

# Training for Space Endeavours

Designing Behavioural Training for Individuals and Teams  
Working in High Risk Environments

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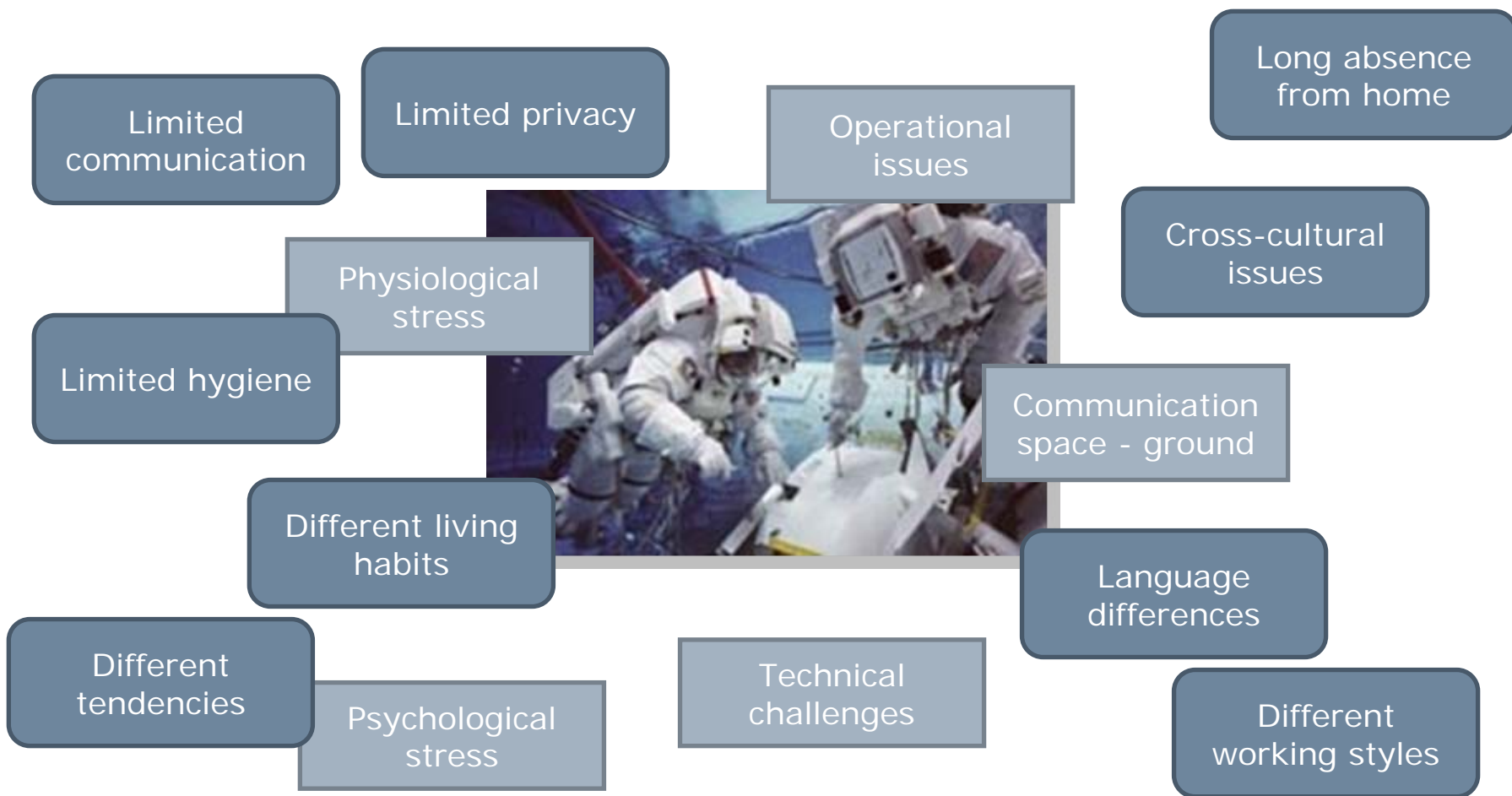


# Outline

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- Why HBP training?
- Prerequisites for training development
- Trainings approach
- Applications
- Lessons Learned
- Challenges

