Episode Book

EPISODE #5795

Digging Harbors with Nuclear Bombs: Project Plowshare

PUBLISHED	9 October 2026 at 09:50 UTC
DURATION	21:08
LISTEN	myweirdprompts.com/episode/project-plowshare-nuclear-excavation/
HOSTS	Corn, Herman, Hilbert
SCRIPT MODEL	deepseek-flash
VOICES	chatterbox-regular (chatterbox-local)
PIPELINE	V5.2
SOURCES	12 cited by the research (listed at the end)
BOOK GENERATED	19 October 2026 at 17:40 UTC

SYNOPSIS

In 1957, the U.S. government launched Project Plowshare under the Atoms for Peace banner, betting that nuclear explosions could dig canals, carve highways, and unlock natural gas. Thirty-five devices and twenty-seven tests later, the program was quietly dead. This episode traces the optimism, the actual detonations — Sedan, Gnome, Gasbuggy, Rulison, Rio Blanco — and the human ledger of exposure that the program never escaped. Why did a program named after Isaiah's swords-into-plowshares prophecy fail? Not for one reason, but three: contamination, economics, and a better, boring alternative called hydraulic fracturing.

TRANSCRIPT



Corn

What if you could dig a harbor with a bomb?



Herman

That is not a rhetorical question, is it.



Corn

It is not. That was a United States government program. Operation Plowshare. Daniel wants the other side of the atomic age this time. We have spent a lot of episodes on the yield, on the fallout, on the deterrent. He wants the version where the same device is pointed at a mountain and the mountain is the problem.



Herman

The sword into the plowshare.



Corn

Literally that. That is where the name comes from. He wants the origins, the optimism, the actual detonations, Sedan in particular, and then the collapse. Why it died, whether it was ever really competitive with a man and a bulldozer, and what the Soviets were doing while we were doing it.



Herman

And he wants the human ledger kept. The exposure.



Corn

He does. He is explicit about that. So let us start with the pitch, because in the nineteen fifties this was not a joke. It was a budget line.



Herman

Project Plowshare is established June nineteen fifty-seven, under the Atoms for Peace umbrella. It runs to nineteen seventy-five. Thirty-five devices, twenty-seven tests. The name is Isaiah. Beat their swords into plowshares.



Corn

Which is a beautiful thing to put on a program that detonates things.



Herman

It is, and it was chosen deliberately. The actual enabling discovery is Rainier. September nineteenth, fifty-seven. First fully contained underground test, one point seven kilotons. Before Rainier, every test put fallout into the atmosphere. Rainier proves you can bury the thing and trap almost all of it. And once you can trap it, suddenly nuclear excavation looks like an engineering problem instead of a contamination problem.



Corn

That is the hinge.



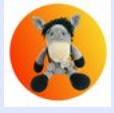
Herman

That is the whole hinge. Every proposal for the next eighteen years sits on the back of that one shot.



Corn

And the origin is not as clean as the name suggests.



Herman

No. Lewis Strauss, who chaired the Atomic Energy Commission, said the point of Plowshare was to highlight the peaceful applications and thereby create a climate of world opinion more favorable to weapons development and tests.



Corn

So the plowshare was partly a shield for the sword.



Herman

Partly. Not entirely. There were people in the program who believed this was the future of civil engineering. Teller was one of them. Edward Teller, who ran Livermore, was the loudest champion the program ever had. His line was, if your mountain is not in the right place, drop us a card.



Corn

That is a very confident sentence from a man who never had to live next to the mountain.



Herman

He also said the discussion about fallout had produced exaggerated and unwarranted fears, and that even small quantities of radioactivity not themselves harmful were being viewed with alarm. He said that in sixty-three.



Corn

After Sedan.



Herman

After Sedan, yes.



Corn

And the proposals got specific. Very specific. Let us talk about what they actually wanted to build.



