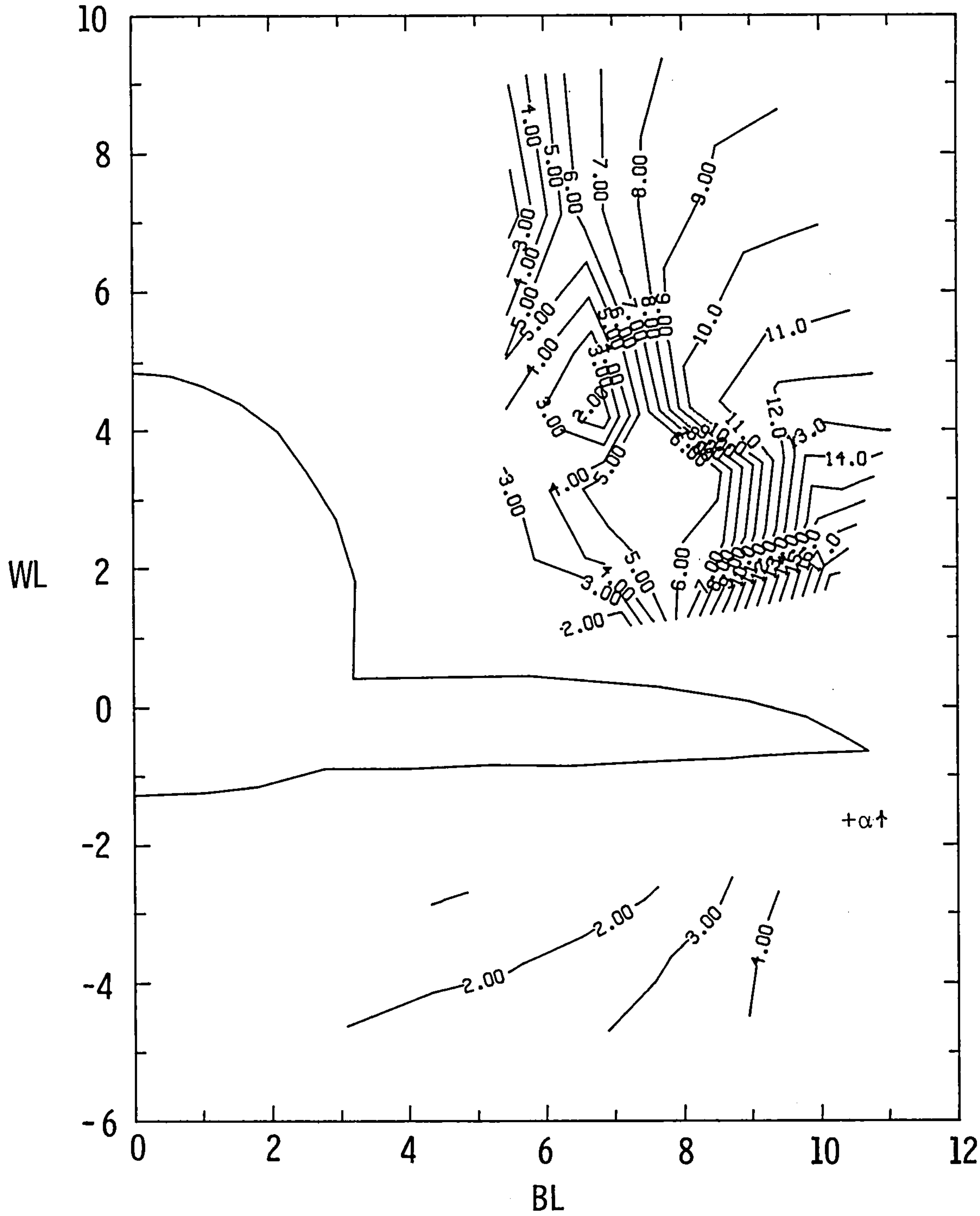
(g) M = 1.2; α = 0°.

Figure 9.- Continued.



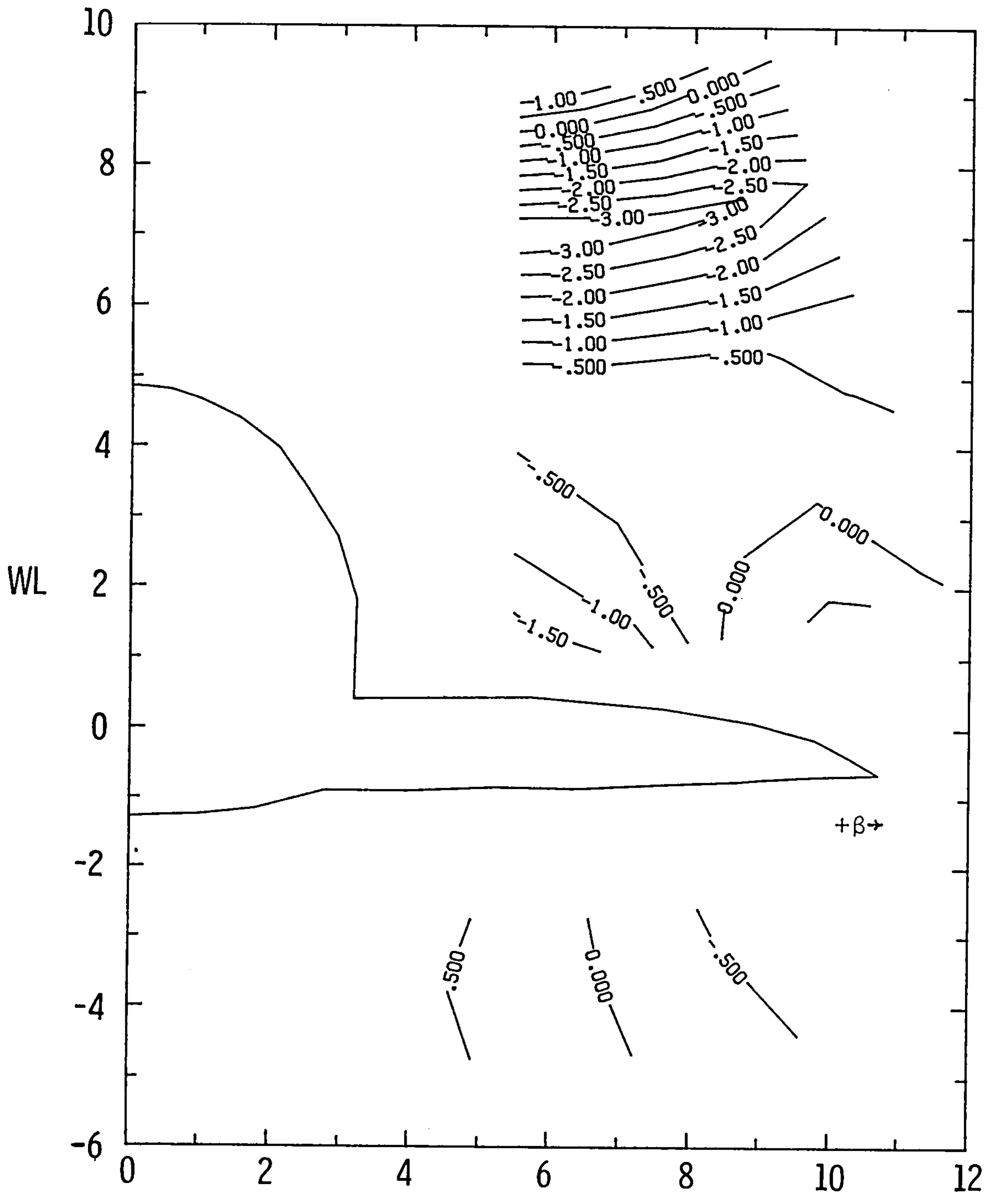
(h) M = 1.2; α = 5°.

Figure 9.- Continued.



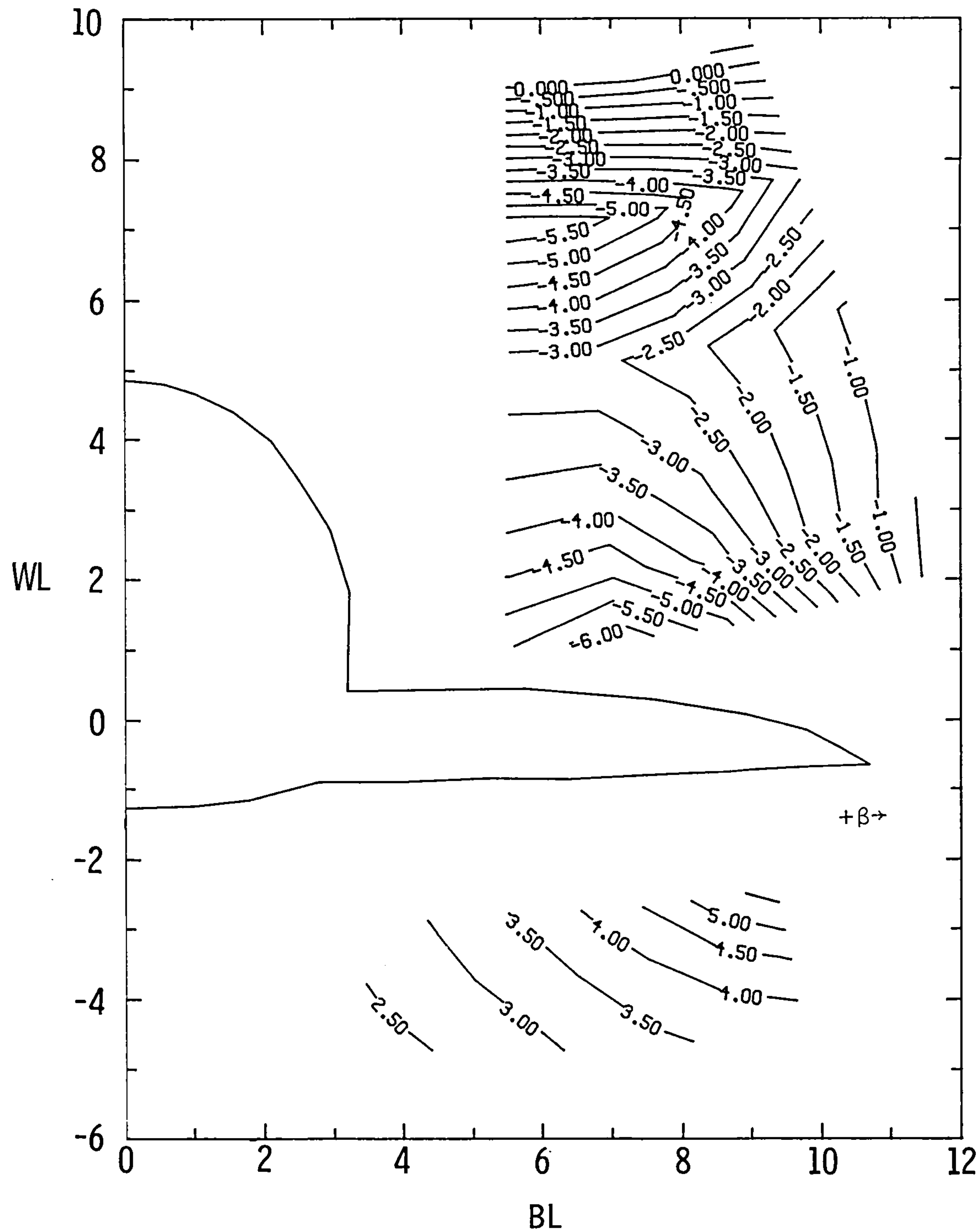
(i) M = 1.2; α = 7.5°.

Figure 9.- Concluded.



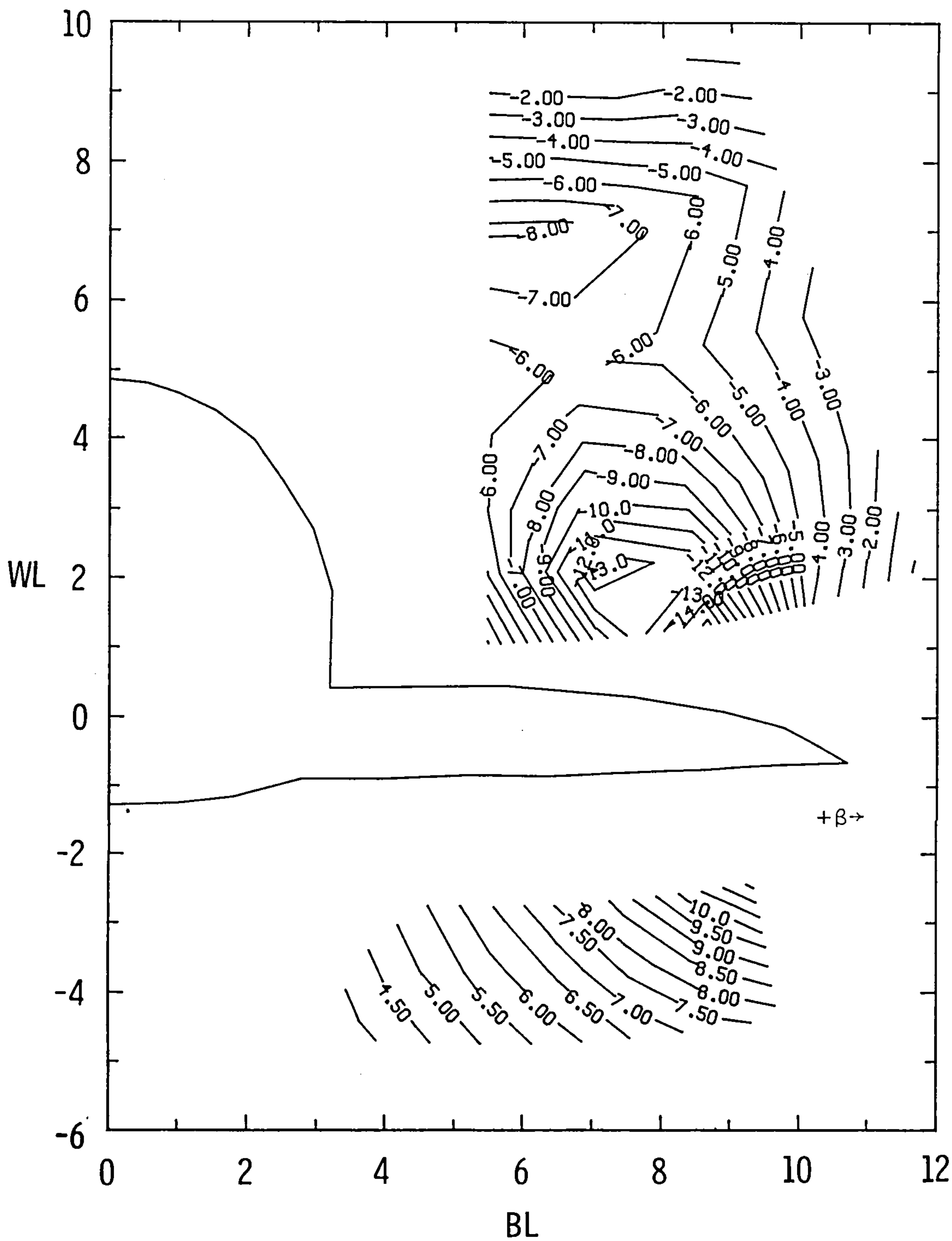
(a) M = 0.6; α = 0°.

Figure 10.- Local side flow contours for areas 1 and 2 (model station 60.0) at various Mach numbers and angles of attack.



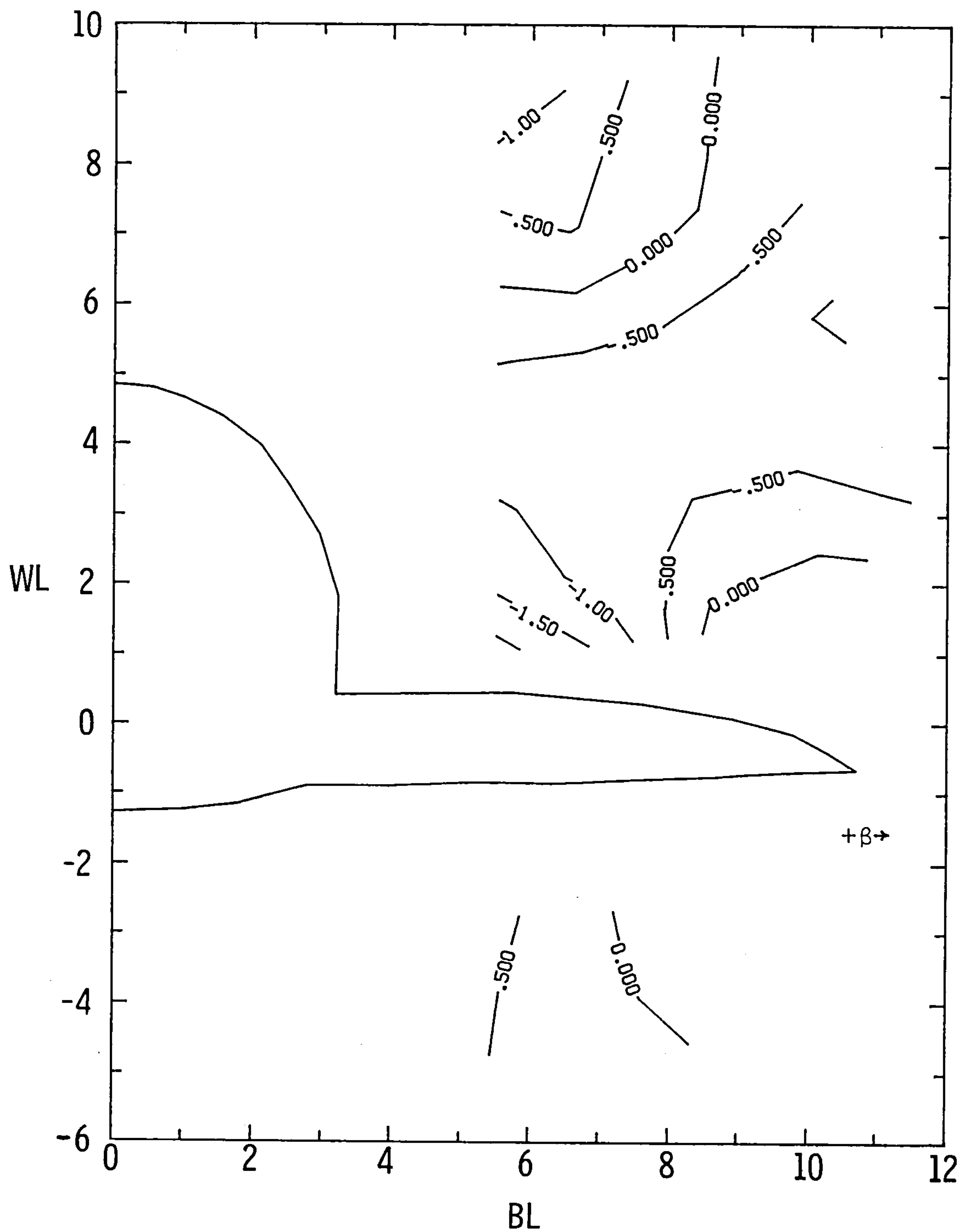
(b) M = 0.6; α = 5°.

Figure 10.- Continued.



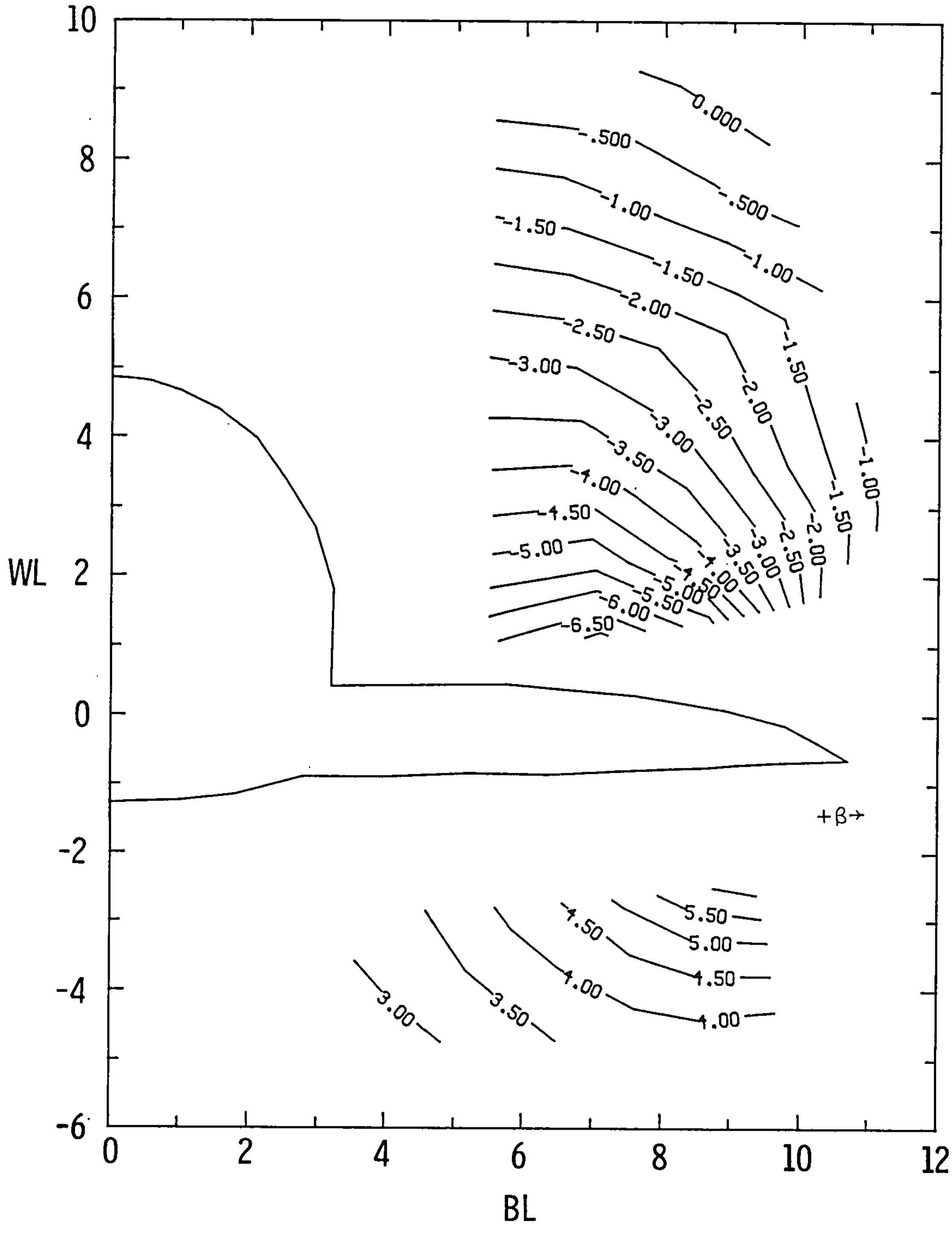
(c) M = 0.6; α = 10°.

Figure 10.- Continued.



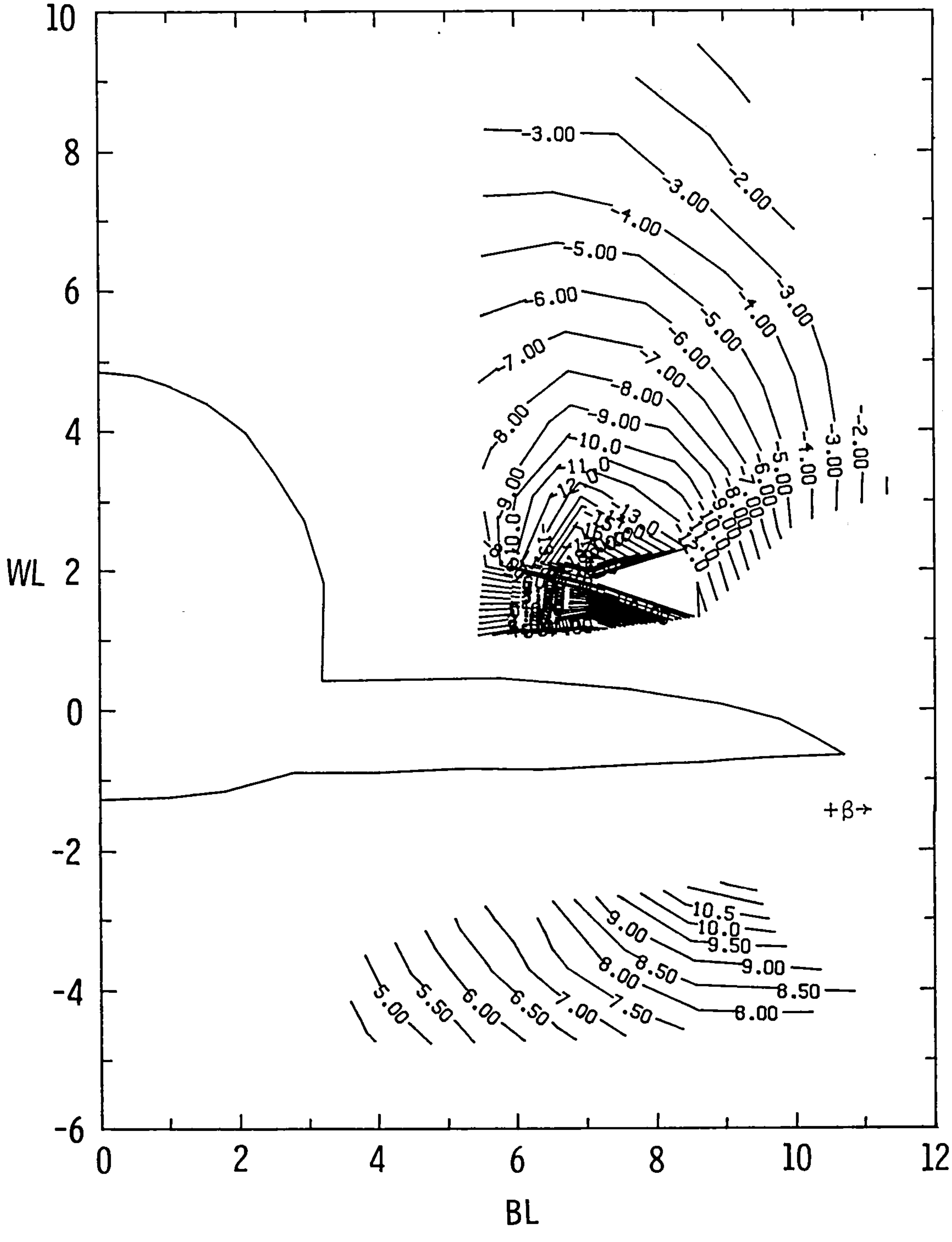
(d) M = 0.9; α = 0°.

Figure 10.- Continued.



