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00:00:01,400 --> 00:00:04,350
The ISS is truly a global asset.

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00:00:04,350 --> 00:00:10,259
It's the result of 15 nations working together,
sharing planning, technology, scientific advancements,

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00:00:10,259 --> 00:00:11,809
and the talents of its people.

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00:00:11,809 --> 00:00:15,959
We recently celebrated a decade of continuous
human presence off-planet.

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00:00:15,959 --> 00:00:20,880
We're learning how humans can exist in the
extremely unforgiving environment of space,

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00:00:20,880 --> 00:00:23,699
where resupply from home is difficult and
costly.

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00:00:23,699 --> 00:00:26,180
What we do here will improve life on Earth.

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00:00:26,180 --> 00:00:31,929
Over the past decade we've conducted over
600 experiments leading to advances in materials,

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00:00:31,929 --> 00:00:37,330
environmental science, medicine and our understanding
of the human body, our planet and the universe.

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00:00:37,330 --> 00:00:41,350
Let me quickly grab the camera as I fly you
through some of the research facilities that

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00:00:41,350 --> 00:00:43,150
we have on board and tell you more.

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00:00:43,150 --> 00:00:47,350
We're presently in the Japanese Experiment
Module also known as the JEM, where we have

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00:00:47,350 --> 00:00:52,650
this airlock where we could put experiments
out into the vacuum of space replace to be

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00:00:52,650 --> 00:00:58,600
place on this external platform, out these
beautiful windows out here.

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00:00:58,600 --> 00:01:01,000
The JEM also has several experiments racks.

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00:01:01,000 --> 00:01:06,940
We'll talk about the first one here which
is the Ryutai rack.

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00:01:06,940 --> 00:01:10,940
The Ryutai rack at the moment is being used
for a Protein Crystal Growth experiment which

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00:01:10,940 --> 00:01:14,770
could lead to advancements in medicine, and
was recently as for a fluids experiment which

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00:01:14,770 --> 00:01:17,580
investigated the Marangoni convection effects.

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00:01:17,580 --> 00:01:20,700
Improved understanding of this phenomena can
have numerous applications including improved

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00:01:20,700 --> 00:01:25,980
silicon chip manufacturing, high quality materials,
improved medical diagnostics and advancements

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00:01:25,980 --> 00:01:29,950
in micro and nanotechnology.

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00:01:29,950 --> 00:01:34,430
The Saibo or cell rack is presently conducting
plant growth experiments.

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00:01:34,430 --> 00:01:38,060
In the unique micro-g environment of the space
station we can better understand how gravity,

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00:01:38,060 --> 00:01:43,050
light and water affect how plants grow, which
may help us grow crops more efficiently, especially

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00:01:43,050 --> 00:01:46,070
in the arid and drought affected regions of
the world.

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00:01:46,070 --> 00:01:50,549
The JEM also has two of our many freezer facilities
that we have onboard for biological and other

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00:01:50,549 --> 00:01:54,729
samples that must be kept frozen to preserve
the science.

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00:01:54,729 --> 00:02:01,409
We're now flying starboard across the forward
edge of the space station toward the European

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00:02:01,409 --> 00:02:03,909
module known as Columbus.

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00:02:03,909 --> 00:02:08,380
This rack contains the Geoflow experiment
which is helping us better understand the

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00:02:08,380 --> 00:02:13,890
Earth's inner core which could help us predict

natural disasters such as volcanoes and earthquakes

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00:02:13,890 --> 00:02:15,480

better.

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00:02:15,480 --> 00:02:19,720

In Columbus there's also many facilities dedicated to study of biology and the human

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00:02:19,720 --> 00:02:25,129

body including two Human Research Facility racks which contain medical diagnostic equipment,

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00:02:25,129 --> 00:02:29,400

Biolab and the European physiology and cultivation modules.

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00:02:29,400 --> 00:02:32,769

Some of the experiments in these facilities will look at how to grow plants in harsh climates

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00:02:32,769 --> 00:02:37,159

and poor soil and explore methods of boosting the human body's immune system.

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00:02:37,159 --> 00:02:41,209

In the US lab there's a number of EXPRESS racks that can be configured for a wide range

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00:02:41,209 --> 00:02:50,040

of experiments, more freezer facilities and a laboratory glovebox facility.

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00:02:50,040 --> 00:02:53,680

This is the Combustion Integrated Rack which is used to create a controlled combustion

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00:02:53,680 --> 00:02:58,040

environment and includes a pressure vessel and advanced diagnostics.

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00:02:58,040 --> 00:03:01,819
Some of the benefits of microgravity combustion research include fire safety and prevention

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00:03:01,819 --> 00:03:07,950
both on spacecraft and on the Earth, pollution control and increased fuel efficiency.

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00:03:07,950 --> 00:03:11,629
This is the Fluids Integrated Rack which is used to perform fluid physics experiments

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00:03:11,629 --> 00:03:16,480
in microgravity and contains a microscope facility in a sealed glovebox.

