N94-33515

528-24
12058

HSCT AIRFRAME MATERIALS

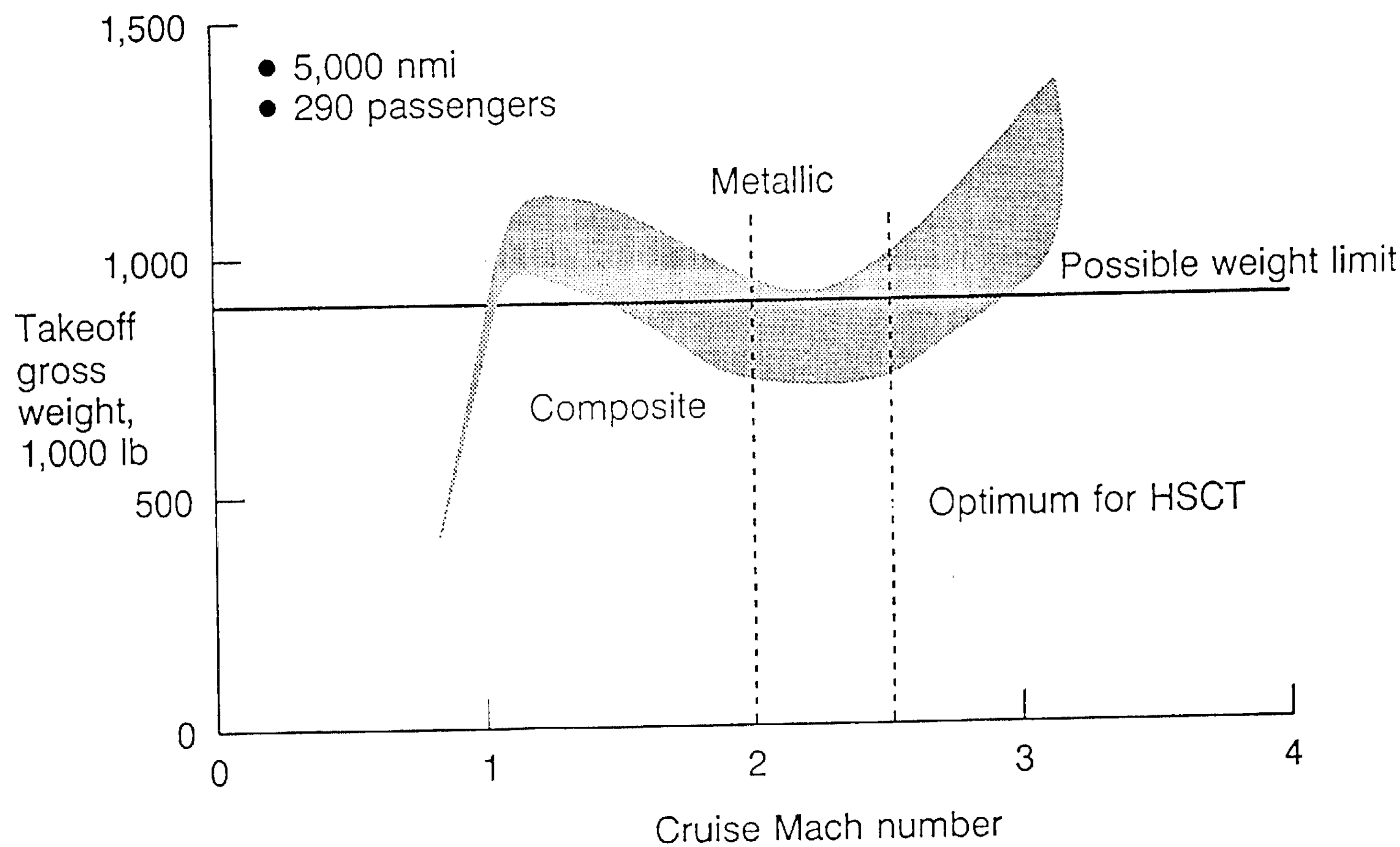
THE BOEING PRESPECTIVE

