Contracting Authority: Global Change Research Centre AS CR, vvi
Registered office: Bělidla 986/4a, 603 00 Brno, Czech Republic
Company Reg. No.: 67179843

Public Contract: Supply of Aerial Hyperspectral Display Systems

Contract Registration No.: 363696

JUSTIFICATION OF THE PUBLIC CONTRACT

Pursuant to § 156 paragraph 1 of Act No. 137/2006 Coll., on Public Contracts, as amended (hereinafter referred to as the "Act") and § 2 et seq. of Decree No. 232/2012 Coll., on the extent of justification of the appropriateness of public contracts and the justification of public contracts (hereinafter referred to as the "Decree").

Justification of the appropriateness of the public contract	
The Contracting Authority shall describe the changes a) in the description of requirements to be met by fulfilling the public contract; b) in the description of the subject of the public contract; c) of the mutual relationship between the subject of the public contract and needs of the Contracting Authority; d) in the expected completion date for fulfilment of the public contract	a,b) In the coming years the Contracting Authority will implement the project "CzechGlobe" in the framework of the Operational Programme Research and Development for Innovation (hereinafter referred to as "OPR&DI"). As part of this programme it will be necessary to supply aerial hyperspectral display systems, which consist of an aerial hyperspectral VNIR delivery system, an aerial hyperspectral SWIR system, an aerial hyperspectral LWIR system, and IMU/GNSS units. Accessories will be supplied together with the sensors which are required for installation of the hyperspectral systems into aircraft and their operating (monitor, cabling, etc.) including all accessories necessary for direct georeferencing of image data (IMU/GNSS, software, etc.).The supply will also include training of the installation, operation and maintenance of the systems. To meet the scientific tasks of the remote sensing within the project CzechGlobe the hyperspectral systems, need to acquire high-quality data in a sufficient spectral and spatial resolution. The technical criteria required in the tender are balanced in such a way as to achieve the scientific objectives of the project CzechGlobe while minimizing the long-term financial demands on data acquisition. c) Implementation of this public contract will fully meet the intended objectives. d) Completion of the subject of the public contract is expected by the following dates: ▪ Supply of aerial hyperspectral VNIR system by **10. 4. 2014** at the latest ▪ Supply of aerial hyperspectral SWIR system by **10. 11. 2014** at the latest ▪ Supply of aerial hyperspectral LWIR system by **10. 11. 2014** at the latest The expected d**eadline for signi**ng the Agreement is **5.12.2013**

Description of the risks associated with the performance of the public contract, which the Contracting Authority took into account during the preparation of the terms of reference. In particular the risk of non-performance of the public contract, delays in the fulfilment of public contract, reduced quality of the performance, incurring of additional costs.	If this public contract did not take place the individual parts of the project "CzechGlobe" would not be fully realized in the framework of the Operational Programme Research and Development for Innovation (hereinafter referred to as "OPR&DI").
The Contracting Authority shall define variants for meeting the needs and justification for the selected alternative of the public contract.	The Contracting Authority did not use this option in the public contract as an alternative option is not possible.
The Contracting Authority shall determine to what extent the public contract affects the fulfilment of the planned objectives.	The Contracting Authority did not use this option in the public contract.
The Contracting Authority shall provide additional information to justify the effectiveness of the public contract.	The Contracting Authority did not use this option in the public contract.

Justification of the requirements for technical qualifications for the performance of the public supply contract **The Contracting Authority shall justify the appropriateness of the technical qualifications in relation to the subject of the public contract and the risks associated with the performance of the public contract.**	
Justification of the appropriateness of the requirements on the list of important supplies. (The Contracting Authority is obliged to complete if the total requested financial value of all important supplies is at least three times the expected value of the public contract.)	The Contracting Authority **did not set** the requirement to submit a list of major supplies hence **they do not justify** the appropriateness of this requirement
Justification of the appropriateness of the requirement to submit a list of technicians or technical staff. (The Contracting Authority is obliged to complete if a list of more than 3 technicians or technical staff is required.)	The Contracting Authority **did not set** the requirement to submit a list of technicians or technical staff hence **they do not justify** the appropriateness of this requirement.

