by Cdr. Brick Imerman

Playing Hyd and Go Seek on an Emergency Divert

I had been out of the cockpit for four years and, statistically speaking, was about as high risk for a mishap as you could find. I completed a quick Cat. IV FA-18 syllabus at the FRS. While an FRS student, I also was conducting XO duties, travelling to Hornet Executive Steering Committee meetings, attending SHARPs, and fulfilling the requirements of XO charm school.

One night when no VFA-147 JOs were available to fly a red air (adversary support) sortie in Superior Valley, I was called to fill in. I was grateful for the flight time and glad to be back in the squadron where I had served my department head tour. I was reassured to see I was flying on the wing of one of the community's strongest sticks—the 2000 Carrier Aviator of the Year.

While the flight lead prepared the tactical portion of the brief, I double-checked the weather and NOTAMS. The NOTAMS were OK, but the weather was marginal. When airborne, we would check if the range was useable for the strike coming in off the USS *Constellation*. Since we were in the midst of fog season, I also checked NAS China Lake, our primary divert. Everything seemed fine, until I realized I had no clue what time their field closed. I queried the Argo ODO, and he said China Lake should be open until midnight.

His "should" didn't reassure me very much, so I pulled out my IFR Supplement, got the phone number, and called China Lake Base Ops. "Field shuts down at 2230," was the reply. That was good info to know, as the strikers had a TOT of 2220 to 2230, aligned precisely with when we should be flying by China Lake on our way home.

We headed over the mountains toward Superior Valley. The weather-guessers were right: There were thin layers of milky clouds from 5,000 to 25,000 feet. As we passed the mountains and hit the desert target area, the weather lifted enough for us to clear the range and work the low end of the 10,000-to-15,000-foot block. With no moon and working under a hazy overcast, it was dark as could be.

The strikers were late getting to the target area. After a 10-minute delay, they called inbound, and we commenced our run. We hadn't gone 30 seconds when I heard that familiar deedle-deedle of the master caution.

The DDI showed a hyd 1A caution, but the pressure still checked good. I reported it to the flight lead, and he promptly knocked off the run and passed me the lead.

As luck would have it, our run had us headed almost directly for China Lake. However, the first thought that crossed my mind—a thought which numerous aviators have had in this situation—I knew better. As if my flight lead sensed my internal debate, he said over aux freq, "You are going to China Lake, aren't you?"

"Affirmative," I replied.

It was as dark as the ace of spades. As I reached for my nav bag, I saw the hyd 1A caution flip to hyd 1B. "Oh great," I thought. "I'm losing fluid and the system doesn't know where from, so it's trying to isolate the leak." I sucked the left engine back to idle to conserve remaining hydraulic fluid. The good news was I was now only 20 miles from the field, and hyd 2 was holding strong; this was going to be a no-brainer.

I fumbled through my nav bag and grabbed my China Lake approach plate. I knew I wouldn't have to shoot an approach, but I needed to know the minimum safe altitude in all sectors, since the hills around the field were invisible in the darkness. "Got it—that's my min alt," I said.

Then I was back in the nav bag, fumbling for my NATOPS pocket checklist. After what was only a moment but seemed like an eternity, I found the hydraulics section.

Suddenly a sickening thought hit me. What time is it? I looked at my clock–2229. Quickly, I called China Lake Tower on 340.2.

"Tower, Jason 41, 15 southeast on an emergency divert," I called.

"Roger, Jason 41. I was just turning the field lights off. Are you in need of an arrested landing?" tower responded.

"Negative, I just need to put it on deck," I responded.

"Roger, controllers have gone home, but I'll keep the lights on for you. Landing runway 14," tower said.

Whew! I went back to my pocket checklist. The hyd 1B was accompanied by a FCS caution light and a left-leading-edge flap channel 1 and 4 failure. I knew there were warnings in the NATOPS about such a situation, but I couldn't remember whether or not they called for resetting the FCS. I fumbled in the darkness, flying with one engine at idle, trying to set up on the duty runway, which was 180 degrees out from where we were, trying to read the checklist, that promptly slid off my kneeboard and fell to the deck.

I was now officially behind the jet.

Then I remembered: aviate, navigate, and communicate. With a good hyd 2, all I had to do was get my landing gear down and fly to touchdown.

With this simplified plan, I slowed below 250 knots and dropped the gear handle and flaps. Problem was, I neither heard nor felt the familiar clunk. I looked for gear indication; none down. Bright red light in the gear handle. I looked again at the gear handle and double-checked hyd 2 pressure. Handle down, 3,000 psi.

It didn't make any sense, hyd 2 controls the gear, not hyd 1. I had a hyd 1 problem, not hyd 2. The gear should have extended.

I reported the predicament to my flight lead and asked him to back me up with the book. He was having so much trouble flying wing in the pitch darkness that he couldn't fly and read effectively at the same time.

"Tower, Jason 41. We're having some additional problems here. Do you have a freq for VX-9 base?" I called. I got the freq and called VX-9, but there was no answer. Everyone had gone home for the night.

"Tower, does anyone have a big book who can help us out?" I requested.

"Jason 41, what's a big book?" tower asked.

"Sorry tower. We need a pilot with an FA-18 NATOPS manual to help us out," I replied.

"Stand by."

I could tell this was going to be a long standby. It was past field-closing time, and everyone had gone home. We were on our own.

Flight lead made the call, "Recommend we elevate. There are hills just east of the field."

Great call, but I informed him I'd already checked our min safe altitude, and we were OK. At least I'd done that right.

As I was doing the comm shuffle between VX-9 base and tower freqs, flight lead started reading the hyd 1B procedures from the pocket checklist. No reset on the FCS: Shut down the engine if dual hyd 1A-1B failure. Luckily, things weren't that bad yet, and I was already min power on the engine.

