

Gaia

ECSS in the eXtreme

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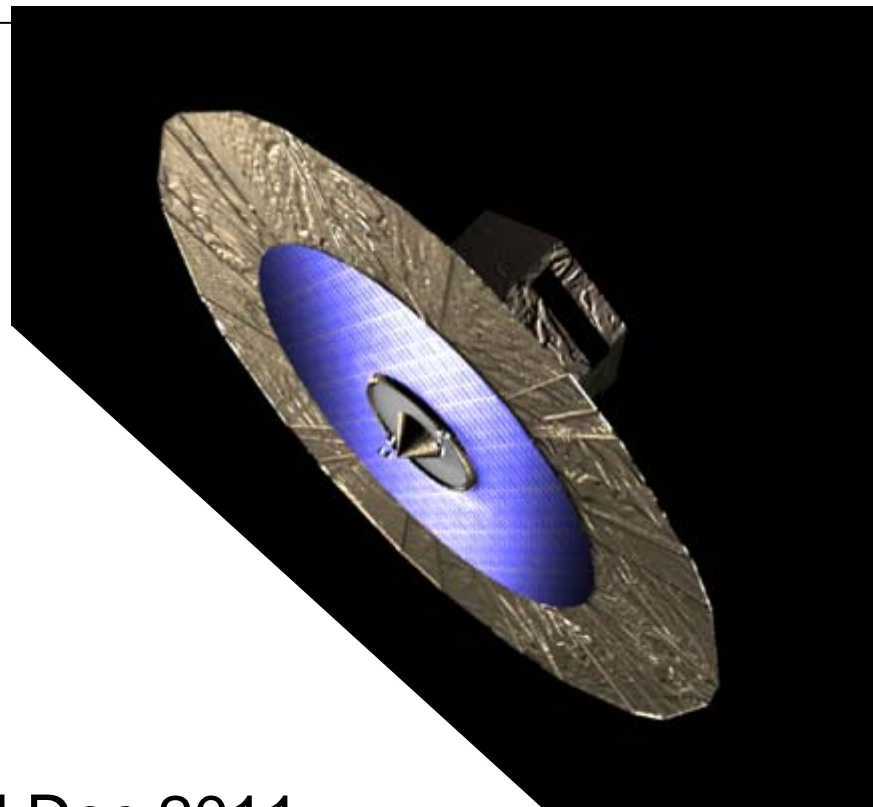
Spain

