

Hello Mr. Pearlman and everyone. This is Ali AbuTaha (#101).

Ten years ago, someone told me that rude remarks were made about my work and me on the net. I checked it out and decided not to dignify the ill informed, ill qualified and ill-mannered folks, though they belonged to respectable organizations, with answers. I had not heard from Tim Furniss for a number of years and I was happy to hear about his book and his Chapter 10 on the Challenger investigations. I respect Tim for caring about our American space program as if it were his own. All of you can claim the same. The difference is that Tim had put far more effort into understanding and disseminating potentially the biggest mistake in the history of the space program – for the benefit of our space program, our economy, our education, and our leadership in the world. Oh, you all expected me to say this and more about Tim. I hope you will read what I have to say.

Pearlman writes, "Abutaha shares the copyright." Tim asked if he could use some of my photo enhancements, diagrams, illustrations and other material in an upcoming book (to follow his eBook), and I agreed. I found it honorable of Furniss to attribute my materials to me than to shamefully claim them to be his, as he describes others had done with my work in his Challenger Chapter. I don't want to give a preview of Tim's chapter or book. I read the chapter, but I have not been able to purchase the book online because of problems mentioned in this thread. Though I avoided postings or chat rooms for a long time, I want to address specific things brought up here.

Bob writes, "Abutaha's claims were raised here in 2002 (Ali AbuTaha's STS-51L reports) to no real resolution." Did it occur to anyone to contact me to see if I could clarify some issues? If these comments are posted, and if this thread continues to reach a resolution, many will see that Tim's reporting of the Challenger investigations is a model for upstanding journalism. This is not reflected in Pearlman's review.

It is obvious that Tim is biased as Pearlman notes, "as far as he is concerned, Abutaha is correct and the Rogers Commission is wrong." That was already Tim's stated position in his numerous articles in Flight International (1986-97). Didn't anyone notice that? I admired him for crunching thousands of pages I shared with him and hours of discussion we had about complex technical issues into one page – sensible to Flight's readers. As I recall it, he always included NASA's position, which might have influenced many of you for many years. With extensive material from me, he apparently has written a lengthy chapter. If I collect all of what NASA told him, as appeared in his many excellent Flight's articles, it would all add up to one sentence, that I was an idiot.

Bob is correct that the photos need interpretation beyond that given by Tim or me. Tim mentions fire that I captured on video striking the Challenger's right wing and, more importantly, through the hinge line before the vehicle cleared the tower. This is a great claim if true, or not true. Is it true? Pearlman fails to tell you that Tim gives a specific reference for two photos of the fire under and through the wing (Spaceflight, BIS, May 1988, page 195). Study the already published photos yourselves, make up your minds, and then write about them. And if you do, do not forget to then go back to the photos of the recovered left and right wings of Challenger and carefully correlate the damage on the right wing with the fire in my pictures. And then, be imaginative, think about your next step to lead to more definitive findings.

Dwayne writes, "Extraordinary claims require extraordinary evidence." Absolutely. Tim Furniss writes that I am the only person to find the crew cabin in the video. He even repeats the claim in his Challenger chapter. This is not only extraordinary, it is staggering. Pearlman, fairly I might add, writes, "there

is absolutely no way in telling if yours and Abutaha's interpretation of what they show is correct." Jim Oberg mocked Tim in a message (and a posting – I don't know where), and Tim shared the message with me. I put a challenge to Jim and, now, I put it to everyone on CollectSpace as follows:

1. Find the crew cabin after the explosion in the video footage (use clues given in Tim's Chapter 10).
2. From the distance and time measurements (should be easy), calculate the horizontal velocity of the crew cabin.
3. From the momentum or other equations, calculate the g-forces that hit the crew cabin at the moment of the explosion. Then compare what NASA concluded and what Chapter 10 concludes.
4. How high did the crew cabin rise after the explosion (in meters, feet, etc.)?
5. How does Jim (and now CollectSpace) explain the "horizontal velocity" and the "height" of the crew cabin after the explosion???

The above is not bragging, and I know it is not fair to Jim or to you. I had obtained industrial quality recording of all the NASA video in the Archives and from other sources. As Tim writes, the crucial New Smyrna Beach video is not in the Archives, and other specific things are missing. Bob seems to think that that is Ok. The crew cabin is not in the New Smyrna Beach video, but the tape is useful to answer some of the above questions. This was a solemn issue for me from day one, as I am sure it was for all of you, and that is the reason you have not seen it on TV programs that I appeared on before. I have shown it privately to Tim and others. It will take everyone a split second to recognize it, when you see it. The crew cabin was tumbling thousands of feet away from what NASA identified as the crew module. And doesn't anyone remember it took 40 long days to locate the cabin? On the day of the accident, I, for one, gave NASA till 5 pm, then 7 pm, to locate the crew cabin then impatiently I said the next day, then the next week, then the end of the month. Weren't any of you around then? If a picture is worth a thousand words, this one is worth a million. I hope the whole sequence will be shown in a respectable forum soon.