Herman

The headline application was excavation, and the headline excavation was a canal. Widening Panama was one strand. A sea-level waterway across Nicaragua was another. The one that gets quoted is the Negev.



Corn

Israel.



Herman

A hundred and sixty miles through the Negev Desert, cut with five hundred and twenty two-megaton bombs. Estimated at five hundred and seventy-five million dollars in sixty-three.



Corn

Which is what, five billion now.



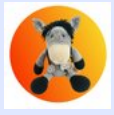
Herman

Roughly, yes.



Corn

Five hundred and twenty bombs. Say that again to yourself.



Herman

And it was not a bar napkin. There is a Livermore memo. The cost estimate is on paper.



Corn

There is also Carryall.



Herman

Project Carryall, sixty-three. Twenty-two nuclear explosions to cut a roadcut through the Bristol Mountains in the Mojave, for Interstate forty and a Santa Fe rail line. This is the one that shows you the proposals were not think-tank fantasy. This got into actual engineering plans, into the alignment studies.



Corn

And then it did not happen.



Herman

It was cut from the budget in sixty-five. Quietly.



Corn

The most American sentence available. Cut from the budget.



Herman

Then there is Chariot. An artificial harbor at Cape Thompson, Alaska. Chained thermonuclear devices. Initially two point four megatons total for the whole thing. Then it gets walked down to four hundred and eighty kilotons, then to a two hundred and eighty kiloton demonstration shot.



Corn

The pattern there is interesting. Every time someone actually looks at the site, the number shrinks.



Herman

Every time. Teller on Chariot: if Chariot is successful, we will have the knowledge and experience for creating a harbor wherever one is needed. Its size and shape can be tailored to the local requirements.



Corn

A harbor wherever one is needed. That is the whole promise in eight words. Any coastline becomes a build site.



Herman

And underneath the excavation headline there is a whole second program, which is underground work. Gas stimulation. Oil shale retorting. In-situ copper leaching. Underground cavities for storage. Geothermal. They even looked at using devices for space propulsion, which is Orion.



Corn

So it is not one idea. It is a portfolio.



Herman

It is a portfolio, and part of why it survived so long is that there was always another application to write a memo about.



Corn

There is a line from Isidor Rabi I want to get to, but let us do the tests first, because the tests are where this stops being a proposal.



Herman

Gnome. December tenth, sixty-one. Carlsbad, New Mexico. Three point one kilotons. The plan was a self-sealing shot. You detonate in the salt, the salt closes behind the device, everything stays down.



Corn

And?



Herman

It vented. Radioactive steam came up and drifted over the press gallery. They had invited the press.



Corn

To watch it not vent.



Herman

And after the test, the crews went down and found a cavity in the melted salt with stalactites hanging from the ceiling, still above sixty degrees Celsius. Weeks later.



Corn

The rock melted and then it grew decorations.



Herman

It grew decorations, yes.



Corn

Sedan. July sixth, sixty-two. This is the one Daniel asked for by name.



Herman

Sedan is the centerpiece. A hundred and four kilotons, buried a hundred and ninety-four meters down in alluvium. It is a cratering shot. The point is not containment. The point is to move earth.



Corn

How much earth.



Herman

Twelve million short tons displaced. The crater is three hundred and twenty feet deep and twelve hundred and eighty feet across. The seismic signal was the equivalent of a four point seven five on the Richter scale.



Corn

For reference, people in Las Vegas felt that.



Herman

People felt it. And the radiation on the crater lip one hour after the burst was five hundred roentgen per hour. Twenty-seven days later it had fallen to five hundred milliroentgen per hour.



Corn

A thousandfold drop and still a number you do not want to stand in.



Herman

Correct.



Corn

And the fallout.



Herman

Sedan contaminated more Americans than any other single test. Over thirteen million people exposed. Eight hundred and eighty thousand curies of iodine one thirty-one released. The highest concentrations were not in Nevada. They were in Iowa and South Dakota.



