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50 years of the Hercules

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A Half Century of Airlift Excellence

The C-130 Hercules Turns 50

by Vic Johnson
with files from Lockheed Martin

Fifty years ago on Aug 23rd 1954, a YC-130 Hercules airlifter lifted off from the runway at the Lockheed Aircraft Corporation "Skunk Works" in Burbank, California. It was one of two Hercules prototypes built at the Burbank facility. During its 61 minute maiden flight, the aircraft was flown to what was then known as the Air Force Flight Test Station at nearby Edwards AFB for a punishing series of flight tests. At the controls were company test pilots Stan Beltz and Roy Wimmer. Dick Stanton was the flight engineer and Jack Real the flight test engineer.

This first flight marked the beginning of an era in air transport which has lasted to this day, and promises to extend for at least another half century. It is the era of the C-130 Hercules.



The prototype YC-130, pictured here in 1954, featured three-bladed propellers and lacked the extended nose radome which was standard on later models.

During 50th anniversary celebrations on Aug 23rd 2004 at the Lockheed Martin Aeronautics Company's assembly facility in Marietta, Georgia, company staff and local dignitaries commemorated five decades of airlift excellence. They also celebrated a huge success story that is still being played out in Marietta. Since that first flight 50 years ago, the manufacturing plant has produced more than 2,260 Hercules aircraft of all types in more than 70 different variants that have been delivered to 60 countries world-wide. Today, 67 nations, counting those that bought used aircraft, fly the Hercules.

During the festivities, Bob Hill, a 53-year employee of the company, who helped build the first production C-130 in 1954, read a proclamation adopted by the Georgia General Assembly declaring 2004 "The Year of the Hercules." In another historic event, the Hon Kevin Hellmer, postmaster of Marietta, unveiled a special U.S. Postal Service pictorial cancellation in honour of the first flight.

The Beginnings

At the end of a hastily called U.S. Air Force budget meeting held one week after the Korean War started in June 1950, an idea was born. One of the participants, an air force colonel whose name is unfortunately lost to history, said that the service needed a rugged medium transport that could be operated out of unimproved landing strips and haul cargo or troops a considerable distance at moderately high speeds. On Feb 2nd 1951 the U.S. Air Force issued a general operational requirement to Boeing, Douglas, Fairchild, and Lockheed for a transport able to: (1) carry 92 infantrymen or 64 paratroopers on a mission with a combat radius of 1,100 nautical

miles or, alternatively, a 30,000-pound cargo more than 960 miles; (2) operate from short, unprepared airstrips of clay, sand, or humus soil; (3) slow down to 125 knots for paratroops and even slower for assault landings; (4) have both an in-flight operable rear ramp for heavy equipment drops and side doors for paratroop drops; (5) handle bulky and heavy equipment including bulldozers, artillery pieces, and trucks; and (6) fly with one engine out.

Willis Hawkins was a 37-year-old aeronautical engineer in charge of the Advanced Design Department for Lockheed. He led the team that in a little over two months had come up with the design for what was being called the Model 82 in response to a U.S. Air Force request for proposal (R for P) for a new transport. Hawkins had convinced his boss, Hall Hibbard, then vice-president and chief engineer of Lockheed Aircraft Corporation, to submit the proposal for the aircraft that would become the C-130 Hercules. It was April 10th 1951.

"We got the R for P and set up teams to look at performance, develop a description of the aircraft, and determine weight," Hawkins recalled during the anniversary festivities. "We also had to estimate development costs."

Hawkins, who died on Sept 28th 2004 at his home in Los Angeles, said that the air force's R for P for the C-130 contained only seven pages. Lockheed responded with a proposal that was 130 pages, quite a contrast to the many thousands of pages required to respond to current government proposals. "Doing things for the U.S. government is always a little bit complicated," Willis Hawkins observed. "The C-130 program was a little simpler. We basically took the dimensions of the biggest piece of equipment the air force needed to carry, drew a circle around its cross section, and turned the circle into a tube about the length of a railroad boxcar. We put wings, engines, a nose, and a tail on it, and we had the design," Hawkins added. "We put the aircraft low to the ground so we could use the ramp to get cargo on and off easily."



The CC-130 came into its own as a humanitarian relief aircraft. During Operation Preserve grain was delivered to Ethiopia by a 429 Sqn Hercules from 8 Wing Trenton, Ont.

