hello and welcome to NASA's Jet Propulsion Laboratory in Pasadena California I'm Jerry Cook of JPL's Media Relations office and I'm going to be the moderator today for our wrap-up news briefing for the Cassini mission to Saturn about an hour and a half ago very early California time we bid farewell to the intrepid Cassini spacecraft it plunged into the skies of Saturn and ended its mission to help us understand these last moments we have some key team members with us today to share their thoughts that we do have some reporters
on the phone and so if you have questions you should press star 1 on your telephone and we're also going to be tracking questions via social media and you can use the hashtag ask NASA so to kick us off I'm going to introduce to you Michael Watkins who is the director of JPL and JPL manages the Cassini mission to Saturn for NASA.

[Applause]

thank you and welcome to JPL.

designed built and operated the Cassini spacecraft for NASA and as you heard about an hour and a half ago transmitted.
its final signals from Saturn and then

became part of the planet that it had been studying for 14 years after a seven-year voyage for 13 years after a seven-year voice to Saturn but continuing the legend of Cassini it turned that event into an event of hope it's not an end but really a beginning and the discoveries that Cassini has made over the past 13 years in orbit have rewritten the textbooks of Saturn have discovered worlds that could be habitable and have guaranteed that we'll return to that ringed world so the
fantastic discoveries that continue to

00:01:58,739 --> 00:02:03,539
be made with the last set of ring

00:02:00,799 --> 00:02:05,609
crossing orbits and in the in the grand

00:02:03,540 --> 00:02:07,920
finale of Cassini haven't really even

00:02:05,609 --> 00:02:10,139
been studied yet and as Linda's bulker

00:02:07,920 --> 00:02:12,900
and I were joking earlier the last few

00:02:10,139 --> 00:02:15,359
seconds of the Cassini mission are our

00:02:12,900 --> 00:02:18,090
first taste of the atmosphere of Saturn

00:02:15,360 --> 00:02:19,920
and those last few seconds might be a

00:02:18,090 --> 00:02:22,080
number of PhD theses for students to

00:02:19,919 --> 00:02:25,589
come so even this last few seconds

00:02:22,080 --> 00:02:27,989
Cassini managed to to continue its its

00:02:25,590 --> 00:02:30,780
rewriting of the textbooks and its

00:02:27,989 --> 00:02:33,390
legend and to talk more about Cassini

00:02:30,780 --> 00:02:34,890
and about the the planetary program I'd
like to introduce Dr. Thomas Azhar

bookin the head of the science Mission Directorate at NASA

while we're here to discuss a magnificent mission that had an amazing end and I want to do this starting with

the big picture I'd like to ask you to

pull up the first picture there it is

one of the most beautiful planets we can match and some of the science actually cannot borders on sci-fi from time to time we look at these images star there or there and we wonder wow that is that
really how nature is and yes it is a

nature is really beautiful this image of
course taken roughly a year ago shows
the amazing planet really the subject of
further research that this spacecraft
and this is Cassini next picture this is
also Cassini
this is Cassini yes
at that verse set of people from all
walks of life you see at the top there
the science team at their last meeting
just a few days ago waving at the camera
and really celebrating at what they're
learning and of course recognizing that
they’re nowhere near done science will go on and more discoveries will be made with the data not just from the last day but also from the last months you see at the bottom many members of the engineering team which of course are really important part of this as well together if we added them up close to 5,000 or so you know individuals putting their heart and soul into this magnificent missions this is ladies and gentlemen Cassini and what you don't see there is that these people are representative of 26 countries or so and
of course you know that at the entire

cassini-huygens mission involved three
space agency and I just really want to
call out my colleagues and our friends
from our sister agencies and I want to
really welcome you here and thank you
for coming here I your here alvaro key
Manistee is a director of science my
counterpart at the European Space Agency
thanks so much
and Robert opposite Patti stone the
president of ossie from Italy a really
important part of this design thanks so
much
or grazie Amelia learn a little bit of
Italian in Switzerland the rest I forgot

for 35 years

you all have come together and worked to

shed light on this most magnificent work

and I would say with the words of former

governor here we will be back you know

thanks to Cassini that we now now to be

a you notice world that has so many

facets to it and many facets actually we

did not expect with today's end of this

mission we know now know the planets

moon will remain pristine so not only

did he do science here at the very end

but we protected science to be done in
the future and we can and will I'm sure

over time find ways to go back to these moons and explore them because the questions they have asked make this ask keep us up at night questions that are so deep so simple that every one of us can understand whether or not we have a PhD or some kind of STEM education questions that are at the heart of an educated kind of populace of humanity as a whole it's those kind of questions that will not have motivated Cassini those kind of questions that will motivate us to go back and explore again
again my shout out to the team to me

what will stick with me about Cassini is

the team in that room working together

as one told the very end of this

magnificent mission Congrats to the

Cassini and to its team thanks

[Applause]