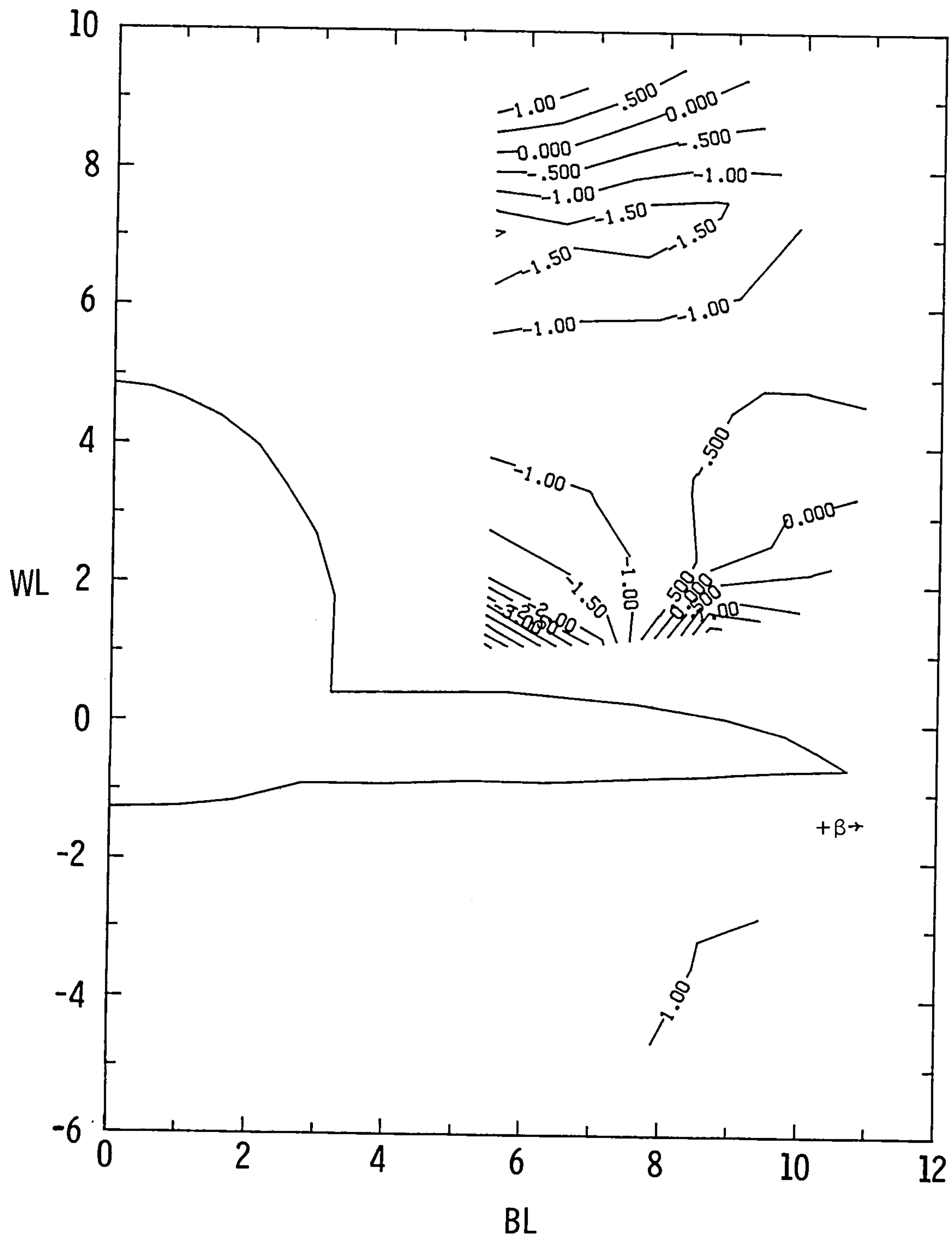
(e) M = 0.9; α = 5°.

Figure 10.- Continued.



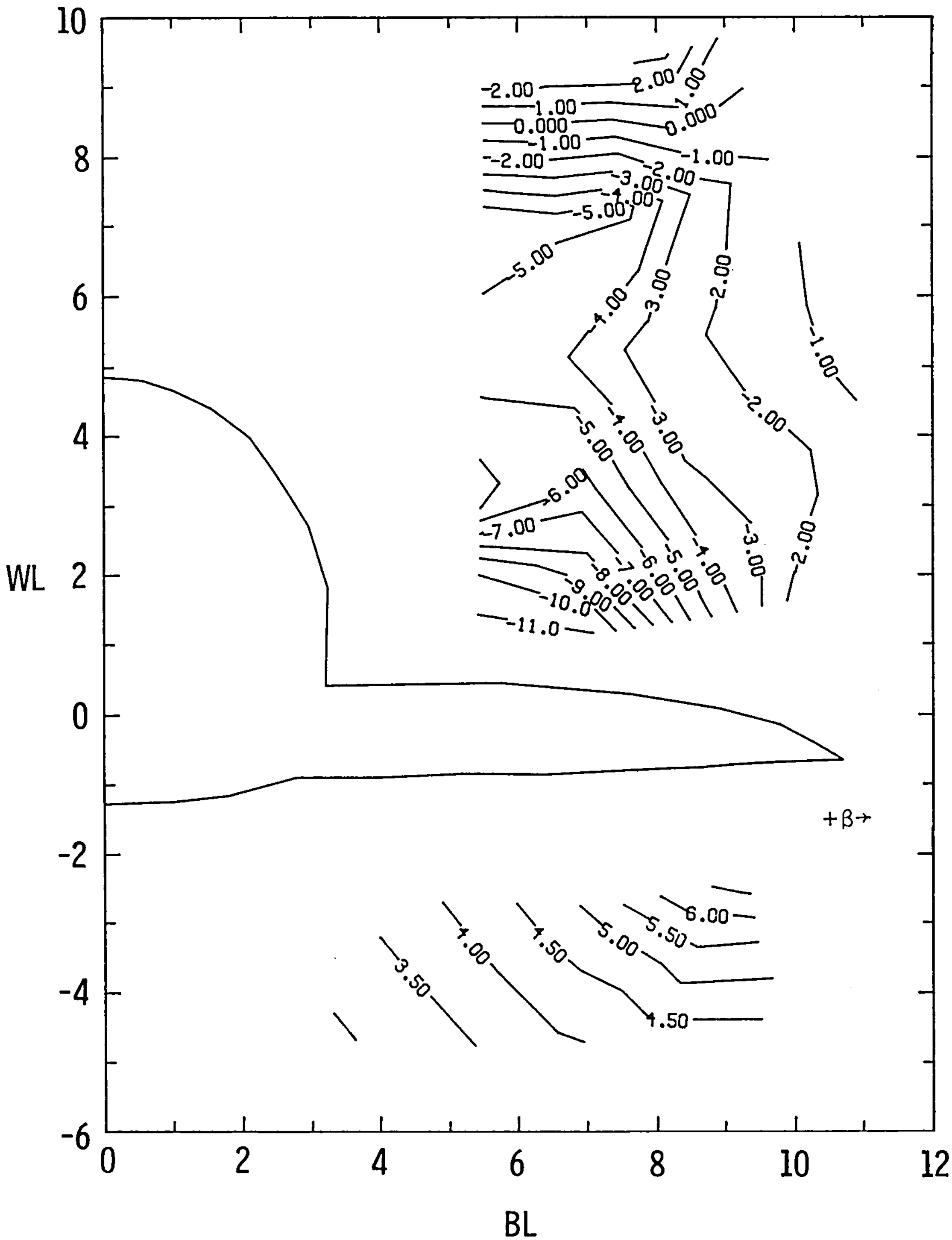
(f) M = 0.9; α = 10°.

Figure 10.- Continued.



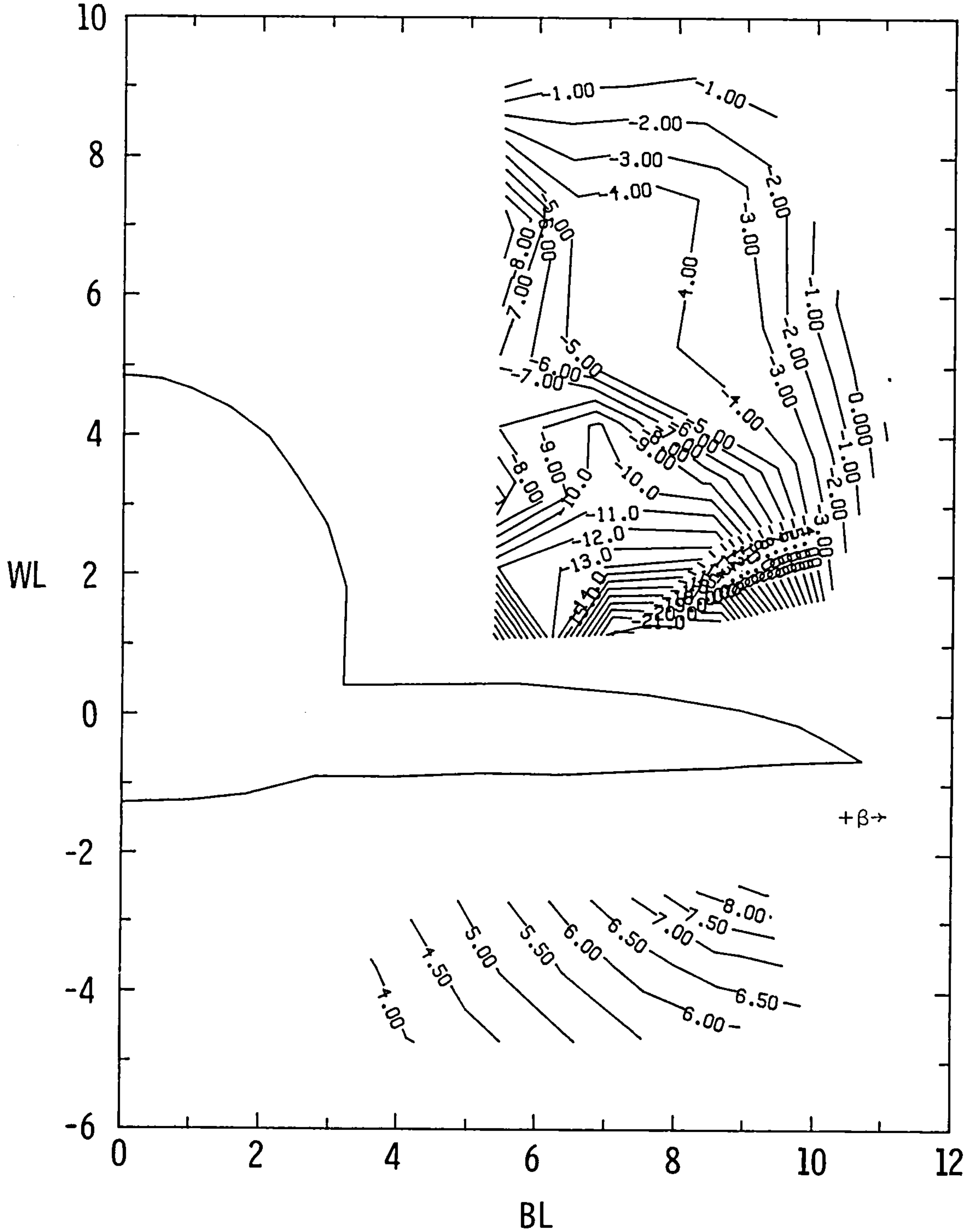
(g) M = 1.2; α = 0°.

Figure 10.- Continued.



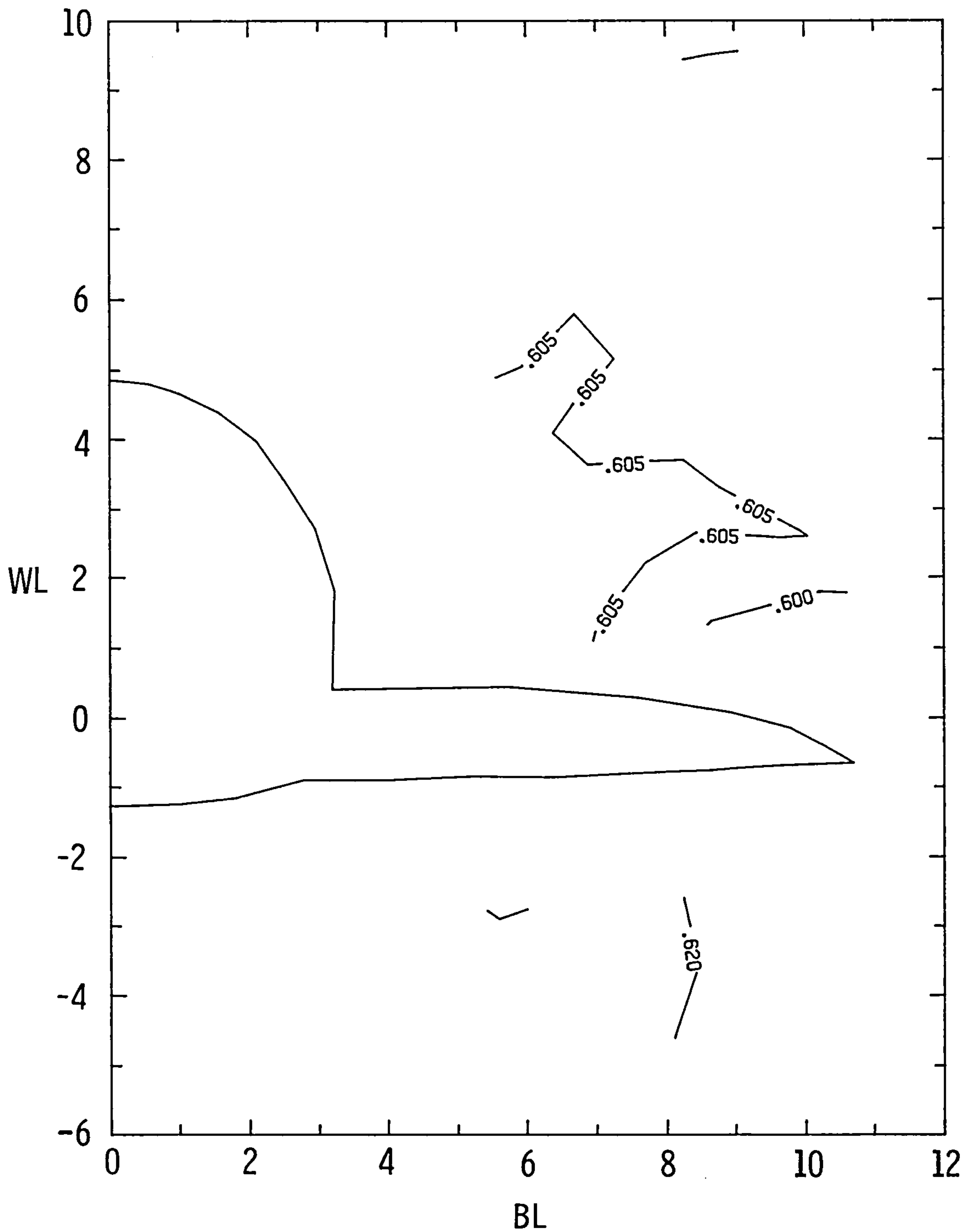
(h) M = 1.2; α = 5°.

Figure 10.- Continued.



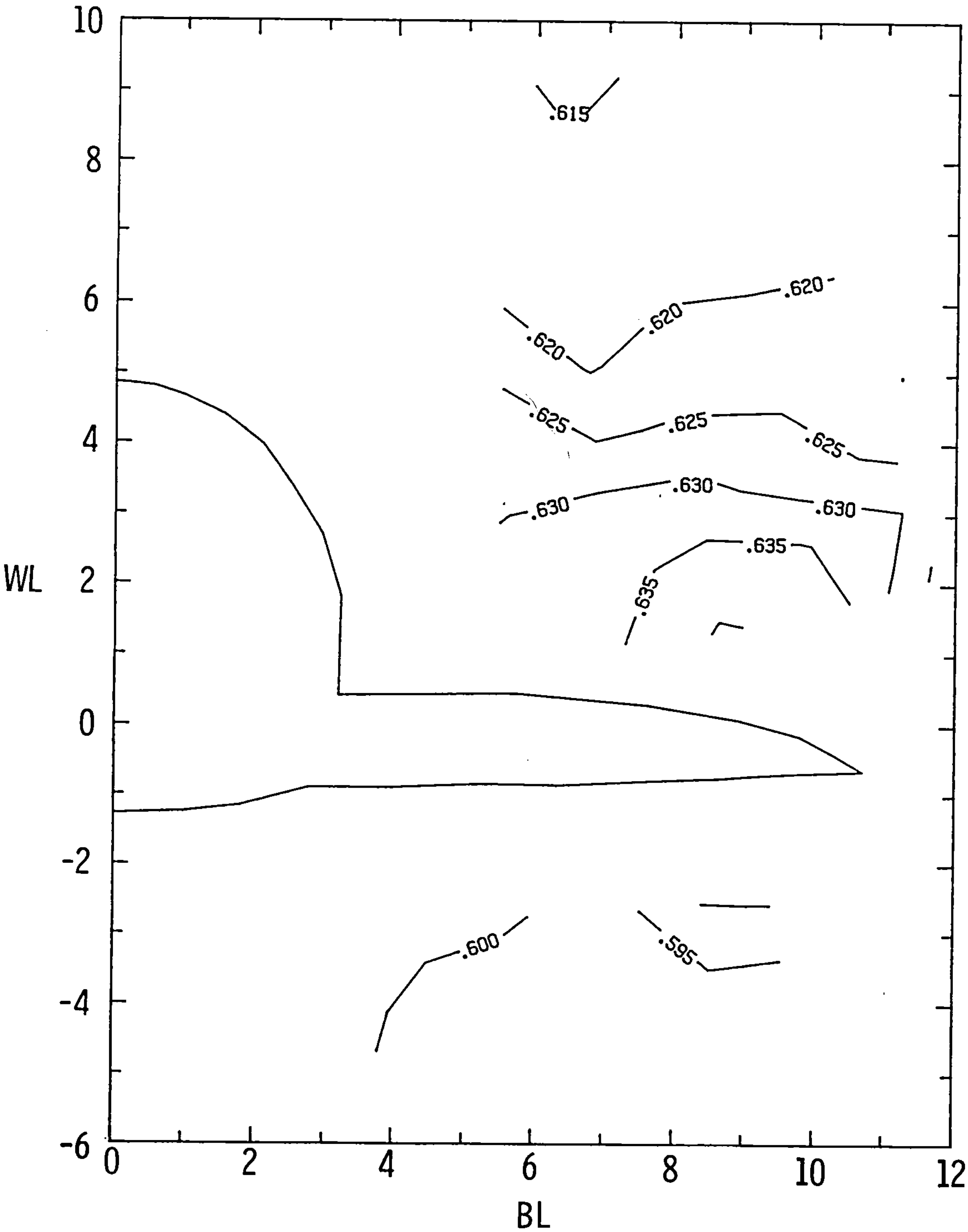
(i) M = 1.2; α = 7.5°.

Figure 10.- Concluded.



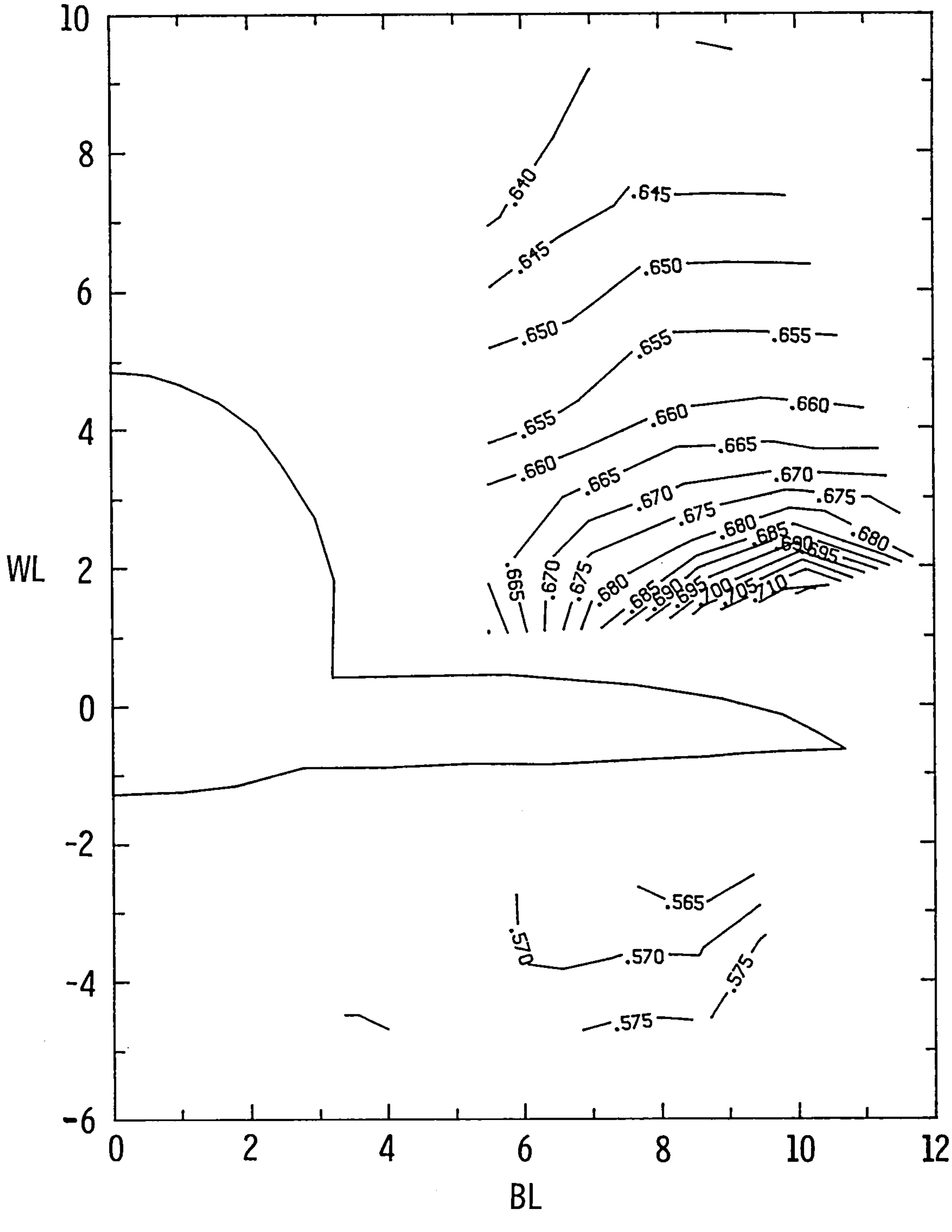
(a) M = 0.6; α = 0°.

Figure 11.- Local Mach number contours for areas 1 and 2 (model station 60.0) at various Mach numbers and angles of attack.



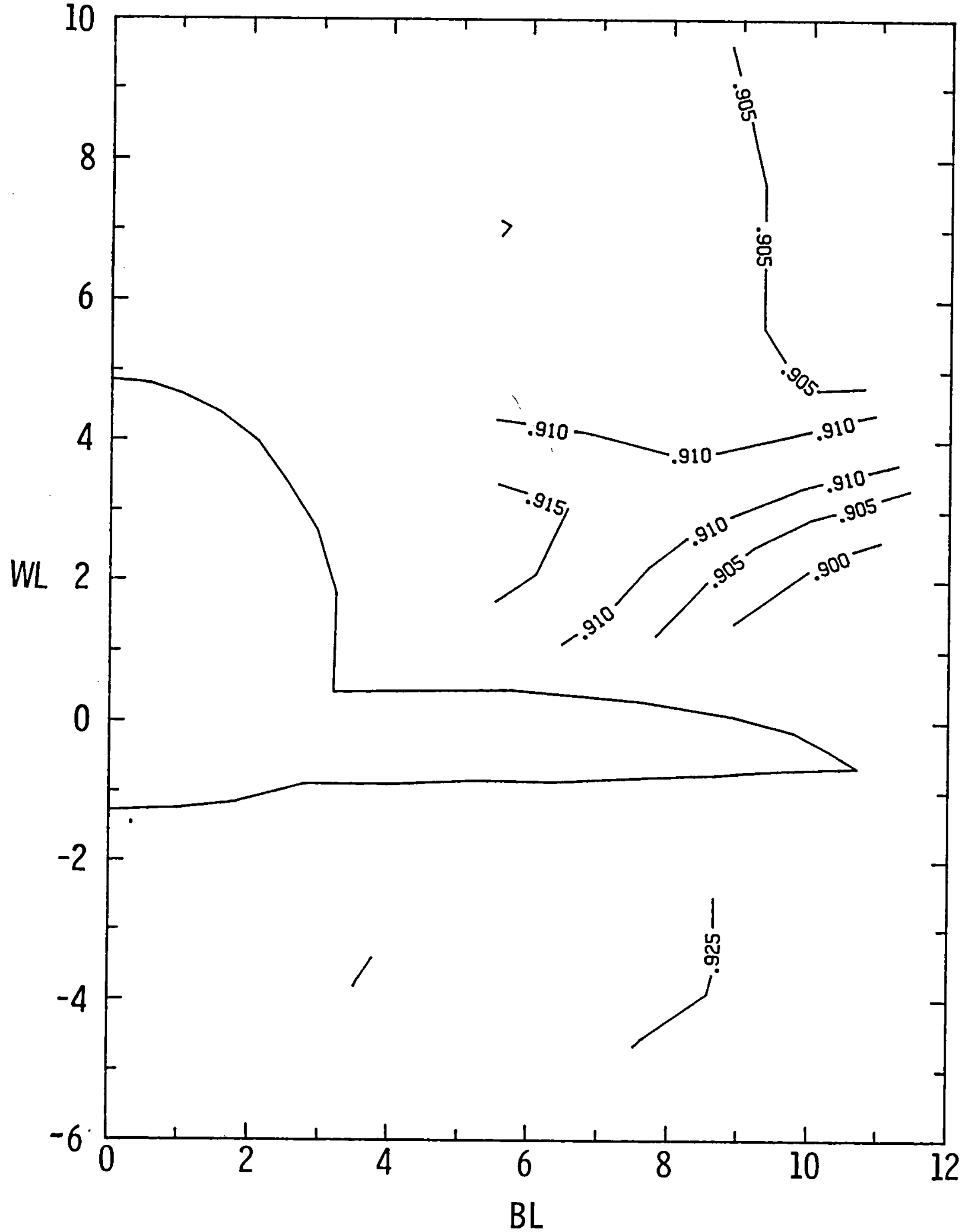
(b) M = 0.6; α = 5°.

Figure 11.- Continued.



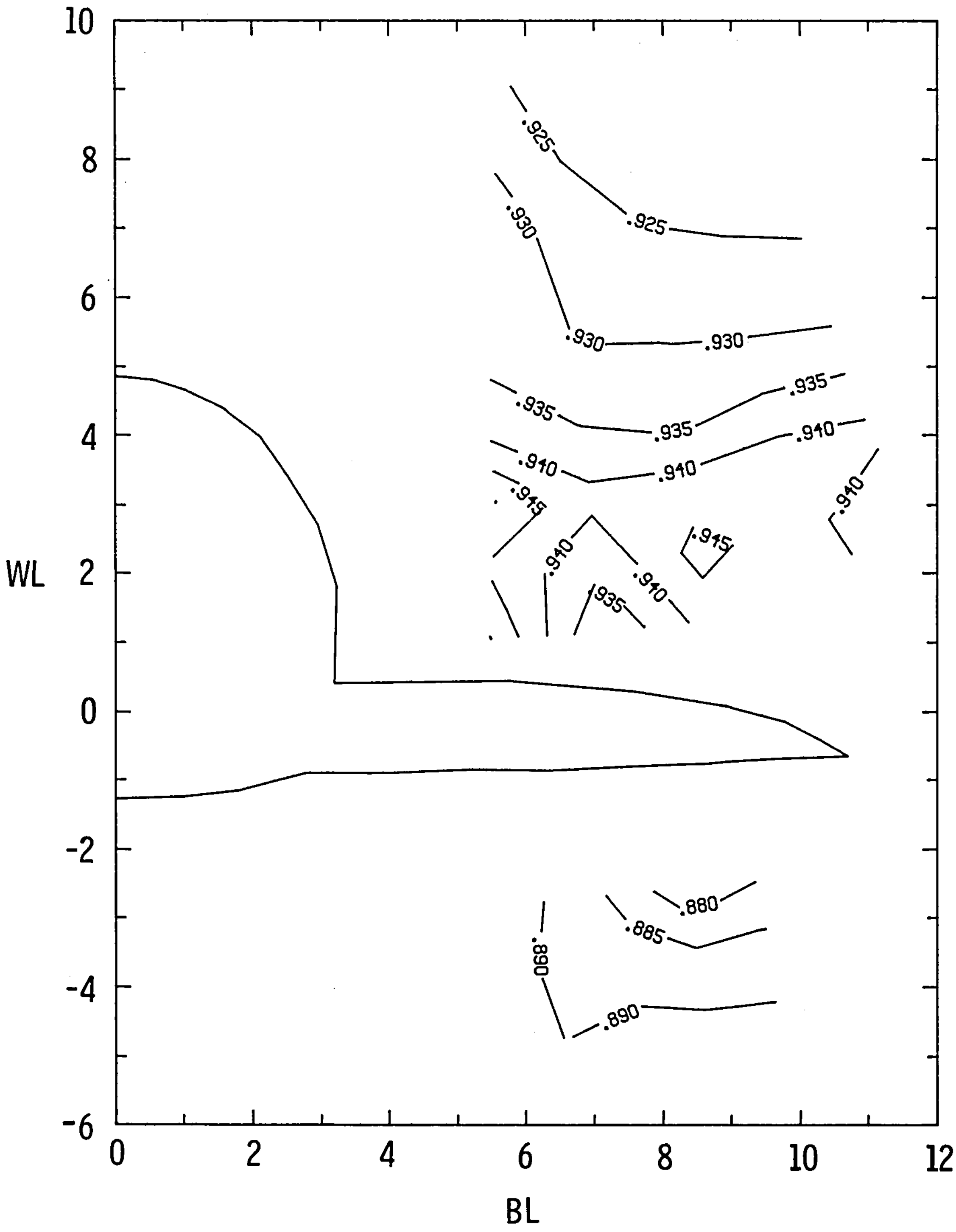
(c) M = 0.6; α = 10°.

