**Project: Solar Orbiter SWA**

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**TITLE: SWA Commanding System Procedure**

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# Introduction

## Purpose and Scope

This SWA commanding description document describes the entire Solar Wind Analyser (SWA) in-flight commanding system. It includes descriptions of the complete chain that produces the Instrument Operation Requests (IOR) that are supplied to the Mission Operating Centre (MOC) by the SWA Operations Team (OT) based at MSSL.

# Normative References

The documents listed below form a part of this document, to the extent specified and described herein.

|  |  |  |
| --- | --- | --- |
| **Ref.** | **No** | **Title** |
|  |  |  |
|  |  |  |
|  |  |  |

## Acronyms, Abbreviations and Terms

|  |  |
| --- | --- |
| **Abbreviation** | **Meaning** |
|  |  |
|  |  |
|  |  |
| DPU | Data Processing Unit |
| EAS | Electron Analyser System |
| ESAC | European Space Astronomy Centre |
|  |  |
| HIS | Heavy Ion System |
|  |  |
| MOC  | Mission Operations Centre |
|  |  |
|  |  |
| PAS | Proton Analyser System |
|  |  |
|  |  |
| SC | Spacecraft |
|  |  |
| SOC | Spacecraft Operations Centre |
|  |  |
| SWA | Solar Wind Analyser |
| TBC | To Be Confirmed |
| TBD | To Be Determined |
|  |  |
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# SWA Commanding System

## General description of the commanding system.

The commanding system of SWA is based on a continuous 6 month cycle. The cycle begins with a Science Working Team (SWT) that meets every six months. During this meeting the Solar Orbiter instrument PI/CoIs decide what the science goals are for the six month period and how the entire Solar Orbiter instrument suite should be employed to achieve those goals. The six month period being discussed at SWT begins six months from the SWT.

Upon completion, the SWT issues the Science Activity Plan (SAP) which details the following 6 monthly SWT requests. The SAP is sent via the Science Operation Centre (SOC) to the Mission Operating Centre (MOC). The MOC investigates if the plan is possible in terms of spacecraft activities passes manouveres etc. If the MOC deems the SAP to be unfeasable the SWT is reconvened and a new SAP is produced. Once the SAP is finalised, the MOC issues the Flight Events Communications Skeleton Interface Control Document (FECS) document. This document details the spacecraft flight events and is sent to the SOC.

The SOC makes the FECS available to MSSL and MSSL uses the SOOP kitchen sandbox to create an initial plan based on telemetry.

The SOC then uses the EFECS to create the plan during the SOWG using the SOOP kitchen.

At the end of the SOWG, the SOC issues



# SOOP Kitchen

Description of the SOOP kitchen, and a list of the blocks available to SWA with details of the telemetry and power rates.

## SOOP Blocks

# SWA TC Procedures

Details of the procedures that are defined in the MOC

## State model

The table below outlines the SWA state model. It details the main power modes of SWA and the MOC procedure that is run in order to move from one mode to another.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Mode** | **Power (W)** | **HV ON** | **Sequence** | **Procedure Title** | **Allowed Transition From Mode** |
| SWA\_DPU | SWA\_DPU\_OFF | 0.0 | No | IA-FCP-002 | SWA DPU Nominal OFF | Any |
| SWA\_DPU\_STANDBY | 5.3 | No | IA-FCP-012 | SWA DPU Nominal ON | SWA\_DPU\_OFF |
| SWA\_DPU\_OPS |
| SWA\_DPU\_OPS | 5.9 | No | IA-FCP-030 | SWA DPU Enter OPS | SWA\_DPU\_STANDBY |
| SWA\_EAS1 | SWA\_EAS1\_OFF | 0.0 | No | IA-FCP-004 | SWA EAS1 OFF | Any |
| SWA\_EAS1\_ON | 2.8 | No | IA-FCP-014 | SWA EAS1 ON | SWA\_EAS1\_OFF |
| SWA\_EAS1\_OPS | 3.9 | Yes | IA-FCP-040 | SWA EAS1 CONFIG | SWA\_EAS1\_ON |
| SWA\_EAS1\_SCIENCE |
| IA-FCP-041 | SWA EAS1 SCIENCE | SWA\_EAS1\_CONFIG |
| SWA\_EAS2 | SWA\_EAS2\_OFF | 0.0 | No | IA-FCP-005 | SWA EAS2 OFF | Any |
| SWA\_EAS2\_ON | 2.8 | No | IA-FCP-015 | SWA EAS2 ON | SWA\_EAS2\_OFF |
| SWA\_EAS2\_OPS | 3.9 | Yes | IA-FCP-050 | SWA EAS2 CONFIG | SWA\_EAS2\_ON |
| SWA\_EAS2\_SCIENCE |
| IA-FCP-051 | SWA EAS2 SCIENCE | SWA\_EAS2\_CONFIG |
| SWA\_PAS | SWA\_PAS\_OFF | 0.0 | No | IA-FCP-006 | SWA PAS OFF | Any |
| SWA\_PAS\_ON | 3.4 | No | IA-FCP-016 | SWA PAS ON | SWA\_PAS\_OFF |
| SWA\_PAS\_CONFIG | 4.2 | Yes | IA-FCP-060 | SWA PAS CONFIG | SWA\_PAS\_ON |
| SWA\_PAS\_NORMAL\_SCIENCE |
| SWA\_PAS\_BURST\_SCIENCE |
| SWA\_PAS\_NORMAL SCIENCE | 4.8 | IA-FCP-061 | SWA PAS NORMAL SCIENCE | SWA PAS CONFIG |
| SWA PAS BURST SCIENCE |
| SWA\_PAS\_BURST\_SCIENCE | 5.6 | Yes | IA-FCP-062 | SWA PAS BURST SCIENCE | SWA PAS CONFIG |
| SWA PAS NORMAL SCIENCE |
| SWA\_HIS | SWA\_HIS\_OFF | 0.0 | No | IA-FCP-007 | SWA HIS OFF | Any |
| SWA\_HIS\_BOOT | 8.5 | No | IA-FCP-008 | SWA HIS BOOT | SWA HIS\_OFF |
| SWA\_HIS\_LV\_ENG | 12.5 | No | IA-FCP-017 | SWA HIS LV ENG | SWA HIS BOOT |
| SWA HIS HV STANDBY |
| SWA\_HIS\_HV\_STANDBY | 13.0 | Yes | IA-FCP-070 | SWA HIS HV STANDBY | SWA HIS LV ENG |
| SWA HIS HV STANDBY |
| SWA\_HIS\_NORMAL\_SCI |
| SWA HIS BURST SCI |
| SWA\_HIS\_NORMAL\_SCIENCE | 13.0 | Yes | IA-FCP-071 | SWA HIS NORMAL SCI | SWA HIS HV STANDBY |
| SWA HIS BURST SCI |
| SWA\_HIS\_BURST\_SCIENCE | 15.0 | Yes | IA-FCP-072 | SWA HIS BURST SCI | SWA HIS HV STANDBY |
| SWA HIS NORMAL SCI |

