BEFORE PREDATOR:  
THE EARLY HISTORY OF USAF REMOTELY PILOTED AIRCRAFT  

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INTRODUCTION  

During the past decade of war, the US Air Force’s (USAF) signature weapon system has been the remotely piloted aircraft (RPA), popularly called a drone. The RPA has seemingly appeared ex nihilo, but in fact the USAF involvement with RPAs stretches back over a circuitous path that covers eight decades.

Significant RPA history takes place outside the United States, and even the American story often has involved the other armed services. But USAF RPA history is particularly interesting. The USAF has been the world's preeminent air force during the era of RPA development. Whereas aviation has been a supporting arm to the armed services whose existence pre-dated the invention of aircraft, the USAF's very existence was based on aircraft and the pilots who flew them. RPAs transform this most fundamental USAF element.

IN THE BEGINNING …

In 1918, the US Army, from which the USAF emerged, worked with Charles Kettering on the Kettering Bug “aerial torpedo.” Although the Kettering Bug was a rudimentary ground-launched cruise missile rather than an RPA, it demonstrated that a military air vehicle did not necessarily need a pilot in the vehicle. The first true RPA in US Army service, meaning a remotely controlled aircraft intended for recovery and reuse after a flight, sprang from the inventiveness and entrepreneurialism of Reginald L. Denny. Denny, a World War I veteran of the Royal Flying Corps who later moved to America, and who was also a movie actor, and model airplane hobbyist, founded the Radioplane Corporation in 1935 to develop relatively large radio-controlled aircraft as anti-aircraft gunnery targets. The US Army began to purchase Radioplane aerial targets shortly before the American entry into World War II. Thousands of Radioplane aerial targets were employed by the American military (US Army designations OQ-2, OQ-3 and OQ-14 and corresponding US Navy designations TDD-1, TDD-2 and TDD-3) during the war. After the war, Radioplane built the short-lived OQ-17 (US Army)/KDR-1 (US Navy) before building the OQ-19 (USAF/US Army)/KD2R (US Navy) that remained in production for the next four decades, thus becoming the most numerous RPA in history.
Besides the aerial targets in the OQ-series, the US Army Air Force used three other related series of aircraft in World War II. The BQ-series were remotely piloted bomb-carrying aircraft. The most famous of these were the BQ-7 and BQ-8, which were converted from the B-17 and B-24, respectively, under Project Aphrodite. Taking off with the BQ-7 or BQ-8 under the control of an onboard human pilot, the crew activated the autopilot and radio-control system, armed the warhead, and finally bailed out over friendly territory. A chase plane then controlled the BQ-7 or BQ-8 to impact against an enemy target. In practice, Aphrodite was a failure, being both dangerous and ineffective. The CQ-series designated the manned radio-control aircraft for RPAs, with the most important aircraft being the CQ-3 (modified C-45) and CQ-4 (modified B-17). Finally, the PQ-series of RPAs were aerial targets that could be operated either by an onboard pilot for ferry flights and dry runs, or by radio control for live fire. The most numerous members of this series were the PQ-8 and the later PQ-14, which were based on the Culver Cadet.

By the end of World War II, the US Army Air Force routinely used RPAs, but their only established role was as aerial targets.

ENTERING THE JET AGE

The jet engine revolutionized military aviation after World War II. It created the need for aerial targets having the same performance as jet-propelled airplanes for fighter pilot training and to test the new air-to-air and surface-to-air guided missiles. The Holloman Air Development Center, Holloman AFB, was the center of USAF missile and RPA testing during the early Cold War, playing the equivalent role for those vehicles that the Air Force Flight Test Center, Edwards AFB, played for manned aircraft. During the 15 years after the USAF separated from the US Army and became an independent service, its RPAs included:

- Radioplane Q-1 – Jet-propelled aerial target; never became operational. XQ-1 first flight 1950. The XQ-1A replaced the pulsejet engine of the XQ-1 with a turbojet. The YQ-1B (first flight 1953) was substantially redesigned. The Q-3, which was never actually built, would have been a version of the Q-1 using an airframe constructed of composite materials.
- Ryan Q-2 – Jet-propelled aerial target known as the Firebee, which saw widespread use not only by the USAF but also by the US Army, US Navy and foreign customers. XQ-2 first flight 1951. The Q-2A was the first operational model. The Q-2B (first flight 1956) had higher performance, but was never manufactured in quantity because it was replaced by the definitive Q-2C (first flight 1958). The Q-2C, later redesignated the BQM-34A, was in operational use as a target for the next five decades.
- Northrop Radioplane Q-4 – Supersonic aerial target, of which only a few were built. XQ-4 first flight 1958. The Q-4A was never built and the Q-4B was the ultimate version. The most lasting result of the Q-4B program was its sophisticated parachute recovery system, which formed the
basis of the Apollo spacecraft parachute system. By the time of the Q-4, Northrop had purchased Radioplane.

- Lockheed Q-5 – Supersonic aerial target derivative of the X-7 (see following) that ended up being used in very small quantities by the US Army to test Nike surface-to-air missiles. The problem with the Q-5 was that it flew higher and faster than any potential Soviet aircraft of that era. First flight 1956.

The USAF flew its last Firebee target mission in 2007 and replaced the Firebee with the Composite Engineering Inc. BQM-167A Skeeter (first flight 2001).

As well as purpose-built RPAs, the USAF also used surplus manned aircraft modified for remote control. The first aircraft to be so modified were the F-80 and B-17, which were redesignated the QF-80 and QB-17 respectively after modification. As well as being used as targets for missiles, the USAF used these RPAs during atmospheric nuclear tests to test the effects of the blast on aircraft in flight and to take samples from radioactive fallout clouds. Later, the USAF recycled the B-47, F-100, F-102, F-104, F-106, X-10, Regulus II, Mace and Bomarc to become aerial targets. The F-4 Phantom II is the basis of the currently operational QF-4 full-scale aerial target. With the F-4 inventory nearly depleted, the next full-scale aerial target will be the QF-16 based on the F-16A and early blocks of F-16C.
UNMANNED X-PLANES

The achievements of research aircraft such as the X-1, X-2, X-3, X-4 and X-5, flying from Edwards AFB, are famous, but the X-series also included less well-known unmanned aircraft to support USAF missile development.

- **Lockheed X-7** – Ramjet technology testbed, supplying data for the Bomarc missile program. It was the first aircraft to fly at Mach 4. First flight 1951.
- **North American X-10** – Aerodynamics test vehicle supporting the Navaho supersonic cruise missile program. It became the first turbojet-powered aircraft to fly at Mach 2. First flight 1953.

RPAs GO TO WAR

During the Cold War, there was a critical need to obtain intelligence about the Soviet Union and China, which were huge, distant and closed to outsiders. With the Pearl Harbor attack being a recent memory, knowing enemy capabilities and detecting preparations for a surprise attack had the highest priority. Aerial reconnaissance, both overflights of denied territory and flights around the periphery, were a principal source of intelligence. The Soviet shootdown of a Central Intelligence Agency (CIA) U-2 in 1960 on a reconnaissance overflight mission was a major blow to American intelligence activities. In response to the vulnerability of the U-2, the CIA and the USAF worked on three alternatives (supersonic high-altitude manned aircraft, reconnaissance satellites, RPAs) to overfly denied territory and gather intelligence. As a side note, the relationship between the CIA and the USAF on national intelligence gathering was very close, with both rivalry and cooperation, eventually resulting in the 1962 creation of the National Reconnaissance Office (NRO) with participation by both organizations.
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<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Supersonic high-altitude manned aircraft</td>
<td>Flexibility</td>
<td>Risk to crew</td>
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<tr>
<td>(A-12 Oxcart)</td>
<td>Avoid most threats with its high speed, altitude and stealth</td>
<td>A surface-to-air missile can fly faster and higher</td>
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<td></td>
<td>Long range with aerial refueling</td>
<td>Extraordinarily difficult technical challenges</td>
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<tr>
<td>Reconnaissance satellite</td>
<td>Invulnerability to air defenses</td>
<td>Lack of reliability</td>
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<tr>
<td>(KH-1 through KH-4 Corona)</td>
<td>National sovereignty does not extend into space</td>
<td>Predictable trajectory</td>
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<td>Little maneuverability</td>
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<td></td>
<td>Analysis must wait for film to be returned to earth</td>
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<td></td>
<td></td>
<td>Inferior photographic quality</td>
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<td></td>
<td></td>
<td>Complexity of film capsule recovery</td>
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<tr>
<td>RPA (Ryan 147)</td>
<td>Flexibility</td>
<td>Lack of reliability</td>
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<td></td>
<td>No risk to crew</td>
<td>Poor navigation accuracy</td>
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<tr>
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<td>Complexity of launch and recovery</td>
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<td>Short range compared to manned aircraft with aerial refueling</td>
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<td>Vulnerability to air defenses</td>
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The Ryan 147 was based on the Q-2C and carried a camera. It was air-launched from a DC-130A and recovered by parachute. The first operational Ryan 147A RPAs (first flight 1962) were poised for use during the 1962 Cuban Missile Crisis, but not actually employed. By 1964, Ryan 147B RPAs (first flight 1963) were flying over China, and shortly thereafter, North Vietnam. Ryan 147 RPAs (later given the military designation AQM-34) were built in dozens of versions, and more than a thousand vehicles were delivered, becoming the primary source of photographic intelligence about North Vietnam during the Vietnam War. Besides photoreconnaissance, the Ryan 147/AQM-34 served in the roles of electronic intelligence, decoy, chaff bomber and propaganda leaflet bomber. On February 13, 1966, a 147D (first flight 1962) collected at close range the radar fuzing signature of the SA-2 surface-to-air missile, which enabled engineers to develop a jammer that saved hundreds of American aircraft. The most common version was the 147SC (AQM-34L, first flight 1968) which was the workhorse of reconnaissance operations during 1969-73.

