



Thunderbirds

**FAA and COMACC
Acceptance Demonstration Guide**

2020

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Section I: High Show

Displays all high show maneuvers demonstrated during a normal show sequence.

Section II: Low show

Displays all maneuvers unique to a low show.

Section III: Flat show

Displays all maneuvers unique to a flat show and other maneuvers available to the Thunderbirds that were not covered in previous pages.

Section IV: Airfield layout of a typical show site.

Lt. Col. John D. Caldwell

Commander/Leader



Lt. Col. John D. Caldwell is the Commander and Leader for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. He is responsible for a 130-person squadron that plans and presents precision aerial maneuvers to exhibit the capabilities of the F-16 and the high degree of professional skill required to operate those aircraft. As Thunderbird 1, Caldwell leads the Thunderbirds signature flying formations with as many as seven other pilots flying at speeds topping 500 miles per hour and with wing tips less than 18 inches apart from each other. Caldwell is in his second season with the team.

Caldwell graduated from the USAF Academy in 2002 and completed Euro-NATO Joint Jet Pilot Training Program in 2003. Caldwell then graduated from the F-16 RTU at Luke AFB, Ariz. in 2005 where he garnered the Red River Rat Trophy, the 2005 AETC Frances Gabreski Top Air-to-Air Student award and Top Graduate honors. Caldwell is also a graduate of the USAF Weapons School and Naval Postgraduate School. Prior to the Thunderbirds, he was the Commander of the 28th Test and Evaluation Squadron, Eglin AFB, Florida.

EDUCATION

2002 Bachelor degree in Aeronautical Engineering, USAF Academy, Distinguished Graduate, Top Aeronautical Design Student
2007 Squadron Officer School, Distinguished Graduate
2009 United States Air Force Weapons School
2013 Master of Science degree in Aerospace Science & Technology, Embry Riddle University
2014 Air Command and Staff College, by correspondence
2015 Master of Science degree in Defense Analysis, Naval Postgraduate School, Distinguished Graduate, Outstanding Thesis Award, Outstanding Air Force Student

ASSIGNMENTS

Aug 2002 - Oct 2002 Operations Scheduler, 27 Fighter Squadron, Langley AFB, Va.
Oct 2002 - Nov 2003 Student Pilot, Euro-NATO Joint Jet Pilot Training Program, Sheppard AFB, Texas
Nov 2003 - Jan 2004 Student Pilot, Introduction to Fighter Fundamentals, Sheppard AFB, Texas
Feb 2004 - Feb 2005 Student Pilot, F-16 RTU, 308 Fighter Squadron, Luke AFB, Ariz.
Feb 2005 - Aug 2007 Chief of Standardization and Evaluation/Instructor Pilot, 524 Fighter Squadron, Cannon AFB, N.M.
Sept 2007 - Jun 2009 Instructor Pilot/Flight Commander, 61 Fighter Squadron, Luke AFB, Ariz.
Jun 2009 - Dec 2009 Student Pilot, USAF Weapons School, Nellis AFB, Nev.
Jan 2010 - Dec 2011 Chief of Weapons and Tactics, 555 Fighter Squadron, Aviano AB, Italy
Jan 2012 - Jun 2014 F-16 Division Commander, 85 Test and Evaluation Squadron, Eglin AFB, Fla.
Jun 2014 - Dec 2015 Student, Naval Postgraduate School, Monterey, Calif.
May 2016 - Jun 2016 Director of Operations, 85 Test and Evaluation Squadron, Eglin AFB, Fla.
Jun 2017 - Aug 2018 Commander, 28 Test and Evaluation Squadron, Eglin AFB, Fla.
Aug 2018 - Present Thunderbird #1, Commander/Leader, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Command Pilot
Total flight hours: More than 2,400
Combat hours: 667
Aircraft flown: T-37, T-38A, F-16

MAJOR AWARDS AND DECORATIONS

Distinguished Flying Cross
Meritorious Service Medal with one oak leaf cluster
Air Medal with eight oak leaf clusters
Air Force Commendation Medal with three oak leaf clusters
Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

Second Lieutenant	May 2002
First Lieutenant	May 2004
Captain	May 2006
Major	Feb 2012
Lieutenant Colonel	Jan 2016

Maj. Trevor J. Aldridge

Left Wing

Maj. Trevor Aldridge is the Left Wing Pilot for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 2, he flies the #2 jet and serves as the teams Navigation Officer. He is in his first year on the team.

Aldridge is a 2009 graduate of the Air Force ROTC program at Texas A&M University. He completed the Euro-NATO Joint Jet Pilot Training Program, Sheppard AFB, Texas in 2011. After pilot training, he was assigned to the F-15C at Kadena AB, Japan where his squadron won the Raytheon Trophy twice and then Sheppard AFB, Texas as an instructor pilot teaching Introduction to Fighter Fundamentals and several other positions. Prior to joining the Thunderbirds, Aldridge flew the F-15C in the 493rd Fighter Squadron, RAF Lakenheath, United Kingdom.



EDUCATION

2009 Bachelor of Science degree in Civil Engineering, Texas A&M University
2009 Air and Space Basic Course, Squadron Officer College
2013 Squadron Officer School

ASSIGNMENTS

Oct 2009 - Sep 2011 Student Pilot, 80th Operations Support Squadron, Sheppard AFB, Texas
Sep 2011 - May 2012 Upgrade Pilot F, 114th Fighter Squadron, Kingsley Field, Ore.
May 2012 - May 2013 Mobility Officer/F-15C Wingman, 67th Fighter Squadron, Kadena AB, Japan
May 2013 - Jan 2014 Assistant Chief of Scheduling/F-15C Flight Lead, 67th Fighter Squadron, Kadena AB, Japan
Jan 2014 - Sep 2014 Executive Officer/F-15C Flight Lead, 67th Fighter Squadron, Kadena AB, Japan
Sep 2014 - Mar 2015 Activity Security Manager/F-15C Mission Commander, 67th Fighter Squadron, Kadena AB, Japan
Mar 2015 - Mar 2016 Flight Commander/T-38C IFF Instructor, 88th Fighter Training Squadron, Sheppard AFB, Texas
Mar 2016 - Mar 2017 Chief of IFF Training/T-38C IFF Instructor, 80th Operations Group, Sheppard AFB, Texas
Mar 2017 - Jan 2019 Executive Officer/T-38C IFF Instructor, 80th Operations Group, Sheppard AFB, Texas
Jan 2019 - July 2019 Activity Security Manager/F-15C Aircraft Commander, 493rd Fighter Squadron, RAF Lakenheath, United Kingdom
July 2019 - Present Thunderbird #2, Left Wing, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Pilot
Flight hours: More than 1,700
Aircraft flown: T-6A, T-38C, F-15C/D, QF-4E, F-16C/D

MAJOR AWARDS AND DECORATIONS

Meritorious Service Medal
Air Force Commendation Medal
Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Aug 2009
First Lieutenant Aug 2011
Captain Aug 2013
Major Jun 2019

Capt. Michael M. Brewer

Right Wing

Capt. Michael M. Brewer is the Right Wing Pilot for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 3, he flies the #3 jet and serves as the squadron's Training Officer and Alumni Liaison. He is in his second season with the team.

Brewer is a 2005 graduate of Embry-Riddle Aeronautical University, Prescott, and commissioned from Officer Training School, Maxwell Air Force Base, Ala. in 2010. He attended Joint Specialized Undergraduate Pilot Training at Vance AFB, Okla. After completing Pilot Training as a distinguished graduate, recipient of the AETC Commander's Trophy, and Flying Training Award in 2012, Brewer served as an F-15E Strike Eagle pilot in multiple assignments. He has over 1,300 hours in the F-15E, including over 315 combat hours over Afghanistan, Iraq and Syria in support of Operation Enduring Freedom and Operation Inherent Resolve. Prior to joining the Thunderbirds, Brewer served as an F-15E Instructor Pilot and Flight Commander, 334th Fighter Squadron, Seymour Johnson AFB, North Carolina.



EDUCATION

2005 Bachelor of Science Degree in Aeronautical Science, Embry-Riddle Aeronautical University
2011 Air and Space Basic Course, Squadron Officer College
2016 Squadron Officer School

ASSIGNMENTS

Jan 2011 - Oct 2012 Pilot Training Student, 25th Flying Training Squadron, Vance AFB, Okla.
Oct 2012 - Dec 2012 IFF Student, 49th Flying Training Squadron, Columbus AFB, Miss.
Dec 2012 - Oct 2013 F-15E Student, 333rd Fighter Squadron, Seymour Johnson AFB, N.C.
Oct 2013 - Jul 2015 F-15E Wingman/Scheduling Officer, 494th Fighter Squadron, RAF Lakenheath, United Kingdom
Jul 2015 - Feb 2016 F-15E Wingman/Chief of Aircrew Flight Equipment, 494th Fighter Squadron, RAF Lakenheath, United Kingdom
Feb 2016 - Oct 2016 F-15E Multi-Ship Flight Lead/Chief of Aircrew Flight Equipment, 494th Fighter Squadron, RAF Lakenheath, United Kingdom
Oct 2016 - Oct 2018 F-15E Instructor Pilot/Flight Commander, 334th Fighter Squadron Seymour Johnson AFB, N.C.
Oct 2018 - Present Thunderbird #3, Right Wing, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Pilot
Flight hours: More than 5,600
Military aircraft flown: F-15E, F-16C/D, T-38C, T-6

MAJOR AWARDS AND DECORATIONS

Air Medal with oak leaf cluster
Air Force Commendation Medal with one oak leaf cluster

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Dec 2010
First Lieutenant Dec 2012
Captain Dec 2014

Maj. Zane J. Taylor

Slot

Maj. Zane J. Taylor is the Slot Pilot for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 4, he flies the #4 jet and serves as the Chief of Scheduling. He is in his first season with the team.

Taylor is a 2010 graduate of the United States Air Force Academy. He completed the Joint Specialized Undergraduate Pilot Training at Vance Air Force Base, Oklahoma and was selected for F-16 training at Joint Base San Antonio Lackland-Kelly, Texas in 2012. After completing pilot training, he was assigned to the 77th Fighter Squadron, Shaw AFB, S.C. before becoming a flight commander for the 80th Fighter Squadron, Kunsan Air Base, Republic of Korea where he was named Flight Lead of the Year. He has over 1,400 hours in the F-16, including 280 combat hours over Iraq and Syria in support of Operation Inherent Resolve. Prior to the Thunderbirds, Taylor served as Evaluator Pilot and Chief of Standardization and Evaluation, 8th Fighter Squadron, Holloman AFB, New Mexico.



EDUCATION

2010 Bachelor of Science degree in Systems Engineering, U.S. Air Force Academy
2010 Air and Space Basic Course, Squadron Officer College, Top Flight Jay Smith Memorial Award Winner
2017 Squadron Officer School, Flight Top Graduate, Flight Outstanding Contributor, Distinguished Graduate

ASSIGNMENTS

Jul 2010 - Aug 2012 Student, Joint Specialized Undergraduate Pilot Training, Vance Air Force Base, Okla.
Aug 2012 - Jul 2013 Student, F-16 Basic Qualification Course, JBSA Lackland-Kelly, Texas
Jul 2013 - Mar 2016 Assistant Chief of Scheduling/Electronic Combat Pilot/Flight Lead, 77th Fighter Squadron, Shaw AFB, S.C.
Mar 2016 - Apr 2017 Wing Electronic Combat Officer/Flight Commander/Instructor Pilot, 80th Fighter Squadron, Kunsan AB, Republic of Korea
Apr 2017 - Jul 2018 Chief of Training/Chief of Standardization and Evaluation/Evaluator Pilot, 8th Fighter Squadron, Holloman AFB, N.M.
July 2018 - Present Thunderbird #4, Slot Pilot, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Pilot
Flight hours: More than 1,400
Aircraft flown: T-6A, T-38, AT-38, F-16

MAJOR AWARDS AND DECORATIONS

Air Medal with one oak leaf cluster
Aerial Achievement Medal
Air Force Commendation Medal with two oak leaf clusters

EFFECTIVE DATES OF PROMOTION

Second Lieutenant May 2010
First Lieutenant May 2012
Captain May 2014
Major Dec 2019

Maj. Michelle M. Curran

Lead Solo

Maj. Michelle M. Curran is the Lead Solo Pilot for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 5, she flies the #5 jet and serves as the squadron's Chief of Standardization and Evaluation. She is in her second season with the team.

Curran entered the Air Force in 2009 with a Reserve Officer Training Corps commission from the University of St. Thomas in St. Paul, Minnesota. She completed the Joint Specialized Undergraduate Pilot Training at Columbus, MS and assigned to the F-16 Misawa Air Base, Japan. Curran has flown more than 1,500 hours in the F-16, including 163 combat hours over Afghanistan in support of Operation Resolute Support and Operation Freedom's Sentinel. Prior to the Thunderbirds, she was an F-16 Instructor Pilot and Flight Commander at Naval Air Station Joint Reserve Base Fort Worth, Texas.



EDUCATION

2009 Bachelor of Arts degree in Criminal Justice, University of St. Thomas
2010 Air and Space Basic Course, Squadron Officer College
2014 Squadron Officer School

ASSIGNMENTS

Nov 2009 - Nov 2011 Student, Joint Specialized Undergraduate Pilot Training and Introduction to Fighter Fundamentals, 14th Operational Support Squadron Columbus AFB, Miss.
Nov 2011 - Nov 2012 Student, F-16 Basic Course, 308th Fighter Squadron, Luke AFB, Ariz.
Nov 2012 - Nov 2015 F-16 Pilot/Chief of Scheduling, 13th Fighter Squadron, Misawa AB, Japan
Nov 2015 - Sept 2018 F-16 Instructor Pilot/Flight Commander, 355th Fighter Squadron, NAS JRB Fort Worth, Texas
Sept 2018 - Present Thunderbird #5, Opposing Solo, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Pilot
Flight hours: More than 1,500
Aircraft flown: T-6, T-38, F-16C

MAJOR AWARDS AND DECORATIONS

Air Medal
Air Force Commendation Medal with one oak leaf cluster

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Aug 2009
First Lieutenant Aug 2011
Captain Aug 2013
Major July 2019

Capt. Kyle S. Oliver

Opposing Solo

Capt. Kyle Oliver is the Opposing Solo Pilot for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 6, he flies the #6 jet and serves as the squadron's Aircrew Flight Equipment Officer and Squadron Flight Safety Officer. He is in his first season with the team.

Oliver entered the Air Force in 2010 with a Reserve Officer Training Corps commission from The Ohio State University. He completed the Joint Specialized Undergraduate Pilot Training at Vance Air Force Base, Oklahoma in 2012. After completing pilot training as a distinguished graduate and Commander's Trophy winner, Oliver served as an F-22 Raptor pilot in Alaska. Oliver has flown more than 1,200 hours, including more than 230 combat hours over Iraq and Syria in support of Operation Inherent Resolve. Prior to the Thunderbirds, Oliver served as the Assistant Director of Operations and Instructor Pilot, 27th Fighter Squadron, Joint Base Langley Eustis, Virginia.



EDUCATION

2010 Bachelor of Arts degree in Communication Technology, Ohio State University
2011 Air and Space Basic Course, Squadron Officer College
2014 Raptor Advanced Mission Planning School
2016 Squadron Officer School

ASSIGNMENTS

Mar 2011 - Oct 2012 Student Pilot, Joint Specialized Undergraduate Pilot Training, Vance Air Force Base, Okla.
Oct 2012 - Oct 2013 Student Pilot, F-22 Formal Training Unit, Tyndall AFB, Fla.
Oct 2013 - Oct 2016 Scheduler/Assistant Squadron Weapons Officer/Chief of Mobility/4-Ship Flight Lead, 90th Fighter Squadron, Joint Base Elmendorf-Richardson, Alaska
Dec 2016 - Nov 2017 Aircrew Flight Equipment Flight Commander/4-Ship Flight Lead, 1st Operational Support Squadron, JB Langley-Eustis, Va.
Nov 2017 - Sept 2019 Assistant Director of Operations/F-22 Instructor Pilot, 27th Fighter Squadron, JB Langley-Eustis, Va.
Sept 2019 - Present Thunderbird #6, Opposing Solo, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Pilot
Flight hours: More than 1,200
Aircraft flown: T-6A, T-38C, F-16C/D, F-22A

MAJOR AWARDS AND DECORATIONS

Air Medal
Air Achievement Medal
Air Force Commendation Medal with one oak leaf cluster

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Dec 2010
First Lieutenant Dec 2012
Captain Dec 2014

Lt. Col. Kevin J. DiFalco

Director of Operations

Lt. Col. Kevin J. DiFalco is the Director of Operations for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 7, he leads the Operations Section, which includes communications, computer systems analysts, training, standardization and evaluation, aircrew flight equipment and airlift support. He is in his first year with the team.

DiFalco commissioned in 2004 as a distinguished graduate of the Reserve Officer Training Corps at the University of Colorado at Boulder and earned his pilot rating in 2006. He served in multiple operational assignments in Republic of Korea and Aviano AB, Italy. He is also a former instructor at the USAF Weapons School and Chief of Staff Master's Fellow in Public Policy. DiFalco has flown more than 1,900 hours, including more than 297 combat flight hours. Prior to the Thunderbirds, he served as the Assistant Director of Operations for the 555th Fighter Squadron and Director of Operations for the 31st Operations Support Squadron, Aviano AB, Italy.