Figure 11.- Continued.



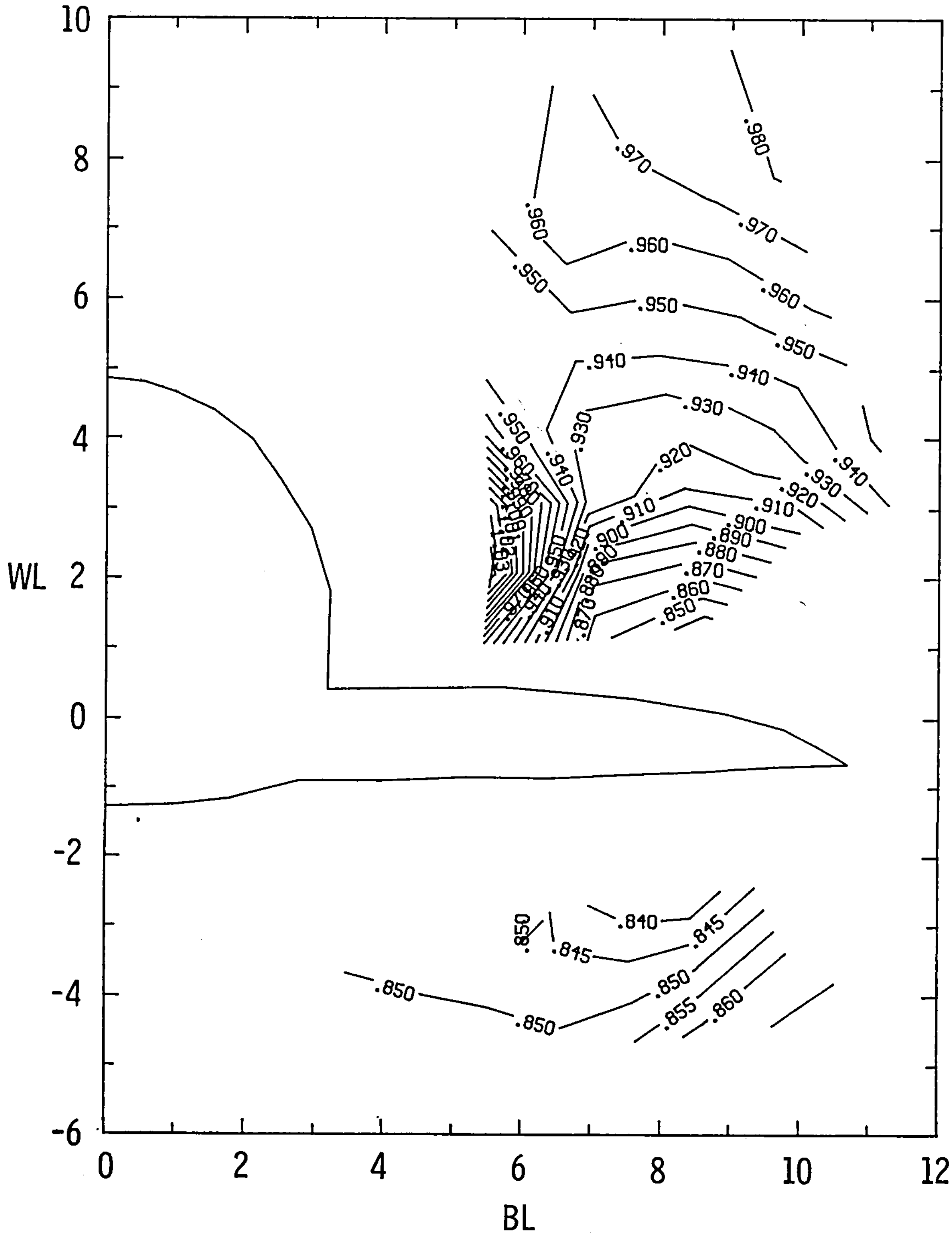
(d) M = 0.9; α = 0°.

Figure 11.- Continued.



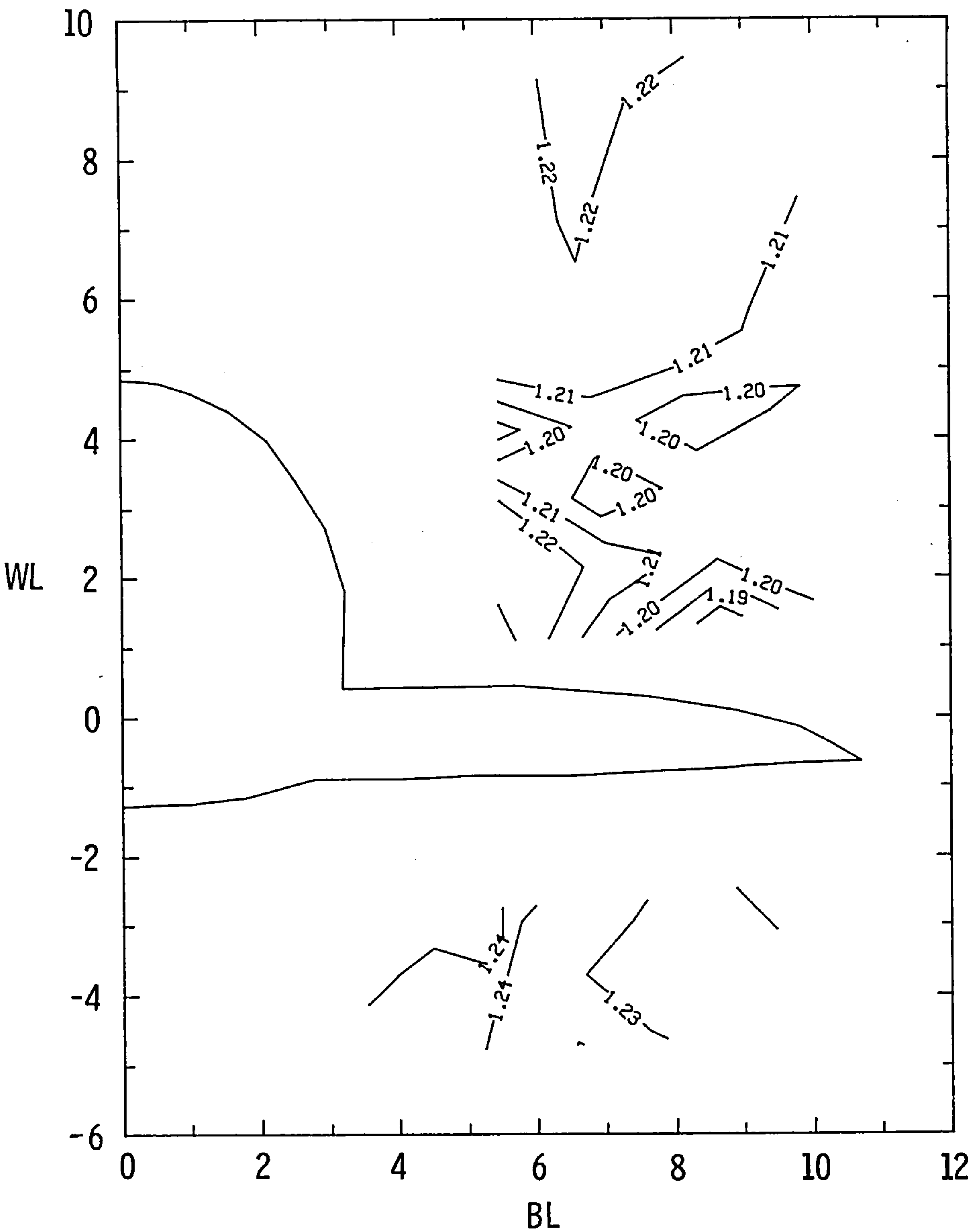
(e) M = 0.9; α = 5°.

Figure 11.- Continued.



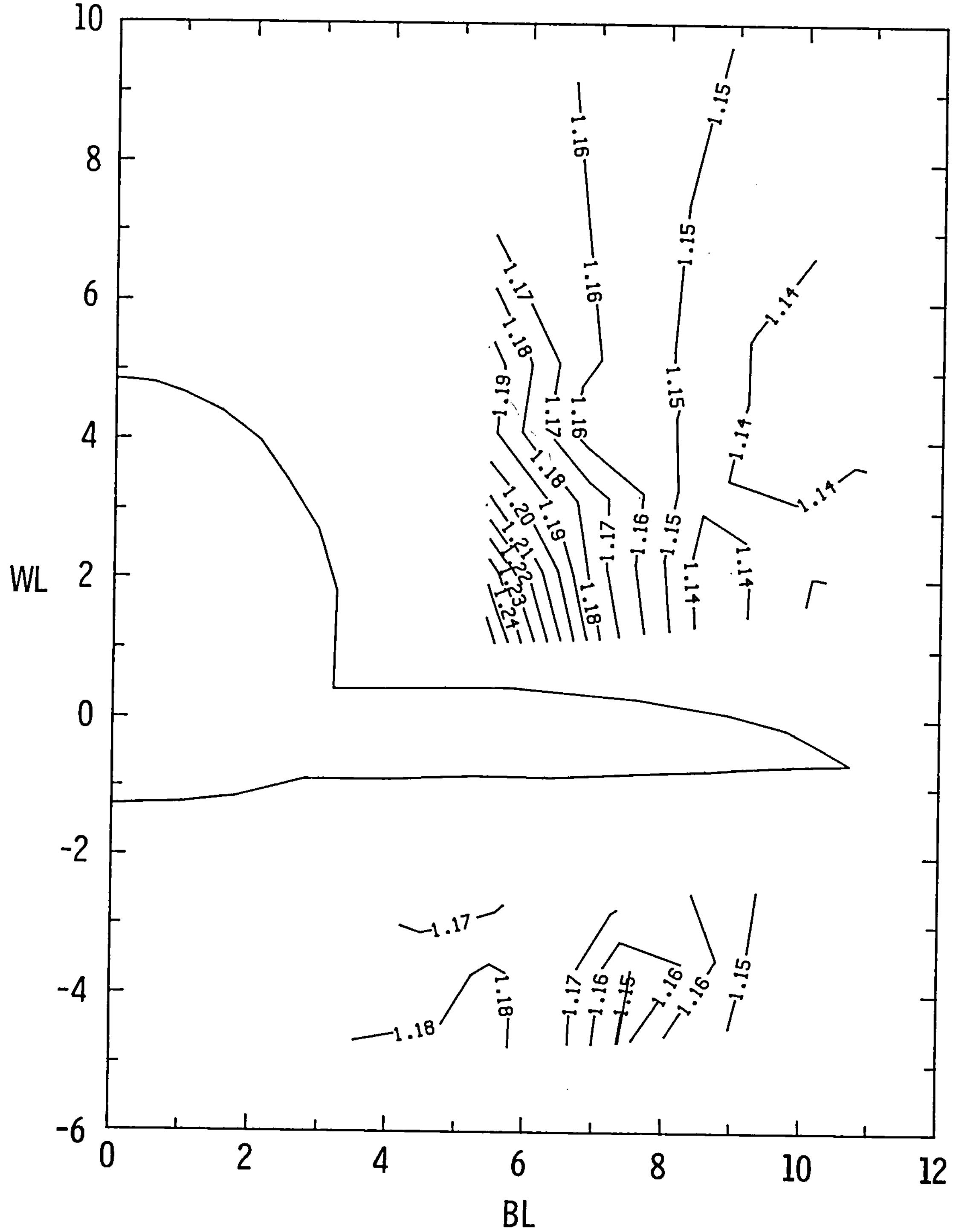
(f) M = 0.9; α = 10°.

Figure 11.- Continued.



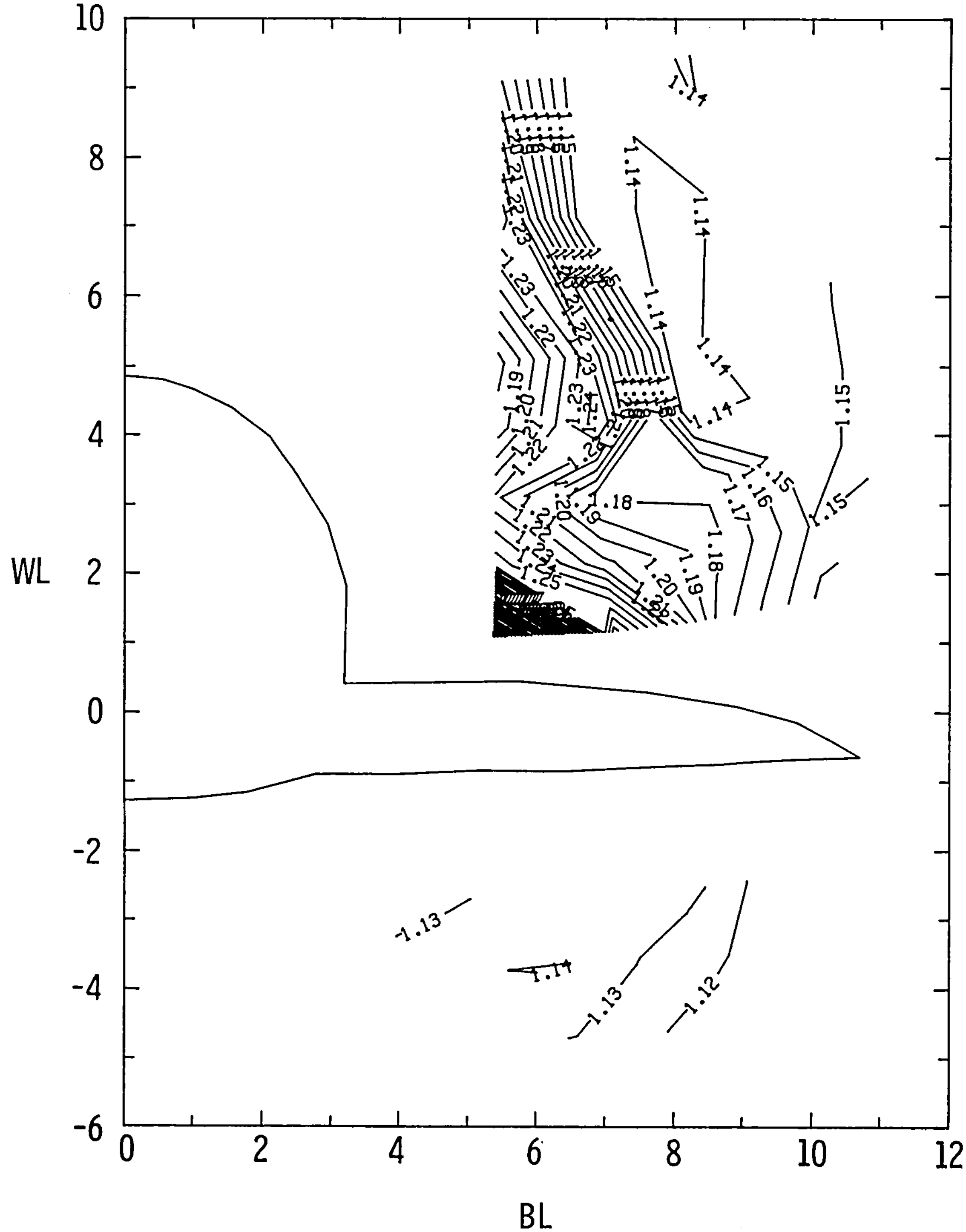
(g) M = 1.2; α = 0°.

Figure 11.- Continued.



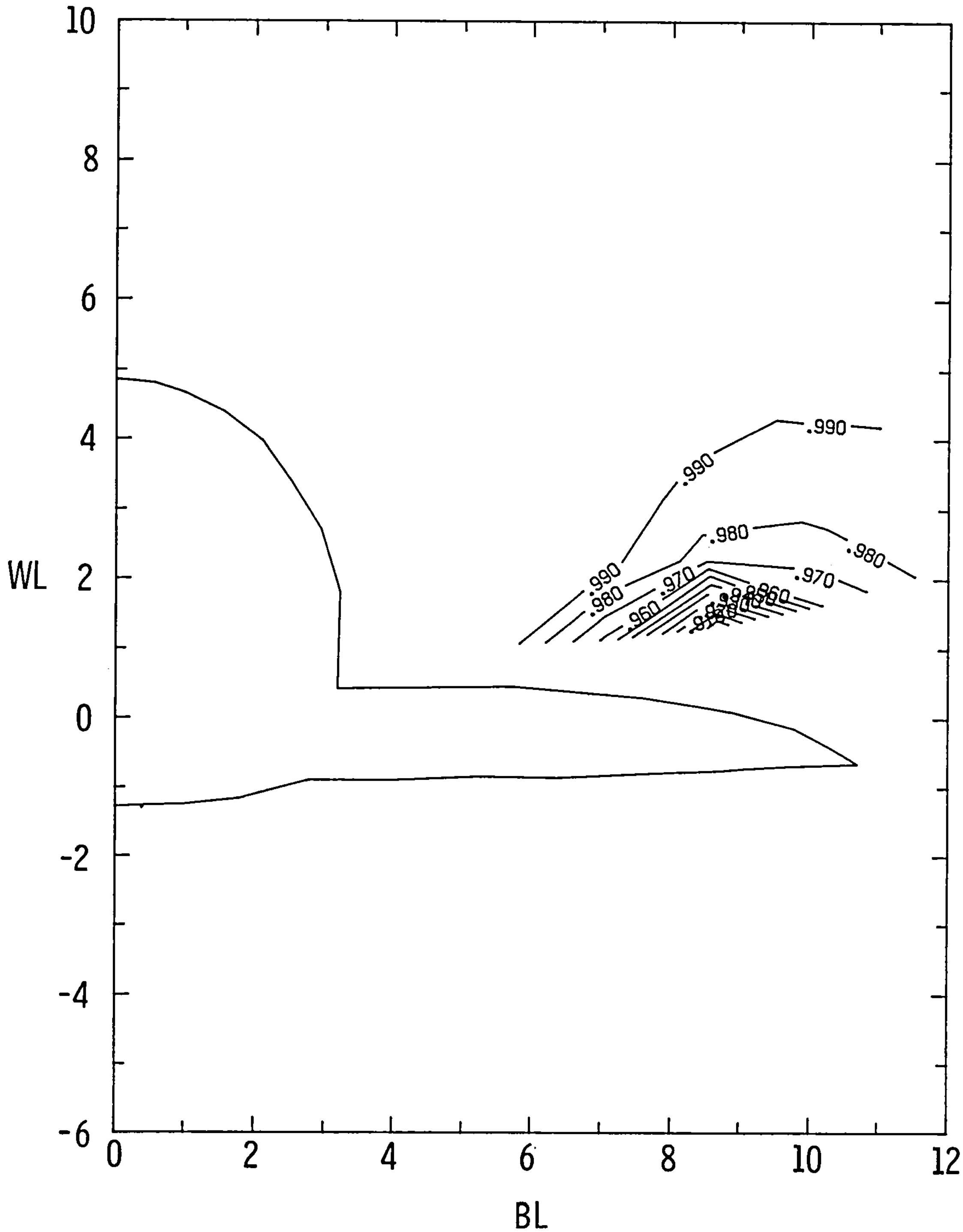
(h) M = 1.2; α = 5°.

Figure 11.- Continued.



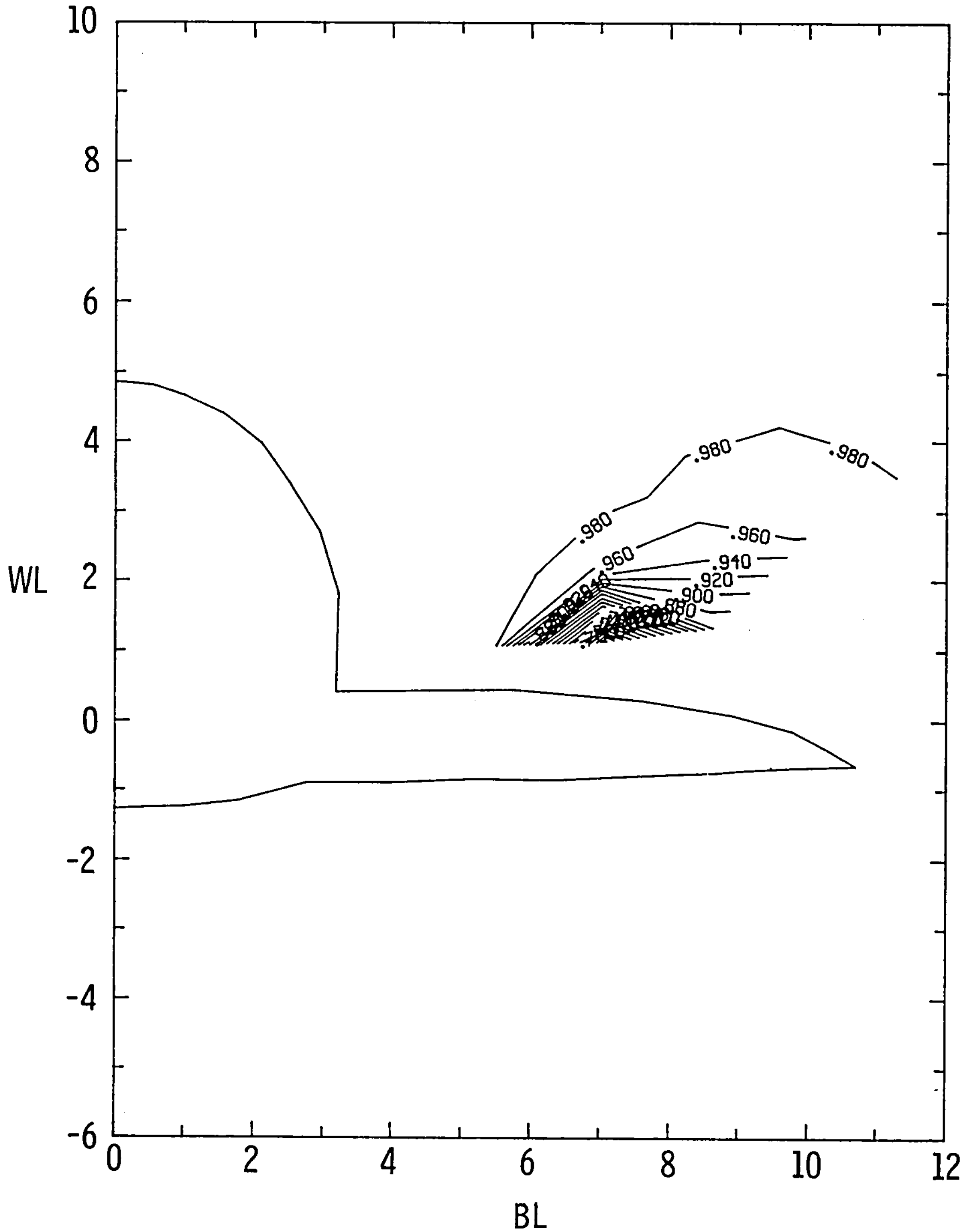
(i) M = 1.2; α = 7.5°.

Figure 11.- Concluded.



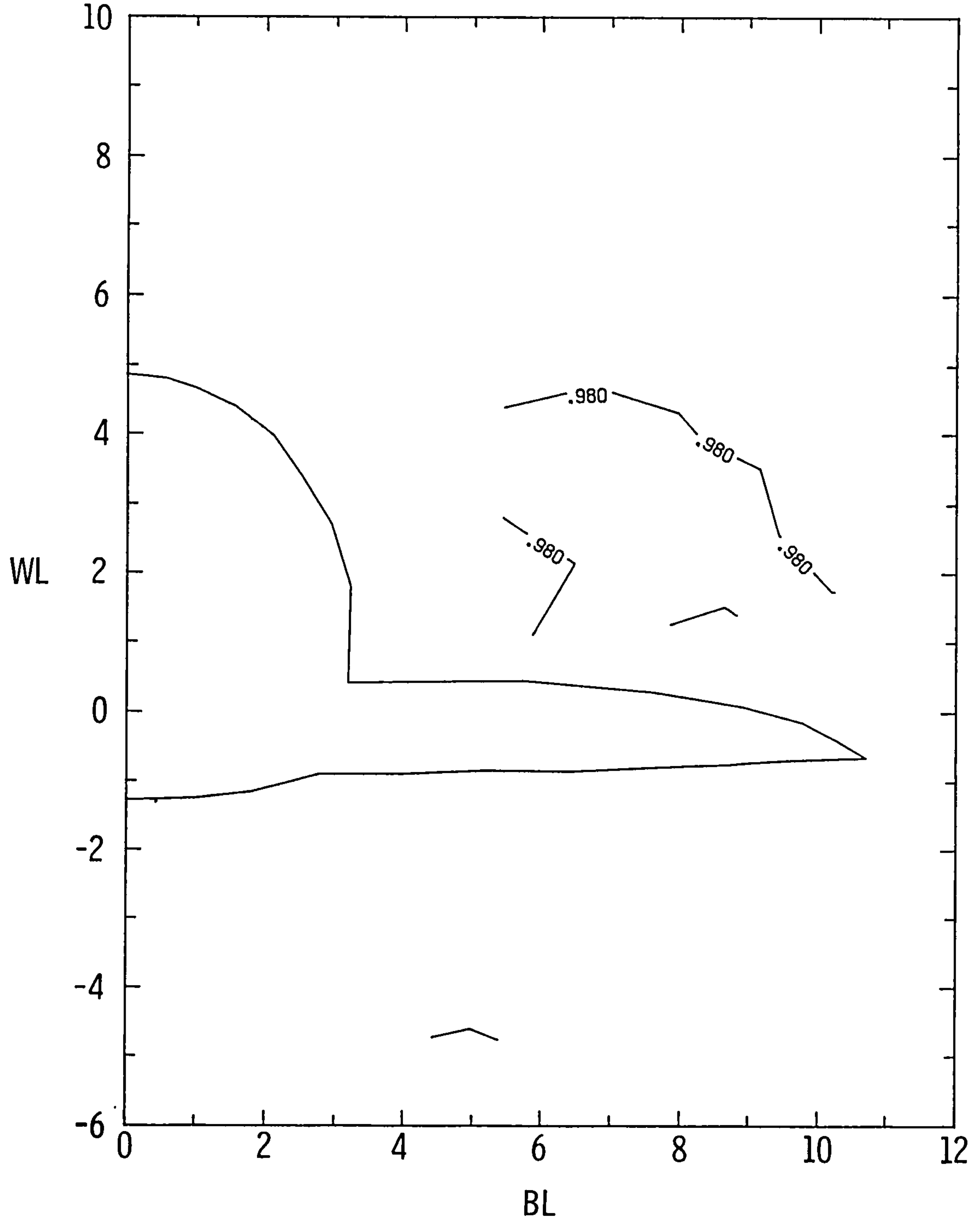
(a) M = 0.6; α = 10°.

