The Boeing KC-135 *Stratotanker* at 50

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An early photo of Boeing KC-135A Stratotanker*, 55-3118, the first of the line, shown here refueling a Boeing B-52C-50-BO, 54-2676. Boeing used the B-52C as a test aircraft until it crashed during a test flight on March 29, 1957. (Boeing Aircraft photo from Paul Minert collection)*

Fifty years ago, on August 31, 1956, the first KC-135A *Stratotanker* took off from Renton Airport near Seattle, Washington. This was the first aircraft specifically designed to fulfill the aerial refueling role. Few military aircraft production programs undertaken since the end of WWII can compare with the KC-135 in size, speed of execution, cost effectiveness, and operational success.

PROGENITORS

Aerial refueling has become a major national asset over the past 60 years. Yes, there were fledgling attempts at transferring fuel in flight during the 1930s. General Curtis E. LeMay was a major proponent of air refueling and assigned some of his most dedicated generals to be advocates for the program. While Tactical Air Command (TAC) and the Navy and Marines preferred a probe and drogue method of refueling, LeMay wanted the boom to provide the high off-load capability that was so necessary for the successful operation of his large aircraft.

The most successful early program was the hose system that was real Rube Goldberg. Designed by the British company Flight Refueling, Limited, the system called for the receiver to fly high and the tanker to fly low in formation. This system was retrofitted on 92 *Superfortresses* that were redesignated KB-29Ms, while the receivers became B-29MRs. Both aircraft would reel out a cable, one with a steel ball at the end, and the other with a grapnel hook. Then the tanker would slide-slip beneath the receiver and the two cables would cross. The grapnel moved along the other cable until it engaged the ball. Now the fun began. The receiver would begin reeling in the cables, and the tanker would climb above the receiver. The cable from the tanker had a refueling fitting attached to a hose that was drawn out of the tanker and hauled into the receiver. Now one of the scanners aboard the receiver would attach the hose fitting to a boss in the aircraft's air refueling system plumbing. Fuel was transferred, the hose was released, and reeled back into the tanker. During the early days, the landscape in the western United States was strewn with various pieces of aerial plumbing. In addition, many a scanner had his brogans filled with 135/150 aviation gasoline as the hose sprayed the waist of the receiver. A better method was needed.

Next came the Boeing-designed flying boom system that was retrofitted on 116 *Superfortress* that were redesignated KB-29Ps. The telescoping boom was attached to a hinge fitting on the aft portion of the fuselage and the boom was plumbed into the KB-29Ps refueling system. The boom had a pair of ruddevators mounted to the aft end of the fixed portion of the

Boeing designed the flying boom, as seen here on a KB-29P. The boom was plumbed into the tanker's fuel system. It had a telescoping end and ruddevators to permit the boom operator, in the former tail gunner's station, to guide the nozzle into the refueling receptacle on the receiver. (Boeing P12881 from author's collection)

boom. These ruddevators controlled the flight of the boom, allowing the boom operator, in the former tail gunner's station, to fly the boom into the receptacle installed on the receiver. The telescoping end of the boom had a nozzle installed on the end. In addition, a set of five director lights was mounted along the belly of the tanker to help guide the receiver into position. Once in position, the receiver held steady while the boom operator controlled the refueling.

MAJOR MILESTONES

The major milestones for Boeing's prototype jet transport and its successful production KC-135 (Model 717) and Model 707 are shown below:

Rollout

367-80	May 14, 1954
KC-135 (717)	July 18, 1956
Model 707	July 28, 1957

First Flight

367-80	June 15, 1954
KC-135 (717)	August 31, 1956
Model 707	December 20, 1957

First Delivery

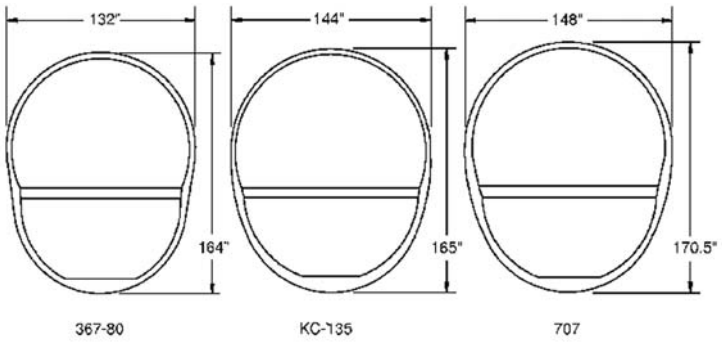
367-80	None
KC-135 (717)	April 30, 1957
Model 707	August 15, 1958

DESIGN

Boeing had a large, double-lobed transport, known as the C-97 *Stratofreighter*. After just over 100 of these aircraft were built, Boeing introduced the KC-97A that incorporated the refueling boom from the KB-29P. Now the boom was attached to a removable boom pod that could replace the clamshell doors on the cargo plane. Additional fuel tanks were installed in the fuselage. Follow-on tankers were the KC-97E, KC-97F, and KC-97G. Of the 888 C-97s produced, 778 were built as tankers. The KC-97s worked well with the B-29s and B-50s in Strategic Air Command's (SAC) inventory at the time, because the aircraft had comparable performance. However, the KC-97 was designed to support SAC's new all-jet B-47 *Stratojets*. This was a completely new ball game. The jet bombers had to descend from their optimum operating altitudes to an altitude that was compatible with the KC-97s. But, there was also a speed difference with which crews had to deal. The bomber was flying just above the stall, while the tanker was at maximum power. As fuel was transferred, the bomber got heavier and had to fly faster to stay in the sky. The redeeming feature was that the ever-lightening tanker could fly faster in a shallow dive. This maneuver was known as a toboggan. While doable, under conditions of weather or darkness, this method of refueling became increasingly more difficult. There were a number of instances of under-runs, bent and broken booms, etc. A better method was obviously needed.

The Boeing designation for the C/KC-97 series of aircraft was the Model 367. In a $16M gamble, Boeing set out to redesign the Model 367 tanker. They transformed a straight-winged, piston-powered aircraft into a swept-wing, jet-powered aircraft. This prototype was known as the "Dash 80," for the eightieth design iteration of the basic model 367. After initial testing, Boeing installed the refueling boom and pod on the -80 and conducted its own air refueling tests. The Air Force was so impressed with the design, that they ordered a small number of tankers, sight unseen. However, the Air Force asked that the fuselage diameter be increased by one foot. The new aircraft had the Boeing designation of Model 717 and the Air Force designation of KC-135A.

To dispel the myth, the KC-135 is not a military version of the commercial Model 707. The 707 was developed in a separate program, with its first flight occurring some 18 months after that of the KC-135. The outward appearance of the KC-135 and Model 707 bear a strong resemblance – particularly with the shorter Model 707-100/-200 *Stratoliners*. However, there are major differences between the aircraft. The differences in fuselage diameter are shown in the accompanying figure. Fuselage lengths also vary between the various aircraft. The body length of the KC-135 is 128' 10", while the



The body diameters were different for the KC-97 (Model 367/Model 367-80), KC-135 (Model 717), and Model 707. (Drawing from the author's collection)

On July 18, 1956, the last KC-97G Stratofreighter, *53-3816, and the first KC1-35A* Stratotanker*, 55-3118, rolled out of the Boeing plant in Renton, Wash., seen here parked together on the ramp at the north end of the plant next to Lake Washington. (Boeing P17087 via the author)*

707-100/-200 length is 138' 10." The 707-300/-400 Intercontinental airplanes have a body length of 145'6." The wingspans for the KC-135 and 707-100/-200 are 130'10." For the Intercontinental jetliners this dimension was increased to 152'11."

Utilization rates between commercial and military airplanes have a relative order of magnitude difference of ten to one. While the average KC-135 achieved 375 flight hours per year, the commercial 707s accrued about 3,500 hours in the air. Because of this difference in operation, two different design philosophies were employed in the development of the two airplanes. Different materials were selected. To achieve the higher strength-to-weight ratio desired by the Air Force, the -135 structure was designed to a safe-life philosophy; whereas the Model 707 was designed to the commercial fail-safe requirements set out by the Federal Aviation Administration.