EDUCATION

2004 Bachelor of Science degree in Aerospace Engineering, University of Colorado at Boulder
2010 Squadron Officer School
2011 United States Air Force Weapons Instructor Course, Distinguished Graduate
2014 Master of Science degree in Aerospace Science, Embry-Riddle Aeronautical University
2018 Master of Public Policy, Princeton University
2019 Air Command and Staff College, by correspondence

ASSIGNMENTS

Jan 2005 - Jul 2006 Student Pilot, Introduction to Fighter Fundamentals, Euro-NATO Joint Jet Pilot Training Program, 80th Operations Support Squadron, Sheppard AFB, Texas
Jul 2006 - Jun 2007 Student Pilot, F-16 RTU, 309th Fighter Squadron, Night Systems, 310th FS, Luke AFB, Ariz.
Jun 2007 - Feb 2011 Standards and Evaluation Officer/Personnel Reliability Program Monitor/Assistant Weapons Officer/Assistant Chief of Scheduling, 510th Fighter Squadron, Aviano Air Base, Italy
Feb 2011 - Jun 2011 Flight Commander, 35th Fighter Squadron Kunsan AB, Republic of Korea
Jul 2011 - Dec 2011 Weapons Instructor Course Student, USAF Weapons School, Nellis AFB, Nev.
Jan 2012 - Sep 2012 Wing Weapons Officer/Flight Commander, 8th OSS, Kunsan AB, Republic of Korea
Sep 2012 - Jan 2015 Chief of Weapons and Tactics/Flight Commander, 510th FS and 31st OSS, Aviano AB, Italy
Jan 2015 - Jul 2017 Chief of Standards and Evaluations, 16th Weapons Squadron, Wing Scheduler, 57th OSS, Precision Strike Flight Commander/Assistant Director of Operations, 16th Weapons Squadron, Nellis AFB, Nev.
Jul 2017 - Aug 2018 Chief of Staff of the Air Force Master's Fellow, Princeton University, Princeton, N.J.
Aug 2018 - Sep 2019 Assistant Director of Operations, 555th FS, Director of Operations, 31st OSS, Aviano AB, Italy
Sep 2019 - Present Thunderbird #7, Operations Officer, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Pilot
Flight hours: More than 1,900
Aircraft flown: T-37, T-38A, T-38C, F-16

MAJOR AWARDS AND DECORATIONS

Meritorious Service Medal with two Bronze Oak Leaf Clusters
Air Medal with two Bronze Oak Leaf Clusters
Air Force Commendation Medal
Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

Second Lieutenant	Jan 2005
First Lieutenant	Jan 2007
Captain	Jan 2009
Major	Jun 2015
Lieutenant Colonel	Nov 2019

Maj. Jason Z. Markzon

Advance Pilot/Narrator

Maj. Jason Z. Markzon is the Advance Pilot and Narrator for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 8, he flies the #8 jet and advances to show sites to coordinate the logistics for aerial demonstrations. Markzon also narrates the performances and provides orientation flights to support Air Force strategic communication goals and serves as the primary liaison between the Thunderbirds and the air show industry. He is in his second season with the team.



Markzon entered the Air Force in 2007 with a Reserve Officer Training Corps commission from Arizona State University. He attended Undergraduate Pilot Training at Laughlin AFB, Texas in 2009 and was selected to remain at Laughlin as an instructor pilot at the 87th Flying Training Squadron. He completed his initial fighter training in the F-16 at Luke AFB, Ariz. and then was assigned to operational squadrons in Republic of Korea and Japan. Prior to joining the Thunderbirds, Markzon was an F-16 flight evaluator and the Maintenance Operations Flight Commander, 35th Maintenance Group, 35th Fighter Wing, Misawa AB, Japan.

EDUCATION

2007 Bachelor of Science degree in Aerospace Engineering, Arizona State University
2008 Air and Space Basic Course, Squadron Officer College
2012 Squadron Officer School
2015 Masters of Business Administration, Strategic Management, Trident University

ASSIGNMENTS

July 2008 - Sept 2009 Student, Undergraduate Pilot Training, 47th Operational Support Squadron, Laughlin AFB, Texas
April 2010 - Mar 2013 T-38 Instructor Pilot/Standardization and Evaluation Liaison Officer, 87th Flying Training Squadron, Laughlin AFB, Texas
July 2013 - May 2014 Student, F-16 Basic Course, 310th Fighter Squadron, Luke AFB, Ariz.
July 2014 - Nov 2015 F-16 Pilot/Assistant Weapons Officer/Wing Electronic Combat Pilot, 51st Operations Support Squadron, Osan AB, Republic of Korea
Nov 2015 - Sept 2018 F-16 Evaluator Pilot/Maintenance Operations Flight Commander, 13th Fighter Squadron, Misawa AB, Japan
Sept 2018 - Present Thunderbird #8, Advance Pilot/ Narrator, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Pilot
Flight Hours: 1,950
Aircraft Flown: T-6, T-38, F-16C/D

MAJOR AWARDS AND DECORATIONS

Meritorious Service Medal
Air Force Commendation Medal with one oak leaf cluster

EFFECTIVE DATES OF PROMOTION

Second Lieutenant July 2007
First Lieutenant July 2009
Captain July 2011
Major July 2017

Lt. Col. (Dr.) Noel Colls

Flight Surgeon

Lt. Col. (Dr.) Noel Colls is the Flight Surgeon for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 9, he provides primary medical care for a 130-person squadron, in addition to ensuring the health and fitness of eight demonstration pilots. Colls is on his second year with the team.

Colls received a direct commission through the Health Professions Scholarship program in 2003 prior to his matriculation into medical school at Texas Tech University Medical Center. He has logged more than 450 flight hours in 19 different aircraft, including more than 310 combat hours. Prior to joining the Thunderbirds, Colls served as a flight surgeon for the 389th and 391st Expeditionary Fighter Squadrons at Mountain Home Air Force Base, Idaho.



EDUCATION

1997 Bachelor of Science degree in Biology, Texas Tech University
2002 Masters of Science in Biology, Texas Tech Health Sciences Center
2008 Medical Doctorate, Texas Tech University Medical Center
2019 Operational Family Practice Residency, David Grant Medical Center

ASSIGNMENTS

Mar 2010 - Oct 2012 Flight Surgeon, 389th Fighter Squadron, Mountain Home AFB, Idaho
Oct 2012 - Oct 2014 Flight Surgeon, 391st Fighter Squadron, Mountain Home AFB, Idaho
Oct 2014 - Jun 2016 Flight Commander, 82nd Aerospace Medicine Squadron Flight Medicine, Sheppard AFB, Texas
Jun 2016 - Jun 2019 Operational Family Practice Residency, David Grant Medical Center, Travis AFB, Calif.
Jun 2019 - Present Thunderbird #9, Flight Surgeon, USAF Air Demonstration Squadron, Nellis AFB, Nev.

FLIGHT INFORMATION

Rating: Senior Flight Surgeon
Flight Hours: More than 450
Combat hours: 667
Aircraft Flown: F-15E, F-16D, T-38A/C, C17A, CH47D, V22, KC10A, AC130W, HC130J, C0130H, C130J, UH60A, E7A, E3B, UH72A, QF4E, C12, T-6

MAJOR AWARDS AND DECORATIONS

Meritorious Service Medal with one oak leaf cluster
Air Medal with two oak leaf clusters
Aerial Achievement Medal
Air Force Commendation Medal
Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Apr 2003
Captain May 2006
Major May 2012
Lieutenant Colonel May 2018

Capt. Katie E. Moorkamp

Executive Officer

Capt. Katie E. Moorkamp is the Executive Officer for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nevada. As Thunderbird 10, she leads the executive support staff responsible for Thunderbirds' cyber and knowledge operations, budget, training and force support actions for the Commander/Leader. Moorkamp in her first season on the team.

Moorkamp is a 2013 graduate of the United States Air Force Academy. She has led personnel and services teams in various assignments in the U.S. as well as the Pacific Command theatre. Moorkamp was also the Installation Sexual Assault Response Coordinator for the 8th Fighter Wing at Kunsan Air Base, Republic of Korea. Prior to joining the Thunderbirds, Moorkamp was the Assistant Chief, Senior Leader Management, Headquarters Air Combat Command, Joint Base Langley-Eustis, Virginia.



EDUCATION

- 2013 Bachelor of Science degree in Foreign Area Studies, United States Air Force Academy
- 2019 Master of Arts in Global Studies, Liberty University
- 2019 Squadron Officer School

ASSIGNMENTS

- Jul 2013 - Aug 2014 Lodging Officer-in-Charge, 90th Force Support Squadron, F.E. Warren AFB, Wyo.
- Aug 2014 - May 2015 Military Personnel Section Chief, 90th Force Support Squadron, F.E. Warren AFB, Wyo.
- May 2015 - Oct 2015 Manpower and Personnel Flight Commander, 90th Force Support Squadron, F.E. Warren AFB, Wyo.
- Oct 2015 - Jun 2016 Sustainment Services Flight Commander, 90th Force Support Squadron, F.E. Warren AFB, Wyo.
- Jun 2016 - Oct 2016 Readiness Chief, 8th Force Support Squadron, Kunsan AB, Republic of Korea
- Oct 2016 - Jun 2017 Installation Sexual Assault Response Coordinator, 8th Fighter Wing, Kunsan AB, Republic of Korea
- Jun 2017 - Apr 2019 Chief, Senior Leader Assignments, HQ ACC, Joint Base Langley-Eustis, Va.
- Apr 2019 - Sep 2019 Assistant Chief, Senior Leader Management, HQ ACC, Joint Base Langley-Eustis, Va.
- Sep 2019 - Present Thunderbird #10, Executive Officer, USAF Air Demonstration Squadron, Nellis AFB, Nev.

MAJOR AWARDS AND DECORATIONS

- Air Force Commendation Medal with two oak leaf clusters
- Joint Service Achievement Medal

EFFECTIVE DATES OF PROMOTION

- Second Lieutenant May 2013
- First Lieutenant May 2015
- Captain May 2017

Capt. Michael W. Bell

Maintenance Officer

Capt. Michael Bell is the Maintenance Officer for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 11, he leads 90 personnel across 13 distinct logistics specialties to maintain the squadron's 12 assigned F-16 block-52 aircraft and associated support equipment. Bell is in his first season with the team.

Bell entered the Air Force in 2011 with a Reserve Officer Training Corps commission from Rutgers University. He is a Senior Aircraft Maintenance Officer with experience on F-15C/D/E, F-16CJ, F-22A, and F-35A aircraft. Bell has led aircraft maintenance teams in the generation of 18,250 sorties. He has also served as the Executive Officer to the 35th Fighter Wing Commander. Bell has deployed multiple times to the Central Command area of operations in support of Operation Enduring Freedom and Operation Inherent Resolve. Prior to joining the Thunderbirds, Bell served as the Chief of Tactics for the 57th Maintenance Group, Nellis Air Force Base, Nevada.



EDUCATION

2011 Bachelor of Arts degree in Political Science, Rutgers University, Distinguished Graduate
2016 Squadron Officer School
2018 Advanced Maintenance and Munitions Operations School, Distinguished Graduate

ASSIGNMENTS

Feb 2012 - Sep 2012 Fabrication Flight Commander, 48th Equipment Maintenance Squadron, RAF Lakenheath, United Kingdom
Sep 2012 - Jun 2013 494th Aircraft Maintenance Unit Assistant Officer-in-Charge, 48th Aircraft Maintenance Squadron, RAF Lakenheath, United Kingdom
Jun 2013 - Mar 2014 493rd Aircraft Maintenance Unit Officer-in-Charge, 748th Aircraft Maintenance Squadron, RAF Lakenheath, United Kingdom
Mar 2014 - Nov 2014 Maintenance Flight Commander, 35th Maintenance Squadron, Misawa AB, Japan
Nov 2014 - Nov 2015 13th Aircraft Maintenance Unit Officer-in-Charge, 35th Aircraft Maintenance Squadron, Misawa AB, Japan
Nov 2015 - Jan 2017 14th Aircraft Maintenance Unit Officer-in-Charge, 35th Aircraft Maintenance Squadron, Misawa AB, Japan
Jan 2017 - Sep 2017 Director of Operations, 379th Expeditionary Aircraft Maintenance Squadron, Central Command
Sep 2017 - Jul 2018 Executive Officer, 35rd Fighter Wing, Misawa AB, Japan
Jul 2018 - Dec 2019 Chief of Tactics, 57th Maintenance Group, Nellis AFB, Nev.
Dec 2019 - Present Thunderbird #11, Maintenance Officer, USAF Air Demonstration Squadron, Nellis AFB, Nev.

MAJOR AWARDS AND DECORATIONS

Meritorious Service Medal with one oak leaf cluster
Air Force Commendation Medal with one oak leaf cluster
Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

Second Lieutenant Aug 2011
First Lieutenant Aug 2013
Captain Aug 2015

Capt. Remoshay R. Nelson

Public Affairs Officer

Capt. Remoshay R. Nelson is the Public Affairs Officer for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. As Thunderbird 12, she leads the team's extensive marketing, publicity and community relations programs. Nelson is in her first season with the team.

Nelson entered the Air Force in 2011 with a Reserve Officer Training Corps commission from Howard University. She served as a diversity recruiter in the Gold Bar Program before completing the public affairs qualification course at Fort Meade, Md. Following training, she was assigned to the 436th Airlift Wing Public Affairs Office at Dover Air Force Base, Del. as the chief of media operations. Nelson then served in public affairs assignments in Turkey, Botswana and various locations in Europe. Prior to joining the Thunderbirds, she was the Chief of Public Affairs, 8th Fighter Wing, Kunsan Air Base, Republic of Korea.



EDUCATION

2011 Bachelor of Science degree in Speech Communications, Howard University
2013 Public Affairs Qualification Course, Defense Information School
2014 Masters of Communication, University of Oklahoma
2016 Joint Intermediate Public Affairs Course, Defense Information School
2018 Squadron Officer School

ASSIGNMENTS

June 2011 - June 2012 AFROTC Gold Bar Recruiter, Northeast Region
July 2012 - Sept 2014 Chief of Media/Deputy Public Affairs Officer, 436th Airlift Wing, Dover Air Force Base, Del.
Sept 2014 - Dec 2015 Chief of Public Affairs, 39th Air Base Wing, Incirlik Air Base, Turkey
Dec 2015 - June 2018 Public Affairs Planner, United States Air Forces in Europe and Africa
June 2018 - June 2019 Chief of Public Affairs, 8th Fighter Wing, Kunsan Air Base, Republic of Korea
June 2019 - Sept 2019 Public Affairs Officer, 57th Wing, Nellis AFB, Nev.
Sept 2019 - Present Thunderbird #12, Public Affairs Officer, USAF Air Demonstration Squadron, Nellis AFB, Nev.

MAJOR AWARDS AND DECORATIONS

Meritorious Service Medal with one oak leaf cluster
Air Force Commendation Medal one oak leaf cluster

EFFECTIVE DATES OF PROMOTION

Second Lieutenant May 2011
First Lieutenant May 2013
Captain May 2015

CMSgt Tim T. Johnson

Chief Enlisted Manager

Chief Master Sgt. Tim T. Johnson is the Chief Enlisted Manager for the United States Air Force Air Demonstration Squadron, the Thunderbirds, Nellis Air Force Base, Nev. He advises the commander on the squadron's health, morale, and welfare of assigned Airmen while guiding their career development. He also communicates concerns and issues of the enlisted force and ensures the commander's policies are known. Johnson is in his second season with the team.

Johnson entered the Air Force in March 1993 and attended technical training at Lowry AFB, Colo. as an Aircraft Armament Systems Technician. He has served in various duties in the Armament career field while stationed in Arizona, Japan, Korea, Nevada, and South Carolina. Johnson has deployed to Afghanistan in support of Operation Enduring Freedom. Prior to joining the team, he was Interim Maintenance Group Superintendent, Misawa Air Base, Japan.



EDUCATION

- 1997 Airman Leadership School
- 2001 Associate in Applied Science, Aircraft Armament Technology, Community College of the Air Force
- 2003 Noncommissioned Officers Academy
- 2005 Senior Noncommissioned Officers Academy
- 2010 Senior Enlisted Joint Professional Military Education Course
- 2011 Senior Noncommissioned Officers Academy
- 2014 Advanced Maintenance Superintendent Course
- 2016 Bachelor of Science degree in Human Resource Management, Columbia Southern University
- 2017 Contingency Wartime Planning Course
- 2017 Senior Enlisted Joint Professional Military Education Course II

ASSIGNMENTS

- Mar 1993 - May 1993 Trainee, Basic Military Training School, Lackland AFB, Texas
- May 1993 - July 1993 Student, Armament Systems Technician, Lowry AFB, Colo.
- Aug 1993 - Aug 1994 Load Crew Member, Kunsan AB, Republic of Korea
- Aug 1994 - Sept 2000 Combat Armament Support Team Member/Squadron Lead Crew Member/SLC Chief, Luke AFB, Ariz.
- Sept 2000 - Apr 2007 LC Chief/SLC Chief/Load Standardization Crew Member/NCOIC, Weapons Loading, Shaw AFB, S.C.
- May 2007 - May 2008 Racks, Adapters and Pylons War Reserve Manager, Osan AB, Republic of Korea
- June 2008 - June 2011 HH-60 Weapons Section Chief/Production Superintendent, Kadena AB, Japan
- July 2011 - Feb 2013 Assistant Superintendent Thunder Aircraft Maintenance Unit, Nellis AFB, Nev.
- Feb 2013 - Dec 2014 Weapons Standardization Superintendent, Nellis AFB, Nev.
- Dec 2014 - Feb 2016 Wing Weapons Manager, Nellis AFB, Nev.
- Mar 2016 - July 2016 (Interim) Maintenance Group Superintendent, Nellis AFB, Nev.
- July 2016 - Oct 2018 Wing Weapons Manager, Misawa AB, Japan
- Feb 2018 - June 2018 (Interim) Maintenance Group Superintendent, Misawa AB, Japan
- Oct 2018 - Present Chief Enlisted Manager, USAF Air Demonstration Squadron, Nellis AFB, Nev.

MAJOR AWARDS AND DECORATIONS

- Meritorious Service Medal with four oak leaf clusters
- Air Force Commendation Medal with one oak leaf cluster
- Air Force Achievement Medal

EFFECTIVE DATES OF PROMOTION

- Airman Basic Mar 1993
- Airman Sept 1993
- Airman First Class July 1994
- Senior Airman Mar 2006
- Staff Sergeant June 1999
- Technical Sergeant July 2002
- Master Sergeant June 2006
- Senior Master Sergeant Aug 2011
- Chief Master Sergeant May 2015

MSgt Sandra A. Santana

First Sergeant

Sandra A. Santana is the First Sergeant, United States Air Force Demonstration Squadron, Nellis Air Force, Nevada. She serves as the commander's advisor on matters concerning morale, welfare, enlisted career progression and mission readiness. She enforces policies and ensures all support agencies are responsive to the needs of unit personnel and their families.

Santana enlisted in the Air Force in 2001 and after basic military training, she graduated as an Aircrew Life Support technician at Sheppard Air Force Base, Texas. She later retrained to be a Special Missions Flight Attendant in 2010. Her assignment background includes various duties as Aircrew Flight Equipment Craftsman and several Flight Attendant duties at the Squadron level while working directly with Headquarters Air and Education Training Command and Headquarters Air Mobility Command as the subject matter expert. Prior to joining the Thunderbirds, she served as the First Sergeant, 11th Medical Operations Squadron, Joint Base Andrews, Maryland.



