THEME [SPA.2013.2.1-01]
[Exploitation of space science and exploration data]

Grant agreement for: Collaborative project*

Annex I - "Description of Work"

Project acronym: HELCATS

Project full title: "Heliospheric Cataloguing, Analysis and Techniques Service"

Grant agreement no: 606692

Version date: 2014-02-17

Table of Contents

Part A

Workplan Tables

A1:
Project summary

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per project

General information

Project title [3]	Heliospheric Cataloguing, Analysis and Techniques Service		
Starting date[4]	The first day of the month after the signature by the Commission		
Duration in months[5]	36		
Call (part) identifier[6]	FP7-SPACE-2013-1		
Activity code(s) most relevant to your topic[7]	SPA.2013.2.1-01:Exploitation of space science and exploration data		

Abstract [9]

The advent of wide-angle imaging of the inner heliosphere has revolutionised the study of the solar wind and, in particular, transient solar wind structures such as Coronal Mass Ejections (CMEs) and Co-rotating Interaction Regions (CIRs). CMEs comprise enormous plasma and magnetic field structures that are ejected from the Sun and propagate at what can be immense speeds through interplanetary space, while CIRs are characterised by extensive swathes of compressed plasma/ magnetic field that form along flow discontinuities of solar origin that permeate the inner heliosphere. With Heliospheric Imaging came the unique ability to track the evolution of these features as they propagate through the inner heliosphere. Prior to the development of wide-angle imaging of the inner heliosphere, signatures of such solar wind transients could only be observed within a few solar radii of the Sun, and in the vicinity of a few near-Earth and interplanetary probes making in-situ measurements of the solar wind. Heliospheric Imaging has, for the first time, filled that vast and crucial observational gap.

HELCATS provides an unprecedented focus for world-leading European expertise in the novel and revolutionary, European-led field of Heliospheric Imaging, in terms of instrumentation, data analysis, modelling and science. HELCATS is a strategic programme that aims to empower the wider scientific community, in Europe and beyond, by providing access to advanced catalogues - validated and augmented through the use of techniques and models - for the analysis of solar wind transients, based on observations from European-led space instrumentation. All participant groups are at the forefront of heliospheric research and bring distinct, yet highly complementary, skills to the project. HELCATS will add significant value to the exploitation of existing European space instrumentation, providing a strong foundation for enhanced exploitation and advancement of the heliospheric research in Europe.

A2:
List of Beneficiaries

Project Number [1]	606692	Project Acronym [2]	HELCATS

List of Beneficiaries

No	Name	Short name	Country	Project entry month[10]	Project exit month
1	SCIENCE AND TECHNOLOGY FACILITIES COUNCIL	STFC	United Kingdom	1	36
2	UNIVERSITAET GRAZ	UNIGRAZ	Austria	1	36
3	UNIVERSITE PAUL SABATIER TOULOUSE 3	UPS	France	1	36
4	GEORG-AUGUST-UNIVERSITAET GOETTINGEN STIFTUNG OEFFENTLICHEN RECHTS	UGOE	Germany	1	36
5	KONINKLIJKE STERRENWACHT VAN BELGIE	ROB	Belgium	1	36
6	IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE	IMPERIAL	United Kingdom	1	36
7	HELSINGIN YLIOPISTO	UH	Finland	1	36
8	THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN	TCD	Ireland	1	36

A3:
Budget Breakdown

Project Number [1]	606692	Project Acronym [2]	HELCATS

One Form per Project

Participant number in this project[11]	Participant short name	Fund. %[12]	Ind. costs[13]	Estimated eligible costs (whole duration of the project)					Total Receipts	Requested EU contribution
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D		
1	STFC	75.0	A	600,477.00	0.00	121,236.30	210,124.30	931,837.60	0.00	781,718.35
2	UNIGRAZ	75.0	T	349,600.00	0.00	0.00	7,800.00	357,400.00	0.00	270,000.00
3	UPS	75.0	T	504,000.00	0.00	0.00	116,747.20	620,747.20	0.00	494,747.20
4	UGOE	75.0	T	358,080.00	0.00	0.00	8,640.00	366,720.00	0.00	277,200.00
5	ROB	75.0	T	262,400.00	0.00	0.00	5,400.00	267,800.00	0.00	202,200.00
6	IMPERIAL	75.0	T	222,376.00	0.00	0.00	10,080.00	232,456.00	0.00	176,862.00
7	UH	75.0	T	228,374.40	0.00	0.00	5,400.00	233,774.40	0.00	176,680.80
8	TCD	75.0	T	150,966.40	0.00	0.00	7,200.00	158,166.40	0.00	120,424.80
Total				2,676,273.80	0.00	121,236.30	371,391.50	3,168,901.60	0.00	2,499,833.15

Note that the budget mentioned in this table is the total budget requested by the Beneficiary and associated Third Parties.

*** The following funding schemes are distinguished**

Collaborative Project (if a distinction is made in the call please state which type of Collaborative project is referred to: (i) Small of medium-scale focused research project, (ii) Large-scale integrating project, (iii) Project targeted to special groups such as SMEs and other smaller actors), Network of Excellence, Coordination Action, Support Action.

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project, and it cannot be changed. The project number **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

2. Project acronym

Use the project acronym as indicated in the submitted proposal. It cannot be changed, unless agreed during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry info force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a detailed justification on a separate note.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Activity code

Select the activity code from the drop-down menu.

8. Free keywords

Use the free keywords from your original proposal; changes and additions are possible.

9. Abstract

10. The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

11. The number allocated by the Consortium to the participant for this project.

12. Include the funding % for RTD/Innovation - either 50% or 75%

13. Indirect cost model

A: Actual Costs
S: Actual Costs Simplified Method
T: Transitional Flat rate
F :Flat Rate

Workplan Tables

Project number

606692

Project title

HELCATS - Heliospheric Cataloguing, Analysis and Techniques Service

Call (part) identifier

FP7-SPACE-2013-1

Funding scheme

Collaborative project

WT1
List of work packages

Project Number [1]	606692	Project Acronym [2]	HELCATS

LIST OF WORK PACKAGES (WP)

WP Number[53]	WP Title	Type of activity[54]	Lead beneficiary number[55]	Person-months[56]	Start month[57]	End month[58]
WP1	Management	MGT	1	8.50	1	36
WP2	Producing a definitive catalogue of CMEs imaged by STEREO/HI	RTD	1	51.50	1	36
WP3	Deriving/cataloguing the kinetic properties of STEREO/HI CMEs based on geometrical and forward modelling	RTD	4	51.00	7	36
WP4	Verifying the kinematic properties of STEREO/HI CMEs against in-situ CME observations and coronal sources	RTD	2	68.00	10	36
WP5	Producing a definitive catalogue of CIRs imaged by STEREO/HI that includes verified model-derived kinematic properties	RTD	3	42.00	1	36
WP6	Initialising advanced numerical models based on the kinetic properties of STEREO/HI CMEs and CIRs	RTD	3	27.00	7	36
WP7	Assessing the complementary nature of radio measurements of solar wind transients	RTD	6	39.50	10	36
WP8	Dissemination	OTHER	1	21.50	1	36
			Total	309.00		

WT2:
List of Deliverables

Project Number [1]	606692	Project Acronym [2]	HELCATS

List of Deliverables - to be submitted for review to EC

Delive-rable Number[61]	Deliverable Title	WP number[53]	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D1.1	HELCATS website launch	WP1	1	1.00	Other	PU	3
D1.2	Minutes of the kick-off meeting	WP1	1	0.50	Report	PP	2
D1.3	Progress report to the Commission (6 months)	WP1	1	0.50	Report	PP	7
D1.4	Cost statement and annual progress report - Year 1	WP1	1	0.50	Report	PP	13
D1.5	Progress report to the Commission (18 months)	WP1	1	0.50	Report	PP	19
D1.6	Cost statements and annual progress report to the EU – Yr 2	WP1	1	0.50	Report	PP	25
D1.7	Progress report to the Commission	WP1	1	0.50	Report	PP	31
D1.8	Final HELCATS cost statements and annual progress report to the EU	WP1	1	1.00	Report	PP	36
D1.9	Final public report	WP1	1	2.00	Report	PU	36
D2.1	Catalogue of observational parameters of HI-1 manually-identified CMEs	WP2	1	13.50	Other	PU	36
D2.2	Report on the feasibility of automatic identification of CMEs in HI-1 data	WP2	5	14.00	Report	PP	12
D2.3	Report on the inter-comparison of the manual and automated CME catalogues	WP2	1	12.00	Report	PP	18
D2.4	Report in which the manual and automated HI	WP2	1	8.00	Report	PP	24

WT2:
List of Deliverables

Delive-rable Number[61]	Deliverable Title	WP number[53]	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
	CME catalogues are compared to pre-existing coronagraph CME catalogues						
D2.5	Scientific management of HELCATS	WP2	1	4.00	Other	PP	36
D3.1	Provision of time-elongation maps for the catalogued CMEs and incorporation of the results of the geometrical fitting into the catalogue	WP3	1	15.00	Other	PU	12
D3.2	Incorporation the results of the forward-modelling techniques into the CME catalogue	WP3	4	11.00	Other	PU	36
D3.3	Report on model results	WP3	1	10.00	Report	PP	36
D3.4	Report on prototype inverse model	WP3	4	15.00	Report	PP	36
D4.1	Establishing an online catalogue of potentially associated solar source and in-situ phenomena	WP4	2	30.00	Other	PU	24
D4.2	Report on statistical analysis and comparison of HI results with coronal and in situ data	WP4	2	33.00	Report	PP	30
D5.1	Establishing an online CIR catalogue	WP5	3	9.00	Report	PU	12
D5.2	Fitting the leading edge of CIRs and determination of latitudinal extent	WP5	3	9.00	Report	PU	24

