Market consultation

for: a Mechanical Manipulation System related to a Thermal Vacuum Chamber

Contracting authority:
The Netherlands Organisation for Applied Scientific Research TNO

Document ref. : **TNO 2018 FPL/INK 91**
Date : **20-04-2018**

Contents

1. Introduction

This document describes the organisation TNO, and the content, objective, schedule, preconditions and procedural matters of the market consultation.

TNO, department Space Systems Engineering intends to purchase a Thermal Vacuum Chamber (TVC). Inside this TVC two pieces of equipment needs to be mechanically manipulated (translation, rotation, tilt) with high precision. TNO would like to gain more information from the market by conducting this market consultation. The information gained might be used as input for the formal tender process following the market consultation. Therefore, any party which is able to deliver such a system for the purposes described in section 3 is invited to contact TNO to present the answers on the questions posed in section 4 and other relevant information they would like to share with TNO.

After this market consultation TNO will decide which tender procedure is the most appropriate choice to buy a Mechanical Manipulation System.

1.1 TNO

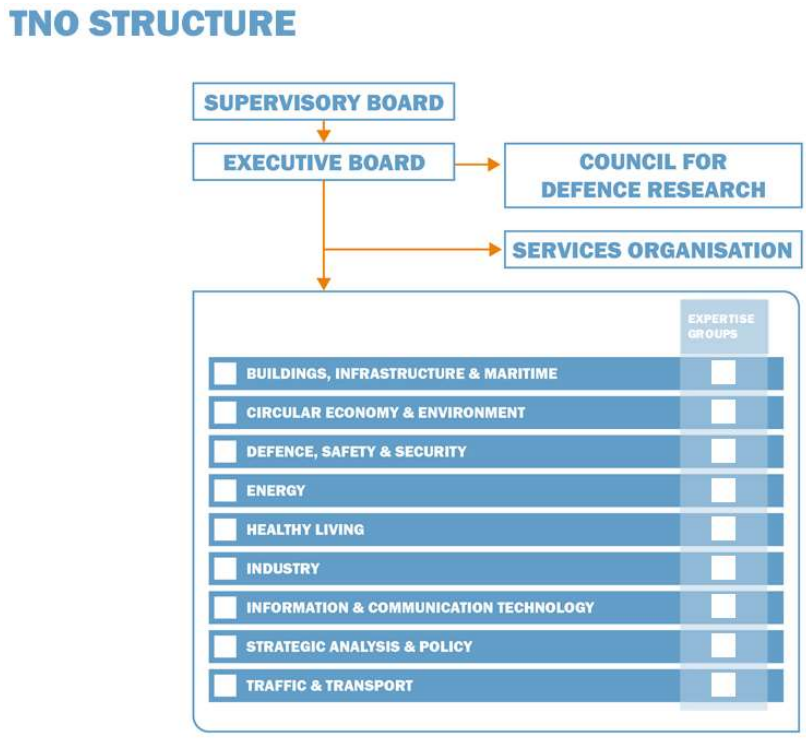
The Netherlands Organisation for Applied Scientific Research, hereafter 'TNO', is a modern, theme-led Research & Knowledge organisation. It was established in 1930 by Act of Parliament with the intention of maximizing the practical relevance of scientific research to the public sector, industry and society at large. The government of the day believed that this would enhance the innovative strength of the Netherlands and contribute to long-term economic growth. TNO is an independent research organisation. We believe in the joint creation of economic and social value.

TNO connects people and knowledge to create innovations that boost the competitive strength of industry and the wellbeing of society in a sustainable way. This is our mission and it is what drives us, the over 2,600 professionals at TNO, in our work every day.

Effective innovation is what TNO stands for. We do not do that alone but with companies, governments and a whole range of organisations. Through collaboration we create innovations that sustainably strengthen the competitiveness of companies and the wellbeing of society. We develop knowledge not for its own sake but for real applications. We work on issues that concern our environment, safety and security, the energy transition, innovations in industry and how to keep the ageing population actively engaged. These are the challenges that TNO researchers take up every day in their drive to produce impactful innovations.

