
BONUS EPISODE:
FLYING ALASKA

1
00:00:01,620 --> 00:00:05,620
Larsen: You guys got everything tied down back there?

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00:00:05,620 --> 00:00:09,620
Truffer: Yep. Christoffersen: Yep.

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00:00:09,620 --> 00:00:13,620
Larsen: We're going through the lee of St. Elias, so there might be some turbulence.

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00:00:13,620 --> 00:00:17,620
Christoffersen: Fasten Seat Belt sign on?

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00:00:17,620 --> 00:00:21,620
Larsen: Well … who am I to tell you what to do?

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00:00:21,620 --> 00:00:25,620
[aircraft engine noise, rising music]

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00:00:29,620 --> 00:00:33,620
[music builds]

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00:00:45,620 --> 00:00:49,620
[booming sound]

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00:00:53,620 --> 00:00:57,620
[theme music]

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00:01:13,620 --> 00:01:17,620
Narrator: There are tens of thousands of glaciers in Alaska,

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some stunning cliffhangers, others wide glaciers that come down

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to meet the ocean tides. Some, like this one

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we flew over in August, are easily visible

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00:01:29,620 --> 00:01:33,620
from low Earth orbit, and are mesmerizing

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from a thousand feet above, and have trees growing on top of their soil-laden boundaries.

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00:01:37,620 --> 00:01:41,620
Those glaciers – although they represent only a fraction

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00:01:41,620 --> 00:01:45,620
fraction of the world's ice – are contributing much more than their share

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to sea level rise.

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00:01:49,620 --> 00:01:53,620
Chris Larsen and his colleagues have repeatedly measured

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00:01:53,620 --> 00:01:57,620
220 of them in a small single engine Otter,

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00:01:57,620 --> 00:02:01,620
measuring their height with lasers and their depth with radar,

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00:02:01,620 --> 00:02:05,620
and watching them change from season to season and year to year.

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00:02:05,620 --> 00:02:09,620
But Alaskan glaciers

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00:02:09,620 --> 00:02:13,620
are all so different we're only just figuring out how they all behave.

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Data from flights like these, part of NASA's Operation IceBridge,

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can help fill the gaps.Chris and radar specialist Martin Truffer

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are both from the University of Alaska Fairbanks,

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and both seasoned Alaskan pilots, but they rely

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00:02:29,620 --> 00:02:33,620
on their good friend and legendary bush pilot Paul Claus

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00:02:33,620 --> 00:02:37,620
and his 35,000 hours in the cockpit

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00:02:37,620 --> 00:02:41,620
cockpit to fly the incredibly demanding flightlines the mission requires.

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00:02:41,620 --> 00:02:45,620
And does it help you guys being pilots too? Chris: I would like to think so but

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00:02:45,620 --> 00:02:49,620
but watching Paul fly and seeing what he does is kind of like trying to

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00:02:49,620 --> 00:02:53,620
learn quantum mechanics in kindergarten.

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00:02:53,620 --> 00:02:57,620
Truffer: you know, I can fly my airplane around, but just seeing what Paul does in this extremely

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00:02:57,620 --> 00:03:01,620
challenging environment in the mountains

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00:03:01,620 --> 00:03:05,620
while trying to follow the specific flight line at a

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00:03:05,620 --> 00:03:09,620

specific altitude above ground negotiating winds,

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00:03:09,620 --> 00:03:13,620
topography, maybe occasional low-level clouds

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00:03:13,620 --> 00:03:17,620
that you have to get around – just managing all that

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00:03:17,620 --> 00:03:21,620
that is just several levels above

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00:03:21,620 --> 00:03:25,620
what I could do as a pilot.

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00:03:25,620 --> 00:03:29,620
Claus: Well, I think the first time I came here to this park I was probably four years old

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with my father. I've been blessed to be able to fly

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fly in lots of places in the world, all over the place actually, almost every continent.