The KC-135A was the only airplane in the world that was specifically designed for the aerial tanker mission. During its first 20 years of service, the refueling requirements for the Armed Forces had more than doubled, thereby making the KC-135 an extremely valuable national asset.

The normal crew of a KC-135 consists of an aircraft commander, pilot, navigator, and boom operator/loadmaster. With incorporation of upgraded avionics under Project PACER CRAG, the navigator's position has been eliminated.

For long flights, the crew may be augmented by a third pilot and a second navigator. In addition, the crew chief and two or three maintenance specialists will accompany the flight crew for a deployment.

There are no cabin windows on the -135s except for those in the two overwing escape hatches and the aft right waist. The large 72" x 144" cargo door is standard on all -135 series aircraft. Crew access is provided through a forward entry hatch in which a crew entry ladder is hung. This hatchway also has a spoiler that may be lowered for crew bailout - a sporty proposition that has only rarely been used. (There is a high probability of a crewmember bailing out of this hatch and bouncing along the bottom of the aircraft and striking protruding antennas; thereby sustaining severe injury or even being killed.) Sonic fatigue induced by the engines resulted in the addition of external barrel-stave (bellyband) reinforcements on the aft fuselage of all -135 series airplanes.

The boom operator's station is located within a pod that is common to all of the -135 series aircraft. Either standard or high-speed ruddevators may be installed on the KC-135 refueling boom. A hose adapter was installed on the end of the flying boom to service TAC fighters early in the war in Southeast Asia. Subsequently, USAF fighters were modified with the SAC-standard boom/receptacle system which was more efficient. During operations in Southeast Asia, it was not uncommon for the tankers to literally drag a crippled USAF fighter, with the standard USAF boom/receptacle refueling system, back to a suitable air base where the tanker would release the fighter at hi-key so that it could dead-stick to a landing. To this day, for the refueling of U.S. Navy fighters and many NATO aircraft, a hose and drogue adapter may be installed on the end of the boom.

While the boom operator controls the operation of the refueling boom and the actual boom/receptacle connection, the KC-135 pilots control the fuel transfer operation through use of the fuel panel on the cockpit aisle stand. In addition to a broad yellow alignment stripe on the belly of the tanker, a set of pilot director lights are installed aft of the nose gear wheel well which instruct the receiver pilot to move UP, DN, FWD, AFT.

Here, the Model 367-80, fitted with the refuelng pod, peels away from first KC-135A, 55-3118. The latter was named "City of Renton" and served in the test fleet until being converted into an EC-135K and transferred to TAC where she served as a command and control airplane. (Boeing)

The KC-135 serves the USAF as both a tanker and a transport. To aid in transporting engines and heavy cargo, a ball-mat roller pallet was developed for the area of the main cargo door, and a transportable lift was provided. The latter hooks into an overhead traversing rail system. In addition, a hoist could be installed in the cargo door area. This cargo system made the KC-135 self-sufficient for cargo operations.

The maximum gross weight of the KC-135A is 297,000 lbs. With a load of 120,000 lbs. of transfer fuel, the KC-135 has a range of 1,150 statute miles. Its ferry range is 9,200 statute miles.

ORIGINALLY DELIVERED -135s

The first flight of the KC-135A was on August 31, 1956. The first KC-135A was delivered to the Air Force on April 30, 1957, where it was pressed into Air Materiel Command's test force. Several of these aircraft were flown out of Wright-Patterson AFB, Ohio, and Edwards AFB, Calif. In less than two years, the KC-135A was deemed ready for service and the first operational *Stratotanker* was delivered to the 93rd AFRES, 93rd BMW, Castle AFB, Calif. On January 12, 1965, the last KC-135A was delivered to the 380th ARES, 380th BMW, Plattsburgh AFB, N.Y . At the end of the program, a total of 732 KC-135s were delivered to the Air Force. These aircraft not only formed the backbone of America's strategic aerial refueling force, but also refueled aircraft flown by our Allied air forces. During the summer of 1975, a number of KC-135As were transferred to the USAF Reserve and Air National Guard units, marking the first time reserve component units performed a mission formerly reserved to Strategic Air Command. In 1964, an additional 12 tankers, known as C-135Fs, were delivered to the French Armee de l'Air.

The C-135As and C-135Bs ordered for Military Air Transport Service (MATS) were used as interim jet transports until the Lockheed C-141 *Starlifters* were available in October 1964, at which time the 45 C-135 transports were converted for test and special missions aircraft. MATS began receiving C-135As in 1961 to serve as long-range logistic transports. These aircraft were powered by Pratt & Whitney J-57 turbojets. Next in line were the TF-33 turbofan-powered C-135Bs. The C-135s were operated by the 1611th and 1501st Air Transport Wings, located at McGuire AFB, N.J., and Travis AFB, California, respectively.

Turbofan-powered KC-135Bs were produced for SAC in 1961. These airplanes were redesignated as EC-135Cs and served as airborne command posts. Under Project LOOKING GLASS, one of these airplanes was on continuous airborne alert from February 3, 1961, until July 24, 1990.

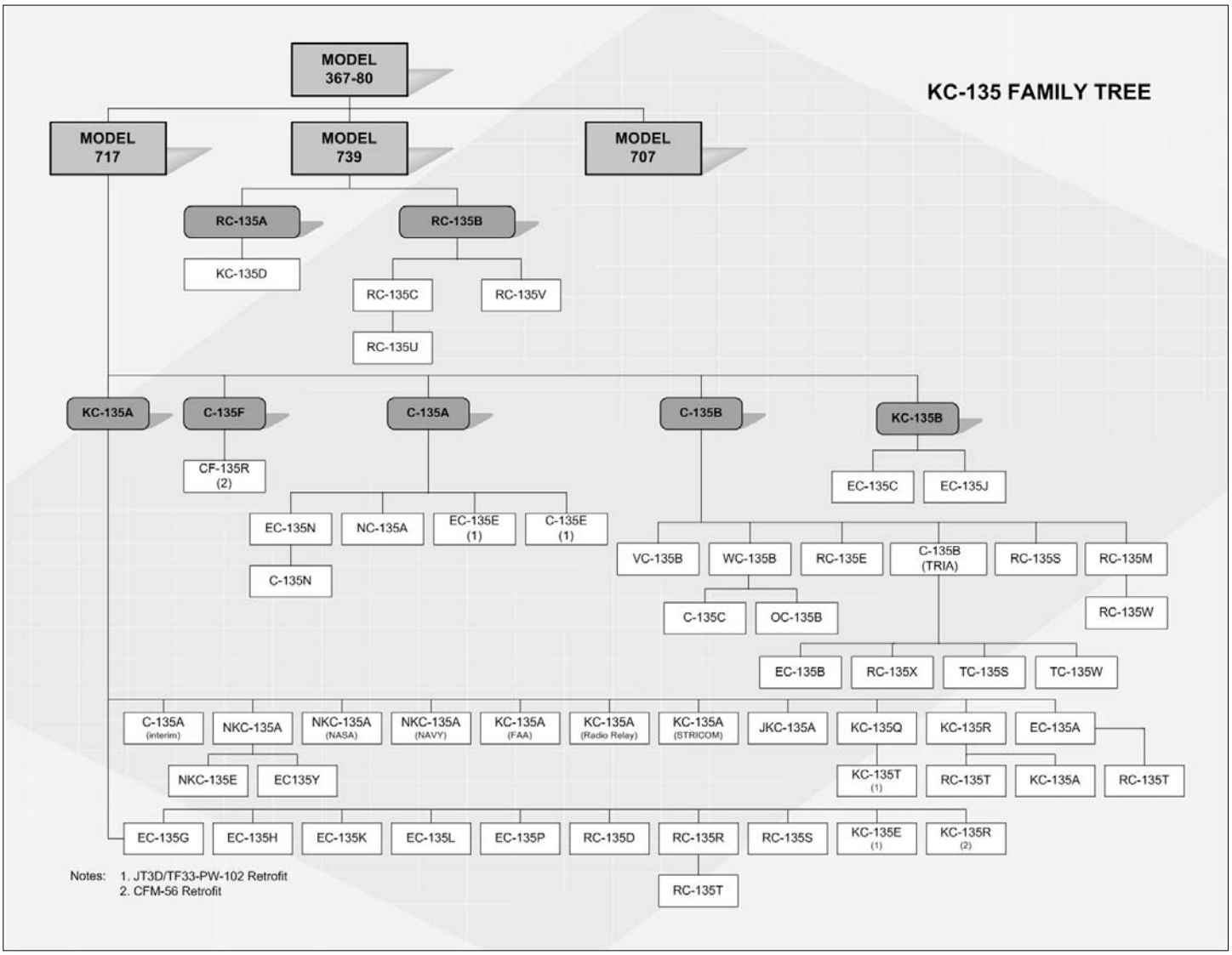
Another production series was the RC-135B, with turbofan engines. These airplanes were immediately sent to the Martin Aircraft Company, Baltimore, Maryland, for conversion into the RC-135C with its large cheek fairings.