The Ryan 147/AQM-34 program was sponsored by the NRO, with acquisition management by the Big Safari program office. Big Safari was a USAF office that specialized in the rapid development of classified reconnaissance systems. The Strategic Air Command operated the system.
Although the Ryan 147/AQM-34 suffered from a variety of teething pains stemming from technical, operational and maintenance factors, eventually it became a mature and more dependable system. Some limitations remained, which were inherent to the technology of the time.

- The combination of air launch and helicopter mid-air recovery of the parachute-borne vehicle was operationally complex and expensive.
- Because the Ryan 147/AQM-34 had neither an onboard crew nor a sensor capable of transmitting imagery back to a remote operator in real-time, it could not react to dynamic situations such as targets of opportunity or weather obscuration of planned targets.
- Given the state of navigation technology at the time and the absence of an onboard crew to correct navigation errors with visual or radar pilotage, the vehicles frequently missed the planned targets.

THE NEXT GENERATION

The success of the Ryan 147/AQM-34 created the impression that RPAs were due for a breakout into the mainstream of the USAF. Events were to prove otherwise.

The Lockheed D-21 Tagboard (first flight 1966) was intended to be the ultimate unmanned reconnaissance aircraft. The CIA desired the ramjet-powered D-21, a member of the famous Blackbird family, for overflights too risky for the manned A-12 and the later SR-71A. The original operational concept for the D-21 was to carry it on the back of the M-21, a two-seat variant of the A-12 with a Launch Control Officer (LCO) in the rear cockpit. The M-21 would accelerate the D-21 to Mach 3, which would allow the ramjet engine of the D-21 to be started. Then the M-21 would release the D-21 to begin its free flight. After taking photos and returning to a recovery zone, the D-21 would eject a hatch containing the film. Descending under a parachute, the hatch would be recovered in mid-air. The rest of the D-21 would be expended. The D-21 ramjet propulsion system benefited from the research of the earlier X-7 program.

After some successful tests, tragedy struck on July 30, 1966 when a D-21 hit the M-21 after separation. Both crewmen successfully ejected from the disintegrating M-21, but the LCO drowned after landing in the water. Abandoning the Mach 3 launch concept, the D-21 Tagboard was rebuilt as the D-21B Senior Bowl (first flight 1967). The D-21B was launched from a B-52H, and a rocket booster propelled the vehicle until the ramjet started. There were four operational launches of the D-21B to photograph targets in China, but none were successful. The project was cancelled in 1971.

