Fifth Dimension Technologies

Training Solutions for Mining and Construction
Welcome to the 5DT Training Solutions pocketbook!

This book is a short-form overview of our products, services and capabilities. It provides an introduction to our company and highlights the benefits of training simulators for your organization. The benefits of our integrated training plan are also explained.

We trust that this book will help you to design a training solution that will fulfill your organization's safety, productivity and maintenance objectives. Please contact us if you need assistance with this process.

The 5DT Vision is:

*We make operators Safer, more Productive and less Destructive!*™

We invite you to join us on our quest.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 5DT</td>
<td>2</td>
</tr>
<tr>
<td>Training Solution Benefits</td>
<td>4</td>
</tr>
<tr>
<td>The 5DT Integrated Training Plan</td>
<td>6</td>
</tr>
<tr>
<td><strong>Training Simulators - Overview</strong></td>
<td>8</td>
</tr>
<tr>
<td>Console Swap Out</td>
<td>10</td>
</tr>
<tr>
<td>Cube</td>
<td>11</td>
</tr>
<tr>
<td>Hexagon</td>
<td>12</td>
</tr>
<tr>
<td>Head Mounted Display</td>
<td>13</td>
</tr>
<tr>
<td><strong>Surface Mining Simulators - Overview</strong></td>
<td>14</td>
</tr>
<tr>
<td>Haul Truck Training Simulator</td>
<td>16</td>
</tr>
<tr>
<td>Shovel Training Simulator</td>
<td>17</td>
</tr>
<tr>
<td>Excavator Training Simulator</td>
<td>18</td>
</tr>
<tr>
<td>Wheel Loader Training Simulator</td>
<td>19</td>
</tr>
<tr>
<td>Dozer Training Simulator</td>
<td>20</td>
</tr>
<tr>
<td>Grader Training Simulator</td>
<td>21</td>
</tr>
<tr>
<td>Dragline Training Simulator</td>
<td>22</td>
</tr>
<tr>
<td>Surface Miner Training Simulator</td>
<td>23</td>
</tr>
<tr>
<td>Road Truck Training Simulator</td>
<td>24</td>
</tr>
<tr>
<td>Light Vehicle Training Simulator</td>
<td>25</td>
</tr>
<tr>
<td><strong>Underground Coal Mining Simulators - Overview</strong></td>
<td>26</td>
</tr>
<tr>
<td>Continuous Miner Training Simulator</td>
<td>28</td>
</tr>
<tr>
<td>Miner Bolter Training Simulator</td>
<td>29</td>
</tr>
<tr>
<td>Scoop/LDH Training Simulator</td>
<td>30</td>
</tr>
<tr>
<td>Shuttle Car Training Simulator</td>
<td>31</td>
</tr>
<tr>
<td>Roof Bolter Training Simulator</td>
<td>32</td>
</tr>
<tr>
<td>Longwall Training Simulator</td>
<td>33</td>
</tr>
<tr>
<td><strong>Underground Hard Rock Mining Simulators - Overview</strong></td>
<td>34</td>
</tr>
<tr>
<td>Drilling Rig Training Simulator</td>
<td>36</td>
</tr>
<tr>
<td>Load Haul Dump (LHD) Training Simulator</td>
<td>37</td>
</tr>
<tr>
<td>Bolter Training Simulator</td>
<td>38</td>
</tr>
<tr>
<td>Articulated Dump Truck Training Simulator</td>
<td>39</td>
</tr>
<tr>
<td>(ADT)Training Simulator</td>
<td>40</td>
</tr>
<tr>
<td>Utility Vehicle (UV) Training Simulator</td>
<td>41</td>
</tr>
<tr>
<td>Other Training Simulators</td>
<td>42</td>
</tr>
<tr>
<td><strong>Construction Training Simulators - Overview</strong></td>
<td>44</td>
</tr>
<tr>
<td>Grader Training Simulator</td>
<td>45</td>
</tr>
<tr>
<td>Dozer Training Simulator</td>
<td>46</td>
</tr>
<tr>
<td>Excavator Training Simulator</td>
<td>47</td>
</tr>
<tr>
<td>Front End Loader Training Simulator</td>
<td>48</td>
</tr>
<tr>
<td><strong>Terrain Databases</strong></td>
<td>49</td>
</tr>
<tr>
<td><strong>Pre-Simulators</strong></td>
<td>50</td>
</tr>
<tr>
<td><strong>Computer Based Training (CBT) Systems</strong></td>
<td>52</td>
</tr>
<tr>
<td><strong>Visualizers - Overview</strong></td>
<td>54</td>
</tr>
<tr>
<td>Underground Coal Mining Visualizer</td>
<td>56</td>
</tr>
<tr>
<td>Underground Hard Rock Mining Visualizer</td>
<td>57</td>
</tr>
<tr>
<td><strong>Mobile Solutions - Overview</strong></td>
<td>58</td>
</tr>
<tr>
<td>Single Container</td>
<td>60</td>
</tr>
<tr>
<td>Dual-size Fold-out Container</td>
<td>61</td>
</tr>
<tr>
<td>Classroom Container</td>
<td>62</td>
</tr>
<tr>
<td>Trailer</td>
<td>63</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>64</td>
</tr>
</tbody>
</table>
ABOUT 5DT

