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ANALYTICAL INVESTIGATION OF CHORD SIZE AND COOLING METHODS ON TURBINE BLADE COOLING REQUIREMENTS

BOOK 2. APPENDIXES J THROUGH M

by
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16. Abstract

This study was conducted to determine the effect of chord size on air cooled turbine blades. In the preliminary design phase, eight turbine blade cooling configurations in 0.75-in. (0.01905-m), 1.0-in. (0.0254-m), and 1.5-in. (0.0381-m) chord sizes were analyzed to determine the maximum turbine inlet temperature capabilities. A pin fin convection cooled configuration and a film-impingement cooled configuration were selected for a final design analysis in which the maximum turbine inlet temperature was determined as a function of the cooling air inlet temperature and the turbine inlet total pressure for each of the three chord sizes. The cooling air flow requirements were also determined for a varying cooling air inlet temperature with a constant turbine inlet temperature.

The conclusions of this study were that allowable turbine inlet temperature increases with increasing chord for the convection cooled and transpiration cooled designs, however, the film-convection cooled designs did not have a significant change in turbine inlet temperature with chord. The film-convection cooled designs allow turbine inlet temperatures about 200°F (111°K) higher than the convection cooled designs but the transpiration cooled design studied offered an advantage only for the 1.5-in. (0.0381-m) chord size. The turbine inlet pressure range studied had little effect on turbine inlet temperature capability, but a reduction in cooling air inlet temperature produced an increase in turbine inlet temperature capability or a reduction in cooling air flow required.

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FOREWORD

This is Book 2 of NASA CR 120882 and includes Appendixes J through M. Book 1 includes Sections 1 through 8 and Appendixes A through I.

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APPENDIX J

DETAILED BOUNDARY CONDITIONS, METAL TEMPERATURE DISTRIBUTION AND COOLING FLOW DISTRIBUTION FOR THE SCHEME A-1 FINAL DESIGN ANALYSIS

The detailed boundary conditioms for the Scheme A-1 Final Designs are shown in Figures J-1 through J-36 for the 0.75 in. (0.01905 m), 1.0 in. (0.0254 m), and 1.5 in. (0.0381 m) chord blades. The boundary conditions include the relative total gas temperature, the effective film temperature where film cooling is applied, and the local external heat transfer coefficient at each element in the thermal model. The internal heat transfer coefficient and cooling air temperature distribution are also given in the boundary conditions. The boundary conditions are given for each of the three pressure levels 450 psia (3.1×10^6 Newtons/sq m), 150 psia (1.034×10^6 Newtons/sq m), and 50 psia (3.45×10^5 Newtons/sq m) for a cooling air inlet temperature of 900°F (755.6°K) and for the 1200°F (922.2°K) cooling air inlet temperature, 2100°F (1422.2°K) turbine inlet temperature condition.

The metal temperature distribution for each design point condition (900°F (755.6°K) cooling air inlet temperature and 150 psia (1.034×10^6 Newtons/sq m) turbine inlet total pressure) is given in Figures J-37 through J-45.

The cooling flow distribution at each cooling air inlet temperature with 150 psia (1.034×10^6 Newtons/sq m) turbine inlet pressure and at the additional condition of reduced cooling air inlet pressure is given in Figures J-46 through J-57.

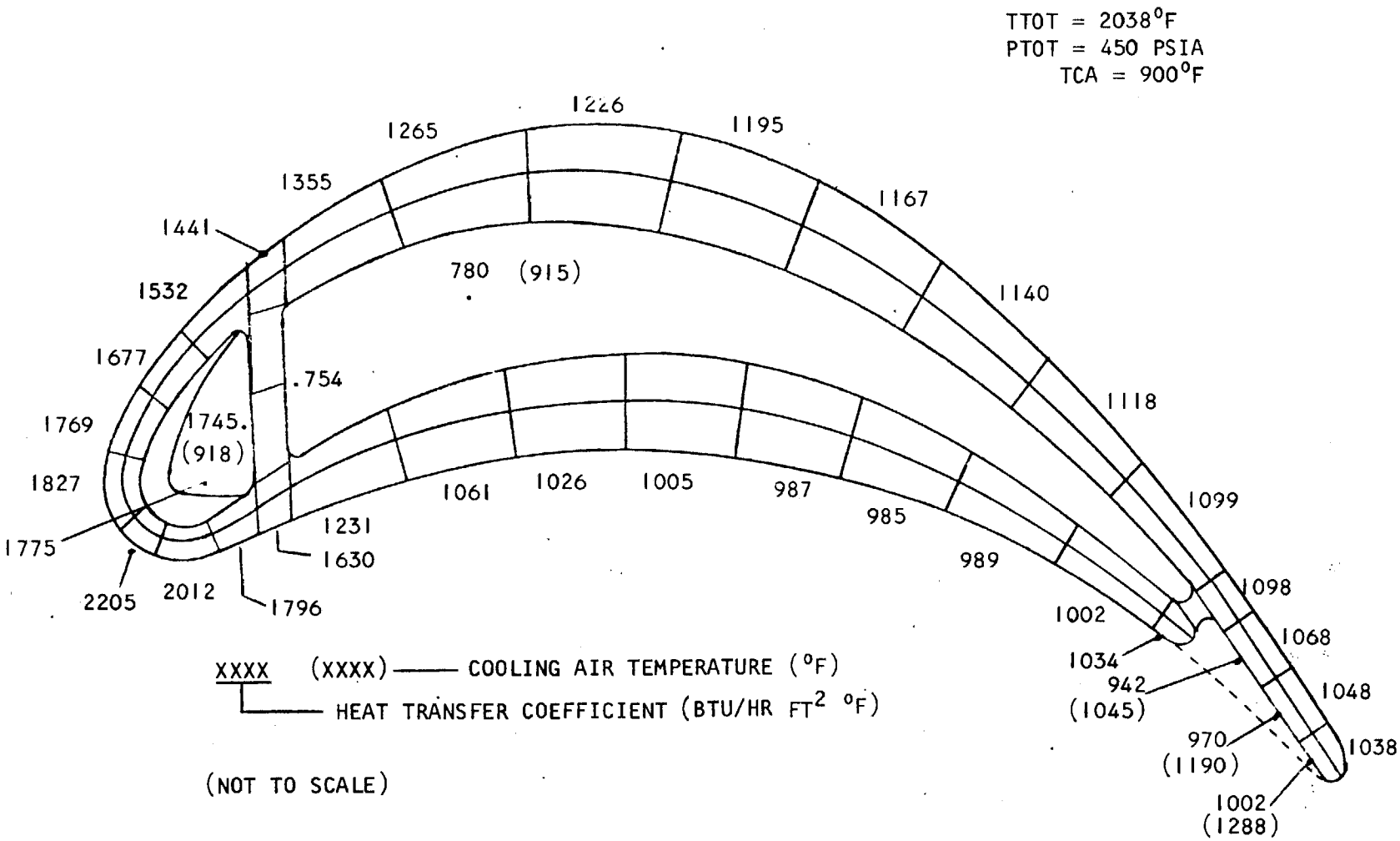

Figure J-1. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Root Section (3 Percent Span) 0.75 in. Chord

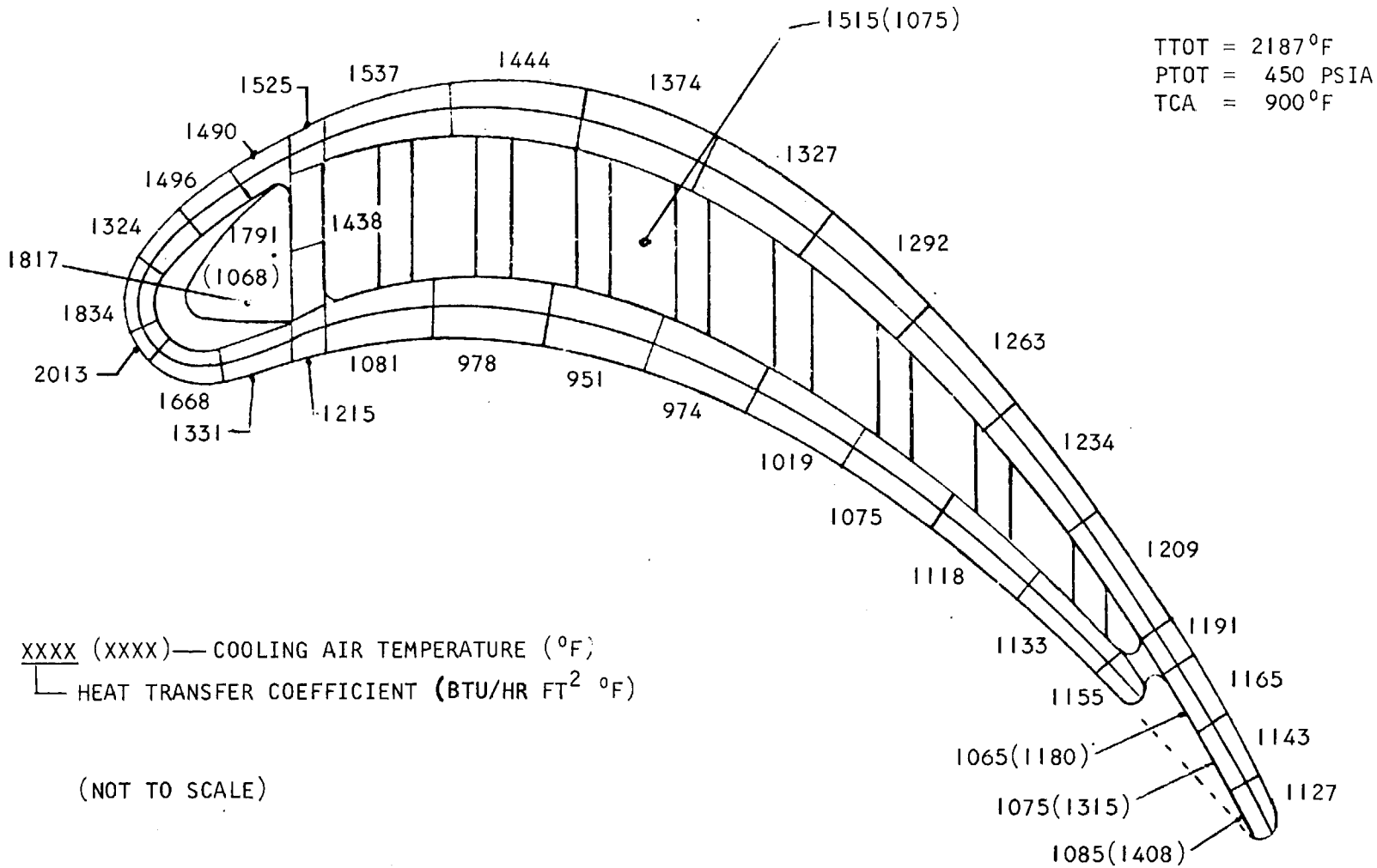

Figure J-2. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Mean Section (50 Percent Span) 0.75 in. Chord

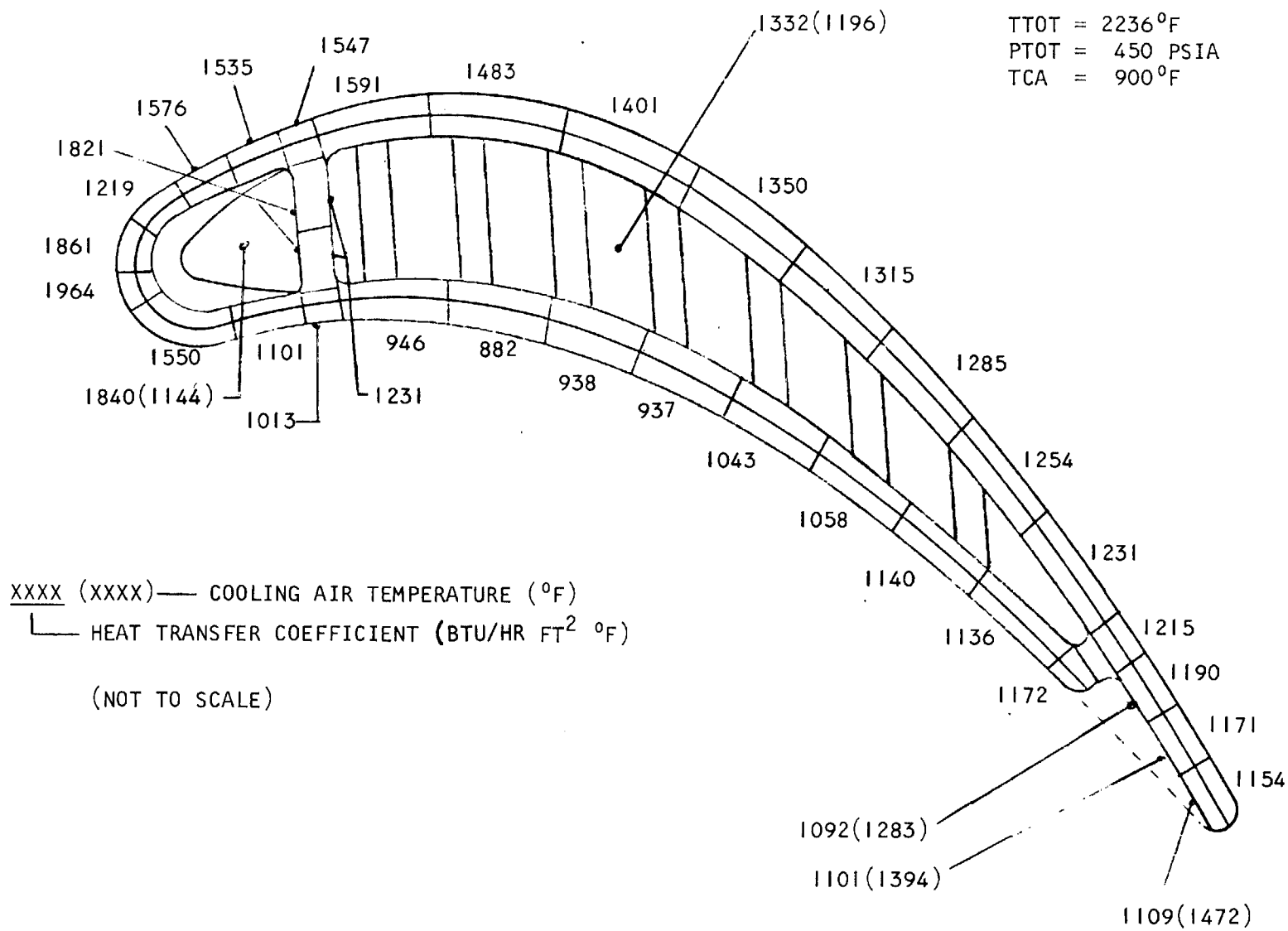

Figure J-3. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Tip Section (75 Percent Span) 0.75 in. Chord

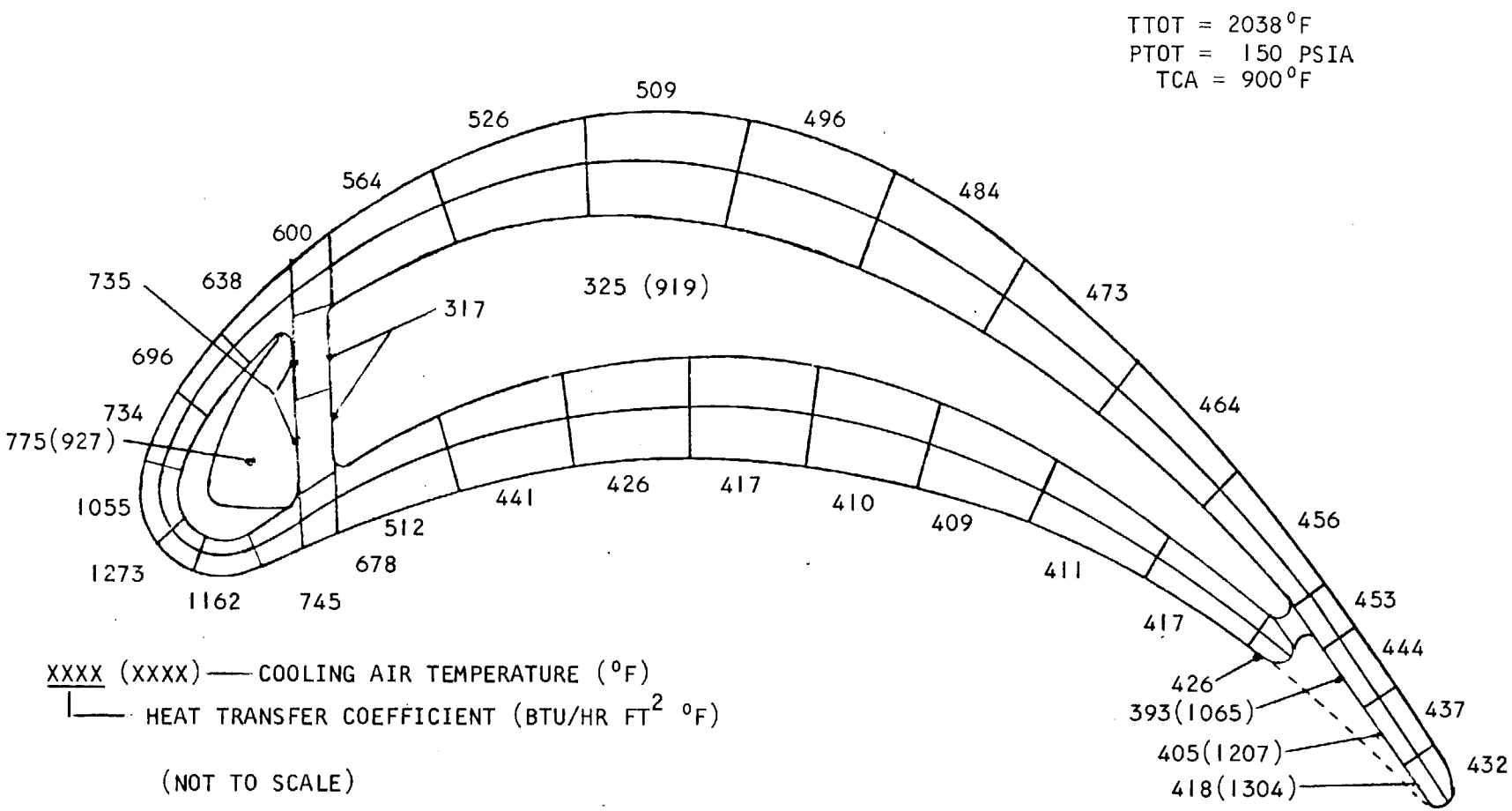

Figure J-4. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Root Section (3 Percent Span) 0.75 in. Chord

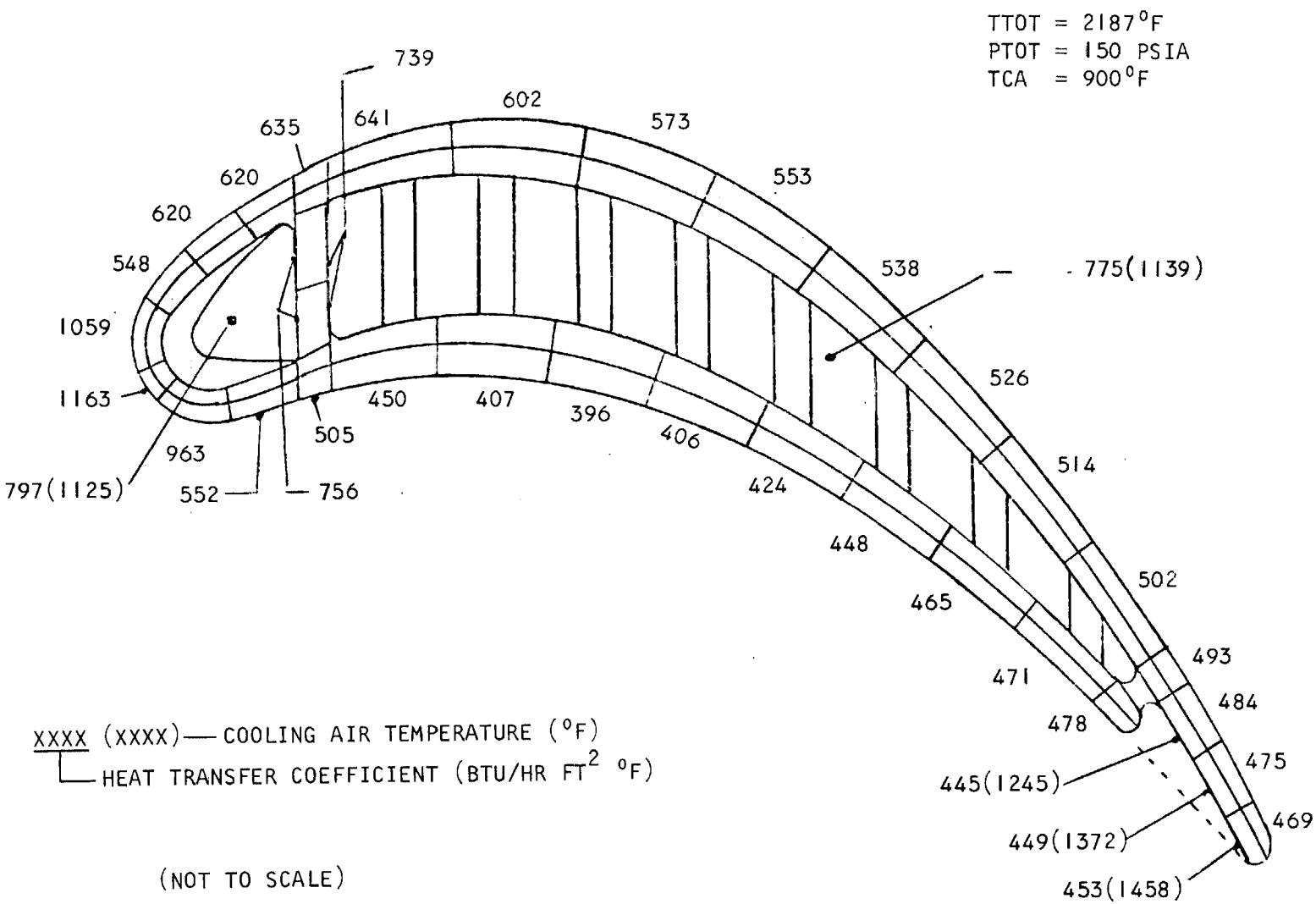

Figure J-5. Boundary Condition for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Mean Section (50 Percent Span) 0.75 in. Chord

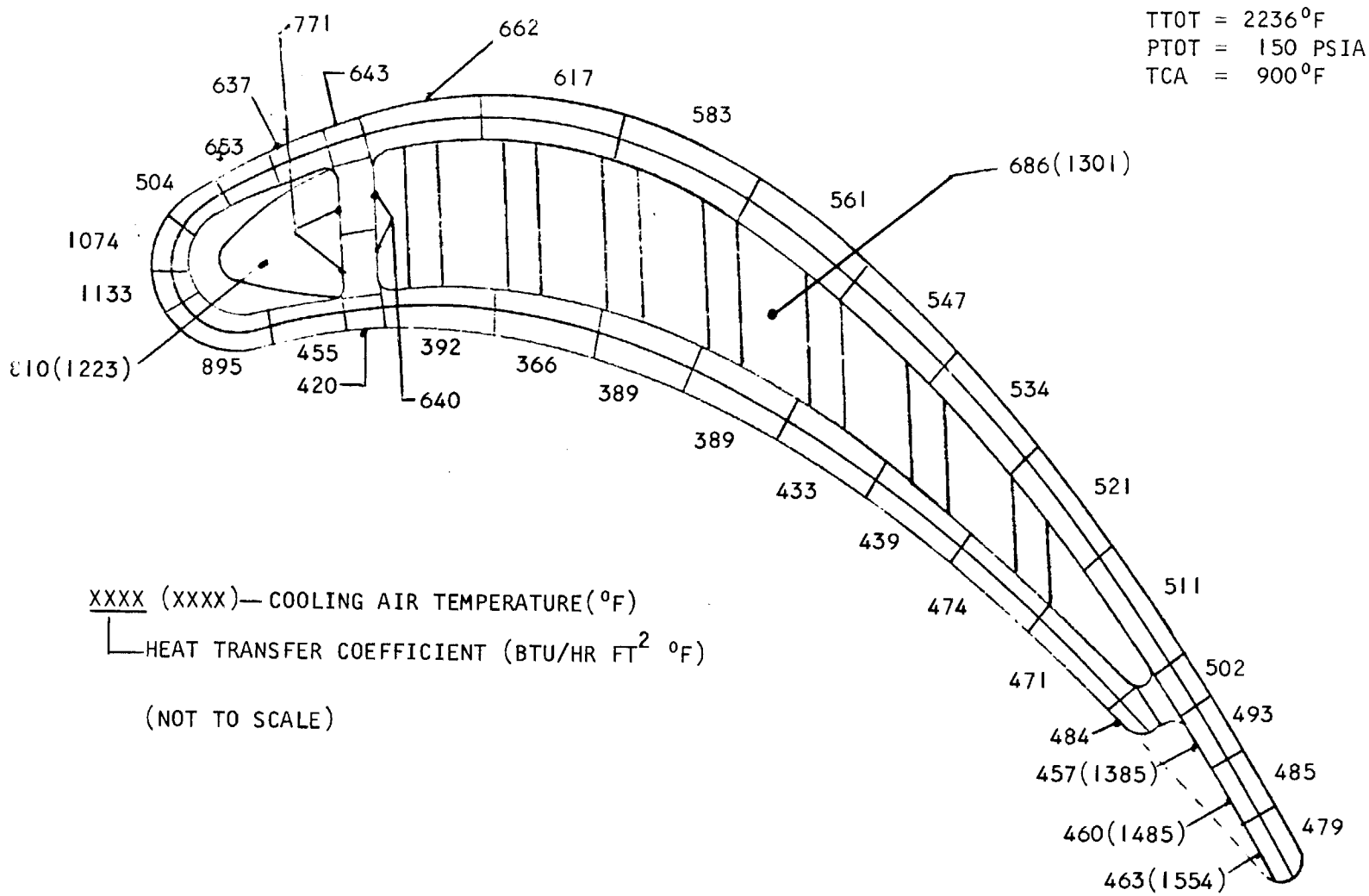

Figure J-6. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Tip Section (75 Percent Span) 0.75 in. Chord

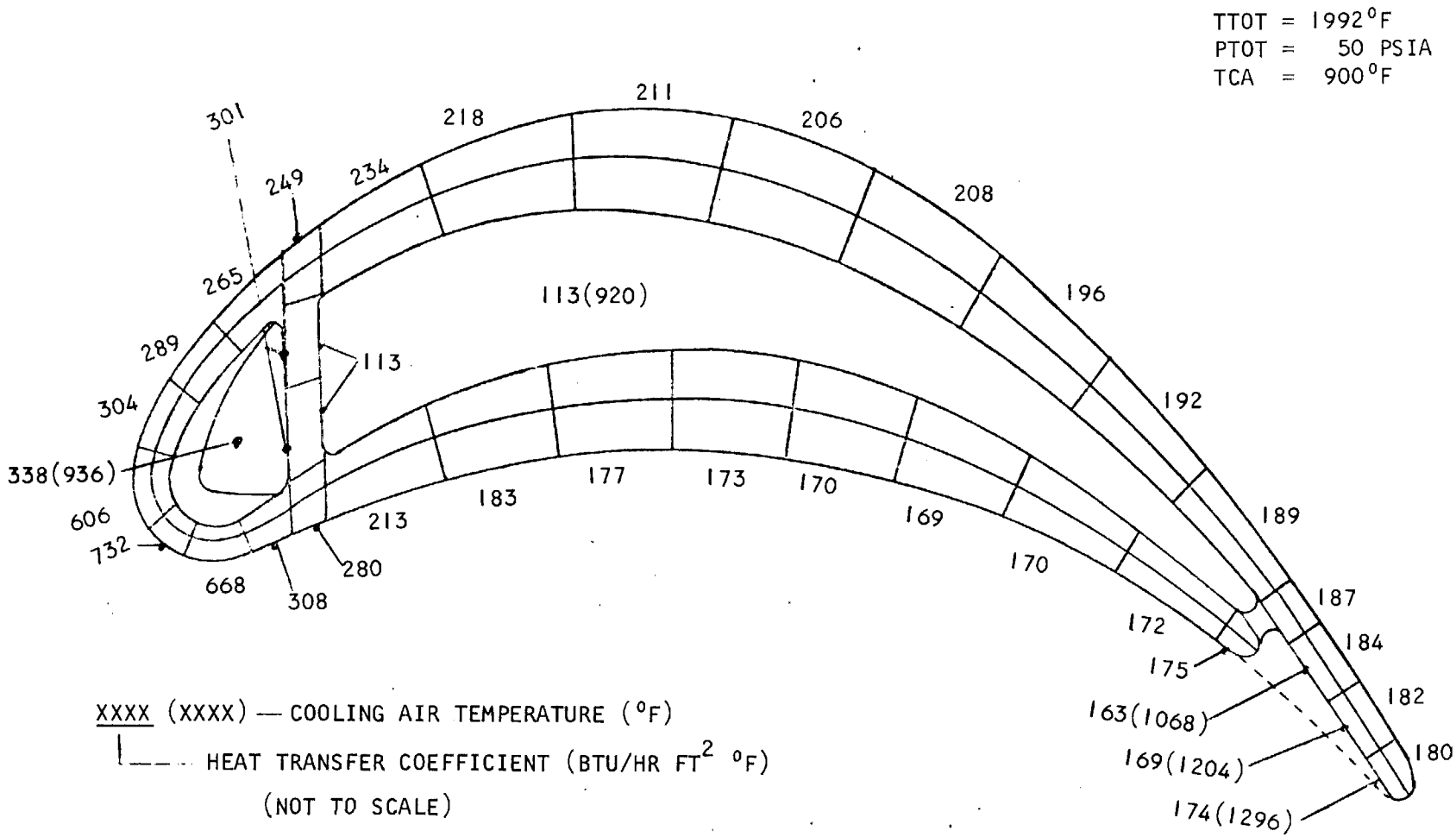

Figure J-7. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Root Section (3 Percent Span) 0.75 in. Chord

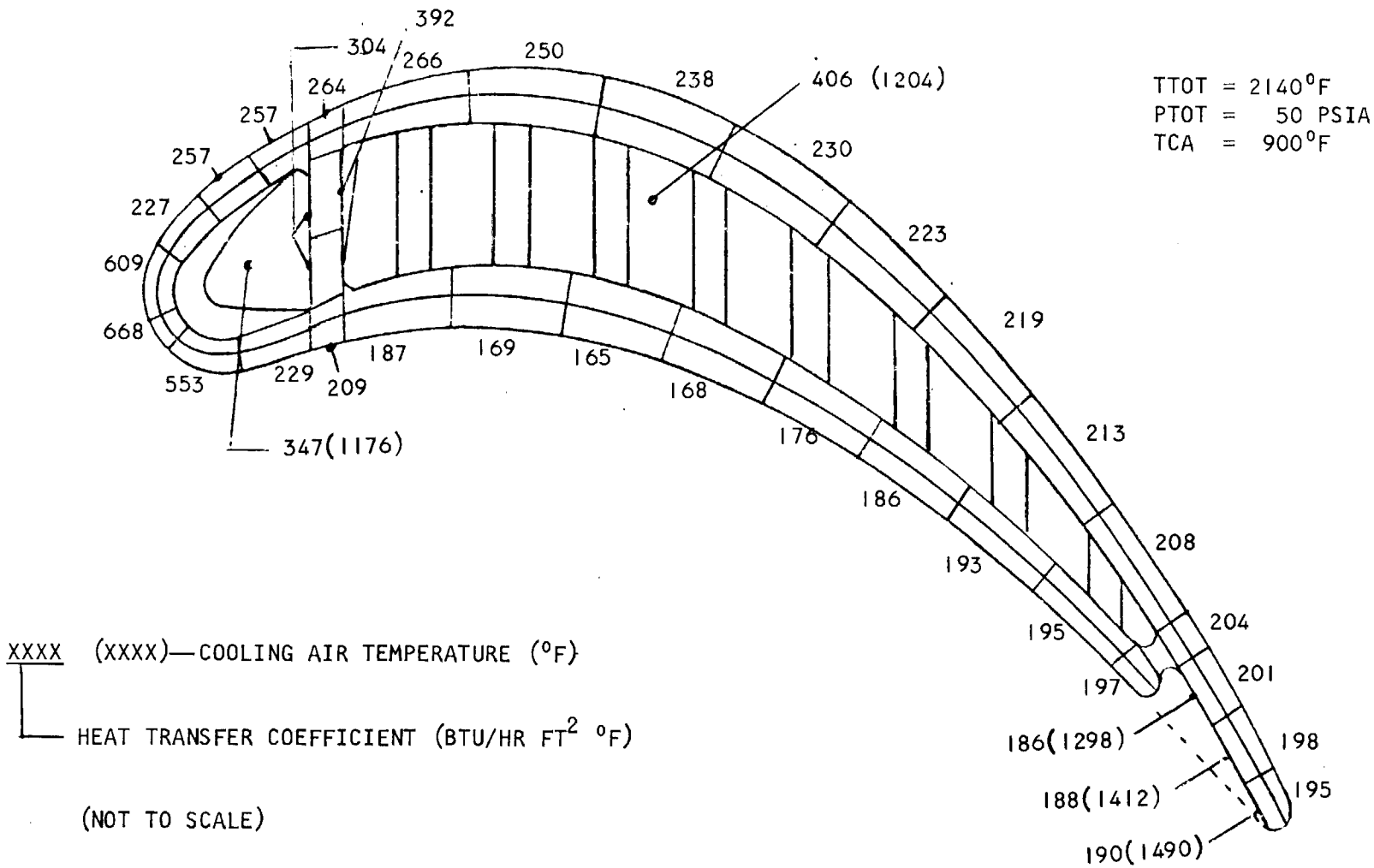

Figure J-8. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Mean Section (50 Percent Span) 0.75 in. Chord

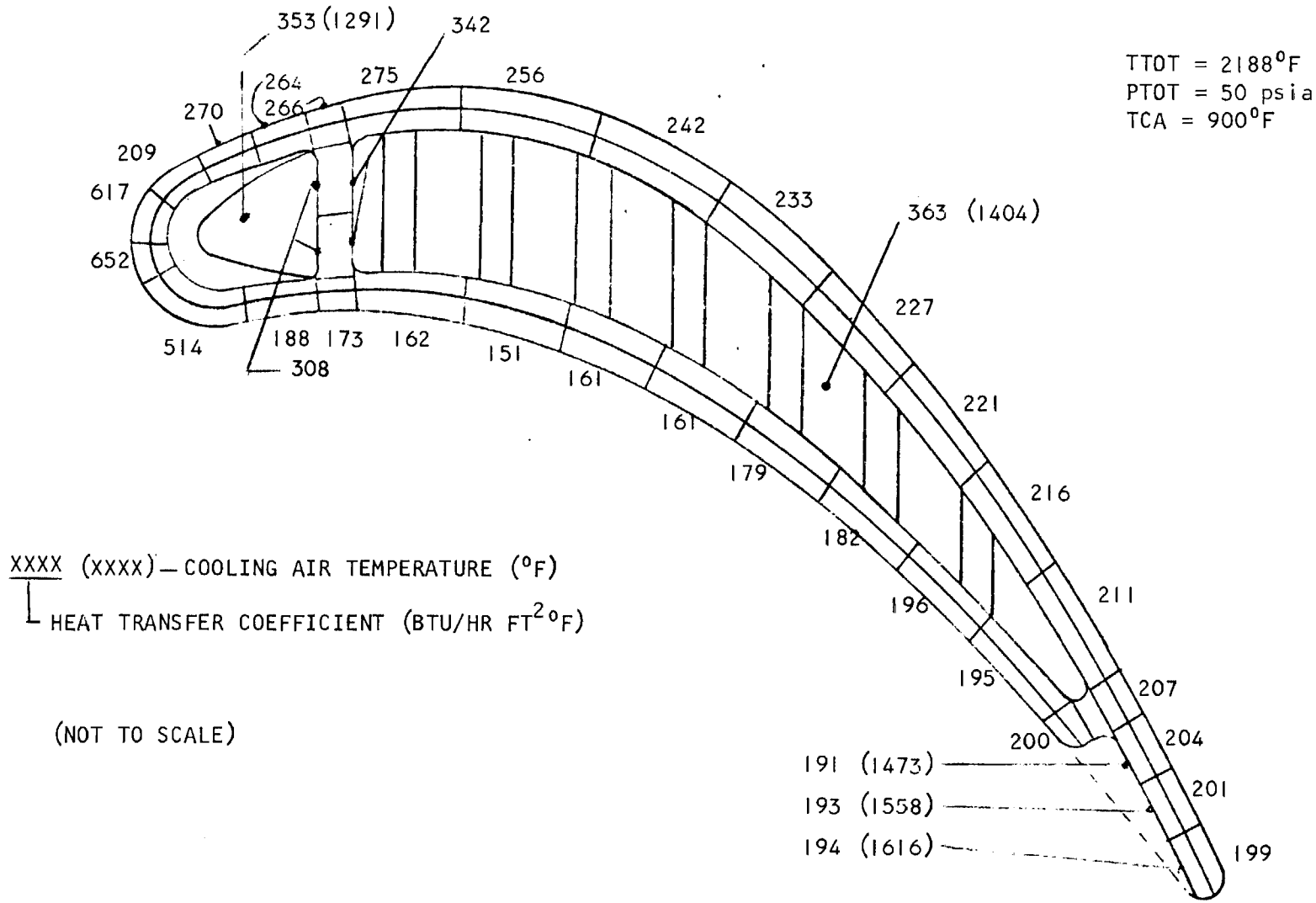

Figure J-9. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Tip Section (75 Percent Span) 0.75 in. Chord

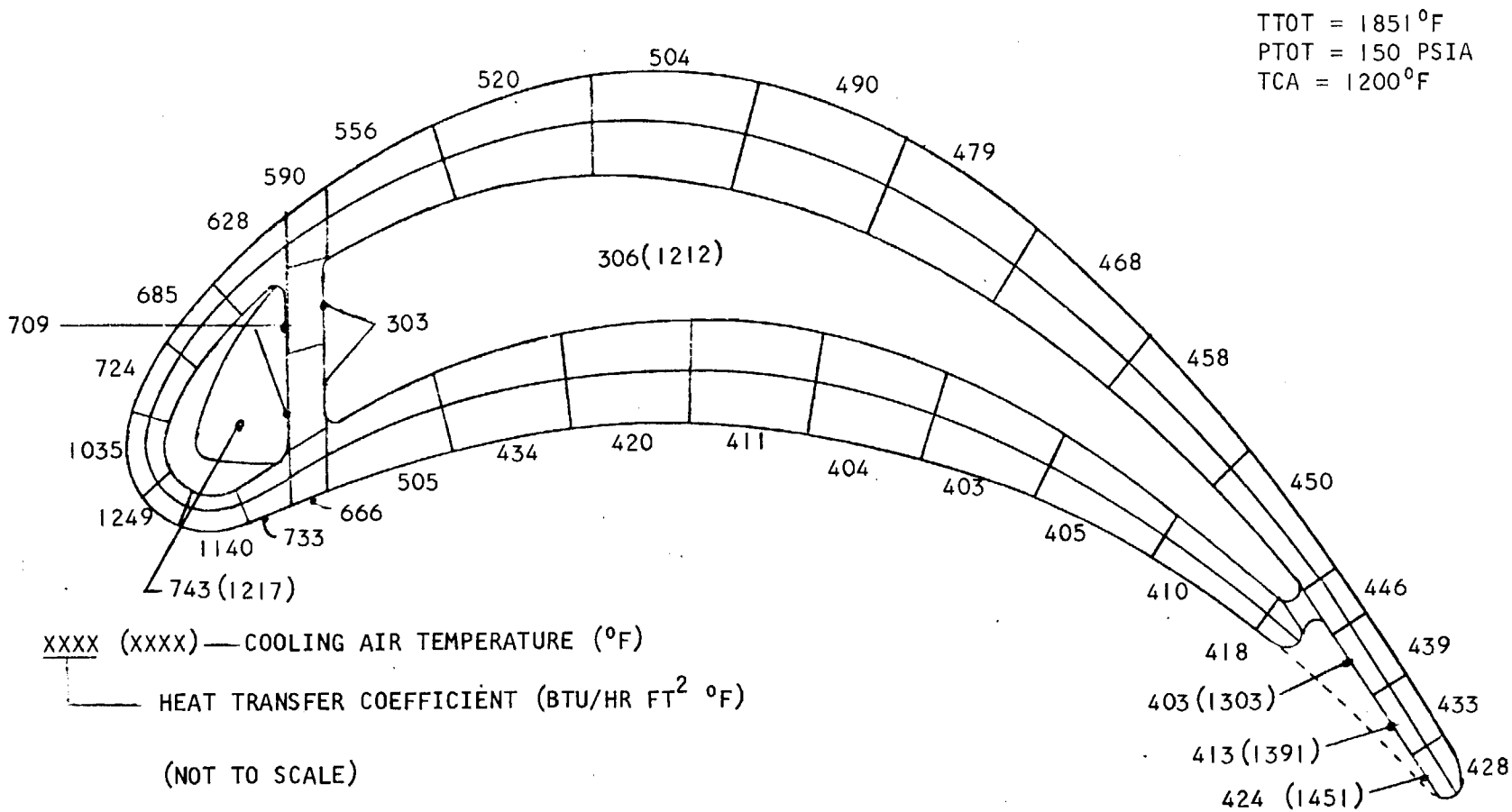

Figure J-10. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Root Section (3 Percent Span) 0.75 in. Chord

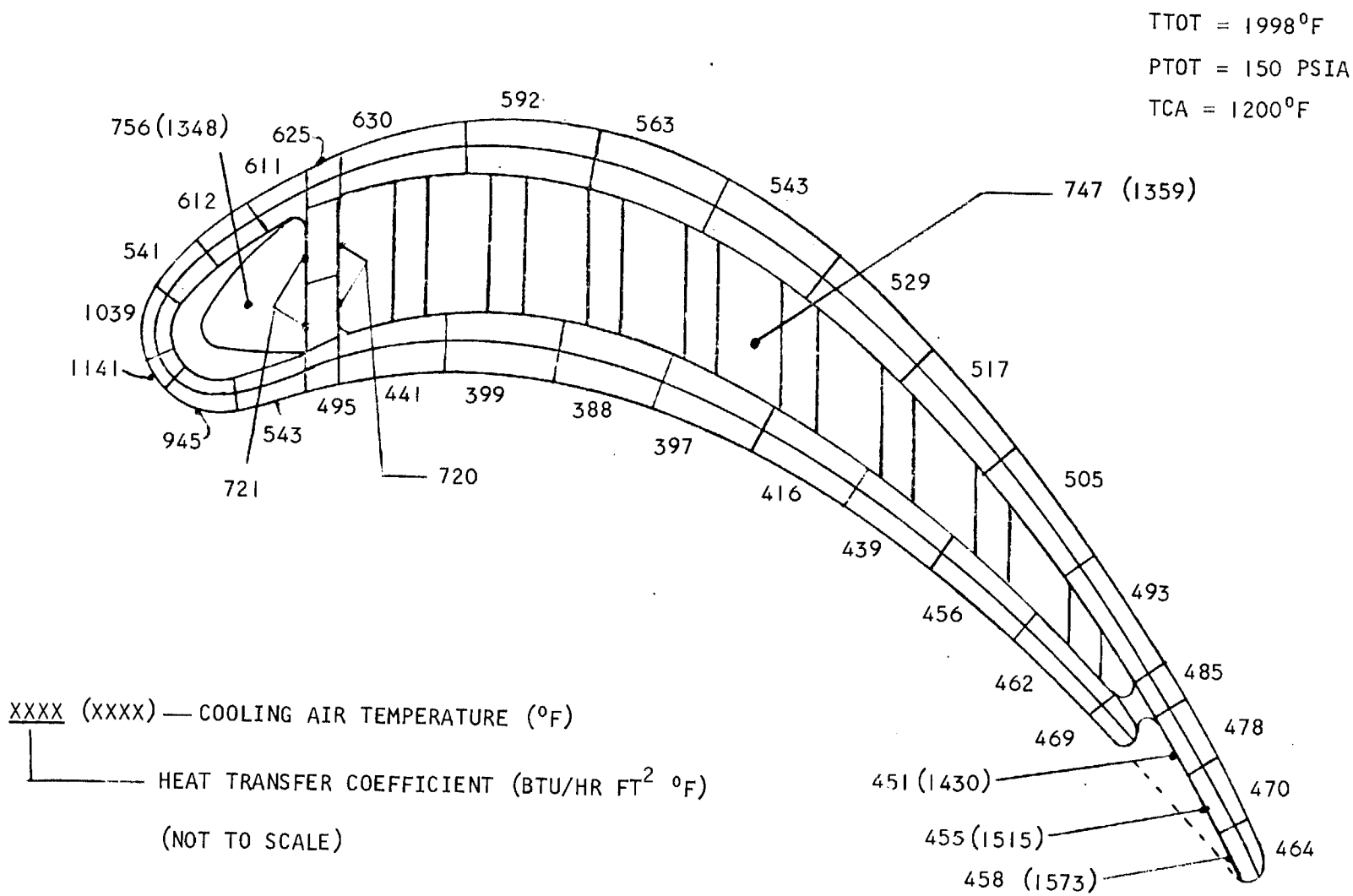

Figure J-11. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Mean Section (50 Percent Span) 0.75 in. Chord

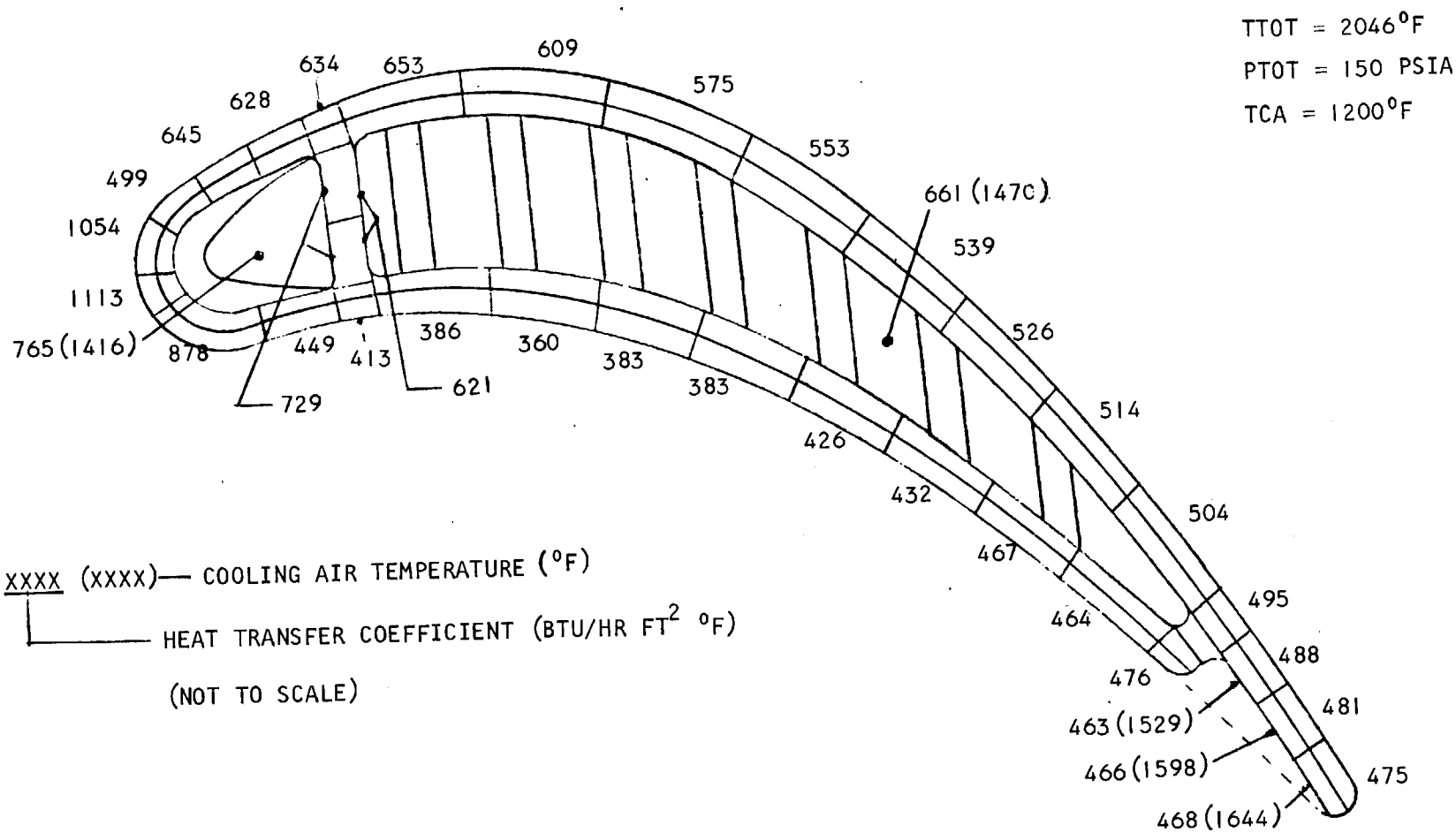

Figure J-12. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Tip Section (75 Percent Span) 0.75 in. Chord

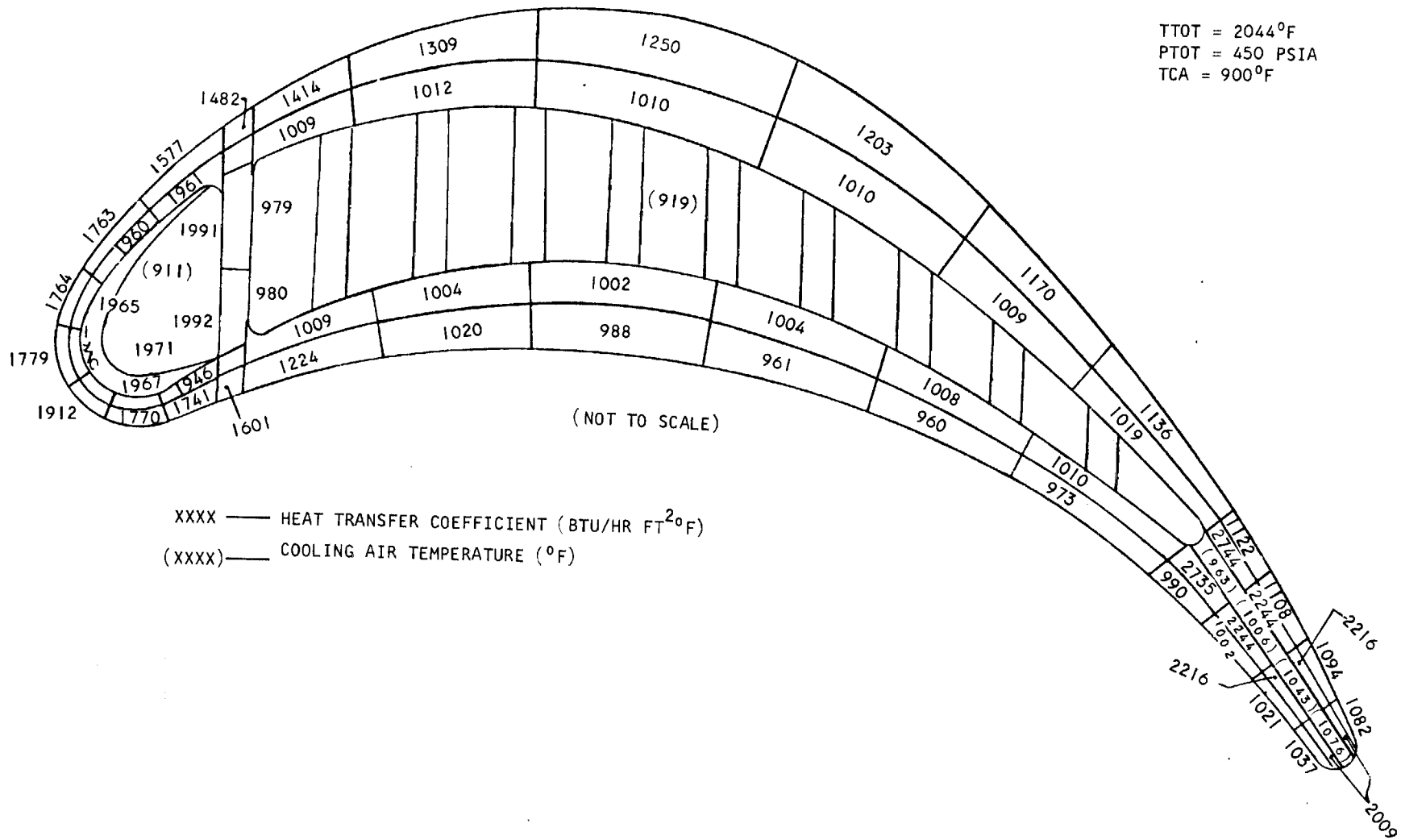

Figure J-13. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 990°F)
Hub Section (3 Percent Span)
1.0 In. Chord

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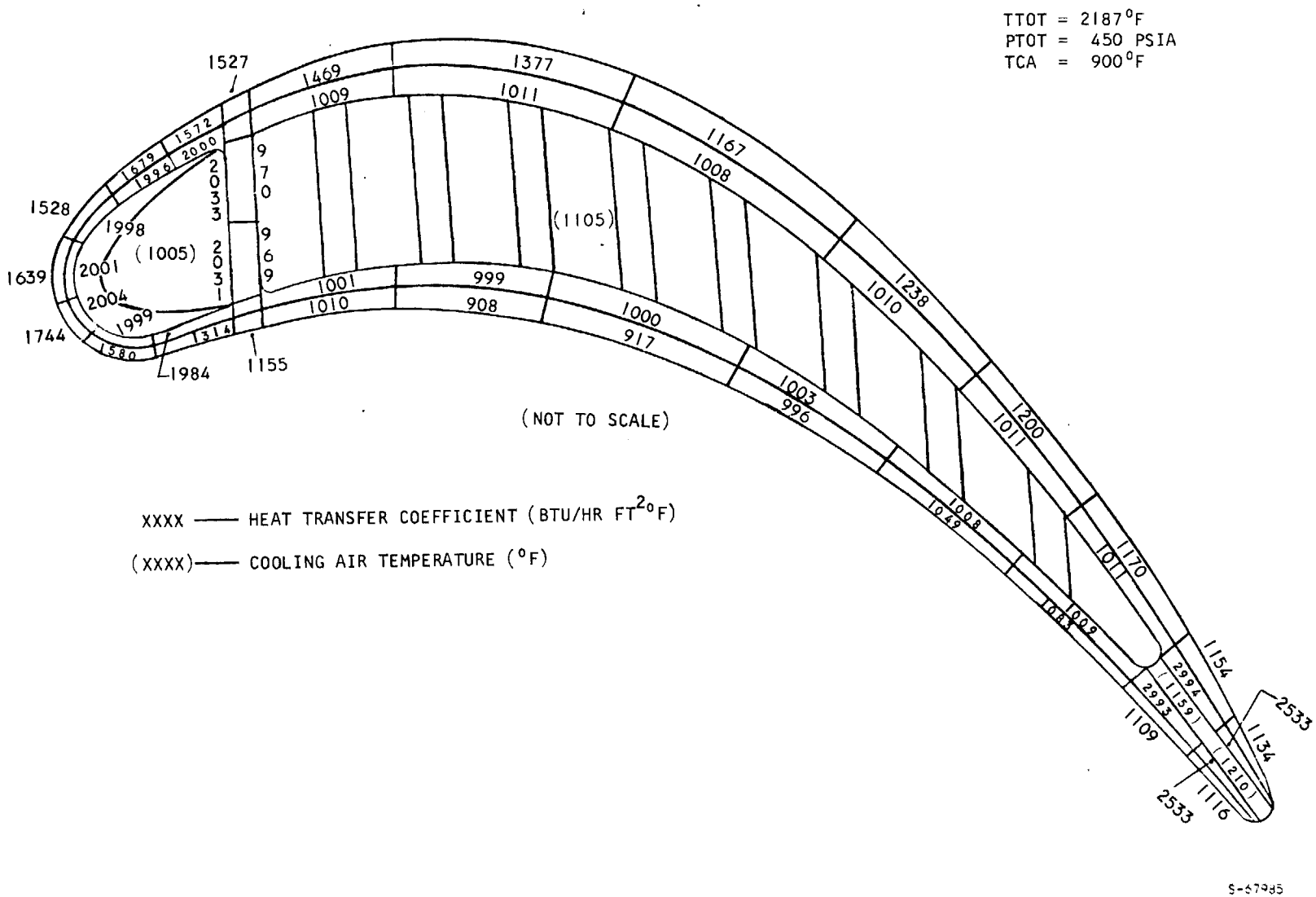

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Figure J-14. Boundary Condition for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Mean Section (50 Percent Span) 1.0 In. Chord

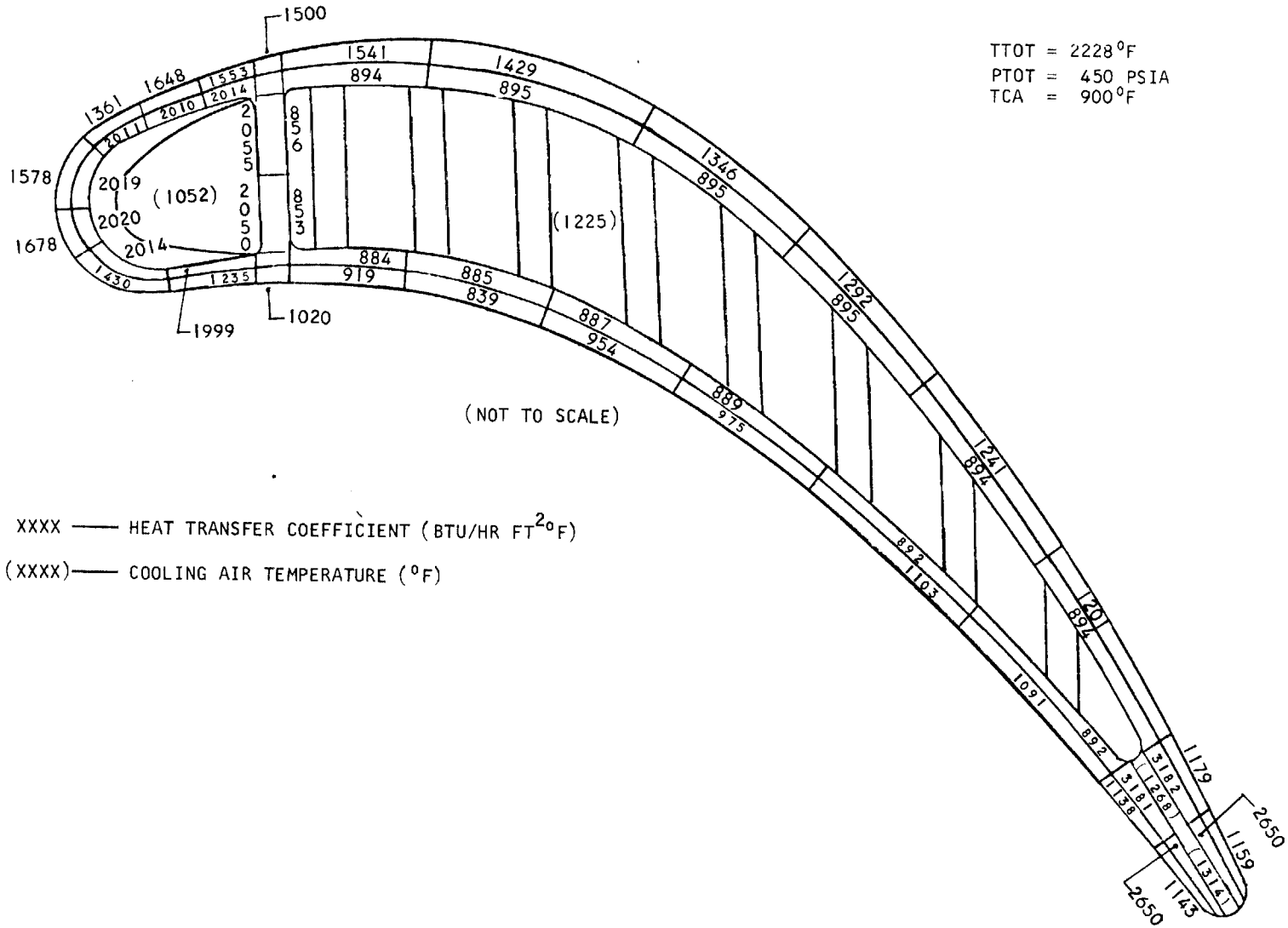

Figure J-15. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Tip Section (75 Percent Span) 1.0 In. Chord

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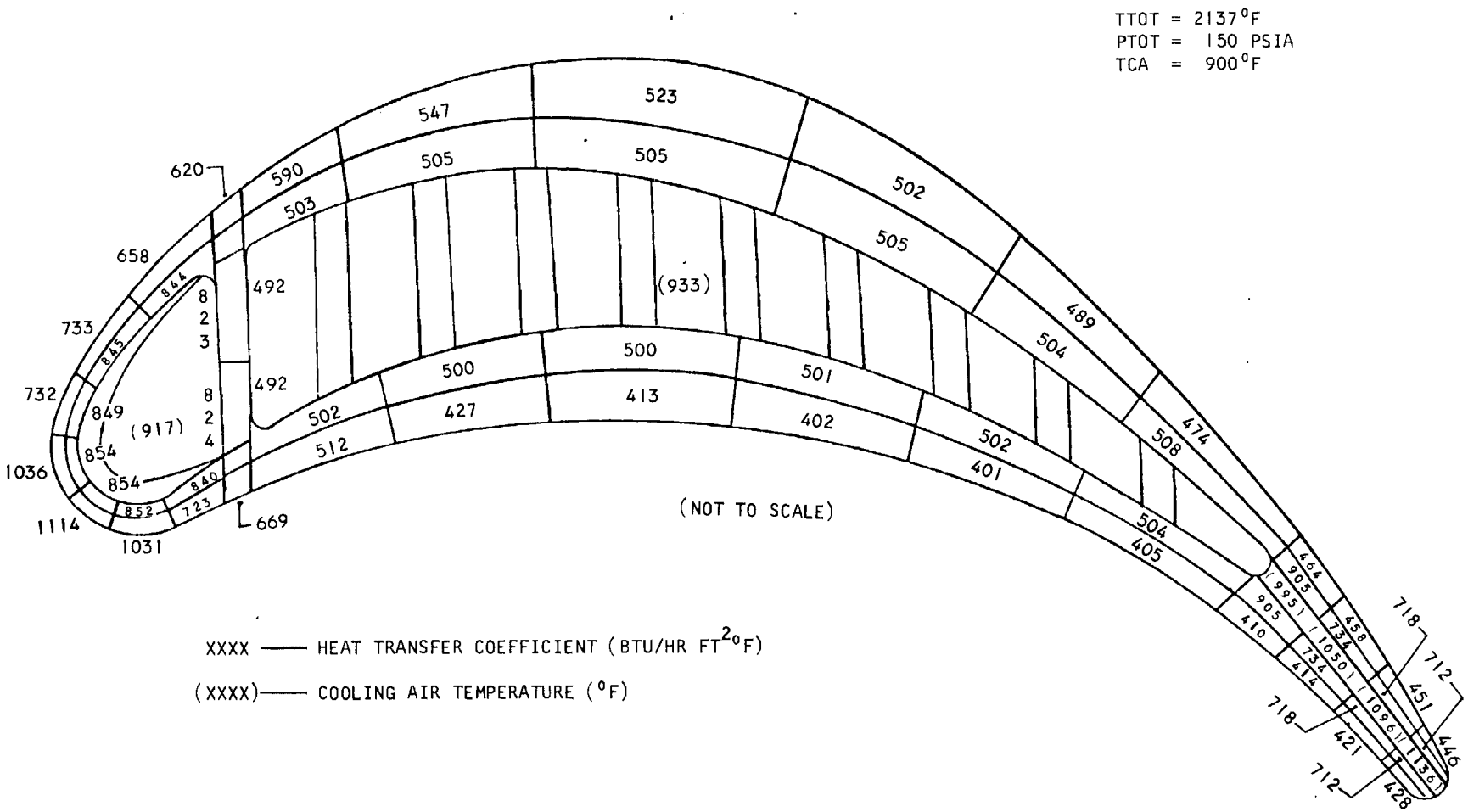

Figure J-16. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Section A-1 (PTOT = 150 psia, TCA = 900°F) Hub Section (3 Percent Span) 1.0 In. Chord

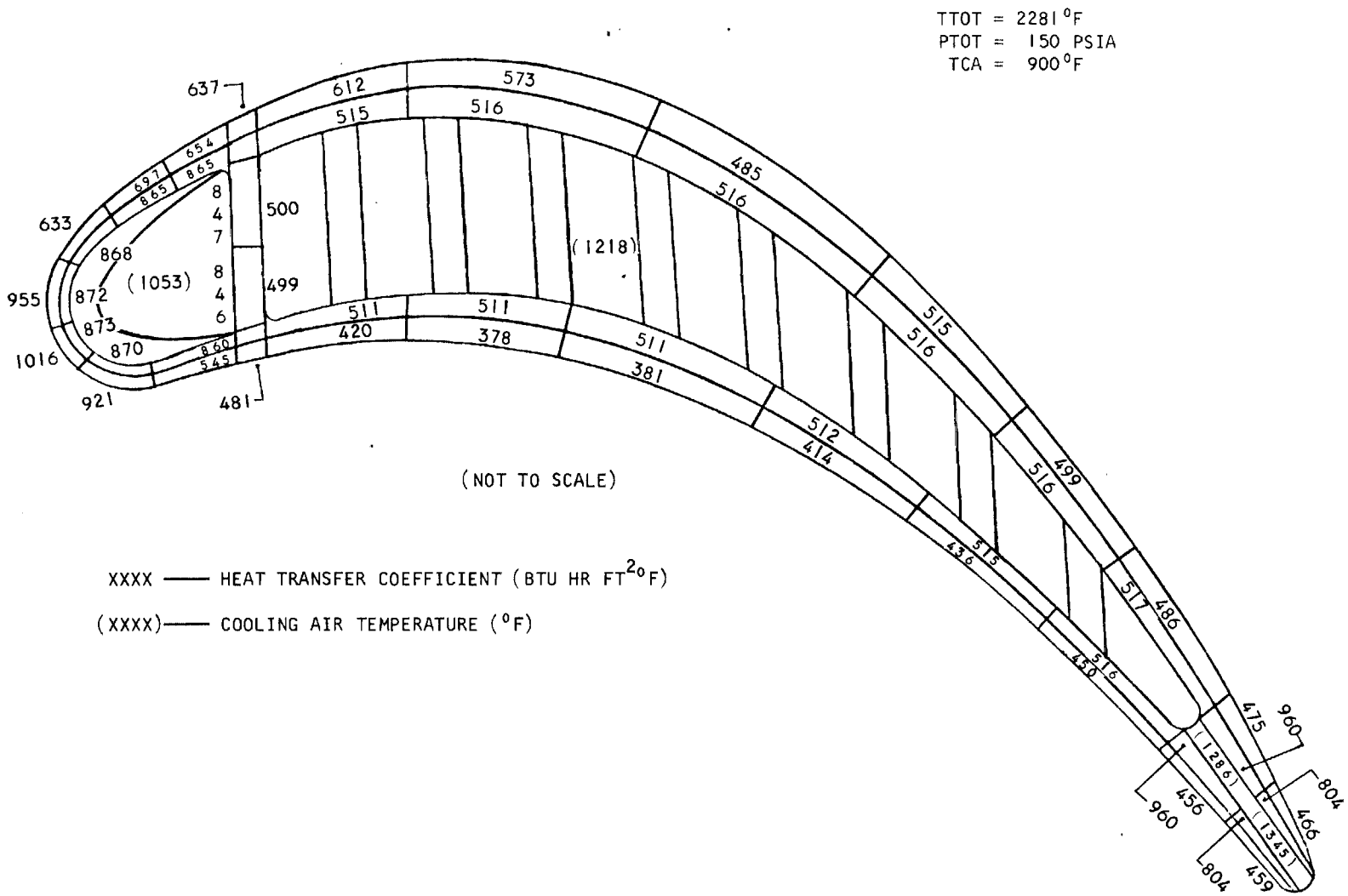

Figure J-17. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Mean Section (50 Percent Span) 1.0 In. Chord

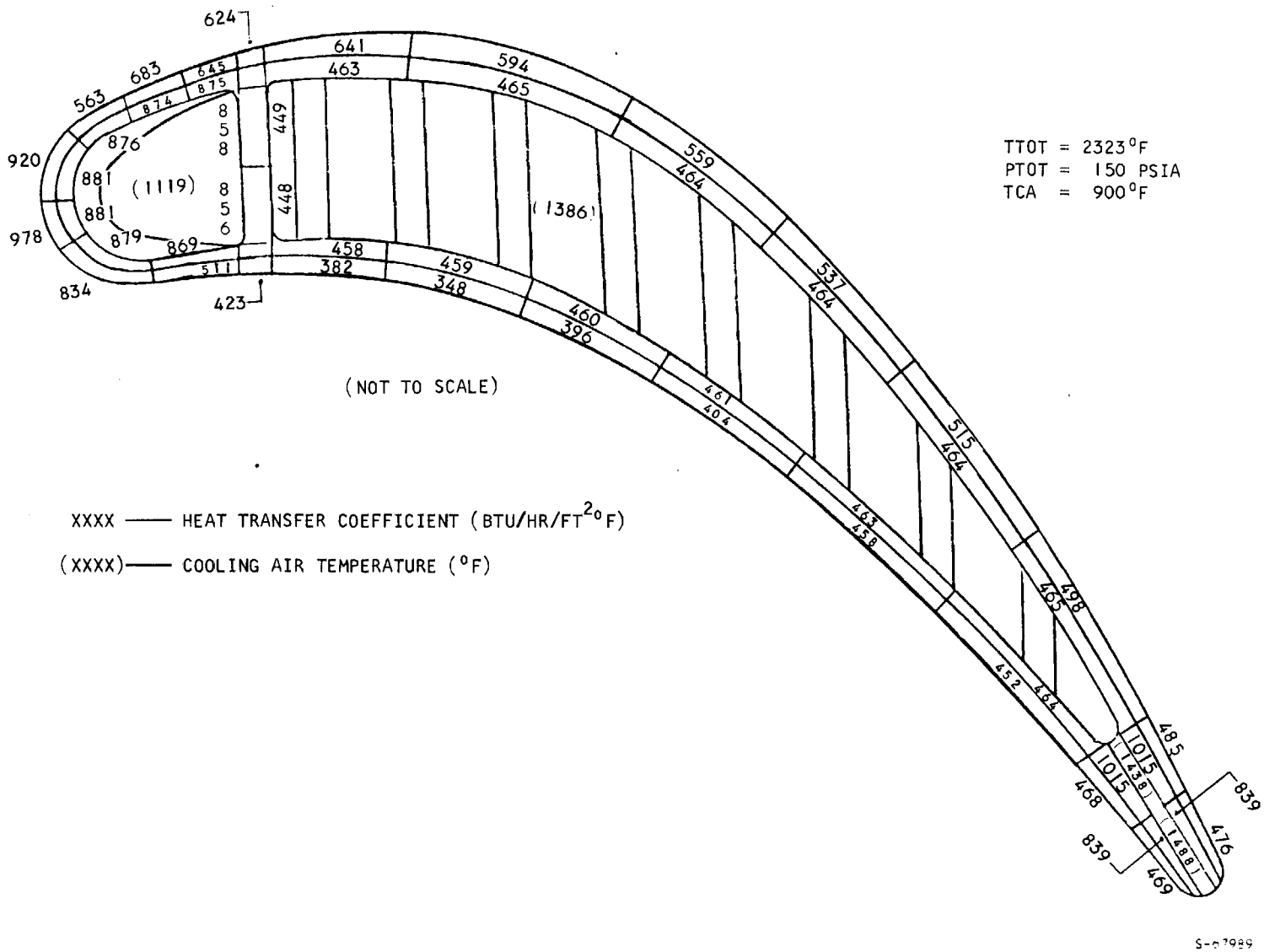

Figure J-18. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Tip Section (75 Percent Span) 1.0 In. Chord

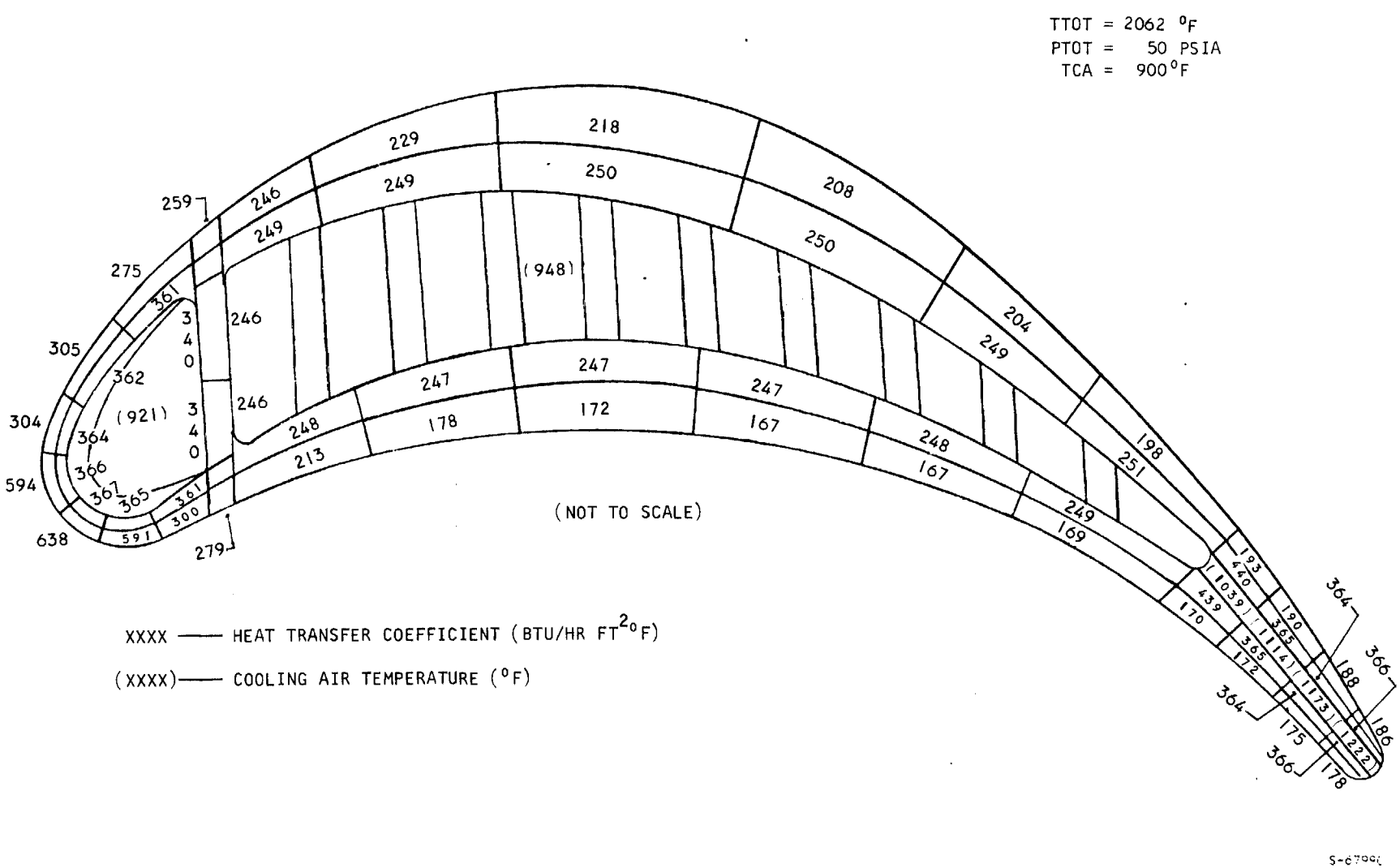

Figure J-19. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, PCA = 900°F) Hub Section (3 Percent Span) 1.0 In. Chord

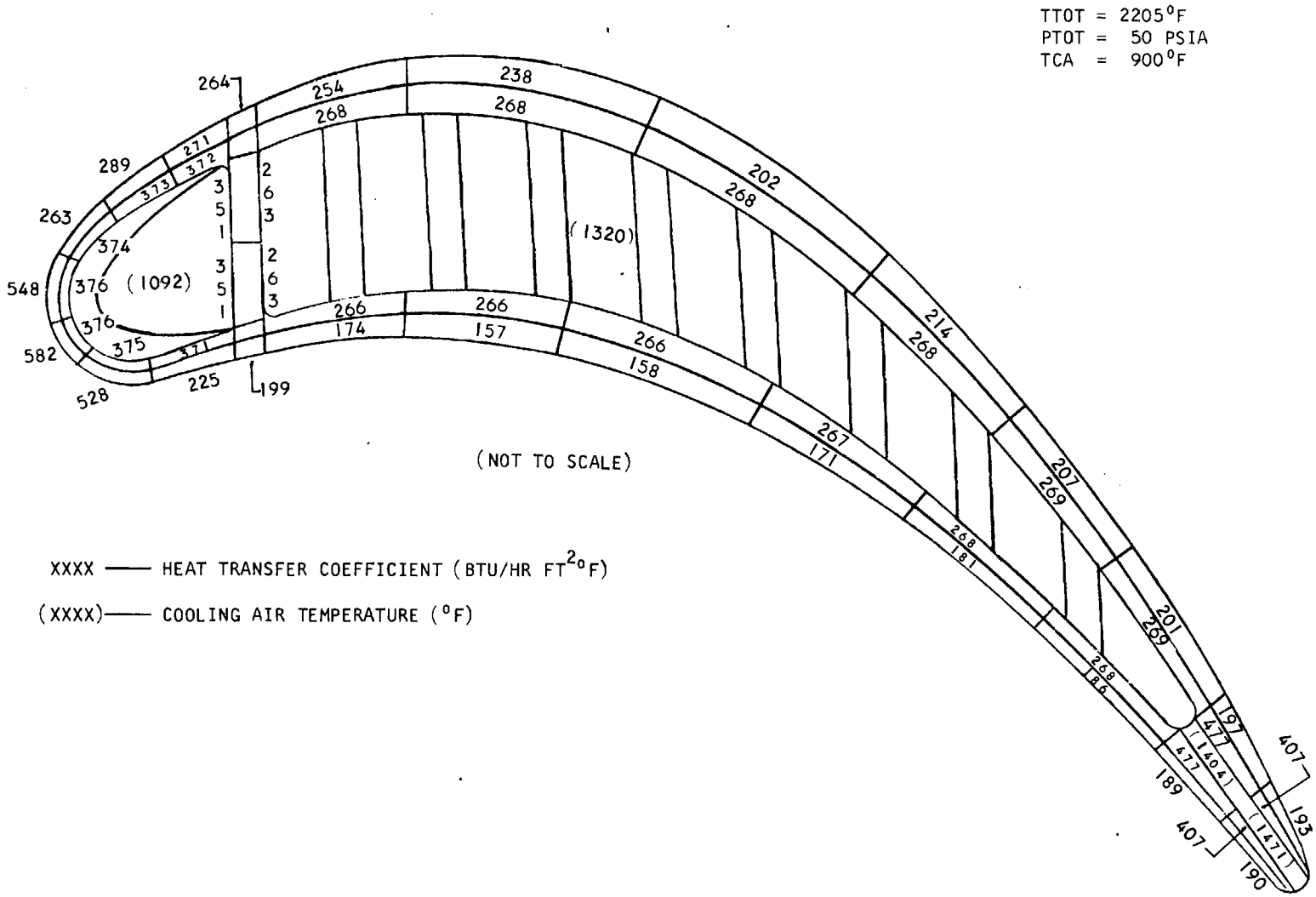

Figure J-20. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Mean Section (50 Percent Span) 1.0 In. Chord

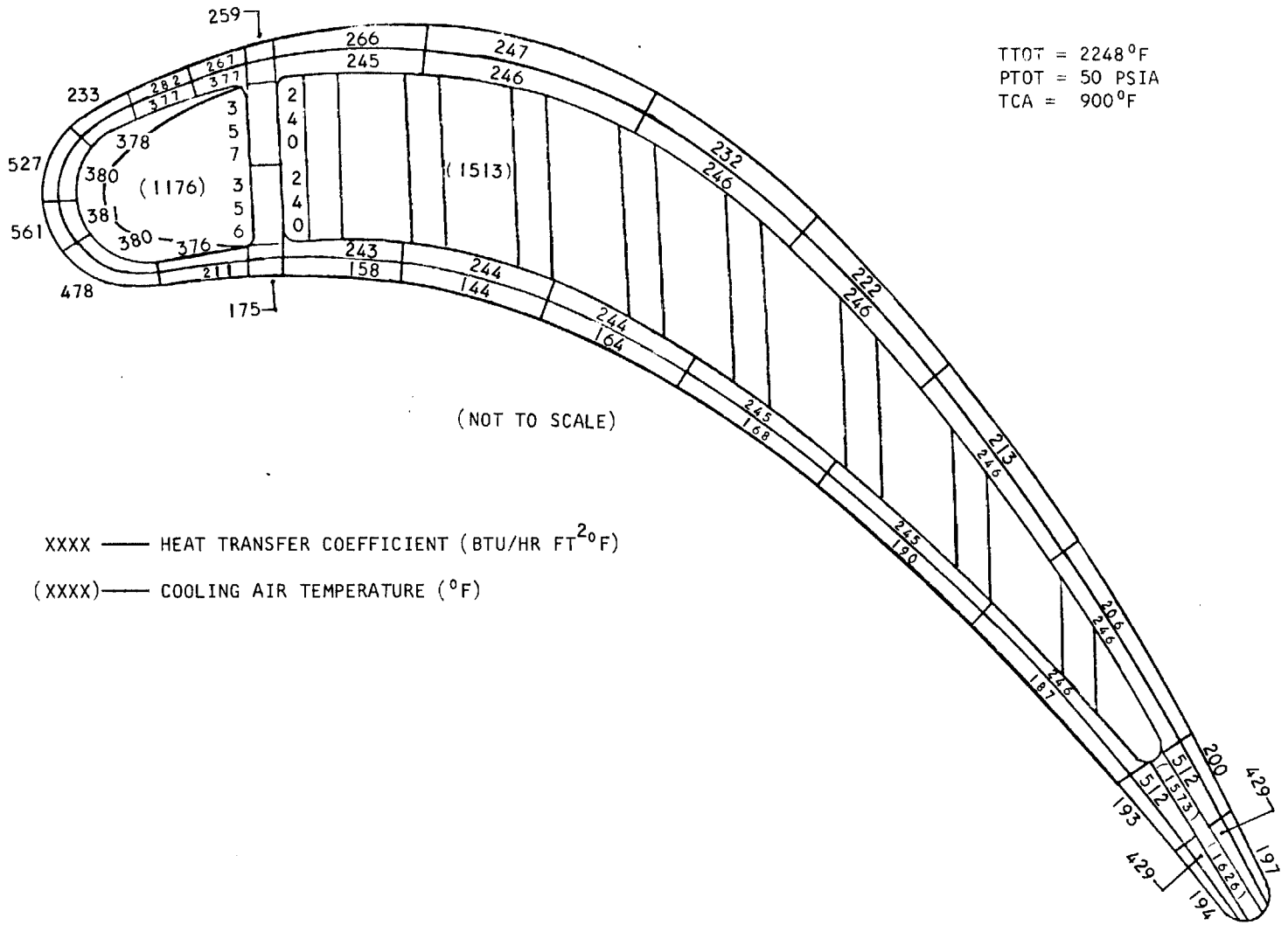

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Figure J-21. Boundary Conditions for Convection Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Tip Section (75 Percent Span) 1.0 In. Chord

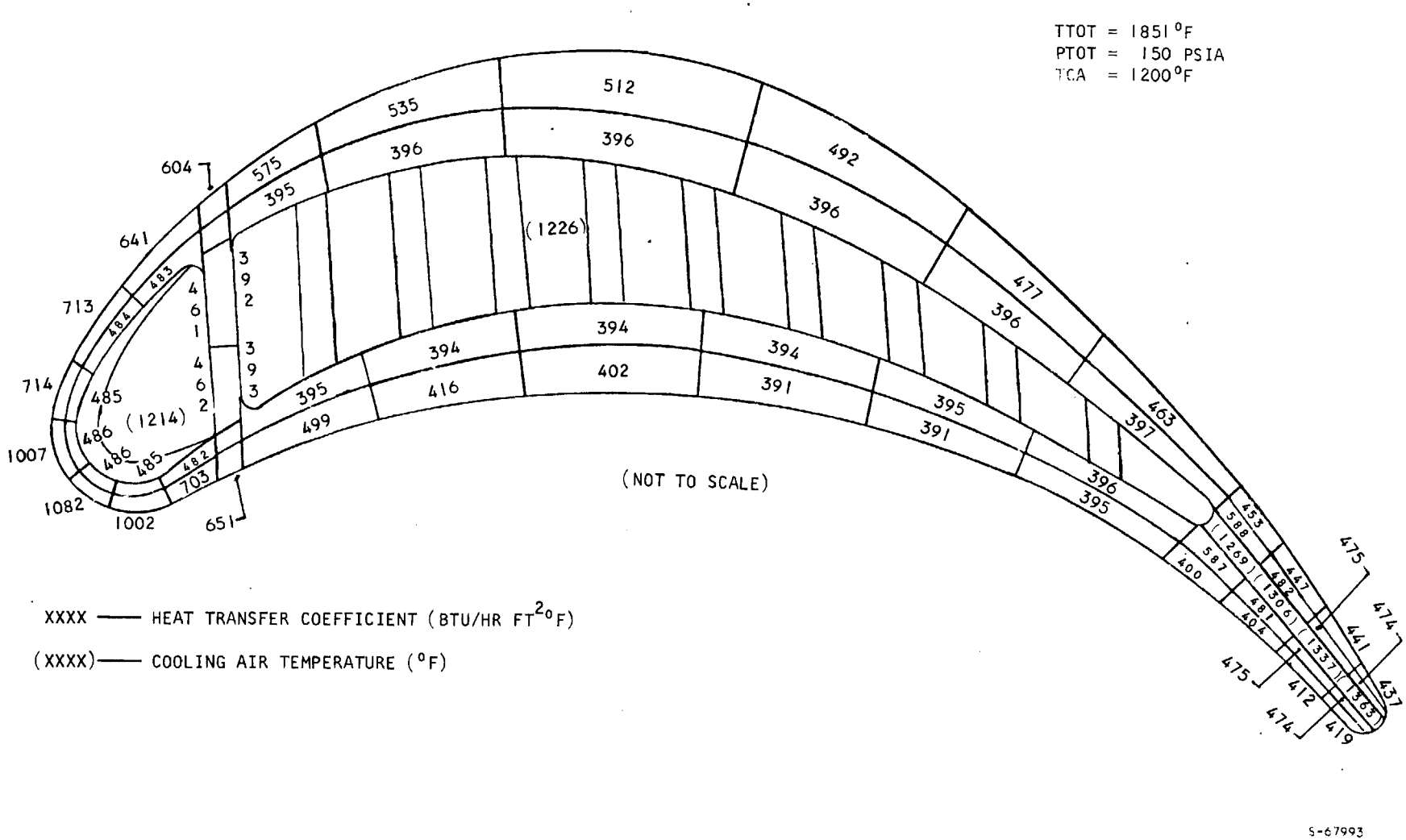

Figure J-22. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200 °F) Hub Section (3 Percent Span) 1.0 In. Chord

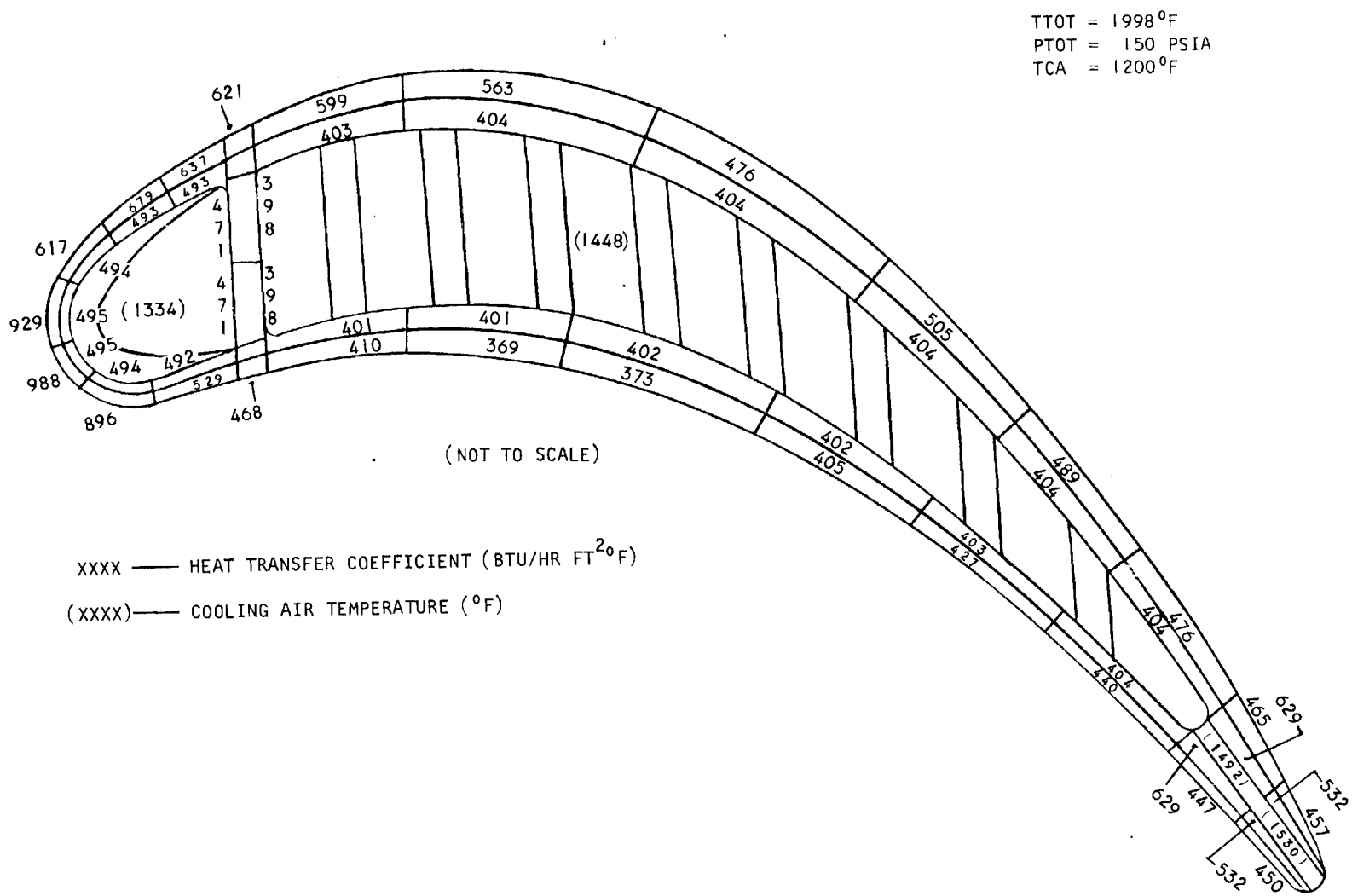

Figure J-23. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Mean Section (50 Percent Span) 1.0 In. Chord

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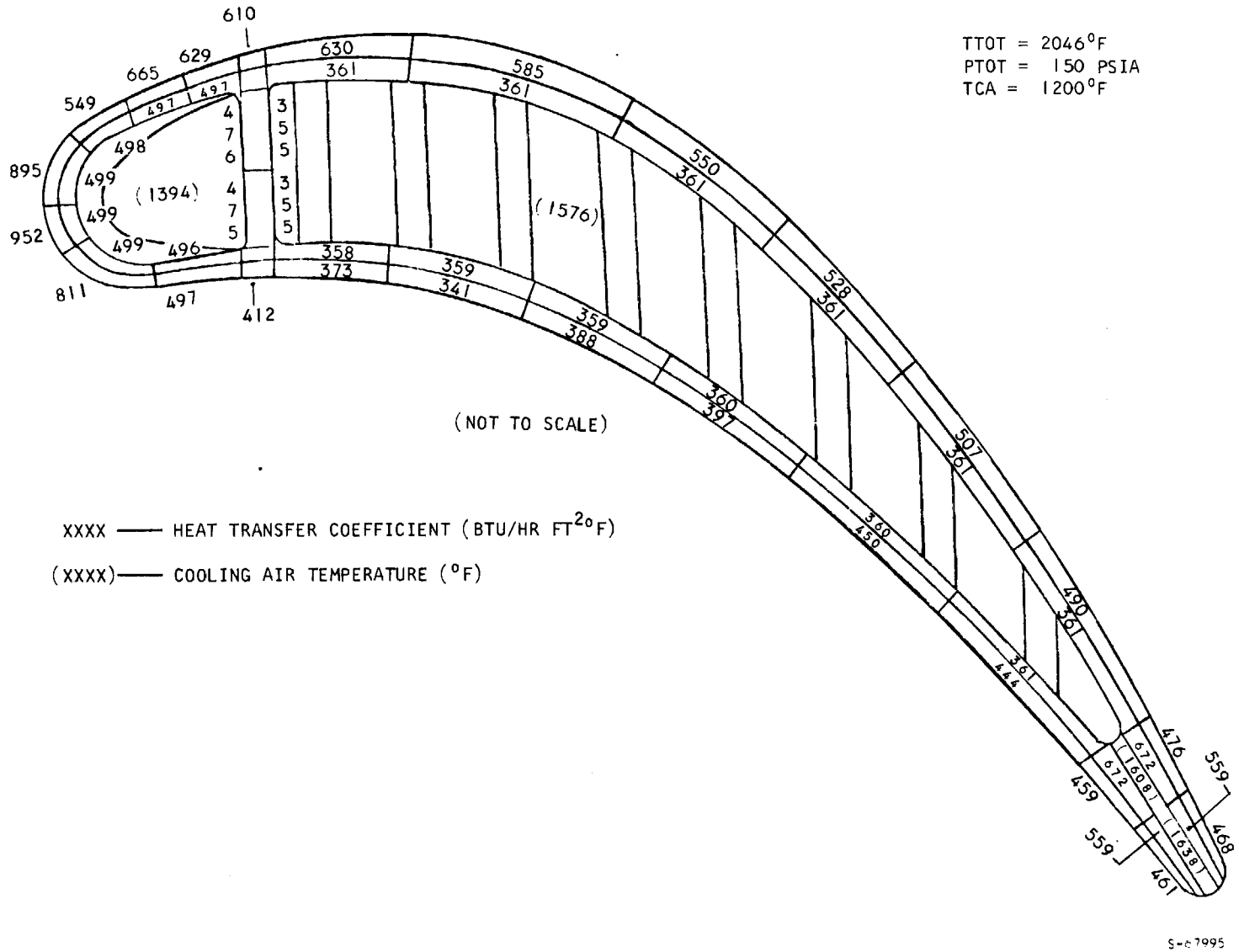


Figure J-24. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Tip Section (75 Percent Span) 1.0 In. Chord

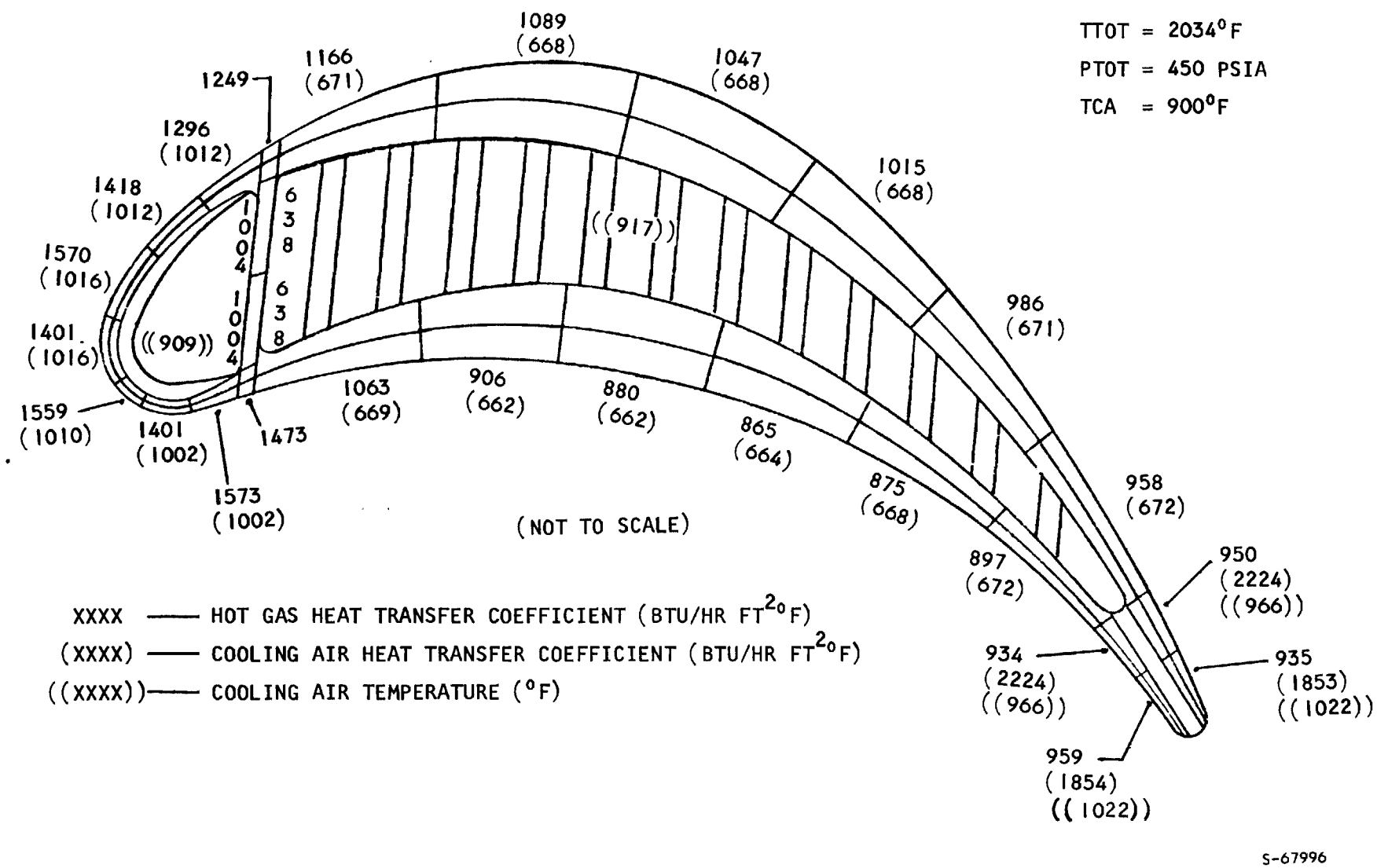


Figure J-25. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Root Section (3 Percent Span) 1.5 in. Chord

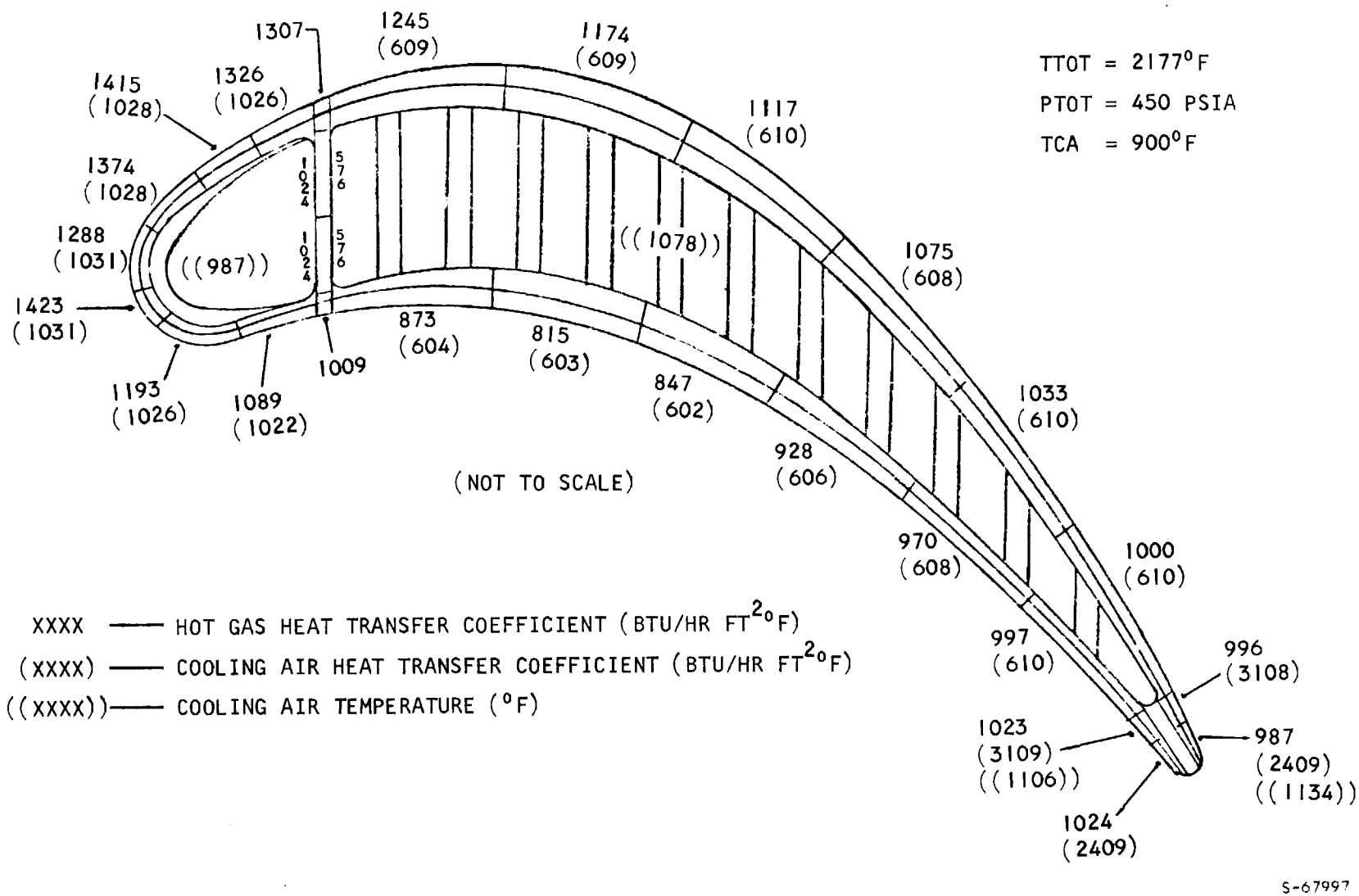


Figure J-26. Boundary Conditions For Convection-Cooled Cast Two-Cavity Pin Fin Blade For Condition 1 (PTOT = 450 PSIA, TCA = 900°F) Mean Section (50% Span) 1.5 Inch Chord

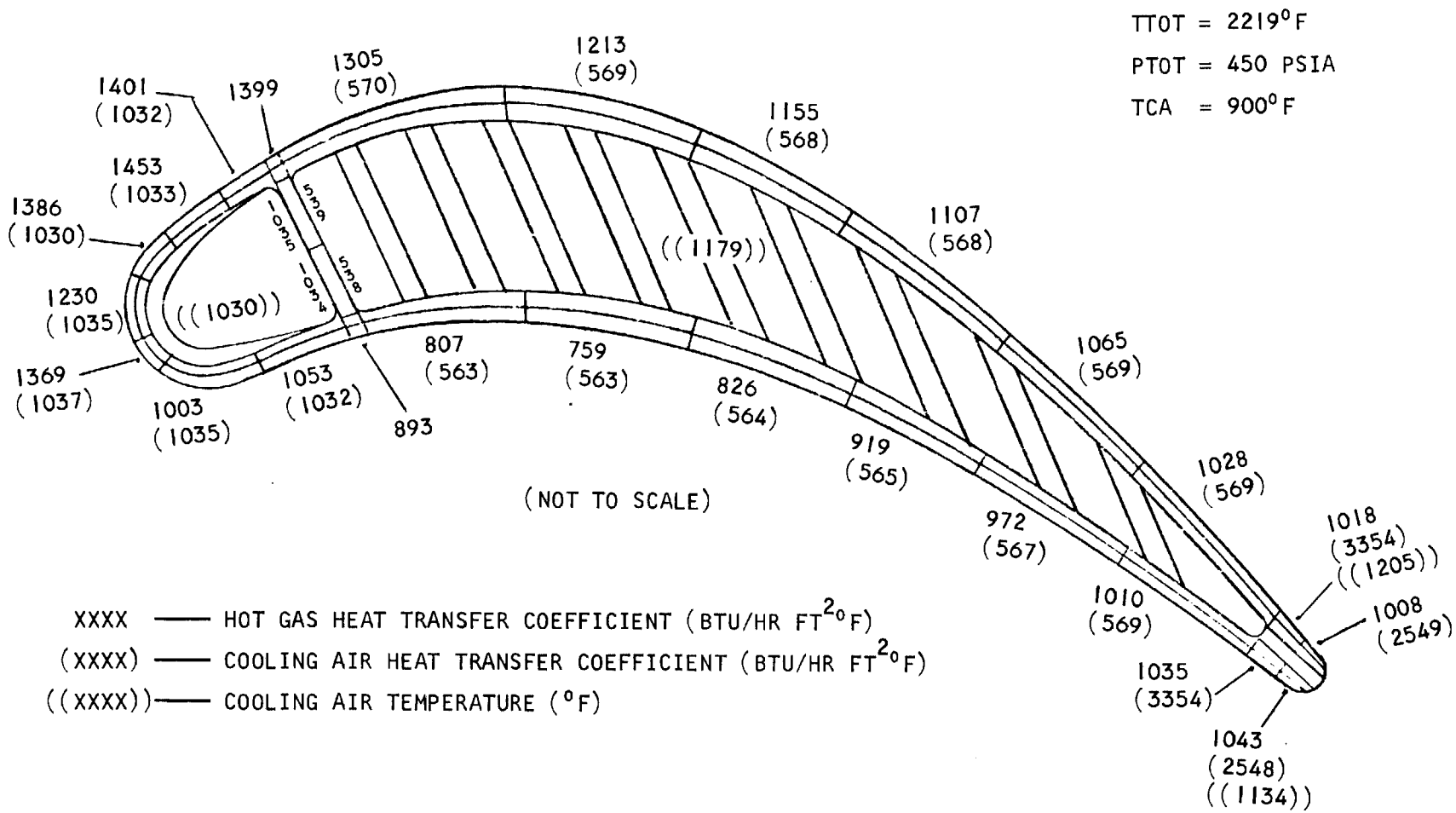


Figure J-27. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 450 psia, TCA = 900°F) Tip Section (75 Percent Span) 1.5 in. Chord

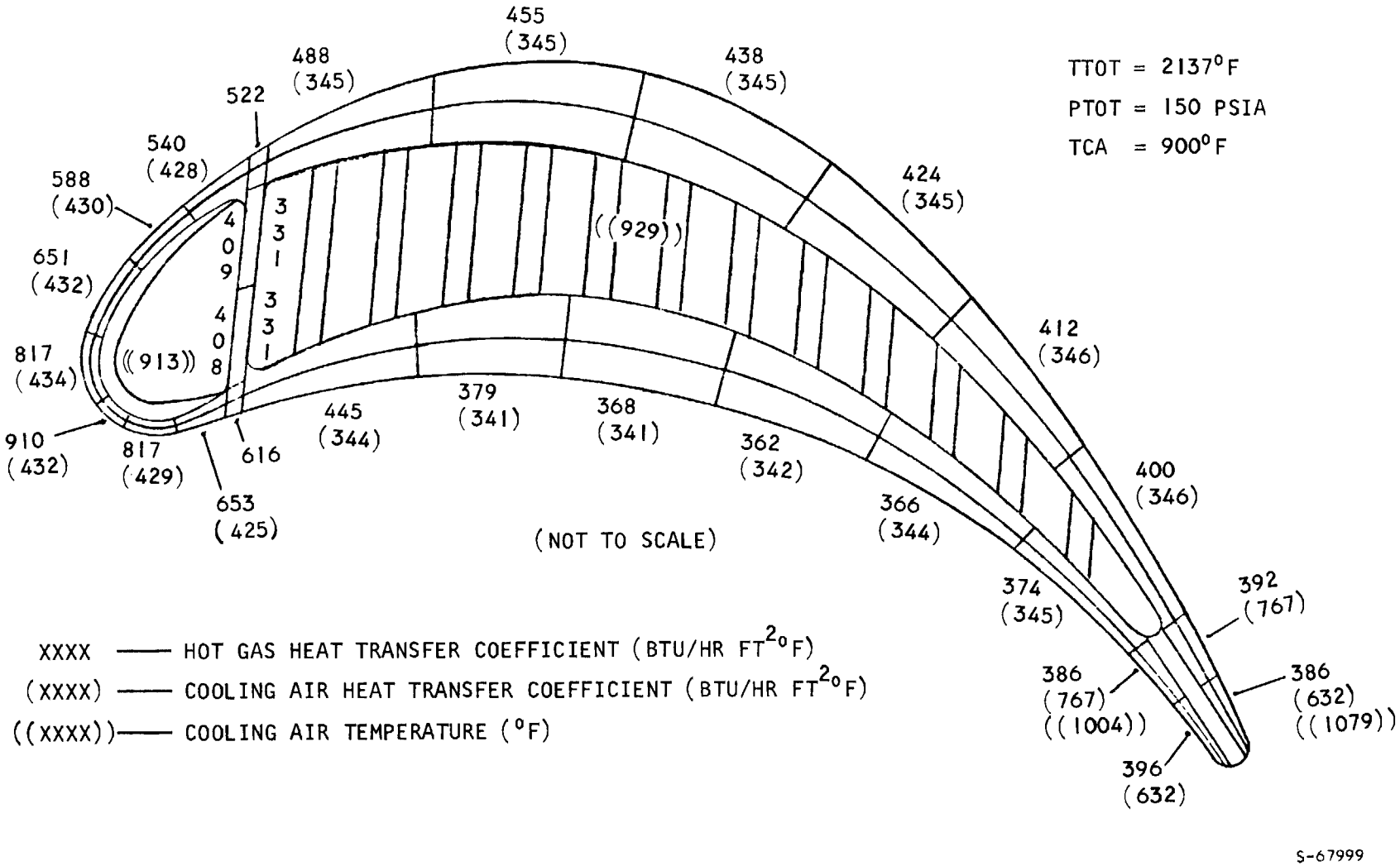


Figure J-28. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Root Section (3 Percent Span) 1.5 in. Chord

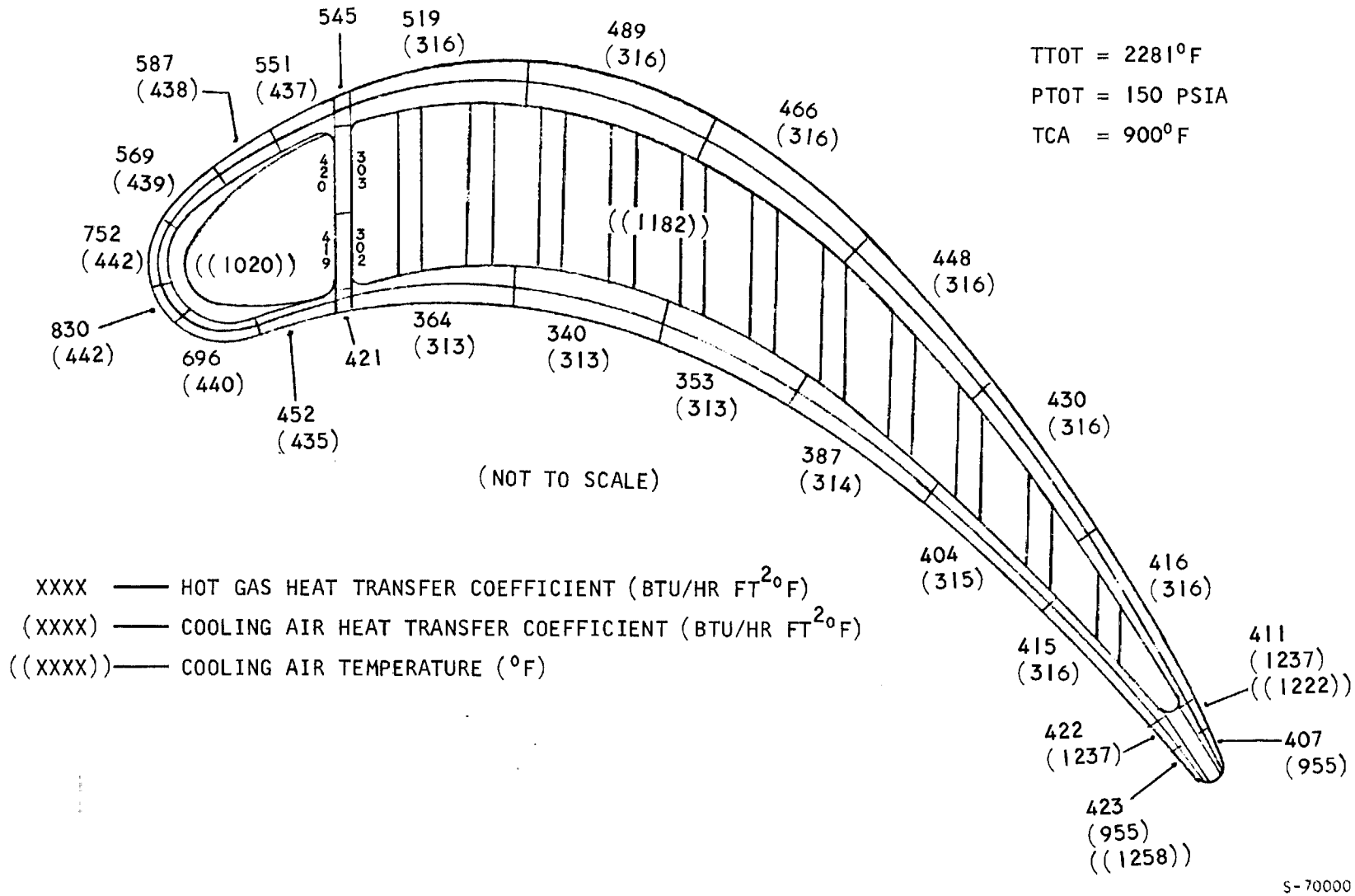


Figure J-29. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Mean Section (50 Percent Span) 1.5 in. Chord

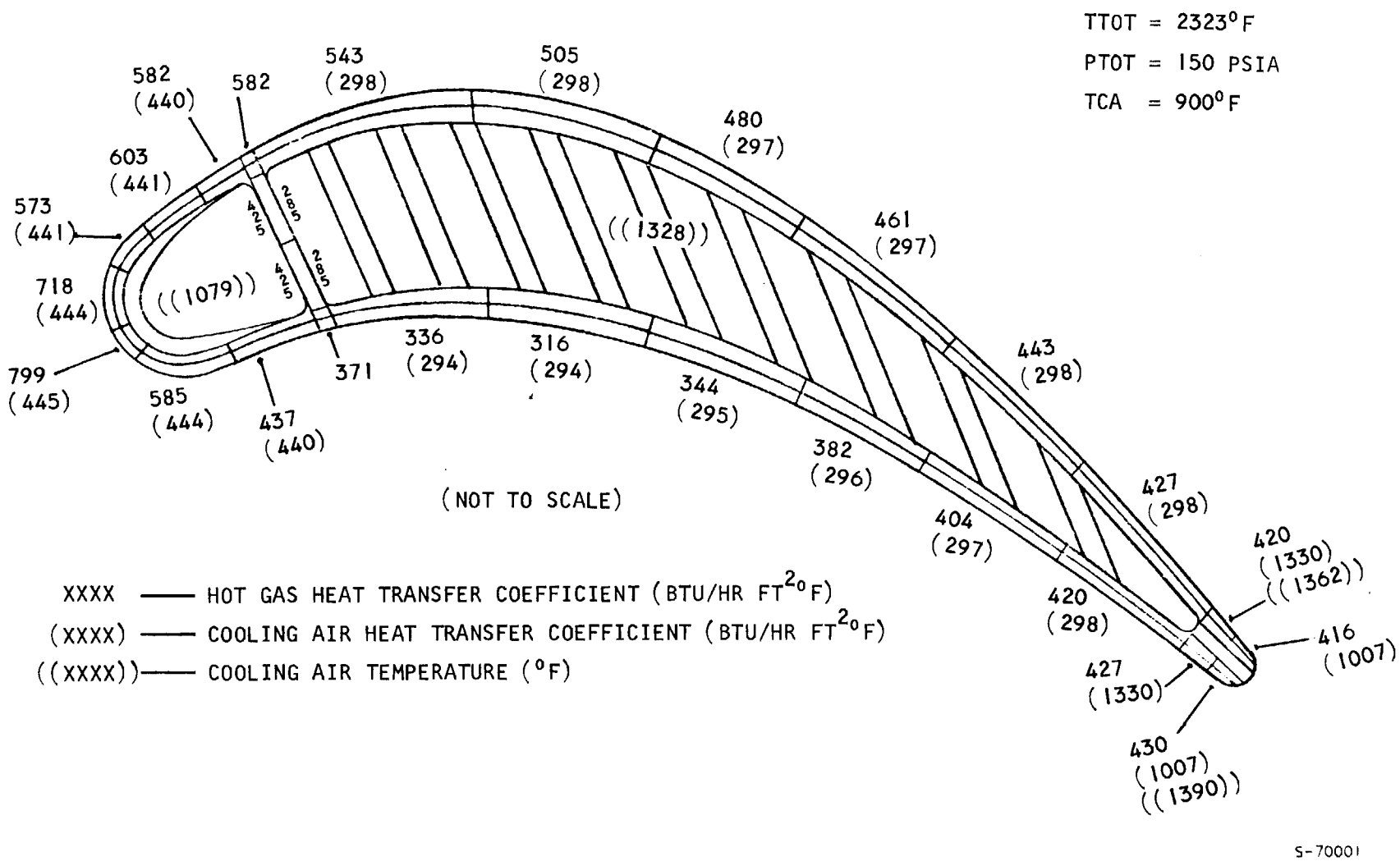


Figure J-30. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 900°F) Tip Section (75 Percent Span) 1.5 in. Chord

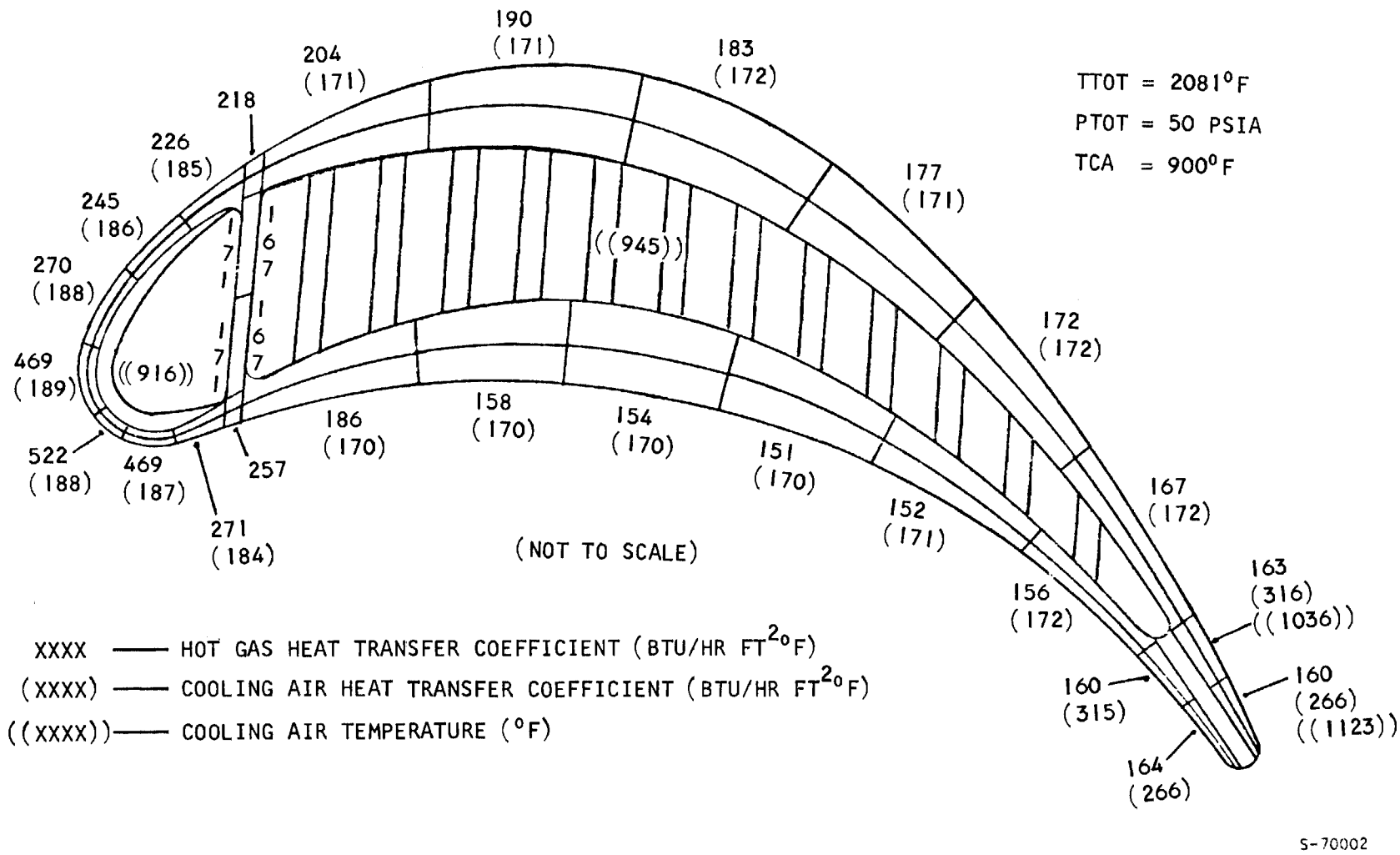


Figure J-31. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Root Section (3 Percent Span) 1.5 in. Chord

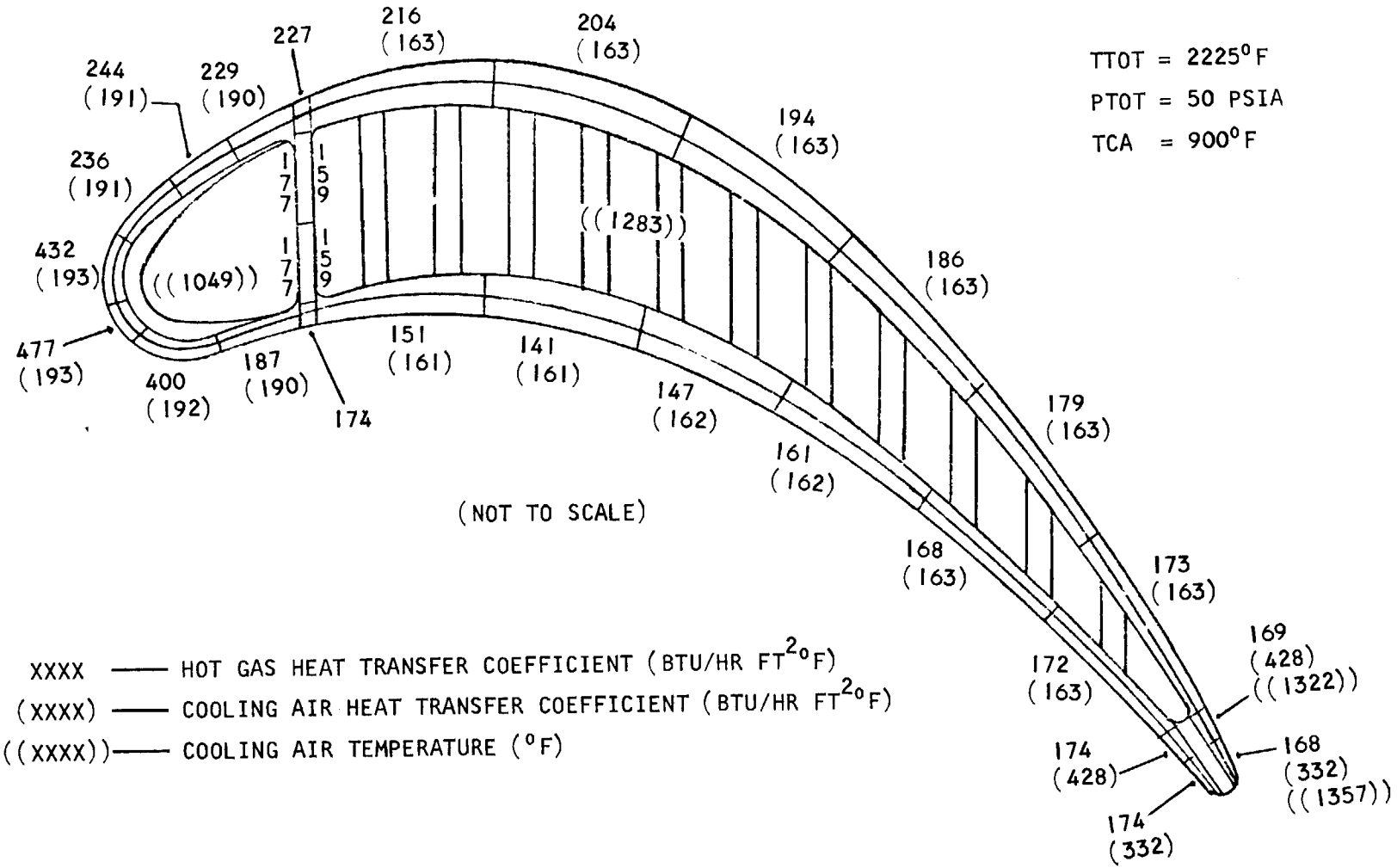
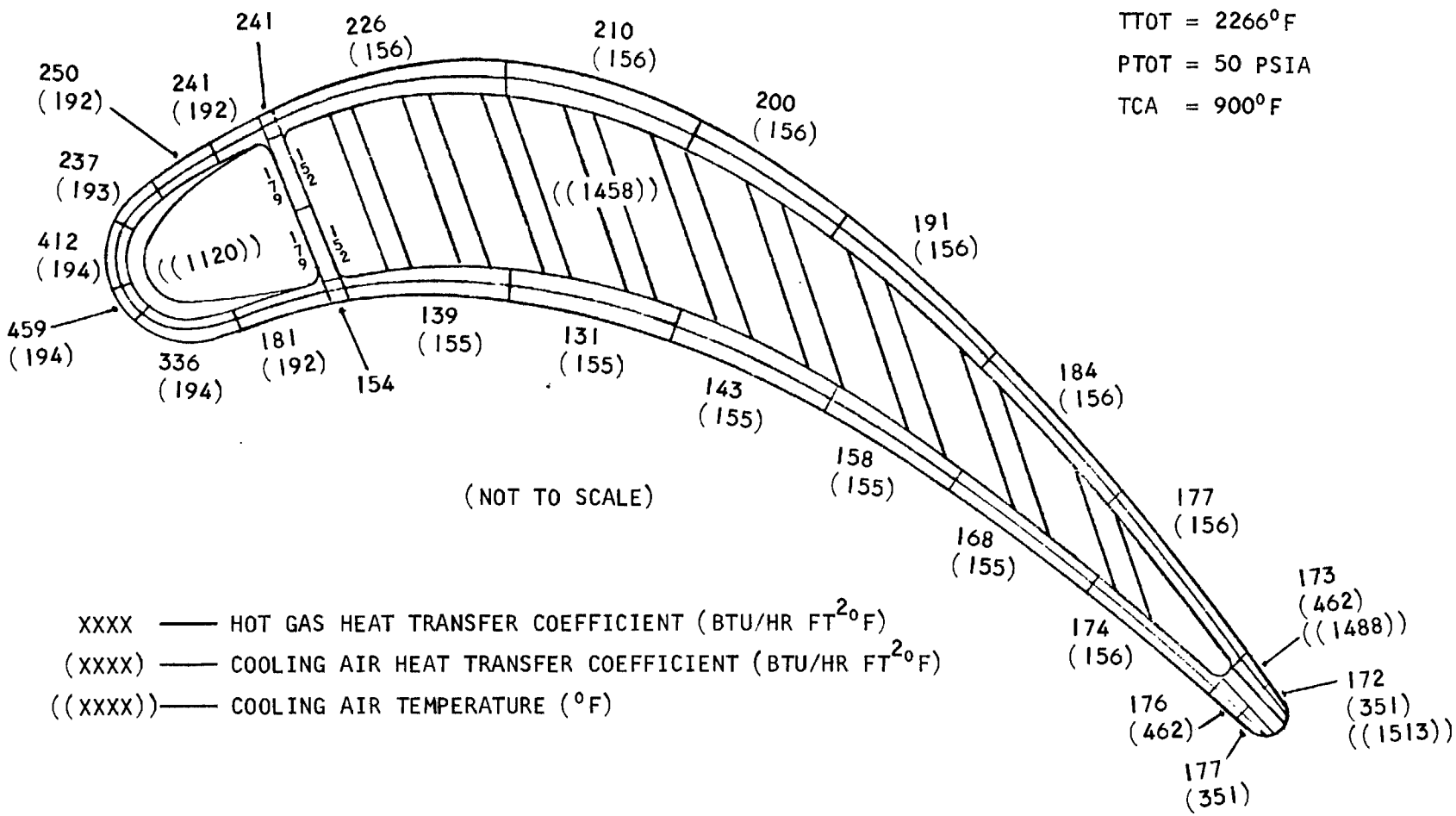


Figure J-32. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Mean Section (50 Percent Span) 1.5 in. Chord



S-70004

Figure J-33. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 50 psia, TCA = 900°F) Tip Section (75 Percent Span) 1.5 in. Chord

