

COMPARISON OF AVIATION MISHAP
RATES FOR HORNET SQUADRONS
DURING PERIODS OF EXTENDED
REDUCED FLIGHT HOURS WITH
PERIODS OF NORMAL FLIGHT
OPERATIONS

By

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Introduction

The wind down of the wars in Iraq and Afghanistan and future budgetary pressures may lead to extended periods for naval aviation squadrons of greatly reduced flight hours. There is a concern that aviation mishaps will increase as a result of extended reduced operating periods. This study examines historical aviation mishap data and analyzes aviation mishap rates in three different manners for the F/A-18 Hornet. The first way compares the rates for squadrons during periods of extended reduced flight hours to mishap rates during normal flying periods. The second way compares the rates for squadrons during a three month period after extended reduced operations and compares it to the rates outside of the three month period, including the reduced operating period. The final way compares the rates for squadrons during a three month period after extended reduced operations to the rates outside of the three month period, not including the reduced operating period.

Data

- Naval Safety Center's Web Enabled Safety System aviation mishap data from FY 1991 through FY 2010.
- Naval Air System Command's Decision Knowledge Programming for Logistics Analysis and Technical Evaluation (DECKPLATE) Squadron Flight Hour data.

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Methodology

The study uses Navy Hornet mishaps that occurred to non-FRS VFA squadrons exclusively. Hornets assigned to test/evaluation squadrons and other non-VFA squadrons were not included. Similar studies may be completed for other naval Type/Model/Series if requested. To find extended periods of reduced flight hours, each individual Hornet squadron's monthly flight hours were extracted from DECKPLATE. Using the monthly flight hour data, a lower confidence interval at the 95% level for each squadron was calculated. Since it is possible that one squadron contains more aircraft than another squadron, each squadron's lower confidence level was calculated

individually. Squadron monthly flight hours that were below the lower confidence level meant that they were statistically significantly lower than the overall squadron dataset. Using guidance from the Aviation Directorate Deputy Department Head, six or more consecutive months of flight hours below the lower confidence level signified a period of extended reduced squadron flight hours.

If the 6 month period of extended reduced flight hours occurred during an A-6 or F-14 transition to the F-18 aircraft, or an F-18C transition to F-18E/F then that period was not marked as an extended reduced flight hour period.

DECKPLATE has no flight hour data prior to FY 1990 so it was not possible to study years prior to 1990. Instead of examining every year for the Hornet since 1990 as a whole, it was decided to separate the analysis into two groups of years. Figures 1 and 2 will provide some insight into why the years were separated.

YEAR	FLIGHT HOURS
FY 90	127,480
FY 91	156,573
FY 92	158,906
FY 93	155,120
FY 94	153,303
FY 95	171,135
FY 96	171,034
FY 97	163,728
FY 98	178,823
FY 99	171,840
FY 00	166,305
FY 01	168,418
FY 02	202,961
FY 03	200,473
FY 04	185,637
FY 05	197,158
FY 06	210,303
FY 07	216,099
FY 08	214,535
FY 09	210,682
FY 10	219,722
FY 11	235,577
FY 12	236,321
FY 13	106,781

Fig 1: Navy F/A-18 Flight Hours By Year

It can be seen in figure 1 that there are four distinct periods where flight hours for the Hornet were similar. However this does not take into account the number of hornet squadrons that were in existence during a given year. Figure 2 shows the number of VFA hornet squadrons (non-FRS) along with the average number of flight hours per squadron.

YEAR	FLIGHT HOURS	SQUADRONS	HOURS/SQDN
FY 90	71,768	19	3,794
FY 91	101,825	25	4,073
FY 92	104,000	28	3,770
FY 93	90,856	26	3,461
FY 94	92,964	26	3,530
FY 95	88,344	22	3,971
FY 96	96,373	24	4,072
FY 97	89,708	25	3,649
FY 98	104,157	26	4,006
FY 99	98,622	27	3,710
FY 00	97,780	27	3,621
FY 01	93,214	27	3,452
FY 02	117,267	28	4,188
FY 03	122,109	30	4,070
FY 04	108,116	31	3,488
FY 05	128,086	32	3,961
FY 06	144,544	34	4,200
FY 07	155,563	37	4,262
FY 08	152,835	36	4,245
FY 09	145,693	36	4,047
FY 10	148,797	36	4,133
FY 11	158,664	36	4,407
FY 12	160,171	36	4,449
FY 13	67,987	36	1,889

Fig 2: Navy VFA F/A-18 Flight Hours per Squadron (FRS Excluded)

If the lower confidence level for each squadron was calculated using FY90 through FY13 as a whole, inaccuracies would result during years where the Hornet community flight hour averages differed substantially from the overall 1990 - 2013 average. For this reason, reduced flight hour periods were determined separately from FY91 - FY01 and FY02 - FY10. FY02 also represents the commencement of Afghanistan combat operations providing further proof of the necessity of dividing the analysis into two periods.

MISHAP RATES DURING PERIODS OF EXTENDED REDUCED FLIGHT OPERATIONS VS RATES DURING ALL OTHER OPERATING PERIODS

To give time for the period of reduced flight hours to take effect, the reduced flight hour mishap rate was calculated commencing the month after the start of the reduced flight hour period. The ending month used was the month after the termination of reduced flight hours. After the mishap data for each squadron was extracted, mishaps that occurred during the reduced flight hour periods, adjusted one month as mentioned above, were used to determine the mishap rate during those periods. Accordingly, mishaps that occurred during normal flight operations were used to calculate the normal operating mishap rate.

When extracting the flight hour and mishap data, the Fleet Replacement Squadrons were excluded. The Fleet Replacement Squadrons contain student pilots and their relative lack of flight experience would skew the mishap data.

Class A/B/C Flight Data

Figure 3 shows the periods of extended reduced flight operations adjusted by one month for each hornet squadron. Periods highlighted in green signify that the reduced hours occurred during an aircraft transition and were not included in the reduced flight hour data.