okay thank you doctors are Buchan so now

I will introduce our panelists for today

first right next to me is Earl maze

the Cassini program manager next we have

Linda's bilker the Cassini project

scientist a next to her we have Julie

Webster the Cassini spacecraft

157
00:07:44,060 --> 00:07:47,350

157
00:07:44,060 --> 00:07:47,350
operations manager

158 00:07:50,899 --> 00:07:57,120
so now I'll turn it over to Earl thanks

159 00:07:54,930 --> 00:08:03,269
Jerry maybe we could just reprise the

160 00:07:57,120 --> 00:08:07,168
last few moments in the MSA just one we

161 00:08:03,269 --> 00:08:16,889
just have a high rate mode and we are in

162 00:08:07,168 --> 00:08:19,829
the atmosphere project manager flight

163 00:08:16,889 --> 00:08:23,269
director go ahead okay we call ah so

164 00:08:19,829 --> 00:08:27,149
signal in one one five five four six

165 00:08:23,269 --> 00:08:30,299
project manager on FS awkward maybe a

166 00:08:27,149 --> 00:08:33,208
trickle of telemetry left but just heard

167 00:08:30,300 --> 00:08:36,240
the signal from the spacecraft is gone

168 00:08:33,208 --> 00:08:40,788
and within the next 45 seconds so will

169 00:08:36,240 --> 00:08:43,709
be the spacecraft I hope you're all as

170 00:08:40,788 --> 00:08:46,198
deeply proud of this amazing

171 00:08:43,708 --> 00:08:48,629
accomplishment congratulations to you
all this has been an incredible mission

an incredible spacecraft and you're all

an incredible team I'm going to call

this the end of mission project manager

off the net

[Aplause]

there there are times in this world when

things just line up when everything is

just about perfect a child's laugh a

desert sunset and this morning it just

couldn't have been better and if you

think about that moment where we've been

waiting for for this entire 7 years

everything clicked out just right and
then we can step back and say the same thing about the Cassini mission a superb machine in an amazing place doing everything we could possibly do to reveal the mysteries and secrets of our solar system this morning a lone Explorer a machine made by humankind finished its mission 900 million miles away the nearest observer wouldn't even know until 84 minutes later the Cassini was gone to the very end the spacecraft did everything we asked that ground systems report was superb and we believed we got
every last second of data it's already back in Arizona and I think the analysts are already working on it so we have indeed accomplished exactly what we set out to do complete this mission with a Saturn probe to the V area maybe just a little bit about the legacy of the of this mission we've built that the blocks and both scientifically and engineering-wise for the next set of missions Europa will capitalize upon our engineering expertise and techniques and the instruments that we have developed for Cassini 30 years later almost will
be that much better and more.

sophisticated and tuned for the environment that we're in the scientific and engineering collaboration I think will be a hallmark for future missions.

the fact that the Cassini presented a unique set of challenges to the scientists and engineers of course there's that ever lasting tension between science goals and engineering conservatism but also this put the scientists in contention with each other and with the engineers and the mix of this as an experiment in sociology was an
astonishing success and I believe that the future missions are also you learn how to cooperate and how to get the very best of their systems well what the Kassim you leave me example we've been able to repurpose the spacecraft in all sorts of unique ways and it is you just saw a little while ago we turned it into an atmospheric probe so every piece of it's been used for a benefit of exploration I've got to thank the many thousands of people we had three space agencies 17 member nations contributing to the launch and of the hardware of the
mission hundreds of contractors

thousands of individuals in science and engineering and we have to reach back all the way back to the early 80s for the folks that did those thankless cost exercises over and over again all the way up to now the people that sent the very final commands thank you and the gratitude I believe of the other of the world is is your be bestowed upon you for the accomplishments in this mission we also need to thank our many millions of fans the the the heartwarming buzz that we've gotten from social media from
the educational regions throughout the world the media the more traditional media as well has just been great
telling the Cassini story inspiring the next set of explorers and is just absolutely as important to us as the scientific results we've found so thank you very much for that exceeding mission ended this morning high over the clouds of Saturn the spacecraft is gone thanks and farewell faithful Explorer but the legacy of Cassini has has just begun the effect the Cassini has and will have on the
The future of planetary exploration will go on for decades. Thank you and long live because the

All right next up we have Julie Webster.

Okay thank you I almost have no words. I was supposed to give the chronology I've been on this on this mission since it was built and as I gave you that over several interviews.