The last four airplanes in the family were the RC-135As that were delivered in 1965-1966.

In addition to the 732 KC-135As, Boeing built six other -135 variants for a total production run of 820 aircraft. From these initial seven series came numerous special purpose modifications resulting in over 42 variants that can be identified by prefix and suffix. (See adjoining table.) From this batch of aircraft came the EC-135C LOOKING GLASS - airborne command post aircraft capable of providing command and control for bomber and missile forces in the event ground-based facilities are rendered ineffective.

The total production run of -135s was accomplished in the Boeing plant in Renton, Washington, the same factory from which the 1,119 B-29As were produced. The total production program cost for these aircraft was $1.66 billion; with the average flyaway cost for each aircraft being $2 million.

Series	Boeing Model No.	Customer	No. Built
KC-135A	717-100		
	717-146		
	717-148	SAC	732
KC-135B	717-166	SAC	17
RC-135B	739-445B	SAC	10
C-135A	717-157	MATS	15
C-135B	717-158	MATS	30
RC-135A	739-700	MATS	4
C-135F	717-164	France	12



Family tree depicting the relationship of the Model 367-80 to the Model 717 (KC-135)/Model 739 (RC-135), and Model 707. Boeing built seven series of -135 airplanes. From these sprang over 40 derivatives that can be identified by prefix and suffix. (Boeing Airplane Company)

The total production run of 820 -135 aircraft, in seven series, are depicted in the table shown above.

C-135 DERIVATIVES

The basic -135 airframe has lent itself to a large number of uses. A host of reconnaissance derivatives have provided photographic, electronic, and weather surveillance capabilities. These airplanes carry the RC/WC designations.

For communications, command and control another series of customized versions were made. Differences resulted because of the specific requirements of the operating command. An EC prefix was assigned to these airplanes. The first KC-135A, 55-3118, was named the "City of Renton" and served both Boeing and the USAF during its stint in the test force. Subsequently the aircraft was converted into an EC-135K to serve with TAC. This airplane's portfolio had numerous letters of commendation from the various distinguished passengers it had carried.

A number of special test series of the *Stratotanker* carried the JKC/NC/NKC prefixes. These specifically modified airplanes have changed continuously to meet particular test requirements for the USAF, U.S. Navy, FAA, and NASA. They have been used for classified missions, testing new equipment, and chasing eclipses and comets. Several have large windows cut into their fuselages resulting in the nickname, "Piccolo Tubes."

VC-135B – At least five MATS C-135Bs were retrofitted with VIP interiors and assigned to the 89th MAW, Andrews AFB, Maryland. They served as staff transports for cabinet officials and members of Congress on a first-come first-serve basis, which also included office levels.

EC-135N – AFSC operated four of these aircraft that were modified for tracking and data recording to support both civilian and military space programs. In 1968, an additional four aircraft were converted for this mission and assigned to NASA. These aircraft operated in pairs – one carried an Airborne Light Weight Optical Tracking System (ALOTS) pod on the cargo door to work in conjunction with a C-135B TIRA.

C-135B, 62-4133, TIRA aircraft of 1975. (G.S. Williams photo from the author's collection)

EC-135N, 55-3123, with ALOTS pod suspended from the main cargo door, housing a telescope that was used with the C-135B TIRA. (Boeing P40912)

C-135B TIRA – Four of these were Telemetry Instrumented Range Aircraft (TIRA) aircraft distinguished by the large theodolite pattern painted to the right forward fuselage. They operated in pairs with an EC-135N ALOTS aircraft.

0-G Trainer – NASA operated three KC-135As and one C-135A as 0-G trainers for the astronaut program. These aircraft flew a parabolic flight path that produced a 0-G environment for 20-30 seconds. They received the unofficial name of "Vomit Comet."

PACER CLERK - Under Project PACER CLERK, the FAA operated a KC-135A, 59-1481, with civil registry N98, to serve as a high-altitude, high-speed, long-range route verification aircraft.

G/NC-135A – These three aircraft were modified under the Project RIVET DIGGER and assigned to the Air Force Special Weapons Laboratory at Kirtland AFB, New Mexico. With the ban on atmospheric nuclear weapons testing, these aircraft served in support of the underground tests conducted by the U.S. These ex-MATS C-135As had a large canoe installed on the upper forward fuselage and a plethora of holes with windows along the fuselage sides. A vast array of sensors was installed in the fuselage. Two aircraft had the modifications on the left side and one on the right. They would fly a box canyon formation around a nuclear blast to record its effects. These aircraft stood alert to be able to respond to similar tests by other nations on a moment's notice. Little known was a fourth aircraft that was a KC-135A assigned to a SAC air refueling wing that was partially modified for this mission and could also be called upon to support the mission.

COMMAND AND CONTROL CHANGES

During March 1965, SAC made two major changes in its command and control programs. The PACCS force was revised and a new automated command and control system was instituted. A number of KC-135A tankers were converted for the airborne command post (ABNCP) role during the year. In addition, SAC took delivery of 17 new KC-13Bs during 1964 and 1965 to server in the ABNCP mission. These aircraft were part of Project COVERALL

Boeing KC-135B - A new aircraft, the KC-135B, which

KC-135B-01-BN, 62-3581, being refueled by a KC-135A during flight testing at Boeing. (Boeing P36036)

combined these improved turbofan engines while retaining the refueling capability, was introduced into the SAC inventory in 1964.. By October 1964 the designation of these SAC aircraft was changed to EC-135C. A total of 17 KC-135B/EC-135Cs were delivered to the command between July 2, 1964, and March 4, 1965. These airplanes had a flight crew of five and a mission crew of 11 headed by a general officer. These were equipped both with a boom air refueling system and an air refueling receiver system. The latter had the receptacle mounted aft of the cockpit.

The first KC-135B was delivered to Barksdale AFB, Louisiana, on July 2, 1964; while the last airplane went to March AFB, California, on March 4, 1965.

Number	Operating Unit	Base
1	HQ USAF	Andrews AFB, Md.
5	HQ SAC	Offutt AFB, Neb.
3	HQ Second Air Force	Barksdale AFB, La.
4	HQ Eighth Air Force	Westover AFB, Mass.
4	HQ Fifteenth Air Force	March AFB, Calif.

Initial distribution of SAC's EC-135 ABNCPs.

During the war in Southeast Asia, some of these airplanes served as airborne radio relays for the SAC bombers and tankers operating in the theater.

EC-135A - Eleven KC-135As were converted at the Oklahoma City Air Depot into EC-135As to serve as radio relay aircraft in support of SAC's PACCS and ALCC missions and were known as LOOKING GLASS airplanes. These aircraft carried a mission crew of 12 in addition to the flight crew. The first of the EC-135As was delivered to the 28th ARES, 28th Bombardment Wing, Ellsworth AFB, South Dakota, on March 25, 1965.

