The X-15 Rocket Plane

Flying the First Wings Into Space

Flight Log

by Michelle Evans

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1. Introduction

This Flight Log for the X-15 research aircraft is a supplement to the book "The X-15 Rocket Plane: Flying the First Wings Into Space," published by the University of Nebraska Press as part of the "Outward Odyssey, People's History of Spaceflight" series. This flight log contains a program summary; basic information about the X-15; a log of all captive flights, aborted flights, and research flights; a timeline which includes important milestone dates such as vehicle rollouts and other significant events; and a glossary of terms.

A. FLIGHT LOG FORMAT

Three X-15s were built. They were designated by their tail numbers: **56-6670**, **56-6671**, and **56-6672**.

Flight Numbers

First Digit signifies the aircraft. 1 is **66670**, 2 is **66671**, and 3 is **66672**.
Second Digit signifies A for Abort, C for Captive, or a numeral that signifies the number of actual releases.
Third Digit signifies the number of times that the X-15 was taken aloft, whether released or not.

Examples:

1. Flight **2-53-97** was the 97th time aircraft 2 (66671) was taken aloft but only the 53rd time it was actually released from the B-52.
2. Flight **3-A-46** was the 46th time aircraft 3 (66672) was carried aloft, but the flight was aborted for weather or technical reasons after the B-52 took off, but before the X-15 was released.
3. Flight **1-C-1** was a scheduled Captive flight for aircraft 1 (66670). The X-15 was carried aloft for a technical checkout and returned to Edwards AFB, still attached to the right wing pylon of the B-52.

Column 1

Flight/Pilot: The flight number as given in the above examples, followed by the pilot who flew the mission. The number in parentheses after the pilot's name signifies their current X-15 flight number.

Launch and **Landing** includes the exact time and area of those events for the X-15.
NOTE: All times for X-15 and B-52 are given in 24-hour format. Example: 15:21 is 3:21 p.m.

Duration is from the moment of X-15 launch until it came to a complete stop after landing.

Column 2

Engine Run and **Duration** are in seconds.

Altitude is in feet above mean sea level (MSL).

Distance is in statute miles. (to convert to nautical miles, multiply by 0.87)

Column 3

B-52/Pilots: Tail number of the carrier aircraft: NB-52A 52-003 (003) and NB-52B 52-008 (008). Pilots are listed as Pilot & Copilot.

Duration is given in hours and minutes for total B-52 flight time from take off to landing.

Chase Pilots: Chase refers to aircraft that flew alongside the B-52/X-15 during flight for observation and photography. These aircraft included F-100, F-104, F-5D, F-4H, and T-38. Due to the extreme speed of the X-15, separate chase aircraft were assigned to the launch from the B-52 and to landing at Edwards AFB, or remote lakebeds during emergency situations.

B. RESEARCH

This X-15 Flight Log has taken years of research to compile. There is no single definitive source available where all data found in this log can be located, so many different sources have had to be identified and researched. When more than one source has any given piece of data, there is often a contradiction. A judgement must often be made as to the validity of the conflicting data. The criteria used in this judgement must be how close these data are to the actual events, how was the data obtained, and how was it recorded.

There are two primary sources for X-15 flight data: the National Aeronautics and Space Administration (NASA) and the United States Air Force (USAF). NASA documents pertaining to the X-15 are primarily found at the Armstrong Flight Research Center, while USAF documents are found at the Air Force Flight Test Center History Office. Both of these are located at Edwards Air Force Base in California. Edwards AFB is where all the X-15 flights originated between 1959 and 1968.

NASA and USAF documents do not always agree on flight specifics. Since NASA was the lead organization for the X-15 program and was responsible for disseminating all data gained from that research, their records must be given priority when it comes to the X-15 itself. The B-52 carrier aircraft was on loan from the USAF and, with a few exceptions, was flown by USAF pilots. For this reason, USAF records are considered the primary source of information concerning the B-52.

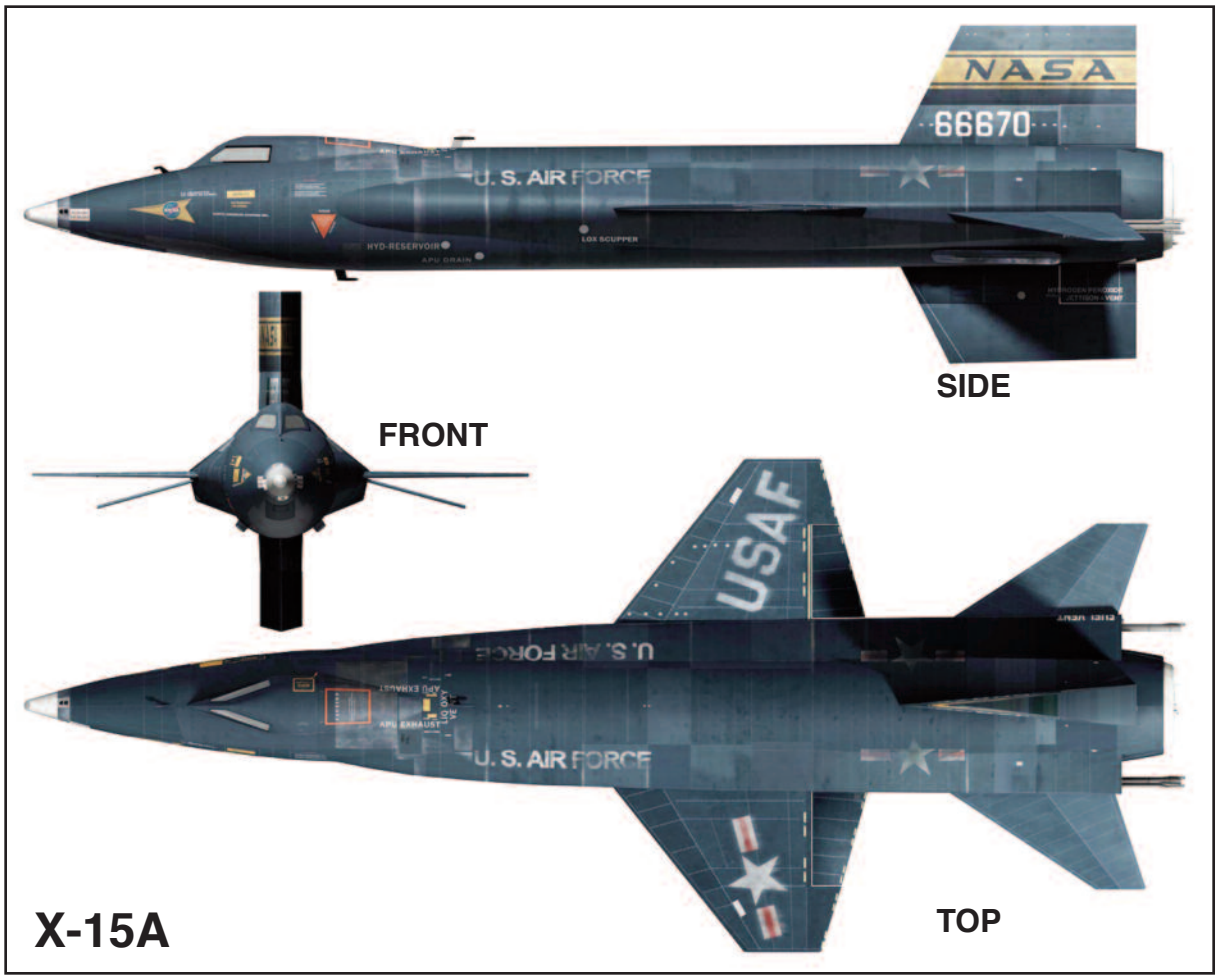
Information surfaced after the first printing of this flight log that raised questions about some of the data contained herein. A new set of records appeared that contradicted many numbers from this log, primarily with concern to the X-15 launch and landing times and the B-52 takeoff and landing times. The records in question have never been made available to researchers for validation, but further work was undertaken to see if these new data could be independently verified through other sources and thus a decision made to be included in this and future revisions of the flight log.

For the X-15 data: A set of graphs was located which were created at the time of each X-15 flight using the raw data recorded by instruments on board the X-15. This information was entered into a computer plotter and the results then output to these graphs. Prior to viewing these graphs, I was told that they are considered the most accurate information on X-15 flights available. After looking at over 300 graphs that covered 144 out of the 199 X-15 flights (graphs from all flights are not available), my conclusion was that some of the original flight records were in error. Those errors have been corrected in this flight log. However, the data that surfaced to instigate this new research was also found to be in error even more often than the original data. With that basis I have stayed with the official Armstrong Flight Research Center records except where directly contradicted by the flight data graphs.

For the B-52 data: In order to verify the B-52 takeoff and landing times I turned to the pilot who flew most of the B-52 sorties during the X-15 program, Fitz Fulton. He kindly went back through his pilot flight hour logs and was able to verify that the original numbers I had obtained through the USAF were very accurate. No independent confirmation of the contradictory data has been found, so the original numbers from the historical record have been retained.

In conclusion: There are many contradictory sets of research numbers connected to the X-15 program. I believe that my research has uncovered the most accurate and verifiable data to date and these data have been incorporated into this flight log. If new records come to light and can be properly scrutinized and verified, then this flight log will be updated accordingly.

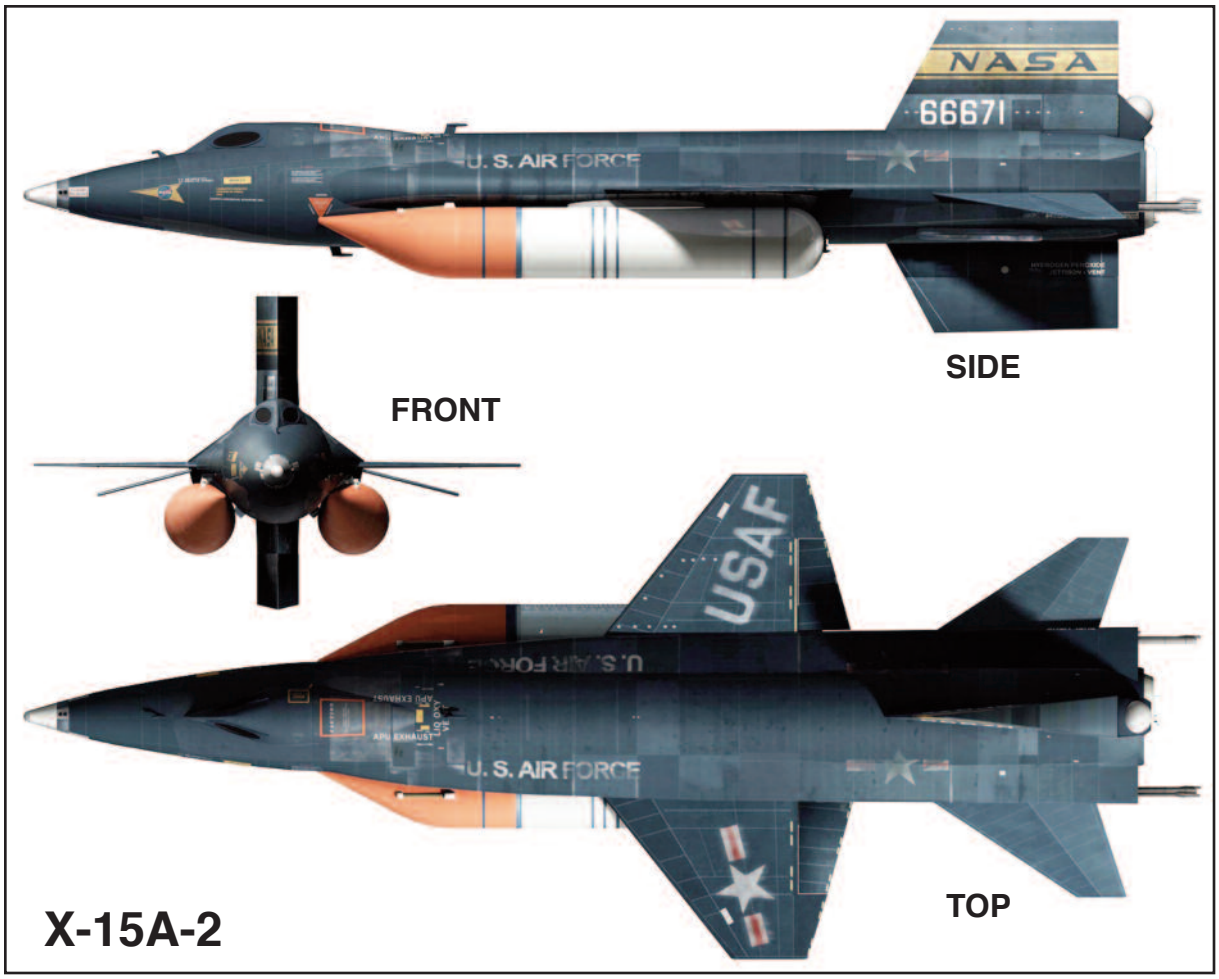
2. X-15 Specifications



Artwork created by Thommy Eriksson

A. X-15A DIMENSIONS

Length	56’ 1.5”	With nose boom and XLR-11 rocket engine
	55’ 2.5”	With nose boom and XLR-99 rocket engine
	50’ 1”	With Q-Ball nose and XLR-11 rocket engine
	49’ 2”	With Q-Ball nose and XLR-99 rocket engine
Span	22’ 4”	Standard aircraft
	23’ 8”	With wing tip pods
Height	13’ 1”	Standard aircraft
	11’ 6”	Without lower ventral fin and with landing gear extended
Launch Weight	33,500 lbs	Standard aircraft
Burn Out Weight	14,500 lbs	Standard aircraft
Landing Weight	13,800 lbs	Standard aircraft



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B. X-15A-2 DIMENSIONS

Length	51’	11”	Modified 66671 aircraft
Span	22’	4”	Standard aircraft
Height	13’	1”	Modified 66671 without lower ventral fin and with landing gear extended
Launch Weight	35,250 lbs		Modified 66671 without external fuel tanks
	51,600 lbs		Modified 66671 with external fuel tanks
	52,050 lbs		Modified 66671 with external fuel tanks and ablative
Burn Out Weight	16,200 lbs		Modified 66671 without external fuel tanks
	16,500 lbs		Modified 66671 with external fuel tanks
	16,950 lbs		Modified 66671 with external fuel tanks and ablative
Landing Weight	15,500 lbs		Modified 66671 without external fuel tanks
	15,600 lbs		Modified 66671 with external fuel tanks - tanks jettisoned
	16,050 lbs		Modified 66671 with external fuel tanks and ablative - tanks jettisoned

External Fuel Tanks for the modified 66671 aircraft were 22’ long and 37.75” in diameter.
The **Liquid Oxygen** tank weighed 7,919 lbs full and the **Anhydrous Ammonia** tank weighed 6,074 lbs full.

3. X-15 Flight Test Program

A. THE HIGH RANGE

The High Range consisted of a 400-mile-long flight corridor starting at Wendover, Utah, and stretching southwest to Edwards Air Force Base California's Mojave Desert. Along the corridor were two tracking stations located at Ely and Beatty, Nevada. Along this track were numerous dry lake beds that were used as launch reference points, as well as emergency landing sites if the X-15 did not have enough energy to glide back to the primary landing site of Rogers Dry Lake at Edwards AFB.

B. POWER FOR THE X-15

The X-15 was to be powered by the XLR99-RM-1 (later YLR-99) rocket engine. This single-chamber rocket built by Reaction Motors, Inc., provided 60,000 pounds of thrust and was able to be throttled from 30% to 100% of rated thrust. Development problems caused delays in the delivery of the LR-99, so an interim rocket engine, the XLR11-RM-13, was installed for the beginning of the flight test program. The LR-11 was a 4-chamber rocket and was the same type used for nearly all the rocket-powered X-planes up to that time. (An LR-11 was the rocket engine that powered the X-1 when it broke the sound barrier in 1947.) To provide enough thrust for the X-15, two LR-11 rockets were mounted one on top of the other, giving a total of eight chambers and nearly 16,000 pounds of thrust. Once the LR-99 finally made it through research and development, it was installed in the X-15 where it proved to be reliable, with more than enough power to push the X-15 to its design limits and beyond.

C. X-15 PROGRAM SUMMARY

On 15 October 1958, the first of three X-15s, was unveiled to the public at the North American Aviation plant in Los Angeles, California. It was black, stubby-winged, and wedge-tailed. It was the next logical step in a long line of research aircraft which had methodically pushed back the edge of the unknown. At the time of its roll-out, the altitude record was just slightly above 100,000 feet. The speed record had touched Mach 3, but had destroyed the aircraft and killed the pilot. The X-15 had been designed to stretch this envelope significantly to Mach 6 and 250,000 feet.

One unusual aspect of the experimental rocket planes in general, and the X-15 in particular, was the method of launch. To conserve fuel, it was decided to carry these craft up to altitude in the bomb bay of a "mother" airplane, where they would then be launched. The X-15 was too large even for this, so the carry point was moved from the bomb bay to a pylon slung under the wing of a specially-modified Boeing B-52 bomber. Nestled securely between the B-52 fuselage and the first set of jet engines on the right wing, the X-15 rode to above 40,000 feet, where it was dropped from its shackles. Immediately after drop the pilot lit the rocket engine and the X-15 sprinted away on its mission, quickly outpacing even the fastest after-burning chase aircraft.

After launch, the pilot pulled back on the stick and headed up toward space. At burnout, the craft plunged onward and upward on a ballistic arc, often to well above the original design limit of 250,000 feet. At this altitude, conventional control surfaces such as flaps and rudders were completely useless, so the pilot had to rely on the small rocket nozzles of the Ballistic Control System (later known as the Reaction Control System) in the nose and wing-tips to keep the X-15 in the proper attitude for re-entry.

While above the atmosphere and in zero-g, many experiments could be carried out that would have been impossible under the blanket of air. For the last half of the program's nine year lifetime, the X-15 served as an experiment carrier instead of solely as the aerospace research vehicle for which it had been designed. A wide diversity of experiments were carried, including ultraviolet stellar photography, horizon sensing and star tracking, Apollo-Saturn insulation tests, and micrometeorite collection, among many others.

Twelve men flew the X-15, from Scott Crossfield, who had been the first man to fly twice the speed of sound in the Douglas D-558, Phase 2, Skyrocket; to Neil Armstrong, who was the first man to take a "small step" onto the lunar surface on 20 July 1969. The only US Navy pilot to fly in the program, Forrest Petersen, later went on to further his career by becoming the commanding officer of the aircraft carrier *U.S.S. Enterprise*. Joe Engle earned his astronaut wings on the X-15 before commanding a different

Enterprise, the first Space Shuttle, which he flew on several atmospheric test flights released from the back of a 747 Shuttle Carrier Aircraft in 1977. He finally flew into space again on the Space Shuttle *Columbia* in November 1981, and also on *Discovery* in August 1985. Joe Walker, one of America's best test pilots, lost his life in the tragic crash of the North American Aviation XB-70A Valkyrie when his Lockheed F-104 Starfighter collided with the huge triplesonic bomber in 1966. His X-15 altitude record of 354,200 feet (67.1 miles) in August 1963 was finally exceeded in October 2004 by Brian Binnie in a flight by SpaceShipOne. A speed record of Mach 6.70 (4,520 mph) was set by Pete Knight, who later became the mayor of Palmdale, California and went on to serve in the California State Assembly.

All test programs of this nature have problems and accidents. Some are minor bumps in the flight envelope, while others may lead to the loss of a valuable aircraft and an irreplaceable pilot. With the right team in place and the proper set of circumstances, an accident that seemed catastrophic may be turned into a true asset. This was certainly the case in the X-15 program. On 9 November 1962, John McKay had an in-flight emergency when the rocket engine would not give the required thrust. This demanded an immediate landing on a hard-packed dry lakebed 200 miles away from his intended goal of Edwards AFB. A chain of malfunctions caught up with him on landing and the aircraft crashed. McKay suffered several compressed vertebrae from the weight of the X-15 literally lying on his neck, since he jettisoned the cockpit canopy as the aircraft rolled over. However, he was able to resume research flying only five months later. Unlike the pilot, the aircraft seemed a total loss. Undaunted by the accident, a proposal was made to rebuild and modify the aircraft to make it capable of research at even higher speed than when the X-15 had first been designed. This resulted in the aircraft into the advanced X-15A-2. With the addition of two external fuel tanks and an ablative coating to protect the Inconel-X skin of the aircraft, the speed range of up to Mach 8 was theoretically possible, but never achieved. This configuration was used when Pete Knight flew Mach 6.70 on 3 October, 1967. After the flight, the insulation was found to need such extensive refurbishment that it would have taken longer to accomplish than the original installation. This, coupled with several other factors, grounded the X-15A-2 for good.

Just three flights later, on 15 November 1967, the program suffered its only loss of life when Michael Adams was killed during the reentry of X-15 no. 3. On this flight, his first that would have qualified him for astronaut wings, Adams became disoriented at high altitude and misread an instrument that could be set to register different functions. When aligning the X-15 for reentry, the aircraft ended up pointed the wrong direction, which sent the craft into a deadly spin, where it broke apart and crashed onto the desert floor.

This left X-15 no. 1 as the sole flying hypersonic aircraft. It continued performing flight experiments for another year before the whole program was finally brought to a close in December 1968 after 199 flights. The 200th flight was attempted but never succeeded due to technical problems in the air and, on the very last attempt, a freak snowstorm at Edwards shut down all flight operations.

Several years later, North American Aviation changed its name to North American Rockwell, and finally Rockwell International. They entered the competition for the design and construction of the world's first reusable Earth-orbiting space vehicle. They already had extensive experience with a vehicle that routinely flew into, and back from, space: the X-15. The old concepts were dusted off, especially those concerning the advanced X-15A-2 with its jettisonable external fuel tanks. They scaled everything up until they had their winning Space Shuttle design.

Without the basic research supplied by the X-15, the Space Shuttle would have taken longer to get into orbit, and the cost could have been considerably higher. If not for the sidetracking into expendable launch vehicles to play catch-up with the Soviet Union (which forced an overshadowing of the X-15 and the cancellation of its orbital follow-on, the X-20 Dyna-Soar) we probably would have had a shuttle-type vehicle a lot sooner.

For more details on the X-15 and the men who flew this magnificent vehicle, along with the stories of many on the ground who made it all possible, please be sure to read

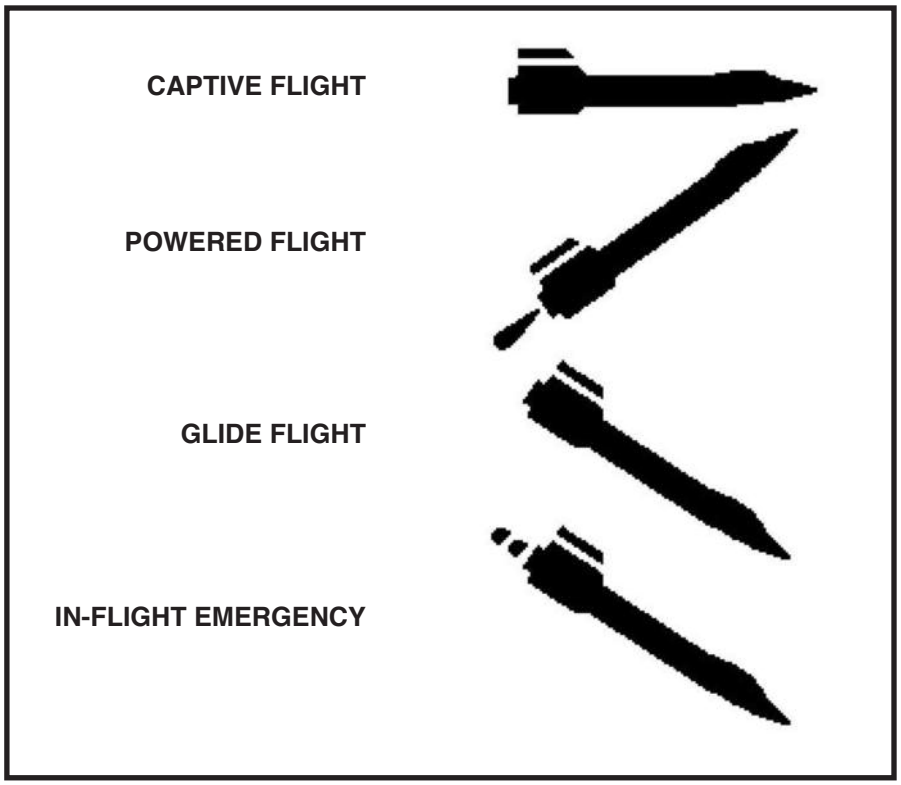
"The X-15 Rocket Plane: Flying the First Wings Into Space."

D. AIRCRAFT DISPOSITION

X-15: 66670 — Original aircraft is at the National Air and Space Museum in Washington, D.C.
66671 — Original aircraft is at the National Museum of the US Air Force, Dayton, OH.
66672 — Original aircraft crashed on 15 November 1967 near Johannesburg, CA.
Mockups — Full-scale mockup of X-15 no. 2 is located at Pima Air & Space Museum in Tucson, AZ. Mockups of X-15 no. 3 are at the Armstrong Flight Research Center at Edwards AFB, and at Evergreen Aviation & Space Museum in McMinnville, OR. There is currently no mockup of 66670.
B-52: 003 — Original aircraft is at the Pima Air & Space Museum in Tucson, AZ.
008 — Original aircraft is at the North Gate of Edwards AFB, CA.

E. FLIGHT DESIGNATION MARKINGS

Each time the X-15 was taken aloft, the B-52 mothership that carried it had a small stencil painted on the right forward fuselage to designate the status of the flight. These stencils can still be seen on B-52 No. 003 on display at the Pima Air & Space Museum in Tucson, AZ. The original stencils on B-52 no. 008 have been removed and replaced with a general stencil to make room for stencils for later programs.



F. GENERAL INFORMATION

All X-15 pilots experienced their first flight in X-15 no. 1.
All X-15 aircraft were launched for the first time from B-52 no. 003.
The highest number of launches in a single month was seven in August 1966.
The highest number of aborted launches in a single month was five in July 1965.
The highest number of scheduled captive flights was two in November 1964 and in February 1965.
Walker, White, and Engle never had to make an X-15 emergency landing.
McKay had the highest number of emergency landings with three.
The most emergency landings in a single year was four in 1966.
Nearly one-third of all flights were launched on a Thursday.

