

The Case for Space Ship Earth

By: Tom Brinkman

Space Ship Earth: The Big Picture



Space Ship Earth as viewed from a reconnaissance flight around the moon by Good Ship Earth's Lunar Reconnaissance Orbiter. We indeed are alone out here! (NASA photograph)

Many decades ago, in my early youth, I wondered if I would ever ride on a spaceship. Recently I realized that Planet Earth is, in effect, **Space Ship Earth**!

Good Ship Earth is nature-made, not man-made as was Apollo or the International Space Station. But all of these ships travel through space on curved paths under the influence of planetary and the sun's gravity fields. All have systems for air, water, food, and require leadership and a competent crew. Man-made vehicles are powered by batteries and free solar. But Space Ship Earth has been powered primarily by petroleum and coal—and only recently with nuclear and rapidly growing wind and solar power (Exception: plant photosynthesis is powered fully by solar).

Man-made space vehicles are loaded and replenished quickly, in the blink of an eye by Nature's timeframe. But Space Ship Earth's resources (supplies) were stocked over millions of years, and natural replenishment requires many thousands of years—Nature does not adapt in the blink of an eye. Space travel is dangerous and man-made mission leadership and crew preparation is intense and critical. Space Ship Earth's leadership and crew preparation is equally critical, but leadership has historically been more inwardly focused on "internal" operations, without much perspective on long term ecological survival issues during our lengthy space travel. Finally, what about the passenger list? Man-made space vehicles will carry passengers within a decade. But Good Ship Earth's passengers already number 7.5 billion, with supplies for only 2-3 billion at America's current standard of living.

During the next 30 years "God speed John Glenn" will become "God speed" to American and world leaders,...but with an urgent "Good luck, wisdom, and enlightenment" fearfully thrown in.

"...it doesn't take many words to speak the truth."

---Chief Joseph, Nez Perce

"...all things are connected. Whatever befalls the earth befalls the children of the earth."

---Chief Seattle, Suquamish and Duwamish

"We are a part of nature, not apart from her."

---Native American belief

Space Ship Earth: Air Supply



Space Ship Earth's deceptively thin atmospheric shell: This vital shell is being continually injected with pollutants at many millions of points over the surface of Good Ship Earth. And the shell is filling up faster than Nature's processes can cleanse it. (NASA photograph)

In today's world man-made spaceships are comparatively small, with fixed air supplies—enhanced by filtration—and loaded quickly compared to Space Ship Earth prior to flight. Space Ship Earth also has a mostly fixed air supply. Earth was already traveling through space as our air supply (the atmosphere) was developing over millions of years. Natural processes provide some air filtration, and photosynthesis actually provides some regeneration. This system has worked well for millions of years when working at Nature's normal rate of change, during the eons of Earth's very small, non-industrialized populations.

Our atmosphere is a very thin shell of air, about the thickness of the shellac coating on a typical 12 inch classroom globe. Take a moment and visualize this thin shell of air. Roughly speaking, most of our air is below an altitude of only 15 miles (79,000 feet). Try to find a 15 mile distance on that classroom globe! And carbon dioxide, methane and other pollutant levels are building to unprecedented levels within this slim atmospheric shell at a rate far exceeding Nature's normal rate. This toxic buildup is occurring much faster than plants and animals can

adapt or evolve. This is driven by rapid population growth and industrial expansion over only the past 100 years, not thousands of years.

When Nature's processes are playing out naturally, we live with environmental challenges and adjust as best we can. But these current rapid changes are occurring in the blink of an eye from Nature's perspective. They are heavily human-driven and humankind is only now maturing enough to recognize that we have not taken a long range view.

