

Worksheet

Turbo Outlet ID: **4.00** in.
 Turbo Inlet Area: **12.57** in²
 Turbo Output: **85.0** lb/min @ 7000 ft

Air density: **0.0575** lb/ft³ @ 7000 ft
 Air density: **0.0644** lb/ft³ @ 4000 ft (Bonneville salt flats)

Turbo Output: **95.2** lb/min @ 4000 ft
 Turbo Output: **1478** ft³/min @ 4000 ft
 Turbo Output: **24.6** ft³/sec @ 4000 ft
 Turbo I/O: **42574** in³/sec @ 4000 ft

Design NACA duct submerged inlet duct for optimum ram air effect at nominal maximum vehicle velocity of 400 mph. NACA duct ram-air recovery ratio ≥ 0.9 (90%) for inlet velocity ratios between 0.6 and 1.5, at Mach numbers from 0.30 to 0.875. Optimum inlet velocity ratio is ≈ 0.70 , i.e. *duct inlet velocity = 0.70 x vehicle (air stream) velocity @ 400 mph.*

Vehicle velocity:	400	mph @ 4000 ft
Vehicle velocity:	587	ft/sec @ 4000 ft
Vehicle velocity:	7040	in/sec @ 4000 ft
0.90	47304	in ³ /sec NACA duct ram-air recovery ratio .
1.00	6.72	in ² Inlet duct area @ nominal velocity ratio.
0.70	9.60	in ² Inlet duct area @ optimum velocity ratio.

Optimum NACA duct inlet dimensions are h:w = 1:4. (Pressure recovery should be studied for other ratios!) Ramp angle is normally 7° but ramp angles up to 10° can be used without serious pressure losses.

h =	1.549	in.	
w =	6.196	in.	Equals 4 times h.
l =	12.617	in.	Based on 7° ramp angle.
l =	8.785	in.	Based on 10° ramp angle.
Duct inlet velocity:	4928	in/sec	
Duct inlet velocity:	411	ft/sec	
1.50	187	mph	Minimum speed for 90% ram-air recovery @ velocity ratio.
0.60	467	mph	Maximum speed for 90% ram-air recovery @ velocity ratio.

Inputs
Outputs

Ref. NACA DUCT RATIONALE FOR BUB STREAMLINER,pdf
 R. Keller 03/15/07
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