Justification of the appropriateness of the requirement for a description of the technical equipment and measures used by the supplier to ensure the quality and a description of facilities or equipment of the supplier appointed to perform research.	The Contracting Authority **did not set** the requirement to submit a description of technical equipment and measures used by the supplier to ensure the quality and a description of facilities or equipment of the supplier appointed to perform research hence **they do not justify** the appropriateness of this requirement.
Justification of the appropriateness of the requirement for the inspection of production capacity by the Contracting Authority or any other person on their behalf, or the inspection of measures relating to quality assurance and research.	The Contracting Authority **did not set** the requirement for the inspection of production capacity by the Contracting Authority or any other person on their behalf, or the inspection of measures relating to quality assurance and research hence **they do not justify** the appropriateness of this requirement.
Justification of the appropriateness of the requirement to submit samples, descriptions or photographs of supplied goods.	The Contracting Authority **did not set** the requirement to submit samples, descriptions or photographs of supplied goods hence **they do not justify** the appropriateness of this requirement.
Justification of the appropriateness of the requirement to submit documentary proof of compliance of the required product issued by a competent authority.	The Contracting Authority **did not set** the requirement to submit documentary proof of compliance of the required product issued by a competent authority hence **they do not justify** the appropriateness of this requirement.

Justification of defining the terms and conditions of the public supply contract and public service contract. **The Contracting Authority shall justify defining the terms and conditions of the public supply contract and public service contract in relation to their needs and the risks associated with the performance of the public contract.**	
Justification for defining terms and conditions providing longer period for payment of invoices over 30 days.	The Contracting Authority of this public contract **did not set** the period for payment of invoices longer than 30 days as a business condition hence **they do not justify** the appropriateness of this requirement.
Justification for defining terms and conditions specifying the requirement for liability insurance for damage caused by the contractor to third parties in excess of twice the estimated value of the public contract.	The Contracting Authority of this public contract **set** the **general** requirement for insurance for damage to the subject of purchase to the value of the subject of delivery.
Justification for defining terms and conditions requiring a bank guarantee higher than 5% of the value of the public contract.	The Contracting Authority of this public contract **did not set** this business condition hence **they do not justify** the appropriateness of this requirement.
Justification for defining terms and conditions requiring a warrantee period longer than 24 months.	The Contracting Authority of this public contract set the business condition requiring a warrantee period longer than 12 months. The Contracting Authority considers that this warranty as standard hence **they do not justify** the appropriateness of this requirement.

Justification for defining terms and conditions setting a penalty for delay of contractor greater than 0.2% of the estimated contract value for each day of delay.	In the case of a delay of the Contractor's compliance with the terms of delivery the Contractor shall be obliged to pay a contractual penalty in the amount of 70,000 CZK for each calendar day of delay, which is less than 0.2% of the estimated value of the public contract (39,000,000 CZK) hence the Contracting Authority **does not justify** the appropriateness of this requirement.
Justification for defining terms and conditions setting a contractual penalty for late payment of invoices by the Contracting Authority higher than 0.05% of the outstanding amount for each day of delay.	The Contracting Authority of this public contract **did not set** the business condition requiring a contractual penalty for late payment of invoices by the Contracting Authority higher than 0.05% of the outstanding amount for each day of delay hence **they do not justify** the appropriateness of this requirement.
Justification for defining further terms and conditions. The Contracting Authority shall justify defining the terms and conditions of the public supply contract and public service contract in relation to their needs and risks associated with the performance of the public contract. **<u>Subject of the Agreement</u>** **Time, place and method of supply of the subject of purchase**	**The terms and conditions of this public contract are defined in the form of a binding Purchase Agreement** specimen where the relevant terms and conditions are determined by the Contracting Authority in an entirely standard way based on their basic needs. **Below the Contracting Authority provides a non-exhaustive list of further terms and conditions and their justification, above and beyond the terms and conditions mentioned above:** A definition of the subject of the Purchase Agreement is dealt with in the terms and conditions by the basic technical description of the individual parts of the supply and also in the technical details with a reference to the attachment to the tender documentation entitled "Detailed technical specifications of the basic parameters of the hyperspectral systems" whose justification is made in a separate section of this document. The subject of the Agreement is defined in enough detail to eliminate any uncertainty during the delivery and acceptance of the delivery any confusion as to whether the transfer is completed by the Contractor or not. Fulfilment of the subject of purchase is required by the following deadlines: • Supply of aerial hyperspectral VNIR system no later than 10.4.2014 • Supply of aerial hyperspectral SWIR system no later than 10.11.2014 • Supply of aerial hyperspectral LWIR system no later than 10.11.2014 Installation of the hyperspectral systems is expected at Brno Airport - Tuřany. Training in the installation, maintenance, service and calibration will be performed in Brno (at the headquarters of the Contractual Authority). The delivery and acceptance of the supplies will also include a test flight to verify the functionality of the hyperspectral system. For an unambiguous determination of the deadlines and place of delivery and process of delivery and acceptance of the equipment sub-deadlines and other necessary data are stated in the terms and conditions. In this part of the terms and conditions the Contracting Authority specifies the deadlines, and qualitative and formal conditions, as well as the requirements which need to be met for the delivery as a whole to be considered functional, and therefore accepted by the Client as a properly completed and ready for operation.

