Nomenclature

Roman variables

a	acceleration	m/s^2
a	Seiliger pressure ratio combustion	-
A	area	m^2
A_B	bore area	m^2
afr	air/fuel ratio	-
afr_{tot}	total air/fuel ratio (including scavenging)	-
A_S	wetted surface of a ship	m^2
b	expansion ratio combustion (3-4)	-
B	magnetic flux density	T
c	expansion ratio combustion (4-5)	-
C	capacitance	F
C	heat capacity	J/K
$\dot{C}$	heat capacity rate	J/K·s
C_{adm}	admiralty constant	$\frac{ton^{\frac{2}{3}} \cdot knts^3}{kW}$
C_D	delivered power coefficient	-
C_E	specific resistance	-
c_m	mean piston speed	m/s
c_p	specific heat at constant pressure	J/kg·K
CSR	continuous service rating	-
C_T	thrust loading coefficient	-
C_T	total resistance coefficient	-
C_T^*	thrust coefficient	-
C_Q^*	torque coefficient	-
c_v	specific heat at constant volume	J/kg·K
d	distance travelled	mile
D	diameter	m
D	drag force	N
D_B	bore diameter	m
e	energy per unit of mass	J/kg
ecm	energy consumption per mile	J/mile
E	energy	J
E	induction voltage	V
E	modulus of elasticity	Pa
$\dot{E}$	energy flow	J/s
E_{kin}	kinetic energy	J
EM	engine margin	-
EMF	electromotive force	V
E_{pot}	potential energy	J
ES	energy source	-
EU	energy use	-

f	frequency	Hz
f	(engine firing) frequency	Hz
F	force	N
F	fuel available on board	kg, tonnes
fcm	fuel consumption per mile	kg/mile
F_L	Lorentz force	N
Fr	Froude number $\frac{v_s}{\sqrt{g \cdot L}}$	-
g	gravitational constant	9.81 m/s²
G	shear modulus of elasticity	Pa
h	height	m
h	specific enthalpy	J/kg
H	enthalpy	J
H	hydraulic energy	J
h^H	higher heat value	J/kg
h^L	lower heat value	J/kg
i	gearbox reduction ratio	-
i	number of cylinders	-
I	electric current	A
I_A	current through armature	A
I_b	base current	A
I_c	collector current	A
I_e	effective current	A
If	current through field windings	A
I_L	line current	A
I_m	amplitude of current	A
Ip	phase current	A
J	advance ratio	-
k	hull roughness	m
k	number of revolutions per cycle (1 or 2)	-
k_e	number of engines	-
K_E	coil constant	-
K_G	generator constant	-
K_M	motor constant	-
k_p	number of propellers	-
K_Q	torque coefficient	-
K_T	thrust coefficient	-
l	length	m
L	(self) inductance	H
L	length	m
L	lift force	N
L_s	stroke length	m
m	mass	kg
M	torque	Nm
M	molecular weight	kg/kmol
$\dot{m}$	mass flow rate	kg/s

$\dot{m}_{air,in}$	total air flow into diesel engine	kg/s
M_B	engine (brake) torque	Nm
m_{ca}	mass of combustion air	kg
$m_{ca,min}$	minimum required m_{ca}	kg
MCR	maximum continuous rating	-
M_{cyl}	effective (brake) torque/cylinder	Nm
M_D	delivered torque	Nm
m_f	mass of fuel (per cycle)	kg
$\dot{m}_f$	mass flow of fuel	kg/s
m_{pe}	mass of pollutant emission	kg
M_S	shaft torque	Nm
N	number of windings	-
n	revolutions per second	rev/s
n	rotational speed	s^{-1}
n_C	polytropic index for compressor	-
n_e	engine speed	rev/s
n_p	propeller speed	rev/s
n_s	synchronous rotational speed	rev/s
n_T	polytropic index for turbine	-
p	pressure	Pa
p	number of poles	-
P	pitch	m
P	power	W
$\bar{p}$	mean pressure	Pa
pem	pollutant emission per mile	kg/mile
P/D	pitch ratio	-
P_a	average power	W
P_A	pneumatic power	W
P_B	brake power	W
P_C	compressor power	W
p_{exp}	pressure during expansion	Pa
P_D	delivered power (all propellers together)	W
P_E	effective towing power	W
per	pollutant emission ratio	kg/kg
P_H	hydraulic power	W
P_i	indicated power	W
P_{loss}	electrical losses	W
p_{me}	mean effective pressure	Pa
p_{mi}	mean indicated pressure	Pa
P_O	open water propeller power	W
P_P	(delivered) propeller power	W
P_S	shaft power	W
P_T	thrust power	W
P_T	turbine power	W
q	heat per unit mass	J/kg