EDUCATION

- 2005 Airman Leadership School
- 2012 Associate in Applied Science, Aircrew Safety Systems Technology, Community College of the Air Force
- 2012 Associate in Applied Science, Aviation Operations, Community College of the Air Force
- 2013 Noncommissioned Officer Academy
- 2013 Senior Enlisted Joint Professional Military Education Course, by correspondence
- 2016 Basic Instructor Course
- 2016 Senior Noncommissioned Officer Academy, by correspondence
- 2018 Professional Manager Certification, Community College of the Air Force

ASSIGNMENTS

- July 2001 - Aug 2001 Student, Basic Military Training, Lackland Air Force Base (AFB), Texas
- Aug 2001 - Oct 2001 Student, Technical Training School, Sheppard AFB, Texas
- Nov 2001 - Feb 2005 Aircrew Life Support Apprentice, 62nd Fighter Squadron, Luke AFB, Ariz.
- Mar 2005 - Mar 2006 Aircrew Life Support Journeyman, 25th Fighter Squadron, Osan AB, Republic of Korea
- Mar 2006 - Apr 2009 Aircrew Flight Equipment Craftsman, 76th Airlift Squadron, Ramstein AFB, Germany
- May 2009 - May 2010 Aircrew Flight Equipment Craftsman, 58 Operations Support Squadron, Kirtland AFB, N.M.
- May 2010 - July 2010 Student, Technical Training School, Medina Annex, San Antonio, Texas
- Oct 2010 - Jan 2012 Special Missions Flight Attendant, 1st Airlift Squadron, Joint Base Andrews, Md.
- Jan 2012 - May 2014 Special Missions Flight Attendant Instructor, 1st Airlift Squadron, Joint Base Andrews, Md.
- May 2014 - Mar 2017 Special Missions Flight Attendant Evaluator, 1st Airlift Squadron, Joint Base Andrews, Md.
- Mar 2017 - Apr 2018 Assistant Flight Chief, Operations, 1st Airlift Squadron, Joint Base Andrews, Md.
- April 2018 - Mar 2019 Flight Attendant Flight Chief, 99th Airlift Squadron, Joint Base Andrews, Md.
- April 2019 - Nov 2019 First Sergeant, 11th Medical Operations Squadron, Joint Base Andrews, Md.
- Nov 2019 - Present First Sergeant, USAF Air Demonstration Squadron, Nellis Air Force Base, Nv.

MAJOR AWARDS AND DECORATIONS

- Meritorious Service Medal with two oak leaf clusters
- Aerial Achievement Medal with oak leaf cluster
- Air Force Commendation Medal with oak leaf cluster
- Air Force Achievement Medal with two oak leaf clusters

EFFECTIVE DATES OF PROMOTION

- Airman Basic July 2001
- Airman Jan 2002
- Airman First Class Nov 2002
- Senior Airman July 2004
- Staff Sergeant Jan 2007
- Technical Sergeant Feb 2012
- Master Sergeant Dec 2016

2020 Show Schedule

March 14: Laughlin AFB, Texas – “Fiesta of Flight”

March 21-22: Luke AFB, Arizona – “Luke Days Air and Space Expo”

March 28-29: March ARB, Calif. – “March Field Air and Space Expo: Thunder Over the Empire”

April 4-5: Lakeland, Florida – “Sun-N-Fun Fly In & Expo”

April 18-19: Maxwell AFB, Alabama – “Beyond the Horizon Air & Space Show”

April 25-26: Columbus AFB, Mississippi – “Wings Over Columbus”

May 2-3: Fort Lauderdale, Florida – “Fort Lauderdale Air Show”

May 9-10: Beale AFB, Calif. – “Wings Over Recce Town, USA”

May 16-17: Shaw AFB, South Carolina – “Shaw Air and Space Expo”

May 23-24: Miami Beach, Florida – “Miami Beach Air & Sea Show”

May 28: Colorado Springs, Colorado – “USAFA Graduation Fly Over”

June 6-7: Salinas, Calif. – “California International Airshow”

June 13-14: Ocean City, Maryland – “OC Air Show”

June 20-21: North Kingstown, Rhode Island – “RI ANG Open House and Air Show”

June 27-28: Hill AFB, Utah – “Warriors Over Wasatch Air & Space Show”

July 4-5: Battle Creek, Michigan – “Battle Creek Field of Flight Air Show and Balloon Festival”

July 11-12: JB Elmendorf-Richardson, Alaska – “Arctic Thunder Open House”

July 18-19: Duluth, Minnesota – “Duluth Air & Aviation Expo”

July 22: F.E Warren AFB, Wyoming – “Cheyenne Frontier Days”

July 25-26: Ellsworth AFB, South Dakota – “Ellsworth Air & Space Show”

August 1-2: Grand Forks AFB, North Dakota – “Grand Forks AFB Air Show”

August 15-16: Chicago, Illinois – “Chicago Air & Water Show”

August 22-23: Avoca, PA – “Wilkes-Barre/Scranton Armed Forces Airshow”

August 26: Atlantic City, New Jersey – “Atlantic City Thunder Over The Boardwalk Airshow”

August 29-30: New Windsor, New York – “New York Air Show”

September 5-6: Gardner, Kansas – “KC Air Show 2020”

September 12-13: London (Ontario), Canada – “Airshow London”

September 19-20: Huntington Beach, Calif. – “Pacific Airshow”

October 3-4: Minden, Nevada – “Aviation Roundup Airshow”

October 10-11: Edwards AFB, Calif. – “Aerospace Valley Air & Space Show”

October 17-18: Fort Worth, Texas – “Bell Fort Worth Alliance Air Show”

October 24-25: Rome, Georgia – “Wings Over North Georgia”

October 31-November 1: Orlando, Florida – “Lockheed Martin Space & Air Show”

November 7-8: New Orleans, Louisiana – “NASJRB New Orleans Air Show”

November 14-15: San Antonio, Texas – “2020 JBSA Air & Space Show & Open House”

2021 Show Schedule

April 10-11: Panama City, Florida – “Tyndall AFB Gulf Coast Salute”
April 17-18: Titusville, Florida – “Space Coast Warbird Airshow”
April 24-25: Davis-Monthan AFB, Arizona – “Thunder and Lightning over Arizona”
May 1-2: St. Joseph, Missouri – “Sound of Speed Airshow and 139AW Open House”
May 8-9: Barksdale AFB, Louisiana – “Defenders of Liberty Air and Space Show”
May 27: Colorado Springs, Colorado – “USAFA Graduation 2021 Flyover”
May 30-31: Wantagh, New York – “Bethpage Airshow at Jones Beach”
June 5-6: Smyrna, Tennessee – “The Great Tennessee Airshow”
June 12-13: Fairchild AFB, Washington – “Inland Northwest Skyfest 2021”
June 19-20: Tinker AFB, Oklahoma – “Star Spangled Salute Air and Space Show”
June 26-27: Saguenay, Quebec – “The Bagotville International Airshow 2021”
July 3-4: Traverse City, Michigan – “National Cherry Festival Airshow”
July 10-11: Dayton, Ohio – “Dayton Airshow”
July 21: F.E. Warren AFB, Wyoming – “Cheyenne Frontier Days”
July 24-25: Milwaukee, Wisconsin – “Milwaukee Air and Water Show”
July 31-August 1: McMinnville, Oregon – “Oregon International Airshow”
August 14-15: Westfield, Massachusetts – “Westfield International Airshow”
August 18: Atlantic City, New Jersey – “Thunder Over the Boardwalk Airshow”
August 28-29: Boise, Idaho – “Gowen Thunder 2021 Open House and Airshow”
September 4-6: Cleveland, Ohio – “Cleveland National Air Show”
September 11-12: Portsmouth, New Hampshire – “Pease Open House”
September 18-19: Reno, Nevada – “National Championship Air Races”
September 25-26: Mather, California – “California Capital Airshow”
October 2-3: San Juan, Puerto Rico – “2021 Puerto Rico International Airshow”
October 9-10: Houston, Texas – “Wings Over Houston Airshow”



USAF Air Demonstration Squadron (Thunderbirds)
2020 FAA Maneuver Package





**DEPARTMENT OF THE AIR FORCE
USAF AIR DEMONSTRATION SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA**

MEMORANDUM FOR FAA Representatives

FROM: USAFADS/CC

SUBJECT: 2020 Thunderbirds Maneuver Package

1. This United States Air Force Air Demonstration Squadron (Thunderbirds) maneuver package is designed to provide you with a pictorial display of all demonstration maneuvers used by the Thunderbirds.
2. The Thunderbirds have three shows that may be performed depending upon weather or terrain considerations. A high show, which includes formation rolls and loops, may be flown with a minimum ceiling of 8,000' and 5 nautical mile visibility. A low show, which has formation rolls only, may be flown with a minimum ceiling of 3,500' and 5 nautical mile visibility. A flat show, which includes no loops or rolls, may be flown with a minimum ceiling of 2,000' and 5 nautical mile visibility (57 WG/CC or USAFWC/CC may waive the flat show minimum ceiling to 1,500').
3. The Department of Defense accepts full responsibility for the operation of Thunderbird demonstration maneuvers as described herein. Lieutenant Colonel John Caldwell, Commander/Leader, USAF Air Demonstration Squadron, has been designated as the representative for the Department of Defense for the execution of these maneuvers and prioritizes safety over visual appeal or presentation.
4. Thunderbird maneuvering airspace and minimum dimensions for an aerobatic box are depicted in section IV. FAA guidelines currently permit non-aerobatic passes to be flown no closer than 500' from the crowd. Aerobatic maneuvers shall occur at the 1500' show line; however non-aerobatic maneuvers may take place on the 500' show line. Non-aerobatic passes over the crowd will be a minimum of 500' AGL. Thunderbird formations in the transition area are permitted to descend from 500' to be at their minimums at 1NM from show center, even over occupied buildings. Any maneuver may be flown as a flat pass if conditions dictate. Altitudes depicted are minimums.
5. The Thunderbirds may fly a demonstration with less than six aircraft. Fallout of the left and right solos are depicted in the maneuvers package as 5-ship shows; any other fallout scenarios will result in an incomplete diamond with or without solos as part of the formation. The Thunderbirds will occasionally fly a seventh aircraft during practice demonstrations and site surveys in a photo-chase profile. This aircraft will be flown by Thunderbirds 7 or 8 upon completion of syllabus-directed training. If the seventh aircraft is a 2-seat F-16, the rear cockpit will only be occupied by a designated Thunderbird team member. The photo-chase aircraft will maneuver as required to achieve the desired photographic position relative to the diamond, solos, or delta. The same rules and regulations which govern the 6-ship within the TFR and aerobatic box also apply to the seventh aircraft. The photo chase aircraft will never fly during an official demonstration.
6. My point of contact to address any questions concerning these maneuvers is Lt Col Kevin DiFalco, Thunderbird Operations Officer, at (702) 271-6627 or DSN 682-9931.


JOHN D. CALDWELL, Lt Col, USAF
Commander/Leader

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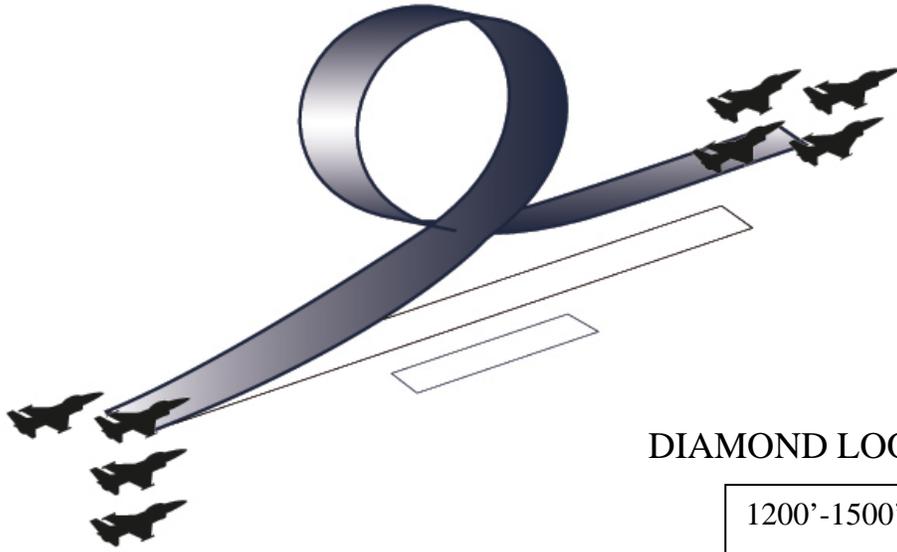
Section I

THUNDERBIRD 2020 HIGH SHOW

WEATHER 8000' AND 5 MILES VISIBILITY

6-SHIP	5-SHIP (Left Solo)	5-SHIP (Right Solo)
Diamond takeoff / Loop on takeoff		Diamond takeoff / Loop on takeoff
(LS) Roll on Takeoff		
(RS) Max Climb / Split S	Roll on Takeoff	Max Climb / Split S
Diamond Cloverloop Opener	⇧←	Diamond Cloverloop Opener
Opposing Knife Edge	→←	4 Point
Trail to Diamond BUP	⇒	Trail to Diamond BUP
Opposing Inverted	→←	Inverted to Inverted
Line to Diamond Loop (Ops √)	⇐	Line to Diamond Loop (Ops √)
(LS) Knife Edge	→	Knife Edge
(RS) Slow Roll	←	Diamond Roll
Diamond Roll	⇒	High Alpha Pass
(LS) 8 - Point	←	Bon Ton Roule
(RS) Aileron Rolls	→	Aileron Rolls
Bon Ton Roule	⇐	Trail to Diamond Cloverloop
Calypso Pass	←	8 - Point
Trail to Diamond Cloverloop	⇩⇐	Diamond PIR
Crossover Break	←⇧→	Max Turn, 1/2 Cuban 8
Diamond PIR	⇐	Trail to Diamond Roll
Opposing – Split S	→←	Sneak Pass
Trail to Diamond Roll	⇒	Hi Low Pass (Ops √)
(RS) Sneak Pass	→	Solo Hit – No Rejoin
(LS) High Alpha /Muscle Climb	←	Inverted to Inverted
High/Low Pass (Ops √)	⇐	Diamond Loop
(RS) Solo hit, ½ Cuban 8, Rejoin	←	Vertical Rolls
5-Card Loop with RS	⇐	Arrowhead Loop
(LS) Vertical Rolls	→	Solo Rejoin to Stinger
Line Break Loop with RS	⇒	Stinger BUP
(RS) Solo Hit	←	Stinger Roll
(LS) Max Turn, 1/2 Cuban 8	→←	Stinger Loop

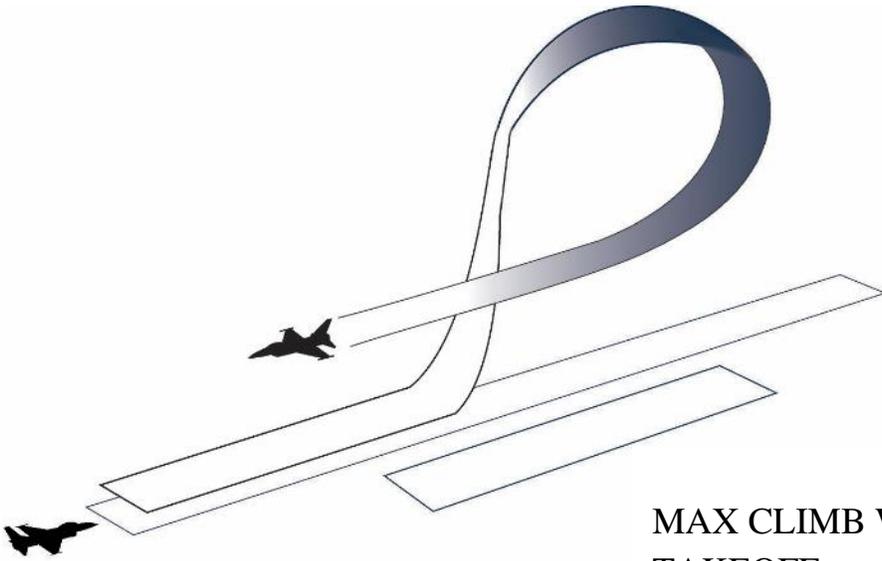
Arrowhead Loop	←	High Bomb Burst	⇒	Stinger Loop	←
Solo Rejoin to Delta	↑	Solo Hit	→	High Bomb Burst	⇒
Delta BUP	⇒	High Bomb Burst Rejoin	←	Solo Hit	→
Delta Roll	←	Thunderbird Diamond Pitch (Pass)**		High Bomb Burst Rejoin	←
Delta Loop	←	Aileron Roll Pitch – (Sneak Pass)		Thunderbird Diamond Pitch (Pass)**	
Delta Burst and Warrior Loop	↓→	(Stinger Closer)		Inverted to Inverted Pitch – (Sneak Pass)	
High Bomb Burst	⇒			(Stinger Closer)	
(LS) Solo Hit	→				
High Bomb Burst Rejoin	←				
Thunderbird Diamond Pitch (Pass)**	←				
Reflection Pitch (No Pitch)	←				
Delta Blue Out Pitch Up (Delta Closer**)	⇒				
(LS) Aileron Roll Pitch Up					
(RS) Inverted to Inverted Pitch					
** (Deployed show option for any show sequence)					