Responsibilities of the Contractual Parties	This section of the terms and conditions defines and specifies the conditions and requirements for interoperability, Seller obligations and also all supplementary parts of the delivery included the prices. At the same time this section defines the statutory obligation of the Seller to submit a list of subcontractors, with the following text: The Seller shall submit to the Purchaser a list of subcontractors, stating those subcontractors to which they pay more than 10% of the total price of the tender (supply) for performance of their subcontract. The list of subcontractors shall be submitted to the Purchaser within 60 days of completion of the Agreement. In the event that the subcontractor is a joint stock company, an attachment to the list shall be a list of owners of shares with an aggregate nominal value exceeding 10% of capital completed within 90 days of the date of submission of the list of subcontractors. All these terms and conditions are solved logically and in a non-discriminatory manner and at the same time reflect the Contracting Authority's obligations pursuant to Article 147a) of the Act.
Purchase price	A definition of the content of the price of the supply is in the interests of legal certainty of both of the Contractual Parties about what is and is not included in the agreed price. The Contracting Authority sets in the terms and conditions not only the requirement to determine the total supply price, but for the above reasons requires a detailed calculation to be made by separating into the following: • Price of aerial hyperspectral VNIR system in CZK without VAT • Price of aerial hyperspectral SWIR system in CZK without VAT • Price of aerial hyperspectral LWIR system in CZK without VAT The payment terms set out the standard method of proforma and interim payments of the total price according to the extent of the actually performed deliveries (individual systems). These terms and conditions are in accordance with the conditions of the given market and at the same time divide the full payment into a proforma part and also based on the factual situation and deadlines during the course of the delivery.
Warranty period, liability for defects, claim conditions, confidentiality	The length of the required warranty period of 12 months is considered by the Contracting authority as being standard and quite common on the relevant market. In addition to the specified warranty period the terms and conditions describe in this part the principles of the claims process, the penalty in case of delay in the removal of defects and the obligations of both Contractual Parties in the event of removal of claimed defects. Without these terms and conditions the Contracting Authority could not be sure that the Contractor will repair any possible defects within a given deadline and thus compromise the scientific activities of the Contracting Authority.
Declarations, sanctions, fictitious delivery	For clear legal certainty of the Contracting Authority the Contractor is required in the terms and conditions to confirm the following, • it has no outstanding obligations, for which enforcement or execution could be held against it by a final court decision, or other title listed in Article 274 of the Civil Procedure Code, • it is not in a state of bankruptcy within the meaning of the Insolvency Act, as amended, it has not been declared bankrupt and at the time of signing this Agreement it has not filed for

	insolvency proceedings, nor is it in a position where he threatened with bankruptcy • it is not liable to pay tax and has no arrears with the state authorities of its departments. In addition to the above justified penalty for delay in completion of the supply as a whole the terms and conditions set out further partial penalties for e.g. falsity of information or for breach of the duty to convey messages that would have an impact on the accuracy of the data. This set of requirements and contractual penalties is, in the opinion of the Contracting Authority, not only standard but also justified, as it indicates the stability of the Contractor and enhances the legal certainty of the Contracting Authority that delivery will be properly fulfilled.
Withdrawal from the Agreement, force majeure	This part of the terms and conditions sets out the conditions under which the Contracting Authority and the Contractor may withdraw from the Agreement and also describes the procedure and the consequences of withdrawal as well as the law applied by both Contractual Parties. The provisions of the terms and conditions protect the Contracting Authority against any delay in fulfilling the delivery and any other substantial breaches of contractual terms by the Contractor, which could result in failure to fulfil the delivery within the agreed time and quality. This part also provides a list of examples of force majeure and the principles and procedures, if such an event occurs.
Other and final provisions	For the legal certainty of both Contractual Parties this final part of the terms and conditions includes the standard means of addressing rights and obligations not addressed in the Agreement, as well as the content of attachments, date of entry into effect of the Agreement and the conditions for its possible amendment. These terms and conditions are an instrument of the Contracting Authority to ensure possible withdrawal from the Agreement in the case the fulfilment of the supply is threatened and an instrument of the Contractor to ensure the agreed payment for the supply. **All further terms and conditions are set in accordance with market standards with regard to the nature of the provided performance.**
Justification of the definition of the technical conditions of the public contract pursuant to § 5 of the Decree If the Contracting Authority determines technical conditions of the public contract in the tender documents they shall justify defining the requirements in relation to their needs and the risks associated with the performance of the public contract.	
Hyperspectral systems Hyperspectral systems will be new, unused Hyperspectral systems will be designed for use in aircraft Hyperspectral systems will meet the detailed technical parameters Sensors will cover the visible, near infrared, mid and far infrared regions	Hyperspectral systems must meet the demands of aviation equipment. Detailed technical specifications are included in the tender documentation. Verbal description of the spectral range of each sensor

