National Aeronautics and
Space Administration

C-17 Globemaster III

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Aeronautical concepts conceived at NASA over the last four decades are being incorporated into the military's newest jet transport – the Boeing (previously McDonnell Douglas) C-17 Globemaster III. Both the Air Force and industry have benefitted significantly from the contributions of NASA's innovative technology.

The C-17 has performance characteristics that distinguish it from its predecessors, including long-range capability, outstanding aerodynamic efficiency and ease of ground operations. Additional characteristics include the ability to perform extensive air drops over hostile territory and to make precision landings and takeoffs from short or makeshift runways. The design of a flexible cargo compartment makes it possible to carry a wide range of vehicles, cargo pallets, paratroops or aeromedical evacuees.

Four NASA research centers made significant contributions to the C-17.

Ames Research Center performed flight demonstrations with the Quiet Short Haul Research Aircraft (QSRA) to validate design features of the flight control system and head-up display. These features provide precision-approach path control and accurate landing performance for the C-17. As a result of this research, NASA technology is now being used as part of the aircraft's head-up display and spoiler control system.

In addition, Ames provided the Air Force with a complete database on aerodynamic performance, stability and control, flying qualities, augmented control and displays and flight test techniques for powered lift aircraft.

Dryden Flight Research Center conducted actual flight tests using the "supercritical" wing, an advanced airfoil design conceived at Langley Research Center in the 1960's. Test results showed that this innovative wing enhances the range, cruising speed and fuel efficiency of jet aircraft by producing weaker shock waves that create less drag and permit high efficiency. The C-17 and other military transports use a "supercritical" wing design.

Another flight research program at Dryden demonstrated the feasibility of digital fly-by-wire flight-control technology. This technology offers a lower volume, lightweight replacement for hydraulic control systems and has been used on many aircraft, including the C-17.

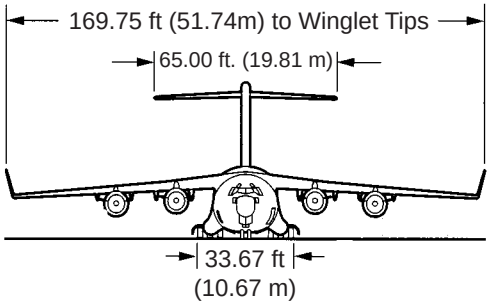
Another key element of the C-17 design is a flap system developed by Langley. This "externally blown flap" or "powered-lift system" enables the airplane to make slow, steep approaches with heavy cargo loads. The steep approach helps pilots make precision landings with the aircraft, touching down precisely in the spot desired on limited runway surfaces. The flap has been applied to jet transports with both conventional and swept wings.

Wind tunnel research at Langley was instrumental in the development of winglet technology. Winglets are small, winglike vertical surfaces at the tip of each wing of an aircraft that enable the airplane to fly with greater efficiency. They curve flow at the wingtip to produce a forward force on the airplane, similar to the sail on a sail boat. Winglets were installed on a KC-135A, flight tested at Dryden and eventually applied to the C-17.

Langley played a major role in developing composites technology incorporated on components of the C-17 design. Several of the major control surface and secondary structural components are made from these composites. The most direct contribution was the development of the DC-10 graphite-epoxy upper aft rudders which entered regular airline service in 1976. The C-17 has benefitted from these past NASA-developed composite materials technology.

Lewis Research Center and the the Energy Efficient Engine Program contributed technologies to the F117-PW-100 (PW2040) engines on the C-17. These technologies led to improved performance and efficiencies of the fan, compressor and turbine components and overall superior fuel consumption for this engine.

McDonnell Douglas was recognized for the performance and efficiency of the C-17, making it the most versitile airlift aircraft in aviation history, when it received the Collier Trophy in 1994, U.S. aviation's highest annual achievement award.



Length:	74.0 feet	Cruise Speed:	0.74 to 0.77 Mach
Height at Tail:	55.1 feet	Maximum TGW:	585,000 pounds
Power Plant:	four PW2040 engines	Empty Weight:	277,000 pounds
	40,440 lbs thrust each	Range:	2,400 nautical miles

Front photo courtesy of The Boeing Company

LG-1998-05-498-HQ