Squadron	EXTENDED REDUCED FLIGHT HOUR PERIOD						
VFA-102	10/03 - 03/04						
VFA-103	07/05 - 02/06						
VFA-105	03/91 - 08/91	06/01 - 07/02	6/03 - 02/04	10/05 - 04/07	06/08 - 03/09		
VFA-11	04/09 - 09/09						
VFA-113	11/96 - 05/97	02/01 - 10-01	06/03 - 11/03	11/09 - 08/10			
VFA-115	05/03 - 10/03	05/07 - 10/07	11/09 - 06/10				
VFA-127	11/92 - 06/93						
VFA-131	08/98 - 04/99	09/02 - 07/03	08/04 - 02/06	09/07 - 07/08			
VFA-132							
VFA-136	08/96 - 02/97	08/98 - 03/99	09/00 - 05/01	09/02 - 04/03	08/04 - 03/05	01/08 - 09/08	
VFA-137	12/91 - 07/92	09/92 - 02/93	04/00 - 10/00	09/01 - 03/02	06/03 - 03/04	04/09 - 10/09	
VFA-14	05/02 - 11/02	04/04 - 12/04	12/05 - 08/06	07/08 - 03/09	03/10 - 08/10		
VFA-143	07/05 - 02/06	09/07 - 07/08					
VFA-146	08/98 - 03/99	07/00 - 05/01	10/07 - 03/08	01/10 - 07/10			
VFA-147	08/93 - 03/94	05/94 - 12/94	08/98 - 02/99	7/00 - 02/01	08/05 - 06/06	10/07 - 04/08	
VFA-15	11/97 - 04/98	12/01 - 06/02	12/03 - 06/04	08/04 - 02/05	10/06 - 10/07	05/09 - 09/10	
VFA-151	05/91 - 03/93	09/01 - 03/02	10/08 - 08/09	10/09 - 05/10			
VFA-154	05/09 - 11/09						
VFA-192	11/92 - 05/93	06/94 - 05/95	12/09 - 09/10				
VFA-195	06/04 - 03/05	12/08 - 05/09					
VFA-2							
VFA-201	04/99 - 09/99	10/06 - 03/07					
VFA-203							
VFA-204	07/91 - 05/92	11/02 - 04/03	10/09 - 03/10				
VFA-211							
VFA-213	11/06 - 05/07						
VFA-22	10/95 - 03/96	05/99 - 02/00	02/02 - 08/02	12/03 - 03/05	05/07 - 10/07		
VFA-25	08/94 - 01/95	02/01 - 10/01	07/06 - 02/07	05/07 - 10/07			
VFA-27	05/91 - 02/92	05/04 - 10/04					
VFA-303							
VFA-305							
VFA-31	10/06 - 06/07						
VFA-32	05/06 - 02/07	10/08 - 03/09					
VFA-34	01/01 - 06/01	02/09 - 09/09					
VFA-37	11/01 - 05/02	06/03 - 02/04	06/08 - 03/09				
VFA-41	06/04 - 12/04	11/08 - 05/09	03/10 - 08/10				
VFA-81	06/94 - 11/94	01/97 - 08/97	01/99 - 08/99	01/06 - 08/06	07/08 - 01/09		
VFA-82	04/00 - 01/01	04/05 - 09/05					
VFA-83	09/95 - 02/96	4/97 - 11/97	01/99 - 06/99	12/00 - 08/01	01/03 - 07/03	01/05 - 02/06	09/07 - 03/09
VFA-86	10/94 - 03/95	04/00 - 06/01	04/02 - 06/03	11/04 - 06/05	01/08 - 12/08	03/10 - 08/10	
VFA-87	07/91 - 02/92	09/92 - 04/93	10/93 - 04/94	10/99 - 04/00	12/01 - 07/02	06/07 - 11/07	05/09 - 08/10
VFA-94	10/95 - 03/96	10/97 - 04/98	09/99 - 10/00	10/03 - 03/04			
VFA-97	05/91 - 01/92	04/00 - 11/00	02/02 - 11/02	10/06 - 03/07	08/08 - 02/09	03/10 - 08/10	

Fig 3: Reduced Flight Hour Periods By Squadron

Figure 4 shows the dates of each squadron's class A/B/C flight mishaps. Dates highlighted in yellow denote that the mishap occurred during a period of extended reduced flight hours. Dates highlighted in green denote that the mishap occurred during an aircraft transition period and were not counted in the reduced flight hour mishap rate calculation.

Squadron	CLASS A/B/C FLIGHT MISHAPS							
VFA-102	4/6/2004	1/29/2005						
VFA-103	1/26/2006	8/21/2007	1/28/2010					
VFA-105	8/12/1991	8/9/1996	5/26/1999	9/12/2001	10/23/2001	3/25/2004	7/28/2005	3/13/2007
	7/6/2007	10/1/2007	1/7/2008	7/18/2010				
VFA-111	9/3/2006	10/10/2006	8/29/2007	4/2/2008	4/6/2008	7/27/2010		
VFA-113	11/27/1996	9/24/1998	11/16/2005	4/6/2006	7/23/2008	9/2/2009		
VFA-115	3/19/1998	2/9/2000	1/3/2002	10/9/2003	11/8/2003	11/1/2007	3/11/2010	
VFA-127								
VFA-131	12/15/1995	4/1/1996	6/11/2003	11/9/2004	12/21/2005	2/15/2007	6/17/2008	
VFA-132	3/15/1992							
VFA-136	7/1/1992	7/17/1993	8/5/1993	3/24/1996	6/20/2000	8/17/2003		
VFA-137	10/6/1991	3/29/1995	6/23/1999	5/26/2004	8/22/2005	3/15/2010	8/5/2010	
VFA-14	3/18/2004	2/11/2005	7/18/2005	4/30/2006	5/8/2008			
VFA-143	12/14/2006	2/8/2007	4/14/2007					
VFA-146	2/15/1993	3/11/1995	10/1/1996	9/17/1998	3/14/2004	4/22/2005	8/4/2007	8/28/2008
VFA-147	7/12/1991	3/19/1992	2/16/1996	9/7/2000	1/22/2002	2/18/2003	11/11/2008	5/3/2009
VFA-15	1/24/1991	5/28/1992	1/22/1995	3/16/1997	9/1/1997	9/14/1997	9/19/2001	3/26/2004
	4/18/2007	6/13/2008	9/10/2010					
VFA-151	5/21/1993	11/18/1994	4/3/1996	10/20/2000	7/14/2001	2/12/2003	7/23/2003	8/26/2004
VFA-154	8/14/2006	1/22/2010						
VFA-192	5/13/1992	7/11/1995	4/27/1998	12/22/2003	4/17/2004	9/6/2007	8/6/2008	1/29/2009
VFA-195	8/31/1991	9/10/1991	1/28/1993	1/6/2005	4/10/2007	7/30/2007	9/22/2010	
VFA-2	8/2/2004	7/27/2009						
VFA-201	12/3/1999	2/22/2002	8/31/2002	3/10/2003	12/11/2003	9/28/2005	5/5/2006	
VFA-203	10/29/1990	1/15/1996	8/21/1998	11/30/2000	1/16/2002	12/4/2002	3/29/2004	
	2/6/1995	2/9/1995	10/17/1995	8/30/1996	10/8/1997	4/25/2005	4/5/2008	8/27/2008
	9/11/2008	10/10/2008	7/20/2009	8/7/2009				
VFA-211	9/8/2005	8/17/2010						
VFA-213	12/15/2008							
VFA-22	8/24/1991	5/7/1992	1/28/1995	1/17/1996	12/2/1997	10/25/2002	3/12/2006	4/9/2006
	5/7/2006	2/18/2009						
VFA-25	4/22/1991	9/9/1992	5/17/1995	9/29/2000	1/17/2003	9/5/2003	6/28/2004	5/18/2005
	10/17/2005	10/26/2005	1/28/2006	1/9/2007				
VFA-27	4/2/1997							
VFA-303								
VFA-305								
VFA-31	4/21/2008	3/25/2009						
VFA-32	12/16/2007							
VFA-34	9/25/1998	12/4/1999	11/3/2002					
VFA-37	7/24/1992	1/20/1993	3/15/1993	5/27/1998	12/9/1999	4/8/2003	11/18/2005	1/26/2008
	4/11/2008							
VFA-41	10/18/2002	10/20/2005	1/10/2007	4/21/2009	5/5/2009			
VFA-81	2/12/1994	5/7/1996	6/17/1997	2/8/1998	2/3/1999	3/16/2004	11/14/2005	11/18/2005
	8/21/2006	6/2/2007						
VFA-82	1/11/1991	6/21/1994	9/24/1997	2/17/1998	5/17/1999	6/21/2000	3/24/2004	5/28/2004
VFA-83	10/25/1991	11/21/1991	4/28/1994	7/6/1995	3/22/1996	9/30/1996	9/16/1998	2/20/2003
	12/23/2003	9/19/2004	3/22/2007	2/7/2008	9/18/2008	11/16/2009	11/16/2009	
VFA-86	1/12/1991	5/24/1993	2/2/1994	3/9/1994	1/4/1995	7/17/1996	7/25/2002	11/6/2002
	6/7/2005	4/24/2006	7/11/2008					
VFA-87	2/5/1991	7/6/1998	7/13/2000	10/27/2000	2/28/2002	10/11/2007	2/2/2009	3/30/2009
VFA-94	12/4/1991	2/18/1999	3/16/2000	4/16/2003	3/10/2004	4/9/2004	4/22/2009	5/5/2009
VFA-97	11/22/1992	12/16/1993	3/24/1994	8/13/1994	11/18/1994	7/18/1998	9/11/1998	11/15/1998
	1/6/2003	1/25/2005	11/1/2005	1/18/2006	8/22/2006	1/17/2007		