# Why HBP training?



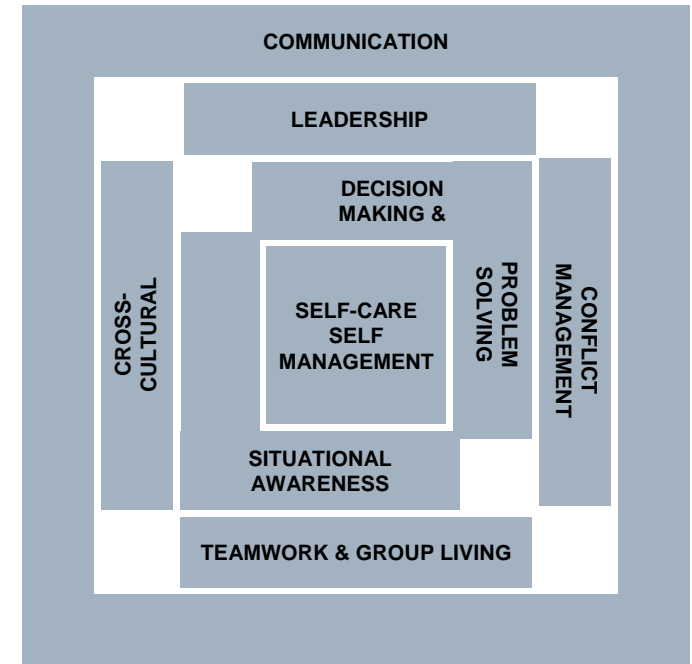
# Possible consequences are...

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- Communication difficulties
- Misunderstandings
- Interpersonal conflicts
- Poor organization and decision making
- Exhaustion
- Irritability
- ...

# Agreements between the IPs

- ❑ ISS HBP Competency Model
- ❑ Formulation of behavioural markers
- ❑ Translation into skills, knowledge and attitudes
- ❑ Common training objectives
- ❑ HBP training flow



# Training approach

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## Training approach: Awareness - Phase

### □ Training goals

The participants...

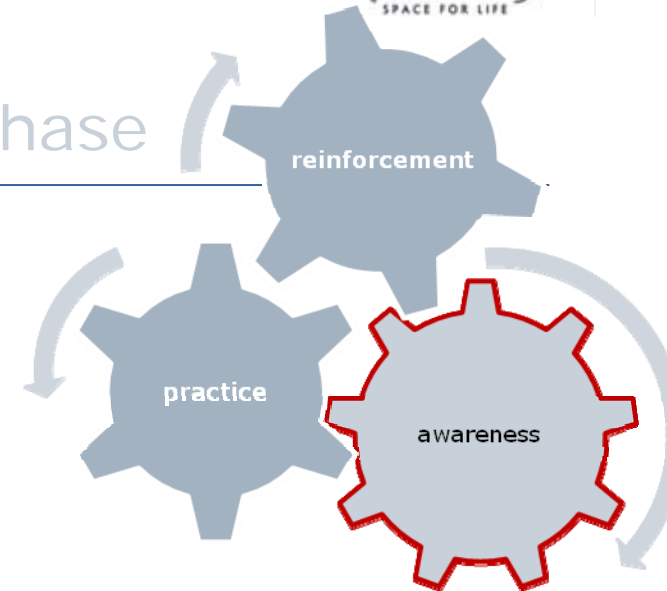
- ... recognize the impact of HBP skills on safety and efficiency
- ... comprehend HBP tools

### □ Rationale

Participants learn basic components and conceptual framework of HBP and realise positive and negative impact of behaviours on overall team performance

### □ Methods

- Lecture
- Group and individual exercises
- Questionnaires
- Case Studies



## Training approach: Practice- Phase

### □ Training goals

The participants...

