

Modelling crisis management for improved action and preparedness

How to evaluate mass casualty mission tactics using field exercises and computer simulation?

Sven Wirth, Johannes Sautter, Fraunhofer IAO • Friederike Schneider, German Red Cross • Maria Egly, AIT • Martin Scholl, cismet • Martin Sommer, Frank Jonat, Airbus DS

Keywords: mass casualty incidents, field exercises, modelling and simulation, mission tactics

1. Conduct field exercise



2. Exercise run (+ data

capturing)

LEITUNG

The context of use of the CRISMA reference application for Exercise-Support is an exercise setting of aid organisations or public authorities in Europe. Some tasks have to be sorted out before, during and after an exercise (run). This includes, for instance, the patient actors- and responder management before an exercise. The data capturing of certain aspects like (pre-) triage, care measures etc. during the exercise as well as the processing of this data after the exercise is very important for the next steps. The CRISMA application supports certain aspects of a field exercise for mass casualty incidents. These aspects can broadly be separated into three categories: preparation, capturing and debriefing.



Figure 1: Mission timeline from a mass casualty exercise (bus accident un rural highway, 25 inured, Source: BRK Garmisch-Partenkirchen)

A typical mission timeline of a mass casualty filed exercise is illustrated in Figure 1. Figure 2 illustrates the most relevant tasks to be done during an exercise day.

Figure 2: Patient Actor Briefing, Data Capturing and **Responder Debriefing**

3. Debriefing

2. Evaluate exercise using CRISMA tool and indicators



used by the patient actors

Figure 3: Debriefing View of the CRISMA Reference **Application for Exercise-**Support



compared. If the results are satisfactory, the

calibration is done; if not, some picked

parameters must be adjusted in the

direction of the mismatch.

The patient actors use an evaluation sheet to capture data on times and care measures performed by the medical responders conducting the field training (see Figure 4). Field exercise quantitative benefits from detailed control evaluation data, which is enhanced by selfassessment of the trainees as well by medical and mission experts feedback.

Values of the red and blue marked indicators from the exercise runs shown in Table 1 are used as model parameters and for calibration of the model in the next step.

No	Category	Name	Deutsch Start End		Priority	BGL Exercise Run 1	BGL Exercise Run 2	
1	Accomplishment	Time until last patient is transported to the hospital	Zeit bis letzter Patient zum Krankenhaus transportiert wirdTime of arrival of t (medical) vehicl scene Status 4 *		Last patient leaves the scene Status 7 *	1	76 min	77 min
2	Accomplishment	Time until red patients are away from the incident scene	Zeit bis alle rot-triagierten Patienten den Notfallort verlassen haben	Time of arrival of the first (medical) vehicle on scene	Last red patient leaves the scene	1	35 min	59 min
3 <mark>a</mark>	Accomplishment	Ratio of medical responders per patient	Verhältnis von Einsatzkräften und Patienten insgesamt	Incident time	Incident time Last patient leaves the scene		1.6	2.1
3 <mark>b</mark>	Accomplishment	Ratio of medical responders per patient per interval	Verhältnis von Einsatzkräften und Patienten pro Intervall	Incident time	Last patient leaves the scene	1	See tool	See tool
4a	Accomplishment	Time until all patients are pretriaged	Zeit bis alle Patienten vorgesichtet wurden (nicht-ärztliche Vorsichtung)	Time of first triage (→ erste dokumentierte Sichtung in Mimenkarte)	All patients are pretriaged	2	6 min	7 min
4b	Accomplishment	Time until all patients are triaged	Zeit bis alle Patienten gesichtet wurden	Time of first triage (→ erste dokumentierte Sichtung in Mimenkarte)	All patients are triaged	2	72 min	63 min
5	Accomplishment	Number (+ kind) of vehicles involved	Anzahl der Rettungsmittel insgesamt	Incident time	Last patient leaves the scene status 7 *	2	10	10
6	Accomplishment	Percentage of correct supplied patients (basic care measures)	Prozent der korrekt versorgten patienten (präklinische Maßnahmen)	en Time of first basic measure (→ Beginn der ersten Maßnahme) Last patient leaves the scene Status 7 *		3	28%	37%

