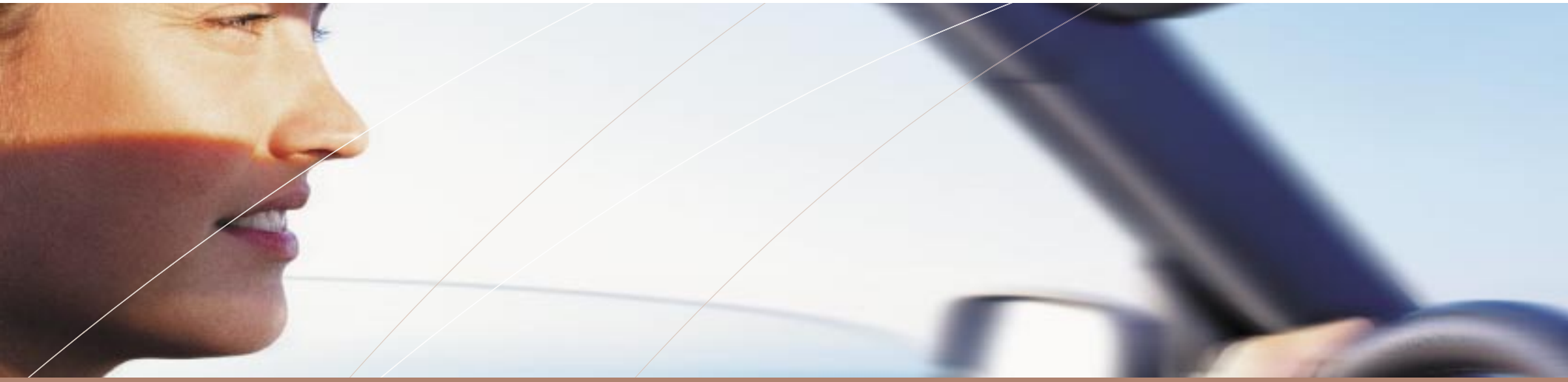
THE INTELLIGENT MANIKIN FOR THE AUTOMOTIVE INDUSTRY

RAMSIS



MOVEMENT STARTS ON THE INSIDE

HUMAN SOLUTIONS

»If you want be up front with the leaders, the time factor is vital.
RAMSIS helps us reach our goals faster.«

Holger Feige, Systems analyst, VW AG

THE HUMAN BEING IS THE MEASURE OF ALL THINGS

RAMSIS—THE KEY TO MORE AND BETTER ERGONOMICS IN VEHICLE INTERIORS

>>> Products should be made for human beings and not vice versa. What we create will only be accepted by our target group if that group's wishes are fulfilled by the product design and if its functionality matches their needs.
This is especially true of a product that moves human beings in the truest sense of the word: the vehicle. Modern vehicles are much more than a means of travelling from A to B, they have become mobile living quarters. That's why vehicle design and construction today must be fine-tuned to a passenger's need for space and to his or her movements. The more precisely this can be achieved, the more convincing the performance will be as far as ergonomics, safety and comfort are concerned.

So how can you attain all these objectives dependably? The answer is RAMSIS—the computer-supported anthropometric mathematical system for vehicle occupant simulations. The power behind RAMSIS is a package of intelligent CAD tools—a package which in itself is absolutely unique in this configuration.

The success rate speaks for itself—today, RAMSIS is used by more than 70% of all automotive and commercial vehicle manufacturers worldwide. The system enables 100% ergonomic design of vehicle interiors and cockpit environments, while retaining maximum flexibility and total control.

