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This instruction implements guidance in AFPD 11-2, Flight Rules and Procedures, and in AFI 11-209, *Air Force Participation in Aerial Events*. It provides guidance and procedures for Air Force performance of specific model, design, series (MDS) single-ship aircraft demonstrations and mission capabilities demonstrations. It designates Air Combat Command as lead command for the A-10, F-15, F-16, and F-22 aircraft demonstrations. This instruction does not apply to the Air National Guard or Air Force Reserve. MAJCOMs, field operating agencies (FOAs), and direct reporting units (DRUs) may supplement this instruction. MAJCOMs, FOAs, and DRUs will coordinate their supplements with HQ Air Combat Command, Director of Air and Space Operations, Flight Operations Division, (ACC/A3T) prior to publication and forward one copy to HQ USAF/A3O-AOB after publication. See **Attachment 1** for a glossary of references and supporting information. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records*, and disposed of in accordance with Air Force Records Information Management

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(35FW) AFI 11-246V1, *Air Force Aircraft Demonstrations*, dated 29 September 2008 is supplemented as follows. This supplement applies to all Misawa AB personnel involved in activities related to Pacific Air Force’s F-16 Demonstration. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, Management of Records, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS) located at h Additionally, if the publication generates a report(s), alert readers in a statement and cite all applicable Reports Control Numbers in accordance with AFI 33-324. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, Recommendation for Change of Publication; route AF Form 847s from the field

(35FW) through the appropriate functional’s chain of command.

SUMMARY OF CHANGES

This Interim Change (IC) alters the sequence of the A-10 demonstration profile, makes minor changes to several maneuver airspeed parameters, and converts the single aileron roll to a double aileron roll. Additionally, changes to the F-16 Spiral Descent maneuver description and parameters are included. Also, the IC makes changes to the sequence of the F-15E Strike Eagle demonstration profile, reorients the LAHD bomb pass maneuver, and includes minor maneuver parameter changes.

Chapter 1—OPERATIONAL PROCEDURES	16
1.1. Introduction.	16
1.2. Terms Explained.	16
1.3. Waiver Authority.	16
1.4. Responsibilities:	16
1.5. Requests and Approval.	24
1.6. Scheduling and Policies.	25
1.7. Support Manual.	25
1.8. Arresting Gear Support.	25
1.9. Reporting.	25
1.10. Recommended Changes.	25
1.11. Demonstration Performance Reviews/Grade Sheets.	26
Figure 1.1. Grading Ranges.	28
1.12. Proficiency Requirements.	28

1.13.	Termination Procedures.	28
1.14.	Transition During Performance.	29
1.15.	Altimeter Procedures.	29
1.16.	Communication Procedures.	29
1.17.	Use of Teams for Static Display.	29
1.18.	Disbursement of Demonstration Team Funds.	29
1.19.	Shortened/Modified Demonstrations.	29
Chapter 2—DEMONSTRATION TEAM PERSONNEL SELECTION AND TRAINING		31
2.1.	General.	31
2.2.	Demonstration Pilot Selection.	31
2.2.	(35FW) Demonstration Pilot Selection.	31
2.3.	Narrator/Ground Safety Observer Selection.	31
2.4.	Support Personnel Selection.	32
2.5.	Training.	34
2.6.	Training Syllabus:	40
Chapter 3—A-10 DEMONSTRATION MANEUVERS		42
Section 3A—General Guidelines		42
3.1.	General.	42
3.2.	Aircraft Configuration and Fuel Requirements.	42
3.3.	Airspeed and G Limits.	42
3.4.	Show Line Restrictions.	42
3.5.	Airspace and Runway Requirements.	42
3.6.	Weather Requirements.	42
3.7.	Demonstration Profiles.	43
3.8.	Repositioning Turn.	44
Figure 3.1.	A-10 Repositioning Turn.	44
Table 3.1.	A-10 Repositioning Turn Parameters.	45
3.9.	High Speed Reposition Maneuver.	45
Figure 3.2.	A-10 High Speed Reposition Maneuver.	46
Table 3.2.	A-10 High Speed Reposition Maneuver Parameters.	46
3.10.	Flat Wifferdill Reposition Maneuver.	47
Figure 3.3.	A-10 Flat Wifferdill Reposition Maneuver.	47

Section 3B—High Profile	49
3.11. Takeoff.	49
Figure 3.4. A-10 Takeoff.	49
Table 3.3. A-10 Takeoff Parameters.	50
3.12. Flat Pass.	50
Figure 3.5. A-10 Flat Pass.	51
Table 3.4. A-10 Flat Pass Parameters.	51
3.13. Split-S.	52
Figure 3.6. A-10 Split-S.	52
Table 3.5. A-10 Split-S Parameters.	53
3.14. Slow Roll.	53
Figure 3.7. A-10 Slow Roll.	54
Table 3.6. A-10 Slow Roll Parameters.	54
3.15. Double Aileron Roll.	55
Figure 3.8. A-10 Double Aileron Roll.	55
Table 3.7. A-10 Double Aileron Roll Parameters.	55
3.16. Cuban Eight.	56
Figure 3.9. A-10 Cuban Eight.	56
Table 3.8. A-10 Cuban Eight Parameters.	57
3.17. Vertical 540.	57
Figure 3.10. A-10 Vertical 540.	58
Table 3.9. A-10 Vertical 540 Parameters.	58
3.18. Split-S.	59
3.19. Level 360.	59
Figure 3.11. A-10 Level 360.	59
Table 3.10. A-10 Level 360 Parameters.	60
3.20. Gear Down Pass.	60
Figure 3.12. A-10 Gear Down Pass.	61
Table 3.11. A-10 Gear Down Pass Parameters.	61
3.21. Three Low Angle Strafe Passes.	62
Figure 3.13. A-10 Three Low Angle Strafe Passes.	62
Table 3.12. A-10 Three Low Angle Strafe Passes Parameters.	63
3.22. Jink-Out Maneuver.	63

Figure 3.14.	A-10 Jink-Out.	64
Table 3.13.	A-10 Jink-Out Parameters.	64
	3.23. Four-Point Roll.	65
Figure 3.15.	A-10 Four-Point Roll.	65
Table 3.14.	A-10 Four-Point Roll Parameters.	66
	3.24. Dedication Pass.	66
Figure 3.16.	A-10 Dedication Pass.	67
Table 3.15.	A-10 Dedication Pass Parameters.	67
	3.25. Tactical Pitch-Up to Land.	68
Figure 3.17.	A-10 Tactical Pitch-up to Land.	68
Table 3.16.	A-10 Tactical Pitch-Up to Land Parameters.	69
	3.26. Staged Show Sites.	69
Figure 3.18.	A-10 Staged Show Sites.	70
Chapter 4—F-15 DEMONSTRATION MANEUVERS		71
Section 4A—General Information		71
	4.1. General.	71
	4.2. Aircraft Configuration and Fuel Requirements.	71
	4.3. Airspeed and G Limits.	71
	4.4. Show line Restrictions.	71
	4.5. Airspace and Runway Requirements.	71
	4.6. Weather Requirements.	72
	4.7. High Density Altitude Demonstrations.	72
	4.8. Demonstration Maneuver Profiles.	72
	4.9. Reposition Maneuvers.	73
Figure 4.1.	F-15 Flat Wifferdill Reposition Maneuver.	73
Figure 4.2.	F-15 Wifferdill Reposition Maneuver.	74
Figure 4.3.	F-15 Vertical Reposition Maneuver.	75
Table 4.1.	F-15 Vertical Reposition Maneuver Parameters.	75
Figure 4.4.	F-15 Flat Pass Reposition Maneuver.	77
Section 4B—High Profile		79
	4.10. Maximum Performance Takeoff and Climb (Left to Right).	79
Figure 4.5.	F-15 Maximum Performance Takeoff and Climb.	79

Table 4.2.	F-15 Maximum Performance Takeoff and Climb Parameters.	80
4.11.	SPLIT-S (Right to Left from MAX Performance Takeoff).	80
Figure 4.6.	F-15 Split-S.	81
Table 4.3.	F-15 Split-S Parameters.	81
4.12.	Flat Pass (Right to Left).	82
Figure 4.7.	F-15 Flat Pass.	82
Table 4.4.	F-15 Flat Pass Parameters.	83
4.13.	Four-Point Roll (Left to Right).	83
Figure 4.8.	F-15 Four-Point Roll.	84
Table 4.5.	F-15 Four-Point Roll Parameters.	84
4.14.	High G Turn (Right to Left).	85
Figure 4.9.	F-15 High G Turn.	85
Table 4.6.	F-15 High G Turn Parameters.	86
4.15.	Triple Aileron Roll (Left to Right).	86
Figure 4.10.	F-15 Triple Aileron Roll.	87
Table 4.7.	F-15 Triple Aileron Roll Parameters.	87
4.16.	Wing Walk (Right to Left).	88
Figure 4.11.	F-15 Wing Walk.	88
Table 4.8.	F-15 Wing Walk Parameters.	89
4.17.	Cuban 8 (Left to Right).	89
Figure 4.12.	F-15 Cuban Eight.	90
Table 4.9.	F-15 Cuban Eight Parameters.	90
4.18.	Double Immelmann (Left to Right).	91
Figure 4.13.	F-15 Double Immelmann.	92
Table 4.10.	F-15 Double Immelmann Parameters.	92
4.19.	SPLIT-S (Right to Left from Double Immelmann).	93
Figure 4.14.	F-15 Split-S.	93
Table 4.11.	F-15 Split-S Parameters.	94
4.20.	Maximum Performance Climb with Rolls (Right to Left).	94
Figure 4.15.	F-15 Maximum Performance Climb With Rolls.	95
Table 4.12.	F-15 Maximum Performance Climb With Rolls Parameters.	95
4.21.	Spiral Descent.	96
Figure 4.16.	F-15 Spiral Descent.	96

Table 4.13.	F-15 Spiral Descent Parameters.	96
	4.22. Dedication Pass.	97
Figure 4.17.	F-15 Dedication Pass.	98
Table 4.14.	F-15 Dedication Pass Parameters.	98
	4.23. Knife Edge Pass.	99
Figure 4.18.	F-15 Knife Edge Pass.	99
Table 4.15.	F-15 Knife Edge Pass Parameters.	100
	4.24. Tactical Pitch-Up to Landing (Direction of Landing).	100
Figure 4.19.	F-15 Tactical Pitch-Up to Landing.	101
Table 4.16.	F-15 Tactical Pitch-Up to Landing Parameters.	101
Section 4C—Low Profile		102
	4.25. Low Profile Abnormal Procedures:	102
	4.26. Maximum Performance Takeoff Inverted.	102
Figure 4.20.	F-15 Maximum Performance Takeoff Inverted.	103
Table 4.17.	F-15 Maximum Performance Takeoff Inverted Parameters.	103
	4.27. Normal Takeoff.	106
Table 4.18.	F-15 Normal Takeoff Parameters.	106
	4.28. Four-Point Roll (Left to Right).	106
	4.29. High G Turn (Right to Left).	106
	4.30. Triple Aileron Roll (Left to Right).	106
	4.31. Wing Walk (Right to Left).	106
	4.32. Level 8 (Left to Right).	107
Figure 4.21.	F-15 Level 8.	107
Table 4.19.	F-15 Level 8 Parameters.	107
	4.33. Knife Edge Pass:	108
	4.34. Tactical Pitch-Up to Landing:	108
	4.35. Staged Show Sites.	108
Figure 4.22.	F-15 Staged Show Sites.	109
	4.36. F-15 No-Flap TOLD.	109
Chapter 5—F-16 DEMONSTRATION MANEUVERS		111
Section 5A—General Information		111
	5.1. General.	111

5.2.	Aircraft Configuration and Fuel Requirements.	111
5.3.	Airspeed and G Limits.	111
5.4.	Show line Restrictions.	111
5.5.	Airspace and Runway Requirements.	111
5.6.	Weather Requirements.	111
5.7.	High Density Altitude Demonstrations.	112
5.8.	Demonstration Maneuver Profiles.	112
5.9.	Reposition Maneuvers.	113
Figure 5.1.	F-16 Flat Wifferdill Reposition Maneuver.	114
Figure 5.2.	F-16 Wifferdill Reposition Maneuver.	115
Figure 5.3.	F-16 Vertical Reposition Maneuver.	117
Table 5.1.	F-16 Vertical Reposition Maneuver Parameters.	118
Figure 5.4.	F-16 Flat Pass.	119
Section 5B—High Profile		119
5.10.	Maximum Performance Takeoff and Climb to Cuban 8 or 1/2 Cuban 8 (depending on takeoff direction).	119
Figure 5.5.	F-16 Maximum Performance Takeoff and Climb to Cuban 8.	120
Table 5.2.	F-16 Maximum Performance Takeoff and Climb to Cuban 8 Parameters.	120
5.11.	High Speed Flat Pass (Right to Left).	121
Figure 5.6.	F-16 Flat Pass.	122
Table 5.3.	F-16 Flat Pass Parameters.	122
5.12.	Triple Aileron Roll (Left to Right).	123
Figure 5.7.	F-16 Triple Aileron Roll.	123
Table 5.4.	F-16 Triple Aileron Roll Parameters.	124
5.13.	High G Turn (Right to Left).	124
Figure 5.8.	F-16 High G Turn.	125
Table 5.5.	F-16 High G Turn Parameters.	125
5.14.	Four-Point Roll (Left to Right).	126
Figure 5.9.	F-16 Four-Point Roll.	126
Table 5.6.	F-16 Four-Point Roll Parameters.	127
5.15.	Double Immelmann (Right to Left).	127
Figure 5.10.	F-16 Double Immelmann.	128
Table 5.7.	F-16 Double Immelmann Parameters.	128

	5.16.	Split-S (Left to Right).	129
Figure	5.11.	F-16 Split-S.	129
Table	5.8.	F-16 Split-S Parameters.	130
	5.17.	Falcon Turn (Left to Right).	130
Figure	5.12.	F-16 Falcon Turn.	131
Table	5.9.	F-16 Falcon Turn Parameters.	131
	5.18.	Shark's Tooth (Right to Left).	132
Figure	5.13.	F-16 Shark's Tooth.	132
Table	5.10.	F-16 Shark's Tooth Parameters.	133
	5.19.	High Alpha Pass (Into the wind).	133
Figure	5.14.	F-16 High Alpha Pass.	134
Table	5.11.	F-16 High Alpha Pass Parameters.	134
	5.20.	Muscle Climb Maneuver.	135
Figure	5.15.	F-16 Muscle Climb Maneuver.	135
Table	5.12.	F-16 Muscle Climb Maneuver Parameters.	136
	5.21.	Knife Edge Pass.	136
Figure	5.16.	F-16 Knife Edge Pass.	137
Table	5.13.	F-16 Knife Edge Pass Parameters.	137
	5.22.	Maximum Performance Climb with Rolls.	138
Figure	5.17.	F-16 Maximum Performance Climb with Rolls.	138
Table	5.14.	F-16 Maximum Performance Climb with Rolls Parameters.	139
	5.23.	F-16 Spiral Descent.	139
Figure	5.18.	F-16 Spiral Descent.	140
Table	5.15.	F-16 Spiral Descent Parameters.	141
	5.24.	Dedication Pass.	142
Figure	5.19.	F-16 Dedication Pass.	142
Table	5.16.	F-16 Dedication Pass Parameters.	142
	5.25.	Tactical Pitch-Up to Landing (Direction of Landing).	143
Figure	5.20.	F-16 Tactical Pitch-Up to Landing.	143
Table	5.17.	F-16 Tactical Pitch-Up to Landing Parameters.	144
Section 5C—Low/Flat Profile			144
	5.26.	Low/Flat Abnormal Procedures:	144
	5.27.	Takeoff to Level 8.	144

Figure 5.21. F-16 Level 8. 145

Table 5.18. F-16 Level 8 Parameters. 145

5.28. Flat Pass (Right to Left). 146

5.29. Triple Aileron Roll (Left to right). 146

5.30. High G Turn (Right to Left). 146

5.31. Four-Point Roll (Left to Right). 146

5.32. Knife Edge Pass. 146

5.33. Falcon Turn (Right to Left). 146

5.34. High Alpha Pass (Into the wind). 147

5.35. Flat Pass. 147

5.36. Tactical Pitch-Up to Landing. 147

5.37. Staged Show Sites. 147

Figure 5.22. F-16 Staged Show Sites. 147

Chapter 6—F-15E DEMONSTRATION MANEUVERS 148

Section 6A—General Information 148

6.1. General. 148

6.2. Aircraft Configuration and Fuel Requirements. 148

6.3. Airspeed and G Limits. 148

6.4. Show line Restrictions. 148

6.5. Airspace and Runway Requirements. 148

6.6. Weather Requirements. 149

6.7. High Density Altitude Demonstrations. 149

6.8. Demonstration Maneuver Profiles. 149

6.9. Reposition Maneuvers. 150

Figure 6.1. F-15E Flat Wifferdill Reposition Maneuver. 151

Figure 6.2. F-15E Wifferdill Reposition Maneuver. 152

Figure 6.3. F-15E Vertical Reposition Maneuver. 153

Table 6.1. F-15E Vertical Reposition Maneuver Parameters. 154

Figure 6.4. F-15E Flat Pass Reposition Maneuver. 155

Section 6B—High Profile 155

6.10. Maximum Performance Takeoff and Climb. 155

Figure 6.5. F-15E Maximum Performance Takeoff and Climb. 156

Table 6.2.	F-15E Maximum Performance Takeoff and Climb Parameters.	156
6.11.	SPLIT-S.	157
Figure 6.6.	F-15E Split-S.	157
Table 6.3.	F-15E Split-S Parameters.	158
6.12.	Flat Pass.	158
Figure 6.7.	F-15E Flat Pass.	159
Table 6.4.	F-15E Flat Pass Parameters.	159
6.13.	Four-Point Roll (Left to Right).	160
Figure 6.8.	F-15E Four-Point Roll.	160
Table 6.5.	F-15E Four-Point Roll Parameters.	161
6.14.	High G Turn (Right to Left).	161
Figure 6.9.	F-15E High G Turn.	162
Table 6.6.	F-15E High G Turn Parameters.	162
6.15.	Cuban 8 (Right to Left).	163
Figure 6.10.	F-15E Cuban Eight.	164
Table 6.7.	F-15E Cuban Eight Parameters.	165
6.16.	Low Angle Strafe Pass (Left to Right).	165
Figure 6.11.	F-15E Low Angle Strafe Pass.	166
Table 6.8.	F-15E Low Angle Strafe Parameters.	166
6.17.	LAHD Bomb Pass (Right to Left).	167
Figure 6.12.	F-15E LAHD Bomb Pass.	167
Table 6.9.	F-15E LAHD Bomb Pass Parameters.	168
6.18.	SAM Weave.	168
Figure 6.13.	F-15E SAM Weave.	169
Table 6.10.	F-15E SAM Weave Parameters.	169
6.19.	F- Maximum Performance Climb with Rolls (Left to Right).	170
Figure 6.14.	15E Maximum Performance Climb With Rolls.	171
Table 6.11.	F-15E Maximum Performance Climb With Rolls Parameters.	172
6.20.	Spiral Descent.	172
Figure 6.15.	F-15E Spiral Descent.	173
Table 6.12.	F-15E Spiral Descent Parameters.	174
6.21.	Dedication Pass.	174
Figure 6.16.	F-15E Dedication Pass (Left to Right).	175

Table	6.13.	F-15E Dedication Pass Parameters.	175
	6.22.	Knife Edge Pass.	176
Figure	6.17.	F-15E Knife Edge Pass (Right to Left).	176
Table	6.14.	F-15E Knife Edge Pass Parameters.	177
	6.23.	Tactical Pitch-Up to Landing (Direction of Landing).	177
Figure	6.18.	F-15E Tactical Pitch-Up to Landing.	178
Table	6.15.	F-15E Tactical Pitch-Up to Landing Parameters.	178
Section 6C—Low Profile			179
	6.24.	Low Profile Abnormal Procedures:	179
	6.25.	Maximum Performance Takeoff Inverted.	179
Figure	6.19.	F-15E Maximum Performance Takeoff Inverted.	179
Table	6.16.	F-15E Maximum Performance Takeoff Inverted Parameters.	180
	6.26.	Flat Pass (Right to Left).	181
	6.27.	Four-Point Roll (Left to Right).	181
	6.28.	High G Turn (Right to Left).	181
	6.29.	Triple Aileron Roll (Left to Right).	181
Figure	6.20.	Triple Aileron Roll (Left to Right).	181
Table	6.17.	F-15E Triple Aileron Roll Parameters.	182
	6.30.	Level 8 (Right to Left).	182
Figure	6.21.	F-15E Level 8.	183
Table	6.18.	F-15E Level 8 Parameters.	183
	6.31.	Low Angle Strafe Pass (Left to Right).	184
	6.32.	LAHD Bomb Pass (Right to Left).	184
	6.33.	SAM Weave.	184
	6.34.	Dedication Pass (Left to Right):	184
	6.35.	Knife Edge Pass (Right to Left):	184
	6.36.	Tactical Pitch-Up to Landing (Direction of Landing):	184
Section 6D—Flat Profile			184
	6.37.	Flat Profile Abnormal Procedures:	184
	6.38.	Normal Takeoff:	184
	6.39.	Flat Pass (Left to Right):	184
	6.40.	High G Turn (Right to Left):	184
	6.41.	Flat Pass (Left to Right):	185

6.42.	Level 8 (Right to Left):	185
6.43.	Dedication Pass (Left to Right):	185
6.44.	Knife Edge Pass (Right to Left):	185
6.45.	Tactical Pitch-Up to Landing (Direction of Landing):	185
Section 6E—Staged Show Sites		185
6.46.	Staged Show Site Entry.	185
Figure 6.22.	F-15E Staged Show Sites.	185
Chapter 7—F-22 DEMONSTRATION MANEUVERS		187
Section 7A—General Information		187
7.1.	General.	187
7.2.	Aircraft Configuration and Fuel Requirements.	187
7.3.	Airspeed and G Limits.	187
7.4.	Show line Restrictions.	187
7.5.	Airspace and Runway Requirements.	187
7.6.	Weather Requirements.	187
7.7.	High Density Altitude Demonstrations.	188
7.8.	Demonstration Maneuver Profiles.	188
7.9.	Reposition Maneuvers.	188
Section 7B—High Profile		191
7.10.	Maximum Power Takeoff to High AOA Loop.	191
Figure 7.1.	F-22 Maximum Power Takeoff to High AOA Loop.	191
Table 7.1.	F-22 Maximum Power Takeoff to High AOA Loop Parameters.	192
7.11.	Minimum Radius Turn.	192
Figure 7.2.	F-22 Minimum Radius Turn.	193
Table 7.2.	F-22 Minimum Radius Turn Parameters.	193
7.12.	Weapon Bay Door Pass.	194
Figure 7.3.	F-22 Weapon Bay Door Pass.	195
Table 7.3.	F-22 Weapon Bay Door Pass Parameters.	196
7.13.	Dedication Pass.	196
Figure 7.4.	F-22 Dedication Pass.	196
Table 7.4.	F-22 Dedication Pass Parameters.	197
7.14.	Pedal Turn.	197

Figure 7.5.	F-22 Pedal Turn.	198
Table 7.5.	F-22 Pedal Turn Parameters.	199
	7.15. Power Loop.	199
Figure 7.6.	F-22 Power Loop.	200
Table 7.6.	F-22 Power Loop Parameters.	200
	7.16. Loaded Roll.	201
Figure 7.7.	F-22 loaded Roll.	201
Table 7.7.	F-22 Loaded Roll Parameters.	202
	7.17. Tail Slide.	202
Figure 7.8.	F-22 Tail Slide.	203
Table 7.8.	F-22 Tail Slide Parameters.	203
	7.18. F-22 Slow Speed Pass.	204
Figure 7.9.	F-22 Slow Speed Pass.	204
Table 7.9.	F-22 Slow Speed Pass Parameters.	205
	7.19. Split-S Reposition.	205
Figure 7.10.	F-22 Split-S Reposition.	206
Table 7.10.	F-22 Split-S Reposition Parameters.	207
	7.20. High Speed Pass.	207
Figure 7.11.	F-22 High Speed Pass	208
Table 7.11.	F-22 High Speed Pass Parameters.	208
	7.21. Hoover Pitch.	208
Table 7.12.	F-22 Hoover Pitch.	209
Section 7C—Flat Profile		209
	7.22. Maximum Power Takeoff.	209
	7.23. Minimum Radius Turn.	209
	7.24. Weapon Bay Door Pass.	209
	7.25. Dedication Pass.	209
	7.26. Slow Speed Pass.	209
	7.27. Loaded Roll.	209
	7.28. High Speed Pass.	209
	7.29. Minimum Radius Turn.	209
	7.30. Hoover Pitch to Land.	209
Chapter 8—PUBLICATION MANAGEMENT		210

8.1. Information Collection, Records and Forms.	210
8.1.3. Adopted and Prescribed Forms.	210
Attachment 1—GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION	211
Attachment 2—EXAMPLE SHOW SUMMARY AND CRITIQUE	213
Attachment 3—AERIAL SITE SURVEY	215
Attachment 4—DEMONSTRATION FLIGHT BRIEFING	216
Attachment 5—SAMPLE FIRST YEAR DEMONSTRATION PILOT CERTIFICATION CHECKLIST	218

Chapter 1

OPERATIONAL PROCEDURES

1.1. Introduction. USAF uses single-ship aerial demonstration teams to exhibit the capabilities of modern high performance USAF aircraft and the degree of skill required to operate and maintain these aircraft. ACC is designated lead command and will establish standard criteria for single-ship aerial demonstrations of the A-10, F-15, F-16, F-22 aircraft and the Heritage Flight program. MAJCOMs interested in developing future airshow programs involving these AF MDS aircraft will be governed by this instruction and approved MAJCOM supplements. This instruction provides specific maneuvers, sequences, and parameters governing the execution of these demonstrations. Other MAJCOMs flying single-ship aerial demonstrations of these MDS aircraft will comply with this instruction. Policy and procedures for team management, selection, training, and scheduling will be in accordance with (IAW) applicable MAJCOM supplements. The directives listed in **Attachment 1** provide further policy or procedural guidance in the conduct of these events.

1.2. Terms Explained. Unless otherwise indicated, terms and definitions used in AFI 11-209, *Aerial Event Policy and Procedures*; AFI 35-101, *Public Affairs Policies and Procedures*; and this instruction are the same.

1.3. Waiver Authority. HQ USAF/A3O-AO has delegated waiver authority for this instruction to HQ ACC/A3. MAJCOMs must submit waiver requests through appropriate MAJCOM channels.

1.4. Responsibilities:

1.4.1. MAJCOM/CC:

1.4.1.1. Provides policy for the MAJCOM's single-ship demonstration program IAW this publication.

1.4.1.2. Certifies first year single-ship demonstration pilots prior to the beginning of their first air show season. OCONUS MAJCOM/CCs (PACAF) may delegate the certification of first-year single-ship demonstration pilots but no lower than WG/CC. Include certification authority delegation in the MAJCOM supplement to AFI 11-246, Vol 1.

1.4.2. MAJCOM/A3:

1.4.2.1. Provides supervisory direction over the single-ship demonstration program.

1.4.2.2. Approves the single-ship demonstration schedule(s) and changes or updates.

1.4.2.3. Approves syllabi for single-ship demonstration aircrew upgrade.

1.4.2.4. Approves modified demo profiles when an air or trade show does not allow the allotted time for a full profile.

1.4.2.5. Approves narration scripts used to describe demonstration maneuvers to the viewing public.

1.4.3. MAJCOM Aerial Events Office or MAJCOM/A3 designee:

1.4.3.1. Coordinates all single-ship demonstrations. Analyzes event sites for operational suitability, safety, recruiting value, and availability of demonstration teams.

1.4.3.2. Develops the annual single-ship demonstration schedule and updates.

1.4.3.3. Performs annual review of the MAJCOM supplement to this AFI and unit single-ship demonstration training syllabi.

1.4.3.4. If applicable, develops OCONUS event schedule and provides Mission Aerial Support funding for deployments.

1.4.3.5. Prepares waiver recommendations for HQ ACC/A3 approval.

1.4.3.6. Provides event sponsors with the Single-Ship Demonstration Team Support Manual to assist them with the necessary preparations.

1.4.3.7. If applicable, maintains the MAJCOM Air Demonstration Public web site to include: current single-ship demonstration schedules, Single-Ship Demonstration Team Support Manual, and the scheduling process.

1.4.3.8. Coordinates initial MAJCOM/CC certification of first year single-ship demonstration pilots IAW [Attachment 5](#).

1.4.3.9. Maintains demonstration team certification documentation.

1.4.3.10. Reviews demonstration grade sheets and forward comments to MAJCOM/A3.

1.4.3.11. Reviews demonstration ground video of all public demonstrations.

1.4.3.12. Develops, reviews, and modifies demo profiles in coordination with the teams, for MAJCOM/CC or MAJCOM/A3 approval as applicable.

1.4.4. NAF commanders or equivalent will: Approve single-ship demonstration prior to MAJCOM/CC's certification for first-year demonstration pilots.

1.4.5. Wing commanders or equivalent:

1.4.5.1. Select and train demonstration team personnel IAW this instruction. Operations and maintenance group commanders may provide nominations, but the wing commander will keep the final approval authority to provide the necessary oversight of the demonstration program.

1.4.5.1.1. Ensure mission effective command oversight of all team elements and personnel.

1.4.5.1.2. Ensure dedicated maintenance support of the demonstration team.

1.4.5.1.3. Designate responsibility for resource management of all team funding.

1.4.5.2. Forward the upgrading demonstration pilot's grade book per MAJCOM supplement for approval.

1.4.5.3. Annotate pre-certification of demonstration team (high show) in demonstration pilot grade book and forward to NAF/CC or equivalent for endorsement.

1.4.5.4. Annotate re-certification of demonstration team (high show) in demonstration pilot grade book for second and subsequent year demonstration pilots.

1.4.5.5. Coordinate with MAJCOM Aerial Events Office on single-ship demonstration schedule.

1.4.5.6. Provide a ground video and grade sheet of a current performance for WG/CC re-certified pilots to MAJCOM/A3.

1.4.5.7. Provide the demonstration team's annual budget per MAJCOM supplement to MAJCOM/A3.

1.4.5.8. Ensure senior leadership review of every practice and demonstration by reviewing the HUD tape, or ground video, and grade sheet IAW [paragraph 1.11](#) of this instruction. This duty may be delegated to the WG/CV, OG/CC, or OG/CD. If one or more of these leaders are not current and qualified in the demo aircraft MDS, the WG/CC may delegate this to a SQ/CC who is current and qualified in the MDS. When not delegated, forward the ground video, and grade sheet IAW [paragraph 1.4.6.4](#) below. **NOTE:** The F-22 is incapable of recording the HUD at most locations.

1.4.5.8.1. (**Added-35FW**) For each post-certification demonstration practice, senior review authority is delegated by the 35 FW/CC to the 35 OG/CC or /CD. If the 35 OG/CC and /CD are unavailable, the grade sheet will be reviewed by senior leadership IAW AFI 11-146V1. The senior reviewer will forward the grade sheets to PACAF/DOOA after review IAW the timeline specified in AFI-11-246V1. The Demonstration Pilot (Team Commander) will maintain the HUD tapes for one year or ensure the digitized copy are retained on the PACAF F-16 Aerial Demonstration Team HUD Video community of practice for a year. The community of practice is located _____ at: <https://www.dmy.af.mil/afknprod/ASPs/CoP/EntryCoP.asp?Filter=OO-SC-PC-16>. The team commander may maintain the HUD tapes for longer than the required time period at the 35 OG/CC's discretion.

1.4.6. Operations Group commanders or equivalent:

1.4.6.1. Provide command oversight of the demonstration team operations element personnel.

1.4.6.1.1. (**Added-35FW**) The operations element of the F-16 Demonstration Team is directly responsible to the 35 OG/CC and will consist of one demonstration pilot (Team Commander), and minimum of four and maximum of six safety observers (pilots).

1.4.6.2. Coordinate with MAJCOM Aerial Events Office designee on single-ship demonstration schedule.

1.4.6.3. Request relief from MAJCOM Aerial Events Office designee if it is determined that an event should not be supported (for safety, OPTEMPO, financial reasons, etc.).

1.4.6.4. Review the HUD tape or ground video, and grade sheet of every practice and demonstration IAW [paragraphs 1.4.5.8](#) and [1.11](#) of this instruction. Provide within 5 work days of each home training event/demonstration or within 5 work days after returning to home station following deployed demonstrations, the following data:

1.4.6.4.1. To MAJCOM Aerial Events Office or MAJCOM/A3 designee:

- 1.4.6.4.1.1. Grade Sheet of every practice and public demonstration.
- 1.4.6.4.1.2. HUD or Ground Video Tape of all public demonstrations.
- 1.4.6.4.2. To WG/CC (if review not delegated):
 - 1.4.6.4.2.1. Grade Sheet of every practice and public demonstration.
 - 1.4.6.4.2.2. HUD or Ground Video Tape of every practice and public demonstration.
- 1.4.6.5. If applicable, attend at least one off-station show during the demonstration season.
- 1.4.6.6. Provide Stage 2 certification to demonstration pilot IAW [paragraph 2.5.13](#) of this instruction.
- 1.4.6.7. Establish procedures for nominating the best qualified demo pilots, narrators, and safety observers to be dedicated to the demonstration team.
- 1.4.7. Maintenance Group commanders or equivalent:
 - 1.4.7.1. Establish procedures to nominate the best-qualified maintenance personnel to be dedicated to the demonstration team.
 - 1.4.7.2. Ensure maintenance personnel selected to the airshow/demonstration program are assigned to an AMU but dedicated to the demonstration team.
- 1.4.8. **Demonstration pilots:**
 - 1.4.8.1. Coordinate demonstration team availability IAW MAJCOM supplements.
 - 1.4.8.2. Coordinate demonstration team support requirements with event point of contact.
 - 1.4.8.3. Coordinate with local Air Force recruiter team's availability and ability to support local Air Force recruiting efforts.
 - 1.4.8.4. Cancel any demonstration when the assigned performance location compromises safety or exceeds aircraft performance capabilities.
 - 1.4.8.5. For off-station sites, accomplish either a practice demonstration or aerial survey (IAW [Attachment 3](#)) at the air show site prior to air show demonstration.
 - 1.4.8.6. Review and grade the HUD tape (if available) and ground video of every practice and demonstration using the grade sheets per [paragraph 1.11](#), obtain ground safety observer review, and forward to the reviewing officer IAW [paragraph 1.4.5.8](#). During training/non-airshow season, upgrading demo pilots will place all grade sheets in their grade book and will forward all HUD or ground tapes for wing leadership review. After MAJCOM/CC certification, demo pilots will begin forwarding the grade sheet and the HUD or ground tape IAW [paragraph 1.4.6.4](#) of this instruction, including those occurring during training/non-airshow season in-between the demo pilot's first and second year.
 - 1.4.8.7. **Individual Responsibility.** Each member assigned to the MAJCOM Single-Ship Demonstration Team must fully understand the solemn trust and special obligation that accompanies a position on the demonstration team. Individual behavior, bearing, and

appearance shape not only the team image but also public image of the USAF. First among the team's many responsibilities is the safety of demonstration audiences. There can be no aspect of any team member's life style or daily conduct that would in any way impair the team's performance or jeopardize public safety. Each member must be at the peak of physical and mental capabilities for all demonstration team activities. In addition, given the continuous rigor of the demonstration team schedule, each member must be able to sustain this mental and physical capability level over an extended period of time. The key to this sustained performance is the establishment of a personal daily regimen to include regular eating, hydration, adequate sleeping, and proper exercise habits, which will minimize the adverse effects of continuous travel, cultural/dietary differences, and time zone changes.

1.4.8.7.1. In view of the special obligations incumbent whether performing in the air or providing ground support, each member of the team, will adhere to the following policies: In no case will the provisions of AFI 11-202 Vol 3, General Flight Rules, concerning the consumption of alcoholic beverages be violated. Additionally, alcoholic beverages will not be consumed later than 12 hours prior to reporting for duty when aerobatic maneuvers are scheduled for the following day. For cross-country flights not involving aerobatic maneuvers, the provisions of AFI 11-202 Vol 3 apply. Although the provisions of this policy do not quantify the maximum amount of alcohol permitted to be consumed, the intent, in concert with a daily regimen and peak daily mental and physical capability, mandates the highest individual responsibility and moderation with the fullest recognition of the next day's duties and obligations.

1.4.8.7.2. Lifestyle and daily activities, on and off duty, will be governed by the need to minimize personal risk and totally avoid any display of reckless behavior. Activities that could result in personal injury or jeopardize availability for team activities are inappropriate for team members. Although each demonstration team activity deserves special attention, those involving demanding flight operations unique to the air demonstration mission, specifically aerobatic maneuvers, whether for practice or official demonstration, are the most critical.

1.4.8.7.3. (**Added-35FW**) The team commander will be in command when the team is off-station during all demonstration-sponsored events. The team superintendent will be the immediate and direct supervisor for all maintenance team members during all demonstration team sponsored events and TDYs. He is also the acting First Sergeant for the team. Together, the team commander and superintendent will address disciplinary actions as permitted by their authority during demonstration-sponsored events and TDYs.

1.4.9. **Demonstration team ground safety observers:**

1.4.9.1. Complete safety observer training and documentation per [paragraph 2.5](#).

1.4.9.2. Monitor all practices and demonstrations with maneuvers conducted below 2,000 feet AGL.

1.4.9.3. Maintain two-way radio communication with the demonstration pilot, monitor demonstration pilot altitude and airspeed radio calls, and direct maneuver abort if outside prescribed parameters.

1.4.9.4. Monitor the demonstration for potential hazards (e.g., flocks of birds, unscheduled aircraft, weather).

1.4.9.5. Critique each maneuver and note needed improvements in the performance. However, in no case should critiquing maneuvers take precedence over monitoring the safe accomplishment of maneuvers.

1.4.9.6. Review the HUD tape or ground video and grade sheet of every practice and demonstration.

1.4.10. **(Added-35FW)** The Demonstration Team.

1.4.10.1. **(Added-35FW)** During the normal week and show season, the team commander, safety observers, superintendent and maintenance technicians are still active members of the 35 FW and perform daily duties as such. However, when there are official demo functions, team members must be released from their duty sections. This includes time for maintenance and appearance of the demonstration aircraft, preparation for deployments/TDY's, scheduled public affairs, recruiting and civic events. Demonstration team members will not be scheduled for weekend duty, squadron or section additional duties, squadron deployments, or details during the demonstration season or pre-season work-up. Exceptions must be coordinated with the owning squadron commander. During the off-season, maintenance team personnel will remain assigned to the team. Leave will be minimized during the season as much as possible. Team members will not be available or tasked for squadron deployments during the demonstration season unless circumstances dictate otherwise and approved by the 35 FW/CC. All team members should be made available for all demonstration shows.

1.4.10.2. **(Added-35FW)** The 35MXG will provide three aircraft for use by the team on all local and off-station demonstrations. All three aircraft will be designated in writing by the 35 FW/CC. These three aircraft will not be cannibalized and will not normally be available for peacetime squadron deployments during the demonstration season or pre-season work-up. Designated demonstration aircraft must be made available to the demonstration team NLT three duty days prior to an off-station demonstration and NLT three calendar days prior to a local demonstration.

1.4.10.2.1. **(Added-35FW)** 35 AMXS will provide team travel pods, tools, tool boxes, support equipment, test equipment, and cleaning materials for off-station demonstrations. Travel pods will be painted and in working condition.

1.4.10.2.2. **(Added-35FW)** The 35 AMXS will provide a storage/workspace for the demonstration team (outside support section) to store their deployment ISUs.

1.4.10.2.3. **(Added-35FW)** The 35 AMXS should provide a programmed MIDS and MMC for off-station demonstrations if they are available in the MRSP kit or cann aircraft/TNB.

1.4.10.3. **(Added-35FW)** Additional Duties within the Demonstration Team.

1.4.10.3.1. **(Added-35FW)** Narrator(s).

1.4.10.3.1.1. **(Added-35FW)** Maintain the scripted narration and keep it updated.

1.4.10.3.1.2. **(Added-35FW)** Work with air show coordinators on which narration will be used and be responsible for the interpretation of the proper narration as required.

1.4.10.3.1.3. **(Added-35FW)** Keep accurate account, maintenance serviceability status and requirements of all radio communications, computer and audio/visual equipment assigned to the team.

1.4.10.3.2. **(Added-35FW)** Support Equipment Representative.

1.4.10.3.2.1. **(Added-35FW)** Maintain an accurate list with serviceability status of all support and test equipment, AGE, cleaning materials and -21 equipment required for each air show.

1.4.10.3.2.2. **(Added-35FW)** Work with supply to maintain and deploy, when required, the demonstration MSK Kits and miscellaneous parts.

1.4.10.3.2.3. **(Added-35FW)** Pack, process and deploy cargo in preparation for team deployments.

1.4.10.3.2.4. **(Added-35FW)** Maintain the serviceable status on all three travel pods issued to the team by the AMU.

1.4.10.3.3. **(Added-35FW)** Travel arrangements.

1.4.10.3.3.1. **(Added-35FW)** The team superintendent is responsible for maintenance members' TDY travel arrangements, procuring military airlift to and from the air show, ground transportation, commercial airline tickets, and lodging.

1.4.10.4. **(Added-35FW)** Support Team Uniforms.

1.4.10.4.1. **(Added-35FW)** Maintenance team members will be provided distinctive duty and social uniforms as outlined in AFI 36-2903_Misawa Sup 1. The funding for the uniforms will be incorporated in the annual team budget provided by PACAF. The following uniform items will be issued to each team member upon joining the team:

1.4.10.4.1.1. **(Added-35FW)** Two (2) black flight suits with three (3) full sets of patches and two (2) sets of aircrew style name patches. One set will be in English and the other will be in Japanese.

1.4.10.4.1.2. **(Added-35FW)** Two (2) blue maintenance uniforms with two (2) full sets of patches, nametapes and occupational badges.

1.4.10.4.1.3. **(Added-35FW)** Two (2) yellow and two (2) white T-shirts.

1.4.10.4.1.4. **(Added-35FW)** One (1) black demonstration ball cap.

1.4.10.4.1.5. **(Added-35FW)** One (1) polo style shirt with the demonstration emblem on it.

1.4.10.4.1.6. **(Added-35FW)** One (1) pair of demonstration team sun glasses.

1.4.10.4.1.7. **(Added-35FW)** One (1) pair of steel toed black high gloss safety

boots.

1.4.10.4.1.8. **(Added-35FW)** One (1) pair of ear defenders.

1.4.10.4.1.9. **(Added-35FW)** One (1) pair of tan khaki pants.

1.4.10.4.1.10. **(Added-35FW)** One (1) black demonstration cold weather watch cap.

1.4.10.4.1.11. **(Added-35FW)** One (1) pair of black gloves.

1.4.10.4.1.12. **(Added-35FW)** Two (2) black T-shirts with demonstration logo and/or PACAF emblem on the front and back.

1.4.10.4.2. **(Added-35FW)** Blue Maintenance Coveralls. Team members are authorized the wear of the blue maintenance uniforms at show locations as directed by team superintendent.

1.4.10.4.3. **(Added-35FW)** Black Flight Suits. These will be worn during the demonstration sponsored team events as directed by team superintendent. Team members are authorized the wear of yellow T-shirt with the demo logo on the front and back of the T-shirt with the black flight suits.

1.4.10.4.4. **(Added-35FW)** Black Demonstration Polo Shirt and Tan Khaki Pants. Will be worn to all official social demonstration team sponsored events where uniforms are not specified or required.

1.4.11. **(Added-35FW)** 35th Fighter Wing Public Affairs.

1.4.11.1. **(Added-35FW)** 35 FW/PA is responsible for public relations packages in conjunction with local and off-station aerial demonstrations by the PACAF Demonstration Team. 35 FW/PA will, at a minimum, coordinate with public affairs offices nearby where off-station demonstrations are to be performed to enhance and promote the mission of recruiting and public relations. U.S. Military and Air Force public relations activities such as team visits to area schools, civic organizations, recruiting visits and media stations will be coordinated by the team superintendent with support from 35 FW/PA as required. 35 FW/PA will produce a media package for the demonstration team to be completed and approved by the demonstration team commander NLT 15 February of the upcoming season. 35 FW/PA will also coordinate for individual and group demonstration team pictures NLT 15 February of the upcoming season.

1.4.12. **(Added-35FW)** Financial Support.

1.4.12.1. **(Added-35FW)** 35 OG/RA will complete demonstration team members' TDY orders NLT three duty days prior to TDY date. 14 FS Operations Personnel Management will accomplish flight orders.

1.4.12.2. **(Added-35FW)** PACAF provides funding to the 35 FW for travel and per diem for off-station demonstrations and team-related travel. They will also provide necessary funding for communication equipment replacement and team uniforms. The Team Superintendent must be trained and issued a Government Purchase Card (GPC) to purchase required team supplies, equipment and uniforms. The team commander, superintendent and 35 OG/RA will manage the demonstration annual budget. The annual

financial planning process and budget execute reviews must include inputs from the MXG/CC concerning budget shortfalls and requirements.

1.4.12.3. **(Added-35FW)** The demonstration team commander and superintendent will carry cell phones with voice mail, paid for by PACAF demo funds, for deployed communication with other deployed team members and home station while TDY within Japan. The phone will be used to communicate with home station the status of personnel, aircraft, and logistics.

1.4.13. **(Added-35FW)** Ground and Maintenance Operational Procedures.

1.4.13.1. **(Added-35FW)** Superintendent will be notified of maintenance team members being tasked for duties outside the squadron, training, leave, and compensation time off before the team member is released. The superintendent will coordinate with each team member's section chief and training manager to ensure each team member receives the required demonstration team training. The superintendent will also notify each section chief of all TDYs and practice times.

1.4.13.1.1. **(Added-35FW)** Team members will be made available for all team duties. Team duties include, but are not limited to, meetings, team practices, public relations functions, off-station TDY support, local and off-station demonstration flights, recruiting visits, and aircraft preparation prior to deployment or demonstration. Each member must be released from work to attend each of these events.

1.4.13.1.2. **(Added-35FW)** Team members will be made available to prepare for each show NLT three duty days prior to each deployment. Deploying team members should also be given one day compensatory day off immediately after each deployment.

1.4.13.2. **(Added-35FW)** Team commander and superintendent will determine required personnel to attend each off-station deployment.

1.4.14. **(Added-35FW)** Flying Operations Procedures.

1.4.14.1. **(Added-35FW)** Demonstration practices will not be flown within 30 minutes of sunrise or sunset or when the bird condition at Misawa AB is severe.

1.4.14.2. **(Added-35FW)** Wing Scheduling (35 OSS/OSO) will coordinate with Base Operations and Japanese aviation authorities to NOTAM airfield closure during demonstration practices. 35 OG squadrons will also be notified of any airfield closures and impacts on wing flying.

1.4.14.2.1. **(Added-35FW)** Misawa's air traffic area will be closed from surface to 15,000 ft within a 5 mile radius. No takeoffs or landings are permitted. Aircraft are allowed to arm / de-arm normally and return to the chocks / hot pits. Aircraft may taxi to EOR and arm normally, but may not make any radio calls over the tower frequency and will not be allowed to cross Rwy 10/28.

1.5. Requests and Approval.

1.5.1. CONUS (including Alaska and Hawaii) civilian locations requesting an aerial demonstration must submit the appropriate request to the Office of the Secretary of Air Force

for Public Affairs (SAF/PA). SAF/PA notifies applicable MAJCOM of events that are eligible for consideration. In the PACOM AOR, civilian locations requesting an aerial demonstration must submit the appropriate request to the Office of Assistant Secretary of Defense for Public Affairs (OASD/PA). OASD/PA notifies PACAF of events that are eligible for consideration.

1.5.2. Air Force units may submit a request directly to HQ ACC/A3TA or other MAJCOM teams for consideration.

1.5.3. Requests from other services should be submitted, through command channels, to HQ ACC/A3T or other appropriate MAJCOM office in accordance with applicable directives.

1.6. Scheduling and Policies. Per MAJCOM supplement to this instruction.

1.6.1. **(Added-35FW)** Maintenance and sortie scheduling will be accomplished IAW ACCI 21-165.

1.7. Support Manual. Detailed information on show site pre-show coordination requirements is contained in the MAJCOM Single-Ship Demonstration Team Support Manual. This manual must be reviewed/revised annually and made available to all aerial event coordinators hosting a single-ship demonstration team, via website, e-mail, normal mail, or fax. For example, HQ ACC/A3TA maintains a copy of the current ACC Support Manual on the Air Combat Command Aerial Events website (<http://www.acc.af.mil/aerialevents/>).

1.8. Arresting Gear Support. For any F-15 or F-16 Demonstration team: show sites without arresting gear and with runways less than 8,000 feet must provide temporary arresting gear if an airfield with suitable arresting gear or runway length at least 10,000 feet is not within 80 NM of the show location or 30 miles from the staged location. For the F-22 Demonstration team, all show sites (regardless of runway length) must have either suitable arresting gear on site or must have a 7000' runway with arresting gear within 80nm.

1.9. Reporting.

1.9.1. The pilot, narrator, ground safety observer, or NCOIC will transmit via phone, fax, or email a post-demonstration report to the MAJCOM Aerial Events office after each day's scheduled public demonstration. As a minimum, include:

1.9.1.1. Weather (if a factor).

1.9.1.2. Show profile.

1.9.1.3. Estimated crowd count.

1.9.1.4. Unusual occurrences/remarks.

1.9.1.5. Any report with an unusual occurrence or area with an unsatisfactory from **Attachment 2** requires an immediate detailed e-mail/fax.

1.9.2. Submit End of Show Summaries and Critiques to MAJCOM Aerial Events NLT 2 work days after each show IAW the MAJCOM approved format. See sample at **Attachment 2**.

1.10. Recommended Changes.

1.10.1. Refer recommended changes and questions about to this publication to the Office of Primary Responsibility (OPR) using the AF IMT 847, *Recommendation for Publication Change*; route AF IMT 847s from the field through the appropriate functional's chain of command to HQ ACC/A3T.

1.10.1.1. Any demo team wishing to perform new maneuvers not outlined in this instruction will submit a detailed description of the maneuver, parameters, and abort procedures to ACC/A3TA for coordination and the WG/CC for approval to practice. New maneuvers will be developed by the demo pilot and evaluated in the simulator prior to flight. Once parameters have been established and the maneuver has been flown satisfactorily in the simulator, demo pilots will fly and evaluate maneuvers in working airspace above 5,000' AGL and then above 2,000' AGL. Once safety evaluation has been accomplished in working airspace, demo pilots will fly the maneuver over the airfield at or above 1,000' AGL and again at 500' AGL, prior to flying the maneuver at maneuver minimums. All maneuver evaluations will be documented on a gradesheet and maintained in the demo pilot's gradebook as well as sent to MAJCOM. Once the maneuver is perfected in practice, a change to this AFI will be submitted IAW **para 1.10.1**. Demo pilots will not perform new maneuvers in actual demonstrations unless approved by MAJCOM/CC.

1.10.2. Each demonstration team may supplement this instruction as necessary. Team organization, maintenance support, selection criteria, and training programs for new pilots are examples of items that may be supplemented. Submit supplements to HQ ACC/A3TA for coordination prior to publication and forward one copy to HQ USAF/A3O-AO after publication.

1.11. Demonstration Performance Reviews/Grade Sheets.

1.11.1. Every practice and demonstration will be recorded on the pilot's HUD tape. Every practice and demonstration involving aerobatics of any kind conducted below 2,000 feet AGL will be videotaped. Each demonstration will be debriefed using these videotapes. Demonstration pilots will use the approved Microsoft Excel grade sheet to evaluate each flight. MAJCOM/CC or A3 may request a videotape and HUD tape for review at any time during the air show season. Demonstration teams will maintain videotapes, HUD tapes, and completed grade sheets for a minimum of one year. Approved grade sheets will be provided by ACC/A3TA.

1.11.2. Each maneuver will be graded using a scale of 0 to 4 and averaged to compute an overall demonstration grade of 0 to 4. Wing reviewers must comment and make recommendations on any maneuver graded zero (0). A maneuver grade of 0 should not be automatically considered dangerous unless the manner in which the maneuver was performed created a safety of flight situation. However, if safety is compromised then the overall demonstration grade will be zero (0). Wing reviewers will recommend additional training for any overall demonstration graded zero (0). The average grade for a typical air show should be a two (2). The grade sheets will reflect altitude and airspeed to the greatest accuracy possible. The following grading criteria will be used to establish individual maneuver and overall demonstration grades.

1.11.2.1. To compute the maneuver grade, "X" equals the distance between the target and minimum altitudes. As an example, if the target altitude is 6,000 feet and the

minimum altitude is 5,000 feet then “X” equals 1000 feet and $1/2X$ equals 500 feet. Grade 0 would be given for all altitudes below 5,000 feet; Grade 1 for all altitudes from 5,000 to 5,499 feet; Grade 2 for all altitudes 5,500 to 5,999 feet and above 6,501 feet; Grade 3 for all altitudes from 6,001 to 6,500 feet; and Grade 4 if altitude equals 6,000 feet. (Figure 1.1)

1.11.2.2. GRADE 0 – Altitude below minimum, or airspeed out of limits.

1.11.2.3. GRADE 1 – Altitude $>1/2X$ below target, and airspeed within limits.

1.11.2.4. GRADE 2 – Altitude $<1/2X$ below target or $>1/2X$ above target, and airspeed within limits.

1.11.2.5. GRADE 3 – Altitude $<1/2X$ above target, and airspeed ± 25 knots of target.

1.11.2.6. GRADE 4 – Altitude on target, and airspeed ± 10 knots of target.

1.11.2.7. Airspeed criteria do not apply to the A-10 unless airspeed is below minimum parameter; the maneuver grade is zero.

1.11.2.8. OVERALL GRADE = Computed average of the maneuver scores.

0 = Dangerous performance

1 = Safe performance, but trend is low

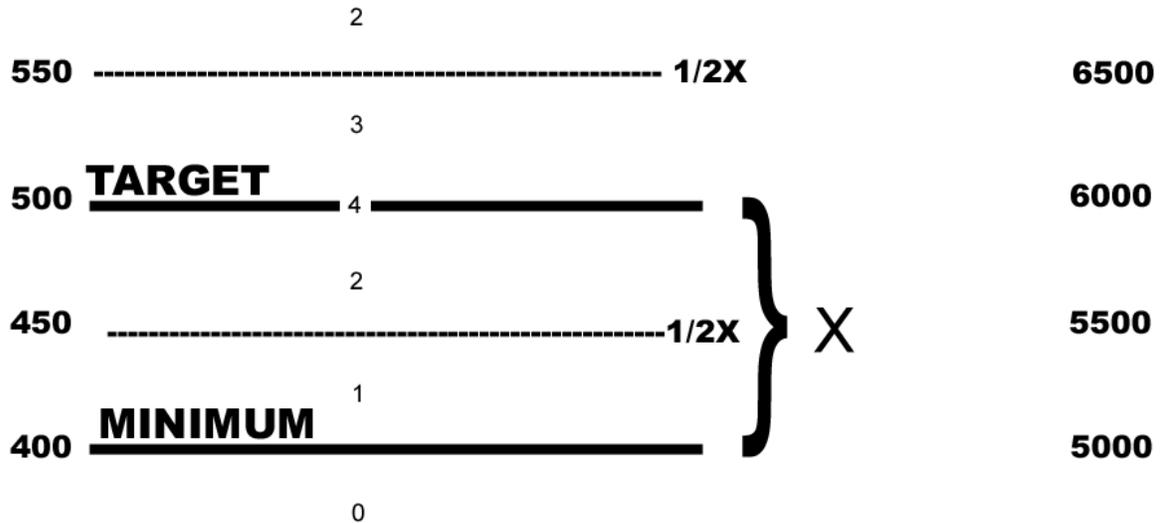
2 = Average performance

3 = Outstanding performance

4 = Perfect performance; no deviations

1.11.3. Refer to [paragraph 1.4.6.4](#) for wing and HHQ grade sheet and tape review requirements.

Figure 1.1. Grading Ranges.



