



J58 (JT11D-20)

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## J58 (JT11D-20) – Project Summary

- **INSERT SUMMARY**

## J58 (JT11D-20) – Introduction

- To gain a better understanding of turbojet engines it is important to analyze the engine characteristics over a range of condition to fully grasp the capabilities of the engine. To that end, an analytical model will be developed that describes the impact of changes in component characterization on the overall performance of a turbojet engine. This will be done for a range of conditions to survey the design space.

## J58 (JT11D-20) – Introduction

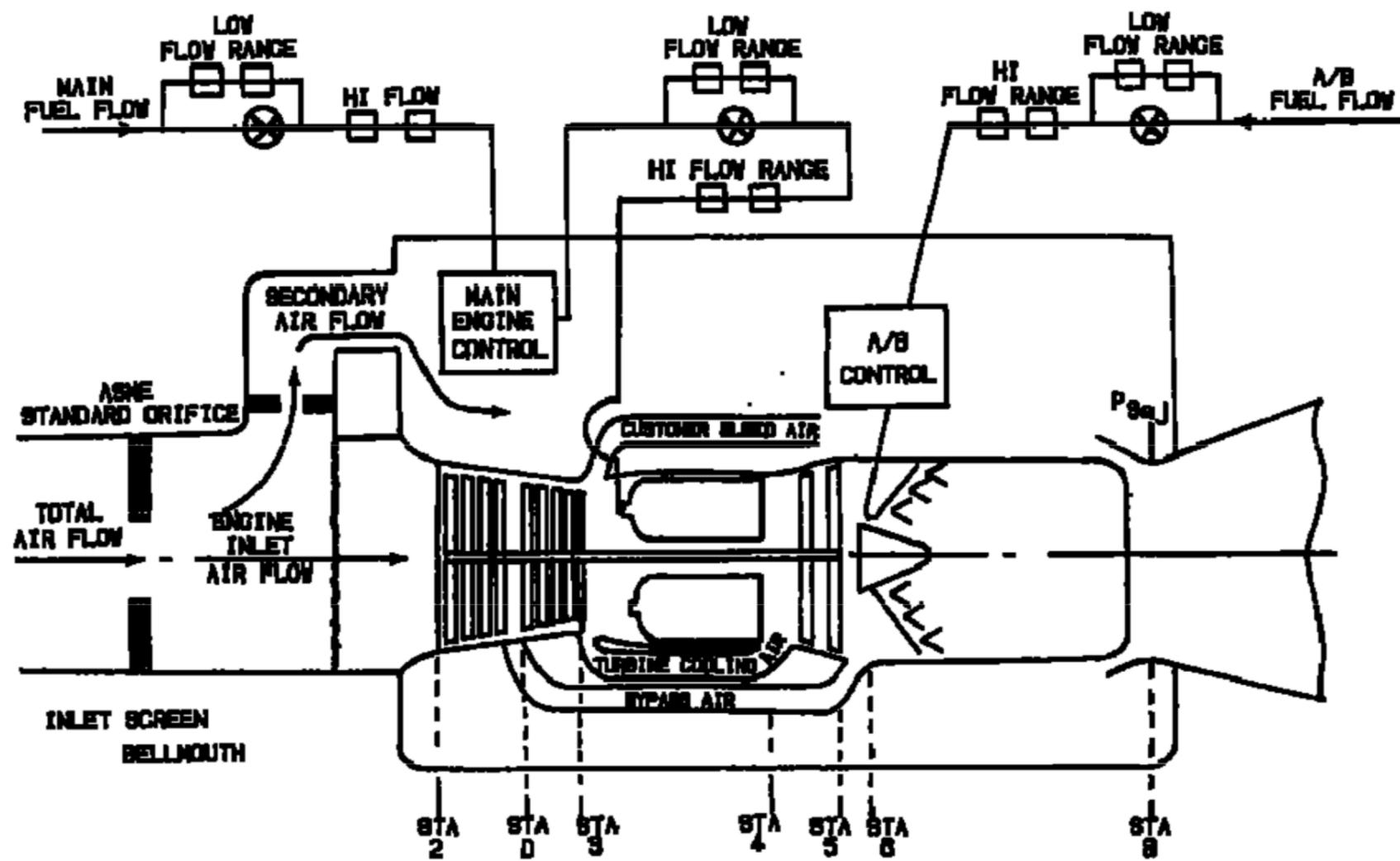


Figure 1: Standard J11D-20 Station Nomenclature [1]