Corn

The wind decides who gets it.



Herman

The wind decides. That is the part the program never solved.



Corn

And Gnome was supposed to be the contained one.



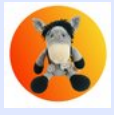
Herman

Gnome was supposed to be the contained one. It was three kt against Sedan's hundred and four, and it still vented.



Corn

Then the gas tests, which are the part where the economics actually get their hands on the idea.



Herman

Gasbuggy, December tenth, sixty-seven. Twenty-nine kilotons. This is the first joint government-industry shot for gas stimulation, and technically it works. It fractures the rock. Gas flow goes up.



Corn

That sounds like a success.



Herman

The gas comes up contaminated with tritium. You cannot sell it. No utility will take it.



Corn

So it worked and the product was unsellable.



Herman

That is exactly the position. Rulison, September tenth, sixty-nine, forty-three kilotons. The National Science Foundation looked at it afterward and found it cost about eleven million dollars and yielded at most one and a half million dollars of gas. And the gas was inferior to what you got conventionally.



Corn

And radioactive. Rio Blanco.



Herman

May seventeenth, seventy-three. Three thirty-three kiloton devices fired together near Rifle, Colorado. The design assumes the three cavities will connect and you get one big fractured chimney to draw from.



Corn

They did not connect.



Herman

And the gas contained strontium ninety at levels nobody would accept.



Corn

So the experiments happened. Some of them worked technically. But that is not the same as working. Let us talk about why this all fell apart.



Herman

The economics were never there, and I want to be precise about that, because the easy story is that the hippies killed it. Look at the gas-stimulation line alone. By seventy-four, about eighty-two million dollars had gone into those three tests. The estimate was that even twenty-five years of production would recover somewhere between fifteen and forty percent of the investment.



Corn

Fifteen to forty, on the optimistic end.



Herman

That is not a close call. That is a program losing money at its best-case projection.



Corn

And while they were doing that, something boring happened.



Herman

Conventional hydrofracturing got good. Hydraulic fracturing, no nuclear device, a fraction of the cost, none of the radiation. The nuclear option was not just killed by opposition. It was outcompeted. That matters, because it means Plowshare did not die of one wound.



Corn

The AEC's own final report said something close to that.



Herman

It said Plowshare was a program that started with great expectations and high hopes, and it said the whole concept tends to appall people. That is the agency's own language in its own report.



Corn

Appall. On the cover.



Herman

In the report. And there is a nice arc in the press. Time magazine cheered it in sixty-one as a hopeful dream. By seventy-three, same magazine, it is Project Dubious.



Corn

Twelve years from hopeful dream to Project Dubious.



Herman

And here is the paradox at the center of it, the one I find interesting. For Plowshare to be acceptable, the devices have to be clean. Fusion-heavy, minimal fission fallout. The whole case rests on the bomb being tidy. And the tests that were meant to demonstrate tidiness, Sedan and Gnome, produced the worst contamination in the program's history.



Corn

The demonstration of cleanliness was the dirtiest thing they did.



Herman

Yes. The technology that was going to make it acceptable is what made it unacceptable. You cannot separate those.



Corn

Then there is the public turn.



Herman

There are two readings. The historian Michael Payne argues the shift in public attitudes after the Cuban Missile Crisis did most of the work. People stopped trusting the word peaceful attached to the word nuclear. Benjamin Sovacool's argument is that the radioactive product itself was the fatal flaw. Honestly, both are true and they reinforce each other.



Corn

Then Chariot, which gets stopped before it is ever fired.



Herman

Chariot never detonates. It is walked down from two point four megatons to a demonstration and then shelved in sixty-two. And that defeat matters beyond Alaska, because it is credited as one of the first government projects stopped on purely ecological grounds.



Corn

That is a real precedent.



Herman

It is a precedent, and it connects to something bigger. The organizing that stopped Chariot fed into Native political organization that led to the Alaska Native Claims Settlement Act in seventy-one.



