

Table of Contents



INTRODUCTION

1 DEFINITIONS AND TERMS USED

1.1 Introduction to Performance | 1-1

1.2 Definitions and Terms | 1-1

1.3 EU-OPS Terminology | 1-22

2 INTRODUCTION TO PERFORMANCE

2.1 What is Performance? | 2-1

2.2 The Operational Envelope | 2-1

2.3 Performance Factors | 2-2

2.4 External Factors | 2-3

2.5 Certification Specifications – CS 23 & CS 25 | 2-5

3 PERFORMANCE BASICS

3.1 Introduction | 3-1

3.2 Take-Off | 3-1

3.3 Climb | 3-9

3.4 Factors Affecting Climb Performance | 3-13

3.5 Level Flight | 3-19

3.6 Descent | 3-23

3.7 Landing | 3-29

4 PERFORMANCE OF SINGLE ENGINE PISTON AEROPLANES (SEP)

- 4.1 Regulations - Take-Off SEP | 4-1
- 4.2 Specimen Aeroplane - Data Sheets | 4-4
- 4.3 Use of Take-Off Graphs | 4-4
- 4.4 Use of Climb Graph | 4-9
- 4.5 En-Route Regulations - SEP | 4-12
- 4.6 Landing Regulations - SEP | 4-13
- 4.7 Landing - Wet and Contaminated Runways | 4-14
- 4.8 Effect of Wind on Landing | 4-15
- 4.9 Steep Approach Procedures | 4-16
- 4.10 Short Landing Operations | 4-16
- 4.11 Use of the Landing Field-Length Graph | 4-18

5 PERFORMANCE OF MULTI-ENGINE AEROPLANES (MEP)

- 5.1 General | 5-1
- 5.2 Definitions of Terms and Speeds used for MEP - Take-Off | 5-1
- 5.3 Regulations - Take-Off MEP | 5-4
- 5.4 Specimen Aeroplane - Data Sheets Take-Off | 5-7
- 5.5 Use of Take-Off Graphs MEP | 5-8
- 5.6 Take-Off Climb MEP | 5-16
- 5.7 Climb Speeds - MEP | 5-19
- 5.8 Construction of Flight Path | 5-21
- 5.9 Climb Graphs | 5-23
- 5.10 Cruise - MEP | 5-29
- 5.11 Elements of Performance | 5-30
- 5.12 En-Route - MEP | 5-31