The Ryan 154 (military designation AQM-91A) Compass Arrow was another advanced reconnaissance RPA. The AQM-91A (first flight 1968) was essentially a somewhat stealthy, longer range, higher flying big brother of the Ryan 147/AQM-34. Unlike its predecessor, Compass Arrow was managed by the Air Force Systems Command as a “normal” acquisition program rather than by Big Safari. Perhaps related, the program had spectacular cost overruns during development. Compass Arrow reached operational status,
but was retired after President Richard M. Nixon began a relationship with China. American overflights had greatly irritated the Chinese, and ending them was an American concession.

**Strategic photoreconnaissance options – 1970s**

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<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Supersonic high-altitude manned aircraft</td>
<td>Flexibility, Reliability, Avoid most threats with its high speed, altitude and stealth, Long range with aerial refueling, Multi-sensor capability</td>
<td>Risk to crew, A surface-to-air missile can fly faster and higher, Diplomatic constraints against overflights of certain nations</td>
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<tr>
<td>Reconnaissance satellite with film return</td>
<td>Inviulnerability to air defenses, National sovereignty does not extend into space, Photographic coverage and resolution</td>
<td>Predictable trajectory, Little maneuverability, Analysis must wait for film to be returned to earth, Complexity of film capsule recovery</td>
</tr>
<tr>
<td>Reconnaissance satellite with digital sensors and downlink</td>
<td>Inviulnerability to air defenses, National sovereignty does not extend into space, Near-real time image downlink</td>
<td>Predictable trajectory, Little maneuverability, Digital photograph coverage and resolution generally adequate but inferior to film</td>
</tr>
<tr>
<td>RPA (Ryan 154/AQM-91A Compass Arrow)</td>
<td>Flexibility, No risk to crew</td>
<td>Reliability inferior to manned aircraft, Some vulnerability to missiles and manned interceptors, Complexity of launch and recovery, Short range compared to manned aircraft with aerial refueling, Diplomatic constraints against overflights of certain nations</td>
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Ultimately the reason for the demise of both the D-21B and the AQM-91A was the existence of a better alternative for the strategic reconnaissance mission. One advantage that RPAs retained was flexibility compared to satellites that flew predictable orbits. But typical strategic reconnaissance targets such as missile silos and aircraft factories don’t move, so flexibility was less important in that mission. The advanced RPAs became available when the KH-9 Hexagon reconnaissance satellite was also entering service. An extraordinary technological achievement, the KH-9 Hexagon had most impressive capabilities and avoided the political problems that RPA overflights of sovereign airspace posed. The follow-on to the KH-9, the KH-11 Kennan with digital imaging sensors and real-time transmission of data, further increased the superiority of satellites over RPAs.
For all their fantastic capabilities, reconnaissance satellites like the KH-9 were unsuited for tactical reconnaissance. In contrast to strategic reconnaissance, tactical reconnaissance required the flexibility and responsiveness to cover mobile targets. The film-return technology of the KH-9 and earlier satellites did not provide the required degree of responsiveness. The technology in the KH-11 solved the time lag associated with film return, but receiving the data from the KH-11 required large, fixed ground stations in that era, and the fundamental nature of orbital mechanics made it impossible to cover a specific target at any specified time. So it was logical that after the Vietnam War, the AQM-34 operational program shifted from the Strategic Air Command to the Tactical Air Command. But RPAs withered in the 1970s under Tactical Air Command. Partly, the fighter pilot generals who ran Tactical Air Command were just not very interested in RPAs, instead focusing on systems like the F-15. But in fairness, the focus of the Tactical Air Command after Vietnam was a high-intensity conventional war in Europe, and in that scenario, the AQM-34 concept was operationally impractical. Launching RPAs from DC-130s and recovering them by helicopter promised low sortie rates compared to manned aircraft. DC-130s and helicopters would not fit into the hardened aircraft shelters then being built in Europe, and the communications and navigation capabilities were inadequate. Undoubtedly the loss rates of reconnaissance aircrews in a high-intensity conventional war would have been high, but the RF-4C reconnaissance version of the F-4 fighter was a more effective reconnaissance platform than the AQM-34. In 1979, the Tactical Air Command deactivated its RPA group.