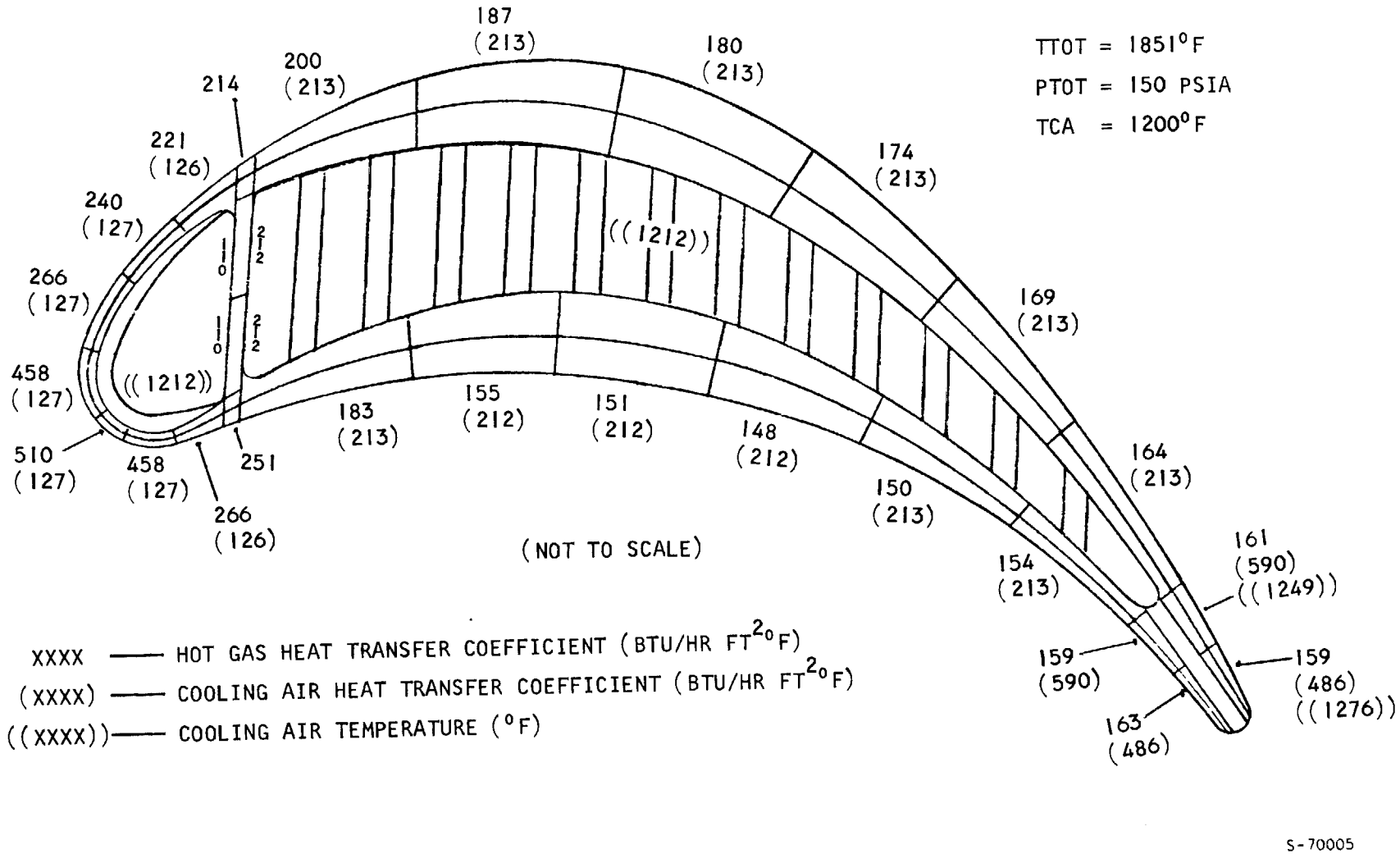


Figure J-34. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Root Section (3 Percent Span) 1.5 in. Chord

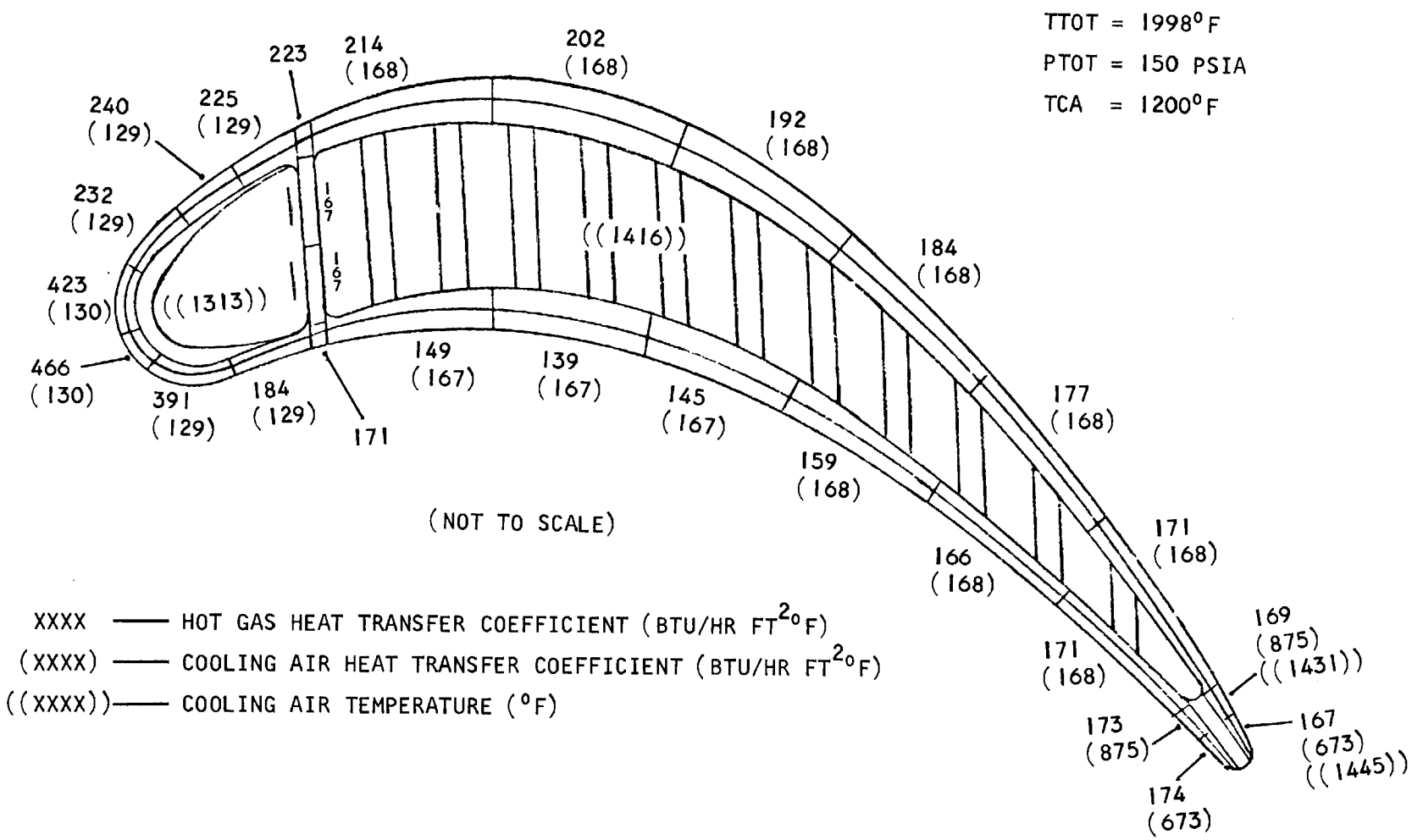


Figure J-35. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Mean Section (50 Percent Span) 1.5 in. Chord

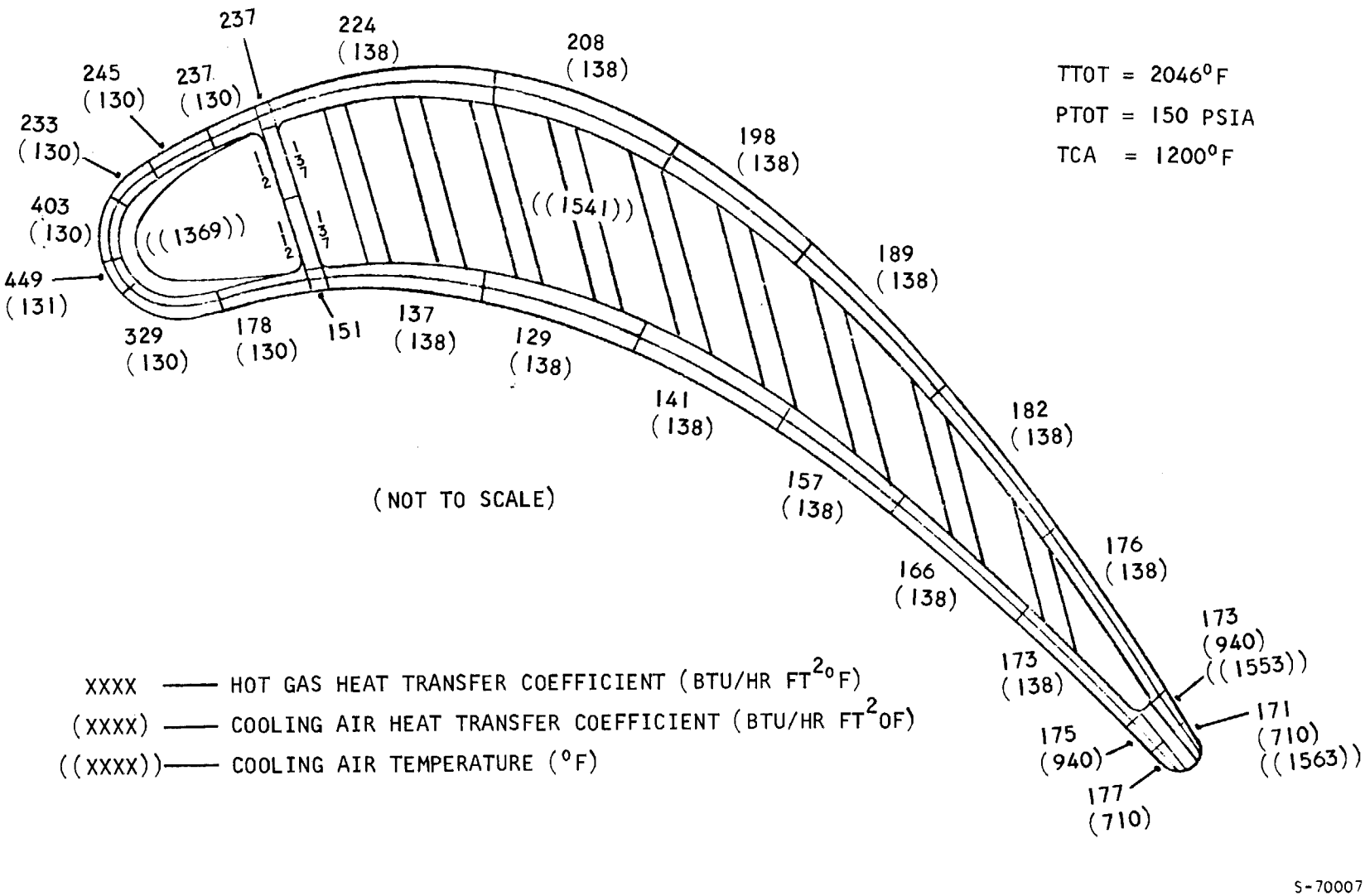
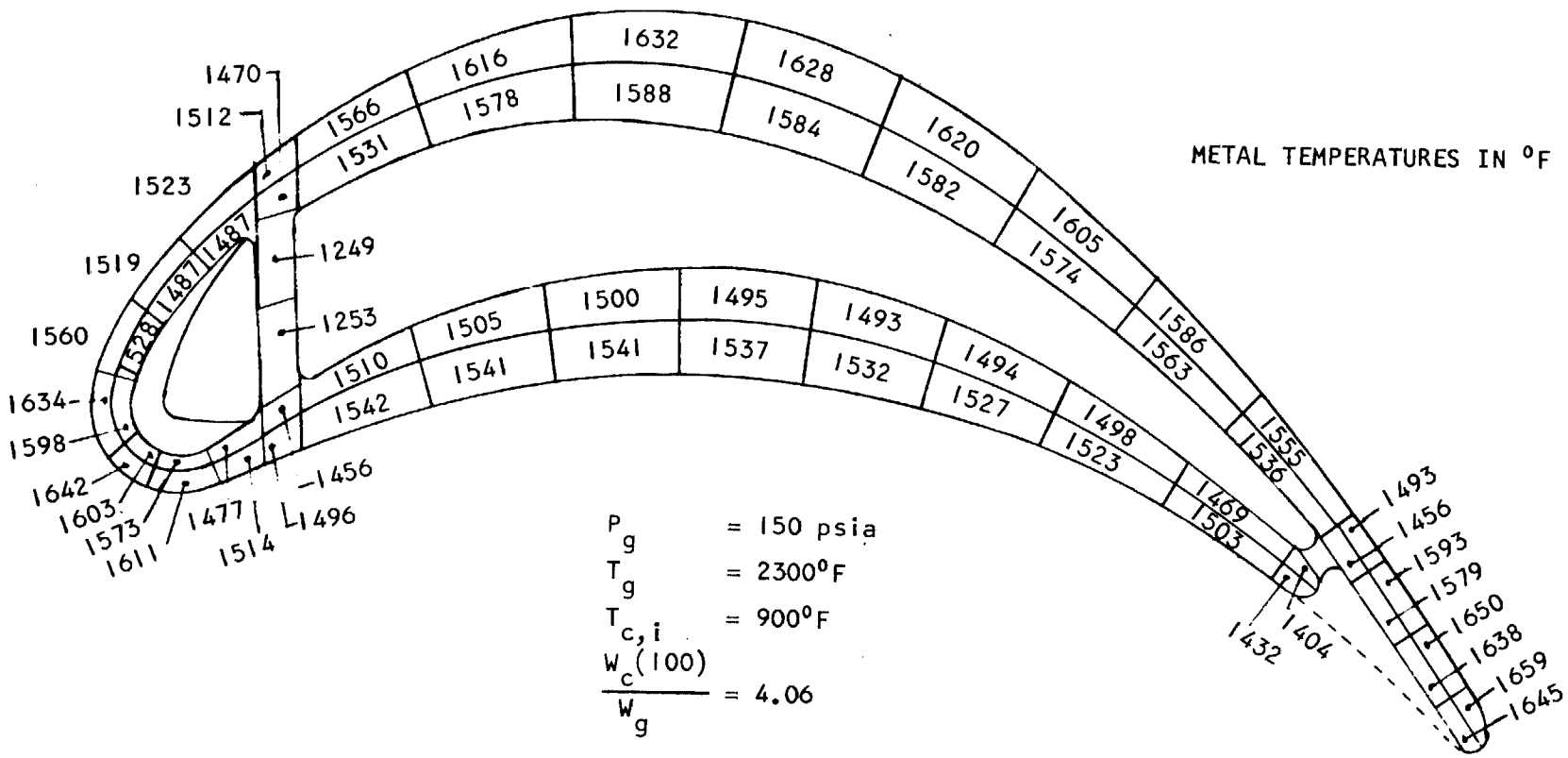


Figure J-36. Boundary Conditions for Convection-Cooled Cast Two-Cavity Pin Fin Blade Scheme A-1 (PTOT = 150 psia, TCA = 1200°F) Tip Section (75 Percent Span) 1.5 in. Chord

AVERAGE METAL TEMPERATURE

$\overline{T}_R = 1544.8^{\circ}F$

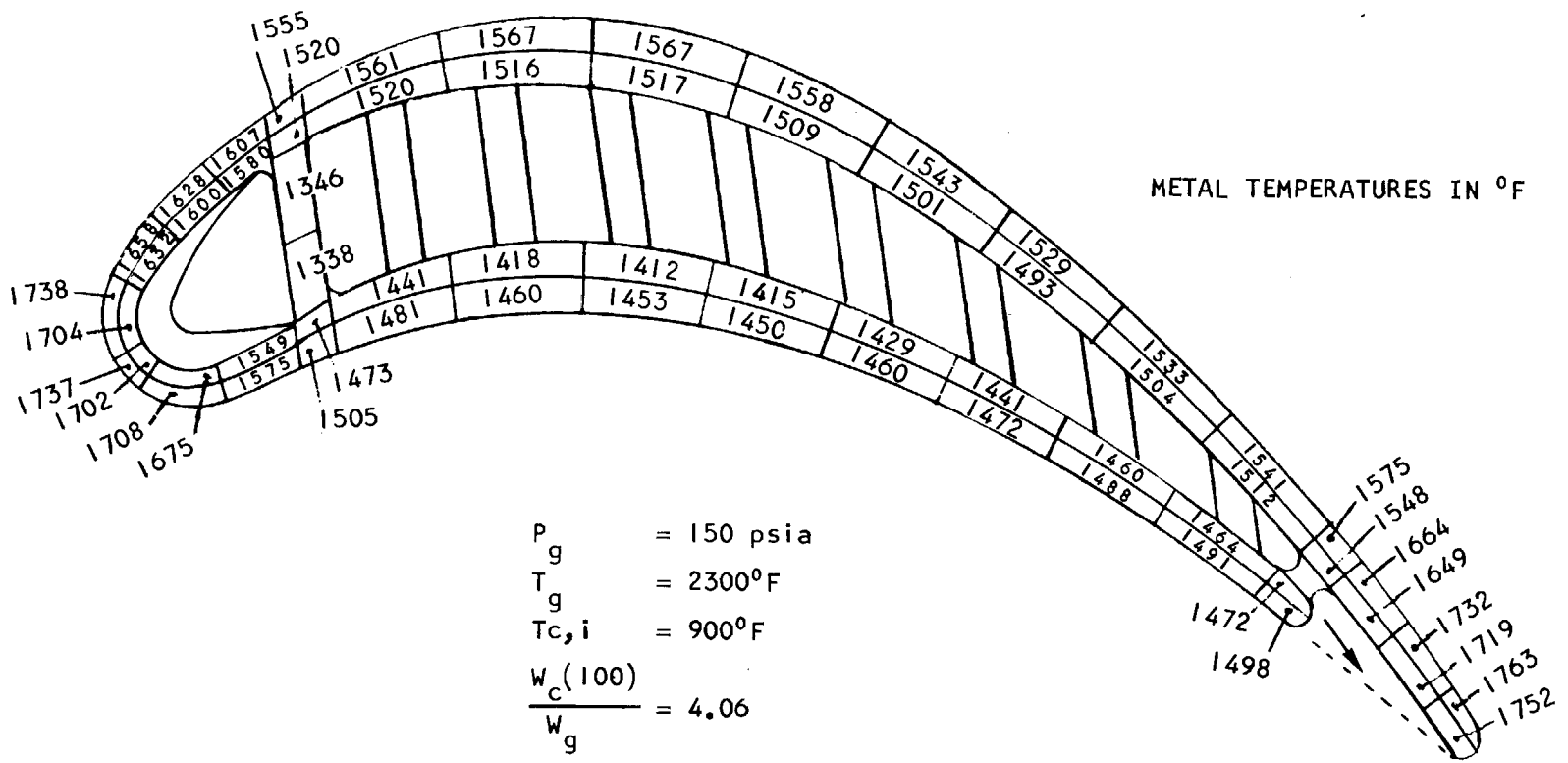


S-70008

Figure J-37. Scheme A-I Convection Cooled Cast Pin Fin Blade
Hub Section (3% Span)
0.75 Inch Chord

AVERAGE METAL TEMPERATURE

$\overline{T}_M = 1522.8^{\circ}F$



$P_g = 150$ psia

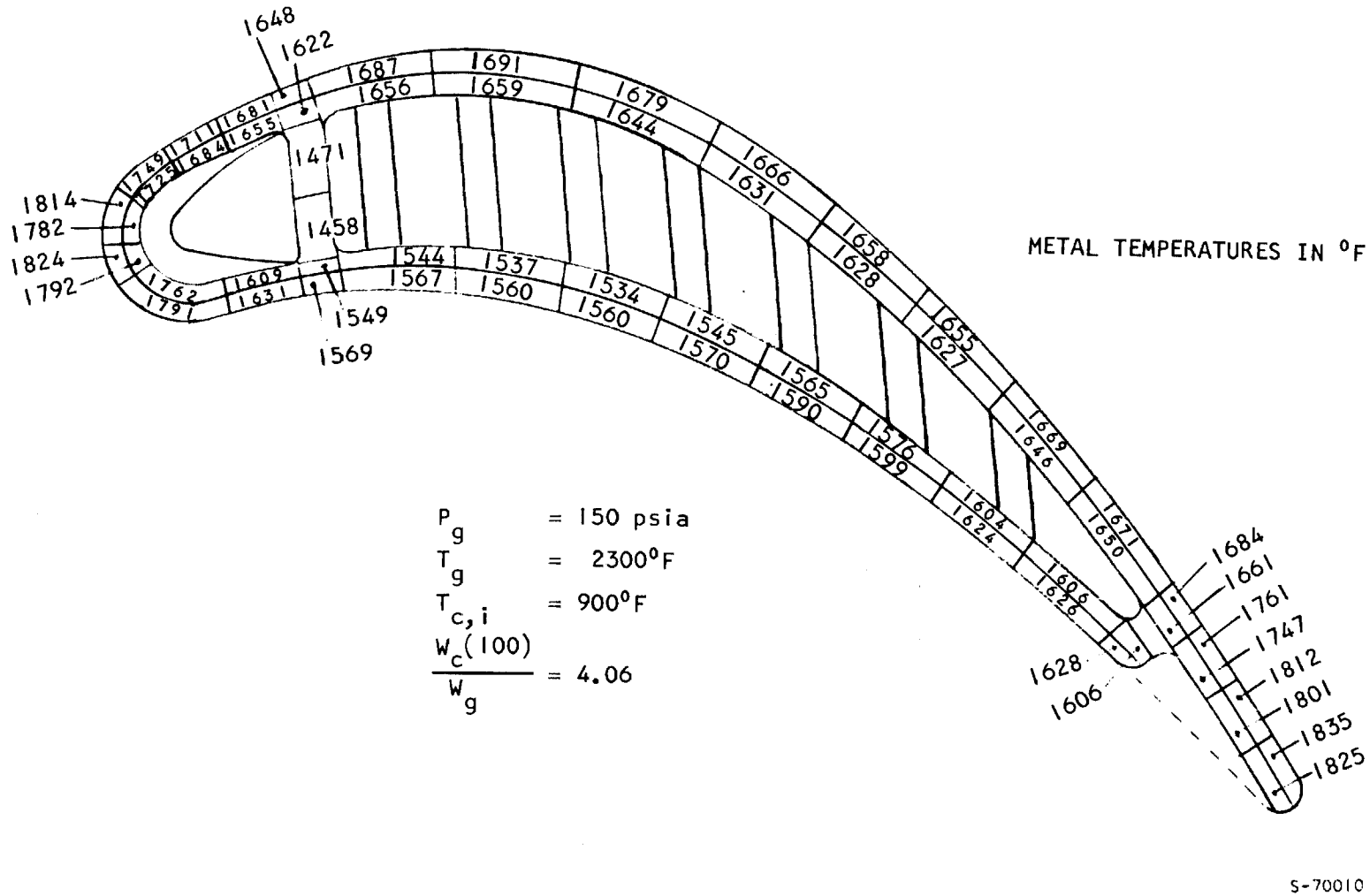
$T_g = 2300^{\circ}F$

$Tc,i = 900^{\circ}F$

$\frac{W_c(100)}{W_g} = 4.06$

S-70009

Figure J-38. Scheme A-I Convection Cooled Cast Pin Fin Blade
Mean Section (50% Span)
0.75 Inch Chord



S-70010

Figure J-39. Scheme A-1 Convection Cooled Cast Pin Fin Blade
Tip Section (75% Span)
0.75 Inch Chord

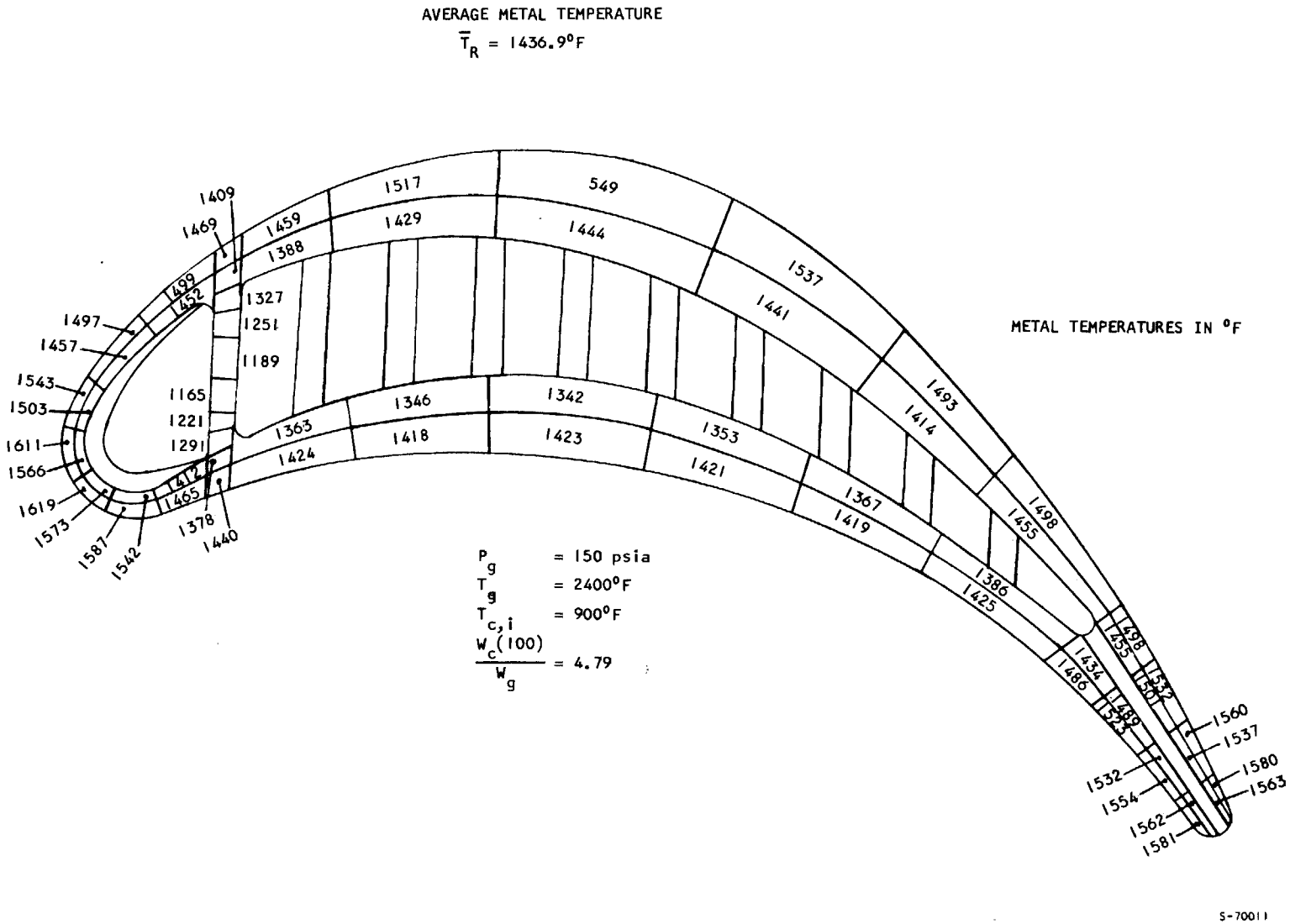


Figure J-40. Scheme A-I Convection Cooled Cast Pin Fin Blade
Hub Section (3% Span)
1.0 Inch Chord

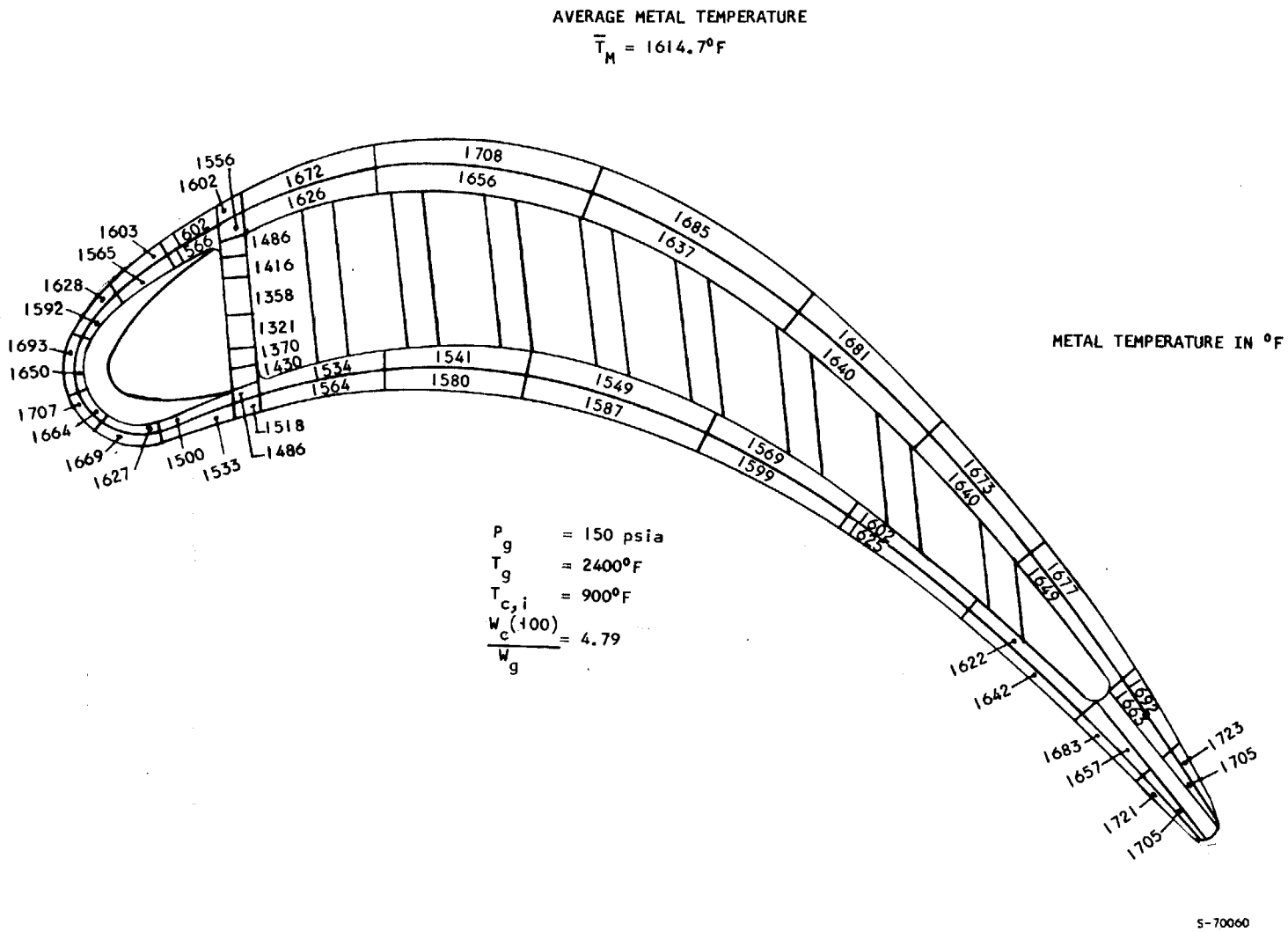


Figure J-41. Scheme A-I Convection Cooled Cast Pin Fin Blade
Mean Section (50% Span)
1.0 Inch Chord

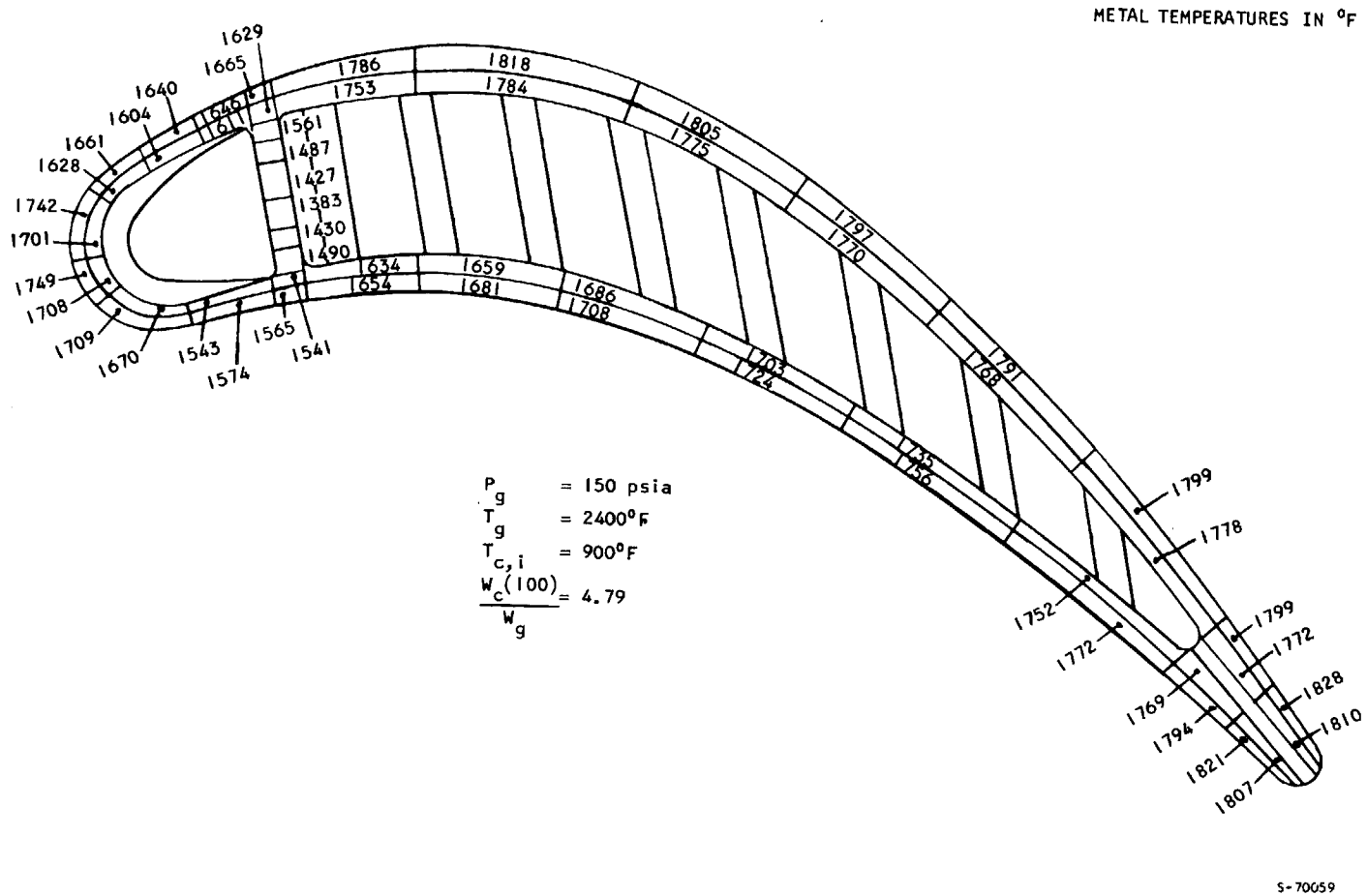
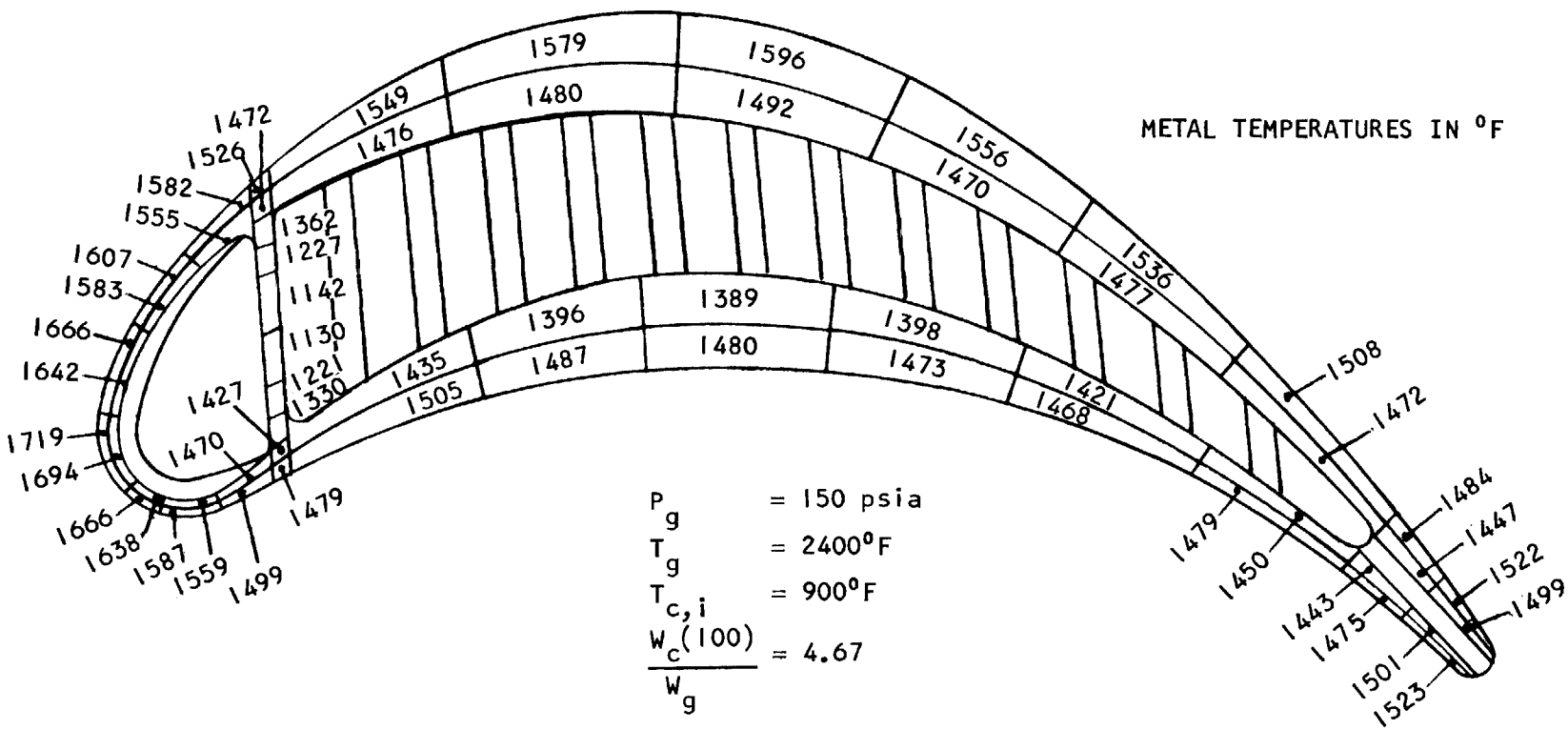


Figure J-42. Scheme A-I Convection Cooled Cast Pin Fin Blade
Tip Section (75% Span)
1.0 Inch Chord

AVERAGE METAL TEMPERATURE

$\overline{T}_R = 1486^0F$

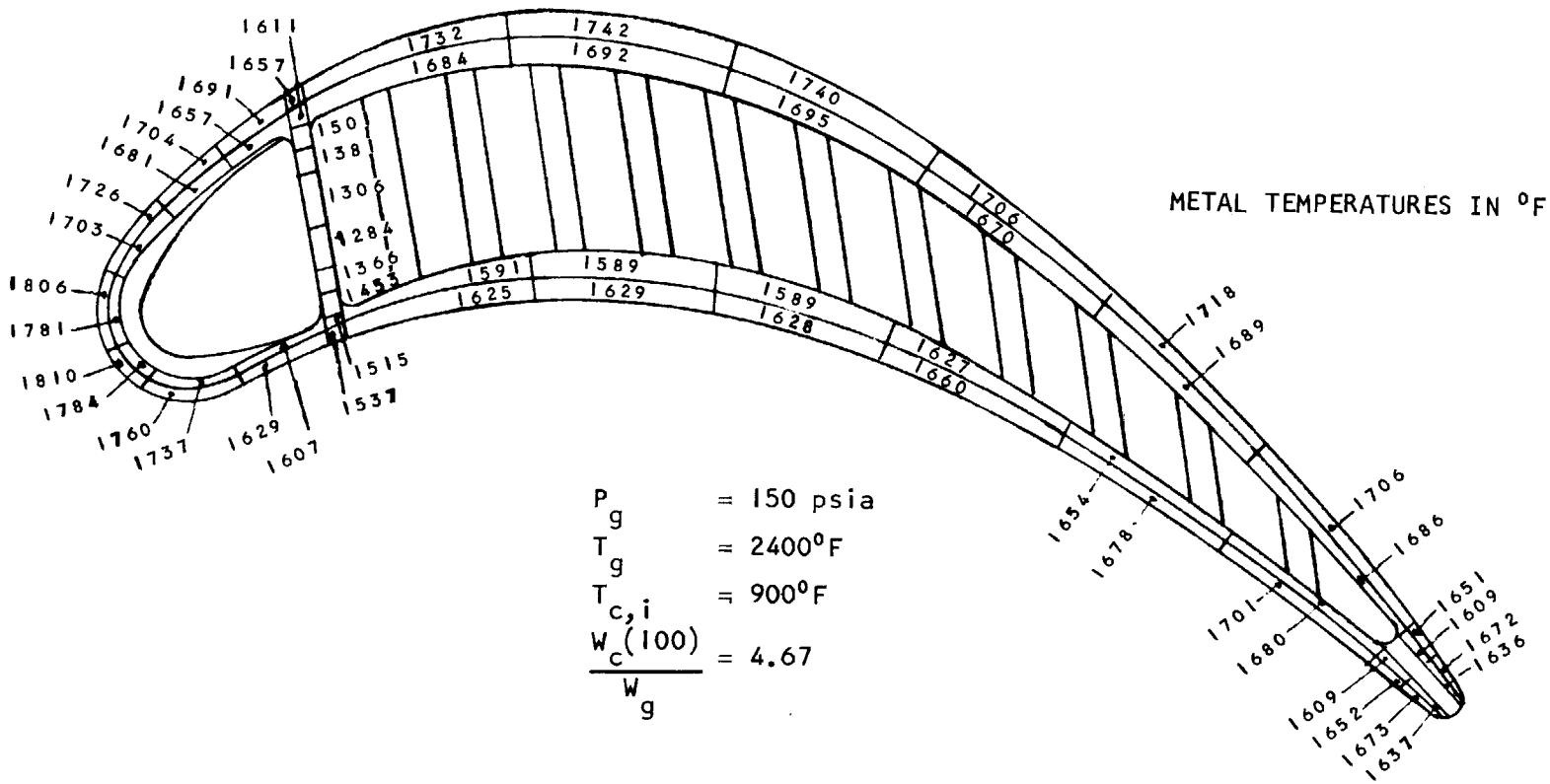


S-70058

Figure J-43. Scheme A-1 Convection Cooled Cast Pin Fin Blade
Hub Section (3% Span)
1.5 Inch Chord

AVERAGE METAL TEMPERATURE

$\overline{T}_M = 1665.1^{\circ}F$



$P_g = 150$ psia

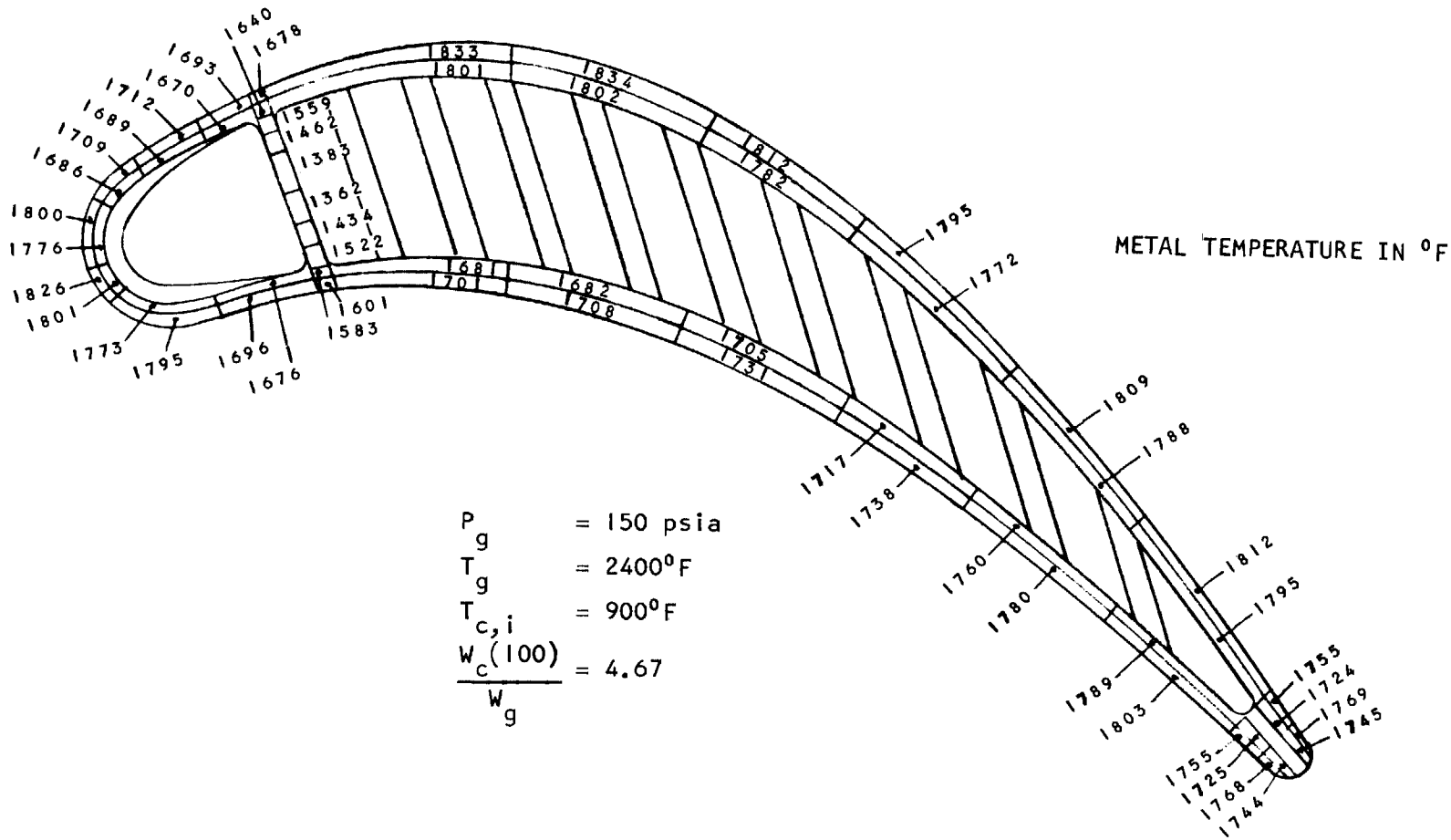
$T_g = 2400^{\circ}F$

$T_{c,i} = 900^{\circ}F$

$\frac{W_c(100)}{W_g} = 4.67$

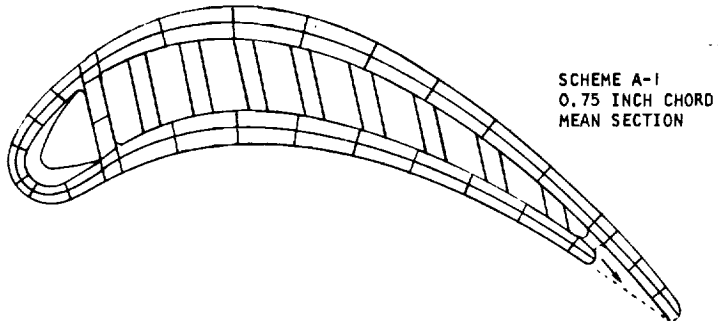
S-70056

Figure J-44. Scheme A-I Convection Cooled Cast Pin Fin Blade
Mean Section (50% Span)
1.5 Inch Chord



S-70057

Figure J-45. Scheme A-I Convection Cooled Cast Pin Fin Blade
Tip Section (75% Span)
1.5 Inch Chord



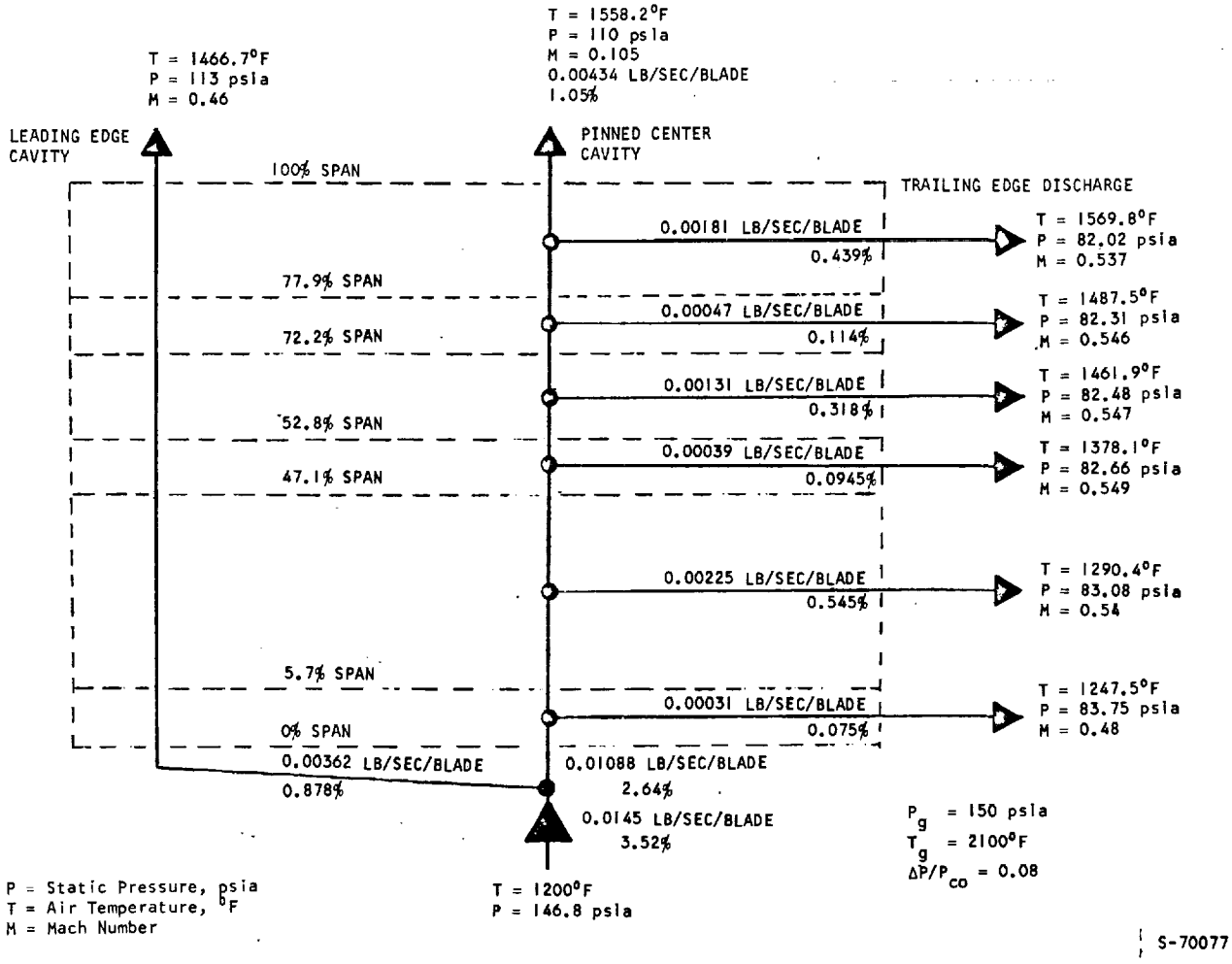
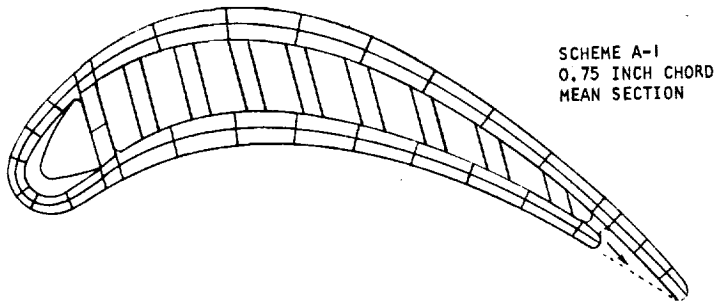


Figure J-46. Scheme A-I Convection Cooled Cast Pin Fin Blade Flow Distribution 0.75 Inch Chord



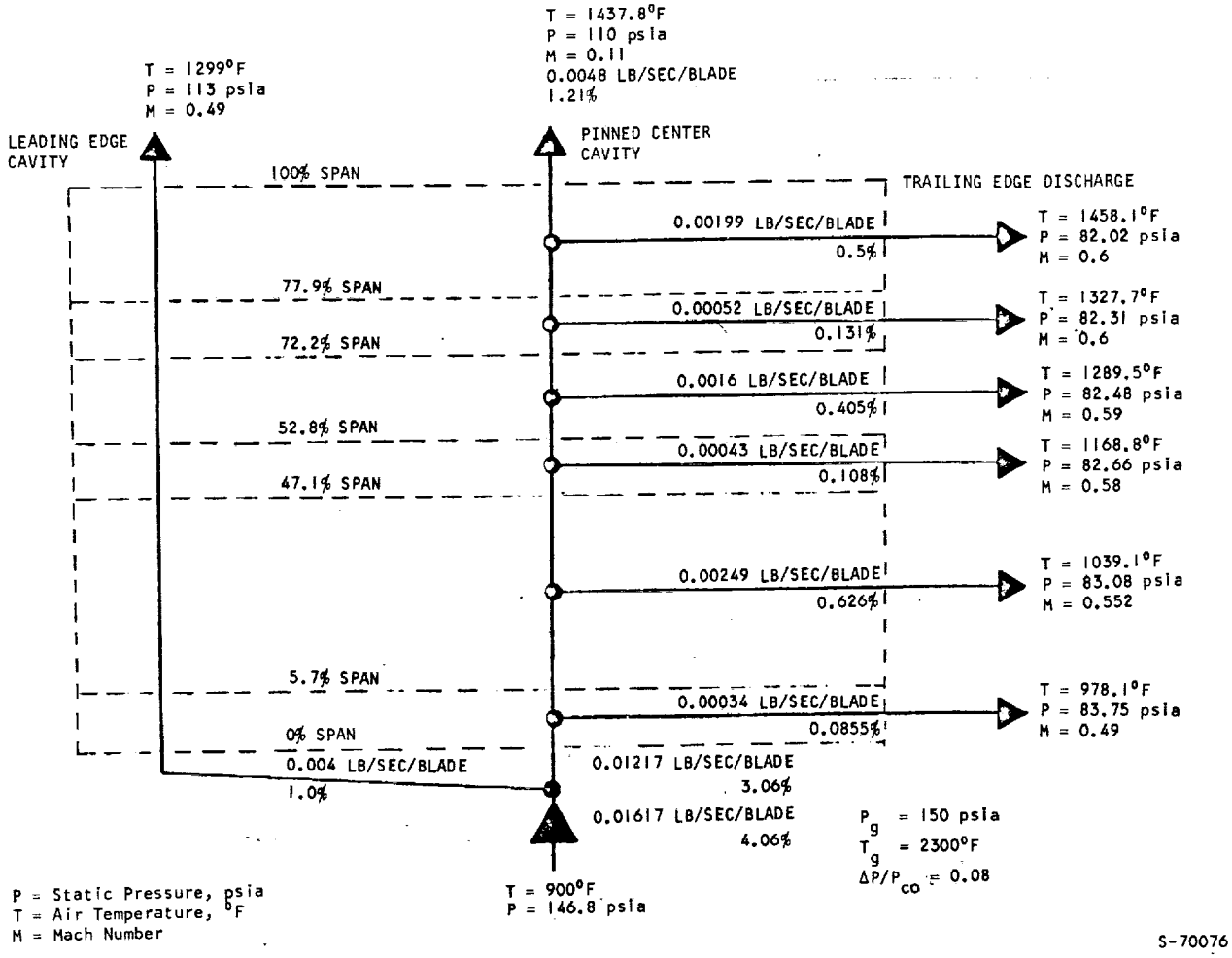
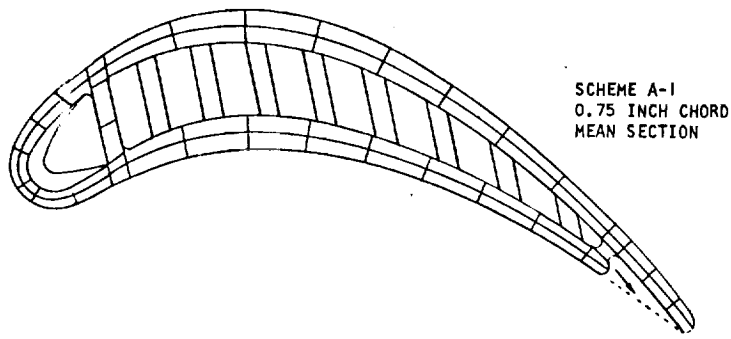


Figure J-47. Scheme A-I Convection Cooled Cast Pin Fin Blade Flow Distribution 0.75 Inch Chord



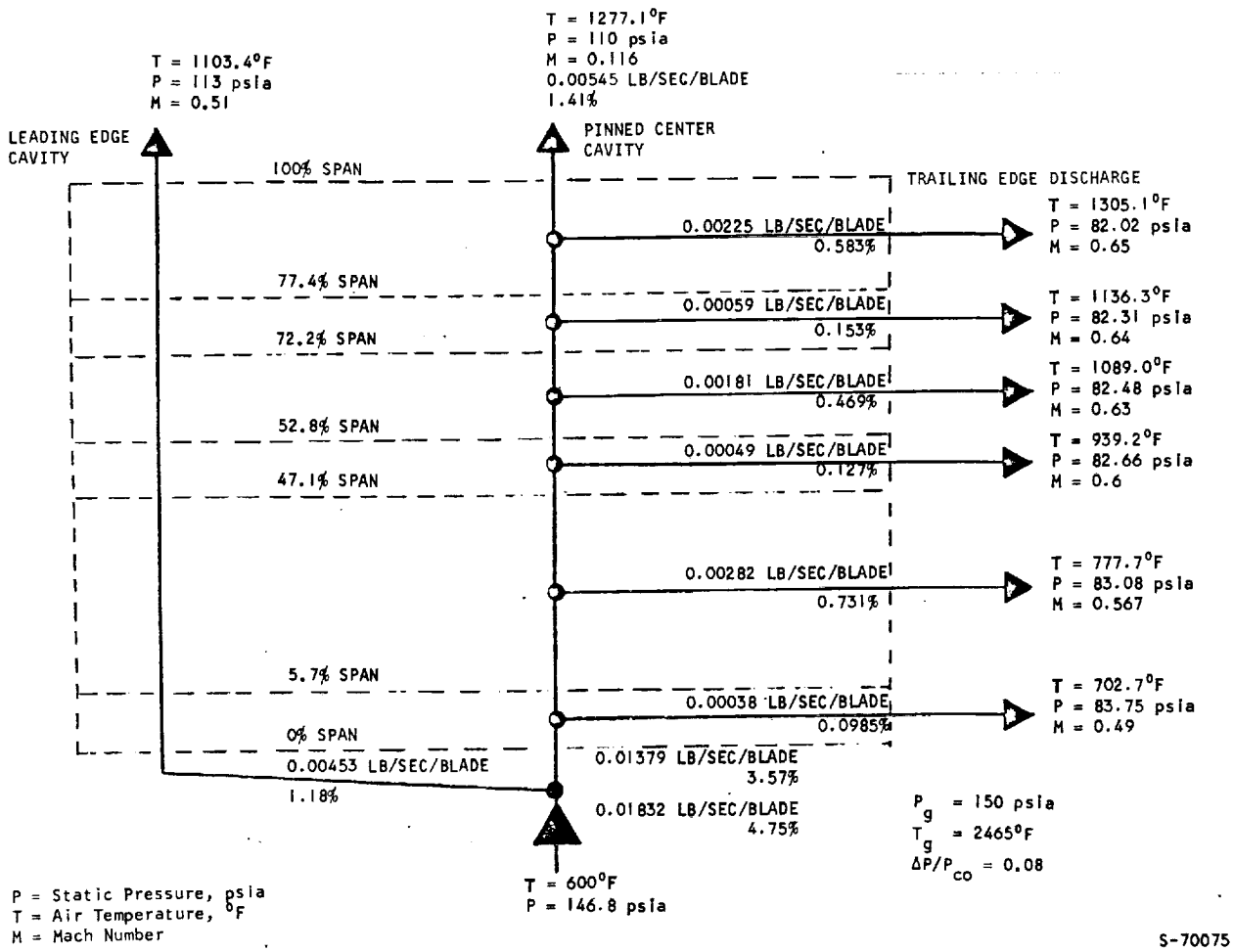


Figure J-48. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 0.75 Inch Chord

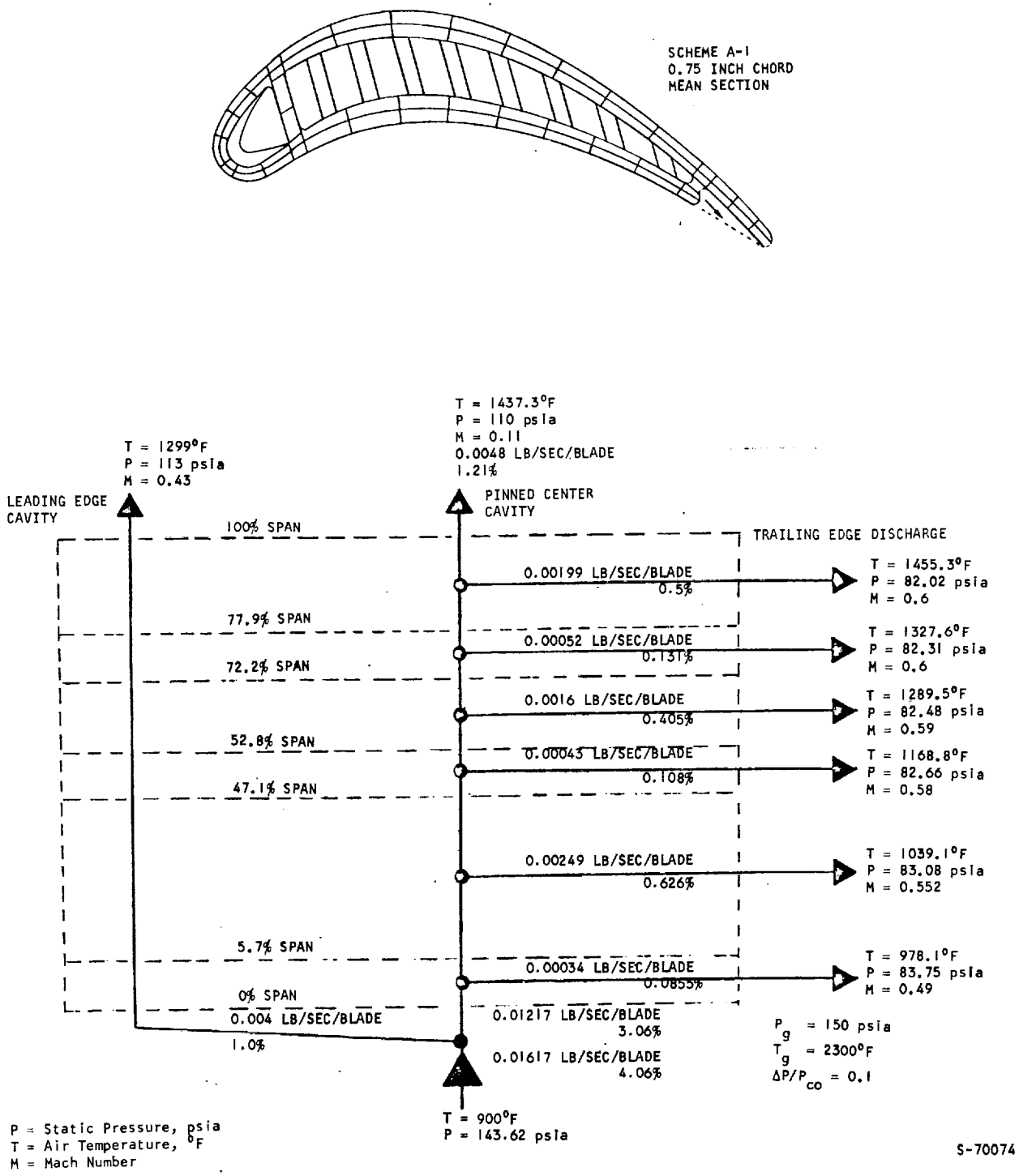


Figure J-49. Scheme A-I Convection Cooled Cast Pin Fin Blade Flow Distribution

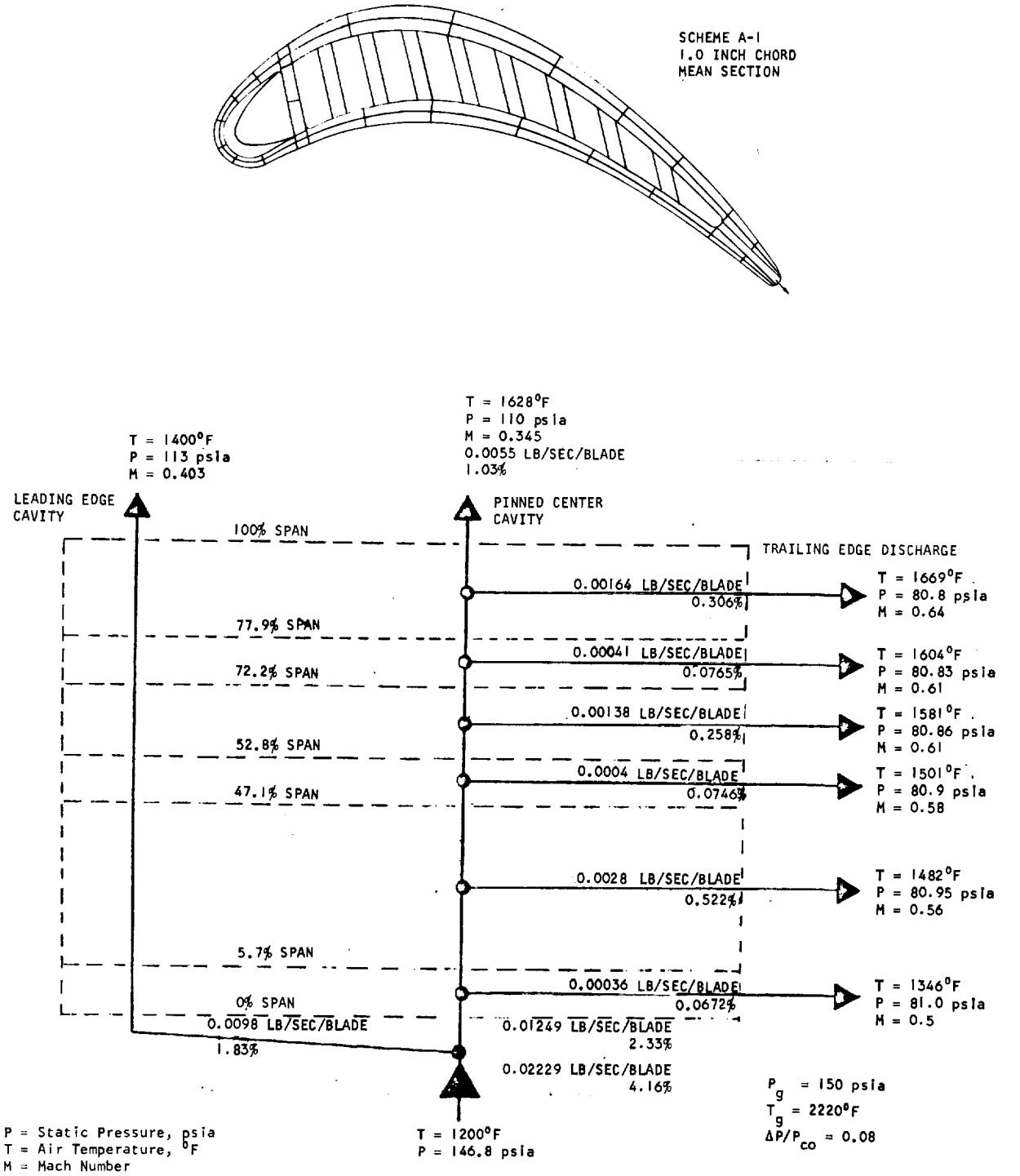


Figure J-50. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 1.0 Inch Chord

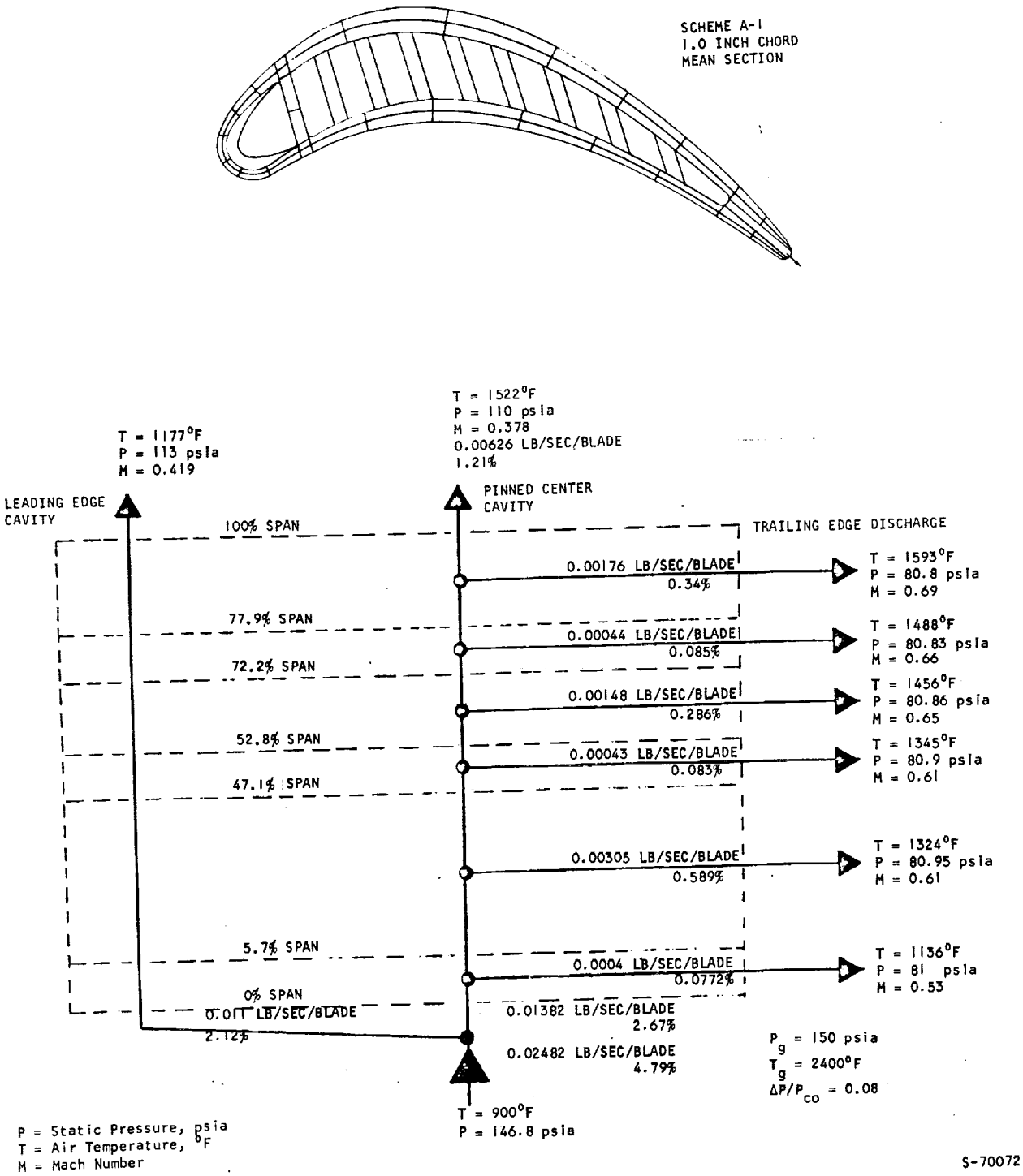


Figure J-51. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 1.0 Inch Chord

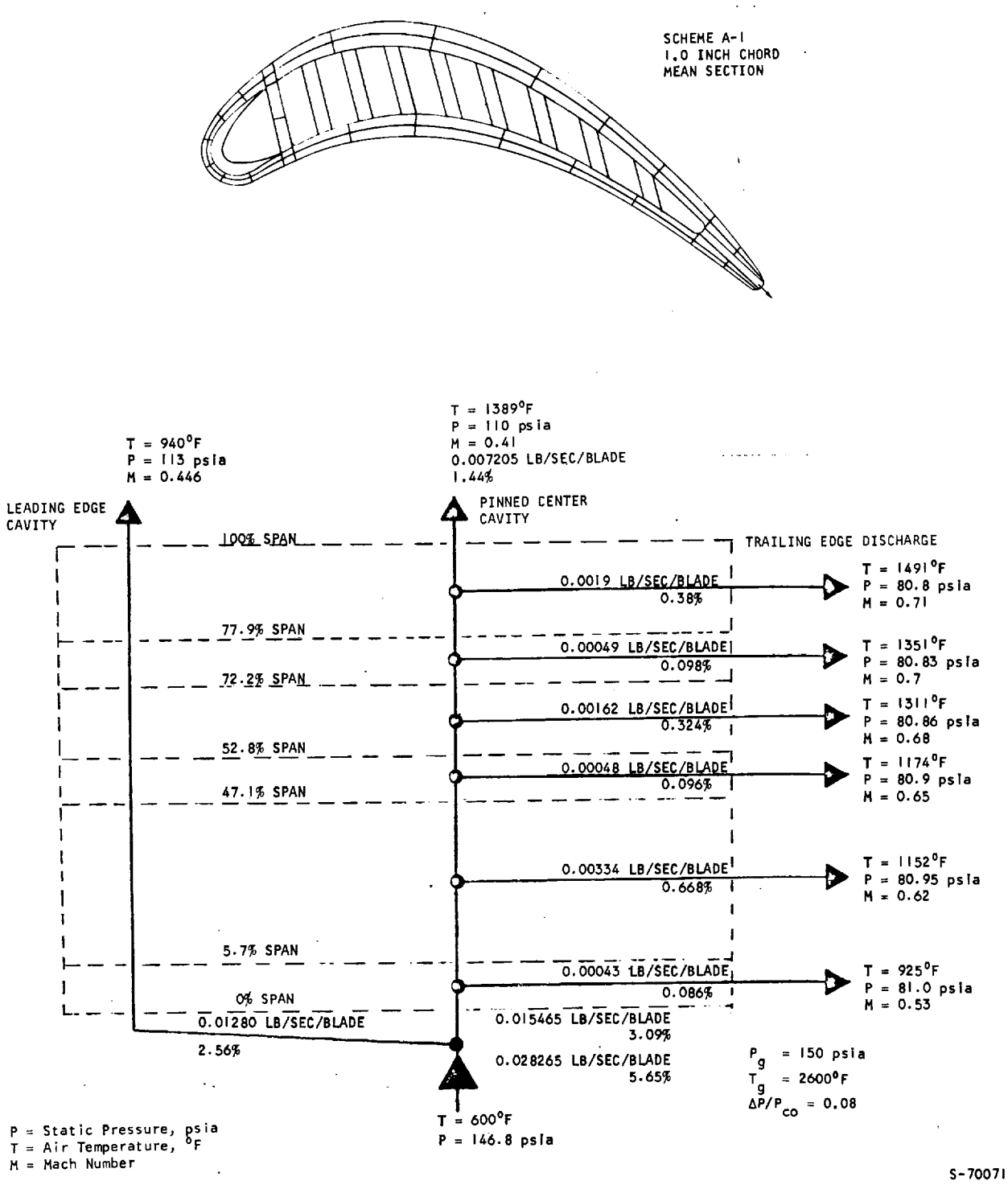


Figure J-52. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 1.0 Inch Chord

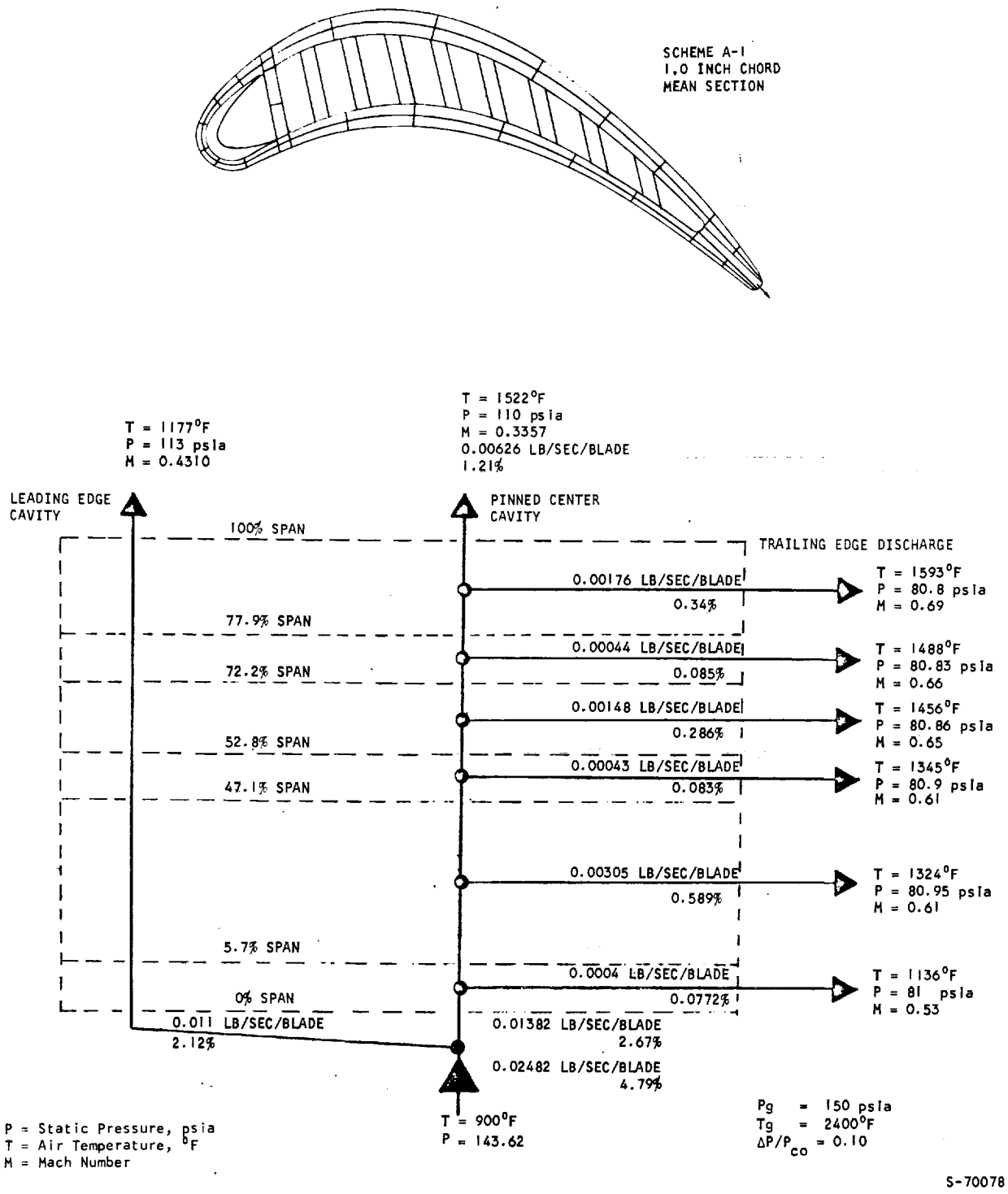


Figure J-53. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 1.0 Inch Chord

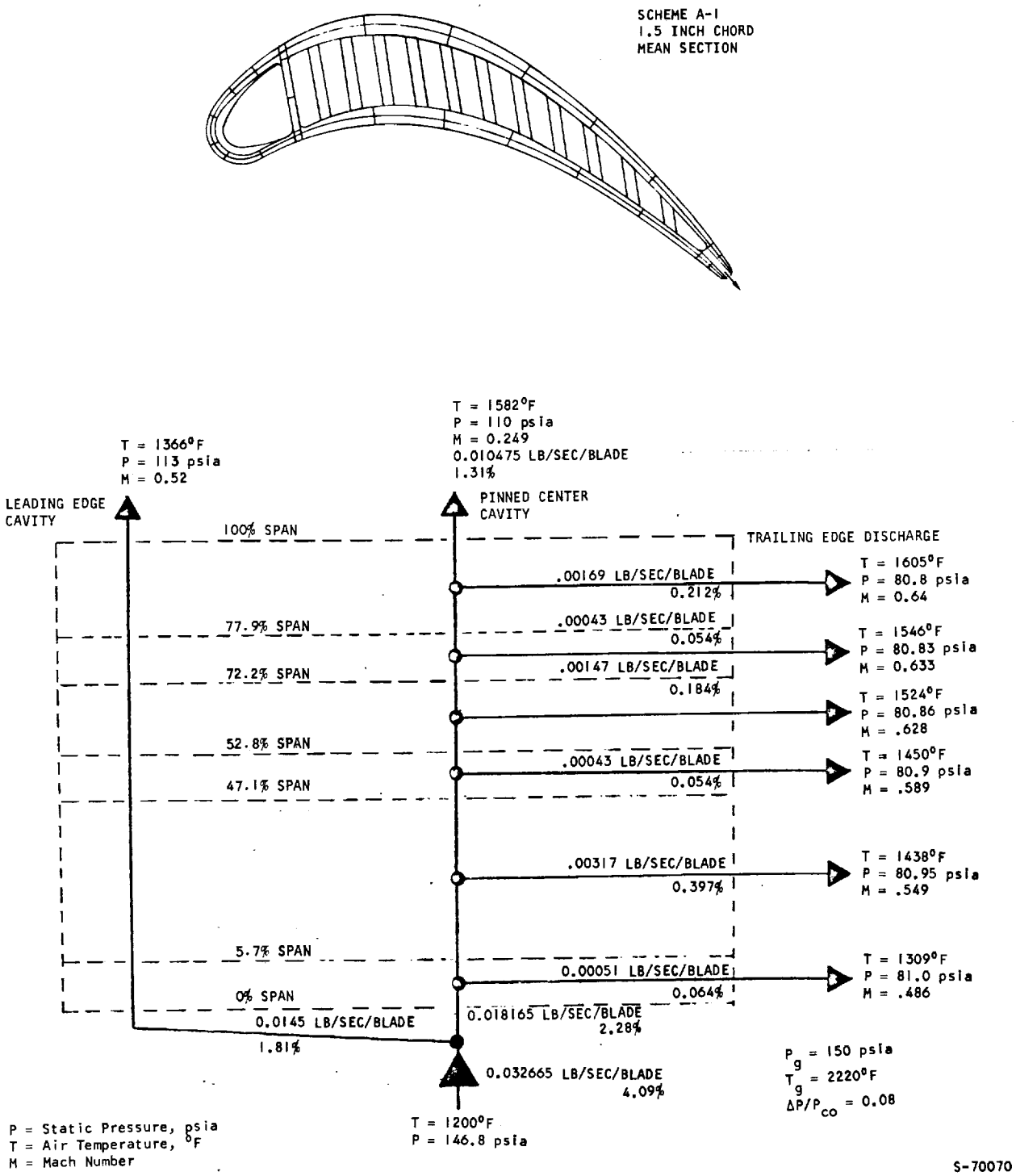
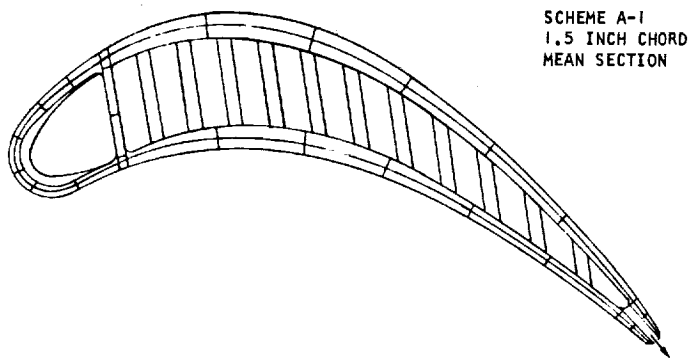


Figure J-54. Scheme A-I Convection Cooled Cast Pin Fin Blade Flow Distribution 1.5 Inch Chord



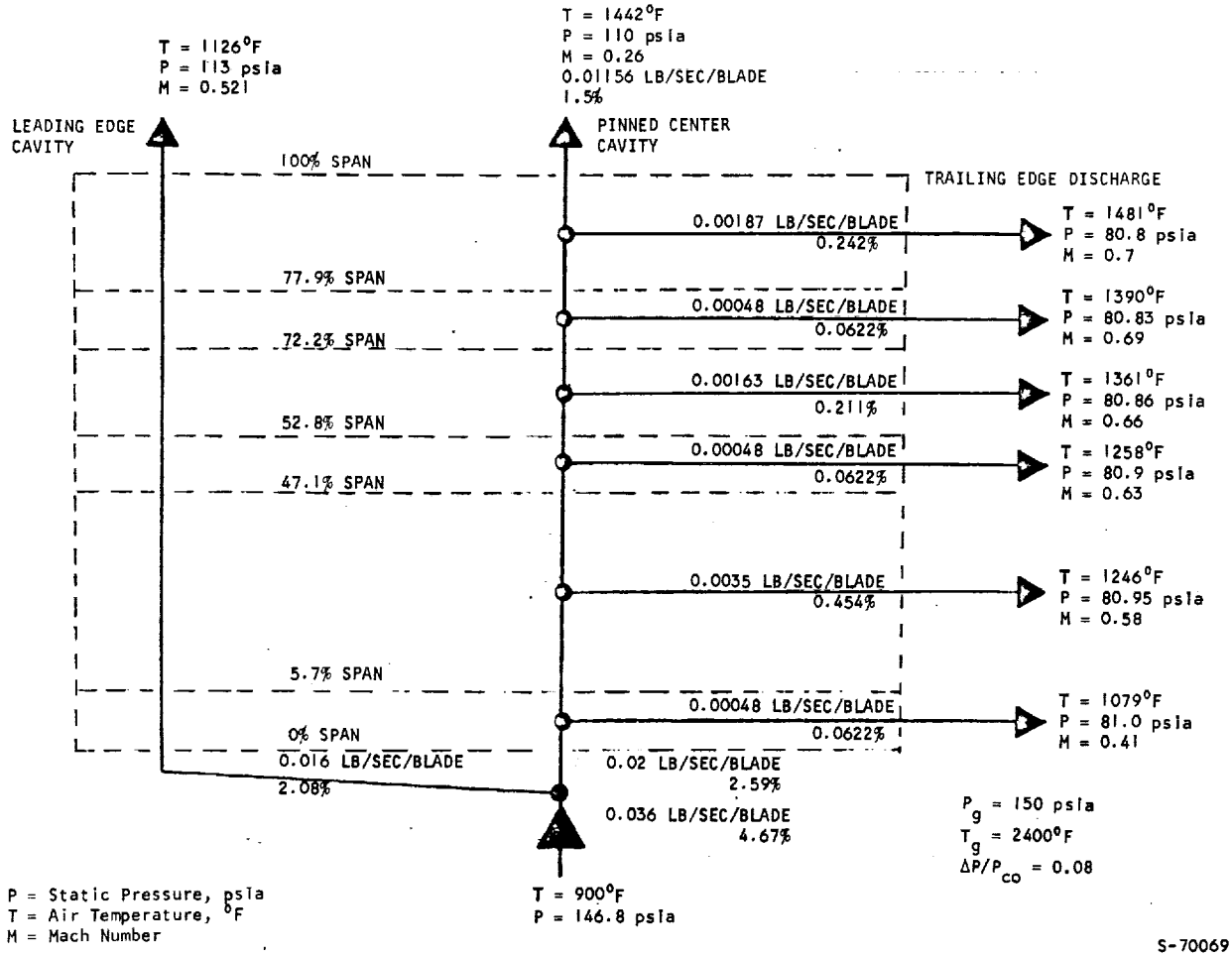


Figure J-55. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 1.5 Inch Chord

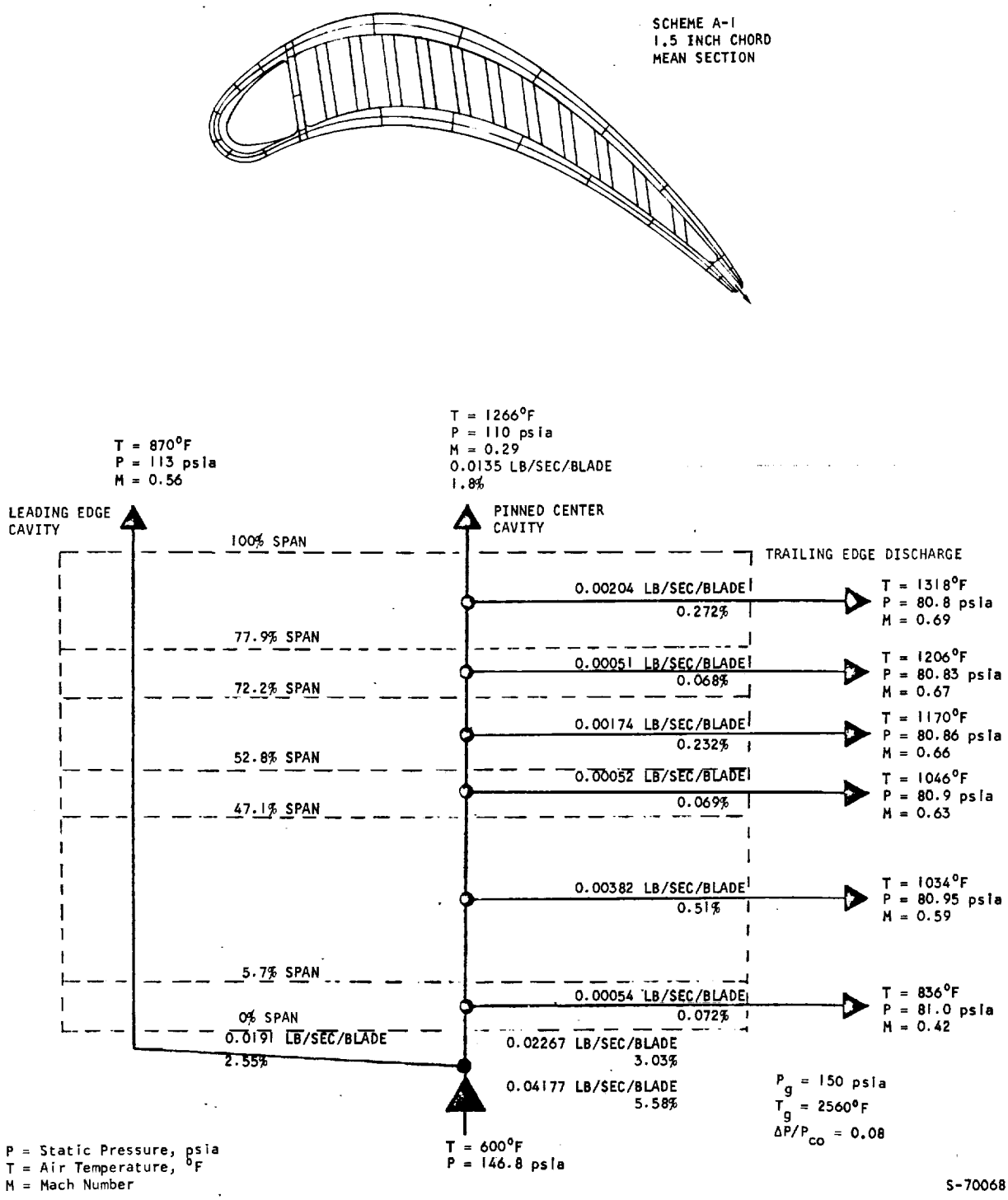


Figure J-56. Scheme A-I Convection Cooled Cast Pin Fin Blade Flow Distribution 1.5 Inch Chord

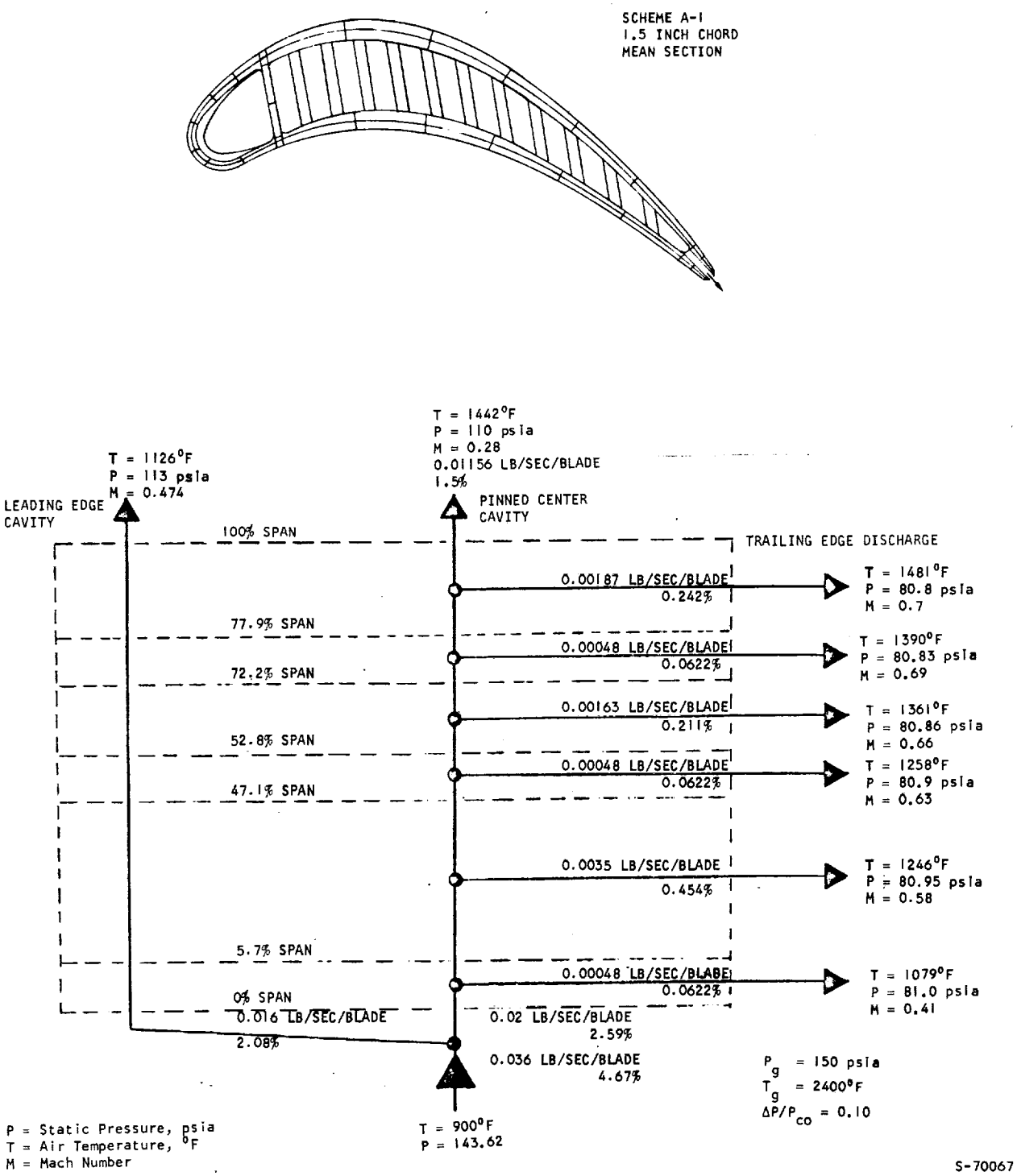


Figure J-57. Scheme A-1 Convection Cooled Cast Pin Fin Blade Flow Distribution 1.5 Inch Chord

APPENDIX K

DETAILED TEMPERATURES, STRESS, AND STRESS TO RUPTURE LIFE FOR EACH ELEMENT AND CREEP STRESS ANALYSIS RESULTS IN THE SCHEME A-1 FINAL DESIGN ANALYSIS

In the Final Design, Task I phase of the study, the convection cooled cast two cavity pin fin blade Scheme A-1 was studied in each of three chord sizes. The cooling configuration was modified as required to obtain the maximum turbine inlet temperature capability for a turbine inlet total pressure of 150 psia (1.034×10^6 Newtons/sq m) and a cooling air inlet temperature of 900°F (755.6°K). Cooling passage dimensions, trailing edge discharge holes, and flow control orifices were finalized to give the proper flow distribution for this condition. Using the Scheme A-1 blade, sized for the design point condition, the turbine inlet temperature capability for two off-design cooling air inlet temperatures and two off-design turbine inlet total pressures, was determined for each chord size.

Using a constant turbine inlet temperature determined for the 0.75 in. (0.01905 m) chord blade with a cooling air inlet temperature of 1200°F (922.2°K) and a turbine inlet total pressure of 150 psia (1.034×10^6 Newtons/sq m), the cooling airflow required as a function of the cooling air inlet temperature was determined for each chord size. These results were obtained by varying flow control orifice sizes only and maintaining a constant cooling passage dimension and trailing edge discharge hole size. Five additional conditions for the 1.0 in. (0.0254 m) chord blade were obtained by varying the trailing edge discharge and flow control orifice sizes to obtain the maximum turbine inlet temperature for three conditions, and to obtain the minimum cooling airflow required for two additional conditions.

A heat transfer analysis was conducted for each of these final design conditions at the hub (5 percent span), mean (50 percent span), and tip (75 percent span) sections of the blade. The analysis was performed using the AiResearch transient and steady state thermal analyzer computer program (H0910) described in Appendix B. The analysis includes the effects of the hot gas relative total temperature with a radial gas temperature correction factor; convection heat transfer from the hot gas to the blade surface; spanwise and chordwise conduction as well as conduction through the wall; internal convection heat transfer from the blade surface to the cooling air; and cooling air heatup due to heat addition and rotational acceleration. The internal convection heat transfer coefficients were calculated using the equations for transverse fins at the leading edge, pin fins in the center cavity, and entrance effects for the trailing edge discharge holes. Film cooling was applied at the trailing edge of the 0.75 in. (0.01905 m) chord design. Each of these techniques is described in the analytical methods section of this report.

The stress analysis was conducted for each element used in the thermal analysis at the hub, mean, and tip sections of the blade. The analysis was performed using the turbine blade elastic, inelastic, and creep stress analysis computer program (X0850) described in Appendix H. The initial stress at each

element of the blade was determined based on an elastic and plastic stress analysis including the effects of centrifugal loads, bending moments due to thermal distortions and local plastic flow of the material. For the blade designs in which the initial stress distribution was critical, a creep relaxation analysis was performed to determine the time to 1 percent creep strain for the critical elements of the blade.

The centrifugal loads for each of the blades include the effects of the dead weight of the fins and the tip cap for the 1.0 in. (0.0254 m) and 1.5 in. (0.0381 m) chord blade. Gas bending loads were neglected because these loads are small and may be cancelled out by tilting the blades. Bending moments due to offsetting the line of action of the centrifugal force as a result of thermal distortion and relaxation of stress due to local instantaneous plastic flow of the material are considered in AiResearch computer program X0850. The creep relaxation analysis was performed according to the strain-hardening procedure described in Appendix H. The life tabulated at each element of the blade was calculated for the initial stress distribution from the minimum design curve of the master stress-rupture curve for IN-100 material. The stress life of each blade is determined by the time required for the critical element of the blade to reach 1 percent creep strain after stress redistribution due to creep. The life of each turbine blade is also limited by a maximum coating temperature limit of 1840°F (1277.8°K) for 1000 hr life.

The metal temperatures, initial stress, and the stress to rupture life based on the initial stress distribution before creep relaxation is given for each element at each condition in the following tables. Half of the conditions are limited by a maximum metal temperature of 1840°F (1277.8°K) for 1000 hr life with IN-100 material. The other conditions were limited by the time to 1 percent creep strain for the critical elements of the blade. Where it was obvious from initial stress distribution analysis, that the condition would be limited by maximum metal temperature, a creep stress analysis was not necessary. The initial stress distribution for conditions in which a creep stress analysis had been performed was used to estimate the time to 1 percent creep strain for other conditions with similar initial stress distribution results. Therefore, a creep stress relaxation analysis was performed for only the most critical stress conditions and the results were used to determine life at other conditions by comparison of initial stress distribution analysis results. The creep strain and the element stress as a function of time are shown in Figures K-1, K-2, K-3, K-5, K-6, K-7, K-10, K-11 and K-12 for the critical elements of the critical stress conditions. The element numbers in each table and figure refer to the numbered locations at the hub, mean, and tip sections of the blade shown in Figures K-4, K-8, K-9, K-13, and K-14 (the foldout pages). The condition numbers referred to in these tables are for identification of the hub, mean, and tip section results of each final design analysis. The conditions of each final design analysis are summarized in Table K-1. The symbol TIT refers to hot gas turbine inlet total temperature, the symbol WCA refers to the total cooling air flow rate for the blade, the symbol TCA refers to the cooling air inlet total temperature at the blade root, and the symbol PTOT refers to the hot gas turbine inlet total pressure. The symbol W_{CLE} refers to the cooling air flow through the leading edge cavity, the symbol W_{CM} refers to the cooling air flow entering the pin passage at the base of the blade, and the symbol W_{CTE} refers to the cooling air

flow discharging from the pin fin passage through the trailing edge holes. The stress levels presented in the tables of this appendix are in psi and the metal temperatures are in ^{0}F.

TABLE K-1

SUMMARY OF FINAL DESIGN ANALYSIS CONDITIONS FOR THE SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE

Condition	Blade Chord	Rotational Speed	Turbine Inlet Temperature	Cooling Air Inlet Temperature	Turbine Inlet Total Pressure PTOT		Cooling Air Flow Distribution lbs/sec./blade (percent of hot gas flow)				Table Numbers for Metal Temperature and Stress Analysis Results		
							Leading Edge	Middle Cavity	Trailing Edge	Blade Total	Hub Section	Mean Section	Tip Section
No.	in. (m)	rpm	TIT °F (°K)	TCA °F (°K)	psia	$\left(\frac{\text{Newtons}}{\text{sq m}}\right)$	W_{CLE}	W_{CM}	W_{CTE}	WCA			
1	0.75(0.01905)	21934	2100(1422)	1200(922)	150	(1.0342×10^6)	0.00362(0.878%)	0.01088(2.64%)	0.00654(1.59%)	0.0145(3.52%)	K-2	K-3	K-4
2	0.75(0.01905)	22774	2300(1533)	900(755)	150	(1.0342×10^6)	0.004(1.0%)	0.01217(3.0%)	0.00737(1.84%)	0.01617(4.05%)	K-5	K-6	K-7
3	0.75(0.01905)	23445	2465(1625)	600(589)	150	(1.0342×10^6)	0.00453(1.173%)	0.01379(3.572%)	0.00834(2.16%)	0.01832(4.745%)	K-8	K-9	K-10
4	0.75(0.01905)	22774	2300(1533)	900(755)	450	(3.103×10^6)	0.012(1.0%)	0.03652(3.07%)	0.02212(1.85%)	0.04852(4.07%)	K-11	K-12	K-13
5	0.75(0.01905)	22567	2250(1506)	900(755)	50	(0.3447×10^6)	0.001333(1.0%)	0.00406(3.03%)	0.00244(1.82%)	0.005393(4.03%)	K-14	K-15	K-16
1A	0.75(0.01905)	21934	2100(1422)	1200(922)	150	(1.0342×10^6)	0.00362(0.878%)	0.01088(2.64%)	0.00654(1.59%)	0.0145(3.52%)	K-2	K-3	K-4
2A	0.75(0.01905)	21934	2100(1422)	900(755)	150	(1.0342×10^6)	0.00177(0.429%)	0.00724(1.757%)	0.00624(1.514%)	0.00901(2.19%)	K-17	K-18	K-19
3A	0.75(0.01905)	21934	2100(1422)	600(589)	150	(1.0342×10^6)	0.00129(0.313%)	0.00665(1.613%)	0.00615(1.492%)	0.00794(1.926%)	K-20	K-21	K-22
1	1.0(0.0254)	22350	2220(1489)	1200(922)	150	(1.0342×10^6)	0.0098(1.83%)	0.01249(2.33%)	0.00699(1.306%)	0.02229(4.163%)	K-23	K-24	K-25
2	1.0(0.0254)	23183	2400(1589)	900(755)	150	(1.0342×10^6)	0.011(2.12%)	0.01382(2.67%)	0.00756(1.46%)	0.02482(4.79%)	K-26	K-27	K-28
3	1.0(0.0254)	23800	2600(1700)	600(589)	150	(1.0342×10^6)	0.0128(2.56%)	0.015465(3.09%)	0.008255(1.65%)	0.028265(5.65%)	K-29	K-30	K-31
4	1.0(0.0254)	22774	2300(1533)	900(755)	450	(3.103×10^6)	0.0337(2.128%)	0.0424(2.677%)	0.02362(1.4%)	0.0761(4.805%)	K-32	K-33	K-34
5	1.0(0.0254)	22860	2320(1544)	900(755)	50	(0.344×10^6)	0.0036(2.05%)	0.00436(2.49%)	0.00224(1.277%)	0.00796(4.54%)	K-35	K-36	K-37
1A	1.0(0.0254)	21934	2100(1422)	1200(922)	150	(1.0342×10^6)	0.005(0.914%)	0.0086(1.571%)	0.00474(0.866%)	0.0136(2.485%)	K-38	K-39	K-40
2A	1.0(0.0254)	21934	2100(1422)	900(759)	150	(1.0342×10^6)	0.00266(0.486%)	0.006825(1.247%)	0.00462(0.844%)	0.009485(1.733%)	K-41	K-42	K-43
3A	1.0(0.0254)	21934	2100(1422)	600(589)	150	(1.0342×10^6)	0.002(0.365%)	0.00599(1.095%)	0.00439(0.802%)	0.00799(1.46%)	K-44	K-45	K-46
1B	1.0(0.0254)	22774	2300(1533)	1200(922)	150	(1.0342×10^6)	0.00956(1.81%)	0.01631(3.09%)	0.00911(1.72%)	0.02587(4.9%)	K-47	K-48	K-49
2B	1.0(0.0254)	23183	2400(1589)	900(755)	450	(3.103×10^6)	0.027(1.73%)	0.05604(3.6%)	0.02784(1.79%)	0.08304(5.33%)	K-50	K-51	K-52
3B	1.0(0.0254)	24369	2700(1756)	600(589)	150	(1.0342×10^6)	0.0117(2.38%)	0.01786(3.63%)	0.00937(1.9%)	0.02956(6.01%)	K-53	K-54	K-55
1C	1.0(0.0254)	21934	2100(1422)	1200(922)	150	(1.0342×10^6)	0.004(0.731%)	0.0086(1.571%)	0.00474(0.806%)	0.0126(2.302%)	K-56	K-57	K-58
2C	1.0(0.0254)	21934	2100(1422)	600(589)	150	(1.0342×10^6)	0.00166(0.304%)	0.004275(0.782%)	0.00312(0.57%)	0.005935(1.086%)	K-59	K-60	K-61
1	1.5(0.0381)	22350	2200(1478)	1200(922)	150	(1.0342×10^6)	0.0145(1.818%)	0.018115(2.272%)	0.00767(0.962%)	0.032615(4.09%)	K-62	K-63	K-64
2	1.5(0.0381)	23183	2400(1589)	900(755)	150	(1.0342×10^6)	0.016(2.075%)	0.02(2.595%)	0.008449(1.096%)	0.036(4.67%)	K-65	K-66	K-67
3	1.5(0.0381)	23800	2560(1678)	600(589)	150	(1.0342×10^6)	0.0191(2.55%)	0.02267(3.03%)	0.00918(1.226%)	0.04177(5.58%)	K-68	K-69	K-70
4	1.5(0.0381)	22700	2290(1528)	900(755)	450	(3.103×10^6)	0.05(2.108%)	0.06149(2.592%)	0.02589(1.091%)	0.11149(4.7%)	K-71	K-72	K-73
5	1.5(0.0381)	22900	2340(1556)	900(755)	50	(0.3447×10^6)	0.00533(2.05%)	0.00639(2.46%)	0.00281(1.08%)	0.01172(4.51)	K-74	K-75	K-76
1A	1.5(0.0381)	21934	2100(1422)	1200(922)	150	(1.0342×10^6)	0.00309(0.379%)	0.00837(1.028%)	0.00636(0.781%)	0.01146(1.407%)	K-77	K-78	K-79
2A	1.5(0.0381)	21934	2100(1422)	900(755)	150	(1.0342×10^6)	0.00178(0.219%)	0.007765(0.953%)	0.00636(0.781%)	0.009545(1.172%)	K-80	K-81	K-82
3A	1.5(0.0381)	21934	2100(1422)	600(589)	150	(1.0342×10^6)	0.0013(0.16%)	0.007335(0.9%)	0.00634(0.77%)	0.008635(1.06%)	K-83	K-84	K-85

TABLE K-2

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F,
WCA = 0.0145 LB/SEC/BLADE (3.52% OF HOT GAS FLOW),
TCA = 1200°F, PTOT = 150 PSIA, CONDITION I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1628.0	102.4	10 YRS PLUS
2	1607.0	7307.2	10 YRS PLUS
3	1610.0	5764.7	10 YRS PLUS
4	1589.0	12561.5	10 YRS PLUS
5	1556.0	22110.6	49465.9500
6	1536.0	28170.4	22414.3820
7	1546.0	26302.1	25734.3200
8	1524.0	33081.9	10368.8610
9	1574.0	21041.0	37860.0540
10	1556.0	26907.0	17021.3200
11	1575.0	23691.4	20534.0880
12	1555.0	30505.9	7856.2015
13	1575.0	26038.6	12242.2041
14	1554.0	33471.0	4172.2777
15	1574.0	27888.9	8366.6822
16	1551.0	36196.8	2464.0917
17	1571.0	29843.5	5894.9468
18	1550.0	37340.4	1961.0872
19	1568.0	30986.1	4965.0353
20	1551.0	37112.6	2008.9933
21	1565.0	31513.0	4790.2365
22	1552.0	36171.2	2412.7420
23	1553.0	33736.7	4040.2444
24	1535.0	39385.4	1853.6044
25	1514.0	43342.6	1619.5005
26	1500.0	47681.2	1132.9137
27	1624.0	2625.3	10 YRS PLUS
28	1604.0	9175.1	10 YRS PLUS
29	1583.0	17827.9	10 YRS PLUS
30	1564.0	22810.9	33831.9760
31	1559.0	27014.5	15297.7562
32	1542.0	31452.0	9085.5274
33	1562.0	29315.4	8455.5230
34	1541.0	34308.7	4923.8584
35	1556.0	33423.8	3994.8324
36	1532.0	38650.2	2371.0039
37	1588.0	27506.8	6242.4015
38	1569.0	31465.7	4347.3069
39	1618.0	22594.9	8168.4092
40	1597.0	27478.0	4942.7268
41	1629.0	22197.1	6657.3231
42	1605.0	27756.2	3766.5328
43	1627.0	23614.4	5174.6841
44	1603.0	29173.1	2917.7707
45	1622.0	24553.4	4819.5396
46	1601.0	29416.3	2916.3311
47	1614.0	25380.0	4974.4646
48	1597.0	29228.6	3374.7149
49	1603.0	26403.1	5327.4725
50	1589.0	29244.1	4155.5519
51	1584.0	28913.0	5104.4239
52	1574.0	30881.2	4325.7999
53	1548.0	36447.9	2524.9507
54	1528.0	41202.3	1592.3797
55	1603.0	20083.5	23651.9530
56	1595.0	21654.9	18571.2550
57	1636.0	8115.5	10 YRS PLUS
58	1629.0	9614.5	10 YRS PLUS
59	1641.0	4972.8	10 YRS PLUS
60	1634.0	6467.8	10 YRS PLUS
61	1411.0	65040.4	602.2976
62	1413.0	63248.3	800.4903

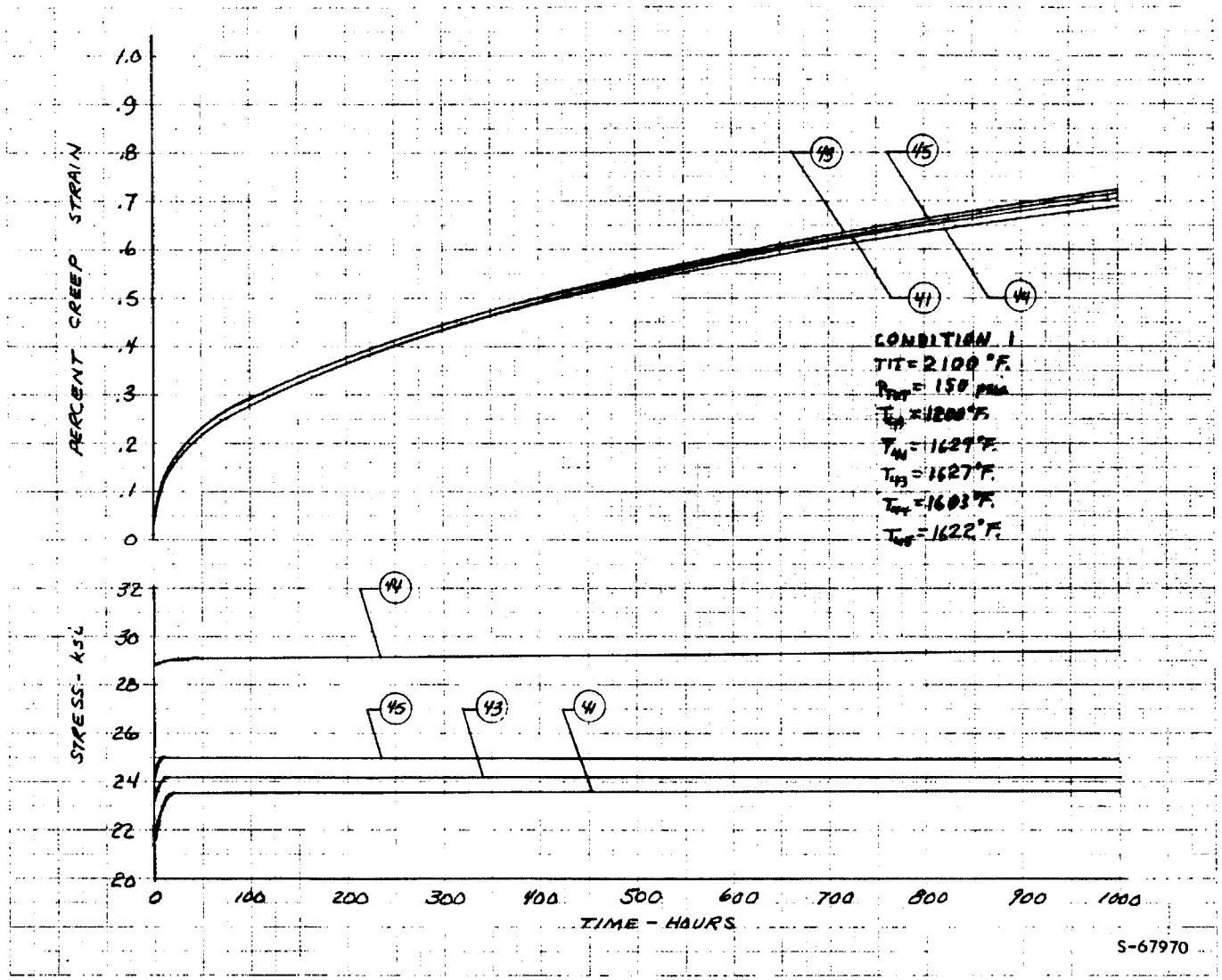


FIGURE K-1. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 0.75 INCH CHORD, CONDITION 1.

TABLE K-3

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 IN. CHORD, MEAN SECTION, CONDITION I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1726.0	-17942.9	2018.7755
2	1705.0	-13577.0	14270.6095
3	1707.0	-12054.9	22349.1010
4	1688.0	-6662.2	10 YRS PLUS
5	1626.0	12086.1	10 YRS PLUS
6	1610.0	16781.9	60874.5780
7	1582.0	24588.5	13918.0233
8	1564.0	29053.8	8485.4461
9	1567.0	27965.4	9949.8449
10	1544.0	33687.1	5214.8263
11	1553.0	31065.6	7324.9389
12	1530.0	36692.0	3890.8561
13	1549.0	31912.3	6764.7335
14	1526.0	37475.2	3637.1317
15	1548.0	32378.3	6265.0610
16	1528.0	37213.3	3653.5136
17	1554.0	31224.0	6880.7906
18	1536.0	35581.8	4240.8329
19	1562.0	29776.7	7633.4429
20	1544.0	34196.3	4653.3155
21	1572.0	27950.5	8713.5532
22	1556.0	31924.0	5576.7389
23	1575.0	28139.3	7706.1796
24	1559.0	32137.8	4903.0884
25	1581.0	27224.2	8015.4260
26	1567.0	30842.7	5264.9329
27	1726.0	-18799.6	1527.3875
28	1706.0	-12974.0	16957.1070
29	1679.0	-6473.6	10 YRS PLUS
30	1663.0	-1059.5	10 YRS PLUS
31	1660.0	-1315.4	10 YRS PLUS
32	1643.0	4168.9	10 YRS PLUS
33	1646.0	2114.9	10 YRS PLUS
34	1630.0	7334.9	10 YRS PLUS
35	1613.0	11597.8	10 YRS PLUS
36	1591.0	18481.7	57262.6060
37	1616.0	8744.9	10 YRS PLUS
38	1592.0	16515.8	10 YRS PLUS
39	1620.0	7443.1	10 YRS PLUS
40	1590.0	16893.5	10 YRS PLUS
41	1620.0	7443.1	10 YRS PLUS
42	1591.0	16622.1	10 YRS PLUS
43	1614.0	9856.6	10 YRS PLUS
44	1586.0	18506.4	65259.2280
45	1605.0	13690.0	10 YRS PLUS
46	1581.0	20895.6	32628.6140
47	1597.0	17407.0	70329.3640
48	1576.0	23531.6	20692.5620
49	1600.0	18176.5	49601.1000
50	1584.0	22842.5	19332.8490
51	1606.0	18039.0	44091.1790
52	1589.0	23207.4	15572.4454
53	1628.0	12342.1	10 YRS PLUS
54	1613.0	17233.1	48004.9040
55	1682.0	-3597.5	10 YRS PLUS
56	1673.0	-607.4	10 YRS PLUS
57	1725.0	-15599.1	4439.2514
58	1717.0	-12985.1	12745.2554
59	1745.0	-20432.8	569.1723
60	1738.0	-18187.1	1391.5884
61	1490.0	46593.2	1791.9502
62	1484.0	49643.7	1251.8816

TABLE K-4

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 IN. CHORD, TIP SECTION, CONDITION I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1823.0	-26693.7	26.0222
2	1790.0	-27481.4	45.8416
3	1790.0	-27191.0	48.5726
4	1760.0	-26490.3	109.8788
5	1632.0	11695.7	10 YRS PLUS
6	1610.0	18359.9	35383.5480
7	1578.0	28448.9	6638.9138
8	1560.0	33092.3	3861.1750
9	1581.0	28423.0	6159.5545
10	1559.0	34168.3	3123.3439
11	1578.0	30746.6	4004.4717
12	1556.0	36483.1	2022.9436
13	1579.0	32033.5	2938.0168
14	1554.0	38718.5	1297.1291
15	1589.0	31040.2	2804.9652
16	1566.0	37192.1	1326.7967
17	1608.0	27296.3	3846.3254
18	1584.0	34150.1	1618.0546
19	1618.0	25917.6	3987.9940
20	1596.0	32719.3	1618.3025
21	1646.0	18918.6	11147.2623
22	1627.0	24894.5	3930.4204
23	1661.0	16019.7	19932.6600
24	1642.0	22037.8	4906.0041
25	1698.0	5756.5	10 YRS PLUS
26	1683.0	10483.3	70572.8350
27	1812.0	-27145.7	30.2195
28	1781.0	-27386.3	57.0843
29	1747.0	-25622.6	176.7275
30	1723.0	-17591.2	2437.2773
31	1710.0	-14614.5	8933.4613
32	1684.0	-6664.5	10 YRS PLUS
33	1682.0	-5843.4	10 YRS PLUS
34	1656.0	2283.3	10 YRS PLUS
35	1654.0	3081.6	10 YRS PLUS
36	1628.0	11390.1	10 YRS PLUS
37	1699.0	-9791.2	63454.3420
38	1669.0	-434.6	10 YRS PLUS
39	1704.0	-9621.8	63213.6400
40	1673.0	7.9	10 YRS PLUS
41	1693.0	-4197.2	10 YRS PLUS
42	1659.0	6339.2	10 YRS PLUS
43	1681.0	1841.3	10 YRS PLUS
44	1647.0	12389.9	10 YRS PLUS
45	1672.0	6792.0	10 YRS PLUS
46	1644.0	15504.3	37292.1240
47	1671.0	9057.6	10 YRS PLUS
48	1643.0	17760.0	17855.3380
49	1687.0	6109.4	10 YRS PLUS
50	1664.0	13179.3	47706.1440
51	1699.0	4418.0	10 YRS PLUS
52	1679.0	10533.2	77247.1930
53	1747.0	-8634.0	43239.8120
54	1732.0	-4317.6	10 YRS PLUS
55	1799.0	-21230.1	129.9715
56	1787.0	-19319.6	304.1211
57	1837.0	-21796.6	50.1174
58	1827.0	-21838.9	61.8405
59	1855.0	-21074.1	39.0878
60	1846.0	-21388.7	44.6417
61	1480.0	53079.4	773.3833
62	1468.0	57016.9	542.9026

TABLE K-5

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, HUB SECTION, 22671 RPM, TIT = 2300°F,
WCA = 0.01617 LB/SEC/BLADE (4.05% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 150 PSIA, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1642.0	-17994.3	16937.1590
2	1603.0	-5052.8	10 YRS PLUS
3	1611.0	-8502.0	10 YRS PLUS
4	1573.0	3270.1	10 YRS PLUS
5	1514.0	19992.7	10 YRS PLUS
6	1477.0	30881.3	66022.7370
7	1496.0	27094.3	10 YRS PLUS
8	1456.0	39040.0	18301.9420
9	1542.0	18373.8	10 YRS PLUS
10	1510.0	28517.4	43411.7290
11	1541.0	23119.9	60422.8990
12	1505.0	34983.1	11468.9921
13	1541.0	26686.2	27172.4160
14	1500.0	40430.2	3896.0353
15	1537.0	30118.0	14073.8496
16	1495.0	44641.1	2180.9175
17	1532.0	33112.8	8246.4017
18	1493.0	46397.3	1706.6842
19	1527.0	34834.6	6422.3492
20	1494.0	46055.3	1760.5113
21	1523.0	35307.0	6446.5249
22	1498.0	43783.0	2325.0226
23	1503.0	38890.9	4970.2004
24	1469.0	49165.8	2056.3238
25	1432.0	56158.2	1710.4904
26	1404.0	63477.8	988.3618
27	1634.0	-13519.5	10 YRS PLUS
28	1598.0	-2081.1	10 YRS PLUS
29	1560.0	12600.0	10 YRS PLUS
30	1528.0	20906.7	10 YRS PLUS
31	1519.0	27806.8	39398.8040
32	1487.0	36066.0	14915.8444
33	1523.0	31599.8	14906.7751
34	1487.0	40111.3	5914.0061
35	1512.0	38413.5	4318.8522
36	1470.0	47598.9	2622.6164
37	1566.0	28179.7	9751.3590
38	1531.0	35696.5	4737.7031
39	1616.0	20122.1	16424.4930
40	1578.0	28588.0	6438.7687
41	1632.0	19744.5	12191.8352
42	1588.0	29917.6	3682.3326
43	1628.0	22056.1	7044.6920
44	1584.0	32073.6	2551.7251
45	1620.0	23396.8	6517.2511
46	1582.0	31839.5	2831.9431
47	1605.0	25288.5	6436.5170
48	1574.0	31772.2	3554.3620
49	1586.0	26670.0	7911.4838
50	1563.0	31189.3	5431.6337
51	1555.0	30531.0	7812.3420
52	1536.0	34479.5	5432.3494
53	1493.0	43551.4	2776.1706
54	1456.0	52360.6	1696.2814
55	1593.0	14531.6	10 YRS PLUS
56	1579.0	17193.6	10 YRS PLUS
57	1650.0	-5467.6	10 YRS PLUS
58	1638.0	-2840.7	10 YRS PLUS
59	1659.0	-10735.2	10 YRS PLUS
60	1645.0	-7531.2	10 YRS PLUS
61	1249.0	85223.6	1294.4523
62	1253.0	82988.8	1824.1376

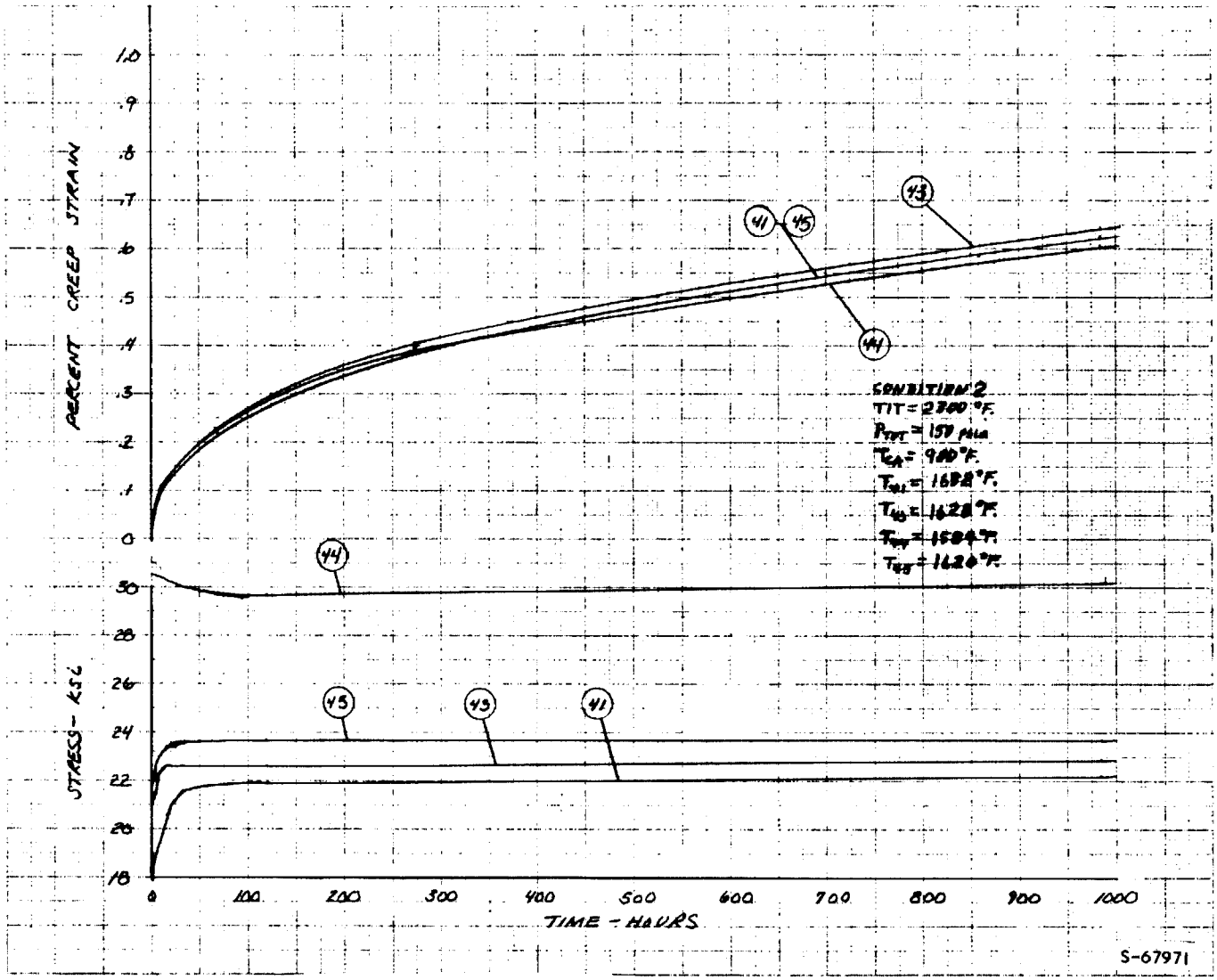


FIGURE K-2. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 0.75 INCH CHORD, CONDITION 2.

