

A personal portrait of science, technology, and the history behind the Physiological Support Division, 'Standing between Life and Death' for crews at the edge of space.

Serious Pressure:
Standing Between Life and Death for Stratospheric Flyers
By Andrew Woodrow

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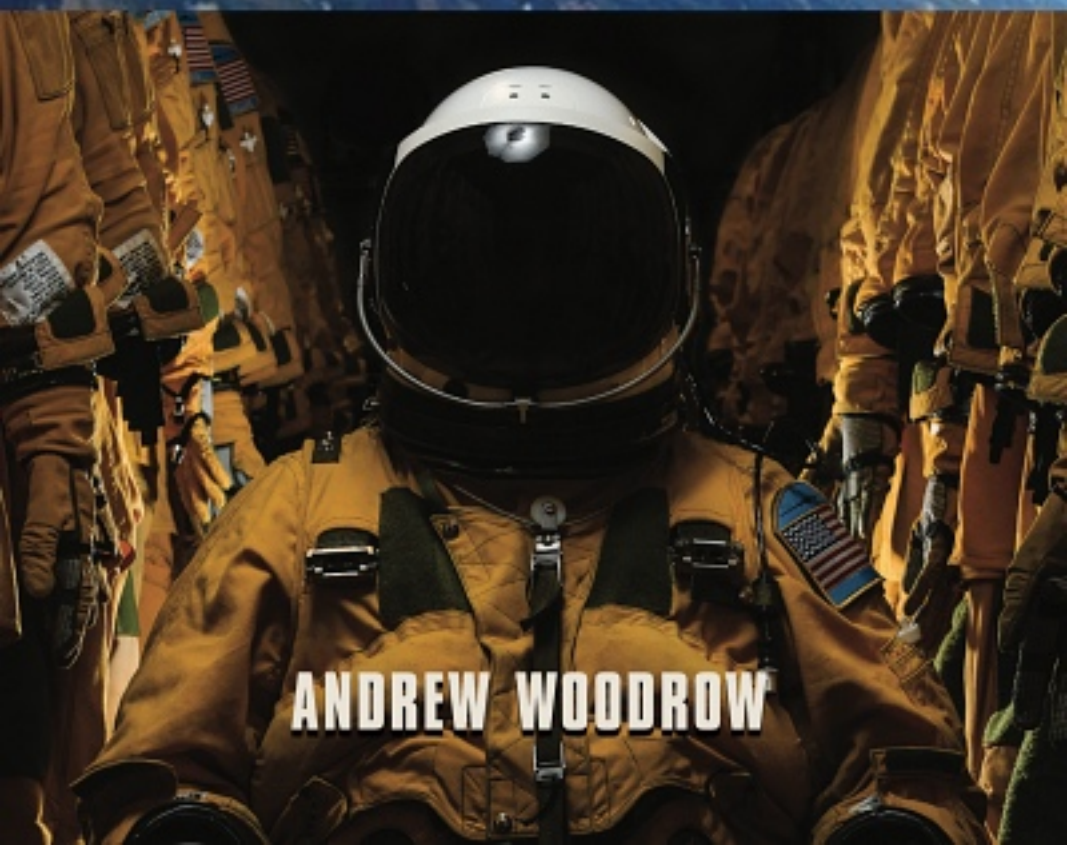
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SERIOUS PRESSURE

STANDING BETWEEN LIFE AND DEATH
FOR STRATOSPHERIC FLYERS

THE PHYSIOLOGICAL SUPPORT DIVISION



ANDREW WOODROW

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Table of Contents

Preface	1
Chapter 1 – Emerging from Lab Coat to Blue Coat	5
Chapter 2 – Tom Bowen and a Legacy of Service	19
Chapter 3 – Aircrew Training and the Diamond Patch.....	35
Chapter 4 – The Wall of Fame.....	69
Chapter 5 – Science and Technology	89
Chapter 6 – Have Passport, Will Travel.....	135
Chapter 7 – The Back Shops: The Central Nervous System of PSD	187
Chapter 8 – Technical Advisors and Rated Compadres	221
Chapter 9 – The Fini Flight	243

Chapter 2 – Tom Bowen and a Legacy of Service

The Father of Pressure Suit Operations

No story about PSD is complete without highlighting the singular name synonymous with the organization: Thomas Bowen. Regardless of their position in PSD—commanders to Airmen, contractors to NASA engineers, civic leaders to senior military officers—all who knew Tom Bowen knew he was a foundation that could not be shaken. As described by Ernest Gann in *The Black Watch*, Bowen was a “shaggy-dog humorous man... his English smacked of mountain bourbon, and there was a special lilt to his diction as he screwed his puckish face into a marquetry of expressions.” There were some who worked with Bowen who attempted to mimic his unique lilt of language; none was perfect, but all impressions were offered with admiration of his depth of knowledge and experience in the program. It is impossible to capture the breadth of his influence; so many people and programs were impacted by his dedication to the mission over a sixty-three-year career.