Yesterday I'm one of the people one of the privileged few that actually sat inside this spacecraft before it was put together and my last image was inside of the parts and the wiring as we went in but we had yeah we've had 13
years at Saturn but 20 years of an incredible spacecraft that was designed by people and I can't emphasize this enough that had 30 years of experience when they designed it they had they took all the lessons learned from the voyagers and the Galileo's and the Magellan's and and Mars Observer and built a perfect spacecraft you know right right to the last end I we the the whole electronic system in the spacecraft ran at room temperature that's an amazing accomplishment and that speaks to all the individual
engineers that built the spacecraft to

last the you know the mission planning
team and the navigation team that design

their trajectory to get the best bang

for the buck with the scientists and I

remember the mission planners going back

and forth with the scientists with you

know there was like seven different

trajectories chosen at this point and I

think the goal was to make all

scientists equally unhappy

and the goal for our team my team and

the navigation team was to make it last

and I think you saw this morning that we
00:15:50,580 --> 00:15:59,009
did we we got we got actually almost 30

315
00:15:56,519 --> 00:16:00,809
seconds longer than we predicted it

316
00:15:59,009 --> 00:16:03,299
didn't seem like it to me because it was

317
00:16:00,809 --> 00:16:03,869
in the flash of an eye I the all night

318
00:16:03,299 --> 00:16:06,629
long

319
00:16:03,870 --> 00:16:09,889
the minutes seemed like a long time and

320
00:16:06,629 --> 00:16:09,889
then all of a sudden it was over

321
00:16:09,980 --> 00:16:15,060
Cassini Cassini is a spacecraft could

322
00:16:13,110 --> 00:16:18,509
have gone on a long time but it it

323
00:16:15,059 --> 00:16:20,519
accomplished its mission at Saturn we we

324
00:16:18,509 --> 00:16:23,960
did everything that the scientists asked

325
00:16:20,519 --> 00:16:26,460
us to do and and we're really over

326
00:16:23,960 --> 00:16:31,740
during that time we traveled four point

327
00:16:26,460 --> 00:16:33,960
nine billion miles we did 292 and a half

328
00:16:31,740 --> 00:16:37,409
two hundred ninety three orbits all

00:16:33,960 -- 00:16:38,910
unique orbits around Saturn shaped by

00:16:37,409 -- 00:16:41,159
the navigation team and by the

00:16:38,909 -- 00:16:44,459
spacecraft team by the nav saying point

00:16:41,159 -- 00:16:48,149
here and go change your air speed this

00:16:44,460 -- 00:16:54,440
way and the spacecraft performing it

00:16:48,149 -- 00:16:58,110
flawlessly we did 360 burns we planned

00:16:54,440 -- 00:17:00,900
472 maneuvers we play at weeks executed

00:16:58,110 -- 00:17:03,840
360 a little more than half of those on

00:17:00,899 -- 00:17:09,449
the main engine the other half on the on

00:17:03,840 -- 00:17:14,150
the other part and you know that the

00:17:09,449 -- 00:17:16,980
last 22 the last 21 weeks since April I

00:17:14,150 -- 00:17:18,630
was I was a lot more nervous in April

00:17:16,980 -- 00:17:21,150
when we when we went when we dove

00:17:18,630 -- 00:17:22,920
through the first time I could barely
speak I could barely breathe when we
when we were waiting for that signal to
say that we got through inside the Rings
and this last time I have no words
because it did exactly what it said it
was supposed to do even better even
better even better as it as it always
did as it always did like I can't at
Radio science you know made the call for
the for the end of mission and I can't
tell you guys radio science does they do
these 30 hour
who long days and I see him stay in day
after day after day doctors are broken
referred to the fact that Cassini will have questions for the scientists that will keep them up at night well I no longer have a spacecraft that will keep me up at night and I think after a few days I think I'm gonna really miss that and don't ask me tomorrow if I'm ready to build another one but you can ask me next month Earl thinks he has a hold on me for a year to write the engineering report and we've got 20 years of test labs and flight hardware and support hardware and a team of 150 people to disperse and break down but
right to the end it did it did
everything and I you know a lot of the
team is in here right now and I want to
thank again the navigation of the space
craft team the real-time operations that
also work the thankless hours that were
the ones that called me in the middle of
the night it's just it went perfect it
did everything he'd ask us to do even
when it didn't do it it was because what
we told it to do it was it still was our
fault
for it's perfect it's perfect and it's I
played the Moody Blues my wildest dreams
coming in and out of the lab the last few days so I'd blast it in the car going home and I'd blast it coming back in this this has truly been beyond my wildest dreams okay and now over to Linda spill Kurt well for me this has been an incredible journey with Cassini that spanned 30 years I was with the mission from when it was just an idea after the Voyager flybys and now to see it through to the end is truly amazing and to share that with my family my personal family and my Cassini family what a wonderful experience I look back
over the Cassini mission I see a mission that was running a 13-year marathon of scientific discovery and this last orbit was just the last lap and so we stood in celebration of successfully completing the race and I know I stood there with a mixture of applause and tears because it felt so much like losing a friend some a spacecraft I'd gotten to know so well and yet in looking ahead you know both an end and a beginning there's so much left so much incredible science left to figure out and understand decade's worth
science that will span a generation when

