



WICHITA STATE
UNIVERSITY

*NATIONAL INSTITUTE
FOR AVIATION RESEARCH*

Recent UAS Aerodynamics Testing Activities at WSU-NIAR

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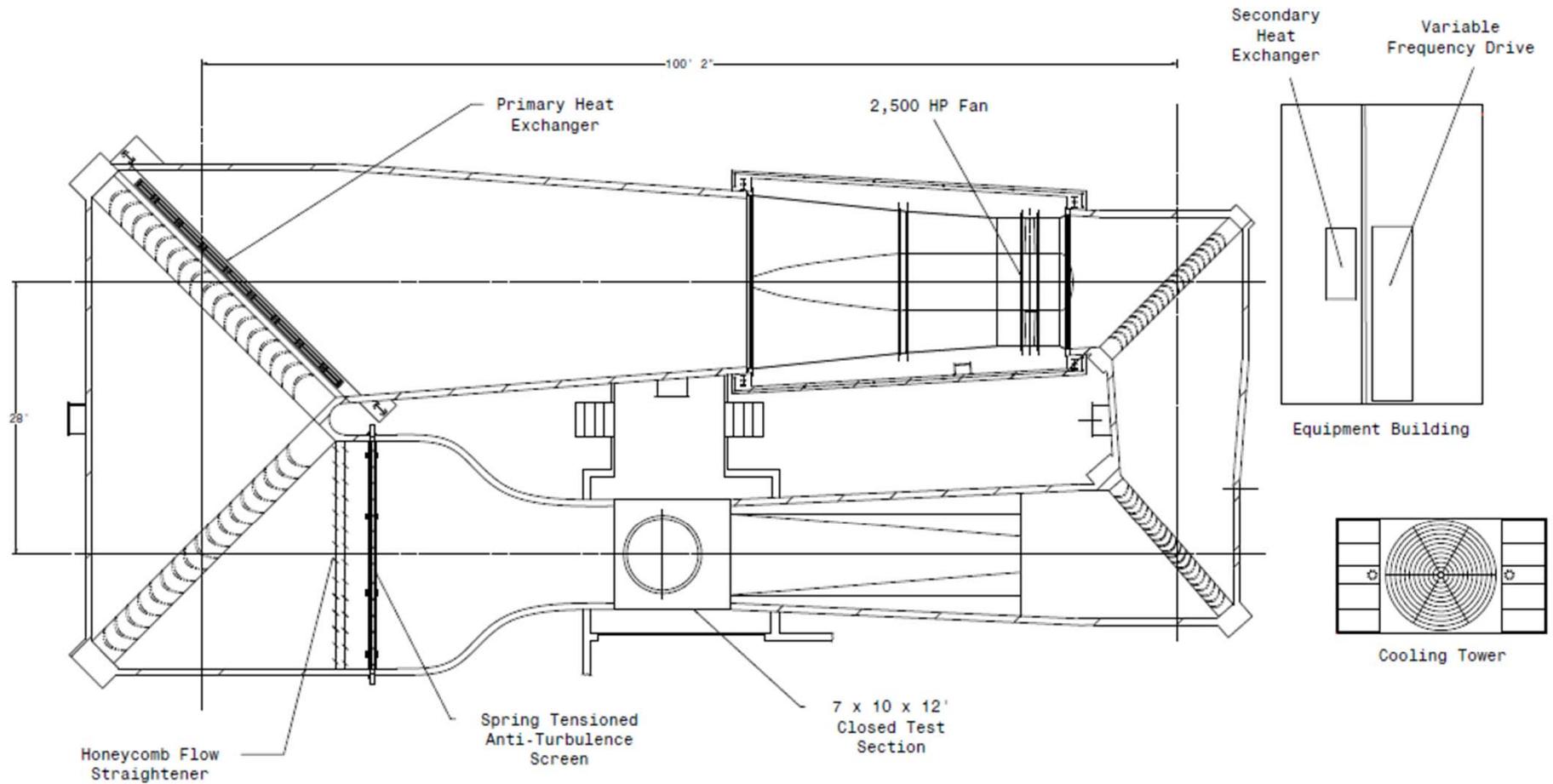
Walter H. Beech Wind Tunnel (WBWT)