Lockheed built a full-scale mock-up of the complete fuselage, one engine, and a section of wing. The government held its first mock-up board review session in the mock-up itself. "We put the tables and projectors on the cargo floor," Hawkins said. "After the review, the air force didn't change much with the design aside from some detail changes in the cockpit. We didn't mind making those changes since we had not built the prototypes."

In July 1951, the Lockheed Model 82 was chosen over the other designs to be the U.S. Air Force's new tactical airlifter.

Later designated the C-130 and nicknamed *Hercules*, this airlifter, with its distinctive shape and four turbo-prop engines, has been in continuous production since early 1954, or nearly half the entire history of powered flight. The C-130 is the product of the longest, continuous, active military aircraft production line in history.

The engineering team obviously got it right the first time. The timeless airframe design has changed little in the past five decades and, on the outside, the new "J" model differs little from the original prototype.

The C-130A entered operational service with the U.S. Air Force in 1956. Since then, Hercules aircrews have, quite literally, been everywhere and done everything. It is safe to say that anytime there is a conflict, a natural disaster, or situation where significant quantities of people, supplies, or equipment have to be on-scene quickly anywhere in the world, Hercules crews will be flying them there. You name it and the Hercules has been used to do it.

Virtually devoid of creature comforts, noisy, and usually overstuffed with freight, a long-range trip in a Hercules can be a daunting experience. But what the Herc lacks in passenger amenities, it more than makes up for in capabilities. Its short take-off and landing abilities enable the aircraft to operate from unimproved strips; to carry respectable loads in and out of remote locations; and to deliver troops, rescue personnel and heavy loads by parachute. In combat situations, a jet assisted take-off (JATO) system is available which gives the aircraft a nearly vertical take-off capability and a low-level parachute extraction system (LAPES) can be used to deliver heavy loads at zero altitude.

Globally, the C-130 has been flown from both poles; landed or airdropped cargo at every hot spot from the Congo to Vietnam to Kosovo to Afghanistan and Iraq; and hauled relief supplies and medicine to virtually every outpost on the earth. It has been used to airdrop 15,000 pound bombs, paratroopers, and leaflets that weigh ounces.

The C-130 serves as gunship; monitors and jams enemy radio transmissions; it is used to track icebergs in the North Atlantic and drug traffickers in the Caribbean and Pacific. Its exemplary record as a search and rescue aircraft cannot be overstated.

The Hercules is flown into hurricanes to obtain wind and rain data; it is used to drop retardant on forest fires and insecticide on mosquito infestations.

A modern-day Noah's ark, the C-130 has been used to haul whales, camels, horses, and cows. In one operation dubbed Op "où est le boeuf?" (*Where's the beef*) thousands of carcasses of caribou, drowned in Northern Canada during a herd migration, were airlifted south by Hercules aircraft to be processed into pet food, thus avoiding an ecological disaster.

The Hercules has been used to medevac thousands of casualties to hospitals. As further proof that this aircraft can be used for everything, there was once a four-ship aerial demonstration team that flew C-130s. Incredibly, a C-130 once carried 452 people, despite being designed to carry only 90. In 1963, a Hercules crew landed on and took off from an aircraft carrier 21 times – without the aid of arrestor cables or catapults. That particular aircraft is still in active service with the U.S. Marine Corps.

Hercules Production

There have been five major military versions of the C-130 along with nearly 70 special-purpose variants. The initial production model was the C-130A, with four Allison T56-A-11 or -9 turbo-props. Following the first prototype flight and the first production flight on April 7th 1955, a total of 219 were ordered and the C-130A joined the U.S. Air Force inventory in Dec 1956. Between 1954 and 1959, 231 C-130As were built.

The C-130B introduced upgraded Allison T56-A-7 turboprop engines featuring four-bladed propellers of reduced diameter which resulted in lower tip speeds, reducing the associated vibration. The first of 134 "Bs" entered U.S. Air Force service in April- June 1959. The B model carried additional fuel in the wings and boasted strengthened landing gear. Vintage C-130Bs are still used in aerial fire fighting missions by the U.S. Air National Guard and Air Force Reserve units. Production of the C-130B ran from 1958 until 1963 and resulted in 230 aircraft.

The C-130E is an extended-range development of the C-130B, with two underwing fuel tanks which increased distance and endurance capabilities. A wing modification to correct fatigue and corrosion considerably extended the life of the aircraft. A total of 488 C-130Es were built from 1961 to 1974.

The most produced version of the Hercules so far is the C-130H, with 1,205 aircraft coming off the assembly line between 1964 and 1997. Featuring an increase in power and a new long-life wing, the aircraft is similar to the E model.