1. Briefing

Table 1: Besides qualitative expert feedback quantitative Indicators are used to evaluate the field exercises

3. Build and calibrate simulation tool using exercise data 9:00 AM 09:13 09:18 09:22 09:25 09:37 10:13 Time Data: Time Data: **Field Exercises Field Exercises** (Arrival/Status 4 (Start Pretriage-Departure last -Start Pretriage) Patient/Status 7) **Time Data:** SEG • • Time Data: **Routing with** SEG Routing with Bluelight **Bluelight** (e.g. Google Maps (e.g. Google Maps MTF "minus 5 min") "minus 5 min")

Figure 5: Several time slots of a mass casualty mission and respective data sources

No	Category	Short Name	Long name	Deutsch	Deutsch Start (Values) End		Priority	Exercise Indicator
1	Situation	Patients	Number of patients	Anzahl Patienten			1	_
2	Situation	Weather	Weather Conditions	Wetterverhältnisse	Values 1-5 (1 hot summer, 5 heavy winter)		2	-
3	Situation	Walking patients	Number of patients able to walk	Anzahl der Patienten, die gehen können			3	-
4	Tactics	Involved medical responders	Number of involved medical responders	Anzahl beteiligter medizinischer Einsatzkräfte	nzahl beteiligter medizinischer Einsatzkräfte		1	-
5	Tactics	Number of used tactical areas	Number of used tactical areas	Anzahl verwendeter Einsatzabschnitte			2	-
6	Tactics	Time until second resource request	Time until second resource request	Zeit bis zur Nachalarmierung	Incident time Status 0*	Second vehicle request is raised	2	-
7	Accomplishment	All patients got pretriaged	Time until Pretriage is done	Zeit bis Vorsichtung abgeschlossen ist	Incident time Status 0*	Last patient has been pretriaged	1	4a
8	Accomplishment	First red patient treated	Time until first red patient is treated	Zeit bis der erste rote Patient behandelt wird	Incident time Status 0*	First red patient is treated	1	-
9	Accomplishment	Last red patient treated	Time until last red patient is treated	Zeit bis der letzte rote Patient behandelt wurde	Incident time Status 0*	Last red patient is treated	1	-
10	Accomplishment	Last red patient evacuated	Time until red patients are away from the incident scene	Zeit bis alle rot-gesichteten Patienten den Notfallort verlassen haben	Incident time Status 0*	Last red patient is evacuated	1	1
11	Mission Accomplishment	Last red patients at hospital	Time until last red patient arrives at the hospital	Zeit bis letzter roter Patient im Krankenhaus eintrifft	Incident time Status 0*	Last red patient arrives at hospital Status 8 *	1	-
12	Accomplishment	-	Ratio of responder per patient	Verhältnis zwischen Einsatzkräften und Patienten	Incident time	Last patient arrives at hospital status 8 *	2	3a
13	Accomplishment	Loading Area built	Time until loading area set	Zeit bis RMHP eingerichtet	Incident time	Time until area BHP has been built.	2	-
14	Accomplishment	Staging Area built	Time until staging area set	Zeit bis Bereitstellungsraum eingerichtet	Incident time	Time until area BHP has been built.	2	-
15	Accomplishment	Treatment Area built	Time until treatment area built	Zeit bis BHP eingerichtet ist	Incident time	Time until area BHP has been built.	3	-
16	Accomplishment	Last patient at hospital	Time until last patient arrives at the hospital	Zeit bis letzter Patient im Krankenhaus eintrifft	Incident time Status 0*	Last patient arrives at hospital Status 8 *	3	-