These aircraft retained their air refueling capability and an air refueling receiver system was retrofitted.

Boeing EC-135G - Four KC-135As were converted into EC-135Gs for SAC in 1965. The retrofit was accomplished at the Oklahoma City Air Depot. These aircraft served in the PACCS and ALCC missions. The mission crew was comprised of 16 personnel.

EC-135G, 62-3570, reveals its overwing HF probe antenna and the four additional blade antennas on top of the fuselage. (E-Systems P-4819-1)

These airplanes retained the air refueling boom. Some EC-135Gs were subsequently retrofitted with a receiver system.

Boeing EC-135L - Three KC-135As were converted into EC-135Ls by Lockheed Air Service in New York to serve in the PACCS and ALCC missions. A mission crew of seven was carried. The main deck fuel tanks were removed and the boom air refueling system was retained. The boom was equipped with a reverse refueling system. Some aircraft were subsequently retrofitted with a receiver system.

EC-135Y – Two of these aircraft support U.S. Central Command (CENTCOM) as airborne command posts. One aircraft retained its air refueling capability and served as a backup tanker during Operation DESERT STORM.

KC-135D - When MATS no longer had a mission for the RC-135As, the four aircraft were transferred to SAC for use as command staff transports. Later a requirement for additional tankers arose, and these aircraft were converted for the tanker mission. Because of a number of systems differences, the aircraft were redesignated KC-135Ds and assigned to the 305th AREFW, Grissom AFB, Indiana. From a maintenance standpoint, keeping the aircraft together made sense. When the 168th ARES, AK-ANG, was activated at Eielson AFB, they eagerly took the four oddball aircraft to get their operation moving.

A 456th BW, KC-135Q refuels a Lockheed SR-71A, 64-17978, named "Rapid Rabbit" on a mission in Southeast Asia during the Vietnam conflict. The SR-71 was severly damaged in a landing accident July 20, 1972, and scrapped. (From SAC Combat Crew Magazine *from the author's collection)*

KC-135Q – To support its SR-71 *Black Bird* operations, SAC had a number of KC-135As converted into KC-135Qs and partial KC-135Qs. These aircraft had an additional rendezvous beacon installed and carried the boron-based JP-7 fuel. While the bulk the KC-135Qs were assigned to the 9th SRW and 100th AREFW, some were assigned to regular KC-135 wings to provide greater global coverage when necessary.

RECONNAISSANCE MISSION

With the phase out of the RB-47 and RB-50 fleets, SAC gained newer, more capable aircraft for the reconnaissance mission. While the U-2s and SR-71s were assigned to other wings, SAC concentrated its new RC-135 aircraft in the 6th and 55th Strategic Reconnaissance Wings, based at Eielson AFB, Alaska, and Offutt AFB, Nebraska, respectively. The strictly photomapping operations were assigned to Military Air Transport Service's (MATS), Air Photographic and Mapping Service; whereas SAC had all intelligence related photographic and electronic missions.

The -135 airframe was extremely adaptable to a multitude of operational reconnaissance requirements. Some reconnaissance variants came with several aircraft with similar configurations while others were a one-of-a-kind. With the exception of the MATS RC-135As that were engaged in photomapping and geodetic survey, all of the SAC RC-135s were employed in peripheral reconnaissance along the Soviet borders.

RC-135A - The RC-135As were photomapping and geodetic survey airplanes were assigned to the 1370th Photo Mapping Wing, Air Photographic and Charting Service, MATS, based at Turner AFB, Georgia. In lieu of the forward lower fuselage fuel tanks, the RC-135As had a camera bay, external fairing with sliding doors, and a glass through which pictures could be taken. Developmental issues with the camera equipment delayed delivery of these aircraft for over a year. When early missile launches were consistently going astray along the Atlantic Missile Range, it readily became apparent that something was wrong with the charts for the areas. One of the first missions for these aircraft was to photograph and re-map the area. When finished, the subsequent missile launches were consistently on target.

WC-135B – The 10 Air Weather Service, MATS, WC-135Bs were former MATS C-135Bs that were converted for the weather reconnaissance mission by Hayes International, Birmingham, Alabama, under Project CONSTANT PHOENIX. These aircraft were assigned to the 55th and 56th Weather Reconnaissance Squadrons based at McClellan AFB, California, and Yokota AB, Japan, respectively. A weather reconnaissance suite was installed in the aircraft, and included a pair of U-1 foils that were mounted on both sides of the waist of the aircraft. The U-1 foil operated like a jukebox in that a disk with a paper wafer was introduced into the air stream within the foil, then retracted into the fuselage so that another filter could be inserted. These filters were marked

Ex-MATS C-135Bs were modified into WC-135Bs for use by the Air Weather Service. This May 25, 1972, photo shows the aircraft while still in its natural metal finish. (USAF photo from author's collection)

with a time stamp that later could be compared with the aircraft flight plan to determine the precise location that the sample was taken. One of these aircraft remains in service with the 55th SRW. The total crew of 33 consists of cockpit crew and special equipment operators.

SAC Reconnaissance

Beginning in 1966, SAC concentrated its RC-135 reconnaissance platforms in two strategic reconnaissance wings. With the dissolution of SAC on June 1, 1992, these assets were concentrated in the 55th Strategic Reconnaissance Wing (SRW), and assigned to the newly formed Air Combat Command.

On March 25, 1967, the 6th Strategic Aerospace Wing at Walker AFB, New Mexico, lost its B-52 bombardment and Atlas strategic missile mission. The wing moved without equipment and personnel to Eielson AFB, Alaska, where it gained one reconnaissance squadron and rotational KC-135s from other SAC wings that served in the Alaskan Tanker Task Force. In addition, the wing gained control of Shemya AFB, the next to the last island in the Aleutian Chain where it would forward-deploy its RC-135s as required.

The 55th SRW was stationed at Ramey AFB, Puerto Rico, from November 1950 where it performed strategic reconnaissance, photo charting, precise electronic geodetic mapping, and electronic reconnaissance until 1954. On May 1, 1954, the wing lost its mapping and charting functions, and assumed the mission of global strategic reconnaissance, including electronic reconnaissance and weather reconnaissance (until June 1963). During this period the wing operated RB-47s. On June 16, 1966, the 55th SRW was transferred to Offutt AFB, Nebraska. There it gained KC-135s in 1966 and RC-135s a year later. To support its worldwide mission, the 55th SRW has detachments in places like RAF Mildenhall, England; Ankara, Turkey; Yokota AB, Japan; and Andersen AB, Guam.

OC-135B – As part of the Open Skies Treaty Program, SAC obtained three OC-135 aircraft, which are conversions from WC-135Bs. The aircraft can carry up to 35 crewmembers who include: flight crew, maintenance crew, crewmembers from the Department of Defense Threat Reduction Agency, and foreign country representatives over whose nation the aircraft is flying. Cameras are installed in the aft fuselage, and a data processing system is included in the system. The first operational OC-135B was assigned to the 55th SRW in October 1993.

RC-135D – Three KC-135As were modified under Project OFFICE BOY for airborne reconnaissance. Initially they were designated KC-135A-II. On January 1, 1965, these aircraft were redesignated RC-135Ds. They were initially assigned to the 4157th SW at Eielson AFB. That unit became the 6th SRW. At one point in their career, large half-cylindrical antenna fairings were added along the fuselage ahead of the wing root.

KC-135R – In June 1967 three KC-135As were modified into the KC-135R configuration and became part of Project RIVET STAND. These aircraft should not be confused with the later KC-135Rs that were retrofitted with F108 (CMF56) high-bypass turbofan engines. The sensors were mounted on the left side of the fuselage, and a three-bladed antenna was mounted on top. Since the working side was the left side, the leading edge of the left wing, inboard pylon surfaces, and engine inlet cowls were painted black to reduce the effects of sunlight reflections,

KC-135T – One of the KC-135Rs was converted into a KC-135T. It had a hog nose (originally identified as a thimble nose by this author in 1980).

