X-15 world altitude record flight

APU EXHAUST

U.S. AIR FORCE

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Summary of Flight 3-7-14, 17 July 1962

X-15 pilot: Major Robert M. WhiteFlight track: Delamar Dry Lake to Edwards (Rogers Dry Lake)

	<u>Planned</u>	<u>Actual</u>
Maximum Altitude:	282,000 ft	314,750 ft
Maximum speed:	5.15	5.45 Mach
:		3,832 mph
Duration of flight:	10 min. 20.7 sec	
Powered (rocket-burn) duration:	80 sec	82.0 sec
Total ground track distance,	~235 miles	~ 300 miles
including landing pattern		

F-104B 57-1303 (later NASA 819), flew as Chase 4, piloted by NASA's Milt Thompson and Naval Lt. Commander Forrest Petersen.

This F-104 is in the Airpark at the Aerospace Museum of California.

- The middle part of this presentation will simulate the flight automatically automatically in real time, from X-15 launch to landing. This covers 10 minutes 20 seconds.
- One embedded video clip will run 2.4 times faster than real time, shot at 10 frames per second from a rear-facing camera on the X-15. This covers the part from launch to rocket engine shutdown. The video clip's end synchronizes with the real time simulation.
- An "encore" video clip appended just after the real-time landing shows an additional landing, viewed from the opposite side of Edwards.



Speed & altitude in an X-15 high-altitude flight

Ideal landing approach: Reach high key at 29,000 feet & 300 knots (345 mph)



The most important source of data on this flight is the plot of the ground track and altitude track.

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THE REAL PROPERTY.





will be edited out in this presentation's flight track plots.







Ground track over Google Earth map

Launch near Delamar-Dry Lake

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Las-Vegas 61

St George

Utah

Calliornia

Bakersfield

Edwards AFB

Landaster

Barstow

Victorville

Riverside

Pomona

Los Angeles Los Angeles (5)0 Canyon (50)

a SIO, NOAA, U.S. Naw, NGA, OFBCO Image © 2018 Te raMatries © 2013 INEGI Google 35°46'58.05" N 114°14'49.27" W elev 3602 ft eye alt

Tour Guide

ard





Altitude and Ground Track, Reentry to Landing



Prebriefing:

Altitude and Ground Track, Reentry to Landing





Mach 3 6:10 60,000 ft 1,770 mph End of Reentry

Rosamond

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Edwards

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North Edwards

High Key

Preview

Google ea

34°53'46.15" N 117°46'00.18" W elev 2366 ft eve alt 35

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• Edwards AFB

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North Edwards

Google earth

eye alt 14939 ft (

" Calibra la Cily













Art by John Bedke





At Drop...

0 min 0 sec

600 mph 45,000 feet

1 second: Rocket engine lights.

3.2 seconds: Full thrust

2G's acceleration



~ 0 min 15 sec

1,000 mph 44,000 feet

Starting pullup to climb attitude

Acceleration increasing as fuel burns





~ 0 min 30 sec 1,365 mph

55,000 feet

Sky going to black,

Acceleration increasing, will reach 4G before shutdown







SHUTDOWN rocket engine burnout

1 min 23.0 sec

3,545 mph 156,000 feet

Acceleration drops abruptly from 4G to 0G



half way to apogee






















Pilot Robert M. White wrote...

... at my highest altitude I could turn my head through a 180° arc and wow! - the earth is really round.

... there was that dramatic view of earth's curvation, but there was a band of light around the earth before fading into the darkness of space. The band of light was, of course, the diffusion of sun light through our atmosphere.



"Looking to my left I felt I could spit into the Gulf of California."

Gulf of California



"Looking to my right I felt I could toss a dime into San Francisco Bay."



