

Engine Comments:
 Triumph Spitfire stock 1493cc

Projected Performance

Engine RPM	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
Brk Tq, ft lb	60.8	62.7	62.3	65.7	71.3	75.7	72.2	64.4	53.4	43.95	27.70
Brake HP	17.38	23.88	29.66	37.52	47.49	57.6	61.9	61.3	56.0	50.2	34.28
Exh Pres, PSI	0.1	0.2	0.3	0.5	0.9	1.3	1.6	1.8	1.9	2.0	1.9
Int Vac, "Hg	0.1	0.2	0.4	0.6	1.0	1.4	1.8	2.1	2.2	2.4	2.2
Vol Eff, %	73.0	75.1	76.6	81.4	87.9	94.1	94.1	90.9	85.0	81.5	72.4
Actual CFM	29.21	40.06	51.0	65.1	82.1	100	113	121	125	130	126
Fuel Flow, lb/hr	10.20	14.00	17.83	22.73	28.67	35.08	39.46	42.34	43.57	45.55	43.85
Nitrous, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ntrs Fuel, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BMEP, PSI	99.6	103	102	107	117	124	118	105	87.4	71.9	45.33
A/F Mxtr Qty, %	95.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
BSFC, lb/HP-hr	0.499	0.501	0.513	0.521	0.525	0.533	0.555	0.592	0.649	0.729	0.923
Thermal Eff, %	33.57	34.26	34.42	34.45	34.48	34.32	34.17	33.92	33.71	33.03	32.21
IMEP, PSI	146	154	157	167	181	193	192	184	171	161	139
Frctn Tq, ft-lbs	17.83	20.43	23.09	25.81	28.60	31.45	34.36	37.34	40.39	43.50	46.68
Frctn HP	5.09	7.78	10.99	14.75	19.06	23.95	29.44	35.55	42.29	49.69	57.8
FMEP, PSI	29.19	33.44	37.79	42.25	46.80	51.5	56.2	61.1	66.1	71.2	76.4
Mech Eff, %	80.0	78.2	76.0	74.7	74.1	73.3	70.7	66.8	61.4	55.7	45.1
Motoring HP	5.26	8.11	11.60	15.86	20.99	27.11	33.66	40.91	47.97	57.2	66.4
Pumpng Work, HP	-0.17	-0.33	-0.60	-1.11	-1.93	-3.16	-4.22	-5.36	-5.68	-7.51	-8.61
Residual Exh, %	7.7	6.6	6.3	5.4	5.3	4.5	4.0	4.3	5.2	5.4	6.2
Shrt Circuit, %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exh Temp, deg F	1135	1211	1241	1264	1298	1320	1320	1320	1313	1305	1293
Mx Cyl Pres, PSI	721	713	728	795	890	993	1014	994	887	829	698
Mx Cyl Tmp, deg F	4376	4444	4436	4485	4533	4618	4640	4636	4526	4497	4398
In Port Tmp, deg F	186	181	178	171	166	157	153	149	149	139	133
Piston Spd, ft/min	860	1147	1433	1720	2007	2293	2580	2867	3153	3440	3727
Piston Gs @ TDC	140	250	400	570	780	1010	1280	1590	1920	2280	2680
Coolant HP	13.39	17.35	20.99	24.89	29.34	33.91	38.20	42.42	46.27	51.0	54.9
Blow By, CFM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
In Tun Pres, PSI	0.0	0.1	0.1	0.5	2.0	3.8	4.5	5.8	5.3	6.4	6.9
Avg In Vel, ft/sec	63	84	105	126	147	168	189	210	231	252	274
Avg Ex Vel, ft/sec	78	104	130	156	183	209	235	261	287	313	339
Mach #	0.108	0.145	0.181	0.217	0.253	0.289	0.325	0.361	0.397	0.433	0.468
Act In FlowArea,%	92.9	92.9	92.9	92.9	92.9	92.9	93.0	93.1	93.0	93.1	93.2
Act Ex FlowArea,%	92.7	92.7	92.7	92.7	92.7	92.6	92.6	92.8	92.7	92.8	92.9
Valve Toss	None	None	None	None	None	None	None	None	None	None	None
Knock Index	1.8	1.5	1.4	1.5	1.7	1.9	1.8	1.6	1.1	0.9	0.5
Spark Advnc, deg	10.0	10.0	11.7	13.3	15.0	16.7	18.3	20.0	20.0	20.0	20.0
Injctr Dty Cyc, %	12.1	16.6	21.2	27.0	33.9	41.4	46.5	49.8	51.2	53.5	51.6
Inj Plse Wdth, ms	9.7	10.0	10.2	10.8	11.6	12.4	12.4	12.0	11.2	10.7	9.5
Calc Error	0	0	0	0	0	0	0	0	0	0	0