MAY 16, 1991

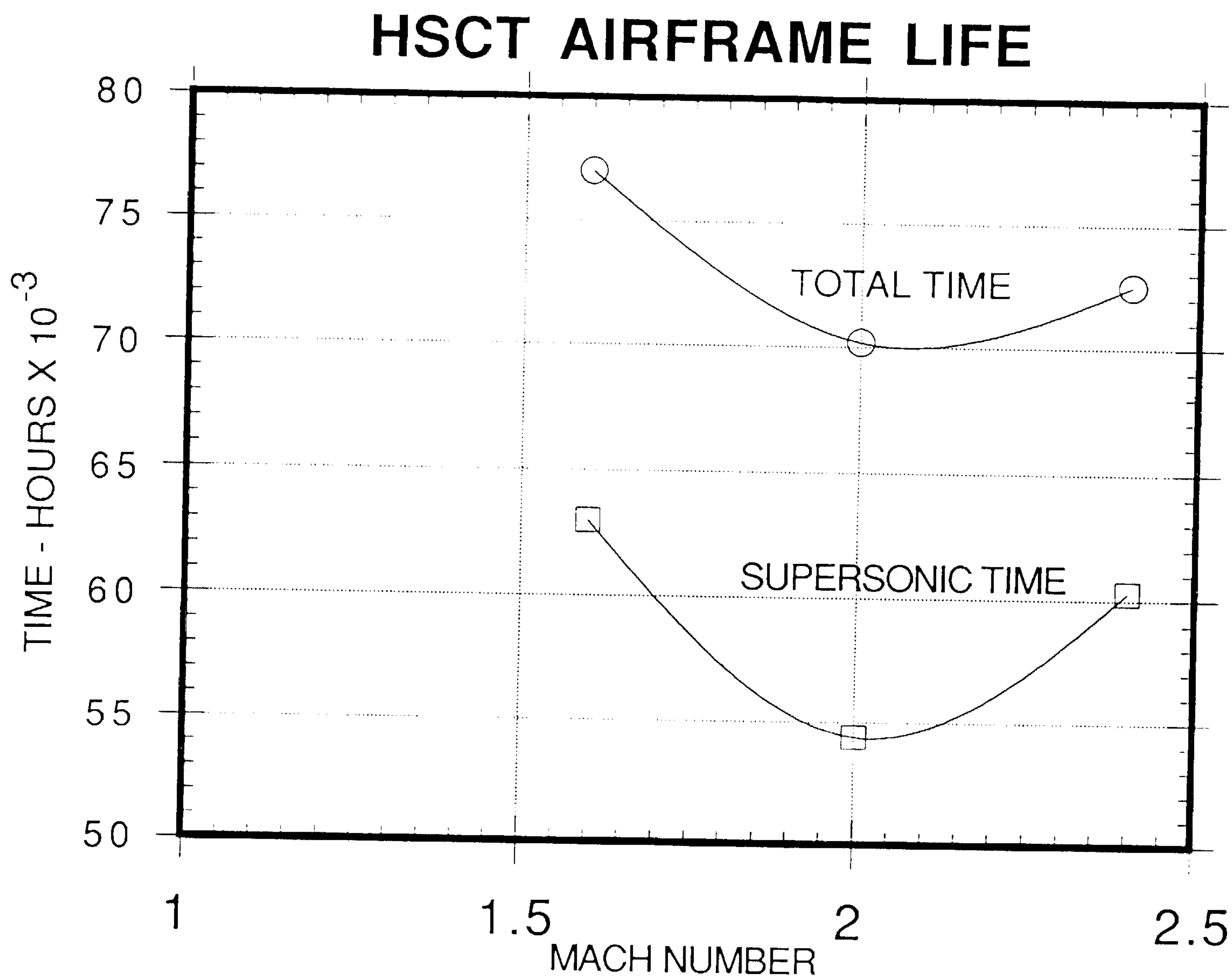
DONALD L. GRANDE
MANAGER - HSCT STRUCTURES