1.12. Proficiency Requirements. To maintain currency, each pilot will fly a minimum of one demonstration every 15-calendar days. A practice session or actual demonstration will be scheduled at least once per week during air show season. If the 15 calendar days currency is exceeded, the next demonstration will be limited to no-lower-than 1000 feet AGL target and 900 feet AGL minimum on all maneuvers, and the operations group commander, deputy operations group commander, or WG/CC designee must be present. MAJCOMs may determine additional procedures for pilots to regain currency.

1.13. Termination Procedures. Demonstrations involving aerobatics flown below 2,000 feet AGL will be terminated when:

- 1.13.1. The safety observer is unable to monitor the safe performance of maneuvers.
- 1.13.2. Two-way radio communication is lost between the demonstration pilot and safety observer.
- 1.13.3. Videotaping is lost.
- 1.13.4. Any time when in the judgment of the pilot or safety observer the safety of the pilot or spectators is compromised.

1.14. Transition During Performance. Each demonstration should be planned to fly a complete high, low, or flat show profile. However, conditions such as scattered clouds in the show area may require the demonstration pilot to transition between show profiles at certain transition points.

1.15. Altimeter Procedures. It is essential that each demonstration pilot be able to quickly and accurately assess actual altitude above the ground during any maneuver in the demonstration. To avoid the mental exercise required to subtract an odd-numbered field elevation from the MSL altimeter reading to get above ground altitude, one of the two procedures described below will be used to “zero the altimeters” (QFE). These procedures will be used for all practice and actual demonstrations whether flown from takeoff at the show site or takeoff from a deployed location.

1.15.1. **Zero Altimeter Method.** Dial aircraft altimeter until indicator reads “0”. This method will be used if possible.

1.15.2. **Nearest 1,000 Feet Method.** If it is not possible to zero the altimeter, dial the altimeter to the current altimeter setting for the field, then round up or down to the most appropriate 1,000 feet corrected field elevation (500 round down, 501 round up).

1.16. Communication Procedures. The demonstration pilot and safety observer will operate on a discrete frequency during all practice and official demonstrations. This is to minimize the amount of third-party radio chatter that can distract the demo pilot and step on required radio calls from the pilot and safety observer during the demonstration. The safety observer will be the only person in direct contact with the demo pilot. As such, all other parties must coordinate through the safety observer for any information needed regarding the demo pilot or the demonstration. To ensure communications with the appropriate controlling agency (tower or air boss), the safety observer will monitor the appropriate control frequency. If the safety observer is engaged in a protracted conversation with the controlling agency that prevents the safety observer from devoting 100% attention to the primary duty of visually and aurally monitoring the demonstration, the safety observer will terminate the demonstration. Once the situation has been resolved and the safety observer can once again give the demonstration 100% attention, the demonstration may continue. These procedures do not pertain to Heritage Flight formation performances.

1.17. Use of Teams for Static Display. The demonstration pilot and narrator/ground safety observer should normally arrive in two aircraft with one to be used as a spare for the demonstration. MAJCOMs may determine if second aircraft can be used as static if spare is not required. This may be verbally delegated to the demo team on a case by case basis.

1.18. Disbursement of Demonstration Team Funds. Per MAJCOM supplement.

1.19. Shortened/Modified Demonstrations. On occasion, certain air or trade shows may require that a demonstration pilot fly a shortened or modified show, due to the time constraints applicable to the show. MAJCOMs must consider the level of importance of participating in the show, the anticipated recruiting value, and the complexity involved in shortening a demonstration profile to determine the cost/benefit of attending the show. Further consideration should be given to demo pilot proficiency and experience level. A profile may be **shortened** by removing, or knocking-off the last few maneuvers. A profile may be **modified** by removing maneuvers throughout the profile, but maintaining the sequential flow of the remaining maneuvers. In no case will a demo pilot fly a shortened or modified profile when request is made

upon arrival at the show site. Four weeks notice is required from show POCs for a shortened or modified profile to be considered, and the show POC will notify the team of the allotted performance time. The demo pilot will shorten or modify the profile to fit in the allotted time by removing certain maneuvers, but the maneuvers must flow in the same sequence as the full profile. Demo pilots will submit a modified profile through command aerial events to MAJCOM/A3 for approval NLT three weeks prior to the show. (OCONUS MAJCOM/A3s (PACAF) may delegate the approval authority for modified profiles no lower than WG/CC. Include delegation of approval authority in the MAJCOM supplement to AFI 11-246, Vol. 1.) Demo pilots are required to practice within ten working days prior to the show both shortened and modified profiles at least once. OG/CC or higher will monitor the practice to note safety considerations and listen to the narration.

Chapter 2

DEMONSTRATION TEAM PERSONNEL SELECTION AND TRAINING

2.1. General. MAJCOMs will provide team description and location via supplement. A standard team includes two aircraft, one demonstration pilot, a minimum of two narrators, two safety observers, and necessary support personnel. Team will deploy with a ground safety observer. Ground safety observers will not simultaneously perform narration duties. Team selection should consider factors affecting assignment stability such as vulnerability for schools or overseas assignment.

2.2. Demonstration Pilot Selection. New demonstration pilots will normally be selected by Wing Commanders in August and enter training no later than September prior to the new pilot's first air show season. Demonstration pilot duty is normally a two-year assignment.

2.2. (35FW) Demonstration Pilot Selection. The 35 FW/CC is responsible for final selection and will approve and certify the new demo pilot upon completion of training. The selection process will begin in the fall, but all cases will be completed NLT 1 April. This timeline will ensure the incoming pilot attends at least one staged and one non-staged show prior to the demonstration. Typically Iwakuni Friendship Day will be the non-staged show, with Hofu or Shizuhama serving as the staged show. Interested pilots will submit a resume and letter of desire to the 35 OG/CC and a copy to the Demonstration Team CC through their respective squadron commanders. 35 OG/CCE will schedule interviews with the 35 OG/CC and coordinate final interviews with the 35 FW/CC. *Minimum requirements:* 750 hrs fighter-coded flight time (T-38 included), 300 hrs F-16 flight time, instructor pilot (desired), flight commander equivalent (Major or senior Captain).

2.3. Narrator/Ground Safety Observer Selection.

2.3.1. Narrators will be selected by the wing commander. To reduce the impact on flying operations by minimizing the number of pilots per TDY, consideration should be given to select non-rated officers or NCOs as the narrator. The narrator tour of duty is a minimum of one year.

2.3.1.1. **(Added-35FW) Narrator(s).** MSgt through SrA in any AFSC currently assigned to the team. Must be an articulate speaker with the ability to be spontaneous and adapt to multiple types of situations. This member is selected from members within the team. This member will be interviewed and selected by the team commander and superintendent, confirmed by the 35 OG/CC before being sent to the 35 FW/CC for approval. The 35 FW/CC will designate the narrators in writing.

2.3.2. Ground safety observers must be rated officers current and qualified in the MDS. Ground safety observers will be selected by wing commanders during training season for upgrade training in preparation for the following air show season. Demo teams will be limited to a maximum of six ground safety observers to ensure sufficient currency and proficiency for each. The normal ground safety observer tour of duty is one year. New ground safety observers may be trained during mid-season for PCS/deployment reasons if necessary, but the maximum number remains six. All ground safety observer names will be recorded in the demo team grade book. WG/CC, OG/CC, OG/CD, SQ/CC, and SQ/DO may

perform ground safety observer duties at any time, provided they are current and qualified in the MDS.

2.3.3. **(Added-35FW)** Safety Observers. The wing commander is responsible for final selection and approval of six (maximum) safety observers. Interested pilots will submit a resume and letter of desire to the 35 OG/CC and the Demonstration Team CC, through their respective squadron commanders NLT 1 December. The Demonstration Team CC will conduct an initial interview with the prospective candidates and forward recommendations to the 35 OG/CC. The candidates will then be interviewed by the 35 OG/CC and final selection forwarded to the 35 FW/CC for approval by 1 January. Safety observers will remain assigned to their respective squadrons and will normally be required to serve for the duration of one season. If a safety observer is unable to finish the season due to a PCS, new candidates can be selected following the process stated above. *Minimum requirements:* Current and qualified F-16 pilot, 4-ship Flight Lead (desired).

2.4. Support Personnel Selection. Support personnel are selected by the wing commander. As new enlisted personnel are assigned to the demonstration teams, it is appropriate to request assignment deferments. However, since AFPC's support/approval of the deferments is directly linked to overseas assignment vulnerability, it is strongly recommended that prospective local candidates be verified by the MAJCOM Airman Assignments Branch before they are firmly hired. A cursory check with AFPC can prevent the WG/CC from hiring people for the team who are extremely vulnerable for PCS.

2.4.1. **(Added-35FW)** Team Manning. The maintenance portion of the F-16 Demonstration Team is directly responsible to the 35 MXG/CC and consists of the team superintendent, three crew chiefs, two avionics specialists, one propulsion system specialist and one aircraft structural maintenance craftsman. The second highest ranking team member will be the Assistant Superintendent. The team will be 100 percent manned. Maintenance Support Team members will be in the following grades and AFSCs:

2.4.1.1. **(Added-35FW)** Team Superintendent or NCOIC (1). MSgt in a maintenance AFSC (2A372, 2A373, 2A676, or 2W171). The superintendent must possess exceptional release (ER) and all system Red 'X' (excluding Egress system).

2.4.1.2. **(Added-35FW)** Team Assistant Superintendent (1). TSgt in AFSC 2A373 or 2A372. The assistant superintendent must possess Red 'X' orders in his/her primary AFSC. He/She will be qualified and counted as a member in one of the AFSCs listed below. He/She is the highest-ranking individual in the 2A373 or 2A372 career fields within the team.

2.4.1.3. **(Added-35FW)** Team Crew Chiefs (3). SSgt, SrA or A1C in the AFSC 2A3X3. One SSgt and SrA or A1C should be assigned to each AMU. The SSgt's must possess Red 'X' orders in his/her primary AFSC. This individual must also be trained and certified to perform inlet & exhaust inspections.

2.4.1.4. **(Added-35FW)** Avionics Specialist (2). SSgt or SrA in AFSC 2A3X2. Individual should be well qualified 5-level on common tasks associated with all three AFSC suffixes.

2.4.1.5. **(Added-35FW)** Propulsion System Craftsman (1). SSgt or SrA in AFSC 2A651. The individual should be a well qualified on all common tasks associated with

their systems on the F-16 and GE-129 engine. This person must be trained and certified to perform blade blend, inlet & exhaust and borescope inspections.

2.4.1.6. **(Added-35FW)** Aircraft Structural Maintenance Craftsman (1). TSgt or SrA in AFSC 2A7X3. Individual should be well qualified with procedures to restore minor superficial flaws on the F-16.

2.4.2. **(Added-35FW)** Demonstration team personnel will be assigned for a two-year rotation unless reassigned by PCS, separation, retirement, or removed administratively by the team commander and superintendent. Past members will not normally be reconsidered for demonstration team membership after being gone for an extended period (i.e. remote tour).

2.4.3. **(Added-35FW)** Support Personnel Selection Process. Once a vacancy exists, the Team Superintendent will advertise the position to all 35th Maintenance Group squadrons for consideration. AMU and squadron superintendents will submit the names of all qualified, interested applicants to the team superintendent by the date set by the team commander (minimum of two weeks prior notice). Personnel submitted for consideration to the demonstration team must meet minimum qualifications in paragraphs 2.4. and 2.4.2.

2.4.3.1. **(Added-35FW)** The team commander and superintendent will interview each candidate for the maintenance support team and select the most qualified. After selection by the team commander and superintendent, the names will be forwarded to the member's squadron commander for confirmation. Once the member's squadron commander has confirmed the individual, the name(s) will be forwarded to the 35 MXG/CC for approval. Once approved by the 35 MXG/CC, the 35 FW/CC approves and appoints the support team members in writing.

2.4.3.2. **(Added-35FW)** Members desiring to become a team member must:

2.4.3.2.1. **(Added-35FW)** Meet all quality standards for dress and appearance, weight, physical fitness and military customs and courtesies.

2.4.3.2.2. **(Added-35FW)** Be willing to spend extra hours daily for aircraft appearance and maintenance.

2.4.3.2.3. **(Added-35FW)** Be willing to be TDY for most weekends during the show season.

2.4.3.2.4. **(Added-35FW)** Present a sharp Air Force image to the general public, both verbally and in action.

2.4.3.2.5. **(Added-35FW)** Must be resourceful, have the ability to work alone, demonstrate initiative and the Air Force Core Values of "Integrity First, Service Before Self and Excellence in all we do."

2.4.3.2.6. **(Added-35FW)** Be recommended by the member's section chief and approved by the member's Chief or NCOIC to the Demonstration Team Superintendent.

2.4.3.2.7. **(Added-35FW)** Submit last three copies of the member's Enlisted Performance Reports.

2.4.3.2.8. **(Added-35FW)** Submit Quality Assurance statistics for the last twelve months to the Demonstration Team Superintendent.

2.4.3.2.9. **(Added-35FW)** The member's personnel records will be made available for examination by the Team Superintendent and Commander upon request.

2.4.3.3. **(Added-35FW)** Team Superintendent Selection. Team Superintendent selection is a competitive choice made from SNCOs within the Maintenance Group. Whenever possible, this position will be filled at least two months prior to the end of the season to allow sufficient turnover time and training. Personnel submitted for consideration as the demonstration team superintendent must meet minimum qualifications in paragraphs 2.4. and 2.4.2.

2.4.3.3.1. **(Added-35FW)** Once an opening and selection date has been determined by the team commander, the outgoing Demonstration Team Superintendent will advertise the open position to all Maintenance Group squadrons for consideration.

2.4.3.3.2. **(Added-35FW)** Three days prior to the selection date, a selection board will convene to interview each candidate and select the most qualified individual. Each candidate must meet and interview with the board in person. The selection board will consist of the team commander and outgoing demonstration team superintendent.

2.4.3.3.3. **(Added-35FW)** The 35 OG/CC and 35 MXG/CC will interview each candidate for team superintendent and select the most qualified.

2.4.3.3.4. **(Added-35FW)** Once chosen, the name will be forwarded to the 35 FW/CC for final approval in writing. The wing commander may choose to interview the candidate prior to final approval.

2.5. Training. Training will be accomplished according to the guidelines of this instruction and as supplemented.

2.5.1. The Wing commander may alter the training sequence and individual sorties, as necessary, to ensure proficiency and progress. Additional training sorties (TS) may be added as required.

2.5.2. Maneuvers and maneuver sequences will be performed as described in this AFI. New demonstration pilots will demonstrate proficiency in the high, low, and flat show profiles.

2.5.3. New demonstration pilots will receive flight training from a currently qualified demonstration pilot. Each new demonstration pilot will receive extensive ground training from their predecessor or a currently qualified demonstration pilot.

2.5.3.1. **(Added-35FW)** Demo pilot ground training will consist of a minimum of one duty day dedicated to review of team procedures, regulations, equipment, show preparation paperwork, and post show reporting procedures. Simulator training will consist of two (minimum) MTC simulator periods.

2.5.4. New demonstration pilots will receive training in aircraft flight control limitations and performance characteristics affecting the demonstration profile. New demonstration pilots will receive training on common conditions leading to aborts for each maneuver. F-16 demonstration pilots will receive training on the flight control system, FLCS limiters and their effect on level flight, and sustaining inverted level flight at <165 KCAS.

2.5.5. New demonstration pilots and ground safety observers will receive academic and flight training for abort procedures. Demonstration pilots will conduct a minimum of one abort procedure during monthly recurrent practice demonstrations, and a minimum of three during upgrade sorties TS-5 through TS-11.

2.5.5.1. **(Added-35FW)** Safety observer training will include the ICAS Airshow 101 academics given by the team commander. The upgrading safety observer will then observe two demo performances or practices. The first practice will require the upgradee to observe a qualified safety observer during a demo practice. He/she will then perform safety observer duties while observed by a qualified safety observer. Safety observer training should be completed prior to the start of the season or 1 February, whichever comes first.

2.5.6. New demonstration pilots who will fly off-station demonstrations will attend a minimum of two air shows with the current demonstration pilot. If possible, the new pilot will fly with the current demonstration pilot in each air show practice demonstration (N/A for A-10 & F-22).

2.5.6.1. **(Added-35FW)** All attempts should be made to attend a non-staged show and a staged show environment to allow exposure to the differences and requirements.

2.5.7. A-10 and F-22 will use a chase aircraft for TS-3 and TS-4; and may use a chase aircraft for missions TS-5 through TS-11, or the instructor may observe from the ground with wing commander approval. The minimum altitude for chase aircraft is 1,500 feet AGL.

2.5.8. All training will be accomplished in VMC. Each practice, except TS-3 and TS-4, will be over a runway environment. All training flights below 2,000 feet AGL will be videotaped.

2.5.9. The currently qualified demonstration pilot monitoring the training program will observe the first solo training flight from the ground, and may act as the safety observer.

2.5.10. Demonstration team film crews will be thoroughly trained. Training should emphasize equipment operation, sound techniques to capture demonstration narration, and techniques to capture the ground environment in the field of view during low altitude maneuvers.

2.5.11. Training performance will be documented in an official grade book and progress monitored by the wing commander. All training flights will be reviewed by the senior leadership IAW [paragraph 1.4.5.8](#).

2.5.12. Final wing commander review, pre/re-certification of the demonstration crew, ground safety observer, and certification of narrator(s) will be documented and forwarded by the wing commander IAW [paragraph 1.4.5.3](#) or [1.4.5.4](#). First-year pilots who will fly demonstrations off-station must accomplish at least one practice flight off home station prior to MAJCOM/CC certification.

2.5.13. Stage 1/Stage 2 Altitude Step-down process:

2.5.13.1. Definitions: Stage 1: All maneuvers will be flown no lower than a target altitude of 500 feet with a minimum altitude of 400 feet (the F-16 High Alpha Pass and the A-10 Gear Down Pass will use a minimum altitude of 450 feet). Stage 2: All maneuvers will be flown no lower than the target and minimum altitudes described in this AFI.

2.5.13.2. Upgrading pilots who will fly demonstrations off-station are required to practice at a minimum of three separate off-station sites at Stage 1 (higher) altitudes prior to the first official public demonstration. The intent of this requirement is for all upgrading pilots to gain experience at a minimum of three separate sites in a training environment before stepping down to Stage 2 (lower) altitudes off-station in an actual airshow environment. This requirement only affects off-station practices. All home station practices will adhere to the normal altitude step-down procedures set forth in the training syllabus. At overseas locations where this requirement is impractical, all practice demonstrations may be conducted at home station. However, every attempt will be made to satisfy the off-site training requirement before reverting to home field practices only to satisfy syllabus requirements.

2.5.13.3. These off-station practices require former demonstration pilot observation and/or supervisor observation (no less than OG/CD or WG/CC designee).

2.5.13.4. All tapes/grade sheets for off-station practices require former demonstration pilot and/or OG/CC or WG/CC designee review.

2.5.13.5. NAF/MAJCOM/CC certifications may be used for partial fulfillment of this requirement.

2.5.13.6. After the three off-station events are accomplished and with OG/CC concurrence, the upgrading pilot will perform a practice demonstration over home station at Stage 2 altitudes with OG/CC or WG/CC designee observation. The OG/CC may then certify the upgrading pilot to perform at Stage 2 altitudes for the remainder of the demonstration tour. This certification must be documented in the upgrading pilot's grade book.

2.5.14. Ground Safety Observer Training.

2.5.14.1. During any capability demonstration the ground safety observer is responsible to advise the demonstration pilot by radio of any observed or developing unsafe condition. This requires intimate knowledge of required maneuver radio calls, maneuver parameters, and the timing of maneuvers so that safety observer radio calls provide timely correction to an observed or developing deviation from procedure or direction prescribed in this publication. Safety observers will complete a closed-book parameters test for those maneuvers requiring parameter radio calls, corrected to 100 percent by a current demo pilot, prior to performing duties solo. This training will be documented in the demo team grade book.

2.5.14.2. To increase "air show situational awareness" and improve the mutual support with the demo pilot, ground safety observers will have a working knowledge of the following subjects: air show airspace; the aerobatic box; show lines; crowd lines; applicable FARs that require waiver; interaction with the air boss; and air show communication plans. These subjects will be reviewed by upgrading safety observers, and briefed by current demo pilots, using the Safety Observer academics provided by ACC/A3TA. This training will be documented in the demo team grade book prior to performing duties solo. For a copy of this course, please contact ACC/A3TA. In addition, it is recommended that at least one ground safety observer per base attend the Air Shows

101 course at ICAS each year. Ground safety observers must also be familiar with all applicable procedures and parameters relevant to MDS in this publication.

2.5.14.3. Upgrading safety observers must complete a two-sortie checkout. For the first sortie, the upgrading safety observer will observe a certified ground safety observer during an official or practice high show demonstration. For the second sortie, the upgrading ground safety observer will execute the duties of the safety observer at an official or practice high show demonstration while under the observation of a certified safety observer. This training will be documented in the demo team grade book.

2.5.15. **(Added-35FW)** Support Team Training. The demonstration team commander and superintendent are responsible for ensuring team training is accomplished.

2.5.15.1. **(Added-35FW)** Superintendent.

2.5.15.1.1. **(Added-35FW)** The superintendent training process will consist of the following:

2.5.15.1.1.1. **(Added-35FW)** Securing billeting for team members.

2.5.15.1.1.2. **(Added-35FW)** Pallet build up and cargo pack-out, processing and deployment.

2.5.15.1.1.3. **(Added-35FW)** Security requirements for personnel and aircraft while TDY IAW AFI 31-101, AFI 31-102, Physical Security and AFI 31-305 - Security Forces Deployment Planning Handbook.

2.5.15.1.1.4. **(Added-35FW)** Submitting airlift and transportation requests for deployment.

2.5.15.1.1.5. **(Added-35FW)** Supply management and deploying RSK or MSK kits.

2.5.15.1.1.6. **(Added-35FW)** Budget and finance.

2.5.15.1.1.7. **(Added-35FW)** Drill and Ceremony procedures as prescribed in AFMAN 36-2203.

2.5.15.1.1.8. **(Added-35FW)** Customs and immigration declaration requirements.

2.5.15.1.1.9. **(Added-35FW)** Creating and submitting AT/FP plans.

2.5.15.1.1.10. **(Added-35FW)** Familiarization with AFI 11-246V1 – Air Force Aircraft Demonstrations and AFI 11-209 – Air Force Participation in Aerial Events.

2.5.15.1.1.11. **(Added-35FW)** Demonstration show launch and recovery routine/procedures.

2.5.15.1.1.12. **(Added-35FW)** Ground video requirements for each aerial show/practice.

2.5.15.1.1.13. **(Added-35FW)** Air show narration (high, low and flat shows).

2.5.15.1.1.14. **(Added-35FW)** Air to ground communication requirements for each show.

2.5.15.1.1.15. **(Added-35FW)** Public and Civic Relations, Recruiting and Retention and professional military education leadership programs.

2.5.15.1.1.16. **(Added-35FW)** General operation of the team.

2.5.15.1.2. **(Added-35FW)** The new superintendent will attend the following classes: Government Purchase Card academic training, pallet build up and cargo processing training and weapons carts removal/installation training.

2.5.15.1.3. **(Added-35FW)** Training and upgrading superintendents will attend a minimum of one show.

2.5.15.1.4. **(Added-35FW)** All training listed in paragraph 2.5.15.1.1 will be accomplished prior to the new superintendent taking over.

2.5.15.2. **(Added-35FW)** Team Assistant Superintendent.

2.5.15.2.1. **(Added-35FW)** Prior to the new assistant superintendent taking over, the incoming assistant superintendent will be familiar with:

2.5.15.2.1.1. **(Added-35FW)** Processing DTS travel orders.

2.5.15.2.1.2. **(Added-35FW)** Securing billeting for team members.

2.5.15.2.1.3. **(Added-35FW)** Pallet build up and cargo pack-out, processing and deployment.

2.5.15.2.1.4. **(Added-35FW)** Security requirements for personnel and aircraft while TDY.

2.5.15.2.1.5. **(Added-35FW)** Submitting airlift and transportation requests for deployment.

2.5.15.2.1.6. **(Added-35FW)** Supply management and deploying RSK or MSK kits.

2.5.15.2.1.7. **(Added-35FW)** Budget and finance.

2.5.15.2.1.8. **(Added-35FW)** Drill and Ceremony procedures as prescribed in AFMAN 36-2203.

2.5.15.2.1.9. **(Added-35FW)** Customs and immigration declaration requirements.

2.5.15.2.1.10. **(Added-35FW)** Creating and submitting AT/FP plans.

2.5.15.2.1.11. **(Added-35FW)** Familiarization with AFI 11-246V1 – Air Force Aircraft Demonstrations.

2.5.15.2.1.12. **(Added-35FW)** Demonstration show launch and recovery routine/procedures.

2.5.15.2.1.13. **(Added-35FW)** Ground video requirements for each aerial show/practice.

2.5.15.2.1.14. **(Added-35FW)** Air show narration (high, low and flat shows).

2.5.15.2.1.15. **(Added-35FW)** Air to ground communication requirements for

each show.

2.5.15.2.1.16. **(Added-35FW)** General operation of the team.

2.5.15.2.2. **(Added-35FW)** The assistant superintendent will be trained on all training tasks listed under their primary AFSC in this supplement.

2.5.15.3. **(Added-35FW)** Team Dedicated/Assistant Crew Chiefs.

2.5.15.3.1. **(Added-35FW)** Dedicated crew chiefs will be trained on:

2.5.15.3.1.1. **(Added-35FW)** The demonstration launch and recovery routine.

2.5.15.3.1.2. **(Added-35FW)** Drill and Ceremony procedures IAW AFMAN 36-2203.

2.5.15.3.1.3. **(Added-35FW)** Pallet buildup, and cargo pack-out, loading and processing procedures.

2.5.15.3.1.4. **(Added-35FW)** Immediate Prior to Launch (IPL) Arming and De-Arming aircraft (IPL/Safing) procedures and AMD pod installation / removal.

2.5.15.3.1.5. **(Added-35FW)** Deploying support equipment (Tools and test equipment).

2.5.15.4. **(Added-35FW)** Team Avionics Specialist Technicians.

2.5.15.4.1. **(Added-35FW)** The avionics technicians will be trained on the following:

2.5.15.4.1.1. **(Added-35FW)** The demonstration launch and recovery routine.

2.5.15.4.1.2. **(Added-35FW)** Drill and Ceremony procedures IAW AFMAN 36-2203.

2.5.15.4.1.3. **(Added-35FW)** Pallet buildup, and cargo loading and processing procedures.

2.5.15.4.1.4. **(Added-35FW)** Land Mobile Radio (LMR)/Communications handling procedures.

2.5.15.4.1.5. **(Added-35FW)** Operation and preventative maintenance of video camera used to film the ground show.

2.5.15.4.1.6. **(Added-35FW)** Operation and preventative maintenance of public address equipment used to narrate the demonstration.

2.5.15.4.1.7. **(Added-35FW)** Deploying RSK and MSK Supply kits.

2.5.15.4.1.8. **(Added-35FW)** Qualified for classified parts custodian

2.5.15.4.1.9. **(Added-35FW)** Basic electrical and environmental duties such as nose wheel steering and anti-skid troubleshooting and repair.

2.5.15.5. **(Added-35FW)** Propulsion System Technicians.

2.5.15.5.1. **(Added-35FW)** Propulsion technicians will be trained on:

2.5.15.5.1.1. **(Added-35FW)** The demonstration launch and recovery routine

2.5.15.5.1.2. **(Added-35FW)** Drill and Ceremony procedures IAW AFMAN 36-2203.

2.5.15.5.1.3. **(Added-35FW)** Pallet buildup, and cargo pack-out, loading and processing procedures.

2.5.15.5.1.4. **(Added-35FW)** Deploying RSK and MSK supply kits.

2.5.15.5.1.5. **(Added-35FW)** Deploying support equipment (Tools and Test equipment) and AGE.

2.6. Training Syllabus:

2.6.1. GT-1 (Ground Training):

2.6.1.1. Standard Procedures

2.6.1.2. Fuel Requirements

2.6.1.3. Waivers

2.6.1.4. Aircraft Handling Characteristics

2.6.1.5. Safety Considerations

2.6.1.6. G-Awareness

2.6.1.7. Lessons Learned

2.6.1.8. Emergency/Abort Procedures

2.6.1.9. Team Management

2.6.1.10. Scheduling

2.6.1.11. All Ground Safety Observer academic topics

2.6.2. GT-2: LOWAT Academics:

2.6.2.1. LOWAT Environment

2.6.2.2. LOWAT Crosscheck

2.6.2.3. LOWAT/Airshow Hazards

2.6.2.4. Handling Emergency and Abort Procedures

2.6.2.5. LOWAT effects on aircraft performance

2.6.2.6. Visual Illusions

2.6.3. GS-1 (Ground Simulator Training):

2.6.3.1. High and Low Show Profiles

2.6.3.2. Crosschecking parameters during Maneuver Description

2.6.3.3. Abort Procedures

2.6.3.4. Abort Mechanics

2.6.3.5. High-speed Dive Recoveries

- 2.6.3.6. Slow-speed Maneuvering
- 2.6.3.7. Recognition and Prevention of Out-of-Control Situations
- 2.6.3.8. Emergency Procedures
- 2.6.4. TS-1 (Back seat of a two-seat model; N/A for A-10 & F-22):
 - 2.6.4.1. Standard ACC Demonstration Profile – High show
 - 2.6.4.2. Minimum Run/Wet Runway Landing
- 2.6.5. TS-2 (Back seat of a two-seat model; N/A for A-10 & F-22):
 - 2.6.5.1. Standard ACC Demonstration Profile – Low show
- 2.6.6. TS-3 (Front seat of a two-seat model; N/A for A-10 & F-22):
 - 2.6.6.1. Standard ACC Demonstration Profile – High show
 - 2.6.6.2. Accomplish above 5,000 feet AGL
 - 2.6.6.3. Emergency/Maneuver Abort Procedures
- 2.6.7. TS-4 (Front seat of a two seat model; N/A for A-10 & F-22):
 - 2.6.7.1. Standard ACC Demonstration Profile – Low show
 - 2.6.7.2. Accomplish above 5,000 feet AGL
 - 2.6.7.3. Emergency/Maneuver Abort Procedures
- 2.6.8. TS-5 through TS-11 (Front seat of a two-seat model; N/A for A-10 & F-22):
 - 2.6.8.1. Standard ACC Demonstration Profiles (upgrading demonstration pilots will demonstrate a safe level of proficiency on both high and low shows prior to solo – N/A for A-10 & F-22)
 - 2.6.8.2. Accomplished over a runway, initial minimum altitude is 2,000 feet AGL
 - 2.6.8.3. Step down from 2,000 feet AGL determined by currently qualified demonstration pilot monitoring the training program
 - 2.6.8.4. Minimum run/wet runway landing
- 2.6.9. TS-12 through TS-16 (Solo): A-10 & F-22 pilots will demonstrate a safe level of proficiency on both high and low shows.
- 2.6.10. TS-17 (Solo): Wing/CC high show certification.

Chapter 3

A-10 DEMONSTRATION MANEUVERS

Section 3A—General Guidelines

3.1. General. Maneuvers described in this chapter will be used for training and for A-10 aerial demonstrations. The demonstration sequence is designed so each maneuver is normally performed in the same direction with respect to the crowd line. As a result, the show is always oriented the same way from the spectators' point of view. The only exception to this is when wind direction and velocity make it advantageous to change the direction of the gear down pass. In this case, the remaining maneuvers may be flown in the opposite direction, or repositions may be used to fly the remaining maneuvers in the appropriate direction. Abnormal Procedures are written for each maneuver. If the entry conditions are not met for any maneuver, a wings-level pass will be flown and the pilot will transition to the next maneuver. Demonstration pilots will transmit parameters prior to initiating the descending portion of vertical pull-throughs and Vertical Reposition maneuvers. These calls will be made when the pilot reaches apex of the maneuver. Ground safety observer will monitor demonstration pilot altitude and airspeed radio calls and direct an abort when parameter limits are exceeded. Following all maneuvers and before clearing the show line to reposition for the next maneuver, the pilot will ensure any descent has been stopped and the aircraft is in a climbing or level attitude with the flight path marker at or above the horizon.

3.2. Aircraft Configuration and Fuel Requirements. Aircraft configuration for all demonstrations will be clean. Each demonstration uses approximately 1,000 pounds of fuel. Optimum performance is obtained when fuel load is 3,500 pounds; however, the demonstration can be safely accomplished with a higher fuel load as long as the wing tanks are empty. The minimum fuel to start the show is 2,500 pounds.

3.3. Airspeed and G Limits. The A-10 demonstration is flown at max power except when slowing to configure for the gear down pass or slowing to configure for the minimum run landing. The maximum Target G for this demonstration profile is 6.0 Gs. This does not preclude a momentary increase in G for safety considerations.

3.4. Show Line Restrictions. The majority of the A-10 demonstration will be flown on the 1,500-foot show line in reference to the distance from the crowd. Non-aerobatic maneuvers (less than 90 degrees of bank) may be flown on the 500-foot show line unless specified in the maneuver description.

3.5. Airspace and Runway Requirements. Required airspace for the A-10 is 7,000 feet AGL vertically and normally a five-mile radius from show center horizontally. The minimum dimensions of the aerobatic box are 3,000 feet wide, 4,000 feet long, and 7,000 feet AGL (high show). If the FAA has waived a show line to closer than 1,500 feet, the aerobatic box may be less than 3,000 feet wide, provided there is at least 1,500 feet from the show line to the outer edges of the box. Minimum runway length is 5,000 feet x 75 feet. The runway, taxiway, and parking area must be stressed for a 35,000-pound aircraft with single wheel type landing gear.

3.6. Weather Requirements. Weather PARAMETER LIMITS for the high show profile are a ceiling of at least 4,000 feet, 3 miles ground and 5 miles in-flight visibility with a discernible

horizon. The low show profile ceiling is at least 2,500 feet. The flat show profile ceiling is at least 1,500 feet. Maneuvers will be planned to maintain VMC throughout the show sequence.

3.7. Demonstration Profiles.

3.7.1. High Show.

3.7.1.1. Takeoff

3.7.1.2. Flat Pass

3.7.1.3. Vertical 540

3.7.1.4. Split-S

3.7.1.5. Double Aileron Roll

3.7.1.6. Slow Roll

3.7.1.7. Cuban 8

3.7.1.8. Split-S

3.7.1.9. Level 360

3.7.1.10. Gear Down Pass

3.7.1.11. Three Low Angle Strafe Passes

3.7.1.12. Jink Out

3.7.1.13. Four-Point Roll

3.7.1.14. Dedication Pass

3.7.1.15. Tactical Pitch-Up to Land

3.7.2. Low Show.

3.7.2.1. Takeoff

3.7.2.2. Flat Pass

3.7.2.3. Double Aileron Roll

3.7.2.4. Slow Roll

3.7.2.5. Level 360

3.7.2.6. Gear Down Pass

3.7.2.7. Three Low Angle Strafe Passes

3.7.2.8. Jink Out

3.7.2.9. Four-Point Roll

3.7.2.10. Dedication Pass

3.7.2.11. Tactical Pitch-Up to Land

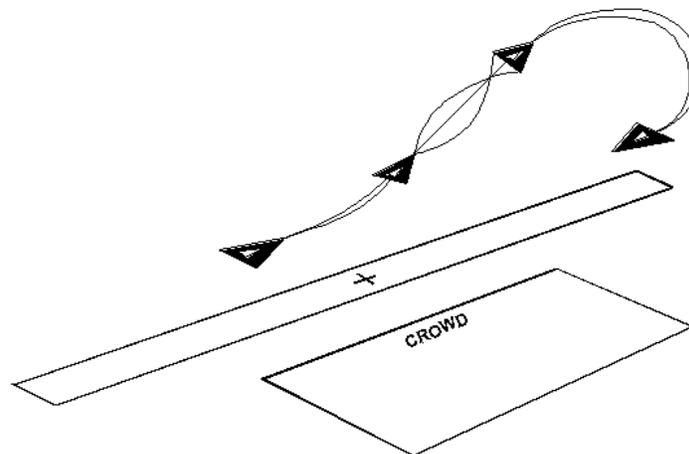
3.7.3. Flat Show.

3.7.3.1. Takeoff

- 3.7.3.2. Flat Pass
- 3.7.3.3. Level 360
- 3.7.3.4. Gear Down Pass
- 3.7.3.5. Three Low Angle Strafe Passes
- 3.7.3.6. Flat Pass
- 3.7.3.7. Dedication Pass
- 3.7.3.8. Tactical Pitch-Up to Land

3.8. Repositioning Turn.

Figure 3.1. A-10 Repositioning Turn.



**Repositioning Turn
A-10**

Table 3.1. A-10 Repositioning Turn Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	300	MAX	5 to 6
Exit	300'	N/A	N/A	N/A

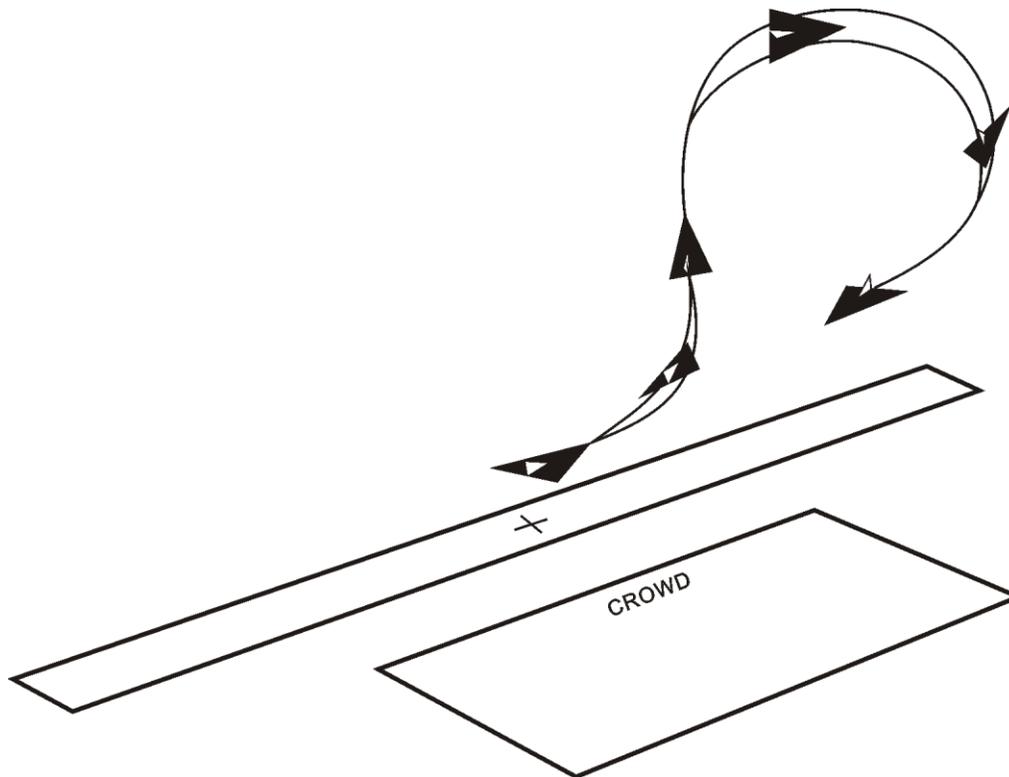
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 200'	120 / N/A	MAX	7.33	
Exit	min 200'	N/A / N/A	N/A	N/A	

3.8.1. **Maneuver Description.** The Repositioning Turn uses both horizontal and vertical turning room to change direction at each end of the show line. The vertical plane is used to maintain necessary proximity to the demonstration area. Each turn may differ slightly in order to meet entry TARGET PARAMETERS for the next maneuver and attain the proper show line alignment. To begin the maneuver, turn 15 to 45 degrees away from the crowd (depending on environmental conditions), rollout, and pull to 45 degrees nose high, and then unload. At 1,000 feet minimum, execute a 270-degree aileron roll opposite the show line. Visually acquire the show line and make a descending turn to meet the entry TARGET PARAMETERS for the next maneuver. Repositioning turns may not include added aileron rolls or other accenting maneuvers.

3.8.2. **Abnormal Procedure:** If at any time the minimum altitude, airspeed, or climb angles, cannot be achieved or maintained, roll the aircraft to the nearest horizon and recover to wings level flight.

3.9. High Speed Reposition Maneuver.

Figure 3.2. A-10 High Speed Reposition Maneuver.



High Speed Reposition Maneuver A-10

Table 3.2. A-10 High Speed Reposition Maneuver Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	330	MAX	5 to 6
Exit	300'	400	MAX	1

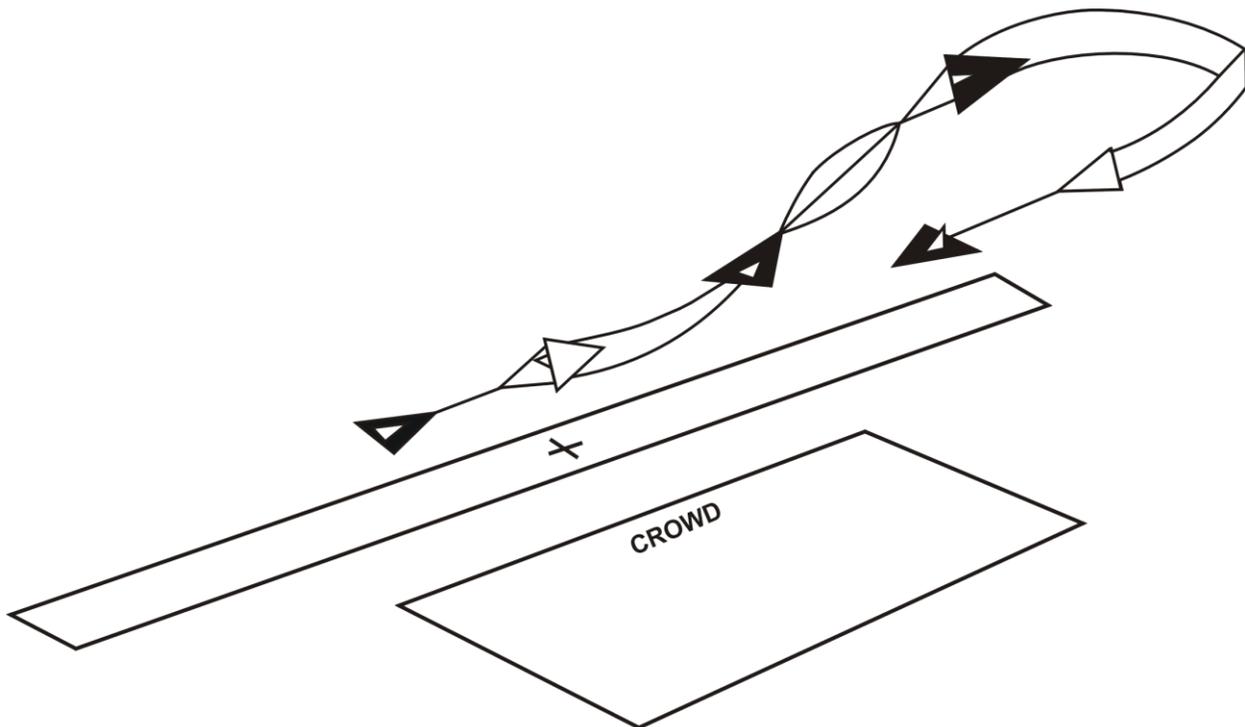
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	400'	290 / AC LMT	MAX	7.33
Exit	min 200'	300 / AC LMT	MAX	7.33

3.9.1. **Maneuver Description.** Initiate an 80 to 90-degree bank turn away from the crowd to 45 degrees off the show line. (The maneuver may be flown behind the show line dependent upon the location of the local populace.) Once at the 45-degree turn point, initiate a 5.0 to 6.0-G pull to 45 degrees of climb (55 degrees maximum) and climb out 120 to 150 knots (120 knots minimum). At 3,500 feet AGL (or 1,000 feet AGL minimum for the Low Show), initiate a 45-degree dive (55 degrees maximum) back to the appropriate show line for the next maneuver. Exit from the High Speed Repositioning Maneuver by pulling at 1,200 feet using 5.0 to 6.0 Gs to level off at the appropriate entry altitude for the next maneuver.

3.9.2. **Abnormal Procedure:** If at anytime the minimum altitude, airspeed, or climb angles cannot be achieved or maintained, roll the aircraft to the nearest horizon and recover to wings-level flight.

3.10. Flat Wifferdill Reposition Maneuver. The Flat Wifferdill Maneuver turn is a combination horizontal and shallow vertical turn used to change direction at each end of the show line. The Flat Wifferdill Maneuver turn uses less altitude than a normal Repositioning Maneuver. It requires a larger cut and tends to be looser and flatter than a normal Repositioning Maneuver. The target G for this maneuver is 3 to 5 Gs. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the Flat Wifferdill. The entry "cut" turn for the Flat Wifferdill is made to ensure no show line or crowd line penetration.

Figure 3.3. A-10 Flat Wifferdill Reposition Maneuver.



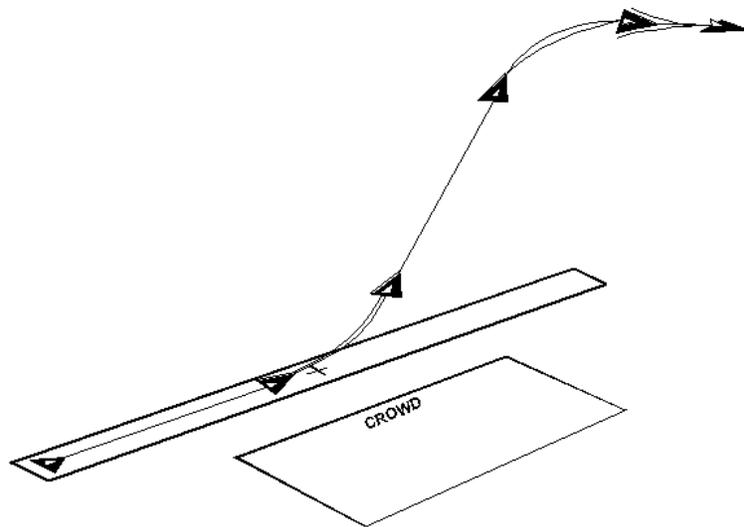
Flat Wifferdill Maneuver A-10

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Section 3B—High Profile

3.11. Takeoff.

Figure 3.4. A-10 Takeoff.



**Takeoff
A-10**

Table 3.3. A-10 Takeoff Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	30'	200	MAX	3-4
Exit	N/A	N/A	N/A	N/A

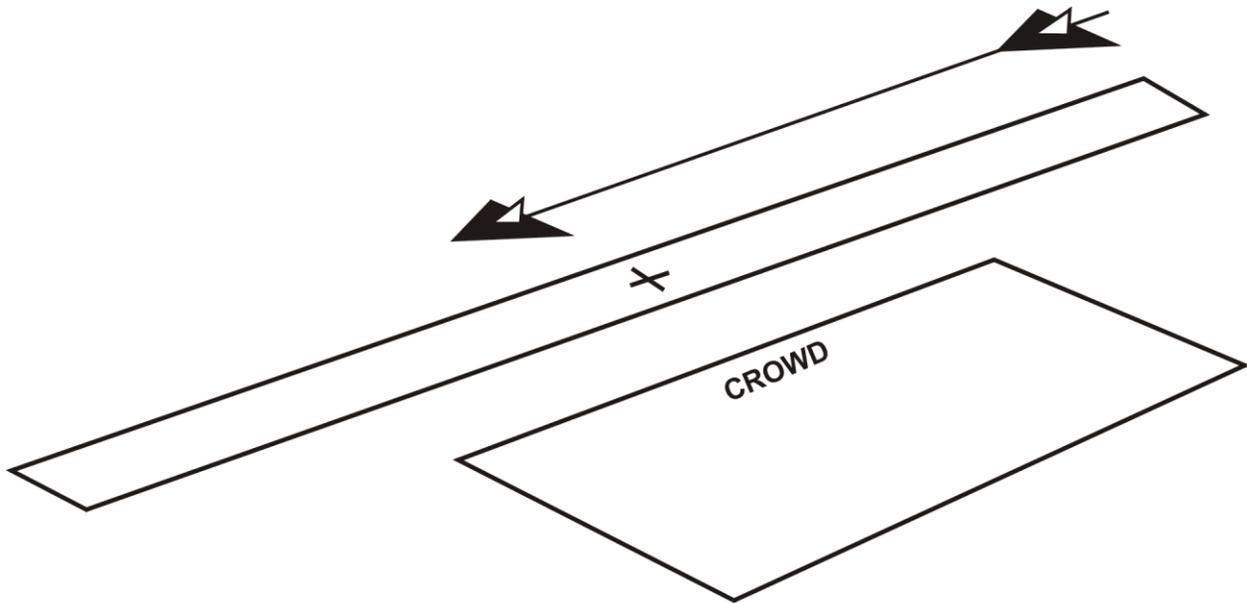
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	20'	175 / N/A	MAX	7.33
Exit	N/A	N/A / N/A	N/A	N/A

3.11.1. **Maneuver Description.** Accomplish a normal takeoff with 7-degree flaps. The rotation airspeed is 110 knots and should be accomplished using a smooth, continuous pull to obtain the normal takeoff attitude. Raise the gear with a positive rate of climb and retract the flaps once the gear is up and the gear horn is out. After gear and flap retraction, level off at 30 feet and accelerate to a minimum of 175 knots. At show center or the end of the runway, with a minimum of 175 knots, pull up 30 to 45 degrees nose high using 3.0 to 4.0 Gs or the steady stall warning tone. Turn 15 to 45 degrees away from the crowd and continue climb out.

3.11.2. **Abnormal Procedure:** Use caution when taking off from short runways, runways at high density altitudes, or wet runways. TOLD data is critical and must be computed very carefully at each show site. Do not fly if refusal speed is less than continuation speed. During the climb out, if the aircraft stalls or the airspeed falls below 110 knots (whichever occurs first) unload and accelerate to break the stall and/or increase airspeed to a minimum of 110 knots. Climbout can then be continued.

3.12. Flat Pass.

Figure 3.5. A-10 Flat Pass.



Flat Pass A-10

Table 3.4. A-10 Flat Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	325	MAX	5-6
Exit	300'	325	MAX	1

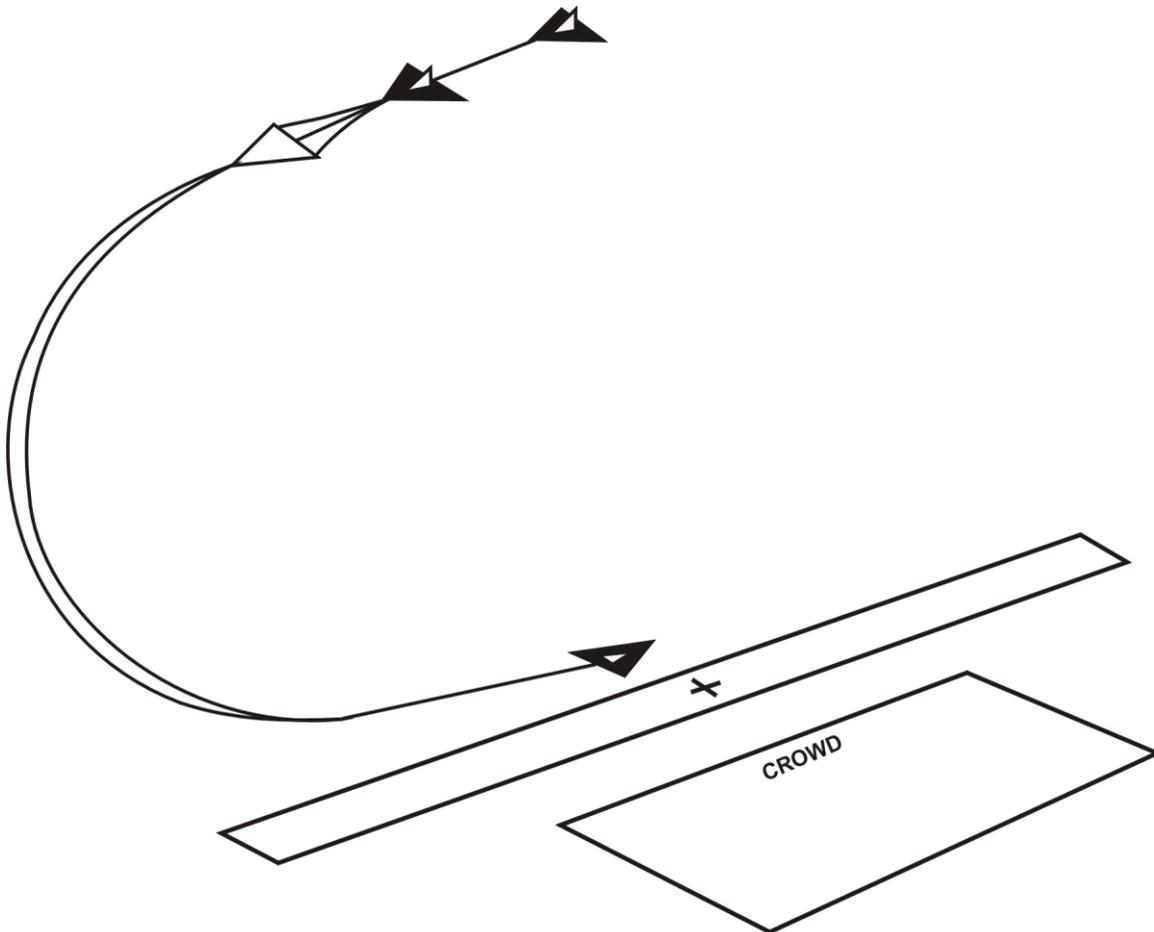
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	200'	200 / AC LMT	MAX	N/A
Exit	min 200'	200 / AC LMT	MAX	N/A

3.12.1. **Maneuver Description.** The Flat Pass is a maneuver used alone or in combination with a Wifferdill/Reposition for the purposes of displaying the aircraft or orienting the subsequent demonstration maneuver in the approved direction relative to the crowd line. It may be flown in either direction at any time during the demonstration sequence if required. It should be flown wings level down the 500-foot show line at 300 feet AGL.

3.12.2. **Abnormal Procedure:** If any problems are encountered, the demo pilot should begin an immediate climbing turn away from the crowd.

3.13. Split-S.

Figure 3.6. A-10 Split-S.