The sole RC-135E, assigned to the 6th SRW is distinguished by several features: thimble nose, fiberglass forward fuselage (right side only) and pods between the inboard engines and wing roots. (E-Systems photo from author's collection)

RC-135E – The sole RC-135E was a conversion made by LTV, Greenville, Texas. The right forward fuselage skin was replaced by a large fiberglass panel, behind which were a phased-array antenna and a telescopic camera. This equipment required more electricity than could be generated by the standard generators and developed a great amount of heat that was damaging to the equipment that took its toll on the crew. A solution was at hand when LTV mounted a pair of self-contained pods on pylons between the inboard engine struts and the fuselage – one pod housed a Lycoming T-55 turbine engine and generator, while the other housed a heat exchanger. On June 5, 1969, this aircraft was lost over the Bering Sea while returning from Shemya to Eielson and it is assumed the aircraft suffered a structural failure of the fiberglass panel.

RC-135M – Six RC-135Bs were converted by E-Systems, Greenville, Texas, for the SIGnals INTelligence (SIGINT) mission. A hog nose was installed along with a static boom on each wingtip. The refueling boom operator's pod was modified to house mission equipment. A teardrop-shaped antenna fairing

RC-135M, 62-4125, showing the static boom probe on the left wing tip, faired over boom position, additional blade antennas beneath the wing center section and thimble nose among characteristics of this model. (Kirby Kasen from the author's collection)

*"Cobra Jaws" was RC-135T, 58-0126, equipped with a 2 segment LORAN antenna mounted on top of its fuselage, a hog nose, over-wing HF antenna on right wing and static probes on the wing tips along with other modifications. (*SAC Historian *from the author's collection)*

was installed on each side of the aft fuselage, forward of the horizontal stabilizer. These aircraft supported Project COMBAT APPLE during the war in Southeast Asia.

RC-135S, 61-2664, assigned to the 6th SRW at Eielson AFB, Alaska. This early version had three large portholes, towel rack antennas on pylons and four sensor fairings forward of the wing. (E-Systems P-118790-3 from the author's collection)

RC-135S - Over time a total of six RC-135Ss were made. The basic airframes were powered by the early J-57 turbojet engines or the later TF-33 low-bypass turbofans. All of these aircraft were equipped with the hog nose radome. A large teardrop-shaped antenna fairing was installed on each side of the aft fuselage ahead of the horizontal stabilizers. These aircraft carried a variety of sensor configurations on the right side of the forward fuselage – they differed between individual aircraft and sometimes modifications changed the configuration of a given airplane. Most noticeable are the various sized portholes and antenna fairings installed forward of the wing. One aircraft had a sliding door that covered a camera port. Because the right side was the working side of the aircraft, the entire wing upper surface and inboard engine pylons and nacelles were painted black to reduce the effects of reflections. These aircraft were operated by the 6th SRW under Project COBRA BALL and worked in conjunction with the large obelisk-like COBRA DANE radar antenna located on Shemya. The COBRA BALL mission has lineage back to the EB-47E (TT), Tell-Two, project.

RC-135T – LTV modified one of the KC-135R RIVET STAND aircraft into the RC-135T for its new role as a COMmunications INTelligence (COMINT), and subsequently a proficiency trainer for RC-135 aircrews.

RC-135U – In 1970 three RC-135Cs were converted by General Dynamics into RC-135Us for the newly emerging COMBAT SCENT mission. These aircraft retained the Martin-built large cheeks on the forward fuselage. In addition, a prominent chin antenna fairing was added just aft of the nose radome. This fairing also houses a pair of noisy fans to provide additional cooling for the new avionics suite. The back-end Ravens had to notify the flight deck crew that they were turning them on. Towel rack antennas were mounted above the cheek fairings. The aft fuselage tail cone was replaced by a large array of aft-looking antennas. The crew consists of two pilots, two navigators, two airborne systems engineers, a minimum of 10 electronic warfare officers, and six or more technicians.

RC-135V – Starting in 1972, seven RC-135Cs and one RC-135U were converted by LTV for the RC-135V RIVET JOINT program. Over the years, LTV was succeeded by Raytheon and L-3 Communications have responsibility for all modifications under the oversight of Air Materiel Command. These are configured for both the COMINT and ELINT missions. Four distinctive strut-mounted circular antennas were installed along the belly, forward of the main gear wheel well of the aircraft, while three large blade antennas were mounted aft of the wheel well. These aircraft had their first operational experience during Operations DESERT SHIELD and DESERT STORM.

RC-135W/TC-135W – A total of seven RC-135W and TC-135W conversions were made by E-systems. Essentially the RC-135W is an upgraded RC-135M. The Martin cheek fairings were replaced by longer E-System-designed fairings. The large belly antennas remain. The TC-135W is a crew proficiency trainer that has the same external antenna configuration, but lacks the expensive internal equipment that could be damaged during touch-and-go operations.

RC-135X – This aircraft was an E-Systems conversion of an EC-135B. The aircraft had a sliding door on the right side of the forward fuselage, behind which was a sophisticated optical system. Because of its similarity with the RC-135S crews could fly either aircraft. It was developed under Project COBRA EYE, and tied to the Strategic Defense Initiative. Because of one interpretation of the 1972 Antiballistic Missile Treaty, the RC-135X was removed from the operational inventory and flown to Greenville, Texas, where it remains, stripped of its mission equipment.

A Boeing B-52 taking on fuel while outbound on an ARC LIGHT mission over Southeast Asia. Up to 12 750-lb. bombs were carried on each external pylon, while another 27 bombs were carried internally. (USAF photo from the author's collection)

A pair of McDonnell F-4C Phantom IIs *being refueled over Southeast Asia on December 15, 1965. (USAF photo from the author's collection)*

KC-135s at War

For the first time in the history of the KC-135, these airplanes were deployed to bases in Southeast Asia to meet the burgeoning demand for air refueling. SAC had developed a massive aerial refueling plan for the war in Southeast Asia – codenamed Operation YOUNG TIGER. SAC bases within the CONUS deployed tankers and their crews to the theater and placed them under control of Pacific Air Forces (PACAF); however, they were managed by SAC under the Single Tanker Manager concept, TDY periods normally ranged from 73 to 77 days. Three to six tanker crews from various SAC units joined to form the provisional tanker wings in Southeast Asia.

SAC deployed its CONUS KC-135s to these bases in Southeast Asia (SEA).

Base	Mission
Andersen AFB, Guam	HQ 3rd AD, strip alert tankers
Clark AB, Philippines	YANKEE TEAM, FOREIGN LEGION, typhoon evacuation base
Kadena AB, Okinawa	4252nd SW, ARC LIGHT and YOUNG TIGER
Don Mung IAP, Thailand	TIGER CUB
Takhli RTAFB, Thailand	Det. 1, 4252nd SW; KING COBRA
U-Tapao RTAFB, Thailand	4258th SW; GIANT COBRA
Ching Chuan AB, Twain (?)	4220th ARES

SAC KC-135s were employed in SEA for the first time on June 9, 1964, when four KC-135s operating out of Clark AB refueled a flight of eight F-100s en route to strike Communist-backed Patet Lao antiaircraft emplacements on the Plain of Jars in northern Laos.

Throughout the war in SEA, SAC KC-135s performed the Herculean task of refueling fighters, tactical bombers, and B-52s. In addition, they provided emergency support to U.S. Navy and Marine aircraft.

Tankers were under orders not to venture beyond the Forward Edge of Battle (FEBA); however, when a combat aircraft called for refueling it was not uncommon for a KC-135 crew to elect to go beyond the FEBA and provide the requisite fuel. On several occasions, the fighters could not take on fuel due to their holed condition, and the tanker would keep the boom nozzle engaged. The tanker would then keep offloading fuel as required and drag the faltering fighter to a friendly base where the boom was disengaged and the fighter dropped in for a dead-stick landing.

