EXECUTIVE SUMMARY

PROPOSAL TITLE	Test Solution for the New Space Market
PRIME COMPANY	Rovsing A/S
COUNTRY	Denmark
ENTITY CODE (if any)	1000007045
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SUMMARY

From a technical standpoint the purpose is to build a flexible and configurable test equipment (EGSE/SCOE) that fits several generic satellites in the Smallsat range (1-150 kg) independent of mission and application – a superset. Following this guideline, the product designed after the feasibility study was a flexible and configurable test equipment that can have the following applications:

1. Solar Array Simulation
2. Battery Simulation
3. Battery Emulation
4. Load Simulation
5. Actuator Simulation
6. Umbilical Charging
7. Bus Acquisition/Decoding + Simulation

The values that this solution provides to the potential customers identified at the Feasibility Study are:

- Flexible and configurable test solution adapted to fit different missions in terms of size and power
- Sustainable solution which will be re-used for different customers without any major hardware or software change, decreasing the usage of hardware, manpower and materials
- Being immediately able to provide consultancy services, replacement- and/or additional test equipment to New Space players, during sensitive and time critical pre-launch integration and validation phases, in case of unforeseen issues.
- To allow New Space players to rent pre-qualified and industry standard compliant test equipment solution in-stead of having to buy one.
- Better cashflow and reduced Net Profit Value (NPV) of test equipment infrastructure by the financial leasing solution

The initial market strategy is to establish the solution with the European market but at a later stage ROVSING plans to reach out to our international customers in South Korea, USA, Turkey etc. The target market for this Project that Rovsing wants to enter is the EGSE one. Based on research described on section 2.5, from the estimated Testing cost, the estimated contribution of EGSE is 30%, so approx. 3% of the total satellite cost. Inside this market pool, the competitors have been identified and a SWOT analysis has been performed detailed on section 2.6.

From research detailed in section 2.7, it is shown that up until 18 months, it is financially preferable to lease the equipment. Generally, a longer lease time is favourable for Rovsing in terms of secured revenues. The leasing model should include an "incentive" to the customer to lease for a longer period of time either/and with a more favourable monthly lease rate or a smaller down payment.

From a financial standpoint, detailed in section **Error! Reference source not found.**, the conclusion is that Rovsing would have a ROI of 29% after 4 test campaigns for 9 months each. The overall investment/ payback time would be around 2 years. Promotion and proactivity would need to be the performed for the purpose of capturing these opportunities.

OVERALL PERSPECTIVE AND BUSINESS ENVIRONMENT

2.1 Company introduction and overview

Rovsing was founded as Rovsing A/S in 1992 and has been listed on the OMX Nordic Stock exchange since December 2006. Rovsing is located in Glostrup on the outskirts of Copenhagen, Denmark. Website: www.rovsing.dk.
The company employs around thirty highly skilled engineers and technicians. Rovsing's high-tech solutions, products and services address satellite test solutions and critical software applications, where quality and reliability is key and usually where valuable material assets are at stake.

2.2 Current markets, customers, and future evolution

Rovsing is recognised for the delivery of ground testing equipment and systems, software solutions, and consultancy services to the European Space Agency (ESA), European space prime contractors, and U.S. defense primes. Since 1992 a wealth of experience working on ESA programmes has been accumulated, both directly for ESA and for the prime contractors, a selection of which is shown in the table below.

Airbus Defence & Space (var.)	Thales-Alenia Space (var.)	ESA/ESTEC, Netherlands
ESO, Germany	EUMETSAT, Germany	OHB, Germany
DLR, Germany	CNES, France	Antwerp Space N.V., Belgium
Clemessy, (var)	Leonardo, Italy	Celestia-STS, The Netherlands
Boeing, USA	Lockheed Martin, USA	KeLiang, PR China
TÜBİTAK UZAY, Turkey	SITAEL, Italy	Astri Polska, Poland
Astroscale ,UK	Jena Optronik, Germany	NASA, USA

Table 2-1: Rovsing Customers

In addition to ESA programmes, Rovsing has gained valuable experience on US commercial (telecom satellites) programmes.

The majority of Rovsing's customer base and revenues come from institutional space business. The commercial space market, driven by the New Space players is one of the fastest growing in the space industry and there are new players emerging at an impressive pace. Rovsing would like to grow into that market segment by levering its capabilities and provide an offer more suitable for this market. With limited budget and financial means the New Space players have a lot of pressure both financially and time wise to finalise their missions. In addition, the market requirements are going towards more guaranteed services which in turn pushes for better qualification and mission lifetime.