After a data analysis that identified outliers, two The main simulation calibration process is running the model with similar inputs model parameters could be derived from average parameters as the inputs for the exercise time spans of two exercise runs in Bad Reichenhall (see Table 1, columns on the right): runs were. Then the results of both are

- pretriage: 19.4 sec/patient
- 188 sec/patient triage:

Contact

Dr Anna-Mari Heikkilä, Project Coordinator VTT Technical Research Centre of Finland Tel: +358 20 722 3490, Email: crisma.coordinator@vtt.fi Table 2: Indicators serve for evaluation of mass casualty missions (=simulations) by the simulation tool's user

CRISMA is funded by the European Community's 7th Framework Programme under the grant agreement no 284552 www.crismaproject.eu





Modelling crisis management for improved action and preparedness

How to use the simulation tool?

Sven Wirth, Johannes Sautter, Fraunhofer IAO • Friederike Schneider, German Red Cross • Maria Egly, AIT • Martin Scholl, cismet • Martin Sommer, Frank Jonat, Airbus DS

Keywords: mass casualty incidents, incident scene simulation, resource management, decision-support, mission tactics analysis

1. Goals and Benefits

- a) Preparation, execution and analysis of mission concepts
- b) New mission tactics



2. Context of Use: Tactical decider at office

Authorities and deciders that face tactical challenges in resource management are situated on a lower level (e.g. regional or municipality) and focus on short term decisions. In this simulation view the user is capable of trying different alternatives of managing available resources and take decisions regarding the allocation and deployment of equipment, vehicles and personnel.

- Local-specific tactic recommendations C)
- d) Preparation and debriefing of field and command level exercises
- e) Executive education and sensitization

3. Select incident scenario

E.g. Train Crash in Berlin with 213 injured

- On the 10.04.2015 at 9:18 railway derailment at the stop Friedenau with 213 patients
- Railway derailment at a speed of 70 km/h ٠
- The locomotive crashed into a bridge abutment
- The second and third wagon were perpendicular to the direction of travel and strong deformed just before a bridge

4. Decide on mission tactics and run

E.g. Early vs. Late Request of SEG & KatS resources

Planning Session Templates	<u>Screen 1</u>
Templates Berlin_Training_Session (195) @2015-02-23T13:54:22.25	Action: Choose incident scenario (Planning Session
. Planning Session Properties	Template),,Big_Berlin_Scenario".
General O Time O Location A Vehicle Requests A Tactics	Output : The application loads an initial incident situation (train crash with 213 injured) including the local order of alarm and action (AAO) and the structure of
Name	less amorgoney medical convices
1. Training Session Berlin Friedenau	local emergency medical services.
Comment	
Lage : - Am 10.04.2015 um 9:18 Uhr S-Bahn-Entgleisung an der S-Bahnhaltestelle Friedenau mit 200 Patienten - S-Bahn ist mit einer Geschwindigkeit von ca. 70 km/h an der Weiche 48 entgleist - Das Triebfahrzeug pralite gegen einen Brückenpfeiler - Der zweite und dritte Waggon lagen quer zur Fahrtrichtung und stark deformiert kurz vor einer Brücke	 Action: Enter name of new mission tactic simulation session and add comments regarding the intended mission tactic. Additionally the development of the operational picture can be described using keywords. For this session we define: Request SEG and KatS units after 12 minutes
Start Planning Session	Output : User Goals and emphasis of the session defined.

Action: User clicks on Tab "Time".

Environmental Conditions: Office Use: For the main usage situations, the user works in a familiar, quiet atmosphere with no or very less interruptions for planning purposes.

Crisis Task Force Use: The CRISMA system may also be consulted as an evaluation tool in a command vehicle during real-life exercises or even when a real crisis is evolving. The command vehicle might be noisy with regular interruptions.

User Profile and Tasks: The following user profile is relevant for this planning and consulting context:

Decider on Tactical Level: situated one level above the operational level that carries out the orders given. Tactical deciders can make decisions which later result in such orders.

