HQ Air Force Safety

F-15 Safety Review

This briefing is for safety and mishap prevention purposes for the F-15 TCP and SSG Data as of 30 Sep 2024

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Controlled Unclassified Information (CUI)

Increase Combat Power through Risk Management, Training, and Analysis



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- USAF Mishap Event Types, Classification, Categories
- USAF Mishap Stats
- F-15 Mishap/Event Stats/History
- F-15 Open Recommendations
- F-15 Physiological Symptom and Cabin Pressure Loss Data
- F-15 Ejection Data





Organizational Overview





Investigation Event Types

- Mishap
 - Mandatory Investigation/Report Class A thru E criteria
 - Some class E's are voluntary
- Hazard
 - Mandatory Investigation/Report when: No injury or damage but meet disciplinespecific reporting criteria (AFMAN91-223)
 - Voluntary Investigation/Report when: Observation of real or potential condition can cause occupational illness, injury, and/or damage (Includes proactive safety reporting)
- Nuclear Surety
- Incident Workplace violence, voluntary off-duty
- Safety Study aggregate

Mishap Classifications

- Class A: ≥ \$2.5 Million Damage
 - Fatality(s) / Perm Total Disability
 - Destroyed / Damaged Beyond Economical Repair
- Class B: ≥ \$600,000 to < \$2.5 Million
 - Permanent Partial Disability
 - 3 or More Persons Hospitalized
- Class C: ≥ \$60,000 to < \$600,000
 - Lost workday/work time due to Injury
- Class D: ≥ \$25,000 to < \$60,000
 - A recordable injury or illness not otherwise classified as a Class A, B, or C mishap
- Class E: > \$0 to < \$25,000 Voluntary, unless required by AFMAN91-223</p>



Mishap Categories

- Aircraft Flight: is any mishap in which there is <u>intent</u> for flight and reportable damage to a DoD aircraft (rate producing)
- Aircraft Flight-related: is any mishap in which there is <u>intent</u> for flight and no reportable damage to the DoD aircraft itself, but the mishap involves a fatality, reportable injury, or reportable property damage
- Aircraft Ground Operations: A mishap that involves DoD aircraft with no intent for flight that result in reportable damage to DoD aircraft, injury, or fatality.

Unless specifically noted otherwise, only Aviation "Flight" category mishaps are used for calculating mishap rates



At a Glance

10 Years at a Glance (2015 - 2024)

526 lives lost in Air Force mishaps, One Death every 7 days

163 manned class A flight mishaps, One every 22 days63 manned aircraft destroyed, One every 58 days

85 RPA class A mishaps, One every 43 days 115 RPAs destroyed, One every 32 days

\$12.1 Billion in total mishap costs, **\$3.32** Million per day

CAO 21 Oct 24



Controlled Unclassified Information (CUI) Class A Misnaps: Manned Aviation FY14 – FY24 (thru 30 Sep)





Controlled Unclassified Information (CUI) **Misnap Fatalities: Aviation FY14 – FY24 (thru 30 Sep)**



Destroyed Aircraft FY14 – FY24 (thru 30 Sep)

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Controlled Unclassified Information (CUII) Class A Manned Aviation Mishap Detail FY24 (thru 30 Sep)