4. Program Summary

A. AIRCRAFT FLIGHT SUMMARY (Number in parentheses refers to X-15A-2 and is included in 66671)

Aircraft	Launch	Abort	Captive	Airborne	Launch %
66670	081	059	002	142	57.0
66671	053	035	009	097	54.6
(66671A)	(022)	(015)	(008)	(045)	(48.9)
66672	065	031	001	097	67.0
Total	199	125	012	336	59.2

B. ORGANIZATION FLIGHT SUMMARY

Organization	Launch	Abort	Captive	Airborne	Launch %
NAA	014	014	002	030	46.7
USN	005	002	000	007	71.4
USAF	089	052	006	147	60.5
NASA	091	057	004	152	59.9

C. PILOT FLIGHT SUMMARY (Number in parentheses refers to the flight sequence 001 through 199)

Pilot	Org.	Flights	First Flight	Last Flight	High Mach	High Altitude
A. Scott Crossfield	NAA	14	8 Jun. 59 (**001**)	6 Dec. 60 (**030**)	2.97 (**026**)	88,116 (**006**)
Joseph A. Walker	NASA	25	25 Mar. 60 (**009**)	22 Aug. 63 (**091**)	5.92 (**059**)	354,200 (**091**)
Robert M. White	USAF	16	13 Apr. 60 (**012**)	14 Dec. 62 (**075**)	6.04 (**045**)	314,750 (**062**)
Forrest S. Petersen	USN	05	23 Sep. 60 (**022**)	10 Jan. 62 (**047**)	5.30 (**041**)	101,800 (**041**)
John B. McKay	NASA	29	28 Oct. 60 (**024**)	8 Sep. 66 (**171**)	5.65 (**115**)	295,600 (**150**)
Robert A. Rushworth	USAF	34	4 Nov. 60 (**025**)	1 Jul. 66 (**159**)	6.06 (**097**)	285,000 (**087**)
Neil A. Armstrong	NASA	07	30 Nov. 60 (**029**)	26 Jul. 62 (**064**)	5.74 (**064**)	207,500 (**051**)
Joe H. Engle	USAF	16	7 Oct. 63 (**092**)	14 Oct. 65 (**153**)	5.71 (**126**)	280,600 (**138**)
Milton O. Thompson	NASA	14	29 Oct. 63 (**093**)	25 Aug. 65 (**144**)	5.48 (**125**)	214,100 (**144**)
William J. Knight	USAF	16	30 Sep. 65 (**151**)	13 Sep. 68 (**198**)	6.70 (**188**)	280,500 (**190**)
William H. Dana	NASA	16	4 Nov. 65 (**156**)	24 Oct. 68 (**199**)	5.53 (**189**)	306,900 (**174**)
Michael J. Adams	USAF	07	6 Oct. 66 (**173**)	15 Nov. 67 (**191**)	5.59 (**177**)	266,000 (**191**)

D. SPEED AND ALTITUDE SUMMARY

Mach Number

0-.99	1-1.99	2-2.99	3-3.99	4-4.99	5-5.99	6-up
002	014	020	008	045	106	004

Altitude (thousands of feet)

0-99.999	100-199.999	200-249.999	250-299.999	300-349.999	350-up
097	060	023	015	003	001

E. B-52 FLIGHT SUMMARY (Number in parentheses refers to X-15A-2 and is included in 66671)

NB-52A Tail Number 52-003		**NB-52B Tail Number 52-008**	
66670	44	66670	37
66671	18	66671	35
(66671A)	(07)	(66671A)	(15)
66672	31	66672	34
Total	**93**	**Total**	**106**

F. AIRCRAFT RECORDS (* signifies record for X-15 program)

(** Mach number varies with altitude/air density so a higher Mach may be a lower mph)

Aircraft	Status	Flight	Date	Pilot	Org.	Record
66670	Fastest	097	5 Dec. 63	Rushworth	USAF	Mach 6.06
	Highest	197	21 Aug. 68	Dana	NASA	267,500 feet
	Farthest*	198	13 Sep. 68	Knight	USAF	299.8 nautical miles
	Longest	199	24 Oct. 68	Dana	NASA	688.3 seconds
66671	Fastest*	188	3 Oct. 67	Knight	USAF	Mach 6.70
	Highest	164	3 Aug. 66	Knight	USAF	249,000 feet
	Farthest	141	3 Aug. 65	Rushworth	USAF	249.2 nautical miles
	Longest	037	25 May 61	Walker	NASA	728.1 seconds
66672	Fastest	076	20 Dec. 62	Walker	NASA	Mach 5.73/3793 mph**
		126	2 Feb. 65	Engle	USAF	Mach 5.71/3886 mph**
	Highest*	091	22 Aug 63	Walker	NASA	354,200 feet
	Farthest*	189	4 Oct. 67	Dana	NASA	299.8 nautical miles
	Longest*	051	20 Apr. 62	Armstrong	NASA	748.7 seconds

G. ASTRONAUT QUALIFICATION FLIGHTS (above 50 miles or 264,000 feet)

Flight	Date	Pilot	Org.	Mach	Altitude
062	17 Jul. 62	White	USAF	5.45	314,750
077	17 Jan. 63	Walker	NASA	5.47	271,700
087	27 Jun. 63	Rushworth	USAF	4.89	285,000
090	19 Jul. 63	Walker	NASA	5.50	347,800
091	22 Aug. 63	Walker	NASA	5.58	354,200
138	29 Jun. 65	Engle	USAF	4.94	280,600
143	10 Aug. 65	Engle	USAF	5.20	271,000
150	28 Sep. 65	McKay	NASA	5.33	295,600
153	14 Oct. 65	Engle	USAF	5.08	266,500
174	1 Nov. 66	Dana	NASA	5.46	306,900
190	17 Oct. 67	Knight	USAF	5.53	280,500
191	15 Nov. 67	Adams	USAF	5.20	266,000
197	21 Aug. 68	Dana	NASA	5.01	267,500

Total Astronaut Qualification Flights: 13

Pilot	Flights
Walker	3
White	1
McKay	1
Rushworth	1
Engle	3
Knight	1
Dana	2
Adams	1
Organization	
USAF	7
NASA	6
Tail Numbers	
66670	2
66672	11

H. IN-FLIGHT EMERGENCIES

Flight	Date	Pilot	Org.	Lake	Remarks
004	5 Nov. 59	Crossfield	NAA	Rosamond	Engine fire and explosion
047	10 Jan. 62	Petersen	USN	Mud	Engine failed to start
051	20 Apr. 62	Armstrong	NASA	Rogers	Overshot altitude and landing
074	9 Nov. 62	McKay	NASA	Mud	Engine would only go to 30% thrust
108	21 May 64	Thompson	NASA	Cuddeback	Engine shutdown at 41 seconds
157	6 May 66	McKay	NASA	Delamar	Engine shutdown at 35 seconds
159	1 Jul. 66	Rushworth	USAF	Mud	No external fuel tank flow indication
171	8 Sep. 66	McKay	NASA	Smith Ranch	Low fuel line pressure
173	6 Oct. 66	Adams	USAF	Cuddeback	Fuel tank bulkhead ruptured
178	26 Apr. 67	Dana	NASA	Silver	Low fuel line pressure
184	29 Jun. 67	Knight	USAF	Mud	Electrical failure
191	15 Nov. 67	Adams	USAF	Randsburg	Fatal crash due to spin

I. LAUNCH LAKE DATA (Number of flights launched from each dry lake area)

Cuddeback	01	Railroad	02
Delamar	62	Rogers [local]	26
Hidden Hills	50	Silver	14
Mud	34	Smith Ranch	10

J. B-52 PILOT DATA (in alphabetical order)

Pilot	Flights
Cap. John E "Jack" Allavie	39
Sq. Ldr. Harry M. Archer	02
Maj. Russell P. Bement	32
Cap./Maj. Charles C. Bock, Jr.	15
Maj. Jerry D. Bowline	01
Maj. Frank E. Cole	01
Col. Joseph P. Cotton	15
Maj. Charles J. Doryland	11
Maj./Lt. Col. Fitzhugh "Fitz" L. Fulton, Jr.	69
Col. Gay E. Jones	03
Cap. Charles F. G. Kuyk, Jr.	03
Maj./Lt. Col. William G. Reschke, Jr.	03
Lt. Col. Emil T. "Ted" Sturmthal	05

Co-Pilot	Flights
Cap. John E. "Jack" Allavie	13
Col. Harry Andonian	07
Sq. Ldr. Harry M. Archer	18
Maj. Russell P. Bement	19
Cap./Maj. Charles C. Bock, Jr.	11
Maj. Jerry D. Bowline	11
Gen. Irvine L. "Twig" Branch	01
Cap. John K. Campbell	01
Maj. Frank E. Cole	06
Col. Joseph P. Cotton	12
Sq. Ldr. David Cretney	01
Cap. Albert H. Crews, Jr.	01
Maj. Carl S. Cross	02
Maj. Charles J. Doryland	06
Maj./Lt. Col. Fitzhugh "Fitz" L. Fulton, Jr.	25
Col. Gay E. Jones	18
Cap. Charles F. G. Kuyk, Jr.	05
Maj./Col. Kenneth K. Lewis, Jr.	16
Sq. Ldr. John Miller	04
Cap. Robert L. Mosley	02
Maj./Lt. Col. William G. Reschke, Jr.	11
Cap. Floyd B. Stroup	01
Lt. Col. Emil T. "Ted" Sturmthal	05
Col. Guy M. Townsend	03

NOTE: All B-52 pilots and co-pilots were USAF with four exceptions: Fitz Fulton retired from the USAF and was then hired by NASA. He continued to fly the B-52 on X-15 missions after becoming a NASA pilot. Squadron Leaders Harry Archer, David Cretney, and John Miller were Royal Air Force pilots.

K. CHASE PILOT DATA (in alphabetical order)

Pilot	Org.	F-100	F-104	T-38	F-5D	F-4H	Total
Maj. Michael J. Adams	USAF	01	08	04	00	00	**13**
Neil A. Armstrong	NASA	00	06	00	00	00	**06**
Robert "Bob" Baker	NAA	02	00	00	00	00	**02**
Maj. Michael Collins	USAF	00	07	00	00	00	**07**
Cap. Albert H. Crews, Jr.	USAF	01	05	00	00	00	**06**
A. Scott Crossfield	NAA	01	00	00	00	00	**01**
Cap. Lawrence C. Curtis, Jr.	USAF	00	02	10	00	00	**12**
Maj./Lt. Col. Fred J. Cuthill	USAF	00	03	09	00	00	**12**
William H. Dana	NASA	00	45	00	00	00	**45**
Maj. Walter F. Daniel	USAF	15	18	04	00	00	**37**
Cap./Maj. Thomas J. Davey, Jr.	USAF	00	03	00	00	00	**03**
Einar Enevoldson	NASA	00	01	00	00	00	**01**
Cap. Joe H. Engle	USAF	00	24	04	00	00	**28**
Cap./Maj. Mervin L. Evenson	USAF	00	13	00	00	00	**13**
Fitzhugh "Fitz" L. Fulton, Jr.	NASA	00	03	00	00	00	**03**
Cap./Maj. Jerauld R. Gentry	USAF	00	26	05	00	00	**31**
Maj. Henry C. Gordon	USAF	01	09	06	00	00	**16**
Frederick W. Haise, Jr.	NASA	00	07	00	00	00	**07**
Cap. Peter C. Hoag	USAF	00	06	00	00	00	**06**
Cap. Robert C. Hover	USAF	00	02	00	00	00	**02**
Hugh M. Jackson	NASA	00	06	00	00	00	**06**
Cap./Maj. William J. "Pete" Knight	USAF	02	35	10	00	00	**47**

Pilot	Org.	F-100	F-104	T-38	F-5D	F-4H	Total
Gary E. Krier	NASA	00	10	00	00	00	**10**
Cap. David W. Livingston	USAF	00	04	00	00	00	**04**
Cap. William R. Looney	USAF	10	03	00	00	00	**13**
Donald L. Mallick	NASA	00	05	00	00	00	**05**
John A. Manke	NASA	00	20	00	03	00	**23**
Cap. George J. Marrett	USAF	00	01	00	00	00	**01**
Maj. James A. McDivitt	USAF	02	03	01	00	00	**06**
John B. “Jack” McKay	NASA	01	32	00	01	00	**34**
Maj. Robert K. Parsons	USAF	00	11	00	00	00	**11**
Lt. Cmdr./Cdr. Forrest S. Petersen	USN	00	16	00	00	01	**17**
Bruce A. Peterson	NASA	00	28	00	01	00	**29**
Cap. James O. Roberts	USAF	01	00	00	00	00	**01**
Maj. Joseph W. Rogers	USAF	01	26	08	00	00	**35**
Cap./Maj./Lt. Col. Robert A. Rushworth	USAF	06	32	20	00	00	**58**
Cap. Wendell H. Shawler	USAF	00	02	00	00	00	**02**
Cap. Thomas H. Smith	USAF	00	05	01	00	00	**06**
Maj./Lt. Col. Donald M. Sorlie	USAF	00	16	33	00	00	**49**
Cap. Joseph F. Stroface	USAF	00	13	00	00	00	**13**
Milton O. Thompson	NASA	00	09	00	00	00	**09**
Maj. William T. “Ted” Twinting	USAF	00	06	04	00	00	**10**
Joseph A. Walker	NASA	01	23	00	01	00	**25**
Cap. Robert E. Whelan	USAF	00	02	00	00	00	**02**
Alvin S. White	NAA	10	01	00	00	00	**11**
Maj. Robert M. White	USAF	11	25	08	00	00	**44**
Cap./Maj. James Wood	USAF	01	10	02	05	00	**18**
Donald T. Ward	USAF	00	01	00	00	00	**01**
Total Sorties (by aircraft)		**67**	**533**	**129**	**11**	**01**	**741**

Summary (by aircraft)

66670	308 sorties
66671	197 sorties
(66671A)	(89 sorties)
66672	236 sorties

Summary (by organization)

NAA	014 sorties
NASA	203 sorties
USN	017 sorties
USAF	507 sorties
Total Chase Sorties	**741**

Summary (pilots)

NAA	03 pilots
NASA	13 pilots
USN	01 pilot
USAF	32 pilots
Total Chase Pilots	**48**

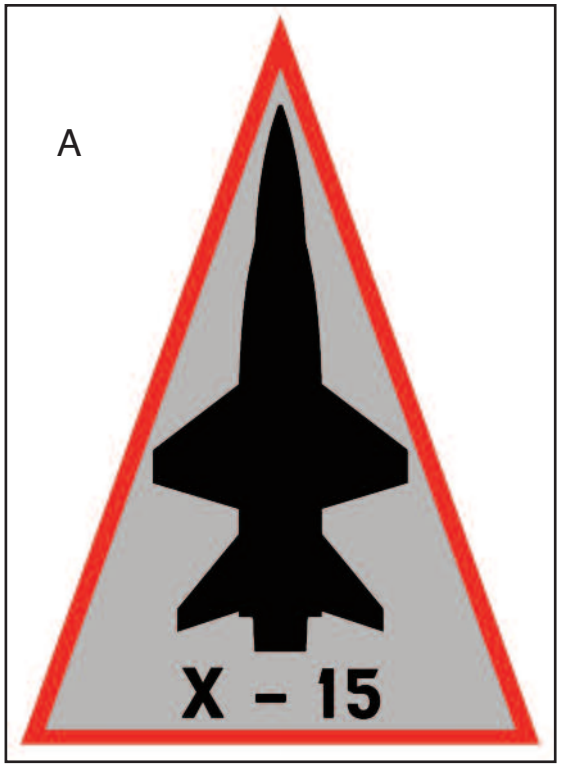
L. LAUNCH PANEL OPERATORS (in alphabetical order)

All Launch Panel Operators were NASA personnel. They were crew members on the B-52 that oversaw the launch of the X-15. Their station was located on the interior right side of the B-52 with a blister window so the LPO could physically observe the X-15 prior to launch if required.

William “Bill” Berkowitz
Stanley P. Butchart
Allen F. Dustin
John W. “Jack” Moise
Bruce A. Peterson
John “Jack” Russell

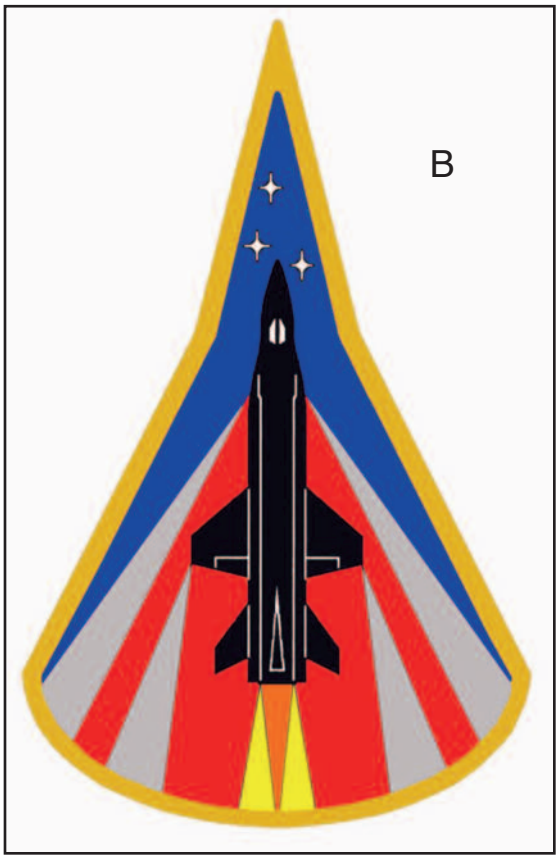
5. X-15 Program Patches

During my early interviews I asked each person if there was a patch created for the X-15. No one recalled seeing one. This led to my design of the X-15 program patch (**B**). Later, two other patches surfaced. One is from pilot Joe Engle (**A**), which is a prototype that never went into production. Ralph Richardson, who worked on the X-15 pressure suits, had a patch that he got during the program, and still had one on a flight jacket (**C**).



A. X-15 PILOT PATCH PROTOTYPE (right)

The exact origin and designer of this patch is unknown. The black X-15 silhouette is on top of a silver triangle which was made from the same material as the outer layer of the pressure suit. The border of the patch is red.



B. X-15 PROGRAM PATCH (left)

This was designed by the author prior to the discovery of other program patches. The black X-15 is shown breaking through hypersonic shockwaves into a dark blue sky with three stars to represent the three primary participants in the X-15 research program: NASA, the US Air Force, and the US Navy. The shock waves alternate silver and red going inward, with the interior exhaust cone being orange and the exterior wedges being yellow. The border of the patch is gold.

C. ALTERNATE X-15 PROGRAM PATCH (right)

As with patch **A**, the origin of this patch is unknown. The black X-15 is rocketing above the blue and green Earth in a medium blue sky with a yellow Sun and five white stars. The border of the patch is red.

6. X-15 Flight Log

Flight/Pilot: 1-C-1/Crossfield **Date**: Tue. 10 Mar. 1959
Remarks: Scheduled captive flight. SAS, B-52 power supply, and generator failures. Windshield frosted.

Flight/Pilot: 1-A-2/Crossfield **Date**: Wed. 1 Apr. 1959
Remarks: Radio failed. APU-2 cutoff. Lost cooling flow to pressure suit.

Flight/Pilot: 1-A-3/Crossfield **Date**: Fri. 10 Apr. 1959
Remarks: Both APUs shut down. Upper panel of vertical stabilizer cracked. B-52 no. 003 right front gear failed to retract, but mission was allowed to proceed.

Flight/Pilot: 1-A-4/Crossfield **Date**: Thu. 21 May 1959
Remarks: APU failed. Liquid Nitrogen source pressure too low.

Flight/Pilot:	1-1-5/A. Scott Crossfield (**1**)			**B-52/Pilots**:	003/Bock & Allavie
Date:	Mon. 8 Jun. 1959	**Engine Run**:	0.0	**Takeoff**:	08:00
Launch:	08:38:40.0 - Rosamond	**Duration**:	296.6	**Landing**:	09:10
Landing:	08:43:36.6 - Rogers	**Altitude**:	37,550	**Duration**:	1:10
Mach/mph:	0.79/522	**Distance**:	23.9	**Chase**:	White/Wood/Roberts

Mission: **001**—Scheduled glide flight to check aircraft systems. Only glide flight ever scheduled for the X-15. First free flight of program. Pitch damper failed prior to launch. PIO near landing due to inoperative pitch damper. Shortest flight of program.

Flight/Pilot: 2-C-1/Crossfield **Date**: Fri. 24 Jul. 1959
Remarks: Scheduled full fuel captive test. Low LOX pressure. Radio failed.

Flight/Pilot: 2-A-2/Crossfield **Date**: Fri. 4 Sep. 1959
Remarks: LOX tank pressure fluctuated due to vent leakage.

Flight/Pilot:	2-1-3/A. Scott Crossfield (**2**)			**B-52/Pilots**:	003/Bock & Allavie
Date:	Thu. 17 Sep. 1959	**Engine Run**:	224.3	**Takeoff**:	07:31
Launch:	08:08:48.0 - Rosamond	**Duration**:	551.0	**Landing**:	09:01
Landing:	08:17:59.0 - Rogers	**Altitude**:	52,341	**Duration**:	1:30
Mach/mph:	2.11/1393	**Distance**:	88.4	**Chase**:	White/Walker/White

Mission: **002**—First powered flight of X-15 with LR-11 engines. First flight of X-15 no. 2. First powered flight for Crossfield. First flight past Mach 2 for program, for no. 2, and for Crossfield. Turbo pump case failed. Roll damper failed. Flaps only extended to sixty percent.

Flight/Pilot: 2-A-4/Crossfield **Date**: Sat. 10 Oct. 1959
Remarks: LOX top-off pressurization system abort. Helium source leak. Intercom failed.

Flight/Pilot: 2-A-5/Crossfield **Date**: Wed. 14 Oct. 1959
Remarks: LOX top-off pressurization system abort. Excessive X-15 cabin pressurization. Water Alcohol jettison valve failed.

Flight/Pilot:	2-2-6/A. Scott Crossfield (**3**)			**B-52/Pilots**:	003/Allavie & Bock
Date:	Sat. 17 Oct. 1959	**Engine Run**:	254.5	**Takeoff**:	09:25
Launch:	10:13:07.0 - Rosamond	**Duration**:	577.7	**Landing**:	10:55
Landing:	10:22:44.7 - Rogers	**Altitude**:	61,781	**Duration**:	1:30
Mach/mph:	2.15/1419	**Distance**:	92.4	**Chase**:	White/Walker/White

Mission: **003**—Roll damper failed at launch but was reengaged. Nose gear door failed on landing. Minor fire in hydrogen peroxide compartment, engine compartment, and lower ventral at landing.

Flight/Pilot: 2-A-7/Crossfield **Date**: Thu. 22 Oct. 1959
Remarks: Pilot's oxygen system failed. Windshield frosted over.

Flight/Pilot: 2-A-8/Crossfield **Date**: Sat. 31 Oct. 1959
Remarks: Weather abort.

Flight/Pilot:	2-3-9/A. Scott Crossfield (**4**)			**B-52/Pilots**:	003/Fulton & Allavie
Date:	Thu. 5 Nov. 1959	**Engine Run**:	13.9	**Takeoff**:	09:00
Launch:	09:39:28.0 - Rosamond	**Duration**:	328.0	**Landing**:	10:15
Landing:	09:44:56.0 - Rosamond	**Altitude**:	45,462	**Duration**:	1:15
Mach/mph:	1.00/660	**Distance**:	34.5	**Chase**:	Baker/White/Walker

Mission: **004**—Roll damper dropped out at launch. Engine fire and explosion in bottom LR-11. Structural failure at instrument bay, just forward of LOX tank, and nose gear failed on landing due to design flaw and excessive propellant weight. First in-flight emergency after launch. First landing at location other than Rogers. Shortest flight for X-15 no. 2. Aircraft returned to NAA for modifications of fuselage and nose gear.

Flight/Pilot: 1-A-6/Crossfield **Date**: Wed. 16 Dec. 1959
Remarks: Low LOX tank pressure. Radio failed.

Flight/Pilot:	1-2-7/A. Scott Crossfield (**5**)			**B-52/Pilots**:	008/Fulton & Kuyk
Date:	Sat. 23 Jan. 1960	**Engine Run**:	267.2	**Takeoff**:	15:43
Launch:	16:17:05.0 - Rosamond	**Duration**:	593.8	**Landing**:	17:00
Landing:	16:26:58.8 - Rogers	**Altitude**:	66,844	**Duration**:	1:17
Mach/mph:	2.53/1669	**Distance**:	108.2	**Chase**:	Baker/Walker/White

Mission: **005**—Telemetry problems caused late takeoff. First powered flight and first past Mach 2 for X-15 no. 1. First use of B-52 no. 008 for an X-15 launch.

Flight/Pilot: 2-A-10/Crossfield **Date**: Thu. 4 Feb. 1960
Remarks: Lost source pressure and fuel tank pressure. APU-2 failed.

Flight/Pilot:	2-4-11/A. Scott Crossfield (**6**)			**B-52/Pilots**:	008/Allavie & Fulton
Date:	Thu. 11 Feb. 1960	**Engine Run**:	251.2	**Takeoff**:	09:07
Launch:	10:15:04.0 - Rosamond	**Duration**:	615.5	**Landing**:	10:57
Landing:	10:25:19.5 - Rogers	**Altitude**:	88,116	**Duration**:	1:50
Mach/mph:	2.22/1466	**Distance**:	114.4	**Chase**:	White/Walker/White

Mission: **006**—Farthest flight and highest altitude attained by Crossfield in program. First use of B-52 no.008 for X-15 no. 2. First flight of this aircraft following structural failure on landing and subsequent rebuild (**004**). Nose gear bottomed out on landing.

Flight/Pilot:	2-5-12/A. Scott Crossfield (**7**)			**B-52/Pilots**:	008/Fulton & Allavie
Date:	Wed. 17 Feb. 1960	**Engine Run**:	309.4	**Takeoff**:	08:54
Launch:	09:41:32.0 - Rosamond	**Duration**:	635.9	**Landing**:	10:09
Landing:	09:52:07.9 - Rogers	**Altitude**:	52,640	**Duration**:	1:15
Mach/mph:	1.57/1036	**Distance**:	97.3	**Chase**:	White/Walker/White

Mission: **007**—Upper LR-11 engine shut down prematurely, but was able to be re-ignited.

Flight/Pilot:	2-6-13/A. Scott Crossfield (**8**)			**B-52/Pilots**:	008/Allavie & Kuyk
Date:	Thu. 17 Mar. 1960	**Engine Run**:	233.5	**Takeoff**:	07:54
Launch:	08:31:25.0 - Rosamond	**Duration**:	519.5	**Landing**:	08:54
Landing:	08:40:04.5 - Rogers	**Altitude**:	52,640	**Duration**:	1:00
Mach/mph:	2.15/1419	**Distance**:	87.5	**Chase**:	White/White/Walker

Mission: **008**—Maneuverability investigation with dampers on and off. Did a 360-degree roll and a 6-g turn.

Flight/Pilot: 2-A-14/Crossfield **Date**: Fri. 18 Mar. 1960
Remarks: Fuel leaked and windshield delaminated. Aborted one minute to launch.

Flight/Pilot: 1-3-8/Joseph A. Walker (**1**) **B-52/Pilots**: 008/Allavie & Fulton
Date: Fri. 25 Mar. 1960 **Engine Run**: 272.0 **Takeoff**: 14:42
Launch: 15:43:23.0 - Rosamond **Duration**: 548.0 **Landing**: 16:12
Landing: 15:52:31.0 - Rogers **Altitude**: 48,630 **Duration**: 1:30
Mach/mph: 2.00/1320 **Distance**: 92.8 **Chase**: Crossfield/White/McKay
Mission: **009**—First flight for NASA and Walker in program. Walker's briefest flight. Roll damper and stable platform malfunctioned. Upper engine required two re-starts. Roll damper inoperable.

Flight/Pilot: 2-7-15/A. Scott Crossfield (**9**) **B-52/Pilots**: 008/Fulton & Allavie
Date: Tue. 29 Mar. 1960 **Engine Run**: 244.2 **Takeoff**: 08:14
Launch: 09:59:28.0 - Rosamond **Duration**: 550.5 **Landing**: 10:24
Landing: 10:08:38.5 - Rogers **Altitude**: 49,982 **Duration**: 2:10
Mach/mph: 1.96/1293 **Distance**: 92.1 **Chase**: White/Knight/Rushworth
Mission: **010**—Cold soak flight to simulate environmental conditions for a flight launched from Wendover, UT.

Flight/Pilot: 2-8-16/A. Scott Crossfield (**10**) **B-52/Pilots**: 008/Allavie & Fulton
Date: Thu. 31 Mar. 1960 **Engine Run**: 254.5 **Takeoff**: 08:00
Launch: 08:42:05.0 - Rosamond **Duration**: 536.5 **Landing**: 09:15
Landing: 08:51:01.5 - Rogers **Altitude**: 51,356 **Duration**: 1:15
Mach/mph: 2.03/1340 **Distance**: 92.2 **Chase**: White/Rushworth/Knight
Mission: **011**—Nominal flight to check SAS gains and perform aircraft maneuverability checkout.

Flight/Pilot: 1-4-9/Robert M. White (**1**) **B-52/Pilots**: 003/Allavie & Kuyk
Date: Wed. 13 Apr. 1960 **Engine Run**: 253.7 **Takeoff**: 08:26
Launch: 09:15:11.0 - Rosamond **Duration**: 532.7 **Landing**: 09:46
Landing: 09:24:03.7 - Rogers **Altitude**: 48,000 **Duration**: 1:20
Mach/mph: 1.90/1254 **Distance**: 93.1 **Chase**: White/Walker/Rushworth
Mission: **012**—First flight for the US Air Force and White in program. White's shortest flight. Hydraulic hose failed. No landing data because of a film drum malfunction.

Flight/Pilot: 1-5-10/Joseph A. Walker (**2**) **B-52/Pilots**: 003/Fulton & Allavie
Date: Tue. 19 Apr. 1960 **Engine Run**: 260.6 **Takeoff**: 07:59
Launch: 08:51:44.0 - Rosamond **Duration**: 598.6 **Landing**: 09:29
Landing: 09:01:42.6 - Rogers **Altitude**: 59,496 **Duration**: 1:30
Mach/mph: 2.56/1689 **Distance**: 107.2 **Chase**: Rushworth/McKay/Knight
Mission: **013**—Hydraulic hose failed. No gear data taken. Performance build-up flight. One B-52 engine required shut down prior to X-15 launch. Walker discovered the rudder could be used after touchdown to steer on the lakebed.

Flight/Pilot: 2-A-17/Crossfield **Date**: Thu. 5 May 1960
Remarks: APU-1 shut down. Hydrogen peroxide failed to jettison.

Flight/Pilot: 1-6-11/Robert M. White (**2**) **B-52/Pilots**: 003/Fulton & Allavie
Date: Fri. 6 May 1960 **Engine Run**: 246.5 **Takeoff**: 09:04
Launch: 09:53:19.0 - Rosamond **Duration**: 563.2 **Landing**: 10:15
Landing: 10:02:42.2 - Rogers **Altitude**: 60,938 **Duration**: 1:09
Mach/mph: 2.20/1452 **Distance**: 105.9 **Chase**: Knight/McKay/Rushworth
Mission: **014**—Roll damper failed at launch, but was reset. Normal ventral jettison system failed. Ventral jettisoned by back-up system when gear was released. First flight for White past Mach 2 in program.