The most important business now was to blow down the landing gear, regardless that all indications were that I shouldn't have to. I slowed below 180 knots, aware that my leading-edge flaps were not extended fully.

I blew the gear. I got one green, then two green. The NATOPS FCF chapter says it may take up to 30 seconds for the gear to extend fully. I swear the last main gear took 29.99 seconds if it took one second.

I was ready to put down the plane, regardless of what little notes we did or did not know from the big NATOPS.

I looked at my hyd pressure gage—hyd 2 held steady at 3,000 psi. I realized that if I took a trap, the only person working at the field was the person in the tower. I could spend the rest of the night sleeping in the wires, waiting for someone to come out and tow me in.

I looked at my fuel gage: 3.9. Still plenty of fuel for a couple of passes.

I would try a normal landing. If the brakes, powered by hyd 2, failed on landing rollout, I would make one attempt with the emergency brakes. If they failed, I had enough gas to execute a go-around and make two attempts at a trap.

"Tower, Jason 41, 5 miles northwest for the straight-in runway 14," I called.

"Roger, Jason. Cleared to land runway 14," tower replied.

My flight lead said on aux, "Recommend you take a trap."

I relayed my plan, and flight lead concurred. Then he pitched in, "Recommend you go hyd ISO override to fully charge the brake accumulator."

Gouge! That's why he's the Carrier Aviator of the Year!

I looked at my DDI, which now indicated both hyd 1A and hyd 1B cautions. I was too close to the field at this point to shut down the left engine.

"Jason 41, tower," tower called.

"Go ahead, tower," I replied.

"I have the ASDO from Weapons Test Squadron on the phone, and he has his ODO on another phone from home. He has a NATOPS and requests you relay your problem," tower said.

I thought about leveling off and starting the tower–ASDO-ODO phone relay. But I looked at my fuel, realized I had a plan, and told tower, "Negative, I'll be on deck in one mike."

The straight-in seemed an eternity. On the way down I kept thinking, why did I have to blow down the gear? Is there a hyd 2 problem? If so, then the normal brakes aren't going to work. Remembering that the emergency brake and parking brake handle in the FA-18 are one and the same, I must have grabbed the handle 50 times in that last five miles. "Emergency brakes," I told myself, "not parking brakes." I could see the worst-case scenario in my mind: Passed up the arresting gear, set the parking brake at 100 knots, blew both tires, FODed both engines, skidded off the runway, flipped the jet, and killed himself...

I was in close now. Threshold, runway, touchdown. Hyd 2 pressure holding... 120 knots, tap the brakes—nothing. Hyd 2 pressure fluctuating wildly... 100 knots, stand on the brakes–nothing. Pull the emergency brake handle, lightly touch the pedals...

Good grip, big sigh of relief. Ride it to a full stop.

No brakes, no nosewheel steering, but still no hyd 2 caution on the DDI.

"Tower, I'm going to need a tow off the runway," I said.

What went wrong? My jet had a leaking hydraulic-drive unit (HDU), the mechanism that drives the leading-edge flaps up and down. The left leading-edge flap, driven by hyd 1B, has a hyd 2A backup. When the HDU started leaking, the system tried to isolate which hydraulic circuit the leak was in; therefore, the switch from hyd 1A to hyd 1B cautions. Since hyd 1 couldn't drive the leading-edge flaps, hyd 2A tried to help. However, a failed switching valve allowed fluid from the hyd 2 system to migrate into the HDU. As a result, the leaking HDU was draining both hyd 1 and hyd 2. That's why my landing gear wouldn't extend normally.

Why didn't I recognize the hyd 2 failure? Not only was the HDU dispensing my hydraulic fluid, but my hyd 2 fluid-level sensors had failed as well. I had lost all of my hyd 1 fluid and nearly all of my hyd 2 fluid, but the DDI indicated no hyd 2 problem. Despite the fact that the jet indicated a good hyd 2 system, I was actually minutes, or seconds, away from losing that jet.

I relearned that a safe flight starts with thorough preflight. Know your divert-field information—cold. Prior to briefing, the weather and NOTAMS checked good at China Lake. However, if I had not checked the field-closing time when in doubt, I may well have radioed China Lake one minute too late. My aircraft may not have made it to the secondary divert field at Edwards AFB. By the way, anyone who tries to take a jet with a hydraulic failure across the mountains is a fool.

Have a clear plan of action in an emergency situation. Know your NATOPS, and ask for help from ODOs, flight members, and anyone else who can help when you need it. But be ready to make a sound and timely decision, based on your systems knowledge, when help is limited or not available.

As for my flight lead, my hat's off to him. He backed me up and gave me important info. He knocked off the engagement when the problem was reported and promptly passed me the lead. As we began descending, he reminded me to check my altitude and the terrain. He backed me up to the best extent possible, given the flight conditions, with the pocket checklist. He advised me to take a trap and then didn't try to talk me out of my plan when he realized my plan made sense. He reminded me to go hyd ISO override to recharge my accumulators prior to landing. But most importantly, he supported me when I needed him, kept his mouth shut when I didn't, and didn't try to fly my jet. I couldn't have asked for better aircrew coordination, given the conditions.

And as for China Lake Tower, the lone person there did a great job linking the phone chain to get an ODO with a NATOPS manual on the line. The timing wasn't perfect, but the initiative was outstanding.

I should have taken a trap, but hindsight is 20/20. I had a plan, and taking a trap was part of my backup.

Once on deck, I wound up waiting over an hour in the jet for the tow job, which is what I sought to avoid by not taking the trap in the first place. My reluctance to sit in the arresting gear for an hour had clouded my judgment. I had formed a solid game plan, stuck to it, and executed it to get the jet on deck.

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