ATTACHMENT A

ADDENDUM A POWERPLANT FACTUAL REPORT

DCA-95-MA-054

The following attachment includes all the documents distributed during the Powerplant Group meeting of September 13 and 14 at Hamilton Standard, Windsor Locks, Connecticut.

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Propeller Blade Fracture 14RF-9 Preliminary Striation Densities, Zone I
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14RF-9 Propeller Blade Fracture Striation Count-Preliminary, S/N 861398
Findings from TEM Analysis of Incident Blades
Theoretical Crack Growth Analysis
da/dN-vs-Delta K for 7075-T73
Figure 2a, 2b
Stress Intensity Relationships
Calculated Typical (B50) Crack Propagation Life
Ratio of Life at any Pit Depth to Life for Single 0.030 Pit

1994 BLADE NON DESTRUCTIVE INSPECTION AND REPAIR PROCESS.
14RF Taper Bore
Station 18.00
Alert Service Bulletin 14RF-19-61-A49 Pages 14, 16, 8, 10
Simulated Pit/Crack for Ultrasonic Testing of the Taper Bore

PS960/PS960A HISTORY
Letter Hamilton Standard to FAA dated April 8, 1994
Statement of Compliance with the FARS dated April 8, 1995
Attachment "A" to 14-RF-FAA-232 page 1, 2, and 3 of 3.
Attachment "B" to 14-RF-FAA-232 page 1, 2, and 3 of 3.
14-RF-14SF-6/5500/F Regional Propeller Blades Ref. PS 960A
Approved Repair or Wear Limits of Service Material Serial No. PS 960A
PS 960 (Original)
PS 960A Diagram

1995 EMB 120 BLADE STRESS SURVEY PLANS.
EMB120 Propeller Blade Stress Survey
Test Plan Summary
14RF-9 Propeller/Blade Stress Survey

FDR INFORMATION REQUEST.

ACCIDENT 95MA054, BLADE FRACTURE INVESTIGATION SUMMARY

AD T95-18-51 AND PRIORITY LETTER AD 95-18-06R1 BLADE INSPECTION STATUS AND SUMMARY OF FINDINGS.
T95-18-51
AD 95-18-06R1
Inspection Status of AD T95-18-51 & AD 95-18-06R1, Sept 14, 95, 8:06 AM.
Not Peened Blades Inspection Status of AD 95-18-06R1, Sept 14, 95, 8:09 AM.
Peened Blades Inspection Status of AD 95-18-061, Sept 14, 95, 8:07 AM.
Blades Done, September 13, 1995.
Blades in Progress, September 13, 1995.

Blades Needing Action, September 13,1995.
Blades Scheduled, September 13, 1995.

CURRENT BLADE INSPECTION AND NDI TECHNIQUES UNDER DEVELOPMENT.
Regional Blade Taper Bore Inspection & Repair History

National Transportation Safety Board

Washington, D.C. 20594

September 7, 1995

Stuart C. Browning
Senior Service Engineer/Group Leader
Regional Aircraft Products
United Technologies Hamilton Standard
One Hamilton Road
Windsor Locks, Connecticut 06096

Dear Stuart:

I would like to reconvene the Powerplant Group at Hamilton Standard, Windsor Locks, Connecticut on or about Wednesday, September 13, 1995. I am forwarding the following questions as part of the investigation into the Atlantic Southeast Airlines EMB-120, accident of August 21, 1995. I would like to discuss my questions with your colleagues at Hamilton Standard followed by the disassembly of the accident propellers.

1. Please brief us on the history of the Hamilton Standard 14RF and SF Propellers. If possible, include discussion about the operation and the development of the design, material, and manufacturing.

2. Please brief us on the history of the Process Standard (PS) 960 repair.

3. Please brief us on the stress in the blade root during each phase of flight. If possible, could you include a description of the various forces that are responsible for the stress in the blade structure.

4. Please brief us on the "reactionless" vibration mode.

5. Please brief us on the fracture mechanics of the bore and shank. If possible, include crack initiation, crack propagation, critical crack length, and striation mechanics.

6. Please brief us on the non-destructive inspection processes currently in use, their defect detection capability and the threshold of detection for each particular defect. Please include any NDI techniques under consideration.

7. Please brief us on the load imbalance associated with a propeller blade failure, the engine support structure to resist the imbalance, and the requirements for the structure to resist the imbalance.

8. Please brief us on the scope and intent of the flight test program surrounding this type failure.

9. Please brief us on the inspection status of Telegraphic AD T95-18-51 and Priority Letter AD 95-18-06R1. Please include the inspection findings of the propeller blades that have been pulled from service as a result of the Telegraphic AD and the Priority Letter.

10. Please brief us on why you requested the reduction gearbox vibration data from the digital flight recorder data recorder (DFDR) data from the accident airplane.

11. Please brief us on known application differences for this propeller, that is stress, vibration, reactionalless vibration mode, rpm, resonances, etc., for the EMB-120, ATR-42, Do-328, S340, CL215/415, ATP, CN235, and DHC-8 or any other installation where this propeller is used.

12. Please brief us on any other engineering effort surrounding the investigation of this blade failure.

Sincerely,

[redacted]

Jerome D. Frechette,
Powerplant Group Chairman

NTSB POWER PLANT GROUP
ACCIDENT INVESTIGATION #95MA054

HAMILTON STANDARD WINDSOR LOCKS, CT

WEDNESDAY , SEPTEMBER 13, 1995
AGENDA

	Time	Item	NTSB Ref #
	9:00 AM	*CONVENE*	
	9:00 - 9:30	*INTRODUCTIONS*	
1.	9:30 - 10:30	*DESIGN, MANUFACTURING AND OPERATIONAL HISTORY OF HAMILTON STANDARD 14RF AND 14SF PROPELLERS.* (S. LUDEMANN)	*1.*
	10:30 - 10:45	BREAK	
2.	10:45 - 12:00	*TYPICAL FLIGHT PROFILE BLADE LOADING / ANALYSIS OF STRESS.* (S. LUDEMANN)	*3.*
	12:00 - 1:00	15 MINUTE BREAK AND WORKING LUNCH	
3.	12:15 - 1:00	*"REACTIONLESS" VIBRATION MODE DISCUSSION.* (S. LUDEMANN)	*4.*
4.	1:00 - 2:00	*SIMILARITIES AND DIFFERENCES IN DESIGN LOADING, VIBRATION, RPM AND RESONANCE FOR HS REGIONAL PROPELLERS.* (S. LUDEMANN)	*11.*
5.	2:00 - 2:30	*LOAD IMBALANCE ASSOCIATED WITH BLADE LOSS AND INSTALLATION FAILURE TOLERANCE REQUIREMENTS.* (S. LUDEMANN)	*7.*
	2:30 - 2:45	BREAK	
6.	2:45 - 3:45	*BLADE TAPER BORE FRACTURE MECHANICS AND PROPAGATION ANALYSIS.* (J. MATTAVI)	*5.*
7.	3:45 - 4:30	1994 *BLADE NON DESTRUCTIVE INSPECTION AND REPAIR PROCESS* (M. PHALIN, J. DEVANSKI)	*6.*

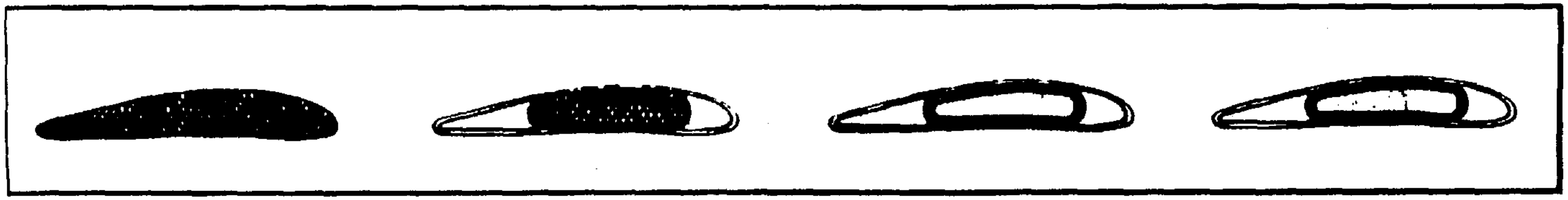
NTSB POWER PLANT GROUP
ACCIDENT INVESTIGATION #95MA054

HAMILTON STANDARD WINDSOR LOCKS, CT

THURSDAY, SEPTEMBER 14, 1995
AGENDA

	Time	Item	NTSB Ref #
	8:00 AM	CONVENE	
1.	8:00 - 8:30	*PS 960/PS960A HISTORY* (J. DEVANSKI, S. LUDEMANN)	*2.*
2.	8:30 - 9:00	*1995 EMB 120 BLADE STRESS SURVEY PLANS* (S. LUDEMANN)	*8.*
3.	9:00 - 9:15	*FDR INFORMATION REQUEST.* (S. BROWNING)	*10.*
4.	9:15 - 10:00	*ACCIDENT #95MA054, BLADE FRACTURE INVESTIGATION SUMMARY.* (M. RATCHFORD)	*12.*
	10:00 - 10:15	BREAK	
4.	10:15 - 11:15	*AD T95-18-51 AND PRIORITY LETTER AD 95-18-06R1 BLADE INSPECTION STATUS AND SUMMARY OF FINDINGS..* (M. RATCHFORD)	*9.*
5.	11:15 - 12:00	*CURRENT BLADE INSPECTION AND NDI TECHNIQUES UNDER DEVELOPMENT.* (R. CLEVERDON, M. RATCHFORD)	*12,6.*
	12:00 - 1:00	15 MINUTE BREAK AND WORKING LUNCH	
6.	12:15 - 1:00	*REVIEW* (POWER PLANT TEAM)	
7.	1:00 - 4:30	*DETAILED DISASSEMBLY OF ACCIDENT#95MA054 PROPELLER HARDWARE.* (POWER PLANT TEAM)	
8.	4:30 - 5:00	REVIEW AND ADJOURN (POWER PLANT TEAM)	

BLADE DESIGN
Maintains Spar/Shell Philosophy



54H60	24PF	54460	247F/568F
C-130H	DHC-7	E-2/C-2	ATR 72/ATR 42-500

- Spar is main load carrying member - protected by shell
- Shell is secondary structure - provides aerodynamic contour
- Shell is field repairable for minor damage
- Result - major system weight reduction

Experience: 20,000,000 flight hours
Composite shells in FOD and erosion environment

HAMILTON STANDARD

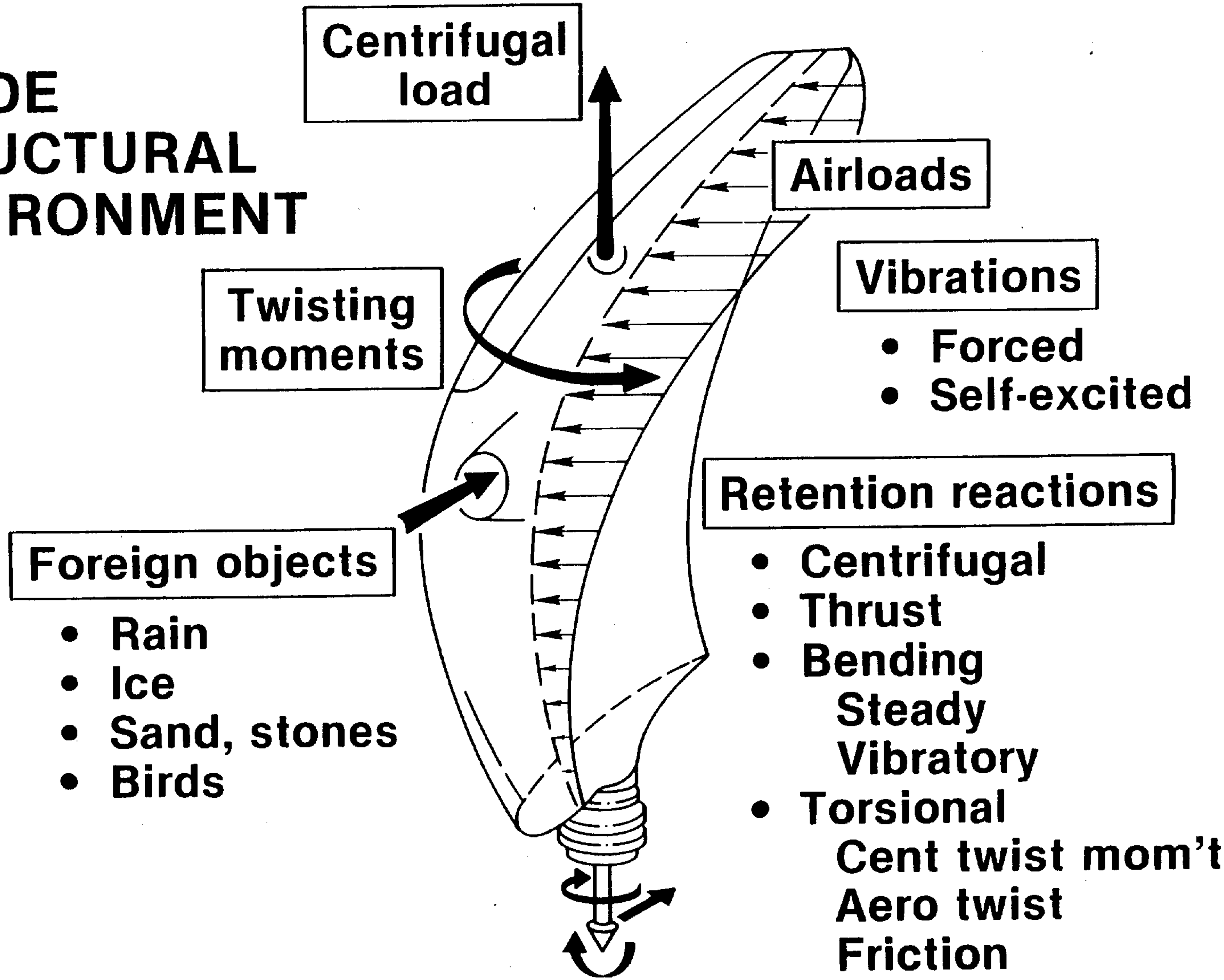
EG1203200ek-4

REGIONAL PROPELLER DISTRIBUTION

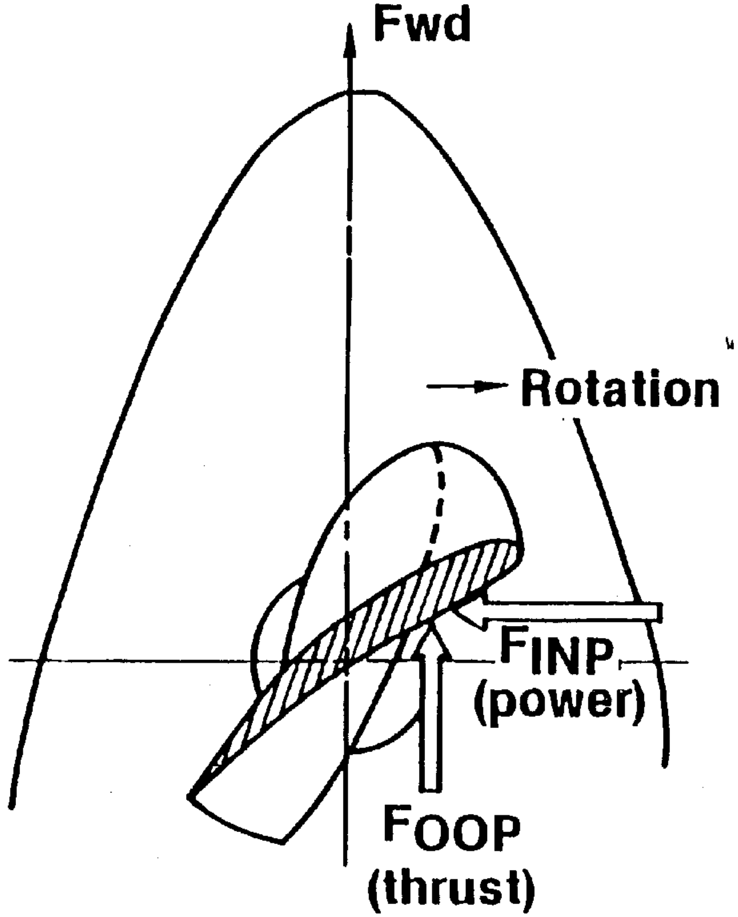
PROPELLER	AIRCRAFT	AIRCRAFT QUANTITY	NUMBER OF OPERATORS
14RF	EMB 120	317	27
14RF	CN 235	32	11
14RF	S 340	89	3
14SF	Dash 8	400	25
14SF	ATR 42/72	418	61
14SF	CL 215/415	30	7
6/5500/F	ATP	57	9
	Totals	**1343**	**143**

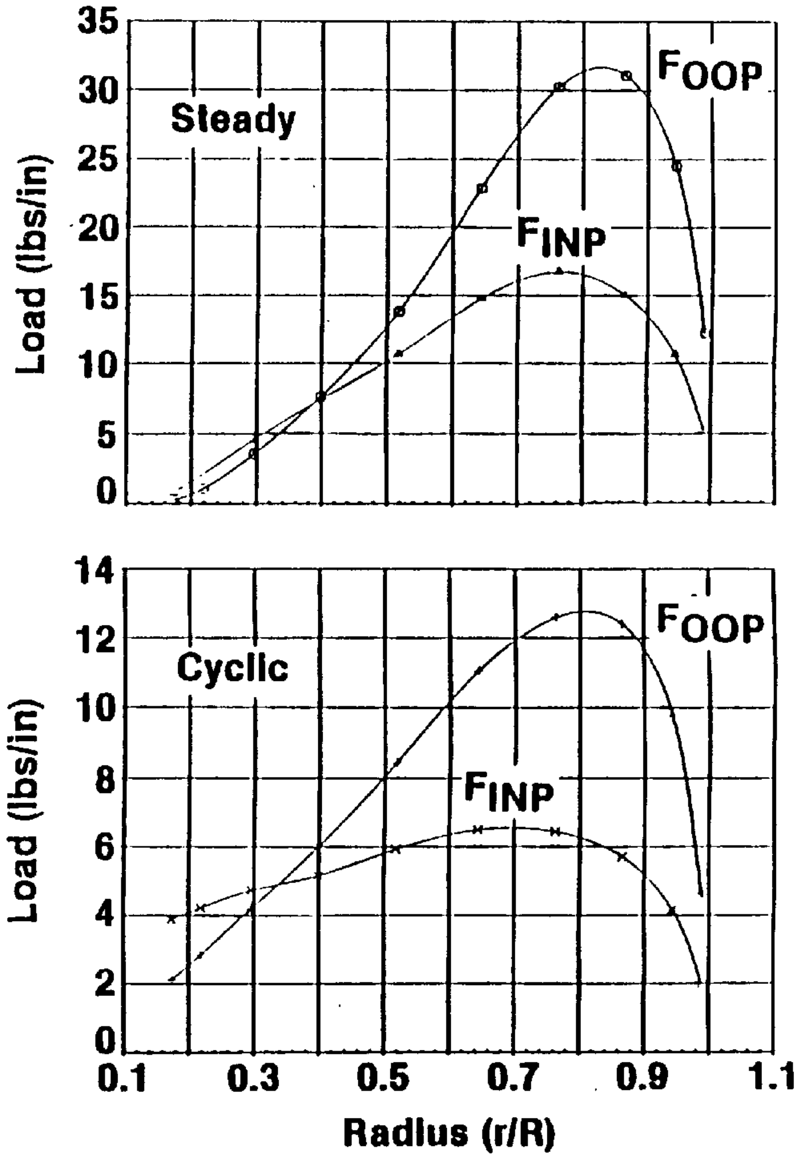
9/13/95 JY Admin Dist

BLADE STRUCTURAL ENVIRONMENT

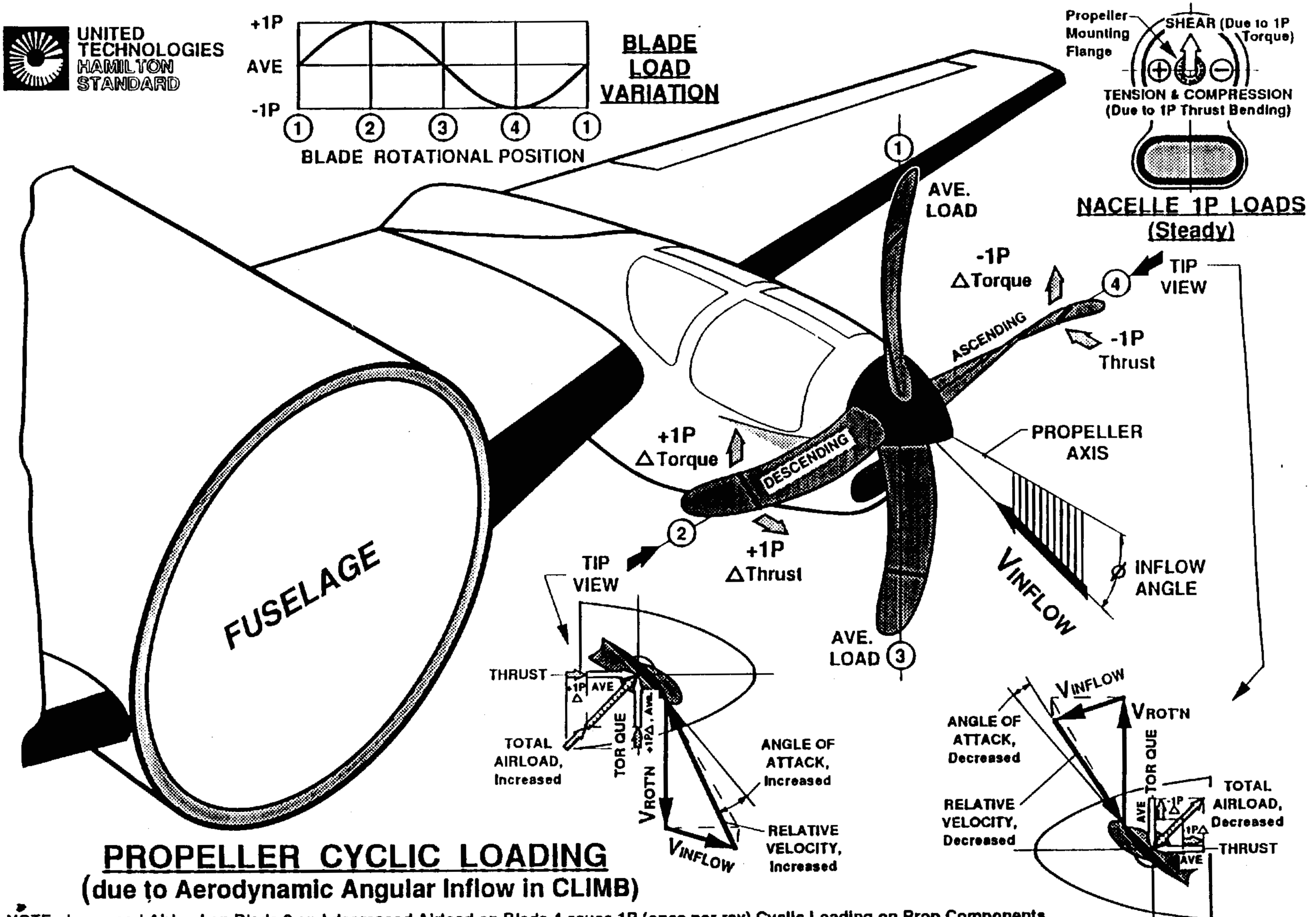


TYPICAL AERO LOADS
Takeoff/Climb Condition





UNITED TECHNOLOGIES
HAMILTON STANDARD



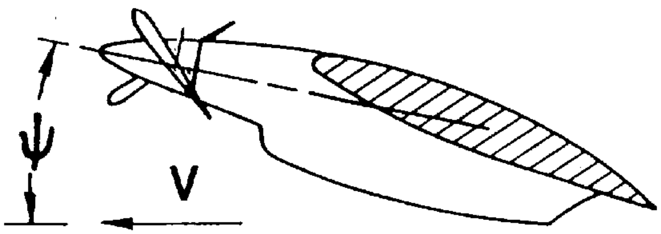
PROPELLER CYCLIC LOADING

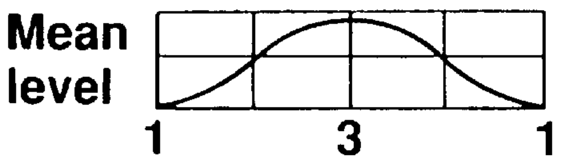
(due to Aerodynamic Angular Inflow in CLIMB)

NOTE: Increased Airload on Blade 2 and decreased Airload on Blade 4 cause 1P (once per rev) Cyclic Loading on Prop Components including Blades, Seals, Retentions & Hub, as well as Mounting Flange & Prop Shaft. However, the loading on Nacelle & Wing static structures is Steady & includes an upward Shear & a Bending Moment (Tension & Compression, shown in sketch, upper right)