Figure 12.- Local total pressure ratio (PTL/PTINF) contours for areas 1 and 2 (model station 60.0) at conditions where the ratio at some point in the field is less than 0.99.



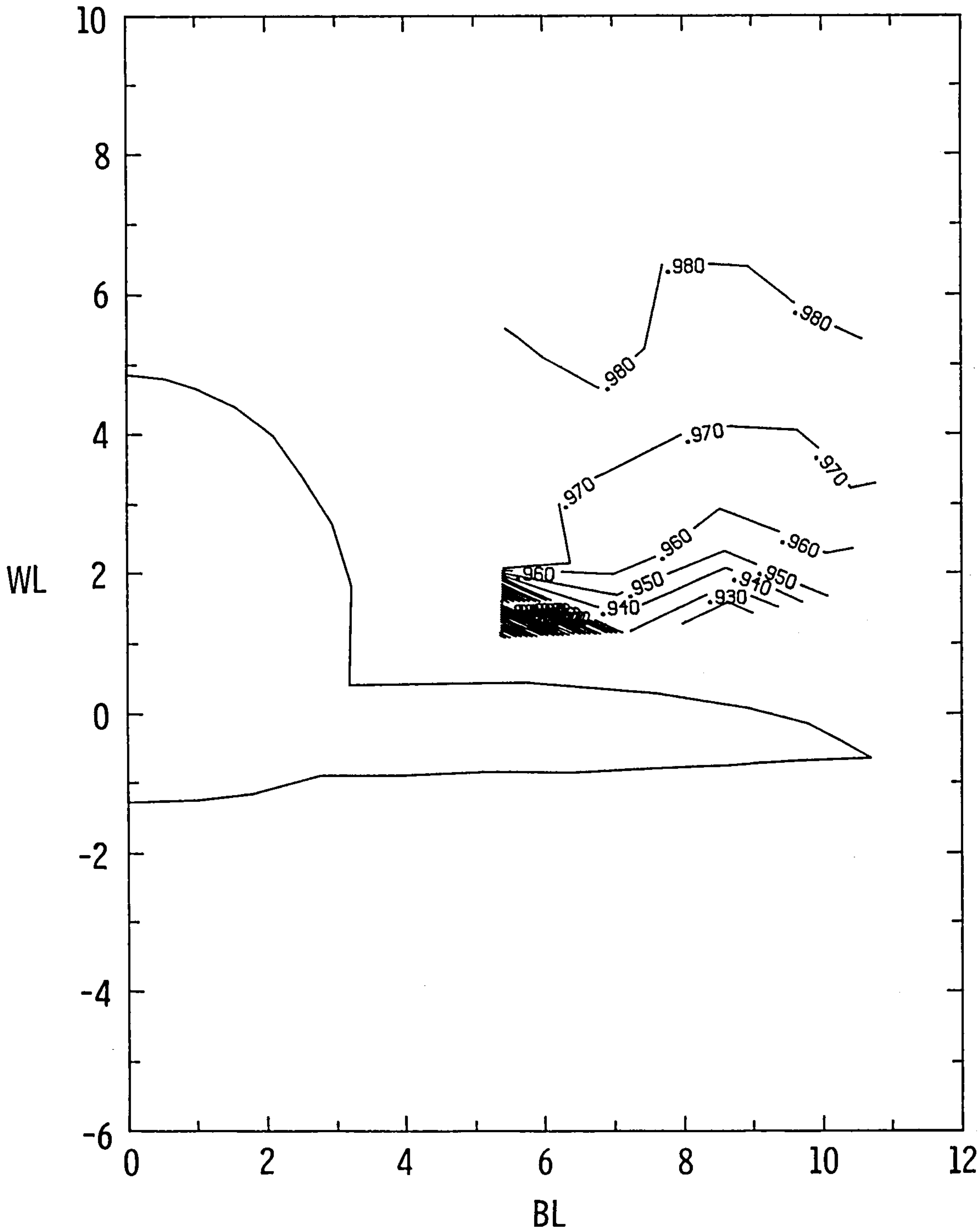
(b) M = 0.9; α = 10°.

Figure 12.- Continued.



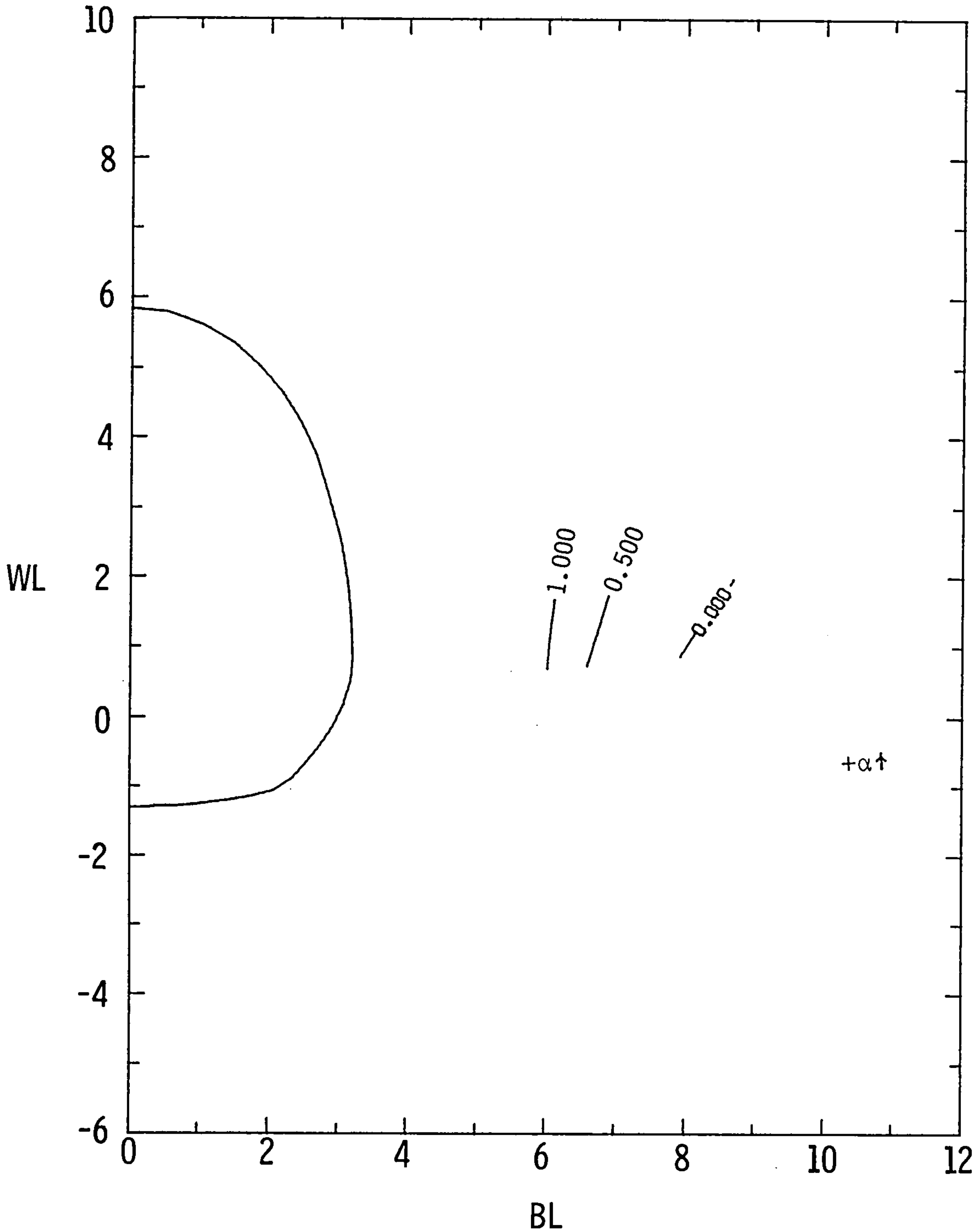
(c) M = 1.2; α = 5°.

Figure 12.- Continued.



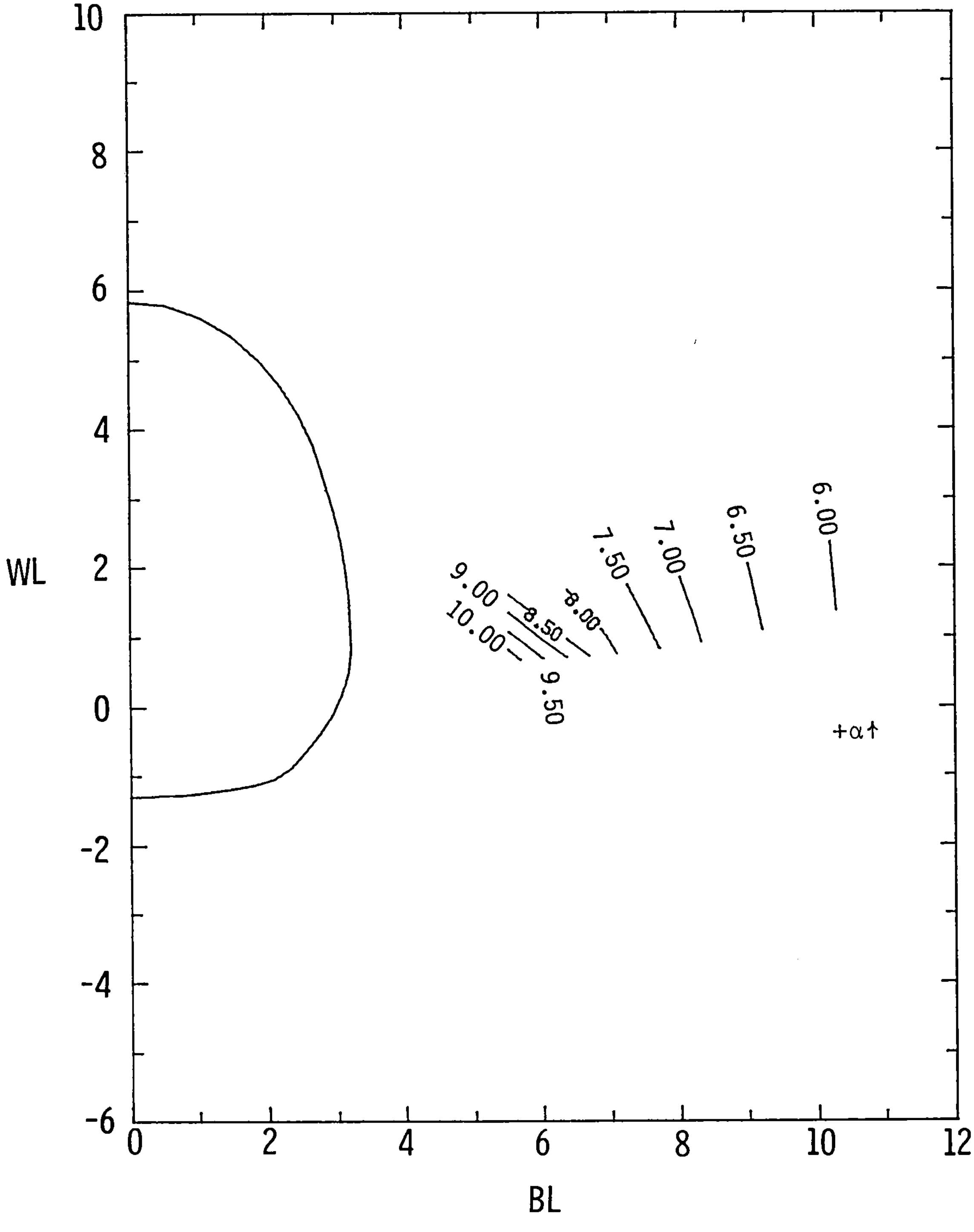
(d) M = 1.2; α = 7.5°.

Figure 12.- Concluded.



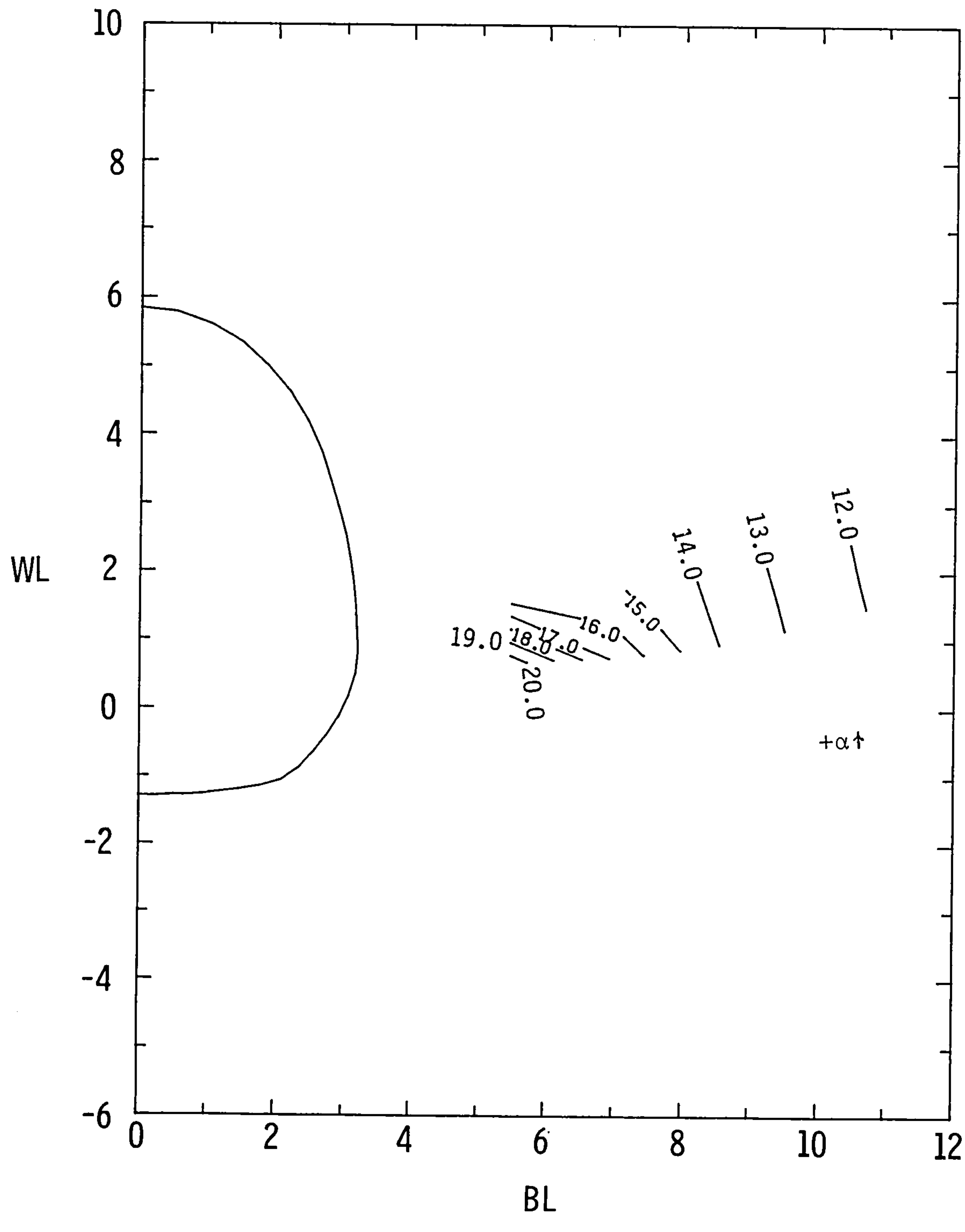
(a) M = 0.6; α = 0°.

Figure 13.- Local angle of attack contours for area 3 (model station 47.8) at various Mach numbers and angles of attack.



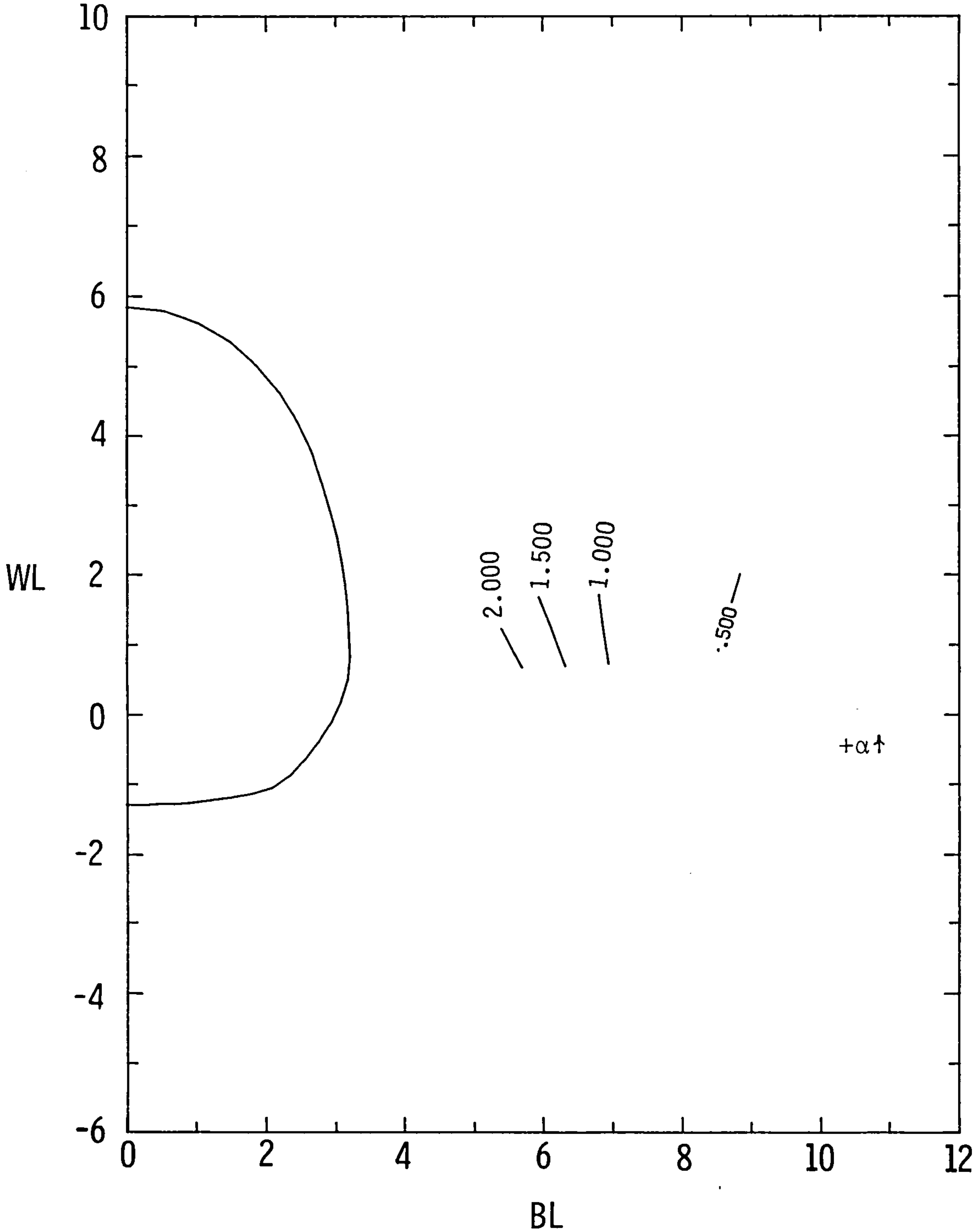
(b) M = 0.6; α = 5°.

Figure 13.- Continued.



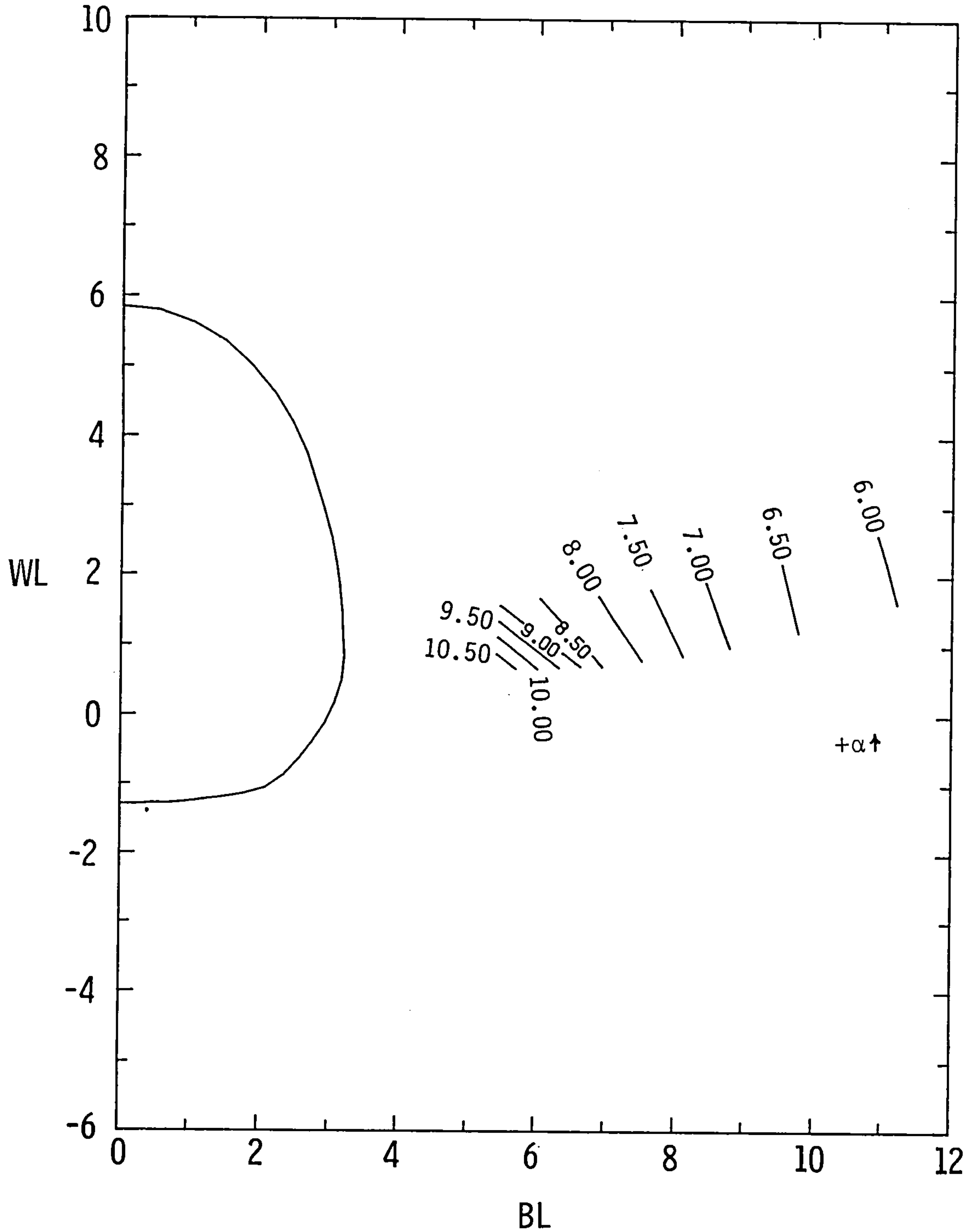
(c) M = 0.6; α = 10°.

Figure 13.- Continued.



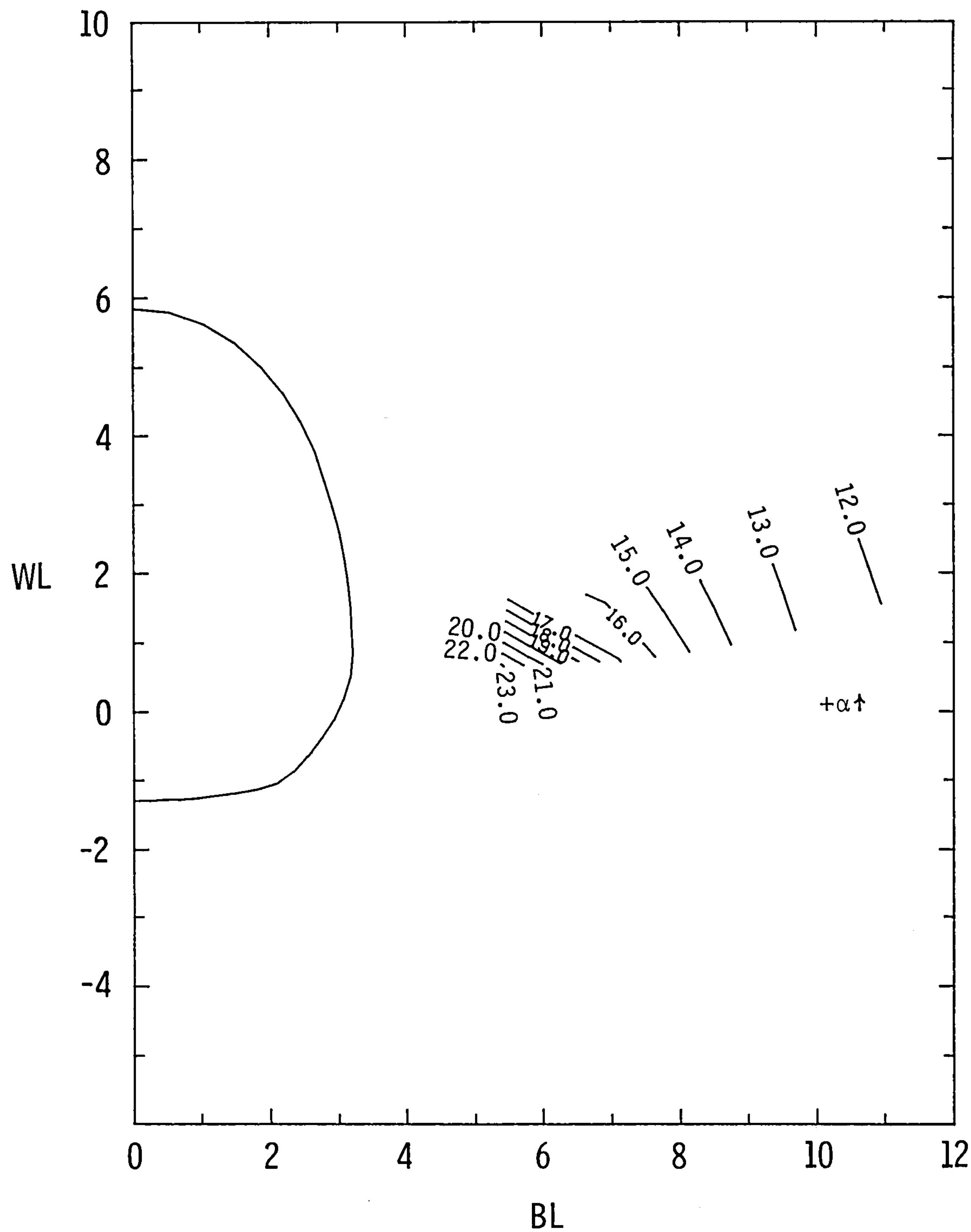
(d) M = 0.9; α = 0°.

Figure 13.- Continued.