Fig 4: Class A/B/C Flight Mishaps By Squadron

Figure 5 compares the class A/B/C flight mishap rate per 100,000 flight hours during the periods of extended reduced flight hours with the class A/B/C flight mishap rate during normal flight hours. Note that the total flight hours will not equal the hours denoted in figure 1. Figure 1 contains FRS hours and also hours for non-deploying Hornet squadrons (Naval Strike and Air Warfare Center and VX-9 for example)

Period	Class A/B/CFM	Flt Hrs	Rate
Reduced Flight Hour	37	218,669	16.92
Normal Operations	228	2,062,184	11.06

Fig 5: Class A/B/C Flight Mishap Rate Per 100,000 Flight Hour Comparison

The reduced flight hour rate is higher. If a test for proportion with the two mishap rates is completed the result is a p-value of .041. A p-value less than .05 as in this instance means that the two rates are statistically significantly different.

The next few sections breaks the flight mishap data into separate mishap severities to determine if each individual severity was also significantly different.

Class A Flight Mishaps

Figure 6 shows the dates of each squadron's class A flight mishaps. Dates highlighted in yellow denote that the mishap occurred during a period of extended reduced flight hours. Dates highlighted in green denote that the mishap occurred during an aircraft transition period and were not counted in the reduced flight hour mishap rate calculation.

CLASS A FLIGHT MISHAPS						
VFA-102	1/29/2005					
VFA-105	8/12/1991	8/9/1996	10/23/2001	1/7/2008		
VFA-131	11/9/2004					
VFA-132	3/15/1992					
VFA-136	8/5/1993					
VFA-137	10/6/1991	3/15/2010				
VFA-14	4/30/2006					
VFA-146	8/4/2007					
VFA-147	7/12/1991	2/18/2003				
VFA-15	1/24/1991	5/28/1992	9/14/1997	9/19/2001	3/26/2004	6/13/2008
VFA-151	5/21/1993	11/18/1994	4/3/1996	10/20/2000	8/26/2004	
VFA-192	5/13/1992	4/27/1998				
VFA-195	7/30/2007					
VFA-201	12/3/1999					
VFA-203	1/15/1996	1/16/2002	3/29/2004			
VFA-22	8/24/1991	5/7/1992	1/28/1995	1/17/1996		
VFA-25	9/9/1992	5/17/1995	9/29/2000	1/17/2003	9/5/2003	1/28/2006
VFA-27	4/2/1997					
VFA-34	9/25/1998	12/4/1999	11/3/2002			
VFA-37	7/24/1992	5/27/1998	4/11/2008			
VFA-41	10/18/2002					
VFA-81	2/12/1994	2/8/1998				
VFA-82	6/21/1994	3/24/2004	5/28/2004			
VFA-83	4/28/1994	9/16/1998				
VFA-86	1/12/1991	5/24/1993	7/17/1996			
VFA-87	2/5/1991	10/27/2000	10/11/2007	2/2/2009		
VFA-94	12/4/1991	3/10/2004				
VFA-97	11/22/1992	11/18/1994	7/18/1998	1/6/2003	1/18/2006	

Fig 6: Class A Flight Mishaps By Squadron

Figure 7 compares the class A flight mishap rate per 100,000 flight hours during the periods of extended reduced flight hours with the class A flight mishap rate during normal flight hours.

Period	Class AFM	Flt Hrs	Rate
Reduced Flight Hour	7	218,669	3.20
Normal Operations	64	2,062,184	3.10

Fig 7: Class A Flight Mishap Rate Per 100,000 Flight Hour Comparison

The reduced flight hour rate is slightly higher. If a test for proportion with the two mishap rates is executed the result is a p-value of .939. A p-value greater than .05 as in this instance means that the two rates are NOT statistically significantly different.

Class B Flight Mishaps

Figure 8 displays the dates of each squadron's class B flight mishaps. Dates highlighted in yellow denote that the mishap occurred during a period of extended reduced flight hours.

Squadron	CLASS B FLIGHT MISHAPS					
VFA-103	8/21/2007					
VFA-105	9/12/2001	10/1/2007	7/18/2010			
VFA-11	4/6/2008					
VFA-113	11/27/1996					
VFA-115	1/3/2002	10/9/2003	11/8/2003			
VFA-131	12/21/2005	6/17/2008				
VFA-137	6/23/1999	8/5/2010				
VFA-14	5/8/2008					
VFA-143	4/14/2007					
VFA-146	10/1/1996					
VFA-147	9/7/2000	5/3/2009				
VFA-15	3/16/1997	4/18/2007	9/10/2010			
VFA-151	7/14/2001					
VFA-192	1/29/2009					
VFA-195	8/31/1991					
VFA-2	8/2/2004					
VFA-201	5/5/2006					
VFA-204	10/8/1997	4/5/2008	8/27/2008	9/11/2008	7/20/2009	8/7/2009
VFA-22	3/12/2006	5/7/2006				
VFA-25	6/28/2004					
VFA-37	12/9/1999					
VFA-41	1/10/2007					
VFA-81	11/14/2005	8/21/2006				
VFA-82	1/11/1991					
VFA-83	12/23/2003					
VFA-87	7/6/1998					
VFA-94	3/16/2000	4/16/2003				
VFA-97	1/17/2007					

Fig 8: Class B Flight Mishaps By Squadron

Figure 9 displays the mishap rates for Hornet Class B Flight mishaps.

Period	Class BFM	Flt Hrs	Rate
Reduced Flight Hour	11	218,669	5.03
Normal Operations	34	2,062,184	1.65

Fig 9: Class B Flight Mishap Rate Per 100,000 Flight Hour Comparison

A p-value of .028 is calculated using the same test for proportion. Since this is lower than .05 the reduced operating rate is statistically significantly higher than the normal operating rate.

Figure 10 shows several details of the 11 class B mishaps that occurred during reduced operating periods.

EVENT DATE	T/M/S	MISHAP TYPE	PLT HRS IN MODEL	PLT HRS (LIFE)	SHORT NARRATIVE
11/27/1996	F018C	CFIT	955	1195	ACFT STRUCK HIGH TENSION POWER CABLES IN FLIGHT AND LANDED SAFELY.
3/16/2000	F018C	UNDET	260	4500	STBD ENGINE BAY SUSTAINED HEAT DAMAGE FROM SEPARATED INLET ICE DUCT
9/7/2000	F018C	OOCF	1487	1876	EXT STORES DEPART A/C DUR SUPERSONIC, HI-ALT DEPRTR CAUSING A/C DAMAGE
9/12/2001	F018C	MATERIAL	2178	3253	AIRCRAFT HAD A RIGHT ENGINE FIRE ON TAKEOFF. NO INJURIES
10/9/2003	F018E	MATERIAL	225.1	501.8	PORT MAIN LANDING GEAR FWD DOOR DEPARTED AIRCRAFT IN FLIGHT.
12/21/2005	F018C	MATERIAL (MAINT ERROR)	1826	2211	PORT MAIN LANDING GEAR DOORS SEPARATED FROM ACFT DURING LOW LEVEL FLT.
8/21/2006	F018C	MIDAIR	598.6	868.9	2 SIMILAR ACFT COLLIDED DUR NIGHT AIR TO AIR OVER-WATER TRNG MISSION.
1/17/2007	F018C	MATERIAL	143.4	431.8	AIRCRAFT LEFT HORIZONTAL STABILIZER DEPARTED IN FLIGHT.
4/18/2007	F018C	MATERIAL (MAINT ERROR)	1259.9	1623.1	PORT ENGINE FODDED WHEN AIRCRAFT INTAKE DELAMINATED IN FLIGHT.
6/17/2008	F018C	MIDAIR	825.9	1080	ACFT MIDAIR COLLISION AT SEA. ACFT RECOVERED UNEVENTFULLY. NO INJURIES
9/10/2010	F018C	BASH	NOT RPRTD	NOT RPRTD	BIRD STRIKE ON TAKEOFF WITH SUSPECTED DAMAGE TO STARBOARD MOTOR.
MEDIAN HRS IN MODEL			890.45	1409.05	
AVERAGE HRS IN MODEL			975.9	1754.6	

Fig 10: Class B Reduced Flight Hour Mishaps

Figure 10 shows no commonality in mishap type. There were three material failures, two maintenance caused material failures, 2 midairs, and 1 each for Controlled Flight Into Terrain, Out of Control Flight and Bird Strike. The 3/16/2000 mishap cause was undetermined.

