

**PROJECT:**

# Dropped Object Simulation

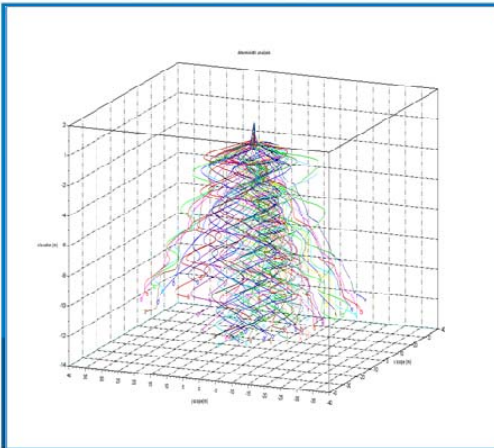
**under-promise  
over-deliver**

**CLIENT:**

Various

**LOCATION:**

Various



Linch-pin have developed a dropped object trajectory simulation package which predicts in the time domain the 3D motion of objects subjected to time varying buoyancy and hydrodynamic loads. These objects may travel in air, water or a combination of both. They may enter in any orientation and with prescribed kinetics, or simply enter under the effects of gravity. The objects may be of any shape, weight and buoyancy distribution, and the hydrodynamic loading may be defined by Morison's equation, by a hydrodynamic database from a previous pressure integration process, or a combination of both. The destabilising moment for aerodynamic structures such as plates and pipes is accounted for. Hydrodynamic loading can account for depth varying current and any number of sea state combinations.

The kinetics of the object are solved in the time domain in six degrees of freedom. The analysis may be carried out deterministically using pre-defined initial conditions, or stochastically using a Monte-Carlo method randomizing the starting conditions and environment.

Processing of the simulation results enables trajectory and velocity time histories. Probability contours of excursion, kinetic energy and impact vectors may be developed at various elevations within the water column. The bias due to prevailing environment may be obtained. Results may be viewed graphically, as ensembles, individual simulations or probability contours.

The simulation may be used in the following areas amongst others:

- Pipeline impairment risk analysis
- Pipeline protection – probabilistic approach to range and impact energy
- Hull breach risk assessment for floaters
- Flexible riser breach risk assessment and as part of configuration development
- Free fall lifeboat simulations and environmental sensitivity. Full scale trials are typically carried out in calm conditions which can be benchmarked and then analysed in simulated environments.
- Forensic assessment following dropped object incidents
- Safe zones for diving operations