Lt. Cmdr. Gallagher Discusses Force Fields and Shields

This is the fifth installment of **“The Fourth Wall.”** In this section, Bestselling and Multi-Award-Winning Author Kurt Springs discusses two long-standing science fiction tropes with Lt. Commander Gallagher (from the third part): force fields and various types of shields.

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Kurt Springs once again interviews Chief Engineer Lt. Commander Gallagher…

Author: Lieutenant Commander Carson Gallagher is back in the opposite seat. For those who missed his previous appearance, he is the Chief Engineer aboard the Finnian Battle Transport D. F. Cú Chulainn. Today’s topic is one most Sci-Fi fans hear about: force fields and various types of shields. *Dia dhuit, a Lefteanant-Cheannasaí.*

Lt. Cmdr. Gallagher: *Dia is Muire duit*.

Author: Let’s start with: what is the difference between a force field and a shield?

Gallagher: They’re essentially the same thing, though in convention, “force field” is the broader term. In general, we use force field for an energy barrier that prevents stuff from going in or out. The word “shield” is used for

something that keeps elements from getting in but allows things to get out, like a one-way mirror.

Author: Where one surface reflects as a mirror does, but the other surface is transparent.

Gallagher: Exactly. We use force fields to seal hull breaches or block the entrance to a prison cell. A ship uses a shield, often called a “deflector shield” in science fiction, to let its engine exhaust or weapons escape while preventing incoming threats from reaching the vessel.

Author: So that’s the basic convention.

Gallagher: Right.

Author: What forms them?

Gallagher: At their core, both are types of electromagnetic fields.

Author: As a planet’s EM field preventing cosmic radiation and the solar wind from stripping away its atmosphere.

Gallagher: Yes. On a space ship, we add advanced math and programming to get the desired effect. The field’s structure determines what can or cannot enter or leave.

Energy expenditure is a major factor. For instance, a force field is actually a very simple electromagnetic configuration since prevents anything from coming in or out. Its energy usage can be enormous, depending on what you want to block, but a deflector shield is more complex, so the outlay goes up exponentially.

Author: That means that how much damage you shrug off depends on the size of the generating plant. A bigger ship possesses a more powerful shield than a smaller craft with smaller power plant.

Gallagher: A battleship has more to throw at a shield compared to a destroyer. It is larger and less maneuverable, but it gains greater strength, whereas a small, nimble vessel is not as well-protected. However, energy usage is a factor. A ship in serious trouble can reroute power to shields by taking it from life support, for instance. Modern deflectors have to account for energy-based weapons and solid, kinetic-kill devices like rail launcher rounds.

Author: One thing I notice in some of our science fiction movies is that ships take damage even when shields are up.

Gallagher: It is real. Shields are not perfect. If the energy directed at them is more powerful, some seepage occurs. The hull or exposed system takes a hit, but the shield remains in place. However, each time, it weakens. More damage gets through, and the risk of collapse increases.

Author: Do ships have other forms of protection?

Gallagher: Many have armor as a backup, like the old warships of Earth's early twentieth century. It is a structure that absorbs energy, sacrificing itself before it reaches anything vital, though it can eventually fail.

Author: What about "fixing" the shield?

Gallagher: It takes time to regenerate the array, returning to 100%. During a battle or other event, the common practice is to divert power to strengthen the shield array. This leaves less for everything else.

Author: There are shields that allow ships and space stations to enter stars to a certain depth. Can you tell me about them?

Gallagher: We call them "phase shields." As I said, electromagnetic fields account for many of these structures. Mathematics does the magic that makes them

work. Raw energy can hold out for a lot, but most vessels and space stations… Well, they can't carry a power plant big enough to shield against the heat, plasma, and radiation from even the smallest red dwarf star.

Author: How does mathematics help?

Gallagher: It controls the structure of the field. That's basic to everything we try to do with those. Most EM fields redirect energy at its most elementary level rather than trying to stop it cold. Phase shields store that power in a sphere around the object in question. Are you familiar with planetary rings?

Author: Like Saturn.

Gallegher: Exactly. Rings form through a "destabilizing orbital resonance." In many ringed systems, there isn't just one ring but a series of them. The planet's gravity causes repeated gravitational interactions that push and pull, creating gaps. The phase shield uses similar mathematics to force radiation, heat, and other nastiness into a sphere, keeping a safety gap between what's happening in the star and the ship. It can be done other ways, but then you run the risk of leakage.

Author: Causing unfortunate problems.

Gallagher: Exactly.

Author: Thank you for speaking with us, Lt. Cmdr. Gallagher.

Gallagher: My pleasure