

9:03:20 PM Tom Bridge: It has been a very long day

9:03:44 PM jharrell@mac.com: Indeed.

9:03:46 PM Tom Bridge: why do some days feel SO much longer than others.

9:03:57 PM jharrell@mac.com: You know, I was thinking about something a few hours ago, and again in reference to your problem earlier.

9:04:07 PM Tom Bridge: okay

9:04:24 PM jharrell@mac.com: I know this is gonna sound silly, but I really admire the way Battlestar Galactica handled its computer story. The only safe computer on that show is one that's not networked to any outside inputs.

9:04:39 PM Tom Bridge: YES!

9:04:42 PM Tom Bridge: I enjoyed that, too

9:04:48 PM jharrell@mac.com: And the only time they hooked internal computers up to the outside network, even for a minute, all hell broke loose.

9:05:22 PM Tom Bridge: there's some cut scenes from the original miniseries expounding on that more

9:05:33 PM jharrell@mac.com: Really? I never knew that.

9:05:46 PM Tom Bridge: Yeah, they were part of the extras on the HD-DVD that I watched

9:05:54 PM jharrell@mac.com: I wonder if my disc has those.

9:05:59 PM Tom Bridge: while unable to believe that the 2nd half wasn't on the fracking disc.

9:06:44 PM jharrell@mac.com: I googled around and found this. You might like it. It's by the show's technical consultant, and it's very thorough. Almost obsessively so.

9:06:45 PM jharrell@mac.com: <http://www.hollywoodnorthreport.com/article.php?Article=2385>

9:06:58 PM jharrell@mac.com: The one-sentence summary is "They got everything pretty much right."

9:06:59 PM Tom Bridge: \*click\*

9:10:56 PM Tom Bridge: that's a pretty good piece.

9:11:03 PM Tom Bridge: but, I think he glosses over something

9:11:07 PM jharrell@mac.com: He's got a whole (short) series.

9:11:28 PM Tom Bridge: The problem is with Dradis, I think

9:11:34 PM jharrell@mac.com: How so?

9:11:40 PM Tom Bridge: well, hold that.

9:11:46 PM Tom Bridge: we don't know how Dradis works at all

9:11:48 PM Tom Bridge: nm

9:11:57 PM Tom Bridge: <-- Totally beat and not thinking at all

9:11:59 PM jharrell@mac.com: Assume for sake of argument it's radar with a different name.

9:12:15 PM Tom Bridge: well right, let's assume it's kinda like radar/lidar.

9:12:47 PM Tom Bridge: the general way that Cylons beat the crap out of the fleet was that they had a penetration point for the computers on board the battlestars and vipers.

9:12:54 PM jharrell@mac.com: Yes.

9:12:57 PM jharrell@mac.com: Well.

9:13:00 PM jharrell@mac.com: Hang on.

9:13:04 PM jharrell@mac.com: Yes, with a caveat.

9:13:08 PM Tom Bridge: that allowed them access, either through coms, or through dradis, ro something

9:13:20 PM jharrell@mac.com: I'm not sure I agree entirely with that interpretation. ALMOST, but not perfectly.

9:13:22 PM Tom Bridge: there was a system open to external stimuli that allowed them to Wreck Shit.

9:14:07 PM jharrell@mac.com: I think there was some expository dialogue in the miniseries about how the cylons could exploit any computer they could get their hands on. The CNP vulnerability that Six inserted was, I got the impression, just a way to get in quickly and easily.

9:14:31 PM jharrell@mac.com: I got the feeling somewhere very early on that the cylons, given time, could get into any computer system.

9:14:43 PM Tom Bridge: Sure

9:15:03 PM Tom Bridge: so, there have been Several encounters between Galactica & the Cylons

9:15:12 PM Tom Bridge: like, physical meatspace encounters

9:15:16 PM jharrell@mac.com: Right.

9:15:22 PM Tom Bridge: so, why doesn't their Dradis go down?

9:15:23 PM Tom Bridge: or Coms?

9:15:27 PM jharrell@mac.com: I have a theory. :)

9:15:39 PM jharrell@mac.com: The coms are analog. There's static and stuff. So that's not exploitable.

9:15:51 PM Tom Bridge: Well, there's still signal processing \*somewhere\*

9:16:03 PM Tom Bridge: and, probably, encryption,

9:16:10 PM jharrell@mac.com: Not necessarily. Could I hack into your transistor radio?

9:16:45 PM Tom Bridge: I find it dubious their coms are wide open

9:16:55 PM jharrell@mac.com: Ours were until the 21st century.

9:17:02 PM jharrell@mac.com: We used coded language over clear channels.

