

## Examples



Bloodhound supersonic car –  
airbrake hinge



Satellite - isostatic mount



Horizontal reaction support - with  
cruciform compression elements

## Ground-breaking design optimization software

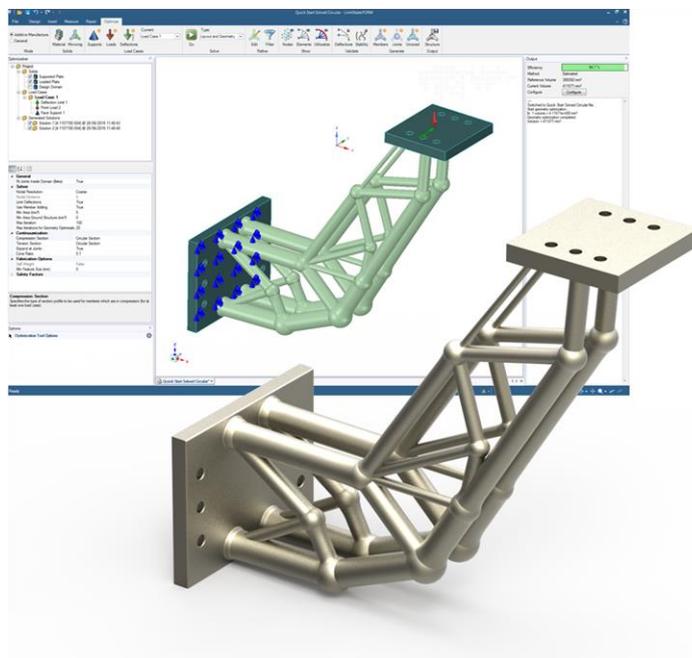
LimitState:FORM is a powerful software application for engineers who want to design strong and light components and structures.

The software is particularly suitable for exploiting the design freedoms associated with additive manufacturing (AM). The software automatically identifies minimum-weight truss designs for specified material stress or deflection limits.

## Unleash the power of advanced manufacturing

New advanced manufacturing methods are capable of producing components and structures with greatly enhanced performance properties, for a wide range of industrial sectors. The key to unlocking the business benefits of these methods is optimization – using advanced mathematical modelling to identify new geometries that deliver the performance and cost improvements that will drive business value.

LimitState:FORM is a powerful tool that identifies more efficient geometries, consistently, reliably and quickly.

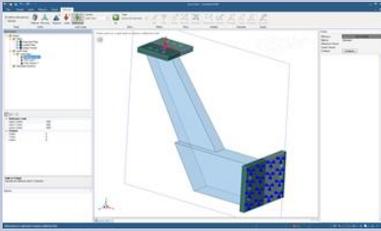


“Optimization is crucial to advanced manufacturing and LimitState:FORM generates consistent, repeatable results, with no fudged parameters - and it’s easy to assess the truss structures produced. It’s a genuinely ground-breaking tool.”

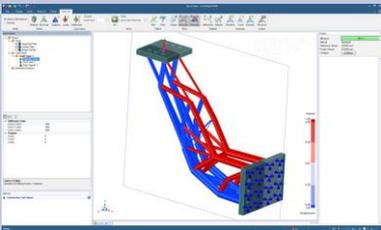
*Iain Todd, Director, Mercury Centre, UK*

## Using the software

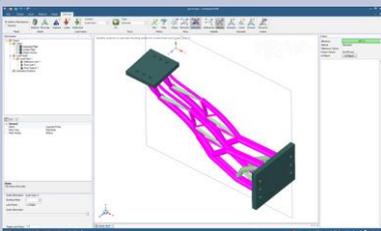
1. Import regions from CAD, or model these directly in LimitState:FORM. Define the region to optimize, add materials, loads, supports and specify deflection limits.



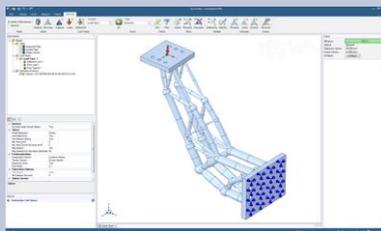
2. Use software to obtain an optimized structural layout, with its efficiency reported. Output is high-level CAD geometry rather than a triangle mesh.



3. Easily refine the geometry if necessary (e.g. merge joints, delete elements, set minimum areas) and undertake validation checks (e.g. elastic stability checks).



4. Create a unioned geometry and add final features, then export for manufacture or further analysis.



## Technology

LimitState:FORM uses **layout** and **geometry optimization** in combination, to identify designs that are extremely structurally efficient.

It is particularly suitable for problems where there is significant design freedom, where the final optimized structure occupies a low proportion of the available space (low volume fraction).

Unlike topology optimization, there is no need to specify a target volume fraction in advance, or to find an appropriate volume fraction by trial and error.

While some tools allow the user to fill areas with a regular lattice structure, LimitState:FORM goes further by identifying a bespoke truss structure for each problem. This means that it is perhaps the first design optimization tool to truly take advantage of the unique ability of additive manufacturing to build intricate parts that are as strong and as light as possible.

Engineers can generate optimized designs without the need to deal with low-level triangle meshes, instead working with high-level CAD models - making their workflow much simpler and faster.

## Key features

- Rapidly identify high fidelity optimized truss designs that are very close to theoretical mathematical optima.
- Easy to edit a design after an optimization has been performed.
- Structural efficiency reported, making it easy to see how changes affect efficiency.
- Built-in elastic analysis tools to check deflections, stresses, global stability and frequency.
- Generate high-level CAD, rather than mesh, geometries, so it is easy to review and refine a model.
- Engineers can move quickly from defining the design domain, to an optimized form, and back again, in one fluid workflow.
- Fully integrated with ANSYS Mechanical – seamlessly edit the geometry and validate with FEA.
- Import and export geometries in a wide range of formats (incl. STL for additive manufacture).

## Before and after optimization example: airbrake hinge



Bloodhound supersonic car airbrake hinge – original design



Bloodhound supersonic car airbrake hinge – LimitState:FORM optimized design

## Fully supported by experts

Need technical advice? Need help with your model? Our engineering support team is on hand to offer expert advice on all aspects of the software.

## Learn more about LimitState:FORM and try it for yourself

See LimitState:FORM in action and get a demo copy to try out in your own office. For more information visit our website: [www.limitstate3d.com](http://www.limitstate3d.com)

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