

JRC TECHNICAL REPORTS

TECHNICAL GUIDANCE

FOR **CWRS** ACCORDING TO THE COUNCIL REGULATION (EC) 1306/2013 (ARTICLES 6(B)21)
AND IN ITS IMPLEMENTING REGULATIONS NO 908/2014 (ARTICLE 26), NO 809/2014
(ARTICLES 24, 38, 39 AND 40), AND NO 2333/2015

HR IMAGE ACQUISITION SPECIFICATIONS

CAMPAIGN 2018

Text highlighted in YELLOW contains changes from 2017



SPOT 7, © Airbus DS

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Document history

Version	Date	Comment	Author
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1.1	30/05/2008	Final version after draft revision deadline 30/05/2008	ME, SPOT
1.2	02/04/2009	2009 Campaign update, introduction of RapidEye (RE)	ME, RapidEye
1.3	20/06/2009	Final review; edits figures, introduction of RE and completion of text for RE	PA
2.0	11/11/2011	Updates to European Union (EU) legislation references and to the administrative requirements (restriction to the use of circles for zone identification; insertion and updates of sensor features and products for THEOS, DMC (constellation), Formosat2 and RapidEye, sensor benchmarking references	JRC (PA, CA, EG, BV, SG, CA)
2.2	12/11/2012	Unit name updated. SPOT4 sensor will not be available after 10/01/2013; RapidEye not available for CwRS 2013. Addition of Resourcesat-2. Changes to previous versions in red. Image request – shapefiles. Changed text in intellectual property rights paragraph. Copyright terms updated	JRC (CA, EG, PA, CD)
3.0	20/02/2013	Rework of document to fit the framework contract for supply of satellite remote sensing (SRS) data and associated services in support to checks within the Common Agricultural Policy (CAP) – HR profile tender: high resolution (HR) sensor-independent ‘profile’	PA
3.1	04/07/2013	Final review	JRC (PA, EG, BV, ISM, AB, CD, CW)
3.2	28/08/2013	Edited feasibility chapter and reintroduced ortho image return	PA, CW
3.3	13/02/2014	Introduction of G-LIO.NET as workflow management tool for 2014 campaign	GDM
4.0	16/03/2014	Final review after HR profile KO meeting held 17-18/02/2014	PA, ISM, CW, JB
4.1	17/11/2014	Airbus review for Campaign 2015	Airbus
5.0	01/12/2014	Check, acceptance, and insertion of certain elements regarding iteration of specified area/shapefile/corrections; update of profiles, and complete check of document for the 2015 Campaign	JRC
5.1	17/12/2014	Minor updates based on Airbus comments (e.g. Haze flag as from HR-1), update of HR profiles	JRC
5.2	16/10/2015	Updates by Airbus for 2016 campaign, including insertion of image return tables	JRC
5.3	21/11/2015	Updates by JRC after meeting with EUSI, and AB (12/10/2015, and 29/10/2015)	JRC
6.0	01/03/2016	Finalisation after Member State’s (MS’s) administrations/contractors input	JRC
6.1	13/03/2017	Finalisation after KO meeting HHR image provider 02/03/2017; and JRC finalisation (including edits on feasibility)	AB/JRC
6.2	29/03/2017	Finalisation after HR feasibility implementation	JRC (PA, GDM)
7.0	20/11/2017	Update after campaign review meeting with Airbus; pre-IRs details; update of zone parameters; introduction of AW parameters; removal of autumn, winter, and HRB2 period; update of Feasibility chapter; update of profiles.	AB (MR, NR)/JRC (PA, BV, GDM, CW, JB)

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Abbreviations, acronyms and terms

Abbreviation/term	Explanation
AOI	Area of interest (of a control zone)
AR	Acquisition request
AW	Acquisition window
CA	Contracting authority
CAP	Common Agricultural Policy
CC	Cloud cover
Contractor	A contractor of the MS administration responsible for the CAP subsidy diagnosis of the MS using the SRS imagery; not to be confused with the successful tenderer of the framework contract signed in [1]
CwRS	Control with Remote Sensing
DEM	Digital elevation model
DG AGRI	Directorate General for Agriculture and Rural Development
DRA	Dynamic range adjustment
EC	European Commission
EFA	Ecological Focus Area
EPSG	European Petroleum Survey Group
EU	European Union
EULA	End-user licence agreement
FW contractor	The successful tenderer/s who has/have been awarded a FWC with the JRC as of [1] – the equivalent of same as IP (see below)
FWC	Framework contract
G ⁴ CAP	Final evolution of *LIO systems, available from August 2015 onwards; URL, and manual (4, 7)
GAEC	Good agricultural and environmental condition (CAP Cross Compliance)
GCP	Ground control point
GSD	Ground sampling distance, the nominal size of one sensor pixel projected onto the imaged surface
HHR	High High Resolution (SRS imagery)
HR	High Resolution (SRS imagery) - used also as generic term for high -resolution imagery in this document.t
IACS	Integrated Administration and Control System (CAP)
IDQA	Input Data Quality Assessment
IP(s)	Image Provider(s), in this document, considered the successful IP or successful consortium of image providers who has signed an FWC with the JRC as of [1] - in the text referred to in the text as FW contractor
JRC	Joint Research Centre of the European Commission EC
KO meeting	Kick-Off meeting
LioDotNet, G-LIO.NET, NG-LIO.NET, G ⁴ CAP	JRC web-based software for the management of image acquisition
MARS	Monitoring Agricultural Resources Unit, JRC IES
MS	Member State(s)
MS administration (or contractor)	MS administrations or appointed contractor/s of the MS administration responsible for the CAP subsidy diagnosis using the SRS imagery delivered by the JRC.
MSP	Multispectral