From day one of my involvement in this mess, I wrote that we have the best scientists and engineers in the world and in history. Many of these great people are in NASA and its Contractors. But that does not mean that we are immune from making mistakes, even blunders. Oh, he called us stupid. No. If I say that X made a mistake, I don't mean X is stupid. Stupidity kicks in when we don't learn from our mistakes.

Tim writes that I discovered a massive blunder in the initial 1972 design of the Space Shuttle, that I discovered, and corrected, the same mistake in another space system in 1970. He gives details and explanations. I am prepared to answer questions, preferably technical, and I'd rather do it spontaneously online than prepare lengthy postings like this one. I printed this CollectSpace thread and I looked for specific technical questions to answer, but I didn't find any until I reached about page 20, where "garymilgrom" asked a question worth answering. But first, let me clear other issues.

Instead of giving a representative synopsis of the technical issues, Bob applauds the free book advertisement of Hansen and McDonald on this thread. Their summary, he writes, is "spot on." I know who is McDonald, I don't know Hansen, Ph.D. is he an engineer, sociologist or historian? Hansen and McDonald write about a stale issue, the rollout and sharp left turn to Pad 39B. Pearlman missed it in Tim's Chapter and Hansen and McDonald should read the Chapter

before they publish their book. The rollout advocates, writes Tim, "led themselves up the garden path," and he explains why. I mention this because McDonald is involved by proxy in bringing the silly rollout about if only because he, and others, did not correctly analyze the loads in the struts of Challenger and previous missions, which you can find tabulated on page 53 of the Report Commission Report. You have read Hansen's post and I wish if someone reads Tim's rollout "garden path" explanation and see the connection that he or she will post the explanation on this thread. Otherwise, I will gladly do it in a future post myself.

Here is the perceptive question by garymilgrom, "Does anyone have knowledge of changes in the Shuttles' liftoff procedure?" He then astutely relates the question to von Braun's "90% lift-off thrust requirement." My answer also goes to valid points raised by Bob and others, and I think it appropriate to address it.

Let me elaborate a little. The 90% liftoff requirement is in the massive 1972 JSC 07700 (for those who don't know it, 07700 is THE Shuttle Spec). The 90% came from pre-Shuttle days. Specs evolve in time. Not this one. As I searched the record, I discovered that the 90% requirement appeared suddenly on the scene, without research, analyses, debates, papers, pros and cons, etc. While I concluded the 90% liftoff requirement is von Braun's, it could have been someone else, but under his supervision. In his book, *Space Frontier* (Holt, Reinhart and Winston, 1971, p. 29), von Braun does not show the "dynamic overshoot" effect in his thrust-time diagrams. Nor is the effect spelled out in his and others' papers, articles, books, specs, etc. My speculation here is that the Apollo 90% requirement addressed the devastating "dynamic overshoot" effect – unknowingly! And the Apollo-to-Shuttle technical transition was not done right. And this goes to the heart of garymilgrom's question.

I was involved in the Shuttle troubles from the outside (with Comsat) in 1978. I, as other space experts, left the space program because there was no vehicle then. NASA dealt with the problems, and instead of launching in 78, STS-1 took off in 81. In the media, the problem was tiles. On the inside, liftoff timing was a problem. In 1982, many experts wrote about the change of liftoff time. A primary reference on this is R. E. Gatto of Rockwell International (RI) who wrote in a technical paper ("Effects of System Interactions on Space Shuttle Loads and Dynamics," International Council of Aeronautical Sciences Congress Proceedings, Seattle, WA, August 1982, pp. 376-383) about 5 options considered to delay liftoff time:

1. "Lift-off with a lower thrust level on the SSME's
2. Lift-off with one engine out
3. Tilt the vehicle on the launch pad
4. Devise a controlled release for the base restraints
5. Introduce a time delay for SRB ignition and vehicles release"

Gatto (RI) commented on the 5 Options as follows, "A study of these options showed that most of them were either ineffective, unfeasible, or introduced undesired risks. Option 5 proved to be both effective and easy to implement." The above happened before STS-1. As garymilgrom correctly remembers, "every launch as waiting for the engines to reach full thrust and then releasing the vehicle." From here on, Gary is onboard, and I hope everyone will catch up quickly.

I said the Apollo-to-Shuttle engineering transition was not right. Every bit of evidence I had convinced me that the 90% requirement was there to avoid the "dynamic overshoot." Let's use numbers. The SSMEs produce about 1.1 million

lbs (MP) at lift-off. If we stay fixed on the pad, the stack rocks forward – and overshoots, just like a slinky. Everyone has seen the “tip deflection” of the external tank on NASA Select, let’s say about 32 inches. Put a washer on a slinky and release it suddenly, you can see and measure the overshoot. The force in the spring is nearly double what it would be if the washer was lowered slowly by hand. Imagine a horizontal g-field and you release the slinky – now the deflection orientation is horizontal like the ET tip-deflection. The 1.1 MP force from the SSMEs punches the structure (the springs) with the equivalent of 1.9 MP. How do we know that? Most of us should be able to calculate it (including Hansen and McDonald) and NASA and RI actually measured it on the Shuttle (see Tim’s Chapter 10).