**Split-S
A-10**

Table 3.5. A-10 Split-S Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	≥ 5,000'	180	MAX	1
90 deg nose low	≥ 3,000'	250		
Exit	≥ 500'	A/R	MAX	1

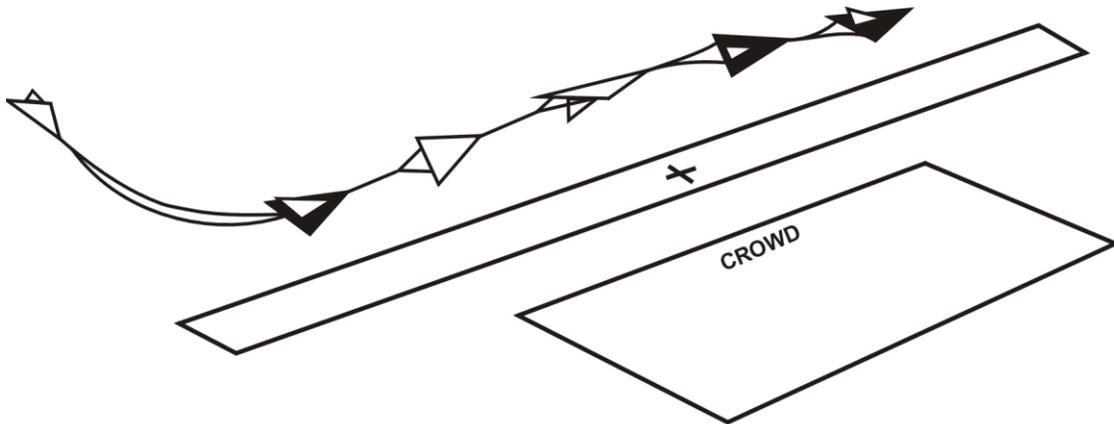
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry min	4,500'	120 / 250	MAX	N/A
90 deg nose low	2,500'	N/A / 375		
Exit min	400'	N/A / N/A	A/R	N/A

3.13.1. **Maneuver Description.** (High Show only) After reaching the minimum entry parameters, perform an unloaded roll to inverted and perform an aggressive 135-degree pull through vertical, to no greater than 45 degrees nose low in the opposite direction. Once recovery above the minimum altitude for the follow-on maneuver is assured, vary the G loading and dive angle as necessary to meet the entry parameters for the next maneuver. As a technique, passing approximately 1,200' AGL begin a 5-6 G pull to level off at 500' AGL.

3.13.2. **Abnormal Procedure:** If the entry parameters are not met, the pilot will transition to a slice back as appropriate. Do not attempt to pull down from the inverted apex below 4,500' AGL or with more than 250 KIAS. If at any time, before reaching the 45 degrees nose low position, the aircraft exceeds 375 knots, reduce the throttles and open the speed brakes to slow the aircraft to approximately 350 knots. If any other altitude, airspeed, or dive angle restrictions cannot be met, immediately execute a nose-low recovery by reducing the throttles to idle, opening the speed brakes, and rolling the aircraft upright to the nearest horizon.

3.14. Slow Roll.

Figure 3.7. A-10 Slow Roll.



Slow Roll A-10

Table 3.6. A-10 Slow Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	325	MAX	+1 to -1
Exit	500'	325	MAX	1

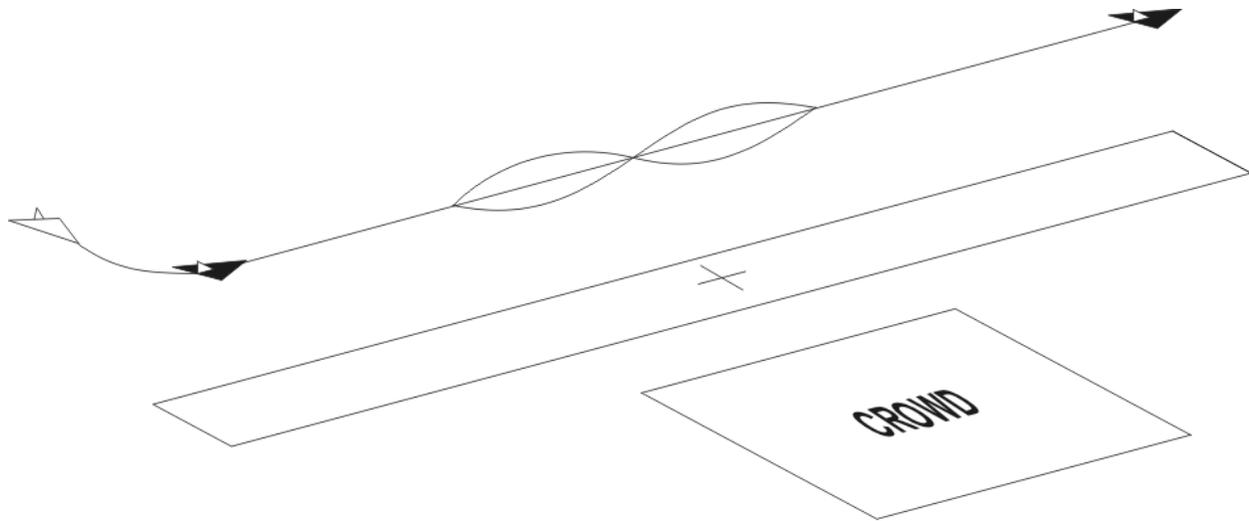
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry min	400'	280 / N/A	MAX	N/A
Exit min	400'	270 / N/A	MAX	N/A

3.14.1. **Maneuver Description.** Position the aircraft on the 1,500' show line at 500' AGL and 325 knots using a reposition maneuver. Approximately 2,000' prior to show center, initiate an 8-10 degree nose-high climb and begin an 8-second coordinated roll to the left. Top rudder should be applied approaching 90 degrees, and then slowly fed out as forward stick pressure is applied to reach -1 G inverted flight at the 180-degree point. Left rudder is slowly fed in through the 270-degree point and slowly fed out to reach upright 1 G flight at 500' AGL. Dive angle during the exit should not exceed 8 degrees.

3.14.2. **Abnormal Procedure:** Abort the maneuver if at any time the nose falls more than 8 degrees below the horizon or the nose drops below the horizon prior to the inverted point. Aborting the maneuver is accomplished by rolling towards the nearest horizon to wings level and climbing to ensure recovery at or above minimum altitude is achieved. Excessive nose drop is most likely to occur during the second half of the roll due to insufficient negative stick pressure, and a decrease in airspeed resulting in less control surface effectiveness.

3.15. Double Aileron Roll.

Figure 3.8. A-10 Double Aileron Roll.



Double Aileron Roll A-10

Table 3.7. A-10 Double Aileron Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	325	MAX	2-3
Exit	500'	325	MAX	1

PARAMETER	LIMITS		
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	G

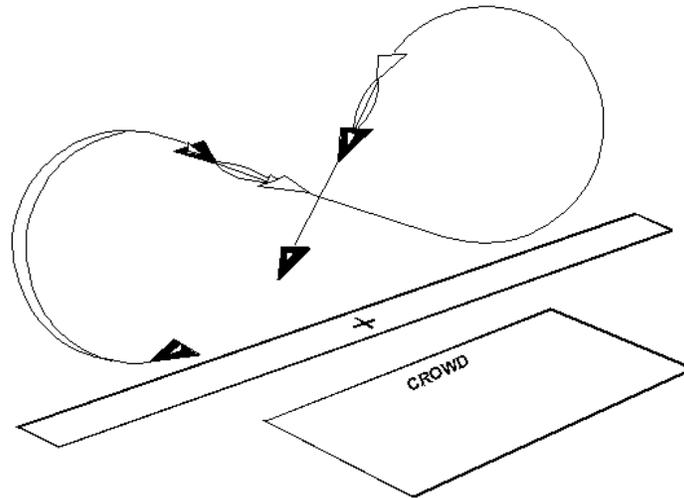
Entry	min	400'	280 / N/A	MAX	N/A
Exit	min	400'	270 / N/A	MAX	N/A

3.15.1. **Maneuver Description.** Enter the double aileron roll from wings level flight at 500' AGL. At 3,000 feet prior to show center, initiate a smooth 5 to 9-degree climb. As show center approaches the mid-point of the corner panel, unload the aircraft to 0 G and execute two 360-degree aileron rolls in either direction.

3.15.2. **Abnormal Procedure:** Abort the maneuver if at any time the nose falls more than 8 degrees below the horizon or the nose drops below the horizon prior to the inverted point. Aborting the maneuver is accomplished by rolling towards the nearest horizon to wings level and climbing to ensure recovery at or above minimum altitude is achieved. Excessive nose drop is most likely to occur during the second half of the roll due to insufficient negative stick pressure, and a decrease in airspeed resulting in less control surface effectiveness.

3.16. Cuban Eight.

Figure 3.9. A-10 Cuban Eight.



Cuban Eight
A-10

Table 3.8. A-10 Cuban Eight Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	325	MAX	6
APEX	≥ 3,500'	180	MAX	2-4
Exit	500'	325	MAX	6

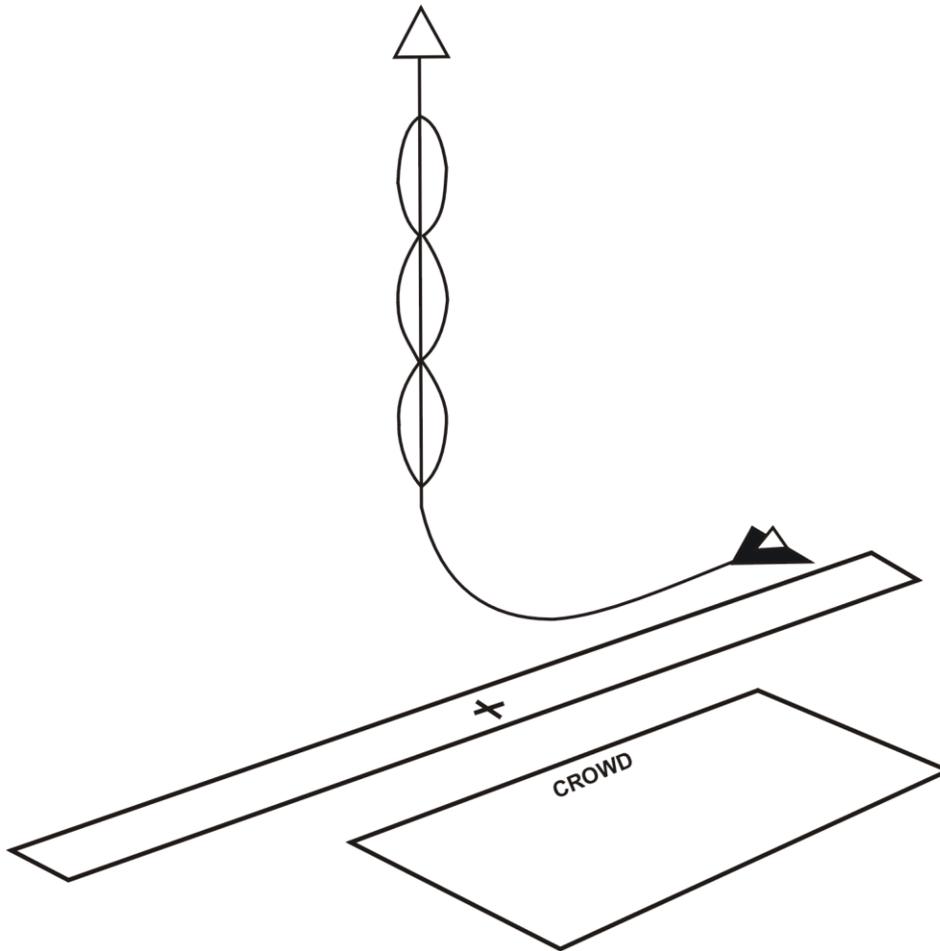
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	270 / AC LMT	MAX	7.33
APEX	min 3,000'	120 / AC LMT	MAX	N/A
Exit	min 400'	275 / AC LMT	MAX	7.33

3.16.1. Maneuver Description. With wings level and 500 feet AGL begin a smooth 6.0 G pull not to exceed the steady stall warning tone. Minimum apex altitude is 3,000 feet AGL with a minimum of 120 knots. Continue the pull until the aircraft is 45 degrees nose low inverted (55 degrees maximum). Due to winds, it may be necessary to use more or less than 45 degrees nose low in order to maintain show center orientation. The typical range is between 30 to 55 degrees nose low. Do not exceed 55 degrees nose low. At 2,500 feet AGL, roll upright while maintaining 45 degrees nose low. At 1,200 feet AGL, begin a 6.0 G pull to level flight at 500 feet AGL. Normal apex altitude is 3,500 to 5,000 feet AGL depending upon environmental conditions. The second half is completed in the opposite direction. Upon completion of the maneuver, begin a 30-60 degree climb to set-up for the Split-S.

3.16.2. Abnormal Procedure: If at anytime during the maneuver it appears you will not attain the prescribed altitude or airspeed over the top, abort the maneuver by performing an unloaded roll to a wings-level position. Furthermore, if more than 45 degrees nose low inverted is required due to winds, add 100 feet for every degree steep to roll out and pull out altitudes. If more than 55 degrees nose low, roll out immediately, and recover to level flight using a max performance pull (steady to chopped tone).

3.17. Vertical 540.

Figure 3.10. A-10 Vertical 540.



Vertical 540 A-10

Table 3.9. A-10 Vertical 540 Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	≥ 500'	325	MAX	1
Exit	≥ 5,000'	140	MAX	1

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G

Entry min	400'	300 / N/A	MAX	N/A
Exit min	3,500'	110 / N/A	MAX	N/A

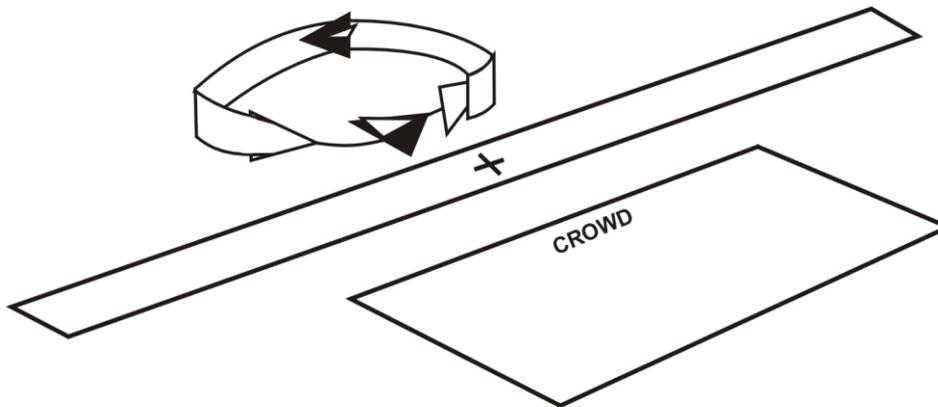
3.17.1. **Maneuver Description.** After completion of the Cuban 8, pull up to 90-degrees nose high using 5.0 to 6.0 Gs, unload, and execute a 540-degree roll. Once the roll is complete, pull the aircraft gently over onto its back and roll upright at no less than 110 knots. Drive straight ahead and attain target entry parameters for the next maneuver.

3.17.2. **Abnormal Procedure:** Vary the angle of climb for wind, weather, and aerobatic-box considerations. If at any time during the maneuver it appears the maneuver will not attain the prescribed altitude or airspeed minimums over the top, the maneuver will be aborted by performing a nose-high recovery IAW tech order procedure.

3.18. Split-S. Fly IAW [paragraph 3.13](#), [Figure 3.6](#), and [Table 3.5](#).

3.19. Level 360.

Figure 3.11. A-10 Level 360.



Level 360
A-10

Table 3.10. A-10 Level 360 Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	325	MAX	6
Exit	500'	250	MAX	6

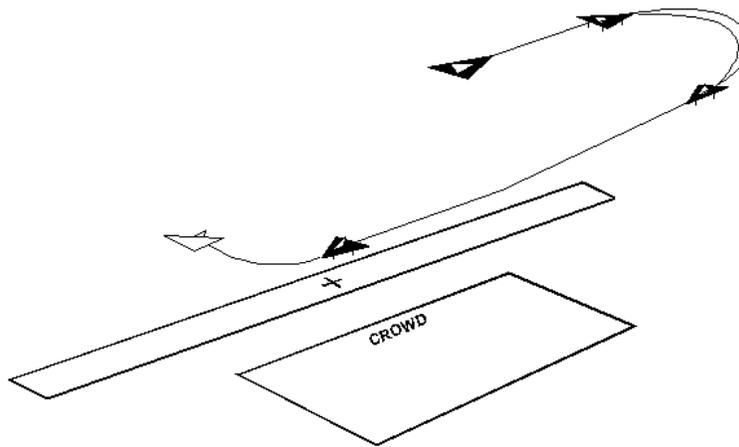
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	300 / N/A	MAX	7.33
Exit	min 400'	240 / N/A	MAX	7.33

3.19.1. **Maneuver Description.** Position the aircraft on the 1,500' show line at 500' AGL and 325 knots. At approximately 1,500 feet past show center, turn away from the crowd using approximately 85 degrees of bank. Begin the turn with a smooth G onset rate to maintain 6.0 Gs or the steady stall warning horn whichever occurs first. G-loading and airspeed bleed-off rate will vary with density altitude. Maintain a minimum of 240 knots. The first 180 degrees of turn should be accomplished with a 1 3/4-degree nose-up attitude and the last 180 should be accomplished with a 1 3/4-degree nose-down attitude to make the turn appear level to the crowd. Vary the bank angle and pitch to arrive at level flight at the completion of 360 degrees of turn and to ensure the maneuver is finished above the entry altitude. Surface winds must be taken into consideration in order to center this maneuver and to avoid overshooting the show line. Continue the turn past 360 degrees as required (usually 30 to 45 additional degrees of turn depending on winds) in order to transition to the reposition maneuver used to set-up for the Gear Down pass.

3.19.2. **Abnormal Procedure.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or airspeed decay below 240 knots, abort the maneuver by rolling wings level and climbing to 500 feet AGL. If necessary, adjust G as required (no lower than 240 knots) to avoid overshooting the show line.

3.20. Gear Down Pass.

Figure 3.12. A-10 Gear Down Pass.



**Gear Down Pass
A-10**

Table 3.11. A-10 Gear Down Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	120	A/R	1
Exit	300'	120	A/R	1

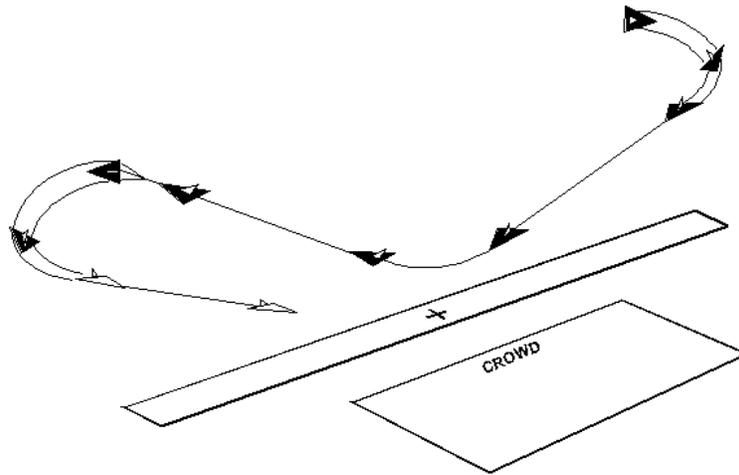
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	200'	110 / 200	A/R	N/A
Exit	200'	110 / 200	A/R	N/A

3.20.1. **Maneuver Description.** After completion of the Level 360, initiate a turn toward the 500-foot show line and begin slowing the aircraft below 200 knots with full speed brakes. Upon reaching the base position for the 500-foot show line and below 200 knots, configure the aircraft with gear, full flaps, and 40% speed brakes and begin a descent down to 300 feet AGL. Continue slowing the aircraft to 120 knots (110 knots minimum) while flying down the 500-foot show line. When passing the last of the crowd, select max power, close the speed brakes, and bring the flaps to seven degrees while smoothly raising the nose to a 25 to 35-degree climb. While climbing, turn away from the crowd as required using 30 degrees of bank (45 degrees maximum). During this climbing turn, raise the gear.

3.20.2. **Abnormal Procedure.** If the minimum altitude or airspeed cannot be maintained, or the aircraft stalls, abort the maneuver by selecting max power, closing the speed brakes, and setting the flaps to MVR. If still sinking, consider engaging the fuel flows to override.

3.21. Three Low Angle Strafe Passes.

Figure 3.13. A-10 Three Low Angle Strafe Passes.



Three Low Angle Strafe Passes
A-10

Table 3.12. A-10 Three Low Angle Strafe Passes Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry (Flat)	1,500' (1,000')	225	MAX	1
Exit (Pyro)	200' (400')	290	MAX	6

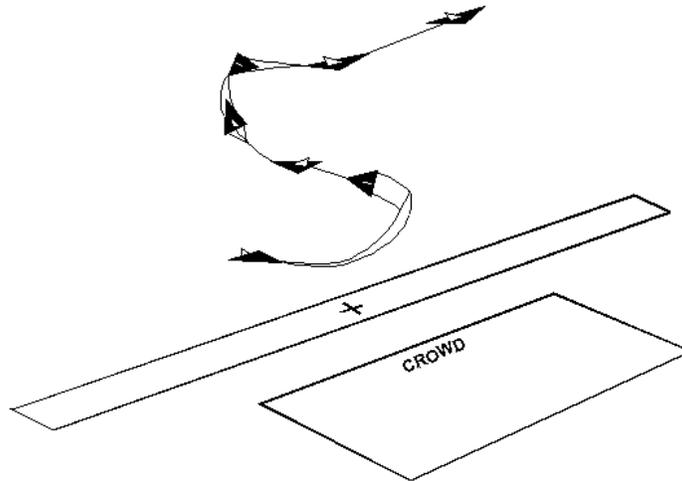
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	1,000'	200 / AC LMT	MAX	N/A
Exit (Pyro)	100' (300')	250 / AC LMT	MAX	7.33

3.21.1. Maneuver Description. After performing a reposition maneuver, align the aircraft to approach the preplanned strafe target/point from an appropriate angle. This angle will normally range from 10 – 30 degrees off the show line depending on the location of the crowd line and winds. Do not allow a vector towards the crowd! The aircraft vector, if extended to infinity, must not penetrate the crowd line. The dive angle will normally be 10 – 30 (5 – 15 Flat) degrees nose low depending on winds. The optimum dive angle is 25 (10 Flat) degrees. Do not exceed 30 (15 Flat) degrees. Recovery should be initiated at 650 feet AGL using a max performance pull in order to bottom out at or above 200 feet AGL. Be very careful not to over-G the aircraft during this pull. In order to make this corner, a minimum of 250 knots must be obtained. After recovering to level flight, accomplish a reposition maneuver to set-up for the next strafe pass. Use the 500-foot show line at show center as a reference point for setting up each strafe pass. Do not cross the 500-foot show line. Depending on winds, this may require aiming 100 – 300 feet outside the 500-foot line away from the crowd. Following the last strafe pass, transition to the Jink-Out maneuver.

3.21.2. Abnormal Procedure. If at any time the dive angle exceeds 30 (15 Flat) degrees, either abort the pass and fly through straight and level or shift the aim point longer and parallel to the show line until the dive angle is 30 (15 Flat) degrees or less. Check airspeed at 1,000 feet AGL. If it is not at least 230 knots, abort the pass and fly through straight and level.

3.22. Jink-Out Maneuver.

Figure 3.14. A-10 Jink-Out.



Jink-Out A-10

Table 3.13. A-10 Jink-Out Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	200'	290	MAX	5 to 6
OTT	$\geq 2,000'$	200	MAX	4

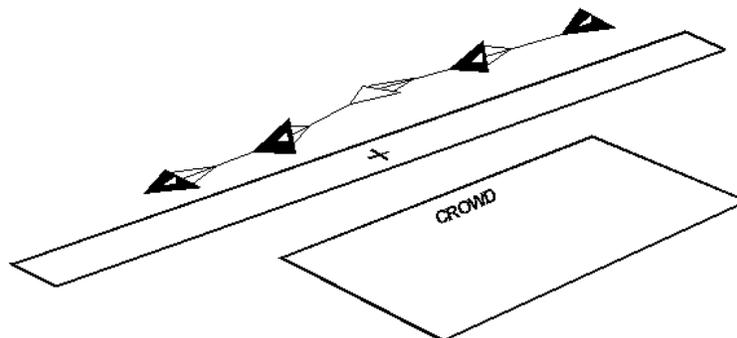
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	100'	200 / AC LMT	MAX	7.33
OTT	1,900'	120 / AC LMT	MAX	N/A

3.22.1. **Maneuver Description.** Upon completion of the last strafe pass and level at the 200-foot target altitude, an 80 to 90-degree bank 5.0 to 6.0 G turn is initiated away from the crowd to complete a 100 to 135-degree turn to be at or beyond the 1,500-foot show line. At the completion of this 100 to 135-degree turn, pull 3.0 to 5.0 Gs up to 40 degrees (55 degrees maximum). Once pitch degree is achieved, maintain climb to 2,000 feet AGL, then roll inverted and pull to 30 degrees nose low (40 degrees maximum). Hold till 1,200 feet AGL, then roll to the nearest horizon and level off at 500 feet AGL. The goal of this maneuver is to show the Jink-Out in front of show center and be at the 1,500-foot line. In order for this to occur, the 100 to 135 degrees of turn is accomplished at a target of 4.0 Gs.

3.22.2. **Abnormal Procedure.** If at any time during the maneuver any altitude or climb/dive angle will not be maintained, abort by rolling wings level and climbing away from the crowd line.

3.23. Four-Point Roll.

Figure 3.15. A-10 Four-Point Roll.



Four - Point Roll
A-10

Table 3.14. A-10 Four-Point Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	325	MAX	+1 to -1
Exit	500'	325	MAX	1

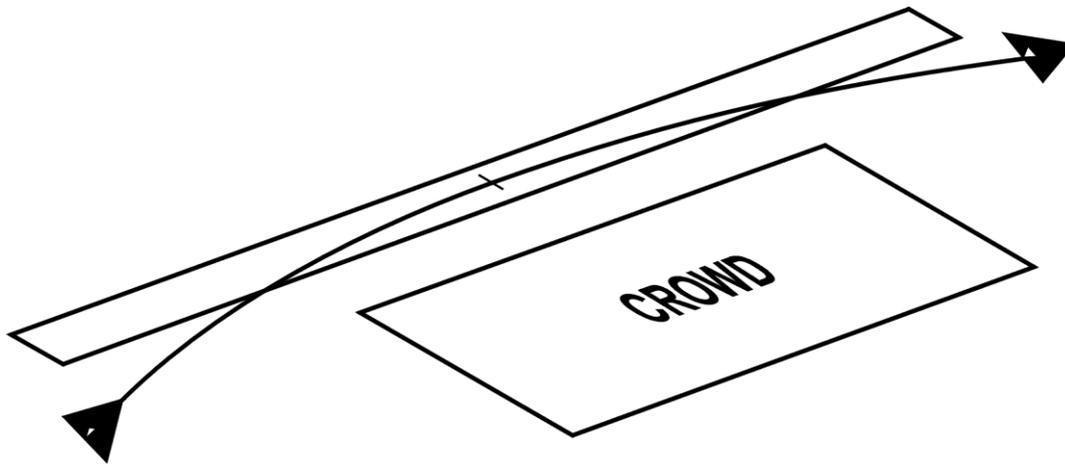
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	280 / AC LMT	MAX	N/A
Exit	min 400'	270 / AC LMT	MAX	N/A

3.23.1. **Maneuver Description.** Enter the Four-Point roll at 500 feet AGL and 325 knots. 2,000 feet prior to show center, pull the nose 3 to 5 degrees nose high, establish a climb, and unload. A cadence four-point roll to the left is then performed by pausing momentarily at the 90-degree, 180-degree, 270-degree, and 360-degree points. The pace of the cadence should ensure the aircraft is at the 180-degree point over show center. In order to facilitate sharp transitions between each 90 degrees of roll, momentarily fan the speed brakes and unload the aircraft to 0 Gs at the initiation of each roll. Be sure to close the speed brakes upon completion of the roll to avoid any unnecessary loss of airspeed. The 90-degree and 270-degree points require top rudder to maintain level flight and zero G to maintain the show line. The 180-degree point requires 1 negative G in order to maintain level flight. This is accomplished using the horizon, not the G meter.

3.23.2. **Abnormal Procedure.** If at anytime during the Four-Point Roll, the nose falls more than five degrees below the horizon, abort by rolling towards the nearest horizon and a wings-level position, then continue down the show line. This would most likely occur during the 3rd point (270 degrees) due to a decrease in airspeed, which results in less rudder effectiveness.

3.24. Dedication Pass. The intent of this maneuver is to pay tribute to our war fighters. It is to be flown before the Tactical Pitch-Up to Land during the High, Low, and Flat Show profiles.

Figure 3.16. A-10 Dedication Pass.



Dedication Pass A-10

Table 3.15. A-10 Dedication Pass Parameters.

TARGET		PARAMETERS	
Altitude AGL	Airspeed KCAS	Power Setting	G
Entry 300'	325	MAX	1 to 3
Exit 300'	325	MAX	4 to 6
PARAMETER		LIMITS	
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	G
Entry min 200'	250 / A/C Limits	MAX	7.33
Exit min 200'	250 / A/C Limits	IDLE to MAX	7.33

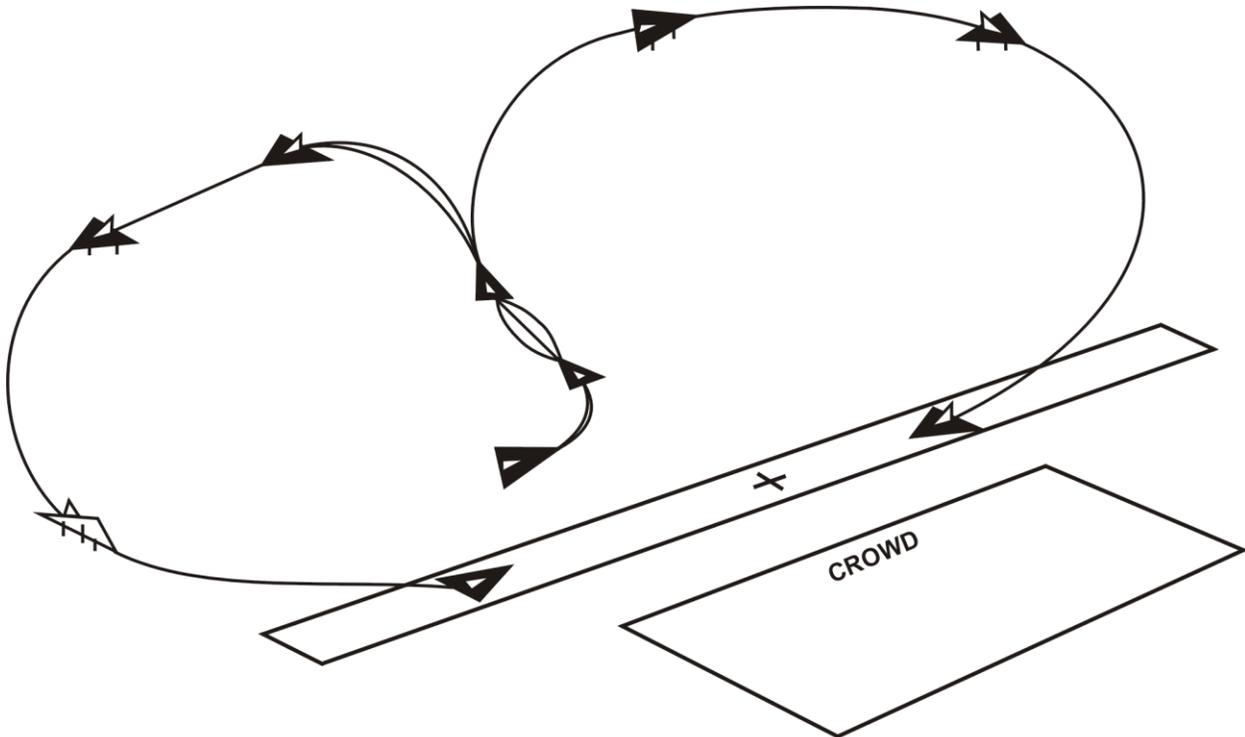
3.24.1. Maneuver Description. The maneuver is flown on the 500-foot line and is non-aerobatic. After performing the Four-Point Roll or Strafe Passes, execute a reposition maneuver on the crowd side to arrive behind and offset the crowd. The approach will be flown from behind the line, approximately 2 miles from show center, with an approximate 30 degree dive angle and a 45 degree cut (max bank angle 90 degrees) to the show line, remaining 500 feet from the crowd at all times. Upon reaching a point 500 feet from the corner of the crowd and 300 feet AGL, roll the aircraft into a level arcing pass using a max bank of 90 degrees. Use top rudder if necessary to maintain altitude. Optimum profile of the aircraft is achieved at approximately 80 degrees of bank. Use caution not to over bank the aircraft and allow the aircraft to lose altitude while banking. In order to maintain 500 feet from the crowd at each corner, the flight path at show center will have to extend beyond

500 feet. Continue the arc beyond the opposite crowd corner, roll out of bank, and continue a maximum 45 degree climb to set up for the Tactical Pitch-Up to Landing.

3.24.2. **Abnormal Procedures.** Abort the maneuver if at any time the aircraft comes closer than 500' to the crowd line or its lateral limits, an excessive dive angle or sink rate develops, entry parameters are not met, or the aircraft descends below 200 feet AGL. Abort the maneuver by rolling the aircraft wings level and flying away from the crowd.

3.25. Tactical Pitch-Up to Land.

Figure 3.17. A-10 Tactical Pitch-up to Land.



Tactical Pitch-Up To Land A-10

Table 3.16. A-10 Tactical Pitch-Up to Land Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	325	MAX	1
Pitch-up	300'	350	MAX	5-6
Exit	≥1,000'	180	A/R	N/A

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	200 / AC LMT	MAX	N/A
Pitch-up	200'	200 / N/A	MAX	7.33
Exit	1,000'	135 / N/A	A/R	N/A

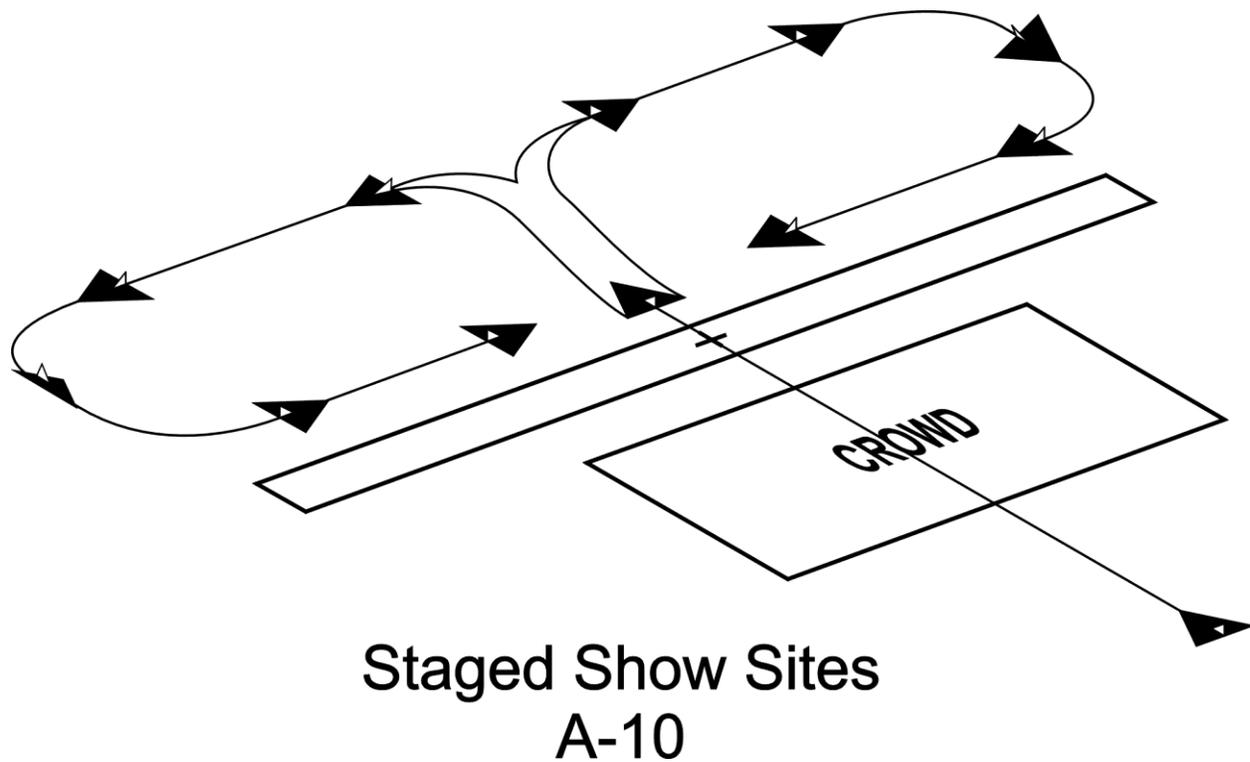
3.25.1. **Maneuver Description.** Reposition the aircraft to level off at 300 feet AGL, on the 500-foot show line at 325 knots (200 knots minimum). Roll into 80 to 90 degrees of bank to turn 90 degrees away from the crowd line. Once pointed away from the crowd, pull 5.0 to 6.0 Gs to 40 degrees nose high to achieve 1,000 feet AGL minimum. At 1,000 feet AGL minimum execute a non-acrobatic 270-degree roll and pull toward the perch point of the landing runway. Begin slowing the aircraft and configure for landing with gear, full flaps, and 40% speed brakes. Fly a normal base to final (no slower than 135 knots final turn). On final, continue slowing to 120 knots (110 minimum) to touchdown. After touchdown, perform a minimum run landing by lowering the nose, opening the speed brakes full, and initiating full anti-skid braking bringing the aircraft to a complete stop. Plan to do the minimum run landing to stop at show center. This is accomplished by planning your touchdown point 2,000 feet prior to show center. Do not land 2,000 feet prior to show center if, at the point of touchdown, there is less than 5,000 feet of useable runway remaining. In this case, plan your touchdown normally in the first 500 feet of runway. **Option:** If a Heritage Flight is to be performed immediately following completion of the demonstration, this maneuver may be deleted and a Flat Pass may be substituted. If not deleted, conduct a wings-level low approach or wings-level pass and proceed to rejoin with Heritage Flight aircraft using pre-briefed procedures.

3.25.2. **Abnormal Procedures.** If airspeeds, altitudes, or stall warning indications are experienced with the stick shaker, a Go-Around must be executed to recover the aircraft. Once the Go-Around is completed, the pilot will then turn out to downwind (away from the crowd) and set up for a normal straight-in to full stop.

3.26. Staged Show Sites. When demonstration aircraft takeoff from other than the air show site, fuel planning must include the fuel required flying to and from the show site, and any

holding time required. The pilot may enter the show from behind the crowd at a minimum of 1000 ft AGL as depicted in **Figure 3.18**, or via a Flat Pass maneuver down the show line, and complete the show as described in this chapter. Upon completion of the Dedication Pass and clearing the crowd, turn out behind the crowd and return to the staging airport. Pilots should plan to fly a full demonstration, but may cut the profile short as required to maintain suitable enroute return fuel.

Figure 3.18. A-10 Staged Show Sites.



Chapter 4

F-15 DEMONSTRATION MANEUVERS

Section 4A—General Information

4.1. General. Maneuvers described in this chapter will be used for training and for F-15 aerial demonstrations. The demonstration sequence is designed so each maneuver is normally flown in the same direction with respect to the crowd line with the following exceptions: Flat Pass, Knife Edge, Photo Pass, and the aileron roll preceding the tactical pitch to landing. As a result, the show is always oriented the same way from the spectators' point of view. Abnormal procedures are written for each maneuver. If the entry conditions are not met for any maneuver, a wings-level pass will be flown and the pilot will transition to the next maneuver. Demonstration pilots will transmit parameters prior to initiating the descending portion of vertical pull-throughs for the Split-S and Vertical Reposition Maneuvers. These calls will be made when the pilot reaches apex of the maneuver. Ground safety observer will monitor demonstration pilot altitude and airspeed radio calls and direct an abort when parameter limits are exceeded. Following all maneuvers and before clearing the show line to reposition for the next maneuver, the pilot will ensure any descent has been stopped and the aircraft is in a climbing or level attitude with the flight path marker at or above the horizon.

4.2. Aircraft Configuration and Fuel Requirements. Aircraft configuration for all demonstrations may be clean, clean with wing pylons, or clean with wing pylons and 1 or 2 smokewinders on stations 2A and/or 8B. Fuel considerations include: divert requirements, cable availability, temperature, and density altitude. Normal minimum fuel for takeoff is:

4.2.1. Staged Show: 13,500 pounds

4.2.2. High Show: 11,000 pounds

4.2.3. Low Show: 9,000 pounds

4.3. Airspeed and G Limits. Demonstration pilots will not exceed 0.94 Mach. The maximum target G for this demonstration is 7.5 Gs. This does not preclude a momentary increase in G for safety considerations.

4.4. Show line Restrictions. The majority of the F-15 demonstration will be flown on the 1,500-foot show line in reference to the distance from the crowd. Non-aerobatic maneuvers (less than 90 degrees of bank) may be flown on the 500-foot show line unless specified in the maneuver description.

4.5. Airspace and Runway Requirements. Required airspace for the F-15 is 15,000 feet AGL and normally a five-mile radius from show center horizontally. The minimum dimensions of the aerobatic box are 3,000 feet wide, 6,000 feet long, and 15,000 feet AGL (high show). If the FAA has waived a show line to closer than 1,500 feet, the aerobatic box may be less than 3,000 feet wide, provided there is at least 1,500 feet from the show line to the outer edges of the box. Minimum runway length is 7,000 feet x 75 feet. The runway, taxiway, and parking area must be stressed for a 45,000-pound aircraft with single wheel type landing gear.

4.6. Weather Requirements. Weather PARAMETER LIMITS for the high profile are a ceiling of at least 7,000 feet, three miles ground and five miles in-flight visibility with a discernible horizon. The low show profile ceiling is at least 2,500 feet. The flat show profile ceiling is at least 1,500 feet. Maneuvers will be planned to maintain VMC throughout the show sequence.

4.7. High Density Altitude Demonstrations. For high density altitude shows, adjust PARAMETER LIMITS in accordance with the following:

4.7.1. Add 500 feet to APEX altitudes for each 2,000 feet of altitude above 3,000 feet MSL and 10 knots to airspeeds. For example, if the show site altitude is 5,000 feet MSL, add 500 feet to the baseline target and 10 knots to the airspeed. If the show site altitude is 7,000 feet MSL, add 1,000 feet to the baseline target and 20 knots to the airspeed.

4.8. Demonstration Maneuver Profiles.

4.8.1. High Show.

4.8.1.1. Maximum Performance Takeoff and Climb

4.8.1.2. Split-S

4.8.1.3. Four-Point Roll

4.8.1.4. High G Turn

4.8.1.5. Triple Aileron Roll

4.8.1.6. Wing Walk

4.8.1.7. Cuban 8

4.8.1.8. Double Immelmann

4.8.1.9. Split-S

4.8.1.10. Maximum Performance Climb with Rolls

4.8.1.11. Spiral Descent

4.8.1.12. Dedication Pass

4.8.1.13. Knife Edge Pass

4.8.1.14. Tactical Pitch-Up to Landing

4.8.2. Low Show.

4.8.2.1. Maximum Performance Takeoff Inverted

4.8.2.2. Four-Point Roll

4.8.2.3. High G Turn

4.8.2.4. Triple Aileron Roll

4.8.2.5. Wing Walk

4.8.2.6. Level 8

4.8.2.7. Dedication Pass

4.8.2.8. Knife Edge Pass

4.8.2.9. Tactical Pitch-Up to Landing

4.8.3. Flat Show.

4.8.3.1. Normal Takeoff

4.8.3.2. Flat Pass

4.8.3.3. High G Turn

4.8.3.4. Wing Walk

4.8.3.5. Level 8

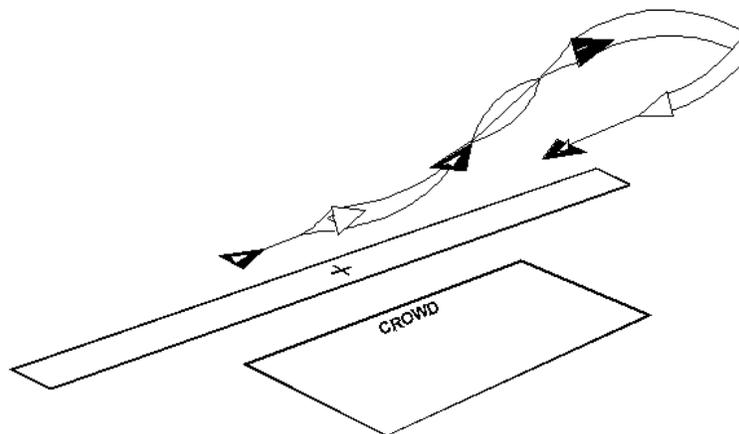
4.8.3.6. Dedication Pass

4.8.3.7. Knife Edge Pass

4.8.3.8. Tactical Pitch-Up to Land

4.9. Reposition Maneuvers. Reposition maneuvers may be flown in either direction at any time during the demonstration sequence as required. Repositioning turns may not include added aileron rolls or other accenting maneuvers.

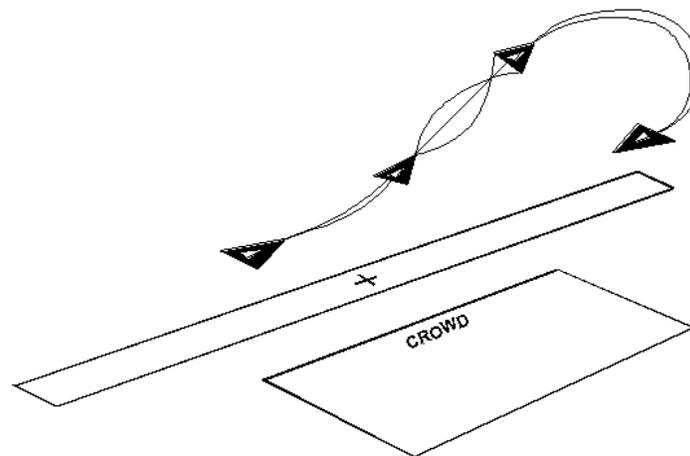
Figure 4.1. F-15 Flat Wifferdill Reposition Maneuver.



Flat Wifferdill Reposition Maneuver
F-15

4.9.1. **Flat Wifferdill Reposition Maneuver.** The Flat Wifferdill Maneuver turn is a combination horizontal and shallow vertical turn used to change direction at each end of the show line when performing the low profile. The Flat Wifferdill Maneuver turn uses less altitude than a normal Wifferdill. It requires a larger cut and tends to be looser and flatter than a normal Wifferdill. 270-degree turn reversal may be made while the aircraft is climbing. The target G for this maneuver is 6.5 to 7.0 Gs. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the flat Wifferdill. The entry "cut" turn for the flat Wifferdill is made to ensure no show line or crowd line penetration.

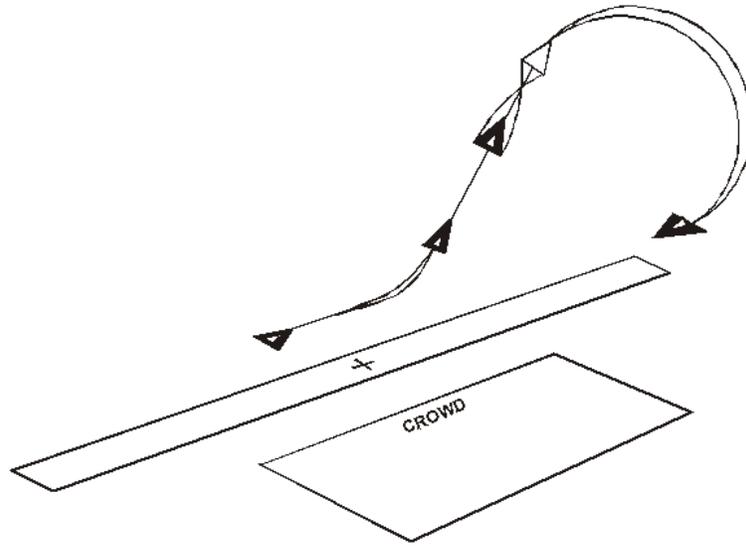
Figure 4.2. F-15 Wifferdill Reposition Maneuver.



Wifferdill Reposition Maneuver
F-15

4.9.2. **Wifferdill Reposition Maneuver.** The Wifferdill turn is a combination horizontal and vertical turn used to change direction at each end of the show line. The vertical plane is used to maintain necessary proximity to the demonstration area. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the Wifferdill. As the aircraft departs the show line, maneuver in the horizontal and vertical plane to reposition for the next maneuver. The target G for this maneuver is 6.5 to 7.0 Gs. A 270-degree turn reversal is made while still climbing. During the last half of the Wifferdill, while descending, the turn is adjusted to establish the proper show line entry. The entry "cut" turn for the Wifferdill is made to ensure no show line or crowd line penetration.

Figure 4.3. F-15 Vertical Reposition Maneuver.



Vertical Reposition Maneuver
F-15

Table 4.1. F-15 Vertical Reposition Maneuver Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	A/R	350	MIL to MAX	6.5 to 7.0
Apex	≥5,000'	300	MIL to MAX	3 to 5
90 degrees nose low	≥4,000'	300	A/R	N/A
Exit	500'	A/R	A/R	1

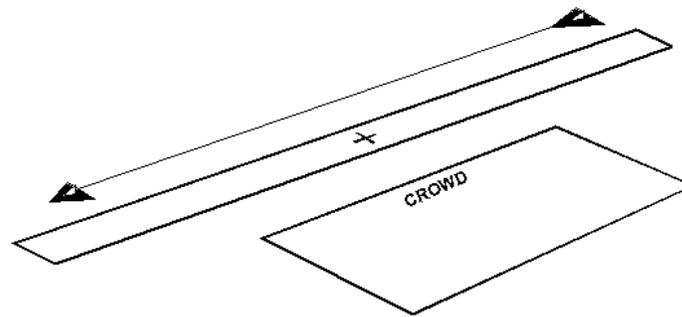
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 500'	275 / 450	A/R	8

Apex	4,500'	200 / 400	A/R	8
90 degrees nose low	3,500'	220 / 400	A/R	N/A
Exit	min 400'	A/R / A/R	A/R	3-5

4.9.3. **Vertical Reposition Maneuver.** The Vertical Reposition Maneuver may be flown to change direction at each end of the show line. Upon passing show center or at the completion of the previous maneuver with a minimum of 275 knots, begin a straight-ahead climb using 6.5 to 7.0 Gs to put the aircraft in a 40 to 55-degree nose high attitude. At a minimum of 3,800 feet AGL, perform an unloaded 180-degree roll to achieve an inverted climbing attitude. Initiate a smooth pull to the horizon to achieve a wings-level inverted position at or above 4,500 feet AGL. Continue the pull in maximum power through the vertical, using 3.0-5.0 Gs to 135 degrees of turn (45 degrees nose low). As the nose drops below the horizon and the airfield environment is reacquired, correct as necessary to complete the Vertical Reposition Maneuver down the show line. On a standard day, at 90 degrees nose low, airspeed should be between 220 to 400 knots and altitude greater than 3,500 feet AGL. At 135 degrees, backpressure is relaxed and the aircraft smoothly flown to be in level flight at 500 feet AGL for the next maneuver. Aircraft power should be modulated through the vertical to achieve the desired airspeed upon rollout for the next maneuver.

4.9.3.1. **Abnormal Procedures.** If not within the target airspeed window, adjust pitch attitude during climb to achieve desired airspeed. If below minimum apex altitude, maintain an inverted climb until reaching minimum apex altitude. If you will be below 3,500 feet AGL and over 400 knots prior to achieving 90 degrees nose low, execute emergency dive recovery procedures. If at anytime during the maneuver it appears that the aircraft will not attain the prescribed altitude/airspeed parameter limits, the maneuver will be aborted. Reposition the aircraft for follow-on maneuvering.

Figure 4.4. F-15 Flat Pass Repositioning Maneuver.



Flat Pass Repositioning Maneuver
F-15

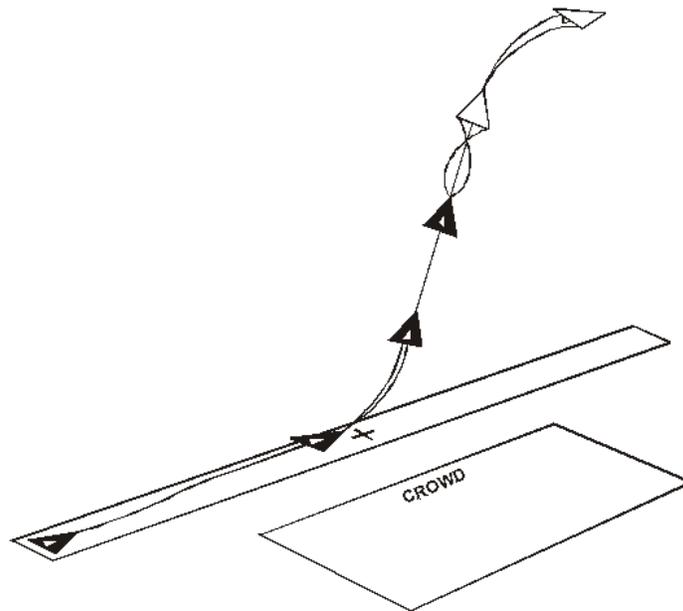
4.9.4. **Flat Pass Repositioning Maneuver.** The flat pass is a repositioning maneuver used alone or in combination with a Wifferdill for the primary purpose of orienting the subsequent demonstration maneuver in the approved direction relative to the crowd line. It should be flown IAW [paragraph 4.12](#).

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Section 4B—High Profile

4.10. Maximum Performance Takeoff and Climb (Left to Right).

Figure 4.5. F-15 Maximum Performance Takeoff and Climb.



**Max Performance Take Off and Climb
F-15**

Table 4.2. F-15 Maximum Performance Takeoff and Climb Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	0'	180	MAX	2
Exit	≥5,000'	220	MAX	A/R

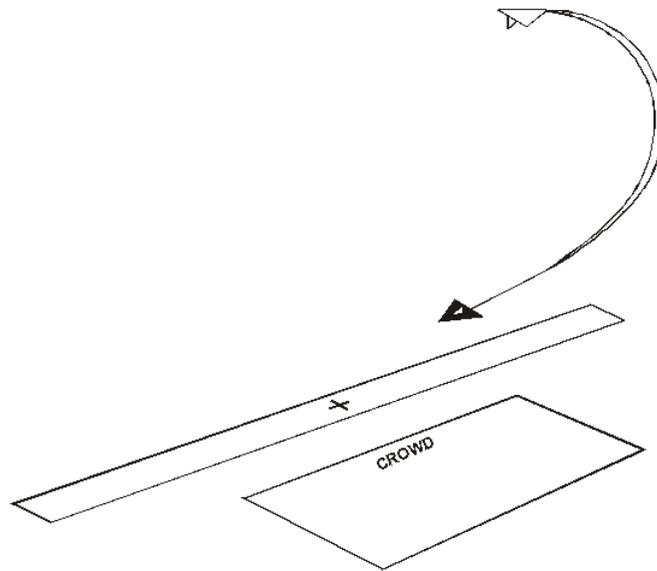
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	N/A	180 / N/A	MAX	N/A
Exit	4,500'	200 / 250	MAX	N/A

4.10.1. **Maneuver Description.** The takeoff is performed without flaps and in afterburner. At 180 knots, execute a smooth, aft-pull of the stick to achieve takeoff rotation. After a positive rate of climb is established, retract the gear and set a pitch attitude of 40 to 70 degrees nose high. Adjust pitch angle to maintain climb airspeed of 220 knots. If airspeed decreases below 200 knots, decrease pitch attitude to achieve climb airspeed.