9:17:06 PM Tom Bridge: Right

9:17:12 PM Tom Bridge: The Viper Pilots don't

9:17:15 PM jharrell@mac.com: Meaning they could, if they chose to.

9:17:26 PM jharrell@mac.com: Well, granted. But at some point you hit the storytelling wall.

9:17:32 PM Tom Bridge: oh course

9:17:35 PM jharrell@mac.com: Wait.

9:17:38 PM jharrell@mac.com: Wait.

9:17:39 PM jharrell@mac.com: YES THEY DO!

9:17:42 PM jharrell@mac.com: I just remembered!

9:18:03 PM jharrell@mac.com: Remember the mining episode, where they used a complex plan to lure the cylons away from their mining facility?

9:18:30 PM Tom Bridge: I think so

9:18:33 PM jharrell@mac.com: Not only did Dualla use coded language ("The back door is open"), she also deliberately sent out misleading messages in the clear as part of the plan.

9:18:46 PM jharrell@mac.com: Ha! My theory holds up! :)

9:18:55 PM Tom Bridge: lol

9:19:02 PM jharrell@mac.com: Okay, so just for sake of the argument,

9:19:14 PM jharrell@mac.com: let's assume coms are plain old radio. Analog, no computers at all.

9:19:21 PM jharrell@mac.com: Because I'm going somewhere with this.

9:19:34 PM jharrell@mac.com: DRADIS is a little harder to wave away, because surely there's digital signal processing there.

9:19:35 PM Tom Bridge: okay

9:19:40 PM Tom Bridge: Sure

9:20:05 PM jharrell@mac.com: But I think there's a more vulnerable point on the Galactica.

9:20:24 PM jharrell@mac.com: It's gotta have sensors, right? Optical telescopes, probably, for taking positional readings.

9:20:35 PM Tom Bridge: Sure

9:20:44 PM jharrell@mac.com: That's practically a hot wire right into a CCD.

9:21:10 PM jharrell@mac.com: I think it's much more likely to assume that you could (given godlike powers) get into a computer system through an optical sensor than through a radio sensor like DRADIS.

9:21:23 PM jharrell@mac.com: Do you think I'm crazy?

9:21:32 PM Tom Bridge: I think they're equally vulnerable.

9:21:38 PM jharrell@mac.com: Hm.

9:21:39 PM Tom Bridge: it's just how the message is passed.

9:21:52 PM jharrell@mac.com: Then in that case, DRADIS does seem like a weak point.

9:21:54 PM Tom Bridge: it's all just photons, right?

9:22:01 PM [jharrell@mac.com](mailto:jharrell@mac.com): True ...

9:22:02 PM [Tom Bridge](#): just at different wavelengths

9:22:11 PM [jharrell@mac.com](mailto:jharrell@mac.com): Okay, try this on for size.

9:22:13 PM [Tom Bridge](#): ok

9:22:21 PM [jharrell@mac.com](mailto:jharrell@mac.com): Visible light has wavelengths in nanometers.

9:22:26 PM [Tom Bridge](#): Correct.

9:22:26 PM [jharrell@mac.com](mailto:jharrell@mac.com): Radio has wavelengths in meters.

9:22:32 PM [Tom Bridge](#): Correct.

9:22:55 PM [jharrell@mac.com](mailto:jharrell@mac.com): Even wireless Internet isn't technically radio. It's microwaves.

9:23:03 PM [Tom Bridge](#): Right.

9:23:15 PM [jharrell@mac.com](mailto:jharrell@mac.com): Does the frequency DRADIS operates on have the bandwidth to let the cylons in?

9:23:31 PM [jharrell@mac.com](mailto:jharrell@mac.com): Especially if it's not a phased array, but a physically slewed antenna?

9:23:38 PM [Tom Bridge](#): Well, we're making a biiiig assumption here

9:23:44 PM [jharrell@mac.com](mailto:jharrell@mac.com): That DRADIS is radio. Yes.

9:23:44 PM [Tom Bridge](#): that Dradis is radar at all

9:23:50 PM [Tom Bridge](#): as opposed to, say, gravitics.

9:23:54 PM [jharrell@mac.com](mailto:jharrell@mac.com): Well, to that point, let me ask you this.

9:24:13 PM [jharrell@mac.com](mailto:jharrell@mac.com): Can you think of any absolute, irrefutable reason that it COULDN'T be radio and yet still perform as we've seen it?

9:24:17 PM [Tom Bridge](#): Yes.

9:24:20 PM [jharrell@mac.com](mailto:jharrell@mac.com): Whassat?

9:24:27 PM [Tom Bridge](#): Well, hold.

9:24:30 PM [jharrell@mac.com](mailto:jharrell@mac.com): Kay.

