FROM THE JOHNS HOPKINS PHYSICS LABORATORY, WELCOME TO NASA'S NEW HORIZON'S COUNT DOWN.

WE'RE ON PLUTO'S DOORSTEP GETTING READY FOR THE FLY BUY ON JULY 14th.

ON JULY 9th, WE'RE FIVE DAYS AWAY. ABOUT 3.5 MILLION MILES FROM PLUTO.

LET'S START WITH OUR OPERATIONS UPDATE.

THIS IS A LIVE LOOK INSIDE THE NEW HORIZONS MISSION OPERATIONS CENTER AT THE APPLIED PHYSICS LABORATORY.

JOINING US IS NEW HORIZONS PROJECT MANAGER, GLENN.

LET'S TAKE A LOOK AT OVERALL OPERATIONS ON NEW HORIZONS.

THE TEAM DOES A LOT TO KEEP NEW
HORIZONS MOVING AND MOVING ON

13 00:01:13,219 --> 00:01:14,219
TARGET.

14 00:01:14,219 --> 00:01:15,219
TAKE US THROUGH AN OPERATION DAY.

15 00:01:15,219 --> 00:01:17,219
WHAT ARE THOSE TEAMS DOING NOW?

16 00:01:17,219 --> 00:01:20,219
>> OKAY, BUT FIRST, LET’S TALK
ABOUT WHAT THE SPACECRAFT DOES

17 00:01:20,219 --> 00:01:23,829
BECAUSE THERE IS A DANCE BETWEEN
THE SPACECRAFT AND WHAT’S

18 00:01:23,829 --> 00:01:25,390
HAPPENING ON THE GROUND.

19 00:01:25,390 --> 00:01:29,200
SO, THE SPACECRAFT DOES TWO
MAJOR THINGS.

20 00:01:29,200 --> 00:01:33,909
ONE IS IT POINTS THE INSTRUMENTS
AT PLUTO AND THEN IT POINTS THE

21 00:01:33,909 --> 00:01:38,200
ANTENNA AT THE EARTH, SO, WE CAN
COMMUNICATE AND WE CAN’T DO BOTH

22 00:01:38,200 --> 00:01:39,978
AT THE SAME TIME.

23 00:01:39,978 --> 00:01:45,478
SO, EARLIER, WE ACTUALLY HAD
TAKEN AN IMAGE OF PLUTO.

24 00:01:45,478 --> 00:01:49,579
WE TURNED THE ANTENNA TO THE
GROUND TO POINT TOWARDS EARTH.
AND TRANSITED THAT SIGNAL.

SO, WE GOT THE IMAGE DOWN HERE EARLY.

IT'S BEEN PROCESSED TWO DIFFERENT WAYS.

FIRST, THE SCIENTISTS LOOK AT IT.

WE GET REALLY EXCITED ABOUT THAT.

THE NAVIGATORS USE THAT IMAGE TO DETERMINE WHERE THE SPACECRAFT IS RELATIVE TO PLUTO, SO WE CAN DETERMINE IF WE ARE ON OUR PASS.

AFTER TRAVELING 3 BILLION MILES, WE HAVE TO HIT A BOX, A VERY CERTAIN DISTANCE FROM PLUTO AND THAT BOX IS ONLY 60 MILES BY 90 MILES.

SO THINK OF A PIECE OF THE SKY
AND AFTER 3 BILLION MILES,

YOU'VE GOT TO HIT THAT TARGET.

WE ARE GOING RIGHT DOWN TO CENTER OF THAT.

THAT'S WHAT THE NAVIGATORS HAVE DONE FOR US.

SO THEIR DOING THAT.

THEY ANALYZE THAT DATA.

AND THEN WE GET TOGETHER IN THE AFTERNOON AND DETERMINE IF WE MAY NEED TO MAKE ANY OTHER ADJUSTMENTS.