4.10.2. **Abnormal Procedures.** If the show profile takeoff is interrupted by an aircraft malfunction, make a normal takeoff or if conditions warrant, abort the takeoff. If the takeoff is continued in a thrust-limited situation or if takeoff distance is critical, consider lowering the flaps. If the takeoff is aborted, consider lowering the flaps. Max abort speed and SETOS calculations are based on a flap-down configuration.

4.11. SPLIT-S (Right to Left from MAX Performance Takeoff).

Figure 4.6. F-15 Split-S.



Climb To Split-S
F-15

Table 4.3. F-15 Split-S Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	5000'	220	MAX	2-4
90 degrees nose low	≥4,000'	250	MAX	A/R
Exit	500'	≤.92M	MAX	3-5

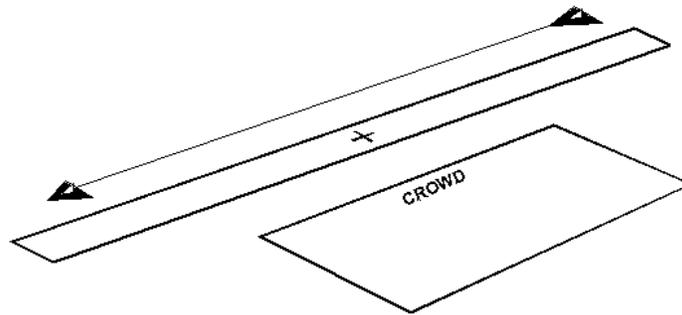
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 4,500'	200 / 250	MAX	6
90 degrees nose low	3,500'	200 / 300	MAX	N/A
Exit	min 400'	N/A / .94M	MAX	8

4.11.1. **Maneuver Description.** After takeoff and at a minimum of 3,800 feet AGL with an attitude of 40-70 degrees nose high, perform an unloaded 180-degree aileron roll to achieve an inverted climbing attitude. Initiate a smooth pull to the horizon to achieve a wings-level inverted position at 5,000 feet AGL. Continue the pull in maximum power through the vertical, using 2.0-4.0 Gs, to 135 degrees of turn (45 degrees nose low). As the nose drops below the horizon and the airfield environment is reacquired, correct as necessary to complete the Split-S down the show line. On a standard day, at 90 degrees nose low, airspeed should be between 200 to 300 knots and altitude greater than 3,500 feet AGL. At 135 degrees, relax backpressure and smoothly transition to be in level flight at 500 feet AGL for the Flat Pass.

4.11.2. **Abnormal Procedures.** If not within the target airspeed window, adjust pitch attitude during climb to achieve desired airspeed. If below minimum apex altitude, maintain an inverted climb until reaching minimum apex altitude. If you will be below 3,500 feet AGL and over 400 knots prior to achieving 90 degrees nose low, execute emergency dive recovery procedures. If at anytime during the maneuver it appears that the aircraft will not attain the prescribed altitude/ airspeed parameter limits, the maneuver will be aborted. Reposition the aircraft for follow-on maneuvering.

4.12. Flat Pass (Right to Left).

Figure 4.7. F-15 Flat Pass.



Flat Pass
F-15

Table 4.4. F-15 Flat Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	≤.92M	MAX	1
Exit	300'	≤.92M	IDLE to MAX	1

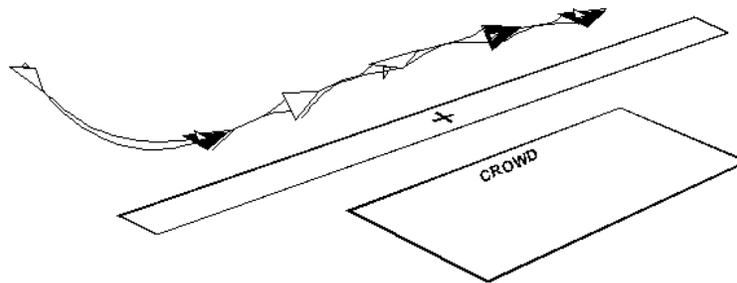
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	N/A / .94M	A/R	N/A
Exit	min 200'	N/A / .94M	A/R	N/A

4.12.1. **Maneuver Description.** The Flat Pass may be flown on the 500-foot show line at 300 feet AGL in maximum power, so as to target 0.92 Mach.

4.12.2. **Abnormal Procedures.** If it becomes apparent 0.94 Mach will be exceeded, afterburner should be deselected.

4.13. Four-Point Roll (Left to Right).

Figure 4.8. F-15 Four-Point Roll.



Four-Point Roll
F-15

Table 4.5. F-15 Four-Point Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Nominal Power Setting	G
Entry	500'	400	80% to MIL	1 to 3
Exit	500'	400	80% to MIL	1

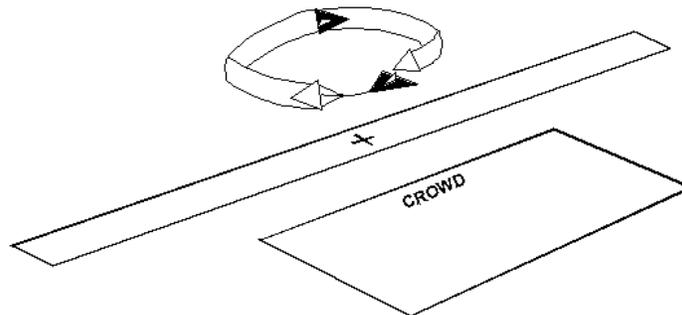
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	350 / 450	80% to MIL	N/A
Exit	min 400'	350 / 450	80% to MIL	N/A

4.13.1. **Maneuver Description.** At 3,000 feet prior to show center, smoothly pull the nose to five degrees up, establish a climb, and relax stick pressure. A cadenced four-point roll to the left is then performed by pausing momentarily at the 90-degree, 180-degree, 270-degree, and 360-degree points. Move the stick briskly, causing a left roll and an immediate stop at each point when pressure is released. The pace of the cadence should ensure the aircraft is at the 180-degree point over show center. At the completion of the pass and at the 360-degree point, a repositioning maneuver is performed to orient for a right to left initiation of the High G Turn.

4.13.2. **Abnormal Procedures.** If starting parameter limits are not achieved, abort maneuver and transition to a flat pass. During the maneuver, if the nose is below the horizon at the 180-degree inverted point, abort the maneuver by rolling to wings level.

4.14. High G Turn (Right to Left).

Figure 4.9. F-15 High G Turn.



High G Turn
F-15

Table 4.6. F-15 High G Turn Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	420	MAX	7.5
Exit	500'	375	MAX	2 to 4

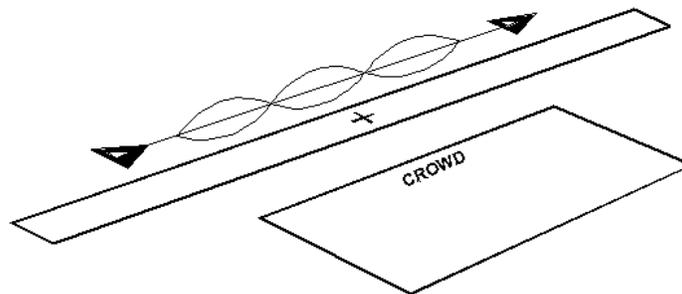
PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min	400'	400 / 450	MAX	9
Exit	min	400'	300 / 425	MAX	9

4.14.1. **Maneuver Description.** At approximately 3,000 feet prior to show center, select full AB and accelerate to approximately 420 knots. At show center, turn away from the crowd using approximately 85 degrees of bank. Begin the turn with a smooth G onset rate to maintain airspeed at approximately 400 knots and 7.5 Gs. G-loading and airspeed bleed-off rate will vary with density altitude. The first 180 degrees of turn should be accomplished with a 1 ¾ degree nose-up attitude and the last 180 degrees of turn should be accomplished with a 1 ¾ degree nose-down attitude to make the turn appear level to the crowd. Vary the bank angle and pitch to arrive at level flight at the completion of 360 degrees of turn and to ensure the maneuver is finished above the entry altitude. Surface winds must be taken into consideration in order to center this maneuver on show center and to avoid overshooting the show line. As you approach show center, smoothly but briskly roll out. Perform a repositioning maneuver to set up for the Triple Roll.

4.14.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or airspeed decay below 300 knots, abort the maneuver by rolling wings level and climbing to 500 feet AGL. If necessary, adjust power and G as required (no lower than 300 knots) to avoid overshooting the show line.

4.15. Triple Aileron Roll (Left to Right).

Figure 4.10. F-15 Triple Aileron Roll.



Triple Aileron Roll F-15

Table 4.7. F-15 Triple Aileron Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	425	80% to MIL	2 to 4
Exit	500'	425	80% to MIL	1

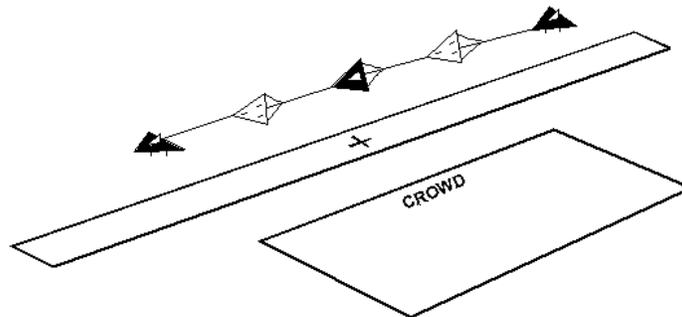
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	400 / 450	80% to MIL	N/A
Exit	min 400'	400 / 450	80% to MIL	N/A

4.15.1. **Maneuver Description.** At 3,000 feet prior to show center with 425 knots and a minimum of 500 feet AGL, raise the nose eight degrees, establish a climb, and relax stick pressure. Apply full left stick pressure to perform a maximum of three consecutive unloaded aileron rolls. As the second roll is completed, it is important to ensure the aircraft has gained altitude and the nose is still above the horizon. At the completion of the third roll, roll out and reposition for the Wing Walk.

4.15.2. **Abnormal Procedures.** If starting parameters are not achieved, abort maneuver and transition to a flat pass. If the nose drops below level inverted on the second roll or roll coupling occurs (to exceed approximately 2.5 G) immediately roll wings level and climb to minimum altitude.

4.16. Wing Walk (Right to Left).

Figure 4.11. F-15 Wing Walk.



Wing Walk
F-15

Table 4.8. F-15 Wing Walk Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	190	80% to MIL	1 to 2
Exit	500'	220	80% to MIL	1 to 2

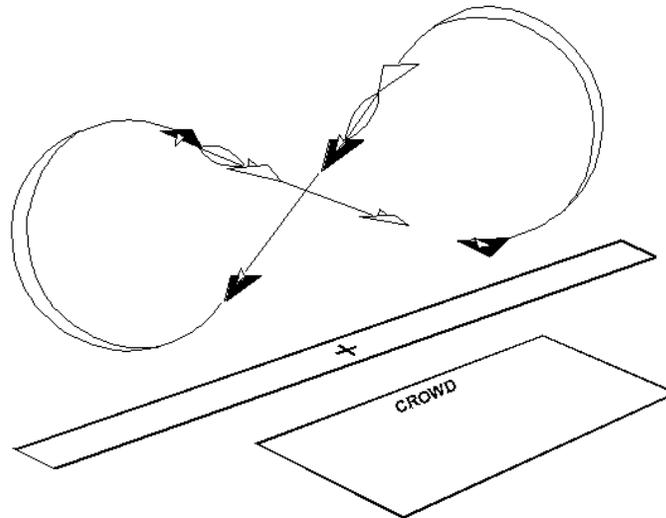
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 400'	170 / 230	A/R	N/A	
Exit	min 400'	190 / 260	A/R	N/A	

4.16.1. **Maneuver Description.** Configure the aircraft (gear down and flaps up) and roll out no lower than 500 feet AGL with 190 knots. At 2,000 feet prior to show center, raise the nose five to ten degrees, advance the power slightly, and blend full aileron away from the crowd and opposite rudder to achieve 85 to 90 degrees of bank. Level flight and track is maintained with top rudder. Pause momentarily and reverse the roll, pause then reverse again to achieve three separate steep bank positions. When performing at field elevations of 3,000 feet or greater, only two wing rocks should be accomplished.

4.16.2. **Abnormal Procedure.** If entry parameter limits are not met, abort the maneuver and perform a wings-level gear-down pass. 90 degrees of bank with the gear down is the maximum allowed in the Dash-1. **NOTE:** The Wing walk is a transition point to the medium/low profile if required by changing weather conditions.

4.17. Cuban 8 (Left to Right).

Figure 4.12. F-15 Cuban Eight.



**Cuban Eight
F-15**

Table 4.9. F-15 Cuban Eight Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	5000'	300	MAX	25 AOA
Apex	≥3,500'	180	IDLE	1 to 2
Exit	500'	350	MAX	3 to 5

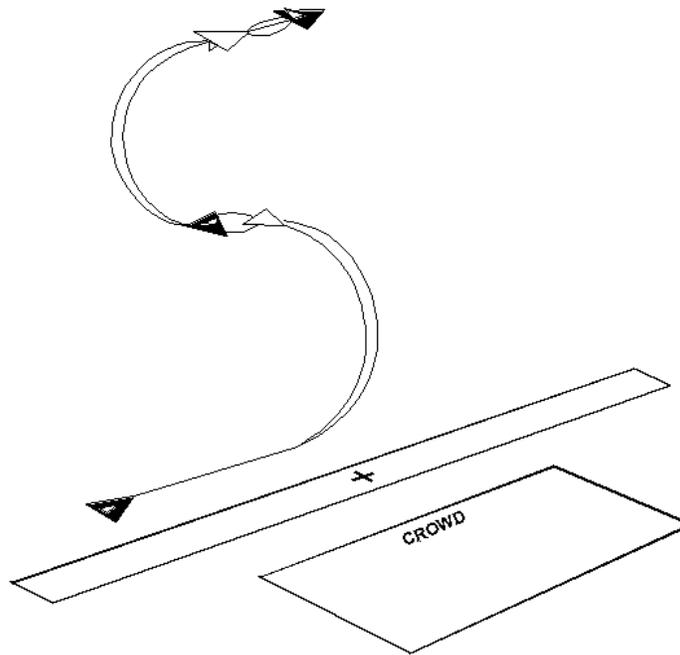
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	275 / 420	MAX	6
Apex	3,300'	150 / 250	IDLE	4
Exit	min 400'	300 / 400	MAX	6

4.17.1. **Maneuver Description.** When wings level following the Wing Walk, select full afterburner, and raise the landing gear. Attain sufficient airspeed (300 knots) and begin a brisk but smooth wings-level pull to approximately 25-unit AOA. Normal apex altitude is above 3,500 feet AGL. At apex altitude, reduce to idle power. Airspeed should be 150-250 knots. The pull is held until the nose passes through 125-140 degrees of pitch where the backpressure is eased to maintain a constant nose track of 25-45 degrees nose low inverted. The 25 to 45-degree nose low inverted attitude is held until approximately 2,500 feet AGL. At 2,500 AGL, perform an unloaded roll to wings level upright and advance throttles to MIL. Roll the aircraft as necessary to maintain proper alignment along the show line (wind correction). Gradually increase backstick pressure to ensure aircraft will not descend below 500 AGL. At no later than 1,200 AGL initiate full afterburner and begin a brisk but smooth wings-level pull to approximately 25-unit AOA. The second half is completed in the opposite direction using the procedures described earlier. A repositioning maneuver is performed to setup for the next pass.

4.17.2. **Abnormal Procedures.** If either or both afterburners fail to light, or one or more gear remain extended, abort maneuver by decreasing pitch attitude to level flight and investigate malfunction. If apex airspeed is less than 150 knots, decrease backstick pressure and accelerate to target airspeed before reducing throttles and pulling nose through horizon. If desired pitch attitude is exceeded while inverted, roll upright and set desired pitch angle and continue maneuver. If less than 2,500 feet AGL while inverted, an immediate roll and pull to wings level will be initiated. If at any time it becomes apparent that the maneuver will be completed inside the show line (poor wind correction, improper alignment after the wing walk) abort the maneuver and setup for the next pass.

4.18. Double Immelmann (Left to Right).

Figure 4.13. F-15 Double Immelmann.



**Double Immelmann
F-15**

Table 4.10. F-15 Double Immelmann Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	420	MAX	6.5-7.5
Exit	≥6,500'	200	A/R	1 to 2

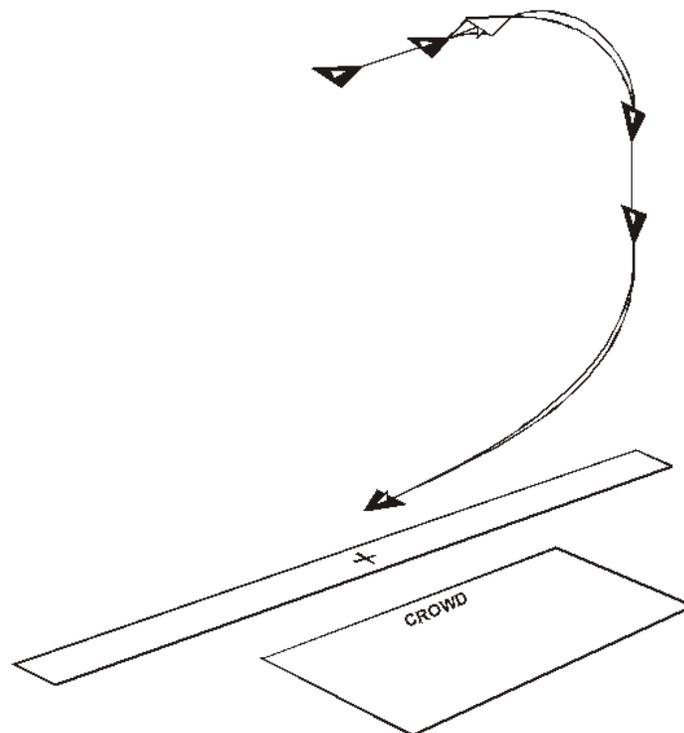
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	380 / 450	MAX	8
Exit	6,000'	160 / 300	A/R	N/A

4.18.1. **Maneuver Description.** Arrive at show center wings level, at 420 knots and 500 feet AGL. Select full afterburner and begin a smooth 6.5 to 7.5 G wings-level pull to execute the first Immelmann. The pull is held until 10 degrees nose high, inverted, and wings level. Relax stick pressure and perform an unloaded 180-degree roll to a wings-level upright position. With greater than 250 knots perform a smooth wings-level pull to approximately 25 units AOA for the second Immelmann. The second pull is also held until 10 degrees nose high, inverted, and wings level. Relax stick pressure and perform an unloaded 180-degree roll to a wings-level upright position. Altitude at the top should be approximately 6,500 feet AGL. Accelerate to 275 knots, terminate afterburner, and set up for the Split-S.

4.18.2. **Abnormal Procedures.** If entry parameters are not achieved by show center, delay initial pull until parameters are met. If not met by 2,000 feet past show center, reposition for next maneuver. If less than 250 knots after rollout on the first Immelmann, delay the second pull until parameters are met. If less than 6,000 feet AGL at the completion of the maneuver, start a gradual climb to be at a minimum of 6,000 feet AGL prior to the Split-S.

4.19. SPLIT-S (Right to Left from Double Immelmann).

Figure 4.14. F-15 Split-S.



Split - S
F-15

Table 4.11. F-15 Split-S Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	≥6,500'	275	MIL or BELOW	2 to 4
90 degrees nose low	≥4,000'	350	MIL or BELOW	1
Exit	500'	400	MIL or BELOW	3 to 5

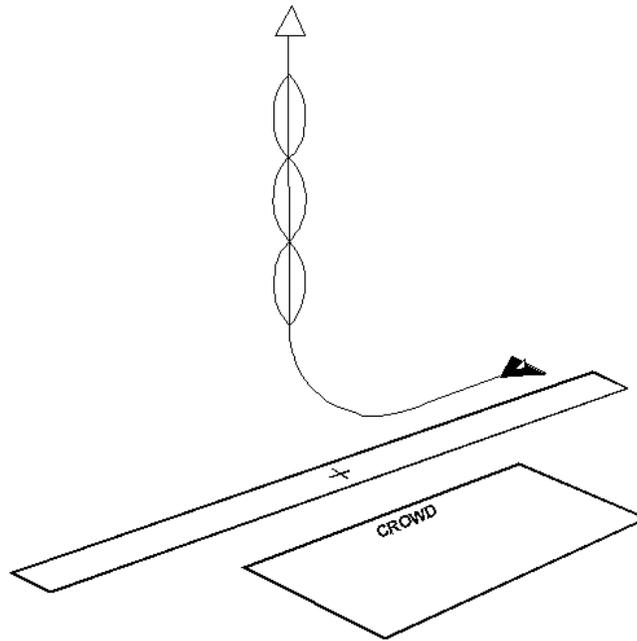
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 6,000'	200 / 300	MIL or BELOW	6
90 degrees nose low	3,500'	220 / 400	MIL or BELOW	N/A
Exit	min 400'	350 / 450	MIL or BELOW	8

4.19.1. **Maneuver Description.** After completion of the Double Immelmann, with airspeed between 200 to 300 knots, and altitude >6,500 feet AGL, delay 15 seconds (no wind) while flying wings level on the extended show line. Adjust aircraft heading to maintain alignment on the extended show line (crosswind correction) and to setup for the Max Climb run-in. With the throttles in Mil or below, perform an unloaded roll to inverted flight and smoothly pull the nose of the aircraft down to achieve a pitch attitude of 90 degrees nose low. Hold this attitude until reaching 4,000 feet AGL, and then continue a smooth pull through the vertical, using 2 to 4 Gs to approximately 45 degrees nose low. On a standard day, at 90 degrees nose low, airspeed should be between 220 to 400 knots and altitude greater than 3,500 AGL. At this point, backpressure is relaxed and smoothly flown to be in level flight at 500 feet for the Max Climb. Power should be modulated in the descent to maintain at or below 450 knots.

4.19.2. **Abnormal Procedures.** If not within the airspeed window, adjust pitch attitude and/or power to achieve desired airspeed. If below 6,000 feet AGL, climb as necessary before executing the Split-S. If you will be below 3,500 feet AGL and over 400 knots prior to achieving 90 degrees nose low, execute emergency dive recovery procedures. If at anytime during the maneuver it appears that the aircraft will not attain the prescribed altitude/airspeed parameters, the maneuver will be aborted. Roll out and/or pull to a wings-level position, initiate a descent and reposition the aircraft for follow-on maneuvering.

4.20. Maximum Performance Climb with Rolls (Right to Left).

Figure 4.15. F-15 Maximum Performance Climb With Rolls.



**Maximum Performance Climb With Rolls
F-15**

Table 4.12. F-15 Maximum Performance Climb With Rolls Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	420	MAX	6.5 to 7.5
Exit	NTEWA	225	80% to MAX	2 to 5

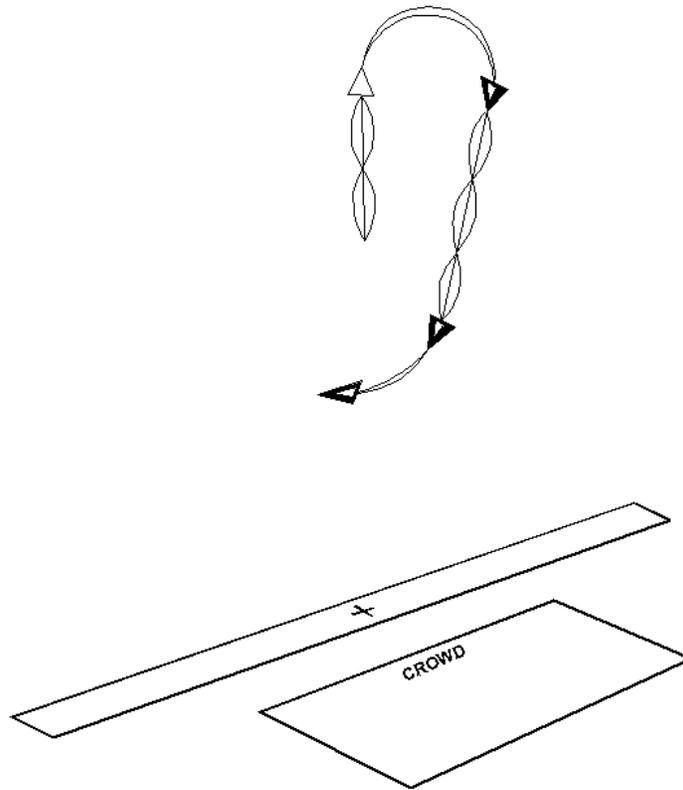
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	400 / 500	MAX	8
Exit	min 10,000'	175 / 275	80% to MIL	6

4.20.1. **Maneuver Description.** Approach show center wings level, at an airspeed of 420 knots and 300 feet AGL. At 2,000 feet prior to show center select full afterburner and initiate a 6.5 to 7.5 G wings-level pull to arrive at show center with 90 degrees of pitch. The pull should be made so the aircraft is vertical at show center. When the aircraft is vertical, perform high-rate unloaded aileron rolls until reaching a minimum of 225 knots or 2,500 feet below waived airspace. Stop the aileron rolls and execute a vertical recovery by smoothly pulling the nose to the nearest horizon. Deselect afterburner and modulate power as necessary to setup for the spiral descent.

4.20.2. **Abnormal Procedures.** If entry parameters are not met at 2,000 feet prior to show center, delay until entry parameters are met. If entry parameters are not met prior to 2,000 feet past show center, abort the maneuver and reposition for the next pass. If it becomes apparent airspeed will decrease below 175 knots in the climb, initiate a vertical recovery.

4.21. Spiral Descent.

Figure 4.16. F-15 Spiral Descent.



Spiral Descent
F-15

Table 4.13. F-15 Spiral Descent Parameters.

TARGET	PARAMETERS
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Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	NTEWA	200	IDLE	1 to 2
Exit	6,000'	400	IDLE	3 to 7

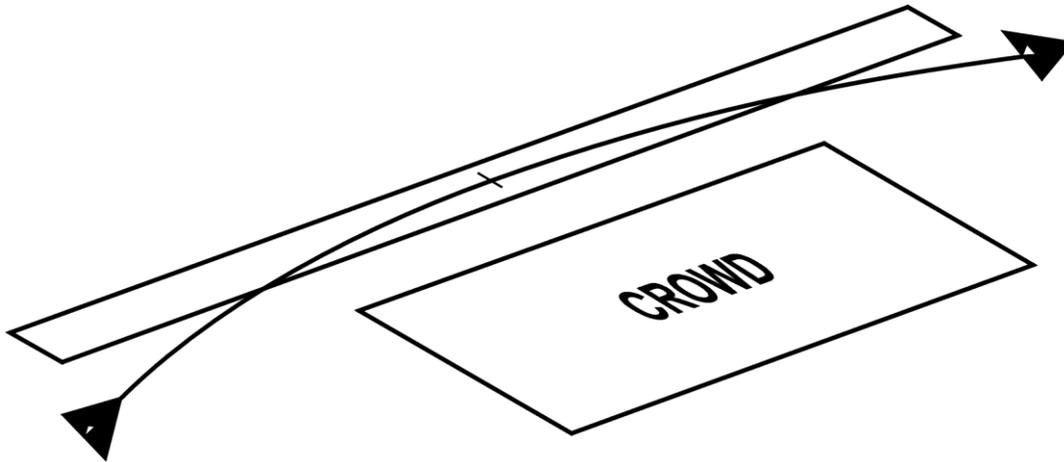
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 10,000'	150 / 300	IDLE	N/A
Exit	5,000'	A/R / 450	IDLE	8

4.21.1. **Maneuver Description.** As the aircraft nose is brought through the horizon, reacquire the airshow environment. In idle power, perform a vertical spiraling descent oriented toward show center. Initiate dive recovery by 6,000 feet AGL. Do not exceed 450 knots in the descent. The direction of the dive recovery should be as necessary to reposition for the next maneuver, however do not exit the maneuver over the crowd.

4.21.2. **Abnormal Procedures.** If entry airspeed window is not met (too fast) adjust dive angle to minimize airspeed in the descent. If below 12,000 AGL at the apex of the climb (airspace restrictions, weather conditions), adjust dive angle to safely execute a recovery at 6,000 AGL. When initiating the spiral descent at altitudes above 15,000 AGL, adjust minimum dive recovery altitude accordingly. (If starting at 18,000 AGL, initiate dive recovery at 9,000 AGL.) Initiate an immediate dive recovery if airspeed is at/or above 450 knots. Show center orientation is a secondary consideration in the spiral descent. If at anytime during the maneuver it appears that the aircraft will not attain the prescribed altitude/airspeed parameters, the maneuver will be aborted. Roll out and/or pull to a wings-level position, initiate a descent and reposition the aircraft for follow-on maneuvering. **OPTION:** Due to changing weather conditions, the vertical spiraling descent may not be possible after the Max Climb. Start a descent when able to maintain VMC conditions to position the aircraft in front of the crowd to set-up for the next maneuver.

4.22. Dedication Pass. The intent of this maneuver is to pay tribute to our war fighters. It is to be flown prior to the Knife Edge Pass during the High, Low, and Flat Show profiles.

Figure 4.17. F-15 Dedication Pass.



Dedication Pass F-15

Table 4.14. F-15 Dedication Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	≤.85M	MAX	1 to 3
Exit	300'	≤.85M	IDLE to MAX	4 to 6

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry min	200'	350 / .90M	MIL to MAX	9
Exit min	200'	350 / .90M	IDLE to MAX	9

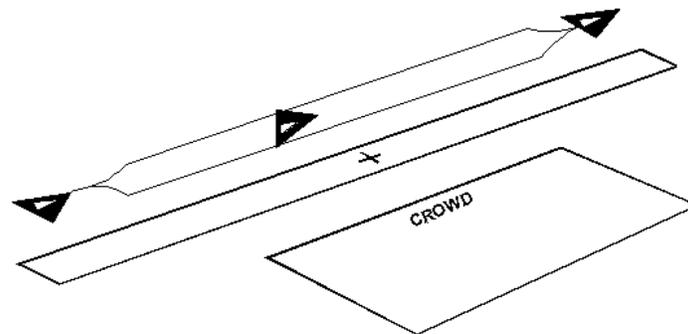
4.22.1. **Maneuver Description.** The maneuver is flown on the 500-foot line and is non-aerobatic. Following the Spiral Descent (high show) or Level Eight (low or flat show), attain a safe airspeed and reposition the aircraft to arrive behind and offset the crowd. The approach will be flown from behind the line, approximately 2 miles from show center, with an approximate 30 degree dive angle and a 45 degree cut (max bank angle 90 degrees) to the show line, remaining 500 feet from the crowd at all times. Upon reaching a point 500 feet

from the corner of the crowd and 300 feet AGL, roll the aircraft into a level arcing pass using a max bank of 90 degrees. Use top rudder if necessary to maintain altitude. Select max power until passing the show line or until a target airspeed of .85M is anticipated. Varying pressure altitudes and temperatures will determine when to select afterburner to ensure the target airspeed is attained at show center and the max airspeed is not exceeded. Optimum profile of the aircraft is achieved at approximately 80 degrees of bank. Use caution not to over bank the aircraft and allow the aircraft to lose altitude while banking. In order to maintain 500 feet from the crowd at each corner, the flight path at show center will have to extend beyond 500 feet. Continue the arc beyond the opposite crowd corner, reduce power as required, roll out of bank, and continue a maximum 45 degree climb to set up for the Knife Edge Pass.

4.22.2. **Abnormal Procedures.** Abort the maneuver if at any time the aircraft comes closer than 500' to the crowd line or its lateral limits, an excessive dive angle or sink rate develops, entry parameters are not met, or the aircraft descends below 200 feet AGL. Abort the maneuver by rolling the aircraft wings level and flying away from the crowd.

4.23. Knife Edge Pass.

Figure 4.18. F-15 Knife Edge Pass.



Knife Edge Pass
F-15

Table 4.15. F-15 Knife Edge Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	400	MAX	1 to 3
Exit	500'	500	80% to MAX	1 to 3

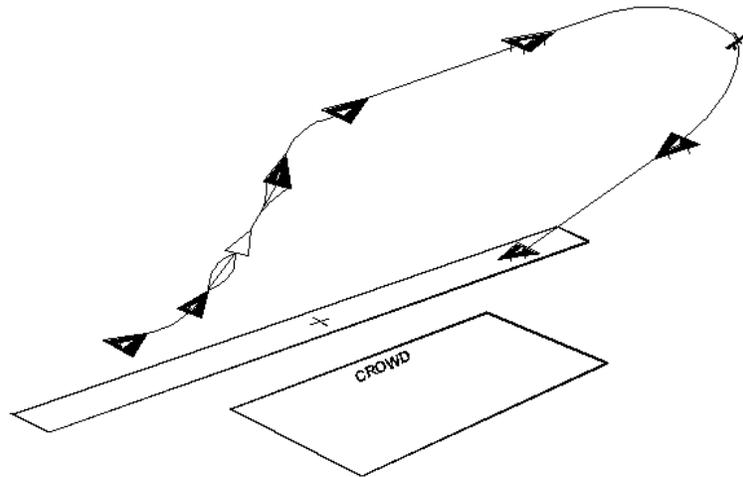
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	350 / 450	MAX	4
Exit	min 400'	475 / 600	80% to MAX	4

4.23.1. **Maneuver Description.** Enter the 1,500' show line at 500 feet AGL and 400 knots. At 4,000 feet prior to show center, raise the nose five to 10 degrees, establish a climb, and apply stick pressure to roll 90 degrees toward the crowd. The aircraft is held in this position until 4,000 feet past show center. Top rudder is applied to help hold the nose above the horizon so the full maneuver can be accomplished. Forward stick pressure is applied to keep the aircraft on the show line and to maintain level flight.

4.23.2. **Abnormal Procedures.** If entry parameters are not met, abort the maneuver, make a flat pass and reposition for the next maneuver. If the nose falls below level flight (zero degrees pitch in the HUD) or if the aircraft will descend below 400 feet AGL, abort the maneuver.

4.24. Tactical Pitch-Up to Landing (Direction of Landing).

Figure 4.19. F-15 Tactical Pitch-Up to Landing.



**Tactical Pitch-Up To Landing
F-15**

Table 4.16. F-15 Tactical Pitch-Up to Landing Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	340	MAX	4 to 6
Exit	Downwind Alt	250	A/R	1 to 4

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	320 / 420	MAX	8
Exit	Downwind Alt	230 / 350	A/R	N/A

4.24.1. **Maneuver Description.** At 2,000 feet prior to show center, 500 feet AGL, and 340 knots select afterburner. Smoothly pull the nose five degrees up, establish a climb and relax stick pressure. Perform an unloaded 405-degree aileron roll followed by an aggressive pull-up to downwind. During the pull to downwind, terminate afterburner and slow to below 300 knots. Configure for and execute a normal final turn and landing.

4.24.1.1. **Option 1:** On the pull-up to downwind, an additional 180-degree roll (reversal) may be performed to land from the opposite direction.

4.24.1.2. **Option 2:** If a Heritage Flight is to be performed immediately following completion of the demonstration, conduct a low approach or wings-level pass and proceed to rejoin with Heritage Flight aircraft using pre-briefed procedures.

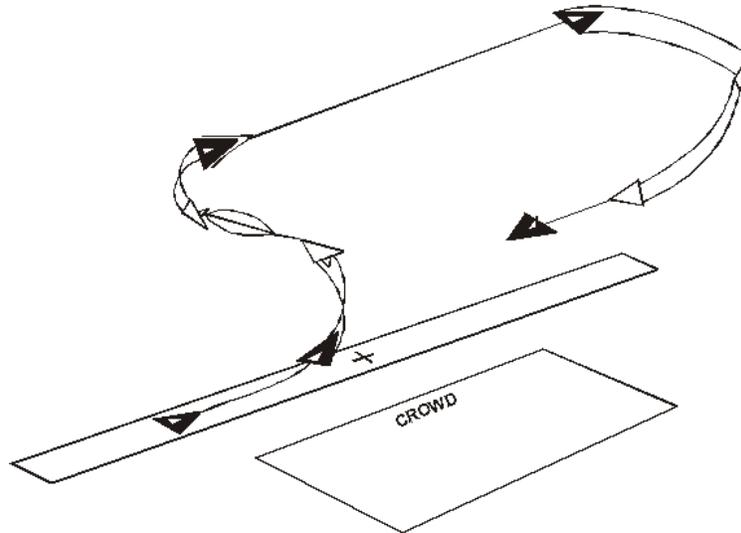
4.24.2. **Abnormal Procedure.** If entry parameters are not achieved by show center, pull-up to a normal closed pattern.

Section 4C—Low Profile

4.25. Low Profile Abnormal Procedures: Unless otherwise noted, **Abnormal Procedures** for the low profile are the same as the high profile.

4.26. Maximum Performance Takeoff Inverted.

Figure 4.20. F-15 Maximum Performance Takeoff Inverted.



**Maximum Performance T/O-Inverted
F-15**

Table 4.17. F-15 Maximum Performance Takeoff Inverted Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	0'	180	MAX	23-25 AOA
Exit	1,200'	350	MAX	1

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	0'	180 / N/A	MAX	N/A
Exit	1,000'	300 / 400	MAX	N/A

4.26.1. **Maneuver Description.** The takeoff is performed without flaps and in full afterburner. At 180 knots, execute a smooth, but brisk aft pull of the stick to achieve takeoff rotation. After a positive rate of climb is established, retract the gear and rotate the nose to achieve a 23-25 unit AOA climb (max AOA 25 units). Smoothly roll and pull away from the crowd to a wings-level inverted position with afterburners pointing directly at the crowd. Hold inverted flight for approximately five seconds, accelerate to 300 to 400 knots, and then perform a 270-degree right turn to position for the Flat Pass. Minimum airspeed in the climb will be 180 knots; minimum altitude inverted will be 1,000 feet. Option: From inverted flight, roll 180 degrees to a wings-level upright position. Delay for approximately 3-5 seconds, and then perform a left 270-degree roll to position for the Flat Pass.

4.26.2. **Abnormal Procedures.** If the show profile takeoff is interrupted by an aircraft malfunction, make a normal takeoff, or if conditions warrant, abort the takeoff. If the takeoff is continued in a thrust-limited situation or if takeoff distance is critical, consider lowering the flaps. If the takeoff is aborted, consider lowering the flaps. Max abort speed and SETOS calculations are based on a flap-down configuration.

NOTE: The Max Performance Takeoff/Inverted may be flown in either direction.

NOTE: The Inverted Takeoff may be substituted for the Vertical Climb Takeoff at any time. Reasons are not limited to, but may include: takeoff direction due to wind and show orientation, weather considerations, terrain, or to demonstrate a different aircraft capability. The Inverted Takeoff is described in the low section.

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4.27. Normal Takeoff.

Table 4.18. F-15 Normal Takeoff Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	N/A	350	MAX	1
Exit	N/A	350	MAX	5-7

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	N/A	150 / N/A	MAX	N/A
Exit	N/A	300 / 400	MAX	8

4.27.1. **Maneuver Description.** The takeoff is made with flaps and in full afterburner. Ensure a positive rate of climb is established after takeoff. Retract the gear, and then initiate a 3 to 5-degree nose high climb accelerating to 350 knots. At this point, maintain afterburner and begin an energy sustaining pitch-up to 500 feet AGL, using 5 to 7 Gs. At the end of the runway, perform a repositioning maneuver to set up for the Flat Pass.

4.27.2. **Abnormal Procedure.** Normal Takeoff abort considerations apply. **NOTE:** The normal takeoff may be flown in place of the Max Performance Takeoff (Climb and Inverted) if required. Reasons include, but are not limited to: weather (ceiling, visibility, winds) and field conditions (rising terrain, high density altitudes, etc.). If flying the normal takeoff to accomplish a weather check before starting the actual profile, start the show from a staged position.

4.28. Four-Point Roll (Left to Right). The Four-Point Roll will be performed as described in [paragraph 4.13](#).

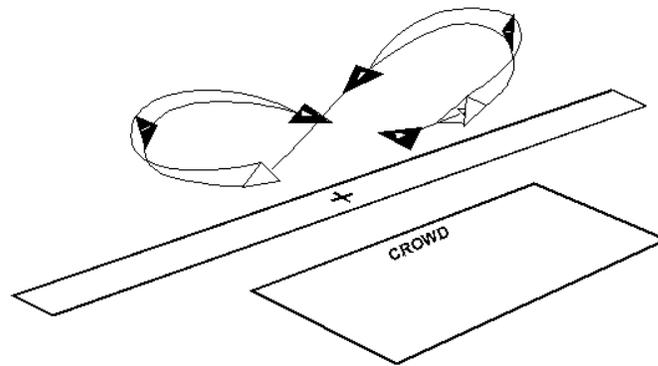
4.29. High G Turn (Right to Left). The high G turn will be performed as described in [paragraph 4.14](#).

4.30. Triple Aileron Roll (Left to Right). The triple roll will be performed as described in [paragraph 4.15](#).

4.31. Wing Walk (Right to Left). The wing walk will be performed as described in [paragraph 4.16](#) At the completion of the wing walk, select full afterburner, raise gear, and perform a repositioning maneuver.

4.32. Level 8 (Left to Right).

Figure 4.21. F-15 Level 8.



**Level 8
F-15**

Table 4.19. F-15 Level 8 Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	420	MAX	7.5
Exit	500'	375	MAX	2 to 4

PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min	400'	400 / 450	MAX	9
Exit	min	400'	300 / 425	MAX	9

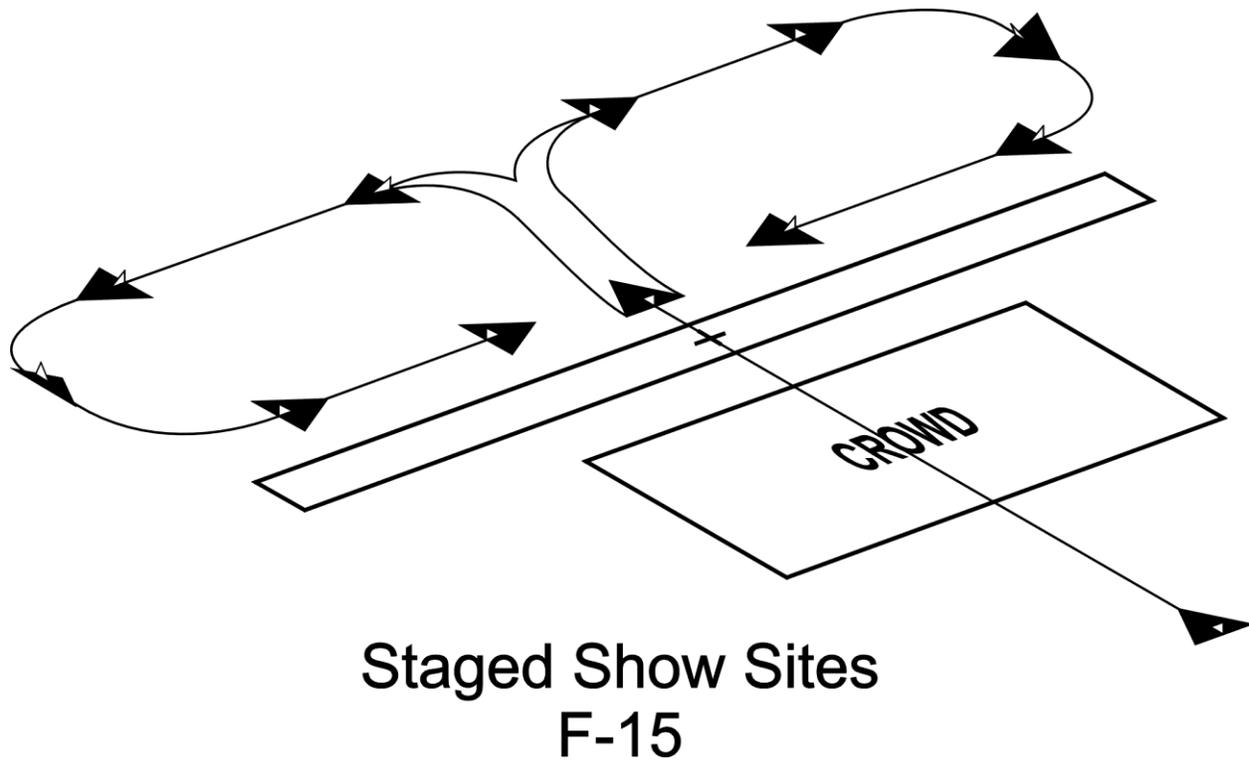
4.32.1. **Maneuver Description.** At approximately 1,500 feet past show center, select full afterburner and accelerate to approximately 420 knots. Turn away from the crowd using approximately 85 degrees of bank. Begin the turn with a smooth G onset-rate to maintain airspeed at approximately 400 knots and 7.5 Gs. G-loading and airspeed bleed-off rate will vary with density altitude. Maintain a minimum of 300 knots. The first 180 degrees of turn should be accomplished with a 1³/₄-degree nose-up attitude to make the turn appear level to the crowd. After 225 degrees of turn, unload and briskly roll wings level. Approaching the show line, reverse direction of turn and accomplish a second level turn in the opposite direction. Adjust power to enter the second turn with the same entry parameters as the first. Fly the second turn using the same techniques as the first. After 270 degrees and with a 45-degree cut to the show line, reverse the turn again. Vary the bank angle and pitch to arrive at level flight at the completion of the maneuver and to ensure the maneuver is finished above the entry altitude. Surface winds must be taken into careful consideration to center the maneuver over show center and to avoid overshooting the show line. Complete the maneuver by turning as required to finish on the show line heading the same direction as entry. Perform a repositioning maneuver to set-up for the next maneuver.

4.32.2. **Abnormal Procedures.** Adjust power and G as required to avoid overshooting the show line. If the aircraft descends below 500 feet AGL, reorient lift vector to ensure a timely correction. If the aircraft descends below 400 feet AGL or the airspeed decays below 300 knots, abort the maneuver by rolling wings level, climbing to 500 feet AGL, and repositioning for the follow-on maneuver.

4.33. Knife Edge Pass: The Knife Edge Pass will be performed as discussed in [paragraph 4.23](#).

4.34. Tactical Pitch-Up to Landing: The Tactical Pitch-Up to Landing will be performed as described in [paragraph 4.24](#).

4.35. Staged Show Sites.

Figure 4.22. F-15 Staged Show Sites.

4.35.1. When demonstration aircraft takeoff from other than the show site, plan to arrive over the show site with the fuel requirements prescribed in [paragraph 4.2](#), plus enroute return fuel IAW AFI 11-2F-15 Vol 3. The pilot may enter from behind the crowd at a minimum of 1,000 ft AGL as depicted in [Figure 4.22](#), or via a Flat Pass maneuver down the show line, and complete the show as described in this chapter. Upon completion of the Dedication Pass and clearing the crowd, turn out behind the crowd and return to the staging airport. Pilots should plan to fly a full demonstration, but may cut the profile short as required to maintain suitable enroute return fuel.

4.36. F-15 No-Flap TOLD. The F-15 flying demonstration takeoff is performed in the flaps up configuration. The effect of flaps on TOLD was investigated in the Boeing F-15 Simulator, with the following (non-scientific) results.

4.36.1. **Effect of Flaps on Takeoff Distance.** Takeoff distance was measured for an afterburner takeoff with flaps up and flaps down. Flap position had a negligible effect on takeoff distance. *Conclusion:* The thrust from afterburner on a clean jet overcomes any drag induced by flaps, and acceleration to takeoff speed is not affected by flap position.

4.36.2. **Effect of Flaps on Stopping Distance.** Stopping distance was measured for a full AB acceleration to max abort speed followed by an abort with both engines in idle. For the acceleration portion, the distance was the same for flaps up and flaps down as discussed above. However, the stopping distance was significantly higher for the flaps-up configuration. The average increase in stopping distance was 1,200 feet with the flaps up compared to flaps-down. *Conclusion:* Flaps have a considerable effect on stopping distance due to aerodynamic drag.

4.36.3. **Effect of Flaps on SETOS.** SETOS was measured by accelerating in AB to max abort speed, moving one throttle to cutoff, and noting the airspeed at which the aircraft can safely become airborne. For 70°F, flaps-down SETOS was 160 knots, while flaps-up SETOS was around 185 knots. This seems to correspond to the Dash-1 recommendation that, during a flaps-down single-engine takeoff with one engine windmilling, retract the gear when airborne, but delay flap retraction until 25 knots above SETOS. *Conclusion:* No-flap SETOS is approximately 25 knots greater than flaps-down SETOS.

4.36.4. **Effect of Flaps on Single-Engine Takeoff Distance.** Single engine takeoff distance was measured by accelerating to max abort speed in AB, moving one throttle to cutoff, accelerating to SETOS, and measuring the distance from brake release at that point. Again, flap configuration had little effect on the acceleration portion, but a significant effect on the takeoff distance. For flaps up, the acceleration to no-flap SETOS and liftoff occurred an average of 1,200 feet further down the runway compared to flaps-down. *Conclusion:* The requirement to accelerate to a higher airspeed before taking off significantly increases the single engine takeoff distance in the no-flap configuration.

4.36.5. **Conclusions.** The F-15 demo is often performed on short runways with no arresting gear available. A serious engine malfunction near max abort speed requires timely and precise action to avoid a runway departure situation. Because the F-15 Dash-1 only provides TOLD for the flaps-down configuration, demo pilots should use this TOLD, but consider the following for takeoff phase engine malfunctions:

4.36.5.1. Max abort speed from the Dash-1 is only valid for flaps down. Flaps up may increase your stopping distance past the end of the runway. If performing a high-speed abort, consider lowering the flaps to minimize stopping distance.

4.36.5.2. SETOS from the Dash-1 is only valid with flaps down. Attempting to takeoff at flaps-down SETOS may significantly delay liftoff. Acceleration to flaps-up SETOS 25 knots higher will significantly increase takeoff distance. If you lose an engine, decide to continue the takeoff, and takeoff distance is critical, consider lowering the flaps to minimize the single-engine takeoff distance.

Chapter 5

F-16 DEMONSTRATION MANEUVERS

Section 5A—General Information

5.1. General. Maneuvers described in this chapter will be used for training and for F-16 aerial demonstrations. The demonstration sequence is designed so all of the maneuvers up to the High Alpha Pass are performed in the same direction with respect to the crowd line. The High Alpha Pass is designed to be flown against the wind. Abnormal procedures are written for each maneuver. If the entry conditions are not met for any maneuver, a wings-level pass will be flown and the pilot will transition to the next maneuver. Demonstration pilots will transmit parameters prior to initiating the descending portion of vertical pull-throughs for the Split-S, Shark's Tooth, and Vertical Reposition maneuvers. These calls will be made when the pilot reaches apex of the maneuver. Ground safety observer will monitor demonstration pilot altitude and airspeed radio calls and direct an abort when parameter limits are exceeded. Following all maneuvers and before clearing the show line to reposition for the next maneuver, the pilot will ensure any descent has been stopped and the aircraft is in a climbing or level attitude with the flight path marker at or above the horizon.

5.2. Aircraft Configuration and Fuel Requirements. Aircraft configuration for all demonstrations will be clean (no wing pylons or missiles except wingtip smoke winders) and internal fuel. Fuel considerations include: divert requirements, cable availability, temperature, and density altitude. Normal minimum fuel for take-off is:

5.2.1. Staged Show: 6,000 pounds.

5.2.2. High Show: 5,000 pounds.

5.2.3. Low Show: 4,000 pounds.

5.3. Airspeed and G Limits. Demonstration pilots will not exceed 0.94 Mach. The maximum target G for this demonstration profile is 7.5 Gs. This does not preclude a momentary increase in G for safety considerations.

5.4. Show line Restrictions. The majority of the F-16 demonstration will be flown on the 1,500-foot show line in reference to the distance from the crowd. Non-aerobatic maneuvers (less than 90 degrees of bank) may be flown on the 500-foot show line unless specified in the maneuver description.

5.5. Airspace and Runway Requirements. Required airspace for the F-16 is 15,000 feet AGL and normally a five-mile radius from show center. The minimum dimensions of the aerobatic box are 3,000 feet wide, 6,000 feet long, and up to 15,000 feet AGL (high show). If the FAA has waived a show line to closer than 1,500 feet, the aerobatic box may be less than 3,000 feet wide, provided there is at least 1,500 feet from the show line to the outer edges of the box. Minimum runway length is 7,000 feet and width is 75 feet. The runway, taxiway, and parking area must be stressed for a 30,000-pound aircraft with single wheel type landing gear.

5.6. Weather Requirements. Weather PARAMETER LIMITS for the high profile are a ceiling of at least 7,000 feet and three miles ground and five miles in-flight visibility with a discernible

horizon. The low show profile ceiling is at least 2,500 feet. The flat show profile ceiling is at least 1,500 feet. Maneuvers will be planned to maintain VMC throughout the show sequence.

5.7. High Density Altitude Demonstrations. For high density altitude shows, adjust PARAMETER LIMITS in accordance with the following:

5.7.1. Add 500 feet to APEX altitudes for each 2,000 feet of altitude above 3,000 feet MSL and 10 knots to airspeeds. For example, if the show site altitude is 5,000 feet MSL, add 500 feet to the baseline target and 10 knots to the airspeed. If the show site altitude is 7,000 feet MSL, add 1,000 feet to the baseline target and 20 knots to the airspeed.

5.8. Demonstration Maneuver Profiles.

5.8.1. High Show.

5.8.1.1. Maximum Performance Takeoff and Climb to Cuban 8

5.8.1.2. High Speed Flat Pass

5.8.1.3. Triple Aileron Roll

5.8.1.4. High-G Turn

5.8.1.5. Four-Point Roll

5.8.1.6. Double Immelmann

5.8.1.7. Split-S

5.8.1.8. Falcon Turn

5.8.1.9. Shark's Tooth

5.8.1.10. High Alpha Pass

5.8.1.11. Muscle Climb

5.8.1.12. Knife Edge Pass

5.8.1.13. Maximum Performance Climb with Rolls

5.8.1.14. Spiral Descent

5.8.1.15. Dedication Pass

5.8.1.16. Tactical Pitch-Up to Landing

5.8.2. Low Show.

5.8.2.1. Takeoff to Level 8

5.8.2.2. Flat Pass

5.8.2.3. Triple Aileron Roll

5.8.2.4. High G Turn

5.8.2.5. Four-Point Roll

5.8.2.6. Knife Edge Pass

5.8.2.7. Falcon Turn

5.8.2.8. High Alpha Pass

5.8.2.9. Dedication Pass

5.8.2.10. Tactical Pitch-Up to Landing

5.8.3. Flat Show.

5.8.3.1. Maximum Performance Takeoff

5.8.3.2. Level 8

5.8.3.3. Flat Pass R-L

5.8.3.4. Flat Pass L-R

5.8.3.5. High G Turn

5.8.3.6. High Alpha Pass

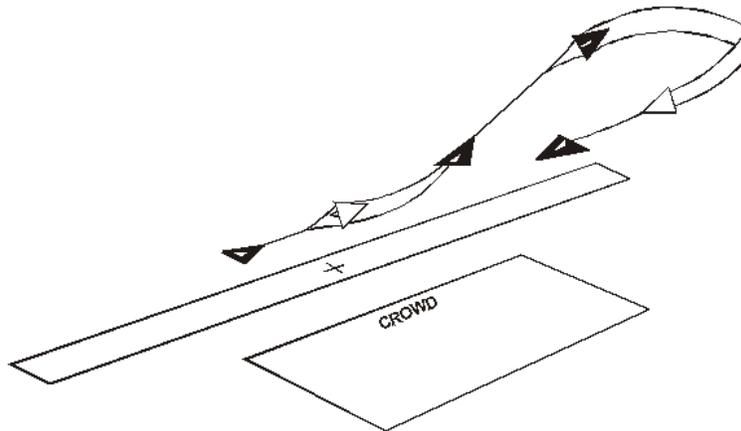
5.8.3.7. Knife Edge Pass

5.8.3.8. Dedication Pass

5.8.3.9. Tactical Pitch-Up to Land

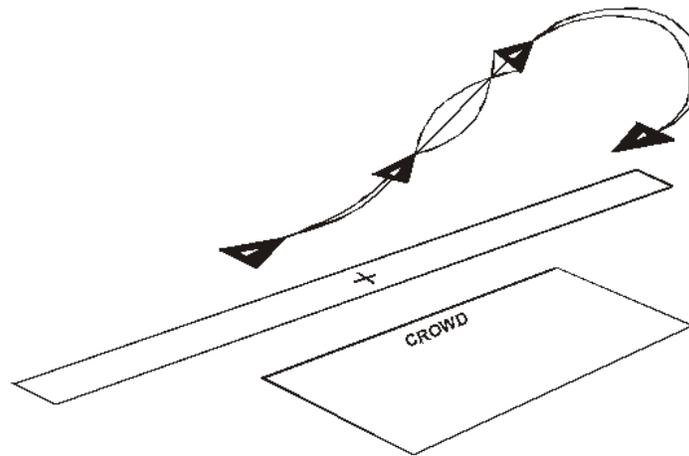
5.9. Reposition Maneuvers. Reposition maneuvers may be flown in either direction at any time during the demonstration sequence as required. Repositioning turns may not include added aileron rolls or other accenting maneuvers.