of the spectrum	
The number of sensors may not exceed four.	This limits the maximum number of sensors. Each sensor has its own specific properties and sensing geometry, thus there is disparity in the data they provide. Correction and data processing must be carried out specifically for each sensor. Processing of data for more sensors would become time consuming and computationally prohibitive.
A sensor shall be considered a single input device with a lens whose output is a hyperspectral data cube. If the device is capable of accurately geometrically co-registering e.g. VNIR and SWIR bands sensed by different chips into one hyperspectral data cube then it is a single sensor.	There are currently sensors that are capable of sensing data with a single lens, dividing VNIR and SWIR radiation, recording VNIR and SWIR radiation on different chips and subsequently co-registering VNIR and SWIR data in a single spatial matrix. Radiometric data are different, but raw data for VNIR and SWIR regions are geometrically co-registered into a single file. This equipment will be considered a single sensor.
In order to meet the parameters of the tender procedure it is possible to combine up to four sensors. If two of the same type of sensor will be placed side by side to enlarge the spatial frame the sensors must be mounted on a holder which will define the angle between the axes of the sensors. The holder must permit the sensors to be laboratory calibrated without being removed from the holder. The Contracting Authority shall allow variable geometry of the mutually attached sensors on the holder only in the case of precise calibration of the relative positions by the Contracting Authority.	Some sensors do not have a sufficient number of spatial pixels required detailed technical specifications. In this case, it is possible to create a set of two identical types of sensors, which will meet the required specifications. The assembly shall be attached to the structure/holder that will not prevent radiometric calibration. The sensors will be radiometrically calibrated without the need for recalibrating their mutual geometric positions.
VNIR and SWIR sensors can be mounted on a common structure together with an IMU and placed above the first sensor hole in the aircraft	The VNIR and SWIR sensors will be mounted on a common structure, whose movements are monitored by the IMU unit. The structure of the sensors will be placed above the first sensor hole.
LWIR sensor(s) will be placed on a structure together with a second IMU over the second sensor hole in the aircraft	The LWIR sensor(s) with the second IMU unit is positioned above the second sensor hole.
All Hyperspectral systems must be from the same manufacturer with the possibility to operate all sensors using a single interface by a single operator	Delivery of sensors from a single manufacturer is required because of the mutual compatibility of the systems. Operation of the sensors from one computer interface by a single operator. Options for servicing the systems in one place. Processing of data in a single type of program.
Accessories required for installation of the hyperspectral systems in the aircraft and their operation (monitor, cables, software, etc.) will be supplied together with the sensors	The hyperspectral systems must be supplied as a complete system designed for installation in aircraft.
Power of the hyperspectral systems will be onboard vehicle electrical system with the voltage of 28 V	The hyperspectral systems will operate in the aircraft with a vehicle system voltage of 28V.
Equipment for recording data will be	Solid state drives are significantly more resistant to vibration and are not dependent on the ambient pressure in comparison to traditional rotating

