

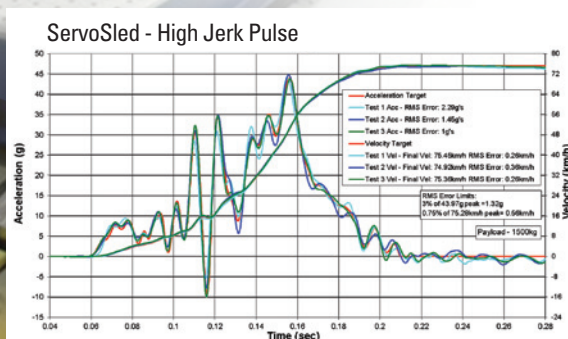
SERVOSLED



ServoSled™ Catapult Sled Systems

The premier choice of automotive safety labs worldwide

For the highest productivity and optimal performance in the lab, ServoSled™ leads the market. Efficiently and accurately test everything from low-g whiplash to high payload crashes. Comply with all of the latest FMVSS, ECE, and NCAP safety standards. The system's innovative technology offers a number of key advantages to help lab managers meet the demands of safety engineering.



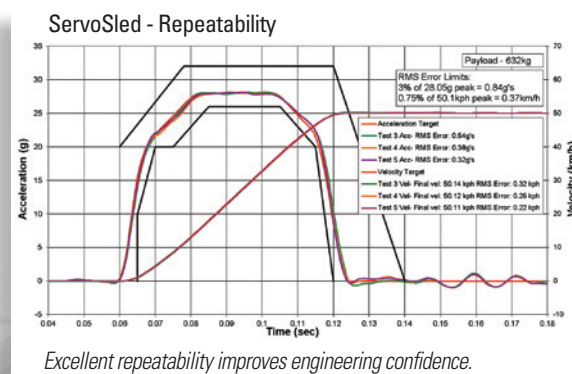
ServoSled offers high frequency pulses and negative G capabilities.

Premium pulse accuracy—Proprietary servo-hydraulic control yields highly accurate and repeatable acceleration and velocity profiles with extremely high frequency response—beyond 250Hz.

High productivity—Rapidly tune new pulses and complete all the tests you need as quickly as possible. With closed-loop acceleration and pressure feedback, you can achieve better than 3% RMS error in three tuning shots or less.

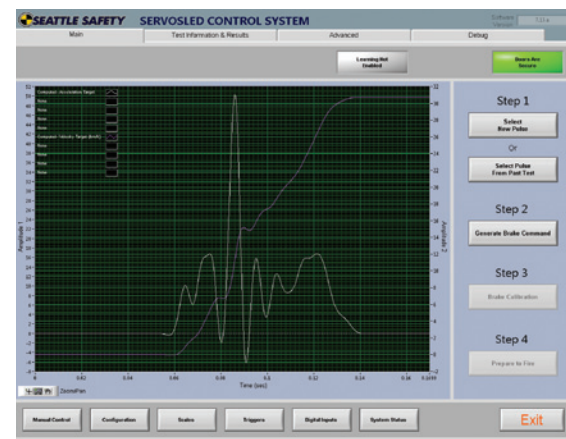
High performance—The advanced control algorithms allow you to perform a wide range of tests—frontal impact, rear impact, complex NCAP simulations and more—with accuracy, repeatability and confidence. Using the built-in negative-G capabilities, you can perform side-impact testing without add-ons.

Superior quality—Custom fabricated in the USA and installed on-site by Seattle Safety technicians to meet your exact requirements, ServoSled provides decades of reliable operation and easy maintenance. With open access to off-the-shelf industrial components, lab technicians can easily perform routine maintenance without manufacturer assistance.