Figure 5.1. F-16 Flat Wifferdill Reposition Maneuver.



**Flat Wifferdill Reposition Maneuver
F-16**

5.9.1. Flat Wifferdill Reposition Maneuver. The Flat Wifferdill Maneuver turn is a combination horizontal and shallow vertical turn used to change direction at each end of the show line when performing the low profile. The Flat Wifferdill Maneuver turn uses less altitude than a normal reposition. It requires a larger cut and tends to be looser and flatter than a normal turn. The target G for this maneuver is 6.5 to 7.0 Gs. A 270-degree turn reversal may be made while the aircraft is climbing. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the flat reposition. The entry "cut" turn for the flat reposition is made to ensure no show line or crowd line penetration.

Figure 5.2. F-16 Wifferdill Reposition Maneuver.

Wifferdill Reposition Maneuver
F-16

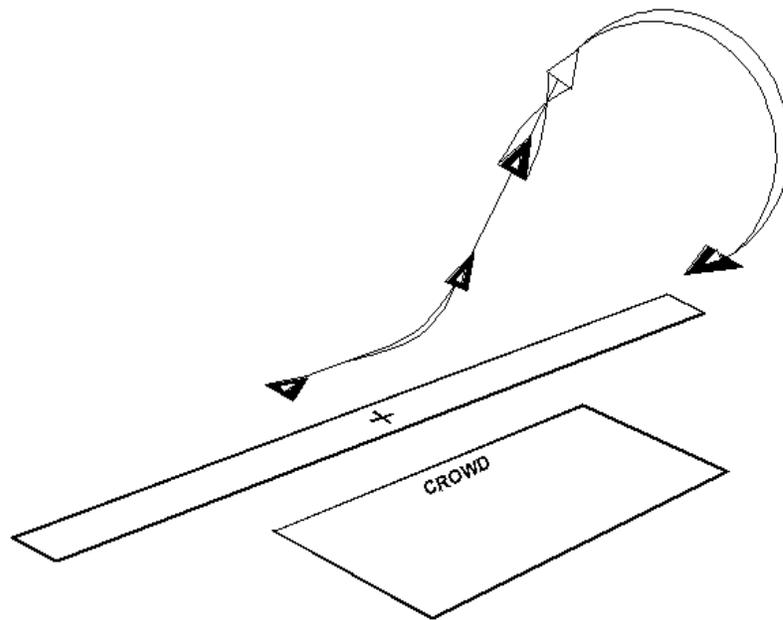
5.9.2. **Wifferdill Reposition Maneuver.** This maneuver is a combination horizontal and vertical turn used to change direction at each end of the show line. The vertical plane is used to maintain proximity to the demonstration area. Each turn may differ slightly so that airspeed/ altitude parameters for the next maneuver are established in the turn. As the aircraft departs the show line, maneuver in the horizontal and vertical plane to reposition for the next maneuver. The Target G for this maneuver is 6.0 to 7.0 Gs. A 270-degree rolling turn reversal is made while still climbing. During the last half of the maneuver, while descending, the turn is adjusted to establish the proper show line entry. The entry "cut" turn for the reposition is made to ensure no show line or crowd line penetration.

5.9.2.1. **Abnormal Procedures:** Weather, terrain, obstacles, and winds into the show line must be considered when determining how much vertical and horizontal turning room is required for the reposition.

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5.9.3. Vertical Reposition Maneuver.

Figure 5.3. F-16 Vertical Reposition Maneuver.



Vertical Reposition Maneuver
F-16

Table 5.1. F-16 Vertical Reposition Maneuver Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	A/R	450	A/R	5.5 to 7.5
Apex	5,000'	275	A/R	Limiter
90 degrees nose low	≥3,500'	300	A/R	
Exit	500'	A/R	A/R	4 to 6

PARAMETER			LIMITS			
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min	400'	150 / N/A	A/R	9	
Apex	min	4,500'	150 / 350	A/R	9	
90 degrees nose low		3,000'	150 / 350			
Exit	min	400'	A/R / A/R	A/R	9	

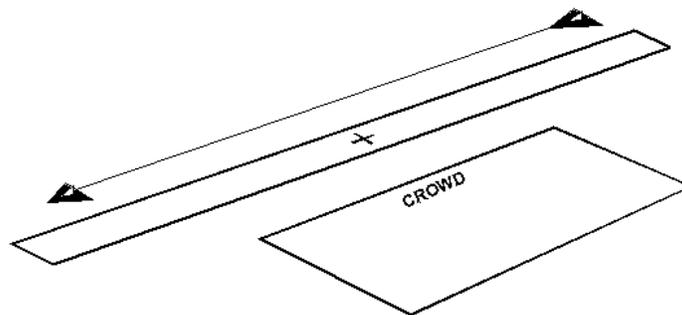
5.9.3.1. Maneuver Description. The vertical reposition will be flown to change direction at each end of the show line during a high show. Upon passing show center or at the completion of the previous maneuver, a straight-ahead climb is commenced using a 6.0 to 7.0 G pull to put the aircraft in a 55-degree nose high attitude. For slower entry parameters, use G as required to maintain a minimum of 150 KIAS. Power setting is based upon entry parameters to ensure a minimum airspeed of 150 KIAS in the climb. Pitch attitude may be reduced as well to hold airspeed. At a minimum of 3,000 feet AGL, the aircraft is rolled inverted and the demonstration pilot unloads the aircraft to attain or exceed the apex target altitude. Once apex parameters are assured, initiate an aggressive 135-degree pull through the vertical, to approximately 45 degrees nose low. The peak altitude reached will be a minimum of 4,500 feet AGL with a target of 5,000 feet AGL. The throttle will be modulated as required to initiate the pull down with a target airspeed of 275 KIAS. Once recovery above the minimum altitude for the follow on maneuver is assured, backpressure is relaxed and the aircraft is smoothly flown to be in level flight at the entry altitude for the next maneuver. In no circumstances should the demonstration pilot play the G during the 135-degree pull through the vertical.

5.9.3.2. Abnormal Procedures. If entry parameters are not attained, reposition in the oblique for follow-on maneuvers. If apex parameters are not achieved with regard to airspeed or altitude, immediately recover the aircraft to the nearest horizon and abort the split-S. If the airspeed exceeds 350 KIAS during any portion of the dive or is below

3,000 feet AGL at 90 degrees nose low, immediately initiate a dive recovery to the nearest horizon.

5.9.4. Flat Pass.

Figure 5.4. F-16 Flat Pass.



Flat Pass
F-16

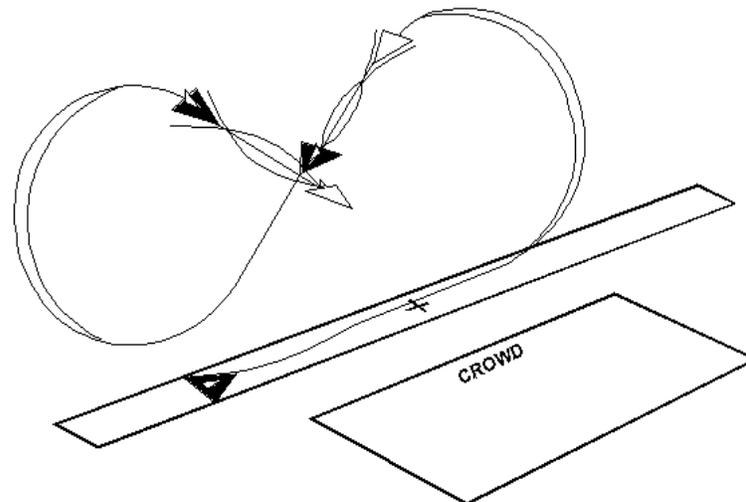
NOTE:

May be flown either direction.

5.9.4.1. **Maneuver Description.** The flat pass is a repositioning maneuver used alone or in combination with an oblique reposition for the primary purpose of orienting the subsequent demonstration maneuver in the approved direction relative to the crowd line. The Flat Pass may be flown in either direction at any time during the demonstration sequence if required. It should be flown IAW [paragraph 5.11](#).

Section 5B—High Profile

5.10. Maximum Performance Takeoff and Climb to Cuban 8 or 1/2 Cuban 8 (depending on takeoff direction).

Figure 5.5. F-16 Maximum Performance Takeoff and Climb to Cuban 8.

**Maximum Performance
Takeoff and Climb to Cuban 8
F-16**

Table 5.2. F-16 Maximum Performance Takeoff and Climb to Cuban 8 Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	200'	350	MIL to MAX	4 to 6
Apex	$\geq 3,500'$	200	MIL to MAX	2 to 4
Exit	500'	A/R	A/R	4 to 6

PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min	100'	300 / 440	MIL to MAX	9
Apex	min	3,000'	150 / 350	MIL to MAX	5
Exit	min	400'	250 / A/R	A/R	9

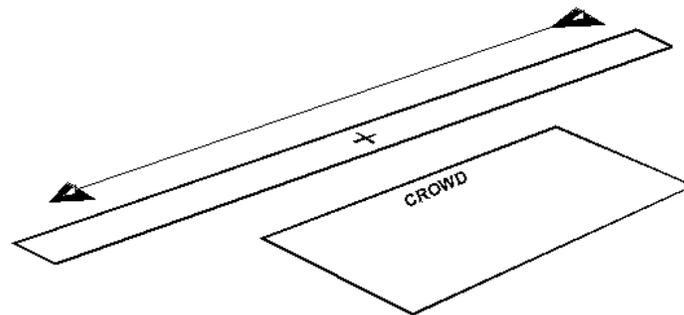
5.10.1. **Maneuver Description.** Takeoff will not be attempted when the takeoff roll exceeds 80 percent of available runway. The takeoff is made in full afterburner. After takeoff, establish a positive rate of climb and raise the gear, at a minimum of 300 knots begin a wings-level 4.0 to 6.0 G pull. Hold the pull until 90 degrees of pitch, then release the backpressure to approximately 2.5 G until 25 to 35 degrees nose high inverted. Play the backpressure to ensure the over-the-top airspeed and altitude are above 150 knots and 3,000 feet AGL. Continue the pull until 25 to 45 degrees nose low inverted. Unload to hold pitch, deselect afterburner, and perform an unloaded 1/2 roll to a wings-level upright. At 2,000 feet AGL, modulate power as required and begin a four to six-G wings-level pull to arrive on the show line at 500 feet AGL with 350 knots. If the direction of takeoff is left to right, accomplish the second half of a Cuban 8 using an entry airspeed of approximately 350 knots, an entry pull of 4.0 to 6.0 Gs and over-the-top minimum of 150 knots. The descending portion of the second half is accomplished exactly as the descending portion of the first half. If the direction of takeoff is right to left, accomplish the first half of the Cuban 8 only.

5.10.2. **Abnormal procedures.** If entry parameters are not attained, clear the show line in front of the crowd. If at any time during the maneuver it appears the minimum over-the-top altitude or airspeed parameters will not be met, the maneuver will be aborted by performing an unloaded roll to the wings-level upright position accelerating to 250 knots in afterburner and continuing down the show line. If desired pitch attitude is exceeded while inverted, roll upright and set desired pitch angle and continue maneuver. If less than 2,500 feet AGL while inverted, an immediate roll and pull to wings level will be initiated. If at any time it becomes apparent that the maneuver will be completed inside the show line (poor wind correction, improper alignment) abort the maneuver and setup for the next pass.

5.10.3. The Cuban 8 is a transition point to the low profile, if required by changing weather.

5.11. High Speed Flat Pass (Right to Left).

Figure 5.6. F-16 Flat Pass.



Flat Pass F-16

Note: May be flown either direction

Table 5.3. F-16 Flat Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	<u>0.70M</u>	MAX	.5 to 1.5
Exit	300'	$\leq .92M$	IDLE to MAX	.5 to 1.5

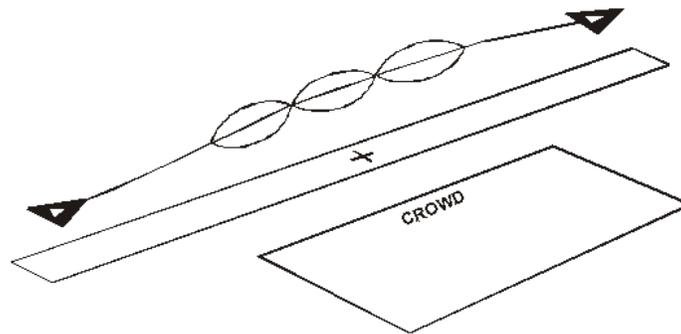
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 200'	N/A / .94M	MAX	N/A	
Exit	min 200'	N/A / .94M	IDLE to MAX	N/A	

5.11.1. **Maneuver Description.** This maneuver may be flown on the 500 foot show line at 300 feet AGL. After the repositioning maneuver, the pilot will perform a flat pass. Upon completion of the flat pass, a reposition maneuver is flown in preparation for the next maneuver.

5.11.2. **Abnormal Procedure.** If it becomes apparent 0.94 Mach will be exceeded, afterburner should be deselected.

5.12. Triple Aileron Roll (Left to Right).

Figure 5.7. F-16 Triple Aileron Roll.



**Triple Aileron Roll
F-16**

Table 5.4. F-16 Triple Aileron Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	425	80% to MIL	.8 to 1.2
Exit	500'	450	80% to MIL	.8 to 1.2

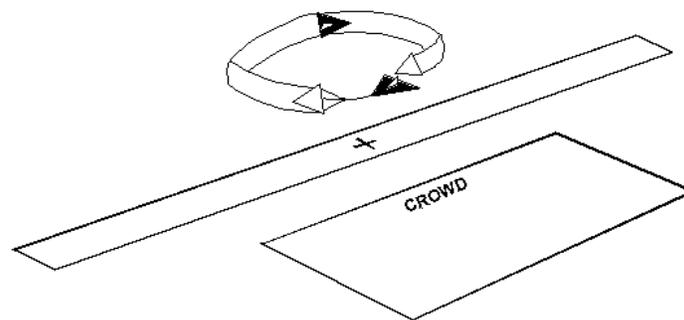
PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min	400'	400 / 500	80% to MIL	2
Exit	min	400'	400 / 500	80% to MIL	N/A

5.12.1. **Maneuver Description.** At 3,500 feet prior to show center with approximately 425 knots raise the nose to 5-7 degrees pitch attitude, establish a climb, and relax stick pressure to approximately 0.8 Gs. Apply left stick pressure to perform a maximum of three consecutive unloaded aileron rolls. Crosscheck the horizon and audibly count the rolls during the maneuver. As you complete the second roll, ensure the aircraft has gained altitude and that the flight path marker is above the horizon line in the HUD. If not, abort the maneuver and recover the aircraft above the minimum altitude. If you lose count of the number of rolls or experience roll-coupling immediately abort the maneuver. In all cases, the rolls will be completed at a higher altitude than entry. After rolling out wings level upon completion of the third roll, smoothly apply aft stick pressure as required to finish the maneuver at entry altitude (the objective of the maneuver is to make the pass look symmetrical to the crowd). Then perform a repositioning maneuver to prepare for the next maneuver.

5.12.2. **Abnormal Procedures.** If the minimum entry parameters are not met, transition to a wings-level flat pass. At wings level following the second roll, abort the maneuver if the flight path marker is not above the horizon line. Abort the maneuver if you lose count of the rolls during the sequence.

5.13. High G Turn (Right to Left).

Figure 5.8. F-16 High G Turn.



High G Turn F-16

Table 5.5. F-16 High G Turn Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	400	MIL to MAX	7.5
Exit	500'	350	MIL to MAX	6.5 to 7.5

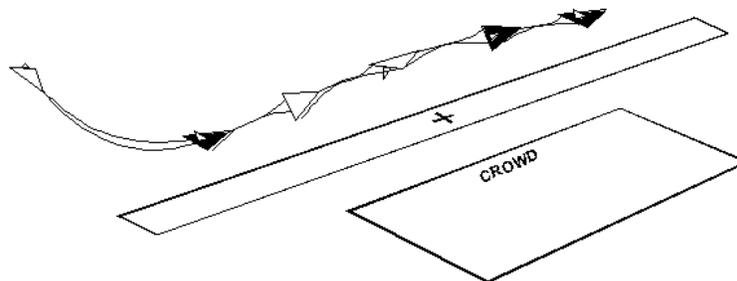
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 400'	330 / 440	MIL to MAX	9	
Exit	min 400'	250 / 440	MIL to MAX	9	

5.13.1. **Maneuver Description.** Just prior to show center select full AB and accelerate to 400 knots. At show center, turn away from the crowd using approximately 85 degrees of bank. Begin the turn with a smooth G onset-rate to approximately 7.5 Gs. G-loading and airspeed bleed-off rate will vary with density altitude. Maintain a minimum of 250 knots. The first 180 degrees of turn should be accomplished with a 1¾-degree nose-up attitude and the last 180 degrees should be accomplished with a 1¾-degree nose-down attitude to make the turn appear level to the crowd. Vary the bank angle and pitch to arrive at level flight at the completion of 360 degrees of turn and to ensure the maneuver is finished above the entry altitude. Surface winds must be taken into consideration in order to center this maneuver on show center and to avoid overshooting the show line. As you approach show center, smoothly but briskly roll out. Perform a repositioning maneuver to prepare for the next maneuver.

5.13.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or airspeed decay below 250 knots, abort the maneuver by rolling wings level and climbing to 500 feet AGL. If necessary, adjust power and G as required (no lower than 250 knots) to avoid overshooting the show line.

5.14. Four-Point Roll (Left to Right).

Figure 5.9. F-16 Four-Point Roll.



Four-Point Roll
F-16

Table 5.6. F-16 Four-Point Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	425	80% to MIL	.8 to 1.2
Exit	500'	450	80% to MIL	.8 to 1.2

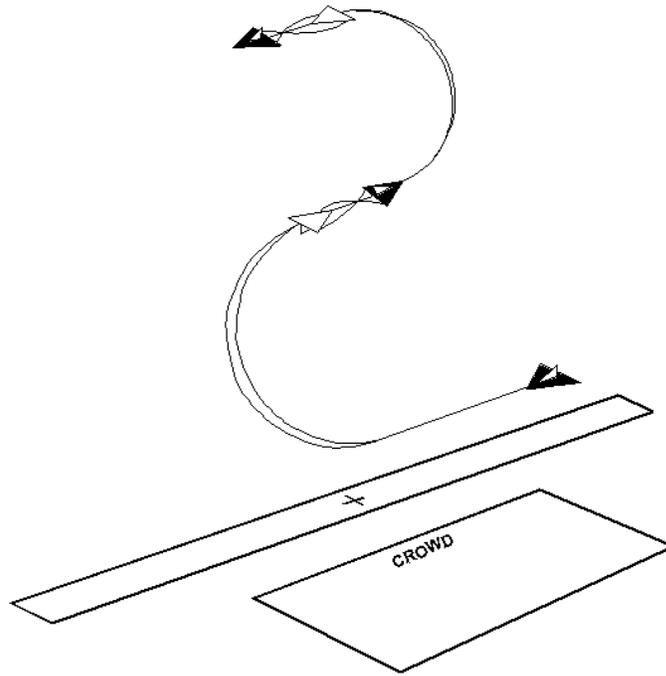
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 400'	400 / 500	80% to MIL	2	
Exit	min 400'	400 / 500	80% to MIL	N/A	

5.14.1. **Maneuver Description.** At 3,000 feet prior to show center, rotate the nose five to seven degrees nose up, establish a climb, and relax stick pressure. A cadence four-point roll to the left is then performed by pausing momentarily at the 90-degree, 180-degree, 270-degree, and 360-degree points. The pace of the cadence should ensure the aircraft is at the 180-degree point over show center. In all cases, the roll will be completed at a higher altitude than it starts. Move the stick briskly, initiating a left roll and an immediate stop at the proper 90-degree point when pressure is released. Upon returning to wings level, smoothly apply aft stick pressure as required to finish the maneuver at entry altitude (the objective of the maneuver is to make the pass look symmetrical to the crowd). At the completion of the pass, a repositioning maneuver is performed to set up for the next maneuver.

5.14.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If the flight path marker is below the horizon line at the wings-level inverted position, an immediate roll to the upright position will be made (abort), clearing the show line past the end of the crowd line. **NOTE:** The Four-Point Roll is a transition point to the Low Show Profile if changing weather conditions require.

5.15. Double Immelmann (Right to Left).

Figure 5.10. F-16 Double Immelmann.



**Double Immelmann
F-16**

Table 5.7. F-16 Double Immelmann Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	450	MAX	6.5 to 7.5
Mid Point	≥3,000'	300	MAX	4 to 6
Apex	≥6,000'	175	A/R	A/R

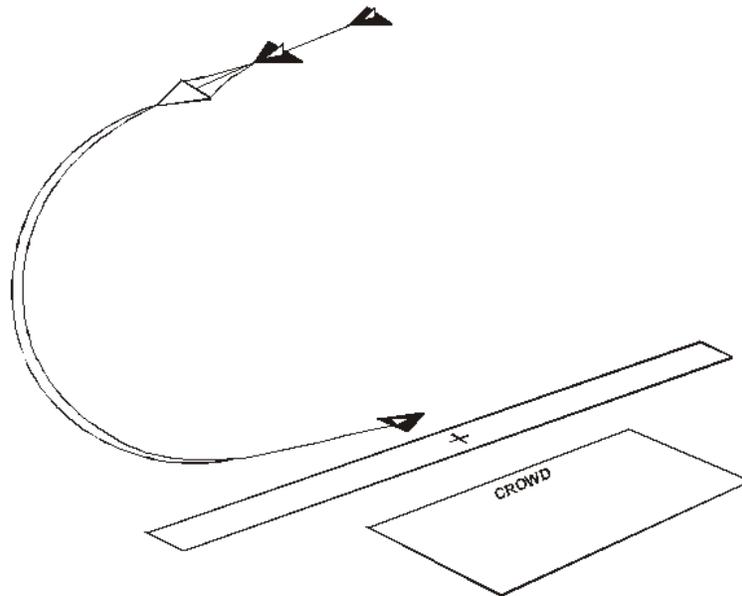
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	330 / 550	MAX	9
Mid Point	min 2,500'	250 / N/A	MAX	9
Apex	min 5,000'	150 / 350	A/R	N/A

5.15.1. **Maneuver Description.** Just prior to show center and wings level, select full afterburner and begin a smooth 6.5 to 7.5 G wings-level pull to execute the first Immelmann. The pull is held until inverted wings level. Relax stick pressure and perform an unloaded 180-degree roll to a wings-level upright position. Accelerate to 300 knots and initiate a 4 to 6 G pull to perform the second Immelmann. Roll out to a wings-level upright position from the second Immelmann at approximately 175 knots and proceed to the end of the show line (approx 6,000 feet).

5.15.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If minimum airspeeds cannot be maintained at any point during the maneuver, recover the aircraft to wings level and clear in front of the line.

5.16. Split-S (Left to Right).

Figure 5.11. F-16 Split-S.



Split-S
F-16

Table 5.8. F-16 Split-S Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Pull Down	≥6,000'	175	MIL or Less	Limiter Pull
90 deg low	≥3,500'	275	A/R	A/R
Exit	500'	A/R	A/R	4-6

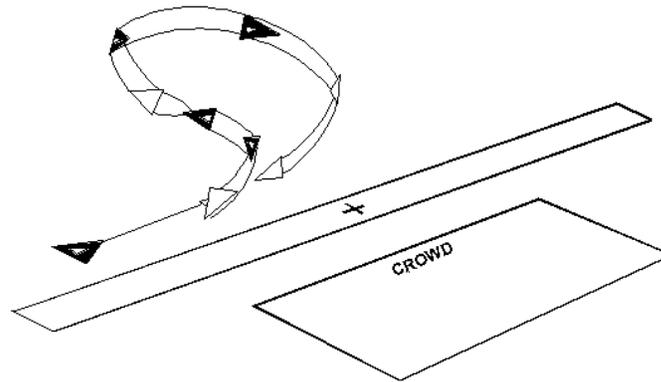
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Pull Down	min 5,000'	150 / 350	MIL or Less	N/A
90 deg low	3,000'	150 / 350	A/R	N/A
Exit	min 400'	A/R / A/R	A/R	9

5.16.1. **Maneuver Description.** With Mil power or less, proceed to the end of the show line (approx 6,000 feet). At 175 knots and 6,000 feet AGL, roll inverted, perform an aggressive 135-degree pull through vertical to approximately 45 degrees nose low, to reenter the show line from left to right at a minimum of 500 feet AGL. The throttle should be modulated as required to initiate the pull down with target airspeed of 175 KIAS. Once recovery above the minimum altitude for the follow-on maneuver is assured, backpressure is relaxed and the aircraft smoothly flown to be in level flight at the entry altitude for the next maneuver.

5.16.2. **Abnormal Procedures.** If the entry parameters are not met, the pilot will transition to a wings-level flat pass. If parameter limits cannot be maintained at any point during the maneuver, recover the aircraft to wings level and clear in front of the line. Do not attempt to pull down from the inverted apex below 5,000 feet AGL or with more than 350 KIAS. At 90 degrees nose low, max airspeed is 350 KIAS and minimum altitude is 3,000 feet AGL. If either is exceeded, execute a dive recovery IAW tech order procedures.

5.17. Falcon Turn (Left to Right).

Figure 5.12. F-16 Falcon Turn.



Falcon Turn
F-16

Table 5.9. F-16 Falcon Turn Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	400	MAX	6.5 to 7.5
Turn Reversal	1,500'	350	MIL to MAX	6.5 to 7.5
Exit	500'	350	MIL to MAX	6.6 to 7.5

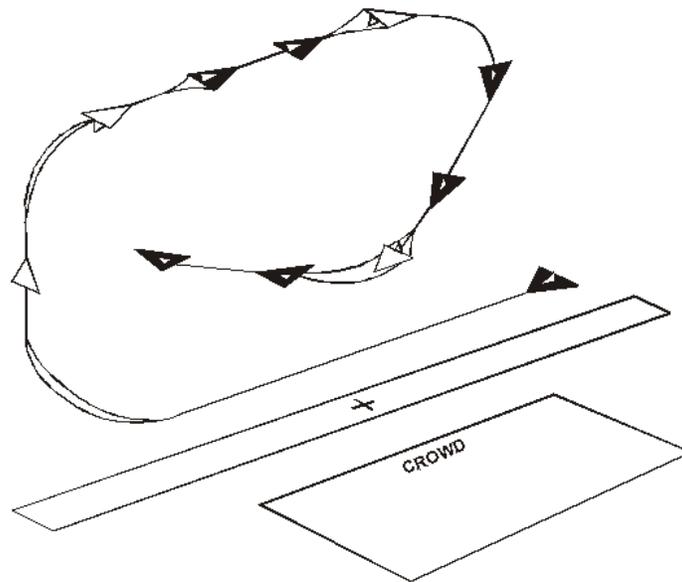
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 400'	330 / 440	MIL or Less	N/A	
Turn Reversal	800'	300 / 440	A/R	N/A	
Exit	min 400'	250 / 440	A/R	9	

5.17.1. **Maneuver Description.** This maneuver may be initiated at the 500-foot show line. Enter the show line at 500 feet AGL and 400 knots. Just prior to show center select full afterburner and perform a 6.5 to 7.5 G slightly climbing turn (20 to 30 degrees pitch angle) left away from the crowd. After 90 degrees of turn, reverse the direction of the turn to the right by unloading and rolling under 180 degrees. Perform a 6.5 to 7.5 G right slightly descending turn (10 to 20 degrees nose low) for 270 degrees rolling out heading the opposite direction with a minimum of 250 knots. Accelerate down the show line at 500 feet AGL in preparation for the next maneuver.

5.17.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or overshoot 30 degrees nose low, the maneuver will be aborted by rolling wings level and climbing to 500 feet AGL. If it becomes apparent the aircraft will overshoot the show line, use airspeed and G as required (no lower than 250 knots) to prevent the overshoot. **NOTE:** The Falcon Turn is a transition point to the Low Profile if required by changing weather conditions.

5.18. Shark's Tooth (Right to Left).

Figure 5.13. F-16 Shark's Tooth.



**Shark's Tooth
F-16**

Table 5.10. F-16 Shark's Tooth Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	350	MAX	6.5 to 7.5
Apex	≥6,000'	250	MIL to MAX	6.5 to 7.5
90 degrees nose low	≥3,500'	275	IDLE to MIL	A/R
Exit	500'	A/R	A/R	4 to 6

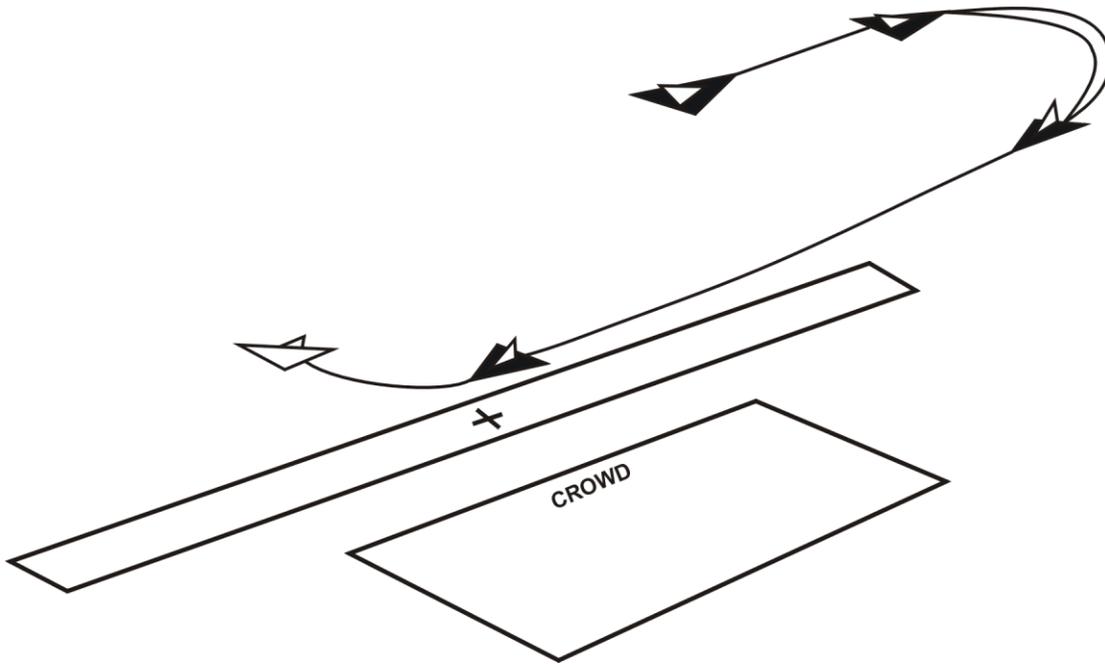
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	330 / N/A	MAX	9
Apex	5,000'	150 / 350	MIL to MAX	9
90 degrees nose low	3,000'	150 / 350	IDLE to MIL	9
Exit	min 400'	A/R / A/R	A/R	9

5.18.1. **Maneuver Description.** This maneuver is a three-sided square loop with the third corner at a 135-degree angle. It avoids the pure vertical recovery in the last corner of a normal square loop. At 2,000 feet past show center, select afterburner and perform a 6.5 to 7.5 G pull to 90 degrees nose high. Maintain full afterburner in the climb to 4,500 feet AGL, and then perform a 5.0 to 7.0 G pull of 90 degrees to inverted. Roll out to wings level upright and maintain 250 knots. At 2,000 feet past show center, roll inverted, select power as required and perform a 5.0 to 7.0 G pull to 90 degrees nose low. Approaching 4,500 feet to 3,500 feet AGL, at a maximum of 350 KIAS, continue to pull to 45 degrees nose low upright. Hold until reaching 2,000 feet AGL, and then perform a descending turn away from the crowd. Turn left or right to set up on the appropriate 1,000 feet downwind for the High Alpha pass into the wind.

5.18.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. Do not attempt to pull down from the inverted apex below 5,000 feet AGL or with more than 350 KIAS. If out of the maneuver envelope, perform a roll to wings-level upright and make a descending turn away from the crowd to set up on a downwind position for the High Alpha pass. At 90 degrees nose low, max airspeed is 350 KIAS and minimum altitude is 3,000 feet AGL. If either is exceeded, execute a dive recovery IAW tech order procedures.

5.19. High Alpha Pass (Into the wind).

Figure 5.14. F-16 High Alpha Pass.



High Alpha Pass F-16

Table 5.11. F-16 High Alpha Pass Parameters.

TARGET		PARAMETERS			
Altitude AGL	Airspeed KCAS	Power Setting	AOA	G	
Entry	500'	125	A/R	20 deg	.5 to 1.5
Exit	500'	125	A/R	20 deg	.5 to 1.5

PARAMETER		LIMITS			
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	AOA MIN/MAX	G	
Entry min	400'	115 / N/A	A/R	N/A / 23 deg	.5 to 1.5
Exit min	400'	115 / N/A	A/R	N/A / 23 deg	.5 to 1.5

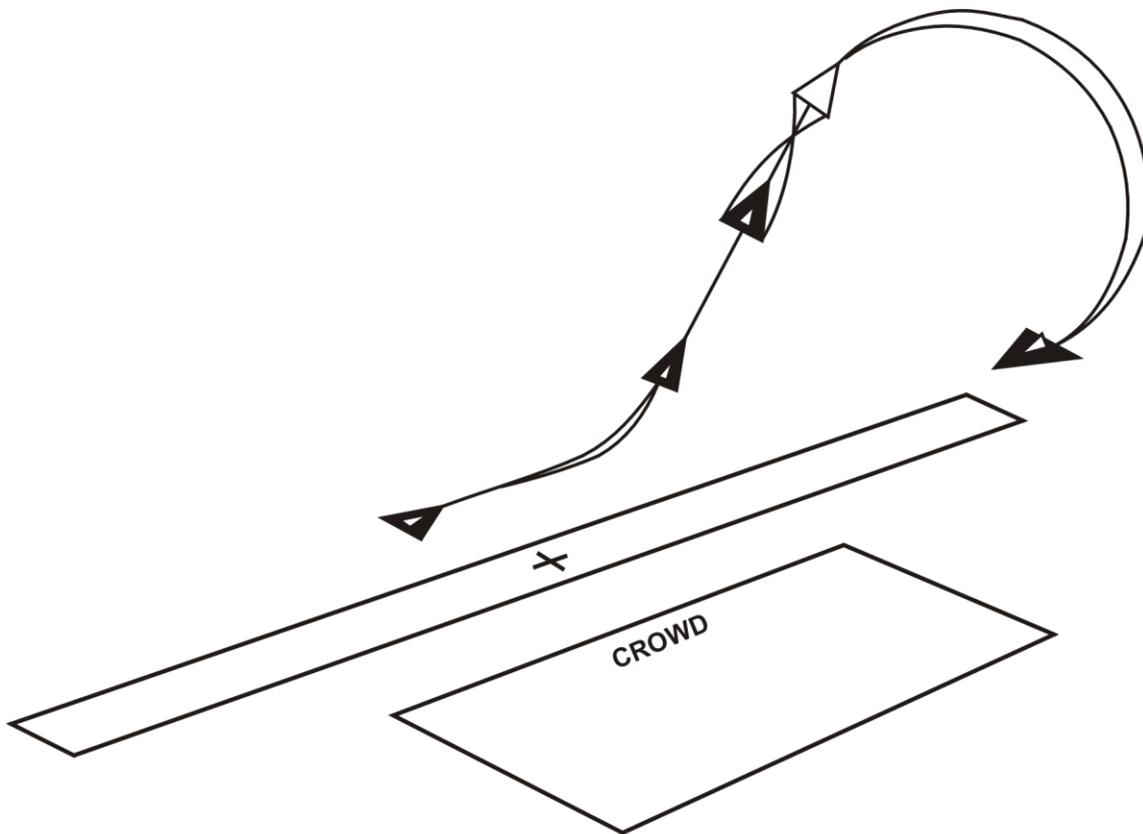
5.19.1. **Maneuver Description.** During the turn to the 500-foot show line following the shark's tooth maneuver, use speed brakes and G as required to gradually slow the airspeed and attain 125 knots and 500' AGL by 2,000 feet prior to show center. As the aircraft rolls

out on the show line, ensure the speed brakes are retracted, smoothly bring the nose up and use power as required to achieve the target parameters. Use the Gun Cross in the HUD in relation to the pitch ladders to achieve the target AOA. As a technique, select VVI in the HUD to help achieve level flight, as the tendency is to climb during the maneuver. Maintain the desired ground track by looking out the sides of the canopy and cross checking the desired heading in the HUD and/or HSI. To complete the maneuver, select full afterburner and transition to the muscle climb in accordance with [paragraph 5.20](#).

5.19.2. **Abnormal Procedures.** If the minimum entry parameters are not met, transition to a wings-level flat pass. If the airspeed falls below 115 knots or a descent rate develops, select full afterburner and perform a normal go-around procedure.

5.20. Muscle Climb Maneuver.

Figure 5.15. F-16 Muscle Climb Maneuver.



Muscle Climb Maneuver F-16

Table 5.12. F-16 Muscle Climb Maneuver Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	125	MAX	1 to 1.8
Apex	≥5,000'	175	MIL to MAX	A/R
90 degrees nose low	≥3,500'	300	A/R	
Exit	500'	A/R	A/R	4 to 6

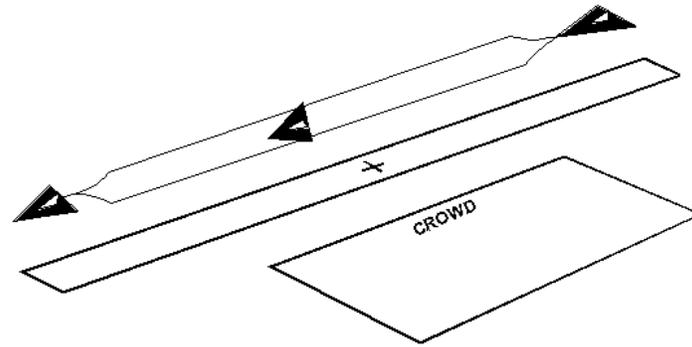
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	115 / N/A	MAX	2
Apex	min 4,500'	150 / 350	MIL to MAX	N/A
90 degrees nose low	3,000'	150 / 350	A/R	
Exit	min 400'	A/R / A/R	A/R	9

5.20.1. **Maneuver Description.** Passing show center, simultaneously select full afterburner and pull up to establish approximately 55-degree nose high attitude using 1.5 – 1.8 Gs. The afterburner must light in order to execute this maneuver and allow the aircraft to accelerate to maintain a minimum of 150 KIAS in the climb. Pitch attitude may be reduced to hold airspeed. The demonstration pilot may then transition to a Wifferdill or Vertical Reposition Maneuver (VRM) as required when adjusting to the show line for subsequent maneuvers. If a VRM is flown, the demonstration pilot will adhere to the apex and 90-degree nose low parameters listed in [Table 5.12](#) above and the procedures for a VRM as described in [paragraph 5.9.3.1](#). Once recovery above the minimum altitude for the follow on maneuver is assured, backpressure is relaxed and power modulated to smoothly transition to level flight at the entry altitude for the next maneuver.

5.20.2. **Abnormal Procedures.** If the airspeed falls below the minimum of 150 knots, a nose high recovery should be accomplished. If the airspeed exceeds 350 KIAS during any portion of a follow-on VRM or if the aircraft is below 3,000 feet AGL at 90 degrees nose low, immediately initiate a dive recovery to the nearest horizon.

5.21. Knife Edge Pass.

Figure 5.16. F-16 Knife Edge Pass.



**Knife Edge Pass
F-16**

Table 5.13. F-16 Knife Edge Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	425	MIL to MAX	.5 to 1.5
Exit	500'	475	MIL to MAX	.5 to 1.5

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	400 / 550	MIL to MAX	N/A
Exit	min 400'	400 / 550	A/R	N/A

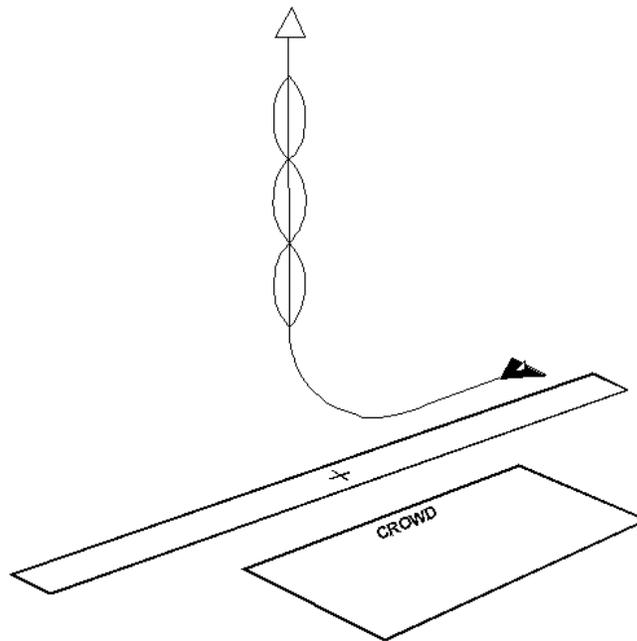
5.21.1. **Maneuver Description.** Enter the 1,500' show line at 500 feet AGL and 425 knots. At 4,000 feet prior to show center, raise the nose to five to seven degrees, establish a climb, and apply stick pressure to roll 90 degrees toward the crowd. Hold this attitude until 4,000 feet past show center. Use top rudder to hold the nose above the horizon and forward stick pressure to keep the aircraft on the show line. To complete the maneuver, unload, roll wings level, and perform a repositioning maneuver.

5.21.2. **Abnormal Procedures.** If the minimum entry parameters are not met, transition to a wings-level flat pass. If it becomes apparent the aircraft will descend below 400 feet AGL, roll out of the bank and clear the show line.

5.21.3. Transition point to the High Profile, if changing weather conditions permit. **NOTE:** The Knife Edge Pass may be used as a repositioning maneuver for the purpose of orienting the subsequent demonstration maneuver in the approved direction relative to the crowd line.

5.22. Maximum Performance Climb with Rolls.

Figure 5.17. F-16 Maximum Performance Climb with Rolls.



Maximum Performance Climb With Rolls
F-16

Table 5.14. F-16 Maximum Performance Climb with Rolls Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	450	MIL to MAX	6 to 7.5
Recovery/Exit 2,500' prior to assigned altitude		250	A/R	4 to 6

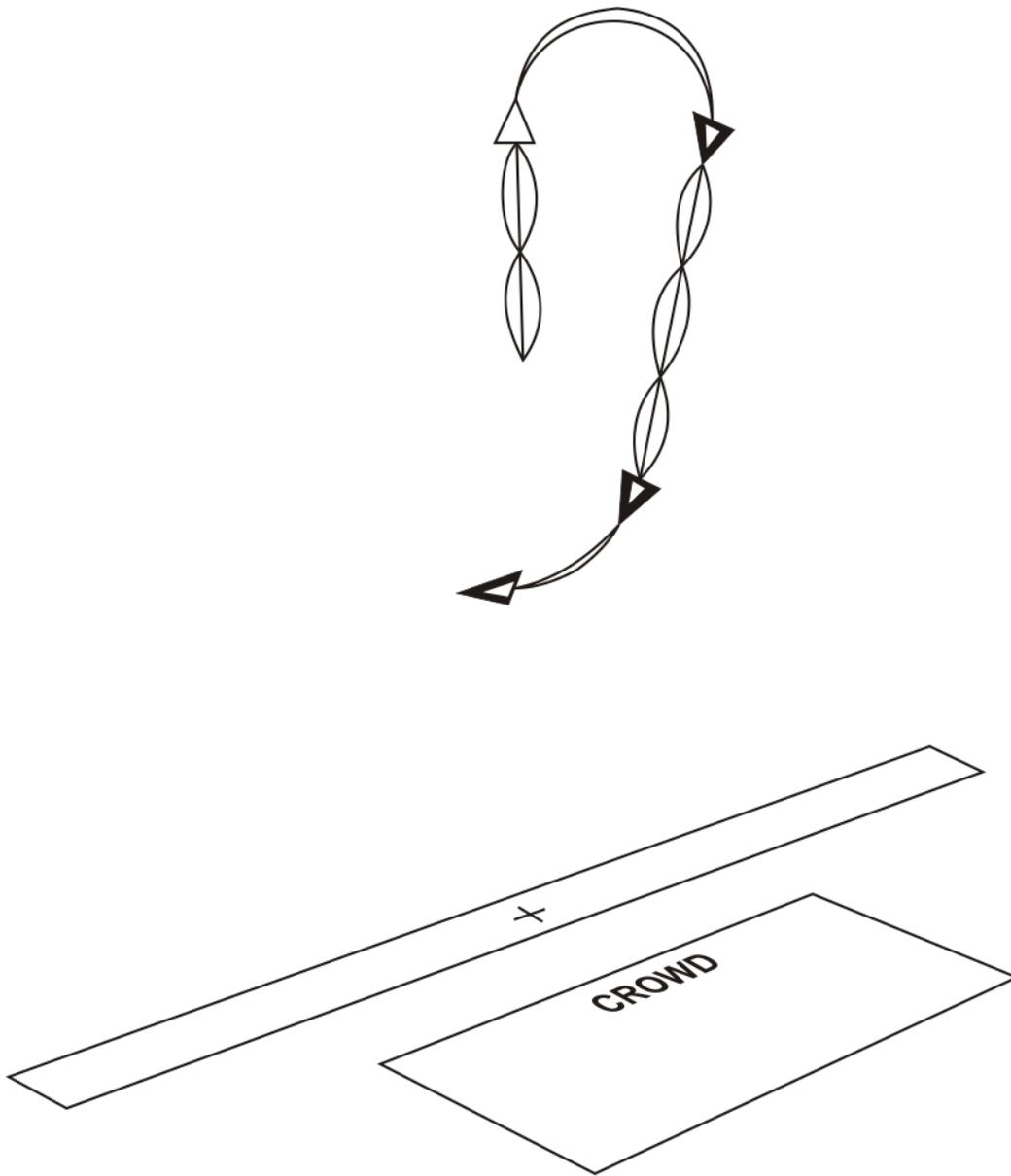
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	330 / 550	MIL to MAX	9
Apex	NTEWA	150 / N/A	A/R	9

5.22.1. **Maneuver Description.** Enter with a minimum of 330 knots at 300 feet AGL approaching show center 135 degrees to the crowd line, but with the flight path not directed toward the crowd. At 3,000 feet prior to show center select full afterburner and initiate a 6.5 to 7.5-G wings-level pull to arrive at show center with 90 degrees of pitch. The pull should be made so the aircraft is vertical at show center. When the aircraft is vertical, perform high rate unloaded aileron rolls until reaching a minimum of 250 knots or 2,500 feet below waived airspace. Every precaution must be taken to avoid slow airspeed in an exaggerated pitch attitude due to the potential of "pitch hang-up." Stop the aileron rolls and execute a vertical recovery by smoothly pulling the nose to the nearest horizon to prevent exceeding waived airspace. Modulate power and speed brakes as required while performing the descending portion of a repositioning maneuver to enter the show line for the Tactical Pitch-Up to Landing.

5.22.2. **Abnormal Procedures.** If the minimum entry parameters are not met, transition to a wings-level, flat pass. If roll coupling occurs during the climb (to exceed approximately 2.5 G), smoothly stop the roll, then pull to the nearest horizon, and roll upright. Initiate an immediate recovery to the nearest horizon if airspeed decays to 250 KIAS minimum or altitude reaches 2,500 feet below the top of waived airspace.

5.23. F-16 Spiral Descent.

Figure 5.18. F-16 Spiral Descent.



Spiral Descent F-16

Table 5.15. F-16 Spiral Descent Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	NTEWA	200	IDLE	1 to 2
Exit	4,000' and 45° NL	A/R	A/R	3 to 7

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 8,000'	150 / 350	IDLE	N/A
Exit	min 3,500' and $\leq 45^\circ$ NL	250 / 440	A/R	8

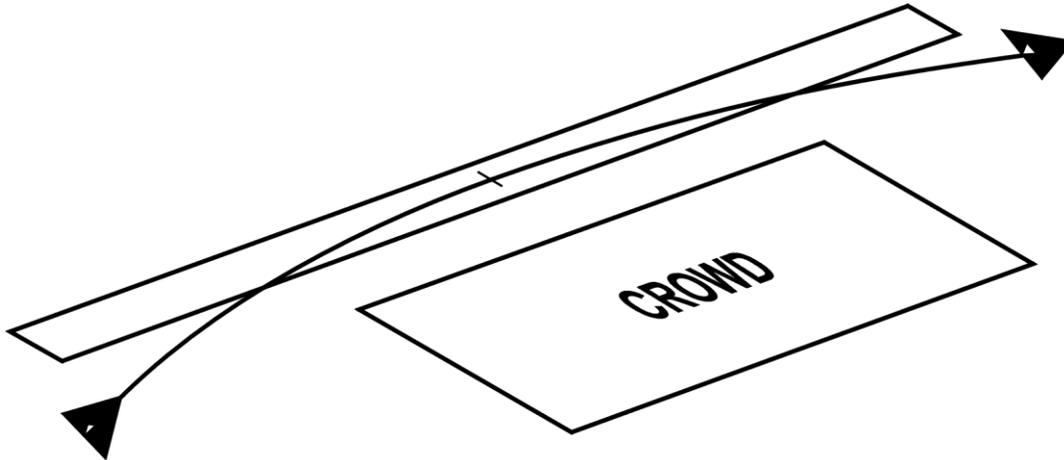
5.23.1. Maneuver Description. As the aircraft nose is brought through the horizon, reacquire the air show environment and perform the spiraling descent oriented toward show center. In idle power, allow the nose to fall below 45 degrees nose low. Once established, apply back stick pressure and roll simultaneously to maintain at least 200 knots initially in a spiraling dive, ensuring airspeed of 250-440 knots prior to initiating the recovery. At approximately 5,000' AGL, adjust dive angle and roll in order to be wings-level, less than 45 degrees nose low at the planned altitude of 4000'. The maneuver is complete when the dive angle is less than 45 degrees. Continue a descent as required to reposition for the next maneuver, however do not perform or exit the maneuver over the crowd. Do not exceed 440 knots in the descent. The airspeed window of 250-440 at maneuver exit allows the pilot the flexibility to show the F-16s maneuvering ability early in the maneuver while gaining energy at or below corner velocity to set up for the next maneuver – the Dedication Pass.

5.23.2. Abnormal Procedures: If below 8,000' AGL at the apex of the climb (airspace restrictions, weather conditions), adjust dive angle to safely execute a recovery at 4,000' AGL. Initiate an immediate dive recovery if airspeed exceeds 440 knots. Show center orientation is a secondary consideration in the spiral descent; do not continue the maneuver below min altitude to attempt a specific orientation in the airshow environment. If at any time during the maneuver it appears that the aircraft will not attain the prescribed altitude/airspeed parameters, the maneuver will be aborted. Roll out and/or pull to a wings-level position, initiate a descent and reposition the aircraft for follow-on maneuvering.
OPTION: Due to changing weather conditions, the vertical spiraling descent may not be

possible after the Max Performance Climb. Start a descent when able to maintain VMC conditions to position the aircraft for the next maneuver.

5.24. Dedication Pass. The intent of this maneuver is to pay tribute to our war fighters. It is flown prior to the Tactical Pitch-Up to Land during the High, Low, and Flat Show profiles.

Figure 5.19. F-16 Dedication Pass.



Dedication Pass F-16

Table 5.16. F-16 Dedication Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	0.65M – 0.90M	MAX	1 to 3
Exit	300'	0.65M – 0.90M	IDLE to MAX	4 to 6

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry min	200'	N/A / .90M	MIL to MAX	9
Exit min	200'	N/A / .90M	IDLE to MAX	9

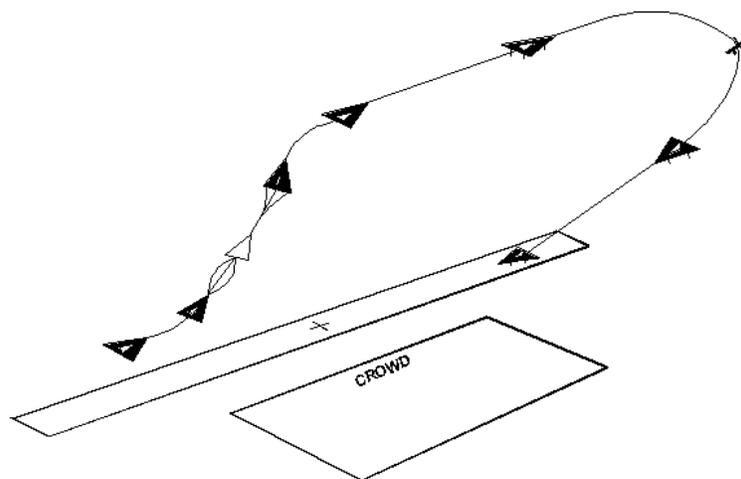
5.24.1. Maneuver Description. The maneuver is flown on the 500-foot line and is non-aerobatic. Following the Max Performance Climb with Rolls (high show), High Alpha (low show), or Knife Edge (flat show), attain a safe airspeed and reposition the aircraft to arrive behind and offset the crowd. The approach will be flown from behind the line,

approximately 2 miles from show center, with an approximate 30 degree dive angle and a 45 degree cut (max bank angle 90 degrees) to the show line, remaining 500 feet from the crowd at all times. Upon reaching a point 500 feet from the corner of the crowd and 300 feet AGL, roll the aircraft into a level arcing pass using a max bank of 90 degrees. Use top rudder if necessary to maintain altitude. Select max power until passing the show line or until a target airspeed of .85M is anticipated. Varying pressure altitudes and temperatures will determine when to select afterburner to ensure the target airspeed is attained at show center and the max airspeed is not exceeded. Optimum profile of the aircraft is achieved at approximately 80 degrees of bank. Use caution not to over bank the aircraft and allow the aircraft to lose altitude while banking. In order to maintain 500 feet from the crowd at each corner, the flight path at show center will have to extend beyond 500 feet. Continue the arc beyond the opposite crowd corner, reduce power as required, roll out of bank, and continue a maximum 45 degree climb to set up for the Tactical Pitch-up to Landing.

