



Figure 1: Movie poster (John Wayne's *JET PILOT*, 1959)

AMERICAN EARLY JET-AGE AIRCREW FLIGHT HELMETS, A HISTORY IN TWO PARTS: *Part I*: A general guide for collectors, and *Part II*: A history of US Air Force 'P-series' helmets

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PART I: A general guide for collectors of American jet-age flight helmets

Who, among aviation buffs and action fans alike the world over, could ever forget the exciting scenes of fighter jock icy-calm bravado as pilots repeatedly pushed the aircraft combat performance envelope to the limits in such classic movies as '*TOP GUN*' and '*THE RIGHT STUFF?*' It took a pretty beat libido and low testosterone titer to sit there and watch those stirring exploits in the *wild blue yonder* without feeling a distinct thrill shoot down the spine like a Sidewinder missile.

Unfortunately, for every natural born, eagle-eyed Chuck Yeager there are several thousands of poor souls who, despite having spent a lifetime blazing new paths across the sky in their daydreams, were not favored by fate with the right combination of abilities, circumstance and opportunity, to achieve such a lofty ambition as actually piloting a state-of-the-art fighter aircraft beyond the speed of sound and into the heat of actual combat.

Today, one of the most interesting means these legions of *armchair* fighter jocks have at their disposal to expiate unrequited yearnings of this sort is to collect aircrew protective flight gear (now known to military professionals as ALSE, or '*Aircrew Life Support Equipment*'). Perhaps you can't actually walk the walk and talk the talk of the righteous brotherhood of *Sierra Hotel* (slang for s**t-hot) military pilots, but you can certainly pursue the fascinating hobby of surrounding yourself with the tools of their trade and in so doing vicariously bask in some of the reflected glory of their calling.

Of all the 'tools' used by the military pilot, perhaps the most glamorous of them all (to the *wannabe* fighter jock) is the pilot's flight helmet. Just as in the medieval era, when a knight's ornately decorated helmet summarily symbolized all of those chivalrous qualities that ennobled him as a fearless fighting man, the protective helmet an aviator or aircrewman wears visibly sums him up as a card-carrying member of this elite fraternity of military fliers. Each flight helmet visually tells a unique story about the special



Figure 2: A heraldic helmet (824th Security Forces Squadron, USAF)



Figure 3: Tom Cruise in 'TOP GUN', 1988.

requirements for pilot safety and protection that modern high-performance military aviation has demanded over the years, as the technology of military aerospace technology continues to advance in quantum leaps. In the early jet-age years (roughly from about 1945 through 1965), personalised color schemes and decorations often served to further differentiate various specimens as unique examples of their type. In later decades, individualization of flight helmets has been officially discouraged and rules governing permissible personal decoration have tightened considerably.

Perhaps surprising to most is the fact that in the modern era, the aircrew who actually wear protective flight gear are the least likely to understand the aesthetic details of their personal safety and survival gear. This is partly because the field of aviation life support technology has become so highly specialized that pilots and aircrew simply don't have the time or luxury to acquire additional specialized awareness that doesn't apply directly or functionally to the immediate operation

of their aircraft. In another sense, although fascinating to collectors, flightgear is for the most part merely a nuisance to military aviators, who regard the gear purely as a mandatory (but annoying) requirement to fly. Collectors and amateur life support historians have therefore attained a remarkable greater level of knowledge and understanding about life support gear used in aviation than pilots themselves.

While 'flightgear collecting' may be regarded by some as just another high-tech 'hobby', we have these specialized collectors to thank for helping collect, preserve and maintain important aspects of aerospace history that would otherwise soon be forgotten or overlooked. In the most recent decades, drastically decreased military budget allocations have further adversely impacted the military services' ability (and willingness) to preserve history of their operations and it is partly due to such difficulties that we owe life support historians and amateur collectors a debit of gratitude for ensuring that the rich and fascinating story of personal aerospace life support research and development is perpetuated for posterity.

SOME EARLY AIRCREW PROTECTIVE HELMET HISTORY:

Today, 100 years since the first powered, controlled heavier-than-air flight took place, the advances in aircrew protective equipment span such a great broad range that for reasons of convenience and necessity, life support historians and collectors generally recognize two principal categories: 1) the era of propeller-driven flight (from about 1900 through 1945), and 2) the era of jet turbine and rocket flight (from 1945 onwards, with some necessary overlap of the two periods). It is fairly easy to see, in examining flight headgear from the earliest days of flight through the present, that it has been largely



Figure 4: Early aircrew protection, 1918.

the increasing challenge to pilot safety in terms of the rapidly advancing raw physics of flight encountered that have dictated the form and substance of latter-era protective headgear.