- Expertise/usage frequency crisis management ■□□□−■■■■
- Expertise/usage frequency IT



 Envisioned Usage Frequency CRISMA system

5. Inspect and Compare results

Compare Early vs. late request of SEG & KatS resources

CRISAA	<u>Screen 5</u>
CRISMA Indicator Table Widget Indicators Early SEQS Accomplishment First red patient treated 38 minutes Last patient in hospital 146 minutes Last red Patient evacuated 78 minutes Last red Patient treated 30 minutes Last red Patient treated 70 minutes Last red Patient treated 10 minutes Staging Area build 34 minutes Staging Area build 36 minutes Stuation Patients 213 Walking patients 100 Weather 3 Tactics Involved medical responders 614 Number of used technical areas 8 Time until second resource request 12	Output: The needed times for each mission phase are depicted in the Phases widget on the top of the Screen. The values of the simulation indicators are shown on the right. E.g. the pre-triage had a duration of 5 minutes and was finished 42 minutes after the incident time. The times patients of each triage category remained in a particular state are visualized in the widget on the bottom of the screen. E.g. the last red patient received basic care measures ~50 minutes after incident time and the last red-triaged patient arrived at the hospital 95 minutes after the incident time. Action: In order to start another simulation session the user repeats the actions from Screen 1 and 2 before he or she arrives at the "resource request" Tab that is again depicted on Screen 6.
V C	Output: The predefined table is again shown.
	Action: Adjust predefined times and requests in order to match the following table:
	Time Request Mission Keyword AAO RTW KTW NEF MTW GwSan ELW/Fwfz (LF) KOM 1 1 12 MANV 50 FW 22 9 3 14 1 40 25 GG Rettung DRK max.100Pat 4 2 6 4 1 40 15 GG Transport DRK 7 1 1 1 1 40 10 SEG Betreuung DRK 1 6 15 3 1 40 10 BTP500 Kat Schutz 2 2 3 1 1 40 1 PTZ 10 Kat Schutz 2 2 3 1 1 40 1 PTZ 10 Kat Schutz 5 1 1 1 Output: Overview of the desired resource requests for the tactic "late SEG/KatS request". Action: User clicks on "Run Simulation". Output: Application switches to Simulation Results View.
CRISMA Indicator Table Widget Indicators LateSEG/ KatS Request Accomplishment First red patient treated 38 minutes Last patient in hospital 200 minutes All patients got pre-triage 42 minutes Last red Patient evacuated 70 minutes	 Screen 7 Output: Due to more available resources with early SEG/KatS requests for the 213 injured scenario the last red patients arrives at the hospital 95 minutes after incident time . While with the late SEG/KatS requests the last red patients arrives at hospital after 125 minutes. As depicted on the screens other indicators also differ.
	CRISMA Indicator Table Wight First red patient treated All patients of pro-fringe Last red Patient in Hospital 1 46 minutes Last red Patient treated 70 minutes Last red Patient treated 70 minutes Last red Patient treated 70 minutes Staging Arabuid 3 4 minutes Staging Arabuid 3 4 minutes 1 20 Wether 1 20 1

