

۱۳۹۴/۴/۱

In the name of Allah, Most Gracious, Most Merciful

Aviation Technical language

(second edition)

By: Alireza Hemmati

and

CAC DESIGNER; INSTRUCTOR FLIGHT ENGINEER

Davood Farashband



www.ghemmat.ir



مرشداسه	: همتی، علیرضا، ۱۳۵۹ -
	Hemmati, Alireza
عنوان و نام پدیدآور	: Aviation technical language (Helicopter) by Alireza Hemmati.
مشخصات نشر	: تهران: قلم همت، ۱۳۹۵ = ۲۰۱۷ م.
مشخصات ظاهری	: ۲۰۲ ص.: مصور (رنگی)، جدول (رنگی)، نمودار (رنگی).
شابک	: 978-600-6602-40-0
وضعیت فهرست نویسی	: فیا
یادداشت	: انگلیسی
یادداشت	: واژه نامه
آوانویسی عنوان	: آویشن...
موضوع	: زبان انگلیسی -- کتاب‌های فرانت -- هلیکوپترها
موضوع	: English language -- Readers -- Helicopters
موضوع	: زبان انگلیسی -- راهنمای آموزشی (عالی)
موضوع	: English language -- Study and teaching (Higher)
رده بندی کتبه	: PE۱۱۲۷/۵۸۸۷۴ ۱۳۹۵
رده بندی دیوپی	: ۴۲۸/۴۴۰ ۲۴۶۲۹۱۳۳۳۵۲
شماره کتابشناسی سی	: ۴۶۰۸۷۸۹

Published by GhalameHemmat Publishing Institution as Aviation Technical language

First edition published 2016

Copyright © GhalameHemmat Publishing

All rights reserved. No part of this publication may be reproduced in any form or by any means without the prior written permission of the publishers.

Record for this book is available from the National Library and Archives of I.R. of Iran

ISBN-13: 978-600-6602-40-0

The book is authored by Alireza Hemmati and Davood Farashband. Text Production and Proofreading by, Mahmood Ojani Text processed, typed and Printed in GhalameHemmat Publishing Institution

ناشر: قلم همت www.ghemmat.ir

عنوان کتاب: Aviation Technical language (second edition) (زبان تخصصی هوایی بالگرد)

تالیف: علیرضا همتی - داود فراشبند (استاد مهندس پرواز سازمان هواپیمایی کشوری)

چاپ: ۱۳۹۵

شمارگان: ۱۱۰۰

نوبت چاپ: اول

قیمت: 60000 تومان (رنگی)

شابک: 978-600-6602-40-0

آدرس پخش: جمالزاده جنوبی کوچه رشتچی پلاک ۱۴۴ واحد منفی یک . تلفن ۴۶۰۵۱۰۱۵ موبایل ۰۹۱۲۴۱۸۷۱۵۴

تمام حقوق مادی و معنوی این اثر به انتشارات قلم همت تعلق دارد

Introduction

The work took more peace we will see less vulnerable in times of war.

The book was compiled based on the needs of helicopter industry employee's, which is the result of years of experience and taught to helicopter's specialists.

For The lack of convenient and practical book for the specialized technical training helicopter students, we were forced to think about the development of the first version of "technical language of helicopters".

The book with the help of images and diagrams, while introducing helicopter parts and functional vocab, defines the vocab. helicopter student and the specialist of this industry. with the study of this book will be familiar with the components and terminology of helicopter.

This book consists of six chapters and all sectors are independent: Airframe and system, Jet Engines, Aerodynamic and Piston engines, failure code and picture dictionary. In the Annex, relevant abbreviation, common and useful words of helicopter, with pronunciation and description were have been presented.

So many thanks to Mr. Mahanoud Ojai for his help in this book. In the end I ask all specialists and experts, to email your comments to GhalameHemmat Publisher Email (hemat_ar1359@yahoo.com).

(www.ghemmat.ir)

Your sincerely

Davood Farashband -Alireza Hemmati - 2017 June

Contents

Chapter 1

Nut, Bolt and Screw	16
Bolt.....	16
Bolt Terms	16
Nut.....	16
Screw	17
Fastener Categories.....	18
Washer Types.....	19
Tools	20
Wrenches.....	20
Ratchets.....	20
Sockets	20
Screwdrivers	20
Vise Grips	21
Long and Short Needle Nose	21
safety wire player	21
Torque wrench	21
b) Rubber Mallet.....	21
Breaker Bar.....	21
Extension Bars	22
Socket Swivels	22
Jack.....	22
Hose and pipe	22
Affix seal.....	23
Gun grease	23
universal joint.....	23
Flange	23
Impeller	23
lubricant jet.....	23
Chock.....	23
Common word for inspection.....	24
Dent, Nick and curl.....	24
Void.....	24
Kink	25

Hair line cracks.....	25
Scratches.....	26
Chafing	26
peeling of paint.....	26
varnish coating.....	26
signal flare launchers	26
De-icing.....	26
Anti-icing	26
Bracket.....	27
bent	27
Coating loss and cracking of vane	27
Crack.....	27
Wear.....	28
Corrosion.....	28
Abrasive Wear	28
Erosive Wear	29
Adhesive Wear	29
Stall and surge	31
Common part of helicopter.....	31
inlet guide vanes	31
nozzle guide vanes (NGVs).....	31
Exhaust Duct	32
Spring washer	32
dust-proof device	33
Oil filter	33
Chip detector	34
Fuel filter.....	35
Relief valve	35
Check valve	36
By-Pass Valves.....	36
cargo hook.....	37
Hoist.....	37
Stowaway tools	37
Mooring.....	38
airframe.....	38