equipped with "solid state" drives.	drives.
The energy demands of all of the supplied hyperspectral systems when activated must be no more than 2200 W at any one time.	The energy demands of the hyperspectral systems shall not exceed the possibilities of the on-board network.
Sensors will be supplied including software for radiometric and geometric correction, whose outputs are compatible with the ENVI software. The output of the supplied software will be georeferenced hyperspectral data (including orthorectification) in values of radiance. If two of the same types of sensor will be placed side by side then the supplied software must enable the creation of a georeferenced file for raw and processed data (e.g. map outputs) from both sensors.	The sensors will be supplied as a comprehensive hyperspectral system including the software for processing the hyperspectral data. During the radiometric correction the raw data recorded by the hyperspectral system will be converted into radiance values. Correction of the geometric distortion of data is performed during the geometric correction and georeferencing while the scanned data is resampled into the coordinate system. In the case of two of the same types of sensor placed side by side the correction must be performed for each sensor separately. In this case, the supplier is required to solve the matching of data from both sensors.
Sensors will be supplied including spectral, radiometric and geometric calibration and calibration documentation	The sensors must be spectrally, radiometrically and geometrically calibrated.
Hyperspectral systems will allow precise synchronization of image data and IMU / GNSS data	Synchronization of image date and IMU/GNSS data is necessary for geometric correction and georeferencing.
Hyperspectral systems will be delivered including all accessories necessary for direct georeferencing of image data (IMU/GNSS, software, etc.). The functionality of all systems and software will be validated by a test flight and pre-processing of acquired data.	The hyperspectral systems must be supplied as a complete system, allowing scanning and processing of data (radiometric correction, georeferencing) after installation in an aircraft. The test flight will verify the functionality of all the systems in practice.
Bad pixels of the sensor matrix will be substituted by interpolated values during the calibration process. A bad pixel shows values which differ from the average pixels in the spectral band by more than min. 10% from the average values measured for a given spectral band during radiometric calibration by means of integration sphere/black body.	There may be defective pixels in the sensor matrix (chip) which must be replaced with values interpolated from neighbouring pixels. This description defines a defective pixel.
The delivery will include a calibration device (integrating sphere/black body) for laboratory radiometric calibration of all of the available sensors. The calibration device will allow sensors to be calibrated to the desired accuracy. The delivery will include everything needed to create radiometric calibration files and	To perform radiometric calibration of the sensors calibration files must be created using a calibration device. These files must be created at least at the beginning and end of the flight season. There is usually one calibration device for the VNIR and SWIR sensors and a separate one for the LWIR sensor. The Contractor shall provide everything needed to create calibration files and radiometric calibration of the scanned data.

perform radiometric correction of data. (software, etc.)	
The Contracting Authority requires the hyperspectral systems to be modified for data acquisition at heights of 5000 m above sea level in unpressurised aircraft.	The extent of the sensing area during a single flyover is dependent on the acquisition height. The hyperspectral systems will be placed in an unpressurized aircraft cabin. The possibility of operating the systems at altitudes above 3000 m will allow for better operational use of the sensors.
VNIR system	
Minimum spectral range of the sensor (the upper limit of the range can be lower, but the condition is the continuity of the spectral range of the SWIR sensor)	The required min. spectral range is 400-2400nm for a combination of VNIR and SWIR sensors; this is commonly used in remote sensing.
Maximum spectral step of individual bands (spectral sampling)	Spectral step limits the detail of the spectral analysis.
Minimum spectral resolution of FWHM (Full Width Half Maximum) of one band	Spectral resolution limits the detail of the spectral analysis.
Option for programmable merging of spectral bands (spectral binning)	Merging spectral bands increases the signal/noise ratio and allows adjustment to the amount of data according to the needs of the current application.
Viewing angle of the sensor must be 30 to 65 degrees	Small viewing angle (below 30 degrees) allows sensing only of a limited area - multiple flyovers. Big viewing angle (above 65 degrees) lowers the usability of the sensed data.
Minimum number of image (spatial) pixels	Number of image pixels affects the amount of data acquired during a single flyover. Less pixels - more flyovers. The increased number of flights increases the time required for data acquisition and thus significantly increases the financial demands of each of the flyovers. The extension of the time of the data acquisition reduces the likelihood of a successful acquisition of hyperspectral data of the area due to changes in atmospheric conditions (clouds), changes in the geometry of solar exposure or exceeding the operating time of the aircraft.
Minimum image coding (digitalized output)	Digitization of outputs affects the quality and scope of the recorded data.
Maximum spectral smile effect of the hyperspectral system	Smile effect causes spectral distortion.
Maximal spatial distortion “keystone effect” of the hyperspectral system	Keystone effect causes spatial distortion.
Minimum “Full Well” capacity of one detector	Full Well capacity of the detector affects the quality of the recorded data (noise, dynamic range).
Optical spot size/diameter in all wave lengths	Size of the optical spot limits the spectral and spatial sharpness of the acquired data. If the optical spot is large e.g. three pixels, then a pixel records a value relating to the two surrounding pixels. This reduces the actual sensor resolution.
	Size of the spatial resolution limits the detail of the surface analysis. The