9:24:36 PM [Tom Bridge](#): This theory is dependent upon a few things.

9:24:38 PM [jharrell@mac.com](mailto:jharrell@mac.com): Kay.

9:24:45 PM [jharrell@mac.com](mailto:jharrell@mac.com): Wank away, my friend. :)

9:24:48 PM [Tom Bridge](#): Most of them have to do with sublight travel speeds.

9:24:58 PM [Tom Bridge](#): We don't know how fast Galactica moves when she fires up her engines.

9:25:01 PM [Tom Bridge](#): it's never discussed.

9:25:04 PM [jharrell@mac.com](mailto:jharrell@mac.com): That's true.

9:25:09 PM [Tom Bridge](#): nor do we know how fast Vipers move.

9:25:10 PM [jharrell@mac.com](mailto:jharrell@mac.com): HOWEVER,

9:25:25 PM [jharrell@mac.com](mailto:jharrell@mac.com): the fact that nobody's mentioned relativity is a (really stretchy) argument in favor of very low sublight speeds.

9:25:27 PM [Tom Bridge](#): I'm going to posit a few things that are reasonable to posit

9:25:32 PM [jharrell@mac.com](mailto:jharrell@mac.com): Sure.

9:25:39 PM [Tom Bridge](#): First

9:25:56 PM [Tom Bridge](#): they are relatively low speeds.

9:25:59 PM [jharrell@mac.com](mailto:jharrell@mac.com): Kay.

9:26:06 PM [Tom Bridge](#): we don't get above, say, .05c

9:26:20 PM [Tom Bridge](#): and that's hauling ass.

9:26:29 PM [Tom Bridge](#): sorry, doing math here to make things make sense in my brain

9:26:34 PM [jharrell@mac.com](mailto:jharrell@mac.com): My math's not good enough, but okay. On the order of solar escape velocity.

9:26:45 PM [jharrell@mac.com](mailto:jharrell@mac.com): Transits between planetary orbits in hours to days, right?

9:26:51 PM [Tom Bridge](#): Correct.

9:26:55 PM [jharrell@mac.com](mailto:jharrell@mac.com): I concur.

9:26:58 PM [Tom Bridge](#): so, remember in the mini-series?

9:27:07 PM [Tom Bridge](#): They have to transit from wherever Galatica is

9:27:14 PM Tom Bridge: to the Ragnar Anchorage to get Weapons  
9:27:17 PM jharrell@mac.com: Yes.  
9:27:27 PM Tom Bridge: (there's also a cut scene about de-gunning Galactica that was kinda neat)  
9:27:32 PM Tom Bridge: anyway  
9:27:43 PM jharrell@mac.com: Dammit, I covet your DVD extras.  
9:27:58 PM Tom Bridge: it's established that that distance is interior to the solar system  
9:28:06 PM Tom Bridge: BUT, would take 3 days transit  
9:28:08 PM jharrell@mac.com: Right. Ragnar is a Neptune-like planet, right?  
9:28:18 PM Tom Bridge: more like oort cloud  
9:28:28 PM jharrell@mac.com: Really? I got the impression there was a planet there, but it's been a long time.  
9:28:37 PM Tom Bridge: no planet, just a whole phenomenon  
9:28:41 PM jharrell@mac.com: Hmmmm.  
9:28:44 PM Tom Bridge: it's inside that weird gascloud thingy  
9:28:45 PM Tom Bridge: I think  
9:28:50 PM jharrell@mac.com: Well, that puts an awful wide error bar on us.  
9:29:03 PM Tom Bridge: Holy crap  
9:29:05 PM Tom Bridge: hold on  
9:29:07 PM jharrell@mac.com: Because even the Kuiper Belt is literally YEARS away at solar escape velocity.  
9:29:11 PM Tom Bridge: you knew this had to exist.  
9:29:12 PM Tom Bridge: [http://en.battlestarwiki.org/wiki/Ragnar\\_Anchorage](http://en.battlestarwiki.org/wiki/Ragnar_Anchorage)  
9:29:18 PM jharrell@mac.com: DUDE!  
9:29:28 PM Tom Bridge: I had NO IDEA there was a BSG wiki.  
9:29:29 PM jharrell@mac.com: Ha. I told you it's a planet. :)  
9:29:37 PM Tom Bridge: okay, so, planet.  
9:29:46 PM Tom Bridge: but yeah, like Jupiter or whatnot  
9:29:46 PM jharrell@mac.com: That's better. That makes our framework so far reasonable.  
9:29:49 PM Tom Bridge: definitely  
9:30:01 PM Tom Bridge: so, 3 days transit seems to indicate really sublight sublight  
9:30:04 PM jharrell@mac.com: Galactica is fast enough to skip about the solar system like it's sailing the seven seas.  
9:30:35 PM Tom Bridge: just to think about this in those terms  
9:30:43 PM Tom Bridge: if Earth is 1 AU out from the sun  
9:30:46 PM jharrell@mac.com: Right.  
9:30:59 PM Tom Bridge: Jupiter is 5.2 AU out from the sun  
9:31:03 PM jharrell@mac.com: Okay.  
9:31:12 PM Tom Bridge: the distance between the two, at the closest point of approach is still 4.2 AU  
9:31:18 PM jharrell@mac.com: Right.  
9:31:31 PM Tom Bridge: perihelion would put them 6.2 AU apart  
9:31:38 PM jharrell@mac.com: And we know that Galactica was five hours from Caprica at the time, right?  
9:31:41 PM Tom Bridge: right  
9:31:47 PM Tom Bridge: so call it a ways out from Caprica  
9:31:50 PM jharrell@mac.com: So those I think are not-crazy data points.  
9:31:58 PM Tom Bridge: Okay  
9:32:06 PM Tom Bridge: so, let's put 5 hours transit at half an AU  
9:32:10 PM Tom Bridge: sound reasonable?  
9:32:13 PM Tom Bridge: well, hold.  
9:32:14 PM jharrell@mac.com: Ehhhhh.