5.13 Descent - MEP | 5-31

5.14 Landing - MEP | 5-33

5.15 Balked Landing Climb Graph | 5-36

5.16 Landing Field Length Graphs | 5-38

6 PERFORMANCE OF AEROPLANES

6.1 Essential Forces Affecting the Take-Off | 6-1

6.2 Effects of Angle of Attack on Acceleration Distance | 6-2

6.3 Influence of Flap Setting on Acceleration Distance | 6-3

6.4 Speeds - Take-Off | 6-5

6.5 Stall Speed (V_{SR}) | 6-6

6.6 Minimum Control Speeds - V_{MC} | 6-7

6.7 Maximum Brake Energy - V_{MBE} | 6-8

6.8 The Critical Engine Failure Speed V_{EF} and the Decision Speed V_1 | 6-9

6.9 Rotation Speed (V_R) | 6-11

6.10 Minimum Unstick Speed (V_{MU}) | 6-11

6.11 Lift-Off Speed (V_{LOF}) | 6-11

6.12 Maximum Tyre Speed ($V_{MAX\ TYRE}$) | 6-12

6.13 Take-Off Safety Speed - V_2 | 6-12

6.14 Final Take-Off Speed- V_{FTO} | 6-13

6.15 Calculation of V Speeds from Data Sheets | 6-13

6.16 Airfield Lengths Available | 6-18

6.17 Take-Off Run Available (TORA)/ Take-off Run Required (TORR) | 6-18

6.18 Take-Off Distance Available (TODA)/Take-Off Distance Required (TODR) | 6-22

6.19 Accelerate Stop Distance Available (ASDA)/Accelerate Stop Distance Required (ASDR) | 6-24

6.20 Field Length Limit Take-Off Mass | 6-28

- 6.21 Effect of Too Early or Too Late Rotation | 6-28
 - 6.22 Effects of Runway Slope | 6-29
 - 6.23 Effects of Wind on Take-off | 6-29
 - 6.24 Take-Off Path | 6-31
 - 6.25 Take-Off Performance | 6-32
 - 6.26 Take-Off Climb (WAT limit) | 6-34
 - 6.27 Obstacle Clearance | 6-34
 - 6.28 Take-Off Tyre Speed Limit | 6-44
 - 6.29 Brake Energy | 6-44
- 6.30 Increased V_2 Take-Off - Climb Limit/Tyre Limit | 6-48
 - 6.31 Increased V_2 Obstacle Limit | 6-51
- 6.32 Reduced/Flexible and Derated Thrust Take-Off | 6-53
 - 6.33 Runway Conditions | 6-60
- 6.34 Contaminated Runway Take-Off Calculations | 6-66
 - 6.35 Wing Icing | 6-69
 - 6.36 Anti Skid System | 6-70
- 6.37 Effects of Flap Setting on Climb Out | 6-71
- 6.38 Effects of a Turn in the Climb Out | 6-72

7 PERFORMANCE OF AEROPLANES

- 7.1 Climb After Net Take-Off Flight Path | 7-1
- 7.2 Noise Abatement Departure Climb Guidance | 7-9

8 PERFORMANCE OF AEROPLANES

- 8.1 Cruise | 8-1
- 8.2 Buffet Boundaries | 8-3

- 8.3 Maximum Endurance | 8-7
- 8.4 Maximum Range | 8-8
- 8.5 Specific Range | 8-8
- 8.6 Economic Speed | 8-14
- 8.7 One Engine Inoperative Cruise - Regulations | 8-15
 - 8.8 Drift Down | 8-16
 - 8.9 Flight over Water Speed | 8-17
 - 8.10 Engine Relighting | 8-17
 - 8.11 MRJT - Maximum % N_1 Value | 8-18
 - 8.12 Net Level Off Altitude | 8-19
 - 8.13 Driftdown Profiles | 8-20
- 8.14 Maximum Distance from an Adequate Aerodrome for Two-Engined Aeroplanes without an ETOPS Approval | 8-20
- 8.15 ETOPS - ETOPS Track and Rule Distance Calculation | 8-22

9 PERFORMANCE OF AEROPLANES

- 9.1 Forces Acting in the Descent | 9-1
- 9.2 Influence of Acceleration | 9-2
- 9.3 Influence of Altitude | 9-2
- 9.4 Influence of Thrust and Drag | 9-3
- 9.5 Influence of Velocity | 9-3
- 9.6 Influence of Mass | 9-4
- 9.7 Influence of Wind | 9-4
- 9.8 Influence of Temperature | 9-5
- 9.9 Speeds in the Descent | 9-5
- 9.10 Practical Problems in Descent | 9-6

9.11 Approach and Landing | 9-8

9.12 Landing Speed | 9-11

9.13 Effects of Mass on Landing Speed | 9-12

9.14 The Density Effects | 9-13

9.15 Displaced Threshold | 9-13

9.16 Technical Malfunction | 9-14

9.17 Missed Approach | 9-14

9.18 Design Landing Mass | 9-16

9.19 Maximum Allowed Landing Mass | 9-16

9.20 Landing Performance MRJT | 9-16

9.21 Quick Turnaround Limit | 9-19

9.22 Brake Cooling Schedule | 9-22

9.23 Method of Use of the "Brake Cooling Schedule" Graph | 9-22

9.24 Runway Pavement Bearing Strength | 9-24

10 PERFORMANCE AND PLANNING

10.1 Introduction | 10-1

10.2 Nautical Air Miles (Performance Miles) - NAM | 10-1

10.3 Application of Practical Flight Planning Data (Extracts from CAP 697) | 10-2

EASA SYLLABUS INDEX