COMPETENCE RETENTION IN HELICOPTER UNDERWATER EGRESS TRAINING (HUET

Dr. Esther Oprins - TNO

TNO innovation for life

TRAINING FOR UNEXPECTED EVENTS (EMERGENCIES)

'Zero-exposure' *(no practice)*

Safety critical

Training effectiveness
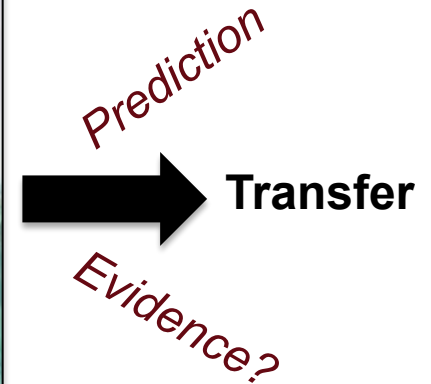- Retention
- Transfer

RETENTION IN EMERGENCY TRAINING

Initial training

Refresher training

Competence level

'skill decay'

Basic competence level

Initial level
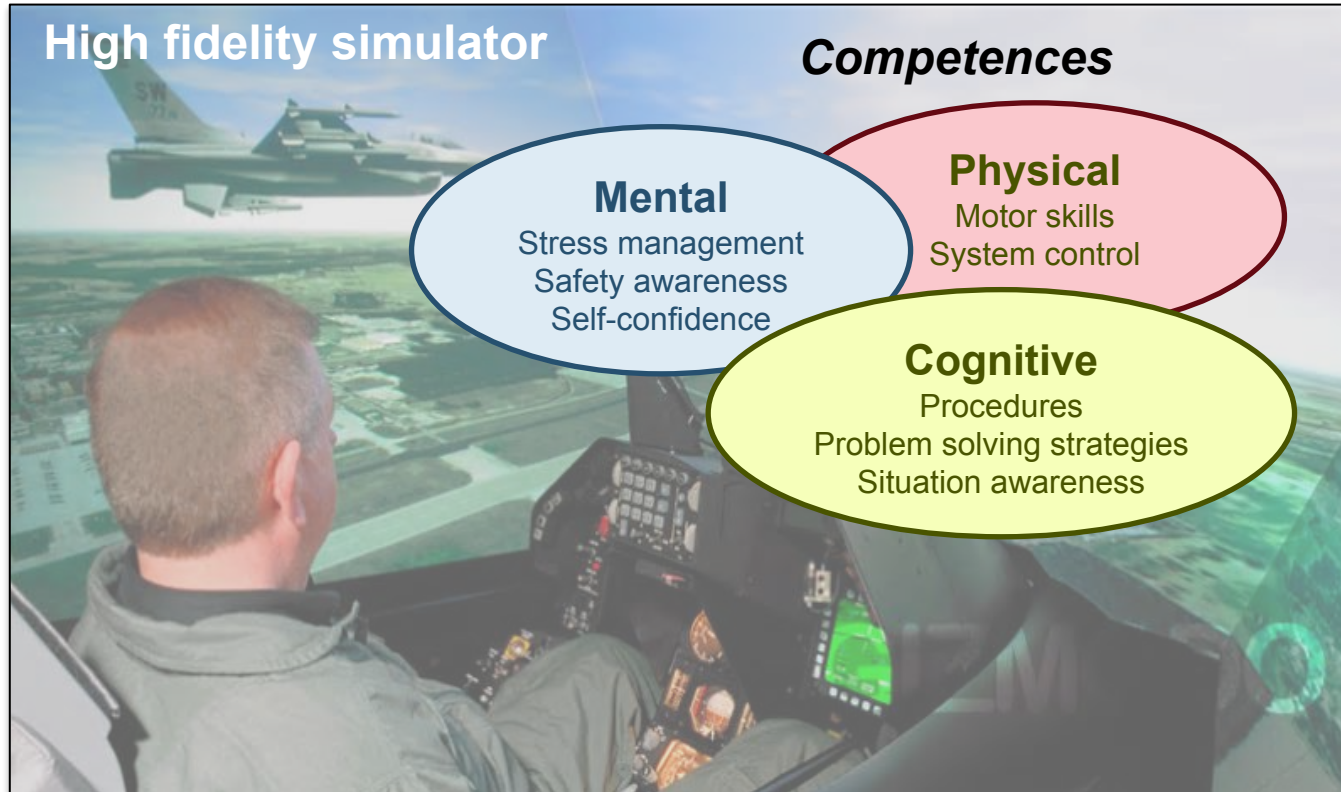
Time
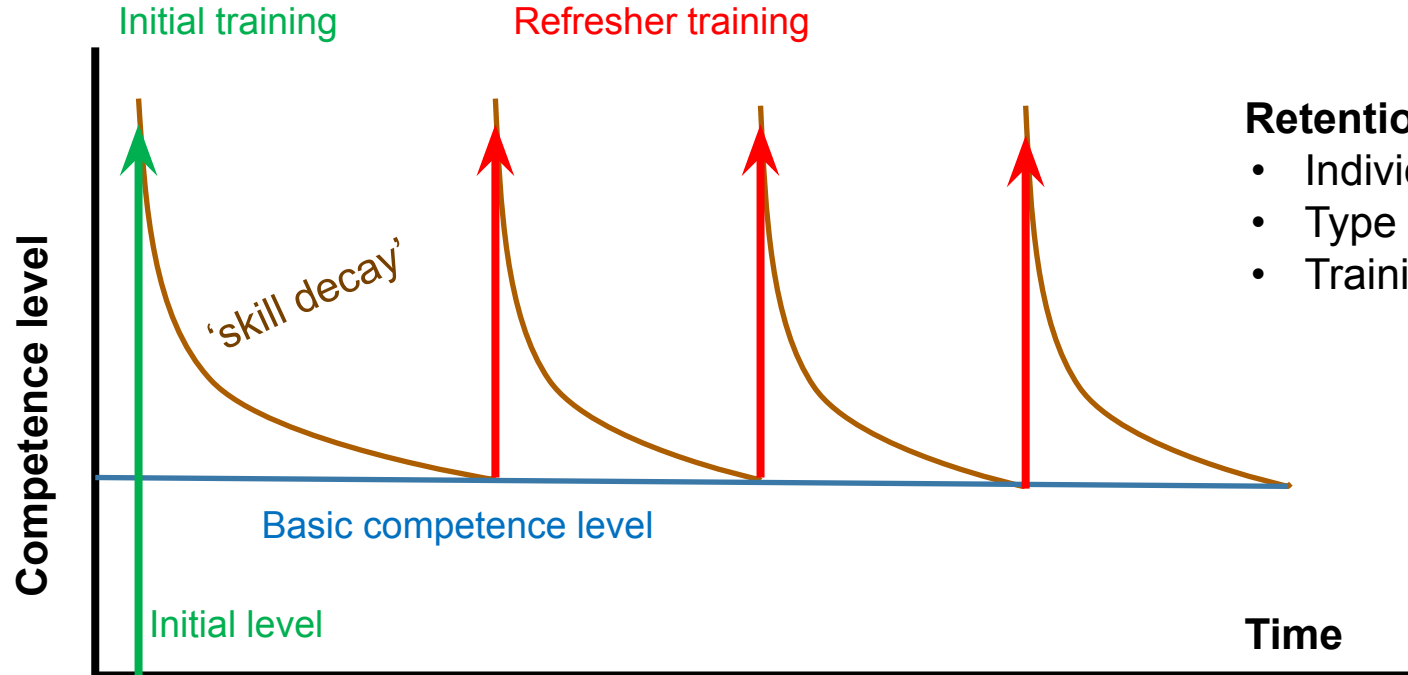
Retention
- Individual differences
- Type of tasks
- Training quality