Traditionally, these players have been building their own test infrastructure with less "sophisticated" equipment since the test equipment available today on the market, has been targeting bigger satellites, thus too costly for the New Space Market. Moreover, this test equipment is typically targeting mission specific requirements and is thus generally not very versatile in application from mission to mission.
Thus, Rovsing would like to support the New Space Market by giving access to industry compliant test equipment and expertise to contribute to the competitiveness and success of the European Commercial Market.

2.3 Current portfolio, capabilities and future

Rovsing is an experienced and acknowledged supplier of test- and engineering services and support in three main areas:

Test and Simulation Systems

- Power check-out systems
- Digital and analog check-out systems

Test and Simulation Products

- Solar Array Simulator, Latch Current Limiter, Second Level Protection, etc.
- Bus simulators, analogue & digital I/Os, etc

SW Engineering

- Independent SW verification and validation of SW up to Class A (only European company which validated Human Rated SW on ATV)
- General SW QA engineering
- SW design and coding and integration

Rovsing has delivered a significant number of EGSE / SCOE solutions for numerous space programmes. The deliveries include Power SCOEs, core EGSE systems, instrument EGSE systems and dedicated EGSE systems for various applications, Bus Protection Units (Second Level Protection Units) with class leading reaction time and a new generation of high performance Solar Array Simulation equipment.

Rovsing is a recognized provider of turn-key Power EGSE and Simulation solutions. The following picture is an example of a complete, turn-key Power SCOE project successfully delivered by Rovsing.

Figure 2-1: Example of Rovsing turn-key Power SCOEs

Besides turn-key testing systems, Rovsing also offers a comprehensive range of self-standing products to assist the testing of satellite power subsystems including Bus Protection Units (Second Level Protection Units) with class leading reaction time and a new generation of high-performance Solar Array Simulation equipment, which is the only European built SAS product. It has been developed with the support of ESA.

A selection of these products used in various current programmes is shown below.

Figure 2-2: Examples of Rovsing Products and Modules

Rovsing has continued focus on improving its product base and related logistics, production and testing environments. Improvements in value chain, heightening of quality and efficiency are a constant focus to improve the Company's competitive advantage.

With the new and improved Company headquarters the foundation for future improvements has been laid, allowing for further scaling of our operations and development.

Product development and feature improvements in the domains of both software and hardware remain key enablers for Rovsing abilities to deliver diverse market leading system solutions to customers. Rovsing's strategic roadmap focuses on achieving increased scalability such that our already modular products can be better address the widening range of satellite architecture.

DETAIL ON PRODUCT MARKET

2.4 The product description

The flexible EGSE solution will be built as much as possible with existing COTS and proven functionalities in order to minimize risks and cost. All chosen products can address and scale from nano to small satellite segment. Granted the capabilities for some nano applications will be much larger than needed but going for a super-set approach ensures that the same system can be used across a wide cross section of users with vast difference in application, S/C size and capabilities. The design and its capabilities have been confirmed and adapted thanks to a conducted market study. The below picture shows the final design of the EGSE:

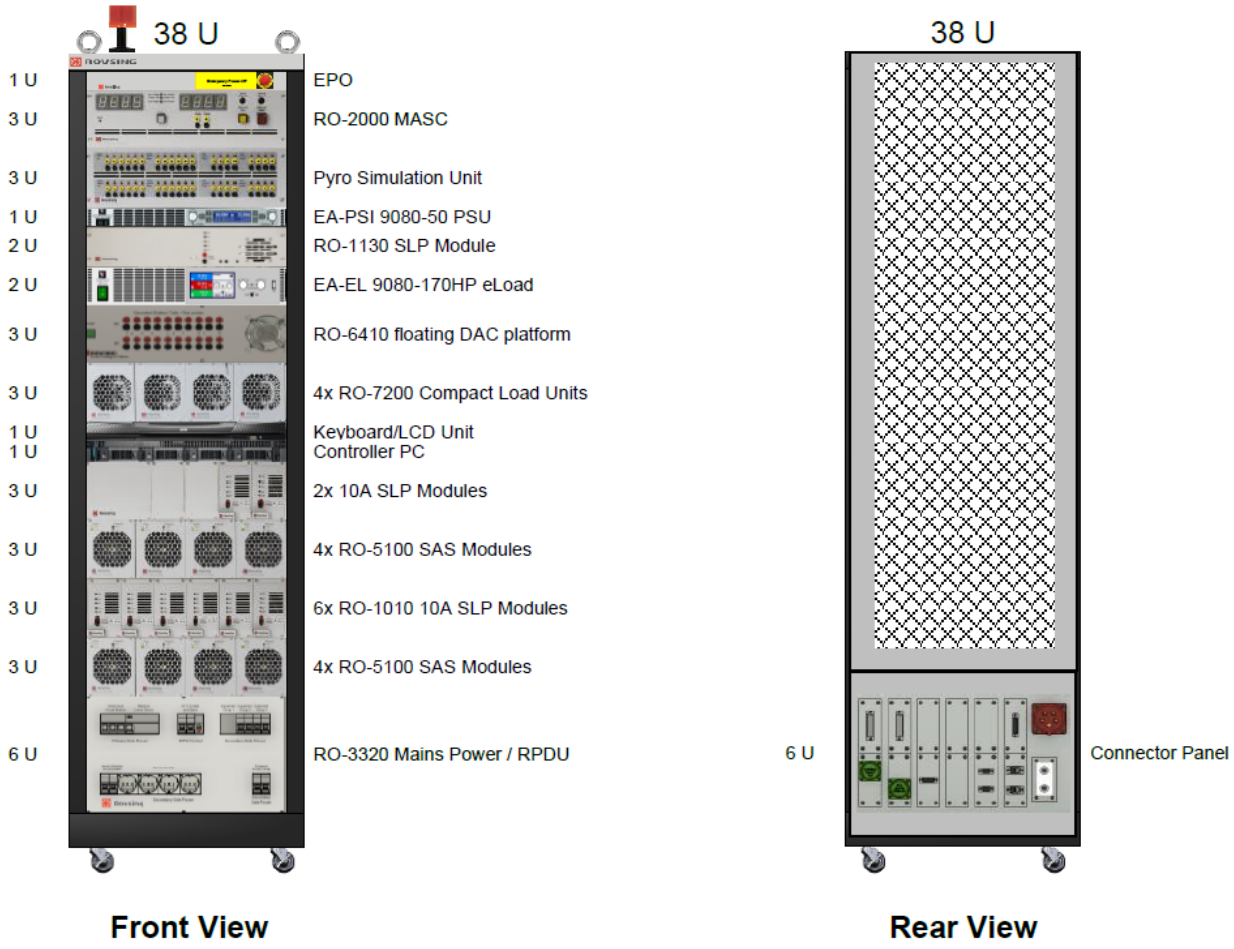

Figure 2-4: Universal test equipment final rack layout

The main changes to Rovsing's portfolio are on the EGSE software. To ensure a swift turnaround time between different mission test campaigns, it is crucial to have a highly configurable EGSE software. The EGSE software should exhibit flexibility in its development to meet the specific requirements of various missions. The following capabilities will be developed for the user:

1) **Enabling/Disabling Hardware Units:** This entails developing the functionality for the user to easily activate or deactivate specific hardware units as needed for different missions. It involves programming and testing to ensure seamless unit control.

2) **Selecting the Number of SAS and SLP Unit**: Providing the user with the ability to choose the appropriate number of SAS (Solar Array Simulator) and SLP (Solar Light Simulator) units based on mission complexity. This task includes software development, interface design, and testing to guarantee accurate unit selection.

3) **Configuring Voltage and Current Levels:** This involves programming and testing to create software that allows the user to configure voltage and current levels for testing. It ensures that the EGSE software is adaptable to different mission equipment requirements and can accurately control power parameters.

4) **Creating Test Scripts**: A critical aspect of the EGSE software is enabling users to generate custom test scripts. This task requires substantial development time to build a user-friendly

interface, script library, and scripting capabilities. Extensive testing and quality assurance are also crucial to ensure that custom test scripts align with mission objectives.

2.5 Market analysis and Market plan

In order to estimate the EGSE market the total market has been broken down in different elements such as satellite service, satellite operations, ground segment etc. where the total size of the market for satellite manufacturing & launch services represents around 2%.

Based on internal assessments averaged over Science and Earth Observation satellites, the cost composition by the various disciplines involved in a typical satellite is estimated as:

- Management 10%
- Back Office 15%
- Engineering 30%
- MAI* 25%
- Quality 10%
- Testing 10% (Power, Avionics, Software, Radio Links, EMC, Propulsion, Mechanisms, Thermal Control)

Of the estimated Testing cost, the estimated contribution of EGSE is 30%, so approx. 3% of the total satellite cost.

