

## **APPENDIX I**

## **GLOSSARY**



## APPENDIX I

### GLOSSARY

#### NOTATIONS

550	Conversion factor	$550 \frac{\text{ft-lb}}{\text{s}} = 1$ horsepower
a	Speed of sound	ft/s or kn
a	Temperature lapse rate	°/ft
ACM	Air combat maneuvering	
ADF	Automatic direction finder	
AEW	Airborne Early Warning	
AFCS	Automatic flight control system	
AGL	Above ground level	
AR	Aspect ratio	
$a_R$	Radial acceleration	ft/s <sup>2</sup>
ARDC	Arnold Research and Development Center	
$a_{ssl}$	Standard sea level speed of sound	661.483 kn
$a_{ssl}$	Standard sea level temperature lapse rate	0.0019812 °K/ft 0.0035662 °R/ft
ASW	Antisubmarine aircraft	
$a_x$	Acceleration parallel flight path	ft/s <sup>2</sup>
$a_z$	Acceleration perpendicular to flight path	ft/s <sup>2</sup>
BHP	Brake horsepower	hp
BLC	Boundary layer control	
c	Chord length	ft
$\frac{c}{2}$	Semi-chord length	ft
CAP	Combat air patrol	
CCF	Climb correction factor	
$C_D$	Drag coefficient	

## FIXED WING PERFORMANCE

$C_{D_i}$	Induced drag coefficient	
$C_{D_M}$	Mach drag coefficient	
$C_{D_p}$	Parasite drag coefficient	
$C_{D_p (M)}$	Parasite drag coefficient at high Mach	
$C_{D_R}$	Coefficient of ram drag	
CG	Center of gravity	% MAC
$CG_{Std}$	Standard CG	% MAC
$CG_{Test}$	Test CG	% MAC
CL	Confidence level	
$C_L$	Lift coefficient	
$C_{L_{aero}}$	Aerodynamic lift coefficient	
$(C_{L_{aero Std \dot{V} , CG, W})_{Pwr OFF}}$	Aerodynamic lift coefficient at standard deceleration rate, CG, and weight, power-off	
$(C_{L_{aero Std \dot{V} , CG, W})_{Pwr ON}}$	Aerodynamic lift coefficient at standard deceleration rate, CG, and weight, power-on	
$C_{L_{max}}$	Maximum lift coefficient	
$C_{L_{max} (\Lambda = 0)}$	Maximum lift coefficient at $\Lambda = 0$	
$C_{L_{max} (\Lambda)}$	Maximum lift coefficient at $\Lambda$ wing sweep	
$C_{L_{max Std \dot{V}}}$	Maximum lift coefficient at standard deceleration rate	
$C_{L_{max Std \dot{V} , CG}}$	Maximum lift coefficient at standard deceleration rate and CG	
$C_{L_{max Std \dot{V} , CG, W}}$	Maximum lift coefficient at standard deceleration rate, CG, and weight	
$(C_{L_{max Std \dot{V} , CG, W})_{Pwr ON}}$	Maximum lift coefficient at standard deceleration rate, CG, and weight, power-on	
$C_{L_{max Std \dot{V} , CG, W, Hp}}$	Maximum lift coefficient at standard deceleration rate, CG, weight, and altitude	
$C_{L_{max Test}}$	Test maximum lift coefficient	
$C_{L_{max TO}}$	Maximum lift coefficient, takeoff configuration	