Production of the L-100, the civilian variant, totalled 115 aircraft and production ran primarily from 1964 to 1987.

All special equipment in the Hercules was designed to be removable, permitting the aircraft to be used as freighters, assault transports, or air ambulances.

The Hercules in Canadian Service

The C-130B was the choice of the RCAF when the first order was placed in 1960. Prior to the introduction of the Hercules, military air transport revolved around the North Star, the C-47 Dakota



and the C-119 Flying Boxcar. By the end of the 1950s it had become evident that the 24 C-119s then in RCAF service were nearing the end of their useful lives and would have to be replaced with a state-of-the-art transport aircraft. The air force was then going through a major re-equipment programme which would see the CF-101 Voodoo, the CF-104 Starfighter, the CC-106 Yukon, the CP-107 Argus, the CC-109 Cosmopolitan, the SA-16B Albattross, the DHC-4 Caribou and the CC-130 Hercules all come on line within a short period of time.

Canada acquired its first four CC-130Bs in 1960 (301, 302, 303 and 304) that were delivered from September through November of that year. The four new aircraft were bought "off the shelf" with no tenders called. The C-130 was the only multi-mission transport aircraft available at that time with as much versatility. They cost \$3.2 million apiece.

Ground school for the first RCAF crews began on June 7th 1960 at Dobbins AFB near the Marietta factory. Flying began on Sep 30th, concluding on Oct 6th. On Oct 12th the first Hercules, No. 10301 took off from Dobbins bound for Trenton, Ont, piloted by W/C Clyde Marshall and F/L Clare Agar. It soon left Trenton, flying to Winnipeg and Rivers, Man, for demonstrations, and on Oct 14th was delivered to 435 Sqn at RCAF Stn Namao (Edmonton). The three remaining aircraft would also go to 435 Sqn.

This small but potent Hercules fleet represented a quantum leap in airlift capability for the RCAF. Bill Carr of Stittsville, Ont, a retired lieutenant general and Canada's first commander of Air Command

Warrant Officer John Melanson of 426 Transport and Training Sqn, Trenton, Ont., supervises the unloading of humanitarian relief supplies in Ethiopia during Operation Preserve.



A Low Altitude Parachute Extraction System (LAPES) drop at Edmonton in 1986 demonstrates the Hercules' "low and slow" capabilities. Due to a series of accidents using the LAPES system, it is no longer used, however the capability remains for potential combat situations.



was then a group captain, and had just taken over as CO of Namao when the Hercs arrived. "At the time, we had 12 C-119s re-supplying Canada's Arctic on Operation *Boxtop*," he recalls. "With only three Hercs we could do it in half the time. We could carry three times the load at twice the speed." He notes that the RCAF was the first in the world to use rubber bladders to airlift bulk fuel and the system was prototyped in the CC-130Bs.

Group Captain Bill Carr flew some 1,000 of his 16,000 flying hours on the Hercules, becoming the first senior rank to ever achieve that milestone. "Of all the aircraft I flew over the years," he recalls, "the Spitfire and the Hercules stand out as my favourites. The Herc was an incredible airframe with incredible engines."

Since their introduction in 1960, Canadian CC-130s have been involved directly or indirectly in virtually every major operation and exercise carried out by the Canadian Forces. Most recently, United Nations and NATO operations world-wide have involved Afghanistan, Haiti, Kosovo, Bosnia-Herzegovina, East Timor, the Persian Gulf, and the Democratic Republic of the Congo.

The RCAF placed an order for 20 C-130E models in 1964 that were delivered between Dec 1964 and Feb 1967. On April 15th 1966, one of the four "B" aircraft (304) of 435 Sqn was written off after losing a cargo door in flight resulting in massive structural damage from the explosive decompression. It crash landed in a farmer's field near Borden, Sask, after a hair-raising let-down by the pilot, F/L John Moore. Group Captain Bill Carr recommended Moore for an Air Force Cross for his exceptional airmanship, "but it never materialized," Carr said.

The remaining three Bs were traded to Lockheed in early 1967 on the purchase of four CC-130Es. Those four Es (305 to 308) were purchased directly from Lockheed, all other acquisitions until 1984 were through the U.S. Foreign Military Sales (FMS) channels. According to Bill Carr, who at the time was at Air Force Headquarters in Ottawa, "We had \$10 million cash available at the end of the fiscal year so we just went ahead and bought them."