5DT makes operators safer, more productive and less destructive using advanced training tools that have been optimized on mine sites around the world over the past 15 years.

5DT offers a Training Solution, not merely training simulators. The 5DT training solution consists of the following elements:

- **Training Simulators**
- **Pre-Simulators**
- **Computer Based Training (CBT) Systems** (E-Learning)
- **Visualizers**

5DT has a well established Mining and Construction Knowledge Base. We have spent a lot of time underground, in surface mines and on construction sites, interacting with real operators and real machines. We also work closely with the world's best training departments and schools to refine our methodologies, products and learning material.

Product Families

5DT offers complete Training Simulator families for underground mining, surface mining and construction:

- Underground Coal Mining Training Simulators
- Underground Hard Rock Mining Training Simulators
- Surface Mining Training Simulators
- Construction Training Simulators

Worldwide Installation Base

5DT is proud to have the following prestigious organizations as customers.

- BHP Billiton
- Anglo Platinum
- Xstrata
- VALE
- Sasol
- INADEH
- Anglo Coal
- Peabody Energy
- SENA
- Patriot Coal
- Agnico-Eagle
- Kentucky Coal Academy
- TAFE
- Fortescue Metals Group
- Mining Industry Skills Centre
- Foskor

**Original Equipment Manufacturers (OEMs)**

5DT uses Real OEM Parts and Performance Data in its simulators and has developed training simulators for machines by the following OEMs.

- Caterpillar
- Komatsu
- Liebherr
- Bucyrus
- Terex
- O&K
- JOY
- Sandvik
- Atlas Copco
- Fletcher
- Wirtgen
- Toyota
- Scania
- Fermel
- AARD
- ARO
- GHH

We have developed relationships to procure parts and to obtain technical information from these OEMs.

**Advanced Technologies by 5DT:**

- 6 Degree of freedom (6-DOF) electrical motion base
- High performance ground interaction technology
- Active force-feedback steering
- 360° Field of view training simulators and visualization studios
- Machine console swap-out within 3 minutes without the use of any tools or cranes

5DT works very closely with its customers. This approach has led to unprecedented growth for 5DT.

_We look forward to working with you in the near future._
5DT Training solutions enable an organization to develop both the Knowledge as well as the Skills of its personnel. This approach offers a wide range of benefits for all departments of an organization, such as:

**Corporate and Investors**
- Higher Return on Investment (ROI):
  - Increased production
  - Lower maintenance costs
  - Reduced number of accidents
- Lower risk
- Improve skills and knowledge of workforce
- Better corporate image

**Human Resources (HR)**
- Screening of new employees
- Training of local populations
- Off-site recruitment
- Off-site training
- Higher workplace skills and knowledge

**Training**
- Training of new operators
- Evaluation (assessment) and re-training of existing operators
- Familiarization and Induction tool
- Shorter operator training periods
- Greater training flexibility
- 24/7 Training
- Consistent high training standard
- Accurate training paper trail

**Operations and Business Improvement**
- Increase productivity
- Reduce loss of production as a result of training with real machines
- Improve application of best practices
  - Evaluate current best practices in simulator
  - Optimize best practices in simulator
  - Use simulator as instrument to roll out best practices into an organization
- Enhance operator skills development
Maintenance
• Reduce machine damage and wear and tear
• “Park & test” machine training for mechanics & artisans

Health & Safety
• Increase safety awareness
• Practise life-threatening scenarios without risk of injury or risk of damage to equipment. The correct response to an emergency may be practiced over and over again.
• The use of training simulators is the only way to guarantee that personnel has been trained to handle emergencies.
• Proper training of operators of machines with no passenger seat
• Reconstruction of accidents and changing policy and/or SOPs

Marketing and PR
• Showcase a mine's operations to groups of people without exposing them to typical mine hazards.
• Showcase a mine's operations far away from the mine site, e.g. on a trade show floor.