WT2:
List of Deliverables

Delive-rable Number[61]	Deliverable Title	WP number[53]	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D5.3	Catalogue of CIRs/coronal holes	WP5	3	9.00	Report	PU	36
D5.4	Imagery/in situ comparison	WP5	3	6.00	Report	PU	36
D5.5	Analysis of in situ data	WP5	7	9.00	Report	PU	36
D6.1	Assessment of how well ENLIL predicts the properties of CIRs using HI	WP6	3	5.00	Other	PU	24
D6.2	Catalogue of optimised ENLIL simulations	WP6	3	4.00	Report	PP	24
D6.3	Catalogue of shocks of obtained using ENLIL	WP6	3	9.00	Report	PU	36
D6.4	Assessment of the use of HI/ENLIL for space-weather forecasting	WP6	3	9.00	Demonstrator	PU	36
D7.1	Catalogues of EISCAT and LOFAR IPS data events and of S/ WAVES events	WP7	6	20.00	Other	PU	27
D7.2	Report of initial comparison between IPS events and HI events.	WP7	1	8.00	Report	PP	30
D7.3	Report of initial comparison between solar radio-burst events and HI events.	WP7	6	8.00	Report	PP	30
D8.1	Publication in the professional scientific literature	WP8	1	2.50	Other	PU	36
D8.2	Annual open meetings	WP8	1	1.50	Other	PU	36
D8.3	Attendance/ presentations at major science meetings	WP8	1	1.50	Other	PU	36

WT2:
List of Deliverables

Delive-rable Number[61]	Deliverable Title	WP number[53]	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D8.4	Posting information on the website	WP8	1	3.50	Other	PU	36
D8.5	Integration with community facilities and websites	WP8	1	3.50	Other	PU	36
D8.6	Production of press releases, public talks	WP8	1	2.00	Other	PU	36
D8.7	Integrate the J-map associated catalogues produced in HELCATS to the propagation tool.	WP8	3	3.00	Report	PU	36
D8.8	Integrate Carrington Map associated catalogues in the propagation tool	WP8	3	3.00	Report	PU	36
			Total	**298.00**			

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP1	**Type of activity**[54]	MGT
Work package title	Management		
Start month	1		
End month	36		
Lead beneficiary number[55]	1		

Objectives

The HELCATS consortium consists of 8 European groups (involving 7 EU counties), plus one third party group from the USA. The project is a complex coordination of activities involving observations and cataloguing, techniques, the development of models and their application, and exercises in validation and assessment.

The objective of WP1 is to provide the necessary management structure to implement the HELCATS project effectively, overseeing all administrative matters, assembling and submitting formal reports, overseeing finance auditing, and arranging meetings as appropriate. WP1 will oversee the scheduling and progress of all activities, and the production and management of the HELCATS website. STFC, the work package leader for WP1, will be the overall coordinator of the HELCATS project.

Description of work and role of partners

WP1 - Management [Months: 1-36]
STFC
The main tasks of WP1 are the initial establishment of the management structure, and its support and communication tools, the general operation of this structure, and its termination at the end of the project together with the delivery of the final reports. The management plan is detailed in Annex 1B.

T1.1 - HELCATS Project Management [Months: 1-36]
STFC
Workpackage 1.1 covers the formal management roles of the HELCATS project. This includes administrative tasks, maintaining project infrastructure, coordinating inputs and reporting as required and handling a range of project issues. Initially, the Executive Board will be set up at the coordinating institute (STFC), and will open the project's Central Web Page. The Executive Board/Steering Committee will establish communication with all consortium members and prepare the project kick-off meeting that will take place in the first month. The kick-off meeting will include a meeting of the Steering Group/ Executive Board. The work can then be summarised in the following activities: (i) Designing and maintaining partner specific templates for collecting input to the required EU documents; (ii) Implementing and maintaining of a project-specific database for reporting and controlling, including the adaptation of the structure after changes in the workplan and the consortium; (iii) Drafting and maintaining the dissemination and exploitation plan following the EC's requirements; (iv) Preparing and post-processing of EC reviews from the consortium-side including support in the implementation of recommendations from the EC and reviewers; (v) The administrative tasks involved in the preparation, executing and post-processing of major project meetings such as Steering Committee meetings, General Assemblies and meetings with the advisory board (tasks: agendas, invitations, location of meeting places, organization of rooms and equipment, preparation distribution and archiving of materials, minutes and action lists); (vi) Implementing and maintaining the project infrastructure, e.g., the internal platform for information exchange and email lists; (vii) Handling of legal issues, IPR issues and maintenance of the consortium agreement; (viii) Handling of the project correspondence and the day-to-day requests from partners and external bodies; (ix) Organising a call or a tender to choose a new beneficiary or subcontractor.
Role of participants: This task will be undertaken by STFC.

T1.2 - HELCATS website maintenance [Months: 1-36]
STFC
The HELCATS website will be used for both internal circulation of information and external dissemination of the projects aims and objectives. The documents will be available to all members of the consortium, during the whole project, on the private part

of our website. The Project Coordinator will have the responsibility to maintain and update the website at least every 2 weeks. Products of the project, such as the catalogues and reports, will be openly available through the website, after their delivery. Role of participants: This task will be undertaken by STFC

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	WP1 additional effort	WP1 TOTAL
1 - STFC	4.50	4.00	0.00	8.50
2 - UNIGRAZ	0.00	0.00	0.00	0.00
3 - UPS	0.00	0.00	0.00	0.00
CNRS	0.00	0.00	0.00	0.00
4 - UGOE	0.00	0.00	0.00	0.00
5 - ROB	0.00	0.00	0.00	0.00
6 - IMPERIAL	0.00	0.00	0.00	0.00
7 - UH	0.00	0.00	0.00	0.00
8 - TCD	0.00	0.00	0.00	0.00
Total	4.50	4.00	0.00	8.50

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D1.1	HELCATS website launch	1	1.00	Other	PU	3
D1.2	Minutes of the kick-off meeting	1	0.50	Report	PP	2
D1.3	Progress report to the Commission (6 months)	1	0.50	Report	PP	7
D1.4	Cost statement and annual progress report - Year 1	1	0.50	Report	PP	13
D1.5	Progress report to the Commission (18 months)	1	0.50	Report	PP	19
D1.6	Cost statements and annual progress report to the EU – Yr 2	1	0.50	Report	PP	25
D1.7	Progress report to the Commission	1	0.50	Report	PP	31
D1.8	Final HELCATS cost statements and annual progress report to the EU	1	1.00	Report	PP	36
D1.9	Final public report	1	2.00	Report	PU	36
		Total	**7.00**			

Description of deliverables

D1.1 : Setting up and launching the HELCATS website. [month 3]

D1.2 : Minutes of the kick-off meeting that will be held in the first month. [month 2]

D1.3 : Progress report to the Commission after the first 6 months of the project. [month 7]

D1.4 : HELCATS cost statements and annual progress report to the EU after the completion of year 1. [month 13]

D1.5 : Progress report to the Commission after the completion of 18 months of the project. [month 19]

D1.6 : HELCATS cost statements and annual progress report to the EU after the completion of year 2. [month 25]

D1.7 : Progress report to the Commission after the completion of 2.5 years of the project. [month 31]

D1.8 : Final HELCATS cost statements and annual progress report to the EU, after the completion of 3 years of the project. [month 36]

D1.9 : Final public report [month 36]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead beneficiary number	Delivery date from Annex I[60]	Comments
MS1	Start	1	1	Onset of project.
MS2	Kick-off Meeting	1	1	Kick-off meeting
MS10	Completion of Project	1	36	Completion of project - work completed and final report produced.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP2	**Type of activity**[54]	RTD
Work package title	Producing a definitive catalogue of CMEs imaged by STEREO/HI		
Start month	1		
End month	36		
Lead beneficiary number[55]	1		

Objectives

This WP includes the scientific coordination of the HELCATS project. Regular operations will include monthly teleconferences, bi-annual project meetings, and annual science meetings, as defined in the management plan. Through these meetings the WP leader will coordinate the scientific discussion, planning and reporting of the project. The following scientific objectives also relate to WP2:

• To enhance the use of STEREO/HI observations by the provision, to the scientific community, of a community-oriented catalogue of CMEs identified in the heliosphere visually from HI images taken during the science phase of the STEREO mission (April 2007 to date).
• To identify those events that are detected by both spacecraft, and update the catalogue accordingly.
• To assess the feasibility of providing the user community with a catalogue of CMEs identified in the heliosphere automatically from HI images taken during the science phase of the STEREO mission (April 2007 to date).
• To compare the lists generated in the above manner to pre-existing CME lists based on coronagraph observations

Description of work and role of partners

WP2 - Producing a definitive catalogue of CMEs imaged by STEREO/HI [Months: 1-36]
STFC
This workpackage is concerned with the cataloguing, by manual and automated means of the heliospheric CME events, rom STEREO/HI data, and the comparison of these catalogues with other CME catalogues.