Fuselage	38
Stringer, spar and rib	38
Cable Ties	39
Castle Nuts	39
Alternating Current (AC)	39
Direct Current (DC)	40
Generating DC	40
rectifier	40
Circuit breaker	40
Regulator	41
Beacon	41
transformer	41
amps, watts, volts and ohms	42
windshield wipers	42
Slip ring	42
Flight Data Recorder (FDR)	43
Cockpit Voice Recorder (CVR)	44
compass	44
Seat belt	44
Shoulder harness	44
Inertia reel	45
legibility of stencils and decal	45
portable fire extinguisher	45
positive locking and unbolting	45
mild soap	45
chamois leather	46
WD40	46
Searchlight, Landing light, anti - collision and navigation lights	46
Spline	47
turboshaft engine	47
INTERSTAGE AIR-BLEED SYSTEM	47
Air Bleed Valve	48
Solenoid valve	48
Fuse	49
Gyrocompass(remote compass)	49

Gyromagnetic Compass	49
Radio Magnetic Indicator (RMI)	50
Pitot-static system	50
altimeter indicator	51
air speed indicator	51
Radio HF/VHF/UHF	51
Atmospheric regions	52

Chapter 2

Helicopter Airframe and System	54
Introduction	55
Anatomy of a Helicopter	56
Main Rotor System	58
Controls system	59
Swash Plate	59
Swashplate outer race and inner race	61
Scissor and sleeve	61
Collective	62
Collective Pitch	63
Cyclic	63
Cyclic Pitch	64
Pedals	64
Main Rotor	65
Main rotor hub	66
Blade Grips	67
Pitch Horn	68
Pitch change Link	68
What is Teetering (Flapping) versus Feathering?	68
How does the Rotor System Teeter?	70
How does (the R22) Control System Transmit Pitch to the Blades?	70
Mast	72
Power Train System	72
Transmission	72
Gearboxes	75
Drive shafts	75
freewheeling clutch	76

Helical Gears	78
Spur Gears.....	78
Worm Gears.....	78
Tail Rotor	79
Fenestron.....	80
Horizontal and Vertical Stabilizers.....	80
Stabilizer bar	81
Tail boom.....	81
Pylon area.....	82
aerospace bearings	83
ball bearing.....	83
Cylindrical Roller Bearings.....	83
Tapered Roller Bearings.....	84
Spherical Roller Bearings.....	84
needle roller bearing.....	84
Tension	85
Compression	85
Torsion.....	86
Shear.....	86
Tension, Compression, Shear, Stress Crack	86
Combination stress.....	86
Hoop stress	87
Axial stress.....	87
axes or reference axes	87
Longitudinal	88
Lateral	88
Normal	88
Classification of main rotor system.....	88
Rigid.....	89
Semi-rigid	89
Fully articulated.....	89
The anti-torque effect.....	92
Anti-Torque Pedals or Tail Rotor Control.....	92
Forces on helicopter.....	94
Pendular Action.....	96

Coning	97
Ground Effect	97
Forward Flight	98
Sideward and Rearward Flight	99
Autorotation	100

Chapter 3

Jet Engines	101
Governor RPM ("beep") Switch	102
Droop Compensator	103
Introduction	103
Newton's Laws of Motion	105
Bernoulli's Theorem	106
Convergent Duct	107
Divergent Duct	107
The Working Cycle of a Gas Turbine Engine	107
Thrust	109
Power	109
Horsepower	110
Efficiencies	110
Specific Fuel Consumption (SFC)	110
Thermal Efficiency	110
Propulsive Efficiency	111
Air breathing	112
Turbine powered	113
Turbojet	113
Turbofan	114
High By-pass Turbofan	115
Turboprop engine	117
Turboshaft engines	118
Propfan	119
Ram powered	120
Ramjet	120
Scramjet	121
Scramjet engine operation	121
Compressor	122

Centrifugal Flow	123
axial flow compressor.....	123
Combination of Centrifugal and Axial.....	123
Three different types of axial flow compressors	123
Single Spool	124
Double Spool.....	124
Triple Spool	124
Blades and Vanes	125
Inlet guide vanes	125
VIGVs	126
Variable Inlet Guide Vanes	126
Compressor pressure ratio	126
Turbines of Engine.....	128
Compressor Turbine (N1)	129
Free Turbine (N2)	130
Combustion Chamber.....	130
Exhaust section.....	133
Accessory Drives	133
Engine Anti Icing System	134

Chapter 4

Piston Engines	135
Principle of Operation.....	136
Induction Stroke.....	137
Compression Stroke	137
Power Stroke	137
Exhaust Stroke	137
Valve Timing.....	138
Power	140
Indicated Horsepower (IHP).....	140
Friction Horsepower (FHP)	140
Brake Horsepower (BHP).....	140
Cylinder Arrangements.....	141
Radial	141
Horizontally Opposed	141
Engine Efficiencies	142

Thermal Efficiency	142
Mechanical Efficiency	142
Volumetric Efficiency	142
Specific Fuel Consumption (SFC).....	142
Compression Ratio	143
Engine Major Component Parts	143
Crankcase	143
Crankshaft	144
Connecting Rod	145
Piston	145
Cylinder Barrel	145
Cylinder Head	145
Valve Operation.....	146

chapter 5

failur codes.....	150
GLOSSARY	191
Appendix148.....	197
Abbreviations	197
Abbreviations	198