[redacted]

Effect of Cruise Mach Number on Maximum Takeoff Weight



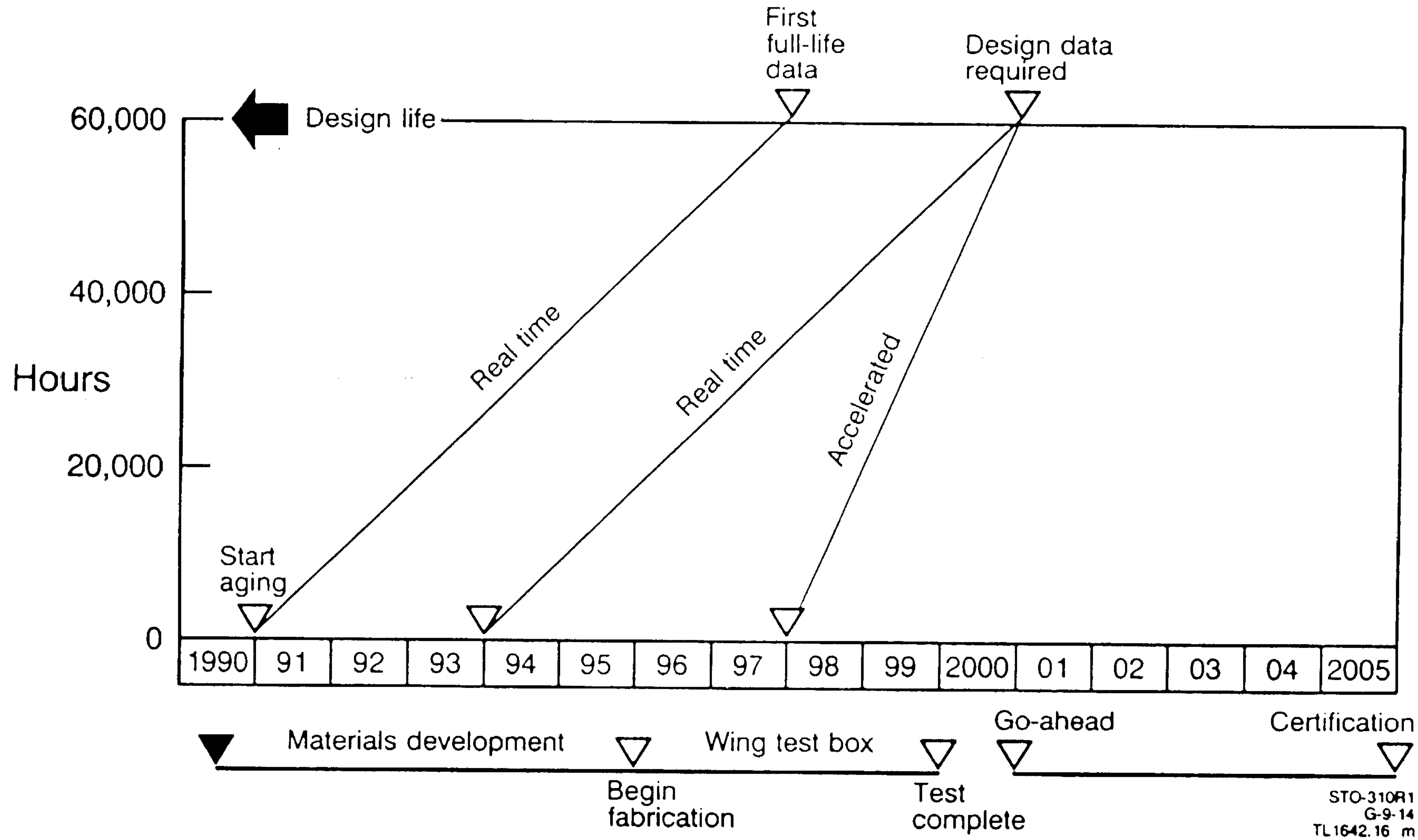
PO-315
G-12-14
SL1642.16


HSCT AIRFRAME LIFE
TIME - HOURS X 10^-3
80
75
70
65
60
55
50