T2.1 - Manual cataloguing of STEREO/HI CMEs [Months: 1-36]
STFC
Each STEREO/HI instrument has detected many hundreds of CMEs in the heliosphere since the start of the science phase of the mission in April 2007 (e.g. Harrison et al. 2009; 2012). In Task 1.1, we will, via visual inspection of the HI-1 images from the two spacecraft independantly, catalogue these CMEs in terms of their basic observational parameters: observing spacecraft; entry time into the HI-1 field of view; position angle corresponding to the central axis of propagation; position angle span. We will also indicate potential halo CMEs - where the CME is directed towards the observing spacecraft. In these situations, a CME‘s central position angle and span cannot be unambiguously determined; such CMEs are of particular interest in terms of comparison with in-situ measurements. This process will be continued throughout as new observations are made.
Instruments used: STEREO/HI
Role of participants: This task will be undertaken by STFC.

T2.2 - Automatic cataloguing of STEREO/HI CMEs [Months: 1-36]
ROB
While in Task 2.1 CMEs are identified manually by visual inspection, in Task 2.2. we investigate the possibility of the automatic detection of CMEs in the heliosphere from STEREO/HI-1 images. This has never been tried before, so a successful result would contribute greatly to the advancement in the analysis of HI data, and to CME research in general. This task will be founded on the vast expertise that has been built up by the team at ROB in the autonomous detection of CMEs in coronagraph images from the SOHO/LASCO instrument and, more recently, from STEREO/COR2 (e.g. Robbrecht et al. 2009). Should this assessment prove successful, the observational parameters of the automatically-detected CMEs will be catalogued in an analogous manner to those detected manually in Task 2.1 above.
Instruments used: STEREO/HI
Role of participants: This task will be undertaken by ROB.

T2.3 - Comparison of CME catalogues [Months: 1-36]
UGOE, STFC, ROB
In Task 2.3, we will asses the outputs from Tasks 2.1 and 2.2 in a number of ways:
As the mission has progressed, the degree of overlap between the fields-of-view of the HI instruments on the two STEREO spacecraft has evolved. In Task 2.3, we will reconcile the CME catalogues that are produced separately for the two STEREO spacecraft (in Task 2.1 and, potentially, Task 2.2). The information in the CME catalogues will be augmented to reflect the fact that some of the CMEs will have been detected simultaneously from the vantage points of STEREO-A and STEREO-B.
We will also compare the manually and automatically-generated catalogues, not least to assess the success of the later. This analysis will be performed both on a case-by-case basis and in terms of the overall statistical properties of CMEs. Note that should the automatic detection of CMEs in HI-1 prove untenable, the reasons why will be assessed to investigate potential improvements to the processing of the HI data steam itself.
The CME catalogues generated in Tasks 2.1 and 2.2 above will be compared to pre-existing manually and automatically-generated CME catalogues derived from coronal imaging observations (primarily from SOHO/LASCO and STEREO/COR2 coronagraph observations), again on a case-by-case basis and statistically. Some of these catalogues have been created under the auspices of previous FP7 projects (the SOTERIA COR2 CME list in particular). The catalogues created in WP2 will be used as a basis for the work that forms WP3 and WP4.
Instruments used: STEREO/HI, STEREO/COR2, SOHO/LASCO
Role of participants: These tasks will be undertaken jointly by RAL and ROB to reflect their roles in manual and automatic identification, respectively. UGOE will compare with the SOTERIA COR2 CME list (updated until the end of 2011 in WP3).

T2.4 - Scientific Management [Months: 1-36]
STFC
This task involves the scientific management of the HELCATS project. Regular operations will include monthly teleconferences, bi-annual project meetings, and annual science meetings, as defined in the management plan. Through these meetings the WP leader will coordinate the scientific discussion, planning and reporting of the project.

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	Task3 specific effort	Task4 specific effort	WP2 additional effort	WP2 TOTAL
1 - STFC	14.00	0.00	7.00	4.00	0.00	25.00
2 - UNIGRAZ	0.00	0.00	0.00	0.00	0.00	0.00
3 - UPS	0.00	0.00	0.00	0.00	0.00	0.00
CNRS	0.00	0.00	0.00	0.00	0.00	0.00
4 - UGOE	0.00	0.00	6.00	0.00	0.00	6.00
5 - ROB	0.00	13.50	7.00	0.00	0.00	20.50
6 - IMPERIAL	0.00	0.00	0.00	0.00	0.00	0.00
7 - UH	0.00	0.00	0.00	0.00	0.00	0.00
8 - TCD	0.00	0.00	0.00	0.00	0.00	0.00
Total	14.00	13.50	20.00	4.00	0.00	51.50

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D2.1	Catalogue of observational parameters of HI-1 manually-identified CMEs	1	13.50	Other	PU	36
D2.2	Report on the feasibility of automatic identification of CMEs in HI-1 data	5	14.00	Report	PP	12
D2.3	Report on the inter-comparison of the manual and automated CME catalogues	1	12.00	Report	PP	18
D2.4	Report in which the manual and automated HI CME catalogues are compared to pre-existing coronagraph CME catalogues	1	8.00	Report	PP	24
D2.5	Scientific management of HELCATS	1	4.00	Other	PP	36
		Total	**51.50**			

Description of deliverables

D2.1 : Catalogue of observational parameters of HI-1 manually-identified CMEs. First release Month 9 and continuously updated as data permits. To be made available online. [month 36]

D2.2 : Report on the feasibility of automatic identification of CMEs in HI-1 data, leading to (if successful) the generation of a catalogue to be made available online. [month 12]

D2.3 : Report on the inter-comparison of the manual and automated CME catalogues. [month 18]

D2.4 : Report in which the manual and automated HI CME catalogues are compared to pre-existing coronagraph CME catalogues. [month 24]

D2.5 : Monthly telecons and biannual project meetings. [month 36]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I[60]	Comments
MS3	Start of WP2	1	1	Start of WP2 activities.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP3	**Type of activity**[54]	RTD
Work package title	Deriving/cataloguing the kinetic properties of STEREO/HI CMEs based on geometrical and forward modelling		
Start month	7		
End month	36		
Lead beneficiary number[55]	4		

Objectives

• To obtain the kinematic properties for the STEREO/HI CMEs in the catalogue established in WP2, through application of geometrical and forward-modelling techniques to the HI data.
• To augment the STEREO/HI CME catalogue with the model results, and supply those results as input for comparisons with coronal source and in-situ observations in the validation of WP4.
• To update the STEREO/COR2 CME catalogue, initiated under the SOTERIA FP7 project, until the end of 2011 (including the application of forward modelling to the appropriate CMEs).
• To compare the results from the geometrical and forward modelling of HI CMEs with the modelling results for COR2.
• To prototype the use of inverse modelling to derive typical HI CME parameters (speed, size, mass), for photospheric and low coronal source regions typically associated with CMEs.

Description of work and role of partners

WP3 - Deriving/cataloguing the kinetic properties of STEREO/HI CMEs based on geometrical and forward modelling [Months: 7-36]
UGOE
This workpackage exploits the skills in geometrical modelling, inverse modelling and forward modelling from the groups involved, using the catalogues established in WP2. It includes a comparison of the performance of the techniques.

T3.1 - Geometrical modelling of STEREO/HI CMEs [Months: 7-36]
STFC, UNIGRAZ, UGOE
The objective of Task 3.1 is to perform geometrical modelling of the STEREO/HI CMEs, identified and catalogued in WP2, to derive their kinematic properties. This allows us to project back to the Sun and forward to specified solar system locations. From time-elongation maps (J-maps) generated from the HI data, the time-elongation profile of each CME will (where possible) be extracted and analysed using a range of single-spacecraft and stereoscopic geometric models (see Davies et al. 2012) to provide estimates of CME propagation speed, direction and potentially size; the STEREO/HI catalogue will be augmented with this information.
Back-projected CME launch time/location, derived from the geometrical modelling, will be incorporated into the catalogue. This enables potential source signatures associated with CME onset to be identified (WP4.1). The geometrically-modelled CME speeds/trajectories will also be used to generate a catalogue of CME arrival time estimates at Mercury, Venus, Earth, Mars and Saturn, thereby providing support to European-funded space missions around these planets. The in-situ observations of CMEs will be compared to their white-light counterparts in WP4.2. The catalogues will be integrated in AMDA, offering access to the catalogues to the community of planetary scientists that use the European Research infrastructure (EUROPLANET).
Instruments used: STEREO/HI
Role of participants: STFC: J-map provision/CME extraction; STFC and UNIGRAZ: geometrical modelling application and development

T3.2 - Forward modelling of STEREO/HI CMEs [Months: 7-36]
UGOE
The principal objective of Task 3.2 is to apply the GCS (Graduated Cylindrical Shell) model (e.g. Thernisien et al. 2006; Bosman et al. 2012) to the STEREO/HI observations of the CMEs in the WP2 catalogue. This will enable CME geometries, speeds, propagation directions and mass estimates to be derived. As in Task 3.1, the catalogue will be augmented with this

information, as well as back-projected launch time/location and forward-projected arrival time estimates at various solar system locations. Note this task includes updating the STEREO/COR2 CME catalogue, initiated in the SOTERIA FP7 project, until the end of 2011 (this also includes forward modelling).
Instruments used: STEREO/HI, STEREO/COR2
Role of participants: This task will be undertaken by UGOE.

T3.3 - Inverse modelling of STEREO/HI CMEs [Months: 7-36]
UGOE, TCD
Task 3.3 will prototype the use of inverse modelling to derive typical parameters (speed, size and mass) for the CMEs in the STEREO/HI CME catalogue (speed, size and mass), for photospheric and low coronal source regions typically associated with CMEs.
Instruments used: STEREO/HI
Role of participants: UGOE: modelling; TCD: source region input expertise.

