EMC13

13th Mars Society European Conference

IPSA Paris – Ivry sur Seine
25-27th of October 2013

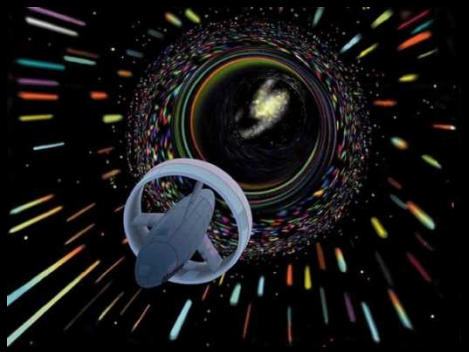
MARS500 SIMULATION PROGRAM

A REALISTIC SIMULATION

FOR PROSPECTIVE MANNED FLIGHTS TO MARS

2 BASIC ISSUES ON A MANNED TRIP TO MARS :

TECHNOLOGICAL ISSUES



HUMAN ISSUES

- ISOLATION
- LONG-TERM CONFINEMENT
- SEVERELY IMPACTING CONFLICTS
- SENSORIAL DEPRIVATION
- MONOTONY
- HYPOKINESIA / HYPODYNAMIA
- LIMITED CREW WITH RESTRICTED INTERACTIONS
- PSYCHOLOGICAL STATE TO SUSTAIN/SUPPORT
- SOCIOLOGICAL BALANCE TO MAINTAIN
- LONG EXPOSURE TO WEIGNTLESSNESS
- LONG EXPOSURE TO COSMIC RADIATIONS
- AUTONOMY, ETC...

ISOLATIONS : A LONG HISTORY...

POLAR COMPOUNDS

Duration, limited crew, autonomy

BUT : Contact with Earth, no real confinement

SUBMARINES

No contact with Earth, autonomy, confinement

BUT : Large crew, no long-term isolation

DEDICATED COMPLEX

Duration, limited crew, autonomy

BUT : Contact with Earth, environment, no real confinement

IN SPACE

Real space flight conditions, limited crew, confinement

BUT : Contact with Earth, crew exchange

MARS 500 : A DEDICATED PROGRAM FOR MANNED FLIGHT

- 2007 : ESA AND IMBP AGREED ON JOINT PROGRAM

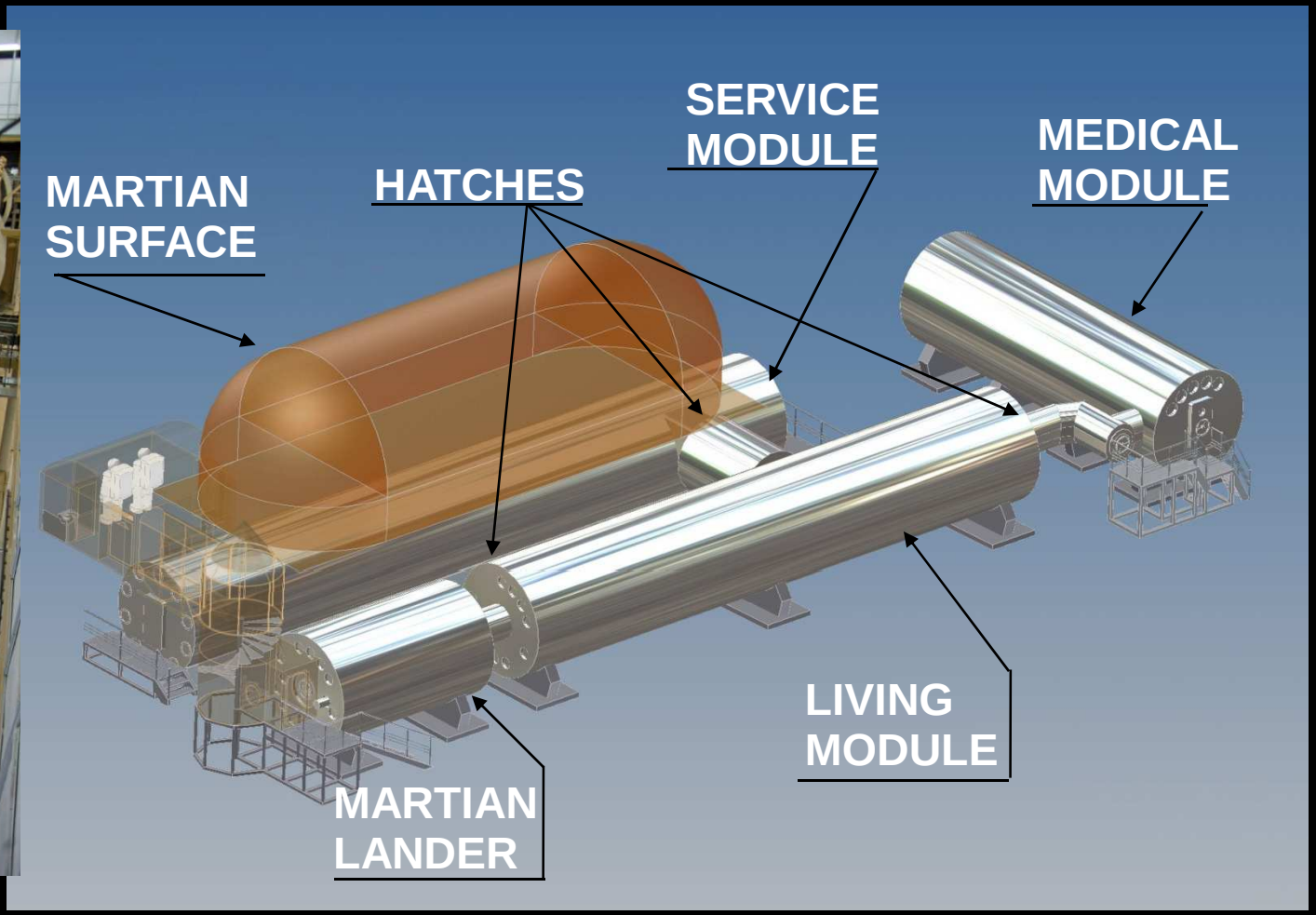
- PURPOSE : TO STUDY AN INTERNATIONAL CREW
ON A SIMULATED MANNED FLIGHT TO MARS
WITH AS-REALISTIC-AS-POSSIBLE CONDITIONS