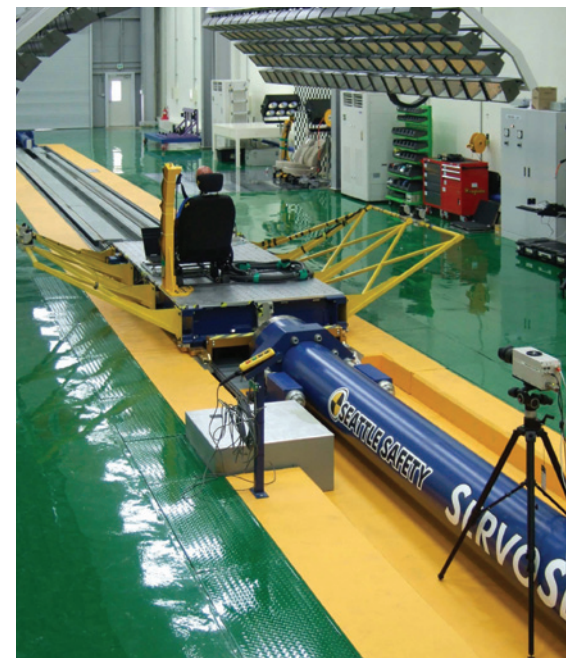


AUTOMATED CONTROL AND ANALYSIS

The ServoSled Software and Control System with its friendly Windows® user interface, provides automated control of the entire system while giving operators opportunities to adjust parameters on the fly. The system automatically calculates, sets and checks settings, providing real-time data collection and analysis during tests. Off-the-shelf National Instruments® control hardware makes it easy for lab technicians to customize the system with new signals or triggers to accommodate evolving testing needs.



Simple user interface provides step-by-step setup.

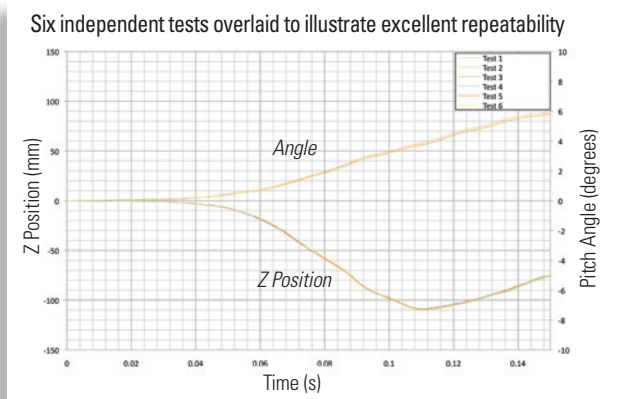
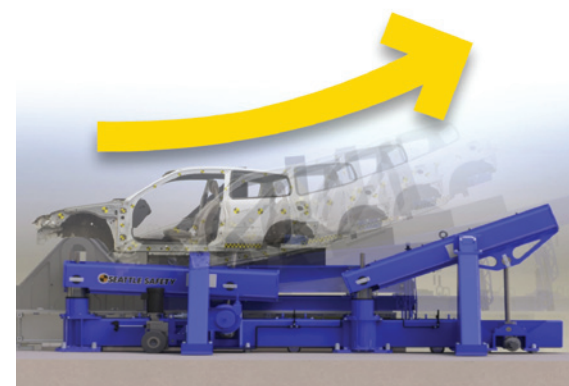
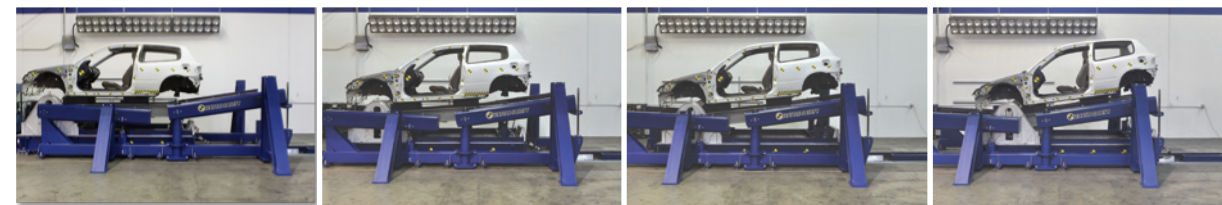


Easily conduct whiplash testing on ServoSled.

DYNAMIC PITCH SIMULATIONS

Add proven pitching simulation to your ServoSled system without any additional up-front cost. The Dynamic Pitch Simulator installs directly to ServoSled with breakthrough simplicity: no lab modifications are required. Achieve a repeatable trajectory by simply using the fixed mechanical

guides, eliminating the need for expensive control systems. When you are finished, the whole pitch system can be removed in less than an hour, providing clear access to the sled and open camera angles for non-pitch testing.



SERVOSLED CONVERSIONS

Easily upgrade a Hyge or other pin-orifice accelerator system with our ServoSled conversion. Converting your existing sled enables the high-frequency pulses needed for frontal impacts, while increasing thrust and payload capacity. The system reuses many existing components to make upgrading quick and economical.