I think about Cassini going in I know that there's a piece of me there in heart and soul because I know we signed our signatures on a list of sheets those sheets were scanned in and put on a CD and that CD is onboard Cassini so a little piece of me went into Saturn's atmosphere along with Cassini so what an incredible ride and just lasting for so long I want to step back just a little bit if we could go to the first slide please this is an image put together by our
visual and infrared mapping spectrometer

team they did a spectacular job turning around this data set that just came down

last night and this is a view in the far

in the infrared at five microns you can see the heat energy coming out of Saturn

and this is the place where Cassini took its final plunge and if we go to the next graphic see little air ellipse there that's where we think because he went in to the atmosphere of Saturn so you know what an incredible ride and to get that that was the very last set of VIMS images that came back from
Cassini and so here it is turned

00:22:13,798 --> 00:22:19,168
around very quickly for you to see if we

00:22:16,950 --> 00:22:22,110
go on to the next set so we had our last

00:22:19,169 --> 00:22:24,659
downlink of images and I'll just look at

00:22:22,109 --> 00:22:29,158
this and you can share what we saw for

00:22:24,659 --> 00:22:31,769
our final set of images and data Saturn

00:22:29,159 --> 00:22:36,778
and solidus setting behind Saturn how

00:22:31,769 --> 00:22:39,269
beautiful part of the mosaic of Saturn

00:22:36,778 --> 00:22:43,230
and the Rings in color our last look at

00:22:39,269 --> 00:22:45,659
this incredible system Titan you can see

00:22:43,230 --> 00:22:48,720
the lakes and seas at the North Pole and

00:22:45,659 --> 00:22:50,809
the haze at the limb an even better view

00:22:48,720 --> 00:22:54,179
of the lakes

00:22:50,808 --> 00:22:56,069
there's Daphna screeing its wake along

00:22:54,179 --> 00:23:01,679
the edge of the Keeler gap and the
beautiful structure in the Rings another

view looking out across the Rings the

bright B ring the dark Cassini division

snuggled next to it views that were

going to miss for a long time to come

that little tiny propeller a little

object just above the dark gap a large

set of ring particles together trying to

force open a gap and here's Cassini's

final image so what an incredible

incredible wonderful set of data and as

we went into the atmosphere we had eight

of our science instruments on including

the ion and neutral mass spectrometer we
had the magnetometer we were collecting gravity data there to answer questions about Saturn itself but in particular trying to understand as we probed deeper into the atmosphere the hydrogen to helium ratio you can't measure helium unless you're directly measuring you can infer it you can model it but to be there and directly measuring sample that was absolutely amazing and so that team is hard at work right now looking at their data and trying to assess what they saw in those very final moments that I'm sure they'll be very happy that
julie was able to get this spacecraft to survive those extra seconds as we plunged on in then of course the longer-term analysis as I said that will go on for years and I just want to thank everyone as well in particular the international science team a lot of them are down at Caltech we had too many to try and fit all at JPL and so they're down and they've been celebrating and I heard having a great time from the reports I've heard and also to thank the public as Earl said who have come along with us and when I
think about Cassini

I think Cassini's final gift to humanity was the fact that we knew the day the hour the minute and now the second of the plunge and so we could gather together with the scientists the engineers with the public with our own families you can think of us as a giant worldwide Cassini family and share this final moment of the plunge and have that memory to add to our Cassini scrapbooks and if I had one thing I could say to Cassini I'd say goodbye Cassini thanks for the ringside seat at Saturn and as Thomas said we'll be back thank you
okay Thank You Linda so we're now gonna
go into the question and answer part of
our briefing so a reminder for reporters
on the phone press star 1 and you'll get
put into the queue
we'll have social media questions with
hashtag ask NASA and anyone here in the
room if you'll raise your hand we'll
bring a mic around and you can stand up
and ask a question so do we have any
questions here in the room we have one
right there hi thank you all and
congratulations calico field of space
comm I know it was a long shot but just
wondering if any of those telescopes in