... participate actively in discussion  
and exercises

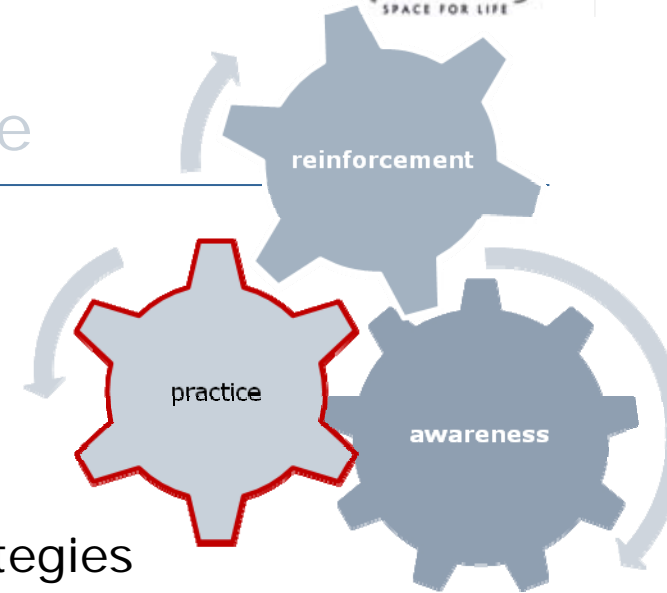
... demonstrate use of HBP tools and strategies

### □ Rationale

Participants familiarize with HBP tools and strategies and  
realise the impact on overall task performance

### □ Methods

- Computer simulation
- Role-plays
- Debriefing and video feedback
- Coaching



## Training approach: Reinforcement-Phase

### □ Training goals

The participants...

... recognize the need to apply HBP tools

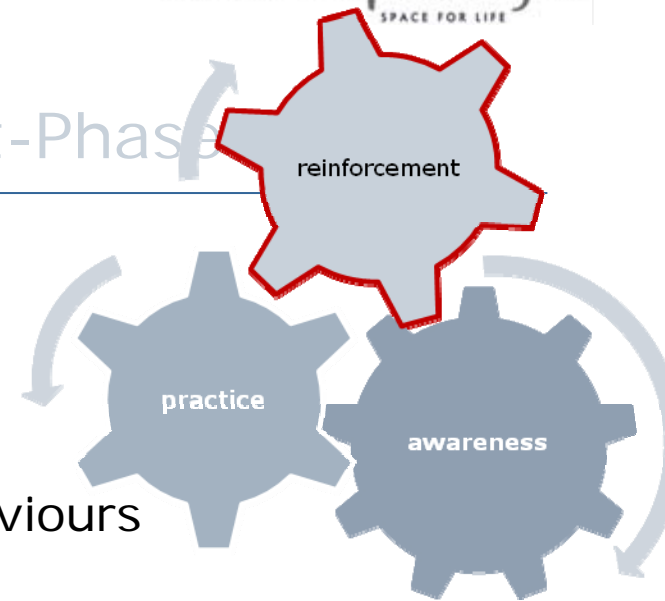
... apply HBP tools and demonstrate behaviours  
in realistic environment