Beginning in 1959, Bowen was central to the development of pressure suits and flight operations support. Climbing the ranks in the burgeoning Air Force as a life support technician, as a noncommissioned officer he was swept into the “black world” of secret high-altitude reconnaissance for the remainder of his military and civilian career. On cue, he could discuss a wide variety of pressure suit designs and how they were used in different types of aircraft. His vaunted memory detail on pressure suits and aircraft history was encyclopedic. Bowen would often joke, “My memory is the thing I miss the most,” but a memory galvanized by firsthand experiences during the Cold War is unlikely to falter. In an interview with Colonel (Ret.) Susan Richardson, Bowen catalogued the alphabet soup of pressure suits used by the pilots of the U-2 high-altitude reconnaissance aircraft, beginning with the MC-3 partial pressure suits and, later, five distinct types of full pressure suits, which he called S1010A,

S1010B, S1030, S1031, and S1034. He possessed the knack of recalling the forgotten details about military pressure suits where written documents might not exist. And, this encyclopedic knowledge was not sprung on an unsuspecting person to impress; it was Bowen's method of conveying the full story. His story intersected many lives, influenced many careers, and stood as a legacy of service to his nation and to the organization that he cherished.

One of over a dozen commanders who served with him, Colonel Paul Sheffield, arrived at PSD in 1984. Sheffield brought high-caliber credentials to the job: PhD in physiology, decades in hyperbaric medicine, but zero experience with space suits. Sheffield had a deep passion for lifelong learning. During his tenure as PSD commander, he sidled up to Bowen for lessons in high-altitude physiological support, and they became a powerful team that amplified the capacity of PSD during the peak of the Cold War. Colonel Sheffield provided a snapshot of Tom's career on the event of Bowen's retirement in 2012:

Mr. Thomas Bowen has served the Department of Defense for sixty-three years providing technical expertise for development of aviation and space life support systems. During his career he has ensured the advancement of life support systems for high altitude intelligence, surveillance and reconnaissance (ISR) mission aircraft for the CIA, USAF, NASA, and international U-2 programs such as Britain, Germany and China. He has served as the senior technical advisor in the development of the U-2/SR-71 life support systems by Lockheed and David-Clark companies. Within the high-altitude reconnaissance community, Mr. Bowen has touched more lives than any other person. Mr. Thomas Bowen's career has spanned over six decades of service to his country. His service to the Department of Defense

includes: twenty-one years active duty with the U.S. Air Force, four years dedicated to CIA undercover intelligence gathering operations, and an additional thirty-eight years as the Chief of Life Sciences/Technical Director for U-2/SR-71 high-altitude ISR programs. Mr. Bowen has been directly involved in every U.S. military operation requiring high altitude ISR support since 1949. During his twenty-one years on active duty, he served in several operational theaters as a physiological support technician ensuring the safety of hundreds of U-2 pilots who gathered intelligence for the DoD during the Cold War (e.g., Cuban Missile Crisis) and numerous Vietnam War campaigns (e.g., Operation Linebacker I & II). He provided technical guidance to Lockheed's Skunk Works and David-Clark Company on design of aircraft life support systems, the full pressure suit, and survival equipment. He has been a primary accident investigation consultant on all U-2 mishaps involving life support systems. His input following several aircraft accidents that involved ejection system failure led directly to implementation of a zero-zero ejection seat capability for the U-2 aircraft. He has been an innovator and forward thinker as evidenced by his push to design mission specific life support equipment. As the U-2/SR-71 Technical Director, he designed and implemented pressure suit-specific training programs to meet pilot's mission requirements worldwide, such as high-altitude chamber flight training, egress training, and water survival training. Mr. Bowen is a true visionary and leader who built an unsurpassed legacy of technical support to the Nation's high altitude ISR mission, with a profound impact on aircrew safety.

