



FROM TUBES AND CUBES TO HAUTE CUISINE – THE REFINEMENT OF SPACE FOOD

ASTRONAUT FOOD — THIS TERM STILL CONVEYS A VIVID PICTURE OF DUSTY AND TASTELESS FOOD-BARS, WHICH MIGHT HAVE ALL THE NUTRIENTS AND VITAMINS A MAN NEEDS PER DAY, BUT STILL HAVE MORE IN COMMON WITH CARDBOARD THAN WITH A PROPER DISH. BUT THE DAYS WHEN SPACE FOOD RESEMBLED PAPIER-MÂCHÉ — IN TASTE AS WELL AS IN CONSISTENCY — ARE LONG GONE. NOWADAYS, RENOWNED CHEFS MAKE SPACE FOOD A CULINARY EXPERIENCE AND THE EUROPEAN FOOD INDUSTRY HAS THE OPPORTUNITY TO SUPPLY ASTRONAUTS ON THE INTERNATIONAL SPACE STATION WITH HIGH-QUALITY AND DELICIOUS FOOD PRODUCTS: A GAP IN THE MARKET THAT OPENS UP NEW AND POSSIBLY LUCRATIVE OPPORTUNITIES FOR THE EUROPEAN NUTRITION INDUSTRY.

FOOD IN TUBES AND CUBES

The food of the early space travellers was not exactly a gourmet experience, to say the least. In their very first considerations of how space food should look, the Russians planned to develop tablets providing all the necessary nutrients and vitamins. Luckily for the cosmonauts, this 'superpill' never materialised. The first space-dish of Russian cosmonaut German Titov, the first man to dine in space, in 1961, came in containers largely resembling tooth-paste tubes. The three-course meal consisted of one tube of vegetable puree soup, one tube of liver pâté and one tube of blackcurrant juice.

When American astronaut John Glenn took off in his Mercury spacecraft in 1962, his lunchbox was filled with bite-sized, crummy cubes, freeze-dried foods that had to be re-hydrated in space

to form a pulpy puree, and semi-liquids in tubes that had to be squeezed out into his mouth. Needless to say that neither cosmonauts nor astronauts were too fond of their meal plan. It wasn't long before the astronaut food was improved. The tubes were the first things to go. They were replaced by the 'spoon bowl' and later by different types of food trays, using knife, fork and spoon to eat, to make a meal in space an experience that more closely resembled a normal meal on Earth. With improved packaging came improved quality and variety of meals. As early as the 1980s, space travellers could choose from a stunning number of 200 specially treated and processed food items, and warm meals were also available.

CRUCIAL ISSUES: VARIETY AND FRESHNESS

Today, astronauts and cosmonauts on the International Space Station (ISS) can choose from a vast selection of food before their mission to the ISS starts. However, there are limitations: after eight days, the meal plan is repeated. But still the variety of food is a critical aspect for space travellers during long-duration missions. Astronauts and cosmonauts who stay on the ISS for half a year have little variation in their day-to-day life apart from performing different

experiments, so food is an important element to add flavour to their daily routine. Any extra variation is more than welcome and cherished by the astronauts and cosmonauts. Of course, not all food will make the grade to be flown to the Space Station. All foods going to space have to pass through a regime of tests to make sure they are able to endure the outer space environment without deteriorating. The food the astronauts and cosmonauts on the International Space Station eat at the moment is either dehydrated or canned food provided by the Russians. Fresh food items are a rarity on the Station, as fruit or vegetables stay fresh only for up to two days in space. So the challenge in designing nutrition that is fit for space is to create food that withstands the extreme conditions of the space environment, is highly balanced and efficient in nutritional value and at the same time is fresh and delicious.

This is a unique opportunity for the food and nutrition industry: by developing fresh, nutritious and tasty astronaut food, nutrition firms not only board a unique marketing platform and use the popular and fascinating factor of space for their promotion, they can also use their >>