TOTAL TIME
SUPERSONIC TIME
1
1.5
2
2.5
MACH NUMBER

RECOMMENDATIONS

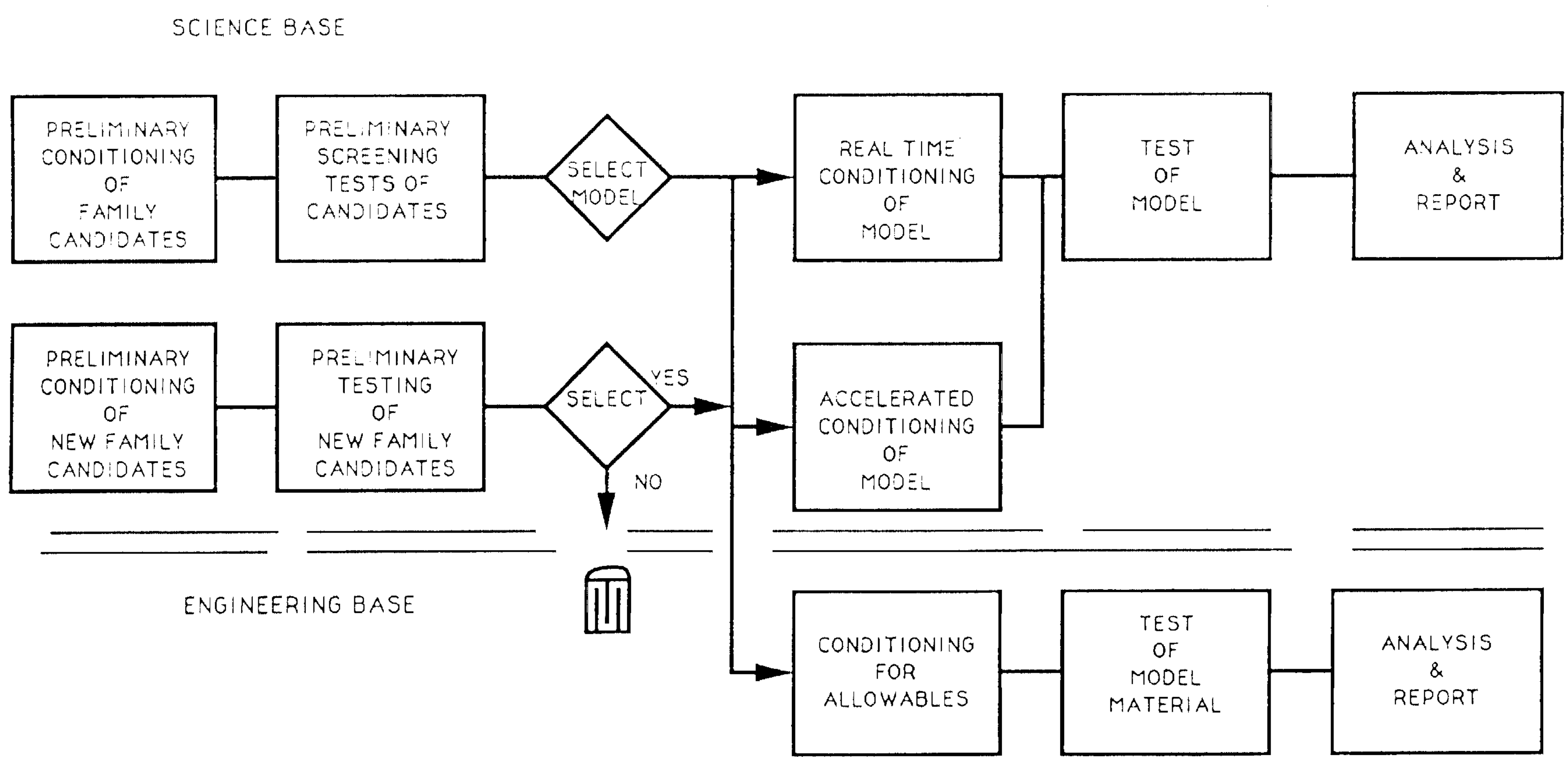
TOTAL TIME	72,000 HRS
SUPERSONIC TIME	60,000 HRS
FLIGHT CYCLES	30,000
TEMPERATURES	200°F TO 350°F