37º47'51.58" N 119º14'26.39" W elev 9564 ft eye alt 58.74





Starting soon: Reentry

Pressure quickly rises <u>VERY</u> high on parts of the airframe ... Those parts heat to 1,200^o F and glow dull red









X-15 right-side view of Edwards, starting high-G windup turn



6:00 63,000 ft 2,242 mph

... Mojave

Rosamond

High-G windup turn maximizes slowing while turning back

34°53'46.15" N 117°46'00.18" W elev 2366 ft eve alt 35

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Edwards

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North Edwards

High Key

Mach 3 6:10 North Edwards 60,000 ft Boron 58 Boron 1,770 mph Leu Key Edwards **End of Reentry** High **AFB** High Key Rosamond Google ea @ 2013 Google

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Mojave 6:20 58,500 ft 1,700 mph

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North Edwards

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High Key

34°53'46.15" N 117°46'00.18" W elev 2366 ft eve alt 35.

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Low Key

Mach 2 6:30 56,550 ft 1,424 mph

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Mojave 6:40 53,660 ft 1,150 mph

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7:00 47,000 ft 690 mph

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Mach 1 7:10 43,300 ft 503 mph

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"Going to jettison" ... Chase 4 (F-104B) joining up

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34°53'46.15" N 117°46'00.18" W elev 2366 ft eve alt 35

7:20 39,725 ft 418 mph

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High Key for landing 7:50 North Edwards 30,500 ft Boron 58 Boron 345 mph Len Edwards **MPB** High Key Rosamond 1 1 138 Google ea © 2013 Google Image County of San Bernardino

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Leve Key









Encore... A second video clip of landing...



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Piloting skill, by the numbers

	Planned	Actual
Powered Climb Angle	41 degrees	41.16 degrees
Unplanned: Downrange overshoot passing Edwards at Mach 3 (~2,000 mph) at 60,000 feet		
High Key:	29,000 feet at 345 mph (300 kt)	29,000 feet At 345 mph (300 kt)
Touchdown Speed	200 kt	198 kt indicated 201 kt true
Distance from ideal touchdown		50 feet

Some of Robert M. White's other X-15 records

First to break Mach 4

First to break Mach 5

First to break Mach 6

During X-15 program expansion of the flight envelope Major White and Joe Walker (NASA) routinely swapped records every week.

Usually one set a new altitude record, the other set a new speed record.

About the research pilot, USAF Major Robert M. White...

- USAF war-time flight experience: WW-II, 52 combat missions in P-51s Korea, 514th Troop Carrier wing Viet Nam, 70 combat missions
- During USAF service, earned Bachelor's degree in aeronautical engineering, Masters in business administration
- USAF test pilot and X-15 research pilot, ~ 1958-1962
- Later command positions included Air Force Flight Test Center at Edwards AFB, Director of F-15 Systems Development, Chief of Staff of Fourth Allied Tactical Air Force.

About the research pilot, USAF Major Robert M. White...

- Held rank of Major as X-15 research pilot and USAF test pilot
- Ultimate rank was 4-Star Major General
- Military Honors: AF Cross, AF Distinguished Service Medal, Silver Star with 3 bronze oak leaf clusters, Legion of Merit, Distinguished Flying Cross with 4 bronze oak leaf clusters, Bronze Star Medal, Air Medal with 3 silver & 1 bronze oak leaf clusters, AF Outstanding Unit Award with Valor device
- Civil Honors: NASA Distinguished Service Medal, 1960 Harmon International Trophy, 1961 Collier Trophy, FAI Silver Medal for altitude record

The Harmon and Collier trophies were personally presented by President John F. Kennedy.





Current news: Legislation introduced 2/26/2013 in Congress To rename NASA Dryden Flight Research Center for X-15 pilot Neil Armstrong





F-104B USAF #57-1303 / NASA 819, (N819NA) Now displayed in the Airpark at the Aerospace Museum of California, Freedom Park Drive off Watt Avenue, north end of McClellan Field

This F-104 flew as Chase 4 on X-15 the X-15 Flight 3-7-14, the flight documented In this presentation.