## J58 (JT11D-20) – Introduction

*Table 1: Maximum Operating Temperatures [1] [2]*

COMPONENT/STAGE	TEMP (°F)	TEMP (°C)
Inlet T1	800+	426+
COMPRESSOR Inlet T2	800+	426+
COMPRESSOR 4 <sup>th</sup> Stage TD	1050	565.56
COMBUSTOR Inlet T3	1300	704.44
TURBINE Inlet T4	2000	1093.33
TURBINE Exit T5	1450	787.78
AB T6	3200	1760
Exhaust NOZZLE T8	1500	815.15

## J58 (JT11D-20) – Introduction

*Table 2: Engine Specs*

SPECIFICATION	VALUE RANGE [EN]	VALUE RANGE [SI]
Altitude [4]	25K-90K ft	7.62 – 27.43 km
Speed [5]		Mach 0.75 – 3.2
Dry TSFC @ Max Thrust [6]	0.8 lb/lbf hr	81.6 kg/kN hr
Wet TSFC @ Max Thrust [6]	1.9 lb/lbf hr	164 kg/kN hr
Fuel [7]		JP-7
Fuel Storage [8]	80,285 lb	36,416 kg
Fuel Lower Heating Value [9]	5.48 kWh/lb	43,682 kJ/kg
Thrust [7]	32,500 lbf	144,567 N
Air Volume Flow @ Cruise [10]	100K ft <sup>3</sup> /s	2831.68 m <sup>3</sup> /s

## J58 (JT11D-20) – Introduction

*Table 2: Engine Specs (Cont.)*

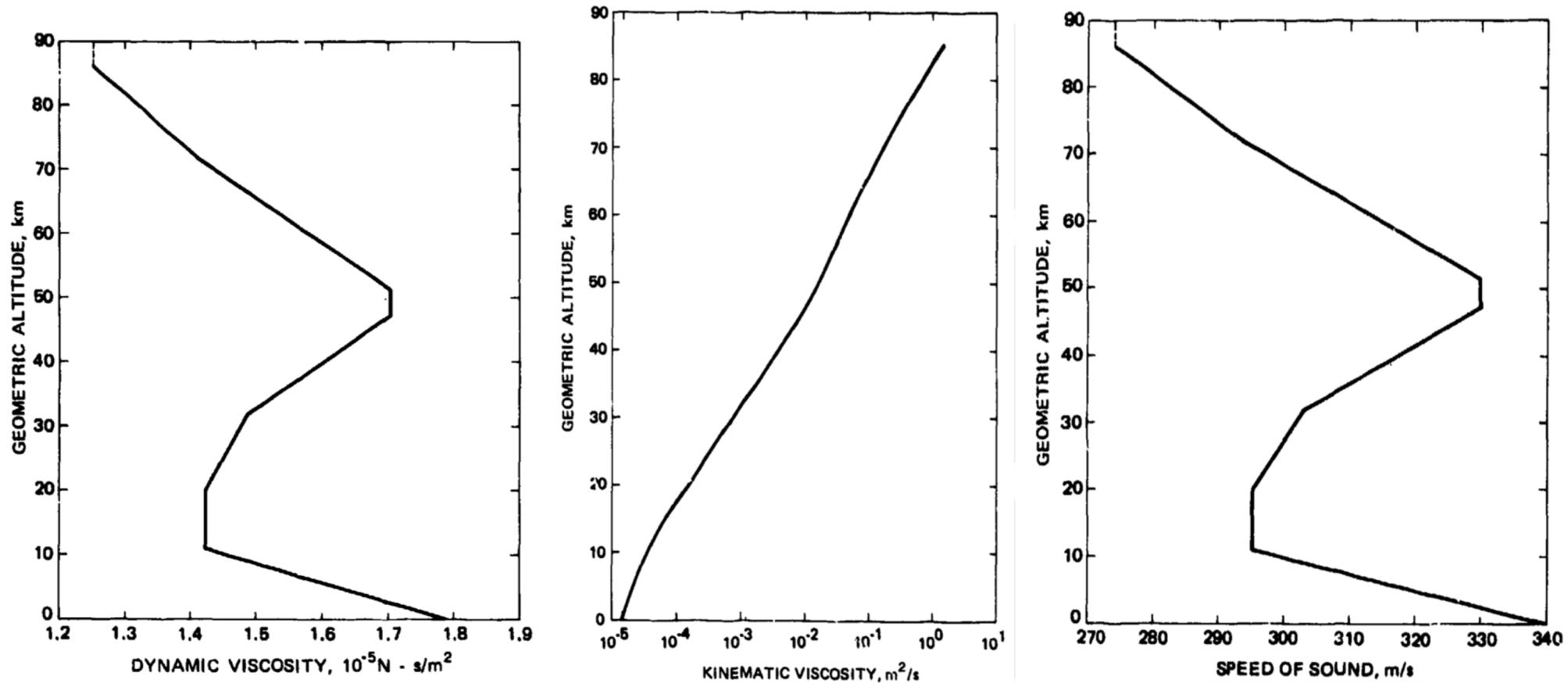
SPECIFICATION	VALUE RANGE [EN]	VALUE RANGE [SI]
Compression Ratio < Mach 2.2 [8]		8.8:1
Compressor [11]		8-Stage Axial
Turbine [11]		2-Stage
Weight [11]	6,500 lb	2,948 kg
Air Mass Flow [8]	326-450 lb/s	147 – 204 kg/s
Dry Fuel Mass Flow @ Max	5.55 lb/s	2.52 kg/s
Wet Fuel Mass Flow @ Max	17.94 lb/s	8.14 kg/s
Dry Fuel to Air Ratio		0.012-0.017
Wet Fuel to Air Ratio		0.0398-0.055