T3.4 - Comparison of modelling results [Months: 7-36]
UGOE, STFC, TCD
In Task 3.4, we will inter-compare the results of the geometrical, forward and inverse modelling of STEREO/HI observations (Tasks 3.1, 3.2 and 3.3, respectively), as well as comparing with the COR2 model results.
Instruments used: as above
Role of participants: RAL will collate, with input from all participants

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	Task3 specific effort	Task4 specific effort	WP3 additional effort	WP3 TOTAL
1 - STFC	6.00	0.00	0.00	3.00	0.00	9.00
2 - UNIGRAZ	6.00	0.00	0.00	0.00	0.00	6.00
3 - UPS	0.00	0.00	0.00	0.00	0.00	0.00
CNRS	0.00	0.00	0.00	0.00	0.00	0.00
4 - UGOE	3.00	7.00	7.00	4.00	0.00	21.00
5 - ROB	0.00	0.00	0.00	0.00	0.00	0.00
6 - IMPERIAL	0.00	0.00	0.00	0.00	0.00	0.00
7 - UH	0.00	0.00	0.00	0.00	0.00	0.00
8 - TCD	0.00	0.00	8.00	7.00	0.00	15.00
Total	15.00	7.00	15.00	14.00	0.00	51.00

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D3.1	Provision of time-elongation maps for the catalogued CMEs and incorporation of the results of the geometrical fitting into the catalogue	1	15.00	Other	PU	12

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D3.2	Incorporation the results of the forward-modelling techniques into the CME catalogue	4	11.00	Other	PU	36
D3.3	Report on model results	1	10.00	Report	PP	36
D3.4	Report on prototype inverse model	4	15.00	Report	PP	36
		Total	**51.00**			

Description of deliverables

D3.1 : Provision of time-elongation maps for the CMEs in the STEREO/HI catalogue (from WP2), and incorporation of the results of the geometrical fitting into the catalogue (Month 12, first release). [month 12]

D3.2 : Incorporation the results of the forward-modelling techniques into the CME catalogue established in WP2 (from M12). [month 36]

D3.3 : Report on model results - comparing the geometrical modelling, forward modelling and inverse modelling method results. [month 36]

D3.4 : Report on prototype inverse model, based on photospheric and low corona source region characteristics, for 3-D HI CME structure. [month 36]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I[60]	Comments
MS5	Start of WP3	4	7	Start of WP3 activities.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP4	**Type of activity**[54]	RTD
Work package title	Verifying the kinematic properties of STEREO/HI CMEs against in-situ CME observations and coronal sources		
Start month	10		
End month	36		
Lead beneficiary number[55]	2		

Objectives

• To construct a community-oriented online database of in-situ CMEs, and their main parameters, from 2007 to 2015 (minimum through maximum and early-declining phase of solar cycle 24) that fully exploits suitable currently-operating heliospheric space missions.
• To establish definitive links to coronal sources (Task 4.1) and in-situ signatures (Task 4.2) for the CMEs in the STEREO/HI catalogue (from WP2), based on the modelling results from WP3 that form the backbone that connects the HI data in space and time to the coronal data (by backward projection) and the in-situ data (by forward projection).
• To benchmark using HI modelling to better predict CME arrival at various heliospheric locations using in-situ data from multiple sources, with the aim of maximizing the prediction lead time and minimizing the prediction error.

Description of work and role of partners

WP4 - Verifying the kinematic properties of STEREO/HI CMEs against in-situ CME observations and coronal sources [Months: 10-36]
UNIGRAZ
The primary goal of WP4 is to provide researchers with the ability to view and obtain the principal CME parameters (e.g. direction, speed) at a glance, following the complete chain of imaging and in-situ observations from the Sun out to 1 AU. We will bring together totally independent data sets, bridging the gap between remote and in-situ observations. The CME database will be optimized to aid the space physics community's search for clues on the origin, propagation, morphology, and planetary effects of CMEs. We will not only furnish the event catalogue with relevant parameters, but will also provide the linkage (including physical interpretations) between different CME-related structures in different datasets. This resource will be useful for future missions (e.g. Solar Orbiter).

T4.1 - Comparing to coronal sources [Months: 10-36]
UGOE
Well-established signatures of the CMEs in the STEREO/HI catalogue (WP2 and 3) will be identified in the low corona and photospheric magnetograms (flares, filaments, EUV post-eruption arcades, coronal dimmings, EUV waves, bipolar regions). The modelling methods used on HI data (in WP3) will produce windows for CME launch time and position on the solar disk, acting as proxies for identification of the sources in the low corona and photosphere.
Instruments used: STEREO/EUVI, SOHO/EIT+MDI, SDO/AIA+HMI, Proba2
Role of participants: UGOE: online cataloguing of signatures with back-projections from WP3.

T4.2 - Comparing to in-situ measurements [Months: 10-36]
UH, UNIGRAZ, UPS, UGOE, IMPERIAL
This task will combine in-situ observations from many spacecraft into a single comprehensive CME database by extensive analysis (of magnetic field, thermal plasma, suprathermal electrons and compositional data) during the estimated CME arrival times (from WP3). Use of a physics-based phenomenological characterization of CMEs and their surrounding solar wind, which we have carefully evaluated to optimize comparison with remote observations, will maximize the benefit to us and other researchers in understanding CME effects. Task 4.2 will consist of the following:
1. Categorizing CMEs based on their physical structure observed in-situ (e.g. flux rope/non-flux rope CMEs, complex CMEs, compound streams) and calculating relevant parameters (e.g. shock stand-off distance, expansion speed).
2. Modelling flux-rope CMEs using Grad-Shafranov (GS) reconstruction.

3. Categorizing CMEs based on ambient solar wind speed/interplanetary magnetic field structure.
4. Analysis of sheath/CME density substructures.
Instruments used: STEREO, Wind, ACE, Venus Express, MESSENGER, Ulysses, MSL
Role of participants: UH: CME categorization/cataloguing (L1 & STEREO in-situ data); UNIGRAZ: CME categorization/ cataloguing (other data), GS reconstruction, multi-point heliospheric analysis; Imperial: multi-point L1 analysis; UPS: sheath/ substructure analysis; UGOE: Minimum Variance Analysis (MVA)

T4.3 - Assessing the validity of the HI modelling [Months: 10-36]
UNIGRAZ, UPS, UGOE, ROB , UH
In Task 4.3 we statistically analyse results from Tasks 4.1 and 2, with STEREO/HI CME parameters from WP3 forming the backbone. The WP3 HI modelling results (over a large portion of solar cycle 24) will be assessed in terms of their reliability, in terms of connecting the different data sets, and their potential for space weather prediction. Direct comparisons between HI and in-situ data sets are possible: (1) comparing HI-derived CME direction with spacecraft position (hit or miss predictions), (2) comparing HI-derived CME arrival times/speeds with in-situ CME arrival times/speeds, and (3) comparing white-light HI morphology with in-situ flux rope orientation. Questions that can be addressed are: How can different CME substructures (sheaths, flux ropes) be identified from HI data? How well can CME arrival times/speeds be forecast using HI data, and how can this be optimized? What is the outcome of binary classifications of CME hits and misses? Are there CME, sheath or substructure properties that optimize predictive capability, and why? Moreover, comparing HI modelling and source region properties will address questions on source position versus CME propagation direction. To test relations for forecasting magnetic clouds, in-situ magnetic structures will be compared with the magnetic field of their photospheric source regions.
Instruments used: as Task 4.1 and Task 4.2
Role of participants: UNIGRAZ: coordinating the analysis, comparing geometrical modelling to in-situ; UGOE: validating back-projections; comparing in-situ to solar magnetic structures;
UH: ICME inputs; UPS: CME HI in-situ substructure identification; ROB: comparing forward modelling to in situ data.

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	Task3 specific effort	WP4 additional effort	WP4 TOTAL
1 - STFC	0.00	0.00	0.00	0.00	0.00
2 - UNIGRAZ	0.00	10.00	20.00	0.00	30.00
3 - UPS	0.00	1.00	1.00	0.00	2.00
CNRS	0.00	1.00	1.00	0.00	2.00
4 - UGOE	6.00	3.00	3.00	0.00	12.00
5 - ROB	0.00	0.00	6.00	0.00	6.00
6 - IMPERIAL	0.00	3.00	0.00	0.00	3.00
7 - UH	0.00	8.00	5.00	0.00	13.00
8 - TCD	0.00	0.00	0.00	0.00	0.00
Total	6.00	26.00	36.00	0.00	68.00

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D4.1	Establishing an online catalogue of potentially associated solar source and in-situ phenomena	2	30.00	Other	PU	24

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D4.2	Report on statistical analysis and comparison of HI results with coronal and in situ data	2	33.00	Report	PP	30
		Total	**63.00**			

Description of deliverables

D4.1 : Establishing an online catalogue of potentially associated solar source and in-situ phenomena for the timeframe 2007-2015. [month 24]

D4.2 : Report on statistical analysis and comparison of HI results with coronal and in situ data; assessment of forecasting accuracy. [month 30]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I[60]	Comments
MS8	Start of WP4	2	10	Start of WP4 activities.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP5	**Type of activity**[54]	RTD
Work package title	Producing a definitive catalogue of CIRs imaged by STEREO/HI that includes verified model-derived kinematic properties		
Start month	1		
End month	36		
Lead beneficiary number[55]	3		

Objectives

• To construct a community-oriented catalogue of CIRs observed by STEREO/HI, with their main parameters, from 2007 to 2015 (minimum through maximum and early declining phase of solar cycle 24).
• To derive the 3-D trajectories and kinematic properties of CIRs using fitting procedures.
• To compare the back-projected results of CIR evolution with solar source observations; to determine the time-dependent effects of the dynamic streamer belt and of coronal holes.
• To compare the forward projected results of the fitting procedure with in-situ measurements of CIRs and the transient slow solar wind.