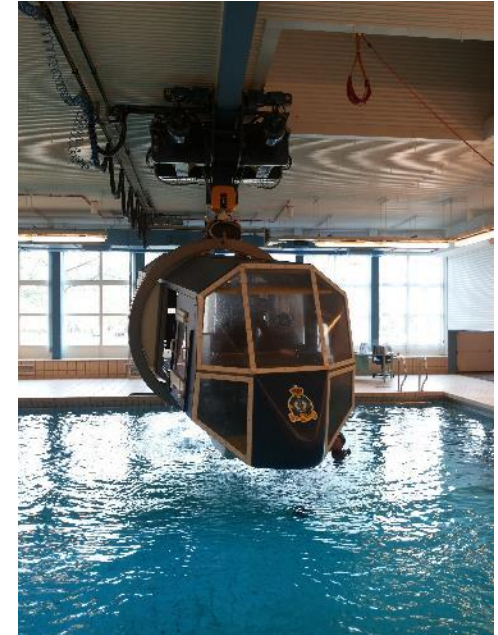# EMERGENCY TRAINING: LEARNING BY EXPERIENCE

HELICOPTER UNDERWATER EGRESS TRAINING (HUET)

- Emergency Breathing System (EBS)

- Shallow Water Egress Training (SWET)

- Modular Egress Training Simulator (METS)

TRAINING PROGRAM HUET (SERE SCHOOL)

Initial

Refresher

| Theory	ISEC	RSEC
Introduction	6,25 hours	4 hours
Safety equipment		
Emergency procedures		
Water survival		
Diving physiology / SEA		
DD Aerazur + R-10 / hoisting		-
Signal equipment		-
Practical training (basin)	**ISEC**	**RSEC**
DD Aerazur + R-10 / hoisting	5 hours	Similar to ISEC
Signal equipment		-
Familiarization SEA/ SWET		-
Egress METS / SEA		Same runs as ISEC

6 ditches

STUDY 1: RETROSPECTIVE QUESTIONNAIRE

Self-Assessed Preferred Retraining Intervals of Helicopter Underwater Egress Training (HUET)

Charelle Bottenheft; Esther A. P. B. Oprins; Mark M. J. Houben; Ted Meeuwsen; Pierre J. L. Valk

BACKGROUND: Royal Netherlands Air Force (RNLAF) helicopter aircrew get Helicopter Underwater Egress Training (HUET) using a Modular Egress Training Simulator (METS™) in order to be prepared for escaping the aircraft when ditching into water. In the current situation the retraining intervals are only chosen on an arbitrary basis for different backgrounds of the crew (maritime and regular flight crew). The frequency of refresher training depends on the expected degree of retention, but evidence-based research on required intervals between refresher courses is scarce. Ideally, training should be based on the amount of retention of acquired competences.

METHODS: Retrospective questionnaires were filled in by 132 helicopter aircrew who followed the HUET course(s) at the Survival Evasion Resistance and Escape (SERE) school in Gilze-Rijen (Netherlands). They assessed themselves on competences and gave their opinion on the preferred interval.

RESULTS: Maritime crew report increasing competence levels with the number of refresher courses followed. According to the opinion of all aircrew, retraining intervals may take longer from 18 (first refresher) to 30 mo (fourth refresher). Maritime and regular flight crew differ in preferred retraining intervals (up to 22 mo and up to 33 mo, respectively).

DISCUSSION: This study provides indications to reconsider the retraining interval and to differentiate between maritime and regular flight crew based on aircrew's opinions and self-assessments. As competence levels still increase with the number of courses followed, it is recommended to reconsider the current fixed intervals of once a year or once every 3 yr for maritime and regular flight crew, respectively.

KEYWORDS: helicopter underwater egress training, retention, competence, safety, refresher training.