# J58 (JT11D-20) – Introduction

*Table 3: Validation Flight Conditions*

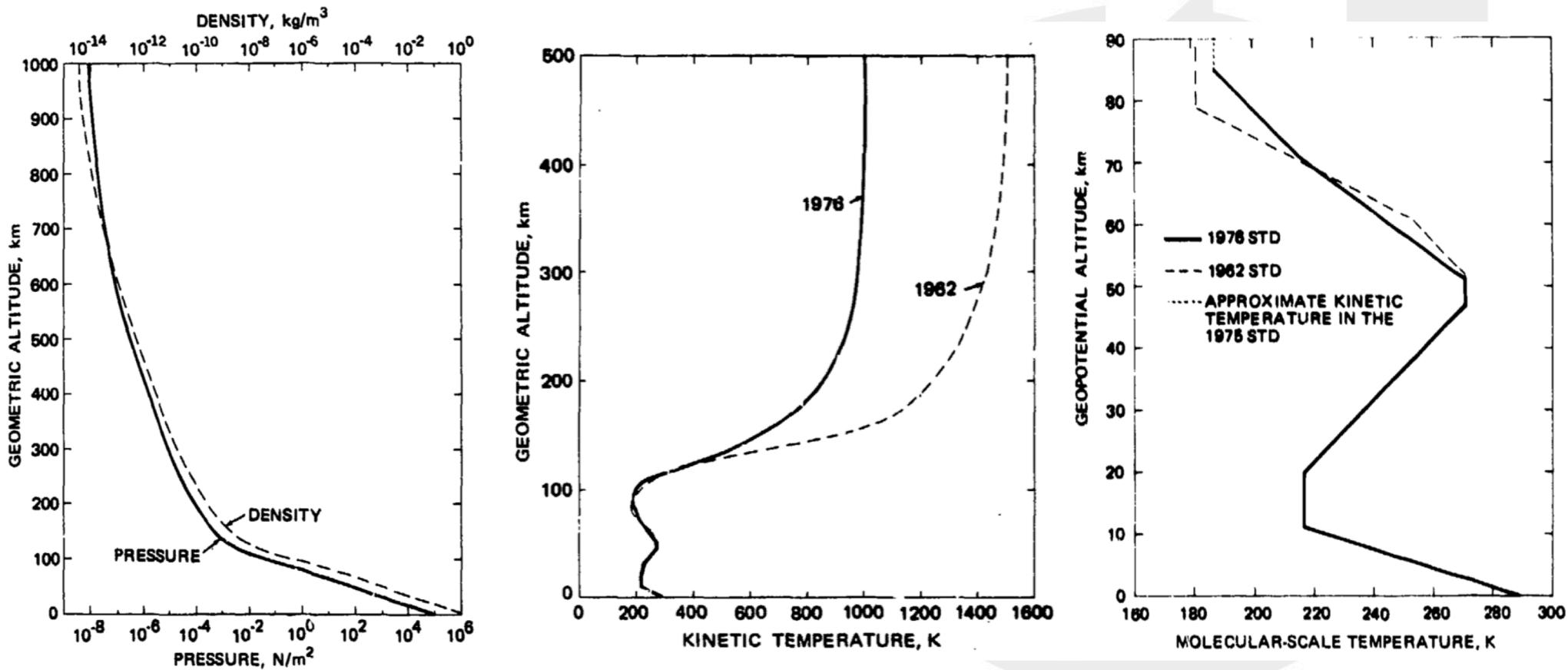
Condition ID	Altitude [ft]	Mach	Afterburner
Takeoff [2]	0 (@ Sea level)	0.3542	ON
Refueling/Buddy Mission [2]	25000	0.75	OFF
Climbing [2]	30000	1.25	ON
Concorde [12]	60000	2.00	ON
YF12A (03/18/65)	65000	2.2	ON
A12 Max Altitude at Mach 2.2	75000	2.2	ON
Lake County Airport	9928	0.3545	ON
Lowest Altitude at Mach 1.0	15000	1.0	ON
MA139-XAA	40000	1.9	ON
French Griffon II[]	61000	2.1	ON
Constant climb	33000	0.9	ON
Supersonic transport flight	70000	2.5	OFF