DIAMOND LOOP ON TAKEOFF

1200'-1500' FROM CROWD

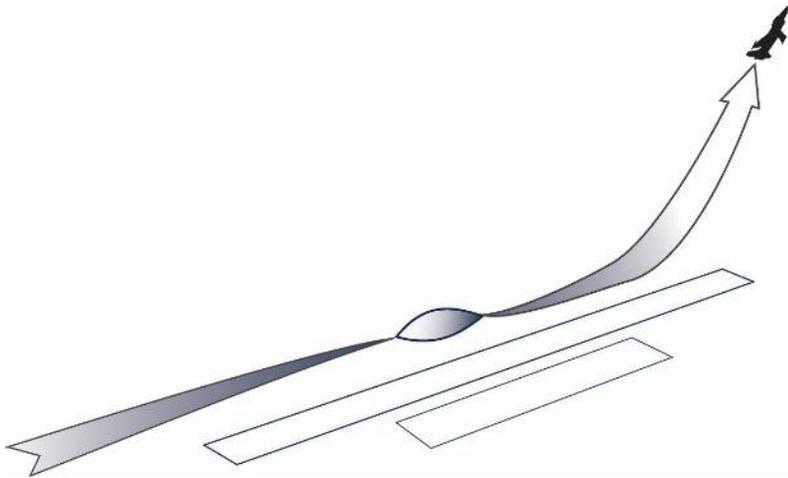
250' AGL MINIMUM



MAX CLIMB WITH SPLIT-S ON TAKEOFF

1200-1500' FROM CROWD

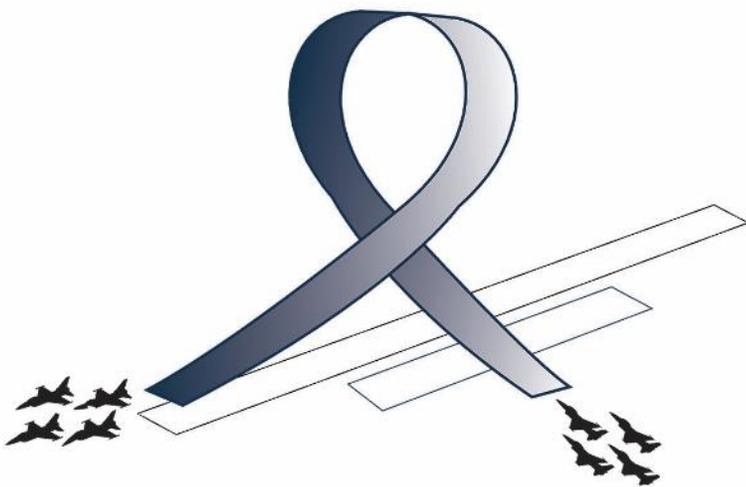
150' AGL MINIMUM



SOLO ROLL ON TAKEOFF

1200' -1500' FROM CROWD LINE OR ROLL
BEYOND END OF CROWD LINE

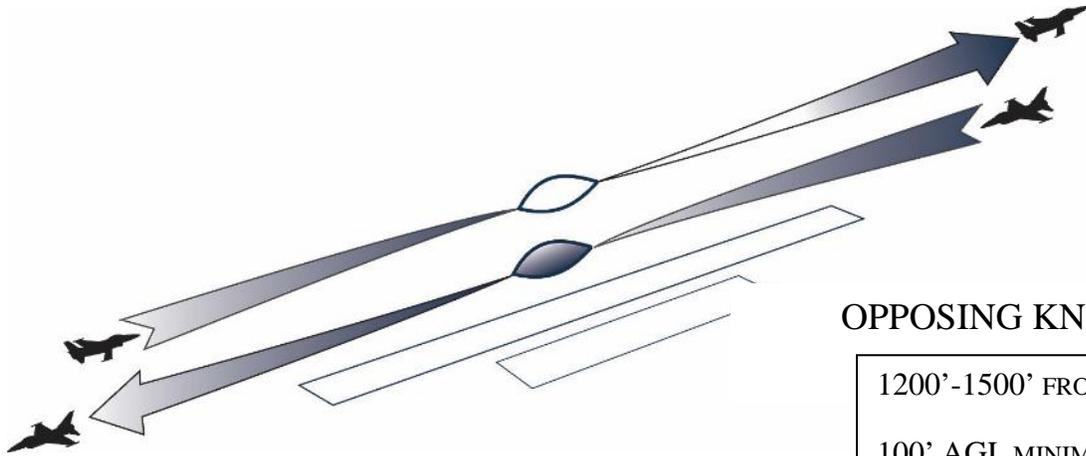
100' AGL MINIMUM



CLOVERLOOP OPENER

1200' -1500' FROM CROWD

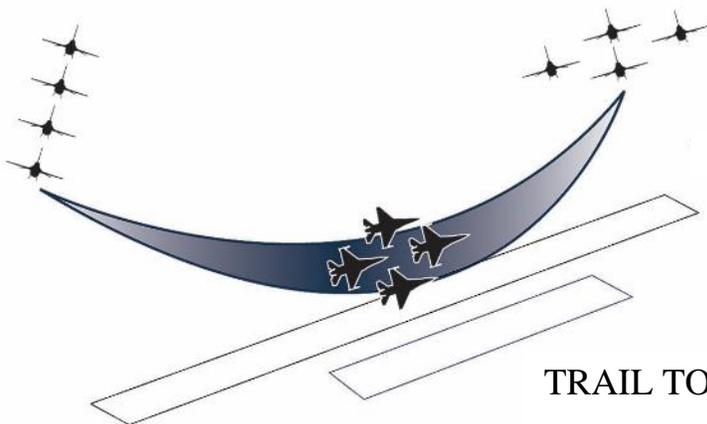
500' AGL MINIMUM



OPPOSING KNIFE-EDGE

1200' -1500' FROM CROWD

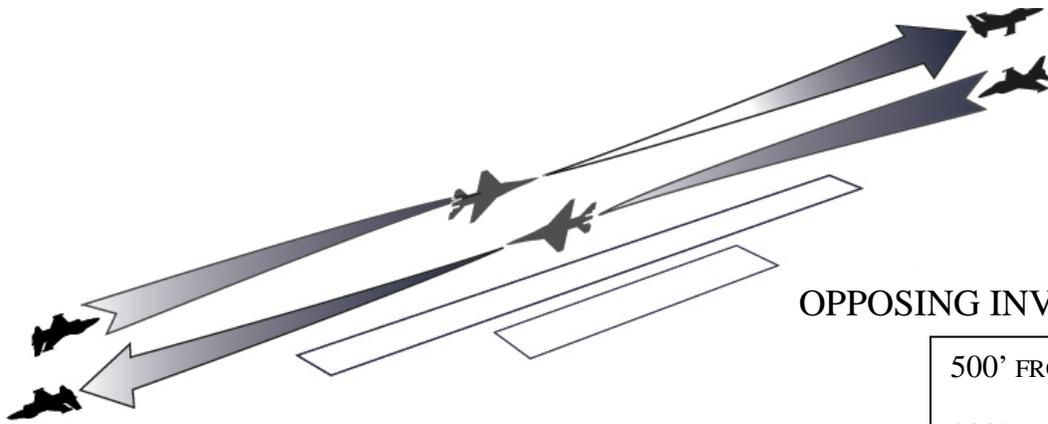
100' AGL MINIMUM



TRAIL TO DIAMOND BOTTOM UP PASS

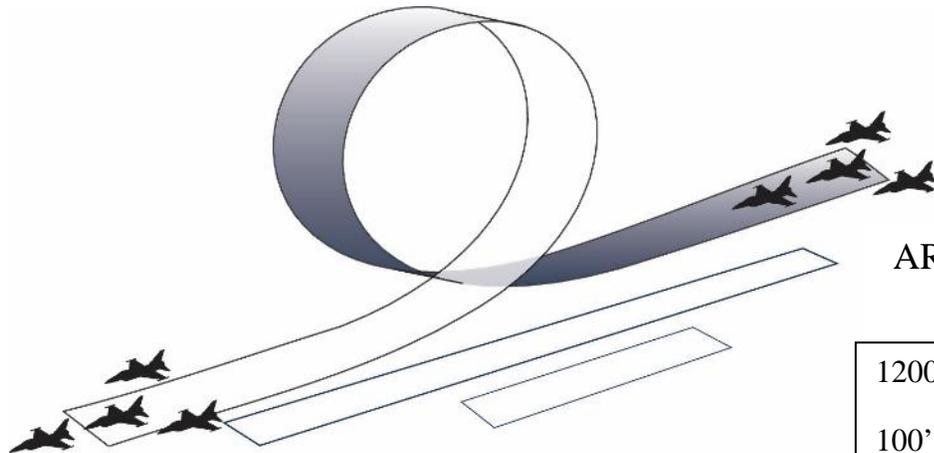
500' FROM CROWD

200' AGL MINIMUM



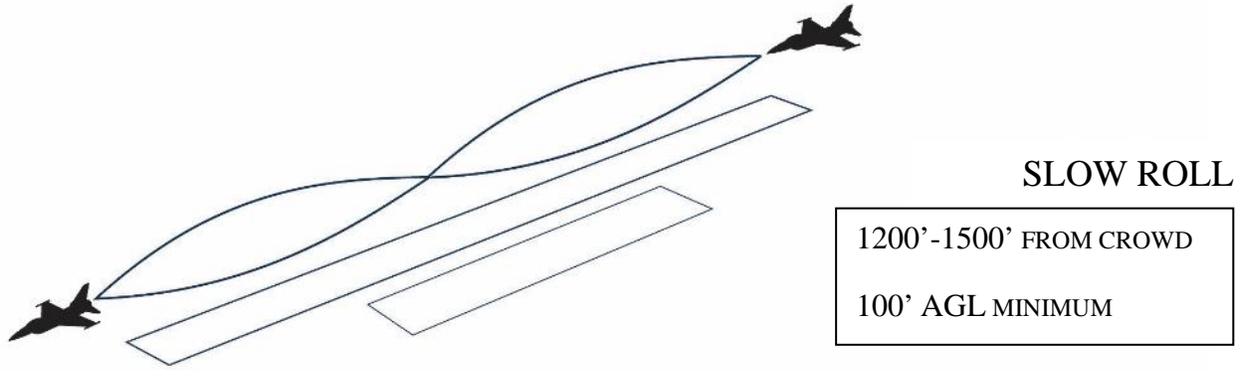
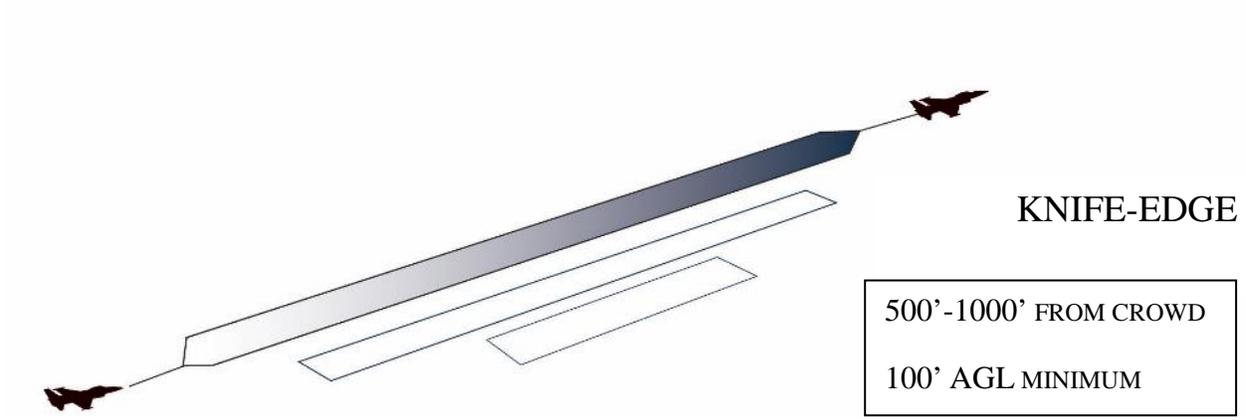
OPPOSING INVERTED PASS

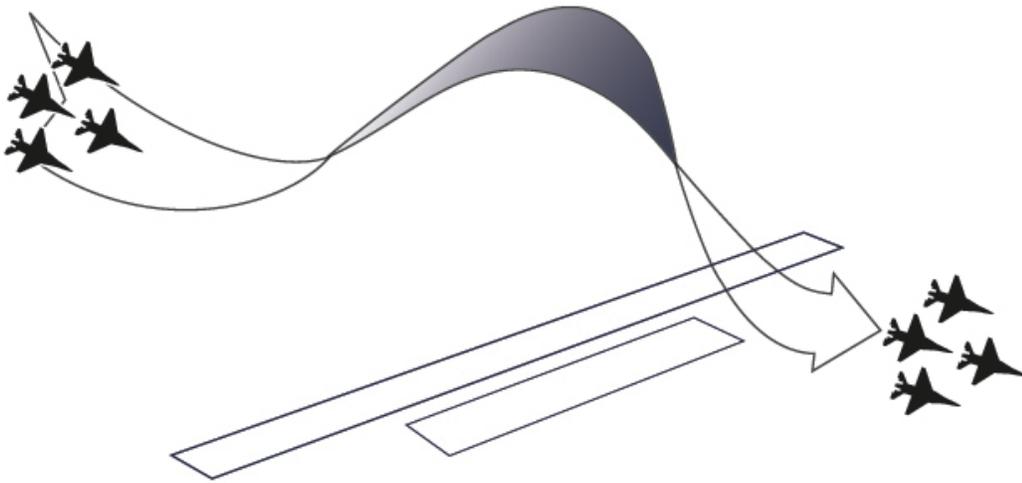
500' FROM CROWD
200' AGL MINIMUM



ARROWHEAD LOOP

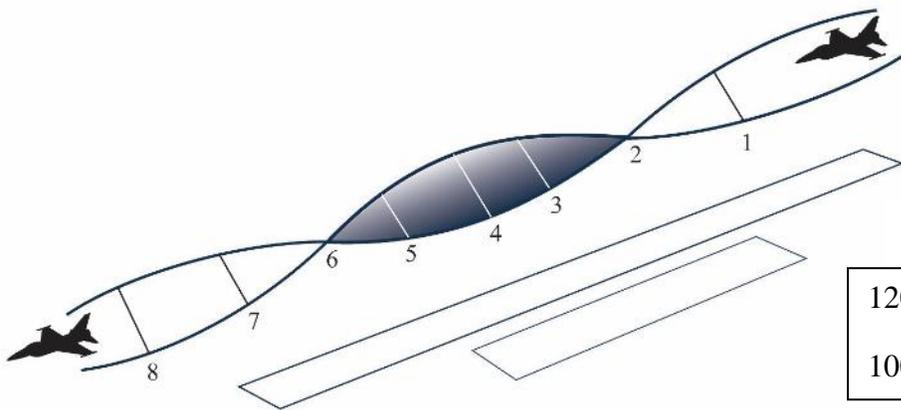
1200'-1500' FROM CROWD
100' AGL MINIMUM





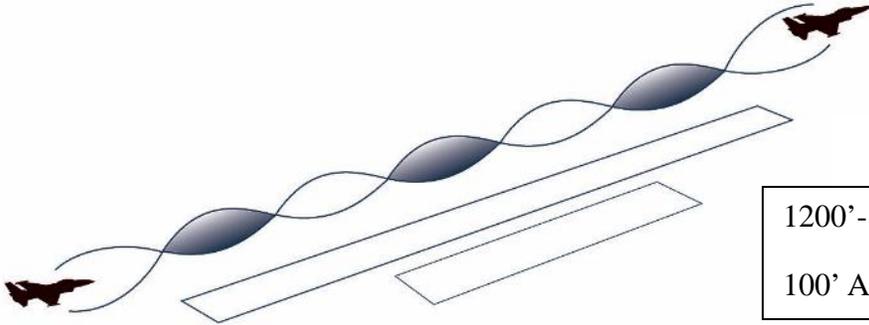
DIAMOND ROLL

1200' -1500' FROM CROWD
250' AGL MINIMUM



EIGHT POINT ROLL

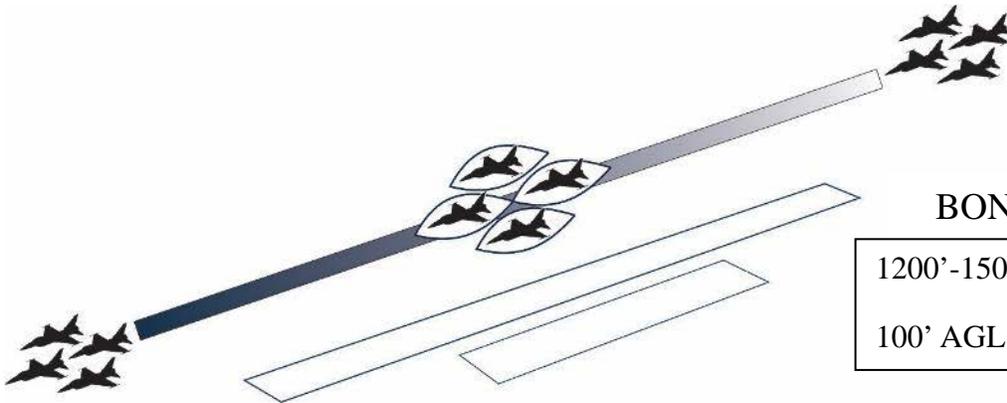
1200' -1500' FROM CROWD
100' AGL MINIMUM