### □ Rationale

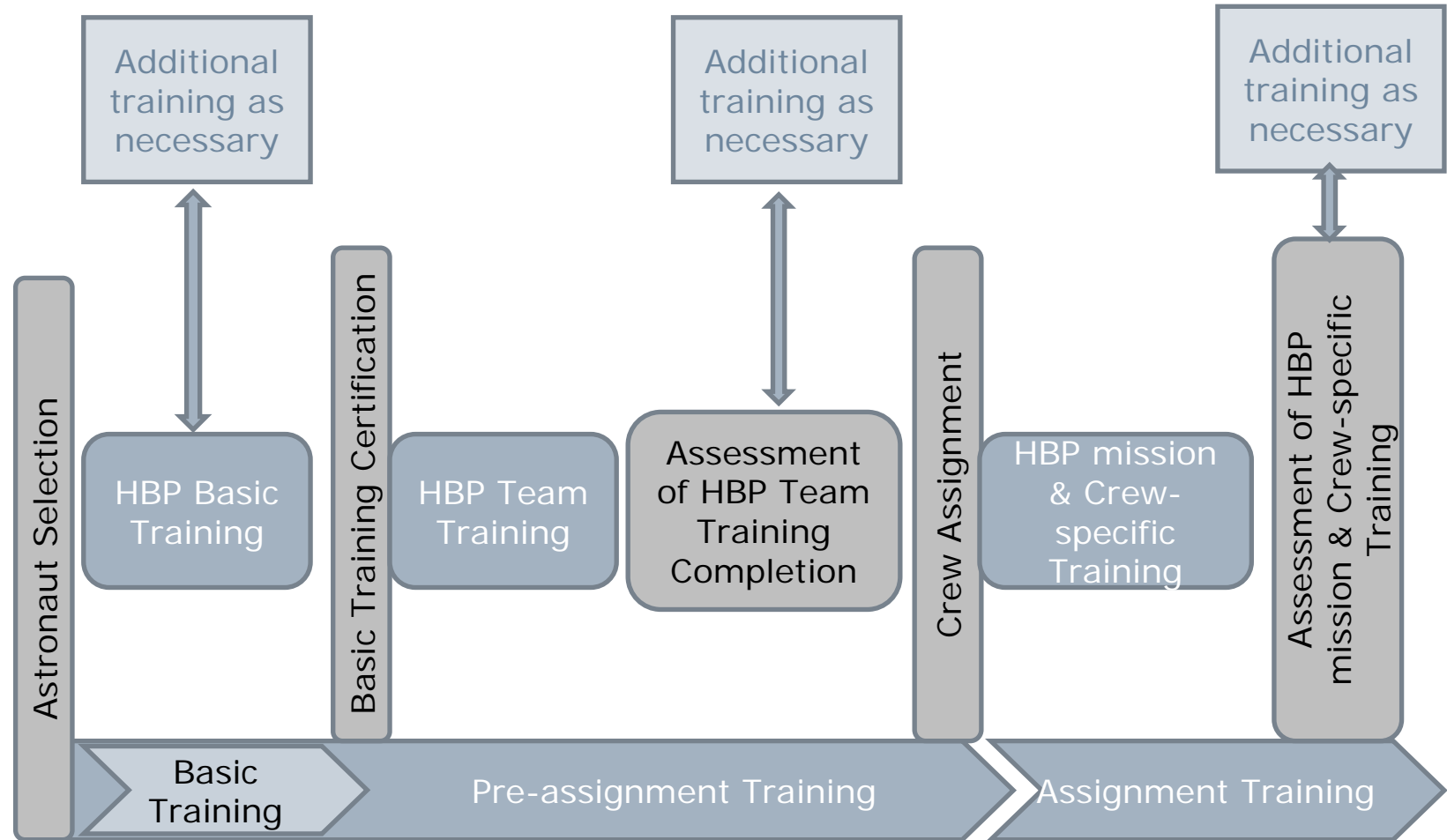
HBP skills become part of the individual behaviours and HBP concepts become part of organization's overall training and operation practices