Environment
• Reduce burning of greenhouse gases because real machines are not used for training.

Research and Development (R&D)
• Try new techniques and procedures in the simulator first, before validating it in reality.
• Check machine compatibility with mine design before the start of procurement and/or construction

Overall
• Increase Motivation: The combination of increased safety awareness, increased production, smarter production and reduced machine damage normally leads to a highly motivated workforce.
5DT offers a Training Plan, not merely Training Simulators.

Our training plan has been developed to provide a systematic development of the trainee's knowledge and skills.

The Training Plan has 4 stages:

**Computer Based Training (CBT) Systems**

**Objective**
Teaches the trainee the theory, basics and terminology of a specific mining machine. The CBT is delivered at the site or via the worldwide web (online).

**Visualizers**

**Objective**
Teaches the trainee where the specific mining machine fits into the overall mining process. Gives the trainee a big-picture, holistic view. It is ideal for coordination and supervisor training.
**Objective**
Teaches the trainee the controls of a specific mining machine, so that no time is wasted teaching controls on the main simulator.

**Objective**
Submits the trainee to training scenarios, ranging from easy to difficult. Teaches the trainee how to handle the machine during emergencies.

With the 5DT Training Plan you can have more than 10 persons training at the same time, instead of a single person in a simulator, as offered by conventional training simulator providers.
A 5DT Training Simulator consists of two elements; a Simulator Base System (below) and Machine Consoles (opposite page).

Simulator Base Systems

The Simulator Base System acts as a base framework. It consists of a visual display system, computer hardware, an instructor station and a motion base. It also includes software functionality.

5DT offers 2 types of Simulator Base Systems, the Cube-Type (top-left) and the Hexagon-Type (top-right).

General Simulator Base System Features:

- User management
- Continuous monitoring of operators and logging of errors during all training scenarios
- Graphs, production metrics & reports
- Record & playback
- Environmental settings (dust, fog, rain)
- Time of day settings (day, dusk, night, dawn)
- Outside view (e.g. top-down view) on instructor and classroom screens
- Simulator safety switch for instructor
Machine Consoles

Several different Machine Consoles may be used with a single Simulator Base System. The Machine Consoles resemble specific mining and construction machines that are simulated. It consists of a simulated cab built with real OEM parts, machine controls and instruments. It also includes software functionality specific to the real machine that is being simulated.

General Features for All 5DT Machine Consoles:

(Specific Machine Console Features are shown separately with each machine)

• The same machine consoles may be interchanged between 5DT's Cube-Type and Hexagon-Type Simulator Base Systems as well in 5DT's Pre-Simulator Framework.
• Realistic machine cab with real OEM controls
• Photorealistic virtual machine
• Photorealistic virtual terrain database
• Realistic ground interaction
• Realistic machine engine model
• Realistic physics (dynamic model)
• Training scenarios
• Operator errors
• Machine failures
• Production metrics
• Easy machine console swap-out
• Single connector interface with computer
• Simulator safety switch for operator
• Instructor initiated events (e.g. brake failures, engine fires, tire bursts, machine failures)

General Training Scenarios for All 5DT Machine Consoles:

(Specific Training Scenarios are shown separately with each machine)

• Machine startup
• Machine shutdown
• Controls familiarization (pre-simulator)
• General driving
• Machine part movements
SIMULATOR BASE SYSTEMS

CONSOLE SWAP-OUT
The 5DT Cube-Type Simulator Base System includes 4 projectors, 4 projection screens, a classroom screen, a computer system, a motion base and an instructor station.

The Cube accommodates a wide variety of Machine Consoles for Underground Coal Mining, Underground Hard Rock Mining, Surface Mining and Construction machines. The Cube-Type simulator family has been developed specifically for Underground Mining training simulator applications.

**Features**
- Modular solution
- High immersion (360° horizontal and 67.5° vertical field of view)
- Wide range of machine consoles available
- 6 Degrees of freedom (6-DOF) motion base
- Ultra low profile motion base available (for machines where the operator is required to stand upright when operating the machine)
- Classroom screen • Motorized rear screen
- Surround-sound • Easy machine console swap-out
- Single connector interface with machine consoles
- Colour laser printer for reports
- Virtual instruments shown on instructor and classroom screens
- Safety switches for instructor & operator
- Ideal for groups and team training
- Most versatile solution

**Machine Console Swap-Out**
- Less than 3 minutes swap-out time
- No tools or cranes required
The 5DT Hexagon-Type Simulator Base System includes 3 projectors, 3 projection screens, a large rear-view LCD screen, a classroom screen, a computer system, a motion base and an instructor station. Different Machine Consoles may be used with a single Simulator Base System.