The estimated size of the global EGSE market for small satellites is illustrated in Figure .

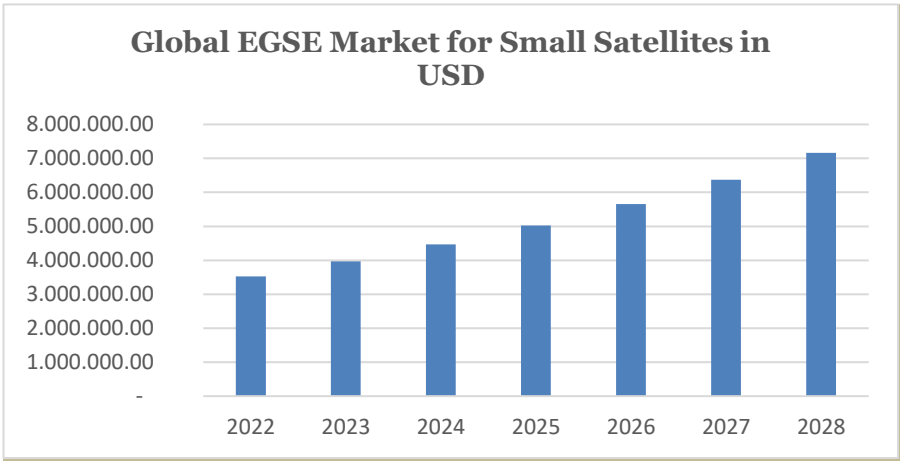

Figure 2-5: Global EGSE Market for Small Satellites

2.6 Competition analysis and Rovsing positioning

Currently two potential types of competition have been identified:

1) The traditional EGSE suppliers such as Celestia-STS, ATOS, Clemessy (Europe) and Keysight, Ametek (US, global). However, we are not aware of any similar solution being available or under development.

2) Customer in-house organizations where some companies prefer the option of building up in-house test facilities

A simple SWOT analysis have been performed to capture the different aspects of the Test solution for New space market.

Strength	**Weakness**
Rovsing is a market leader of EGSE in Europe Flexible and agile SME that can quickly adapt to new requirements. Proven heritage and good reputation. Solution adds value to both industry veterans and newcomers.	Rovsing portfolio might be "too sophisticated" for the new space market segment. Small sales organization which needs to work with a big amount of companies to be successful. Limited internal funds for development.
Opportunity	**Threat**
The solution offers a way to enter the new space market. In the future, further grow with the successful new space companies and sell EGSE as service. Enter other markets where sophisticated testing is required.	Customer In-house organization and "want to do it all" business culture. Our competitors developing a similar solution. Price point not matching customer needs.

Table2-3: SWOT analysis

2.7 Product pricing

Every mission needs to test the satellite's performance in terms of power where a satellite manufacturer has the choice to either:

- Build their in-house infrastructure which requires investment from the company in terms of equipment and competences. The risk is that the satellite might not be tested in the right environment (due to costly development of equipment) or missing the right protection and safety towards the satellite which can damage the equipment or;
- Purchase an EGSE where this equipment is normally built to mission specific requirements and limitations in terms of re-usages which often gets stored after test campaigns.

The customer would be able to see the following benefits and value of this solution:

- Flexible and configurable test solution adapted to fit different missions in terms of size and power
- Sustainable solution which will be re-used for different customers without any major hardware or software change, decreasing the usage of hardware, manpower and materials
- Being immediately able to provide consultancy services, replacement- and/or additional test equipment to New Space players, during sensitive and time critical pre-launch integration and validation phases, in case of unforeseen issues.
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As part of the feasibility study, a simple business case based on the customer situation has been built up comparing the option of leasing vs direct purchasing of EGSE. Some estimations have been done to get a rough understanding of the figures based on historical data from Rovsing as well as the calculated minimum price for Rovsing to have a positive business case.

The following graph illustrates at which point in time it becomes more interesting to actually buy the equipment.