the you know over by Australia and in

that area actually saw the flash of

Saturn of Cassini going into Saturn I

haven't heard any reports back about

that yet and it was a long shot and

maybe we'll see something and I was

wondering if you could also just mention

on because you mentioned the science

instruments going into the planet how

much hope do you have that those

measurements are going to help you

finally figure out the rotation the

internal rotation rate of Saturn and the
the length of the day well Michelle is

here and she's looking pretty grim but I

know she's going to work really hard to

figure that out I mean you know one of

the things that we were hoping is if we

take data for as long as possible on the

way and that will get us closer to the

planet than anything's ever been and we

need to do that to be able to try and

resolve the tilt between the dipole and

the rotation axis I'm hoping we can do

it I'm not going to promise but ask me

in 3 months time give us time to analyze

the data we have some other questions
over here Emily Locke de ella from

the Planetary Society

we were watching two graphs right down

toward the end one of them flatlined a little earlier than the other and the bottom one seemed to kind of go up and down a little bit can you tell us what was happening what were the two different ones and what was happening there you were watching the radio science signal the carrier the actual x-band carrier was the top one that's the one that's the eight gigahertz signal that we have our telemetry on and
the other one was a radio science signal that was coherent with that at two-two gigahertz down lower than it so we expected that the espan would last longer than the X the X is when we cut off the telemetry but because the X has a wider beam width pattern that it would last and you may i I don't know if a seal or a lies can answer that you may have seen a couple of side bands coming down for the for the S band they have a damn pretty dramatic and you might have seen a little on the X but it goes way way down into a first null in less
than a degree and then it might have bounced up after that but it was a side band of s ban hi Sarah Kaplan from The Washington Post Linda you showed us that image of the infrared image of the spot where Cassini probably disintegrate it can you tell us anything about that spot and sort of situated on Saturn yeah I haven't looked in any detail maybe Bob Brown who's back here do you know anything about that region of the atmosphere Bob I guess I would call it Jay random Saturn atmosphere around 10 degrees a lot of
latitude we we found out we had an opportunity to image that site a few months back and because the impact took place on the dark side and because we can see in the dark what you see there is the thermal heat image from Saturn it's the heat leaking out of Saturn's interior we took this shot and luckily we got it sorry when was that image taken about 15 hours ago thank you okay great any other questions in the room okay we're gonna go to the phones we have Marsha Dunn of the AP on the line please
go ahead

614 00:29:51,140 --> 00:29:57,600
yes hello thank you I'm just wondering

615 00:29:54,380 --> 00:29:59,970
if the toasts have begun yet or is there

616 00:29:57,599 --> 00:30:03,039
a champagne in store for the team

617 00:29:59,970 --> 00:30:06,490
to morning or afternoon what's what's

618 00:30:03,039 --> 00:30:08,558
next for celebration well the science

619 00:30:06,490 --> 00:30:11,079
team is going to get together later this

620 00:30:08,558 --> 00:30:13,029
afternoon and we're going to get

621 00:30:11,079 --> 00:30:17,019
together and celebrate and reminisce

622 00:30:13,029 --> 00:30:20,339
about the good times on Cassini the

623 00:30:17,019 --> 00:30:23,019
flight team is going to get some sleep

624 00:30:20,339 --> 00:30:25,178
and we're going to get together on on

625 00:30:23,019 --> 00:30:26,679
Sunday afternoon but I don't think we're

626 00:30:25,179 --> 00:30:31,330
gonna wait until then to open the

627 00:30:26,679 --> 00:30:34,960
champagne okay well let's go to some
social media questions Kendra so Nancy

asked as Cassini's journey ends what questions you do you have left that you would like to see explored in future

missions to Saturn for future missions to Saturn I think there are a lot of possibilities one certainly involves the tiny moon Enceladus and the potential for life in that global ocean is there to go back with the instruments to sample through the plume Titan you know the potential for astrobiology in the oceans on Titan to have something perhaps to land and
figure that out also the source of methane in Titan's atmosphere that keeps the atmosphere as extensive as it is the hexagon what's keeping it going and going and going like the Energizer Bunny it just keeps going also there's questions about the rings can we get even closer and look at those individual ring particles to try and understand what's going on so lots of questions remain and that's why I say we have to go back let's take another social media question or parth is asking which is a great follow-up what's the
next probe state what is the next probe

or spacecraft that will be sent to

Saturn who will have to ask NASA and

about that Jim Green about that oh well

can we get a mic to Jim Green here we go

so I'm Jim Green I'm the director of

planetary science at NASA

and currently we're conducting a

competition we call new frontiers and in

that call for proposals we included

Enceladus and Titan so hang tight going

through the evaluations now and

by the end of the year we'll start

announcing what are some of the
finalists that will look in greater
detail at there's also a Saturn probe

mission I think in that there's a Saturn

probe yes thank you very much Linda

there is indeed Saturn already four
decades in terms of being able to get

into the get into the clouds and really

understand its composition and and much

more about it Saturn probe was also in

that list thank you right and Cassini

was really sort of a micro probe just

looking at the very top level and so

this probe would go much deeper like the

Galileo probe okay great just a reminder

again if you're on the phone star one
for reporter questions and if you're in here raise your hand oh we have a we have a follow-up question here Emily locked away with follow-up what does it mean that you had this signal for 30 seconds longer is that just the usual over performance of the DSN in locking on the spacecraft or does it mean that the spacecraft was able to fight the atmosphere for longer bit of everything the spacecraft I think we did come in a little bit later than we thought and that just didn't delay though their demise it just delayed the start of it
but we thought the DSN has just been phenomenal

