

## Clarence Johnson



Kelly Johnson participated in the design of the [Lockheed L-10 Electra](#), testing a model of the design in the [wind tunnel](#) of the [University of Michigan](#).

**Clarence Leonard "Kelly" Johnson** ([February 27, 1910](#) – [December 21, 1990](#)) was an [aircraft engineer](#) and [aeronautical](#) innovator. As a member and first team leader of the [Lockheed Skunk Works](#), Johnson worked for more than four decades and is said to have been an 'organizing genius.'<sup>[1]</sup> He played a leading role in the design of over forty aircraft including several that were honored with the prestigious [Collier Trophy](#). Johnson acquired a reputation as one of the most talented and prolific aircraft design engineers of the 20th century. In 2003, as part of its commemoration of the 100th anniversary of the Wright Brothers' flight, [Aviation Week & Space Technology](#) ranked Johnson 8th on its list of the top 100 "most important, most interesting, and most influential people" in the first century of aerospace.<sup>[2]</sup>

### Life

Born to immigrant Swedish parents in the remote mining town of [Ishpeming, Michigan](#), Johnson was a mere 13 when he won a prize for his first aircraft design. He worked his way through school, first at Flint Junior College, and then at the [University of Michigan](#) at Ann Arbor. While attending grad school at Michigan, he was ridiculed for his name, Clarence. Some boys started calling him "Clara". One morning while waiting in line to get into a classroom, one boy started with the normal routine of calling him "Clara". Johnson tripped the boy so hard he broke his leg. The boys then decided that he wasn't a "Clara" and started calling him "Kelly". The nickname came from the popular song at the time, "Kelly With the Green Neck Tie". Henceforth he was always known as "Kelly" Johnson.

Johnson married Althea Louise Young in [1937](#), who died in December [1969](#). In May [1971](#), he married Mary Ellen Elberta Meade of New York, who died on [October 13, 1980](#), at 38 years of age. He married Nancy Powers Horrigan in November [1980](#).

His [autobiography](#), titled *Kelly: More Than My Share of it All*, [ISBN 0-87474-491-1](#), was published in [1985](#).

Johnson died at the age of 80 at St Joseph Medical Center, after an illness that lasted for several years. He is buried at [Forest Lawn Cemetery](#), [Los Angeles](#), [California](#).

## Lockheed career

At Michigan, he conducted a wind tunnel test of [Lockheed's](#) proposed twin-engined [Lockheed L-10 Electra](#) airliner. He found that the aircraft did not have adequate directional stability, and proposed adding a "H" tail to address the problem. Lockheed accepted his suggestion and the L-10 went on to be a success. This brought Johnson to the attention of Lockheed management. Upon completing his master's degree in [1933](#), Johnson joined the Lockheed Company as a tool designer at a salary of \$83 a month. After assignments as flight test engineer, stress analyst, aerodynamicist, and weight engineer, he became chief research engineer in [1938](#). In [1952](#), he was appointed chief engineer of Lockheed's [Burbank, California](#) plant, which later became the Lockheed-California Company. In [1956](#) he became Vice President of Research and Development.

Johnson became Vice President of Advanced Development Projects (ADP) in [1958](#). The first ADP offices were nearly uninhabitable; the stench from a nearby plastic factory was so vile one of the engineers began answering the phone "skonk works!" (Big Barnsmell's Skonk Works – spelled with an "o" – was where Kickapoo Joy Juice was brewed in the comic strip [L'il Abner](#) by [Al Capp](#).) Here the [F-104 Starfighter](#), and the secret reconnaissance planes, the [U-2](#) and the [SR-71 Blackbird](#), were developed.

He served on Lockheed's board of directors from [1964](#) to [1980](#), becoming a senior vice president in [1969](#). He officially retired from Lockheed in [1975](#) and was succeeded by [Ben Rich](#), but continued as a consultant at the [Skunk Works](#). In June [1983](#), the Lockheed Rye Canyon Research facility was renamed Kelly Johnson Research and Development Center, Lockheed-California Company, in honor of Johnson's 50 years of service to the company.

## Aircraft contributions

While at Lockheed, Johnson designed the [P-38 Lightning](#) fighter, made [fowler flaps](#) work on the [L-14 Super Electra](#), and played a major role in converting the type into the [Royal Air Force's](#) [Lockheed Hudson](#) on short notice in [1938](#). He worked on the development of the [Constellation](#) for [Howard Hughes' TWA](#).