	Output: Switch to Screen 2.
Planning Session Templates Templates Berlin_Training_Session (195) @2015-02-23T13:54:22.25	Screen 2
Planning Session Properties ■ General Image: Time ● Location Image: Text Planning Session	 Action: Simulation time can be changed. Output: Simulation Time is set. Model behaviour may vary regarding time of day - due to traffic boundaries and resource availabilities. Action: User clicks on Tab "Location ". Output: Switch to Screen 3.
Planning Bescion Templates Templates Berlin_Training_Bession (195) @2015-02-23T13:54:22.25	<u>Screen 3</u>
Prevent structure	 Action: User creates all needed tactical areas for the planned mission tactic . For the first area he or she positions the cursor on the map and selects "Danger Zone" for the first area to be defined from the dropdown menu. Then he or she creates the area by clicking "Create Area". Output: Danger Zone defined. Action: User clicks on the desired location on the map, selects "Advanced-Medical-Post" from the menu and confirms by clicking "Create Area". Output: "Advanced-Medical-Post" defined. For the other desired tactical areas Treatment Area, Staging Area, and Loading Area the proceeding is the same. Action: User clicks on Tab "Vehicle Requests". Output: Switch to Screen 4.
Start Planning Session	Screen A
Planning Session Templates	
Templates Berlin_Training_Session (195) @2015-02-23T13:54:22.25	Output : A predefined table suggests a series of resource requests for particular times based on a particular development of an operational picture and the
Planning Session Properties Image: General OTime OLocation Location Image: Tactics Time Image: Time Image: Time OLocation Vehicles 1 min RTW x 2, MTW x 0, GW-San x 0, LF x 1, NEF x 0, KOM x 0, KTW x 0 1 min RTW x 2, MTW x 0, GW-San x 0, LF x 1, NEF x 0, KOM x 0, KTW x 0	mission keywords of the local order of alarm and action (AAO). E.g. one minute after the incident time 4 RTW (ambulances) and 2LF (fire truck) are requested by the command centre. Further resources are requested at shown later points in time – depending on the operational picture o the situation that exists at mission commander and command centre.
2 min NEF x 1, MTW x 0, GW-San x 0, LF x 1, KOM x 0, RTW x 2, KTW x 0 2 min NEF x 1, MTW x 0, GW-San x 0, LF x 1, KOM x 0, RTW x 2, KTW x 0 12 min KTW x 1, NEF x 0, MTW x 1, GW-San x 0, KOM x 0, LF x 0, RTW x 1	Action: Adjust predefined times and requests in order to match the following table:

12 min	KTW x 0, NEF x 0, MTW x 0, LF x 3, GW-San x 1, KOM x 1, RTW x 0		-		DT14/	1/771 4 /			0			
12 min	KTW x 1, NEF x 0, MTW x 1, GW-San x 0, KOM x 0, LF x 0, RTW x 1	Time of	Request	Mission Keyword AAO	RIW	KIW	NEF	MIW	GwSan	ELW/Fwfz (LF) KOM	
				5				-			2	
12 min	KTW x 0, NEF x 0, MTW x 0, LF x 3, GW-San x 1, KOM x 1, RTW x 0		1	2 MANV 50 FW	22			9		3	14	1
22 min	GW-San x 0, KOM x 0, NEF x 0, MTW x 0, RTW x 0, KTW x 0, LF x 0		1	2 2 SEG Rettung DRK max.100Pat	4	-	2	2	6	4		
			1	2 1 SEG Transport DRK	7			1			1	
22 min	GW-San x 0, KOM x 0, NEF x 0, MTW x 0, RTW x 0, KTW x 0, LF x 0		1	2 10 SEG Betreuung DRK							10	
			1	2 3 BHP25 Kat Schutz					6	15	3	
	10 25 50 100		1	2 1 BTP500 Kat Schutz			2		2	3	1	
			1	2 1 PTZ 10 Kat Schutz			5				1	
	Start Planning Session	Outp	out: Ov	verview of the des	ired res	ource	reque	sts.				
		Actio Outp	on: Use out: Ap	er clicks on "Run S oplication switches	imulati to Sim	on". ulatior	n Resu	lts Viev	V.			

Contact

Dr Anna-Mari Heikkilä, Project Coordinator VTT Technical Research Centre of Finland Tel: +358 20 722 3490, Email: crisma.coordinator@vtt.fi







Modelling crisis management for improved action and preparedness

Which other tactics can be tested using the tool?