AILERON ROLLS

1200'-1500' FROM CROWD

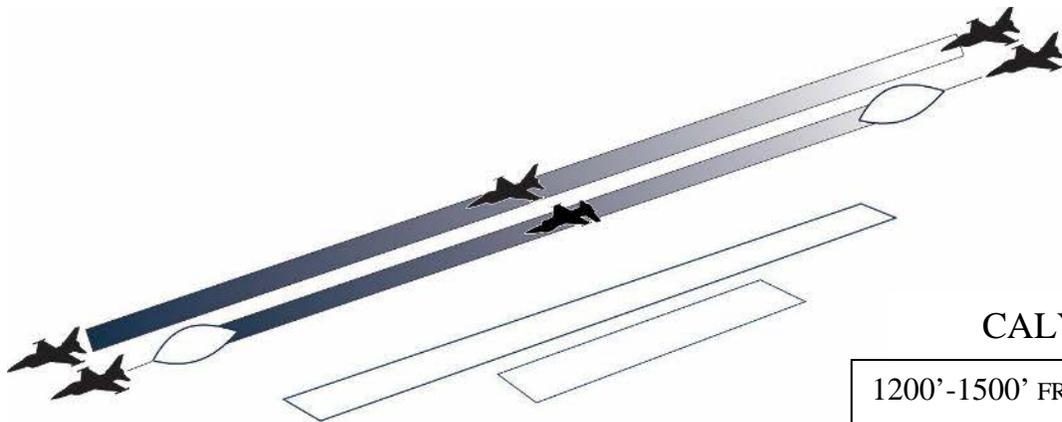
100' AGL MINIMUM



BON TON ROULLE

1200'-1500' FROM CROWD

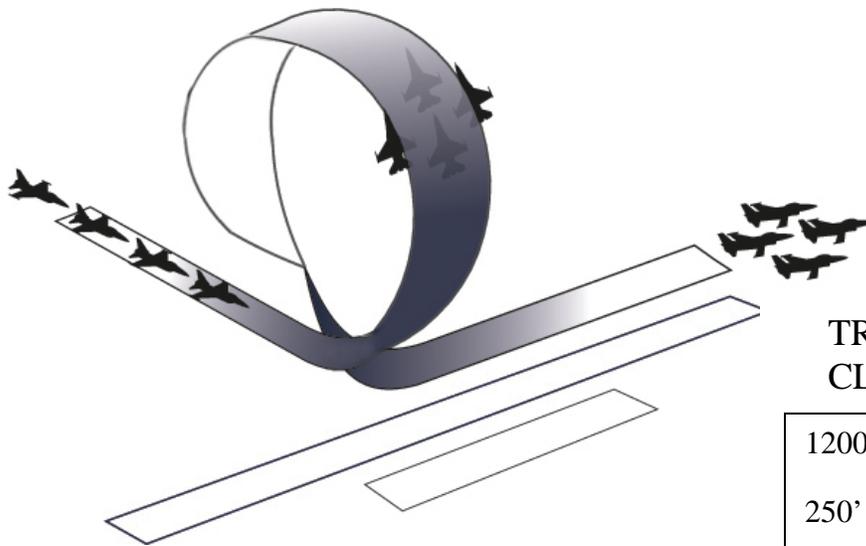
100' AGL MINIMUM



CALYPSO PASS

1200'-1500' FROM CROWD

100' AGL MINIMUM

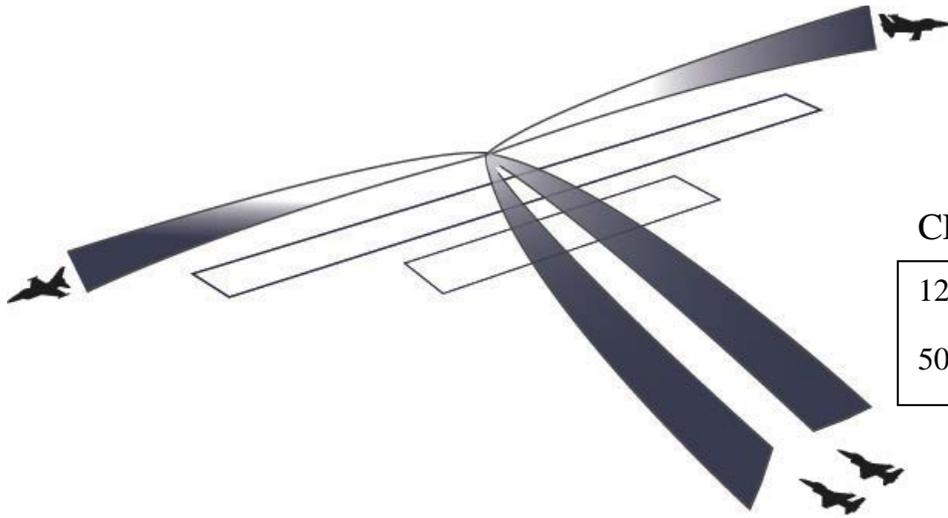


TRAIL-TO-DIAMOND CLOVERLOOP

1200'-1500' FROM CROWD

250' AGL MINIMUM

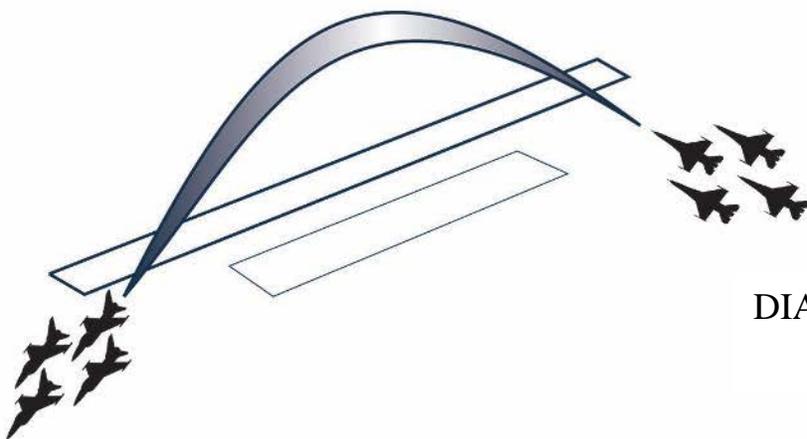
CAN BE EXECUTED WITH A LEFT OR RIGHT TURN OUT.



CROSS OVER BREAK

1200' -1500' FROM CROWD

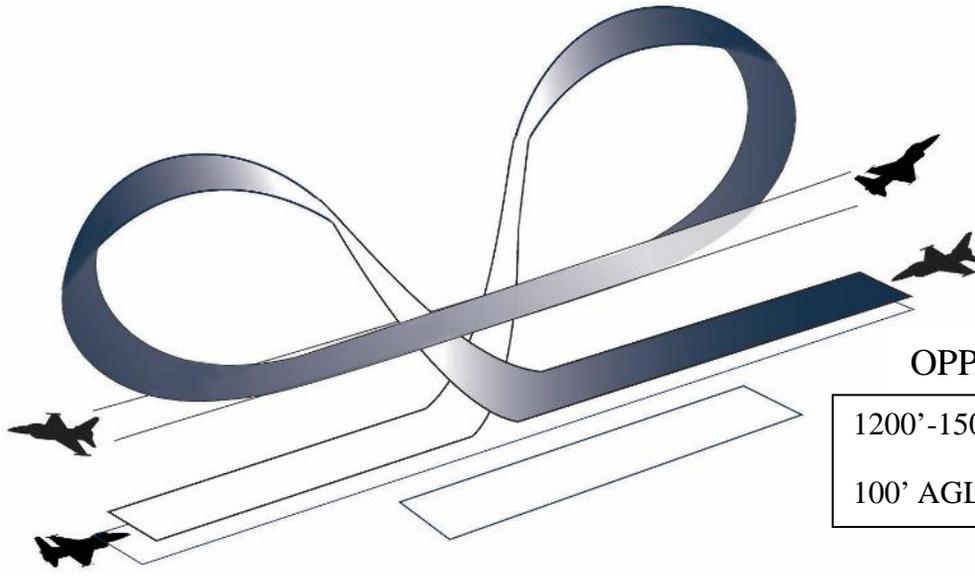
500' AGL MINIMUM



DIAMOND PASS IN REVIEW

500' FROM CROWD

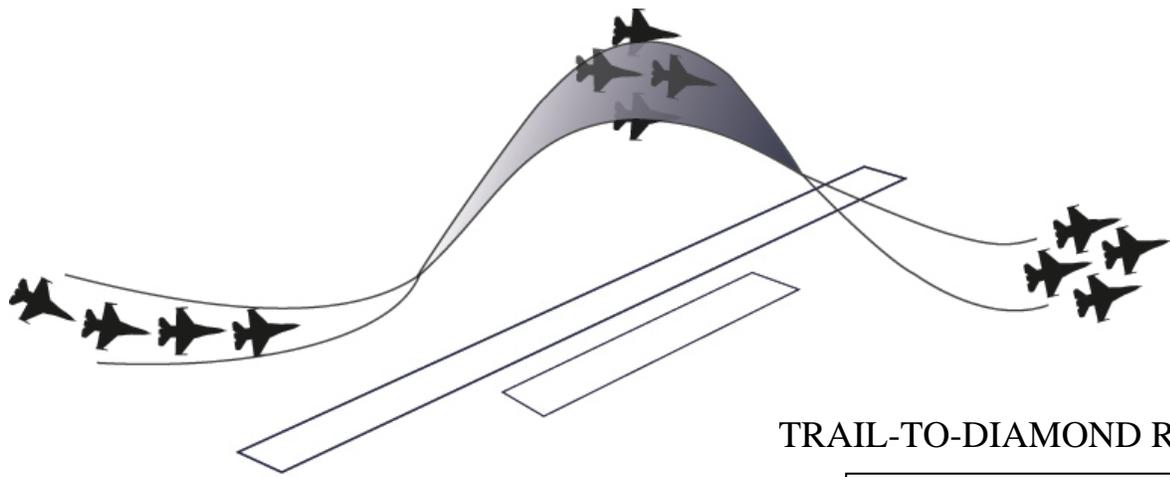
200' AGL MINIMUM



OPPOSING SPLIT-S

1200' -1500' FROM CROWD

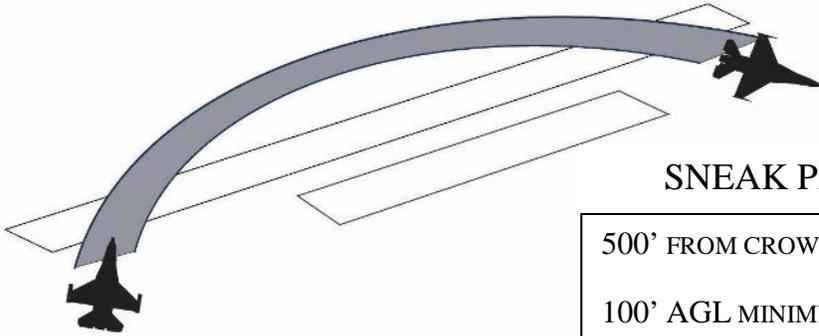
100' AGL MINIMUM



TRAIL-TO-DIAMOND ROLL

1200' -1500' FROM CROWD

250' AGL MINIMUM

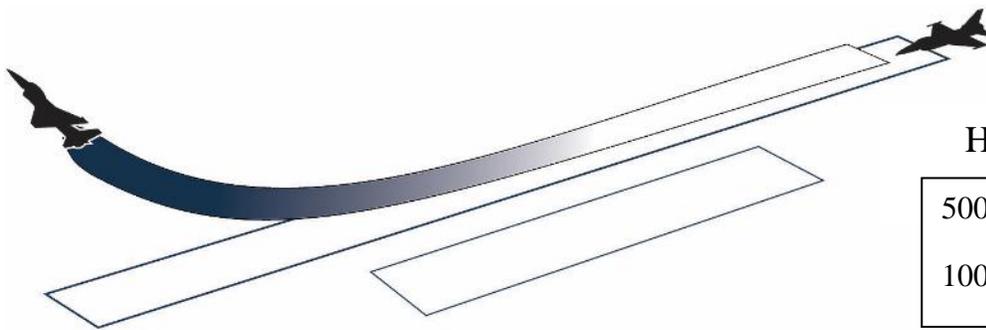


SNEAK PASS/AFTER BURNER ON

500' FROM CROWD

100' AGL MINIMUM (500' AGL OVER CROWD)

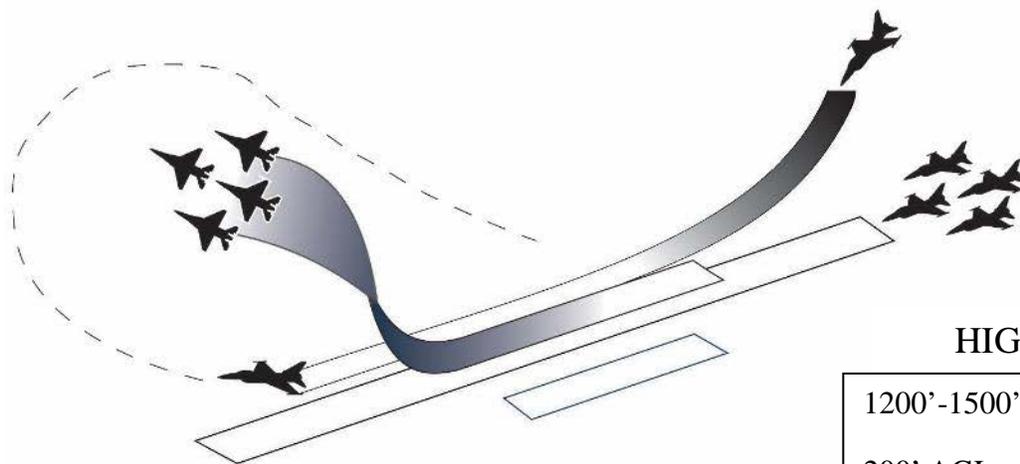
.94 MACH MAX



HIGH AOA PASS

500' FROM CROWD

100' AGL MINIMUM



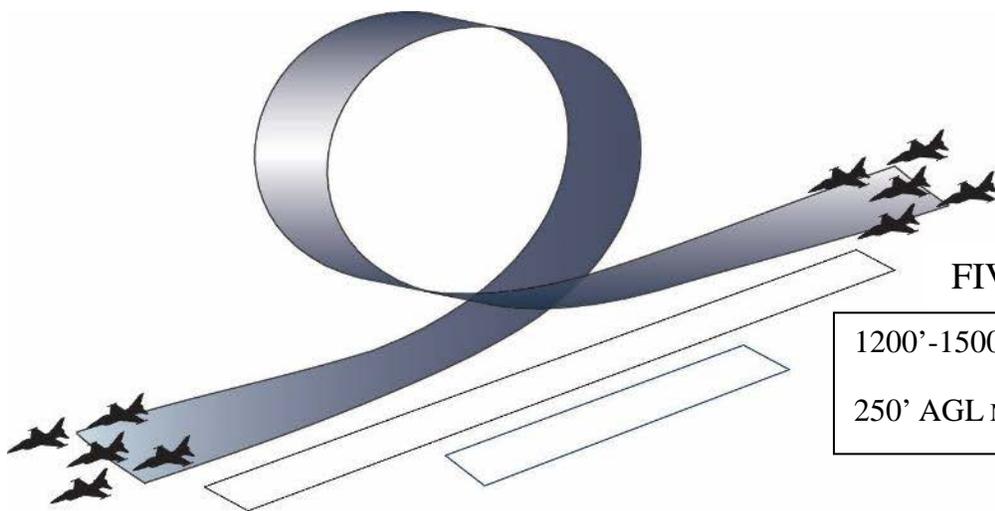
HIGH/LOW

1200' -1500' FROM CROWD

200' AGL MINIMUM

.94 Mach Max

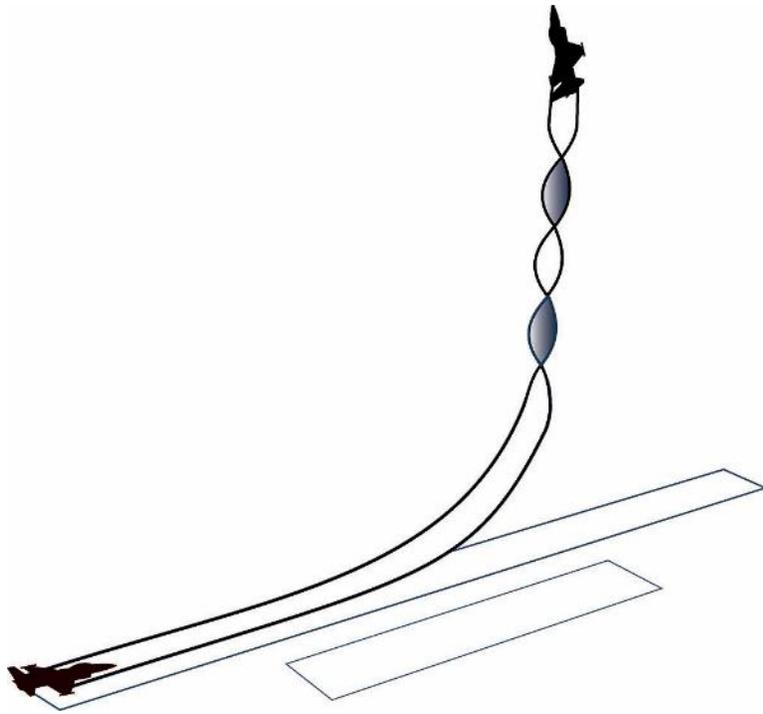
Post Pass, Solo Executes Half Cuban then rejoins with Diamond.