Johnson contributed to the design of the following Lockheed aircraft:



Kelly Johnson with an early variant of the U-2.

- [Orion 9D](#)
- [Model 10](#)
- [Model 12 Electra/XC-35/C-36/Y1C-37](#)
- [Model 14 Super Electra](#)
- [Model 18 Lodestar](#)
- [Model 22](#)
- [PV-1 Ventura/B-37](#)
- [P-38 Lightning](#)
- [Constellation/Super Constellation](#)
- [F-80 Shooting Star](#), the first successful American jet fighter;
- [T-33/TV-2](#) trainers
- [P2V Neptune](#)
- [XF-90](#)
- [F-94 Starfire](#)
- [X-7](#)
- [F-104 Starfighter](#)
- [C-130 Hercules](#)
- [U-2](#)
- Blackbird family: [A-12](#), [YF-12](#), [SR-71](#), [M-21](#), and [D-21](#)
- [JetStar/C-140](#)
- [AH-56 Cheyenne](#)

See also: [List of Lockheed aircraft](#)

## Kelly Johnson's 14 Rules of Management

Johnson's famed 'down-to-brass-tacks' management style was summed up by his motto, "Be quick, be quiet, and be on time." He ran [Skunk Works](#) by the [Kelly's 14 Rules](#)

1. The Skunk Works manager must be delegated practically complete control of his program in all aspects. He should report to a division president or higher.
2. Strong but small project offices must be provided both by the military and industry.
3. The number of people having any connection with the project must be restricted in an almost vicious manner. Use a small number of good people (10% to 25% compared to the so-called normal systems).
4. A very simple drawing and drawing release system with great flexibility for making changes must be provided.
5. There must be a minimum number of reports required, but important work must be recorded thoroughly.
6. There must be a monthly cost review covering not only what has been spent and committed but also projected costs to the conclusion of the program. Don't have the books 90 days late, and don't surprise the customer with sudden overruns.
7. The contractor must be delegated and must assume more than normal responsibility to get good vendor bids for subcontract on the project. Commercial bid procedures are very often better than military ones.
8. The inspection system as currently used by the Skunk Works, which has been approved by both the Air Force and Navy, meets the intent of existing military requirements and should be used on new projects. Push more basic inspection responsibility back to subcontractors and vendors. Don't duplicate so much inspection.

9. The contractor must be delegated the authority to test his final product in flight. He can and must test it in the initial stages. If he doesn't, he rapidly loses his competency to design other vehicles.
10. The specifications applying to the hardware must be agreed to well in advance of contracting. The Skunk Works practice of having a specification section stating clearly which important military specification items will not knowingly be complied with and reasons therefore is highly recommended.
11. Funding a program must be timely so that the contractor doesn't have to keep running to the bank to support government projects.
12. There must be mutual trust between the military project organization and the contractor with very close cooperation and liaison on a day-to-day basis. This cuts down misunderstanding and correspondence to an absolute minimum.
13. Access by outsiders to the project and its personnel must be strictly controlled by appropriate security measures.
14. Because only a few people will be used in engineering and most other areas, ways must be provided to reward good performance by pay not based on the number of personnel supervised.
15. (Unspoken rule) Never, ever, make a contract with the Navy.