Space food floating through the International Space Station



Space drink in a tube: Russian cherry-apple juice

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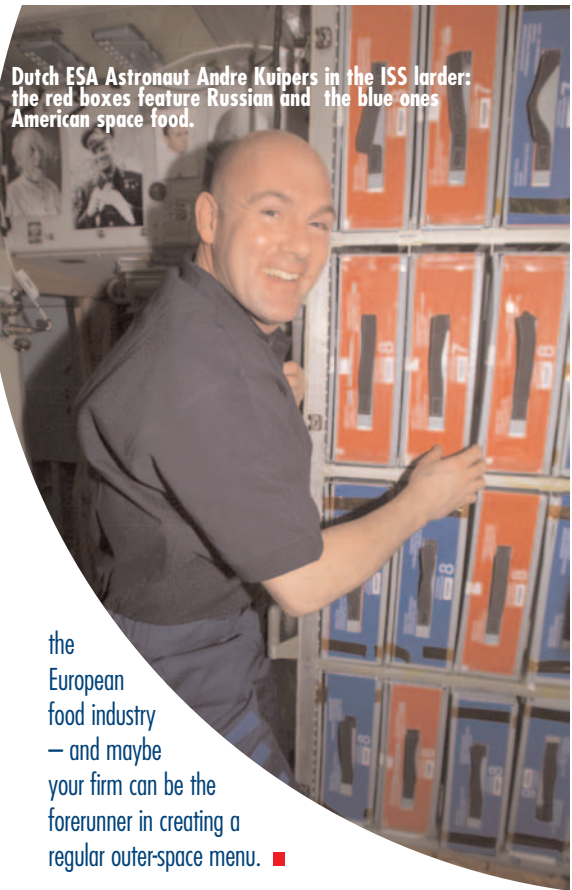
» findings for growing market sectors. Initial exercises have introduced quality foods to the ISS environment, and there is now an opportunity for companies to exploit this situation on a regular and on-going commercial basis.

**SPACE FOOD:
NOT ONLY FOR ASTRONAUTS**

The space environment has detrimental effects on the human body: astronauts who stay in space for a longer period of time lose bone and muscle mass, and their cardiovascular system is strained as the body fluids shift into the upper part of the body. These processes are well known on Earth, too: we call them 'ageing'. There are, however, countermeasures that can work against these effects. The two most important means are physical training and nutrition. The opportunities for the application of space food on Earth are vast. Possible target groups range from the elderly and hospital foods, to functional foods for people who have to deal

with extreme situations like athletes, adventurers or the military.

Food provision for the ISS is a real gap in the market: why not provide a variety of European food commercially to the Space Station? It would not only add diversity to the astronauts' menu, but would also be a great opportunity for the respective food company – not everybody can say that their products are marketed not only globally, but even beyond. After all, astronauts may not form the largest consumer base in the world, but they are certainly premium customers. And they are not the only ones who could be interested in highly nutritious, sustainable, healthy and delicious food. A range of commercially provided national delicacies of European countries for the Space Station would not only benefit the astronauts, but also benefit



Dutch ESA Astronaut Andre Kuipers in the ISS larder: the red boxes feature Russian and the blue ones American space food.

the European food industry – and maybe your firm can be the forerunner in creating a regular outer-space menu. ■

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EFFECTS OF FOOD ON MOOD – SPACE SOLUTIONS FOR EARTHLY PROBLEMS

TNO IS A KNOWLEDGE ORGANISATION FOR COMPANIES, GOVERNMENT BODIES AND PUBLIC ORGANISATIONS PROVIDING SPECIALIST CONSULTANCY, CONTRACT RESEARCH AND GRANT LICENSES FOR PATENTS AND SPECIALIST SOFTWARE. TNO SPECIALISATIONS INCLUDE FOOD AND NUTRITION, TESTING AND CERTIFYING PRODUCTS AND SERVICES, AND INDEPENDENTLY EVALUATING QUALITY. ITS AIM IS THE DEVELOPMENT AND APPLICATION OF INNOVATIVE KNOWLEDGE IN THE FOOD AND NUTRITION SECTOR. WE TALKED WITH DR. JAN PIETER VAN DER LUGT, MARKETING AND SALES DIRECTOR OF FOOD AND NUTRITION AT TNO, ABOUT THE BENEFITS OF NUTRITION RESEARCH IN SPACE.



*A SCEPTIC MIGHT SAY "THE SPACE AND THE FOOD INDUSTRY DON'T GO TOGETHER".
HOW DO YOU RESPOND TO THAT?*

Space and food have a great deal of common ground. Food is a key ingredient for the well-being of humans. The new trend is not curing illnesses, but rather securing health through balanced and healthy food. But high-quality, balanced food can do

much more than securing health: it can enhance the performance of a person. Cognition and concentration for instance can be largely influenced by the kind of food you eat. Astronaut food is the ultimate challenge for nutrition: they have to deliver peak performance every day in the most hostile environment in which a human being can survive. So the requirements of the food are extremely high: it has to be not only highly balanced, healthy and tasty but also weigh as little as possible because the payload capacity in spaceflight is limited.

as fresh as possible and storable at room temperature. And it can be transferred to Earth easily: food systems for people who have to deal with extreme conditions in their day-to-day life, like athletes or the armed forces, who require similar standards.