Wichita State University/National Institute
for Aviation Research (WSU-NIAR)

WBWT Facility History and Purpose

- Built in 1948 to support aerodynamic testing needs of local aircraft development
- Tied to WSU College of Engineering
 - Modern experimental aerodynamics education tool
 - Hands-on student opportunities
 - Cooperative education program
- Today – provide support for:
 - Local aircraft industry
 - National and international aircraft development
 - Non-aviation aerodynamics development

WBWT Facility Overview



Test Section



Measurement Balances

- External Under-floor Balance
 - $\pm 2000 \text{ lb}_f$ lift load range
 - Full six-component measurement
 - EIS Date: 2003
- Variety of model mounts
 - Under-fuselage
 - Under-wing
 - Wing-root half models
 - Non-traditional setups



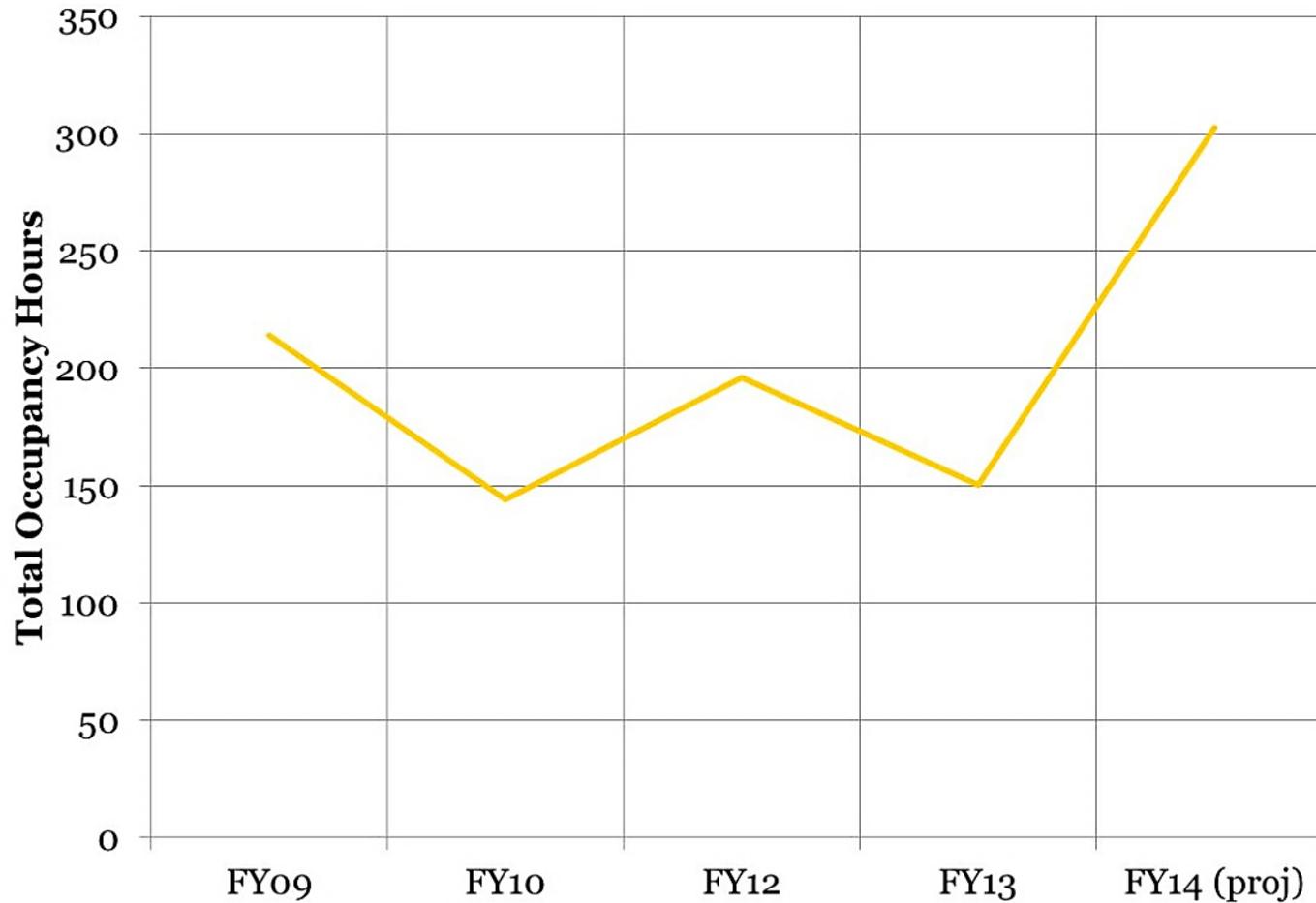
Measurement Balances (cont.)

