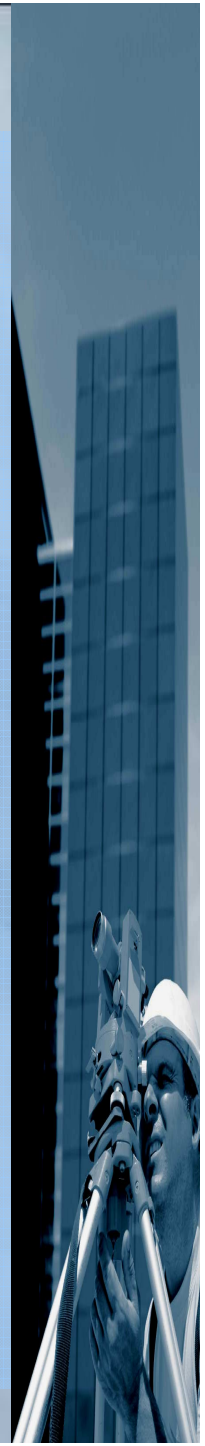
Simulator Training in Action

Crane Safety 2005

Bruno RENDERS

SCHEDULE

- **INTRODUCTION**
  - Construction in Luxemburg
- **HEALTH & SAFETY in LUXEMBURG**
  - Lifting H&S requirements
- **IFSB** — Who we are
- **SIMULATION TRAINING, A TRAINING INTEREST**
- **IFSB TRAINING PROCESS**
  - Psycho-motor skills evaluation
  - Simulation training
- **EDUCATIONAL AND TRAINING BENEFITS**
  - Instructors
  - Operators
- **SIMULATION TRAINING DEVELOPMENT**
  - Actual Equipment
  - Future Developments



About Luxemburg

Luxemburg

450 000 people

Construction in Luxemburg

> **2 000** companies

> **50 000** workers

10 % GDP (Gross Domestic Product)

REGULATIONS

- HEALTH INSURANCE REQUIREMENTS

General safety guidelines
Specific /Sectorial guidelines

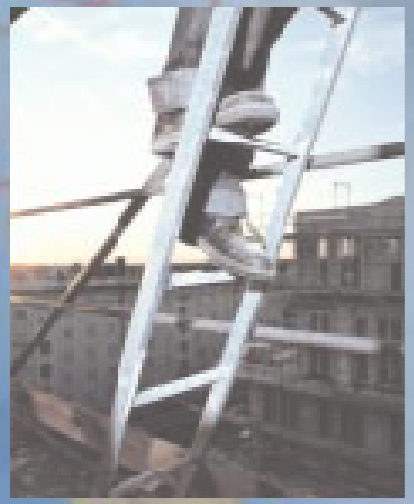
Crane/Lifting guidelines

Equipment

Operator

> 18 years
Medical ability
Psycho-motor skills

Education and Training



About IFSB

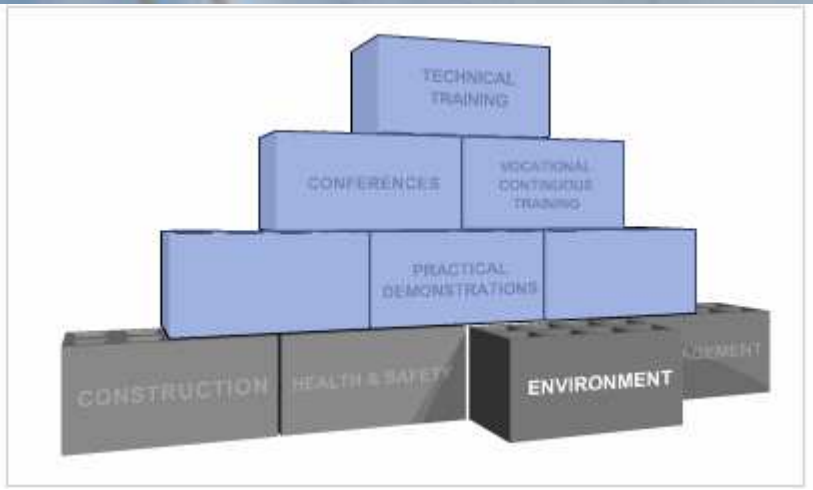
1996	Analysis of Construction Industry Vocational training requirements
2002	IFSB creation
2003	1st Construction Equipment and Crane Operator Training programs