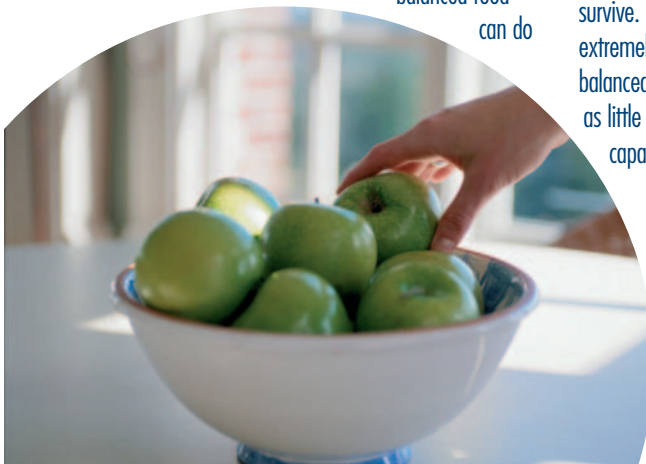
Dr. Jan Pieter van der Lugt MBA

WHERE'S THE BENEFIT FOR A NUTRITION COMPANY IN DEVELOPING SPACE FOOD?

The most striking asset is, of course, the exposure: by getting involved in space nutrition a large food company can show that it is at the forefront of innovation and aims for nothing but the highest standards in its area. It is a great marketing tool and it is expected to trigger significant return on investment. But this is just the most »

NOT AN EASY TASK.

A challenging task, but absolutely doable. And forward-looking. Right now, we at TNO are talking about projects together with ESA to develop astronaut food that – in addition to all the other criteria – is



YOUR PARTNER FOR
THE INTERNATIONAL SPACE STATION

» obvious benefit. Space is the ultimate platform for nutritional innovations, in which astronauts are a unique "lead user" for product innovations.

WHAT KIND OF INNOVATIONS DERIVING FROM SPACE ACTIVITIES IN THE FOOD AND NUTRITION AREA COULD YOU ENVISAGE?

As mentioned before, the key issues of food today are that it tastes good and has optimum ingredients. But what is just as important is that the food is digested in the right way. With the increase in knowledge about the human genome, the genetic information that human beings carry in every cell of their bodies, we are gaining more and more understanding of the metabolic processes. We are working on "metabolic typing". As people digest different kinds of food in a different way, a nutrition profile can be created for foods that are appropriate for a person. Then, an individual diet can be

developed that is tailored to the needs of that person. We envisage that people will be grouped into five or six different 'metabolic' categories with compatibility with different foods. Diets will be developed on this basis and will ultimately be sold off the shelf. This will be the future for nutrition – to move away from producing nutrition for the majority of people, but instead focusing on individual diet development. Of course, we are still far from it, but it will surely come. And astronaut food will be the first milestone in its development.

ARE NUTRITIONAL RESEARCH AND DEVELOPMENT ACTIVITIES ON THE ISS IMPORTANT FOR THE FOOD INDUSTRY?

Absolutely. The body reacts to food immediately: nutrition has effects on blood pressure, bone health, concentration and cognition, just to mention some. We already know quite a bit about the overall action of

food on the body. With astronauts in space, these effects are considerably increased and can be monitored and pinned down a lot better. Space is the perfect place to study the relation between food and mood in more depth. And findings are important not only for the well-being of astronauts but for everybody.

THANK YOU FOR THE INTERVIEW ■

Cosmonaut Valery G. Korzun prepares to eat a meal in the Zvezda Service Module on the International Space Station



SPACE MEETS MEDICINE AT THE MEDICA 2005

At MEDICA 2005, the largest medical trade show of its kind worldwide, the European Space Agency will present itself via an unprecedented line-up of international industrial partners to promote research aboard the International Space Station in the medical and pharmaceutical industry.

At its booth (Number H03 in Hall 11), ESA together with its Commercial Agent for

Biotechnology, Health, Food and Nutrition, ISS Lab Ruhr GmbH, will inform MEDICA visitors about the unique opportunity to perform commercial R&D on the International Space Station, and host an array of partnering companies from the medical, biotechnology and research management sectors. Based on the core competencies of all the partners, space will be promoted as a solution for various 'earthly' medical problems.

ESA OFFERS

ESA will describe the opportunities of space research on a commercial and institutional basis. The Erasmus Experiment Archive will document the vast number of accomplished experiments in physiology and sports medicine. The agency will broach the issue of the latest 'WISE' bedrest study, present its past success in transferring space technology to medical applications, and introduce two new ventures in breast cancer treatment and malaria prevention.