- Internal Balances
 - Multiple load range calibrations
 - Multiple sting support designs
 - EIS Date: 2007



Our Recent Experience with UAS Testing

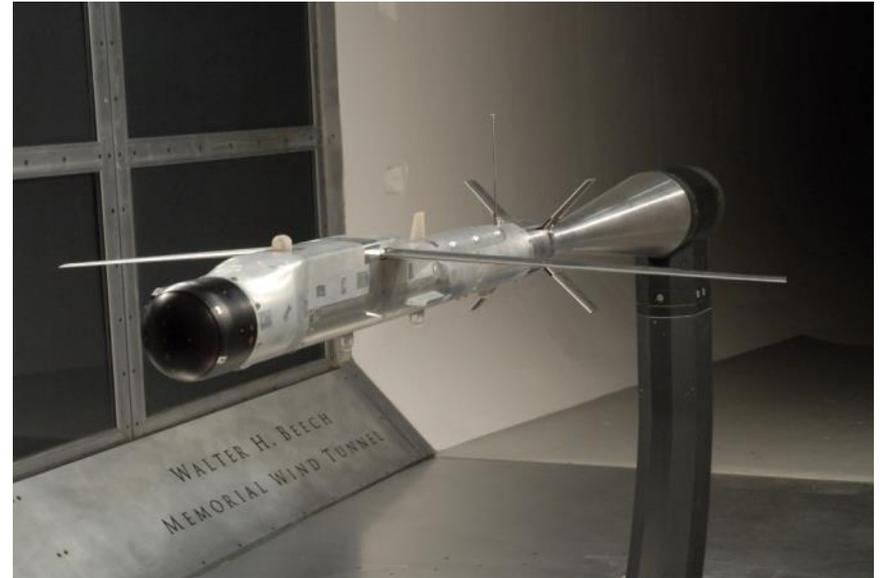
UAS Testing Trend at WBWT (FY09-FY14)



Public Photos of our UAS Testing



Boeing ScanEagle
Compressed Carriage UAV



Raytheon Missile Systems
Small Diameter Bomb

Public Photos of our UAS Testing



Composite Engineering
Firejet II Aerial Target

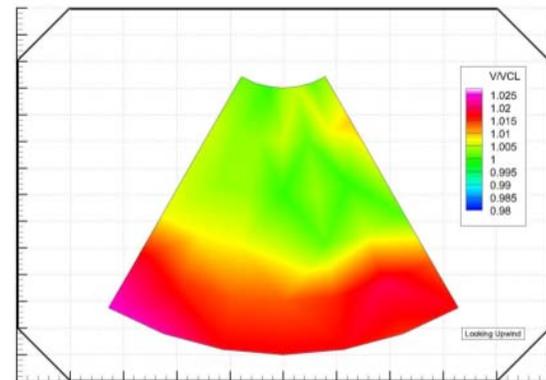
What We Offer in UAS Testing

- Cost-effective aerodynamic analysis
- **Real-time data**
- Design change analysis
- Design estimate validation
- Takeoff/landing cases
- Control systems failure aerodynamics
- Flight control database development
- **Complex interactions in powered vehicles**



Recent Improvements

- Equipment
 - Very low load external balance repeatability
 - Variable sting support size
- Flow Characterization
 - Low speeds
 - Airspeed at specific model location
 - Flow angle at specific model location
- Developing In-House CFD Capability
 - Cooperative effort with local aircraft industry
 - End-goal: prediction of testing flow phenomena



Questions?