1.2 Organisational structure

TNO's high level of ambition demands an appropriate organisational structure and corporate culture. Staff must be given every support as they pursue innovation and productive cooperation. The current organisational structure is shown below:



We focus on transitions or changes in nine societal themes:

- Buildings, Infrastructure & Maritime: 'Robust constructions, sustainable use'
- Circular Economy and the Environment: 'Directing and accelerating sustainability'
- Defence, Safety and Security: 'We're putting our knowledge and technology to work for safety and security'
- Energy: 'Faster towards a sustainable energy supply'
- Healthy living: 'Focussing on participation, not on the disease'
- Industry: 'Innovating for employment, welfare and well-being'
- Information & Communication Technology: 'Interpreting and accelerating digital transformation'
- Strategic Analysis & Policy: 'Turning complex issues into concrete innovations'
- Traffic and Transport: 'Helping to create liveable, sustainable cities'

Innovation with purpose is what TNO stands for. We develop knowledge not for its own sake, but for practical application. *For further information, see: www.TNO.nl.*

1.3 Procurement

The TNO Procurement Department is involved in the purchasing, procurement and tendering procedures on behalf of TNO. For the TVC that is done in close cooperation with the department Space Systems Engineering which is part of the unit Industry. As part of the Finance, Procurement & Legal division, the Procurement Department is responsible for organizing and implementing all procurement processes in keeping with the corporate objectives of the organisation.

1.4 Purpose

Before proceeding with the preparation of a tender, TNO would like to consult the market on how this tender (in broad lines) can be structured. Within the scope of the market consultation, advice is sought to gain insight into the potential market for the delivery of a Mechanical Manipulation System for TNO. The market consultation is open to all players in the market.

The market consultation generates benefits for all parties involved. TNO observes what is possible and what the perception is of the market. So as to provide a more effective and coordinated response in how, for example, preferences and requirements can be formulated in the tender.

For interested players in the market an added advantage is that they get an early view of TNO and the tender which might follow. In addition, the market can affect requirements which will come back in the tender. This allows participants to contribute to the success of the tender.

The purpose of the market consultation is covering the following aspects:

- To gain more insights in discriminating factors for different configurations of Mechanical Manipulation Systems.
- To gain more insight into the current possibilities and the choice on the market.
- To get a clear understanding of the visions, ideas and suggestions of market participants.
- To gauge market interest for this possible tender;
- To decide which procurement strategy is best suited to our functional requirements in the current market.

The results of the market consultation may be processed in the possible tender documents, without traceability of participants of this market consultation.

1.5 Schedule

There are no follow up sessions planned for this market consultation, although after the market consultation TNO may wish to contact subscribers for an explanatory interview on their reply.

The schedule of the market consultation is shown in the table below.

Date	Deliverable / activity	Who?
20th of April 2018	Market Consultation document published by TNO	TNO
2nd of May 2018, 15:00h	Deadline for submitting your input	Subscriber
Date of tender publication	TNO summary of market consultation results on TenderNed	TNO

1.6 Explanatory interview

Based on the answers of the Questionnaire of section 4, TNO may wish to invite or visit parties for an explanatory interview. TNO will assess the received answers on content and relevance for an explanatory interview for TNO, as well as the need for (further) explanation. The location for the interview will be Stieltjesweg 1 Delft or the location of Subscriber.

2. Basic principles and preconditions

The basic principles and preconditions mentioned below apply to this market consultation:

- TNO observes the principles on non-discrimination and transparency when carrying out this market consultation;
- This document is solely intended for market consultation purposes;
- Market parties who do not join this market consultation are thus not excluded of participating the possible tender. Neither are market players who join this market consultation in any way excluded, or privileged in, the possible participation of the tender;
- If market parties are not joining this market consultation, although they are able to deliver such system, they are kindly requested to forward this information to the TNO contact person named in section 2.1.
- This market consultation is without any obligation, both for participants and for TNO;
- Parties who are participating or not in this market consultation cannot derive any mutual obligations or rights towards TNO;
- Participating to this market consultation does not confer an entitlement at obtaining a contract award;
- TNO shall not reimburse any eventual costs in participating to this market consultation;
- Participating market parties agree that the information provided by them can be processed anonymized in the further elaborating program of requirements;
- In the context of the market consultation, provided information may differ from the information that will be provided in the tender procedure;
- The contribution of participating Parties will be handled as much as possible with confidentiality and in any case TNO will take into account the legitimate interests of the parties;
- The official language during this market consultation is English;
- TNO is not bound in any way by the outcome of the market consultation or obliged in realisation and/or tendering of the project upon which the market consultation is linked;
- No claim will be honoured for the use of information, confidentiality, or request for compensation herewith;
- All documents submitted by the participating Parties are considered public documents and shall be copy-right free unless otherwise marked by participating Parties. If copyrights are applicable, TNO is protected by the participating Parties;
- TNO reserves the right:
  - To perform the proposed procurement process in a different way, in terms of content and style, than the process that may have been communicated;
  - To cease publication of the market consultation temporarily or permanently;
- Participating in this market consultation, constitutes the Parties unconditional approval of the procedure as stated in this document.