The Aging Issue



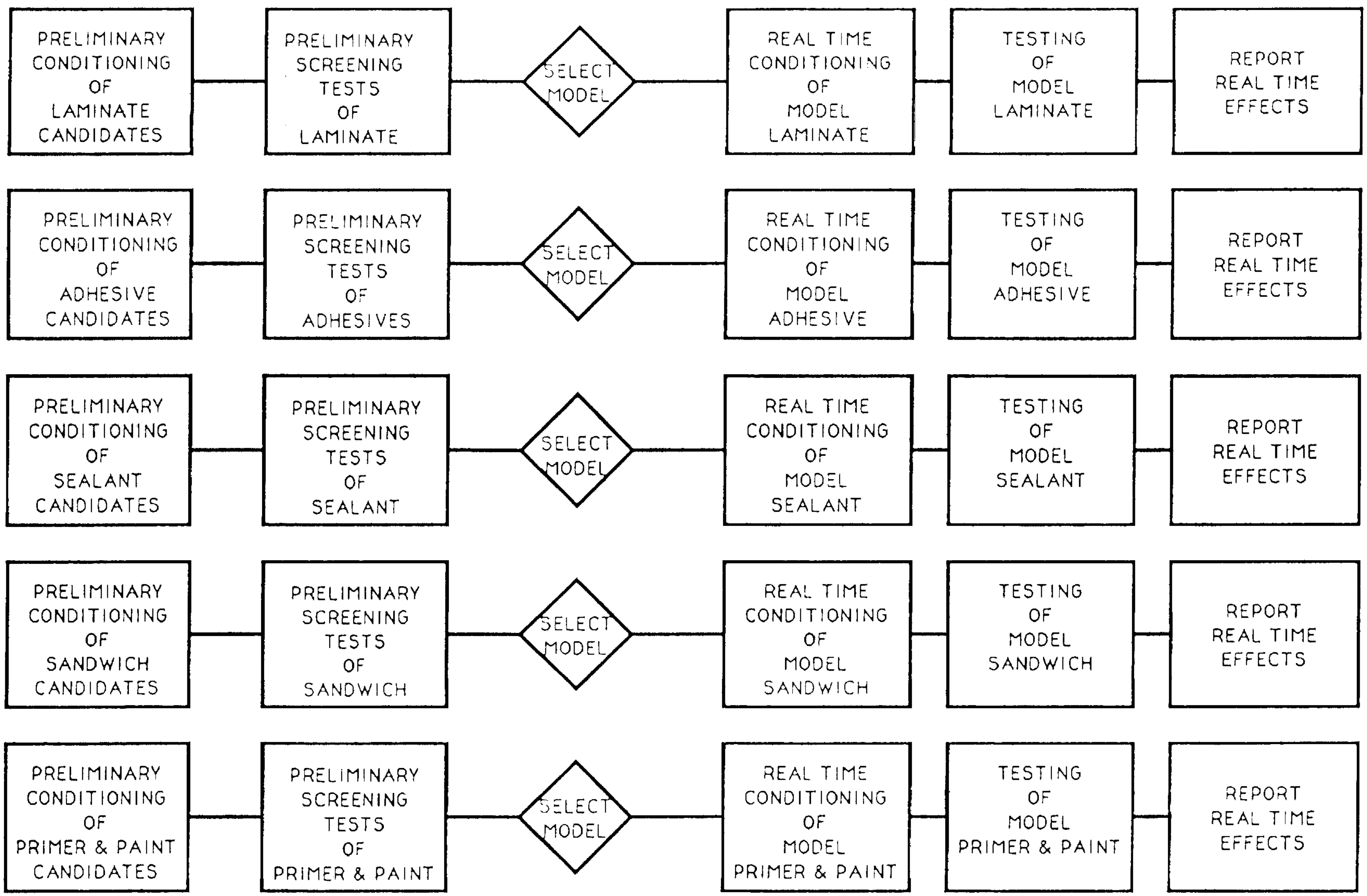
CHARACTERIZING MATERIAL AGING EFFECTS

MATERIAL FAMILY "A"



MATERIAL FAMILY "A"

REAL TIME TESTING



CHACTERIZING MATERIAL AGING EFFECTS

	REAL TIME CONDITIONING-COMPOSITES				TESTING	
LAMINATE	ISOTHERMAL		200°F 275°F 350°F	10K 30K 60K 90K 120K	OHC CAI TENS COMP SHEAR	-65°F RT 200°F 275°F 350°F
	TEMP-TIME HIST					
	LOAD & TEMP TIME HIST					
	LOAD-TIME HIST		RT			
	ISOTHERMAL & UV	PAINTED UNPAINTED	RT 200°F 350°F	10K 30K 60K		
	ISOTHERMAL & O3					
	TIME HIST WATER ABSORB					
	TIME HIST LOAD & H2O		RT			
ADHESIVE	ISOTHERMAL	WET DRY	200°F 275°F 350°F	10K 30K 60K	SHEAR PEEL PULL-OFF	-65°F RT 200°F 275°F 350°F
	TEMP-TIME HIST					
	LOAD & TEMP TIME HIST					
	LOAD-TIME HIST		RT			
SEALANT	ISOTHERMAL		200°F 275°F 350°F	10K 30K 60K	SOLVENT SHEAR ADHESION	-65°F RT 200°F 275°F 350°F
	TEMP-TIME HIST					
	LOAD & TEMP TIME HIST					

FIGURE 7

REAL TIME CONDITIONING-COMPOSITES (CONCLUDED) — TESTING

