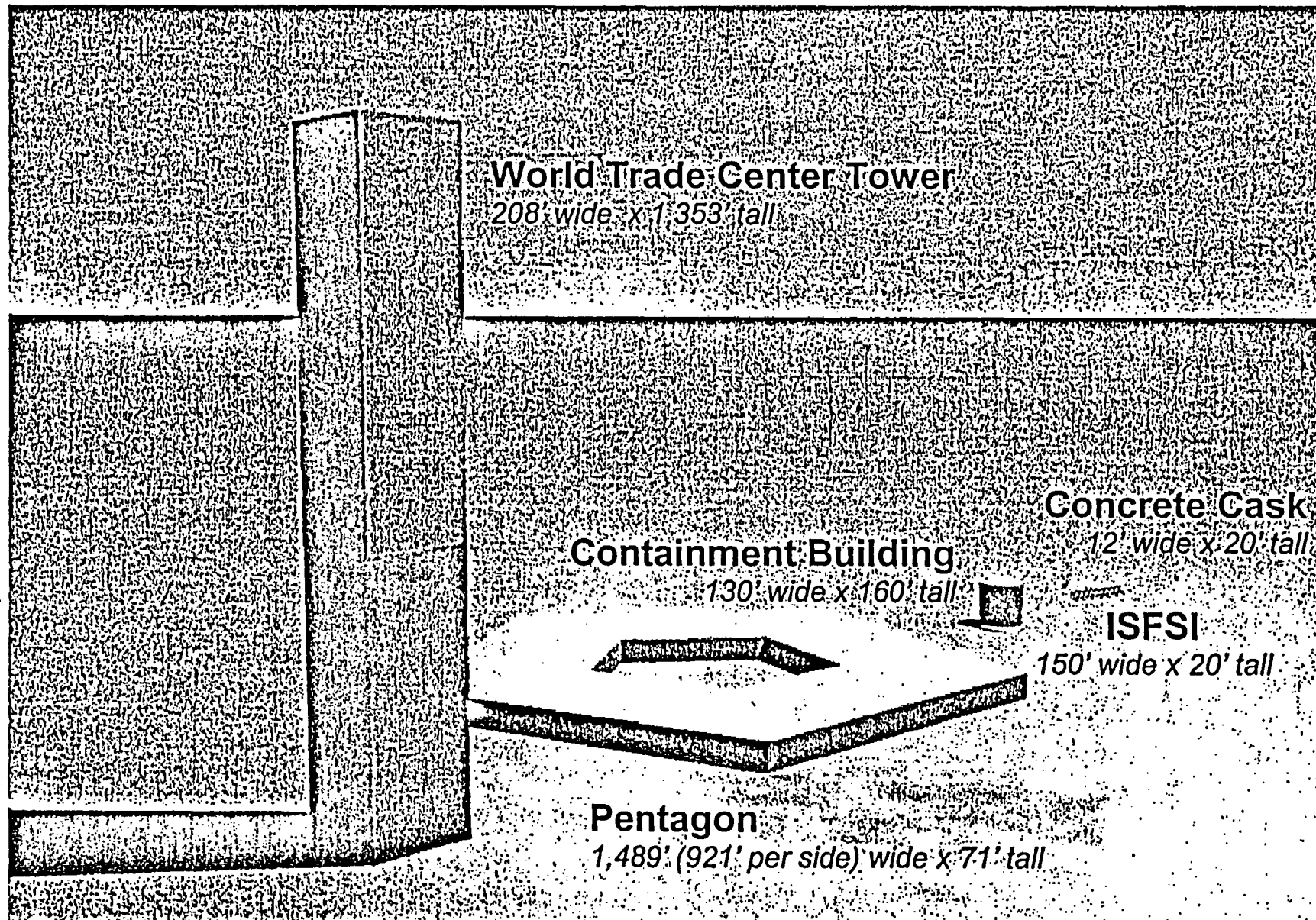


CONSIDERATION OF UMS® UNDER MASSIVE AIRCRAFT IMPACT

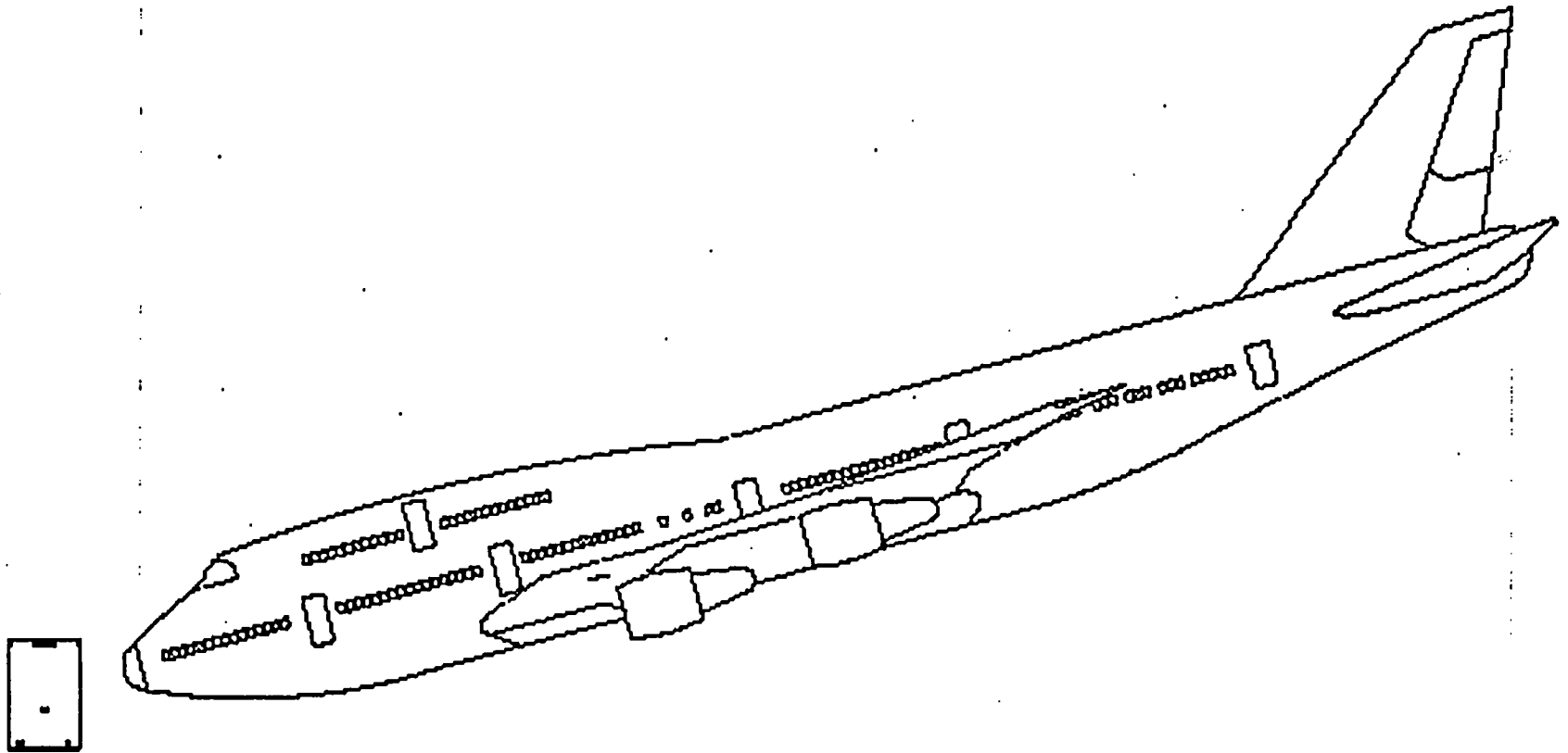
- Consider 747-400 impacting UMS® within ISFSI
 - Impact of 747 fuselage on CG of concrete cask
 - Impact of turbine rotor on CG of adjacent cask
 - UMS® weight 304,500 lb., 747 fuselage weight 452,000 lb.
 - UMS® density 162 lb/ft³, 747 density 5.9 lb/ft³
 - Velocity at impact of 200 mph to 500 mph
- Evaluate the following
 - Loads on canister from cask sliding impact
 - Loads on canister from cask tipover impact
 - Damage to canister from rotor impact
 - Damage to canister from engulfing jet fuel fire
- Acceptance criterion
 - No release of radioactivity

