Short Final

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HSL-35

I REMEMBER when I first went to see the Sistine Chapel in Rome. Crowds of people were looking skyward as they wound their way through the corridors, passing up untold art treasures, because they'd come there to see one thing, and one thing only – the beautiful ceiling by Michelangelo. I don't think anyone has ever taken a good look at the *floor* of the Sistine Chapel, or the surrounding walls.

It's the same thing with compressor stalls in helicopters flying in a saltwater environment. Everyone *expects* a stall over saltwater to be associated with saltwater ingestion, with the emphasis on training being almost exclusively on deceleration stall flight techniques. In other words, deceleration stalls have become the Michelangelo ceilings of our saltwater emergency expectations. Well, there are plenty of other ways to stall a compressor, as we found out one night flying over the Pacific.

My OIC and I were out conducting day and night doppler work, with an SSSC sweep thrown in for variety. The preflight brief had included standard warnings concerning salt encrustation and the ensuing compressor stall should the salt ever build to excess. We exercised due caution in the dopplers and experienced no salt spray on the windshield,

which indicated an equally low amount of salt spray being ingested by the engines. We finished our doppler work and took off to visually identify a surface contact.

During the trip to the contact, the weather gradually turned from partially scattered to broken and headed for overcast at about 1,000 feet. The moon was fairly bright and provided a discernible horizon when it could break through the cloud cover. There were some isolated rain cells in the area but none close enough to be of any consequence. As we flew, the sky slowly turned black.

The ship had set flight quarters and had a ready deck upon our return. We had enough fuel for two or three bounces, which we requested and were approved. My HAC, generous guy that he is, allowed me to do the first approach. The tower called winds 90 degrees to starboard at about 5 knots, so I set up for a port-to-starboard approach. I drove down the glide slope and picked up the deck environment at about one-half mile. There was a minor problem with the deck lighting, so we made a call to our ship's tower to try and rectify the situation. As I closed to within one-quarter mile, the lighting was still wrong, so we placed another call, and I commenced a waveoff at about 80 feet AGL, 30 KIAS, 100 yards from the deck.

I lowered the nose and rolled right to pass astern of the ship while I raised the collective to climb back to a comfortable altitude. As I applied power, my rearview mirror reflected a multitude of sparks coming from the exhaust of the engine. Just as I was going to bring this to the attention of the HAC, the engine suffered a series of very audible detonations and then spit fire rings out of both ends. I froze the collective and rolled wings level as I beeped up both engines, purely as a reaction to my training in simulated engine failures.

There was no doubt in either of our minds that we had just had a total compressor stall. For an instant, I thought it couldn't be happening. It didn't bother me that it was happening to me – what *did* bother me was that the engine stalled as it was accelerating. Whenever compressor stalls had been addressed in my H-2 past, the lectures had always concerned *decelerating* stall as a result of excessive salt encrustation, and we hadn't taken in any salt. One quick scan of the instruments removed any doubt. We'd stalled, all right! We then completed our emergency procedures, contacted our ship, and flew a single-engine approach to a no-hover landing. Finally, we conducted the shutdown as normally as we could and started breathing again.

We were fortunate enough to be able to see the engine after AIMD had torn it down. The third through seventh compressor stages had sustained extensive damage, although none of the blades had broken loose. The helo had been checked over thoroughly several times for possible sources of external FOD, but none could be found. The FODing occurred far enough away from the ship so that the ship could be ruled out as a source. The lack of a source of external FOD combined with the condition of the first two stages (very minor damage, and all of that on the trailing edges) leaves only internal FOD as the culprit, but that source, as well as the FOD itself, could not be found.

FOD will, of course, cause a compressor stall, as it did in this case. We in the LAMPS community talk about compressor stalls associated with deceleration – almost to exclusion. The emphasis on deceleration stalls has been effective in helping us avoid situations that would cause them, but we need to consider other forms of compressor stalls in briefs and training. Although discussion of these conditions may not always prevent mishaps, it will prepare the aircrews better and possibly reduce the surprise and confusion in the cockpit when such an event happens again.

I've got one other point – the case for recovery from a single-engine failure at low altitude and airspeed. H-2 pilots practice this type of single-engine failure from a 40-foot hover. This is done to show that recovery can be effected (given the right conditions) and to prepare pilots in the event they experience an engine failure in a doppler hover. This close call highlighted that theory. We were already light, at twice the altitude, and had 30 knots on the airspeed indicator. The reaction was probably as quick as an unsuspecting pilot can make, yet we lost 40 feet and 7 percent N_r while only gaining 20 knots. The thought of setting your H-2 in the water is not an appealing one, but you stand a better chance of surviving a single-engine water takeoff than you do a water impact at 20-30 knots and low N_r. This option makes you a prime candidate for a decelerating compressor stall, but you will know that it's coming, and then you can control when and where it will happen if it does.

Knowledge won't prevent some of these misadventures, but preparedness can keep them from becoming more extensive and damaging than they need to be. There's no doubt compressor stalls will continue to occur. Hopefully, my dues are up to date. In any case, this experience has shed some new light for me on a neglected subject, and I know of at least one crew that's just a little more ready for its next encounter with an accelerating compressor stall. ◄