PkTq=75.7@4000 Avg=60.0
 PkHP=61.9@4500 Avg=43.4

Special Calculations

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----- Valve Flow & Cam Calculations ----- --Int-- --Exh--
Overlap Area, deg*sq-in    1.7          Vlv Area, deg*sq-in    166.4    147.8
Total Exh/Int %           88.8          Total Avg Flow Coef    0.486    0.531
Lobe Separation, deg      110.0         Lobe Area, inch*deg    15.09    15.37
Overlap, deg               39            Duration, deg           256      257
Overlap @ .050, deg       -24           Opening Events, deg     19        56
                               Closing Events, deg     58        21
----- --Int-- --Exh--
Duration @.200, deg       54            68          Opn Evnts @.050, deg   -13       29
TDC Tappet Lift, in       0.028         0.034       Cls Evnts @.050, deg   27        -11
Gross Valve Lift, in      0.314         0.314       Lobe Centerlns, deg   110.0     110.0
Net Valve Lift, in        0.304         0.304       Grss Tappet Lft, in   0.215     0.215

----- General Engine Calculations -----
Displacement, ccs         1510.3        Displacement, cu in     92.15
Dynamic Comp. Ratio       8.60          Compression Ratio       10.25
Theo. Crank Comprsn,PSI  224           Clearance Volume, ccs   40.8
Pk Secondary Tuning RPM   na            Idle Vacuum, ''Hg      18.1
Pk Secondary Tuning RPM   na            Idle Vacuum, ''Hg      18.1
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Engine Input Specs

Short Block, File: 1500 Spitfire stock

Triumph Spitfire 1500 stock

Block/Pistons/Rods

Bore, in 2.92
 Stroke, in 3.44
 # of Cylinders 4
 Rings: 3 Standard Tension
 Rod Length, in 5.75
 Pstn Skrt: Smaller Skirt
 Pstn Skrt: 2.66 Calculated
 Pstn Top: No Coating
 Cyl Lckg: Zero Leakage

Accessories

Fan Type: Electric
 Wtr Pump: Production Size
 Engine Inertia/Crank Design
 Inertia: 3.66 Calculated
 Crank Design: High Oil Drag

Head(s), File: 1500 Spitfire stock

Spitfire 1500 head - stock

Intake Port Specs

Port Layout: 1 valve & 1 port
 Valve Diameter, in 1.305
 Avg Port Diameter, in 1.33
 Port Length, in 3.5
 Single Flow Coef na
 Anti-Reversion, % 0

Exhaust Port Specs

Port Layout: 1 valve & 1 port
 Valve Diameter, in 1.176
 Avg Port Diameter, in 1.25
 Port Length, in 3.5
 Single Flow Coef na
 Anti-Reversion, % 0.00

Combustion Chamber

Compression Ratio 10.25
 Chamber Design: Pent Roof

Miscellaneous

Mtrl/Coating: Aluminum
 Burn Rating: Typical

Int Valve Primary Angle
 Int Valve Canted Angle
 Int Valve-Deck Distance
 Deck Ht Clearance

Exh Valve Primary Angle
 Exh Valve Canted Angle
 Exh Valve-Deck Distance
 Head Gasket Thickness

---- Int Head Flow @ 25" ----

Lift	L/D	CFM	FlCf
.1	.077	70	1.181
.2	.153	136	1.147
.3	.230	185	1.040
.4	.307	230	1.189
.5	.383	265	1.370
.6	.460	287	1.484
.7	.536	290	1.499
.75	.575	285	1.474

---- Exh Head Flow @ 25" ----

Lift	L/D	CFM	FlCf
.1	.085	57	1.067
.2	.170	125	1.170
.3	.255	176	1.121
.4	.340	205	1.305
.5	.425	213	1.356
.6	.510	216	1.375
.7	.595	219	1.394
.75	.638	220	1.401

Intake System, File: 1500 Spitfire stock

Spitfire 1500 eurospec twin HS4s

Manifold Specs (1 runner /cyl)

Runner Dia @ Head, in 1.31
 Runner Design: Tapered Runners
 Runner Length, in 15
 Runner Flow Coef 3.00
 Runner Taper, deg .73
 Type: Ind Runner-fuel injection
 Int Heat: Prod (full) Heat