Description of work and role of partners

WP5 - Producing a definitive catalogue of CIRs imaged by STEREO/HI that includes verified model-derived kinematic properties [Months: 1-36]
UPS
The primary goal of WP5 is to provide a catalogue of the spatial and temporal evolution of CIRs observed by HI (and their substructures) in 3-D, following their complete formation process using different observations (mainly imaging but also in-situ) from the Sun out to 1 AU. The output of the solar wind stream advanced catalogue will be optimized to help the space physics community in the search for clues on the origin, propagation, 3D morphology, and the planetary effects of CIRs and the slow solar wind. The delivery of these advanced catalogues will enhance forefront research on: the 3-D structure of CIRs; their associated pressure ridges and shocks; the origin and nature of the variability of the slow solar wind; the time-dependent evolution of high-speed streams. This resource will also be useful for future missions (e.g. ESA's Solar Orbiter).

T5.1 - Cataloguing the occurrence of CIRs [Months: 1-36]
UPS
Using J-maps and optimized running-difference images, we will list the times of observations of each CIR in HI images, measure their latitudinal extent, measure the number of small-scale transients entrained inside each CIR for each latitudinal band, determine the minimum and maximum radial distance at which CIR are observed, and establish a common timeline (first order catalogue) of remote-sensing and in-situ measurements of CIRs. From the CIR fitted trajectories, we will provide a catalogue of the arrival times of CIRs at Mercury, Venus, Mars, Earth, Saturn, thereby providing support to European-funded space missions around these planets.
Instruments used: STEREO/HI and in-situ data, Wind, ACE, Venus Express, Ulysses.
Role of participants: This task will be undertaken by UPS.

T5.2 - Deriving/cataloguing the kinematic variation of CIRs [Months: 1-36]
UPS
We will fit the leading edge of each CIR in HI J-maps derived at all available latitudes to obtain the spatial/temporal evolution of each CIR over ~180o longitude and ~90o latitude. When the STEREO-A and B HI fields of view overlap, we will compare the estimated location of the CIR leading edge from both spacecraft. We will fit the kinematic evolution of each transient entrained inside CIRs at all latitudes, using different fitting techniques, which will provide another estimate of the CIR location as a function of time. For small-scale transients identified simultaneously in STEREO-A/HI and STEREO-B/HI, we will use triangulation techniques to detect potential speed variations near the Sun. This catalogue will be useful to determine the kinematic properties of the slow-solar wind in the upper corona.

Instruments used: STEREO/HI
Role of participants: This task will be undertaken by UPS.

T5.3 - Comparing back-projected CIR tracks with coronal sources [Months: 1-36]
UPS
Using the derived trajectories and kinematic properties of CIRs and their small-scale transients, we will determine for each CIR observed in white-light images if there is an associated coronal hole observed in EUV. We will create a catalogue of these identified coronal holes by combining EUV images from STEREO and SDO images with potential field source surface calculations based on HMI and GONG magnetograms. This catalogue will enable scientists to study the time-dependent evolution of coronal holes with direct space-weather applications. Using trajectories of small-scale transients derived from HI we will determine the portions in the streamer belt that generate small-scale transients and compare these locations of continually updated magnetograms.
Instruments used: STEREO/HI, STEREO/EUVl
Role of participants: This task will be undertaken by UPS.

T5.4 - Comparing forward-projected CIR tracks with in-situ measurements [Months: 1-36]
UPS, UH
We will track small-scale transients to 1 AU and make a list of predicted impacts at points in the heliosphere where in-situ measurements are taken. We will catalogue the in-situ properties of each small-scale transient. This latter catalogue will enable scientists to study the origin and variability of the slow solar wind.
Instruments used: STEREO SECCHI/in situ, Wind, ACE, Venus Express, Ulysses where/when solar wind data is available.
Role of participants: UPS: list small-scale transients that hit a spacecraft, UH: analysis of in-situ data in order to catalogue the in-situ properties of each small transient.

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	Task3 specific effort	Task4 specific effort	WP5 additional effort	WP5 TOTAL
1 - STFC	0.00	0.00	0.00	0.00	0.00	0.00
2 - UNIGRAZ	0.00	0.00	0.00	0.00	0.00	0.00
3 - UPS	7.00	7.00	7.00	4.00	0.00	25.00
CNRS	2.00	2.00	2.00	2.00	0.00	8.00
4 - UGOE	0.00	0.00	0.00	0.00	0.00	0.00
5 - ROB	0.00	0.00	0.00	0.00	0.00	0.00
6 - IMPERIAL	0.00	0.00	0.00	0.00	0.00	0.00
7 - UH	0.00	0.00	0.00	9.00	0.00	9.00
8 - TCD	0.00	0.00	0.00	0.00	0.00	0.00
Total	9.00	9.00	9.00	15.00	0.00	42.00

List of deliverables

Deliverable Number[61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature[62]	Dissemination level[63]	Delivery date[64]
D5.1	Establishing an online CIR catalogue	3	9.00	Report	PU	12

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D5.2	Fitting the leading edge of CIRs and determination of latitudinal extent	3	9.00	Report	PU	24
D5.3	Catalogue of CIRs/coronal holes	3	9.00	Report	PU	36
D5.4	Imagery/in situ comparison	3	6.00	Report	PU	36
D5.5	Analysis of in situ data	7	9.00	Report	PU	36
		Total	**42.00**			

Description of deliverables

D5.1 : Using J-maps and optimized running-difference images, we will list the times of observations of each CIR in HI images, measure the number of small-scale transients entrained inside each CIR in the ecliptic plane, determine the minimum and maximum radial distance at which CIR are observed, and establish a common timeline (first order catalogue) of remote-sensing and in-situ measurements of CIRs. From the CIR fitted trajectories, we will provide an estimate of the arrival times of CIRs at Mercury, Venus, Mars, Earth, Saturn, thereby providing support to European-funded space missions around these planets. [month 12]

D5.2 : We will fit the leading edge of each CIR in HI J-maps derived at all available latitudes to obtain the spatial/temporal evolution of each CIR over ~180o longitude and ~90o latitude. We will fit the kinematic evolution of transients entrained inside CIRs using different fitting techniques. For small-scale transients identified simultaneously in STEREO-A/HI and STEREO-B/HI, we will use triangulation techniques to detect potential speed variations near the Sun. This catalogue will be useful to determine the kinematic properties of the slow-solar wind in the upper corona. [month 24]

D5.3 : Using the derived trajectories and kinematic properties of CIRs and their small-scale transients, we will determine for each CIR observed in white-light images if there is an associated coronal hole observed in EUV. We will create a catalogue of these identified coronal holes by combining EUV images from STEREO and SDO images with potential field source surface calculations based on HMI and GONG magnetograms. This catalogue will enable scientists to study the time-dependent evolution of coronal holes with direct space-weather applications. Using trajectories of small-scale transients derived from HI we will determine the portions in the streamer belt that generate small-scale transients. [month 36]

D5.4 : We will track small-scale transients to 1 AU and make a list of predicted impacts at points in the heliosphere where in-situ measurements are taken. We will catalogue the in-situ properties of each small-scale transient. This latter catalogue will enable scientists to study the origin and variability of the slow solar wind. [month 36]

D5.5 : We will analyse the in-situ signature of small-scale transients that are predicted to impact a spacecraft. We will provide a report on the magnetic, plasma and particle signatures of these small transients. [month 36]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I[60]	Comments
MS4	Start of WP5	3	1	Start of WP5 activities.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP6	**Type of activity**[54]	RTD
Work package title	Initialising advanced numerical models based on the kinetic properties of STEREO/HI CMEs and CIRs		
Start month	7		
End month	36		
Lead beneficiary number[55]	3		

Objectives

• To assess the use of HI observations of solar wind streams to initialise numerical models of the background solar wind.
• To assess the use of HI observations of CMEs to inject transients in numerical models of the background solar wind.
• To compare initialisation techniques of MHD codes with HI-assimilated initialisation techniques.
• To establish a catalogue of numerically-predicted CME and shock impacts at in-situ spacecraft and a catalogue of optimised background solar wind and CME simulation results.

Description of work and role of partners

WP6 - Initialising advanced numerical models based on the kinetic properties of STEREO/HI CMEs and CIRs [Months: 7-36]
UPS
The primary goal of WP6 is to transform the catalogues of CMEs and CIRs observed by HI, accomplished in WP2/3 and WP5, into more advanced catalogues of simulations results of CIRs and CMEs. This advanced database will provide to the space community a set of simulation results optimised by assimilating direct images of the solar wind into ENLIL simulations. The delivery of these advanced catalogues will enhance forefront research on the 'background' solar wind (fast and slow solar wind) and on the spatial and temporal evolution of CIRs and CME shocks, and will provide unique material to study and interpret particle radiation measurements in the inner heliosphere. This resource will also be useful to assess the potential role of HI images for space-weather predictions and to prepare future missions (e.g. ESA's Solar Orbiter).