In 1974 the Canadian Forces purchased five C-130Hs (310 to 314) with deliveries made in 1974 and 1975. When these aircraft arrived, four E models

were relieved of their transport duties and converted to CC-130E (NT) navigation trainers and assigned to 429 Sqn in Winnipeg. These trainers accommodated two pallet-mounted consoles which made the aircraft a flying classroom for four students and two instructors from Winnipeg's Air Navigation School. This navigation training role ended in the early 1990s when the De Havilland Dash-8 took over those duties in Winnipeg.

In Aug 1984 a contract for two CC-130H aircraft was signed calling for scheduled deliveries in March 1985. The aircraft were title-transferred early in Dec 1984 and flown to Canada in 1985, following post-transfer modifications.

In August 1986, Canada purchased two former H models from Abu Dhabi in the United Arab Emirates.

With the retirement of the forces' Boeing 707 air refuellers used for CF-5 and CF-18 fighters, a contract for five Hercules tanker aircraft was signed in Ottawa on Dec 11th 1990, with deliveries to take place in first quarter 1991. Title transfer of these five aircraft was accomplished also in Dec 1990 with the aircraft being modified into CC-130T aircraft in Canada.

In 1996, the CAF contracted for two L-100-30s (stretched C-130s) and at SPAR Aerospace (formerly CAE) had them modified to CC-130H-30s.

Search and Rescue

The record of the Hercules as a search and rescue aircraft in Canada has been the subject of many books and newspaper and magazine articles, too numerous to mention. The aircraft is particularly well suited to the SAR role, especially in the Far North with the lack of airstrips, navigational aids and its large expanses of barren lands. Many modifications to enhance this role have been incorporated into the aircraft over the years, including blister windows in the side doors, and a slide-in module fitted to the rear ramp which gives spotters a panoramic view out the back through a large plexiglas window. Prior to this development, spotters endured cold wind blasts on the open, unprotected ramp.

Canada's Current Hercules Fleet

19 CC-130Es
6 CC-130Hs
5 KC-130HTs (Tankers)
2 CC-130H-30s (Stretched Hercules)

Locations:

8 Wing, Trenton, Ont
424 Transport and Rescue Sqn, 426 Transport Training Sqn, 429 Transport Sqn, 436 Transport Sqn (20 aircraft).
14 Wing, Greenwood, NS
413 Transport and Rescue Sqn (four aircraft).
17 Wing, Winnipeg, Man
435 Transport and Rescue Sqn (eight aircraft, five of which are KC-130H tankers).

These aircraft carry out a wide range of missions including troop transport, tactical airlift, support to the United Nations and NATO, humanitarian aid, search and rescue, air-to-air refuelling, and aircrew training/qualification.

Bert Proulx of Ottawa, a retired

brigadier general and the last commander of Air Transport Group before it was absorbed by 1 Canadian Air Division Headquarters in 1997, racked up 5,000 of his 8,000 flying hours as a navigator on the Hercules. He also counted 100 parachute jumps from the aircraft during his long career. He counts such hot spots as Vietnam, India/Pakistan, Sarajevo and Rwanda among his destinations over the years. "Few people realize that the Hercules is one of the very few Canadian military aircraft to take bullets since WW II," he said. "On three occasions CC-130s have come under ground fire while in theatres of conflict."

Bert Proulx remembers the Hercules as "a wonderful, wonderful aircraft that has given absolutely incredible service."

"A phenomenal aircraft" is how WO Don Rocheleau describes the Hercules. Now at National Defence Headquarters in Ottawa, as an airframe technician WO Rocheleau spent 20 years of his 28-year career on Hercs at Edmonton and Trenton. "On Operation *Boxtop* we always operated around-the-clock," he recalls. "And if the aircraft broke,

Willis M. Hawkins Father of the Hercules 1914 - 2004

Willis M. Hawkins, the principal designer of the C-130 Hercules airlifter, which is still in production after 50 years, died Sept 28th at home in Los Angeles, Calif. He was 90.

Hawkins also was involved in development of the P-80 Shooting Star, America's first operation jet fighter; the derivative T-33 Silver Star jet trainer; the Constellation airliner, which also served in military early warning and electronic intelligence-gathering roles; the U.S. Navy's Polaris missile; the M-1 Abrams main battle tank and the Corona reconnaissance satellite. His design work included the P-38 Lightning, Lodestar transport and its Hudson bomber spin-off, XF-90 experimental fighter, F-104 Starfighter and X-17 re-entry test vehicle.