The pilot lifetime hours and hours in model display a mix of experienced and inexperienced pilots. Even if material/BASH mishaps are deleted since they are generally not pilot causal, the median model/life hours are 890.45/1137.5.

Class C Flight Mishaps

Class C flight mishaps are shown in figure 11. Dates highlighted in yellow denote that the mishap occurred during a period of extended reduced flight hours. Dates

highlighted in green denote that the mishap occurred during an aircraft transition period and were not counted in the reduced flight hour mishap rate calculation.

Squadron	CLASS C FLIGHT MISHAPS							
VFA-102	4/6/2004							
VFA-103	1/26/2006	1/28/2010						
VFA-105	5/26/1999	3/25/2004	7/28/2005	3/13/2007	7/6/2007			
VFA-11	9/3/2006	10/10/2006	8/29/2007	4/2/2008	7/27/2010			
VFA-113	9/24/1998	11/16/2005	4/6/2006	7/23/2008	9/2/2009			
VFA-115	3/19/1998	2/9/2000	11/1/2007	3/11/2010				
VFA-131	12/15/1995	4/1/1996	6/11/2003	2/15/2007				
VFA-136	7/1/1992	7/17/1993	3/24/1996	6/20/2000	8/17/2003			
VFA-137	3/29/1995	5/26/2004	8/22/2005					
VFA-14	3/18/2004	2/11/2005	7/18/2005					
VFA-143	12/14/2006	2/8/2007						
VFA-146	2/15/1993	3/11/1995	9/17/1998	3/14/2004	4/22/2005	8/28/2008		
VFA-147	3/19/1992	2/16/1996	1/22/2002	11/11/2008				
VFA-15	1/22/1995	9/1/1997						
VFA-151	2/12/2003	7/23/2003						
VFA-154	8/14/2006	1/22/2010						
VFA-192	7/11/1995	12/22/2003	4/17/2004	9/6/2007	8/6/2008			
VFA-195	9/10/1991	1/28/1993	1/6/2005	4/10/2007	9/22/2010			
VFA-2	7/27/2009							
VFA-201	2/22/2002	8/31/2002	3/10/2003	12/11/2003	9/28/2005			
VFA-203	10/29/1990	8/21/1998	11/30/2000	12/4/2002				
VFA-204	2/6/1995	2/9/1995	10/17/1995	8/30/1996	4/25/2005	10/10/2008		
VFA-211	9/8/2005	8/17/2010						
VFA-213	12/15/2008							
VFA-22	12/2/1997	10/25/2002	4/9/2006	2/18/2009				
VFA-25	4/22/1991	5/18/2005	10/17/2005	10/26/2005	1/9/2007			
VFA-31	4/21/2008	3/25/2009						
VFA-32	12/16/2007							
VFA-37	1/20/1993	3/15/1993	4/8/2003	11/18/2005	1/26/2008			
VFA-41	10/20/2005	4/21/2009	5/5/2009					
VFA-81	5/7/1996	6/17/1997	2/3/1999	3/16/2004	11/18/2005	6/2/2007		
VFA-82	9/24/1997	2/17/1998	5/17/1999	6/21/2000				
VFA-83	10/25/1991	11/21/1991	7/6/1995	3/22/1996	9/30/1996	2/20/2003	9/19/2004	3/22/2007
	2/7/2008	9/18/2008	11/16/2009	11/16/2009				
VFA-86	2/2/1994	3/9/1994	1/4/1995	7/25/2002	11/6/2002	6/7/2005	4/24/2006	7/11/2008
VFA-87	7/13/2000	2/28/2002	3/30/2009					
VFA-94	2/18/1999	4/9/2004	4/22/2009	5/5/2009				
VFA-97	12/16/1993	3/24/1994	8/13/1994	9/11/1998	11/15/1998	1/25/2005	11/1/2005	8/22/2006

Fig 11: Class C Flight Mishaps By Squadron

Figure 12 displays the mishap rates for Hornet Class C Flight mishaps.

Period	Class CFM	Flt Hrs	Rate
Reduced Flight Hour	19	218,669	8.69
Normal Operations	130	2,062,184	6.30

Fig 12: Class C Flight Mishap Rate Per 100,000 Flight Hour Comparison

A p-value of .249 is calculated using the same test for proportion. Since this is higher than .05 the normal operating rate is NOT statistically significantly different than the reduced operating rate.

Ground Mishaps

The final rate analysis compares the ground mishap rate during reduced operating periods with normal operating periods. Class A/B/C ground mishaps were extracted for the comparison. Figure 13 displays the ground mishaps that occurred during a period of extended reduced flight hours. Dates highlighted in yellow denote that the mishap occurred during a period of extended reduced flight hours. Dates highlighted in green denote that the mishap occurred during an aircraft transition period and were not counted in the reduced flight hour mishap rate calculation.