### □ Methods

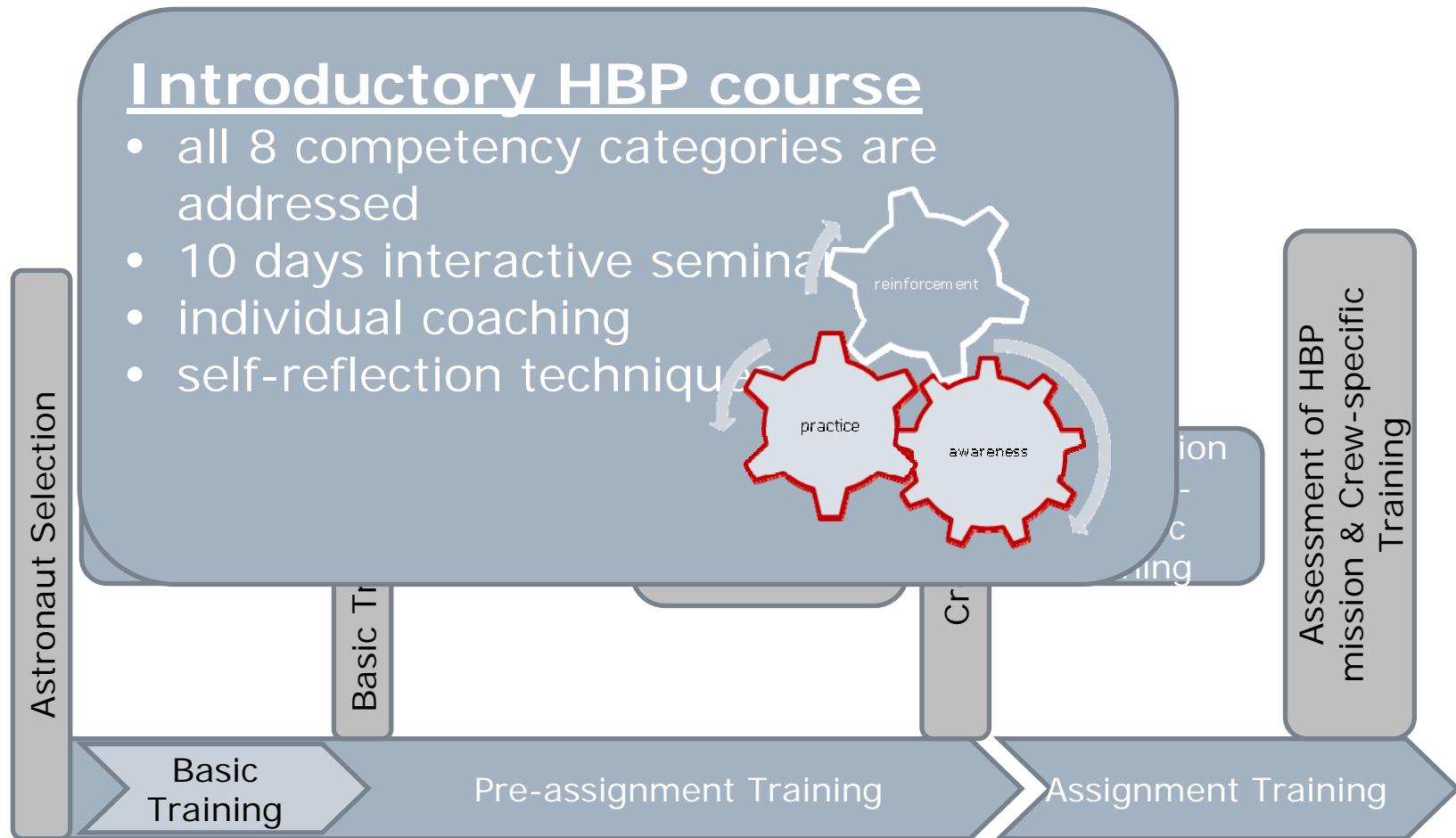
- Outdoor training, environments replicating selected stressors and realistic "spaceflight related" exercises
- Technical training