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00:03:37,620 --> 00:03:41,620
I guess I'm always looking for some place that might be better

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00:03:41,620 --> 00:03:45,620
than this, but I haven't found it. [laughs]

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00:03:45,620 --> 00:03:49,620
Narrator:Paul's plane is about 60 years old and the first single engine Otter

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00:03:49,620 --> 00:03:53,620
ever retrofitted with a 1000 horsepower engine,

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00:03:53,620 --> 00:03:57,620
which make takeoffs feel effortless and gives Paul the ability

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00:03:57,620 --> 00:04:01,620
to negotiate wild terrain.■Which he certainly did during the first

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00:04:01,620 --> 00:04:05,620
first two incredible science flights of this campaign, and with sunny skies

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00:04:05,620 --> 00:04:09,620
and relatively calm air, we covered three vastly different pieces of ice.

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00:04:09,620 --> 00:04:13,620
While Paul fueled up

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the plane Chris gave us a preview of today’s science and scenery.

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00:04:17,620 --> 00:04:21,620
Larsen: So it has one of the greatest coastal

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00:04:21,620 --> 00:04:25,620
reliefs anywhere in the world. So between

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00:04:25,620 --> 00:04:29,620
the ocean and the summit of Mt. St. Elias, which is 18,008 feet high,

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00:04:29,620 --> 00:04:33,620
it’s less than 10 miles. There’s a stupendous amount of mountain

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00:04:33,620 --> 00:04:37,620
right off the ocean. It’s hard to beat it anywhere in the world.

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00:04:37,620 --> 00:04:41,620
It might be the prettiest for me. It’s absolutely stunning.

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00:04:41,620 --> 00:04:45,620
From here in McCarthy we’ll cross one of the bigger

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precipitation gradients in Alaska too. Here it’s about

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00:04:49,620 --> 00:04:53,620
10 inches of precipitation a year and we’ll go over to an area where it’s on the order

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00:04:53,620 --> 00:04:57,620
of 200 inches per year. So from one of the driest parts of Alaska

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to one of the wettest parts of Alaska in about 45 minutes, flight time.

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00:05:01,620 --> 00:05:05,620
[aircraft engine noise, music]

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00:05:05,620 --> 00:05:09,620
Truffer: Whoa that’s pretty good. Larsen: That’s awesome.

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00:05:09,620 --> 00:05:13,620
Do you want to do Tyndall next? Claus: Sure, whatever you want.

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00:05:13,620 --> 00:05:17,620
Larsen: If the winds are calm now might as well grab it. [laughs]

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00:05:17,620 --> 00:05:21,620
Narrator: First, we came to the rugged landscape

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00:05:21,620 --> 00:05:25,620
of Icy Bay, which not that long ago wasn’t a bay at all –

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00:05:25,620 --> 00:05:29,620
it was filled with ice. Tidewater glaciers in this region

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00:05:29,620 --> 00:05:33,620
can make dramatic advances and retreats as they feed on high rates

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00:05:33,620 --> 00:05:37,620
of snowfall and then retreat as they’re melted by warm ocean waters.

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00:05:37,620 --> 00:05:41,620
Like the Tyndall glacier seen here, most of these glaciers

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00:05:41,620 --> 00:05:45,620
retreated dramatically over the last hundred years, but nearby

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Yahtse Glacier, after years of retreat, is currently the most rapidly

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00:05:49,620 --> 00:05:53,620
advancing glacier in Alaska.Overall though,

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00:05:53,620 --> 00:05:57,620
the IceBridge Alaska surveys, from the Denali region in the north,

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00:05:57,620 --> 00:06:01,620
to the Juneau Icefield in the Southeast, have documented pretty substantial

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00:06:01,620 --> 00:06:05,620
thinning of glacial ice. Areas seen here

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00:06:05,620 --> 00:06:09,620
here in orange and red show between about 10 and 15 feet

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00:06:09,620 --> 00:06:13,620
of thinning per year. Larsen: 1,200

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00:06:13,620 --> 00:06:17,620
Truffer: That’s a nice waterfall up there from that hanging ice.

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00:06:17,620 --> 00:06:21,620
Larsen: When we very first started profiling this Paul

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00:06:21,620 --> 00:06:25,620
this gravel fan and the one in the valley next to it didn’t exist.