they've been tuned in as well as you could and the spacecraft you know the

all of our modeling is we don't have any real-world experience with this that's so it to be within 13 seconds of our predict is for us that so it's a whole one okay let's oh we have another

reporter question here oh she's coming right behind you

thank you Lisa Grossman from science news can you just confirm what the actual times were for the atmosphere
insertion and then loss of signal

because they are they different from what was projected it was 11:55 39 for

the x-band signal at which also cost the telemetry and 11:55 46 for s loss of signal and we had predicted much to my embarrassment yesterday's press conference I called it that's so that's it's UTC also okay so I it's

we called for 5516 I unfortunately announced oh six but the real the baseline we were working from was fifty

five sixteen and we lost x-band at fifty five thirty nine and that essentially is

five thirty nine and that essentially is
when we lost data the spacecraft of

00:34:43,940 --> 00:34:48,289

course was going to last longer on for

00:34:46,039 --> 00:34:49,489

at least another minute but and of

00:34:48,289 --> 00:34:53,389

course the s-band did go a little bit

00:34:49,489 --> 00:35:02,300

longer okay let's take another question

00:34:57,139 --> 00:35:02,300

from Orion do Cassini have only options

00:35:00,530 --> 00:35:03,740

to rush into Saturn I would like to know

00:35:02,300 --> 00:35:07,068

if there are other ideas that I've been

00:35:03,739 --> 00:35:09,858

considered we had lots of different

00:35:07,068 --> 00:35:11,329

ideas and what really came down to it

00:35:09,858 --> 00:35:13,848

let me just give you a few of the

00:35:11,329 --> 00:35:16,339

different flavors we could have left the

00:35:13,849 --> 00:35:19,670

Saturn system all together and gone to

00:35:16,338 --> 00:35:22,730

Jupiter or up to your orders those were
very long missions and we would not be chatting about them and probably our children would not be chatting about them they're very long and there were several options so those were discarded pretty much immediately but as an exercise could we leave the system there's also sent our asteroid mission that was was actually achievable staying at Saturn we could have gone into first of all if we stay at Saturn the Cassini spacecraft must be put into a safe place there are international treaties that require us not to leave an unattended
spacecraft in the inner system where it might even advertently collide with Enceladus which we know is just rife with all of the materials for life Titan or any of the other icy satellites so if we stayed inside the Saturn system we had to dispose of the spacecraft somehow well then it becomes where's the best science well it's inside the Saturn system it's not way out at the edges it's inside so seven years ago we began a mission that planned to use every last kilogram of our propellant and finish up exactly the way we did we knew that
these final 22 orbits were very risky so

he didn't want to put them in the middle

because they would maybe not come back

out so it turns out they weren't

anywhere near as risky as we thought so

we could have done a lot more but you

know

Sall hindsight so there were lots of

some other options but this was by far

the best Cassini going out with an empty

tank of gas at the very top of its game

in a scientifically unexplored

environment great okay we have another

reported question in the room
hi there Steve Futterman from CBS News I

785 00:37:02,659 --> 00:37:07,429 want to ask the three of you a question

786 00:37:05,179 --> 00:37:08,899 that's not really concerns the data or

787 00:37:07,429 --> 00:37:11,569 what you've discovered but just sort of

788 00:37:08,900 --> 00:37:13,820 the the human side of this mission this

789 00:37:11,570 --> 00:37:15,830 spacecraft we all know the story of

790 00:37:13,820 --> 00:37:19,099 Pinocchio the wooden doll that becomes

791 00:37:15,829 --> 00:37:20,900 human I'm wondering what was going

792 00:37:19,099 --> 00:37:23,359 through your heart and soul today as

793 00:37:20,900 --> 00:37:25,760 this came to an end I'm not suggesting

794 00:37:23,358 --> 00:37:28,190 it became like a child to you but what

795 00:37:25,760 --> 00:37:33,950 did Cassini mean to you did it hurt

796 00:37:28,190 --> 00:37:35,869 today yes yes it does hurt I mean what

797 00:37:33,949 --> 00:37:38,329 can you say we've been with this

798 00:37:35,869 --> 00:37:40,130 spacecraft off and on since since uh

since launch I haven't been on the mission the entire time but I helped build it I helped launch it I've been through up 20 years with it it is an extension of ourselves an extension in kind of the more anthropomorphic sense but also in our senses itself we are out at Saturn every day we get a call back home we get data we get images we know what's going on out there and that is an extension I believe of all of us we feel you know if ourselves and so that's gone there so there's a loss if it if I can talk about it being a robot
that's it's it finished the end of its