TABLE K-6

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1737.0	-32039.3	60.2292
2	1702.0	-30458.0	188.2914
3	1708.0	-29720.5	190.2938
4	1675.0	-20459.1	3144.1949
5	1575.0	8618.3	10 YRS PLUS
6	1549.0	15274.1	10 YRS PLUS
7	1505.0	26798.6	74239.0840
8	1473.0	34787.5	30027.9520
9	1481.0	32378.8	41524.6640
10	1441.0	42322.7	15081.1626
11	1460.0	37150.9	25324.9970
12	1418.0	47467.9	11947.8242
13	1453.0	38753.7	21364.6340
14	1412.0	48725.5	11403.7967
15	1450.0	39801.3	18243.0880
16	1415.0	48299.8	11258.4566
17	1460.0	37749.6	22020.5800
18	1429.0	45293.9	12704.5426
19	1472.0	35452.4	26496.3210
20	1441.0	43085.8	13189.5921
21	1488.0	32278.9	34660.1300
22	1460.0	39255.4	15491.7651
23	1491.0	32676.9	28997.5840
24	1464.0	39422.2	13271.6827
25	1498.0	31667.1	29877.5100
26	1472.0	38344.0	13543.1540
27	1738.0	-32432.4	54.3344
28	1704.0	-29992.8	197.7447
29	1658.0	-18344.7	9878.1006
30	1632.0	-9915.0	10 YRS PLUS
31	1628.0	-10071.0	10 YRS PLUS
32	1600.0	-1248.3	10 YRS PLUS
33	1607.0	-4694.4	10 YRS PLUS
34	1580.0	3169.3	10 YRS PLUS
35	1555.0	8729.5	10 YRS PLUS
36	1520.0	18549.9	10 YRS PLUS
37	1561.0	4944.5	10 YRS PLUS
38	1520.0	16645.6	10 YRS PLUS
39	1567.0	3299.9	10 YRS PLUS
40	1516.0	17557.8	10 YRS PLUS
41	1567.0	3299.9	10 YRS PLUS
42	1517.0	17291.9	10 YRS PLUS
43	1558.0	6405.5	10 YRS PLUS
44	1509.0	20069.7	10 YRS PLUS
45	1543.0	11671.5	10 YRS PLUS
46	1501.0	23427.0	10 YRS PLUS
47	1529.0	17008.6	10 YRS PLUS
48	1493.0	27066.3	10 YRS PLUS
49	1533.0	17810.9	10 YRS PLUS
50	1504.0	25899.5	10 YRS PLUS
51	1541.0	17712.4	10 YRS PLUS
52	1512.0	25803.7	75962.4150
53	1575.0	9940.7	10 YRS PLUS
54	1548.0	17451.5	10 YRS PLUS
55	1664.0	-15417.7	22533.9000
56	1649.0	-10627.8	10 YRS PLUS
57	1732.0	-30946.8	84.4405
58	1719.0	-30186.9	133.4363
59	1763.0	-31208.3	39.6164
60	1752.0	-30934.4	53.6278
61	1346.0	65625.3	3545.1096
62	1338.0	68128.3	2749.6136

TABLE K-7

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1824.0	-26779.2	25.0425
2	1792.0	-27699.9	41.9881
3	1791.0	-27560.0	44.1404
4	1762.0	-26885.5	96.9271
5	1631.0	10516.6	10 YRS PLUS
6	1609.0	17256.1	53158.3670
7	1569.0	28979.3	7531.0051
8	1549.0	34253.5	4011.5412
9	1567.0	29909.1	6472.6671
10	1544.0	35993.5	3112.5861
11	1560.0	32564.4	4341.2513
12	1537.0	38634.3	2079.4471
13	1560.0	33363.0	3635.9937
14	1534.0	40312.2	1573.8223
15	1570.0	31554.9	4149.6793
16	1545.0	38244.7	1831.2816
17	1590.0	27054.7	6532.5931
18	1565.0	33813.1	2878.5461
19	1599.0	25545.6	7140.2781
20	1576.0	31807.4	3344.0124
21	1624.0	18724.1	21373.3020
22	1604.0	24976.5	7073.3137
23	1626.0	19080.4	17936.9720
24	1606.0	25365.9	6163.6613
25	1628.0	19152.1	16592.1890
26	1606.0	26093.1	5263.6383
27	1814.0	-27150.9	28.9030
28	1782.0	-27543.2	54.0988
29	1749.0	-26292.8	147.2602
30	1725.0	-18799.8	1565.0727
31	1711.0	-15237.5	7100.3064
32	1684.0	-7070.6	10 YRS PLUS
33	1681.0	-6090.8	10 YRS PLUS
34	1655.0	1956.8	10 YRS PLUS
35	1648.0	4173.5	10 YRS PLUS
36	1622.0	12378.2	10 YRS PLUS
37	1687.0	-7354.0	10 YRS PLUS
38	1656.0	2251.6	10 YRS PLUS
39	1691.0	-7737.7	10 YRS PLUS
40	1659.0	2158.9	10 YRS PLUS
41	1679.0	-3009.0	10 YRS PLUS
42	1644.0	7831.5	10 YRS PLUS
43	1666.0	2228.7	10 YRS PLUS
44	1631.0	13101.9	10 YRS PLUS
45	1658.0	5864.0	10 YRS PLUS
46	1628.0	15203.4	63744.6280
47	1655.0	7851.3	10 YRS PLUS
48	1627.0	16564.2	41190.2760
49	1669.0	4618.4	10 YRS PLUS
50	1646.0	11722.7	10 YRS PLUS
51	1671.0	5111.5	10 YRS PLUS
52	1650.0	11597.3	10 YRS PLUS
53	1684.0	1910.9	10 YRS PLUS
54	1661.0	8962.8	10 YRS PLUS
55	1761.0	-20417.0	392.2025
56	1747.0	-16540.5	1904.3259
57	1812.0	-24621.7	49.7306
58	1801.0	-24395.3	66.3243
59	1835.0	-23896.4	34.7313
60	1825.0	-24203.2	40.6305
61	1471.0	54281.6	803.1578
62	1458.0	57915.1	610.0331

TABLE K-8

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, HUB SECTION, 23445 RPM, TIT = 2465°F, WCA = 0.01832 LB/SEC/BLADE (4.745% OF HOT GAS FLOW), TCA = 600°F, PTOT = 150 PSIA, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1628.0	-32819.1	698.3269
2	1571.0	-15284.9	10 YRS PLUS
3	1584.0	-20102.0	39594.9940
4	1528.0	-3704.3	10 YRS PLUS
5	1447.0	18740.6	10 YRS PLUS
6	1391.0	34615.6	10 YRS PLUS
7	1423.0	27896.8	10 YRS PLUS
8	1362.0	45491.0	10 YRS PLUS
9	1485.0	16137.3	10 YRS PLUS
10	1437.0	30755.1	10 YRS PLUS
11	1482.0	22518.6	10 YRS PLUS
12	1427.0	39795.8	36089.0270
13	1480.0	27470.5	10 YRS PLUS
14	1420.0	46739.5	12819.0121
15	1474.0	31940.2	56437.7560
16	1410.0	52880.8	5762.1089
17	1466.0	36024.4	27633.1580
18	1408.0	54824.6	4316.5503
19	1460.0	37967.0	20930.5770
20	1411.0	53826.0	4727.4821
21	1454.0	38650.4	21256.5820
22	1418.0	50341.5	7168.3407
23	1427.0	43339.9	19039.6840
24	1377.0	58062.9	6003.0670
25	1323.0	68542.9	3985.8729
26	1282.0	75308.6	3595.4932
27	1616.0	-26590.4	3633.9684
28	1562.0	-10919.5	10 YRS PLUS
29	1509.0	8842.5	10 YRS PLUS
30	1461.0	21120.3	10 YRS PLUS
31	1452.0	29200.5	10 YRS PLUS
32	1404.0	41338.8	54314.1640
33	1460.0	33255.8	62895.1450
34	1405.0	46200.5	22062.8940
35	1445.0	42077.6	14006.4375
36	1383.0	55775.6	7601.8150
37	1518.0	28176.0	37288.3360
38	1466.0	39503.8	12292.0923
39	1585.0	17917.8	82363.6230
40	1529.0	29759.3	19083.7490
41	1606.0	17760.0	48538.2940
42	1541.0	31555.8	9124.7610
43	1599.0	21094.5	18823.3030
44	1535.0	34376.1	5714.6035
45	1587.0	22700.2	18375.8470
46	1531.0	34313.3	6469.3030
47	1567.0	24378.4	22000.2790
48	1521.0	34000.3	9158.4302
49	1542.0	25882.9	31627.1320
50	1506.0	33333.5	16243.9500
51	1499.0	31470.2	30368.7130
52	1471.0	37400.8	17351.5630
53	1411.0	49913.6	9502.4922
54	1355.0	63562.8	4059.5403
55	1559.0	8053.0	10 YRS PLUS
56	1538.0	12248.0	10 YRS PLUS
57	1639.0	-18290.9	16588.2270
58	1621.0	-14187.5	10 YRS PLUS
59	1649.0	-24543.5	2402.8309
60	1629.0	-19901.5	12514.8641
61	1062.0	94761.8	10 YRS PLUS
62	1068.0	93446.5	10 YRS PLUS

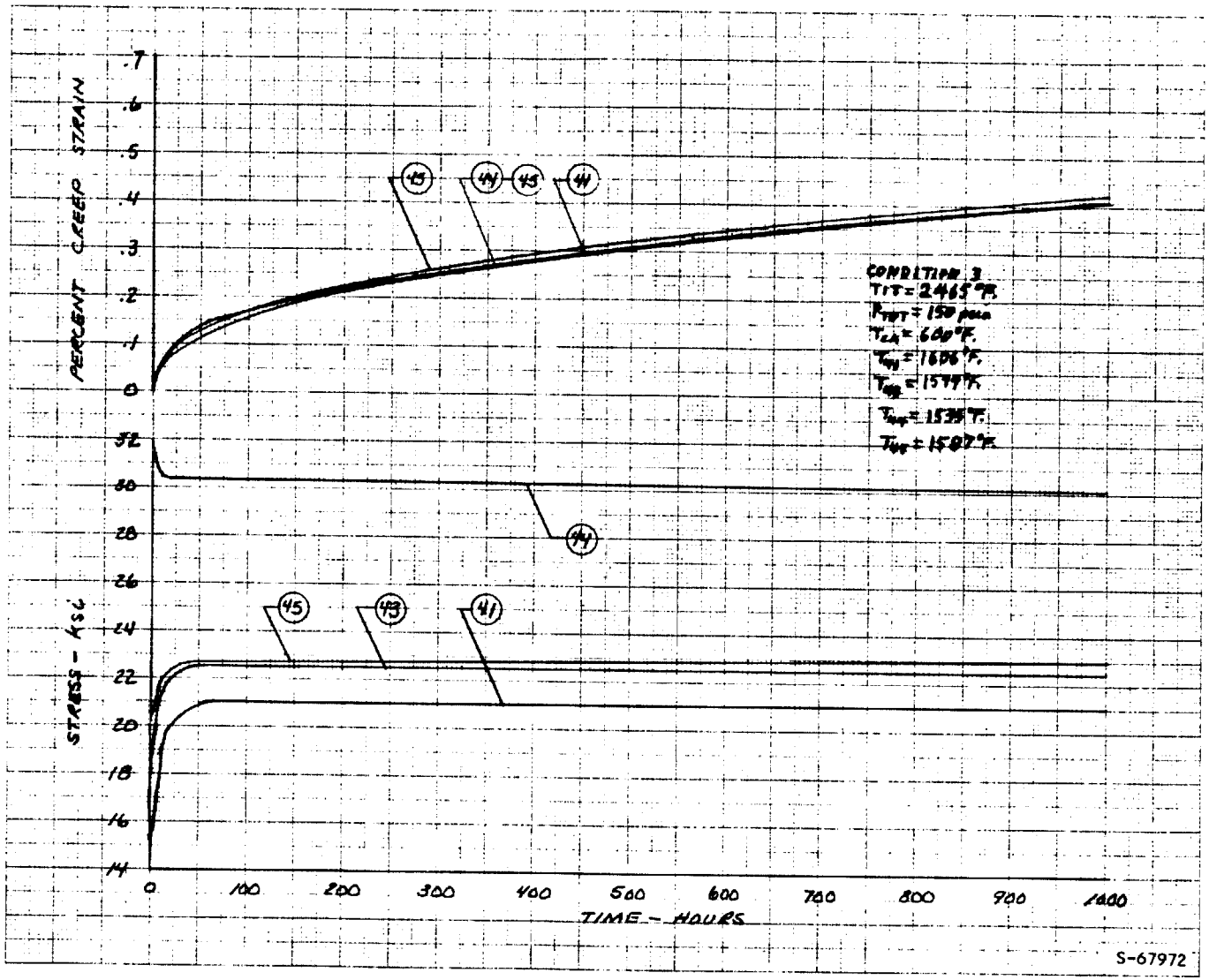


FIGURE K-3. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 0.75 INCH CHORD, CONDITION 3.

TABLE K-9

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1712.0	-40074.1	20.5028
2	1661.0	-40336.5	64.0213
3	1673.0	-39919.8	51.7414
4	1625.0	-31880.0	921.7896
5	1493.0	3773.9	10 YRS PLUS
6	1454.0	13719.0	10 YRS PLUS
7	1401.0	27338.4	10 YRS PLUS
8	1355.0	38739.9	10 YRS PLUS
9	1371.0	34460.2	10 YRS PLUS
10	1313.0	49107.3	10 YRS PLUS
11	1343.0	41220.2	10 YRS PLUS
12	1283.0	56497.9	10 YRS PLUS
13	1335.0	43250.5	10 YRS PLUS
14	1275.0	58532.0	10 YRS PLUS
15	1331.0	44635.8	10 YRS PLUS
16	1280.0	57619.5	10 YRS PLUS
17	1343.0	42091.8	10 YRS PLUS
18	1298.0	53484.0	10 YRS PLUS
19	1359.0	38748.1	10 YRS PLUS
20	1313.0	50395.5	10 YRS PLUS
21	1379.0	34543.4	10 YRS PLUS
22	1339.0	44608.1	10 YRS PLUS
23	1381.0	35089.6	10 YRS PLUS
24	1341.0	45182.3	10 YRS PLUS
25	1383.0	35317.8	10 YRS PLUS
26	1345.0	45040.4	10 YRS PLUS
27	1712.0	-40268.3	19.8996
28	1663.0	-40119.3	63.1852
29	1601.0	-27101.8	4825.3482
30	1562.0	-16227.1	10 YRS PLUS
31	1561.0	-17027.1	10 YRS PLUS
32	1520.0	-5881.7	10 YRS PLUS
33	1538.0	-11648.4	10 YRS PLUS
34	1497.0	-536.7	10 YRS PLUS
35	1469.0	5928.7	10 YRS PLUS
36	1417.0	19816.7	10 YRS PLUS
37	1479.0	1823.9	10 YRS PLUS
38	1420.0	17765.8	10 YRS PLUS
39	1488.0	-407.5	10 YRS PLUS
40	1415.0	19085.0	10 YRS PLUS
41	1488.0	-407.5	10 YRS PLUS
42	1416.0	18826.9	10 YRS PLUS
43	1475.0	3700.4	10 YRS PLUS
44	1405.0	22323.9	10 YRS PLUS
45	1455.0	10046.6	10 YRS PLUS
46	1395.0	25978.4	10 YRS PLUS
47	1436.0	16372.0	10 YRS PLUS
48	1383.0	30354.6	10 YRS PLUS
49	1439.0	17186.5	10 YRS PLUS
50	1397.0	28299.5	10 YRS PLUS
51	1448.0	16571.7	10 YRS PLUS
52	1405.0	27973.5	10 YRS PLUS
53	1489.0	6983.4	10 YRS PLUS
54	1449.0	17637.5	10 YRS PLUS
55	1614.0	-25999.3	4351.0745
56	1593.0	-19745.9	34947.0880
57	1705.0	-39330.6	27.9184
58	1687.0	-39085.7	44.4531
59	1745.0	-38068.0	14.7352
60	1729.0	-38602.9	18.8582
61	1172.0	79463.0	56240.9860
62	1161.0	81067.9	58208.9280

TABLE K-10

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1819.0	-30982.2	12.2034
2	1773.0	-34107.7	17.7131
3	1775.0	-34031.6	17.2151
4	1732.0	-34979.2	37.0093
5	1554.0	8997.4	10 YRS PLUS
6	1521.0	17778.5	10 YRS PLUS
7	1472.0	31622.2	64453.3260
8	1442.0	39457.7	25022.1270
9	1470.0	32953.5	50191.5550
10	1436.0	41898.2	18822.0020
11	1462.0	36377.6	28609.7980
12	1427.0	45589.8	12787.0893
13	1461.0	37856.9	20858.3240
14	1424.0	47664.3	9671.5574
15	1475.0	35345.5	24892.6780
16	1439.0	44952.4	10071.8324
17	1502.0	29312.4	45619.8800
18	1465.0	39258.0	13397.1143
19	1513.0	27399.5	51343.4110
20	1480.0	36336.8	17127.3430
21	1546.0	19561.8	10 YRS PLUS
22	1517.0	27490.3	44827.4550
23	1546.0	20502.6	10 YRS PLUS
24	1517.0	28442.6	36119.0940
25	1543.0	21988.0	73535.9760
26	1510.0	30978.2	24794.1260
27	1805.0	-32154.6	13.0624
28	1759.0	-34446.7	22.5221
29	1713.0	-34401.9	64.3628
30	1678.0	-28095.0	549.6770
31	1662.0	-22796.2	2499.3942
32	1623.0	-11100.2	10 YRS PLUS
33	1623.0	-10466.9	10 YRS PLUS
34	1585.0	568.2	10 YRS PLUS
35	1581.0	2186.4	10 YRS PLUS
36	1543.0	12403.2	10 YRS PLUS
37	1635.0	-12525.3	10 YRS PLUS
38	1590.0	846.2	10 YRS PLUS
39	1639.0	-11979.7	10 YRS PLUS
40	1593.0	1703.1	10 YRS PLUS
41	1624.0	-5781.7	10 YRS PLUS
42	1573.0	8699.3	10 YRS PLUS
43	1605.0	1529.2	10 YRS PLUS
44	1555.0	14966.7	10 YRS PLUS
45	1593.0	6124.6	10 YRS PLUS
46	1550.0	17494.4	10 YRS PLUS
47	1589.0	8160.6	10 YRS PLUS
48	1548.0	18990.1	10 YRS PLUS
49	1608.0	3606.4	10 YRS PLUS
50	1574.0	12878.9	10 YRS PLUS
51	1607.0	4727.8	10 YRS PLUS
52	1577.0	12909.2	10 YRS PLUS
53	1622.0	709.7	10 YRS PLUS
54	1587.0	10732.8	10 YRS PLUS
55	1732.0	-30276.1	96.8576
56	1713.0	-26472.7	330.5365
57	1801.0	-30193.9	21.0016
58	1785.0	-30597.2	27.4936
59	1832.0	-27803.5	17.2568
60	1818.0	-29071.0	18.1603
61	1328.0	68127.8	3718.8184
62	1311.0	70670.6	3756.3507

TABLE K-11

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, HUB SECTION, 22774 RPM, TIT = 2300°F, WCA = 0.04852 LB/SEC/BLADE (4.07% OF HOT GAS FLOW), TCA = 900°F, PTOT = 450 PSIA, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1632.0	-15990.4	43725.2960
2	1557.0	6508.2	10 YRS PLUS
3	1600.0	-6185.8	10 YRS PLUS
4	1527.0	14651.3	10 YRS PLUS
5	1521.0	17231.6	10 YRS PLUS
6	1440.0	39779.2	24606.3360
7	1530.0	17304.0	10 YRS PLUS
8	1444.0	41546.4	15829.3502
9	1583.0	6829.9	10 YRS PLUS
10	1513.0	27328.8	52174.5750
11	1571.0	14807.3	10 YRS PLUS
12	1491.0	38643.8	7358.3748
13	1567.0	19647.2	74693.7590
14	1479.0	46188.9	2603.0114
15	1562.0	23462.4	30962.8460
16	1469.0	51866.9	1288.4253
17	1552.0	27862.0	15372.3031
18	1467.0	53638.5	1001.6967
19	1547.0	29550.6	12110.2998
20	1475.0	51370.4	1190.1476
21	1542.0	30180.9	12077.9258
22	1488.0	46550.5	1907.1329
23	1525.0	32784.4	10784.8237
24	1451.0	53772.9	1524.4463
25	1383.0	66371.6	1033.3964
26	1319.0	76582.6	901.9155
27	1621.0	-10413.6	10 YRS PLUS
28	1551.0	9773.0	10 YRS PLUS
29	1567.0	10267.7	10 YRS PLUS
30	1496.0	28941.5	59118.7690
31	1533.0	23919.0	63473.4370
32	1463.0	42229.3	8107.1206
33	1562.0	21319.8	49795.9040
34	1483.0	41281.0	5414.2149
35	1556.0	27065.1	16433.2420
36	1468.0	48439.6	2397.7393
37	1601.0	19385.3	31785.8070
38	1525.0	37905.5	3391.7168
39	1649.0	10943.9	10 YRS PLUS
40	1566.0	32793.7	3512.1707
41	1660.0	12360.8	69899.7240
42	1565.0	37348.7	1315.7179
43	1649.0	16839.8	20779.0060
44	1555.0	41124.8	788.3650
45	1639.0	18640.3	14734.8395
46	1555.0	40203.9	918.3130
47	1620.0	21514.5	9778.9458
48	1551.0	38793.1	1381.1464
49	1601.0	23110.3	11499.2528
50	1546.0	36230.6	2796.9492
51	1566.0	27719.1	10797.8386
52	1522.0	38316.4	3354.7562
53	1462.0	51610.1	1635.3139
54	1378.0	68250.7	829.6123
55	1618.0	6727.3	10 YRS PLUS
56	1585.0	15152.4	10 YRS PLUS
57	1689.0	-17753.1	5415.5646
58	1662.0	-10762.9	10 YRS PLUS
59	1690.0	-20753.8	1955.2929
60	1658.0	-12313.1	74971.6310
61	1138.0	94114.7	7112.0882
62	1142.0	93045.8	7874.7086

TABLE K-12

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1714.0	-34083.8	67.1575
2	1643.0	-17014.6	22978.4730
3	1687.0	-31292.6	226.3342
4	1621.0	-11425.8	10 YRS PLUS
5	1574.0	2982.7	10 YRS PLUS
6	1513.0	19465.4	10 YRS PLUS
7	1529.0	16013.7	10 YRS PLUS
8	1459.0	34822.7	44929.6010
9	1525.0	18428.0	10 YRS PLUS
10	1441.0	40967.3	19134.6280
11	1505.0	25499.3	10 YRS PLUS
12	1418.0	48794.5	9437.6528
13	1500.0	28261.5	61480.3810
14	1413.0	51665.3	6555.7010
15	1494.0	30865.1	40306.3630
16	1419.0	51075.1	6111.0165
17	1503.0	29280.0	44648.7770
18	1436.0	47440.7	7092.3198
19	1515.0	26627.5	57752.9610
20	1448.0	44833.2	7923.9891
21	1525.0	24298.9	73329.5340
22	1464.0	40908.9	9907.1075
23	1514.0	27435.8	49475.1850
24	1453.0	43978.9	7965.8911
25	1479.0	36774.7	15929.9420
26	1417.0	53339.7	4330.2737
27	1711.0	-33808.3	76.2019
28	1643.0	-17821.4	17487.7490
29	1639.0	-14315.3	63859.4060
30	1578.0	2342.1	10 YRS PLUS
31	1632.0	-12093.2	10 YRS PLUS
32	1568.0	6185.6	10 YRS PLUS
33	1642.0	-13851.8	68862.4040
34	1579.0	4435.8	10 YRS PLUS
35	1601.0	-353.7	10 YRS PLUS
36	1527.0	19297.1	10 YRS PLUS
37	1617.0	-1441.7	10 YRS PLUS
38	1533.0	21295.6	10 YRS PLUS
39	1628.0	-3274.4	10 YRS PLUS
40	1526.0	24723.0	64740.3940
41	1628.0	-3274.4	10 YRS PLUS
42	1527.0	24455.7	66816.4200
43	1617.0	1085.3	10 YRS PLUS
44	1517.0	28092.7	39102.8880
45	1594.0	8348.8	10 YRS PLUS
46	1509.0	30615.4	27709.1000
47	1575.0	13527.1	10 YRS PLUS
48	1500.0	33111.4	20270.5790
49	1570.0	14654.6	10 YRS PLUS
50	1507.0	31125.3	26121.5580
51	1564.0	15901.4	10 YRS PLUS
52	1501.0	32387.7	23245.4780
53	1562.0	16096.4	10 YRS PLUS
54	1497.0	33139.1	21947.1400
55	1671.0	-15998.9	15436.6250
56	1635.0	-5491.0	10 YRS PLUS
57	1747.0	-31282.4	55.9643
58	1717.0	-30089.7	142.6871
59	1781.0	-31149.9	26.8826
60	1755.0	-31755.2	42.4422
61	1247.0	81239.0	3175.5912
62	1238.0	81991.6	3613.1728

TABLE K-13

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1796.0	-30729.0	21.0533
2	1729.0	-30476.5	99.6394
3	1755.0	-31434.6	45.2876
4	1693.0	-21837.6	1404.9032
5	1603.0	8464.8	10 YRS PLUS
6	1549.0	23538.1	43850.6320
7	1563.0	21720.3	44302.7060
8	1515.0	35098.7	8439.3885
9	1574.0	20915.3	39352.9540
10	1521.0	36001.6	5822.1263
11	1573.0	24110.9	19779.1060
12	1518.0	39893.6	2617.9313
13	1573.0	26314.2	12166.2071
14	1514.0	43204.0	1657.9078
15	1586.0	24262.9	13408.1002
16	1530.0	40547.5	1684.3721
17	1610.0	18321.4	35856.0760
18	1553.0	35195.2	2919.5412
19	1614.0	17495.2	42690.0790
20	1563.0	32854.6	3755.1651
21	1641.0	9177.6	10 YRS PLUS
22	1594.0	24588.6	10058.0186
23	1627.0	13358.1	10 YRS PLUS
24	1581.0	27858.4	6973.0166
25	1583.0	26346.2	9209.1749
26	1527.0	42200.5	1383.1769
27	1786.0	-30426.8	27.8266
28	1721.0	-28605.9	176.2593
29	1721.0	-26450.2	274.5547
30	1664.0	-12771.3	54696.2370
31	1700.0	-17690.6	4185.1313
32	1638.0	614.2	10 YRS PLUS
33	1685.0	-10821.2	59809.4530
34	1623.0	7622.0	10 YRS PLUS
35	1671.0	-4685.9	10 YRS PLUS
36	1613.0	12492.0	10 YRS PLUS
37	1727.0	-18201.8	1810.6656
38	1659.0	1723.9	10 YRS PLUS
39	1730.0	-14518.8	5569.0783
40	1659.0	5944.6	10 YRS PLUS
41	1717.0	-7918.6	10 YRS PLUS
42	1640.0	14703.7	54481.6060
43	1700.0	-1546.5	10 YRS PLUS
44	1624.0	20742.9	10726.4684
45	1686.0	2732.9	10 YRS PLUS
46	1620.0	22141.2	8543.1488
47	1680.0	4060.1	10 YRS PLUS
48	1617.0	22667.9	8256.6484
49	1691.0	-419.3	10 YRS PLUS
50	1638.0	15072.0	50766.0140
51	1677.0	2369.3	10 YRS PLUS
52	1629.0	16463.7	40373.6640
53	1648.0	10220.9	10 YRS PLUS
54	1589.0	27192.3	6510.7322
55	1748.0	-20635.9	496.4709
56	1714.0	-11596.5	21678.4200
57	1808.0	-26150.9	40.1405
58	1779.0	-26137.0	76.6661
59	1832.0	-25683.0	26.1292
60	1806.0	-26724.1	37.4451
61	1356.0	72450.2	690.4653
62	1345.0	73213.0	818.4969

TABLE K-14

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, HUB SECTION, 22567 RPM, TIT = 2250°F,
WCA = 0.005393 LB/SEC/BLADE (4.03% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 50 PSIA, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1619.0	-10416.7	10 YRS PLUS
2	1600.0	-3714.4	10 YRS PLUS
3	1594.0	-2668.5	10 YRS PLUS
4	1575.0	3318.8	10 YRS PLUS
5	1514.0	20638.1	10 YRS PLUS
6	1498.0	25682.7	10 YRS PLUS
7	1492.0	28471.1	74030.7120
8	1457.0	38736.2	19085.3100
9	1517.0	24913.0	80427.8910
10	1505.0	29280.6	42136.5340
11	1520.0	28154.8	35386.5010
12	1506.0	33519.6	15568.7350
13	1522.0	30986.9	17611.7830
14	1507.0	37056.2	6758.0749
15	1522.0	33406.7	10187.0239
16	1506.0	40194.3	3435.7775
17	1522.0	35345.4	6570.1231
18	1507.0	41567.9	2647.3160
19	1522.0	36261.7	5339.9932
20	1510.0	41346.2	2531.9480
21	1524.0	35926.7	5451.2957
22	1515.0	39736.8	2944.3203
23	1519.0	36559.5	5422.6242
24	1507.0	40751.9	3040.5563
25	1503.0	40077.3	3807.5054
26	1493.0	43488.0	2806.4238
27	1613.0	-7189.9	10 YRS PLUS
28	1596.0	-1615.9	10 YRS PLUS
29	1546.0	15173.7	10 YRS PLUS
30	1533.0	18543.7	10 YRS PLUS
31	1507.0	28970.9	42686.0940
32	1494.0	32333.5	28776.1550
33	1500.0	34802.6	13766.9893
34	1485.0	38023.3	10058.5151
35	1496.0	39084.5	5779.6727
36	1478.0	42387.8	5151.7811
37	1538.0	31494.7	10049.6398
38	1525.0	33590.7	8989.0118
39	1580.0	25553.6	11888.2653
40	1565.0	27758.2	11001.2461
41	1599.0	24788.9	8419.4069
42	1582.0	26999.1	8197.7307
43	1602.0	25538.8	6601.6722
44	1586.0	27512.0	6578.3379
45	1601.0	25724.0	6512.0440
46	1587.0	27390.0	6578.0093
47	1595.0	25909.9	7338.7450
48	1583.0	27454.7	7220.3129
49	1584.0	26508.5	8650.3819
50	1575.0	27546.5	8781.4224
51	1566.0	28491.5	9101.2132
52	1559.0	29426.5	8953.2176
53	1538.0	33675.5	6160.1706
54	1526.0	36076.3	4987.9922
55	1581.0	20658.6	35440.4700
56	1574.0	21618.4	33335.0430
57	1609.0	10872.9	10 YRS PLUS
58	1604.0	11530.4	10 YRS PLUS
59	1614.0	7544.0	10 YRS PLUS
60	1609.0	8233.3	10 YRS PLUS
61	1362.0	67749.2	1454.3772
62	1366.0	65370.3	2057.2158

TABLE K-15

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1718.0	-27886.1	219.3571
2	1701.0	-27873.9	329.6120
3	1690.0	-19310.1	3153.2421
4	1675.0	-15719.8	15262.9024
5	1572.0	13161.6	10 YRS PLUS
6	1562.0	15136.0	10 YRS PLUS
7	1503.0	29825.9	39414.0580
8	1491.0	31942.3	34331.1150
9	1463.0	37881.2	19567.2220
10	1445.0	41319.0	15997.8445
11	1438.0	41586.9	18744.2010
12	1420.0	44774.1	18173.6570
13	1428.0	42524.3	21352.0530
14	1411.0	45212.7	21985.9960
15	1425.0	42857.3	22006.0420
16	1411.0	44962.6	22989.4650
17	1433.0	41043.5	23911.0900
18	1420.0	43012.1	24850.7890
19	1445.0	38905.8	26080.7360
20	1432.0	41001.1	24816.4080
21	1466.0	34899.8	35903.9430
22	1454.0	36971.8	31497.3180
23	1484.0	32014.6	41380.2040
24	1472.0	34167.1	35705.5930
25	1517.0	24657.7	85223.0300
26	1509.0	26168.5	76283.3170
27	1721.0	-30875.5	110.5360
28	1705.0	-26563.9	392.8494
29	1654.0	-16672.5	19256.1720
30	1643.0	-11372.3	10 YRS PLUS
31	1614.0	-5974.3	10 YRS PLUS
32	1603.0	-2042.3	10 YRS PLUS
33	1578.0	1384.4	10 YRS PLUS
34	1567.0	5026.4	10 YRS PLUS
35	1530.0	11896.0	10 YRS PLUS
36	1516.0	16665.9	10 YRS PLUS
37	1517.0	8244.2	10 YRS PLUS
38	1499.0	14739.3	10 YRS PLUS
39	1514.0	7616.0	10 YRS PLUS
40	1492.0	14955.4	10 YRS PLUS
41	1514.0	7616.0	10 YRS PLUS
42	1492.0	14955.4	10 YRS PLUS
43	1508.0	9501.4	10 YRS PLUS
44	1487.0	16536.9	10 YRS PLUS
45	1500.0	13391.1	10 YRS PLUS
46	1482.0	19623.2	10 YRS PLUS
47	1494.0	17678.3	10 YRS PLUS
48	1478.0	23187.3	10 YRS PLUS
49	1505.0	18168.1	10 YRS PLUS
50	1492.0	22597.2	10 YRS PLUS
51	1527.0	16142.1	10 YRS PLUS
52	1515.0	20264.1	10 YRS PLUS
53	1577.0	5378.8	10 YRS PLUS
54	1569.0	8255.6	10 YRS PLUS
55	1637.0	-10427.3	10 YRS PLUS
56	1631.0	-7812.3	10 YRS PLUS
57	1685.0	-22750.7	1416.0558
58	1681.0	-20729.1	2469.8827
59	1708.0	-27181.9	321.7023
60	1703.0	-24962.3	574.5273
61	1424.0	43423.6	20505.8350
62	1419.0	48560.2	9554.0942

TABLE K-16

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1810.0	-23603.5	63.5452
2	1796.0	-23401.1	90.3362
3	1786.0	-22484.9	135.8472
4	1773.0	-20638.4	276.3448
5	1656.0	12673.5	70107.5590
6	1647.0	14912.8	42014.6650
7	1597.0	29575.8	3128.7739
8	1591.0	30460.2	3020.8852
9	1583.0	32028.6	2645.8950
10	1574.0	33400.5	2482.3778
11	1569.0	34467.8	2239.1348
12	1560.0	35667.5	2180.0365
13	1565.0	34980.0	2223.0663
14	1555.0	36563.4	2040.7403
15	1570.0	33980.6	2428.4131
16	1561.0	35133.9	2389.6381
17	1585.0	30810.8	3278.2163
18	1575.0	32475.8	2963.8850
19	1595.0	29577.7	3296.4960
20	1587.0	30833.4	3093.9313
21	1620.0	23809.8	5962.1447
22	1612.0	25304.0	5330.4157
23	1637.0	20619.6	7936.9286
24	1630.0	21950.8	6836.8004
25	1664.0	13610.2	41292.7480
26	1657.0	15161.3	29566.4820
27	1802.0	-24232.2	66.9992
28	1787.0	-23842.7	101.2806
29	1751.0	-19572.2	651.3353
30	1741.0	-12386.0	8445.5116
31	1711.0	-10223.0	36746.0220
32	1701.0	-6628.6	10 YRS PLUS
33	1679.0	-2608.8	10 YRS PLUS
34	1669.0	1158.1	10 YRS PLUS
35	1645.0	6270.2	10 YRS PLUS
36	1635.0	10354.5	10 YRS PLUS
37	1658.0	-172.9	10 YRS PLUS
38	1645.0	4628.3	10 YRS PLUS
39	1657.0	-2891.3	10 YRS PLUS
40	1644.0	2407.7	10 YRS PLUS
41	1648.0	-745.1	10 YRS PLUS
42	1634.0	4764.1	10 YRS PLUS
43	1640.0	3017.5	10 YRS PLUS
44	1626.0	8718.7	10 YRS PLUS
45	1636.0	6650.3	10 YRS PLUS
46	1624.0	11566.5	10 YRS PLUS
47	1638.0	8723.1	10 YRS PLUS
48	1627.0	13173.3	10 YRS PLUS
49	1654.0	7126.6	10 YRS PLUS
50	1645.0	10783.0	10 YRS PLUS
51	1670.0	5946.1	10 YRS PLUS
52	1661.0	9476.2	10 YRS PLUS
53	1705.0	-2069.5	10 YRS PLUS
54	1698.0	937.7	10 YRS PLUS
55	1754.0	-14905.9	2718.5637
56	1749.0	-12818.1	6018.8507
57	1790.0	-22005.9	136.5084
58	1786.0	-21195.4	175.7338
59	1808.0	-21828.3	94.3484
60	1804.0	-21376.9	112.8192
61	1559.0	34460.9	2926.8542
62	1549.0	40144.6	1086.0601

TABLE K-17

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F,
WCA = 0.00901 LB/SEC/BLADE (2.19% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 150 PSIA, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1618.0	-8263.4	10 YRS PLUS
2	1597.0	-1116.2	10 YRS PLUS
3	1595.0	-1713.5	10 YRS PLUS
4	1573.0	5158.0	10 YRS PLUS
5	1525.0	18322.6	10 YRS PLUS
6	1503.0	25091.0	10 YRS PLUS
7	1503.0	25664.7	10 YRS PLUS
8	1477.0	33695.3	34418.4110
9	1529.0	20943.0	10 YRS PLUS
10	1508.0	27878.7	53191.8750
11	1526.0	24315.2	70984.3970
12	1502.0	32612.4	21459.3060
13	1525.0	26395.6	45665.0090
14	1498.0	35884.6	11373.2679
15	1522.0	28087.6	33936.4610
16	1493.0	38423.8	7316.2060
17	1518.0	29394.7	28287.0340
18	1492.0	38537.5	7331.0941
19	1513.0	30039.2	28179.8230
20	1492.0	37467.1	9374.6494
21	1506.0	30385.0	31823.2250
22	1490.0	36014.4	13855.2749
23	1481.0	34612.8	24784.2480
24	1458.0	41618.2	10408.6359
25	1409.0	51705.2	7319.7252
26	1388.0	57926.5	4441.6234
27	1616.0	-5706.4	10 YRS PLUS
28	1596.0	580.5	10 YRS PLUS
29	1570.0	11198.4	10 YRS PLUS
30	1552.0	15676.1	10 YRS PLUS
31	1540.0	22355.3	73796.5030
32	1522.0	26815.4	45254.5260
33	1533.0	27674.8	27265.0290
34	1512.0	32337.0	17195.9970
35	1514.0	35415.2	8076.1541
36	1488.0	40716.3	5183.7686
37	1548.0	29125.4	12953.6933
38	1526.0	33396.4	9134.8707
39	1581.0	24075.9	16007.0869
40	1557.0	28424.6	11815.8486
41	1593.0	23213.4	13952.4336
42	1565.0	28275.9	9809.8037
43	1591.0	23272.2	14541.7106
44	1563.0	28414.6	10046.8490
45	1585.0	22728.5	19287.7420
46	1561.0	27156.5	14028.3927
47	1574.0	22388.4	28130.7190
48	1554.0	26176.4	21168.9030
49	1557.0	22749.0	41728.3710
50	1541.0	25833.4	32894.1140
51	1523.0	27372.9	38768.8630
52	1510.0	30018.2	30849.7640
53	1452.0	42738.3	10181.6395
54	1423.0	49656.4	6995.6774
55	1519.0	22960.4	10 YRS PLUS
56	1507.0	25366.5	10 YRS PLUS
57	1559.0	9659.0	10 YRS PLUS
58	1549.0	11652.9	10 YRS PLUS
59	1565.0	5686.3	10 YRS PLUS
60	1554.0	7884.1	10 YRS PLUS
61	1332.0	72886.2	1280.6120
62	1335.0	70572.9	1853.4161

TABLE K-18

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1735.0	-27700.2	152.9730
2	1716.0	-24420.6	469.7011
3	1711.0	-20904.6	1107.7425
4	1693.0	-16008.1	8710.9421
5	1611.0	7816.8	10 YRS PLUS
6	1576.0	17446.0	10 YRS PLUS
7	1543.0	25468.0	33741.8880
8	1523.0	30395.0	19574.9680
9	1510.0	32707.2	16727.8040
10	1482.0	39608.2	7597.8260
11	1487.0	36835.4	12493.6941
12	1458.0	43850.0	7057.7754
13	1479.0	37452.7	13617.9613
14	1450.0	44299.1	8212.3613
15	1477.0	37064.6	15777.9469
16	1452.0	42933.8	9839.9004
17	1485.0	34342.3	23501.0500
18	1464.0	39201.9	13970.9130
19	1496.0	31176.4	35418.0850
20	1475.0	36081.2	20990.8060
21	1511.0	27202.0	56893.7350
22	1492.0	31689.6	35345.2860
23	1511.0	27397.4	54420.5640
24	1492.0	31918.2	33537.3990
25	1504.0	29492.0	41327.3080
26	1485.0	34159.6	24511.8510
27	1738.0	-28587.9	119.0386
28	1720.0	-24461.6	423.2119
29	1689.0	-18228.9	4625.9626
30	1674.0	-12507.6	45733.0990
31	1662.0	-10508.6	10 YRS PLUS
32	1647.0	-5802.6	10 YRS PLUS
33	1634.0	-3571.6	10 YRS PLUS
34	1619.0	1251.6	10 YRS PLUS
35	1581.0	10677.3	10 YRS PLUS
36	1559.0	17038.9	10 YRS PLUS
37	1573.0	8330.1	10 YRS PLUS
38	1545.0	16609.1	10 YRS PLUS
39	1573.0	6790.4	10 YRS PLUS
40	1539.0	16627.1	10 YRS PLUS
41	1572.0	7059.6	10 YRS PLUS
42	1538.0	16894.7	10 YRS PLUS
43	1565.0	8176.9	10 YRS PLUS
44	1532.0	17758.8	10 YRS PLUS
45	1555.0	10864.6	10 YRS PLUS
46	1527.0	19117.1	10 YRS PLUS
47	1545.0	14035.6	10 YRS PLUS
48	1521.0	21120.5	10 YRS PLUS
49	1550.0	13535.8	10 YRS PLUS
50	1530.0	19421.3	10 YRS PLUS
51	1552.0	14043.8	10 YRS PLUS
52	1532.0	19889.6	10 YRS PLUS
53	1558.0	13226.9	10 YRS PLUS
54	1538.0	19013.6	10 YRS PLUS
55	1616.0	-2476.9	10 YRS PLUS
56	1604.0	1648.2	10 YRS PLUS
57	1665.0	-16656.6	14493.8512
58	1655.0	-13191.1	60515.3550
59	1688.0	-22693.6	1330.2238
60	1680.0	-19915.9	3319.4723
61	1433.0	51602.8	3713.4753
62	1426.0	55057.1	2464.2742

TABLE K-19

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1816.0	-22326.9	71.5864
2	1799.0	-21815.5	115.7148
3	1794.0	-21640.2	134.1132
4	1779.0	-18063.4	545.4903
5	1687.0	9125.4	10 YRS PLUS
6	1675.0	12802.7	40360.5220
7	1636.0	25024.4	3027.3201
8	1624.0	28737.6	1859.0534
9	1630.0	26805.0	2413.0229
10	1616.0	31120.5	1365.9681
11	1622.0	29245.6	1754.4080
12	1608.0	33545.3	992.1918
13	1620.0	29871.9	1613.7903
14	1605.0	34506.6	869.6665
15	1628.0	27433.5	2219.9443
16	1614.0	31731.1	1260.1379
17	1644.0	22527.1	4196.7729
18	1629.0	27160.9	2293.8999
19	1652.0	20220.8	6141.5983
20	1639.0	24231.6	3319.3354
21	1670.0	14819.4	23499.7620
22	1659.0	18168.9	10209.3676
23	1667.0	16056.8	16812.2280
24	1656.0	19428.5	7228.4152
25	1655.0	20042.7	6033.4998
26	1640.0	24718.9	2915.1818
27	1811.0	-22270.3	80.8730
28	1794.0	-21755.0	131.0869
29	1772.0	-16725.8	984.7672
30	1760.0	-12833.5	4566.1625
31	1746.0	-9516.7	23040.8120
32	1732.0	-5301.8	10 YRS PLUS
33	1721.0	-2268.5	10 YRS PLUS
34	1707.0	2076.9	10 YRS PLUS
35	1691.0	6771.0	10 YRS PLUS
36	1675.0	11865.2	55166.6740
37	1716.0	-1134.8	10 YRS PLUS
38	1698.0	4469.9	10 YRS PLUS
39	1718.0	-2003.1	10 YRS PLUS
40	1700.0	3642.7	10 YRS PLUS
41	1709.0	744.2	10 YRS PLUS
42	1689.0	7033.4	10 YRS PLUS
43	1701.0	3416.7	10 YRS PLUS
44	1681.0	9756.8	10 YRS PLUS
45	1696.0	5286.6	10 YRS PLUS
46	1679.0	10692.0	73272.6750
47	1695.0	5948.3	10 YRS PLUS
48	1679.0	11029.0	65499.8090
49	1705.0	3291.1	10 YRS PLUS
50	1692.0	7394.4	10 YRS PLUS
51	1700.0	5304.2	10 YRS PLUS
52	1689.0	8789.6	10 YRS PLUS
53	1689.0	9062.2	10 YRS PLUS
54	1673.0	14153.0	27123.6510
55	1733.0	-4192.8	10 YRS PLUS
56	1724.0	-1415.4	10 YRS PLUS
57	1766.0	-13606.8	3078.9462
58	1758.0	-11240.9	7994.9069
59	1782.0	-17812.1	550.8167
60	1775.0	-15797.8	1232.5493
61	1577.0	42081.0	381.3936
62	1566.0	45433.7	291.0886

TABLE K-20

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F,
WCA = 0.00794 LB/SEC/BLADE (1.926% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1595.0	-16941.0	87378.5440
2	1571.0	-9620.9	10 YRS PLUS
3	1566.0	-9771.7	10 YRS PLUS
4	1542.0	-2326.3	10 YRS PLUS
5	1479.0	14334.9	10 YRS PLUS
6	1454.0	21922.7	10 YRS PLUS
7	1444.0	24843.4	10 YRS PLUS
8	1414.0	33917.4	10 YRS PLUS
9	1466.0	21022.8	10 YRS PLUS
10	1440.0	29330.5	10 YRS PLUS
11	1457.0	25419.5	10 YRS PLUS
12	1426.0	35668.9	10 YRS PLUS
13	1452.0	27915.4	10 YRS PLUS
14	1419.0	39076.0	54516.1950
15	1447.0	29432.6	10 YRS PLUS
16	1411.0	41637.9	41609.1200
17	1441.0	30428.1	10 YRS PLUS
18	1408.0	41379.8	47726.9400
19	1435.0	30472.2	10 YRS PLUS
20	1408.0	39431.1	70012.4820
21	1427.0	30089.4	10 YRS PLUS
22	1406.0	36992.3	10 YRS PLUS
23	1393.0	35471.1	10 YRS PLUS
24	1364.0	43989.7	10 YRS PLUS
25	1299.0	57727.5	72517.1070
26	1271.0	65990.7	34463.3550
27	1594.0	-14318.1	10 YRS PLUS
28	1572.0	-8167.2	10 YRS PLUS
29	1543.0	3564.4	10 YRS PLUS
30	1523.0	8378.6	10 YRS PLUS
31	1506.0	16573.4	10 YRS PLUS
32	1485.0	21616.0	10 YRS PLUS
33	1489.0	24502.3	10 YRS PLUS
34	1465.0	29714.0	10 YRS PLUS
35	1458.0	35239.2	41985.0350
36	1426.0	41795.0	25781.3080
37	1490.0	29441.3	62811.1590
38	1462.0	34952.4	39894.3680
39	1524.0	23805.5	84381.3750
40	1494.0	29346.9	57106.1780
41	1537.0	21922.4	10 YRS PLUS
42	1501.0	28751.6	53385.2440
43	1532.0	21702.0	10 YRS PLUS
44	1497.0	28407.5	64894.1500
45	1525.0	20248.8	10 YRS PLUS
46	1494.0	26328.7	10 YRS PLUS
47	1511.0	19528.9	10 YRS PLUS
48	1486.0	24475.3	10 YRS PLUS
49	1490.0	19669.7	10 YRS PLUS
50	1470.0	23723.7	10 YRS PLUS
51	1445.0	25885.7	10 YRS PLUS
52	1429.0	29235.6	10 YRS PLUS
53	1352.0	45800.5	10 YRS PLUS
54	1314.0	55201.6	71893.1090
55	1435.0	21793.5	10 YRS PLUS
56	1419.0	25170.7	10 YRS PLUS
57	1484.0	5842.5	10 YRS PLUS
58	1471.0	8614.8	10 YRS PLUS
59	1491.0	1197.5	10 YRS PLUS
60	1476.0	4378.1	10 YRS PLUS
61	1237.0	80342.2	5272.0915
62	1240.0	77954.6	7891.8075

TABLE K-21

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, MEAN SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1718.0	-33409.0	70.3619
2	1699.0	-34035.3	96.1864
3	1690.0	-29422.7	311.1204
4	1671.0	-24445.8	1406.9431
5	1569.0	3247.8	10 YRS PLUS
6	1552.0	7465.2	10 YRS PLUS
7	1476.0	26095.2	10 YRS PLUS
8	1452.0	31827.0	10 YRS PLUS
9	1423.0	37311.7	73526.8950
10	1388.0	45678.2	40604.9010
11	1389.0	42707.2	67338.2120
12	1353.0	51282.9	43191.9570
13	1377.0	43044.7	10 YRS PLUS
14	1341.0	51363.4	62095.3520
15	1374.0	41886.3	10 YRS PLUS
16	1343.0	48967.0	10 YRS PLUS
17	1385.0	37524.2	10 YRS PLUS
18	1358.0	43524.0	10 YRS PLUS
19	1399.0	32952.9	10 YRS PLUS
20	1372.0	38921.2	10 YRS PLUS
21	1417.0	27744.7	10 YRS PLUS
22	1393.0	33066.2	10 YRS PLUS
23	1415.0	27972.4	10 YRS PLUS
24	1392.0	33082.1	10 YRS PLUS
25	1402.0	31301.8	10 YRS PLUS
26	1377.0	37114.8	10 YRS PLUS
27	1724.0	-33915.5	55.2283
28	1705.0	-33619.0	91.1241
29	1670.0	-29144.9	536.4454
30	1654.0	-22340.7	3375.5264
31	1636.0	-19359.0	12501.1581
32	1619.0	-14117.0	10 YRS PLUS
33	1596.0	-9948.4	10 YRS PLUS
34	1579.0	-5109.5	10 YRS PLUS
35	1523.0	7492.3	10 YRS PLUS
36	1497.0	14950.8	10 YRS PLUS
37	1499.0	6344.9	10 YRS PLUS
38	1465.0	16325.1	10 YRS PLUS
39	1495.0	4437.0	10 YRS PLUS
40	1452.0	16730.7	10 YRS PLUS
41	1492.0	5226.9	10 YRS PLUS
42	1450.0	17252.3	10 YRS PLUS
43	1484.0	5460.0	10 YRS PLUS
44	1442.0	17537.6	10 YRS PLUS
45	1471.0	8172.9	10 YRS PLUS
46	1436.0	18450.6	10 YRS PLUS
47	1459.0	11364.9	10 YRS PLUS
48	1429.0	20196.8	10 YRS PLUS
49	1465.0	10377.3	10 YRS PLUS
50	1441.0	17462.8	10 YRS PLUS
51	1465.0	11256.7	10 YRS PLUS
52	1442.0	18007.6	10 YRS PLUS
53	1466.0	11767.3	10 YRS PLUS
54	1440.0	19227.7	10 YRS PLUS
55	1535.0	-5893.6	10 YRS PLUS
56	1520.0	-1191.1	10 YRS PLUS
57	1593.0	-20697.2	25130.0950
58	1581.0	-16737.6	10 YRS PLUS
59	1621.0	-27925.1	2392.5745
60	1611.0	-24290.4	6815.9152
61	1345.0	56333.9	21818.6470
62	1335.0	61267.9	11724.9843

TABLE K-22

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
0.75 INCH CHORD, TIP SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1810.0	-24820.6	49.9663
2	1794.0	-24499.0	75.9426
3	1786.0	-24225.1	95.9767
4	1770.0	-23601.3	156.4456
5	1665.0	6366.9	10 YRS PLUS
6	1652.0	10312.7	10 YRS PLUS
7	1595.0	27227.5	5505.0891
8	1583.0	30369.7	3808.0551
9	1580.0	30529.5	3982.2073
10	1564.0	34638.9	2462.1012
11	1565.0	33490.5	3091.6815
12	1549.0	37537.6	1927.4310
13	1561.0	33686.2	3294.7572
14	1543.0	38243.9	1932.2325
15	1569.0	30842.6	4989.1043
16	1552.0	35090.4	3069.8307
17	1588.0	25154.2	10448.4935
18	1571.0	29459.6	6416.3092
19	1598.0	22085.2	15586.4117
20	1582.0	26139.9	9899.7998
21	1619.0	15358.7	77397.9280
22	1606.0	19104.1	30549.1180
23	1614.0	16756.4	55008.8690
24	1600.0	20839.0	19769.9760
25	1593.0	22901.8	14935.1083
26	1575.0	27556.1	8762.9255
27	1805.0	-24883.4	55.1028
28	1789.0	-24491.3	85.0736
29	1764.0	-22845.8	209.1181
30	1752.0	-18694.3	843.6457
31	1734.0	-15205.6	4034.0365
32	1719.0	-10688.6	25643.8200
33	1702.0	-6513.3	10 YRS PLUS
34	1687.0	-1826.0	10 YRS PLUS
35	1661.0	5376.3	10 YRS PLUS
36	1643.0	11149.9	10 YRS PLUS
37	1679.0	-1289.6	10 YRS PLUS
38	1658.0	5298.9	10 YRS PLUS
39	1678.0	-2683.2	10 YRS PLUS
40	1656.0	4370.9	10 YRS PLUS
41	1667.0	-478.9	10 YRS PLUS
42	1643.0	7243.0	10 YRS PLUS
43	1656.0	2209.9	10 YRS PLUS
44	1633.0	9742.2	10 YRS PLUS
45	1651.0	3493.1	10 YRS PLUS
46	1631.0	10059.8	10 YRS PLUS
47	1650.0	3737.3	10 YRS PLUS
48	1631.0	9961.5	10 YRS PLUS
49	1661.0	468.1	10 YRS PLUS
50	1646.0	5397.9	10 YRS PLUS
51	1653.0	3173.1	10 YRS PLUS
52	1639.0	7772.1	10 YRS PLUS
53	1632.0	9854.3	10 YRS PLUS
54	1613.0	16113.1	70514.5910
55	1682.0	-5359.1	10 YRS PLUS
56	1671.0	-1710.1	10 YRS PLUS
57	1720.0	-16501.1	3746.7882
58	1710.0	-13273.1	13870.1148
59	1738.0	-21494.1	506.0302
60	1729.0	-18639.0	1495.7336
61	1532.0	43374.7	993.8506
62	1519.0	47385.4	715.3654

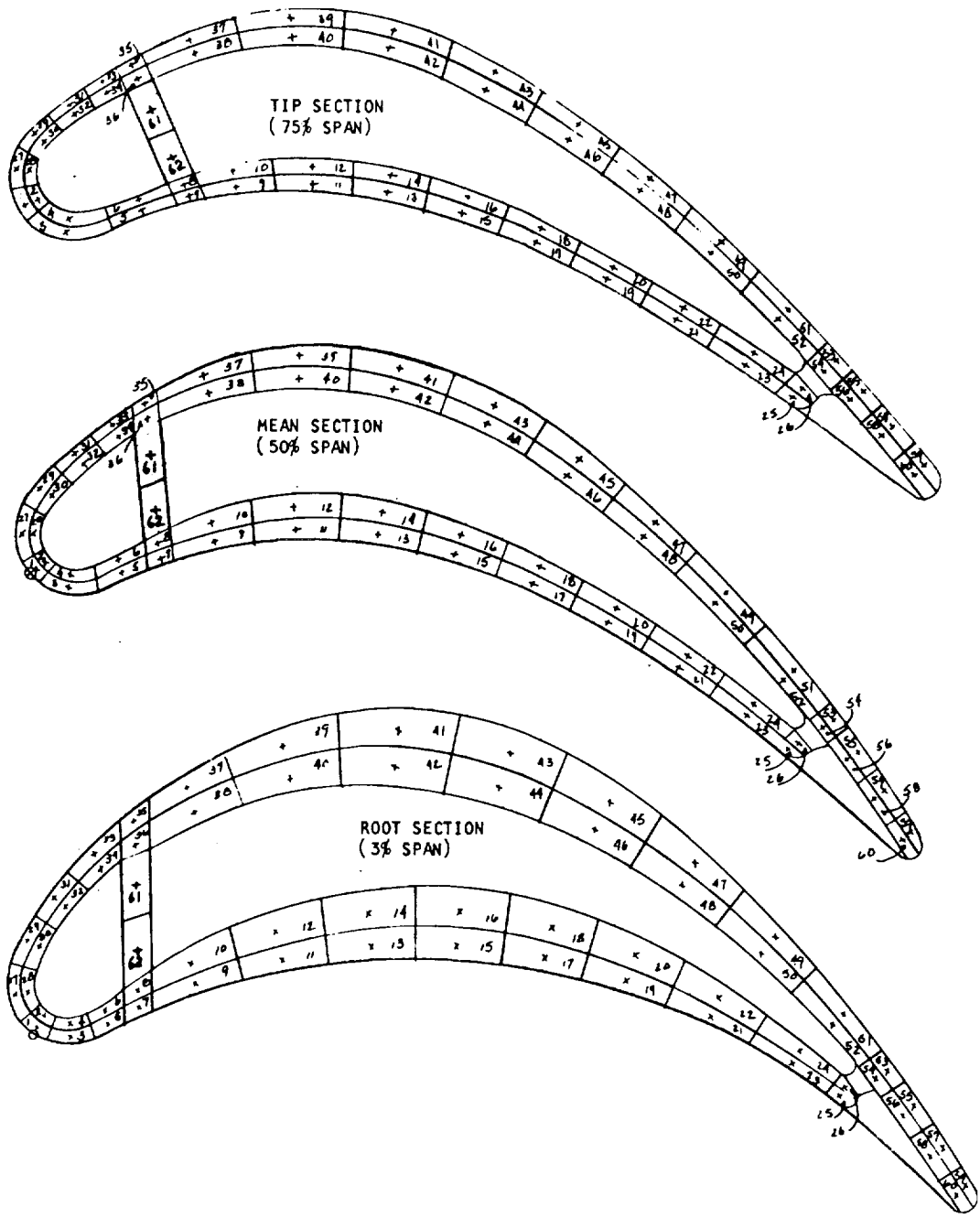


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FIGURE K-4. SCHEME A-1 CONVECTION COOLED CAST TWO-CAVITY PIN FIN BLADE 0.75 INCH CHORD

TABLE K-23

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 22350 RPM, TIT = 2220°F,
WCA = 0.02229 LB/SEC/BLADE (4.163% OF HOT GAS FLOW),
TCA = 1200°F, PTOT = 150 PSIA, CONDITION I

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1640.0	-15206.6	45944.5770
2	1613.0	-6684.7	10 YRS PLUS
3	1619.0	-8413.2	10 YRS PLUS
4	1593.0	-395.7	10 YRS PLUS
5	1545.0	13640.0	10 YRS PLUS
6	1515.0	22078.8	10 YRS PLUS
7	1527.0	20021.1	10 YRS PLUS
8	1491.0	30214.5	51067.6440
9	1517.0	24993.6	78971.6440
10	1482.0	34893.8	22564.6980
11	1513.0	29094.6	34928.1210
12	1472.0	40874.0	7928.7410
13	1517.0	31057.3	19961.2850
14	1471.0	44485.5	4369.1415
15	1517.0	33357.1	11848.1967
16	1478.0	44791.0	3405.2522
17	1515.0	35233.5	8184.9504
18	1486.0	43857.1	3198.8503
19	1522.0	33825.0	9267.2441
20	1499.0	40610.5	3884.3471
21	1567.0	21341.2	43073.7060
22	1538.0	29836.3	14580.9616
23	1591.0	14432.6	10 YRS PLUS
24	1572.0	20021.7	56899.0460
25	1611.0	8068.8	10 YRS PLUS
26	1598.0	12317.9	10 YRS PLUS
27	1627.0	2584.4	10 YRS PLUS
28	1616.0	6138.4	10 YRS PLUS
29	1635.0	-13094.4	10 YRS PLUS
30	1610.0	-1771.5	10 YRS PLUS
31	1595.0	672.0	10 YRS PLUS
32	1572.0	7024.3	10 YRS PLUS
33	1567.0	10557.8	10 YRS PLUS
34	1544.0	16722.3	10 YRS PLUS
35	1566.0	14016.8	10 YRS PLUS
36	1539.0	20975.7	10 YRS PLUS
37	1545.0	21920.3	70512.6150
38	1509.0	30889.6	26031.7860
39	1539.0	25722.7	35680.4170
40	1498.0	35992.8	11094.8853
41	1575.0	19585.4	60936.6330
42	1524.0	32255.8	12497.2811
43	1596.0	18053.6	57812.1510
44	1534.0	33149.6	7738.9594
45	1588.0	21626.3	22620.8600
46	1532.0	35118.2	5250.6280
47	1562.0	28088.6	11099.2719
48	1516.0	39206.3	3231.4434
49	1566.0	25494.4	17667.3980
50	1541.0	31540.3	9156.5198
51	1575.0	21618.2	32423.9290
52	1551.0	27601.6	16748.7090
53	1597.0	14658.5	10 YRS PLUS
54	1580.0	18888.4	67567.9850
55	1614.0	8579.4	10 YRS PLUS
56	1601.0	12289.3	10 YRS PLUS
57	1626.0	3946.5	10 YRS PLUS
58	1616.0	6806.5	10 YRS PLUS
59	1462.0	42720.3	7660.6084
60	1416.0	54102.4	3891.9054
61	1379.0	62977.7	2236.3658
62	1368.0	64743.0	2191.8148
63	1402.0	54780.5	5184.7421
64	1445.0	42924.9	12073.5177

Leading Edge W_{CLE} = 0.0098 Lb/Sec/Blade (1.830% of hot gas flow)

Middle Cavity W_{CM} = 0.01249 Lb/Sec/Blade (2.333% of hot gas flow)

Trailing Edge W_{CTE} = 0.00699 Lb/Sec/Blade (1.306% of hot gas flow)

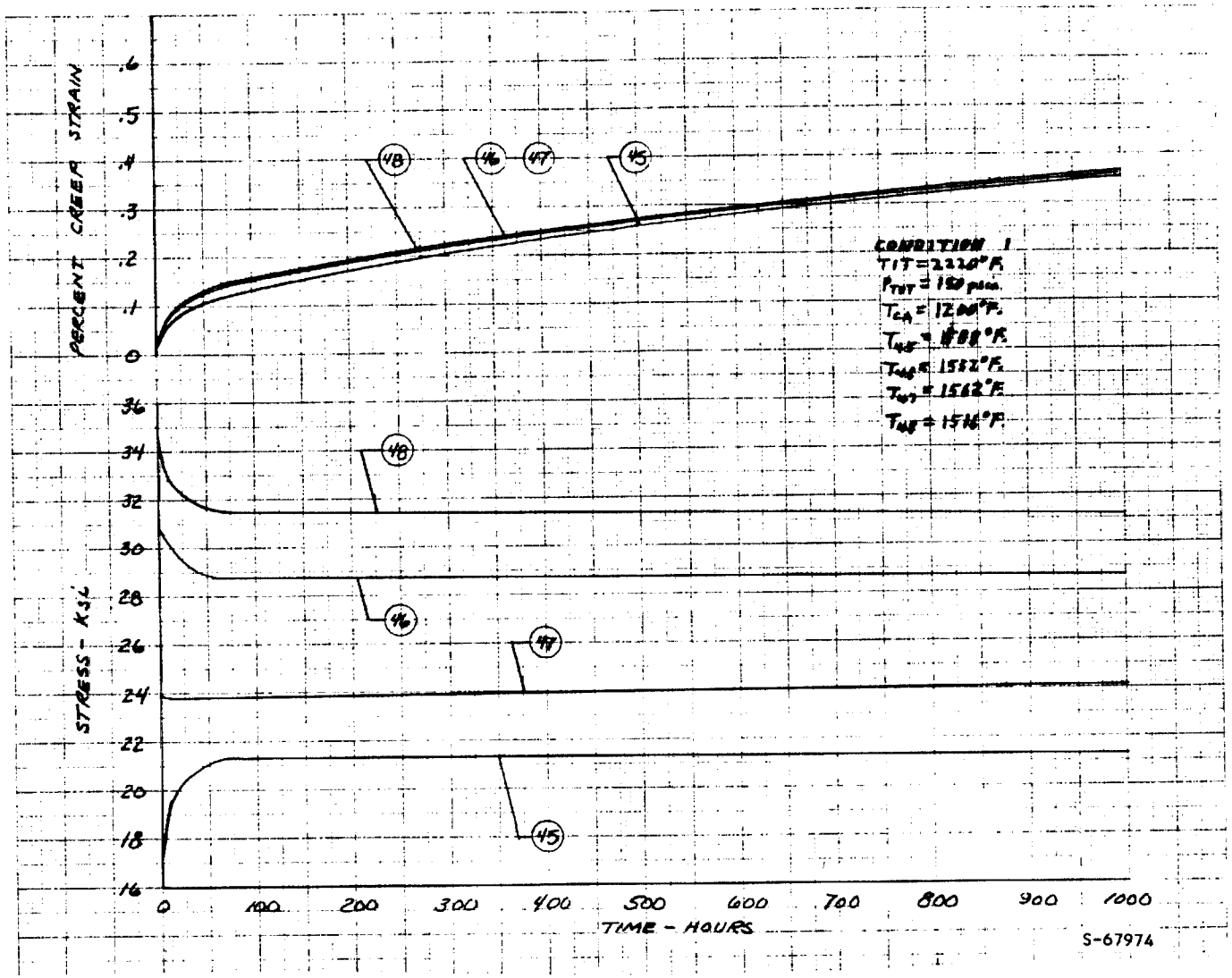

FIGURE K-5. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 1.0 INCH CHORD, CONDITION 1.

TABLE K-24

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION I

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1731.0	-18698.8	1397.2048
2	1704.0	-10291.2	43144.5160
3	1705.0	-10579.6	38227.9920
4	1680.0	-2384.2	10 YRS PLUS
5	1619.0	19386.1	19497.2230
6	1599.0	25795.5	6762.1752
7	1607.0	25923.4	5318.6591
8	1589.0	31469.9	2553.2342
9	1637.0	20330.5	8755.1402
10	1619.0	26628.2	3332.9955
11	1647.0	22530.6	3881.1538
12	1624.0	30754.7	1204.5024
13	1652.0	25440.1	1840.1106
14	1630.0	33747.8	544.0775
15	1661.0	25841.4	1346.7382
16	1642.0	32971.5	476.1964
17	1678.0	21936.7	1999.9545
18	1664.0	27097.8	958.1250
19	1691.0	18329.2	4253.8323
20	1678.0	23011.9	1596.2167
21	1723.0	8376.0	10 YRS PLUS
22	1707.0	13918.6	12118.0546
23	1748.0	421.1	10 YRS PLUS
24	1738.0	3788.5	10 YRS PLUS
25	1722.0	-14999.3	5818.1799
26	1696.0	-6781.3	10 YRS PLUS
27	1682.0	191.2	10 YRS PLUS
28	1660.0	6992.8	10 YRS PLUS
29	1665.0	8898.5	10 YRS PLUS
30	1643.0	15718.4	35630.5970
31	1663.0	12989.7	52217.6140
32	1641.0	19610.1	10061.5360
33	1661.0	16309.3	18086.4280
34	1633.0	24550.4	3620.9191
35	1706.0	6565.4	10 YRS PLUS
36	1678.0	14590.9	20554.3440
37	1730.0	4269.5	10 YRS PLUS
38	1698.0	15248.2	9849.8772
39	1716.0	15620.4	5521.8451
40	1686.0	23720.8	1127.8909
41	1713.0	17727.7	2986.2227
42	1689.0	24070.0	973.7279
43	1709.0	18363.8	2677.7257
44	1689.0	23757.4	1039.3699
45	1713.0	15737.9	5730.0126
46	1696.0	20284.7	1966.2336
47	1728.0	9691.0	32082.4300
48	1711.0	14320.6	9589.9958
49	1749.0	2172.6	10 YRS PLUS
50	1738.0	5121.3	10 YRS PLUS
51	1591.0	36670.1	777.1721
52	1546.0	48211.4	307.0505
53	1510.0	55067.1	247.4795
54	1486.0	58420.8	262.9226
55	1516.0	52881.2	306.1555
56	1554.0	41978.3	702.4941

TABLE K-25

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION I

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1767.0	-22000.7	231.3239
2	1742.0	-13829.7	5165.4737
3	1741.0	-13985.3	5035.3615
4	1718.0	-6415.3	10 YRS PLUS
5	1655.0	18683.9	9531.2119
6	1636.0	25059.1	3004.9257
7	1648.0	24932.9	2269.0423
8	1634.0	29914.5	1118.7179
9	1706.0	11511.6	27417.4680
10	1694.0	15926.5	8722.7280
11	1724.0	13171.6	10038.8768
12	1710.0	18600.3	2417.0586
13	1742.0	13405.8	5923.9331
14	1728.0	19057.2	1337.7514
15	1753.0	14325.7	3357.1494
16	1740.0	19661.6	822.8417
17	1774.0	11014.3	5794.0290
18	1761.0	16180.1	1524.5810
19	1785.0	9583.2	8283.3623
20	1773.0	14440.8	1992.1765
21	1804.0	4688.7	10 YRS PLUS
22	1789.0	10356.3	4953.6199
23	1822.0	-964.5	10 YRS PLUS
24	1813.0	2385.8	10 YRS PLUS
25	1763.0	-17956.4	822.8354
26	1738.0	-10344.0	17637.6370
27	1712.0	2397.6	10 YRS PLUS
28	1692.0	8457.9	10 YRS PLUS
29	1698.0	11415.5	34865.5130
30	1677.0	17710.0	7466.8874
31	1701.0	15402.8	8669.8462
32	1680.0	21457.5	2103.0657
33	1711.0	15494.8	6526.1373
34	1691.0	21199.2	1686.4363
35	1791.0	-2593.6	10 YRS PLUS
36	1770.0	2621.2	10 YRS PLUS
37	1812.0	744.2	10 YRS PLUS
38	1791.0	5876.1	10 YRS PLUS
39	1804.0	9316.3	6328.7463
40	1786.0	13489.7	1974.0457
41	1799.0	13293.2	1542.3478
42	1783.0	16956.5	705.9450
43	1796.0	14393.9	1170.0538
44	1782.0	17790.8	554.5675
45	1802.0	11321.2	2672.3024
46	1789.0	14390.4	1381.9586
47	1807.0	8173.5	13436.5125
48	1791.0	12122.2	2700.1056
49	1826.0	1023.9	10 YRS PLUS
50	1815.0	3612.6	10 YRS PLUS
51	1649.0	33443.6	362.1818
52	1602.0	46701.6	96.0883
53	1564.0	52312.0	98.5049
54	1534.0	56316.9	107.9262
55	1564.0	50790.4	126.6099
56	1602.0	41191.9	234.4858

TABLE K-26

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 23183 RPM, TIT = 2400°F,
WCA = 0.02482 LB/SEC/BLADE (4.79% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 150 PSIA, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1619.0	-38462.7	259.6093
2	1573.0	-25083.3	15961.3349
3	1587.0	-28814.6	4814.6207
4	1542.0	-16243.7	10 YRS PLUS
5	1465.0	5737.6	10 YRS PLUS
6	1412.0	20247.4	10 YRS PLUS
7	1440.0	14733.9	10 YRS PLUS
8	1378.0	31740.7	10 YRS PLUS
9	1424.0	22500.7	10 YRS PLUS
10	1363.0	39270.8	10 YRS PLUS
11	1418.0	28729.6	10 YRS PLUS
12	1346.0	49018.7	81785.3200
13	1423.0	31966.3	10 YRS PLUS
14	1342.0	55243.2	29316.5580
15	1421.0	35758.0	10 YRS PLUS
16	1353.0	55374.1	20332.6240
17	1419.0	37940.7	71480.1650
18	1367.0	53048.9	20251.8360
19	1425.0	36583.4	82280.1580
20	1386.0	47797.7	29427.8860
21	1486.0	19571.9	10 YRS PLUS
22	1434.0	34311.1	10 YRS PLUS
23	1523.0	8859.9	10 YRS PLUS
24	1489.0	18587.1	10 YRS PLUS
25	1554.0	-478.0	10 YRS PLUS
26	1532.0	5883.5	10 YRS PLUS
27	1581.0	-8812.7	10 YRS PLUS
28	1562.0	-3456.3	10 YRS PLUS
29	1611.0	-34961.8	676.2335
30	1566.0	-16269.0	10 YRS PLUS
31	1543.0	-13482.6	10 YRS PLUS
32	1503.0	-2698.0	10 YRS PLUS
33	1497.0	2524.0	10 YRS PLUS
34	1457.0	12945.2	10 YRS PLUS
35	1499.0	7186.4	10 YRS PLUS
36	1452.0	18983.2	10 YRS PLUS
37	1469.0	18701.5	10 YRS PLUS
38	1409.0	33183.6	10 YRS PLUS
39	1459.0	24811.2	10 YRS PLUS
40	1388.0	42068.6	77947.2610
41	1517.0	15088.1	10 YRS PLUS
42	1429.0	36415.0	75839.3700
43	1549.0	12773.9	10 YRS PLUS
44	1444.0	37803.6	34823.5420
45	1537.0	17513.8	10 YRS PLUS
46	1441.0	40200.1	21894.6370
47	1493.0	27594.0	10 YRS PLUS
48	1414.0	46249.4	16709.6500
49	1498.0	23147.8	10 YRS PLUS
50	1455.0	33343.3	71525.6980
51	1498.0	20347.8	10 YRS PLUS
52	1455.0	30868.2	10 YRS PLUS
53	1532.0	9452.7	10 YRS PLUS
54	1501.0	17081.4	10 YRS PLUS
55	1560.0	227.6	10 YRS PLUS
56	1537.0	5876.8	10 YRS PLUS
57	1580.0	-6830.0	10 YRS PLUS
58	1563.0	-2627.2	10 YRS PLUS
59	1327.0	53530.6	64781.3490
60	1251.0	72830.6	16082.8818
61	1189.0	80956.1	22644.2310
62	1165.0	82466.6	37215.4270
63	1221.0	75355.9	25479.8470
64	1291.0	55527.9	10 YRS PLUS

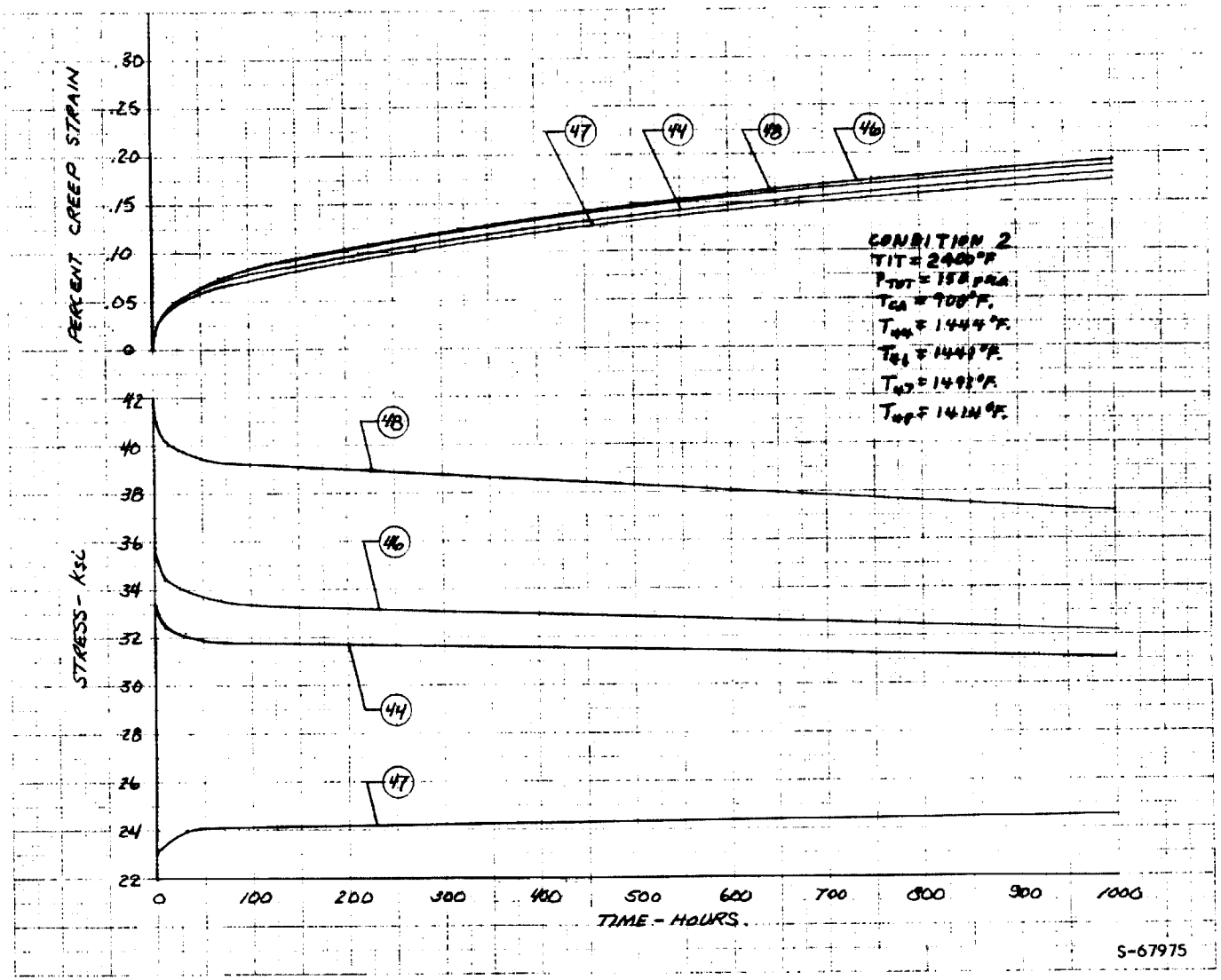

FIGURE K-6. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 1.0 INCH CHORD, CONDITION 2.

TABLE K-27

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1707.0	-33260.1	93.6753
2	1664.0	-23003.1	2274.2288
3	1669.0	-24604.2	1430.6347
4	1627.0	-11056.2	10 YRS PLUS
5	1533.0	19379.0	10 YRS PLUS
6	1500.0	28466.5	58663.2420
7	1518.0	27484.7	43614.9210
8	1486.0	36544.3	13746.9754
9	1564.0	20824.0	53756.6300
10	1534.0	29883.2	16131.8263
11	1580.0	24354.4	15473.6517
12	1541.0	36356.8	3111.5866
13	1587.0	28871.5	4755.0333
14	1549.0	41181.8	914.1091
15	1599.0	30043.1	2681.3457
16	1569.0	39853.6	681.0462
17	1625.0	23686.5	5369.0650
18	1602.0	32032.4	1608.3890
19	1642.0	18621.1	13698.6038
20	1622.0	25783.5	3697.8357
21	1683.0	5556.1	10 YRS PLUS
22	1657.0	14497.8	36955.6900
23	1721.0	-6753.7	10 YRS PLUS
24	1705.0	-1406.6	10 YRS PLUS
25	1693.0	-30375.7	237.3481
26	1650.0	-17014.9	19074.6990
27	1628.0	-6118.7	10 YRS PLUS
28	1592.0	4593.3	10 YRS PLUS
29	1603.0	6820.7	10 YRS PLUS
30	1565.0	17096.4	10 YRS PLUS
31	1602.0	12396.6	10 YRS PLUS
32	1566.0	21751.9	40448.3370
33	1602.0	16472.2	84529.9770
34	1556.0	28071.7	13136.7895
35	1672.0	1255.7	10 YRS PLUS
36	1626.0	14367.5	10 YRS PLUS
37	1708.0	-2515.9	10 YRS PLUS
38	1656.0	15221.7	29754.3700
39	1685.0	14707.4	16472.8680
40	1637.0	27703.2	1663.7878
41	1681.0	17060.6	8361.6499
42	1640.0	28082.7	1421.4385
43	1673.0	18113.5	7235.1490
44	1640.0	27084.6	1759.0941
45	1677.0	14258.6	23569.6590
46	1649.0	21813.6	4293.2934
47	1692.0	7156.7	10 YRS PLUS
48	1663.0	15158.2	25239.9150
49	1723.0	-4218.9	10 YRS PLUS
50	1705.0	626.0	10 YRS PLUS
51	1486.0	45569.4	2384.5652
52	1416.0	62433.9	858.6708
53	1358.0	70891.7	884.0992
54	1321.0	75624.6	1029.2374
55	1370.0	67383.9	1236.7103
56	1430.0	52815.0	3267.3071

TABLE K-28

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1749.0	-31566.9	50.4826
2	1708.0	-26829.3	346.0380
3	1709.0	-28018.8	264.2038
4	1670.0	-15325.8	19841.5530
5	1574.0	21824.2	31856.1020
6	1543.0	30810.6	10203.4786
7	1565.0	30510.8	5980.5123
8	1541.0	37861.0	2221.2646
9	1654.0	11647.1	10 YRS PLUS
10	1634.0	18976.6	15011.0194
11	1681.0	14425.1	20080.4060
12	1659.0	23006.9	2579.8779
13	1708.0	14802.5	8836.9934
14	1686.0	23754.9	1119.8670
15	1724.0	16172.6	3775.4823
16	1703.0	24807.9	593.2213
17	1756.0	10680.8	10058.1901
18	1735.0	19028.3	1139.4411
19	1772.0	8171.5	32157.7280
20	1752.0	16186.5	1890.5169
21	1794.0	2611.1	10 YRS PLUS
22	1769.0	11791.3	5111.2802
23	1821.0	-5817.3	51849.7830
24	1807.0	-667.9	10 YRS PLUS
25	1742.0	-29504.4	90.0602
26	1701.0	-21009.7	1369.4912
27	1661.0	-1144.8	10 YRS PLUS
28	1628.0	8806.2	10 YRS PLUS
29	1640.0	12721.5	10 YRS PLUS
30	1604.0	23465.5	9821.7671
31	1646.0	18577.2	12510.7217
32	1611.0	28633.9	2661.3616
33	1665.0	17655.9	10371.2693
34	1629.0	28002.3	1914.8952
35	1786.0	-9358.0	9525.0659
36	1753.0	-1329.9	10 YRS PLUS
37	1818.0	-4282.2	10 YRS PLUS
38	1784.0	3916.2	10 YRS PLUS
39	1805.0	8498.5	11157.2544
40	1775.0	15602.5	1311.6223
41	1797.0	14151.6	1233.6081
42	1770.0	20591.8	300.6820
43	1791.0	15687.2	874.7113
44	1768.0	21428.1	253.6508
45	1799.0	10763.6	3422.0906
46	1778.0	15717.8	1177.3295
47	1799.0	8070.4	17628.0930
48	1772.0	14600.3	1939.4069
49	1828.0	-3014.3	10 YRS PLUS
50	1810.0	1245.6	10 YRS PLUS
51	1561.0	45920.5	305.2629
52	1487.0	59580.1	209.8829
53	1427.0	68422.6	204.0138
54	1383.0	74058.4	234.2538
55	1430.0	65268.8	340.5101
56	1490.0	53238.8	574.3318

TABLE K-29

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 23800 RPM, TIT = 2600°F,
WCA = 0.028265 LB/SEC/BLADE (5.65% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1586.0	-50705.2	74.2750
2	1518.0	-38911.5	3270.7240
3	1543.0	-45654.1	508.1802
4	1476.0	-27269.8	10 YRS PLUS
5	1376.0	288.6	10 YRS PLUS
6	1296.0	21214.7	10 YRS PLUS
7	1351.0	9814.1	10 YRS PLUS
8	1257.0	35209.5	10 YRS PLUS
9	1332.0	19528.3	10 YRS PLUS
10	1243.0	44031.3	10 YRS PLUS
11	1325.0	27659.4	10 YRS PLUS
12	1220.0	57510.9	10 YRS PLUS
13	1332.0	31849.1	10 YRS PLUS
14	1214.0	66102.2	10 YRS PLUS
15	1327.0	37220.2	10 YRS PLUS
16	1227.0	66375.8	10 YRS PLUS
17	1323.0	39975.3	10 YRS PLUS
18	1247.0	62295.1	10 YRS PLUS
19	1326.0	38770.7	10 YRS PLUS
20	1269.0	55333.5	10 YRS PLUS
21	1394.0	19443.1	10 YRS PLUS
22	1315.0	41185.7	10 YRS PLUS
23	1441.0	5790.1	10 YRS PLUS
24	1389.0	20115.1	10 YRS PLUS
25	1483.0	-6933.0	10 YRS PLUS
26	1449.0	2612.5	10 YRS PLUS
27	1521.0	-18697.1	10 YRS PLUS
28	1492.0	-10716.5	10 YRS PLUS
29	1574.0	-49121.3	129.6553
30	1507.0	-25816.6	10 YRS PLUS
31	1476.0	-22540.3	10 YRS PLUS
32	1417.0	-7052.9	10 YRS PLUS
33	1414.0	-1107.3	10 YRS PLUS
34	1354.0	13589.3	10 YRS PLUS
35	1423.0	3805.8	10 YRS PLUS
36	1353.0	20547.3	10 YRS PLUS
37	1392.0	16684.6	10 YRS PLUS
38	1302.0	37851.3	10 YRS PLUS
39	1379.0	24728.4	10 YRS PLUS
40	1275.0	49809.3	10 YRS PLUS
41	1461.0	11156.0	10 YRS PLUS
42	1333.0	41479.5	10 YRS PLUS
43	1504.0	7845.0	10 YRS PLUS
44	1351.0	43673.7	10 YRS PLUS
45	1487.0	13524.1	10 YRS PLUS
46	1347.0	46098.8	10 YRS PLUS
47	1426.0	26344.9	10 YRS PLUS
48	1310.0	53626.3	10 YRS PLUS
49	1428.0	20657.3	10 YRS PLUS
50	1366.0	34974.6	10 YRS PLUS
51	1410.0	20841.2	10 YRS PLUS
52	1344.0	36569.8	10 YRS PLUS
53	1454.0	6538.6	10 YRS PLUS
54	1407.0	17878.4	10 YRS PLUS
55	1491.0	-5852.6	10 YRS PLUS
56	1456.0	2619.7	10 YRS PLUS
57	1519.0	-15795.9	10 YRS PLUS
58	1493.0	-9442.8	10 YRS PLUS
59	1185.0	66776.5	10 YRS PLUS
60	1078.0	82902.0	10 YRS PLUS
61	991.0	89640.8	10 YRS PLUS
62	964.0	90674.3	10 YRS PLUS
63	1045.0	83022.8	10 YRS PLUS
64	1148.0	64207.9	10 YRS PLUS

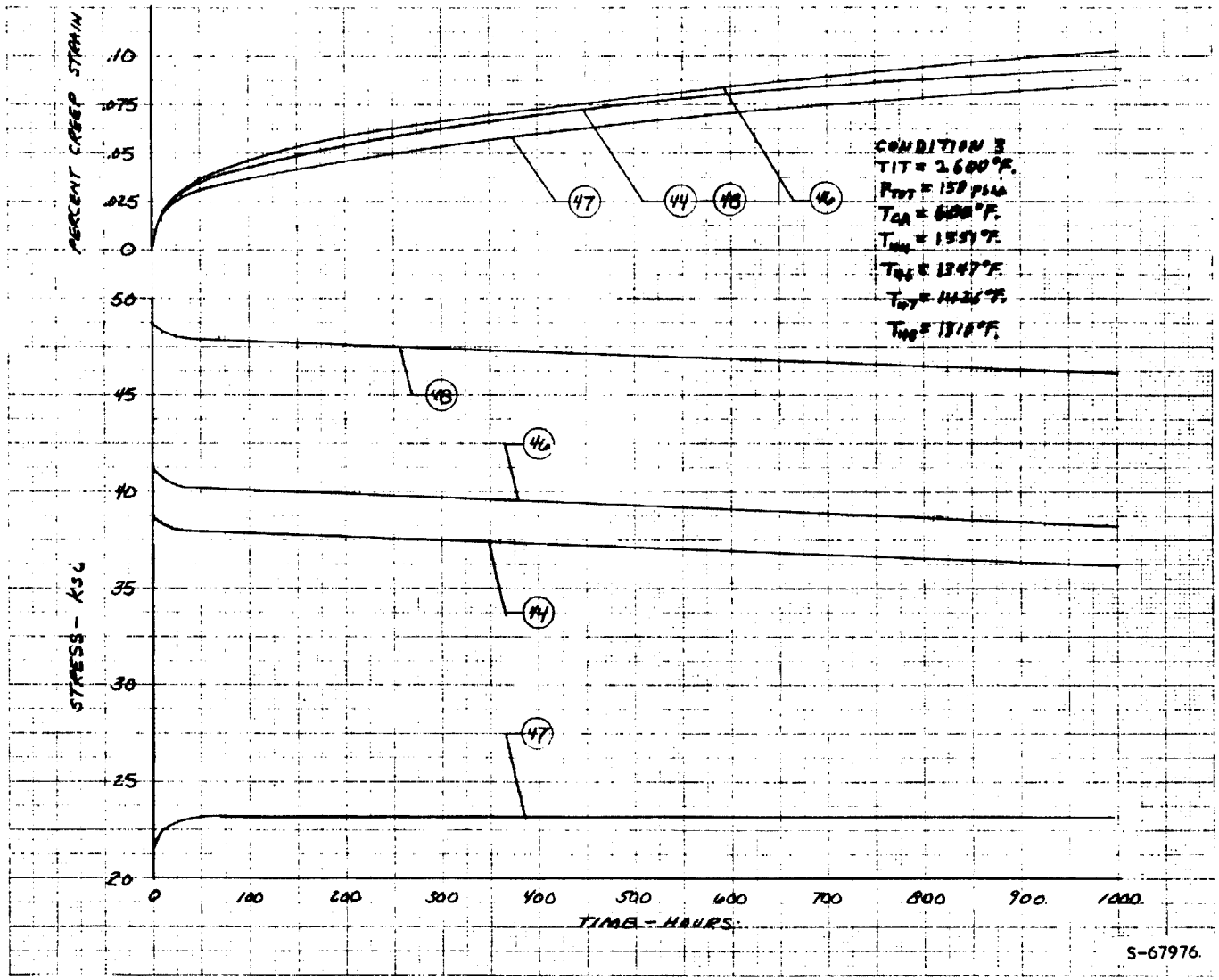

FIGURE K-7. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 1.0 INCH CHORD, CONDITION 3.

TABLE K-30

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1668.0	-41767.3	43.3604
2	1605.0	-32422.1	1367.5153
3	1617.0	-36370.6	428.6043
4	1555.0	-17967.9	10 YRS PLUS
5	1431.0	20108.1	10 YRS PLUS
6	1381.0	33414.5	10 YRS PLUS
7	1419.0	28644.4	10 YRS PLUS
8	1371.0	41866.0	10 YRS PLUS
9	1483.0	19398.1	10 YRS PLUS
10	1438.0	32612.2	10 YRS PLUS
11	1503.0	24292.1	10 YRS PLUS
12	1448.0	40856.3	15891.8861
13	1513.0	29608.9	31075.1510
14	1457.0	47207.7	4047.0705
15	1528.0	30703.7	15862.3032
16	1484.0	44679.0	2936.7751
17	1561.0	23419.4	32144.1180
18	1527.0	34056.9	7654.5125
19	1580.0	17810.8	10 YRS PLUS
20	1550.0	27102.5	19248.1610
21	1615.0	6708.5	10 YRS PLUS
22	1576.0	19026.7	72033.4740
23	1664.0	-9748.5	10 YRS PLUS
24	1640.0	-1715.4	10 YRS PLUS
25	1647.0	-40250.0	90.6086
26	1585.0	-24193.7	13988.1112
27	1556.0	-10434.1	10 YRS PLUS
28	1503.0	3564.1	10 YRS PLUS
29	1523.0	5535.9	10 YRS PLUS
30	1468.0	19828.9	10 YRS PLUS
31	1526.0	11829.2	10 YRS PLUS
32	1473.0	25138.4	10 YRS PLUS
33	1533.0	15427.2	10 YRS PLUS
34	1467.0	31547.4	76064.4020
35	1628.0	-2480.5	10 YRS PLUS
36	1561.0	14955.5	10 YRS PLUS
37	1676.0	-8049.0	10 YRS PLUS
38	1602.0	17178.3	66248.7170
39	1644.0	14812.5	47123.5800
40	1575.0	32383.9	3024.5440
41	1637.0	17343.4	24129.5930
42	1580.0	31700.1	3078.8093
43	1625.0	18190.0	24968.0650
44	1578.0	29972.8	4747.6435
45	1627.0	13081.4	10 YRS PLUS
46	1586.0	23576.5	15584.5204
47	1628.0	8788.4	10 YRS PLUS
48	1583.0	20642.4	33721.9230
49	1667.0	-6281.4	10 YRS PLUS
50	1640.0	1109.1	10 YRS PLUS
51	1368.0	55716.6	12065.8906
52	1269.0	76039.2	4651.1725
53	1189.0	85504.7	8443.3322
54	1138.0	88582.1	24578.8370
55	1206.0	82003.9	10215.1088
56	1291.0	65341.3	20625.5890

TABLE K-31

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1712.0	-39791.5	21.6499
2	1652.0	-37887.3	130.9624
3	1659.0	-39120.6	85.2610
4	1602.0	-22988.9	11493.9077
5	1474.0	22682.4	10 YRS PLUS
6	1428.0	35606.5	10 YRS PLUS
7	1465.0	33366.1	52850.5310
8	1431.0	43499.6	16445.8040
9	1586.0	11094.2	10 YRS PLUS
10	1558.0	20184.9	79772.6060
11	1622.0	15454.2	68974.0130
12	1589.0	27644.4	5897.4876
13	1658.0	15767.6	23483.5890
14	1626.0	28654.0	1797.9946
15	1679.0	17256.9	8246.9404
16	1648.0	29829.1	800.8177
17	1721.0	9467.0	45496.0070
18	1691.0	21350.8	1633.9794
19	1740.0	5918.9	10 YRS PLUS
20	1711.0	17471.4	3413.8026
21	1756.0	1811.8	10 YRS PLUS
22	1719.0	15498.7	5329.2219
23	1791.0	-8747.5	13136.5374
24	1770.0	-1709.1	10 YRS PLUS
25	1702.0	-37802.8	41.0449
26	1643.0	-29798.0	913.8296
27	1589.0	-2976.7	10 YRS PLUS
28	1540.0	9808.3	10 YRS PLUS
29	1562.0	14364.6	10 YRS PLUS
30	1509.0	27773.9	52923.9610
31	1573.0	21896.4	32235.4270
32	1521.0	34469.2	8236.1097
33	1604.0	20176.3	22292.1730
34	1552.0	32941.2	4956.0487
35	1767.0	-16106.1	1351.9702
36	1720.0	-4651.6	10 YRS PLUS
37	1808.0	-8290.8	12047.2322
38	1759.0	3027.7	10 YRS PLUS
39	1790.0	8036.6	22586.6980
40	1747.0	18215.6	1109.5526
41	1778.0	15084.7	1439.9213
42	1740.0	24290.7	272.8917
43	1768.0	16791.4	1060.5020
44	1735.0	25177.6	256.1028
45	1777.0	9552.9	10313.2322
46	1747.0	16750.5	1779.6095
47	1763.0	9439.8	15878.4732
48	1723.0	19483.1	1315.3373
49	1800.0	-4364.5	10 YRS PLUS
50	1774.0	1123.5	10 YRS PLUS
51	1456.0	55859.0	922.0203
52	1352.0	73389.9	644.7721
53	1269.0	83325.2	1036.4047
54	1208.0	88498.7	2370.0552
55	1274.0	79580.7	1921.6539
56	1358.0	65216.9	2684.7689

TABLE K-32

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 22774 RPM, TIT = 2300°F,
WCA = 0.0761 LB/SEC/BLADE (4.805% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 450 PSIA, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1546.0	-25813.5	28704.0020
2	1464.0	-3354.4	10 YRS PLUS
3	1527.0	-20556.3	10 YRS PLUS
4	1447.0	1425.4	10 YRS PLUS
5	1457.0	849.4	10 YRS PLUS
6	1352.0	29073.5	10 YRS PLUS
7	1488.0	-3809.1	10 YRS PLUS
8	1376.0	27014.7	10 YRS PLUS
9	1474.0	4697.9	10 YRS PLUS
10	1366.0	34549.8	10 YRS PLUS
11	1471.0	11323.4	10 YRS PLUS
12	1346.0	46658.1	10 YRS PLUS
13	1475.0	15278.1	10 YRS PLUS
14	1336.0	55216.1	35565.9710
15	1465.0	20688.3	10 YRS PLUS
16	1343.0	55581.3	26690.1210
17	1452.0	24227.1	10 YRS PLUS
18	1357.0	51394.9	37344.5290
19	1436.0	26175.8	10 YRS PLUS
20	1362.0	47096.8	70282.5900
21	1440.0	21651.0	10 YRS PLUS
22	1325.0	53256.6	72695.1210
23	1453.0	15759.0	10 YRS PLUS
24	1371.0	38033.3	10 YRS PLUS
25	1465.0	9949.1	10 YRS PLUS
26	1409.0	25218.7	10 YRS PLUS
27	1491.0	548.2	10 YRS PLUS
28	1442.0	13718.6	10 YRS PLUS
29	1539.0	-21440.8	10 YRS PLUS
30	1459.0	10521.8	10 YRS PLUS
31	1513.0	-9360.3	10 YRS PLUS
32	1433.0	11693.7	10 YRS PLUS
33	1486.0	3759.8	10 YRS PLUS
34	1406.0	24259.0	10 YRS PLUS
35	1517.0	3423.2	10 YRS PLUS
36	1425.0	26469.6	10 YRS PLUS
37	1524.0	6807.7	10 YRS PLUS
38	1420.0	32103.0	10 YRS PLUS
39	1499.0	18337.0	10 YRS PLUS
40	1375.0	48594.8	35682.4930
41	1564.0	8433.7	10 YRS PLUS
42	1417.0	44085.0	22462.1900
43	1594.0	7254.9	10 YRS PLUS
44	1421.0	48686.4	8809.6933
45	1578.0	10489.6	10 YRS PLUS
46	1416.0	49143.2	9407.5472
47	1527.0	18614.9	10 YRS PLUS
48	1390.0	51456.8	13460.4786
49	1515.0	14092.4	10 YRS PLUS
50	1435.0	33409.5	10 YRS PLUS
51	1446.0	25947.2	10 YRS PLUS
52	1347.0	50537.9	59837.9010
53	1463.0	17544.7	10 YRS PLUS
54	1388.0	36135.5	10 YRS PLUS
55	1474.0	10949.5	10 YRS PLUS
56	1416.0	25356.6	10 YRS PLUS
57	1489.0	3631.9	10 YRS PLUS
58	1444.0	14898.0	10 YRS PLUS
59	1283.0	66370.2	21616.1950
60	1166.0	84566.9	22629.5290
61	1079.0	90371.7	10 YRS PLUS
62	1062.0	90591.7	10 YRS PLUS
63	1140.0	83600.8	69881.5790
64	1246.0	62904.4	10 YRS PLUS

TABLE K-33

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1620.0	-30195.7	1504.9817
2	1540.0	-7253.1	10 YRS PLUS
3	1586.0	-20771.8	29675.3530
4	1509.0	1331.5	10 YRS PLUS
5	1497.0	9735.6	10 YRS PLUS
6	1426.0	28971.7	10 YRS PLUS
7	1527.0	7285.2	10 YRS PLUS
8	1461.0	25827.8	10 YRS PLUS
9	1564.0	4785.8	10 YRS PLUS
10	1500.0	23672.9	10 YRS PLUS
11	1577.0	10889.7	10 YRS PLUS
12	1499.0	34299.6	15891.2666
13	1580.0	16483.4	10 YRS PLUS
14	1502.0	40632.9	3561.1610
15	1588.0	16970.4	10 YRS PLUS
16	1525.0	36522.0	4635.9841
17	1605.0	11180.2	10 YRS PLUS
18	1557.0	26074.4	19923.4840
19	1608.0	7008.7	10 YRS PLUS
20	1564.0	20573.1	58715.4690
21	1563.0	16191.9	10 YRS PLUS
22	1493.0	36232.0	12101.1677
23	1587.0	6583.8	10 YRS PLUS
24	1542.0	19570.8	10 YRS PLUS
25	1603.0	-21320.3	16081.0375
26	1524.0	752.5	10 YRS PLUS
27	1582.0	-7533.0	10 YRS PLUS
28	1506.0	12490.9	10 YRS PLUS
29	1575.0	2179.1	10 YRS PLUS
30	1496.0	22800.0	10 YRS PLUS
31	1592.0	5145.5	10 YRS PLUS
32	1515.0	24804.4	87364.2940
33	1622.0	1958.8	10 YRS PLUS
34	1534.0	24751.6	51148.8150
35	1676.0	-5697.7	10 YRS PLUS
36	1585.0	19620.8	45534.4380
37	1710.0	-9005.8	85919.1340
38	1610.0	25080.3	5898.3651
39	1679.0	11743.6	51640.0800
40	1584.0	37599.8	759.1714
41	1671.0	10973.6	82686.5570
42	1591.0	32789.9	1815.2349
43	1654.0	10337.3	10 YRS PLUS
44	1587.0	28534.7	5119.1006
45	1646.0	5095.9	10 YRS PLUS
46	1586.0	21318.1	25565.3300
47	1578.0	18923.9	70586.9370
48	1500.0	38245.7	6262.4400
49	1592.0	10188.5	10 YRS PLUS
50	1542.0	22708.9	64386.7680
51	1407.0	56059.0	3563.8697
52	1290.0	77606.3	1758.5727
53	1203.0	87664.9	3334.4362
54	1180.0	88385.3	6089.5935
55	1255.0	78685.6	4190.6858
56	1356.0	55913.9	16785.4270

TABLE K-34

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1650.0	-37371.9	153.3500
2	1572.0	-13193.4	10 YRS PLUS
3	1613.0	-27484.8	3239.3114
4	1540.0	-5707.0	10 YRS PLUS
5	1525.0	8312.8	10 YRS PLUS
6	1457.0	27365.4	10 YRS PLUS
7	1532.0	13991.1	10 YRS PLUS
8	1481.0	28966.8	10 YRS PLUS
9	1624.0	-2819.8	10 YRS PLUS
10	1580.0	11723.7	10 YRS PLUS
11	1643.0	4033.1	10 YRS PLUS
12	1592.0	22042.9	18513.9950
13	1669.0	4673.3	10 YRS PLUS
14	1619.0	23226.1	6942.3380
15	1684.0	4887.0	10 YRS PLUS
16	1637.0	22382.3	5190.6684
17	1712.0	-2006.5	10 YRS PLUS
18	1666.0	14721.0	26991.1390
19	1714.0	-4533.8	10 YRS PLUS
20	1670.0	11564.6	69723.2780
21	1653.0	11982.7	10 YRS PLUS
22	1582.0	35948.9	1148.6407
23	1665.0	6183.2	10 YRS PLUS
24	1623.0	20343.8	12624.6159
25	1646.0	-28595.3	1094.8835
26	1570.0	-6287.9	10 YRS PLUS
27	1598.0	-2413.9	10 YRS PLUS
28	1527.0	16035.8	10 YRS PLUS
29	1598.0	7232.8	10 YRS PLUS
30	1521.0	26920.8	45473.0110
31	1617.0	11313.1	10 YRS PLUS
32	1541.0	30836.3	10721.0225
33	1659.0	4567.0	10 YRS PLUS
34	1587.0	24689.8	11884.1094
35	1771.0	-16871.2	962.7137
36	1703.0	521.0	10 YRS PLUS
37	1791.0	-5651.4	10 YRS PLUS
38	1720.0	12228.1	15118.4162
39	1773.0	6940.0	77353.7460
40	1710.0	23368.9	674.3480
41	1761.0	10446.4	9574.1513
42	1704.0	25532.8	498.2661
43	1747.0	9311.6	26155.3230
44	1698.0	22567.8	1066.9073
45	1744.0	1351.0	10 YRS PLUS
46	1697.0	13710.9	16782.1760
47	1661.0	19726.6	5745.8099
48	1586.0	40303.7	405.5050
49	1681.0	8608.1	10 YRS PLUS
50	1628.0	22958.4	5803.8087
51	1462.0	55240.6	870.3662
52	1338.0	76128.0	564.5030
53	1248.0	86435.5	1035.7119
54	1215.0	88400.8	1932.6780
55	1286.0	78133.2	1785.5526
56	1385.0	56771.1	5981.3629

TABLE K-35

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 22700 RPM, TIT = 2320°F,
WCA = 0.00796 LB/SEC/BLADE (4.54% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 50 PSIA, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1588.0	-34102.9	1472.8516
2	1565.0	-27738.9	11048.4071
3	1551.0	-23794.0	39146.1700
4	1529.0	-17765.9	10 YRS PLUS
5	1427.0	9807.1	10 YRS PLUS
6	1404.0	15960.0	10 YRS PLUS
7	1374.0	24419.8	10 YRS PLUS
8	1346.0	31897.2	10 YRS PLUS
9	1343.0	34072.7	10 YRS PLUS
10	1315.0	41659.2	10 YRS PLUS
11	1332.0	39341.3	10 YRS PLUS
12	1299.0	48484.9	10 YRS PLUS
13	1337.0	40622.3	10 YRS PLUS
14	1300.0	51063.4	10 YRS PLUS
15	1345.0	40685.5	10 YRS PLUS
16	1313.0	49746.1	10 YRS PLUS
17	1350.0	40912.5	10 YRS PLUS
18	1327.0	47527.8	10 YRS PLUS
19	1370.0	36676.9	10 YRS PLUS
20	1352.0	41771.6	10 YRS PLUS
21	1432.0	20929.7	10 YRS PLUS
22	1410.0	27091.0	10 YRS PLUS
23	1469.0	11276.1	10 YRS PLUS
24	1455.0	15238.7	10 YRS PLUS
25	1502.0	2502.2	10 YRS PLUS
26	1493.0	5086.8	10 YRS PLUS
27	1525.0	-3737.2	10 YRS PLUS
28	1518.0	-1759.9	10 YRS PLUS
29	1583.0	-32537.9	2366.0681
30	1561.0	-24437.3	25646.2020
31	1510.0	-12121.0	10 YRS PLUS
32	1493.0	-7509.6	10 YRS PLUS
33	1451.0	4859.2	10 YRS PLUS
34	1435.0	9054.0	10 YRS PLUS
35	1424.0	14031.2	10 YRS PLUS
36	1404.0	19048.3	10 YRS PLUS
37	1386.0	25327.9	10 YRS PLUS
38	1358.0	32071.4	10 YRS PLUS
39	1378.0	28950.0	10 YRS PLUS
40	1344.0	37295.9	10 YRS PLUS
41	1415.0	22190.5	10 YRS PLUS
42	1372.0	32570.2	10 YRS PLUS
43	1444.0	18121.5	10 YRS PLUS
44	1391.0	30750.9	10 YRS PLUS
45	1439.0	21210.4	10 YRS PLUS
46	1393.0	32021.3	10 YRS PLUS
47	1413.0	28313.0	10 YRS PLUS
48	1375.0	37242.5	10 YRS PLUS
49	1423.0	25432.2	10 YRS PLUS
50	1404.0	29868.9	10 YRS PLUS
51	1442.0	20024.3	10 YRS PLUS
52	1424.0	24348.2	10 YRS PLUS
53	1475.0	11001.4	10 YRS PLUS
54	1462.0	14128.2	10 YRS PLUS
55	1505.0	2731.1	10 YRS PLUS
56	1495.0	5139.4	10 YRS PLUS
57	1524.0	-2736.7	10 YRS PLUS
58	1518.0	-1310.0	10 YRS PLUS
59	1319.0	41783.1	10 YRS PLUS
60	1281.0	51368.5	10 YRS PLUS
61	1248.0	59581.1	10 YRS PLUS
62	1239.0	61258.1	10 YRS PLUS
63	1271.0	52212.8	10 YRS PLUS
64	1309.0	41820.1	10 YRS PLUS

TABLE K-36

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1696.0	-27976.9	363.8496
2	1676.0	-21762.8	2181.2157
3	1661.0	-16852.6	15072.3973
4	1642.0	-10728.4	10 YRS PLUS
5	1536.0	21794.6	10 YRS PLUS
6	1522.0	25569.8	59985.4770
7	1507.0	31743.5	22687.7440
8	1493.0	35577.4	14063.8706
9	1534.0	27703.2	26337.6360
10	1523.0	30939.3	17308.2280
11	1546.0	29182.7	13516.6365
12	1531.0	33723.7	7387.8545
13	1556.0	31048.7	6775.2558
14	1541.0	35916.3	3434.3971
15	1568.0	31850.6	4101.1958
16	1557.0	35526.2	2436.7943
17	1596.0	26911.6	5743.0283
18	1587.0	29828.1	3856.0931
19	1619.0	21816.6	9408.8022
20	1611.0	24704.0	6232.1803
21	1671.0	6853.0	10 YRS PLUS
22	1661.0	10344.8	10 YRS PLUS
23	1704.0	-2665.5	10 YRS PLUS
24	1699.0	-932.1	10 YRS PLUS
25	1687.0	-25039.1	835.5130
26	1668.0	-19019.8	6079.4694
27	1619.0	-2623.4	10 YRS PLUS
28	1604.0	2085.4	10 YRS PLUS
29	1580.0	11112.8	10 YRS PLUS
30	1565.0	15255.8	10 YRS PLUS
31	1566.0	17495.6	10 YRS PLUS
32	1551.0	21466.5	65777.0620
33	1558.0	21709.7	51111.3960
34	1540.0	26293.0	30523.4040
35	1612.0	10047.2	10 YRS PLUS
36	1594.0	15090.1	10 YRS PLUS
37	1642.0	6166.0	10 YRS PLUS
38	1620.0	13434.9	10 YRS PLUS
39	1633.0	15747.6	46219.2630
40	1613.0	21050.6	13027.9981
41	1633.0	18757.3	16609.5410
42	1617.0	22853.2	7932.7940
43	1635.0	19315.6	13027.6330
44	1622.0	22711.7	7165.8844
45	1646.0	16546.7	24847.8870
46	1634.0	19693.6	11764.5466
47	1676.0	7359.0	10 YRS PLUS
48	1665.0	10290.9	10 YRS PLUS
49	1705.0	-1500.0	10 YRS PLUS
50	1699.0	38.1	10 YRS PLUS
51	1510.0	33909.0	12724.6043
52	1477.0	42327.7	5354.1893
53	1449.0	49172.7	3604.2322
54	1415.0	57407.2	2224.2176
55	1440.0	50419.7	3743.0815
56	1468.0	42757.2	6414.4316

TABLE K-37

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1749.0	-27877.0	106.7641
2	1730.0	-23400.2	414.5952
3	1716.0	-19202.9	1710.8709
4	1698.0	-13214.1	19265.5830
5	1594.0	24601.5	10029.8695
6	1581.0	28394.5	6198.2958
7	1586.0	30945.4	3099.7694
8	1578.0	33526.5	2172.2485
9	1646.0	17830.3	16102.9024
10	1639.0	20537.4	7744.4506
11	1671.0	17940.5	8071.1369
12	1664.0	21039.0	3442.8237
13	1695.0	17297.6	5406.1511
14	1687.0	20938.3	1982.3775
15	1710.0	18218.1	2739.7955
16	1702.0	21902.8	1110.2387
17	1739.0	13862.4	5506.3886
18	1731.0	17424.8	2113.4486
19	1758.0	11733.9	6825.1452
20	1751.0	15006.3	2832.0660
21	1793.0	3313.3	10 YRS PLUS
22	1785.0	6662.6	69715.5900
23	1816.0	-3029.7	10 YRS PLUS
24	1811.0	-997.5	10 YRS PLUS
25	1742.0	-25504.0	203.3815
26	1724.0	-19850.8	1138.6988
27	1669.0	1132.7	10 YRS PLUS
28	1656.0	5142.4	10 YRS PLUS
29	1638.0	15400.6	45411.0180
30	1624.0	19617.7	15751.9388
31	1635.0	21319.5	6865.2037
32	1621.0	25310.0	4203.2818
33	1645.0	21507.6	5081.7151
34	1631.0	25464.9	3134.6381
35	1735.0	127.7	10 YRS PLUS
36	1723.0	2992.0	10 YRS PLUS
37	1768.0	1196.4	10 YRS PLUS
38	1755.0	3799.1	10 YRS PLUS
39	1766.0	9393.4	15240.5630
40	1755.0	11393.6	8201.3229
41	1764.0	13947.6	2898.3960
42	1754.0	15789.9	2046.1216
43	1766.0	15324.3	1777.9446
44	1757.0	17186.7	1215.1970
45	1777.0	12732.1	3117.1618
46	1769.0	14230.0	2346.1825
47	1796.0	6712.0	50888.3100
48	1787.0	8330.2	19655.1690
49	1818.0	-492.6	10 YRS PLUS
50	1813.0	198.6	10 YRS PLUS
51	1603.0	33328.5	1182.4907
52	1569.0	41970.1	476.7962
53	1540.0	48470.8	343.4522
54	1502.0	55436.6	286.7761
55	1527.0	49016.0	440.0688
56	1555.0	40653.9	852.3455

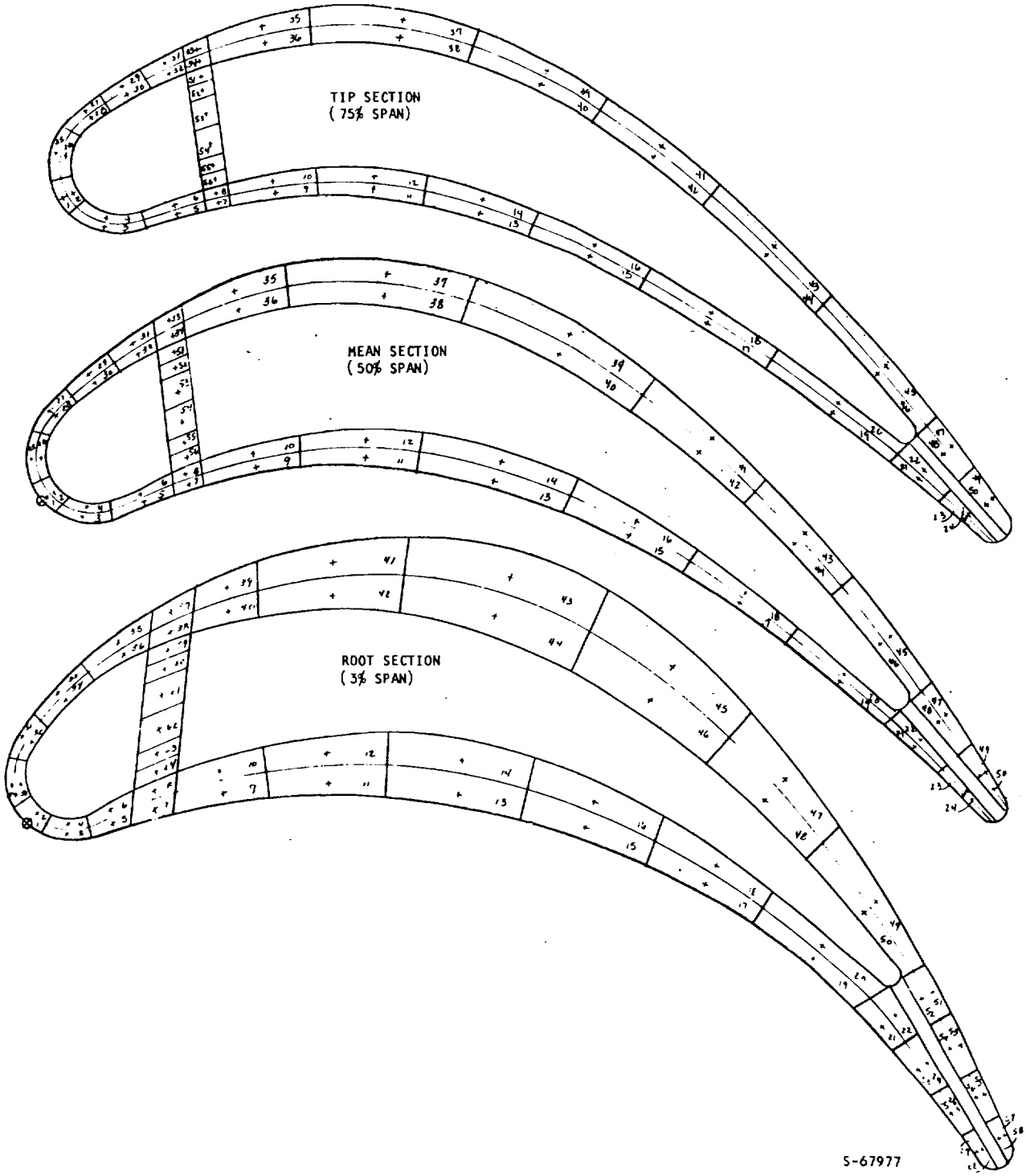

FIGURE K-8. SCHEME A-1 CONVECTION COOLED CAST TWO-CAVITY PIN FIN BLADE
1.0 INCH CHORD

TABLE K-38

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F, WCA = 0.0136 LB/SEC/BLADE (2.485% OF HOT GAS FLOW), TCA = 1200°F, PTOT = 150 PSIA, CONDITION IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1644.0	-12356.5	10 YRS PLUS
2	1627.0	-7025.4	10 YRS PLUS
3	1625.0	-6271.2	10 YRS PLUS
4	1608.0	-926.9	10 YRS PLUS
5	1561.0	12708.7	10 YRS PLUS
6	1541.0	18260.2	10 YRS PLUS
7	1533.0	21076.6	10 YRS PLUS
8	1505.0	28821.5	46791.2930
9	1512.0	27967.4	46444.5200
10	1484.0	35663.4	17835.6280
11	1505.0	31581.8	24923.1460
12	1472.0	40723.1	8138.2631
13	1508.0	32622.2	18049.5990
14	1471.0	42993.6	5654.8718
15	1511.0	33329.8	14113.5873
16	1479.0	42340.1	5049.9973
17	1510.0	34639.6	10775.0714
18	1487.0	41205.3	4902.3882
19	1519.0	32845.5	12579.6613
20	1502.0	37703.6	6703.3589
21	1567.0	20027.5	65355.9220
22	1545.0	26311.6	26409.5220
23	1590.0	13753.1	10 YRS PLUS
24	1577.0	17504.2	10 YRS PLUS
25	1609.0	8140.4	10 YRS PLUS
26	1600.0	11082.9	10 YRS PLUS
27	1623.0	3668.4	10 YRS PLUS
28	1615.0	6225.0	10 YRS PLUS
29	1643.0	-11849.3	10 YRS PLUS
30	1627.0	-5248.8	10 YRS PLUS
31	1614.0	-2203.4	10 YRS PLUS
32	1600.0	2180.9	10 YRS PLUS
33	1590.0	5963.6	10 YRS PLUS
34	1575.0	10038.1	10 YRS PLUS
35	1578.0	10857.3	10 YRS PLUS
36	1560.0	15594.1	10 YRS PLUS
37	1546.0	20674.2	10 YRS PLUS
38	1520.0	27336.9	42587.5050
39	1534.0	25081.4	47493.0960
40	1501.0	33590.7	17655.5590
41	1559.0	20356.8	72980.3040
42	1518.0	30876.4	20216.6450
43	1576.0	18291.8	10 YRS PLUS
44	1527.0	30670.7	16435.3090
45	1571.0	20868.1	43499.4730
46	1526.0	32159.6	12077.6477
47	1549.0	26955.6	20450.9060
48	1513.0	35967.5	7325.0315
49	1556.0	24724.9	27655.4850
50	1537.0	29477.0	16252.7108
51	1573.0	19689.9	62141.4190
52	1556.0	24015.1	32385.0070
53	1595.0	13378.9	10 YRS PLUS
54	1583.0	16424.3	10 YRS PLUS
55	1611.0	8291.8	10 YRS PLUS
56	1602.0	10902.4	10 YRS PLUS
57	1622.0	4531.3	10 YRS PLUS
58	1616.0	6259.2	10 YRS PLUS
59	1427.0	51298.5	4657.0158
60	1432.0	48635.6	6451.1982

TABLE K-39

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1756.0	-15551.5	2104.4932
2	1739.0	-10382.0	16985.0740
3	1734.0	-8696.5	57755.4940
4	1718.0	-3613.1	10 YRS PLUS
5	1663.0	15002.1	26596.4980
6	1649.0	19449.4	8613.2549
7	1638.0	24388.9	3293.5619
8	1622.0	29570.4	1635.8858
9	1649.0	23059.1	3294.4732
10	1635.0	27742.7	1736.1683
11	1654.0	24603.2	2088.9196
12	1636.0	30732.9	892.6667
13	1658.0	26245.7	1333.1174
14	1640.0	32604.0	541.3261
15	1665.0	26473.5	1066.1392
16	1652.0	31140.6	548.5613
17	1682.0	22562.4	1587.1885
18	1672.0	26088.4	971.3745
19	1696.0	19118.7	2889.4167
20	1687.0	22247.2	1496.8894
21	1735.0	7509.3	10 YRS PLUS
22	1724.0	11195.5	19114.2720
23	1757.0	1034.0	10 YRS PLUS
24	1751.0	3001.1	10 YRS PLUS
25	1751.0	-13789.7	4189.6599
26	1735.0	-8845.7	50346.1740
27	1722.0	-3771.8	10 YRS PLUS
28	1708.0	534.8	10 YRS PLUS
29	1706.0	2824.5	10 YRS PLUS
30	1691.0	7491.4	10 YRS PLUS
31	1696.0	7693.3	10 YRS PLUS
32	1681.0	12288.2	40857.5960
33	1681.0	13783.0	24858.6090
34	1661.0	19860.1	5494.2230
35	1706.0	8296.9	10 YRS PLUS
36	1685.0	14595.7	17095.1780
37	1723.0	6406.5	10 YRS PLUS
38	1699.0	14266.1	13271.7255
39	1711.0	14491.0	9068.9985
40	1689.0	20756.2	2003.1279
41	1710.0	16402.5	4969.7993
42	1692.0	21453.5	1560.1479
43	1708.0	17477.5	3672.2186
44	1693.0	21749.8	1430.8257
45	1715.0	15352.9	6180.3895
46	1702.0	19030.1	2560.7273
47	1739.0	7715.5	10 YRS PLUS
48	1727.0	11095.9	18286.3150
49	1758.0	1763.1	10 YRS PLUS
50	1751.0	3677.9	10 YRS PLUS
51	1564.0	48458.4	186.0088
52	1556.0	49259.7	199.6507

TABLE K-40

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1800.0	-17406.9	412.3879
2	1784.0	-12406.9	2919.1887
3	1777.0	-10451.7	6439.4119
4	1763.0	-5989.4	10 YRS PLUS
5	1707.0	14656.4	9510.4669
6	1694.0	18936.3	3226.7633
7	1689.0	22854.5	1254.8334
8	1679.0	26318.6	778.3933
9	1724.0	14849.4	5810.8389
10	1716.0	17707.9	2789.7925
11	1736.0	15797.2	3169.4048
12	1726.0	19528.4	1204.7901
13	1750.0	15416.2	2543.2444
14	1740.0	19279.9	930.9895
15	1759.0	15799.2	1807.6354
16	1750.0	19362.0	713.7093
17	1778.0	12492.4	3283.7225
18	1769.0	15955.1	1352.5196
19	1790.0	10769.9	4241.9832
20	1781.0	14232.0	1797.7031
21	1814.0	4240.3	10 YRS PLUS
22	1805.0	7800.9	18474.1560
23	1831.0	-819.8	10 YRS PLUS
24	1825.0	1363.6	10 YRS PLUS
25	1798.0	-15363.1	822.4488
26	1782.0	-10669.3	5317.9643
27	1760.0	-1527.7	10 YRS PLUS
28	1748.0	2058.5	10 YRS PLUS
29	1747.0	5165.2	10 YRS PLUS
30	1733.0	9354.5	36268.7910
31	1743.0	9348.9	28174.6570
32	1729.0	13429.9	8135.7663
33	1740.0	12262.9	9011.5581
34	1724.0	16981.8	2900.3346
35	1792.0	378.6	10 YRS PLUS
36	1778.0	4020.9	10 YRS PLUS
37	1807.0	2197.2	10 YRS PLUS
38	1791.0	6345.3	75395.1020
39	1801.0	8491.1	12371.7675
40	1787.0	11930.8	3158.1035
41	1797.0	11844.5	2553.4052
42	1785.0	14766.8	1348.6582
43	1796.0	13038.0	1794.6466
44	1786.0	15553.0	1026.6150
45	1804.0	10607.1	3189.2445
46	1794.0	13187.3	1795.3000
47	1817.0	5933.9	52692.8750
48	1806.0	8884.1	8240.4377
49	1833.0	523.9	10 YRS PLUS
50	1826.0	2186.6	10 YRS PLUS
51	1632.0	43343.9	79.4623
52	1617.0	45382.3	82.4164

TABLE K-41

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F,
WCA = 0.009485 LB/SEC/BLADE (1.733% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 150 PSIA, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1629.0	-29700.3	1329.9931
2	1611.0	-24276.9	6835.9709
3	1600.0	-21009.9	18659.7760
4	1582.0	-16093.1	10 YRS PLUS
5	1511.0	3050.3	10 YRS PLUS
6	1488.0	9235.5	10 YRS PLUS
7	1455.0	18130.9	10 YRS PLUS
8	1421.0	27137.9	10 YRS PLUS
9	1406.0	31370.9	10 YRS PLUS
10	1365.0	42125.1	10 YRS PLUS
11	1388.0	36667.8	10 YRS PLUS
12	1341.0	49180.6	10 YRS PLUS
13	1390.0	36787.3	10 YRS PLUS
14	1337.0	50962.4	75964.0440
15	1394.0	36197.0	10 YRS PLUS
16	1350.0	47933.2	10 YRS PLUS
17	1395.0	36136.1	10 YRS PLUS
18	1362.0	44934.6	10 YRS PLUS
19	1408.0	32763.9	10 YRS PLUS
20	1383.0	39373.7	10 YRS PLUS
21	1465.0	17745.4	10 YRS PLUS
22	1435.0	25738.5	10 YRS PLUS
23	1497.0	9173.2	10 YRS PLUS
24	1477.0	14545.5	10 YRS PLUS
25	1522.0	2378.0	10 YRS PLUS
26	1510.0	5629.6	10 YRS PLUS
27	1541.0	-2853.3	10 YRS PLUS
28	1530.0	110.3	10 YRS PLUS
29	1631.0	-30104.9	1158.9144
30	1613.0	-23811.5	7170.0054
31	1599.0	-20166.7	25628.7480
32	1583.0	-15849.5	10 YRS PLUS
33	1565.0	-10490.7	10 YRS PLUS
34	1549.0	-6235.3	10 YRS PLUS
35	1535.0	-1729.9	10 YRS PLUS
36	1515.0	3492.3	10 YRS PLUS
37	1472.0	15442.8	10 YRS PLUS
38	1438.0	24151.6	10 YRS PLUS
39	1437.0	25094.8	10 YRS PLUS
40	1391.0	36803.9	10 YRS PLUS
41	1464.0	18853.3	10 YRS PLUS
42	1406.0	33654.1	10 YRS PLUS
43	1485.0	14210.4	10 YRS PLUS
44	1416.0	31804.6	10 YRS PLUS
45	1478.0	16206.7	10 YRS PLUS
46	1416.0	31974.2	10 YRS PLUS
47	1449.0	23495.5	10 YRS PLUS
48	1398.0	36412.5	10 YRS PLUS
49	1460.0	20094.6	10 YRS PLUS
50	1433.0	26967.8	10 YRS PLUS
51	1475.0	15704.1	10 YRS PLUS
52	1450.0	22131.3	10 YRS PLUS
53	1503.0	8028.4	10 YRS PLUS
54	1486.0	12423.9	10 YRS PLUS
55	1525.0	1921.1	10 YRS PLUS
56	1512.0	5294.9	10 YRS PLUS
57	1540.0	-2334.0	10 YRS PLUS
58	1531.0	7.7	10 YRS PLUS
59	1313.0	56437.0	58840.7030
60	1322.0	53242.6	80260.7680

TABLE K-42

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1760.0	-24640.4	159.6568
2	1744.0	-20051.0	659.3523
3	1734.0	-17064.2	2207.5325
4	1718.0	-12247.5	15810.4782
5	1647.0	10166.7	10 YRS PLUS
6	1634.0	14233.9	75244.7600
7	1597.0	26388.9	6267.2384
8	1581.0	30792.0	3660.2771
9	1590.0	29308.1	3990.4950
10	1573.0	34038.4	2214.4888
11	1590.0	30794.6	2882.8318
12	1569.0	36686.2	1371.4315
13	1595.0	30844.0	2500.6802
14	1573.0	37115.3	1123.4328
15	1605.0	29124.7	2798.2686
16	1588.0	34212.8	1437.8099
17	1627.0	22964.5	5950.0892
18	1615.0	26903.2	3486.4077
19	1644.0	18159.7	15188.4605
20	1633.0	21744.6	6605.0437
21	1677.0	8188.3	10 YRS PLUS
22	1664.0	12366.3	62645.9970
23	1702.0	630.3	10 YRS PLUS
24	1694.0	3156.0	10 YRS PLUS
25	1758.0	-23964.0	191.6877
26	1742.0	-19341.0	869.9668
27	1727.0	-14482.5	6074.2716
28	1713.0	-10315.3	33843.4410
29	1704.0	-6868.2	10 YRS PLUS
30	1690.0	-2605.0	10 YRS PLUS
31	1682.0	633.5	10 YRS PLUS
32	1668.0	4914.5	10 YRS PLUS
33	1649.0	11494.1	10 YRS PLUS
34	1629.0	17652.4	26928.0760
35	1662.0	8530.0	10 YRS PLUS
36	1637.0	16220.3	35326.1960
37	1677.0	5525.6	10 YRS PLUS
38	1648.0	14716.1	43707.9210
39	1662.0	12289.7	67830.8610
40	1636.0	20128.8	9625.7088
41	1661.0	13452.9	47164.6230
42	1639.0	20057.1	9114.2723
43	1660.0	14055.4	39574.3250
44	1642.0	19482.1	10234.5587
45	1667.0	11990.7	65538.9470
46	1651.0	16802.2	19957.0360
47	1683.0	7000.1	10 YRS PLUS
48	1667.0	11820.0	69392.0990
49	1704.0	502.8	10 YRS PLUS
50	1694.0	3474.9	10 YRS PLUS
51	1512.0	50311.1	525.4469
52	1502.0	52404.3	480.4427