## Procedures

# Instrument Operating Request (IOR)

## IOR Software

<?xml version="1.0" encoding="UTF-8"?>

<planningData xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="soc.solarorbiter.org IOR\_schema.xsd" xmlns="soc.solarorbiter.org">

 <commandRequests>

 <header type="IOR" formatVersion="1">

 <genTime>2017-199T11:10:00Z</genTime>

 <validityRange type="absoluteTime">

 <startTime>2022-172T00:00:00Z</startTime>

 <stopTime>2022-179T00:00:00Z</stopTime>

 </validityRange>

 </header>

 <header2 ICDVersion="v1\_0" VSTP\_slot\_count="1" planningCycle="S" missionSTP="001" IORorSlotNumberInSTP="01" instrument="SSWA" IORVersion="1"/>

 <occurrenceList count="8" creationTime="2017-199T11:10:00Z" author="Gill Watson">

 <sequence name="IA-FCP-010">

 <observationID>SSWA0000010101</observationID>

 <source>SSWA</source>

 <destination>R</destination>

 <executionTime>

 <actionTime>2022-172T00:00:00Z</actionTime>

 </executionTime>

 </sequence>

 <sequence name="IA-FCP-049">

 <observationID>SSWA0000010101</observationID>

 <source>SSWA</source>

 <destination>R</destination>

 <executionTime>

 <actionTime>2022-172T00:01:00Z</actionTime>

 </executionTime>

 <parameterList count="1">

 <parameter name="PIA60739" position="1">

 <value representation="Engineering">POST</value>

 </parameter>

 </parameterList>

 </sequence>

 <sequence name="IA-FCP-040">

 <observationID>SSWA0000010101</observationID>

 <source>SSWA</source>

 <destination>R</destination>

 <executionTime>

 <actionTime>2022-172T00:01:10Z</actionTime>

 </executionTime>

 </sequence>

 <sequence name="IA-FCP-050">

 <observationID>SSWA0000010101</observationID>

 <source>SSWA</source>

 <destination>R</destination>

 <executionTime>

 <actionTime>2022-172T00:01:20Z</actionTime>

 </executionTime>

 </sequence>

 <sequence name="IA-FCP-051">

 <observationID>SSWA0000010101</observationID>

 <source>SSWA</source>

 <destination>R</destination>

 <executionTime>

 <actionTime>2022-172T00:01:40Z</actionTime>

 </executionTime>

 <parameterList count="4">

 <parameter name="PIA60031" position="1">

 <value representation="Engineering">MBOX1</value>

 </parameter>

 <parameter name="PI60446" position="2">

 <value representation="Engineering">0</value>

 </parameter>

 <parameter name="PI60447" position="3">

 <value representation="Engineering">0</value>

 </parameter>

 <parameter name="PI60448" position="4">

 <value representation="Raw">0x02</value>

 </parameter>

 </parameterList>

 </sequence>

 </occurrenceList>

 </commandRequests>

</planningData>

## IOR Reports

# Conclusion