9:32:15 PM Tom Bridge: no  
9:32:17 PM Tom Bridge: that's wrong.  
9:32:19 PM jharrell@mac.com: Yeah.  
9:32:26 PM jharrell@mac.com: It'd say that's more like the moon's orbit, really.  
9:32:39 PM Tom Bridge: I think it has to be further than that.  
9:32:42 PM jharrell@mac.com: At most, Caprica's L4 or L5.  
9:32:53 PM Tom Bridge: because you can still SEE Earth from the Moon  
9:32:59 PM Tom Bridge: we never could see Caprica from Galactica  
9:33:04 PM jharrell@mac.com: Yeah, the fact that we never saw Caprica is conspicuous.  
9:33:10 PM jharrell@mac.com: On the other hand,  
9:33:20 PM jharrell@mac.com: they were decommissioning Galactica to become a museum ship, right?  
9:33:35 PM jharrell@mac.com: Putting it at L5, if that's 5 hours away by "plane," is reasonable.  
9:33:45 PM Tom Bridge: right  
9:33:54 PM jharrell@mac.com: So yeah, I think your half-an-AU-ish estimate is okay.  
9:33:54 PM Tom Bridge: trying to calculate the distance for L5.  
9:34:03 PM jharrell@mac.com: It's 60° ahead of us in our orbit.  
9:34:06 PM Tom Bridge: okay  
9:34:13 PM Tom Bridge: doing trig.  
9:34:18 PM jharrell@mac.com: So something on the order of 2/3rds of an AU.  
9:34:20 PM Tom Bridge: Okay  
9:34:24 PM jharrell@mac.com: (in my head, maybe wrong)  
9:34:32 PM jharrell@mac.com: But between .5 AU and 1 AU.  
9:34:43 PM Tom Bridge: so that makes Galactica's speed something on the order of .1AU/hr  
9:34:46 PM jharrell@mac.com: As the crow flies.  
9:34:50 PM Tom Bridge: or, 2.4AU/day  
9:34:50 PM Tom Bridge: right  
9:34:59 PM jharrell@mac.com: That's about 2.4 million miles in a day.  
9:35:02 PM Tom Bridge: right  
9:35:05 PM jharrell@mac.com: Oh, wait.  
9:35:09 PM jharrell@mac.com: Dang. We've gotta rethink again.  
9:35:21 PM jharrell@mac.com: Wouldn't you say it's reasonable to think Galactica could go faster than Colonial One?  
9:35:26 PM Tom Bridge: Yes.  
9:35:30 PM jharrell@mac.com: Cause it's Colonial One that's 5 hours away.  
9:35:31 PM Tom Bridge: almost certainly  
9:35:33 PM Tom Bridge: damn  
9:35:47 PM Tom Bridge: so, cross referencing from other science fiction  
9:35:53 PM jharrell@mac.com: Go back. How far was it from L5 to Ragnar's orbit? Three days you said?  
9:35:58 PM Tom Bridge: right  
9:36:02 PM jharrell@mac.com: Okay.  
9:36:14 PM jharrell@mac.com: Welllll.  
9:36:25 PM jharrell@mac.com: Assume Ragnar isn't Jupiter. Assume it's wayyyyy out there. Neptune.  
9:36:42 PM Tom Bridge: Okay  
9:36:43 PM jharrell@mac.com: That lets Galactica have a higher cruising speed than Colonial One, while still keeping the three-day transit reasonable.  
9:36:50 PM jharrell@mac.com: Assume for a minimum case  
9:36:58 PM jharrell@mac.com: that L5 and Ragnar are at perihelion.  
9:37:10 PM Tom Bridge: let's give Galactica and C1 a 20% differential

9:37:18 PM [jharrell@mac.com](mailto:jharrell@mac.com): Give Galactica a top speed of 5 AUs a day, and a three-day trip is pretty close to right.