Dr. Seidl
Managing Director
Human Solutions

>> RAMSIS harmonizes space concepts and movement sequences in modern vehicles

>> RAMSIS thus improves ergonomics, safety and comfort performances

>> And the reason? Simply because design and construction are customized for the particular target group

HUMAN SOLUTIONS

»The new Audi A6 is powerfully convincing thanks to its sporty and driver-oriented interior concept. With RAMSIS, we have succeeded in perfecting a combination of functionality, comfort and safety.«

Wolfram Remlinger, Professional Consultant for Ergonomics Concepts, AUDI AG

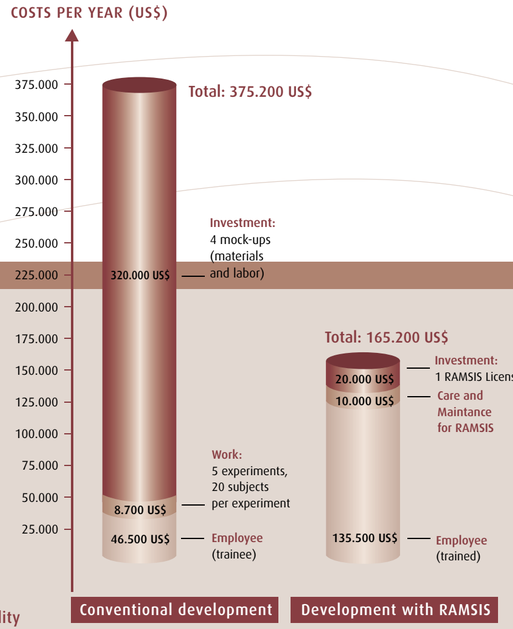
TIME TO MARKET

RAMSIS—A HEAD START THANKS TO EFFICIENT VEHICLE DEVELOPMENT

>>> If you want to be at the market forefront, you simply have to be faster than your competitors. RAMSIS will provide you with all the prerequisites for getting to the top—because the system enables extensive design and construction analysis as early as the conception phase. So how is this possible? RAMSIS works on the basis of permanently current databases, which can be individualized to deal with your specific tasks in just a few simple steps. This means you can obtain dependable information up front, thereby avoiding complex after-editing. This in turn reduces analysis costs by up to 50%, as independent calculations of car manufacturers have shown. And there's more—as well as giving you considerable time savings, RAMSIS will significantly improve the quality of your analyses too.
The system delivers representative results for complex, international target markets roughly three to five times faster than conventional analysis methods.

>>> So what's the upshot of this? RAMSIS acquires and analyzes physical sizes just as dependably as it evaluates the needs of your target group, integrating both of these into the design process. If for example, it transpires that a hood concept is ergonomically critical because individual controls are difficult to access or perhaps require too much force to operate them, RAMSIS will search for, and find, ergonomically appropriate solutions based on your specific input. This reduces development costs and leads to proven results in the shortest possible time frame. So thanks to these intelligent tools, you can now develop vehicles which not only possess cutting-edge technology and exteriors, but have perfectly harmonized interiors as well—vehicles in which your customer will feel good—and which he can totally control. In a nutshell . . .

>> RAMSIS reduces development costs by more than 50%
>> Vehicle development time is reduced by a factor of between three and five
>> Early fine tuning to adjust to the needs of future customers significantly increases quality



VEHICLES FOR HUMAN BEINGS—WORLDWIDE

RAMSIS—YOUR MARKET IS GLOBAL—LIKE OUR VIRTUAL TEST PERSONS

>>> No two people are totally alike. This poses enormous challenges for car manufacturers who want to market their vehicles on a global scale. How can you build a car that will achieve the same high level of customer satisfaction in Asia as it does in Europe? You'll find the fast and perfect solution to this problem with RAMSIS, designing vehicle interiors in which every driver can reach the controls—comfortably and safely. Whether it's brakes, gearshift levers, belt guides, outward visibility or all-round view of the instruments, all safety-relevant operating elements offer optimal access—ergonomic comfort guaranteed!

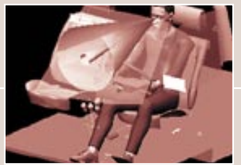
RAMSIS creates the basic prerequisites for these factors as early as the conception phase. Depending on the target market, you'll put together a team made up of different virtual test persons in the 3D CAD environment: various percentages of males and females, large and small persons, Africans, Americans, Asians and Europeans. Then you define which vehicle elements are to be tested—and get a dependable result fast.

You can even take these one-off configured test samples with you, giving you the opportunity to directly compare various vehicle designs with one another.