- FIELDS OF STUDY :
  - PSYCHOLOGY
  - SOCIOLOGY
  - PSYCHOSOCIOLOGY
  - STRESS
  - IMMUNOLOGY
  - NEUROLOGY
  - PHYSIOLOGY
  - MEDICAL
  - SLEEP PATTERN
  - PSYCHO-VIGILANCE PERFORMANCES, ...

- 2 STEPS : A 105-DAY ISOLATION & A 520-DAY ISOLATION

MARS 500 : PRACTICAL DATA

THE ENVIRONMENT : AUTONOMOUS MODULE IN IMBP, MOSCOW
DEDICATED MISSION-CONTROL



MARS 500 : PRACTICAL DATA

THE CONDITIONS :

- INTERNATIONAL CREW OF 6
- WORKING LANGUAGES : ENGLISH and RUSSIAN

105-DAY CREW :	520-DAY CREW :
(March-July 2009)	(June 2010 – November 2011)

- 24-HOUR DAYS
- DA[illegible]E[illegible]NAL AC[illegible]ES PROGRAM
- COMMUNICATION WITH EARTH AVAILABLE (messages, audio, video, ...)
- 1 CREW MEMBER ON DUTY DAILY FOR 24H (Maintenance, servicing, meals, etc...)

- NO PHYSICAL/VISUAL CONTACT WITH THE OUTSIDE

2 DEVIATIONS FROM A REAL FLIGHT :

- NO WEIGHTLESSNESS
- NO HARMUL RADIATIONS

INSIDE THE MODULE : A COMMON DAY

- WAKE-UP TIME : 08:00, EVERY DAY
- MEDCONTROL + URINE COLLECTION ON 24h
- 08:30 : BREAKFAST
- MORNING SCIENTIFIC PROGRAM
- 13h : LUNCH
- AFTERNOON SCIENTIFIC PROGRAM (INCLUDING PHYSICAL ACTIVITIES) + LEISURE TIME
- 19h : DINER, 22h : MEDCONTROL
- NIGHT TIME : TESTS, MAINTENANCE BY DUTY CREWMEMBER

ISOLATIONS COMPLETED : INITIAL CONCLUSIONS

- BOTH ISOLATIONS CARRIED OUT UNTIL THEIR SCHEDULED ENDS

- NO CONFLICT WITHIN THE CREWS...
  ... BUT TENSIONS BETWEEN CREWS AND MISSION-CONTROL

- ISOLATION FELT DIFFERENTLY DEPENDING ON CREWMEMBER

- HUGE AMOUNT OF DATA COLLECTED

- ALL SCIENTIFIC TEAMS SATISFIED WITH THEIR DATA

ISOLATIONS COMPLETED : SCIENTIFIC RESULTS

DATA ANALYSIS IS STILL IN PROGRESS...

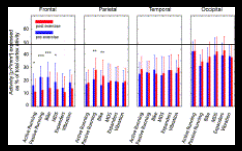
... BUT SOME RESULTS ARE ALREADY STRONGLY EXPECTED

ISOLATIONS COMPLETED : SCIENTIFIC RESULTS

G. SANDAL

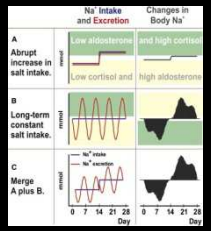
Personal values and crew compatibility

S. SCHNEIDER



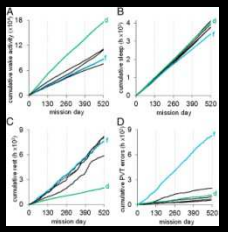
Exercises and cognitive performance

J. TITZE



Infradian Rhythmicity in Human Na^+ Balance

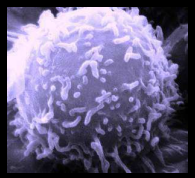
D. DINGES



Sleep alteration and Psycho-vigilance performance

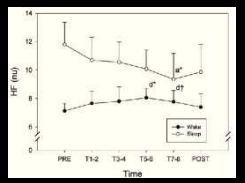
AND MANY MORE...

A. CHOUKER



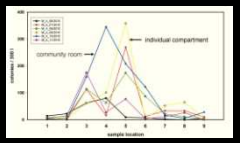
Stress and Immunity

A. AUBERT



Circadian Rhythm of Autonomic Cardiovascular Control

P. RETTBERG



Microbiology and health In sealed environments

FINALLY, A MANNED MISSION TO MARS :

NOT ONLY A TECHNOLOGICAL CHALLENGE...

ABOVE ALL, A HUMAN ADVENTURE AIMING AT FOSTERING

SCIENCE

INTERNATIONAL COOPERATION

HUMAN KNOWLEDGE

AND MANY MORE SIDE FIELDS... !

GRAZIE !

DANKE !

TAK !

THANK YOU !

СПАСИБО !

XIE XIE !

GRACIAS !

MERCI !