FOR INSTANCE, WE CARRY ON BOARD THE SPACECRAFT A KNOWLEDGE OF WHERE PLUTO IS SO AS THEY GO DPO TO TIMELINE, THE SPACECRAFT KNOWS WHERE TO POINT SO WE'RE TAKING PICTURES OF PLUTO AND NOT A BLANK PACE.

VERY IMPORTANT.
ON OPERATION WITH A LOT OF TIMING AND PRECISION.

SO AFTER TRAVELING NINE AND A HALF YEAR, WE HAVE TO KNOW WITHIN 100 SECONDS OF WHEN WE GO BY PLUTO.

YOU SEE, TOO, THAT THE INTERACTION BETWEEN TWO TEAMS,

THEM OFTEN COME TOGETHER.

IT IS A DANCE.

THE NAVIGATORS FORM THEIR ANALYSIS.

THEY COMMUNICATE WITH THE TEAM ITSELF AND THAT INFORMATION GOES TO THE OPERATIONS TEAM AND THEY THEN SEND UP THE COMMANDS.

FIRST, THEY TEST THEM AND THEN THEY SEND THEM TO THE SPACECRAFT, THEN WE GET MORE DATA.

WE GO BACK THERE THAT CYCLE AGAIN.
Earlier this week, I think Tim was very excited to find out New Horizons was in encounter mode.

Encounter mode is a special mode that's been set up for the encounter.

We've been traveling nine and a half years across the solar system.

If something should go wrong with the spacecraft and it needs help, until this time, it would point back to Earth, send the antenna pointing to the Earth and basically phone home and say, I don't know what to do, I need the ground people to intervene and take action.

Once we're in encounter mode, we do things differently and the
REASON FOR THAT IS GIVEN THAT IT'S NINE AND A HALF HOURS ROUND TRIP LIFETIME, YOU CAN'T SIT THERE AND JOY STICK IT.

YOU'VE GOT TO RUN AUTOMATICALLY AND THE DATA DURING THESE NINE DAYS IS IMPORTANT, WE'RE BETTER TRUSTING THE SPACECRAFT TO BRING IT BACK ON TO THE TIMELINE AND CONTINUE WITH THE OPERATIONS.

SO, ONCE WE GET INTO ENCOUNTER MODE, WE DO NOT TURN BACK TO THE EARTH IF SOMETHING SHOULD GO WRONG.

IT REPAIRS ITSELF THROUGH THE AUTONOMY SYSTEM AND CONTINUES TO OPERATE.

WE THINK THAT'S THE BEST MODE OF OPERATING AND IT WILL BE FINE.

>> IT'S LIKE FULL STEAM AHEAD.
HOW IS THE SPACECRAFT?
EVERYTHING HEALTHY?
>> IT IS PERFECT.
AFTER NINE AND A HALF YEAR, EVERYTHING.
BOTH SYSTEMS WORKING.
EVERYTHING'S WORKING PERFECTLY FINE.
>> GLENN, THANKS FOR JOINING US.
>> MY PLEASURE.
>> NOW, A CHALLENGE OF THIS MISSION IS THE DISTANCE.
RIGHT NOW, NEW HORIZONS ALMOST 3 BILLION MILES AWAY, IT TAKES
NINE HOURS FOR OPERATORS TO HAVE A TWO-WAY CONVERSATION WITH THE SPACECRAFT.
JUST HOW FAR IS 3 BILLION MILES?
IF DAYTONA INTERNATIONAL SPEED WAY IT WOULD TAKE 1 BILLION 200 MILLION LAPS TO EQUAL 3 BILLION MILES.

HERE FROM NEW YORK TO LOS ANGELES, WHICH IS 2,248 MILE, YOU WOULD HAVE THE MAKE THE TRIP 1 MILLION, 294,000 TIMES.

IF YOU WERE TO FLY AROUND THE EQUATOR, 24,901 MILES, YOU WOULD HAVE TO MAKE THE TRIP 120,477 TIMES TO EQUAL 3 BILLION MILES.

THAT'S A LOT OF FREQUENT FRIER MILES.

BECAUSE NEW HORIZONS WAS DESTINED TO TRAVEL SO FAR, IT NEEDED A POWER SOURCE DESIGNED FOR DEEP SPACE.