RAMSIS allows you to produce various vehicle design concepts like small cars and sports cars—but on the same platform. The question as to where you can (and may) make the necessary room available for this is answered by RAMSIS in its virtual environment. Time and costs for complex tests can now be dispensed with, since the decisive factors are the pre-calculated spatial concept and the position of the controls. To obtain exact statements on the H-point adjustment field, RAMSIS not only handles the extreme types—»5% Female« and »95% Male«—but also enables completely different typologies like seated giants and dwarves to be positioned, too. Using these results, the seat adjustment field (length and height adjustment) can be precisely defined at a later point in time.

»Using RAMSIS, we have developed a driver's cockpit for our new BMW 6 Coupé—one that combines comfortable spatial proportions with ergonomic positioning of all instruments and dials.«

Dr. Ernst Assmann, Manager, Ergonomics Dept., BMW AG



>> RAMSIS guarantees optimal accessibility and operability for all controls

>> An international team of virtual test persons represents the differences in human beings

>> Different vehicle concepts can be directly compared with one another—using the same test samples

PREPARED FOR FAST MARKETS

RAMSIS—CUSTOMIZED TOOLS FOR SOPHISTICATED REQUIREMENTS

>>> **RAMSIS STANDARD** creates a manikin for the detailed simulation of vehicle occupants. To do this, the virtual human being is positioned in a CAD environment, which in space and design terms conforms exactly to the future vehicle. This forms the basis for precise analyses. In order to design the vehicle for the complete physical spectrum of future users, RAMSIS works with anthropometric scaling, changing smoothly between male and female models. Task-related postures and movements plus individual movement sequences are calculated automatically. Yet another advantage: The user sees the vehicle interior as RAMSIS sees it. Thus outward visibility and the view of each individual instrument can be optimally evaluated.

>>> **RAMSIS PRO** goes one step further—it actually simulates complex movement sequences. This enables the positioning of the operating fields and the actual freedom of movement areas to be tested under realistic conditions. In this way, RAMSIS PRO bridges the gap between simple posture analysis and movement analysis. Special simulation functions for hand and foot movements portray an exact image of the trajectories and the spatial areas used. Critical positioning of individual controls is recognized by RAMSIS and replaced by more harmonic configurations. The performance spectrum ranges from simple path optimization to collision analyses and force evaluations.

THE FUNCTIONS OF RAMSIS STANDARD:

Model structure
- >> Rendering of the skin in wire grill model form, surface area model form or in the form of a 3D scan
- >> Physiologically exact joint representation: 53 joints, 104 degrees of joint freedom
- >> Correct simulation of the H-point (dependent on manikin and seat)
- >> Various shoe models
- >> User-defined reference points—can be optionally coupled with the skin
- >> Attachment of geometry (tools, clothing . . .)

Anthropometric databases
- >> 90 statistically validated anthropometric types for each database (adults)
- >> Typology based on body height, proportions and corpulence
- >> Children's data for different age groups from nine months to twelve years
- >> Data is matched to target markets: databases for North and Central Europe, USA/Canada, Mexico, South America, Japan/Korea, China; standard configuration: Germany
- >> Acceleration prognosis for taking future body size development into account
- >> Direct coupling with the anthropometric editor RAMSIS BodyBuilder

Geometrical functions
- >> Import and export via the CAD interfaces IGES, VDAFS and SAT
- >> Optional: Direct translators for reading and writing of models from CATIA V5
- >> Creation of basic geometry
- >> Interactive or numerical rotation and translation
- >> Sectional view calculation for surface areas
- >> Definition and control of kinematic degree of freedom (rotation and translation)
- >> Layer function, including individual allocation of names and automatic positioning of geometry during import

Task-related posture simulation
- >> Automatic calculation of postures for freely-definable tasks
- >> Probability-based optimization of posture as applies to a specific posture model; available models: car drivers and passengers, trucks, motor cycles, pilots, Formula 1, standing posture including balance; standard configuration: car drivers, standing posture
- >> Task definition, interactive and independent of type, carried out by user
- >> Flexible reusability thanks to manikin-independent archiving
- >> Large number of various task types: targeting, directional, edge surface, grasping, pelvic, joint angle and fixation (anchorage) tasks
- >> Self-penetrations taken into account
- >> Rendering of the variation area of H-point and eye positions
- >> Automatic calculation and analysis of the entire test samples, including documentation (automatic sequence generator)

