

## C-17 Increased Gross Weight (IGW) and Formation Spacing Reduction (FSR)

### Executive Summary

- In September 2013, the Army Test and Evaluation Command, with support from the Air Force Air Mobility Command, conducted Increased Gross Weight testing for a single C-17 Globemaster III aircraft with a full paratrooper load. This was Part 1 of a three-part test.
- On April 25, 2014, DOT&E published an Operational Assessment report on Part 1.
- Increasing the gross weight of a single C-17 from 385,000 to 400,000 pounds, when deploying a full paratrooper load with the T-11 parachute system in mass exit configuration, does not increase the risk to paratrooper or aircraft beyond acceptable levels for airborne operations.
- Parts 2 and 3 of the test effort are not funded.

### System

- C-17 Increased Gross Weight and Formation Spacing Reduction are proposed changes to airborne tactics, techniques, and procedures.
- The Army hypothesizes that the introduction of the new T-11 parachute may allow for the following changes in order to increase unit effectiveness and reduce vulnerability to aircraft and paratroopers:
  - Increased Gross Weight: Increase C-17 gross weight by 15,000 pounds (from 385,000 to 400,000) at the time of a parachute drop. This will allow increased range for refueling aircraft and projection of the airborne force further into a hostile environment.
  - Formation Spacing Reduction: Reduce formation spacing within and between aircraft elements to the minimum safe distance, which will decrease delivery time of the airborne force, decrease enemy air defense reaction time, and increase paratrooper concentration and unit cohesion on the ground.
- The T-11 Advanced Tactical Parachute System is a personnel parachute system consisting of the main parachute, reserve parachute, and harness. The main parachute deployment



- system uses a drogue/sleeve and a mesh slider to control the rate of canopy opening and minimize aircraft exit interference problems. The T-11 replaced the T-10 parachute.
- The C-17 Globemaster III aircraft is one of the Air Force's main long-range, heavy transport aircraft. It can deploy 102 paratroopers from two troop doors in a single pass.

### Mission

Airborne forces execute parachute assaults to destroy enemy forces and seize and hold key objectives until linkup with follow-on forces. Airborne assaults are used in forced entry operations to deliver Soldiers with speed and surprise into hostile territory.

### Major Contractors

- T-11:
  - BAE Systems – Phoenix, Arizona
  - Aerostar International – Sioux Falls, South Dakota
  - Airborne Systems North America – Santa Ana, California
- C-17: The Boeing Company, Integrated Defense Systems – Long Beach, California

### Activity

- The Army Test and Evaluation Command, with support of the Air Force Air Mobility Command, executed the single C-17 Increased Gross Weight test in September 2013 at Fort Bragg, North Carolina. This was the first of a three-part test.
- In April 2014, the Army and Air Force began collecting and analyzing vortex data to populate the Vortex Modeling Tool

- that will be used in the development of C-17 formations for Parts 2 and 3 of the test.
- DOT&E published an Operational Assessment report on Part 1 of the test on April 25, 2014.
  - The Army and Air Force conducted all testing in accordance with DOT&E-approved test plans.

# FY14 ARMY PROGRAMS

- Parts 2 and 3, which will test multiple aircraft at increased gross weight and formation spacing reduction, are scheduled for FY15.
- Required Army resources for Parts 2 and 3 of the test effort are not funded.

## Assessment

- Increasing the gross weight of a single C-17 from 385,000 to 400,000 pounds, when deploying a full paratrooper load with the T-11 parachute system in mass exit configuration, does not increase the risk to paratroopers or aircraft beyond acceptable levels for airborne operations. During the test:
  - Test evaluators did not observe, nor did test participants report, any Soldier-to-Soldier interactions after exiting the aircraft until parachute stabilization of T-11-equipped paratroopers deploying from a single C-17 at a gross weight of 400,000 pounds.
  - Test evaluators did not observe any T-11 parachute problems at 400,000 pounds aircraft weight.
  - There was no damage to the T-11 parachute system caused by deployment from a C-17 at 400,000 pounds.
  - Modeling and simulation predicted T-11-equipped paratroopers deploying from C-17 at 400,000 pounds would be closer during parachute deployment than T-11 or T-10-equipped paratroopers at 385,000 pounds. The jumper separation distance predicted is better than the C-141 aircraft, the original benchmark for paratrooper safety.

- The current airdrop flight profile of a single C-17 at 385,000 pounds can be maintained at 400,000 pounds while conducting dual-door mass exit operations with the T-11.
- Paratroopers and C-17 aircrews used current single aircraft tactics, techniques, procedures and training to execute mass exit operations at 400,000 pounds.

## Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY14 Recommendations. The Army and Air Force should:
  1. Populate the Vortex Modeling Tool with empirical data to support C-17 aircraft formation spacing at increased aircraft gross weights and operational jump altitudes (training and combat) with different environmental conditions.
  2. Progress to Parts 2 and 3 of the test, multiple aircraft at increased gross weight and formation spacing reduction, after completing post-model analysis with the new data.
  3. Conduct verification, validation, and accreditation of the Vortex Modeling Tool in order to make confident predictions of vortex interactions under conditions not included in the test effort, such as combat jump altitudes.
  4. Include validation testing of the current approved formation geometry at an aircraft gross weight of 400,000 pounds during Part 2 of testing.