DEVELOPMENT

2002 – 2004	CONSTRUCTION WORKERS TRAINING CONCEPT
2005 – 2007	CONSTRUCTION MANAGEMENT MODULAR CONCEPT
2007 -	RESEARCH & DEVELOPMENT ACTIONS

4 COMPETENCE PILLARS

About IFSB



SOCIOLOGY

- TIC – Technology of Information and Communication

  CONTINUOUSLY IMPACTED CONSTRUCTION

- 2005 CRANE OPERATORS ARE FAMILIAR WITH TIC

- SIMULATION IS A WORK REALITY

  from space, military, aeronautics technologies

- TIC PROGRESS (3D, VIRTUAL REALITY, …) IS PERMANENT

BASIC CRANE OPERATOR TRAINING PROGRAM

TRAINING PROCESS

5 STAGES PROGRAM

PSYCHOMOTOR SKILLS EVALUATION

HEALTH & SAFETY ISSUES

SIMULATION TRAINING

CRANE'S LIVE TRAINING

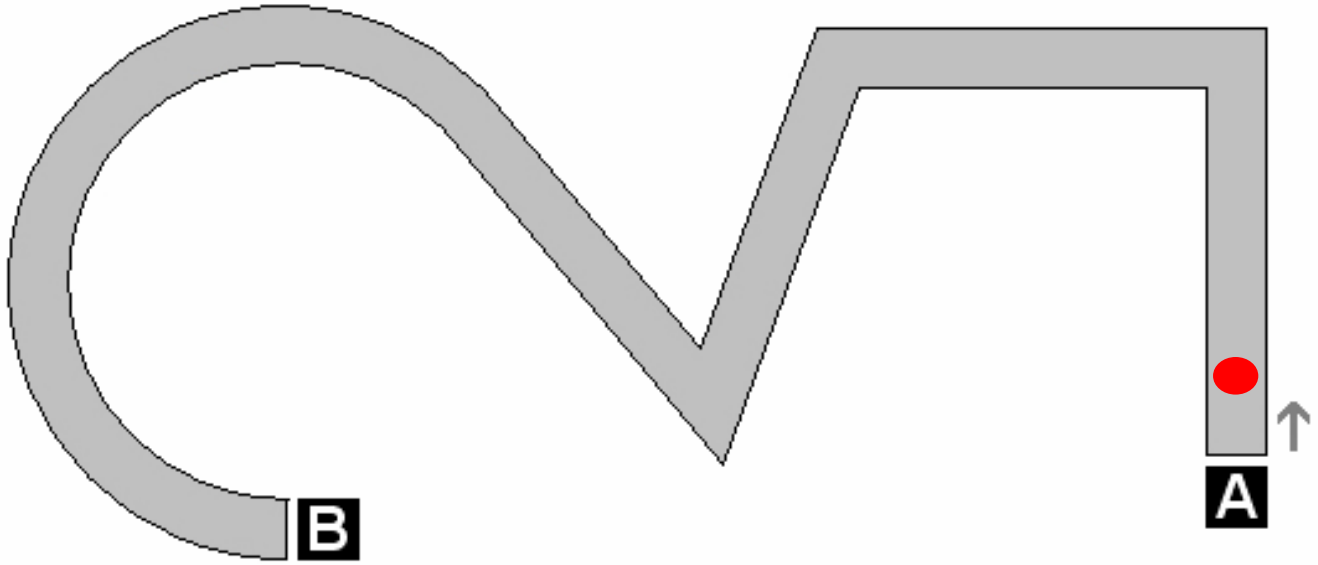
EVALUATION

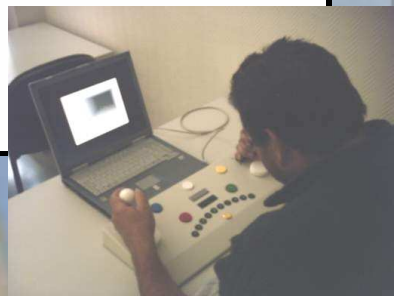
40-80 HOURS PROGRAM


IFSB
Simulator based training
Traditional based training
COGNITIVE PROCESS
Retention %
THEORY
5
READING
10
AUDIO VISUAL
20
DEMONSTRATION
30
DISCUSSION INTERACTIVE
50
Learning by doing
SIMULATION
75
TRAINING
Immediate use of learning
90