Manikin analysis
- >> Calculation of all body part coordinates and joint angles
- >> Request for body sizes and body mass including partial mass and centers of gravity
- >> Distance analyses between manikin and geometry

Health and comfort analysis
- >> Analysis of posture comfort
- >> Comfort analysis for body parts
- >> Orthopedic evaluation of spinal curvature
- >> Direct comparison between various postures

Visibility and mirror visibility analysis
- >> Line of sight and movement integrate into posture simulation
- >> Internal vision (as seen from RAMSIS's eyes), for right and left eyes
- >> Representation of occlusion by means of calculation of the shadows cast by objects as seen by eye vision
- >> Realtime output of vision, also during playback of animation
- >> Mirror view, simulation planar/spherical (any desired number of mirrors possible)
- >> Mirror position and mirror orientation freely definable
- >> Ergonomic evaluation of the visual field
- >> Focusing distance taken into account

Belt analysis
- >> Calculation and visualization of the belt run over the manikin
- >> Imaging/representation of belt release points
- >> Analysis for 2 and 3 point belts

Force analysis
- >> Comprehensive force atlas based on detailed measurements of test persons
- >> Differentiation of data according to gender and age group
- >> Calculation of forces and maximum moments as regards current posture and the body measurements of the manikin

Accessibility analysis
- >> Body size-dependent calculation of accessibility limit areas for freely definable joint chains
- >> Visualization of accessibility areas as 3D CAD surface areas

AVAILABLE PLATFORMS AND INTEGRATIONS

RAMSIS is available as a stand-alone version on the following platforms:
- >> IBM
- >> SGI
- >> SUN
- >> HP
- >> Windows 2000
- >> Windows XP

Integrated into CATIV V, RAMSIS is available on the platforms:
- >> IBM
- >> SUN
- >> HP
- >> Windows 2000
- >> Windows XP

RAMSIS is also available in eM-Human by Tecnomatix/IGS and in VR (Virtual Reality) by vrcom.

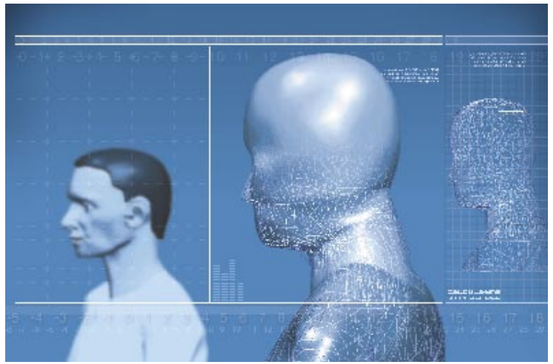
THE FUNCTIONS OF RAMSIS PRO:

Motion paths (trajectories)
- >> Interactive definition of trajectories
- >> Additional definition possibility for associated movement orientation (tripod)
- >> Interactive processing of trajectories (location, curvatures, phase, tripod)
- >> Creation of trajectories by means of kinematic guidance
- >> Automated forecasting of trajectories, based on task definition and start/end posture
- >> Grasp strategies fully taken into consideration