Flight/Pilot: 1-7-12/Joseph A. Walker (**3**) **B-52/Pilots**: 003/Bock & Allavie
Date: Thu. 12 May 1960 **Engine Run**: 256.3 **Takeoff**: 08:10
Launch: 08:47:37.0 - Silver **Duration**: 610.3 **Landing**: 09:40
Landing: 08:57:47.3 - Rogers **Altitude**: 77,882 **Duration**: 1:30
Mach/mph: 3.19/2111 **Distance**: 127.9 **Chase**: White/Rushworth/Knight/McKay
Mission: **015**—Stable platform inoperative. Three engine chambers intentionally shut down and the remaining five chambers shut down on their own at the same time. First flight launched away from local area. First flight in program above 2,000 mph and above Mach 3. First flight of any manned aircraft past Mach 3 without pilot loss. First flight for Walker above Mach 3.

Flight/Pilot: 1-8-13/Robert M. White (**3**) **B-52/Pilots**: 003/Allavie & Bock
Date: Thu. 19 May 1960 **Engine Run**: 274.7 **Takeoff**: 08:05
Launch: 08:46:47.0 - Silver **Duration**: 684.6 **Landing**: 09:20
Landing: 08:58:11.6 - Rogers **Altitude**: 108,997 **Duration**: 1:15
Mach/mph: 2.31/1590 **Distance**: 138.8 **Chase**: Knight/Rushworth/McKay
Mission: **016**—Altitude build-up flight. First flight for White and the X-15 above 100,000 feet.

Flight/Pilot: 2-9-18/A. Scott Crossfield (**11**) **B-52/Pilots**: 008/Bock & Allavie
Date: Thu. 26 May 1960 **Engine Run**: 243.4 **Takeoff**: 08:07
Launch: 09:08:36.0 - Rosamond **Duration**: 554.4 **Landing**: 09:30
Landing: 09:17:50.4 - Rogers **Altitude**: 51,282 **Duration**: 1:23
Mach/mph: 2.20/1452 **Distance**: 94.4 **Chase**: White/White/Petersen
Mission: **017**—First BCS checkout. Suit/helmet pressures telemetered. Control system vibrated after landing.

Flight/Pilot: 1-A-14/Walker **Date**: Fri. 27 May 1960
Remarks: Telemetry and power supply failure.

Flight/Pilot: 1-A-15/Walker **Date**: Fri. 3 Jun. 1960
Remarks: Lost hydraulic pressure to APUs.

Flight/Pilot: 1-A-16/Walker **Date**: Wed. 8 Jun. 1960
Remarks: Nitrogen gas leaked. Insufficient propulsion system source pressure. Same day as LR-99 ground test explosion in No. 3.

Flight/Pilot: 1-9-17/Joseph A. Walker (**4**) **B-52/Pilots**: 003/Allavie & Fulton
Date: Thu. 4 Aug. 1960 **Engine Run**: 264.2 **Takeoff**: 08:14
Launch: 08:59:13.0 - Silver **Duration**: 622.6 **Landing**: 09:40
Landing: 09:09:35.6 - Rogers **Altitude**: 78,112 **Duration**: 1:26
Mach/mph: 3.31/2196 **Distance**: 135.5 **Chase**: White/Rushworth/Petersen/Knight
Mission: **018**—Stability and control flight. Aerodynamic heating build-up flight. Canopy seal burned.

Flight/Pilot: 1-A-18/White **Date**: Thu. 11 Aug. 1960
Remarks: Nitrogen fuel pressure leak. Scheduled altitude record attempt.

Flight/Pilot: 1-10-19/Robert M. White (**4**) **B-52/Pilots**: 003/Fulton & Allavie
Date: Fri. 12 Aug. 1960 **Engine Run**: 256.2 **Takeoff**: 08:00
Launch: 08:48:43.0 - Silver **Duration**: 699.1 **Landing**: 09:15
Landing: 09:00:22.1 - Rogers **Altitude**: 136,500 **Duration**: 1:15
Mach/mph: 2.52/1772 **Distance**: 137.1 **Chase**: Rushworth/Petersen/Looney
Mission: **019**—Maximum altitude attempt with LR-11s. Succeeded with a new altitude record. Highest altitude attained using the LR-11. White's longest flight.

Flight/Pilot: 1-A-20/Walker **Date**: Thu. 18 Aug. 1960
Remarks: APU-1 failed to start. Scheduled high temperature test.

Flight/Pilot: 1-11-21/Joseph A. Walker (**5**) **B-52/Pilots**: 003/Allavie & Cole
Date: Fri. 19 Aug. 1960 **Engine Run**: 251.6 **Takeoff**: 07:50
Launch: 08:34:22.0 - Silver **Duration**: 582.4 **Landing**: 09:20
Landing: 08:44:04.4 - Rogers **Altitude**: 75,982 **Duration**: 1:30
Mach/mph: 3.13/1986 **Distance**: 129.0 **Chase**: White/Rushworth/Petersen/Looney
Mission: **020—**Aerodynamic heat build-up. Held Mach 3 for thirteen seconds. Achieved aircraft skin temperatures of nearly 500 degrees F.

Flight/Pilot: 1-A-22/White **Date**: Fri. 2 Sep. 1960
Remarks: Telemetry failure. Scheduled stability flight.

Flight/Pilot: 1-12-23/Robert M. White (**5**) **B-52/Pilots**: 008/Kuyk & Allavie
Date: Sat. 10 Sep. 1960 **Engine Run**: 264.3 **Takeoff**: 11:05
Launch: 11:45:10.0 - Silver **Duration**: 600.0 **Landing**: 12:25
Landing: 11:55:10.0 - Rogers **Altitude**: 79,864 **Duration**: 1:20
Mach/mph: 3.23/2182 **Distance**: 138.1 **Chase**: Looney/Armstrong/Rushworth/Knight
Mission: **021—**Aircraft stability and control evaluated. First flight past Mach 3 for White. APU malfunction.

Flight/Pilot: 1-A-24/Petersen **Date**: Tue. 20 Sep. 1960
Remarks: First launch attempt for Petersen. APU-2 failed to start.

Flight/Pilot: 1-13-25/Forrest S. Petersen (**1**) **B-52/Pilots**: 008/Allavie & Fulton
Date: Fri. 23 Sep. 1960 **Engine Run**: 146.6 **Takeoff**: 09:10
Launch: 09:52:06.0 - Rosamond **Duration**: 429.6 **Landing**: 10:20
Landing: 09:59:15.6 - Rogers **Altitude**: 53,043 **Duration**: 1:10
Mach/mph: 1.68/1108 **Distance**: 62.4 **Chase**: Looney/Walker/Rushworth
Mission: **022—**First flight for US Navy and Petersen in program. Premature shutdown of all chambers of both LR-11 engines. Two unsuccessful restart attempts.

Flight/Pilot: 1-A-26/Petersen **Date**: Tue. 11 Oct. 1960
Remarks: Hydrogen peroxide source pressure regulator runaway.

Flight/Pilot: 2-A-19/Crossfield **Date**: Thu. 13 Oct. 1960
Remarks: APU-2 system leaked. First attempted flight with LR-99 rocket engine.

Flight/Pilot: 1-14-27/Forrest S. Petersen (**2**) **B-52/Pilots**: 008/Fulton & Kuyk
Date: Thu. 20 Oct. 1960 **Engine Run**: 285.4 **Takeoff**: 09:00
Launch: 09:30:27.0 - Rosamond **Duration**: 566.1 **Landing**: 10:00
Landing: 09:39:53.1 - Rogers **Altitude**: 53,800 **Duration**: 1:00
Mach/mph: 1.94/1280 **Distance**: 99.6 **Chase**: White/Rushworth/Armstrong
Mission: **023—**Stability and control evaluation. B-52 to X-15 umbilical pulled out during taxi which prevented hard-wired communications between aircraft. All communications accomplished via radio.

Flight/Pilot: 1-15-28/John B. McKay (**1**) **B-52/Pilots**: 008/Fulton & Cole
Date: Fri. 28 Oct. 1960 **Engine Run**: 267.5 **Takeoff**: 09:05
Launch: 09:43:56.0 - Rosamond **Duration**: 545.3 **Landing**: 10:20
Landing: 09:53:01.3 - Rogers **Altitude**: 50,700 **Duration**: 1:15
Mach/mph: 2.02/1333 **Distance**: 96.8 **Chase**: Looney/White/Petersen
Mission: **024—**First flight for McKay in program. Ventral parachute did not open.

Flight: 2-A-20/Crossfield **Date**: Fri. 4 Nov. 1960
Remarks: APU-2 malfunctioned. Hydrogen peroxide leak.

Flight/Pilot: 1-16-29/Robert A. Rushworth (**1**) **B-52/Pilots**: 008/Fulton & Cole
Date: Fri. 4 Nov. 1960 **Engine Run**: 271.0 **Takeoff**: 12:10
Launch: 12:43:33.0 - Rosamond **Duration**: 526.3 **Landing**: 13:15
Landing: 12:52:19.3 - Rogers **Altitude**: 48,900 **Duration**: 1:05
Mach/mph: 1.95/1287 **Distance**: 101.2 **Chase**: Looney/White/Armstrong
Mission: **025—**First flight for Rushworth in program. First time two flights attempted on same day with different X-15 aircraft, but flight 2-A-20 did not launch (see above).

Flight/Pilot: 2-10-21/A. Scott Crossfield (**12**) **B-52/Pilots**: 003/Allavie & Kuyk
Date: Tue. 15 Nov. 1960 **Engine Run**: 137.3 **Takeoff**: 08:58
Launch: 09:59:00.0 - Rosamond **Duration**: 508.4 **Landing**: 10:28
Landing: 10:07:28.4 - Rogers **Altitude**: 81,200 **Duration**: 1:30
Mach/mph: 2.97/1960 **Distance**: 93.7 **Chase**: White/Walker/White
Mission: **026—**First launch with LR-99 rocket engine. Highest Mach for Crossfield in program. Hydraulic leak.

Flight/Pilot: 1-17-30/Robert A. Rushworth (**2**) **B-52/Pilots**: 003/Fulton & Allavie
Date: Thu. 17 Nov. 1960 **Engine Run**: 261.9 **Takeoff**: 12:10
Launch: 12:43:07.0 - Palmdale **Duration**: 538.2 **Landing**: 13:10
Landing: 12:52:05.2 - Rogers **Altitude**: 54,750 **Duration**: 1:00
Mach/mph: 1.90/1254 **Distance**: 97.8 **Chase**: Looney/Walker/Knight
Mission: **027—**Lower LR-11 shut down prematurely. Restart accomplished successfully. APU-2 start was sluggish. Launch occurred over Palmdale, not over a lakebed as was normal practice. This is one of only two flights in the program where this type of launch occurred (**031**).

Flight/Pilot: 2-11-22/A. Scott Crossfield (**13**) **B-52/Pilots**: 003/Allavie & Fulton
Date: Tue. 22 Nov. 1960 **Engine Run**: 125.1 **Takeoff**: 12:45
Launch: 13:25:55.0 - Rosamond **Duration**: 451.7 **Landing**: 13:45
Landing: 13:33:26.7 - Rogers **Altitude**: 61,900 **Duration**: 1:00
Mach/mph: 2.51/1656 **Distance**: 85.0 **Chase**: White/Walker/White
Mission: **028—**First restart attempt for LR-99 in-flight. Restart perfect. No. 2 BCS nose-down rocket leaked. Flew with LR-99 throttle settings at 50, 75, and 100 percent with no problems.

Flight/Pilot: 1-18-31/Neil A. Armstrong (**1**) **B-52/Pilots**: 008/Cole & Fulton
Date: Wed. 30 Nov. 1960 **Engine Run**: 309.1 **Takeoff**: 10:10
Launch: 10:42:43.0 - Rosamond **Duration**: 593.8 **Landing**: 11:10
Landing: 10:52:36.8 - Rogers **Altitude**: 48,840 **Duration**: 1:00
Mach/mph: 1.75/1155 **Distance**: 102.0 **Chase**: Looney/Petersen/Walker
Mission: **029—**First and shortest flight for Armstrong in program. No. 3 chamber on upper LR-11 engine failed to light.

Flight/Pilot: 2-12-23/A. Scott Crossfield (**14**) **B-52/Pilots**: 003/Allavie & Cole
Date: Tue. 6 Dec. 1960 **Engine Run**: 128.9 **Takeoff**: 14:45
Launch: 15:29:30.0 - Rosamond **Duration**: 487.2 **Landing**: 16:00
Landing: 15:37:37.2 - Rogers **Altitude**: 53,374 **Duration**: 1:15
Mach/mph: 2.85/1881 **Distance**: 85.2 **Chase**: White/Petersen/White
Mission: **030—**Crossfield's final flight. LR-99 shut down on first restart attempt. Two restarts attempted. North American Aviation contractor flight testing phase of X-15 program completed.

Flight/Pilot: 1-19-32/Neil A. Armstrong (**2**) **B-52/Pilots**: 008/Allavie & Cole
Date: Fri. 9 Dec. 1960 **Engine Run**: 270.1 **Takeoff**: 11:21
Launch: 11:52:40.0 - Palmdale **Duration**: 649.0 **Landing**: 12:20
Landing: 12:03:29.0 - Rogers **Altitude**: 50,095 **Duration**: 1:00
Mach/mph: 1.80/1188 **Distance**: 108.2 **Chase**: Daniel/Petersen/White
Mission: **031—**First flight with Q-ball Flight Path Control Sensor system installed in place of nose boom.

Flight/Pilot: 1-A-33/McKay **Date**: Thu. 15 Dec. 1960
Remarks: No. 2 hydraulic system pressure failure. Aborted 30 seconds to launch.

Flight/Pilot: 1-A-34/McKay **Date**: Wed. 11 Jan. 1961
Remarks: No. 2 hydraulic system pressure abort.

Flight/Pilot: 1-20-35/John B. McKay (**2**) **B-52/Pilots**: 008/Fulton & Lewis
Date: Wed. 1 Feb. 1961 **Engine Run**: 263.7 **Takeoff**: 10:13
Launch: 10:47:32.0 - Rosamond **Duration**: 647.7 **Landing**: 11:28
Landing: 10:58:19.7 - Rogers **Altitude**: 49,780 **Duration**: 1:15
Mach/mph: 1.88/1211 **Distance**: 98.3 **Chase**: White/Petersen/Wood
Mission: **032—**Last launch from the local Edwards area. Checkout of pilot's side-arm controller.

Flight/Pilot: 1-21-36/Robert M. White (**6**) **B-52/Pilots**: 008/Fulton & Mosley
Date: Tue. 7 Feb. 1961 **Engine Run**: 276.1 **Takeoff**: 12:10
Launch: 12:56:10.0 - Silver **Duration**: 627.8 **Landing**: 13:30
Landing: 13:06:37.8 - Rogers **Altitude**: 78,150 **Duration**: 1:20
Mach/mph: 3.50/2275 **Distance**: 139.3 **Chase**: Daniel/Knight/Petersen/Rushworth
Mission: **033—**Last flight and highest speed with LR-11. X-15 no. 1 returned to NAA for installation of LR-99 engine on 8 February. X-15 no. 2 formally delivered to NASA on the same date.

Flight/Pilot: 2-A-24/White **Date**: Tue. 21 Feb. 1961
Remarks: Inoperative inertial system. No cabin pressurization.

Flight/Pilot: 2-A-25/White **Date**: Fri. 24 Feb. 1961
Remarks: Attitude gyro malfunctioned.

Flight/Pilot: 2-13-26/Robert M. White (**7**) **B-52/Pilots**: 008/Kuyk & Cole
Date: Tue. 7 Mar. 1961 **Engine Run**: 127.0 **Takeoff**: 09:50
Launch: 10:28:33.0 - Silver **Duration**: 514.1 **Landing**: 10:55
Landing: 10:37:07.1 - Rogers **Altitude**: 77,450 **Duration**: 1:05
Mach/mph: 4.43/2905 **Distance**: 150.5 **Chase**: Rushworth/Walker/Petersen/Looney
Mission: **034—**First flight for US Air Force and White with LR-99. First flight for any aircraft above Mach 4. First flight for White in X-15 no. 2. Permanent buckles found on fuselage skin. First flight of Q-ball on X-15 no. 2. First and only time that an F-4H was used as a chase aircraft (Petersen).

Flight/Pilot: 2-A-27/Walker **Date**: Tue. 21 Mar. 1961 **Pilot**:
Remarks: Lost electrical power from B-52. Drag chute from B-52 lost on landing. Wheels locked, blowing a tire. First time an A/P 22S-2 pressure suit was worn by an X-15 pilot.

Flight/Pilot: 2-14-28/Joseph A. Walker (**6**) **B-52/Pilots**: 008/Kuyk & Fulton
Date: Thu. 30 Mar. 1961 **Engine Run**: 81.9 **Takeoff**: 09:20
Launch: 10:05:00.0 - Hidden Hills **Duration**: 616.5 **Landing**: 10:25
Landing: 10:15:16.5 - Rogers **Altitude**: 169,600 **Duration**: 1:05
Mach/mph: 3.95/2760 **Distance**: 180.5 **Chase**: White/Knight/Petersen/Rushworth
Mission: **035—**First flight for NASA and Walker with LR-99. Highest altitude to date. Walker weightless for two minutes. First flight for Walker above 100,000 feet and in X-15 no. 2. Required LR-99 restart. First use of the T-38 chase aircraft in the X-15 program (Knight).

Flight/Pilot: 2-15-29/Robert M. White (**8**) **B-52/Pilots**: 003/Allavie & Mosley
Date: Fri. 21 Apr. 1961 **Engine Run**: 71.6 **Takeoff**: 09:10
Launch: 10:05:17.0 - Hidden Hills **Duration**: 603.4 **Landing**: 10:40
Landing: 10:15:20.4 - Rogers **Altitude**: 105,000 **Duration**: 1:30
Mach/mph: 4.62/3074 **Distance**: 169.3 **Chase**: Looney/Walker/Rogers/Wood
Mission: **036—**First flight over 3,000 mph. White dropped 8,000 feet before engine start. Required LR-99 restart. Cabin pressure fell to 46,000 feet. Pitch damper dropped out at engine shutdown.

Flight/Pilot: 2-A-30/Walker **Date**: Fri. 19 May 1961
Remarks: Lacked APU source pressure. Radar beacon from Beatty failed. Cabin pressurization difficulties. Launch scrubbed at launch minus two seconds.

Flight/Pilot: 2-16-31/Joseph A. Walker (**7**) **B-52/Pilots**: 003/Allavie & Fulton
Date: Thu. 25 May 1961 **Engine Run**: 74.3 **Takeoff**: 11:30
Launch: 12:16:35.0 - Mud **Duration**: 728.1 **Landing**: 13:00
Landing: 12:28:43.1 - Rogers **Altitude**: 107,500 **Duration**: 1:30
Mach/mph: 4.95/3307 **Distance**: 228.5 **Chase**: Looney/Daniel/Petersen/Rushworth
Mission: **037—**First launch from Mud Dry Lake. First flight for Walker past Mach 4. Longest flight to date at more than 12 minutes. SAS dropout at launch but able to reengage. Cabin pressure fell to 50,000 feet. On this day, President John F. Kennedy committed America to land a man on the Moon.

Flight/Pilot: 2-A-32/White **Date**: Tue. 20 Jun. 1961
Remarks: Chase pilot thought LOX spillage was hydrogen peroxide coming from APU drain.

Flight/Pilot: 2-17-33/Robert M. White (**9**) **B-52/Pilots**: 003/Allavie & Fulton
Date: Fri. 23 Jun. 1961 **Engine Run**: 78.7 **Takeoff**: 13:09
Launch: 14:00:05.0 - Mud **Duration**: 605.7 **Landing**: 14:45
Landing: 14:10:10.7 - Rogers **Altitude**: 107,700 **Duration**: 1:36
Mach/mph: 5.27/3603 **Distance**: 230.3 **Chase**: Looney/Daniel/Crews/Walker
Mission: **038—**First flight of any aircraft past Mach 5. Heat effects noted on wings. Cabin pressure fell to 56,000 feet which inflated the pilot's pressure suit.

Flight/Pilot: 1-22-37/Forrest S. Petersen (**3**) **B-52/Pilots**: 003/Allavie & Archer
Date: Thu. 10 Aug. 1961 **Engine Run**: 117.7 **Takeoff**: 09:42
Launch: 10:27:05.0 - Silver **Duration**: 564.4 **Landing**: 10:52
Landing: 10:36:29.4 - Rogers **Altitude**: 78,200 **Duration**: 1:10
Mach/mph: 4.11/2735 **Distance**: 122.8 **Chase**: White/Rushworth/Walker
Mission: **039** —Longest flight for Petersen and his first flight past Mach 4. First flight for X-15 no. 1 with LR-99 and first past Mach 4. Lost cabin pressure and suit overinflated. At launch Petersen grabbed speed brake handle instead of engine throttle.

Flight/Pilot: 2-18-34/Joseph A. Walker (**8**) **B-52/Pilots**: 008/Archer & Allavie
Date: Tue. 12 Sep. 1961 **Engine Run**: 115.0 **Takeoff**: 13:44
Launch: 14:40:17.0 - Mud **Duration**: 523.9 **Landing**: 15:10
Landing: 14:49:00.9 - Rogers **Altitude**: 114,300 **Duration**: 1:26
Mach/mph: 5.21/3618 **Distance**: 210.3 **Chase**: White/Petersen/Daniel/Rushworth
Mission: **040—**First flight for Walker past Mach 5. Fuel pressure loss at launch. Engine throttled back to 50 percent, then up to 75 percent. Leak in cabin pressure.

Flight/Pilot: 2-19-35/Forrest S. Petersen (**4**) **B-52/Pilots**: 008/Allavie & Archer
Date: Thu. 28 Sep. 1961 **Engine Run**: 87.1 **Takeoff**: 09:00
Launch: 09:50:25.0 - Hidden Hills **Duration**: 521.6 **Landing**: 10:30
Landing: 09:59:06.6 - Rogers **Altitude**: 101,800 **Duration**: 1:30
Mach/mph: 5.30/3600 **Distance**: 158.5 **Chase**: Daniel/McKay/Rogers
Mission: **041—**Petersen's farthest flight. Achieved 1,000 degree F. First flight by Petersen past Mach 5. Highest altitude attained by Petersen. First flight for Petersen in X-15 no. 2. Only pilot to attain highest speed and altitude on same flight.

Flight/Pilot: 1-A-38/Rushworth **Date**: Fri. 29 Sep. 1961
Remarks: SAS roll mode pulsating. Scheduled as stability and control flight with lower ventral removed.

Flight/Pilot: 1-23-39/Robert A. Rushworth (**3**) **B-52/Pilots**: 003/Allavie & Archer
Date: Wed. 4 Oct. 1961 **Engine Run**: 122.0 **Takeoff**: 10:00
Launch: 10:40:50.0 - Silver **Duration**: 511.3 **Landing**: 11:10
Landing: 10:49:21.3 - Rogers **Altitude**: 78,000 **Duration**: 1:10
Mach/mph: 4.30/2830 **Distance**: 135.6 **Chase**: Daniel/McKay/White
Mission: **042—**First flight flown with lower ventral removed as stability and control test of configuration. First flight for Rushworth with LR-99 and first past Mach 4.

Flight/Pilot: 2-20-36/Robert M. White (**10**) **B-52/Pilots**: 003/Allavie & Fulton
Date: Wed. 11 Oct. 1961 **Engine Run**: 82.5 **Takeoff**: 11:20
Launch: 12:20:00.0 - Mud **Duration**: 614.7 **Landing**: 13:00
Landing: 12:30:14.7 - Rogers **Altitude**: 217,000 **Duration**: 1:40
Mach/mph: 5.21/3647 **Distance**: 237.1 **Chase**: Daniel/McKay/Wood/Rushworth
Mission: **043—**First flight of a manned aircraft above 200,000 feet. Studied BCS system and reentry characteristics. White had two minutes of 0-g and maximum of 4-g on reentry. Outer panel of left windshield shattered during reentry at approximately 70,000 feet.

Flight/Pilot: 1-24-40/Joseph A. Walker (**9**) **B-52/Pilots**: 003/Allavie & Archer
Date: Tue. 17 Oct. 1961 **Engine Run**: 84.6 **Takeoff**: 10:00
Launch: 10:57:33.0 - Mud **Duration**: 611.7 **Landing**: 12:30
Landing: 11:07:44.7 - Rogers **Altitude**: 108,600 **Duration**: 2:30
Mach/mph: 5.74/3900 **Distance**: 201.1 **Chase**: White/McKay/Daniel/Knight
Mission: **044—**Pressure and air friction research accomplished at high speeds without use of the SAS. Achieved 1,100 degrees F. First flight for X-15 no. 1 past Mach 5. McKay's chase plane developed trouble and he had to replace it at the last minute.

Flight/Pilot: 1-A-41/White **Date**: Fri. 27 Oct. 1961
Remarks: Overcast at Mud lake launch area. Scheduled maximum speed run and evaluation of handling characteristics without using the SAS.

Flight/Pilot: 1-A-42/White **Date**: Thu. 2 Nov. 1961
Remarks: Cabin pressurization failure.

Flight/Pilot: 1-A-43/White **Date**: Fri. 3 Nov. 1961
Remarks: Engine igniter malfunctioned. Aborted ten seconds to launch.

Flight/Pilot:	2-21-37/Robert M. White (**11**)			**B-52/Pilots**:	008/Allavie & Archer
Date:	Thu. 9 Nov. 1961	**Engine Run**:	86.9	**Takeoff**:	09:00
Launch:	09:57:17.0 - Mud	**Duration**:	571.2	**Landing**:	10:30
Landing:	10:06:48.2 - Rogers	**Altitude**:	101,600	**Duration**:	1:30
Mach/mph:	6.04/4093	**Distance**:	211.7	**Chase**:	Rushworth/Walker/Gordon/Daniel

Mission: **045—**First flight of a manned aircraft above Mach 6 and 4,000 mph. Highest Mach attained by White in program. Outer panel of right windshield shattered at Mach 2.7.

Flight/Pilot: 3-A-1/Armstrong **Date**: Tue. 19 Dec. 1961
Remarks: First time X-15 no. 3 taken aloft. Q-ball malfunctioned. Scheduled to check out MH-96 system.

Flight/Pilot:	3-1-2/Neil A. Armstrong (**3**)			**B-52/Pilots**:	003/Allavie & Bement
Date:	Wed. 20 Dec. 1961	**Engine Run**:	106.3	**Takeoff**:	14:05
Launch:	14:45:50.0 - Silver	**Duration**:	625.4	**Landing**:	15:10
Landing:	14:56:15.4 - Rogers	**Altitude**:	81,000	**Duration**:	1:05
Mach/mph:	3.76/2502	**Distance**:	150.9	**Chase**:	Daniel/Petersen/Rushworth

Mission: **046—**First flight for X-15 no. 3. First flight for Armstrong with LR-99 and his first flight past Mach 3. All three axes on the MH-96 system disengaged at launch but reengaged after engine light. Yaw limit cycle at fixed gain during boost phase.

Flight/Pilot:	1-25-44/Forrest S. Petersen (**5**)			**B-52/Pilots**:	003/Allavie & Bement
Date:	Wed. 10 Jan. 1962	**Engine Run**:	3.3	**Takeoff**:	11:30
Launch:	12:28:16.0 - Mud	**Duration**:	225.7	**Landing**:	13:20
Landing:	12:32:01.7 - Mud	**Altitude**:	44,750	**Duration**:	1:50
Mach/mph:	0.97/645	**Distance**:	32.0	**Chase**:	Daniel/Walker/McDivitt/Rushworth

Mission: **047—**Petersen's shortest flight. Scheduled for high angle of attack stability and control tests, and aerodynamic heating. Last flight in program for US Navy and Petersen. First flight to land outside local Edwards AFB area. Two attempts to light engine failed. Main chamber pressure switch failed.

Flight/Pilot:	3-2-3/Neil A. Armstrong (**4**)			**B-52/Pilots**:	003/Allavie & Bement
Date:	Wed. 17 Jan. 1962	**Engine Run**:	97.4	**Takeoff**:	11:05
Launch:	12:00:34.0 - Mud	**Duration**:	627.7	**Landing**:	12:34
Landing:	12:11:01.7 - Rogers	**Altitude**:	133,500	**Duration**:	1:29
Mach/mph:	5.51/3765	**Distance**:	223.5	**Chase**:	Gordon/Petersen/McDivitt/Rushworth

Mission: **048—**First flight for Armstrong past Mach 5 and above 100,000 feet. First flight for X-15 no. 3 past Mach 5. More than two months elapsed before next flight attempt due to poor weather conditions.

Flight/Pilot: 3-A-4/Armstrong **Date**: Thu. 29 Mar. 1962
Remarks: Stable platform heat exchanger iced up. Faulty fire detector caused fire warning light.

Flight/Pilot: 3-A-5/Armstrong **Date**: Fri. 30 Mar. 1962
Remarks: Engine cooling gas circuit breaker did not close. Launch canceled at zero seconds.

Flight/Pilot: 3-A-6/Armstrong **Date**: Sat. 31 Mar. 1962
Remarks: MH-96 analyzer test failure.