Squadron	CLASS A/B/C GROUND MISHAPS							
VFA-102	8/3/2004	12/5/2004	2/12/2005	8/1/2006				
VFA-103	12/30/2009							
VFA-105	6/12/1992	1/26/1993	8/21/2000	1/18/2001	7/6/2004	6/7/2005	8/2/2010	
VFA-11	4/6/2007	7/30/2007						
VFA-113	6/24/2000	12/18/2000	5/16/2002	10/30/2002	2/8/2003	3/13/2003	4/22/2005	12/10/2005
	5/20/2009	8/25/2009	9/10/2009					
VFA-115	9/6/2001	12/3/2001	5/5/2002	11/22/2002	3/23/2004	8/25/2004	8/28/2004	9/19/2004
	8/16/2006	3/12/2007	1/10/2008					
VFA-131	6/27/1991	9/30/1999	7/14/2000	11/16/2003	7/26/2006	1/18/2010		
VFA-136	7/31/1991	11/4/1991	5/16/1996	4/16/1998	3/24/2000	7/29/2006		
VFA-137	8/16/1991	5/16/1994	5/20/1994	9/18/1994	11/6/2000	5/8/2003	1/17/2006	
VFA-14	11/10/2002	12/12/2002	12/2/2004					
VFA-143	5/5/2006	5/23/2006	3/28/2007	1/14/2009				
VFA-146	4/22/1991	3/6/1992	7/1/1993	5/6/1995	2/17/1996	5/12/1996	7/21/1997	6/22/1998
	1/11/2000	5/9/2000	1/18/2002	9/2/2002	7/19/2004	1/28/2007		
VFA-147	11/4/1990	2/5/1993	3/23/1996	2/21/1997	12/7/1997	2/9/2010		
VFA-15	6/23/2001	10/9/2007						
VFA-151	11/22/1996	5/10/1997	6/5/1997	9/6/1999	9/16/1999	2/9/2001	5/1/2001	3/22/2003
	10/22/2004	8/26/2009	7/27/2010					
VFA-154	7/22/2004	5/20/2005	3/5/2007	7/15/2007	8/4/2007	10/14/2007	5/30/2008	9/30/2008
	1/23/2009	9/2/2010						
VFA-192	4/7/1991	3/16/1995	2/12/1998	10/26/2000	11/2/2005	4/26/2008	6/7/2008	9/25/2009
VFA-195	8/13/2005	8/9/2009	11/13/2009	12/8/2009				
VFA-2	2/25/2004	11/4/2004						
VFA-201	10/7/2002							
VFA-203	4/28/1998							
VFA-204	4/22/1994	4/4/2007	11/21/2008					
VFA-211	11/10/2005	6/30/2006	7/24/2006					
VFA-213	9/19/2008	10/10/2008	11/8/2008	9/2/2009				
VFA-22	7/17/1995	8/20/1998	9/19/2000	7/17/2001	11/5/2002	1/28/2003	10/21/2005	2/13/2006
	6/30/2009							
VFA-25	2/10/1996	8/30/2002	11/7/2002	11/30/2002	1/29/2004	10/27/2005	6/14/2009	6/30/2009
VFA-27	10/16/2008	8/23/2009						
VFA-303	7/16/1993							
VFA-305	6/1/1993							
VFA-31	6/24/2007							
VFA-34	9/21/1999	9/13/2000	7/22/2002	5/20/2005	1/25/2006	5/10/2010		
VFA-37	8/7/2000	10/30/2007						
VFA-41	6/30/2004	8/30/2005	10/5/2005	5/9/2007	8/19/2007	4/9/2009		
VFA-81	5/20/1992	8/18/2000	8/31/2000	7/15/2001	10/27/2004	4/5/2006		
VFA-82	12/30/2003	10/19/2004						
VFA-83	3/3/1993	3/7/1996	3/7/2000	8/17/2000	11/25/2003	7/10/2006	7/23/2006	4/9/2007
	12/29/2008							
VFA-86	8/26/1991	10/3/1992	9/23/1994	6/27/1999	2/5/2004	6/2/2006	1/20/2007	2/23/2009
VFA-87	6/8/1993	11/16/1994	6/21/2002	1/16/2010				
VFA-94	7/31/1995	2/23/1996	6/10/1998	10/29/2002	8/2/2005			
VFA-97	2/5/1993	2/5/2001	1/21/2004	9/5/2005	3/25/2007	3/18/2010		

Fig 13: Class A/B/C Ground Mishaps By Squadron

The rates were calculated using flight hours as the denominator. Figure 14 displays the results.

Period	Class A/B/C GRD	Flt Hrs	Rate
Reduced Flight Hour	12	218,669	5.49
Normal Operations	195	2,062,184	9.46

Fig 14: Class A/B/C Ground Mishap Rate Per 100,000 Flight Hour Comparison

The p-value is calculated as .021 meaning that the reduced operating ground mishap rate is statistically significantly lower than the normal operating rate. Flight hours may not be the best method of rate determination for ground operations, but they do provide an indication of squadron OPTEMPO.

The final section examines human and material factors during reduced and normal operations as a possible reason for the mishap rates.

Human/Material Factors

Figures 15 - 17 show the percentages of material and human factors respectively. The human factors were divided between aircrew and maintenance. None of the differences are statistically significant.

Material Factors				
Mishap Class	Reduced Operations Mishaps	Percent	Normal Operations	Percent
A	4 of 7	43%	23 of 64	36%
B	4 of 11	36%	18 of 34	53%
C	13 of 19	68%	72 of 130	55%
GRD	1 of 12	8%	21 of 195	11%

Fig 15: Material Factors

Aircrew Factors				
Mishap Class	Reduced Operations Mishaps	Percent	Normal Operations	Percent
A	5 of 7	71%	48 of 64	75%
B	4 of 11	36%	13 of 34	38%
C	5 of 19	26%	36 of 130	28%
GRD	2 of 12	17%	22 of 195	11%

Fig 16: Aircrew Factors

Maintenance Personnel Factors				
Mishap Class	Reduced Operations Mishaps	Percent	Normal Operations	Percent
A	1 of 7	14%	6 of 64	9%
B	3 of 11	27%	8 of 34	24%
C	4 of 19	21%	24 of 130	18%
GRD	7 of 12	58%	70 of 195	36%

Fig 17: Maintenance Personnel Factors

**MISHAP RATES DURING THE THREE MONTH PERIOD AFTER EXTENDED
REDUCED FLIGHT OPERATIONS VS RATES DURING ALL OTHER
OPERATIONS (INCLUDING REDUCED OPERATIONS PERIOD)**

Class A/B/C Flight Mishaps

Figure 18 shows the three month period after extended reduced flight operations for each hornet squadron. Periods highlighted in green signify that the three month period occurred after an aircraft transition and was not included in the three month post reduced operating period data.

Squadron	THREE MONTH PERIOD AFTER REDUCED FLIGHT HOURS						
VFA-102	03/04 - 05/04						
VFA-103	02/06 - 04/06						
VFA-105	08/91 - 10/91	07/02 - 09/02	02/04 - 04/04	04/07 - 06/07	03/09 - 05/09		
VFA-11	09/09 - 11/09						
VFA-113	05/97 - 07/97	10/01 - 12/01	11/03 - 01/04	08/10 - 10/10			
VFA-115	10/03 - 12/03	05/07 - 7/07	06/10 - 08/10				
VFA-127	06/93 - 08/93						
VFA-131	04/99 - 06/99	07/03 - 09/03	02/06 - 04/06	07/08 - 09/08			
VFA-132							
VFA-136	02/97 - 04/97	03/99 - 05/99	05/01 - 07/01	04/03 - 06/03	03/05 - 05/05	09/08 - 11/08	
VFA-137	07/92 - 09/92	02/93 - 04/93	10/00 - 12/00	03/02 - 05/02	03/04 - 05/04	10/09 - 12/09	
VFA-14	11/02 - 01/03	12/04 - 02/04	08/06 - 10/06	03/09 - 05/09	08/10 - 10/10		
VFA-143	02/06 - 04/06	07/08 - 09/08					
VFA-146	03/99 - 05/99	05/01 - 07/01	03/08 - 05/08	07/10 - 09/10			
VFA-147	03/94 - 05/94	12/94 - 02/95	02/99 - 04/99	02/01 - 04/01	06/06 - 08/06	04/08 - 06/08	
VFA-15	04/98 - 06/98	06/02 - 08/02	06/04 - 08/04	02/05 - 04/05	10/07 - 12/07	09/10 - 11/10	
VFA-151	03/93 - 05/93	03/02 - 05/02	08/09 - 10/09	05/10 - 07/10			
VFA-154	11/09 - 01/10						
VFA-192	05/93 - 07/93	05/95 - 07/95	09/10 - 11/10				
VFA-195	03/05 - 05/05	05/09 - 07/09					
VFA-2							
VFA-201	09/99 - 11/99	03/07 - 05/07					
VFA-203							
VFA-204	05/92 - 07/92	04/03 - 06/03	03/10 - 05/10				
VFA-211							
VFA-213	05/07 - 07/07						
VFA-22	03/96 - 05/96	02/00 - 04/00	08/02 - 10/02	03/05 - 05/05	10/07 - 12/07		
VFA-25	01/95 - 03/95	10/01 - 12/01	02/07 - 04/07	10/07 - 12/07			
VFA-27	02/92 - 04/92	10/04 - 12/04					
VFA-303							
VFA-305							
VFA-31	06/07 - 08/07						
VFA-32	02/07 - 04/07	03/09 - 05/09					
VFA-34	06/01 - 08/01	09/09 - 11/09					
VFA-37	05/02 - 07/02	02/04 - 04/04	03/09 - 05/09				
VFA-41	12/04 - 02/05	05/09 - 07/09	08/10 - 10/10				
VFA-81	11/94 - 01/95	08/97 - 10/97	08/99 - 10/99	08/06 - 10/06	01/09 - 03/09		
VFA-82	01/01 - 03/01	09/05 - 11/05					
VFA-83	02/96 - 04/96	11/97 - 01/98	06/99 - 08/99	08/01 - 10/01	07/03 - 09/03	02/06 - 04/06	03/09 - 05/09
VFA-86	03/95 - 05/95	06/01 - 08/01	06/03 - 08/03	06/05 - 08/05	12/08 - 02/09	08/10 - 10/10	
VFA-87	02/92 - 04/92	04/93 - 06/93	04/94 - 06/94	04/00 - 06/00	07/02 - 09/02	11/07 - 01/08	08/10 - 10/10
VFA-94	03/96 - 05/96	04/98 - 06/98	10/00 - 12/00	03/04 - 05/04			
VFA-97	01/92 - 03/92	11/00 - 01/01	11/02 - 01/03	03/07 - 05/07	02/09 - 04/09	08/10 - 10/10	