Minimum spatial resolution that the sensor must be able to achieve at a speed of 110 knots and spectral step set between the bands to a max of 10nm.	spatial resolution is limited by the size of the data flow that the system is able to save.
Minimum accuracy with which it is possible to calibrate the sensor radiometrically using the equipment supplied for its calibration and also maximum difference between two calibrations performed before and after the flight	Radiometric stability of the system and accurate radiometric calibration are necessary for further processing of the sensed data.
Minimum accuracy of synchronization marks between image and IMU/GNSS data	Affects the accuracy of georeferencing. This is the exact timestamp when the data was scanned.
Maximum number of unsaved scan lines per 10 000 scanned lines	Loss of scanned data. It is usually caused by the inability of the recording equipment to accommodate the flow of data from the sensor.
Minimum temperature range in which the system can operate	Temperature range allowing operation in the aircraft.
Minimum storage capacity	Storage capacity limits the amount of data that can be sensed. The required storage capacity is sufficient for a standard 1-day campaign.
Option to change operative data disks for empty ones during the flight	Changing operative data disks allows large amounts of data to be sensed during one flight
Maximum number of bad pixels	Bad pixels lead to an inability to capture data from the given area.
Maximum dimensions of the sensor	The maximum dimensions of the system for operation in the acquired aircraft.
Maximum weight of the sensor	The maximum possible weight of the sensor for operation in the acquired aircraft.
Maximum weight of the control unit and recording equipment	The maximum possible weight of the recording equipment for operation in the acquired aircraft.
Construction insulated against vibration enabling joint assembly of VNIR, SWIR sensors and IMU units in the aircraft.	The construction is necessary for mounting the sensors on the plane.
SWIR system	
Minimum spectral range of the sensor. The lower limit of the range can be lower, but the condition is direct relation to the range of the VNIR sensor.	The required min. spectral range is 400-2400nm for a combination of VNIR and SWIR sensors; this is commonly used in remote sensing.
Maximum spectral step of individual bands (spectral	Spectral step limits the detail of the spectral analysis.

sampling)	
Minimum spectral resolution of FWHM (Full Width Half Maximum) of one band	Spectral resolution limits the detail of the spectral analysis.
Sensor must be mounted on a support frame in such a way that the VNIR, SWIR sensors are arranged in a row along the flight path and the distance between the optical centres of the lens is not greater than 0.25 m	Installing sensors on a combined construction allows simultaneous recording of both sensors from a single sensing hole.
Viewing angle of the sensor must be in the range of 30 to 45 degrees, while the viewing angle of the sensor must not differ by more than 5 degrees of visual angle of the VNIR sensor.	Small viewing angle (below 30 degrees) allows sensing only of a limited area - multiple flyovers. Big viewing angle (above 65 degrees) lowers the usability of the sensed data. The data acquired by the sensors will be analyzed simultaneously. Effective use of the data is possible only when both sensors sense the same area.
Minimum number of image (spatial) pixels	Number of image pixels affects the amount of data acquired during a single flyover. Less pixels - more flyovers. The increased number of flights increases the time required for data acquisition and thus significantly increases the financial demands of each of the flyovers. The extension of the time of the data acquisition reduces the likelihood of a successful acquisition of hyperspectral data of the area due to changes in atmospheric conditions (clouds), changes in the geometry of solar exposure or exceeding the operating time of the aircraft.
Minimum image coding (digitalized output)	Digitization of outputs affects the quality and scope of the recorded data.
Minimum “Full Well” capacity of one detector	Full Well capacity of the detector affects the quality of the recorded data (noise, dynamic range).
Optical spot size/diameter in all wave lengths	Size of the optical spot limits the spectral and spatial sharpness of the acquired data. If the optical spot is large e.g. three pixels, then a pixel records a value relating to the two surrounding pixels. This reduces the actual sensor resolution.
Maximum spectral smile effect of the hyperspectral system	Smile effect causes spectral distortion.
Maximal spatial distortion “keystone effect” of the hyperspectral system	Keystone effect causes spatial distortion.
Minimum spatial resolution that the sensor must be able to achieve at a speed of 110 knots and spectral step set between the bands to a max of 20nm.	Size of the spatial resolution limits the detail of the surface analysis. The spatial resolution is limited by the size of the data stream that the system is able to store.
Minimum accuracy with which it is possible to calibrate the sensor radiometrically using the equipment supplied for its calibration and also maximum difference between two	Radiometric stability of the system and accurate radiometric calibration are necessary for further processing of the sensed data.

