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 10.1 include:
• New K solution for curved through crack (offset) in finite width plate
• New K solution for two corner cracks at single hole in row of holes
• New weight function K solution for internal surface crack in hollow sphere
• Finite width and hole offset added to K solution for through crack between unequal diameter holes
• Improved weight function K solutions for one or two surface cracks at hole
• Improved weight function K solution for one or two through cracks at hole
• Spectrum editing capability expanded to different load inputs
• Graphical user interface upgrades to accommodate different screen resolutions

Future Development
Major new features planned for version 10.2 include:
• FAD and shakedown implementation for multi-temperature analysis
• New K solution for one corner crack at one hole in row of holes
• New weight function K solution for internal surface crack in hollow cylinder
• New K solution for two curved through cracks at every hole in row of holes
• New K solutions for corner cracks at pressure vessel nozzles
• New bivariant remote stress capabilities for corner crack at offset hole
• New K solution for surface crack in notched round bar

Plans for future versions include:
• Additional K solutions for curved through cracks
• Superposition methods for time-dependent crack growth
• Advanced methods for multi-temperature fatigue crack growth
• Approximate (compounding) method for multi-site damage
• Additional K solutions for interference or clearance fit pin-loaded holes
• Additional K solutions for other unique geometries
Crack Growth Module
- Over 100 different \( K \) solutions
  - Uniform tension/bend/pressure/pin load
  - Univariant/bivariant weight function models
  - User-defined tables
  - Generalized compounding
- Multiple crack growth rate models
  - 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
- Over 500 metallic materials
- 3,600 sets of FCG data
- 6,500 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 10.1 is $4,400. 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 China and India. Please contact SwRI for a specific quote.

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- Airbus Canada Limited Partnership
- Blue Origin
- Boeing
- Bombardier
- Embraer
- GKN Aerospace
- Honda Aircraft Engines
- Honeywell
- IHI Corporation
- Israel Aerospace Industries
- Korea Aerospace Industries
- Leonardo
- Lockheed Martin Aeronautics
- Mitsubishi Heavy Industries
- Raytheon Technologies
- Siemens Energy
- Sierra Nevada Corporation
- Sierra Space
- Sikorsky
- SpaceX
- Spirit AeroSystems
- United Launch Alliance

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