Sven Wirth, Johannes Sautter, Fraunhofer IAO • Friederike Schneider, German Red Cross • Maria Egly, AIT • Martin Scholl, cismet • Martin Sommer, Frank Jonat, Airbus D&S

Keywords: mass casualty incidents, incident scene simulation, resource management, mid-term decision support

1. Test use of tactical areas

Planning Beccion Tempistec	Screen 1
Templates Berlin_Training_Bession (195) @2015-02-23T13:54:22.25 C	Action: In order to elaborate mission tactics it is necessary to
Planning Bession Properties	define tactical areas to be used for mission accomplishment. A
E General O Time Q Location HVebicia Requests & Tartics	define tactical areas to be used for mission accomplishment. A

E.g. Train Crash in Berlin with 213 injured



PTW x 2 MTW x 0 GW-San x 0 LE x 1 NEE x 0 KOM x 0 KTW x

Screen 1 and Screen 2 Screen 1 shows some initial resource requests as well as mission keywords from the order of alarm and action (AAO) of the particular region



- user is capable of positioning the following area types:
- Danger Zone Advanced Medical Poster (PA)
- Loading Area (LZ/RMHP)
- Staging Area (BR) Treatment Area (BHP)

Output: According to defined areas the simulation tool assigns particular resources to these areas. E.g. the danger zone binds personnel for situation analysis. The advanced medical post binds personnel for leading the area as well as for treating patients. The Loading and Staging Area only binds personnel for leading. The Treatment area needs particular time, personnel and equipment for setup and patient treatment.

<u>Screen 2</u>

Output: The simulation result view shows a simulation run that used a Danger Zone, an Advanced Medical Post (PA) a Loading Area (RMHP) and a Staging Area (BR).

- On the 10.04.2015 at 9:1 railway derailment at the stop Friedenau with 213 patients
- Railway derailment at a speed of 70 km/h
- The locomotive crashed a bridge abutment
- The second and third wagon were perpendicula to the direction of travel a strong deformed just beformed a bridge

8	12 min KTW x 1, NEF x 0, MTW x 1, GW-San x 0, KOM x 0, LF x 0, RTW x 1 12 min KTW x 0, LF x 3, GW-San x 1, KOM x 1, RTW x 0, NEF x 0, MTW x 0 22 min GW-San x 0, KOM x 0, NEF x 0, MTW x 0, RTW x 0, LF x 0 10 25 50 100		Action: A user is capable of changing times as well as number of vehicles to request. Now he or she changes the time of the 3th, 4 th and 5 th resource request and adds 2
	Start Planning Session		additional GWSan, 2 MTW and 2 KOM.
			Screen 2 shows the user interface after these changes.
	Planning Session Properties General O Time Q Location		
	Time - Vehicles	When: 4000 min	
	1 min RTW x 2, MTW x 0, GW-San x 0, LF x 1, NEF x 0, KOM x 0, KTW x 0		
nto	2 min NEF X 1, MIW X 0, GW-San X 0, LF X 1, KOM X 0, RIW X 2, KIW X 0 20 min KTW X 1, NEF X 0, MTW X 1, GW-San X 0, KOM X 0, LF X 0, RTW X 1	Vehicle: KOM * +	
	35 min KTW x 0, LF x 3, GW-San x 2, KOM x 1, RTW x 0, NEF x 0, MTW x 2	country.	
	40 min GW-San x 0, KOM x 2, NEF x 0, MTW x 0, RTW x 0, KTW x 0, LF x 0	🕫 GW-San x 0 💿	
	10 25 50 100	₩ KOM x 2 ⊙	
		₩ NEF x 0 📀	
		₩ MTW x 0 📀	
		🕫 RTW x 0 💿	
r		₩ KTW x 0 📀	
		🕫 LF x 0 💿	
ind			
	Start Planning Session		
ore			