Here is the problem. The “experts” told me that the 90% thrust was always “engine performance verification” (EPV) requirement. I said it was “dynamic overshoot” requirement. What do you think (after the above explanation)?

Look at the 5 lift-off options above. Imagine 5 experts in a conference room discussing it and you are sitting as an observer. Expert 2 does not even care about “engine performance verification.” He says, let’s fire up 2 engines fully, wait for the stack to spring back, fire the holddown posts – and then fire up the third engine. Expert 2 is not even concerned about EPV, he is concerned about riding high on the overshoot curve (look up one of my write-ups or your dynamics textbook). The same is true of Expert 1. He says let’s lift off with “a lower thrust level.” How low? How about like Expert 2’s idea? The thrust of two out of three engines is about 67%. Expert 1 is then saying, let’s take the three engines to 67%, wait till the stack springs back, release the holddown posts, throttle up to 100, or 104%. Then, what’s “the 90% engine performance verification?” Study the 5 Options carefully. You can see that Experts 1 and 2 are, what I call, Apollo-mentality folks, 3 and 5 are Shuttle-mentality EPV folks, I don’t know about 4.

I hope you will agree that this kind of discussion is what is needed to bring about resolution to the vexing issues that still simmer after so many years.

Another “extraordinary” point brought up in Tim’s Chapter is how engineers mix up pressure and force in the start up of the SSMEs and SRBs. A slim 100-lb lady steps suddenly on an old bathroom weight scale – from zero height. On an ideal scale, the scale registers 100% overshoot. The lady will see the pointer reach 200 lb, though momentarily. NASA wrote that they control the SSMEs’ pressure to within 2%. The “pressure” is the equivalent of the lady’s 100-lb weight, so the weight of the lady is controlled between 98 and 102 lb. Bob seems to have missed the point in Tim’s chapter, “the pressure does not overshoot, the force (or thrust) does!” Bob would have done great service to Hansen and McDonald with this single observation. Hansen grumbles, “AbuTaha’s second failure scenario turned out to be much tougher.” Hansen and McDonald should have been immediately referred to Tim’s Chapter. If my technical reports have been too difficult for them, Tim gives it in plain English. McDonald shows the traces of “26 SRM Thrust-Time Traces During Ignition,” (McDonald, A., “Design Evolution of the Space Shuttle Solid Rocket Motors,” 21st AIAA/SAE/ASME/ASEE Joint Propulsion Conference, July 1985, pp. 496-507, Figure 16). The traces are correct if the ordinate is marked “pressure,” e.g., psi. But McDonald’s ordinate is distinctly marked “thrust,” or force. If he were truly measuring “force,” he would have captured the “dynamic overshoot,” as Tim described how the Marshall engineers captured the “thrust” or “force” overshoot for the SSME’s, which was not captured in “pressure” traces.

Pearlman includes 8-lines from a long sentence from an AIAA’s reviewer about my paper which, like Hansen, dismiss my work as “junk science,” and Bob says

Furniss missed the point of the (brilliant?) reviewer when he writes, "Furniss seems to have missed the AIAA reviewer's warning about being misled." It seems that Gary Milgrom read Tim's chapter, and I wonder if he noticed the AIAA reviewer's last sentence, which Bob skipped, "The delay for SRM ignition did reduce the liftoff loads as stated but did not effect the pre-liftoff design loads." The delay ... did not effect the pre-liftoff design loads? Furniss' next words were, "The war was on." The delay did not take the liftoff load from 90% to 100%; for the SSMEs, the delay took the effect of the liftoff loads on the structures from 90% to 172% - exceeding all safety margins for the Shuttle. Bob does not mention that distinguished space experts edited my paper, and I will add that one of the editors was the Chairman of the Dynamics Committee of the AIAA itself. Oh, Tim researched a lot of material over this issue. I think Bob just does not want you to see it. Maybe Gary can provide an opinion now that he sees the liftoff procedure story outlined above.

I knew a couple of the Commissioners, I spoke with a few of them and I knew of all of them. They are honorable citizens who worked hard to serve our Country. I don't believe the investigation began with the motto, "let's cover it up." The Rogers Commission was served badly. Mr. Pearlman, Mr. Oberg, and everyone else, you have my challenge above. Find the crew cabin in the record. And don't complain that you don't have the time, resources, equipment or sponsors. I didn't have any. At least you have considerable input from Tim's Challenger Chapter and from me.

There is much more I want to say about most of the comments on this thread, but I think that I have overextended my welcome. If ever invited to answer questions, I hope those would be succinct and to the point, and I'll try to do the same. Thank you.

Ali F. AbuTaha