<http://www.rssd.esa.int/Gaia>



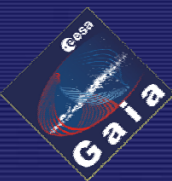
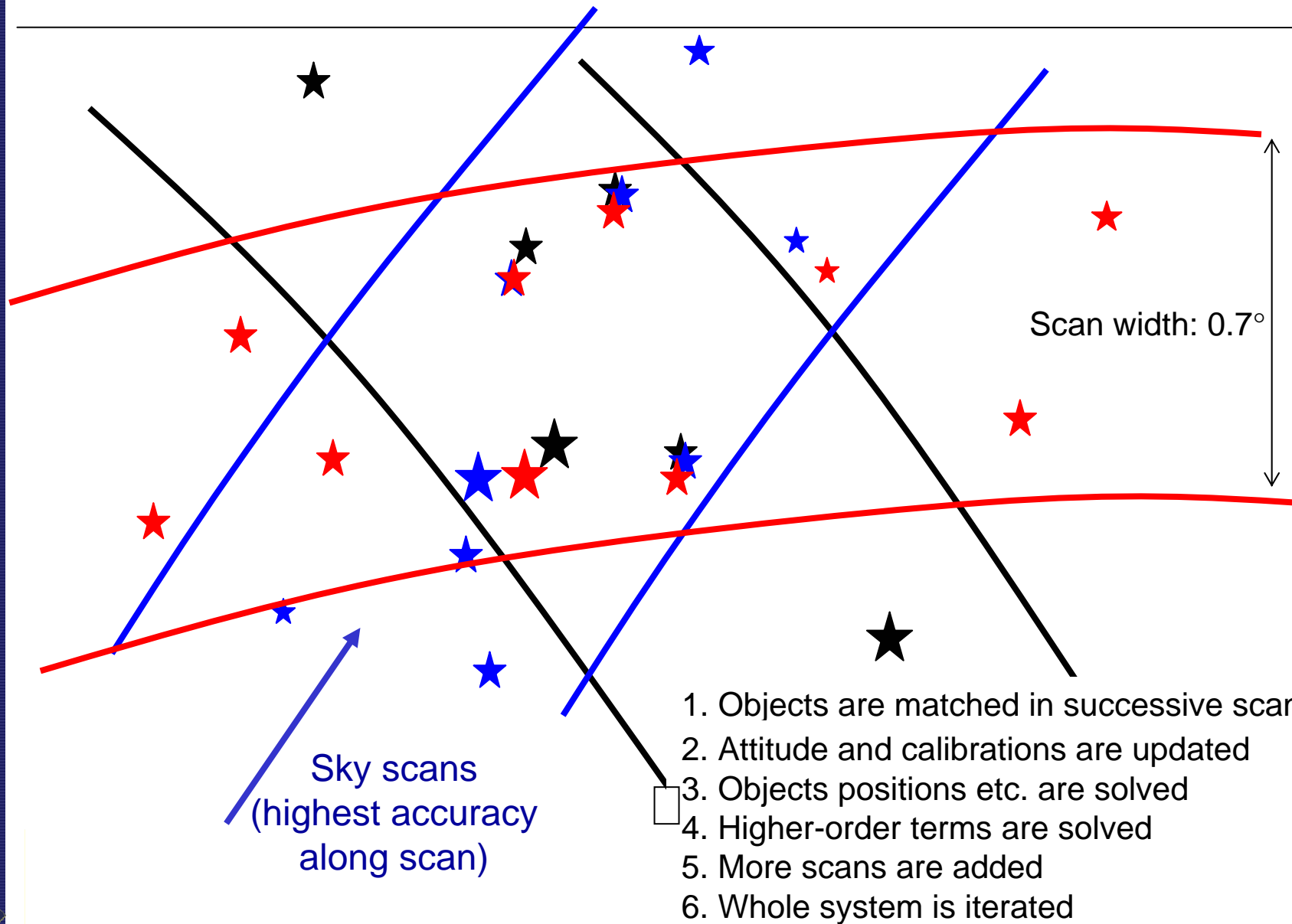
First Gaia ...

- Mission:
 - Stereoscopic Census of Galaxy 5yr @ L2
 - μ arcsec Astrometry $G < 20$ (10^9 sources)
 - Radial Velocities $G < 16$
 - Photometry $G < 2$
- Status:
 - Launch: Still Scheduled Dec 2011.
 - EADS/Astrium building Gaia
 - DPAC doing the processing



Gaia: Global Iterative Solution

Gaia ECSS in the eXtreme
ADASS XVII – London, UK – September 2007



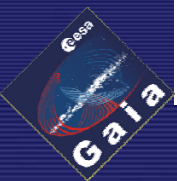
Astrometric GIS – What ? (recap)

Calculate parameters describing

- observed (proper) directions to a subset of "well-behaved" (*primary*) sources
- attitude of the instrument as function of time
- transformation from field angles to pixel coordinates

This requires

- Selecting $\sim 10^5$ primaries from $\sim 10^9$
- Treating iteratively those 10^7 transits

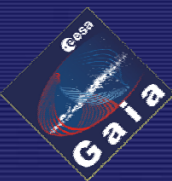


A question !

- Herein lies the crux of science processing problems for me ...
- In a recent meeting I was asked :

“What do you think you are doing, a science project or something ?”

“Well yes ... I rather think I am!” did not seem to be the expected answer.