Perform all your simulations with one sled

VEHICLE-LEVEL SIMULATIONS

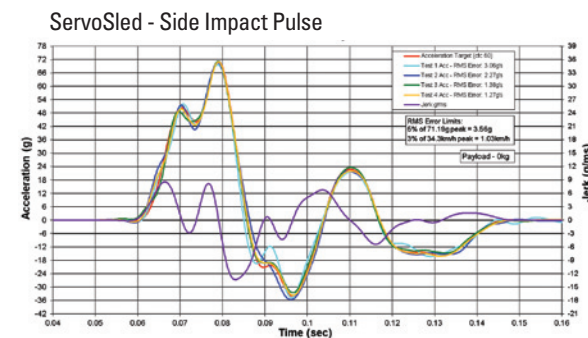
Achieve higher safety ratings by tuning the complete safety system on accurate repeatable pulses. You can simulate:

- Frontal Impacts (FMVSS 208, EuroNCAP)
- Offset Impacts (EuroNCAP, IIHS)
- Side Impacts (FMVSS 214, IIHS, and EuroNCAP)

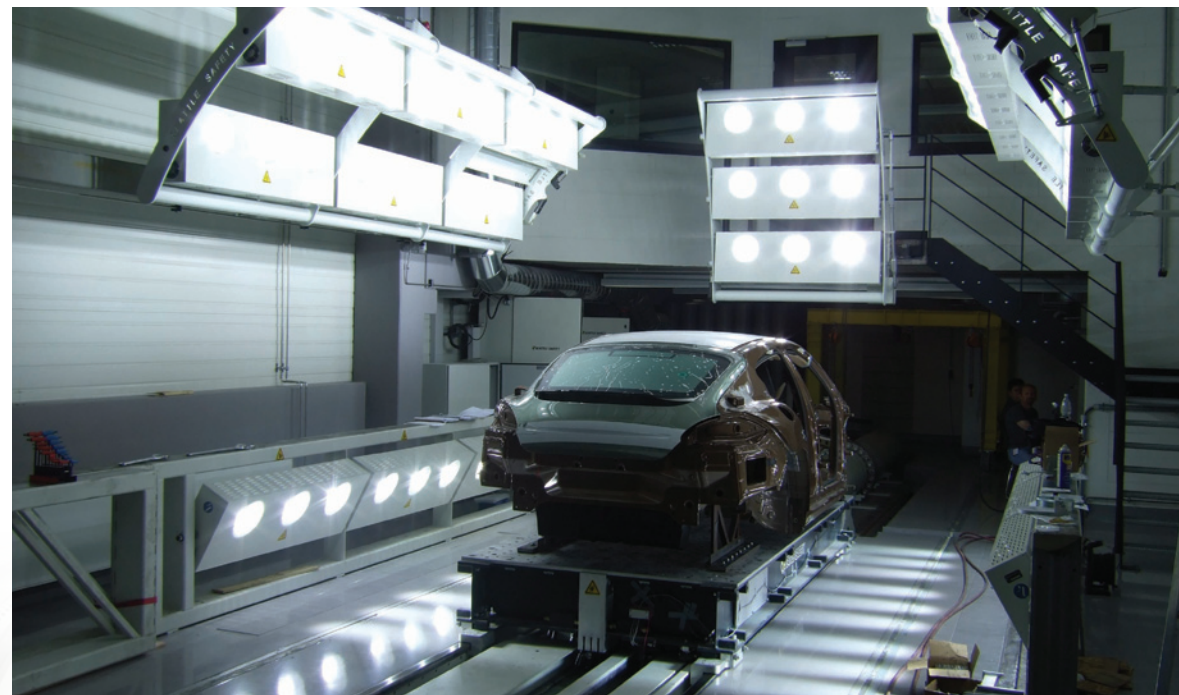
High-performance pulses—Perform demanding high-energy and high-frequency pulses with excellent accuracy. The closed loop servobrake control follows complex targets and provides up to 122G / 4000kg capacity. The inherent braking capability allows the frontal pulse to dip below zero without risk of losing ram contact.

Side-impact simulations—With negative-G capability, ServoSled can match the velocity of the impact fixture and seat after the initial pulse to maintain the relative

position of the ATD and restraint system throughout the test. Simply mount the side impact or pole impact fixtures on the sled to run the most challenging side-impact pulses.



