NASGRO is a suite of programs used to analyze fracture and fatigue crack growth (FCG) in structures and mechanical components. The software is developed jointly by Southwest Research Institute® (SwRI®) and NASA under a Space Act Agreement, with additional support from the NASGRO Consortium and the Federal Aviation Administration.

NASGRO consists of integrated modules with user-friendly graphical interfaces that:
• Calculate stress intensity factors (K), FCG life, and critical crack size
• Store, retrieve, and curve-fit FCG and fracture toughness data

NASGRO is the most widely used fracture mechanics and FCG software in the world today.

Recent Enhancements
Recent enhancements available in the current version 9.1 include:
• Expanded K solution for through crack at edge of plate with symmetric step change in thickness
• New K solution for displacement-controlled surface crack
• New K solution for displacement-controlled off-center through crack
• New K solutions for through cracks in C-section
• Bending restraint option added to K solution for through crack in L-section
• Bending restraint option added to K solution for curved through crack at plate edge
• 2D data table (DT and KT) models for one or two through cracks (two tips)
• Revised and expanded cycle counting options
• Bivariant monotonic shakedown capabilities
• Polynomial input option for residual stress
• Residual stress capabilities added to SC04 & SC06 surface cracks in cylinders
• Several new and revised material property sets in NASFLA
• New GUI functionality for window and font resizing

Future Development
Major new features planned for version 9.2 include:
• New NASFAD module for Failure Assessment Diagram calculations
• New weight function K solutions for surface crack in solid or hollow cylinder
• New K solution for corner cracks at a row of identical holes
• New K solution for crack at angled corner
• Bending restraint option for several edge through crack solutions
• Partial restraint options for structural section solutions

Plans for future versions include:
• Additional K solutions for curved through cracks
• Superposition methods for time-dependent crack growth
• K solutions for cracks at countersunk holes
• K solutions for lugs and pin-loaded holes with interference or clearance fit
• Approximate (compounding) method for multi-site damage
• Additional K solutions for other unique geometries
Crack Growth Module
- Over 85 different \( K \) solutions
  - Uniform tension/bend/pressure/pin load
  - Univariant/bivariant weight function models
  - User-defined tables
  - Generalized compounding
- Multiple crack growth equations
  - NASGRO, Walker
  - Tabular \( da/dN \) vs. \( \Delta K \) data
  - Temperature effects
- Multiple load interaction models
- Multiple load history input formats
- Load spectrum visualization, editing, cycle counting
- Multiple analysis options
  - Calculate \( K \), life, \( da/dN \)
  - Critical initial, final, or threshold crack size
- Account for residual stresses
- Cyclic shakedown for local plasticity
- Elastic-plastic crack growth analysis
- Failure assessment diagrams
- Interactive and batch modes

Material Property Module
- Search, retrieve, plot, and curve fit data
- Import user data
- English or metric units
- Nearly 500 metallic materials
- 3,000 sets of FCG data
- 6,000 fracture toughness points

The NASGRO software runs on all Windows platforms. User support and training courses are available. A perpetual license for a single copy of version 9.1 is $4,200. Organizations with multiple users should consider a site license or participation in the NASGRO Consortium. Special prices may apply for non-US companies, especially in mainland China and India. Please contact SwRI for a specific quote.

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- Honda Aircraft Engines
- Honeywell
- IHI Corporation
- Israel Aerospace Industries
- Korea Aerospace Industries
- Leonardo
- Mitsubishi Aircraft
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- Siemens Energy
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- United Technologies Corporation

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