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00:06:25,620 --> 00:06:29,620

Claus: Yeah, I was gonna say. Look at all the good landing spots here.

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00:06:29,620 --> 00:06:33,620
There was no place to land here before. Larsen: No, it was deep water.

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00:06:33,620 --> 00:06:37,620
Narrator:After covering several of Icy Bay’s glaciers,

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00:06:37,620 --> 00:06:41,620
given that it was time for lunch, just like that, we landed

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00:06:41,620 --> 00:06:45,620
in this unforgettable spot. [waterfall noise]

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00:06:53,620 --> 00:06:57,620
[engine noise taking off]

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00:06:57,620 --> 00:07:01,620
Flying eastward, leaving Icy Bay behind,

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00:07:01,620 --> 00:07:05,620
we came to the mighty Malaspina, one of the Earth’s

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00:07:05,620 --> 00:07:09,620
great examples of a “Piedmont” glacier, that spills out like pancake

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00:07:09,620 --> 00:07:13,620
batter onto a broad plane as it approaches the sea.

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00:07:13,620 --> 00:07:17,620
It surges at uneven intervals, creating dramatic patterns

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00:07:17,620 --> 00:07:21,620
on its surface as it distorts the moraines of rock and soil

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00:07:21,620 --> 00:07:25,620
borne along by the glacier. The Malaspina

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00:07:25,620 --> 00:07:29,620
is less dynamic than the Yahtse and is only melting

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at about the average rate for Alaska. But that could change quickly.

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00:07:33,620 --> 00:07:37,620
Larsen:Has the potential for being one of the bigger geographic evolutions in Alaska

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Certainly, my son will be able to witness

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some big geography changes there … There's potential for it being connected

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with the ocean through some narrow lagoons, estuaries,

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which would take a little bit of coastal erosion, but it's not too hard

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to imagine that this – where the Malaspina Glacier

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00:07:57,620 --> 00:08:01,620
is now could become a large bay.

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00:08:01,620 --> 00:08:05,620
Narrator:The data that Martin's radar provides could reveal how vulnerable the Malaspina is

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to melting by the nearby ocean. Here we see the

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radar returns from the surface of the glacier, and here is something that Chris's lasers

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00:08:13,620 --> 00:08:17,620

can’t see – the rocky bed of the glacier, giving us both

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00:08:17,620 --> 00:08:21,620
clues as to what’s happening under the ice, as well as a

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measurement of its thickness.

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00:08:25,620 --> 00:08:29,620
Finally, we came to the Yakutat ice field, 300 square miles of absolutely

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doomed ice perched high in the mountains.

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Researchers even debate how this ice field came to be at all,

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Since in its current configuration, it’s hard to imagine how

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00:08:41,620 --> 00:08:45,620
it could capture enough snow to form glacial ice.

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And so even if the Arctic weren’t warming faster than the rest

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00:08:49,620 --> 00:08:53,620
of the planet, this area would be likely to melt within a century or two.

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00:08:53,620 --> 00:08:57,620
But with many other glaciers,

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00:08:57,620 --> 00:09:01,620
, it’s easier to see the connection between a warming planet and ice loss.

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00:09:01,620 --> 00:09:05,620
Thanks to data from IceBridge and other surveys,

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we now have a good estimate of the current rate of loss from Alaskan glaciers

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-- 75 gigatons a year.

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While airborne observations over Alaskan glaciers have

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00:09:17,620 --> 00:09:21,000
provided a rich record of change in the area, those efforts

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00:09:21,000 --> 00:09:25,620
are now augmented by NASA’s newest ice-measuring tool, ICESat-2.

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With six laser beamss of its own,

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00:09:29,000 --> 00:09:33,620
and orbiting the Earth every 90 minutes, the satellite

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00:09:33,620 --> 00:09:37,620
will carry on the record of Alaskan change.

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00:09:37,620 --> 00:09:41,620
For their part, Chris and his team will continue to do their surveys for at least