**Fig 18: Three Month Post Reduced Flight Operations Period
By Squadron**

Figure 19 shows the dates of each squadron's class A/B/C flight mishaps. Dates highlighted in yellow denote that the mishap occurred during the three month period after extended reduced flight hours. Dates highlighted in green denote that the mishap occurred during a three month period after an aircraft transition period and was not counted in the calculation.

Squadron	CLASS A/B/C FLIGHT MISHAPS							
VFA-102	4/6/2004	1/29/2005						
VFA-103	1/26/2006	8/21/2007	1/28/2010					
VFA-105	8/12/1991	8/9/1996	5/26/1999	9/12/2001	10/23/2001	3/25/2004	7/28/2005	3/13/2007
	7/6/2007	10/1/2007	1/7/2008	7/18/2010				
VFA-11	9/3/2006	10/10/2006	8/29/2007	4/2/2008	4/6/2008	7/27/2010		
VFA-113	11/27/1996	9/24/1998	11/16/2005	4/6/2006	7/23/2008	9/2/2009		
VFA-115	3/19/1998	2/9/2000	1/3/2002	10/9/2003	11/8/2003	11/1/2007	3/11/2010	
VFA-127								
VFA-131	12/15/1995	4/1/1996	6/11/2003	11/9/2004	12/21/2005	2/15/2007	6/17/2008	
VFA-132	3/15/1992							
VFA-136	7/1/1992	7/17/1993	8/5/1993	3/24/1996	6/20/2000	8/17/2003		
VFA-137	10/6/1991	3/29/1995	6/23/1999	5/26/2004	8/22/2005	3/15/2010	8/5/2010	
VFA-14	3/18/2004	2/11/2005	7/18/2005	4/30/2006	5/8/2008			
VFA-143	12/14/2006	2/8/2007	4/14/2007					
VFA-146	2/15/1993	3/11/1995	10/1/1996	9/17/1998	3/14/2004	4/22/2005	8/4/2007	8/28/2008
VFA-147	7/12/1991	3/19/1992	2/16/1996	9/7/2000	1/22/2002	2/18/2003	11/11/2008	5/3/2009
VFA-15	1/24/1991	5/28/1992	1/22/1995	3/16/1997	9/1/1997	9/14/1997	9/19/2001	3/26/2004
	4/18/2007	6/13/2008	9/10/2010	10/10/2010				
VFA-151	5/21/1993	11/18/1994	4/3/1996	10/20/2000	7/14/2001	2/12/2003	7/23/2003	8/26/2004
VFA-154	8/14/2006	1/22/2010						
VFA-192	5/13/1992	7/11/1995	4/27/1998	12/22/2003	4/17/2004	9/6/2007	8/6/2008	1/29/2009
	10/5/2010							
VFA-195	8/31/1991	9/10/1991	1/28/1993	1/6/2005	4/10/2007	7/30/2007	9/22/2010	
VFA-2	8/2/2004	7/27/2009						
VFA-201	12/3/1999	2/22/2002	8/31/2002	3/10/2003	12/11/2003	9/28/2005	5/5/2006	
VFA-203	10/29/1990	1/15/1996	8/21/1998	11/30/2000	1/16/2002	12/4/2002	3/29/2004	
VFA-204	2/6/1995	2/9/1995	10/17/1995	8/30/1996	10/8/1997	4/25/2005	4/5/2008	8/27/2008
	9/11/2008	10/10/2008	7/20/2009	8/7/2009				
VFA-211	9/8/2005	8/17/2010						
VFA-213	12/15/2008							
VFA-22	8/24/1991	5/7/1992	1/28/1995	1/17/1996	12/2/1997	10/25/2002	3/12/2006	4/9/2006
	5/7/2006	2/18/2009						
VFA-25	4/22/1991	9/9/1992	5/17/1995	9/29/2000	1/17/2003	9/5/2003	6/28/2004	5/18/2005
	10/17/2005	10/26/2005	1/28/2006	1/9/2007				
VFA-27	4/2/1997							
VFA-303								
VFA-305								
VFA-31	4/21/2008	3/25/2009						
VFA-32	12/16/2007							
VFA-34	9/25/1998	12/4/1999	11/3/2002					
VFA-37	7/24/1992	1/20/1993	3/15/1993	5/27/1998	12/9/1999	4/8/2003	11/18/2005	1/26/2008
	4/11/2008							
VFA-41	10/18/2002	10/20/2005	1/10/2007	4/21/2009	5/5/2009			
VFA-81	2/12/1994	5/7/1996	6/17/1997	2/8/1998	2/3/1999	3/16/2004	11/14/2005	11/18/2005
	8/21/2006	6/2/2007						
VFA-82	1/11/1991	6/21/1994	9/24/1997	2/17/1998	5/17/1999	6/21/2000	3/24/2004	5/28/2004
VFA-83	10/25/1991	11/21/1991	4/28/1994	7/6/1995	3/22/1996	9/30/1996	9/16/1998	2/20/2003
	12/23/2003	9/19/2004	3/22/2007	2/7/2008	9/18/2008	11/16/2009	11/16/2009	
VFA-86	1/12/1991	5/24/1993	2/2/1994	3/9/1994	1/4/1995	7/17/1996	7/25/2002	11/6/2002
	6/7/2005	4/24/2006	7/11/2008					
VFA-87	2/5/1991	7/6/1998	7/13/2000	10/27/2000	2/28/2002	10/11/2007	2/2/2009	3/30/2009
VFA-94	12/4/1991	2/18/1999	3/16/2000	4/16/2003	3/10/2004	4/9/2004	4/22/2009	5/5/2009
VFA-97	11/22/1992	12/16/1993	3/24/1994	8/13/1994	11/18/1994	7/18/1998	9/11/1998	11/15/1998
	1/6/2003	1/25/2005	11/1/2005	1/18/2006	8/22/2006	1/17/2007		

Fig 19: Class A/B/C Mishap By Squadron

Figure 20 compares the class A/B/C flight mishap rate per 100,000 flight hours during the three month period after extended reduced flight hours with the class A/B/C flight mishap rate during all other periods.

Period	Class A/B/CFM	Flt Hrs	Rate
Three Month	18	105,590	17.05
Normal Operations	249	2,175,263	11.45

Fig 20: Class A/B/C Flight Mishap Rate Per 100,000 Flight Hour Comparison

If a test for proportion with the two mishap rates is completed the result is a p-value of .170. A p-value greater than .05 as in this instance means that the two rates are not statistically significantly different.