The Simulator Base System accommodates a wide variety of Machine Consoles for Underground Coal Mining, Underground Hard Rock Mining, Surface Mining and Construction machines.

Features
- Modular solution
- High degree of classroom interaction
- Wide range of machine consoles available
- 210° Horizontal field of view (180° front, 30° rear)
- 45° Vertical field of view
- 6 Degrees of freedom (6-DOF) motion base
- Safety switches for instructor & operator
- Classroom screen • Rear-view screen
- Surround-sound • Easy machine console swap-out
- Single connector interface with machine consoles
- Colour laser printer for reports
- Virtual instruments shown on classroom screen

Machine Console Swap-Out
- Less than 3 minutes swap-out time
- No tools or cranes required
The Head Mounted Display Type Simulator Base System is an ergonomic framework that includes a head mounted display (HMD), a head tracker, an LCD classroom screen, a barricaded training area with anti-slip flooring and an instructor station.

The system is ideal for training simulators of machines and/or vehicles that are operated with wireless remote control devices, e.g. a Continuous Miner or a Longwall.

Applications
The system offers a wide range of applications for training simulators and viewing stations, for example:
- Continuous Miner Training Simulators
- Longwall Mining Training Simulators
- Welding Simulators

Features
- Modular solution
- High degree of classroom interaction
- Integrated solution
- Non-slip floor material
- Classroom screen
- Barricaded training area
- Wide field of view head mounted display
- Colour laser printer for reports
- Easy-to-reach HMD stowage
- Single connector interface with machine remote controls
SURFACE MINING SIMULATORS

OVERVIEW

HAUL TRUCKS

SHOVELS

WHEEL LOADERS

GRADERS

DRAGLINES
EXCAVATORS
DOZERS
ROAD TRUCKS
LIGHT VEHICLES
SURFACE MINERS
This simulator develops the Skills of a Haul Truck operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Electrical drive and mechanical drive truck models available
- Major suppliers accommodated
- Artificial intelligence (AI) shovels and excavators

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Parking truck for loading by shovel and excavator
- Loading Patterns:
  - Back-up
  - Double-side
  - Hauling material
  - Dumping material at crusher
  - Drive-by
  - Modified back-up
  - Retarder use
  - Dumping material at waste dump
  - Single-side
  - Brake test

Emergency Training Scenarios:
- Brake failure
- Tire burst
- Engine fire
- Hydraulic failures
- Tire fire
This simulator develops the Skills of a Shovel operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

**Features:**
- Advanced ground interaction software
- Hydraulic and electric (rope) shovel models available
- Artificial intelligence (AI) haul trucks
- Cycle time analyses
- Simulation of on-board systems

**Specific Training Scenarios:**
(General Training Scenarios are shown separately under Training Simulator Overview)
- Loading a truck with shovel:
  - Single side back-up
  - Dual side back-up
  - Modified back-up

**Emergency Training Scenarios:**
- Fires
- Hydraulic failures
This simulator develops the Skills of an Excavator operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Advanced ground interaction software
- Artificial intelligence (AI) haul trucks

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Digging a trench
- Loading a truck with excavator:
  - Bench back-up
  - Top loading
  - Stockpiling
  - Bench drive-by
  - Trench loading
  - Building a ramp

Emergency Training Scenarios:
- Fires
- Hydraulic failures
This simulator develops the Skills of a Wheel Loader operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

**Features:**
- Advanced ground interaction software

**Specific Training Scenarios:**
- Loading a truck
- Stockpiling
- Brake test

**Emergency Training Scenarios:**
- Fires
- Hydraulic failures
This simulator develops the Skills of a Dozer operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Advanced ground interaction software
- Rear screen for ripping

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Levelling an area
- Cutting a v-ditch
- Ripping
- Stockpiling
- Cleanup at loading area
- Overburden (topsoil) removal
- Pushing material over
- Shaping walls (berms)
- Shaping embankments
- Filling a trench
- Removing trees
This simulator develops the Skills of a Grader operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Advanced ground interaction software
- Lever-type and joystick-type control models available
- Collision detection between machine parts