Mishap Date	MDS	Fatalities	Destroyed Aircraft	One-liner
15 Sep 2024	F-22A	0	0	GEAR MALFUNCTION; GEAR UP LANDING; NO INJURIES
21 Aug 2024	KC-46	0	0	KC-46A REFUELING MISSION; A PORTION OF THE BOOM LIBERATED IN-FLIGHT; BOOM/FUSELAGE DAMAGED; LANDED WITH REMAINING BOOM IN TRAIL, NO INJURIES
19 Aug 2024	F-22	0	0	F-22A SORTIE; LIGHTNING STRIKE IN FLIGHT; EXTENSIVE AIRCRAFT DAMAGE; DIVERT TO SEYMOUR JOHNSON, NO INJURIES
23 Jul 2024	C-17	0	0	C17 departure; audible loud noise accompanied by uncommanded shut down; #2 engine failed; emergency engine shutdown/aircraft RTB
03 Jul 2024	F-35	0	0	F-35A; ENGINE FOD DAMAGE DUE TO BIRD STRIKE; ENGINE/INLET DAMAGED; NO INJURIES
13 May 2024	T-6	1	0	T-6; REAR COCKPIT EJECTION DURING TAXI; SIGNIFICANT AIRCRAFT DAMAGE; REAR COCKPIT PILOT FATAL
30 Apr 2024	F-16	0	1	F-16C INITIAL TAKEOFF; LOSS OF POWER; ACFT DESTROYED; MINOR INJURIES TO PILOT
03 Apr 2024	H-1	0	0	TH-1H; Dynamic rollover occurred during TH-1H helicopter slope operations; Aircraft damaged, crew egressed; Minor injuries
20 Mar 2024	F-16	0	0	F-16C; DEPARTED RUNWAY ON LANDING; AIRCRAFT DAMAGED; PILOT SAFELY EGRESSED AIRCRAFT
15 Mar 2024	F-22	1	0	F-22A weapons rail operational checks; rail closed on maintenance personnel; severe injury; One Fatality
23 Feb 2024	B-52	0	0	B-52H; ENGINE FIRE; AIRCRAFT DAMAGED; LANDED SAFELY, NON-LIFE-THREATENING INJURIES
02 Feb 2024	C-17	0	0	C-17A; LEVEL FLIGHT AT FL370, LOST OIL QUANTITY FOR ENG#3; UNKNOWN DAMAGE; PRECAUTIONARY SHUTDOWN, RTB'D, NO INJURIES
31 Jan 2024	F-16	0	1	F-16C TRAINING SORTIE; PILOT EJECTED; ACFT DESTROYED; NO INJURIES
17 Jan 2024	C-130	0	0	During 3-engine go-around; three engines and propellers were over-torqued; no injuries; engines and props condemned
04 Jan 2024	B-1	0	1	B-1B ON APPROACH; IMPACTED TERRAIN SHORT OF RUNWAY, CREW EJECTED; AIRCRAFT DESTROYED; CREW RECOVERED WITH INJURIES
11 Dec 2023	F-16	0	1	F-16C Training Sortie; Pilot ejected; Minor injuries; Acft Destroyed
29 Nov 2023	V-22	8	1	CV-22B; IMPACTED WATER; AIRCRAFT DESTROYED; 8 FATALITIES
15 Nov 2023	C-17	0	0	C-17A Training sortie; Engine Failure on Departure; Turbine section damaged; Return to Base (RTB) OK, no injuries
30 Oct 2023	F-22	0	0	F-22A routine flight; Left shoulder ECS bay fire; ECS components and bay damaged; Landed safely/no injuries
19 Oct 2023	C-130	0	0	5796 enroute cruise; #3 engine overtemperature warning received; overtemp, ESP; Mishap Crew RTB with no injury

Increase Combat Power through Risk Management, Training, and Analysis



USAF Fighter Comparison Class A Flight Rates

MDS	NUMBER	RATE
A-10	107	1.85
F-35A	5	2.22
F-15	160	2.29
F-16	383	3.30
F-22	33	7.80
A-7	101	5.71
F / RF-4	596	5.76
F-5	39	8.82
F-106	153	9.47
F-104	197	30.63

Thru FY23

http://www.safety.af.mil/Divisions/Aviation-Safety-Division/Aviation-Statistics/



USAF F-15 Losses

Total Flight Hours	7,175,142
Total Class A Flight Mishaps	162
Aircraft Destroyed	127
Fatalities	54

As of 30 Sep 24



F-15 Class A Mishaps FY15 – FY24





F-15 Class B Mishaps FY15 – FY24





F-15 Class B Mishap Details FY24

- Aircraft Flight Powerplant Failure or Malfunction
- Engine stall/stagnation; Engine damage; Landed uneventfully, no injuries
- Under Investigation



F-15 Class B Mishap Details FY24

- Aircraft Flight Powerplant Failure or Malfunction
- F-15E in-flight; Engine stall; engine overtemp; RTB, no injuries
- Under Investigation



F-15 Class B Mishap Details FY24

- Aircraft Flight Other
- Aerial Refueling, boom nozzle broke off in F-15
- Primary damage to tanker/refueling boom





F-15 Class B Mishap Details FY24

- Aircraft Flight bird strike, 2 Gadwell Ducks
- Damage to right vertical stab leading edge
- Damage to right Conformal Fuel Tank









F-15 Class B Mishap Details FY24

- Aircraft Ground Operations FOD
- Damage to #2 Engine fan blades
- Sheet metal guard from composite took kit (CTK)





F-15 Class B Mishap Details FY23

- Aircraft Flight Lightning Strike
- Damage to radar thermal burn through
- Damage to wing pod broken lens impact damage







F-15 Class B Mishap Details FY23

- Aircraft flight Engine FOD
 - Unknown FOD damaged Inlet Guide Vane
 - IGV ingested and damaged engine