RESULTS: PREFERRED TIME INTERVAL OF COURSES
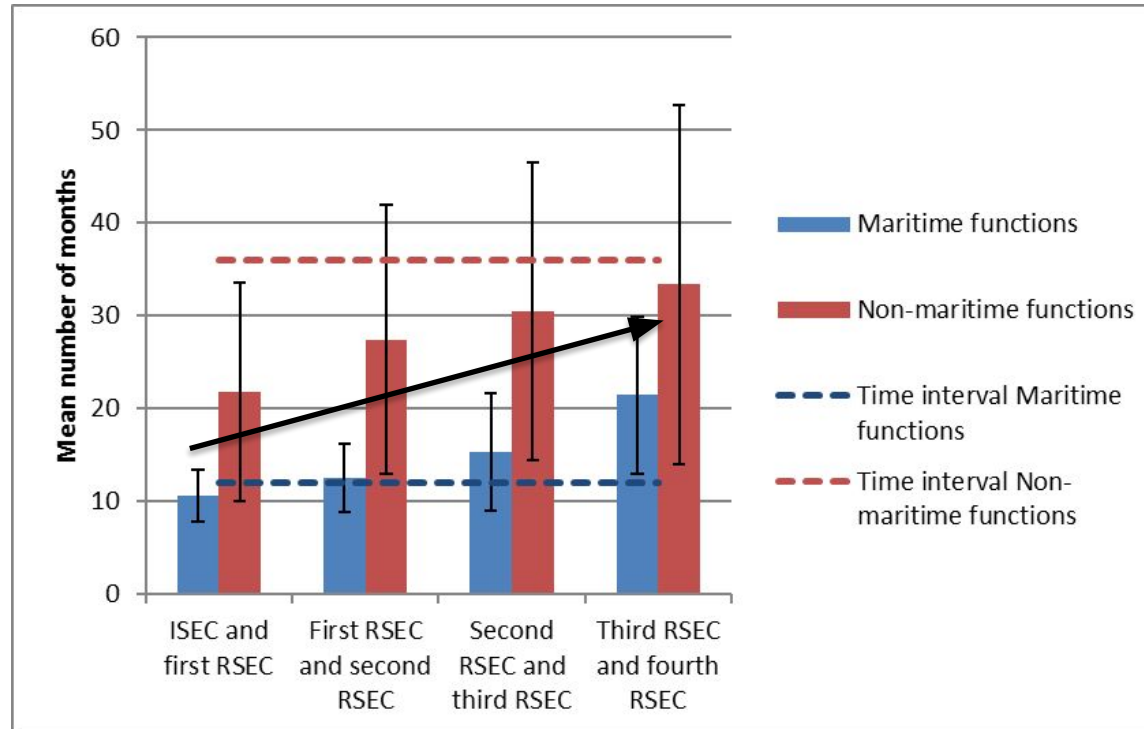
STUDY 2: LONGITUDINAL DATA COLLECTION

Self-assessed competences **before**

& general information
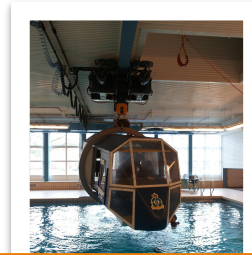
HUET course

Self-assessed competences **after**

& course evaluation

Instructor's ratings
(Physiological measures)

Training effectiveness / personalization

RESEARCH QUESTIONS

- How important is self-confidence for performance in HUET?
- How similar are the instructor's ratings to the trainees' own view on their competence (cf. self-efficacy)?
- What is the relationship between the number of refreshers followed and the level of competence?

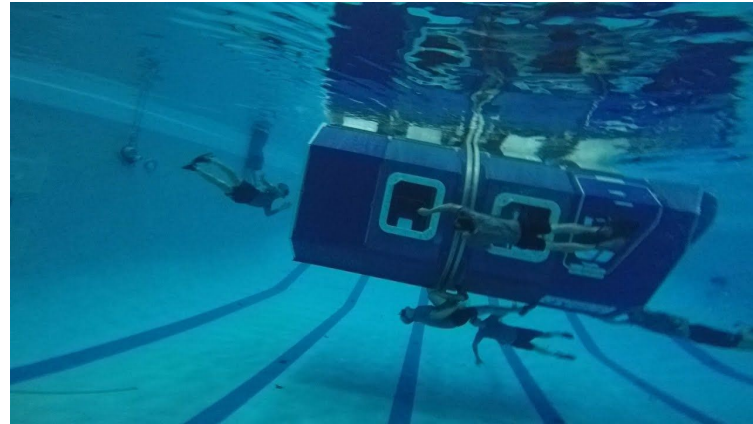# PARTICIPANTS (JAN 2016 – JAN 2019; *TO BE CONTINUED*)