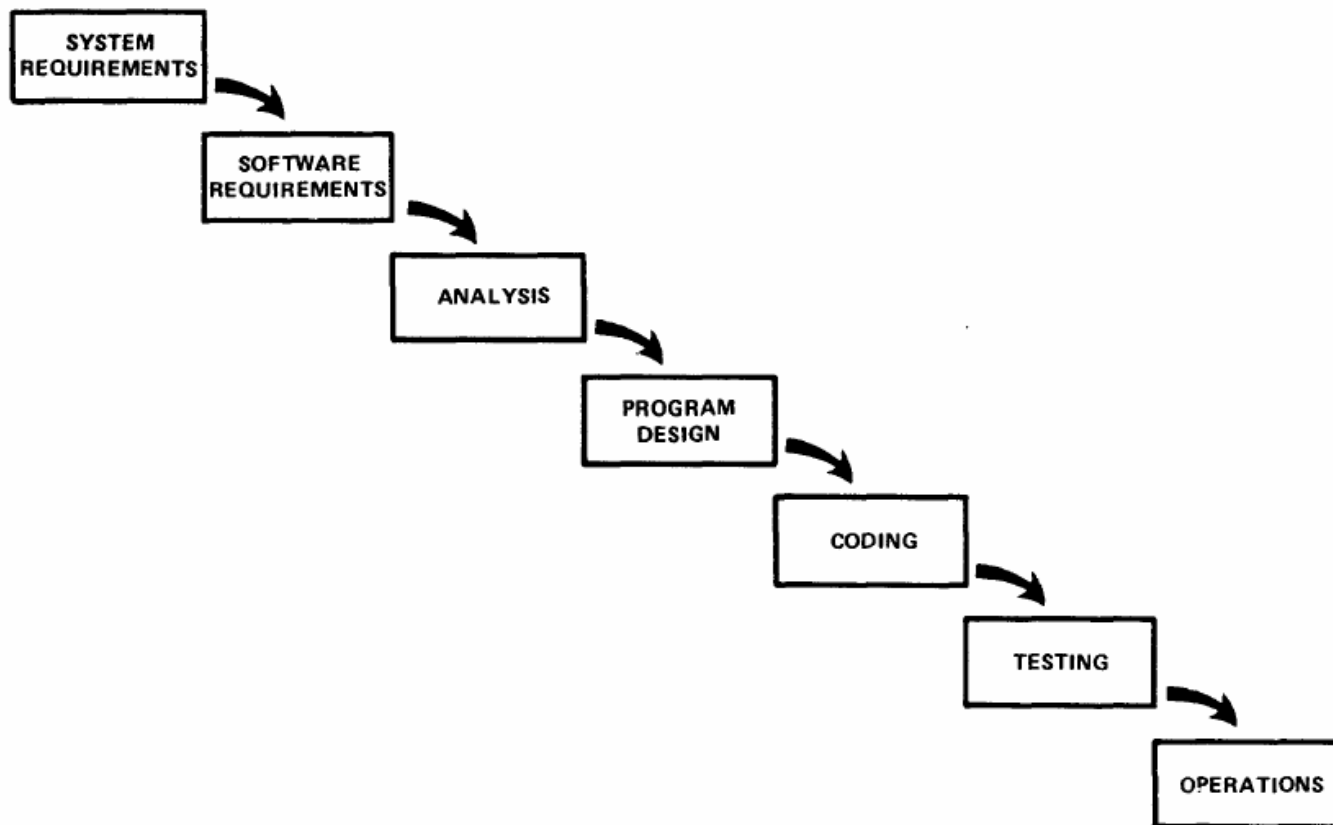
Is science processing different ?

- To clarify In the ESA context think “different to satellite development”
 - i.e. the waterfall
 - Requirements
 - Design
 - Implement
 - Deliver
 - Precisely in that order and precisely once
 - Genuinely how many of you ever do this ?
- Not clear any large software is done in this manner anymore.