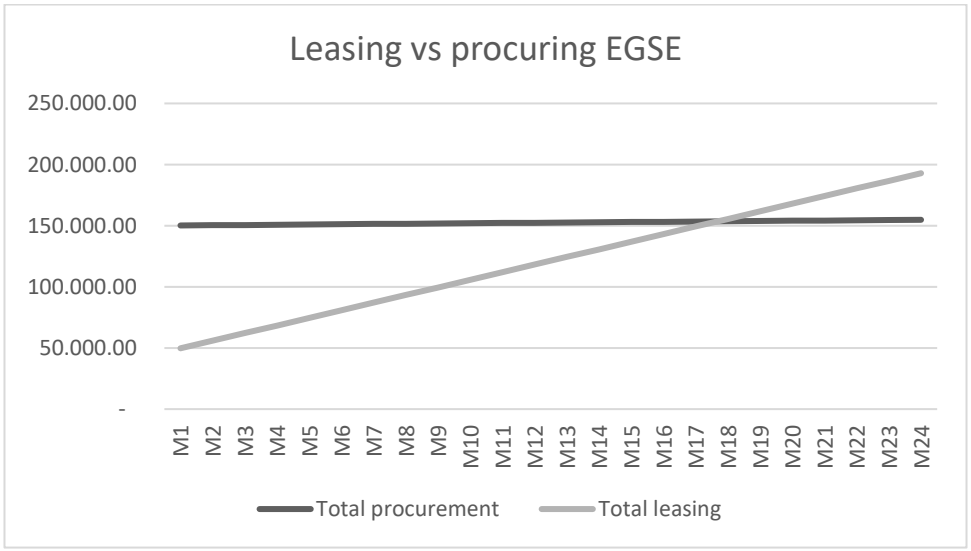

Figure 2-6: Leasing vs Procuring EGSE

The graph shows that up until 18 months, it is financially preferable to lease the equipment. Especially in the start phase of a new space market player where the importance is to use the financial means wisely until your concept is proven and you have started to gain a solid customer base.

As mentioned before, a longer lease time is favorable for Rovsing in terms of secured revenues. The leasing model should include an "incentive" to the customer to lease for a longer period of time either/and with a more favorable monthly lease rate or a smaller down payment.

2.8 Export strategy

The initial market strategy is to establish the solution with the European market.
The second step is to reach out to our international customers in South Korea, USA, Turkey etc. It will require to work with locally based partners to allow an acceptable turnaround time of the EGSE and perform local maintenance, repair etc. when required.

2.9 Operational plan

The figure below illustrates the aspects of a "testing cycle" – from configuration to Customer 1 requirements up until arrival to Customer 2.

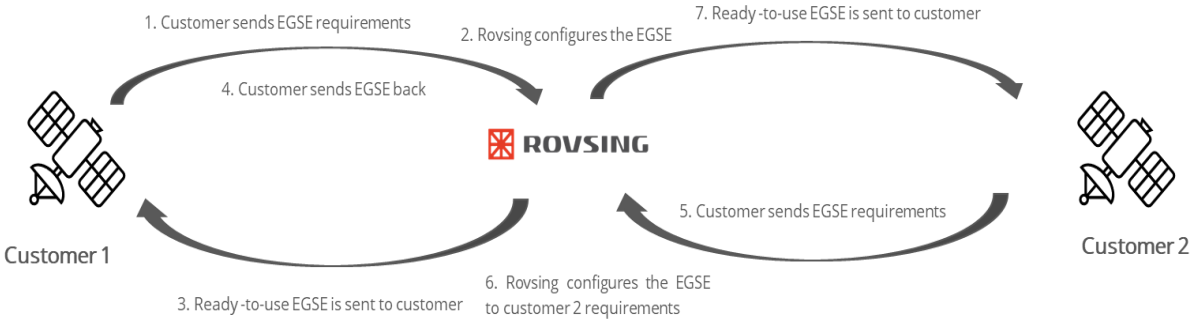

Figure 2-7: Length of the testing cycle from configuration to Customer 1 requirements up until arrival to Customer 2

A detailed analysis of the time Rovsing needs to get the EGSE ready between two customers/ test campaigns have been done. The table below illustrates this:

Step	Description	Duration (days)	Comment
1	Customer 1 sends test requirements	--	
2	Rovsing configure EGSE + inspection	2	*1 Senior engineer*
3	EGSE sent to customer	2	*ROV takes care of transportation fee*
4	Customer 1 send EGSE back to Rovsing	2	*ROV takes care of transportation fee*
5	Customer 2 send test requirements	--	
6	Rovsing configure EGSE + inspection	2	*1 Senior engineer*
7	EGSE sent to customer	2	*ROV takes care of transportation fee*

Table 2-5: Time needed by ROVSING to get the EGSE ready in between test campaigns

The operational procedures need to be added in Rovsing's overall processes according to ISO9001 requirements including for example incoming inspection check-list of EGSE, configuration manual and management, outgoing inspection etc.