Pilots

	Frequency	Percent
Pilot Transport/Attack	106	28.6
Pilot Maritime	35	9.5
Tactical coordinator	15	4.1
Loadmaster	47	12.7
Helicopter Sensor Operator	23	6.2
Flight Test Engineer	4	1.1
Aerial Gunner	21	5.7
Rescue operator	10	2.7
Rescue Swimmer	2	0.5
Aeromedical Physician	1	0.3
Flight Mechanic	16	4.3
Aeromedical Nurse	15	4.1
Aeromedical Physician	12	3.2
Sniper/observer	10	2.7
SAR Physician	31	8.4
Overig	22	5.9
Total	370	100.0

	Diving experience	Claustrophobia	Fear of water	Motion sickness	Stress experience
No	185	360	361	350	321
Yes	183	4	5	14	43

	Frequency	Percent
Male	326	88.1
Female	38	10.3

Helicopter Underwater Egress Training (HUET)

ASSESSMENT FORM

Eindoordeel:	☐	O	gezakt of herkansing
	☐	S -	minder dan standaard
	☐	S	standaard
	☐	S +	beter dan standaard

Simple Histogram Count of Eindoordeel

Failed — Low — Passed — Average — High
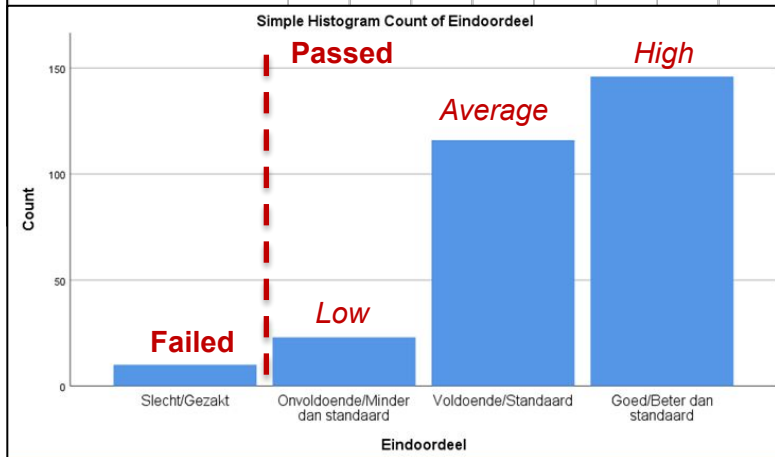
	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	HH	HH2	HH3
Voorbereiding									
Brace positie	4	1	1			1			
Wacht op stabiliteit	3	2						1	
Gebruik S.E.A.									
Vinden 2e trap	1	1	1	1					
Plaatsen 2e trap	1	4	2		3	1			
Purgen	4	13	3	1	1		3		
Ademhalingspatroon	26	22	7	5	3	1	1	1	
Rust/beheersing	22	25	7	5	5	1	6	1	
Vluchtweg vrijmaken									
Oriëntatie	22	18	10	16	8	6	1	2	
Referentiepunt	32	17	5	15	6	5	4	1	
Belts openen	9	9	5	5	2	1	1		
Controle belts	8	4	3	6	3		3		
Verplaatsen	7	5	3	13	6	1			
Exit openen	6	23	9	13	7	4			
Rust/beheersing	11	8	5	7	2				
Exit maken									
Referentiepunt	29	20	6	11	8	6	3		1
Uitzwemmen	10	3	5	1	2	1	1		1
Uitblazen bij opkomen	20	8	4	3	4				
360° aan oppervlakte	14	11	7	10	3	2	1		
Dinghy meenemen	0			1		3			
Rust/beheersing	9	5	1	4	2		3		
Algemeen									
Probleemopl. vermogen	4	2	1		1	2	1	1	
Alg. rust/beheersing/stress	11	9	4	4	5			1	
Extra elementen									
C/W seat	3	37	1	29	23	7	1		
Verduisterd	0	0	143	7	2		3		
Verwonding	0	0	0	21	36		1		
Seatbelts/safetybelt			1	3	7				
X-run	1	2	1	23	24	4			