## Honors and Awards

- [1932](#) (September) Sheehan Fellowship in Aeronautics, at the University of Michigan.
- [1937](#) Lawrence Sperry Award, Presented by the Institute of Aeronautical Sciences for "Important improvements of aeronautical design of high speed commercial aircraft."
- [1940](#) The [Wright Brothers Medal](#), presented by [SAE](#) for "Rudder control problems on four-engined airplanes."
- [1956](#) The Sylvanus Albert Reed Award, presented by the Institute of Aeronautical Sciences, for "Design and rapid development of high performance subsonic and supersonic aircraft."
- [1956](#) Elected Aviation Man of the Year by a group of Aviation writers and editors appointed by the Airlines Activities Committee, representing 7,000 airline employees.
- [1958](#) Elected Distinguished Member of the Jet Pioneers Association of U.S.A.
- [1959](#) Co-Recipient of the Collier Trophy as designer of the airframe of the F-104 Starfighter, sharing the honor with General Electric (engine) and U.S. Air Force (Flight Records). The F-104 was designated the previous year's "Greatest achievement in aviation in America."
- [1960](#) The General Hap Arnold Gold Medal, presented by the Veterans of Foreign Wars for "Design of the U-2 high altitude research plane."
- [1961](#) Chosen as one of 50 outstanding Americans of meritorious performance in the fields of endeavor, to be honored as a Guest of Honor to the first annual banquet of the Golden Plate. Honor was awarded by vote of the National Panel of Distinguished Americans of the Academy of Achievement of Monterey, California.
- [1963](#) The [Theodore von Karman](#) Award, presented by the Air Force Association for "Designing and directing development of the U-2, thus providing the Free World with one of it's most valuable instruments in the defense of freedom."
- [1963](#) Elected an Honorary Member of the Aerospace Medical Association, in appreciation of his sincere and effective interest and activities in behalf of their work.
- [1964](#) The Medal of Freedom, presented by President Lyndon B. Johnson in ceremonies at the White House. The highest civil honor the President can bestow, this recognizes "Significant contributions to the quality of American life." Johnson was cited for his advancement of aeronautics.
- [1964](#) The Award of Achievement, presented by the national Aviation club of Washington D.C., for "Outstanding achievement in airplane design and development over many years, including

such models as the Constellation, [P-80](#), [F-104](#), [JetStar](#), the [U-2](#), and climaxed by the metallurgical and performance breakthroughs of the A-11 (YF-12A).

- [1964](#) The Collier Trophy (his second), following his work on the [YF-12](#) Interceptor, capable of flying at more than 2,000 mph. His achievement for the previous year was called the greatest in American aviation.
- [1964](#) The [Theodore von Karman](#) Award (his second), presented by the Air force Association for his work with the A-11 ([YF-12A](#)) Interceptor.
- [1964](#) Honorary degree of Doctor of Engineering, [University of Michigan](#).
- [1964](#) Honorary degree of Doctor of Science, [University of Southern California](#).
- [1965](#) Honorary degree of Doctor of Laws, [University of California at Los Angeles](#).
- [1965](#) San Fernando Valley Engineer of the Year, so designated by the San Fernando, California, Valley Engineers Council.
- [1965](#) Elected a Member of the National Academy of Engineering.
- [1965](#) Elected a Member of the [National Academy of Sciences](#).
- [1965](#) Selected as one of the first 20 men to be included in the International Aerospace Hall of Fame in San Diego, California.
- [1966](#) The Sylvanus Albert Reed Award (his second) given by the American Institute of Aeronautics and Astronautics "In recognition of notable contributions to the aerospace sciences resulting from experimental or theoretical investigations."
- [1966](#) National Medal of Science, presented by President [Lyndon Johnson](#) at the White House.
- [1966](#) The Thomas D. White National Defense Award, presented by the U.S. Air Force Academy in Colorado Springs, Colorado, in recognition of "Your great contributions to the national defense and security of the United States. "
- [1967](#) Elected Honorary Fellow of American Institute of Aeronautics and Astronautics.
- [1968](#) Elected a Fellow of the Royal Aeronautical Society.
- [1969](#) The General William Mitchell Memorial Award, presented by the Aviators Post #743 of the American Legion.
- [1970](#) Awarded the Spirit of St. Louis Medal by the American Society of Mechanical Engineers.
- [1970](#) On behalf of Lockheed's Advanced Development Projects facility, which he directed until his retirement in 1975, accepted the first annual Engineering Materials Achievements Award of the American Society for Metals.
- [1970](#) The Engineering Merit Award-Presented by the Institute for the Advancement of Engineering, Beverly Hills, California.
- [1970](#) Honored by the Air Force Association, Washington D.C., for design of the [P-38 Lightning](#).
- [1971](#) Awarded the Sixth Annual Founders Medal by the National Academy of Engineering (NAE) at the Statler-Hilton Hotel, Washington D.C.. in recognition of his fundamental contributions to engineering.
- [1972](#) Awarded the Silver Knight Award by the Lockheed Management Club of California at the Hollywood Palladium for his contributions to Lockheed's success.
- [1973](#) Awarded the first "Clarence L. Johnson Award" by The Society of Flight Test Engineers In Las Vegas, Nevada, for his contributions to aviation and flight test engineering.
- [1973](#) Civilian Kitty Hawk Memorial Award by Los Angeles Area Chamber of Commerce for his outstanding contributions in the field of aviation.
- [1974](#) Air Force Exceptional Service Award for his many outstanding contributions to the United States Air Force. Presented by the Secretary of the Air force, John McLucas.
- [1974](#) Enshrined in the Aviation Hall of Fame in Dayton, Ohio for his outstanding contributions to aviation.
- [1975](#) Awarded the Central Intelligence Agency's Distinguished Intelligence Medal for his work on reconnaissance systems.
- [1975](#) Awarded the Wright Brothers Memorial Trophy for his vital and enduring contributions over a period of 40 years to the design and development of military and commercial aircraft.