SCIENCE SFRUMT INSTRUMENTS IS PROVIDED BY A GENERATOR SIMPLIED BY THE DEPARTMENT OF ENERGY.
SAFETY MANAGER.

00:06:41,870 --> 00:06:43,149
WHAT IS AN RTG.

00:06:43,149 --> 00:06:47,810
>> IT IS A POWER SYSTEM WHICH
USES THE NATURAL HEAT OF

00:06:47,810 --> 00:06:51,800
PLUTONIUM DOCK SIDE TO GENERATE
ELECTRICITY BY USING THERMO

00:06:51,800 --> 00:06:54,370
COUPLES.

00:06:54,370 --> 00:06:58,399
BETWEEN THE VERY HOT FUEL AND
COLDEST SPACE TO PASSIVELY

00:06:58,399 --> 00:06:59,418
GENERATE ELECTRICITY.

00:06:59,418 --> 00:07:02,299
THE KIND OF THINGS THAT WORKS IN
AREAS WHERE SOLAR POWER MIGHT

00:07:02,300 --> 00:07:06,020
NOT BE ABLE TO REACH.

00:07:06,019 --> 00:07:08,628
>> HOW LONG HAVE RTGs BEEN IN
SERVICE?

00:07:08,629 --> 00:07:11,580
HOW LONG HAVE THEY BEEN POWERING
SPACECRAFT?

00:07:11,579 --> 00:07:17,250
>> THEY'VE BEEN USED FOR OVER 50
YEARS ON 27 U.S. MISSIONS.

00:07:17,250 --> 00:07:22,199
THE FIRST NUCLEAR POWER MISSION
WAS THE TRANSIT 480 SPACECRAFT,
WHICH IS THE NAVIGATION SATELLITE AND WAS AN APL MISSION. THAT WAS LAUNCHED IN JUNE OF 1961.

SINCE THEN, SOME OF THE MOST EXCITING SPACE MISSIONS HAVE USED RTGs.

THEY'VE GONE TO THE MOON WITH THE ASTRONAUTS.

AND IN 2020, THE NEXT NUCLEAR POWER MISSION WILL BE THE MARS 2020 ROVER.

RTGs HAVE BEEN USED TO POWER MISSIONS THAT HAVE Explored VENUS, MARS, EARTH, SATURN AND NEXT WEEK, WE'RE GOING TO ADD PLUTO.

>> WHAT IS THE RTG ON NEW HORIZONS DO FOR THE SPACECRAFT?
HOW DOES IT HELP IT WORK AND HOW MUCH POWER DOES IT GIVE IT?

? >> IT'S LIFE LINE FOR THE SPACECRAFT.

IT PROVIDES ENOUGH HEAT TO KEEP ALL THE INSTRUMENTS WARM.

IT ALSO PRODUCES ALL THE POWER, THIS IS FOR EVERYTHING FOR THE

COMPUTER, COMMUNICATIONS AND ALL THE SCIENCE INSTRUMENTS.

AND DURING THE PLUTO ENCOUNTER NEXT WEEK, IT WILL PRODUCE ABOUT

202 WATTS OF ELECTRICITY.

202 WATTS ISN'T A LOT OF POWER.

IT'S JUST ENOUGH TO PRODUCE FOR ABOUT TWO LIGHTBULBS OR A VIDEO GAME CONSOLE, BUT IT'S MORE THAN ENOUGH TO SUPPLY EVERYTHING FOR
THE NEW HORIZONS SPACECRAFT.

>> AND THAT’S THROUGH PLUTO, TOO.

HOW LONG WOULD THE SPACECRAFT LAST WITH A POWER SOURCE?

WE FULLY EXPECT THE RTG TO PRODUCE ENOUGH POWER FOR THE SPACECRAFT AND FOR ITS INSTRUMENTS THROUGH THE EARLY 2030s.

