

AFRL CALL FOR RESEARCH

1. **Research Title:** “*Load Phasing of an Aluminum Alloy for 3D Crack Growth Prediction*”
2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** *Aerospace Engineering, Mechanical Engineering (MS)*
4. **Objectives:** Explore crack growth behavior on Aluminum 2024-T351 for in-phase and out-of-phase loading conditions
5. **Description:** Fatigue crack growth analysis in metallic components is a fundamental tool for the assessment of fatigue strength for aging USAF a/c. However, maintainers and ASIP (Aircraft Structural Integrity) managers rely heavily on 2D frameworks to assess remaining fatigue life albeit the true scenarios contain complex loading and complex 3D structure. Reliable characterization data for complex loading scenarios is rare and is laced with complexities stemming from the testing environment: testing constraints/clamping conditions, material anisotropy, load-phasing, crack closure effects, and turning angle behavior. This project requires the student to: design baseline set of characterization data for 3D fatigue crack growth behavior in Al-2024-T351 by performing a DOE using the specimen geometry, equivalent stress intensity factor (K_{eq}), the load ratio, and phase angle. For a complete set of data, the full range of crack growth rate values will range from 10^{-7} in/cycle to 10^{-2} in/cycle. (Near threshold values (10^{-9} to 10^{-7} in/cycle) will be ignored for time considerations.)
6. **Research Classification/Restrictions:** *This research is FOUO*
7. **Interest in Summer USAFA Cadet:** No
8. **Eligible Research Institutions:** Place an X in all that apply.
 Universities (DAGSI) AFIT (only) USAFA