NASGRO®
Fracture Mechanics & Fatigue Crack Growth Analysis Software

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 in the current version 9.2 include:

• New weight function $K$ solution for external surface crack in hollow cylinder
• New weight function $K$ solution for surface crack in solid cylinder
• New bivariant weight function $K$ solution for crack at angled corner
• End bending restraint option added to several edge through crack solutions
• Partial bending restraint options added to structural section through crack solutions
• New thread restraint option for circumferential surface crack in threaded solid cylinder
• Improved bending solution for surface crack in bolt head fillet
• Expanded solution limits for numerous $K$ solutions
• New NASFAD module for Failure Assessment Diagram calculations
• Graphical user interface upgraded to allow dynamic resizing of display windows

Future Development
Major new features planned for version 10.0 include:

• New $K$ solution for identical corner cracks at a row of identical holes
• New $K$ solution for through crack between two unequal holes in an infinite plate
• New $K$ solution for through crack at a hole with an interference fit fastener
• New $K$ solution for through crack in a T-section
• New $K$ solution for corner crack at knee of countersunk hole
• New weight function $K$ solution for external surface crack in a sphere

Plans for future versions include:

• Additional $K$ solutions for curved through cracks
• Superposition methods for time-dependent crack growth
• $K$ 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 95 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. ΔK 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 9.2 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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- GKN Aerospace
- Honda Aircraft Engines
- Honeywell
- IHI Corporation
- Israel Aerospace Industries
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- Mitsubishi Aircraft
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- Sikorsky
- SpaceX
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