Flight/Pilot:	3-3-7/Neil A. Armstrong (**5**)			**B-52/Pilots**:	003/Allavie & Fulton
Date:	Thu. 5 Apr. 1962	**Engine Run**:	79.2	**Takeoff**:	09:23
Launch:	10:04:25.0 - Hidden Hills	**Duration**:	677.0	**Landing**:	10:27
Landing:	10:15:42.0 - Rogers	**Altitude**:	180,000	**Duration**:	1:04
Mach/mph:	4.12/2850	**Distance**:	181.7	**Chase**:	Daniel/McKay/Rushworth

Mission: **049—**Engine would not ignite on the first attempt. Second attempt successful. Q-Ball system tested at low and high dynamic pressures.

Flight/Pilot: 1-A-45/Walker **Date**: Wed. 18 Apr. 1962
Remarks: Cloud cover over Mud launch area.

Flight/Pilot: 1-26-46/Joseph A. Walker (**10**) **B-52/Pilots**: 003/Allavie & Archer
Date: Thu. 19 Apr. 1962 **Engine Run**: 84.3 **Takeoff**: 08:58
Launch: 10:02:20.0 - Mud **Duration**: 538.9 **Landing**: 10:37
Landing: 10:11:18.9 - Rogers **Altitude**: 154,000 **Duration**: 1:39
Mach/mph: 5.69/3866 **Distance**: 218.5 **Chase**: Dana/Rushworth/Daniel/Knight
Mission: **050—**No landing data. McKay was supposed to be on chase but had to abort.

Flight/Pilot: 3-4-8/Neil A. Armstrong (**6**) **B-52/Pilots**: 008/Allavie & Bement
Date: Fri. 20 Apr. 1962 **Engine Run**: 82.4 **Takeoff**: 10:34
Launch: 11:26:58.0 - Mud **Duration**: 748.7 **Landing**: 12:58
Landing: 11:39:26.7 - Rogers **Altitude**: 207,500 **Duration**: 2:24
Mach/mph: 5.31/3789 **Distance**: 286.6 **Chase**: White/McKay/Gordon/Rushworth
Mission: **051—**During reentry Armstrong maintained g-limit which caused the aircraft to bounce back up out of the atmosphere. The X-15 went approximately 45 miles south of Edwards before turning around. First flight by Armstrong above 200,000 feet. Armstrong's highest altitude attained and farthest flight. Longest duration flight in program at 12.4 minutes. First flight of X-15 no. 3 from B-52 no. 008.

Flight/Pilot: 2-A-38/White **Date**: Wed. 25 Apr. 1962
Remarks: Chuck Yeager on board B-52 as copilot. Aborted due to cloud cover at launch lake.

Flight/Pilot: 2-A-39/White **Date**: Thu. 26 Apr. 1962
Remarks: Engine igniter malfunctioned.

Flight/Pilot: 1-A-47/Walker **Date**: Fri. 27 Apr. 1962
Remarks: Cloud cover over launch lake.

Flight/Pilot: 1-27-48/Joseph A. Walker (**11**) **B-52/Pilots**: 008/Allavie & Bement
Date: Mon. 30 Apr. 1962 **Engine Run**: 81.6 **Takeoff**: 09:32
Launch: 10:23:20.0 - Mud **Duration**: 586.2 **Landing**: 10:51
Landing: 10:33:06.2 - Rogers **Altitude**: 246,700 **Duration**: 1:21
Mach/mph: 4.94/3489 **Distance**: 231.6 **Chase**: Daniel/White/Dana/Rushworth
Mission: **052—**First flight for Walker above 200,000 feet. Flight specifically designed to beat Soviet altitude record. This new altitude record was certified by the FAI.

Flight/Pilot: 2-22-40/Robert A. Rushworth (**4**) **B-52/Pilots**: 008/Allavie & Bement
Date: Tue. 8 May 1962 **Engine Run**: 97.9 **Takeoff**: 09:07
Launch: 10:01:28.0 - Hidden Hills **Duration**: 530.5 **Landing**: 10:37
Landing: 10:10:18.5 - Rogers **Altitude**: 70,400 **Duration**: 1:30
Mach/mph: 5.34/3524 **Distance**: 143.5 **Chase**: Daniel/McKay/Rogers
Mission: **053—**First flight for Rushworth in X-15 no. 2 and first past Mach 5. First flight with LR-99 at 30 percent thrust. B-52 engine no. 4 out. Aerodynamic heating reached 1,250 degrees F on speed brakes.

Flight/Pilot: 1-28-49/Robert A. Rushworth (**5**) **B-52/Pilots**: 003/Allavie & Campbell
Date: Tue. 22 May 1962 **Engine Run**: 75.3 **Takeoff**: 09:22
Launch: 10:04:46.0 - Hidden Hills **Duration**: 556.2 **Landing**: 10:25
Landing: 10:14:02.2 - Rogers **Altitude**: 100,400 **Duration**: 1:03
Mach/mph: 5.03/3450 **Distance**: 143.0 **Chase**: Daniel/Dana/Rogers
Mission: **054—**First flight for Rushworth above 100,000 feet. Boundary layer flow study. Premature engine shutdown. Left roll out of trim.

Flight/Pilot: 2-A-41/White **Date**: Fri. 25 May 1962
Remarks: Stable platform overheated. Scheduled to test alternate SAS and high angle-of-attack.

Flight/Pilot: 2-A-42/White **Date**: Tue. 29 May 1962
Remarks: B-52 stable platform did not function.

Flight/Pilot: 2-23-43/Robert M. White (**12**) **B-52/Pilots**: 008/Fulton & Bement
Date: Fri. 1 Jun. 1962 **Engine Run**: 86.0 **Takeoff**: 09:59
Launch: 10:51:15.0 - Delamar **Duration**: 601.9 **Landing**: 11:28
Landing: 11:01:16.9 - Rogers **Altitude**: 132,600 **Duration**: 1:29
Mach/mph: 5.42/3675 **Distance**: 224.5 **Chase**: Daniel/Dana/Rogers/Collins
Mission: **055—**First launch from Delamar Dry Lake. Engine vibration noted at 30 percent thrust. 100th time an X-15 was taken aloft, but only 55th time a successful launch occurred.

Flight/Pilot: 1-29-50/Joseph A. Walker (**12**) **B-52/Pilots**: 003/Allavie & Bement
Date: Thu. 7 Jun. 1962 **Engine Run**: 81.5 **Takeoff**: 09:45
Launch: 10:29:20.0 - Hidden Hills **Duration**: 504.2 **Landing**: 10:53
Landing: 10:37:44.2 - Rogers **Altitude**: 103,600 **Duration**: 1:08
Mach/mph: 5.39/3672 **Distance**: 168.6 **Chase**: Daniel/McKay/White
Mission: **056—**Studied air flow over surfaces. Engine vibration noted during boost. Near 90 degree right turn was made over Daggett, California, to test maneuverability of spacecraft returning from orbit.

Flight/Pilot: 3-5-9/Robert M. White (**13**) **B-52/Pilots**: 008/Allavie & Fulton
Date: Tue. 12 Jun. 1962 **Engine Run**: 81.9 **Takeoff**: 10:56
Launch: 12:04:00.0 - Delamar **Duration**: 575.4 **Landing**: 12:40
Landing: 12:13:35.4 - Rogers **Altitude**: 184,600 **Duration**: 1:44
Mach/mph: 5.02/3517 **Distance**: 249.0 **Chase**: McDivitt/McKay/Collins/Gordon
Mission: **057—**First flight for White in X-15 no. 3. Scheduled flight for pilot checkout and to evaluate BCS system.

Flight/Pilot: 3-6-10/Robert M. White (**14**) **B-52/Pilots**: 008/Allavie & Lewis
Date: Thu. 21 Jun. 1962 **Engine Run**: 82.3 **Takeoff**: 09:01
Launch: 09:47:05.0 - Delamar **Duration**: 573.6 **Landing**: 10:22
Landing: 09:56:38.6 - Rogers **Altitude**: 246,700 **Duration**: 1:21
Mach/mph: 5.08/3641 **Distance**: 246.5 **Chase**: McKay/Armstrong/Collins/Daniel
Mission: **058—**Contractual demonstration of the MH-96 system. APU-1 shutdown during captive portion of flight, but was successfully restarted prior to launch.

Flight/Pilot: 1-30-51/Joseph A. Walker (**13**) **B-52/Pilots**: 003/Allavie & Townsend
Date: Wed. 27 Jun. 1962 **Engine Run**: 88.6 **Takeoff**: 12:13
Launch: 13:08:10.0 - Mud **Duration**: 572.4 **Landing**: 13:38
Landing: 13:17:42.4 - Rogers **Altitude**: 123,700 **Duration**: 1:25
Mach/mph: 5.92/4104 **Distance**: 223.2 **Chase**: Rushworth/McKay/Knight/Daniel
Mission: **059—**Unofficial world absolute speed record to date. Highest speed attained by Walker in program. Ventral parachute lost during flight and pitch damper went inoperative during a pull-up maneuver.

Flight/Pilot: 2-24-44/John B. McKay (**3**) **B-52/Pilots**: 008/Allavie & Archer
Date: Fri. 29 Jun. 1962 **Engine Run**: 112.4 **Takeoff**: 09:57
Launch: 10:41:47.0 - Hidden Hills **Duration**: 533.4 **Landing**: 11:05
Landing: 10:50:40.4 - Rogers **Altitude**: 83,200 **Duration**: 1:08
Mach/mph: 4.95/3280 **Distance**: 167.0 **Chase**: Rushworth/Armstrong/Daniel
Mission: **060—**First flight for McKay past Mach 4, and first with LR-99. First flight for McKay in X-15 no. 2. Evaluated heating rates at low angle-of-attack and low Mach number.

Flight/Pilot: 3-A-11/White **Date**: Tue. 10 Jul. 1962
Remarks: Could not retract left aft landing gear on B-52 no. 003.

Flight/Pilot: 3-A-12/White **Date**: Wed. 11 Jul. 1962
Remarks: APU-1 pressure regulator ruptured causing hydrogen peroxide jettison.

Flight/Pilot: 3-A-13/White **Date**: Mon. 16 Jul. 1962
Remarks: Umbilical connecting X-15 to B-52 pylon came loose because the lanyard was too short.

Flight/Pilot: 1-31-52/Joseph A. Walker (**14**) **B-52/Pilots**: 008/Allavie & Archer
Date: Mon. 16 Jul. 1962 **Engine Run**: 83.9 **Takeoff**: 13:23
Launch: 14:09:25.0 - Mud **Duration**: 577.8 **Landing**: 14:40
Landing: 14:19:02.8 - Rogers **Altitude**: 107,200 **Duration**: 1:17
Mach/mph: 5.37/3674 **Distance**: 227.8 **Chase**: Daniel/Dana/Engle/Rushworth
Mission: **061—**Second time two launches attempted on the same day. First flight with new X-15 instrument panel arrangement where the aircraft and simulator were to be set up in an identical configuration. Checkout of SAS. Ventral parachute failed. Last use of the F-100 chase plane for X-15 no. 1 (Daniel). Canopy was difficult to open after landing due to a latch pin that was the wrong size.

Flight/Pilot: 3-7-14/Robert M. White (**15**) **B-52/Pilots**: 003/Allavie & Archer
Date: Tue. 17 Jul. 1962 **Engine Run**: 82.0 **Takeoff**: 08:46
Launch: 09:31:10.0 - Delamar **Duration**: 620.7 **Landing**: 10:03
Landing: 09:41:30.7 - Rogers **Altitude**: 314,750 **Duration**: 1:17
Mach/mph: 5.45/3832 **Distance**: 268.3 **Chase**: McDivitt/McKay/Dana/Thompson
Mission: **062—**Rain forced change from Smith Ranch to Delamar. Set FAI World Absolute Altitude Record. First manned aircraft flight above 300,000 feet. Farthest flight and highest altitude for White. First flight in X-15 program above 50 miles. First pilot to achieve astronaut rating in a non-ballistic vehicle. Last use of the F-100 chase aircraft for X-15 no. 3 (McDivitt).

Flight/Pilot: 2-25-45/John B. McKay (**4**) **B-52/Pilots**: 008/Fulton & Bement
Date: Thu. 19 Jul. 1962 **Engine Run**: 106.2 **Takeoff**: 09:11
Launch: 09:53:45.0 - Hidden Hills **Duration**: 503.8 **Landing**: 10:20
Landing: 10:02:08.8 - Rogers **Altitude**: 85,250 **Duration**: 1:09
Mach/mph: 5.18/3474 **Distance**: 161.2 **Chase**: Rogers/Dana/Rushworth
Mission: **063—**Evaluated heating rates at low angle of attack and high Mach number. First flight for McKay past Mach 5. Ventral parachute failed. Last use of the F-100 chase aircraft during program (Rogers).

Flight/Pilot: 1-32-53/Neil A. Armstrong (**7**) **B-52/Pilots**: 003/Fulton & Bement
Date: Thu. 26 Jul. 1962 **Engine Run**: 82.8 **Takeoff**: 10:34
Launch: 11:22:30.0 - Mud **Duration**: 621.4 **Landing**: 11:57
Landing: 11:32:51.4 - Rogers **Altitude**: 98,900 **Duration**: 1:23
Mach/mph: 5.74/3989 **Distance**: 214.8 **Chase**: Rushworth/Collins/Daniel/White
Mission: **064—**Highest Mach attained by Armstrong and final flight in program. Evaluated aerodynamic stability and drag handling. Smoke in cockpit. Lost lower vertical door in flight. Hydraulic system leaked. After flight, X-15 no. 1 was returned to NAA for installation of cameras and modifications required for turbulence studies. First use of the T-38 chase aircraft with X-15 no. 1 (Rushworth).

Flight/Pilot: 3-A-15/Walker **Date**: Wed. 1 Aug. 1962
Remarks: Fuel tank pressurization failed. Flight scheduled to investigate yawing noticed by White on flight **062**.

Flight/Pilot: 3-8-16/Joseph A. Walker (**15**) **B-52/Pilots**: 003/Fulton & Bement
Date: Thu. 2 Aug. 1962 **Engine Run**: 80.0 **Takeoff**: 09:05
Launch: 09:56:15.0 - Mud **Duration**: 554.0 **Landing**: 10:31
Landing: 10:05:29.0 - Rogers **Altitude**: 144,500 **Duration**: 1:26
Mach/mph: 5.07/3438 **Distance**: 223.5 **Chase**: Daniel/McKay/Collins/Rushworth
Mission: **065—**First flight by Walker in X-15 no. 3. Evaluated modification to fixed gain of MH-96 system in relation to yaw problem noted previously. System checked out okay. First use of the T-38 chase aircraft with X-15 no. 3 (Daniel).

Flight/Pilot: 2-26-46/Robert A. Rushworth (**6**) **B-52/Pilots**: 008/Fulton & Sturmthal
Date: Wed. 8 Aug. 1962 **Engine Run**: 95.8 **Takeoff**: 09:15
Launch: 10:08:35.0 - Hidden Hills **Duration**: 462.8 **Landing**: 10:33
Landing: 10:16:17.8 - Rogers **Altitude**: 90,877 **Duration**: 1:16
Mach/mph: 4.40/2943 **Distance**: 143.9 **Chase**: McDivitt/McKay/Engle/Collins
Mission: **066—**Evaluated aerodynamic heating at moderate velocity and low altitude.

Flight/Pilot: 3-A-17/Walker **Date**: Fri. 10 Aug. 1962
Remarks: Broken wire on BCS controls. Scheduled to test new re-entry technique.

Flight/Pilot: 3-9-18/Joseph A. Walker (**16**) **B-52/Pilots**: 003/Fulton & Crews
Date: Tue. 14 Aug. 1962 **Engine Run**: 84.2 **Takeoff**: 09:45
Launch: 10:41:35.0 - Delamar **Duration**: 544.9 **Landing**: 11:16
Landing: 10:50:39.9 - Rogers **Altitude**: 193,600 **Duration**: 1:31
Mach/mph: 5.25/3747 **Distance**: 231.7 **Chase**: Rushworth/Dana/Engle/White
Mission: **067—**Lower than anticipated altitude and speed caused by various difficulties (scheduled for 220,000 feet). MH-96 roll mode inoperative. Some instability about all three axes. Low engine fuel pressure. Last flight with ventral for X-15 no. 3.

Flight/Pilot: 2-27-47/Robert A. Rushworth (**7**) **B-52/Pilots**: 008/Fulton & Andonian
Date: Mon. 20 Aug. 1962 **Engine Run**: 86.5 **Takeoff**: 09:20
Launch: 10:08:40.0 - Hidden Hills **Duration**: 518.2 **Landing**: 10:34
Landing: 10:17:18.2 - Rogers **Altitude**: 88,900 **Duration**: 1:14
Mach/mph: 5.24/3534 **Distance**: 154.2 **Chase**: Gordon/McKay/Engle/Daniel
Mission: **068—**Evaluated aerodynamic heating rates at high speed and moderate angle-of-attack. Electrocardiogram successfully telemetered for first time. SAS tripped out and required alternate SAS. Minor detonation in engine.

Flight/Pilot: 2-28-48/Robert A. Rushworth (**8**) **B-52/Pilots**: 008/Fulton & Bement
Date: Wed. 29 Aug. 1962 **Engine Run**: 92.0 **Takeoff**: 09:50
Launch: 10:36:03.0 - Hidden Hills **Duration**: 527.1 **Landing**: 11:00
Landing: 10:44:50.1 - Rogers **Altitude**: 97,200 **Duration**: 1:10
Mach/mph: 5.12/3447 **Distance**: 160.6 **Chase**: White/Walker/McDivitt/Knight
Mission: **069—**Evaluated aerodynamic heating at high angle-of-attack and high Mach. Intermittent SAS roll. Speed brake vibrations noticed. Last flight for X-15 no. 2 with lower ventral until flight **155**.

Flight/Pilot: 2-A-49/McKay **Date**: Thu. 27 Sep. 1962
Remarks: McKay accidentally tripped ejection seat handles and could not re-stow them. Scheduled to evaluate stability without lower ventral.

Flight/Pilot: 2-29-50/John B. McKay (**5**) **B-52/Pilots**: 008/Bement & Sturmthal
Date: Fri. 28 Sep. 1962 **Engine Run**: 128.2 **Takeoff**: 09:17
Launch: 10:04:55.0 - Hidden Hills **Duration**: 567.5 **Landing**: 10:34
Landing: 10:14:22.5 - Rogers **Altitude**: 68,200 **Duration**: 1:17
Mach/mph: 4.22/2765 **Distance**: 144.2 **Chase**: White/Walker/Engle/Rushworth
Mission: **070—**All subsequent X-15 flights are flown with no lower ventral until flight **155**, where it was reinstalled for testing on the X-15 no. 2 using external fuel tanks. Longest LR-99 burn time to date.

Flight/Pilot: 3-10-19/Robert A. Rushworth (**9**) **B-52/Pilots**: 008/Fulton & Lewis
Date: Thu. 4 Oct. 1962 **Engine Run**: 103.2 **Takeoff**: 09:26
Launch: 10:10:11.0 - Delamar **Duration**: 590.5 **Landing**: 10:53
Landing: 10:20:01.5 - Rogers **Altitude**: 112,200 **Duration**: 1:27
Mach/mph: 5.17/3493 **Distance**: 229.6 **Chase**: Rogers/Walker/Collins/Gordon
Mission: **071—**First flight for Rushworth in X-15 no. 3. APU-1 shut down five minutes after launch.

Flight/Pilot: 2-30-51/John B. McKay (**6**) **B-52/Pilots**: 003/Fulton & Lewis
Date: Tue. 9 Oct. 1962 **Engine Run**: 79.5 **Takeoff**: 10:10
Launch: 10:58:32.0 - Delamar **Duration**: 580.3 **Landing**: 11:40
Landing: 11:08:12.3 - Rogers **Altitude**: 130,200 **Duration**: 1:30
Mach/mph: 5.46/3716 **Distance**: 235.3 **Chase**: White/Dana/Rushworth/Rogers
Mission: **072—**First flight in program for McKay above 100,000 feet. Second stage engine igniter exploded, causing 79 second restriction on burn time for several missions until correction was found.

Flight/Pilot: 3-11-20/Robert A. Rushworth (**10**) **B-52/Pilots**: 008/Bement & Cross
Date: Tue. 23 Oct. 1962 **Engine Run**: 78.0 **Takeoff**: 10:31
Launch: 11:30:40.0 - Mud **Duration**: 586.3 **Landing**: 12:28
Landing: 11:40:26.3 - Rogers **Altitude**: 134,500 **Duration**: 1:57
Mach/mph: 5.47/3764 **Distance**: 235.3 **Chase**: Rogers/Dana/Thompson/Knight
Mission: **073—**Popped circuit breaker in X-15 forced B-52 to initiate launch. APU exploded.

Flight/Pilot: 2-31-52/John B. McKay (**7**) **B-52/Pilots**: 008/Bement & Lewis
Date: Fri. 9 Nov. 1962 **Engine Run**: 70.5 **Takeoff**: 09:29
Launch: 10:23:07.0 - Mud **Duration**: 391.0 **Landing**: 11:45
Landing: 10:29:38.0 - Mud **Altitude**: 53,950 **Duration**: 2:16
Mach/mph: 1.49/1019 **Distance**: 45.4 **Chase**: White/Walker/Evenson/Daniel
Mission: **074—**Engine only produced 30 percent thrust due to a failed governor valve, causing fuel starvation. Higher than normal landing speed caused by inability to extend flaps put excessive loads on landing gear, causing left skid to fail at touchdown. Left wing and stabilizer dug in, causing the aircraft to roll over. McKay jettisoned the canopy prior to rollover. Aircraft required extensive refurbishment which included lengthened landing gear, extended fuselage, and external fuel tanks to extend range and speed. After rebuild this aircraft will be designated X-15A-2. McKay suffered crushed vertebrae but was later able to return to flight status. McKay's shortest flight.

Flight/Pilot: 3-A-21/White **Date**: Thu. 13 Dec. 1962
Remarks: Lost liquid nitrogen pressure. Low pressure relief valve failure. Checkout ultraviolet photometer.

Flight/Pilot: 3-12-22/Robert M. White (**16**) **B-52/Pilots**: 008/Bement & Cross
Date: Fri. 14 Dec. 1962 **Engine Run**: 77.7 **Takeoff**: 09:47
Launch: 10:44:07.0 - Mud **Duration**: 577.1 **Landing**: 12:00
Landing: 10:53:44.1 - Rogers **Altitude**: 141,400 **Duration**: 2:13
Mach/mph: 5.65/3742 **Distance**: 227.5 **Chase**: Rogers/Dana/Evenson/Knight
Mission: **075—**Final flight for White in program. Flown at 22 degree angle-of-attack. Ultraviolet photometer experiment flown but did not function during the flight.

Flight/Pilot: 3-13-23/Joseph A. Walker (**17**) **B-52/Pilots**: 008/Bement & Fulton
Date: Thu. 20 Dec. 1962 **Engine Run**: 81.0 **Takeoff**: 10:30
Launch: 11:25:04.0 - Mud **Duration**: 534.3 **Landing**: 11:55
Landing: 11:33:58.3 - Rogers **Altitude**: 160,400 **Duration**: 1:25
Mach/mph: 5.73/3793 **Distance**: 226.6 **Chase**: Rushworth/White/Daniel/Gordon
Mission: **076—**Investigated control system limits at high dynamic pressure.

Flight/Pilot: 3-14-24/Joseph A. Walker (**18**) **B-52/Pilots**: 008/Bement & Archer
Date: Thu. 17 Jan. 1963 **Engine Run**: 81.2 **Takeoff**: 10:07
Launch: 10:59:16.0 - Delamar **Duration**: 583.9 **Landing**: 12:08
Landing: 11:08:59.9 - Rogers **Altitude**: 271,700 **Duration**: 2:01
Mach/mph: 5.47/3677 **Distance**: 246.2 **Chase**: White/Dana/Gordon/Daniel
Mission: **077—**First astronaut qualification flight for Walker. Infrared experiment flown. APU-1 failed four minutes after launch. Hydraulic pressure loss caused shutdown of the Q-ball system and rudder servo about two minutes prior to landing. Altitude buildup with ventral removed.

Flight/Pilot: 1-33-54/Robert A. Rushworth (**11**) **B-52/Pilots**: 008/Bement & Archer
Date: Thu. 11 Apr. 1963 **Engine Run**: 120.5 **Takeoff**: 09:21
Launch: 10:02:47.1 - Hidden Hills **Duration**: 536.7 **Landing**: 10:40
Landing: 10:11:43.8 - Rogers **Altitude**: 74,400 **Duration**: 1:19
Mach/mph: 4.25/2864 **Distance**: 150.8 **Chase**: Rogers/McKay/Crews
Mission: **078—**Checkout of APU repair which consisted of pressurizing the APU compartment. Optical degradation experiment (KC-1 camera) mounted under fuselage to study photographic degradation caused by shock waves and hypersonic air flow. SAS roll disengaged at launch but was reset.

Flight/Pilot: 3-15-25/Joseph A. Walker (**19**) **B-52/Pilots**: 008/Fulton & Archer
Date: Thu. 18 Apr. 1963 **Engine Run**: 79.0 **Takeoff**: 11:37
Launch: 12:16:17.6 - Hidden Hills **Duration**: 433.2 **Landing**: 13:10
Landing: 12:23:30.8 - Rogers **Altitude**: 92,500 **Duration**: 1:33
Mach/mph: 5.51/3770 **Distance**: 147.5 **Chase**: White/Dana/Sorlie/Rogers
Mission: **079—**First test of new Q meter to measure dynamic pressure. Nose gear scoop door opened at Mach 3.4 and 55,000 feet. Skids spread to 125 inches at landing.

Flight/Pilot: 1-34-55/John B. McKay (**8**) **B-52/Pilots**: 008/Bement & Fulton
Date: Thu. 25 Apr. 1963 **Engine Run**: 86.3 **Takeoff**: 13:14
Launch: 14:03:38.3 - Delamar **Duration**: 632.3 **Landing**: 14:45
Landing: 14:14:10.6 - Rogers **Altitude**: 105,500 **Duration**: 1:31
Mach/mph: 5.32/3654 **Distance**: 234.0 **Chase**: White/Thompson/Wood/Knight
Mission: **080—**First launch from Delamar for X-15 no. 1. KC-1 camera tested. Winds at 30 mph with 50 percent cloud cover hindered flight. McKay's first flight following rollover accident on flight **074**. SAS roll disengaged at launch. Alternate SAS engaged.

Flight/Pilot: 3-16-26/Joseph A. Walker (**20**) **B-52/Pilots**: 008/Bement & Archer
Date: Thu. 2 May 1963 **Engine Run**: 79.2 **Takeoff**: 09:08
Launch: 09:59:54.0 - Mud **Duration**: 557.2 **Landing**: 10:40
Landing: 10:09:11.2 - Rogers **Altitude**: 209,400 **Duration**: 1:32
Mach/mph: 4.73/3488 **Distance**: 216.3 **Chase**: White/Dana/Rogers/Knight
Mission: **081—**Check-out of APU at high altitude after modifications to pressurize the housing. Infrared and ultraviolet experiments conducted. Nose gear door was replaced and main gear (rear skid) oleos changed following the incident on flight **079**.

Flight/Pilot: 3-A-27/Rushworth **Date**: Fri. 10 May 1963
Remarks: Hydraulic line ruptured on no. 1 system.

Flight/Pilot: 3-17-28/Robert A. Rushworth (**12**) **B-52/Pilots**: 008/Bement & Archer
Date: Tue. 14 May 1963 **Engine Run**: 86.9 **Takeoff**: 11:30
Launch: 12:11:56.0 - Hidden Hills **Duration**: 453.1 **Landing**: 12:40
Landing: 12:19:29.1 - Rogers **Altitude**: 95,600 **Duration**: 1:09
Mach/mph: 5.20/3600 **Distance**: 149.2 **Chase**: Sorlie/Dana/Daniel
Mission: **082—**LR-99 did not light on first attempt due to vibration. Restart required. Evaluated heat transfer rates of skin and conducted ultraviolet experiment. Made a 50 degree right bank turn at flight mid-point.

Flight/Pilot: 1-35-56/John B. McKay (**9**) **B-52/Pilots**: 003/Bement & Archer
Date: Wed. 15 May 1963 **Engine Run**: 84.1 **Takeoff**: 09:57
Launch: 10:50:46.0 - Delamar **Duration**: 620.5 **Landing**: 11:28
Landing: 11:01:06.5 - Rogers **Altitude**: 124,200 **Duration**: 1:31
Mach/mph: 5.57/3856 **Distance**: 242.9 **Chase**: Rushworth/Dana/Evenson/Daniel
Mission: **083—**First use of traversing probe which extended every four seconds to take measurements of air flow. Lost gear box pressure five minutes after launch. Nose gear scoop door opened at Mach 5.2. Both tires disintegrated after touchdown. Fire in nose gear compartment. Buckles in forward fuselage.