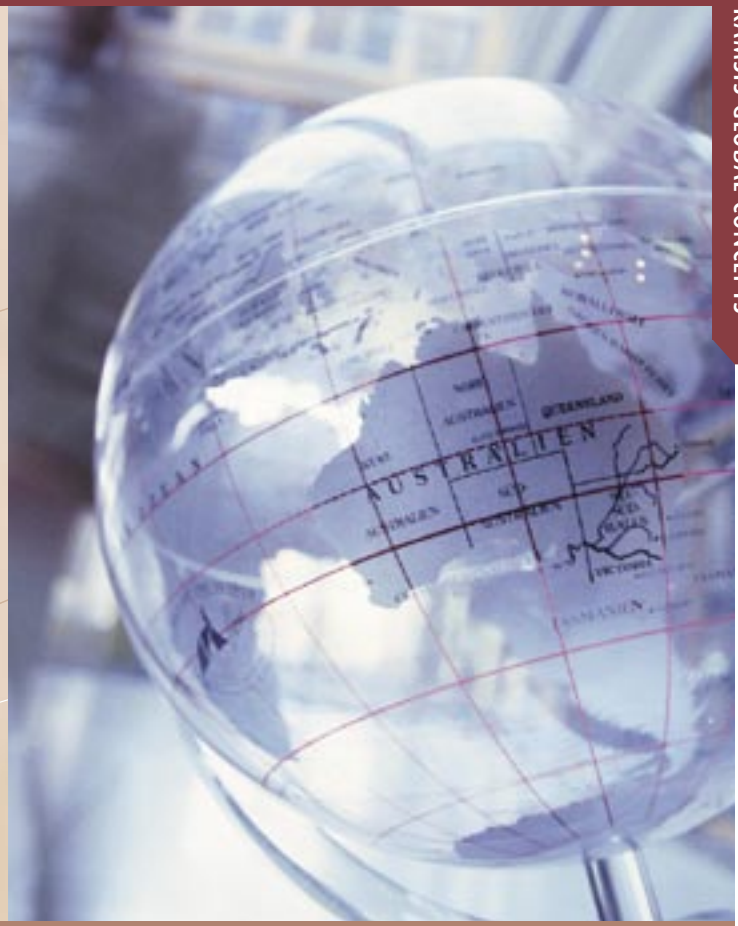
Task-related movement simulation
- >> Docking of the manikin with trajectories
- >> Orientation information taken fully into account
- >> Automatic calculation of key-frame postures for definable movement tasks
- >> Probability-based optimization of posture for one specific posture model
- >> Task Editor for posture simulation completely integrated
- >> Flexible reusability thanks to manikin-independent archiving

Movement recorder
- >> Recording of key-frame postures for definable movement sequences
- >> Provision made for manikin and geometrical kinematics
- >> Automatic calculation of intermediate postures
- >> Extensive editing functions: Insert, Append, Invert, Replace, Cut, Copy, Delete . . .
- >> Loop mode with and without direction reversal

Movement analysis
- >> All analysis functions fully functional during movement sequence representation
- >> Creation of a motion track simulation of critical body points
- >> Representation of the need for space during movement
- >> Collision analysis and display



AUTOMOBILES FOR THE WORLD



>>> **RAMSIS GLOBAL CONCEPTS** is a module for designers who develop vehicle concepts for international markets. Whether SUV, crossover or minivan, throughout the entire product range, this module will provide you with the ideal dimensions for all the important target markets worldwide.

For example, RAMSIS calculates the sitting postures that are body height-dependent for vehicles with different seating height concepts—from sports cars to small delivery trucks. For comprehensive analyses, test samples of widely differing nationalities can be generated—so-called boundary manikins. To do this, the body sizes of the manikin are configured with the RAMSIS BodyBuilder, a tool that is based on special, nationally different databases.

Data sets are available for Germany, France, Korea/Japan, USA/Canada, Mexico, South America, USA (NHANES III) and China.

Your advantage?

You can quickly adapt locally developed vehicle concepts to the demands of your global target markets and tackle the necessary design adaptations at an early stage.

THE FUNCTIONS OF RAMSIS GLOBAL CONCEPTS:

International test samples

>> Free selection of 3 additional anthropometrical databases
>> Data is matched to target markets: databases for Central Europe, USA/Canada, Mexico, South America, Japan/Korea, China
>> 90 statistically validated anthropometric types for each database
>> Typology based on body height, proportions and corpulence
>> Secular growth prognosis for taking future body size development into account
>> Direct link to the advanced anthropometrics editor RAMSIS BodyBuilder Pro
>> Selection of task-specific, optimal, international test samples
>> Automatic posture calculation and ergonomics analysis across the international test samples

BodyBuilder Pro

>> Multi-dimensional statistics of anthropometrical data
>> Automated creation of boundary types for specific population groups
>> Automated generation of test samples for design requirements
>> Comprehensive statistics output and statistics functions for anthropometrical analysis