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Levelling an area
- Ripping
- Cleanup at loading area
- Shaping embankments
- Levelling a road
- Mixing road bedrock material
- Cutting a V-ditch
- Stockpiling
- Overburden (topsoil) removal
- Grading a cul-de-sac
- Blue topping (final trim)
This simulator develops the Skills of a Dragline operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Propel Mode (walking) and Production Mode (dragging)
- Accurate simulation of dragline system
- Accurate shadows to facilitate better depth perception
- Production analyses tool - Measures the relevant data of each of the production cycle elements: Drag, Swing, Spoil, Return-Swing, Spot
- This data is compared to editable baselines that are set by the instructor
- Real-time overlays of bucket zones
- Real-time overlays of dragline dials and instruments
- Advanced reporting - results are categorized such that an instructor can easily identify problem areas
- Advanced rope dynamics model
- Advanced ground interaction model

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Walking
- Production Cycle: Drag, Swing, Spoil, Return-Swing, Spot
This simulator develops the Skills of a Surface Miner operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Artificial intelligence (AI) haul trucks

Specific Training Scenarios:
- Steering modes
- Starting a cut (ramping down)
- Park-up in cut
- 3-Point turn
- Cutting against the high wall
- Cutting a strip (continuous loading)
- Alignment for cutting
- Completing a cut (ramping up)
- Park-up outside cut
- U-Turn
- Cutting a strip (windrow)
This simulator develops the Skills of a Road Truck operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Manual, automatic or semi-automatic gearboxes
- On- and off-road terrain databases
- Artificial intelligence (AI) vehicles

Specific Training Scenarios:
- Parking for loading by excavator
- Brake test

Note:
This training simulator can also be used to train operators for construction applications.
This simulator develops the Skills of a Light Vehicle operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Driving in a live mine with haul trucks and other machines
- Manual, automatic or semi-automatic gearboxes
- On- and off-road terrain databases

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Brake test
- Collision avoidance
- 4WD driving skills

Note:
The light vehicle training simulator may also be used to train drivers for underground conditions like coal mines and hard rock mines. It is also useful for construction training.
UNDERGROUND COAL MINING SIMULATORS
OVERVIEW

CONTINUOUS MINERS

MINER BOLTERS

SCOOPS/ LHDS
LONGWALLS

ROOFBOLTERS

SHUTTLE CARS
This simulator develops the Skills of a Continuous Miner operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

**Features:**
- Simulated remote control (with radio device) or on-board (from cab) operation
- Artificial intelligence (AI) shuttle cars and humans
- Different seam heights simulated

**Specific Training Scenarios:**
(General Training Scenarios are shown separately under Training Simulator Overview)
- Alignment with coal face
- Cutting cycle
- Cutting a cross-cut
- Sweeping the floor
- Trimming the roof

**Emergency Training Scenarios:**
- Gas detected
- Machine failure under unprotected roof
This simulator develops the Skills of a Miner-Bolter operator team. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Team trainer (miner-operator and bolter-operator may work simultaneously)
- Artificial intelligence (AI) shuttle cars

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Cutting cycle
- Bolting cycle
This simulator develops the Skills of a Scoop/LHD operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Scoop or LHD virtual machine
- Artificial intelligence (AI) continuous miner

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Loading/Scooping material
- Hauling material
- Brake test
This simulator develops the Skills of a Shuttle Car operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

**Features:**
- North-south (stick-steer) and side-saddle machine models
- Low seam and high seam machine models
- Artificial intelligence (AI) continuous miner

**Specific Training Scenarios:**
(General Training Scenarios are shown separately under Training Simulator Overview)
- Loading material at the continuous miner
- Hauling/shuttling material
- Discharging material at the feeder breaker
This simulator develops the Skills of a Roof Bolter operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Virtual tool table
- Team trainer
- Left boom and right boom operation
- Joystick-type and lever-type operation
- 'Spin to stall' and 'spin & hold' bolt installation cycles
- Configurable cycle timing and evaluation

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Deploying the temporary roof support (TRS)
- Installing single bolts
- Installing bolt patterns
This simulator develops the Skills of a Longwall operator team. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

The trainee controls the machine with the same radio controller that is used for the real machine. The trainee is first taught how to start the shearer. The trainee is then taught how to operate the radio device. From this point the trainee moves on to cutting coal with the shearer. The trainee can control the primary and secondary booms, the cutting drums, the cutting direction, the water spray booms and the cowels.

The support shields of the longwall are controlled from the simulator keyboard.

Apart from teaching the trainee how to control the shearer, this simulator is also very useful to teach trainees about the long wall process. The trainee may ‘walk’ up and down the long wall underneath the plates. The trainee may view the advancement of the long wall in accelerated mode, leading to rapid understanding of the process. The system also has a see-through mode where the long wall may be viewed from any angle through the coal.