## GLOSSARY

$C_{L_{Opt}}$	Optimum lift coefficient	
$C_{L_s}$	Stall lift coefficient	
$C_{L_{Test}}$	Test lift coefficient	
$C_{TG}$	Coefficient of gross thrust lift	
CV	Carrier	
Cycle time	Time of flight from the start of enroute climb (omitting takeoff time) to stopping engines after landing	
D	Course length	nmi
D	Drag	lb
d	Distance	ft or nmi
d	Horizontal distance (Tower to aircraft)	ft
D.R.	Dead reckoning	
DCF	Descent correction factor	
$\Delta C_{L_E}$	Coefficient of thrust-entrainment lift	
$\Delta C_{L_t}$	Incremental tail lift coefficient	
$\Delta D$	Standard drag minus test drag	lb
$\Delta D_i$	Change in induced drag	lb
$\Delta D_p$	Change in parasite drag	lb
deg	Degree	
$\Delta h$	Aircraft height above tower	ft
dh/dt	Rate of climb	ft/s
$\Delta H_{P_{ic}}$	Altimeter instrument correction	ft
$\Delta H_{P_{ic\ ref}}$	Reference altimeter instrument correction	ft
$\Delta H_{pos}$	Altimeter position error	ft
$D_i$	Induced drag	lb
$\Delta L_t$	Tail lift increment	lb
$D_M$	Mach drag	lb
$\Delta M_{pos}$	Mach position error	
$\Delta n_{z_{ic}}$	Normal acceleration instrument correction	g
$\Delta n_{z_{tare}}$	Accelerometer tare correction	g
$\Delta P$	Static pressure error	psf

*FIXED WING PERFORMANCE*

$D_p$	Parasite drag	lb
$\frac{\Delta P}{q_c}$	Static pressure error coefficient	
$\frac{\Delta P}{q_{ci}}$	Indicated static pressure error coefficient	
$D_R$	Ram drag	lb
$\Delta S_2$	Change in $S_2$ , equal to $t V_w$	ft
$D_{Std}$	Standard drag	lb
$\Delta T$	Change in thrust	lb
DT IIA	Developmental Test IIA	
$\Delta t$	Elapsed time	s
$\Delta T_a$	Temperature differential	
$D_{Test}$	Test drag	lb
$\Delta T_{ic}$	Temperature instrument correction	°C or °K
$\Delta t_j$	Time of each time interval	s
$\Delta T_{N_x}$	Standard net thrust parallel flight path minus test net thrust	lb
$\Delta V_c$	Compressibility correction	kn
$\Delta V_{ic}$	Airspeed instrument correction	kn
$\Delta V_{pos}$	Airspeed position error	kn
e	Base of natural logarithm	
e	Oswald's efficiency factor	
$e_{(M)}$	Oswald's efficiency factor at high Mach	
EGT	Exhaust gas temperature	°C
$E_h$	Energy height	ft
$E_{h1}$	Energy height at start of climb	ft
$E_{h2}$	Energy height at end of climb	ft
$E_{hTest}$	Test energy height	ft
EPR	Engine pressure ratio	
ESHP	Engine shaft horsepower	hp
F/C	Fuel counter	lb
FAM	Familiarization	
FAR	Federal Aviation Regulations	
FCLP	Field carrier landing pattern	
FOD	Foreign object damage	

## GLOSSARY

FPA	Flight path accelerometer	
$F_R$	Radial force	lb
ft/min	Foot per minute	
FTE	Flight test engineer	
FTM	Flight Test Manual	
$F_x$	Forces parallel flight path	lb
$F_Y$	Sideforce	lb
$F_z$	Force perpendicular to flight path	lb
$g$	Gravitational acceleration	ft/s <sup>2</sup>
$g_c$	Conversion constant	32.17 lb <sub>m</sub> /slug
GCA	Ground controlled approach	
GR	Glide ratio	
GS	Ground speed	kn
$g_{ssl}$	Standard sea level gravitational acceleration	32.174049 ft/s <sup>2</sup>
GW	Gross weight	lb
H	Geopotential	ft
h	Tapeline altitude	ft
$h_1$	Tapeline altitude start of climb	ft
$h_2$	Tapeline altitude end of climb	ft
$H_P$	Pressure altitude	ft
$H_{P_{ref}}$	Reference pressure altitude	ft
$H_{P_c}$	Calibrated pressure altitude	ft
$H_{P_{c_{ref}}}$	Reference calibrated pressure altitude	ft
$H_{P_{c_{twr}}}$	Tower calibrated pressure altitude	ft
$H_{P_i}$	Indicated pressure altitude	ft
$H_{P_{i_{ref}}}$	Reference indicated pressure altitude	ft
$H_{P_o}$	Observed pressure altitude	ft
$H_{P_{o_{ref}}}$	Reference observed pressure altitude	ft
$h_{Test}$	Test tapeline altitude	ft
ICAO	International Civil Aeronautics Organization	
IFR	Instrument flight rules	
ILS	Instrument landing system	
INS	Inertial navigation system	