SANDWICH	ISOTHERMAL TEMP-TIME HIST LOAD-TIME HIST LOAD & TEMP TIME HIST	200°F 275°F 350°F	10K 30K 60K	OHC CAI SHEAR PULL-OFF	RT 200°F 275°F 350°F
PAINT & PRIMER	ISOTHERMAL TEMP-TIME HIST	200°F 275°F 350°F	10K 20K	COLOR GLOSS RAIN EROSION	RT 200°F 275°F 350°F

REAL TIME CONDITIONING-METALS — TESTING

SHEET	ISOTHERMAL TEMP-TIME HIST LOAD & TEMP TIME HIST	200°F 275°F 350°F	10K 30K 60K 90K 120K	TENSION COMPRESSION BEARING SHEAR da/dN KAPP, CREEP	-65°F RT 200°F 275°F 350°F
	LOAD-TIME HIST	RT			

FIGURE 7 (CONT.)

CANDIDATE ADVANCED METALLIC MATERIALS

Mach=2.0

Advanced Aluminums
- 2xxx
- 7xxx
- X7093

Aluminum-Lithiums
- 2090
- 8090
- Weldalite 049

Metal-Matrix Composites (MMCs)
- 2009/SiC/15% to 25% w or p (modified 2124 matrix)
- X2080/SiC/xxx
- 6090/SiC/xxx (modified 6013 matrix)
- Weldalite 049/SiC/xxx
- 6xxx/SCS-2/50% (continuous fiber)

Mach=2.4

High-Temperature Aluminums (RSRs)
- X8019 (CZ42)
- 8009 (FVS0812)
- FVS 0611
- FVS1212

High-Temperature MMCs
- 8009/SiC/xxx
- X8019/SiC/xxx
- FVS1212/SiC/xxx
- Ti xxx/SCS-6/40% (continuous fiber)