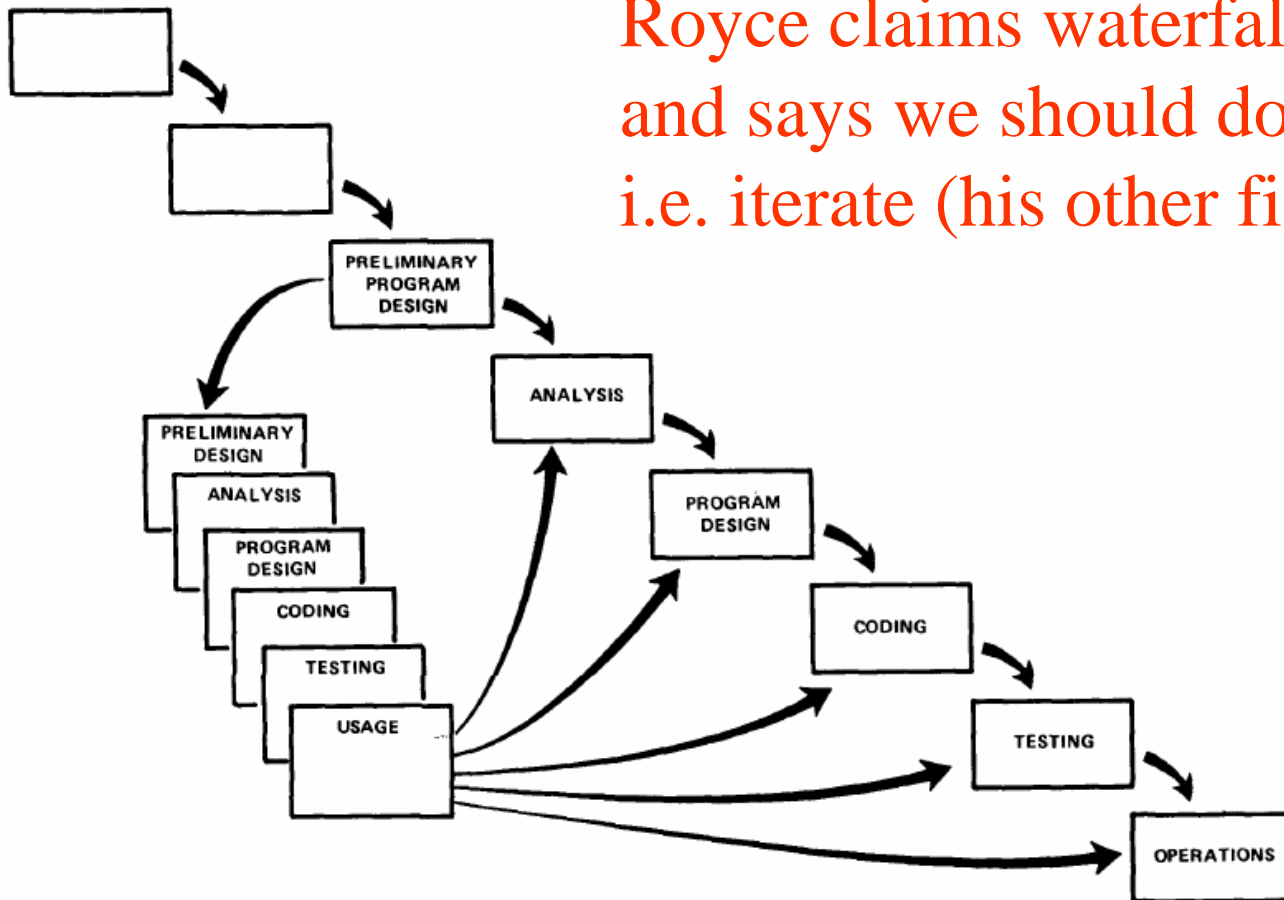
A little amusing history ...

- Royce W., August 1970, In: Proceedings of IEEE WESCON, 1–9
 - Considered inventor of term waterfall (his fig)



And what is amusing ...