Abbreviation/term	Explanation
OTSC	On-the-spot checks
PAN	Panchromatic
Pre-IRs	Pre-image requests
PSH	Pansharpened
QC	Quality Control
QL(s)	Quick-Llook, reduced resolution browse image.
SRS	Satellite Remote Sensing
UTM	Universal Transverse Mercator
VHR	Very Hhigh Rresolution (SRS imagery)
WGS 84	World Geodetic System 19845

1. Introduction

1.1 HR (i.e. HHR profile) image acquisition for the CAP checks programme

- 1.1.1 Since 1993, the Directorate-General for Agriculture and Rural Development (DG AGRI) has promoted the use of 'Control with Remote Sensing' (CwRS) as an appropriate control system suitable for checking whether or not aid is granted correctly. The legal basis of CwRS is Council Regulation (EC) 1306/2013 (Article 6(b), 21) and in its implementing Regulations No 908/2014 (Article 26), No 809/2014 (Articles 24, 38, 39 and 40) and No 2333/2015 [2]. On this basis, the European Commission (EC) Services are required to centralise satellite remote sensing (SRS) image acquisition. This task was transferred to the Joint Research Centre of the European Commission (JRC) in 1998 (September 1998/VI/34942) and it is managed through a horizontal co-delegation (Type I) between DG AGRI and the JRC (via the Directorate-General for Budget) (internal ref. Ares (2015)1215220) to implement the yearly Common Agricultural Policy (CAP) image acquisition work programme.
- 1.1.2 Regarding the timing of the operations, Commission Implementing Regulation (EU) No 908/2014, mentioned above, in Article 26, says:
1. For the purposes of Article 21 of Regulation (EU) No 1306/2013, each Member State shall inform the Commission by 1 November of each year at the latest, as to: (a) whether it wishes the Commission to acquire the satellite images necessary for its programme of checks and/or for its Land Parcel Identification System Quality Assessment; (b) the area to be checked and the number of planned control zones.
 2. Member States requesting the Commission to obtain the satellite images shall finalise, in cooperation with the latter and before 15 January following the communication of information referred to paragraph 1, the zones to be covered and the timetable for obtaining those images.
- 1.1.3 High-resolution (HR) imagery may be used in the CwRS Programme (in addition to very high resolution (VHR) imagery) for crop and/or land use identification, to check if the requirement of keeping the land in good agricultural and environmental condition (GAEC) is maintained and for further checks of the new 'greening' requirements defined in the CAP reform implemented as of 2015. A series of images over the control zones suitably acquired during the crop cycle is supplied to the MS administrations (or their contractors) for them to fulfil their area-based subsidy control in accordance with EC Regulation 809/2014 [2]. The control methods are further described in the document 'Guidance for on the-spot checks and area measurement' [3].
- 1.1.4 Since the 2014 Campaign, the detailed management of HR image acquisitions – to cover the correct areas required for the CAP checks at the correct times of the growing season – has passed to industry to carry out under the quality control (QC) of the JRC. This choice has been made because there are currently several suppliers of satellite remote sensing (SRS) imagery that have proven competency in supplying efficiently the imagery needed for the CAP checks, adhering to JRC quality specifications.
- 1.1.5 There may be one or more framework (FW) contractors appointed by the contracting authority, the JRC, to manage the HR image acquisition. In these specifications, the image provider (IP) therefore refers to the FW

contractor(s), with which the JRC has signed a framework contract (FWC). Currently, Airbus DS GEO SA holds the contract for high-high resolution (HHR) profile [1].

1.2 Objectives, referencing and structure of this document

- 1.2.1 This document defines the HR profile-based and HHR profile-based specifications to be used within the CAP checks programme. Its objective is to give the stakeholders¹ clarity regarding the technical details of the process of SRS image acquisition (see Figure 1).
- 1.2.2 The JRC has an overarching role to be responsible for the functioning of the FWCs and for the QC of the operations, while most of the interaction necessary within the image acquisition process takes place between the FW contractor and the MS administrations (or their contractors) performing the CAP checks. These specifications are intended to describe these interactions.
- 1.2.3 This document is available in the documentation section of the G⁴CAP Web application [4].
- 1.2.4 Several references are made here to 'Guidance for on the-spot checks and area measurement' [3], to the Guidelines for Best Practice and Quality Checking of Ortho Imagery [5] and to the VHR profile-based specifications [6], which should be used in conjunction with the present document. Reference is also made to the terms and conditions of the FWCs for image procurement with the JRC [1].