2.1 Form and content

The consultation is set up as follows:

Written responses

Any interested market party who believes that they can contribute to the market consultation, should respond to TNO via the TenderNed procedure. Responses should be received by TNO no later than 2nd of May 2018, 15:00h. Responses can be sent to:

Name : Raymond Peddemors
Position : Senior buyer
Department : Procurement
E-mail : aanbesteden@tno.nl

In the heading of your e-mail and in all future correspondence relating to this market consultation should be clearly mentioned ‘Market consultation 2018 FPL/INK 91’.

2.2 Intellectual property rights

Except where expressly permitted under Copyright Law or where necessary for the successful preparation of a Market Consultation document, no part of the market consultation documents may be reproduced in any form, by print, photocopy, DVD, CD-ROM, microfilm or other means, without the prior written permission of TNO. Market consultation documents and all accompanying documents submitted further to the Market Consultation Procedure become the property of TNO upon receipt.

2.3 Use of TNO logo

It is not permitted to copy, modify or otherwise use the TNO logo on any documents submitted by the Market Party further to the Market Consultation Procedure.

3. Background of the demand

TNO intends to replace its current TVC named the VCF (Vacuum Chamber Facility) by a new TVC called the CSI (Calibration Space Instruments). The CSI is also going to be located in the Van Leeuwenhoek Laboratory clean room facilities of TNO in Delft. The CSI will typically be used for calibration and characterisation of optical instruments or components of instruments of Earth Observation satellites. The calibration facility has to fulfil the typical requirements needed by Earth Observation instruments, covering:

- Thermal aspects
- Vacuum and cleanliness compatibility.
- Optical aspects
- Mechanical aspects

In the sections below these aspects are discussed in more detail, although it needs to be noted many of the figures mentioned are still under discussion and can also be influenced by the outcome of this market consultation.

3.1 The vessel

The heart of the TVC will be the vacuum vessel. The final geometry of the vessel is still subject to discussion, but for the time being a horizontal cylinder of approximately 3 m diameter and a length of 4 m can be assumed. The vessel is not part of this market consultation.

3.2 The equipment

Inside the vessel two pieces of equipment will be installed: the Instrument (subject to calibration) and an optical stimulus unit (also known as Optical Ground Support Equipment or OGSE) which will provide a light beam for the calibration. The volume claim of the OGSE is 1 m x 1 m x 2 m (2m in length axis of the cylinder). The volume claim of the Instrument will be approximately a 1.2 m cube. The weight of the OGSE and the Instrument will be respectively maximum 200 kg and 160 kg. The Instrument and the OGSE are not part of this market consultation.

3.3 Environment

The vessel will be located in an ISO-6 clean room environment.
Inside the vessel the temperature range at the Instrument will be approximately -60 °C to +45 °C (in the vessel itself the temperature can be as high as 60 °C). There will be a vacuum pressure of better than 1 10^{-7} mbar throughout the range of temperatures. Note that the OGSE and the Mechanical Manipulation System do not need to be exposed to the mentioned full temperature range, as insulation and locally positioned heaters can be used where possible.

3.4 Mechanical Manipulation System

Both the OGSE and the Instrument need to be manipulated mechanically, in translations as well as rotations. This can be done with a combination of several devices such as translation stages, rotation tables, gimbals, and hexapods. The choice of combination will be highly driven by the possibilities available on the market. Exactly this is the topic of this market consultation.
As during a calibration test both the OGSE and the Instrument have to be aligned relative to each other (in a large number of positions and directions) control software is needed to accomplish this. This software should exist of a layer on top of the different drivers (for hexapod, translation stages, etc) that can be embedded in the overall CSI Control System software that will be developed separately.

3.5 First sketches

In Annex A a market consultation presentation is enclosed, which shows the numbers as mentioned above as well as some additional numbers, some of which are still to be discussed. Also two sketches are shown for possible location of the Mechanical Manipulation System: design option 1 (slide 11) ïn which the manipulation system is fully located inside the vessel (so in vacuum), and design option 2 (slide 12) in which the system is located outside the vessel in an ambient environment. Alternative solutions can be considered as well (e.g. partly inside and partly outside the vessel).