3. Adjust mission task priorities

								Play	ning Service	Properties					
		Prioritize T	asks					Plat	ining session	Properties					
	Danger-Zone-1	10 RTW						-	General	O Time ♀ Location ◄ Vehicle Request	sts & Tactics				
0	Pre-Triage		DTW OIN	KTW			\prec					Prioritize T	asks		
0	rie inage		NIN ON	NIW .			\prec			Danger-Zone-1	10 RTW				
0	Triage	1. NEF							0			- 197			
0	Advanced-Medical-Post-2 - Command	10 LF							۲	Pre-Inage	10	민민	RIW	UQ K	IW
0	Advanced Medical Dect 2 T1			KTIM 0181	CWEan	INI MITINI	\prec		0	Triage	10 NEF				
0	Advanced-wedical-Post-2 - 11	IN NEP		0	Gwsan	NILLAN	_		0	Evacuation (T1)	20 RTW	00	KTW		
0	Advanced-Medical-Post-2 - T2	1월 NEF 1월	RTW 0	KTW 0	GWSan	MTW			0						
0	Advanced-Medical-Post-2 - T3	10 NEF 10	RTW 0	KTW 0	GWSan	MTW			۲	Advanced-Medical-Post-2 - Command	10 04				
0	halded Queened						\prec		0	Advanced-Medical-Post-2 - T1	1 NEF	1	RTW	010 K	TW
0	Incident Command	10 LP					_		0	Advanced-Medical-Post-2 - T2	10 NEF	10	RTW	0 ф К	TW
0	Evacuation (T1)	20 RTW 00	KTW						0				0704		
0	Evenueties (70)				KOM				٢	Advanced-Medical-Post-2 - 13	19 NEP	19	RIW	US K	IW

Screen 1 and 2 Screen 1 shows an initial tactical tasks configuration that first foresees a situation analysis (Danger Zone), followed by Pretraieg and Triage. Further the four tasks of the Advanced Medical Post (PA) are listed as well as the incident command and the evacuation of red, yellow and green patients.

E.g. Bus accident in Berlin with 25 injured

Bus accident with 25 passengers at 18:25 in Berlin on the 10.04.2015 Bus leaved the road with a speed of 70 km, tilted to the right and crashed into

4. Test task resource assignments

General	© Time ♀ Location ◄ Vehicle Reque	Tactics	
		Prioritize Tasks	
	Danger-Zone-1	10 RTW	
© ©	Pre-Triage		
© ©	Triage	10 NEF	
© ©	Staging-4 - Command	10 LF	
© ©	Advanced-Medical-Post-2 - Command	10 LF	
0 0	Advanced-Medical-Post-2 - T2		WSan 0 MTW
0	Advanced-Medical-Post-2 - T1		WSan 0 MTW

Screen 1

The Tactics tab shows a configuration with high prioritizes tasks of the leading of a Staging Area as well as the Command and Casic Care within an Advanced Medical Post (PA) (positions 4 to 8 in the priority list). The evacuation of red patients (T1) has further been set to a priority as the evacuation of other patients (last).

Action: In order to elaborate mission tactics for resource assignment to these tasks, a user is now capable of assigning reasonable vehicles to these tasks. Some vehicles per task type are preset. Some more vehicles of each type can be assigned.



a tree

- Bus is in the front area strongly deformed and wedged in trees
- Suburban area, weather resistant at 6 degrees, light rain and calm

0		
0	Treatment-3 - T1	10 NEF 10 RTW 10 KTW 10 GWSan 10 MTW
© ©	Treatment-3 - T2	1 NEF 1 RTW 1 GWSan 1 MTW
© ©	Treatment-3 - T3	10 NEF 10 RTW 10 KTW 10 GWSan 10 MTW
© ©	Incident Command	1\$ LF
©	Evacuation (T2)	0€ RTW 1€ KTW 1€ MTW 0€ KOM
	Evacuation (all)	all

V OF KTW OF GWSan OF MTW	Important to know is that the user only should assign those
v	resources he or she ordered previously on the resource request
v	Tab.
V 1. KTW 1. GWSan 1. MTW	
V 10 KTW 10 GWSan 10 MTW	
V 10 KTW 10 GWSan 10 MTW	
V 10 MTW 00 KOM	
sion	

5. Compare several simulation runs using multi criteria analysis



Screen 1 and 2

Action: For comparing several previously done simulation runs testing some mission tactics in a small mass casualty scenario of 25 injured, the user first defines a criteria function for scenarios around 25 injured (Screen 1, on the left) on the Decision-Support and Analysis Tab of the Resource Planning Application. Output: The Criteria function widget allows to define a level of satisfaction for both "0% satisfaction" and "100% satisfaction" for each indicator and visualizes the definition. Action: Second the user defines several decision functions that formulate decision strategies using the decision strategy widget. Output: For each indicator the decision function widget shows the weight it is taken into account using the decision strategy.