Flight/Pilot: 3-18-29/Joseph A. Walker (**21**) **B-52/Pilots**: 008/Bement & Fulton
Date: Wed. 29 May 1963 **Engine Run**: 84.3 **Takeoff**: 09:53
Launch: 10:43:22.0 - Delamar **Duration**: 702.5 **Landing**: 11:22
Landing: 10:55:04.5 - Rogers **Altitude**: 92,000 **Duration**: 1:29
Mach/mph: 5.52/3858 **Distance**: 232.9 **Chase**: White/Dana/Knight/Rogers
Mission: **084—**Evaluated heat transfer rates. Inner panel on left windshield shattered approximately at engine burn out. The loss of the windshield was attributed to the bolts holding it in place being too long.

Flight/Pilot: 3-19-30/Robert A. Rushworth (**13**) **B-52/Pilots**: 008/Bement & Archer
Date: Tue. 18 Jun. 1963 **Engine Run**: 79.3 **Takeoff**: 09:42
Launch: 10:34:21.0 - Delamar **Duration**: 580.3 **Landing**: 11:40
Landing: 10:44:01.3 - Rogers **Altitude**: 223,700 **Duration**: 1:58
Mach/mph: 4.97/3539 **Distance**: 235.0 **Chase**: Gordon/Dana/Ward/Rogers
Mission: **085—**First flight by Rushworth above 200,000 feet. Altitude build-up flight. Ultraviolet experiment.

Flight/Pilot: 1-36-57/Joseph A. Walker (**22**) **B-52/Pilots**: 003/Bement & Archer
Date: Tue. 25 Jun. 1963 **Engine Run**: 92.8 **Takeoff**: 09:06
Launch: 09:53:50.0 - Delamar **Duration**: 599.3 **Landing**: 10:30
Landing: 10:03:49.3 - Rogers **Altitude**: 111,800 **Duration**: 1:24
Mach/mph: 5.51/3911 **Distance**: 248.4 **Chase**: Daniel/McKay/Wood/Rogers
Mission: **086—**Evaluated heat build-up. Traversing probe and optical degradation experiments. Left forward fuselage faring cracked at buckle noted on flight **083**.

Flight/Pilot: 3-20-31/Robert A. Rushworth (**14**) **B-52/Pilots**: 008/Bement & Archer
Date: Thu. 27 Jun. 1963 **Engine Run**: 80.1 **Takeoff**: 09:07
Launch: 09:56:03.0 - Delamar **Duration**: 628.0 **Landing**: 10:33
Landing: 10:06:31.0 - Rogers **Altitude**: 285,000 **Duration**: 1:26
Mach/mph: 4.89/3425 **Distance**: 236.6 **Chase**: Daniel/McKay/Wood/Rogers
Mission: **087—**Highest altitude attained by Rushworth in program. First flight by Rushworth above 50 miles altitude. Becomes third X-15 pilot to achieve astronaut qualification.

Flight/Pilot: 1-A-58/Walker **Date**: Wed. 3 Jul. 1963
Remarks: X-15 could not be received on the radio.

Flight/Pilot: 1-37-59/Joseph A. Walker (**23**) **B-52/Pilots**: 008/Archer & Bement
Date: Tue. 9 Jul. 1963 **Engine Run**: 83.6 **Takeoff**: 11:17
Launch: 12:12:12.0 - Delamar **Duration**: 537.7 **Landing**: 12:49
Landing: 12:21:09.7 - Rogers **Altitude**: 226,400 **Duration**: 1:32
Mach/mph: 5.07/3631 **Distance**: 240.8 **Chase**: Daniel/McKay/Rogers/Wood
Mission: **088—**Evaluated optical degradation. A cork sheet ablation material was tested on the lower right speed brake. Traversing probe became inoperative after engine burnout because of an overloaded fuse.

Flight/Pilot: 1-A-60/Rushworth **Date**: Wed. 17 Jul. 1963
Remarks: Pilot's oxygen quick disconnect from B-52 uncoupled during takeoff. The flight was aborted and had to quickly return to Edwards since Rushworth had a limited internal oxygen supply.

Flight/Pilot: 1-38-61/Robert A. Rushworth (**15**) **B-52/Pilots**: 003/Fulton & Bock
Date: Thu. 18 Jul. 1963 **Engine Run**: 85.2 **Takeoff**: 09:17
Launch: 10:07:20.0 - Mud **Duration**: 563.9 **Landing**: 10:42
Landing: 10:16:43.9 - Rogers **Altitude**: 104,800 **Duration**: 1:25
Mach/mph: 5.63/3925 **Distance**: 214.8 **Chase**: Rogers/Dana/Evenson/Gordon
Mission: **089—**Ablative test articles installed on both lower speed brakes, the left upper speed brake, and the leading edge of the lower fixed ventral. Flight was performed without automatic systems. Engine was shut down manually, and a malfunction was found in the second stage igniter.

Flight/Pilot: 3-21-32/Joseph A. Walker (**24**) **B-52/Pilots**: 008/Fulton & Bement
Date: Fri. 19 Jul. 1963 **Engine Run**: 84.6 **Takeoff**: 09:19
Launch: 10:20:05.0 - Smith Ranch **Duration**: 684.1 **Landing**: 11:04
Landing: 10:31:29.1 - Rogers **Altitude**: 347,800 **Duration**: 1:45
Mach/mph: 5.50/3710 **Distance**: 288.5 **Chase**: Crews/Dana/Rogers/Daniel/Wood
Mission: **090—**First flight in program by Walker above 300,000 feet. First launch from Smith Ranch Dry Lake. Towed balloon experiment tested, which was developed for the Mercury-Atlas 9 mission that flew on 15 May 1963. The experiment failed on both X-15 and Mercury.

Flight/Pilot: 3-A-33/Walker **Date**: Tue. 6 Aug. 1963
Remarks: Weather cancellation and an overheated computer.

Flight/Pilot: 3-A-34/Walker **Date**: Tue. 13 Aug. 1963
Remarks: APU-1 would not run after start. Stayed operational about four seconds, then shut down.

Flight/Pilot: 3-A-35/Walker **Date**: Thu. 15 Aug. 1963
Remarks: Weather canceled the flight. After abort, APU-1 had the same start-up problems as encountered in previous aborted flight. APU controller was adversely affected by low temperatures.

Flight/Pilot:	3-22-36/Joseph A. Walker (**25**)			**B-52/Pilots**:	003/Bement & Lewis
Date:	Thu. 22 Aug. 1963	**Engine Run**:	85.8	**Takeoff**:	09:09
Launch:	10:05:57.0 - Smith Ranch	**Duration**:	668.6	**Landing**:	10:56
Landing:	10:17:05.6 - Rogers	**Altitude**:	354,200	**Duration**:	1:47
Mach/mph:	5.58/3794	**Distance**:	293.4	**Chase**:	Wood/Dana/Gordon/Rogers

Mission: **091—**Unofficial altitude record set. Highest altitude achieved by Walker and by the X-15 (67.1 miles). Last flight by Walker in program. X-15 no. 1 left BCS nozzle froze up. First flight with altitude predictor instrument. Towed balloon experiment. Weather delayed flights for six weeks.

Flight/Pilot: 1-A-62/Engle **Date**: Fri. 4 Oct. 1963
Remarks: First attempted launch by Engle. Radio communication lost between X-15 and B-52.

Flight/Pilot:	1-39-63/Joe H. Engle (**1**)			**B-52/Pilots**:	008/Bement & Jones
Date:	Mon. 7 Oct. 1963	**Engine Run**:	118.9	**Takeoff**:	11:22
Launch:	12:22:56.0 - Hidden Hills	**Duration**:	457.8	**Landing**:	13:00
Landing:	12:30:33.8 - Rogers	**Altitude**:	77,800	**Duration**:	1:38
Mach/mph:	4.21/2834	**Distance**:	138.5	**Chase**:	Sorlie/Thompson/Rogers

Mission: **092—**First and shortest flight by Engle in program. First flight with KS-25 (Phase 2 optical degradation instrument). Ablative tested on speed brakes. Abort originally called for bad angle-of-attack indicator. Indicator started working and the flight went ahead, but the indicator became inoperative immediately after launch. An unauthorized 360-degree roll performed by Engle during glide back to Edwards.

Flight/Pilot: 3-A-37/Rushworth **Date**: Mon. 14 Oct. 1963
Remarks: Upper vertical leading edge modified to razor edge. Inertial system platform malfunctioned.

Flight/Pilot: 3-A-38/Rushworth **Date**: Fri. 25 Oct. 1963
Remarks: Inertial system platform malfunctioned. A flight attempt the day before was canceled prior to takeoff when a cracked right windshield was found on the B-52.

Flight/Pilot:	1-40-64/Milton O. Thompson (**1**)			**B-52/Pilots**:	008/Fulton & Jones
Date:	Tue. 29 Oct. 1963	**Engine Run**:	126.1	**Takeoff**:	11:59
Launch:	12:42:34.0 - Hidden Hills	**Duration**:	523.0	**Landing**:	13:09
Landing:	12:51:17.0 - Rogers	**Altitude**:	74,400	**Duration**:	1:10
Mach/mph:	4.10/2712	**Distance**:	144.2	**Chase**:	Sorlie/Walker/Rushworth

Mission: **093—**First flight for Thompson and first past Mach 4. Previous ablative test material was removed and replaced with a new Emerson Electric ablative material which was tested on the lower right speed brake. Optical degradation tests performed.

Flight/Pilot:	3-23-39/Robert A. Rushworth (**16**)			**B-52/Pilots**:	008/Bement & Jones
Date:	Thu. 7 Nov. 1963	**Engine Run**:	107.2	**Takeoff**:	09:24
Launch:	10:11:14.0 - Hidden Hills	**Duration**:	531.7	**Landing**:	10:41
Landing:	10:20:05.7 - Rogers	**Altitude**:	82,300	**Duration**:	1:17
Mach/mph:	4.40/2925	**Distance**:	145.8	**Chase**:	Gordon/Thompson/Sorlie

Mission: **094—**First flight with razor sharp leading edge on upper vertical stabilizer. Evaluated heat transfer and damper-off stability. Main gear spread too much on landing creating a turn to the left. Discovered the main gear oleo was not serviced properly prior to the flight.

Flight/Pilot: 1-41-65/Joe H. Engle (**2**) **B-52/Pilots**: 008/Bement & Jones
Date: Thu. 14 Nov. 1963 **Engine Run**: 84.6 **Takeoff**: 10:36
Launch: 11:19:21.0 - Hidden Hills **Duration**: 466.5 **Landing**: 11:55
Landing: 11:27:07.5 - Rogers **Altitude**: 90,800 **Duration**: 1:19
Mach/mph: 4.75/3286 **Distance**: 146.5 **Chase**: Rushworth/Dana/Rogers
Mission: **095—**Optical degradation experiment. All ablative test materials removed from aircraft.

Flight/Pilot: 3-A-40/Thompson **Date**: Tue. 19 Nov. 1963
Remarks: Weather closed in over the launch area. President Kennedy assassinated four days later.

Flight/Pilot: 3-24-41/Milton O. Thompson (**2**) **B-52/Pilots**: 008/Fulton & Lewis
Date: Wed. 27 Nov. 1963 **Engine Run**: 89.0 **Takeoff**: 11:34
Launch: 12:17:40.0 - Hidden Hills **Duration**: 424.3 **Landing**: 12:59
Landing: 12:24:44.3 - Rogers **Altitude**: 89,800 **Duration**: 1:25
Mach/mph: 4.94/3310 **Distance**: 145.9 **Chase**: Rushworth/Dana/Sorlie
Mission: **096—**Takeoff was delayed when an O-ring on X-15 pilot's seat was damaged when entering the cockpit. Pilot input caused left roll at launch. Inertial system failed at launch.

Flight/Pilot: 1-A-66/Rushworth **Date**: Tue. 3 Dec. 1963
Remarks: X-15 radio malfunctioned.

Flight/Pilot: 1-42-67/Robert A. Rushworth (**17**) **B-52/Pilots**: 008/Bement & Jones
Date: Thu. 5 Dec. 1963 **Engine Run**: 81.2 **Takeoff**: 10:11
Launch: 11:04:36.0 - Delamar **Duration**: 574.0 **Landing**: 11:39
Landing: 11:14:10.0 - Rogers **Altitude**: 101,000 **Duration**: 1:28
Mach/mph: 6.06/4018 **Distance**: 233.7 **Chase**: Wood/Sorlie/Dana/Engle
Mission: **097—**First flight by Rushworth above Mach 6 in program. Highest Mach attained by Rushworth. First flight above Mach 6 for X-15 no. 1. Highest Mach achieved for the standard X-15 aircraft (Higher Mach attained with modified aircraft X-15A-2). Inner pane of right windshield cracked.

Flight/Pilot: 1-A-68/Rushworth **Date**: Wed. 18 Dec. 1963
Remarks: Camera system was incorrectly wired, which caused an abort.

Flight/Pilot: 1-43-69/Joe H. Engle (**3**) **B-52/Pilots**: 008/Fulton & Lewis
Date: Wed. 8 Jan. 1964 **Engine Run**: 76.6 **Takeoff**: 11:15
Launch: 12:10:31.0 - Mud **Duration**: 530.7 **Landing**: 12:44
Landing: 12:19:21.7 - Rogers **Altitude**: 139,900 **Duration**: 1:29
Mach/mph: 5.32/3616 **Distance**: 219.3 **Chase**: Rushworth/Dana/Wood/Sorlie
Mission: **098—**First flight past Mach 5 and above 100,000 feet for Engle in program. Evaluated high angle-of-attack stability without SAS. Inertial platform malfunctioned at peak altitude.

Flight/Pilot: 3-25-42/Milton O. Thompson (**3**) **B-52/Pilots**: 008/Fulton & Lewis
Date: Thu. 16 Jan. 1964 **Engine Run**: 84.2 **Takeoff**: 09:20
Launch: 10:03:30.0 - Hidden Hills **Duration**: 497.0 **Landing**: 10:30
Landing: 10:11:47.0 - Rogers **Altitude**: 71,000 **Duration**: 1:10
Mach/mph: 4.92/3242 **Distance**: 145.8 **Chase**: Gordon/Peterson/Crews
Mission: **099—**Heat transfer experiment with upper vertical razor leading edge. Evaluated stability and damper-off controllability. Speed brakes difficult to open during period of highest heat. Skids coated with cermet.

Flight/Pilot: 1-44-70/Robert A. Rushworth (**18**) **B-52/Pilots**: 008/Bement & Branch
Date: Tue. 28 Jan. 1964 **Engine Run**: 77.2 **Takeoff**: 11:14
Launch: 12:11:36.0 - Delamar **Duration**: 625.5 **Landing**: 12:55
Landing: 12:22:01.5 - Rogers **Altitude**: 107,400 **Duration**: 1:39
Mach/mph: 5.34/3618 **Distance**: 238.7 **Chase**: Engle/Dana/Crews/Wood
Mission: **100—**100th launch of the X-15 since the first flight on 8 Jun. 59. Edwards commander, General Branch, aboard B-52 as co-pilot. Evaluated stability and control using the upper speed brakes only in preparation for redesigned lower ventral to be used in scramjet program. SAS roll failed repeatedly.

Flight/Pilot: 3-26-43/Milton O. Thompson (**4**) **B-52/Pilots**: 003/Fulton & Jones
Date: Wed. 19 Feb. 1964 **Engine Run**: 83.3 **Takeoff**: 09:16
Launch: 09:57:24.0 - Hidden Hills **Duration**: 423.1 **Landing**: 10:55
Landing: 10:04:27.1 - Rogers **Altitude**: 78,600 **Duration**: 1:39
Mach/mph: 5.29/3519 **Distance**: 151.0 **Chase**: Rushworth/Peterson/Dana
Mission: **101—**First flight past Mach 5 for Thompson in program. Razor edge experiment and boundary layer noise experiment. Premature engine burnout due to a LOX line not being covered.

Flight/Pilot: 3-27-44/John B. McKay (**10**) **B-52/Pilots**: 003/Bement & Lewis
Date: Fri. 13 Mar. 1964 **Engine Run**: 105.2 **Takeoff**: 09:01
Launch: 09:46:27.0 - Hidden Hills **Duration**: 449.0 **Landing**: 10:13
Landing: 09:53:56.0 - Rogers **Altitude**: 76,000 **Duration**: 1:12
Mach/mph: 5.11/3392 **Distance**: 151.5 **Chase**: Rogers/Peterson/Engle
Mission: **102—**First flight for McKay in X-15 no. 3. Experiments with heat transfer, skin friction, and boundary layer noise. An on-board data recorder failed due to a switch being in the wrong position.

Flight/Pilot: 1-A-71/Rushworth **Date**: Tue. 17 Mar. 1964
Remarks: Computer malfunctioned.

Flight/Pilot: 1-45-72/Robert A. Rushworth (**19**) **B-52/Pilots**: 003/Bement & Lewis
Date: Fri. 27 Mar. 1964 **Engine Run**: 85.0 **Takeoff**: 09:16
Launch: 10:10:18.0 - Delamar **Duration**: 592.4 **Landing**: 11:30
Landing: 10:20:10.4 - Rogers **Altitude**: 101,500 **Duration**: 2:14
Mach/mph: 5.63/3827 **Distance**: 228.7 **Chase**: Gordon/Peterson/Adams/Engle
Mission: **103—**Induced-turbulence experiment tested.

Flight/Pilot: 3-A-45/McKay **Date**: Tue. 31 Mar. 1964
Remarks: Inertial guidance system failure.

Flight/Pilot: 1-46-73/Joe H. Engle (**4**) **B-52/Pilots**: 003/Bement & Fulton
Date: Wed. 8 Apr. 1964 **Engine Run**: 79.9 **Takeoff**: 09:10
Launch: 10:02:27.0 - Delamar **Duration**: 585.7 **Landing**: 10:38
Landing: 10:12:12.7 - Rogers **Altitude**: 175,000 **Duration**: 1:28
Mach/mph: 5.01/3468 **Distance**: 227.2 **Chase**: Gordon/Thompson/Crews/Rogers
Mission: **104—**Phase II optical degradation experiment tested. A small fire occurred in APU-2 due to overheating. A peroxide leak was suspected as the cause but never located in post-flight ground testing.

Flight/Pilot: 1-47-74/Robert A. Rushworth (**20**) **B-52/Pilots**: 003/Fulton & Bock
Date: Wed. 29 Apr. 1964 **Engine Run**: 82.3 **Takeoff**: 09:09
Launch: 10:00:27.0 - Delamar **Duration**: 574.6 **Landing**: 10:40
Landing: 10:10:01.6 - Rogers **Altitude**: 101,600 **Duration**: 1:31
Mach/mph: 5.72/3906 **Distance**: 233.7 **Chase**: Sorlie/Dana/Crews/Rogers
Mission: **105—**Phase II optical degradation experiment. Inner pane of right windshield shattered. Pilot reported smoke in cockpit. Flight attempt on previous day was canceled for weather before B-52 takeoff.

Flight/Pilot: 3-A-46/McKay **Date**: Mon. 11 May 1964
Remarks: LOX tank regulator over pressurized.

Flight/Pilot: 3-28-47/John B. McKay (**11**) **B-52/Pilots**: 003/Bement & Jones
Date: Tue. 12 May 1964 **Engine Run**: 108.6 **Takeoff**: 09:07
Launch: 09:51:46.0 - Hidden Hills **Duration**: 491.3 **Landing**: 10:40
Landing: 09:59:57.3 - Rogers **Altitude**: 72,800 **Duration**: 1:33
Mach/mph: 4.66/3084 **Distance**: 155.6 **Chase**: Sorlie/Peterson/Engle
Mission: **106—**No velocity, altitude, or rate-of-climb information was available to the pilot because of an inertial guidance computer failure. Pitch and roll channels of SAS tripped off and could not be reengaged. Speed brakes only opened to 30 percent during high heat.

Flight/Pilot: 1-48-75/Joe H. Engle (**5**) **B-52/Pilots**: 003/Fulton & Jones
Date: Tue. 19 May 1964 **Engine Run**: 78.7 **Takeoff**: 09:35
Launch: 10:26:28.0 - Delamar **Duration**: 541.2 **Landing**: 11:05
Landing: 10:35:29.2 - Rogers **Altitude**: 195,800 **Duration**: 1:30
Mach/mph: 5.02/3494 **Distance**: 221.6 **Chase**: Sorlie/Gordon/Dana/Daniel
Mission: **107—**Phase II optical degradation experiment. Altitude buildup flight. This aircraft was used as a static display during Armed Forces Day celebrations at Edwards.

Flight/Pilot: 3-29-48/Milton O. Thompson (**5**) **B-52/Pilots**: 003/Fulton & Jones
Date: Thu. 21 May 1964 **Engine Run**: 42.9 **Takeoff**: 08:58
Launch: 09:39:34.0 - Silver **Duration**: 476.5 **Landing**: 10:40
Landing: 09:47:30.5 - Cuddeback **Altitude**: 64,200 **Duration**: 1:42
Mach/mph: 2.90/1865 **Distance**: 87.0 **Chase**: Rushworth/Dana/Sorlie
Mission: **108—**Thompson's shortest flight. Engine shut down at 41 seconds and would not re-light in two attempts. Emergency landing with no damage. Defective fuel line switch caused engine shutdown.

Flight/Pilot: 1-A-76/Thompson **Date**: Thu. 11 Jun. 1964
Remarks: Radio, SAS, APU, and cabin pressurization problems.

Flight/Pilot: 2-C-53/Rushworth **Date**: Mon. 15 Jun. 1964
Remarks: Captive flight after aircraft refurbishment and modifications following flight **074**. First time airborne for X-15A-2. Cabin pressure and inertial system oscillation. SAS kept disengaging. Landing gear lanyard too long. (Landing gear problem surfaced again because lanyard was shortened too much.) Ram air door could not be closed in flight. Rushworth was unable to open cockpit after landing.

Flight/Pilot: 2-A-54/Rushworth **Date**: Tue. 23 Jun. 1964
Remarks: APU-2 shut down. Scheduled check of stability at low angles-of-attack.

Flight/Pilot: 2-32-55/Robert A. Rushworth (**21**) **B-52/Pilots**: 003/Fulton & Bement
Date: Thu. 25 Jun. 1964 **Engine Run**: 78.2 **Takeoff**: 08:50
Launch: 09:34:47.0 - Hidden Hills **Duration**: 534.7 **Landing**: 09:58
Landing: 09:43:41.7 - Rogers **Altitude**: 83,300 **Duration**: 1:08
Mach/mph: 4.59/3104 **Distance**: 159.9 **Chase**: Engle/Peterson/Rogers/Sorlie
Mission: **109—**First flight of aircraft no. 2 since 9 Nov. 62 rollover accident at Mud Dry Lake, which led to rebuild and upgrade to X-15A-2 configuration. First flight past Mach 4 for A-2. Right roll out of trim. Right horizontal stabilizer warped. This stabilizer was exchanged with the stabilizer on X-15 no. 3.

Flight/Pilot: 1-49-77/John B. McKay (**12**) **B-52/Pilots**: 003/Fulton & Lewis
Date: Tue. 30 Jun. 1964 **Engine Run**: 83.4 **Takeoff**: 08:59
Launch: 09:49:40.0 - Delamar **Duration**: 686.7 **Landing**: 10:27
Landing: 10:01:06.7 - Rogers **Altitude**: 99,600 **Duration**: 1:28
Mach/mph: 4.96/3334 **Distance**: 226.4 **Chase**: Engle/Peterson/Sorlie/Rogers
Mission: **110—**Stable platform power supply failed at launch so alternate profile was flown. Flight scheduled for 182,000 feet. McKay replaced Thompson, who was original pilot slated for this flight.

Flight/Pilot: 3-A-49/Engle **Date**: Thu. 2 Jul. 1964
Remarks: First attempted flight by Engle in X-15 no. 3. MH-96 malfunctioned.

Flight/Pilot: 3-30-50/Joe H. Engle (**6**) **B-52/Pilots**: 003/Bement & Lewis
Date: Wed. 8 Jul. 1964 **Engine Run**: 78.9 **Takeoff**: 11:59
Launch: 13:02:52.0 - Delamar **Duration**: 596.4 **Landing**: 13:45
Landing: 13:12:48.4 - Rogers **Altitude**: 170,400 **Duration**: 1:46
Mach/mph: 5.05/3520 **Distance**: 242.7 **Chase**: Sorlie/Dana/Smith/Rogers
Mission: **111—**First flight for Engle in X-15 no. 3. Flights suspended three weeks for rework required on ejection seat booms. Ablative test articles were installed on lower ventral and speed brakes. Aircraft used as static display on 2 and 3 Jun.

Flight/Pilot: 3-A-51/Engle **Date**: Tue. 28 Jul. 1964
Remarks: Cooling gas depleted.

Flight/Pilot: 3-31-52/Joe H. Engle (**7**) **B-52/Pilots**: 003/Bement & Fulton
Date: Wed. 29 Jul. 1964 **Engine Run**: 93.5 **Takeoff**: 11:12
Launch: 11:55:19.0 - Hidden Hills **Duration**: 469.0 **Landing**: 12:20
Landing: 12:03:08.0 - Rogers **Altitude**: 78,000 **Duration**: 1:08
Mach/mph: 5.38/3623 **Distance**: 151.6 **Chase**: Sorlie/McKay/Rogers
Mission: **112—**Evaluated heat transfer rates, measured airflow, and tested ablative samples.

Flight/Pilot: 3-32-53/Milton O. Thompson (**6**) **B-52/Pilots**: 003/Bement & Fulton
Date: Wed. 12 Aug. 1964 **Engine Run**: 82.0 **Takeoff**: 09:30
Launch: 10:12:33.2 - Hidden Hills **Duration**: 402.8 **Landing**: 10:35
Landing: 10:19:16.0 - Rogers **Altitude**: 81,200 **Duration**: 1:05
Mach/mph: 5.24/3535 **Distance**: 136.9 **Chase**: Rushworth/McKay/Sorlie
Mission: **113—**Experienced high vibrations with speed brakes at high aerodynamic pressures.

Flight/Pilot: 2-33-56/Robert A. Rushworth (**22**) **B-52/Pilots**: 003/Fulton & Bement
Date: Fri. 14 Aug. 1964 **Engine Run**: 80.9 **Takeoff**: 09:04
Launch: 09:54:19.0 - Delamar **Duration**: 726.3 **Landing**: 10:32
Landing: 10:06:25.3 - Rogers **Altitude**: 103,300 **Duration**: 1:28
Mach/mph: 5.23/3590 **Distance**: 227.4 **Chase**: Knight/Dana/Engle/Sorlie
Mission: **114—**First flight of A-2 past Mach 5. Nose gear extended after peak Mach at about Mach 4.2. Chase aircraft reported tires appeared badly burned, but Rushworth stayed with aircraft. Tires failed 300 feet after touchdown and remainder of the 5,630 foot rollout was on the rims.

Flight/Pilot: 3-33-54/John B. McKay (**13**) **B-52/Pilots**: 003/Fulton & Bement
Date: Wed. 26 Aug. 1964 **Engine Run**: 94.4 **Takeoff**: 10:00
Launch: 10:42:07.0 - Hidden Hills **Duration**: 439.7 **Landing**: 11:23
Landing: 10:49:26.7 - Rogers **Altitude**: 91,000 **Duration**: 1:23
Mach/mph: 5.65/3863 **Distance**: 157.5 **Chase**: Sorlie/Peterson/Knight
Mission: **115—**Highest Mach number attained by McKay in program. Heat transfer, skin friction, and boundary layer experiments.

Flight/Pilot: 3-34-55/Milton O. Thompson (**7**) **B-52/Pilots**: 003/Bement & Jones
Date: Thu. 3 Sep. 1964 **Engine Run**: 92.2 **Takeoff**: 09:10
Launch: 09:54:54.0 - Hidden Hills **Duration**: 378.1 **Landing**: 10:16
Landing: 10:01:12.1 - Rogers **Altitude**: 78,600 **Duration**: 1:06
Mach/mph: 5.35/3615 **Distance**: 140.9 **Chase**: Knight/Walker/Rogers
Mission: **116—**Evaluated heat transfer/turbulence over distorted panels. U-2 took off across X-15 approach.

Flight/Pilot: 3-A-56/Engle **Date**: Wed. 23 Sep. 1964
Remarks: Cabin pressure regulator failure. Scheduled ablator samples tests and boundary layer noise data.

Flight/Pilot: 3-35-57/Joe H. Engle (**8**) **B-52/Pilots**: 003/Fulton & Lewis
Date: Mon. 28 Sep. 1964 **Engine Run**: 82.6 **Takeoff**: 12:24
Launch: 13:16:00.0 - Delamar **Duration**: 574.3 **Landing**: 13:54
Landing: 13:25:34.3 - Rogers **Altitude**: 97,000 **Duration**: 1:30
Mach/mph: 5.59/3888 **Distance**: 230.3 **Chase**: Rogers/McKay/Parsons/Knight
Mission: **117—**Ablative sample tested. Warped right stabilizer found on X-15A-2 on flight **109** and was put on X-15 no. 3. Smoke in cockpit after burnout. Inertial velocity malfunction.