**Features:**
- Real shearer remote control used in simulator

**Specific Training Scenarios:**
*General* Training Scenarios are shown separately under Training Simulator Overview)
- Cutting coal (to tailgate)
- Cutting coal (to maingate)
- Movement of support shields
UNDERGROUND HARD ROCK MINING SIMULATORS

OVERVIEW

DRILLING RIGS

BOLTERS
LOAD HAUL DUMPS (LHDs)

ARTICULATED DUMP TRUCKS (ADTs)

UTILITY VEHICLES (UVs)
This simulator develops the Skills of a Drilling Rig operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Analyses of individual holes
- Analyses of drilling patterns
- Tramming controls as well as drilling controls

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Collision avoidance
- Drilling single holes
- Drilling hole patterns

Emergency Scenarios:
- Brake failure
- Machine fire
This simulator develops the Skills of an LHD operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Artificial intelligence (AI) haul trucks and humans

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Collision avoidance
- Loading material (bogging)
- Hauling material
- Dumping material
- Dumping material on trucks
- Brake test

Emergency Scenarios:
- Brake failure
- Machine fire
This simulator develops the Skills of a Bolter operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Analyses of individual bolts
- Analyses of bolting patterns
- Tramming controls as well as bolting controls

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Collision avoidance
- Installing single bolts
- Installing bolt patterns

Emergency Scenarios:
- Brake failure
- Machine fire
This simulator develops the Skills of an ADT operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

**Features:**
- Artificial intelligence (AI) LHDs and humans

**Specific Training Scenarios:**
- Collision avoidance
- Park truck for loading
- Hauling material
- Dump material
- Brake test

**Emergency Scenarios:**
- Brake failure
- Machine fire
This simulator develops the Skills of a Utility Vehicle operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Artificial intelligence (AI) vehicles and humans

Specific Training Scenarios:
- Collision avoidance
- Brake test
- Deploying cassette
- Picking up cassette

Emergency Scenarios:
- Brake failure
- Machine fire
5DT offers a wide variety of simulators for other industries, such as:

**Crane Training Simulators**
- Mobile Crane (telescopic boom)
- Gantry Crane
- Tower Crane
- Container Crane

**Port Training Simulators**
- Bulk Ship Loader (shown above)
- Stacking Crane
- Yard Tractor
- Container Crane
- Straddler Crane

**Industrial Simulators**
- Welding Simulator

**Aerospace & Defence Training Simulators**
- Aircrew Training Simulators
- Gunnery Crew Training Simulators
- Driving Training Simulators (Military vehicles)

Please contact us if you have a requirement for a simulator not listed above or if you need more information.
CONSTRUCTION TRAINING SIMULATORS

OVERVIEW

EXCAVATORS

GRADERS
This simulator develops the Skills of a Grader operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Lever-type and joystick-type control models available
- Advanced ground interaction software
- Virtual road construction landscape

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Levelling an area
- Ripping
- Cleanup at loading area
- Shaping embankments
- Levelling a road
- Mixing road bedrock material
- Cutting a v-ditch
- Stockpiling
- Overburden (topsoil) removal
- Grading a cul-de-sac
- Blue topping (cut not scrape)
This simulator develops the Skills of a Dozer operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Advanced ground interaction software
- Virtual road construction landscape
- Rear screen for ripping

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Levelling an area
- Ripping
- Cleanup at loading area
- Pushing material over
- Shaping embankments
- Removing trees
- Cutting a v-ditch
- Stockpiling
- Overburden (topsoil) removal
- Shaping walls (berms)
- Filling a trench
This simulator develops the Skills of an Excavator operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Advanced ground interaction software
- Virtual road construction landscape

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Levelling an area
- Digging a trench
- Loading a truck:
  - Bench back-up
  - Bench drive-by
  - Top loading
  - Trench loading
- Stockpiling
- Removing trees
- Laying pipes
This simulator develops the Skills of a Front-End Loader operator. Skills are developed progressively by subjecting the trainee to general, specific and emergency Training Scenarios. Operator errors are recorded and reported.

Features:
- Advanced ground interaction software
- Virtual road construction landscape

Specific Training Scenarios:
(General Training Scenarios are shown separately under Training Simulator Overview)
- Filling a trench
- Loading a truck
- Stockpiling
- Brake test
- Cleaning an area
The training simulators come standard with a generic terrain database. Site-specific terrain databases may be developed on request at additional cost. These virtual mines closely resemble the real mines.
Pre-Simulators are used to teach the trainee how to identify and operate the controls of a machine. The use of a pre-simulator station frees up the main simulator. The pre-simulator utilizes the same machine console as used in the main simulator.