Class A Flight Mishaps

Figure 21 shows the class A flight mishaps for each hornet squadron with the same yellow and green annotation.

CLASS A FLIGHT MISHAPS						
VFA-102	1/29/2005					
VFA-105	8/12/1991	8/9/1996	10/23/2001	1/7/2008		
VFA-131	11/9/2004					
VFA-132	3/15/1992					
VFA-136	8/5/1993					
VFA-137	10/6/1991	3/15/2010				
VFA-14	4/30/2006					
VFA-146	8/4/2007					
VFA-147	7/12/1991	2/18/2003				
VFA-15	1/24/1991	5/28/1992	9/14/1997	9/19/2001	3/26/2004	6/13/2008
VFA-151	5/21/1993	11/18/1994	4/3/1996	10/20/2000	8/26/2004	
VFA-192	5/13/1992	4/27/1998				
VFA-195	7/30/2007					
VFA-201	12/3/1999					
VFA-203	1/15/1996	1/16/2002	3/29/2004			
VFA-22	8/24/1991	5/7/1992	1/28/1995	1/17/1996		
VFA-25	9/9/1992	5/17/1995	9/29/2000	1/17/2003	9/5/2003	1/28/2006
VFA-27	4/2/1997					
VFA-34	9/25/1998	12/4/1999	11/3/2002			
VFA-37	7/24/1992	5/27/1998	4/11/2008			
VFA-41	10/18/2002					
VFA-81	2/12/1994	2/8/1998				
VFA-82	6/21/1994	3/24/2004	5/28/2004			
VFA-83	4/28/1994	9/16/1998				
VFA-86	1/12/1991	5/24/1993	7/17/1996			
VFA-87	2/5/1991	10/27/2000	10/11/2007	2/2/2009		
VFA-94	12/4/1991	3/10/2004				
VFA-97	11/22/1992	11/18/1994	7/18/1998	1/6/2003	1/18/2006	

Fig 21: Class A Flight Mishaps By Squadron

The corresponding mishap rates displayed below resulted in a p-value of .866 implying that the difference is not statistically significant.

Period	Class AFM	Flt Hrs	Rate
Three Month	3	105,590	2.84
Normal Operations	68	2,175,263	3.13

Fig 22: Class A Flight Mishap Rate Per 100,000 Flight Hour Comparison

Class B Flight Mishaps

Class B mishaps and rates are displayed in the following two tables.

Squadron	CLASS B FLIGHT MISHAPS					
VFA-103	8/21/2007					
VFA-105	9/12/2001	10/1/2007	7/18/2010			
VFA-11	4/6/2008					
VFA-113	11/27/1996					
VFA-115	1/3/2002	10/9/2003	11/8/2003			
VFA-131	12/21/2005	6/17/2008				
VFA-137	6/23/1999	8/5/2010				
VFA-14	5/8/2008					
VFA-143	4/14/2007					
VFA-146	10/1/1996					
VFA-147	9/7/2000	5/3/2009				
VFA-15	3/16/1997	4/18/2007	9/10/2010	10/10/2010		
VFA-151	7/14/2001					
VFA-192	1/29/2009					
VFA-195	8/31/1991					
VFA-2	8/2/2004					
VFA-201	5/5/2006					
VFA-204	10/8/1997	4/5/2008	8/27/2008	9/11/2008	7/20/2009	8/7/2009
VFA-22	3/12/2006	5/7/2006				
VFA-25	6/28/2004					
VFA-37	12/9/1999					
VFA-41	1/10/2007					
VFA-81	11/14/2005	8/21/2006				
VFA-82	1/11/1991					
VFA-83	12/23/2003					
VFA-87	7/6/1998					
VFA-94	3/16/2000	4/16/2003				
VFA-97	1/17/2007					

Fig 23: Class B Flight Mishaps By Squadron

Period	Class BFM	Flt Hrs	Rate
Three Month	5	105,590	4.74
Normal Operations	41	2,175,263	1.88

Fig 24: Class B Flight Mishap Rate Per 100,000 Flight Hour Comparison

The p-value of .182 means the difference is not statistically significant.

Class C Flight Mishaps

Squadron	CLASS C FLIGHT MISHAPS							
VFA-102	4/6/2004							
VFA-103	1/26/2006	1/28/2010						
VFA-105	5/26/1999	3/25/2004	7/28/2005	3/13/2007	7/6/2007			
VFA-11	9/3/2006	10/10/2006	8/29/2007	4/2/2008	7/27/2010			
VFA-113	9/24/1998	11/16/2005	4/6/2006	7/23/2008	9/2/2009			
VFA-115	3/19/1998	2/9/2000	11/1/2007	3/11/2010				
VFA-131	12/15/1995	4/1/1996	6/11/2003	2/15/2007				
VFA-136	7/1/1992	7/17/1993	3/24/1996	6/20/2000	8/17/2003			
VFA-137	3/29/1995	5/26/2004	8/22/2005					
VFA-14	3/18/2004	2/11/2005	7/18/2005					
VFA-143	12/14/2006	2/8/2007						
VFA-146	2/15/1993	3/11/1995	9/17/1998	3/14/2004	4/22/2005	8/28/2008		
VFA-147	3/19/1992	2/16/1996	1/22/2002	11/11/2008				
VFA-15	1/22/1995	9/1/1997						
VFA-151	2/12/2003	7/23/2003						
VFA-154	8/14/2006	1/22/2010						
VFA-192	7/11/1995	12/22/2003	4/17/2004	9/6/2007	8/6/2008	10/5/2010		
VFA-195	9/10/1991	1/28/1993	1/6/2005	4/10/2007	9/22/2010			
VFA-2	7/27/2009							
VFA-201	2/22/2002	8/31/2002	3/10/2003	12/11/2003	9/28/2005			
VFA-203	10/29/1990	8/21/1998	11/30/2000	12/4/2002				
VFA-204	2/6/1995	2/9/1995	10/17/1995	8/30/1996	4/25/2005	10/10/2008		
VFA-211	9/8/2005	8/17/2010						
VFA-213	12/15/2008							
VFA-22	12/2/1997	10/25/2002	4/9/2006	2/18/2009				
VFA-25	4/22/1991	5/18/2005	10/17/2005	10/26/2005	1/9/2007			
VFA-31	4/21/2008	3/25/2009						
VFA-32	12/16/2007							
VFA-37	1/20/1993	3/15/1993	4/8/2003	11/18/2005	1/26/2008			
VFA-41	10/20/2005	4/21/2009	5/5/2009					
VFA-81	5/7/1996	6/17/1997	2/3/1999	3/16/2004	11/18/2005	6/2/2007		
VFA-82	9/24/1997	2/17/1998	5/17/1999	6/21/2000				
VFA-83	10/25/1991	11/21/1991	7/6/1995	3/22/1996	9/30/1996	2/20/2003	9/19/2004	3/22/2007
	2/7/2008	9/18/2008	11/16/2009	11/16/2009				
VFA-86	2/2/1994	3/9/1994	1/4/1995	7/25/2002	11/6/2002	6/7/2005	4/24/2006	7/11/2008
VFA-87	7/13/2000	2/28/2002	3/30/2009					
VFA-94	2/18/1999	4/9/2004	4/22/2009	5/5/2009				
VFA-97	12/16/1993	3/24/1994	8/13/1994	9/11/1998	11/15/1998	1/25/2005	11/1/2005	8/22/2006

Fig 25: Class C Flight Mishaps By Squadron

Period	Class CFM	Flt Hrs	Rate
Three Month	10	105,590	9.47
Normal Operations	140	2,175,263	6.44

Fig 26: Class C Flight Mishap Rate Per 100,000 Flight Hour Comparison

The class C mishap rates result in a p-value of .319 meaning that there is no statistically significant difference in the class C rates.