¹The stakeholders, or actors, are the JRC, DG AGRI and the FW Contractor/s acting as IPs and operators, and the MS administrations (or their contractor) performing the CAP checks.

1.2.5 Figure 1 depicts the overall process of the SRS image acquisition process, split into macro-actions and coloured by the function of the type of user responsible for the single macro-action. This document tries to follow the same flow as that shown here.

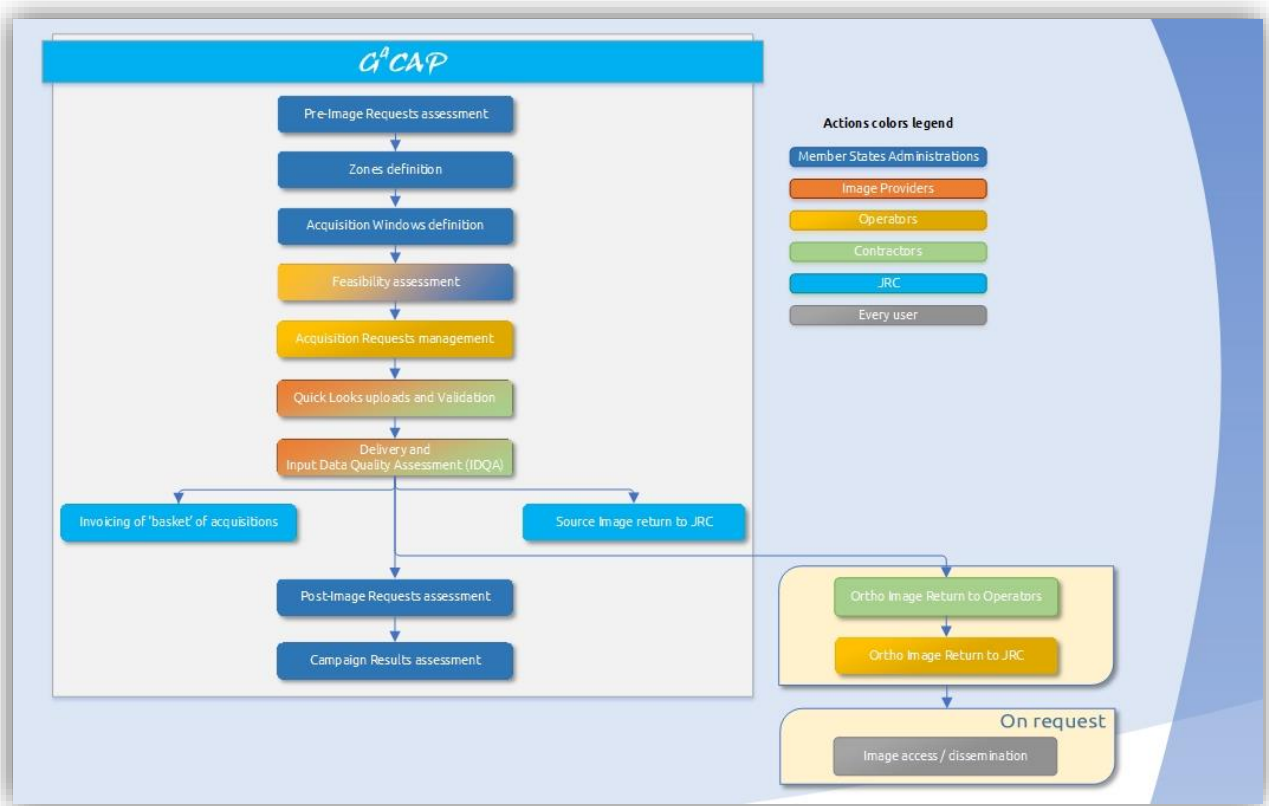


Figure 1 - The structure of this document and the SRS image acquisition process

1.3 G⁴CAP

1.3.1 Reference is made to the VHR profile-based image acquisition specifications for the CAP checks (see section 1.3 in [6]), regarding the G⁴CAP system. See the G⁴CAP manual [7].

1.3.2 It is compulsory for all the stakeholders involved in the CAP checks to use G⁴CAP.

2. Pre-image request

- 2.1.1 Reference is made to the VHR profile-based image acquisition specifications for the CAP checks [6], chapter 2, regarding the pre-image requests (pre-IRs). As the cited chapter says, the pre-IRs give the JRC information on:
- basic on-the-spot check (OTS) information;
 - basic CwRS information;
 - details of planned CwRS methods, with relevant justifications;
 - VHR/HR profiles requests (for each type of profile, see chapter 13, and [6]).

3. Data Requests

3.1 General

- 3.1.1 Reference is made to the VHR profile-based image acquisition specifications for the CAP checks [6], chapter 2, regarding general information on data request [6], section 3.1.