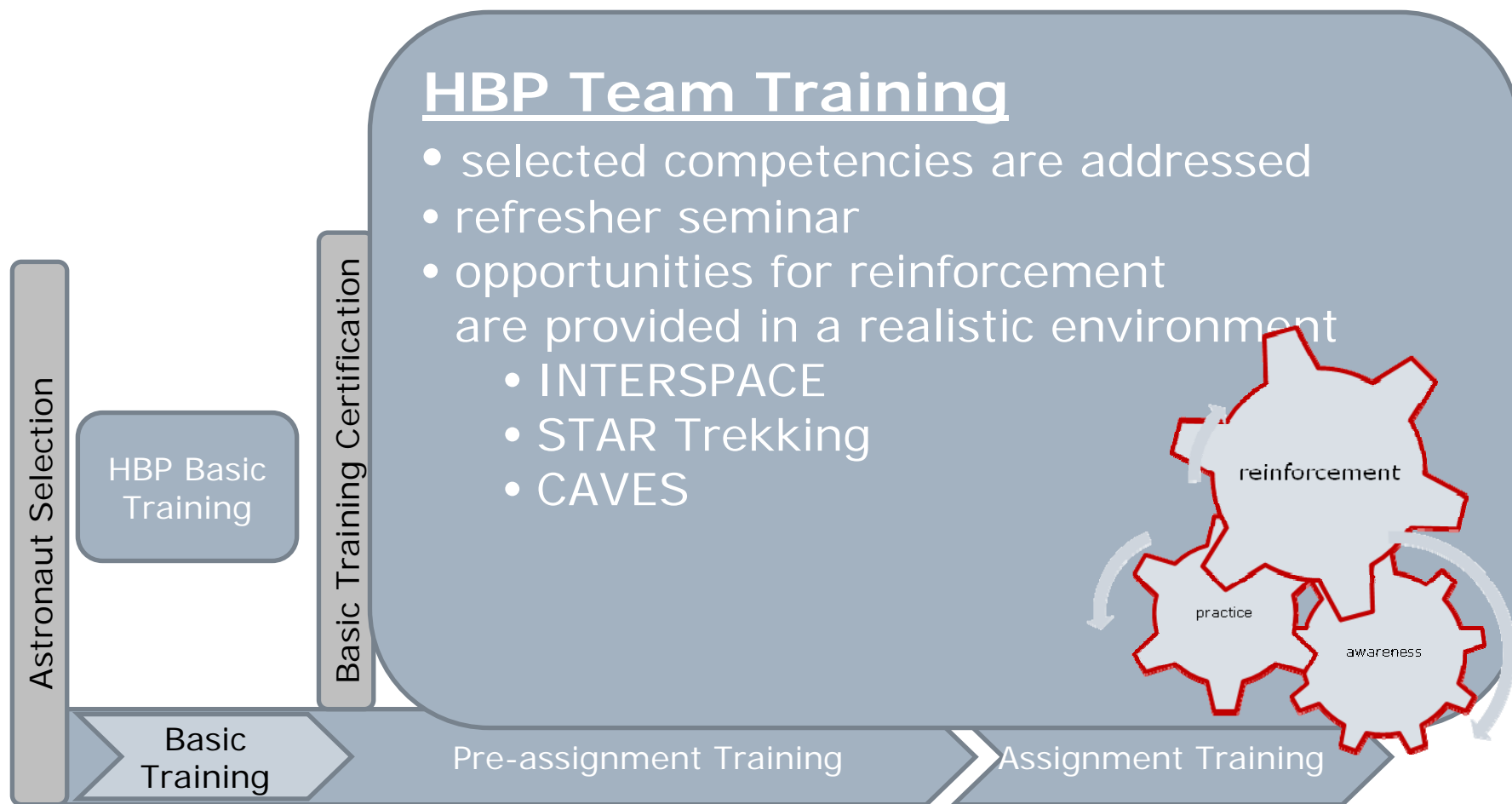
# HBP Training Flow



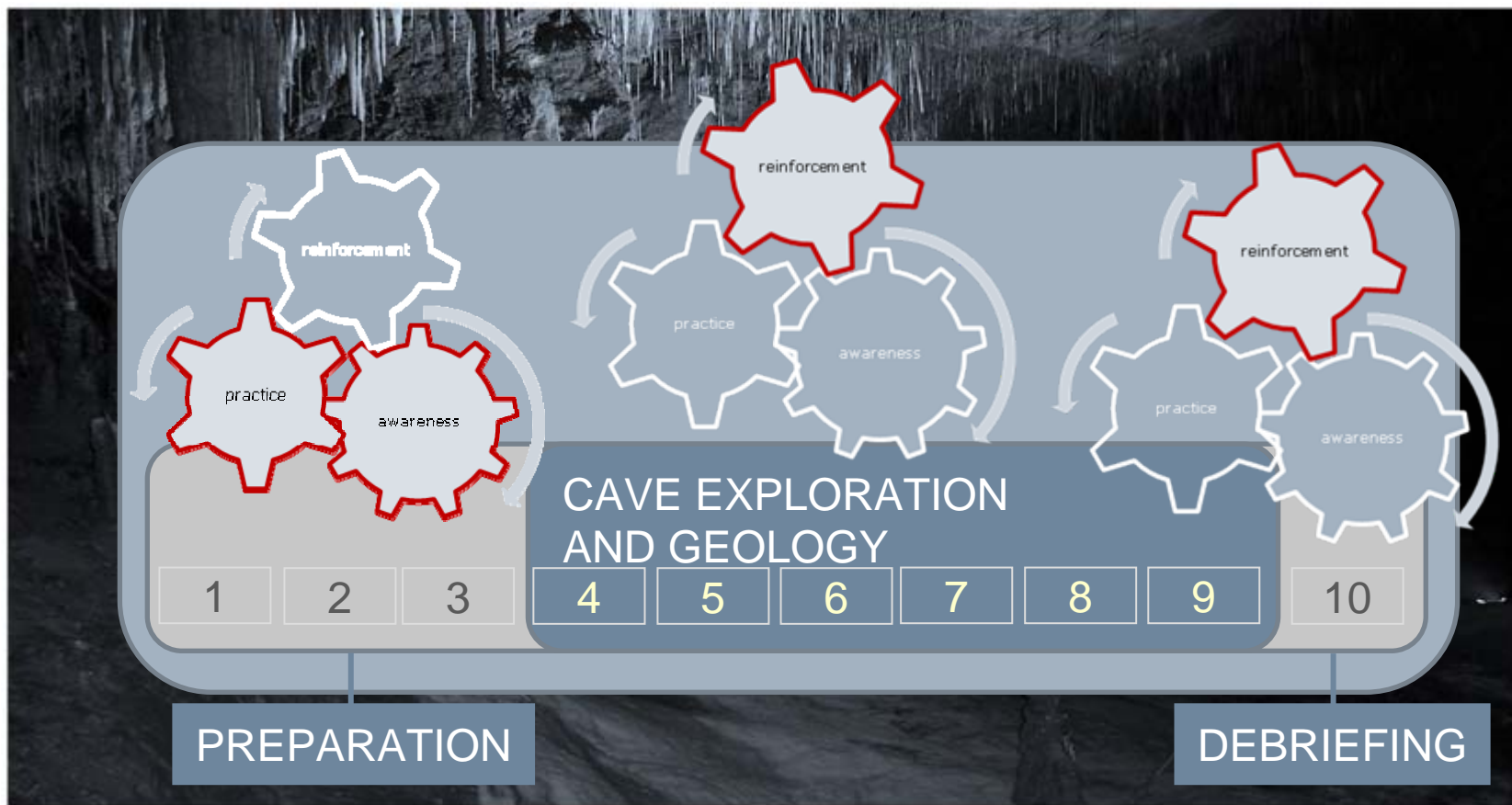
# HBP Training Flow



# HBP Training Flow



# Example of application: CAVES



# Stressors for Long Duration Missions

Physiological/Physical	Psychological	Psychosocial	Human Factors	Habitability
Radiation	Isolation & confinement	High team coordination demands	High & low levels of workload	Limited hygiene
Absence of natural time parameters	Limited possibility for abort/rescue	Interpersonal tension between crew/ground	Limited exchange of info/comms with external environment	Chronic exposure to vibration and noise
Altered circadian rhythms	High-risk conditions & potential for loss of life	Family life disruption	Limited equipment, facilities and supplies	Limited sleep facilities
Decrease in exposure to sunlight	System & mission complexity	Enforced interpersonal contact	Mission danger & risk associated with: equipment failure, malfunction, or damage	Lighting & illumination
Adaptation to micro-gravity	Hostile external environment	Crew factors (i.e., gender, size, personality, etc.)	Adaptation to the artificially engineered environment	Lack of privacy
Sensory/perceptual deprivation of varied natural sources	Alterations in sensory stimuli	Multicultural issues	Food restrictions/ limitations	Isolation from support systems
Sleep disturbance	Disruptions in sleep (readjustment with crew changeovers)	"Host-Guest" phenomenon	Technology-interface challenges	
Space Adaptation Sickness (SAS)	Limited habitability (e.g., limited hygiene)	Social conflict	Use of equipment in microgravity conditions	

# ESA HBP audiences

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# Lessons learned

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- ❑ HBP culture needs to be created
- ❑ Training and assessment need to be separated
- ❑ A comprehensive approach needs to be imbedded into training flow
- ❑ Long duration spaceflight stressors need to be reproduced in training events
- ❑ Exercises need to reflect realistic human spaceflight situations
- ❑ Behaviour needs to be practiced and reinforced frequently
- ❑ Ground personnel need to be trained as well
- ❑ Various methods need to be combined to achieve higher level of information processing
- ❑ Specific competencies (e.g. Self-Care Self-Management, Cross-Cultural, Group Living) need to be addressed carefully

# Challenges

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- Extend awareness, practice and observation training to all technical instructors
- Secure inter-rater reliability
- Extend awareness and practice to full flight control team
- Cross-train different target groups together
- Evaluate HBP training
- Extend scope to exploration missions



# Backup slides

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# Why HBP Training?

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“The most critical problems facing humans in long duration spaceflight, after the biomedical problems, are the psychosocial and psychological problems”

Oleg Atkov, Russian Cosmonaut  
(237 days aboard Salut 7, 1984).