Q	electric charge	C
Q	heat	J
Q	torque	Nm
$\dot{Q}$	heat flow	J/s
Q_{comb}	combustion heat	J
Q_f	fuel heat input	J
Q_{in}	heat input	J
q_{in}	specific heat input	J/kg
Q_{out}	heat output	J
q_{out}	specific heat output	J/kg
q_{xy}	specific heat transfer in stage x-y	J/kg
r	propeller radius	m
r	radius	m
R	electric resistance	ohm=Ω
R	gas constant ($\bar{R}$/M)	J/kg·K
R	range	miles
R	resultant force of drag and lift	N
R	ship resistance	N
$\bar{R}$	universal gas constant	8.314 kJ/kmol·K
R_a	armature resistance	Ω
r_c	geometric compression ratio (1-2)	-
r_e	effective expansion ratio (5-6)	-
Re	Reynolds number $\frac{v_s \cdot L}{\nu}$	-
Ro	roughness $\frac{k}{L}$	-
R_F	electrical resistance of field windings	Ω
s	slip between stator and rotor	-
s	specific entropy	J/kg·K
S	entropy	J/K
sac	specific air consumption	kg/Ws (kg/kWh)
sfc	specific fuel consumption	kg/Ws (g/kWh)
SM	service margin	-
spe	specific pollutant emission	kg/Ws (g/kWh)
spi	specific pollutant index	-
t	thrust deduction factor	-
t	time	s
T	period	s
T	temperature	K
T	endurance	sec, hours, days
T	thrust	T
t_{on}	on-time of transistor	s
u	specific internal energy	J/kg
U	internal energy	kJ
U	potential difference	V
U	overall heat transfer coefficient	J/s·m²·K

U	voltage	V
U_A	voltage drop over armature	V
U_{av}	average voltage	V
U_C	voltage drop over a capacitance	V
U_{ce}	voltage drop over base-emitter	V
U_e	effective voltage	V
U_F	voltage over field windings	V
U_L	line voltage	V
U_L	voltage drop over a self-inductance	V
U_m	amplitude of the voltage	V
U_{nom}	nominal voltage	V
U_P	phase voltage	V
U_R	voltage drop over a resistor	V
v	specific volume	m^3/kg
v	velocity	m/s
V	volume	m^3
$\dot{V}$	volume flow	m^3/s
V_{BDC}	volume at BDC	m^3
v_S	ship speed	m/s
V_s	swept volume	m^3
V_{TDC}	volume at TDC	m^3
∇	displacement volume	m^3
w	specific work	J/kg
w	wake factor	-
W	work	J
$\dot{W}$	rate of work or power	J/s
W_{com}	compression work	J/cycle
W_{exp}	expansion work	J/cycle
W_e	effective work	J/cycle
W_i	indicated work	J/cycle
X_C	capacitive reactance	Ω
X_L	inductive reactance	Ω
X_R	resistance	Ω
z	elevation	m
Z	impedance	

Greek variables

α	angle of attack	rad
α	firing angle	rad
α_p	phase displacements	rad
β	hydrodynamic pitch angle	rad
β	angle between conductor velocity - vector and magnetic field	rad
β	coefficient of performance	-
β_{AB}	bore area specific power	W/m²
$\beta_{\dot{m}}$	specific power related to mass flow	kJ/kg
β_{VS}	swept volume specific power	W/m³
δ	diminutive	-
∂	partial derivative	-
Δ	displacement	tonne
Δ	difference	-
ε	geometric compression ratio	-
η	efficiency	-
η	dynamic viscosity	N/m²s
η_c	polytropic compressor efficiency	-
η_{carnot}	Carnot efficiency	-
η_{comb}	combustion efficiency	-
η_D	propulsive efficiency	-
η_e	effective (engine) efficiency	-
η_{GB}	gearbox efficiency	-
η_H	hull efficiency	-
η_{HE}	heat exchanger efficiency	-
η_i	indicated efficiency	-
η_m	mechanical efficiency	-
η_O	open water propeller efficiency	-
η_q	input heat efficiency	-
η_R	relative rotative efficiency	-
η_S	shaft efficiency	-
η_{scav}	scavenge efficiency	-
η_{td}	thermodynamic efficiency	-
η_{trap}	trapped air efficiency	-
η_T	polytropic turbine efficiency	-
η_{TRM}	transmission efficiency	-
φ	phase difference	rad
φ	volume ratio	-
Φ	magnetic flux	Wb = kg·m²/A·s²
κ	isentropic index, specific heat ratio	-
λ	air excess ratio	-
λ_s	stroke/bore ratio	-
λ_{tot}	total air excess ratio	-

μ	permeability of medium	H/m
μ_0	permeability of vacuum	H/m
μ_R	permeability of medium relative to vacuum	-
υ	kinematic viscosity	m^2/s
π	pressure ratio	-
π_C	compressor pressure ratio	-
π_T	turbine pressure ratio	-
σ_b	bending stress	Pa
σ_t	tensile stress	Pa
σ_y	yield stress	Pa
θ	non-dimensional heat flow	-
θ	pitch angle	rad
ω	angular velocity	rad/s
ω	radial frequency of a voltage	rad/s
ρ	density	kg/m^3
σ	stoichiometric air/fuel ratio	-
τ	temperature ratio	-
τ_C	compressor temperature ratio	-
τ_T	turbine temperature ratio	-