Accomplishments of the KC-135As during the war in Southeast Asia were phenomenal. A summary of their operations between 1964 and 1974 are shown in this table.

Flying Hours	911,364
Sorties	194,687
Refuelings	813,873
Fuel Offload	8,963.7 billion pounds

During the conflict, four KC-135s were lost. All of these losses occurred between September 24 and December 15, 1968. The specific aircraft lost were:

			Fatalities	
Date	**Serial No.**	**Wing**	**Crew**	**PAX**
SEP/24/1968	55-3133	509th BMW	0	11
OCT/1/1968	55-3138	320th BMW	4	0
OCT/22/1968	61-0301	454th BMW	4	2
DEC/19/1968	56-3629	7th BMW	4	0

A Tennessee ANG KC-135E-06-BN, 56-3607, refuels a trio of Georgia ANG F-106 "Wild Weasles" in October 1982. (Don Spering photo from the author's collection)

POST-SEA WAR FORCE REDISTRIBUTION

CINCSAC, General Russell Dougherty, was confronted with a major dilemma at the end of the war in Southeast Asia. As in all post-war environments, a major downsizing of the military occurs. General Dougherty wanted to save as much of his command as possible in order to meet the Single Integrated Operating Plan (SIOP) requirements, yet still comply with the downsizing requirement. His solution was to transfer a total of 128 KC-135A to the Reserve Component – a move that initially was not taken well by those fighter units. Over time the number of aircraft was increased to 335. Today, the bulk of the air refueling mission is assigned to the Reserve Component.

During July 1975, SECDEF James R. Schlesinger directed SAC to transfer 128 KC-135A tankers to the Reserve Component. Over the next four years these aircraft would be reassigned to three Air Force Reserve and 13 Air National Guard units. In addition, SAC would gain all of the Air National Guard's KC-97L tankers in the event of wartime.

One traditionally thinks of the Air National Guard in terms of fighters; however, they were not neophytes to the air refueling mission. Since 1961, there were as many as 10 guard tanker units operating KC-97s in support of TAC operations within the Continental United States (CONUS), Southeast Asia, Latin America, and Europe. These tankers were equipped with the drogue attachment on the refueling booms to accommodate fighters with a probe and drogue refueling systems.

As the war in Southeast Asia escalated, SAC's SIOP requirements continued. The United States Air Forces in Europe (USAFE) began experiencing a serious shortfall in SAC tanker support. The ANG volunteered to fill the void with their KC-97s in what was dubbed Operation CREEK PARTY. This mission called for Air National Guard tankers and crews to deploy to Rhein-Main AB, West Germany, for two weeks every three months. While deployed to Germany, the KC-97s supported all active Air Force fighter and reconnaissance aircraft assigned to USAFE. ANG units flew Operation CREEK

This KC-135E, 58-0096, was assigned to the 940th AREFG, Mather AFB, Calif., in 1986. Because the AFRES more closely mimicked their active duty counterparts, the vertical fin cap was adorned with a simple red/white flash with the letters AFRES and a SAC "MilkyWay" band with an AFRES insignia on the right side. (Photo by the author)

PARTY missions between April 28, 1967, and April 28, 1977. During this period, the ANG flew 6,512 accident-free sorties, involving 47,207 hookups, and off-loading 137,398,620 pounds of fuel.

Since 1960, another 18 ANG air transport squadrons operated C-97s and another 10 such squadrons flew the C-124s in the airlift role. Some of these would become KC-135 tanker units.

While the fighter mission is demanding, it is nowhere as resource and personnel intensive as the operation of heavy multi-engine aircraft. When SAC became the gaining command for TAC's tanker units equipped with KC-97 *Stratofreighters* were phased out, the ANG units came fully trained for the air refueling mission.

The number of Reserve Component tanker units continued to grow between July 1, 1976, and April 1, 1992. Eight ANG KC-97L tanker units now came under the jurisdiction of SAC on July 1, 1976. These units would soon transition into the KC-135 *Stratotanker*. Another seven Air National Guard and two Air Force Reserve KC-135 air refueling group/wings were activated as new tanker units during this period.

SAC provided training to the Guard units as they made the transition into the KC-135s. This was the first time in history that a SAC mission was allocated to reserve units. (In the past, reservists only augmented active duty SAC units.)

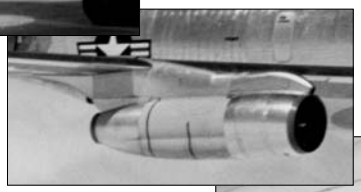
FORCE MULTIPLIERS

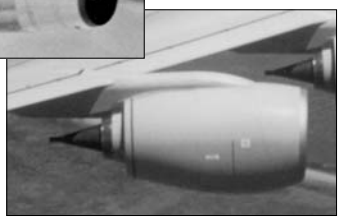
Over the years since the initial development of the C-135, major improvements in engine technology had evolved. Beginning in 1982, Boeing offered the USAF two different re-engining programs. These programs centered around the new General Electric/SNECMA CFM-56-2 high-bypass turbofan and salvaged Pratt & Whitney JT-3D low-bypass turbofans. Each of these engines offered significant state-of-the-art improvements over the earlier 1950's-vintage P&W J-57 turbojets.

Engine	Manf.	Static Thrust	Fuel Offload Increase
J-57	P & W	13,500 lb.	-
JT-3D	P & W	18,000 lb.	18%
CFM56-2	GE/SNECMA	22,000 lb.	50%

The improved engine performance allowed greater payload/range capability and enhanced engine-out performance. From an economic standpoint, these newer engines significantly reduced fuel consumption, thereby resulting in a direct payback; also, they made the airplanes better neighbors from the noise standpoint. KC-135As retrofitted with the JT-3D and CFM56-2 engines were redesignated as KC-135Es and KC-135Rs, respectively. When France retrofitted their fleet of *Stratotanker*s with the CFM-56 engines, the airplanes were redesignated as C-135FRs.

While the CFM56 engines were new production, the JT-3Ds came from retired commercial 707s. The fan engines required larger horizontal stabilizers to provide the requisite pitch control margins required by the higher thrust engines.





Left: P&W J-57
Middle: P&W JT-3D/ TF-33-201
Bottom: GE CFM-56-2

The JT-3Ds were completely overhauled and given the military designation of TF-33-201s, these differed from the TF-33s that powered other C-135s and the C-141s by one compressor stage.

The donor 707s provided JT-3D engines, struts, cowls, thrust reversers, horizontal stabilizers and elevators, and a series yaw damper for the rudder. The latter permitted operation of the autopilot in all flight regimes.

During the first seven months of 1982, a total of 18 special purpose -135s were retrofitted with the TF-33-201 engines. Next in line were the KC-135As assigned to the ANG and AFRES.

The first KC-135Rs were delivered to the 384th ARES, 384th AREFW, McConnell AFB, Kansas, on July 2, 1984. The Armee de l'Air took delivery of their first C-135FR in August 1985.

MAJOR MODIFICATIONS

Over the years, the -135s have undergone a number of minor and major modifications, in addition to the two engine retrofits, to keep the fleet in a state-of-the-art configuration.

Project/Year	Remarks
ECP-405/	The KC-135 was built to a safe-life philosophy. Over time, the aircraft began experiencing cracking of the primary wing structure. To extend the structural life of the aircraft, Boeing changed the material of the skins on the lower surfaces of the wings from just outboard of the engine struts through the wing center section. 746 aircraft were retrofitted under this program.
Pacer CRAG/	Various -135 aircraft have been undergoing a modification program to upgrade the avionics suite of the basic aircraft to a new glass cockpit, and eliminating the navigator station.
MPRS/1997	Under contract to the Air Force, Boeing retrofitted 20 KC-135Rs with wingtip-mounted probe and drogue air refueling pods to support the U.S. Navy and another four for Singapore.
ROBE/2003	At least 33 KC-135s have been retrofitted with the Roll-on-Beyond Line of Sight Enhancement (ROBE) designed to provide large amounts of tactical communications data between fighters and the E-8 JOINT STARS.