5.24.2. **Abnormal Procedures.** Abort the maneuver if at any time the aircraft comes closer than 500' to the crowd line or its lateral limits, an excessive dive angle or sink rate develops, entry parameters are not met, or the aircraft descends below 200 feet AGL. Abort the maneuver by rolling the aircraft wings level and flying away from the crowd.

5.25. Tactical Pitch-Up to Landing (Direction of Landing).

Figure 5.20. F-16 Tactical Pitch-Up to Landing.



**Tactical Pitch-Up To Landing
F-16**

Table 5.17. F-16 Tactical Pitch-Up to Landing Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	350	MIL to MAX	5 to 7
Exit	Downwind Alt	250	A/R	1

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	300 / 440	MIL to MAX	9
Exit	Downwind Alt	200 / N/A	A/R	N/A

5.25.1. **Maneuver Description.** Enter the show line at 500 feet AGL and 350 knots. At 2,000 feet prior to show center raise the nose to five to seven degrees pitch angle, unload, and perform a 405-degree aileron roll away from the crowd followed by a 5.0 to 7.5-G pull-up to downwind using afterburner. Configure for and execute a normal final turn and landing. **Option:** If a Heritage Flight is to be performed immediately following completion of the demonstration, conduct a low approach or wings-level pass and proceed to rejoin with Heritage Flight aircraft using pre-briefed procedures.

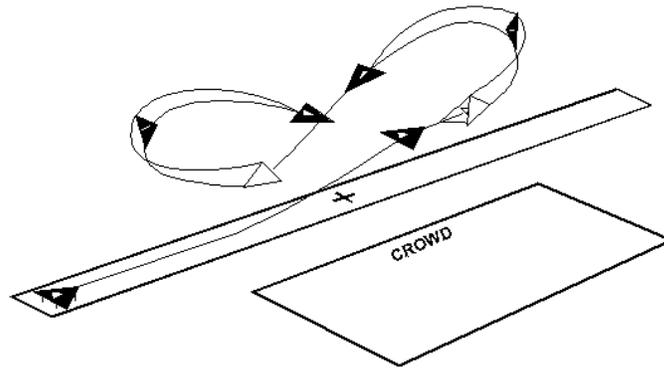
5.25.2. **Abnormal Procedures.** If entry parameter limits are not achieved by show center, the 405-degree aileron roll will not be performed and a simple pull-up to a normal closed pattern will be flown.

Section 5C—Low/Flat Profile

5.26. Low/Flat Abnormal Procedures: Unless otherwise noted, abnormal procedures for the low profile are the same as the high profile.

5.27. Takeoff to Level 8.

Figure 5.21. F-16 Level 8.



**Level 8
F-16**

Table 5.18. F-16 Level 8 Parameters.

TARGET		PARAMETERS		
		Airspeed KCAS	Power Setting	G
Entry	500'	400	MAX	5 to 7
Turn Reversals	500'	350	MIL to MAX	5 to 7
Exit	500'	350	A/R	1

PARAMETER		LIMITS		
		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	330 / 440	MAX	9
Turn Reversals	min 400'	250 / 440	MIL to MAX	9
Exit	min 400'	250 / 440	A/R	1

5.27.1. Maneuver Description. Takeoff will not be attempted when the takeoff roll exceeds 80 percent of available runway length. If airfield conditions permit, a brake release point should be selected so takeoff occurs at show center. The show-center takeoff point is a secondary consideration to determining critical field length, abort criteria, etc. In no case will the takeoff be initiated with less than 6,000 feet of runway remaining. The takeoff is made in full afterburner. Ensure a positive rate of climb is established after takeoff. Once the gear is retracted, a three to five-degree nose high climb is made while accelerating to 400 knots. At this point, maintain afterburner and begin an energy sustaining pitch-up to 500 feet AGL, using 5.0 to 7.0 Gs, turning away from the crowd. After 225 degrees of turn, unload and reverse the direction of turn and perform a second level turn in the opposite direction. After 270 degrees with a 45-degree cut to the show line, the turn is again reversed. Vary the bank angle and pitch to arrive at level flight at the completion of the maneuver and to ensure the maneuver is finished above the entry altitude. Complete the maneuver by turning to finish on the show line heading in the same direction as takeoff. Surface winds must be taken into consideration in order to center this maneuver on show center and to avoid overshooting the show line. Once on the show line, execute a repositioning maneuver to prepare for either a Flat Pass (left to right takeoff) or the Triple Aileron Roll (right to left takeoff).

5.27.2. Abnormal Procedures. If, during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or airspeed will decay below 250 knots, abort the maneuver by rolling wings level, climbing to 500 feet AGL, and clearing the show line. Use power and G as required (no lower than 250 knots) to prevent the aircraft from overshooting the show line.

5.28. Flat Pass (Right to Left). If the direction of takeoff is left to right, the repositioning maneuver following the horizontal Cuban 8 will be used to prepare for a flat pass as described in [paragraph 5.11.1](#). At 2,000 feet past show center, execute a repositioning maneuver to set up for the next maneuver.

5.29. Triple Aileron Roll (Left to right). The triple aileron roll will be performed as described in [paragraph 5.12.1](#). When wings level following the last aileron roll, the pilot performs a repositioning maneuver to set up for the next maneuver.

5.30. High G Turn (Right to Left). The high G turn will be performed as described in [paragraph 5.13.1](#). At 2,000 feet past show center, perform a repositioning maneuver to set up for the next maneuver.

5.31. Four-Point Roll (Left to Right). The four-point roll is performed as described in [paragraph 5.14.1](#). At the completion of the pass, execute a repositioning maneuver to set up for the next maneuver. **NOTE:** Transition to the High Profile if changing weather conditions permit.

5.32. Knife Edge Pass. The Knife Edge Pass will be performed as in [paragraph 5.21.1](#). At the completion of the pass, execute a repositioning maneuver to set up for the next maneuver. **NOTE:** Transition to the High Profile if changing weather conditions permit.

5.33. Falcon Turn (Right to Left). The Falcon Turn is performed as described in [paragraph 5.17.1](#). At the completion of the maneuver, pull up to a downwind to prepare for the slow speed pass against the wind. If the wind favors a right to left final, a normal 180-degree pitch-up to downwind is performed. **NOTE:** Transition to the high profile if changing weather conditions permit

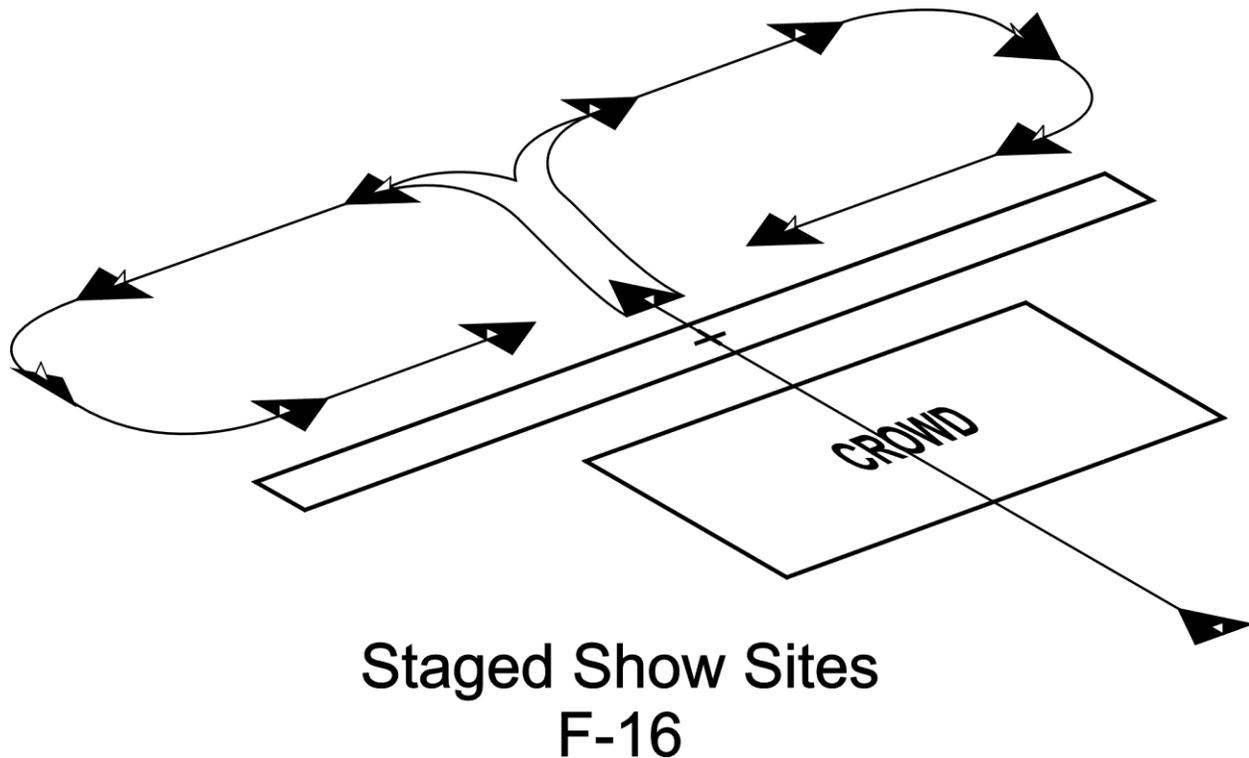
5.34. High Alpha Pass (Into the wind). This maneuver may be flown on the 500-foot show line. The High Alpha pass is performed as described in [paragraph 5.19.1](#). At 3,000 feet past show center, perform a repositioning maneuver to set up for the next maneuver. **NOTE:** Transition to the High Profile if changing weather conditions permit.

5.35. Flat Pass. The flat pass is performed as described in [paragraph 5.11.1](#).

5.36. Tactical Pitch-Up to Landing. The tactical pitch-up to landing is performed as described in [paragraph 5.25.1](#).

5.37. Staged Show Sites.

Figure 5.22. F-16 Staged Show Sites.



5.37.1. When demonstration aircraft takeoff from other than the show site, plan to arrive over the show site with the fuel requirements prescribed in [paragraph 5.2](#) plus enroute return fuel IAW AFI 11-2F-16 Vol 3. The pilot may enter from behind the crowd at a minimum of 1000 ft AGL as depicted in [Figure 5.22](#), or via a Flat Pass maneuver down the show line, and complete the show as described in this chapter. Upon completion of the Dedication Pass and clearing the crowd, turn out behind the crowd and return to the staging airport. Pilots should plan to fly a full demonstration, but may cut the profile short as required to maintain suitable enroute return fuel.

Chapter 6

F-15E DEMONSTRATION MANEUVERS

Section 6A—General Information

6.1. General. Maneuvers described in this chapter will be used for training and for F-15E aerial demonstrations. The demonstration sequence is designed so each maneuver is normally flown in the same direction with respect to the crowd line with the following exceptions: Flat Pass, the first Split-S, and the aileron roll preceding the tactical pitch to landing. As a result, the show is always oriented the same way from the spectators' point of view. Abnormal procedures are written for each maneuver. If the entry conditions are not met for any maneuver, a wings-level pass will be flown and the pilot will transition to the next maneuver. Demonstration pilots will transmit parameters prior to initiating the descending portion of vertical pull-throughs for the Split-S and Vertical Reposition Maneuvers. These calls will be made when the pilot reaches apex of the maneuver. Ground safety observer and the WSO will monitor demonstration pilot altitude and airspeed radio calls and direct an abort when parameter limits are exceeded. Following all maneuvers and before clearing the show line to reposition for the next maneuver, the pilot will ensure any descent has been stopped and the aircraft is in a climbing or level attitude with the flight path marker at or above the horizon.

6.2. Aircraft Configuration and Fuel Requirements. Aircraft configuration for all demonstrations will be clean with CFTs, no wing pylons on stations 2 and 8, no LANTIRN pods, no external fuel tanks, and no travel pods. Fuel considerations include: divert requirements, cable availability, temperature, and density altitude. Normal minimum fuel **for takeoff is:**

- 6.2.1. Staged Show: 16,500 pounds
- 6.2.2. High Show: 14,000 pounds
- 6.2.3. Low Show: 13,000 pounds

6.3. Airspeed and G Limits. Demonstration pilots will not exceed 0.94 Mach. The maximum target G for this demonstration is 7.5 Gs. This does not preclude a momentary increase in G for safety considerations.

6.4. Show line Restrictions. The majority of the F-15E demonstration will be flown on the 1,500-foot show line in reference to the distance from the crowd. Non-aerobatic maneuvers (less than 90 degrees of bank) may be flown on the 500-foot show line unless specified in the maneuver description.

6.5. Airspace and Runway Requirements. Required airspace for the F-15E is 15,000 feet AGL and normally a five-mile radius from show center horizontally. The minimum dimensions of the aerobatic box are 3,000 feet wide, 6,000 feet long, and 15,000 feet AGL (high show). If the FAA has waived a show line to closer than 1,500 feet, the aerobatic box may be less than 3,000 feet wide, provided there is at least 1,500 feet from the show line to the outer edges of the box. Minimum runway length is 7,000 feet x 75 feet. The runway, taxiway, and parking area must be stressed for a 62,000-pound aircraft with single wheel type landing gear. If needed, on a case by case basis, the absolute minimum weight allowable is 52,000-pounds with no CFT gas.

6.6. Weather Requirements. Weather PARAMETER LIMITS for the high profile are a ceiling of at least 7,000 feet, three miles ground and five miles in-flight visibility with a discernible horizon. Ceiling required for the low profile is 2,500 feet. The flat show profile ceiling is at least 1,500 feet. Maneuvers will be planned to maintain VMC throughout the show sequence.

6.7. High Density Altitude Demonstrations. For high density altitude shows, adjust PARAMETER LIMITS in accordance with the following:

6.7.1. Add 500 feet to APEX altitudes for each 2,000 feet of altitude above 3,000 feet MSL and 10 knots to airspeeds. For example, if the show site altitude is 5,000 feet MSL, add 500 feet to the baseline target and 10 knots to the airspeed. If the show site altitude is 7,000 feet MSL, add 1,000 feet to the baseline target and 20 knots to the airspeed.

6.8. Demonstration Maneuver Profiles.

6.8.1. High Show

- 6.8.1.1. Maximum Performance Takeoff Inverted
- 6.8.1.2. Flat Pass (Vertical Reposition)
- 6.8.1.3. High G Turn
- 6.8.1.4. Triple Aileron Roll
- 6.8.1.5. Four Point Roll
- 6.8.1.6. Cuban 8
- 6.8.1.7. Low Angle Strafe Pass
- 6.8.1.8. LAHD Bomb Pass
- 6.8.1.9. SAM Weave
- 6.8.1.10. Dedication Pass
- 6.8.1.11. Knife Edge Pass
- 6.8.1.12. Maximum Performance Climb with Rolls
- 6.8.1.13. Spiral Descent
- 6.8.1.14. Tactical Pitch-Up to Landing

6.8.2. Low Show

- 6.8.2.1. Maximum Performance Takeoff Inverted
- 6.8.2.2. Flat Pass
- 6.8.2.3. Four-Point Roll
- 6.8.2.4. High G Turn
- 6.8.2.5. Triple Aileron Roll
- 6.8.2.6. Level 8
- 6.8.2.7. Low Angle Strafe Pass
- 6.8.2.8. LAHD Bomb Pass

6.8.2.9. SAM Weave

6.8.2.10. Dedication Pass

6.8.2.11. Knife Edge Pass

6.8.2.12. Tactical Pitch-Up to Landing

6.8.3. Flat Show

6.8.3.1. Normal Takeoff

6.8.3.2. Flat Pass

6.8.3.3. High G Turn

6.8.3.4. Flat Pass

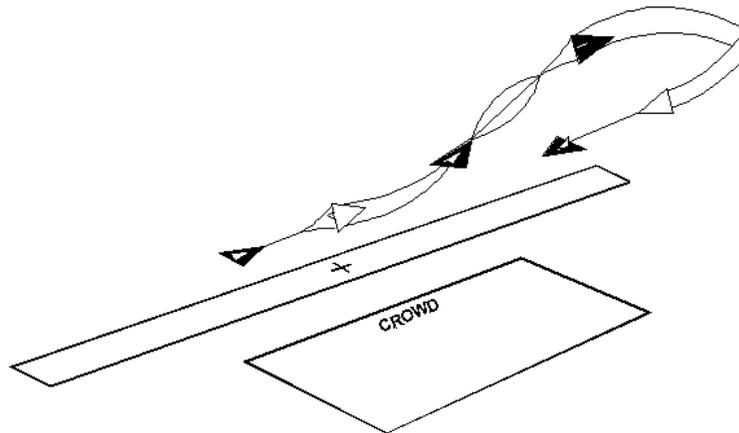
6.8.3.5. Level 8

6.8.3.6. Dedication Pass

6.8.3.7. Knife Edge Pass

6.8.3.8. Tactical Pitch-Up to Landing

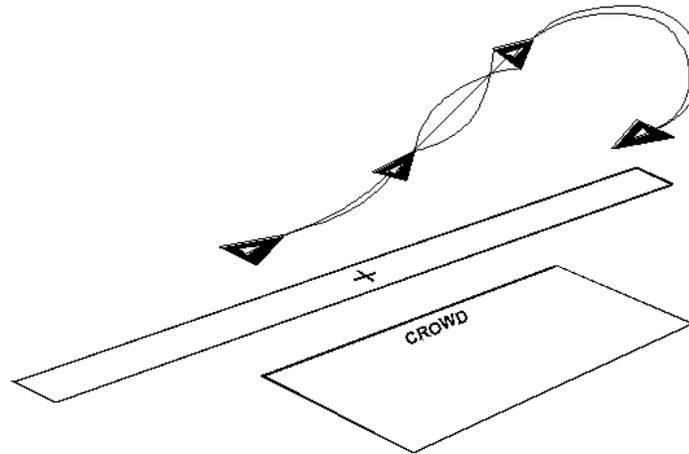
6.9. Reposition Maneuvers. Reposition maneuvers may be flown in either direction at any time during the demonstration sequence as required. Repositioning turns may not include added aileron rolls or other accenting maneuvers.

Figure 6.1. F-15E Flat Wifferdill Reposition Maneuver.

Flat Wifferdill Reposition Maneuver F-15E

6.9.1. Flat Wifferdill Reposition Maneuver. The Flat Wifferdill Maneuver turn is a combination horizontal and shallow vertical turn used to change direction at each end of the show line when performing the low profile. The Flat Wifferdill Maneuver turn uses less altitude than a normal Wifferdill. It requires a larger cut and tends to be looser and flatter than a normal Wifferdill. 270-degree turn reversal may be made while the aircraft is climbing. The target G for this maneuver is 6.5 to 7.0 Gs. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the flat Wifferdill. The entry "cut" turn for the flat Wifferdill is typically made away from the crowd. However if local conditions dictate, the turn may be made toward the crowd side, provided the aircraft is beyond the corner marker (500' past the edge of the crowd) to ensure no show line or crowd line penetration.

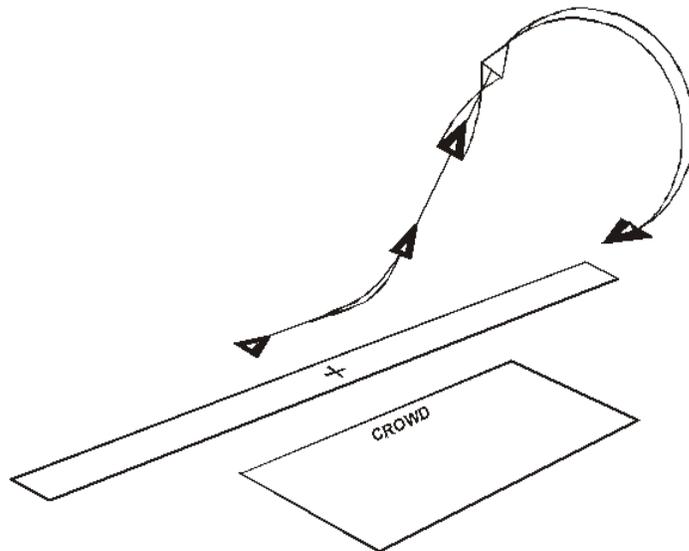
Figure 6.2. F-15E Wifferdill Reposition Maneuver.



Wifferdill Reposition Maneuver F-15E

6.9.2. Wifferdill Reposition Maneuver. The Wifferdill turn is a combination horizontal and vertical turn used to change direction at each end of the show line. The vertical plane is used to maintain necessary proximity to the demonstration area. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the Wifferdill. As the aircraft departs the show line, maneuver in the horizontal and vertical plane to reposition for the next maneuver. The target G for this maneuver is 6.5 to 7.0 Gs. A 270-degree turn reversal is made while still climbing. During the last half of the Wifferdill, while descending, the turn is adjusted to establish the proper show line entry. The entry "cut" turn for the Wifferdill is typically made away from the crowd. However if local conditions dictate, the turn may be made toward the crowd side, provided the aircraft is beyond the corner marker (500' past the edge of the crowd) to ensure no show line or crowd line penetration.

Figure 6.3. F-15E Vertical Reposition Maneuver.



Vertical Reposition Maneuver
F-15E

Table 6.1. F-15E Vertical Reposition Maneuver Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	A/R	400	MIL to MAX	6.5 to 7.0
Apex	≥5,500'	350	MIL to MAX	3 to 5
90 degrees nose low	≥4,500'	350	A/R	N/A
Exit	500'	A/R	A/R	1

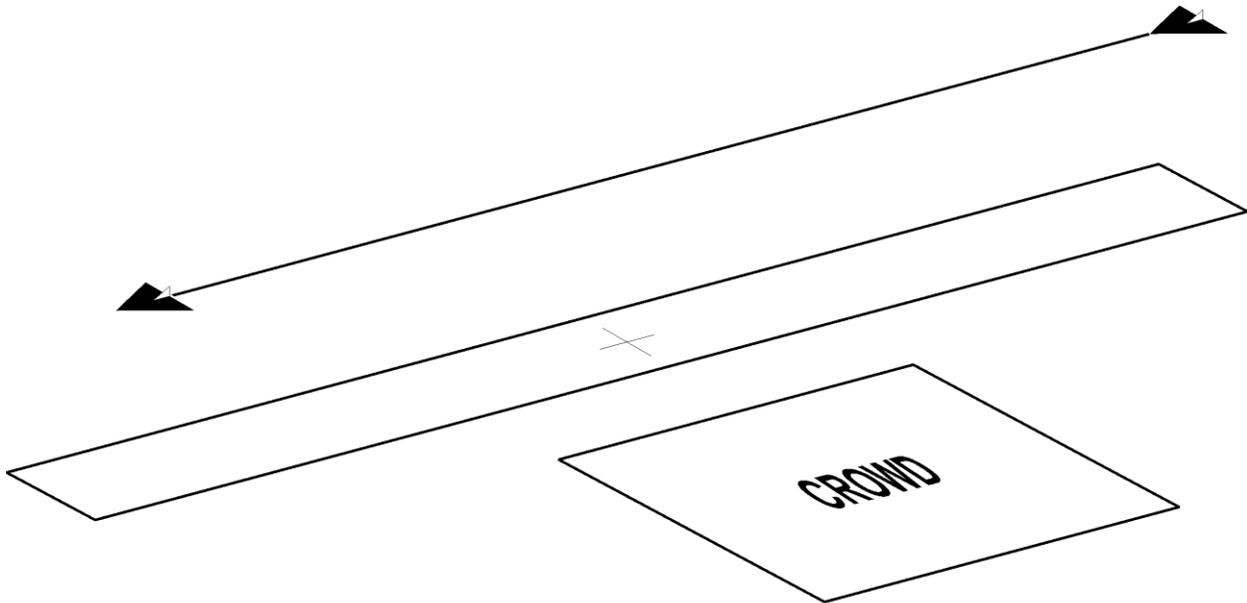
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 300'	350 / 450	A/R	8
Apex	5,000'	300 / 400	A/R	8
90 degrees nose low	4,000'	300 / 425	A/R	N/A
Exit	min 400'	A/R / A/R	A/R	3-5

6.9.3. Vertical Reposition Maneuver. The Vertical Reposition Maneuver may be flown to change direction at each end of the show line. Upon passing show center or at the completion of the previous maneuver with a minimum of 350 knots, begin a straight-ahead climb using 6.5 to 7.0 Gs to put the aircraft in a 40 to 55-degree nose high attitude. At a minimum of 4,500 feet AGL, perform an unloaded 180-degree roll to achieve an inverted climbing attitude. Initiate a smooth pull to the horizon to achieve a wings-level inverted position at or above 5,500 feet AGL. Continue the pull in maximum power through the vertical, using 3.0-5.0 Gs to 135 degrees of turn (45 degrees nose low). As the nose drops below the horizon and the airfield environment is reacquired, correct as necessary to complete the Vertical Reposition Maneuver down the show line. On a standard day, at 90 degrees nose low, airspeed should be between 300 to 400 knots and altitude greater than 4,000 feet AGL. At 135 degrees, backpressure is relaxed and the aircraft smoothly flown to be in level flight at 500 feet AGL for the next maneuver. Aircraft power should be modulated through the vertical to achieve the desired airspeed upon rollout for the next maneuver.

6.9.3.1. Abnormal Procedures. If not within the target airspeed window, adjust pitch attitude during climb to achieve desired airspeed. If below minimum apex altitude, maintain an inverted climb until reaching minimum apex altitude. If you will be below 4,000 feet AGL and over 400 knots prior to achieving 90 degrees nose low, execute emergency dive recovery procedures. If at anytime during the maneuver it appears that

the aircraft will not attain the prescribed altitude/airspeed parameter limits, the maneuver will be aborted. Reposition the aircraft for follow-on maneuvering.

Figure 6.4. F-15E Flat Pass Reposition Maneuver.



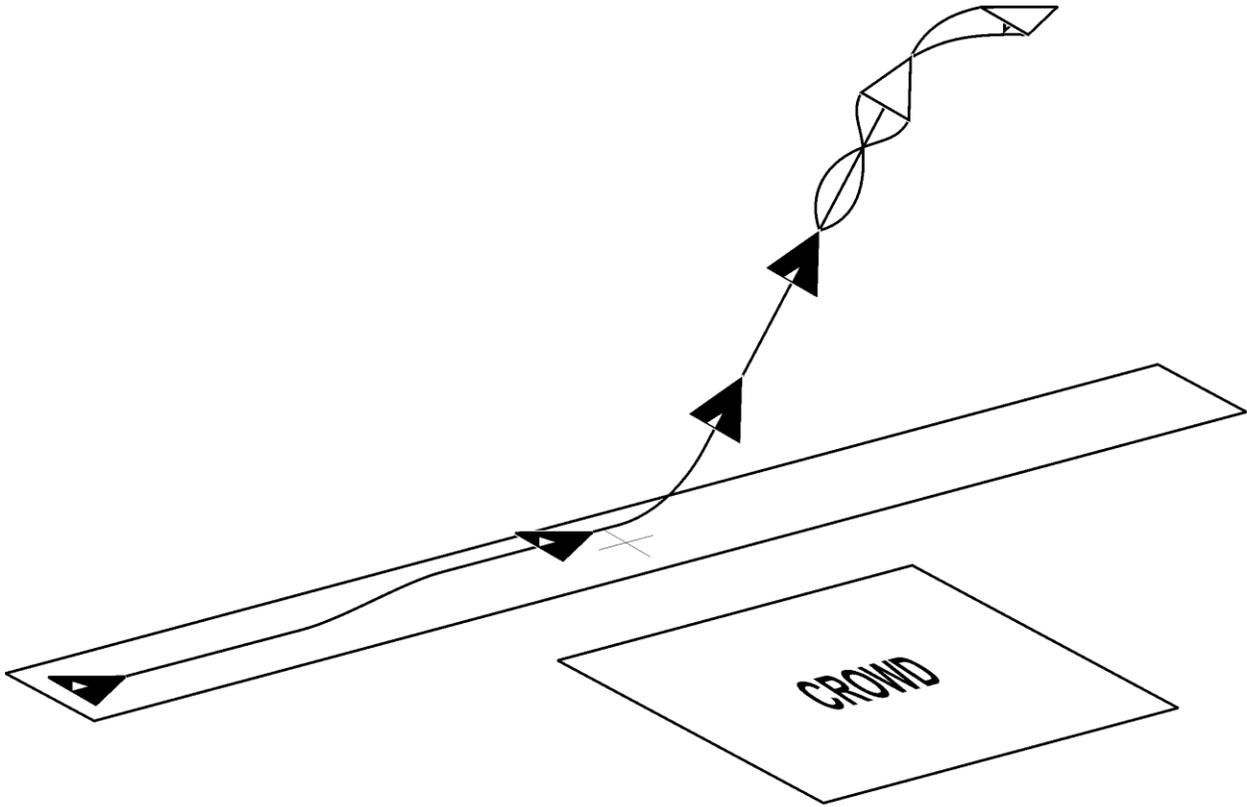
Flat Pass Reposition Maneuver F-15E

6.9.4. **Flat Pass Reposition Maneuver.** The flat pass is a repositioning maneuver used alone or in combination with a Wifferdill for the primary purpose of orienting the subsequent demonstration maneuver in the approved direction relative to the crowd line. It should be flown IAW [paragraph 6.12](#).

Section 6B—High Profile

6.10. Maximum Performance Takeoff and Climb.

Figure 6.5. F-15E Maximum Performance Takeoff and Climb.



Max Performance Take Off and Climb F-15E

Table 6.2. F-15E Maximum Performance Takeoff and Climb Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	0'	190	MAX	2
Exit	≥5,500'	250	MAX	A/R

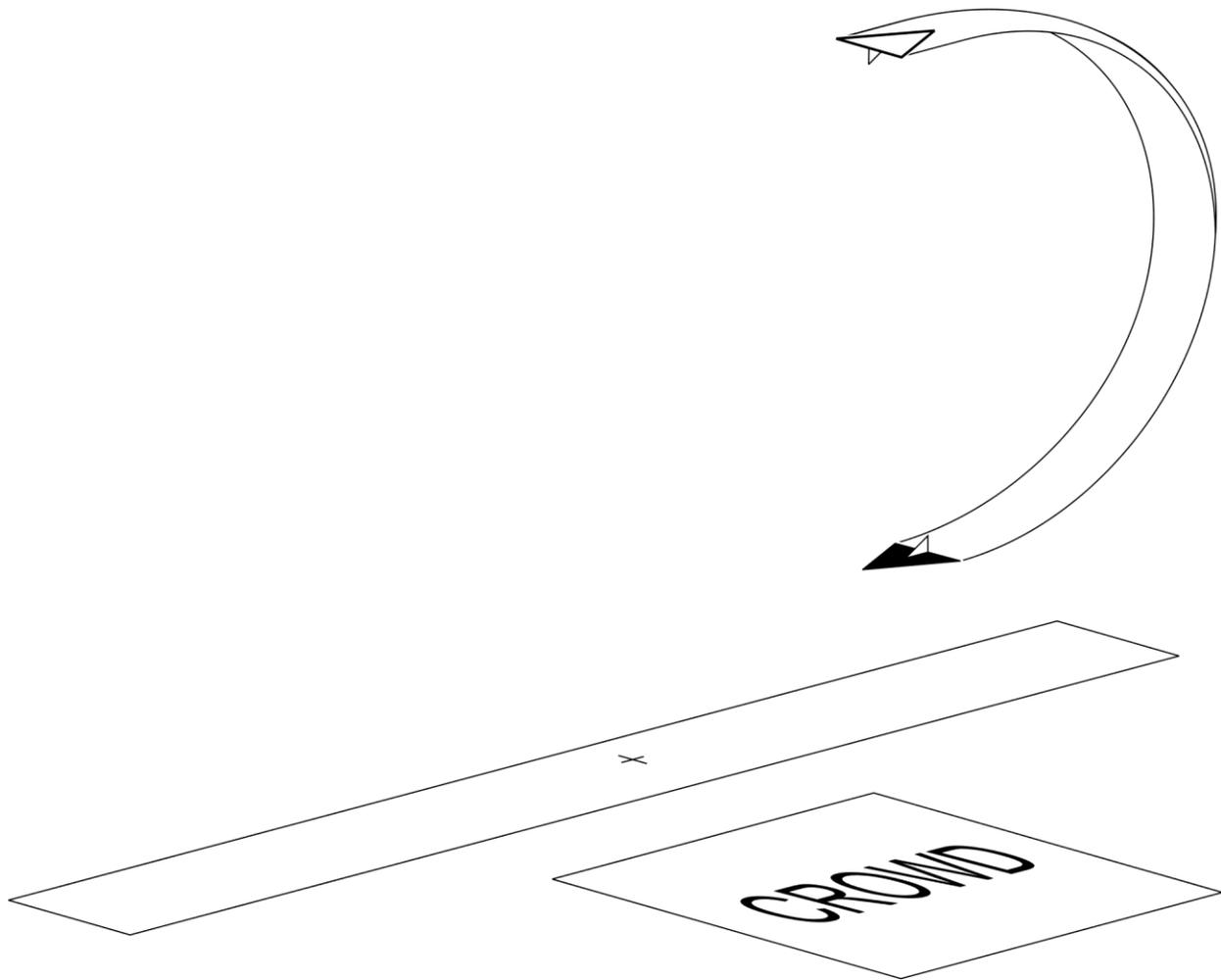
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	N/A	190 / N/A	MAX	N/A
Exit	5,000'	225 / 275	MAX	N/A

6.10.1. **Maneuver Description.** The takeoff is performed with flaps and in afterburner. At 190 knots, execute a smooth, aft-pull of the stick to achieve takeoff rotation. After a positive rate of climb is established, retract the gear and flaps and set a pitch attitude of 30 to 70 degrees nose high. Adjust pitch angle to maintain climb airspeed of 250 knots. If airspeed decreases below 225 knots, decrease pitch attitude to achieve climb airspeed.

6.10.2. **Abnormal Procedures.** If the show profile takeoff is interrupted by an aircraft malfunction, make a normal takeoff or if conditions warrant, abort the takeoff.

6.11. SPLIT-S.

Figure 6.6. F-15E Split-S.



Split-S
F-15E

Table 6.3. F-15E Split-S Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	≥5,500'	250	MAX	2-4
90 degrees nose low	≥4,500'	275	MAX	A/R
Exit	300'	.92M	MAX	3-5

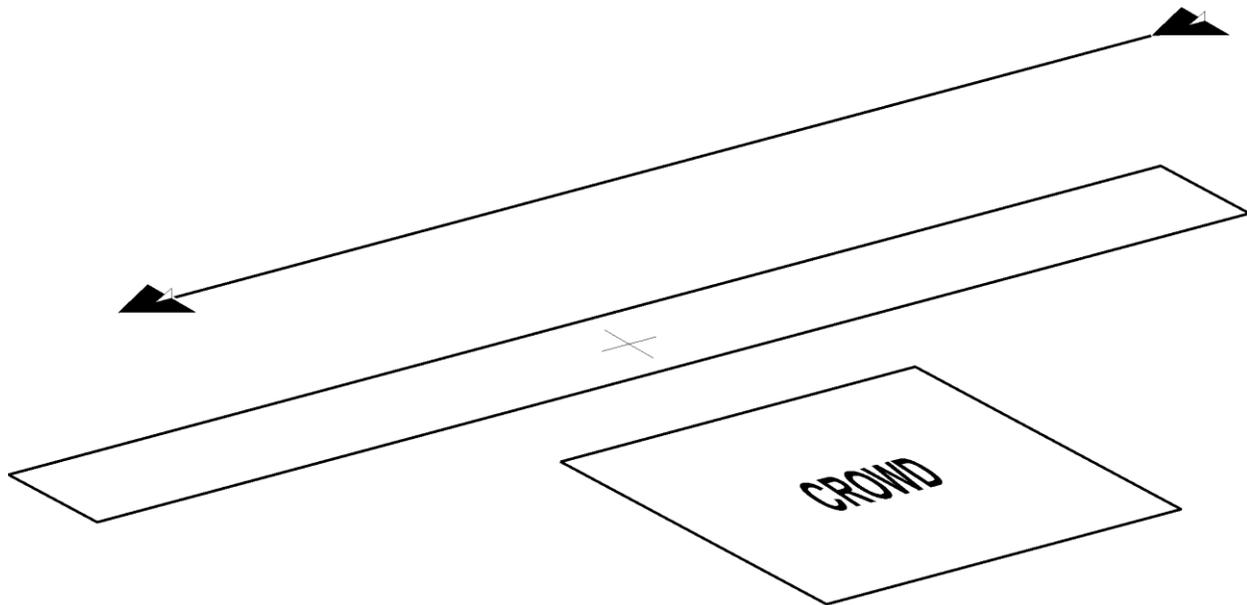
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry min	5,000'	225 / 275	MAX	6
90 degrees nose low	4,000'	225 / 325	MAX	N/A
Exit min	200'	N/A / .94M	MAX	8

6.11.1. **Maneuver Description.** After takeoff and at a minimum of 4,500 feet AGL with an attitude of 30-70 degrees nose high, perform an unloaded 180-degree aileron roll to achieve an inverted climbing attitude. Initiate a smooth pull to the horizon to achieve a wings-level inverted position at 5,500 feet AGL. Continue the pull in maximum power through the vertical, using 2.0-4.0 Gs, to 135 degrees of turn (45 degrees nose low). As the nose drops below the horizon and the airfield environment is reacquired, correct as necessary to complete the Split-S down the show line. On a standard day, at 90 degrees nose low, airspeed should be between 225 to 325 knots and altitude greater than 4,000 feet AGL. At 135 degrees, relax backpressure and smoothly transition to be in level flight at 300 feet AGL for the Flat Pass.

6.11.2. **Abnormal Procedures.** If not within the target airspeed window, adjust pitch attitude during climb to achieve desired airspeed. If below minimum apex altitude, maintain an inverted climb until reaching minimum apex altitude. If you will be below 4,000 feet AGL and over 325 knots prior to achieving 90 degrees nose low, execute emergency dive recovery procedures. If at anytime during the maneuver it appears that the aircraft will not attain the prescribed altitude/ airspeed parameter limits, the maneuver will be aborted. Reposition the aircraft for follow-on maneuvering.

6.12. Flat Pass.

Figure 6.7. F-15E Flat Pass.



Flat Pass (Optional) F-15E

Table 6.4. F-15E Flat Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	.92M	MAX	1
Exit	300'	.92M	IDLE to MAX	1

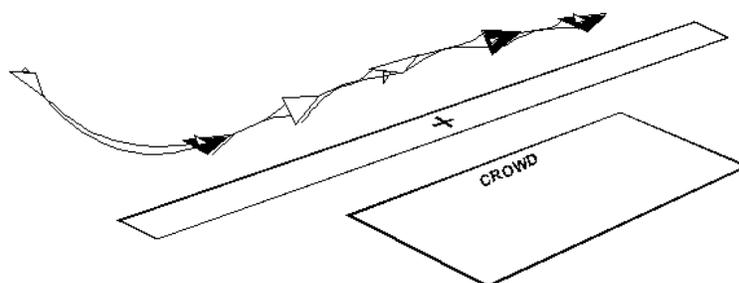
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX		Power Setting	G
Entry	min	200'	N/A / .94M	A/R	N/A
Exit	min	200'	N/A / .94M	A/R	N/A

6.12.1. **Maneuver Description.** This Flat Pass may be flown to orient the aircraft for the left-to-right Four-Point Roll. The Flat Pass may be flown on the 500-foot show line at 300 feet AGL in maximum power, so as to target 0.92 Mach.

6.12.2. **Abnormal Procedures.** If it becomes apparent 0.94 Mach will be exceeded, afterburner should be deselected.

6.13. Four-Point Roll (Left to Right).

Figure 6.8. F-15E Four-Point Roll.



Four-Point Roll
F-15E

Table 6.5. F-15E Four-Point Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Nominal Power Setting	G
Entry	500'	425	80% to MIL	1 to 3
Exit	500'	425	80% to MIL	1

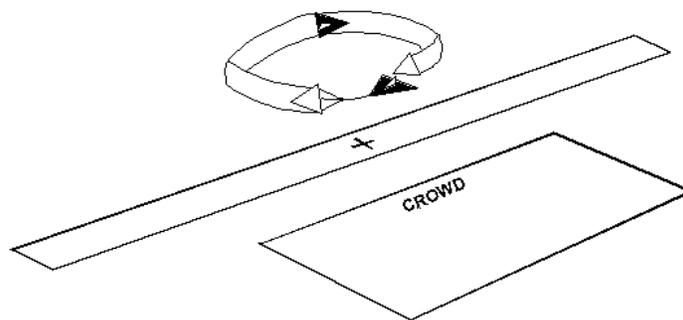
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 400'	375 / 475	80% to MIL	N/A	
Exit	min 400'	375 / 475	80% to MIL	N/A	

6.13.1. **Maneuver Description.** At 4,000 feet prior to show center, smoothly pull the nose to five degrees up, establish a climb, and relax stick pressure. A cadenced four-point roll to the left is then performed by pausing momentarily at the 90-degree, 180-degree, 270-degree, and 360-degree points. Move the stick briskly, causing a left roll and an immediate stop at each point when pressure is released. The pace of the cadence should ensure the aircraft is at the 180-degree point over show center. At the completion of the pass and at the 360-degree point, a repositioning maneuver is performed to orient for a right to left initiation of the High G Turn.

6.13.2. **Abnormal Procedures.** If starting parameter limits are not achieved, abort maneuver and transition to a flat pass. During the maneuver, if the nose is below the horizon at the 180-degree inverted point, abort the maneuver by rolling to wings level.

6.14. High G Turn (Right to Left).

Figure 6.9. F-15E High G Turn.



High G Turn
F-15E

Table 6.6. F-15E High G Turn Parameters.

TARGET PARAMETERS				
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	450	MAX	7.5
Exit	500'	350	MAX	2 to 4

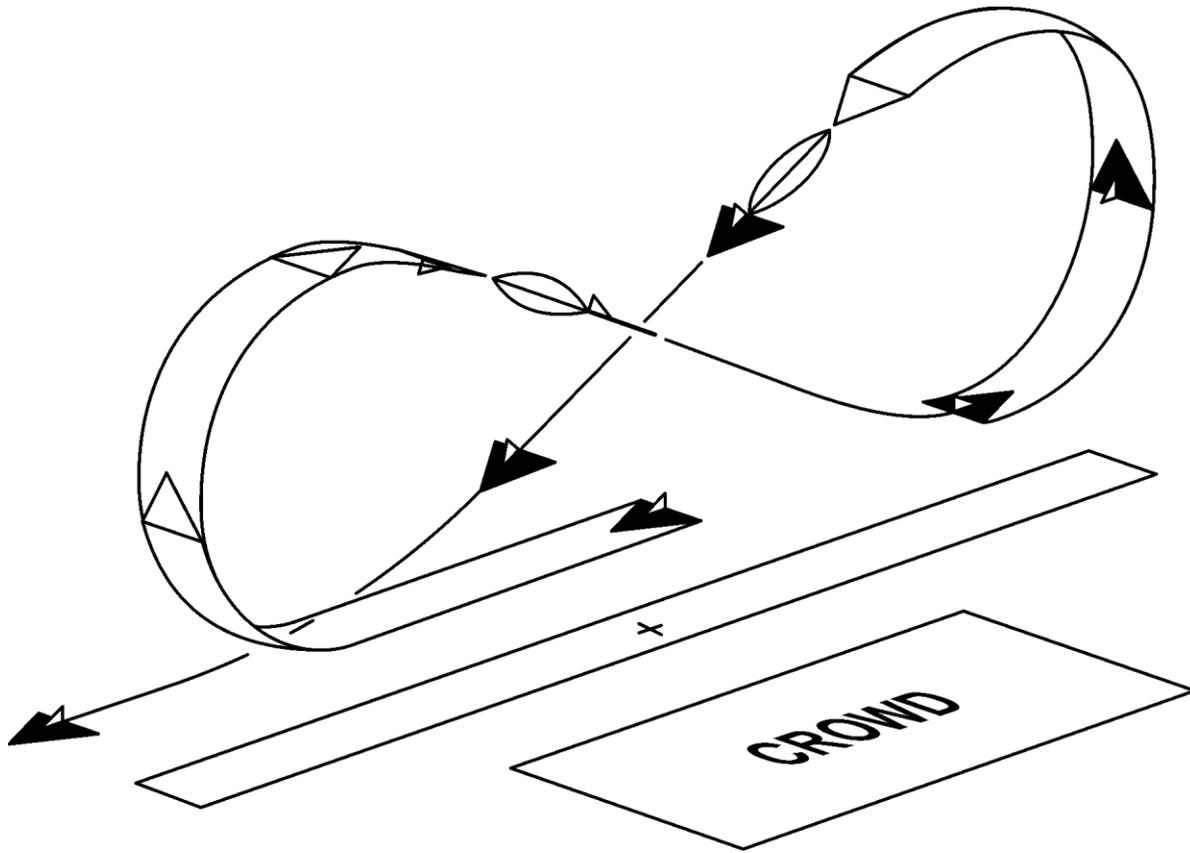
PARAMETER LIMITS				
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	400 / 500	MAX	9
Exit	min 400'	300 / 425	MAX	9

6.14.1. **Maneuver Description.** At approximately 3,000 feet prior to show center, select full AB and accelerate to approximately 450 knots. At show center, turn away from the crowd using approximately 85 degrees of bank. Begin the turn with a smooth G onset rate to maintain airspeed at approximately 350 knots and 7.5 Gs. G-loading and airspeed bleed-off rate will vary with density altitude. The first 180 degrees of turn should be accomplished with a 1 $\frac{3}{4}$ degree nose-up attitude and the last 180 degrees of turn should be accomplished with a 1 $\frac{3}{4}$ degree nose-down attitude to make the turn appear level to the crowd. Vary the bank angle and pitch to arrive at level flight at the completion of 360 degrees of turn and to ensure the maneuver is finished above the entry altitude. Surface winds must be taken into consideration in order to center this maneuver on show center and to avoid overshooting the show line. As you approach show center, smoothly but briskly roll out to set up for the Cuban 8.

6.14.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or airspeed decay below 300 knots, abort the maneuver by rolling wings level and climbing to 500 feet AGL. If necessary, adjust power and G as required (no lower than 300 knots) to avoid overshooting the show line.

6.15. Cuban 8 (Right to Left).

Figure 6.10. F-15E Cuban Eight.



Cuban Eight F-15E

Table 6.7. F-15E Cuban Eight Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	400	MAX	25 AOA
Apex	≥4,500	175	IDLE-MIL	1 to 2
Exit	500'	400	MIL-MAX	3 to 5

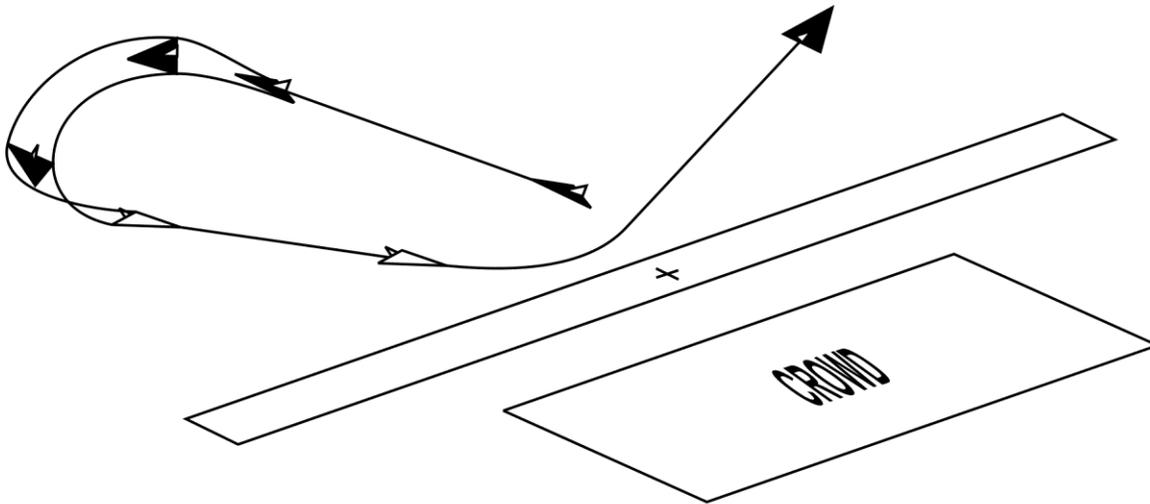
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	350 / 450	MAX	6
Apex	4,000	150 / 250	IDLE-MAX	4
Exit	min 400'	325 / 450	MAX	6

6.15.1. Maneuver Description. Following the High-G Turn, reposition the aircraft and descend to fly wings level down the 1,500-foot show line at 500 feet AGL and 400 knots. Approximately 3,000 feet past show center, begin a brisk but smooth wings-level pull to approximately 25-units AOA. Normal apex altitude is above 4,500 feet AGL. At apex altitude, reduce power. Airspeed should be 150-250 knots. The pull is held until the nose passes through 125-140 degrees of pitch where the backpressure is eased to maintain a constant nose track of 25-45 degrees nose low inverted. The 25 to 45-degree nose low inverted attitude is held until approximately 3,000 feet AGL and airspeed should be approximately 300 knots. At 3,000 feet AGL, advance throttles to MIL and perform an unloaded roll to wings level upright. Roll the aircraft as necessary to maintain proper alignment along the show line (wind correction). Gradually increase backstick pressure to ensure aircraft will not descend below 500 AGL. At no later than 1,200 feet AGL initiate full afterburner and begin a brisk but smooth wings-level pull to approximately 25-unit AOA. The second half is completed in the opposite direction using the procedures described earlier.

6.15.2. Abnormal Procedures. If either or both afterburners fail to light abort maneuver by decreasing pitch attitude to level flight and investigate malfunction. If apex airspeed is less than 175 knots, decrease backstick pressure and accelerate to target airspeed before reducing throttles and pulling nose through horizon. If desired pitch attitude is exceeded while inverted, roll upright and set desired pitch angle and continue maneuver. If less than 2,500 feet AGL while inverted, an immediate roll and pull to wings level will be initiated. If at any time it becomes apparent that the maneuver will be completed inside the show line (poor wind correction, improper alignment) abort the maneuver and setup for the next pass.

6.16. Low Angle Strafe Pass (Left to Right).

Figure 6.11. F-15E Low Angle Strafe Pass.



Low Angle Strafe Pass F-15E

Table 6.8. F-15E Low Angle Strafe Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	≥2,000'	350	80% to MIL	1 to 2
Exit	400'	400	80% to MIL	5

PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min	1,500'	300 / 400	MAX	N/A
Exit	min	300'	350 / 450	MAX	9

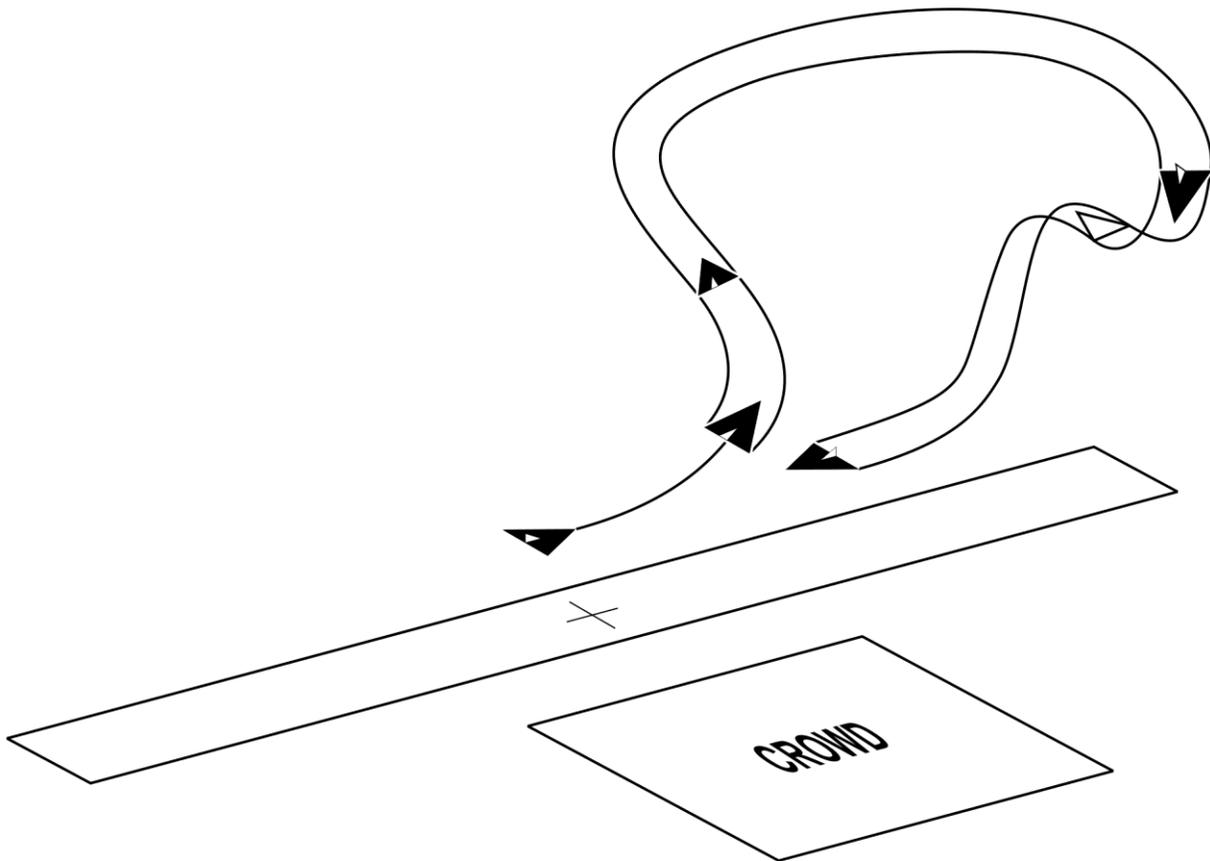
6.16.1. **Maneuver Description.** After performing a reposition maneuver, align the aircraft to fly down the 1500' line. At 6,000' from show center roll and pull to a 20 degree dive angle. The dive angle will normally be 10 – 25 degrees nose low depending on winds. The optimum dive angle is 20 degrees. Do not exceed 25 degrees. Recovery should be initiated at 1,000 - 800 feet AGL using a max performance pull in order to bottom out at or above 300 feet AGL. Be careful not to over-G the aircraft during this pull. In order to make this corner, a minimum of 400 knots must be obtained. After recovering to level flight,

accomplish a reposition maneuver to set up for the LAHD Bomb Pass. Use the 1500-foot show line at show center as a reference point, and offset the pyro area at least 150 feet.

6.16.2. **Abnormal Procedure.** If entry parameter limits are not met, abort the maneuver and perform a wings-level pass. If at any time the dive angle exceeds 25 degrees, either abort the pass and fly through straight and level or shift the aim point longer and parallel to the show line until the dive angle is 25 degrees or less. Check airspeed at 1,500 feet AGL. If it is not at least 375 knots, abort the pass and fly through straight and level.

6.17. LAHD Bomb Pass (Right to Left).

Figure 6.12. F-15E LAHD Bomb Pass.