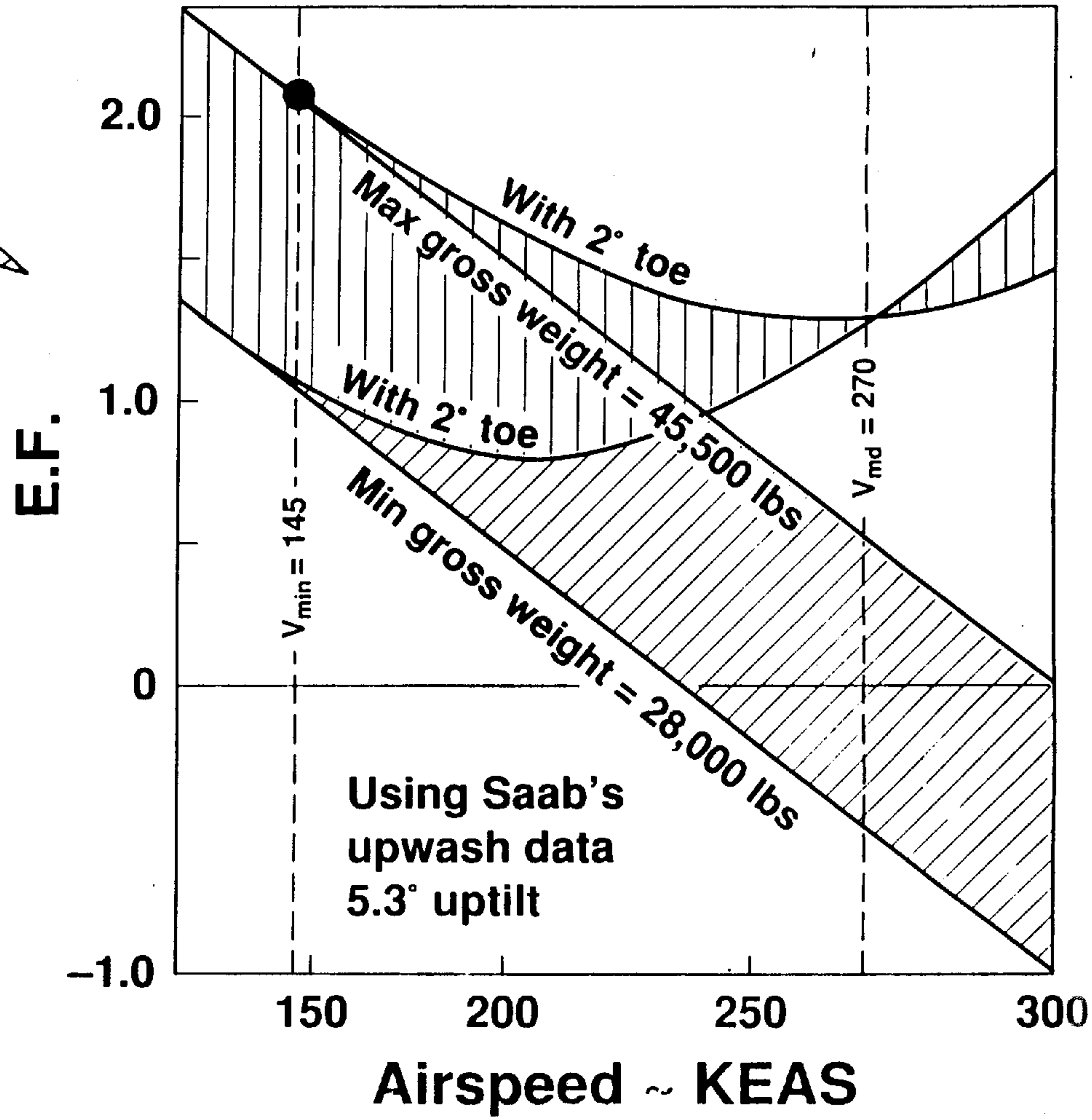
John Violette
Feb. 14, 1994

AERODYNAMIC EXCITATION FACTORS ESTIMATED FOR SAAB-2000 PROPELLER

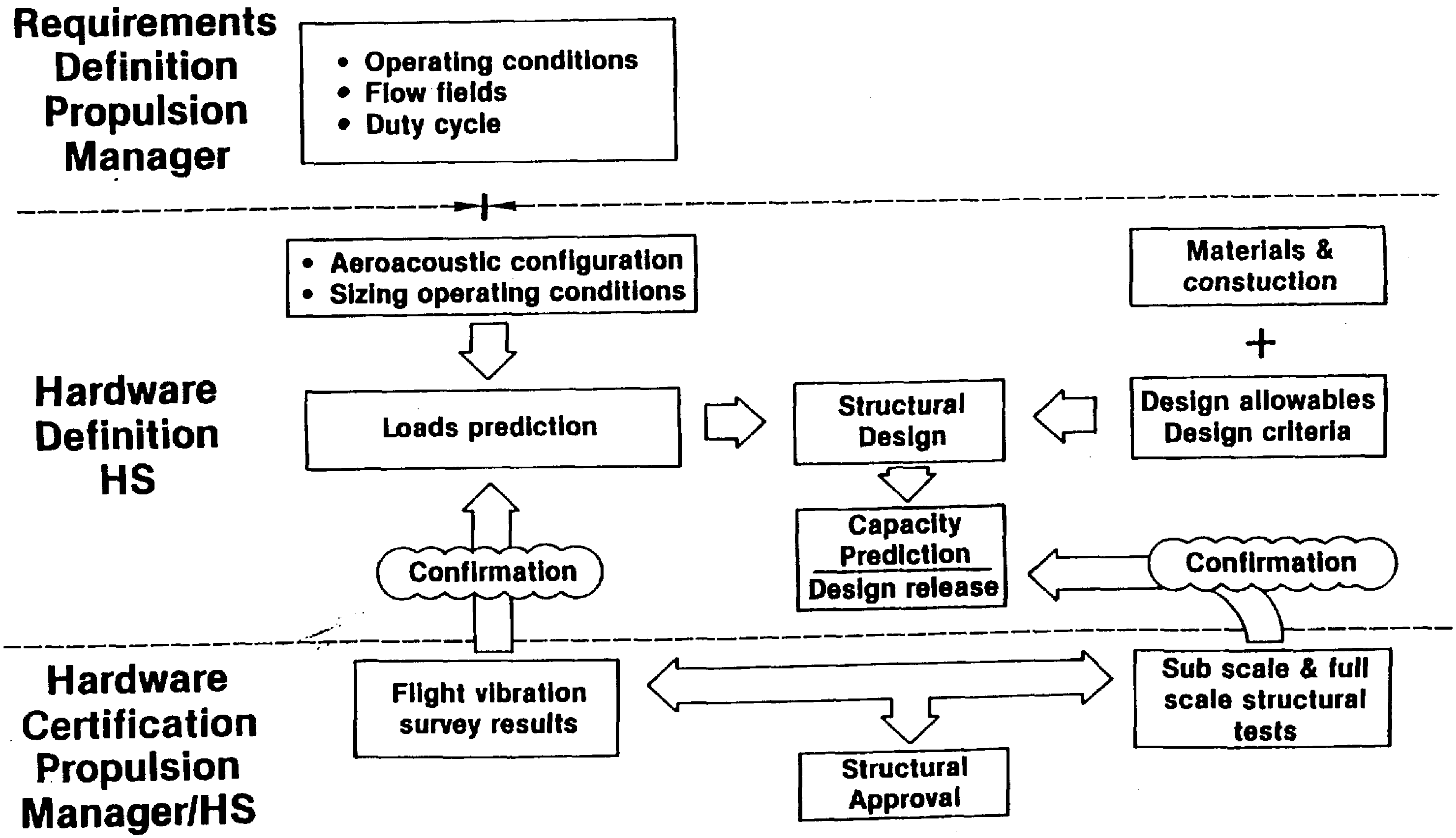


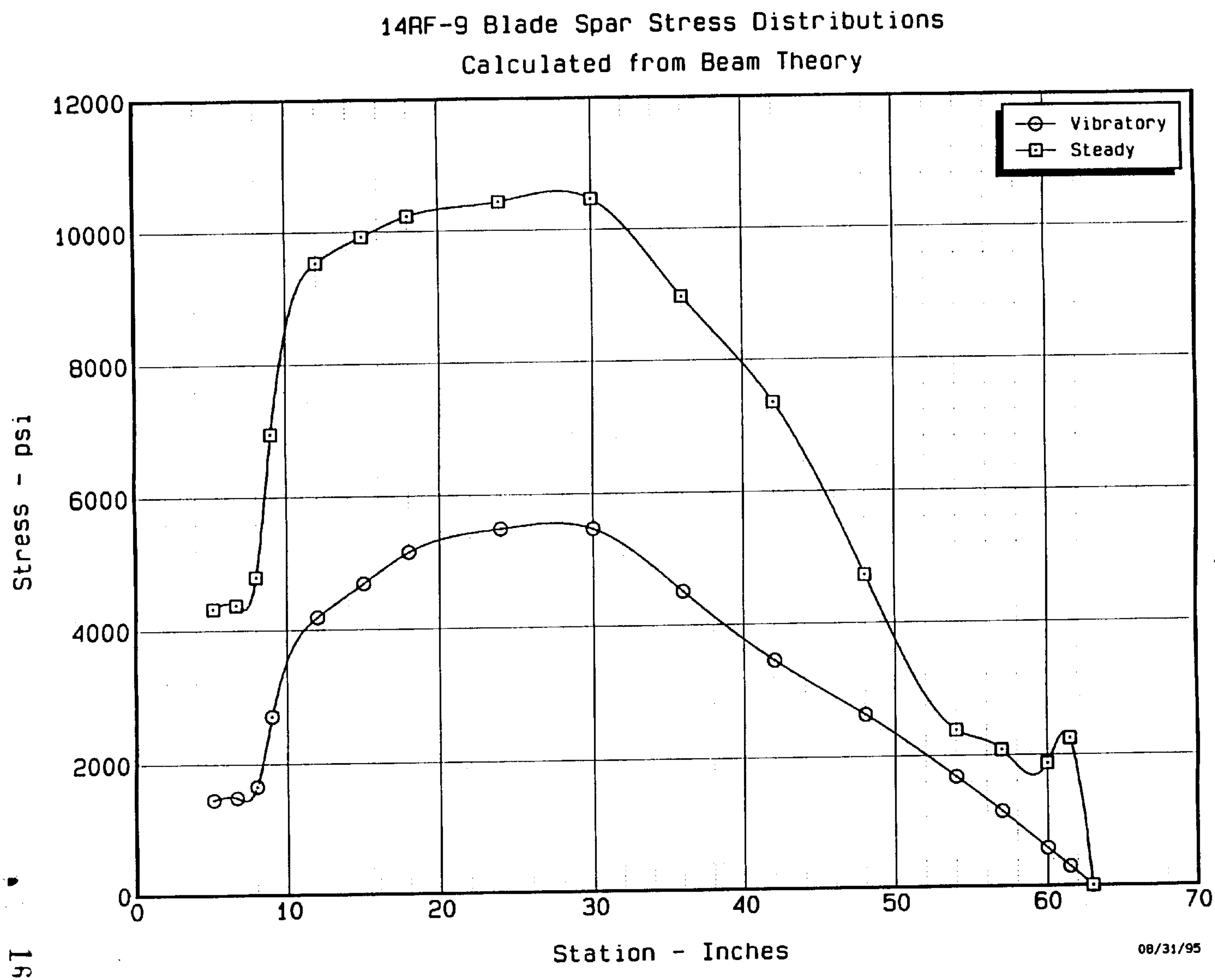


$$E.F. = \psi \left(\frac{V_{KEAS}}{348} \right)^2$$



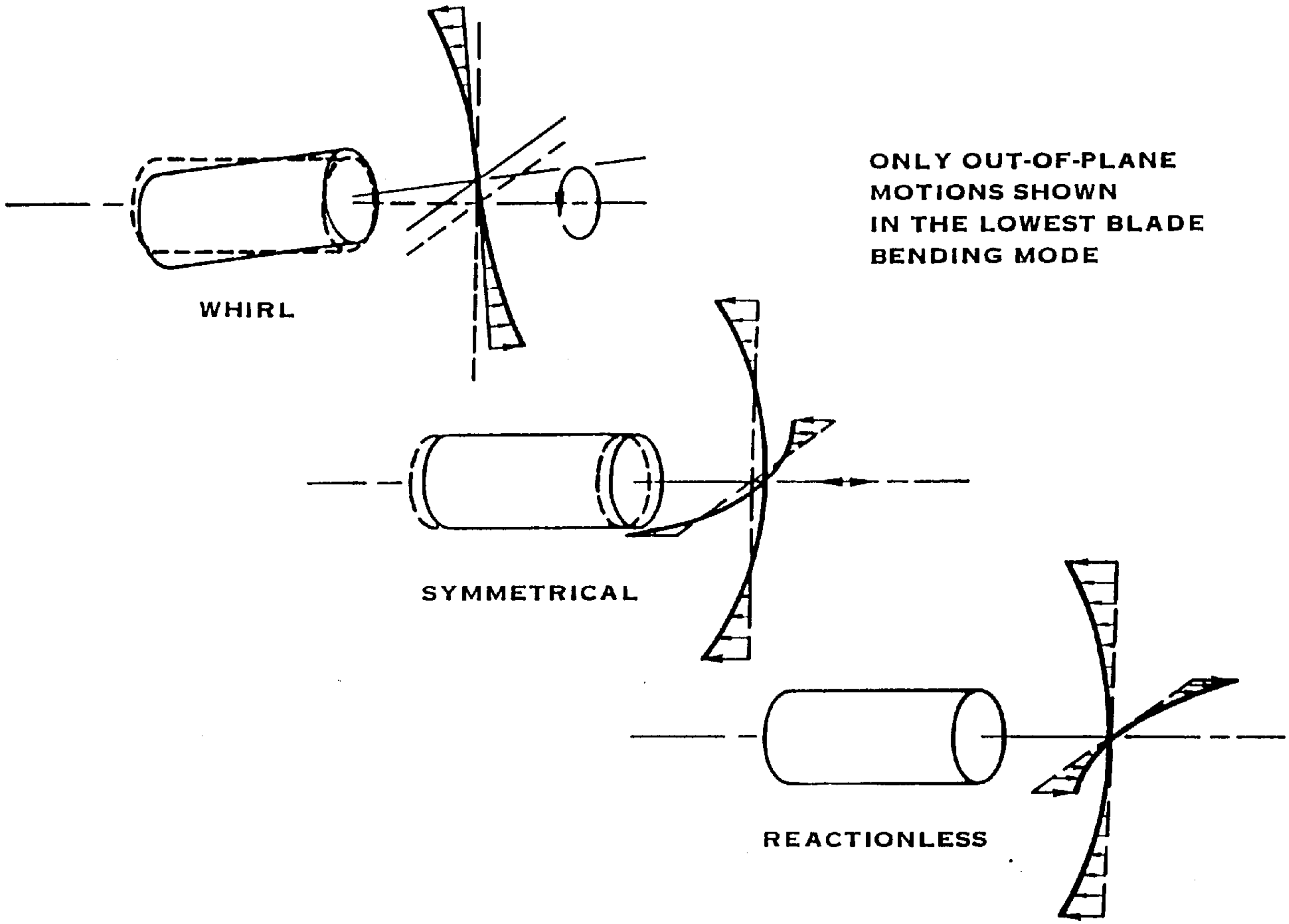
STRUCTURAL FLOW CHART





14RF-9 Blade Spar Stress Distributions
Calculated from Beam Theory
Vibratory
Steady
Stress - psi
0
2000
4000
6000
8000
10000
12000
0
10
20
30
40
50
60
70
Station - Inches
08/31/95

PROPELLER VIBRATION MODES



ONLY OUT-OF-PLANE MOTIONS SHOWN IN THE LOWEST BLADE BENDING MODE

TYPES OF PROPELLER MODES

P-order \ No. blades →	3	4	5	6	8	10
1	W	W	W	W	W	W
2	W	R	R	R	R	R
3	S	W	R	R	R	R
4	W	S	W	R	R	R
5	W	W	S	W	R	R
6	S	R	W	S	R	R
7	W	W	R	W	W	R
8	W	S	R	R	S	R

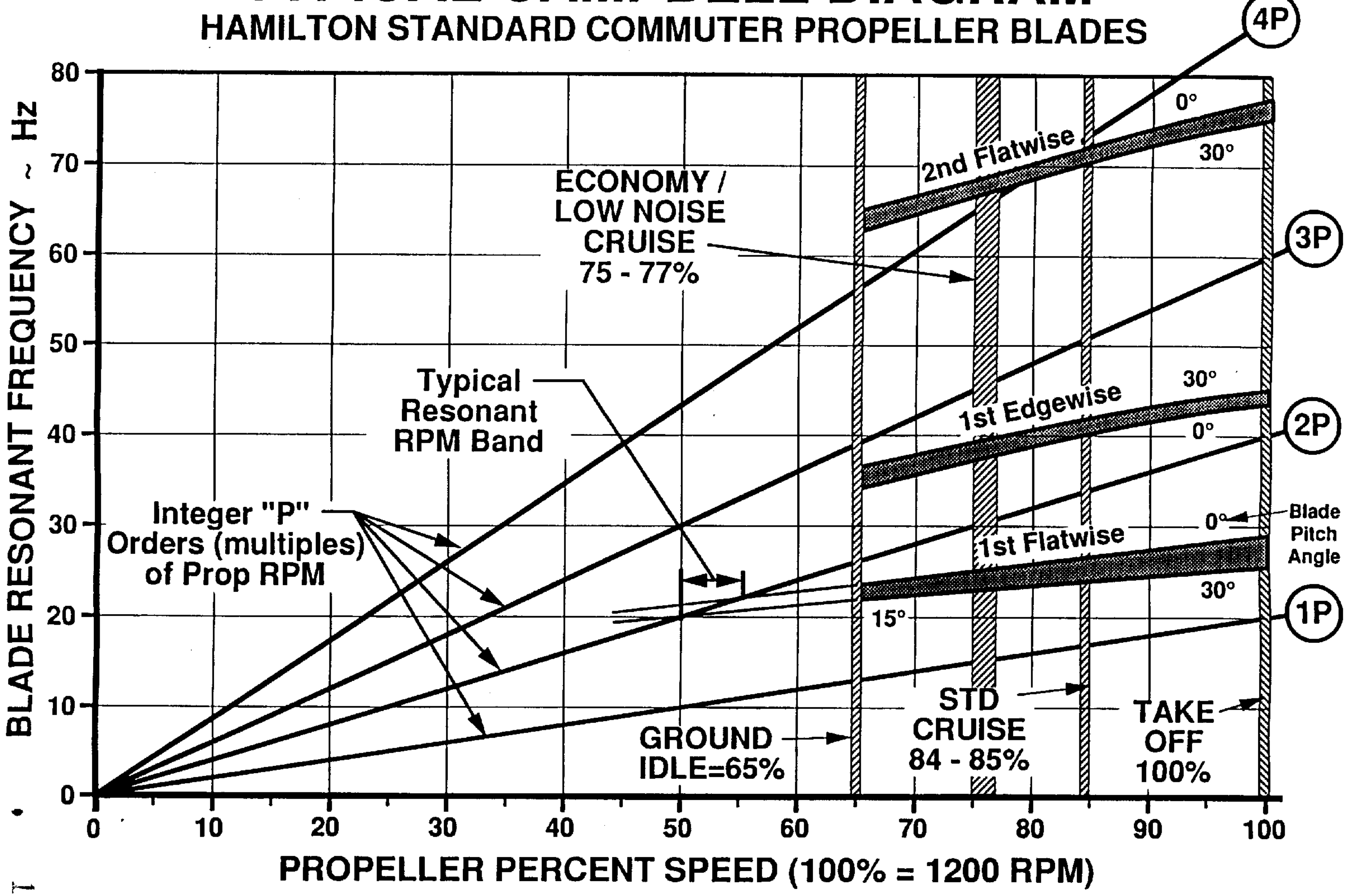
W = Whirl or unsymmetrical
S = Symmetrical (all blades in phase)
R = Reactionless (blade reactions cancel at hub)