3.2 Zone definition

- 3.2.1 Reference is made to the VHR profile-based image acquisition specifications for the CAP checks [6], section 3.2, regarding the CwRS zone or area of interest (AOI).
- 3.2.2 The swath of the HR satellite sensors is usually not a constraint in the HR image acquisition, since scene sizes are significantly larger than the control zones. However, if it is a constraint, the same rules apply to such HHR sensors' acquisitions as to the VHR sensors [6], section 3.3.2, aiming to acquire the zone in as few acquisitions as possible.
- 3.2.3 In summary, the relevant zone parameters to be uploaded/inserted in G⁴CAP are:
- control zone shapefile (specifications as described above and in [6], section 3.2);
 - zone name (≤ 5 characters); this must be unique for the whole Campaign and shall not include special country-specific characters such as 'é', 'Ç', etc. (i.e. only ISO basic Latin characters and numbers allowed);
 - European Petroleum Survey Group (EPSG) code (optional); this is the final output national projection used by the MS. Currently, this is relevant to HR image acquisitions only if the HHR ORTHO profile is requested (i.e. the HHR F2 profile).
- 3.2.4 If an ORTHO profile² is requested the MS administration will choose the cartographic projection to be used (pull-down menu will be shown in G⁴CAP). If no specific projection is chosen, the default Universal Transverse Mercator (UTM), WGS 84 will be used by the IP FW contractor(s).

² For further information see <http://www.intelligence-airbusds.com/en/4594-spot-67-products-and-Chapter-13-on-HR-Profiles>.

3.2.5 If a pansharpener (PSH) product mode is requested, it will be delivered as an orthorectified product and the rule for the projection is as explained above in the previous item.

3.3 Acquisition window definition

- 3.3.1 An acquisition window (AW) is the time interval in which the HR satellites are tasked. One AW before and one or two AWs after the VHR AWs are normally defined within the crop season (see 2.1.5 in [6]). More AWs may be defined in accordance with the JRC if cross-compliance and GAEC or 'greening' requirements need to be controlled. Such HR AWs can also lie between two VHR AWs (see HRB1 below). The minimum HR AW length is **4 weeks, preferably longer (6 weeks)** and the HR AWs must have at least a **1-week** dead period, that is, the minimum time between the last acquisition in the previous AW and the new AW.
- 3.3.2 It should be mentioned that the MS administrations should make correct use of the earliest/latest start dates of their HR AWs to fit with their crop calendars. This is of great importance, since the correct use of these dates gives the best basis for feasibility and the best likelihood of acquisition success (Chapter 4: Feasibility).
- 3.3.1 The number of multi-temporal HR images tasked over a control zone may vary depending on MS control strategy and agriculture. MS administrations need to justify their choices in the pre-IRs (chapter 2) and the JRC needs to accept this information.
- 3.3.2 Only one HR period (AW) between the two VHR periods is accepted. This period is called HRB1 and can be defined only if there are two VHR AWs. The previously used HRB2 AW (i.e. a second HR AW between two VHR periods) has been removed.
- 3.3.3 The HR AWs are named as follows: HR-1, HRB1, HR+1, HR+2 and HR+3. It should be mentioned that the previously used autumn and winter periods shall, as of Campaign 2018, be replaced with Copernicus free-of-charge S1/S2 imagery. The MS administration is welcome to use the S2alert function of G⁴CAP to receive appropriate alerts when imagery (service available for S2 only) has been collected over its zone, in any relevant AW or time gap. Thereafter, the MS administrations will, however, handle download of imagery (e.g. from ESA or other archives) individually. G⁴CAP provides a direct link for download from ESA SCIHUB.
- 3.3.4 For early spring (HR-1) AWs or very late HR+ AWs, the JRC suggests defining them only if the sun angle is above 20 degrees, to ensure sufficient contrast and to minimise the effect of shadows. The FW contractor is informed that validated imagery, that is, cloud cover $\leq 1\%$, will not be accepted if quick-looks (QLs) are not interpretable (e.g. too dark).
- 3.3.5 In general, only perennial snow is allowed in any validated imagery and it is the MS administration's task to warn the IP/operator (FW contractor) in due time in the event of extraordinary weather conditions (e.g. snow) so that the AW can be moved. If there is no notice given by MS administration, and if in doubt, the FW contractor shall upload a snow-covered image as validated but with the special 'meteo' flag [6], chapter 7. Please also refer to the VHR profile-based specifications [6], chapter 3, for details regarding changes in AWs

due to climatic conditions, in which case the MS administrations should inform the FW contractor in due time if a AW needs to be moved.