6. Technical Implementation



Figure 1: Implementation Architecture

The Resource Allocation Tactic (RAT) model replicates the decision making process of crisis managers in resource management planning applications. It allows us to test the planning different mission with scenarios tactics, e.g. "prioritize transport to hospital" or "prioritize treatment on the field". It realizes a second layer above the Ambulance Model in order being capable of running simulations with predefined strategy settings.



Figure 2: Use cases of the **Resource Planning Application**

Run model 2129		
Situation Tasks Advanced	Мексале	Status
Vehicle-Request-01	Released 3 vehicle(s).	done
Vehicle-Request-02	Released 4 vehicle(s).	done
Vehicle-Request-03	Released 3 vehicle(s).	done
Vehicle-Request-04	Tasked 2 vehicle(s).	active
Vehicle-Request-05	No vehicle available.	done
Situation Analysis	Released 1 vehicle(s).	done
Incident Command	Command with 1 vehicle(s).	done
Lead AMP	Lead with 1 vehicle(s).	done
Rescue to AMP	Released 5 vehicle(s).	done
Pre-Triage	Released 1 vehicle(s).	done
Triage	Tasked 1 vehicle(s).	active
Treatment T1	Tasked 2 vehicle(s).	active
Treatment T2	Tasked 2 vehicle(s).	active
Treatment T3	Tasked 1 vehicle(s).	active
Evacuation T1	Released 2 vehicle(s)	done

Pretriage - Treatment - Evacua	ation		98.23 %		cir
2 Pretriage - Treatment + Evacu	uation T1 - Setup BHP		92.09 %		5
3 Pretriage - Setup BHP - Treatr	ment		86.29 %		9
Indicator table			Change Mode +		ι
Indicators	Pretriage - Treatment + Evacuation T1 - Setup BHP	Pretriage - Treatment - Evacuation	Pretriage - Setup BHP - Treatment	 Criteria radar chart comparison 	
Mission accomplishment				Reference Worldstate	
Fime until last patient arrives at hospital	180 min	114 min	126 min	Pretriage - Setup BHP - Treatment Pretriage - Treatment + Evacuation	Pretriage
Time until last red patient arrives at hospital	52 min	47 min	75 min	Pretriage - Treatment - Evacuation	Evacuati
Ratio of responder per patient	3	3	3		ntil last patient
Time until red patients are away from incident scene	40 min	37 min	68 min		Number of In
Time until last red patient is either treated or evacuated	35 min	32 min	63 min		umber of used.
Time until loading area set	42 min	26 min	42 min		me until sed
Time until Pretriage is done	16 min	16 min	16 min		e until are example
					a unel last red ba

Dr Anna-Mari Heikkilä, Project Coordinator

VTT Technical Research Centre of Finland

Tel: +358 20 722 3490, Email: crisma.coordinator@vtt.fi

Contact

un without treatment area (see 1.) got a score of 98 others that use treatment areas only got a 92% and s shown in Screen 4 (below)also radar charts can be alize the criteria-fulfilment of indicators.



The Resource planning application is conceptually based on the CRISMA Reference Application for Resource Management Training. However, the interactive view enabling the user to manipulate during a training session the model behavior is replaced by the RAT Model which undertakes the active part "during incident" from the user in the training case (see Figure 1).

Figure 3: RAT Model widget

CRISMA is funded by the European Community's 7th Framework Programme under the grant agreement no 284552 www.crismaproject.eu