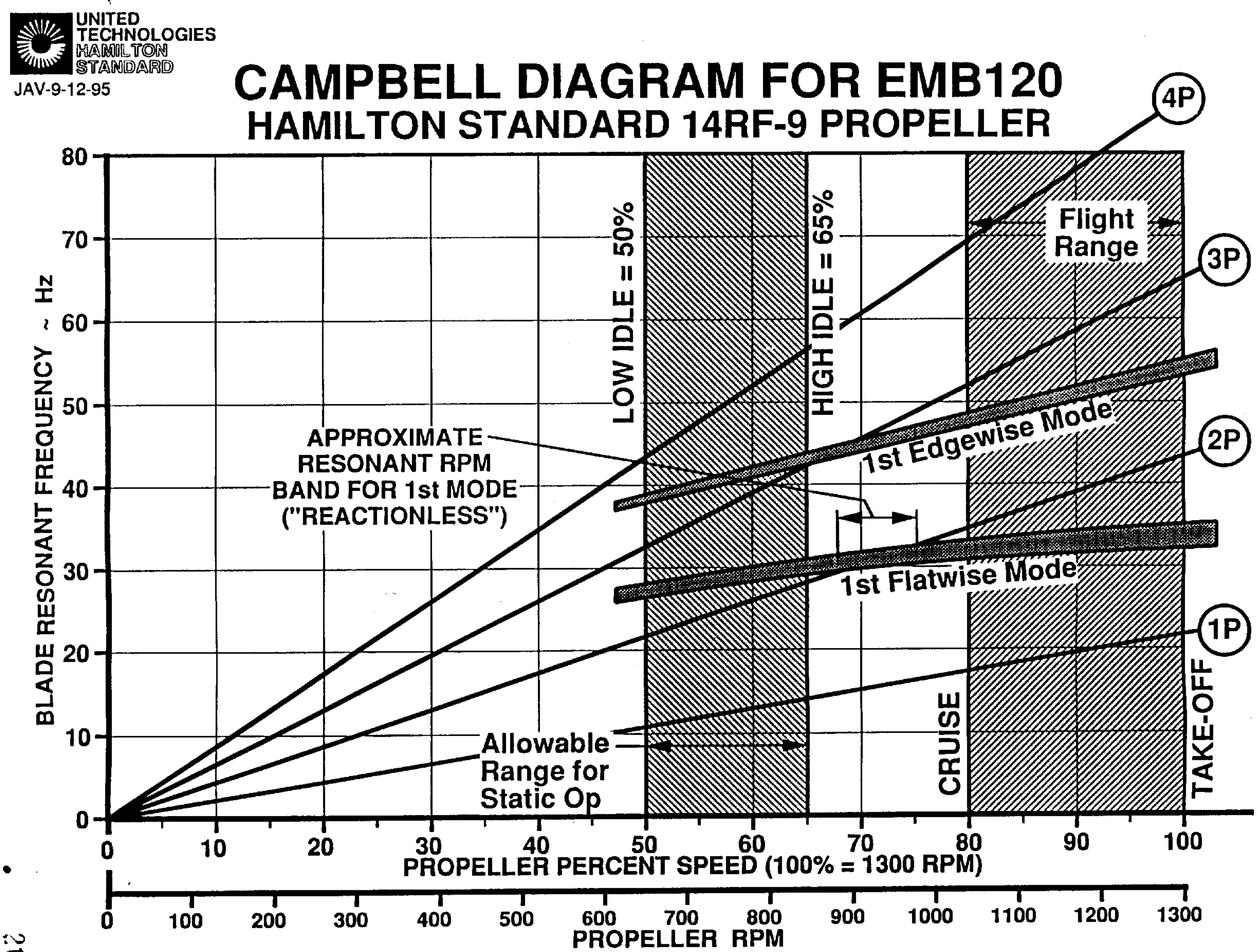
UNITED TECHNOLOGIES
HAMILTON STANDARD

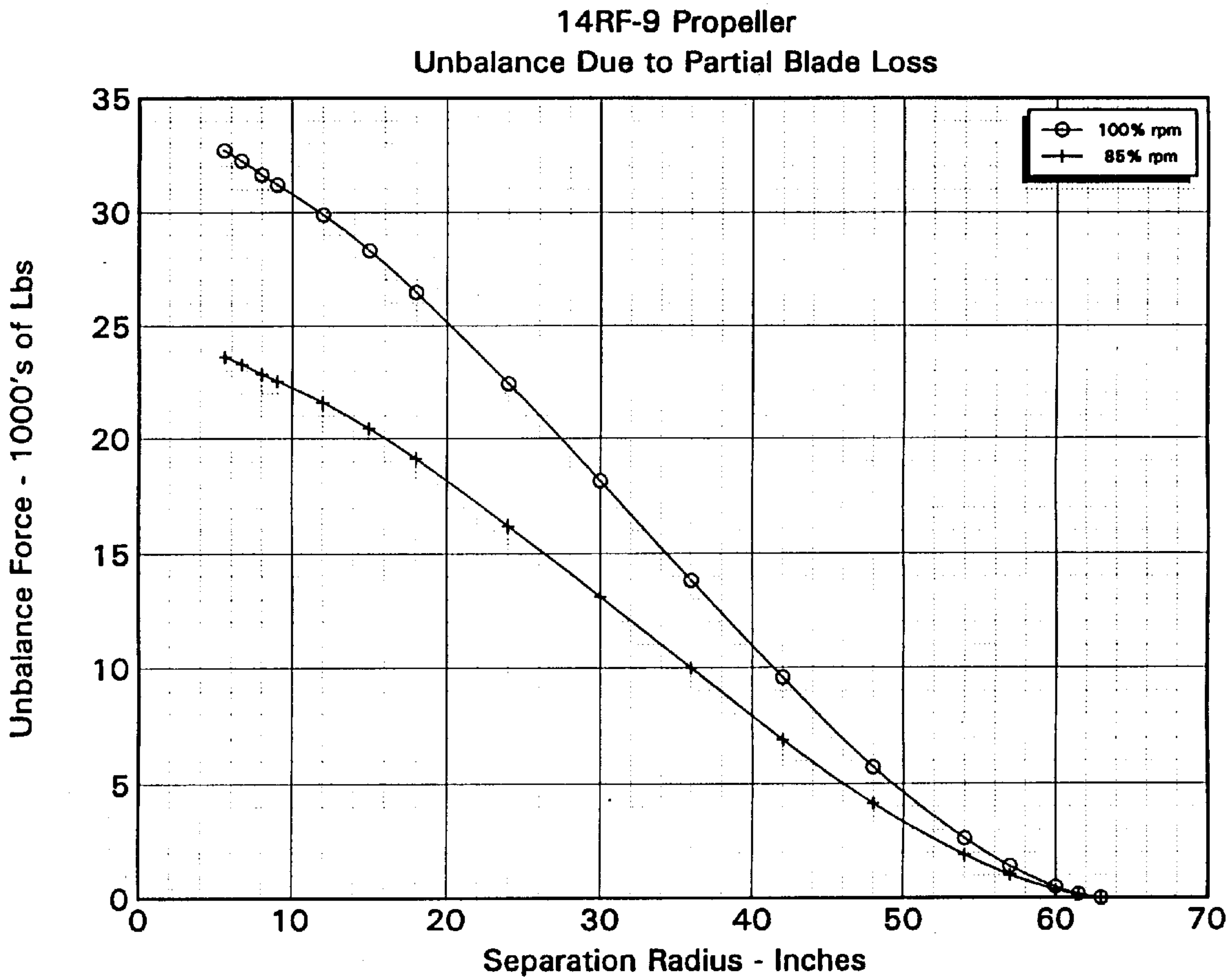
JAV-9-12-95

TYPICAL CAMPBELL DIAGRAM

HAMILTON STANDARD COMMUTER PROPELLER BLADES




UNITED TECHNOLOGIES
HAMILTON STANDARD
JAV-9-12-95
CAMPBELL DIAGRAM FOR EMB120
HAMILTON STANDARD 14RF-9 PROPELLER
BLADE RESONANT FREQUENCY ~ Hz
80
70
60
50
40
30
20
10
0
LOW IDLE = 50%
HIGH IDLE = 65%
Flight Range
4P
3P
2P
1P
1st Edgewise Mode
1st Flatwise Mode
APPROXIMATE RESONANT RPM BAND FOR 1st MODE ("REACTIONLESS")
Allowable Range for Static Op
CRUISE
TAKE-OFF
0
10
20
30
40
50
60
70
80
90
100
PROPELLER PERCENT SPEED (100% = 1300 RPM)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
PROPELLER RPM


14RF-9 Propeller
Unbalance Due to Partial Blade Loss
Unbalance Force - 1000's of Lbs
Separation Radius - Inches
100% rpm
85% rpm
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60
70

BLADE TAPER BORE — FRACTURE ANALYSIS

J. L. MATTAVI
SEPTEMBER 13, 1995

FRACTURE SUMMARY

Aircraft/ Blade Model	Operator	Fracture Location	Initiating Defect	TT Hrs.	TO Hrs.	Observations	Blade S/N
ATR42/ 14SF-5	InterCanadian	Taperbore	0.031" deep pit x 0.058" wide	12,038	4,748	Coarse banding 10,000-15,000	856922
EMB120/ 14RF-9	Nordeste	Taperbore	Band of pits .011-.015" deep x 0.160" wide	4,210	N/A	Oxidized beach mark; 0.032" deep x 0.160" wide	865093
EMB120/ 14RF-9	ASA	Taperbore	Pit (initial size unknown); .005" deep x 0.037" wide (at surface) 0.011 wide (subsurface)	14,664	2,399	Oxidized beach mark; 0.0487" deep x 0.0542" wide (at surface) 0.066" wide (subsurface)	861398

All dimensions after rework

JLM:mam
9/1/95

Figure 1

14SF-5 Aircraft Propeller Blade, P/N SFA13M1-OA/SK 112315

S/N 856922 — Propeller S/N 890728

Inter-Canadian ATR 42-300/PW 120 Installation — 4,748 Hours; 5,357 Cycles TSO; 12,038 Hours; 12,630 Cycles TT

a.) Overall view of the chordal fracture plane as it was found at the site on the frozen lake. Approximately 1/3 Size

b.) The fracture profile across the 22.3 inch station viewed from the face side of the airfoil. Approximately 1/4 Size

Figure 1, Concluded

14SF-5 Aircraft Propeller Blade, P/N SFA13M1-OA/SK 112315

S/N 856922

Propeller S/N 890728

Inter-Canadian ATR 42-300/PW 120 Installation

4,748 Hours; 5,357 Cycles TSO
12,038 Hours; 12,630 Cycles TT

c.) The fracture surface of the spar showing a series of semi-elliptical crack arrest fronts and a dark elongated pit at the crack origin in the surface of the taper bore.

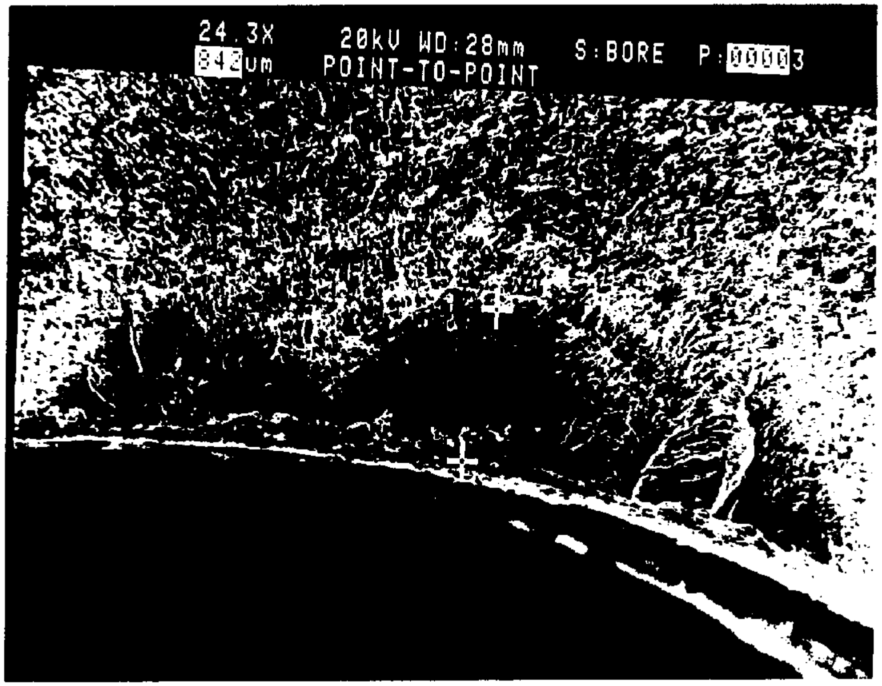
Approximately true size

d.) The origin area of the crack at the pit in the surface of the taper bore.

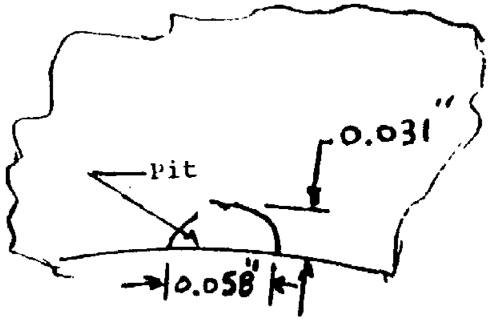
2 X

14RF-9 Aircraft Propeller Blade
Nordeste EMB-120 Installation
Serial No. 865093   4210 Hours TT

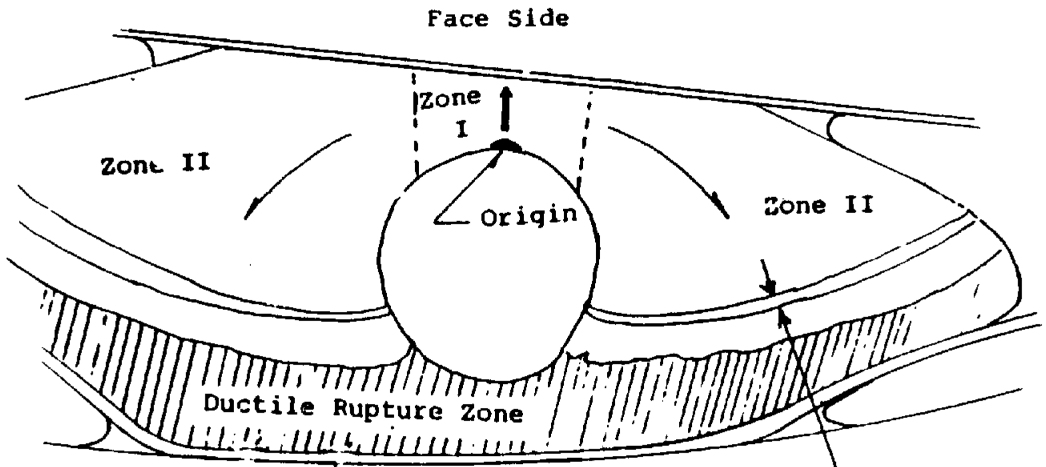
14RF-9 Aircraft Propeller Blade
Nordeste EMB-120 Installation
Serial No. 865093   4210 Hours TT



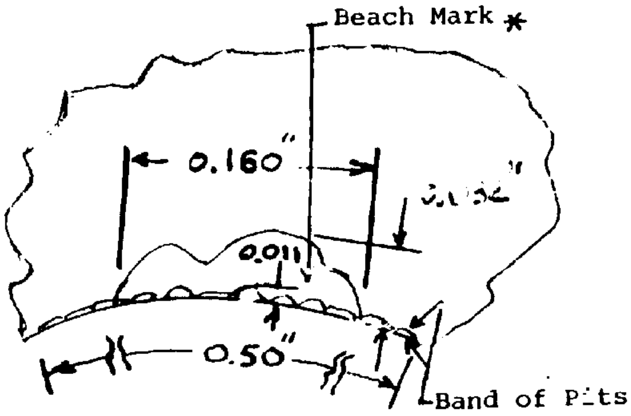
ATR 42/14SF-5 Blade Spar Fracture	S/N 856922	4,748 Hours TSO 12,038 Hours TT



Magnification of Origin

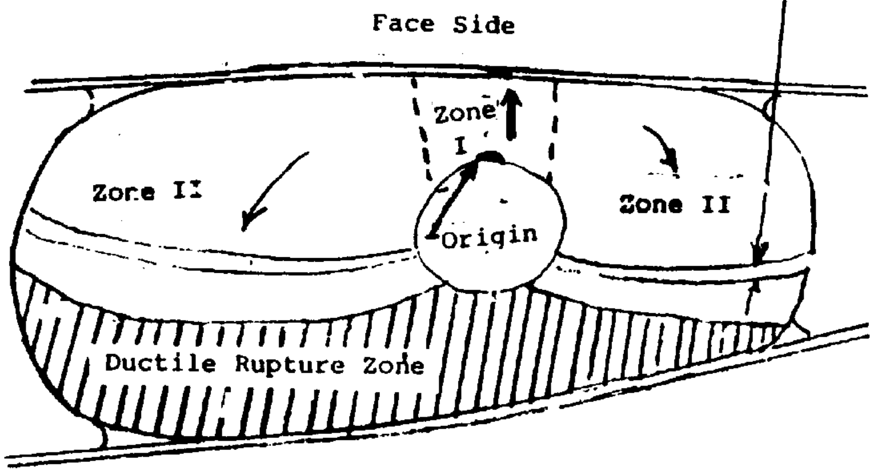


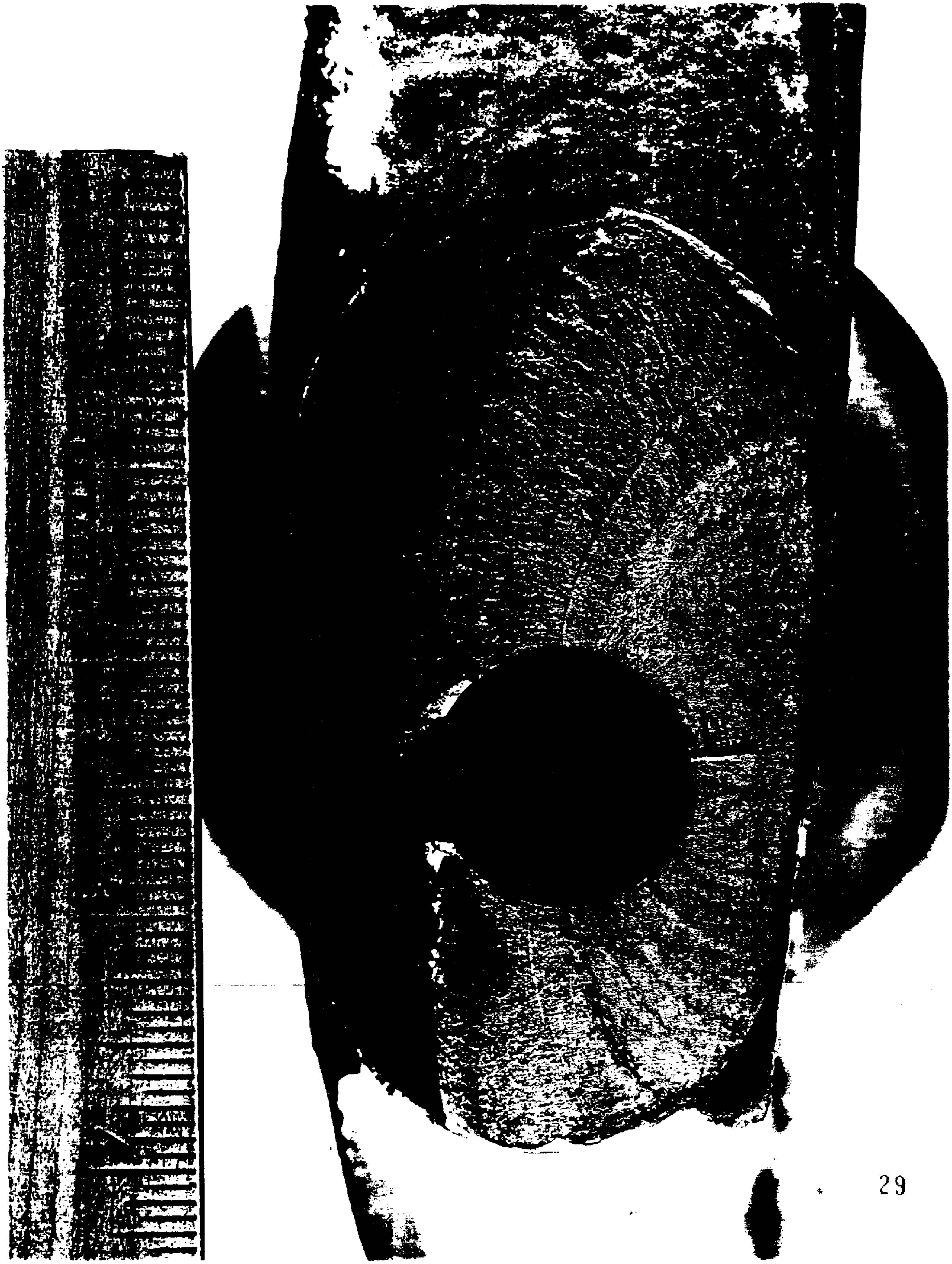
EMB-120/14RF-9 Blade Spar Fracture	S/N 8[illegible]5093	4,210 Hours TT

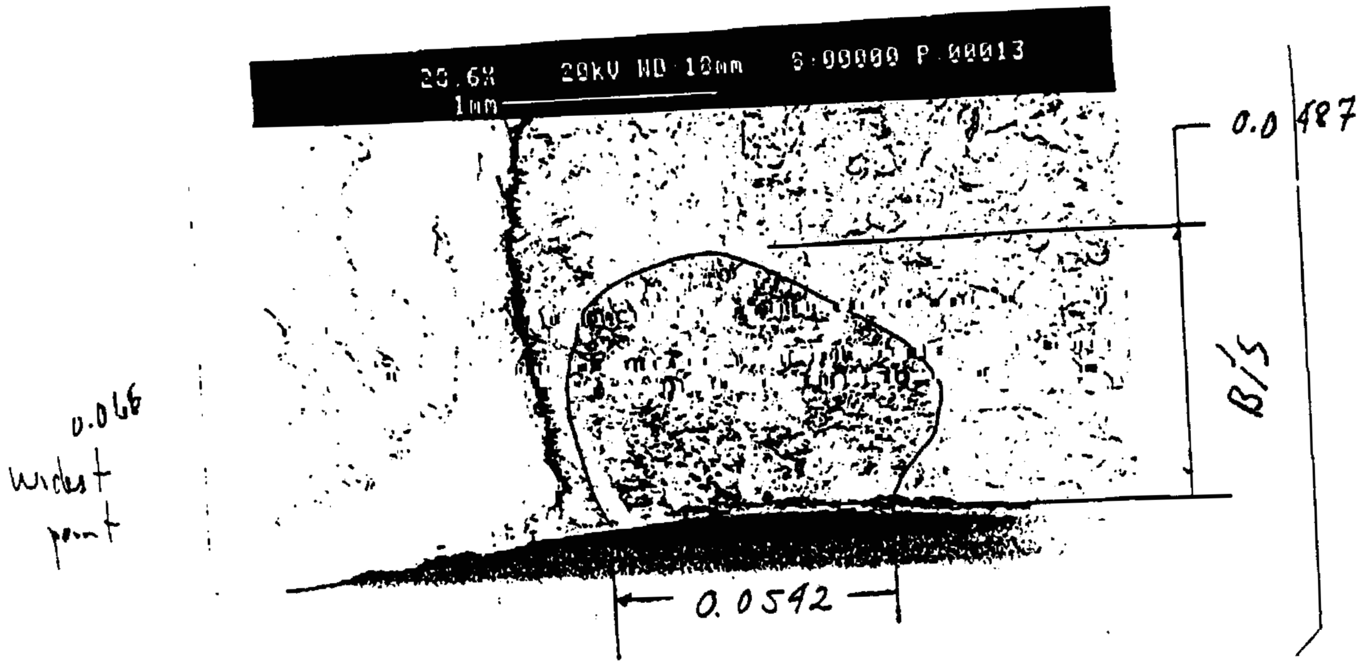


* (Indicative of Interrupted Fatigue Cycling)

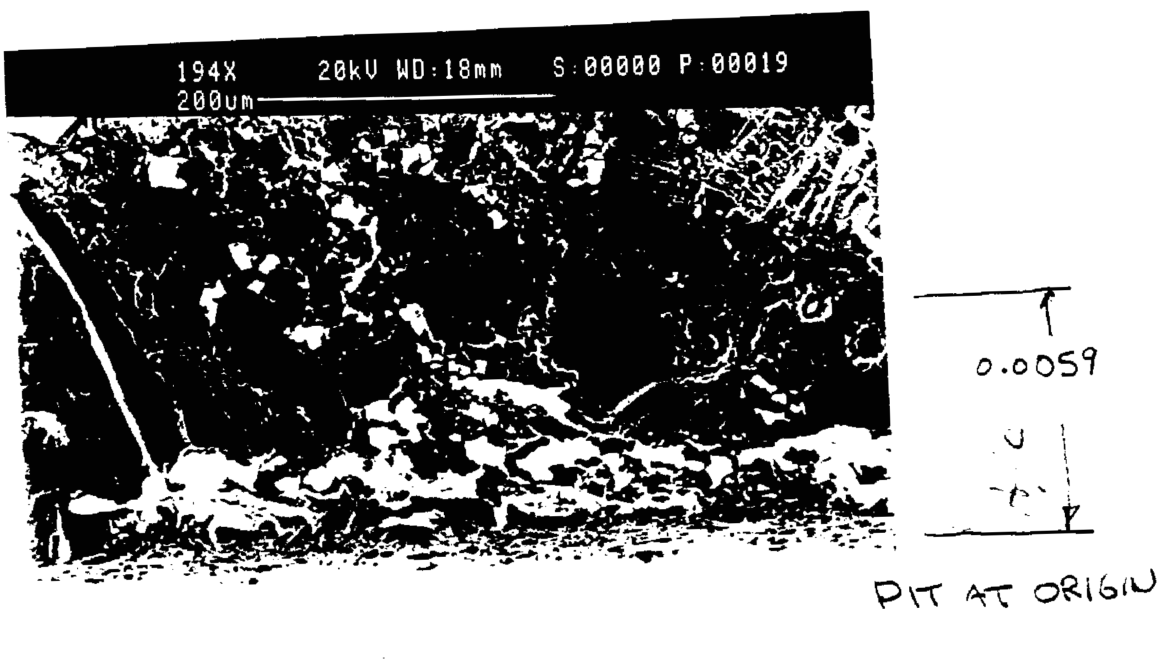
Magnification of Origin







20.6X 20kV WD 18mm S 00000 P 00013
1mm
0.0487
B/S
0.066
widest
point
0.0542



194X 20kV WD:18mm S:00000 P:00019
200um
0.0059
PIT AT ORIGIN

SUMMARY OF FINDINGS
14SF-5 Aircraft Propeller Blade, P/N SFA 13M1-0A/SK 112315, S/N 856922, 4748 Hours TSO, 12038 Hours T.T.

- The fracture occurred at the 22.3 inch station and propagated generally in the chordal plane.
- The crack origin was located at a cavity pit in the surface of the taperbore in line with the minimum stock thickness alignment on the face side of the airfoil.
- The dimensions of the cavity were approximately:
  - A = 0.031
  - 2C = 0.058
  - B/2 = 0.050 (the outboard end of the pit is missing)
- Four other cavities of similar size were found in the surface of the taperbore on the camber side. No chordwise cracks were apparent at these locations.
- No material abnormalities were found.
- Traces of chlorine were found by TSBC at the cavity site.

SUMMARY OF FINDINGS
14RF Aircraft Propeller Blade, P/N RFC11N1-6A, S/N 856093, 4120 Hours T.T.

- The fracture occurred at the 17.9 inch station and propagated in the chordal plane.
- The crack origin was located at a series of multiple pits on the surface of the taperbore in line with the minimum stock thickness ligament of the face side of the blade
- The dimensions of the pitted area was an .011-inch x 0.500 with a stained fracture surface .032-inch x 0.160-inch
- Cavities of smaller size were found elsewhere in the taperbore. No chordwise cracks were apparent at these locations
- Chlorine was found in the origin pit, as well as areas in the vicinity of the fracture.