LAHD Bomb Pass F-15E

Table 6.9. F-15E LAHD Bomb Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry (Pull up)	500'	400 at pull-up	80% to MIL	2-4
Exit	400'	400	80% to MIL	5

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry (Pull up) min	400'	325 / 450	MAX	6
Exit	300'	350 / 450	MAX	9

6.17.1. **Maneuver Description:** After performing the Low Angle Strafe Pass, continue straight-and-level to approximately 3,000 feet past show center, then begin a 40-50 degree turn away from the crowd starting a slight climb to apex around 1,000 feet AGL accelerating to approximately 450 knots. At approximately 2.5 miles from show center, make a flat turn and pull to a point to begin a run-in at 500 feet AGL and 20-30 degrees off the show line. Align the aircraft to fly slightly offset the preplanned bombing target/point, away from the crowd. Do not allow a vector towards the crowd! At approximately 1.3 miles from the target, pull up to 20-40 degrees nose high. Passing approximately 1,500 feet AGL and approaching the run-in on the 500-foot show line, roll-in on the target. The dive angle will normally be 10 – 25 degrees nose low depending on winds. The optimum dive angle is 20 degrees. Do not exceed 25 degrees. Recovery should be initiated at 1,000 feet AGL using a max performance pull in order to bottom out at or above 400 feet AGL. Be careful not to over-G the aircraft during this pull. In order to make this corner, a minimum of 400 knots must be obtained. Use the 500-foot show line at show center as a reference point, and offset the pyro area at least 150 feet. After recovering to level flight, accomplish a reposition maneuver to set up for the SAM Weave.

6.17.2. **Abnormal Procedures.** If entry parameter limits are not met, abort the maneuver and perform a wings-level pass. If at any time the dive angle exceeds 25 degrees, either abort the pass and fly through straight and level or shift the aim point longer and parallel to the show line until the dive angle is 25 degrees or less. Check airspeed at 1,500 feet AGL. If it is not at least 375 knots, abort the pass and fly through straight and level.

6.18. SAM Weave.

Figure 6.13. F-15E SAM Weave.

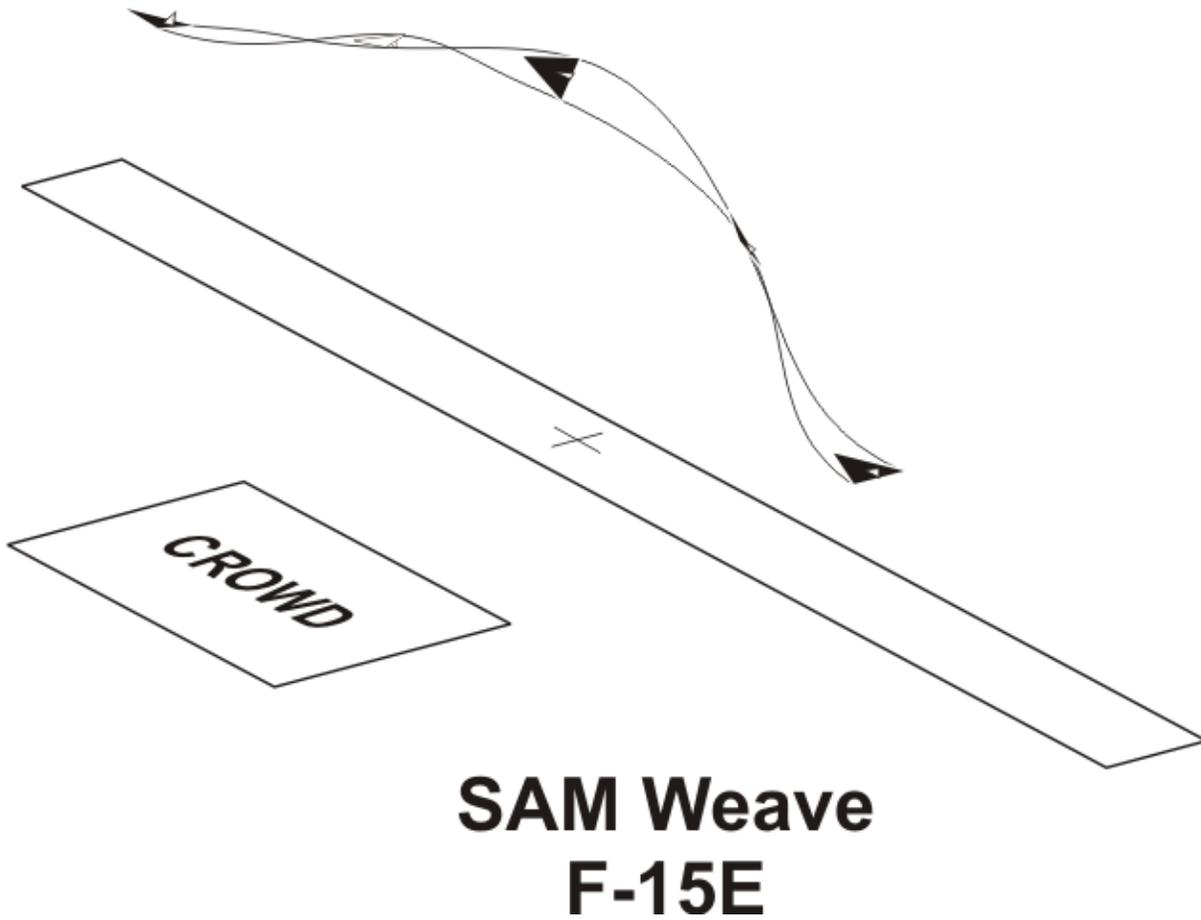


Table 6.10. F-15E SAM Weave Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	400	80% to MAX	5-6
Exit	500'	350	80% to MAX	5-6

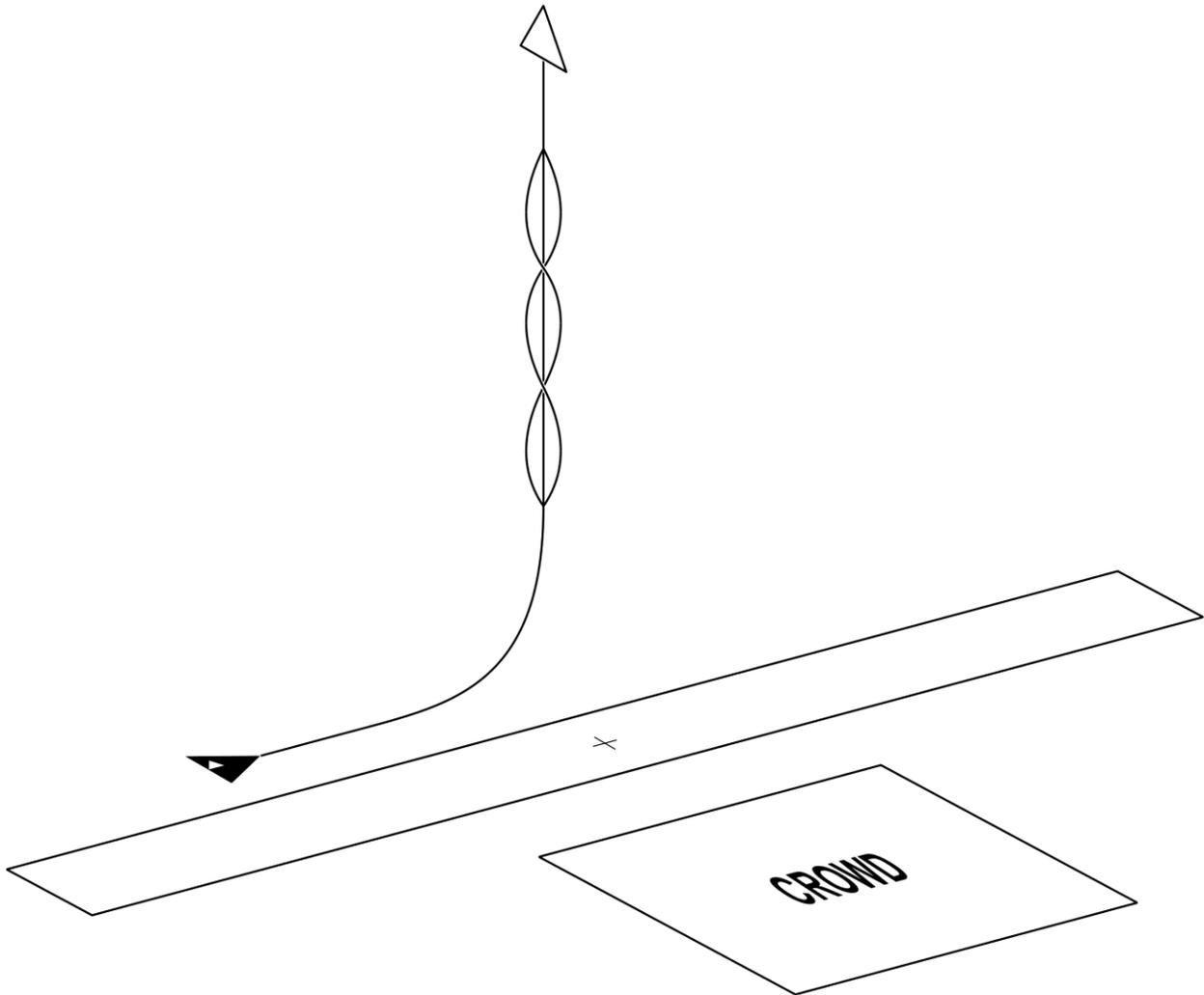
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry min	400'	325 / 450	MAX	2
Exit	400'	300 / 450	MAX	9

6.18.1. **Maneuver Description:** After performing the LAHD Bomb Pass recovery to level flight, begin a right 30-70 degree turn away from the crowd ensuring a slight climb away from the ground. The bank angle will be approximately 70-90 degrees ensuring you are at or above 500 feet AGL at the end of the turn. Rapidly unload the jet and roll left 135 degrees and use a max performance pull into the oblique 10-20 degrees nose high. Then rapidly unload and roll the jet 180 degrees to the right and perform a maximum pull to 10-20 degrees nose low into the oblique. Once reaching 10-20 degrees nose low, rapidly unload, and roll upright to pull up into a normal reposition for the Dedication Pass.

6.18.2. **Abnormal Procedures.** If entry parameter limits are not met, abort the maneuver and perform a normal reposition maneuver. If at any time the dive angle exceeds 25 degrees nose low, immediately transition to a level pull to the reposition maneuver. At no time should airspeed drop below 300 knots or should the jet be lower than 500 feet AGL. If the airspeed drops below 300 knots in the climb, accelerate uphill prior to pull down.

6.19. F- Maximum Performance Climb with Rolls (Left to Right).

Figure 6.14. 15E Maximum Performance Climb With Rolls.



Maximum Performance Climb With Rolls F-15E

Table 6.11. F-15E Maximum Performance Climb With Rolls Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	500	MAX	5-6
Exit	NTEWA	175	80% to MAX	2 to 5

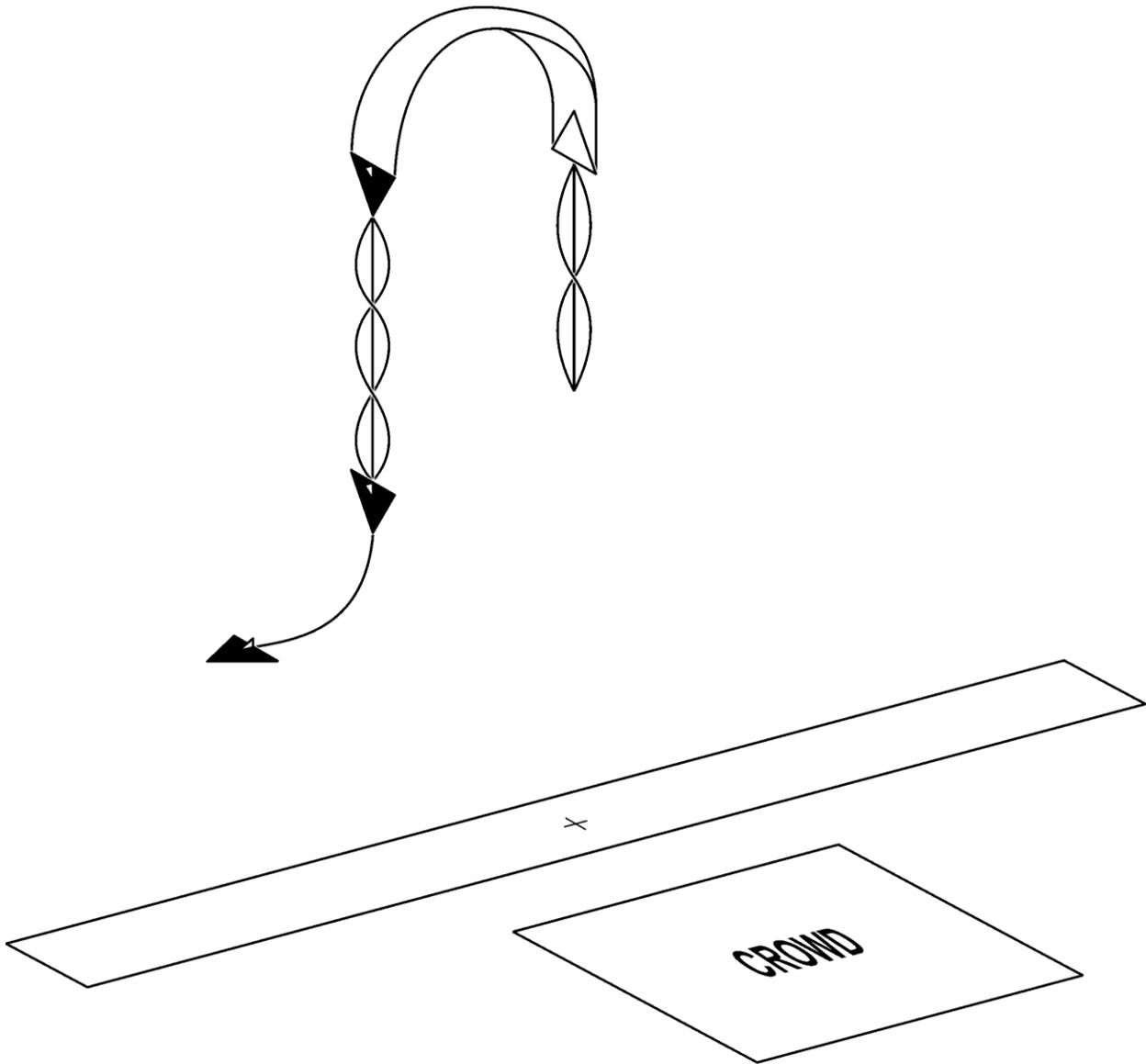
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 200'	450 / 550	MAX	8	
Exit	min 10,000'	125 / 250	80% to MIL	6	

6.19.1. **Maneuver Description.** Approach show center wings level, at 500 knots and 300 feet AGL. At 3,500 feet prior to show center select full afterburner and initiate a 6 to 7.5 G wings-level pull to arrive at show center with 90 degrees of pitch. The pull should be made so the aircraft is vertical at show center. When the aircraft is vertical, perform high-rate unloaded aileron rolls until reaching a minimum of 250 knots or 3,000 feet below waived airspace. Stop the aileron rolls and execute a vertical recovery by smoothly pulling the nose to the nearest horizon. Deselect afterburner and modulate power as necessary to setup for the spiral descent.

6.19.2. **Abnormal Procedures.** If entry parameters are not met at 3,000 feet prior to show center, delay until entry parameters are met. If entry parameters are not met prior to 2,000 feet past show center, abort the maneuver and reposition for the next pass. If it becomes apparent airspeed will decrease below 150 knots in the climb, initiate a vertical recovery.

6.20. Spiral Descent.

Figure 6.15. F-15E Spiral Descent.



**Spiral Descent
F-15E**

Table 6.12. F-15E Spiral Descent Parameters.

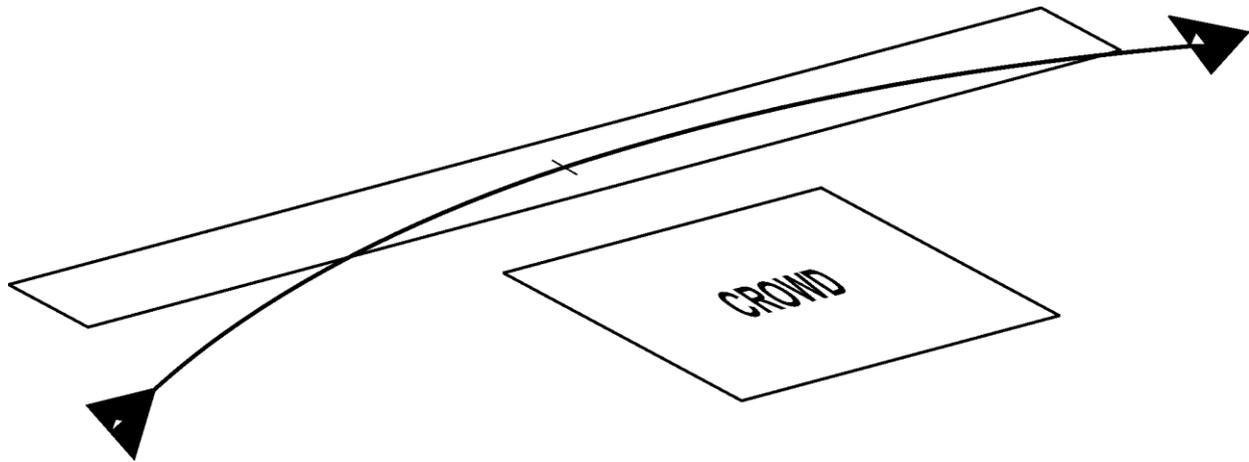
TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	NTEWA	175	IDLE	1 to 2
Exit	6,000'	400	IDLE	3 to 7

PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min	10,000'	125 / 250	IDLE	N/A
Exit	min	5,000'	A/R / 450	IDLE	8

6.20.1. **Maneuver Description.** As the aircraft nose is brought through the horizon, reacquire the airshow environment. In idle power, perform a vertical spiraling descent oriented toward show center. Initiate dive recovery to recover by 6,000 feet AGL. Do not exceed 450 knots in the descent. The direction of the dive recovery should be as necessary to reposition for the next maneuver, however do not exit the maneuver over the crowd.

6.20.2. **Abnormal Procedures.** If entry airspeed window is not met (too fast) adjust dive angle to minimize airspeed in the descent. If below 12,000 AGL at the apex of the climb (airspace restrictions, weather conditions), adjust dive angle to safely execute a recovery at 6,000 AGL. When initiating the spiral descent at altitudes above 15,000 AGL, adjust minimum dive recovery altitude accordingly. (If starting at 18,000' AGL, initiate dive recovery at 9,000 AGL.) Initiate an immediate dive recovery if airspeed is at/or above 450 knots. Show center orientation is a secondary consideration in the spiral descent. If at anytime during the maneuver it appears that the aircraft will not attain the prescribed altitude/airspeed parameters, the maneuver will be aborted. Roll out and/or pull to a wings-level position, initiate a descent and reposition the aircraft for follow-on maneuvering. **OPTION:** Due to changing weather conditions, the vertical spiraling descent may not be possible after the Max Climb. Start a descent when able to maintain VMC conditions to position the aircraft to set-up for the next maneuver.

6.21. Dedication Pass.

Figure 6.16. F-15E Dedication Pass (Left to Right).

Dedication Pass F-15E

Table 6.13. F-15E Dedication Pass Parameters.

TARGET		PARAMETERS	
Altitude AGL	Airspeed KCAS	Power Setting	G
Entry 300'	.85M	MIL	1 to 3
Exit 300'	.85M	IDLE to MIL	4 to 6

PARAMETER		LIMITS	
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	G
Entry min 200'	.6M / .94M	MIL	9
Exit min 200'	.6M / .94M	IDLE to MIL	9

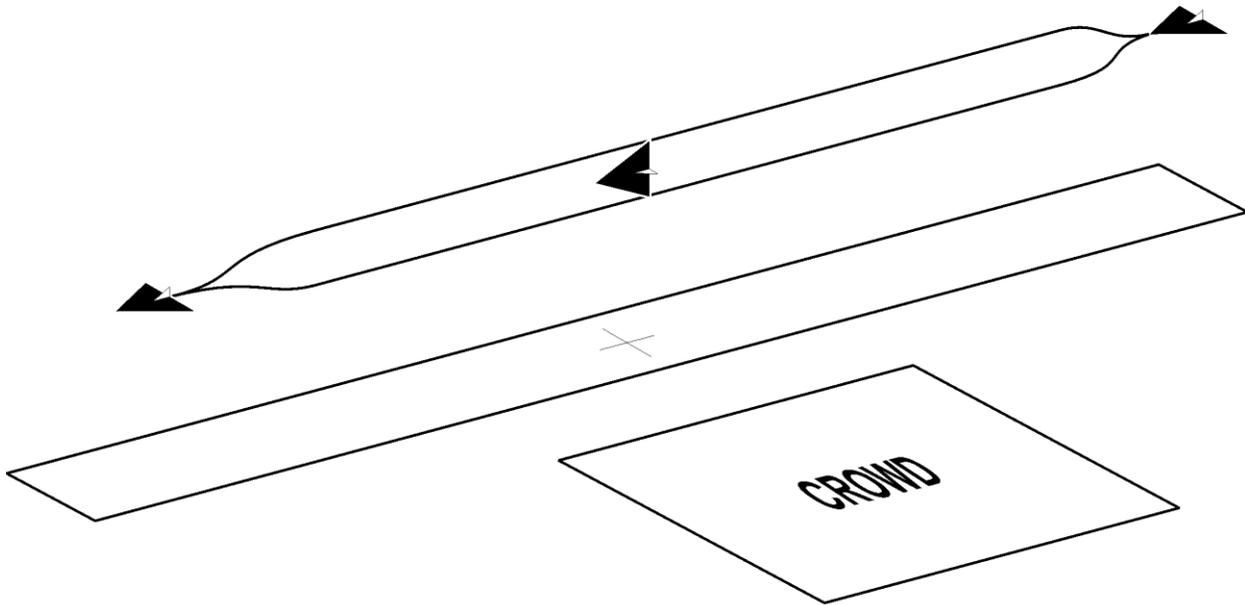
6.21.1. Maneuver Description. The intent of this maneuver is to pay tribute to our war fighters. It is to be flown prior to the Knife Edge Pass during the High and Flat Show profiles and prior to the Tactical Pitch-Up to Landing for the Low Show. The maneuver is flown on the 500-foot line and is non-aerobatic. Following the Spiral Descent (high show), LAHD Bomb Pass (low show), or Level 8 (flat show) attain a safe airspeed and reposition the aircraft to arrive behind and offset the crowd. The approach will be flown from behind the line, approximately 2 miles from show center, with an approximate 30 degree dive angle

and a 45 degree cut (max bank angle 90 degrees) to the show line, remaining 500 feet from the crowd at all times. Upon reaching a point 500 feet from the corner of the crowd and 300 feet AGL, roll the aircraft into a level arcing pass using a max bank of 90 degrees. Use top rudder if necessary to maintain altitude. Select mil power until passing the show line or until a target airspeed of .85M is anticipated. Varying pressure altitudes and temperatures will determine when to deselect afterburner to ensure the target airspeed is attained at show center and the max airspeed is not exceeded. Ensure military power is selected prior to entering the arcing pass and through the exit of the maneuver. Do not use afterburner during the arcing pass. Optimum profile of the aircraft is achieved at approximately 80 degrees of bank. Use caution not to over bank the aircraft and allow the aircraft to lose altitude while banking. In order to maintain 500 feet from the crowd at each corner, the flight path at show center will have to extend beyond 500 feet. Continue the arc beyond the opposite crowd corner, reduce power as required, roll out of bank, and continue a maximum 45 degree climb to set up for the Knife Edge Pass.

6.21.2. **Abnormal Procedures.** Abort the maneuver if at any time the aircraft comes closer than 500' to the crowd line or its lateral limits, an excessive dive angle or sink rate develops, entry parameters are not met, or the aircraft descends below 200 feet AGL. Abort the maneuver by rolling the aircraft wings level and flying away from the crowd.

6.22. Knife Edge Pass.

Figure 6.17. F-15E Knife Edge Pass (Right to Left).



Knife Edge Pass F-15E

Table 6.14. F-15E Knife Edge Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	400	MAX	1 to 3
Exit	500'	500	80% to MAX	1 to 3

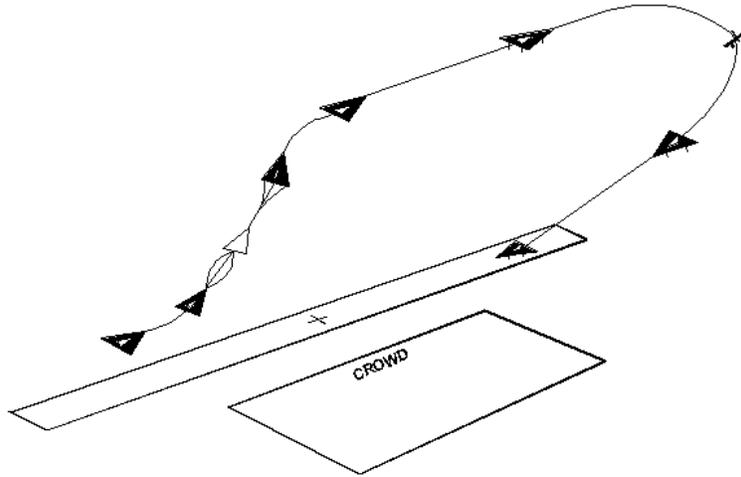
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	
Entry	min 400'	350 / 450	MAX	4	
Exit	min 400'	400 / 600	80% to MAX	4	

6.22.1. **Maneuver Description.** Enter the 1,500' show line at 500 feet AGL and 400 knots. At 8,000 to 6,000 feet prior to show center, raise the nose three to five degrees, establish a climb, and apply stick pressure to roll 90 degrees toward the crowd. The aircraft is held in this position until 8,000 to 6,000 feet past show center. Top rudder is applied to help hold the nose above the horizon so the full maneuver can be accomplished. Forward stick pressure is applied to keep the aircraft on the show line and to maintain level flight.

6.22.2. **Abnormal Procedures.** If entry parameters are not met, abort the maneuver, make a flat pass, and reposition for the next maneuver. If the nose falls below level flight (zero degrees pitch in the HUD) or if the aircraft will descend below 400 feet AGL, abort the maneuver.

6.23. Tactical Pitch-Up to Landing (Direction of Landing).

Figure 6.18. F-15E Tactical Pitch-Up to Landing.



Tactical Pitch-Up to Landing
F-15E

Table 6.15. F-15E Tactical Pitch-Up to Landing Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	350	MAX	4 to 6
Exit	Downwind Alt	250	A/R	1 to 4

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	300 / 425	MAX	8
Exit	Downwind Alt	200 / 350	A/R	N/A

6.23.1. **Maneuver Description.** At 3,000 feet prior to show center, 500 feet AGL, and 350 knots select afterburner. Smoothly pull the nose five degrees up, establish a climb, and relax stick pressure. Perform an unloaded 405-degree aileron roll followed by an aggressive pull-up to downwind. During the pull to downwind, terminate afterburner and slow to below 300 knots. Configure for and execute a normal final turn and landing.

6.23.1.1. **Option 1:** On the pull-up to downwind, an additional 180-degree roll (reversal) may be performed to land from the opposite direction. Start at 4,000 feet prior to show center.

6.23.1.2. **Option 2:** If a Heritage Flight is to be performed immediately following completion of the demonstration, conduct a low approach or wings-level pass and proceed to rejoin with Heritage Flight aircraft using pre-briefed procedures.

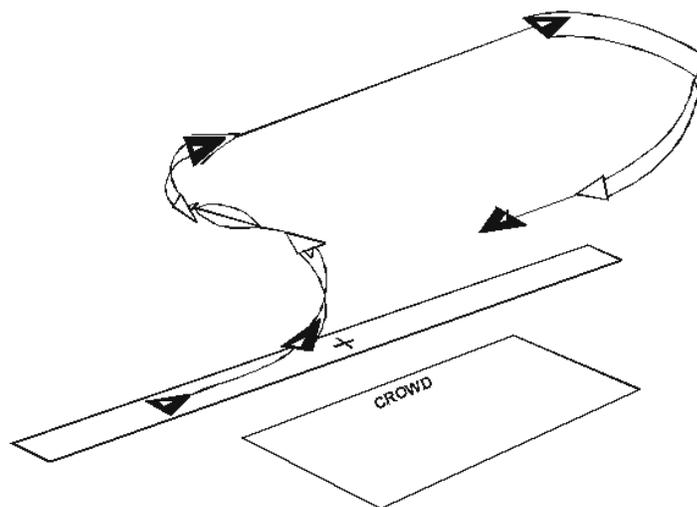
6.23.2. **Abnormal Procedure.** If entry parameters are not achieved by show center, pull-up to a normal closed pattern.

Section 6C—Low Profile

6.24. **Low Profile Abnormal Procedures:** Unless otherwise noted, **Abnormal Procedures** for the low profile are the same as the high profile.

6.25. **Maximum Performance Takeoff Inverted.**

Figure 6.19. F-15E Maximum Performance Takeoff Inverted.



**Maximum Performance T/O-Inverted
F-15E**

Table 6.16. F-15E Maximum Performance Takeoff Inverted Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	0'	190	MAX	23-25 AOA
Exit	1,000'	250	MAX	1

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	0'	180 / N/A	MAX	N/A
Exit	800'	225 / 350	MAX	N/A

6.25.1. Maneuver Description: The takeoff is performed with flaps and in full afterburner. At 190 knots, execute a smooth, but brisk aft pull of the stick to achieve takeoff rotation. After a positive rate of climb is established, retract the gear and flaps and rotate the nose to achieve a 23-25 unit AOA climb (max AOA 30 units). Smoothly roll and pull away from the crowd to a wings-level inverted position with afterburners pointing directly at the crowd. Hold inverted flight for approximately five seconds, accelerate to 250 to 400 knots, and then perform a 270-degree right turn to position for the Flat Pass. Minimum airspeed in the climb will be 190 knots; minimum altitude inverted will be 800 feet AGL.

6.25.2. Abnormal Procedures. If the show profile takeoff is interrupted by an aircraft malfunction, make a normal takeoff, or if conditions warrant, abort the takeoff.

NOTES:

The Max Performance Takeoff/Inverted may be flown in either direction.

The Inverted Takeoff may be substituted for the Vertical Climb Takeoff at any time. Reasons are not limited to, but may include: takeoff direction due to wind and show orientation, weather considerations, terrain, or to demonstrate a different aircraft capability. The Inverted Takeoff is described in the low section.

A normal takeoff may be flown in place of the Max Performance Takeoff (Climb and Inverted) if required. Reasons include, but are not limited to: weather (ceiling, visibility, winds) and field conditions (rising terrain, high density altitudes, etc.). If flying the normal takeoff to accomplish a weather check before starting the actual profile, start the show from a staged position.

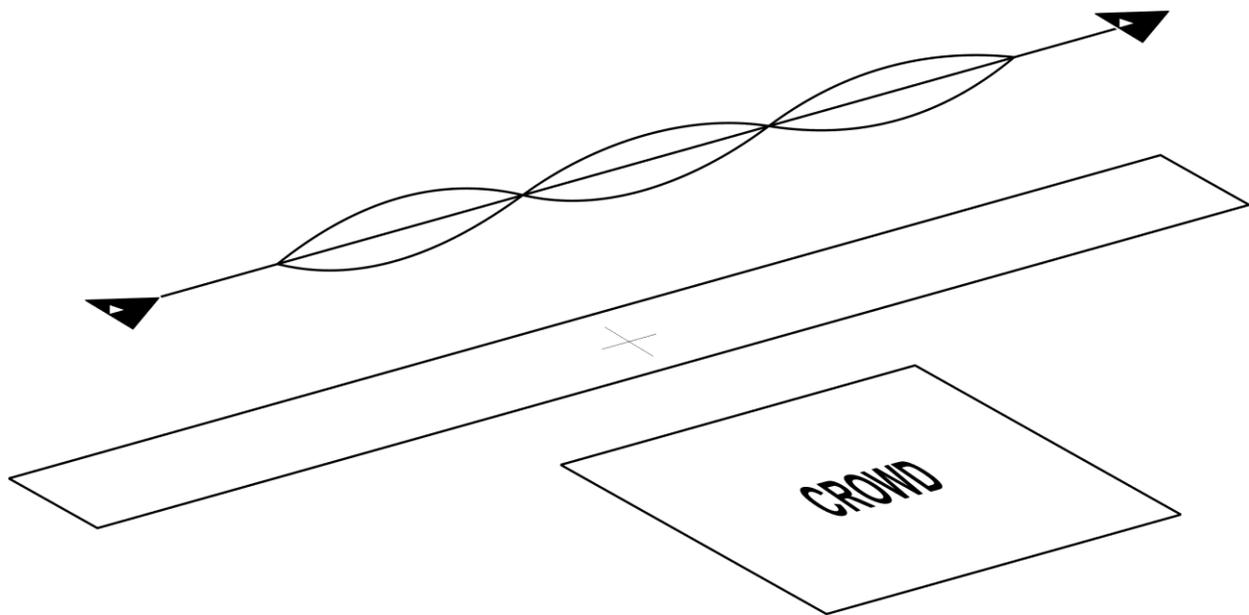
6.26. Flat Pass (Right to Left). The Flat Pass will be performed as described in [paragraph 6.12](#).

6.27. Four-Point Roll (Left to Right). The Four-Point Roll will be performed as described in [paragraph 6.13](#).

6.28. High G Turn (Right to Left). The high G turn will be performed as described in [paragraph 6.14](#).

6.29. Triple Aileron Roll (Left to Right). F-15E Triple Aileron Roll.

Figure 6.20. Triple Aileron Roll (Left to Right).



Triple Aileron Roll F-15E

Table 6.17. F-15E Triple Aileron Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	425	80% to MIL	2 to 4
Exit	500'	425	80% to MIL	1

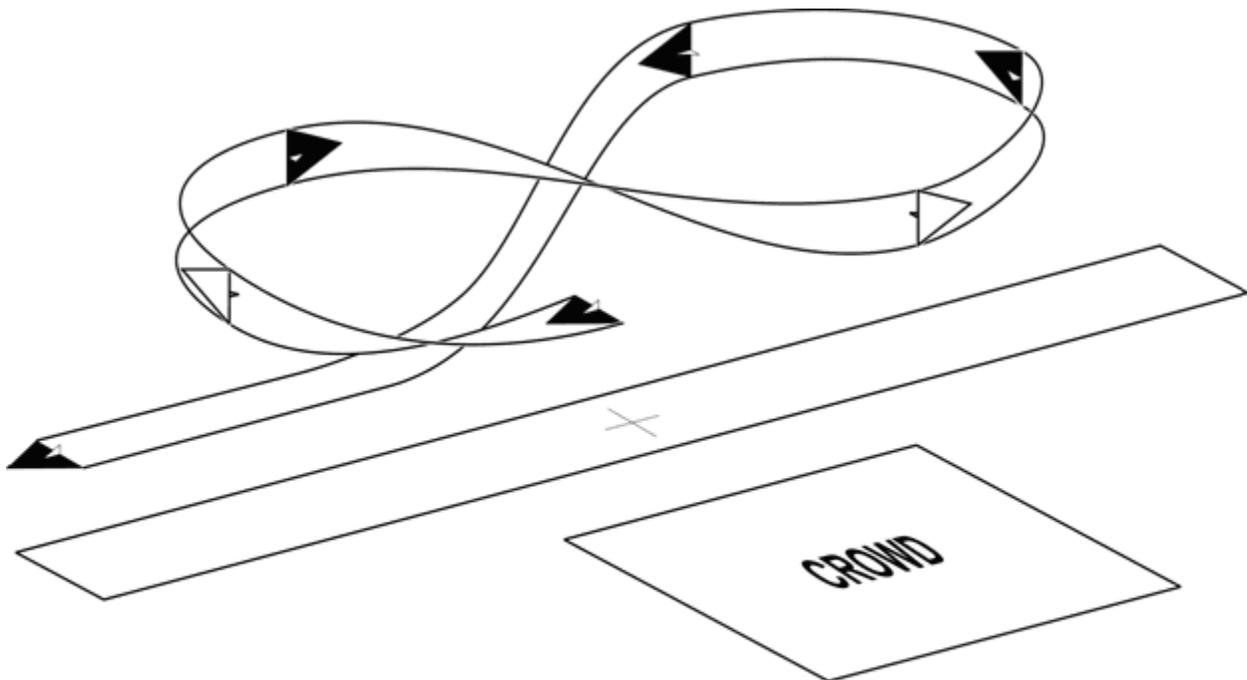
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 400'	375 / 475	80% to MIL	N/A
Exit	min 400'	375 / 475	80% to MIL	N/A

6.29.1. **Maneuver Description.** At 4,000 feet prior to show center with 425 knots and a minimum of 500 feet AGL, raise the nose eight degrees, establish a climb, and relax stick pressure. Apply full left stick pressure to perform a maximum of three consecutive unloaded aileron rolls. As the second roll is completed, it is important to ensure the aircraft has gained altitude and the nose is still above the horizon. At the completion of the third roll, roll out and reposition for the Level 8.

6.29.2. **Abnormal Procedures.** If starting parameters are not achieved, abort maneuver and transition to a flat pass. If the nose drops below level inverted on the second roll or roll coupling occurs (to exceed approximately 2.5 G) immediately roll wings level and climb to minimum altitude.

6.30. Level 8 (Right to Left).

Figure 6.21. F-15E Level 8.



Level 8 F-15E

Table 6.18. F-15E Level 8 Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	500'	450	MAX	6-7
Exit	500'	400	MAX	2 to 4

PARAMETER			LIMITS	
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting G
Entry	min	400'	400 / 500	MAX 9
Exit	min	400'	300 / 450	MAX 9

6.30.1. **Maneuver Description.** At approximately 2,500 feet past show center, select full afterburner and accelerate to approximately 450 knots. Turn away from the crowd using

approximately 85 degrees of bank. Begin the turn with a smooth G onset-rate to maintain airspeed at approximately 350-400 knots and 5 to 7 Gs. G-loading and airspeed bleed-off rate will vary with density altitude. Maintain a minimum of 300 knots. The first 180 degrees of turn should be accomplished with a 1¾-degree nose-up attitude to make the turn appear level to the crowd. After 225 degrees of turn, unload and briskly roll wings level. Approaching the show line, reverse direction of turn and accomplish a second level turn in the opposite direction. Adjust power to enter the second turn with the same entry parameters as the first. Fly the second turn using the same techniques as the first. After 270 degrees and with a 45-degree cut to the show line, reverse the turn again. Vary the bank angle and pitch to arrive at level flight at the completion of the maneuver and to ensure the maneuver is finished above the entry altitude. Surface winds must be taken into careful consideration to center the maneuver over show center and to avoid overshooting the show line. Complete the maneuver by turning as required to finish on the show line heading the same direction as entry. Perform a repositioning maneuver to set-up for the next maneuver.

6.30.2. Abnormal Procedures. Adjust power and G as required to avoid overshooting the show line. If the aircraft descends below 500 feet AGL, reorient lift vector to ensure a timely correction. If the aircraft descends below 400 feet AGL or the airspeed decays below 300 knots, abort the maneuver by rolling wings level, climbing to 500 feet AGL, and repositioning for the follow-on maneuver.

6.31. Low Angle Strafe Pass (Left to Right). The low angle strafe pass will be performed as described in [paragraph 6.16](#). At the completion of the low angle strafe pass, reposition the aircraft to set up for the LAHD Bomb Pass.

6.32. LAHD Bomb Pass (Right to Left). The LAHD Bomb Pass will be performed as described in [paragraph 6.17](#).

6.33. SAM Weave. The SAM Weave will be performed as described in [paragraph 6.18](#).

6.34. Dedication Pass (Left to Right): The Dedication Pass will be performed as described in [paragraph 6.21](#).

6.35. Knife Edge Pass (Right to Left): The Knife Edge Pass will be performed as described in [paragraph 6.22](#).

6.36. Tactical Pitch-Up to Landing (Direction of Landing): The Tactical Pitch-Up to Landing will be performed as described in [paragraph 6.23](#).

Section 6D—Flat Profile

6.37. Flat Profile Abnormal Procedures: Unless otherwise noted, **Abnormal Procedures** for the flat profile are the same as the high profile.

6.38. Normal Takeoff: Perform a normal takeoff IAW TOs. Reposition the aircraft using a non-aerobatic Flat Wifferdill to maneuver for a Flat Pass.

6.39. Flat Pass (Left to Right): The Flat Pass will be performed as described in [paragraph 6.12](#).

6.40. High G Turn (Right to Left): The High G Turn will be performed as described in [paragraph 6.14](#).

6.41. Flat Pass (Left to Right): The Flat Pass will be performed as described in [paragraph 6.12](#).

6.42. Level 8 (Right to Left): The Level 8 will be performed as described in [paragraph 6.30](#)

6.43. Dedication Pass (Left to Right): The Dedication Pass will be performed as described in [paragraph 6.21](#).

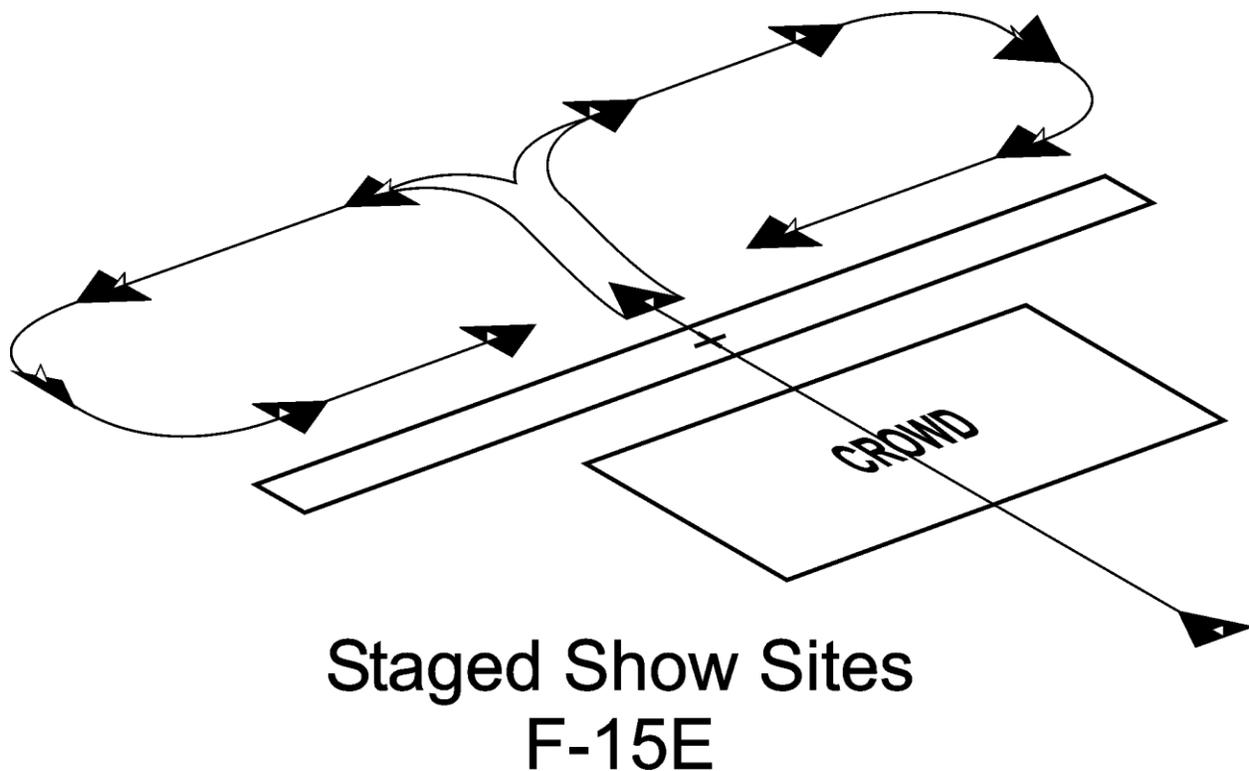
6.44. Knife Edge Pass (Right to Left): The Knife Edge Pass will be performed as described in [paragraph 6.22](#).

6.45. Tactical Pitch-Up to Landing (Direction of Landing): The Tactical Pitch-Up to Landing will be performed as described in [paragraph 6.23.1](#), however, DO NOT perform the rolling portion of the maneuver. The maneuver will be non-aerobatic.

Section 6E—Staged Show Sites

6.46. Staged Show Site Entry.

Figure 6.22. F-15E Staged Show Sites.



6.46.1. When demonstration aircraft takeoff from other than the show site, plan to arrive over the show site with the fuel requirements prescribed in [paragraph 6.2](#) plus enroute return fuel IAW AFI 11-2F-15E, Vol 3. The pilot may enter from behind the crowd at a minimum of 1000 ft AGL as depicted in [Figure 6.22](#), or via a Flat Pass maneuver down the show line, and complete the show as described in this chapter. Upon completion of the Dedication Pass and clearing the crowd, turn out behind the crowd and return to the staging

airport. Pilots should plan to fly a full demonstration, but may cut the profile short as required to maintain suitable enroute return fuel.

Chapter 7

F-22 DEMONSTRATION MANEUVERS

Section 7A—General Information

7.1. General. Maneuvers described in this document will be used for training and flown in F-22 aerial demonstrations as the complete aerobatic demonstration profile. Aerobatic maneuvers are included in this grouping, and as such this profile will be treated as a standard Single Ship Tactical Demonstration profile. The profile passes are listed in a specific order and described in a specific orientation to the crowd. Abnormal procedures are written for each maneuver. If the entry conditions are not met for any maneuver, the pilot will recover to wings-level flight and transition to the next maneuver. For certain maneuvers, the pilot is required to transmit airspeed and/or altitude to a safety observer. The ground safety observer will confirm parameters are good, monitor the demonstration pilot's flight path, engine performance and visually clear the demonstration area for traffic. The safety observer will direct an abort when parameter limits are exceeded. Following each maneuver, and before clearing the show line to reposition for the next maneuver, the pilot will ensure any descent has been stopped and the aircraft is in a level or climbing attitude with the flight path marker at or above the horizon.

7.2. Aircraft Configuration and Fuel Requirements. These maneuvers will be flown in a standard configured aircraft with a full fuel load of 18,000 pounds at engine start. If mission needs dictate, taking off with less than full fuel is authorized. Under all circumstances, the pilot must takeoff with enough fuel to execute the profile and divert if necessary. Inert weapons may be loaded, but if the total weight exceeds 1000 pounds the total fuel at takeoff must be less than 17,000 pounds.

7.3. Airspeed and G Limits. Demonstration pilots will not exceed 0.94 Mach. The maximum target G for this demonstration is 7.5 Gs. This does not preclude a momentary increase in G for safety considerations.

7.4. Show line Restrictions. The majority of the F-22 demonstration will be flown on a show line that is 1,500 foot from the crowd. Occasionally, due to show site limitations, the FAA may reduce the show line to 1,200 feet. The pilot is authorized to perform on a FAA approved 1,200 foot show line. Non-aerobatic maneuvers may be flown on the 500-foot show line unless specified in the maneuver description.

7.5. Airspace and Runway Requirements. Required airspace for the F-22 is 7,000 feet AGL and normally a five-mile radius from show center horizontally. The minimum dimensions of the aerobatic box are 3,000 feet wide, 6,000 feet long, and 7,000 feet AGL. If the FAA has waived a show line to closer than 1,500 feet, the aerobatic box may be less than 3,000 feet wide, provided there is at least 1,500 feet from the show line to the outer edges of the box. Minimum runway length and width is 7,000 feet x 75 feet. The runway, taxiway, and parking area must be stressed for a 65,000-pound aircraft with single wheel type landing gear.

7.6. Weather Requirements. Weather PARAMETER LIMITS for the high show profile are a ceiling of at least 4,500 feet AGL, three miles ground and five miles in-flight visibility with a discernible horizon. Ceiling required for the flat profile is 1,500 feet. Maneuvers will be planned to maintain VMC throughout the show sequence.

7.7. High Density Altitude Demonstrations. For high density altitude shows, adjust PARAMETER LIMITS in accordance with the following:

7.7.1. Add 500 feet to APEX altitudes for each 2,000 feet of altitude above 3,000 feet MSL and 10 knots to airspeeds. For example, if the show site altitude is 5,000 feet MSL, add 500 feet to the baseline target and 10 knots to the airspeed. If the show site altitude is 7,000 feet MSL, add 1,000 feet to the baseline target and 20 knots to the airspeed.

7.8. Demonstration Maneuver Profiles.

7.8.1. High Show.

- 7.8.1.1. Maximum Power Takeoff to High AOA Loop
- 7.8.1.2. Minimum Radius Turn to J-Turn Reposition
- 7.8.1.3. Weapon Bay Door Pass
- 7.8.1.4. Dedication Pass
- 7.8.1.5. Pedal Turn
- 7.8.1.6. Power Loop
- 7.8.1.7. Loaded Roll
- 7.8.1.8. Tail Slide
- 7.8.1.9. Slow Speed Pass
- 7.8.1.10. Split S Reposition
- 7.8.1.11. High Speed Pass
- 7.8.1.12. Hoover Pitch to Land

7.8.2. Flat Show.

- 7.8.2.1. Maximum Power Takeoff
- 7.8.2.2. Minimum Radius Turn
- 7.8.2.3. Weapon Bay Door Pass
- 7.8.2.4. Dedication Pass
- 7.8.2.5. Slow Speed Pass
- 7.8.2.6. Loaded Roll
- 7.8.2.7. High Speed Pass
- 7.8.2.8. Minimum Radius Turn
- 7.8.2.9. Hoover Pitch to Land

7.9. Reposition Maneuvers. Reposition maneuvers may be flown in either direction at any time during the demonstration sequence as required. IAW FAA regulations, 90 degrees of bank may be exceeded during repositions (if required). Repositioning turns may not include added aileron rolls or other accenting maneuvers.

7.9.1. Flat Wifferdill Reposition Maneuver. The Flat Wifferdill Maneuver turn is a combination horizontal and shallow vertical turn used to change direction at each end of the show line when performing the low profile. The Flat Wifferdill Maneuver turn uses less altitude than a normal Wifferdill. It requires a larger cut and tends to be looser and flatter than a normal Wifferdill. 270-degree turn reversal may be made while the aircraft is climbing. The target G for this maneuver is 6.5 to 7.0 Gs. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the flat Wifferdill. The entry "cut" turn for the flat Wifferdill is made to ensure no show line or crowd line penetration.

7.9.2. Wifferdill Reposition Maneuver. The Wifferdill turn is a combination horizontal and vertical turn used to change direction at each end of the show line. The vertical plane is used to maintain necessary proximity to the demonstration area. Each turn may differ slightly so that airspeed/altitude parameters for the next maneuver are established in the Wifferdill. As the aircraft departs the show line, maneuver in the horizontal and vertical plane to reposition for the next maneuver. The target G for this maneuver is 6.5 to 7.0 Gs. A 270-degree turn reversal is made while still climbing. During the last half of the Wifferdill, while descending, the turn is adjusted to establish the proper show line entry. The entry "cut" turn for the Wifferdill is made to ensure no show line or crowd line penetration.

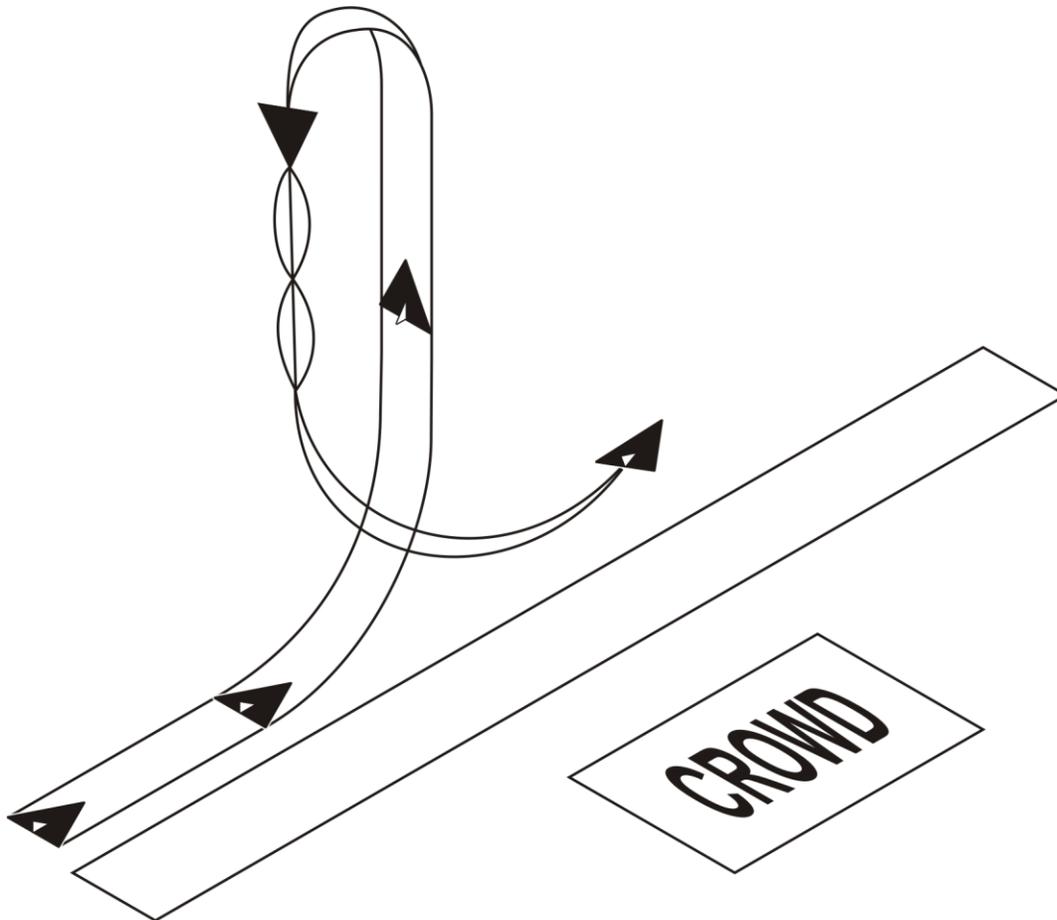
7.9.3. J-Turn Reposition Maneuver. The J-Turn reposition maneuver can be used to quickly change directions at each end of the show line while minimizing separation from the crowd and further displaying the slow speed maneuverability of the Raptor. From desired position with 100 KCAS minimum, aggressively apply aft stick while wings level to climb and slow the aircraft while loading the aircraft up with alpha. At 36 degrees AOA or more, feed in stick and rudder back in the direction of the runway. Do not maintain high alpha more than is required to maneuver the aircraft and do not slow the aircraft to below 75 KCAS if below 2,500 feet AGL and greater than 75 degrees nose high. Once the nose slices back to the horizon and is pointed towards the crowd line, break the alpha to 36 degrees for the recovery and maintain alpha until sink rate is arrested and begin to set up for the next pass. Regardless of nose position, recover from high AOA and fly the aircraft out not later than 2,500 feet AGL.

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Section 7B—High Profile

7.10. Maximum Power Takeoff to High AOA Loop.

Figure 7.1. F-22 Maximum Power Takeoff to High AOA Loop.



**T/O To High AOA Loop
F-22**

Table 7.1. F-22 Maximum Power Takeoff to High AOA Loop Parameters.