serviceable life and needs to be put

into the junk pile but you know now of

course there's element of truth to that

there's also an alum of truth that has

been our companion and and our dutiful

servant for many many decades and so

they're yeah he's a loss but there's

also a sense of serenity and peace with

that because we've done exactly what we

believe is the correct thing so there's

it's a whole potpourri you name it I

think for me there's a core of sadness

and part in thinking about the
breakup of the Cassini family coming into work on Monday morning and you know they'll be empty offices there and the people I could just stop by to chat with will be often doing other things and but it's both an end and a beginning as these people go off and work on other things but I also feel a tremendous sense of pride to have worked on this mission over so many decades and to see the fruition of this particular mission although part of the sadness is thinking about you know Cassini has revealed Saturn as as familiar as our own
neighborhood might be and now for a time

until we go back

that's a distant very distant world now

just like a small little world and a

telescope and those details of the Rings

those tiny moons snuggled in so close

those are all gone until we go back I

think it's the loss of the of the day to

day you know we're we're in the trenches

working this all the time you know with

a with a core team of people that you

see every day for eight hours plus and

sometimes a lot longer than that and and

I don't know if did or I'll say that we

stepped on you know that the celestial
mechanics does not recognize us holidays

or European holidays we stomped on every Christmas every Thanksgiving we were always either doing a maneuver or something went wrong with the spacecraft and so for our families maybe they will be glad not to have the pager go off in the middle of the night or in the middle of dinner going oh sorry I got a run!

it's the loss of that camaraderie I think for me and I really thought I was going to be more sad about the spacecraft but you can't I am NOT the
spacecraft did everything we asked it to

do everything right to the very end

that's all you can do for anybody

any human let alone you know a robot

all started I think we messed it up a little bit I must admit it's uh it was

it was a very emotional moment

I think cheers and applause at the same time and I had a little purple hankie

there you know to be able to use so

cheers and applause okay we're gonna go

back to the phones we have Leo and right

of Irish TV go ahead thank you I wonder
could I ask a question of Alvaro Jimenez

oh yes once you come up to the podium

here thank you very much what I wanted

to know really was and would we look at

hobble we look at cassini-huygens we

look at solo all these great

collaborative missions between the

United States and Europe I wonder what

is the prospect of us ever frankly doing

the sort of great collaborations again

is it going to happen or is it more

likely that Europe and the US will take

slightly more independent paths well we

have we are very proud of actually
having collaborated with NASA in this
great mission and and we don't mind we
are convinced this is the way to go we
have to work together to really be
ambitious and achieve missions like this
one this could be in different fields we
have now as you have mentioned JWST to
be launched this is a another great
mission where Europe is deeply involved
with NASA we have the experience of
Hubble we have missions though and that
has been a little bit of a change we're
also are led by Issa but NASA is
participating also actively like Jews to
Jupiter and we are looking into all
kinds of possibilities now we would like to have more more cooperation and I think here we have an example to follow which is cassini-huygens where it is important to have the same goals but also define well clean interfaces clean management structure how the emission is led how is put in place and then making it a success so I'm really making sure because we have and this is something you can see in Europe and in the u.s. our scientists the scientific community is totally mixed they are working
together already regardless of what the agencies do and if they work together we are servicing our scientific community we have to work together okay all right thank you okay so why don't we go back to social media sure president buff asked what was the most surprising reveal and have any of you named a child or pet after Cassini no no child or pet named after this email that's true Larry raises a very good point Larry's with the ultraviolet team and they the some of the features have been
named after cat's pet cats

I do remember hearing one of the engineers telling me that he named his daughter Phoebe after the moon Phoebe so

okay let's take another social media questions

Jason is asking what do you feel is the most valuable contribution of the Cassini mission to science and space

exploration well there are probably two answers I'll defer the science question to Linda but I think in terms of showing a path forward in space exploration the techniques that Cassini
has has developed in astrodynamics

supposed to mechanics mission design and

engineering and as I mentioned in my

earlier remarks in just being able to

manage an extremely complex system to

the ultimate of its capabilities and I

might also add the importance of a

flagship a mission that has a full suite

of instruments ready to deal with

whatever it finds there's always room

for the tactical missions with a focused

instrument but something that's ready to

deal with whatever it finds and then go

back again and we have stories over and

over again where one instrument has

revealed something about Saturn or its moons and the other instruments have all piled on and we get from a little snippet a full picture of the entire thing so the value of flagship the engineering techniques and and management techniques that have been exploited I think well lead us the way we'll lead I would certainly agree with Earl to have that full toolbox of instruments available to follow up on the unexpected discoveries and as far as Cassini goes I think one of the biggest legacies from
Cassini will be the fact that we now know that there are ocean worlds not only around Jupiter but also around Saturn you haven't sell it as Titan perhaps dye oni sort of opening up our view of where could we find life in our solar system and maybe it doesn't have to be in that narrow zone the Goldilocks zone where the earth is but could be elsewhere and the implications forward for exoplanets as well okay we have a couple of other questions the gentlemen and in the back there hold on wait for the mic comes hi my name is Neville you
had onboard the Cassini something that could quote-unquote sniff the atmosphere was it a hope or an absolute plan that you would be able to utilize that it was planned to use that the iana neutral mass spectrometer we've used it very successfully for Titan's atmosphere for looking in the GAT the gas from the plumes from Enceladus and also earlier orbits where he has sort of dipped our toe into the atmosphere of Saturn so we knew it would work and continue to work and we just wanted to keep getting data back as long as we could to get those
very last seconds the deepest data that