F-15 Class B Mishap Details FY23

- Aircraft ground operations Engine FOD during engine maintenance run
- Engine ingested flashlight









F-15 Class C Mishaps FY15 – FY24



AFET COMPANY

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F-15 Class C Mishap Data FY23 – FY24

FY23 - FY24 Class C Total: 93				
Flight/Flight Related	39	Ground Operations	83	
Hot brakes/blown tires	8	Injury during Mx	71	
Engine damage	8	Non-head injury	14	
Gun damage	6	Head injury	57	
Wildlife Strike	4	Object struck aircraft during Mx	4	
Aerial refueling damage	3	CGB Failure/fire	3	
Lightning strike	3	Engine damage/FOD	2	
MSOGS Concentrator failure	1	Fuel spill	1	
Dropped object (Door 40)	1	Utility hydraulic pump failure/fire	1	
Hard-over rudder – spline damage	1	Burnt wire harness	1	
Utility A Sys Hyd fail, cable damage	1			
Weapon damage – loading	1			
Emer landing, fail engage, tail hook broke	1			
NLG aft door damage during FCF	1			



F-15 Class D Mishaps FY15 – FY24





F-15 Class D Mishap Data FY23 – FY24

FY23- FY24 Class D Total: 91				
Flight/Flight Related	29	Ground Operations	96	
Engine damage/FOD	5	Injury during Mx	93	
Wildlife strike	5	Head injury	54	
Lightning/hail/weather damage	5	Non-head injury	39	
Tail strike during landing	2	Engine damage/FOD	2	
Physiological symptoms	2	Acft damage during Mx	1	
Gun malfunction	2			
MSOGS failure	1			
Anti-skid fail – blown tires	1			
Util A failure – barrier damage	1			
AMAD Fire	1			
Supersonic flight – ground damage	1			
Dropped object	1			
Right MLG tire blown	1			
Nose wheel tire blown on T/O	1			



F-15 Class E Mishaps FY15 – FY23





F-15 Hazards FY15 – FY24





F-15 AFSAS Recommendations FY15 – FY24





Physiological Symptom Reports





F-15 ACBS-related Physios

(thru 30 Sep 24)





F-15 Cockpit Pressure Loss

(thru 30 Sep 24)





Controlled Unclassified Laformation (CUI) it Pressure Loss and Physiological Events - Causes





Controlled Unclassified Cormation (CUI) it Pressure Loss and Physiological Events - Causes





ACES II Ejection Data



ALE TOPICS

Controlled Unclassified Information (CUI) USAF ACES II Ejections 8 Aug 78 to present

	Total	Survived	Rate	Fatal	Rate
F-16	317	295	93%	22	7%
F-15	92	84	91%	8	9%
A-10	57	47	82%	10	18%
B-1B	28	27	96%	1	4%
F-117	2	2	100%	0	0%
F-22	4	3	75%	1	25%
B-2	2	2	100%	0	0%
	502	460	92%	42	8%



Controlled Unclassified Information (CUI) **ACES II Aircraft Ejections** FY15 – FY24





FY15 – FY24





MDS:	ACES II		
One Liner:	NITIAL TAKEOFF; LOSS OF POWER; ACFT DESTROYED; NO FATALITIES		
Occupant:	Pilot, Gender: Male, Age 29, Weight xxx lbs		
Parameters:	1,046 feet AGL, 156 KIAS, MODE 1		
Equipment Issues:	 Wearing JHMCS Equipped with MASS – all three channels selected Mode 1 R/H Quick disconnect did not separate, hose tore STAPAC piston/rack did not lock, absorption cylinder not compressed 		
Injuries:	 Minor neck pain - ejection force wearing JHMCS Ankle sprain – parachute landing fall 		



MDS:	ACES II		
One Liner:	TRAINING SORTIE; PILOT EJECTED; ACFT DESTROYED; NO INJURIES		
Occupant:	Pilot, Gender xxx, Age xx, Weight xxx lbs		
Parameters:	1,500 feet AGL (above water), 200 KIAS, MODE X		
Equipment Issues:	 Wearing Digital JHMCS Two attempted self rescue via ladder and stairs by a commercial cargo vessel – unsuccessful Rescued by ROK H-60 helicopter WRECKAGE INCLUDING EJECTION SEAT NOT RECOVERED Signs of overserviced/improperly sewn Over-The-Side anti exposure suit 		
Injuries:	 Mild Hypothermia – in 50 degree water for 40+ minutes 		