Vehicle concept and task-related posture simulation

>> Automatic calculation of postures for freely definable tasks
>> Posture model, optimally adjustable for the vehicle concept thanks to H-30 size
>> Large variation range from H30 = 140 mm to H30 = 550 mm
>> Passenger H30 posture model for optimal representation of front and rear seat passengers
>> Probability-based optimization of posture selectable for the driver or passenger posture model
>> Posture simulation fully available from RAMSIS Automotive

THE VIRTUAL WAY TO MORE REAL SAFETY

>>> **RAMSIS SEAT BELT DESIGN** is a module, the heart of which is the so-called "Electronic Beltfit Test Device". The background: Before a vehicle can be registered in Canada, it must pass a belt routing test. Until now, authorities have only recognized actual physical test procedures. RAMSIS Seat Belt Design is the only digital test worldwide that is legally approved for certification. The tool is based on a comprehensive library of so-called anchorage kinematics, by means of which virtually any situation can be simulated. Belt width is taken into account as are possible collisions of the belt strap with the seat.

The result of the simulation represents a seamless belt routing over the testing device and evaluates all safety-relevant aspects in accordance with Transport Canada's criteria. Parallel to this, an even more accurate belt simulation was developed for the RAMSIS manikin. This enables you to check at first hand how the belt runs over the virtual body. This is a tool that provides you with still more time and additional design safety, proving extremely advantageous for both you and your customers.

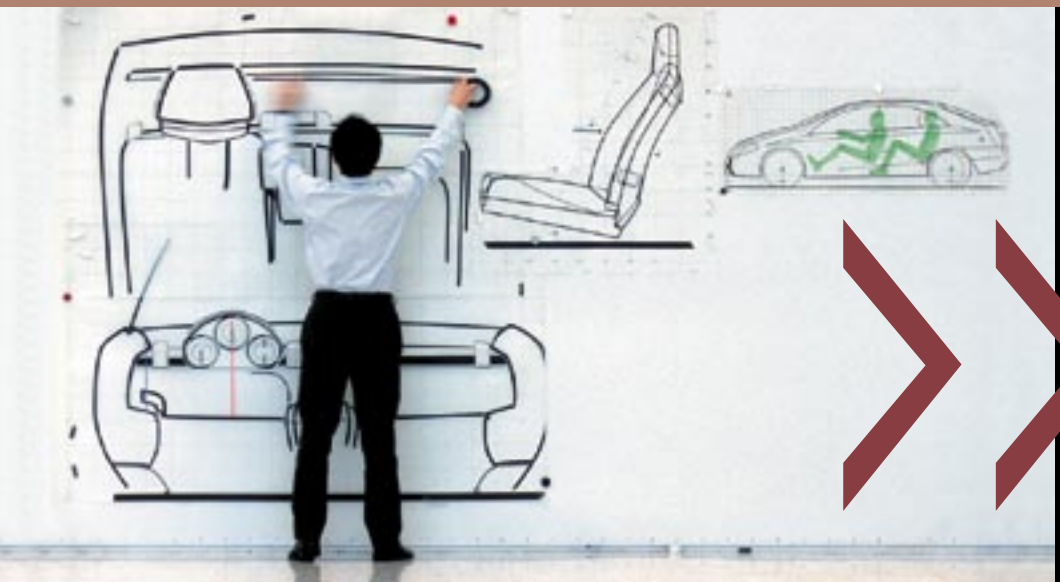
THE FUNCTIONALITIES OF RAMSIS SEAT BELT DESIGN

Electronic Beltfit Test Device (eBTD, Transport Canada)

>> Direct integration of the Beltfit Test Device (BTD) from Transport Canada
>> Complete CAD representation of the BTD
>> Hardware (including kinematics) can be directly manipulated
>> Interactive and numerical positioning
>> Extensive library with anchorage kinematics
>> Belt routing simulation over the BTD with full observance of belt width, belt anchorage kinematics and seat geometry.
>> Representation of belt routing including belt release points
>> Evaluation of belt routing in accordance with the BTD-Pass/Fail criteria of Transport Canada
>> Released for certification of seat belt systems