MEASURES

- **Instructor's ratings**
  - Overall rating (1 item; 4-points scale)
  - Number of check marks: insufficient (per item, per run)

- **Self-assessment**: 4 categories, based on PCA (5-points scale):
  - Knowledge *("I know the steps of the procedure to survive on water," 7 items, Cronbach's alpha = .84)*
  - Skills *("I clear the exit in a flexible manner," 12 items, Cronbach's alpha = .92)*
  - Using air *("I remain calm when breathing with the EBS," 9 items, Cronbach's alpha = .89)*
  - Attitude *("I am aware of the dangers when the helicopter hits the water," 2 items, Cronbach's alpha = .78)*

- **Self-confidence** (10 points scale)
  - Confidence before *("Confidence in the water and under water", 3 items, Cronbach's alpha = .86)*
 - Confidence after *("Confidence in the water and under water", 3 items, Cronbach's alpha = .86)*

RESULTS: CORRELATIONS

	Instructor's ratings		Self-assessment				Self-confidence	
	Overall rating	#Check marks	Knowledge	Skills	Using air	Attitude	Before	After
Instructor's ratings								
Overall rating	1							
#Check marks	-.573[**]	1						
Self-assessment								
Knowledge	.302[**]	-.212[**]	1					
Skills	.411[**]	-.310[**]	.661[**]	1				
Using air	.418[**]	-.305[**]	.610[**]	.824[**]	1			
Attitude	168[**]	-.110[*]	.495[**]	.616[**]	.575[**]	1		
Self-confidence								
Before	.325[**]	-.244[**]	.293[**]	.380[**]	.381[**]	.254	1	
After	440[**]	-.317[**]	.436[**]	.526[**]	.578[**]	.349[**]	.678[**]	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).