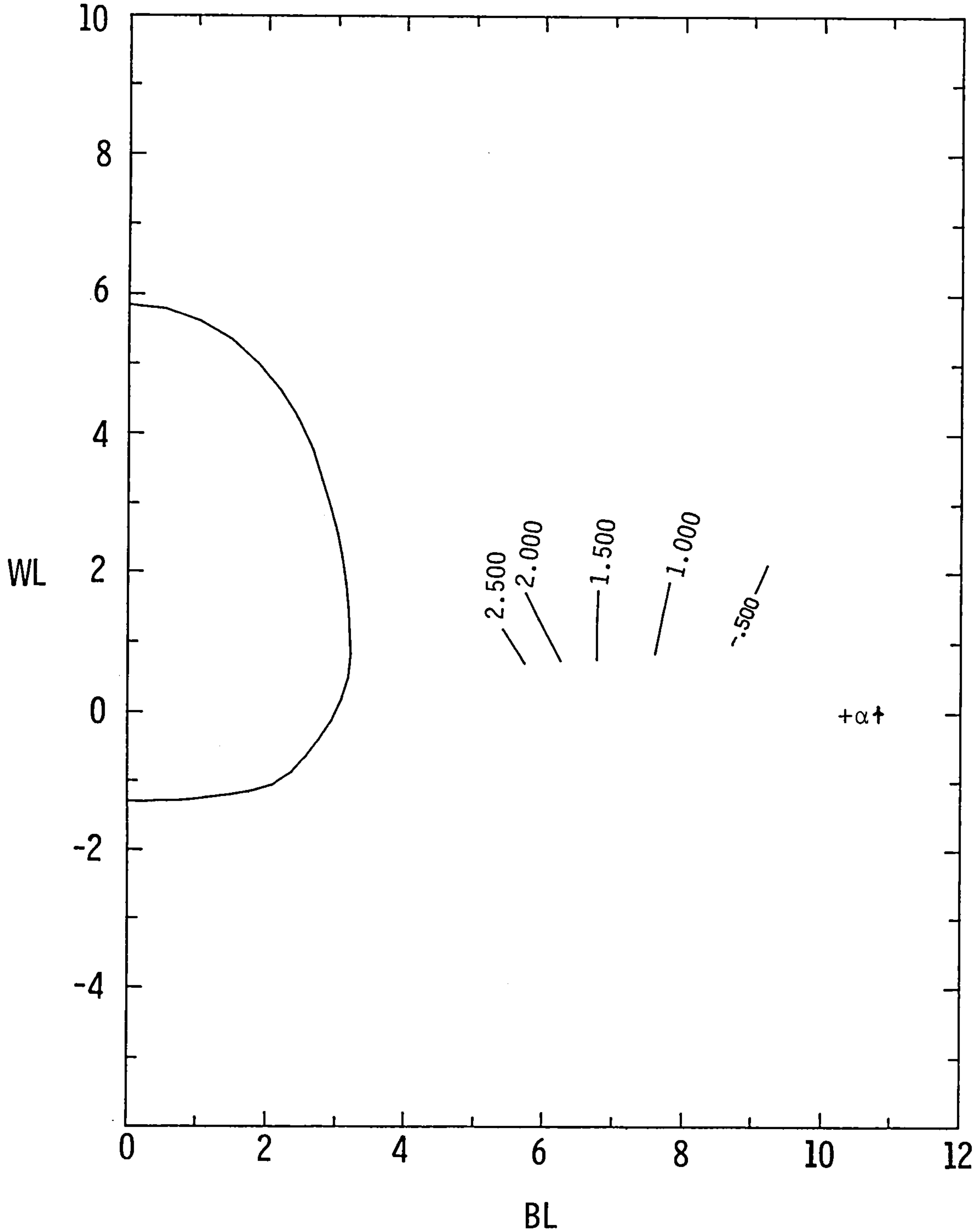
(e) M = 0.9; α = 5°.

Figure 13.- Continued.



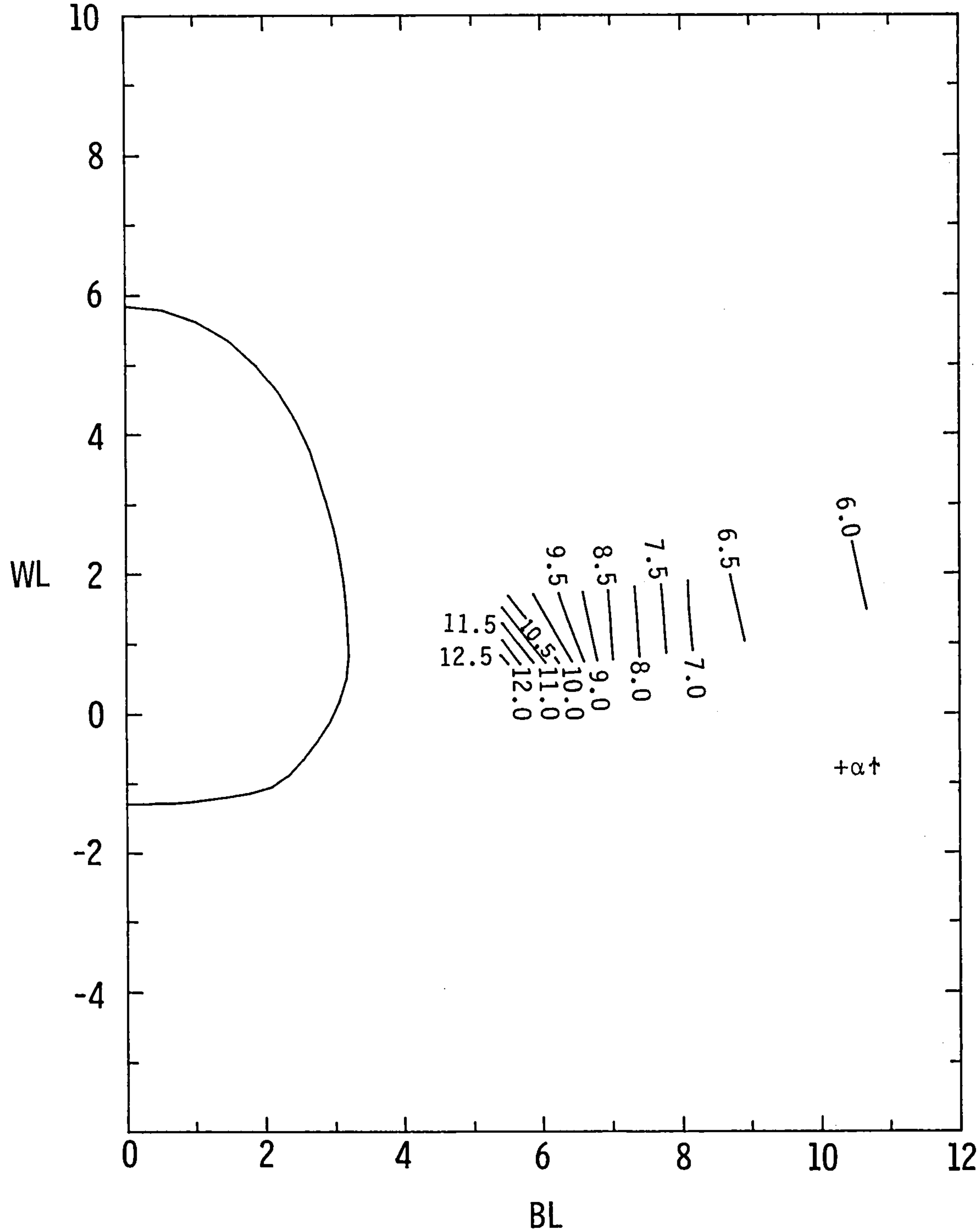
(f) M = 0.9; α = 10°.

Figure 13.- Continued.



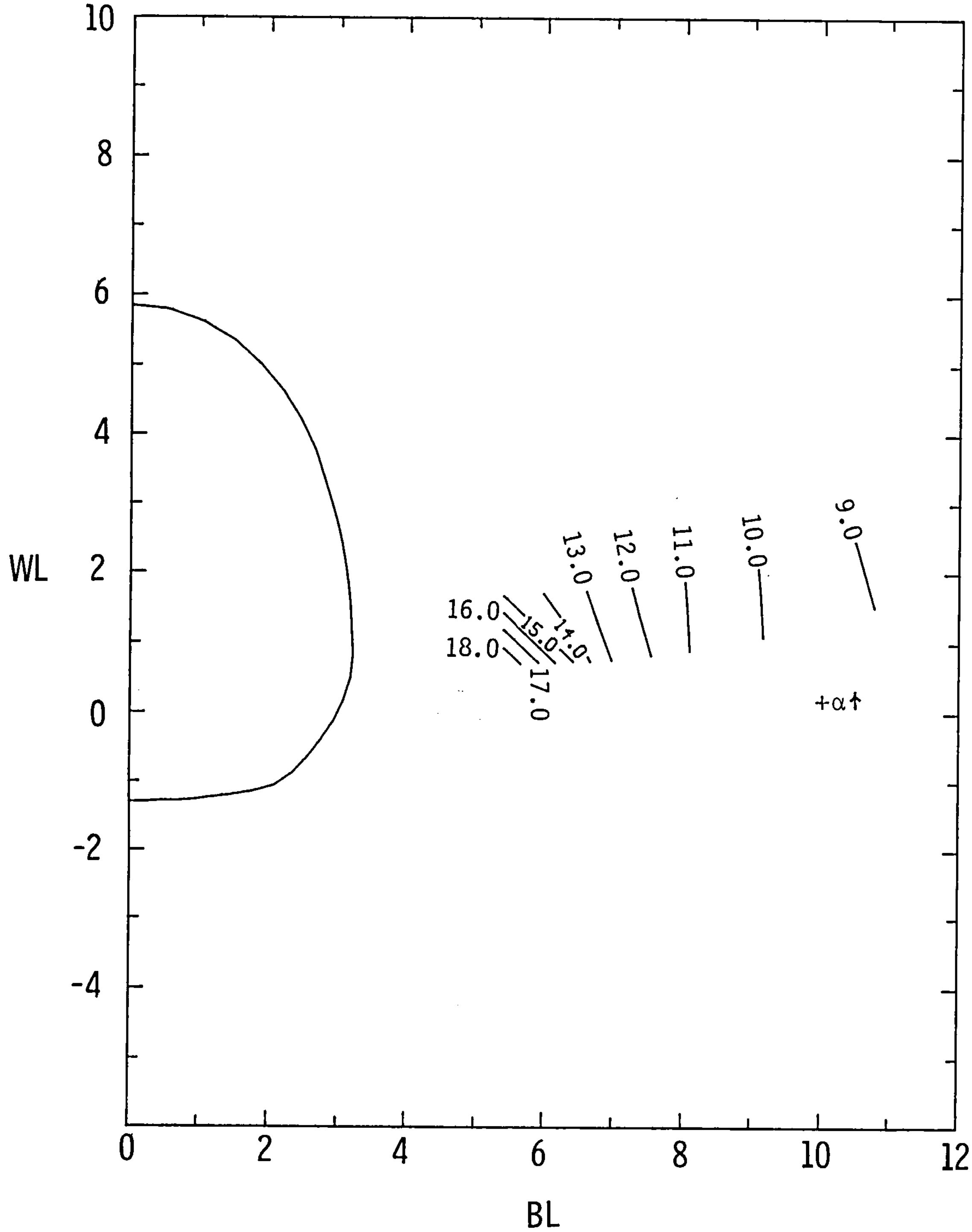
(g) M = 1.2; α = 0°.

Figure 13.- Continued.



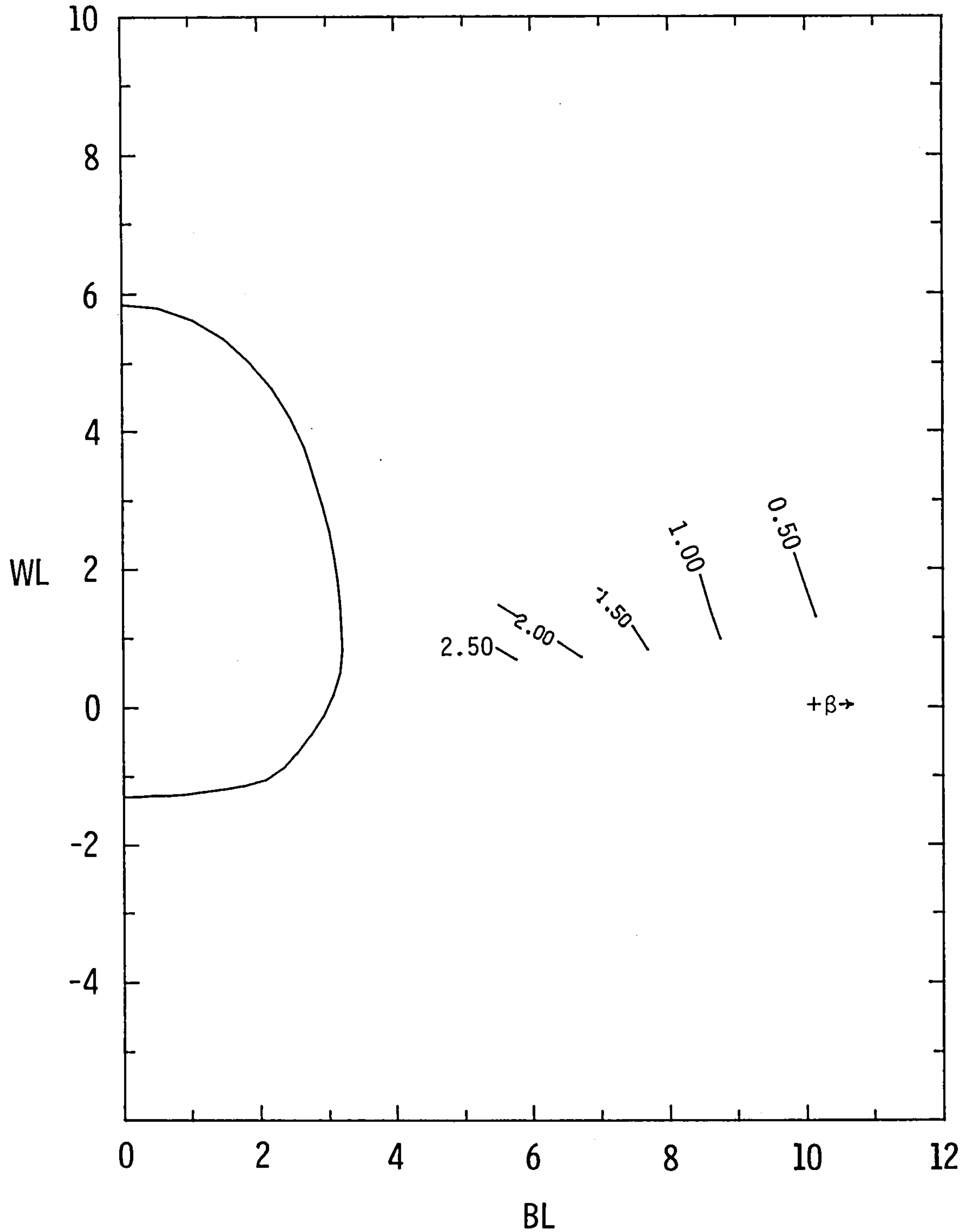
(h) M = 1.2; α = 5°.

Figure 13.- Continued.



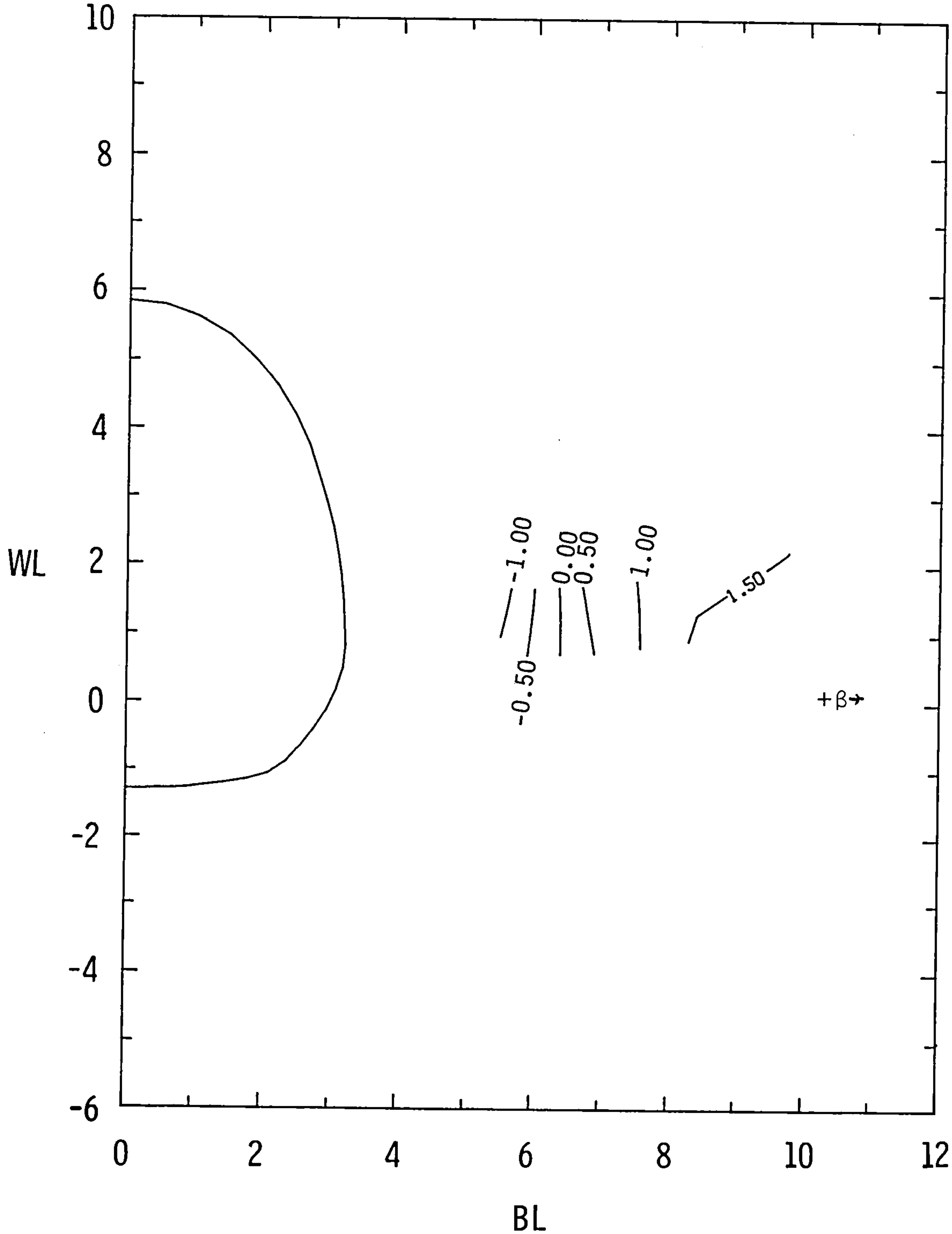
(i) M = 1.2; α = 7.5°.

Figure 13.- Concluded.



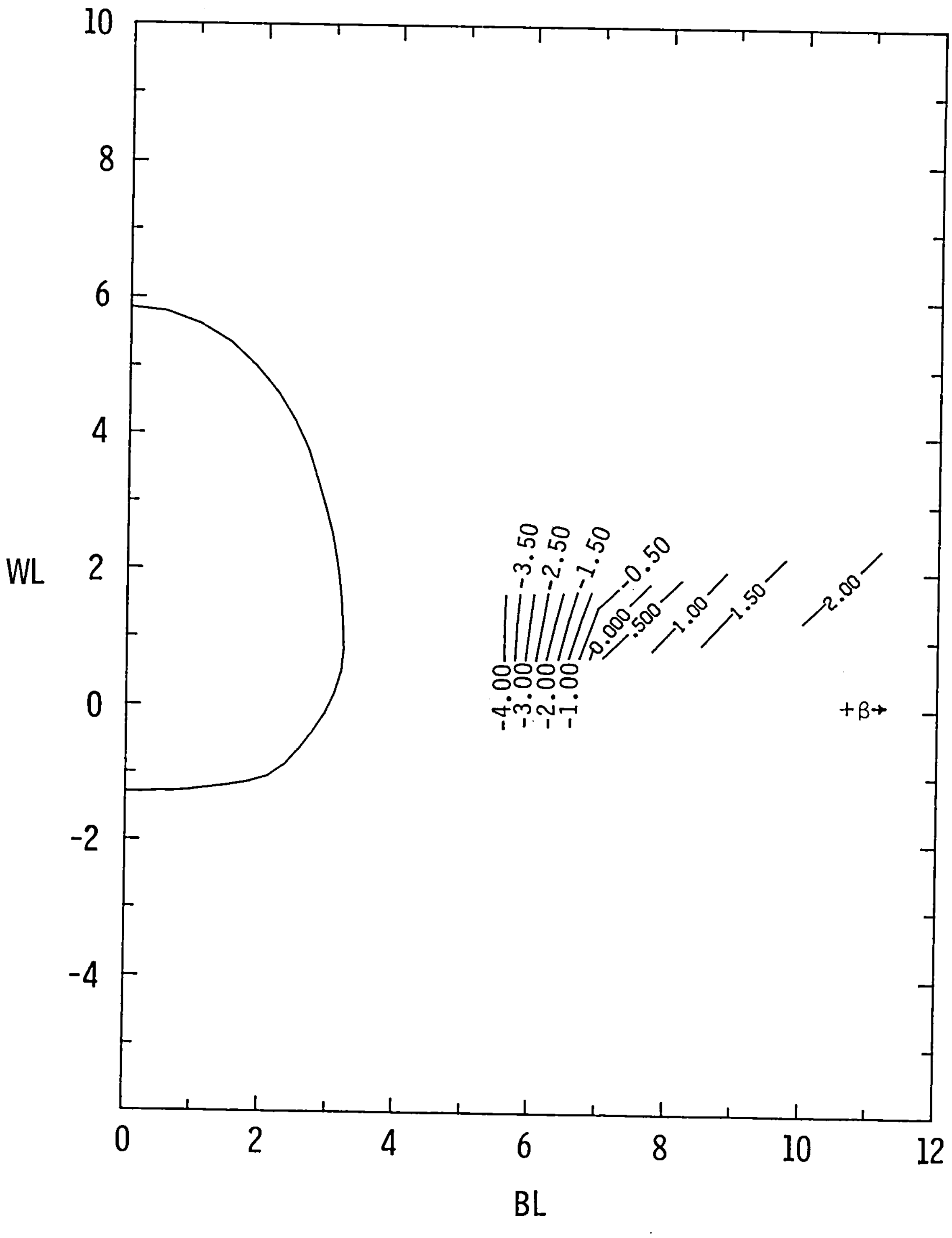
(a) M = 0.6; α = 0°.

Figure 14.- Local side flow contours for area 3 (model station 47.8) at various Mach numbers and angles of attack.



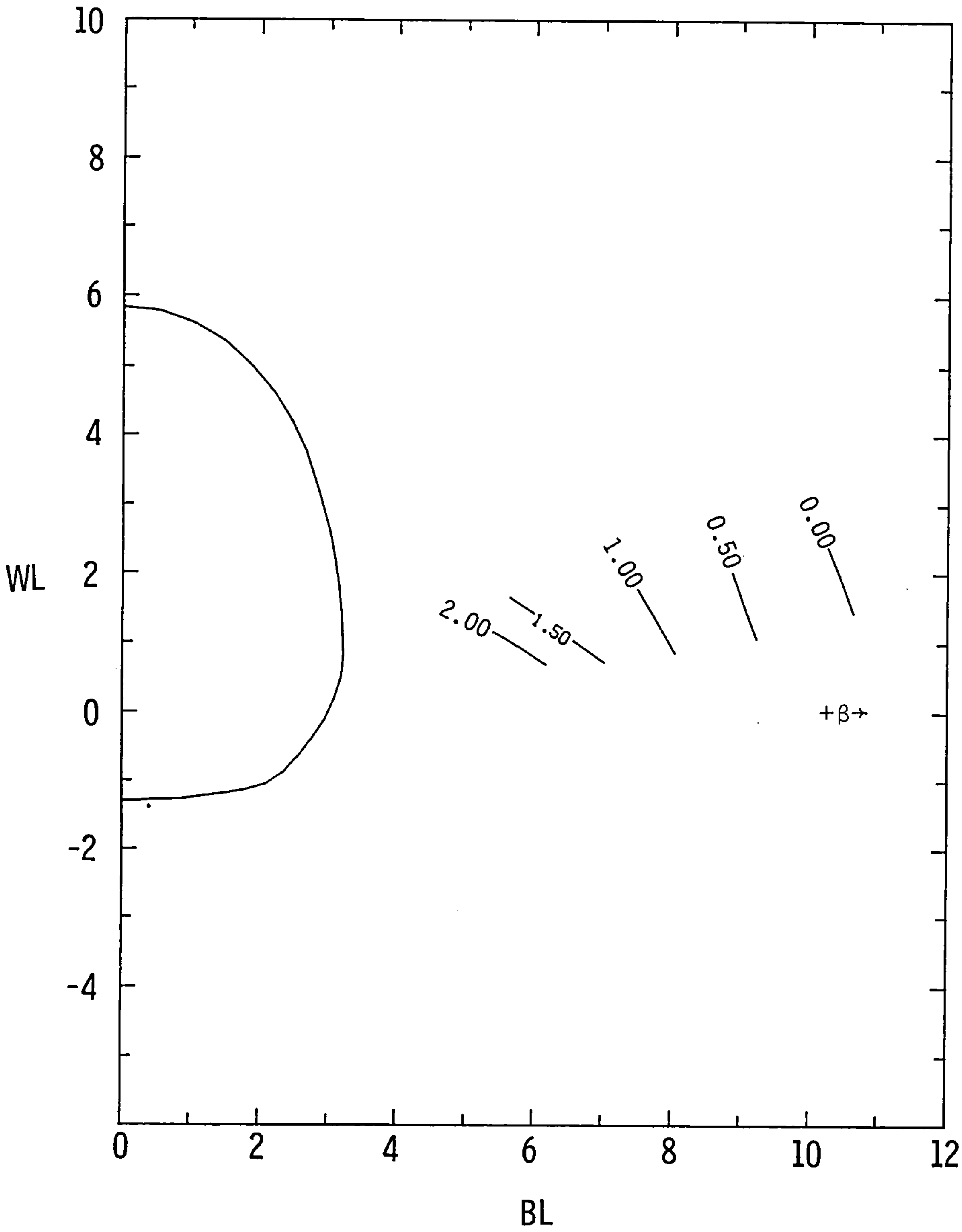
(b) M = 0.6; $\alpha = 5°$.

Figure 14.- Continued.



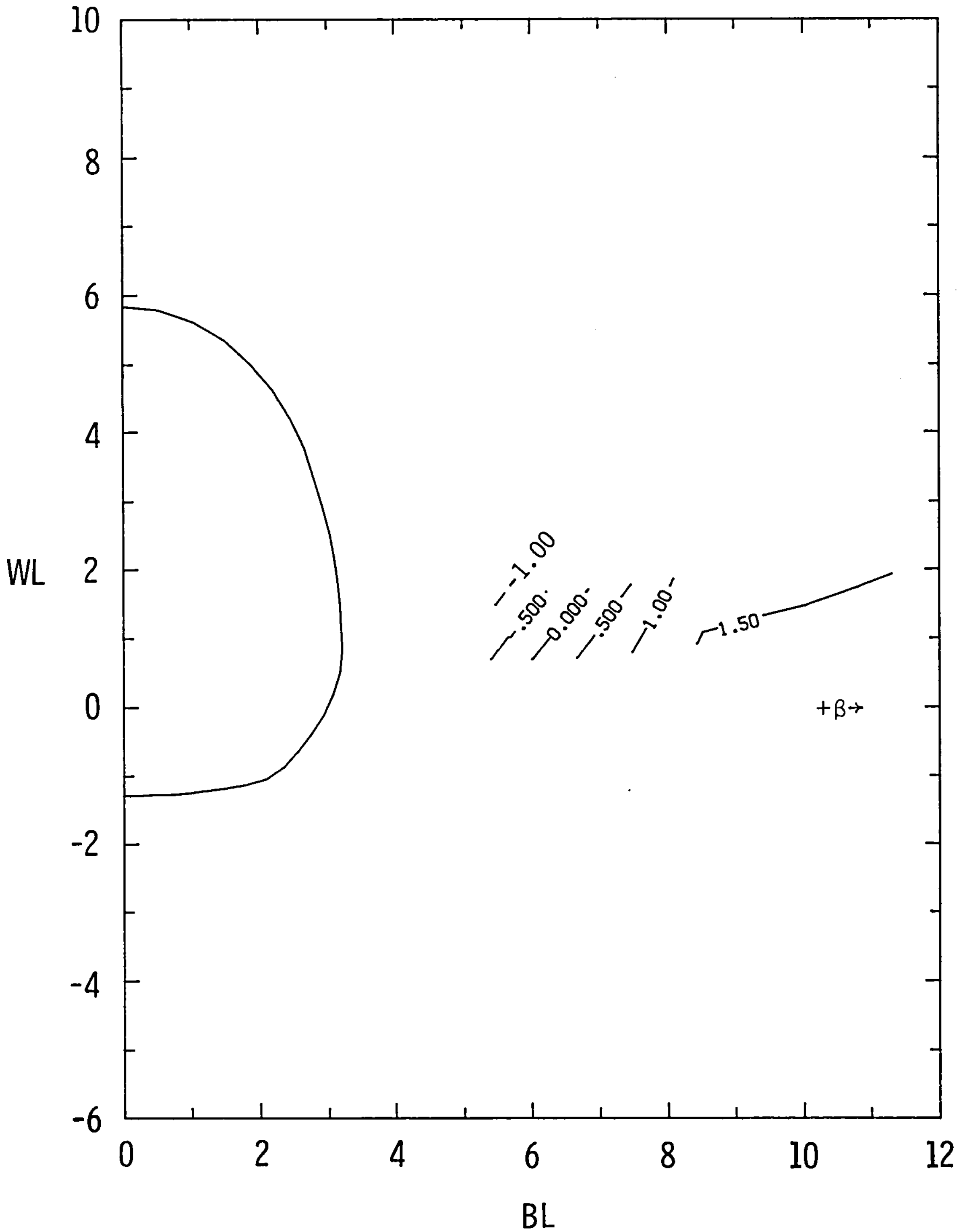
(c) M = 0.6; α = 10°.

Figure 14.- Continued.



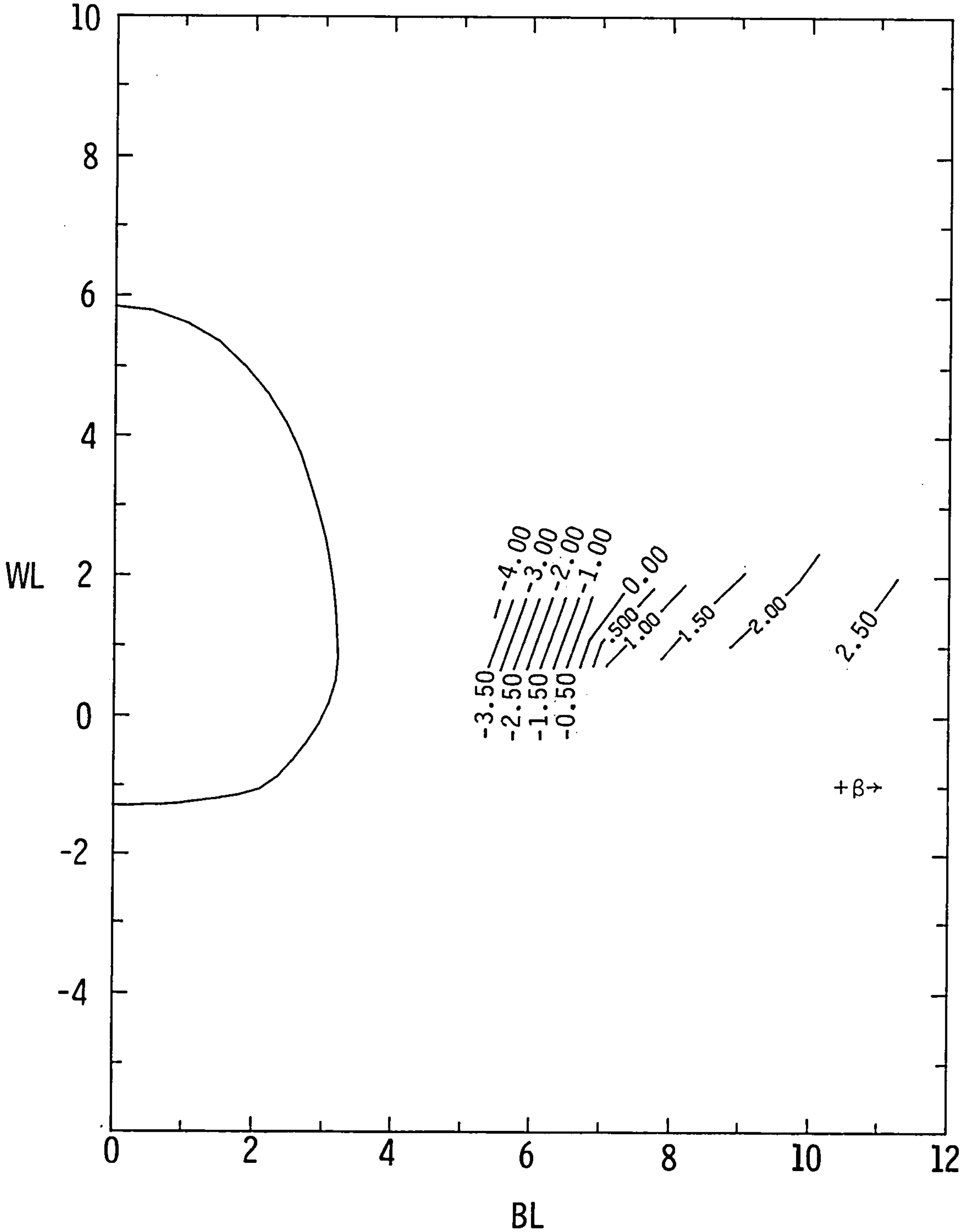
(d) M = 0.9; α = 0°.

Figure 14.- Continued.



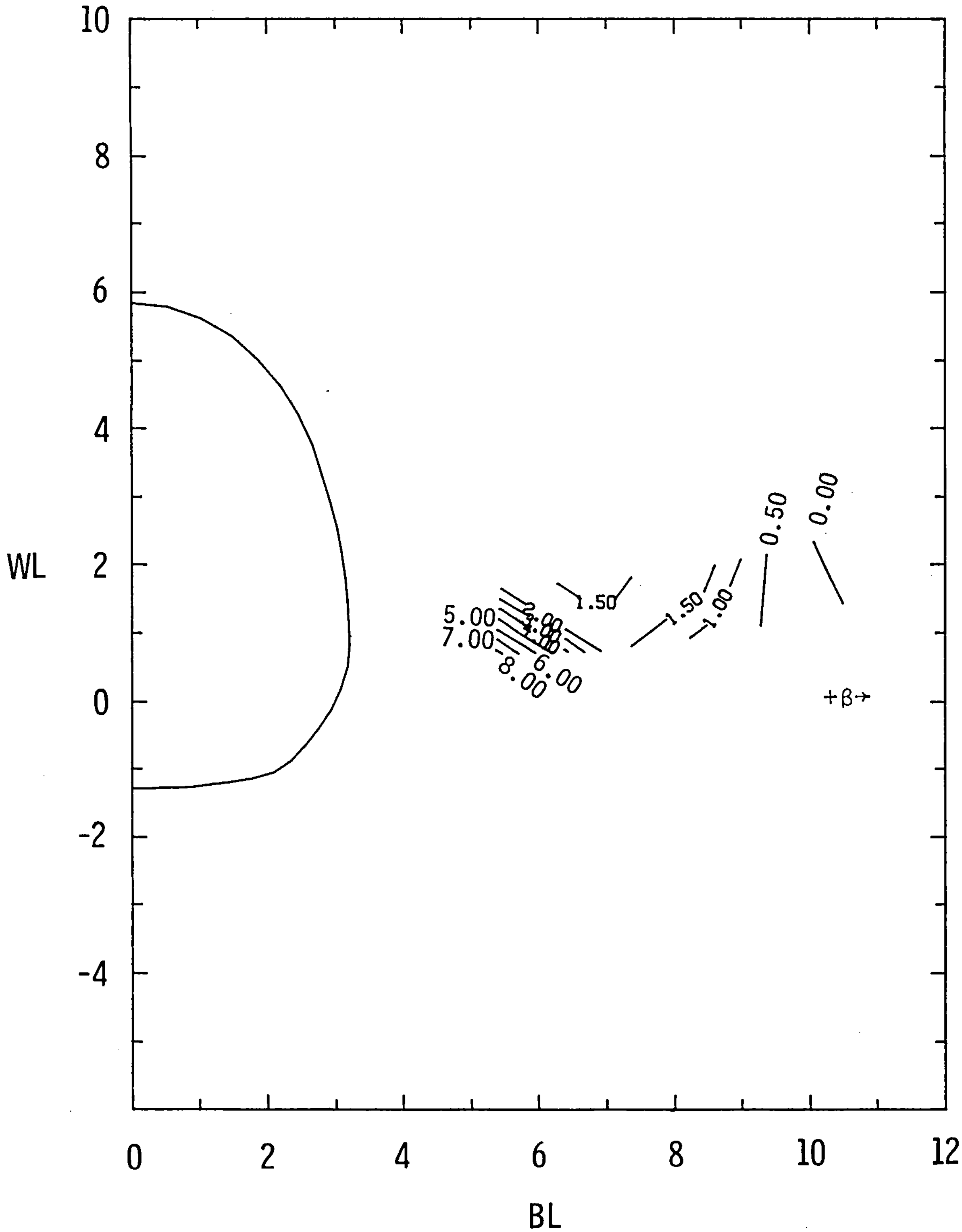
(e) M = 0.9; α = 5°.

Figure 14.- Continued.



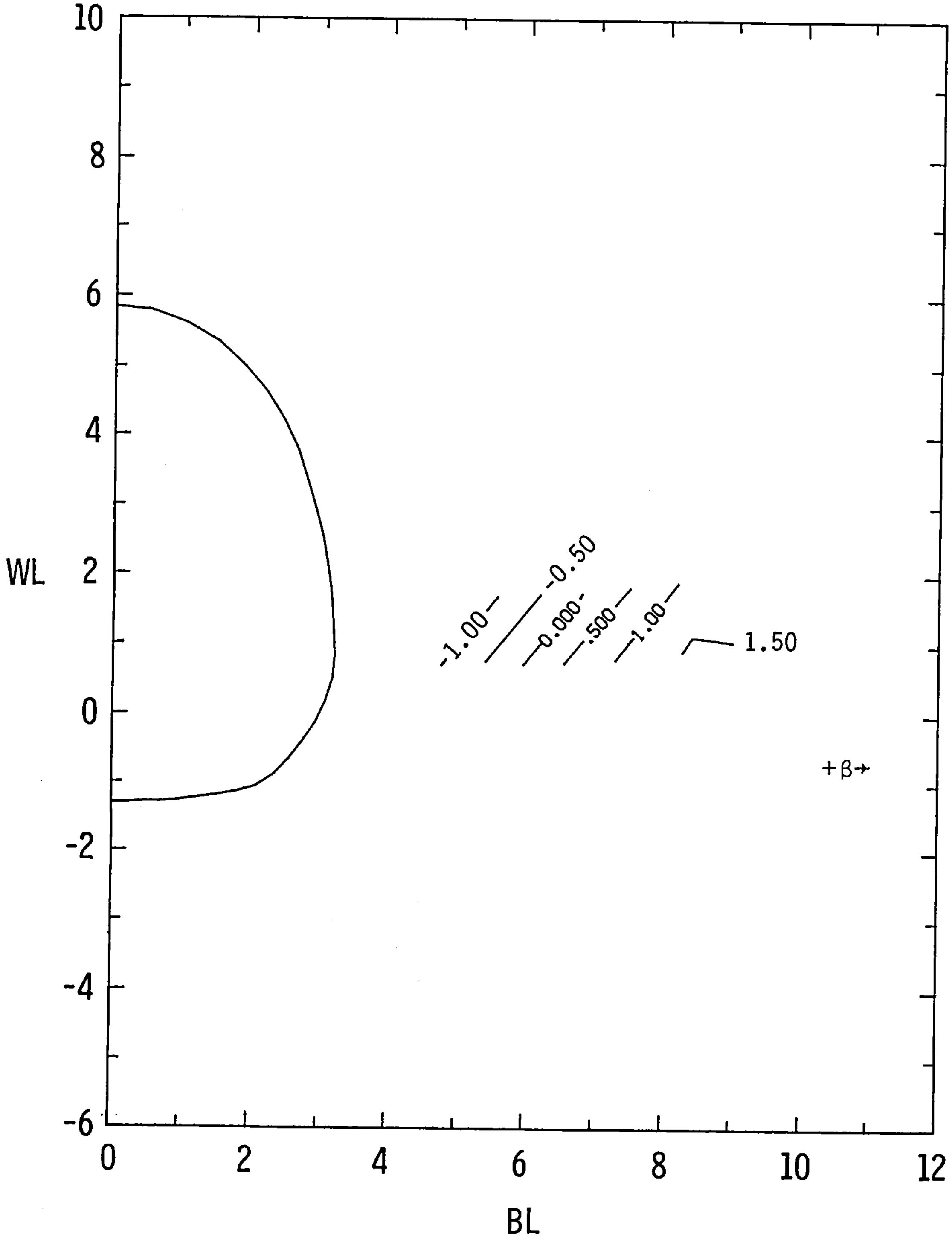
(f) M = 0.9; α = 10°.

Figure 14.- Continued.



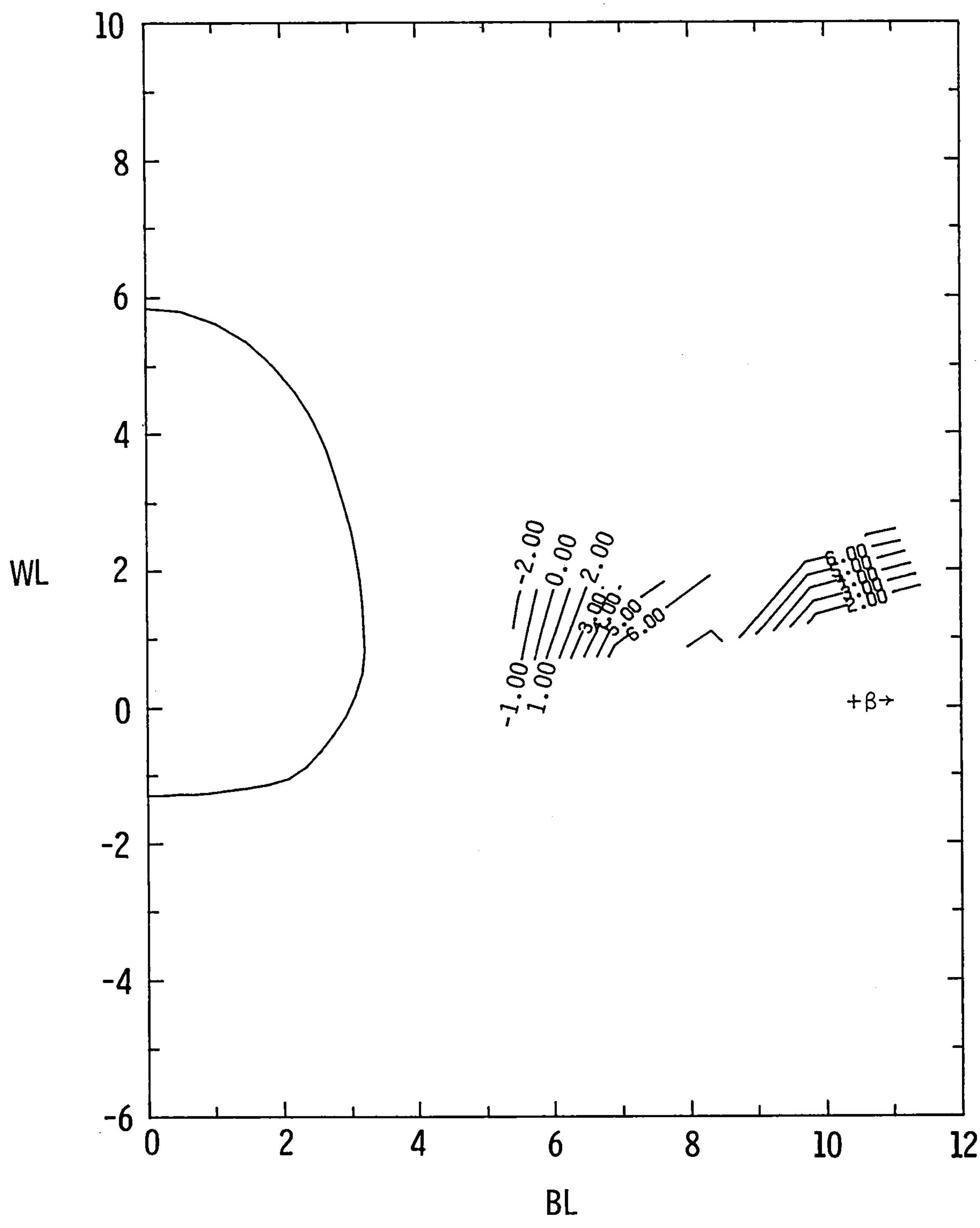
(g) M = 1.2; α = 0°.

Figure 14.- Continued.



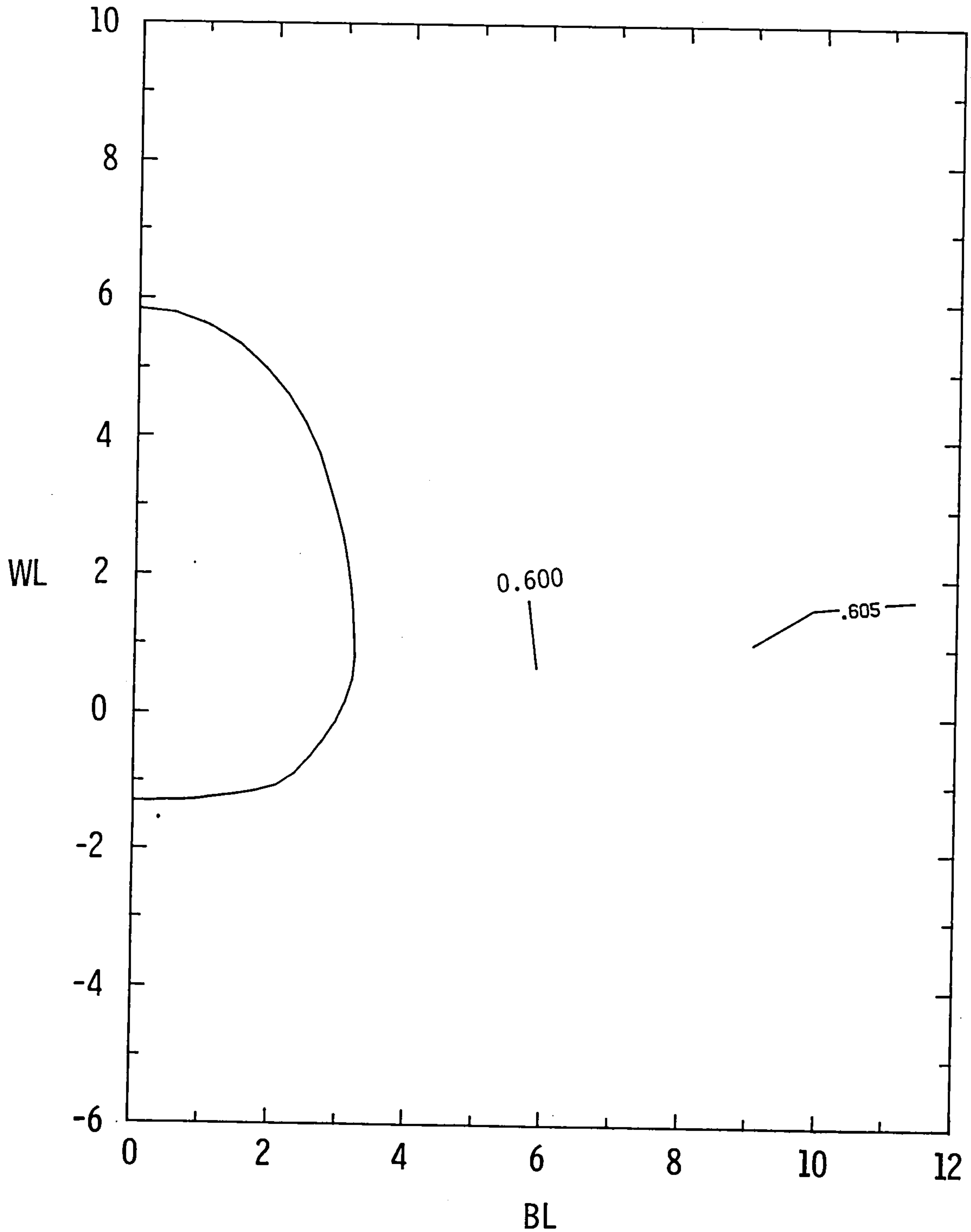
(h) M = 1.2; α = 5°.

Figure 14.- Continued.



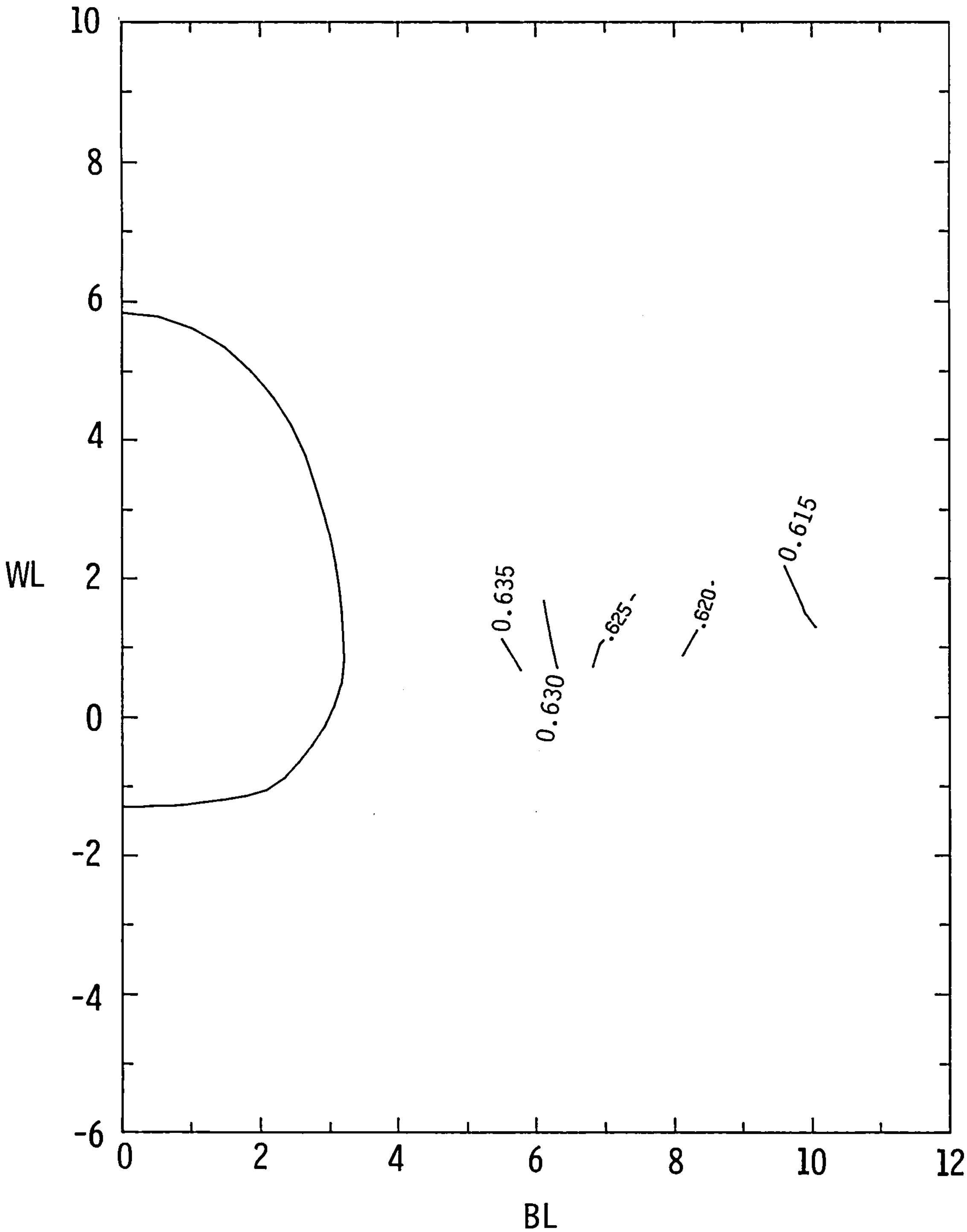
(i) M = 1.2; α = 7.5°.

Figure 14.- Concluded.



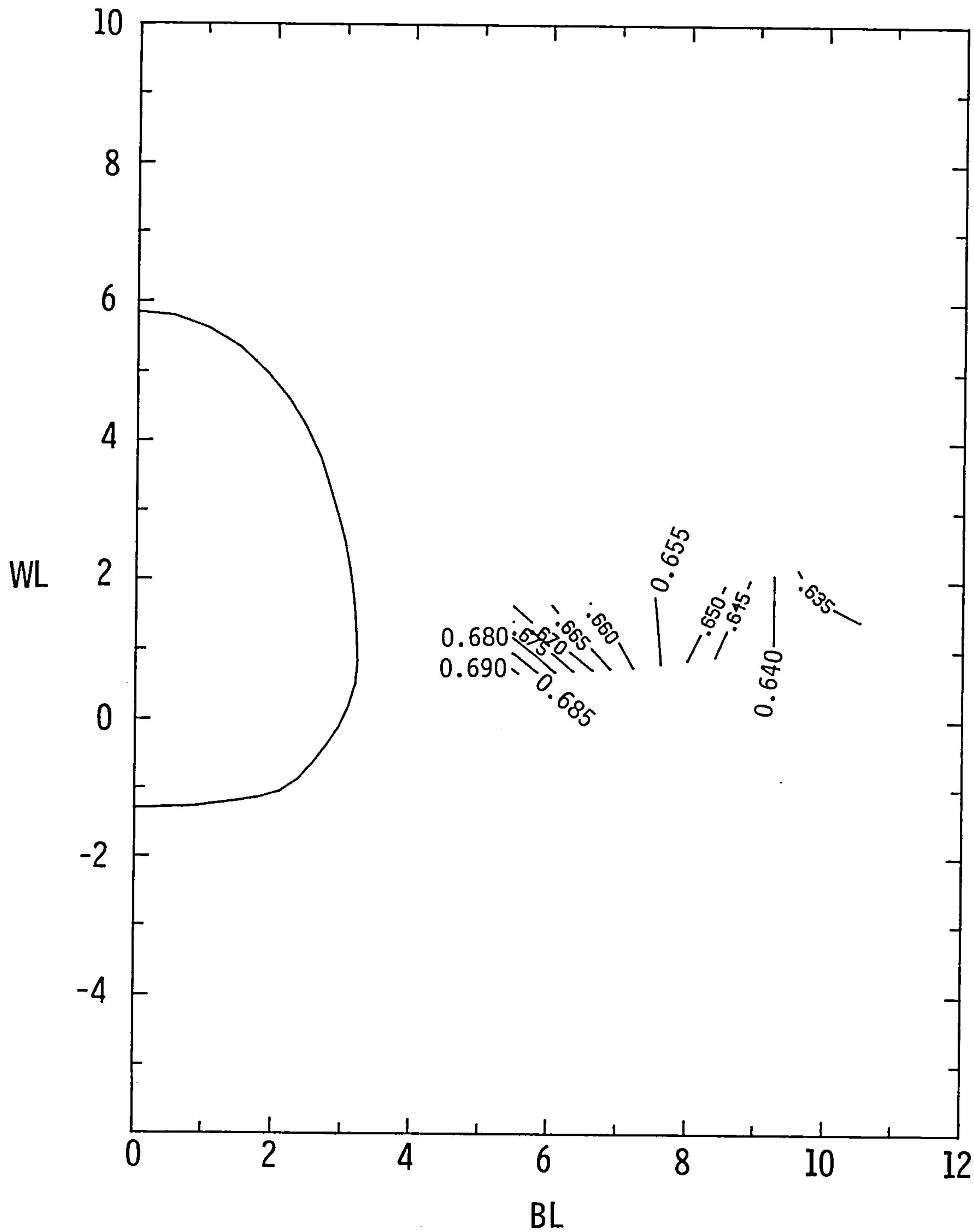
(a) M = 0.6; α = 0°.