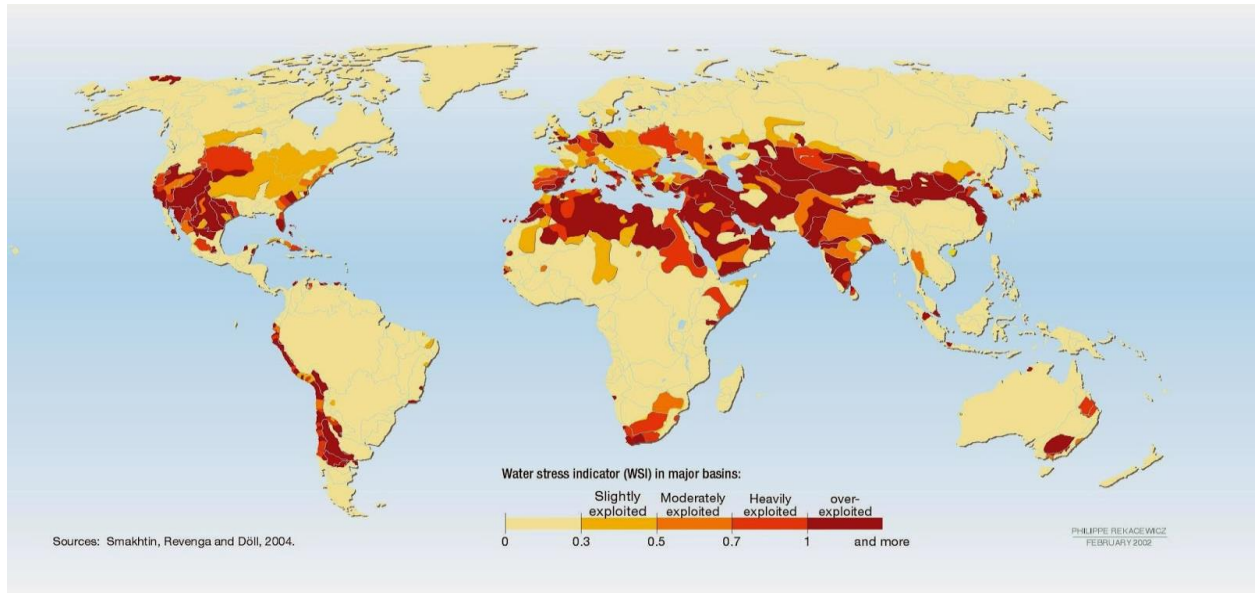
"Deeds speak louder than words."

---Assiniboine proverb

"All things share the same breath—the beast, the tree, the man—the air shares its spirit with the life it supports."

---Chief Seattle, Suquamish and Duwamish

Space Ship Earth: Water Supply



Water Stress Indicator Map illustrates Good Ship Earth's over-extended water supply (which has occurred in a record short time). Note: This plot does not include contamination levels. (NASA illustration)

Man-made spacecraft such as Apollo and the International Space Station have refillable tanks and filtration, allowing some extension of supply. Space Ship Earth has a large, more complex system with underground aquifers (very slowly refillable), fresh water lakes and rivers, and marshes (providing filtration). But expanding industrialization and exponential population growth demand ever more water.

As civilization developed, raw sewage was dumped in streets, then later, rivers and streams. Growing population eventually overwhelmed the "sewage-to-the-sea" method and so city dumps (now landfills), wastewater reclamation plants and recycling became mostly the norm in the western world. But more needs to be done by limiting chemicals, pesticides and fertilizer in both cities and agriculture. Rapid growth and shifts in population within Good Ship Earth have resulted in drastically drained aquifers and lower lake and river levels. Aquifers such as the huge, critical Oglaala Aquifer in Middle America are now rapidly headed for depletion — and recovery times are hundreds, perhaps several thousand years.

Man-made spacecraft necessarily ration and manage water supplies. But on Space Ship Earth we have not seriously rationed or managed our mostly fixed fresh water supply. For example, proposals to just transport or pipe fresh water from the Midwest/Great Lakes to the West or the Sun Belt are just a "lets party on" wish, not a serious management plan. With our now much larger and still growing population, but with still only the same size Good Ship Earth, we must urgently manage and protect water supplies.