P/D

Perspective on Target Size



HYPOTHETICAL AIRCRAFT IMPACT EVENT



RESULTS OF UMS® EVALUATION UNDER MASSIVE AIRCRAFT IMPACT

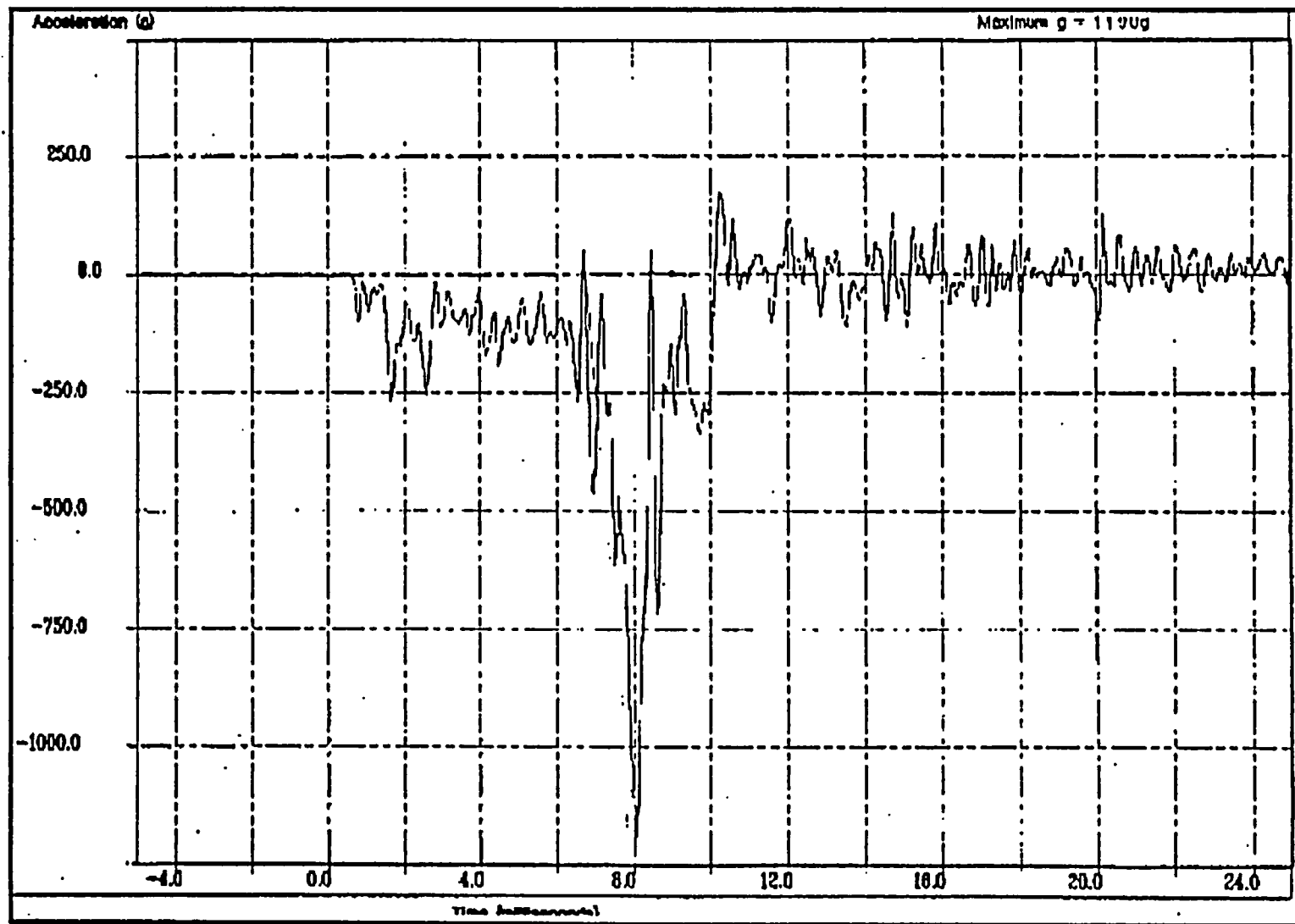
- Structural
 - For either sliding or tipover impact, no canister material or shell/lid weld failures using ultimate strain criterion (strain is well below ultimate)
 - Turbine rotor does not impact canister
 - At credible 747 velocities, lid welds meet ASME Code allowables
- Thermal
 - No effect of fire on structural stability of canister
 - Concrete bulk temperature <350°F, peak temperature <1475 °F
- Shielding
 - Because jet fuel dispersed and burn unconfined, minimal shielding degradation from fire
- Containment/Confinement
 - No release of radioactivity