FIVE CARD LOOP

1200' -1500' FROM CROWD

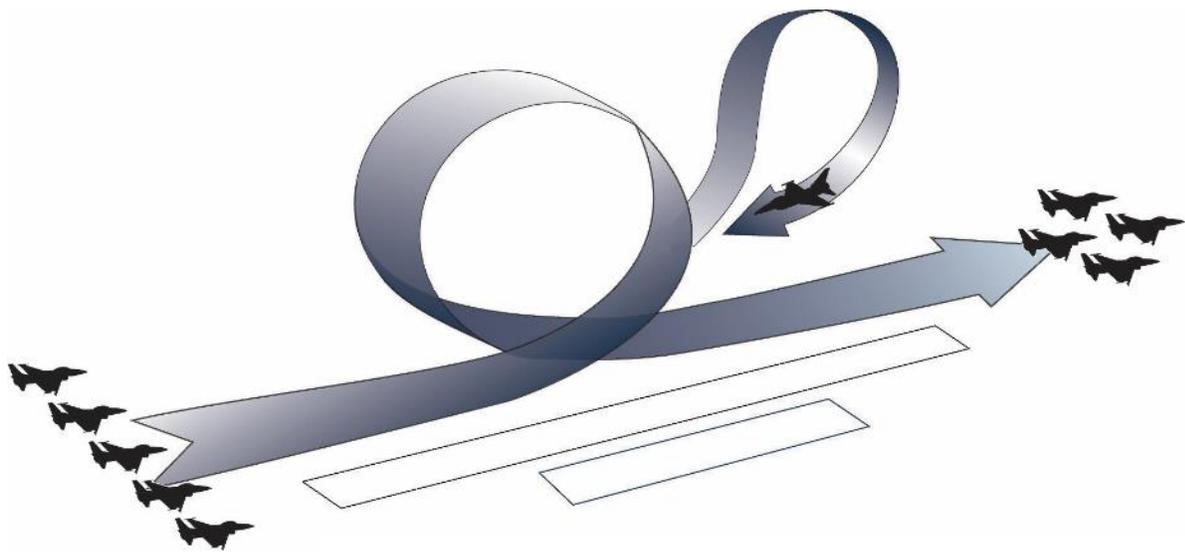
250' AGL MINIMUM



VERTICAL ROLLS

1200' -1500' FROM CROWD

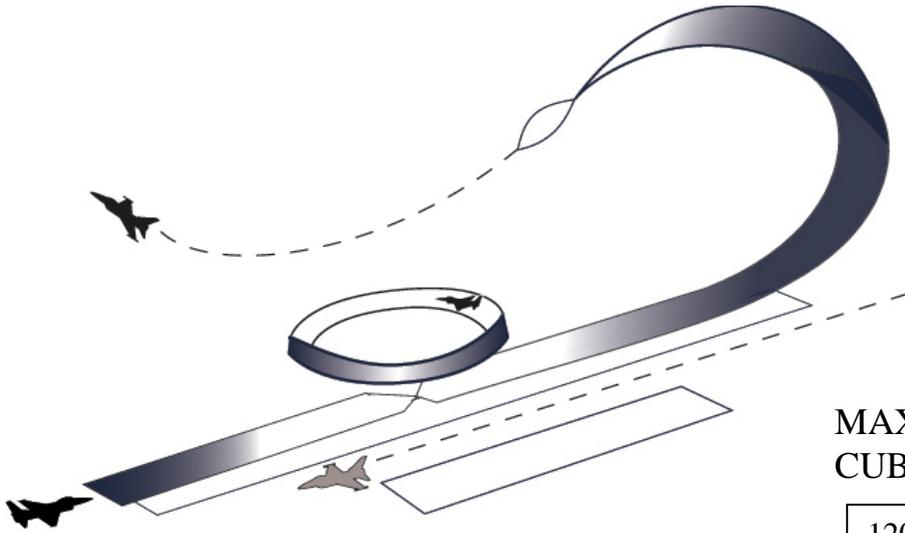
100' AGL MINIMUM



LINE ABREAST LOOP PLUS SOLO BREAKAWAY

1200' -1500' FROM CROWD

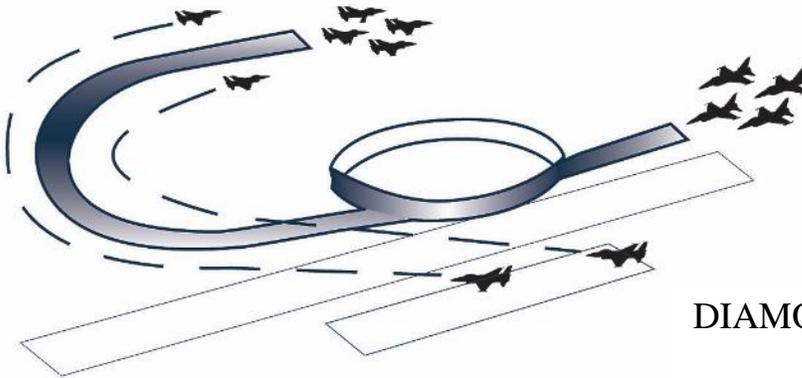
250' AGL MINIMUM



**MAX TURN WITH HALF
CUBAN EIGHT**

1200'-1500' FROM CROWD

100' AGL MINIMUM

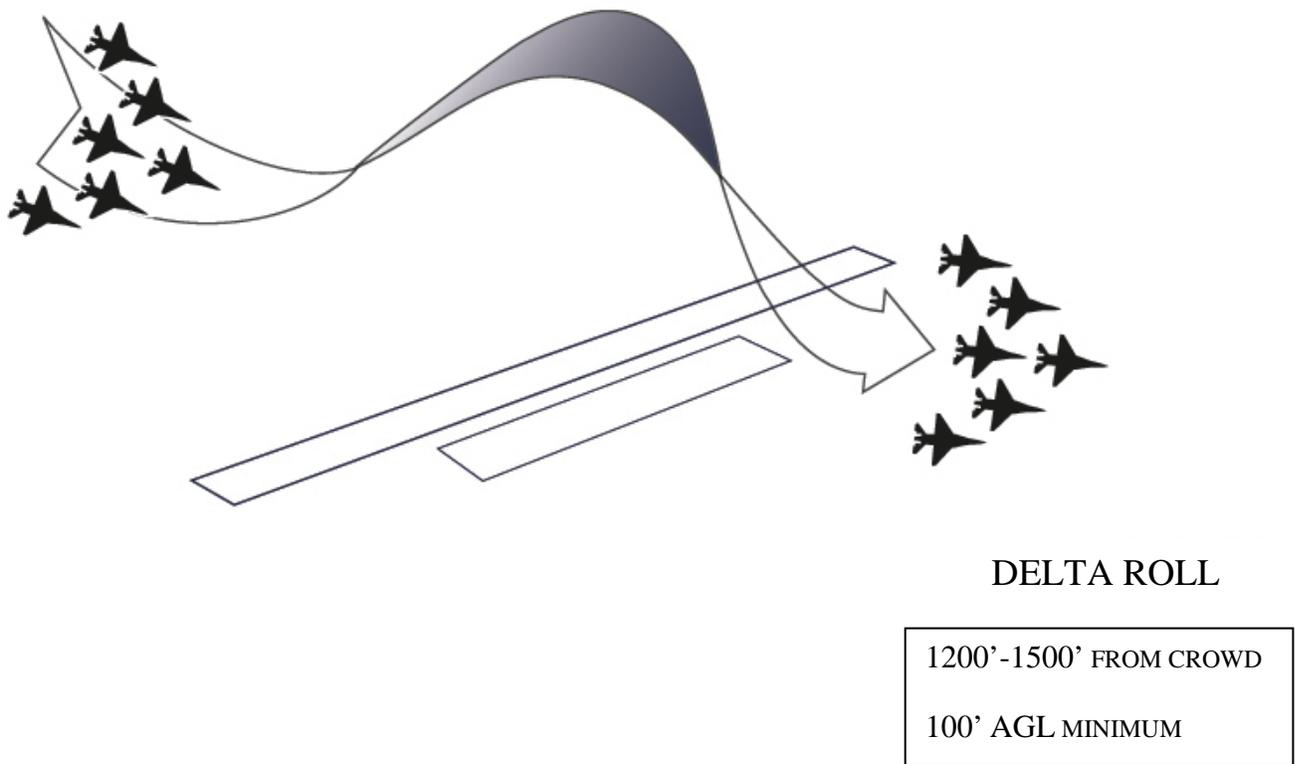
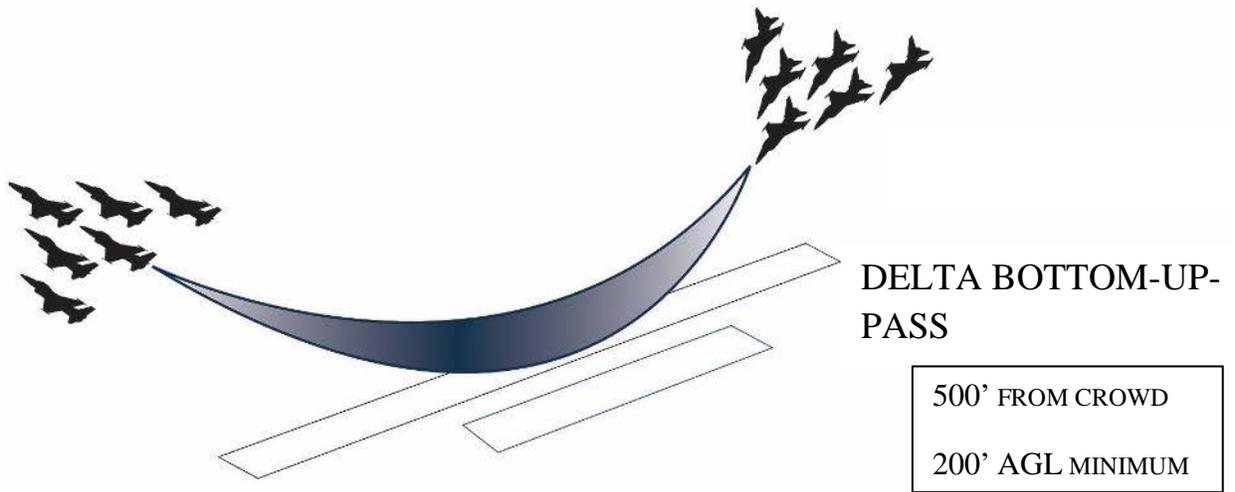


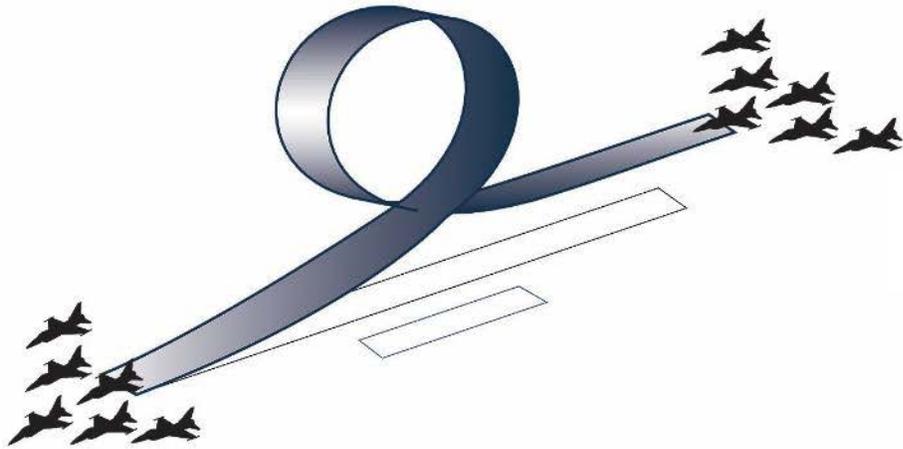
**DIAMOND 360 SOLO REJOIN
(Afterburner on)**

