

*An Automated System for Verifying Aircraft Weight and Balance Moments Before Takeoff*



## OVERVIEW

Although refined methods have long been used to calculate the weight and balance of an aircraft, it wasn't until 1999 that a first of its kind Automatic Aircraft Weight and Verification Balance System (AAWBVS) was developed by the Emery Winslow Scale Co.

Working in harmony with the International Civil Aviation Organization (ICAO), Emery Winslow engineered and manufactured an AAWBVS, installed and in use at the Bogota, Colombia El Dorado International Airport, capable of verifying the weight and balance of a full range of aircraft up to and including the Boeing 747.

The AAWBVS is comprised of a network of high capacity scales, including instruments, computers and software.

The network of scales consists of four main gear weighbridges, each with a capacity of 150,000 kg, and a nose wheel weighbridge with a capacity of 50,000 kg. The total system capacity is 400,000 kg. (See Figure 1)

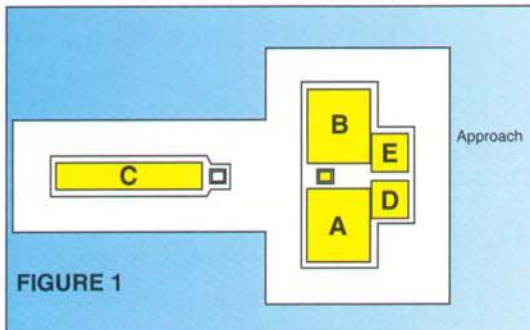


FIGURE 1

Each weighbridge is a structural steel framework with a reinforced concrete deck, mounted on 100,000 kg hydrostatic load cells.

The weighbridge is designed to support a wheel load up to 23,000 Kg (50,000 lb.).

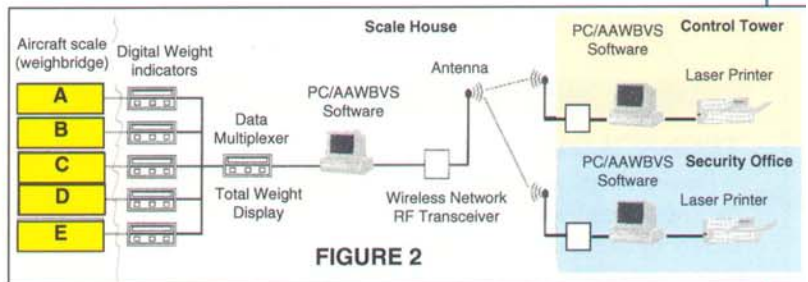


FIGURE 2

A representation of the AAWBVS instrumentation and RF communications from the scale house to the control tower and security office. The system handles aircraft as large as a Boeing 747 or 777.

## INSTRUMENTATION

The digital weight indicators and the computers display the weight of each gear, calculate the total weight and the center-of-gravity of the aircraft.

The actual weights and center-of-gravity are then compared against database limits for the aircraft being weighed. If the results are within specifications, the aircraft is cleared for takeoff; if not within specifications, the aircraft is required to return for a cargo adjustment.

Each transaction is printed out and stored for future analysis. (See Figure 2)

# AUTOMATIC AIRCRAFT WEIGHT AND BALANCE VERIFICATION SYSTEM



The AAWBVS installed at Bogota's airport consists of four main weighbridges with a reinforced concrete deck.



## SCALE ARRANGEMENT

The AAWBVS is located to minimize aircraft time and distance on its way for takeoff.

The aircraft taxis to the the AAWBVS, comes to a complete stop and reduces engines to idle. Within 30 seconds, the aircraft is weighed, the data analyzed and, if within specifications, cleared for takeoff. (See Figure 3)

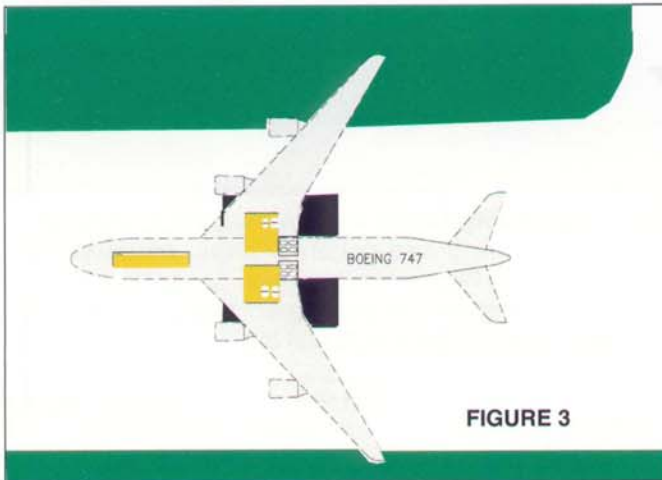


FIGURE 3

## TECHNOLOGY

Emery Winslow developed and utilizes a technology known as Hytronics™, a technology that combines hydrostatic load cells and state-of-the-art instrumentation, computers and software.

Hydrostatic load cells are non-electronic and cannot be damaged by lightning, water or corrosion. This is extremely important because the load cell components are most crucial to reliable performance.

The reliability of the hydrostatic load cell is certified by Emery Winslow with a LIFE/10 guarantee; a lifetime guarantee against failure caused by lightning and water, and a 10-year performance guarantee.

## AAWBVS BENEFITS:

- Improved Safety: It is common for aircraft to take off without an absolute measure of weight and balance. The AAWBVS eliminates this uncertainty. All aircraft passing over the AAWBVS receives verification that weight and balance are either inside or outside the acceptable safe zone.
- A wide range of aircraft can be weighed on one AAWBVS. A single AAWBVS can handle aircraft with weights ranging from 5,000 kg to 400,000 kg ... and higher.
- Improved Fuel Economy: a properly loaded aircraft consumes less fuel.
- Noise Reduction: A properly loaded aircraft minimizes takeoff noise.
- Pollution Reduction: A properly loaded aircraft reduces CO<sub>2</sub> pollution.
- Improved Loading Efficiency: Feedback to cargo executives will improve the quality of the cargo handling and loading process, leading to improved safety, fuel economy, noise and pollution reduction.
- Reduced Maintenance: It is known that an out-of-tolerance or a marginally acceptable weight and balance causes the aircraft to work harder than one that is correctly loaded, resulting in increased maintenance.



Aircraft positioned for weight and balance verification.

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