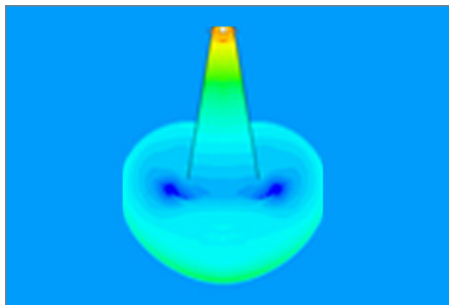


## Gaseous Mixing and Explosions: MND Group

### The Background



The MND Group, a company with an annual turnover of 61,3m in 2014/15 and represented in 49 countries, is a major player in the field of mountain infrastructure and specialise in making dangerous sites safer. They design and install systems which make it possible to blow away unstable snow fields in a controlled fashion, using gaseous explosions in areas where the potentially devastating accidental release of avalanches is of concern.

MND's well-established fixed Gazex technological development enables avalanches to be preventatively started by remote control; its success results from the combination of accuracy with safety. MND's innovation, Daisybell, is a portable device transported by helicopter to above the avalanche area and controlled from the cockpit.

***"Renuda's work had great consequences for us; we were using 3 bottles of fuel to make 60 shots, now we only need 2 -we saved 100 kilos."***

**Dr Philippe Berthet-Rambaud,  
Director, MND Engineering**

### The Challenge

Safety verification was MND's primary concern – they wanted to be absolutely certain that Daisybell would in no way compromise the safety of a helicopter or its staff. A secondary consideration was efficiency; MND was interested to know if this could be improved.

Renuda's challenge was to ensure that MND had reliable, realistic simulation results to make informed safety and product efficiency decisions.

***"I can't think of anything that Renuda needs to improve; for us it was quite perfect"***

**Dr Philippe Berthet-Rambaud,  
Director, MND Engineering**

### The Solution

Although MND hadn't initially thought of using Computational Fluid Dynamics (CFD), believing it would be cost prohibitive. Renuda came highly recommended from an influential industry contact and they realised that the simulating the gaseous mixing and explosions may be a cost effective option in the long run.

Renuda recommended simulating a maximum explosion, greater than would be required, to determine whether Daisybell could cope with the resulting pressures. Using Star-CCM+ they simulated the unsteady formation and propagation of the shock and detonation waves through Daisybell, from ignition to diffraction in the surrounding air outside Daisybell. The results enabled MND to verify the structural integrity of Daisybell.

Renuda then examined Daisybell's efficiency in injecting and mixing the fuel and oxidizer gases. They produced unsteady compressible simulations of turbulent mixing, and discovered that the original design dispersed too much gas before the explosions. The results of the simulations were the catalyst for MND to improve Daisybell's design which Renuda worked with MND to produce an improved redesign.

***"CFD calculations were required in order to rationally investigate and quantify the complex physics in the system. The calculations made it possible to first characterise and then optimise the energy release, guiding us towards the final design. Renuda's professional approach made them a great development partner"***

**Pascal Roux, General Manager,  
TAS (an MND Group company)**

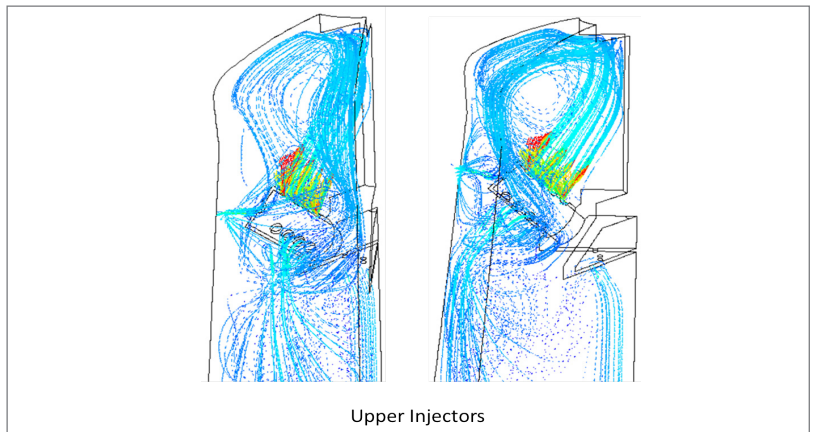
## How MND Benefited



- MND were reassured that Daisybell would be safe even in extreme circumstances.
- The effective redesign MND produced jointly with Renuda almost doubled Daisybell's efficiency.
- The resulting massive fuel saving was a great cost saving for MND's customers.
- The reduction in weight from the reduced fuel load gained customers for MND by giving operators the option to fly higher or for longer.
- Renuda's calculations provided MND with greater insight into Daisybell's workings.

## Unexpected Benefits

Working with Renuda helped MND's non-engineering staff access new knowledge, improving their confidence, they trusted themselves to contribute ideas and to understand that science and technology can be accessible for everyone. Renuda work helped MND uncover new operational capabilities for Daisybell, which they would not have discovered without the CFD results.



Upper Injectors

## Why MND chose Renuda?

The quality of Renuda's knowledge, specialist experience, amicability and quick response times were all contributing factors.

***"Renuda were very flexible; they proposed relevant new actions and were happy to adapt their approach if it made more sense"***

***Dr Philippe Berthet-Rambaud, Director, MND Engineering***

## Contact Us

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