1200'-1500' FROM CROWD

DIAMOND 200' AGL MINIMUM

SOLOS 500' OVER CROWD

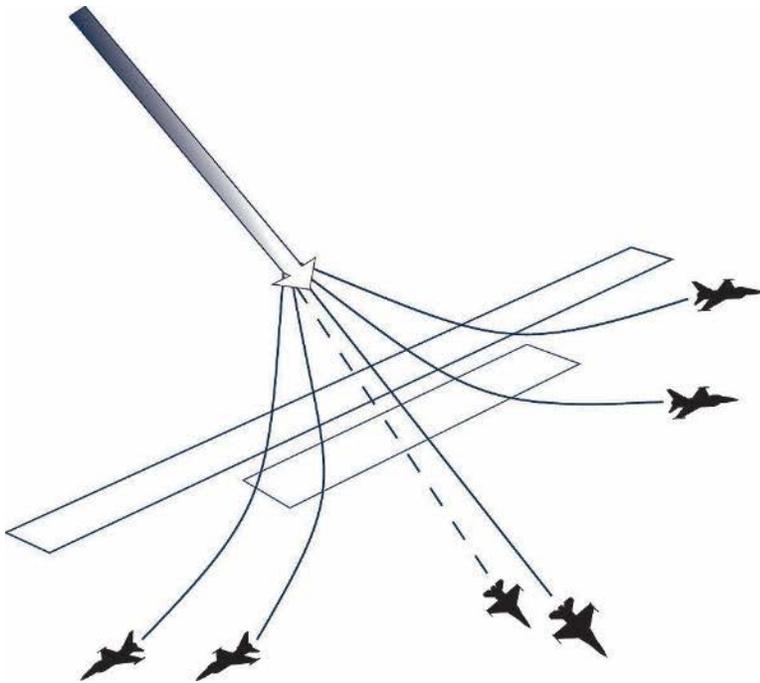




DELTA LOOP

1200' - 1500' FROM CROWD

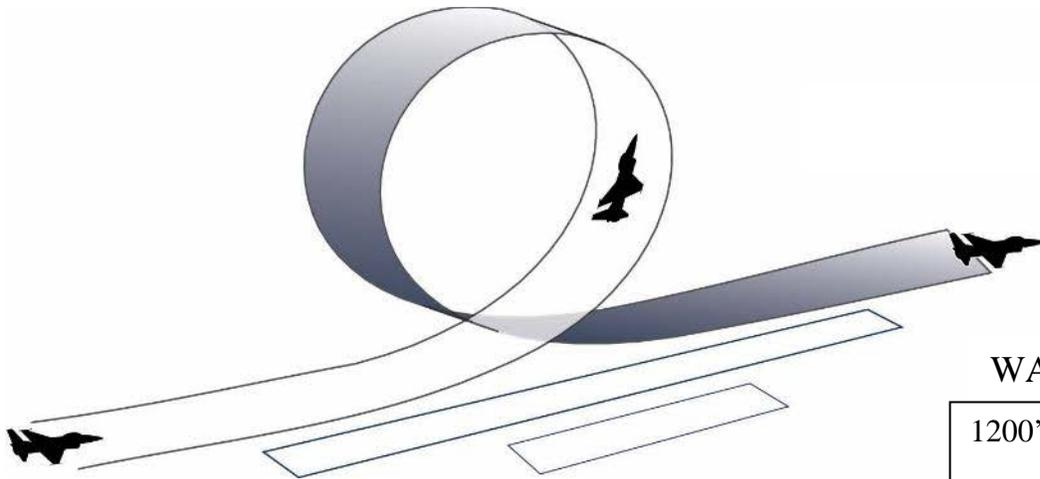
200' AGL MINIMUM



DELTA BURST

WINGS LEVEL

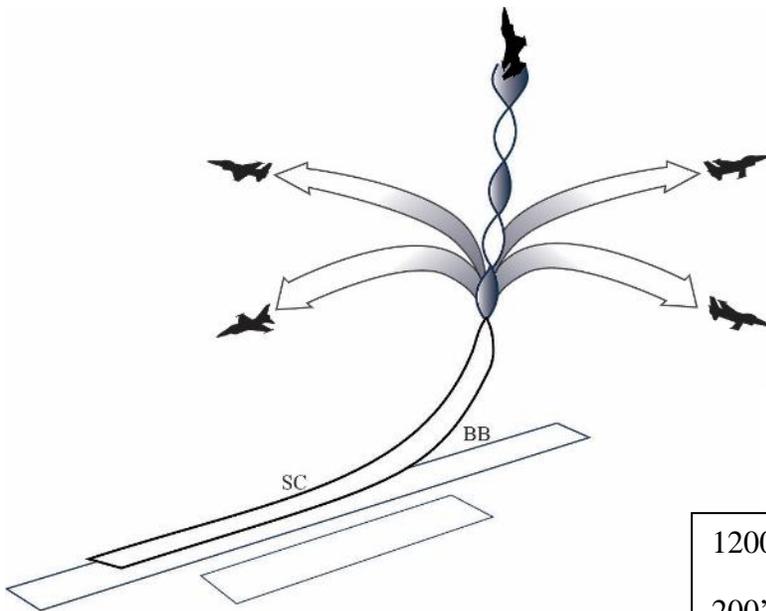
500' OVER THE CROWD



WARRIOR LOOP

1200'-1500' FROM CROWD

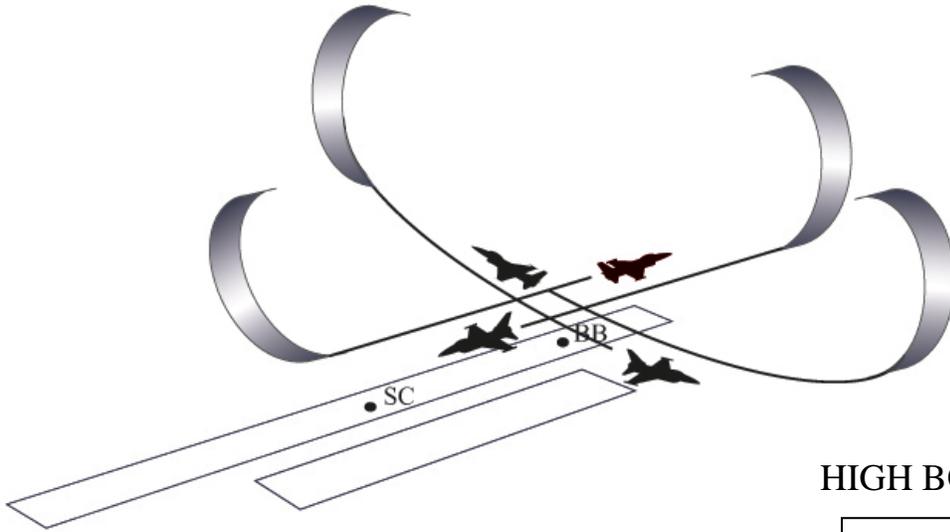
100' AGL MINIMUM



**HIGH BOMB BURST WITH SOLO
HIT TO VERTICAL ROLLS**

1200'-1500' FROM CROWD SC – SHOW CENTER

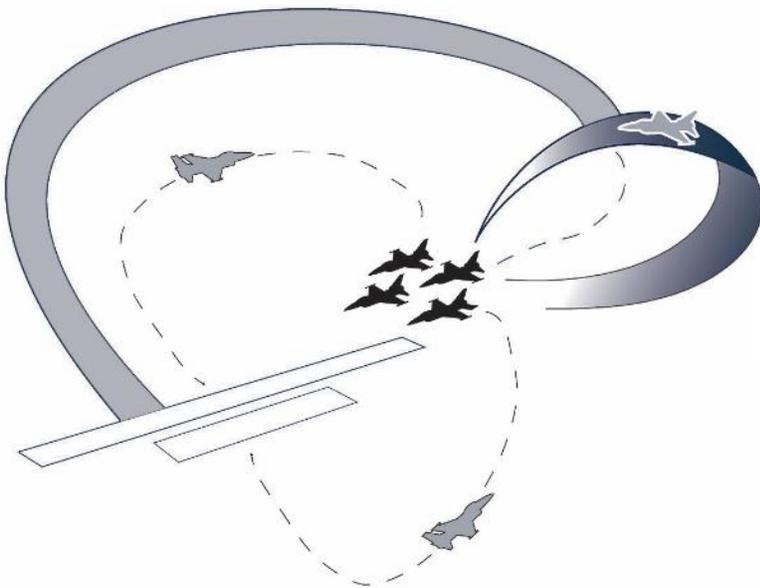
200' AGL MINIMUM BB – BOMB BURST



HIGH BOMB BURST CROSS

1200-1500' FROM CROWD

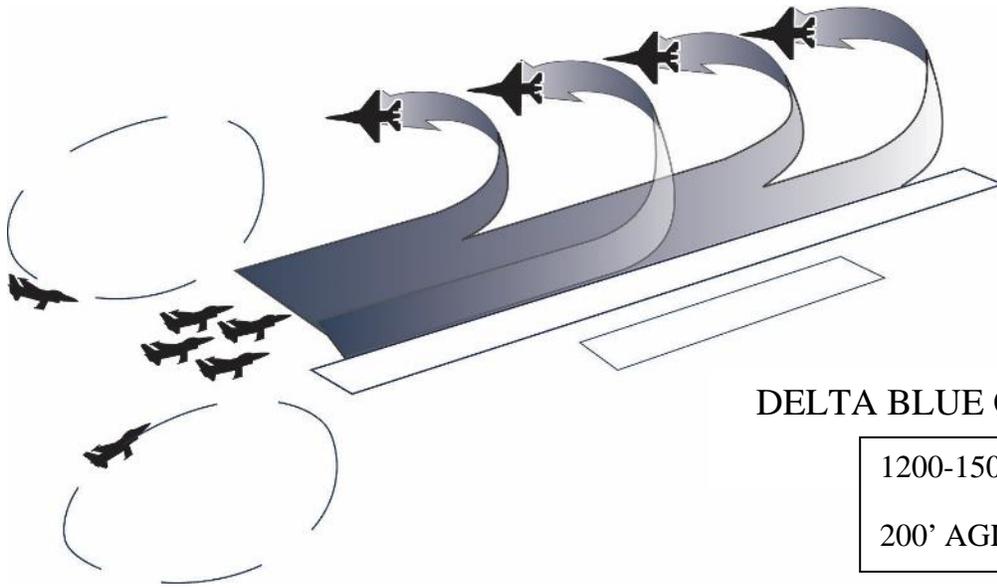
200' AGL MINIMUM



HIGH BOMB BURST REJOIN

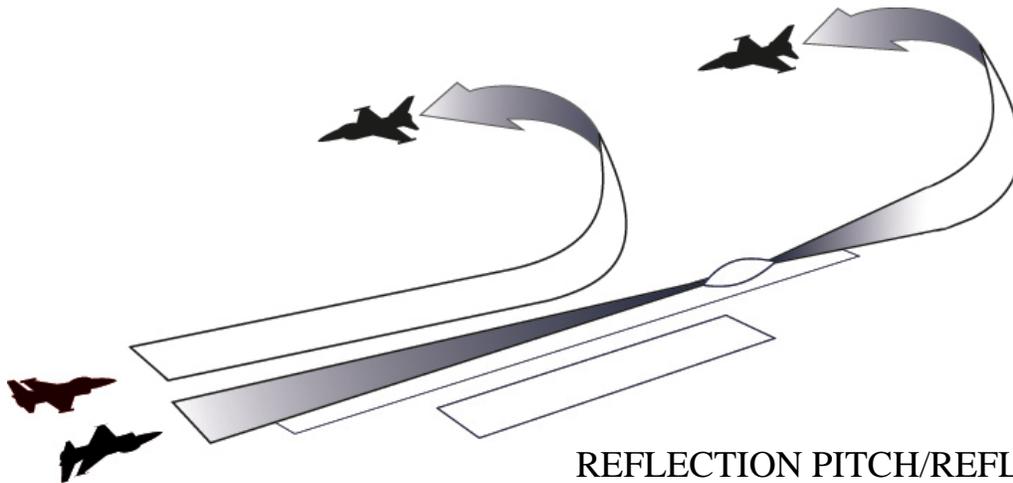
1200-1500' FROM CROWD

300' AGL MINIMUM



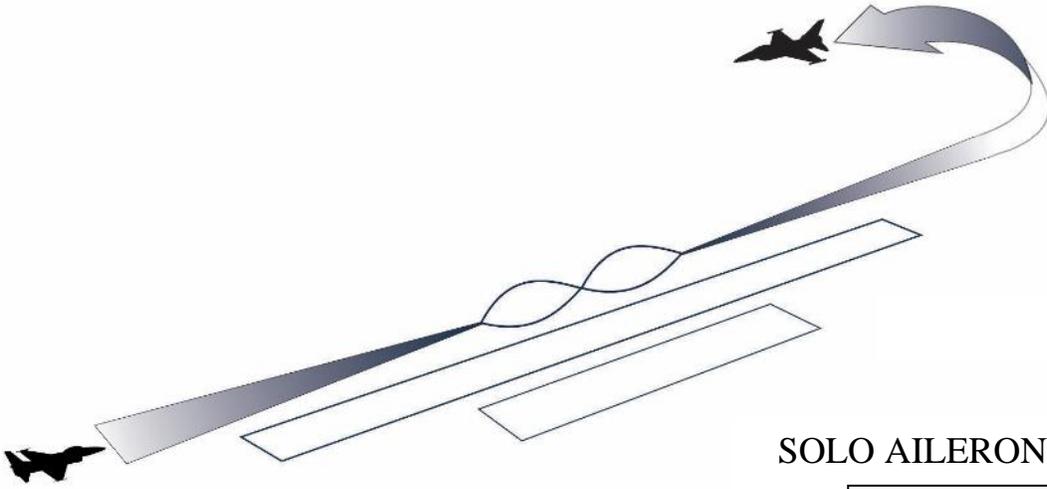
DELTA BLUE OUT PITCH-UP

1200-1500' FROM CROWD
200' AGL MINIMUM



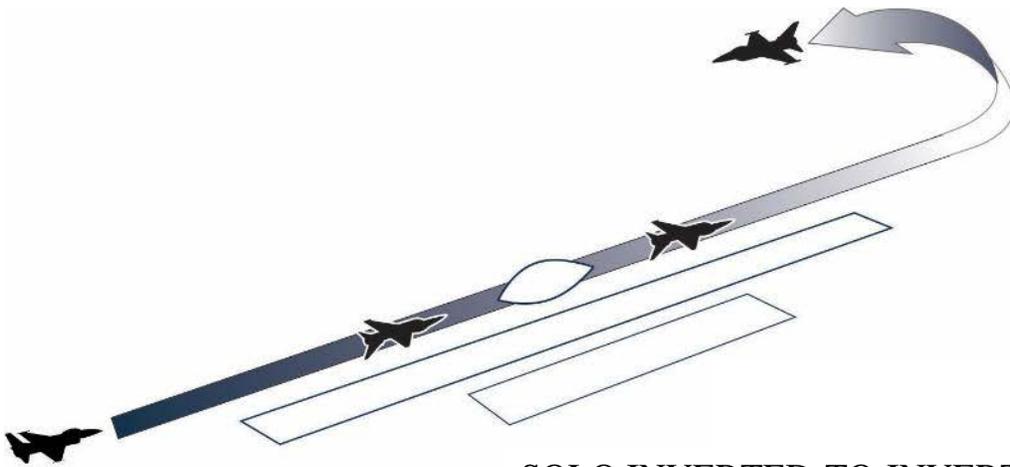
REFLECTION PITCH/REFLECTION PASS

1200-1500' FROM CROWD
100' AGL MINIMUM



SOLO AILERON PITCH-UP

1200-1500' FROM CROWD
100' AGL MINIMUM



SOLO INVERTED-TO-INVERTED PITCH-UP

1200-1500' FROM CROWD
100' AGL MINIMUM

Section II

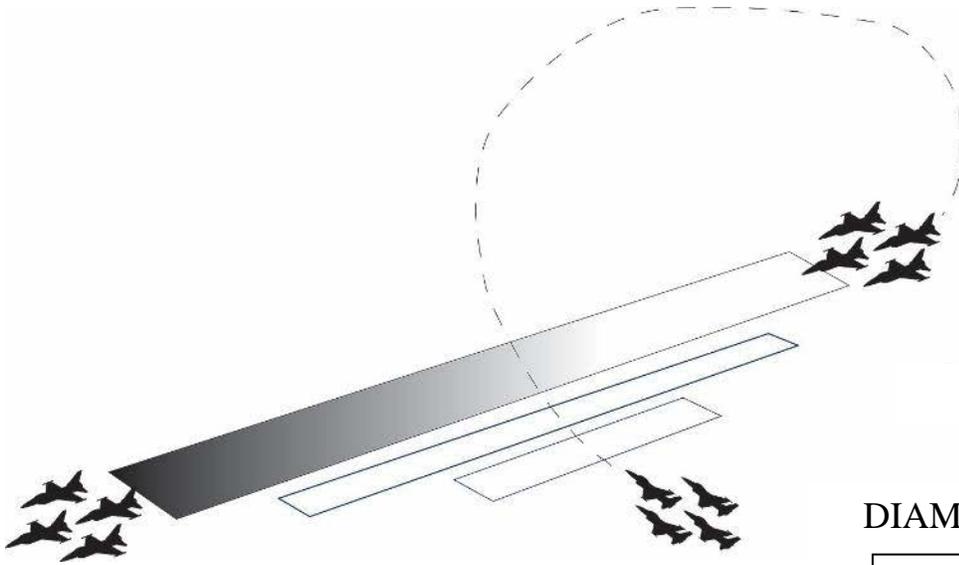
THUNDERBIRD 2020 LOW SHOW

WEATHER 3500' AND 5 MILES VISIBILITY

Many of the maneuvers featured in the low show have already been presented in the previous pages. The maneuvers that are unique to the low show are viewed on the following pages.

6-SHIP		5-SHIP (Left Solo)		5-SHIP (Right Solo)	
Diamond Takeoff		Diamond Takeoff		Diamond Takeoff	
(LS) Roll on Takeoff					
(RS) Max Climb / Split S		(LS) Roll on Takeoff		(RS) Maximum Climb/Split-S	
Low Opener	↑←	Low Opener	↑←	Low Opener	↑←
Opposing Knife Edge	→←	4-Point	→	4-Point	→
Trail to Diamond BUP	⇒	Trail to Diamond BUP	⇒	Trail to Diamond BUP	⇒
Opposing Inverted	→←	Inverted	←	Inverted	←
Diamond PIR (Ops √)	←	Diamond PIR (Ops √)	←	Diamond PIR (Ops √)	←
(LS) Knife Edge	→	Knife Edge	→	Knife Edge	→
(RS) Slow Roll	←	Diamond Roll	⇒	Diamond Roll	⇒
Diamond Roll	⇒	High Alpha Pass	←	Slow Roll	←
(LS) 8- Point	←	Diamond BUP	←	Diamond BUP	←
(RS) Aileron Rolls	→	Aileron Rolls	→	Aileron Rolls	→
Diamond BUP	←	Arrowhead Roll	⇒	Arrowhead Roll	⇒
Calypso Pass	←	8-Point	←	8-Point	←
Arrowhead Roll	⇒	Bon Ton Roule	←	Bon Ton Roule	←
Cross Over Break	←↑ →	Max Turn 1/2 Cuban	→ ←	Max Turn	→
Bon Ton Roule	←	Trail to Diamond Roll	⇒	Trail to Diamond Roll	⇒
Opposing – Split S	→←	Sneak Pass	→	Sneak Pass	→
Trail to Diamond Roll	⇒	High/Low Pass (L.T.) (Ops √)	←	High/Low Pass (L.T.) (Ops √)	←
(RS) Sneak Pass	→	Solo Hit	←	Solo Hit	←
(LS) High Alpha Pass	←	Inverted-to-Inverted	→	Inverted-to-Inverted	→

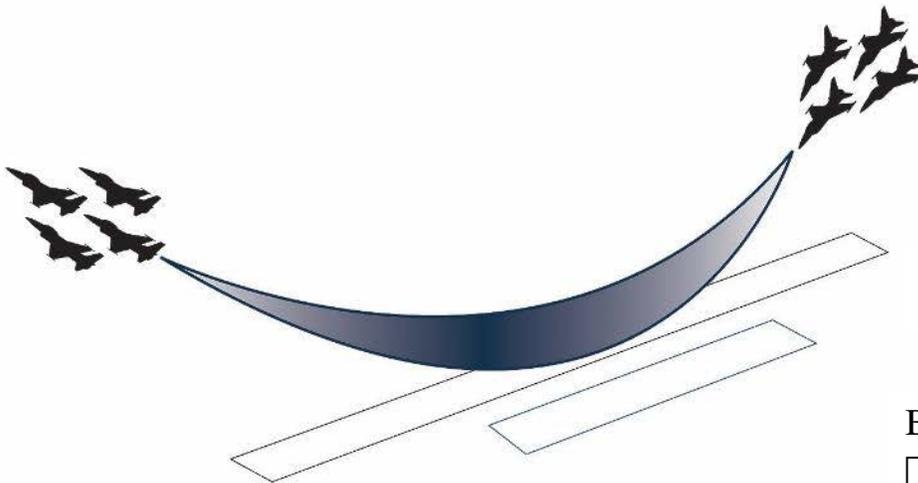
High/Low Pass (L.T.) (Ops √)	←	Echelon PIR	⇒	Echelon PIR	⇒
(RS) Solo Hit	←	Sneak Pass	→	Sneak Pass	→
(LS) Max Turn 1/2 Cuban	→←←	Diamond 360°	←	Diamond 360°	←
Echelon PIR	⇒	Solo Rejoin	↑	Solo Rejoin	↑
(RS) Sneak Pass	→	Stinger BUP	←	Stinger BUP	←
(LS) 4 Point	←	Stinger Roll	⇒	Stinger Roll	⇒
Diamond 360°	←	Low Bomb Burst	↓	Low Bomb Burst	↓
Solo Rejoin to Delta	↑	Diamond Closer	↓	Diamond Closer	↓
Delta BUP	←	Thunderbird Diamond Pitch		Thunderbird Diamond Pitch	
Delta Roll	⇒	(LS) Aileron Roll Pitch Up		(RS)Inverted to Inverted Pitch	
Low Bomb Burst	↓				
Reflection Pitch – No Pitch	→				
Diamond Closer	↓				
Delta Blue Out Pitch Up					
(LS) Aileron Roll Pitch Up					
(RS) Inverted to Inverted Pitch					