TABLE K-43

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1813.0	-20263.7	125.1643
2	1798.0	-18238.9	332.2418
3	1788.0	-15698.2	935.3470
4	1774.0	-11416.7	5096.8022
5	1706.0	12028.5	23135.1640
6	1693.0	16290.5	7934.5106
7	1673.0	24612.6	1292.2462
8	1663.0	28070.6	799.8604
9	1699.0	18998.3	2788.9089
10	1690.0	22187.0	1407.0182
11	1708.0	20185.3	1509.6529
12	1697.0	24226.3	774.5795
13	1724.0	18450.0	1797.4479
14	1713.0	22606.0	734.0752
15	1735.0	17533.3	1850.1741
16	1725.0	21368.7	708.6891
17	1759.0	11985.5	6142.2697
18	1748.0	16024.8	2194.7996
19	1771.0	9612.1	11457.9652
20	1762.0	13015.0	4102.0871
21	1786.0	5762.5	10 YRS PLUS
22	1774.0	9968.6	8190.6682
23	1802.0	1156.9	10 YRS PLUS
24	1795.0	3529.0	10 YRS PLUS
25	1811.0	-19619.1	160.2060
26	1797.0	-16869.0	523.6342
27	1773.0	-7754.6	42567.6140
28	1761.0	-4298.1	10 YRS PLUS
29	1775.0	-5963.1	10 YRS PLUS
30	1742.0	3735.2	10 YRS PLUS
31	1744.0	5831.8	10 YRS PLUS
32	1731.0	9561.4	32718.4800
33	1731.0	11569.2	14160.0594
34	1715.0	16283.1	4558.6157
35	1773.0	2120.8	10 YRS PLUS
36	1762.0	4935.5	10 YRS PLUS
37	1791.0	2303.7	10 YRS PLUS
38	1775.0	6323.0	10 YRS PLUS
39	1784.0	7903.7	28913.4790
40	1769.0	11714.7	5237.9203
41	1781.0	10335.5	6058.6886
42	1767.0	13951.6	2691.5115
43	1780.0	11008.6	5013.2019
44	1769.0	13881.7	2622.1845
45	1787.0	8526.5	17034.6970
46	1778.0	10734.8	5742.6374
47	1788.0	7602.0	32584.8150
48	1776.0	10647.2	6201.1582
49	1805.0	1972.9	10 YRS PLUS
50	1796.0	4264.3	10 YRS PLUS
51	1613.0	45839.5	84.3971
52	1594.0	48472.3	87.7589

TABLE K-44

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F,
WCA = 0.00799 LB/SEC/BLADE (1.46% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1604.0	-43613.5	150.7691
2	1584.0	-38182.2	668.1048
3	1568.0	-33875.6	2620.9871
4	1548.0	-28578.5	14636.4507
5	1457.0	-4629.4	10 YRS PLUS
6	1430.0	2354.5	10 YRS PLUS
7	1380.0	15075.5	10 YRS PLUS
8	1336.0	26111.2	10 YRS PLUS
9	1307.0	33643.1	10 YRS PLUS
10	1255.0	47158.5	10 YRS PLUS
11	1281.0	40548.9	10 YRS PLUS
12	1219.0	56854.2	10 YRS PLUS
13	1283.0	40255.5	10 YRS PLUS
14	1214.0	58428.2	10 YRS PLUS
15	1288.0	39192.0	10 YRS PLUS
16	1230.0	54428.0	10 YRS PLUS
17	1292.0	38385.7	10 YRS PLUS
18	1249.0	49647.3	10 YRS PLUS
19	1311.0	33697.8	10 YRS PLUS
20	1279.0	42000.9	10 YRS PLUS
21	1391.0	13649.4	10 YRS PLUS
22	1354.0	22904.0	10 YRS PLUS
23	1434.0	2758.6	10 YRS PLUS
24	1410.0	8956.3	10 YRS PLUS
25	1468.0	-5997.1	10 YRS PLUS
26	1454.0	-2345.0	10 YRS PLUS
27	1493.0	-12471.5	10 YRS PLUS
28	1481.0	-9323.6	10 YRS PLUS
29	1608.0	-44823.8	112.3449
30	1589.0	-39579.1	432.9076
31	1572.0	-35054.1	1817.2929
32	1554.0	-30263.9	8520.6002
33	1531.0	-24164.1	63610.5250
34	1513.0	-19405.9	10 YRS PLUS
35	1487.0	-12529.5	10 YRS PLUS
36	1464.0	-6512.6	10 YRS PLUS
37	1399.0	10321.2	10 YRS PLUS
38	1357.0	20756.5	10 YRS PLUS
39	1348.0	23094.2	10 YRS PLUS
40	1288.0	38473.9	10 YRS PLUS
41	1377.0	15992.5	10 YRS PLUS
42	1303.0	34759.8	10 YRS PLUS
43	1402.0	10097.2	10 YRS PLUS
44	1314.0	32212.2	10 YRS PLUS
45	1394.0	12392.5	10 YRS PLUS
46	1314.0	32519.8	10 YRS PLUS
47	1359.0	21345.1	10 YRS PLUS
48	1294.0	37927.2	10 YRS PLUS
49	1376.0	17301.7	10 YRS PLUS
50	1342.0	25837.0	10 YRS PLUS
51	1404.0	10472.1	10 YRS PLUS
52	1373.0	18171.1	10 YRS PLUS
53	1442.0	741.5	10 YRS PLUS
54	1421.0	6153.8	10 YRS PLUS
55	1472.0	-6994.6	10 YRS PLUS
56	1457.0	-3100.0	10 YRS PLUS
57	1493.0	-12443.1	10 YRS PLUS
58	1481.0	-9310.5	10 YRS PLUS
59	1201.0	61333.8	10 YRS PLUS
60	1214.0	57893.4	10 YRS PLUS

TABLE K-45

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1746.0	-28983.7	91.3463
2	1729.0	-26959.8	204.7804
3	1716.0	-23147.8	610.5645
4	1699.0	-18151.7	3686.8027
5	1615.0	7635.3	10 YRS PLUS
6	1601.0	11957.5	10 YRS PLUS
7	1548.0	26587.8	22829.0740
8	1530.0	31418.9	12766.1590
9	1529.0	32061.3	11357.4147
10	1508.0	37688.4	5690.6322
11	1526.0	33442.2	9041.0259
12	1500.0	40420.5	3902.4764
13	1531.0	32720.0	9261.7110
14	1505.0	39745.1	3869.0365
15	1543.0	30105.8	11947.2802
16	1523.0	35537.2	6119.5808
17	1571.0	23008.8	26656.5600
18	1556.0	27103.3	16294.0818
19	1590.0	18245.9	63899.6970
20	1577.0	21806.2	29432.8440
21	1624.0	8361.2	10 YRS PLUS
22	1608.0	13360.1	10 YRS PLUS
23	1653.0	-412.1	10 YRS PLUS
24	1643.0	2678.6	10 YRS PLUS
25	1745.0	-28957.0	93.9746
26	1728.0	-26687.6	221.6730
27	1711.0	-21688.7	931.2870
28	1696.0	-17266.9	5324.4846
29	1683.0	-13178.8	28830.1390
30	1668.0	-8641.4	10 YRS PLUS
31	1653.0	-3841.0	10 YRS PLUS
32	1637.0	1065.5	10 YRS PLUS
33	1608.0	10218.5	10 YRS PLUS
34	1582.0	17572.5	10 YRS PLUS
35	1615.0	8430.6	10 YRS PLUS
36	1584.0	17410.5	10 YRS PLUS
37	1630.0	4540.3	10 YRS PLUS
38	1596.0	14916.6	10 YRS PLUS
39	1612.0	10987.7	10 YRS PLUS
40	1580.0	20050.5	45047.3580
41	1611.0	11859.7	10 YRS PLUS
42	1585.0	19255.1	51713.9550
43	1610.0	12485.7	10 YRS PLUS
44	1589.0	18511.3	59918.7330
45	1617.0	10583.2	10 YRS PLUS
46	1599.0	16067.4	10 YRS PLUS
47	1631.0	6405.6	10 YRS PLUS
48	1612.0	12241.2	10 YRS PLUS
49	1655.0	-875.1	10 YRS PLUS
50	1643.0	2780.4	10 YRS PLUS
51	1449.0	53054.4	1827.9821
52	1437.0	56126.5	1493.8562

TABLE K-46

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1804.0	-23007.6	81.6813
2	1789.0	-22335.5	130.7579
3	1777.0	-20364.6	274.8876
4	1762.0	-15786.0	1688.6838
5	1684.0	10654.8	64910.1420
6	1671.0	14929.5	22062.6990
7	1642.0	26085.4	2068.8859
8	1632.0	29558.8	1270.1887
9	1666.0	21168.1	3183.7866
10	1655.0	25027.6	1861.3337
11	1674.0	22710.2	1879.8313
12	1661.0	27430.5	962.4500
13	1692.0	20280.5	2175.4301
14	1679.0	25125.0	999.6860
15	1705.0	18593.2	2743.4348
16	1693.0	23109.5	1077.9715
17	1732.0	11879.1	12483.8489
18	1721.0	15963.5	4355.4503
19	1746.0	8580.7	46155.7240
20	1736.0	12339.9	9718.5402
21	1755.0	6321.8	10 YRS PLUS
22	1741.0	11235.0	12253.5868
23	1772.0	1258.8	10 YRS PLUS
24	1764.0	3928.0	10 YRS PLUS
25	1803.0	-22333.3	95.4621
26	1789.0	-21831.9	144.5676
27	1762.0	-12054.1	5580.5115
28	1750.0	-8638.6	39898.9010
29	1741.0	-3415.5	10 YRS PLUS
30	1727.0	643.2	10 YRS PLUS
31	1726.0	3767.0	10 YRS PLUS
32	1712.0	7760.0	10 YRS PLUS
33	1708.0	11099.6	29800.2900
34	1692.0	15768.1	9675.1066
35	1756.0	-118.3	10 YRS PLUS
36	1738.0	4776.9	10 YRS PLUS
37	1769.0	1595.9	10 YRS PLUS
38	1751.0	6203.7	10 YRS PLUS
39	1760.0	7707.7	61421.5790
40	1744.0	11804.0	9455.5029
41	1757.0	9921.2	12938.3762
42	1742.0	13821.8	5178.6798
43	1757.0	9954.6	12623.1201
44	1745.0	13114.3	6041.3246
45	1764.0	7064.8	10 YRS PLUS
46	1753.0	9870.2	14853.6693
47	1758.0	8005.6	51899.2180
48	1743.0	11987.5	9137.2874
49	1775.0	2268.8	10 YRS PLUS
50	1765.0	4716.9	10 YRS PLUS
51	1577.0	48852.4	125.7071
52	1555.0	51164.5	149.3706

TABLE K-47

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 22774 RPM, TIT = 2300°F,
WCA = 0.02587 LB/SEC/BLADE (4.9% OF HOT GAS FLOW),
TCA = 1200°F, PTOT = 150 PSIA, CONDITION 1B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1695.0	-24808.1	720.6742
2	1666.0	-15875.2	18340.8360
3	1671.0	-17646.8	8902.6757
4	1642.0	-8506.9	10 YRS PLUS
5	1584.0	9474.3	10 YRS PLUS
6	1551.0	18949.9	10 YRS PLUS
7	1557.0	18170.1	10 YRS PLUS
8	1517.0	29688.9	27225.2890
9	1535.0	26069.5	36966.6260
10	1493.0	38097.8	7884.6833
11	1527.0	30611.7	16655.9080
12	1479.0	44592.1	3426.7602
13	1530.0	31854.8	11571.8643
14	1476.0	47742.0	2164.8890
15	1528.0	33517.8	8408.2565
16	1482.0	47021.7	2075.5055
17	1524.0	34619.2	7325.5423
18	1489.0	44946.9	2441.9407
19	1524.0	33673.7	9070.8409
20	1497.0	41584.5	3477.4657
21	1555.0	[illegible]7889.7	34246.9890
22	1517.0	34774.0	8591.9838
23	1576.0	171[illegible]6.1	10 YRS PLUS
24	1550.0	24641.5	33328.4940
25	1594.0	11192.6	10 YRS PLUS
26	1578.0	15824.0	10 YRS PLUS
27	1612.0	4795.3	10 YRS PLUS
28	1598.0	9183.9	10 YRS PLUS
29	1690.0	-22338.6	1363.2428
30	1662.0	-9620.0	10 YRS PLUS
31	1645.0	-6774.7	10 YRS PLUS
32	1620.0	913.3	10 YRS PLUS
33	1612.0	5781.0	10 YRS PLUS
34	1587.0	12875.9	10 YRS PLUS
35	1607.0	10541.3	10 YRS PLUS
36	1578.0	18230.4	10 YRS PLUS
37	1576.0	21379.	33211.8990
38	1536.0	31335.2	[illegible]9.3789
39	1560.0	27725.8	12707.9128
40	1512.0	39725.6	3204.7718
41	1597.0	20752.1	22105.0110
42	1536.0	35929.8	3921.8894
43	1618.0	17139.5	43234.1370
44	1545.0	35800.6	3163.2809
45	1609.0	19464.1	24872.2710
46	1542.0	36225.4	3119.1082
47	1576.0	26469.9	10833.8100
48	1522.0	39726.4	2438.5098
49	1575.0	23519.9	21324.9570
50	1546.0	30639.7	9759.4460
51	1562.0	24411.1	25088.6170
52	1531.0	32269.1	10251.7492
53	1581.0	17631.8	10 YRS PLUS
54	1559.0	23229.4	35457.5000
55	1598.0	11484.2	10 YRS PLUS
56	1581.0	15808.8	10 YRS PLUS
57	1611.0	6150.2	10 YRS PLUS
58	1598.0	9880.9	10 YRS PLUS
59	1405.0	64392.8	806.7877
60	1412.0	58918.1	1851.6658

TABLE K-48

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION IB

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1790.0	-22904.8	114.1196
2	1762.0	-18028.2	823.4672
3	1761.0	-18037.4	840.7818
4	1734.0	-9658.4	28172.5380
5	1662.0	14579.9	31464.6910
6	1640.0	21722.2	5527.8537
7	1636.0	25051.0	3010.1480
8	1614.0	32420.5	1085.6321
9	1650.0	23732.0	2783.1703
10	1628.0	31383.5	950.4793
11	1657.0	25671.8	1543.7787
12	1630.0	35231.2	395.7750
13	1661.0	27470.4	954.3600
14	1634.0	37352.2	227.5240
15	1669.0	26642.1	931.3872
16	1647.0	34685.0	292.1501
17	1686.0	21464.0	1807.4111
18	1670.0	27221.1	804.2758
19	1696.0	17651.7	4689.4642
20	1681.0	22929.7	1506.7996
21	1711.0	12147.6	19552.5650
22	1690.0	19267.4	3198.1899
23	1735.0	3855.9	10 YRS PLUS
24	1722.0	8179.7	10 YRS PLUS
25	1781.0	-22098.1	164.4545
26	1753.0	-14243.1	3447.4707
27	1735.0	-6406.4	10 YRS PLUS
28	1712.0	475.8	10 YRS PLUS
29	1715.0	2631.9	10 YRS PLUS
30	1691.0	9922.1	71026.7700
31	1707.0	8052.1	10 YRS PLUS
32	1684.0	14896.7	15877.3659
33	1695.0	14080.2	15644.3022
34	1663.0	23563.5	2072.2004
35	1728.0	7385.4	10 YRS PLUS
36	1694.0	17251.3	5630.5269
37	1751.0	3704.9	10 YRS PLUS
38	1712.0	16938.4	3965.1418
39	1732.0	14649.3	5078.2929
40	1697.0	24454.7	738.6695
41	1728.0	15465.3	4303.1778
42	1699.0	23520.8	854.0762
43	1721.0	15988.3	4320.3506
44	1697.0	22735.7	1055.9352
45	1722.0	13313.9	10081.6008
46	1701.0	19208.1	2475.9389
47	1717.0	12869.2	13237.0907
48	1694.0	19500.1	2678.3049
49	1737.0	5114.6	10 YRS PLUS
50	1722.0	9380.6	47296.1080
51	1527.0	56589.5	123.2692
52	1517.0	56726.7	155.7847

TABLE K-49

SCHEME A-I COMVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION IB

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1832.0	-21232.9	62.4052
2	1805.0	-19947.2	165.4706
3	1803.0	-20211.8	159.3027
4	1777.0	-13391.8	2526.9587
5	1701.0	14354.5	12244.9189
6	1681.0	21110.2	2205.6972
7	1679.0	25006.7	1024.7827
8	1663.0	30727.2	456.3824
9	1723.0	15412.9	4958.2831
10	1709.0	20572.9	1297.0444
11	1737.0	17414.4	1831.2696
12	1720.0	23898.3	475.2056
13	1755.0	16520.8	1579.0893
14	1738.0	23207.1	356.7897
15	1767.0	15918.2	1435.6385
16	1751.0	22235.1	320.2006
17	1790.0	10656.9	4396.3126
18	1774.0	16734.9	936.4429
19	1799.0	8374.4	14142.1138
20	1784.0	14105.4	1703.3482
21	1801.0	7681.2	22241.7360
22	1780.0	15191.3	1327.2404
23	1818.0	1737.3	10 YRS PLUS
24	1807.0	5772.7	76100.5710
25	1828.0	-19970.1	98.2372
26	1801.0	-17438.1	399.0554
27	1770.0	-4009.7	10 YRS PLUS
28	1749.0	2061.2	10 YRS PLUS
29	1752.0	5705.8	10 YRS PLUS
30	1729.0	12446.9	11199.3326
31	1750.0	10848.5	11071.9103
32	1727.0	17395.9	2353.6532
33	1742.0	16313.2	2314.7551
34	1726.0	20681.0	827.8167
35	1821.0	-2535.2	10 YRS PLUS
36	1796.0	4367.5	10 YRS PLUS
37	1839.0	222.7	10 YRS PLUS
38	1813.0	7145.5	24333.9750
39	1828.0	8198.0	7928.9367
40	1805.0	14441.4	933.3865
41	1821.0	11553.0	1586.1337
42	1801.0	17022.2	454.8854
43	1816.0	12037.2	1533.0394
44	1798.0	17120.0	472.7345
45	1820.0	8120.0	10172.0688
46	1803.0	12836.0	1620.4628
47	1805.0	10744.3	2982.5970
48	1783.0	16600.6	790.3653
49	1824.0	2966.9	10 YRS PLUS
50	1809.0	6918.6	31645.9430
51	1593.0	52881.3	43.9111
52	1573.0	53664.2	63.0452

TABLE K-50

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 23183 RPM, TIT = 2400°F,
WCA = 0.08304 LB/SEC/BLADE (5.33% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 450 PSIA, CONDITION 2B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1631.0	-38301.7	199.8374
2	1551.0	-15302.5	10 YRS PLUS
3	1608.0	-31728.7	1471.1635
4	1530.0	-9733.6	10 YRS PLUS
5	1524.0	-6703.4	10 YRS PLUS
6	1420.0	21908.8	10 YRS PLUS
7	1534.0	-6519.7	10 YRS PLUS
8	1416.0	26278.1	10 YRS PLUS
9	1493.0	8212.6	10 YRS PLUS
10	1370.0	42162.6	10 YRS PLUS
11	1485.0	14747.9	10 YRS PLUS
12	1343.0	54709.8	31364.3870
13	1489.0	17029.6	10 YRS PLUS
14	1332.0	61752.8	11683.9324
15	1475.0	21919.6	10 YRS PLUS
16	1338.0	60698.5	11964.3788
17	1459.0	24861.9	10 YRS PLUS
18	1350.0	55566.2	21532.6480
19	1438.0	26926.9	10 YRS PLUS
20	1353.0	50609.2	48896.9690
21	1448.0	20152.6	10 YRS PLUS
22	1319.0	55242.0	60748.2880
23	1460.0	14170.6	10 YRS PLUS
24	1366.0	39436.1	10 YRS PLUS
25	1468.0	9121.4	10 YRS PLUS
26	1404.0	26363.2	10 YRS PLUS
27	1495.0	-760.8	10 YRS PLUS
28	1438.0	14432.6	10 YRS PLUS
29	1625.0	-33930.7	593.0679
30	1547.0	-2109.7	10 YRS PLUS
31	1596.0	-20577.6	24130.5590
32	1518.0	241.3	10 YRS PLUS
33	1564.0	-6637.5	10 YRS PLUS
34	1487.0	13412.7	10 YRS PLUS
35	1589.0	-6494.0	10 YRS PLUS
36	1498.0	16708.6	10 YRS PLUS
37	1571.0	2806.6	10 YRS PLUS
38	1459.0	30633.8	10 YRS PLUS
39	1522.0	20013.3	10 YRS PLUS
40	1381.0	54972.3	9335.4376
41	1587.0	8517.1	10 YRS PLUS
42	1419.0	50038.2	7347.3270
43	1619.0	3779.8	10 YRS PLUS
44	1423.0	52573.8	4170.4116
45	1600.0	6713.7	10 YRS PLUS
46	1417.0	51488.2	6019.3200
47	1543.0	15393.5	10 YRS PLUS
48	1387.0	53673.4	9868.1058
49	1523.0	12210.6	10 YRS PLUS
50	1430.0	35159.8	10 YRS PLUS
51	1454.0	23661.6	10 YRS PLUS
52	1342.0	51830.0	55177.4270
53	1470.0	15336.7	10 YRS PLUS
54	1383.0	37192.7	10 YRS PLUS
55	1479.0	9096.6	10 YRS PLUS
56	1412.0	25967.3	10 YRS PLUS
57	1492.0	2246.1	10 YRS PLUS
58	1440.0	15423.2	10 YRS PLUS
59	1145.0	89287.3	16437.4640
60	1160.0	85492.6	22698.3210

TABLE K-51

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 2B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1714.0	-34954.4	56.1188
2	1637.0	-18770.0	14869.1373
3	1677.0	-31893.2	253.8824
4	1603.0	-8635.0	10 YRS PLUS
5	1575.0	2468.2	10 YRS PLUS
6	1506.0	21483.3	10 YRS PLUS
7	1572.0	7124.9	10 YRS PLUS
8	1502.0	26789.8	81197.3030
9	1567.0	13559.5	10 YRS PLUS
10	1492.0	35105.4	16127.1328
11	1577.0	17201.2	10 YRS PLUS
12	1486.0	43606.2	3339.5582
13	1578.0	20456.3	41335.3880
14	1486.0	47622.2	1676.6686
15	1583.0	19496.2	50271.2210
16	1509.0	41383.0	2585.9836
17	1599.0	12942.6	10 YRS PLUS
18	1542.0	29659.3	13574.4753
19	1600.0	8761.4	10 YRS PLUS
20	1548.0	23845.7	42113.2440
21	1563.0	15145.8	10 YRS PLUS
22	1483.0	37504.4	12001.8224
23	1587.0	5528.7	10 YRS PLUS
24	1534.0	20457.9	10 YRS PLUS
25	1697.0	-33346.7	116.3235
26	1622.0	-11111.9	10 YRS PLUS
27	1674.0	-21130.0	2620.0780
28	1600.0	936.3	10 YRS PLUS
29	1664.0	-12495.8	59984.5900
30	1588.0	9812.4	10 YRS PLUS
31	1671.0	-9234.7	10 YRS PLUS
32	1597.0	12483.0	10 YRS PLUS
33	1673.0	-5785.9	10 YRS PLUS
34	1583.0	19865.8	44197.9280
35	1691.0	-5018.7	10 YRS PLUS
36	1584.0	25684.2	10364.8606
37	1722.0	-10677.8	23820.1130
38	1603.0	28752.0	3197.4332
39	1686.0	7109.0	10 YRS PLUS
40	1575.0	38328.3	816.2313
41	1676.0	5810.3	10 YRS PLUS
42	1580.0	32824.8	2404.4554
43	1654.0	6694.9	10 YRS PLUS
44	1574.0	28912.4	6676.6702
45	1644.0	2474.5	10 YRS PLUS
46	1573.0	22040.5	31227.1820
47	1580.0	15624.1	10 YRS PLUS
48	1490.0	38536.5	7757.9310
49	1594.0	7344.4	10 YRS PLUS
50	1534.0	22786.2	79575.7820
51	1255.0	84934.4	1141.4445
52	1248.0	83033.6	2113.8210

TABLE K-52

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION 2B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1751.0	-33611.5	31.8732
2	1677.0	-26429.6	798.9304
3	1712.0	-33763.4	75.1478
4	1641.0	-17076.9	23732.6980
5	1608.0	250.1	10 YRS PLUS
6	1542.0	19301.0	10 YRS PLUS
7	1576.0	14927.2	10 YRS PLUS
8	1522.0	30688.5	18841.6340
9	1625.0	7280.6	10 YRS PLUS
10	1571.0	24439.4	19437.2560
11	1634.0	13799.5	87215.3570
12	1573.0	33884.1	2291.1298
13	1662.0	10861.9	10 YRS PLUS
14	1601.0	32504.3	1489.5838
15	1677.0	8739.7	10 YRS PLUS
16	1619.0	29277.5	1882.2901
17	1706.0	-410.4	10 YRS PLUS
18	1650.0	19038.0	9640.2525
19	1707.0	-4092.1	10 YRS PLUS
20	1652.0	14973.9	35988.6000
21	1652.0	9695.7	10 YRS PLUS
22	1569.0	36357.9	1474.6275
23	1664.0	3586.5	10 YRS PLUS
24	1613.0	20299.2	16754.4670
25	1748.0	-31883.5	48.4220
26	1675.0	-20551.0	3049.3875
27	1696.0	-17775.3	4501.9027
28	1627.0	2516.8	10 YRS PLUS
29	1691.0	-8986.3	10 YRS PLUS
30	1617.0	12809.6	10 YRS PLUS
31	1700.0	-4279.5	10 YRS PLUS
32	1628.0	16494.5	41050.0230
33	1716.0	-4448.6	10 YRS PLUS
34	1640.0	17521.1	20968.6350
35	1788.0	-16365.2	757.2929
36	1705.0	5816.6	10 YRS PLUS
37	1801.0	-7816.4	20166.1660
38	1714.0	15465.0	6109.8598
39	1778.0	3093.2	10 YRS PLUS
40	1701.0	24414.7	675.6539
41	1763.0	5964.4	10 YRS PLUS
42	1694.0	25271.6	670.5756
43	1746.0	5055.1	10 YRS PLUS
44	1685.0	22413.6	1519.4466
45	1742.0	-2735.3	10 YRS PLUS
46	1683.0	13699.8	24249.5450
47	1661.0	15064.5	27463.7160
48	1573.0	39609.7	648.0493
49	1682.0	3867.2	10 YRS PLUS
50	1619.0	21704.4	9639.3573
51	1317.0	82768.7	277.0513
52	1288.0	82151.3	741.0138

TABLE K-53

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 24369 RPM, TIT = 2700°F,
WCA = 0.02956 LB/SEC/BLADE (6.01% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 3B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1658.0	-49461.8	16.3112
2	1590.0	-48069.8	103.4122
3	1611.0	-49339.7	50.4005
4	1544.0	-38671.5	1709.5631
5	1430.0	-7081.3	10 YRS PLUS
6	1349.0	14419.8	10 YRS PLUS
7	1389.0	6479.6	10 YRS PLUS
8	1291.0	32899.2	10 YRS PLUS
9	1350.0	20679.5	10 YRS PLUS
10	1254.0	47310.2	10 YRS PLUS
11	1338.0	29256.1	10 YRS PLUS
12	1224.0	61949.1	10 YRS PLUS
13	1343.0	32715.5	10 YRS PLUS
14	1216.0	69802.7	10 YRS PLUS
15	1335.0	37400.4	10 YRS PLUS
16	1228.0	68675.4	82532.0450
17	1328.0	39308.2	10 YRS PLUS
18	1246.0	63328.2	10 YRS PLUS
19	1324.0	38179.2	10 YRS PLUS
20	1262.0	56130.7	10 YRS PLUS
21	1370.0	23084.9	10 YRS PLUS
22	1279.0	48150.8	10 YRS PLUS
23	1412.0	10171.3	10 YRS PLUS
24	1351.0	26540.5	10 YRS PLUS
25	1451.0	-2399.1	10 YRS PLUS
26	1411.0	8607.6	10 YRS PLUS
27	1490.0	-14967.3	10 YRS PLUS
28	1456.0	-5767.2	10 YRS PLUS
29	1646.0	-48885.5	23.6063
30	1580.0	-36965.7	967.6791
31	1544.0	-32682.2	6529.6960
32	1485.0	-17061.3	10 YRS PLUS
33	1476.0	-9271.6	10 YRS PLUS
34	1417.0	5732.1	10 YRS PLUS
35	1478.0	-2540.5	10 YRS PLUS
36	1406.0	15136.9	10 YRS PLUS
37	1429.0	15073.5	10 YRS PLUS
38	1335.0	37230.7	10 YRS PLUS
39	1400.0	27103.2	10 YRS PLUS
40	1288.0	54142.1	10 YRS PLUS
41	1480.0	13194.6	10 YRS PLUS
42	1342.0	46032.9	10 YRS PLUS
43	1524.0	7950.9	10 YRS PLUS
44	1359.0	46864.5	80602.2220
45	1505.0	11925.1	10 YRS PLUS
46	1353.0	47596.3	85161.5380
47	1437.0	24552.6	10 YRS PLUS
48	1312.0	54138.5	10 YRS PLUS
49	1433.0	18378.3	10 YRS PLUS
50	1365.0	34211.6	10 YRS PLUS
51	1386.0	24529.6	10 YRS PLUS
52	1309.0	43203.0	10 YRS PLUS
53	1425.0	10889.5	10 YRS PLUS
54	1370.0	24050.3	10 YRS PLUS
55	1460.0	-1638.5	10 YRS PLUS
56	1419.0	8342.9	10 YRS PLUS
57	1488.0	-12082.3	10 YRS PLUS
58	1457.0	-4458.6	10 YRS PLUS
59	1029.0	89775.4	10 YRS PLUS
60	1044.0	85485.3	10 YRS PLUS

TABLE K-54

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 3B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1747.0	-38203.4	13.7161
2	1685.0	-39013.2	47.2795
3	1692.0	-39459.9	36.6222
4	1631.0	-30265.2	1119.7612
5	1492.0	12452.0	10 YRS PLUS
6	1442.0	26055.8	10 YRS PLUS
7	1457.0	26515.4	10 YRS PLUS
8	1407.0	40390.2	58726.4660
9	1495.0	23137.3	10 YRS PLUS
10	1446.0	37480.8	35407.8190
11	1510.0	27974.7	49119.7620
12	1450.0	45884.8	6224.2275
13	1518.0	32227.5	14883.3156
14	1457.0	51078.6	2062.2895
15	1532.0	31890.7	10857.6074
16	1484.0	46849.3	2022.9758
17	1564.0	23493.3	29084.7740
18	1528.0	34611.0	6570.8444
19	1581.0	17179.3	10 YRS PLUS
20	1548.0	27225.4	19799.4220
21	1597.0	10869.4	10 YRS PLUS
22	1551.0	24414.2	34090.8860
23	1645.0	-5830.5	10 YRS PLUS
24	1617.0	3452.8	10 YRS PLUS
25	1726.0	-38244.7	21.7075
26	1664.0	-37482.1	106.9895
27	1631.0	-22150.4	6380.7263
28	1578.0	-7084.2	10 YRS PLUS
29	1592.0	-4020.2	10 YRS PLUS
30	1537.0	10424.4	10 YRS PLUS
31	1586.0	4108.5	10 YRS PLUS
32	1533.0	17568.8	10 YRS PLUS
33	1576.0	11802.0	10 YRS PLUS
34	1508.0	28620.3	44922.4730
35	1648.0	-1601.8	10 YRS PLUS
36	1575.0	18233.9	10 YRS PLUS
37	1693.0	-8201.0	10 YRS PLUS
38	1611.0	19603.6	22455.8150
39	1657.0	13653.0	49092.3200
40	1580.0	34134.8	1802.8922
41	1648.0	15078.4	38675.6700
42	1584.0	31984.5	2602.0456
43	1633.0	15751.8	46153.6220
44	1581.0	29348.2	5026.5340
45	1632.0	10544.2	10 YRS PLUS
46	1586.0	22710.5	18841.6970
47	1611.0	12398.4	10 YRS PLUS
48	1560.0	25279.0	21875.4490
49	1649.0	-2909.8	10 YRS PLUS
50	1617.0	6108.4	10 YRS PLUS
51	1208.0	87014.9	3259.3509
52	1189.0	86074.3	7460.7783

TABLE K-55

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION 3B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1798.0	-33735.2	11.0960
2	1738.0	-36262.2	24.8752
3	1741.0	-36665.5	21.4250
4	1685.0	-35972.8	89.2682
5	1539.0	15220.0	10 YRS PLUS
6	1494.0	28142.4	75287.6130
7	1506.0	31845.2	22808.8690
8	1472.0	42129.9	6381.8444
9	1603.0	14953.1	10 YRS PLUS
10	1571.0	25333.9	15953.9406
11	1630.0	20322.2	10560.3838
12	1594.0	33730.9	1366.9171
13	1666.0	19238.7	5948.5935
14	1629.0	33761.2	556.2869
15	1687.0	19340.2	3367.1754
16	1653.0	32866.2	371.0472
17	1731.0	9457.8	35351.1270
18	1697.0	22552.2	1096.9964
19	1748.0	5017.5	10 YRS PLUS
20	1716.0	17413.0	3072.2092
21	1751.0	3835.9	10 YRS PLUS
22	1707.0	19763.2	1777.3698
23	1786.0	-7370.5	40564.2600
24	1761.0	900.7	10 YRS PLUS
25	1787.0	-33320.2	15.2813
26	1729.0	-34897.2	40.2867
27	1669.0	-16000.8	16255.1193
28	1621.0	-1903.7	10 YRS PLUS
29	1636.0	3483.2	10 YRS PLUS
30	1584.0	18122.5	78880.3050
31	1638.0	12736.6	10 YRS PLUS
32	1587.0	26685.9	7674.8651
33	1653.0	14446.1	41854.2530
34	1601.0	29251.6	3022.7415
35	1794.0	-15550.4	851.3111
36	1742.0	-2926.1	10 YRS PLUS
37	1829.0	-8584.6	5870.4639
38	1775.0	4817.7	10 YRS PLUS
39	1807.0	7498.6	21876.9630
40	1759.0	19534.0	545.5987
41	1793.0	13990.3	1426.5840
42	1751.0	24566.8	199.5476
43	1781.0	15024.1	1366.7663
44	1744.0	24741.6	226.6897
45	1788.0	7170.8	44609.2580
46	1754.0	15628.1	2155.3581
47	1758.0	11179.2	8154.8775
48	1712.0	23283.0	653.9885
49	1797.0	-3811.6	10 YRS PLUS
50	1766.0	3275.8	10 YRS PLUS
51	1311.0	82157.5	373.4888
52	1271.0	82992.7	1044.2880

TABLE K-56

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 21933.6 RPM, TIT = 2100°F,
WCA = 0.0126 LB/SEC/BLADE (2.302% OF HOT GAS FLOW),
TCA = 1200°F, PTOT = 150 PSIA, CONDITION IC

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1663.0	-14156.5	35312.3730
2	1648.0	-9522.3	10 YRS PLUS
3	1643.0	-7927.1	10 YRS PLUS
4	1628.0	-3261.0	10 YRS PLUS
5	1578.0	11674.1	10 YRS PLUS
6	1559.0	16913.4	10 YRS PLUS
7	1544.0	21352.8	82379.1870
8	1518.0	28486.9	34750.7050
9	1516.0	29630.0	28388.9320
10	1488.0	37243.6	11054.0126
11	1507.0	33092.8	16680.4040
12	1473.0	42363.2	5958.4508
13	1509.0	33669.1	13823.1227
14	1471.0	44103.8	4667.2125
15	1511.0	34035.5	12020.1267
16	1479.0	42857.1	4619.9198
17	1510.0	34912.2	10126.9317
18	1487.0	41308.9	4816.1384
19	1520.0	32581.3	12986.1607
20	1502.0	37584.5	6888.3797
21	1567.0	19973.0	66618.7790
22	1545.0	26120.4	27563.7400
23	1590.0	13702.3	10 YRS PLUS
24	1577.0	17365.1	10 YRS PLUS
25	1609.0	8119.9	10 YRS PLUS
26	1600.0	11000.3	10 YRS PLUS
27	1623.0	3694.5	10 YRS PLUS
28	1615.0	6215.4	10 YRS PLUS
29	1663.0	-14020.0	36966.1580
30	1648.0	-8406.5	10 YRS PLUS
31	1636.0	-5332.2	10 YRS PLUS
32	1623.0	-1304.4	10 YRS PLUS
33	1612.0	2733.3	10 YRS PLUS
34	1598.0	6976.1	10 YRS PLUS
35	1595.0	8796.2	10 YRS PLUS
36	1579.0	13051.5	10 YRS PLUS
37	1557.0	19799.1	10 YRS PLUS
38	1531.0	26592.3	36815.6630
39	1538.0	25634.0	37442.4280
40	1505.0	34264.3	13513.2903
41	1560.0	20933.9	57888.3410
42	1519.0	31635.7	16546.8810
43	1576.0	18136.6	10 YRS PLUS
44	1527.0	30820.7	15888.5086
45	1571.0	20195.4	55063.5530
46	1526.0	31795.2	13113.1700
47	1549.0	26178.5	24324.1840
48	1513.0	35433.0	8271.1614
49	1556.0	24036.6	32230.0670
50	1537.0	28925.1	18396.8040
51	1574.0	18872.4	80429.8370
52	1556.0	23568.9	35763.4080
53	1595.0	12950.6	10 YRS PLUS
54	1583.0	16076.2	10 YRS PLUS
55	1612.0	7666.2	10 YRS PLUS
56	1602.0	10651.3	10 YRS PLUS
57	1622.0	4344.4	10 YRS PLUS
58	1616.0	6119.0	10 YRS PLUS
59	1442.0	49806.0	3937.6120
60	1447.0	47640.3	4989.2987

TABLE K-57

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 1C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1780.0	-17409.9	655.8736
2	1765.0	-13051.8	3767.4386
3	1758.0	-10866.1	9016.7783
4	1744.0	-6580.0	10 YRS PLUS
5	1688.0	11637.0	42147.4050
6	1676.0	15419.8	16433.1790
7	1654.0	23361.3	2718.4757
8	1640.0	27869.0	1487.8046
9	1653.0	25139.3	1912.3035
10	1639.0	29742.2	1022.8245
11	1655.0	26655.4	1318.1000
12	1638.0	32332.2	603.0695
13	1659.0	27435.4	1010.6866
14	1641.0	33588.0	427.9929
15	1666.0	26988.6	932.8272
16	1652.0	31802.1	476.6839
17	1683.0	22712.5	1500.2345
18	1672.0	26441.8	901.7923
19	1697.0	19077.4	2856.5685
20	1687.0	22430.7	1440.5998
21	1735.0	7687.6	10 YRS PLUS
22	1725.0	10970.1	20050.8290
23	1758.0	907.1	10 YRS PLUS
24	1752.0	2817.6	10 YRS PLUS
25	1776.0	-16135.4	1080.9714
26	1672.0	15340.5	18734.8710
27	1749.0	-7482.7	10 YRS PLUS
28	1737.0	-3872.7	10 YRS PLUS
29	1732.0	-1288.6	10 YRS PLUS
30	1719.0	2701.5	10 YRS PLUS
31	1717.0	4455.9	10 YRS PLUS
32	1704.0	8435.0	10 YRS PLUS
33	1695.0	12219.1	28926.9550
34	1677.0	17748.2	7372.6367
35	1711.0	8782.7	10 YRS PLUS
36	1689.0	15511.9	11375.9662
37	1724.0	7136.6	10 YRS PLUS
38	1700.0	14848.5	10676.1092
39	1712.0	13904.8	10714.1335
40	1690.0	20404.9	2194.6865
41	1710.0	15792.8	6069.7947
42	1692.0	21060.8	1693.1684
43	1709.0	16555.7	4846.4961
44	1694.0	20987.5	1638.4310
45	1715.0	14877.6	7220.3679
46	1702.0	18696.0	2858.4368
47	1739.0	7405.5	10 YRS PLUS
48	1727.0	10900.0	19490.1820
49	1759.0	1286.2	10 YRS PLUS
50	1751.0	3570.0	10 YRS PLUS
51	1584.0	46268.5	161.0558
52	1576.0	47621.2	157.7254

TABLE K-58

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, TIP SECTION, CONDITION 1C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1825.0	-17141.5	253.3782
2	1811.0	-13221.0	1189.8237
3	1804.0	-11010.1	2809.7458
4	1791.0	-6957.2	48309.6470
5	1733.0	12976.9	8523.8095
6	1722.0	16549.5	3509.0926
7	1708.0	22656.7	820.1989
8	1698.0	26039.7	518.5826
9	1731.0	17544.7	2032.7468
10	1722.0	20627.7	927.8780
11	1738.0	18735.9	1165.0242
12	1728.0	22315.0	543.1050
13	1751.0	17568.3	1241.4706
14	1741.0	21236.5	496.6142
15	1760.0	17121.0	1155.0222
16	1751.0	20480.5	486.2121
17	1779.0	13170.4	2583.7955
18	1770.0	16445.2	1129.4002
19	1790.0	11341.4	3540.4474
20	1782.0	14297.1	1681.1249
21	1815.0	4259.7	10 YRS PLUS
22	1805.0	7973.6	16306.0904
23	1831.0	-535.1	10 YRS PLUS
24	1826.0	1250.2	10 YRS PLUS
25	1823.0	-16302.2	344.3777
26	1810.0	-12142.0	1708.2993
27	1789.0	-4041.3	10 YRS PLUS
28	1777.0	-545.3	10 YRS PLUS
29	1774.0	2272.2	10 YRS PLUS
30	1762.0	5821.9	10 YRS PLUS
31	1766.0	6743.6	10 YRS PLUS
32	1754.0	10252.2	12134.8365
33	1757.0	10904.9	9129.3557
34	1743.0	15076.6	3368.2015
35	1797.0	1576.0	10 YRS PLUS
36	1783.0	5394.7	10 YRS PLUS
37	1808.0	2730.5	10 YRS PLUS
38	1793.0	6875.3	48748.5620
39	1801.0	8241.8	14819.4601
40	1788.0	11630.6	3390.3949
41	1798.0	10819.7	3443.7937
42	1786.0	13963.4	1698.8666
43	1797.0	11919.9	2493.4313
44	1787.0	14597.3	1357.1332
45	1804.0	9944.0	4019.4663
46	1795.0	12386.2	2257.5230
47	1818.0	5170.3	10 YRS PLUS
48	1807.0	8311.3	12163.9563
49	1834.0	-80.9	10 YRS PLUS
50	1827.0	1743.6	10 YRS PLUS
51	1655.0	40389.9	73.2018
52	1640.0	42760.2	71.9501

TABLE K-59

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, HUB SECTION, 21933.6 RPM, TIT = 2100°F,
WCA = 0.005935 LB/SEC/BLADE (1.086% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 2C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1629.0	-39286.6	169.9088
2	1611.0	-33964.9	839.1402
3	1595.0	-29355.5	3460.2905
4	1577.0	-24504.4	16251.0601
5	1494.0	-2350.6	10 YRS PLUS
6	1469.0	4255.0	10 YRS PLUS
7	1423.0	16380.8	10 YRS PLUS
8	1385.0	26165.0	10 YRS PLUS
9	1356.0	33814.8	10 YRS PLUS
10	1310.0	45843.6	10 YRS PLUS
11	1333.0	40212.3	10 YRS PLUS
12	1277.0	55065.8	10 YRS PLUS
13	1336.0	39898.5	10 YRS PLUS
14	1274.0	56387.1	10 YRS PLUS
15	1344.0	38192.8	10 YRS PLUS
16	1292.0	51965.2	10 YRS PLUS
17	1348.0	37397.8	10 YRS PLUS
18	1310.0	47438.3	10 YRS PLUS
19	1364.0	33395.0	10 YRS PLUS
20	1336.0	40721.3	10 YRS PLUS
21	1427.0	17265.6	10 YRS PLUS
22	1393.0	26089.8	10 YRS PLUS
23	1469.0	6304.9	10 YRS PLUS
24	1448.0	11844.0	10 YRS PLUS
25	1506.0	-3459.8	10 YRS PLUS
26	1494.0	-257.8	10 YRS PLUS
27	1534.0	-10918.5	10 YRS PLUS
28	1524.0	-8246.4	10 YRS PLUS
29	1632.0	-40094.2	133.4766
30	1616.0	-34937.6	598.9380
31	1600.0	-30471.8	2379.2955
32	1584.0	-26172.0	9313.0480
33	1562.0	-20019.0	75499.9370
34	1546.0	-15762.5	10 YRS PLUS
35	1520.0	-8445.1	10 YRS PLUS
36	1500.0	-3204.1	10 YRS PLUS
37	1441.0	12571.4	10 YRS PLUS
38	1405.0	21794.8	10 YRS PLUS
39	1396.0	24477.4	10 YRS PLUS
40	1343.0	37937.2	10 YRS PLUS
41	1423.0	18049.7	10 YRS PLUS
42	1358.0	34534.3	10 YRS PLUS
43	1449.0	11927.5	10 YRS PLUS
44	1371.0	31746.6	10 YRS PLUS
45	1443.0	13754.1	10 YRS PLUS
46	1373.0	31505.4	10 YRS PLUS
47	1412.0	21769.1	10 YRS PLUS
48	1354.0	36426.6	10 YRS PLUS
49	1427.0	17752.9	10 YRS PLUS
50	1398.0	25127.4	10 YRS PLUS
51	1438.0	14750.0	10 YRS PLUS
52	1410.0	21923.7	10 YRS PLUS
53	1476.0	4728.9	10 YRS PLUS
54	1457.0	9641.5	10 YRS PLUS
55	1510.0	-4314.7	10 YRS PLUS
56	1497.0	-933.1	10 YRS PLUS
57	1533.0	-10507.6	10 YRS PLUS
58	1524.0	-8155.6	10 YRS PLUS
59	1265.0	57981.7	10 YRS PLUS
60	1276.0	54654.6	10 YRS PLUS

TABLE K-60

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.0 INCH CHORD, MEAN SECTION, CONDITION 2C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1775.0	-24347.7	120.1376
2	1761.0	-21863.9	273.2962
3	1748.0	-18196.3	1089.9413
4	1734.0	-13929.4	6102.8229
5	1661.0	9245.5	10 YRS PLUS
6	1649.0	13048.0	74703.6430
7	1611.0	25931.1	4778.0842
8	1595.0	30886.5	2477.5924
9	1604.0	29571.0	2606.9956
10	1587.0	34612.5	1352.0490
11	1604.0	31585.6	1682.9284
12	1583.0	37839.8	739.0264
13	1609.0	31709.6	1439.6661
14	1589.0	38052.4	604.6226
15	1622.0	28844.5	1912.7005
16	1606.0	34313.8	883.9415
17	1648.0	21209.8	5009.3339
18	1636.0	25264.9	2875.5136
19	1664.0	16390.7	16264.5628
20	1653.0	20062.8	6311.3982
21	1681.0	11117.1	60304.2030
22	1667.0	15709.5	18883.6150
23	1708.0	2655.9	10 YRS PLUS
24	1700.0	5243.4	10 YRS PLUS
25	1774.0	-24170.8	127.3442
26	1760.0	-21205.9	319.4938
27	1744.0	-15724.6	2665.9475
28	1732.0	-12224.5	11159.2697
29	1721.0	-7744.2	10 YRS PLUS
30	1707.0	-3546.9	10 YRS PLUS
31	1697.0	764.7	10 YRS PLUS
32	1684.0	4662.6	10 YRS PLUS
33	1664.0	11963.5	71698.3300
34	1642.0	18646.9	13579.4927
35	1679.0	8886.8	10 YRS PLUS
36	1655.0	16130.4	22506.7750
37	1695.0	5867.1	10 YRS PLUS
38	1668.0	14661.2	26118.0870
39	1681.0	12887.8	33473.7760
40	1657.0	19907.2	5996.1931
41	1681.0	13365.6	28558.0800
42	1661.0	19174.1	6916.2460
43	1682.0	12848.9	33027.9250
44	1666.0	17513.8	10597.1281
45	1687.0	10810.2	56921.1970
46	1673.0	14882.3	21265.3010
47	1687.0	10326.4	66822.6180
48	1671.0	15076.7	21004.3500
49	1709.0	3127.0	10 YRS PLUS
50	1700.0	5746.9	10 YRS PLUS
51	1529.0	50635.7	318.1849
52	1518.0	52353.0	317.6359

TABLE K-61

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 2C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1833.0	-17541.2	186.9518
2	1820.0	-16091.7	393.7504
3	1810.0	-13373.2	1161.2537
4	1797.0	-8934.5	9895.6867
5	1733.0	13822.5	6478.0775
6	1721.0	17858.9	2346.4839
7	1708.0	24418.2	569.7713
8	1698.0	27995.8	345.3821
9	1740.0	17449.3	1683.1936
10	1732.0	20436.0	775.7850
11	1752.0	18492.5	900.2381
12	1743.0	22053.2	401.0698
13	1769.0	16976.7	976.0968
14	1760.0	20671.0	370.1071
15	1781.0	16027.2	993.9046
16	1773.0	19382.2	412.4205
17	1804.0	10813.8	2988.5959
18	1796.0	14131.6	1271.0034
19	1815.0	8318.4	9957.3416
20	1807.0	11744.7	2077.1868
21	1815.0	8876.5	6663.5861
22	1804.0	13250.2	1389.4228
23	1829.0	4353.1	10 YRS PLUS
24	1824.0	6291.9	34240.0740
25	1833.0	-16808.7	234.6775
26	1820.0	-14606.9	625.9189
27	1798.0	-4701.0	10 YRS PLUS
28	1787.0	-1617.3	10 YRS PLUS
29	1781.0	3236.7	10 YRS PLUS
30	1769.0	6657.8	10 YRS PLUS
31	1772.0	9137.3	15834.0609
32	1760.0	12457.8	5150.6052
33	1763.0	14041.3	2881.8666
34	1749.0	18028.9	1123.0475
35	1815.0	1943.8	10 YRS PLUS
36	1802.0	5530.5	10 YRS PLUS
37	1830.0	3611.6	10 YRS PLUS
38	1817.0	6864.8	26979.1390
39	1825.0	9135.1	4354.7594
40	1814.0	11810.5	1724.8764
41	1823.0	11254.7	1661.1201
42	1813.0	13719.7	971.3169
43	1824.0	10911.9	1805.6358
44	1816.0	12929.0	1159.9436
45	1830.0	8018.7	8590.4792
46	1822.0	9995.7	2522.6425
47	1817.0	11256.6	1911.3463
48	1806.0	14182.8	989.0207
49	1832.0	5604.8	45926.5020
50	1825.0	7236.0	16982.3430
51	1655.0	42075.4	96.1008
52	1636.0	44667.7	58.4497

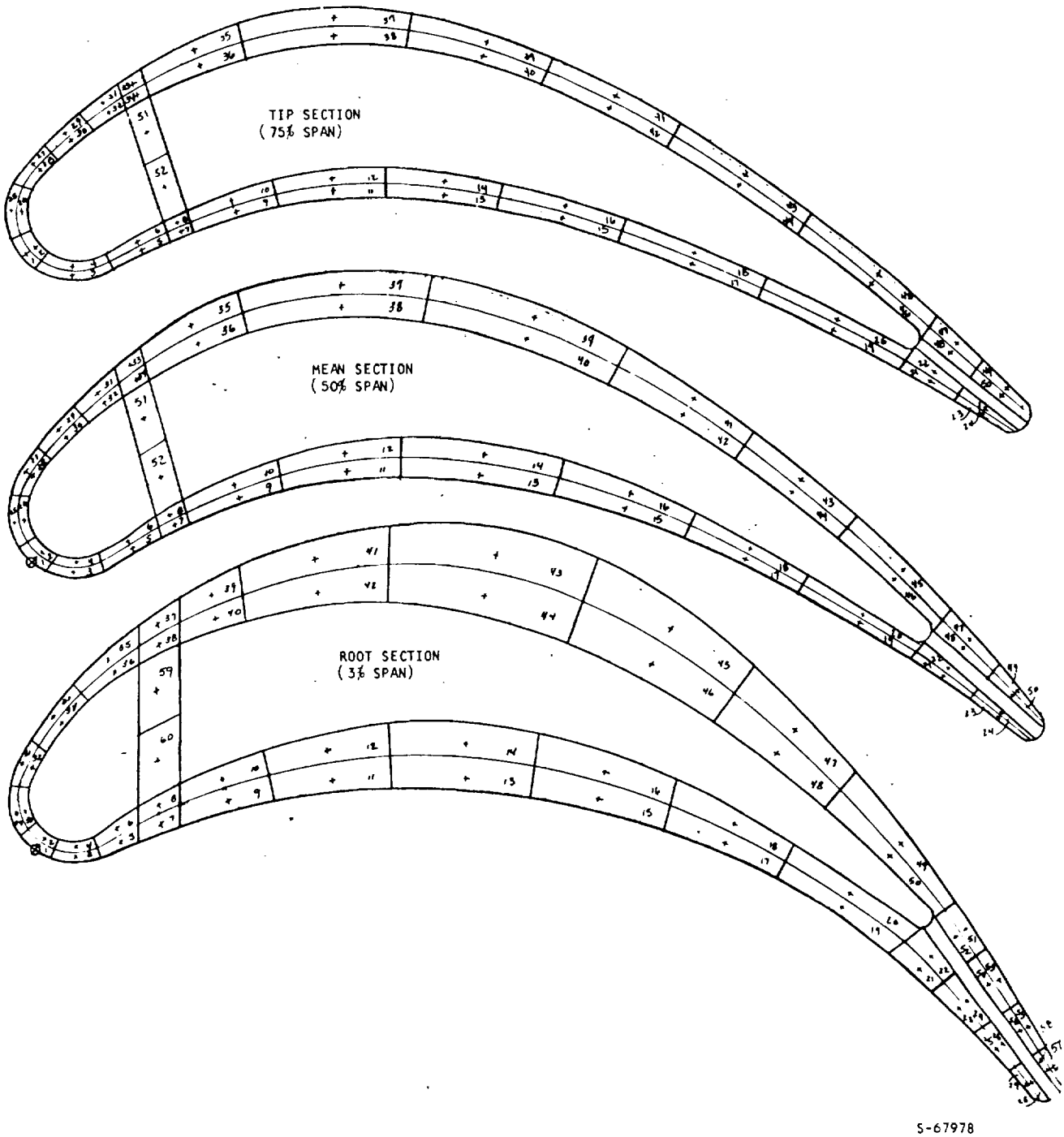

FIGURE K-9. SCHEME A-1 CONVECTION COOLED CAST TWO-CAVITY PIN FIN BLADE
1.0 INCH CHORD

TABLE K-62

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, HUB SECTION, 22350 RPM, TIT = 2200°F,
WCA = 0.032615 LB/SEC/BLADE (4.09% OF HOT GAS FLOW),
TCA = 1200°F, PTOT = 150 PSIA, CONDITION 1

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1680.0	-12533.5	38667.2840
2	1663.0	-7228.6	10 YRS PLUS
3	1631.0	2041.5	10 YRS PLUS
4	1614.0	7536.4	10 YRS PLUS
5	1574.0	19462.6	65421.8670
6	1557.0	24310.0	29493.1600
7	1558.0	24672.4	26461.8830
8	1528.0	33250.0	8931.8619
9	1576.0	21673.3	31157.3680
10	1534.0	33826.5	6646.1124
11	1565.0	26279.1	15264.7786
12	1512.0	41814.5	2214.5483
13	1561.0	25148.3	21903.4730
14	1508.0	43704.4	1792.6045
15	1557.0	28591.9	11384.2878
16	1513.0	41462.7	2287.2065
17	1555.0	27407.6	15654.6021
18	1527.0	35640.2	5354.8416
19	1561.0	23131.0	34267.9960
20	1544.0	28029.3	18494.0550
21	1548.0	24151.8	39330.9910
22	1529.0	29654.0	19542.2720
23	1576.0	14879.2	10 YRS PLUS
24	1563.0	18491.1	10 YRS PLUS
25	1714.0	-21240.4	949.6178
26	1699.0	-16812.9	5732.0137
27	1682.0	-9069.2	10 YRS PLUS
28	1668.0	-4970.2	10 YRS PLUS
29	1644.0	5080.4	10 YRS PLUS
30	1631.0	8870.7	10 YRS PLUS
31	1626.0	12773.7	10 YRS PLUS
32	1610.0	17472.5	48008.4070
33	1589.0	25310.7	9827.7918
34	1555.0	33872.0	3714.4582
35	1605.0	22741.8	11189.6110
36	1561.0	34069.6	3026.0739
37	1625.0	18971.4	19122.5830
38	1565.0	34900.2	2262.6871
39	1636.0	15148.5	52223.0920
40	1573.0	32334.6	3224.6295
41	1611.0	20294.4	17710.5920
42	1559.0	33660.9	3495.9428
43	1597.0	20551.8	23691.7700
44	1562.0	29330.3	8427.7495
45	1579.0	20854.8	34980.9070
46	1557.0	26352.8	18727.9400
47	1554.0	24004.1	34335.4700
48	1532.0	29529.2	18475.4020
49	1576.0	15851.9	10 YRS PLUS
50	1562.0	19428.0	10 YRS PLUS
51	1488.0	50968.9	894.3172
52	1405.0	67002.6	490.3411
53	1352.0	74618.3	506.5741
54	1345.0	74940.9	582.1960
55	1401.0	65622.6	714.2768
56	1468.0	49979.2	1836.5753

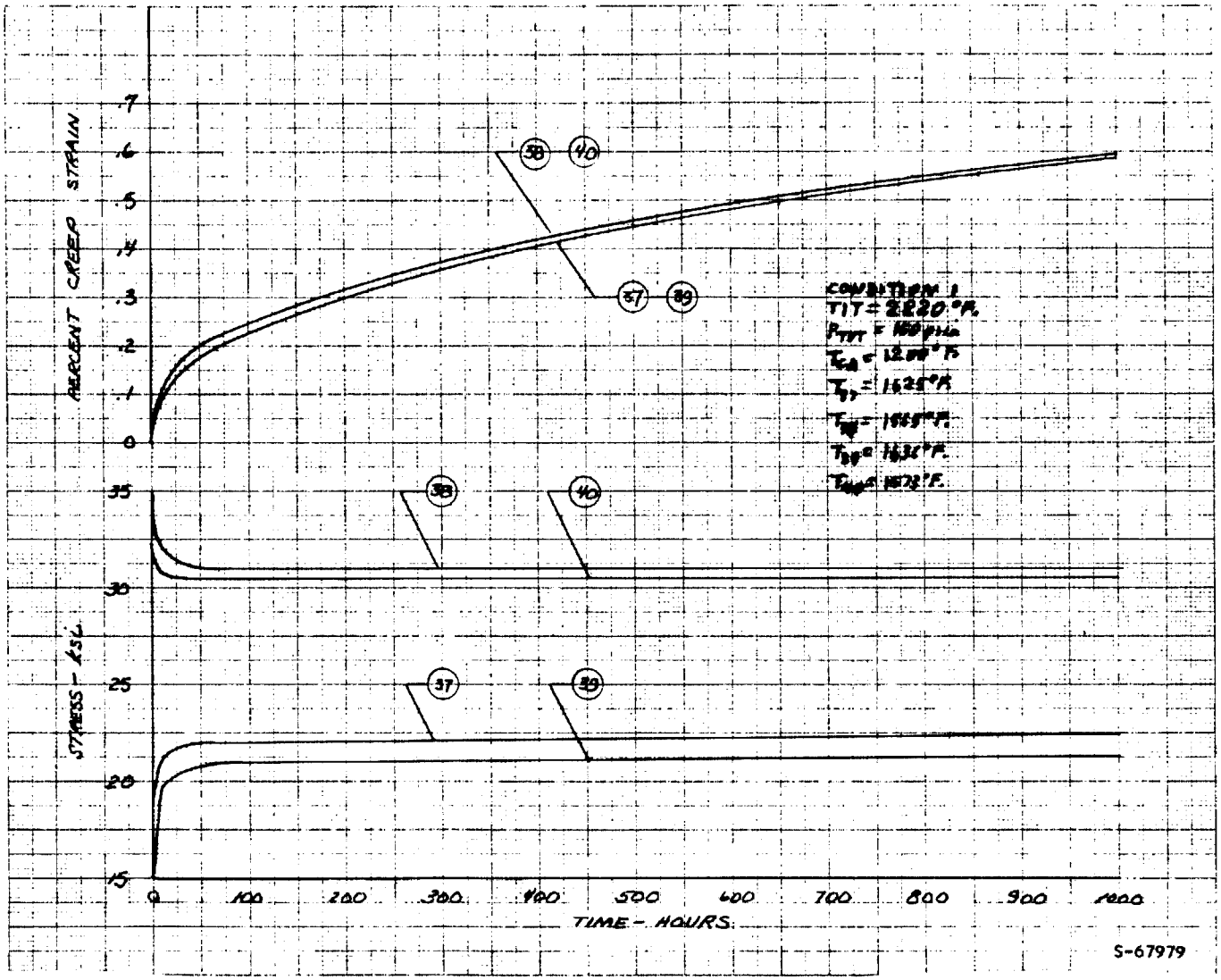

FIGURE K-10. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 1.5 INCH CHORD, CONDITION 1.

TABLE K-63

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, MEAN SECTION, CONDITION 1

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1808.0	-18853.3	217.9800
2	1791.0	-13299.4	1860.9986
3	1775.0	-9302.6	13016.5741
4	1759.0	-4243.2	10 YRS PLUS
5	1688.0	19873.4	2751.5481
6	1675.0	24293.5	1314.6262
7	1626.0	41316.2	127.0868
8	1612.0	45200.6	95.8552
9	1684.0	25546.8	808.9320
10	1663.0	32847.7	291.6240
11	1687.0	27644.8	484.8601
12	1662.0	36541.0	136.9225
13	1687.0	29309.8	342.4481
14	1662.0	38028.6	99.9901
15	1708.0	22913.9	777.7043
16	1687.0	30256.1	281.0346
17	1721.0	18146.1	2136.5549
18	1706.0	23364.6	743.7554
19	1737.0	11964.2	10703.5162
20	1725.0	16039.8	3845.6202
21	1715.0	17877.5	2705.4574
22	1690.0	26203.5	608.8397
23	1730.0	12713.0	10015.0913
24	1708.0	19802.9	1711.5820
25	1806.0	-16296.2	509.2540
26	1790.0	-9436.3	8156.4447
27	1755.0	541.0	10 YRS PLUS
28	1740.0	5073.9	10 YRS PLUS
29	1739.0	8213.0	72718.4280
30	1725.0	12402.1	12576.2501
31	1729.0	13868.8	7053.6733
32	1707.0	20578.1	1360.0203
33	1704.0	23408.9	773.7235
34	1676.0	31842.9	262.8502
35	1755.0	10470.1	11034.4589
36	1725.0	19389.0	1291.7867
37	1762.0	11948.4	5772.6335
38	1730.0	21252.5	643.5698
39	1761.0	13126.8	4055.7180
40	1733.0	21252.4	598.9719
41	1739.0	19015.0	1038.9910
42	1717.0	25432.6	372.2890
43	1745.0	15063.5	3220.3075
44	1729.0	19659.2	1073.5141
45	1741.0	13392.7	6098.9951
46	1728.0	16999.0	2612.8917
47	1715.0	19476.7	1603.1975
48	1689.0	27429.0	483.1211
49	1729.0	14184.7	6365.1151
50	1707.0	20925.5	1213.3712
51	1605.0	49073.5	60.8393
52	1527.0	61514.7	52.9864
53	1478.0	68931.1	48.0850
54	1463.0	70815.5	50.0836
55	1516.0	61843.4	65.9759
56	1572.0	52653.2	76.2996

TABLE K-64

SCHEME A-I CONVECTION-COOLED CAST TWO-CAVITY PIN FIN BLADE
1.5 INCH CHORD, TIP SECTION, CONDITION I

A-1 FINAL DESIGN, TIP, 1.5IN CHORD, PTOT-150PSIA,TIT-2220DEG,TCA-1200DEG

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1827.0	-18631.0	152.3605
2	1811.0	-16467.1	430.2018
3	1807.0	-15156.8	711.6388
4	1792.0	-10290.5	4703.0436
5	1741.0	9487.4	26750.0140
6	1728.0	14008.6	6911.3915
7	1676.0	33064.2	203.4022
8	1666.0	36787.1	118.1075
9	1744.0	15232.4	3125.2497
10	1731.0	20164.3	867.9971
11	1748.0	19214.9	784.9123
12	1731.0	25672.7	254.2833
13	1763.0	17595.8	923.5376
14	1747.0	23854.9	253.0954
15	1769.0	17033.5	958.5432
16	1755.0	22368.6	283.8166
17	1797.0	8363.2	14976.9171
18	1784.0	13236.5	2243.8329
19	1814.0	2470.6	10 YRS PLUS
20	1806.0	5733.1	80313.9260
21	1791.0	9306.7	8745.9835
22	1773.0	15628.9	1364.1696
23	1800.0	6376.7	58667.9480
24	1786.0	11071.8	4247.1910
25	1811.0	-15118.1	656.5620
26	1795.0	-10014.4	4772.4424
27	1751.0	6157.5	10 YRS PLUS
28	1737.0	10483.2	17293.9250
29	1752.0	9691.9	17382.3400
30	1738.0	13826.4	5711.1568
31	1739.0	17474.0	1710.9047
32	1724.0	21978.6	640.4984
33	1726.0	23889.1	412.5342
34	1702.0	31133.1	163.6904
35	1831.0	-2440.6	10 YRS PLUS
36	1810.0	3659.3	10 YRS PLUS
37	1832.0	4059.0	10 YRS PLUS
38	1811.0	10044.7	3219.4573
39	1817.0	10980.0	2083.9234
40	1798.0	16376.2	597.6311
41	1807.0	14039.3	1010.7198
42	1792.0	18030.5	407.4298
43	1816.0	8998.5	5958.4770
44	1803.0	12630.2	1728.8106
45	1819.0	5076.6	10 YRS PLUS
46	1808.0	7985.3	15019.8475
47	1791.0	12099.2	2719.8326
48	1772.0	17523.8	763.5157
49	1801.0	8257.6	14651.2419
50	1786.0	12513.3	2689.8705
51	1650.0	42468.7	59.3576
52	1588.0	54980.2	35.2218
53	1537.0	62472.6	34.7735
54	1523.0	64094.5	36.8914
55	1569.0	56530.7	43.4289
56	1523.0	63351.8	42.1509

TABLE K-65

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, HUB SECTION, 23183 RPM, TIT = 2400°F
WCA = 0.036 LB/SEC/BLADE (4.67% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 150 PSIA, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1666.0	-30489.1	445.8284
2	1638.0	-21975.0	5517.2636
3	1587.0	-7762.8	10 YRS PLUS
4	1559.0	112.0	10 YRS PLUS
5	1499.0	16889.0	10 YRS PLUS
6	1470.0	24895.1	10 YRS PLUS
7	1479.0	23439.2	10 YRS PLUS
8	1427.0	37764.9	58474.3100
9	1505.0	19246.3	10 YRS PLUS
10	1435.0	38813.0	35866.8450
11	1487.0	26388.8	10 YRS PLUS
12	1396.0	51986.7	10224.9163
13	1480.0	25232.9	10 YRS PLUS
14	1389.0	55105.1	7178.0205
15	1473.0	30491.8	81337.5250
16	1398.0	51544.7	10430.5206
17	1468.0	29491.2	10 YRS PLUS
18	1421.0	42766.7	25193.7900
19	1479.0	22955.7	10 YRS PLUS
20	1450.0	31019.5	10 YRS PLUS
21	1475.0	20583.3	10 YRS PLUS
22	1443.0	29533.0	10 YRS PLUS
23	1523.0	5514.6	10 YRS PLUS
24	1501.0	11490.6	10 YRS PLUS
25	1719.0	-35029.7	49.2580
26	1694.0	-34224.4	104.0039
27	1666.0	-24787.4	1483.9773
28	1642.0	-17850.4	17782.8410
29	1607.0	-3448.1	10 YRS PLUS
30	1583.0	2951.5	10 YRS PLUS
31	1582.0	6567.4	10 YRS PLUS
32	1555.0	13435.4	10 YRS PLUS
33	1526.0	23638.1	82709.3890
34	1472.0	37049.8	18288.2410
35	1549.0	20325.5	10 YRS PLUS
36	1476.0	38604.2	11368.2376
37	1579.0	15869.9	10 YRS PLUS
38	1480.0	40346.4	6919.6907
39	1596.0	10850.3	10 YRS PLUS
40	1492.0	36727.1	11111.6184
41	1556.0	17994.3	10 YRS PLUS
42	1470.0	39191.1	11783.0776
43	1536.0	17839.8	10 YRS PLUS
44	1477.0	32499.9	45390.4520
45	1508.0	18950.2	10 YRS PLUS
46	1472.0	27826.0	10 YRS PLUS
47	1484.0	20294.7	10 YRS PLUS
48	1447.0	29456.0	10 YRS PLUS
49	1522.0	7162.3	10 YRS PLUS
50	1499.0	12967.4	10 YRS PLUS
51	1362.0	64842.0	2566.0763
52	1227.0	84612.4	2950.1418
53	1142.0	90636.0	13496.5730
54	1130.0	90795.5	19803.1520
55	1221.0	83253.0	4779.8366
56	1330.0	64470.5	7241.6612

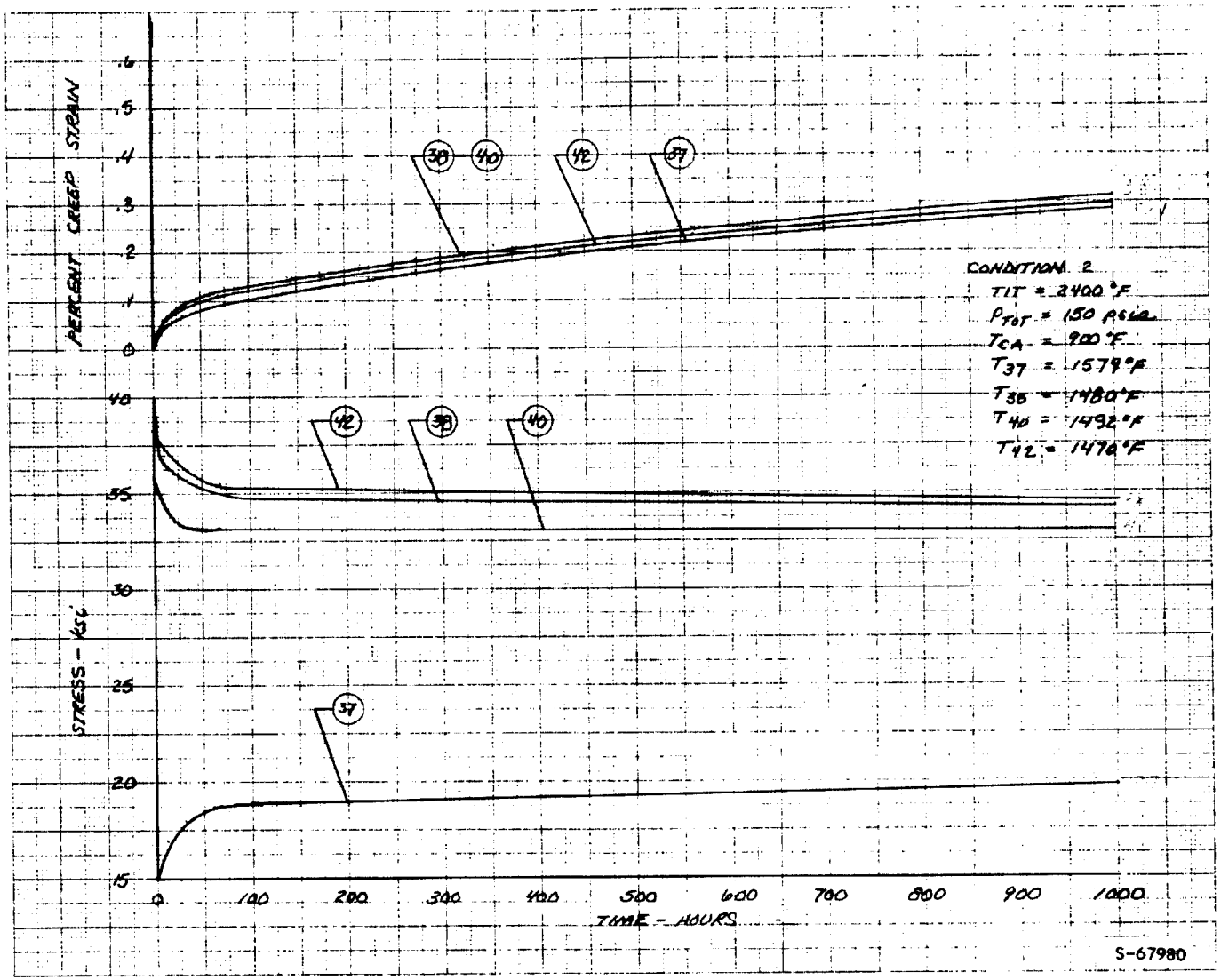

FIGURE K-11. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 1.5 INCH CHORD, CONDITION 2.

TABLE K-66

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, MEAN SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1810.0	-25592.9	42.8961
2	1784.0	-24863.7	88.3774
3	1760.0	-23756.1	190.8780
4	1735.0	-16007.6	3034.2697
5	1629.0	19856.1	12710.1171
6	1607.0	27256.2	3983.2328
7	1537.0	48602.1	363.2363
8	1515.0	54138.0	254.1297
9	1625.0	28038.5	2105.8546
10	1591.0	39360.2	431.6219
11	1629.0	31449.8	913.6225
12	1589.0	45079.5	172.5574
13	1628.0	34149.7	524.7553
14	1589.0	47127.5	123.5960
15	1660.0	24171.7	1965.9033
16	1627.0	35662.1	388.7959
17	1678.0	17098.0	8921.7567
18	1654.0	25413.3	1759.1289
19	1701.0	7692.0	10 YRS PLUS
20	1680.0	14746.7	18521.7820
21	1652.0	21206.8	4520.3723
22	1609.0	35421.9	643.9621
23	1673.0	13793.6	30579.8260
24	1637.0	25384.0	2731.9134
25	1806.0	-24685.9	56.0467
26	1781.0	-22553.4	150.1346
27	1726.0	-7331.7	10 YRS PLUS
28	1703.0	-441.1	10 YRS PLUS
29	1704.0	3826.2	10 YRS PLUS
30	1681.0	10667.4	70026.7460
31	1691.0	11918.4	35480.5740
32	1657.0	22202.5	3218.9077
33	1657.0	25217.8	1699.5783
34	1611.0	38953.1	284.9661
35	1732.0	6619.8	10 YRS PLUS
36	1684.0	20814.4	2226.6463
37	1742.0	9082.6	35231.6830
38	1692.0	23539.1	1010.2722
39	1740.0	10723.3	14828.8350
40	1695.0	23758.6	896.5583
41	1706.0	19330.0	2100.5353
42	1670.0	29824.9	464.8949
43	1715.0	12783.0	14329.2831
44	1689.0	20231.7	2383.0499
45	1706.0	10464.4	38678.7080
46	1686.0	15944.9	10647.5349
47	1651.0	24108.2	2504.5367
48	1609.0	36889.0	468.5646
49	1672.0	15970.1	15183.6160
50	1636.0	27000.0	1983.8560
51	1501.0	60472.0	124.2701
52	1381.0	79095.8	93.5671
53	1306.0	85930.5	201.3003
54	1284.0	87447.5	281.7685
55	1366.0	79186.9	139.2817
56	1453.0	64892.0	195.7337

TABLE K-67

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1826.0	-23994.3	41.4182
2	1801.0	-23720.9	75.8160
3	1795.0	-23538.2	89.8996
4	1773.0	-21846.8	207.7538
5	1696.0	8100.8	10 YRS PLUS
6	1676.0	15111.9	18208.7400
7	1601.0	42725.8	187.5228
8	1583.0	48325.5	117.9936
9	1701.0	16902.9	5289.9126
10	1681.0	24565.9	1069.6203
11	1708.0	22657.9	820.0013
12	1682.0	32641.5	192.4410
13	1731.0	19914.2	941.4553
14	1705.0	30109.6	188.4968
15	1738.0	19396.2	940.7676
16	1717.0	27528.6	241.7638
17	1780.0	5956.9	10 YRS PLUS
18	1760.0	13505.1	3681.5745
19	1803.0	-1886.5	10 YRS PLUS
20	1789.0	3317.8	10 YRS PLUS
21	1755.0	11659.8	7528.8849
22	1725.0	22334.1	581.2858
23	1768.0	7235.8	70786.2390
24	1744.0	15383.3	2976.5628
25	1800.0	-22732.3	94.3244
26	1776.0	-20709.8	252.0470
27	1709.0	4138.0	10 YRS PLUS
28	1686.0	11252.0	50486.5280
29	1712.0	9271.6	66698.3770
30	1689.0	16088.4	9398.9304
31	1693.0	21084.2	1643.5805
32	1670.0	27977.4	685.9112
33	1678.0	29437.0	414.8297
34	1640.0	40869.0	97.1888
35	1833.0	-8453.6	5859.3209
36	1801.0	642.5	10 YRS PLUS
37	1834.0	1311.4	10 YRS PLUS
38	1802.0	10362.2	3613.5080
39	1812.0	11191.6	2194.8768
40	1782.0	19392.3	333.5478
41	1795.0	15905.6	743.4256
42	1772.0	21790.1	215.0309
43	1809.0	7759.6	17247.9110
44	1788.0	13341.4	1972.4999
45	1812.0	1800.1	10 YRS PLUS
46	1795.0	6105.5	81064.4350
47	1755.0	16119.3	1796.5402
48	1724.0	25178.3	332.0595
49	1769.0	10453.1	7835.9919
50	1745.0	17384.7	1522.3739
51	1559.0	56057.6	60.1065
52	1462.0	71043.4	49.2791
53	1383.0	81540.7	55.2401
54	1362.0	82994.4	73.9606
55	1434.0	73485.8	65.1724
56	1522.0	58433.1	102.7320

TABLE K-68

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, HUB SECTION, 23800 RPM, TIT = 2560°F,
WCA = 0.04177 LB/SEC/BLADE (5.58% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1617.0	-41839.6	145.6604
2	1575.0	-29847.4	5289.1313
3	1509.0	-13385.3	10 YRS PLUS
4	1467.0	-1870.6	10 YRS PLUS
5	1398.0	17048.4	10 YRS PLUS
6	1354.0	28632.2	10 YRS PLUS
7	1386.0	21802.8	10 YRS PLUS
8	1310.0	42303.0	10 YRS PLUS
9	1426.0	15281.3	10 YRS PLUS
10	1326.0	42586.4	10 YRS PLUS
11	1401.0	24941.0	10 YRS PLUS
12	1271.0	61457.0	87524.4940
13	1391.0	23096.2	10 YRS PLUS
14	1262.0	65588.2	50317.5540
15	1382.0	30063.8	10 YRS PLUS
16	1274.0	60478.8	10 YRS PLUS
17	1372.0	29179.1	10 YRS PLUS
18	1304.0	48227.8	10 YRS PLUS
19	1382.0	21357.6	10 YRS PLUS
20	1340.0	32659.3	10 YRS PLUS
21	1347.0	25214.7	10 YRS PLUS
22	1298.0	38605.1	10 YRS PLUS
23	1409.0	6270.8	10 YRS PLUS
24	1375.0	14939.7	10 YRS PLUS
25	1690.0	-42940.2	21.7067
26	1652.0	-42776.8	53.9145
27	1614.0	-32805.0	999.0463
28	1578.0	-23072.2	21669.8520
29	1535.0	-6241.5	10 YRS PLUS
30	1500.0	2556.7	10 YRS PLUS
31	1512.0	4052.1	10 YRS PLUS
32	1472.0	14020.6	10 YRS PLUS
33	1449.0	23428.3	10 YRS PLUS
34	1369.0	42860.1	10 YRS PLUS
35	1483.0	18445.0	10 YRS PLUS
36	1379.0	43880.9	74255.3880
37	1523.0	12795.0	10 YRS PLUS
38	1383.0	46642.0	39766.4720
39	1546.0	5911.5	10 YRS PLUS
40	1398.0	41939.7	58599.4840
41	1491.0	15218.9	10 YRS PLUS
42	1368.0	44865.6	87554.4330
43	1463.0	14688.0	10 YRS PLUS
44	1379.0	34988.8	10 YRS PLUS
45	1424.0	15791.6	10 YRS PLUS
46	1371.0	28405.7	10 YRS PLUS
47	1360.0	24875.5	10 YRS PLUS
48	1303.0	38702.8	10 YRS PLUS
49	1408.0	8446.6	10 YRS PLUS
50	1372.0	17017.6	10 YRS PLUS
51	1216.0	77919.8	17481.6650
52	1032.0	91745.0	10 YRS PLUS
53	915.0	95382.2	10 YRS PLUS
54	901.0	95315.0	10 YRS PLUS
55	1026.0	90276.5	10 YRS PLUS
56	1175.0	77421.2	79001.9540

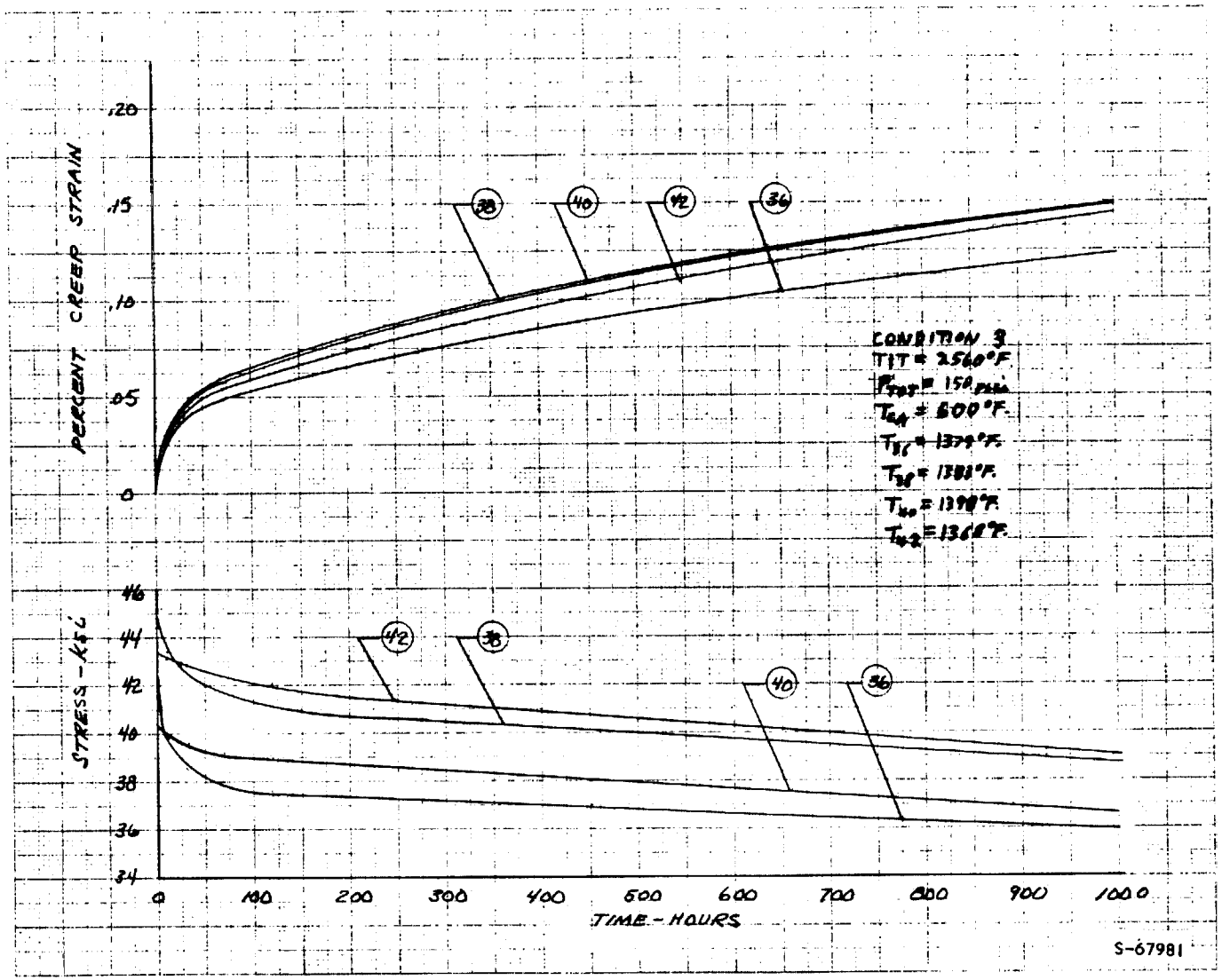

FIGURE K-12. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS OF THE PIN FIN BLADE SCHEME A-1, 1.5 INCH CHORD, CONDITION 3.

TABLE K-69

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1773.0	-32665.3	23.6637
2	1735.0	-32648.5	55.6680
3	1707.0	-32311.9	113.9805
4	1671.0	-22083.1	2313.0529
5	1533.0	22093.2	10 YRS PLUS
6	1502.0	31006.0	30978.6410
7	1424.0	54202.2	3036.0759
8	1392.0	63474.0	1393.8761
9	1545.0	28076.1	17798.7220
10	1497.0	42164.8	3149.6505
11	1551.0	32624.7	5464.7224
12	1493.0	50005.0	921.0869
13	1549.0	36226.0	2582.9106
14	1492.0	53152.2	552.4301
15	1591.0	24996.9	9973.7381
16	1543.0	39301.9	1524.7351
17	1612.0	16778.9	57670.6160
18	1578.0	27476.5	8222.5110
19	1640.0	4927.8	10 YRS PLUS
20	1611.0	14593.5	10 YRS PLUS
21	1568.0	23392.6	26612.3750
22	1505.0	41078.8	3039.0158
23	1597.0	14410.0	10 YRS PLUS
24	1543.0	29328.1	14219.3632
25	1768.0	-31630.8	32.5443
26	1732.0	-29630.1	110.5399
27	1658.0	-9799.4	10 YRS PLUS
28	1624.0	477.1	10 YRS PLUS
29	1632.0	4289.3	10 YRS PLUS
30	1597.0	14598.4	10 YRS PLUS
31	1621.0	13225.2	10 YRS PLUS
32	1571.0	27056.3	10907.4208
33	1585.0	27333.1	7027.5525
34	1519.0	43883.2	1291.6292
35	1686.0	3157.5	10 YRS PLUS
36	1619.0	22886.8	7469.4131
37	1699.0	6576.0	10 YRS PLUS
38	1629.0	26772.1	2493.5778
39	1697.0	8427.2	10 YRS PLUS
40	1634.0	26632.9	2258.9029
41	1650.0	20143.3	6640.1493
42	1600.0	34590.1	970.8137
43	1660.0	11783.1	84860.5140
44	1623.0	22358.9	7530.0545
45	1647.0	8658.8	10 YRS PLUS
46	1618.0	16613.6	51767.0430
47	1566.0	27418.7	11540.1702
48	1504.0	43303.0	2140.3126
49	1595.0	17478.3	72543.2280
50	1542.0	31339.6	9317.0167
51	1367.0	73367.0	420.8059
52	1204.0	91279.8	1482.3635
53	1102.0	95201.6	19655.1600
54	1075.0	95563.7	48316.8070
55	1187.0	90630.4	2961.1105
56	1306.0	77571.0	1090.5589

TABLE K-70

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1784.0	-31777.0	22.2025
2	1747.0	-32125.9	47.1498
3	1743.0	-32160.8	51.2562
4	1710.0	-30567.7	152.3586
5	1613.0	8405.3	10 YRS PLUS
6	1583.0	18109.0	81508.1430
7	1495.0	46862.4	1492.4044
8	1469.0	54833.3	771.0357
9	1631.0	17068.4	31129.6210
10	1602.0	27998.3	3867.0551
11	1640.0	25115.4	2678.5446
12	1603.0	39126.0	335.3837
13	1670.0	21792.1	2522.1121
14	1634.0	35838.9	314.6041
15	1679.0	21118.2	2315.5329
16	1648.0	32955.9	411.7970
17	1733.0	3549.8	10 YRS PLUS
18	1704.0	14499.8	10809.3148
19	1762.0	-6646.8	10 YRS PLUS
20	1742.0	728.0	10 YRS PLUS
21	1696.0	11966.7	30629.1700
22	1653.0	27230.7	1226.8922
23	1713.0	6062.7	10 YRS PLUS
24	1680.0	17340.6	7816.9319
25	1749.0	-30969.1	56.9949
26	1713.0	-28698.9	208.7928
27	1624.0	5305.2	10 YRS PLUS
28	1590.0	15399.2	10 YRS PLUS
29	1632.0	11258.7	10 YRS PLUS
30	1598.0	21232.9	18766.9780
31	1612.0	25601.7	4997.8904
32	1577.0	35020.1	1605.4046
33	1599.0	34564.7	1001.6306
34	1545.0	48112.3	320.3286
35	1807.0	-14578.2	853.3947
36	1762.0	-3001.5	10 YRS PLUS
37	1809.0	-1461.3	10 YRS PLUS
38	1763.0	10612.6	8638.0821
39	1778.0	11632.0	4317.0480
40	1736.0	22764.2	409.4730
41	1754.0	17696.4	1108.5869
42	1721.0	26263.7	285.2860
43	1772.0	6870.5	83521.4430
44	1742.0	14606.8	4018.1646
45	1774.0	-908.3	10 YRS PLUS
46	1750.0	4746.9	10 YRS PLUS
47	1696.0	18193.8	3920.9896
48	1652.0	31059.1	558.1358
49	1715.0	10371.5	31545.0280
50	1682.0	19944.2	3126.2483
51	1432.0	68449.0	177.2337
52	1300.0	85459.6	263.9378
53	1192.0	94615.9	1059.5912
54	1166.0	95172.2	2188.2248
55	1264.0	86958.3	568.1655
56	1384.0	70962.6	414.0182

TABLE K-71

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, HUB SECTION, 22700 RPM, TIT = 2290°F,
WCA = 0.11149 LB/SEC/BLADE (4.7% OF HOT GAS FLOW,
TCA = 900°F, PTOT = 450 PSIA, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1550.0	-1825.1	10 YRS PLUS
2	1498.0	12336.8	10 YRS PLUS
3	1475.0	17456.8	10 YRS PLUS
4	1424.0	31268.3	10 YRS PLUS
5	1476.0	18812.2	10 YRS PLUS
6	1416.0	34957.8	10 YRS PLUS
7	1522.0	8395.9	10 YRS PLUS
8	1432.0	33037.6	10 YRS PLUS
9	1556.0	3000.2	10 YRS PLUS
10	1440.0	35251.7	71628.6880
11	1535.0	11899.4	10 YRS PLUS
12	1387.0	53262.4	10629.3312
13	1527.0	10035.8	10 YRS PLUS
14	1377.0	57721.2	6387.7464
15	1515.0	17924.0	10 YRS PLUS
16	1388.0	53266.4	10308.3414
17	1496.0	19896.9	10 YRS PLUS
18	1411.0	43501.9	29835.6330
19	1494.0	15549.3	10 YRS PLUS
20	1440.0	30336.8	10 YRS PLUS
21	1406.0	33906.5	10 YRS PLUS
22	1333.0	53773.4	51143.4800
23	1443.0	21085.0	10 YRS PLUS
24	1390.0	34985.2	10 YRS PLUS
25	1609.0	-15327.5	10 YRS PLUS
26	1560.0	-1804.8	10 YRS PLUS
27	1614.0	-11519.0	10 YRS PLUS
28	1563.0	2403.8	10 YRS PLUS
29	1566.0	6869.8	10 YRS PLUS
30	1517.0	19536.6	10 YRS PLUS
31	1580.0	7232.6	10 YRS PLUS
32	1524.0	21719.5	10 YRS PLUS
33	1564.0	14319.9	10 YRS PLUS
34	1470.0	38125.3	15093.6538
35	1588.0	11736.2	10 YRS PLUS
36	1467.0	42504.7	6894.6677
37	1615.0	8842.0	10 YRS PLUS
38	1458.0	48766.6	2998.9862
39	1632.0	3124.0	10 YRS PLUS
40	1467.0	45879.5	3842.1597
41	1586.0	11919.6	10 YRS PLUS
42	1444.0	47437.9	5633.6744
43	1563.0	10709.3	10 YRS PLUS
44	1461.0	36453.1	28945.8130
45	1526.0	12054.4	10 YRS PLUS
46	1458.0	29150.2	10 YRS PLUS
47	1418.0	33660.6	10 YRS PLUS
48	1334.0	54876.0	40354.9600
49	1443.0	22987.7	10 YRS PLUS
50	1387.0	37070.9	10 YRS PLUS
51	1301.0	74738.5	2247.1602
52	1122.0	91574.4	22030.0710
53	1024.0	95316.3	10 YRS PLUS
54	1023.0	95085.0	10 YRS PLUS
55	1131.0	89315.9	26676.5010
56	1280.0	72596.2	6664.0691

TABLE K-72

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1684.0	-22774.1	1444.6253
2	1633.0	-5555.1	10 YRS PLUS
3	1638.0	-8687.4	10 YRS PLUS
4	1590.0	6764.3	10 YRS PLUS
5	1584.0	14096.1	10 YRS PLUS
6	1537.0	27536.3	25128.9500
7	1542.0	29388.0	14424.7918
8	1496.0	42738.4	2936.0078
9	1632.0	10831.6	10 YRS PLUS
10	1567.0	31260.1	4800.5641
11	1635.0	17238.9	26379.0060
12	1556.0	42401.1	621.6886
13	1628.0	23122.0	5603.3763
14	1551.0	47265.4	315.8703
15	1662.0	12689.0	59328.3450
16	1597.0	34590.9	1048.5511
17	1666.0	9135.9	10 YRS PLUS
18	1618.0	25334.2	4522.9936
19	1681.0	842.3	10 YRS PLUS
20	1639.0	14667.1	56679.1640
21	1569.0	31398.5	4412.2799
22	1470.0	57838.3	446.1188
23	1595.0	22997.1	13856.2411
24	1507.0	47140.2	1028.0932
25	1683.0	-16938.2	8272.2609
26	1634.0	3960.6	10 YRS PLUS
27	1657.0	-3201.5	10 YRS PLUS
28	1607.0	12107.4	10 YRS PLUS
29	1660.0	3235.6	10 YRS PLUS
30	1609.0	18601.4	33465.1020
31	1671.0	6388.1	10 YRS PLUS
32	1600.0	27915.0	4151.0103
33	1667.0	11708.3	72034.1090
34	1579.0	37018.2	981.7164
35	1736.0	-1678.6	10 YRS PLUS
36	1648.0	24334.2	2577.2265
37	1743.0	4909.9	10 YRS PLUS
38	1651.0	31821.7	486.5971
39	1742.0	6718.0	10 YRS PLUS
40	1659.0	31045.1	470.8549
41	1698.0	16996.6	5533.6715
42	1629.0	37384.6	255.5770
43	1703.0	9364.6	78855.5790
44	1651.0	24522.4	2293.5902
45	1683.0	7194.7	10 YRS PLUS
46	1641.0	19047.5	12174.0718
47	1566.0	36409.9	1577.5825
48	1469.0	59025.0	373.2453
49	1592.0	26858.2	6464.3114
50	1506.0	49512.8	705.9082
51	1399.0	72555.0	200.5137
52	1230.0	90729.7	733.0273
53	1138.0	94978.5	5860.1926
54	1143.0	94538.2	5451.3139
55	1254.0	86356.7	874.6436
56	1388.0	68147.4	636.0501

TABLE K-73

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1700.0	-27664.9	352.5914
2	1650.0	-11447.4	10 YRS PLUS
3	1674.0	-19107.8	5061.1431
4	1630.0	-4566.6	10 YRS PLUS
5	1649.0	-532.6	10 YRS PLUS
6	1604.0	14505.5	10 YRS PLUS
7	1579.0	26350.7	10251.8834
8	1539.0	38295.3	2126.4343
9	1680.0	3569.0	10 YRS PLUS
10	1637.0	18830.7	14565.5434
11	1684.0	12269.5	37977.8790
12	1629.0	31969.3	817.2182
13	1706.0	10581.1	37222.8680
14	1652.0	30293.6	656.6330
15	1707.0	11403.6	27679.9080
16	1662.0	27619.3	902.0255
17	1745.0	-1938.3	10 YRS PLUS
18	1703.0	12949.2	18471.3360
19	1761.0	-9106.9	21339.0560
20	1731.0	1278.3	10 YRS PLUS
21	1650.0	22912.2	3312.8492
22	1574.0	47669.9	164.5350
23	1667.0	16684.9	13625.5738
24	1605.0	37321.0	472.0027
25	1675.0	-15260.3	17789.5790
26	1628.0	-346.4	10 YRS PLUS
27	1628.0	7413.2	10 YRS PLUS
28	1576.0	22505.2	25941.0390
29	1665.0	4378.1	10 YRS PLUS
30	1613.0	19956.1	18848.7620
31	1657.0	14805.6	33322.2730
32	1606.0	30180.5	2167.8074
33	1669.0	15798.0	17395.5140
34	1593.0	38347.5	511.8098
35	1817.0	-14914.4	609.2590
36	1755.0	1894.8	10 YRS PLUS
37	1814.0	-1109.6	10 YRS PLUS
38	1751.0	16391.0	1813.5316
39	1789.0	9318.8	9104.7606
40	1728.0	26400.6	235.0996
41	1764.0	14492.1	2434.8874
42	1716.0	27791.4	234.5096
43	1776.0	4385.1	10 YRS PLUS
44	1732.0	16429.5	2849.0276
45	1770.0	-2259.3	10 YRS PLUS
46	1733.0	7335.9	10 YRS PLUS
47	1648.0	29991.8	773.5783
48	1573.0	49644.8	121.9915
49	1669.0	21145.7	2963.9875
50	1608.0	39762.4	257.7221
51	1450.0	66104.5	169.2692
52	1305.0	84815.9	259.8458
53	1199.0	94121.5	942.6359
54	1193.0	93685.7	1255.2867
55	1291.0	84203.6	444.9626
56	1429.0	64029.2	442.0524

TABLE K-74

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, HUB SECTION, 22900 RPM, TIT = 2340°F,
WCA = 0.01172 LB/SEC/BLADE (4.51% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 50 PSIA, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1665.0	-39988.5	61.5584
2	1651.0	-38421.7	119.7635
3	1592.0	-21565.9	20547.9140
4	1579.0	-17893.6	10 YRS PLUS
5	1460.0	14123.6	10 YRS PLUS
6	1448.0	17445.1	10 YRS PLUS
7	1410.0	27857.4	10 YRS PLUS
8	1386.0	34394.0	10 YRS PLUS
9	1406.0	30500.7	10 YRS PLUS
10	1371.0	40133.1	10 YRS PLUS
11	1395.0	34862.4	10 YRS PLUS
12	1350.0	47529.0	10 YRS PLUS
13	1393.0	34035.5	10 YRS PLUS
14	1348.0	49028.1	76622.6540
15	1394.0	35888.0	10 YRS PLUS
16	1358.0	46056.2	10 YRS PLUS
17	1405.0	32101.1	10 YRS PLUS
18	1383.0	38311.9	10 YRS PLUS
19	1424.0	25485.9	10 YRS PLUS
20	1411.0	29102.0	10 YRS PLUS
21	1464.0	13390.5	10 YRS PLUS
22	1451.0	17099.8	10 YRS PLUS
23	1503.0	1961.1	10 YRS PLUS
24	1495.0	4155.2	10 YRS PLUS
25	1707.0	-39948.6	23.4729
26	1695.0	-40025.8	30.4218
27	1630.0	-29363.7	1393.6350
28	1619.0	-26201.8	3654.1155
29	1558.0	-7170.0	10 YRS PLUS
30	1548.0	-4666.2	10 YRS PLUS
31	1500.0	9953.5	10 YRS PLUS
32	1488.0	12915.3	10 YRS PLUS
33	1442.0	26342.4	10 YRS PLUS
34	1418.0	32083.8	10 YRS PLUS
35	1452.0	25408.6	10 YRS PLUS
36	1415.0	34413.0	10 YRS PLUS
37	1478.0	20867.9	10 YRS PLUS
38	1428.0	32856.0	10 YRS PLUS
39	1495.0	16495.9	10 YRS PLUS
40	1441.0	29555.6	10 YRS PLUS
41	1470.0	21419.4	10 YRS PLUS
42	1427.0	31701.3	10 YRS PLUS
43	1459.0	21596.7	10 YRS PLUS
44	1431.0	28330.5	10 YRS PLUS
45	1444.0	22329.8	10 YRS PLUS
46	1427.0	26388.1	10 YRS PLUS
47	1470.0	12998.2	10 YRS PLUS
48	1455.0	16612.7	10 YRS PLUS
49	1503.0	2755.1	10 YRS PLUS
50	1494.0	4961.2	10 YRS PLUS
51	1360.0	46482.3	83774.2830
52	1284.0	66038.2	22399.5980
53	1231.0	75795.6	16660.0880
54	1216.0	77406.2	19495.8630
55	1272.0	65701.7	35397.5760
56	1335.0	48244.8	10 YRS PLUS

TABLE K-75

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1812.0	-25899.2	38.6476
2	1799.0	-25866.9	51.7767
3	1764.0	-24140.6	161.0724
4	1753.0	-20929.4	401.4416
5	1614.0	22531.2	9209.5043
6	1605.0	25455.2	6207.7187
7	1528.0	47329.3	569.0536
8	1520.0	49618.8	478.0028
9	1576.0	35970.7	1336.7809
10	1563.0	39700.5	823.4477
11	1581.0	36655.0	1009.5077
12	1564.0	41609.7	575.6702
13	1586.0	36799.3	859.3249
14	1569.0	41747.1	494.6141
15	1609.0	31090.0	1646.5662
16	1595.0	35575.8	890.5555
17	1638.0	22478.3	4954.5553
18	1629.0	25524.3	3259.4368
19	1667.0	13665.3	37424.0740
20	1658.0	16639.0	17522.6230
21	1691.0	6230.0	10 YRS PLUS
22	1676.0	11064.3	70144.8260
23	1708.0	989.0	10 YRS PLUS
24	1695.0	5059.2	10 YRS PLUS
25	1809.0	-25714.1	42.8110
26	1798.0	-24981.6	63.1104
27	1717.0	-9407.1	52823.1500
28	1708.0	-6676.9	10 YRS PLUS
29	1667.0	7179.5	10 YRS PLUS
30	1657.0	10262.4	10 YRS PLUS
31	1639.0	17210.1	23930.3690
32	1625.0	21553.2	8494.5995
33	1607.0	28123.8	3299.8475
34	1587.0	33674.5	1660.4536
35	1662.0	12593.7	61254.6960
36	1642.0	18699.8	13338.3186
37	1672.0	11955.2	58001.8740
38	1650.0	18539.5	11405.3996
39	1672.0	13271.0	37384.2600
40	1653.0	18923.1	9264.9907
41	1654.0	19409.8	7662.0378
42	1639.0	23864.7	3589.9508
43	1667.0	15306.2	21611.8050
44	1656.0	18544.4	9731.6521
45	1671.0	13661.3	33697.6430
46	1663.0	15953.8	19331.6600
47	1691.0	7004.1	10 YRS PLUS
48	1677.0	11176.4	65787.6010
49	1707.0	1880.2	10 YRS PLUS
50	1695.0	5452.9	10 YRS PLUS
51	1533.0	48207.1	430.7278
52	1470.0	60243.7	293.4484
53	1427.0	67253.5	254.3345
54	1397.0	72040.6	233.8691
55	1444.0	63865.6	302.2413
56	1490.0	56090.5	352.4623

TABLE K-76

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, TIP SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1830.0	-23378.3	42.8369
2	1818.0	-23340.9	56.1000
3	1796.0	-22562.1	106.7285
4	1786.0	-21569.8	163.0779
5	1678.0	15038.8	17707.3350
6	1669.0	18173.6	7862.1686
7	1608.0	40022.3	243.9041
8	1600.0	42912.1	186.5319
9	1678.0	21623.6	2135.7023
10	1670.0	24792.3	1341.1133
11	1685.0	25186.5	851.0270
12	1675.0	29170.9	471.9744
13	1706.0	22624.6	866.8980
14	1696.0	26727.2	471.8418
15	1716.0	22136.5	752.0264
16	1708.0	25407.3	464.3611
17	1755.0	11312.8	8417.0175
18	1747.0	14555.6	3611.8878
19	1782.0	4090.5	10 YRS PLUS
20	1776.0	6442.0	10 YRS PLUS
21	1799.0	-501.5	10 YRS PLUS
22	1790.0	2724.4	10 YRS PLUS
23	1809.0	-3563.1	10 YRS PLUS
24	1802.0	-916.5	10 YRS PLUS
25	1810.0	-22866.3	73.5064
26	1799.0	-22389.4	103.2553
27	1719.0	394.2	10 YRS PLUS
28	1710.0	3246.8	10 YRS PLUS
29	1688.0	13373.7	23706.7970
30	1679.0	16097.2	12130.2344
31	1666.0	23700.4	1866.3536
32	1656.0	26740.6	1262.3370
33	1652.0	30256.2	661.8674
34	1638.0	34397.2	387.8707
35	1775.0	-1606.5	10 YRS PLUS
36	1762.0	1811.8	10 YRS PLUS
37	1780.0	4394.5	10 YRS PLUS
38	1767.0	7583.5	56244.4720
39	1768.0	11327.2	6075.2355
40	1756.0	14279.2	3166.6781
41	1762.0	14625.2	2449.1542
42	1752.0	17000.2	1455.0887
43	1776.0	10264.7	7004.0043
44	1768.0	12102.3	4742.7957
45	1785.0	6718.9	66910.9050
46	1779.0	7932.0	32116.0010
47	1799.0	1794.6	10 YRS PLUS
48	1790.0	4031.6	10 YRS PLUS
49	1809.0	-1711.1	10 YRS PLUS
50	1802.0	226.2	10 YRS PLUS
51	1600.0	46001.2	113.0610
52	1551.0	53802.9	106.6922
53	1508.0	60616.7	101.0222
54	1487.0	63545.0	102.1686
55	1527.0	56723.5	120.5238
56	1572.0	49083.9	137.1581

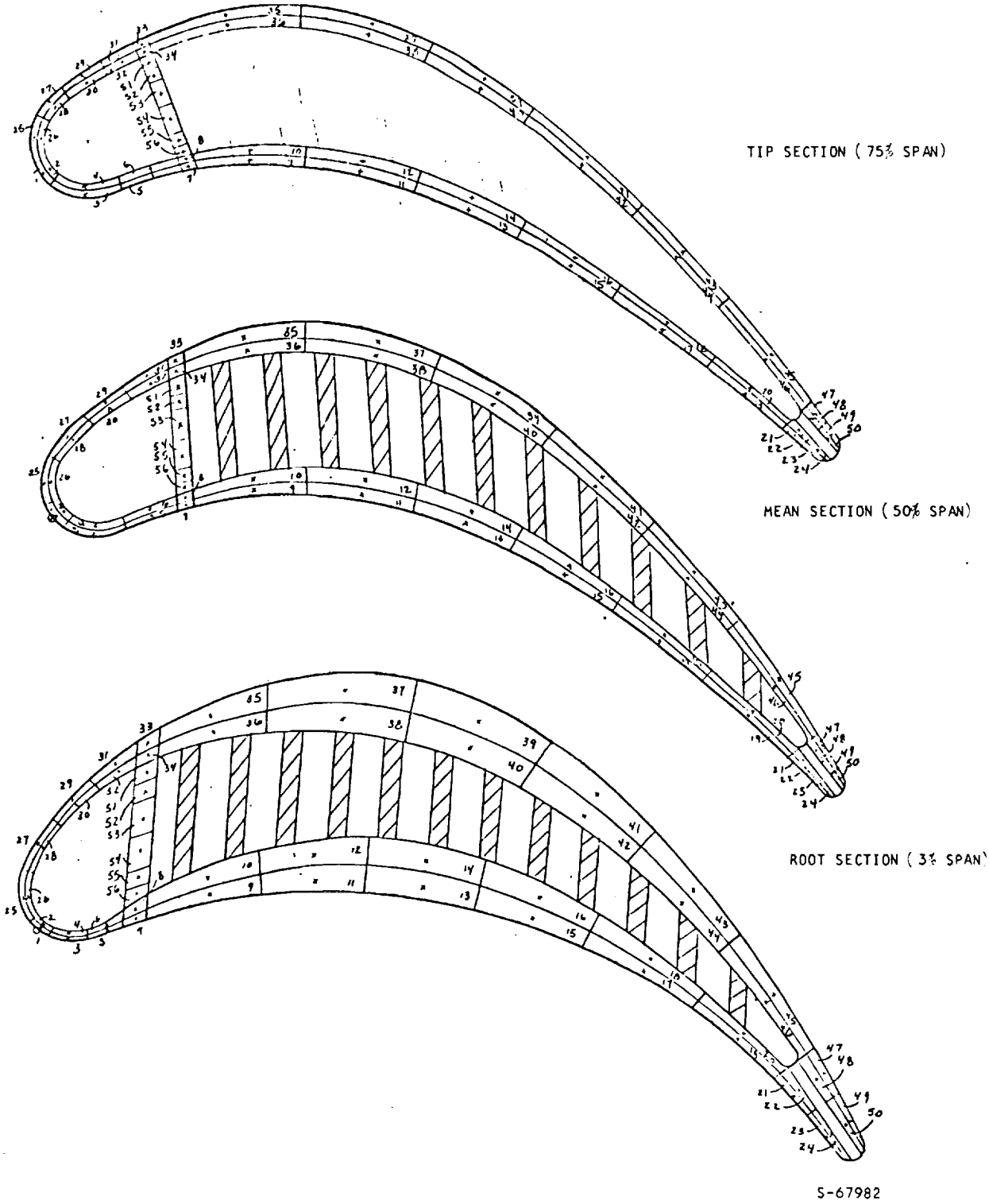

FIGURE K-13. SCHEME A-1 CONVECTION COOLED CAST TWO-CAVITY PIN FIN BLADE 1.5 INCH CHORD

TABLE K-77

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F, WCA = 0.01146 LB/SEC/BLADE (1.407% OF HOT GAS FLOW), TCA = 1200°F, PTOT = 150 PSIA, CONDITION 1A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1665.0	-22202.9	2625.2857
2	1659.0	-20389.4	4842.7912
3	1624.0	-10566.8	10 YRS PLUS
4	1618.0	-8654.1	10 YRS PLUS
5	1540.0	12351.3	10 YRS PLUS
6	1535.0	13794.7	10 YRS PLUS
7	1496.0	23818.0	10 YRS PLUS
8	1484.0	27217.0	10 YRS PLUS
9	1465.0	31233.5	86852.2350
10	1445.0	36832.1	42491.2000
11	1455.0	32324.6	10 YRS PLUS
12	1429.0	39665.4	35060.2150
13	1452.0	30040.4	10 YRS PLUS
14	1427.0	38158.9	53247.5080
15	1450.0	29166.4	10 YRS PLUS
16	1430.0	34658.8	10 YRS PLUS
17	1453.0	25403.3	10 YRS PLUS
18	1440.0	28933.0	10 YRS PLUS
19	1454.0	22147.2	10 YRS PLUS
20	1446.0	24251.6	10 YRS PLUS
21	1433.0	25474.7	10 YRS PLUS
22	1424.0	27869.1	10 YRS PLUS
23	1446.0	20715.9	10 YRS PLUS
24	1439.0	22519.5	10 YRS PLUS
25	1689.0	-28317.5	401.3652
26	1684.0	-26960.8	601.8401
27	1654.0	-17218.7	16021.8211
28	1650.0	-16163.9	25416.0590
29	1611.0	-3894.0	10 YRS PLUS
30	1606.0	-2536.9	10 YRS PLUS
31	1559.0	10489.3	10 YRS PLUS
32	1553.0	11899.8	10 YRS PLUS
33	1512.0	22924.9	10 YRS PLUS
34	1478.0	31674.7	53354.0760
35	1492.0	27751.9	87329.8700
36	1471.0	32900.9	49332.9850
37	1503.0	23054.4	10 YRS PLUS
38	1473.0	30464.8	81848.9220
39	1511.0	18027.5	10 YRS PLUS
40	1479.0	26108.3	10 YRS PLUS
41	1494.0	19009.4	10 YRS PLUS
42	1469.0	25370.2	10 YRS PLUS
43	1423.0	34021.3	10 YRS PLUS
44	1466.0	22726.9	10 YRS PLUS
45	1466.0	19299.8	10 YRS PLUS
46	1456.0	21910.0	10 YRS PLUS
47	1436.0	24668.7	10 YRS PLUS
48	1426.0	27258.8	10 YRS PLUS
49	1446.0	20608.7	10 YRS PLUS
50	1439.0	22458.7	10 YRS PLUS
51	1394.0	52978.0	9078.8312
52	1392.0	51846.7	11816.2178

TABLE K-78

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1802.0	-20015.3	173.3370
2	1796.0	-18893.7	282.9435
3	1773.0	-13054.9	3098.5702
4	1767.0	-11439.5	6006.9999
5	1684.0	12343.6	37054.7860
6	1680.0	13573.3	27362.8260
7	1613.0	33934.3	802.7642
8	1607.0	35794.8	624.8745
9	1601.0	36036.9	690.6927
10	1592.0	38476.7	510.4063
11	1599.0	34142.7	1098.0346
12	1589.0	36697.9	813.2337
13	1600.0	31644.6	1843.2327
14	1590.0	34175.0	1376.2713
15	1614.0	25324.9	5034.0399
16	1606.0	27651.0	3753.5431
17	1629.0	18947.6	17321.1940
18	1624.0	20363.3	12211.0800
19	1638.0	14662.3	58334.5830
20	1633.0	16099.7	41004.2110
21	1605.0	24229.6	8100.5447
22	1593.0	27554.6	5405.9288
23	1609.0	22697.8	10149.8902
24	1599.0	25721.7	6871.6213
25	1803.0	-20256.8	157.0652
26	1797.0	-20635.0	159.6942
27	1756.0	-8292.8	44187.0390
28	1752.0	-7210.2	10 YRS PLUS
29	1720.0	1400.6	10 YRS PLUS
30	1716.0	2570.1	10 YRS PLUS
31	1691.0	9223.4	10 YRS PLUS
32	1685.0	11049.3	55449.3840
33	1657.0	19117.4	7819.8035
34	1647.0	22356.0	4028.0394
35	1656.0	17681.5	13008.5589
36	1643.0	21801.0	5027.9033
37	1656.0	14653.7	36016.9820
38	1643.0	18901.9	12132.0984
39	1654.0	12942.6	67597.9620
40	1642.0	16912.3	24431.2080
41	1642.0	14911.3	48104.0710
42	1633.0	17940.3	21928.6170
43	1649.0	11360.5	10 YRS PLUS
44	1642.0	13723.6	71918.0960
45	1646.0	11183.5	10 YRS PLUS
46	1640.0	13213.6	10 YRS PLUS
47	1605.0	23530.3	9428.7916
48	1593.0	27187.2	5857.6196
49	1609.0	22130.8	11477.1476
50	1598.0	25627.6	7203.5851
51	1551.0	50372.9	188.5592
52	1543.0	51867.5	180.3945

TABLE K-79

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE
1.5 INCH CHORD TIP SECTION CONDITION 1

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1830.0	-17964.8	175.2803
2	1824.0	-17729.0	215.8125
3	1810.0	-14641.3	780.2874
4	1805.0	-13000.0	1468.1573
5	1739.0	6910.9	10 YRS PLUS
6	1735.0	8247.0	78690.5590
7	1682.0	25185.5	916.5468
8	1678.0	26562.8	757.9804
9	1689.0	23318.3	1139.0878
10	1685.0	24745.8	933.1596
11	1689.0	23642.3	1064.6313
12	1683.0	25743.0	795.7504
13	1701.0	19764.4	2061.4169
14	1695.0	21878.3	1325.8327
15	1708.0	17173.9	4057.0381
16	1703.0	18905.5	2602.2384
17	1731.0	9412.0	36581.1970
18	1726.0	11110.1	18673.1190
19	1740.0	6051.3	10 YRS PLUS
20	1737.0	7080.3	10 YRS PLUS
21	1705.0	16567.9	5338.7590
22	1696.0	19537.4	2516.3947
23	1705.0	16417.2	5609.9042
24	1699.0	18366.8	3434.3857
25	1821.0	-17444.5	252.3534
26	1816.0	-15926.1	454.3780
27	1774.0	-3060.7	10 YRS PLUS
28	1769.0	-1621.9	10 YRS PLUS
29	1751.0	4336.4	10 YRS PLUS
30	1746.0	5798.7	10 YRS PLUS
31	1729.0	11605.4	14723.6003
32	1724.0	13098.7	10280.4352
33	1710.0	17864.8	3076.4539
34	1702.0	20295.4	1688.3538
35	1750.0	6203.4	10 YRS PLUS
36	1742.0	8526.2	53286.6610
37	1749.0	7039.9	10 YRS PLUS
38	1742.0	9035.6	36486.1500
39	1741.0	9245.0	32036.1610
40	1734.0	11248.1	14563.8332
41	1737.0	9798.3	23505.6060
42	1732.0	11208.4	15520.9716
43	1746.0	6042.0	10 YRS PLUS
44	1741.0	7474.0	10 YRS PLUS
45	1747.0	4613.5	10 YRS PLUS
46	1743.0	5724.5	10 YRS PLUS
47	1704.0	17313.9	4284.0213
48	1696.0	19767.8	2332.0827
49	1706.0	16435.2	5437.8812
50	1699.0	18600.5	3179.7449
51	1629.0	42696.1	94.7485
52	1619.0	44420.8	91.6204

TABLE K-80

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F, WCA = 0.009545 LB/SEC/BLADE (1.172% OF HOT GAS FLOW), TCA = 900°F, PTOT = 150 PSIA, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1646.0	-44211.3	49.5286
2	1640.0	-44123.9	57.9259
3	1591.0	-34453.3	1261.8256
4	1584.0	-32490.9	2328.4636
5	1465.0	-2151.9	10 YRS PLUS
6	1458.0	-214.1	10 YRS PLUS
7	1387.0	17309.6	10 YRS PLUS
8	1371.0	21559.5	10 YRS PLUS
9	1314.0	34169.9	10 YRS PLUS
10	1284.0	42351.7	10 YRS PLUS
11	1294.0	36450.3	10 YRS PLUS
12	1254.0	47509.7	10 YRS PLUS
13	1288.0	33428.8	10 YRS PLUS
14	1249.0	45243.2	10 YRS PLUS
15	1285.0	31358.4	10 YRS PLUS
16	1254.0	39591.0	10 YRS PLUS
17	1289.0	25799.8	10 YRS PLUS
18	1270.0	30721.5	10 YRS PLUS
19	1290.0	21197.6	10 YRS PLUS
20	1278.0	24190.6	10 YRS PLUS
21	1249.0	28613.2	10 YRS PLUS
22	1234.0	32467.4	10 YRS PLUS
23	1266.0	22379.3	10 YRS PLUS
24	1256.0	24862.1	10 YRS PLUS
25	1678.0	-43927.9	24.5112
26	1673.0	-44007.7	27.1689
27	1639.0	-43316.4	67.4566
28	1634.0	-43295.9	76.3067
29	1576.0	-27662.3	8331.5316
30	1572.0	-26810.8	11205.1444
31	1486.0	-4359.7	10 YRS PLUS
32	1479.0	-2780.0	10 YRS PLUS
33	1406.0	15902.8	10 YRS PLUS
34	1385.0	20919.2	10 YRS PLUS
35	1353.0	28068.1	10 YRS PLUS
36	1321.0	35815.6	10 YRS PLUS
37	1362.0	22370.9	10 YRS PLUS
38	1318.0	33045.2	10 YRS PLUS
39	1372.0	15297.8	10 YRS PLUS
40	1325.0	26812.2	10 YRS PLUS
41	1345.0	16946.8	10 YRS PLUS
42	1310.0	25665.8	10 YRS PLUS
43	1333.0	15022.1	10 YRS PLUS
44	1309.0	21078.2	10 YRS PLUS
45	1309.0	16323.0	10 YRS PLUS
46	1294.0	20178.6	10 YRS PLUS
47	1254.0	26957.7	10 YRS PLUS
48	1236.0	31643.2	10 YRS PLUS
49	1267.0	21726.6	10 YRS PLUS
50	1256.0	24608.3	10 YRS PLUS
51	1240.0	57839.6	10 YRS PLUS
52	1237.0	56893.4	10 YRS PLUS

TABLE K-81

SCHEME A-1 CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1802.0	-25247.3	54.7873
2	1797.0	-25344.8	60.0380
3	1767.0	-24806.3	131.4890
4	1762.0	-24257.3	164.7329
5	1654.0	4514.3	10 YRS PLUS
6	1650.0	5609.0	10 YRS PLUS
7	1545.0	34040.0	4689.5906
8	1537.0	35969.3	3782.9203
9	1490.0	44564.5	2536.1853
10	1478.0	47426.3	2162.6000
11	1485.0	40165.6	6198.3948
12	1470.0	43507.5	5322.5789
13	1484.0	35683.2	17754.3300
14	1470.0	38740.7	13082.9130
15	1503.0	26958.6	75875.5590
16	1491.0	29565.7	59279.2180
17	1523.0	18738.9	10 YRS PLUS
18	1515.0	20422.8	10 YRS PLUS
19	1534.0	13451.4	10 YRS PLUS
20	1527.0	14968.7	10 YRS PLUS
21	1479.0	26951.8	10 YRS PLUS
22	1461.0	31271.6	10 YRS PLUS
23	1483.0	25537.6	10 YRS PLUS
24	1468.0	29297.1	10 YRS PLUS
25	1805.0	-25808.8	45.8788
26	1800.0	-26949.6	40.8538
27	1754.0	-23315.2	239.8417
28	1750.0	-22355.7	319.8740
29	1704.0	-11812.0	26164.7280
30	1700.0	-10660.9	42426.9590
31	1656.0	-270.3	10 YRS PLUS
32	1650.0	1574.5	10 YRS PLUS
33	1599.0	15290.9	10 YRS PLUS
34	1587.0	18901.7	55313.2970
35	1566.0	19770.7	73572.3990
36	1548.0	24846.5	33679.1690
37	1562.0	13748.6	10 YRS PLUS
38	1543.0	19459.3	10 YRS PLUS
39	1557.0	10332.6	10 YRS PLUS
40	1541.0	15290.7	10 YRS PLUS
41	1541.0	11623.7	10 YRS PLUS
42	1529.0	15450.0	10 YRS PLUS
43	1550.0	7380.1	10 YRS PLUS
44	1541.0	10296.4	10 YRS PLUS
45	1545.0	7679.0	10 YRS PLUS
46	1538.0	10027.1	10 YRS PLUS
47	1478.0	25330.9	10 YRS PLUS
48	1460.0	30526.3	10 YRS PLUS
49	1482.0	24317.5	10 YRS PLUS
50	1467.0	28585.4	10 YRS PLUS
51	1467.0	51535.5	1442.0493
52	1456.0	56600.3	810.2920

TABLE K-82

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, TIP SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1835.0	-21593.6	54.4656
2	1829.0	-21526.8	62.9195
3	1811.0	-21277.0	98.3966
4	1806.0	-21092.9	114.1123
5	1725.0	-1442.1	10 YRS PLUS
6	1721.0	-196.3	10 YRS PLUS
7	1640.0	24346.5	3156.4670
8	1636.0	25623.7	2663.0438
9	1615.0	31079.6	1413.9234
10	1609.0	32941.7	1102.2962
11	1610.0	30499.0	1823.7321
12	1603.0	32654.2	1369.1498
13	1624.0	24033.6	5115.1173
14	1616.0	26476.8	3724.2285
15	1633.0	19304.1	13791.0746
16	1627.0	21103.5	8875.1240
17	1663.0	8297.3	10 YRS PLUS
18	1657.0	10043.5	10 YRS PLUS
19	1674.0	3419.9	10 YRS PLUS
20	1670.0	4565.0	10 YRS PLUS
21	1619.0	19665.0	17721.8240
22	1607.0	23327.0	9341.4469
23	1619.0	19351.5	19729.2320
24	1610.0	22052.4	11365.3731
25	1826.0	-21371.2	69.2853
26	1821.0	-21297.8	78.4848
27	1776.0	-14597.5	1763.6194
28	1772.0	-13571.8	2692.1603
29	1744.0	-6001.8	10 YRS PLUS
30	1740.0	-4872.7	10 YRS PLUS
31	1710.0	3573.8	10 YRS PLUS
32	1705.0	5062.0	10 YRS PLUS
33	1677.0	13357.4	31819.3970
34	1667.0	16474.9	14617.2427
35	1692.0	7037.4	10 YRS PLUS
36	1682.0	10131.2	81478.3860
37	1689.0	5212.5	10 YRS PLUS
38	1679.0	8405.2	10 YRS PLUS
39	1676.0	7208.5	10 YRS PLUS
40	1667.0	10099.5	10 YRS PLUS
41	1672.0	6610.4	10 YRS PLUS
42	1665.0	8913.1	10 YRS PLUS
43	1653.0	10870.5	10 YRS PLUS
44	1677.0	3563.5	10 YRS PLUS
45	1684.0	-210.7	10 YRS PLUS
46	1679.0	1432.7	10 YRS PLUS
47	1618.0	19510.3	19194.4930
48	1607.0	23042.0	9937.2788
49	1619.0	18941.8	22699.7410
50	1610.0	21848.3	11879.0741
51	1583.0	42222.8	319.8833
52	1569.0	45652.9	260.1029

TABLE K-83

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, HUB SECTION, 21934 RPM, TIT = 2100°F,
WCA = 0.008635 LB/SEC/BLADE (1.06% OF HOT GAS FLOW),
TCA = 600°F, PTOT = 150 PSIA, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1628.0	-54802.7	14.0077
2	1622.0	-54825.1	16.0599
3	1561.0	-52928.7	95.9086
4	1553.0	-52402.8	127.9677
5	1396.0	-15823.6	10 YRS PLUS
6	1388.0	-13801.2	10 YRS PLUS
7	1286.0	10001.0	10 YRS PLUS
8	1266.0	15332.1	10 YRS PLUS
9	1176.0	35374.1	10 YRS PLUS
10	1135.0	45670.8	10 YRS PLUS
11	1146.0	38866.5	10 YRS PLUS
12	1092.0	52584.6	10 YRS PLUS
13	1137.0	35024.0	10 YRS PLUS
14	1085.0	49738.7	10 YRS PLUS
15	1134.0	32214.7	10 YRS PLUS
16	1092.0	42490.3	10 YRS PLUS
17	1140.0	24902.3	10 YRS PLUS
18	1114.0	31138.9	10 YRS PLUS
19	1140.0	19191.1	10 YRS PLUS
20	1124.0	22893.5	10 YRS PLUS
21	1072.0	31156.5	10 YRS PLUS
22	1051.0	36127.9	10 YRS PLUS
23	1095.0	23236.6	10 YRS PLUS
24	1080.0	26683.8	10 YRS PLUS
25	1667.0	-51837.5	9.1363
26	1661.0	-52237.6	9.8337
27	1623.0	-53852.5	18.3344
28	1619.0	-53908.4	19.9655
29	1545.0	-49390.6	258.9083
30	1540.0	-48351.5	350.3632
31	1419.0	-17167.2	10 YRS PLUS
32	1412.0	-15701.0	10 YRS PLUS
33	1309.0	9059.2	10 YRS PLUS
34	1287.0	14150.9	10 YRS PLUS
35	1226.0	28508.7	10 YRS PLUS
36	1183.0	38587.7	10 YRS PLUS
37	1235.0	21930.5	10 YRS PLUS
38	1175.0	36016.6	10 YRS PLUS
39	1247.0	12984.9	10 YRS PLUS
40	1184.0	28137.2	10 YRS PLUS
41	1216.0	14046.7	10 YRS PLUS
42	1165.0	26091.1	10 YRS PLUS
43	1198.0	11956.1	10 YRS PLUS
44	1165.0	19680.9	10 YRS PLUS
45	1166.0	13130.3	10 YRS PLUS
46	1146.0	17887.2	10 YRS PLUS
47	1079.0	29106.2	10 YRS PLUS
48	1054.0	35061.9	10 YRS PLUS
49	1095.0	22776.2	10 YRS PLUS
50	1080.0	26394.5	10 YRS PLUS
51	1093.0	60854.0	10 YRS PLUS
52	1090.0	59126.6	10 YRS PLUS

TABLE K-84

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, MEAN SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1797.0	-30291.7	22.4697
2	1791.0	-30583.9	24.1679
3	1756.0	-31383.2	44.7433
4	1750.0	-31389.5	51.1618
5	1622.0	-4872.1	10 YRS PLUS
6	1617.0	-3203.5	10 YRS PLUS
7	1477.0	32348.2	47012.7810
8	1471.0	33477.7	41191.3610
9	1389.0	50117.9	17664.7990
10	1374.0	53727.8	14455.0104
11	1381.0	44936.8	57616.0010
12	1362.0	49188.2	47908.6780
13	1380.0	39048.4	10 YRS PLUS
14	1362.0	42951.4	10 YRS PLUS
15	1403.0	28264.8	10 YRS PLUS
16	1388.0	31398.4	10 YRS PLUS
17	1428.0	17886.3	10 YRS PLUS
18	1418.0	19932.3	10 YRS PLUS
19	1440.0	11512.4	10 YRS PLUS
20	1431.0	13418.1	10 YRS PLUS
21	1359.0	30630.1	10 YRS PLUS
22	1336.0	36018.1	10 YRS PLUS
23	1363.0	29070.5	10 YRS PLUS
24	1343.0	33949.9	10 YRS PLUS
25	1801.0	-30659.1	19.1507
26	1796.0	-31710.1	17.3233
27	1746.0	-31682.4	52.7781
28	1742.0	-31681.5	57.8089
29	1684.0	-24159.9	1081.1470
30	1679.0	-22767.5	1638.6848
31	1620.0	-8729.3	10 YRS PLUS
32	1612.0	-6326.9	10 YRS PLUS
33	1543.0	10171.4	10 YRS PLUS
34	1527.0	14842.0	10 YRS PLUS
35	1484.0	20301.5	10 YRS PLUS
36	1462.0	26323.6	10 YRS PLUS
37	1477.0	13167.9	10 YRS PLUS
38	1453.0	20160.8	10 YRS PLUS
39	1471.0	8828.7	10 YRS PLUS
40	1450.0	14813.0	10 YRS PLUS
41	1451.0	9644.4	10 YRS PLUS
42	1435.0	14551.4	10 YRS PLUS
43	1462.0	4089.8	10 YRS PLUS
44	1451.0	7574.4	10 YRS PLUS
45	1454.0	4437.4	10 YRS PLUS
46	1446.0	7093.0	10 YRS PLUS
47	1358.0	28534.6	10 YRS PLUS
48	1335.0	35012.3	10 YRS PLUS
49	1362.0	27466.0	10 YRS PLUS
50	1343.0	32723.6	10 YRS PLUS
51	1381.0	53701.3	11755.5210
52	1368.0	59634.6	5899.0163

TABLE K-85

SCHEME A-I CONVECTION COOLED CAST TWO CAVITY PIN FIN BLADE,
1.5 INCH CHORD, TIP SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1832.0	-24172.1	35.1155
2	1827.0	-24370.3	37.6461
3	1805.0	-24936.0	54.5324
4	1800.0	-24825.5	62.2680
5	1706.0	-7260.5	10 YRS PLUS
6	1702.0	-6066.5	10 YRS PLUS
7	1598.0	24797.2	8632.2466
8	1593.0	26117.0	7400.0641
9	1550.0	35731.4	2807.9233
10	1543.0	37463.2	2301.2408
11	1542.0	34305.5	4794.9459
12	1534.0	36250.3	3853.5772
13	1559.0	26561.9	16915.1470
14	1549.0	29004.8	12944.2602
15	1570.0	20845.9	45082.3900
16	1562.0	22778.4	36034.2460
17	1606.0	8636.9	10 YRS PLUS
18	1599.0	10482.9	10 YRS PLUS
19	1617.0	3279.0	10 YRS PLUS
20	1612.0	4608.4	10 YRS PLUS
21	1542.0	23030.1	59917.2820
22	1527.0	26815.0	39233.7940
23	1540.0	23169.6	61482.2060
24	1530.0	25627.8	47071.4280
25	1824.0	-24403.6	39.9226
26	1819.0	-24595.5	42.8763
27	1771.0	-23585.9	153.3768
28	1766.0	-22351.6	220.5841
29	1732.0	-13862.4	6556.5756
30	1727.0	-12450.6	11766.9308
31	1686.0	-1476.0	10 YRS PLUS
32	1682.0	-290.3	10 YRS PLUS
33	1642.0	11202.2	10 YRS PLUS
34	1632.0	14350.5	76390.1430
35	1643.0	7781.8	10 YRS PLUS
36	1631.0	11572.2	10 YRS PLUS
37	1637.0	4933.6	10 YRS PLUS
38	1625.0	8895.8	10 YRS PLUS
39	1622.0	6512.4	10 YRS PLUS
40	1611.0	10169.9	10 YRS PLUS
41	1616.0	5883.5	10 YRS PLUS
42	1608.0	8650.0	10 YRS PLUS
43	1630.0	-390.1	10 YRS PLUS
44	1623.0	2035.4	10 YRS PLUS
45	1630.0	-2040.0	10 YRS PLUS
46	1624.0	42.8	10 YRS PLUS
47	1541.0	22297.0	72657.2530
48	1526.0	26494.0	43402.9370
49	1541.0	22051.2	76772.8850
50	1530.0	25163.4	52264.7630
51	1533.0	42516.8	1117.3792
52	1516.0	46992.0	828.1244

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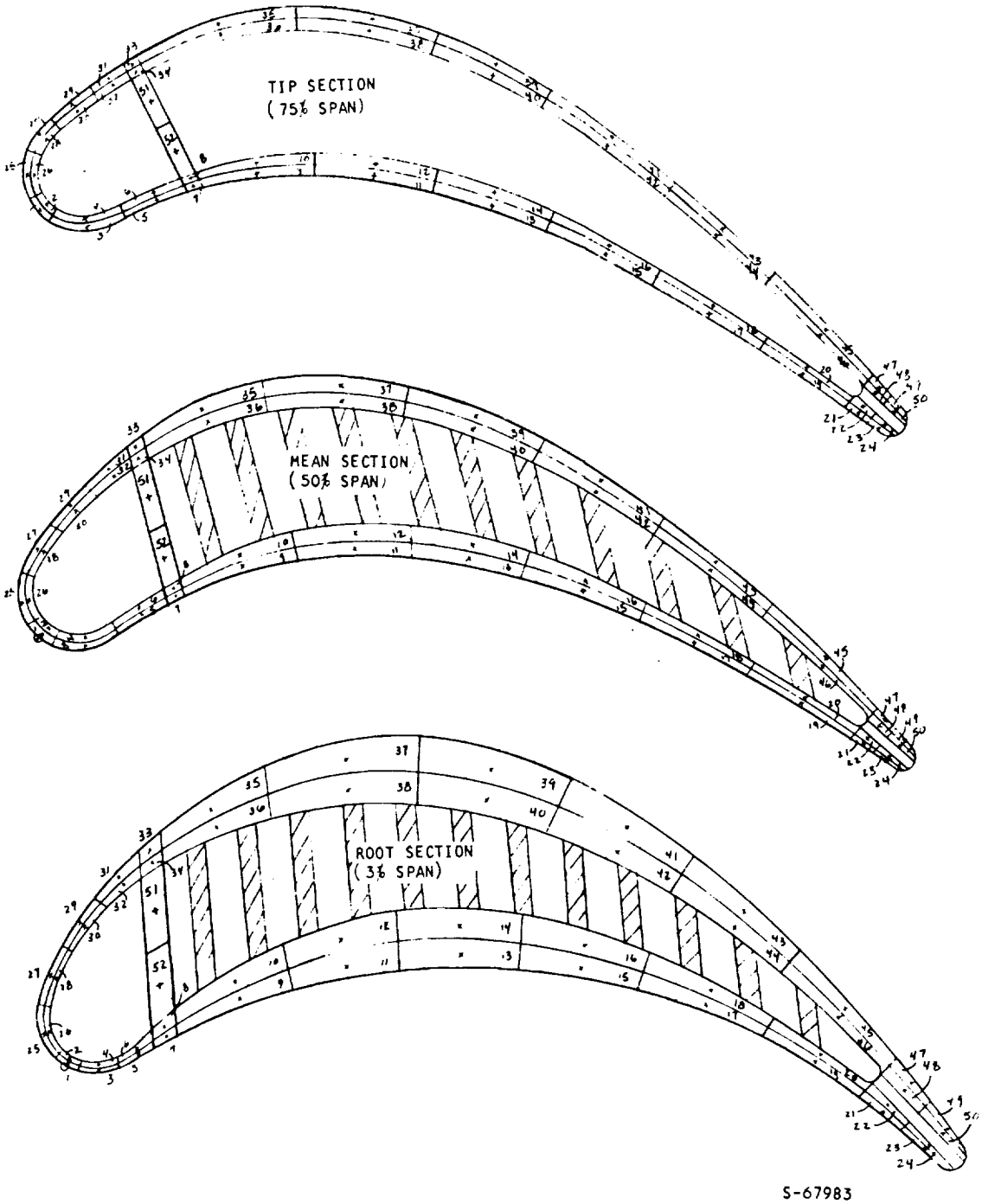

FIGURE K-14. SCHEME A-1 CONVECTION COOLED CAST TWO-CAVITY PIN FIN BLADE 1.5 INCH CHORD

APPENDIX L

DETAILED BOUNDARY CONDITIONS, METAL TEMPERATURE DISTRIBUTION, AND COOLING FLOW DISTRIBUTION FOR THE SCHEME B-5 FINAL DESIGN ANALYSIS

The detailed boundary conditions for the Scheme B-5 Final Designs are shown in Figures L-1 through L-36 for the 0.75 in. (0.01905 m), 1.0 in. (0.0254 m), and 1.5 in. (0.0381 m) chord blades. The boundary conditions include the relative total gas temperature, the effective film temperature where film cooling is applied, and the local external heat transfer coefficient at each element in the thermal model. The internal heat transfer coefficient and cooling air temperature distribution are also given in the boundary conditions. The boundary conditions are given for each of the three pressure levels 450 psia (3.1×10^6 Newtons/sq m), 150 psia (1.034×10^6 Newtons/sq m), and 50 psia (3.45×10^5 Newtons/sq m) for a cooling air inlet temperature of 900°F (755.6°K) and for the 1200°F (922.2°K) cooling air inlet temperature, and 2320°F (1543°K) turbine inlet temperature condition.