00:47:46,690 --> 00:47:51,550
we could get just piled that for a

00:47:49,239 --> 00:47:53,409
second because when we launched the ion

00:47:51,550 --> 00:47:57,670
neutral mass spectrometer was going to

00:47:53,409 --> 00:48:00,099
be used for Titan we got in syllabus and

00:47:57,670 --> 00:48:04,500
we got him saturd again because of the

00:48:00,099 --> 00:48:06,489
fact that we were able to find these

00:48:04,500 --> 00:48:09,699
mysteries with other instruments and

00:48:06,489 --> 00:48:12,369
then use this mass spec in a different

00:48:09,699 --> 00:48:14,379
way so again it's just the point if you

00:48:12,369 --> 00:48:15,730
think you fit it on Jim to probably

00:48:14,380 --> 00:48:19,930
shoot me for this but if you get it on

00:48:15,730 --> 00:48:21,429
underpriced if I get the ride and that's

00:48:19,929 --> 00:48:25,019
kind of the point of my question is you

00:48:21,429 --> 00:48:27,759
you're building into these missions
serendipity with the anticipation that could maybe used another way absolutely halfed even even a very tactical mission with a single objective and a single instrument still has got to be ready for to roll with the punches or the surprises if this is that cassini happened to be so superbly built for that because if you see something with one instrument then the entire might Majesty the entire spacecraft can be brought onto it and reveal its enceladus if I don't have the time to go into the story of how many instruments it took to
reveal that entire story the entire spacecraft I think it took every instrument on the spacecraft working together to reveal what we know today about Enceladus so every single one okay other questions in the room other

gentleman here in the front hi i'm kurt

j mac i'm here with the NASA social a

lot of the pictures from Cassini were uploaded online in real time the raw images and were taken by amateurs and people online and stitched together and almost finished before the scientists

got a chance to do so I wonder if that
was an expected outcome and if that impacts the way and the decisions made
during the mission and perhaps future missions for such investment we love the amateurs to get out there in fact I think Emily lakhta Walla here was one of the first to put together a movie of Enceladus setting behind Saturn I think I saw last night so she got those images and put them together right away we love it that's what we want to do is involve the community there's a small community that's been doing this to us for years and so we don't even try to get ahead
of them anymore

1070 00:50:11,599 --> 00:50:15,860 we are scooped at the minute and that's

1071 00:50:14,119 --> 00:50:18,019 what Cassini has always been about get

1072 00:50:15,860 --> 00:50:21,110 the images out it was a decision from

1073 00:50:18,019 --> 00:50:23,449 NASA a long time ago as soon as they're

1074 00:50:21,110 --> 00:50:25,490 on the ground everybody gets to see them

1075 00:50:23,449 --> 00:50:27,500 and then do what you will and we've got

1076 00:50:25,489 --> 00:50:31,009 some great graphics they're better than

1077 00:50:27,500 --> 00:50:33,199 our sometimes I have to be careful about

1078 00:50:31,010 --> 00:50:35,960 that they're quick they're fast they're

1079 00:50:33,199 --> 00:50:38,949 faster than ours you know and so it

1080 00:50:35,960 --> 00:50:41,480 satisfies that need for the immediacy

1081 00:50:38,949 --> 00:50:44,659 all right well we're reaching the end of

1082 00:50:41,480 --> 00:50:46,760 the hour here so we're going to do

1083 00:50:44,659 --> 00:50:48,318 playback of the graphics that you saw in
today's press briefing including those last wonderful images that Linda showed earlier we're also going to add some additional Saturn imagery onto the feed so thank you everyone for helping us say goodbye to Cassini and to Saturn [Applause] you [Music] [Music] [Music] [Music] [Music] [Music] [Music]
this is SES one we just had transition
to high rate mode and we are in the
atmosphere project manager flight
director go ahead okay we call ah so
signal in one one five five four six
project manager on FS awkward maybe a
trickle of telemetry left but just heard
the signal from the spacecraft is gone
and within the next 45 seconds so will
be the spacecraft I hope you're all as
deeper proud of this amazing
accomplishment congratulations to you
all
this has been an incredible mission an
incredible spacecraft and you're all an

incredible team I'm going to call this

the end of mission project manager off

the net

[Applause]

[Music]

[Music]