PROOF TESTING

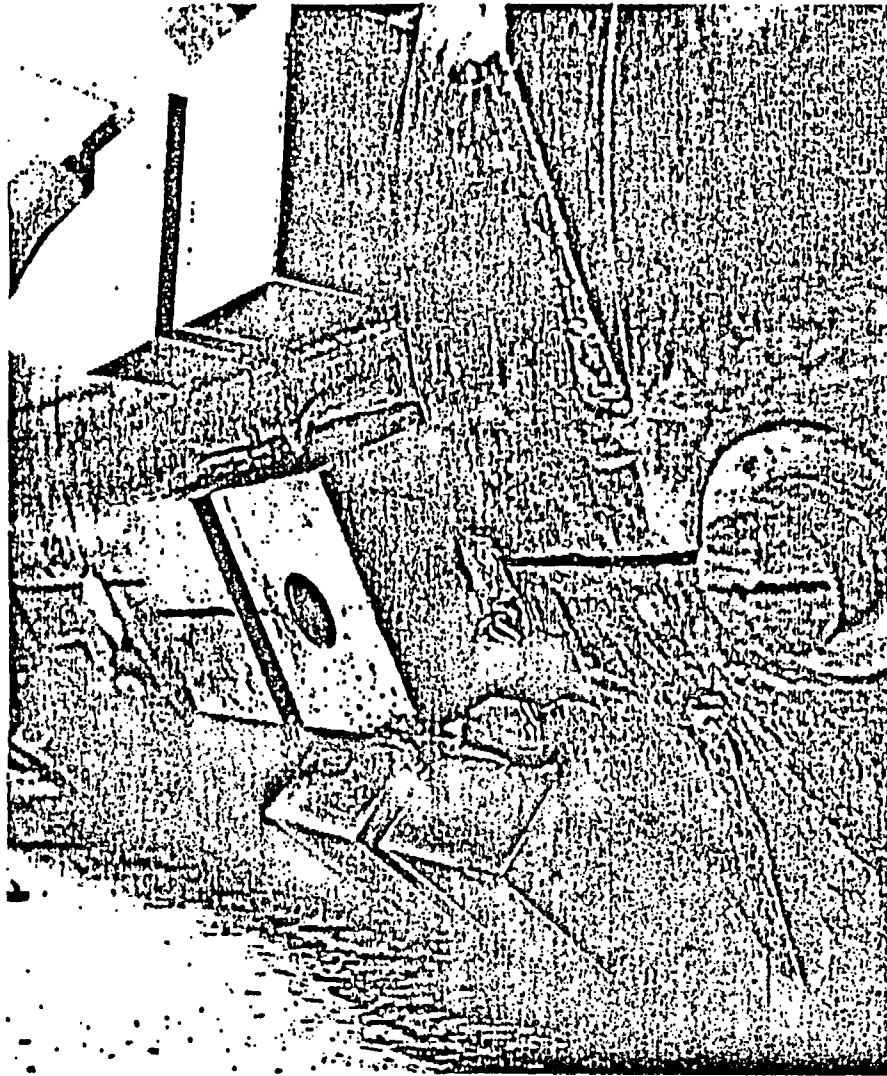
- NAC has tested welded stainless steel containment vessels under severe accident conditions.
- One scale model tested to 5 times its regulatory design basis structural limit (300g full/1200g scale).
- This is within range of loads imposed by an aircraft impact.
- The results were:
 - No failure of any containment weld
 - No yielding of any containment weld
- Stainless steel and its welds have very large safety margins above regulatory limits.

Quod erat demonstratum (QED)

CURVE OF G LOADS DURING TEST



PHOTOS OF CONTAINMENT VESSEL



CONCLUSIONS

- NAC Multipurpose Systems Safety:
9/11 > SAFE! > 9/11; Safe Then, Safe Now
- Higher Potential for MADness Requires Different Acceptance Criteria for BDBAs
- Suggested Approach: Set Structural Acceptance at Some Fraction of Ultimate Strain
- Dry Storage Offers Greater Protection of Public, Considering Potential for MADness
- As Industry Evaluation Progresses, More Rapid Shift of Fuel Into Dry Storage May Be Desired

RECOMMENDATIONS

- Establish Industry/NRC Task Force to Evaluate Approach to Address MADness
- Develop Rational Methods for BDBA Evaluation
- Complete Expeditious Inclusion of High Burnup Fuel and Burnup Credit in Licensing
- In Some Designs, Incorporate Effective Modifications for BDBAs
- Government MUST Advocate for Safety of Dry Multipurpose Spent Fuel Storage
 - It is the truth
 - It is safer than any other technology
 - It is vital to stem the psychological terrorism arising from those who would exploit this MADness