In Figures L-1 through L-36, the hot gas heat transfer coefficient on the outer surface of the blade is presented without parentheses and the cooling air heat transfer coefficient is presented with parentheses. The effective hot gas temperature due to film cooling is presented with brackets and the cooling air temperature is presented in double parentheses. The asterisk (*) beside any of the symbols indicates that the conditions exist on the cooling air impingement supply tube. The heat transfer coefficient on inner blade surface is high due to impingement, but the outer surface of the supply tube is only exposed to forced convection from the spent impingement cooling air and, therefore, has a low heat transfer coefficient. Where the element is located in an area where a separator exists, the letter (f) is used to designate conditions forward or toward the leading edge of the separator and the letter (a) is used to designate conditions aft, or toward the trailing edge, of the separator.

The metal temperature distribution for each design point condition (900°F (755.6°K) cooling air inlet temperature and 150 psia (1.034×10^6 Newtons/sq m) turbine inlet total pressure) is given in Figures L-37 through L-45.

The cooling air flow distribution at each cooling air inlet temperature with 150 psia (1.034×10^6 Newtons/ sq m) turbine inlet pressure and at the additional condition of reduced cooling air inlet pressure is given in Figures L-46 through L-57.

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

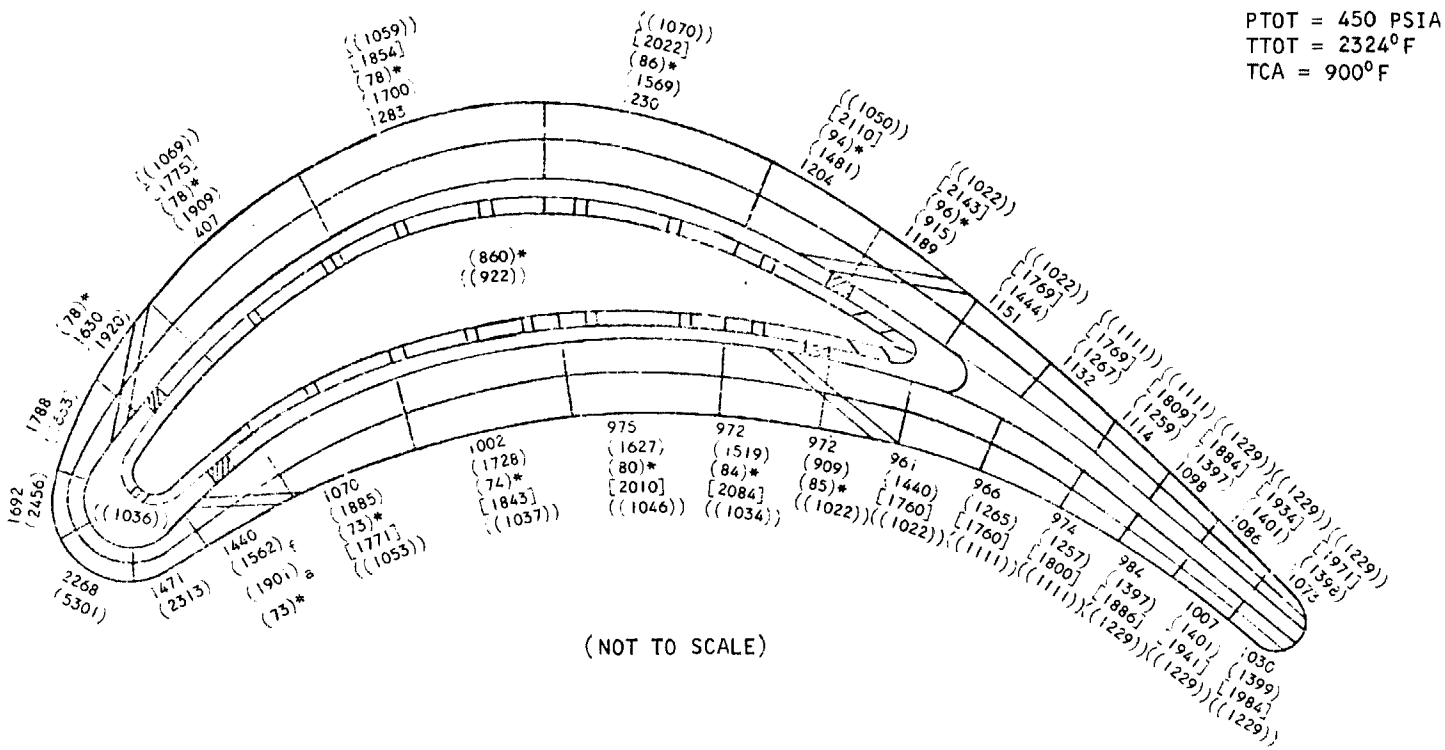

Figure L-1. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 1 (PTOT = 450 PSIA, TCA = 900°F)
Root Section (3% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 450 PSIA
TTOT = 2470^{0}F
TCA = 900^{0}F

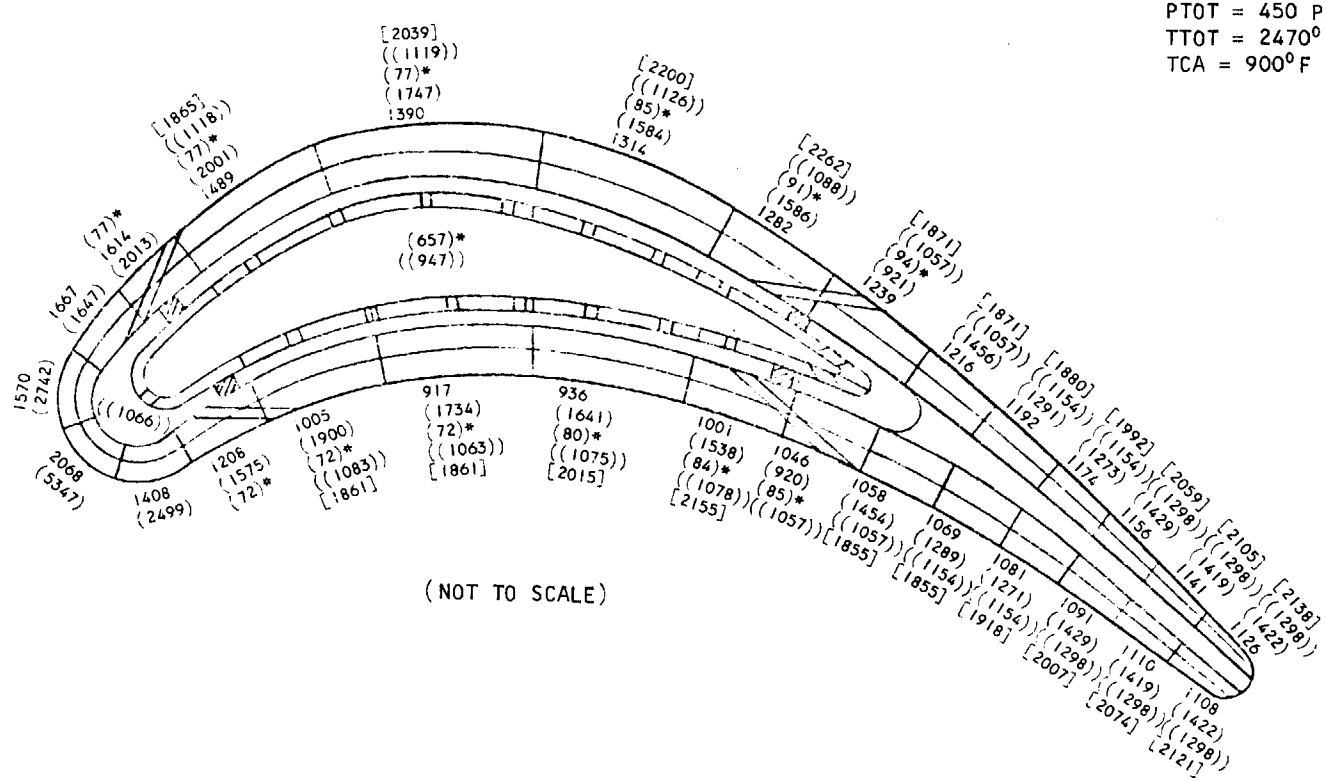

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Figure L-2. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 1 (PTOT 450 PSIA, TCA 900^{0}F)
Mean Section 50% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 450 PSIA
TTOT - 2480^{0}F
TCA = 900^{0}F

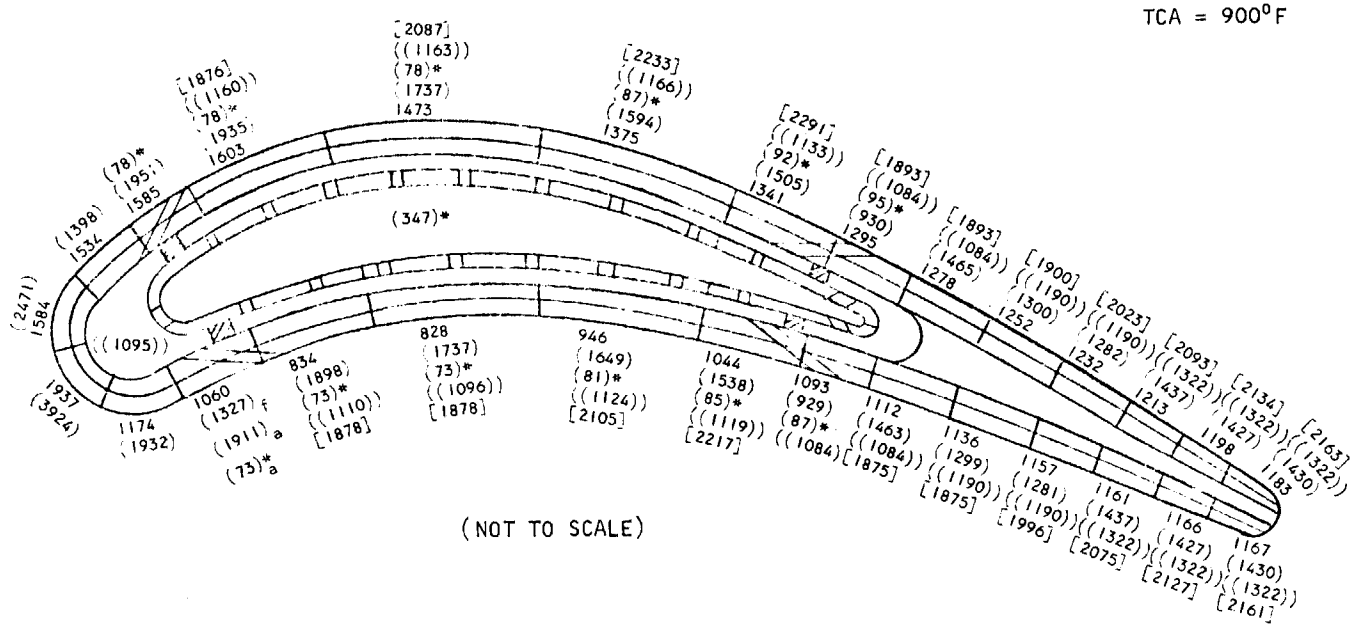
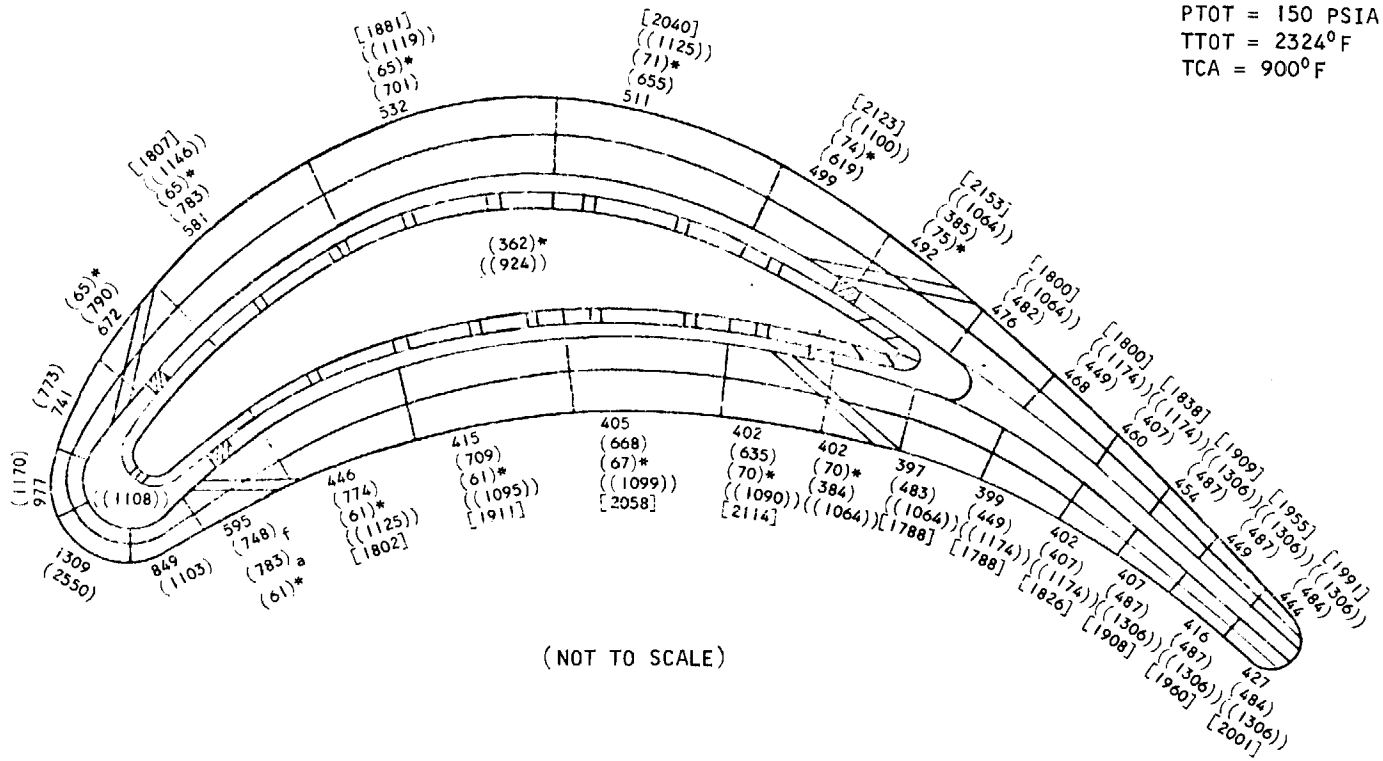


Figure L-3. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT 450 PSIA, TCA 900^{0}F)
Tip Section (75% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 150 PSIA
TTOT = 2324^{0}F
TCA = 900^{0}F



(NOT TO SCALE)

S-70015

Figure L-4. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT 150 PSIA, TCA 900^{0}F) Root Section (3% Span) 0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 150 PSIA
TTOT = 2470^{0}F
TCA = 900^{0}F

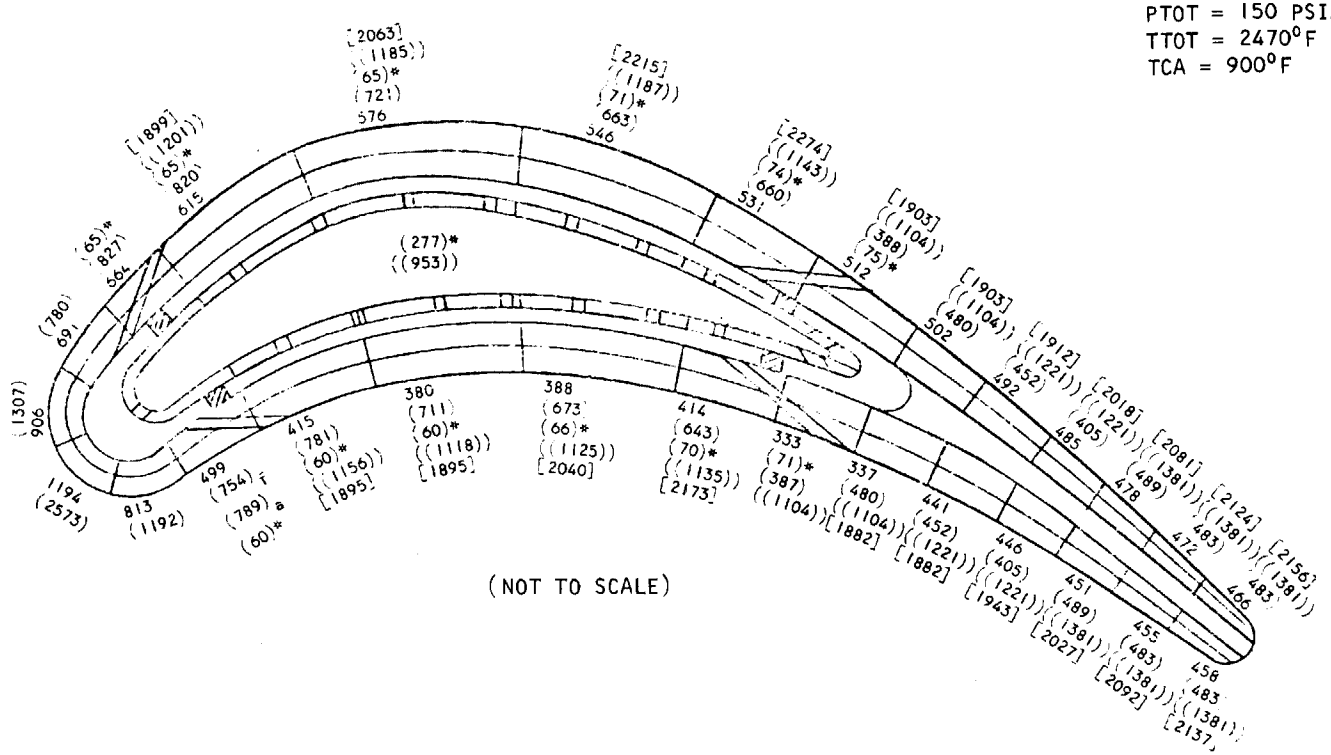


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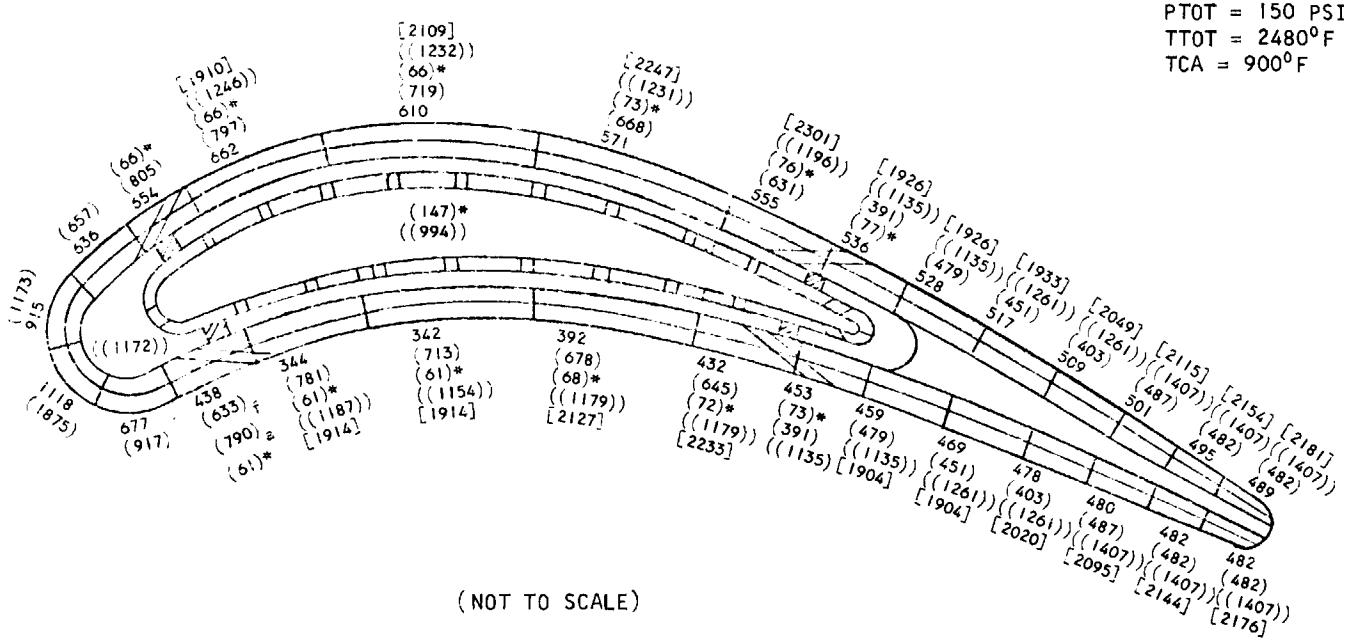
Figure L-5. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900^{0}F)
Mean Section (50% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 150 PSIA
TTOT = 2480^{0}F
TCA = 900^{0}F



(NOT TO SCALE)

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Figure L-6. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900^{0}F) Tip Section (75% Span) 0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 50 PSIA
TTOT = 2296^{0}F
TCA = 900^{0}F

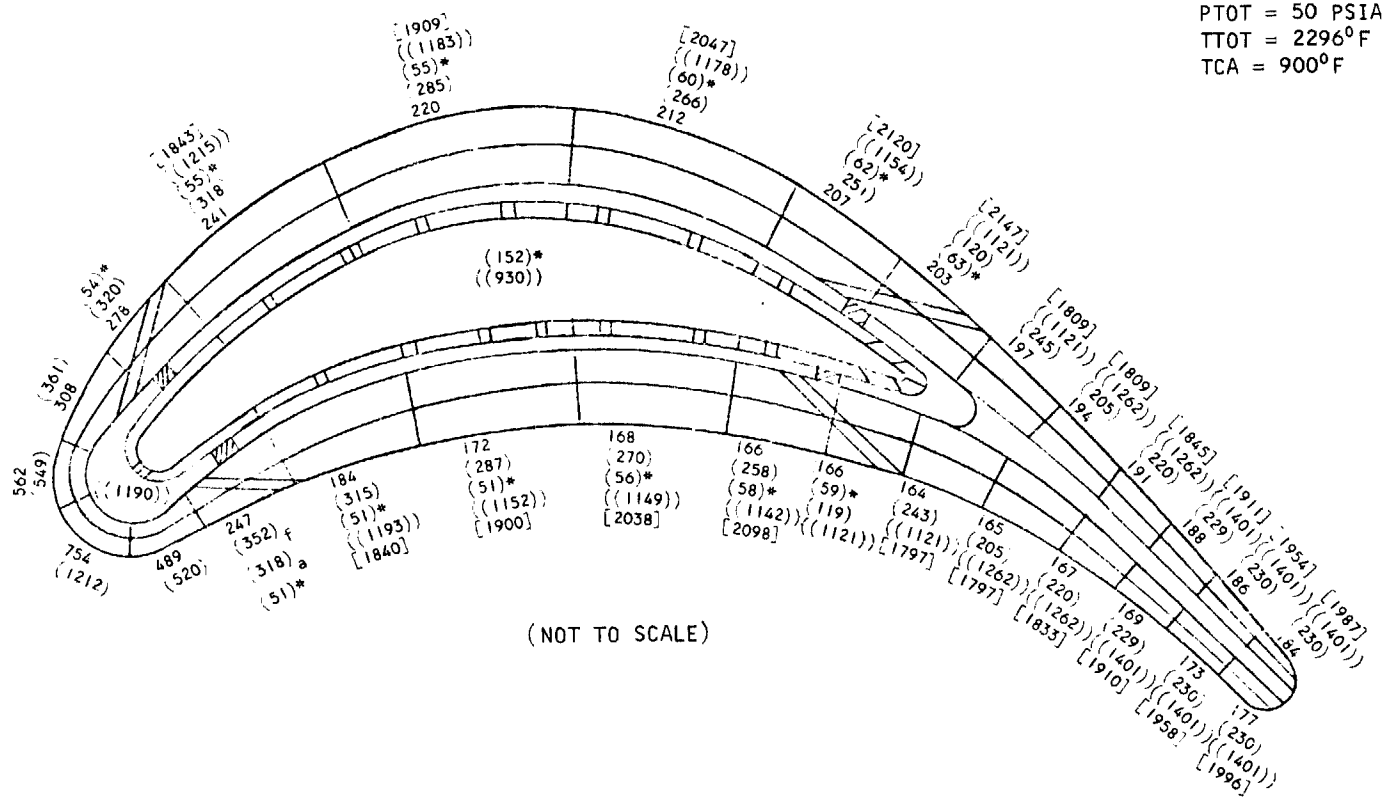


Figure L-7. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900^{0}F)
Root Section (3% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 50 PSIA
TTOT = 2442^{0}F
TCA = 900^{0}F

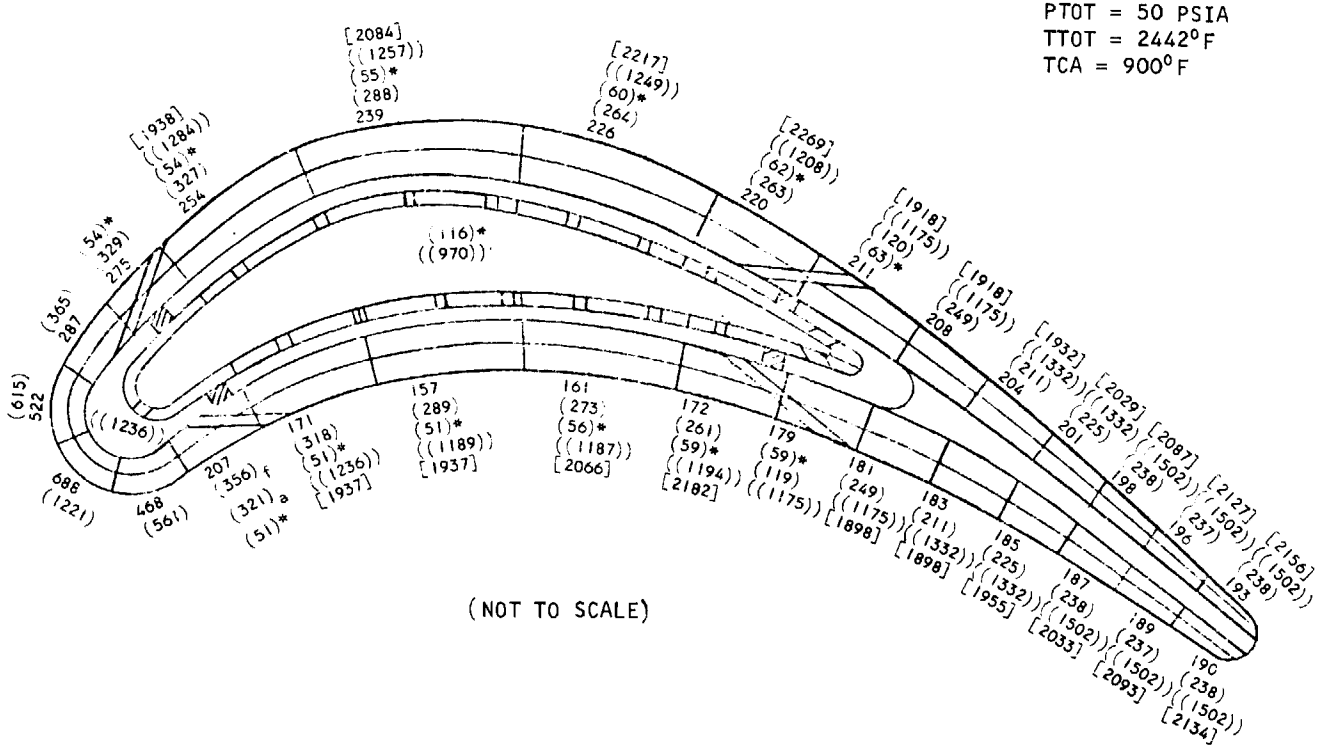


Figure L-8. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900^{0}F
Mean Section 50% Span
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 50 PSIA
TTOT = 2452^{0}F
TCA = 900^{0}F

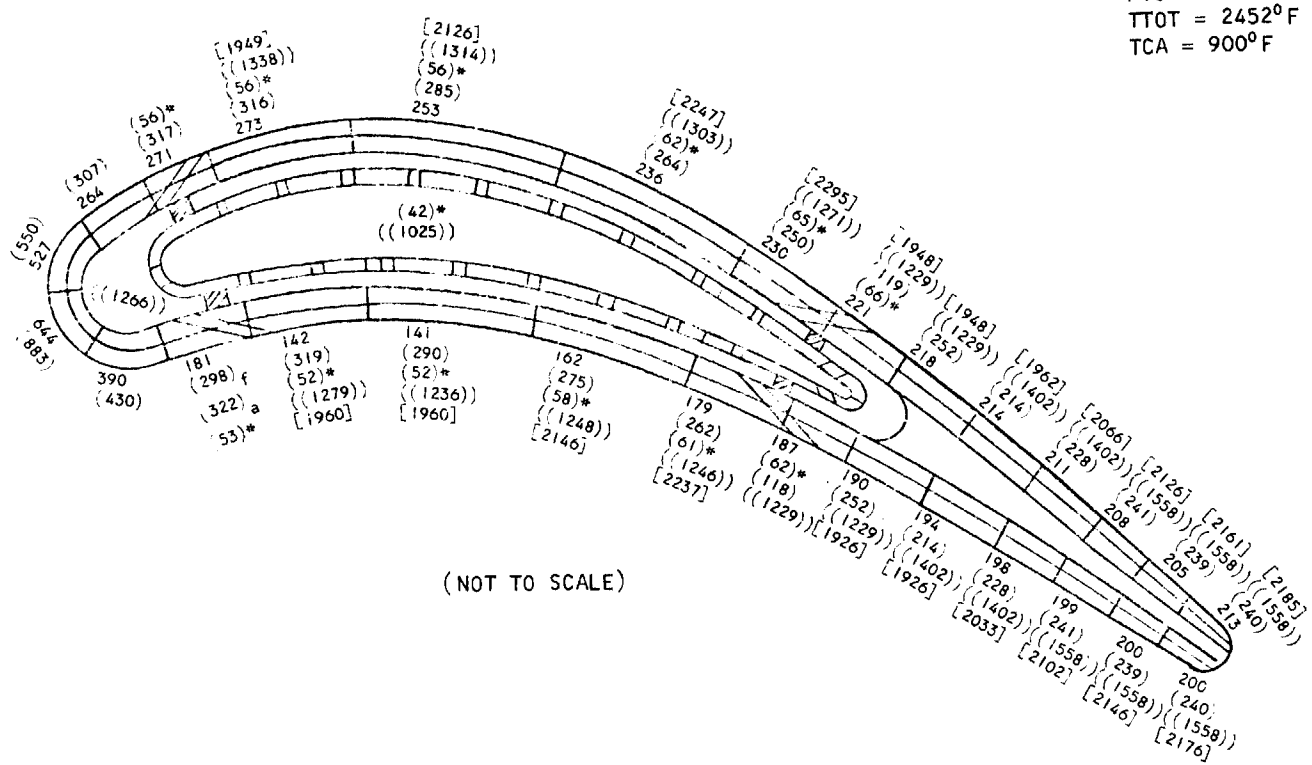


Figure L-9. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900^{0}F)
Tip Section (75% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{0}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{0}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{0}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

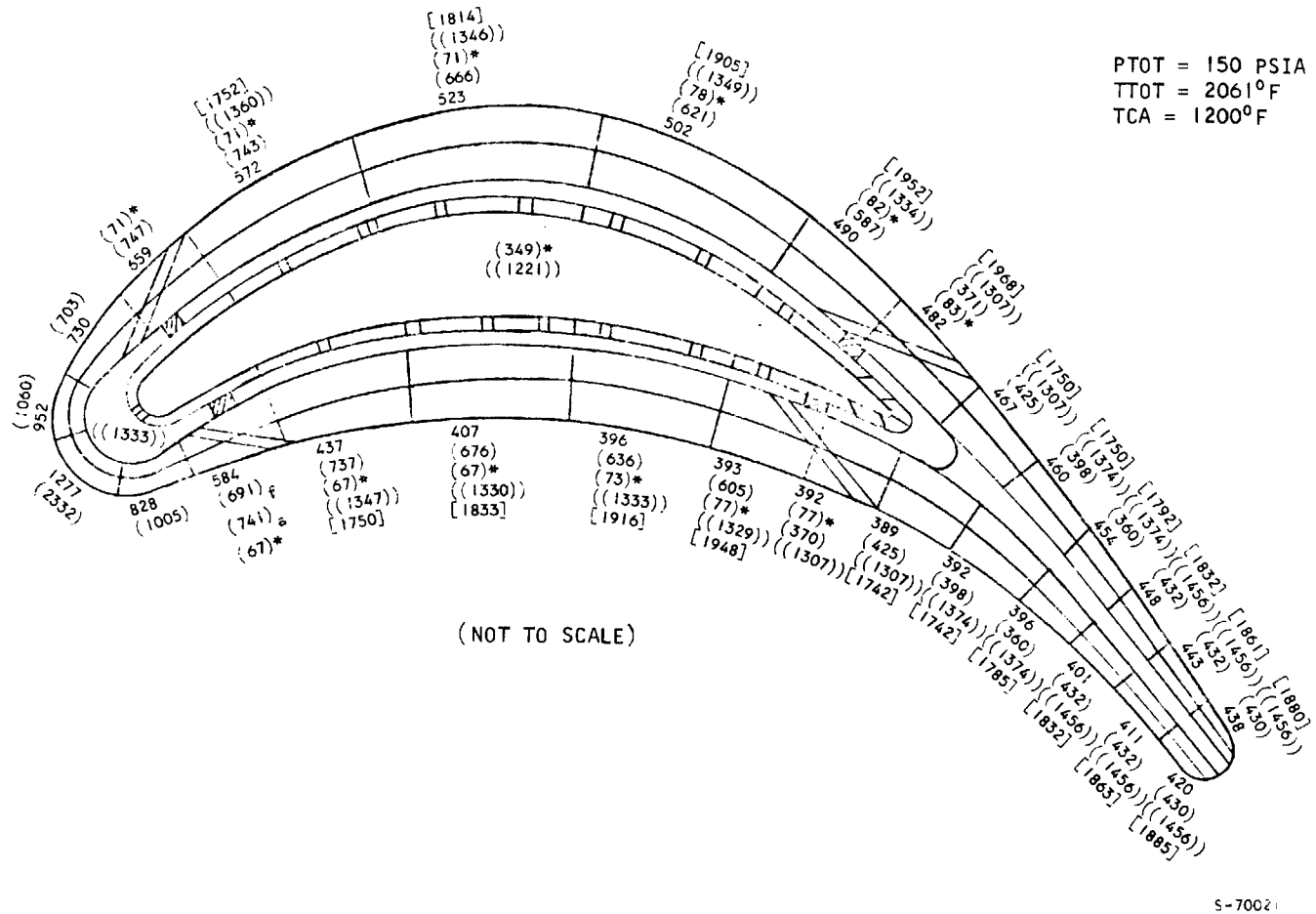


Figure L-10. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT 150 PSIA, TCA 1200°F
Root Section (3% Span)
0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

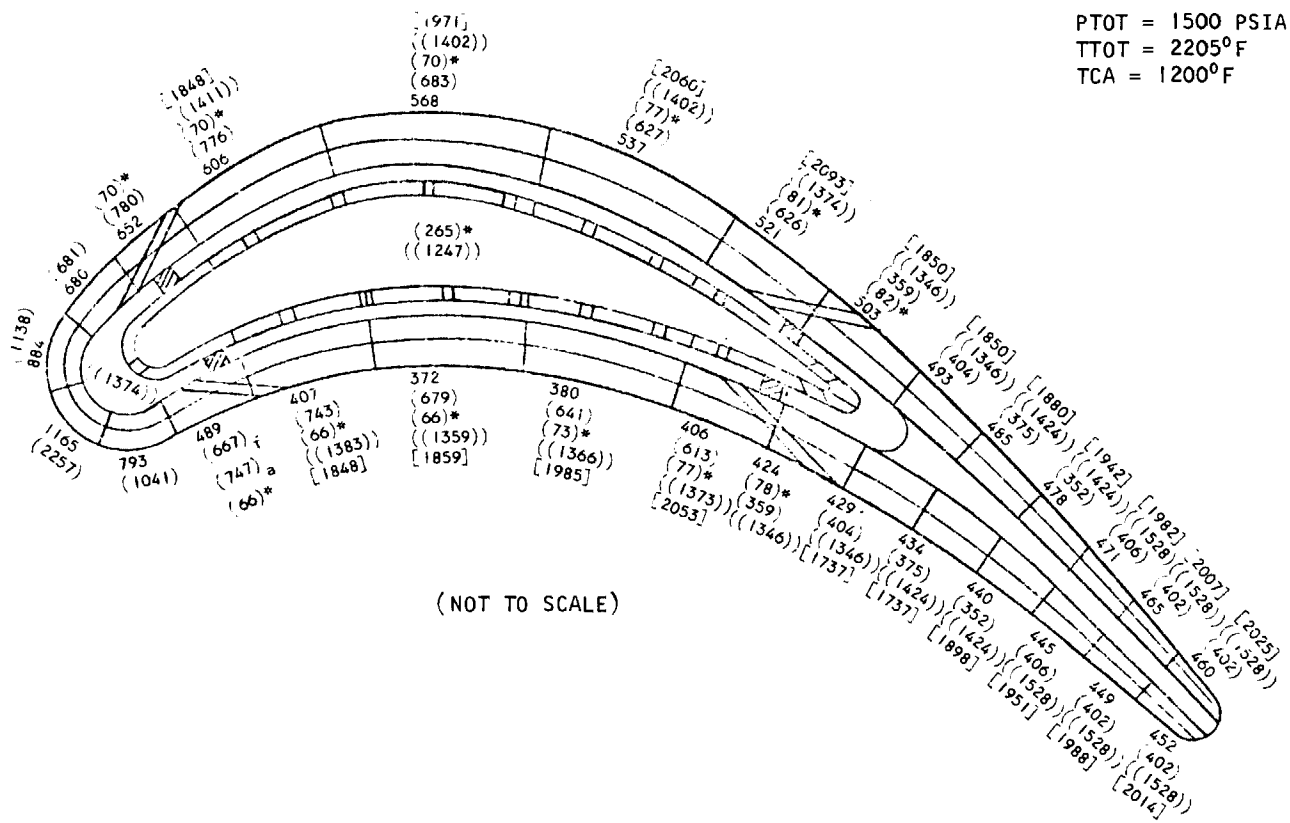
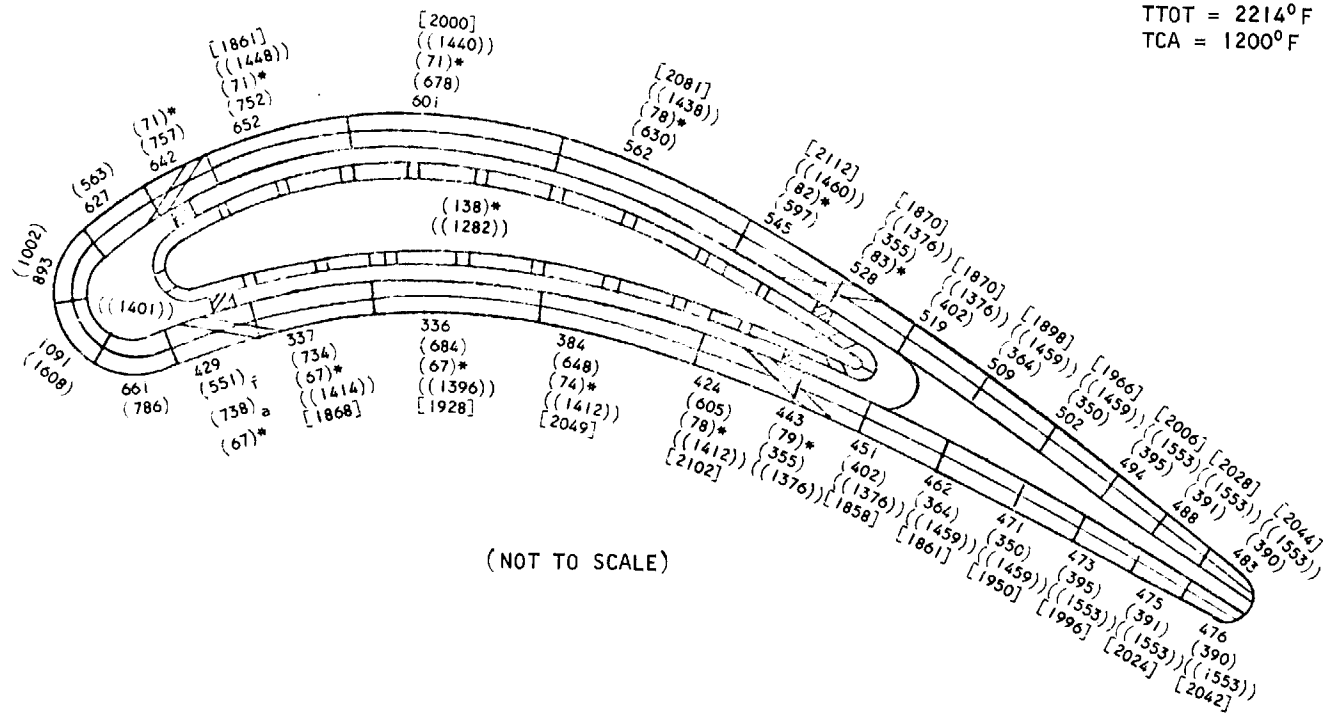


Figure L-11. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT 150 PSIA, TCA 1200°F) Mean Section (50% Span) 0.75 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
f - FORWARD
a - AFT

PTOT = 150 PSIA
TTOT = 2214°F
TCA = 1200°F



(NOT TO SCALE)

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Figure L-12. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition (PTOT 150 PSIA, TCA 1200°F) Tip Section (75% Span) 0.75 Inch Chord

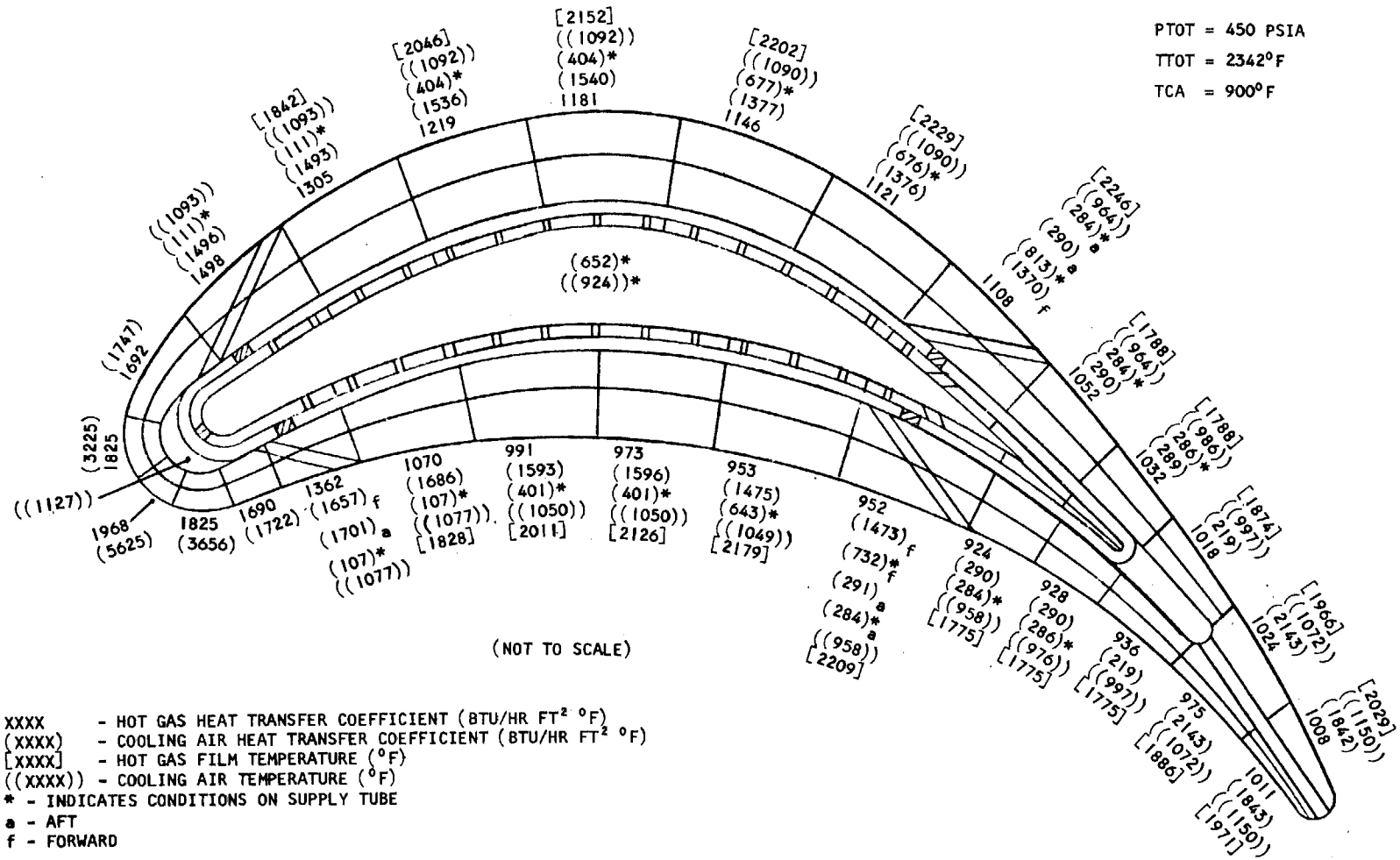

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Figure L-13. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT = 450 PSIA, TCA = 900°F) Root Section (3% Span) 1.0 Inch Chord

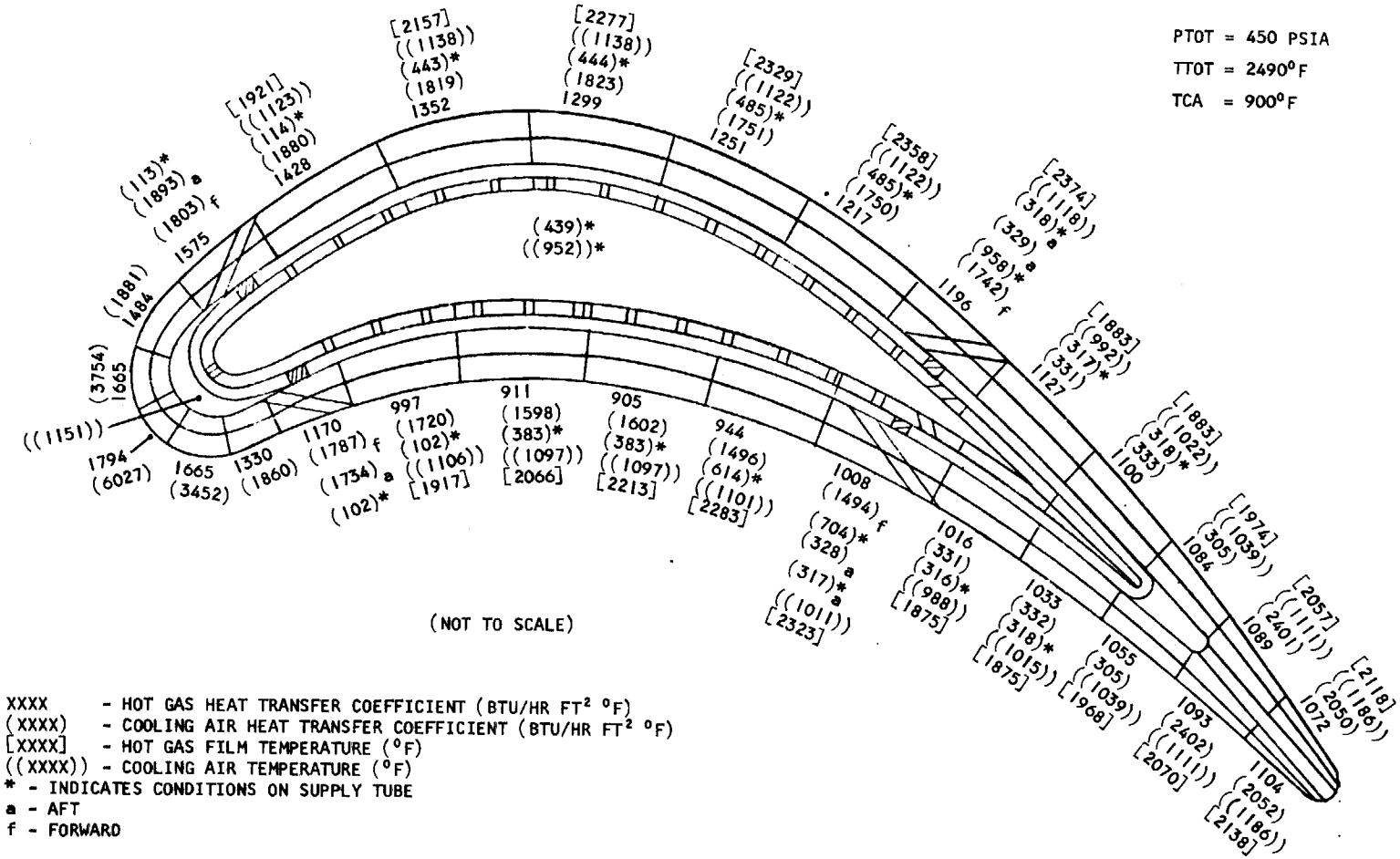


Figure L-14. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT = 450 PSIA, TCA = 900°F) Mean Section (50% Span) 1.0 Inch Chord

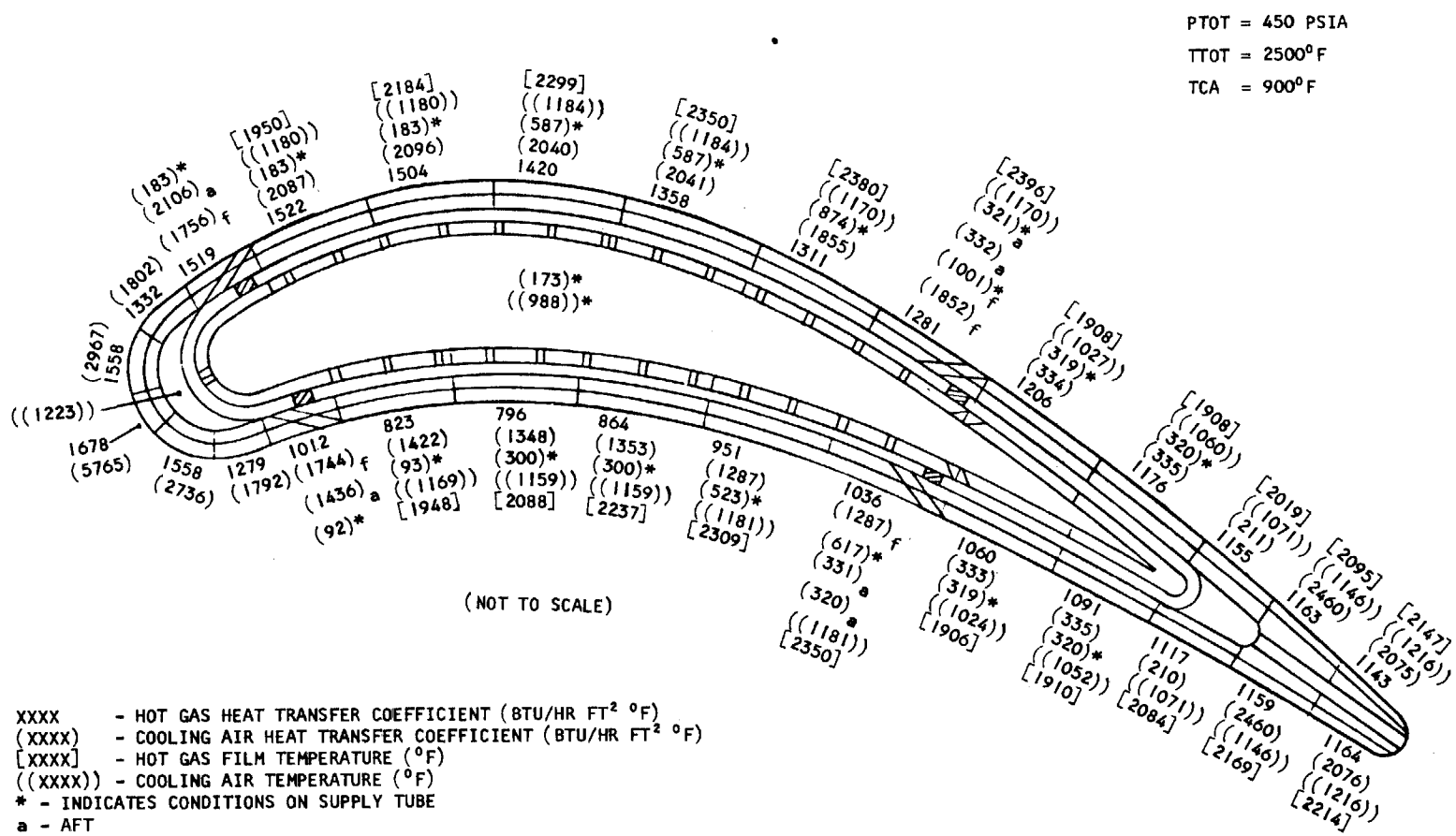


Figure L-15. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT = 450 PSIA, TCA = 900°F)
Tip Section (75% Span)
1.0 Inch Chord

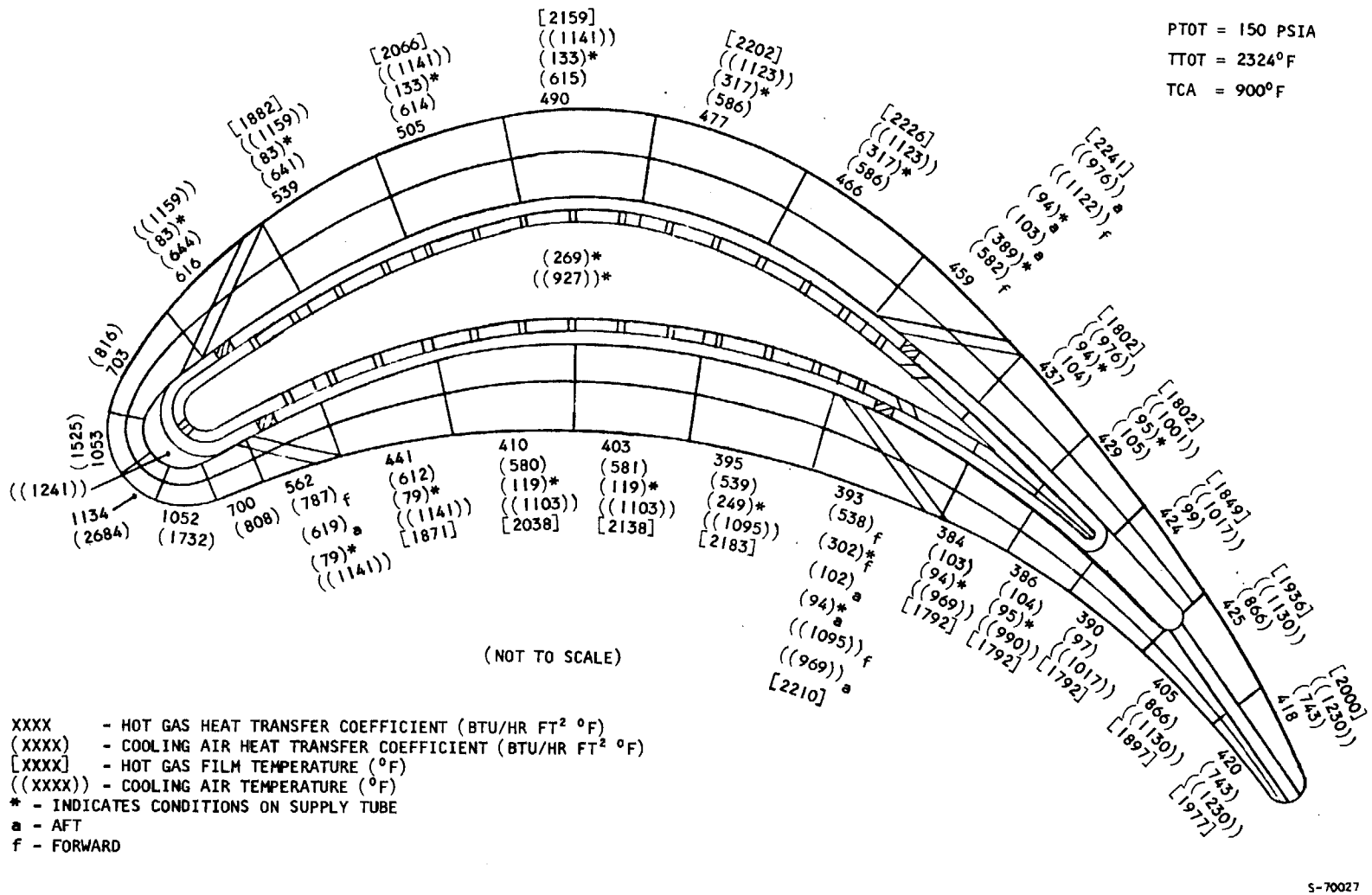


Figure L-16. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900°F) Root Section (3% Span) 1.0 Inch Chord

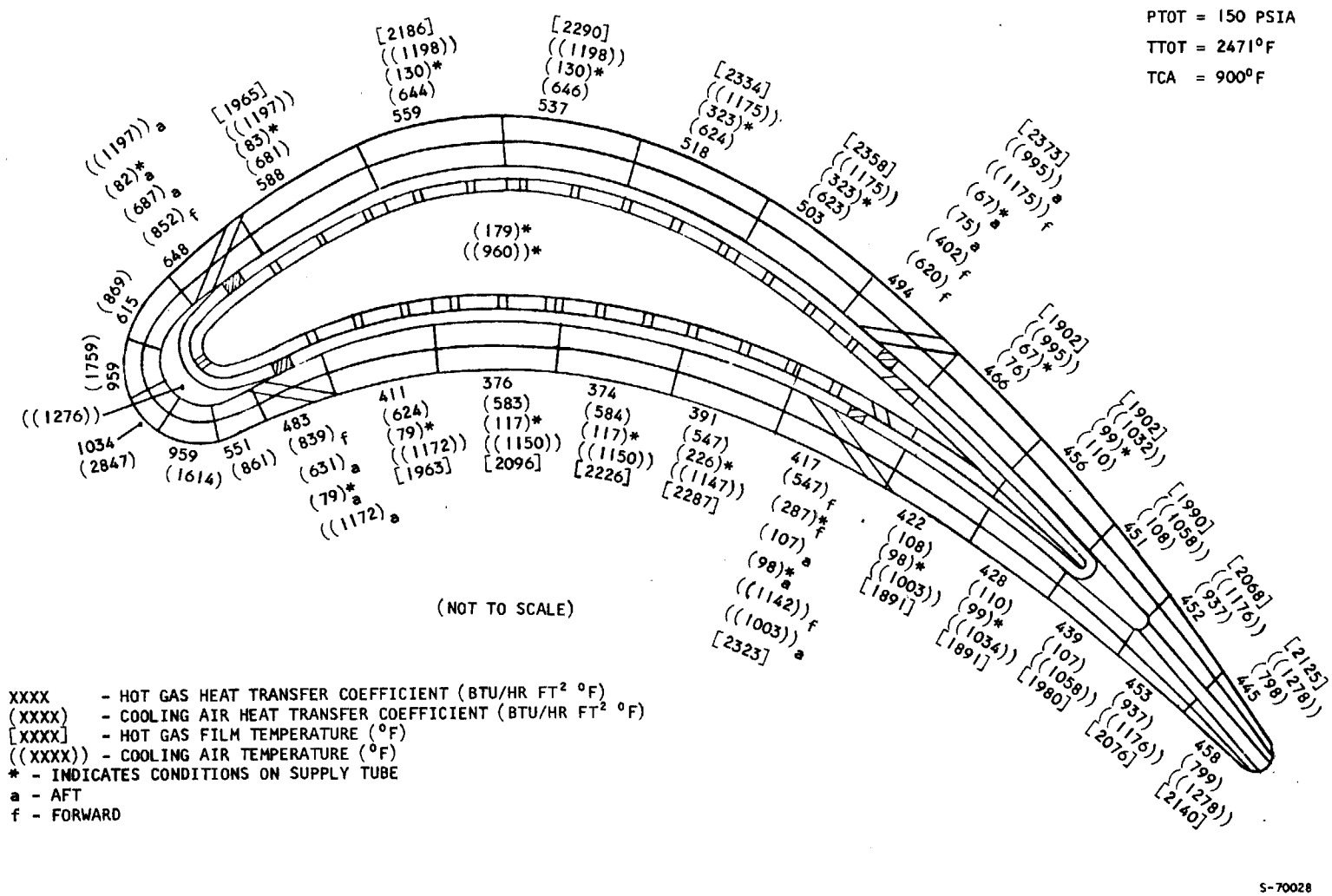


Figure L-17. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900°F) Mean Section (50% Span) 1.0 Inch Chord

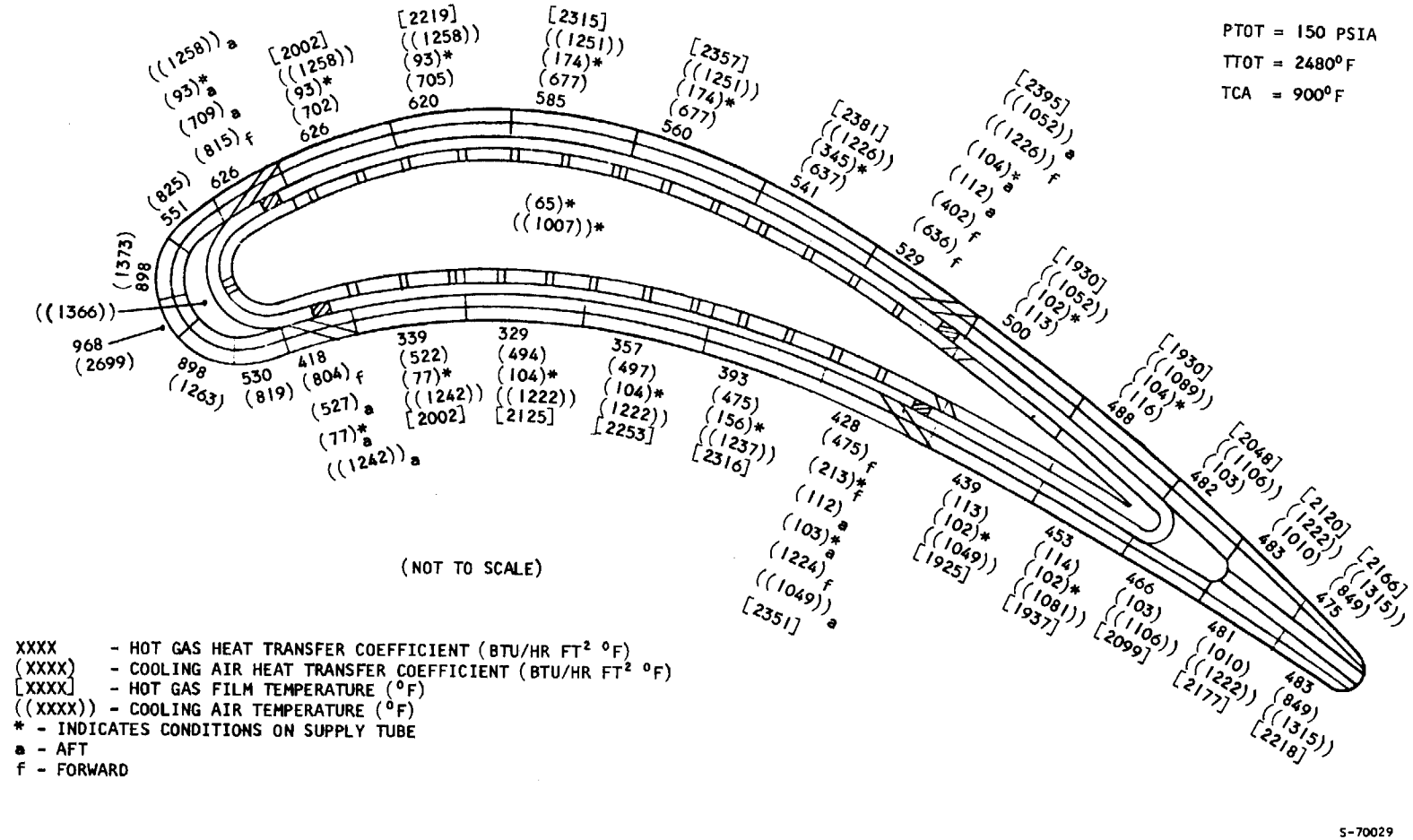
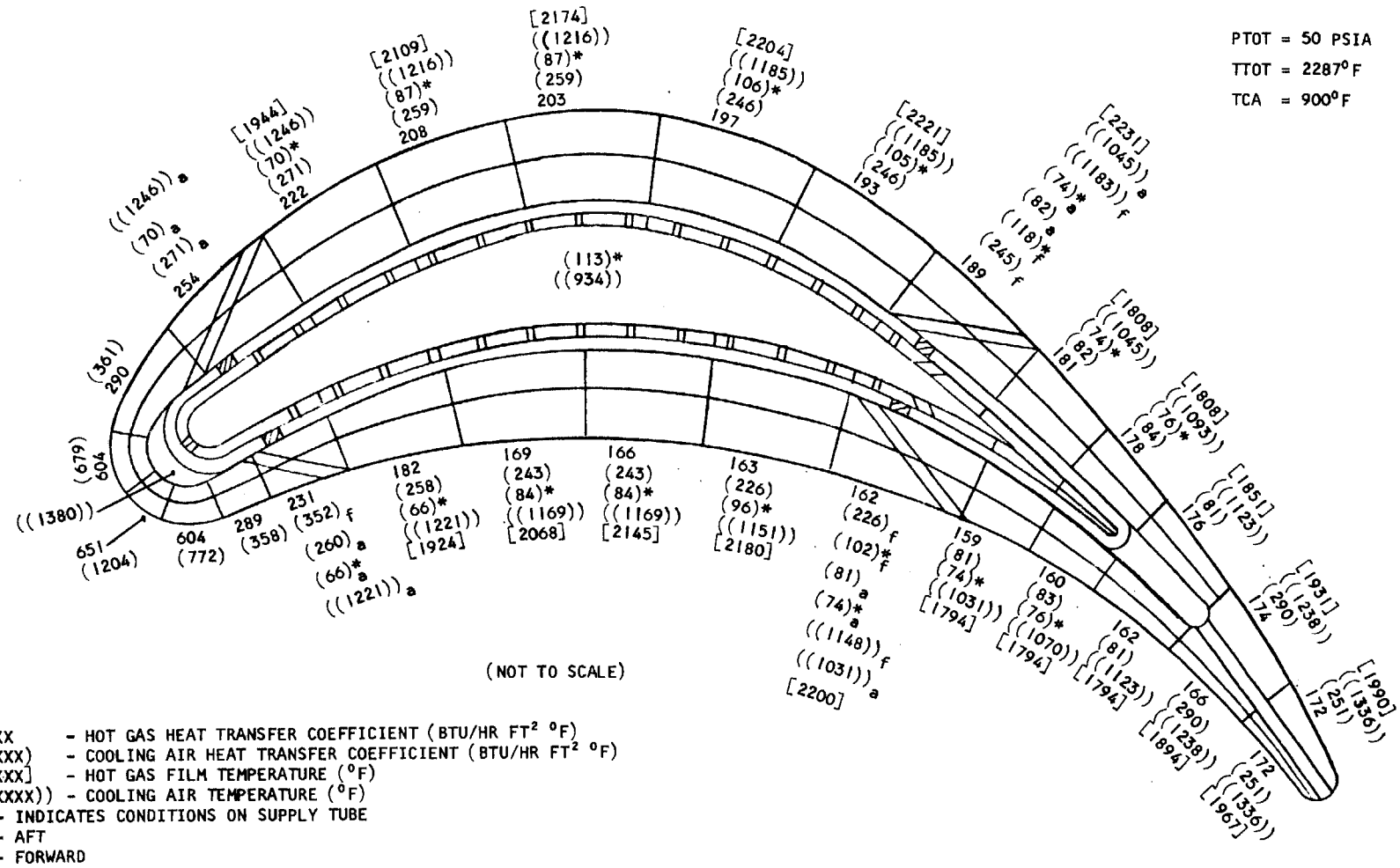


Figure L-18. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900°F) Tip Section (75% Span) 1.0 Inch Chord



XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT² °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT² °F)
[XXXX] - HOT GAS FILM TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

Figure L-19. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900°F) Root Section (3% Span) 1.0 Inch Chord

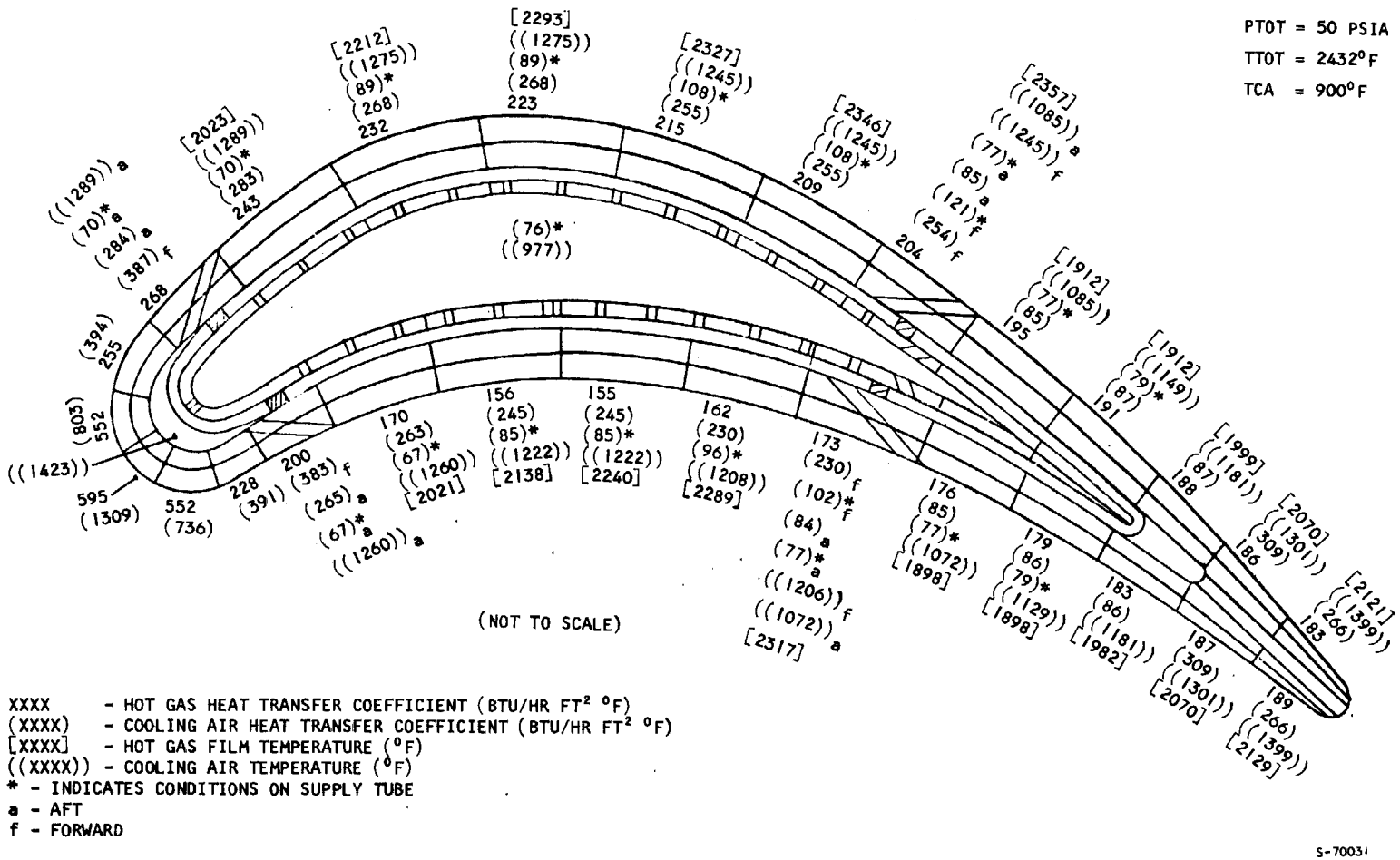


Figure L-20. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900°F) Mean Section (50% Span) 1.0 Inch Chord

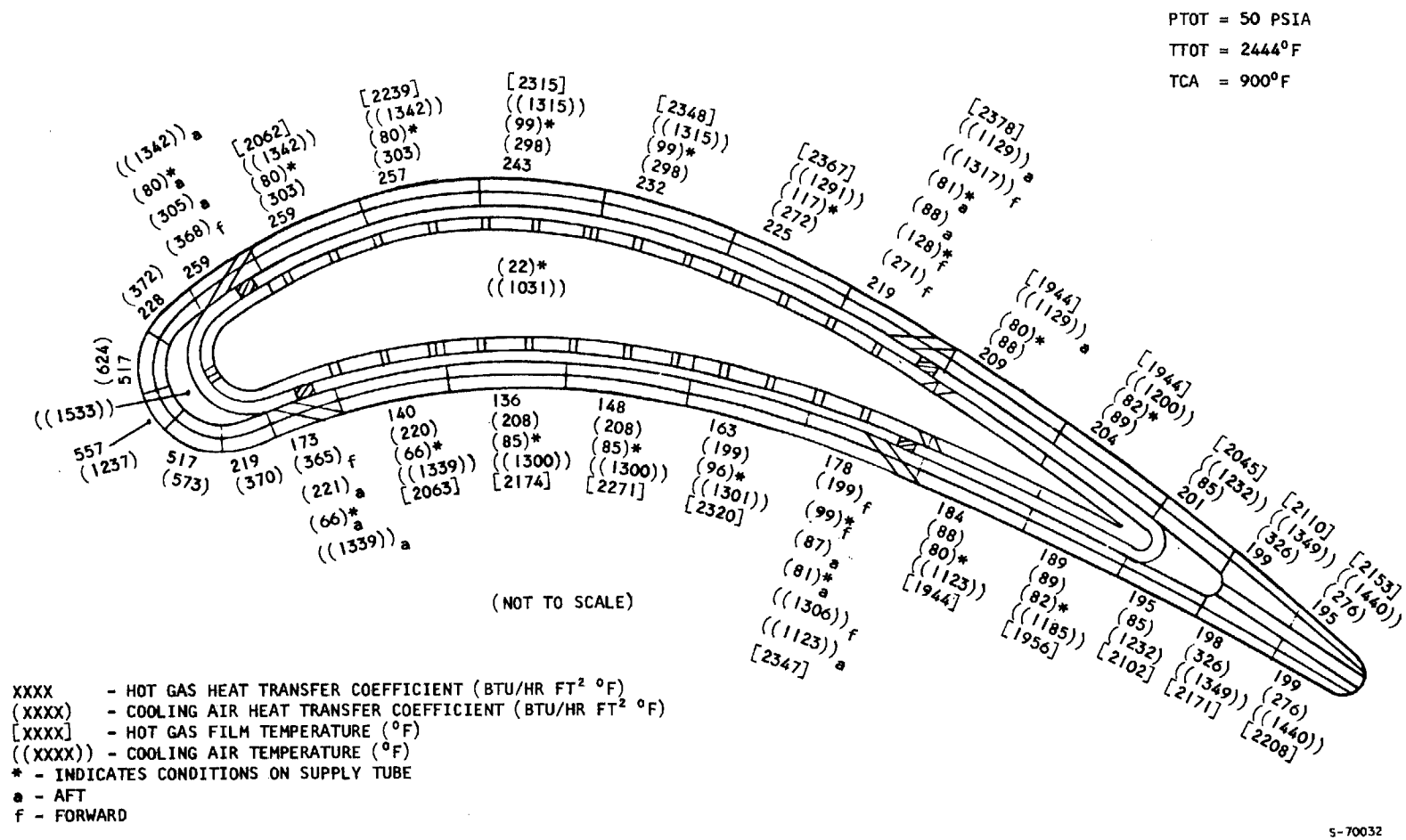


Figure L-21. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900°F)
Tip Section (75% Span)
1.0 Inch Chord

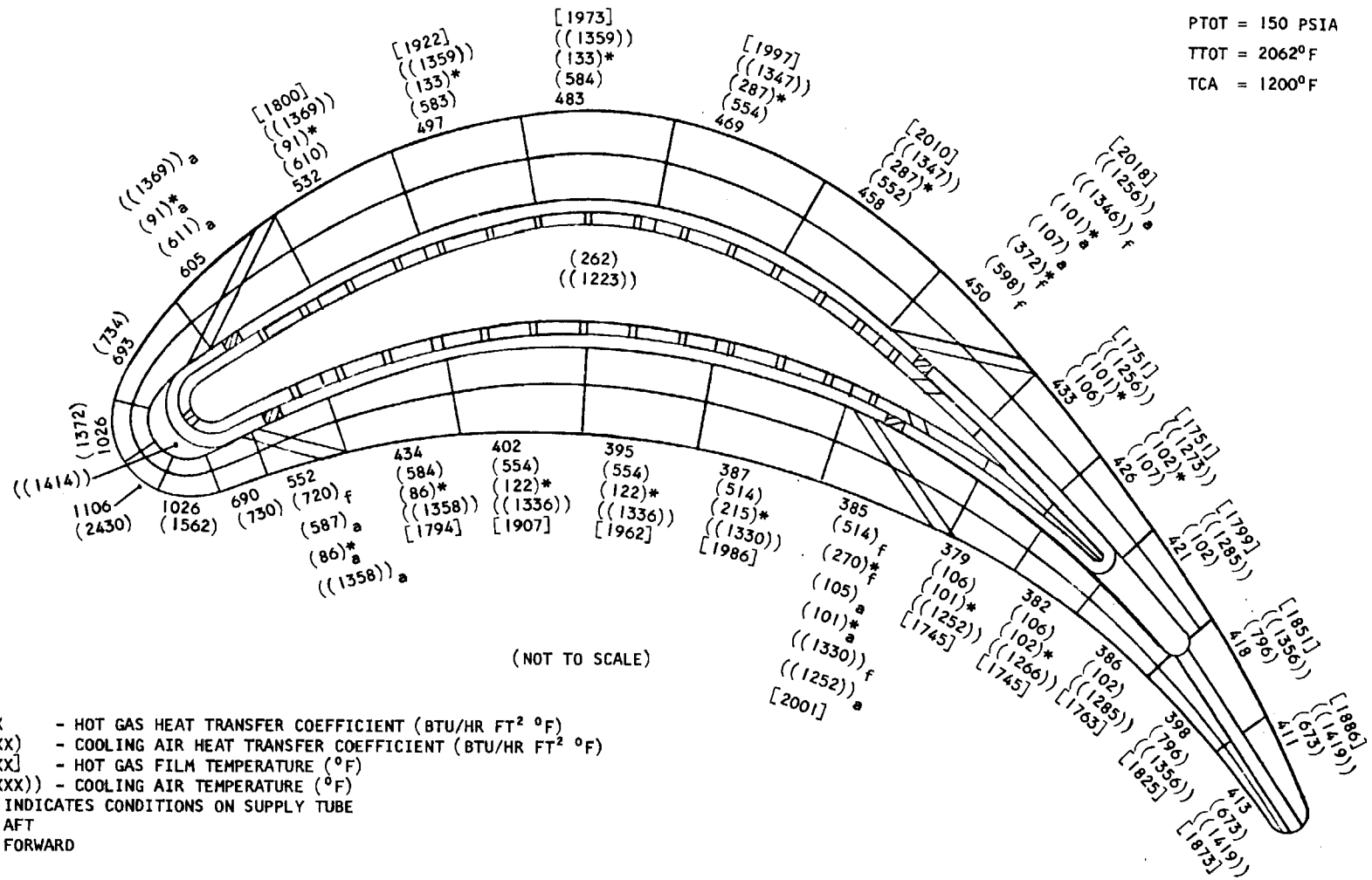


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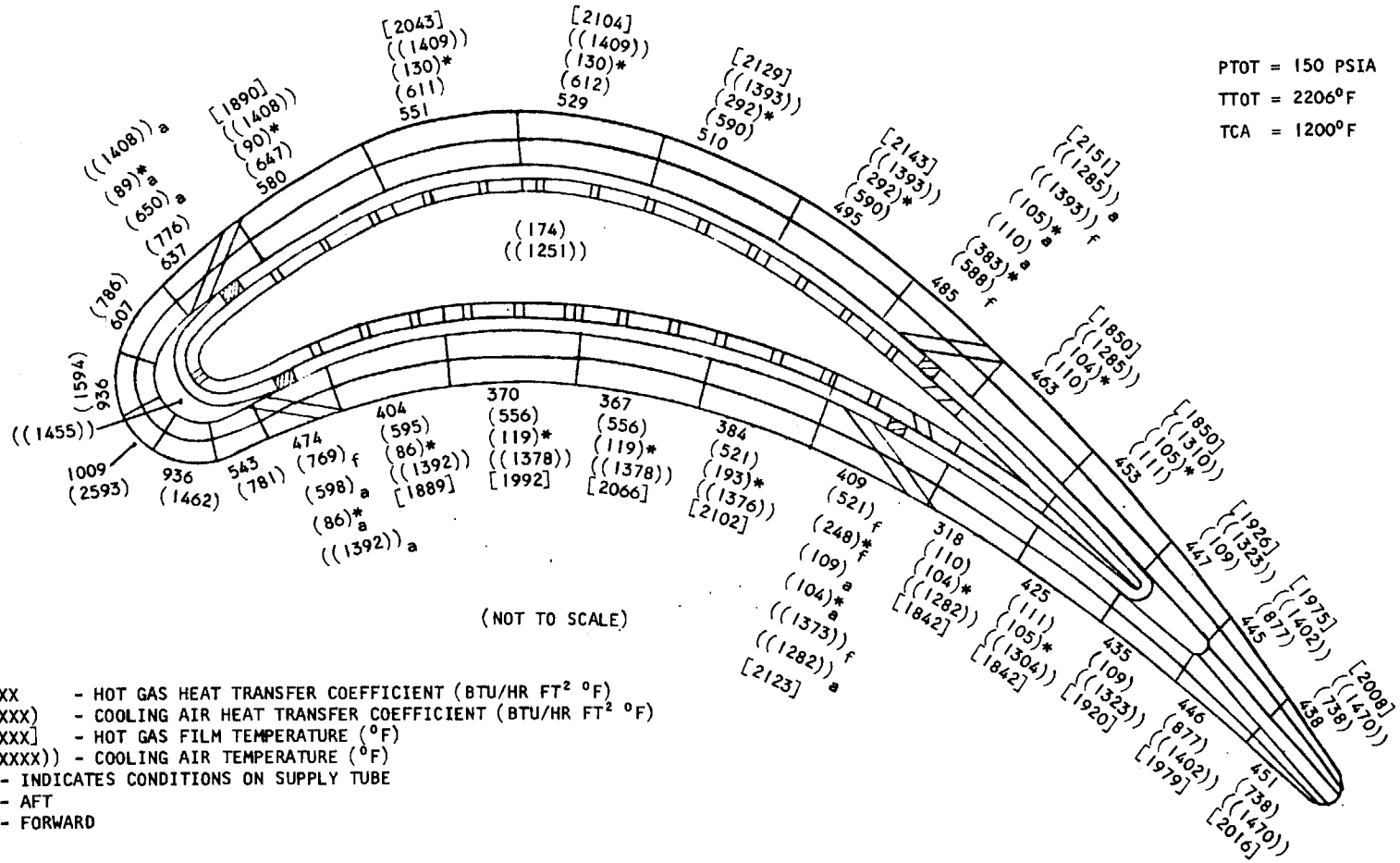
Figure L-22. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT = 150 PSIA, TCA = 1200°F) Root Section (3% Span) 1.0 Inch Chord



S-70034

Figure L-23. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT = 150 PSIA, TCA = 1200°F) Mean Section (50% Span) 1.0 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT² °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT² °F)
[XXXX] - HOT GAS FILM TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 150 PSIA
TTOT = 2215°F
TCA = 1200°F

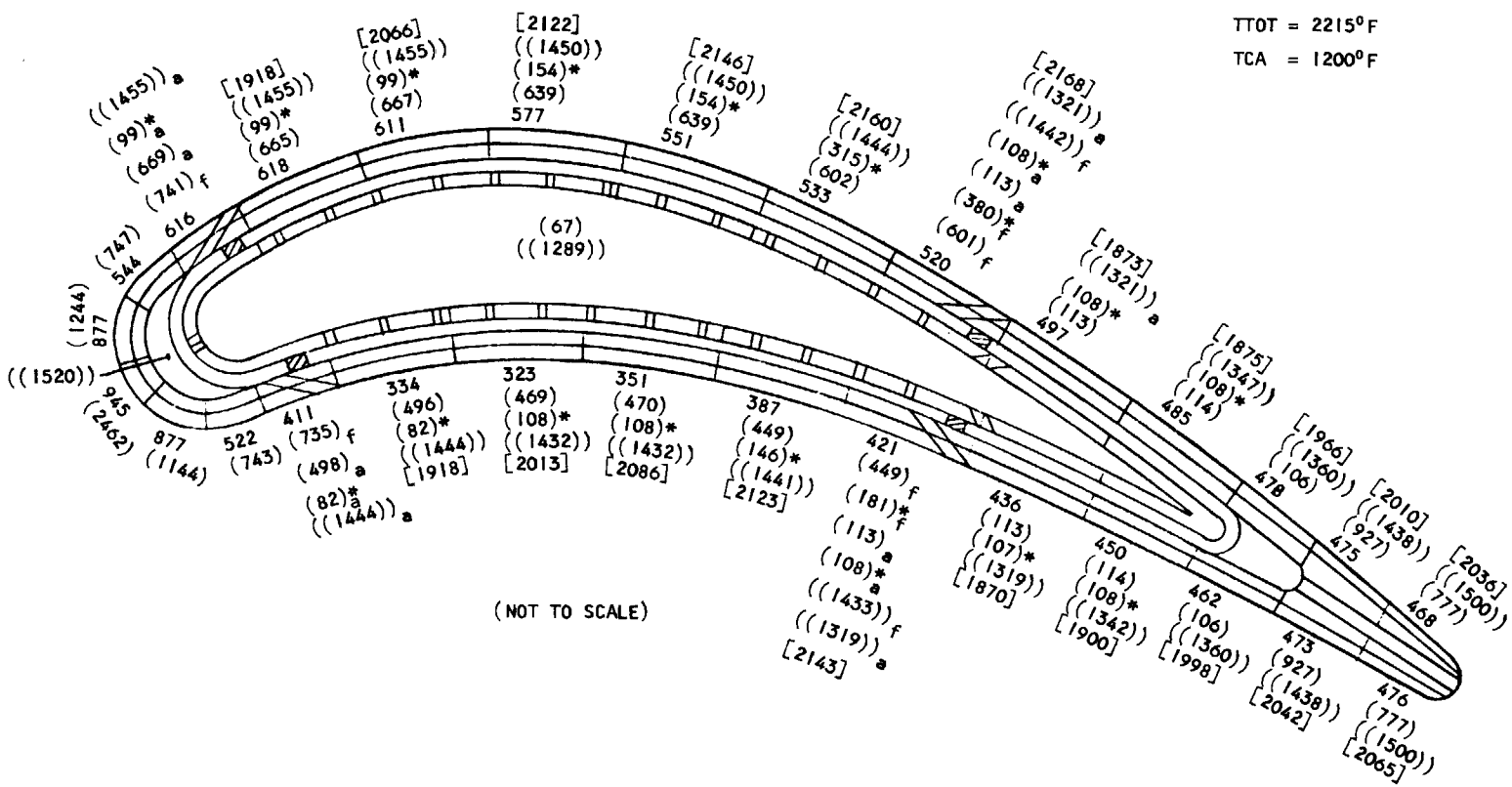


Figure L-24. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT = 150 PSIA, TCA = 1200°F) Tip Section (75% Span) 1.0 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 $^\circ$F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 $^\circ$F)
[XXXX] - HOT GAS FILM TEMPERATURE ($^\circ$F)
((XXXX)) - COOLING AIR TEMPERATURE ($^\circ$F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 450 PSIA
TTOT = 2324°F
TCA = 900°F

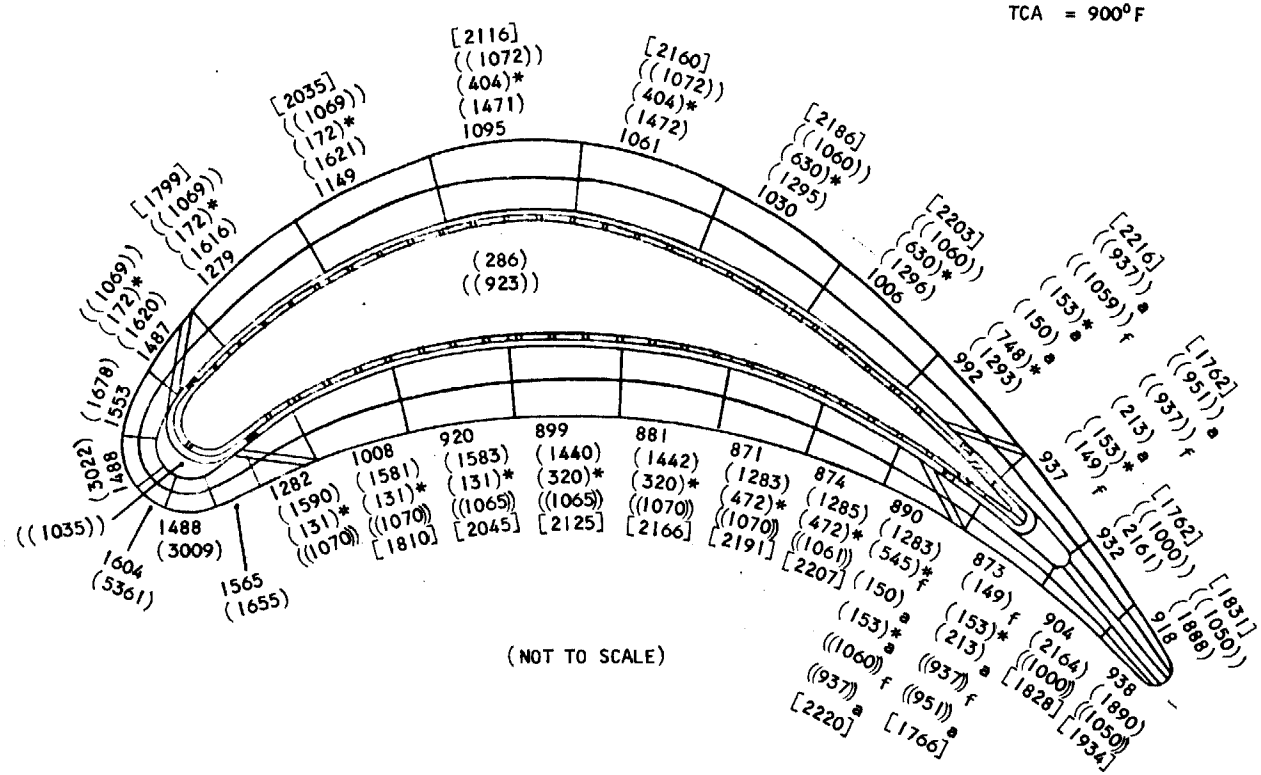


Figure L-25. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT = 450 PSIA, TCA = 900°F)
Root Section (3% Span)
1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
[XXXX] - HOT GAS FILM TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 450 PSIA
TTOT = 2471°F
TCA = 900°F

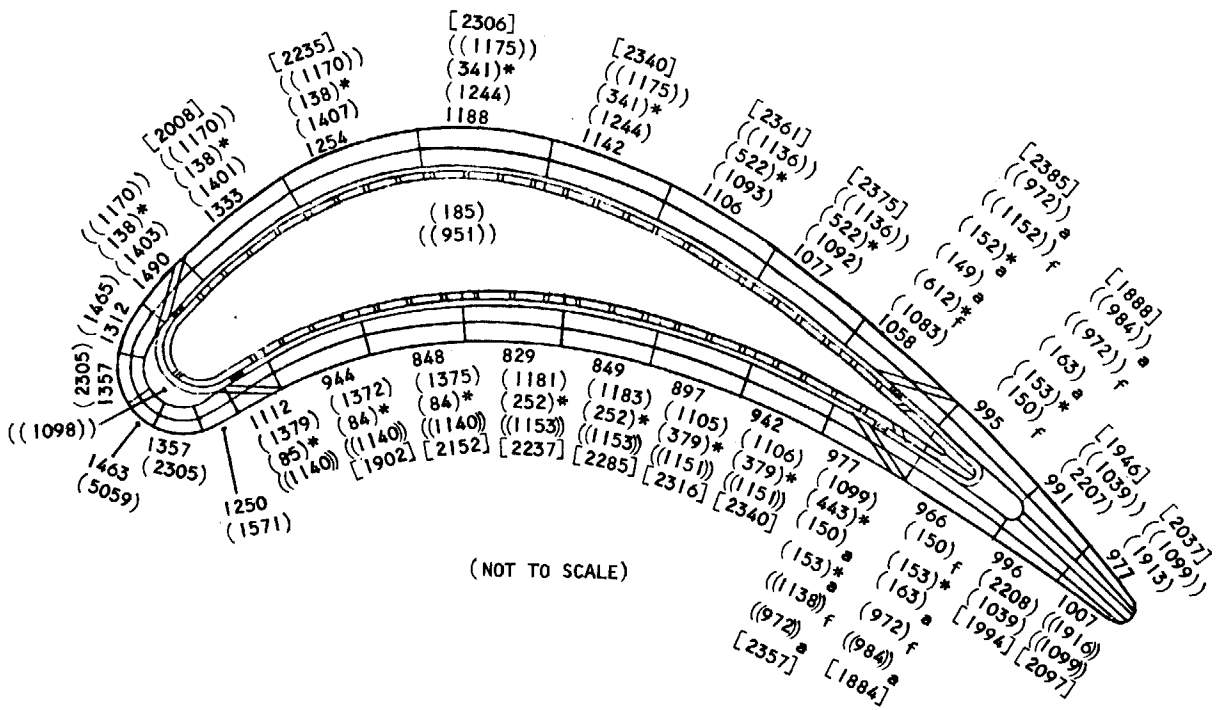


Figure L-26. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT = 450 PSIA, TCA = 900°F) Mean Section (50% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
[XXXX] - HOT GAS FILM TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 450 PSIA
TTOT = 2480°F
TCA = 900°F

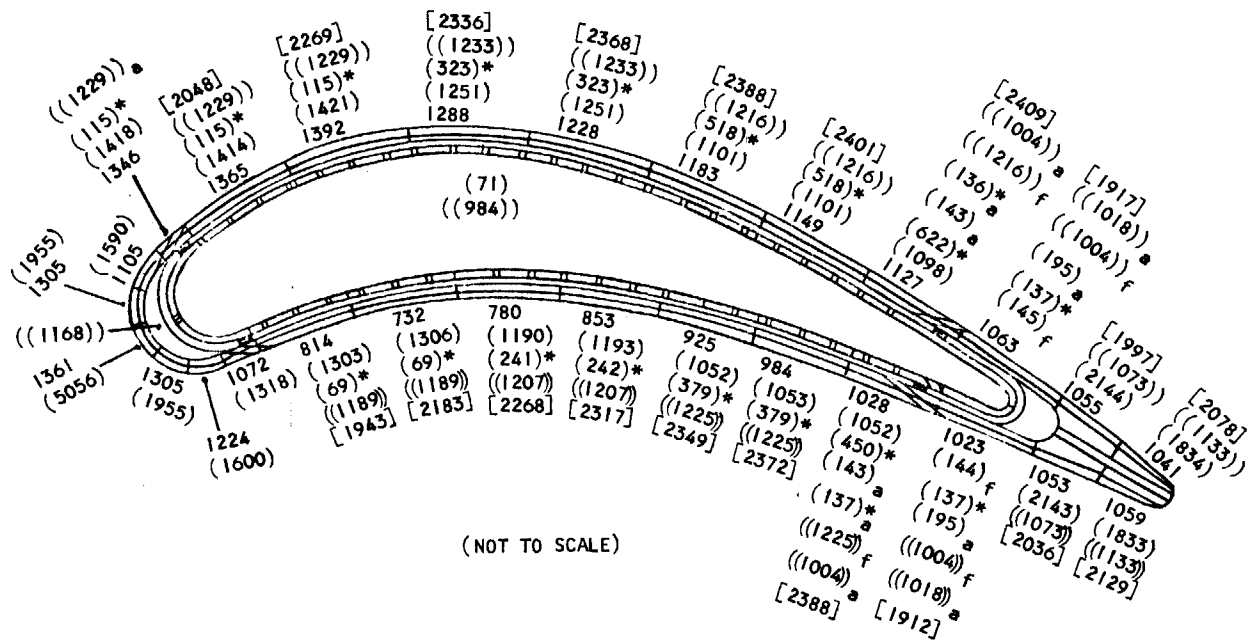


Figure L-27. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition I (PTOT = 450 PSIA, TCA = 900°F)
Tip Section (75% Span)
1.5 Inch Chord

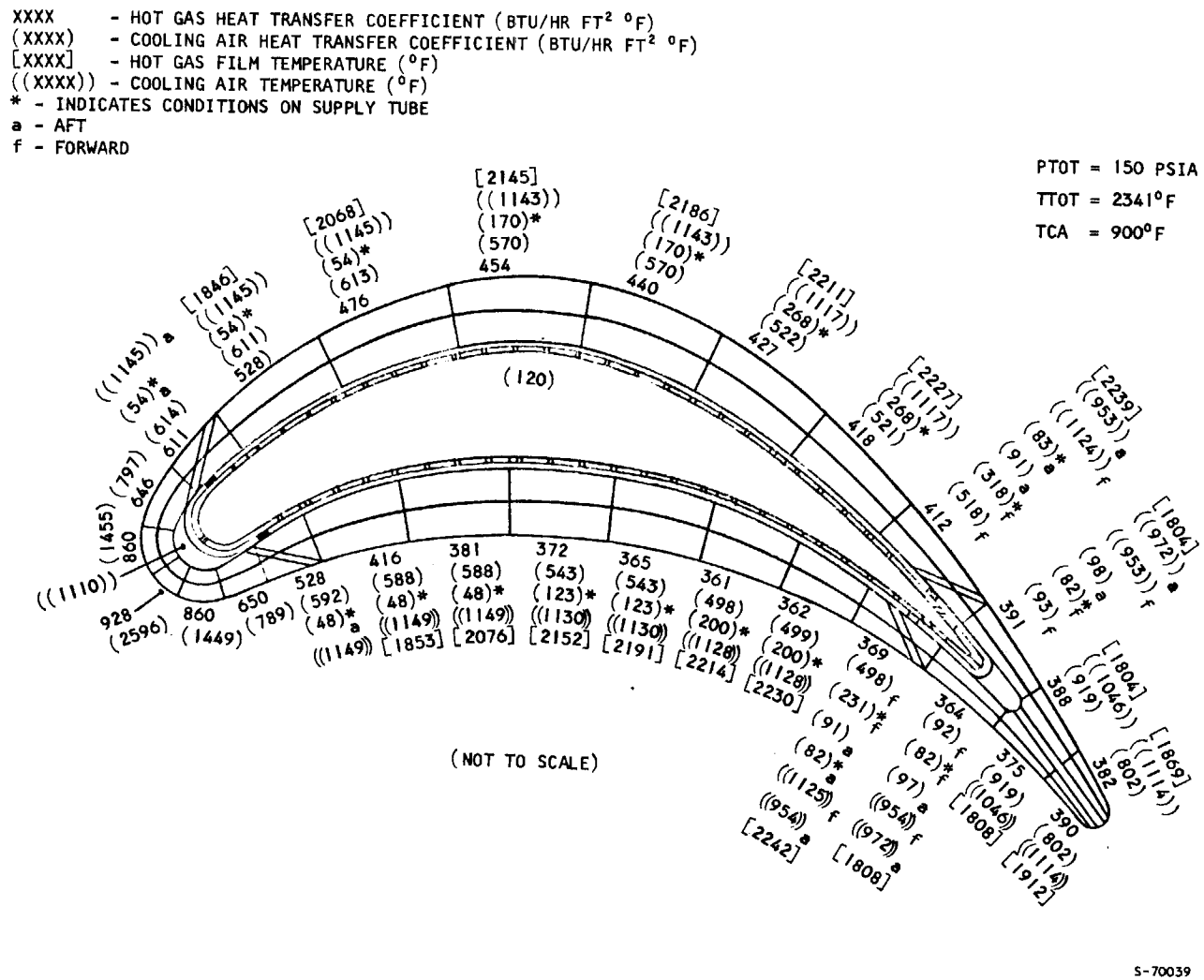


Figure L-28. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900°F) Root Section (3% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
[XXXX] - HOT GAS FILM TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 150 PSIA
TTOT = 2490°F
TCA = 900°F

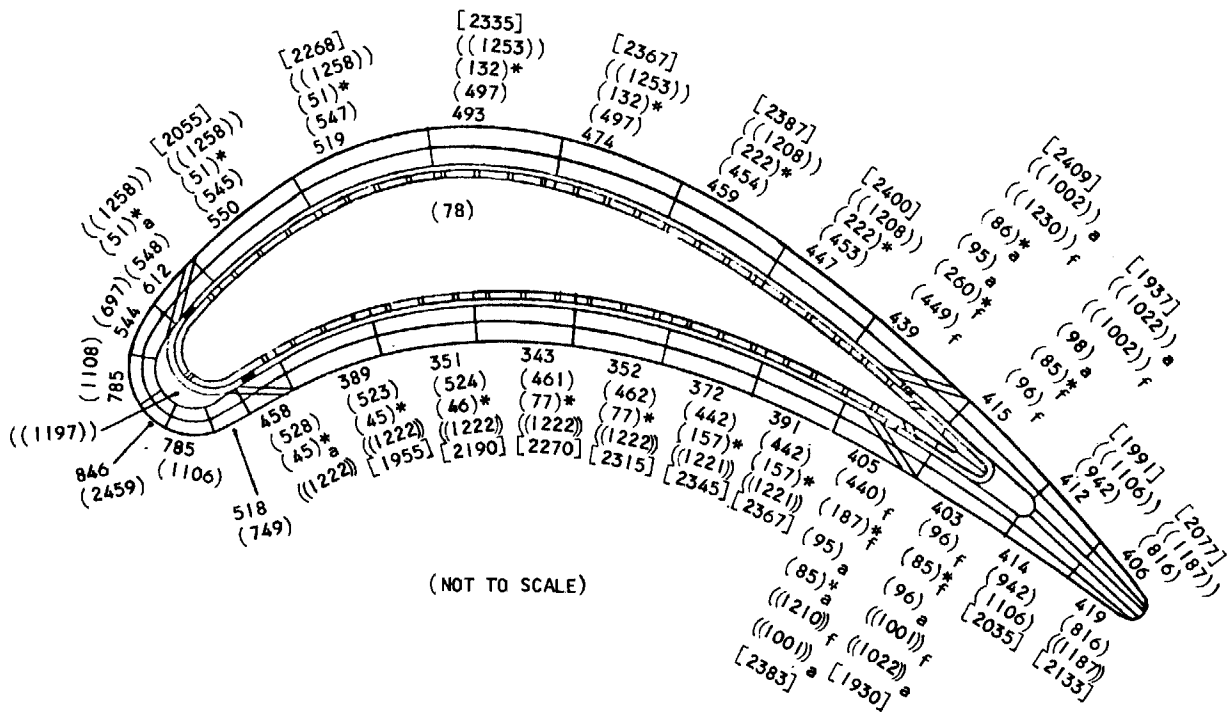


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Figure L-29. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 900°F) Mean Section (50% Span) 1.5 Inch Chord)

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - HOT GAS FILM TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 150 PSIA
TTOT = 2500°F
TCA = 900°F

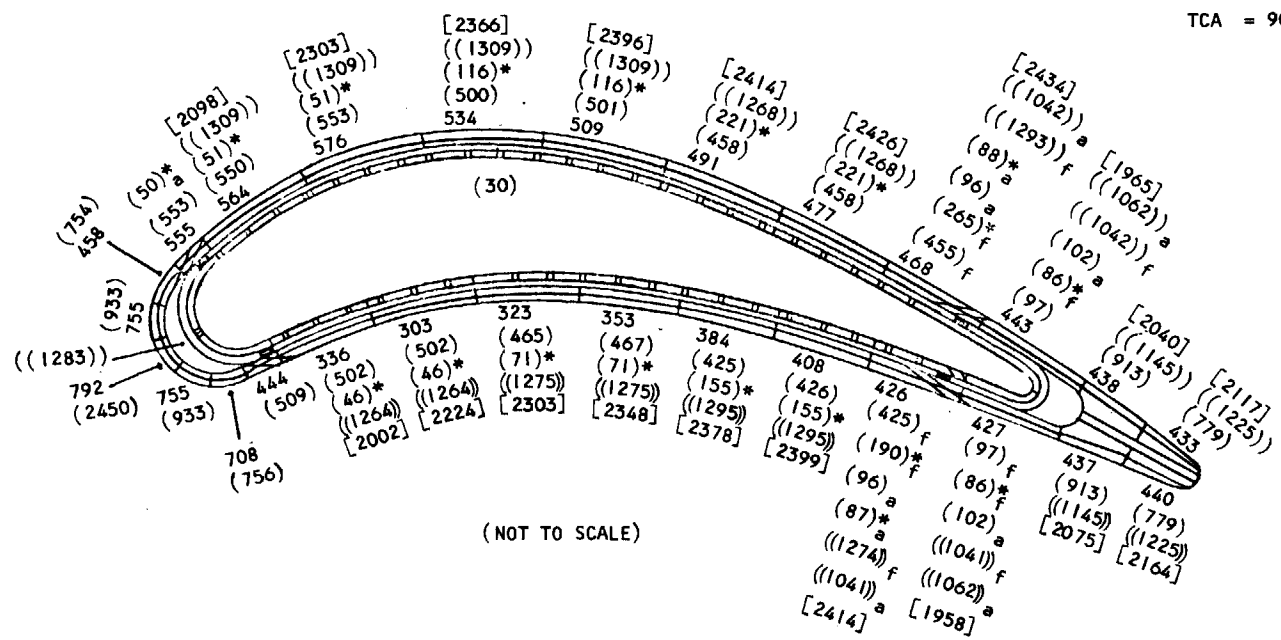

Figure L-30. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 2 (PTOT = 150 PSIA, TCA = 500°F)
Tip Section (75% Span)
1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
[XXXX] - COOLING AIR TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

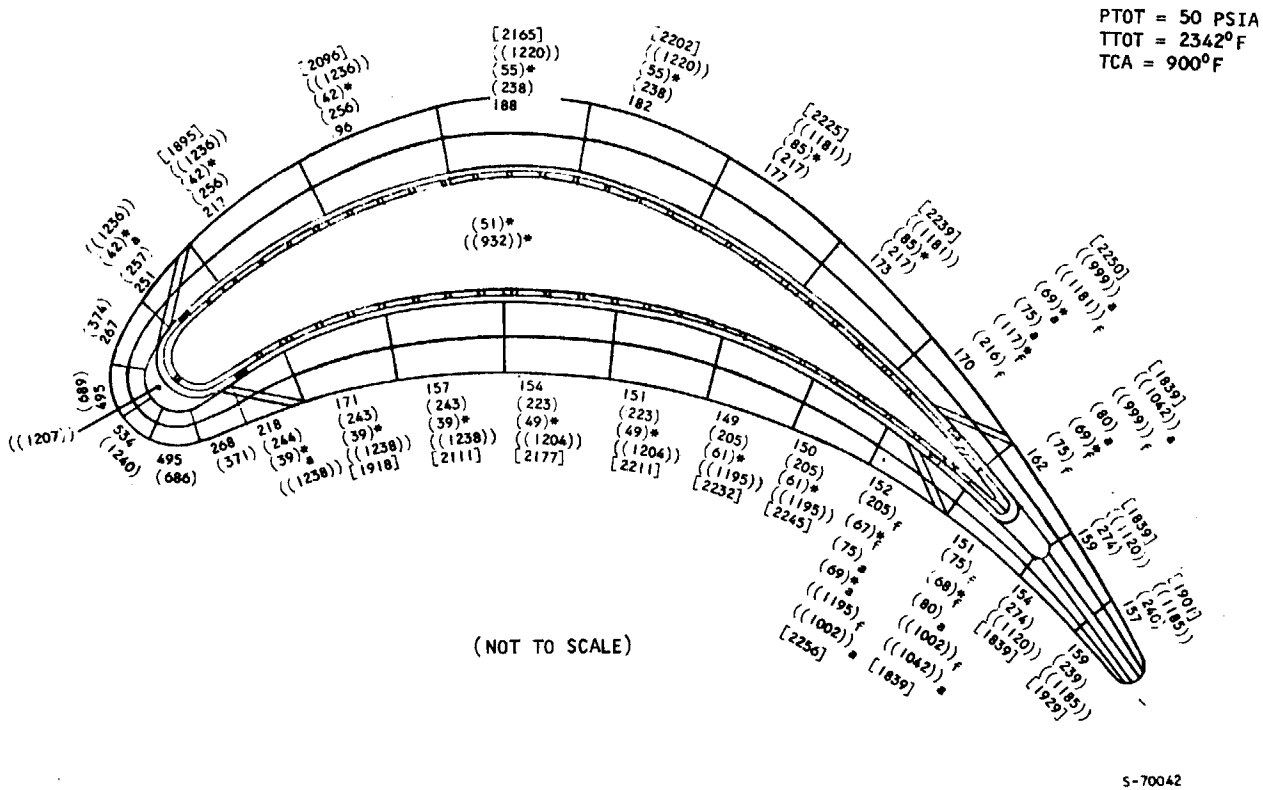

Figure L-31. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900°F) Root Section (3% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - COOLING AIR TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

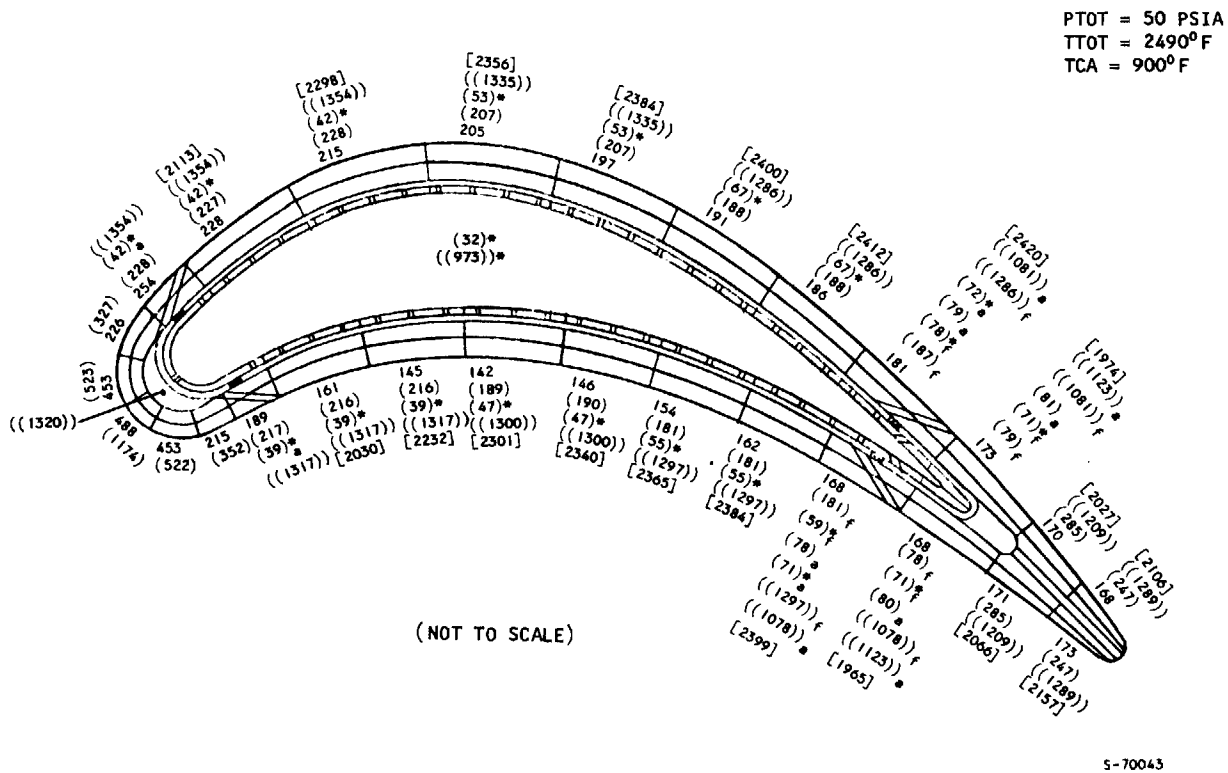

Figure L-32. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900°F, Mean Section (50% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - COOLING AIR TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 50 PSIA
TTOT = 2500°F
TCA = 900°F

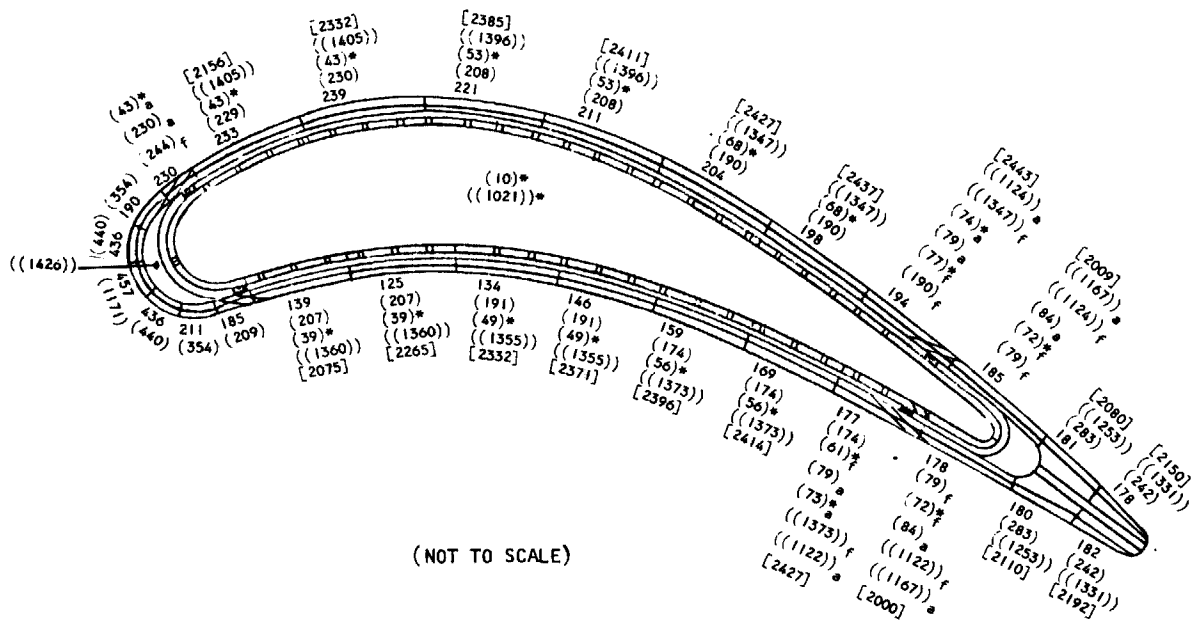

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Figure L-33. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 3 (PTOT = 50 PSIA, TCA = 900°F) Tip Section (75% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
[XXXX] - COOLING AIR TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

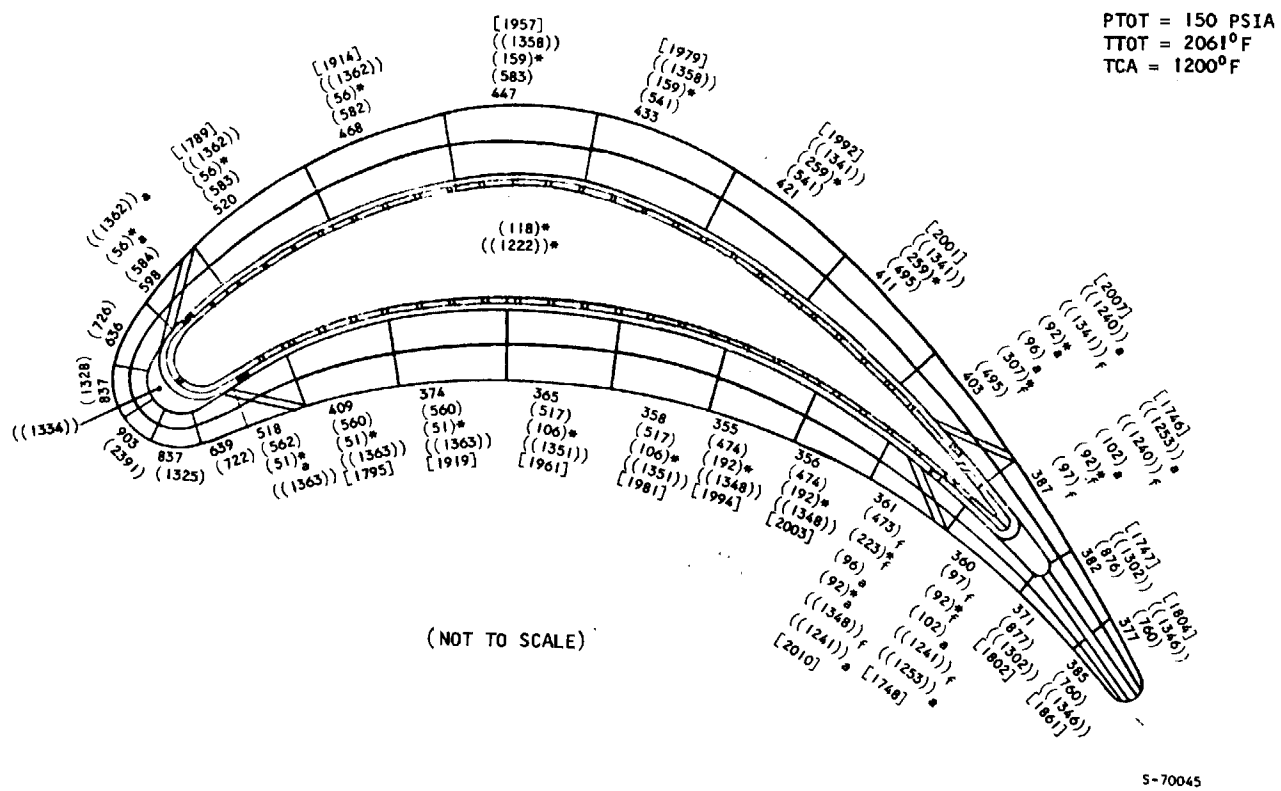


Figure L-34. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT = 150 PSIA, TCA = 1200°F) Root Section (3% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 ^{o}F)
[XXXX] - COOLING AIR TEMPERATURE (^{o}F)
((XXXX)) - COOLING AIR TEMPERATURE (^{o}F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

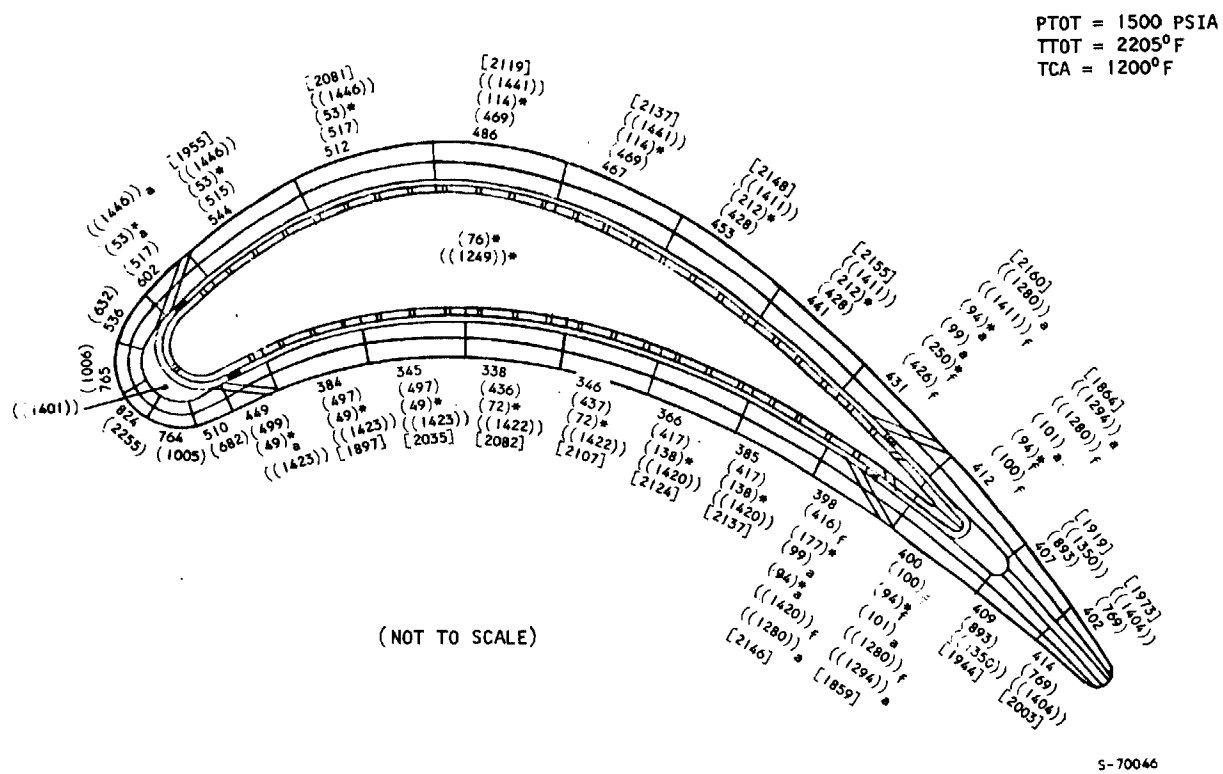


Figure L-35. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT = 150 PSIA, TCA = 1200°F) Mean Section (50% Span) 1.5 Inch Chord