Flight/Pilot: 2-34-57/Robert A. Rushworth (**23**) **B-52/Pilots**: 008/Fulton & Townsend
Date: Tue. 29 Sep. 1964 **Engine Run**: 79.7 **Takeoff**: 12:10
Launch: 13:00:13.0 - Mud **Duration**: 591.0 **Landing**: 13:30
Landing: 13:10:04.0 - Rogers **Altitude**: 97,800 **Duration**: 1:20
Mach/mph: 5.20/3542 **Distance**: 210.3 **Chase**: Sorlie/Thompson/Parsons/Engle
Mission: **118—**Stability and control flight. First use of B-52 no. 008 in eight months and first with A-2. Nose gear scoop door came open at about Mach 4.5. Checkout of star tracker system

Flight/Pilot: 1-A-78/McKay **Date**: Fri. 2 Oct. 1964
Remarks: First flight of X-15 no. 1 since wing tip pods were modified to perform high altitude research. SAS problems.

Flight/Pilot: 1-50-79/John B. McKay (**14**) **B-52/Pilots**: 008/Fulton & Cotton
Date: Thu. 15 Oct. 1964 **Engine Run**: 72.9 **Takeoff**: 12:31
Launch: 13:15:40.0 - Hidden Hills **Duration**: 520.9 **Landing**: 13:50
Landing: 13:24:20.9 - Rogers **Altitude**: 84,900 **Duration**: 1:19
Mach/mph: 4.56/3048 **Distance**: 153.5 **Chase**: Rogers/Peterson/Knight50
Mission: **119—**Flight fifty for X-15 no. 1. First flight with 200-pound wing tip pods installed. Micrometeorite experiment opened while going transonic at High-Key point. Evaluated inertial guidance system that was to have been used in X-20 Dyna-Soar program and was later incorporated into X-15.

Flight/Pilot: 3-C-58/Thompson **Date**: Thu. 29 Oct. 1964
Remarks: Scheduled captive flight to verify nose gear modifications. Flight was flown late in the day and did not return until just before sunset at 4:53 p.m.

Flight/Pilot: 3-36-59/Milton O. Thompson (**8**) **B-52/Pilots**: 008/Bement & Lewis
Date: Fri. 30 Oct. 1964 **Engine Run**: 74.4 **Takeoff**: 09:12
Launch: 09:51:52.2 - Hidden Hills **Duration**: 430.8 **Landing**: 10:27
Landing: 09:59:03.0 - Rogers **Altitude**: 84,600 **Duration**: 1:15
Mach/mph: 4.66/3113 **Distance**: 142.1 **Chase**: Rushworth/Peterson/Engle
Mission: **120—**Evaluated nose gear modification. Evaluated center stick controller. Boundary layer noise and shear layer experiments. Fire warning light came on 54 seconds after engine shutdown.

Flight/Pilot: 2-C-58/McKay **Date**: Fri. 6 Nov. 1964
Remarks: Scheduled captive flight to check landing gear modification.

Flight/Pilot: 2-C-59/McKay **Date**: Mon. 16 Nov. 1964
Remarks: Scheduled captive flight to check landing gear modification.

Flight/Pilot: 2-35-60/John B. McKay (**15**) **B-52/Pilots**: 008/Bement & Bock
Date: Mon. 30 Nov. 1964 **Engine Run**: 75.3 **Takeoff**: 11:30
Launch: 12:09:32.0 - Hidden Hills **Duration**: 514.8 **Landing**: 12:42
Landing: 12:18:06.8 - Rogers **Altitude**: 87,200 **Duration**: 1:12
Mach/mph: 4.66/3089 **Distance**: 159.4 **Chase**: Sorlie/Mallick/Rogers/Knight/Twinting
Mission: **121—**First launch for McKay in X-15A-2. Same aircraft that rolled over on McKay when crash landing on flight **074**, 9 Nov. 62. Evaluated stability and control. Star tracker experiment. Landing gear checkout after cable pull was modified by shortening from 13.75 inches to 11 inches.

Flight/Pilot: 1-A-80/Engle **Date**: Fri. 4 Dec. 1964
Remarks: Fuel vent valve failure. Scheduled checks of X-20 guidance system and MIT Horizon Photometer.

Flight/Pilot: 3-37-60/Milton O. Thompson (**9**) **B-52/Pilots**: 008/Fulton & Lewis
Date: Wed. 9 Dec. 1964 **Engine Run**: 101.4 **Takeoff**: 09:56
Launch: 10:36:17.0 - Hidden Hills **Duration**: 385.7 **Landing**: 11:05
Landing: 10:42:42.7 - Rogers **Altitude**: 92,400 **Duration**: 1:09
Mach/mph: 5.42/3723 **Distance**: 142.1 **Chase**: Rushworth/Peterson/Sorlie/Twinting
Mission: **122—**Gathered data on skin friction, boundary layer noise, and ablatives.

Flight/Pilot: 1-51-81/Joe H. Engle (**9**) **B-52/Pilots**: 003/Fulton & Bock
Date: Thu. 10 Dec. 1964 **Engine Run**: 80.5 **Takeoff**: 10:02
Launch: 11:10:26.0 - Delamar **Duration**: 584.7 **Landing**: 11:48
Landing: 11:20:10.7 - Rogers **Altitude**: 113,200 **Duration**: 1:46
Mach/mph: 5.35/3675 **Distance**: 227.2 **Chase**: Sorlie/McKay/Parsons/Rogers
Mission: **123—**Evaluated X-20 guidance and dampers-off directional control. SAS pitch malfunction 10 seconds after launch. Unable to correct during flight. Air density experiments.

Flight/Pilot: 3-38-61/Robert A. Rushworth (**24**) **B-52/Pilots**: 003/Fulton & Bock
Date: Tue. 22 Dec. 1964 **Engine Run**: 88.0 **Takeoff**: 09:54
Launch: 10:44:52.0 - Hidden Hills **Duration**: 469.9 **Landing**: 11:08
Landing: 10:52:41.9 - Rogers **Altitude**: 81,200 **Duration**: 1:14
Mach/mph: 5.55/3593 **Distance**: 148.4 **Chase**: Twinting/Mallick/Knight
Mission: **124—**Rushworth experienced continual roll oscillations after launch. He stated that nothing on the flight appeared normal. Originally scheduled to land on runway 23 but was unavailable. Changing runways forced a high crosswind landing that nearly overloaded the landing struts. Ablative samples tested.

Flight/Pilot: 3-39-62/Milton O. Thompson (**10**) **B-52/Pilots**: 003/Bement & Fulton
Date: Wed. 13 Jan. 1965 **Engine Run**: 98.5 **Takeoff**: 10:03
Launch: 10:51:06.7 - Hidden Hills **Duration**: 407.6 **Landing**: 11:15
Landing: 10:57:54.3 - Rogers **Altitude**: 99,400 **Duration**: 1:12
Mach/mph: 5.48/3712 **Distance**: 147.7 **Chase**: Smith/Dana/Rushworth
Mission: **125—**Highest Mach number attained by Thompson in program. Gathered data on heat transfer, boundary layer noise, and skin friction. Roll damper malfunctioned during pull-up/roll maneuver.

Flight/Pilot: 1-A-82/McKay **Date**: Tue. 26 Jan. 1965
Remarks: Inertial system malfunctioned.

Flight/Pilot: 3-40-63/Joe H. Engle (**10**) **B-52/Pilots**: 008/Fulton & Bement
Date: Tue. 2 Feb. 1965 **Engine Run**: 81.4 **Takeoff**: 12:00
Launch: 12:50:14.6 - Delamar **Duration**: 598.3 **Landing**: 13:15
Landing: 13:00:12.9 - Rogers **Altitude**: 98,200 **Duration**: 1:15
Mach/mph: 5.71/3885 **Distance**: 230.6 **Chase**: Sorlie/Peterson/Stroface/Rushworth
Mission: **126—**Highest Mach attained by Engle in program. Evaluated ablative test samples. Boundary layer noise and skin friction experiments. MH-96 system fixed gain evaluation. Radar beacon did not function properly on outbound portion of flight. Reset and restarted 10 seconds to launch and worked properly

Flight/Pilot: 2-C-61/Rushworth **Date**: Mon. 15 Feb. 1965
Remarks: Scheduled captive flight to check out modifications to main landing gear. Supposed to photograph gear deployment but failed to get it, so a second flight was scheduled later that same day.

Flight/Pilot: 2-C-62/Rushworth **Date**: Mon. 15 Feb. 1965
Remarks: Scheduled captive flight to check out modifications to main landing gear. Photography successful on second attempt that day.

Flight/Pilot: 2-36-63/Robert A. Rushworth (**25**) **B-52/Pilots**: 008/Fulton & Bement
Date: Wed. 17 Feb. 1965 **Engine Run**: 79.8 **Takeoff**: 09:54
Launch: 10:44:59.6 - Mud **Duration**: 559.8 **Landing**: 11:15
Landing: 10:54:19.4 - Rogers **Altitude**: 95,100 **Duration**: 1:21
Mach/mph: 5.27/3511 **Distance**: 207.2 **Chase**: Sorlie/Dana/Thompson/Engle
Mission: **127—**Check out of the landing gear modifications and the star tracker experiment. Right main landing gear extended shortly after engine shutdown at approximately Mach 4.3 and 85,000 feet. Inertial altitude failure. Engine momentarily lost power at 23 seconds.

Flight/Pilot: 1-A-83/McKay **Date**: Fri. 19 Feb. 1965
Remarks: APU-2 malfunctioned. Scheduled to check out guidance system and BCS.

Flight/Pilot: 1-A-84/McKay **Date**: Thu. 25 Feb. 1965
Remarks: Weather abort.

Flight/Pilot: 1-52-85/John B. McKay (**16**) **B-52/Pilots**: 008/Fulton & Bock
Date: Fri. 26 Feb. 1965 **Engine Run**: 83.2 **Takeoff**: 10:57
Launch: 11:45:55.0 - Delamar **Duration**: 566.0 **Landing**: 12:16
Landing: 11:55:21.0 - Rogers **Altitude**: 153,600 **Duration**: 1:19
Mach/mph: 5.40/3750 **Distance**: 236.9 **Chase**: Knight/Peterson/Stroface/Engle
Mission: **128—**Evaluated guidance system and BCS. Computer malfunctioned. Air density and sky brightness.

Flight/Pilot: 1-53-86/Robert A. Rushworth (**26**) **B-52/Pilots**: 008/Fulton & Bock
Date: Fri. 26 Mar. 1965 **Engine Run**: 79.6 **Takeoff**: 10:16
Launch: 11:01:59.2 - Delamar **Duration**: 664.3 **Landing**: 11:44
Landing: 11:13:03.5 - Rogers **Altitude**: 101,900 **Duration**: 1:28
Mach/mph: 5.17/3580 **Distance**: 230.8 **Chase**: Engle/Dana/Gentry/Knight
Mission: **129—**Infrared scanner photography experiment and inertial guidance system checked out.

Flight/Pilot: 3-41-64/Joe H. Engle (**11**) **B-52/Pilots**: 008/Fulton & Cotton
Date: Fri. 23 Apr. 1965 **Engine Run**: 91.4 **Takeoff**: 09:04
Launch: 09:44:16.7 - Hidden Hills **Duration**: 462.1 **Landing**: 10:13
Landing: 09:51:58.8 - Rogers **Altitude**: 79,700 **Duration**: 1:09
Mach/mph: 5.48/3580 **Distance**: 148.7 **Chase**: Rushworth/McKay/Knight
Mission: **130—**Heat transfer and boundary layer noise experiments. Evaluated ablative test samples.

Flight/Pilot: 2-37-64/John B. McKay (**17**) **B-52/Pilots**: 008/Bock & Townsend
Date: Wed. 28 Apr. 1965 **Engine Run**: 78.9 **Takeoff**: 11:28
Launch: 12:26:20.9 - Hidden Hills **Duration**: 472.5 **Landing**: 12:45
Landing: 12:34:13.4 - Rogers **Altitude**: 92,600 **Duration**: 1:17
Mach/mph: 4.80/3273 **Distance**: 154.1 **Chase**: Sorlie/Thompson/Engle
Mission: **131**—Landing gear checked out, and stability and control evaluated. Inertial altitude rate failure.

Flight/Pilot: 1-A-87/Thompson **Date**: Tue. 11 May 1965
Remarks: SAS, APU, and cabin pressure problems. Scheduled use of MIT horizon scanner.

Flight/Pilot: 2-A-65/McKay **Date**: Thu. 13 May 1965
Remarks: Cabin could not be pressurized.

Flight/Pilot: 2-38-66/John B. McKay (**18**) **B-52/Pilots**: 008/Fulton & Jones
Date: Tue. 18 May 1965 **Engine Run**: 78.9 **Takeoff**: 09:06
Launch: 09:56:38.0 - Mud **Duration**: 582.0 **Landing**: 10:35
Landing: 10:06:20.0 - Rogers **Altitude**: 102,100 **Duration**: 1:29
Mach/mph: 5.17/3541 **Distance**: 215.9 **Chase**: Sorlie/Mallick/Gentry/Engle
Mission: **132—**Engine shut down during ignition idle. Reset and worked at launch. Landing gear modification checked out. Star tracker and stability and control experiments.

Flight/Pilot: 1-54-88/Milton O. Thompson (**11**) **B-52/Pilots**: 008/Fulton & Jones
Date: Tue. 25 May 1965 **Engine Run**: 81.1 **Takeoff**: 09:22
Launch: 10:12:07.5 - Mud **Duration**: 542.5 **Landing**: 10:35
Landing: 10:21:10.0 - Rogers **Altitude**: 179,800 **Duration**: 1:13
Mach/mph: 4.87/3418 **Distance**: 211.9 **Chase**: Rushworth/Peterson/Stroface/Knight
Mission: **133—**First flight by Thompson above 100,000 feet in program. MIT scanner experiment. Originally scheduled for launch at Delamar, but weather conditions deteriorated and forced a change to Mud.

Flight/Pilot: 3-42-65/Joe H. Engle (**12**) **B-52/Pilots**: 008/Fulton & Jones
Date: Fri. 28 May 1965 **Engine Run**: 82.5 **Takeoff**: 08:56
Launch: 09:43:51.0 - Delamar **Duration**: 575.4 **Landing**: 10:24
Landing: 09:53:26.4 - Rogers **Altitude**: 209,600 **Duration**: 1:28
Mach/mph: 5.17/3754 **Distance**: 243.4 **Chase**: Sorlie/Haise/Parsons/Knight
Mission: **134—**First flight by Engle above 200,000 feet in program. Langley's Horizon Scanner mounted above engine exhaust on upper ventral. Northrop Space Lab Radiometer, boundary layer noise experiments.

Flight/Pilot: 2-A-67/McKay **Date**: Fri. 4 Jun. 1965
Remarks: Cabin pressure regulator failure. Scheduled star tracker checkout.

Flight/Pilot: 2-A-68/McKay **Date**: Tue. 8 Jun. 1965
Remarks: Helium source pressure lost.

Flight/Pilot: 2-A-69/McKay **Date**: Fri. 11 Jun. 1965
Remarks: Helium source pressure lost.

Flight/Pilot: 3-43-66/Joe H. Engle (**13**) **B-52/Pilots**: 003/Fulton & Cretney
Date: Wed. 16 Jun. 1965 **Engine Run**: 77.8 **Takeoff**: 09:38
Launch: 10:26:33.0 - Delamar **Duration**: 586.4 **Landing**: 11:00
Landing: 10:36:19.4 - Rogers **Altitude**: 244,700 **Duration**: 1:22
Mach/mph: 4.69/3404 **Distance**: 232.1 **Chase**: Wood/Mallick/Sorlie/Twinting
Mission: **135—**Measured ultraviolet radiation with tail mounted scanner. Boundary layer noise experiment. APU-2 shut down after initial start, but restart was successful.

Flight/Pilot: 1-55-89/Milton O. Thompson (**12**) **B-52/Pilots**: 008/Fulton & Cotton
Date: Thu. 17 Jun. 1965 **Engine Run**: 82.2 **Takeoff**: 08:56
Launch: 09:40:31.2 - Delamar **Duration**: 534.0 **Landing**: 10:23
Landing: 09:49:25.2 - Rogers **Altitude**: 108,500 **Duration**: 1:27
Mach/mph: 5.14/3541 **Distance**: 218.2 **Chase**: Twinting/McKay/Stroface/Engle
Mission: **136—**Infrared scanner and reflected solar radiation experiment. Two SAS pitch and roll failures prior to launch. Able to reset, but went out again at launch. Used Alternate SAS during flight.

Flight/Pilot: 2-39-70/John B. McKay (**19**) **B-52/Pilots**: 008/Fulton & Bock
Date: Tue. 22 Jun. 1965 **Engine Run**: 85.3 **Takeoff**: 08:58
Launch: 09:44:43.9 - Delamar **Duration**: 587.7 **Landing**: 10:15
Landing: 09:54:31.6 - Rogers **Altitude**: 155,900 **Duration**: 1:17
Mach/mph: 5.64/3938 **Distance**: 245.0 **Chase**: Rushworth/Peterson/Gentry/Knight
Mission: **137—**Evaluated star tracker and landing gear. Originally scheduled for Mud launch but had to be changed to Delamar due to thunderstorms.

Flight/Pilot: 3-44-67/Joe H. Engle (**14**) **B-52/Pilots**: 008/Fulton & Andonian
Date: Tue. 29 Jun. 1965 **Engine Run**: 81.0 **Takeoff**: 09:37
Launch: 10:21:17.6 - Delamar **Duration**: 632.5 **Landing**: 11:05
Landing: 10:31:50.1 - Rogers **Altitude**: 280,600 **Duration**: 1:28
Mach/mph: 4.94/3432 **Distance**: 239.2 **Chase**: Wood/McKay/Gentry/Parsons
Mission: **138—**Highest altitude attained by Engle in program. Fourth X-15 pilot to attain astronaut rating. Boundary layer noise, horizon scanner, and radiometer experiments. Reentry techniques evaluated.

Flight/Pilot: 2-A-71/McKay **Date**: Fri. 2 Jul. 1965
Remarks: Inertial platform malfunctioned.

Flight/Pilot: 2-40-72/John B. McKay (**20**) **B-52/Pilots**: 003/Fulton & Cotton
Date: Thu. 8 Jul. 1965 **Engine Run**: 82.9 **Takeoff**: 08:29
Launch: 09:16:55.8 - Delamar **Duration**: 573.4 **Landing**: 09:50
Landing: 09:26:29.2 - Rogers **Altitude**: 212,600 **Duration**: 1:21
Mach/mph: 5.19/3659 **Distance**: 245.5 **Chase**: Adams/Peterson/Gentry/Knight
Mission: **139—**First flight for McKay above 200,000 feet in program. RAS failed to operate. Evaluated landing dynamics. Star Tracker experiment worked but no data was taken due to excessive roll and yaw.

Flight/Pilot: 3-A-68/Rushworth **Date**: Tue. 13 Jul. 1965
Remarks: Cabin pressure regulator malfunctioned. Scheduled boundary layer noise experiment.

Flight/Pilot: 3-45-69/Robert A. Rushworth (**27**) **B-52/Pilots**: 008/Jones & Andonian
Date: Wed. 20 Jul. 1965 **Engine Run**: 79.2 **Takeoff**: 09:08
Launch: 09:59:28.8 - Delamar **Duration**: 634.5 **Landing**: 10:38
Landing: 10:10:03.3 - Rogers **Altitude**: 105,400 **Duration**: 1:30
Mach/mph: 5.40/3760 **Distance**: 236.4 **Chase**: Knight/Dana/Whelan/Gentry
Mission: **140—**Boundary layer noise experiment. Experiments in tail cone removed prior to flight. APU-1 helium fill valve was knocked off by pilot during cockpit entry. Valve was replaced and flight went ahead.

Flight/Pilot: 1-A-90/Thompson **Date**: Fri. 23 Jul. 1965
Remarks: Pressure suit face plate leaked, causing a pipe organ sound to the pilot. Infrared experiment.

Flight/Pilot: 1-A-91/Thompson **Date**: Tue. 27 Jul. 1965
Remarks: Radio malfunctioned. X-15 could not receive uprange stations.

Flight/Pilot: 1-A-92/Thompson **Date**: Wed. 28 Jul. 1965
Remarks: Q-ball nose beta mechanism was wired in reverse causing the system to malfunction.

Flight/Pilot:	2-41-73/Robert A. Rushworth (**28**)			**B-52/Pilots**:	008/Bock & Andonian
Date:	Tue. 3 Aug. 1965	**Engine Run**:	82.4	**Takeoff**:	11:51
Launch:	12:40:05.7 - Delamar	**Duration**:	572.0	**Landing**:	13:05
Landing:	12:49:37.7 - Rogers	**Altitude**:	208,700	**Duration**:	1:14
Mach/mph:	5.16/3602	**Distance**:	249.2	**Chase**:	Sorlie/Dana/Whelan/Stroface

Mission: **141—**Evaluated BCS stability in relation to the star tracker experiment. Rushworth's farthest flight. Farthest flight for A-2. Right roll out of trim.

Flight/Pilot:	1-56-93/Milton O. Thompson (**13**)			**B-52/Pilots**:	008/Fulton & Andonian
Date:	Fri. 6 Aug. 1965	**Engine Run**:	83.0	**Takeoff**:	08:51
Launch:	09:41:46.7 - Delamar	**Duration**:	613.0	**Landing**:	10:36
Landing:	09:51:59.7 - Rogers	**Altitude**:	103,200	**Duration**:	1:45
Mach/mph:	5.15/3534	**Distance**:	235.6	**Chase**:	Rushworth/Haise/Livingston/Engle

Mission: **142—**Stability and control tests. SAS wiring was completely replaced prior to flight. Q-ball system replaced because unit was required on A-2, and another unit was unavailable. Space Lab Infrared Scanner experiment. Engine cockpit timer failed to operate after launch.

Flight/Pilot:	3-46-70/Joe H. Engle (**15**)			**B-52/Pilots**:	003/Jones & Andonian
Date:	Tue. 10 Aug. 1965	**Engine Run**:	82.1	**Takeoff**:	10:28
Launch:	11:24:21.7 - Delamar	**Duration**:	591.8	**Landing**:	11:51
Landing:	11:34:13.5 - Rogers	**Altitude**:	271,000	**Duration**:	1:23
Mach/mph:	5.20/3550	**Distance**:	246.9	**Chase**:	Sorlie/Dana/Gentry/Stroface

Mission: **143—**Reentry techniques evaluated. Yaw damper kept disengaging. Had to be reset twenty times throughout flight. Boundary layer noise and infrared horizon scanner experiments. Engle's farthest flight.

Flight/Pilot: 1-A-94/Thompson **Date**: Fri. 20 Aug. 1965
Remarks: Cabin pressure regulator failure.

Flight/Pilot: 1-A-95/Thompson **Date**: Tue. 24 Aug. 1965
Remarks: Inertial system abort.

Flight/Pilot:	1-57-96/Milton O. Thompson (**14**)			**B-52/Pilots**:	003/Fulton & Cotton
Date:	Wed. 25 Aug. 1965	**Engine Run**:	84.5	**Takeoff**:	09:05
Launch:	09:54:46.8 - Delamar	**Duration**:	531.5	**Landing**:	10:38
Landing:	10:03:38.3 - Rogers	**Altitude**:	214,100	**Duration**:	1:33
Mach/mph:	5.11/3604	**Distance**:	237.1	**Chase**:	Rushworth/McKay/Merrett/Parsons

Mission: **144—**First flight by Thompson above 200,000 feet in program, as well as highest altitude and farthest flight. Thompson's final flight in the X-15 program. Horizon scanner experiment. Poor pitch control during landing due to position of center of gravity.

Flight/Pilot:	3-47-71/Robert A. Rushworth (**29**)			**B-52/Pilots**:	008/Cotton & Bock
Date:	Thu. 26 Aug. 1965	**Engine Run**:	78.6	**Takeoff**:	09:01
Launch:	09:52:12.1 - Delamar	**Duration**:	627.6	**Landing**:	10:30
Landing:	10:02:39.7 - Rogers	**Altitude**:	239,600	**Duration**:	1:29
Mach/mph:	4.79/3372	**Distance**:	230.0	**Chase**:	Sorlie/Haise/Livingston/Parsons

Mission: **145—**Boundary layer noise and radiometer experiments. Flight slipped due to wet lakebeds, then slipped again due to conflict with flight **144**.

Flight/Pilot: 2-42-74/John B. McKay (**21**) **B-52/Pilots**: 008/Bock & Jones
Date: Thu. 2 Sep. 1965 **Engine Run**: 84.0 **Takeoff**: 08:52
Launch: 09:40:05.6 - Delamar **Duration**: 549.8 **Landing**: 10:15
Landing: 09:49:15.4 - Rogers **Altitude**: 239,800 **Duration**: 1:23
Mach/mph: 5.16/3570 **Distance**: 242.4 **Chase**: Rushworth/Peterson/Stroface/Knight
Mission: **146—**Prior to flight the basic structure of the X-15 was x-rayed by the US Air Force. No defects were noted. Star tracker experiment and landing dynamics data.

Flight/Pilot: 1-58-97/Robert A. Rushworth (**30**) **B-52/Pilots**: 008/Bock & Fulton
Date: Thu. 9 Sep. 1965 **Engine Run**: 82.1 **Takeoff**: 09:10
Launch: 09:55:50.7 - Delamar **Duration**: 670.2 **Landing**: 10:40
Landing: 10:07:00.9 - Rogers **Altitude**: 97,200 **Duration**: 1:30
Mach/mph: 5.25/3534 **Distance**: 234.0 **Chase**: Wood/Peterson/Livingston/Parsons
Mission: **147—**Evaluation of ablative on lower fixed ventral and speed brakes. MIT Infrared Horizon Scanner experiment. Unexplained periodic pitch motion reported by pilot during flight.

Flight/Pilot: 3-48-72/John B. McKay (**22**) **B-52/Pilots**: 008/Bock & Jones
Date: Tue. 14 Sep. 1965 **Engine Run**: 80.9 **Takeoff**: 09:12
Launch: 10:01:06.0 - Delamar **Duration**: 598.1 **Landing**: 10:39
Landing: 10:11:04.1 - Rogers **Altitude**: 239,000 **Duration**: 1:27
Mach/mph: 5.03/3519 **Distance**: 239.2 **Chase**: Rushworth/Haise/Evenson/Knight
Mission: **148—**Boundary layer and infrared scanner experiments. Faulty pitch trim motor filter caused bad data on MH-96 system and SAS servos.

Flight/Pilot: 1-59-98/Robert A. Rushworth (**31**) **B-52/Pilots**: 003/Bock & Jones
Date: Tue. 22 Sep. 1965 **Engine Run**: 82.0 **Takeoff**: 10:07
Launch: 10:58:39.7 - Delamar **Duration**: 653.9 **Landing**: 11:38
Landing: 11:09:33.6 - Rogers **Altitude**: 100,300 **Duration**: 1:31
Mach/mph: 5.18/3550 **Distance**: 232.7 **Chase**: Sorlie/Dana/Adams/Engle
Mission: **149—**Infrared scanner experiment. LOX tank venting caused pitch down after burnout first noted on flight **147**.

Flight/Pilot: 3-49-73/John B. McKay (**23**) **B-52/Pilots**: 003/Bock & Andonian
Date: Tue. 28 Sep. 1965 **Engine Run**: 80.8 **Takeoff**: 09:24
Launch: 10:07:37.6 - Delamar **Duration**: 716.6 **Landing**: 10:42
Landing: 10:19:34.2 - Rogers **Altitude**: 295,600 **Duration**: 1:18
Mach/mph: 5.33/3732 **Distance**: 290.5 **Chase**: Rushworth/Peterson/Haise/Engle
Mission: **150—**McKay becomes fifth X-15 pilot to achieve astronaut qualification. Highest altitude and farthest flight attained by McKay in program. Boundary layer noise and infrared scanner experiments.

Flight/Pilot: 1-60-99/William J. Knight (**1**) **B-52/Pilots**: 003/Bock & Fulton
Date: Thu. 30 Sep. 1965 **Engine Run**: 127.4 **Takeoff**: 08:55
Launch: 09:43:55.3 - Hidden Hills **Duration**: 502.6 **Landing**: 10:10
Landing: 09:52:17.9 - Rogers **Altitude**: 76,600 **Duration**: 1:15
Mach/mph: 4.06/2718 **Distance**: 143.7 **Chase**: Sorlie/Peterson/Engle
Mission: **151—**First flight for Knight in program and first past Mach 4. Infrared scanner experiment.

Flight/Pilot: 1-A-100/Engle **Date**: Fri. 8 Oct. 1965
Remarks: BCS leak. 100th time X-15 no. 1 carried aloft. Only X-15 to achieve 100 times aloft.

Flight/Pilot: 3-50-74/William J. Knight (**2**) **B-52/Pilots**: 008/Jones & Fulton
Date: Tue. 12 Oct. 1965 **Engine Run**: 86.2 **Takeoff**: 09:02
Launch: 09:43:13.2 - Hidden Hills **Duration**: 427.8 **Landing**: 10:22
Landing: 09:50:21.0 - Rogers **Altitude**: 94,400 **Duration**: 1:20
Mach/mph: 4.62/3108 **Distance**: 140.7 **Chase**: Sorlie/Haise/Engle
Mission: **152—**First flight for Knight in X-15 no. 3. Launch number 50 for aircraft no. 3. Shortest flight by Knight. APU-2 shutdown after launch and was reset ninety seconds after burnout.