TABLE I

ZONE I

4/29/94

Propeller Blade Fracture
14SF-5
Preliminary Striation Count Results

Distance (mm) from Origin (radial)	Avg. Fine Striations per micron (µm)	Incremental Distance (mm)	dA/dN, 10^{-6} mm/cycle	Incremental Count
0.3	25.7	0.3	38.91	7,710
0.5	25.1	0.2	39.84	5,020
1.0	23.1	0.5	43.29	11,550
1.5	25.2	0.5	39.68	12,600
2.0	22.1	0.5	45.25	11,050
3.0	24.3	1.0	41.15	24,300
4.0	23.2	1.0	43.10	23,200
4.5	24.0	0.5	41.67	12,000
5.0	21.8	0.5	45.87	10,900
6.0	22.3	1.0	44.84	22,300
6.2	20.1	0.2	49.75	4,020
7.0	19.0	0.8	52.63	15,200
7.5	24.5	0.5	40.82	12,250
8.0	20.1	0.5	49.75	10,050

Estimated total number of striations radially = 182,150
from the origin to the face surface of the spar

in/cycle — See Penciled Table JLM 8-13-95

TABLE III

ZONE II

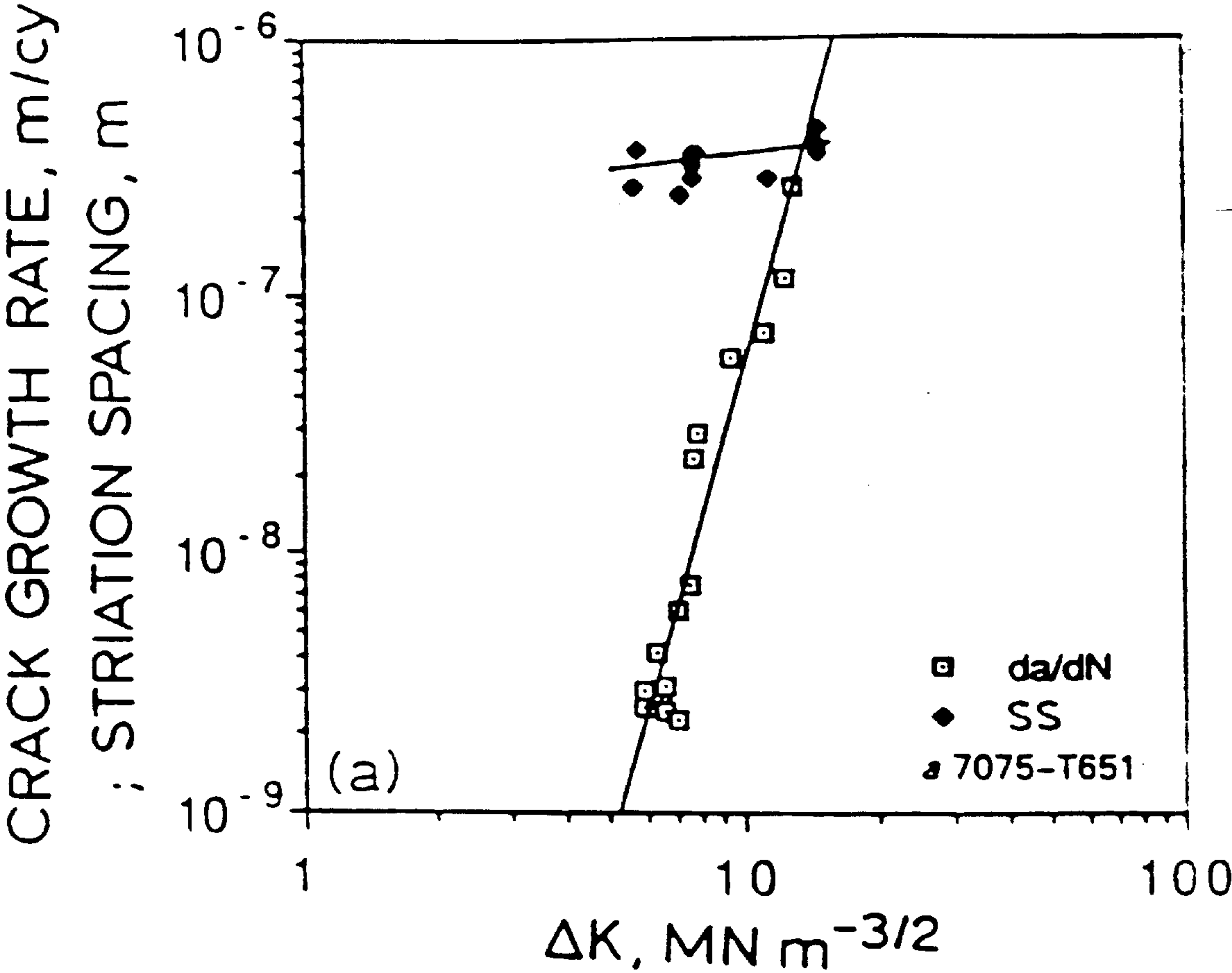
4/29/94

Propeller Blade Fracture
14SF-8
Preliminary Striation Count Results

Band #	Band Width (mm)	Distance (mm) from BTE	Avg. Striation per micron (µm)	Incremental Distance (mm)	da/dN 10^{-6} mm/cycle	Incremental Count
L-19	1.5	3.0	15.7	3.0	63.69	47,100
L-16	1.0	7.0	16.2	4.0	61.73	64,800
L-15	1.0	9.0	19.9	2.0	50.25	39,800
L-13	1.5	12.0	20.0	3.0	50.00	60,000
L-10	2.0	16.0	14.6	4.0	68.49	58,400
L-5	2.0	25.0	12.3	9.0	81.30	110,700
		27.0	15.6	2.0	64.10	31,200
L-3	4.0	35.0	14.2	8.0	70.42	113,600
		37.0	12.4	2.0	80.65	24,800
L-2	3.0	40.0	4.2	3.0	238.10	12,600

Estimated Number of Striations from Breakthrough = 563,000

▸ A review of the literature [1] showed correspondence between striation count the trend is shown in the figure below.



Striation Spacing and Crack Growth Rate vs Delta-K [1]

TABLE II

ZONE I

4/29/94

Propeller Blade Fracture
14SF-6
Preliminary Striation Count Results

Averages of Fine and Coarse Striations

Distance (mm) from Origin (radial)	Δd mm		Avg. Fine Striations per micron (µm)	Avg. Medium Coarse Striations per micron (µm)	Avg. Very Coarse Striations per micron (µm)	Cycles	cumulative
0.3	0.30		25.7	6.15	1.45	4350	4350
0.5	0.20		25.1	4.8	0.63	120	4470
1.0	0.50		23.1	10.9	1.23	615	5085
1.5	0.50		25.2	6.3	0.5	250	5335
2.0	0.50		22.1	7.9	1.1	550	5955
3.0	1.00	} 2.0	24.3	7.2	1.8	3600	9555
4.0	1.00		23.2	5.1			
4.5	0.50	} 1.0	24.0		1.5	} 1500	11,055
5.0	0.50		21.8	2.1			
6.0	1.00	} 2.0	22.3	5	1.6	} 3200	14255
6.2	0.20		20.1	2.7			
7.0	0.80		19.0				
7.5	0.50		24.5	6.2	1.4	700	14955
8.0	0.50		20.1	2.8	0.3	150	15,105

Total coarse striations = 15,105
− 4350*
10755

* uncertainty of using the full 0.30 mm distance

Brazil 1998 incident blade

5/24/94

ZONE I

Propeller Blade Fracture
14RF-9
Preliminary Striation Densities

Distance (mm) from Origin radial	in.	Avg. Fine Striation per micron (µm)	da/dN 10^{-6} in/cycle	Avg. Medium Coarse per micron (µm)	Avg. Very Coarse per micron (µm)
0.1	0.004	17.2	2.28	2.5	0.7
1.0	0.04	10.4	3.78	3.5	0.4
1.5	0.059	15.0	2.62	-	-
2.5	0.10	-		-	0.4
4.0	0.157	-		-	-
6.0	0.236	-		-	-
8.0	0.315	-		-	-
10.0	0.394	-		-	-

1. Dashes indicate areas examined for striations but where none were resolved.
2. Densities should be considered a minimum due to excessive oxide and rubbing of the fracture surface.
3. Not enouph data for incremental count or da/dN.

Brazilian Blade Fracture

~17" STA

ZONE II

5/19/94

Propeller Blade Fracture
14RF-9
Preliminary Striation Count Results

Band #	Band Width (mm)	Distance (mm) from BTE	in	Avg. Striation per micron (µm)	da/dN 10^{-6} in/cycle	Incremental Distance (mm)	da/dN 10^{-6} mm/cycle	Incremental Count
L-14	1.0	15.0	0.59	12.9	3.04	15.0	77.52	193,500
L-8	1.0	19.0	0.75	17.9	2.19	4.0	55.87	71,600
		20.0	0.79	12.0	3.27	1.0	83.33	12,000
L-7	2.0	20.0	0.79	10.8	3.64	0.1	92.59	1,080
		22.0	0.87	15.2	2.58	2.0	65.79	30,400
L-4	2.0	25.0	0.98	13.2	2.98	3.0	75.76	39,600
		27.0	1.062	15.8	2.48	2.0	63.29	31,600
L-1	1.0	33.0	1.30	9.6	4.09	6.0	104.17	57,600
		34.0	1.34	11.7	3.35	1.0	85.47	11,700

Estimated Number of Striations from Breakthrough = 449,100

14RF-9 Aircraft Propeller Blade
S/N 861398
Striction Count Results-preliminary

9/5/95

Distance (mm) from origin (radial)	in	Average Striation per micron(µm)	da/dN 10^{-6} in/cycle	Incremental Distance(mm)	Incremental Count	Comment[1]	
0.5	0.02	34.0	1.15	0.5	17,000		
1.0	0.04	32.0	0.81	0.5	16,000		
2.0	0.08	29.0	0.74	1.0	29,000		
2.5	0.098	34.0	0.865	0.5	17,000	2.5	15.72
3.0	0.118	31.8	0.81	0.5	15,900		
3.5	0.138	23.3	0.59	0.5	11,650		
4.0	0.157	31.8	0.81	0.5	15,900		
6.0	0.236	25.1	0.64	2.0	50,200	1.1	35.7
7.0	0.275	22.5	0.57	1.0	22,500	0.8	49.1
8.5	0.335	34.0	0.865	1.5	51,000		

Total estimated number of striations radially – 246,150

Distance (mm) from BTE[2] (circum.) trailing edge	in	Average Striation per micron(µm)	da/dN 10^{-6} in/cycle	Incremental Distance(mm)	Incremental Count	Comment	
8.0	0.314	12.0	3.275	8.0	96,000	1.2	32.75
10.0	0.39	13.8	2.84	2.0	27,600	0.9	28.2
18.0	0.71	2.9	13.55	8.0	23,200		
20.0	0.79	3.1	12.7	2.0	6,200		
30.0	1.18	4.0	9.82	10.0	40,000		
32.0	1.26	3.2	12.30	2.0	6,400		
40.0	1.57	3.1	12.70	8.0	24,800		
42.0	1.65	2.5	15.72	2.0	5,000		

Total estimated number of striations from BTE – 229,200

Total estimated number of striations – 475,350

1. These numbers represent the densities/µm of coarse striations where observed.
2. BTE – Breakthrough Equivalency

$$\frac{da}{dN} = \frac{39.3\times10^{-6}}{\frac{\text{striation}}{\text{micron}}} \text{ (in/cycle)}$$

100 microns = .004"

FINDINGS FROM TEM ANALYSIS OF INCIDENT BLADES

14SF -5 Blade, P/N SFA13M1-0A / SK112315, S/N 856922

- Striations of fine, medium course, and very coarse spacing were noted in Zone I where Zone I is defined as the region from the origin until break-through the outer surface.

- Coarse striation bands accompanied by fine striations were noted in Zone II, where Zone II is defined as the region from break-through where the crack front turns around and advances back toward the center of the blade until separation occurs.

- Coarse striation spacing in Zone II is seen to represent individual flights and fine striations represent individual fatigue cycles within the flights.

- Fine striation spacing in Zone I is inconsistent with number of individual fatigue cycles. This behavior is classic and results from the fact that for the high striation counts (low crack growth), not all events are recorded plus plasticity in this zone may result in crack retardation effects.

- Very coarse striations in Zone I attributed to individual flights; however, 10,000 flights are inferred from this analysis.

FINDING FROM TEM ANALYSIS OF INCIDENT BLADES

14RF BLADE, P/N RFC11N1-6A, S/N 856093

- STRIATIONS IN ZONE 1 NOT VERY DISCERNIBLE DUE TO EXCESSIVE RUBBING OF SURFACES
- STRIATIONS IN ZONE II SIMILAR TO THOSE FOUND IN 14SF BLADE, S/N 856922, IN THAT COARSE STRIATION BANDS ACCOMPANIED BY FINE STRIATIONS WERE NOTED.
- ZONE II STRIATION SPACING MAGNITUDES SIMILAR TO 14SF BLADE, S/N 856922, SUGGESTING COMPARABLE LOAD MAGNITUDE NEAR THE END OF THE FRACTURE PROCESS.

THEORETICAL CRACK GROWTH ANALYSIS

- EMPLOYS A SURFACE CRACK MODEL WITH CONSIDERATIONS FOR
  - LARGE CRACKS (CRACK LENGTH LARGER THAN OR EQUAL TO PIT DEPTH)
  - INTERMEDIATE CRACKS (CRACK LENGTH LESS THAN PIT DEPTH) USES BOWIE SOLUTION
  - SMALL CRACKS (CRACK LENGTH VERY SMALL I.E., LESS THAN .010 INCHES) USES INCREASED GROWTH COEFFICIENT.
- UTILIZES MATERIAL CRACK GROWTH COEFFICIENTS OBTAINED FROM THE LITERATURE FOR GOVERNING ALUMINUM ALLOY - CORROBORATED BY OTHER UTC DIVISIONS.
- USED TO CALCULATE GROWTH LIVES AS FUNCTION OF PIT DEPTH AND INSTALLATION.

da/dN-vs-Delta K for 7075-T73

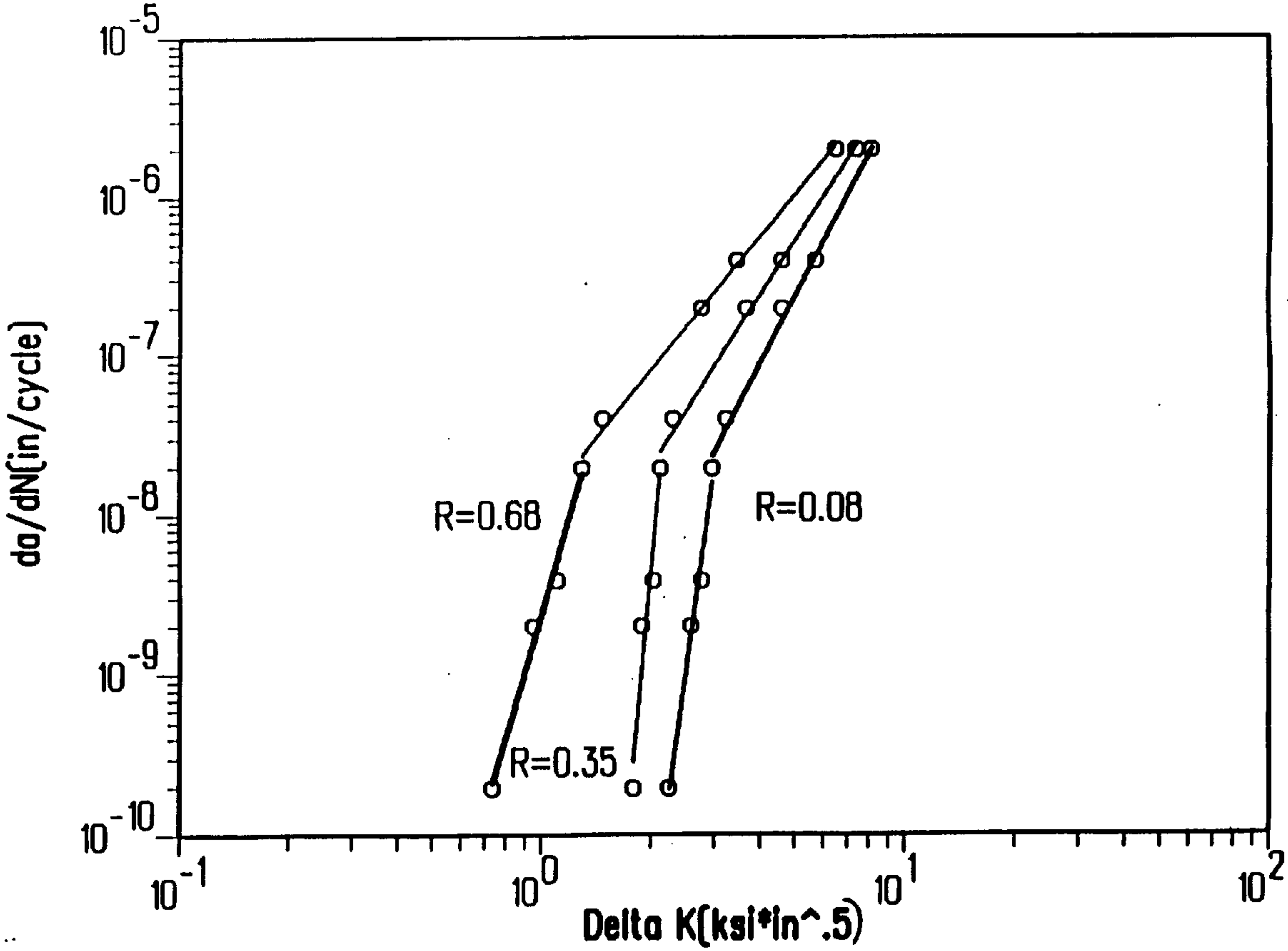
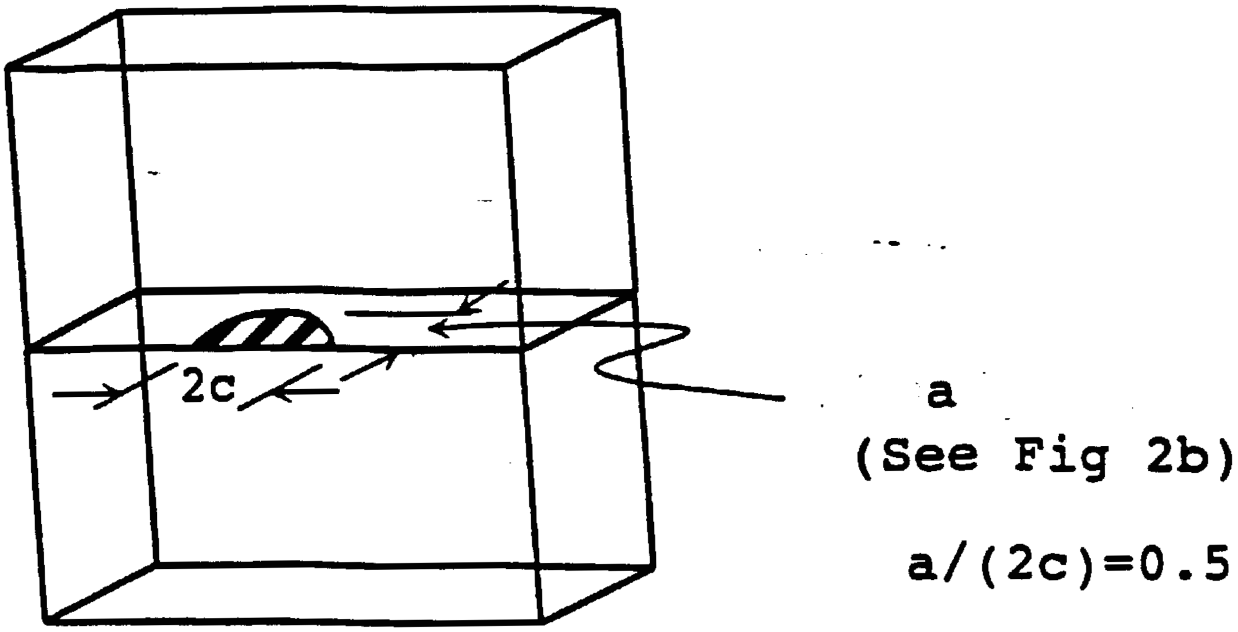
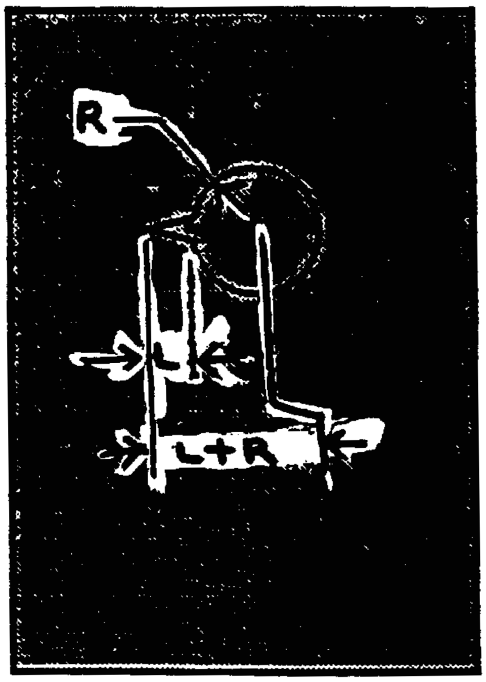


Figure 1



a > 0.03 inches

Fig. 2a



L≤R or L<0.03 inches

Fig. 2b

Stress Intensity Relationships

Large Cracks: $a \geq 0.03$ in., $^{L}/_{r} \geq 1.0$

$K = 1.3\ \sigma\ a^{1/2}$ where $a = r + L$

where 1.3 represents factor $1.1\sqrt{\Pi}/Q^{1/2}$ for a semi circular flaw

Intermediate Cracks: 0.01 in. $< L < 0.03$ in, $^{L}/_{r} < 1.0$

$K = 1.3\ (SF)\ \sigma\ L^{1/2}$

where $SF = 3.3571 - 6.6724\ (L/R) + 8.7726\ (L/R)^2 - 4.1098\ (L/R)^3$

Small Cracks: $L < .01$ in., $^{L}/_{r} << 1.0$

$K = 1.3(SF)\ 1.77\sigma\ L^{1/2}$

where 1.77 is used to shift K to right on da/dN vs. ΔK curve and hence account for short crack growth behavior.

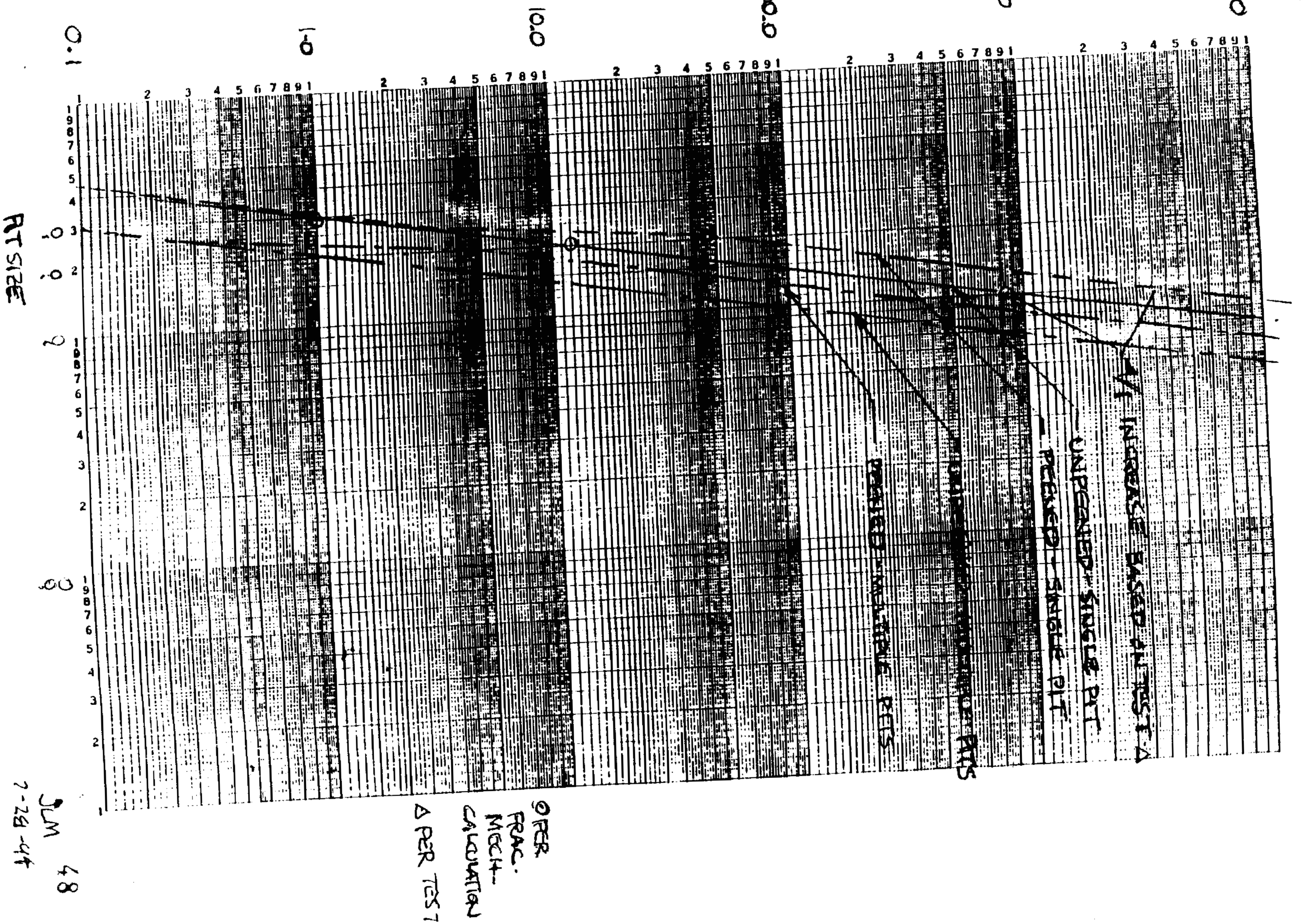
jm94001

CALCULATED TYPICAL (B50) CRACK PROPAGATION LIFE

PIT DEPTH = .030 IN CRACK LENGTH = .020 IN

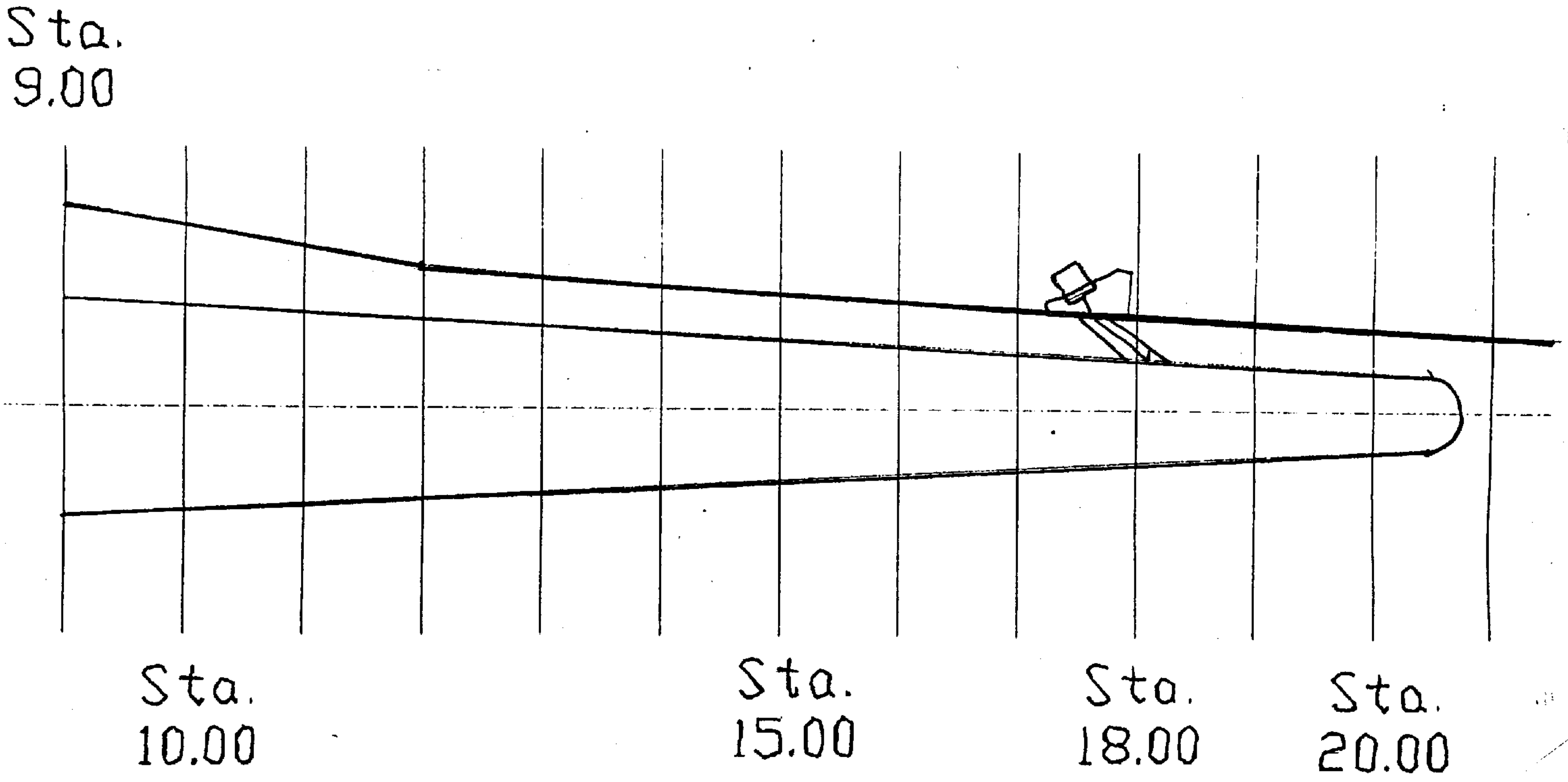
A/C TYPE	B50 LIFE (FLIGHTS)
EMB 120	2550

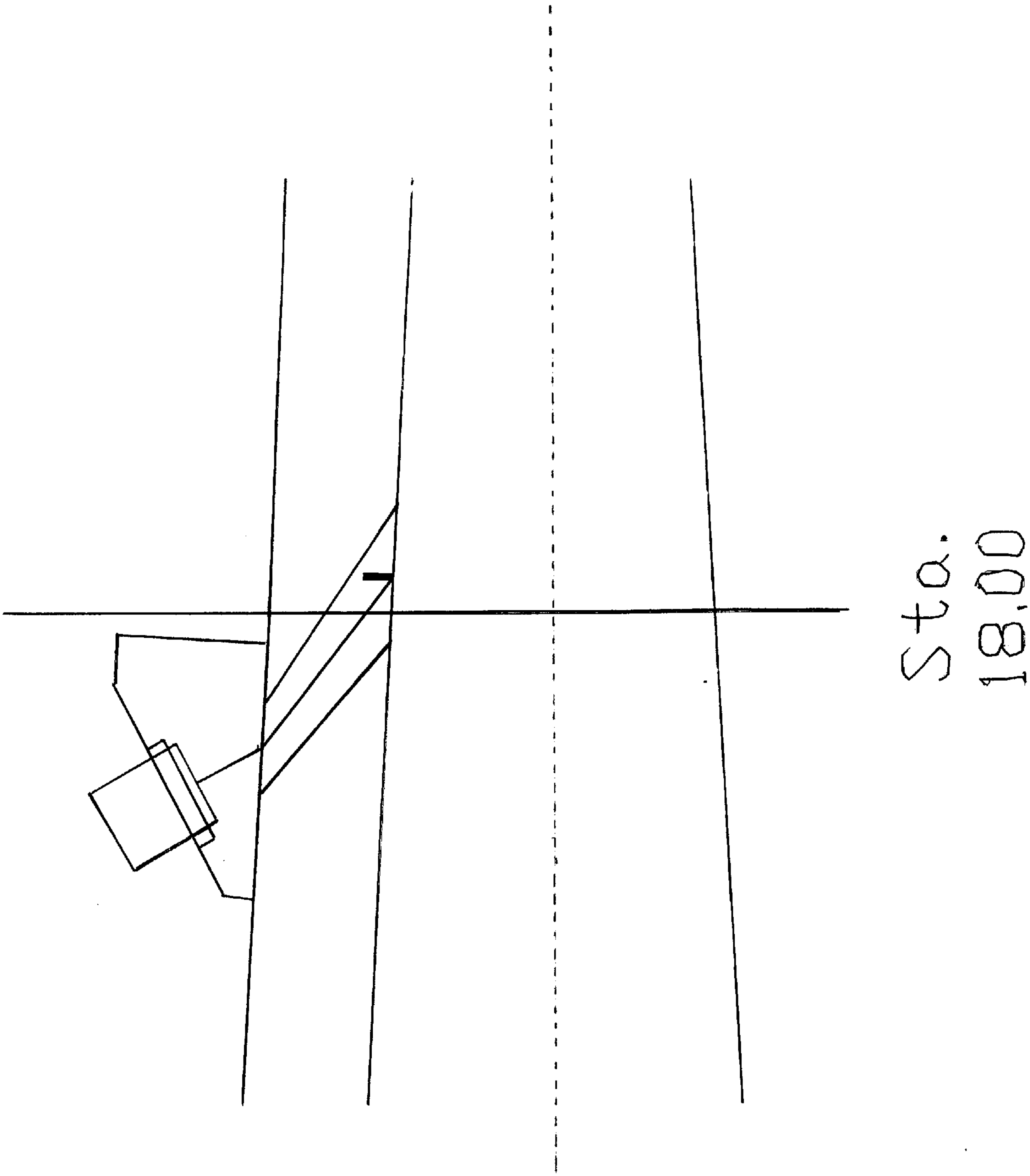
RATIO OF LIFE AT ANY PIT DEPTH TO LIFE FOR SINGLE .030 PIT



JLM 48
7-28-47

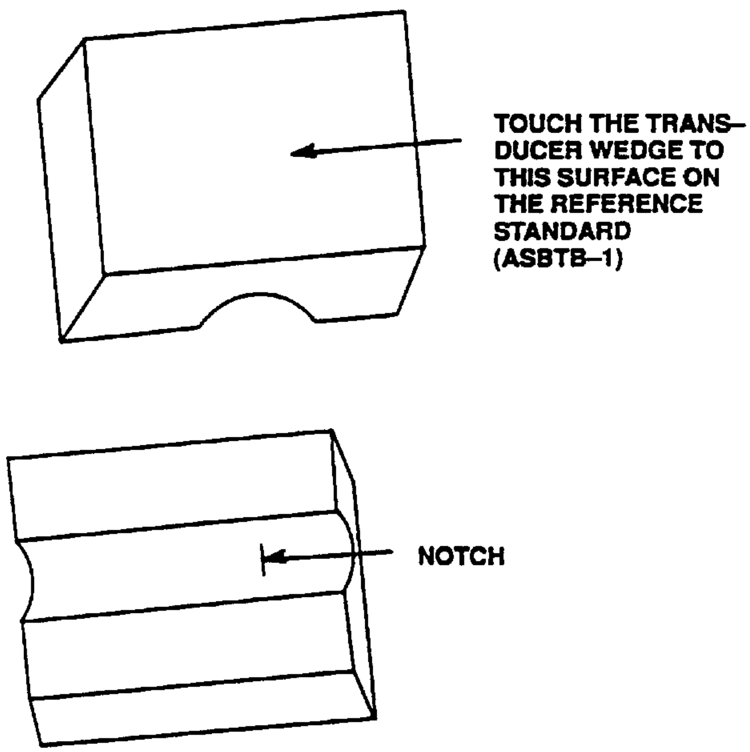
14RF Taper Bore




Sta. 18.00

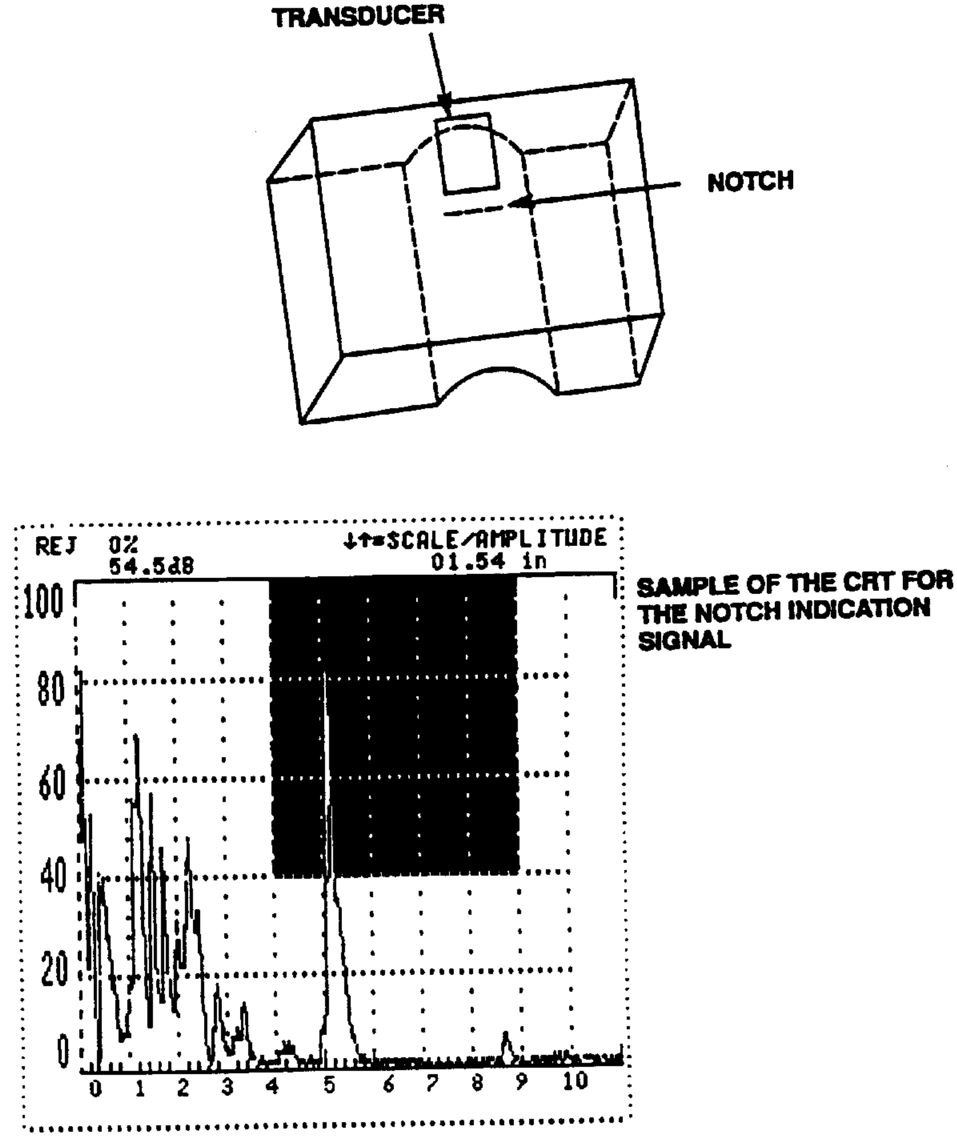
UNITED TECHNOLOGIES HAMILTON STANDARD

ALERT SERVICE BULLETIN



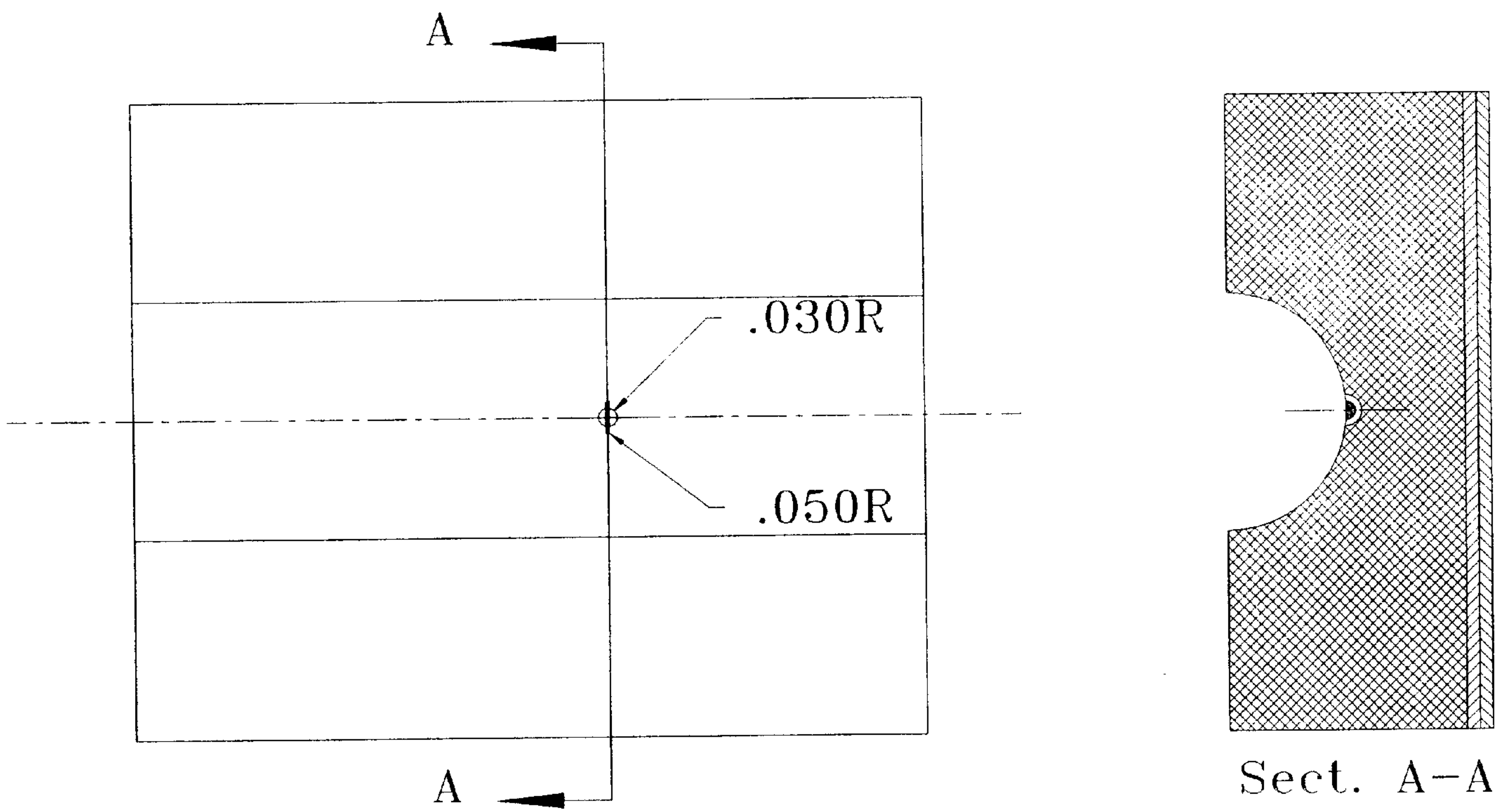
Reference Standard
Figure 3

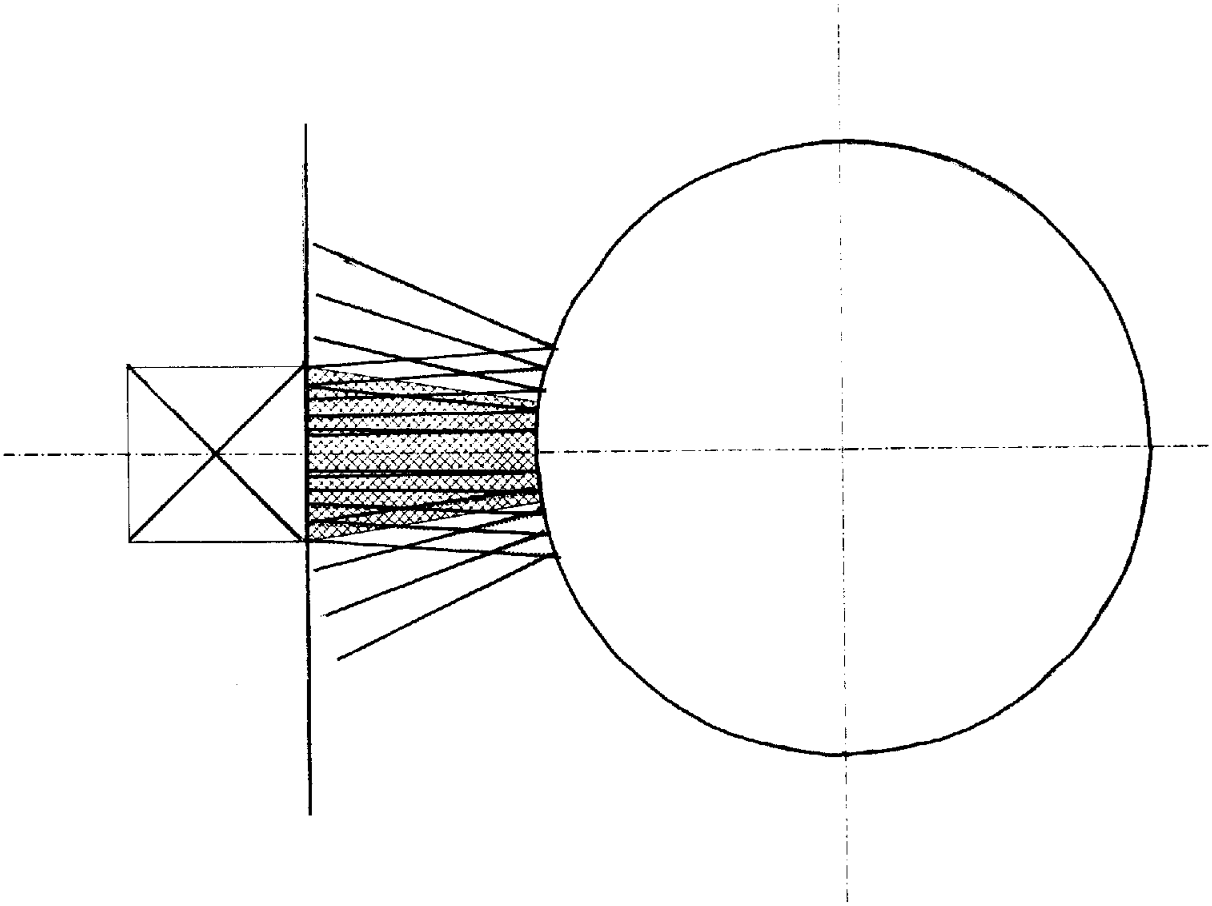
51



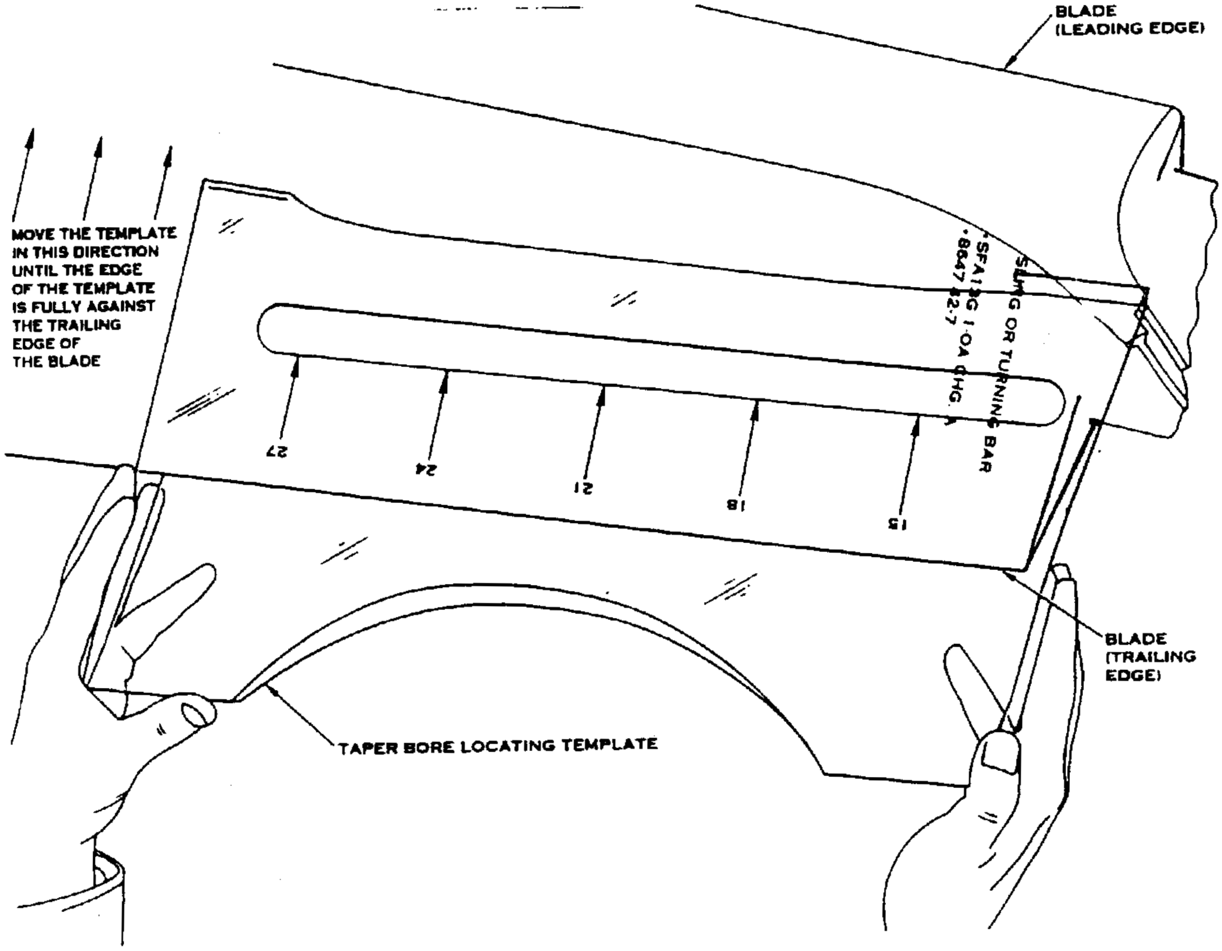
Position the Transducer/Wedge to See the Notch Indication Signal
Figure 4

Simulated Pit/Crack for Ultrasonic Testing of the Taper Bore



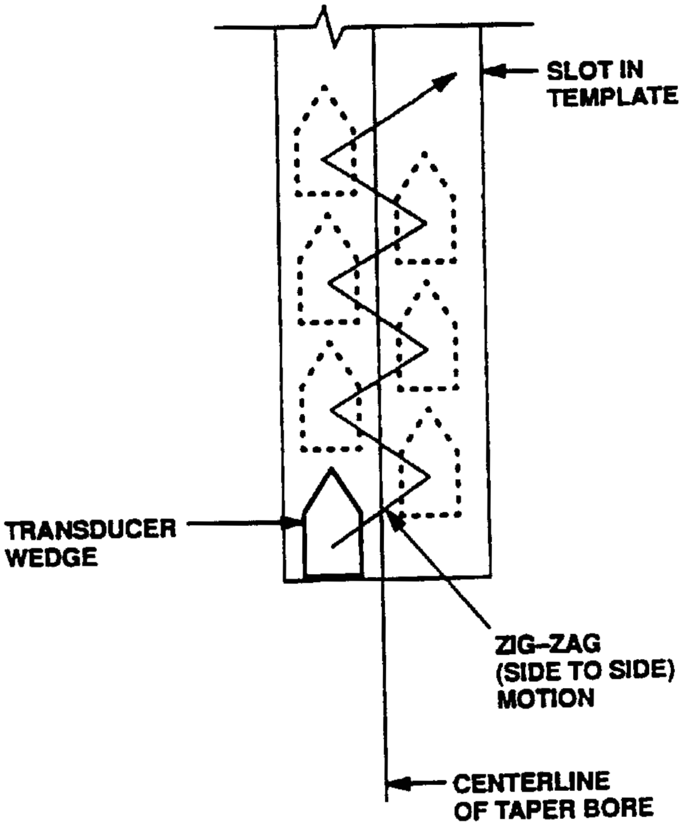


Sta. 18



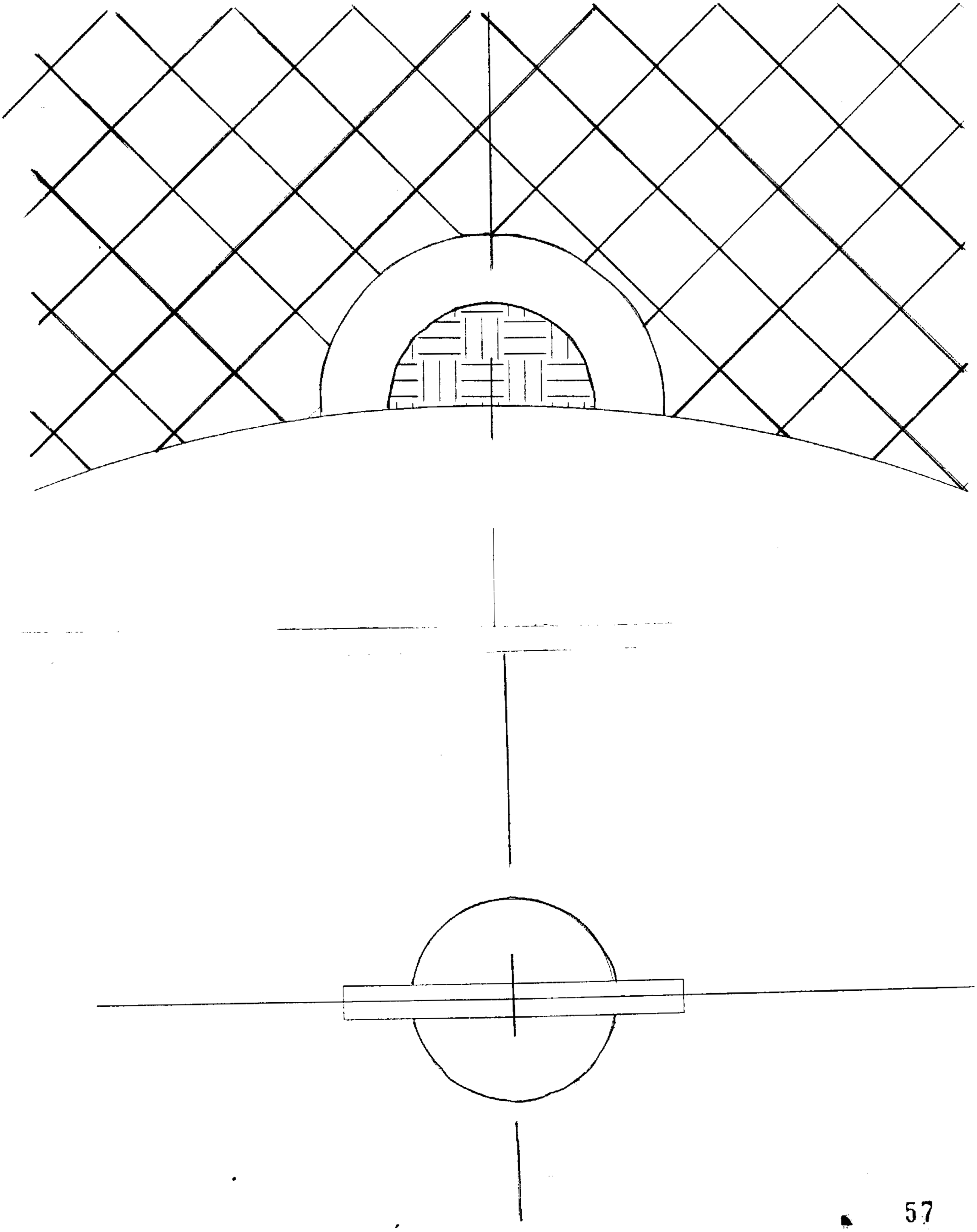
Example of the Taper Bore Locating Template on the Blade
Figure 7

ALERT SERVICE BULLETIN



Move the Transducer/Wedge in this Pattern
Figure 9

56



UNITED TECHNOLOGIES HAMILTON STANDARD

One Hamilton Road
Windsor Locks, Connecticut 06096-1010
203/654-6000

April 8, 1994
Reference No. 4-RAP-0260
14RF-FAA-232

Federal Aviation Administration
Boston Aircraft Certification Office
12 New England Executive Park
Burlington, MA 01803

Attention: Mr. F. Walsh

Subject: Approval of Repair Procedure PS960

The subject, repair is forwarded along with an FAA Form 8110-3, because it affects an critical part. The repair is inside the blade taper bore and is not currently allowed by FAA approved data.

The substantiating data is included and consists of the results of an Engineering Review of the structural effects of local removal of material.

If you have any further questions, please contact me at [redacted]

THE FAA NEW ENGLAND REGION BOSTON AIRCRAFT CERTIFICATION OFFICE ACKNOWLEDGES RECEIPT,
___ ACCEPTS APPROVAL,
✓ APPROVES RECOMMENDATION *
___ REQUIRES CONFORMITY INSPECTION
AND HAS ADDED THE DATA TO ITS FILES.
for [redacted] 4/8/94
MANAGER, BOSTON AIRCRAFT CERTIFICATION OFFICE DATE

Very truly yours;

UNITED TECHNOLOGIES CORPORATION
Hamilton Standard Division

[redacted]

Stuart C. Browning
Senior Service Engineer
Regional and General Aviation Products

/Enclosures

8110-3 Form dated April 8, 1994
Attachment "A", PS960 dated April 8, 1994 Page 1-3
Attachment "B", Engineering Memo Ref. No: BR-94.001 ,Page 1-3

* This approval granted for Hamilton Standard "HS" local repair station only. Hamilton Standard will send additional information on dimensional verification procedures in April 1994 [initials]

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS

DATE: April 8, 1994

AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION

MAKE	MODEL NO.	TYPE (Airplane, Radio, Helicopter, etc.)	NAME OF APPLICANT
	14RF, 14SF 6/5500/F	Propeller	Hamilton Standard

LIST OF DATA

IDENTIFICATION	TITLE
Attachment "A" to 14-RF-FAA-232 PS 960 pg 1-3	Process to perform local rework of mechanical damage in blade taper bore
Attachment "B" to 14-RF-FAA-232 Data 1-3	The substantiating data consists of the results of an Engineering Review of the structural effects of local removal of material

PURPOSE OF DATA

Submit substatiation data for repair of taper bore

APPLICABLE REQUIREMENTS (List specific sections)

FAR 35.19
FAR 35.37

CERTIFICATION - Under authority vested by direction of the Administrator and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered ______ ______ have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.

I (We) Therefore
[X] Recommend approval of these data
[ ] Approve these data

SIGNATURE(S) OF DESIGNATED ENGINEERING REPRESENTATIVE(S)	DESIGNATION NUMBERS(S)	CLASSIFICATION(S)
S. Browning [redacted]	ANE 256	

FAA Form 8110-3 (11-70) SUPERSEDES PREVIOUS EDITION
GPO 901-613

APPROVED REPAIR OR WEAR LIMITS OF SERVICE MATERIAL (CHANGE TO SERVICE DOCUMENT)

SERIAL NO. [illegible]
SHEET 1 OF [illegible]
EFFECTIVE DATE 4/8/94

A. 1. PROGRAM: [illegible]
2. END ITEM PART NUMBER: [illegible] NOMENCLATURE: Blade
3. DETAIL/SUBASSEMBLY PART NAME REQUIRING ACTION:
PART NUMBER (S) NOMENCLATURE:
4. INITIATOR: (☒ SER ENG ☐ HSS ☐ ENGINEERING) NAME [illegible] DATE 4/8/94

B. 1. CONDITION REQUIRING REVIEW: (List B/P and/or Publication # including location, references, figures, etc., and specific condition requiring review.) [illegible]
2. QTY IN THIS CONDITION: ____ (KNOWN) ____ (ESTIMATED FIELD TOTAL) ☒ NO ESTIMATE

C. APPROVED ACTION: (☒ See attached for further information)
1. ☐ All Parts will require repair/test as follows:
2. ☐ Some parts will not require repair based on the following criteria
3. ☐ Parts not meeting the following limtis must be scrapped:

D. RESTRICTIONS: This approval is valid for (check applicable boxes)
1. ☐ ____ pieces, but not after ____ .
2. ☐ ____ pieces, no date restriction.
3. ☐ All pieces regardless of date.
4. ☐ Any quantity before ____ .
5. ☒ Recommend inclusion in applicable OHM/Service Bulletin.
6. ☐ See Attached
7. Use Only
☐ At HS
☐ At the following facilities:

E. CLASSIFICATION: (Applies only to repair or alteration of commercial items in accordance with FAA, FAR Part 1, and/or FAR Part 43, Appendix A) Check applicable box
☐ Minor
☒ Major
Classified by (name/title) [redacted] / SC MGR - PROJ ENG Date 4/8/94

F. HAMILTON STANDARD APPROVALS:

	Name	Date
1. MFG. ENG. (REPAIRS)	[redacted]	4/8/94
2. PROJECT ENGINEERING	[redacted]	4/8/94
3. QUALITY ENGINEERING	[redacted]	4/8/94
4. SERVICE ENGINEERING	[redacted]	4/8/94

G. U.S. GOVERNMENT APPROVALS:

	Name	Date
1. FAA DER (Commercial Propellers Only)	[redacted]	4/8/94
2. FAA (Major Repairs a/o Alterations)		
3. DoD Agency		

H. DISTRIBUTION:

	Name
1. PUBLICATIONS	D. Duvall
2. SERVICE ENGINEERING — BLDG. 1 ☒ — 4 ☐ — 14 ☐	S. Baum
3. HSS QUALITY CONTROL MANAGER	J Devanski
4. QUALITY ENGINEERING — PS ☒ · HSS ☒ · ECS ☐ · FS ☐ · ECA ☐	D Picco / R Palmer
5. DER (PROPELLER)	S. [illegible]
6. RECORDS	R Carpenter

NOTE: FOR INTERNAL USE ONLY. NOT TO BE DISTRIBUTED OUTSIDE HAMILTON STANDARD

INITIATOR REF. NO. ____

1) Visually inspect the blade taper bore for evidence of mechanical damage. No unblended mechanical damage is allowed.

2) Locally blend mechanical damage to 50 times the repair depth. Repair limits are 0.010" maximum stock removal for the face area, 0.020" maximum stock removal for all other areas, including end of taper bore. When the blending is complete, no evidence of damage may remain. Reference Figure 1 (page 3) for definition of face area at any taper bore location.

3) Inspect repairs using a borescope with a 1:1 magnification to verify blending to the above requirements. Surface finish of repair area must be 63 RMS.

4) Perform an ultrasonic inspection of the blade taper bore area.

5) WARNING; CONVERSION COATING IS POISONOUS TO EYES, SKIN, AND RESPIRATORY TRACT. USE SKIN AND EYE PROTECTION. MAKE SURE THE TIME YOU USE IT IS THE MINIMUM NECESSARY. MAKE SURE THE AREA HAS A GOOD FLOW OF AIR.

6) Apply "PS960" to the face and camber side of each blade with white stenciling ink in accordance with stenciling procedures provided in the applicable Component Maintenance Manual.

With a brush, touch up all areas repaired per the above procedure with a coating that agrees with MIL-C-5541, Class 1A. Allow to cure 24 hours.

NOTE: Alodine 600 is recommended because it is without cyanide, but Alodine 1200 or 1201, or any material which agrees with MIL-C-5541, Class 1A is satisfactory.

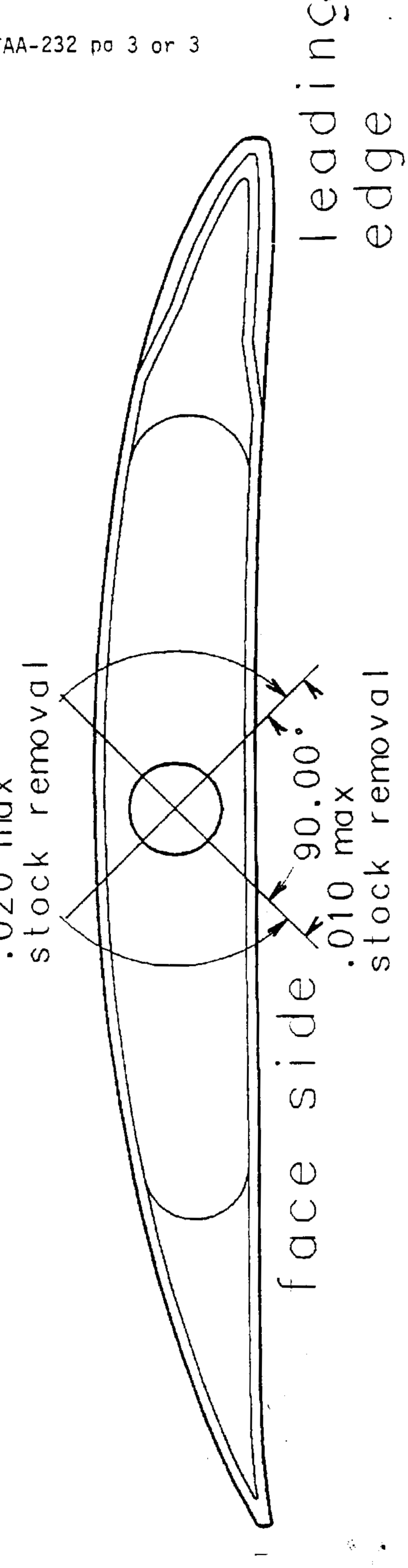


Figure 1. Maximum Permissible Taper Bore Stock Removal

Internal Correspondence

UNITED TECHNOLOGIES
HAMILTON STANDARD

BR94001
April 8, 1994

Memorandum to: S. Browning

cc: K. Duclos
J. Turnberg

From: D. Nagle

Subject: **Taper Bore Rework**

Local rework of the 14SF, 14RF and BAe spars has been shown by analysis to be acceptable within the limits listed below:

- Definition of leading edge, trailing edge, face and camber sides is shown in Figure 1.
- Up to .020 stock removal (radial) on leading edge, trailing edge and camber sides.
- Up to .010 stock removal (radial) on face side.
- The depth of the bore may be increased up to .020.
- The minimum blend area of 50 times the removal depth along the blade axis and 20 times the removal depth circumferentially.
- The 63 RMS surface finish.

The analysis results supporting the rework for each of the blades is shown on a Goodman diagram in Figure 2.

[redacted] 4/8/94

D. Nagle

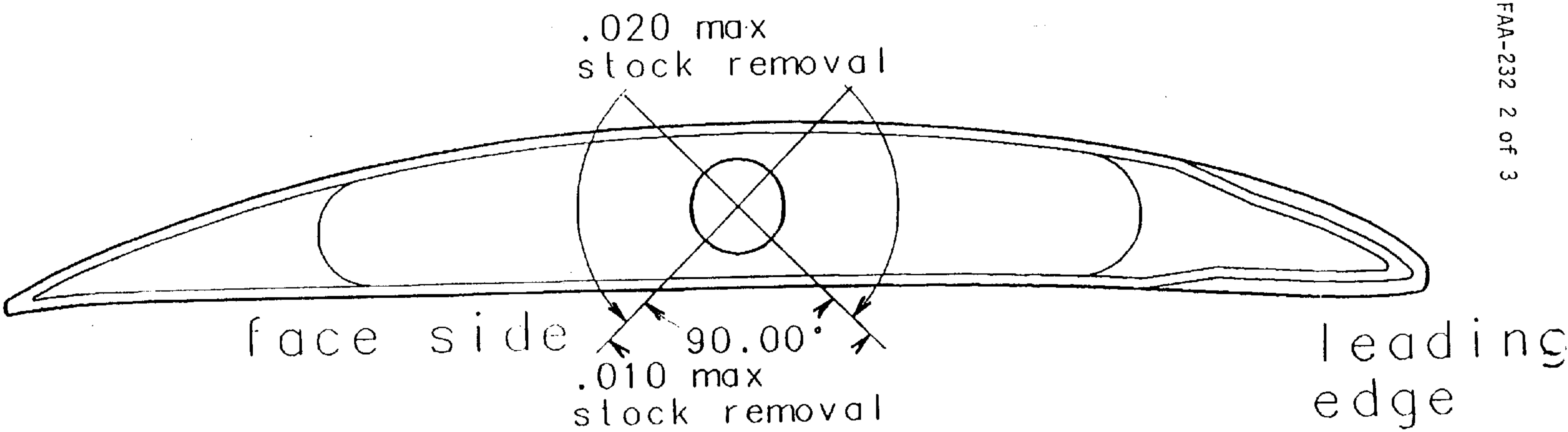


Figure 1. Maximum Permissible Taper Bore Stock Removal

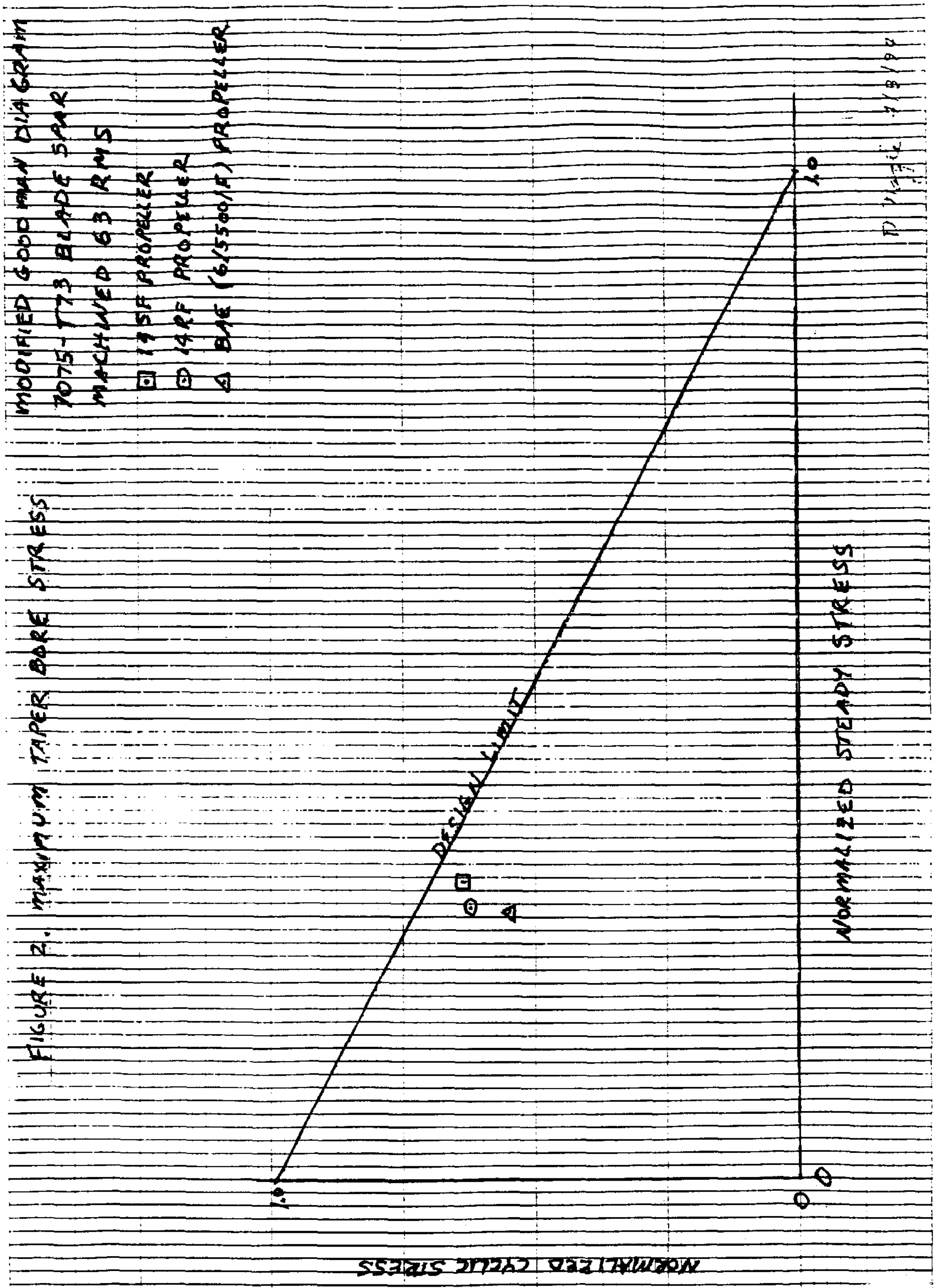


FIGURE 2. MAXIMUM TAPER BORE STRESS
MODIFIED GOODMAN DIAGRAM
7075-T73 BLADE SPAR
MACHINED 63 RMS
14SF PROPELLER
14RF PROPELLER
BAE (6/5500/F) PROPELLER
DESIGN LIMIT
NORMALIZED STEADY STRESS
NORMALIZED CYCLIC STRESS
1.0
0
1.0
0

14RF-14SF-6/5500/F
REGIONAL PROPELLER BLADES
REF. PS 960A

A) The following procedure removes the cork plug from the Taperbore and replaces it with a sealant, PROSEAL 870B-1/2 or 2.

NOTES: - 1/2 cures in 1/2 an hour.
- 2 cures in 2 hours

B) Rework the blade per PS 960 N/C and the applicable "Ultrasonic" Alert Service Bulletins:

NOTE: Stencil the blade with "PS 960A" and per the directions in the applicable Alert Service Bulletin.

C) After balancing the blade with lead wool per the current CMM, proceed as follows:

1) Mix the PROSEAL per manufacturing instructions.

2) Using a long stemmed artist brush, paint the lead wool and the Taperbore just inboard of the lead with PROSEAL (only one coat is required). See attached illustration.

NOTES: 1) Have been advised that this sealant can be applied with the blade in a horizontal position.

2) Have been advised that you can smooth our lumps and bumps in the PROSEAL with alcohol on a brush. We have not tried it so I can't advise you of how well alcohol works. We will continue to FAX you copies of our RI 5687 which is the document we are using to implement PS 960 and the Alert Service Bulletin's.

In conclusion, HSD Senior Management expects us to use this procedure when PROSEAL is available at your facility. A copy of PS 960A which is FAA approved is attached.

R. Rutz

APPROVED REPAIR OR WEAR LIMITS OF SERVICE MATERIAL
(CHANGE TO SERVICE DOCUMENT)

SERIAL NO. PS 760 A
SHEET 1 OF 3
EFFECTIVE DATE 4/18/94

PROGRAM: 14RF/14SF/550OF PROPELLERS
END ITEM PART NUMBER: BLADE NOMENCLATURE: BLADE
DETAIL/SUBASSEMBLY PART NAME REQUIRING ACTION:
PART NUMBER (S) ______ NOMENCLATURE: ______

4. INITIATOR: (☐ SER ENG ☒ HSS ☐ ENGINEERING) NAME R. RUTZ DATE 4/18/94

1. CONDITION REQUIRING REVIEW: (List B/P and/or Publication # including location, references, figures, etc., and specific condition requiring review.) ATTACHED REPAIR PROCEDURE REMAINS UNCHANGED EXCEPT THAT TAPER BORE CORK IS ELIMINATED AND REPLACED WITH A SEALANT WHICH WILL NOT CAUSE CORROSION.

2. QTY IN THIS CONDITION: ______ (KNOWN) ______ (ESTIMATED FIELD TOTAL), ☐ NO ESTIMATE

APPROVED ACTION: (☐ See attached for further information)
1. ☐ All Parts will require repair/test as follows:
2. ☐ Some parts will not require repair based on the following criteria
3. ☐ Parts not meeting the following limits must be scrapped:

RESTRICTIONS: This approval is valid for (check applicable boxes)
1. ☐ ______ pieces, but not after ______
2. ☐ ______ pieces, no date restriction.
3. ☒ All pieces regardless of date.
4. ☐ Any quantity before ______
5. ☐ Recommend inclusion in applicable OHM/Service Bulletin.
6. ☐ See Attached
7. Use Only
☒ At HS
☐ At the following facilities:

CLASSIFICATION: (Applies only to repair or alteration of commercial items in accordance with FAA, FAR Part 1, and/or FAR Part 43, Appendix A) Check applicable box.
☐ Minor
☒ Major
Classified by (name/title) R. RUTZ R.R. / MGR. OP. ENG. Date 4/18/94

H... ON STANDARD APPROVALS:	Name	Date
1. M... ENG. (REPAIRS)	R. Rutz	4/18/94
2. PROJECT ENGINEERING	[redacted]	4/18/94
3. QUALITY ENGINEERING	[redacted]	4/18/94
4. SERVICE ENGINEERING	[redacted]	4/18/94

U.S. GOVERNMENT APPROVALS:	Name	Date
. FAA DER (Commercial Propellers Only)	SEE HSD LETTER TO FAA 14RF-FAA-234	
. FAA (Major Repairs a/o Alterations)		
. DoD Agency		

DISTRIBUTION:	Name
PUBLICATIONS	D. DUVALL
SERVICE ENGINEERING — BLDG. 1 ☒ — 4 ☐ — 14 ☐	J. BAUM
HSS QUALITY CONTROL MANAGER	J. DEVANSKI
QUALITY ENGINEERING — PS ☒ · HSS ☒ · ECS ☐ · FS ☐ · ECA ☐	D. PIGEON / R DAULMER
DER (PROPELLER)	S. BROWNING / R. RUTZ
RECORDS	R. CORDIER

NOTE: FOR INTERNAL USE ONLY. NOT TO BE DISTRIBUTED OUTSIDE HAMILTON STANDARD

INITIATOR REF. NO. ______

724C (9/87) MSP 408

1) Visually inspect the blade taper bore for evidence of mechanical damage. No unblended mechanical damage is allowed.

2) Locally blend mechanical damage to 50 times the repair depth. Repair limits are 0.010" maximum stock removal for the face area, 0.020" maximum stock removal for all other areas, including end of taper bore. When the blending is complete, no evidence of damage may remain. Reference Figure 1 (page 3) for definition of face area at any taper bore location.

3) Inspect repairs using a borescope with a 1:1 magnification to verify blending to the above requirements. Surface finish of repair must be 63 RMS.

4) ~~Reform~~ PERFORM an ultrasonic inspection of the blade taper bore area.

5) WARNING; CONVERSION COATING IS POISONOUS TO EYES, SKIN, AND RESPIRATORY TRACT. USE SKIN AND EYE PROTECTION. MAKE SURE THE TIME YOU USE IT IS THE MINIMUM NECESSARY. MAKE SURE THE AREA HAS A GOOD FLOW OF AIR.

6) Apply "PS 960" to the face and camber side of each blade with white stenciling ink in accordance with stenciling procedures provided in the applicable Component Maintenance Manual.

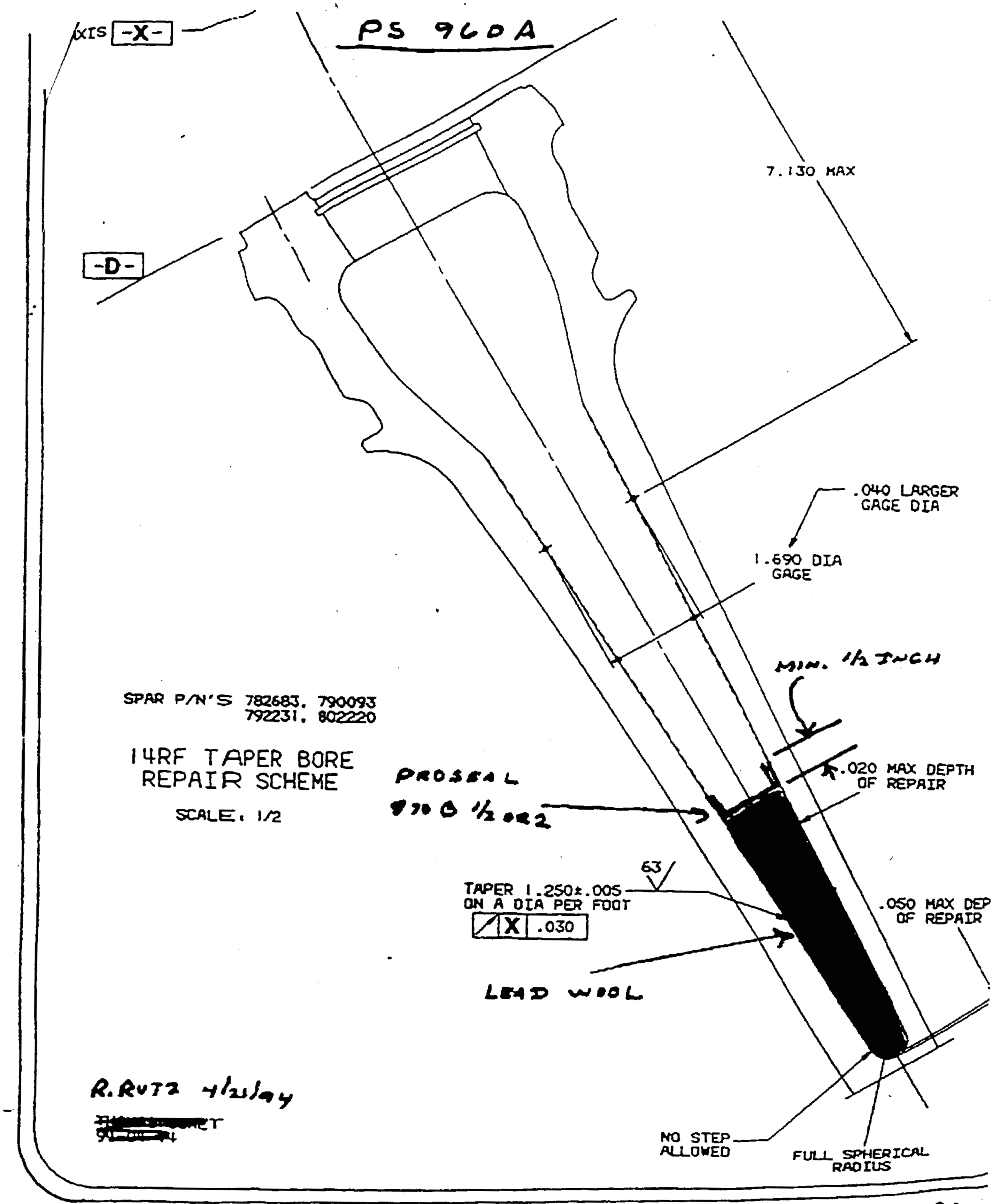
With a brush, touch up all areas repaired per the above procedure with a coating that agrees with MIL-C-5541, Class 1A. Allow to cure 24 hours.

NOTE: Alodine 600 is recommended because it is without cyanide, but Alodine 1200 or 1201, or any material which agrees with MIL-C-5541, Class 1A is satisfactory.

PS 960A

1) After final balance, the taper bore is normally sealed with a cork plug. HSD engineering recommends that the cork be substituted with sealant PROSEAL 870B which will not cause corrosion to the blade base material.

2) Blades processed via this procedure will be marked "PS 960A". See above Para. 6 for location of markings.


PS 960A
AXIS -X-
-D-
7.130 MAX
.040 LARGER GAGE DIA
1.690 DIA GAGE
MIN. 1/2 INCH
.020 MAX DEPTH OF REPAIR
PROSEAL 870 B 1/2 OR 2
SPAR P/N'S 782683, 790093 792231, 802220
14RF TAPER BORE REPAIR SCHEME
SCALE: 1/2
63
TAPER 1.250±.005 ON A DIA PER FOOT
X .030
.050 MAX DEP OF REPAIR
LEAD WOOL
R. RUTZ 4/21/94
[redacted]
NO STEP ALLOWED
FULL SPHERICAL RADIUS

REGIONAL BLADE TAPER BORE INSPECTION & REPAIR HISTORY

September 11, 1995

REGIONAL BLADE TAPER BORE INSPECTION & REPAIR HISTORY

PS	960	4/8/94	Cork Reinstalled
PS	960A	4/18/94	Cork Eliminated Proseal installed

-INSPECT FOR DAMAGE — Visual Inspection
-REPAIR MECH DAMAGE
-REPAIR LIMITS ESTABLISHED — Visual Insp. to known standard
-UT

→

ASB - 4/18/94
14RF-9-61-A66

-ONE TIME UT INSPECTION

-ALL BLADES

→

ASB 8/29/94
14RF-9-61-A69

-INSPECTION OF UNPEENED BLADES
UNPEENED BLADES IDENTIFIED BY S/N
-PS960/960A EXEMPT*
-PEENED BLADES EXEMPT*

THREE INSPECTION OPTIONS

OPTION 1*

OPTION 2*

OPTION 3

*ALL BLADES WILL BE INSPECTED AND REWORKED AS REQUIRED TO OPTION 3 NO LATER THAN NEXT MAJOR INSPECTION

September 11, 1995

REGIONAL BLADE TAPER BORE INSPECTION & REPAIR HISTORY

OPTION 1

– REPEAT UT INSPECTION PER TECHNIQUE IN A66 EVERY 1250 FLT. CYC.

REGIONAL BLADE TAPER BORE INSPECTION & REPAIR HISTORY

OPTION 2

- FIELD VISUAL INSPECTION REQUIREMENTS PER SB 14RF-9-61-70 (8/29)
- REMOVE CORK
- INSPECTION FOR CORROSION
- NO CORROSION, NO FURTHER INSPECTION
- CORROSION FOUND:
  - A) REMOVE FROM SERVICE SEND TO OVERHAUL FACILITY
  - B) CONDUCT UT; IF PASSES CONTINUE IN SERVICE WITH REPEAT UT EVERY 1250 CYCLES

September 11, 1995

REGIONAL BLADE TAPER BORE INSPECTION & REPAIR HISTORY

OPTION 3

- CMM 61-13-04, REPAIR 4-25 DATED 9/1/94
- INSPECT (BOROSCOPE & FPI) & REPAIR AS REQUIRED
- ALL BLADES NOT MARKED +A, +B, +C
- WHENEVER REBALANCE REQUIRED
  - * MARK +A
    - NO CORROSION - NO LOCAL REWORK
    - SHOTPEEN - DAMAGE LESS THAN .005 ACCEPTABLE
  - * MARK +B
    - LOCAL REWORK WITHIN LIMITS OR PREVIOUSLY MARKED PS 960,960A
    - SHOTPEEN
  - * MARK +C
    - REAMED WITHIN LIMITS
    - DAMAGE LESS THAN .010 ACCEPTABLE
    - SHOTPEEN
  - * NOTE - RETIRE +C BLADE WITH DAMAGE GREATER THAN .010

September 11, 1995

REGIONAL BLADE TAPER BORE INSPECTION & REPAIR HISTORY

FAA AD 95-05-03

- EFFECTIVE 3/23/95
- COMPLIANCE BY 12/97
  - APPLIES TO UNPEENED BLADES (DEFINED BY A69)
  - ENFORCES REQUIREMENTS CONTAINED IN
    * SB 70, EXCEPT MUST REMOVE BLADE FROM SERVICE IF ANY CORROSION FOUND (NO UT OPTION
    * CMM 61-13-04, REPAIR 4-25, DATED 9/1/95

EMB120 PROPELLER BLADE STRESS SURVEY

• PURPOSE OF TEST

DETERMINE :

- IF SIGNIFICANT BLADE TO BLADE STRUCTURAL VARIABILITY EXISTS
- IF LOAD SIGNATURES ARE DIFFERENT ON LEFT VS. RIGHT NACELLE
- IF THERE IS PROPELLER LOAD VARIABILITY FROM AIRCRAFT TO AIRCRAFT
- IF NORMAL GROUND OPERATIONS CAN GENERATE HIGH BLADE STRESSES

EMB120 PROPELLER BLADE STRESS SURVEY

TEST PLAN SUMMARY

- FOUR BLADES WITH IDENTICAL STRAIN GAGE CONFIGURATIONS
- THREE "USED" BLADES REMOVED FROM ROCK HILL BLADE POOL
    - USED BLADES INCORPORATE VARIOUS REPAIRS
    - MINIMUM TIME ON USED BLADES IS 11,943 HOURS
- ONE "ZERO TIME" BLADE WILL SERVE AS BASE LINE
- FOUR STRAIN GAGE HOOK UPS REQUIRED TO OBTAIN DATA FROM ALL GAGES

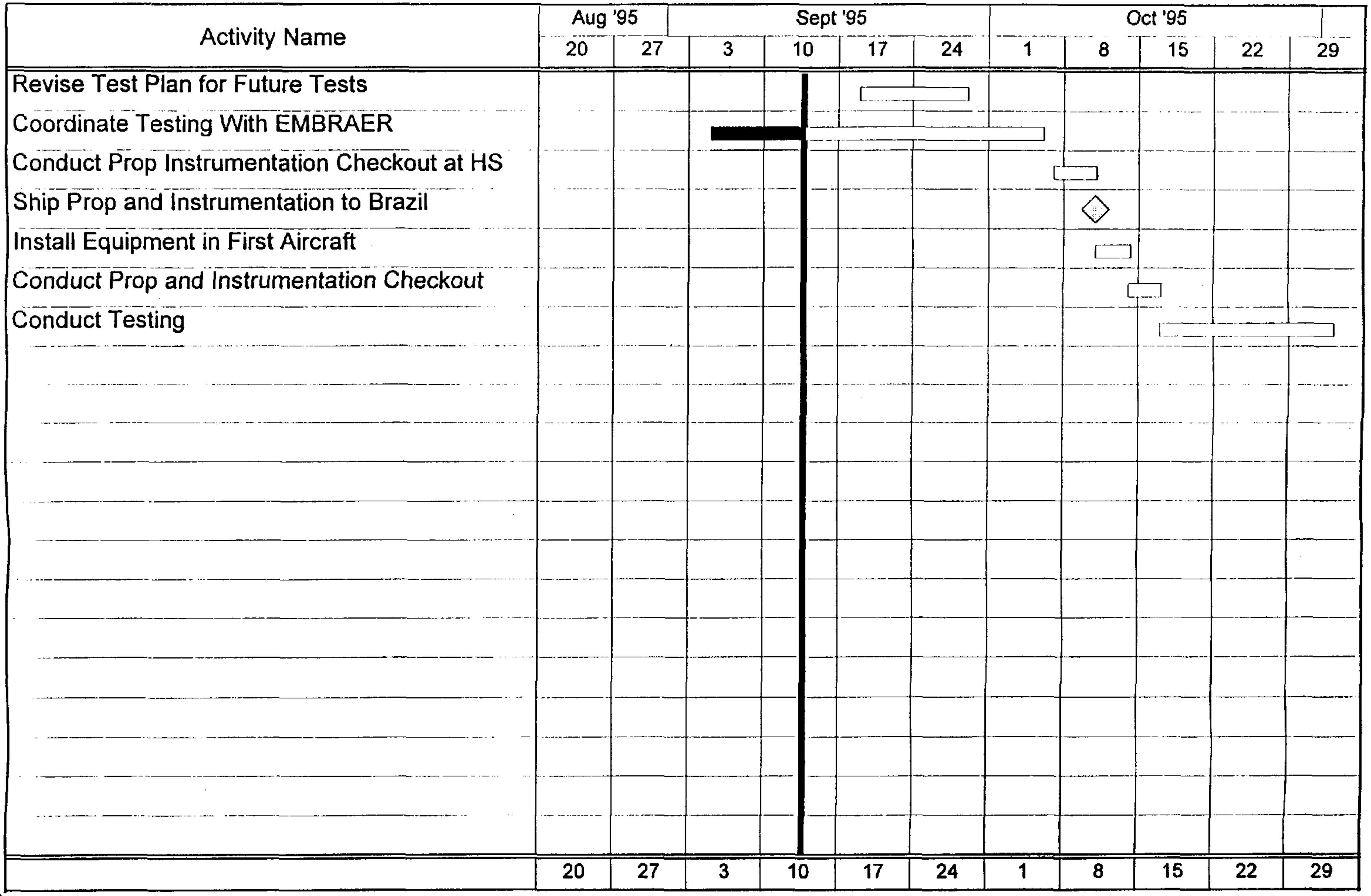
EMB120 PROPELLER BLADE STRESS SURVEY

TEST PLAN SUMMARY

- **FIRST TEST IN MONTREAL ON UTC CORPORATE AIRCRAFT**
- **TESTING SEPARATED BY GROUND AND FLIGHT OPERATIONS**
  - **- THREE GROUND TEST WIND CONDITIONS PER INSTRUMENTATION HOOK UP**
    - **CALM / HEAD WIND**
    - **TWO REAR QUARTERING WIND CONDITIONS**
  - **- ONE SINGLE FLIGHT REQUIRED PER INSTRUMENTATION HOOK UP**
- **TESTING TO BE CONDUCTED WITH INSTRUMENTED PROP ON BOTH NACELLES**
- **TEST CONDITIONS COORDINATED WITH PWC, FAA AND EMBRAER**

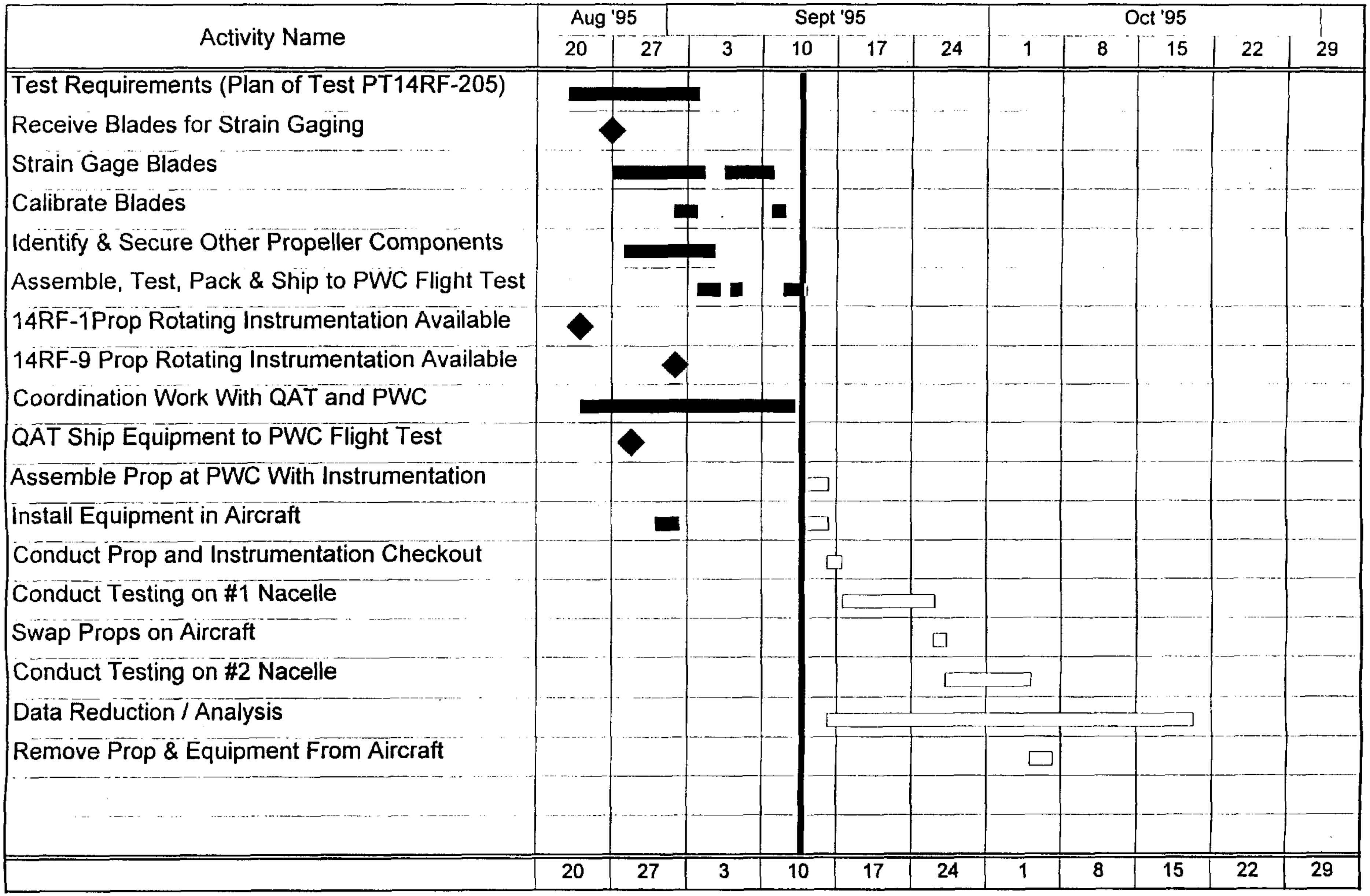
14RF-9 PROPELLER / EMB120 STRESS SURVEY

Sept 13, 1995



14RF-9 PROPELLER / EMB120 STRESS SURVEY

Sept 13, 1995



DOT/FAA

NEW ENGLAND REGION/ENGINE AND PROPELLER DIRECTORATE

PRIORITY

BURLINGTON, MASSACHUSETTS

[FRANK WALSH] [617-238-7158]

FAA HEADQUARTERS

ADA-40

WASHINGTON, DC.

EMERGENCY DISTRIBUTION BY TELEGRAM IS REQUIRED.

TRANSMITTED AS FOLLOWS IS TELEGRAPHIC AIRWORTHINESS DIRECTIVE T95-18-51 FOR IMMEDIATE TRANSMITTAL TO ALL OWNERS AND OPERATORS OF HAMILTON STANDARD MODELS 14RF-9, 14RF-19, 14RF-21, AND 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, AND 14SF-23; AND HAMILTON STANDARD/BRITISH AEROSPACE 6/5500/F PROPELLERS INSTALLED ON BUT NOT LIMITED TO EMBRAER EMB-120 AND EMB 120-RT; SAAB-SCANIA SF 340B; AEROSPATIALE ATR42-100, ATR42-300, ATR42-320, ATR72; DEHAVILLAND DHC-8-100 SERIES, DHC-8-300 SERIES; CONSTRUCCIONES AERONAUTICAS SA (CASA) CN-235 SERIES AND CN-235-100; CANADAIR CL-215T AND CL-415; AND BRITISH AEROSPACE ATP AIRPLANES.

THIS TELEGRAPHIC AIRWORTHINESS DIRECTIVE (AD) IS PROMPTED BY REPORT OF A HAMILTON STANDARD 14RF-9 PROPELLER BLADE INSTALLED ON AN EMBRAER EMB-120 AIRCRAFT THAT SEPARATED IN FLIGHT. THE PRELIMINARY INVESTIGATION HAS REVEALED THAT THIS PROPELLER BLADE TAPER BORE HAD

BEEN ULTRASONICALLY INSPECTED FOR CRACKS IN ACCORDANCE WITH AIRWORTHINESS DIRECTIVE (AD) 94-09-06, AMENDMENT 39-8894 (59 FR 19127, APRIL 22, 1994). THAT AD WAS SUBSEQUENTLY SUPERSEDED BY AD 95-05-03, AMENDMENT 39-9170 (60 FR 12663, MARCH 8, 1995). THAT INSPECTION DETERMINED THAT THE SUBJECT PROPELLER BLADE HAD CRACK INDICATIONS AND WAS REMOVED FROM SERVICE. THE PROPELLER WAS SUBSEQUENTLY REWORKED IN ACCORDANCE WITH APPROVED DATA AND RETURNED TO SERVICE. AFTER THE PROPELLER WAS REWORKED IN ACCORDANCE WITH APPROVED DATA, DEFECTS REMAINED THAT WERE UNDETECTABLE USING CURRENT METHODS. IN ADDITION, SERVICE EXPERIENCE SUGGESTS THE POSSIBILITY THAT PROPELLER BLADES INSTALLED ON EMBRAER EMB-120 SERIES AIRCRAFT MAY EXPERIENCE HIGHER STRESS THAN SIMILAR PROPELLER BLADES INSTALLED ON OTHER AIRCRAFT. THIS CONDITION, IF NOT CORRECTED, COULD RESULT IN SEPARATION OF A PROPELLER BLADE DUE TO CRACKS INITIATING IN THE BLADE TAPER BORE, THAT CAN RESULT IN AIRCRAFT DAMAGE, AND POSSIBLE LOSS OF AIRCRAFT CONTROL.

THE FAA HAS REVIEWED AND APPROVED THE TECHNICAL CONTENTS OF HAMILTON STANDARD ALERT SERVICE BULLETINS (ASB'S): NO. 14RF-21-61-A68, DATED AUGUST 25, 1995; NO. 14SF-61-A88, DATED AUGUST 25, 1995; NO. 14RF-19-61-A49, DATED AUGUST 25, 1995; NO. 6/5500/F-61-A36, DATED AUGUST 25, 1995.

SINCE AN UNSAFE CONDITION HAS BEEN IDENTIFIED THAT IS LIKELY TO EXIST OR DEVELOP ON OTHER PROPELLERS OF THIS SAME TYPE DESIGN, THIS TELEGRAPHIC AD WILL REQUIRE: REMOVAL

FROM SERVICE OF CERTAIN HAMILTON STANDARD 14RF-9 PROPELLER BLADES INSTALLED ON EMBRAER EMB-120 SERIES AIRCRAFT; AND AN INITIAL AND REPETITIVE ULTRASONIC SHEAR WAVE INSPECTIONS FOR CRACKS ON CERTAIN REWORKED PROPELLER BLADES INSTALLED ON AIRCRAFT OTHER THAN THE EMBRAER EMB-120 SERIES. PROPELLER BLADES REMOVED FROM SERVICE IN ACCORDANCE WITH THIS AD MAY NOT BE RETURNED TO SERVICE. THE ACTIONS ARE REQUIRED TO BE ACCOMPLISHED IN ACCORDANCE WITH THE ASB'S DESCRIBED PREVIOUSLY.

THIS RULE IS ISSUED UNDER 49 U.S.C. SECTION 44701 (FORMERLY SECTION 601 OF THE FEDERAL AVIATION ACT OF 1958) PURSUANT TO THE AUTHORITY DELEGATED TO ME BY THE ADMINISTRATOR, AND IS EFFECTIVE IMMEDIATELY UPON RECEIPT OF THIS TELEGRAM:

T95-18-51 HAMILTON STANDARD: DOCKET 95-ANE-48.

APPLICABILITY: HAMILTON STANDARD MODELS 14RF-9, 14RF-19, 14RF-21, AND 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, AND 14SF-23; AND HAMILTON STANDARD/BRITISH AEROSPACE 6/5500/F PROPELLERS INSTALLED ON BUT NOT LIMITED TO EMBRAER EMB-120 AND EMB 120-RT; SAAB-SCANIA SF 340B; AEROSPATIALE ATR42-100, ATR42-300, ATR42-320, ATR72; DEHAVILLAND DHC-8-100 SERIES, DHC-8-300 SERIES; CONSTRUCCIONES AERONAUTICAS SA (CASA) CN-235 SERIES AND CN-235-100; CANADAIR CL-215T AND CL-415; AND BRITISH AEROSPACE ATP AIRPLANES.

NOTE: THIS AD APPLIES TO EACH PROPELLER IDENTIFIED IN THE PRECEDING APPLICABILITY PROVISION, REGARDLESS OF WHETHER

IT HAS BEEN MODIFIED, ALTERED, OR REPAIRED IN THE AREA SUBJECT TO THE REQUIREMENTS OF THIS AD. FOR PROPELLERS THAT HAVE BEEN MODIFIED, ALTERED, OR REPAIRED SO THAT THE PERFORMANCE OF THE REQUIREMENTS OF THIS AD IS AFFECTED, THE OWNER/OPERATOR MUST USE THE AUTHORITY PROVIDED IN PARAGRAPH (E) TO REQUEST APPROVAL FROM THE FAA. THIS APPROVAL MAY ADDRESS EITHER NO ACTION, IF THE CURRENT CONFIGURATION ELIMINATES THE UNSAFE CONDITION, OR DIFFERENT ACTIONS NECESSARY TO ADDRESS THE UNSAFE CONDITION DESCRIBED IN THIS AD. SUCH A REQUEST SHOULD INCLUDE AN ASSESSMENT OF THE EFFECT OF THE CHANGED CONFIGURATION ON THE UNSAFE CONDITION ADDRESSED BY THIS AD. IN NO CASE DOES THE PRESENCE OF ANY MODIFICATION, ALTERATION, OR REPAIR REMOVE ANY PROPELLER FROM THE APPLICABILITY OF THIS AD.

COMPLIANCE: REQUIRED AS INDICATED, UNLESS ACCOMPLISHED PREVIOUSLY.

TO PREVENT SEPARATION OF A PROPELLER BLADE DUE TO CRACKS INITIATING IN THE BLADE TAPER BORE, THAT CAN RESULT IN AIRCRAFT DAMAGE, AND POSSIBLE LOSS OF AIRCRAFT CONTROL, ACCOMPLISH THE FOLLOWING:

(A) FOR HAMILTON STANDARD 14RF-9 PROPELLER BLADES, INSTALLED ON EMBRAER EMB-120 SERIES AIRCRAFT, WITHIN THE NEXT 10 FLIGHT CYCLES AFTER THE EFFECTIVE DATE OF THIS AD, REMOVE FROM SERVICE PROPELLER BLADES THAT HAVE BEEN ULTRASONICALLY SHEAR WAVE INSPECTED IN ACCORDANCE WITH AD 94-09-06 OR AD 95-05-03, REMOVED FROM SERVICE DUE TO CRACK

INDICATIONS, AND SUBSEQUENTLY REWORKED AND RETURNED TO SERVICE. THESE PROPELLER BLADES INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING SERIAL NUMBERS:

847598

851646

852085

852561

853151

854530

854535

854838

855014

855042

855196

855859

857375

858696

859824

860589

867590

876707

880245

(B) FOR HAMILTON STANDARD MODELS 14RF-19, 14RF-21, AND 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, AND 14SF-23; AND HAMILTON STANDARD/BRITISH AEROSPACE 6/5500/F PROPELLER BLADES, INSTALLED ON AIRCRAFT OTHER THAN EMBRAER EMB-120 AIRCRAFT, WITHIN THE NEXT 10 FLIGHT CYCLES AFTER THE

EFFECTIVE DATE OF THIS AD, AND THEREAFTER AT INTERVALS NOT TO EXCEED 1,250 FLIGHT CYCLES SINCE LAST INSPECTION, PERFORM AN ULTRASONIC SHEAR WAVE INSPECTION FOR CRACKS IN THE BLADE TAPER BORE OF PROPELLER BLADES THAT HAVE BEEN ULTRASONICALLY INSPECTED IN ACCORDANCE WITH AD 94-09-06 OR AD 95-05-03, REMOVED FROM SERVICE DUE TO CRACK INDICATIONS, AND SUBSEQUENTLY REWORKED AND RETURNED TO SERVICE. PERFORM THE ULTRASONIC SHEAR WAVE INSPECTION IN ACCORDANCE WITH THE ACCOMPLISHMENT INSTRUCTIONS OF THE FOLLOWING HAMILTON STANDARD ALERT SERVICE BULLETINS (ASB'S), AS APPLICABLE: NO. 14RF-21-61-A68, DATED AUGUST 25, 1995; NO. 14SF-61-A88, DATED AUGUST 25, 1995; NO. 14RF-19-61-A49, DATED AUGUST 25, 1995; NO. 6/5500/F-61-A36, DATED AUGUST 25, 1995. REMOVE CRACKED PROPELLER BLADES FROM SERVICE AND REPLACE WITH SERVICEABLE PARTS.

(C) PROPELLER BLADES REMOVED FROM SERVICE IN ACCORDANCE WITH THIS AD MAY NOT BE RETURNED TO SERVICE.

(D) FOR THE PURPOSE OF THIS AD, A FLIGHT CYCLE IS DEFINED AS ONE TAKEOFF AND THE NEXT LANDING OF AN AIRCRAFT.

(E) AN ALTERNATIVE METHOD OF COMPLIANCE OR ADJUSTMENT OF THE INITIAL COMPLIANCE TIME THAT PROVIDES AN ACCEPTABLE LEVEL OF SAFETY MAY BE USED IF APPROVED BY THE MANAGER, BOSTON AIRCRAFT CERTIFICATION OFFICE. THE REQUEST SHOULD BE FORWARDED THROUGH AN APPROPRIATE FAA PRINCIPAL MAINTENANCE INSPECTOR, WHO MAY ADD COMMENTS AND THEN SEND IT TO THE MANAGER, BOSTON AIRCRAFT CERTIFICATION OFFICE.

NOTE: INFORMATION CONCERNING THE EXISTENCE OF APPROVED ALTERNATIVE METHODS OF COMPLIANCE WITH THIS AIRWORTHINESS DIRECTIVE, IF ANY, MAY BE OBTAINED FROM THE BOSTON AIRCRAFT CERTIFICATION OFFICE.

(F) SPECIAL FLIGHT PERMITS MAY BE ISSUED IN ACCORDANCE WITH SECTIONS 21.197 AND 21.199 OF THE FEDERAL AVIATION REGULATIONS (14 CFR 21.197 AND 21.199) TO OPERATE THE AIRCRAFT TO A LOCATION WHERE THE REQUIREMENTS OF THIS AD CAN BE ACCOMPLISHED.

(G) COPIES OF THE APPLICABLE SERVICE INFORMATION MAY BE OBTAINED FROM HAMILTON STANDARD, ONE HAMILTON ROAD, WINDSOR LOCKS, CT 06096-1010; TELEPHONE (203) 654-3610. THIS INFORMATION MAY BE EXAMINED AT THE FAA, NEW ENGLAND REGION, OFFICE OF THE ASSISTANT CHIEF COUNSEL, 12 NEW ENGLAND EXECUTIVE PARK, BURLINGTON, MA.

(H) TELEGRAPHIC AD T95-18-51, ISSUED ON AUGUST 25, 1995, BECOMES EFFECTIVE UPON RECEIPT.

FOR FURTHER INFORMATION CONTACT: FRANK WALSH, AEROSPACE ENGINEER, BOSTON AIRCRAFT CERTIFICATION OFFICE, FAA, ENGINE AND PROPELLER DIRECTORATE, 12 NEW ENGLAND EXECUTIVE PARK, BURLINGTON, MA 01803-5299; TELEPHONE (617) [redacted], FAX (617) 238-7199.

ISSUED IN BURLINGTON, MASSACHUSETTS, ON August 25, 1995.

[redacted]

JAY J. PARDEE,

MANAGER, ENGINE AND PROPELLER DIRECTORATE,

AIRCRAFT CERTIFICATION SERVICE.

PRIORITY LETTER AIRWORTHINESS DIRECTIVE

REGULATORY SUPPORT DIVISION
P.O. BOX 26460
OKLAHOMA CITY, OKLAHOMA 73125-0460

U.S. Department
of Transportation
Federal Aviation Administration

DATE: August 30, 1995
95-18-06 R1

This priority letter Airworthiness Directive (AD) revises priority letter 95-18-06, that was issued on August 28, 1995, and made effective upon receipt. That AD superseded telegraphic AD T95-18-51, that was issued on August 25, 1995, and AD 95-05-03, Amendment 39-9170. That AD also requires ultrasonic shear wave inspection on all Hamilton Standard 14RF-9 propeller blades, and ultrasonic shear wave inspection on certain Hamilton Standard Model, 14RF-19, -21, 14SF-5, -7, -11, -15, -17, 19, and -23; 14SFL11; and Hamilton Standard British Aerospace 6/5500/F propeller blades. This priority letter requires the same requirements as the original priority letter with the exception of paragraphs (d)(1) and (d)(2) which clarifies the compliance time of affected propeller blades, and paragraph (g) which clarifies the definition of an in flight cycle. Specifically the compliance requirements of paragraphs (d)(1) and (2) were revised to insert the phrase "since last ultrasonic shear wave inspection" following the words "for propeller blades with 1,250 or more flight cycles," in (d)(1), and "for propeller blades with less than 1,250 flight cycles, in (d)(2). This revision focuses inspection priorities on the correct population. Paragraph (g) is revised to add a flight cycle definition for water bomber aircraft. The other contents of the priority letter remain the same.

The FAA has reviewed and approved the technical contents of the following Hamilton Standard Alert Service Bulletins (ASB's): ASB's No. 14RF-9-61-A85, No. 14RF-19-61-A50, No. 14RF-21-61-A69, No. 14SF-61-A89, and No. 6/5500/F-61-A37, all dated August 28, 1995, that describe procedures for ultrasonic shear wave inspections of the blade taper bores for cracks.

Since an unsafe condition has been identified that is likely to exist or develop on other propellers of this same type design, this priority letter AD revises priority letter 95-18-06 to insert inspection priorities for paragraphs (d)(1) and (2) and to clarify paragraph (g). All other requirements of the AD remain the same.

This rule is issued under 49 U.S.C. Section 44701 (formerly section 601 of the Federal Aviation Act of 1958) pursuant to the authority delegated to me by the Administrator, and is effective immediately upon receipt of this priority letter.

95-18-06 R1 Hamilton Standard: Priority Letter issued on August 30, 1995. Docket No. 95-ANE-50. Revises Priority Letter 95-18-06, issued August 28, 1995.

Applicability: Hamilton Standard Models 14RF-9, 14RF-19, 14RF-21, and 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, and 14SF-23; and Hamilton Standard/British Aerospace 6/5500/F propellers installed on but not limited to Embraer EMB-120 and EMB 120-RT; SAAB-SCANIA SF 340B; Aerospatiale ATR42-100, ATR42-300, ATR42-320, ATR72; DeHavilland DHC-8-100 series, DHC-8-300 Series; Construcciones Aeronauticas SA (CASA) CN-235 series and CN-235-100; Canadair CL-215T and CL-415; and British Aerospace ATP airplanes.

NOTE: This AD applies to each propeller identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For propellers that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must use the authority provided in paragraph (h) to request approval from the Federal Aviation Administration (FAA). This approval may address either no action, if the current configuration eliminates the unsafe condition, or different actions necessary to address the unsafe condition described in this AD. Such a request should include an assessment of the effect of the changed configuration on the unsafe condition addressed by this AD. In no case does the presence of any modification, alteration, or repair remove any propeller from the applicability of this AD.

Compliance: Required as indicated, unless accomplished previously.

To prevent separation of a propeller blade due to cracks initiating in the blade taper bore, that can result in aircraft damage, and possible loss of aircraft control, accomplish the following:

(a) For Hamilton Standard Model 14RF-9 propeller blades, installed on Embraer EMB-120 series aircraft, within the next 10 flight cycles after the effective date of this AD, remove from service propeller blades that have been ultrasonically shear wave inspected in accordance with AD 94-09-06 or AD 95-05-03, removed from service due to crack indications, and subsequently reworked and returned to service. These propeller blades include, but are not limited to, the following serial numbers:

847598	851646
852085	852561
853151	854530
854535	854838
855014	855042
855196	855859
857375	858696
859824	860589
867590	876707
880245	

(b) For Hamilton Standard Models 14RF-19, 14RF-21, and 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, and 14SF-23; and Hamilton Standard/British Aerospace 6/5500/F propeller blades, installed on aircraft other than Embraer EMB-120 series aircraft, within the next 10 flight cycles after the effective date of this AD, unless inspected previously in accordance with Telegraphic AD T95-18-51, perform an ultrasonic shear wave inspection for cracks in the blade taper bore of propeller blades that have been ultrasonically inspected in accordance with AD 94-09-06 or AD 95-05-03, removed from service due to crack indications, and subsequently reworked and returned to service. Thereafter, at intervals not to exceed 1,250 flight cycles since last inspection, perform an ultrasonic shear wave inspection for cracks in the blade taper bore of propeller blades. Perform the ultrasonic shear wave inspection in accordance with the Accomplishment Instructions of the following Hamilton Standard Alert Service Bulletins (ASB's), as applicable: No. 14RF-21-61-A68, No. 14SF-61-A88, No. 14RF-19-61-A49, No. 6/5500/F-61-A36; all dated August 25, 1995. Remove propeller blades with crack indications from service and replace with serviceable parts.

(c) For Hamilton Standard Model 14RF-9 propeller blades, installed on Embraer EMB-120 series aircraft, not affected by paragraph (a) of this AD, perform ultrasonic shear wave inspections in accordance with the Accomplishment Instructions of Hamilton Standard ASB No. 14RF-9-61-A85, dated August 28, 1995. Remove propeller blades with crack indications from service and replace with serviceable parts:

(1) For propeller blades with 1,250 or more flight cycles since last ultrasonic shear wave inspection on the effective date of this AD, or that have not been ultrasonically shear wave inspected, perform an ultrasonic shear wave inspection for cracks within the next 50 flight cycles after the effective date of this AD.

(2) For propeller blades with less than 1,250 flight cycles since last ultrasonic shear wave inspection on the effective date of this AD, perform an ultrasonic shear wave inspection for cracks within the next 50 flight cycles after the effective date of this AD, or prior to accumulating 1,250 flight cycles, whichever occurs later.

(3) Thereafter, perform repetitive ultrasonic shear wave inspections at intervals not to exceed 1,250 flight cycles since last inspection.

(d) For Hamilton Standard Models 14RF-19, 14RF-21, and 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, and 14SF-23; and Hamilton Standard/British Aerospace 6/5500/F propeller blades; identified by serial number in the ASB's listed in this paragraph, installed on aircraft other than Embraer EMB-120 aircraft, and not affected by paragraph (b) of this AD, perform ultrasonic shear wave inspections in accordance with the Accomplishment Instructions of Hamilton Standard ASB's, as applicable: No. 14RF-21-61-A69, No. 14SF-61-A89, No. 14RF-19-61-A50, No. 6/5500/F-61-A37; all dated August 28, 1995. Remove propeller blades with crack indications from service and replace with serviceable parts:

(1) For propeller blades with 1,250 or more flight cycles since last ultrasonic shear wave inspection on the effective date of this AD, or that have not been ultrasonically shear wave inspected, perform an ultrasonic shear wave inspection for cracks within the next 150 flight cycles after the effective date of this AD.

(2) For propeller blades with less than 1,250 flight cycles since last ultrasonic shear wave inspection on the effective date of this AD, perform an ultrasonic shear wave inspection for cracks within the next 150 flight cycles after the effective date of this AD, or prior to accumulating 1,250 flight cycles, whichever occurs later.

(3) Thereafter, perform repetitive ultrasonic shear wave inspections at intervals not to exceed 1,250 flight cycles since last inspection.

(e) No ultrasonic shear wave inspections are required for Hamilton Standard Models 14RF-19, 14RF-21, and 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, and 14SF-23; and Hamilton Standard/British Aerospace 6/5500/F propeller blades, that have been shotpeened in the taper bore during manufacture, and not identified by serial numbers in the ASB's listed in paragraph (b) of this AD.

(f) Propeller blades removed from service in accordance with this AD may not be returned to service.

(g) For the purpose of this AD, a flight cycle is defined as one takeoff and the next landing of an aircraft. In addition, each touch and go is defined as a flight cycle, and each water load pick up for amphibian aircraft operation is defined as a flight cycle.

(h) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Boston Aircraft Certification Office. The request should be forwarded through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, Boston Aircraft Certification Office.

NOTE: Information concerning the existence of approved alternative methods of compliance with this airworthiness directive, if any, may be obtained from the Boston Aircraft Certification Office.

(i) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the aircraft to a location where the requirements of this AD can be accomplished.

(j) Copies of the applicable service information may be obtained from Hamilton Standard, One Hamilton Road, Windsor Locks, CT 06096-1010; telephone (203) 654-6876. This information may be examined at the FAA, New England Region, Office of the Assistant Chief Counsel, 12 New England Executive Park, Burlington, MA.

(k) Priority Letter AD 95-18-06 R1, issued August 30, 1995, becomes effective upon receipt.

(l) Priority Letter AD 95-18-06 R1 revises priority letter 95-18-06 issued August 25, 1995.

FOR FURTHER INFORMATION CONTACT: Frank Walsh, Aerospace Engineer, Boston Aircraft Certification Office, FAA, Engine and Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803-5299; telephone (617) 238-7158, fax (617) 238-7199.

ALL BLADES
REGIONAL PROPELLER BLADES INSPECTION STATUS
DATA RECEIVED IN RESPONSE TO TELEGRAPHIC AD T95-18-51 AND PRIORITY LETTER AD 95-18-06R1

INSTALLATION	PASS	UT REJEC	UNKNOWN	TOTAL INSPECTED	% PASSED	NO. OF BLADES	% INSPECT
ATP	203	8	0	211	96.2	1419	14.9
ATR	968	61	3	1029	94.1	4138	24.9
CL215/415	45	0	0	45	100	316	14.2
CN235	33	0	0	33	100	1500	2.2
DHC8	1357	93	4	1450	93.6	4100	35.4
EMB120	774	33	15	807	95.9	2885	28.0
S340	626	4	0	630	99.4	864	72.9
UNKNOWN	59	15	0	74	79.7	0	0
TOTAL	**4065**	**214**	**22**	**4279**	**95.0**	**15222**	**28.1**

NOT PEENED BLADES
REGIONAL PROPELLER BLADES INSPECTION STATUS
DATA RECEIVED IN RESPONSE TO PRIORITY LETTER AD 95-18-06R1

INSTALLATION	PASS	UT REJECT	UNKNOWN	TOTAL INSPECTED	% PASSED	NO. OF BLADES	% INSPECT
ATP	177	6	0	183	96.7	1250	14.6
ATR	614	30	3	644	95.3	2637	24.4
CL215/415	9	0	0	9	100	179	5.0
CN235	28	0	0	28	100	923	0
DHC8	887	61	3	948	93.6	2573	36.8
EMB120	660	28	11	688	95.9	2454	28.0
S340	246	4	0	250	98.4	341	73.3
UNKNOWN	37	12	0	49	75.5	0	0
TOTAL	**2658**	**141**	**17**	**2799**	**95.0**	**10357**	**27.0**

PEENED BLADES
REGIONAL PROPELLER BLADES INSPECTION STATUS
DATA RECEIVED IN RESPONSE TO PRIORITY LETTER AD 95-18-06R1

INSTALLATION	PASS	UT REJECT	UNKNOWN	TOTAL INSPECTED	% PASSED	NO. OF BLADES	% INSPECT
ATP	26	2	0	28	93	169	16.6
ATR	354	31	0	385	91.9	1501	25.6
CL215/415	36	0	0	36	100	137	26.3
CN235	5	0	0	5	100	577	0.9
DHC8	470	32	1	502	93.6	1527	32.9
EMB120	114	5	4	119	95.8	431	27.6
S340	380	0	0	380	100.0	523	72.7
UNKNOWN	22	3	0	25	88.0	0	0
TOTAL	**1407**	**73**	**5**	**1480**	**95.1**	**4865**	**30.4**

BLADES DONE

13-Sep-95

Region	# AIRLINES	BLADES DONE	REJECTED
Africa	4	269	0
Asia	4	221	9
Australia	1	29	7
Canada Eastern	9	682	21
Canada Western	1	10	0
Caribbean	3	125	6
Europe Eastern	1	67	0
Europe Northern	9	384	6
Europe Southern	11	571	3
Mexico / CA	1	58	0
Pacific	1	58	9
South America	3	221	7
United Kingdom	5	547	0
US Mid Central	10	1661	10
US Northeast	6	941	40
US Pacific	2	67	0
US Pacific NW	2	240	2
US South Central	5	1094	14
US South East	10	1238	12
US South West	5	758	20
	93	**9240**	**166**

BLADES IN PROGRESS

13-Sep-95

Region	# AIRLINES	BLADES IN PROGRESS	REJECTED
Africa	4	67	1
Asia	1	38	1
Australia	3	154	39
Canada Eastern	2	163	8
Canada Western	1	163	10
Europe Northern	9	605	5
Europe Southern	4	221	20
United Kingdom	1	38	0
US Northeast	1	96	0
US South West	1	19	0
	27	**1565**	**84**

BLADES NEEDING ACTION

13-Sep-95

Region	# AIRLINES	BLADES NEEDING ACTION
Africa	9	130
Asia	3	58
Australia	3	67
Canada Eastern	4	96
Canada Western	5	163
Caribbean	2	106
Europe Eastern	2	58
Europe Northern	1	10
Europe Southern	5	134
Indonesia	2	58
Mexico / CA	2	29
Middle East	2	125
Pacific	3	29
South America	15	259
United Kingdom	8	202
US Mid Central	1	10
US Northeast	1	10
US South East	2	67
	70	**1608**

BLADES SCHEDULED

13-Sep-95

Region	# AIRLINES	BLADES SCHEDULED
Africa	2	19
Asia	2	38
Australia	1	29
Europe Eastern	2	86
Indonesia	1	72
Middle East	1	19
	9	**264**