# What could be causes for problems?

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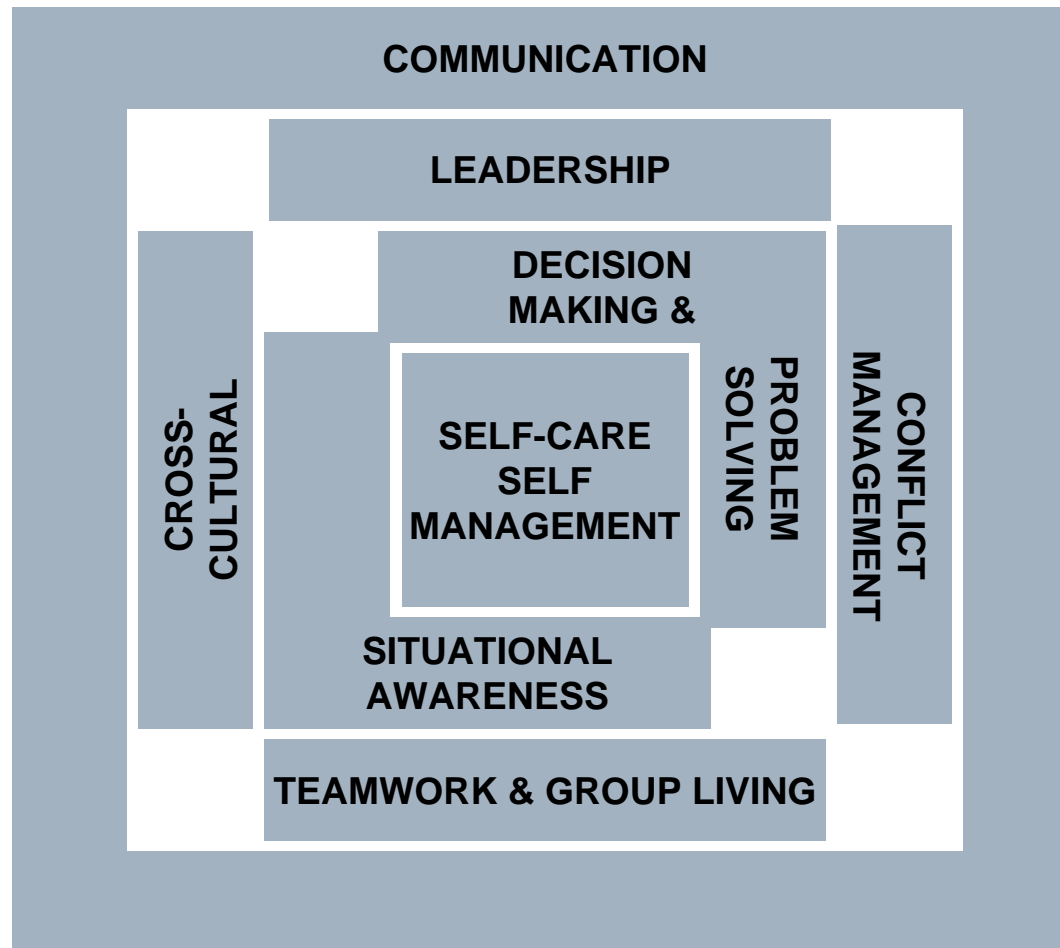
- Crew heterogeneity
  - Personality
  - Gender
  - Cultural and language background
  - Career goals
- Crew cohesion over time
  - Triphasic model
  - Bipasic model
  - Quarter model
- Crew size
  - Smaller vs. larger
  - Odd vs. Even
- Leadership role
  - Task role
  - Support role
- Crew/ground interactions
  - Effective communication
  - Displacement

Kanas (2005)

# Which skills are required?



# The ISS-HBP competency model



# Translation into... Training Objectives

□ e.g. Attitude Enabling Objectives

Learning Level	Performance Statement	Conditions	Standards
Responding	Engages in discussions and exercises/activities	During classroom instruction, training exercise/activities, briefs/debriefs, and facilitator guidance/assistance	Listening actively; participating in exercises and discussions; asking and responding to questions; and attempting to apply some HBP behavioral markers during group tasks
Responding	Supports safety, mission success, crew health and team cohesion		Listening actively; participating in exercises and discussions; asking and responding to questions
Responding	Supports individual/team learning and development		
Responding	Demonstrates empathy and respect		

# Translation into... Behavioural Markers

## COM1: Communicates information clearly and concisely

### Knowledge (Thinking)

- Communication procedures [Apply]
- Protocols [forms, structure] [Comprehend]
- Terminology ex: radio [as related to job and not trained elsewhere] [Comprehend]
- Sources of misunderstanding [Comprehend]
- Barriers to communication [Comprehend]

### Attitudes (Feelings)

- Willingness to take responsibility for communication [Value]
- Willingness to adapt communication to ensure clarity [Value]