4. Questionnaire

Subscribers are not obliged to answer all questions of the market consultancy.
Subscribers can be asked for additional explanation in a second round.
Subscribers are requested to limit their response with a maximum of 8 pages of A4.

	Questions on interest
A1	Do you consider, based on the limited information of this document, to apply to the tender? If yes, why, if not, why not?
A2	If you consider to apply as a combination of parties, which parties would that be and why would you choose for these parties?
	Questions on the content
B1	Are you capable of supplying vacuum manipulation devices (see Option 1 of Annex A)?
B2	What is the maximum range of the standard products (X and Y)?
B3	What is the maximum allowed loads of the standard products?
B4	Is balancing (counter weights) needed to be able to manipulate Instrument or OGSE due to their sizes and weights?
B5	Which possible solutions do you have for the manipulation ranges, loads, and accuracies as mentioned in Annex A?
B6	Referring to slide 8 of Annex A: Is an increase of range in X and Y from +/- 250 mm to 350 mm possible, and if yes at what cost?
B7	Is an increase of range of one axes (X or Y) from +/- 250 mm to 500 mm possible, and if yes at what cost?
B8	What would be the cost saver of two identical manipulation systems (for OGSE and Instrument)?
B9	What value of position accuracy and reproducibility can be obtained?
B10	What would be the standard temperature range during operation and non-operation?
B11	What are the minimum and maximum operational and non-operational temperatures?
B12	What kind of thermal measures can be offered (insulation, local heaters, etc) in order to stay within the operational temperature ranges of the Mechanical Manipulation System if the vessel is at different temperature?
B13	What kind of greases are used, if applicable?
B14	Is active anti-vibration control possible with the manipulation system?
B15	Is first time alignment of the manipulation devices possible and in what range?
B16	Is it possible to receive external position data (supplied by our own position sensors) to the manipulation devices and use this as input for accurate positioning?
B17	What is the amount and size of control cables going towards the manipulation devices?
B18	Do you have a software application to control the manipulation system (GUI, HMI)?
B19	Can the manipulation system handle external signals as input and send out signals to another system?
B20	Can you deliver a software application for easy and repeatitive aligning of OGSE and Instrument that uses the drivers of the manipulation devices, which can be embedded in an overall control application (also known as API)?
B21	Which measures are used to prevent Instrument and OGSE damage in case of failure of the manipulation system i.e. stepper motor failure?
B22	Do you have specific innovative solutions that can be used for the Mechanical Manipulation System?
	Question regarding the tender
C1	What is the track-record of your company in engineering / procurement / commissioning of high precision mechanical manipulation systems in vacuum environments?
C2	We consider the development of the Mechanical Manipulation System to consist of several phases: design, engineering, manufacturing, system integration, testing,

	commissioning. Which phases will be performed by yourself, which will be outsourced to third parties?
C3	Interfaces with other parts of the TVC (the vessel, the anti-vibration table, etc.) will probably not be clear at Mechanical Manipulation System contract signing. What kind of flexibility can be offered regarding late definition of interface definitions?
C4	What are your strongest added values?
C5	Is your organisation able to estimate the price-impact of still TBD requirements, and can you provide estimation per each TBD item if applicable?
C6	Which ones are the price-driving parameters in the execution of the project?
C7	Which important costs can be reduced using a well-chosen approach during contract?
C8	Is your componay ISO9001 certified?
C9	Does your company have a configuration control management system in place?
C10	Does your company have a qualification on cleanliness, known with “ECSS-Q-ST-70-02 - space product assurance – Thermal vacuum outgassing test for the screening of space materials”?
	Questions regarding planning
D1	How much time do you need to make a sufficient proposal during the tender?
D2	What would be the lead time from contract award to Preliminary Design Review?
D3	When would it be possible to perform the Factory Acceptance Test at your premises?
D4	When would it be possible to perform the Site Acceptance Test at TNO?
D5	What is the expected maintenance interval?
D6	What do you consider as the greatest risk(s) of the development of the Mechanical Manipulation System?
	Finally
E1	Are you prepared to explain your answers to the questionnaire orally by invitation?
E2	Do you have other ideas, suggestions, or comments?

Annex A Presentation: Market Consultation CSI Mechanical Manipulation System