Hawkins was born in Kansas City, Mo., and graduated from the University of Michigan as an aerospace engineer. He joined Lockheed in 1937. Also in his 50-year career, Hawkins served as president of the Lockheed Missiles and Space Company. He retired in 1986, but continued to serve as a consultant on such projects as the C-130J Hercules, which is now in production.





which was not very often, we'd have it right back in the air. It was definitely a user-friendly aircraft."

Hercules Accidents

Although the reliability and safety record of the Hercules in Canadian service has been outstanding, considering the flying rate and operational conditions, that record is not perfect. In addition to the crash landing of No. 304 in Saskatchewan previously mentioned, an E model (309) of 436 Sqn crashed during a night training flight near Trenton on April 27th 1967, killing all the crew. Runaway trim control was blamed.

Another CC-130E (312) of 436 Sqn stalled and crashed on Oct 15th 1980 during a search in northern Quebec. Eight of the 10 aboard were killed. In Nov 1982 a CC-130H (329) of 435 Sqn crashed at CFB Edmonton during a LAPES drop. The LAPES load got hung up on the rear ramp causing the aircraft to stall and crash. All seven crew were killed.

On March 29th 1985, two CC-130Hs (330 and 331) of 435 Sqn collided over CFB Edmonton (Namao), killing all 10 crew aboard both aircraft.

In Jan 1989 one CC-130E (318) was destroyed when it landed short in ice fog at Fort Wainwright, Alaska during Exercise *Brim Frost*. Four crew members and seven passengers died and seven survived, three with serious injuries.

One CC-130E (322) crashed at night near Alert, NWT, on Oct 30th 1991 when the crew miscalculated their approach altitude and struck a rocky slope. The crash resulted in one of the most dramatic High Arctic rescue operations in Canadian history. After 32 hours in appalling cold and pain from their

injuries, the 13 nearly-frozen surviving passengers and crew were rescued by a team of 26 search and rescue technicians (SAR Techs) led by WO Arnie Macauley of 413 Sqn, CFB Greenwood, NS. Two of the crew and three passengers had already perished.

Another CC-130E (321) inadvertently flew into the ground at CFB Wainwright, Alta, on July 22nd 1993 while performing LAPES training. Five crew were killed, four survived.

Significant in this accident record is that with more than 500,000 total flying hours on Canadian CC-130s, only two of the Category "A" crashes were attributed to mechanical failure.

To the Future

There is much conjecture about Canada's plans for future airlift capability. There have been no definitive plans for the replacement of the Hercules fleet, nor have any moves been made to address the problems of maintaining the ageing aircraft. "All indications are that there will be an ongoing need for the Hercs," says Jean Jacques Blais of Ottawa, a former minister of national defence and an acknowledged expert on air transport. "Some of the of CC-130Es now in service have more than 40,000 flying hours on them, the highest usage rate in the world. "The fleet could theoretically be upgraded by installing new centre wing boxes which would extend the airframe lives, coupled with engine and avionics upgrades. But we would still end up with 40- year-old aircraft without many of the technological advances of the past four decades," he said. "Why spend money on that? Why not buy new aircraft?"

Two possible contenders for any replacement include the new C- 130J

Hercules and the EADS Airbus A400M, both four-engine turbo- props. "But the A400M is not in production, nor does a prototype even exist," said Jean Jacques Blais. "So the C-130J would be the logical choice for any off-the-shelf purchase."

Today's C-130J represents a nearly complete re-invention of the Hercules. The J model, first flown in 1996, has a wingspan of 132 feet - 12 feet longer than the Wright Brothers' first flight - a height of 38 feet, and comes in two lengths. The short fuselage aircraft is 97 feet, the same as all previous models, and the longer aircraft is 112 feet, which allows it to accommodate more payload. The longer aircraft can carry a maximum payload of 47,812 pounds (21,787 kg). Maximum range with a 25,000 pound payload is more than 3,700 nautical miles without external fuel tanks.

A total of 179 C-130Js are on order and 113 have been delivered to date. International C-130J operators include the Royal Air Force, Royal Australian Air Force, Italian Air Force, and the Royal Danish Air Force.

The C-130J incorporates advanced technologies in engines, avionics systems, cockpit displays, materials and other areas – building on the long heritage that all started with the original Hercules being "designed right the first time," as Willis Hawkins put it. He viewed the C-130 as one of his greatest successes: "The C-130 is not exactly an attractive aircraft," he said shortly before his death. "It is still in production and still doing the job it was designed for. Originally, some questioned who would want to buy such an aircraft. Irv Culver, one of our engineers, said that if we made it right the first time, we could sell it to anybody. I think we must have done it exactly right." ©