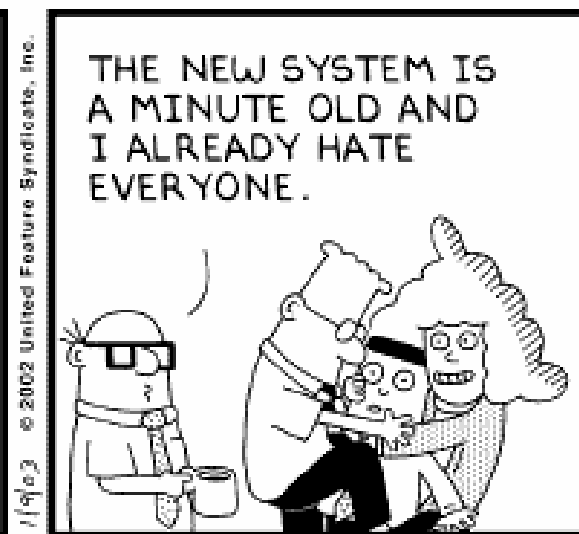
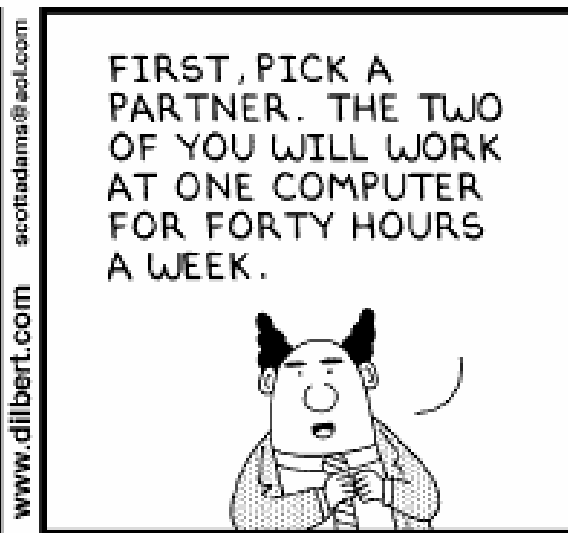
- for the *managers* that actually read the next page of the paper



Royce claims waterfall is flawed and says we should do it twice! i.e. iterate (his other fig)

Extreme Development approach

- One of the so called Agile techniques
- This is not how it is



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At ESAC the story goes ..

- We plan once a month using points
- Yes we write stories on post-its – they are costed in points (1 point \sim 1/2 day)
- Each team member uses their points to buy stories to work on for the month



The story continues

- Costing is done as a group
- All stories are put in the XP tracker twiki where everyone records the time they actually spent on the story
- We get better at knowing how long something actually takes.
- We sometimes sit at one computer but usually when there is a problem – not as a norm



The XP tracker twiki

InfrastructureIteration < Tracking < TWiki - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://gaias10:8000/twiki/bin/view/Tracking/InfrastructureIteration

java api Zoom Astronomy Glos... weather.com - Local ... GaiaAGIS < Tracking ...

sun coding java static v... Talk:CU1:Coding standa... Yahoo! Mail - womullan... InfrastructureIteration ... Ecología Certificada - Pro...

Infrastructure for properties, extended to SQL statements stored outside of application code		1	1	0	😊	100%	0%	Complete	JohnHoar
SpecialUtilitiesStory Design and implements a couple of special utility classes		2	2	0	😊	100%	0%	Complete	UweLammers
UpdateArchitectureStory Update the Architecture Document		4	2.5	0	😊	100%	-37%	Complete	JohnHoar UweLammers WilliamOMullane
WhiteBoardObserverStory Monitor contents of Whiteboard and schedule processing tasks for execution		3	3	0	😊	100%	0%	Complete	UweLammers
Team totals		26.4	21.7	0	😊	100%	-17%		

Create new story in this iteration

Developer velocity for iteration InfrastructureIteration

Who	Assigned	Spent	Remaining	Completion	Assigned Tasks	Remaining Tasks
WilliamOMullane	11	9	0	100%	12	0
UweLammers	11	8.5	0	100%	13	0
JohnHoar	4.4	4.2	0	100%	7	0

Features ...

- We have a long term plan to launch with more firm 'stories' for the six month cycle we are in

But work is planned in detail monthly

- We concentrate on what we need this month
- We know quickly when something is much tougher than expected
- We do not design for what we might want next year – do that next year
- This keeps the code base at a minimum
 - Also most code is in use !
- This has been essential to keep system performance at peak
 - Immediately obvious if new features slow us down.