Pre-Simulator training generally develops the Skills of a trainee, specifically focused at machine controls. It helps to develop muscle memory and rapid reaction in an emergency.

Benefits:
• Trainees can familiarize themselves with the controls of a vehicle/machine before going to the main simulator. This ensures that valuable main simulator time is not wasted on teaching a trainee the machine basics.
• Machine controls familiarization in the pre-simulator can take place in parallel with scenario-based training in the main simulator. More people can therefore be trained simultaneously.
• Training can generally be conducted without an instructor present.
Computer Based Training (CBT) is ideal for teaching trainees the basics before they graduate to simulator training.

CBT generally develops the Knowledge of a trainee.

**CBT Systems are ideal for teaching the following:**
- Walk-around inspections (pre-shift and post-shift)
- Vehicle/Machine terminology (e.g. parts and functions)
- Standard operating procedures (SOPs)
- Guidelines, rules, regulations and safety measures
- Machine safety (e.g. machine blind spots)
- Accident and incident reporting
- Lockout procedures
5.10.6. Types of holes

The different types of holes are explained below:

- Bar holes
- The bar holes are the bottom row of 8 holes.
- Vowel holes
The purpose of a Visualizer is to enable users to visualize the processes and activities on a worksite.

Users get the opportunity to interactively manage a worksite. This develops their management skills in a safe and controlled environment.

Visualizer training generally develops the Knowledge and Supervisory Skills of a trainee, specifically focused at big picture understanding.

This package is aimed at mine section or site managers. It may however be used equally effective for the training and induction of machine operators, site managers and administrators.

The visualiser gives users a holistic view of the process and enables them to see where a specific machine fits into the overall process.

**Visualizations may be viewed with any of the following hardware, as shown above and to the right:**
- Large LCD Screen
- Cube Type Simulator Base System
- 120 Degree Visualization Studio
- 360 Degree Visualization Studio

**Benefits:**
- Training tool
- Planning tool
- Optimization tool
- Production management tool
- Orientation tool
The purpose of this visualizer is to enable users to visualize the processes and activities in an underground coal mining section.

Users get the opportunity to interactively manage an underground coal mining section. This develops their management skills in a safe and controlled environment.

This package is aimed at underground coal mine section managers. It may however be used equally effectively for the training and induction of machine operators, mine managers and administrators.

It is possible to set up a virtual mine with one continuous miner and two shuttle cars and let the process run its course for a specific time-period. One could then increase the number of shuttle cars and perform another run. The outcomes of the different runs (measured in tons of coal produced per time period) could then be compared with each other.

In terms of the operational use of the system one could set up the virtual mine according to the plan of an existing mine and with the same number and type of machines. The system could then be used for planning, briefing and debriefing (feedback) purposes.

The total system consists of the system software, a high performance notebook computer and a large screen display for classroom viewing.
Visualizer Program Modes:

- Edit a Mine Section (Setting up the virtual mine)
- Edit a Scenario (Setting up the virtual machines in the virtual mine)
- Run a Scenario (Pre-programmed mode)
- Control a Scenario (Interactive mode)

Features:

- Active indicators: Time and Production (tons of coal mined)
- Visualization can be run in normal, accelerated or decelerated time
- Transparency view (look through rock to see what is hidden)
- Ventilation view (air/gas flow is continuously calculated)
- Hazards view (illuminated hazards in the workplace)
- Static viewpoints (e.g. at coal face or at feeder-breaker)
- Dynamic viewpoints (e.g. driving on-board a shuttle car)
- Viewpoint navigation with computer mouse
- Cut sequences may be programmed
- Artificial intelligence (AI) machines
This visualization shows a multi-level underground hard rock mine with inclines, machines and ore shoots. Artificial intelligence (AI) machines are programmed to perform certain tasks in a circuit. The user can view the entire mine to see how everything is happening. The user can also zoom in on specific processes by jumping to that location or by navigating him/herself to that position with a space controller like a computer mouse.

Features:

- Supervisor / shift boss management training
- Artificial intelligence (AI) machines
- Jump to static viewpoints
- Jump to dynamic viewpoints (outside or inside machines)
- Viewpoint navigation
- Visualization can be run in normal, accelerated or decelerated time
This visualizer allows the user to experience the operation of a surface mine. A shovel with a circuit of 10 haul trucks is set up. The haul trucks are spaced all over the circuit. The scenario is then started. The user can view activities at the shovel where ore is loaded on the trucks, or he/she can take a ride in one of the haul trucks on its way to the crusher. The user can then jump to the crusher and see how another haul truck is dumping its load there.

