Interview with Alain Maillet : Condition in the space station

WHO ARE WE INTERVIEWING? (job, studies…)
Scientific Executive at MEDES-IMPS

RATIONALE (What questions did we ask him? What answers did we want to have?)

1. Regulations and constraints on the consumption of water station:
- What is the water recycling cycle in the plant?
- How does the supply work?
- How will astronauts on long space voyages meet their water needs?

The electrolysis of the water works continuously. It recycles water and water condensation. The volume of fluid that does not re-enter the recycling loop must be reduced as much as possible. We should try as much as possible to make the fluid used by our device re-enter the recycling cycle.
For lunar missions there is no water replenishment possible. You have to bring huge quantities of water.

2. Electrolysis :
- How often is electrolysis performed on the station?
- For what needs?
- Is H2 already used?
At the moment hydrogen is not kept and used.

3. How does air recycling work?
- What is the impact of CO2 consumption on air recycling?
We first have to design the bioreactor to answer this question, and ask ourselves: is it realistic in terms of the CO2 that we can have on board the ISS?

4. Urine Recycling :
- What is its current recovery and the constraints?

5. Energy: electricity
- How to generate it?
- How many must be generated?
- What are the regulations on this

The energy is generated by using solar energy, there is in space an alternation 45min sun / 45min shade, the energy supplied during periods of sunshine is stored in the batteries.
The equipment consumes roughly a hundred watts.
→ Energy consumption is not a problem if it's below that.

6. Space constraint
- Is there a size limit for our reactor?
- Is there a weight limit for our reactor?
- What are the regulations on this?

The equipment must be able to enter the ships, pass through the airlocks of the station. We pay per kilo 30000€/kg . Everything must be optimized to the maximum weight, volume and performance.

7. Constraint on astronaut handling time.
- How much time can he spend on one machine a week?

It all depends on whether the machine in question is vital or not. On the other hand, you have to prove that what you are bringing is not dangerous for the crew in all flight conditions.

8. What is the astronauts' level of knowledge of biology?

Standard risks are related to the presence of organic products, depressurization, etc...
For each experiment, specific risks can be described.
The bio in the station is done in a kind of glove box.
The astronauts are in weightlessness in a primary lab with limited freedom of movement.
They are non-specialists who follow step by step procedures and diagrams, it is then necessary to plan to multiply the handling time by 1.5 or 2.

To do for the next meeting

- Look at the table and then contact them again. Look if an experiment is approaching our project to compare.

- Constraints in the implementation of the bioreactor: time to reach the cruising speed of the reactor continues.

- Components must be doubled if there are failures, system maintenance (time, cost, parts etc)

- Recovery process of what is produced → process to be implemented

→ List the main phases of the system: How it is built (constraints on materials, reactor must it be stérilisé→ sterilizable materials or particular sterilization method)
Design phase to end of use and "littering" of the system → Bioreactor life cycle and associated constraints