- [1978](#) The American Institute of Aeronautics and Astronautics presented "A Salute to Kelly Johnson" night.
- [1980](#) Awarded the Bernt Balchen Trophy, the highest award of the New York State Air Force Association. The trophy is presented annually to "An individual of national prominence whose contribution to the field of aviation has been unique, extensive or of great significance." It followed announcement of the A-12.
- [1981](#) Presented the Department of Defense Medal for Distinguished Public Service. Presented by Harold Brown.
- [1981](#) Honored by the Society of Automotive Engineers (SAE) for his ability to motivate a small staff to work within a tight time frame and budget in creating revolutionary aircraft design.
- [1981](#) The U.S. Air Force creates the "Kelly Johnson Blackbird Achievement Trophy" to recognize the individual or group who has made the most significant contribution to the U-2, SR-71 or the TR-1 Program since the previous annual reunion.
- [1981](#) The Daniel Guggenheim Medal, "For his brilliant design of a wide range of pace-setting, commercial, combat and reconnaissance aircraft, and for his innovative management techniques which developed these aircraft in record time at minimum cost."
- [1982](#) The Meritorious Service to Aviation Award from National Business Aircraft Association, recognizing design of more than 40 aircraft, including the world's first business jet, the JetStar.
- [1983](#) The Aero Club of Southern California presented the [Howard Hughes](#) Memorial Award for 1982 to C. L. "Kelly" Johnson as a leader in aviation. The recipient must have devoted a major portion of his life to the pursuit of aviation as a science and as an art. Engraved on the medal was the sentence: "His vision formed the concept, His courage forged the reality".
- [1983](#) The National Security Medal was presented by President [Ronald Reagan](#) to Clarence L. Johnson for "Exceptional meritorious service performed in a position of high responsibility and have made an outstanding contribution to the National Security of the Nation".
- [1984](#) Honorary Royal Designer for Industry (HonRDI), in recognition of achievements in aircraft design, conferred by the Royal Society for the encouragement of the Arts, Manufacturers, and Commerce, London.

## References

1. [^](#) Bennis, Warren and Patricia Ward Biederman. *Organizing Genius: The Secrets of Creative Collaboration*. Perseus Books, 1997.
  2. [^](#) <http://www.spaceref.com/news/viewpr.html?pid=11860>
- <http://www.spaceref.com/news/viewpr.html?pid=11860>.
  - [Lockheed Martin Corporation, How the Skunk Works got its name.](#)
  - [Lockheed Martin Corporation, P-38 Lightning.](#)
  - [Lockheed Martin Corporation, Kelly's 14 Rules.](#)
  - [Lockheed Martin Corporation, The Skunk Works Today.](#)
  - [Lockheed Martin Corporation, Collier Trophy.](#)

## Memberships

- Honorary fellow of the [American Institute of Aeronautics and Astronautics](#)
- Fellow of the [Royal Aeronautical Society](#)

- Member of the [Society of Automotive Engineers](#)
- [Tau Beta Pi](#) and [Sigma Xi](#) engineering fraternities.

### Further reading

- Johnson, Clarence L. "Kelly", and Maggie Smith, 1985. *Kelly: More Than My Share of It All*. Smithsonian Institution Press, [ISBN 0-87474-564-0](#)
- Rich, Ben, and Leo Janos, 1996. *Skunk Works*. Little, Brown & Company, [ISBN 0-316-74300-3](#)

### External links

- [Clarence Leonard \(Kelly\) Johnson.](#)
- [Kelly Johnson's rules](#) for Skunkworks aircraft.
- "[Lord of the Skunk Works.](#)" from *Air Force Magazine*.
- [Clarence Johnson](#) on Find-A-Grave.