Flight/Pilot: 1-61-101/Joe H. Engle (**16**) **B-52/Pilots**: 003/Bock & Jones
Date: Thu. 14 Oct. 1965 **Engine Run**: 84.8 **Takeoff**: 11:54
Launch: 12:46:32.6 - Delamar **Duration**: 558.4 **Landing**: 13:26
Landing: 12:55:51.0 - Rogers **Altitude**: 266,500 **Duration**: 1:32
Mach/mph: 5.08/3554 **Distance**: 237.4 **Chase**: Sorlie/McKay/Parsons/Knight
Mission: **153—**Final flight in program for Engle. MIT Horizon Photometer experiment and Pace transducer tests. Data timer failure. Yaw damper tripped out twice and was reset successfully.

Flight/Pilot: 3-51-75/John B. McKay (**24**) **B-52/Pilots**: 003/Fulton & Jones
Date: Wed. 27 Oct. 1965 **Engine Run**: 75.6 **Takeoff**: 09:56
Launch: 10:49:10.3 - Delamar **Duration**: 713.7 **Landing**: 11:20
Landing: 11:01:04.0 - Rogers **Altitude**: 236,900 **Duration**: 1:24
Mach/mph: 5.06/3519 **Distance**: 276.3 **Chase**: Sorlie/Peterson/Stroface/Engle
Mission: **154—**Boundary layer noise, infrared scanner, and horizontal stabilizer loads experiments.

Flight/Pilot: 1-A-102/Dana **Date**: Tue. 2 Nov. 1965
Remarks: Cabin pressure regulator malfunctioned and lost telemetry. First attempted launch for Dana.

Flight/Pilot: 2-43-75/Robert A. Rushworth (**32**) **B-52/Pilots**: 003/Bock & Doryland
Date: Wed. 3 Nov. 1965 **Engine Run**: 84.1 **Takeoff**: 08:26
Launch: 09:09:10.7 - Cuddeback **Duration**: 301.6 **Landing**: 09:33
Landing: 09:14:12.3 - Rogers **Altitude**: 70,600 **Duration**: 1:07
Mach/mph: 2.31/1500 **Distance**: 54.4 **Chase**: Knight/Haise/Engle
Mission: **155—**First time A-2 is configured with external tanks for flight (tanks were empty). Tanks separated properly. Ammonia tank landed intact, but LOX tank was destroyed on impact when parachute failed. Only external tank not recovered intact. Lower ventral installed for flight but lost when parachute failed to deploy. First use of lower ventral since flight **070**. First and only flight that launched from Cuddeback.

Flight/Pilot: 1-62-103/William H. Dana (**1**) **B-52/Pilots**: 008/Bock & Doryland
Date: Thu. 4 Nov. 1965 **Engine Run**: 124.2 **Takeoff**: 08:27
Launch: 09:11:31.0 - Hidden Hills **Duration**: 525.1 **Landing**: 09:40
Landing: 09:20:16.1 - Rogers **Altitude**: 80,200 **Duration**: 1:13
Mach/mph: 4.22/2765 **Distance**: 141.8 **Chase**: Sorlie/Peterson/Knight
Mission: **156—**First flight for Dana in program and first past Mach 4. Engine took three attempts and nearly 25 seconds before ignition. Weather problems put the next attempted flight off for more than five months. The next successful launch did not occur for six months and two days.

Flight/Pilot: 2-A-76/Rushworth **Date**: Wed. 13 Apr. 1966
Remarks: Inertial system failed prior to launch.

Flight/Pilot: 2-A-77/Rushworth **Date**: Wed. 20 Apr. 1966
Remarks: Yaw channel of SAS failed to engage after APU start.

Flight/Pilot: 2-A-78/Rushworth **Date**: Thu. 5 May 1966
Remarks: Yaw channel of SAS failed to engage after APU start.

Flight/Pilot: 1-63-104/John B. McKay (**25**) **B-52/Pilots**: 003/Fulton & Doryland
Date: Fri. 6 May 1966 **Engine Run**: 35.4 **Takeoff**: 12:34
Launch: 13:30:12.8 - Delamar **Duration**: 362.7 **Landing**: 14:22
Landing: 13:36:15.5 - Delamar **Altitude**: 68,400 **Duration**: 1:48
Mach/mph: 2.21/1434 **Distance**: 62.2 **Chase**: Knight/Curtis/Peterson/Gentry/Stroface
Mission: **157—**Premature engine shutdown at 35 seconds. Ruptured turbo pump case. Window shade test flown over left window. Canopy damaged after ejection on landing. Aircraft went off lakebed before coming to a stop, but there was no damage to the airframe except for the canopy.

Flight/Pilot: 2-44-79/Robert A. Rushworth (**33**) **B-52/Pilots**: 003/Fulton & Doryland
Date: Wed. 18 May 1966 **Engine Run**: 81.9 **Takeoff**: 09:33
Launch: 10:24:00.3 - Mud **Duration**: 536.8 **Landing**: 11:00
Landing: 10:32:57.1 - Rogers **Altitude**: 99,000 **Duration**: 1:27
Mach/mph: 5.43/3689 **Distance**: 211.7 **Chase**: Sorlie/Dana/Peterson/Gentry
Mission: **158—**Ablative test on nose gear door, horizontal stabilizer, and lower fixed ventral. Fuel leak through jettison tube caused premature burnout of the engine, although planned Mach number was reached.

Flight/Pilot: 1-A-105/McKay **Date**: Thu. 2 Jun. 1966
Remarks: Inertial system malfunctioned. Six days after this flight, on 8 June, former X-15 pilot Joseph A. Walker was killed in a mid-air collision between his F-104A and XB-70A no. 2.

Flight/Pilot: 1-A-106/McKay **Date**: Fri. 10 Jun. 1966
Remarks: Inertial system malfunctioned.

Flight/Pilot: 3-A-76/Dana **Date**: Mon. 20 Jun. 1966
Remarks: Inertial system malfunctioned.

Flight/Pilot: 2-C-80/Rushworth **Date**: Mon. 27 Jun. 1966
Remarks: Scheduled captive flight to check out the fully-loaded external fuel tanks.

Flight/Pilot: 2-45-81/Robert A. Rushworth (**34**) **B-52/Pilots**: 008/Fulton & Doryland
Date: Fri. 1 Jul. 1966 **Engine Run**: 33.2 **Takeoff**: 10:12
Launch: 11:02:36.1 - Mud **Duration**: 268.6 **Landing**: 11:55
Landing: 11:07:04.7 - Mud **Altitude**: 44,800 **Duration**: 1:43
Mach/mph: 1.70/1061 **Distance**: 35.2 **Chase**: Knight/Peterson/Curtis/Sorlie
Mission: **159—**First flight with full external fuel tanks. Telemetry indicated no fuel flow from external tanks after launch. Bad indicator was at fault. Tanks separated under worst conditions (half full) but there were no problems and the tanks were recovered intact. The tank parachutes failed to separate on touchdown, dragging the tanks across the ground. Shortest and last flight for Rushworth in program. On return of the X-15 from Mud lake on 6 July the wingtip was clipped by a camper truck as the truck passed the convoy on the highway. Truck owner attempted to sue for damages but was unsuccessful.

Flight/Pilot: 1-64-107/William J. Knight (**3**) **B-52/Pilots**: 003/Fulton & Bowline
Date: Tue. 12 Jul. 1966 **Engine Run**: 83.2 **Takeoff**: 10:44
Launch: 11:32:15.7 - Mud **Duration**: 516.0 **Landing**: 12:25
Landing: 11:40:51.7 - Rogers **Altitude**: 130,000 **Duration**: 1:41
Mach/mph: 5.34/3652 **Distance**: 209.8 **Chase**: Curtis/Dana/Hoag/Gentry
Mission: **160—**First flight for Knight past Mach 5 and above 100,000 feet. Landing was shorter than normal. Nose strut was bent on landing.

Flight/Pilot: 3-A-77/Dana **Date**: Wed. 13 Jul. 1966
Remarks: Inertial system malfunctioned.

Flight/Pilot: 3-52-78/William H. Dana (**2**) **B-52/Pilots**: 003/Fulton & Doryland
Date: Mon. 18 Jul. 1966 **Engine Run**: 95.5 **Takeoff**: 10:52
Launch: 11:38:24.1 - Hidden Hills **Duration**: 450.6 **Landing**: 12:15
Landing: 11:45:54.7 - Rogers **Altitude**: 96,100 **Duration**: 1:23
Mach/mph: 4.71/3217 **Distance**: 146.1 **Chase**: Curtis/Manke/Gentry
Mission: **161—**First flight for Dana in X-15 no. 3. First flight with new Lear Cockpit Display (energy management system). First flight with third skid installed on lower ventral.

Flight/Pilot: 2-A-82/Knight **Date**: Wed. 20 Jul. 1966
Remarks: Weather abort.

Flight/Pilot: 2-46-83/William J. Knight (**4**) **B-52/Pilots**: 003/Doryland & Bowline
Date: Thu. 21 Jul. 1966 **Engine Run**: 81.3 **Takeoff**: 11:09
Launch: 12:02:03.1 - Delamar **Duration**: 531.0 **Landing**: 12:30
Landing: 12:10:54.1 - Rogers **Altitude**: 192,300 **Duration**: 1:21
Mach/mph: 5.12/3568 **Distance**: 231.9 **Chase**: Curtis/Manke/Sorlie/Gentry/Peterson
Mission: **162—**First flight for Knight in X-15A-2. Right roll was out of trim. Star tracker experiment.

Flight/Pilot: 1-65-108/John B. McKay (**26**) **B-52/Pilots**: 008/Fulton & Bowline
Date: Thu. 28 Jul. 1966 **Engine Run**: 85.4 **Takeoff**: 09:08
Launch: 10:01:12.1 - Delamar **Duration**: 583.0 **Landing**: 11:05
Landing: 10:10:55.1 - Rogers **Altitude**: 241,800 **Duration**: 1:57
Mach/mph: 5.19/3702 **Distance**: 253.4 **Chase**: Curtis/Peterson/Sorlie/Gentry
Mission: **163—**Computer malfunctioned due to electrical transients on alternator-2. Precise launch schedule was maintained to simulate WTR missile tracking with experiment on later flights.

Flight/Pilot: 2-47-84/William J. Knight (**5**) **B-52/Pilots**: 008/Doryland & Bowline
Date: Wed. 3 Aug. 1966 **Engine Run**: 81.8 **Takeoff**: 07:54
Launch: 08:45:26.3 - Delamar **Duration**: 545.5 **Landing**: 09:24
Landing: 08:54:31.8 - Rogers **Altitude**: 249,000 **Duration**: 1:30
Mach/mph: 5.03/3440 **Distance**: 231.1 **Chase**: Curtis/Manke/Parsons/Sorlie
Mission: **164—**First flight for Knight above 200,000 feet in program. Inertial altitude incorrect throughout flight. Star tracker experiment. Engine thrust misalignment.

Flight/Pilot: 3-53-79/William H. Dana (**3**) **B-52/Pilots**: 008/Doryland & Bowline
Date: Thu. 4 Aug. 1966 **Engine Run**: 78.9 **Takeoff**: 09:06
Launch: 09:54:43.7 - Mud **Duration**: 508.0 **Landing**: 10:45
Landing: 10:03:11.7 - Rogers **Altitude**: 132,700 **Duration**: 1:39
Mach/mph: 5.34/3693 **Distance**: 212.4 **Chase**: Curtis/Manke/Parsons/Gentry
Mission: **165—**First flight for Dana above 100,000 feet and Mach 5. Boundary layer noise experiment. Tail loads data. Bug eye camera installed to monitor third skid on lower ventral.

Flight/Pilot: 1-A-109/McKay **Date**: Tue. 9 Aug. 1966
Remarks: Inertial system malfunctioned and BCS valve leaked.

Flight/Pilot: 1-A-110/McKay **Date**: Wed. 10 Aug. 1966
Remarks: No helicopter was available at launch lake to support operations.

Flight/Pilot: 1-66-111/John B. McKay (**27**) **B-52/Pilots**: 003/Doryland & Bowline
Date: Thu. 11 Aug. 1966 **Engine Run**: 84.8 **Takeoff**: 08:53
Launch: 09:44:13.1 - Delamar **Duration**: 562.2 **Landing**: 10:19
Landing: 09:53:35.3 - Rogers **Altitude**: 251,000 **Duration**: 1:26
Mach/mph: 5.21/3590 **Distance**: 239.5 **Chase**: Sorlie/Manke/Evenson/Gentry
Mission: **166—**Highest dynamic pressure (2,050 psf) attained in program. Electrical power transients caused intermittent SAS. High crosswind caused the aircraft to swing sharply to the left on landing.

Flight/Pilot: 2-48-85/William J. Knight (**6**) **B-52/Pilots**: 003/Doryland & Bowline
Date: Fri. 12 Aug. 1966 **Engine Run**: 81.7 **Takeoff**: 09:38
Launch: 10:25:33.0 - Delamar **Duration**: 519.4 **Landing**: 11:04
Landing: 10:34:12.4 - Rogers **Altitude**: 231,100 **Duration**: 1:26
Mach/mph: 5.02/3472 **Distance**: 231.4 **Chase**: Sorlie/Mallick/Smith/Adams
Mission: **167—**Star tracker experiment. Engine thrust misalignment.

Flight/Pilot: 3-54-80/William H. Dana (**4**) **B-52/Pilots**: 003/Fulton & Bowline
Date: Fri. 19 Aug. 1966 **Engine Run**: 75.8 **Takeoff**: 09:03
Launch: 10:04:35.7 - Delamar **Duration**: 573.1 **Landing**: 10:45
Landing: 10:14:08.8 - Rogers **Altitude**: 178,000 **Duration**: 1:42
Mach/mph: 5.20/3607 **Distance**: 241.6 **Chase**: Sorlie/Manke/Smith/Adams
Mission: **168—**Altitude buildup flight for pilot. Boundary layer noise experiment.

Flight/Pilot: 1-67-112/John B. McKay (**28**) **B-52/Pilots**: 003/Doryland & Bowline
Date: Thu. 25 Aug. 1966 **Engine Run**: 83.4 **Takeoff**: 08:58
Launch: 09:49:11.2 - Delamar **Duration**: 616.2 **Landing**: 10:35
Landing: 09:59:27.4 - Rogers **Altitude**: 257,500 **Duration**: 1:37
Mach/mph: 5.11/3543 **Distance**: 253.4 **Chase**: Adams/Manke/Smith/Knight
Mission: **169—**Telemetry lost five minutes after launch. After this flight the wing tip pods were removed from X-15 no. 1 until late in the program, after the loss of X-15 no. 3 on flight **191**. Cockpit system displays degraded during reentry at 80,000 feet through landing due to a computer program malfunction.

Flight/Pilot: 2-49-86/William J. Knight (**7**) **B-52/Pilots**: 008/Doryland & Cotton
Date: Tue. 30 Aug. 1966 **Engine Run**: 80.5 **Takeoff**: 09:02
Launch: 09:51:37.2 - Mud **Duration**: 529.9 **Landing**: 10:30
Landing: 10:00:27.1 - Rogers **Altitude**: 102,200 **Duration**: 1:28
Mach/mph: 5.21/3543 **Distance**: 209.3 **Chase**: Curtis/Manke/Hover/Stroface
Mission: **170—**First flight with the Maurer camera system. Ventral parachute deployed prior to jettison and ventral was severely damaged after jettison and subsequent impact.

Flight/Pilot: 1-68-113/John B. McKay (**29**) **B-52/Pilots**: 008/Doryland & Cotton
Date: Thu. 8 Sep. 1966 **Engine Run**: 45.5 **Takeoff**: 09:40
Launch: 10:39:16.8 - Smith Ranch **Duration**: 384.5 **Landing**: 11:40
Landing: 10:45:41.3 - Smith Ranch **Altitude**: 73,200 **Duration**: 2:00
Mach/mph: 2.44/1602 **Distance**: 67.5 **Chase**: Curtis/Manke/Stroface/Gentry
Mission: **171—**First flight launched from Smith Ranch Dry Lake for X-15 no. 1. Last flight for McKay in program. Engine shut down prematurely at 45 seconds. Fuel tank regulator malfunctioned, causing an indication of low fuel line pressure. Nose wheel tire punctured by nail on lakebed runway.

Flight/Pilot: 3-A-81/Dana **Date**: Tue. 13 Sep. 1966
Remarks: Radio failure.

Flight/Pilot: 3-55-82/William H. Dana (**5**) **B-52/Pilots**: 003/Doryland & Cotton
Date: Wed. 14 Sep. 1966 **Engine Run**: 79.3 **Takeoff**: 11:12
Launch: 12:01:29.5 - Delamar **Duration**: 538.6 **Landing**: 13:10
Landing: 12:10:28.1 - Rogers **Altitude**: 254,200 **Duration**: 1:58
Mach/mph: 5.12/3586 **Distance**: 235.8 **Chase**: Curtis/Manke/Hover/Stroface
Mission: **172—**First flight for Dana above 200,000 feet in program. X-15 no. 1 tip pods installed on X-15 no. 3. Third skid did not deploy on landing. Energy management system computer was too cold to turn on. Engine thrust misalignment caused nose right yaw during boost.

Flight/Pilot: 1-A-114/Adams **Date**: Wed. 28 Sep. 1966
Remarks: First attempted launch for Adams in program. Weather abort. McKay was originally scheduled to take this flight but a wet lakebed forced a delay. MIT Horizon Scanner experiment was changed to a pilot checkout for Adams.

Flight/Pilot: 1-A-115/Adams **Date**: Tue. 4 Oct. 1966
Remarks: Cabin source pressure failure due to a malfunction of the canopy seal regulator.

Flight/Pilot: 1-69-116/Michael J. Adams (**1**) **B-52/Pilots**: 003/Doryland & Cotton
Date: Thu. 6 Oct. 1966 **Engine Run**: 89.9 **Takeoff**: 11:31
Launch: 12:16:59.8 - Hidden Hills **Duration**: 506.4 **Landing**: 12:35
Landing: 12:25:26.2 - Cuddeback **Altitude**: 75,400 **Duration**: 1:04
Mach/mph: 3.00/1977 **Distance**: 112.8 **Chase**: Sorlie/Dana/Gentry
Mission: **173—**Engine shutdown prematurely due to a rupture in the forward fuel tank bulkhead. First flight for Adams in program and first to Mach 3. Shortest flight in program for Adams.

Flight/Pilot: 2-A-87/Knight **Date**: Fri. 7 Oct. 1966
Remarks: Telemetry malfunctioned.

Flight/Pilot: 2-A-88/Knight **Date**: Wed. 19 Oct. 1966
Remarks: Ammonia tank pressure failure.

Flight/Pilot: 3-56-83/William H. Dana (**6**) **B-52/Pilots**: 003/Doryland & Reschke
Date: Tue. 1 Nov. 1966 **Engine Run**: 82.8 **Takeoff**: 12:22
Launch: 13:24:12.8 - Smith Ranch **Duration**: 643.9 **Landing**: 14:05
Landing: 13:34:56.7 - Rogers **Altitude**: 306,900 **Duration**: 1:43
Mach/mph: 5.46/3750 **Distance**: 292.1 **Chase**: Adams/Peterson/Stroface/Gentry
Mission: **174—**First flight for Dana above 300,000 feet. Dana becomes sixth X-15 pilot to achieve astronaut qualification. Highest altitude attained by Dana. Checklist knocked loose at peak altitude. Micrometeorite experiment did not cycle. Last time an X-15 would fly above 300,000 feet.

Flight/Pilot: 3-A-84/Dana **Date**: Fri. 18 Nov. 1966
Remarks: Hadley transformer malfunctioned.

Flight/Pilot: 2-50-89/William J. Knight (**8**) **B-52/Pilots**: 008/Fulton & Cotton
Date: Fri. 18 Nov. 1966 **Engine Run**: 136.4 **Takeoff**: 12:28
Launch: 13:24:07.2 - Mud **Duration**: 506.8 **Landing**: 14:10
Landing: 13:32:34.0 - Rogers **Altitude**: 98,900 **Duration**: 1:42
Mach/mph: 6.33/4250 **Distance**: 204.3 **Chase**: Adams/Peterson/Curtis/McKay/Gentry
Mission: **175—**Maurer camera system used. Unofficial world speed record set for class. Second flight with full external tanks. Ammonia flow sensor inoperative. First flight past Mach 6 for Knight. Highest speed attained since flight **059**. First flight for A-2 past Mach 6. First flight past Mach 6 since flight **097**. Flight 50 for X-15A-2. Flight accomplished after X-15 no. 3 aborted its flight earlier in the day.

Flight/Pilot: 3-A-85/Adams **Date**: Wed. 23 Nov. 1966
Remarks: APU bearing temperatures went high.

Flight/Pilot: 3-57-86/Michael J. Adams (**2**) **B-52/Pilots**: 003/Fulton & Cotton
Date: Tue. 29 Nov. 1966 **Engine Run**: 97.9 **Takeoff**: 10:55
Launch: 11:38:32.6 - Hidden Hills **Duration**: 476.2 **Landing**: 12:25
Landing: 11:46:28.8 - Rogers **Altitude**: 92,100 **Duration**: 1:30
Mach/mph: 4.65/3120 **Distance**: 149.2 **Chase**: Knight/Manke/Gentry
Mission: **176—**Radio malfunctioned at launch and contact was not regained until Cuddeback.

Flight/Pilot: 2-C-90/Knight **Date**: Thu. 22 Dec. 1966
Remarks: Scheduled captive flight for thermocouple environmental checkout. Weather problems canceled all X-15 flights for nearly three months.

Flight/Pilot: 1-A-117/Adams **Date**: Wed. 15 Mar. 1967
Remarks: Weather abort. Radio malfunction.

Flight/Pilot: 1-A-118/Adams **Date**: Tue. 21 Mar. 1967
Remarks: Inertial system malfunctioned.

Flight/Pilot: 1-70-119/Michael J. Adams (**3**) **B-52/Pilots**: 003/Cotton & Reschke
Date: Wed. 22 Mar. 1967 **Engine Run**: 79.7 **Takeoff**: 08:55
Launch: 09:52:04.5 - Mud **Duration**: 567.9 **Landing**: 10:15
Landing: 10:01:32.4 - Rogers **Altitude**: 133,100 **Duration**: 1:20
Mach/mph: 5.59/3822 **Distance**: 222.2 **Chase**: Gentry/Peterson/Evenson/Knight
Mission: **177—**Highest Mach attained by Adams, and first past Mach 5 and above 100,000 feet. Inertial system malfunctioned after shutdown. Cockpit pressurization lost. First use of third skid on X-15 no. 1. Ablatives tested on left stabilizer. LR-99 engine governor control was erratic and was replaced after flight.

Flight/Pilot: 1-A-120/Adams **Date**: Thu. 20 Apr. 1967
Remarks: Weather abort. Inertial system over-cooled and the liquid nitrogen line had to be replaced with a smaller line. Flight rescheduled for after higher priority X-15 no. 3 flight.

Flight/Pilot: 3-58-87/William H. Dana (**7**) **B-52/Pilots**: 008/Cotton & Bowline
Date: Wed. 26 Apr. 1967 **Engine Run**: 23.2 **Takeoff**: 10:20
Launch: 11:20:17.3 - Silver **Duration**: 310.3 **Landing**: 11:45
Landing: 11:25:27.6 - Silver **Altitude**: 53,400 **Duration**: 1:25
Mach/mph: 1.80/1163 **Distance**: 42.3 **Chase**: Gentry/Manke/Knight
Mission: **178—**Low fuel line pressure indication forced premature shutdown. Erroneous indication caused by frozen sensing line. Dana's shortest flight in the program and shortest for X-15 no. 3.

Flight/Pilot: 1-71-121/Michael J. Adams (**4**) **B-52/Pilots**: 003/Cotton & Bowline
Date: Fri. 28 Apr. 1967 **Engine Run**: 82.0 **Takeoff**: 08:30
Launch: 09:23:32.6 - Delamar **Duration**: 556.0 **Landing**: 10:30
Landing: 09:32:48.6 - Rogers **Altitude**: 167,200 **Duration**: 2:00
Mach/mph: 5.44/3720 **Distance**: 235.3 **Chase**: Sorlie/Manke/Evenson/Cuthill
Mission: **179—**Pitch attitude malfunctioned and inertial velocity was erratic. WTR and MIT experiments checked out. WTR experiment did not deploy because minimum altitude of 170,000 feet not reached. Circuit breakers were found open on WTR experiment after flight and power diodes were burned.

Flight/Pilot: 2-A-91/Knight **Date**: Fri. 5 May 1967
Remarks: Weather abort.

Flight/Pilot: 2-51-92/William J. Knight (**9**) **B-52/Pilots**: 008/Cotton & Reschke
Date: Mon. 8 May 1967 **Engine Run**: 76.9 **Takeoff**: 11:45
Launch: 12:27:38.8 - Hidden Hills **Duration**: 506.8 **Landing**: 12:55
Landing: 12:36:05.6 - Rogers **Altitude**: 97,600 **Duration**: 1:10
Mach/mph: 4.75/3193 **Distance**: 166.9 **Chase**: Sorlie/Evenson/Dana/Adams
Mission: **180—**Dummy scramjet mounted on modified lower ventral. Scramjet chute came off but was repairable. Final flight before full ablative installed on A-2. Eyelid tested on left window. When eyelid opened the aircraft pitched up, rolled right, and yawed right. Window fogged over after eyelid opened.

Flight/Pilot: 3-A-88/Dana **Date**: Fri. 12 May 1967
Remarks: Q-ball system and radio malfunctioned.

Flight/Pilot: 3-59-89/William H. Dana (**8**) **B-52/Pilots**: 003/Reschke & Cotton
Date: Wed. 17 May 1967 **Engine Run**: 96.1 **Takeoff**: 09:55
Launch: 10:45:48.0 - Silver **Duration**: 415.6 **Landing**: 11:22
Landing: 10:52:43.6 - Rogers **Altitude**: 71,100 **Duration**: 1:27
Mach/mph: 4.80/3177 **Distance**: 124.5 **Chase**: Sorlie/Manke/Evenson/Cuthill
Mission: **181—**Attempted lifting body approach during glide, but did not use all the way to landing.

Flight/Pilot: 1-A-122/Adams **Date**: Fri. 26 May 1967
Remarks: Inertial system malfunctioned.

Flight/Pilot: 1-A-123/Adams **Date**: Thu. 1 Jun. 1967
Remarks: Inertial system malfunctioned.

Flight/Pilot: 1-A-124/Adams **Date**: Wed. 14 Jun. 1967
Remarks: Radio failure at 15 seconds to launch.

Flight/Pilot: 1-72-125/Michael J. Adams (**5**) **B-52/Pilots**: 003/Cotton & Reschke
Date: Thu. 15 Jun. 1967 **Engine Run**: 81.4 **Takeoff**: 10:10
Launch: 11:09:28.3 - Delamar **Duration**: 551.0 **Landing**: 12:00
Landing: 11:18:39.3 - Rogers **Altitude**: 229,300 **Duration**: 1:50
Mach/mph: 5.14/3606 **Distance**: 236.9 **Chase**: Gentry/Manke/Davey/Hoag
Mission: **182—**First flight for Adams above 200,000 feet, and his longest flight. Stick kicker inoperative. WTR frequency converter circuit breaker blew out at shutdown causing video recorder malfunction.

Flight/Pilot: 3-60-90/William H. Dana (**9**) **B-52/Pilots**: 008/Cotton & Sturmthal
Date: Thu. 22 Jun. 1967 **Engine Run**: 93.2 **Takeoff**: 13:57
Launch: 14:57:17.2 - Hidden Hills **Duration**: 426.3 **Landing**: 15:38
Landing: 15:04:23.5 - Rogers **Altitude**: 82,200 **Duration**: 1:41
Mach/mph: 5.34/3611 **Distance**: 139.7 **Chase**: Knight/Manke/Krier/Gentry
Mission: **183—**Buffeting experienced during pull-up at Mach 3. Window shade would not retract.

Flight/Pilot: 1-73-126/William J. Knight (**10**) **B-52/Pilots**: 008/Reschke & Sturmthal
Date: Thu. 29 Jun. 1967 **Engine Run**: 67.6 **Takeoff**: 10:22
Launch: 11:27:51.2 - Smith Ranch **Duration**: 607.0 **Landing**: 12:00
Landing: 11:37:58.2 - Mud **Altitude**: 173,000 **Duration**: 1:38
Mach/mph: 4.23/2870 **Distance**: 169.9 **Chase**: Cuthill/Dana/Jackson/Evenson/Hoag
Mission: **184—**Complete electrical system failure while climbing through 107,000 feet. One APU was restarted to allow emergency landing at Mud lake with no damage. Last emergency landing of an X-15. Headrest ejected into canopy after landing. Timing should have placed landing at Grapevine.