First Bowen Encounter. It was not just the commanders who were influenced by Mr. Bowen. One morning in early 1983, an Airman Basic arrived at PSD on his first Air Force assignment. Wearing freshly starched green fatigues and highly shined black boots, the Airman was welcomed by the Division Secretary, Miss Fae, who told the Airman that the commander, Colonel Dick Trumbo, was away and that the orientation would be conducted by the Technical Director, Mr. Bowen. That Airman was me.

This was the next first step in a journey imagined through that article I'd read about PSD in *Airman Magazine* during basic training. Gripping my personnel file and tucking my hat under my arm, I entered Bowen's lair and stood at attention at his desk. He looked up, perched a little smile on his face, and said briskly, "Sit down, sit down"; then, realizing he was supposed to signed something, he asked for my in-processing checklist, then sat back in his creaking, high-backed office chair. His distinctly laid-back approach concealed the intensity that was Bowen's hallmark of bringing the highest caliber of technical support to the program.

During my in-processing talk, he asked about my young family and said that he, too, was married as a young Airman but reassured me that the challenge of being away from Beale on TDYs would be met by a caring family of supervisors and other spouses. There was not much to the welcome briefing, but his words stuck with me across my career: "You will find it challenging here, but there is no other unit that will give you as much satisfaction." Sage wisdom from the man who had dedicated his professional life to the Air Force mission we know as PSD. At that moment, I knew that I was still years from fully understanding the breadth and depth of the mission, but I stepped out of his office with an excitement to learn as much as I could, as fast as I could. This assignment could be the realization of my ambitions: science, teaching, operations, and a mission that makes a difference.

As welcoming as Bowen was in my orientation brief, throughout my time as an Airman and NCO, he seemed unapproachable unless you were on his astral plane. Only the “important people” gained an audience with him. His office was adjoined to the commander’s through our secretary, Miss. Fae, and his desk was tucked around the corner, so you generally only heard his iconic voice broadcast into the hallway when he was talking on the phone. Bowen seemed to know who was committed to the mission and would take those who demonstrated interest in a deeper understanding of the “whys and wherefores” under his wing.

Universal Connector. Bowen was a consummate connector. Over the course of an hour in his office, it was not uncommon to watch him make four phone calls to four different company representatives, conduct technical conversations, and recite previous conversations without the aid of notes, all with the aim of nailing down a detail for an upcoming operation. He could seem abrupt at times, and yet, he was always on task; Bowen was not a guy who would call to simply chitchat. He had imprinted so much technical information about each of the systems that we often jokingly referred to the technical references for our specialized equipment as T.B.T.O.s (Tom Bowen Technical Orders). Once, he and I were talking about pressure schedules for a new full-pressure suit and, rather than pause and reach for a technical manual, he simply reached into his shirt pocket and pulled out a miniaturized laminated card with all the details of atmospheric and suit pressures. I keep a copy of that card near me today.

Because of his unique depth of expertise, Bowen was a consultant on every aircraft investigation of U-2 or SR-71 crashes. He may not have walked through the scene of each crash site, but in his early days he was fully part of investigation boards and was the go-to guy for any questions related to pressure suits, parachutes, oxygen systems, or survival equipment. His education was earned through decades of practical application; there was no wall of diplomas or certifications in his office, yet he understood the value of education and encouraged people to seek

formal education whenever possible. The influence he wielded in analysis and recommendations for improving a system or procedure were recognized by investigation board presidents, and he was instrumental in improving safety for the pilots.

Second Bowen Contact. In 2001, just months before the tragedy of 9/11 terrorist attacks on the United States and nearly twenty years after I'd arrived as a young Airman at PSD, I was recruited by Colonel Britt Marlowe to return to PSD to lead the Operations Flight. Marlowe phoned me one day and asked, "How long have you been over there (in Europe), Andy?" I was near the end of my third year on an exchange tour with the Royal Air Force at Farnborough, England, but had three back-to-back assignments in Europe.

"I think it's been about ten years, sir," I replied.

"I think it's time for you to come home, and I need you here at Beale."

I knew Marlowe from his days in the European theater as our Command Consultant for Aerospace Physiology—a hawk when it came to details and a leader without compromise. He knew I had unique pressure-suit experience and as a newly minted major, I was a good match for his vision for PSD. Plus, it was a terrific opportunity to work with two of my primary mentors, Marlowe and Bowen. Once again, Bowen provided his wisdom and wit to the ever-evolving mission within PSD. It was a change in my role alongside him; transitioning from Airman and non-commissioned officer to a flight commander and "peer" was like being made a shift supervisor for your dad!