PSYCHO-MOTOR SKILLS

TEST 1	**HAND-EYE and HAND-HAND COORDINATION** **TECHNICAL MOTOR ABILITY** **SPEED** **PRECISION** **STRESS RESISTANCE**	
DURATION	**training** **testing**	**10 min** **10 min**

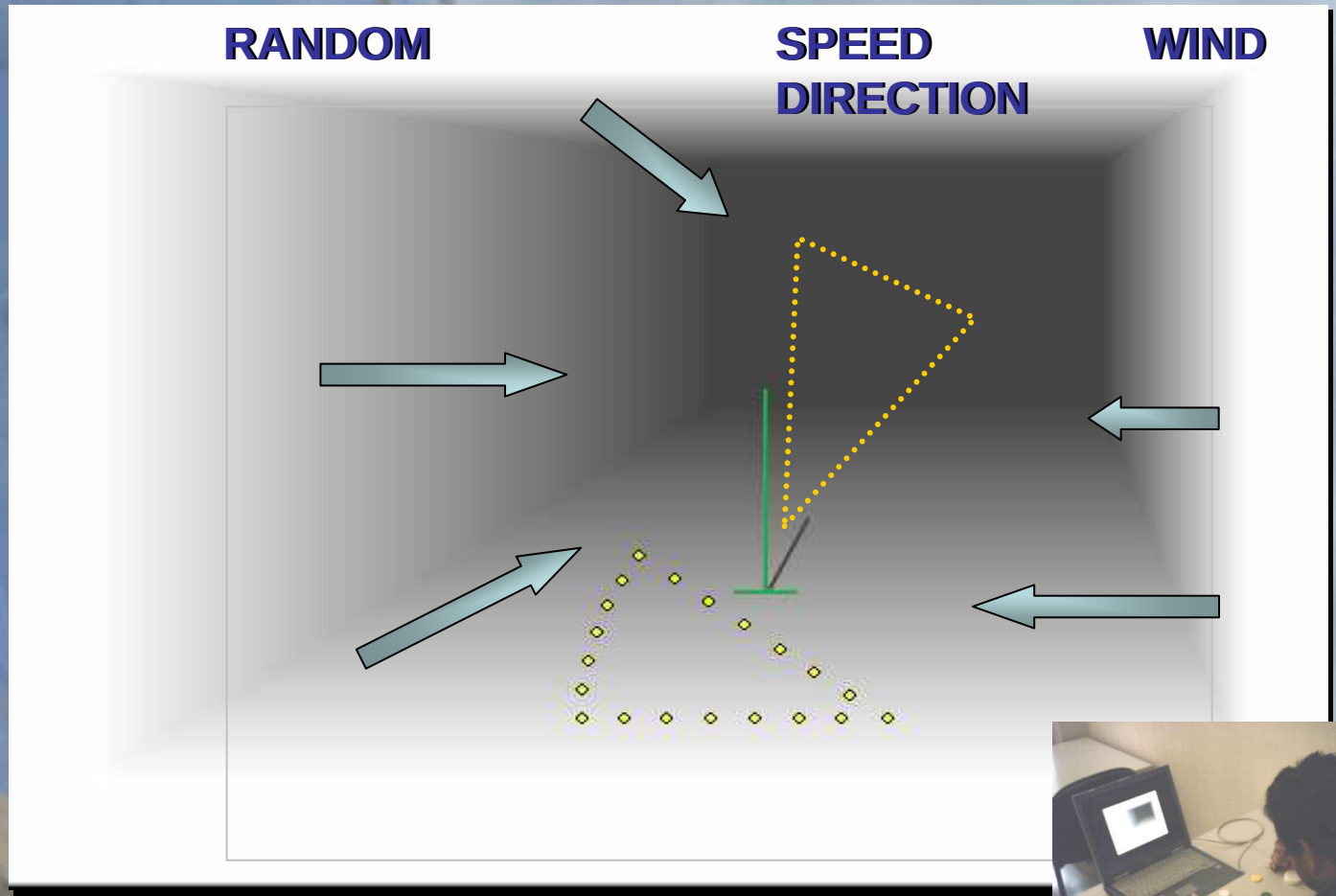


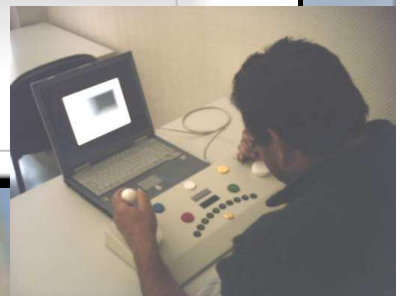


SCHUHFRIED - AUSTRIA - 2HAND TEST

PSYCHO-MOTOR SKILLS

TEST 1	**HAND-EYE and HAND-HAND COORDINATION** **SENSORIMOTOR COORDINATION** **SPEED** **PRECISION** **STRESS RESISTANCE**		
DURATION		**training**	**10 min**
		testing	**15 min**