Armed RPAs were another development, particularly for the hazardous mission of air defense suppression. Under the Have Lemon project, Teledyne Ryan Aeronautical (TRA, after Ryan was acquired in 1979) modified some AQM-34 RPAs to the BGM-34A armed configuration (first flight 1971). The 6514th Test Squadron, Air Force Flight Test Center, tested the BGM-34A and it fired the first weapon from an RPA on December 14, 1971. The plan was for Tactical Air Command to field the BGM-34C (first flight 1976), which was to be a multi-mission RPA that replaced the Vietnam-era AQM-34 vehicles and added the strike mission. But the BGM-34C had the same disadvantages as the AQM-34, and the program faded away. On a historical note, the photographs below refute the claim by some that the Predator was the first armed RPA, with the BGM-34A beating the Predator by nearly 30 years.
### Tactical strike and reconnaissance options – 1970s

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<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Manned tactical aircraft (A-7, A-10, F-4, RF-4C, F-16, F-111)</td>
<td>Flexibility</td>
<td>Risk to crew</td>
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<td>Responsiveness</td>
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<td></td>
<td>Reliability</td>
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<td>Air-to-air capability</td>
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<td>Aircrew has situational awareness to respond to threats and opportunities</td>
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<td></td>
<td>Aircraft can fit in hardened aircraft shelters</td>
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<tr>
<td>Armed RPA (BGM-34C)</td>
<td>No risk to crew</td>
<td>Reliability inferior to manned aircraft</td>
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<td>Poor navigation accuracy</td>
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<td>Complexity of launch and recovery with attendant low sortie rates</td>
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<td>Vulnerability of launch airplanes and recovery helicopters on the ground</td>
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<td>and in the air</td>
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<td>Vulnerability of datalink to jamming and interference</td>
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<td>Low bandwidth and line-of-sight limitations of datalink</td>
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The Compass Cope program proposed to use high-altitude, long-endurance RPAs to fly in NATO airspace and peer across the border to gather electronic intelligence about the Warsaw Pact. The Boeing YQM-94A (first flight 1973) and TRA YQM-98A (first flight 1974) were developed and flight tested as part of the Compass Cope program. In 1977, the Lockheed TR-1A, a U-2R in all but designation, was chosen for the mission over either of the Compass Cope RPAs.

As of 1979, the USAF was completely out of the RPA business, with the exception of aerial targets and a few small research projects.

**SCATHE MEAN**

Soviet-style integrated air defenses had bedeviled both the United State in Vietnam and the Israeli Defense Force (IDF) in 1973. In 1982, the IDF invaded Lebanon, fighting Palestinian and Syrian forces. The Israelis used small RPAs with great success. Most notably, RPAs and decoys were an important part of Operation Mole Cricket 19, the total destruction of Syria's integrated air defense system in Lebanon by the IDF. The USAF took a great interest in Operation Mole Cricket 19.

There were several reasons why the USAF did not emulate the IDF and deploy operational RPAs in the 1980s. Undoubtedly the distaste of Tactical Air Command leadership for RPAs played a role, but there
were other considerations. Israel is a small country and the IDF employed RPAs against enemies that were on its borders. At these short ranges, line-of-sight radio navigation and communications could be effective. The avionics technology of the era still could not provide the required level of performance at the longer ranges needed by the USAF. The hottest emerging technology of the era was low observables, which promised to make manned aircraft much more survivable and therefore competed with the RPAs on their primary benefit, which was that RPAs reduced aircrew losses.

The USAF found itself in the Persian Gulf in late 1990, deterring further advances by Iraqi forces after their conquest of Kuwait in August 1990. As the focus of American planning shifted from the defensively-oriented Operation Desert Shield to the offensively-oriented Operation Desert Storm, a high priority was destroying the Iraqi integrated air defense system. Perhaps inspired by the success of Operation Mole Cricket 19, the USAF determined that it needed decoys as part of its air defense suppression force. On an expedited basis, the Big Safari program office acquired Northrop Ventura (previously Northrop Radioplane) BQM-74C aerial targets drawn from US Navy stocks and also directly supplied by Northrop. USAF crews from recently deactivated ground-launched cruise missile units formed the 4468th Tactical Reconnaissance Group to launch the BQM-74C vehicles. The program had the code name Scathe Mean. On the first day of Operation Desert Storm combat operations, the crews fired the BQM-74C vehicles from remote locations in Saudi Arabia towards Iraq. The vehicles were detected by Iraqi early warning radars and mistaken for strike aircraft. Next the Iraqis turned on target tracking and missile guidance radars to attack the “strike aircraft”. The Iraqi radars now having been revealed to Wild Weasel aircraft, they were destroyed.