Throttle Body(s)

Total CFM Rating 284
 Secondary Throttles na
 Air Cleaner CFM Rating na
 Air Meter CFM Rating na
 Restrictor CFM Rating na
 Plenum
 Plenum Volume, cu in na

Engine Input Specs

Fuel Delivery, File: 1500 Spitfire stock

Fuel Injection		Carburetor	
Injector Rating, lb/hr	14	# Primary Venturies	na
Injector Rated Pres, PSI	43	# Secondary Venturies	na
Operating Fuel Pres, PSI	43	Primary Venturi Diameter, in	na
Pres Contrl: Hold Const. Pres		Secondary Venture Dia, in	na
Total # Injectors on Engine	6	Power Valve	na
Firing: Once/Cycle (2 revs)		Venturi Discharge Coef	na
		Air Bleed	na

Exhaust System, File: 1500 Spitfire stock

Spitfire 1500 stock

Header Primary (1 runner /cyl)		Full Exhaust System	
Straight Primary (no diameter change		CFM Rating	138
Section 1, Inside Dia, in	1.25	Collector (not used)	
Section 1, Length, in	10	Collector Length, in	na
Section 2, Inside Dia, in	na	Collector Dia, in	na
Section 2, Length, in	na	Collector Taper, deg	na
Section 3, Inside Dia, in	na		
Section 3, Length, in	na		
Runner Flow Coef	2.04		

Cam/Valve Train, File: 1500 Spitfire stock

Triumph Spitfire 1500 stock

Intake Cam Profile		Exhaust Cam Profile	
Centerline, deg ATDC	110	Cam File	C:\perftrns.p
Duration @ Seat Timing	270	Centerline, deg BTDC	110
Opening @ Seat Timing	25	Duration @ Seat Timing	270
Closing @ Seat Timing	65	Opening @ Seat Timing	65
Max Lobe Lift, in	.215	Closing @ Seat Timing	25
Actual Valve Lash, in	.01	Max Lobe Lift, in	.215
Designed Valve Lash, in	.01	Actual Valve Lash, in	.01
Rocker Arm Ratio	1.46	Designed Valve Lash, in	.01
Profile Type: Mild Solid Flat		Rocker Arm Ratio	1.46
Gross Valve Lift, in	.314	Profile Type: Aggr Solid Flat	
Dwell over Nose: 0 Deg-Std Profile		Gross Valve Lift, in	.314
Use a Cam File	No	Dwell over Nose: 0 Deg-Std Profile	
		Use a Cam File	No
		Overall Cam Specs	
		Total Cam Adv: Straight Up	

Valve Train Dynamics, File: 1500 Spitfire stock

Intake Valve Train		Exhaust Valve Train	
Gen Type: Pushrod & Rocker Arm		Gen Type: Pushrod & Rocker Arm	
Eff Valve Mass, gms	205	Eff Valve Mass, gms	201
Eff Rckr Arm Stffnss, lb/in	35000	Eff Rckr Arm Stffnss, lb/in	35000
Eff Lifter Mass, gms	144	Eff Lifter Mass, gms	144
Eff Lifter Stiffness, lb/in	guess	Eff Lifter Stiffness, lb/in	guess
Spring Rate, lb/in	586	Spring Rate, lb/in	586
Seated Spring Force, lbs	240	Seated Spring Force, lbs	240

Engine Input Specs

Calculation Conditions, File: 1500 Spitfire stock

Test Conditions

CorFctr: SAE Conds (77 deg, 29.6")

Barometric Pressure, "Hg na

Intake Air Temp, deg F na

Dew Point, deg F na

Elevation, feet na

Cooling Sys: Liquid Cooled

Coolant Temp, deg F 185

Accel Rate: 900 RPM/sec

RPM to Run

Starting RPM 1500

Number of RPM Steps 11

RPM Step Size 500

Fuel Specs

Fuel Type: Gasoline

Fuel Octane (R+M)/2

Use Nitrous Oxide No

Use User Defined Spark Specs

Spark Curve, File: 1500 Spitfire stock

Specs Determine Spark Curve Only (program determines burn rate)

Type: 2 Break Points in Curve

Break Point #1, Spark Advanc 10

Break Point #1, RPM 2000

Break Point #2, Spark Advanc 20

Break Point #2, RPM 5000

Break Point #3, Spark Advanc na

Break Point #3, RPM na

Break Point #4, Spark Advanc na

Break Point #4, RPM na