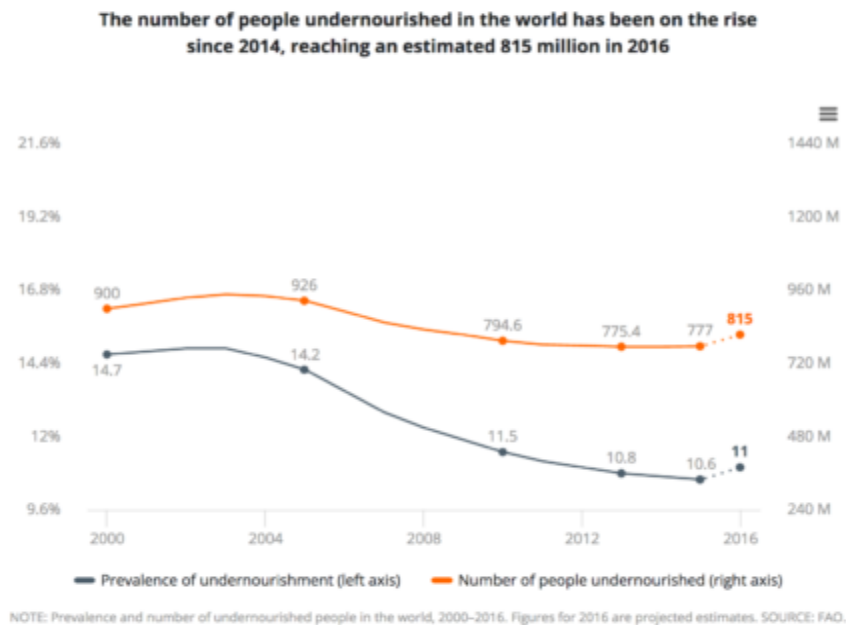
"The frog does not drink up the pond in which he lives."

---Sioux proverb

"One rain won't make a crop."

---Creole proverb

Space Ship Earth: Food Supply



After a decade of leveling and slowing, undernourished people increased by 38 million in 2016! This grim trend is ominous because climate change and wars are already exacerbating famines just as rain and temperature patterns shift....and this is all in the face of a rapidly growing passenger list which is already over-loaded. (NASA illustration)

Continuing our storyline of Space Ship Earth, what about long term food supply for the crew and the growing number of passengers on man-made space vehicles and on Good Ship Earth as they journey through space?

There are indeed limits to growth for both water supply and arable land. Only 17% of Earth's land is livable, and 4% is arable. Arable land typically loses out to competing demands due to growing urban spread and increasing population. Soil is also lost over the years from erosion, washing into lakes, rivers and oceans, as well as losing some of its vibrancy without repeated addition of petroleum based fertilizers. And clean water suffers in this process without some regulation and proactive measures.

Whatever food production capability we can preserve by conservation, or add through development of more prolific crop strains, is in competition against these losses that we inflict on our land. An inadequate food supply/distribution system creates a huge risk for worldwide strife and armed conflict. And the net is that this is all there will be to feed our Good Ship Earth's exponentially growing passenger list during its long trajectory through the heavens—we are pretty much locked in.

“A starving man will eat with the wolf.”

---Oklahoma proverb

“As long as the sun shines and [clean] waters flow, this land will be here to give life to men and animals.”

---Chief Crowfoot, Siksika

“Say thanks to the members of the plant and animal kingdoms who have given up their life so we can continue ours: The vegetable, berry, four-legged, swimmer and winged nations.”

---Native American teachings

Space Ship Earth: The Passenger List



Tell-tales of Space Ship Earth's heavily over-loaded (in record time) passenger list, as well as its very thin atmospheric shell.
(NASA photograph)

Today's manned space vehicles have only working crews, but will likely carry passengers within a decade. However, Space Ship Earth is already overcrowded with 7.5 billion passengers. Estimates show that Good Ship Earth could only support 2-3 billion at America's current standard of living, but earth is headed for 9-11 billion passengers. Each person requires a certain amount of resource (air, water, and food) and gives off waste products—just as machines and vehicles do. We no longer have a small population on a big planet, but a huge population on a small planet. This is a big deal!

The specter of a steep exponential growth curve looms—we clearly passed the sharp knee of the growth curve 50-100 years ago and have been on the very steep portion of this curve in population, carbon dioxide, methane and resource utilization. High population growth drives demand for more production and energy, resulting in greater release of carbon dioxide, methane, and other pollutants into our space ship's environment. Whereas past climate changes on our Good Ship Earth occurred over thousands and tens of thousands of years (except the dinosaur extinction 65 million years ago), our industrial era is driving this change in only 100 years! Plants and animals can't adapt or evolve this quickly. This is a rush to many extinctions, environmental imbalances, and resource depletions in Nature's normal flow.

“A danger half-seen is [only] half half-avoided.”

---Cheyenne proverb

“Continue to contaminate your own bed, and you will one night suffocate in your own waste.”

---Chief Seattle, Suquamish and Duwamish

“We are all one child, spinning through Mother Sky.”