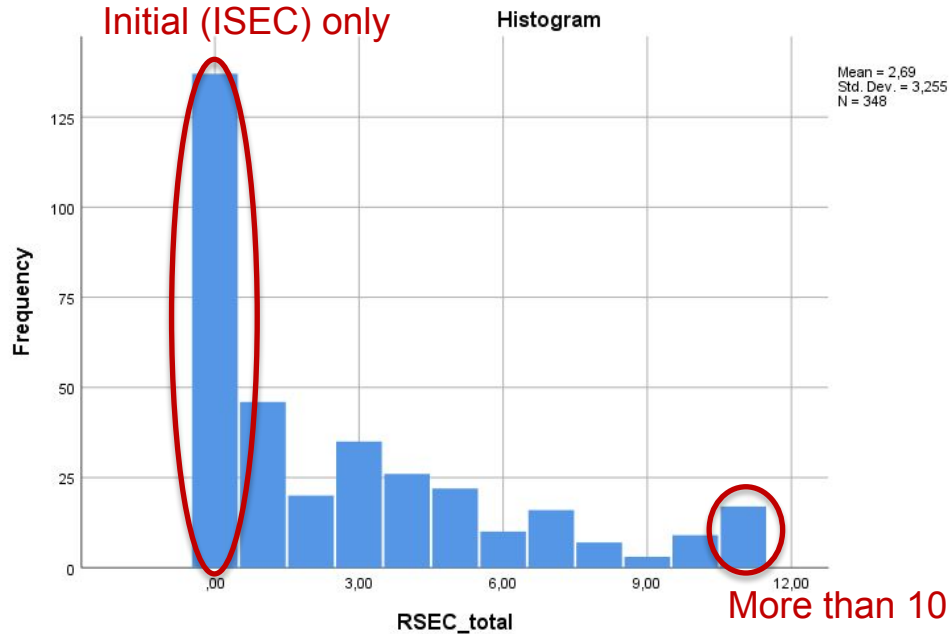
INITIAL (ISEC; N=142) VS. REFRESHER (RSEC; N=227)
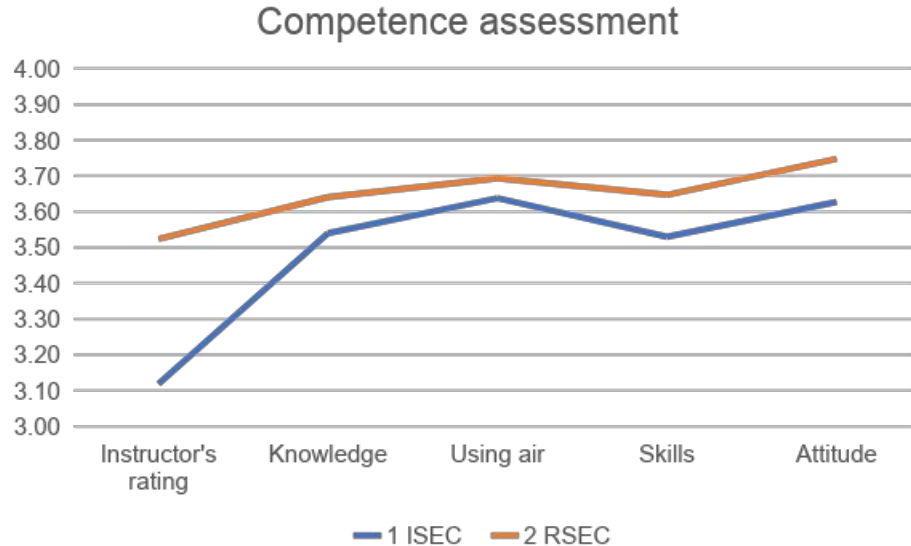
Independent samples T-test:
all means significantly different at p<.05

Independent samples T-test:
only 'before' significantly different at p<.05

Helicopter Underwater Egress Training (HUET)

NUMBER OF COURSES FOLLOWED

Initial (ISEC) only

Histogram

Mean = 2,69
Std. Dev. = 3,255
N = 348

More than 10

	# RSEC (refresher)
Instructor's ratings	
Overall rating	.259**
#Check marks	-.232**
Self-assessment	
Knowledge	.182**
Skills	.227**
Using air	.161**
Attitude	.149**
Self-confidence	
Before	.236**
After	.081

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).
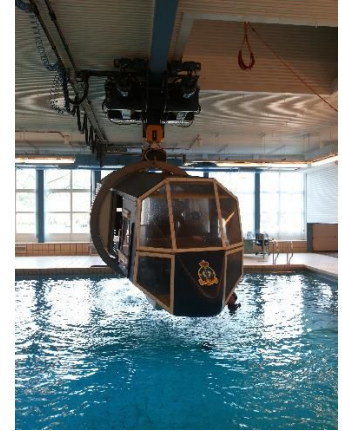
DISCUSSION AND CONCLUSIONS

Main findings

- Self-confidence is quite important for performance in HUET
- Trainees have a good picture on their competence level, rated by instructors
- More refresher training results in a higher competence level

Recommendations for HUET

- Improving the instructors' ratings: more variance, more differentiation between trainees
- Personalized content and frequency of HUET based on individual competence, including stress

Further research

- Using heart rate as physiological, more objective, measure in training also for stress

EXAMPLE PHYSIOLOGICAL MEASURES (PILOT DEC 2017)

Helicopter Underwater Egress Training (HUET)