XXXX - HOT GAS HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
(XXXX) - COOLING AIR HEAT TRANSFER COEFFICIENT (BTU/HR FT^2 °F)
[XXXX] - COOLING AIR TEMPERATURE (°F)
((XXXX)) - COOLING AIR TEMPERATURE (°F)
* - INDICATES CONDITIONS ON SUPPLY TUBE
a - AFT
f - FORWARD

PTOT = 150 PSIA
TTOT = 2214°F
TCA = 1200°F

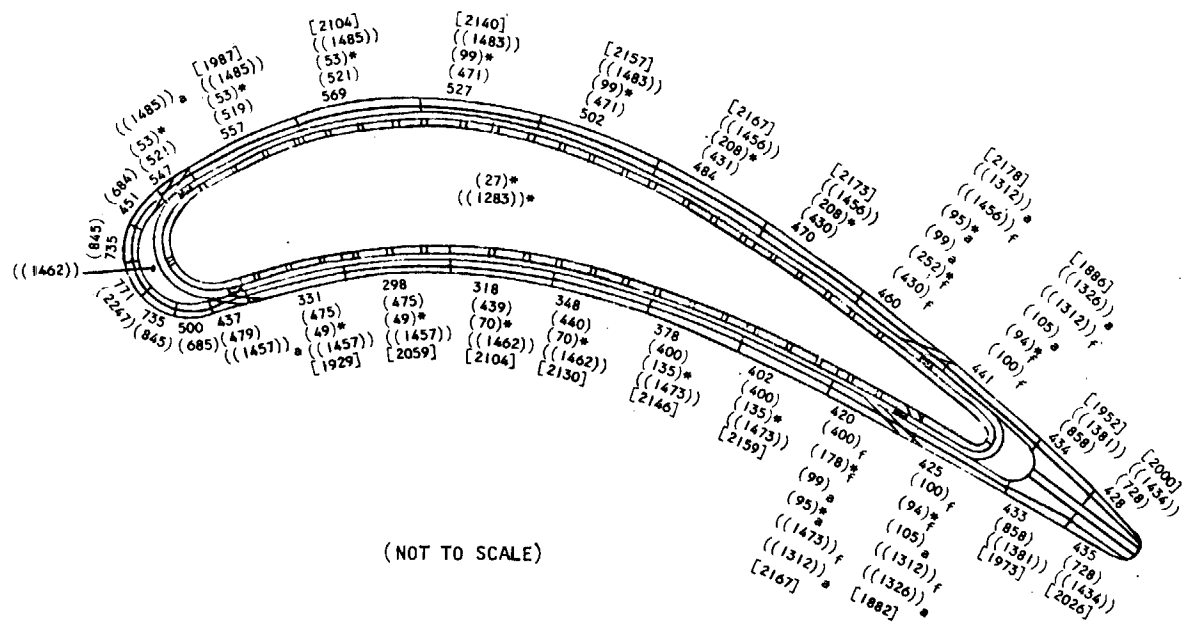


Figure L-36. Boundary Conditions For Film-Convection Cooled Fabricated Impingement Tube Blade For Condition 4 (PTOT = 150 PSIA, TCA = 1200°F)
Tip Section (75% Span)
1.5 Inch Chord

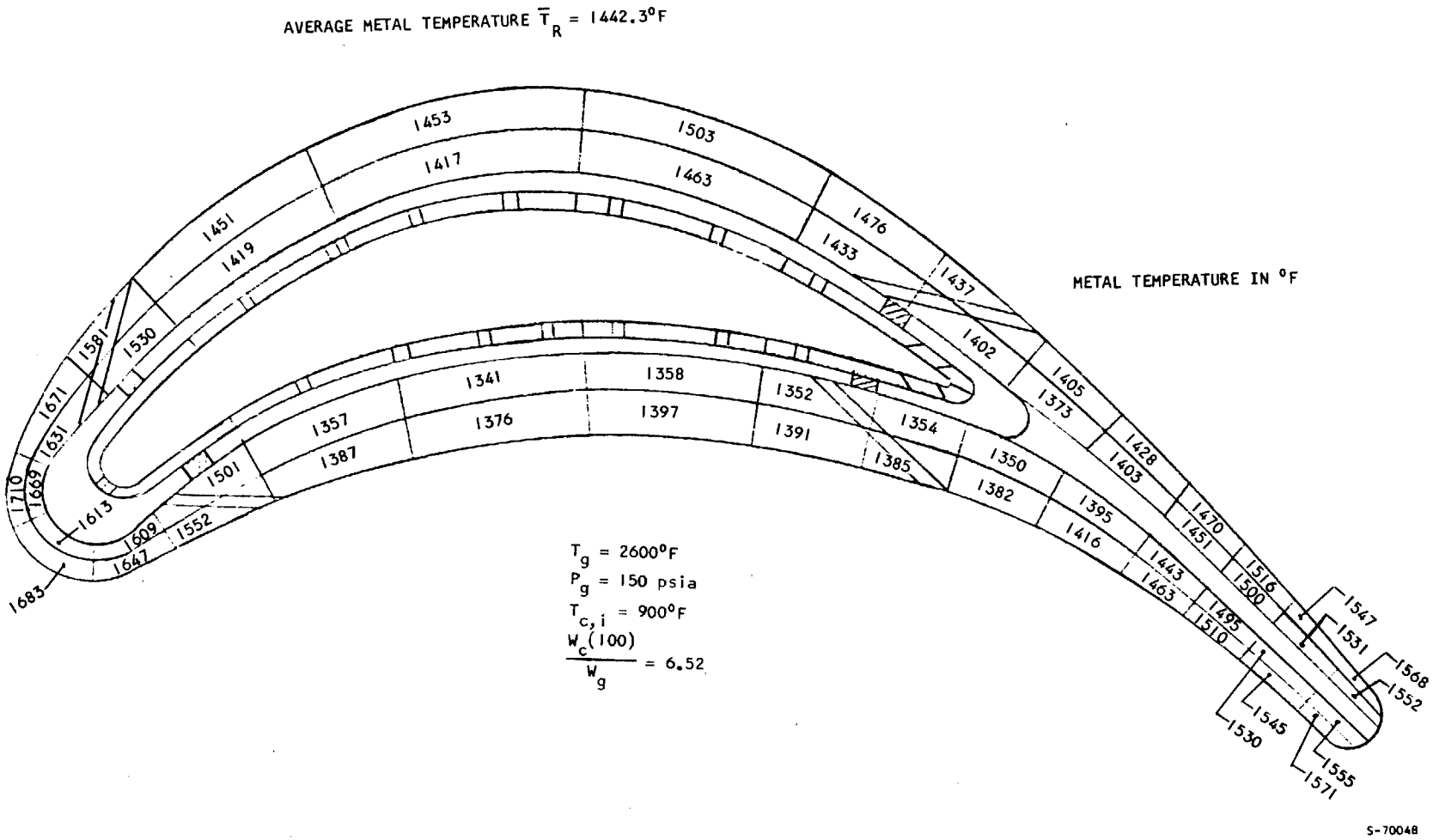


Figure L-37. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade 0.75 Inch Chord

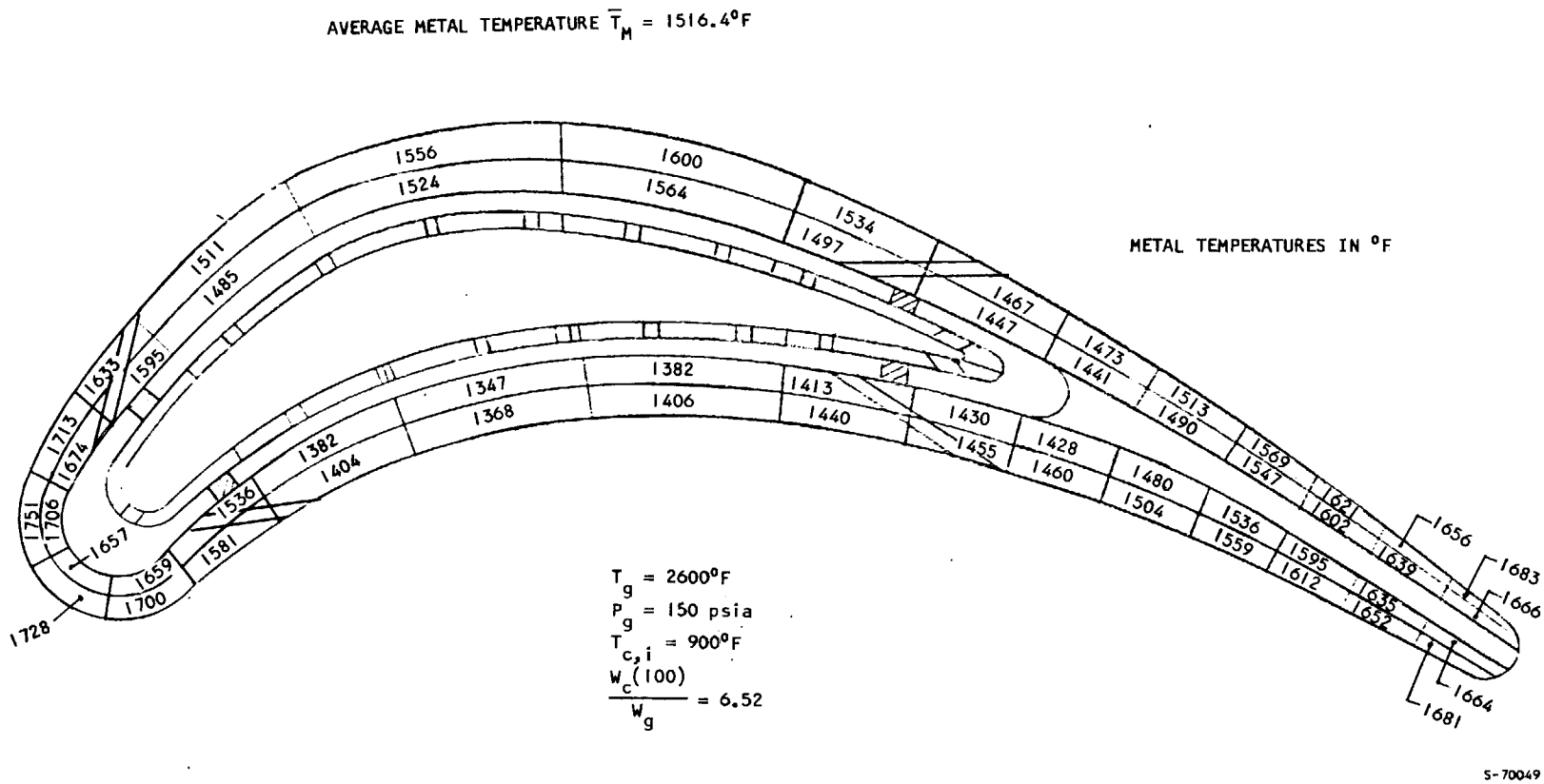
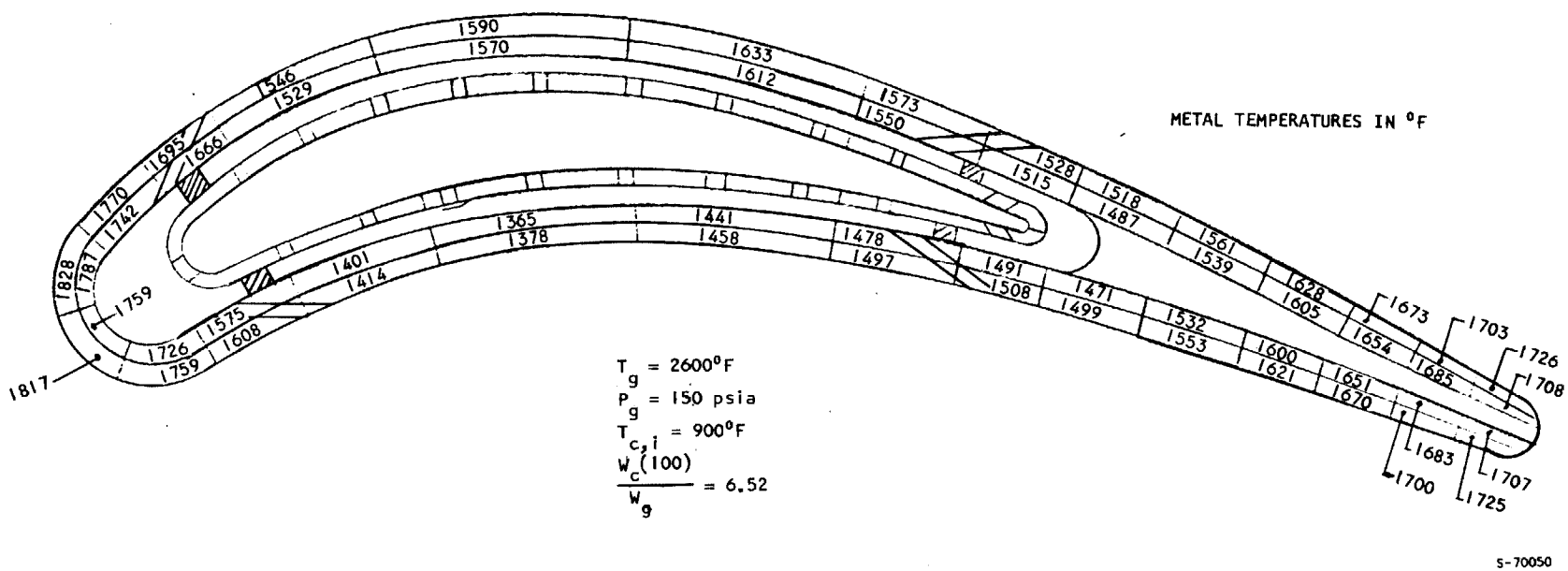


Figure L-38. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade
Mean Section (50% Span)
0.75 Inch Chord



$T_g = 2600°F$

$P_g = 150$ psia

$T_{c,i} = 900°F$

$\frac{W_c(100)}{W_g} = 6.52$

S-70050

Figure L-39. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade
Tip Section (75% Span)
0.75 Inch Chord

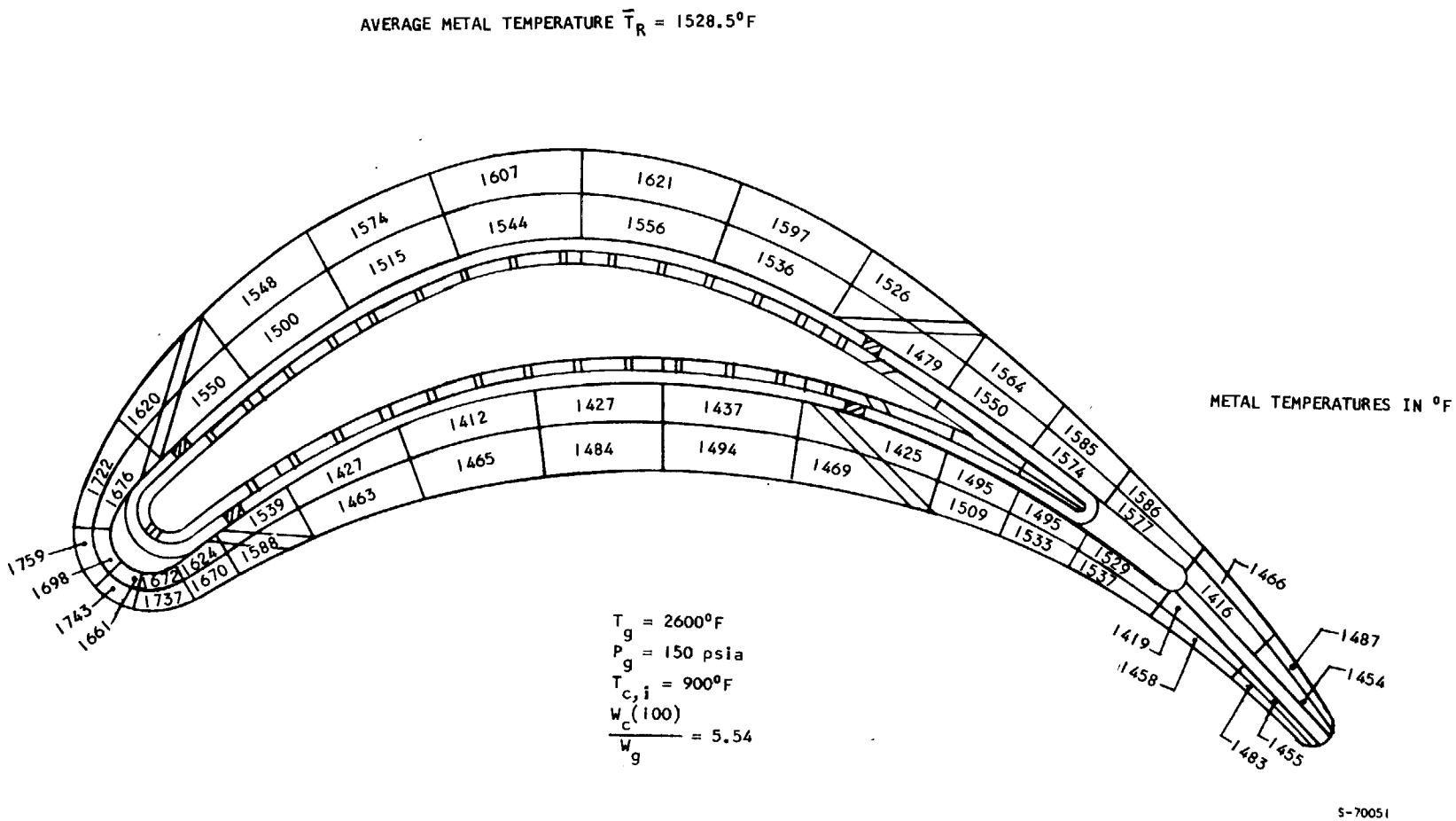


Figure L-40. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade
Hub Section (3% Span)
1.0 Inch Chord

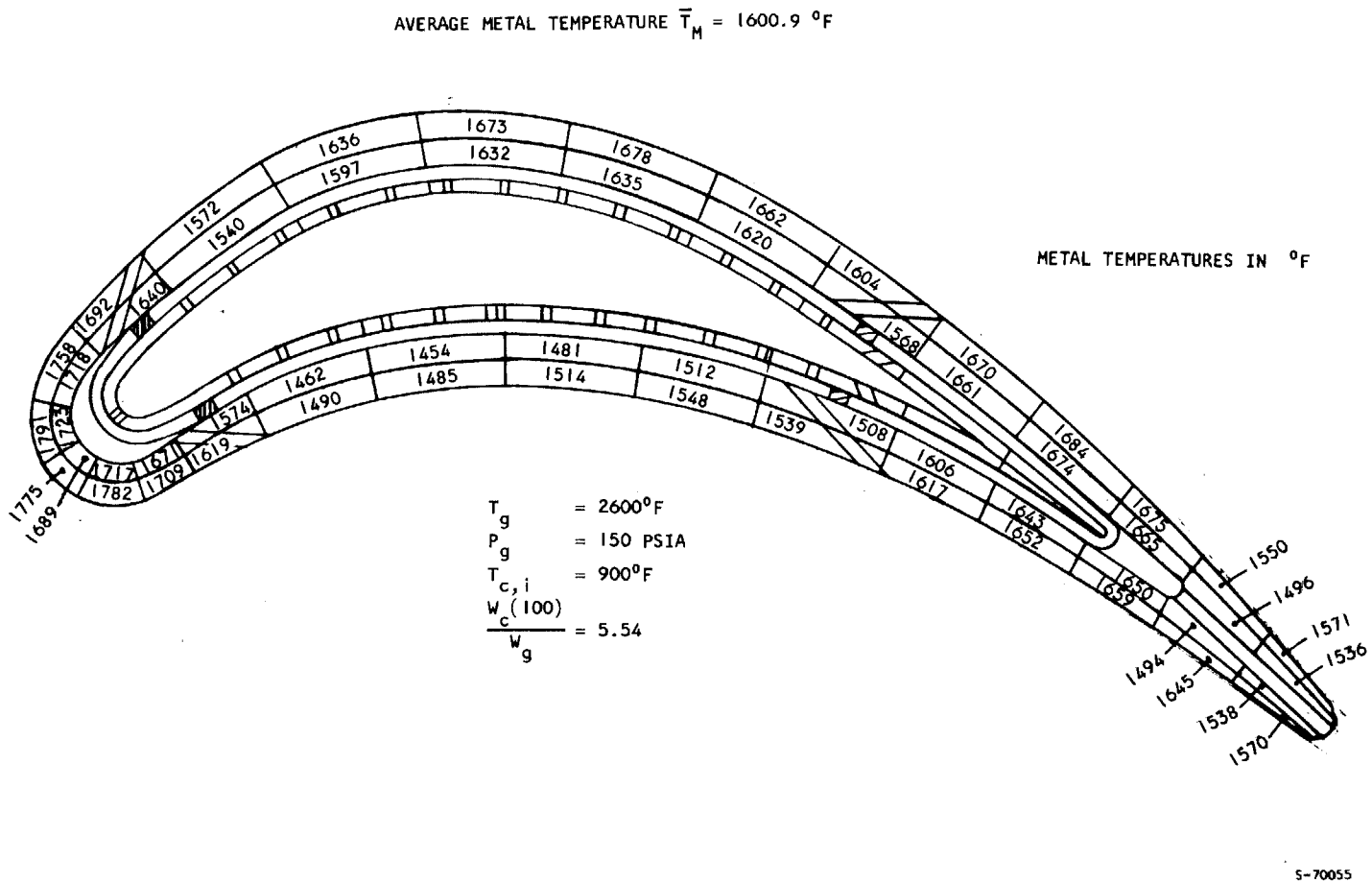


Figure L-41. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade
Mean Section (50% Span)
1.0 Inch Chord

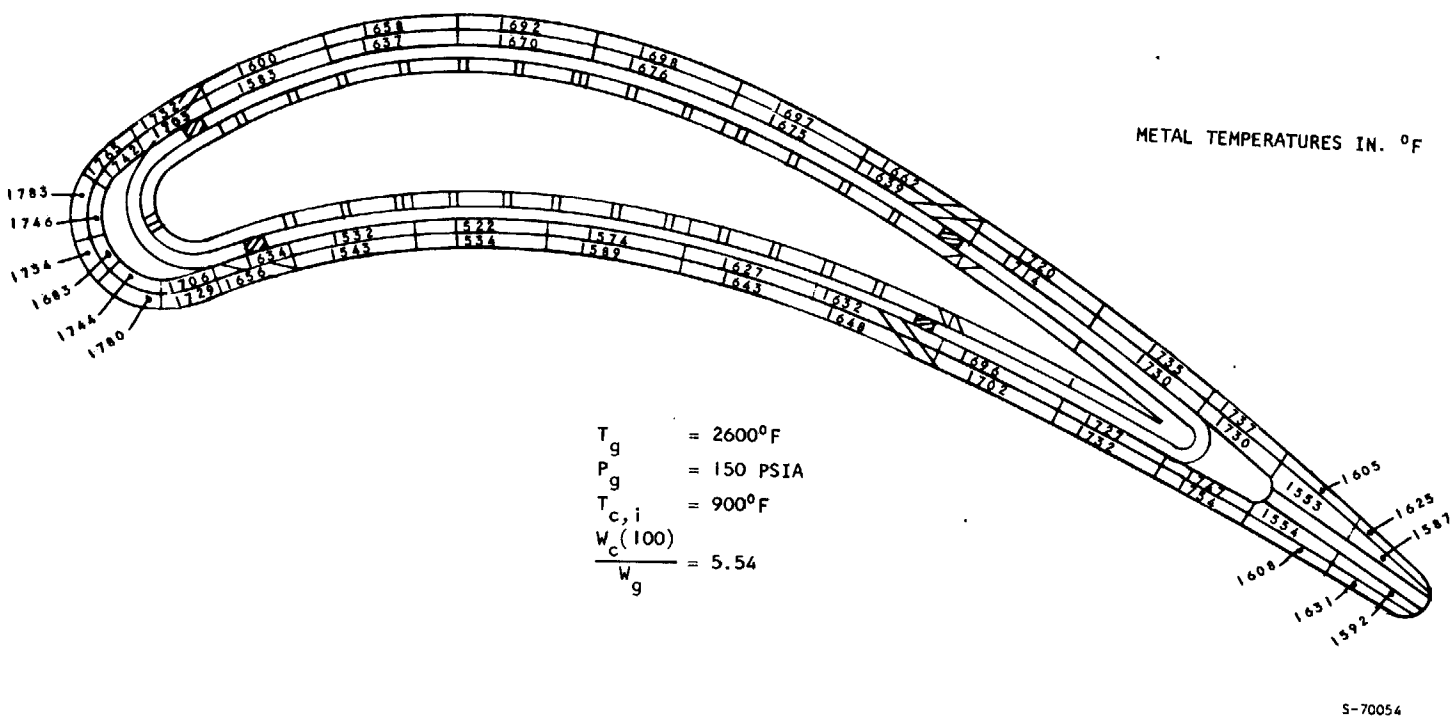


Figure L-42. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade
Tip Section (75% Span)
1.0 Inch Chord

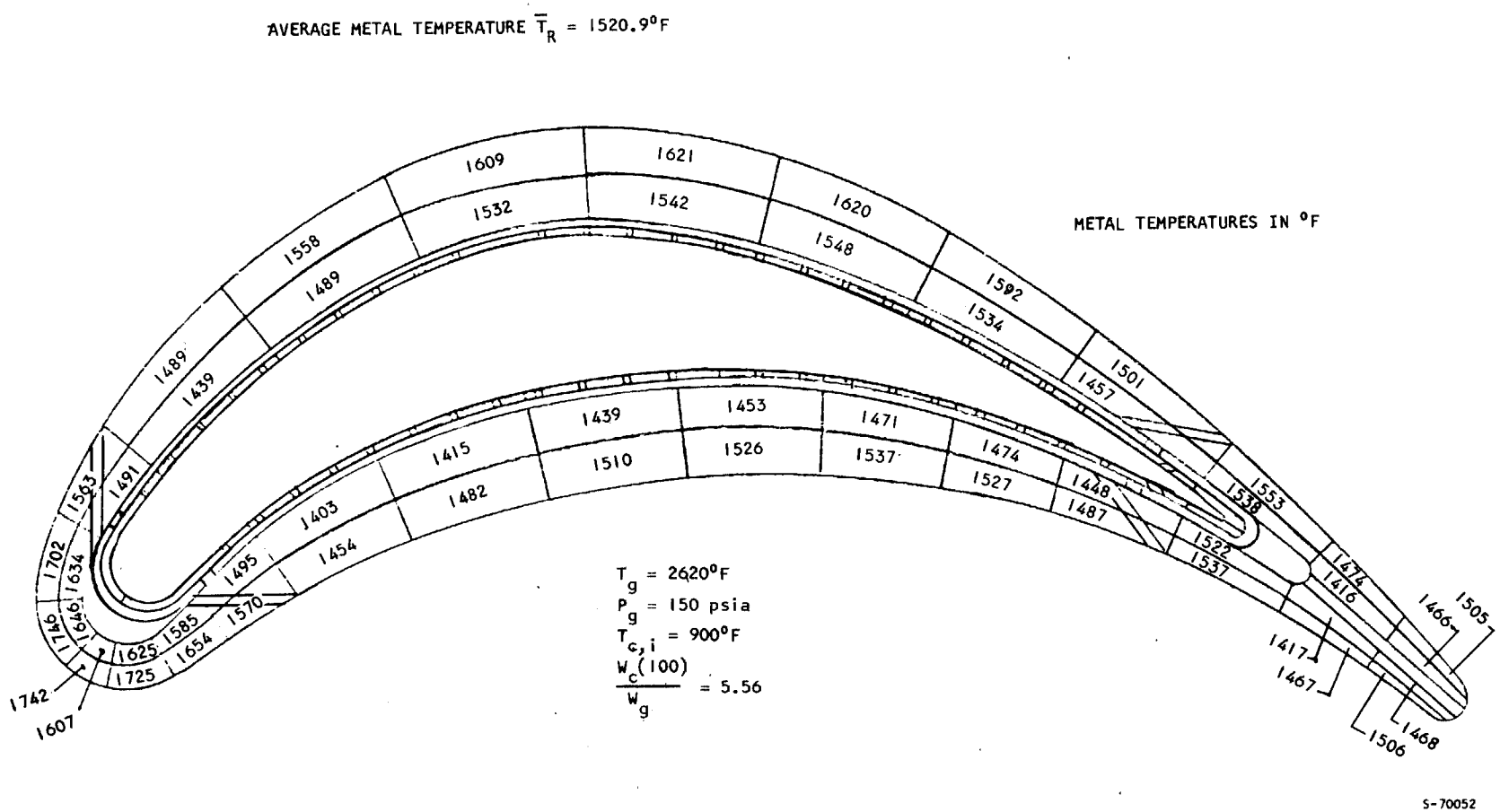


Figure L-43. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade Hub Section (3 percent Span) 1.5 Inch Chord

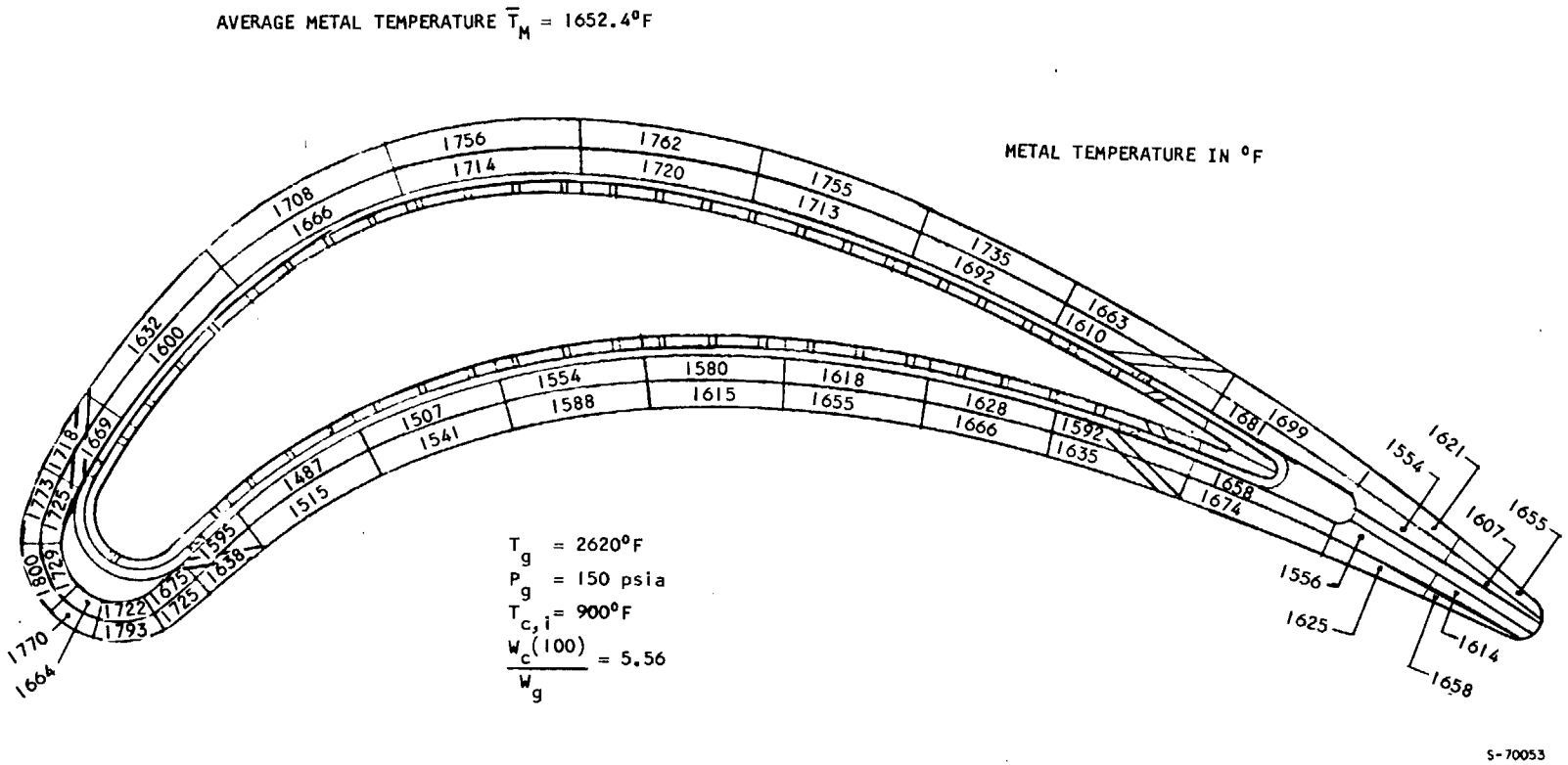


Figure L-44. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade
Mean Section (50 percent Span)
1.5 Inch Chord

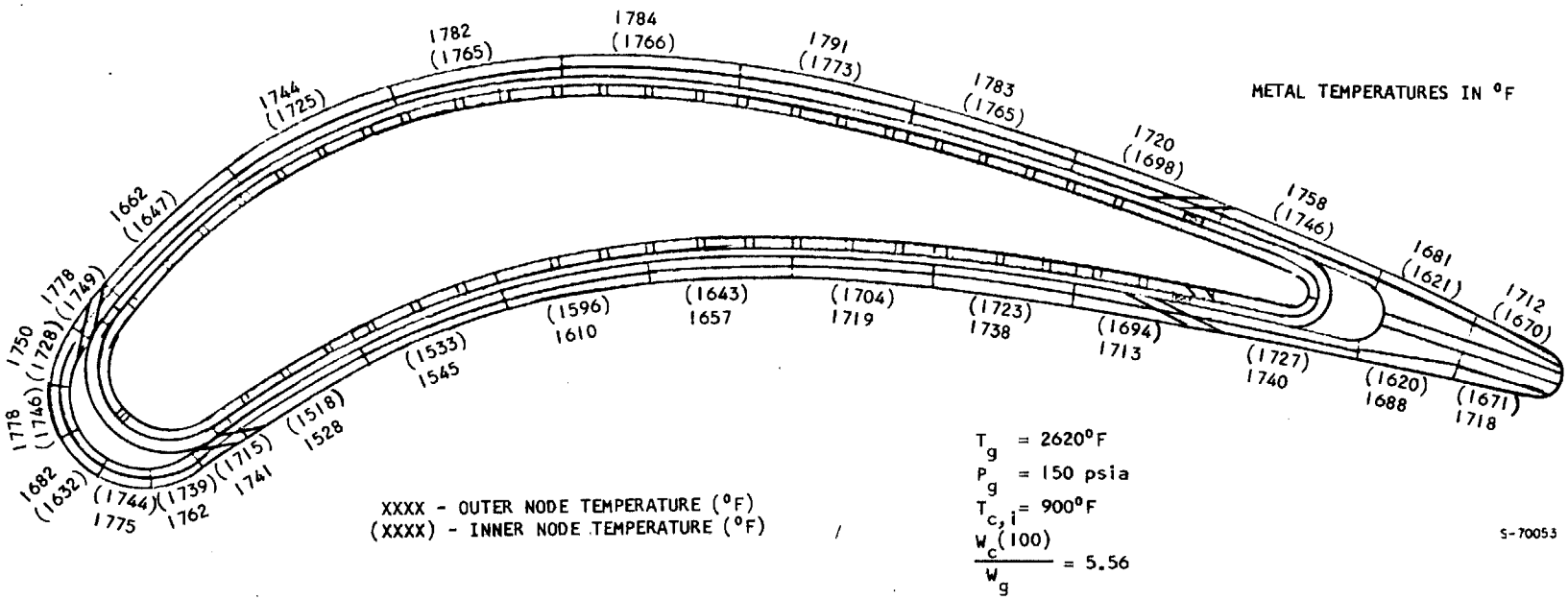


Figure L-45. Metal Temperature Distribution for Film-Convection Cooled Fabricated Impingement Tube Blade Tip Section (75 percent Span) 1.5 Inch Chord

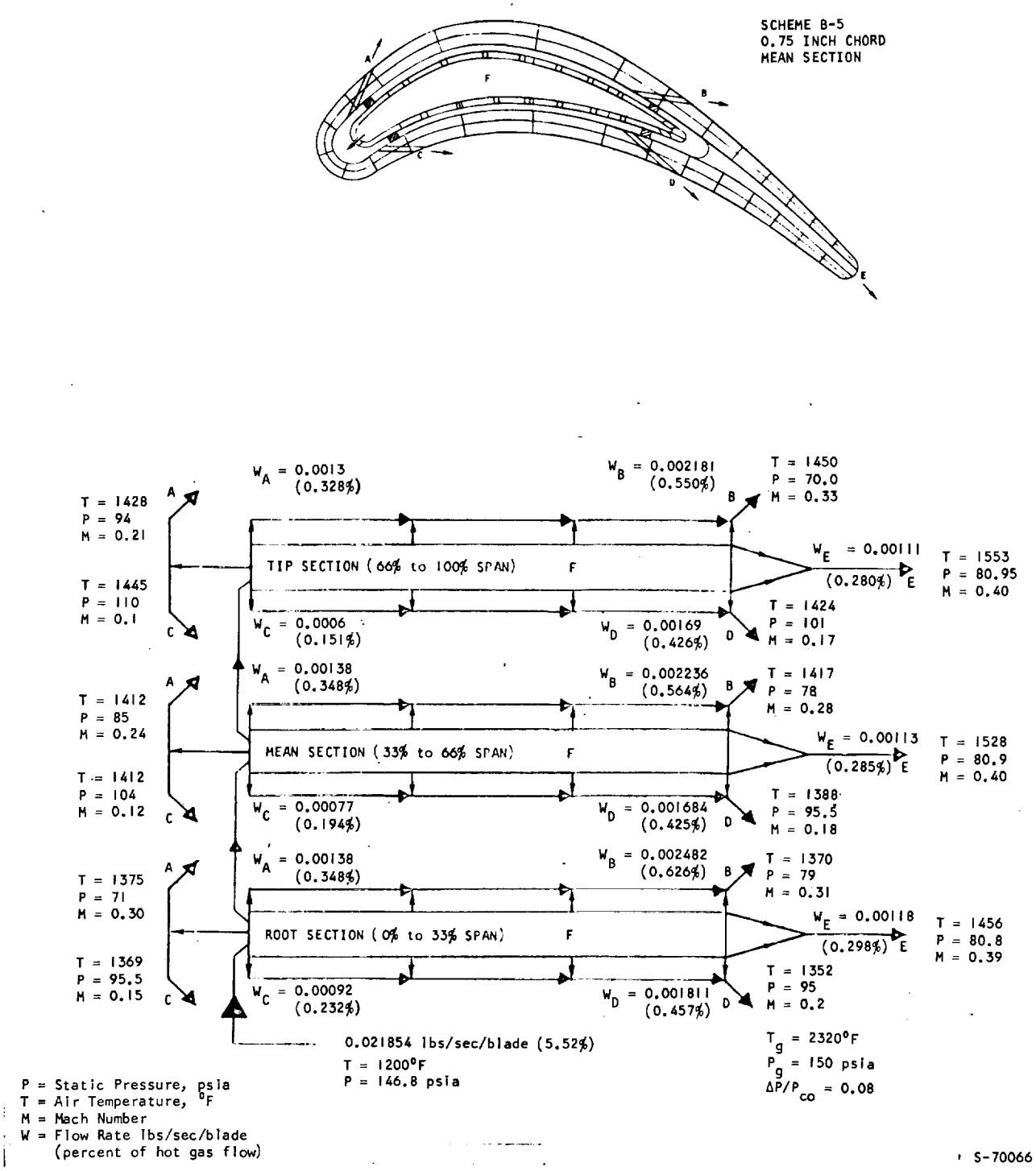


Figure L-46. Scheme B-5 Film Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 0.75 Inch Chord

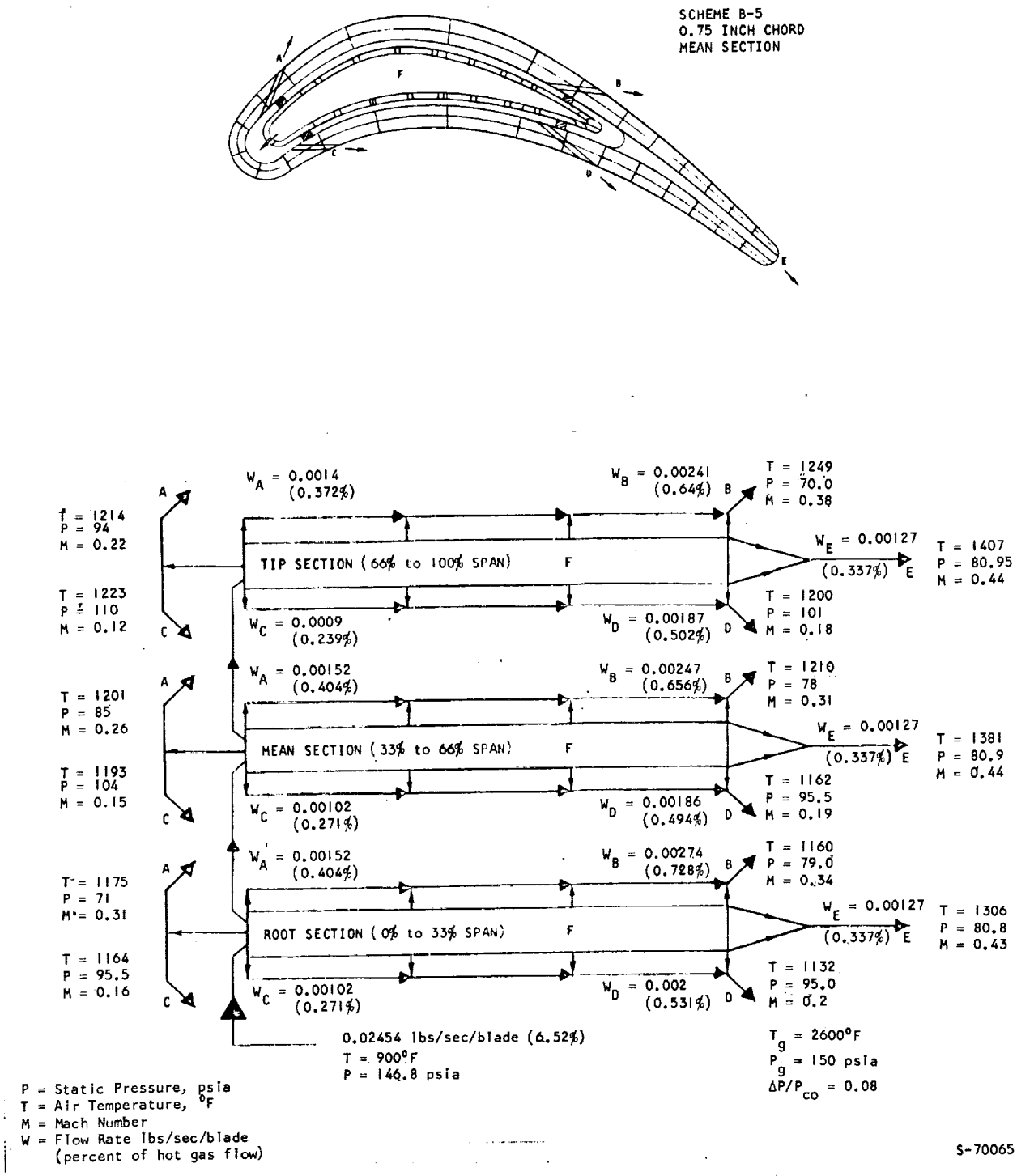


Figure L-47. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 0.75 Inch Chord

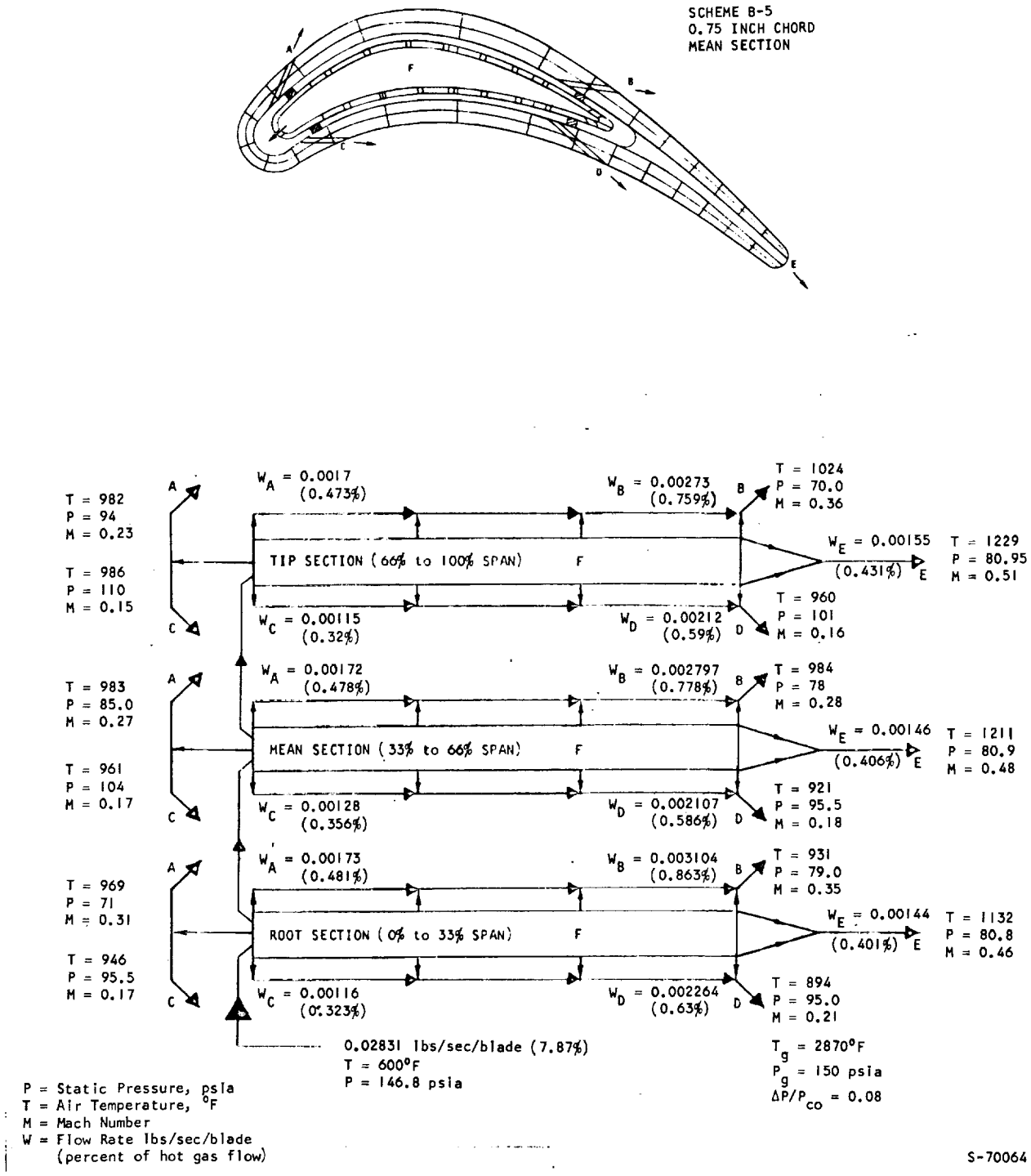


Figure L-48. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 0.75 Inch Chord

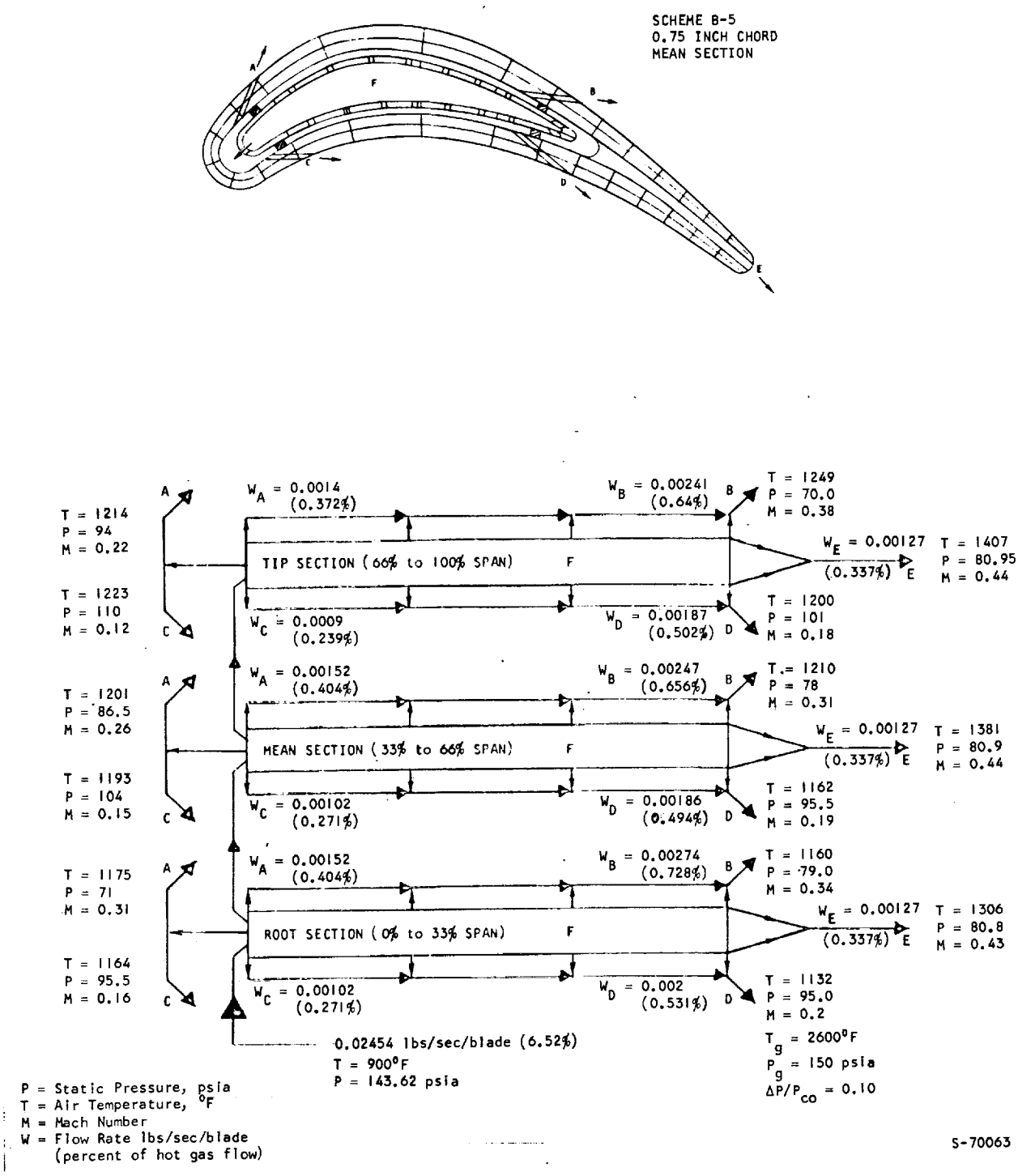


Figure L-49. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 0.75 Inch Chord

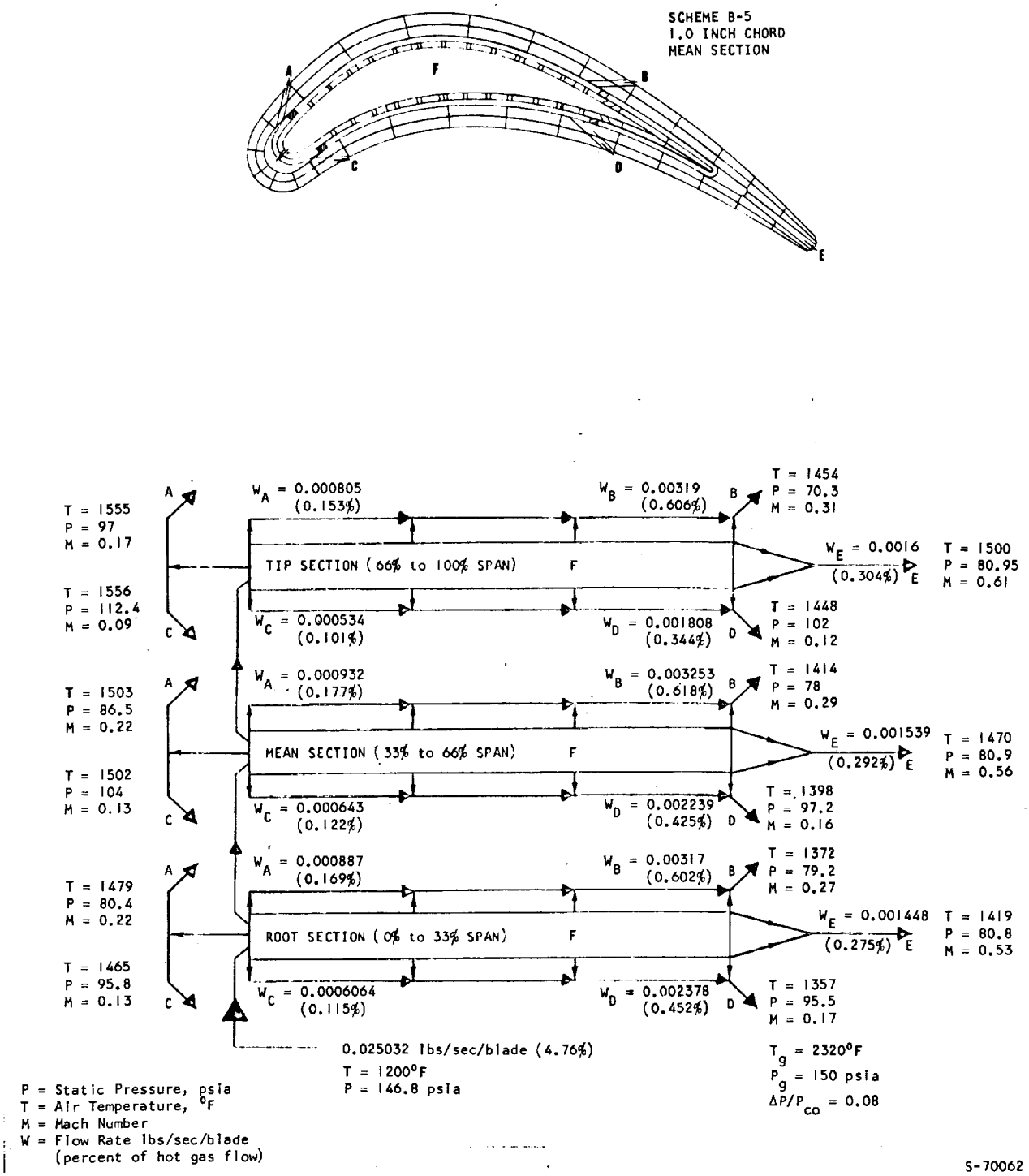
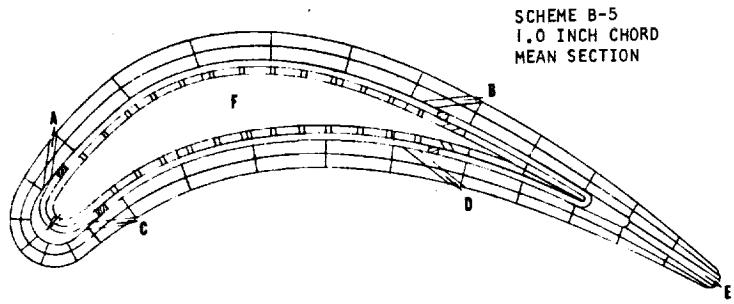


Figure L-50. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.0 Inch Chord



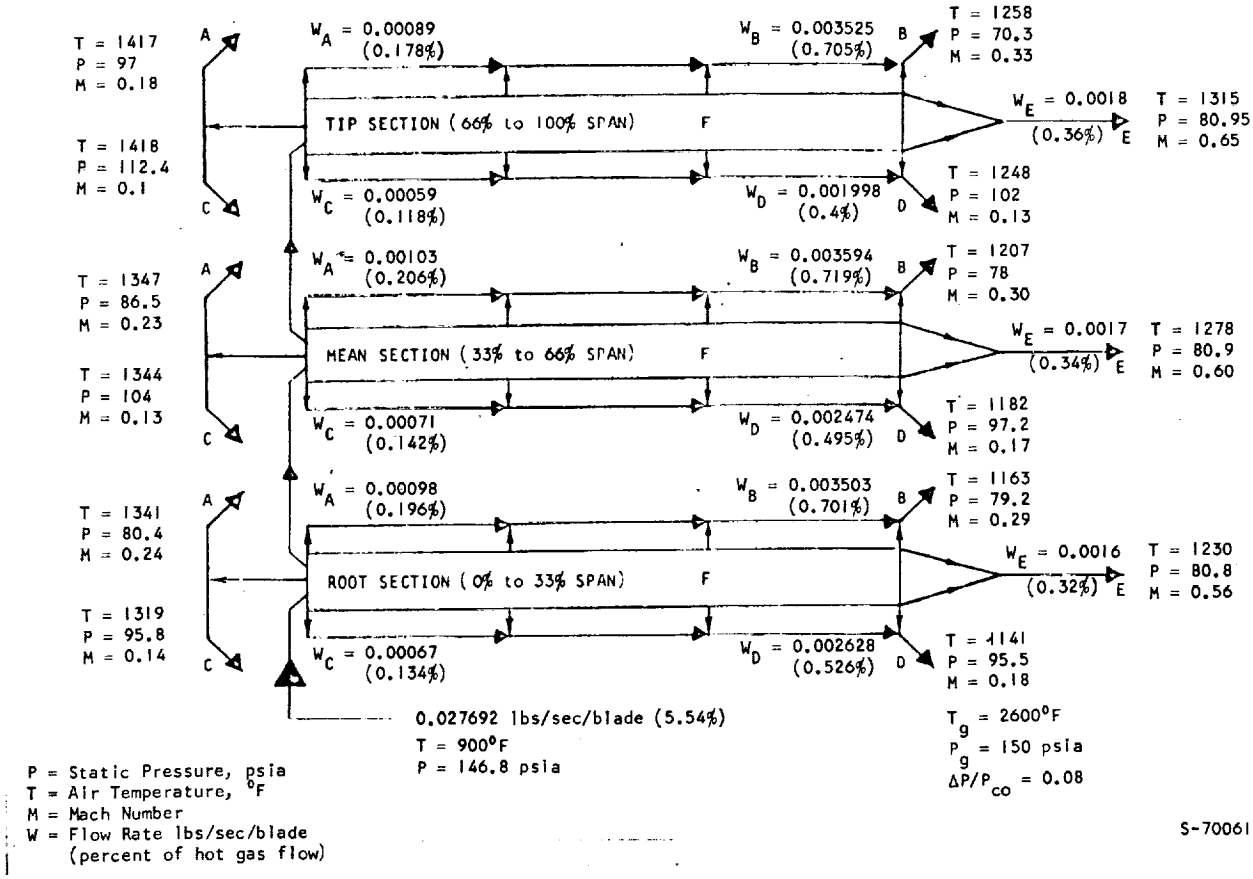


Figure L-51. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.0 Inch Chord

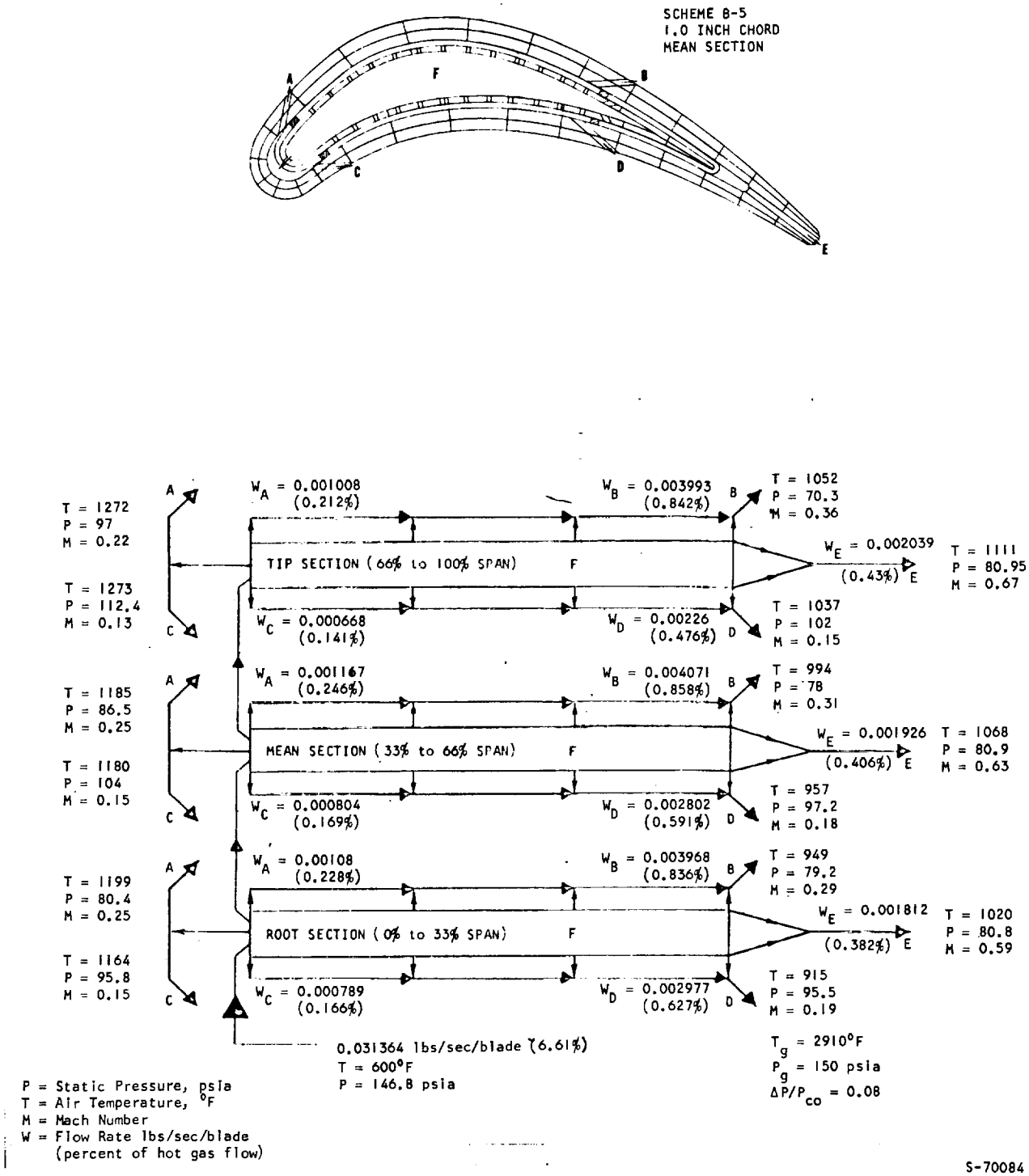
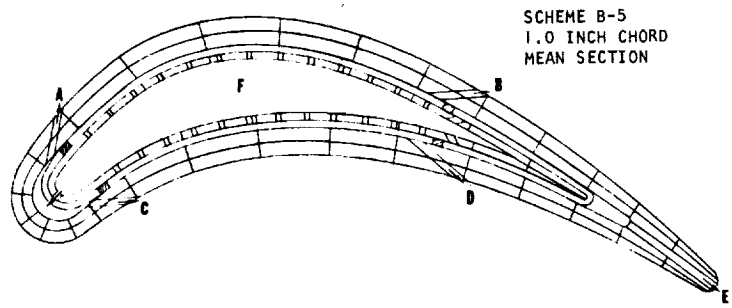


Figure L-52. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.0 Inch Chord



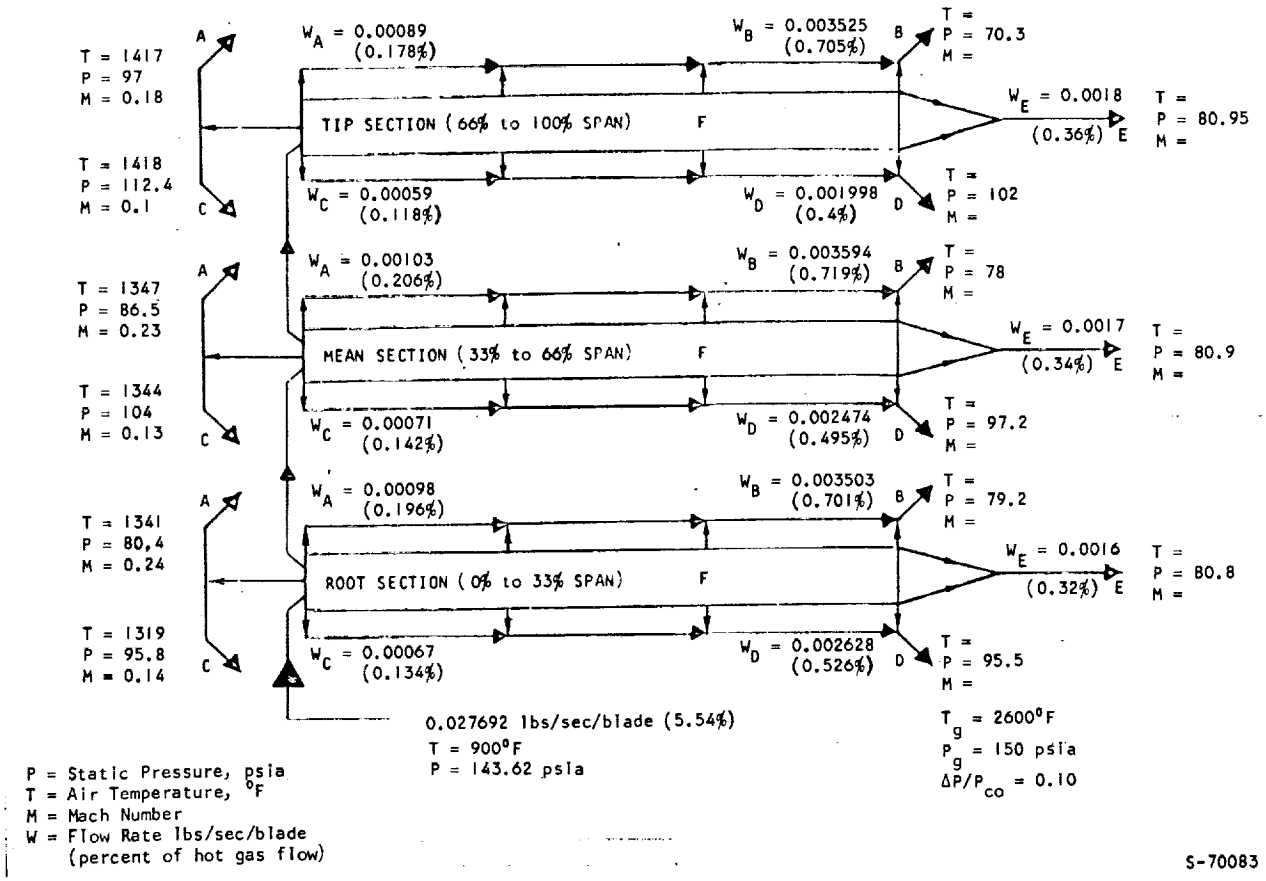


Figure L-53. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.0 Inch Chord

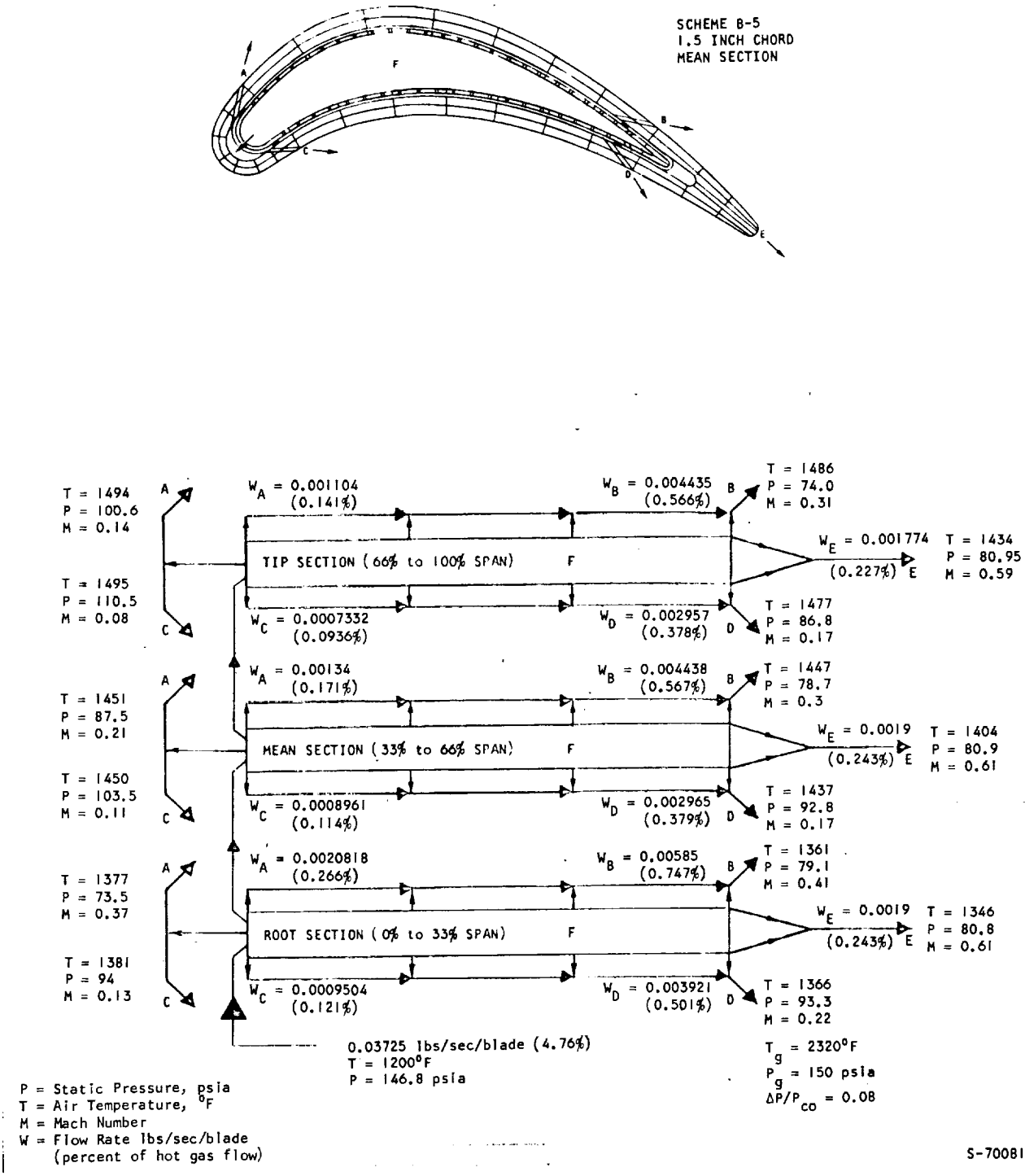


Figure L-54. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.5 Inch Chord

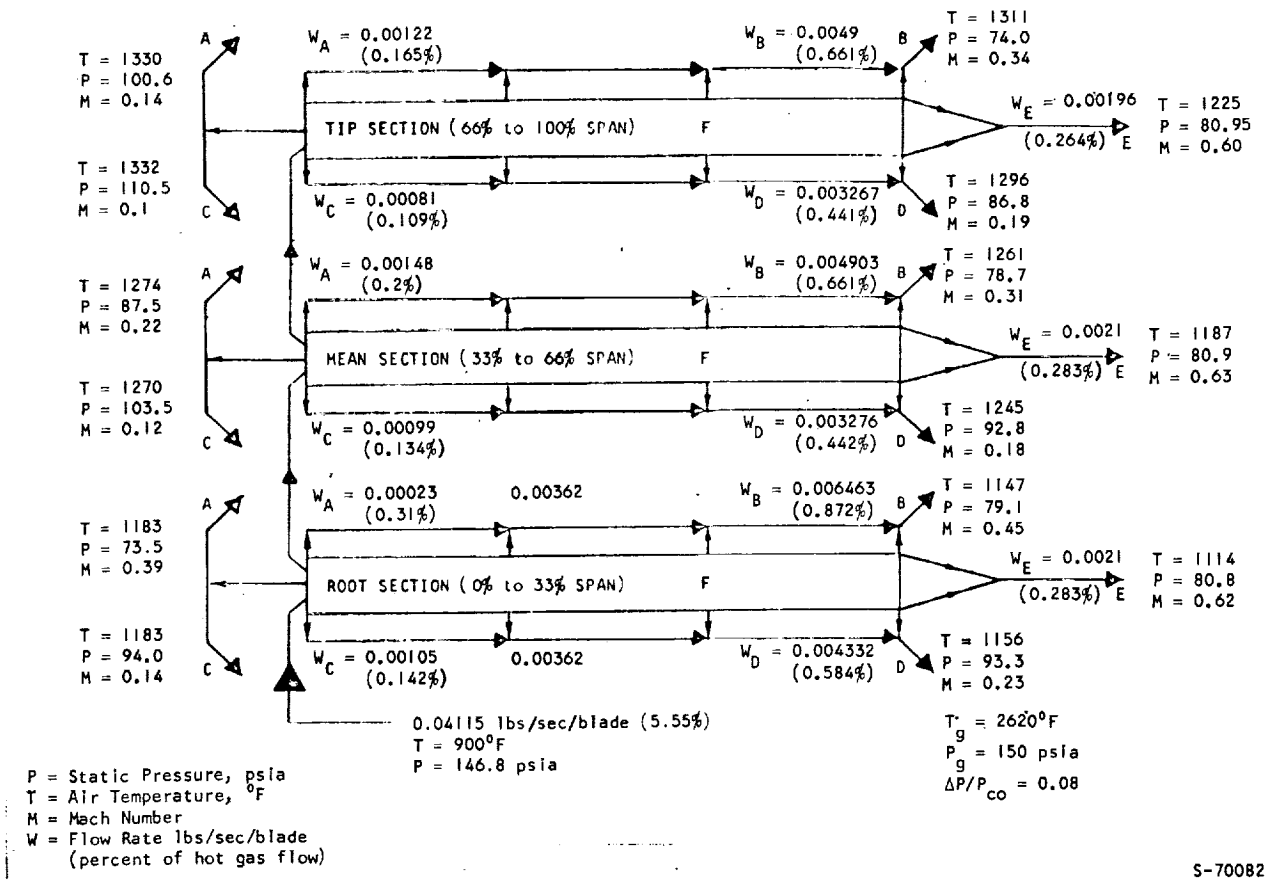


Figure L-55. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.5 Inch Chord

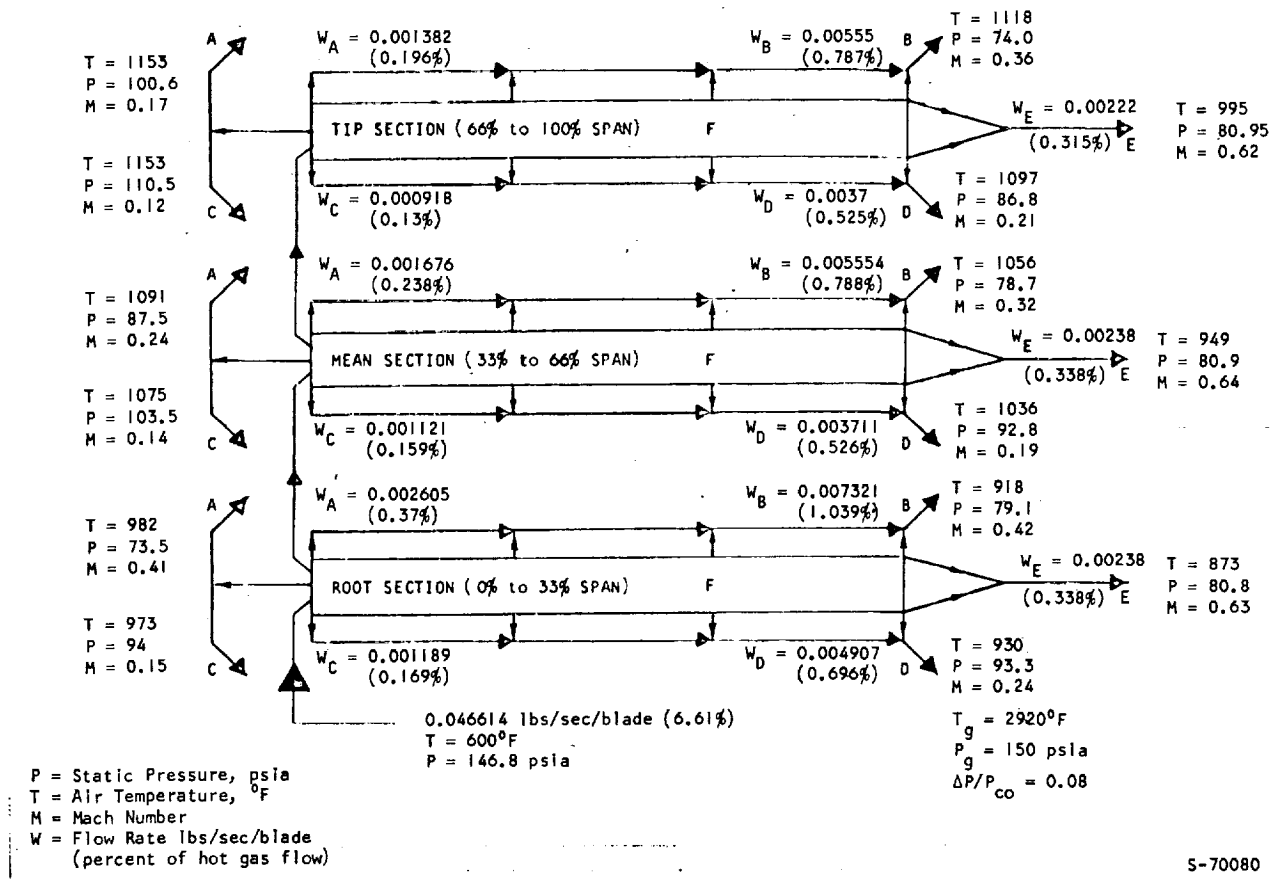


Figure L-56. Scheme B-5 Film Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.5 Inch Chord

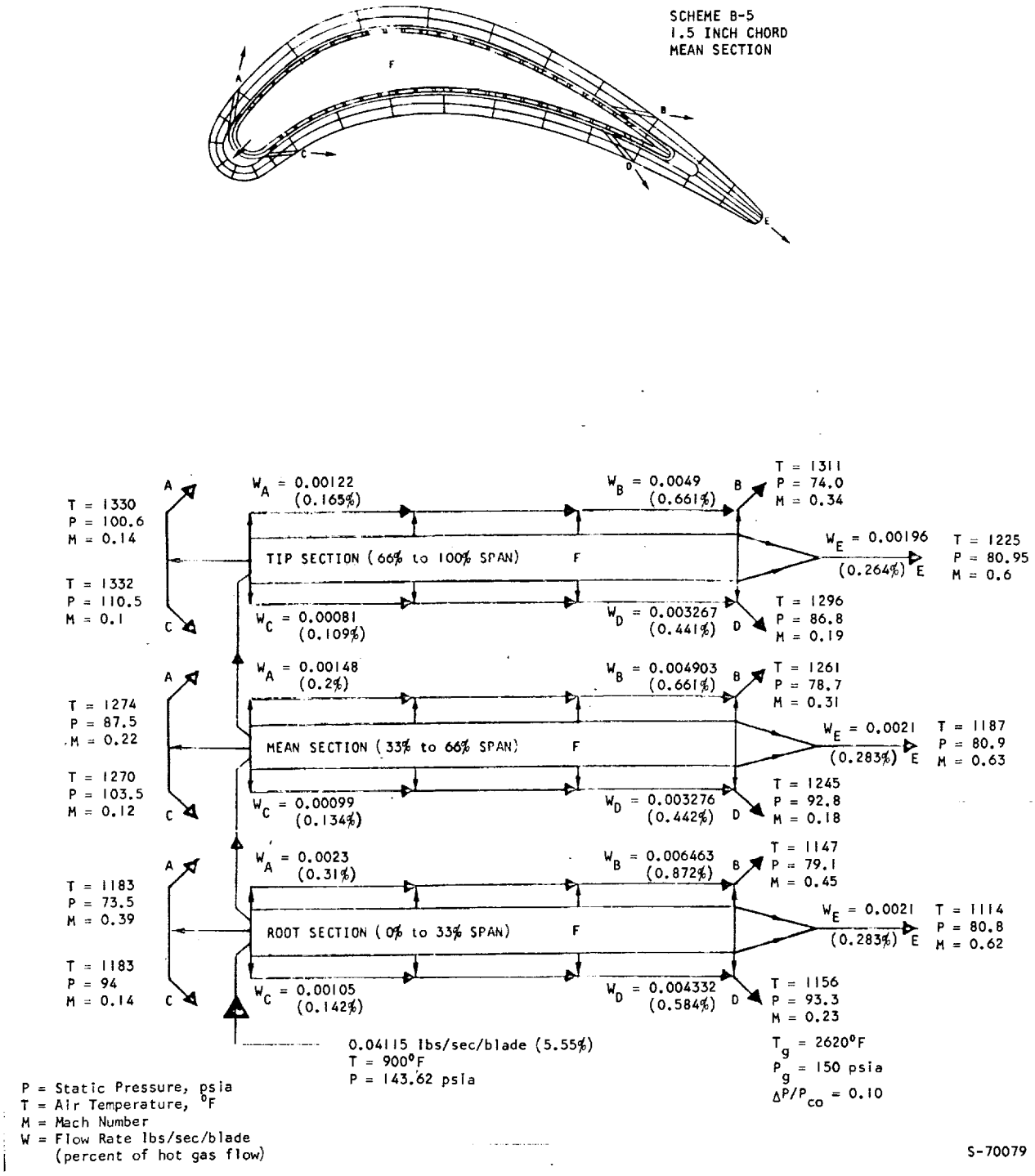


Figure L-57. Scheme B-5 Film-Convection Cooled Fabricated Impingement Tube Blade Flow Distribution 1.5 Inch Chord

APPENDIX M

DETAILED TEMPERATURES, STRESS, AND STRESS TO RUPTURE LIFE FOR EACH ELEMENT AND CREEP STRESS ANALYSIS RESULTS IN THE SCHEME B-5 FINAL DESIGN ANALYSIS

In the Final Design, Task I phase of the study, the film-convection cooled fabricated impingement tube blade scheme B-5 was studied in each of three chord sizes. The cooling configuration was modified as required to obtain the maximum turbine inlet temperature capability for a turbine inlet total pressure of 150 psia (1.034×10^6 Newtons/sq m) and a cooling air inlet temperature of 900°F (755.6°K). The cooling passage dimensions, impingement holes, film cooling holes, trailing edge discharge holes, and flow control orifices were finalized to give the proper flow distribution for this condition. Using the scheme B-5 blade sized for the design point condition, the turbine inlet temperature capability for two off-design cooling air inlet temperatures and two off-design turbine inlet total pressures was determined for each chord size.

Using a constant turbine inlet temperature determined for the 0.75 in. (0.01905 m) chord blade with a cooling air inlet temperature of 1200°F (922.2°K) and a turbine inlet total pressure of 150 psia (1.034×10^6 Newtons/sq m), the cooling air flow required, as a function of the cooling air inlet temperature, was determined for each chord size. These results were obtained by varying flow control orifice sizes only and maintaining a constant cooling passage dimension and trailing edge discharge hole size. Five additional conditions for the 1.0 in.(0.0254 m) chord blade were obtained by varying trailing edge discharge and flow control orifice sizes to obtain maximum turbine inlet temperature for three conditions and to obtain minimum cooling air flow required for two additional conditions.

A heat transfer analysis was conducted for each of these final design conditions at the hub (five percent span), mean (50 percent span), and tip (75 percent span) sections of the blade. The analysis was performed using the AiResearch transient and steady state thermal analyzer computer program (H0910) described in Appendix B. The analysis includes the effects of the hot gas relative total temperature with a radial gas temperature correction factor; convection heat transfer from the hot gas to the blade surface; spanwise and chordwise conduction as well as conduction through the wall; internal convection heat transfer from the blade surface to the cooling air; and cooling air heatup due to heat addition and rotational acceleration. The internal convection heat transfer coefficients were calculated using the equations for impingement at the leading edge, impingement with crossflow in the center cavity, and entrance effects for the trailing edge discharge holes. Film cooling was applied at the leading and trailing edges of the blades. Each of these techniques is described in the analytical methods section of this report.

The stress analysis was conducted for each element used in the thermal analysis at the hub, mean, and tip sections of the blade. The analysis was performed using the turbine blade elastic, inelastic, and creep stress analysis computer program (X0850) described in Appendix H. The initial stress at each element of the blade was determined based on an elastic and plastic stress analysis including the effects of centrifugal loads, bending moments due to thermal distortion, and local plastic flow of the material. For the blade designs in which the initial stress distribution was critical, a creep relaxation analysis was performed to determine the time to 1 percent creep strain for the critical elements of the blade.

The centrifugal loads for each of the blades includes the effects of the dead weight of the fins and the tip cap. Gas bending loads were neglected because these loads are small and may be cancelled out by tilting the blades. Bending moments due to offsetting the line of action of the centrifugal force as a result of thermal distortion and relaxation of stress due to local instantaneous plastic flow of the material are considered in AiResearch computer program X0850. The creep relaxation analysis was performed according to the strain-hardening procedure described in Appendix H. The life tabulated at each element of the blade was calculated for the initial stress distribution from the minimum design curve of the master stress-rupture curve for IN-100 material. The stress life of each blade is determined by the time required to reach the 1 percent creep strain after critical stress redistribution due to creep for the critical element of the blade. The life of each turbine blade is also limited by a maximum coating temperature limit of 1840°F (1277.8°K) for 1000 hr life.

The metal temperatures, initial stress, and the stress to rupture life based on the initial stress distribution before creep relaxation is given for each element at each condition in the following tables. Some of the conditions are limited by a maximum metal temperature of 1840°F (1277.8°K) for 1000 hr life with IN-100 material. Other conditions were limited by the time to 1 percent creep strain for the critical elements of the blade. Where it was obvious from initial stress distribution analysis that the condition would be limited by maximum metal temperature, a creep stress analysis was not necessary. The initial stress distribution for conditions in which a creep stress analysis had been performed was used to estimate the time to 1 percent creep strain for other conditions with similar initial stress distribution results. Therefore, a creep stress relaxation analysis was performed for only the most critical stress conditions and the results were used to determine life at other conditions by comparison of initial stress distribution analysis results. The creep strain and the element stress as a function of time are shown in Figures M-1, M-2, M-3, M-5, M-6, M-7, M-8, M-9, M-11, M-12, and M-13 for the critical elements of the critical stress conditions. The element numbers in each table and figure refer to the numbered locations at the hub, mean, and tip sections of the blade shown in Figures M-4, M-10, and M-14 (the foldout pages). The condition numbers referred to in these tables are for identification of the hub, mean, and tip section results of each final design analysis. The conditions of each final design analysis are summarized in Table M-1. The symbol TIT refers to the hot gas turbine inlet total temperature, the symbol WCA refers to the total cooling air flow rate from the blade, the symbol TCA refers to the cooling air inlet total temperature at

the blade root, and the symbol PTOT refers to the hot gas turbine inlet total pressure. The cooling air flow distribution is expressed as the cooling air flow for one third of the blade span allocated to each area of the blade. The symbol W_{CLE} refers to the flow from the impingement tube to the leading edge; The symbol W_{CAP} refers to the flow from the impingement tube to the pressure side of the blade; the symbol W_{CAS} refers to the flow from the impingement tube to the pressure side of the blade; the symbol W_{CAS} refers to the flow from the impingement tube to the suction side of the blade, and the symbol W_{CTE} refers to the flow from the impingement tube to the trailing edge of the blade. The stress levels presented in the tables of this appendix are in psi and the metal temperatures are in ^{0}F.

TABLE M-1

SUMMARY OF FINAL DESIGN ANALYSIS CONDITIONS FOR THE SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE

Condition	Blade Chord	Rotational Speed	Turbine Inlet Temperature	Cooling Air Inlet Temperature	Turbine Inlet Total Pressure		Cooling Air Flow Distribution lbs/sec./blade (percent of hot gas flow)					Table Numbers for Metal Temperature and Stress Analysis Results	
							Leading Edge	Pressure Side	Suction Side	Trailing Edge	Blade Total	Blade	Table
No.	in. (m)	rpm	TIT °F (°K)	TCA °F (°K)	psia	(Newtons / sq m)	W_{CLE}	W_{CAP}	W_{CAS}	W_{CTE}	WCA	Section	No.
1							0.0023(0.581%)	0.001811(0.457%)	0.002481(0.626%)	0.00118(0.298%)		Hub	M-2
1	0.75(0.01905)	22857	2320(1544)	1200(922)	150	1.0342×10^6	0.00215(0.543%)	0.001684(0.425%)	0.002236(0.565%)	0.00113(0.285%)	0.021854(5.52%)	Mean	M-3
1							0.0019(0.48%)	0.00169(0.427%)	0.002181(0.551%)	0.00111(0.28%)		Tip	M-4
2							0.00254(0.675%)	0.002(0.531%)	0.00274(0.728%)	0.00127(0.337%)		Hub	M-5
2	0.75(0.01905)	23980	2600(1700)	900(755)	150	1.0342×10^6	0.00254(0.675%)	0.00186(0.494%)	0.00247(0.656%)	0.00127(0.337%)	0.02454(6.52%)	Mean	M-6
2							0.0023(0.611%)	0.00187(0.497%)	0.00241(0.64%)	0.00127(0.337%)		Tip	M-7
3							0.00289(0.803%)	0.002264(0.629%)	0.003104(0.863%)	0.00144(0.4%)		Hub	M-8
3	0.75(0.01905)	25016	2870(1850)	600(589)	150	1.0342×10^6	0.003(0.834%)	0.002107(0.586%)	0.002797(0.777%)	0.00146(0.406%)	0.02831(7.87%)	Mean	M-9
3							0.00285(0.792%)	0.00212(0.589%)	0.00273(0.759%)	0.00155(0.431%)		Tip	M-10
4							0.00762(0.675%)	0.006(0.531%)	0.00822(0.728%)	0.00381(0.337%)		Hub	M-11
4	0.75(0.01905)	23980	2600(1700)	900(755)	450	3.103×10^6	0.00762(0.675%)	0.00558(0.494%)	0.00741(0.656%)	0.00381(0.337%)	0.07362(6.52%)	Mean	M-12
4							0.0069(0.611%)	0.00561(0.497%)	0.00723(0.64%)	0.00381(0.337%)		Tip	M-13
5							0.000847(0.672%)	0.0006667(0.529%)	0.0009134(0.724%)	0.000423(0.335%)		Hub	M-14
5	0.75(0.01905)	23862	2570(1683)	900(755)	50	0.3447×10^6	0.000847(0.672%)	0.00062(0.492%)	0.0008065(0.639%)	0.00041(0.325%)	0.008092(6.42%)	Mean	M-15
5							0.0007667(0.608%)	0.0006233(0.494%)	0.00077861(0.617%)	0.00039(0.309%)		Tip	M-16
1A												Hub	M-2
1A	0.75(0.01905)	22857	2320(1544)	1200(922)	150	1.0342×10^6		Same as Condition 1				Mean	M-3
1A												Tip	M-4
2A							0.001118(0.282%)	0.00088(0.222%)	0.001206(0.304%)	0.0005588(0.141%)		Hub	M-17
2A	0.75(0.01905)	22857	2320(1544)	900(755)	150	1.0342×10^6	0.001118(0.282%)	0.0008184(0.207%)	0.001087(0.274%)	0.0005588(0.141%)	0.0108(2.73%)	Mean	M-18
2A							0.001012(0.255%)	0.0008228(0.208%)	0.0010604(0.268%)	0.0005588(0.141%)		Tip	M-19
3A							0.000792(0.2%)	0.0006203(0.157%)	0.0008505(0.215%)	0.0003946(0.1%)		Hub	M-20
3A	0.75(0.01905)	22857	2320(1544)	600(589)	150	1.0342×10^6	0.000822(0.207%)	0.0005773(0.146%)	0.0007664(0.193%)	0.0004(0.101%)	0.007758(1.96%)	Mean	M-21
3A							0.0007809(0.197%)	0.0005809(0.147%)	0.000748(0.189%)	0.0004247(0.107%)		Tip	M-22
1							0.00149(0.283%)	0.002378(0.452%)	0.00317(0.602%)	0.001448(0.275%)		Hub	M-23
1	1.0(0.0254)	22857	2320(1544)	1200(922)	150	1.0342×10^6	0.00157(0.298%)	0.002239(0.425%)	0.003253(0.618%)	0.001539(0.292%)	0.025024(4.76%)	Mean	M-24
1							0.001339(0.254%)	0.001808(0.344%)	0.00319(0.606%)	0.0016(0.304%)		Tip	M-25
2							0.00165(0.33%)	0.002628(0.526%)	0.003503(0.701%)	0.0016(0.32%)		Hub	M-26
2	1.0(0.0254)	23980	2600(1700)	900(755)	150	1.0342×10^6	0.00174(0.348%)	0.002474(0.495%)	0.003594(0.719%)	0.0017(0.34%)	0.027692(5.54%)	Mean	M-27
2							0.00148(0.296%)	0.001998(0.4%)	0.003525(0.705%)	0.0018(0.36%)		Tip	M-28
3							0.001867(0.393%)	0.002977(0.626%)	0.003968(0.834%)	0.001812(0.381%)		Hub	M-29
3	1.0(0.0254)	25165	2910(1872)	600(589)	150	1.0342×10^6	0.00197(0.414%)	0.002802(0.589%)	0.004071(0.856%)	0.001926(0.404%)	0.031363(6.6%)	Mean	M-30
3							0.001676(0.352%)	0.00226(0.475%)	0.003993(0.842%)	0.002039(0.429%)		Tip	M-31
4							0.00506(0.339%)	0.007884(0.527%)	0.00896(0.599%)	0.005(0.335%)		Hub	M-32
4	1.0(0.0254)	24058	2620(1711)	900(755)	450	3.103×10^6	0.00543(0.363%)	0.00742(0.496%)	0.01089(0.729%)	0.0056(0.375%)	0.083974(5.63%)	Mean	M-33
4							0.00467(0.312%)	0.00615(0.411%)	0.01131(0.757%)	0.0056(0.375%)		Tip	M-34
5							0.0005(0.298%)	0.000876(0.522%)	0.001168(0.696%)	0.000533(0.318%)		Hub	M-35
5	1.0(0.0254)	23823	2560(1678)	900(755)	50	0.3447×10^6	0.000546(0.325%)	0.000824(0.491%)	0.001171(0.698%)	0.000576(0.338%)	0.00913(5.44%)	Mean	M-36
5							0.000461(0.275%)	0.000666(0.397%)	0.001222(0.728%)	0.000596(0.355%)		Tip	M-37
1A												Hub	M-23
1A	1.0(0.0254)	22857	2320(1544)	1200(922)	150	1.0342×10^6		Same as Condition 1				Mean	M-24
1A												Tip	M-25

TABLE M-1 (CONTINUED)

Condition	Blade Chord	Rotational Speed	Turbine Inlet Temperature	Cooling Air Inlet Temperature	Turbine Inlet Total Pressure		Cooling Air Flow Distribution lb/sec blade (percent of hot gas flow)					Table Numbers for Metal Temperature and Stress Analysis Results	
							Leading Edge	Pressure Side	Suction Side	Trailing Edge	Blade Total	Blade	Table
No.	in. (m)	rpm	TIT °F (°K)	TCA °F (°K)	psia	(Newtons/sq m)	W_{CLE}	W_{CAP}	W_{CAS}	W_{CTE}	WCA	Section	No.
2A							0.000792(0.151%)	0.001262(0.24%)	0.001682(0.32%)	0.000768(0.146%)		Hub	M-38
2A	1.0(0.0254)	22857	2320(1544)	900(755)	150	1.0342×10^6	0.0008352(0.159%)	0.0011876(0.226%)	0.001725(0.328%)	0.000816(0.155%)	0.013293(2.53%)	Mean	M-39
2A							0.00071(0.135%)	0.0009591(0.182%)	0.001692(0.322%)	0.000864(0.164%)		Tip	M-40
3A							0.0005871(0.112%)	0.0009351(0.178%)	0.0012464(0.237%)	0.0005691(0.108%)		Hub	M-41
3A	1.0(0.0254)	22857	2320(1544)	600(589)	150	1.0342×10^6	0.0006188(0.118%)	0.0008801(0.167%)	0.001279(0.243%)	0.000605(0.115%)	0.009852(1.87%)	Mean	M-42
3A							0.0005264(0.1%)	0.00071(0.135%)	0.001254(0.238%)	0.00064(0.122%)		Tip	M-43
1B							0.001955(0.377%)	0.002497(0.482%)	0.004421(0.852%)	0.00152(0.293%)		Hub	M-44
1B	1.0(0.0254)	23183	2400(1589)	1200(922)	150	1.0342×10^6	0.00175(0.337%)	0.002172(0.419%)	0.004064(0.784%)	0.001493(0.288%)	0.02909(5.61%)	Mean	M-45
1B							0.00157(0.303%)	0.001808(0.349%)	0.00424(0.818%)	0.0016(0.309%)		Tip	M-46
2B							0.0006248(0.379%)	0.0008751(0.531%)	0.001469(0.891%)	0.0005329(0.323%)		Hub	M-47
2B	1.0(0.0254)	24212	2660(1733)	900(755)	50	0.3447×10^6	0.000636(0.386%)	0.000824(0.5%)	0.0015466(0.938%)	0.0005664(0.344%)	0.010327(6.26%)	Mean	M-48
2B							0.0005778(0.35%)	0.000632(0.383%)	0.001482(0.899%)	0.00056(0.34%)		Tip	M-49
3B							0.0023344(0.498%)	0.0030761(0.656%)	0.0049507(1.055%)	0.001873(0.399%)		Hub	M-50
3B	1.0(0.0254)	25462	2990(1917)	600(589)	150	1.0342×10^6	0.0023335(0.497%)	0.0028962(0.617%)	0.00542(1.155%)	0.001991(0.424%)	0.0368(7.84%)	Mean	M-51
3B							0.002031(0.433%)	0.002339(0.499%)	0.005485(1.169%)	0.00207(0.441%)		Tip	M-52
1C							0.00157(0.298%)	0.00201(0.382%)	0.00355(0.675%)	0.001221(0.232%)		Hub	M-53
1C	1.0(0.0254)	22857	2320(1544)	1200(922)	150	1.0342×10^6	0.001405(0.267%)	0.001744(0.331%)	0.0032637(0.62%)	0.0011987(0.228%)	0.023365(4.44%)	Mean	M-54
1C							0.001261(0.24%)	0.001452(0.276%)	0.003405(0.647%)	0.001285(0.244%)		Tip	M-55
2C							0.0004934(0.0938%)	0.0007561(0.144%)	0.0011156(0.212%)	0.000768(0.146%)		Hub	M-56
2C	1.0(0.0254)	22857	2320(1544)	600(589)	150	1.034×10^6	0.000478(0.0908%)	0.000712(0.135%)	0.0011103(0.211%)	0.0008(0.152%)	0.009268(1.76%)	Mean	M-57
2C							0.000416(0.0791%)	0.0005749(0.109%)	0.0011236(0.214%)	0.00092(0.175%)		Tip	M-58
1							0.00306(0.391%)	0.00392(0.501%)	0.00585(0.747%)	0.0019(0.243%)		Hub	M-59
1	1.5(0.0381)	22857	2320(1544)	1200(922)	150	1.0343×10^6	0.002236(0.286%)	0.002965(0.379%)	0.004438(0.567%)	0.0019(0.243%)	0.03728(4.76%)	Mean	M-60
1							0.00184(0.235%)	0.002957(0.378%)	0.004435(0.566%)	0.0017741(0.227%)		Tip	M-61
2							0.00338(0.456%)	0.004332(0.585%)	0.006463(0.873%)	0.0021(0.284%)		Hub	M-62
2	1.5(0.0381)	24058	2620(1711)	900(755)	150	1.0342×10^6	0.00247(0.333%)	0.003276(0.442%)	0.004903(0.662%)	0.0021(0.284%)	0.04118(5.56%)	Mean	M-63
2							0.00203(0.274%)	0.003267(0.441%)	0.0049(0.662%)	0.00196(0.265%)		Tip	M-64
3							0.00383(0.543%)	0.004907(0.696%)	0.007321(1.038%)	0.002379(0.337%)		Hub	M-65
3	1.5(0.0381)	25203	2920(1878)	600(589)	150	1.0342×10^6	0.002798(0.397%)	0.003711(0.526%)	0.005554(0.788%)	0.002379(0.337%)	0.04665(6.61%)	Mean	M-66
3							0.0023(0.326%)	0.0037(0.525%)	0.00555(0.787%)	0.00222(0.315%)		Tip	M-67
4							0.01014(0.454%)	0.013(0.583%)	0.0194(0.869%)	0.0063(0.282%)		Hub	M-68
4	1.5(0.0381)	23980	2600(1700)	900(755)	450	3.103×10^6	0.00741(0.332%)	0.009828(0.44%)	0.01471(0.659%)	0.0063(0.282%)	0.12356(5.54%)	Mean	M-69
4							0.00609(0.273%)	0.0098(0.439%)	0.0147(0.659%)	0.00588(0.263%)		Tip	M-70
5							0.001115(0.452%)	0.00143(0.579%)	0.002132(0.863%)	0.000693(0.281%)		Hub	M-71
5	1.5(0.0381)	24058	2620(1711)	900(755)	50	0.3447×10^6	0.000815(0.33%)	0.001081(0.438%)	0.001618(0.655%)	0.000693(0.281%)	0.01359(5.5%)	Mean	M-72
5							0.00067(0.271%)	0.001078(0.437%)	0.001617(0.655%)	0.0006468(0.262%)		Tip	M-73
1A												Hub	M-59
1A	1.5(0.381)	22857	2320(1544)	1200(922)	150	1.0342×10^6		Same as Condition 1			0.03728(4.76%)	Mean	M-60
1A												Tip	M-61
2A							0.002151(0.275%)	0.002757(0.352%)	0.004113(0.525%)	0.001336(0.171%)		Hub	M-74
2A	1.5(0.0381)	22857	2320(1544)	900(755)	150	1.0342×10^6	0.001572(0.201%)	0.002085(0.266%)	0.00312(0.399%)	0.001336(0.171%)	0.02621(3.35%)	Mean	M-75
2A							0.001292(0.165%)	0.002079(0.266%)	0.003118(0.398%)	0.001247(0.159%)		Tip	M-76
3A							0.001504(0.192%)	0.001928(0.246%)	0.002876(0.367%)	0.0009344(0.119%)		Hub	M-77
3A	1.5(0.0381)	22857	2320(1544)	600(589)	150	1.0342×10^6	0.001099(0.14%)	0.001458(0.186%)	0.002182(0.279%)	0.0009344(0.119%)	0.01833(2.34%)	Mean	M-78
3A							0.0009032(0.115%)	0.001454(0.186%)	0.00218(0.278%)	0.000872(0.111%)		Tip	M-79

TABLE M-2

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, HUB SECTION, 22857 RPM, TIT = 2320°F, WCA = 0.021854 LB/SEC/BLADE (5.52% OF HOT GAS FLOW) TCA = 1200°F, PTOT = 150 PSIA

CONDITION I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1685.0	1502.7	10 YRS PLUS
2	1645.0	13474.7	72103.0710
3	1662.0	7790.5	10 YRS PLUS
4	1641.0	14045.5	66269.2290
5	1601.0	24944.8	7715.0267
6	1573.0	32217.2	3309.2246
7	1505.0	48581.7	849.3527
8	1489.0	52198.4	705.0979
9	1502.0	46861.5	1233.8092
10	1482.0	51411.8	975.7437
11	1515.0	41627.4	2106.4825
12	1493.0	46614.9	1644.3657
13	1513.0	41146.0	2413.1104
14	1492.0	45792.1	1945.4028
15	1511.0	41200.3	2525.2779
16	1493.0	45223.5	2085.9458
17	1510.0	41293.5	2554.5241
18	1493.0	45142.0	2115.2072
19	1531.0	35847.7	4579.0879
20	1520.0	38179.1	3655.3332
21	1563.0	27566.8	12123.7636
22	1552.0	30100.1	9334.9870
23	1593.0	19896.6	33168.8350
24	1583.0	22228.9	22734.0880
25	1614.0	14157.0	10 YRS PLUS
26	1606.0	16378.5	78121.4500
27	1629.0	9093.7	10 YRS PLUS
28	1621.0	12234.3	10 YRS PLUS
29	1702.0	4827.3	10 YRS PLUS
30	1678.0	2382.6	10 YRS PLUS
31	1677.0	725.9	10 YRS PLUS
32	1654.0	7989.6	10 YRS PLUS
33	1622.0	15421.8	69742.6880
34	1593.0	24448.6	10653.2826
35	1545.0	33645.9	5121.7040
36	1527.0	39065.4	2472.0206
37	1551.0	27592.5	16702.6720
38	1530.0	34066.5	7030.2305
39	1580.0	17732.3	10 YRS PLUS
40	1557.0	24855.3	26125.8180
41	1564.0	22233.3	38450.3950
42	1539.0	30002.0	13663.3031
43	1539.0	29686.8	14664.2543
44	1520.0	35561.3	6612.9783
45	1523.0	34907.4	7056.1871
46	1506.0	40149.0	3462.2912
47	1538.0	31725.2	9542.9027
48	1527.0	35167.8	5957.2142
49	1567.0	24611.3	20895.4350
50	1556.0	28079.9	13113.0481
51	1596.0	17473.3	70674.2160
52	1586.0	20625.9	31220.5490
53	1615.0	12515.7	10 YRS PLUS
54	1606.0	15617.8	10 YRS PLUS
55	1628.0	9177.6	10 YRS PLUS
56	1619.0	12238.3	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0023 LB/SEC/BLADE (0.581% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001811 LB/SEC/BLADE (0.457% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002481 LB/SEC/BLADE (0.626% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00118 LB/SEC/BLADE (0.298% OF HOT GAS FLOW)

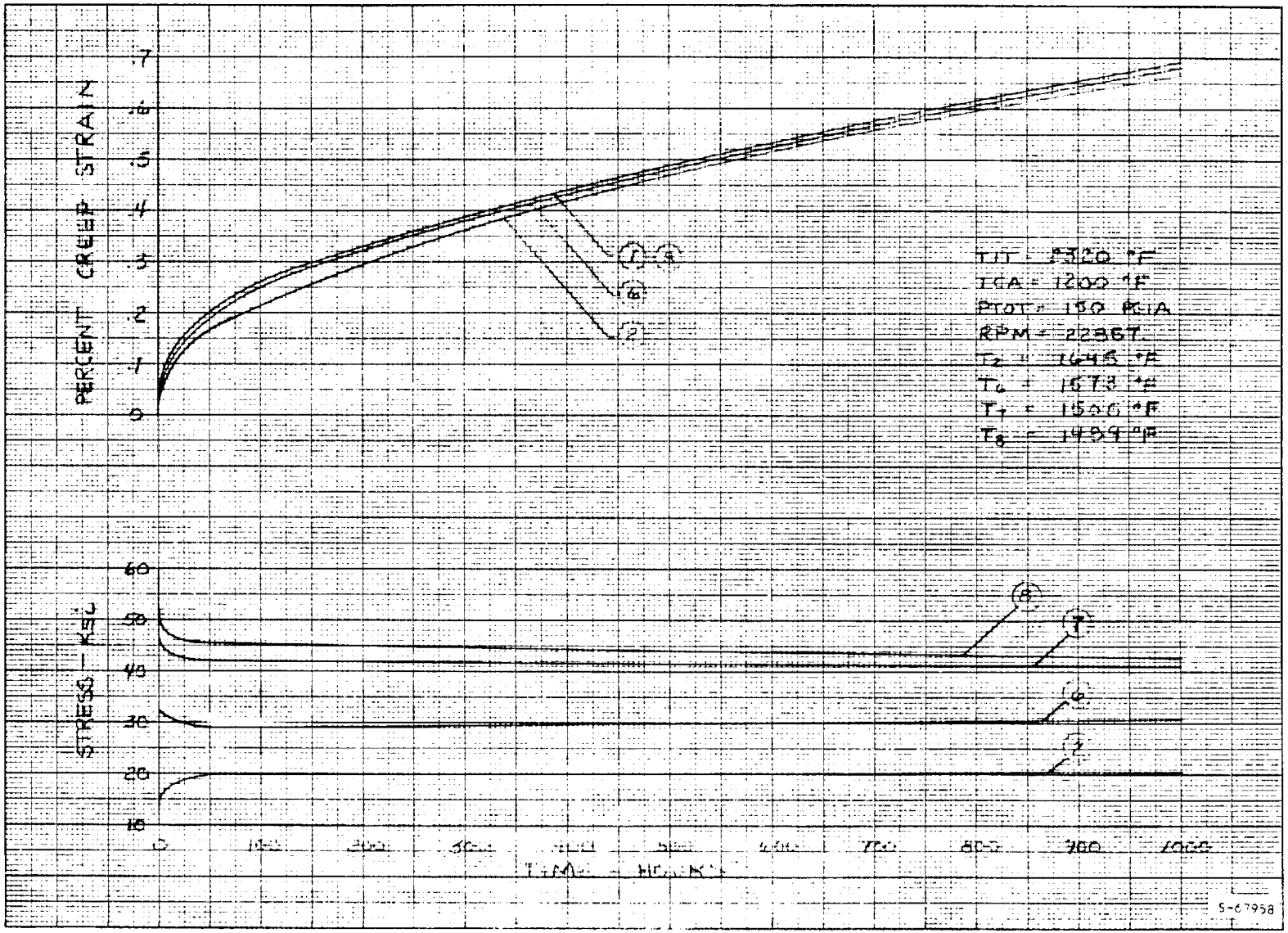


FIGURE M-1. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE ROOT SECTION OF THE 0.75 INCH CHORD SCHEME B-5 BLADE.

TABLE M-3

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION I AND 1A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1754.0	-12047.5	6813.8428
2	1713.0	-297.0	10 YRS PLUS
3	1735.0	-6385.9	10 YRS PLUS
4	1711.0	298.4	10 YRS PLUS
5	1655.0	16220.6	21834.3440
6	1629.0	23823.7	4695.3534
7	1543.0	46683.5	428.0538
8	1530.0	49375.8	382.9773
9	1522.0	50353.2	400.6961
10	1510.0	52647.0	372.9650
11	1554.0	41055.9	818.5665
12	1539.0	44114.0	729.7373
13	1577.0	35256.9	1523.8523
14	1561.0	38676.6	1088.8504
15	1588.0	32940.0	1899.8943
16	1573.0	36179.8	1380.8636
17	1591.0	32955.1	1750.8586
18	1574.0	36856.5	1158.7579
19	1621.0	24986.7	4506.4672
20	1608.0	28253.7	3125.3044
21	1657.0	14839.3	32946.7960
22	1645.0	17927.2	16001.9739
23	1693.0	4713.2	10 YRS PLUS
24	1683.0	7152.8	10 YRS PLUS
25	1720.0	-2392.7	10 YRS PLUS
26	1710.0	188.9	10 YRS PLUS
27	1738.0	-6751.3	10 YRS PLUS
28	1728.0	-4129.2	10 YRS PLUS
29	1768.0	-18196.8	676.9142
30	1742.0	-10699.1	14208.5494
31	1742.0	-13306.7	6116.9107
32	1719.0	-6163.6	10 YRS PLUS
33	1687.0	1025.7	10 YRS PLUS
34	1664.0	8415.8	10 YRS PLUS
35	1609.0	21703.2	12591.6144
36	1594.0	26886.3	6090.8373
37	1642.0	7652.7	10 YRS PLUS
38	1623.0	14543.9	10 YRS PLUS
39	1668.0	-258.2	10 YRS PLUS
40	1647.0	7258.1	10 YRS PLUS
41	1628.0	14095.6	10 YRS PLUS
42	1606.0	21857.5	13198.6313
43	1586.0	28689.5	5082.1864
44	1575.0	32542.7	2920.5383
45	1597.0	27538.3	4878.1916
46	1580.0	32894.0	2368.1615
47	1628.0	19688.6	13819.4731
48	1615.0	24375.3	6020.3046
49	1664.0	10058.2	10 YRS PLUS
50	1651.0	14639.2	41381.0920
51	1698.0	1060.3	10 YRS PLUS
52	1687.0	4830.2	10 YRS PLUS
53	1721.0	-4463.5	10 YRS PLUS
54	1712.0	-1348.1	10 YRS PLUS
55	1739.0	-8479.8	59617.4560
56	1730.0	-5511.1	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.00215 LB/SEC/BLADE (0.543% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001684 LB/SEC/BLADE (0.425% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002236 LB/SEC/BLADE (0.565% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00113 LB/SEC/BLADE (0.285% OF HOT GAS FLOW)

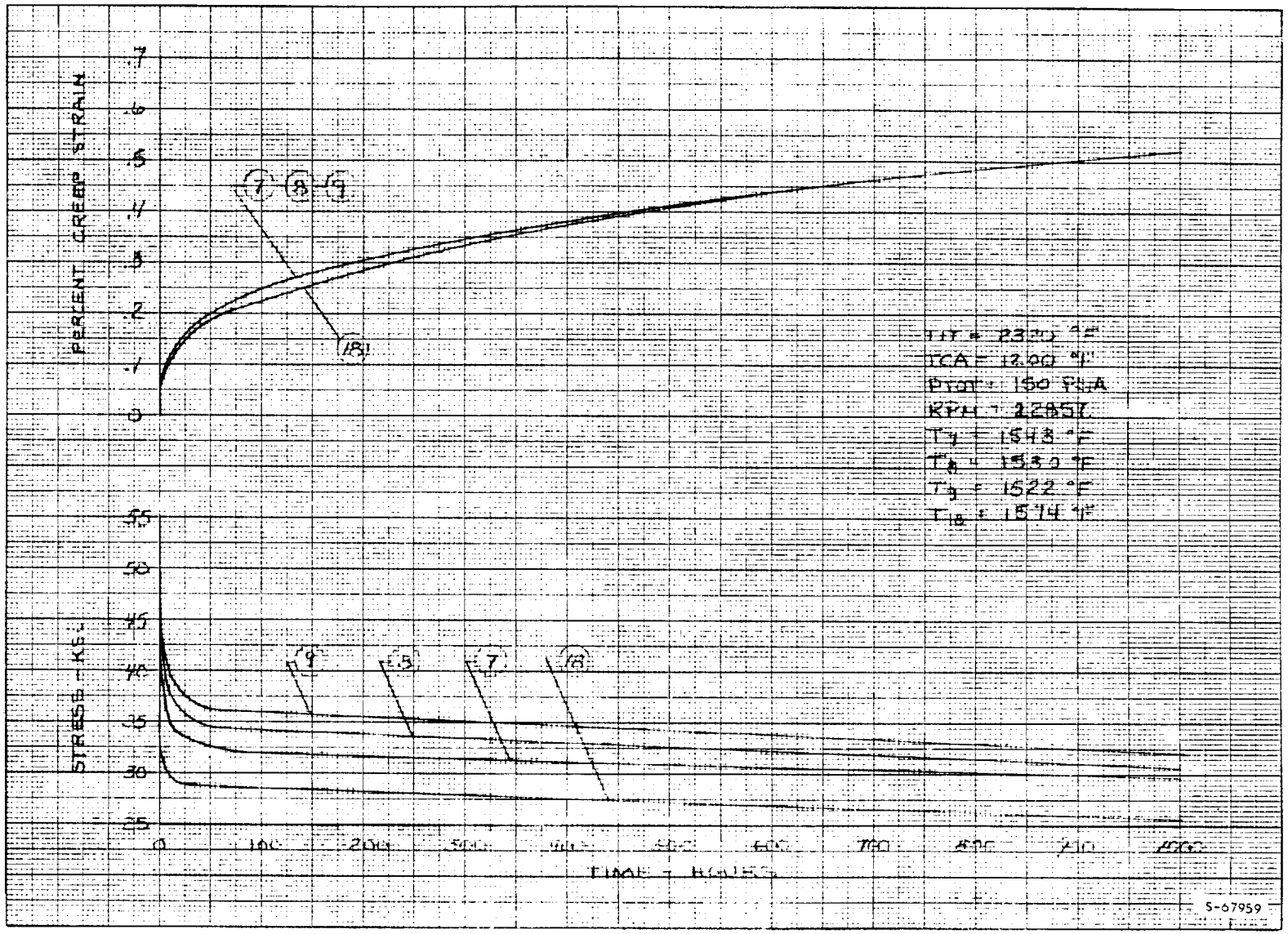


FIGURE M-2. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE MEAN SECTION OF THE 0.75 INCH CHORD SCHEME B-5 BLADE.

TABLE M-4

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1819.0	-19673.8	131.6188
2	1787.0	-13780.7	1757.7233
3	1782.0	-10393.9	5803.8945
4	1763.0	-5761.7	10 YRS PLUS
5	1685.0	16249.8	9874.5932
6	1666.0	21204.6	3159.3850
7	1563.0	49354.5	164.5545
8	1556.0	49796.7	182.6616
9	1550.0	50240.2	197.7433
10	1542.0	51063.0	211.6459
11	1599.0	36559.5	648.6914
12	1589.0	38054.8	604.3139
13	1626.0	29268.1	1575.6368
14	1615.0	31510.1	1288.3157
15	1634.0	27909.8	1718.5154
16	1624.0	29824.3	1471.4389
17	1627.0	31356.7	980.5206
18	1611.0	35295.6	629.0827
19	1662.0	21732.9	3129.0969
20	1651.0	24089.8	2514.3427
21	1707.0	9281.4	75536.9990
22	1694.0	12293.6	28971.3110
23	1739.0	742.2	10 YRS PLUS
24	1728.0	3129.9	10 YRS PLUS
25	1760.0	-4390.0	10 YRS PLUS
26	1750.0	-2241.3	10 YRS PLUS
27	1775.0	-7601.5	45263.5470
28	1765.0	-5192.5	10 YRS PLUS
29	1826.0	-21370.5	69.2949
30	1802.0	-20516.7	148.0395
31	1787.0	-21391.8	165.1717
32	1772.0	-16575.8	1033.0062
33	1733.0	-9256.1	39031.4050
34	1716.0	-3337.2	10 YRS PLUS
35	1639.0	15309.3	45589.3870
36	1629.0	19447.1	14610.6800
37	1671.0	1774.7	10 YRS PLUS
38	1659.0	6716.7	10 YRS PLUS
39	1696.0	-4678.2	10 YRS PLUS
40	1683.0	431.2	10 YRS PLUS
41	1660.0	9359.3	10 YRS PLUS
42	1647.0	14598.6	46718.4740
43	1635.0	19778.6	11131.2412
44	1627.0	23314.5	5519.0601
45	1635.0	22035.6	5889.5740
46	1618.0	28654.5	2209.3838
47	1669.0	13940.3	32370.2010
48	1656.0	18934.6	8534.8232
49	1711.0	3227.6	10 YRS PLUS
50	1698.0	7906.8	10 YRS PLUS
51	1741.0	-3745.2	10 YRS PLUS
52	1730.0	403.5	10 YRS PLUS
53	1761.0	-8042.0	46785.7710
54	1751.0	-4404.3	10 YRS PLUS
55	1776.0	-10566.7	6362.0897
56	1766.0	-7168.6	78293.6090

LEADING EDGE W_{CLE} = 0.0019 LB/SEC/BLADE (0.48% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00169 LB/SEC/BLADE (0.427% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002181 LB/SEC/BLADE (0.551% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00111 LB/SEC/BLADE (0.28% OF HOT GAS FLOW)

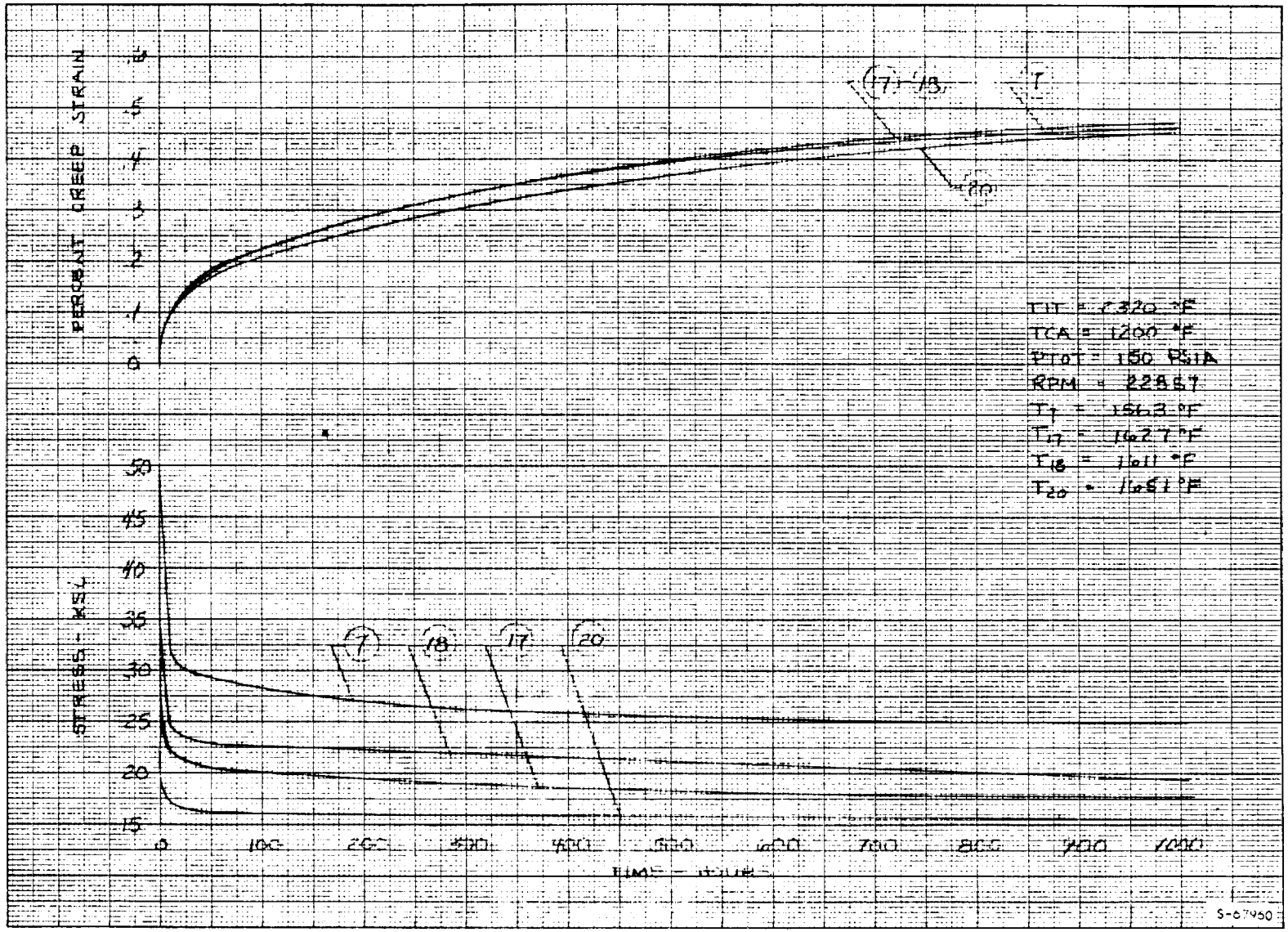


FIGURE M-3. CREEP STRESS AND STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE TIP SECTION OF THE 0.75 INCH CHORD SCHEME B-5 BLADE.