By the end of 2001, the mission focus was on the U-2's role in post-9/11 activities. Just as our nation was recoiling from the unfathomable attacks in New York, Washington, D.C, and Pennsylvania, PSD was in the middle of a major renovation, and operations were split across several different buildings. The "hush hallway" with senior staff was in a loft above

the U-2 operations area; the back shops and LRT were shifted to make room for the building expansions; and, although Aircrew Training was reasonably untouched on the east end of the complex, chamber operations were isolated to the trailer positioned behind the building we called “The Birdhouse.” The mission was ramping up both at home and away. New detachments were bedded down across the globe, and the demand for increased TDYs to support the U-2 strained the staff roster and once again required senior NCOs to fill detachment leadership positions.

Bowen knew the drill and was a steady hand in conversations about extending FPS pressure-bladder service life or swapping out one survival item for another. What would normally require a Higher Headquarters (HHQ) approval in other operations came to Bowen as the designated configuration control authority. This meant that Bowen could sign off on changes to the configuration of survival kit contents, inspection cycles, and virtually anything related to PSD operations. He had been part of the U-2 and SR-71 missions during similar times: the Soviet shoot-down of a U-2 flown by Gary Powers, the Cuban Missile Crisis and loss of Rudy Anderson, the Fall of the Berlin Wall, overflights of Central America during the Sandinista revolution, and so many other national security events. Highly agile reconnaissance relied on the human capacity to suit up, get to the target, and return vital reconnaissance, and it is the men and women of PSD who play a vital role in that mission. Bowen was the trusted advisor to many commanders, at both the squadron and wing levels, and his insight would continue to bring value to the conversation for another decade.

Bowen’s Encouragement. I shared many treasured conversations with Bowen over the years, but during the unit picnic at Ryden Park in 2005, he leaned toward me from under his floppy hat with his off-centered smile and asked, “When are you comin’ back as the commander?” At the time, the billet for the PSD boss was for a full colonel, and I was still a couple of years away from my eligibility, but I told him that as long as he was there, I would keep the option open. Bowen was a man who had been

with the U-2 program from the beginning, ushered generations of technicians, Chiefs, and officers through the rigors of PSD, and pulled many under his wing to share his wisdom. In my time at PSD, I always felt at arm's length because of his incredible command of the disciplines within PSD, and I was generally hesitant to interrupt his day with unnecessary questions or concerns. But, at that moment, standing in Ryden Park, I felt that Bowen was pulling me under his wing. If I returned to PSD, I would graduate to his inner circle. I tucked that thought away for safekeeping. The opportunity to return to Beale and be part of the PSD mission one more time would stay on my radar until the squadron command selection process several years later.

Reflections on Tom Bowen from other commanders have a similar tone. Being in the inner circle did not happen just because you were the Chief or Commander: you had to earn his trust. Colonel (Ret.) Tom Workman was in the top billet when PSD officially became a squadron under the composite medical group model. He noted that "Tom was a man of impeccable honor, and when asked why he would not discuss information about the planes that had been long declassified, he simply replied 'I pledged never to talk about those things, and I will not do so now.'" Many of the commanders who worked alongside Bowen had the opportunity to travel with him to conferences or higher headquarters meetings; those trips would inevitably include hours of reflection on the evolution of the PSD mission and the people who have made the U-2 and SR-71 programs so legendary.

In His Own Words. As reticent as Bowen was to reveal too much of the story, he did have a few that he would share. A couple of tales that resonate across the span of several commanders include the first time he felt worried about being part of the program and a humorous memory of the SR-71. For the first, he recounted his days of listening to a shortwave broadcast of Radio Havana while sitting in the hanger at McCoy AFB, Florida. Radio Havana was Cuba's answer to the U.S. propaganda broadcast

on Radio Martí, and Bowen recalls listening to the broadcasts after launching the U-2 for the daily mission. One day, he was startled to hear the broadcaster read a list of USAF personnel involved with the U-2 program. Castro's propaganda machine cranked out a steady stream of rhetoric threatening to overthrow the U.S. government and come after those involved with the reconnaissance program and their families! Tom said that although they all knew it was propaganda, he had never been more afraid for his safety or the safety of his family.