Class A/B/C Ground Mishaps

Squadron	CLASS A/B/C GROUND MISHAPS							
VFA-102	8/3/2004	12/5/2004	2/12/2005	8/1/2006				
VFA-103	12/30/2009							
VFA-105	6/12/1992	1/26/1993	8/21/2000	1/18/2001	7/6/2004	6/7/2005	8/2/2010	
VFA-111	4/6/2007	7/30/2007						
VFA-113	6/24/2000	12/18/2000	5/16/2002	10/30/2002	2/8/2003	3/13/2003	4/22/2005	12/10/2005
	5/20/2009	8/25/2009	9/10/2009					
VFA-115	9/6/2001	12/3/2001	5/5/2002	11/22/2002	3/23/2004	8/25/2004	8/28/2004	9/19/2004
	8/16/2006	3/12/2007	1/10/2008					
VFA-131	6/27/1991	9/30/1999	7/14/2000	11/16/2003	7/26/2006	1/18/2010		
VFA-136	7/31/1991	11/4/1991	5/16/1996	4/16/1998	3/24/2000	7/29/2006		
VFA-137	8/16/1991	5/16/1994	5/20/1994	9/18/1994	11/6/2000	5/8/2003	1/17/2006	
VFA-14	11/10/2002	12/12/2002	12/2/2004					
VFA-143	5/5/2006	5/23/2006	3/28/2007	1/14/2009				
VFA-146	4/22/1991	3/6/1992	7/1/1993	5/6/1995	2/17/1996	5/12/1996	7/21/1997	6/22/1998
	1/11/2000	5/9/2000	1/18/2002	9/2/2002	7/19/2004	1/28/2007		
VFA-147	11/4/1990	2/5/1993	3/23/1996	2/21/1997	12/7/1997	2/9/2010		
VFA-15	6/23/2001	10/9/2007						
VFA-151	11/22/1996	5/10/1997	6/5/1997	9/6/1999	9/16/1999	2/9/2001	5/1/2001	3/22/2003
	10/22/2004	8/26/2009	7/27/2010					
VFA-154	7/22/2004	5/20/2005	3/5/2007	7/15/2007	8/4/2007	10/14/2007	5/30/2008	9/30/2008
	1/23/2009	9/2/2010						
VFA-192	4/7/1991	3/16/1995	2/12/1998	10/26/2000	11/2/2005	4/26/2008	6/7/2008	9/25/2009
	10/17/2010							
VFA-195	8/13/2005	8/9/2009	11/13/2009	12/8/2009				
VFA-2	2/25/2004	11/4/2004						
VFA-201	10/7/2002							
VFA-203	4/28/1998							
VFA-204	4/22/1994	4/4/2007	11/21/2008					
VFA-211	11/10/2005	6/30/2006	7/24/2006					
VFA-213	9/19/2008	10/10/2008	11/8/2008	9/2/2009				
VFA-22	7/17/1995	8/20/1998	9/19/2000	7/17/2001	11/5/2002	1/28/2003	10/21/2005	2/13/2006
	6/30/2009							
VFA-25	2/10/1996	8/30/2002	11/7/2002	11/30/2002	1/29/2004	10/27/2005	6/14/2009	6/30/2009
VFA-27	10/16/2008	8/23/2009						
VFA-303	7/16/1993							
VFA-305	6/1/1993							
VFA-31	6/24/2007							
VFA-34	9/21/1999	9/13/2000	7/22/2002	5/20/2005	1/25/2006	5/10/2010		
VFA-37	8/7/2000	10/30/2007						
VFA-41	6/30/2004	8/30/2005	10/5/2005	5/9/2007	8/19/2007	4/9/2009	10/14/2010	
VFA-81	5/20/1992	8/18/2000	8/31/2000	7/15/2001	10/27/2004	4/5/2006		
VFA-82	12/30/2003	10/19/2004						
VFA-83	3/3/1993	3/7/1996	3/7/2000	8/17/2000	11/25/2003	7/10/2006	7/23/2006	4/9/2007
	12/29/2008							
VFA-86	8/26/1991	10/3/1992	9/23/1994	6/27/1999	2/5/2004	6/2/2006	1/20/2007	2/23/2009
VFA-87	6/8/1993	11/16/1994	6/21/2002	1/16/2010	10/26/2010			
VFA-94	7/31/1995	2/23/1996	6/10/1998	10/29/2002	8/2/2005			
VFA-97	2/5/1993	2/5/2001	1/21/2004	9/5/2005	3/25/2007	3/18/2010		

Fig 27: Class A/B/C Ground Mishaps By Squadron

Period	Class A/B/C GRD	Flt Hrs	Rate
Three Month	13	105,590	12.31
Normal Operations	197	2,175,263	9.06

Fig 28: Class A/B/C Ground Mishap Rate Per 100,000 Flight Hour Comparison

The resulting p-value of .349 means that there is no statistically significant difference between the two mishap rates.

MISHAP RATES DURING THE THREE MONTH PERIOD AFTER EXTENDED REDUCED FLIGHT OPERATIONS VS RATES DURING ALL OTHER OPERATIONS (EXCLUDING REDUCED OPERATIONS PERIOD)

In this section the mishaps and flight hours during the three month period following an extended reduced operating period will be the same as the previous section. These rates will be compared to the remaining operating periods however the mishaps and flight hours that were compiled during the reduced operating period were excluded this time. The results follow.

Period	Class A/B/C FM	Flt Hrs	Rate	p-value
Three Month	18	105,590	17.05	0.115
Normal Operations	212	1,998,888	10.61	

Fig 29: Class A/B/C Flight Mishap Rate Per 100,000 Flight Hours

Period	Class AFM	Flt Hrs	Rate	p-value
Three Month	3	105,590	2.84	0.901
Normal Operations	61	1,998,888	3.05	

Fig 30: Class A Flight Mishap Rate Per 100,000 Flight Hours

Period	Class BFM	Flt Hrs	Rate	p-value
Three Month	5	105,590	4.74	0.13
Normal Operations	30	1,998,888	1.50	

Fig 31: Class B Flight Mishap Rate Per 100,000 Flight Hours

Period	Class CFM	Flt Hrs	Rate	p-value
Three Month	10	105,590	9.47	0.262
Normal Operations	121	1,998,888	6.05	

Fig 32: Class C Flight Mishap Rate Per 100,000 Flight Hours

Period	Class A/B/C GRD	Flt Hrs	Rate	p-value
Three Month	13	105,590	12.31	0.38
Normal Operations	185	1,998,888	9.26	

Fig 33: Class A/B/C Ground Mishap Rate Per 100,000 Flight Hours

In each case the p-value is greater than .05 meaning that the difference in rates is not statistically significant.

Conclusions

- Extended Reduced Operating Periods
 - The data shows that the overall flight mishap rate during periods of extended reduced flight hours was statistically significantly higher than normal operating periods. However the most serious mishaps, class A, taken by themselves were not statistically significantly higher during extended reduced operations. Only the class B rate was statistically significantly higher and it is the main reason why the overall A/B/C flight mishap rate was statistically significantly higher.
 - The overall ground mishap rate was the opposite of the flight rate. It is statistically significantly lower than the normal operations rate.
 - The data also showed that the human and material factors were not statistically significantly different during the two operating periods.
- Three Months After Extended Reduced Operating Periods
 - Mishap rates for the period spanning three months after extended reduced operating periods are not statistically significantly different than all other operating periods. This is true regardless of whether the extended reduced operating periods were included or excluded from the comparison.