Flight/Pilot: 3-61-91/William H. Dana (**10**) **B-52/Pilots**: 008/Cotton & Fulton
Date: Thu. 20 Jul. 1967 **Engine Run**: 92.1 **Takeoff**: 09:19
Launch: 10:11:00.8 - Hidden Hills **Duration**: 456.5 **Landing**: 10:42
Landing: 10:18:37.3 - Rogers **Altitude**: 84,300 **Duration**: 1:23
Mach/mph: 5.44/3693 **Distance**: 144.7 **Chase**: Adams/Krier/Davey
Mission: **185—**Boost guidance computer did not operate properly throughout flight. An incorrect memory bit was found in the computer after landing, but a power recycle cleared the problem.

Flight/Pilot: 2-C-93/Knight **Date**: Mon. 7 Aug. 1967
Remarks: Scheduled captive flight checked effects of cold-soak with full ablative coating, dummy scramjet, and external tanks in place. External tanks removed after captive flight.

Flight/Pilot: 2-A-94/Knight **Date**: Fri. 11 Aug. 1967
Remarks: Pilot's suit vent heater failed just before launch, causing excess chilling of windshield defrost lines, which, in turn, caused liquid nitrogen from B-52 pylon to be sprayed on X-15.

Flight/Pilot: 2-A-95/Knight **Date**: Tue. 16 Aug. 1967
Remarks: APU-2 helium source pressure loss.

Flight/Pilot: 2-52-96/William J. Knight (**11**) **B-52/Pilots**: 008/Cotton & Reschke
Date: Mon. 21 Aug. 1967 **Engine Run**: 82.2 **Takeoff**: 10:01
Launch: 10:59:16.0 - Hidden Hills **Duration**: 460.0 **Landing**: 11:27 (approximate)
Landing: 11:06:56.0 - Rogers **Altitude**: 91,000 **Duration**: 1:26 (approximate)
Mach/mph: 4.94/3368 **Distance**: 157.0 **Chase**: Cuthill/Evenson/Manke/Adams
Mission: **186—**First flight with full ablative coating. Dummy scramjet shape installed. Ejected too close to ground but was refurbishable. Forward quarter of right window smeared with ablative after heating.

Flight/Pilot: 3-62-92/Michael J. Adams (**6**) **B-52/Pilots**: 003/Bowlin & /Reschke
Date: Fri. 25 Aug. 1967 **Engine Run**: 71.3 **Takeoff**: 12:35
Launch: 13:27:28.0 - Hidden Hills **Duration**: 457.0 **Landing**: 14:01
Landing: 13:35:05.0 - Rogers **Altitude**: 84,400 **Duration**: 1:26
Mach/mph: 4.63/3115 **Distance**: 147.3 **Chase**: Gentry/Jackson/Knight
Mission: **187—**Engine failed to ignite on first try. Second attempt successful 16 seconds after launch. Inertial and Q-ball systems failed 10 seconds to touchdown when a circuit breaker popped.

Flight/Pilot: 3-A-93/Dana **Date**: Fri. 22 Sep. 1967
Remarks: Weather abort.

Flight/Pilot: 2-53-97/William J. Knight (**12**) **B-52/Pilots**: 008/Cotton & Reschke
Date: Tue. 3 Oct. 1967 **Engine Run**: 140.7 **Takeoff**: 13:31
Launch: 14:31:50.9 - Mud **Duration**: 497.0 **Landing**: 15:20
Landing: 14:40:07.9 - Rogers **Altitude**: 102,100 **Duration**: 1:49
Mach/mph: 6.70/4520 **Distance**: 213.7 **Chase**: Cuthill/Twinting/Krier/Adams
Mission: **188**—Communications problems forced replacement of pilot's helmet. During flight, shock waves burned through leading edge of lower ventral causing small fires in lower engine bay. Heat set off scramjet separation charges, ejecting over Edwards bombing range at Mach 1 and 32,000 feet. Control gas line destroyed, resulting in loss of helium to force fuel through jettison lines, thus preventing jettison. Unofficial world absolute speed record set. Full ablative coating, dummy scramjet, external tanks, and eyelid. Longest run time of LR-99. Highest Mach attained by X-15. Not surpassed by winged vehicle until reentry of Space Shuttle *Columbia* from orbit on 14 April 1981. Final flight of A-2 and last flight of an X-15 above Mach 6. NAA fully refurbished A-2 for flight. Decided not to fly it again and aircraft was eventually sent to National Museum of the US Air Force at Wright-Patterson AFB, Ohio, for permanent display.

Flight/Pilot: 3-63-94/William H. Dana (**11**) **B-52/Pilots**: 003/Cotton & Reschke
Date: Wed. 4 Oct. 1967 **Engine Run**: 84.7 **Takeoff**: 09:12
Launch: 10:16:54.0 - Smith Ranch **Duration**: 646.0 **Landing**: 11:04
Landing: 10:27:40.0 - Rogers **Altitude**: 251,100 **Duration**: 1:52
Mach/mph: 5.53/3897 **Distance**: 299.8 **Chase**: Cuthill/Krier/Gentry/Manke
Mission: **189—**Highest Mach attained by Dana. Micrometeorite system did not retract.

Flight/Pilot: 3-64-95/William J. Knight (**13**) **B-52/Pilots**: 008/Reschke & Miller
Date: Tue. 17 Oct. 1967 **Engine Run**: 84.2 **Takeoff**: 08:41
Launch: 09:40:23.0 - Smith Ranch **Duration**: 606.3 **Landing**: 10:28
Landing: 09:50:29.3 - Rogers **Altitude**: 280,500 **Duration**: 1:47
Mach/mph: 5.53/3856 **Distance**: 296.5 **Chase**: Cuthill/Twinting/Gentry/Adams
Mission: **190—**Highest altitude attained by Knight and longest flight. Knight became seventh X-15 pilot to achieve astronaut qualification. Last successful flight of X-15 no. 3. Third skid did not deploy.

Flight/Pilot: 3-A-96/Adams **Date**: Tue. 31 Oct. 1967
Remarks: LR-99 engine igniter idle malfunctioned. Ablative test insulation de-bonded from speed brake.

Flight/Pilot: 3-65-97/Michael J. Adams (**7**) **B-52/Pilots**: 008/Cotton & Miller
Date: Wed. 15 Nov. 1967 **Engine Run**: 82.3 **Takeoff**: 09:13
Launch: 10:30:07.4 - Delamar **Duration**: 291.4 **Landing**: 11:25
Impact: 10:34:58.8 **Altitude**: 266,000 **Duration**: 2:12
Mach/mph: 5.20/3570 **Distance**: 185.8 **Chase**: Cuthill/Jackson/Dana/Twinting
Mission: **191—**X-15 no. 3 entered spin at reentry, caused by excessive yaw at peak altitude. Aircraft recovered, but PIO, complicated by saturation of MH-96 system, caused oscillations in pitch which exceeded design limits. Aircraft disintegrated and crashed near Johannesburg. Michael Adams killed. Only fatal accident of program. Highest altitude attained by Adams, who posthumously became eighth X-15 pilot to achieve astronaut qualification. Next flight did not take place for four months.

Flight/Pilot: 1-C-127/Dana **Date**: Tue. 6 Feb. 1968
Remarks: Scheduled captive flight to check modifications after electrical failure on flight **184**.

Flight/Pilot: 1-A-128/Dana **Date**: Wed. 7 Feb. 1968
Remarks: Cabin pressurization failure and yaw channel of SAS failed pre-launch check.

Flight/Pilot: 1-A-129/Dana **Date**: Tue. 27 Feb. 1968
Remarks: SAS failed pre-launch check. Metal chips found in test box after de-mating.

Flight/Pilot: 1-74-130/William H. Dana (**12**) **B-52/Pilots**: 008/Cotton & Stroup
Date: Fri. 1 Mar. 1968 **Engine Run**: 65.6 **Takeoff**: 10:34
Launch: 11:28:11.0 - Hidden Hills **Duration**: 455.1 **Landing**: 12:15
Landing: 11:35:46.1 - Rogers **Altitude**: 104,500 **Duration**: 1:41
Mach/mph: 4.36/2878 **Distance**: 141.0 **Chase**: Twinting/Krier/Knight/Jackson
Mission: **192—**Pressure suit inflated during final approach.

Flight/Pilot: 1-A-131/Dana **Date**: Thu. 28 Mar. 1968
Remarks: Radio malfunctioned.

Flight/Pilot: 1-A-132/Dana **Date**: Wed. 3 Apr. 1968
Remarks: Weather abort.

Flight/Pilot: 1-75-133/William H. Dana (**13**) **B-52/Pilots**: 008/Cotton & Sturmthal
Date: Thu. 4 Apr. 1968 **Engine Run**: 78.8 **Takeoff**: 08:29
Launch: 10:02:17.1 - Delamar **Duration**: 562.8 **Landing**: 10:43
Landing: 10:11:39.9 - Rogers **Altitude**: 187,500 **Duration**: 2:14
Mach/mph: 5.27/3610 **Distance**: 232.8 **Chase**: Cuthill/Jackson/Smith/Hoag/Fulton
Mission: **193—**Emergency retraction required for WTR experiment. Saturn ablative tests. Tip pods installed.

Flight/Pilot: 1-76-134/William J. Knight (**14**) **B-52/Pilots**: 008/Sturmthal & Reschke
Date: Fri. 26 Apr. 1968 **Engine Run**: 81.5 **Takeoff**: 10:49
Launch: 11:51:49.8 - Delamar **Duration**: 557.1 **Landing**: 12:45
Landing: 12:01:06.9 - Rogers **Altitude**: 209,600 **Duration**: 1:56
Mach/mph: 5.05/3545 **Distance**: 237.2 **Chase**: Manke/Krier/Livingston/Gentry/Fulton
Mission: **194—**WTR and Saturn rocket ablative tests. Wing tip pod camera used.

Flight/Pilot: 1-A-135/Dana **Date**: Thu. 23 May 1968
Remarks: Weather abort.

Flight/Pilot: 1-77-136/William H. Dana (**14**) **B-52/Pilots**: 008/Cotton & Reschke
Date: Wed. 12 Jun. 1968 **Engine Run**: 83.4 **Takeoff**: 07:19
Launch: 08:31:01.0 - Smith Ranch **Duration**: 692.4 **Landing**: 09:24
Landing: 08:42:33.4 - Rogers **Altitude**: 220,100 **Duration**: 2:05
Mach/mph: 5.15/3563 **Distance**: 294.4 **Chase**: Gentry/Manke/Jackson/Hoag/Fulton
Mission: **195—**Emergency retraction of WTR experiment. Altitude build-up flight.

Flight/Pilot: 1-A-137/Knight **Date**: Mon. 15 Jul. 1968
Remarks: BCS malfunctioned. Originally scheduled for 5 July, but changed to 8 July, then 15 July, due to missile launch schedule slippage at Vandenberg AFB.

Flight/Pilot: 1-78-138/William J. Knight (**15**) **B-52/Pilots**: 003/Sturmthal & Reschke
Date: Tue. 16 Jul. 1968 **Engine Run**: 80.5 **Takeoff**: 14:17
Launch: 15:23:06.7 - Railroad **Duration**: 582.3 **Landing**: 16:24
Landing: 15:32:49.0 - Rogers **Altitude**: 221,500 **Duration**: 2:07
Mach/mph: 4.79/3382 **Distance**: 239.8 **Chase**: Gentry/Manke/Cuthill/Davey/Krier
Mission: **196—**First launch from Railroad Dry Lake. Hydraulic gauge malfunction during boost forced a profile change. WTR experiment not utilized due to alternate profile. Sky brightness experiment in left tip pod. Forward looking tip pod camera installed. Experienced shaking and vibration during reentry from 200,000 feet to 65,000 feet. One year from this date the Apollo 11 flight will launch to the Moon for the first lunar landing with former X-15 pilot Neil Armstrong as Commander.

Flight/Pilot: 1-79-139/William H. Dana (**15**) **B-52/Pilots**: 003/Sturmthal & Fulton
Date: Wed. 21 Aug. 1968 **Engine Run**: 82.9 **Takeoff**: 07:52
Launch: 09:04:48.0 - Railroad **Duration**: 563.0 **Landing**: 10:30
Landing: 09:14:11.0 - Rogers **Altitude**: 267,500 **Duration**: 2:38
Mach/mph: 5.01/3443 **Distance**: 234.1 **Chase**: Cuthill/Krier/Hoag/Gentry/Shawler
Mission: **197—**Last flight of X-15 program to exceed 50 miles. Only scheduled for 250,000 feet altitude. WTR experiment retracted by a timer due to altitude overshoot.

Flight/Pilot: 1-80-140/William J. Knight (**16**) **B-52/Pilots**: 003/Sturmthal & Miller
Date: Fri. 13 Sep. 1968 **Engine Run**: 84.3 **Takeoff**: 10:06
Launch: 11:19:23.2 - Smith Ranch **Duration**: 655.5 **Landing**: 12:15
Landing: 11:30:18.7 - Rogers **Altitude**: 254,100 **Duration**: 2:09
Mach/mph: 5.37/3723 **Distance**: 299.8 **Chase**: Twinting/Manke/Shawler/Gentry/Krier
Mission: **198—**Knight's farthest flight. Farthest flight for X-15 no. 1. Emergency retraction of WTR experiment. Last launch for Knight and the US Air Force in the X-15 program.

Flight/Pilot:	1-81-141/William H. Dana (**16**)			**B-52/Pilots**:	003/Sturmthal & Miller
Date:	Thu. 24 Oct. 1968	**Engine Run**:	83.8	**Takeoff**:	08:56
Launch:	10:02:47.3 - Smith Ranch	**Duration**:	688.3	**Landing**:	11:02
Landing:	10:14:15.6 - Rogers	**Altitude**:	255,000	**Duration**:	2:06
Mach/mph:	5.38/3716	**Distance**:	297.4	**Chase**:	Cuthill/Krier/Evenson/Hoag/Manke/Enevoldson

Mission: **199—**Originally scheduled for 12 October, but slipped because of Vandenberg missile launch schedule. First time a missile launch and an X-15 launch were properly coordinated to track launch with WTR experiment. WTR experiment extended properly, but lost power. No data taken and experiment doors were closed. BCS system no. 2 never turned on. Sky brightness experiment lost power at engine shutdown due to a shorted wire. Last flight for Dana and last launch accomplished in the X-15 program.

Flight/Pilot: 1-A-142/Knight **Date**: Thu. 12 Dec. 1968
Remarks: Inertial system malfunctioned. Last time that the X-15 aircraft taken aloft for attempted launch.

Flight 200

A total of eight attempts were made to launch the 200th flight. The research program was funded through 31 December 1968. All attempts to launch Flight 1-82 met with problems and the flight never occurred. Only once out of the eight attempts, on Thursday, 12 December, did the X-15 even make it off the ground before cancellation. The following sequence of events occurred during the last month of the X-15 program:

25 Nov. X-15 no. 1 was mated to B-52 no. 008.

27 Nov. The first flight attempt was made on Wednesday, 27 November 1968, but was canceled after pilot entry and prior to B-52 taxi. The BCS system developed a malfunction causing the right yaw rocket to steam. This was cleared, but a blower overheated causing cancellation. The X-15 was demated from B-52 no. 008 because it was committed for other testing. B-52 no. 003 was then scheduled to take the final X-15 flight, but this had to be postponed until early December because of its commitment to a flight in the lifting body program.

9 Dec. X-15 no. 1 was mated to B-52 no. 003.

10 Dec. Flight canceled just prior to servicing due to weather conditions.

11 Dec. Flight again canceled for weather. An inertial guidance system malfunction was detected and repaired.

12 Dec. X-15 was taken aloft for launch but canceled due to an inertial system malfunction and weather conditions at Railroad Valley Dry Lake (Flight 1-A-142).

13 Dec. Flight canceled due to weather conditions. An engine governor flange was found to be leaking. Operational checks found the leak was at an acceptable rate to accomplish the flight. Weather was unacceptable to attempt any flights for the next four days.

17 Dec. The required C-130 support aircraft was unavailable for X-15 flight operations.

18 Dec. Flight canceled due to weather conditions.

19 Dec. Microwave transmissions unavailable so the flight plan was changed to launch from Hidden Hills Dry Lake to obtain data from a newly-installed Autonetics experiment.

20 Dec. The final attempt occurred on Friday, 20 December 1968. The B-52, which was ready for taxi with Pete Knight in the X-15, never left the ground because of a snowstorm at Edwards AFB. Paul Bikle, the head of NASA at Edward AFB, came on the radio from the control room to tell everyone that *"Someone is trying to tell us something. It's time to wrap up the program."* Later that day, X-15 no. 1 was taken back to the hangar and demated from B-52 no. 003 for the final time. It was prepared for storage and later shipment to the Smithsonian Institute in Washington, D.C. for permanent static display in June 1969.

7. Timeline

This timeline is a summary of major events in the X-15 program and also significant events concerning the pilots who flew the X-15. Included are other major space program and historical events.

1951

20 Apr. Scott Crossfield makes his first flight in a rocket plane, the XS-1.
27 Aug. Joe Walker makes his first flight in a rocket plane, the XS-1.

1953

29 May Edmund Hillary and Tenzing Norgay reach the summit of Mt. Everest.
27 Jul. End of the Korean War.
20 Nov. Scott Crossfield makes the first flight by a manned aircraft to Mach 2 in the D-558, Phase 2.
30 Dec. First color television set sold.

1954

17 May Segregation ruled illegal in America.
9 Jul. First meeting held to discuss what will eventually become the X-15.
5 Oct. NACA unveils resolution for Mach 7 research aircraft.
9 Nov. "Memorandum of Understanding" signed between NACA, USAF, and USN for X-15 program.
30 Dec. Prospective contractors asked to submit proposals for the X-15 aircraft.

1955

4 Feb. Prospective contractors asked to submit proposals for the LR-99 rocket engine.
27 Apr. Jack McKay makes his first flight in a rocket plane in the D-558, Phase 2.
9 May NAA, Douglas, Republic, and Bell submit X-15 aircraft proposals.
15 Jul. Specifications set for the X-15 High Range.
17 Jul. Disneyland opens in Anaheim, California.
5 Aug. Completed evaluation report shows North American Aviation as the winning contractor.
8 Aug. Joe Walker jumps from X-1A just before it explodes in the bomb bay of the B-50.
30 Sep. North American Aviation informed it has won the X-15 design competition.
30 Nov. Reaction Motors design is accepted for X-15 rocket engine.
9 Dec. Official contract for three X-15 aircraft is executed.

1956

22 Mar. Jack McKay makes emergency drop in D-558, Phase 2, when an engine runs away on B-50.
28 May X-15 aircraft have their tail numbers assigned (**56-6670**, **56-6671**, and **56-6672**).
29 Jun. Interstate highway system approved.
7 Sep. XLR99-RM-1 rocket engine contract signed with Reaction Motors.
9 Sep. Elvis Presley first appears on the *Ed Sullivan Show*.
25 Sep. Trans-Atlantic telephone cable carries first telephone call between America and Europe.

1957

15 Aug. Neil Armstrong makes his first flight in a rocket plane, the X-1B.
4 Oct. Launch of first artificial Earth satellite by the Soviet Union, Sputnik 1.

1958

31 Jan. Launch of first artificial Earth satellite by the United States, Explorer 1.
3 Aug. USS *Nautilus* crosses the North Pole under the Arctic ice pack.
1 Oct. The NACA becomes the National Aeronautics and Space Administration (NASA).
4 Oct. First Trans-Atlantic passenger jet operations begin (BOAC).
15 Oct. Rollout ceremonies are held for first X-15 aircraft at NAA plant in Los Angeles, California.
17 Oct. X-15 no. 1 arrives at Edwards AFB.
10 Dec. First jet airline passenger service in America (National Airlines).

1959

3 Jan. Alaska admitted as 49th state of the United States of America.
22 Feb. First Daytona 500 stock car race.
27 Feb. Rollout ceremonies are held for X-15 no. 2 at North American Aviation plant in Los Angeles.
2 Apr. NASA selects the original seven astronauts for Project Mercury.

10 Apr. X-15 no. 2 arrives at Edwards AFB.
18 Apr. Completion of initial qualification runs on LR-99 rocket engine by Reaction Motors.
8 Jun. Flight 1-1-5: Scott Crossfield makes first free flight in the X-15.
21 Aug. Hawaii admitted as 50th state of the United States of America.
17 Sep. Flight 2-1-3: Scott Crossfield makes the first flight of X-15 no. 2 and first powered flight of the program.

1960

17 Mar. Flight 2-6-13: Scott Crossfield experiences maximum positive g (+6.0g) recorded on X-15 flight.
29 Mar. Flight 2-7-15: Scott Crossfield experiences maximum negative g (-3.0g) recorded on X-15 flight.
1 Apr. First weather satellite orbited, Tiros 1.
1 May U-2 reconnaissance aircraft flown by Francis Gary Powers shot down by Soviet Union.
8 Jun. X-15 no. 3 is severely damaged in LR-99 rocket engine ground firing explosion.
1 Jul. 50-star United States flag introduced.

1961

7 Mar. Flight 2-13-26: Robert White makes the first manned aircraft flight above Mach 4.
12 Apr. Vostok 1: Soviet launch of Yuri Gagarin as the first man to orbit the Earth.
5 May Mercury 3: Suborbital launch of Alan Shepard, who becomes the first United States man in space.
25 May President John F. Kennedy commits America to land a man on the Moon before 1970.
13 Jun. Joe Walker receives Chanute prize for record flights in the X-15.
19 Jun. Harmon trophy presented to X-15 pilots Scott Crossfield, Joe Walker, and Bob White.
23 Jun. Flight 2-17-33: Robert White makes the first manned aircraft flight above Mach 5.
12 Aug. The Soviet Union begins construction of the Berlin Wall.
9 Nov. Flight 2-21-37: Robert White makes the first manned aircraft flight above Mach 6.
21 Nov. World premiere of the motion picture *"X-15"* in Washington, D. C.
20 Dec. Flight 3-1-2: Neil Armstrong makes the first flight of X-15 no. 3.

1962

20 Feb. Mercury 6: Launch of John Glenn, who becomes first United States man to orbit the Earth.
20 Apr. Flight 3-4-8: Neil Armstrong makes the longest flight by the X-15 at 748.7 seconds.
17 Jul. Flight 3-7-14: Robert White makes the first X-15 flight above 50 miles altitude.
18 Jul. Collier Trophy presented to Crossfield, Walker, White, and Petersen by President Kennedy.
14 Oct. First of 13 days of the Cuban Missile Crisis.
9 Nov. Flight 2-31-52: Jack McKay crash lands and rolls over in X-15 no. 2 at Mud Dry Lake.

1963

13 May Construction begins on the X-15A-2 (refurbished and lengthened X-15 no. 2).
10 Jun. Joe Engle and Milt Thompson announced as new X-15 pilots.
22 Aug. Flight 3-22-36: Joe Walker flies X-15 no. 3 to a record altitude of 354,200 feet (67.1 miles).
22 Nov. President John F. Kennedy is assassinated in Dallas, Texas.

1964

28 Jan. Flight 1-44-70: Robert Rushworth makes the 100th flight of the X-15 program.
7 Feb. The Beatles arrive in America.
14 Feb. Advanced X-15A-2 rollout ceremonies at North American Aviation plant in Los Angeles.
25 Jun. Flight 2-32-55: Robert Rushworth makes the first flight of X-15A-2 aircraft.

1965

8 Mar. Arrival of first American troops in South Vietnam.
23 Mar. Gemini 3: First mission in the two-man Gemini program.
25 Dec. Patent application submitted for Astroturf.

1966

16 Mar. Gemini 8: Neil Armstrong launched on first spaceflight. Stuck thruster causes spin. Emergency reentry.
8 Jun. Joseph A. Walker is killed in collision between his F-104 and the XB-70A.
12 Jul. Milt Thompson makes the first flight of the M2-F2 lifting body.
8 Sep. *"Star Trek"* television series premiere.
1 Nov. Flight 3-56-83: Bill Dana makes the last flight of X-15 above an altitude of 300,000 feet.
15 Dec. Walt Disney dies.

1967

27 Jan. Apollo 1 fire takes the lives of astronauts Gus Grissom, Ed White, and Roger Chaffee.
3 Oct. Flight 2-53-97: Pete Knight sets world absolute speed record at Mach 6.70 in the X-15A-2.
9 Nov. Apollo 4: First launch of the Saturn V space vehicle.

15 Nov. Flight 3-65-97: Michael J. Adams is killed in X-15 no. 3. Only fatality of the X-15 program.
3 Dec. First human heart transplant accomplished by Dr. Christiaan Barnard in South Africa.

1968

4 Apr. Rev. Martin Luther King, Jr. assassinated in Memphis, Tennessee.
6 Jun. Sen. Robert F. Kennedy assassinated in Los Angeles, California.
11 Oct. Apollo 7: First manned launch of the Apollo program.
24 Oct. Flight 1-81-141: Bill Dana makes the 199th and final flight of the X-15 program.
20 Dec. Pete Knight makes the last attempted flight of the X-15 program.
21 Dec. Apollo 8: Launch of first manned mission around the Moon (Borman, Lovell, Anders).

1969

10 May X-15 no. 1 departs Edwards AFB to Andrews AFB on C-133 (s/n 62003)
10 Jun. X-15 no. 1 arrives at the Smithsonian Institute in Washington, D.C.
3 Jun. Final episode of *"Star Trek"* airs on television.
16 Jul. Apollo 11: Launch of first manned lunar landing mission (Armstrong, Aldrin, Collins).
20 Jul. Former X-15 pilot Neil A. Armstrong becomes the first man to set foot on the Moon.
15 Aug. Woodstock rock concert takes place over three days in Bethel, New York.

1972

7 Dec. Apollo 17: Launch of final manned lunar landing mission (Cernan, Evans Schmitt).
9 Sep. Bill Dana makes the last powered flight of a rocket plane in the X-24B lifting body.

1975

27 Apr. X-15 pilot John B "Jack" McKay dies.

1976

17 Sep. Roll out of the Space Shuttle *Enterprise*.

1977

12 Oct. Joe Engle pilots Space Shuttle *Enterprise* on atmospheric test flight.

1981

12 Apr. STS-1: first launch of the Space Shuttle.
12 Nov. STS-2: Joe Engle enters space for the 4th time as commander of the *Columbia*.

1983

20 Sep. Decision made to write the book *"The X-15 Rocket Plane, Flying the First Wings into Space."*
22 Sep. First book interview accomplished with X-15 pilot Milt Thompson and Flight Planner Jack Kolf.

1985

27 Aug. STS-51I: Joe Engle enters space for the 5th, and final, time as commander of the *Discovery*.

1990

13 Feb. German re-unification.
8 Dec. X-15 pilot Forrest S. Petersen dies.

1993

17 Mar. X-15 pilot Robert A. Rushworth dies.
6 Aug. X-15 pilot Milton O. Thompson dies.

2004

7 May X-15 pilot William J. "Pete" Knight dies.

2006

19 Apr. X-15 pilot A. Scott Crossfield dies.

2010

8 Jul. *Solar Impulse* becomes first solar-powered aircraft to complete a 24 hour flight
8 Dec. X-15 pilot Robert M. White dies.

2012

5 Aug. Mars Science Laboratory Rover *Curiosity* lands on Mars
12 Aug. X-15 pilot Neil A. Armstrong dies.

2014

6 May X-15 pilot William H. Dana dies.

8. Glossary

APU	—	Auxiliary Power Unit.
BCS	—	Ballistic Control System. System of small steam rockets on the nose and wings of the X-15 used to control the attitude and orientation of the aircraft when outside the atmosphere (see also RCS).
EAFB	—	Edwards Air Force Base, California.
FAI	—	Fédération Aéronautique Internationale. Organization that verifies all aviation records.
High-Key	—	Point at which the X-15 starts its final descent to the lakebed for landing.
LOX	—	Liquid Oxygen.
LPO	—	Launch Panel Operator.
MACH	—	Speed of Sound.
MH-96	—	Minneapolis-Honeywell System that combined use of BCS with aerodynamic controls depending on the altitude flown at the time.
MIT	—	Massachusetts Institute of Technology.
NAA	—	North American Aviation.
NACA	—	National Advisory Committee for Aeronautics.
NASA	—	National Aeronautics and Space Administration.
PIO	—	Pilot Induced Oscillation.
Q-Ball	—	Nortronics Flight Path Control Sensor is installed on the nose of the X-15 to sense the attitude of the X-15 through dynamic air pressure, also known as Q.
RAS	—	Reaction Augmentation System.
RCS	—	Reaction Control System (see also BCS).
SAS	—	Stability Augmentation System.
USAF	—	United States Air Force.
USN	—	United States Navy.
WTR	—	Western Test Range. WTR is located at Vandenberg AFB on the central California coast.
XLR-11	—	Interim rocket engine used while XLR-99 engine was still in development.
XLR-99	—	Primary rocket engine used in the X-15 program.
YLR-99	—	Official designation of the XLR-99 rocket engine after 29 Dec. 1961.