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00:03:16,480 --> 00:03:20,359
Some of our fluids experiments investigate how fluids behave near the critical point

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00:03:20,359 --> 00:03:24,260
which can lead to advancements in clean energy production and clean methods for eliminating

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00:03:24,260 --> 00:03:25,829
hazardous waste.

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00:03:25,829 --> 00:03:31,040
I'd like to show you inside the WORF, the Window Observational Research Facility, although

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00:03:31,040 --> 00:03:33,999
we can't open it up right now because we have an experiment ongoing in there called

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00:03:33,999 --> 00:03:38,180
ISSAC, the International Space Station Agricultural Camera.

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00:03:38,180 --> 00:03:44,569
This camera takes frequent visual and infrared pictures of vegetated areas around the Earth.

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00:03:44,569 --> 00:03:48,840
This camera takes images frequently enough to evaluate rapidly changing conditions of

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00:03:48,840 --> 00:03:52,739
crops and areas which have a short growing season and provides valuable information that

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00:03:52,739 --> 00:03:57,239
farmers can use to optimize crop growth and increased food production.

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00:03:57,239 --> 00:04:02,029
Beyond its initial agricultural focus, scientists also plan and investigate how a quick response

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00:04:02,029 --> 00:04:06,519
Earth sensor such as ISSAC can be used to study a number of rapidly changing phenomena

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00:04:06,519 --> 00:04:10,969
around the planet, for measuring how glaciers are changing to the potential applications

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00:04:10,969 --> 00:04:15,749
in helping monitor conditions following natural disasters.

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00:04:15,749 --> 00:04:19,400
Technologies developed and demonstrated here on orbit will help alleviate some of the issues

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00:04:19,400 --> 00:04:21,790
humans face daily on the planet.

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00:04:21,790 --> 00:04:24,229

One example has to do with water purification.

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00:04:24,229 --> 00:04:27,190

As we flight aft through the space station
to the Russian segment I'll tell you all

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00:04:27,190 --> 00:04:29,900

about it.

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00:04:29,900 --> 00:04:34,060

One of the challenges of our technology on
the ISS is that it needs to be sustainable.

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00:04:34,060 --> 00:04:38,060

Which means it needs to be easy to use and
work for long periods of time without maintenance

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00:04:38,060 --> 00:04:39,669

or resupply.

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00:04:39,669 --> 00:04:43,870

Applying this sustainable engineering approach,
a group of NASA engineers volunteered their

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00:04:43,870 --> 00:04:48,150

time and developed the water treatment system
for communities in Rwanda where they also

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00:04:48,150 --> 00:04:51,180

need clean water with limited training and
resupply.

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00:04:51,180 --> 00:04:55,030

That project went to a project in Kenya for
providing household-scale water treatment

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00:04:55,030 --> 00:04:56,290

systems for 4 million people.

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00:04:56,290 --> 00:05:00,690

It is the largest water treatment project of its kind in the world.

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00:05:00,690 --> 00:05:08,310

I'm entering the MRM2 research facility in the Russian segment.

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00:05:08,310 --> 00:05:14,460

Here in the Russian MRM2 module, this experiment is investigating how electromagnetic fields

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00:05:14,460 --> 00:05:16,800

can affect the structure of crystal growth.

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00:05:16,800 --> 00:05:25,080

Here in the Russian service module there's a number of scientific experiments.

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00:05:25,080 --> 00:05:30,300

In the LADA experiment investigators are evaluating different methods of growing wheat and vegetables

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00:05:30,300 --> 00:05:31,970

using hydroponics.

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00:05:31,970 --> 00:05:38,449

Here in the Russian segment there's also a great deal of photo equipment that's used

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00:05:38,449 --> 00:05:41,840

for Earth observation through these great Earth-facing windows.

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00:05:41,840 --> 00:05:46,780

We look at things like human impact, the effect of human impact on the environment, on the

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00:05:46,780 --> 00:05:48,860

atmosphere, on pollution control.

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00:05:48,860 --> 00:05:54,100

There's also an experiment called Rusalka which evaluates the human impact on the Earth's

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00:05:54,100 --> 00:05:55,100

atmosphere.

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00:05:55,100 --> 00:05:59,000

These are just a small subset of all the research that's being conducted aboard the International

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00:05:59,000 --> 00:06:00,000

Space Station.

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00:06:00,000 --> 00:06:04,580

All the research is leading to things like new emergency sutureless wound closure and

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00:06:04,580 --> 00:06:08,949

disinfection, breakthroughs in the understanding and protection against bacteria such as Salmonella,

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00:06:08,949 --> 00:06:13,389

the treatment of osteoporosis and skin disorders, and the development of a NASA bioreactor which

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00:06:13,389 --> 00:06:18,570

is being used in laboratories around the world for research in things like cancer, regenerative

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00:06:18,570 --> 00:06:23,830

medicine, artificial organs, diabetes, AIDS, vaccine production and infectious disease.

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00:06:23,830 --> 00:06:29,129

Thanks to the cooperation of the 15 nations of our International Space Station partnership,

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00:06:29,129 --> 00:06:32,360
research is being conducted onboard the ISS
that simply cannot be done on Earth and is

96
00:06:32,360 --> 00:06:35,389
making a big positive impact on our world.