Highly precise simulation of the belt routing

>> Belt routing simulation over the manikin with full observance of belt width, belt anchorage kinematics and seat geometry.
>> Extensive library with anchorage kinematics
>> Representation of belt routing including belt release points



OPEN TO YOUR KNOW-HOW

>>> **RAMSIS ERGONOMIC EXPERT** opens up the system for company-specific analyses and evaluations. An expansion module, which enables you to program RAMSIS individually and flexibly adapt it to meet the challenges of your own particular vehicle design and construction program. To this end, company data, current research results, or e.g. motion studies are directly integrated into the system via open programming and data interfaces.

RAMSIS ERGONOMIC EXPERT supports you during the process with interactive assistants, so-called Wizards—they will take over certain tasks on a permanent basis if you wish. Standardized or regularly recurring workflow steps can thus be easily automated. This module also enables the analysis of more complex procedures. Entering and exiting a vehicle, for example, can only be dependably calculated in a dynamic context.

>>> So with RAMSIS Ergonomic Expert you will not only gain valuable knowledge but free up even more time for your important analyses.

THE FUNCTIONS OF RAMSIS ERGONOMIC EXPERT:

Programming interface (API)
>> Application Programming Interface (API) as a plug-in interface
>> Programming language C
>> Integration of self-programmed modules with RAMSIS
>> Full access to RAMSIS internal manikin parameters
>> Program modules for interface programming
>> Sample programs for typical application cases

Programming interface for Assistant function (Task Wizard RPI)
>> Transfer of standard procedures to company-specific Wizards
>> Wizards lead designers reliably through the process of task definition
>> Minimization of sources of error
>> Programming language tcl/tk
>> Sample Wizards for typical applications

Trajectories
>> Import/export interface
>> Interactive definition of trajectories
>> Additional definition option for associated movement orientation (tripod)
>> Interactive processing of trajectories (location, curvatures, phase, tripod)

Movement simulation
>> Docking of the manikin with trajectories
>> Orientation information taken fully into account
>> Automatic calculation of key-frame postures along trajectories
>> Probability-based optimization of key-frame postures for specific posture models
>> Task Editor for posture simulation completely integrated
>> Flexible reusability thanks to manikin-independent archiving

Movement recorder
>> Recording of key-frame postures for movement sequences
>> Automatic calculation of intermediate postures
>> Extensive editing functions: Insert, Append, Invert, Replace, Cut, Copy, Delete, etc.
>> Loop mode, with and without direction reversal

Movement analysis
>> All analysis functions fully functional during movement sequences
>> Creation of a motion track of critical body points
>> Representation of the need for space during movement
>> Collision analysis and display

ERGONOMICS BETWEEN HUMAN BEINGS AND REGULATIONS

>>> **RAMSIS STANDARDS & REGULATIONS** bridge the "no-man's land" between the need for human beings' comfort and the laws and regulations on safety. The company that is seeking success on the market in the long-term must fulfill all international registration requirements—and at the same time create the ideal conditions for a wide spectrum of users. RAMSIS Standards & Regulations does exactly that. The module provides the SAE template in conformance with SAE J826. Upon request, eyellipse and headroom contours can be faded in, with the result that prescribed vision and spatial tolerance tests can be carried out within the RAMSIS environment—and that saves time and money. Then there's the new H-point measuring machine integrated into RAMSIS—in conformance with SAE J4002–4004. Human Solutions, as the only supplier of this innovative technology, constantly monitored and promoted its development process. This high-performance module is rounded off by the new Electronic Beltfit Test Device (eBTD). Before a vehicle can be registered in Canada, it must undergo a belt run test. The new digital process in RAMSIS is the only process that is certificated for this test and the only one that replaces the necessary physical tests to date.