Most importantly TESTING

- This type of approach only works with lots of test code and continuous integration
- That means automatic tests like Junit
 - CruiseControl builds/tests a few times a day
 - emails everyone if the build or tests fail
- Trying to get >80% test coverage
- AGIS – just for interest
 - ~100K lines of code
 - ~30K lines of test code on top of that
 - ~95K lines of comments



Then there was ECSS ..

European Cooperation for Space Standardization

- Tells us how to do things and what documentation to produce: many books
 - ECSS-E-10B Requirements
 - ECSS-M-30A Phasing
 - ECSS-M-40B Configuration Management
 - ECSS-Q-20B Quality Assurance
 - The list is long, very long ...
- Also reviews – waterfall style !
 - Not surprising this is mainly concerned with satellite construction.

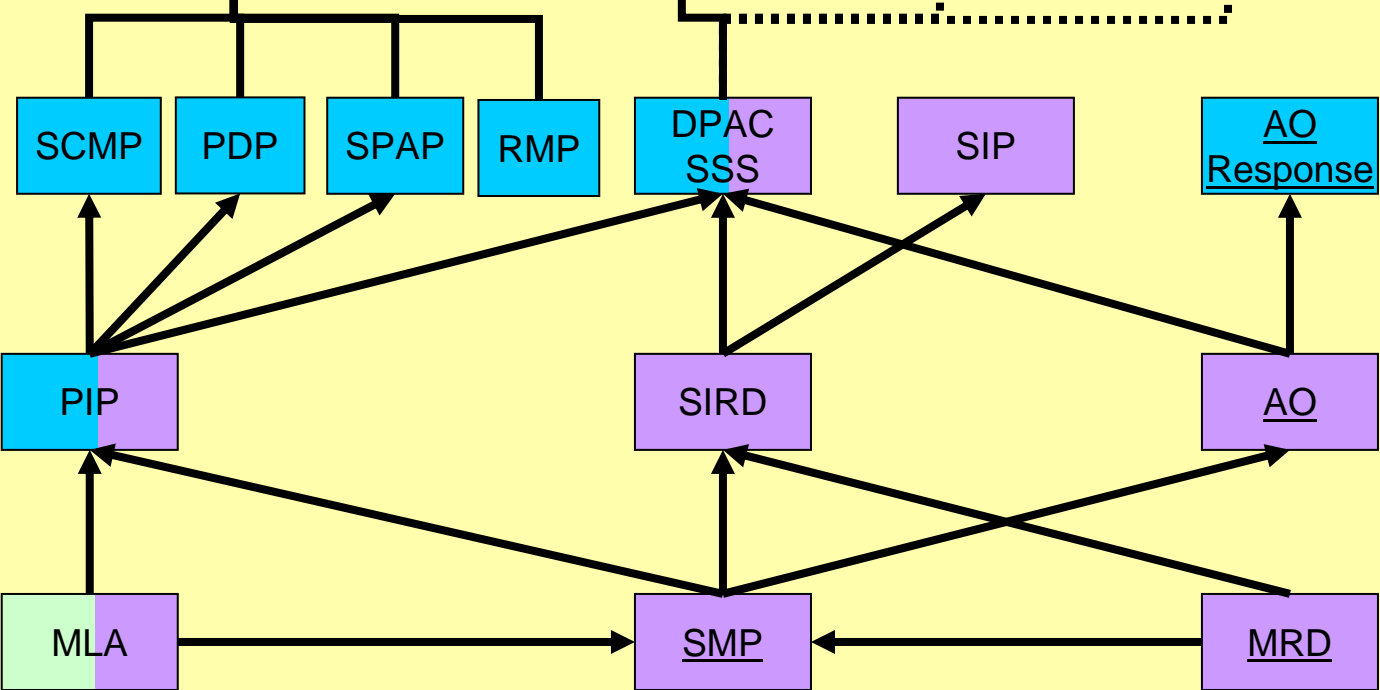
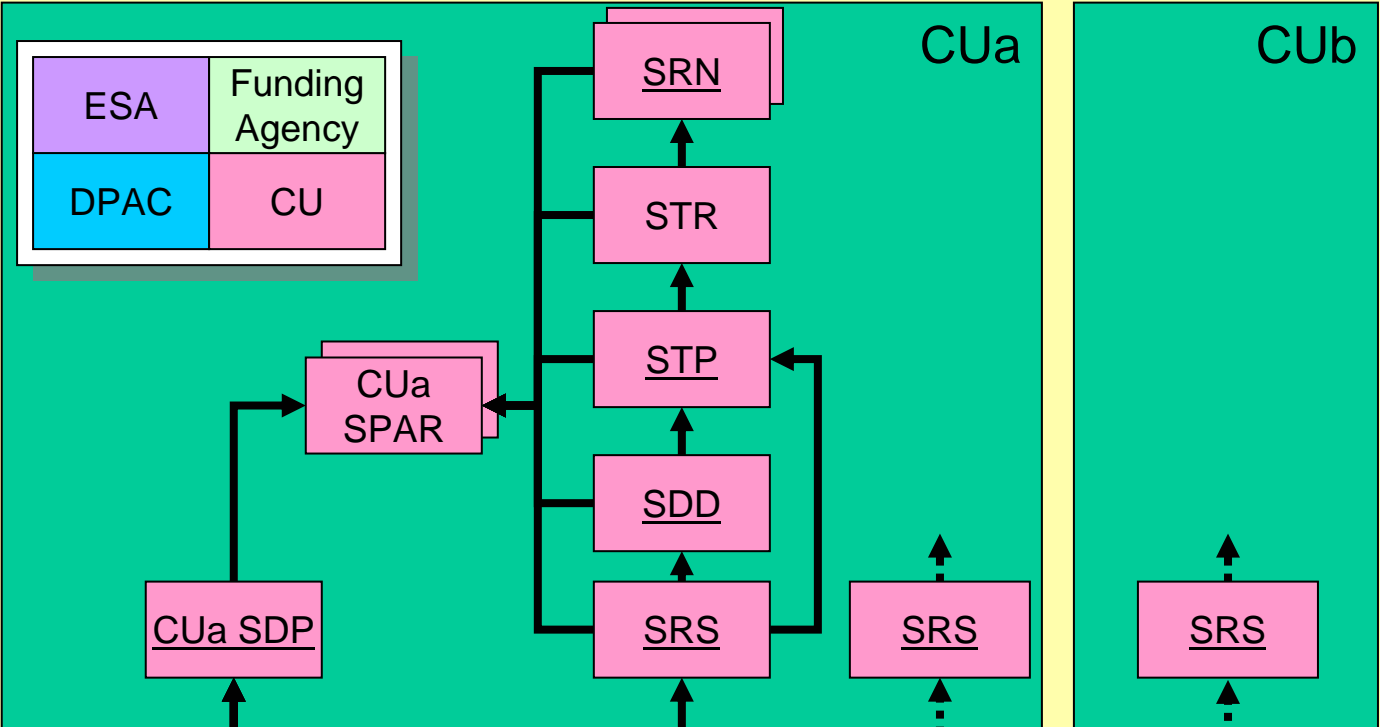