Bowen kept a Polaroid photo in the lap drawer of his desk amidst the stationery, pencils, and paperclips. One time during my tour as commander at PSD, I was sitting with him and he tossed the photo across the desk nonchalantly in my direction. "Ya know who that is?"

I studied the grainy photo and strained to pick up any clues. There was a guy in a partial-pressure suit and a lanky man in civilian clothes standing behind him in what looked like the integration room. Politely, I guessed: "Is that YOU, Tom?" pointing to the young man behind the pilot. He gently nodded his head and added, "That's me and Frank Powers in Turkey." "Frank" as Bowen referred to him, was Francis Gary Powers, the U-2 pilot shot down over Russia in 1960. The connection between the PSD leader and pilots and engineers in the early days of the program was powerful and this simple photo reflected that kinship.

On a lighter note, Bowen recalled a story of the early days of the SR-71 Blackbird when the jet would only take off and land in the dark from the Southern California base. The operations were all developmental under Lockheed's Skunkworks—the pseudonym for the Advanced Development Program—and every effort was taken to conceal the aircraft. While operating from Palmdale, California, Bowen recalled, "the Blackbird would land at the desert runway and quickly taxi directly into the hanger so the doors could close and keep prying eyes from getting an image of it. More than once, the bird would land so hot [fast] that even with the time to taxi back to the hanger, the titanium skin of the fuselage was still emitting

enough heat that it would activate the fire suppression system in the hanger, soaking everyone and everything inside!”

Imitation Is the Sincerest Form of Flattery. Tom Bowen was not a man who needed flattering. To many, he was bristly and curt about anything other than the mission. I think there are only one or two PSD unit photos in history that included him. And yet, the vast majority of people embraced him as the foundation of our business. One endearing gesture of affection by PSD troops was a routine attempt to imitate him in voice. His distinctive diction was everyone’s challenge to replicate, and a couple of NCOs nearly perfected it. There were prank calls made to *him* by an NCO imitating his voice, tributes in the form of skits at holiday parties, which he didn’t often attend, and everyday conversations that inserted “his” voice into the mix even when he was within earshot.

Here are a few “Bowenisms” that were shared for this publication:

Bob Soule: “Bowen comes to me with a fistful of sticky notes in the hallway and says, ‘Bob I need you to replace all the bladders on those 1031-suits tomorrow just in case we put them back in service.’”

Jeffrey Scism: “Bowen strolls into the suit maintenance area with an armful of pressure suits and says, ‘Gotta get all the hardware (neck rings and glove rings) off these and ship ‘em back to the factory so they can build up new suits for the shuttle program... get ‘em shipped out by tomorrow, if you can.’”

Allen Faulkner: “In regard to the cost of specialized equipment Bowen would typically say, ‘It’s a mere pittance.’”

James Chester: “Bowen knew how important the oxygen shop was and probably told me and (Brett) Paige, ‘I’m gonna to make you and Paige GS-10s and keep you guys down there’... never happened.”

Other random “Bowenisms” offered by several members of PSD:

“It’s gonna be cancer or leprosy.”

“It’s my memory I miss the most”

“If I find out someone’s chewin’ tobacco in that helmet, you send him directly to me... I don’t care if it’s the Wing Commander!”

I suppose Bowen was aware of the impersonations, and I hope he knew that each was offered in the sincerest form of flattery and love for him.

Bowen’s Universe. Bowen maintained untold connections to the universe of flight operations. He had worked in life support as an Airman and NCO in the 40s and 50s, then shifted into the high-altitude flight support world. His Rolodex was chock-full of names and numbers of key people at headquarters, depots, and manufacturers; all were hand scribed and many smudged. If there was a question about ejection systems, Bowen would pick up the phone and call the Lockheed-Martin representative directly. If there was a concern about inflators on life preservers, he would skip the supply chain and go directly to the manufacturer. Likewise, he remained in touch with friends and colleagues with a quick “How do you do?” phone call. His universe was galvanized by personal contact, not e-mails or tweets. He made no effort to elevate himself but remained a humble servant and gentleman in all circumstances.