9:37:20 PM [Tom Bridge](#):  $G(\max) = 1.2 C1(\max)$

9:37:21 PM [jharrell@mac.com](mailto:jharrell@mac.com): (I just doubled it.)

9:37:28 PM [Tom Bridge](#): okay

9:37:33 PM [Tom Bridge](#): 2x as fast.

9:37:44 PM [Tom Bridge](#): Neptune's 30 AU out

9:37:48 PM [jharrell@mac.com](mailto:jharrell@mac.com): It's a hell of a lot bigger, but it's also a bigger engine.

9:37:53 PM [Tom Bridge](#): oh sure

9:37:59 PM [jharrell@mac.com](mailto:jharrell@mac.com): Okay, so say it's up to 4X as fast as Colonial One.

9:38:06 PM [jharrell@mac.com](mailto:jharrell@mac.com): Not unreasonable, I think.

9:38:09 PM [Tom Bridge](#): no

9:38:13 PM [Tom Bridge](#): not unreaasoanble

9:38:29 PM [jharrell@mac.com](mailto:jharrell@mac.com): That all works then. Galactica can cross 29 AUs in three days if it does 10 AU a day.

9:38:38 PM [Tom Bridge](#): right

9:38:49 PM [jharrell@mac.com](mailto:jharrell@mac.com): That's nearly a billion miles in a day.

9:39:08 PM [jharrell@mac.com](mailto:jharrell@mac.com): 930 million miles ish.

9:39:37 PM [Tom Bridge](#): it's so geeky that google's calc understands AU/day as a speed.

9:39:39 PM [Tom Bridge](#): anyway

9:39:40 PM [jharrell@mac.com](mailto:jharrell@mac.com): lol

9:39:47 PM [jharrell@mac.com](mailto:jharrell@mac.com): What's that in miles per second?

9:39:47 PM [Tom Bridge](#): that's 0.05c

9:39:50 PM [jharrell@mac.com](mailto:jharrell@mac.com): PERFECT!

9:39:53 PM [Tom Bridge](#): so we're right

9:39:55 PM [jharrell@mac.com](mailto:jharrell@mac.com): All this math is working out!

9:40:01 PM [Tom Bridge](#): damn we're nersd.

9:40:02 PM [Tom Bridge](#): anyway

9:40:09 PM [jharrell@mac.com](mailto:jharrell@mac.com): You know what's even worse than that?

9:40:19 PM [jharrell@mac.com](mailto:jharrell@mac.com): You know DAMN WELL that the writers sat around and had this very conversation.

9:40:26 PM [Tom Bridge](#): yeah

9:40:27 PM [jharrell@mac.com](mailto:jharrell@mac.com): I have a question.

9:40:35 PM [jharrell@mac.com](mailto:jharrell@mac.com): And I'm not sure off the top of my head how to do the math to get the answer.

9:40:48 PM [Tom Bridge](#): so, now that we know how fast they travel, we can get a feel for the distances involved in combat, right?

9:40:49 PM [jharrell@mac.com](mailto:jharrell@mac.com): Assuming Galactica needs to traverse 30 AUs in 3 days.

9:41:13 PM [jharrell@mac.com](mailto:jharrell@mac.com): and that they accelerate halfway there, and decelerate the rest of the way,

9:41:19 PM [Tom Bridge](#): right

9:41:25 PM [jharrell@mac.com](mailto:jharrell@mac.com): I wonder how many gs of acceleration they'd have to pull to make it?

9:41:41 PM [Tom Bridge](#): Ooooo

9:41:46 PM [Tom Bridge](#): now that's a good question

9:41:53 PM [jharrell@mac.com](mailto:jharrell@mac.com): Cause if we can figure that to within an order of magnitude, and we can make an educate guess as to Galactica's mass ...

9:41:58 PM [jharrell@mac.com](mailto:jharrell@mac.com): that gives us her horsepower!

9:41:59 PM [Tom Bridge](#): that would involve calculus

9:42:05 PM [jharrell@mac.com](mailto:jharrell@mac.com): You sure?