Figure 15.- Local Mach number contours for area 3 (model station 47.8) at various Mach numbers and angles of attack.



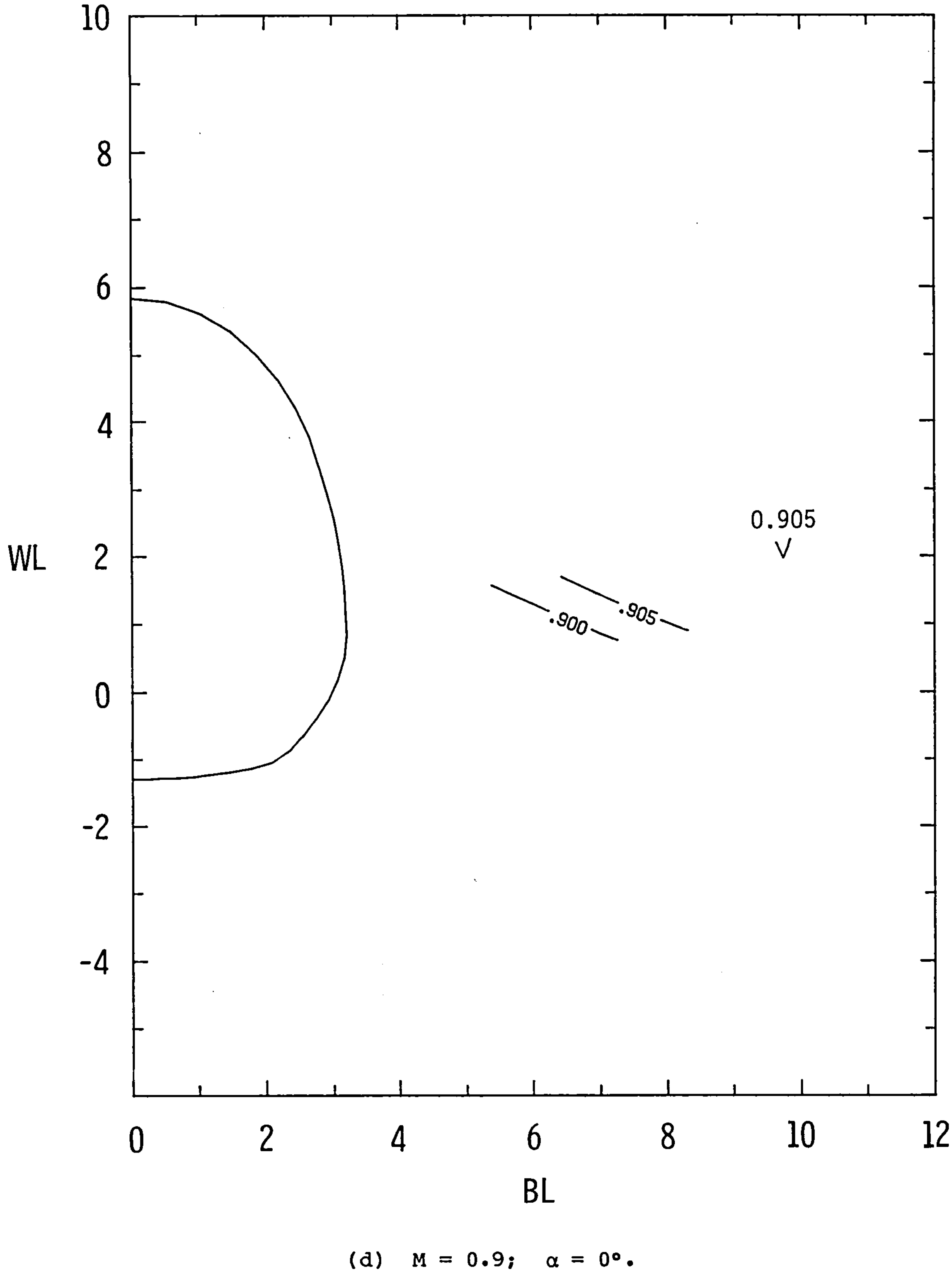
(b) M = 0.6; α = 5°.

Figure 15.- Continued.



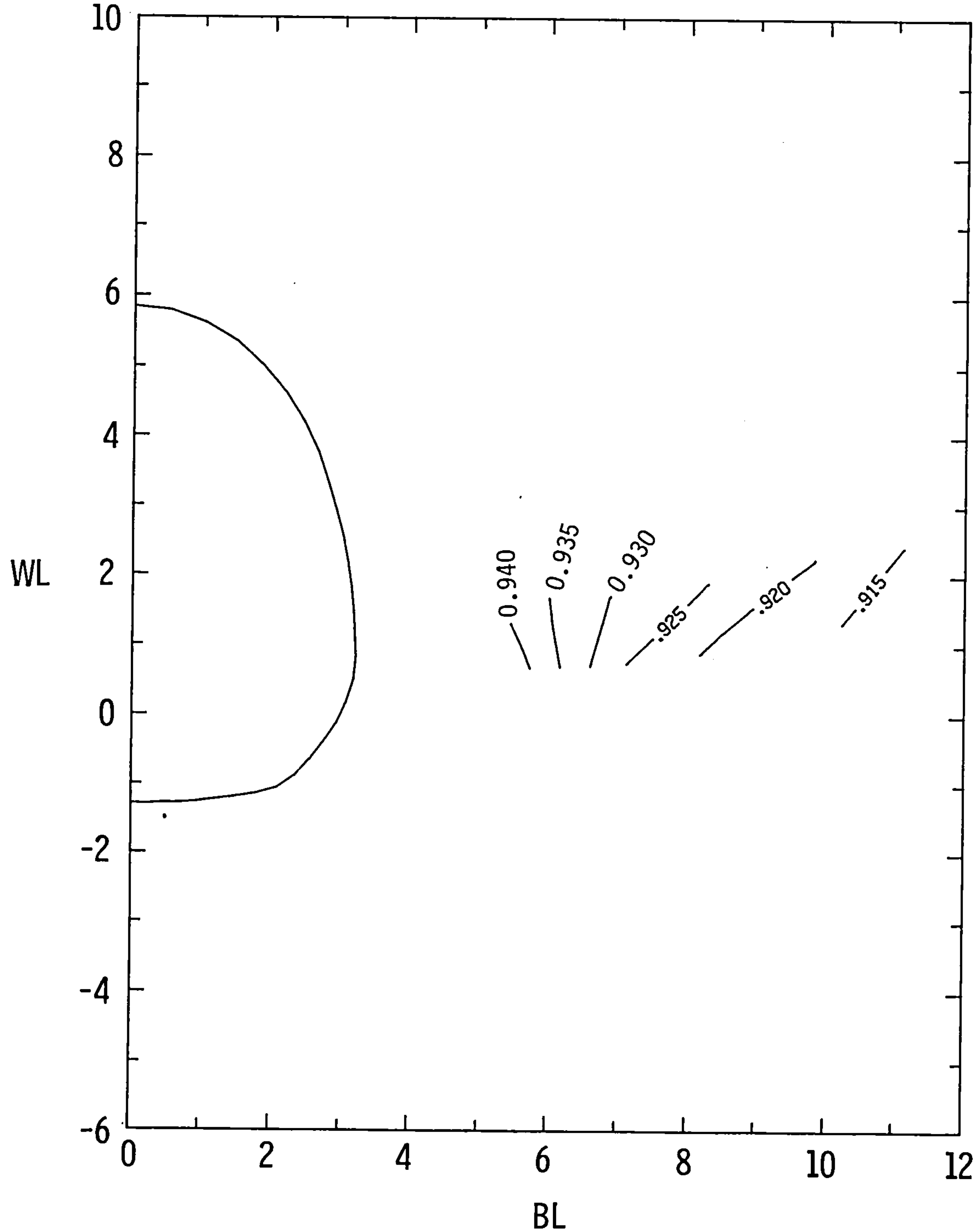
(c) M = 0.6; α = 10°.

Figure 15.- Continued.



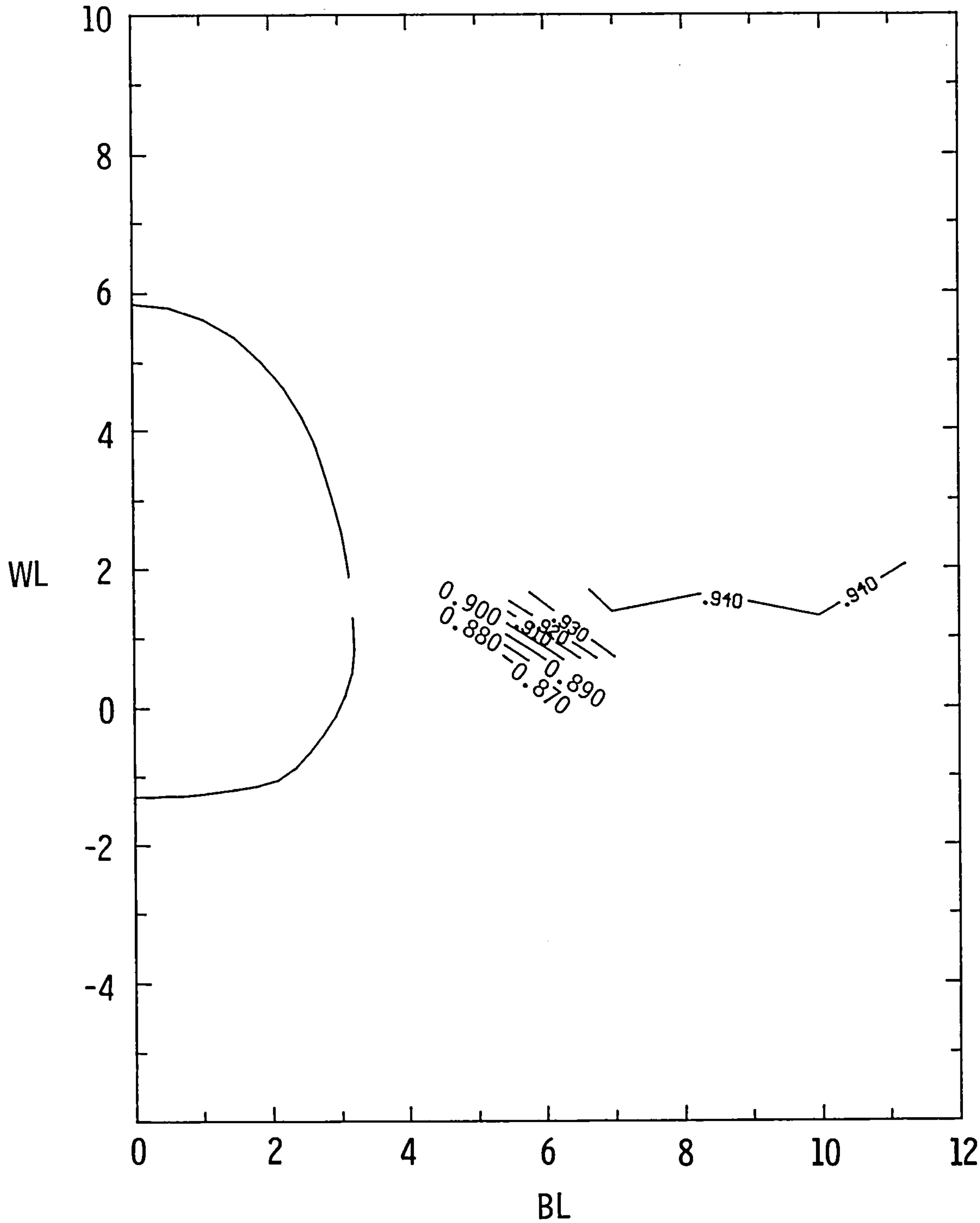
(d) M = 0.9; $\alpha = 0°$.

Figure 15.- Continued.



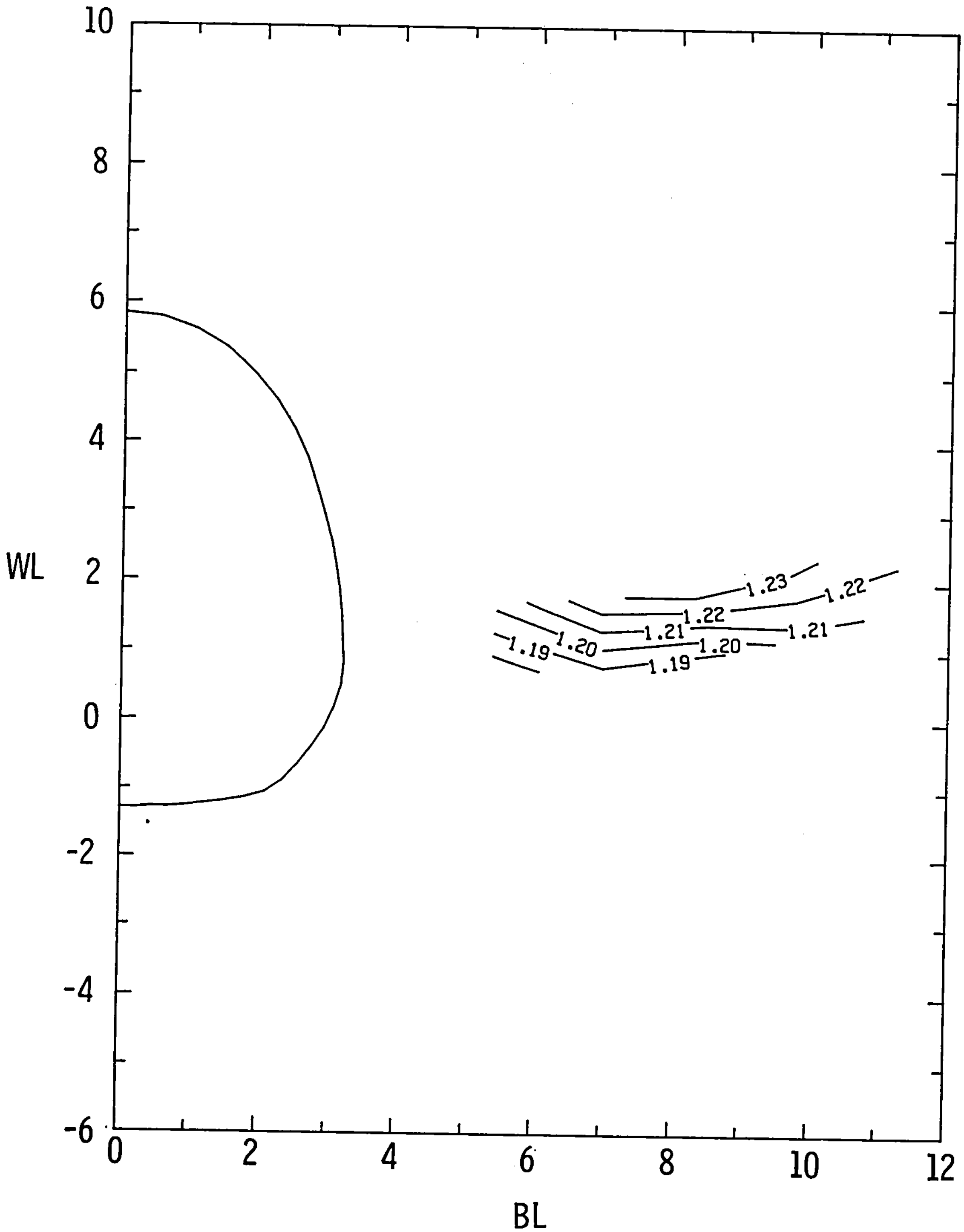
(e) M = 0.9; α = 5°.

Figure 15.- Continued.



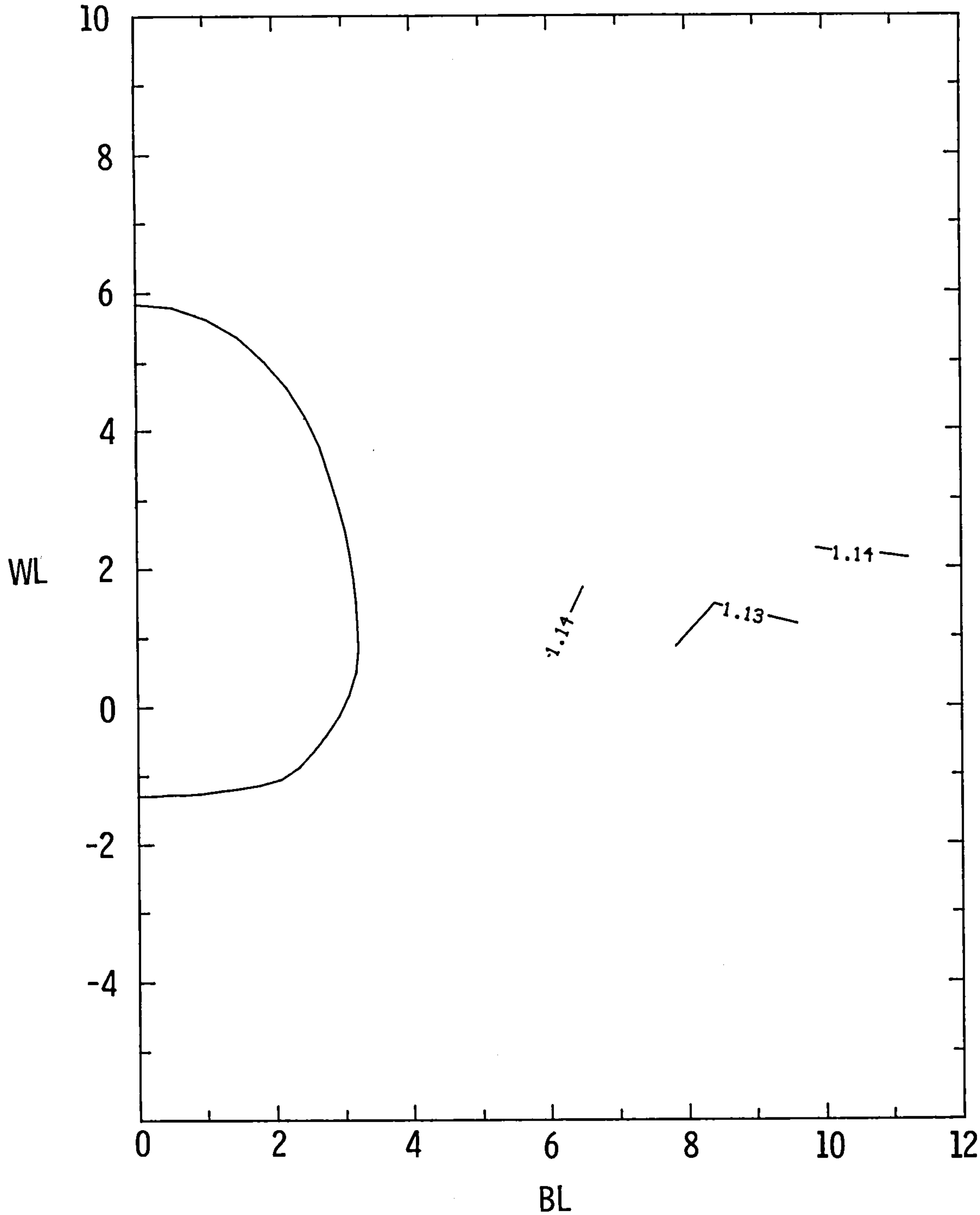
(f) M = 0.9; α = 10°.

Figure 15.- Continued.



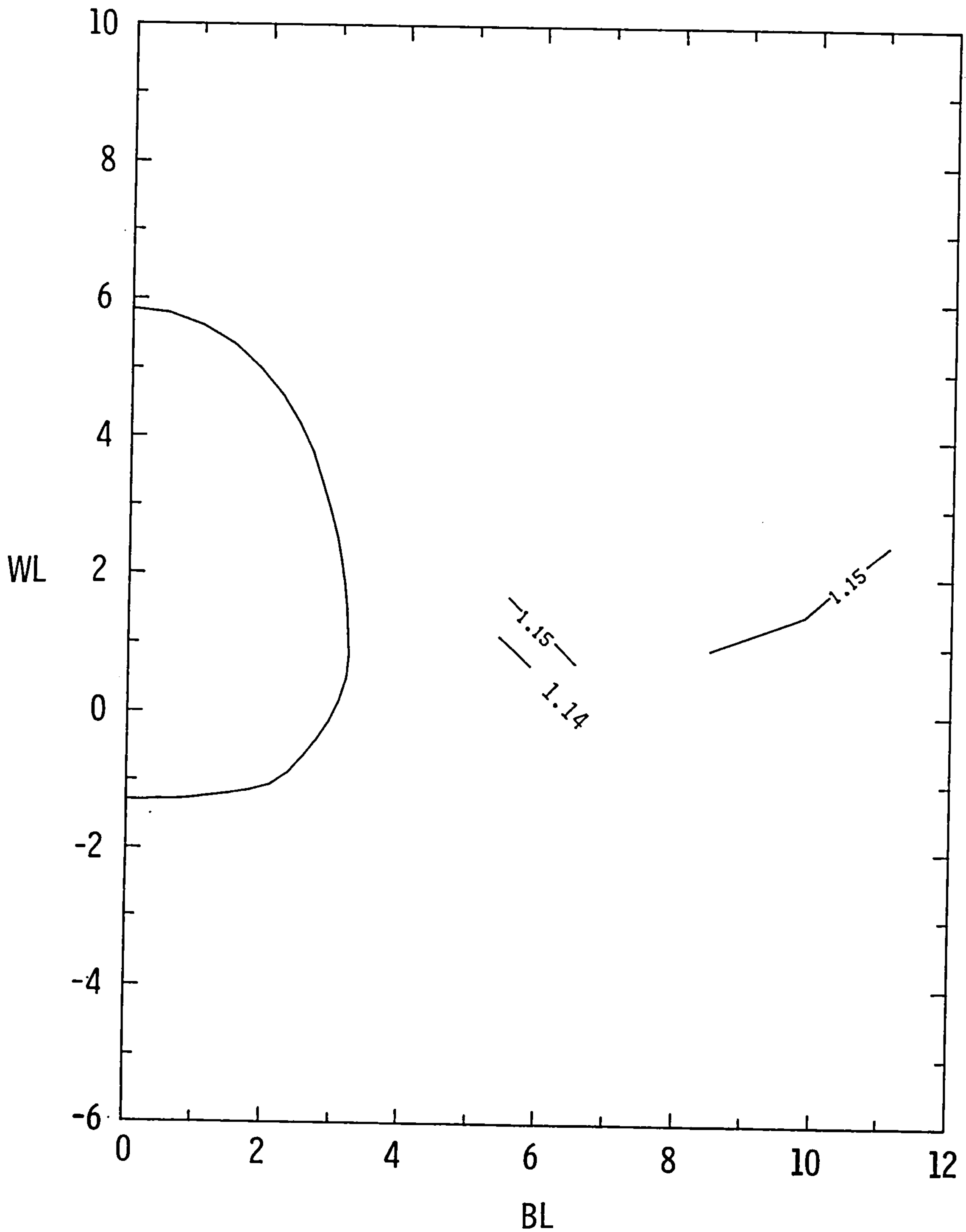
(g) M = 1.2; α = 0°.

Figure 15.- Continued.



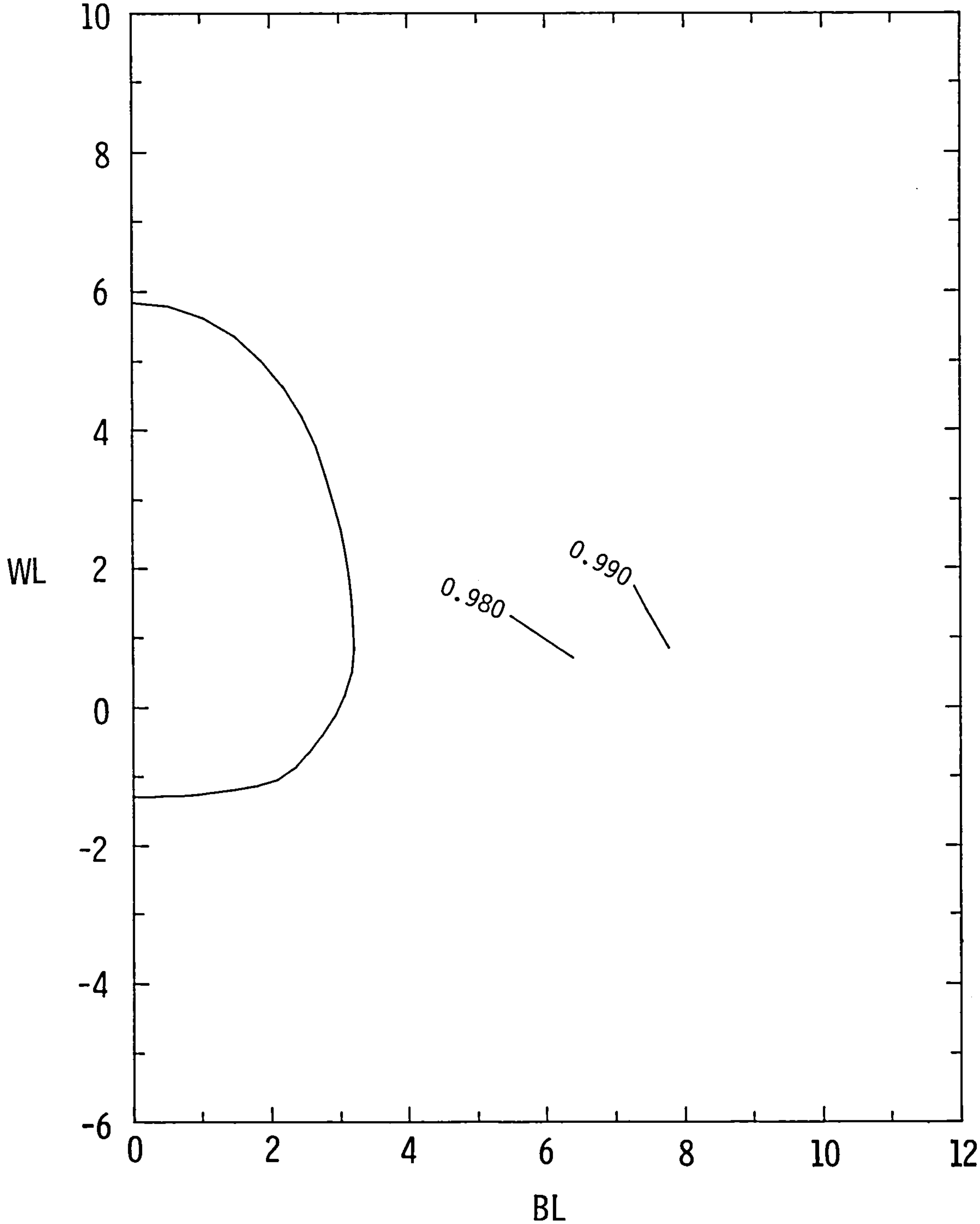
(h) M = 1.2; α = 5°.

Figure 15.- Continued.