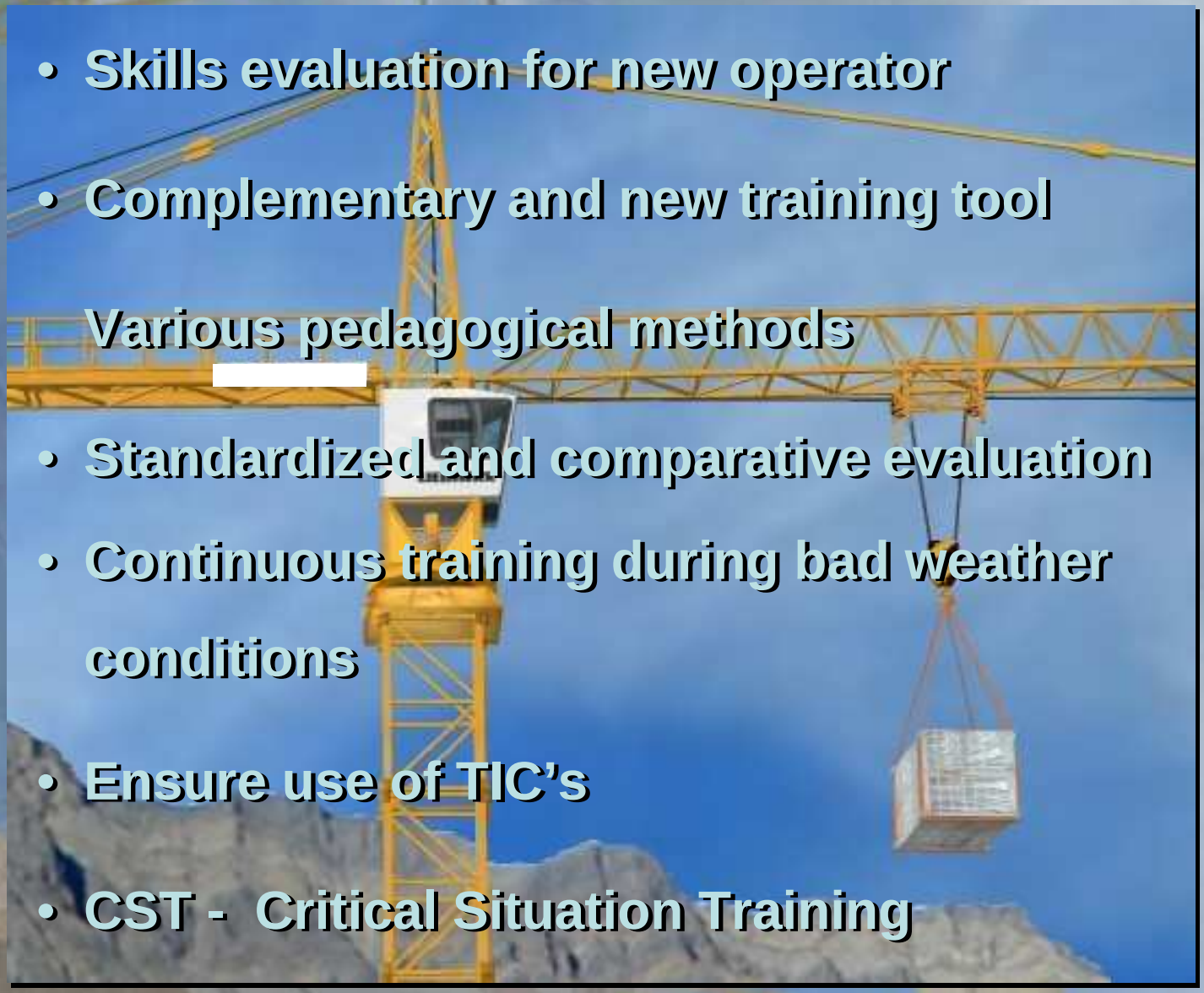




SCHUHFRIED - AUSTRIA - SMK TEST

SIMLOG TOWER CRANE SIMULATOR

SIMULATION TRAINING

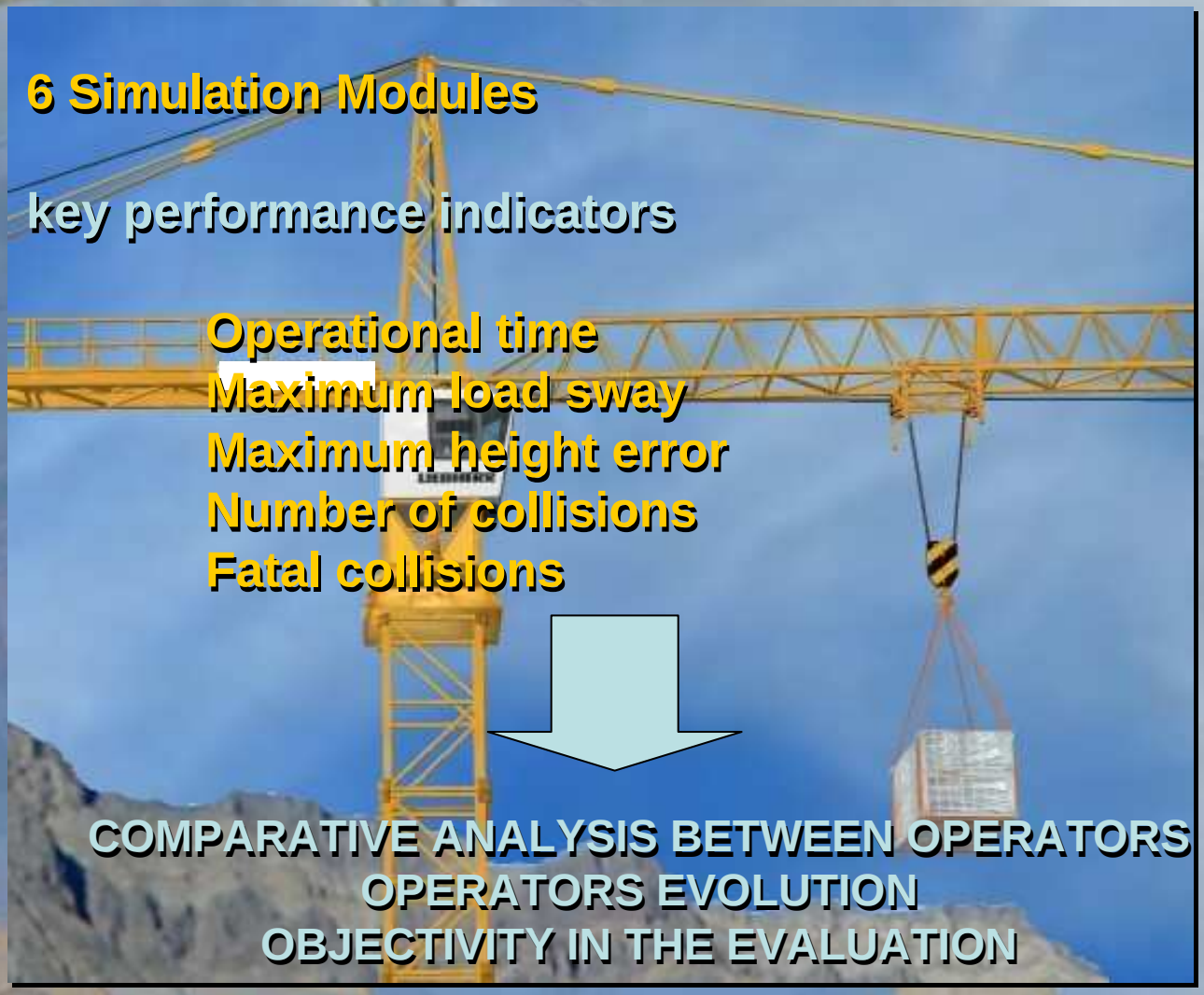


- Skills evaluation for new operator
- Complementary and new training tool

  Various pedagogical methods
- Standardized and comparative evaluation
- Continuous training during bad weather conditions
- Ensure use of TIC's
- CST - Critical Situation Training