- 3.3.6 If overlap between HR-1 and VHR AW occurs after import of final dates after feasibility assessment (in exceptional circumstances there is, for example, the possibility of changing by ± 3 days to adjust the optimum number of passes), the HR-1 AW will be shifted to prevent overlap. The shift will also imply modifying the starting date of the HR-1, so that the length of AW remains as before. If the acquisition request (AR) for the HR-1 AW has been already opened, it will close and open again according to the shifted dates. The same operations may be needed for the ending dates. When, therefore, the start of an HRB1 or HR+1 AW is delayed by the VHR feasibility result, the HRB1 or HR+1 AW end date will also be delayed by the same number of days. This process will be automatically checked by G⁴CAP.
- 3.3.7 Moreover, if the VHR AW is extended by the MS administration (or its contractors) as a result of lack or incomplete coverage of the control zone (e.g. due to adverse weather conditions), the subsequent HR AW's opening and closing dates will change by the same number of days to allow the HR AW to last for the same time as originally defined. This process will be automatically managed by G⁴CAP.
- 3.3.8 If an HRB1 AW comes to an end without acquisition, it can be extended only if a dead period is possible before the subsequent VHR2 AW opening. If this limit is exceeded, the HRB1 will be considered failed or partially acquired.
- 3.3.9 In the event of an aerial VHR, it is important that the MS administration (or its contractors) enter its acquisition date in the aerial AWs management module in G⁴CAP to trigger the definition of the starting date of any subsequent HR AW.
- 3.3.10 When HR imagery has been acquired by the HR FW contractor and has been accepted by the MS administration (or its contractors) for a given AW, the AW will be closed automatically in G⁴CAP.
- 3.3.11 If no image has been acquired at the end of the HR AW, or if the whole area has not been acquired, the MS administration (or its contractors) can request an archive search for the period of the AW or earlier if applicable.
- 3.3.12 In the case of an HR-1 period, the AW may be extended up to the opening of the VHR AW or the start date of the aerial photo flight. In the cases of HR+1, HR+2 and HR+3, AWs can be extended until the image has been acquired or until the MS administration (or its contractors) indicates that the AR should be considered failed. In these cases, it is strongly advised to use Copernicus S1/S2 imagery.
- 3.3.13 If the VHR image is acquired late in the AW, the MS administration (or its contractors) may request an archive search for a suitable HR image acquired during the first part of the VHR AW. The FW contractor should obtain permission from the JRC before such an SRS image is approved and can be delivered. Even in this case, it is strongly advised to use Copernicus S1/S2 imagery.
- 3.3.14 Further to the above, see the VHR Specifications for the CAP checks [6], chapter 3: Acquisition window definition, sections 3.3.16 to 3.3.22.

3.3.15 The relevant AW parameters are therefore summarised as follows (each AW is identified in G⁴CAP by a unique integer value called an ID):

- period: HR-1, HRB1, HR+1, HR+2, HR+3;
- image profile (see Table 1);
- start and end dates;
- previous AW, where applicable;
- image mode: Bundle/PSH³/Multispectral (MSP)/Panchromatic (PAN) (possible choices are dependent on chosen image profile);
- delivery method: DVD/file transfer protocol (FTP)
- possibility of automatic extension of AW

³ Please note that pansharpened mode exist only as ortho product; see Table 1

4. Feasibility

4.1.1 Please see the VHR specification [6], chapter 4; the relevant paragraphs valid for the HR feasibility are 4.1.1 to 4.1.5 and 4.1.12 to 4.1.15.

4.1.2 The main difference between HR and VHR feasibility is that the HR AWs, except HR-1, are not known, since they depend on a preceding VHR or aerial acquisition. Therefore, the FW contractor should first check the correctness of the AW (e.g. that the AW is placed correctly in time and that there is enough time for it to fit between any already defined AWs) and that the MS administration is making the correct use of the earliest/latest starting dates (e.g. if the MS administration is systematically setting these as equal to each other, the MS administration should be contacted). Any iterations can take place with the MS administrations in this respect. The only time that the earliest start date and the latest start date should be same is if a VHR2 AW has been removed in favour of an HHR profile acquisition to allow for a fixed AW (setting in G⁴CAP AW module the earliest and latest start date to the same date and AW length to, for instance, 6 weeks).

4.1.3 Thereafter, the Feasibility module in G⁴CAP regarding these ‘floating’ HRB1 and HR+ AWs will allow the FW contractor to interact with the MS administration, giving it two results, each with the possible values GOOD, MEDIUM, LOW (GREEN, YELLOW, RED) and any suggestions of changes:

- the maximum possible length of the AW, that is, from earliest start date to latest start date plus AW length, unless a VHR AW is starting before that date, in which case the end date would be the day before the start of that VHR AW – result 1 (‘best case’);
- the minimum possible length of the AW, that is, from latest start date of AW to window length, unless a VHR AW is starting before that date, in which case the end date would be the day before the start of that VHR AW – result 2 (‘worst case’).

G⁴CAP AWs exported to perform the feasibility assessment will automatically include these ‘best case’ and ‘worst case’ dates, to avoid creating confusion for the FW contractor and giving them responsibility for determining these scenarios.