Tailoring

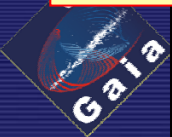
- ECSS actually very flexible
- But that means care must be taken
- Standard must be **tailored** for the project.
- Which documents will you produce when etc ...
- [We have the following document tree..](#)



In reality this nice “flow” did not happen ...



Unfortunately not covered by ECSS ...

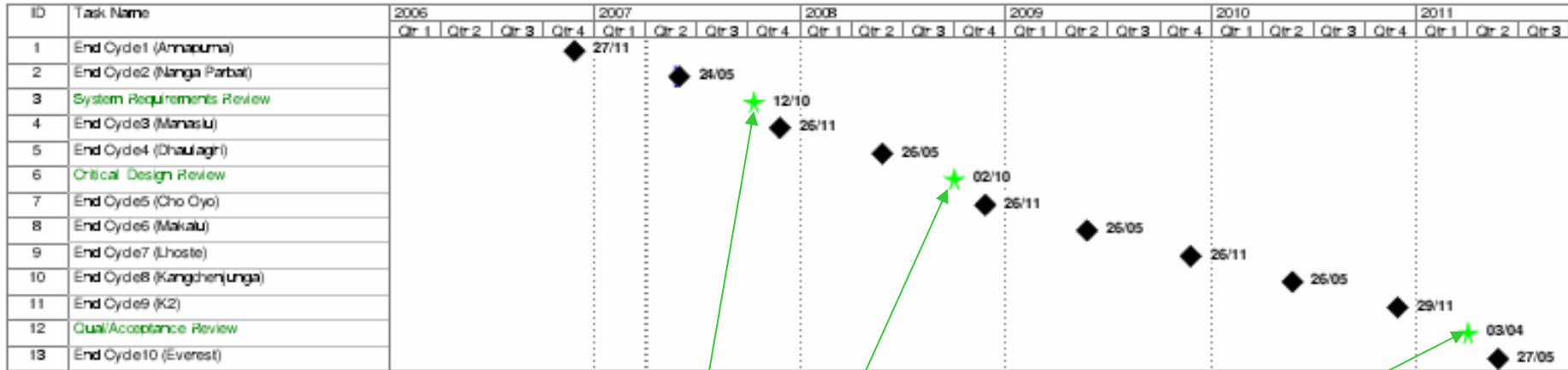


ECSS reviews

- At least 3 or 4 before launch typically
 - System Requirements Review
 - We have this in November !!!
 - Critical Design Review (2009)
 - Qualification Review (2011)
 - Acceptance Review (late 2011)
- Within DPAC there are six month development cycles – more XP style



Altogether looks like this ..



ECSS Reviews

interspersed among DPAC cycles

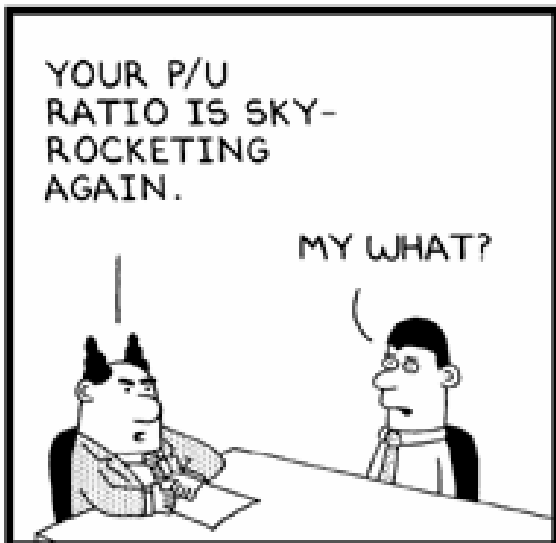
All documents updated in each cycle –
concentration before review on docs for that review.

Finally ..

- If it works remains to be seen – encouraging experiences from AGIS so far ...
- We have tried to pick “useful” documents from ECSS
- We do need documentation it is nice to have a set of templates for these
- Still pressure for traditional planning and accounting - care to be taken on this one
- For sanity one must read Dilbert every day ...

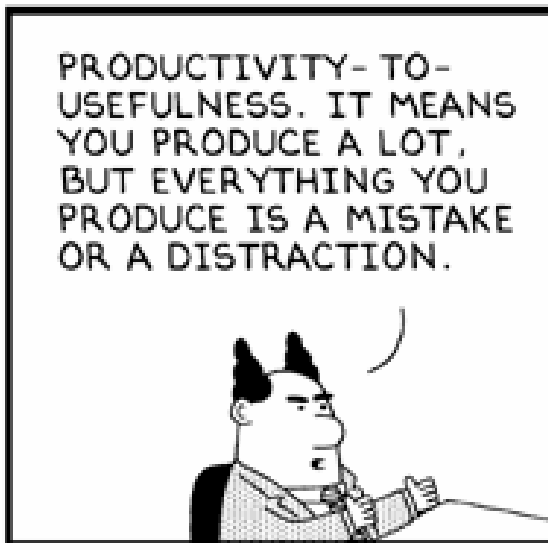


The End



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