DIAMOND FLAT PASS

1200-1500' FROM CROWD

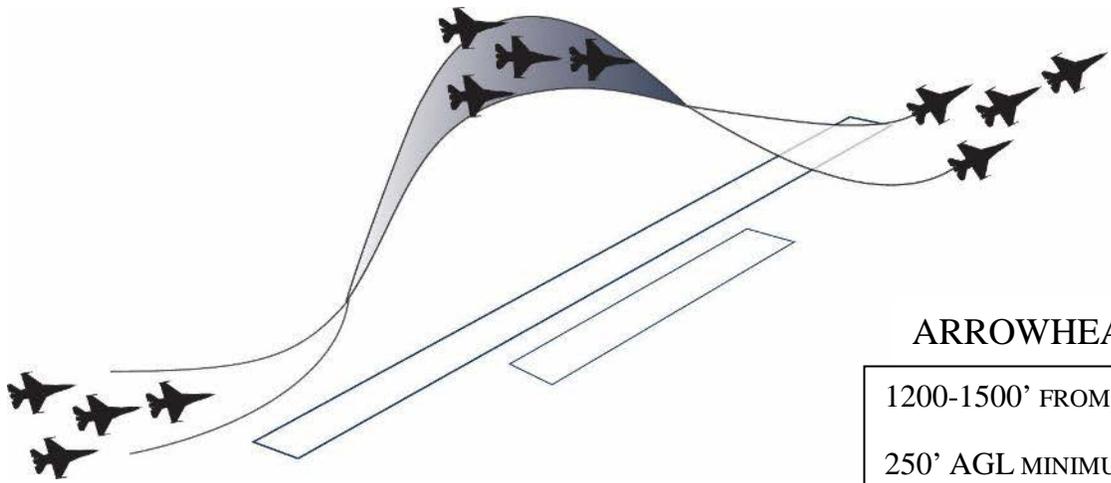
200' AGL MINIMUM



BOTTOM-UP-PASS

500' FROM CROWD

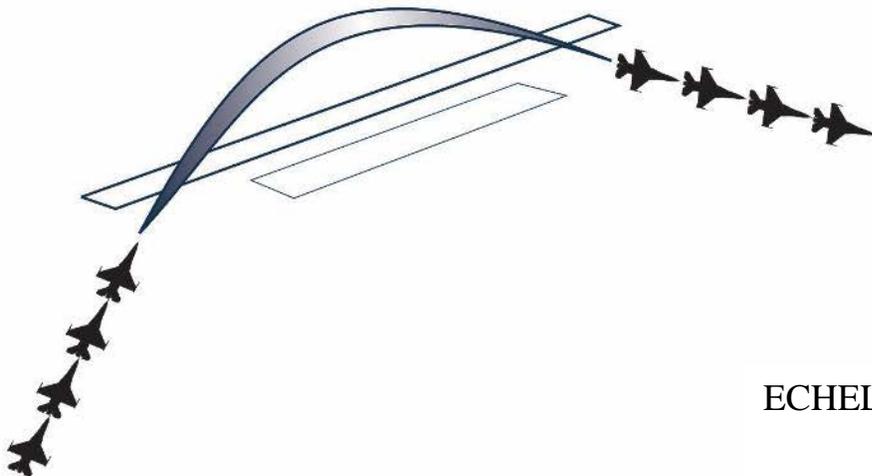
200' AGL MINIMUM



ARROWHEAD ROLL

1200-1500' FROM CROWD

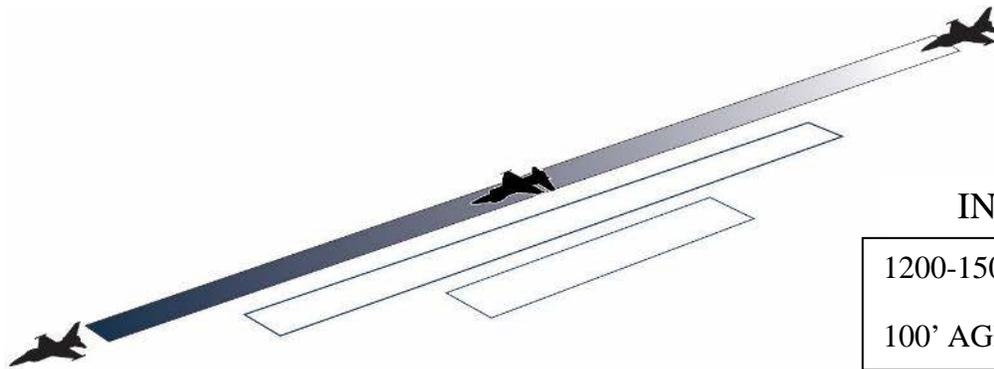
250' AGL MINIMUM



ECHELON PASS-IN-REVIEW

500' FROM CROWD

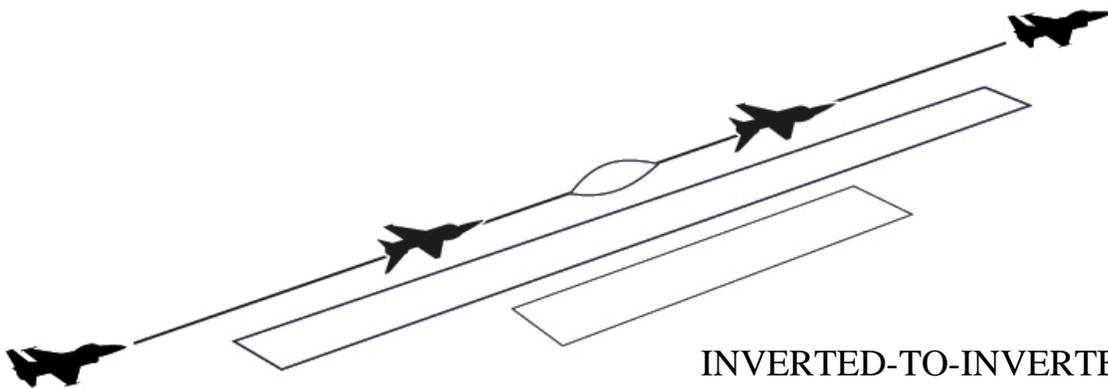
200' AGL MINIMUM



INVERTED PASS

1200-1500' FROM CROWD

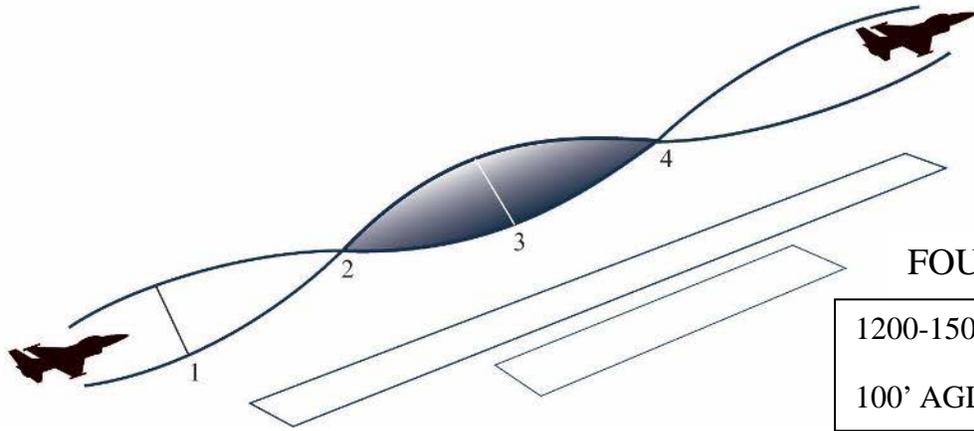
100' AGL MINIMUM



INVERTED-TO-INVERTED PASS

1200-1500' FROM CROWD

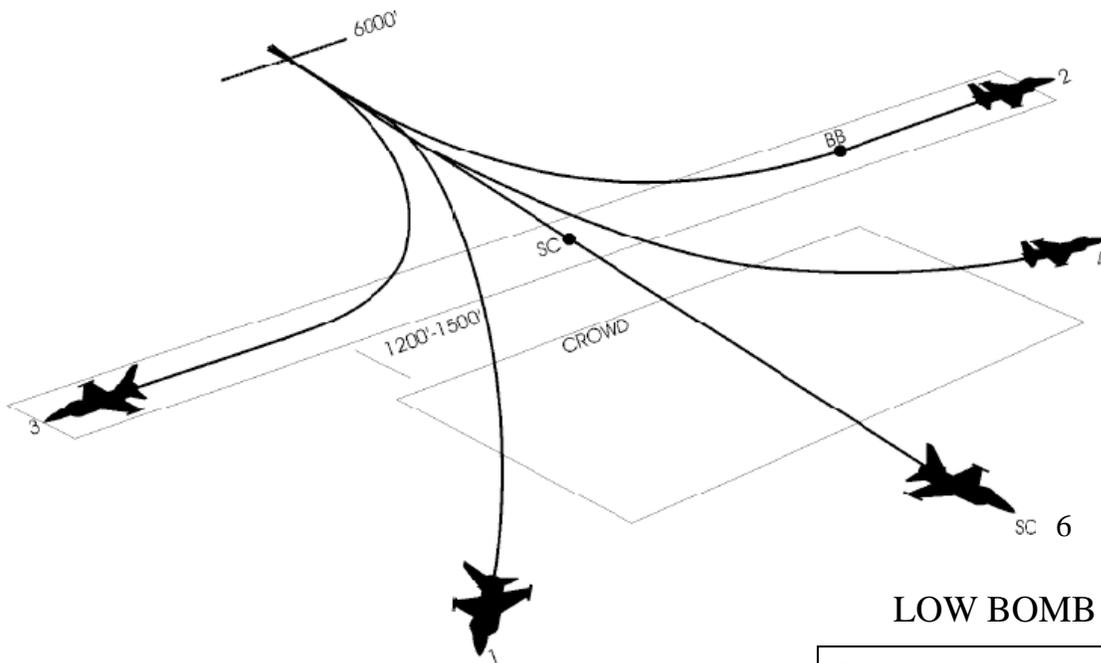
100' AGL MINIMUM



FOUR POINT ROLL

1200-1500' FROM CROWD

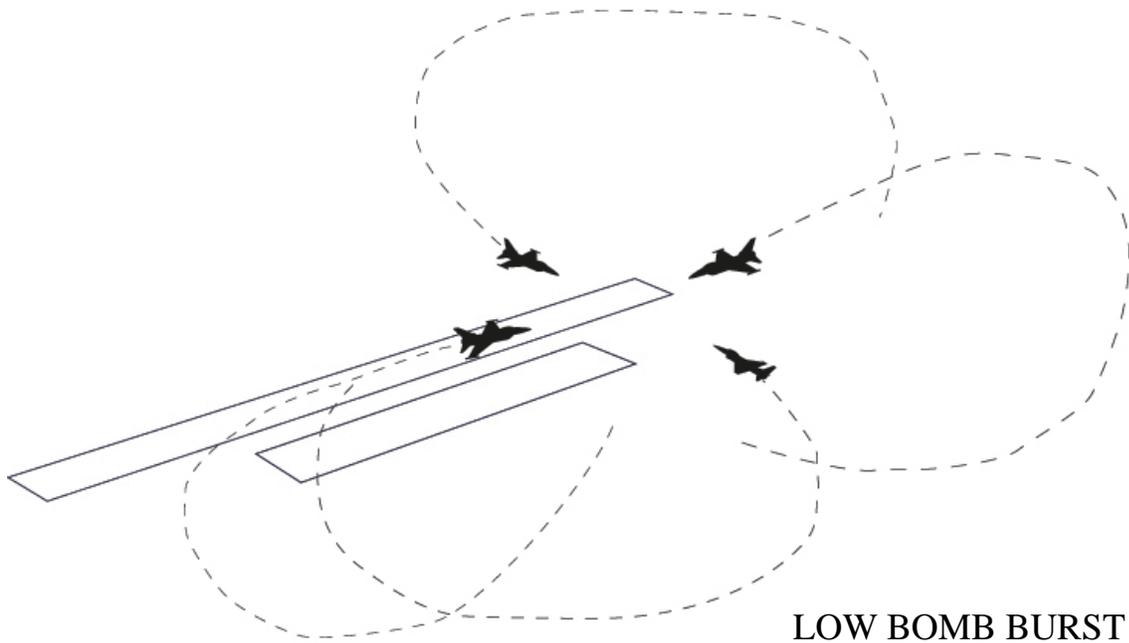
100' AGL MINIMUM



LOW BOMB BURST

WINGS LEVEL OVER CROWD

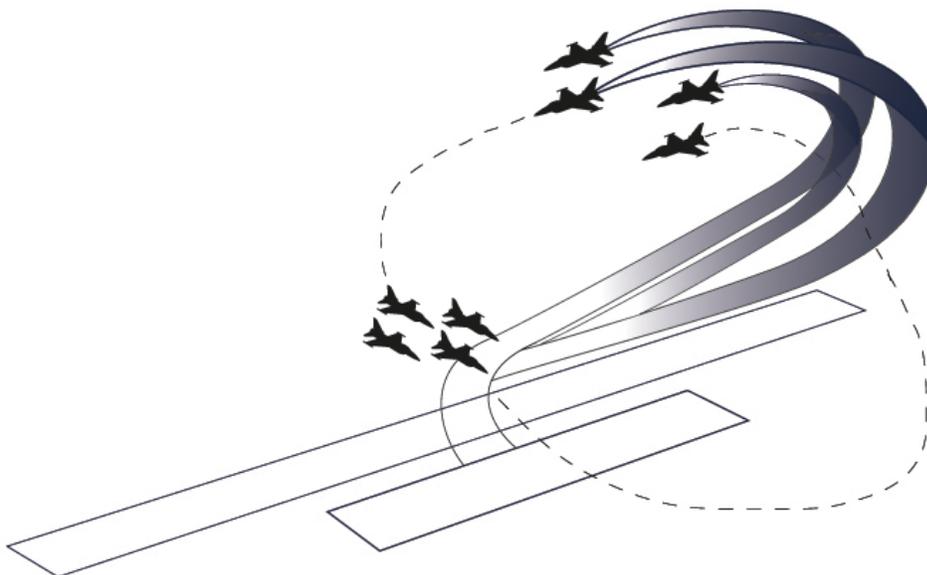
500' AGL MINIMUM



LOW BOMB BURST CROSS

500' FROM CROWD OVER BB

100' AGL MINIMUM



**LOW BOMB BURST
REJOIN**

WINGS LEVEL OVER CROWD

500' AGL MINIMUM

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Section III

THUNDERBIRD 2020 FLAT SHOW

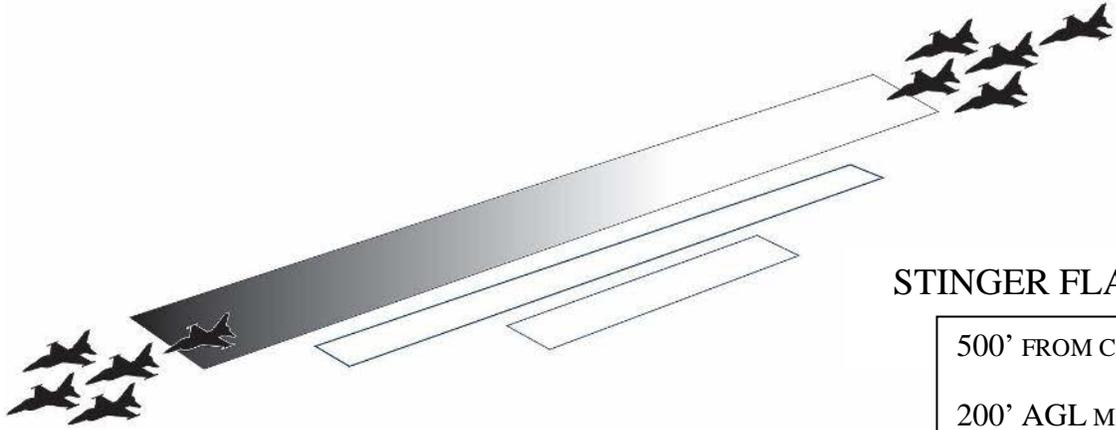
WEATHER 2000' AND 5 MILES VISIBILITY

WAIVER DOWN TO 1500' AND 5 MILES VISIBILITY BY 57 WG/CC or USAFWC/CC

The maneuvers that are unique to the flat show and all additional maneuvers available to the team are presented on the following pages.

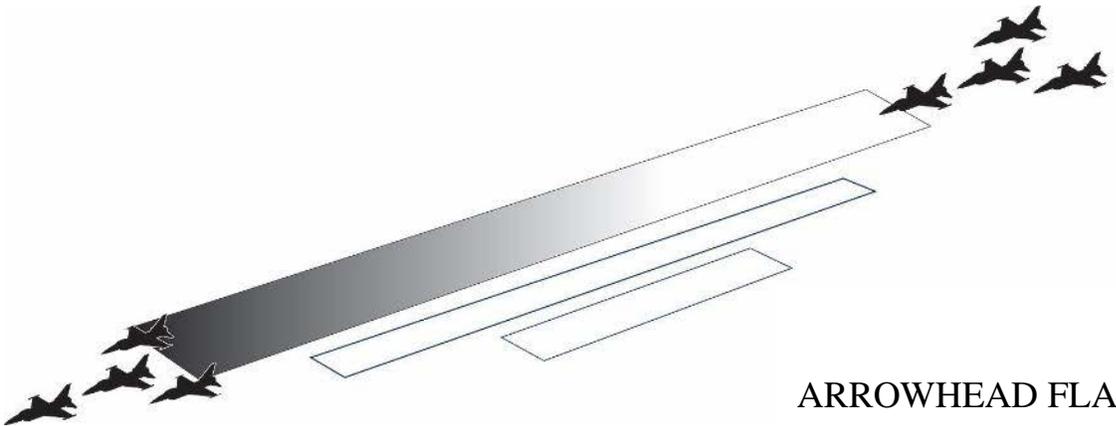
6-SHIP	5-SHIP (Left Solo)	5-SHIP (Right Solo)
Diamond Takeoff	Diamond Takeoff	Diamond Takeoff
(LS) Roll on Takeoff		
(RS) Low Transition Takeoff	(LS) Roll on Takeoff	(RS) Low Transition Takeoff
Flat Opener	↑← Flat Opener	↑← Flat Opener
Opposing Knife Edge	→← 4 - Point	→ 4 - Point
Trail to Diamond BUP	⇒ Trail to Diamond BUP	⇒ Trail to Diamond BUP
Opposing Inverted	← Inverted	← Inverted
Diamond PIR (Ops √)	← Diamond PIR (Ops √)	← Diamond PIR (Ops √)
(LS) Knife Edge	→ Knife Edge	→ Knife Edge
(RS) Slow Roll	← Line Abreast Flat Pass	⇒ Line Abreast Flat Pass
Line Abreast Flat Pass	⇒ High Alpha Pass	← Slow Roll
(LS) 8 - Point	← Diamond BUP	← Diamond BUP
(RS) Aileron Rolls	→ Aileron Rolls	→ Aileron Rolls
Diamond BUP	← Arrowhead BUP	⇒ Arrowhead BUP
Calypso Pass	← 8 - Point	← 8- Point
Arrowhead BUP	⇒ Bon Ton Roule (L.T.)	← Bon Ton Roule (L.T.)
Cross Over Break	←↑ → Inverted to Inverted	→ Inverted to Inverted
Bon Ton Roule (L.T.)	← Echelon PIR	⇒ Echelon PIR
Opposing 4 Point	→← Sneak Pass	→ Sneak Pass

Echelon PIR	⇒	High/Low Pass (Ops √)	⇐	High/Low Pass (Ops √)	⇐
(RS) Sneak Pass	→	Solo Hit	←	Solo Hit	←
(LS) High Alpha	←	Max Turn	→	Max Turn	→
High/Low Pass (Ops √)	⇐	Diamond 360°	⇐	Diamond 360°	⇐
(RS) Solo Hit	←	Solo Rejoin	↑	Solo Rejoin	↑
(LS) Max Turn	→	Stinger BUP	⇐	Stinger BUP	⇐
(RS) Sneak Pass	→	Stinger Flat Pass	⇒	Stinger Flat Pass	⇒
Diamond 360°	⇐	Stinger Closer	⇓	Stinger Closer	⇓
Solo Rejoin to Delta	↑	Low BB		Low BB	
Delta BUP	⇐	TBird Diamond Closer		TBird Diamond Closer	
Delta Flat Pass **	⇒	Thunderbird Diamond Pitch		Thunderbird Diamond Pitch	
Delta Closer	⇓	(LS) Aileron Roll Pitch Up		(RS) Inverted to Inverted Pitch	
Delta Blue Out Pitch Up					
(LS) Aileron Roll Pitch Up					
(RS) Inverted to Inverted Pitch					
** Blue Out					
** Reflection Pitch					
** Low BB					
** Thunderbird Diamond Pitch					
** Allows for a low BB ensuring safety/deconfliction. Solos land prior to the low BB.					



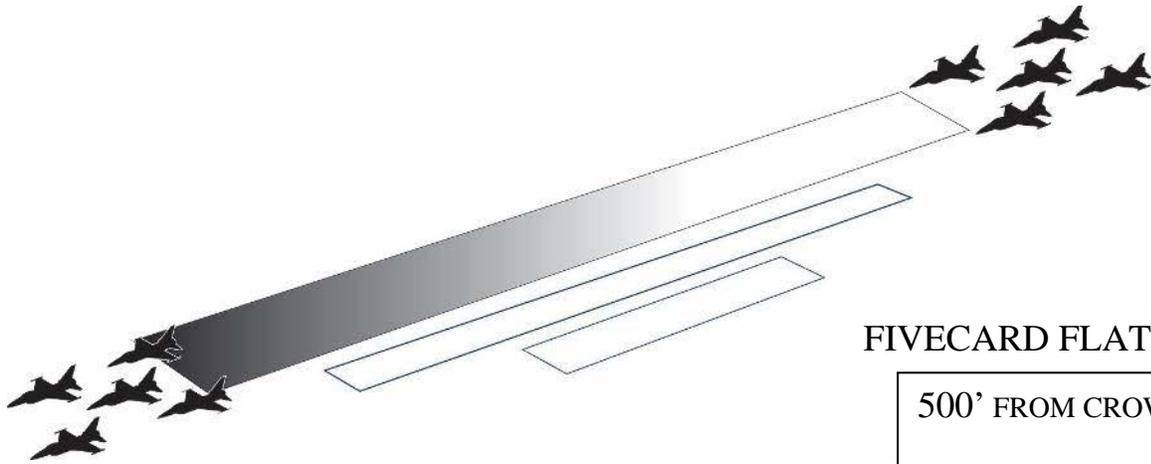
STINGER FLAT PASS

500' FROM CROWD
200' AGL MINIMUM



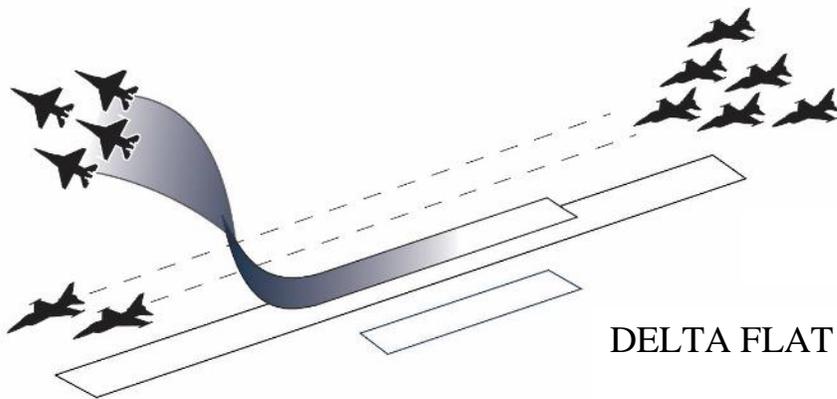
ARROWHEAD FLAT PASS

500' FROM CROWD
200' AGL MINIMUM



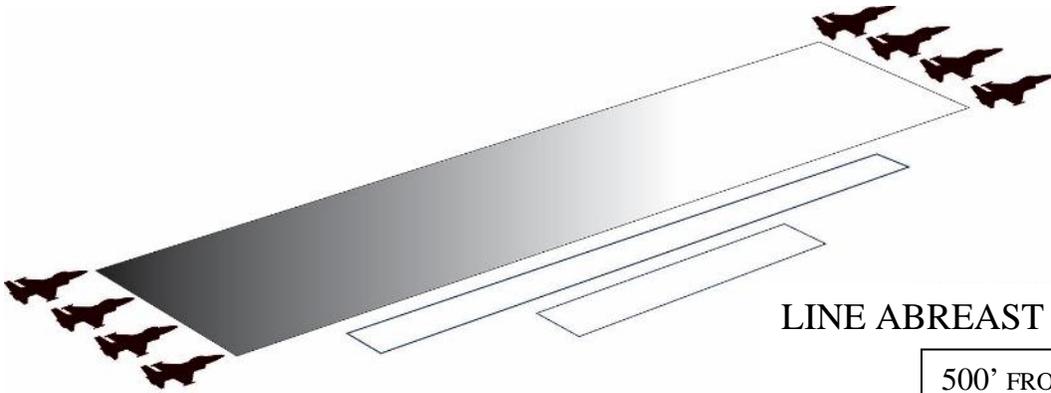
FIVECARD FLAT PASS

500' FROM CROWD
200' AGL MINIMUM



DELTA FLAT PASS WITH BLUEOUT

500' FROM CROWD
200' AGL MINIMUM



LINE ABREAST FLAT PASS

500' FROM CROWD
200' AGL MINIMUM



DIAMOND FLAT PASS

500' FROM CROWD
200' AGL MINIMUM

Section IV

Typical show site airfield layout:

