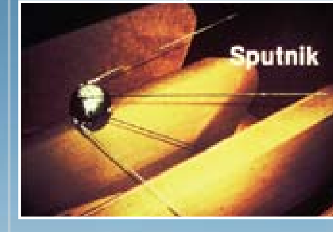
NASA AERONAUTICS: SOLVING DECADES OF AVIATION CHALLENGES

1957

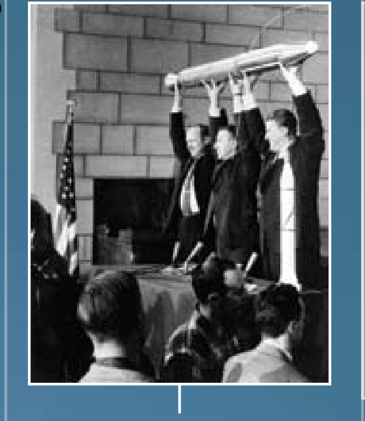
The National Advisory Committee for Aeronautics (NACA), founded in 1915, was soon to become the core of a new federal agency that took NACA's mandate to "direct and conduct research and experimentation in aeronautics, with a view to their practical solution" and expanded it to the realm of space.

October 4, 1957
The Soviet Union launched Sputnik I, the first artificial satellite to orbit Earth.



Panoramic runway photo by: Tom Bozak

1958



January 31, 1958
Explorer 1 became the first satellite launched by the United States.

March 17, 1958
The Vanguard I satellite was successfully launched into Earth orbit.

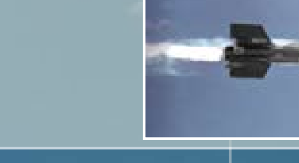
October 1, 1958
The National Aeronautics and Space Administration (NASA) was formed. The 1958 Space Act established NASA as the organization responsible for both aeronautics and astronautics.

November 6, 1958
Last flight of the Bell X-1E, the last of the X-1 series of aircraft. The X-1 was the first aircraft to exceed the speed of sound.

1959

X-15 Program ***1959–1969:*** *A revolutionary aircraft, the X-15's 199 test flights uncovered many "first's" in high-speed, high-altitude research that were also later used in the space program such as high-temperature materials, reaction control systems, and full-pressure pilot suits.*

June 8, 1959
First flight of the hypersonic X-15, a planned glide flight to 522 mph piloted by A. Scott Crossfield.



February 17, 1959
The United States launched Vanguard 2, an International Geophysical Year scientific satellite, from Cape Canaveral, FL. Vanguard produced the first photos of Earth from space.

March 3, 1959
The United States sent Pioneer 4 to the moon, successfully making the first U.S. lunar flyby.

1960

March 25, 1960
First NASA X-15 research flight by pilot Joseph A. Walker.

April 1, 1960
The United States launched TIROS 1, the first successful meteorological satellite, for monitoring Earth's weather.

August 12, 1960
NASA successfully orbited Echo 1, a 100-foot inflatable, passive communications satellite.

1961

March 7, 1961
First Mach 4 flight by pilot Robert M. White.

June 23, 1961
First Mach 5 flight by pilot Robert M. White.

November 9, 1961
First Mach 6 flight by pilot Robert M. White.

May 5, 1961
Alan Shepard became the first American to fly in space on the *Freedom 7* suborbital flight from Cape Canaveral, FL.

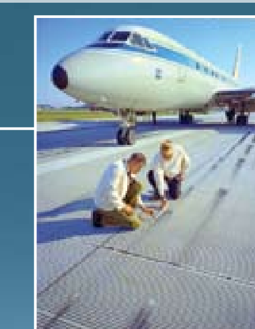
May 25, 1961
President John F. Kennedy committed the United States and NASA to landing on the moon by the end of the decade.

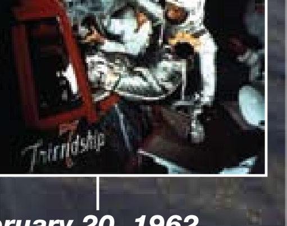
1962

June 27, 1962
Pilot Joseph A. Walker flew the X-15 to an unofficial world speed record of 4,104 mph.

July 17, 1962
Pilot Robert M. White set a Fédération Aéronautique Internationale world altitude record of 314,750 ft.

Runway Grooves
1962–1987 (approx.)
NASA developed a process for cutting transverse grooves into runways to help aircraft land safely on wet pavement. The process was adapted to U.S. highways and other types of wet surfaces.





February 20, 1962
John Glenn became the first American to orbit Earth, making three orbits in his *Friendship 7* Mercury spacecraft.

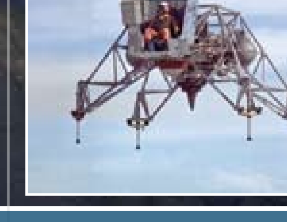
1963

August 22, 1963
Highest X-15 flight (unofficial), 354,200 ft (67+ miles) by Joseph A. Walker.

Lifting Body Vehicles Research Program
1963–1976: *The program demonstrated the low speed entry and landing characteristics of vehicles that use body shape, rather than wings, to generate lift.*

March 1, 1963
M2-F1, first flight (ground tow)

August 16, 1963
M2-F1, first air tow



1964

June 25, 1964
First flight of the X-15A-2.

October 30, 1964
The first flight of the Lunar Landing Research Vehicle, the forerunner of the Lunar Lander that was used to train the astronauts for flying the Lunar Excursion Module, was flown at NASA Dryden by Joe Walker.

1965

October 21, 1965
M2-F1, last captive flight

June 3, 1965
The second piloted Gemini mission, Gemini IV, stayed aloft for four days, and astronaut Ed White performed the first spacewalk by an American.

December 15, 1965
First rendezvous in space between Gemini 6-A and Gemini 7 for five hours of station-keeping.

1966

July 12, 1966
NASA's Milt Thompson made the first flight of the M2-F2, a heavyweight lifting body vehicle designed to demonstrate the handling characteristics of a spacecraft capable of landing on a runway.

August 16, 1966
M2-F1, last flight (air tow)

December 22, 1966
NASA's Bruce A. Peterson piloted the HL-10 lifting body on its first glide flight.

1967

October 3, 1967
An unofficial world speed record of Mach 6.7 (4,520 mph) was reached in a modified version of the X-15 by research pilot William "Pete" Knight.

May 10, 1967
M2-F2, last flight

January 27, 1967
During a simulation aboard an Apollo command module on the launch pad at Kennedy Space Center, a flash fire broke out, engulfing the capsule in flames. The three astronauts aboard—Gus Grissom, Ed White, and Roger Chaffee—died of asphyxiation.

1968

October 24, 1968
NASA pilot William H. Dana ended an era by flying the final flight in the X-15 flight research program.

Runway Grooves
1968–1972
NASA teamed with the U.S. Air Force and FAA to conduct the first tests of pavement grooving using an F-4 fighter, a Convair 990 jet transport, and a Beech Queen Air twin-propeller aircraft.

October 23, 1968
First rocket-powered flight of the HL-10, flown by Air Force Major Jerauld R. Gentry.

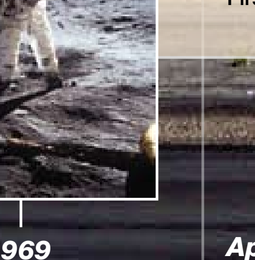
December 21, 1968
Apollo 8 launched atop the Saturn V booster from Kennedy Space Center with three astronauts aboard–Frank Borman, James A. Lovell, Jr., and William A. Anders. On Christmas Eve, the crew read from the book of Genesis.

1969

Wake Vortex Research
1969-1980
NASA conducted research and test flights on the dangerous wakes of turbulent air that trail behind every aircraft (wing-tip vortices). Resulting data helped the Federal Aviation Administration (FAA) establish safe separation distances between aircraft during takeoffs, landings and cruise flight.

April 17, 1969
First X-24A glide flight, by pilot Jerauld R. Gentry.

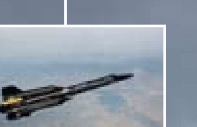
May 9, 1969
NASA pilot John A. Manke made the first supersonic flight of a wingless lifting body when he reached a top speed of 744 mph.



July 20, 1969
Apollo 11 became the first mission to land people on the moon. Astronauts Neil Armstrong and Buzz Aldrin walked on its surface while Michael Collins orbited overhead in the Apollo command module.

1970

March 3, 1970
NASA researchers began flight tests of the triplesonic YF-12 aircraft to investigate the effects of sustained high-speed flight.



February 18, 1970
First max speed of 1,228 mph on the HL-10

February 27, 1970
First max altitude of 90,303 ft. on the HL-10

June 2, 1970
First M2-F3 glide flight

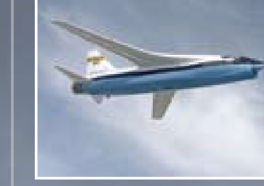
July 17, 1970
HL-10, last flight

November 25, 1970
First M2-F3 powered flight

April 11-17, 1970
Fifty-six hours into the flight of Apollo 13, the oxygen tank in the service module ruptured and damaged several of the power, electrical, and life support systems. All crew members returned safely to Earth.

1971

March 9, 1971
NASA research pilot Thomas McMurtry completed the first flight of an F-8A modified with a new wing called the supercritical airfoil. Work on the airfoil design concept began in the 1960s under NASA chief scientist Richard Whitcomb.



June 4, 1971
X-24A, last flight

August 25, 1971
First M2-F3 supersonic flight

July 26, 1971
Apollo 15 made the first use of a Lunar Roving Vehicle on the moon.

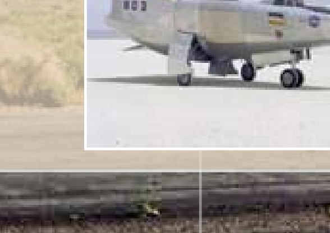
1972

April 1972
NASA published fundamental papers introducing the concept of 4-dimensional trajectories (three spatial dimensions plus time), which today are a basis for air traffic guidance in the NextGen.

Advanced Supersonic Technology (AST)/Supersonic Cruise Research (SCR) Project ***1972–1982:*** *This research effort tackled the technical and environmental challenges of making a viable, advanced commercial supersonic transport. The program resulted in technology of value to the subsonic transport industry such as new aerodynamic design modeling tools.*

May 25, 1972
NASA research pilot Gary Krier flew an F-8C modified with an all-electric, digital fly-by-wire (DFBW) control system, a prototype of the flight control system used today on some aircraft and on the space shuttle.

December 20, 1972
M2-F3, last flight



December 7-19, 1972
Apollo 17 was the last of the six Apollo missions to the moon. The astronaut crew included Eugene A. Cernan, Ronald A. Evans and Dr. Harrison H. Jack Schmitt, a geologist.

1973

November 1, 1973
First flight of supercritical wing on F-III variable sweep wing aircraft.

August 1, 1973
First X-24B glide flight

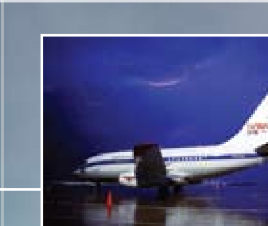
November 15, 1973
First X-24B powered flight

May 14, 1973
Skylab, an orbital space platform, was launched. Skylab became home to three crews during 1973–74 for periods of 28, 59 and 84 days.

1974

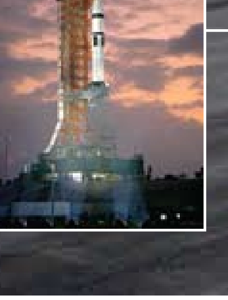
Quiet Short-Haul Research Aircraft (QSRA) Project ***1974-1981:*** *Developed and demonstrated technologies necessary to support short-takeoff and landing (STOL), and high-lift cargo aircraft. These technologies were employed on the C-17 Globemaster III.*

June 7, 1974
First flight of the NASA Boeing 737 Transport Systems Research Vehicle, which conducted thousands of flight hours of research for more than 20 different projects from wind shear detection to noise studies to runway friction.

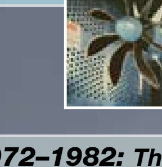


March 5, 1974
First X-24B supersonic flight

October 25, 1974
Fastest lifting body flight (Mach 1.76, 1164 mph) in an X-24B



1975

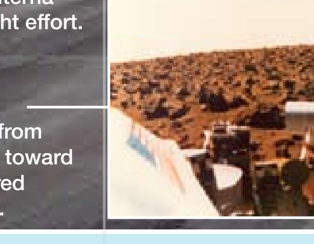


The Aircraft Energy Efficiency (ACEE) Program ***1975–1986:*** *This program stimulated wide application of lighter and more durable composite materials to secondary and primary structures on civil aircraft.*

November 26, 1975
X-24B, last flight for the Lifting Body Vehicles Research Program

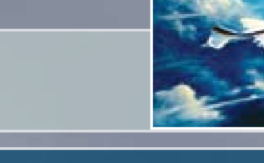
July 15–24, 1975
At the height of the Cold War, the Apollo-Soyuz Test Project became the first joint international human space flight effort.

August 20, 1975
Viking 1 was launched from Kennedy Space Center toward Mars. It landed on the red planet on July 20, 1976.



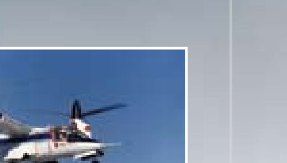
1976

Advanced Turboprop Project ***1976-1987:*** *After the energy crisis of the early '70s, NASA initiated research into a unique "swirled" design for propellers used on propeller-powered aircraft to reduce noise and increase fuel efficiency.*



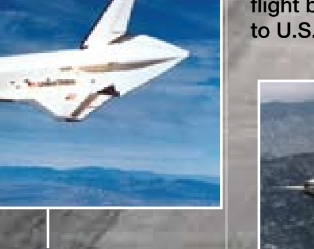
Energy Efficient Engines Project ***1976–1984:*** *Managed at NASA's Glenn Research Center, this project proved that a 15 percent reduction in fuel consumption could be made relative to the best commercial aircraft engines in service at the time. Research enabled industry's development of the more fuel-efficient high-bypass GE90 turbofan jet engine, which powers the intercontinental Boeing 777.*

XV-15 Tilt Rotor
October 22, 1976
After decades of research and wind tunnel testing into technologies to make vertical takeoff and landing (VTOL) possible, NASA and Bell Aircraft rolled out the experimental XV-15 tilt rotor aircraft. Successful flights of the XV-15 led to Department of Defense approval in 1986 to produce the V-22 Osprey.



1977

May 3, 1977
First hover and low-speed flight of the XV-15.



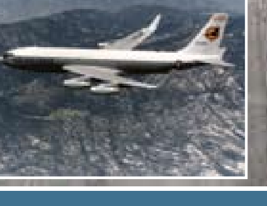
August 12, 1977
First free flight of Enterprise

1978

Storm Hazards Program *1978–1986: This program conducted extensive research and flight tests to identify conditions that cause lightning strikes. Results informed new design guidelines used in aircraft and flight operations to protect critical digital systems.*

July 6, 1978
First flight of QSRA at Boeing Field, Seattle, WA.

September 28, 1978
Last NASA YF-12 research flight before returning aircraft to U.S. Air Force.



1979

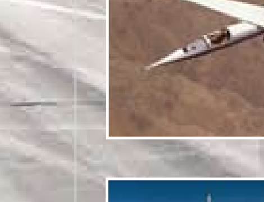
Highly Maneuverable Aircraft Technology (HIMAT) ***1979–1983:*** *HiMAT was installed for the first time on an unpiloted subscale flight test vehicle to validate use on future fighter aircraft. HiMAT's extensive use of composites, winglets and canards was adapted for other aircraft.*

July 27, 1979
The HiMAT remotely piloted vehicle completed its first flight.

July 24, 1979
First full in-flight conversion from helicopter-to-airplane mode with the XV-15.

Oblique Wing Program ***1979–1982:*** *The wing of this unique research aircraft could be pivoted up to 60 degrees to the fuselage to decrease drag and increase speed and range. The AD-1 was flown 79 times to evaluate the pivot-wing concept and collect data on handling qualities.*

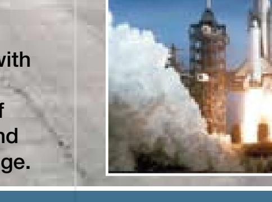
December 21, 1979
First flight of the AD-1



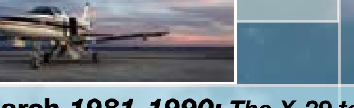
July 24, 1979
Research pilot Thomas McMurty flew a KC-135A Stratotanker jet outfitted with winglets, proving that the vertical tips on the ends of the wings reduced drag and improved the aircraft's range.

1980

July 10, 1980
QSRA began sea carrier trials on the USS Kitty Hawk without catapult launch or landing arresting gear.



1981



Forward Swept Wing Research ***1981-1990:*** *The X-29 test vehicle demonstrated forward swept wing technology and provided data on aeroelastic tailoring, active controls, and canard effects.*

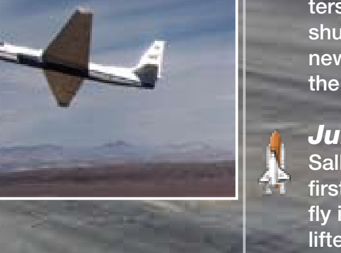
June 12, 1981
First operational flight of the Lockheed ER-2 high-altitude aircraft used for atmospheric research, observation and mapping missions.

April 12, 1981
Astronauts John W. Young and Robert L. Crippen flew Space Shuttle *Columbia* on the first flight of the Space Transportation System (STS-1).

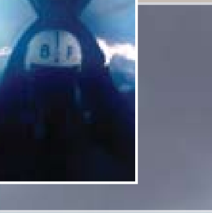
1982

May 11, 1982
First supersonic flight of HiMAT, Aircraft Number 1.

August 7, 1982
AD-1, last flight

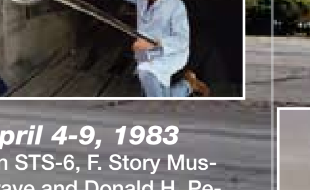


1983



January 11, 1983
Last of 26 flights made of the HiMat test vehicle.

December 6, 1983
Ribbon-cutting ceremonies were held for the new National Transonic Facility (NTF), the first NASA wind tunnel equipped for scale model testing in actual flight conditions.

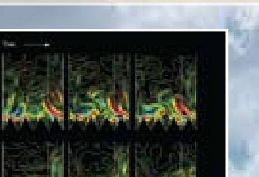


April 4-9, 1983
On STS-6, F. Story Musgrave and Donald H. Peterson conducted the first shuttle spacewalk to test new spacesuits and work in the cargo bay.

June 18-24, 1983
Sally K. Ride became the first American woman to fly in space when STS-7 lifted off on June 18, 1983, another early milestone of the shuttle program.

1984

December 14, 1984
The X-29 took its first test flight.



1984
Riblets, or small V-shaped grooves, were discovered to reduce aerodynamic drag. This technology has been used on many aircraft and sailing vessels.

December 1, 1984
NASA and the FAA conducted the Controlled Impact Demonstration using a remotely-controlled Boeing 720 aircraft to test an anti-misting fuel for suppressing post-crash fire.

	1958	1959	1960	1961	1962	1963	1964	1965	1966
U.S. President	Dwight D. Eisenhower January 20, 1953 – January 19, 1961			John F. Kennedy January 20, 1961 – November 22, 1963		Lyndon B. Johnson November 22, 1963 – January 19, 1969			
NASA Administrator	Dr. T. Keith Glennan August 19, 1958 – January 20, 1961			James E. Webb February 14, 1961 – October 7, 1968					
Price of Gas	$0.30	$0.31	$0.31	$0.31	$0.31	$0.30	$0.30	$0.31	$0.32
Collier Trophy	USAF and the industry team of Lockheed and General Electric for development of the F-104	USAF and the Convair Div. of General Dynamics for creation and operation of the Atlas ICBM	Vice Adm. William F Raborn for directing creation of the Polaris fleet ballistic missile system	X-15 test pilots for invaluable technological contributions to the advancement of flight	The seven Mercury astronauts for pioneering manned American spaceflight	Clarence "Kelly" Johnson for designing and directing development of the Mach 3 Lockheed A-11	Gen. Curtis LeMay for great achievements with respect to air vehicles and national defense	The Gemini Program teams for significantly advancing the human spaceflight experience	James McDonnell for leadership and perseverance in advancing aeronautics and astronautics
Sports Illustrated Sportsperson of the Year	Rafer Johnson	Ingemar Johansson	Arnold Palmer	Jerry Lucas	Terry Baker	Pete Rozelle	Ken Venturi	Sandy Koufax	Jim Ryun
Time Magazine Person of the Year	Charles de Gaulle	Dwight Eisenhower	U.S. Scientists	John F. Kennedy	Pope John XXIII	Martin Luther King, Jr.	Lyndon B. Johnson	William Westmoreland	The Generation Twenty-Five & Under
Academy Award for Best Picture	Gigi	Ben-Hur	The Apartment	West Side Story	Lawrence of Arabia	Tom Jones	My Fair Lady	The Sound of Music	A Man for All Seasons

	1967	1968	1969	1970	1971	1972	1973	1974	1975
U.S. President			Richard M. Nixon January 20, 1969 – August 9, 1974					Gerald R. Ford August 9, 1974 – January 19, 1977	
NASA Administrator			Dr. Thomas O. Paine March 21, 1969 – September 15, 1970		Dr. James C. Fletcher April 27, 1971 – May 1, 1977				
Price of Gas	$0.33	$0.34	$0.35	$0.36	$0.36	$0.36	$0.39	$0.53	$0.57
Collier Trophy	Hughes Aircraft Surveyor Program team and the Jet Propulsion Lab for aiding lunar exploration	The Apollo 8 crew for flawless execution of the first manned lunar orbit	Neil Armstrong, Edwin "Buzz" Aldrin and Michael Collins for the epic flight of Apollo 11	Boeing, Pratt & Whitney and Pan American Airways for pioneering the Boeing 747	The Apollo 15 crew and NASA's Robert Gilruth for most ambitious science lunar mission	The personnel of the 7th and 8th Air Forces and Task Force 77 during Operation Linebacker II	NASA's Skylab Program, with recognition to director William Schneider and its three astronaut crews	John Clark (NASA) and Daniel Fink for the Earth Resources Technology Satellite Program (LANDSAT)	General Dynamics and the USAF F-16 team for advancements leading to effective fighter aircraft
Sports Illustrated Sportsperson of the Year	Carl Yastrzemski	Bill Russell	Tom Seaver	Bobby Orr	Lee Trevino	Billie Jean King / John Wooden	Jackie Stewart	Muhammad Ali	Pete Rose
Time Magazine Person of the Year	Lyndon B. Johnson	The Apollo 8 Astronauts	The Middle Americans	Willy Brandt	Richard Nixon	Henry Kissinger / Richard Nixon	John Sirica	King Faisal	American Women
Academy Award for Best Picture	In the Heat of the Night	Oliver!	Midnight Cowboy	Patton	The French Connection	The Godfather	The Sting	The Godfather Part II	One Flew Over the Cuckoo's Nest

	1976	1977	1978	1979	1980	1981	1982	1983	1984
U.S. President		Jimmy Carter January 20, 1977 – January 19,1981				Ronald Reagan January 20, 1981 – January 19, 1989			
NASA Administrator		Dr. Robert A. Frosch June 21, 1977 – January 20, 1981				James M. Beggs July 10, 1981 – December 4, 1985			
Price of Gas	$0.61	$0.67	$0.63	$0.90	$1.25	$1.38	$1.30	$1.24	$1.21
Collier Trophy	USAF, the B-1 Industry Team and Rockwell Intl. Corp. for B-1 bomber design and development	Gen. Robert Dixon and the USAF TAC for developing and implementing flight-training programs	Williams Research Corp. for concept and development of a turbofan to power cruise missiles	Paul MacCready and pilot Bryan Allen for design, construction and flight of the Gossamer Condor	NASA's Voyager Mission team for a spectacular fly-by of and return from Saturn	NASA, Rockwell, Martin Marietta, Thiokol and the Space Shuttle *Columbia* crew	T. A. Wilson and Boeing Co. for development of the 757 and 767 airliners	The Army and Hughes Helicopters Inc. for development of AH-64A Apache helicopter weapons	NASA and Martin Marietta for development of manned maneuvering units to rescue satellites
Sports Illustrated Sportsperson of the Year	Chris Evert	Steve Cauthen	Jack Nicklaus	Terry Bradshaw / Willie Stargell	U.S. Olympic Hockey Team	Sugar Ray Leonard	Wayne Gretzky	Mary Decker	Ed Moses / Mary Lou Retton
Time Magazine Person of the Year	Jimmy Carter	Anwar Sadat	Deng Xiaoping	Ayatollah Khomeini	Ronald Reagan	Lech Walesa	The Computer	Ronald Reagan / Yuri Andropov	Peter Ueberroth
Academy Award for Best Picture	Rocky	Annie Hall	The Deer Hunter	Kramer vs. Kramer	Ordinary People	Chariots of Fire	Gandhi	Terms of Endearment	Amadeus