## J58 (JT11D-20) – Standard Atmosphere



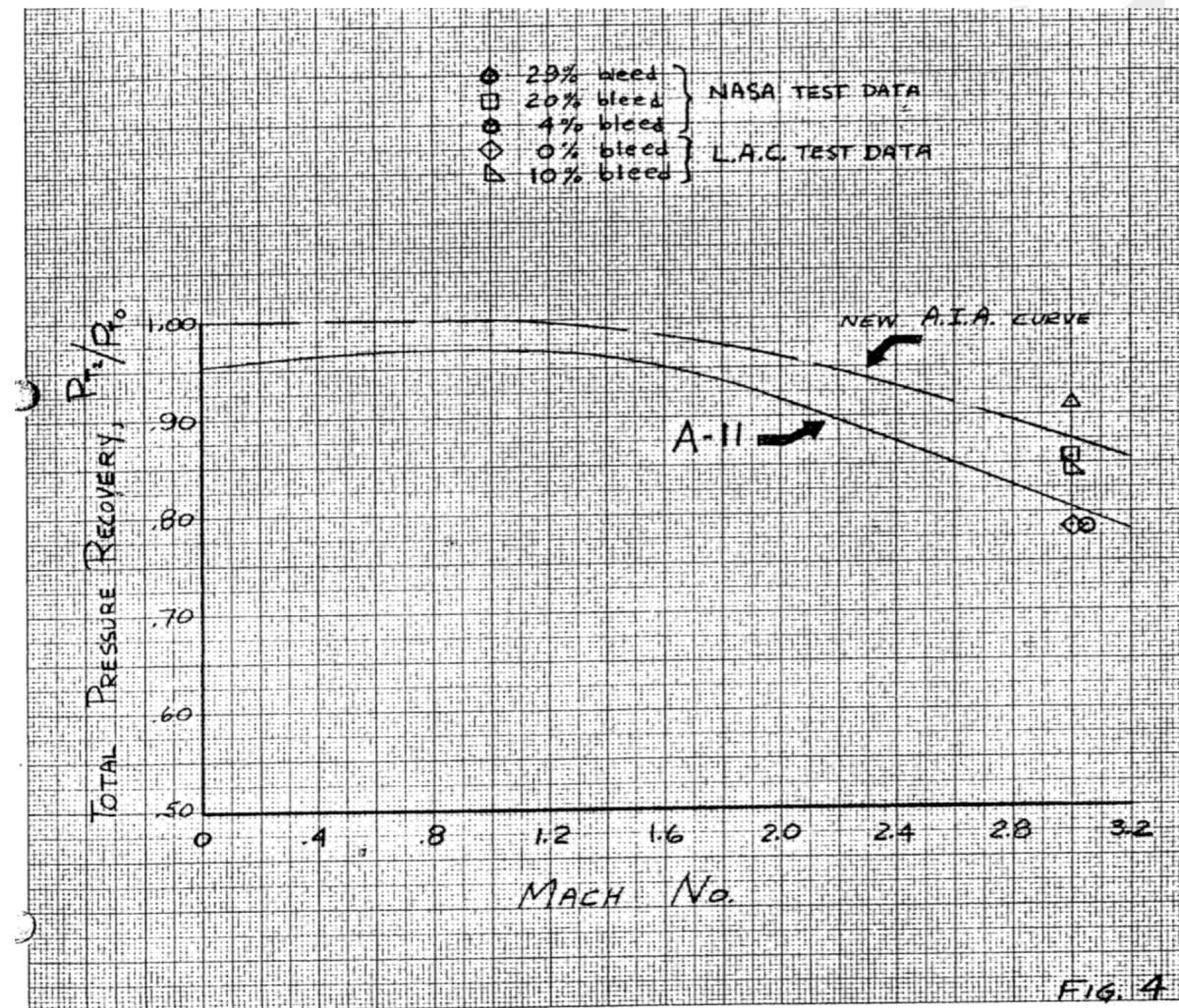
*Figure 2-4: Standard Atmosphere Dynamic Viscosity, Kinematic Viscosity and Speed of Sound [15]*

