

IMPACT ASSESSMENT ON SAFETY STRUCTURES AND AIRCRAFT COMPONENTS

KEYWORDS

Bird Strike

Compressor Failure

Safety Shielding

Shrapnel

Aircraft Impact
Survivability

Compressed Gas Guns

FAA FAR 25.775

ASTM F330

Foreign Object Damage
(FOD)

Engine Fragment
Containment

Containment Rings

Canopy Testing

Aircraft Leading
Edge Testing

Impact Survivability

Homeland Security

Southwest Research Institute (SwRI) conducts a wide variety of safety-related impact tests for many applications, projectiles, and test specimens: aircraft components, bird impact resistance, engine failure fragments, and foreign object damage to many different structural and shielding components. SwRI maintains three ballistic gun systems that launch a large variety of projectile types and shapes at speeds from 10 ft/s to over 2000 ft/s. The Large Compressed Gas Gun Facility is capable of performing bird impacts from 240-knot commercial aircraft FAA certification to 550+ knot Air Force canopy qualification testing. Projectiles, test specimens and sabots are often designed, constructed and tested at SwRI to meet the specific requirements of clients. A large suite of state-of-the-art instrumentation and computer simulation codes support the experimental facilities.

Capabilities

- Launch of projectiles from 0.1 to 15 inches in diameter (larger if required)
- Impact speeds from 10 ft/s to over 2000 ft/s

- High-speed digital imaging of impacts up to 100,000,000 frames per second
- Nicolet Multipro® high-speed data acquisition up to 200 MHz
- Test fixture fabrication
- Institute ISO-compliant QA
- Computer impact simulation
- Temperature control from -50°F to 150°F
- Gelatin and bird projectile testing
- Sabot design

Experience

- FAA bird strike certification testing at 240–280 knots
- Air Force bird strike qualification testing at 240–550 knots
- Engine containment shield tests with irregularly shaped projectiles
- Pressure measurements at impact point; correlation to simulations
- Impacts into Space Shuttle tiles with lightweight foam projectiles
- Impacts into personal protection shields, simulated plant equipment
- Shield and airframe design for impact survivability



65-lb fragment-simulating projectile about to impact Lexan shield design



F16 canopy deflecting under impact by a 4-lb projectile at 550 knots

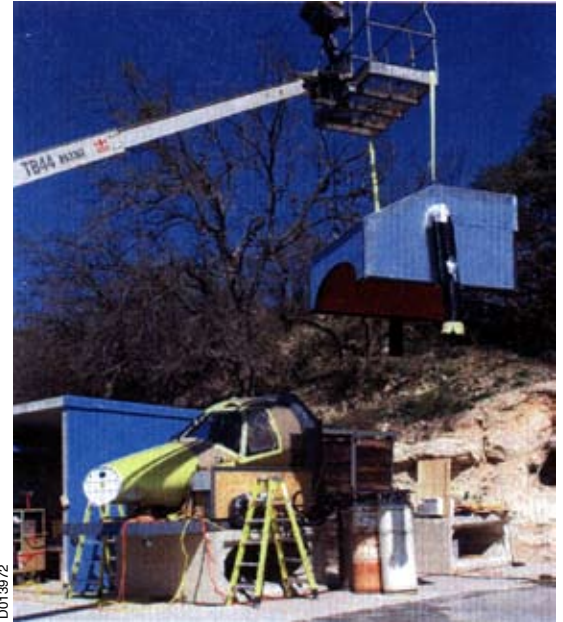
Facilities

- Ballistics ranges with three compressed gas guns and over 20 barrels
- Three fully equipped instrumentation suites (one mobile)
- Target area for large components
- Mobile gun platform for easy targeting (yaw, pitch, waterline and butline)



D013973

One-third of a jet engine compressor packed in a sabot for launching. Complex sabots are often needed to launch irregularly shaped projectiles.



D013972

Civil aircraft fuselage undergoing temperature-controlled bird strike testing. The insulated hood, hanging from the crane, covers the fuselage for cooling or heating to the desired test temperature and is raised moments before the projectile is fired at the target.



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,300 employees who perform contract work for industry and government clients.

**We welcome
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