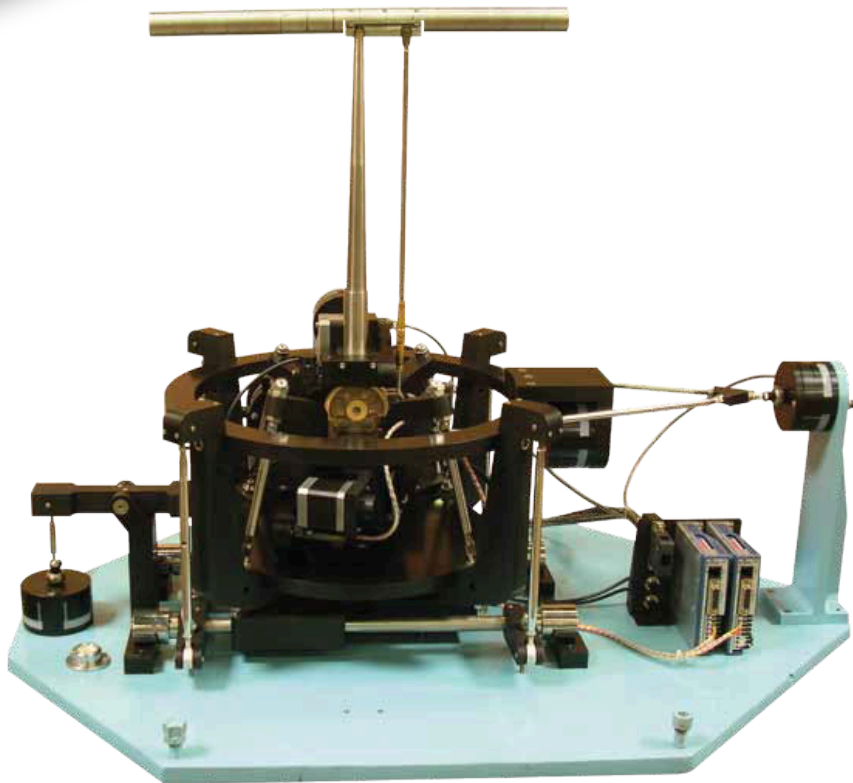


AEROLAB



PYRAMIDAL FORCE/MOMENT BALANCE

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During the early years of wind tunnel testing, Forces and Moments were literally measured with pan-type “balances.” Although technology has advanced dramatically since those early days, the term “balance” is still applied to the devices used for Force and Moment measurements, today. Balances can be divided into two main groups: internal and external. The group names are derived from their location relative to the test model and wind tunnel test section – internal balances reside inside a test model while external balances reside outside the test section. AEROLAB external balances are of the “pyramidal” type. The name is derived from the architecture of the supporting members. Although the four slender supporting members do not actually converge to form the “peak” of a pyramid, Forces and Moments are measured about their projected convergence – known as the “resolving center” of the balance.

AEROLAB offers pyramidal balances with either three or six measured “components”. Three-component balances provide Lift, Drag and Pitching Moment information while six-component balances also provide Side Force, Rolling Moment and Yawing Moment.

AEROLAB Pyramidal Balances are available in three sizes: small, medium and large. Size selection is based on test section size and application.

Small Pyramidal Balance

- Approximate resolving center height - 12 inches (30.48cm)
- Minimum required height below test section - approximately 13 inches (33.02cm)

Medium Pyramidal Balance

- Approximate resolving center height - 16 inches (40.64cm)
- Minimum required height below test section - approximately 46 inches (116.84cm)

Large Pyramidal Balance

- Approximate resolving center height - 40 inches (101.6cm)
- Minimum required height below test section - approximately 40 inches (101.6cm)

Load Limits	Small Balance	Medium Balance	Large Balance
Lift - lbf (N)	+/- 50 (222)	+/- 275 lbs (1,223)	+/- 300 (1,334)
Drag - lbf (N)	+/- 50 (222)	+/- 85 (378)	+/- 120 (534)
Pitching Moment - inch-lbf (Nm)	+/- 100 (11.3)	+/- 720 (81.3)	+/- 110 ft-lbs (149)
Side Force - lbf (N)	+/- 50 (222)	+/- 95 (422)	+/- 175 (778)
Yawing Moment - inch-lbf (Nm)	+/- 100 (11.3)	+/- 720 (81.3)	+/- 110 foot-lbs (149)
Rolling Moment - inch-lbf (Nm)	+/- 100 (11.3)	+/- 720 (81.3)	+/- 110 foot-lbs (149)

Pyramidal balances are rather complicated devices employing a series of carefully machined lever arms, turnbuckles, exures and pivots. Unlike an internal balance, output does not need to be mathematically reduced – Drag, Side and Lift Forces as well as Pitching, Yawing and Rolling Moments are read directly (Internal balance output consists of , in part, Normal, Side and Axial Forces. These Forces must then be evaluated as a function of Pitch and Yaw angles to calculate Lift, Side and Drag Forces.)

A pyramidal balance has two main components: the “spider” and the “cradle”. Moments are measured from the spider and Forces are measured from the cradle. Moments are converted to forces through lever arms and directed to a load cell. There are six load cells – one for each component. Forces are transferred to a load cell through levers, as well. Each load cell is excited by a small controller located in the silver case.

Hand-cranked pitch/yaw control is standard; however, high-accuracy stepper motors are available as an option.

AEROLAB Pyramidal Force/Moment Balances are made from anodized 6061 aluminum, high-quality carbon steel and stainless steel. Stainless steel fasteners are used throughout.

Pyramidal Balances are supplied with calibration fixtures and a first-order calibration matrix.

Optional Features Include:

- Data Acquisition and Control (DAC) System
- High-accuracy stepper motor drives for pitch and/or yaw
- Motor-driven fairing table