**Features:**
- Supervisor / shift boss management training
- Artificial intelligence (AI) control of machines
- Jump to static viewpoints
- Jump to dynamic viewpoints (outside or inside machines)
- Viewpoint navigation
- Visualization can be run in normal, accelerated or decelerated time
5DT's Simulator Base Systems can be mounted inside a classroom (building) or it can be mobilized.

The 5DT Mobile Solutions are based on High-cube ISO shipping containers. These containers are 300mm (1') higher than standard ISO containers. 5DT also offers a fold-out container that doubles the available floor space when deployed. The increased height and floor space lead to user comfort that sharply contrasts with the cramped mobile solutions offered by conventional simulator suppliers.

The containers may be transported with dedicated container trucks or with 5DT's container trailer solution. When using the trailer, the container can be left on the trailer permanently or it can be removed from the trailer at the target site. The trailer can then be used elsewhere.

The containers may also be attached (by means of container locks) onto a truck. This solution provides for very rapid deployment and deployment over difficult road conditions.

**General Features for all 5DT Mobile Solutions:**

- (Specific Features are shown with the individual solutions)
- Modular, standardised and turn-key solution
- High-Cube ISO containers are used (some applications require that machine operators stand upright on motion base)
- Eco-friendly (recycling of shipping containers and use of low-energy lights)
- Rugged and secure
- Fully insulated
- Air conditioned (cooling and heating)
- Non-slip flooring
- Anti lock-in for occupants
- Waterproof
- Emergency lighting
- Fire extinguisher
- Whiteboard for instructor
- Electrical distribution board
A single container folds out to form a dual container space.

**Specific Features:**

(General Features are shown under Mobile Solutions Overview)

- Almost double the floor space of a single container
- Deployed by two persons in less than 1 hour
- May be shipped via a container ship, railcar or road truck
The single container is 5DT’s mobile workhorse. 5DT applied ergonomic design principles to ensure that there is as much as possible free floor space inside the container. The single container is ideal for housing the 5DT Cube-Type Simulator Base System.

**Specific Features:**

(General Features are shown under Mobile Solutions Overview)

- Motorized roll-down rear screen
- Space for other class members
The objective of the classroom container is to provide a mobile computer based training (CBT) classroom. A classroom consisting of one instructor desk and six operator desks are mounted in a single or dual-size container.

**Specific Features:**

(General Features are shown under Mobile Solutions Overview)

- Privacy cubicles between trainees
- Separate instructor station
- Large LCD classroom screen
- Storage cabinet for manuals
- Classroom whiteboard
- All computers are networked
The 5DT trailer solution is essentially a trailer to which a container (either single or dual-size fold-out) is attached with container locks. The trailer may be deployed with the container or the container may be off-loaded so that the trailer may be used elsewhere.

**Specific Features:**
*General Features are shown under Mobile Solutions Overview*

- Trailer weight, including container and simulator: 4,500kg (9,900 lbs)
- May be towed by most commercial tow vehicles
- Tow ring coupling
- Deployable in less than one hour
- Optional hydraulic stabilizer jacks
- Optional lift gate
Our simulators are designed with availability in mind from the ground up, where availability is a function of reliability and maintainability. We choose the most reliable parts, sub-systems and designs. We also design our simulators so they can be maintained easily and effectively.

A 3-year support plan is mandatory. The plan may also be extended to 5 years.

**The support plan includes the following:**
- Warranty extension to 3 years
- Three (3) pro-active (planned) site visits per year
- One (1) re-active (unplanned) site visit per year
- 5DT Train-the-Trainer (T3) program for instructors
- All parts, labor, travel and accommodation costs
- Free software upgrades
- Free documentation upgrades
- Computer hardware upgrade at the end of year 3
- Projector hardware upgrade at the end of year 5 (if 3-year plan was extended to 5-year plan)

**Support is generally provided progressively as follows:**
- Telephone and E-mail Support
- Internet or Modem Support
- On-Site Support

Emergency spares for the systems are kept on site to ensure that it can be serviced quickly and efficiently.
CONTACT INFORMATION

California, USA (North America)

15375 Barranca Parkway, G-103
Irvine, CA 92618
United States of America
Tel: +1 949 450 9044
Fax: +1 949 450 9045
E-mail: sales@5DT.com
Web: www.5DT.com

Pretoria, South Africa (Rest of World)

25 De Havilland Crescent, P.O. Box 5
Persequor Park, 0020
Pretoria, South Africa
Tel: +27 12 349 2690
Fax: +27 12 349 1404
E-mail: sales@5DT.com
Web: www.5DT.com
We make operators Safer, more Productive and less Destructive!™

www.5DT.com