T6.1 - Assimilating HI images to model the background solar wind [Months: 7-36]
UPS
The combination of the catalogues of CIRs derived in WP5.1 and WP5.2, J-maps derived from HI images and movies will be compared with synthetic J-maps and movies of CIRs derived from numerical simulations of the background solar wind (ENLIL). We will divide events in two classes: Class 1 for which a good correspondence is immediately obtained between simulated and observed height-time maps and Class 2 for which J-maps differ significantly. We will compare how well ENLIL predicts the in-situ measurements of CIRs for these two classes of events separately. We will then modify the coronal input of ENLIL of the second class of events until synthetic and observed J-maps are in good agreement. We will then quantify the improvement in the predicted simulations by a statistical comparison of results with in-situ measurements of CIRs. A catalogue of the most accurate set of simulations of the background solar wind will then be established. This catalogue will be very useful for further simulations or for scientific users to obtain a more accurate estimate of the magnetic connectivity of spacecraft with solar events.
Instruments used: STEREO SECCHI/in situ, Wind, ACE, Venus Express, Ulysses.
Role of participants: GMU: simulate the background solar wind using unaltered and altered coronal inputs, compare simulations with HI images/height-time maps. Toulouse: statistical comparisons with in-situ measurements, modify coronal input.

T6.2 - Assessing the use of HI to initialize ENLIL [Months: 7-36]
UPS
The results of WP3 and 4 will provide the central axis, volume and speed of CMEs between 10 and 20 solar radii (range of inner boundary for ENLIL). These CMEs will then be injected as hydrodynamic spheres into the most accurate simulations of the background solar wind derived from WP6.1. The arrival time of the leading edge of the CMEs and the properties of the potential shocks driven ahead of them will be compared with in-situ measurements (exploiting the results of WP4.2). A

catalogue of these optimised ENLIL simulations of CMEs and their shocks will then be stored for the ecliptic plane. This advanced catalogue will help studies of the origin of solar energetic particle events.
Instruments used: STEREO/SECCHI/in situ, Wind, ACE, Venus Express, Ulysses.
Role of participants: UPS: Derivation of CME properties from combined COR-2 and HI. Comparisons of simulations with in-situ measurements of CMEs and shocks. GMU: simulate CMEs, compare simulations with HI images/J-maps.

T6.3 - Continual assimilation of HI data in ENLIL and comparison with standard implementation techniques
[Months: 7-36]
UPS
In Task 6.2, the CME properties are specified once at the inner boundary. The CME position, volume and speed can be updated every 40 minutes for HI-1 and 2 hours for HI-2. Medium resolution ENLIL simulations will be re-launched at every time step such that the CME position and speed remains in agreement with HI images. The results of this set of assimilated simulations will be compared with results of Task 5.2 and in-situ measurements; we will determine whether a continual assimilation of HI images provides a better forecast of CME arrival times at 1 AU.
Instruments used: STEREO/SECCHI
Role of participants: UPS: to derive the properties of CMEs in HI images at consecutive time steps, compare simulation results with in-situ measurements. GMU: simulate CMEs, compare simulations with HI images/J-maps.

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	Task3 specific effort	WP6 additional effort	WP6 TOTAL
1 - STFC	0.00	0.00	0.00	0.00	0.00
2 - UNIGRAZ	0.00	0.00	0.00	0.00	0.00
3 - UPS	8.00	8.00	8.00	0.00	24.00
CNRS	1.00	1.00	1.00	0.00	3.00
4 - UGOE	0.00	0.00	0.00	0.00	0.00
5 - ROB	0.00	0.00	0.00	0.00	0.00
6 - IMPERIAL	0.00	0.00	0.00	0.00	0.00
7 - UH	0.00	0.00	0.00	0.00	0.00
8 - TCD	0.00	0.00	0.00	0.00	0.00
Total	9.00	9.00	9.00	0.00	27.00

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D6.1	Assessment of how well ENLIL predicts the properties of CIRs using HI	3	5.00	Other	PU	24
D6.2	Catalogue of optimised ENLIL simulations	3	4.00	Report	PP	24
D6.3	Catalogue of shocks of obtained using ENLIL	3	9.00	Report	PU	36
D6.4	Assessment of the use of HI/ENLIL for space-weather forecasting	3	9.00	Demonstrator	PU	36

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
		Total	**27.00**			

Description of deliverables

D6.1 : J-maps derived from HI images and movies will be compared with synthetic J-maps and movies of CIRs derived from numerical simulations of the background solar wind (ENLIL). We will divide events in two classes: Class 1 for which a good correspondence is immediately obtained between simulated and observed height-time maps and Class 2 for which J-maps differ significantly. We will compare how well ENLIL predicts the in-situ measurements of CIRs for these two classes of events separately. We will then modify the coronal input of ENLIL of the second class of events until synthetic and observed J-maps are in good agreement. [month 24]

D6.2 : A catalogue of the most accurate set of simulations of the background solar wind will then be established. This catalogue will be very useful for further simulations or for scientific users to obtain a more accurate estimate of the magnetic connectivity of spacecraft with solar events. [month 24]

D6.3 : The results of WP3 and 4 will provide the central axis, volume and speed of CMEs between 10 and 20 solar radii (range of inner boundary for ENLIL). These CMEs will then be injected as hydrodynamic spheres into the most accurate simulations of the background solar wind derived from WP6.1. The arrival time of the leading edge of the CMEs and the properties of the potential shocks driven ahead of them will be compared with in-situ measurements (exploiting the results of WP4.2). A catalogue of these optimised ENLIL simulations of CMEs and their shocks will then be stored for the ecliptic plane. This advanced catalogue will help studies of the origin of solar energetic particle events. [month 36]

D6.4 : In Task 6.2, the CME properties are specified once at the inner boundary. The CME position, volume and speed can be updated every 40 minutes for HI-1 and 2 hours for HI-2. Medium resolution ENLIL simulations will be re-launched at every time step such that the CME position and speed remains in agreement with HI images. The results of this set of assimilated simulations will be compared with results of Task 5.2 and in-situ measurements; we will determine whether a continual assimilation of HI images provides a better forecast of CME arrival times at 1 AU. [month 36]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I[60]	Comments
MS6	Start of WP6	3	7	Start of WP6 activities.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP7	**Type of activity**[54]	RTD
Work package title	Assessing the complementary nature of radio measurements of solar wind transients		
Start month	10		
End month	36		
Lead beneficiary number[55]	6		

Objectives

• To identify and analyse potentially-geoeffective solar wind events that are observed by both HI and IPS, and use IPS to augment the HI observations.
• To identify and analyse solar wind transients that are observed by both HI and in radio, and add value to the HI data by establishing/cataloguing the relationships between them.

Description of work and role of partners

WP7 - Assessing the complementary nature of radio measurements of solar wind transients [Months: 10-36]
IMPERIAL
Recognising radio observations that are associated with heliospheric transients, this work package links, in particular IPS and Type II events to the established Heliospheric Imager observed events.

T7.1 - Identifying and analysing potentially-geoeffective solar wind events that are observed by both HI and IPS [Months: 10-36]
STFC
Interplanetary scintillation (IPS) results from inhomogeneities in solar wind/heliospheric outflow (~150 km scale size) crossing the line of sight (LOS) from a distant, point-like astronomical natural radio source to receiving telescopes/antennas on Earth. IPS enables the solar wind velocity, density and turbulence of material flowing across the LOS to be inferred. IPS was the first technique that remotely sensed the heliosphere, and has led to several fundamental discoveries of solar wind structure (some only later confirmed by spacecraft). In the past, IPS was considered to have only modest potential for space weather science based on experimental and instrumental capabilities of the time. Today, these capabilities have been far exceeded due to advances in technology/data analysis/interpretation (e.g. Bisi et al. 2009; Bisi et al. 2010a; 2010b; Fallows et al. 2012; Jackson et al. 2012), making IPS a powerful tool for space weather science and forecasting.
The combination of IPS with white-light heliospheric imaging has already been proven to be highly effective for solar wind, CME, and space weather investigations (e.g. Dorrian et al. 2010; Hardwick et al. 2012); this will be capitalised upon here in WP7.

The following goals will be achieved in this WP7 objective:
1. Development of a catalogue of CMEs observed using IPS by EISCAT/ESR, LOFAR, and KAIRA/EISCAT_3D during the STEREO mission timeline and comparison with observations from STEREO/HI and COR and LASCO, where appropriate, and where the geometry allows.
2. As 1 but for CIRs and their non-corotating counterparts, Stream Interaction Regions (SIRS).
3. Interaction with the solar wind: (1) investigating effects, if any, on the ambient solar wind due to the events catalogued above (2) investigating the systematic effects, if any, of the ambient solar wind on CMEs/CIRs/SIRs in terms of modification to propagation direction and speed, such that this knowledge can feed into improved space-weather forecasting models.
4. Determining the number of interacting CMEs in HI images, and exploring how IPS may be used to aid interpretation of such complex events including the use of readily-available 3-D computer-assisted tomography where appropriate/sufficient extant IPS data allow (e.g. with IPS data from STELab in Japan).
Instruments used: EISCAT/ESR, LOFAR, KAIRA/EISCAT_3D
Role of participants: This task will be undertaken by STFC.