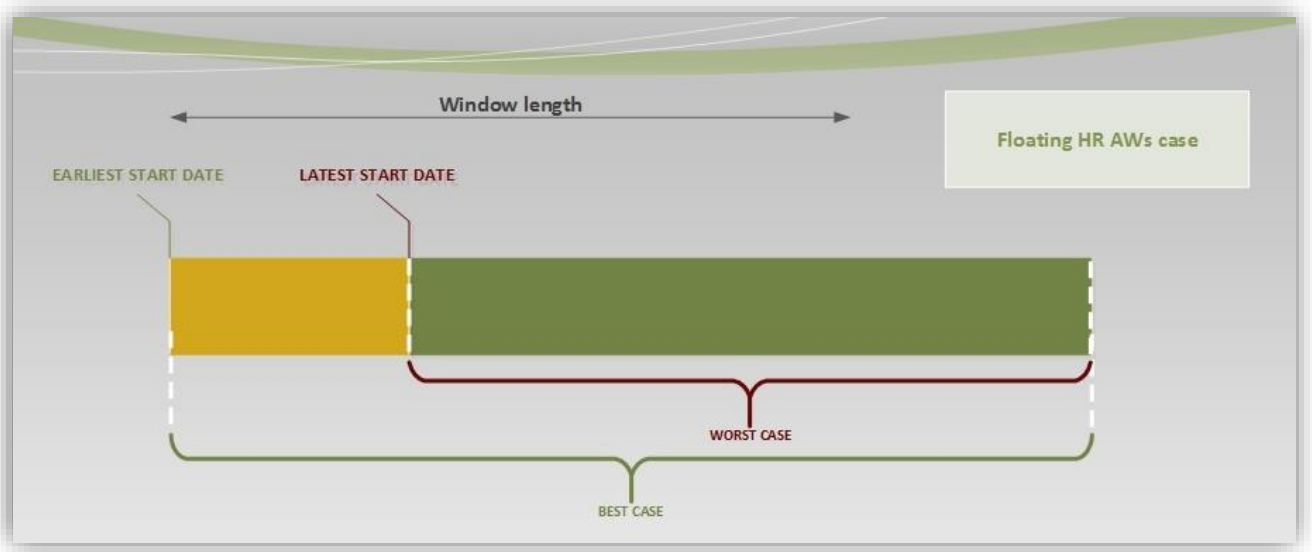


Figure 2 – Floating HR AWs feasibility cases

- 4.1.4 Therefore, for the HR-1 AW, a VHR feasibility approach is followed [6], chapter 4, starting from initially requested AWs. Extended dates will be optional in the case of MEDIUM and compulsory in the case of LOW feasibility results.
- 4.1.5 The above procedure will give MS administrations the best basis for accepting a feasibility proposal from the FW contractor. At the end of this procedure, it will therefore be up to the MS administration to accept or reject the proposal within the constraints of adjacent AWs and crop calendars.

5. Acquisition request

- 5.1.1 Reference is made to the VHR specifications for the CAP checks [6], chapter 5.

6. Quick-look upload

- 6.1.1 Reference is made to the VHR specifications for the CAP checks [6], chapter 6.
- 6.1.2 The use of the 'MeteoFlag' is also mandatory for HR images [6], chapter 7; section 7.1.7.
- 6.1.3 The FW contractor is requested to upload SRS image QLs to best fit the shapefile provided by the MS administrations (or their contractors), with the minimum possible surface excess. As for VHR imagery, also in the case of HR imagery, depending on the sensor swath, more than one acquisition can be uploaded for a unique zone (see section 3.2.2).

7. Acquisition acceptance – validation

- 7.1.1 Acquisition acceptance or validation is performed on the QLs uploaded by the FW contractor. The procedure follows the same process as described in the VHR Specifications [6], chapter 7, except that cloud cover (CC) thresholds for HR acceptance varies.
- 7.1.2 For an HR zone and each open AW, the QL uploaded by the FW contractor with cloud cover $\leq 1\%$ is considered **Validated**. For low sun angle imagery, please refer also to section 3.3.4.
- 7.1.3 If the AOI has cloud cover $> 1\%$, dense haze, etc., then:
- if cloud cover over the AOI is $\leq 5\%$, the QL of the HR/HHR profile image is uploaded as **Proposed** in G⁴CAP by the FW contractor; upon acceptance by the MS administration (or its contractors), the FW contractor may close the AR; upon rejection, the FW contractor shall continue tasking;
 - if $5\% < \text{cloud cover} \leq 20\%$, the image is **Retained**; the MS administration (or its contractors) shall accept the image as soon as possible if it is usable for the CAP checks, but the FW contractor will continue tasking until such acceptance is received;
 - if cloud cover is $> 20\%$, the FW contractor should not upload the QLs. In exceptional cases, only at the request of the MS administration (or contractor), such QLs may be uploaded (e.g. when an AW has come to an end without a validated acquisition).
- 7.1.4 MS administrations (or contractors) should accept/reject proposed/retained SRS imagery in G⁴CAP within 3 working days after upload.

8. Ordering

- 8.1.1 Ordering follows the procedures set up in the FWC signed by the FW contractor and the JRC [1]. This is managed by the signature of specific contracts (SCs) within the FWC.

9. Delivery

- 9.1.1 See the VHR specifications for the CAP checks [6], chapter 9.

10. Input data quality assessment

- 10.1.1 See the VHR profile-based image specifications for the CAP checks [6], chapter 10.

11. Pricing and invoicing

- 11.1.1 See the VHR specifications for the CAP checks [6] and FCs [1].