## FIXED WING PERFORMANCE

J	Propeller advance ratio	
K	Constant	
$K_1$	Parasite drag constant	
$K_2$	Induced drag constant	
$K_3$	Constant	
$K_4$	Constant	
$K_c$	Slope of $C_{L_{max}} \text{ Std } \dot{V}$ vs CG	
$K_d$	Slope of $C_{L_{max}}$ vs $\dot{V}$	
KE	Kinetic energy	ft-lb
$K_o$	Constant	
$K_T$	Temperature recovery factor	
$K_W$	Slope of $C_{L_{max}} \text{ Std } \dot{V}, \text{ CG}$ vs GW	lb <sup>-1</sup>
L	Lift	lb
l	Length	ft
$L_{a/c}$	Length of aircraft	ft
$L_{aero}$	Aerodynamic lift	lb
$l_t$	Moment arm for tail lift	ft
$L_{Thrust}$	Thrust lift	lb
M	Mach number	
m	Mass	lb <sub>m</sub>
MAC	Mean aerodynamic chord	
MAX	Maximum power	
MDA	Minimum descent altitude	
$M_i$	Indicated Mach number	
MIL	Military power	
Mission time	Time in air (excluding time before start of initial climb and reserve)	
$M_{max}$	Mach number at maximum thrust	
$M_{mrt}$	Mach number at military rated thrust	
$M_o$	Observed Mach number	
MSL	Mean sea level	
$M_{Std}$	Standard Mach number	
$M_T$	True Mach number	
$M_{Test}$	Test Mach number	
N	Engine speed	RPM

## GLOSSARY

n	Number of time intervals	
NACA	National Advisory Committee on Aeronautics	
NATOPS	Naval Air Training and Operating Procedures Standardization Program	
NAVAIRSYSCOM	Naval Air System Command	
NAVAIRWARCENACDIV	Naval Air Warfare Center Aircraft Division	
$n_L$	Limit normal acceleration	g
$n_R$	Radial load factor, $\frac{F_R}{W}$	g
$N_{Std}$	Standard propeller speed	rpm
NTE	Navy Technical Evaluation	
$N_{Test}$	Test propeller speed	rpm
$n_x$	Acceleration along the X axis	g
$n_Y$	Sideforce load factor, $\frac{F_Y}{W}$	g
$n_z$	Normal acceleration	g
$n_{z\text{ sust}}$	Sustained normal acceleration	g
$n_{z\text{ sust max}}$	Maximum sustained normal acceleration	g
$n_z \frac{W}{\delta}$	Referred normal acceleration	g-lb
$n_{z_i}$	Indicated normal acceleration	g
$n_{z_{max}}$	Maximum normal acceleration	g
$n_{z_O}$	Observed normal acceleration	g
$n_{z_{Std}}$	Standard normal acceleration	g
$n_{z_{Test}}$	Test normal acceleration	g
$\frac{N}{\sqrt{\theta}}$	Referred engine speed	RPM
OAT	Outside air temperature	°C or °K
P	Pressure	psf
$P_A$	Power available	ft-lb/s
$P_a$	Ambient pressure	psf
$P_{a_{Std}}$	Standard ambient pressure	psf
$P_{a_{Test}}$	Test ambient pressure	psf
PE	Potential energy	ft-lb