THE FUNCTIONS OF RAMSIS STANDARDS & REGULATIONS:

SAE template including all design tools

>> SAE template in conformance with SAE J826
>> Complete CAD representation of the template
>> Interactive and numerical positioning of the template
>> Automatic positioning subject to H30 measurement, heel point and pedal point (SAE J1516/1517)
>> Torso angle taken into account
>> H-point curves subject to H30 measurement and body height percentile (SAE J1517)
>> Eyellipse in conformance with SAE J941
>> Eyellipse in conformance with SAE J1052
>> Class A and Class B vehicles taken into account

New SAE H point measuring machine (ASPECT)

>> Direct integration with the new H point measuring machine in conformance with SAE J4002–4004
>> Complete CAD representation of the measuring machine
>> Hardware (including kinematics) can be directly manipulated
>> Interactive and numerical positioning of the measuring machine
>> Evaluation of all new SAE parameters (ASPECT parameter: H point, torso angle, spinal curvature)
>> Integration of the ASPECT human model as a RAMSIS manikin with reduced degrees of freedom

Electronic Beltfit Test Device (eBTD, Transport Canada)

>> Direct integration of the Beltfit Test Device (BTD), Transport Canada
>> Complete CAD representation of the BTD
>> Hardware (including kinematics) can be directly manipulated
>> Interactive and numerical positioning
>> Extensive library with anchorage kinematics
>> Belt run simulation over the BTD with intensive observance of belt width, belt anchorage kinematics and seat geometry
>> Representation of belt run including belt release points
>> Evaluation of belt run in accordance with the pass/fail criteria of Transport Canada
>> Released for certification of seat belt systems

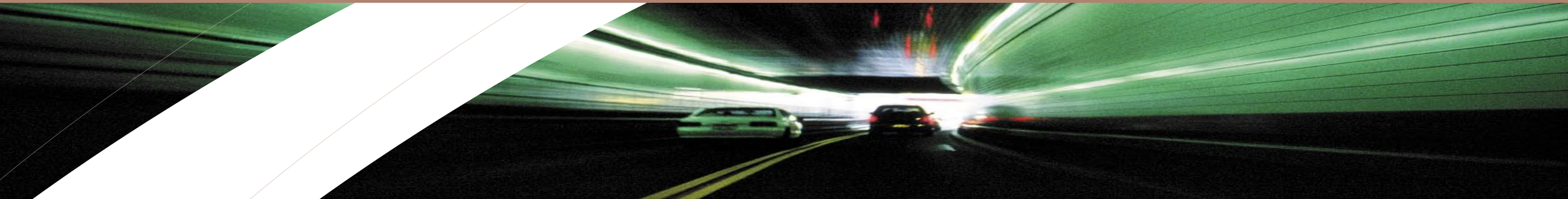
OUR CUSTOMERS ARE ALSO OUR PARTNERS

RAMSIS—THE BASIS FOR A LASTING PARTNERSHIP WITH OUR CUSTOMERS

>>> For the last 15 years, the Human Solutions Company of Kaiserslautern has been developing and marketing the RAMSIS manikin—a system created and continuously further developed in cooperation with the Department of Ergonomics of the Technical University in Munich, Germany. This ambitious project was originally commissioned by representatives of the entire German automotive industry. The objective was to create a human model (a manikin) which would enable much more precise ergonomic analyses than the models of that period.

Today RAMSIS is *the* worldwide state-of-the-art software tool for ergonomic design and is used by over 70% of all vehicle manufacturers. Human Solutions' customer list includes well-known names like Audi, BMW, Citroën, Daewoo, DaimlerChrysler, Fiat, Ford, General Motors, Honda, Mazda, Opel, Peugeot, Porsche, Renault, Rover, Saab, Seat, Skoda, Volkswagen and Volvo. Truck manufacturers like Freightliner and Iveco are also included on this illustrious list of RAMSIS users, as are famous companies from the supply sector like Continental-Teves, Delphi, EDAG, Faurecia, Johnson Controls, Karmann, Keiper, Lang-Mekra and Visteon.

AUDI BMW BRILLIANCE DAEWOO DAIMLERCHRYSLER FIAT FORD GENERAL MOTORS HONDA MAZDA OPEL PORSCHE PSA RENAULT ROVER SAAB SEAT SKODA VOLKSWAGEN



HUMAN SOLUTIONS

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