9:42:12 PM [Tom Bridge](#): the speed curve isn't linear

9:42:15 PM Tom Bridge: it's sloped  
9:42:28 PM jharrell@mac.com: Yeah, but disregarding lost fuel mass, the acceleration is linear.  
9:42:32 PM jharrell@mac.com: It's a falling-body problem!  
9:42:34 PM jharrell@mac.com: Get this ...  
9:42:46 PM jharrell@mac.com: you take a rock up to 15 AUs from the surface of the earth and drop it.  
9:42:53 PM jharrell@mac.com: It falls under constant acceleration, right?  
9:43:02 PM Tom Bridge: Okay  
9:43:05 PM jharrell@mac.com: You can calculate the time it takes to fall given the constant acceleration.  
9:43:08 PM Tom Bridge: NO!  
9:43:14 PM Tom Bridge: it doesn't fall at constant acceleration  
9:43:22 PM jharrell@mac.com: It does in my imaginary model.  
9:43:30 PM Tom Bridge: because the attraction gets greater as it gets closer to the mass  
9:43:31 PM jharrell@mac.com: I'm ignoring gravity's inverse-square law. ;-)  
9:43:33 PM Tom Bridge: Oh.  
9:43:34 PM Tom Bridge: cheater.  
9:43:44 PM jharrell@mac.com: No no, I'm just reducing the problem.  
9:43:53 PM jharrell@mac.com: We know they have to accelerate constantly over a day and a half  
9:43:58 PM jharrell@mac.com: and cover a distance of 15 AUs.  
9:44:04 PM Tom Bridge: okay  
9:44:06 PM jharrell@mac.com: Then turn around, and do that exact same thing again.  
9:44:08 PM Tom Bridge: right  
9:44:32 PM jharrell@mac.com: What's the formula for a falling body again?  $s = 1/2at^2$ ?  
9:44:38 PM Tom Bridge: Yep  
9:44:45 PM jharrell@mac.com: So  $s = 15$  AU,  
9:44:50 PM jharrell@mac.com: and  $t = 36$  hours  
9:45:43 PM jharrell@mac.com: so  $a = 2s/t^2$ ? Is that right?  
9:46:07 PM Tom Bridge:  $d = 1/2 * g * t^2$   
9:46:19 PM Tom Bridge:  $2d = g * t^2$   
9:46:28 PM jharrell@mac.com: Right. Solving for  $g$  gives us ... right.  $2s/t^2$ .  
9:46:31 PM Tom Bridge: right  
9:46:33 PM jharrell@mac.com: ( $s = d$ , whatever)  
9:46:35 PM Tom Bridge: right right  
9:46:41 PM Tom Bridge: sorry, pulling ancient formulae out  
9:46:43 PM jharrell@mac.com: Now we just need to normalize units.  
9:46:46 PM Tom Bridge: right  
9:47:07 PM Tom Bridge: 30 AU/ 1296 hrs  
9:47:23 PM jharrell@mac.com: 1 AU = 149,589,000,000 meters  
9:47:30 PM jharrell@mac.com: (meters because I remember  $g$  in meters/second)  
9:47:47 PM Tom Bridge: (we all do.)  
9:47:52 PM jharrell@mac.com: So  $t = 4,665,600$  seconds  
9:48:08 PM Tom Bridge: which gives us what, exactly?  
9:48:17 PM jharrell@mac.com: One sec.  
9:48:52 PM jharrell@mac.com: Wow, that's not possibly right.  
9:49:00 PM jharrell@mac.com: I get  $0.013 \text{ m/s}^2$   
9:49:07 PM Tom Bridge: No  
9:49:08 PM Tom Bridge: hm  
9:49:09 PM jharrell@mac.com: I know.  
9:49:10 PM jharrell@mac.com: Hang on.  
9:49:22 PM jharrell@mac.com: Check me.