MDS:	ACES II				
One Liner:	Training Sortie; Pilot ejected; Minor injuries; Acft Destroyed				
Occupant:	Pilot, Gender Male, Age xx, Weight xxx lbs				
Parameters:	2,500 feet AGL (above water), 150 KIAS, MODE 1				
Equipment Issues:	 Ejected over water Equipped with MASS – dried and successfully downloaded, Mode 1 selected all three channels, disrupted airflow evident at pitots Wearing JHMCS R/H QD did not separate, tore gas hose 				
HM55 5/9 400-01 AI Flots Pressures us to Moze Selection Time (MCIE) 	KVSS 502 4034; 31 ch ² hor Presures up to Mode Selection Time (hCE) /				
Injuries:	 Minor neck soreness – ejection force wearing JHMCS Minor abrasions – ejection forces 				



MDS:	ACES II		
One Liner:	ON APPROACH; IMPACTED TERRAIN SHORT OF RUNWAY, CREW EJECTED; AIRCRAFT DESTROYED; CREW RECOVERED WITH INJURIES		
Occupant:	Pilot, Gender Male, Age xx, Weight xxx lbs		
Parameters:	0 feet AGL, 160 KIAS, MODE 1		
Equipment Issues:	 Hatch jettisoned properly Equipped with MASS – Mode 1 selected all channels Auto mode selection –full sequencing Handles rotated (seat initiation) 		
Injuries:	 Superficial burns on face/head – hatch/rocket motor Abrasions/contusions right side - PLF 		



MDS:	ACES II
One Liner:	ON APPROACH; IMPACTED TERRAIN SHORT OF RUNWAY, CREW EJECTED; AIRCRAFT DESTROYED; CREW RECOVERED WITH INJURIES
Occupant:	MDSO, Gender Male, Age xx, Weight xxx lbs
Parameters:	0 feet AGL, 160 KIAS, MODE 1
Equipment Issues:	 Hatch jettisoned properly Equipped with MASS – Mode 1 selected all channels Auto mode selection – full sequencing Handles rotated – (seat initiation)
Injuries:	1. Burns to hand – hatch/rocket motor - not wearing gloves



MDS:	ACES II		
One Liner:	ON APPROACH; IMPACTED TERRAIN SHORT OF RUNWAY, CREW EJECTED; AIRCRAFT DESTROYED; CREW RECOVERED WITH INJURIES		
Occupant:	MOSO, Gender Male, Age xx, Weight xxx lbs		
Parameters:	0 feet AGL, 160 KIAS, MODE 1		
Equipment Issues:	 Hatch jettisoned properly Equipped with MASS – Mode 1 selected all channels Auto mode selection – full sequencing Handles not rotated (seat initiated by auto sequencing) Main parachute melting damage – aircraft/ground fire 		
Injuries:	1. Burns to face, ears, hands – hatch/rocket motor – not wearing helmet and gloves Image: state of the state		



MDS:	ACES II				
One Liner:	ON APPROACH; IMPACTED TERRAIN SHORT OF RUNWAY, CREW EJECTED; AIRCRAFT DESTROYED; CREW RECOVERED WITH INJURIES				
Occupant:	Instructor Pilot, Gender Male, Age xx, Weight xxx Ibs				
Parameters:	0 feet AGL, 160 KIAS, MODE 1				
Equipment Issues:	 Hatch jettisoned properly Equipped with MASS – Mode 1 selected all channels Auto mode selection – full sequencing Handles rotated (seat initiation) Main parachute melting damage – aircraft/ground fire Inertial reel straps not fully retracted evenly – body out of position 				
Injuries:	 Burns to hand – hatch/rocket motor – not wearing gloves Loss of consciousness – ejection force – out of position Sternum and rib fractures, acute kidney injury – impact with seat/controls at aircraft ground impact Spine and pelvis fractures – PLF while unconsciousness 				



Proactive Safety "Hazard Hunters"





Military Flight Operations Quality Assurance MFOQA





Controlled Unclassified Information (CUI) MFOQA F-15 Processing Summary January 2024 - March 2024