TABLE M-5

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, HUB SECTION, 23980 RPM, TIT = 2600°F
WCA = 0.02454 LB/SEC/BLADE (6.52% OF HOT GAS FLOW)
TCA = 900°F, PTOT = 150 PSIA, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1683.0	-12774.5	32973.0700
2	1613.0	7875.5	10 YRS PLUS
3	1647.0	-3472.9	10 YRS PLUS
4	1609.0	7782.5	10 YRS PLUS
5	1552.0	20601.1	81690.9510
6	1501.0	33671.7	17331.4200
7	1387.0	60076.0	3098.8727
8	1357.0	67199.7	1875.6668
9	1376.0	58391.9	5825.6497
10	1341.0	66609.5	3392.7634
11	1397.0	49361.1	15912.8469
12	1358.0	58318.0	10151.7652
13	1391.0	48797.8	21101.8850
14	1352.0	57610.3	13888.8511
15	1385.0	49239.4	23373.1720
16	1354.0	56196.4	16945.9120
17	1382.0	49422.5	24773.7050
18	1350.0	56787.1	17190.4940
19	1416.0	40477.9	43977.3170
20	1395.0	44904.6	37686.7990
21	1463.0	28475.4	10 YRS PLUS
22	1443.0	32977.9	10 YRS PLUS
23	1510.0	16562.7	10 YRS PLUS
24	1495.0	19904.0	10 YRS PLUS
25	1545.0	7847.8	10 YRS PLUS
26	1530.0	11405.3	10 YRS PLUS
27	1571.0	1468.2	10 YRS PLUS
28	1555.0	5333.2	10 YRS PLUS
29	1710.0	-22399.4	623.9321
30	1669.0	-10487.2	10 YRS PLUS
31	1671.0	-14218.9	27971.9940
32	1631.0	-1912.5	10 YRS PLUS
33	1581.0	8576.8	10 YRS PLUS
34	1530.0	22588.3	10 YRS PLUS
35	1451.0	37148.7	33015.1480
36	1419.0	46343.2	14166.7151
37	1453.0	28785.7	10 YRS PLUS
38	1417.0	39449.3	52985.5360
39	1503.0	11464.5	10 YRS PLUS
40	1463.0	23468.5	10 YRS PLUS
41	1476.0	18209.6	10 YRS PLUS
42	1433.0	31174.0	10 YRS PLUS
43	1437.0	29131.2	10 YRS PLUS
44	1402.0	39515.3	82495.4440
45	1405.0	38542.4	10 YRS PLUS
46	1373.0	48050.0	41912.3350
47	1428.0	33624.0	10 YRS PLUS
48	1408.0	39640.9	66573.9240
49	1470.0	23492.8	10 YRS PLUS
50	1451.0	29313.6	10 YRS PLUS
51	1516.0	12273.3	10 YRS PLUS
52	1500.0	17245.4	10 YRS PLUS
53	1547.0	5069.8	10 YRS PLUS
54	1531.0	9834.7	10 YRS PLUS
55	1568.0	354.0	10 YRS PLUS
56	1552.0	5088.0	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.00254 LB/SEC/BLADE (0.675% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002 LB/SEC/BLADE (0.531% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00274 LB/SEC/BLADE (0.728% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00127 LB/SEC/BLADE (0.337% OF HOT GAS FLOW)

TABLE M-6

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1728.0	-25415.5	287.6928
2	1657.0	-4982.4	10 YRS PLUS
3	1700.0	-17582.0	4337.6473
4	1659.0	-5925.1	10 YRS PLUS
5	1581.0	15101.4	10 YRS PLUS
6	1536.0	26602.9	31875.7150
7	1404.0	58605.9	2464.3731
8	1382.0	63567.6	1828.1738
9	1368.0	64998.3	2085.5428
10	1347.0	67825.6	2230.5651
11	1406.0	53102.4	6227.1567
12	1382.0	58265.3	4987.6557
13	1440.0	43984.9	11596.1380
14	1413.0	49882.2	9008.6495
15	1455.0	40274.9	14346.0245
16	1430.0	45755.7	11370.3899
17	1460.0	39449.6	14804.8237
18	1428.0	46906.5	9837.3564
19	1504.0	28683.2	49709.3710
20	1480.0	33980.7	29525.3330
21	1559.0	14954.8	10 YRS PLUS
22	1536.0	20234.8	10 YRS PLUS
23	1612.0	1178.6	10 YRS PLUS
24	1595.0	5347.2	10 YRS PLUS
25	1652.0	-9954.0	10 YRS PLUS
26	1635.0	-5409.1	10 YRS PLUS
27	1681.0	-17726.0	6702.4575
28	1664.0	-13125.8	48570.6490
29	1751.0	-28571.9	72.3134
30	1706.0	-21594.0	1073.0621
31	1713.0	-26873.1	304.3243
32	1674.0	-15099.7	19265.4770
33	1633.0	-5966.3	10 YRS PLUS
34	1595.0	5736.5	10 YRS PLUS
35	1511.0	23177.3	10 YRS PLUS
36	1485.0	30850.9	52559.6630
37	1556.0	5472.0	10 YRS PLUS
38	1524.0	15198.2	10 YRS PLUS
39	1600.0	-7518.3	10 YRS PLUS
40	1564.0	3501.1	10 YRS PLUS
41	1534.0	11649.7	10 YRS PLUS
42	1497.0	22625.6	10 YRS PLUS
43	1467.0	31133.9	83746.9630
44	1447.0	37490.8	34293.1570
45	1473.0	31238.6	68399.6130
46	1441.0	40567.0	20528.3520
47	1513.0	22311.7	10 YRS PLUS
48	1490.0	29210.0	66242.4230
49	1569.0	8878.6	10 YRS PLUS
50	1547.0	15494.0	10 YRS PLUS
51	1621.0	-4407.7	10 YRS PLUS
52	1602.0	1946.9	10 YRS PLUS
53	1656.0	-13535.2	52468.4150
54	1639.0	-7876.0	10 YRS PLUS
55	1683.0	-20254.2	2750.1255
56	1666.0	-14794.2	26337.4630

LEADING EDGE W_{CLE} = 0.00254 LB/SEC/BLADE (0.675% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00186 LB/SEC/BLADE (0.494% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00247 LB/SEC/BLADE (0.656% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00127 LB/SEC/BLADE (0.337% OF HOT GAS FLOW

TABLE M-7

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1817.0	-26744.8	29.3360
2	1759.0	-26783.8	105.9481
3	1759.0	-25981.7	124.5902
4	1726.0	-17983.9	1992.0103
5	1608.0	15617.8	10 YRS PLUS
6	1575.0	23739.4	20318.1630
7	1414.0	62444.4	906.6311
8	1401.0	63766.0	1018.7052
9	1378.0	66645.4	1132.0203
10	1365.0	68120.1	1239.3487
11	1458.0	47521.3	3724.9607
12	1441.0	50608.7	3518.9758
13	1497.0	38272.8	6769.0992
14	1478.0	41915.2	5588.7621
15	1508.0	36463.0	7523.3608
16	1491.0	39575.8	5939.5937
17	1499.0	40045.3	4277.1478
18	1471.0	46171.7	3264.1732
19	1553.0	27052.4	17907.7700
20	1532.0	31431.4	12040.2172
21	1621.0	9547.7	10 YRS PLUS
22	1600.0	14863.8	10 YRS PLUS
23	1670.0	-4186.7	10 YRS PLUS
24	1651.0	514.9	10 YRS PLUS
25	1700.0	-12052.1	26826.9440
26	1683.0	-7893.1	10 YRS PLUS
27	1725.0	-18215.8	1893.0208
28	1707.0	-13504.0	13885.5037
29	1828.0	-27100.6	21.5731
30	1707.0	-28689.7	30.5001
31	1770.0	-30249.4	41.0973
32	1742.0	-29303.9	93.8134
33	1695.0	-22822.8	1089.2731
34	1666.0	-13302.8	43392.5700
35	1546.0	15394.2	10 YRS PLUS
36	1529.0	21032.3	10 YRS PLUS
37	1590.0	-874.9	10 YRS PLUS
38	1570.0	5896.4	10 YRS PLUS
39	1633.0	-12717.6	10 YRS PLUS
40	1612.0	-5055.6	10 YRS PLUS
41	1573.0	7599.4	10 YRS PLUS
42	1550.0	15110.3	10 YRS PLUS
43	1528.0	22364.8	10 YRS PLUS
44	1515.0	26977.6	53340.9510
45	1518.0	27354.6	44919.6130
46	1487.0	36993.5	12047.0268
47	1561.0	18553.0	10 YRS PLUS
48	1539.0	25503.3	37480.4130
49	1628.0	1868.7	10 YRS PLUS
50	1605.0	9726.7	10 YRS PLUS
51	1673.0	-9583.6	10 YRS PLUS
52	1654.0	-2854.1	10 YRS PLUS
53	1703.0	-16827.0	5156.5035
54	1685.0	-10659.9	63098.6010
55	1726.0	-21601.1	659.5988
56	1708.0	-15744.7	6485.9136

LEADING EDGE W_{CLE} = 0.0023 LB/SEC/BLADE (0.611% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00187 LB/SEC/BLADE (0.497% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00241 LB/SEC/BLADE (0.64% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00127 LB/SEC/BLADE (0.337% OF HOT GAS FLOW)

TABLE M-8

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, HUB SECTION, 25016 RPM, TIT = 2870°F, WCA = 0.02831 LB/SEC/BLADE (7.87% OF HOT GAS FLOW) TCA = 600°F, PTOT = 150 PSI, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1652.0	-26271.5	1542.3631
2	1547.0	2602.1	10 YRS PLUS
3	1606.0	-15060.6	10 YRS PLUS
4	1547.0	536.7	10 YRS PLUS
5	1484.0	13113.2	10 YRS PLUS
6	1406.0	32876.7	10 YRS PLUS
7	1249.0	69026.4	37905.6200
8	1203.0	77750.4	28044.1870
9	1225.0	68471.6	10 YRS PLUS
10	1174.0	77744.1	76266.4040
11	1226.0	62515.9	10 YRS PLUS
12	1198.0	68235.2	10 YRS PLUS
13	1239.0	55222.3	10 YRS PLUS
14	1182.0	68044.9	10 YRS PLUS
15	1227.0	56187.0	10 YRS PLUS
16	1181.0	66355.4	10 YRS PLUS
17	1218.0	57110.4	10 YRS PLUS
18	1167.0	68409.0	10 YRS PLUS
19	1261.0	44878.4	10 YRS PLUS
20	1228.0	52213.4	10 YRS PLUS
21	1315.0	30603.2	10 YRS PLUS
22	1286.0	37090.3	10 YRS PLUS
23	1379.0	14558.0	10 YRS PLUS
24	1357.0	19236.3	10 YRS PLUS
25	1426.0	2966.9	10 YRS PLUS
26	1403.0	8315.4	10 YRS PLUS
27	1461.0	-5820.0	10 YRS PLUS
28	1436.0	82.5	10 YRS PLUS
29	1689.0	-35870.3	33.0091
30	1626.0	-20649.7	10500.9255
31	1635.0	-27105.4	1989.6922
32	1574.0	-9620.0	10 YRS PLUS
33	1505.0	3571.2	10 YRS PLUS
34	1428.0	23927.7	10 YRS PLUS
35	1334.0	39907.4	10 YRS PLUS
36	1284.0	53930.8	10 YRS PLUS
37	1325.0	31058.0	10 YRS PLUS
38	1272.0	46332.1	10 YRS PLUS
39	1399.0	5631.2	10 YRS PLUS
40	1339.0	22313.5	10 YRS PLUS
41	1362.0	12933.4	10 YRS PLUS
42	1298.0	31318.7	10 YRS PLUS
43	1308.0	26481.8	10 YRS PLUS
44	1256.0	41659.6	10 YRS PLUS
45	1251.0	41783.8	10 YRS PLUS
46	1201.0	56510.4	10 YRS PLUS
47	1280.0	34917.5	10 YRS PLUS
48	1247.0	44651.5	10 YRS PLUS
49	1327.0	23363.3	10 YRS PLUS
50	1296.0	32403.4	10 YRS PLUS
51	1389.0	8593.0	10 YRS PLUS
52	1365.0	15463.7	10 YRS PLUS
53	1429.0	-711.4	10 YRS PLUS
54	1405.0	6068.9	10 YRS PLUS
55	1457.0	-7294.1	10 YRS PLUS
56	1433.0	-511.2	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.00289 LB/SEC/BLADE (0.803% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002264 LB/SEC/BLADE (0.629% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.003104 LB/SEC/BLADE (0.863% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00144 LB/SEC/BLADE (0.4% OF HOT GAS FLOW)

TABLE M-9

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1674.0	-37264.4	88.3044
2	1568.0	-7989.6	10 YRS PLUS
3	1640.0	-28697.6	1246.5523
4	1577.0	-11209.7	10 YRS PLUS
5	1485.0	10300.3	10 YRS PLUS
6	1417.0	27547.7	10 YRS PLUS
7	1248.0	68154.4	46988.8640
8	1215.0	75344.4	31237.6400
9	1200.0	76104.2	44186.0430
10	1168.0	78826.7	74347.4520
11	1232.0	64407.2	10 YRS PLUS
12	1198.0	72272.5	10 YRS PLUS
13	1271.0	52465.2	10 YRS PLUS
14	1232.0	61630.4	10 YRS PLUS
15	1289.0	47026.3	10 YRS PLUS
16	1253.0	55371.4	10 YRS PLUS
17	1292.0	45959.9	10 YRS PLUS
18	1242.0	58172.8	10 YRS PLUS
19	1350.0	31079.4	10 YRS PLUS
20	1312.0	39710.7	10 YRS PLUS
21	1413.0	15421.5	10 YRS PLUS
22	1379.0	23036.2	10 YRS PLUS
23	1485.0	-2839.5	10 YRS PLUS
24	1459.0	3002.9	10 YRS PLUS
25	1536.0	-15758.5	10 YRS PLUS
26	1510.0	-9583.7	10 YRS PLUS
27	1574.0	-25451.5	14318.9813
28	1549.0	-19334.0	10 YRS PLUS
29	1703.0	-38515.7	34.6006
30	1635.0	-28784.2	1388.6710
31	1652.0	-37205.0	151.3770
32	1593.0	-19783.1	34499.5280
33	1540.0	-9148.9	10 YRS PLUS
34	1484.0	5763.1	10 YRS PLUS
35	1388.0	24957.8	10 YRS PLUS
36	1349.0	35561.0	10 YRS PLUS
37	1440.0	4274.9	10 YRS PLUS
38	1393.0	17475.8	10 YRS PLUS
39	1505.0	-15727.9	10 YRS PLUS
40	1452.0	-463.0	10 YRS PLUS
41	1413.0	8263.9	10 YRS PLUS
42	1360.0	22812.7	10 YRS PLUS
43	1323.0	31665.7	10 YRS PLUS
44	1293.0	40680.2	10 YRS PLUS
45	1315.0	34644.2	10 YRS PLUS
46	1264.0	49008.4	10 YRS PLUS
47	1362.0	23644.2	10 YRS PLUS
48	1326.0	33735.5	10 YRS PLUS
49	1428.0	7860.1	10 YRS PLUS
50	1395.0	17114.7	10 YRS PLUS
51	1497.0	-9161.0	10 YRS PLUS
52	1469.0	-1176.3	10 YRS PLUS
53	1541.0	-19772.7	10 YRS PLUS
54	1516.0	-12580.3	10 YRS PLUS
55	1577.0	-28483.7	6768.0697
56	1552.0	-21368.5	65347.7420

LEADING EDGE W_{CLE} = 0.003 LB/SEC/BLADE (0.834% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002107 LB/SEC/BLADE (0.586% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002797 LB/SEC/BLADE (0.777% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00146 LB/SEC/BLADE (0.406% OF HOT GAS FLOW)

TABLE M-10

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1775.0	-34192.4	16.6687
2	1686.0	-34216.9	125.7831
3	1700.0	-34517.4	85.0107
4	1649.0	-22732.0	3531.7507
5	1504.0	14114.6	10 YRS PLUS
6	1453.0	26461.0	10 YRS PLUS
7	1248.0	74040.9	13783.8610
8	1228.0	76197.5	16901.8170
9	1203.0	78277.3	25053.6720
10	1183.0	79848.4	35325.7700
11	1290.0	55392.9	10 YRS PLUS
12	1266.0	60252.6	10 YRS PLUS
13	1334.0	43072.0	10 YRS PLUS
14	1307.0	48581.8	10 YRS PLUS
15	1343.0	40727.5	10 YRS PLUS
16	1317.0	45953.2	10 YRS PLUS
17	1318.0	47474.6	10 YRS PLUS
18	1271.0	58402.4	10 YRS PLUS
19	1387.0	29948.6	10 YRS PLUS
20	1353.0	37333.2	10 YRS PLUS
21	1468.0	9742.7	10 YRS PLUS
22	1433.0	17539.7	10 YRS PLUS
23	1532.0	-6537.0	10 YRS PLUS
24	1503.0	-133.4	10 YRS PLUS
25	1572.0	-16699.2	10 YRS PLUS
26	1545.0	-10571.8	10 YRS PLUS
27	1606.0	-25445.3	6058.2595
28	1577.0	-18179.3	10 YRS PLUS
29	1788.0	-34281.0	12.3453
30	1724.0	-36919.1	29.8085
31	1708.0	-38516.4	30.8566
32	1666.0	-37367.0	104.5106
33	1611.0	-26619.3	4116.6314
34	1568.0	-13908.9	10 YRS PLUS
35	1422.0	17181.5	10 YRS PLUS
36	1397.0	24588.2	10 YRS PLUS
37	1464.0	-817.0	10 YRS PLUS
38	1435.0	8137.9	10 YRS PLUS
39	1531.0	-20302.2	10 YRS PLUS
40	1501.0	-10985.0	10 YRS PLUS
41	1448.0	2620.5	10 YRS PLUS
42	1415.0	12577.0	10 YRS PLUS
43	1385.0	20321.5	10 YRS PLUS
44	1364.0	26906.4	10 YRS PLUS
45	1347.0	31242.2	10 YRS PLUS
46	1297.0	45783.8	10 YRS PLUS
47	1399.0	19880.0	10 YRS PLUS
48	1363.0	30160.2	10 YRS PLUS
49	1478.0	1064.9	10 YRS PLUS
50	1442.0	11334.5	10 YRS PLUS
51	1537.0	-13020.5	10 YRS PLUS
52	1507.0	-4016.3	10 YRS PLUS
53	1577.0	-22544.1	25019.8600
54	1548.0	-13896.9	10 YRS PLUS
55	1607.0	-29362.5	2522.3031
56	1578.0	-20676.6	38273.8090

LEADING EDGE W_{CLE} = 0.00285 LB/SEC/BLADE (0.792% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00212 LB/SEC/BLADE (0.589% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00273 LB/SEC/BLADE (0.759% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00155 LB/SEC/BLADE (0.431% OF HOT GAS FLOW)

TABLE M-11

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, HUB SECTION, 23980 RPM, TIT = 2600°F, WCA = 0.07362 LB/SEC/BLADE (6.52% OF HOT GAS FLOW) TCA = 900°F, PTOT = 450 PSIA, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1658.0	-21627.4	3543.9847
2	1529.0	14594.1	10 YRS PLUS
3	1617.0	-10634.8	10 YRS PLUS
4	1542.0	10057.3	10 YRS PLUS
5	1536.0	9844.1	10 YRS PLUS
6	1424.0	39296.3	44474.2090
7	1349.0	56586.7	18397.0060
8	1279.0	72852.1	6526.8329
9	1356.0	51627.6	36913.2270
10	1281.0	71111.2	8747.4246
11	1401.0	37105.9	10 YRS PLUS
12	1315.0	59277.2	32340.5210
13	1381.0	40245.3	10 YRS PLUS
14	1294.0	62720.6	31895.6170
15	1363.0	43611.4	10 YRS PLUS
16	1292.0	61961.7	39686.3910
17	1340.0	48606.8	10 YRS PLUS
18	1265.0	68200.1	26592.3080
19	1369.0	40072.7	10 YRS PLUS
20	1317.0	53290.2	10 YRS PLUS
21	1413.0	28113.5	10 YRS PLUS
22	1362.0	40911.5	10 YRS PLUS
23	1469.0	13100.5	10 YRS PLUS
24	1429.0	23257.6	10 YRS PLUS
25	1504.0	3540.8	10 YRS PLUS
26	1463.0	14116.6	10 YRS PLUS
27	1537.0	-5513.8	10 YRS PLUS
28	1492.0	6151.4	10 YRS PLUS
29	1692.0	-31763.2	112.0632
30	1611.0	-7929.2	10 YRS PLUS
31	1685.0	-31076.1	218.4561
32	1595.0	-4507.0	10 YRS PLUS
33	1550.0	5864.0	10 YRS PLUS
34	1430.0	37460.8	57408.6890
35	1417.0	37898.6	76743.6030
36	1342.0	57715.0	18544.5420
37	1447.0	25468.9	10 YRS PLUS
38	1366.0	46882.6	64480.7150
39	1523.0	1703.2	10 YRS PLUS
40	1434.0	25652.2	10 YRS PLUS
41	1495.0	7361.0	10 YRS PLUS
42	1399.0	33144.3	10 YRS PLUS
43	1440.0	20949.1	10 YRS PLUS
44	1361.0	41990.8	10 YRS PLUS
45	1370.0	38482.7	10 YRS PLUS
46	1295.0	58771.1	67745.0410
47	1387.0	33705.8	10 YRS PLUS
48	1335.0	47649.0	10 YRS PLUS
49	1426.0	23268.6	10 YRS PLUS
50	1374.0	37062.4	10 YRS PLUS
51	1481.0	8682.0	10 YRS PLUS
52	1437.0	20520.2	10 YRS PLUS
53	1508.0	1415.0	10 YRS PLUS
54	1465.0	12914.9	10 YRS PLUS
55	1531.0	-4870.6	10 YRS PLUS
56	1488.0	6689.1	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.00762 LB/SEC/BLADE (0.675% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.006 LB/SEC/BLADE (0.531% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00822 LB/SEC/BLADE (0.728% of HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00381 LB/SEC/BLADE (0.337% OF HOT GAS FLOW)

TABLE M-12

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1701.0	-33989.3	92.6648
2	1569.0	2547.2	10 YRS PLUS
3	1673.0	-27853.5	653.8244
4	1593.0	-4221.6	10 YRS PLUS
5	1562.0	3319.7	10 YRS PLUS
6	1462.0	29809.7	10 YRS PLUS
7	1356.0	56006.8	15519.5747
8	1306.0	69369.4	5693.4604
9	1344.0	58454.8	15200.0473
10	1295.0	70505.9	6370.7750
11	1401.0	42321.5	49913.6440
12	1344.0	57129.8	19424.2020
13	1430.0	34156.9	10 YRS PLUS
14	1365.0	50869.4	32082.6110
15	1439.0	31411.2	10 YRS PLUS
16	1380.0	46506.1	44702.8330
17	1413.0	37877.3	87176.4400
18	1336.0	57910.3	21553.5800
19	1454.0	27017.1	10 YRS PLUS
20	1394.0	42354.4	61502.6660
21	1507.0	12917.0	10 YRS PLUS
22	1448.0	28215.0	10 YRS PLUS
23	1569.0	-3681.1	10 YRS PLUS
24	1522.0	8648.7	10 YRS PLUS
25	1608.0	-14487.5	10 YRS PLUS
26	1562.0	-2032.2	10 YRS PLUS
27	1641.0	-24443.1	3013.4235
28	1593.0	-10399.2	10 YRS PLUS
29	1727.0	-34797.9	43.5295
30	1640.0	-18160.7	16082.2230
31	1720.0	-34842.4	50.0328
32	1632.0	-16490.5	36885.3570
33	1581.0	-2482.4	10 YRS PLUS
34	1486.0	22298.8	10 YRS PLUS
35	1467.0	26525.9	10 YRS PLUS
36	1406.0	42509.8	41438.4740
37	1554.0	1471.3	10 YRS PLUS
38	1478.0	21866.8	10 YRS PLUS
39	1622.0	-18681.1	22889.3360
40	1540.0	4328.5	10 YRS PLUS
41	1538.0	-4133.6	10 YRS PLUS
42	1455.0	26342.9	10 YRS PLUS
43	1437.0	30580.8	10 YRS PLUS
44	1391.0	42787.0	62399.8290
45	1430.0	32334.9	10 YRS PLUS
46	1352.0	52936.2	32862.0580
47	1467.0	22648.0	10 YRS PLUS
48	1410.0	37708.0	10 YRS PLUS
49	1525.0	7309.1	10 YRS PLUS
50	1466.0	23085.4	10 YRS PLUS
51	1584.0	-8439.7	10 YRS PLUS
52	1533.0	5366.2	10 YRS PLUS
53	1615.0	-17211.8	45779.8940
54	1568.0	-3969.0	10 YRS PLUS
55	1643.0	-25551.2	2260.0490
56	1597.0	-11769.1	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.00762 LB/SEC/BLADE (0.675% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00558 LB/SEC/BLADE (0.494% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00741 LB/SEC/BLADE (0.656% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00381 LB/SEC/BLADE (0.337% OF HOT GAS FLOW)

TABLE M-13

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1787.0	-31556.9	21.7258
2	1677.0	-20778.7	2687.1251
3	1724.0	-31400.8	92.5517
4	1659.0	-14891.6	30693.5880
5	1575.0	8330.2	10 YRS PLUS
6	1501.0	27556.5	70161.6530
7	1352.0	65005.5	3345.9424
8	1320.0	70050.1	3231.7805
9	1343.0	65081.4	4319.5679
10	1312.0	70431.5	3822.1966
11	1449.0	36164.3	44137.7990
12	1408.0	46112.4	20483.2870
13	1481.0	27926.7	10 YRS PLUS
14	1435.0	39253.3	32318.7610
15	1488.0	26412.3	10 YRS PLUS
16	1446.0	36711.4	42433.6920
17	1443.0	38639.3	29460.7960
18	1374.0	56008.2	9543.8355
19	1493.0	25999.1	10 YRS PLUS
20	1442.0	38752.7	29545.8920
21	1567.0	6928.3	10 YRS PLUS
22	1508.0	22057.8	10 YRS PLUS
23	1624.0	-8740.3	10 YRS PLUS
24	1573.0	5237.0	10 YRS PLUS
25	1654.0	-17315.6	15507.5909
26	1606.0	-3318.9	10 YRS PLUS
27	1683.0	-25423.5	850.7644
28	1632.0	-10533.3	10 YRS PLUS
29	1803.0	-31187.7	16.5353
30	1722.0	-32476.8	77.7121
31	1773.0	-33053.3	21.8904
32	1711.0	-32968.3	90.6384
33	1651.0	-19977.7	6841.3399
34	1579.0	1534.6	10 YRS PLUS
35	1492.0	21402.6	10 YRS PLUS
36	1450.0	32984.6	10 YRS PLUS
37	1577.0	-4092.5	10 YRS PLUS
38	1529.0	9462.0	10 YRS PLUS
39	1638.0	-21836.5	5682.9433
40	1587.0	-6233.6	10 YRS PLUS
41	1566.0	-133.3	10 YRS PLUS
42	1512.0	14975.5	10 YRS PLUS
43	1496.0	19654.4	10 YRS PLUS
44	1464.0	28701.6	10 YRS PLUS
45	1467.0	28266.1	10 YRS PLUS
46	1393.0	48303.8	21713.0430
47	1507.0	18896.4	10 YRS PLUS
48	1452.0	33958.1	67740.6150
49	1580.0	480.3	10 YRS PLUS
50	1518.0	17496.8	10 YRS PLUS
51	1630.0	-13005.3	10 YRS PLUS
52	1577.0	2811.6	10 YRS PLUS
53	1659.0	-20934.2	4033.0667
54	1608.0	-5131.8	10 YRS PLUS
55	1685.0	-27704.4	502.7558
56	1634.0	-12210.1	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0069 LB/SEC/BLADE (0.611% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00561 LB/SEC/BLADE (0.497% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00723 LB/SEC/BLADE (0.64% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00381 LB/SEC/BLADE (0.337% OF HOT GAS FLOW)

TABLE M-14

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, HUB SECTION, 23862 RPM, TIT = 2570°F, WCA = 0.008092 LB/SEC/BLADE (6.42% OF HOT GAS FLOW) TCA = 900°F, PTOT = 50 PSIA, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1694.0	-11665.9	35648.2450
2	1660.0	-1977.0	10 YRS PLUS
3	1650.0	111.9	10 YRS PLUS
4	1631.0	5646.8	10 YRS PLUS
5	1532.0	30904.8	13555.4634
6	1511.0	36094.0	7525.3557
7	1424.0	55683.1	2335.2779
8	1412.0	58046.5	2163.0666
9	1396.0	58672.8	3071.1824
10	1382.0	61455.0	2749.6107
11	1400.0	54224.2	6075.6657
12	1384.0	57331.2	5567.3419
13	1400.0	52006.2	9046.9448
14	1385.0	54709.9	8685.3804
15	1406.0	49200.9	12516.0398
16	1394.0	51280.7	12324.6334
17	1408.0	47906.7	14863.5301
18	1393.0	50871.2	13671.5652
19	1440.0	39216.8	28099.1070
20	1432.0	40428.9	27453.1040
21	1476.0	29746.5	10 YRS PLUS
22	1468.0	31212.2	79822.6810
23	1516.0	19357.0	10 YRS PLUS
24	1512.0	19876.5	10 YRS PLUS
25	1548.0	11131.6	10 YRS PLUS
26	1543.0	12083.0	10 YRS PLUS
27	1568.0	6081.7	10 YRS PLUS
28	1562.0	7307.1	10 YRS PLUS
29	1701.0	-14998.1	9905.8094
30	1681.0	-9271.1	10 YRS PLUS
31	1631.0	3349.0	10 YRS PLUS
32	1614.0	8686.7	10 YRS PLUS
33	1563.0	19461.7	10 YRS PLUS
34	1543.0	25031.8	37202.9060
35	1486.0	34696.5	21043.3950
36	1473.0	38771.8	11916.1400
37	1477.0	29905.2	82760.7640
38	1462.0	34896.9	40414.3100
39	1501.0	19307.4	10 YRS PLUS
40	1485.0	24784.7	10 YRS PLUS
41	1466.0	22415.8	10 YRS PLUS
42	1469.0	28384.0	10 YRS PLUS
43	1466.0	27921.7	10 YRS PLUS
44	1453.0	32481.1	10 YRS PLUS
45	1428.0	38477.2	47904.2570
46	1414.0	43112.5	29220.1060
47	1448.0	33873.4	77901.9100
48	1440.0	36701.1	50878.9810
49	1480.0	25939.7	10 YRS PLUS
50	1472.0	28787.7	10 YRS PLUS
51	1520.0	15931.3	10 YRS PLUS
52	1515.0	17900.2	10 YRS PLUS
53	1549.0	8895.2	10 YRS PLUS
54	1544.0	10653.3	10 YRS PLUS
55	1566.0	4922.1	10 YRS PLUS
56	1561.0	6651.2	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.000847 LB/SEC/BLADE (0.672% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0006667 LB/SEC/BLADE (0.529% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0009134 LB/SEC/BLADE (0.724% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000423 LB/SEC/BLADE (0.335% OF HOT GAS FLOW)

TABLE M-15

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1746.0	-21522.1	416.2639
2	1711.0	-11970.2	20722.9470
3	1708.0	-10944.1	31361.6160
4	1688.0	-5551.6	10 YRS PLUS
5	1579.0	24864.9	14213.5808
6	1541.0	29157.9	8998.3382
7	1459.0	53238.0	1339.3202
8	1451.0	54448.6	1354.6901
9	1420.0	59786.0	1263.5974
10	1412.0	60815.5	1307.4764
11	1435.0	53622.5	2456.7586
12	1426.0	54776.2	2589.8093
13	1459.0	46648.4	4214.9398
14	1449.0	48123.6	4330.1405
15	1484.0	39965.1	6612.5865
16	1475.0	41259.1	6812.3654
17	1491.0	38339.9	7890.7030
18	1476.0	41368.7	6497.9385
19	1531.0	28298.9	25067.8000
20	1522.0	29611.9	24037.9010
21	1572.0	18023.0	10 YRS PLUS
22	1563.0	19523.4	87373.2200
23	1620.0	5065.5	10 YRS PLUS
24	1614.0	6015.8	10 YRS PLUS
25	1656.0	-5093.3	10 YRS PLUS
26	1650.0	-3905.9	10 YRS PLUS
27	1680.0	-11604.6	52663.3230
28	1674.0	-10295.7	10 YRS PLUS
29	1754.0	-26125.2	[illegible].7559
30	1732.0	-19977.6	900.3048
31	1690.0	-10925.7	50597.6240
32	1674.0	-5808.7	10 YRS PLUS
33	1627.0	5241.1	10 YRS PLUS
34	1612.0	10086.7	10 YRS PLUS
35	1558.0	19841.1	10 YRS PLUS
36	1548.0	23267.3	47919.4100
37	1576.0	8693.6	10 YRS PLUS
38	1563.0	13370.1	10 YRS PLUS
39	1596.0	1475.2	10 YRS PLUS
40	1581.0	6899.3	10 YRS PLUS
41	1554.0	13778.7	10 YRS PLUS
42	1540.0	18715.3	10 YRS PLUS
43	1518.0	24798.2	80189.4240
44	1511.0	27815.7	49480.3170
45	1503.0	30212.7	36081.6580
46	1489.0	34895.5	18441.5880
47	1536.0	22841.2	74211.0090
48	1528.0	25816.5	47763.3780
49	1577.0	13156.6	10 YRS PLUS
50	1569.0	16060.4	10 YRS PLUS
51	1624.0	871.2	10 YRS PLUS
52	1618.0	3299.9	10 YRS PLUS
53	1657.0	-7882.8	10 YRS PLUS
54	1652.0	-5820.1	10 YRS PLUS
55	1681.0	-13939.9	23594.9430
56	1675.0	-11718.7	57928.5250

LEADING EDGE W_{CLE} = 0.000847 LB/SEC/BLADE (0.672% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00062 LB/SEC/BLADE (0.492% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0008065 LB/SEC/BLADE (0.639% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00041 LB/SEC/BLADE (0.325% OF HOT GAS FLOW)

TABLE M-16

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1828.0	-23818.7	41.0433
2	1800.0	-23888.3	74.9918
3	1771.0	-19398.9	429.8302
4	1756.0	-16052.7	1791.5754
5	1621.0	22791.9	7231.5153
6	1608.0	25842.3	5271.8917
7	1490.0	54882.7	433.4370
8	1485.0	54556.1	524.1599
9	1446.0	60554.4	531.1881
10	1441.0	60878.0	573.7296
11	1490.0	49849.7	1026.0656
12	1483.0	50424.7	1125.0307
13	1521.0	42159.5	1636.7104
14	1514.0	42724.4	1798.0272
15	1544.0	36753.2	2625.9920
16	1538.0	37051.4	2887.7834
17	1541.0	38428.6	1955.9574
18	1529.0	40427.8	1765.4057
19	1593.0	25435.3	8588.0935
20	1586.0	26167.6	8832.4732
21	1643.0	11448.0	10 YRS PLUS
22	1635.0	12825.4	10 YRS PLUS
23	1688.0	-1398.0	10 YRS PLUS
24	1682.0	-599.6	10 YRS PLUS
25	1716.0	-8937.0	77237.1380
26	1711.0	-8318.6	10 YRS PLUS
27	1736.0	-13898.2	5864.8142
28	1730.0	-12679.7	10123.9575
29	1830.0	-24789.8	32.4923
30	1810.0	-25355.5	44.9560
31	1757.0	-25361.4	147.8774
32	1746.0	-21589.0	410.6454
33	1690.0	-9465.6	10 YRS PLUS
34	1679.0	-5315.2	10 YRS PLUS
35	1607.0	11128.6	10 YRS PLUS
36	1601.0	13958.8	10 YRS PLUS
37	1624.0	1255.5	10 YRS PLUS
38	1616.0	4983.6	10 YRS PLUS
39	1646.0	-5292.0	10 YRS PLUS
40	1638.0	-1642.3	10 YRS PLUS
41	1605.0	9640.8	10 YRS PLUS
42	1597.0	13238.3	10 YRS PLUS
43	1580.0	18827.8	69012.7180
44	1576.0	20986.8	36304.2530
45	1557.0	26939.8	16436.9240
46	1543.0	32019.8	7783.6464
47	1598.0	18115.7	53532.5130
48	1590.0	21270.5	23149.7110
49	1647.0	5068.6	10 YRS PLUS
50	1638.0	8576.8	10 YRS PLUS
51	1689.0	-5909.1	10 YRS PLUS
52	1683.0	-3195.9	10 YRS PLUS
53	1718.0	-13165.9	11711.6423
54	1712.0	-10636.8	31262.1410
55	1737.0	-17086.9	2036.2739
56	1731.0	-14773.9	4999.9732

LEADING EDGE W_{CLE} = 0.0007667 LB/SEC/BLADE (0.608% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0006233 LB/SEC/BLADE (0.494% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00077861 LB/SEC/BLADE (0.617% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00039 LB/SEC/BLADE (0.309% OF HOT GAS FLOW)

TABLE M-17

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD,
HUB SECTION, 22857 RPM, TIT = 2320°F,
WCA = 0.0108 LBS/SEC/BLADE (2.73% OF HOT GAS FLOW)
TCA = 900°F, PTOT = 150 PSIA
CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1675.0	-4829.3	10 YRS PLUS
2	1635.0	7519.5	10 YRS PLUS
3	1648.0	2830.2	10 YRS PLUS
4	1626.0	9838.4	10 YRS PLUS
5	1574.0	24575.9	17367.7650
6	1544.0	32954.6	6143.6420
7	1471.0	51738.8	1246.6372
8	1454.0	56600.3	856.2085
9	1490.0	45826.4	2043.3681
10	1467.0	52245.5	1275.1247
11	1505.0	40612.7	3289.4925
12	1481.0	47293.0	2036.4361
13	1500.0	40791.2	3663.6546
14	1477.0	47175.9	2321.4999
15	1498.0	40431.4	4117.4427
16	1480.0	45403.3	2898.1780
17	1478.0	44871.5	3358.3514
18	1459.0	50023.1	2343.1511
19	1504.0	36890.2	7632.8851
20	1493.0	39912.4	5198.2050
21	1540.0	26352.6	30118.2400
22	1528.0	29601.0	20341.7350
23	1574.0	16356.4	10 YRS PLUS
24	1566.0	18576.1	10 YRS PLUS
25	1599.0	8786.3	10 YRS PLUS
26	1591.0	10987.1	10 YRS PLUS
27	1615.0	3157.9	10 YRS PLUS
28	1607.0	5590.6	10 YRS PLUS
29	1595.0	-10072.5	58773.6490
30	1672.0	-3248.1	10 YRS PLUS
31	1668.0	-1459.5	10 YRS PLUS
32	1645.0	5349.7	10 YRS PLUS
33	1612.0	16057.1	73896.8770
34	1585.0	23578.9	16006.5679
35	1534.0	37692.9	2785.9769
36	1516.0	42130.2	1883.0435
37	1570.0	27153.0	10972.0540
38	1548.0	32754.3	5760.4454
39	1602.0	16364.4	10 YRS PLUS
40	1578.0	22755.9	23231.1510
41	1582.0	19986.5	43571.7460
42	1558.0	26360.2	18186.4420
43	1556.0	25590.8	22810.6200
44	1538.0	30393.4	12867.3941
45	1495.0	40612.4	4339.5309
46	1477.0	45299.3	3208.0972
47	1507.0	36308.0	8014.8623
48	1497.0	38968.6	5771.5463
49	1531.0	28892.6	21930.2560
50	1522.0	31286.2	16458.7840
51	1563.0	19432.9	10 YRS PLUS
52	1557.0	21019.1	61298.3270
53	1584.0	12925.6	10 YRS PLUS
54	1578.0	14481.5	10 YRS PLUS
55	1596.0	8881.3	10 YRS PLUS
56	1591.0	10204.2	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.001118 LBS/SEC/BLADE (0.282% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00088 LBS/SEC/BLADE (0.222% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001206 LBS/SEC/BLADE (0.304% OF HOT GAS FLOW)

TRAILING SIDE W_{CTE} = 0.0005588 LBS/SEC/BLADE (0.141% OF HOT GAS FLOW)

TABLE M-18

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1746.0	-18715.4	967.2945
2	1705.0	-6189.9	10 YRS PLUS
3	1721.0	-11933.8	16222.4466
4	1628.0	-4369.6	10 YRS PLUS
5	1628.0	18506.9	20673.8940
6	1601.0	27752.4	4188.5033
7	1511.0	53592.7	309.4679
8	1499.0	56091.9	277.6752
9	1512.0	54136.2	274.9632
10	1499.0	56718.5	249.4866
11	1554.0	43225.6	571.2719
12	1539.0	48422.8	355.3231
13	1577.0	35672.8	1390.5331
14	1560.0	41325.4	669.3515
15	1592.0	30215.3	3104.0477
16	1578.0	34948.8	1588.5476
17	1569.0	35011.7	1985.5818
18	1549.0	41225.0	907.5667
19	1603.0	23869.7	9239.7924
20	1590.0	28439.3	4825.6209
21	1641.0	10191.0	10 YRS PLUS
22	1627.0	15268.4	64076.8790
23	1679.0	-3108.3	10 YRS PLUS
24	1670.0	336.8	10 YRS PLUS
25	1705.0	-12623.2	19596.3910
26	1696.0	-9457.1	10 YRS PLUS
27	1721.0	-18879.0	1682.1920
28	1713.0	-16147.2	5011.0444
29	1766.0	-21658.5	253.6320
30	1741.0	-14734.5	3952.0353
31	1743.0	-12420.3	7944.9580
32	1721.0	-6396.2	10 YRS PLUS
33	1699.0	2998.8	10 YRS PLUS
34	1679.0	8769.0	10 YRS PLUS
35	1651.0	21561.5	4301.6787
36	1636.0	25408.2	2788.6946
37	1720.0	3062.9	10 YRS PLUS
38	1700.0	8141.7	10 YRS PLUS
39	1732.0	-1917.8	10 YRS PLUS
40	1711.0	3390.9	10 YRS PLUS
41	1670.0	14128.4	29603.3200
42	1649.0	19815.0	7613.5467
43	1597.0	34081.7	1171.6401
44	1588.0	35636.8	1052.6347
45	1573.0	37989.8	926.3588
46	1554.0	42386.1	656.5754
47	1598.0	28677.5	3706.3359
48	1587.0	31060.8	2943.6174
49	1629.0	16707.6	37154.5960
50	1619.0	19306.1	20038.2960
51	1664.0	3710.8	10 YRS PLUS
52	1658.0	5186.9	10 YRS PLUS
53	1688.0	-5659.4	10 YRS PLUS
54	1682.0	-4257.2	10 YRS PLUS
55	1704.0	-12377.1	21726.8750
56	1696.0	-10890.9	41450.4840

LEADING EDGE W_{CLE} = 0.001118 LBS/SEC/BLADE (0.282% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0008184 LBS/SEC/BLADE (0.207% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001087 LBS/SEC/BLADE (0.274% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0005588 LBS/SEC/BLADE (0.141% OF HOT GAS FLOW)

TABLE M-19

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1818.0	-22075.3	71.9712
2	1797.0	-19006.4	335.8322
3	1774.0	-15524.7	1376.9862
4	1756.0	-10418.2	10942.9576
5	1658.0	19350.2	7045.8786
6	1639.0	25366.8	2604.5509
7	1534.0	52854.4	192.7138
8	1527.0	54042.3	189.1180
9	1544.0	51222.5	195.7877
10	1536.0	52559.7	192.3049
11	1608.0	34014.2	896.2871
12	1596.0	37071.5	595.2249
13	1634.0	25445.1	2913.1452
14	1623.0	28894.7	1844.0495
15	1644.0	22081.5	4614.8553
16	1635.0	24894.5	3194.0042
17	1607.0	33627.2	1000.0148
18	1590.0	38541.2	529.5954
19	1654.0	18552.9	10224.2765
20	1642.0	22317.7	4621.5040
21	1694.0	5879.4	10 YRS PLUS
22	1681.0	9884.8	10 YRS PLUS
23	1726.0	-4023.0	10 YRS PLUS
24	1716.0	-1033.0	10 YRS PLUS
25	1745.0	-9789.3	19295.7710
26	1736.0	-7158.5	10 YRS PLUS
27	1759.0	-13961.6	3258.9126
28	1749.0	-11095.7	10483.9735
29	1828.0	-22193.9	56.4329
30	1806.0	-21691.9	101.3561
31	1790.0	-19979.7	230.3487
32	1775.0	-15911.5	1188.7079
33	1739.0	-5688.0	10 YRS PLUS
34	1723.0	-883.6	10 YRS PLUS
35	1681.0	21213.6	4631.7842
36	1642.0	24049.6	3194.0418
37	1721.0	-1082.7	10 YRS PLUS
38	1709.0	2595.7	10 YRS PLUS
39	1744.0	-8452.9	53435.9130
40	1732.0	-4860.4	10 YRS PLUS
41	1693.0	6697.3	10 YRS PLUS
42	1681.0	10455.6	75134.3860
43	1642.0	22496.0	4449.1229
44	1636.0	24427.8	3439.4501
45	1611.0	32136.8	1246.5975
46	1594.0	37305.7	626.3562
47	1644.0	21530.2	5190.2211
48	1634.0	24725.9	3398.1577
49	1677.0	11027.9	69122.9080
50	1667.0	14182.5	31477.1270
51	1707.0	1607.8	10 YRS PLUS
52	1701.0	3473.8	10 YRS PLUS
53	1726.0	-4264.0	10 YRS PLUS
54	1721.0	-2734.8	10 YRS PLUS
55	1739.0	-8235.0	71535.9490
56	1733.0	-6433.7	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.001012 LBS/SEC/BLADE (0.255% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0008228 LBS/SEC/BLADE (0.208% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0010604 LBS/SEC/BLADE (0.268% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0005588 LBS/SEC/BLADE (0.141% OF HOT GAS FLOW)

TABLE M-20

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD,
HUB SECTION, 22857 RPM, TIT = 2320°F,
WCA = 0.007758 LBS/SEC/BLADE (1.96% OF HOT GAS FLOW)
TCA = 600°F, PTOT = 150 PSIA
CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1641.0	-5038.5	10 YRS PLUS
2	1599.0	7937.3	10 YRS PLUS
3	1612.0	4157.8	10 YRS PLUS
4	1589.0	10906.6	10 YRS PLUS
5	1533.0	26548.4	35129.4[illegible]
6	1552.0	34924.1	12652.4367
7	1424.0	56158.6	2146.5[illegible]
8	1457.0	60752.1	1506.1427
9	1455.0	48120.9	3355.7[illegible]
10	1433.0	54894.0	2076.1[illegible]25
11	1475.0	44298.9	4731.8779
12	1449.0	51402.0	2440.5814
13	1464.0	47629.0	3186.7262
14	1438.0	54737.3	1654.4593
15	1440.0	48916.2	2741.9783
16	1440.0	54398.2	1360.4317
17	1439.0	54566.6	1657.1[illegible]
18	1418.0	60257.9	1225.9307
19	1496.0	39563.8	5276.2934
20	1483.0	43200.1	3593.3154
21	1559.0	22667.4	40171.2761
22	1546.0	26301.9	25735.3830
23	1617.0	6249.5	10 YRS PLUS
24	1610.0	6524.6	10 YRS PLUS
25	1657.0	-6100.7	10 YRS PLUS
26	1650.0	-3889.3	10 YRS PLUS
27	1679.0	-12830.5	35966.2192
28	1672.0	-10649.9	10 YRS PLUS
29	1666.0	-12317.6	60345.1[illegible]
30	1641.0	-4695.5	10 YRS PLUS
31	1640.0	-3813.7	10 YRS PLUS
32	1616.0	3507.0	10 YRS PLUS
33	1587.0	12718.1	10 YRS PLUS
34	1558.0	20502.7	71314.2860
35	1519.0	32131.1	14789.9973
36	1500.0	37052.4	8228.3[illegible]49
37	1562.0	22046.9	42350.6[illegible]
38	1538.0	28279.3	20079.6[illegible]
39	1592.0	14747.6	10 YRS PLUS
40	1568.0	20981.5	45461.8240
41	1562.0	22985.7	34415.2180
42	1537.0	29402.6	16526.4990
43	1528.0	32035.5	11746.4969
44	1508.0	37142.3	6444.6777
45	1459.0	50204.0	2270.5512
46	1440.0	54966.4	1677.7211
47	1508.0	37050.8	6580.4540
48	1496.0	40093.4	4611.3[illegible]
49	1566.0	21352.9	44182.1[illegible]
50	1552.0	24974.3	29257.[illegible]80
51	1623.0	4880.6	10 YRS PLUS
52	1614.0	7532.7	10 YRS PLUS
53	1658.0	-6002.6	10 YRS PLUS
54	1650.0	-3653.3	10 YRS PLUS
55	1678.0	-12180.2	45736.2840
56	1671.0	-10161.3	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.000792 LBS/SEC/BLADE (0.2% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0006203 LBS/SEC/BLADE (0.157% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0008505 LBS/SEC/BLADE (0.215% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0003946 LBS/SEC/BLADE (0.1% OF HOT GAS FLOW)

TABLE M-21

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, MEAN SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1707.0	-18651.0	2561.0872
2	1664.0	-5490.4	10 YRS PLUS
3	1671.0	-9709.4	10 YRS PLUS
4	1636.0	-2059.3	10 YRS PLUS
5	1561.0	22302.3	23634.1450
6	1553.0	29785.2	9742.6154
7	1460.0	57184.6	655.8224
8	1447.0	59801.5	593.4063
9	1479.0	55377.7	534.9717
10	1464.0	58453.5	471.7628
11	1528.0	45446.5	780.6983
12	1512.0	50031.1	550.9643
13	1548.0	42401.2	766.2585
14	1531.0	47338.7	525.0300
15	1567.0	38894.4	686.8574
16	1551.0	43625.0	578.0923
17	1549.0	45114.6	475.4955
18	1528.0	51132.5	300.4399
19	1618.0	26696.8	3370.7654
20	1604.0	31544.1	1698.1570
21	1662.0	7635.0	10 YRS PLUS
22	1667.0	12705.8	51592.3940
23	1743.0	-10134.5	16626.5280
24	1735.0	-7411.2	10 YRS PLUS
25	1704.0	-20974.5	192.8229
26	1776.0	-18533.5	503.8633
27	1809.0	-22504.8	80.7211
28	1801.0	-22175.7	103.0018
29	1731.0	-25462.3	265.4708
30	1704.0	-17399.2	4165.5334
31	1707.0	-17236.9	4074.9246
32	1623.0	-9915.6	10 YRS PLUS
33	1659.0	-1363.8	10 YRS PLUS
34	1638.0	5297.1	10 YRS PLUS
35	1595.0	20841.9	22629.7770
36	1511.0	24700.8	13929.3134
37	1683.0	-1599.6	10 YRS PLUS
38	1663.0	4297.9	10 YRS PLUS
39	1704.0	-4171.5	10 YRS PLUS
40	1684.0	1435.6	10 YRS PLUS
41	1637.0	18834.7	14546.1509
42	1615.0	25267.3	4964.8637
43	1558.0	43487.6	493.0726
44	1550.0	45161.2	459.7281
45	1562.0	43501.2	443.6523
46	1540.0	49049.5	311.8251
47	1631.0	24244.3	4072.4353
48	1616.0	28591.2	2358.8053
49	1689.0	6881.0	10 YRS PLUS
50	1675.0	10873.1	76790.8890
51	1749.0	-10618.5	12226.3262
52	1740.0	-8297.3	66543.4160
53	1786.0	-20470.9	216.0782
54	1778.0	-18523.5	482.3955
55	1810.0	-22184.7	84.1004
56	1802.0	-22006.9	104.1472

LEADING EDGE W_{CLE} = 0.000822 LBS/SEC/BLADE (0.207% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0005773 LBS/SEC/BLADE (0.146% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0007664 LBS/SEC/BLADE (0.193% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0004 LBS/SEC/BLADE (0.101% OF HOT GAS FLOW)

TABLE M-22

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 0.75 INCH CHORD, TIP SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1763.0	-25684.3	76.7161
2	1748.0	-21174.0	426.1429
3	1733.0	-15720.7	3498.6334
4	1714.0	-10159.6	34699.4620
5	1607.0	24441.4	7335.4336
6	1586.0	30168.8	3674.9351
7	1481.0	58024.4	321.5395
8	1474.0	59128.4	320.5395
9	1511.0	54361.6	271.6928
10	1502.0	55779.7	270.5095
11	1586.0	38793.6	555.5673
12	1575.0	41781.8	421.5003
13	1607.0	35694.1	636.6035
14	1596.0	39041.3	477.5249
15	1618.0	34125.6	678.4997
16	1607.0	37629.5	419.7926
17	1571.0	46805.9	159.[illegible]167
18	1562.0	50367.0	142.3179
19	1670.0	21266.9	2516.[illegible]
20	1698.0	25004.8	1733.[illegible]
21	1727.0	2137.4	10 YRS PLUS
22	1723.0	6453.5	10 YRS PLUS
23	1726.0	-11500.1	3573.4[illegible]32
24	1779.0	-8907.9	15732.2438
25	1818.0	-18396.3	200.6132
26	1810.0	-16657.3	414.7161
27	1838.0	-18599.5	120.4839
28	1830.0	-18358.4	155.3994
29	1795.0	-26263.3	52.2909
30	1771.0	-25468.1	105.0262
31	1757.0	-23948.7	196.7852
32	1742.0	-19429.6	645.4047
33	1710.0	-9474.2	60337.6760
34	1694.0	-4428.8	10 YRS PLUS
35	1636.0	14831.3	58141.6790
36	1627.0	17959.3	25595.5500
37	1719.0	-7114.2	10 YRS PLUS
38	1707.0	-3378.3	10 YRS PLUS
39	1741.0	-9343.1	29780.6720
40	1730.0	-6081.7	10 YRS PLUS
41	1677.0	13419.1	31172.4400
42	1664.0	17528.8	11107.6531
43	1614.0	35493.0	558.7201
44	1609.0	37021.3	455.3221
45	1599.0	42206.9	214.4708
46	1577.0	48038.0	143.6590
47	1678.0	18957.3	4804.5729
48	1664.0	23307.0	2132.9149
49	1741.0	967.6	10 YRS PLUS
50	1726.0	5484.3	10 YRS PLUS
51	1790.0	-11803.1	3059.4198
52	1780.0	-9009.8	14243.7951
53	1820.0	-18379.2	192.[illegible]
54	1811.0	-16804.8	386.9967
55	1839.0	-18567.3	119.0301
56	1830.0	-18333.1	156.3052

LEADING EDGE W_{CLE} = 0.0007809 LBS/SEC/BLADE (0.197% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0005809 LBS/SEC/BLADE (0.147% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.000748 LBS/SEC/BLADE (0.189% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0004247 LBS/SEC/BLADE (0.107% OF HOT GAS FLOW)

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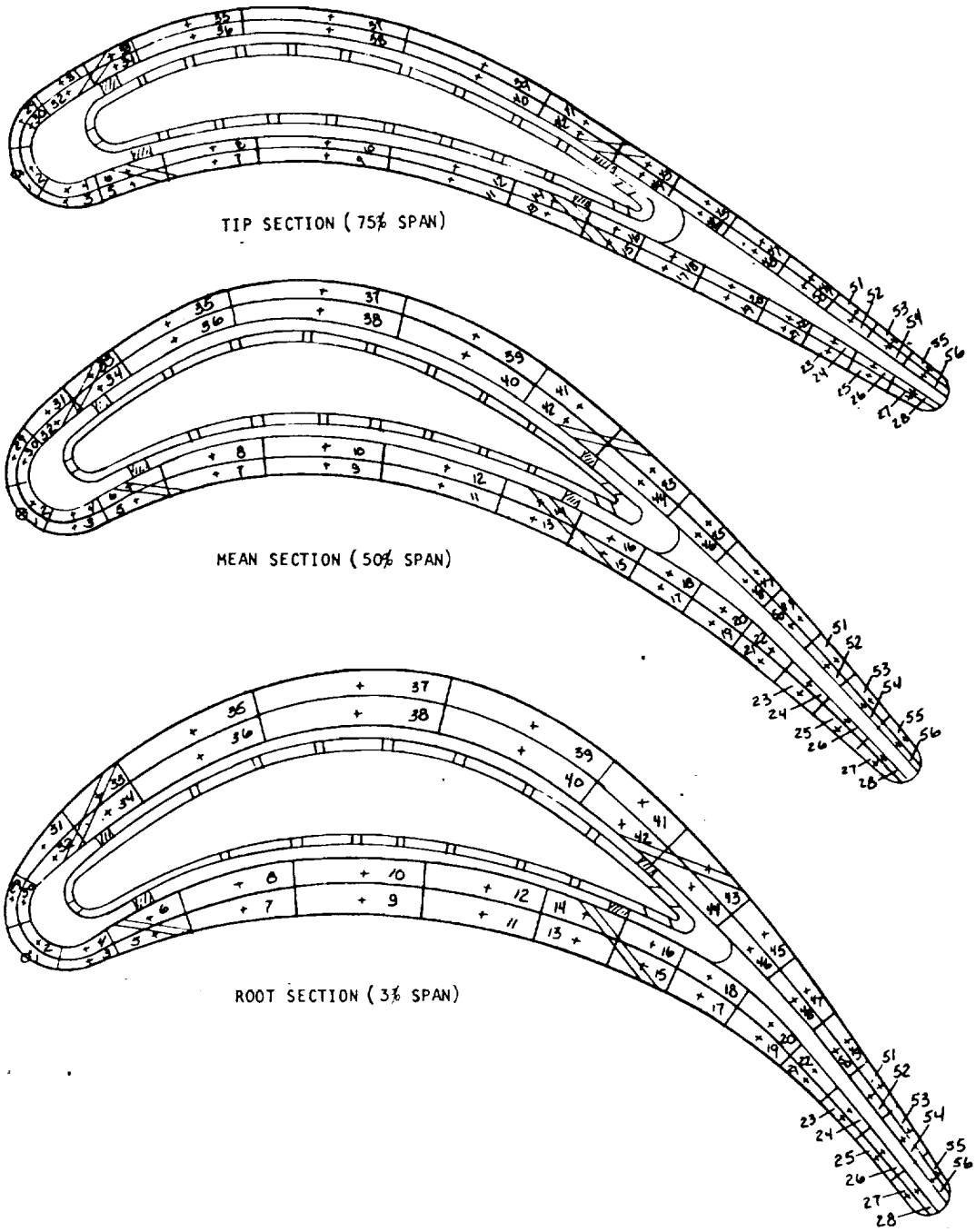

S-67900

FIGURE M-4. SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE 0.75 INCH CHORD

TABLE M-23

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 22857 RPM, TIT = 2320 °F,
WCA = 0.025024 LBS/SEC/BLADE (4.76% of HOT GAS FLOW),
TCA = 1200°F, PTOT = 150 PSIA
CONDITIONS I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1723.0	-7405.6	10 YRS PLUS
2	1676.0	7027.3	10 YRS PLUS
3	1719.0	-6735.8	10 YRS PLUS
4	1682.0	4769.4	10 YRS PLUS
5	1678.0	5516.1	10 YRS PLUS
6	1652.0	13950.8	50803.9300
7	1625.0	21932.2	7829.7526
8	1594.0	31817.8	2075.5111
9	1552.0	42462.4	683.0716
10	1532.0	48354.7	431.3421
11	1555.0	40848.1	825.3531
12	1525.0	49549.3	424.0142
13	1566.0	36728.9	1470.0332
14	1534.0	46015.0	605.6983
15	1572.0	33761.7	2417.0294
16	1539.0	43186.1	852.0699
17	1559.0	35482.9	2332.5218
18	1533.0	42928.0	1043.0000
19	1579.0	26532.3	6345.2010
20	1571.0	30912.2	4655.9451
21	1594.0	23267.9	13419.1814
22	1588.0	25082.8	10613.0573
23	1601.0	19991.1	25785.1560
24	1597.0	21256.2	19186.1480
25	1561.0	29202.1	8910.4603
26	1539.0	35225.9	4233.0920
27	1577.0	23225.3	21535.9110
28	1563.0	27020.6	13683.9849
29	1733.0	-9700.4	28012.4570
30	1698.0	748.3	10 YRS PLUS
31	1710.0	-1902.5	10 YRS PLUS
32	1684.0	5775.6	10 YRS PLUS
33	1645.0	18834.8	11773.2169
34	1605.0	30869.2	1915.3878
35	1604.0	31920.7	1564.7678
36	1577.0	38770.1	703.2068
37	1622.0	25958.4	3561.1355
38	1588.0	36383.6	893.9103
39	1642.0	18855.2	12654.8281
40	1605.0	29843.1	2394.0645
41	1649.0	15023.5	38354.5560
42	1612.0	26166.0	4423.2862
43	1634.0	17673.0	23379.7680
44	1599.0	28295.2	3923.4012
45	1591.0	28549.5	4587.1871
46	1564.0	35676.0	1956.6910
47	1611.0	20534.4	16308.5202
48	1602.0	23244.4	10872.7109
49	1624.0	14894.1	79155.4460
50	1618.0	16706.3	50148.8050
51	1631.0	11069.0	10 YRS PLUS
52	1625.0	12872.3	10 YRS PLUS
53	1565.0	26369.7	9608.2658
54	1537.0	35883.2	3656.8259
55	1580.0	22519.3	23161.6850
56	1561.0	27607.8	12691.8136

LEADING EDGE W_{CLE} = 0.00149 LBS/SEC/BLADE (0.283% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002378 LBS/SEC/BLADE (0.452% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00317 LBS/SEC/BLADE (0.602% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001448 LBS/SEC/BLADE (0.275% OF HOT GAS FLOW)

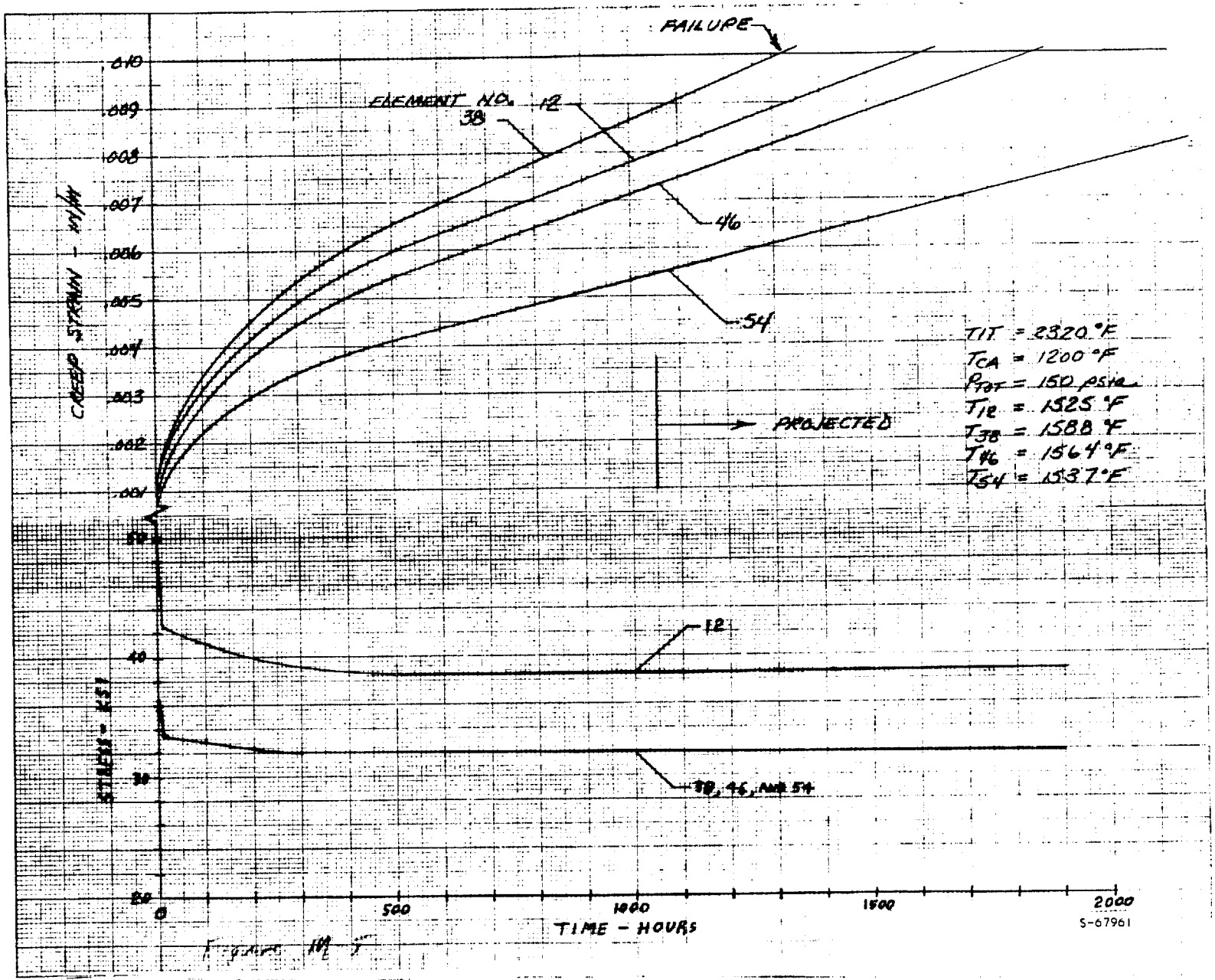

FIGURE M-5. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE ROOT SECTION OF THE 1.0 INCH CHORD SCHEME B-5 BLADE.

TABLE M-24

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITIONS I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1777.0	-15887.4	1142.3046
2	1725.0	-546.1	10 YRS PLUS
3	1780.0	-16914.5	767.6812
4	1742.0	-5783.2	10 YRS PLUS
5	1734.0	-3418.9	10 YRS PLUS
6	1712.0	3445.4	10 YRS PLUS
7	1674.0	15535.7	16658.3960
8	1647.0	24234.4	2700.7771
9	1594.0	41183.5	286.9699
10	1578.0	45847.1	200.6051
11	1594.0	41577.4	269.1692
12	1575.0	47088.1	176.5189
13	1611.0	36576.4	476.7302
14	1592.0	42535.1	242.2226
15	1632.0	29732.9	1223.6600
16	1611.0	36704.5	463.6906
17	1630.0	29988.7	1218.7552
18	1611.0	36323.3	503.5806
19	1672.0	16234.1	13902.8952
20	1645.0	18675.3	7371.3659
21	1694.0	8783.0	10 YRS PLUS
22	1689.0	10558.4	58675.0960
23	1706.0	4525.6	10 YRS PLUS
24	1700.0	6547.6	10 YRS PLUS
25	1640.0	24642.1	2963.3920
26	1610.0	34302.2	800.1498
27	1659.0	18016.6	10745.3111
28	1640.0	24079.8	3341.4012
29	1787.0	-18229.8	429.4882
30	1746.0	-6519.2	10 YRS PLUS
31	1767.0	-11966.7	5075.6063
32	1743.0	-5086.7	10 YRS PLUS
33	1721.0	2432.3	10 YRS PLUS
34	1690.0	11850.4	37254.9010
35	1647.0	26640.1	1618.6072
36	1628.0	32493.5	748.8953
37	1690.0	13953.7	18570.0510
38	1667.0	20961.1	3257.9342
39	1713.0	7096.2	10 YRS PLUS
40	1688.0	14618.2	15695.8129
41	1715.0	6274.0	10 YRS PLUS
42	1639.0	14086.5	18239.1720
43	1703.0	9428.4	75138.1390
44	1678.0	16966.5	9259.2096
45	1663.0	21321.6	3327.2207
46	1641.0	27996.2	1411.6502
47	1694.0	10678.8	49394.3380
48	1687.0	12613.7	31307.0170
49	1711.0	4584.5	10 YRS PLUS
50	1705.0	6198.4	10 YRS PLUS
51	1715.0	2543.5	10 YRS PLUS
52	1709.0	4204.4	10 YRS PLUS
53	1643.0	24258.9	2977.0188
54	1611.0	34250.4	788.8338
55	1639.0	16422.2	9376.7596
56	1638.0	24934.5	2931.0316

LEADING EDGE W_{CLE} = 0.00157 LBS/SEC/BLADE (0.298% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002239 LBS/SEC/BLADE (0.425% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.003253 LBS/SEC/BLADE (0.618% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001539 LBS/SEC/BLADE (0.292% OF HOT GAS FLOW)

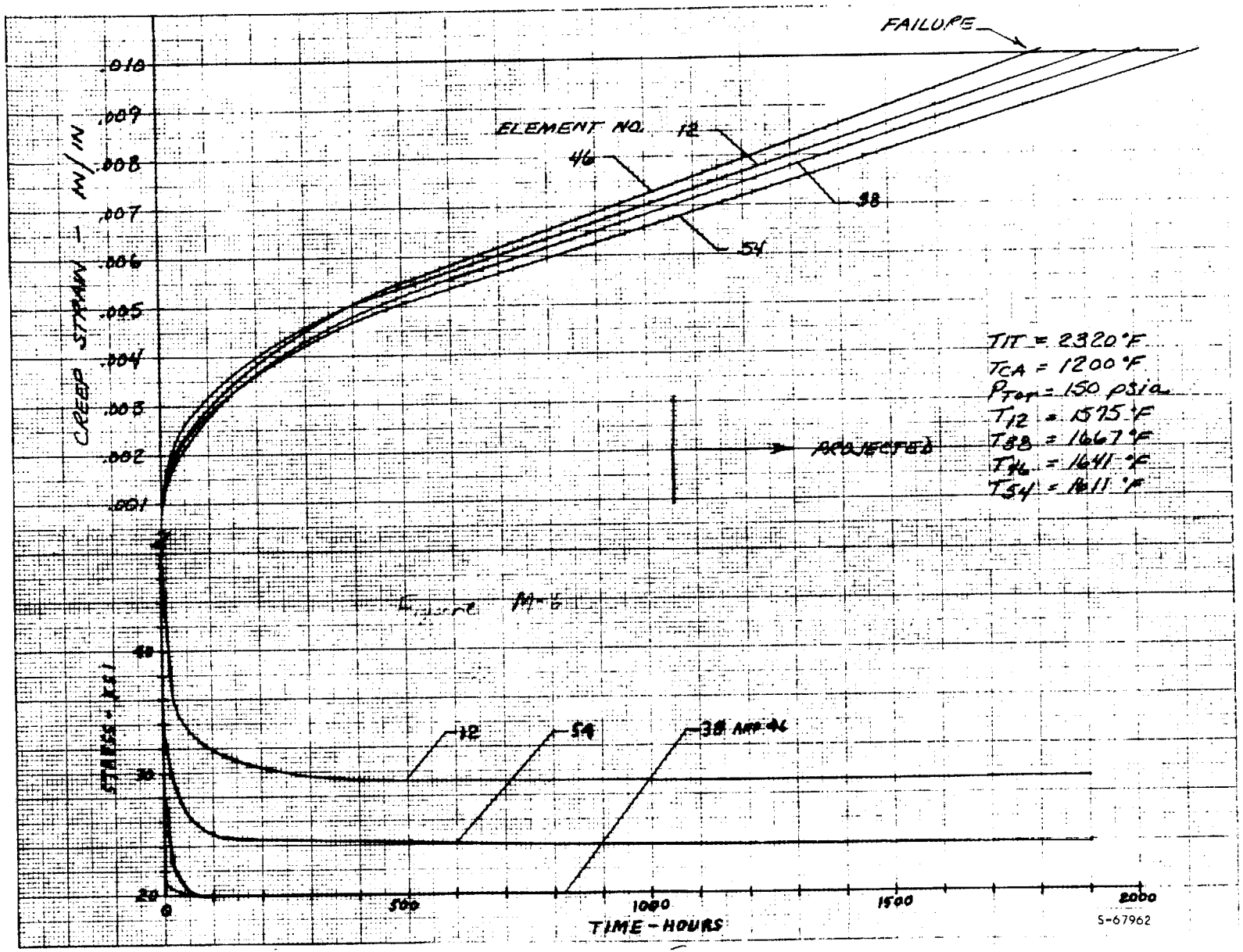

FIGURE M-6. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE MEAN SECTION OF THE 1.0 INCH CHORD SCHEME B-5 BLADE.

TABLE M-25

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITIONS I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1758.0	-735.0	10 YRS PLUS
2	1728.0	8478.8	79477.9350
3	1786.0	-8849.5	13709.1935
4	1765.0	-2715.4	10 YRS PLUS
5	1754.0	752.9	10 YRS PLUS
6	1740.0	5038.0	10 YRS PLUS
7	1704.0	16636.6	5353.0955
8	1691.0	20779.2	1891.1657
9	1636.0	38875.9	156.3621
10	1629.0	41175.6	120.8133
11	1634.0	40165.2	125.7749
12	1626.0	42784.3	100.4725
13	1667.0	30070.0	475.2164
14	1658.0	33026.3	317.2725
15	1701.0	19658.9	2134.2306
16	1691.0	22901.1	1182.7317
17	1706.0	18474.3	2782.5350
18	1695.0	22023.6	1286.3509
19	1732.0	10618.2	16799.1270
20	1729.0	11609.0	14706.2086
21	1759.0	2600.0	10 YRS PLUS
22	1756.0	3564.5	10 YRS PLUS
23	1775.0	-1951.0	10 YRS PLUS
24	1770.0	-417.6	10 YRS PLUS
25	1688.0	25255.0	779.3140
26	1656.0	35622.6	192.2034
27	1703.0	20636.3	1472.3618
28	1680.0	28049.0	528.4937
29	1769.0	-9617.2	7327.0707
30	1767.0	-3218.6	10 YRS PLUS
31	1778.0	-6161.0	10 YRS PLUS
32	1764.0	-2072.2	10 YRS PLUS
33	1753.0	1596.0	10 YRS PLUS
34	1736.0	6774.4	10 YRS PLUS
35	1672.0	27580.3	709.7582
36	1662.0	30778.6	462.6887
37	1712.0	15560.6	6227.5873
38	1699.0	19636.7	2259.7066
39	1732.0	9875.5	25218.2392
40	1719.0	13876.7	9051.9924
41	1735.0	9460.5	31828.0280
42	1722.0	13461.5	9607.6386
43	1734.0	10132.6	20913.4530
44	1720.0	14439.8	7343.6292
45	1710.0	17930.9	3010.4175
46	1699.0	21344.1	1342.2365
47	1741.0	8449.4	57899.9710
48	1737.0	9622.9	26767.6263
49	1753.0	4960.0	10 YRS PLUS
50	1750.0	5799.0	10 YRS PLUS
51	1763.0	1939.8	10 YRS PLUS
52	1757.0	3786.0	10 YRS PLUS
53	1696.0	26217.1	669.1994
54	1656.0	35784.7	185.7130
55	1700.0	21837.1	1182.1779
56	1678.0	26830.8	471.0728

LEADING EDGE W_{CLE} = 0.001339 LBS/SEC/BLADE (0.254% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001808 LBS/SEC/BLADE (0.344% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00319 LBS/SEC/BLADE (0.606% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0016 LBS/SEC/BLADE (0.304% OF HOT GAS FLOW)

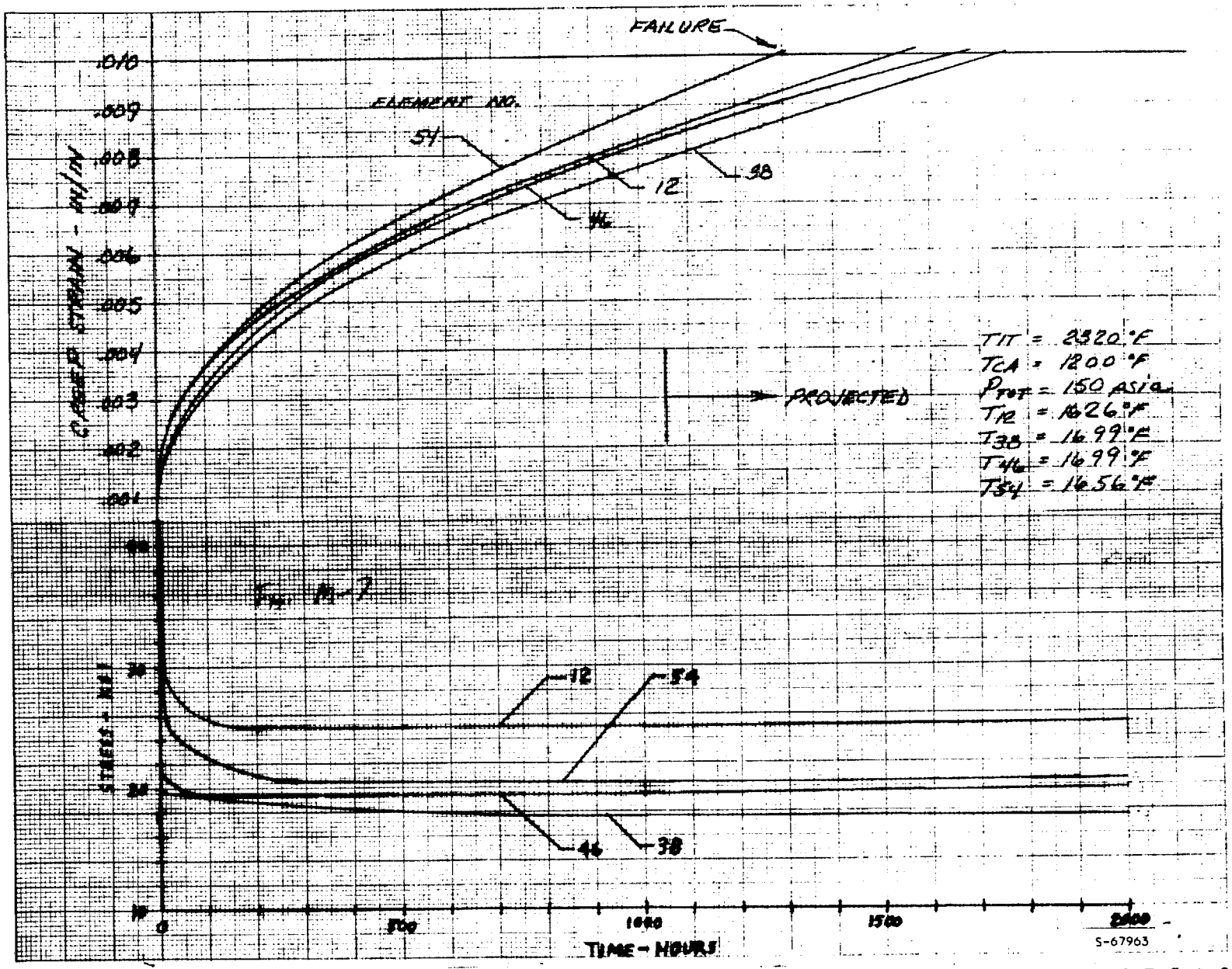

FIGURE M-7. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE TIP SECTION OF THE 1.0 INCH CHORD SCHEME B-5 BLADE.

TABLE M-26

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, HUB SECTION, 23980. RPM, TIT = 2600°F, WCA = 0.027692 LBS/SEC/BLADE (5.54% OF HOT GAS FLOW), TCA = 900°F, PTOT = 150 PSIA

CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1743.0	-25228.6	210.1489
2	1661.0	-796.8	10 YRS PLUS
3	1737.0	-24432.5	284.4864
4	1672.0	-4849.4	10 YRS PLUS
5	1670.0	-5088.3	10 YRS PLUS
6	1624.0	9648.5	10 YRS PLUS
7	1588.0	19504.3	43630.6310
8	1539.0	33383.1	6399.9753
9	1463.0	52289.2	1413.5844
10	1427.0	61581.7	741.1916
11	1465.0	50368.0	1866.3137
12	1412.0	63525.8	781.0541
13	1484.0	43369.0	3677.7544
14	1427.0	59463.8	1098.1739
15	1494.0	38395.7	7159.3387
16	1437.0	54280.3	2067.3952
17	1469.0	41889.7	7244.8387
18	1425.0	54166.6	2968.8974
19	1509.0	28646.2	43389.1660
20	1495.0	32725.5	25554.8210
21	1533.0	20194.2	10 YRS PLUS
22	1495.0	30628.7	41336.6150
23	1537.0	16824.7	10 YRS PLUS
24	1529.0	19196.4	10 YRS PLUS
25	1458.0	34843.1	46058.7510
26	1419.0	45181.5	17414.7080
27	1483.0	25414.2	10 YRS PLUS
28	455.0	32787.5	81467.7020
29	1759.0	-26546.6	111.150[illegible]
30	1698.0	-11143.6	38136.5340
31	1722.0	-16518.8	3544.3933
32	1676.0	-3264.1	10 YRS PLUS
33	1620.0	15554.6	70413.0440
34	1550.0	34341.7	3828.4819
35	1548.0	36145.7	2701.2324
36	1500.0	47823.0	1105.8814
37	1574.0	28634.7	7098.2211
38	1515.0	44865.7	1218.4455
39	1607.0	17985.3	43696.7400
40	1544.0	34165.3	4685.6839
41	1621.0	10779.5	10 YRS PLUS
42	1556.0	28382.2	12260.1618
43	1597.0	14538.6	10 YRS PLUS
44	1536.0	30433.0	13482.8943
45	1526.0	29776.4	20685.2240
46	1479.0	41918.1	5430.5933
47	1564.0	15921.2	10 YRS PLUS
48	1550.0	19500.0	10 YRS PLUS
49	1585.0	7521.9	10 YRS PLUS
50	1574.0	10387.7	10 YRS PLUS
51	1586.0	4392.9	10 YRS PLUS
52	1577.0	6712.1	10 YRS PLUS
53	1466.0	33169.9	53708.4860
54	1416.0	46165.3	15982.3073
55	1467.0	24541.8	10 YRS PLUS
56	1454.0	33129.0	77492.7340

Leading Edge W_{CLE} = 0.00165 lbs/sec/blade (0.33% of hot gas flow)

Pressure Side W_{CAP} = 0.002628 lbs/sec/blade (0.526% of hot gas flow)

Suction Side W_{CAS} = 0.003503 lbs/sec/blade (0.701% of hot gas flow)

Trailing Edge W_{CTE} = 0.0016 lbs/sec/blade (0.32% of hot gas flow)

TABLE M-27

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1775.0	-27373.3	65.4724
2	1689.0	-8721.9	10 YRS PLUS
3	1782.0	-27690.9	52.5239
4	1717.0	-17256.4	3154.3312
5	1709.0	-14864.3	8442.3640
6	1671.0	-3084.8	10 YRS PLUS
7	1619.0	13629.4	10 YRS PLUS
8	1574.0	26947.7	10296.0345
9	1490.0	50424.3	929.9229
10	1462.0	57955.7	543.0933
11	1485.0	52752.7	714.3506
12	1454.0	59761.3	493.2971
13	1514.0	45555.1	1113.9420
14	1481.0	54879.4	552.2522
15	1548.0	36303.8	2607.5038
16	1512.0	46567.8	990.3192
17	1539.0	38196.4	2174.0895
18	1508.0	47099.6	1007.7070
19	1617.0	15628.1	74576.6980
20	1606.0	19550.3	26196.0910
21	1652.0	3782.8	10 YRS PLUS
22	1643.0	7016.8	10 YRS PLUS
23	1659.0	676.1	10 YRS PLUS
24	1650.0	3799.5	10 YRS PLUS
25	1545.0	32837.1	6137.1998
26	1494.0	46786.4	1553.7639
27	1570.0	24948.2	17856.5150
28	1538.0	33721.7	6096.6719
29	1791.0	-27483.9	44.8142
30	1723.0	-18175.9	2014.3064
31	1758.0	-26062.7	125.4118
32	1718.0	-15597.8	5290.5426
33	1692.0	-5994.2	10 YRS PLUS
34	1640.0	9637.5	10 YRS PLUS
35	1572.0	32356.9	3295.4211
36	1540.0	40637.0	1270.0332
37	1636.0	15554.8	45494.0050
38	1597.0	27176.8	5278.1731
39	1673.0	4951.1	10 YRS PLUS
40	1632.0	17152.8	29443.6240
41	1678.0	3237.4	10 YRS PLUS
42	1635.0	16003.8	40130.9450
43	1662.0	7256.6	10 YRS PLUS
44	1620.0	19778.8	16593.2000
45	1604.0	24187.6	8395.7335
46	1568.0	33495.1	2851.0443
47	1670.0	2005.0	10 YRS PLUS
48	1661.0	4247.4	10 YRS PLUS
49	1684.0	-3779.7	10 YRS PLUS
50	1674.0	-1234.5	10 YRS PLUS
51	1675.0	-2552.5	10 YRS PLUS
52	1665.0	117.5	10 YRS PLUS
53	1550.0	32703.4	5517.5819
54	1496.0	46824.9	1461.5735
55	1571.0	25555.1	15193.4893
56	1536.0	34726.0	5139.8009

Leading Edge W_{CLE} = 0.00174 lbs/sec/blade (0.348% of hot gas flow)

Pressure Side W_{CAP} = 0.002474 lbs/sec/blade (0.495% of hot gas flow)

Suction Side W_{CAS} = 0.003594 lbs/sec/blade (0.719% of hot gas flow)

Trailing Edge W_{CTE} = 0.0017 lbs/sec/blade (0.34% of hot gas flow)

TABLE M-28

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1734.0	-8009.2	10 YRS PLUS
2	1683.0	7634.2	10 YRS PLUS
3	1780.0	-21235.6	199.9631
4	1744.0	-10929.1	12542.3345
5	1729.0	-6342.3	10 YRS PLUS
6	1706.0	732.5	10 YRS PLUS
7	1656.0	16840.0	17264.5460
8	1634.0	23877.8	4074.8731
9	1543.0	50835.0	214.2723
10	1532.0	52814.2	204.2738
11	1534.0	52798.3	194.5312
12	1522.0	54806.1	189.2569
13	1589.0	39853.1	407.7068
14	1574.0	44119.0	294.7086
15	1643.0	23635.4	3400.3580
16	1627.0	28864.3	1675.0375
17	1648.0	22319.6	3956.0032
18	1632.0	27528.9	1962.5573
19	1702.0	5533.0	10 YRS PLUS
20	1696.0	7532.4	10 YRS PLUS
21	1732.0	-3574.5	10 YRS PLUS
22	1727.0	-1919.4	10 YRS PLUS
23	1754.0	-10060.9	12904.3916
24	1747.0	-7866.6	76409.5140
25	1608.0	35249.0	685.7501
26	1554.0	50230.4	178.8670
27	1631.0	27904.8	1857.5884
28	1592.0	40078.1	361.2735
29	1783.0	-21513.1	176.6132
30	1746.0	-11036.5	11520.8125
31	1765.0	-15836.7	1545.9141
32	1742.0	-9279.8	30427.8380
33	1732.0	-5549.2	10 YRS PLUS
34	1703.0	3176.1	10 YRS PLUS
35	1600.0	36714.8	611.3507
36	1583.0	41288.2	372.6666
37	1658.0	19462.7	6784.5528
38	1637.0	25989.8	2399.9847
39	1692.0	9588.3	10 YRS PLUS
40	1670.0	16314.3	14260.7340
41	1698.0	8198.3	10 YRS PLUS
42	1676.0	14929.9	19347.0650
43	1697.0	8691.3	10 YRS PLUS
44	1675.0	15412.2	16911.0140
45	1662.0	19665.3	5716.0281
46	1639.0	26780.8	1925.5252
47	1720.0	1461.9	10 YRS PLUS
48	1714.0	3170.0	10 YRS PLUS
49	1735.0	-3262.1	10 YRS PLUS
50	1730.0	-1920.3	10 YRS PLUS
51	1737.0	-4571.0	10 YRS PLUS
52	1730.0	-2152.2	10 YRS PLUS
53	1605.0	36939.8	512.7381
54	1553.0	50542.4	174.2247
55	1625.0	30362.0	1277.6437
56	1587.0	41760.3	311.7260

Leading Edge W_{CLE} = 0.00148 lbs/sec/blade (0.296% of hot gas flow)

Pressure Side W_{CAP} = 0.001998 lbs/sec/blade (0.4% of hot gas flow)

Suction Side W_{CAS} = 0.003525 lbs/sec/blade (0.705% of hot gas flow)

Trailing Edge W_{CTE} = 0.0018 lbs/sec/blade (0.36% of hot gas flow)

TABLE M-29

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 25165. RPM, TIT = 2910.°F,
WCA = 0.031363 LBS/SEC/BLADE (6.6% OF HOT GAS FLOW),
TCA = 600.°F, PTOT = 150. PSIA
CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1758.0	-32771.4	32.3088
2	1633.0	-7826.9	10 YRS PLUS
3	1751.0	-33253.6	34.2728
4	1652.0	-14456.4	42845.0820
5	1655.0	-16422.3	20401.0050
6	1596.0	4863.4	10 YRS PLUS
7	1547.0	14340.6	10 YRS PLUS
8	1467.0	36473.8	24173.0920
9	1366.0	61457.0	4410.4299
10	1311.0	72414.6	2645.8877
11	1362.0	60904.7	5536.5490
12	1284.0	76093.5	2878.6204
13	1393.0	50199.9	15429.3139
14	1308.0	71545.4	3453.7808
15	1410.0	42872.3	34406.5870
16	1323.0	67253.8	5155.3604
17	1375.0	47995.3	39794.5600
18	1307.0	67267.6	8428.6889
19	1442.0	27134.2	10 YRS PLUS
20	1421.0	33137.3	10 YRS PLUS
21	1478.0	15023.8	10 YRS PLUS
22	1463.0	19427.7	10 YRS PLUS
23	1478.0	11981.4	10 YRS PLUS
24	1467.0	15221.1	10 YRS PLUS
25	1341.0	43582.1	10 YRS PLUS
26	1252.0	59455.1	10 YRS PLUS
27	1358.0	32693.0	10 YRS PLUS
28	1326.0	43599.8	10 YRS PLUS
29	1750.0	-31745.9	24.3904
30	1656.0	-22520.6	1449.3725
31	1725.0	-30806.8	102.1575
32	1656.0	-11766.9	10 YRS PLUS
33	1595.0	8993.9	10 YRS PLUS
34	1489.0	36045.5	14154.2859
35	1487.0	38567.5	8345.5255
36	1413.0	56374.6	2631.6742
37	1512.0	31624.2	20221.9510
38	1423.0	55569.9	2443.0174
39	1560.0	17178.4	10 YRS PLUS
40	1444.0	41124.2	9543.7934
41	1582.0	7664.0	10 YRS PLUS
42	1484.0	32646.8	35765.9580
43	1552.0	11083.9	10 YRS PLUS
44	1460.0	34637.8	45545.1110
45	1456.0	31371.2	10 YRS PLUS
46	1379.0	50876.8	20850.6070
47	1520.0	9599.9	10 YRS PLUS
48	1498.0	15107.2	10 YRS PLUS
49	1547.0	-1238.3	10 YRS PLUS
50	1531.0	2818.2	10 YRS PLUS
51	1531.0	-823.3	10 YRS PLUS
52	1519.0	2167.9	10 YRS PLUS
53	1352.0	41451.9	10 YRS PLUS
54	1277.0	61160.9	76264.0140
55	1375.0	31254.3	10 YRS PLUS
56	1326.0	43773.8	10 YRS PLUS

Leading Edge W_{CLE} = 0.001869 lbs/sec/blade (0.393% of hot gas flow)

Pressure Side W_{CAP} = 0.002977 lbs/sec/blade (0.626% of hot gas flow)

Suction Side W_{CAS} = 0.003968 lbs/sec/blade (0.834% of hot gas flow)

Trailing Edge W_{CTE} = 0.001812 lbs/sec/blade (0.381% of hot gas flow)

TABLE M-30

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1768.0	-33360.4	22.9773
2	1640.0	-14501.5	58346.0160
3	1778.0	-33209.7	19.0093
4	1681.0	-26874.4	659.5702
5	1678.0	-25849.6	880.2892
6	1621.0	-8397.1	10 YRS PLUS
7	1561.0	9441.2	10 YRS PLUS
8	1498.0	26636.7	10 YRS PLUS
9	1379.0	59201.4	4599.9394
10	1337.0	68763.5	2498.5272
11	1366.0	64143.3	2612.9404
12	1320.0	72137.8	2129.0052
13	1408.0	53849.3	5138.5738
14	1358.0	66622.3	2039.0750
15	1456.0	41410.7	11433.2597
16	1404.0	55695.6	4150.4882
17	1443.0	44433.4	9821.9990
18	1398.0	56866.3	4008.6968
19	1567.0	10821.4	10 YRS PLUS
20	1551.0	15719.1	10 YRS PLUS
21	1612.0	-2758.0	10 YRS PLUS
22	1600.0	1468.4	10 YRS PLUS
23	1603.0	-1000.4	10 YRS PLUS
24	1591.0	2789.2	10 YRS PLUS
25	1433.0	43263.9	16162.9060
26	1358.0	63434.6	3805.516[illegible]
27	1463.0	34181.6	48363.5[illegible]
28	1415.0	46900.2	14444.8973
29	1789.0	-32450.9	17.4016
30	1688.0	-27990.1	440.3003
31	1742.0	-33074.5	43.5314
32	1682.0	-24860.0	981.1711
33	1659.0	-15722.9	23216.2735
34	1581.0	6928.8	10 YRS PLUS
35	1469.0	34839.8	10679.0750
36	1441.0	47056.5	6566.8884
37	1559.0	18933.9	10 YRS PLUS
38	1502.0	33618.5	17051.49[illegible]
39	1612.0	5551.6	10 YRS PLUS
40	1551.0	21802.4	61030.4800
41	1622.0	2534.8	10 YRS PLUS
42	1560.0	19381.9	10 YRS PLUS
43	1606.0	6575.6	10 YRS PLUS
44	1542.0	23346.6	55817.1940
45	1532.0	25526.9	45483.5180
46	1477.0	39348.4	9299.3771
47	1642.0	-7416.0	10 YRS PLUS
48	1628.0	-3817.9	10 YRS PLUS
49	1658.0	-13887.6	44169.7440
50	1644.0	-10305.4	10 YRS PLUS
51	1626.0	-5898.9	10 YRS PLUS
52	1613.0	-2433.4	10 YRS PLUS
53	1440.0	42962.2	13879.0181
54	1361.0	63360.3	3530.8124
55	1464.0	35026.9	36965.6120
56	1412.0	48257.5	12396.4882

Leading Edge W_{CLE} = 0.00197 lbs/sec/blade (0.414% of hot gas flow)

Pressure Side W_{CAP} = 0.002802 lbs/sec/blade (0.589% of hot gas flow)

Suction Side W_{CAS} = 0.004071 lbs/sec/blade (0.856% of hot gas flow)

Trailing Edge W_{CTE} = 0.001926 lbs/sec/blade (0.404% of hot gas flow)

TABLE M-31

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1698.0	-13985.9	14935.9700
2	1622.0	9315.0	10 YRS PLUS
3	1763.0	-27913.0	77.0090
4	1710.0	-17387.5	3597.7481
5	1693.0	-12050.5	32227.2160
6	1659.0	-1678.7	10 YRS PLUS
7	1602.0	16623.6	80226.3220
8	1568.0	25991.0	14982.3117
9	1441.0	60000.7	676.1367
10	1424.0	62860.3	633.0800
11	1420.0	64049.0	565.2715
12	1402.0	67122.5	521.3223
13	1497.0	47853.0	1193.4694
14	1475.0	53830.7	778.4711
15	1573.0	28151.9	8112.0443
16	1549.0	34767.2	3576.9790
17	1577.0	27692.3	8056.0375
18	1551.0	34841.4	3333.5502
19	1674.0	-1052.9	10 YRS PLUS
20	1666.0	1513.8	10 YRS PLUS
21	1710.0	-11548.1	24422.0200
22	1702.0	-9042.1	10 YRS PLUS
23	1726.0	-15955.6	3855.4836
24	1716.0	-12901.8	13435.5323
25	1514.0	46190.9	1000.3689
26	1434.0	63711.2	408.9249
27	1544.0	38351.5	1836.1523
28	1484.0	54536.9	540.2431
29	1766.0	-27879.7	72.4363
30	1711.0	-17435.4	3454.2872
31	1741.0	-25524.7	207.3098
32	1706.0	-15449.8	7516.9744
33	1704.0	-14138.6	12173.1025
34	1660.0	-881.8	10 YRS PLUS
35	1519.0	40731.1	2198.2894
36	1493.0	47642.0	1379.5505
37	1588.0	23371.4	15437.5820
38	1557.0	31693.3	5713.1547
39	1627.0	12697.3	10 YRS PLUS
40	1594.0	22627.9	15431.4826
41	1637.0	10432.9	10 YRS PLUS
42	1604.0	20610.5	19192.7220
43	1640.0	10051.9	10 YRS PLUS
44	1608.0	19892.5	22053.5460
45	1599.0	23175.9	11963.0510
46	1571.0	30634.8	4949.9931
47	1704.0	-8919.7	10 YRS PLUS
48	1695.0	-6332.7	10 YRS PLUS
49	1724.0	14635.1	6231.1340
50	1716.0	12425.1	15702.2937
51	1704.0	-8874.6	10 YRS PLUS
52	1695.0	-6034.8	10 YRS PLUS
53	1508.0	48433.8	803.5834
54	1433.0	64038.6	395.2361
55	1534.0	41530.2	1283.4667
56	1478.0	56403.9	460.5481

Leading Edge W_{CLE} = 0.001676 lbs/sec/blade (0.352% of hot gas flow)

Pressure Side W_{CAP} = 0.00226 lbs/sec/blade (0.475% of hot gas flow)

Suction Side W_{CAS} = 0.003993 lbs/sec/blade (0.84% of hot gas flow)

Trailing Edge W_{CTE} = 0.002039 lbs/sec/blade (0.429% of hot gas flow)

TABLE M-32

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 24058. RPM, TIT = 2620.°F,
WCA = 0.083974 LBS/SEC/BLADE (5.63% OF HOT GAS FLOW),
TCA = 900°F, PTOT = 450. PSIA
CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1738.0	-33552.0	43.2390
2	1580.0	4351.5	10 YRS PLUS
3	1738.0	-33682.7	42.1021
4	1610.0	-4279.1	10 YRS PLUS
5	1692.0	-28764.7	340.0659
6	1587.0	3253.5	10 YRS PLUS
7	1579.0	6232.2	10 YRS PLUS
8	1455.0	40219.2	14486.0092
9	1414.0	52253.3	5733.4550
10	1331.0	71177.2	1852.6480
11	1453.0	43891.3	8088.5380
12	1335.0	71590.9	1514.6819
13	1494.0	33832.7	20399.5730
14	1364.0	67620.4	1406.6636
15	1512.0	29233.6	34825.4730
16	1380.0	65107.6	1438.6587
17	1467.0	40124.8	10413.4998
18	1352.0	68925.8	1549.3644
19	1507.0	28071.0	52405.9240
20	1475.0	37743.6	14280.0610
21	1541.0	17486.6	10 YRS PLUS
22	1517.0	24862.2	81360.4300
23	1568.0	10920.3	10 YRS PLUS
24	1543.0	15724.5	10 YRS PLUS
25	1464.0	33094.0	58000.5060
26	1376.0	56760.0	7838.4229
27	1469.0	23421.2	10 YRS PLUS
28	1420.0	41702.0	31360.9960
29	1759.0	-32886.2	30.8713
30	1637.0	-11256.9	10 YRS PLUS
31	1763.0	-31855.5	34.7678
32	1657.0	-14168.6	41279.6960
33	1603.0	7607.9	10 YRS PLUS
34	1445.0	48719.5	4372.8916
35	1513.0	36130.3	7058.9652
36	1411.0	61406.1	1202.2813
37	1379.0	21907.3	27237.7570
38	1452.0	56965.3	848.9630
39	1637.0	6820.0	10 YRS PLUS
40	1499.0	43655.2	2311.8253
41	1669.0	-2995.2	10 YRS PLUS
42	1533.0	34548.5	5807.3085
43	1647.0	1729.3	10 YRS PLUS
44	1518.0	36682.5	5421.2255
45	1552.0	25943.9	23571.4960
46	1446.0	52547.3	2173.5178
47	1572.0	16718.1	10 YRS PLUS
48	1539.0	24498.2	46958.9990
49	1600.0	6291.7	10 YRS PLUS
50	1575.0	12098.3	10 YRS PLUS
51	1637.0	-8282.4	10 YRS PLUS
52	1617.0	-2904.1	10 YRS PLUS
53	1488.0	29106.1	71945.7430
54	1378.0	57381.7	6594.4934
55	1503.0	21202.8	10 YRS PLUS
56	1422.0	42054.5	27745.6770

Leading Edge W_{CLE} = 0.00506 lbs/sec/blade (0.339% of hot gas flow)

Pressure Side W_{CAP} = 0.007884 lbs/sec/blade (0.527% of hot gas flow)

Suction Side W_{CAS} = 0.00896 lbs/sec/blade (0.599% of hot gas flow)

Trailing Edge W_{CTE} = 0.005 lbs/sec/blade (0.335% of hot gas flow)

TABLE M-33

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1762.0	-32882.1	28.8999
2	1596.0	1794.2	10 YRS PLUS
3	1779.0	-32390.9	21.9117
4	1649.0	-13939.2	55301.3040
5	1723.0	-32184.5	80.6372
6	1631.0	-7576.3	10 YRS PLUS
7	1599.0	3618.5	10 YRS PLUS
8	1490.0	32973.1	27650.2100
9	1430.0	50891.9	4589.1413
10	1364.0	66670.4	1693.1005
11	1455.0	46697.8	4681.6935
12	1380.0	65362.9	1369.3483
13	1501.0	36743.3	8586.4382
14	1420.0	58517.6	1582.8604
15	1548.0	25583.1	28571.1560
16	1463.0	48825.2	2579.3822
17	1527.0	32522.6	10821.4755
18	1451.0	53237.1	1674.0474
19	1607.0	11479.6	10 YRS PLUS
20	1580.0	19546.0	53716.5930
21	1644.0	503.6	10 YRS PLUS
22	1622.0	7725.5	10 YRS PLUS
23	1677.0	-9202.5	10 YRS PLUS
24	1656.0	-2472.0	10 YRS PLUS
25	1544.0	29750.7	12582.3204
26	1433.0	59539.8	915.8471
27	1572.0	22219.4	30662.9070
28	1490.0	44423.5	2596.1588
29	1784.0	-32234.0	20.2649
30	1649.0	-13052.0	56953.1720
31	1780.0	-31922.3	23.5443
32	1684.0	-23198.6	1321.8972
33	1654.0	-12211.9	86448.5670
34	1528.0	23505.1	80448.1150
35	1508.0	32065.4	20490.8900
36	1429.0	52775.3	3386.0239
37	1608.0	8363.0	10 YRS PLUS
38	1515.0	33453.1	12262.2744
39	1659.0	-4560.0	10 YRS PLUS
40	1558.0	24523.6	27351.6530
41	1669.0	-5930.9	10 YRS PLUS
42	1566.0	23949.2	24871.4670
43	1659.0	-1969.8	10 YRS PLUS
44	1555.0	27810.1	14313.4023
45	1586.0	20525.1	32334.6960
46	1495.0	44283.9	2318.1047
47	1639.0	4620.0	10 YRS PLUS
48	1610.0	13007.8	10 YRS PLUS
49	1667.0	-4018.0	10 YRS PLUS
50	1642.0	3038.6	10 YRS PLUS
51	1688.0	-10623.8	58961.7980
52	1665.0	-4127.8	10 YRS PLUS
53	1551.0	29321.1	11414.9590
54	1434.0	60007.5	820.0782
55	1573.0	23032.3	25091.6200
56	1485.0	46260.5	2177.2449

Leading Edge W_{CLE} = 0.00543 lbs/sec/blade (0.363% of hot gas flow)

Pressure Side W_{CAP} = 0.00742 lbs/sec/blade (0.496% of hot gas flow)

Suction Side W_{CAS} = 0.01089 lbs/sec/blade (0.729% of hot gas flow)

Trailing Edge W_{CTE} = 0.0056 lbs/sec/blade (0.375% of hot gas flow)

TABLE M-34

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1673.0	-6157.9	10 YRS PLUS
2	1568.0	25037.2	18499.5280
3	1746.0	-26384.4	154.9338
4	1670.0	-4371.6	10 YRS PLUS
5	1732.0	-21790.4	549.5454
6	1674.0	-4959.8	10 YRS PLUS
7	1642.0	5385.6	10 YRS PLUS
8	1583.0	22705.4	20476.4300
9	1462.0	55975.4	766.0663
10	1434.0	61368.6	635.0247
11	1476.0	53386.1	817.9305
12	1444.0	60258.5	593.1138
13	1550.0	35269.5	3112.6989
14	1512.0	45146.1	1259.8357
15	1618.0	18077.9	31350.5630
16	1578.0	29400.9	5384.2336
17	1623.0	18986.3	20074.3220
18	1575.0	32746.8	2792.1107
19	1674.0	5496.2	10 YRS PLUS
20	1658.0	10201.8	10 YRS PLUS
21	1712.0	-3690.4	10 YRS PLUS
22	1598.0	31457.6	2022.4927
23	1803.0	-22732.6	88.2004
24	1788.0	-22354.1	133.2580
25	1614.0	30833.9	1529.8831
26	1496.0	58493.9	199.4293
27	1643.0	23522.4	3483.2413
28	1545.0	51310.8	188.0517
29	1742.0	-27592.2	132.9341
30	1663.0	-4165.7	10 YRS PLUS
31	1762.0	-28492.7	70.0789
32	1702.0	-16671.0	5567.1189
33	1690.0	-13764.3	19771.6050
34	1612.0	10391.6	10 YRS PLUS
35	1509.0	38249.2	4871.1213
36	1464.0	50545.4	1860.8270
37	1595.0	15626.5	10 YRS PLUS
38	1539.0	31069.7	10753.3303
39	1635.0	4660.9	10 YRS PLUS
40	1576.0	22355.0	26813.7970
41	1643.0	4642.1	10 YRS PLUS
42	1583.0	22877.1	19719.3570
43	1657.0	2900.4	10 YRS PLUS
44	1598.0	21368.8	18219.5480
45	1635.0	12361.5	10 YRS PLUS
46	1585.0	27561.9	6683.6006
47	1693.0	-2500.6	10 YRS PLUS
48	1678.0	2177.6	10 YRS PLUS
49	1714.0	-5886.7	10 YRS PLUS
50	1700.0	-1481.4	10 YRS PLUS
51	1768.0	-17567.5	827.6349
52	1754.0	-15025.6	2615.9731
53	1603.0	33378.0	1169.8450
54	1492.0	58939.5	205.2968
55	1628.0	27601.5	2141.2753
56	1536.0	52624.9	190.2174

Leading Edge W_{CLE} = 0.00467 lbs/sec/blade (0.312% of hot gas flow)

Pressure Side W_{CAP} = 0.00615 lbs/sec/blade (0.411% of hot gas flow)

Suction Side W_{CAS} = 0.01131 lbs/sec/blade (0.757% of hot gas flow)

Trailing Edge W_{CTE} = 0.0056 lbs/sec/blade (0.375% of hot gas flow)

TABLE M-35

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 23823. RPM, TIT = 2560.°F,
WCA = 0.00913 LBS/SEC/BLADE (5.44% OF HOT GAS FLOW),
TCA = 900.°F, PTOT = 50.PSIA
CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1755.0	-18670.0	791.6042
2	1719.0	-8280.8	10 YRS PLUS
3	1743.0	-16316.7	2254.9108
4	1714.0	-7645.7	10 YRS PLUS
5	1668.0	5210.0	10 YRS PLUS
6	1651.0	10856.2	10 YRS PLUS
7	1591.0	27690.8	5534.5008
8	1571.0	33556.1	2597.2375
9	1503.0	49360.0	785.1571
10	1489.0	53591.0	555.4422
11	1483.0	51870.7	877.5259
12	1462.0	58018.8	537.1718
13	1483.0	48749.1	1500.4214
14	1460.0	55299.1	910.2987
15	1483.0	45416.6	2660.1332
16	1459.0	51985.5	1665.4108
17	1472.0	44459.9	4266.5687
18	1453.0	49662.1	2954.3427
19	1481.0	39088.7	8812.7026
20	1474.0	40867.1	7499.1142
21	1496.0	32972.5	23464.2470
22	1490.0	34538.1	19455.6420
23	1512.0	26467.2	65325.1460
24	1508.0	27481.4	58231.5250
25	1516.0	22680.7	10 YRS PLUS
26	1503.0	26062.8	10 YRS PLUS
27	1543.0	12985.8	10 YRS PLUS
28	1534.0	15308.5	10 YRS PLUS
29	1763.0	-19969.5	431.9222
30	1736.0	-12603.4	8922.6000
31	1703.0	-1957.5	10 YRS PLUS
32	1696.0	2701.2	10 YRS PLUS
33	1623.0	21925.3	8266.7630
34	1596.0	29410.5	3330.0912
35	1585.0	31590.1	2763.2675
36	1565.0	36119.4	1727.3307
37	1589.0	28140.3	5291.0043
38	1564.0	34857.5	2345.7073
39	1600.0	22176.8	14474.2349
40	1573.0	28775.6	7069.5364
41	1600.0	18164.5	49807.8190
42	1573.0	25228.4	15458.5463
43	1581.0	19305.8	56802.7360
44	1556.0	26078.7	20464.5750
45	1543.0	25696.3	32060.6880
46	1525.0	30777.9	16969.2320
47	1539.0	23515.2	58544.5260
48	1531.0	25927.4	42763.2610
49	1544.0	19721.1	10 YRS PLUS
50	1538.0	21646.7	10 YRS PLUS
51	1550.0	15689.8	10 YRS PLUS
52	1546.0	16956.5	10 YRS PLUS
53	1521.0	20821.7	10 YRS PLUS
54	1504.0	25534.7	10 YRS PLUS
55	1544.0	12260.2	10 YRS PLUS
56	1534.0	15002.1	10 YRS PLUS

Leading Edge W_{CLE} = 0.0005 lbs/sec/blade (0.298% of hot gas flow)

Pressure Side W_{CAP} = 0.000876 lbs/sec/blade (0.522% of hot gas flow)

Suction Side W_{CAS} = 0.001168 lbs/sec/blade (0.696% of hot gas flow)

Trailing Edge W_{CTE} = 0.000533 lbs/sec/blade (0.318% of hot gas flow)

TABLE M-36

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1795.0	-22295.9	115.0904
2	1757.0	-13912.9	3475.9463
3	1791.0	-22396.5	123.4635
4	1742.0	-15744.8	1711.0662
5	1717.0	-3231.2	10 YRS PLUS
6	1704.0	819.7	10 YRS PLUS
7	1635.0	21346.6	6825.3697
8	1618.0	26846.8	3263.4223
9	1545.0	46002.4	455.1776
10	1534.0	49079.7	362.5788
11	1523.0	50274.3	395.5395
12	1510.0	53622.3	316.1398
13	1529.0	46746.1	611.2668
14	1516.0	50223.4	479.7016
15	1546.0	40536.4	1101.5020
16	1531.0	44454.2	851.6420
17	1547.0	38394.3	1679.0368
18	1534.0	41831.1	1220.4076
19	1572.0	30087.8	5437.0664
20	1566.0	31636.0	4537.8617
21	1598.0	21665.6	17078.5110
22	1593.0	22945.4	14793.4976
23	1624.0	12409.2	10 YRS PLUS
24	1620.0	13580.2	10 YRS PLUS
25	1612.0	15088.3	10 YRS PLUS
26	1595.0	20105.4	29204.7110
27	1640.0	5325.0	10 YRS PLUS
28	1630.0	8389.0	10 YRS PLUS
29	1801.0	-22338.8	99.7234
30	1771.0	-17658.7	748.8497
31	1753.0	-12534.0	5973.2185
32	1738.0	-8312.1	69324.3560
33	1690.0	5688.3	10 YRS PLUS
34	1671.0	11421.1	71208.9340
35	1622.0	25674.4	3785.7624
36	1609.0	29591.5	2278.3388
37	1649.0	15255.1	35471.3250
38	1633.0	20152.6	10334.6847
39	1667.0	7502.5	10 YRS PLUS
40	1651.0	12472.7	85904.7960
41	1667.0	5548.6	10 YRS PLUS
42	1650.0	10926.8	10 YRS PLUS
43	1653.0	8083.9	10 YRS PLUS
44	1637.0	13233.4	10 YRS PLUS
45	1621.0	16519.9	49242.5020
46	1605.0	21719.1	13972.0938
47	1620.0	15412.8	73913.7130
48	1613.0	17766.3	39974.4550
49	1630.0	11010.1	10 YRS PLUS
50	1625.0	12774.4	10 YRS PLUS
51	1642.0	6216.4	10 YRS PLUS
52	1637.0	7929.0	10 YRS PLUS
53	1615.0	13646.4	10 YRS PLUS
54	1597.0	19276.7	36828.9240
55	1640.0	4997.0	10 YRS PLUS
56	1629.0	8560.1	10 YRS PLUS

Leading Edge W_{CLE} = 0.000546 lbs/sec/blade (0.325% of hot gas flow)

Pressure Side W_{CAP} = 0.000824 lbs/sec/blade (0.491% of hot gas flow)

Suction Side W_{CAS} = 0.001171 lbs/sec/blade (0.698% of hot gas flow)

Trailing Edge W_{CTE} = 0.000576 lbs/sec/blade (0.338% of hot gas flow)

TABLE M-37

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1800.0	-9642.4	5506.1168
2	1778.0	-3753.9	10 YRS PLUS
3	1817.0	-14353.8	725.9490
4	1802.0	-10237.3	3758.3496
5	1753.0	3737.1	10 YRS PLUS
6	1746.0	5439.8	10 YRS PLUS
7	1685.0	22800.8	1401.3037
8	1677.0	24977.9	1083.4096
9	1612.0	43806.0	120.0094
10	1608.0	44598.9	116.5003
11	1567.0	47665.4	118.9836
12	1562.0	48295.7	121.5580
13	1611.0	39529.5	251.5327
14	1606.0	40529.8	236.1945
15	1641.0	28796.1	1190.1248
16	1635.0	30154.3	1036.1572
17	1641.0	28265.2	1332.8897
18	1633.0	30318.3	1052.3612
19	1649.0	25629.6	1907.3748
20	1646.0	26070.2	1874.3694
21	1676.0	17287.6	8619.4929
22	1673.0	17689.8	8333.7864
23	1710.0	6874.7	10 YRS PLUS
24	1706.0	7580.0	10 YRS PLUS
25	1679.0	16692.3	9951.2874
26	1661.0	21808.7	3158.8690
27	1702.0	9851.7	55594.7190
28	1689.0	13486.2	22250.4790
29	1823.0	-17553.4	233.1509
30	1807.0	-13486.8	1202.1434
31	1781.0	-8205.5	25007.9950
32	1773.0	-5615.5	10 YRS PLUS
33	1738.0	2267.6	10 YRS PLUS
34	1727.0	5919.2	10 YRS PLUS
35	1654.0	25121.7	1871.3953
36	1647.0	27646.8	1306.4733
37	1674.0	15210.3	18567.9110
38	1665.0	18466.0	7906.6169
39	1685.0	9347.2	10 YRS PLUS
40	1676.0	12736.8	40176.9050
41	1686.0	7805.5	10 YRS PLUS
42	1678.0	10800.1	72600.5170
43	1687.0	7247.7	10 YRS PLUS
44	1678.0	10597.6	77662.4520
45	1668.0	13549.9	37876.3720
46	1660.0	16640.1	16617.7850
47	1668.0	14422.5	28289.3940
48	1664.0	16121.7	17798.8490
49	1681.0	11386.8	55132.3090
50	1679.0	12587.1	39002.4700
51	1702.0	7820.8	10 YRS PLUS
52	1699.0	7485.4	10 YRS PLUS
53	1677.0	14859.0	19297.4340
54	1660.0	20857.6	4033.3455
55	1699.0	8954.2	10 YRS PLUS
56	1687.0	13073.7	26878.5260

Leading Edge W_{CLE} = 0.000461 lbs/sec/blade (0.275% of hot gas flow)

Pressure Side W_{CAP} = 0.000666 lbs/sec/blade (0.397% of hot gas flow)

Suction Side W_{CAS} = 0.001222 lbs/sec/blade (0.728% of hot gas flow)

Trailing Edge W_{CTE} = 0.000596 lbs/sec/blade (0.355% of hot gas flow)

TABLE M-38

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 22857 RPM, TIT = 2320°F,
WCA = 0.013293 LBS/SEC/BLADE (2.53% OF HOT GAS FLOW)
TCA = 900°F, PTOT = 150 PSIA
CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1708.0	-8025.8	10 YRS PLUS
2	1662.0	6219.0	10 YRS PLUS
3	1703.0	-6934.1	10 YRS PLUS
4	1667.0	4380.2	10 YRS PLUS
5	1659.0	6541.2	10 YRS PLUS
6	1633.0	15045.6	58680.0560
7	1602.0	24606.9	8084.6491
8	1571.0	33558.8	2595.6781
9	1530.0	44413.4	880.5492
10	1508.0	50916.5	527.3559
11	1539.0	41846.0	1065.8150
12	1505.0	51725.8	497.8237
13	1549.0	38577.5	1528.2010
14	1514.0	48843.6	638.7182
15	1555.0	36141.3	2241.7275
16	1519.0	46557.4	822.6227
17	1543.0	38024.4	2029.5532
18	1515.0	46171.3	977.1326
19	1540.0	37564.5	2438.6251
20	1532.0	40091.3	1723.1501
21	1557.0	31916.5	5436.5440
22	1552.0	33578.1	4300.1764
23	1595.0	20356.9	26769.0110
24	1589.0	22232.9	19274.0040
25	1594.0	18990.9	44165.9160
26	1574.0	24598.0	17283.3890
27	1622.0	8869.6	10 YRS PLUS
28	1608.0	13255.0	10 YRS PLUS
29	1720.0	-10893.4	23374.2760
30	1686.0	-642.9	10 YRS PLUS
31	1699.0	-3268.5	10 YRS PLUS
32	1673.0	4434.3	10 YRS PLUS
33	1634.0	18214.4	19449.8960
34	1594.0	29925.2	3137.3548
35	1602.0	29210.5	2970.9470
36	1572.0	36707.6	1261.6996
37	1626.0	22186.3	7220.5780
38	1589.0	33729.1	1557.3232
39	1645.0	16132.6	29354.6130
40	1608.0	26961.0	4136.3785
41	1651.0	13221.2	66744.8600
42	1612.0	24765.9	5988.7288
43	1632.0	17451.5	26598.9650
44	1597.0	27757.2	4650.9147
45	1589.0	28387.0	5012.9294
46	1560.0	35805.6	2114.2378
47	1579.0	28986.3	5742.2431
48	1570.0	31136.1	4551.9163
49	1601.0	21370.6	16789.9520
50	1594.0	23085.5	13964.3577
51	1632.0	9994.6	10 YRS PLUS
52	1625.0	11985.8	10 YRS PLUS
53	1600.0	17986.8	52960.7870
54	1574.0	24902.9	16159.8350
55	1624.0	8614.8	10 YRS PLUS
56	1607.0	13769.2	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.000792 LBS/SEC/BLADE (0.151% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001262 LBS/SEC/BLADE (0.24% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001682 LBS/SEC/BLADE (0.32% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000768 LBS/SEC/BLADE (0.146% OF HOT GAS FLOW)

TABLE M-39

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1768.0	-16173.9	1291.7604
2	1718.0	-1160.2	10 YRS PLUS
3	1771.0	-17023.7	916.9961
4	1734.0	-5936.5	10 YRS PLUS
5	1722.0	-1952.6	10 YRS PLUS
6	1700.0	5002.1	10 YRS PLUS
7	1656.0	19742.2	6504.5444
8	1630.0	28164.3	1602.6497
9	1576.0	45702.4	216.2490
10	1559.0	50722.1	145.2467
11	1591.0	43188.8	223.3148
12	1570.0	49406.8	136.7819
13	1612.0	36239.0	324.3787
14	1591.0	44957.0	167.4564
15	1635.0	31591.7	761.7506
16	1613.0	39138.0	240.4494
17	1633.0	32713.9	629.[illegible]
18	1614.0	39274.6	246.6738
19	1643.0	29693.2	934.4914
20	1636.0	32347.2	631.9841
21	1685.0	16239.0	9910.1964
22	1679.0	18522.4	5412.9312
23	1729.0	2405.9	10 YRS PLUS
24	1722.0	4852.5	10 YRS PLUS
25	1701.0	10779.1	39751.4140
26	1675.0	19210.0	4768.1819
27	1730.0	1452.9	10 YRS PLUS
28	1714.0	6512.3	10 YRS PLUS
29	1780.0	-19034.1	391.4703
30	1742.0	-7969.1	80638.3770
31	1762.0	-12761.1	4449.6677
32	1739.0	-6143.8	10 YRS PLUS
33	1718.0	1895.4	10 YRS PLUS
34	1688.0	10991.1	52205.2350
35	1661.0	22050.0	3001.7815
36	1641.0	28204.4	1360.3057
37	1714.0	7924.4	10 YRS PLUS
38	1691.0	14796.3	13691.3763
39	1736.0	2849.7	10 YRS PLUS
40	1711.0	10136.2	37807.2360
41	1734.0	4244.6	10 YRS PLUS
42	1709.0	11478.8	25638.9760
43	1719.0	9010.7	67529.8640
44	1694.0	16312.1	7679.3330
45	1680.0	21087.7	2272.4928
46	1657.0	27817.6	979.9314
47	1670.0	23683.1	1693.8353
48	1664.0	25094.6	1442.4560
49	1709.0	10810.8	31922.6320
50	1702.0	12507.9	21938.3450
51	1741.0	304.1	10 YRS PLUS
52	1733.0	2361.9	10 YRS PLUS
53	1704.0	10991.1	34274.2970
54	1677.0	19144.8	4630.3836
55	1730.0	2284.7	10 YRS PLUS
56	1713.0	7233.6	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0008352 LBS/SEC/BLADE (0.159% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0011876 LBS/SEC/BLADE (0.226% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001725 LBS/SEC/BLADE (0.328% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000816 LBS/SEC/BLADE (0.155% OF HOT GAS FLOW)

TABLE M-40

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1753.0	977.2	10 YRS PLUS
2	1725.0	9720.8	33903.0570
3	1783.0	-7445.9	41413.8850
4	1763.0	-1564.7	10 YRS PLUS
5	1749.0	3324.8	10 YRS PLUS
6	1737.0	6979.3	10 YRS PLUS
7	1697.0	20540.0	1763.0154
8	1685.0	24330.7	1017.7448
9	1628.0	43069.8	91.4427
10	1622.0	44310.3	86.7048
11	1645.0	40237.5	95.2558
12	1637.0	41877.5	88.9086
13	1684.0	29276.1	370.8417
14	1675.0	32233.4	248.0787
15	1717.0	20245.3	1187.2307
16	1708.0	23175.2	736.7947
17	1715.0	22426.2	725.7980
18	1702.0	26649.3	414.8484
19	1704.0	27314.4	344.4542
20	1700.0	28665.7	286.4430
21	1768.0	8345.5	31315.6280
22	1763.0	9938.9	10993.6333
23	1807.0	-2460.5	10 YRS PLUS
24	1802.0	-799.2	10 YRS PLUS
25	1756.0	14021.9	3439.4501
26	1729.0	22692.3	490.8246
27	1778.0	8040.2	30430.5630
28	1758.0	14316.1	2980.3530
29	1787.0	-9002.6	12041.4992
30	1767.0	-3032.4	10 YRS PLUS
31	1779.0	-6215.8	10 YRS PLUS
32	1766.0	-2343.0	10 YRS PLUS
33	1758.0	731.6	10 YRS PLUS
34	1742.0	5656.4	10 YRS PLUS
35	1696.0	21371.0	1437.4303
36	1685.0	24950.8	894.0138
37	1743.0	8316.8	60673.5620
38	1731.0	12041.0	12147.8207
39	1760.0	4696.2	10 YRS PLUS
40	1747.0	8628.7	43410.5380
41	1760.0	6457.3	10 YRS PLUS
42	1747.0	10404.8	13773.8085
43	1755.0	9448.1	19299.7220
44	1742.0	13387.9	5958.4536
45	1731.0	18229.7	1627.2057
46	1720.0	21594.7	763.2282
47	1711.0	25939.4	387.0811
48	1707.0	27090.7	335.2102
49	1764.0	10386.4	9059.2003
50	1760.0	11493.4	7016.5665
51	1798.0	1198.6	10 YRS PLUS
52	1793.0	2376.2	10 YRS PLUS
53	1735.0	14805.4	2740.2618
54	1729.0	22914.6	468.9761
55	1775.0	9320.0	12852.3140
56	1756.0	15148.9	2394.9780

LEADING EDGE W_{CLE} = 0.00071 LBS/SEC/BLADE (0.135% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0009591 LBS/SEC/BLADE (0.182% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001692 LBS/SEC/BLADE (0.322% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000864 LBS/SEC/BLADE (0.164% OF HOT GAS FLOW)

TABLE M-41

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, HUB SECTION, 22857 RPM, TIT = 2320°F, WCA = 0.009852 LBS/SEC/BLADE (1.87% OF HOT GAS FLOW) TCA = 600°F, PTOT = 150 PSIA

CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1674.0	-6928.4	10 YRS PLUS
2	1625.0	8409.6	10 YRS PLUS
3	1670.0	-6255.2	10 YRS PLUS
4	1631.0	6177.9	10 YRS PLUS
5	1624.0	7958.3	10 YRS PLUS
6	1596.0	17085.3	80833.8030
7	1568.0	24570.8	20509.1450
8	1535.0	34076.8	6112.2616
9	1497.0	44087.8	2268.7358
10	1472.0	51581.4	1246.2232
11	1505.0	41949.9	2620.9369
12	1467.0	53116.1	1096.5960
13	1514.0	38926.6	3637.5111
14	1474.0	50799.5	1350.0108
15	1516.0	37422.2	4844.1769
16	1476.0	49123.0	1706.1044
17	1495.0	41280.3	3871.7305
18	1463.0	50669.7	1872.5689
19	1485.0	42261.4	4325.4936
20	1477.0	44944.9	3410.1667
21	1514.0	33118.5	13607.4458
22	1507.0	35452.0	9741.9360
23	1563.0	18266.8	10 YRS PLUS
24	1556.0	20520.9	74997.9820
25	1570.0	14135.1	10 YRS PLUS
26	1548.0	20328.6	10 YRS PLUS
27	1606.0	1889.6	10 YRS PLUS
28	1592.0	5967.9	10 YRS PLUS
29	1669.0	-10446.8	60884.2740
30	1653.0	516.5	10 YRS PLUS
31	1670.0	-2726.1	10 YRS PLUS
32	1642.0	5520.1	10 YRS PLUS
33	1611.0	17635.2	44168.8010
34	1568.0	28899.1	7876.4811
35	1586.0	26393.6	8405.6167
36	1552.0	34532.3	3476.4137
37	1610.0	20430.0	17366.1340
38	1570.0	32237.1	3569.1740
39	1629.0	14582.8	76629.6790
40	1588.0	25764.4	9141.8885
41	1631.0	12703.4	10 YRS PLUS
42	1590.0	24083.6	12511.9790
43	1608.0	17591.8	48679.6710
44	1570.0	27394.5	10402.1856
45	1556.0	29150.6	10334.0429
46	1524.0	37054.6	4224.7180
47	1529.0	33486.6	8236.3179
48	1521.0	35171.3	7025.9765
49	1563.0	22148.3	40293.3100
50	1554.0	24204.2	32839.7510
51	1604.0	8508.1	10 YRS PLUS
52	1596.0	10538.0	10 YRS PLUS
53	1575.0	13762.2	10 YRS PLUS
54	1547.0	21071.6	80512.1350
55	1608.0	1855.8	10 YRS PLUS
56	1591.0	6565.1	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0005871 LBS/SEC/BLADE (0.112% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0009351 LBS/SEC/BLADE (0.178% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0012464 LBS/SEC/BLADE (0.237% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0005691 LBS/SEC/BLADE (0.108% OF HOT GAS FLOW)

TABLE M-42

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1735.0	-14644.5	4720.6223
2	1643.0	1426.3	10 YRS PLUS
3	1739.0	-15990.5	2765.2600
4	1701.0	-4140.7	10 YRS PLUS
5	1659.0	-136.4	10 YRS PLUS
6	1666.0	7330.8	10 YRS PLUS
7	1626.0	21024.0	9269.9467
8	1598.0	30089.4	2724.9244
9	1551.0	44562.4	494.7728
10	1532.0	50311.9	310.7111
11	1547.0	42082.2	492.6728
12	1544.0	49044.6	281.4278
13	1586.0	38331.7	614.1969
14	1563.0	45217.9	325.6895
15	1606.0	33144.0	1139.4392
16	1583.0	40436.6	428.3173
17	1595.0	36562.0	718.1426
18	1574.0	43010.8	353.3045
19	1592.0	37160.2	680.5432
20	1585.0	39685.8	468.2783
21	1654.0	17288.9	15647.6167
22	1646.0	20375.7	6812.7057
23	1709.0	-399.5	10 YRS PLUS
24	1701.0	2484.2	10 YRS PLUS
25	1687.0	5618.9	10 YRS PLUS
26	1660.0	14392.0	35345.8670
27	1724.0	-6528.9	10 YRS PLUS
28	1708.0	-1505.5	10 YRS PLUS
29	1749.0	-17870.6	1178.7879
30	1710.0	-6134.3	10 YRS PLUS
31	1733.0	-11401.9	14210.6582
32	1709.0	-4443.3	10 YRS PLUS
33	1695.0	2243.0	10 YRS PLUS
34	1664.0	11519.0	83214.6590
35	1651.0	19099.3	9199.3569
36	1629.0	25687.3	3147.3397
37	1706.0	5119.3	10 YRS PLUS
38	1681.0	12381.9	39605.3180
39	1726.0	898.7	10 YRS PLUS
40	1701.0	7932.8	10 YRS PLUS
41	1721.0	3004.3	10 YRS PLUS
42	1695.0	10312.9	54287.4230
43	1702.0	8526.2	10 YRS PLUS
44	1675.0	16229.2	12879.2168
45	1653.0	23173.7	2902.0787
46	1629.0	29952.6	1259.9027
47	1624.0	31051.7	1129.9323
48	1617.0	32568.1	974.0359
49	1681.0	11782.8	48332.6720
50	1672.0	13917.2	30130.0830
51	1722.0	-2185.9	10 YRS PLUS
52	1713.0	33.3	10 YRS PLUS
53	1690.0	6269.7	10 YRS PLUS
54	1661.0	14847.2	29541.2040
55	1724.0	-5397.5	10 YRS PLUS
56	1706.0	-318.9	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0006188 LBS/SEC/BLADE (0.118% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0008801 LBS/SEC/BLADE (0.167% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001279 LBS/SEC/BLADE (0.243% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000605 LBS/SEC/BLADE (0.115% OF HOT GAS FLOW)

TABLE M-43

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1721.0	4097.3	10 YRS PLUS
2	1693.0	13000.8	23539.2180
3	1755.0	-5904.3	10 YRS PLUS
4	1734.0	519.8	10 YRS PLUS
5	1722.0	4848.3	10 YRS PLUS
6	1789.0	8929.7	10 YRS PLUS
7	1675.0	20817.2	2790.4015
8	1662.0	24985.3	1573.7300
9	1611.0	42784.0	145.0213
10	1614.0	45125.6	118.0547
11	1629.0	39019.6	179.9315
12	1620.0	41995.1	131.9874
13	1669.0	27902.0	714.3038
14	1659.0	31259.1	450.0774
15	1700.0	19548.2	2269.2951
16	1691.0	22555.5	1271.0057
17	1687.0	25125.7	820.6340
18	1673.0	29747.4	439.0721
19	1656.0	36304.3	166.3508
20	1652.0	37740.5	135.1784
21	1745.0	9051.3	33391.2160
22	1740.0	10741.8	14740.2681
23	1795.0	-5027.1	10 YRS PLUS
24	1749.0	-3175.9	10 YRS PLUS
25	1747.0	10075.3	15317.7325
26	1718.0	19378.1	1538.2315
27	1774.0	2488.5	10 YRS PLUS
28	1754.0	8715.6	34023.4670
29	1760.0	-7375.7	78465.3517
30	1739.0	-92[illegible].7	10 YRS PLUS
31	1735.0	-5014.0	10 YRS PLUS
32	1742.0	-1121.8	10 YRS PLUS
33	1740.0	540.2	10 YRS PLUS
34	1724.0	5433.5	10 YRS PLUS
35	1691.0	17515.7	5867.7972
36	1680.0	21008.0	2310.7924
37	1739.0	4644.3	10 YRS PLUS
38	1726.0	8574.7	77951.4167
39	1753.0	2162.4	10 YRS PLUS
40	1740.0	5983.1	10 YRS PLUS
41	1750.0	4803.7	10 YRS PLUS
42	1737.0	8664.8	54726.4700
43	1741.0	8873.0	42248.5170
44	1728.0	12734.8	10459.6335
45	1709.0	19956.4	1587.8919
46	1697.0	23563.6	869.0703
47	1641.0	36380.1	145.1059
48	1657.0	37482.2	126.5348
49	1743.0	11110.8	12129.0761
50	1737.0	12769.6	8245.5917
51	1785.0	-1179.4	10 YRS PLUS
52	1779.0	540.4	10 YRS PLUS
53	1745.0	11517.7	10114.2916
54	1719.0	19468.4	1457.3471
55	1771.0	4005.5	10 YRS PLUS
56	1752.0	9684.6	17476.4250

LEADING EDGE W_{CLE} = 0.0005264 LBS/SEC/BLADE (0.1% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00071 LBS/SEC/BLADE (0.135% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001254 LBS/SEC/BLADE (0.238% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000641 LBS/SEC/BLADE (0.122% OF HOT GAS FLOW)

TABLE M-44

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 23183. RPM, TIT = 2400. °F,
WCA = 0.02909 LBS/SEC/BLADE (5.61% OF HOT GAS FLOW
TCA = 1200 °F, PTOT = 150. PSIA
CONDITION 1B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1739.0	-7283.9	10 YRS PLUS
2	1682.0	9787.5	10 YRS PLUS
3	1736.0	-6332.0	10 YRS PLUS
4	1691.0	6989.1	10 YRS PLUS
5	1691.0	6874.8	10 YRS PLUS
6	1660.0	16149.8	19590.7721
7	1638.0	22552.8	4876.[illegible]
8	1603.0	33221.6	1210.[illegible]
9	1561.0	43951.9	422.[illegible]
10	1540.0	49026.7	313.[illegible]
11	1562.0	42563.2	517.9798
12	1531.0	50164.6	326.[illegible]
13	1577.0	37830.5	864.7314
14	1543.0	46072.9	473.[illegible]
15	1587.0	34700.8	1376.[illegible]
16	1552.0	43303.4	594.[illegible]
17	1579.0	36997.8	986.[illegible]
18	1553.0	43273.5	581.[illegible]
19	1605.0	30082.9	2272.[illegible]
20	1597.0	31921.1	1875.[illegible]
21	1625.0	24266.5	4739.4611
22	1619.0	25711.1	4261.[illegible]
23	1640.0	20254.4	8303.6774
24	1635.0	21464.4	6653.[illegible]
25	1623.0	26662.3	2981.7514
26	1597.	34475.9	1175.1743
27	1646.0	20580.3	6357.4012
28	1629.0	25850.7	3038.[illegible]
29	1749.0	-10760.6	11678.9524
30	1707.0	1658.6	10 YRS PLUS
31	1721.0	-4098.4	10 YRS PLUS
32	1689.0	5798.2	10 YRS PLUS
33	1641.0	18285.3	15760.3554
34	1592.0	33883.2	1392.6523
35	1539.0	32104.5	2222.1415
36	1555.0	42013.0	880.4711
37	1603.0	26276.8	5475.8069
38	1563.0	36770.2	1576.5487
39	1626.0	17787.6	27881.1137
40	1582.0	31661.5	2944.7763
41	1639.0	13332.6	10 YRS PLUS
42	1594.0	28058.3	4715.8515
43	1627.0	17662.4	28522.5387
44	1585.0	31035.9	3120.3347
45	1589.0	30329.7	3276.7914
46	1558.0	39527.7	975.1782
47	1622.0	21886.9	8558.7479
48	1613.0	25257.7	5244.[illegible]
49	1641.0	17017.6	24271.1031
50	1634.0	19681.3	11614.[illegible]
51	1650.0	15478.1	32031.[illegible]
52	1645.0	17395.0	19156.5957
53	1626.0	24585.0	4311.6174
54	1597.0	33921.8	1213.4611
55	1645.0	20171.4	7492.7278
56	1626.0	26370.6	2937.3492

LEADING EDGE W_{CLE} = 0.001955 LBS/SEC/BLADE (0.377% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002497 LBS/SEC/BLADE (0.482% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.004421 LBS/SEC/BLADE (0.852% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00152 LBS/SEC/BLADE (0.293% OF HOT GAS FLOW)

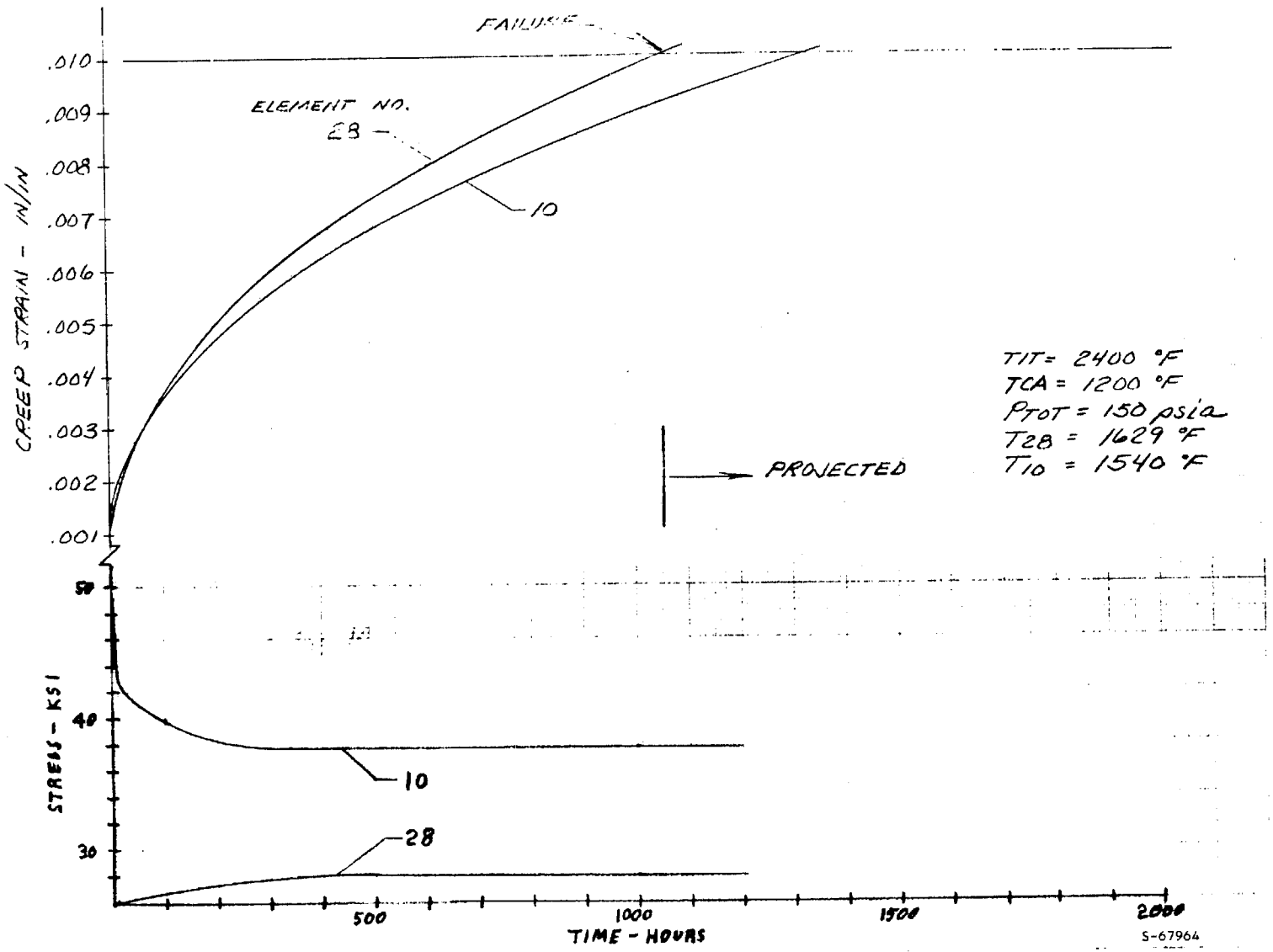

FIGURE M-8. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE ROOT SECTION OF THE 1.0 INCH CHORD SCHEME B-5 BLADE.