Corn

Celia Hunter, from the Alaska Conservation Society, said it well.



Herman

She said they thought they could push everybody around and they suddenly discovered they were up against an informed citizenry.



Corn

That sentence is the tombstone of the program, honestly. Not the radiation. The citizenry.



Herman

There is also the canal study. December first, seventy, the Atlantic-Pacific Interoceanic Canal Study Commission puts out its final report and advises against basing U.S. canal policy on nuclear excavation.



Corn

So the flagship application, the reason the program existed in the public imagination, gets formally advised against by its own commission.



Herman

And now the Soviets, because Daniel asked and because the comparison is unfair to us in one direction and worse in another.



Corn

Go.



Herman

Their program is called Nuclear Explosions for the National Economy. Sixty-five to eighty-nine. Over a hundred and twenty tests. Larger, longer, more diverse than Plowshare ever was.



Corn

Chagan.



Herman

January fifteenth, sixty-five. A hundred and forty kilotons. The largest peaceful nuclear explosion ever fired. It creates an artificial reservoir in Kazakhstan. The problem is about twenty percent of the radioactive products escape. They get detected over Japan.



Corn

Which is a problem because of the treaty.



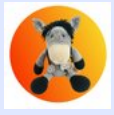
Herman

A partial test ban problem. The U.S. formally complained that Chagan violated the Partial Test Ban Treaty. That is a government complaining about fallout from another government's civil-engineering project.



Corn

And the reservoir itself.



Herman

They called it Lake Chagan. It is still there.



Corn

Then the one that actually worked.



Herman

Urtabulak, sixty-six. A gas well had been burning for nearly three years. They drill down and offset, they set a thirty kiloton charge, they fire it, and the collapse pinches the wellbore shut. The fire goes out. That is the first of five such attempts, and all but one were fully successful. No radioactivity above background detected.



Corn

That is a genuine engineering win.



Herman

It is. And it is the one that keeps coming back. During the Deepwater Horizon spill in twenty-ten, the Urtabulak technique was cited publicly as a possible precedent for stopping a runaway well.



Corn

Which tells you what the honest rump of this idea looks like. A very carefully placed explosion to close a hole that is already a disaster.



Herman

And the Soviet ledger has its own disasters, which they did not advertise. Kraton-3 in seventy-eight in Yakutia leaves plutonium pollution in drinking water. Globus-1 in seventy-one creates a radioactive hotspot two kilometers wide in populated European Russia.



Corn

So the argument that the Soviets did it cleaner does not survive contact with the file.



Herman

It does not survive at all. They did it bigger, and they did it with less scrutiny, which is not the same as doing it safely.



Corn

The legal end.



Herman

The Peaceful Nuclear Explosions Treaty between the U.S. and the USSR, signed seventy-six, in force ninety. Caps a single explosion at a hundred and fifty kilotons and a group at fifteen hundred kilotons aggregate. And the Comprehensive Test Ban Treaty, when it enters into force, bans peaceful nuclear explosions outright. No country has fired one since eighty-nine.



Corn

And then there is the strangest footnote in the whole story.



Herman

Sedan, Sudan.



Herman

In two thousand five there was congressional testimony, and a transcript mis-transcribed Sedan as Sudan. The Sudanese government read it and formally demanded an investigation into U.S. nuclear testing causing cancer in Sudan.



Corn

A typo became a diplomatic incident. Okay. So where does that leave us? The one thing Plowshare actually accomplished that still matters.



Herman

It is not a crater and it is not a canal. It is that the only defensible application turned out to be the one that stops a catastrophe rather than the one that builds something. Extinguish the fire, seal the well, walk away.



Corn

And they got there by trying to build a harbor wherever one was needed.



Herman

And getting a hole people pay to look at. The Sedan crater is the largest human-made crater in the United States. It went on the National Register of Historic Places in ninety-four. Ten thousand people a year go stand at the rim.



Corn

The most successful thing the program ever built was a hole people pay to look at.



Herman

That is where the money ended up, yes. Let me add one thing on the exposure, because Daniel asked and it deserves to sit here rather than in a footnote. Sedan's fallout went over thirteen million people, and the heaviest deposition was in Iowa and South Dakota, not Nevada. The people most exposed were people who had no part in the decision and no way to know. That is not a side effect. That is the thing.



Corn

The program's own numbers did not kill it as fast as the people reading them.



Herman

Correct.



Corn

Which is the part that has aged best. The engineers had the arithmetic. The public had the arithmetic too, eventually.



Hilbert

That all tracks.



Hilbert

But it was never the radiation that killed the project I was near. It was the scale. They wanted to move mountains. You do not move mountains. You move a marina. You move a boat ramp. You move a very small amount of dirt and you call it a day.



Corn

You were near something like this?



Hilbert

I still have the study. A nuclear-excavated marina on a lake I am not going to name. Late two thousands work, but the study was a reprint from the sixties, feasibility, and I kept a copy because the cost estimate was the funniest thing I have ever read in a bound document.



Herman

What did it say?



Hilbert

Fourteen dollars and a ham sandwich.



Corn

Say that again.



Hilbert

Fourteen dollars and a ham sandwich. The sandwich was itemized.



Corn

Of course it was.



Hilbert

Three dentists and a man who sold above-ground pools commissioned it. That was the consortium. The dentists were the money. The pool man was the vision.



Herman

What happened to it?



Hilbert

The pool man insisted on a dry run with conventional explosives before they committed to anything. And the dry run drained the lake.



Corn

The dry run drained the lake.



Herman

Did they refill it?



Hilbert

No.



Herman

It is still dry?



Hilbert

There is a very nice marina there. Very dry. Very radioactive-free. Nobody uses it.



Corn

So the only Plowshare project that ever actually got built was a marina with no water.



Hilbert

Correct.



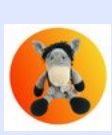
Hilbert

Fourteen dollars and a ham sandwich, Corn. The sandwich was the line item that got the study read.



Corn

Noted.



Herman

I want to sit with the one throwaway in there. A marina is a small excavation. That is Hilbert's actual point under the joke, whether he meant it or not.



Corn

That is the closure of the whole episode. They proposed the largest holes ever dug by humans, and the one thing anybody actually needed was a boat ramp.



Herman

The scale was the pitch. If you only move a boat ramp's worth of dirt, nobody funds a program, nobody writes a feasibility study, nobody gets a headline. So the ambition was load-bearing. It had to be a canyon or it was not worth doing.



Corn

The one legitimate remaining use is still a small hole. A thirty kiloton charge to pinch a wellbore shut. Not a hundred and sixty miles of canal. A hole the size of the problem.



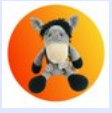
Herman

And that is real. It worked five times. It is the only piece of this that survives contact with a modern engineer.



Corn

So the question sitting under the whole episode is whether there is any scenario left where a nuclear explosion is the least bad option. Extinguish the well. Seal the breach. The treaty that would ban it has not entered into force, and no one has fired one since eighty-nine.



Herman

I do not know that anyone will. I do know we have not had to, and that is not the same as never will.



Corn

Which is the shape of the whole program, honestly. A failure to imagine what the public would accept. The atomic age promised to reshape the landscape, and the public looked at the landscape and decided it was fine.



Herman

That is the part I keep turning over. They were not wrong about the physics. Sedan made exactly the crater they said it would make. They were wrong about the country.



Corn

If you enjoyed this one, subscribe and leave us a review. It helps other listeners find the show.



Corn

This has been My Weird Prompts.



Herman

Our producer is Hilbert Flumingtop. Send us your own prompt on Telegram at t dot me slash MWP listener bot.



Corn

We will be back soon.

SOURCES

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