T7.2 - Identifying and analysing solar wind transients that are observed by both HI and in Type II radio burst emission [Months: 10-36]

IMPERIAL, ROB
Solar radio-burst observations cover a broad frequency domain corresponding to different distances from the Sun. The S/WAVES instruments on STEREO measures radio emission and in-situ plasma waves in the frequency range 2.5 kHz – 16.025 MHz. Radio emissions produced by non-thermal electrons accelerated at the shock front (type II radio bursts) are unique means of studying shock wave propagation. Type II radio bursts appear in dynamic spectra as slowly drifting lanes of enhanced emission decreasing in frequency with distance from the Sun, generated at the local plasma frequency and/or its harmonics. Since frequency is proportional to density, applying a coronal density model allows estimation of the height of the shock signatures. Combining STEREO solar radio-burst, coronagraph and HI observations enables unique study of the propagation of shock waves and their drivers (CMEs), as well as interaction of fast CMEs, all the way from the low corona to 1 AU. This links strongly to the IPS observations.
S/WAVES observations impose a lower boundary condition for the HI J-map analysis (Harrison et al. 2012). A key advantage of space-based radio measurements is their effectiveness in tracking CMEs through the interface between coronagraph and HI fields of view, and in analysing examples where fast CMEs interact. The metric Type II radio bursts in conjunction with CME onset are observed using ground-based instruments. We will leverage team participation in ground-based radio observations, e.g. the CALLISTO spectrometer network (10 – 800 MHz), that extend the data down to the low corona, critical in measuring CME kinematics/shock-wave formation near the Sun.

The following goals will be achieved in this WP7 objective:
1. Developing a joint catalogue of CMEs observed in HI, and S/WAVES and Wind/WAVES data.
2. Extending the catalogue with ground-based radio observations to examine more closely the source region of each CME.
3. Constructing height-time statistics, and systematically examining usefulness of radio data in constraining modelling of CME lift-off and its impact on CME forecasting.
4. Determining the number of interacting CME events and exploring how radio data can be used to decipher event kinematics and improve forecasting.
Instruments used: STEREO/SECCHI and SWAVES; WIND/WAVES
Role of participants: This task will be undertaken by IMPERIAL and ROB.

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	WP7 additional effort	WP7 TOTAL
1 - STFC	19.50	0.00	0.00	19.50
2 - UNIGRAZ	0.00	0.00	0.00	0.00
3 - UPS	0.00	0.00	0.00	0.00
CNRS	0.00	0.00	0.00	0.00
4 - UGOE	0.00	0.00	0.00	0.00
5 - ROB	0.00	3.00	0.00	3.00
6 - IMPERIAL	0.00	17.00	0.00	17.00
7 - UH	0.00	0.00	0.00	0.00
8 - TCD	0.00	0.00	0.00	0.00
Total	19.50	20.00	0.00	39.50

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D7.1	Catalogues of EISCAT and LOFAR IPS data events and of S/WAVES events	6	20.00	Other	PU	27
D7.2	Report of initial comparison between IPS events and HI events.	1	8.00	Report	PP	30
D7.3	Report of initial comparison between solar radio-burst events and HI events.	6	8.00	Report	PP	30
		Total	**36.00**			

Description of deliverables

D7.1 : Catalogues of EISCAT and LOFAR IPS data events and of S/WAVES events, both extending throughout the STEREO HI Mission timeline [month 27]

D7.2 : Report of initial comparison between IPS events and HI events. [month 30]

D7.3 : Report of initial comparison between solar radio-burst events and HI events. [month 30]

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I[60]	Comments
MS9	Start of WP7	6	10	Start of WP7 activities.

WT3:
Work package description

Project Number [1]	606692	Project Acronym [2]	HELCATS

One form per Work Package

Work package number[53]	WP8	**Type of activity[54]**	OTHER
Work package title	Dissemination		
Start month	1		
End month	36		
Lead beneficiary number[55]	1		

Objectives

• To publish the results of the studies in the professional literature, and present them at major international science meetings.
• To arrange annual, open meetings for the scientific community during the lifetime of the project.
• To install all relevant documents, catalogues, publications on the project website.
• To integrate into relevant, established community facilities and websites, including the IRAP propagation tool, the AMDA data-mining tool, HELIO and the UKSSDC.
• To disseminate information and results to the public and policy makers.

Description of work and role of partners

WP8 - Dissemination [Months: 1-36]
STFC
The aim of WP8 is to set up the processes/facilities to disseminate HELCATS results and products.

T8.1 - Publication of results and conclusions [Months: 1-36]
STFC
The cataloguing, comparison and assessment activities will all deliver reports to the project and the FP7 programme. These deliverables (from WP2-7) are the topics for open publication (see above). Here we focus on the preparation, submission and publication of results to the open research community through the professional literature. Most publications would be submitted as the project concludes. This work will involve most groups, coordinated through the lead participant, STFC.

T8.2 - Annual open meetings with the science community and presentations at major science meetings [Months: 1-36]
STFC
We propose holding one meeting per year that is open to the wider science community (in association with every other bi-annual project meeting). We anticipate one in the UK, France and Germany to maximise potential community involvement across Europe. The meetings will focus on dissemination of results and their exploitation in future research. Funds to attract key speakers (paying limited travel costs) are included. We anticipate a workshop-style forum (coordinated by STFC) akin to CDAW meetings (http://spdf.gsfc.nasa.gov/cdaw.html) involving 30 to 50 attendees. Team members would present results at major meetings (e.g European Geosciences Union (EGU) in Vienna, and American Geophysics Union (AGU) in San Francisco in fall and another US city in spring) to provide the most comprehensive platform for advertising the project outcomes. Depending on what is presented, costs come into WP8 (administered by STFC) or individual WPs.

T8.3 - Installation of relevant documents, catalogues, publications on the project website [Months: 1-36]
STFC
The project website is the principal repository for all information, for the project team and the open user community. Task 8.3 ensures that all information is available to both. STFC (responsible for the website; WP1) will oversee posting of information by all participants.

T8.4 - Integrate with relevant, established community facilities and websites [Months: 1-36]
STFC, UPS
As a logical extension of task 8.3, we will:
1. Standardise the delivery format of CME and CIR kinematic catalogues across WPs such that programming languages like IDL, MATLAB, C++ and FORTRAN, but also virtual observatories, can ingest them easily within their computational framework.

2. Ingest these standardised catalogues into the UK Solar System Data Centre (UKSSDC; RAL).
3. Put in place web-services from the source archive, UKSSDC, to other data centers such as CDPP/IRAP (France), the European virtual observatories e.g. HELIO (Heliophysics Integrated Observatory; FP7 project), and the American Virtual Solar Observatory (VSO). By doing so, the planetary community that uses the FP7 EUROPLANET platform will immediately gain access.
4. Create a web-service between UKSSDC and the IRAP propagation tool. This CNRS-financed tool (will be fully operational in March 2013) will provide web-based access and manipulation of HI J-maps, including access to pre-generated time-elongation profiles for specific CMEs/CIRs or permitting users to extract profiles by clicking on J-maps. This tool will provide access to the CME/CIR catalogues (from WP3 and WP5) and will offer an additional platform to help scientists access and manipulate catalogues developed in this project. The propagation tool will link plasma data centers like the CDPP to solar archives like UKSSDC.
5. Create a web-service to send the catalogues of solar features and in-situ features associated with the HI/CMEs and CIRs, determined as part of WP3 and WP5, to the above listed virtual observatories, the propagation tool and the web-based data mining tool AMDA.
6. Store the most accurate Carrington maps of solar wind speed at UKSSDC and integrate these maps in the IRAP propagation tool. Upon completion of the IRAP propagation tool, the interface will offer direct visualization of Carrington maps; integrating the Carrington maps calibrated in this proposal will be straightforward.

T8.5 - Dissemination of information to the public and policy makers [Months: 1-36]
STFC
This WP includes interaction with the public (see Annex 1B) and policy makers. The website will include public/media targeted information, and press releases will be produced when appropriate (e.g. project initiation, key milestones and results). Basic information for the non-scientist will be available (e.g. background, aims, galleries, links). The activities will include media interviews and public talks/presentations, in which most team members have extensive experience. Recognizing that this is a topic of interest to the public, we will maximize the outreach activities of the project. On the issue of policy makers, we recognize the project's value to space weather and will maintain contact with key strategic European bodies, such as the ESA Space Situational Awareness programme and national bodies. This deliberate strategy will include targeting agenda items, inviting key speakers to meetings, and providing copies of our reports to these organizations.