---Shawnee proverb

Space Ship Earth: Leadership and Crew

Leaders need to have a broad view of Good Ship Earth’s place in the universe as well as of its internal workings, problems and opportunities. They should set goals and expectations for the operating crew and passengers. They must recognize that global warming is not uniform over Earth’s surface. Many regions are warmer, some cooler, and these areas drift and migrate year-to-year due to variations in weather, ocean currents, wind patterns, permafrost and moisture content, etc... Leaders need to understand that fossil fuels will remain a small part of our energy mix due to its high energy content, but that Space Ship Earth needs to be moved very briskly to a much higher percent of renewable energy given science’s credible environmental pollutant data and a heavily over-populated passenger list. Leaders must look at what other countries are doing—what works, what doesn’t—and shape solutions to fit our particular situation. For example, even Minnesota’s vigorous climate offers a sunnier environment for solar power than does Germany’s climate. Yet Germany already obtains a much larger percent of their power from solar. And less polluting, energy efficient American cars are necessary to compete against energy efficient foreign competition. Regulatory legislation must be crafted sensitively enough to provide both relief from excessively burdensome or ineffective regulations, as well as worker retraining support due to disruptions in longstanding industries and jobs.

Yes, leadership and crewing Good Ship Earth is a broad and difficult job, but these are the visions, capabilities and actions that are needed right now.

“...leaders are encouraged to remember seven generations in the past and consider seven generations in the future when making decisions that affect the people.”

---Iroquois Society, Dakota, Cherokee, and several other nations’ belief system

“You must always be careful with something that is greater than you are.”

---Shoshone proverb

“Do not only point out the way, but lead the way.”

---Sioux saying

Space Ship Earth: Final Thoughts

Throughout this series I have viewed Earth as Space Ship Earth, and explored an array of issues concerning environmental survival. It is hard to see the large scale impact we are having on earth's operation day-to-day, but in Nature's timescale this is happening in a blink of the eye. Demand for resources (clean water, clean air, arable land, minerals, energy) is ramping up steeply in step with population growth. For 10 years or so, the Pentagon has recognized global warming as globally destabilizing, and urged a whole-government response. So how to preserve Good Ship Earth as we know it?

Technological advances are only part of the answer--sometimes they are a solution, but also sometimes back us into a new problem. My lifetime experience indicates that we must choose leaders and crew members with characteristics of broad vision, practicality, altruism, and cooperativeness. And our leaders, crew and passengers need to share a perspective of not just living on Planet Earth, but of traveling on our curved trajectory through space in our self-contained Space Ship Earth with mostly fixed resources.

A final thought...Practically speaking, we are alone out here, we have to do this ourselves. Human nature leans towards good news. But as an engineer I know that a problem won't get solved unless it is first recognized and then actively addressed. Nature is offering energy sources essentially free of pollutants with minimal demands on resources. There are solutions out there—a mix of facing facts, cooperation, technological advances, meshing with nature, and yes, even some regulations.

“We will be known forever by the tracks we leave.”

---Dakota proverb

“Nature has roles. Nature has laws. You think you can ignore the rules or, if you don't like them, you can change them. But Mother Earth doesn't change the rules [in the end, Nature's laws will overrule man's priorities].”

---Native American elder

“Let’s put our minds together and see what kind of life we can make for our children.”
---Sitting Bull, Lakota

Acknowledgements: Native American proverbs in this article are from Kent Nerburn’s superlative books (*The Wisdom of Native Americans*, and *Voices in the Stones*), and Guy A Zona’s compilation of Native American proverbs (*The Soul Would Have No Rainbow if the Eyes Had No Tears*).

Biography:

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Tom Brinkman has authored ***An Aeronautical Engineers View: The F4U Corsair and its Contemporaries***, has co-authored ***Marine Wings: Stories of war & peace as written by the pilots*** and has written articles for EAA’s *WARBIRDS* magazine. Tom is a retired engineering manager and program manager from IBM and several other engineering firms. He has a BS and MS in Aeronautics & Engineering Mechanics, Univ. of Minnesota; and an MS in Electrical Engineering, Univ. of Vermont. He is Past-President of a large WWII Round Table in Rochester, MN. His books have been carried in the Smithsonian Air & Space Museum, the National Museum of the USMC, the National Museum of the USAF, and many other major aviation and military museums. He presents annually at EAA’s AirVenture air show at Oshkosh, WI and has been selected as a Feature Author there several years. Tom has also engaged in activist work on Native American history, perspectives and related issues.

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