4468th Tactical Reconnaissance Group crew prepares Northrop Ventura BQM-74C for launch, observed by Lt. General Charles A. Horner, the Operation Desert Storm air commander

**BQM-145A PEREGRINE MR-UAV**

In the 1980s, the US military had a rapidly aging tactical reconnaissance force, consisting of the USAF RF-4C, the US Marine Corps RF-4B, the US Navy RF-8G (retired in 1987) and the US Navy F-14A Tomcat carrying a reconnaissance pod. The proposed replacements were advanced reconnaissance packages for the F-16 and F/A-18, plus a new unmanned reconnaissance vehicle, the TRA BQM-145A Peregrine MR-UAV (Medium Range-Unmanned Air Vehicle). The BQM-145A was successfully test flown
in 1992, but ran into technical and cost problems. Neither should have been fatal to the program, but the post-Cold War downsizing of the American military was in full swing and the BQM-145A program was cancelled in 1993.

TRA YBQM-145A Peregrine MR-UAV on its first flight on May 5, 1992

AMBER, GNAT AND THE PREDATOR ACTD

In the early 1980s, the Defense Advanced Research Projects Agency (DARPA) began to take an interest in RPA technology under the Teal Rain project. DARPA funded Leading Systems, started by an eccentric but brilliant Israeli engineer named Abe Karem, to develop Amber (first flight 1986). Amber was slow and small, but it demonstrated extraordinary endurance. The government found Leading Systems and Abe Karem to be difficult to work with, and the Amber program assets were sold to General Atomics in 1990, who continued work at a low level.

In the aftermath of the BQM-145A cancellation and other RPA program failures such as the US Army/Lockheed MQM-105 Aquila, the Department of Defense centralized reconnaissance programs in the Defense Airborne Reconnaissance Office (DARO). DARO defined three categories of reconnaissance RPA, in increasing levels of capability the Tier 1, Tier 2 and Tier 3.

When Yugoslavia broke up in a series of wars, the CIA had a requirement to conduct reconnaissance missions over Yugoslavia without endangering aircrews, with more flexibility and dwell time than satellites could provide, and the ability to fly under an overcast. General Atomics Aeronautical Systems, Inc. (GAASI) provided the CIA with Gnat-750 (first flight 1989), derived from the Amber. In the DARO scheme, Gnat-750 was Tier 1.
Tier 2 was a medium-altitude, long-endurance RPA. Although none of the armed services had a specific requirement for Tier 2, DARPA launched an Advanced Concept Technology Demonstration (ACTD) project to determine if a Tier 2 RPA could be of military use. The vehicle selected to be the Tier 2 RPA for the ACTD was the GAASI Predator (first flight 1994), an enhanced Gnat-750 with a bulbous nose containing a satellite communication system.

With Predator, the RPA finally came of age as a combat aircraft. Although no faster than a small general aviation aircraft, it had tremendous endurance, allowing persistent surveillance. A strapdown inertial navigation system aided by GPS eliminated the navigation errors that had been the bane of earlier RPAs. Digital sensors and satellite communications small enough to fit in the Predator enabled real-time observation and analysis, without the time lag required to recover the vehicle and develop film. A remote pilot on the ground could take off and land Predator on a runway, eliminating the complex air launch and mid-air helicopter recovery operations of earlier RPAs.

The ACTD were successful, but it was unclear if any of the military services including the USAF had an interest in Predator. A slow airplane flown from a computer terminal was not a high USAF priority at this time, so the Predator might easily have died at the completion of the ACTD, an interesting if soon forgotten project. But the USAF Chief of Staff, General Ronald R. Fogleman, believed that the Predator might be the start of something significant, and that it was the role of the USAF to be at the forefront of airpower. So the USAF adopted the Predator with the designation RQ-1A and activated the 11th Reconnaissance Squadron in 1995, with it actually becoming operational in 1996. The Big Safari office performed the same function for the Predator that it had performed for the Ryan 147/AQM-34 program.