TABLE M-45

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION IB

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1805.0	-14289.3	979.1011
2	1747.0	2186.9	10 YRS PLUS
3	1809.0	-14573.3	815.8541
4	1766.0	-2821.5	10 YRS PLUS
5	1760.0	-554.7	10 YRS PLUS
6	1735.0	6375.0	10 YRS PLUS
7	1698.0	17585.1	4557.4349
8	1668.0	26470.6	989.9605
9	1616.0	42807.0	127.7745
10	1600.0	46907.4	97.6168
11	1616.0	42420.2	135.9769
12	1596.0	47571.8	96.7049
13	1636.0	36580.4	255.5098
14	1616.0	42134.2	142.3767
15	1661.0	30007.3	558.1971
16	1639.0	36183.0	258.3727
17	1661.0	32356.8	339.6843
18	1641.0	37870.1	171.6100
19	1709.0	19386.7	1914.2236
20	1702.0	20864.8	1399.7760
21	1740.0	12248.9	9052.5784
22	1734.0	13445.5	7139.9888
23	1769.0	5749.0	10 YRS PLUS
24	1764.0	6760.4	10 YRS PLUS
25	1743.0	16215.6	2331.2584
26	1713.0	25380.8	414.0691
27	1762.0	12799.5	4395.2363
28	1743.0	18635.4	1066.6230
29	1814.0	-18494.9	212.9076
30	1769.0	-5565.6	10 YRS PLUS
31	1790.0	-13737.3	659.2936
32	1763.0	-5556.7	10 YRS PLUS
33	1733.0	752.1	10 YRS PLUS
34	1698.0	12269.5	26307.3900
35	1641.0	26790.6	1825.8930
36	1618.0	34906.7	573.2633
37	1633.0	11492.2	50480.0160
38	1655.0	21227.8	6165.7300
39	1708.0	3872.4	10 YRS PLUS
40	1678.0	14171.0	25637.8820
41	1712.0	4454.5	10 YRS PLUS
42	1683.0	14418.7	19098.9990
43	1703.0	10214.4	45424.7010
44	1673.0	20506.5	3255.9405
45	1666.0	25102.4	1368.5923
46	1640.0	34374.6	370.9146
47	1714.0	13730.3	10780.9080
48	1707.0	16700.2	4860.3807
49	1742.0	8488.1	56820.3610
50	1735.0	11344.2	13763.8158
51	1760.0	6245.9	10 YRS PLUS
52	1754.0	8599.2	37781.1360
53	1740.0	15672.3	3059.3626
54	1709.0	25954.8	404.8075
55	1759.0	12649.8	4963.6292
56	1738.0	19584.8	885.0510

LEADING EDGE W_{CLE} = 0.00175 LBS/SEC/BLADE (0.337% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002172 LBS/SEC/BLADE (0.419% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.004064 LBS/SEC/BLADE (0.784% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001493 LBS/SEC/BLADE (0.288% OF HOT GAS FLOW)

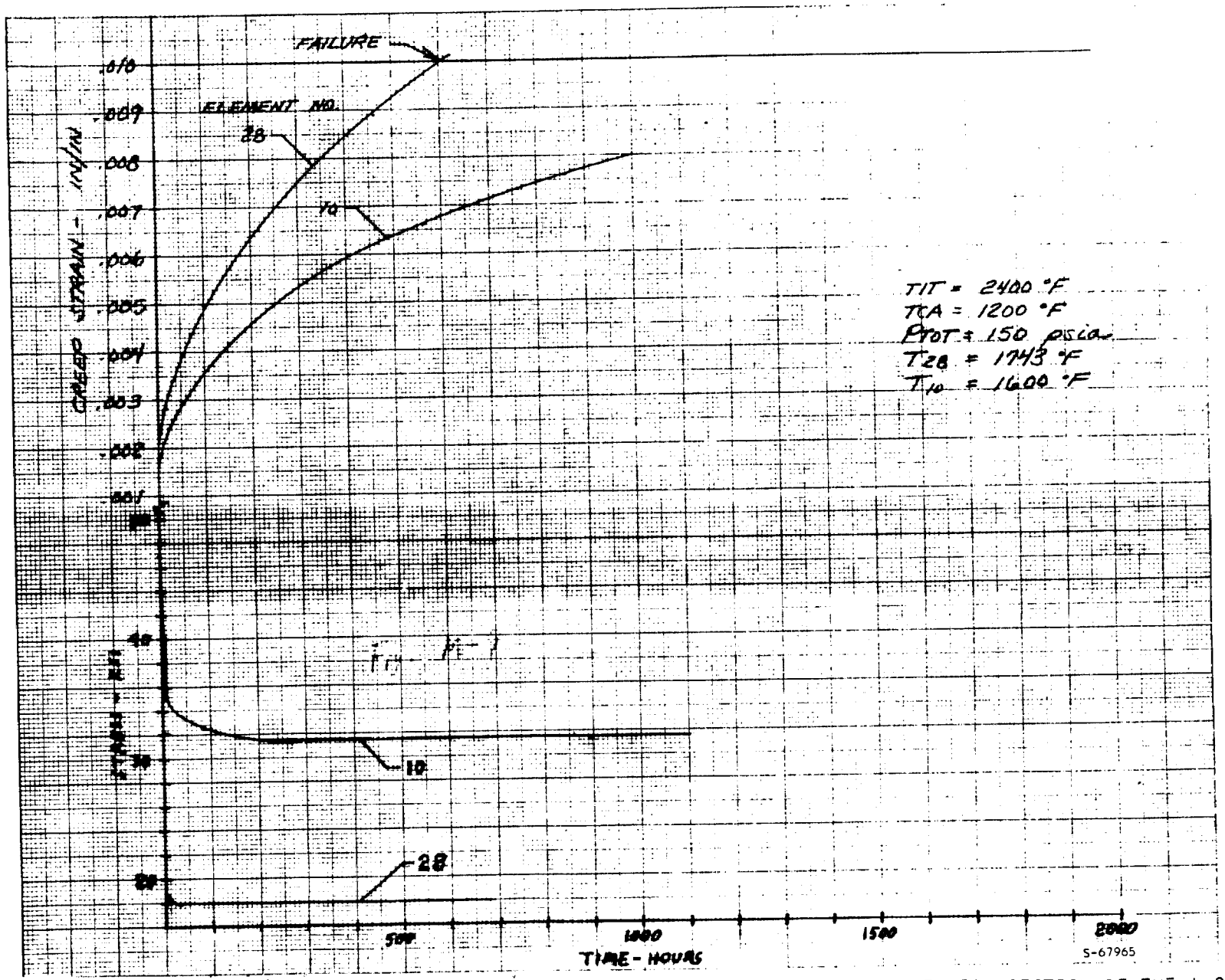

FIGURE M-9. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE MEAN SECTION OF THE 1.0 INCH CHORD SCHEME B-5 BLADE.

TABLE M-46

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 1B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1776.0	1257.8	10 YRS PLUS
2	1741.0	11705.2	10525.[illegible]
3	1807.0	-5813.0	73917.[illegible]
4	1782.0	789.7	10 YRS PLUS
5	1772.0	4995.6	10 YRS PLUS
6	1757.0	8719.9	31418.[illegible]
7	1722.0	19243.9	1457.[illegible]
8	1707.0	23239.3	744.[illegible]
9	1652.0	39969.5	84.1705
10	1645.0	41056.5	83.6517
11	1648.0	40655.3	82.[illegible]
12	1640.0	41971.0	81.[illegible]
13	1666.0	30909.4	251.[illegible]
14	1677.0	32879.1	206.[illegible]
15	1724.0	20956.6	794.1666
16	1715.0	22994.0	645.[illegible]
17	1732.0	21774.1	551.[illegible]
18	1721.0	24558.9	405.[illegible]
19	1767.0	14240.1	2454.4427
20	1763.0	14761.8	2288.2677
21	1801.0	7512.9	25123.8190
22	1798.0	7673.8	24089.4210
23	1836.0	-714.3	10 YRS PLUS
24	1831.0	123.8	10 YRS PLUS
25	1786.0	18113.0	456.[illegible]
26	1754.0	26726.3	121.[illegible]
27	1801.0	16256.3	578.[illegible]
28	1776.0	23451.0	140.[illegible]
29	1808.0	-11010.6	2554.[illegible]
30	1783.0	-3581.0	10 YRS PLUS
31	1793.0	-9718.6	6173.[illegible]
32	1777.0	-4409.5	10 YRS PLUS
33	1761.0	-2516.0	10 YRS PLUS
34	1741.0	4225.6	10 YRS PLUS
35	1657.0	27338.1	1084.[illegible]
36	1645.0	31936.2	551.[illegible]
37	1692.0	14503.0	14701.[illegible]
38	1677.0	20014.0	3466.[illegible]
39	1716.0	7170.9	10 YRS PLUS
40	1700.0	13081.5	19110.2210
41	1721.0	8504.6	10 YRS PLUS
42	1705.0	14266.1	11378.1770
43	1724.0	11351.6	18166.[illegible]
44	1708.0	17089.6	4170.[illegible]
45	1703.0	22331.0	991.3059
46	1689.0	27497.2	476.2939
47	1759.0	9959.2	11766.6767
48	1755.0	11633.3	7593.[illegible]
49	1781.0	8391.6	21827.[illegible]
50	1777.0	10252.6	6860.5471
51	1803.0	9709.7	4877.7956
52	1799.0	8023.5	18237.7220
53	1778.0	17661.6	634.[illegible]
54	1780.0	26909.5	126.9724
55	1794.0	16322.7	667.[illegible]
56	1770.0	24183.6	139.1594

LEADING EDGE W_{CLE} = 0.00157 LBS/SEC/BLADE (0.303% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001808 LBS/SEC/BLADE (0.349% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00424 LBS/SEC/BLADE (0.818% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0016 LBS/SEC/BLADE (0.309% OF HOT GAS FLOW)

TABLE M-47

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 24214. RPM, TIT = 2660°F,
WCA = 0.010327 LBS/SEC/BLADE (6.26% OF HOT GAS FLOW)
TCA = 900°F, PTOT = 50. PSIA
CONDITION 2B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1773.0	-18661.6	518.8908
2	1730.0	-6826.3	10 YRS PLUS
3	1761.0	-15579.5	1848.1804
4	1727.0	-6237.0	10 YRS PLUS
5	1681.0	7196.3	10 YRS PLUS
6	1661.0	12873.2	57291.9120
7	1601.0	30289.7	2411.6415
8	1579.0	35795.7	1284.5268
9	1515.0	50750.2	450.5871
10	1500.0	53900.6	392.7241
11	1495.0	53199.8	505.6475
12	1473.0	57922.7	405.4814
13	1499.0	49909.8	796.1795
14	1475.0	54787.6	659.9784
15	1504.0	46701.2	1201.1499
16	1479.0	51883.7	976.3620
17	1497.0	47368.5	1291.8902
18	1477.0	51434.0	1114.3433
19	1515.0	42194.0	1914.0711
20	1507.0	43350.1	1956.2668
21	1538.0	36113.3	3564.4666
22	1532.0	36948.5	3477.6107
23	1569.0	28175.0	8996.0366
24	1564.0	28882.7	8813.1040
25	1602.0	19946.9	25478.0160
26	1588.0	23323.5	15600.0817
27	1640.0	9244.1	10 YRS PLUS
28	1631.0	11840.9	10 YRS PLUS
29	1780.0	-21121.9	204.5649
30	1748.0	-12532.2	6765.5585
31	1707.0	-2575.1	10 YRS PLUS
32	1687.0	3546.1	10 YRS PLUS
33	1610.0	23167.2	8927.1367
34	1577.0	33095.0	2452.5812
35	1543.0	32200.6	4340.9108
36	1538.0	39753.9	1574.5766
37	1564.0	27896.2	10965.9240
38	1535.0	34805.4	5188.9183
39	1579.0	20612.9	38063.6420
40	1548.0	30096.0	10429.4215
41	1586.0	16613.1	10 YRS PLUS
42	1555.0	26376.5	19691.9990
43	1573.0	19699.1	62157.6290
44	1544.0	28891.7	15248.5135
45	1543.0	28427.1	17396.9920
46	1520.0	35997.4	5990.9980
47	1554.0	26827.0	18314.4350
48	1545.0	30267.2	10903.5897
49	1571.0	23234.8	25359.2650
50	1565.0	25782.5	17038.7860
51	1591.0	19172.4	45058.5880
52	1587.0	20927.5	27348.9800
53	1606.0	16589.7	72639.4300
54	1591.0	21475.7	21536.7860
55	1640.0	7856.7	10 YRS PLUS
56	1629.0	11630.4	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0006248 LBS/SEC/BLADE (0.379% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0008751 LBS/SEC/BLADE (0.531% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001469 LBS/SEC/BLADE (0.891% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0005329 LBS/SEC/BLADE (0.323% OF HOT GAS FLOW)

TABLE M-48

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 2B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1616.0	-20285.4	116.2557
2	1771.0	-11761.5	4913.7734
3	1813.0	-19800.1	144.3[illegible]
4	1770.0	-13677.3	2147.1[illegible]
5	1734.0	-234.8	10 YRS PLUS
6	1719.0	3360.1	10 YRS PLUS
7	1649.0	23621.6	2923.1[illegible]
8	1631.0	28411.8	1666.2475
9	1560.0	46937.5	264.7[illegible]
10	1548.0	48634.6	271.[illegible]
11	1538.0	50407.4	261.7[illegible]
12	1525.0	52186.5	272.1[illegible]
13	1548.0	46507.9	3[illegible]7.1[illegible]
14	1534.0	48855.4	376.4[illegible]
15	1569.0	41365.7	526.6491
16	1554.0	43845.[illegible]	515.[illegible]
17	1574.0	41773.5	433.[illegible]
18	1561.0	43712.1	439.[illegible]
19	1610.0	33752.1	9[illegible]
20	1603.0	34631.3	[illegible]
21	1648.0	24623.6	2423.3337
22	1643.0	24967.3	2[illegible].7[illegible]
23	1693.0	13221.5	21[illegible]
24	1678.0	13833.9	20[illegible]
25	1714.0	9535.4	51[illegible]
26	1698.0	13790.9	15[illegible].1324
27	1748.0	2171.0	10 YRS PLUS
28	1738.0	4875.0	10 YRS PLUS
29	1721.0	-21211.4	79.[illegible]
30	1736.0	-17591.1	538.1769
31	1763.0	-14758.0	2291.[illegible]
32	1746.0	-9206.2	29[illegible].[illegible]
33	1684.0	4547.0	10 YRS PLUS
34	1662.0	12357.1	66[illegible].[illegible]
35	1591.0	27260.6	[illegible]
36	1575.0	32688.2	2[illegible].3743
37	1614.0	14866.0	10 YRS PLUS
38	1595.0	21999.4	17226.3170
39	1636.0	5848.0	10 YRS PLUS
40	1616.0	13642.3	10 YRS PLUS
41	1647.0	3245.3	10 YRS PLUS
42	1627.0	11101.6	10 YRS PLUS
43	1640.0	8294.5	10 YRS PLUS
44	1620.0	16121.6	57997.[illegible]
45	1617.0	19017.1	23349.1[illegible]
46	1599.0	26402.3	5925.[illegible]751
47	1635.0	18116.9	19575.4[illegible]
48	1628.0	21783.5	7449.4467
49	1662.0	14064.1	37427.7450
50	1656.0	17329.9	14641.6795
51	1691.0	9373.1	10 YRS PLUS
52	1687.0	11665.2	42873.7452
53	1712.0	7056.2	10 YRS PLUS
54	1696.0	12[illegible]	22[illegible].7780
55	1746.0	573.6	10 YRS PLUS
56	1734.0	4922.9	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.000636 LBS/SEC/BLADE (0.386% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.000824 LBS/SEC/BLADE (0.5% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0015466 LBS/SEC/BLADE (0.938% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0005664 LBS/SEC/BLADE (0.344% OF HOT GAS FLOW)

TABLE M-49

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 2B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1803.0	-6473.5	50715.8760
2	1778.0	249.1	10 YRS PLUS
3	1826.0	-10514.3	1950.0392
4	1807.0	-6092.8	60388.8100
5	1759.0	9601.8	15578.0973
6	1750.0	10926.1	10798.8349
7	1691.0	27600.3	444.0768
8	1683.0	28838.9	416.3378
9	1627.0	43578.7	86.3603
10	1623.0	43808.1	91.7213
11	1606.0	46917.4	84.1332
12	1601.0	47388.5	88.1074
13	1638.0	39115.0	141.5072
14	1632.0	39330.0	156.4235
15	1674.0	29534.9	448.0544
16	1668.0	29906.6	479.9310
17	1679.0	31937.6	239.6846
18	1670.0	33460.9	216.2378
19	1696.0	31110.6	189.6133
20	1693.0	30678.5	222.8443
21	1740.0	22191.4	418.6172
22	1736.0	21981.8	480.4039
23	1799.0	8122.6	16972.6590
24	1794.0	8236.3	17685.9420
25	1807.0	9003.9	7376.0132
26	1790.0	13115.6	2019.8997
27	1835.0	3681.4	10 YRS PLUS
28	1822.0	6972.2	22082.5000
29	1828.0	-17369.3	220.6091
30	1809.0	-13161.6	1270.3212
31	1780.0	-10815.3	5330.6705
32	1770.0	-6742.8	10 YRS PLUS
33	1728.0	-30.6	10 YRS PLUS
34	1716.0	4810.6	10 YRS PLUS
35	1629.0	24665.8	3902.2020
36	1621.0	28449.8	2136.8340
37	1647.0	13751.9	62187.7650
38	1637.0	18252.4	17724.6460
39	1667.0	5700.0	10 YRS PLUS
40	1657.0	10503.1	10 YRS PLUS
41	1674.0	6288.2	10 YRS PLUS
42	1663.0	11131.0	10 YRS PLUS
43	1678.0	9804.3	10 YRS PLUS
44	1668.0	14320.6	29270.1970
45	1667.0	19253.9	5768.0810
46	1658.0	23470.3	2399.1062
47	1693.0	18712.2	3563.3552
48	1689.0	20926.0	1893.5759
49	1726.0	16096.1	3683.0824
50	1723.0	18362.6	1895.3490
51	1775.0	13903.7	2252.9867
52	1771.0	10198.3	8090.6297
53	1801.0	5456.3	10 YRS PLUS
54	1787.0	11081.8	4132.4563
55	1830.0	1312.4	10 YRS PLUS
56	1818.0	5999.0	49043.6410

LEADING EDGE W_{CLE} = 0.0005778 LBS/SEC/BLADE (0.35% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.000632 LBS/SEC/BLADE (0.383% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001482 LBS/SEC/BLADE (0.899% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00056 LBS/SEC/BLADE (0.34% OF HOT GAS FLOW)

TABLE M-50

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 25462. RPM, TIT = 2990°F
WCA = 0.0368 LBS/SEC/BLADE (7.84% OF HOT GAS FLOW)
TCA = 600.°F, PTOT = 150. PSIA
CONDITION 3B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1754.0	-33603.6	29.6526
2	1614.0	-5071.6	10 YRS PLUS
3	1748.0	-33803.7	32.7[illegible]
4	1636.0	-11858.2	10 YRS PLUS
5	1648.0	-15671.7	31654.[illegible]
6	1571.0	6576.1	10 YRS PLUS
7	1539.0	14735.6	10 YRS PLUS
8	1452.0	37667.2	203[illegible]4.2[illegible]
9	1357.0	62003.7	5169.165[illegible]
10	1301.0	72456.8	3563.5439
11	1343.0	64942.5	4439.5[illegible]
12	1265.0	77711.1	3736.1715
13	131[illegible]1.0	54058.7	11017.[illegible]
14	1294.0	73175.2	3[illegible]4.[illegible]
15	1403.0	47656.7	18049.[illegible]
16	1314.0	69963.8	3933.[illegible]
17	1375.0	54599.9	11[illegible]5.5561
18	1326.0	71115.5	4[illegible]4.[illegible]
19	1461.0	31877.9	64213.[illegible]
20	1440.0	37133.9	45936.2747
21	1510.0	18871.9	10 YRS PLUS
22	1495.0	22658.8	10 YRS PLUS
23	1532.0	13026.7	10 YRS PLUS
24	1520.0	16065.5	10 YRS PLUS
25	1456.0	33220.0	71453.[illegible]
26	1392.0	49772.2	17175.[illegible]
27	1494.0	23366.1	10 YRS PLUS
28	1452.0	34391.2	61197.[illegible]
29	1776.0	-32949.9	20.[illegible]31
30	1671.0	-22283.2	2217.[illegible]11
31	1714.0	-33223.8	[illegible].2404
32	1634.0	-11771.5	10 YRS PLUS
33	1564.0	7154.1	10 YRS PLUS
34	1444.0	39081.2	25774.[illegible]
35	1446.0	37377.9	36275.5[illegible]
36	1362.0	59610.6	7095.3[illegible]32
37	1467.0	30787.5	10 YRS PLUS
38	1372.0	55442.8	11237.[illegible]16
39	1526.0	14259.2	10 YRS PLUS
40	1422.0	41877.5	28635.9460
41	1565.0	3150.4	10 YRS PLUS
42	1461.0	31096.3	10 YRS PLUS
43	1538.0	10103.3	10 YRS PLUS
44	1440.0	36326.8	55577.6[illegible]
45	1433.0	37810.5	48280.1[illegible]
46	1356.0	58394.1	1[illegible]672.9579
47	1522.0	14550.8	10 YRS PLUS
48	1499.0	20923.3	10 YRS PLUS
49	1564.0	3472.6	10 YRS PLUS
50	1546.0	7997.3	10 YRS PLUS
51	1570.0	2090.4	10 YRS PLUS
52	1589.0	5213.[illegible]	10 YRS PLUS
53	1466.0	30[illegible]9.5	10 YRS PLUS
54	1394.0	48979.7	1[illegible]652.3[illegible]
55	1495.0	22756.8	10 YRS PLUS
56	1445.0	36004.1	51634.2147

LEADING EDGE W_{CLE} = 0.0023344 LBS/SEC/BLADE (0.498% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0030761 LBS/SEC/BLADE (0.656% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0049507 LBS/SEC/BLADE (1.055% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001873 LBS/SEC/BLADE (0.399% OF HOT GAS FLOW)

TABLE M-51

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 3B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1766.0	-32823.2	26.7603
2	1625.0	-8405.0	10 YRS PLUS
3	1778.0	-32151.8	23.4972
4	1671.0	-21124.8	2829.8187
5	1673.0	-20773.2	2978.7435
6	1610.0	-2701.8	10 YRS PLUS
7	1558.0	11616.4	10 YRS PLUS
8	1485.0	30167.4	61530.1210
9	1375.0	59235.4	5148.0184
10	1332.0	68149.7	3280.2182
11	1354.0	65098.4	3101.1040
12	1398.0	71993.0	3156.2334
13	1399.0	54548.0	5923.8015
14	1349.0	66491.9	2732.4128
15	1453.0	43003.9	9443.5398
16	1410.0	55725.3	4640.6392
17	1446.0	48640.9	4308.7184
18	1399.0	59728.9	2328.2477
19	1589.0	14212.0	10 YRS PLUS
20	1573.0	17594.3	10 YRS PLUS
21	1649.0	122.1	10 YRS PLUS
22	1636.0	3253.7	10 YRS PLUS
23	1665.0	-1042.7	10 YRS PLUS
24	1654.0	1674.0	10 YRS PLUS
25	1572.0	30408.0	5066.1556
26	1591.0	49016.9	578.3693
27	1599.0	26931.2	5280.4248
28	1551.0	39816.8	1099.2759
29	1736.0	-32729.6	17.5709
30	1675.0	-25060.7	1118.9678
31	1730.0	-34821.8	39.9950
32	1663.0	-23798.8	1971.7399
33	1630.0	-17256.7	29994.6870
34	1543.0	8109.4	10 YRS PLUS
35	1429.0	34143.7	10 YRS PLUS
36	1370.0	50625.0	28752.2630
37	1495.0	14994.8	10 YRS PLUS
38	1430.0	33288.6	10 YRS PLUS
39	1555.0	114.3	10 YRS PLUS
40	1485.0	19981.3	10 YRS PLUS
41	1578.0	-2849.9	10 YRS PLUS
42	1507.0	17301.7	10 YRS PLUS
43	1564.0	5565.4	10 YRS PLUS
44	1492.0	25810.4	10 YRS PLUS
45	1483.0	31966.2	43083.6630
46	1421.0	49379.1	7790.5038
47	1613.0	2204.5	10 YRS PLUS
48	1596.0	8220.4	10 YRS PLUS
49	1663.0	-7971.4	10 YRS PLUS
50	1648.0	-2594.3	10 YRS PLUS
51	1654.0	-439.6	10 YRS PLUS
52	1643.0	3560.1	10 YRS PLUS
53	1546.0	30141.0	6317.5821
54	1492.0	50588.4	656.4919
55	1592.0	27520.4	5593.3996
56	1540.0	41980.5	1014.8799

LEADING EDGE W_{CLE} = 0.0023335 LBS/SEC/BLADE (0.497% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0028962 LBS/SEC/BLADE (0.617% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00542 LBS/SEC/BLADE (1.155% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001991 LBS/SEC/BLADE (0.424% OF HOT GAS FLOW)

TABLE M-52

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE 1.0 INCH CHORD, TIP SECTION, CONDITION 3B

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1664.0	-11417.1	50399.1610
2	1599.0	14260.7	10 YRS PLUS
3	1755.0	-26927.8	112.7371
4	1694.0	-12144.6	30433.1350
5	1681.0	-6054.2	10 YRS PLUS
6	1643.0	4105.8	10 YRS PLUS
7	1503.0	19024.6	44675.2430
8	1554.0	28319.3	13137.2154
9	1432.0	60568.7	780.2510
10	1414.0	62922.6	828.2430
11	1412.0	65667.1	658.4066
12	1394.0	67946.4	740.9715
13	1405.0	49654.2	1258.6466
14	1463.0	54054.5	1040.4103
15	1568.0	31486.6	4444.9043
16	1544.0	36650.0	2677.3568
17	1578.0	34682.4	1654.4446
18	1551.0	40829.7	919.4940
19	1697.0	4426.1	10 YRS PLUS
20	1689.0	5752.5	10 YRS PLUS
21	1748.0	-4666.0	10 YRS PLUS
22	1740.0	-3564.0	10 YRS PLUS
23	1793.0	-12301.2	2432.3718
24	1734.0	-10968.0	4657.3523
25	1662.0	32491.7	322.1620
26	1576.0	50932.9	71.5673
27	1619.0	28867.5	356.3614
28	1628.0	44927.1	68.3229
29	1755.0	-29999.4	63.6423
30	1692.0	-18257.5	4247.2517
31	1722.0	-31019.1	194.8534
32	1683.0	-19643.5	3368.4107
33	1671.0	-20394.1	3556.7220
34	1620.0	-3856.2	10 YRS PLUS
35	1446.0	38525.9	27690.0010
36	1415.0	47810.8	12262.7090
37	1499.0	22392.8	10 YRS PLUS
38	1462.0	33376.6	57619.4760
39	1558.0	7429.6	10 YRS PLUS
40	1520.0	19042.4	10 YRS PLUS
41	1575.0	8042.2	10 YRS PLUS
42	1536.0	19716.4	10 YRS PLUS
43	1594.0	9429.0	10 YRS PLUS
44	1556.0	20792.4	68141.2100
45	1552.0	28103.5	14566.7519
46	1520.0	37736.3	4046.4217
47	1701.0	-7237.1	10 YRS PLUS
48	1692.0	-3671.4	10 YRS PLUS
49	1734.0	-8545.0	64667.2180
50	1725.0	-4901.4	10 YRS PLUS
51	1724.0	7834.6	10 YRS PLUS
52	1716.0	5324.6	10 YRS PLUS
53	1643.0	33805.7	358.6056
54	1576.0	51494.2	83.5201
55	1670.0	31523.4	325.1414
56	1614.0	47093.5	67.3103

LEADING EDGE W_{CLE} = 0.002031 LBS/SEC/BLADE (0.433% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002339 LBS/SEC/BLADE (0.499% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.005485 LBS/SEC/BLADE (1.169% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00207 LBS/SEC/BLADE (0.441% OF HOT GAS FLOW)

TABLE M-53

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 22857. RPM, TIT = 2320°F,
WCA = 0.023365 LBS/SEC/BLADE (4.44% OF HOT GAS FLOW)
TCA = 1200°F, PTOT = 150 PSIA
CONDITION IC

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1723.0	-2842.5	10 YRS PLUS
2	1675.0	11603.6	60194.6230
3	1720.0	-1775.1	10 YRS PLUS
4	1682.0	9494.8	10 YRS PLUS
5	1680.0	10098.4	86908.0890
6	1654.0	17782.8	13250.5341
7	1632.0	24298.7	3922.0059
8	1602.0	33327.2	1213.7036
9	1566.0	42549.4	468.2252
10	1548.0	46741.0	372.3875
11	1572.0	39979.6	612.8995
12	1545.0	46424.3	424.2950
13	1585.0	36015.3	1047.2032
14	1555.0	43095.9	568.7004
15	1593.0	33690.4	1415.3167
16	1563.0	40879.5	666.4468
17	1585.0	36328.6	977.6042
18	1562.0	41740.1	593.3796
19	1604.0	31640.8	1662.8564
20	1596.0	33412.9	1391.1171
21	1622.0	26657.6	3063.3171
22	1617.0	27766.1	2746.6356
23	1645.0	20342.2	7072.1646
24	1642.0	20907.4	6316.5767
25	1644.0	21982.9	4712.9162
26	1624.0	28016.8	2170.9348
27	1669.0	15552.2	10885.1890
28	1656.0	19547.5	6944.8113
29	1732.0	-6203.6	10 YRS PLUS
30	1697.0	4283.9	10 YRS PLUS
31	1707.0	-452.2	10 YRS PLUS
32	1681.0	7723.3	10 YRS PLUS
33	1636.0	19183.4	13249.3003
34	1594.0	32754.9	1691.5416
35	1591.0	30900.3	2743.7359
36	1563.0	39299.6	899.9529
37	1609.0	23831.0	7939.8131
38	1573.0	33470.6	2509.9488
39	1629.0	16475.1	40216.7550
40	1591.0	28942.5	4209.5399
41	1638.0	13592.6	83854.5240
42	1600.0	26440.7	5721.6859
43	1625.0	18613.5	21607.0360
44	1589.0	30318.7	3284.7197
45	1584.0	32421.3	2364.3217
46	1556.0	40822.4	807.4598
47	1612.0	26120.9	4466.7041
48	1603.0	29507.3	2713.3169
49	1632.0	21186.9	7641.4130
50	1626.0	23551.3	5384.4763
51	1653.0	16153.8	23547.7510
52	1648.0	18075.8	14058.3760
53	1647.0	19897.1	7802.2179
54	1624.0	27457.6	2448.4874
55	1668.0	15147.2	22200.0400
56	1652.0	20387.0	5807.0274

LEADING EDGE W_{CLE} = 0.00157 LBS/SEC/BLADE (0.298% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00201 LBS/SEC/BLADE (0.382% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00355 LBS/SEC/BLADE (0.675% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001221 LBS/SEC/BLADE (0.232% OF HOT GAS FLOW)

TABLE M-54

SCHEME B-5 FILM CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION IC

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1795.0	-8267.3	16869.5670
2	1746.0	5681.8	10 YRS PLUS
3	1799.0	-8314.6	14767.5894
4	1763.0	1279.1	10 YRS PLUS
5	1757.0	3585.0	10 YRS PLUS
6	1736.0	9265.9	35662.9880
7	1703.0	19119.3	2425.4339
8	1679.0	26019.7	828.7188
9	1634.0	39920.1	131.0612
10	1620.0	43242.3	108.0408
11	1645.0	35764.3	243.8369
12	1627.0	40302.0	145.8709
13	1663.0	30459.3	482.9509
14	1644.0	35555.4	261.2622
15	1683.0	25561.9	826.4762
16	1664.0	30613.9	456.0906
17	1684.0	27769.7	508.1699
18	1668.0	31837.6	319.5010
19	1709.0	22386.5	846.4849
20	1703.0	23422.3	790.6061
21	1737.0	16437.9	2512.7089
22	1731.0	17520.7	2043.3186
23	1776.0	7054.8	65057.0910
24	1771.0	7978.9	37989.6800
25	1767.0	12492.2	4290.8308
26	1744.0	19267.2	840.2595
27	1739.0	8521.8	16265.6622
28	1773.0	13275.7	2887.9514
29	1804.0	-12606.6	1701.0131
30	1766.0	-1739.0	10 YRS PLUS
31	1781.0	-8711.7	17276.0290
32	1759.0	-1724.0	10 YRS PLUS
33	1728.0	4484.1	10 YRS PLUS
34	1698.0	14628.8	12082.4690
35	1647.0	26584.1	1638.0093
36	1627.0	33865.9	571.9038
37	1688.0	11054.0	51128.1800
38	1664.0	19666.7	5426.3735
39	1711.0	3860.6	10 YRS PLUS
40	1696.0	12753.6	30683.1430
41	1715.0	4546.3	10 YRS PLUS
42	1689.0	13739.0	20464.0570
43	1704.0	11245.0	31527.5920
44	1679.0	20133.3	3167.0239
45	1667.0	26545.3	999.0512
46	1645.0	34734.4	303.6510
47	1704.0	19109.2	2373.7168
48	1697.0	22255.0	1166.9260
49	1732.0	14244.1	5792.4580
50	1727.0	16645.3	3004.8365
51	1765.0	7744.7	52575.1610
52	1760.0	9895.5	12232.5163
53	1764.0	11591.3	6160.6876
54	1740.0	19697.1	813.4270
55	1786.0	8165.3	22724.0410
56	1770.0	13470.2	2918.7384

LEADING EDGE W_{CLE} = 0.001405 LBS/SEC/BLADE (0.267% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001744 LBS/SEC/BLADE (0.331% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0032637 LBS/SEC/BLADE (0.620% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0011987 LBS/SEC/BLADE (0.228% OF HOT GAS FLOW)

TABLE M-55

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION IC

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1773.0	4376.4	10 YRS PLUS
2	1744.0	13038.8	6346.0618
3	1801.0	-1635.0	10 YRS PLUS
4	1781.0	3357.8	10 YRS PLUS
5	1771.0	7654.3	48208.3620
6	1758.0	10746.4	9369.6788
7	1726.0	20316.2	932.2762
8	1713.0	23637.3	593.3429
9	1666.0	37905.7	93.2869
10	1660.0	38771.5	89.6335
11	1673.0	36029.4	117.2240
12	1666.0	37426.7	103.2033
13	1707.0	26400.0	387.3504
14	1699.0	27990.1	337.5921
15	1740.0	18173.4	1331.6338
16	1732.0	19833.6	943.3835
17	1747.0	19446.2	746.0954
18	1736.0	22177.5	461.5813
19	1763.0	18086.5	789.2700
20	1758.0	18891.4	686.5487
21	1803.0	9514.0	5619.8360
22	1799.0	9998.6	4357.2009
23	1840.0	735.4	10 YRS PLUS
24	1836.0	1217.2	10 YRS PLUS
25	1808.0	13987.4	1003.5940
26	1783.0	21370.3	181.7290
27	1825.0	11249.7	1587.6556
28	1805.0	17484.6	358.7396
29	1802.0	-7164.5	31537.3390
30	1781.0	-974.8	10 YRS PLUS
31	1789.0	-6808.3	56631.5150
32	1776.0	-2253.9	10 YRS PLUS
33	1759.0	-219.9	10 YRS PLUS
34	1742.0	5691.9	10 YRS PLUS
35	1667.0	25762.9	1178.2070
36	1687.0	29763.4	648.9479
37	1704.0	12168.4	23270.1570
38	1691.0	17075.2	6441.4626
39	1726.0	5456.4	10 YRS PLUS
40	1712.0	10773.0	29897.7400
41	1729.0	7522.9	10 YRS PLUS
42	1716.0	12376.0	15956.8051
43	1730.0	11166.2	16556.4760
44	1717.0	15998.8	4758.3914
45	1708.0	22681.5	816.0077
46	1696.0	27255.2	422.7725
47	1746.0	16188.1	2166.0851
48	1742.0	17922.9	1375.7870
49	1768.0	14823.9	1988.2106
50	1765.0	16455.1	1268.4710
51	1807.0	11156.9	2498.1459
52	1803.0	9340.6	6370.9748
53	1802.0	12921.5	1615.1872
54	1779.0	20960.8	217.1747
55	1819.0	11015.2	1966.2941
56	1801.0	17553.6	384.8171

LEADING EDGE W_{CLE} = 0.001261 LBS/SEC/BLADE (0.24% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001452 LBS/SEC/BLADE (0.276% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.003405 LBS/SEC/BLADE (0.647% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001285 LBS/SEC/BLADE (0.244% OF HOT GAS FLOW)

TABLE M-56

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD,
HUB SECTION, 22857. RPM, TIT = 2320. °F,
WCA = 0.009268 LBS/SEC/BLADE (1.76% OF HOT GAS FLOW)
TCA = 600°F, PTOT = 150 PSIA
CONDITION 2C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1670.0	8046.2	10 YRS PLUS
2	1653.0	13180.9	64094.0160
3	1694.0	267.7	10 YRS PLUS
4	1659.0	10990.0	10 YRS PLUS
5	1633.0	12390.7	83640.5580
6	1628.0	20195.8	11625.2096
7	1608.0	25710.4	5424.8069
8	1579.0	33947.7	1928.5858
9	1546.0	41667.3	912.5197
10	1522.0	48070.7	588.5799
11	1545.0	40500.4	1137.8302
12	1510.0	49813.1	602.9073
13	1548.0	38327.1	1659.6106
14	1512.0	47790.3	805.1722
15	1544.0	38065.8	1957.6935
16	1508.0	47458.4	948.1883
17	1518.0	43727.5	1362.1700
18	1488.0	51499.6	816.5639
19	1511.0	44693.9	1397.3307
20	1502.0	46852.4	1235.7907
21	1547.0	34459.1	4044.6870
22	1538.0	36697.4	3126.5073
23	1601.0	19264.0	33145.3170
24	1593.0	21319.5	21100.9000
25	1629.0	9997.5	10 YRS PLUS
26	1603.0	17948.8	49397.3470
27	1665.0	-1512.3	10 YRS PLUS
28	1649.0	3333.6	10 YRS PLUS
29	1710.0	-4093.3	10 YRS PLUS
30	1678.0	5505.6	10 YRS PLUS
31	1692.0	883.8	10 YRS PLUS
32	1667.0	8453.3	10 YRS PLUS
33	1628.0	19511.7	14678.4052
34	1599.0	28477.3	3770.9047
35	1612.0	23128.9	8534.7296
36	1579.0	32560.1	2616.7803
37	1622.0	18427.9	24958.4970
38	1582.0	30002.3	4239.2105
39	1632.0	13762.7	10 YRS PLUS
40	1592.0	26003.9	7791.0081
41	1629.0	13129.8	10 YRS PLUS
42	1588.0	25699.8	9272.0333
43	1605.0	19420.8	28147.8500
44	1567.0	30271.8	5973.6870
45	1558.0	31474.0	5838.0425
46	1526.0	40486.9	1895.1607
47	1541.0	35481.3	3786.0743
48	1532.0	38210.5	2617.6425
49	1583.0	23681.1	16529.2580
50	1573.0	26693.7	11189.3587
51	1632.0	8756.9	10 YRS PLUS
52	1624.0	11444.3	10 YRS PLUS
53	1637.0	6895.4	10 YRS PLUS
54	1606.0	16705.2	69804.9290
55	1666.0	-2256.1	10 YRS PLUS
56	1646.0	3985.8	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0004934 LBS/SEC/BLADE (0.0938% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0007561 LBS/SEC/BLADE (0.144% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0011156 LBS/SEC/BLADE (0.212% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000768 LBS/SEC/BLADE (0.146% OF HOT GAS FLOW)

TABLE M-57

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, MEAN SECTION, CONDITION 2C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1779.0	-5092.7	10 YRS PLUS
2	1736.0	7455.1	10 YRS PLUS
3	1785.0	-6408.3	83924.2470
4	1753.0	2518.9	10 YRS PLUS
5	1743.0	5560.1	10 YRS PLUS
6	1724.0	11036.1	20133.4020
7	1692.0	20427.5	2072.2106
8	1670.0	27066.7	830.8617
9	1631.0	38647.8	185.5458
10	1613.0	43791.9	117.3685
11	1631.0	37606.6	231.9613
12	1610.0	43637.7	129.5204
13	1638.0	34851.5	351.9801
14	1618.0	40677.1	171.3137
15	1648.0	31859.1	519.9975
16	1626.0	38255.9	228.2500
17	1632.0	37702.7	221.7383
18	1612.0	43466.6	126.7558
19	1625.0	40873.4	139.7966
20	1618.0	42565.7	126.4756
21	1694.0	19970.1	2293.0273
22	1685.0	22322.6	1548.6484
23	1786.0	1813.7	10 YRS PLUS
24	1748.0	3857.8	10 YRS PLUS
25	1765.0	252.1	10 YRS PLUS
26	1736.0	8783.5	51367.2900
27	1794.0	-6960.4	44685.3410
28	1776.0	-1911.2	10 YRS PLUS
29	1791.0	-9389.0	8237.6320
30	1758.0	43.6	10 YRS PLUS
31	1775.0	-6463.3	10 YRS PLUS
32	1755.0	-305.3	10 YRS PLUS
33	1736.0	3401.5	10 YRS PLUS
34	1708.0	12462.7	19049.5920
35	1685.0	16849.5	8092.7797
36	1664.0	23935.8	1867.7865
37	1719.0	4016.6	10 YRS PLUS
38	1694.0	12325.1	28670.8370
39	1729.0	65.6	10 YRS PLUS
40	1704.0	8382.8	10 YRS PLUS
41	1716.0	4336.4	10 YRS PLUS
42	1690.0	13089.4	24721.0870
43	1698.0	11067.5	39105.3770
44	1671.0	20218.0	3772.1033
45	1659.0	24813.7	1760.1606
46	1634.0	33525.7	516.2758
47	1640.0	32828.4	516.0044
48	1632.0	36004.8	319.0281
49	1708.0	13037.8	15772.4895
50	1698.0	16750.4	6001.7461
51	1761.0	-1469.2	10 YRS PLUS
52	1753.0	1344.8	10 YRS PLUS
53	1766.0	-1290.3	10 YRS PLUS
54	1736.0	8186.8	80185.0650
55	1794.0	-7829.7	23764.1310
56	1774.0	-1798.5	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.000478 LBS/SEC/BLADE (0.0908% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.000712 LBS/SEC/BLADE (0.135% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0011103 LBS/SEC/BLADE (0.211% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0008 LBS/SEC/BLADE (0.152% OF HOT GAS FLOW)

TABLE M-58

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.0 INCH CHORD, TIP SECTION, CONDITION 2C

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1774.0	10147.0	7637.9696
2	1751.0	17107.2	1440.1158
3	1805.0	1787.2	10 YRS PLUS
4	1788.0	6456.2	75069.4860
5	1776.0	10524.5	6448.0682
6	1765.0	13427.5	3340.8439
7	1736.0	21843.3	494.1861
8	1725.0	24916.0	342.2060
9	1680.0	36940.0	82.0286
10	1674.0	37928.0	76.8116
11	1686.0	35339.6	99.5235
12	1679.0	36538.2	91.3683
13	1716.0	26107.2	331.8077
14	1707.0	28422.2	254.9266
15	1738.0	19657.7	864.3803
16	1729.0	21995.6	566.1162
17	1721.0	26406.4	277.0358
18	1707.0	30455.3	167.3676
19	1681.0	37744.3	67.6981
20	1677.0	38346.7	65.5454
21	1772.0	13457.6	2792.0018
22	1766.0	14816.5	2091.3350
23	1828.0	-2691.6	10 YRS PLUS
24	1821.0	-959.1	10 YRS PLUS
25	1806.0	5584.1	10 YRS PLUS
26	1774.0	15096.1	1578.4428
27	1827.0	108.7	10 YRS PLUS
28	1803.0	7581.9	22742.5370
29	1808.0	-1963.1	10 YRS PLUS
30	1791.0	3227.7	10 YRS PLUS
31	1802.0	-2191.5	10 YRS PLUS
32	1791.0	1488.0	10 YRS PLUS
33	1784.0	1543.4	10 YRS PLUS
34	1770.0	6140.9	10 YRS PLUS
35	1731.0	15680.6	3724.3244
36	1720.0	19576.4	1372.8499
37	1744.0	3619.5	10 YRS PLUS
38	1851.0	-16885.1	153.4681
39	1759.0	4439.3	10 YRS PLUS
40	1746.0	8997.5	33875.0000
41	1750.0	8019.0	63142.3640
42	1737.0	12540.7	8890.1636
43	1736.0	13910.2	5842.0693
44	1723.0	18497.0	1814.1071
45	1709.0	24484.6	548.5805
46	1697.0	28830.8	297.4204
47	1674.0	37240.4	88.7500
48	1669.0	38379.6	78.6172
49	1761.0	13206.2	3953.9405
50	1755.0	15550.6	2156.7015
51	1814.0	1182.6	10 YRS PLUS
52	1808.0	1462.6	10 YRS PLUS
53	1804.0	4249.6	10 YRS PLUS
54	1775.0	13699.6	2404.2534
55	1824.0	-381.3	10 YRS PLUS
56	1801.0	7404.0	27185.9780

LEADING EDGE W_{CLE} = 0.000416 LBS/SEC/BLADE (0.0791% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0005749 LBS/SEC/BLADE (0.109% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0011236 LBS/SEC/BLADE (0.214% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00092 LBS/SEC/BLADE (0.175% OF HOT GAS FLOW)

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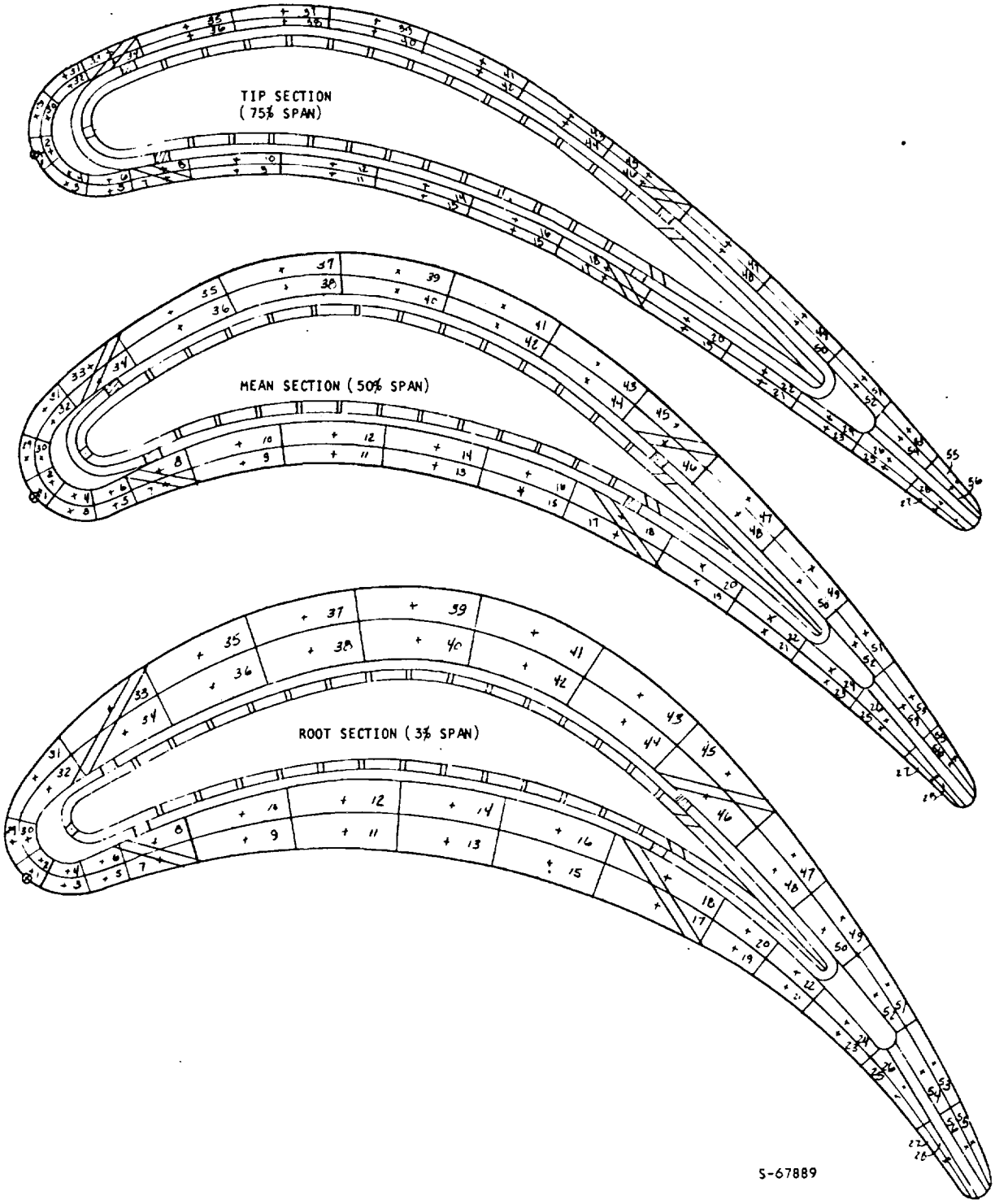

FIGURE M-10. SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE 1.0 INCH CHORD

TABLE M-59

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 22857 RPM, TIT = 2320°F,
WCA = 0.03728 LBS/SEC/BLADE (4.76% OF HOT GAS FLOW)
TCA = 1200°F, PTOT = 150 PSIA
CONDITIONS I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1714.0	-13618.0	11184.5499
2	1636.0	10512.3	10 YRS PLUS
3	1703.0	-10681.0	38960.3080
4	1647.0	6862.7	10 YRS PLUS
5	1661.0	2354.0	10 YRS PLUS
6	1693.0	14574.4	10 YRS PLUS
7	1619.0	19061.0	18571.7070
8	1568.0	31246.7	4687.0375
9	1547.0	36952.0	2317.3960
10	1518.0	45583.1	995.8681
11	1562.0	33442.7	3385.7005
12	1524.0	44552.7	1009.1641
13	1577.0	29281.9	5677.3990
14	1537.0	41049.6	1284.0058
15	1546.0	26465.9	8273.4866
16	1545.0	38462.7	1744.1365
17	1592.0	23989.9	12098.2059
18	1555.0	34816.2	3010.5908
19	1587.0	24373.5	12736.7923
20	1557.0	33085.0	4192.8260
21	1543.0	29642.0	7653.8235
22	1542.0	35758.2	3463.1618
23	1591.0	20411.5	29311.1700
24	1582.0	23167.4	19815.2730
25	1565.0	25803.3	16960.8030
26	1535.0	34146.4	6017.2681
27	1593.0	16712.7	10 YRS PLUS
28	1571.0	22781.4	28029.0690
29	1717.0	-13768.9	9890.0601
30	1660.0	3654.8	10 YRS PLUS
31	1693.0	-5092.3	10 YRS PLUS
32	1695.0	6300.5	10 YRS PLUS
33	1614.0	20922.3	13169.9763
34	1574.0	31974.9	3399.0794
35	1572.0	34627.7	1996.6909
36	1543.0	41855.0	957.2901
37	1610.0	25672.4	5188.3552
38	1570.0	36189.5	1490.7921
39	1638.0	17612.6	21442.5010
40	1574.0	30357.0	2855.1152
41	1645.0	14617.7	48991.9220
42	1599.0	28230.5	3979.0978
43	1643.0	13472.1	76203.4980
44	1602.0	25569.7	6557.5081
45	1625.0	16761.0	40665.9740
46	1592.0	26224.3	7424.7606
47	1570.0	30076.5	5752.2925
48	1546.0	36162.5	2839.8224
49	1599.0	19532.8	32239.8700
50	1590.0	21680.2	21165.6500
51	1564.0	26883.8	13723.0815
52	1531.0	35484.6	4969.1968
53	1590.0	17963.0	70006.3720
54	1567.0	24073.0	23538.0030

LEADING EDGE W_{CLE} = 0.00306 LBS/SEC/BLADE (0.391% OF HOT GAS FLOW)
PRESSURE SIDE W_{CAP} = 0.00392 LBS/SEC/BLADE (0.501% OF HOT GAS FLOW)
SUCTION SIDE W_{CAS} = 0.00585 LBS/SEC/BLADE (0.747% OF HOT GAS FLOW)
TRAILING EDGE W_{CTE} = 0.0019 LBS/SEC/BLADE (0.243% OF HOT GAS FLOW)

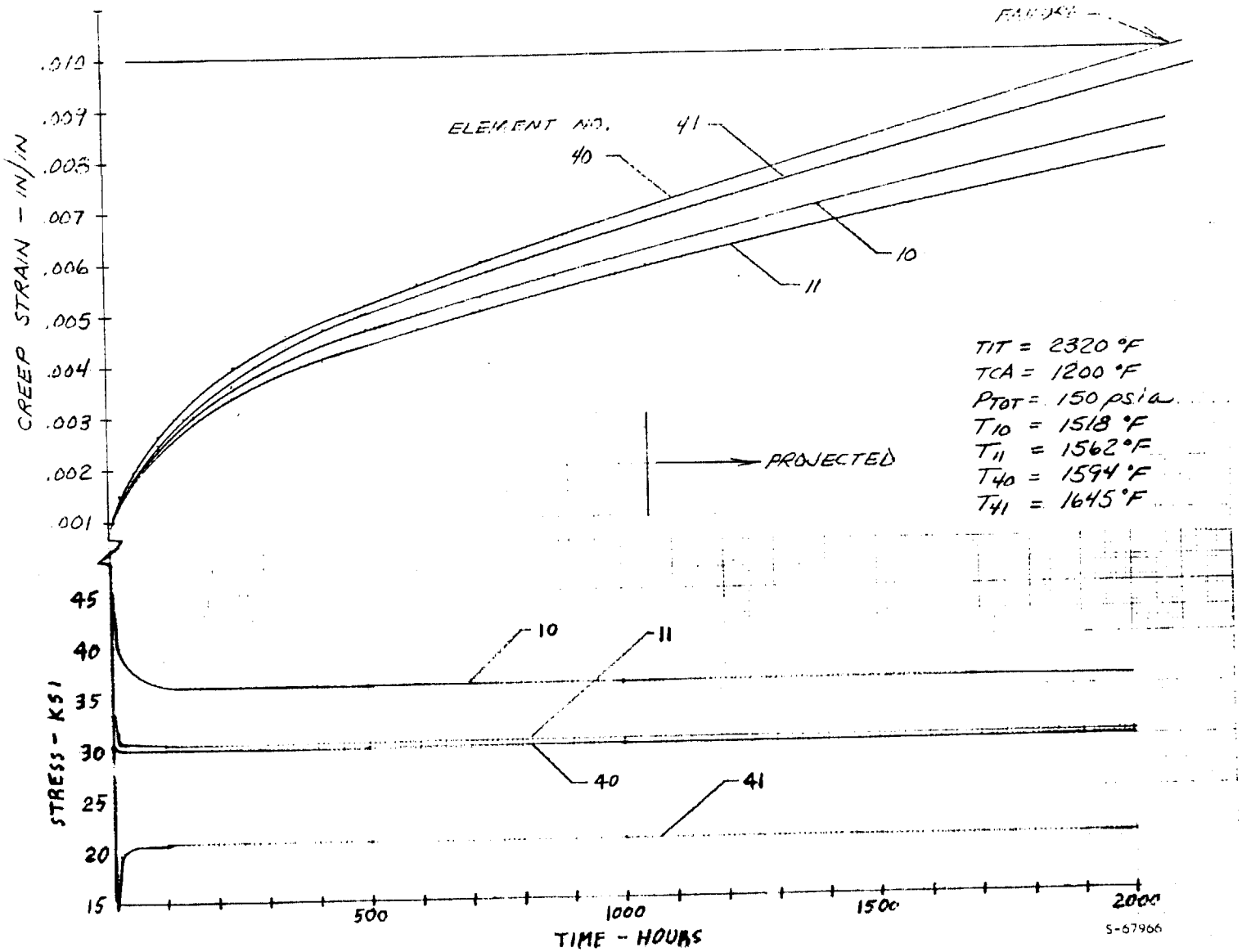

FIGURE M-11. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE ROOT SECTION OF THE 1.5 INCH CHORD SCHEME B-5 BLADE.

TABLE M-60

SCHEME B-5 FILM CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITIONS I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1765.0	-13815.2	2951.2417
2	1703.0	5805.7	10 YRS PLUS
3	1779.0	-17765.5	599.6737
4	1737.0	-4850.3	10 YRS PLUS
5	1737.0	-4604.7	10 YRS PLUS
6	1736.0	4834.2	10 YRS PLUS
7	1601.0	14506.7	19543.0250
8	1656.0	23058.6	2754.4347
9	1611.0	39471.0	254.7340
10	1594.0	45605.7	139.8466
11	1695.0	37736.1	261.6279
12	1605.0	45320.5	111.6119
13	1653.0	38507.4	612.1006
14	1633.0	37903.5	207.2129
15	1670.0	25473.6	1161.9168
16	1649.0	33359.2	372.6624
17	1694.0	17459.4	5256.4943
18	1672.0	25606.8	1074.9718
19	1701.0	14346.3	12277.9293
20	1678.0	22543.6	1760.9569
21	1682.0	18662.9	4765.3161
22	1656.0	27924.7	982.2152
23	1701.0	10487.8	43753.6030
24	1691.0	14392.7	15647.4617
25	1682.0	13912.1	23197.9531
26	1641.0	27701.4	1503.3146
27	1736.0	4424.6	10 YRS PLUS
28	1680.0	13006.1	33043.7062
29	1725.0	-17368.0	591.2432
30	1749.0	-5101.6	10 YRS PLUS
31	1749.0	-9969.0	9264.4363
32	1741.0	-1940.5	10 YRS PLUS
33	1733.0	3845.9	10 YRS PLUS
34	1705.0	11733.5	26160.0197
35	1636.0	23099.5	1284.2455
36	1666.0	26995.7	610.8847
37	1731.0	14545.7	5384.6444
38	1705.0	21862.5	1040.1849
39	1759.0	8297.5	40783.1490
40	1734.0	15109.8	4161.4352
41	1762.0	7285.1	79663.4427
42	1737.0	13861.8	5788.5482
43	1737.0	6845.9	10 YRS PLUS
44	1731.0	13969.5	6493.0315
45	1743.0	8498.7	53000.1660
46	1718.0	15267.5	5893.3742
47	1698.0	19132.6	2735.7329
48	1669.0	27423.5	790.0503
49	1716.0	9558.9	48370.5472
50	1705.0	12207.4	22386.3190
51	1690.0	17265.2	8215.3687
52	1645.0	29286.8	1099.1956
53	1725.0	6763.7	10 YRS PLUS
54	1675.0	15636.1	15694.7444

LEADING EDGE W_{CLE} = 0.002236 LBS/SEC/BLADE (0.286% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002965 LBS/SEC/BLADE (0.379% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.004438 LBS/SEC/BLADE (0.567% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0019 LBS/SEC/BLADE (0.243% OF HOT GAS FLOW)

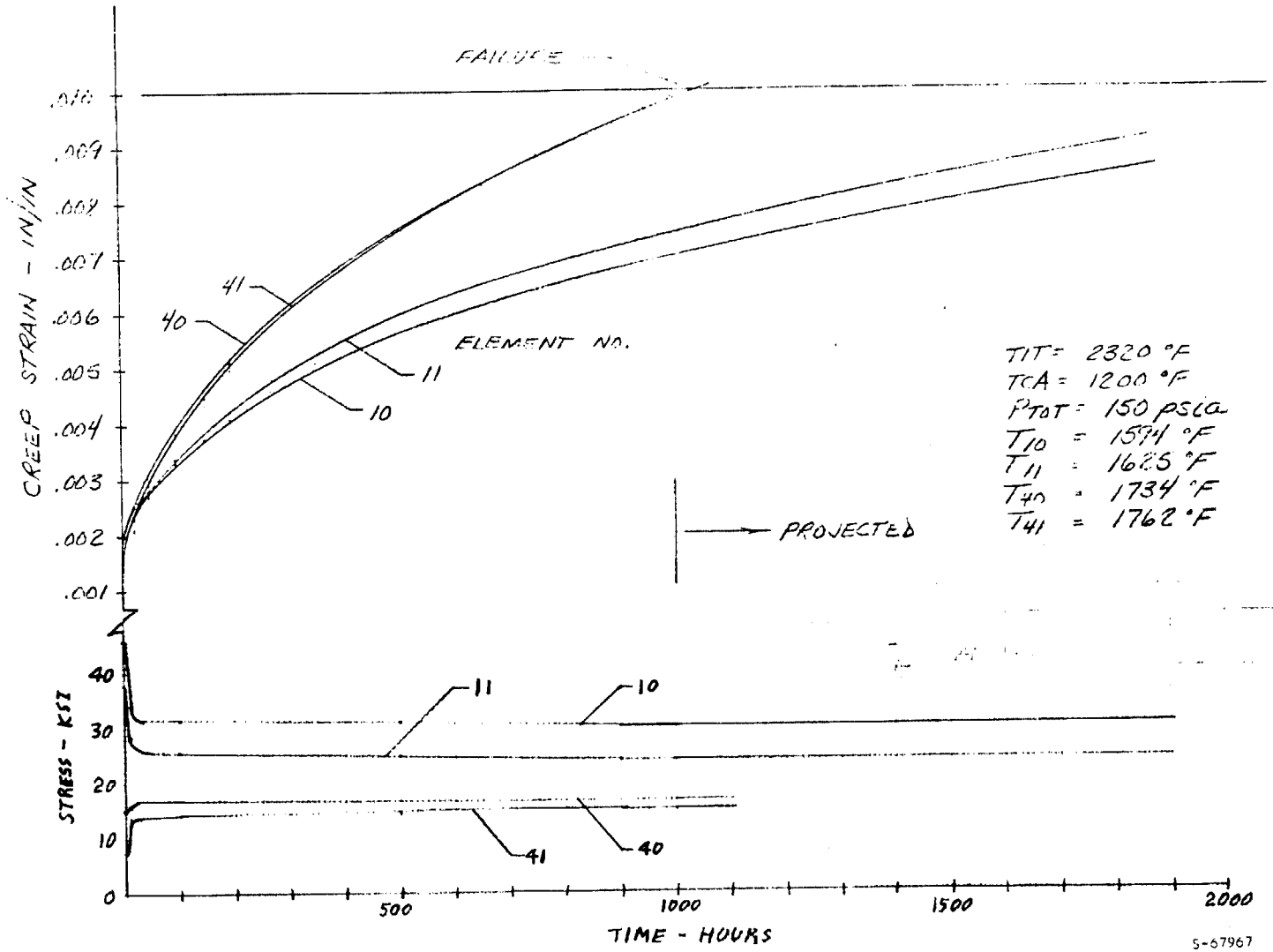

FIGURE M-12. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE MEAN SECTION OF THE 1.5 INCH CHORD SCHEME B-5 BLADE.

TABLE M-61

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITIONS I AND IA

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1718.0	7353.2	10 YRS PLUS
2	1689.0	16840.9	7325.5502
3	1776.0	-11297.7	5041.3356
4	1757.0	-5066.0	10 YRS PLUS
5	1768.0	-8299.9	32383.1230
6	1754.0	-3772.7	10 YRS PLUS
7	1751.0	-1639.7	10 YRS PLUS
8	1736.0	3328.8	10 YRS PLUS
9	1627.0	41336.4	123.5840
10	1621.0	43590.2	99.7156
11	1635.0	42343.1	86.7090
12	1628.0	43989.2	78.9411
13	1674.0	34034.9	174.0535
14	1666.0	37243.9	107.2597
15	1704.0	25849.1	466.6493
16	1695.0	29271.4	284.7143
17	1742.0	14150.5	4656.7733
18	1733.0	17491.1	1969.5729
19	1753.0	10296.1	12268.2304
20	1744.0	11557.4	10239.0593
21	1737.0	14696.3	4417.3285
22	1725.0	18992.5	1469.8637
23	1747.0	10393.5	13823.7143
24	1740.0	13116.9	6836.2300
25	1729.0	15137.9	4668.9682
26	1638.0	29206.7	341.5541
27	1750.0	7738.7	77714.9070
28	1722.0	17159.0	2876.4072
29	1778.0	-7907.7	33526.6100
30	1759.0	-2426.5	10 YRS PLUS
31	1762.0	162.8	10 YRS PLUS
32	1749.0	3654.6	10 YRS PLUS
33	1776.0	-1016.9	10 YRS PLUS
34	1759.0	3851.3	10 YRS PLUS
35	1713.0	23574.7	601.0774
36	1704.0	26019.9	450.4314
37	1761.0	15361.7	1981.7725
38	1750.0	18409.8	969.8537
39	1783.0	11744.2	3690.1379
40	1772.0	14879.6	1774.1586
41	1783.0	12988.2	2486.7124
42	1772.0	15774.1	1333.9131
43	1746.0	11328.4	3915.5922
44	1776.0	13992.5	2138.1283
45	1780.0	11544.8	4227.8920
46	1770.0	14049.2	2426.3362
47	1740.0	21706.8	462.0714
48	1726.0	25579.5	291.6525
49	1758.0	13031.0	4501.4653
50	1750.0	14870.2	3032.1385
51	1725.0	20118.7	1018.5006
52	1639.0	30609.2	248.8155
53	1746.0	11467.0	10026.7541
54	1721.0	18529.8	1685.1453

LEADING EDGE W_{CLE} = 0.00184 LBS/SEC/BLADE (0.235% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002957 LBS/SEC/BLADE (0.378% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.004435 LBS/SEC/BLADE (0.566% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0017741 LBS/SEC/BLADE (0.227% OF HOT GAS FLOW)

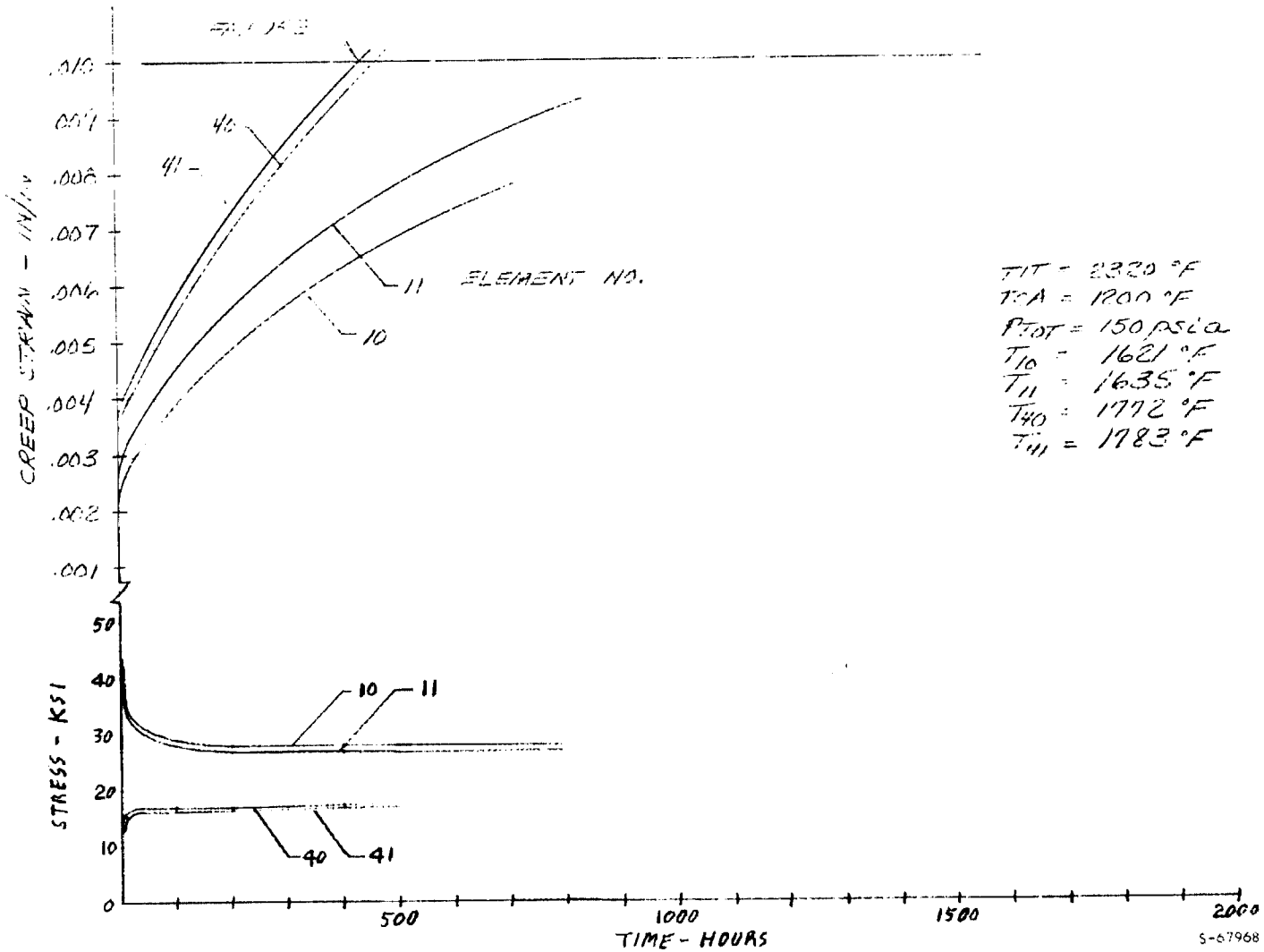

FIGURE M-13. CREEP STRAIN VARIATION WITH TIME FOR THE CRITICAL ELEMENTS AT THE TIP SECTION OF THE 1.5 INCH CHORD SCHEME B-5 BLADE.

TABLE M-62

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 24058 RPM, TIT = 2620°F,
WCA = 0.04118 LB/SEC/BLADE = (5.56 PERCENT OF HOT GAS FLOW)
TCA = 900°F, PTOT = 150 PSIA
CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1742.0	-31987.0	54.3228
2	1607.0	2146.2	10 YRS PLUS
3	1725.0	-31800.6	83.3095
4	1625.0	-3707.8	10 YRS PLUS
5	1654.0	-12716.3	72948.8600
6	1585.0	8524.8	10 YRS PLUS
7	1570.0	12906.2	10 YRS PLUS
8	1495.0	34109.2	19605.5730
9	1454.0	45179.9	6277.1343
10	1403.0	59890.1	2015.1581
11	1432.0	38984.8	6774.1174
12	1415.0	58033.9	1989.3471
13	1510.0	31630.4	21374.0900
14	1439.0	52016.9	2900.6579
15	1526.0	26989.3	38811.2840
16	1453.0	47875.0	4035.7397
17	1537.0	22830.9	72270.9910
18	1471.0	41752.1	7008.8779
19	1527.0	24032.0	73520.8380
20	1474.0	39121.3	10678.0973
21	1487.0	32739.8	32086.9590
22	1448.0	43795.8	9501.3243
23	1537.0	16820.7	10 YRS PLUS
24	1522.0	21378.9	10 YRS PLUS
25	1467.0	32711.8	58011.0440
26	1417.0	46237.7	15316.3192
27	1506.0	19947.2	10 YRS PLUS
28	1468.0	30181.7	10 YRS PLUS
29	1746.0	-31611.9	53.5399
30	1646.0	-8797.9	10 YRS PLUS
31	1702.0	-23206.6	847.1673
32	1634.0	-3243.2	10 YRS PLUS
33	1563.0	20426.3	63595.2320
34	1491.0	39021.4	6746.7461
35	1489.0	43296.7	3239.7350
36	1439.0	55450.7	1590.3877
37	1558.0	28238.0	11982.3031
38	1489.0	45366.4	2272.6101
39	1609.0	15648.2	10 YRS PLUS
40	1532.0	35393.2	4935.5412
41	1621.0	10888.5	10 YRS PLUS
42	1542.0	31725.3	8545.9581
43	1620.0	8436.4	10 YRS PLUS
44	1548.0	27381.8	19119.8750
45	1592.0	13026.8	10 YRS PLUS
46	1534.0	27698.6	26365.0340
47	1501.0	33124.7	19640.3500
48	1457.0	44042.4	7023.6186
49	1553.0	14804.3	10 YRS PLUS
50	1538.0	18339.0	10 YRS PLUS
51	1474.0	32337.6	51470.0680
52	1416.0	46989.5	13801.7617
53	1505.0	21060.9	10 YRS PLUS
54	1466.0	31100.3	86957.8130

LEADING EDGE W_{CLE} = 0.00338 LB/SEC/BLADE (0.456 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.004332 LB/SEC/BLADE (0.585 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.006463 LB/SEC/BLADE (0.873 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0021 LB/SEC/BLADE (0.284 PERCENT OF HOT GAS FLOW)

TABLE M-63

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1770.0	-27448.3	72.1801
2	1664.0	-106.1	10 YRS PLUS
3	1793.0	-27796.2	40.2904
4	1722.0	-18003.6	2183.8014
5	1725.0	-18397.6	1784.1406
6	1675.0	-2425.6	10 YRS PLUS
7	1630.0	11179.5	10 YRS PLUS
8	1595.0	25511.6	8005.1007
9	1515.0	50724.9	452.5247
10	1487.0	57337.5	308.3133
11	1541.0	48432.7	336.7973
12	1507.0	56244.6	219.2249
13	1588.0	38722.7	535.6462
14	1554.0	49620.7	197.8901
15	1615.0	31494.0	1292.8089
16	1580.0	43603.5	275.3905
17	1655.0	18328.0	10743.5474
18	1618.0	31989.2	1075.8687
19	1666.0	13482.4	40860.2160
20	1628.0	27017.8	2427.2201
21	1635.0	20536.1	8605.8724
22	1592.0	35458.9	986.9867
23	1674.0	4800.9	10 YRS PLUS
24	1658.0	11074.0	10 YRS PLUS
25	1625.0	15937.5	53665.4090
26	1556.0	37116.3	1757.2082
27	1658.0	2381.6	10 YRS PLUS
28	1614.0	16884.3	52647.2790
29	1800.0	-26772.1	42.3187
30	1729.0	-17533.8	2142.4910
31	1773.0	-24337.0	126.0049
32	1725.0	-12104.5	13556.3468
33	1718.0	-4390.6	10 YRS PLUS
34	1669.0	9362.1	10 YRS PLUS
35	1632.0	30117.3	1126.8771
36	1600.0	39483.4	334.6282
37	1708.0	15750.9	6472.8276
38	1666.0	27568.9	825.3712
39	1756.0	5109.2	10 YRS PLUS
40	1714.0	16556.5	4274.0683
41	1762.0	3320.8	10 YRS PLUS
42	1720.0	14333.0	7604.2939
43	1765.0	2342.4	10 YRS PLUS
44	1713.0	13733.0	11049.3895
45	1735.0	4188.2	10 YRS PLUS
46	1692.0	15833.1	9469.3673
47	1663.0	21038.6	3532.1229
48	1610.0	36272.4	522.1917
49	1699.0	3384.1	10 YRS PLUS
50	1661.0	7629.0	10 YRS PLUS
51	1621.0	21823.8	8908.8895
52	1554.0	39799.3	1019.7163
53	1655.0	6752.6	10 YRS PLUS
54	1607.0	20871.7	16174.3820

LEADING EDGE W_{CLE} = 0.00247 LB/SEC/BLADE (0.333 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.003276 LB/SEC/BLADE (0.442 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.004903 LB/SEC/BLADE (0.662 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0021 LB/SEC/BLADE (0.284 PERCENT OF HOT GAS FLOW)

TABLE M-64

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 2

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1682.0	2470.2	10 YRS PLUS
2	1632.0	18706.6	17354.8210
3	1775.0	-24270.5	122.0130
4	1744.0	-17088.8	1716.0671
5	1762.0	-22248.3	247.0882
6	1739.0	-15036.7	3765.3361
7	1741.0	-13670.7	5574.5934
8	1715.0	-5267.7	10 YRS PLUS
9	1528.0	54047.1	184.1513
10	1518.0	56038.8	170.5050
11	1545.0	54406.7	112.3018
12	1533.0	56727.1	103.3562
13	1610.0	45305.0	98.9795
14	1596.0	48461.9	83.6900
15	1657.0	32634.7	353.2552
16	1643.0	37995.4	159.1445
17	1719.0	13385.6	10626.9328
18	1704.0	18930.9	2517.0648
19	1738.0	6675.6	10 YRS PLUS
20	1723.0	8801.4	71151.6160
21	1713.0	13364.4	12466.9798
22	1694.0	20175.0	2142.9805
23	1740.0	2974.4	10 YRS PLUS
24	1727.0	7831.3	10 YRS PLUS
25	1608.0	17602.9	5838.4051
26	1620.0	40928.0	156.6467
27	1718.0	6735.5	10 YRS PLUS
28	1671.0	22592.9	2077.7969
29	1778.0	-21297.9	206.7558
30	1746.0	-12411.8	7392.2399
31	1750.0	-7974.0	65284.9530
32	1728.0	-2120.3	10 YRS PLUS
33	1778.0	-11314.2	4776.1565
34	1749.0	-3237.7	10 YRS PLUS
35	1682.0	32569.3	316.9248
36	1647.0	36668.8	191.5374
37	1744.0	17626.1	1442.7184
38	1725.0	22984.8	508.6253
39	1782.0	10796.7	5107.2159
40	1765.0	15626.1	1653.6092
41	1764.0	12003.4	3317.7739
42	1766.0	16587.6	1187.1401
43	1791.0	8546.4	15204.8534
44	1773.0	13397.2	2778.2922
45	1783.0	8253.8	22961.9670
46	1765.0	12844.6	4025.5855
47	1720.0	24002.2	465.1528
48	1698.0	30086.7	223.6753
49	1758.0	7128.5	10 YRS PLUS
50	1746.0	9764.8	19166.1690
51	1681.0	25878.1	612.6062
52	1621.0	43423.8	102.4122
53	1712.0	12651.9	16152.6684
54	1670.0	24630.7	1387.5248

Leading edge W_{CLE} = 0.00203 LB/SEC/BLADE (0.274 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.003267 LB/SEC/BLADE (0.441 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0049 LB/SEC/BLADE (0.662 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00196 LB/SEC/BLADE (0.265 PERCENT OF HOT GAS FLOW)

TABLE M-65

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 25203 RPM, TIT = 2920°F,
WCA = 0.04665 LB/SEC/BLADE (6.61 PERCENT OF HOT GAS FLOW)
TCA = 600°F, PTOT = 150 PSIA
CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1755.0	-37750.0	12.6110
2	1555.0	-8228.2	10 YRS PLUS
3	1730.0	-38931.9	17.2396
4	1580.0	-15195.5	10 YRS PLUS
5	1630.0	-29433.7	1372.8620
6	1525.0	458.6	10 YRS PLUS
7	1517.0	3462.1	10 YRS PLUS
8	1404.0	34511.4	10 YRS PLUS
9	1340.0	52205.2	54830.6810
10	1265.0	72671.3	10572.5543
11	1383.0	43375.2	71867.4630
12	1282.0	71282.9	8182.8343
13	1425.0	33381.3	10 YRS PLUS
14	1319.0	63571.6	12174.5726
15	1450.0	27213.3	10 YRS PLUS
16	1340.0	58155.0	18186.0420
17	1466.0	22104.4	10 YRS PLUS
18	1367.0	49832.7	36451.9140
19	1453.0	24125.5	10 YRS PLUS
20	1373.0	46362.8	56990.7090
21	1395.0	37147.3	10 YRS PLUS
22	1339.0	52947.2	49314.3810
23	1481.0	11816.2	10 YRS PLUS
24	1460.0	18138.1	10 YRS PLUS
25	1378.0	35359.5	10 YRS PLUS
26	1300.0	56515.9	10 YRS PLUS
27	1425.0	20292.9	10 YRS PLUS
28	1367.0	35492.4	10 YRS PLUS
29	1757.0	-37331.8	13.1355
30	1607.0	-21171.2	14911.4814
31	1690.0	-37412.5	58.7828
32	1587.0	-12905.5	10 YRS PLUS
33	1488.0	18044.4	10 YRS PLUS
34	1377.0	46208.5	51770.6220
35	1386.0	49423.3	21931.7960
36	1310.0	68461.3	6039.2825
37	1485.0	29184.2	77183.3950
38	1382.0	54388.4	10071.2512
39	1559.0	12690.9	10 YRS PLUS
40	1445.0	40985.0	16962.3470
41	1579.0	7015.2	10 YRS PLUS
42	1462.0	36227.9	29626.1300
43	1580.0	3875.4	10 YRS PLUS
44	1473.0	30510.4	80987.0850
45	1542.0	9716.7	10 YRS PLUS
46	1455.0	31318.1	10 YRS PLUS
47	1417.0	37419.5	86048.8900
48	1353.0	53104.2	30884.1280
49	1504.0	9187.1	10 YRS PLUS
50	1481.0	14514.9	10 YRS PLUS
51	1384.0	36097.8	10 YRS PLUS
52	1297.0	58150.5	71421.3250
53	1415.0	24254.5	10 YRS PLUS
54	1357.0	38729.7	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.00383 LB/SEC/BLADE (0.543 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.004907 LB/SEC/BLADE (0.696 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.007321 LB/SEC/BLADE (1.038 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.002379 LB/SEC/BLADE (0.337 PERCENT OF HOT GAS FLOW)

TABLE M-66

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1751.0	-35292.6	22.6651
2	1597.0	-5497.0	10 YRS PLUS
3	1785.0	-33856.9	14.3547
4	1620.0	-30729.4	301.3845
5	1690.0	-32779.4	154.4860
6	1616.0	-9427.3	10 YRS PLUS
7	1577.0	4867.1	10 YRS PLUS
8	1514.0	23186.0	10 YRS PLUS
9	1401.0	58059.4	2964.8061
10	1360.0	67988.6	1471.6497
11	1433.0	56558.3	1549.5185
12	1363.0	67776.7	787.8531
13	1499.0	43754.2	2273.1679
14	1449.0	58916.5	655.7148
15	1538.0	34852.2	4730.4857
16	1486.0	51326.7	888.0101
17	1594.0	19444.6	37740.4830
18	1539.0	37022.0	2829.3636
19	1610.0	13186.5	10 YRS PLUS
20	1554.0	30941.3	7327.9189
21	1568.0	21672.6	38926.5300
22	1493.3	44113.6	2521.7660
23	1634.0	-1938.1	10 YRS PLUS
24	1612.0	6656.9	10 YRS PLUS
25	1539.0	19690.5	10 YRS PLUS
26	1440.0	47839.4	5890.4924
27	1577.0	5216.1	10 YRS PLUS
28	1514.0	23276.8	10 YRS PLUS
29	1769.0	-32836.3	16.1145
30	1685.0	-28909.8	390.7658
31	1746.0	-32108.5	48.4000
32	1673.0	-19435.0	4655.2086
33	1661.0	-7917.3	10 YRS PLUS
34	1589.0	12018.1	10 YRS PLUS
35	1545.0	36706.4	2583.2225
36	1498.0	48232.0	1088.8247
37	1657.0	17860.0	11933.9140
38	1595.0	35155.4	976.1171
39	1727.0	2554.7	10 YRS PLUS
40	1667.0	19020.4	6236.6778
41	1738.0	-168.3	10 YRS PLUS
42	1677.0	15957.3	13385.8231
43	1729.0	-1252.7	10 YRS PLUS
44	1668.0	15403.6	20376.0010
45	1704.0	956.6	10 YRS PLUS
46	1642.0	17805.5	18055.2180
47	1609.0	23189.5	9124.0746
48	1545.0	38663.4	1660.1547
49	1670.0	-4113.1	10 YRS PLUS
50	1646.0	1378.9	10 YRS PLUS
51	1532.0	28025.3	25918.6770
52	1436.0	51860.3	3256.7914
53	1573.0	11115.1	10 YRS PLUS
54	1503.0	28677.0	51242.9420

LEADING EDGE W_{CLE} = 0.002798 LB/SEC/BLADE (0.397 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.003711 LB/SEC/BLADE (0.526 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.005554 LB/SEC/BLADE (0.788 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.002379 LB/SEC/BLADE (0.337 PERCENT OF HOT GAS FLOW)

TABLE M-67

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 3

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1619.0	-2401.6	10 YRS PLUS
2	1545.0	19177.8	10 YRS PLUS
3	1748.0	-32991.9	38.6624
4	1701.0	-28317.1	300.6480
5	1730.0	-32017.9	71.0115
6	1695.0	-25728.6	595.0465
7	1713.0	-28217.3	230.6058
8	1674.0	-15024.5	15128.7270
9	1404.0	64479.2	816.3761
10	1389.0	67463.4	705.2369
11	1429.0	65111.5	360.5176
12	1411.0	68703.5	300.0796
13	1519.0	53217.0	267.4568
14	1499.0	57061.7	235.3121
15	1585.0	38540.4	601.9803
16	1563.0	45713.2	300.1282
17	1670.0	13030.2	42726.5170
18	1649.0	20766.0	5523.4219
19	1697.0	3525.8	10 YRS PLUS
20	1675.0	6825.4	10 YRS PLUS
21	1666.0	11633.5	75875.2240
22	1639.0	21237.0	6293.3377
23	1720.0	-7729.1	10 YRS PLUS
24	1703.0	-1410.2	10 YRS PLUS
25	1615.0	22556.8	8918.3093
26	1518.0	51727.2	353.0253
27	1651.0	9221.3	10 YRS PLUS
28	1583.0	31352.2	3069.4059
29	1751.0	-29674.1	70.8299
30	1704.0	-21851.2	1068.4723
31	1708.0	-15194.7	7769.4257
32	1675.0	-6287.4	10 YRS PLUS
33	1756.0	-22423.0	274.2390
34	1713.0	-10484.6	32017.4720
35	1580.0	42044.5	355.4358
36	1558.0	47019.0	274.8975
37	1697.0	21426.6	1386.2206
38	1670.0	29083.6	543.4086
39	1754.0	10544.2	11047.4852
40	1729.0	17736.4	2005.5537
41	1758.0	11844.9	6586.2875
42	1732.0	18568.3	1422.6931
43	1769.0	6634.8	10 YRS PLUS
44	1744.0	13398.2	5650.8380
45	1760.0	5588.5	10 YRS PLUS
46	1735.0	11972.9	11225.4809
47	1677.0	26025.3	869.6617
48	1646.0	34565.3	307.1429
49	1747.0	-2563.2	10 YRS PLUS
50	1731.0	805.7	10 YRS PLUS
51	1606.0	33852.0	977.1288
52	1520.0	53984.4	228.9415
53	1643.0	17405.1	20133.6230
54	1582.0	34022.6	1753.4259

LEADING EDGE W_{CLE} = 0.0023 LB/SEC/BLADE (0.326 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0037 LB/SEC/BLADE (0.525 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00555 LB/SEC/BLADE (0.787 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00222 LB/SEC/BLADE (0.315 PERCENT OF HOT GAS FLOW)

TABLE M-68

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 23980 RPM, TIT = 2600°F,
WCA = 0.12356 LB/SEC/BLADE = (5.54 PERCENT OF HOT GAS FLOW)
TCA = 900°F, PTOT = 450 PSIA
CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1747.0	-36610.1	18.9591
2	1523.0	7384.3	10 YRS PLUS
3	1727.0	-37170.8	26.4530
4	1551.0	5.9	10 YRS PLUS
5	1662.0	-36131.0	92.6942
6	1537.0	5035.1	10 YRS PLUS
7	1554.0	1945.3	10 YRS PLUS
8	1394.0	47799.5	31271.9260
9	1414.0	41666.9	36480.4010
10	1302.0	70851.3	4778.9392
11	1484.0	26949.6	10 YRS PLUS
12	1335.0	67404.8	3473.2283
13	1526.0	17838.1	10 YRS PLUS
14	1371.0	60572.9	4513.7567
15	1545.0	14454.4	10 YRS PLUS
16	1366.0	58189.4	4492.7602
17	1558.0	11432.4	10 YRS PLUS
18	1414.0	51176.5	6946.0127
19	1542.0	15629.5	10 YRS PLUS
20	1422.0	48625.1	8648.8249
21	1483.0	30680.5	57966.4150
22	1398.0	53929.0	6795.7507
23	1559.0	8992.3	10 YRS PLUS
24	1532.0	17003.1	10 YRS PLUS
25	1482.0	27717.1	10 YRS PLUS
26	1375.0	56424.7	8505.0053
27	1532.0	12598.2	10 YRS PLUS
28	1444.0	36198.9	50615.6140
29	1750.0	-36270.2	19.0057
30	1573.0	-5154.8	10 YRS PLUS
31	1744.0	-35667.2	24.5519
32	1603.0	-10996.5	10 YRS PLUS
33	1532.0	12267.6	10 YRS PLUS
34	1367.0	55222.6	13612.8940
35	1452.0	38268.1	24653.0000
36	1341.0	66639.9	3372.4330
37	1557.0	16680.4	10 YRS PLUS
38	1406.0	55234.3	4252.3893
39	1622.0	2708.0	10 YRS PLUS
40	1457.0	46144.3	4870.5116
41	1637.0	-282.2	10 YRS PLUS
42	1467.0	45003.0	4472.2153
43	1641.0	-2354.0	10 YRS PLUS
44	1488.0	38613.2	8064.9671
45	1612.0	4273.7	10 YRS PLUS
46	1483.0	37988.7	10732.6655
47	1518.0	26907.0	49717.6150
48	1425.0	50429.6	5755.1856
49	1574.0	8359.0	10 YRS PLUS
50	1546.0	15151.5	10 YRS PLUS
51	1480.0	30551.7	65222.0530
52	1366.0	59723.8	6102.1390
53	1518.0	17827.3	10 YRS PLUS
54	1432.0	40040.9	29398.5450

LEADING EDGE W_{CLE} = 0.01014 LB/SEC/BLADE (0.454 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.013 LB/SEC/BLADE (0.583 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0194 LB/SEC/BLADE (0.869 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0063 LB/SEC/BLADE (0.282 PERCENT OF HOT GAS FLOW)

TABLE M-69

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1745.0	-34896.0	28.0864
2	1559.0	7218.6	10 YRS PLUS
3	1780.0	-33630.0	16.7272
4	1648.0	-14293.0	13064.3529
5	1731.0	-33758.8	48.5982
6	1620.0	-7278.5	10 YRS PLUS
7	1579.0	8130.3	10 YRS PLUS
8	1474.0	37237.3	16527.2520
9	1455.0	48097.5	3667.8807
10	1388.0	65232.4	1114.9913
11	1516.0	39495.6	3026.1287
12	1435.0	61238.7	632.9208
13	1580.0	28032.0	6895.0614
14	1499.0	51737.5	583.0702
15	1608.0	23116.2	9520.9098
16	1523.0	48777.8	506.8756
17	1657.0	9322.9	10 YRS PLUS
18	1571.0	37483.8	1091.2267
19	1672.0	4974.8	10 YRS PLUS
20	1582.0	34421.8	1606.2818
21	1636.0	14942.4	56009.5900
22	1542.0	44113.3	674.4576
23	1698.0	-6323.7	10 YRS PLUS
24	1672.0	3320.8	10 YRS PLUS
25	1630.0	11683.7	10 YRS PLUS
26	1491.0	52183.5	669.7731
27	1664.0	-1268.6	10 YRS PLUS
28	1565.0	29135.6	8109.4482
29	1779.0	-33095.2	19.0292
30	1647.0	-15937.0	29727.3650
31	1783.0	-31450.1	24.2269
32	1675.0	-16990.8	5129.5770
33	1647.0	-3372.0	10 YRS PLUS
34	1527.0	29459.7	21600.8090
35	1583.0	26408.0	9085.0433
36	1506.0	46431.1	1191.3367
37	1693.0	6885.3	10 YRS PLUS
38	1592.0	36689.5	754.2545
39	1752.0	-3396.6	10 YRS PLUS
40	1655.0	24820.7	1944.8070
41	1760.0	-2982.1	10 YRS PLUS
42	1662.0	24901.2	1601.9844
43	1761.0	-4675.9	10 YRS PLUS
44	1665.0	22995.0	2221.1999
45	1747.0	-3302.1	10 YRS PLUS
46	1650.0	24653.0	2288.4084
47	1677.0	13797.1	27485.0140
48	1575.0	42870.5	352.6239
49	1722.0	-5454.1	10 YRS PLUS
50	1693.0	1622.6	10 YRS PLUS
51	1619.0	21110.9	10955.6460
52	1484.0	56284.3	400.1762
53	1658.0	4871.0	10 YRS PLUS
54	1551.0	35127.4	3127.5854

LEADING EDGE W_{CLE} = 0.00741 LB/SEC/BLADE (0.332 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.009828 LB/SEC/BLADE (0.44 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.01471 LB/SEC/BLADE (0.659 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0063 LB/SEC/BLADE (0.282 PERCENT OF HOT GAS FLOW)

TABLE M-70

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 4

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1607.0	3909.1	10 YRS PLUS
2	1512.0	30581.1	25634.8830
3	1731.0	-31511.4	76.9783
4	1667.0	-15000.2	23941.9320
5	1762.0	-31455.4	38.5420
6	1706.0	-25299.0	498.3348
7	1716.0	-25467.0	378.5981
8	1651.0	-5411.2	10 YRS PLUS
9	1457.0	55879.7	893.7052
10	1430.0	61862.5	646.6409
11	1500.0	54439.9	358.2562
12	1469.0	59950.7	317.9865
13	1577.0	40676.3	480.1315
14	1544.0	50776.0	210.9085
15	1625.0	30569.4	1221.9314
16	1589.0	42496.9	262.8406
17	1700.0	8996.5	10 YRS PLUS
18	1664.0	21253.7	3290.2729
19	1721.0	2931.8	10 YRS PLUS
20	1684.0	11912.3	42758.8980
21	1709.0	6752.2	10 YRS PLUS
22	1668.0	20552.4	3641.2452
23	1757.0	-8487.4	37304.6350
24	1735.0	-970.5	10 YRS PLUS
25	1688.0	12068.1	36537.8070
26	1549.0	52091.3	130.5756
27	1721.0	1149.6	10 YRS PLUS
28	1615.0	35730.6	517.5281
29	1730.0	-27974.5	162.5074
30	1667.0	-9483.5	10 YRS PLUS
31	1727.0	-20810.3	774.7870
32	1673.0	-5496.4	10 YRS PLUS
33	1714.0	-11232.9	24419.1650
34	1643.0	10102.8	10 YRS PLUS
35	1604.0	33011.4	1234.6352
36	1566.0	42789.6	450.0507
37	1708.0	14586.4	9486.8036
38	1662.0	28462.2	754.8543
39	1757.0	6767.9	10 YRS PLUS
40	1713.0	20031.1	1404.3735
41	1758.0	10263.6	10939.7556
42	1714.0	22960.5	665.9871
43	1778.0	4348.9	10 YRS PLUS
44	1735.0	16831.7	2322.7900
45	1774.0	4018.5	10 YRS PLUS
46	1731.0	16195.1	3151.1967
47	1721.0	17430.5	2698.5229
48	1675.0	30967.2	323.6532
49	1772.0	-2148.8	10 YRS PLUS
50	1751.0	2966.3	10 YRS PLUS
51	1675.0	23104.1	1687.6440
52	1552.0	53789.2	104.2735
53	1709.0	9479.1	61719.3310
54	1613.0	38412.6	304.7222

LEADING EDGE W_{CLE} = 0.00609 LB/SEC/BLADE (0.273 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.0098 LB/SEC/BLADE (0.439 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.0147 LB/SEC/BLADE (0.659 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.00588 LB/SEC/BLADE (0.263 PERCENT OF HOT GAS FLOW)

TABLE M-71

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 24058 RPM, TIT = 2620°F,
WCA = 0.01359 LB/SEC/BLADE = (5.5 PERCENT OF HOT GAS FLOW)
TCA = 900°F, PTOT = 50 PSIA
CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1744.0	-26161.3	169.8216
2	1673.0	-5042.6	10 YRS PLUS
3	1725.0	-21332.3	713.9667
4	1674.0	-5751.2	10 YRS PLUS
5	1641.0	3850.9	10 YRS PLUS
6	1612.0	13310.2	10 YRS PLUS
7	1563.0	26771.1	14462.1065
8	1532.0	35824.0	4479.3355
9	1495.0	45117.6	2010.4796
10	1474.0	51556.1	1184.7059
11	1499.0	43776.1	2264.6941
12	1471.0	52073.9	1176.4528
13	1512.0	39456.7	3406.8491
14	1482.0	48343.9	1653.4749
15	1523.0	35328.9	6414.7100
16	1493.0	44166.9	2498.8728
17	1532.0	31384.1	12168.9659
18	1504.0	39580.0	4130.2790
19	1530.0	30363.2	16194.6054
20	1508.0	36739.6	7063.8299
21	1516.0	32312.1	15446.3996
22	1500.0	36955.7	8412.2457
23	1526.0	27470.9	34812.4190
24	1517.0	30114.0	24723.0410
25	1531.0	24050.4	65260.5200
26	1514.0	28786.7	36401.5420
27	1554.0	16075.8	10 YRS PLUS
28	1542.0	19345.4	10 YRS PLUS
29	1746.0	-25872.8	171.9119
30	1695.0	-11034.2	42780.8260
31	1687.0	-7276.1	10 YRS PLUS
32	1658.0	1196.6	10 YRS PLUS
33	1595.0	22148.0	16676.7590
34	1566.0	29494.9	7288.6811
35	1536.0	39210.2	1876.9471
36	1515.0	44135.5	1378.5473
37	1570.0	30827.1	4873.4487
38	1541.0	37821.3	2241.1160
39	1602.0	21739.8	15081.2706
40	1569.0	29955.9	6069.1081
41	1611.0	17053.6	53940.6510
42	1577.0	26042.8	11582.5863
43	1607.0	15688.8	10 YRS PLUS
44	1577.0	23472.8	20394.1200
45	1584.0	19169.5	54783.5680
46	1559.0	25506.9	21381.2130
47	1521.0	32870.2	11627.9064
48	1501.0	37895.0	6598.3788
49	1537.0	25417.3	40439.2350
50	1528.0	27638.9	31665.3700
51	1534.0	23773.3	63735.3200
52	1514.0	28915.7	35350.3510
53	1557.0	15495.9	10 YRS PLUS
54	1544.0	18907.3	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.001115 LB/SEC/BLADE (0.452 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.00143 LB/SEC/BLADE (0.579 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002132 LB/SEC/BLADE (0.863 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000693 LB/SEC/BLADE (0.281 PERCENT OF HOT GAS FLOW)

TABLE M-72

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1801.0	-22867.8	89.7927
2	1749.0	-10968.8	10921.2983
3	1807.0	-23032.6	76.0287
4	1772.0	-17771.5	705.5304
5	1729.0	-4980.9	10 YRS PLUS
6	1709.0	1703.8	10 YRS PLUS
7	1652.0	20871.7	4932.0229
8	1635.0	26910.0	2074.8868
9	1574.0	47436.1	170.9699
10	1563.0	49858.9	151.4120
11	1576.0	48677.8	132.6325
12	1563.0	51337.3	118.6296
13	1604.0	44051.4	140.4588
14	1590.0	47767.0	108.6398
15	1626.0	37615.0	261.9622
16	1612.0	43262.4	130.9942
17	1656.0	27815.8	1005.1412
18	1641.0	33817.4	407.5419
19	1668.0	23240.7	1955.1759
20	1652.0	29307.4	809.5699
21	1659.0	24560.2	1857.1714
22	1640.0	31652.1	663.3406
23	1663.0	21209.0	3407.2626
24	1653.0	25202.8	1886.7014
25	1694.0	9071.8	10 YRS PLUS
26	1671.0	17114.5	10634.8853
27	1729.0	-3550.3	10 YRS PLUS
28	1715.0	1199.3	10 YRS PLUS
29	1818.0	-22553.9	65.4995
30	1784.0	-19631.7	295.1950
31	1770.0	-13052.8	3334.6357
32	1751.0	-7761.3	74468.5730
33	1720.0	5035.2	10 YRS PLUS
34	1700.0	10460.2	45328.5760
35	1674.0	24246.4	1361.2251
36	1661.0	27910.0	869.6746
37	1720.0	15733.7	4613.4632
38	1703.0	20192.0	1704.1498
39	1753.0	8214.8	50558.6140
40	1736.0	12504.4	9213.8726
41	1758.0	6852.1	10 YRS PLUS
42	1741.0	10885.6	13719.2851
43	1750.0	7512.0	10 YRS PLUS
44	1732.0	12117.4	11554.2109
45	1732.0	10576.4	19055.9850
46	1715.0	14827.9	7338.8535
47	1694.0	19182.2	2974.9570
48	1672.0	25192.5	1172.7850
49	1684.0	18523.1	4764.1081
50	1673.0	21175.9	2661.3411
51	1694.0	11871.5	33306.5820
52	1671.0	18410.3	6898.9158
53	1728.0	-1194.1	10 YRS PLUS
54	1712.0	3180.2	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.000815 LB/SEC/BLADE (0.33 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001081 LB/SEC/BLADE (0.438 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001618 LB/SEC/BLADE (0.655 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000693 LB/SEC/BLADE (0.281 PERCENT OF HOT GAS FLOW)

TABLE M-73

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 5

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1767.0	-6678.5	10 YRS PLUS
2	1744.0	604.1	10 YRS PLUS
3	1816.0	-19407.9	152.9614
4	1821.0	-16580.5	521.4171
5	1771.0	-8007.0	37214.0390
6	1762.0	-4972.0	10 YRS PLUS
7	1730.0	6207.3	10 YRS PLUS
8	1720.0	9732.9	30240.9410
9	1600.0	48723.4	72.7286
10	1596.0	49608.3	69.4747
11	1596.0	51755.3	49.0239
12	1591.0	52810.6	46.6319
13	1641.0	43702.6	60.4769
14	1636.0	44995.5	55.4763
15	1683.0	35984.3	93.3545
16	1677.0	37379.2	80.2994
17	1732.0	22405.1	484.6087
18	1727.0	24550.1	351.7703
19	1750.0	16832.5	1611.7637
20	1744.0	17288.4	1608.9612
21	1739.0	20314.9	682.1988
22	1730.0	23737.6	386.9187
23	1721.0	25542.1	330.9074
24	1714.0	28394.1	217.1452
25	1761.0	12505.3	4949.6102
26	1738.0	20762.1	600.6051
27	1790.0	3209.5	10 YRS PLUS
28	1775.0	8416.9	24907.4010
29	1822.0	-18238.0	192.6225
30	1807.0	-15496.9	639.5754
31	1774.0	-2467.1	10 YRS PLUS
32	1766.0	-510.3	10 YRS PLUS
33	1769.0	2257.1	10 YRS PLUS
34	1758.0	5387.4	10 YRS PLUS
35	1713.0	25409.0	411.6659
36	1708.0	26584.9	363.9821
37	1770.0	15290.0	1632.8998
38	1762.0	17398.1	1007.6013
39	1799.0	10359.1	3887.2696
40	1792.0	12226.6	2550.6563
41	1800.0	12083.8	2204.5860
42	1793.0	13590.4	1618.6561
43	1802.0	11418.5	2591.7396
44	1796.0	12864.0	1895.9318
45	1793.0	13276.5	1787.4228
46	1786.0	14822.4	1294.0317
47	1754.0	23815.0	216.7494
48	1743.0	26706.8	155.5465
49	1734.0	27874.8	151.0857
50	1726.0	29692.4	125.4521
51	1759.0	16988.6	1234.3228
52	1739.0	22255.8	423.0525
53	1788.0	6350.5	61076.1000
54	1774.0	9809.0	9206.8446

LEADING EDGE W_{CLE} = 0.00067 LB/SEC/BLADE (0.271 PERCENT OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001078 LB/SEC/BLADE (0.437 PERCENT OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.001617 LB/SEC/BLADE (0.655 PERCENT OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0006468 LB/SEC/BLADE (0.262 PERCENT OF HOT GAS FLOW)

TABLE M-74

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 22857 RPM, TIT = 2320°F,
WCA = 0.02621 LBS/SEC/BLADE (3.35% OF HOT GAS FLOW)
TCA = 900°F, PTOT = 150 PSIA

CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1649.0	-16691.0	21849.1100
2	1556.0	10582.5	10 YRS PLUS
3	1637.0	-13618.9	85415.4940
4	1569.0	6716.0	10 YRS PLUS
5	1538.0	1313.0	10 YRS PLUS
6	1541.0	14652.1	10 YRS PLUS
7	1527.0	18603.7	10 YRS PLUS
8	1477.0	32948.5	40913.4170
9	1460.0	37500.4	23340.3200
10	1422.0	48762.5	8440.5930
11	1479.0	33413.8	34653.5630
12	1431.0	47392.6	8270.6665
13	1497.0	28543.2	62906.7620
14	1447.0	43244.0	10772.3024
15	1508.0	25075.7	10 YRS PLUS
16	1457.0	39978.3	14273.3522
17	1514.0	22168.4	10 YRS PLUS
18	1468.0	35611.7	28692.1380
19	1503.0	23560.0	10 YRS PLUS
20	1466.0	34265.2	41620.2220
21	1459.0	33215.3	65410.5200
22	1432.0	40996.7	24835.3930
23	1486.0	23513.9	10 YRS PLUS
24	1475.0	26917.5	10 YRS PLUS
25	1476.0	23519.0	10 YRS PLUS
26	1440.0	33367.3	10 YRS PLUS
27	1522.0	8964.4	10 YRS PLUS
28	1496.0	16025.5	10 YRS PLUS
29	1655.0	-17270.8	15333.8611
30	1547.0	3168.2	10 YRS PLUS
31	1632.0	-7690.2	10 YRS PLUS
32	1586.0	5235.2	10 YRS PLUS
33	1561.0	17642.3	10 YRS PLUS
34	1504.0	29539.6	40881.0050
35	1499.0	34269.3	16002.0144
36	1463.0	42797.1	7346.0108
37	1544.0	25216.0	34707.0160
38	1496.0	36754.3	9060.2313
39	1578.0	17303.0	10 YRS PLUS
40	1524.0	30469.5	18713.1500
41	1564.0	14441.7	10 YRS PLUS
42	1530.0	27700.8	29505.7740
43	1582.0	12162.2	10 YRS PLUS
44	1533.0	24128.6	60550.0790
45	1558.0	14899.9	10 YRS PLUS
46	1518.0	24725.5	81522.0090
47	1482.0	30915.7	56538.0440
48	1450.0	38682.4	23723.1770
49	1500.0	21864.6	10 YRS PLUS
50	1489.0	24336.0	10 YRS PLUS
51	1479.0	24041.5	10 YRS PLUS
52	1438.0	34318.6	10 YRS PLUS
53	1501.0	9971.6	10 YRS PLUS
54	1494.0	16895.6	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.002151 LBS/SEC/BLADE (0.275% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002757 LBS/SEC/BLADE (0.352% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.004113 LBS/SEC/BLADE (0.525% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001336 LBS/SEC/BLADE (0.171% OF HOT GAS FLOW)

TABLE M-75
SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
MEAN SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1701.0	-15109.9	9547.7445
2	1628.0	8655.2	10 YRS PLUS
3	1719.0	-20448.6	1058.0794
4	1671.0	-5003.6	10 YRS PLUS
5	1672.0	-4960.0	10 YRS PLUS
6	1637.0	6651.3	10 YRS PLUS
7	1610.0	16775.7	61004.6[illegible]
8	1581.0	25966.8	10565.7658
9	1539.0	40120.8	1421.7233
10	1519.0	46798.7	789.[illegible]
11	1557.0	38943.0	1140.[illegible]
12	1533.0	46997.6	527.4746
13	1591.0	32048.5	2134.6321
14	1568.0	39638.0	733.0474
15	1612.0	26343.2	4256.8901
16	1587.0	35192.5	1190.7431
17	1641.0	16681.1	27137.7720
18	1615.0	26438.1	3854.9694
19	1649.0	12929.3	77756.7740
20	1623.0	22339.2	7562.0526
21	1629.0	16886.1	34937.4570
22	1598.0	27891.3	4398.9491
23	1625.0	15105.5	71555.2[illegible]
24	1613.0	19923.1	19063.4[illegible]
25	1634.0	8843.3	10 YRS PLUS
26	1586.0	24356.4	13136.0613
27	1672.0	-5586.1	10 YRS PLUS
28	1643.0	3972.5	10 YRS PLUS
29	1726.0	-19604.7	1175.2295
30	1678.0	-4981.8	10 YRS PLUS
31	1713.0	-11695.4	21536.1470
32	1680.0	-2046.2	10 YRS PLUS
33	1660.0	2603.9	10 YRS PLUS
34	1647.0	11758.6	10 YRS PLUS
35	1639.0	21586.2	5840.8701
36	1616.0	26171.3	2582.7446
37	1691.0	12993.3	24862.2510
38	1662.0	20871.5	3814.1289
39	1722.0	6706.9	10 YRS PLUS
40	1694.0	14099.7	15951.2611
41	1724.0	5950.5	10 YRS PLUS
42	1696.0	13042.0	21477.4790
43	1716.0	5696.0	10 YRS PLUS
44	1687.0	13421.7	23950.1470
45	1697.0	7913.6	10 YRS PLUS
46	1668.0	15554.1	19375.6810
47	1637.0	21938.5	5707.3554
48	1604.0	31061.7	1585.7922
49	1636.0	16841.3	29391.7370
50	1623.0	19832.0	15036.9331
51	1631.0	13478.6	10 YRS PLUS
52	1584.0	26612.2	8455.8[illegible]
53	1671.0	-2529.3	10 YRS PLUS
54	1638.0	6952.4	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.001572 LBS/SEC/BLADE (0.201% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002085 LBS/SEC/BLADE (0.266% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00312 LBS/SEC/BLADE (0.399% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001336 LBS/SEC/BLADE (0.171% OF HOT GAS FLOW)

TABLE M-76

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 2A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1642.0	10788.6	10 YRS PLUS
2	1668.0	21966.5	12216.1075
3	1714.0	-12876.1	14259.4422
4	1693.0	-5613.8	10 YRS PLUS
5	1708.0	-10075.2	41713.7780
6	1692.0	-4708.8	10 YRS PLUS
7	1691.0	-2713.1	10 YRS PLUS
8	1674.0	3050.0	10 YRS PLUS
9	1558.0	42245.1	605.6089
10	1551.0	44831.5	473.1566
11	1568.0	45867.8	257.5323
12	1560.0	46728.8	196.8086
13	1616.0	36167.7	459.1901
14	1607.0	39831.3	260.3205
15	1652.0	26822.9	1371.9645
16	1643.0	30363.1	810.1012
17	1699.0	12673.3	22436.3220
18	1639.0	16467.8	8289.1171
19	1712.0	8262.2	10 YRS PLUS
20	1702.0	9440.1	76472.6730
21	1695.0	12988.4	22436.5060
22	1690.0	18362.6	5564.4510
23	1675.0	17967.9	7213.8981
24	1665.0	21846.0	2830.6484
25	1695.0	10727.5	47340.1900
26	1649.0	26509.2	1582.0620
27	1727.0	-95.8	10 YRS PLUS
28	1697.0	10001.2	57074.3000
29	1716.0	-8340.6	10 YRS PLUS
30	1695.0	-2069.2	10 YRS PLUS
31	1702.0	361.4	10 YRS PLUS
32	1687.0	4416.6	10 YRS PLUS
33	1726.0	-2979.8	10 YRS PLUS
34	1707.0	2525.0	10 YRS PLUS
35	1671.0	20742.2	3166.3453
36	1660.0	23672.4	2184.8613
37	1726.0	12675.2	11218.1501
38	1714.0	15903.9	5292.0388
39	1750.0	9625.4	19205.5190
40	1738.0	12990.2	7487.1401
41	1748.0	12105.1	7764.0752
42	1737.0	14706.1	4403.3073
43	1751.0	10466.4	12211.3013
44	1739.0	13634.7	5927.5118
45	1742.0	11364.3	11459.7398
46	1731.0	14014.5	6398.7181
47	1689.0	25185.6	771.5268
48	1672.0	29822.2	442.9363
49	1680.0	24389.5	1137.7534
50	1671.0	26383.9	935.7671
51	1691.0	16759.4	7150.9566
52	1650.0	28406.4	1030.6877
53	1723.0	4315.3	10 YRS PLUS
54	1696.0	11664.6	33841.5240

LEADING EDGE W_{CLE} = 0.001292 LBS/SEC/BLADE (0.165% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.002079 LBS/SEC/BLADE (0.266% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.003118 LBS/SEC/BLADE (0.398% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.001247 LBS/SEC/BLADE (0.159% OF HOT GAS FLOW)

TABLE M-77

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED
IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD,
HUB SECTION, 22857. RPM, TIT = 2320.°F,
WCA = 0.01833 LBS/SEC/BLADE (2.34% OF HOT GAS FLOW)
TCA = 600°F, PTOT = 150 PSIA
CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1610.0	-15394.7	10 YRS PLUS
2	1508.0	12990.8	10 YRS PLUS
3	1597.0	-12094.1	10 YRS PLUS
4	1523.0	8651.0	10 YRS PLUS
5	1545.0	2629.9	10 YRS PLUS
6	1494.0	17031.1	10 YRS PLUS
7	1484.0	20163.7	10 YRS PLUS
8	1431.0	35365.4	10 YRS PLUS
9	1427.0	36891.0	71969.[illegible]
10	1364.0	49717.2	22,98.[illegible]
11	1447.0	33305.2	10 YRS PLUS
12	1394.0	48806.9	19242.[illegible]
13	1467.0	28379.5	10 YRS PLUS
14	1412.0	44647.6	23600.[illegible]
15	1478.0	25289.2	10 YRS PLUS
16	1423.0	41485.1	29789.[illegible]
17	1485.0	22223.3	10 YRS PLUS
18	1435.0	36954.7	55675.[illegible]
19	1474.0	23562.9	10 YRS PLUS
20	1434.0	35236.0	86187.[illegible]
21	1428.0	33490.5	10 YRS PLUS
22	1398.0	42194.4	55977.[illegible]
23	1435.0	28762.4	10 YRS PLUS
24	1423.0	32549.0	10 YRS PLUS
25	1470.0	16605.7	10 YRS PLUS
26	1434.0	26556.9	10 YRS PLUS
27	1534.0	-3070.3	10 YRS PLUS
28	1509.0	3800.4	10 YRS PLUS
29	1618.0	-16347.7	56701.[illegible]
30	1544.0	4518.5	10 YRS PLUS
31	1598.0	-7234.9	10 YRS PLUS
32	1548.0	5741.7	10 YRS PLUS
33	1520.0	17065.2	10 YRS PLUS
34	1470.0	29539.8	10 YRS PLUS
35	1480.0	31416.7	53423.[illegible]
36	1439.0	40999.4	27180.[illegible]
37	1527.0	23225.5	10 YRS PLUS
38	1475.0	35460.0	24241.[illegible]
39	1561.0	16286.6	10 YRS PLUS
40	1504.0	29837.5	38192.[illegible]
41	1567.0	13767.7	10 YRS PLUS
42	1509.0	27648.8	54453.[illegible]
43	1563.0	11833.2	10 YRS PLUS
44	1510.0	24429.2	10 YRS PLUS
45	1535.0	15112.6	10 YRS PLUS
46	1492.0	25374.7	10 YRS PLUS
47	1443.0	34506.7	78009.[illegible]
48	1407.0	42997.7	36840.[illegible]
49	1446.0	28673.5	10 YRS PLUS
50	1433.0	31465.8	10 YRS PLUS
51	1473.0	17613.8	10 YRS PLUS
52	1432.0	27689.2	10 YRS PLUS
53	1532.0	-1465.4	10 YRS PLUS
54	1506.0	5082.3	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.001504 LBS/SEC/BLADE (0.192% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001928 LBS/SEC/BLADE (0.246% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002876 LBS/SEC/BLADE (0.367% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0009344 LBS/SEC/BLADE (0.119% OF HOT GAS FLOW)

TABLE M-78

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, MEAN SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1666.0	-11811.6	71484.0930
2	1588.0	13411.0	10 YRS PLUS
3	1687.0	-17884.8	5454.8587
4	1636.0	-1180.1	10 YRS PLUS
5	1639.0	-1363.1	10 YRS PLUS
6	1603.0	10637.5	10 YRS PLUS
7	1580.0	19332.0	57681.3170
8	1550.0	28354.1	14558.8686
9	1524.0	39080.6	2672.5972
10	1501.0	46623.0	1320.3408
11	1543.0	38856.7	1684.5237
12	1517.0	47545.0	734.4266
13	1579.0	32567.2	2612.6721
14	1554.0	40809.1	852.7499
15	1601.0	27931.9	4028.0346
16	1576.0	36503.2	1188.8443
17	1633.0	18098.4	20780.8790
18	1607.0	28068.6	3339.6095
19	1645.0	13707.4	66647.1680
20	1618.0	23639.1	6520.4147
21	1632.0	15967.3	44071.1900
22	1600.0	27567.7	4476.9931
23	1618.0	17760.1	34955.2040
24	1604.0	23408.2	9944.8265
25	1660.0	1629.2	10 YRS PLUS
26	1615.0	16857.7	51691.2180
27	1708.0	-15341.5	7403.7869
28	1682.0	-6795.7	10 YRS PLUS
29	1695.0	-17483.4	5084.4752
30	1645.0	-1902.6	10 YRS PLUS
31	1686.0	-10110.8	73712.4850
32	1651.0	298.4	10 YRS PLUS
33	1660.0	2893.5	10 YRS PLUS
34	1627.0	12010.1	10 YRS PLUS
35	1639.0	16858.7	26958.3230
36	1614.0	24049.5	6632.4621
37	1692.0	9897.6	70461.6870
38	1663.0	17656.8	10922.5754
39	1723.0	5064.9	10 YRS PLUS
40	1695.0	12291.3	28244.7350
41	1724.0	5697.0	10 YRS PLUS
42	1696.0	12530.6	25427.1960
43	1714.0	6650.1	10 YRS PLUS
44	1695.0	14194.5	19529.3280
45	1693.0	9962.7	65302.1230
46	1664.0	17421.8	11513.3013
47	1632.0	24676.2	3617.1342
48	1595.0	34634.1	1093.7090
49	1609.0	26702.6	4261.1433
50	1594.0	29877.6	3170.0921
51	1656.0	7146.3	10 YRS PLUS
52	1613.0	19480.2	22193.9110
53	1706.0	-11652.7	26175.5910
54	1677.0	-3681.8	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.001099 LBS/SEC/BLADE (0.14% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001458 LBS/Sec/BLADE (0.186% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.002182 LBS/SEC/BLADE (0.279% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.0009344 LBS/SEC/BLADE (0.119% OF HOT GAS FLOW)

TABLE M-78

SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE, 1.5 INCH CHORD, TIP SECTION, CONDITION 3A

ELEMENT NO.	TEMPERATURE	STRESS	LIFE(HRS)
1	1601.0	17174.9	68190.4040
2	1566.0	27368.5	11669.1186
3	1662.0	-9146.7	10 YRS PLUS
4	1660.0	-1401.6	10 YRS PLUS
5	1660.0	-6966.8	10 YRS PLUS
6	1664.0	-1566.2	10 YRS PLUS
7	1668.0	-565.0	10 YRS PLUS
8	1651.0	5200.3	10 YRS PLUS
9	1549.0	40623.5	1002.9727
10	1541.0	43464.4	771.5899
11	1557.0	46293.9	317.9761
12	1548.0	49446.8	237.4681
13	1608.0	37651.0	407.3414
14	1598.0	41589.7	242.9785
15	1648.0	28406.4	1083.0294
16	1638.0	32297.3	607.5754
17	1698.0	14578.5	12254.3754
18	1668.0	18434.1	4432.6708
19	1714.0	10304.5	33792.1370
20	1704.0	11711.4	27044.9800
21	1705.0	13645.5	13962.9941
22	1690.0	19086.6	3395.3661
23	1676.0	22727.3	1781.3970
24	1665.0	27008.4	952.3447
25	1731.0	5565.5	10 YRS PLUS
26	1690.0	19719.9	2753.2524
27	1769.0	-6058.5	10 YRS PLUS
28	1742.0	2882.2	10 YRS PLUS
29	1645.0	-5192.9	10 YRS PLUS
30	1663.0	1570.0	10 YRS PLUS
31	1675.0	2715.2	10 YRS PLUS
32	1659.0	7137.2	10 YRS PLUS
33	1708.0	-2924.9	10 YRS PLUS
34	1690.0	2342.0	10 YRS PLUS
35	1675.0	14909.4	19997.7750
36	1664.0	17839.6	10009.3927
37	1732.0	8109.5	10 YRS PLUS
38	1720.0	11326.4	20293.2137
39	1755.0	6989.9	10 YRS PLUS
40	1743.0	10332.0	15599.7198
41	1752.0	11295.9	9119.5075
42	1740.0	14178.2	4849.5435
43	1753.0	11680.1	7841.2483
44	1741.0	14810.4	3855.2525
45	1743.0	14146.1	4549.4728
46	1731.0	17074.2	2368.3591
47	1669.0	29585.0	378.1976
48	1671.0	34507.0	169.3756
49	1664.0	35131.5	175.7334
50	1653.0	37761.5	131.3737
51	1726.0	12158.0	13275.1576
52	1690.0	22069.8	1435.5371
53	1766.0	-1859.2	10 YRS PLUS
54	1742.0	4318.6	10 YRS PLUS

LEADING EDGE W_{CLE} = 0.0009032 LBS/SEC/BLADE (0.115% OF HOT GAS FLOW)

PRESSURE SIDE W_{CAP} = 0.001454 LBS/SEC/BLADE (0.186% OF HOT GAS FLOW)

SUCTION SIDE W_{CAS} = 0.00218 LBS/SEC/BLADE (0.278% OF HOT GAS FLOW)

TRAILING EDGE W_{CTE} = 0.000872 LBS/SEC/BLADE (0.111% OF HOT GAS FLOW)

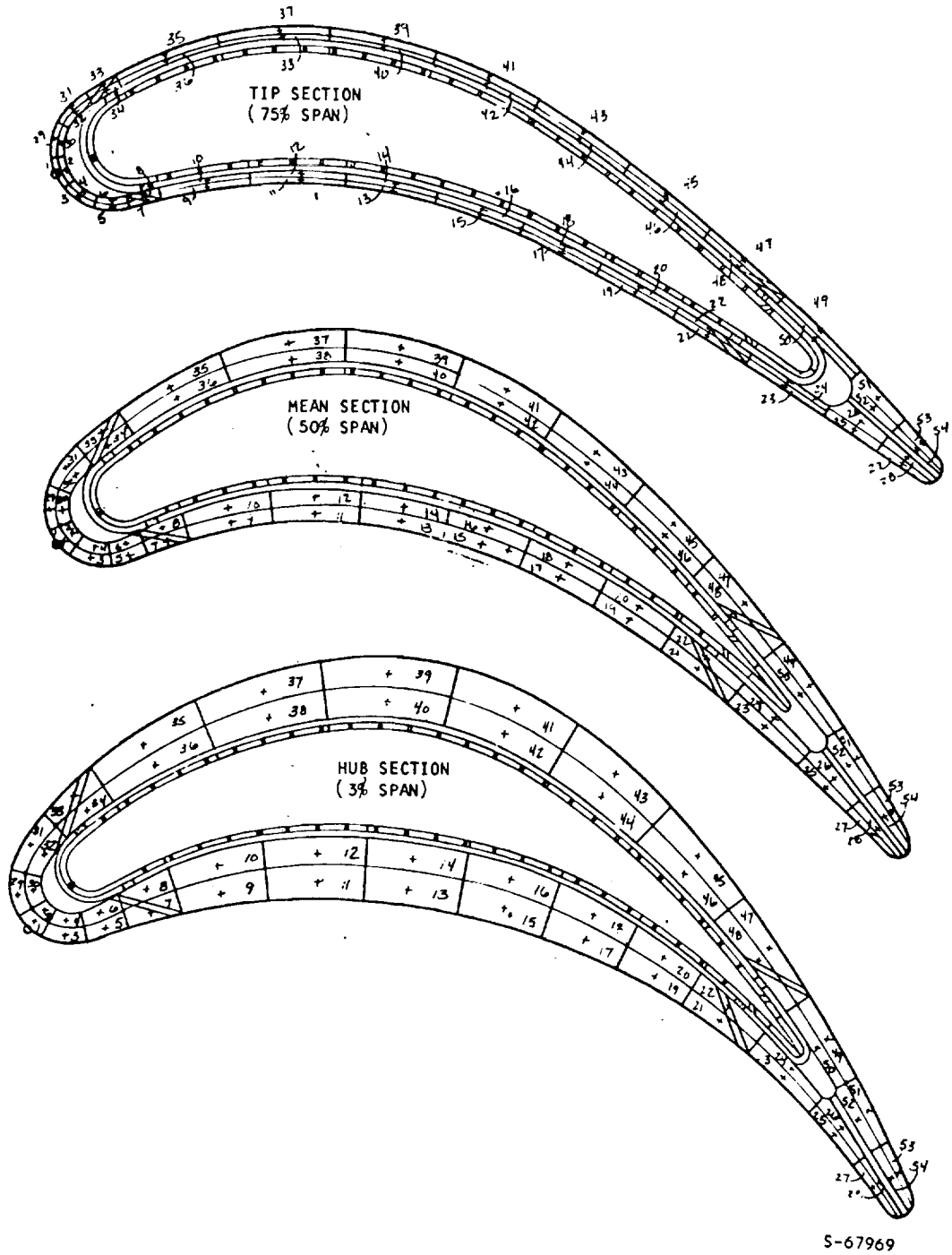

FIGURE M-14. SCHEME B-5 FILM-CONVECTION COOLED FABRICATED IMPINGEMENT TUBE BLADE 1.5 INCH CHORD

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