12. Image data provision to the JRC (image-return) and image access

12.1 HR/HHR Image data provision to JRC by FW contractor

12.1.1 See the VHR specifications for the CAP checks [6], sections 12.1, 12.2 and 12.3.

12.2 HR Image Access

12.2.1 See the VHR profile-based image specifications for the CAP checks [6], section 12.4.

12.2.2 The JRC purchases a limited right of use, but the images themselves remain the property of the FW contractor. In addition, according to the end-user licence agreement (EULA) [8], paragraph 6 on intellectual property rights, imagery must have proper references. When using the imagery, the licensee must refer to the supplier with the exact display of the credits as specified in the product's metadata which will take the form:

'© owner or supplier name or mission name (year of acquisition, or validity of Framework Contract), all rights reserved)'.

In addition, the end user should indicate the following information:

'Data received via the Joint Research Centre of the European Commission under FWC xxx.yyy'

where the FWC number is available from the JRC.

12.2.3 For the presently running FWC 389.912, and FWC 198.995 [1] with Airbus DS GEO SA, the first sentence above shall be substituted with:

- Spot 6/7 © Airbus DS (year of acquisition)

13. HR image profiles

13.1 Profiles

13.1.1 A summary of the profile characteristics is given in Table 1.

Table 1 – HR and HHR profiles adopted within the CAP checks

Image Profile ID	Description	Spatial Resolution	Radiometric resolution (*) and spectral bands		abs. 1-D RMSE	Cloud Cover (CC) over AOI	Acquisition programming	Remarks	Example of sensors
F1. HHR prime - CwRS [HHR]	Pan+Multispectral (Bundle)	GSD ≤ 3m	4 bands including B, G, R, NIR	> 50 deg	x,y ≤ 5m	≤ 1% validated (profile F11) ≤ 5% proposed (profile F12) ≤ 20% retained (profile F13) archive (profile F14)	Priority programming (excluded F14)		SPOT 6/7
		GSD ≤ 12m							
F2. HHR prime - CwRS [ORTHO]	Pan+Multispectral (Bundle)	GSD ≤ 3m	4 bands including B, G, R, NIR	> 50 deg	x,y ≤ 5m	≤ 1% validated (profile F21) ≤ 5% proposed (profile F22) ≤ 20 % retained (profile F23) archive (profile F24)	Priority programming (excluded F24)	Ortho rectified using Ref3D	SPOT 6/7
		GSD ≤ 12m							
	Multispectral	GSD ≤ 12m			x,y ≤ 1.5 x GSD (MSP)				
	Pan-sharpened	GSD ≤ 3m			x,y ≤ 5m				

(*) - minimum 8 bits/pixel, preferably 11-12.

(**) - SPOT5 will be de-commissioned in March 2015

13.1.2 When the MS administration selects its profile in G⁴CAP, it will therefore choose HHR prime profiles as F1, or F2, and will be served by the following sensors:

- F1 - HHR prime Bundle – Spot 6 and 7; this profile is available as a bundle, which includes all bands both PAN and MSP;
- F2 - HHR prime Ortho – Spot 6 and 7. For cartographic projections available, please refer to section 3.2.3 or options implemented in G⁴CAP; this profile is available as a bundle, MSP and PSH.

13.1.3 For a complete description of image-processing levels and data formats, please consult the technical documentation regarding respective sensors (section 18.4).