Acceleration up to impact speed followed by negative-G provides excellent velocity matching.



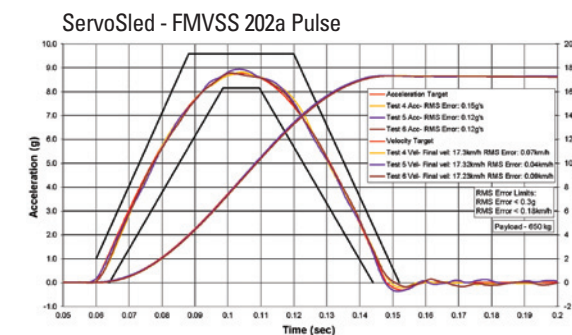
ServoSled ready for NCAP frontal impact testing.

SEAT AND RESTRAINT SYSTEM VALIDATION

ServoSled gives you the freedom to define the optimal test program to satisfy compliance testing. With accurate and repeatable control, engineers can avoid costly over-design or test variability. You can validate:

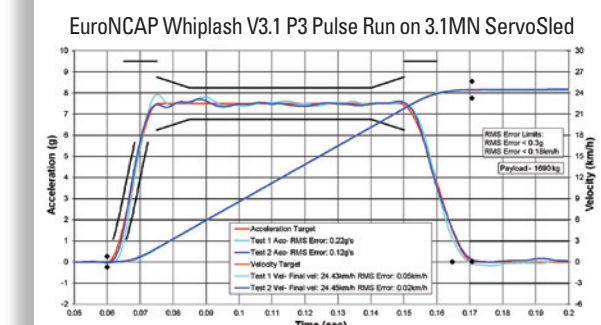
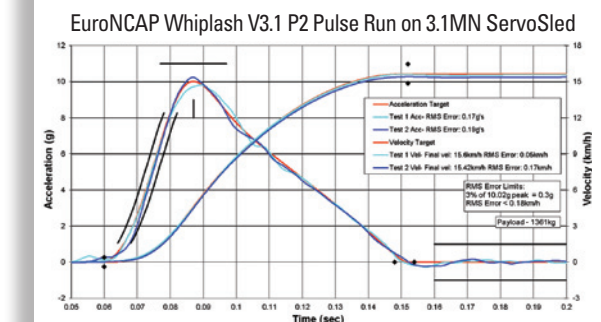
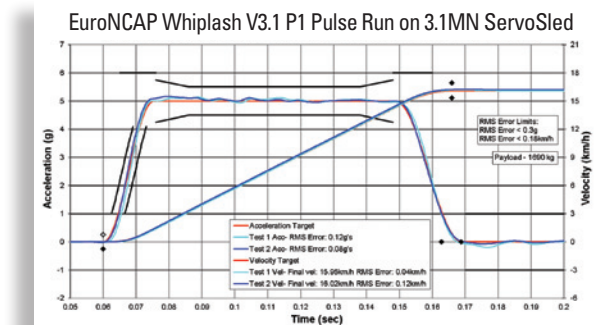
- Seats (ECE R17, R80, GB15083, FAA)
- Child Seats (ECE R44, FMVSS 213)
- Seatbelts (ECE R16, GB14166)
- Whiplash (FMVSS 202a, EuroNCAP, IIHS)

Seats and safety restraint testing—Test seats, child restraints, and other components with speed and accuracy. Technicians can quickly switch between test pulses without pausing for mechanical changes. The software can easily run historical pulses or learn new ones directly from raw data.



Demonstrated repeatability for seat certification tests.

Whiplash simulations—Quickly set up and execute a full range of whiplash simulations to comply with EuroNCAP and other safety standards. You can achieve pulse within corridors in the first shot, even with low-G tests.



Whiplash test program with repeatable pulses within corridors.