Titaniums
- 6-4
- 15-3-3-3-3
- 6-2-2-2-2
- 10-2-3
- SP 700

OBJECTIVES

1. Develop and evaluate "low-cost" airplane designs by examining alternate structural, material, and manufacturing concepts

2. Advise material suppliers and NASA on desired material properties, product forms, and processing techniques

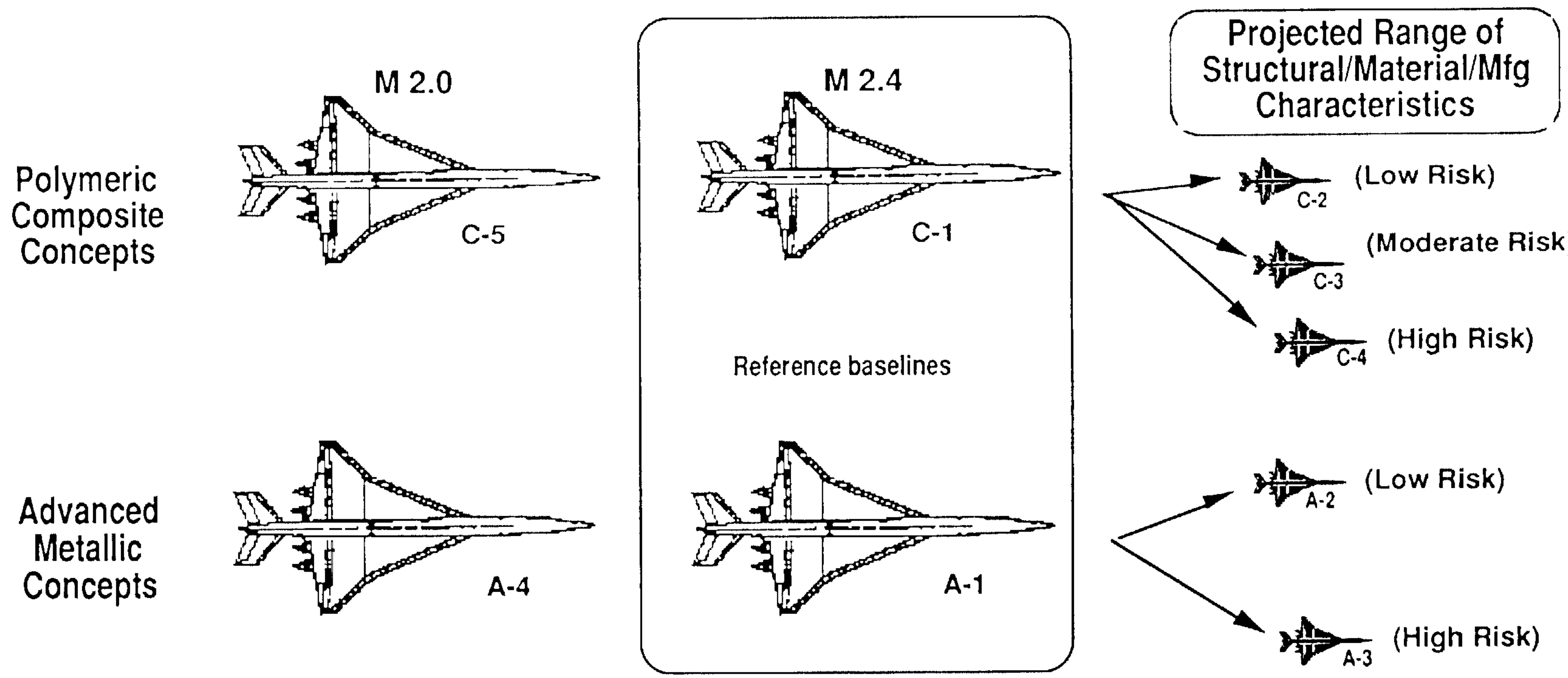
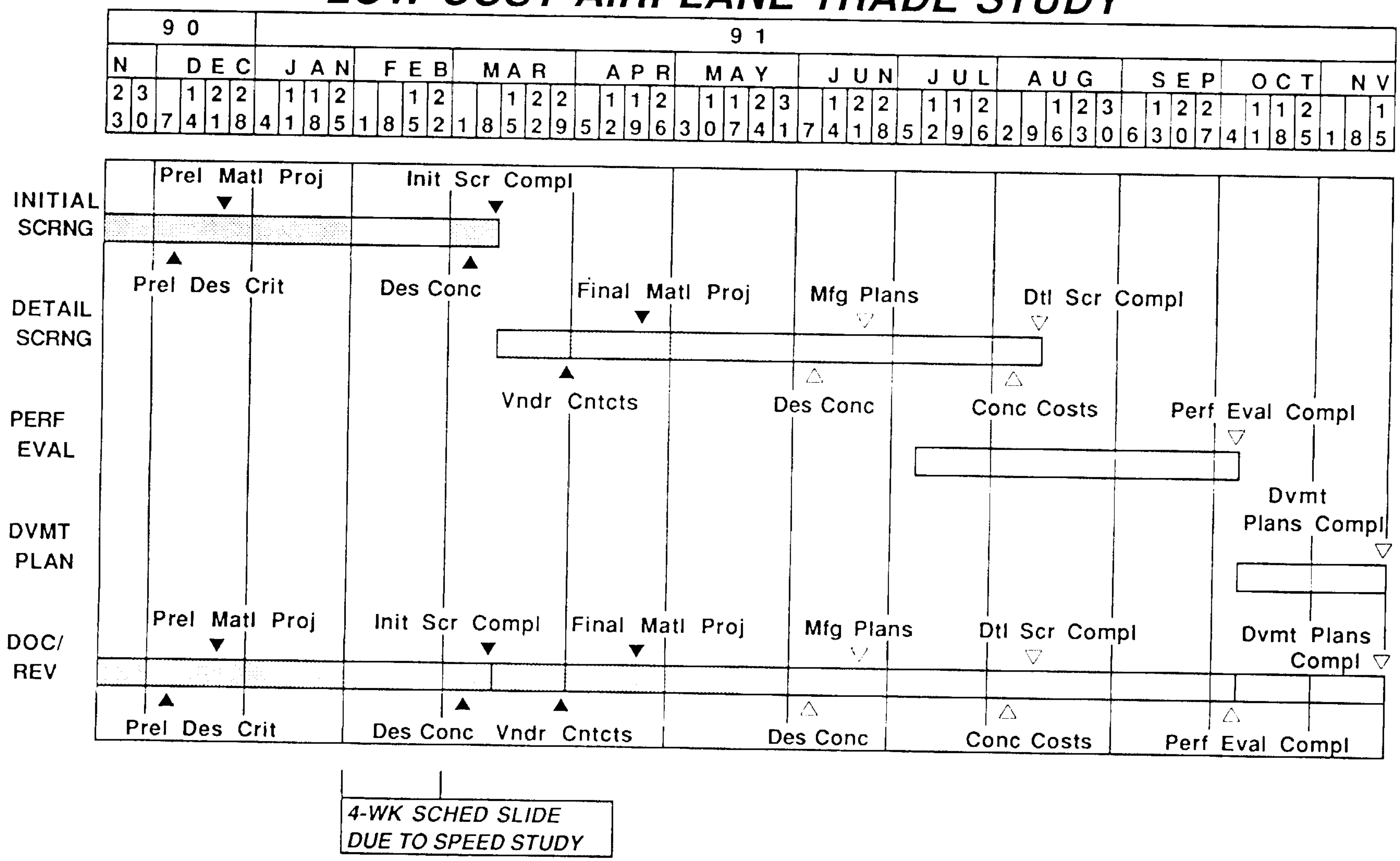


Figure 1-1. Structures and Materials Trady Study Design Options

LOW-COST AIRPLANE TRADE STUDY



May 1991

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