9:49:30 PM jharrell@mac.com: 1296 hours = 4665600 seconds  
9:49:39 PM jharrell@mac.com:  $4665600^2 = 21767823360000$   
9:49:49 PM Tom Bridge: correct.  
9:49:50 PM jharrell@mac.com: oh!  
9:50:21 PM jharrell@mac.com: 15 AU = 2243970000000 meters. I forgot to multiply by 15.  
9:50:30 PM Tom Bridge: ahhhhh  
9:50:30 PM jharrell@mac.com:  $2243970000000^2 = 4487940000000$   
9:50:40 PM Tom Bridge: why are you squaring the distance  
9:50:41 PM jharrell@mac.com: And  $4487940000000 / 21767823360000 =$   
9:50:46 PM jharrell@mac.com: Doubling.  
9:50:50 PM jharrell@mac.com:  $2s/t^2$   
9:50:59 PM Tom Bridge: oh sorry  
9:51:00 PM Tom Bridge: my bad  
9:51:02 PM Tom Bridge: read that wrong  
9:51:09 PM jharrell@mac.com: That still only yields .20 m/s<sup>2</sup>  
9:51:20 PM Tom Bridge: something's wrong.  
9:51:21 PM jharrell@mac.com: Admittedly that'd be a shitload of acceleration for Galactica.  
9:51:32 PM Tom Bridge: that's not even 1/10th of a gravity  
9:51:39 PM Tom Bridge: er  
9:51:40 PM jharrell@mac.com: Waaaaaait.  
9:52:04 PM jharrell@mac.com: Our seconds number is way off. I haven't been keeping notes, so I don't know where I screwed that one.  
9:52:10 PM jharrell@mac.com: 1.5 days = 129600 seconds.  
9:52:17 PM jharrell@mac.com: So third time's the charm:  
9:52:34 PM jharrell@mac.com:  $129600^2 = 16796160000$   
9:52:36 PM jharrell@mac.com: And  
9:52:44 PM jharrell@mac.com:  $4487940000000/16796160000 =$   
9:52:57 PM Tom Bridge: omg so many zeroes.  
9:52:57 PM jharrell@mac.com: 267.2 m/s<sup>2</sup>  
9:53:06 PM Tom Bridge: or 27g  
9:53:09 PM Tom Bridge: that's a lot of g  
9:53:10 PM jharrell@mac.com: Yup.  
9:53:14 PM jharrell@mac.com: It really, really is.  
9:53:15 PM Tom Bridge: damn that's a lot of g.  
9:53:25 PM Tom Bridge: they must have Magical Compensators.  
9:53:35 PM jharrell@mac.com: Well, I'll give them that one, 'cause of the gravity.  
9:53:39 PM jharrell@mac.com: Plus,  
9:53:53 PM jharrell@mac.com: wouldn't it be kinda neat if the ONLY thing we needed to make these numbers reasonable is Magical Compensators?  
9:54:27 PM Tom Bridge: sure  
9:54:38 PM Tom Bridge: getting back to why I think Dradis is gravitics...  
9:54:44 PM jharrell@mac.com: Hang on a sec first.  
9:54:46 PM Tom Bridge: okay  
9:54:50 PM jharrell@mac.com: I'm gonna make your head hurt right quick.  
9:54:55 PM Tom Bridge: please, do  
9:55:17 PM jharrell@mac.com: Hee hee.  
9:55:30 PM jharrell@mac.com: Galactica puts out about 7.5 million pounds of thrust.  
9:55:49 PM jharrell@mac.com: I arbitrarily gave it 10 times the mass of a Nimitz carrier.  
9:55:53 PM Tom Bridge: ah, okay  
9:55:55 PM Tom Bridge: was about to ask ;)