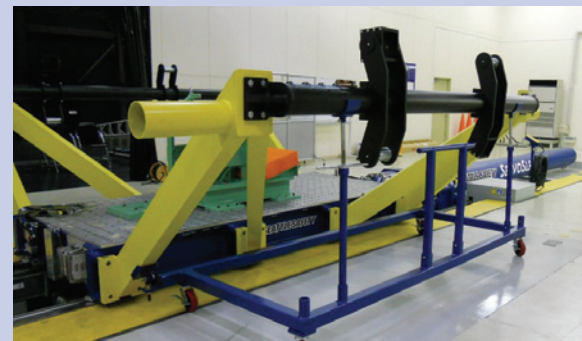
ACCESSORIES

Expand testing capability with ServoSled



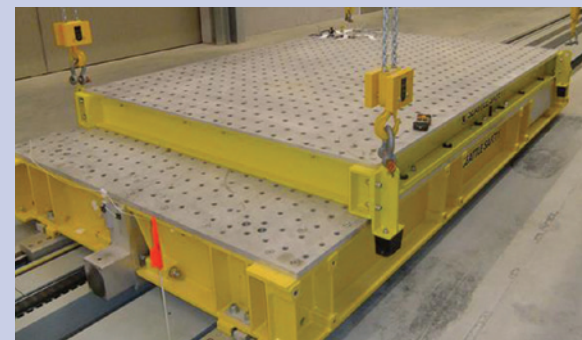
Non-Destructive Side Impact Simulation System and Pole Intrusion Simulation System

For high quality side-impact testing, the sled mounting plate can be replaced with the side-impact base frame, pre-assembled with either the side impact or pole intrusion fixture. It includes the secondary sled for the seat and ATD. During the side-impact pulse, the ServoSled accelerates the door into the seat on the secondary sled.



Camera Outriggers

The outriggers provide rigid camera-mounting locations overhung from each side of the sled, accommodating cameras up to 18kg per outrigger (9kg per camera mount) at 80G. You can adjust the camera tilt and location, fore and aft. The hinged outriggers open like a gate allowing easy access to the sled during payload setup.



Quick Change System

Dramatically increase throughput. This system lets you change bucks in minutes and move much of the set-up process off the sled. The pre-engineered structural interface between the buck and the Quick Change system simplifies buck planning and design. Data acquisition and video can be mounted onto the Quick Change frame for off-sled connections and operation checks.

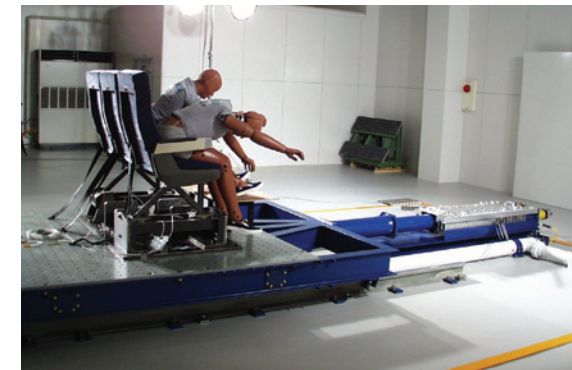


On-Sled Fixtures

ServoSled can be enhanced with a variety of fixtures for specific testing needs. The extensive options range from static yaw plates for offset and small overlap simulation to actuated footwell intrusion systems.

Safety testing solutions from the market leader.

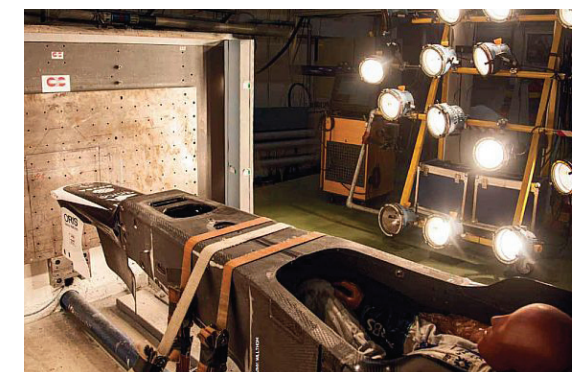
Seattle Safety leads the market in sled test systems offering the most advanced technology and a full spectrum of products and services. We've installed more than 60 systems for major manufacturers around the world. We're ready to support you with a complete system approach, ranging from expert systems integration and training to a broad line of test solutions.



Decelerator sleds—Reproduce a full spectrum of crash pulses with excellent accuracy and repeatability. Our pneumatically propelled sleds use wire bender or polytube decelerators to offer excellent pulse repeatability with a minimal investment.



Lighting systems—We offer a wide range of flexible lighting options for high-speed video photography. Choose fluorescent, metal-halide, or tungsten-halogen systems for overhead bank, floor, camera pit, and tripod-mounted applications. Lighting solutions are all custom-engineered and built in the USA to meet your exact requirements.