BUT THAT’S MORE THAN ENOUGH TIME TO POWER THE ENCOUNTER NEXT WEEK, SEND ALL THAT INFORMATION BACK AND EXPLORE ANOTHER OBJECT.

SO, MUCH MORE AHEAD.

THANKS FOR JOINING US.

NOW, THE SUN MIGHT NOT BE STRONG ENOUGH TO POWER THE SPACECRAFT,

BUT IT IS BLIGHTER ON PLUTO THAN YOU MIGHT EXPECT.
THE NASA WEBSITE WHERE YOU CAN FIND THE MOMENT BETWEEN DAWN AND
DUSK EACH DAY FOR THE ILLUMINATION ON EARTH MATCHES THAT ON PLUTO.

FOR A SCIENCE UPDATE, WE WELCOME FRAN.

A NEW HORIZONS INVESTIGATOR FROM THE UNIVERSITY OF COLORADO

THANKS FOR JOINING US.

WITH PLUTO TIME, IT’S DESIGNED TO GIVE AN IDEA OF HOW BRIGHT IT IS.

IF I WAS STANDING ON PLUTO, WHAT WOULD I SEE?

>> MOST EXCITING WOULD BE THE BIG MOON SHOWER.

IF YOU THINK OF OUR MOON, FULL MOON, IT'S ABOUT THE SIZE OF A
LITTLE THING OF†-- IF WE WERE ON PLUTO, LOOKED UP, WE WOULD SEE A

MOON THAT'S THREE FAT FINGERS ACROSS UP IN THE SKY, SO, BIG,

BUT IT STAYS THERE.

IF YOU'RE ON ONE SIDE.

NOW, IF YOU'RE ON THE OTHER SIDE, NEVER SEE IT.

NEVER, EVER, EVER WOULD YOU SEE SHOWER IN THE SKY.

YOU'D SEE THE OTHER MOONS GO BY, BUT BECAUSE THEY'RE IN THAT ORBIT.

WE'RE GETTING BETTER AND BETTER LOOKS AT PLUTO.

EVEN TO THE POINT WHERE SOME OF THE FEATURES, WHAT ARE WE SEEING IN SOME TO HAVE LATEST PICTURES THAT HAVE COME DOWN?

THEY'RE A LITTLE LESS FUZZY.
WE'RE GOING TO SEE FEATURES.

DARK REGIONS, LIGHT REGIONS.

SORT OF SHAPES A LITTLE BIT.

IN FACT, THEY'RE CALLING THIS THING BIG BLACK THING THE WHALE.

LITTLE ROUND THING LOOKS LIKE A DONUT AND YOU KNOW, THEY'RE STILL FUZZY.

WE CAN'T REALLY SAY, BUT WE'RE GETTING THERE.

WE'RE GETTING CLOSE.

THE PICTURES ARE CAPTIVATING US, BUT NEW HORIZONS IS IS MORE IN THE PICTURES.

YOU LEAD THE MISSIONS PARTICLE OF PLASMA TEAM.

IN PARTICULAR, WHAT ARE YOU LOOKING FOR?

>> THE MOST INTERESTING THING TO
ME IS THE FACT WE'VE GOT THESE

ICE ON THE SURFACE.

THE IYES EVAPORATE, THEY MOVE OUT.

SO, IT HAS AN ATMOSPHERE OF NITROGEN MUCH LIKE THE

ATMOSPHERE HERE IN THIS ROOM, BUT THAT MAKES IT AN ESCAPING

ATMOSPHERE BECAUSE THE GROUND IS A LITTLE WEAKER AND IT MOVES OUT

AND ESCAPES AND OUT INTO SPACE AND MAKES A BIG REGION THAT IS

COMPARABLE IN SIZE TO THAT OF THE EARTH IS ESPECIALLY

CAPING ATMOSPHERE REGION AND THE PARTICLES MOVE AWAY AND WHAT

HAPPENS THEN IS AS THESE PARTICLES MOVE AWAY IS THE

MATERIAL FROM THE SUN COMES IN AND INTERACTS WITH THAT

ATMOSPHERE, SO FROM THE SUN WE HAVE PROTONS AND ELECTRONS THAT
COME AWAY AND RAM INTO THIS REGION AND THAT MATERIAL IS IONIZED, THE MATERIAL FROM PLUTO AND WHEN IT BECOMES IONIZED, IT GETS PICKS UP AND CARRIED AWAY.