 Monthly Aircrew Focus Area Trends: F-15E Overhead Patterns 22.21% of overheads are <17 AOA at 300' AGL 13.80% of overheads are >=24 AOA at 300' AGL F-15E Straight-In Patterns 8.29% of straight-ins are <17 AOA at 300' AGL 21.39% of straight-ins are >=24 AOA at 300' AGL 	 Sources F-15 Aircrew Evaluation Criteria AFMAN 11-2F-15EV2, 20 May 2019 F-15 Operations Procedures AFMAN 11-2F-15EV3, 24 Sep 2020 F-15 Combat Aircraft Fundamentals AFTTP 3-3.F-15E, 25 Aug 2023
 Aggregate Analysis (Jan 2024 – Mar 2024) Trends / Observations: 1,788 F-15E Supersonic Events 6.81% of F-15E Overheads end in fast landings <=17 AOA 6.95% of F-15E Straight-Ins end in fast landings <=17 AOA 28.4% MFOQA Capture Rate for the F-15E over the last 12 months. 28.4% MFOQA Capture Rate for the F-15E during Jan 2024 - Mar 2024—the period covered in this brief. 	 Current Actions New MFOQA software enhancements are planned to add additional proactive safety analysis capabilities. Dure Actions Plan to add F-15E Strafe, F-15E single-engine approaches, no-flap approaches, Low Altitude training, over-Gs, -1 Section V Ops Limits, and anything else that the F-15E community wants.



MFOQA TEs vs. ROMs

- A Triggered Event (TE) is an event that is triggered based on a set of criteria. These criteria are usually time and magnitude based and are derived from flight manuals, command guidance or from parameters set by the MFOQA analysts. An example would be the "Approach AOA High" Triggered Event which has a warning level limit triggered at >22 units of AOA for 5 seconds during approach and landing.
- Routine Operational Measurements (ROM) are instantaneous snapshots of flight data at a specific moment in time. Any recorded
 or derived aircraft parameter can be analyzed at that chosen moment. For example, the aircraft's parameters at 100', 300', 500',
 and 1,000' AGL during takeoff can be analyzed in aggregate for multiple sorties or for a single sortie.

Examples	Examples of TEs			
Runway Entry	Negative G Start / End	art / End T		Trigger Value
Takeoff Roll Start	Descending FL180, 15,000', 10,000'	A		
Takeoff 80 knot	Gear Down	Approach AOA High		AOA >22 units AOA for 5 seconds AOA <20 units AOA for 5
Takeoff Point	Approach 3 Miles, 2 Miles, 1 Mile			
Takeoff Point (Initial)	Approach 1,000', 500', 300', 100', 50', 20' Go Around		ach AOA	
Gear Up			ow	seconds
Departure 35', 50', 100', 300', 500', 1000'	Touchdown G-Spike	Landing Pitch		Pitch >13.5 degrees at landing
Departure 1 Mile, 2 Miles, 3 Miles	Touchdown Point	High		
Climbing 10,000', 15,000', FL180, FL250	Final Touchdown			
High G Maneuver	Aerobrake End			
Supersonic Start / End	Full Stop Taxi Back			
Zero G Start / End				

Current MAJCOM approved F-15 ROM and TE values for analysis products



F-15E Approach and Landing AOA

- Conducted MFOQA approach analysis, in order to identify potential fast or slow approach trends
 - Primary operating locations / runway lengths:
 - Seymour Johnson AFB 11,760'
 - Mountain Home AFB 13,510'
 - Nellis AFB 10,120'
 - Robbins AFB 12,001'
 - RAF Lakenheath 9,000'
- Only full-stop landings were analyzed
- Data is filtered to analyze Overheads and Straight-Ins
 - At 1,000' AGL approaches were split into Overheads (assessed as >30 bank) and Straight-Ins (<=30 degrees bank).



F-15E Approach and Landing AoA

- "On-speed" assessed IAW AFMAN 11-2F-15EV2 and AFTTP 3-3.F-15E
 - "On speed" defined as those within Q criteria for a normal approach
 - Note: While 20-22 AOA is an optimal normal landing, some Emergency Procedures prescribe 18 AOA.
 - "Fast" defined as faster than Q criteria <= 17° AOA</p>
 - "Slow" >23° AOA
 - Note: 23° AOA is ~10 kts slow for a normal approach, which exceeds Q/Q- criteria. However, 23° AOA short-field landings are also present in the data. Since approach type is not evident, 23° AOA approaches will not be identified as "slow".

F-15E AoA at 1,000' AGL Overheads



F-15EAoA at 500' AGL





F-15E AoA at 300' AGL Overheads





F-15E AoA at 100' AGL Overheads





F-15E AoA at Touchdown





F-15E AoA at 1,000' AGL Straight-Ins





F-15E AoA at 500' AGL Straight-Ins





F-15E AoA at 300' AGL Straight-Ins





F-15E AoA at 100' AGL Straight-Ins



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F-15E AoA at Touchdown Straight-Ins







Outstanding Safety Record

Demanding mission at home and abroad





Questions