ESA PARTNERS OFFER

• The Germany-based Enterprise Management Technology Transfer GmbH (EMBLEM) is an affiliate and the commercial

arm of the European Molecular Biology Laboratory (EMBL). At MEDICA, EMBLEM will present the research opportunities in biotechnology, pharmaceutical, IT and mechanical/electrical engineering and the subsequent transfer of the results to the respective markets.

- MEDES, the French Institute of Space Medicine, will inform MEDICA visitors mainly about its applications for clinical research on ground such as bedrest studies, and in telemedicine.
- The project "Promotion of Industrial Users of the International Space Station" (PIN Project) of the German Space Agency DLR, managed by Kesberg, Bueftfering & Partner, and furthering innovative German research projects in weightlessness, will offer insight into commercial research projects in areas including telemedicine and in-vitro diagnostics.
- The Russian Institute of Biomedical Problems (IBMP) is the leading research centre for every aspect of biomedical issues in human spaceflight. At MEDICA, IBMP will present and demonstrate a cosmonaut's rehabilitation suit. ■



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ESA PROPOSAL SELECTED FOR EU FUNDING

An ESA proposal has been selected by the European Union as a promising candidate for an EU infrastructure research funding within the 6th framework programme of the European Commission. The target of this EU programme is to improve European research coordination as well as technological development and demonstration. Negotiations to finalise a contract between ESA and the EU are under way. ESA's SURE (International Space Station: a unique research infrastructure) proposal is a joint initiative by ESA's Commercial Promotion Office and the ISS

Utilisation and Microgravity Promotion Division. The two ESA divisions joined forces in the SURE initiative to make the unique research environment of the ISS available to small and medium enterprises and the scientific community of EU member states (including the two EU aspirants Bulgaria and Romania) for whom it is typically harder to gain access to the Station.

Once endorsed, the contract will provide funding to those states to enable them to access the ISS and therefore implement

and lead industrial or institutional research projects in the form of experiments on the ISS in cooperation with the Agency.

ESA will issue a corresponding Announcement of Opportunity by the end of this year, inviting Scientists and Small and Medium Enterprises to submit proposals to fly their experiments. Once all applications have been received and reviewed, experiments will be selected and subsequently performed on the ISS. ■

COMPANY PROFILE - ISS LAB RUHR GMBH

“WE ENHANCE YOUR ABILITIES”



ISS Lab Ruhr GmbH, founded in 2004, is a service-provider located in Dortmund, Germany. Its main business focus is on offering innovative companies access to and the possibility of using innovative research opportunities available in weightlessness conditions. To this end, ISS Lab Ruhr GmbH informs and consults for companies on research in microgravity for industrial and commercial purposes. ISS Lab Ruhr GmbH offers comprehensive customer support services ranging from the identification of company-specific benefits of research in microgravity, project development and the implementation of project financing models. The business segments currently focus on

biotechnology, materials science, energy management and nano-technology.

One major project of ISS Lab Ruhr GmbH is the implementation of the “Spaceflight Application Centre Ruhr” initiated by the German Aerospace Centre (DLR) and the Projekt Ruhr GmbH. Based on economical core competencies in the Ruhr area (e.g. chemistry, energy management, and material sciences), which are widely congruent with the research opportunities that space offers, the “Spaceflight Application Centre Ruhr” focuses on the interests and needs of non-space industry in the Ruhr valley. By systematically offering innovative research tools in space to the non-space industry, the market and customer-oriented centre – organised in a public-private-partnership model – “helps to foster and accelerate the transition and modernisation processes in the Ruhr area” says Dr. Michael Massow, managing director of ISS Lab Ruhr GmbH. ISS Lab Ruhr GmbH is the co-ordinator of the “Commercial Agent Network” which has been

appointed by ESA to market and sell the use of the European research facilities on board the International Space Station to the Life Sciences sector (biotechnology, health, nutrition and food) in Europe. The Commercial Agent Network comprises the companies AGT Engineering (Italy), EMBL EM Technology Transfer GmbH (Germany) and MEDES – Institute for Space Medicine and Physiology (France). “Based on this network of highly experienced and motivated partners, we are confident that we will be able to systematically develop the commercial utilisation of ISS” states Dr. Massow. The company’s team has expertise in different terrestrial market sectors as well as in bridging the space sector with the non-space sector. In order to connect both worlds successfully additional customer-oriented expertise will be made available through the ISS Lab Ruhr network. All these activities are backed by a competent support team in charge of project management, sales, marketing and organisational and administrative tasks. ■



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