FOREIGN OPERATORS

In addition to the 11 remaining C-135FRs in the French Armee de l'Air, another three KC-135Rs have been delivered to France, seven to Turkey, and four to Singapore. No other nations have operated the *Stratotanker*.

OPERATION EL DORADO CANYON

Libya, under the leadership of Colonel Muammar al-Qadhafi, was involved in numerous acts of international terrorism during the mid-1980s. Several unpublicized encounters between Libyan and American aircraft occurred during this period, including skirmishes with U.S. Navy carrier aircraft operating in the Mediterranean. SAC RC-135s monitored the Libyan air defense system and attempted to lure their eager fighter pilots out to sea in an attempt to force them to run out of fuel and ditch at sea without America having to fire a shot. On April 2, 1986, a TWA 727 airliner was bombed in flight and four passengers were sucked to their deaths near Athens, Greece. Three days later, an attack on a West German nightclub resulted in the deaths of a pair of U.S. servicemen and a Turkish woman. Libyan terrorists claimed full responsibility for the airliner and were suspected in the nightclub bombing.

Enough was enough, and President Ronald Reagan began high-level, behind the scenes talks with Allied nations regarding a preemptive strike against Libya in retaliation for their active and passive support of international terrorism. Britain's Prime Minister Margaret Thatcher was instrumental in permitting the United States to use England's bases for this operation.

Operational planners had their hands full in determining the targets and available aircraft for a strike on Libya. A B-52 raid was out of the question for both political reasons and the potential dilution of SAC's EWO posture. U.S. Navy carrier aircraft in the Mediterranean were too few in number to strike all of the targets on one night. The best available USAF aircraft to work in concert with the Navy was the F-111F *Aardvark* supported by EF-111A *Raven* (a.k.a. "Sparkvark"*)* jammers. For the USAF to pull off such a long strike with these aircraft, extensive refueling support and diplomatic clearances were required.

High-level diplomatic missions were conducted in an effort to secure adequate support bases and overflight permission for a preemptive strike on Libya. While the shortest route is over France and Italy, but neither the French nor the Italians would grant overflight permission because of their political and commercial ties with Libya. Another major problem is the U.S. was only permitted a small number of no-notice exercises in England; all others must be publicly announced in advance. The U.S. was fortunate in that they had one unannounced exercise left unused at this time. When asked by the media about the commotion, the reply was that this was Exercise SALTY NOTION, a base efficiency exercise.

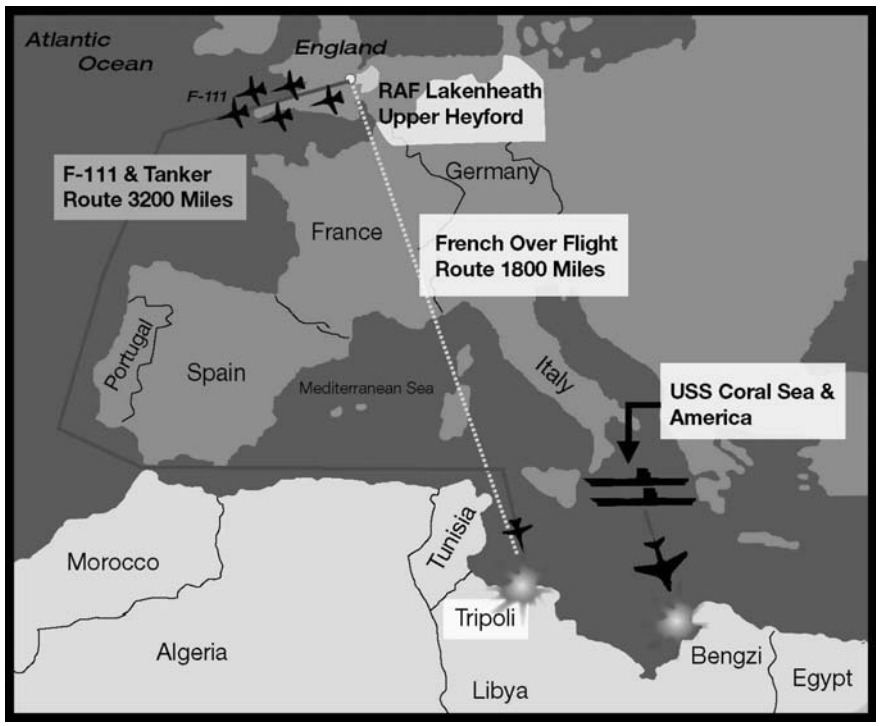
The planning was completed, support tankers were deployed to bases in England, and all awaited the strike order. SAC tankers from a number of wings provided refueling support for Operation EL DORADO CANYON. While SAC still had its EWO alert commitments, various wings were able to provide a limited number of tankers to support the operation. RAF Mildenhall hosted nine KC-135As, one KC-135E, and 17 KC-10As while RAF Fairford had nine KC-135As and 10 KC-10As.

In addition, Air Force Reserve tanker crews from the 452nd Air Refueling Wing (Associate), March AFB, California, and the 78th Air Refueling Group, Barksdale AFB, Louisiana, augmented the active duty KC-10 crews from the 22nd Air Refueling Wing, March AFB, and the 2nd Bombardment Wing, Barksdale AFB.

So classified was Operation EL DORADO CANYON that no radio communications regarding the mission were undertaken. A general officer from the Pentagon personally delivered the strike orders to England.

On the night of April 12/13, 1986, U.S. Navy ships in the Mediterranean moved off the coast of Libya. At 1713 Hours GMT, 28 SAC tankers took off a half hour ahead of the strike aircraft. The targets in Libya were attacked around midnight. Outbound and return legs were over international waters; resulting in a 3,200-nautical mile flight. Maintaining radio silence for the entire mission, the tankers refueled the F-111s four times on the outbound leg.

Three F-111 strike forces from the 48th Tactical Fighter Wing, supported by EF-111As from the 42nd Electronics Countermeasures Squadron, attacked the Tripoli Airfield with two waves of strike aircraft, attacked the Sidi Bilal Terrorist Training Camp with a wave of four aircraft, and three waves of four aircraft each demolished the Al Azziziyah Barracks compound.



Because of geopolitical constraints the F-111 Aardvarks *based in England had to fly this 3,200-mile route with four outbound refuelings instead of the shorter 1,800-mile route during Operation ELDORADO CANYON.*

EC-135C, 62-2583, was assigned to the LOOKING GLASS mission with the 2nd ACCS, 55th SRW, Offutt AFB, Neb. Note the HF probe antennas on the vertical fin and on top of the wing tip. A saddle-shaped SATCOM antenna is mounted over the mid-fuselage. A pair of low-frequency long-wire antennas extend between the fin leading edge and short masts aft of the cockpit. (Photo by the author)

The tankers refueled the returning fighters twice. The strike force recovered around 0810 Hours GMT. Of the 24 F-111Fs dispatched, one failed to return. The total flying time for each of the strike aircraft was 13 hours.

Units participating in Operation EL DORADO CANYON between April 12 and 17, 1986, were awarded the Armed Forces Expeditionary Medal for this operation.

LOOKING GLASS STOOD DOWN

The Soviet threat had abated and SAC had increased confidence in its attack warning and detection systems, while the pressure to reduce operating expenses mounted. *Casey One*, the command's EC-135C Looking Glass, took off at 0659 Hours on July 24, 1990. Then CINCSAC General John T. "Jack" Chain, was the Airborne Emergency Action Officer aboard the aircraft. When the aircraft landed at 1428 Hours, almost 30 years of continuous airborne command operations ceased. In a remarkable feat, the LOOKING GLASS aircraft accrued over 281,000 hours of accident-free flying. A new alert plan went into effect, the LOOKING GLASS stood ground alert, and flew random weekly sorties. Now, quick reaction ground alert constituted the bulk of daily LOOKING GLASS operations.