WE DON'T REALLY KNOW THE SIZE, BUT WE'RE GOING TO FLY THROUGHEN IT AND THE PARTICLES AND PLASMA INSTRUMENTS, SWAP AND-- WILL MEASURE THOSE PARTICLES.

NOW, THERE'S A LOT OF THINGS THAT WILL HELP THE TEAM COMPLETE THE PICTURE OF THE PLUTO SYSTEM.

THERE'S THE JOLI, WE SEE A LOT OF THE PICTURES.

YOU MENTION WHAT'S GOING ON WITH PARTICLES AND PLASMA.

THERE ARE OTHER ELEMENTS, TOO.

SEEMS LIKE THAT'S THE COME TOGETHER TO GET THAT COMPLETE
PICTURE OF WHAT'S HAPPENING IN PLUTO.

00:13:08,320 --> 00:13:12,150
>> SO, WE HAVE A REALLY EXCITING SITUATION WITH PLUTO BECAUSE WE

00:13:12,149 --> 00:13:13,149
HAVE AN ATMOSPHERE.

00:13:13,149 --> 00:13:14,149
WE HAVE A SURFACE.

00:13:14,149 --> 00:13:17,649
THIS ICE IS EVAPORATING.

00:13:17,649 --> 00:13:20,360
WHAT'S INTERESTING IS THAT THEY ALL COME TOGETHER.

00:13:20,360 --> 00:13:24,289
RIG RIGHT NOW, THE ATMOSPHERE IS ESCAPING.

00:13:24,289 --> 00:13:29,709
WHAT HAPPENS IS IT FREEZES DOWN AND THE SOLO HITS THE SURFACE

00:13:29,710 --> 00:13:35,310
AND INTERACTS, RADIATES AND SO, THE METHANE AND NITROGEN AND SO

00:13:35,309 --> 00:13:39,469
ON, CHEMICAL REACTIONS OCCUR THIS MAKE THAT BROWNIE, GUNKY,

00:13:39,470 --> 00:13:43,220
OIL WILL I, HYDRO CASHI N MATERIAL.

00:13:43,220 --> 00:13:47,700
THE BROWN GUNK, WE LIKE TO CALL IT, ON THE SURFACE AND MAKES IT

00:13:47,700 --> 00:13:52,180
THAT REDDISH BROWNISH, DARKISH COLOR.

>> EVEN STARTING SINCE WE'RE GETTING CLOSER, YOU WERE ON THE

VOYAGER TEAM WHEN IT FLEW PAST NEPTUNE IN 1989 TO GIVE US OUR

LAST FIRST LOOK AT A NEW PLANET UNTIL NOW.

I'M WONDERING, STARTING TO FEEL THE SAME WORKING ON NEW HORIZONS

AS YOU DID THEN?

>> AFTER WE WERE ALL LIKE IT'S A LIFE AFTER TRITON.

OF COURSE NOW, WE KNOW IT'S PLUTO AND IT'S THE SAME THING.

IT'S JUST BRILLIANT.

>> THE EXCITEMENT I KNOW GETTING THERE DAYS IN AND SEEING WHAT'S COMING UP EVERY DAY.
>> EACH DAY’S DIFFERENT.

>> THANKS.

JOIN THE CONVERSATION VIA TWITTER, FACEBOOK AND OTHER PLATFORMS TALKING ABOUT THE JULY 14th FLY BY.

SEND QUESTIONS, MISSION INFORMATION ALONG WITH NEW INFORMATION ARE AVAILABLE ON LINE AT NASA.GOV/NEW HORIZONS.

WE ARE FIVE DAYS AWAY.

LESS THAN A PLUTO DAY AWAY FROM THE FLY BY.

THANKS FOR WATCHING.