My Three-peat. Five years after my tour as Operations Flight Commander, and twenty-eight years after I arrived as an Airman on the doorstep of PSD, I returned to serve alongside Bowen once again, now as the Squadron Commander. A surge of excitement pulsed through me as my wife, Angie, and I drove over the Sierras along Highway 20 to the Grass Valley Gate of “The Ranch”. Coming back home to the squadron that I had grown up in was surreal, but knowing the mission and the PSD professionals gave me confidence for the next steps as commander.

What an incredible joy it was to serve again alongside Tom Bowen. Now aged 78, Bowen had guided several generations of PSD troops through every aspect of the mission. When I stepped into his office, the same location he had occupied all the years I had known him, he leapt from

his chair, a puckered grin on his face, and pulled me in for a hearty embrace. "Gee, it's good to see you... I knew you'd be back!" he said, giving me a big hug. "How's Angie?" And just like that, I was invited under his wing. The mutual respect is difficult to convey. For me, Bowen was always elevated because of his experience, tenacity, and commitment to the mission. He revealed that my return to PSD was something "he knew the Air Force would get right" eventually, and that was not a slight to the incredible commanders who preceded my tenure in the big chair. But the relationship he and I had was different because of the varied roles I had filled in PSD. He may have held the image of the young Airman and his family arriving at a first assignment in much the same way he saw himself as he started his career: humbly serving the mission and continuing to strive to be the best at all he did.

On one of the last TDYs that Bowen would take, he and I traveled by car to Palmdale for a meeting with teams of NASA and Palmdale Flight Test operations. The hours of that drive south along Highway 99 were precious moments in which to hear again his wisdom about the mission; the places, people, and events were like peering into a time capsule of treasured memories. Over all those years, we turned to Bowen for technical guidance, advice on equipment or operations, and foundational understanding of why things worked the way they did in the U-2 and SR-71 programs. There were rarely times that Tom was lost for an answer or straightforward technical advice.

The Turning Point. Several years before my return in 2010, Tom had begun suffering from progressively diminishing lung function, a condition caused by idiopathic pulmonary fibrosis. Although it did not seem to slow him down, he knew it was a serious condition that would only be resolved by a complete lung transplant. Despite this significant challenge, he stayed on task and remained an influential force in PSD. One day in 2011, at about 7:45, I received a call from Tom and he said, "I don't think I'm going to come in today: just having more difficulty with my breathing."

Frankly, I was not concerned about his missing a day of work. He had months of leave in the bank. I was more concerned about his dogged spirit to keep coming in despite his diminishing health. We spoke briefly about perhaps planning for retirement, but I told him that we would talk about that more when he returned. Even on that phone call, he used the honorifics of *Sir* and *Colonel* to me—an awkward feeling since I still saw him as a senior mentor and guide. To his credit and upbringing, Bowen never lost his wisdom for protocol; the commander is the commander, even if he is a young pup!

Not long after that phone call and a few heart-to-heart conversations, Bowen spent some precious days of leave to regain his strength, then called me once more: “I guess I’m going to go ahead and retire ...just bring me a couple things from my office, and I will speak to civilian personnel to get the paperwork taken care of.” Really? Clear my desk and have civilian personnel forward the last check? After sixty-three years of dedicated service to his nation, Tom Bowen was not going to get a certificate forwarded from the civilian personnel office. I wanted to respect some of his request: no fanfare, no big party. But the senior staff gathered to talk about this monumental moment.

Chief (Ret.) Wayne Smith and I had the honor of presenting Bowen with his retirement award, certificate, and a few mementos. We drove to Yuba City and pulled up the driveway to the house he had occupied for over thirty-five years. We were met at the door like old friends stopping by for a sandwich and a glass of sweet tea. After a few moments of hallway greetings, we were invited to “come on in and have a seat.” So, there we were in Tom’s living room with his wife, Marilyn, amidst a trail of the oxygen line that kept Bowen on the right side of oxygenation. He had his characteristic smile turning up the side of his mouth, was seated comfortably on his couch, and practically refused any “fuss from the official party.”

From Tom's office, we had brought a small box of items from his desk, including a jeweler's magnifying glass, a couple of small books, and his Rolodex, a lovely, framed lithograph presented by the CIA on the occasion of the fiftieth anniversary of the U-2, and a hard hat he kept on the shelf from a PSD building renovation project. He brushed all aside (except for the Rolodex), claiming that "none of that is mine, just loaned to me from the Air Force for a time." Always the gentleman. So, we sat awkwardly beside him on the living room couch while I read a citation for the Career Civilian Outstanding Service Award. This is an award ranked just below the Air Force Valor Award and recognizes noteworthy career service of long-time civilian employees of the Air Force; "significant accomplishments, notable leadership and competence, and a major impact on the mission." Yep, that sums up Tom Bowen. Chief Smith placed the hard hat on Tom's head, and we gathered for a goofy photo. And that was it: two men who had the honor of service alongside Bowen for significant parts of our Air Force journey, representing the hundreds who came before us, providing a simple thank you.