Person-Months per Participant

Participant number and short name[10]	Task1 specific effort	Task2 specific effort	Task3 specific effort	Task4 specific effort	Task5 specific effort	WP8 additional effort	WP8 TOTAL
1 - STFC	3.00	2.00	2.00	2.00	2.50	0.00	11.50
2 - UNIGRAZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3 - UPS	0.00	0.00	0.00	10.00	0.00	0.00	10.00
CNRS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4 - UGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5 - ROB	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6 - IMPERIAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7 - UH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8 - TCD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3.00	2.00	2.00	12.00	2.50	0.00	21.50

WT3:
Work package description

List of deliverables

Delive-rable Number[61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature[62]	Dissemi-nation level[63]	Delivery date[64]
D8.1	Publication in the professional scientific literature	1	2.50	Other	PU	36
D8.2	Annual open meetings	1	1.50	Other	PU	36
D8.3	Attendance/presentations at major science meetings	1	1.50	Other	PU	36
D8.4	Posting information on the website	1	3.50	Other	PU	36
D8.5	Integration with community facilities and websites	1	3.50	Other	PU	36
D8.6	Production of press releases, public talks	1	2.00	Other	PU	36
D8.7	Integrate the J-map associated catalogues produced in HELCATS to the propagation tool.	3	3.00	Report	PU	36
D8.8	Integrate Carrington Map associated catalogues in the propagation tool	3	3.00	Report	PU	36
		Total	**20.50**			

Description of deliverables

D8.1 : Publication in the professional scientific literature on the topics subject to reports in WP2-7. Completion of submission of papers after Month 36. [month 36]

D8.2 : Arrange and run annual open meetings in months 12, 24 and 36. [month 36]

D8.3 : Attendance/presentations at major science meetings, representing the HELCATS colaboration and showcasing HELCATS results and facilities (nominally in M12, M24, M36). [month 36]

D8.4 : Regular and continuous posting of information on the website, as appropriate, throghout the life of the project. [month 36]

D8.5 : Integration with community facilities and websites. [month 36]

D8.6 : Production of press releases, presentation of public talks, as appropriate, throughout the life of the project. [month 36]

D8.7 : Create a web-service between UKSSDC and the already existing IRAP propagation tool. This tool will provide access to the CME/CIR catalogues (from WP3 and WP5) and will offer an additional platform to help scientists access and manipulate catalogues developed in this project. Integrate the newly calibrated HI J-maps to the propagation tool. Including access to pre-generated time-elongation profiles for specific CMEs/CIRs or permitting users to extract profiles by clicking on J-maps. [month 36]

D8.8 : Store the most accurate Carrington maps of solar wind speed at UKSSDC and integrate these maps in the IRAP propagation tool. Upon completion of the IRAP propagation tool, the interface will offer direct visualization of Carrington maps; integrating the Carrington maps calibrated in this proposal will be straightforward. [month 36]

WT3:
Work package description

Schedule of relevant Milestones

Milestone number[59]	Milestone name	Lead beneficiary number	Delivery date from Annex I[60]	Comments
MS7	Start of WP8	1	1	Start of WP8 activities.

WT4:
List of Milestones

Project Number [1]	606692	Project Acronym [2]	HELCATS

List and Schedule of Milestones

Milestone number[59]	Milestone name	WP number[53]	Lead beneficiary number	Delivery date from Annex I[60]	Comments
MS1	Start	WP1	1	1	Onset of project.
MS2	Kick-off Meeting	WP1	1	1	Kick-off meeting
MS3	Start of WP2	WP2	1	1	Start of WP2 activities.
MS4	Start of WP5	WP5	3	1	Start of WP5 activities.
MS5	Start of WP3	WP3	4	7	Start of WP3 activities.
MS6	Start of WP6	WP6	3	7	Start of WP6 activities.
MS7	Start of WP8	WP8	1	1	Start of WP8 activities.
MS8	Start of WP4	WP4	2	10	Start of WP4 activities.
MS9	Start of WP7	WP7	6	10	Start of WP7 activities.
MS10	Completion of Project	WP1	1	36	Completion of project - work completed and final report produced.

WT5:
Tentative schedule of Project Reviews

Project Number [1]	606692	Project Acronym [2]	HELCATS

Tentative schedule of Project Reviews

Review number[65]	Tentative timing	Planned venue of review	Comments, if any

WT6:
Project Effort by Beneficiary and Work Package

Project Number [1]	606692	Project Acronym [2]	HELCATS

Indicative efforts (Person-months) per Beneficiary per Work Package

Beneficiary number and short-name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Total per Beneficiary
1 - STFC	8.50	25.00	9.00	0.00	0.00	0.00	19.50	11.50	73.50
2 - UNIGRAZ	0.00	0.00	6.00	30.00	0.00	0.00	0.00	0.00	36.00
3 - UPS	0.00	0.00	0.00	2.00	25.00	24.00	0.00	10.00	61.00
CNRS	0.00	0.00	0.00	2.00	8.00	3.00	0.00	0.00	13.00
4 - UGOE	0.00	6.00	21.00	12.00	0.00	0.00	0.00	0.00	39.00
5 - ROB	0.00	20.50	0.00	6.00	0.00	0.00	3.00	0.00	29.50
6 - IMPERIAL	0.00	0.00	0.00	3.00	0.00	0.00	17.00	0.00	20.00
7 - UH	0.00	0.00	0.00	13.00	9.00	0.00	0.00	0.00	22.00
8 - TCD	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	15.00
Total	8.50	51.50	51.00	68.00	42.00	27.00	39.50	21.50	309.00

WT7:
Project Effort by Activity type per Beneficiary

Project Number [1]	606692	Project Acronym [2]	HELCATS

Indicative efforts per Activity Type per Beneficiary

Activity type	Part. 1 STFC	Part. 2 UNIGRAZ	Part. 3 UPS	CNRS	Part. 4 UGOE	Part. 5 ROB	Part. 6 IMPERIA	Part. 7 UH	Part. 8 TCD	Total
1. RTD/Innovation activities										
WP2	25.00	0.00	0.00	0.00	6.00	20.50	0.00	0.00	0.00	51.50
WP3	9.00	6.00	0.00	0.00	21.00	0.00	0.00	0.00	15.00	51.00
WP4	0.00	30.00	2.00	2.00	12.00	6.00	3.00	13.00	0.00	68.00
WP5	0.00	0.00	25.00	8.00	0.00	0.00	0.00	9.00	0.00	42.00
WP6	0.00	0.00	24.00	3.00	0.00	0.00	0.00	0.00	0.00	27.00
WP7	19.50	0.00	0.00	0.00	0.00	3.00	17.00	0.00	0.00	39.50
Total Research	**53.50**	**36.00**	**51.00**	**13.00**	**39.00**	**29.50**	**20.00**	**22.00**	**15.00**	**279.00**
2. Demonstration activities										
Total Demo	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
3. Consortium Management activities										
WP1	8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50
Total Management	**8.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.50**
4. Other activities										
WP8	11.50	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	21.50
Total other	**11.50**	**0.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.50**
Total	**73.50**	**36.00**	**61.00**	**13.00**	**39.00**	**29.50**	**20.00**	**22.00**	**15.00**	**309.00**

WT8:
Project Effort and costs

Project Number [1]	606692	Project Acronym [2]	HELCATS

Project efforts and costs

Beneficiary number	Beneficiary short name	Estimated eligible costs (whole duration of the project)						Requested EU contribution (€)
		Effort (PM)	Personnel costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs OR lump sum, flat-rate or scale-of-unit (€)	Total costs	
1	STFC	73.50	413,539.10	0.00	84,082.50	434,216.00	931,837.60	781,718.35
2	UNIGRAZ	36.00	201,000.00	0.00	22,375.00	134,025.00	357,400.00	270,000.00
3	UPS	61.00	295,342.00	0.00	36,625.00	199,180.20	531,147.20	427,547.20
	CNRS	13.00	56,000.00	0.00	0.00	33,600.00	89,600.00	67,200.00
4	UGOE	39.00	195,000.00	0.00	34,200.00	137,520.00	366,720.00	277,200.00
5	ROB	29.50	147,500.00	0.00	19,875.00	100,425.00	267,800.00	202,200.00
6	IMPERIAL	20.00	129,196.00	0.00	16,089.00	87,171.00	232,456.00	176,862.00
7	UH	22.00	127,234.00	0.00	18,875.00	87,665.40	233,774.40	176,680.80
8	TCD	15.00	80,354.00	0.00	18,500.00	59,312.40	158,166.40	120,424.80
Total		309.00	1,645,165.10	0.00	250,621.50	1,273,115.00	3,168,901.60	2,499,833.15

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It cannot be changed unless agreed so during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

53. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

54. Type of activity

For all FP7 projects each work package must relate to one (and only one) of the following possible types of activity (only if applicable for the chosen funding scheme # must correspond to the GPF Form Ax.v):

• **RTD/INNO =** Research and technological development including scientific coordination - applicable for Collaborative Projects and Networks of Excellence

• **DEM =** Demonstration - applicable for collaborative projects and Research for the Benefit of Specific Groups

• **MGT =** Management of the consortium - applicable for all funding schemes

• **OTHER =** Other specific activities, applicable for all funding schemes

• **COORD =** Coordination activities - applicable only for CAs

• **SUPP =** Support activities - applicable only for SAs

55. Lead beneficiary number

Number of the beneficiary leading the work in this work package.

56. Person-months per work package

The total number of person-months allocated to each work package.

57. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

58. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

59. Milestone number

Milestone number:MS1, MS2, ..., MSn

60. Delivery date for Milestone

Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

61. Deliverable number

Deliverable numbers in order of delivery dates: D1 - Dn

62. Nature

Please indicate the nature of the deliverable using one of the following codes

R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

63. Dissemination level

Please indicate the dissemination level using one of the following codes:

• **PU =** Public

• **PP =** Restricted to other programme participants (including the Commission Services)

• **RE =** Restricted to a group specified by the consortium (including the Commission Services)

• **CO =** Confidential, only for members of the consortium (including the Commission Services)

• **Restreint UE =** Classified with the classification level "Restreint UE" according to Commission Decision 2001/844 and amendments

• **Confidentiel UE =** Classified with the mention of the classification level "Confidentiel UE" according to Commission Decision 2001/844 and amendments

• **Secret UE =** Classified with the mention of the classification level "Secret UE" according to Commission Decision 2001/844 and amendments

64. Delivery date for Deliverable

Month in which the deliverables will be available. Month 1 marking the start date of the project, and all delivery dates being relative to this start date

65. Review number

Review number: RV1, RV2, ..., RVn

66. Tentative timing of reviews

Month after which the review will take place. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

67. Person-months per Deliverable

The total number of person-month allocated to each deliverable.