SIMLOG TOWER CRANE SIMULATOR

SIMULATION TRAINING



6 Simulation Modules

key performance indicators

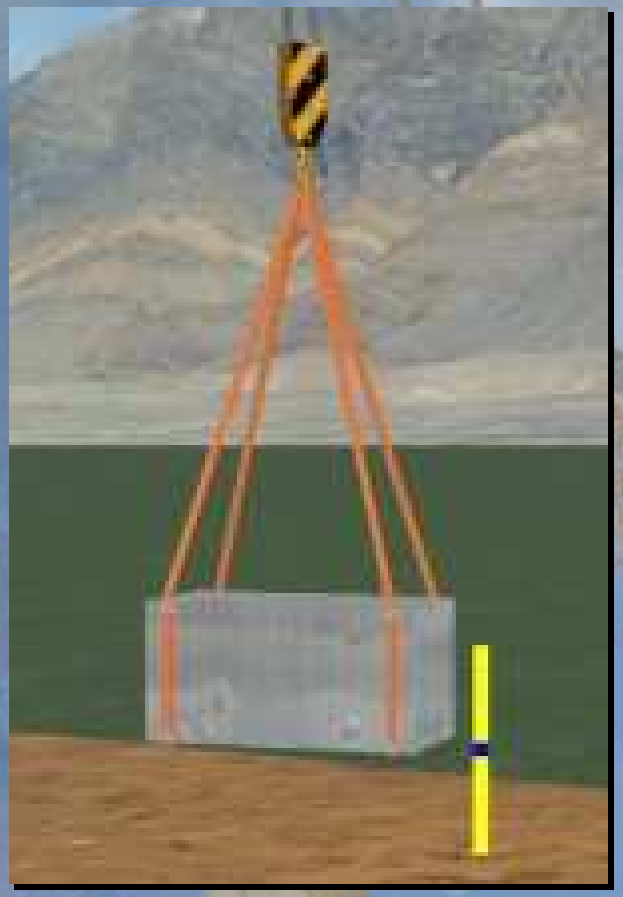
- Operational time
- Maximum load sway
- Maximum height error
- Number of collisions
- Fatal collisions

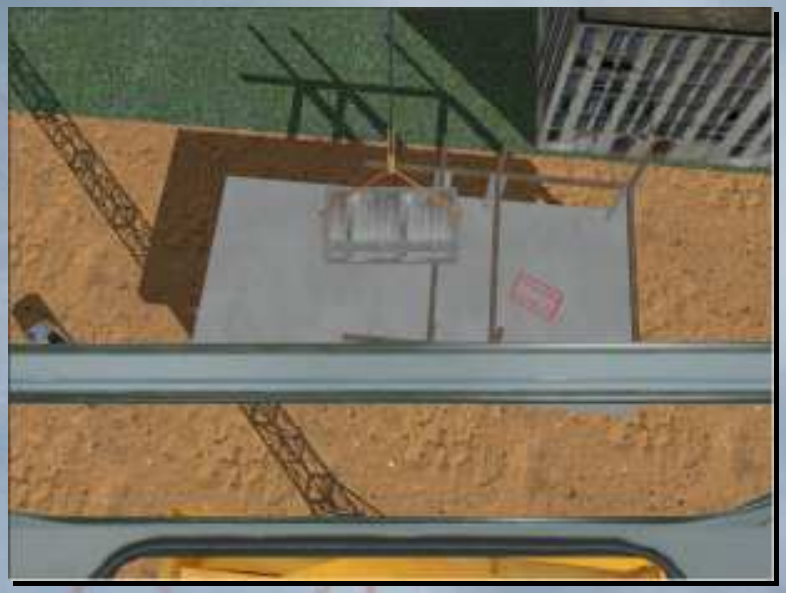
COMPARATIVE ANALYSIS BETWEEN OPERATORS
OPERATORS EVOLUTION
OBJECTIVITY IN THE EVALUATION