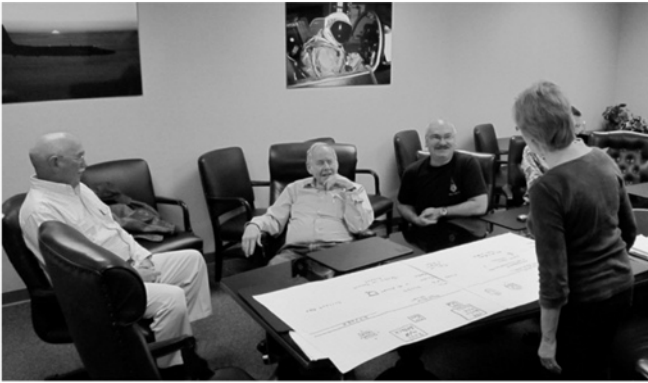
It was an odd moment for us: inelegant yet touching, celebratory yet sad. As Bowen often said, "There's no hole left in the water when you pull your finger out of the bucket," and that was his way of telling us that the mission would continue even after he had retired. Wise words from a wise man. Tom Bowen was a faithful man, to his family, to his nation, and to his God. He rarely got riled up about the daily minutia, but if he did get a burr in his saddle, you did not stand in his way. It has often been said, and probably not with hyperbole, that Tom Bowen was a national asset; he touched countless lives and influenced a program that still keeps pilots safe in the upper reaches of the stratosphere.

Bowen watches over all of us now. Just months after his retirement, he took his last flight and is at peace at Arlington National Cemetery in the shadow of the Air Force Memorial.

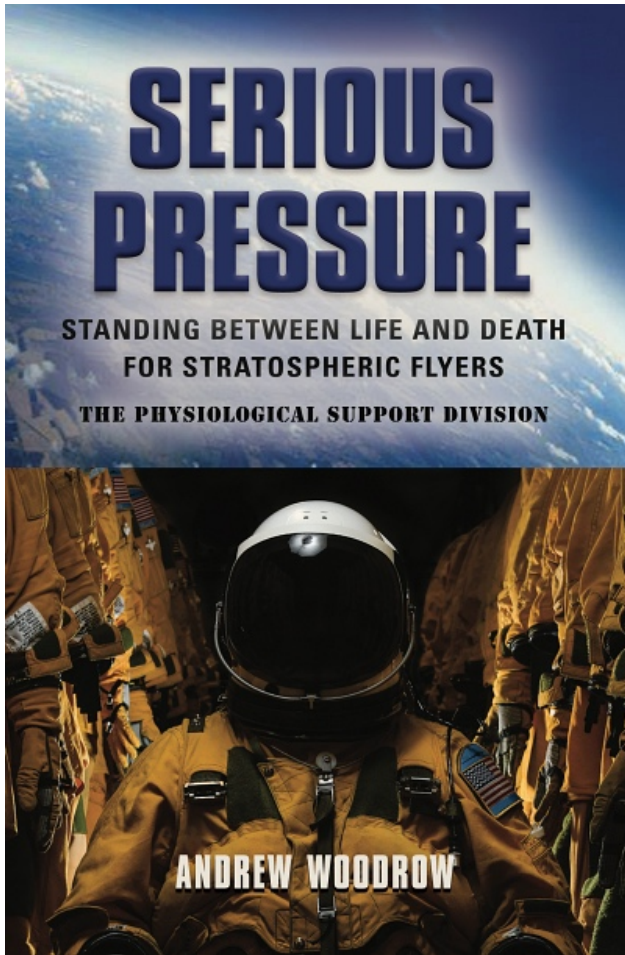
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Tom's familiar smile; with the author during meeting at Palmdale; with Chief Wayne Smith during an impromptu retirement ceremony in Yuba City CA



Tom and the author in suit storage area (2009); during planning for PSD reunion with Susan Richardson, Larry Johnson, and Jim Denniston; with Rich Pope in the integration room



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