## FIXED WING PERFORMANCE

POPU	Push-over, pull-up	
$P_{req}$	Power required	ft-lb/s
$P_s$	Specific excess power	ft/s
$P_s$	Static Pressure	psf
$P_{s\ 1\ g}$	Specific excess energy at 1 g	ft/s
$P_{ssl}$	Standard sea level pressure	2116.217 psf 29.9212 inHg
$P_{sStd}$	Standard specific excess power	ft/s
$P_{sTest}$	Test specific excess power	ft/s
$P_T$	Total pressure	psf
$P_T'$	Total pressure at total pressure source	psf
$q$	Dynamic pressure	psf
$q_c$	Impact pressure	psf
$q_{ci}$	Indicated impact pressure	psf
$R$	Engineering gas constant for air	96.93ft- lb <sub>f</sub> /lb <sub>m</sub> -°K
$R$	Number of semi-chord lengths	
$R$	Resistance force	lb
$R$	Turn radius	ft
R.F.	Range factor	
R.F.Test	Test day average range factor	
$R_e$	Reynold's number	
$R_{min\ V>V_A}$	Minimum turn radius for $V > V_A$	ft
ROC	Rate of climb	ft/s
ROD	Rate of descent	ft/s
$R_{Std}$	Standard day cruise range	nmi
$R_{sust}$	Sustained turn radius	ft
$R_T$	Total range	nmi
$R_{Test}$	Test cruise range	nmi
$S$	Distance	ft
$S$	Wing area	ft <sup>2</sup>
S.E.	Specific endurance	h/lb
S.R.	Specific range	nmi/lb
$S_1$	Takeoff distance, brake release to lift off	ft

## GLOSSARY

$S_{1SL}$	Takeoff distance, brake release to lift off, sloping runway	ft
$S_{1Std}$	Standard takeoff distance, brake release to lift off	ft
$S_{1Test}$	Test takeoff distance, brake release to lift off	ft
$S_{1w}$	Takeoff distance, brake release to lift off, with respect to wind	ft
$S_2$	Takeoff distance, lift off to 50 ft	ft
$S_{2Std}$	Standard takeoff distance, lift off to 50 ft	ft
$S_{2Test}$	Test takeoff distance, lift off to 50 ft	ft
$S_{2w}$	Takeoff distance, lift off to 50 ft, with respect to wind	ft
$S_3$	Landing distance, 50 ft to touchdown	ft
$S_{3Std}$	Standard landing distance, 50 ft to touchdown	ft
$S_{3Test}$	Test landing distance, 50 ft to touchdown	ft
$S_4$	Landing distance, touchdown to stop	ft
$S_{4SL}$	Landing distance, touchdown to stop, sloping runway	ft
$S_{4Std}$	Standard landing distance, touchdown to stop	ft
$S_{4Test}$	Test landing distance, touchdown to stop	ft
$S_{4w}$	Landing distance, touchdown to stop, with respect to wind	ft
SAC	Standard aircraft characteristics	
SAS	Stability augmentation system	
SHP	Shaft horsepower	hp
$SHP_e$	Equivalent shaft horsepower	hp
SHPSFC	Shaft horsepower specific fuel consumption	$\frac{lb/h}{hp}$
SS	Split-S	
STOL	Short take off and landing	

## FIXED WING PERFORMANCE

T	Temperature	°C or °K
T	Thrust	lb
t	Time	s
T <sub>a</sub>	Ambient temperature	°C or °K
T <sub>a_ref</sub>	Reference ambient temperature	°C or °K
TACAN	Tactical air navigation	
TAMPS	Tactical Air Mission Planning System	
T <sub>aStd</sub>	Standard ambient temperature	°K
T <sub>aTest</sub>	Test ambient temperature	°K
TE	Total energy	ft-lb
T <sub>ex</sub>	Excess thrust	lb
T <sub>exAvg</sub>	Average excess thrust	lb
T <sub>exAvg w</sub>	Average excess thrust, with respect to wind	lb
T <sub>G</sub>	Gross thrust	lb
THP	Thrust horsepower	hp
THP <sub>avail</sub>	Thrust horsepower available	hp
THP <sub>e</sub>	Equivalent thrust horsepower	hp
THP <sub>i</sub>	Induced thrust horsepower	hp
THP <sub>min</sub>	Minimum thrust horsepower	hp
THP <sub>p</sub>	Parasite thrust horsepower	hp
THP <sub>req</sub>	Thrust horsepower required	hp
THPSFC	Thrust horsepower specific fuel consumption	$\frac{\text{lb/h}}{\text{hp}}$
T <sub>i</sub>	Indicated temperature	°C or °K
Time	Time at the start of each segment	s
T <sub>N</sub>	Net thrust	lb
T <sub>NStd</sub>	Standard net thrust	lb
T <sub>NTest</sub>	Test net thrust	lb
T <sub>N<sub>x</sub></sub>	Net thrust parallel flight path	lb
$\frac{T_{N_x}}{\delta}$	Referred net thrust parallel flight path	lb
T <sub>o</sub>	Observed temperature	°C or °K
T <sub>R</sub>	Ram drag	lb
TSFC	Thrust specific fuel consumption	$\frac{\text{lb/h}}{\text{lb}}$