IFSB

SIMULATION TRAINING

Different types of training and work situations





IFSB

SIMULATION TRAINING

Different types of training and work situations

MORE THAN 200 DIFFERENT LIFTING TRAINING SITUATIONS

IFSB

BENEFITS

- **LEARNING**
  - ✓ OBJECTIVE
  - ✓ COMPLEMENTARY
  - ✓ IMPROVE LEARNING HOURS
  - ✓ IDENTIFICATION OF ABILITY
- **FINANCIAL**
  - ✓ COST EFFECTIVE
  - ✓ LESS EQUIPMENT
  - ✓ INSTRUCTOR OPTIMIZATION
  - ✓ NO INSURANCE COST
- **LOGISTICAL**
  - ✓ OPTIMIZE EQUIPMENT
  - ✓ OPTIMIZE SPACE NEEDS
- **SAFETY**
  - ✓ CRITICAL SITUATIONS TRAINING
  - ✓ NO RISK
- **ENVIRONMENT**

TRAINING BENEFITS

- Psycho-motor skills evaluation
- Pre-employment skill evaluation for new operators
- Ensure vocational continuous training
- New operator familiarization for existing operator's moving to a new machine type
- Able to measure the operator learning progress
- Asess an operator's ability
- Regular performance monitoring
- Comparative analysis of each operator compared to others on site.

POSITIVE

- DIFFERENT TRAINING SITUATIONS
- REALISTIC TECHNICAL ENVIRONMENT (TOWER CABIN)
- REALISTIC REACTIONS
- OBJECTIVE RESULTS
- TRAINING TIME IS OPTIMIZED
- POSSIBILITY TO TRAIN MORE TRAINEES IN THE SAME TIME

OPERATOR FEEDBACK

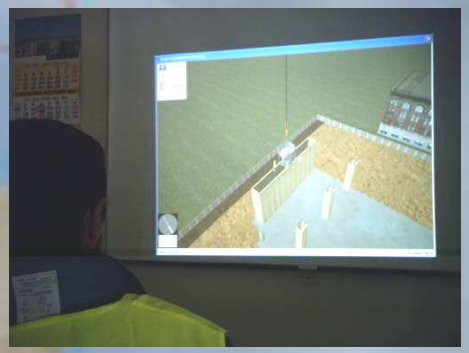
HIGHLY DIFFICULT

TRAINING ASPECTS

GOOD REACTIONS (joysticks)
REALISTIC
STRESS RESISTANCE
GAME LIKE INTEREST

VISUAL TECHNICAL ASPECTS

PC SCREEN DISTURBANCE
MULTIPLE SCREENS
TECHNICAL SEAT




IFSB
NEGATIVE
• 2D VISION
• NON LOCAL OR CONSTRUCTION ENVIRONMENT
• STATIC POSITION
• NO TOWER CRANE TRANSLATION (on rails)
• LIMITED SIZE OF A PC SCREEN (psychological disturbance)

EVOLUTION

SIMLOG EQUIPMENT VALIDATION

VISUAL ENVIRONMENT, GRAPHICS

CONSTRUCTION ENVIRONMENT
MULTIPLE SCREENS
VIRTUAL REALITY SCREEN

TRAINING EVOLUTIONS

NEW HEALTH & SAFETY SITUATIONS (CST)
WEATHER CONDITIONS
WIND CONDITIONS

TOWER CRANE SIMULATOR EVOLUTION

LIEBHERR CABIN CONNECTION
MOBILE (motion platform) CABIN SIMULATOR

INTEGRATION IN OUR VIRTUAL CONSTRUCTION SITE PROJECT
LINKED WITH OUR FUTURE BUILDING PROJECT

SIMULATOR TRAINING IN ACTION

CONCLUSION

- TRAINING INTEREST
  - CRITICAL SITUATIONS TRAINING
  - FIRST TRAINING FOR NEW OPERATORS
  - COMPARATIVE ANALYSIS
  - OBJECTIVE EVALUATION
  - OBJECTIVE MEASUREMENT OF PROGRESS
  - EFFECTIVE COMPLEMENT OT THE PSYCHOMOTOR TESTING TOOL
- FINANCIAL INTEREST
  - LIMITED COSTS
  - INSURANCE BENEFITS
  - LIMITED SPACE
- TECHNICAL INTEREST
  - POSSIBLE EVOLUTION
  - 3D AND VIRTUAL REALITY IMPLEMENTATION
  - MOBILE SIMULATOR