9:55:56 PM [jharrell@mac.com](mailto:jharrell@mac.com): Which, fully loaded, is 100,000 pounds.  
9:56:03 PM [Tom Bridge](mailto:Tom Bridge): that's all?  
9:56:12 PM [jharrell@mac.com](mailto:jharrell@mac.com): sorry, was reading and typing at the same time  
9:56:15 PM [jharrell@mac.com](mailto:jharrell@mac.com): it's 100,000 TONS.  
9:56:27 PM [jharrell@mac.com](mailto:jharrell@mac.com): That's 90 million kilos.  
9:56:43 PM [jharrell@mac.com](mailto:jharrell@mac.com): Oops.  
9:57:00 PM [jharrell@mac.com](mailto:jharrell@mac.com): WOAH.  
9:57:02 PM [jharrell@mac.com](mailto:jharrell@mac.com): WOAH.  
9:57:04 PM [jharrell@mac.com](mailto:jharrell@mac.com): WOAH.  
9:57:11 PM [jharrell@mac.com](mailto:jharrell@mac.com): They've also gotta have Magical Engines, Tom.  
9:57:20 PM [jharrell@mac.com](mailto:jharrell@mac.com):  $5.40621275 \times 10^{10}$  pounds force  
9:58:06 PM [jharrell@mac.com](mailto:jharrell@mac.com): 54 billion pounds of thrust  
9:58:14 PM [Tom Bridge](mailto:Tom Bridge): wow.  
9:58:24 PM [jharrell@mac.com](mailto:jharrell@mac.com): Yeah.  
9:58:32 PM [jharrell@mac.com](mailto:jharrell@mac.com): So ANYhoo, what about DRADIS? :D  
9:58:58 PM [Tom Bridge](mailto:Tom Bridge): so, I think the distances are such that we're seeing things propagate too fast  
9:59:29 PM [jharrell@mac.com](mailto:jharrell@mac.com): (Saturn 5? Seven million pounds thrust. Galactica = 7,700 Saturn 5s.)  
9:59:36 PM [jharrell@mac.com](mailto:jharrell@mac.com): See, I'm not entirely sure I buy that idea.  
9:59:42 PM [jharrell@mac.com](mailto:jharrell@mac.com): I'm trying to remember now.  
10:00:15 PM [jharrell@mac.com](mailto:jharrell@mac.com): I don't think I recall any instances in which Galactica picked up a DRADIS contact at extreme range.  
10:00:23 PM [jharrell@mac.com](mailto:jharrell@mac.com): Do you?  
10:00:24 PM [Tom Bridge](mailto:Tom Bridge): well, wait  
10:00:28 PM [Tom Bridge](mailto:Tom Bridge): I'm a moron  
10:00:33 PM [Tom Bridge](mailto:Tom Bridge): moe. ron.  
10:00:40 PM [jharrell@mac.com](mailto:jharrell@mac.com): Why?  
10:00:50 PM [Tom Bridge](mailto:Tom Bridge): so  
10:01:02 PM [jharrell@mac.com](mailto:jharrell@mac.com): (I hope you're saving this transcript, by the way. This is gonna make one hell of a blog entry for somebody.)  
10:01:05 PM [Tom Bridge](mailto:Tom Bridge): hah  
10:01:07 PM [Tom Bridge](mailto:Tom Bridge): yeah  
10:01:20 PM [Tom Bridge](mailto:Tom Bridge): so, I was saying Well, enemies appear and then instantly appear on Dradis  
10:01:24 PM [Tom Bridge](mailto:Tom Bridge): but I'm a GIANT MORON  
10:01:32 PM [Tom Bridge](mailto:Tom Bridge): if we can see their light, they should show on fucking RADAR  
10:01:36 PM [Tom Bridge](mailto:Tom Bridge): because that's just photons  
10:01:37 PM [jharrell@mac.com](mailto:jharrell@mac.com): lol  
10:01:39 PM [Tom Bridge](mailto:Tom Bridge): <-- moron.  
10:01:39 PM [jharrell@mac.com](mailto:jharrell@mac.com): Yes, that's true.  
10:01:57 PM [jharrell@mac.com](mailto:jharrell@mac.com): But more to the point, I don't think we've had any on-screen evidence of the effective range of DRADIS.  
10:02:06 PM [Tom Bridge](mailto:Tom Bridge): concur  
10:02:12 PM [jharrell@mac.com](mailto:jharrell@mac.com): I don't think it'd be absurd to say it works inside 20 miles or so.  
10:02:23 PM [jharrell@mac.com](mailto:jharrell@mac.com): I'm trying to remember ...  
10:02:38 PM [jharrell@mac.com](mailto:jharrell@mac.com): when Pegasus appeared, it was on DRADIS while it was a ways out there.  
10:02:43 PM [Tom Bridge](mailto:Tom Bridge): yeah  
10:02:48 PM [jharrell@mac.com](mailto:jharrell@mac.com): But it was only minutes away by viper.  
10:02:52 PM [Tom Bridge](mailto:Tom Bridge): right  
10:03:15 PM [Tom Bridge](mailto:Tom Bridge): quick break while I get dragged into an attempt on Al'ar  
10:03:23 PM [jharrell@mac.com](mailto:jharrell@mac.com): Heh. Okay. Also, I'ma get my DVD out.

10:04:17 PM Tom Bridge: ok

10:13:41 PM jharrell@mac.com: Yeah, I checked the DVD. Pegasus appeared at extreme dradis range, and it took the alert vipers about two minutes to get there.

10:16:09 PM jharrell@mac.com: That gives us really a maximum practical distance of about 90 miles,

10:16:24 PM jharrell@mac.com: if we assume that a viper and pilot could accelerate at 2gs constantly to get there at best speed.

10:17:05 PM jharrell@mac.com: There's an episode where they talk (in the context of Starbuck's broken knee) about how many gs a viper pilot pulls in a turn, but I think 2gs of constant acceleration for two minutes is pretty reasonable.

10:17:22 PM jharrell@mac.com: The distance goes down if you assume the vipers got up to speed and then coasted.

10:19:47 PM jharrell@mac.com: Heh. Amusingly, about two minutes of clock time elapses between when Apollo says he's intercepting and when he does his flyby.

10:21:51 PM Tom Bridge: gotcha

10:21:55 PM Tom Bridge: </delay>

10:22:37 PM jharrell@mac.com: So max practical dradis range could be reasonably pegged at 100 miles, without a raptor out there to provide their equivalent of J-STARS.

10:23:16 PM Tom Bridge: gotcha

10:23:18 PM Tom Bridge: that's fair