13.1.4 For satellite benchmarks pls. see references (9, 10, 11, 12)

14. Quality assurance / quality control

14.1.1 See the VHR specifications for the CAP checks [6], chapter 14.

15. Risk of satellite failure

15.1.1 See the VHR specifications for the CAP checks [6], chapter 15.

16. JRC responsible staff and e-mail addresses

16.1.1 Directorate D Sustainable Resources/Unit D.5/image acquisition: par-johan.astrand@ec.europa.eu.

16.1.2 Directorate D Sustainable Resources/Unit D.5/contractual FWC: philippe.loudjani@ec.europa.eu.

17. References

- 1 FWs for SRS imagery purchase administered by the JRC:
 - a) Framework contracts for supply of SRS data and associated services in support to checks within the CAP; (1) VHR profile II FWC 931.886, VHR+ profile FWC 199.309, with **European Space Imaging** GmbH; (2) HHR profile FWC 198.995 with **Airbus Defence and Space**.
 - b) Framework contract for supply of any type of satellite remote sensing data; Broker FWC 391.782.
- 2 Access to European Union law. Available online: <http://eur-lex.europa.eu/homepage.html>
- 3 Technical guidance document (Campaign 2017) for On-The-Spot Checks (OTSC) and area measurement; Technical guidance document on the On-The-Spot Check of Crop Diversification requirements; Technical guidance document on the On-The-Spot Check of Ecological Focus Areas requirements. Available online: https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Main_Page
- 4 G⁴CAP. Available online: <https://g4cap.jrc.ec.europa.eu>
- 5 Kapnias, D., Milenov, P. and Kay, S., *Guidelines for best practice and quality checking of ortho imagery*, Issue 3.0. Available online: <https://g4cap.jrc.ec.europa.eu/g4cap/Portals/0/Documents/10133.pdf>
- 6 VHR profile-based technical specifications. See Documentation section in G⁴CAP.
- 7 G⁴CAP manual. Available online: <https://g4cap.jrc.ec.europa.eu/g4cap/Portals/0/Documents/G4CAP%20user%20manual%201.2.pdf?ver=2016-02-03-110656-263>
- 8 Satellite Remote Sensing Data EULA. Available online: <https://g4cap.jrc.ec.europa.eu/g4cap/EULA.htm>
- 9 Benchmarking THEOS
 - a) Nowak Da Costa, J. K. and Åstrand P. J., WorldView-2, GeoEye-1, Cartosat-2, Kompsat-2, RapidEye and THEOS image. JRC Oral presentation (Cat3.4 JRC60286 JRC IPSC/G03/C/JNO/jno D(2010)(12136), Int. ref file: //S:\FMPArchive\C\12136.ppt), MARS Unit's GEOCAP Action's Control Methods Workshop – 2010 campaign; 13-14 April 2010, Ispra, Italy.
 - b) Walczynska, A. and Nowak Da Costa, J. K., THEOS Geometric Image Quality Testing – Initial Findings, JRC Scientific and Technical Report (Category 2.2 no. 24655 EN, ISSN 1831-9424, ISBN 978-92-79-18908-1. JRC PUBSY No JRC61992, 2010. <http://publications.jrc.ec.europa.eu/repository/handle/JRC61992>
 - c) Nowak Da Costa, J. K. and Walczynska, A. Evaluating the WorldView-2, GeoEye-1, DMCI, THEOS and KOMPSAT-2 imagery for use in the Common Agricultural Policy Control with Remote Sensing Programme, oral presentation (JRC61995), 16th Conference on 'Geomatics in support of the CAP', GeoCAP Action of the MARS Unit, IPSC, DG JRC (organiser), 24 November 2010, Bergamo, Italy, 2010..
- 10 Nowak Da Costa, J. K. and Walczynska, A., THEOS Geometric Quality Assessment for use in the Common Agricultural Policy control, 16th Conference on 'Geomatics in support of the CAP', JRC PUBSY No JRC61994, Category 3.5, 24–26 November 2010, Bergamo, Italy.
- 11 Benchmarking SPOT7 (PUBSY JRC93987, EUR 27063, ISBN 978-92-79-45053-2, ISSN 1831-9424 doi:10.2788/17914]. Available online: <http://publications.jrc.ec.europa.eu/repository/handle/JRC93987> (details for SPOT 6 (JRC82314); <http://publications.jrc.ec.europa.eu/repository/handle/JRC82314>).

- 12 Vajsova, B. and Åstrand, P., *New sensors benchmark report on Sentinel-2B. Geometric benchmarking over Maussane test site for CAP purposes*, (PUBSY JRC107674, EUR 28760 EN, ISBN 978-92-79-73186-0, ISSN 1831-9424, doi: 10.2760/419553), 2017. Available online: <http://publications.jrc.ec.europa.eu/repository/handle/JRC107674>

18. Annexes

18.1 XML metadata file specification for image providers used for the QL upload

18.1.1 See the VHR specifications [6], Annex 19.1.

18.4 HHR/HR sensor details

SPOT6/7	
Satellite specification	
Launch information	Date: SPOT 6: 9/09/2012 Date: Spot 7: 30/06/2014 Launch Vehicle: PSLV C23 Launch Site: ISRO, India
Orbit	Altitude: 694 km Type: Sun-synchronous, 10.00 a.m. descending node Period: 98,79 minutes
Sensor bands	PAN: 450–745 nm 4 MSP: Blue: 450–520 nm Green: 530–590 nm Red: 625–695 nm NIR: 760–890 nm
Sensor resolution ground sampling distance	PAN: 1.5 m at nadir MSP: 6 m at nadir
Dynamic range	12 bits per pixel
Swath width	60 km at nadir
Retargeting agility	Time to slew 30° in every direction: 14 seconds (stabilisation time included)
Max contiguous area collected in a single pass (at 30° ONA)	60 × 600 km mono
Revisit frequency	3.5 days at 30° off-nadir
Geolocation accuracy (CE90)	35m CE90 without ground control and up to 30° 10m CE90 for orthorectified products when Reference3D available
Product specification	
Tasking level	Priority tasking
Product options	Level primary Level ortho (Elevation 30 (Reference 3D))
Spectral combinations	PAN, MSP, Bundle and PSH
Resolution	PAN: 0.7 m MSP: 2.8 m
CC	Cloud cover 'validated': 0 to ≤ 10%; 'proposed': 10% < CC ≤ 30%;
Resampling kernel	Cubic convolution, nearest neighbours
Format	DIMAP V2 containing a JPEG 2000/GeoTIFF image file
Dynamic range adjustment (DRA)	Off (optional)
Bit depth	12 bit for JPEG2000 and 16 bit for GeoTIFF
Projection/datum	UTM/WGS 84 (default)
Tiling	km ²
Delivery medium	DVD or FTP

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