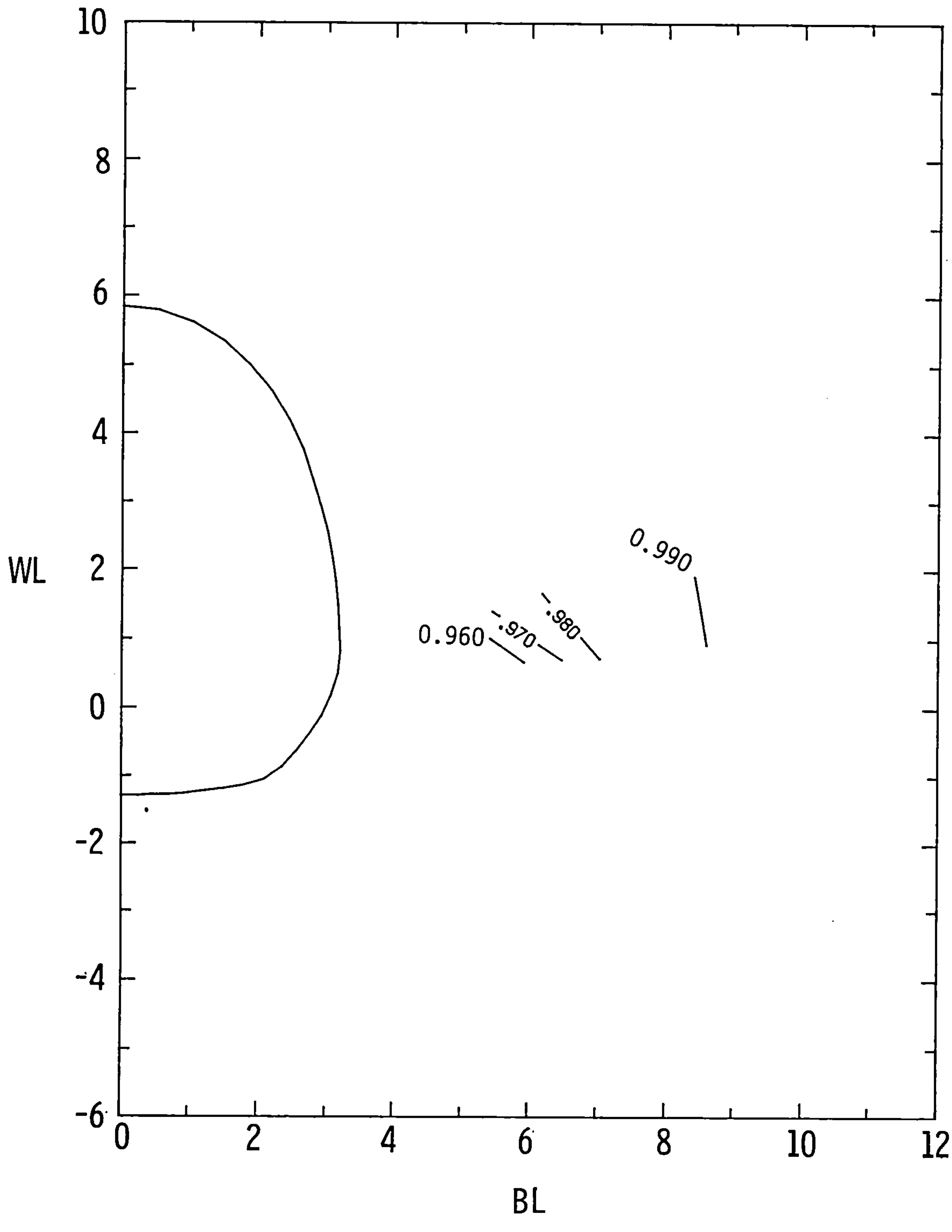
(i) M = 1.2; α = 7.5°.

Figure 15.- Concluded.



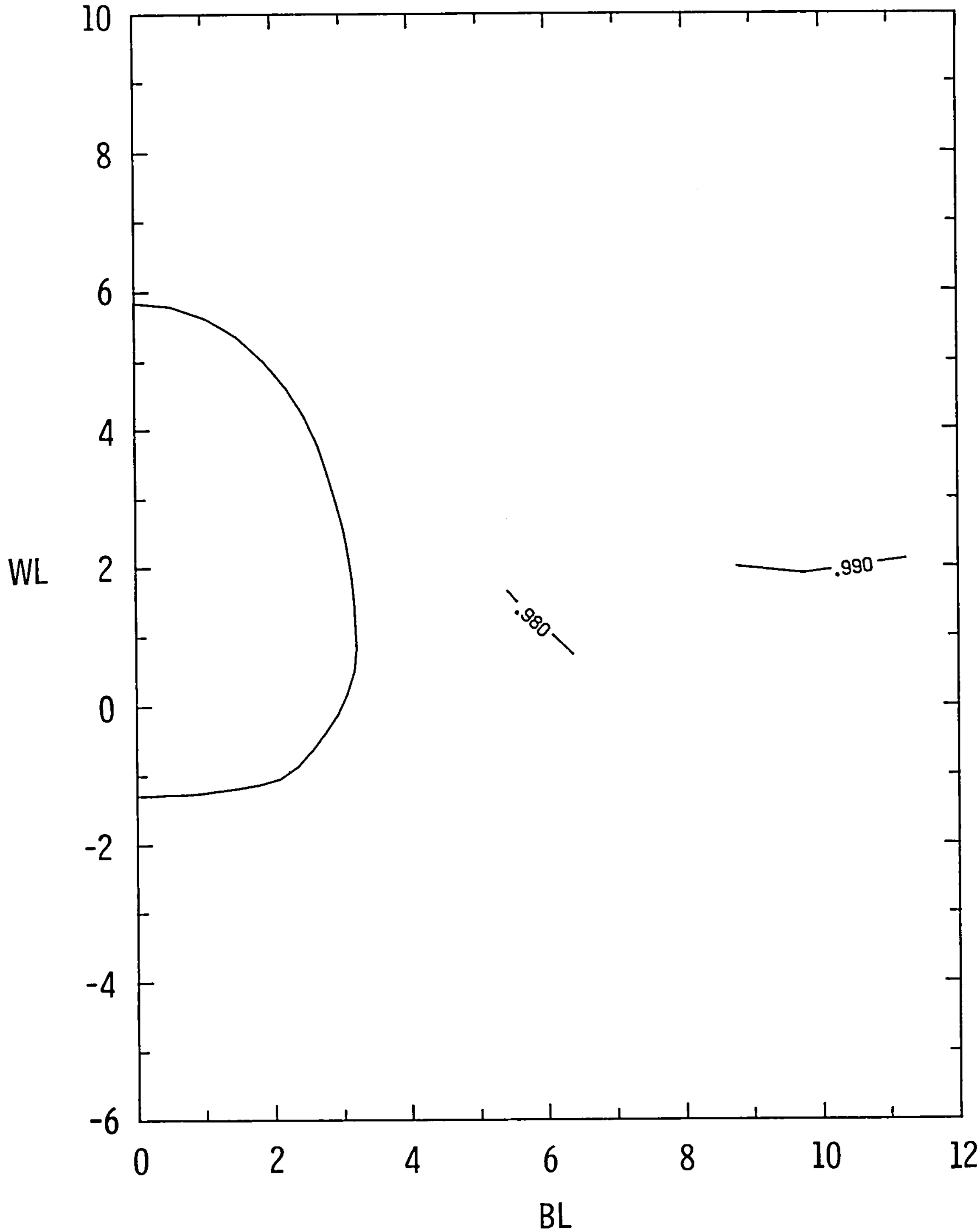
(a) M = 0.6; α = 10°.

Figure 16.- Local total pressure ratio (PTL/PTINF) contours for area 3 (model station 47.8) at conditions where the ratio at some point in the field is less than 0.99.



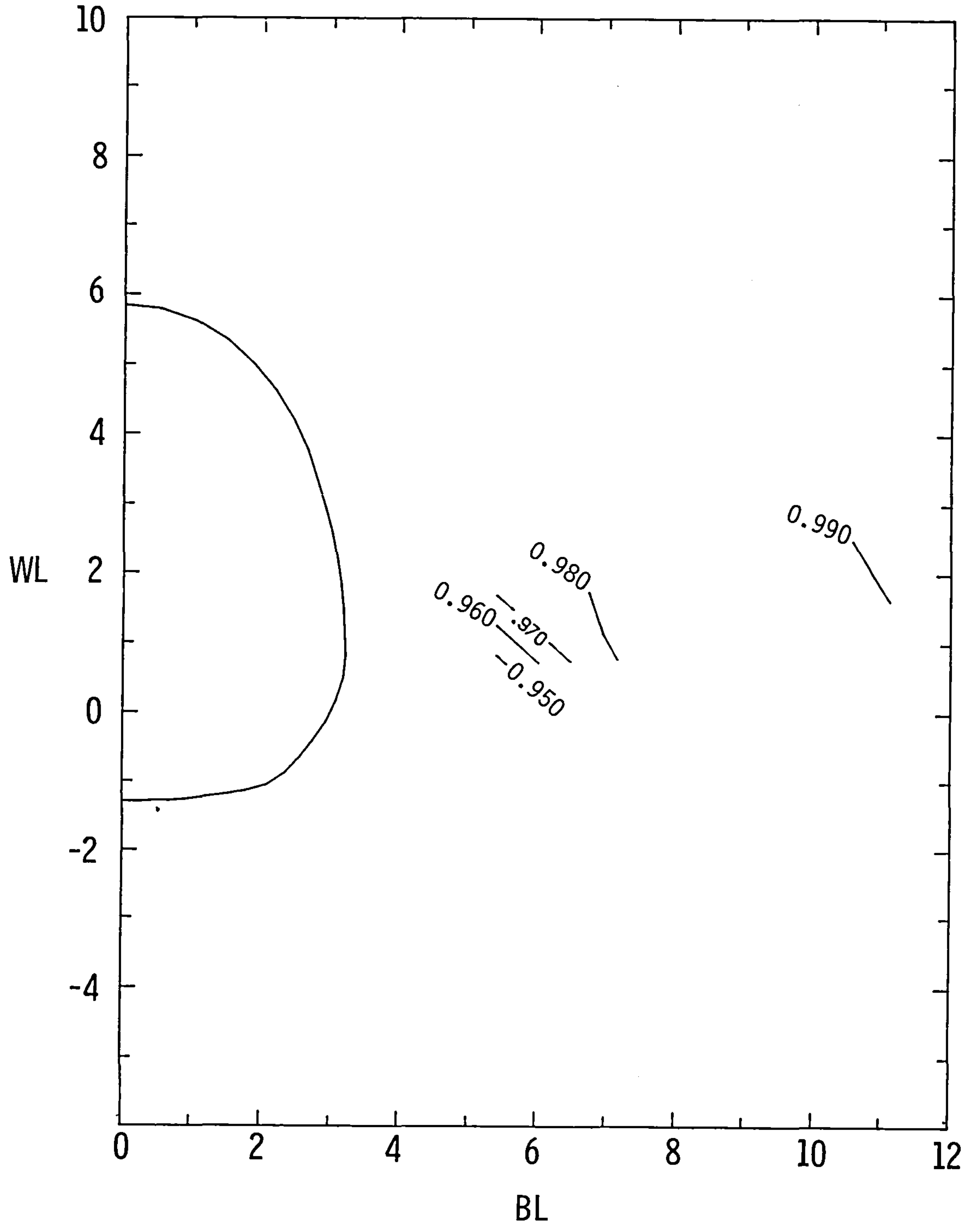
(b) M = 0.9; α = 10°.

Figure 16.- Continued.



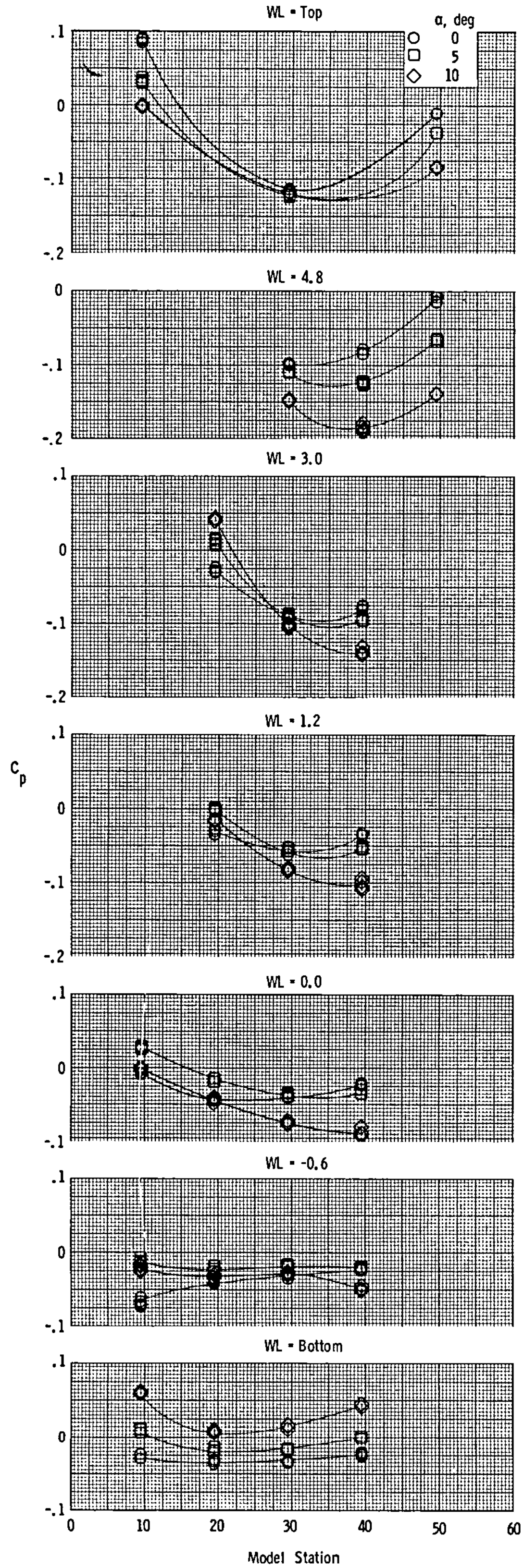
(c) M = 1.2; $\alpha = 5°$.

Figure 16.- Continued.



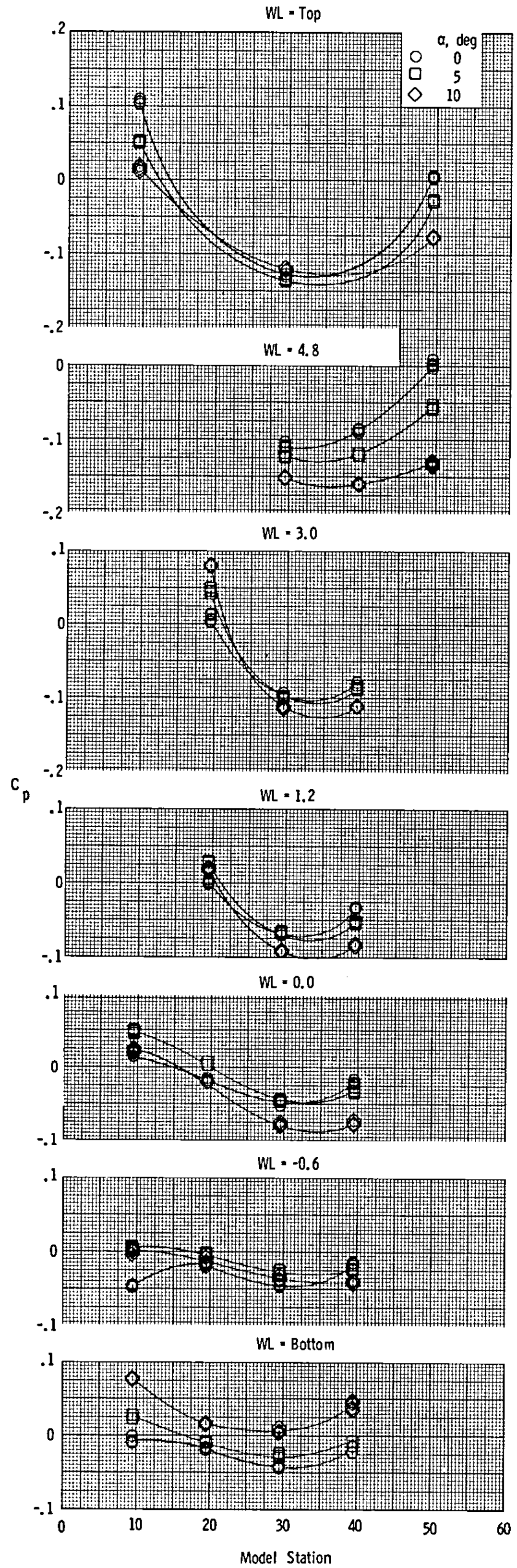
(d) M = 1.2; α = 7.5°.

Figure 16.- Concluded.



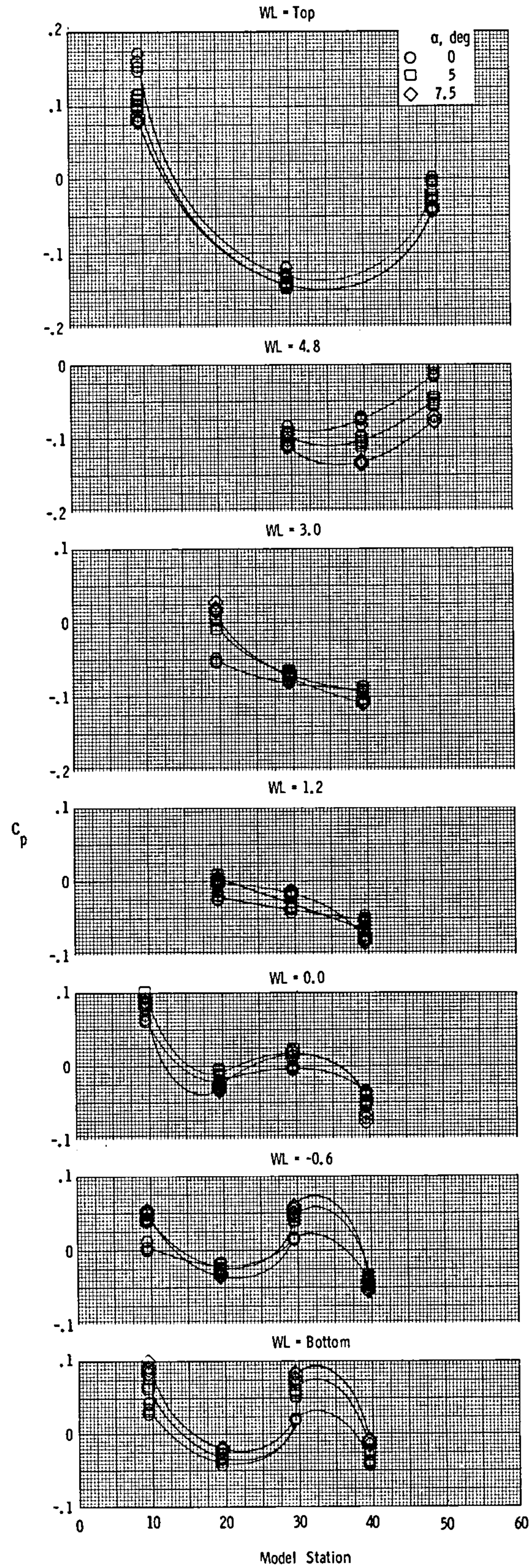
(a) M = 0.6.

Figure 17.- Fuselage pressure coefficients at various Mach numbers.



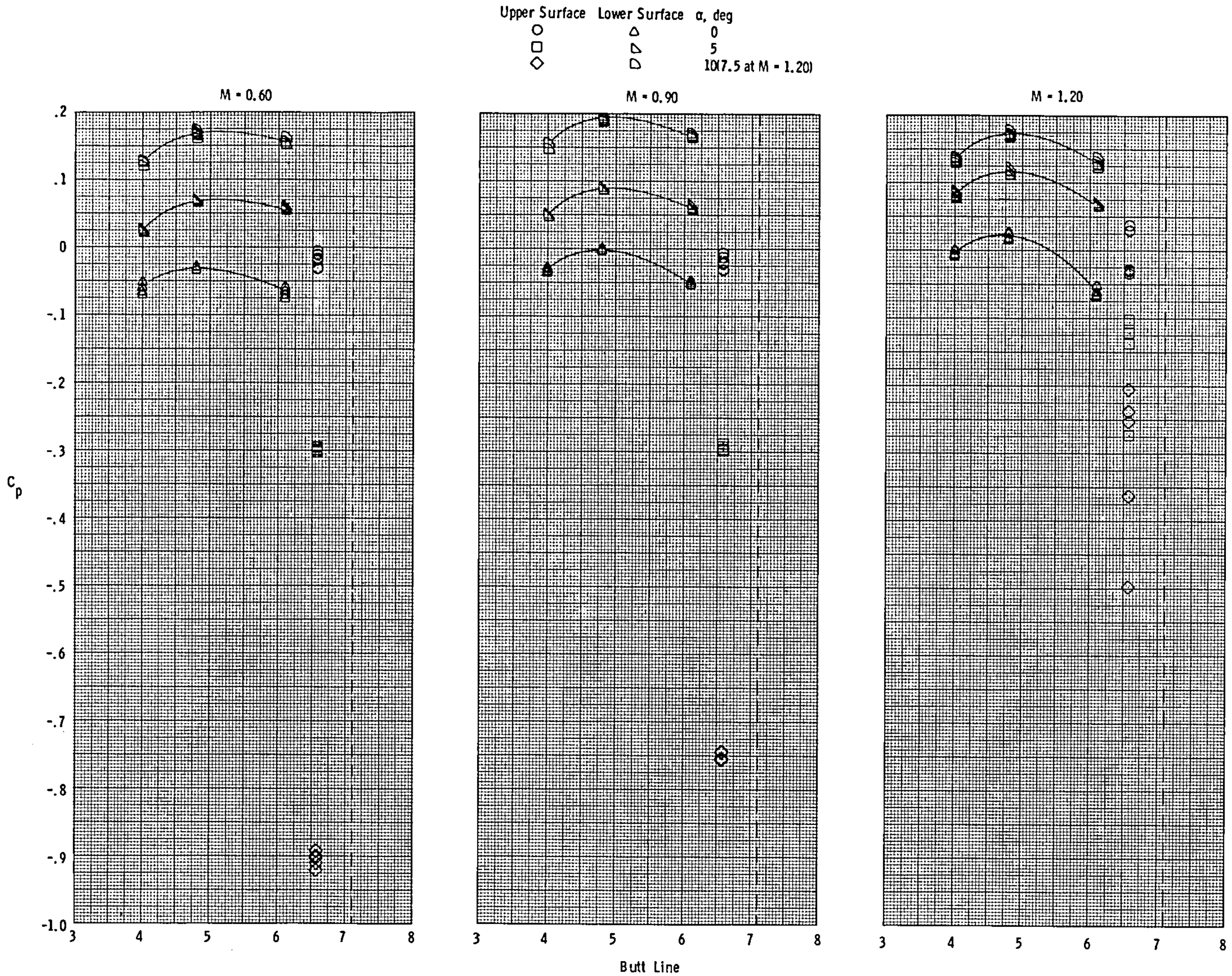
(b) M = 0.9.

Figure 17.- Continued.



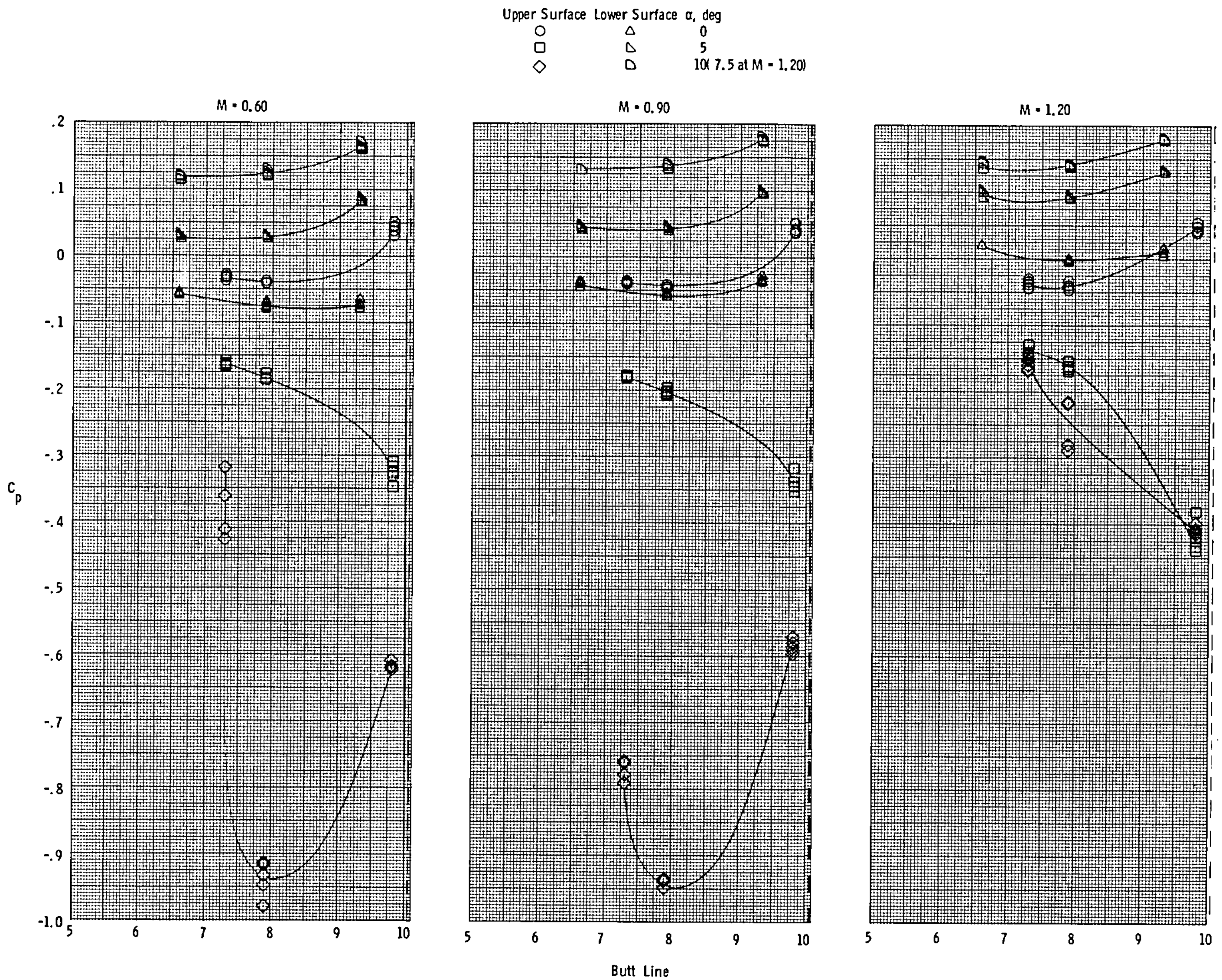
(c) M = 1.2.

Figure 17.- Concluded.



(a) Model station 51.79.

Figure 18.- Wing pressure coefficients at various Mach numbers. (Dashed line indicates wing leading edge.)



(b) Model station 59.09.

Figure 18.- Concluded.

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA TM-86361		

4. Title and Subtitle	5. Report Date
Investigation of a Supersonic Cruise Fighter Model Flow Field	November 1985
	6. Performing Organization Code 505-40-90-01
7. Author(s) David E. Reubush and E. Ann Bare	8. Performing Organization Report No. L-15884
	10. Work Unit No.
9. Performing Organization Name and Address NASA Langley Research Center Hampton, VA 23665-5225	11. Contract or Grant No.
	13. Type of Report and Period Covered Technical Memorandum
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546-0001	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

An investigation was conducted in the Langley 16-Foot Transonic Tunnel to survey the flow field around a model of a supersonic cruise fighter configuration. Local values of angle of attack, side flow, Mach number, and total pressure ratio were measured with a single multi-holed probe in three survey areas on a model previously used for nacelle/nozzle integration investigations. The investigation was conducted at Mach numbers of 0.6, 0.9, and 1.2, and at angles of attack from 0° to 10°. The purpose of the investigation was to provide a base of experimental data with which theoretically determined data can be compared. To that end the data are presented in tables as well as graphically, and a complete description of the model geometry is included as fuselage cross sections and wing span stations. Measured local angles of attack were generally greater than free stream angle of attack above the wing and generally smaller below. There were large spanwise local angle-of-attack and side flow gradients above the wing at the higher free stream angles of attack.

17. Key Words (Suggested by Author(s))	18 Distribution Statement
Transonic flow Flow field survey Fighter model	Unclassified - Unlimited Subject Category 02

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	148	A07

For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1985

National Aeronautics and
Space Administration
Code NIT-3

Washington, D.C.
20546-0001