FIRST GULF WAR KC-135 OPERATIONS SUMMARY

During the build-up for the war in the Gulf, known as Operation DESERT SHIELD, and later in the combat resupply efforts for Operation DESERT STORM, KC-135s and Douglas (now Boeing) KC-10s provided air refueling support for deploying combat aircraft and Military Airlift Command's Lockheed C-5B *Galaxies* and C-141 *Starlifters*. During Operations DESERT SHIELD and DESERT STORM, the deployed 46 KC-10 and 256 KC-135 tankers accomplished the following:

Operation DESERT SHIELD

Sorties	Hours	Refuelings	Fuel Offload*
4,967	19,089	14,588	68.2

Operation DESERT STORM

Sorties	Hours	Refuelings	Fuel Offload*
15,434	59,943	45,955	110.2

***** Millions of gallons

McKay Trophies awarded to KC-135 crews

May 13, 1967 Maj. John J. Casteel, Capt. Deal L. Hoar, Capt. Richard I. Trail, MSgt Nathan C. Campbell, 902nd ARES, Clinton-Sherman AFB, Okla., performed two emergency refuelings for the U.S. Navy

September 3, 1983 Capt. Robert J. Goodman, Capt. Michael R. Glover, 1st Lt. Karol R. Wokcikski, and SSgt Douglas D. Simmons, 43rd ARES, Loring AFB, Maine, saved an F-4 and crew over the North Atlantic during Exercise CRESTED CAP.

January 21, 1985 Lt Col. David L Faught, 97th BW, Blytheville, Ark., errant NLG, reverse refuelings from an EC-135, a KC-10, and a strip alert tanker, 13 hours of flying time, used aerodynamic braking with minimum damage to the aircraft.

TOWARDS THE FUTURE

The venerable KC-135 *Stratotanker* has served this nation well for the past 50 years and is slated to remain in the inventory until 2040. For an airframe to remain viable over such a period is a testament to its original design and to the dedication of the maintainers who have kept them flying under all sorts of conditions.

Earlier this decade there was a proposal for leasing new tankers from Boeing that collapsed in a political furor. Today there is a Request for Proposal on the table for a replacement

tanker.

Both Boeing and EADS (a European consortium) have proposals for a new tanker for the USAF. EADS is touting a relatively new design, whereas Boeing's entry is based on the proven Model 767, which was subsequently augmented by a Model 777 offer. Formal proposals are due in January 2007, with source selection coming in the fall of 2007.

We must remember that aerial refueling is a national asset that requires direct control from the Joint Chiefs of Staff and the operational commands within the Air Force. We, as a nation, cannot afford to have a foreign-built aircraft perform this mission – just look back at what happened with Operation EL DORADO CANYON when our aircraft had to fly 3,200 miles instead of 1,800 because of France and Italy denying us overflight permission.

There is consideration by Congress for a dual procurement program. In addition to the sovereignty trap, there are the added costs of two designs, two sets of suppliers, dual ground support equipment, two programs for operating and training programs, and dual program management and maintenance/overhaul systems.

Below are some examples of the project code names applied to the various -135 aircraft.

Project	Remarks
BIG CROW	NKC-135A serves as an electronic warfare laboratory.
BLUE EAGLE	PACAF's EC-135P airborne command post.
COBRA BALL	RC-135Ss that operated in conjunction with the COBRA DANE ground-based radar system at Shemya AFB, AK, and a sea-based radar system COBRA JUDY installed on the USNS *Observation Wind*.
COMBAT LIGHTNING	7 KC-135As converted for radio relay operations during the war in SEA. They were equipped with 4 radio operator stations in the main cabin.
COMBAT SENT	RC-135U
COVERALL	SAC's total airborne command and control program.
HEAD DANCER	TAC EC-135K airborne command posts.
LISA ANN	Sole RC-135E. Renamed RIVET AMBER.
LOOKING GLASS	SAC's 24-hour airborne alert command post with ICBM launch capability.
NIGHT WATCH	National Command Authority airborne command post – National Emergency Airborne Command Post (NEACP) EC-135J.
OFFICE BOY	3 RC-135Ds
OXEYE DAISY	TAC EC-135K airborne command post conversion program.
RIVET AMBER	Sole RC-135E renamed from LISA ANN.
RIVET DIGGER	3 NC-135s provided support to the 1964 Nuclear Test Ban Treaty.
RIVET JOINT	RC-135V
SILK PURSE	USCINCEUR EC-135H airborne command post.
SPECKLED TROUT	The VIP/electronic test-bed aircraft assigned to Andrews AFB, Md., for use by the USAF Chief of Staff. It carried a variety of prototype avionics over the years to give the boss an idea of what was going on with new technology.

C/KC-135 Inventory
(As of September 30, 2006)

USAF	KC-135	198*
	C-135	1
	NC-135	1
	OC-135	2
	RC-135	22
	WC-135	1
AFRES	KC-135	84
ANG	KC-135	251
TOTAL		**560**

*(includes 2 KC-135Rs and 1 KC-135E at Edwards)

C/KC-135 Distribution
Regular Air Force

ACC	1 Wing	OC-135/RC-135/TC-135/WC-135
AETC	1 Wing	KC-135
AFMC	1 Wing	NKC-135/NC-135/KC-135
AMC	5 Wings	KC-135
PACAF	1 Wing	KC-135
USAFE	1 Wing	KC-135

C/KC-135 Distribution
Reserve Component

AFRES	7 Wings	KC-135
ANG	20 Wings	KC-135

EXTERIOR MARKINGS EVOLUTION

Initially all C/KC-135s were delivered in a natural metal finish. Soon, *Day-Glo* orange conspicuous markings were applied – nose, waist band, and wing tips. For corrosion protection, the aircraft had an overall silver/gray Corrogard finish applied. During the late 1970s and early 1980s the Corrogard was replaced with an overall F.S. 595 16473 *Gloss Aircraft Gray* finish. This was replaced with the *Baby Shamu* scheme, consisting of F.S. 595 34086 *Drab Green* on all upper and vertical surfaces, while the *Gloss Aircraft Gray* was retained on the lower surfaces. With the dissolution of SAC and activation of Air Mobility Command (AMC), most of the KC-135s were transferred to AMC and were repainted in the new F.S. 595 36173 *Mobility Gray*.

The National Insignia was applied to the waist, top left wing, and lower right wing. USAF was applied to the top right and lower left wings. U.S. AIR FORCE was generally applied to the forward fuselage; however, some special purpose -135s had this marking located along the waist. The radio call

number (abbreviated serial number) was applied to the vertical fin. Black walkway markings are applied to the upper surfaces of the wings, and the hockey-stick shaped striping on the left side of the vertical fin was a walkway marking for when the fin was folded.

The SAC *Milky Way* band was initially applied to the nose, but then moved to the waist. The SAC insignia was centered on the *Milky Way* band on the left side of the aircraft, and oftentimes the wing insignia was applied to the right side of the aircraft. The SAC band was deleted with the *Baby Shamu* markings. At this time, the SAC insignia was applied to the left nose, while the wing insignia was applied to the right side of the nose. During the late 1980s, SAC began applying decorative tail bands to denote their various units – many carried a state or base name within the band.

Named aircraft began to appear during the mid-1980s when the then CINCSAC, Gen. Jack Chain, wanted to instill greater pride within his units. Oftentimes the names and nose art were replicas of famous bombers from World War II that served in the heritage bomb groups. With the transition to AMC, these names and nose art disappeared.

To permit refueling of early TAC fighters and USN/USMC tactical airplanes, Boeing developed the drogue adapter that could be attached to the boom nozzle. This system is also used to refuel airplanes from Allied air forces. (USAF photo from the author's collection)

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KC-135R, 61-0318, just after gear retraction. The huge CFM56 engines help quickly identify this model Stratotanker. *(USAF photo from the author's collection)*

This hog-nosed RC-135M, 61-4843, of the 55th SRW reveals its Martin Aircraft sensor cheeks along with a plethora of other antennas. (via SAC Combat Crew Magazine *from the author's collection)*