## J58 (JT11D-20) – Standard Atmosphere



*Figure 5-7: Standard Atmosphere Pressure, Kinetic Temperature and Molecular-Scale Temperature [15]*

## J58 (JT11D-20) – Inlet



*Figure 8: Expected Inlet Performance [16]*

## J58 (JT11D-20) – EGT

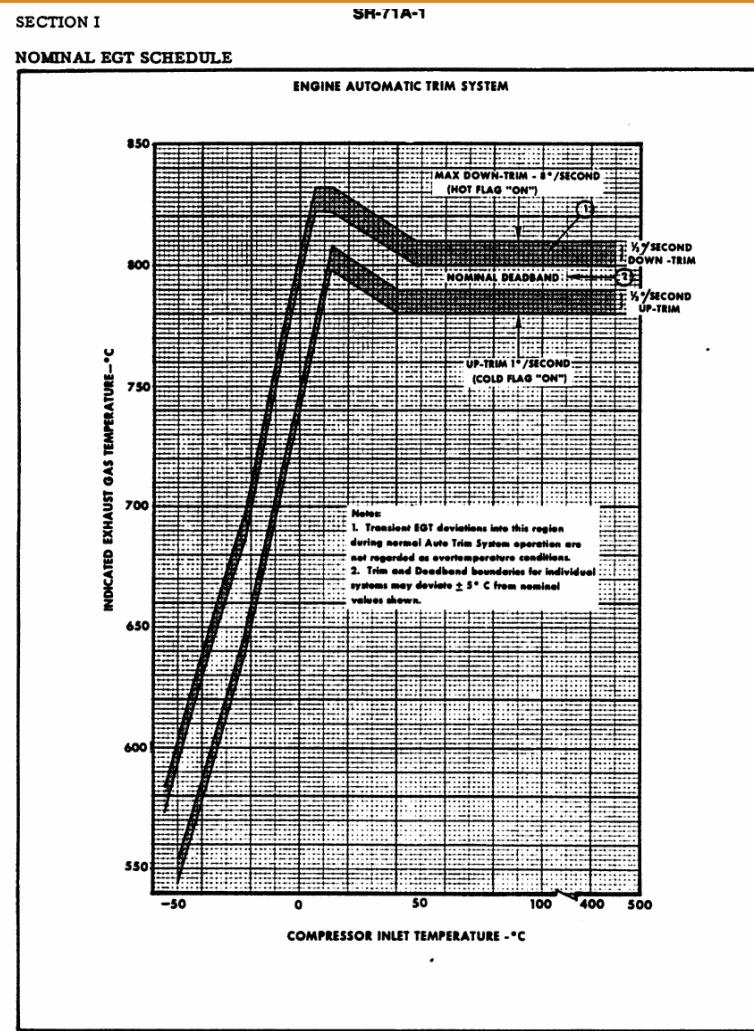


Figure 1-9

*Figure 9: Indicated EGT vs Compressor Inlet Temperature [2]₁₂*

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