Fogleman proved to be prescient, because shortly after becoming operational, the 11th Reconnaissance Squadron and its RQ-1A Predators were deployed to fly reconnaissance missions over Bosnia in the former Yugoslavia. The RQ-1A Predator was slow and proved to be vulnerable, not only to air defenses but also to icing, but having the ability to stay over territory for many hours while continuously providing high-resolution video proved valuable.
DARKSTAR AND GLOBAL HAWK

The Tier 3 RPA would have been a large and low-observable vehicle. Forecast to be astronomically expensive, it was replaced by two vehicles. The Tier 2+ was a high-altitude long-endurance RPA. Tier 3- was smaller, but had low observables. DARPA also sponsored ACTD programs for these vehicles, resulting in the Lockheed Martin/Boeing RQ-3A DarkStar (first flight 1996) and TRA (later Northrop Grumman, after that corporation acquired TRA) RQ-4A Global Hawk (first flight 1998) to meet the requirements of Tier 3- and Tier 2+ respectively.

EPILOGUE

Less than two decades after the adoption of the RQ-1A Predator by the USAF, RPAs have fundamentally transformed the service. The RQ-1A begat the more capable RQ-1B, which became the armed MQ-1B. There is a new aeronautical rating and career field for RPA pilots, and the USAF trains more RPA pilots than fighter and bomber pilots combined. Various models of RPA have been heavily involved in combat operations in 1999 (Kosovo) and since 2001. The Boeing X-45A (a DARPA program) and the Northrop Grumman X-47B (a US Navy project, albeit initially tested at Edwards AFB with significant USAF participation) are a preview of future unmanned strike aircraft with the capability to attack heavily defended targets.
CONCLUSIONS

USAF RPAs did not miraculously appear in the 1990s, but instead have a history that goes back to before World War II, including extensive combat operations during the Vietnam War.

While the resistance of the pilot leadership of the USAF to RPAs may have been a retarding factor in USAF RPA deployment, the most important inhibiting factor was that the concepts were more advanced than the technology required to fully implement them. Once that technology (strapdown internal navigation system aided by GPS, digital imaging sensors, compact satcom datalinks) became available, RPA deployment was rapid.

The mainstream USAF acquisition organization during this period (Air Force Systems Command and its predecessors) was relatively disengaged from RPA programs. Instead, RPA progress largely has been the result of unconventional sponsorship and program management (Big Safari, CIA, DARO, DARPA, NRO) and small niche contractors (Radioplane, Ryan, General Atomics). It would seem that RPA programs are particularly well-suited for an agile program management approach instead of the usual “Big Air Force” way of acquisition.

AUTHOR’S NOTE

Knowledgeable readers may have noticed that this paper omits some of the more obscure USAF RPA projects and covers the large and important Ryan 147 program in only a cursory manner. In addition, the detailed history stops in 1996 with only a short epilogue to cover later developments. The omissions were intentional, to prevent the paper from exceeding the specified length. Given the constraints, the author’s
intent was to describe those aircraft, operations and policy decisions that were most important in the history of USAF RPAs before the entry of the RQ-1A Predator into USAF operational service.

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REFERENCES

This comprehensive bibliography is presented for the benefit of those who want to study this topic in greater depth. The primary sources used in this paper are marked with a • symbol.


BIOGRAPHY

Kenneth P. Katz is currently employed as a project manager and scrum master in the health insurance industry. He began his career on active duty as a US Air Force flight test engineer and officer at the Air Force Flight Test Center, Edwards AFB. After leaving military service, Ken was employed by Boeing as a flight test engineer on the V-22 Osprey program. He has also worked as a manufacturing engineering and business development manager in general aviation avionics at AlliedSignal. Ken has an FAA Commercial Pilot certificate and over 1000 hours of flight time. He is a prolific author on aviation subjects with two published books and numerous magazine articles to his credit, and several more books currently in work. Ken is a 28-year member of the Society of Flight Test Engineers. He has a BS in Aeronautics and Astronautics from MIT, an MSE in Aerospace Engineering from the University of Michigan, and a Master of Engineering in Manufacturing also from the University of Michigan.