## GLOSSARY

$T_{ssl}$	Standard sea level temperature	15°C, 288.15°K; 59°F, 518.67°R
$T_{Std}$	Standard temperature	°C or °K
$T_{Std}$	Standard thrust	lb
$T_T$	Total temperature	°K
$t_T$	Total cruise time	s
$T_{T2}$	Inlet total temperature (at engine compressor face)	°K
$T_{Test}$	Test temperature (At tower)	°K
$T_{Test}$	Test thrust	lb
USNTPS	U.S. Naval Test Pilot School	
$V$	Velocity	ft/s or kn
$V_{50}$	Ground speed at 50 ft reference point	ft/s
$V_A$	Maneuvering speed	ft/s
$V_{APR}$	Approach speed	kn
$V_c$	Calibrated airspeed	kn
$V_{CL50}$	Climb speed at 50 ft	kn
$V_{cStd}$	Standard calibrated airspeed	kn
$V_{cTest}$	Test calibrated airspeed	kn
$V_{cW}$	Calibrated airspeed corrected to standard weight	kn
$V_e$	Equivalent airspeed	ft/s or kn
$V_{es}$	Stall equivalent airspeed	kn
$V_{eStd}$	Standard equivalent airspeed	kn
$V_{eTest}$	Test equivalent airspeed	kn
VFR	Visual flight rules	
$V_G$	Ground speed	kn
$V_H$	Maximum level flight airspeed	kn
$V_{hor}$	Horizontal velocity	ft/s or kn
$V_i$	Indicated airspeed	kn
$V_{iTest}$	Test indicated airspeed	kn
$V_{iW}$	Indicated airspeed corrected to standard weight	kn
$V_j$	Avg true airspeed in time interval	kn

## FIXED WING PERFORMANCE

$V_L$	Landing airspeed	ft/s or kn
$V_{L50}$	Landing speed at 50 ft	kn
$V_{max}$	Maximum airspeed	kn
$V_{mc}$	Airspeed for minimum control	kn
$V_{min}$	Minimum airspeed	kn
$V_{mrt}$	Military rated thrust airspeed	kn
$V_o$	Observed airspeed	kn
$V_{o_{ref}}$	Reference observed airspeed	kn
$V_{PA_{min}}$	Minimum speed in the approach configuration	kn
$V_R$	Rotation airspeed	kn
$V_s$	Stall speed	ft/s or kn
$V_{SL}$	Stall speed, landing configuration, power off	kn
$V_{ST}$	Stall speed, transition configuration, power off, flaps down, gear up	kn
$V_{sTest}$	Test stall speed	kn
$V_T$	True airspeed	ft/s or kn
$V_{T_{avg}}$	Average true airspeed	ft/s or kn
$V_{TD}$	Touchdown ground speed	ft/s
$V_{TD_w}$	Touchdown ground speed with respect to wind	ft/s
$V_{TO}$	Takeoff ground speed	ft/s
$V_{TO_w}$	Takeoff ground speed with respect to wind	ft/s
$V_{T_{ref}}$	Reference true airspeed	ft/s
$V_{T_{Std}}$	Standard true airspeed	ft/s or kn
$V_{T_{Test}}$	Test true airspeed	ft/s or kn
$V_v$	Vertical velocity	ft/s or fpm
$V_w$	Wind velocity	ft/s or kn
$V_x$	Speed for maximum climb angle	kn
$V_y$	Speed for maximum rate of climb	kn
$\dot{V}$	Acceleration/deceleration rate	kn/s
$\dot{V}_{Std}$	Standard acceleration /deceleration rate	kn/s