calibrations performed before and after the flight.	
Minimum accuracy of synchronization marks between image and IMU/GNSS data	Affects the accuracy of georeferencing. This is the exact timestamp when the data was scanned.
Maximum rate of loss of data stored on the recording equipment	Loss of sensed data.
Minimum temperature range in which the system can operate	Temperature range allowing operation in the aircraft.
Minimum recording capacity	Storage capacity limits the amount of data that can be sensed. The required storage capacity is sufficient for a standard 1-day campaign.
Option to change operative data disks for empty ones during the flight	Changing operative data disks allows large amounts of data to be sensed during one flight.
Maximum number of bad pixels	Bad pixels lead to an inability to capture data from the given area.
Maximum dimensions of the sensor	The maximum dimensions of the system for operation in the acquired aircraft.
Maximum weight of the sensor	The maximum possible weight of the sensor for operation in the acquired aircraft.
Maximum weight of the control unit and recording equipment	The maximum possible weight of the recording equipment for operation in the acquired aircraft.
LWIR system	
Minimum spectral range of the sensor	The spectral range of the sensor covers the spectrum for remote sensing used for the acquisition and analysis of thermal data.
Maximum spectral step of individual bands (spectral sampling)	Spectral step limits the detail of the spectral analysis.
Minimum spectral resolution of FWHM (Full Width Half Maximum) of one band	Spectral resolution limits the detail of the spectral analysis.
Viewing angle of the sensor must be in the range of 30 to 65 degrees, while the viewing angle of the sensor must not differ by more than 5 degrees of visual angle of the VNIR sensor.	Small viewing angle (below 30 degrees) allows sensing only of a limited area - multiple flyovers. Big viewing angle (above 65 degrees) lowers the usability of the sensed data. The data acquired by the sensors will be analyzed simultaneously. Effective use of the data is possible only when both sensors sense the same area.
Minimum number of image (spatial) pixels	Number of image pixels affects the amount of data acquired during a single flyover. Less pixels - more flyovers. The increased number of flights increases the time required for data acquisition and thus significantly increases the financial demands of each of the flyovers. The extension of the time of the data acquisition reduces the likelihood of a successful acquisition of hyperspectral data of the area due to changes

	in atmospheric conditions (clouds), changes in the geometry of solar exposure or exceeding the operating time of the aircraft.
Minimum image coding (digitalized output)	Digitization of outputs affects the quality and scope of the recorded data.
Minimum "Full Well" capacity of one detector	Full Well capacity of the detector affects the quality of the recorded data (noise, dynamic range).
Optical spot size/diameter in all wave lengths	Size of the optical spot limits the spectral and spatial sharpness of the acquired data. If the optical spot is large e.g. three pixels, then a pixel records a value relating to the two surrounding pixels. This reduces the actual sensor resolution.
Maximum spectral smile effect of the hyperspectral system	Smile effect causes spectral distortion.
Maximal spatial distortion "keystone effect" of the hyperspectral system	Keystone effect causes spatial distortion.
Minimum spatial resolution that the sensor must be able to achieve at a speed of 110 knots and spectral step set between the bands to a max of 120nm.	Size of the spatial resolution limits the detail of the surface analysis.
Minimum accuracy with which it is possible to calibrate the sensor radiometrically using the equipment supplied for its calibration and also maximum difference between two calibrations performed before and after the flight.	Radiometric stability of the system and accurate radiometric calibration are necessary for further processing of the sensed data.
Minimum accuracy of synchronization marks between image and IMU/GNSS data	Affects the accuracy of georeferencing.
Maximum rate of loss of data stored on the recording equipment	Loss of sensed data.
Maximum energy consumption of the SWIR system	The maximum possible energy consumption of the system allowing operation in the acquired aircraft.
Minimum temperature range in which the system can operate	Temperature range allowing operation in the aircraft.
Minimum storage capacity	Storage capacity limits the amount of data that can be sensed.
Option to change operative data disks for empty ones during the flight	Changing operative data disks allows large amounts of data to be sensed during one flight.
Maximum number of bad pixels	Bad pixels lead to an inability to capture data from the given area.