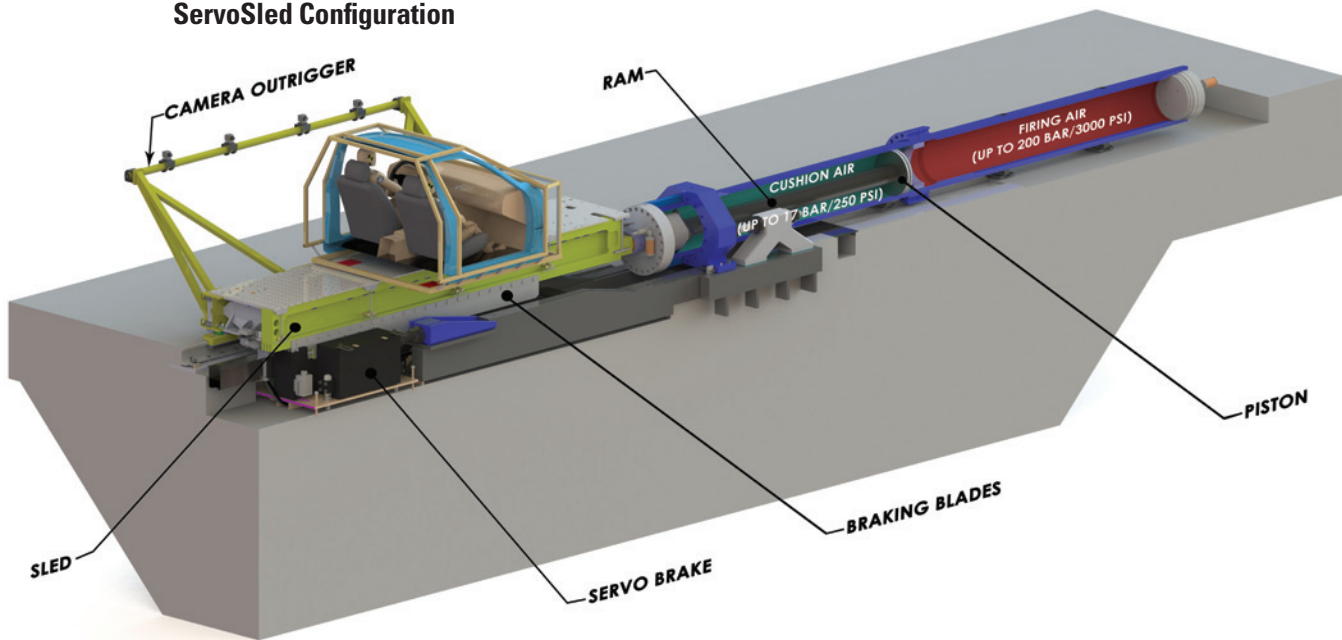


Structural impactors—Leveraging Seattle Safety experience in Decelerator Sleds and Crash Test Barriers, our Structural Impactors provide a low-cost solution for performing destructive validation of critical structures.



Crash test barriers—For full-scale crash test labs, these proven systems provide all your barrier configurations from FMVSS full frontals to EuroNCAP offsets to IIHS small overlaps. We also offer wall-mounted barrier block fixtures for frontal and side-impact testing and ramps for curb trip and rollovers.

ServoSled Configuration



ServoSled System Capacities

| | 1.4 MN ServoSled | 2.0 MN ServoSled | 3.1 MN ServoSled |
|-------------------------|----------------------------------|----------------------------------|-------------------------------------|
| Nominal Force | 1400 kN (315,000 lb) | 2000 kN (450,000 lb) | 3100 kN (697,000 lb) |
| Available Stroke | 2000 mm (79 in.) | 2000 mm (79 in.) | 2000 mm (79 in.) |
| Maximum Velocity | 90 kph (56 mph) | 90 kph (56 mph) | 90 kph (56 mph) |
| Peak Acceleration | 87 g | 104 g | 122 g |
| Maximum Jerk | 20 g/ms | 20 g/ms | 30 g/ms |
| Maximum Payload | 2500 kg (5500 lb) | 3000 kg (6600 lb) | 4000 kg (8800 lb) |
| Sled Dimensions (L x W) | 3.0 m x 1.5 m (118 in. x 59 in.) | 3.5 m x 1.5 m (138 in. x 59 in.) | 4.0 m x 1.68 m (157.5 in. x 66 in.) |

Note: Any performance data contained herein is operating-condition dependant.



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