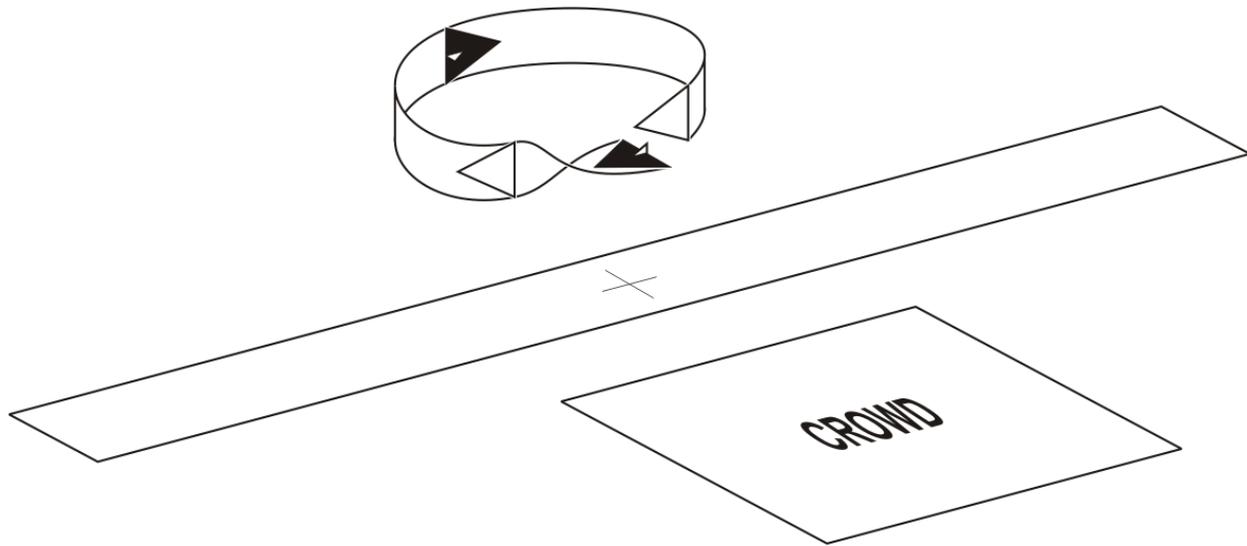
TARGET		PARAMETERS		
	Altitude AGL	Airspeed KCAS	Power Setting	Deg NH
Entry	0'	250	MAX	75
Pull	3,500'	100	MAX	N/A
Roll	3,000'	100	MAX	90 NL
Recovery	2,500'	N/A	MAX	N/A

PARAMETER		LIMITS		
	Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	Deg NH
Entry	N/A	200 / N/A	MAX	80
Pull	3,000' Min	80 / N/A	MAX	N/A
Roll	2,800' Min	90 / N/A	MAX	90 NL
Recovery	2,000' Min	N/A / 400	MAX	N/A

7.10.1. Maneuver Description. Select full AB at brake release and check engine conditions on the roll. Rotate at tech order speed and begin climb. Confirm gear is retracted and the light is extinguished in the gear handle. Accelerate in full AB with a positive climb rate until approaching show center. At 250 KCAS begin an aggressive pull (soft to hard stop initially) up to 75 degrees nose high. Hold 75 degrees nose high (water mark) and allow airspeed to slow, AOA to decrease and altitude to increase. Passing 3,000 feet AGL, smoothly bring the nose to 90 degrees nose high and wait for 3,500 feet AGL. At 3,500 feet AGL, execute a full aft stick high AOA loop to bring the nose to 90 degrees nose low. Hold 90 degrees nose low and accelerate. At 100 KCAS, execute a 405 degree roll to set the lift vector on a 45 degree reposition line. If 100 KCAS is not obtained prior to 2,800 feet AGL, do not execute the 405 degree roll, but rather a 45 degree roll to set the reposition line and wait for recovery parameters. At 2000 feet AGL, execute a 36 degree AOA recovery and reposition for the next maneuver.

7.10.2. Abnormal Procedures. If the show profile takeoff is interrupted by an aircraft malfunction, make a normal takeoff or if conditions warrant, abort the takeoff. If an afterburner does not light or they are producing thrust asymmetrically do not initiate the pull up. If an afterburner blows out, or if airspeed is ever <75 KCAS below 2,500' AGL, immediately abort the maneuver and recover the aircraft by rolling and smoothly pulling to the nearest horizon. Should an engine fail, ensure throttles are in MIL and recover the aircraft. Do not reselect AB until any yaw rate is arrested. If the aircraft slows to 75 KCAS prior to reaching 2500 feet AGL, do not execute the high AOA loop and push the nose down to wings level on the horizon. Should the takeoff need to be executed from right to left for winds or runway length, execute a 225 degree roll to set the reposition line. Regardless of the starting axis, the reposition line need to be set and the recovery initiated by 2,000 feet AGL.

7.11. Minimum Radius Turn.

Figure 7.2. F-22 Minimum Radius Turn.

Minimum Radius Turn F-22

Table 7.2. F-22 Minimum Radius Turn Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G * Deg NH
Entry	500'	440	MAX	7.5
Exit	500'	275	MAX	N/A
Pull	500'	275	MAX	*90
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G *Deg NH Max
Entry	min 400'	350 / 475	MAX	A/R
Exit	min 400'	200 / 400	MAX	A/R
Pull	min 400'	200 / N/A	MAX	*110

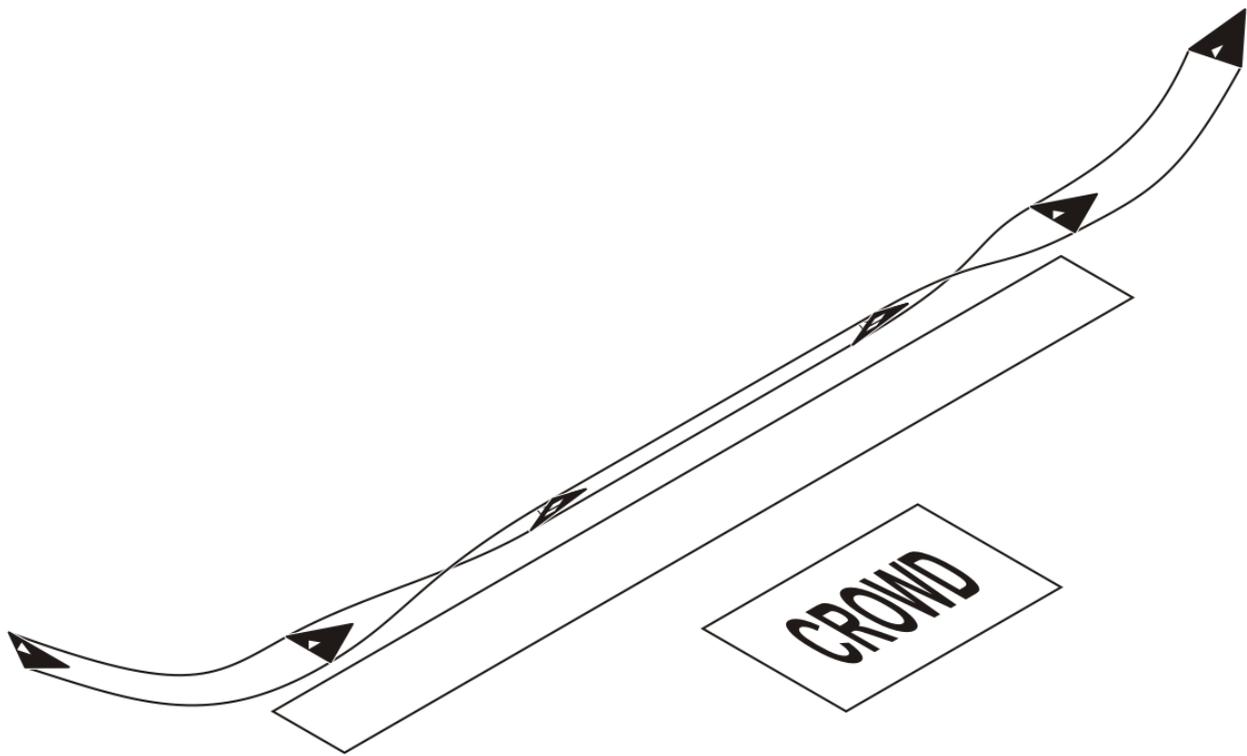
7.11.1. Maneuver Description. Prior to show center, select full AB and accelerate to 475 KCAS. At show center, turn away from the crowd using approximately 85 degrees of bank. Begin the turn with an aggressive G onset rate to 7.5 Gs to avoid accelerating and begin bleeding airspeed. G-loading and airspeed bleed-off rate will vary with density altitude. The first 180 degrees of turn should be accomplished with a 1 ¾ degree nose-up attitude and the last 180 degrees of turn should be accomplished with a 1 ¾ degree nose-down attitude to make the turn appear level to the crowd. After the first 180 degrees of turn continue bleed airspeed down to 250 KCAS. Vary the bank angle, pitch and pull to arrive at

level flight and 275 KCAS at the completion of 360 degrees of turn. Maximum degrees of flight path marker negative pitch allowed in correcting for altitude is 5 degrees. Surface winds must be taken into consideration in order to center this maneuver on show center and to avoid overshooting the show line. As you approach show center, smoothly roll out and aggressively pull the nose to 90 degrees nose high. 90 degrees nose high may be exceeded (up to 110 degrees) as long as the airspeed minimum can be maintained. As soon as the aircraft reaches 150 KCAS, begin a full forward push to drive the nose back down to level and set up for the J-Turn reposition.

7.11.2. **Abnormal Procedures.** If the minimum entry parameters are not met, the pilot will transition to a wings-level flat pass. If during any portion of the maneuver it becomes apparent the aircraft will descend below 400 feet AGL or airspeed decay below 200 KCAS, abort the maneuver by rolling wings level and climbing to 500 feet AGL. If the aircraft is accelerating past 475 KCAS and the pilot is already at 9 Gs, reduce power to not less than minimum afterburner and bleed energy. If necessary, adjust power and G as required (no lower than 200 KCAS) to avoid overshooting the show line. In the pull after the roll-out, if airspeed reaches 150 KCAS prior to achieving 90 degrees nose high begin the push forward early.

7.12. **Weapon Bay Door Pass.**

Figure 7.3. F-22 Weapon Bay Door Pass.



Weapon Bay Door Pass F-22

Table 7.3. F-22 Weapon Bay Door Pass Parameters.

TARGET		PARAMETERS			
Altitude AGL		Airspeed KCAS	Power Setting	G	Bank
Entry	300'	200	A/R	1 to 2	80
Exit	300'	200	A/R	1 to 2	80
Roll	500'	250	A/R	1 to 2	N/A

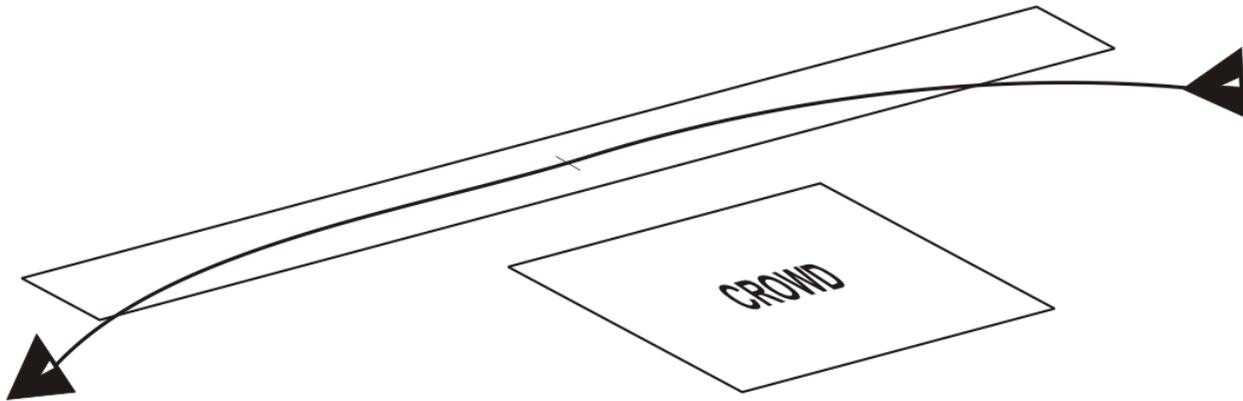
PARAMETER		LIMITS			
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G	Bank
Entry	min 200'	175 / N/A	A/R	N/A	90
Exit	min 200'	175 / N/A	A/R	N/A	90
Roll	min 400'	200 / N/A	A/R	N/A	N/A

7.12.1. **Maneuver Description.** On extended show line (offset up to 30 degrees), establish wings level and 200 KCAS. Approaching the 500 foot line, bank away from the crowd (not to exceed 90 degrees), open all doors and begin a gentle turn to maintain bank, airspeed and altitude. Passing show center, close all doors, add power and fly to the 1,500 foot line and climb to 500 feet AGL. At 500 feet AGL and 250 KCAS execute a 360 degree roll to wings level, select full AB and pitch back to the right for the Dedication Pass.

7.12.2. **Abnormal Procedure.** Doors will only be opened IAW tech order guidance. If doors do not open symmetrically, close all doors and abort the pass.

7.13. Dedication Pass.

Figure 7.4. F-22 Dedication Pass.



**Dedication Pass
F-22**

Table 7.4. F-22 Dedication Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	.65 - .92M	MAX	1
Exit	300'	.65 - .92M	IDLE to MAX	4 to 7.5

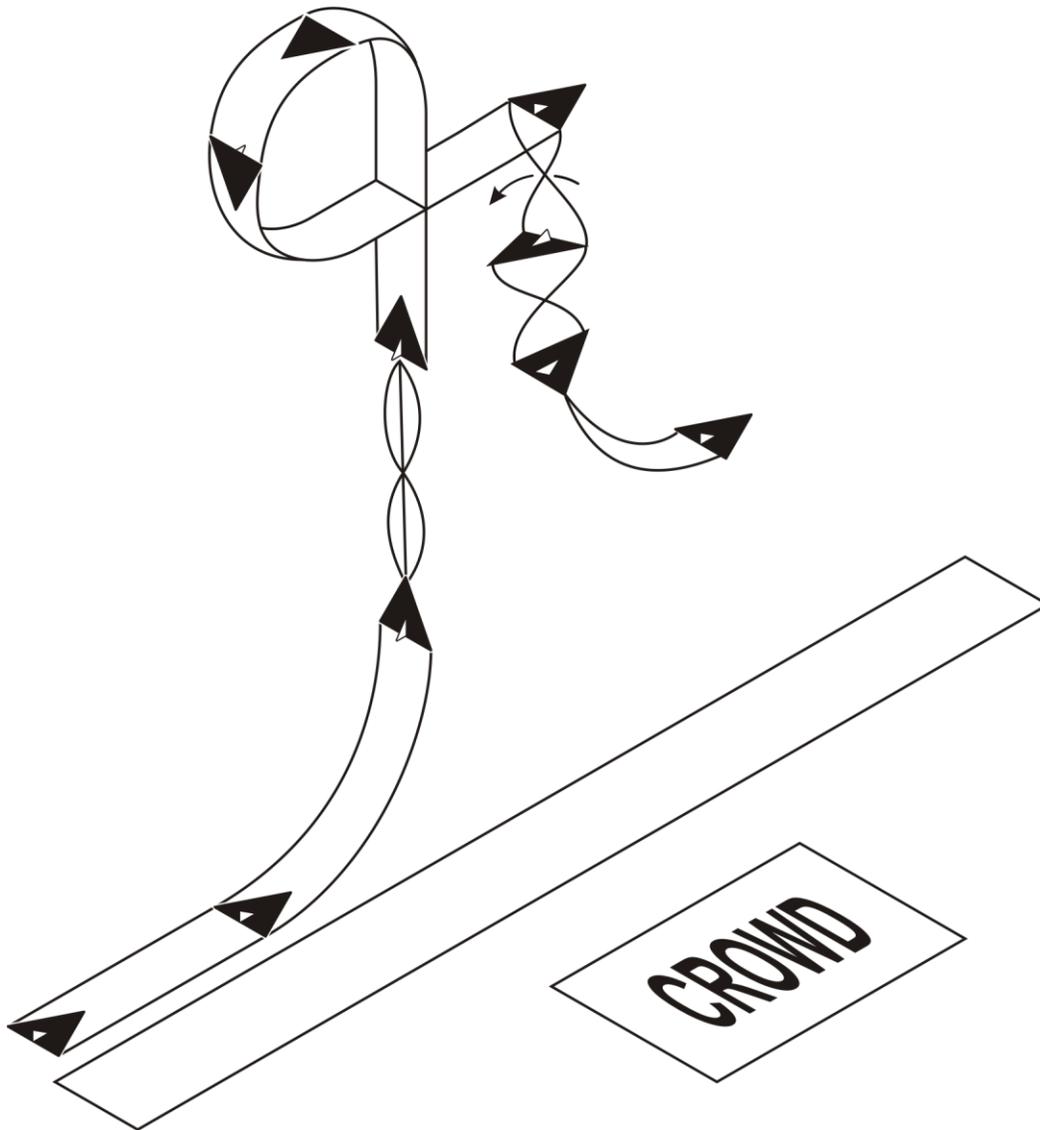
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	.5 / .94M	IDLE to MAX	A/R.
Exit	min 200'	.5 / .94M	IDLE to MAX	A/R

7.13.1. **Maneuver Description.** The maneuver is flown on the 500-foot crowd line and is non-aerobatic. The approach will be flown from behind the line, approximately 2 miles from show center with an approximate dive angle of 30 degrees and a maximum of 45 degree cut from the show line (as to not exceed 90 degrees of bank in the turn). Maintain 500 feet horizontally from the crowd at all times. Upon reaching a point 500 feet from the corner of the crowd at 300' AGL, roll the aircraft into a level arcing pass using a maximum of 90 degrees of bank. Select full AB until passing the show line or until .92M is anticipated. In order to maintain 500 feet separation from the crowd at both corners, the apex of the arc will be greater than 500' from show center (the amount depends on the degrees offset from the show line at the start of the arc and the amount of G used in the turn). Continue the arc until reaching the opposite crowd corner, roll out, reduce power and initiate a climb.

7.13.2. **Abnormal Procedure.** Abort the maneuver if at any time if: the aircraft comes closer than 500' to the crowd line or its lateral limits, an excessive dive angle or sink rate develops, entry parameters are not met, or the aircraft descends below 200 feet AGL. Abort procedures are to roll wings level, climb and fly away from the crowd.

7.14. Pedal Turn.

Figure 7.5. F-22 Pedal Turn.



Pedal Turn F-22

Table 7.5. F-22 Pedal Turn Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	Deg NH
Entry	300'	300	MAX	0
Pull	4,000'	N/A	MAX	90
Exit / Recovery	N/A	N/A	MAX	N/A

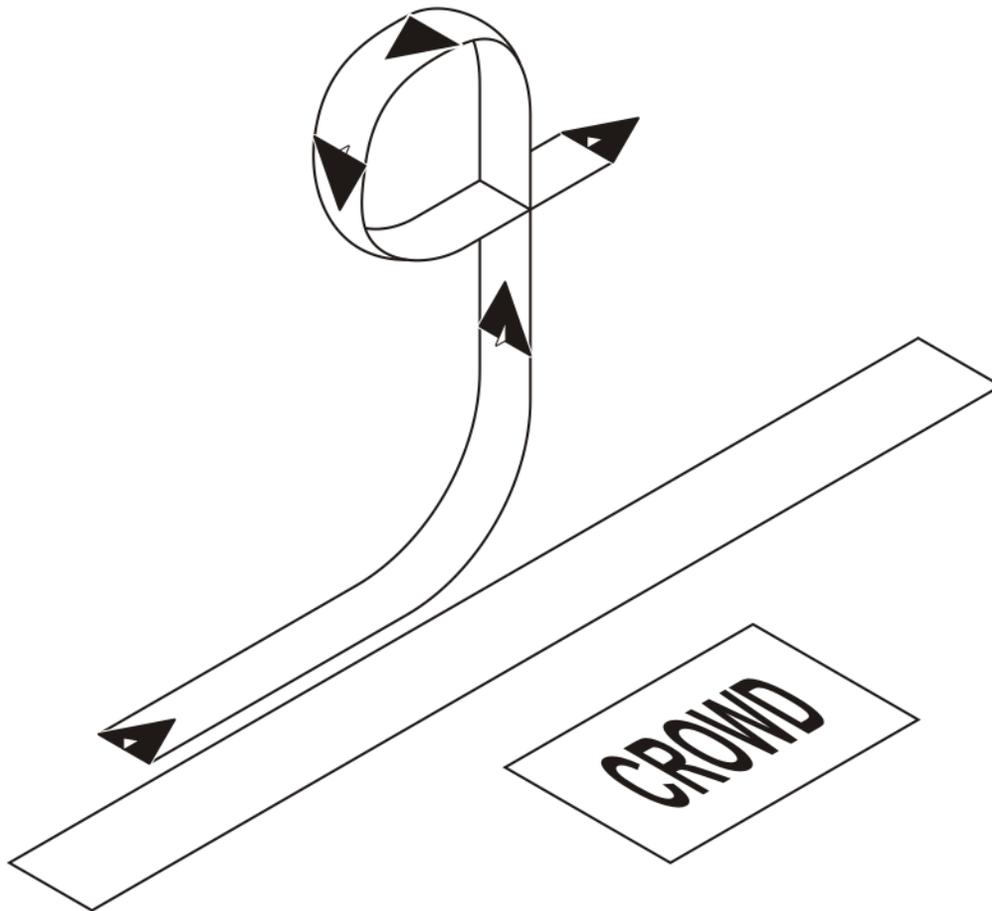
PARAMETER			LIMITS		
Altitude AGL			Airspeed KCAS MIN/MAX	Power Setting	Min Deg NH
Entry	min	200'	250 / 375	MAX	N/A
Pull	min	3,000'	75 / N/A	MAX	80
Exit / Recovery	min	2,300'	N/A	MAX	

7.14.1. **Maneuver Description.** Following the Dedication Pass reposition, align on the 1,500 foot crowd line at 300 feet AGL and 300 KCAS. Approaching show center, select full AB, ensure both are lit symmetrically and begin an aggressive (soft to hard stop) pull to 90 degrees nose high. Continue to climb and decelerate. Once 90 degrees nose high is established and the AOA has lowered, execute a 360 degree roll. Arrive at 4,000 feet AGL at no less than 75 KCAS. Execute a maximum (hard stop) wings level pull to pull nose around to the horizon (high alpha loop). As the nose approaches the horizon, apply full pedal in the best direction for winds and maintain full aft stick. Continue the turn for 360 degrees or until lined up on the 1,500 foot crowd line and begin an aggressive push forward to break the alpha and accelerate. Catch 36 alpha in full AB and arrest the descent rate. Set up for the loaded roll. Should winds, weather or other factors dictate, the pedal turn may be executed as two 180 degree turns. This must be pre-briefed and should not be executed from an airborne "on the fly" assessment. If the 180/180 pedal turn is decided upon, add 1,000 feet to the apex pull, making the top altitude 5,000 feet AGL. Two 360 degree rolls will be executed on the way up due to the additional altitude.

7.14.2. **Abnormal Procedure.** If an afterburner does not light, do not initiate the pull up. If an afterburner blows out, or if airspeed is ever <75 KCAS below 2,500' AGL, abort the maneuver and recover the aircraft by rolling and smoothly pulling to the nearest horizon. If airspeed reaches 75 KCAS prior to 4,000 feet AGL, initiate the pull early and assess altitude parameters to execute the pedal turns. Should 2,500 feet AGL be reached prior to completing the turn, recover early. Should an engine fail, ensure both throttles are in MIL and recover the jet. Do not reselect AB until the aircraft is under control and greater than 100 KCAS

7.15. Power Loop.

Figure 7.6. F-22 Power Loop.



Power Loop F-22

Table 7.6. F-22 Power Loop Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	Alpha
Entry	1,500'	250	MAX	0
Recovery (initiate)	2,500'	A/R	MAX	36

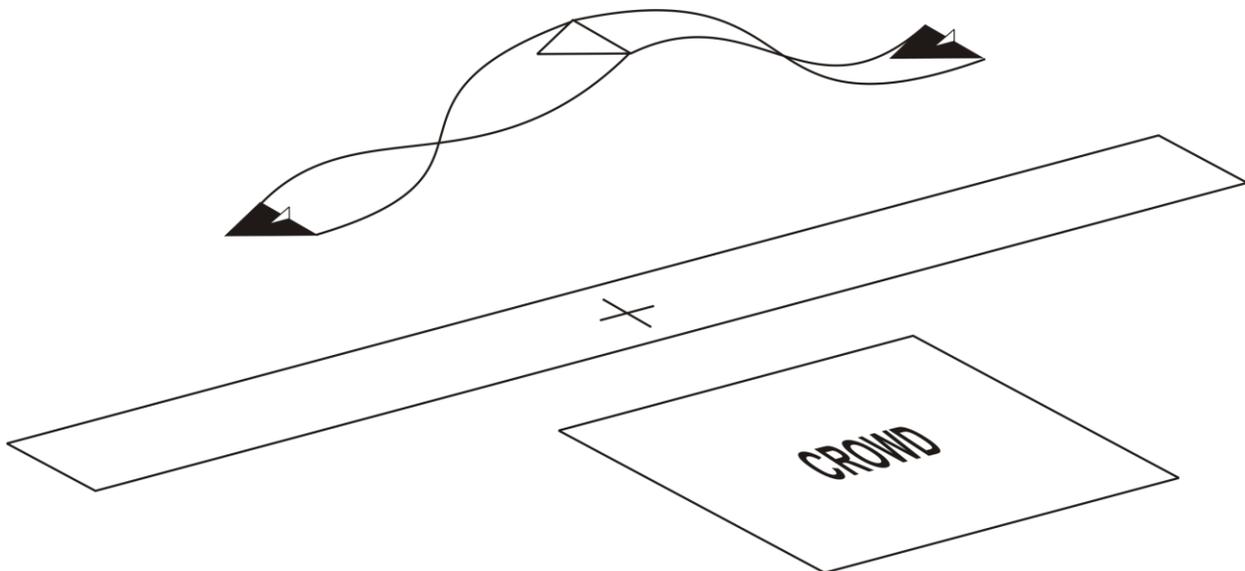
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	Alpha (min)
Entry	min 1,300'	225 / 350	MAX	N/A
Recovery (initiate)	min 2,300'	A/R	MAX	30

7.15.1. **Maneuver Description.** Following the Pedal Turn, accelerate in full AB and reposition to arrive at show center at 1,500 feet AGL and 250 KCAS. Abeam show center, execute a maximum wings level pull to bring the nose of the aircraft into the vertical. Continue a maximum pull all the way around until the nose of the aircraft is back at the starting horizon. Command full forward stick to decrease alpha and accelerate. Catch 36 degrees alpha and maintain until sink rate is arrested.

7.15.2. **Abnormal Procedures.** If afterburners are not symmetrically lit, do not initiate the pull up. Smoothly pull to the nearest horizon, rolling out and recover the aircraft. Should an engine fail, ensure throttles are in MIL and recover the aircraft. Do not reselect AB until any yaw rate is arrested.

7.16. Loaded Roll.

Figure 7.7. F-22 loaded Roll.



Loaded Roll F-22

Table 7.7. F-22 Loaded Roll Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	AOA
Entry	1,400'	150	MAX	36
Exit	1,300'	150	MAX	36

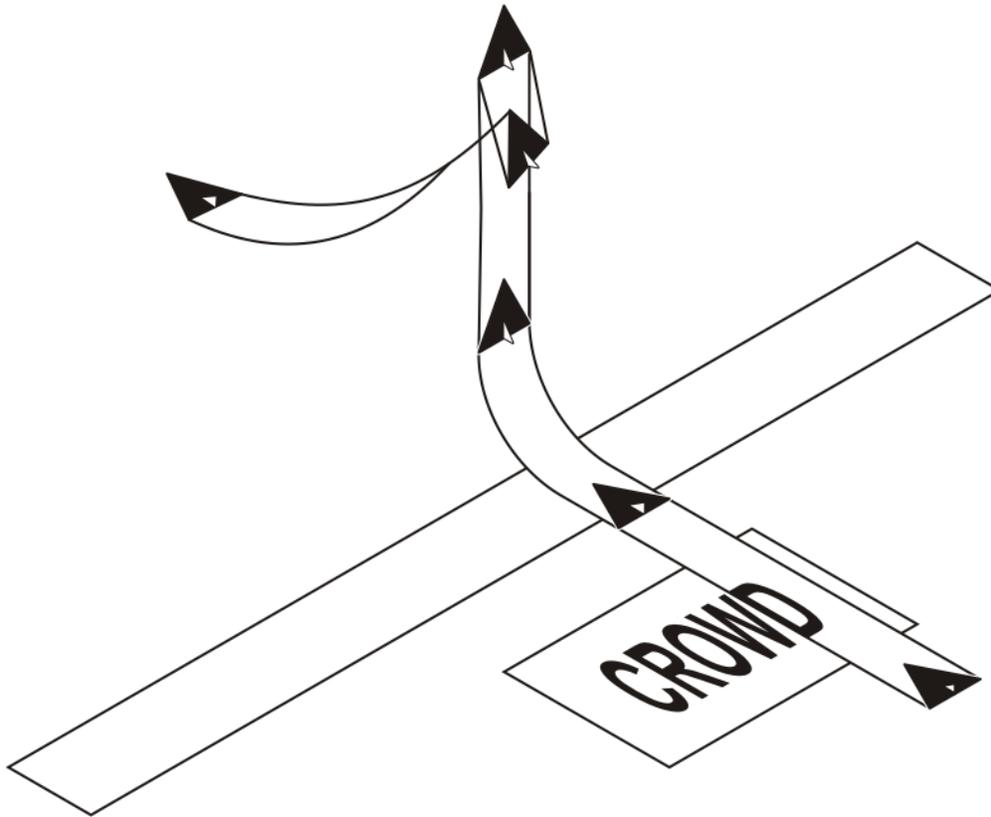
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	AOA (max)
Entry	min 1,300'	110 / N/A	MAX	40
Exit	min 1,200'	100 / N/A	MAX	40

7.16.1. **Maneuver Description.** Following recovery from the Power Loop, at 1,400 feet AGL (higher if aircraft is recovered earlier) and 36 degrees AOA, apply full lateral stick as soon as the flight path marker is above the horizon on the recovery. Maintain 30-36 degrees AOA with back stick pressure and complete the roll. When the aircraft reaches wings level to the horizon again, decrease angle of attack, accelerate and continue to reposition for the next maneuver.

7.16.2. **Abnormal Procedures.** If both afterburners do not light, do not exceed 30 degrees angle of attack. If the aircraft descends below 1,200 feet AGL, immediately initiate a recovery by rolling wings level and pulling to the nearest horizon. If the aircraft ever exceeds 45 degrees nose low, recover. If airspeed is allowed to decay to less than 100 KCAS, terminate the maneuver and recover.

7.17. Tail Slide.

Figure 7.8. F-22 Tail Slide.



Tail Slide F-22

Table 7.8. F-22 Tail Slide Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	Deg NH
Entry	1,000'	250	MIL	0
Apex	3,000'	0	Idle to MIL	80
Recovery	2,500'	75	MIL	N/A

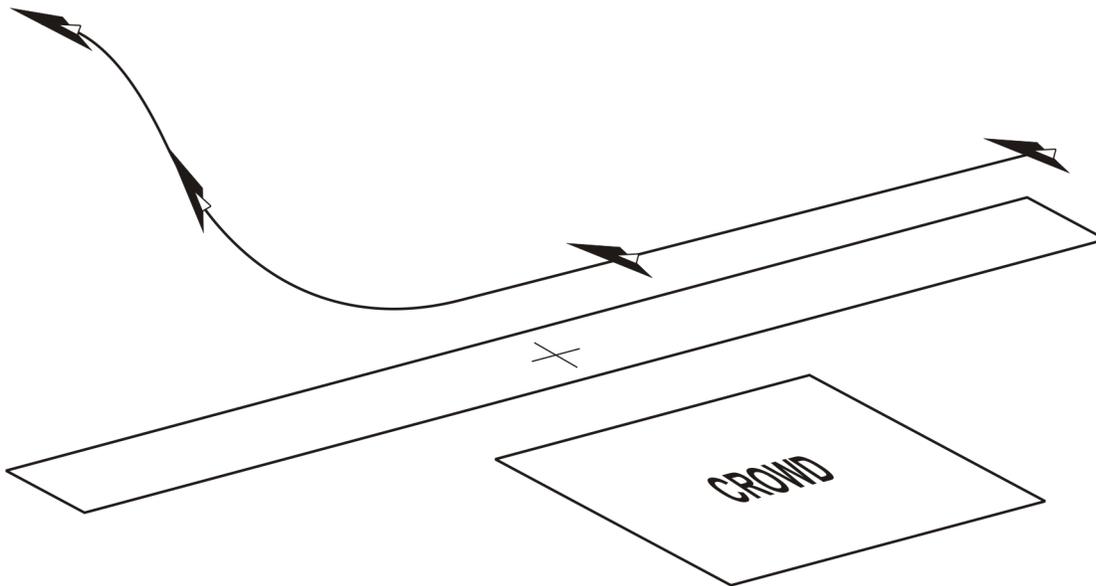
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	Deg NH
Entry	min 900'	225 / 350	MIL	N/A
Apex	min 2,800'	N/A	Idle to MIL	90
Recovery	min 2,300'	N/A / 80	MIL	N/A

7.17.1. **Maneuver Description.** After the Loaded Roll, reposition behind the crowd, perpendicular to the show line and directly behind show center. Fly over show center at 1,000 feet AGL and 250 KCAS. Select MIL power over show center and at the 1,500 foot line, execute a hard stop pull in MIL power to 80 degrees nose high. Hold 80 degrees nose high and allow the aircraft to slow. Power modulate to arrive at 3,000 feet AGL and 0 KCAS. Allow the aircraft to slide backwards while holding 80 degrees nose high and in MIL power. At 2,500 feet AGL or 75 KCAS backwards (whichever occurs first), execute a full push forward to drive the nose of the aircraft to the horizon. Achieve level flight and command full AB at 100 KCAS. Begin a turning reposition for the Slow Speed Pass.

7.17.2. **Abnormal Procedure.** If beta in the HUD is observed to be greater than 20 degrees and rapidly increasing, initiate a recovery. If the tail slide begins prior to 2,800 feet AGL, immediately initiate a recovery.

7.18. F-22 Slow Speed Pass.

Figure 7.9. F-22 Slow Speed Pass.



Slow Speed Pass F-22

Table 7.9. F-22 Slow Speed Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	AOA
Entry	800'	80	Cruise to MIL	36
Exit	800'	80	Cruise to MIL	36

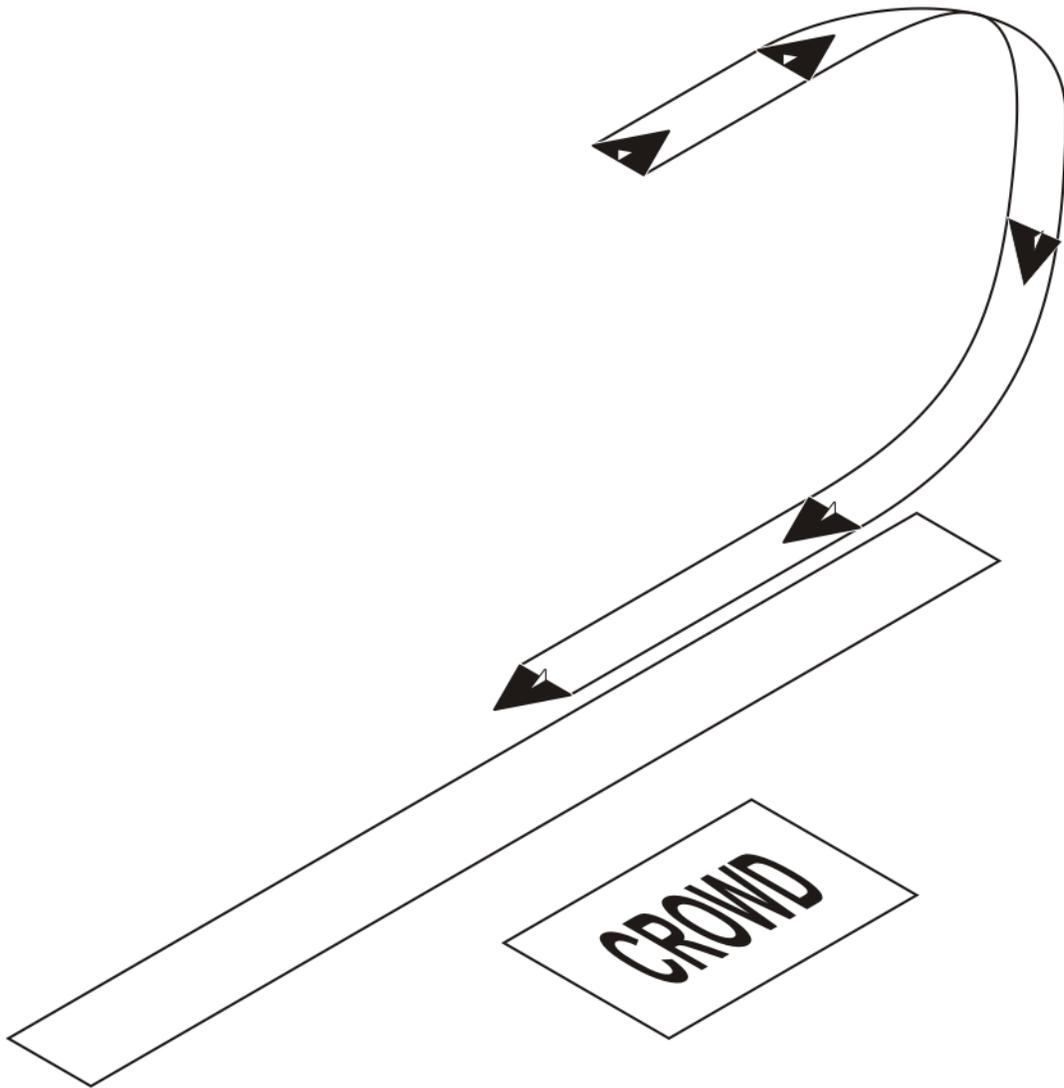
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	AOA (max)
Entry	min 700'	75 / N/A	MIL	40
Exit	min 700'	75 / N/A	MIL	40

7.18.1. **Maneuver Description.** Following the Tail Slide, begin a turn in the direction to set up the Slow Speed Pass into the wind. If wind is negligible or predominantly a crosswind, set the pass up for a crowd right to left flow. Maintain 150 KCAS in the reposition turn and fly to a point ~3,000' from the start of the crowd line. Hit the line at 90 degrees off pass heading at 150 KCAS, 800 feet AGL and in MIL power. Execute a soft stop pull to align the jet on the desired heading and catch 36 degrees angle of attack. Do not exceed 40 degrees angle of attack. Manipulate power and pitch to maintain 800 feet AGL and 36 degrees angle of attack on show line heading. After passing the crowd on the opposite side, select full afterburner and climb to 4,000 feet AGL to set up for the Split-S.

7.18.2. **Abnormal Procedures.** If 40 degrees angle of attack is exceeded, immediately add power and push forward to catch and sustain 36 degrees. If the aircraft descends below 700 feet AGL terminate the maneuver and recover the aircraft. Do NOT select afterburner at any time unless greater than 75 KCAS and less than 36 degrees angle of attack. If the aircraft slows below 75 KCAS, add power (up to MIL) and decrease angle of attack. If an engine fails, select full afterburner on both engines and immediately break the angle of attack to less than 30 degrees and obtain 150 KCAS while arresting any sink rate.

7.19. Split-S Reposition.

Figure 7.10. F-22 Split-S Reposition.



Split-S Reposition F-22

Table 7.10. F-22 Split-S Reposition Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	AOA
Entry	4,000'	200	MAX	N/A
Exit	300'	.8 - .92M	MAX	N/A

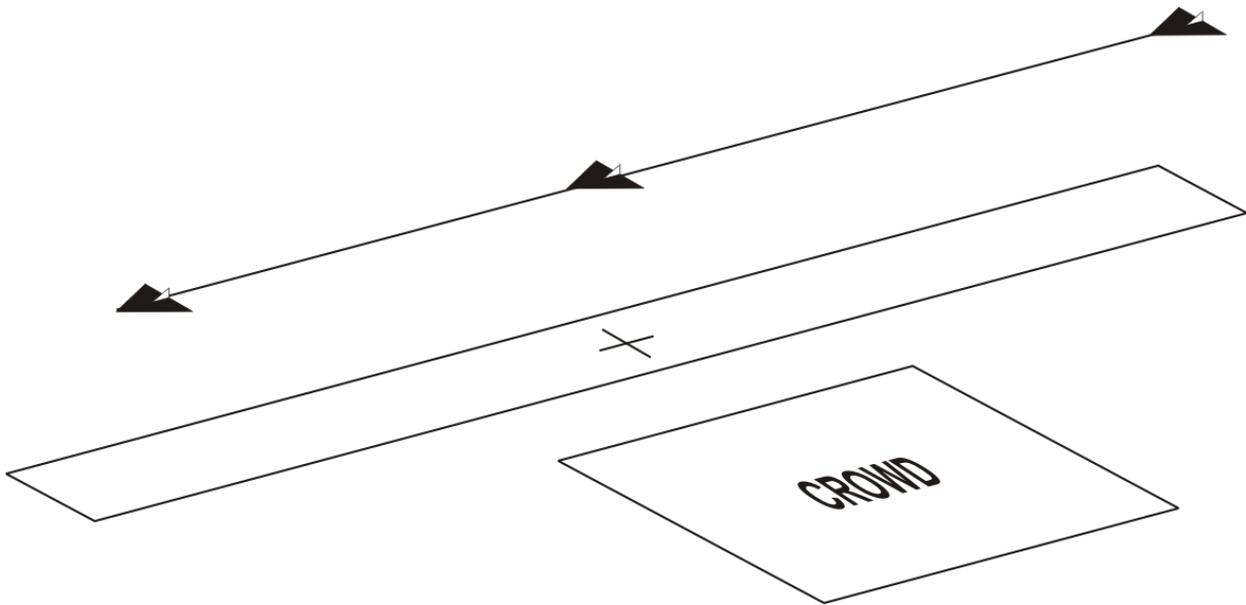
PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	AOA
Entry	min 3,500'	150 / 350	MAX	N/A
Exit	min 200'	N/A / .94M	A/R	N/A

7.19.1. **Maneuver Description.** In the climb after the Slow Speed pass, maintain 45-50 degrees nose high and allow the aircraft to accelerate. Tailor degrees nose high to not only accelerate but also gain separation away from the crowd for the follow-on High Speed Pass. If the nose is held too nose high there may not be enough room to accelerate after the maneuver. At 4,000 feet AGL, crosscheck airspeed. With 150 KCAS (minimum) roll to the inverted and execute an energy gaining turn to proceed back towards show center. Do not exceed 400 KCAS until the nose is through 90 degrees nose low. Orientation to the crowd line needs to be immediately assessed. If the aircraft is not on the extended show line immediate corrections must be made. Position the aircraft on the non-aerobatic show line at 300 feet AGL and approximately .8M for the high speed pass.

7.19.2. **Abnormal Procedures.** A parameters call to the safety observer is required prior to starting the pull. If airspeed is not 150 KCAS (minimum) at 4,000 feet AGL, push the nose forward to level flight and accelerate. At 200 KCAS, execute the Split-S. If an aircraft malfunction that will affect the aerodynamic performance of the aircraft asserts prior to reaching 90 degrees nose low, discontinue the pull, roll wings level and recover the aircraft.

7.20. High Speed Pass.

Figure 7.11. F-22 High Speed Pass



High Speed Pass F-22

Table 7.11. F-22 High Speed Pass Parameters.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	G
Entry	300'	.8 - .92M	MAX	1
Exit	300'	.8 - .92M	IDLE to MAX	1

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	G
Entry	min 200'	N/A / .94M	A/R	N/A
Exit	min 200'	N/A / .94M	A/R	N/A

7.20.1. **Maneuver Description.** The High Speed Pass may be flown on the 500-foot show line at 300 feet AGL in maximum power, so as to target .8 - .92 Mach.

7.20.2. **Abnormal Procedures.** If it becomes apparent 0.94 Mach will be exceeded, afterburner should be deselected.

7.21. Hoover Pitch.

Table 7.12. F-22 Hoover Pitch.

TARGET		PARAMETERS		
Altitude AGL		Airspeed KCAS	Power Setting	Bank Angle
Entry	500'	350	A/R	90
Exit	500'	350	MAX	80

PARAMETER		LIMITS		
Altitude AGL		Airspeed KCAS MIN/MAX	Power Setting	Bank Angle
Entry	min 400'	300 / 450	A/R	95
Exit	min 400'	300 / 450	MAX	85

7.21.1. **Maneuver Description.** Establish the jet on the 1,500 foot crowd line from either right to left or left to right. Prior to entering the aerobatic box, achieve 300-400 feet AGL and 350 KCAS. Approximately 3,000 feet prior to show center bring the nose of the aircraft up (5 degrees nose high or less should be required) to obtain 500 feet AGL by 1,000 feet prior to show center. 1,000 feet prior to show center, select full afterburner and roll the aircraft to 90 degrees of bank with the canopy to the crowd. At show center, execute a 190 degree roll into the crowd (tuck under) to establish 80 degrees of bank away from the crowd. Aggressively pull for the pitch to land or to reform for the Heritage Flight.

7.21.2. **Abnormal Procedures.** If airspeed is less than 300 KCAS, do not roll and simply pitch to land. If altitude is less than 400 feet AGL, do not execute the roll and pitch to land.

Section 7C—Flat Profile

7.22. Maximum Power Takeoff.

7.23. Minimum Radius Turn.

7.24. Weapon Bay Door Pass.

7.25. Dedication Pass.

7.26. Slow Speed Pass.

7.27. Loaded Roll.

7.28. High Speed Pass.

7.29. Minimum Radius Turn.

7.30. Hoover Pitch to Land.

Chapter 8

PUBLICATION MANAGEMENT

8.1. Information Collection, Records and Forms.

8.1.1. **Information Collections.** No information collections are created by this publication.

8.1.2. **Records.** The program records create as a result of the processes prescribed in this publication are maintained in accordance with AFMAN 33-363 and disposed of in accordance with the AFIRMS RDS located at https://afirms.amc.af.mil/rds_series.cfm.

8.1.3. Adopted and Prescribed Forms.

8.1.3.1. Adopted Forms:

AF Form 847, *Recommendation for Change of Publication*

8.1.3.2. Prescribed Forms:

None

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DCS/Air, Space and Information Operations,
Plans and Requirements

(35FW)

DAVID R. STILWELL, Colonel, USAF
Commander

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

DoD Directive 5410.18, *Community Relations*, 20 Nov 2001

DoD Instruction 5410.19, *Armed Forces Community Relations*, 13 Nov 2001

AFI 11-202, V3 *General Flight Rules*, 5 Apr 2006

AFI 11-209, *Air Force Participation in Aerial Events*, 4 May 2006

AFI 31-101, *The Air Force Installation Security Program*, 1 Mar 2003

AFI 35-101, *Public Affairs Policies and Procedures*, 29 Nov 2005

AFPD 33-3, *Information Management*, 28 Mar 2006

AFPD 11-2, *Aircraft Rules and Procedures*, 14 Jan 2005

AFMAN 33-363, *Management of Records*, 1 Mar 2008

Part 91, *Federal Aviation Regulations*, 7 Jan 1999

FAA Order 8900.1, *Flight Standards Information Management System (FSIMS) AFRIMS RDS*, https://afrims.amc.af.mil/rds_series.cfm

Sponsor Support Manual/Document via ACC/A3TA Website
(<http://www.acc.af.mil/aerialevents>)

Abbreviations and Acronyms

AGL—Above Ground Level

EAA—Experimental Aircraft Association

FAA—Federal Aviation Administration

FLCS—Flight Control System

G—Gravity

HUD—Heads-up-display

ICAS—International Council of Air Shows

KCAS—Knots Calibrated Air Speed

KIAS—Knots Indicated Air Speed

MIA—Missing In Action

MDS—Mission Design Series

MSL—Mean Sea Level

POW—Prisoner Of War

VMC—Visual Meteorological Conditions

Terms

Abnormal Procedure—Specific abort procedure for maneuver.

Attachment 2

EXAMPLE SHOW SUMMARY AND CRITIQUE

A2.1. Example Show Summary and Critique. Single-Ship demonstration teams will use their MAJCOM-approved forms to critique air shows:

F-16 EAST DEMONSTRATION TEAM AIR SHOW SUMMARY AND CRITIQUE

Show Location: _____ Dates(s): _____

Demos Time/Type: _____/_____; _____/_____; _____/_____
Time (H/L/Cnx) Time (H/L/Cnx) Time (H/L/Cnx)

Estimated Attendance Each Day: _____/_____/_____

Total Flying Hours Required to Support Event: _____

Estimated Cost: Travel: _____ Per Diem: _____ Lodging: _____

Recruiting Support

Was recruiter contacted? Yes / No

Was recruiter present at airshow? Yes / No

Was Recruiting Opportunities and Autographs Booth in a good location? Yes / No

What were the off-show recruiting activities? _____

PA Support

What PA type activities did you participate in? _____

FAA Support: UNSAT SAT

Preshow Support/Planning: UNSAT SAT

Airshow support and operations: UNSAT SAT

Overall recommendation to attend this event again: NO YES

REMARKS (explain above responses; unsat or no answers require comments):



Attachment 3

AERIAL SITE SURVEY

A3.1. Aerial Site Survey. Pilots Will Accomplish Following Site Survey Actions In Preparation For Aerial Demonstration.

A3.1.1. Preflight:

A3.1.1.1. Review Airfield Diagram (Photo If Possible) To Include Runways, Taxiways, Barriers, Show Line, Crowd Line, Field Elevation, And Obstacles (Such As Towers, Mountains, Rising Terrain, Buildings, Etc.)

A3.1.1.2. Analyze Weather Patterns, Sun Angle/elevation, Mountain Shadows, For Impact On Flight Profile

A3.1.1.3. Obtain Local No-fly Restrictions, Noise Abatement, And Bird Avoidance Procedures

A3.1.1.4. Review FAA Waiver For Applicable Details, Airspace (Up To 5 Nm/15,000 Feet)

A3.1.1.5. Identify Control Agencies Such As On-site Tower/local Radar (Tracon) Traffic Control

A3.1.2. Survey Flight:

A3.1.2.1. Circle Show Site, Fly Show Line, Look For Maneuver Reference Points, And Obstacles

A3.1.2.2. If Practical, Accomplish Aerial Survey Flight At Same Time Of Day As Planned Aerial Demo

A3.1.2.3. Observe Holding Points (For Staged Shows And Heritage Flights)

Attachment 4**DEMONSTRATION FLIGHT BRIEFING**

A4.1. Demonstration Flight Briefing. Pilots will accomplish the following flight briefing actions in preparation for aerial demonstrations:

A4.1.1. Demonstration pilot will attend FAA mass briefing.

A4.1.2. As a minimum, review the following with ground safety observer:

A4.1.2.1. Time hack

A4.1.2.2. EP of the Day

A4.1.2.3. WX/NOTAMS

A4.1.2.4. Mission overview

A4.1.2.5. Mission data card

A4.1.2.6. Airfield diagram and show layout

A4.1.2.7. Review site survey data

A4.1.2.8. Accomplish any non-briefing items prior to flight

A4.1.3. Ground procedures:

A4.1.3.1. Start, taxi, marshalling

A4.1.3.2. Spare procedures

A4.1.4. Takeoff:

A4.1.4.1. Runway lineup

A4.1.4.2. Minimum fuel

A4.1.4.3. Abort procedures

A4.1.4.4. Low altitude ejection

A4.1.4.5. Land immediately after T/O

A4.1.5. Aerial Demonstration:

A4.1.5.1. Staged vs. local

A4.1.5.2. Primary show (HI):

A4.1.5.2.1. Maneuvers

A4.1.5.2.2. Individual maneuver parameters

A4.1.5.2.3. Mandatory parameter radio calls

A4.1.5.2.4. WX transition (HI/LO) points

A4.1.5.3. Alternate show (LO):

A4.1.5.3.1. Maneuvers

- A4.1.5.3.2. Individual maneuver parameters
- A4.1.5.3.3. Mandatory parameter radio calls
- A4.1.5.3.4. WX transition (HI/LO) points
- A4.1.5.4. Abnormals:
 - A4.1.5.4.1. Maneuver abort and reposition
 - A4.1.5.4.2. Emergencies
 - A4.1.5.4.3. Ground safety observer termination procedure calls/procedures
- A4.1.6. Recovery:
 - A4.1.6.1. Pattern and Landing
 - A4.1.6.2. After landing/de-arm
 - A4.1.6.3. Emergency/alternate airfields
- A4.1.7. Debrief
 - A4.1.7.1. When/where?
- A4.1.8. Set aside time to mentally prepare for demo

Attachment 5

SAMPLE FIRST YEAR DEMONSTRATION PILOT CERTIFICATION CHECKLIST

The following actions will be taken prior to MAJCOM/CC certification: (NLT times provide guidance and are not mandatory)

- ____ 1. Aug: WG/CC will:
 - ____ a. Designate new demonstration pilot
 - ____ b. Inform MAJCOM Aerial Events of selection
 - ____ 2. Sept: OG/CC will:
 - ____ a. Ensure demonstration pilot has entered training
 - ____ b. NLT 30 Oct - Inform MAJCOM Aerial Events of planned NAF/CC and WG/CC certification dates
 - ____ 3. 15 Nov. MAJCOM Aerial Events forward SSS to MAJCOM/CC to obtain approval of certification schedule
 - ____ a. Names of pilot that will need certification
 - ____ b. General method of certification (individually, two at a time, etc)
 - ____ c. Dates for certification
- NOTE:** MAJCOM/CC certification date initiates certification countdown for individual pilot
- ____ 4. MAJCOM Aerial Events inform WG/CC of planned certification dates
 - ____ 5. NLT Cert – 30 days: WG/CC pre-certify demonstration pilot and forward grade book to NAF/CC
 - ____ 6. NLT Cert – 15 days: NAF/CC approve demonstration pilot and WG/CC forward grade book to MAJCOM Aerial Events
 - ____ 7. NLT Cert – 14 days: applicable OG submits airspace waiver
 - ____ 8. NLT Cert – 7 days: protocol coordinates:
 - ____ a. With airfield manager for MAJCOM/CC observation location
 - ____ b. With local communications squadron for PA system at MAJCOM/CC observation location
 - ____ c. With local transportation for demonstration team and unit leadership if required
 - ____ 9. NLT Cert – 2 days:
 - ____ a. MAJCOM Aerial Events prepare IOI for MAJCOM/A3 to include: Demonstration team arrival and departure times; unit leadership arrival and departure times; practice, certification, and backup times; demonstration pilot meeting time with MAJCOM/CC; other significant information
 - ____ b. MAJCOM Aerial Events forward demonstration pilot grade book to MAJCOM/A3

____c. MAJCOM Aerial Events checks with protocol to ensure support arranged

____10. Demonstration team arrival: MAJCOM Aerial Events representative meets team at Base Ops

____11. Cert – 2 hrs: protocol ensures setup of MAJCOM/CC observation location

____12. Cert + 1 day: MAJCOM Aerial Events prepares letter to FAA (AFS 800) to inform them of additional MAJCOM pilot approved to perform single-ship demonstrations

NOTE FOR ACC: ACC/A3TA will update letter to FAA to inform them of pilots approved to fly Heritage Flight profiles if training is accomplished WELL AFTER COMACC certification.