Maximum dimensions of the sensor	The maximum dimensions of the system for operation in the acquired aircraft.
Maximum weight of the sensor	The maximum possible weight of the sensor for operation in the acquired aircraft.
Maximum weight of the control unit and recording equipment	The maximum possible weight of the recording equipment for operation in the acquired aircraft.
GNSS/IMU	
Signal reception and calculation of the position of the NAVSTAR GPS	The NAVSTAR GPS system is a basic long-established GNSS system.
Option to save the measured data and subsequent precisely process it in the supplied program (post-processing)	Post-processing provides more accurate processing of position data allowing sufficient quality of georeferencing of the image data from the sensors.
Min. memory for data storage	Storage capacity limits the amount of data that can be sensed. The required storage capacity is sufficient for a standard 1-day campaign.
Frequency of position sensing and orientation in space	For accurate georeferencing of image data the frequency of the position sensing must be higher than the frequency of image data sensing.
Accuracy of positioning with post-processing using a data reference station	The minimum positioning accuracy must be greater than half the size of a pixelon the surface. This ensures accuracy when resampling data into the coordinate system
Accuracy of the determination of pitch by post-processing	Affects the accuracy of georeferencing. The selected requirement guarantees the fulfilment of the required minimum accuracy of thge georeferencing (half the size of a pixel on the surface).
Accuracy of the determination of roll by post-processing	Affects the accuracy of georeferencing. The selected requirement guarantees the fulfilment of the required minimum accuracy of thge georeferencing (half the size of a pixel on the surface).
Accuracy of the determination of heading by post-processing	Affects the accuracy of georeferencing. The selected requirement guarantees the fulfilment of the required minimum accuracy of thge georeferencing (half the size of a pixel on the surface).
Output (RS232) for controlling gyrostabilization platform	Enables the transfer of information on the orientation of the aircraft in the space of the gyrostabilization platform which compensates for fluctuations.
Min. operating temperature range of the unit	Temperature range allowing operation of the system in the aircraft.
The delivery will include software for processing IMU/GNSS data and training of responsible persons from the Contracting Authority in the processing of navigation data (calculating trajectories, exporting IMU/GNSS data, etc)	Software and knowledge of its use are necessary for georeferencing the image data.
IMU / GNSS will be supplied separately for installation on sensor holders, but with a prepared interface for synchronization with sensors	Placing the IMU/GNSS outside the sensor body allows the unit to be used for other sensors. The interface is essential for synchronizing the IMU/GNSS and image data.

Justification for defining basic and partial evaluation criteria pursuant to § 6 paragraph of the Decree **The Contracting Authority shall justify defining basic and partial evaluation criteria in relation to their needs. The Contracting Authority shall justify the appropriateness of defining the partial evaluation criteria if they use the economic advantageousness of the tender proposal as an evaluation criterion and if the partial evaluation criterion of the bid price has a lower weight than (a) 60% for public service contracts, or (b) 80% for public supply contracts and construction work.**	
The basic evaluation criterion is the economic advantageousness of the tender proposal. Partial evaluation criteria were set by the Contracting Authority as follows:	
1. The total amount of the offer price without VAT – weight of 80%	**1.** An essential criterion for fulfilling the needs of the Contracting Authority is the low cost of the supply in full, which corresponds to the weight assigned to the appropriate partial evaluation criterion (80%).
2. The technical level of the offered performance and functional properties - weight of 20%	**2.** For the needs of the Contracting Authority and the relationship between the utility value and price another very important criterion is the technical level of the offered performance, in the sense that the parameters are met to the highest possible level in the parts of the supply which are essential in terms of the functional properties of the supply in question. The Contracting Authority for the purposes of the evaluation of this partial criterion compiled a list of technical parameters to be evaluated into a table with an exhaustive set of points for the amount (level) of parameters offered by the Tenderer. This table contains three groups of evaluated parameters, VNIR, SWIR and LWIR systems, whereby the following most suitable parameters will be evaluated in all three groups: 1. i offered number of sensors necessary to meet the basic technical parameters 2. ii. number of (spatial) pixels of each of the sensors The Contracting Authority considers these parameters essential for the following reasons: **ad i/** this parameter significantly affects the quality of data, the operability of the devices and the financial demands on maintenance of a larger number of scanners. To achieve the optimum number of spatial pixels a solution where two scanners with same bandwidth are coupled is acceptable. Such a solution is not as advantageous for the Contracting Authority because 1) It is very difficult, if not impossible, for both scanners to be mutually spectrally corrected so as to provide the same spectral response; 2) There will be two different geometries of the scanned data. The stated reasons underlie the disparity of scanned data, which can be partially suppressed by significantly more demanding additional data processing. They cannot be completely eliminated in order to achieve the quality of results comparable with those obtained from data acquired by a single sensor with the same number of spatial pixels.
3.	

	ad. ii./ this parameter significantly affects a) the financial demands of the data acquisition, because fewer spatial resolution means a longer flyover and the resulting significantly higher cost for data acquisition (i.e. cost of operation of the hyperspectral system and the costs of operating the aircraft in which the system is placed) b) worse quality of scanned data due to changes in light conditions for extended flyover periods, and a much higher risk of total nullification of the flyover due to cloud cover over a long period of scanning.

Justification of estimated value	
Justification of estimated value	The Contracting Authority set the estimated value of the public contract based on market research and experience with similar contracts.

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Prof. RNDr. Ing. Michal V. Marek, DrSc.
Director

Michal Marek

Digitálně podepsal Michal Marek
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