## GLOSSARY

$\dot{V}_{\text{Test}}$	Test acceleration/deceleration rate	kn/s
W	Weight	lb
W/ $\delta$	Weight to pressure ratio	lb
W <sub>1</sub>	Initial cruise weight	lb
W <sub>2</sub>	Final cruise weight	lb
W <sub>aircraft</sub>	Aircraft weight	lb
W <sub>f</sub>	Fuel weight	lb
W <sub>fEnd</sub>	End fuel weight	lb
W <sub>fStart</sub>	Start fuel weight	lb
W <sub>fUsed</sub>	Fuel used	lb
$\dot{W}_{f \text{ ref}}$	Referred fuel flow	lb/h
W <sub>ref</sub>	Referred aircraft weight	lb
W <sub>Std</sub>	Standard weight	lb
W <sub>Std1</sub>	Standard initial cruise weight	lb
W <sub>Std2</sub>	Standard final cruise weight	lb
W <sub>Test</sub>	Test weight	lb
WUT	Wind-up-turn	
$\dot{W}_f$	Fuel flow	lb/h
x	Scaled length of aircraft	
Y	Height of CG above ram drag	ft
y	Scaled height of aircraft above tower	
Z	Height of CG above gross thrust	ft
$\phi$	Constant	

### GREEK SYMBOLS

$\alpha$ (alpha)	Angle of attack	deg
$\alpha_i$	Induced angle of attack	deg
$\alpha_j$	Thrust angle	deg
$\beta$ (beta)	Sideslip angle	deg
$\delta$ (delta)	Pressure ratio	
$\delta_h$	Pressure ratio for selected altitude	
$\delta_{\text{Test}}$	Test pressure ratio	
$\phi$ (phi)	Bank angle	deg
$\phi_E$	Equivalent bank angle	deg

*FIXED WING PERFORMANCE*

$\gamma$ (gamma)	Ratio of specific heats	
$\gamma$	Flight path angle	deg
$\gamma_{Std}$	Standard flight path angle	deg
$\gamma_{Test}$	Test flight path angle	deg
$\eta_P$ (eta)	Propeller efficiency	
$\Lambda$ (Lambda)	Wing sweep angle	deg
$\lambda$ (lambda)	Taper ratio	
$\lambda$	Lag error constant	
$\lambda_s$	Static pressure lag error constant	
$\lambda_T$	Total pressure lag error constant	
$\mu$ (mu)	Viscosity	lb-s/ft <sup>2</sup>
$\mu$	Coefficient of friction	
$\mu_2$	Coefficient of friction, brakes applied	
$\pi$ (pi)	Constant	
$\theta$ (theta)	Pitch attitude	deg
$\theta$	Runway slope angle	deg
$\theta$	Temperature ratio	
$\theta$	Angle	deg
$\theta_{Std}$	Standard temperature ratio	
$\theta_T$	Total temperature ratio	
$\theta_{Test}$	Test temperature ratio	
$\rho$ (rho)	Air density	slug/ ft <sup>3</sup>
$\rho_a$	Ambient air density	slug/ ft <sup>3</sup>
$\rho_{ssl}$	Standard sea level air density	0.0023769 slug/ ft <sup>3</sup>
$\sigma$ (sigma)	Density ratio	
$\sigma_{Std}$	Standard density ratio	
$\sigma_{Test}$	Test density ratio	
$\tau$ (tau)	Inclination of the thrust axis with respect to the chord line	deg
$\omega$ (omega)	Turn rate	rad/s
$\omega_{max\ V>V_A}$	Maximum turn rate for $V > V_A$	rad/s
$\omega_{sust}$	Sustained turn rate	deg/s