In the early years of the 1900s through the end of the Second World War, the aviator's helmet was invariably made of soft (frequently insulated) leather and was intended purely to protect an aircrewman from the effects of wind and cold. As advances in wireless radio communications developed, the basic leather helmet began to feature earphones for radio receiver headsets; still later, as turbocharging technology permitted higher aircraft operating altitudes, oxygen delivery devices became standard as well. Early eye protection in the form of rubber-framed glass goggles were adopted virtually from the fledgling days of manned flight as the most reasonable way to protect

the eyes, especially in the old open-cockpit machines. This yielded out of necessity, as operating speeds became substantially increased (in jet aircraft), to more substantial, rigid visors capable of protecting aircrew from the potentially deadly wind-blast effects of emergency ejection from a disabled high-performance jet aircraft.

Although the crash forces encountered in the early days of aviation were in a sense just as deadly (perhaps more-so) as those created by far more modern high-performance jet aircraft, little thought was initially given to providing a pilot's head with added crash protection in the form of semi-rigid shells. Partly this was the result of insufficient materials technology advanced enough to allow use in headgear protection designs, but nevertheless one regularly finds the occasional concerted attempt to provide sturdier, reinforced head protection for pilots in aviation's earlier years. A handful of such designs (one French, another Italian, several German) originating in Europe (and many more from other nations including the USA), surfaced in the first two decades of powered flight. They consisted mostly of thickly padded and leather reinforced sections added to the upper hemisphere of a conventional soft leather helmet. Quite frequently, upper crown protection consisted of layers of natural cushioning material, like cork. Further examples of this concern for physical impact safety are discovered from time to time in studies of flight protection in these early years. In the 30s and 40s, German glider pilot students, for example, sometimes wore substantially reinforced, leather covered, aluminum-shelled helmets as crash protection in their lightweight sailplanes of the 30s and there are specimens to be found in just about every nation of that era.

In the Second World War, successive advances in science and technology brought on by war research resulted in the development of RAF scientist Frank Whittle's pioneering axial-flow turbojet engine in the West and in concurrent radial flow designs produced in Germany. Ironically, in the United States, the need for sturdier protective aircrew helmets had been initially investigated by no less distinguished an investigator than American aviation medicine's eminently respected high-altitude researcher Dr. Harry G. Armstrong (in 1938), but was somewhat ironically found 'unnecessary' by this early pioneer of modern aerospace medicine. Part of this disapprobation may have resulted from the relatively 'junior' status held at that time by fledgling aviation medicine, but there was nevertheless an apparent lack of serious concern over the need to provide more substantial



Figure 5: A WWII French aviator's padded helmet.



Figure 6: WWII German NSFK Glider helmet.

impact and buffeting protection for pilots' helmets until well *after* the first jets started to be test-flown (in the early 1940s). It is noteworthy to observe that aviation medicine (later 'aerospace medicine') as an important area of flight technology only came into its own with the dawning of the 'space age', with major steps taken just prior to the threshold of orbital flight.

However, with the higher speeds permitted by jet engine powered aircraft, more thought began to be given to sparing the pilot from the potential hazards resulting from the substantially increased inertial forces encountered in high-speed jet turbine powered flight. Just before the war ended, for instance, German aeronautical laboratories at Rechlin had investigated a protective helmet design that drew heavily upon then-existing steel shelled flak helmets, using a doubled-walled outer aluminum shell similar to the NSFK glider helmet. Advanced flight helmet studies in hard helmet penetration resistance and crash-worthiness by Germany's aeronautical laboratories were in progress when Berlin fell, but again it appears the technology simply had not yet been sufficiently advanced to permit adoption of production standards which truly satisfied the requirements. The closest that these studies got to producing a production hard shell 'crash helmet' for Luftwaffe flyers were the steel flak shells that fitted over the soft leather flight helmet; they were not intended, it should be noted, to protect aircrew from inertial forces (cockpit buffeting and impact protection) of increasingly higher-speed flight, and were devised instead to protect from flak injury.

As has been mentioned earlier, prior to the introduction of the new jet turbine engine aircraft of the 40s, the standard flight helmet was typically a soft fabric or leather helmet. When the potential for buffeting in jet aircraft cockpits became better understood, American researchers' thoughts began focusing on devising some sort of enhanced protective headgear to protect the contracted civilian flight test pilots who were evaluating the new jets at such secret testing sites as *Muroc Field* (shortly to gain world-wide recognition as the *Edwards Air Force Flight Test Center*), in the Mojave desert. The result was a number of what are now called 'transitional' helmet designs. These were typically constructed by private aircraft company personnel for their own use and usually incorporated some form of hard protective hemispherical crown attached to the upper dome section of the standard soft fabric or leather flight helmet. Examples known to have existed and been used in flight test aircraft of the early 40s were made from old leather football helmets, phenolic resin miners' helmets, pith horse polo helmets, and even cork-lined vintage race-car driving helmets. One such design became known as the 'Tanker' interim helmet, which used the compressed fiber top half of the US Army M-1 leather tanker helmet attached to a standard USAAF ANH-15 or A-10A fabric flight helmet; this type of helmet was used briefly by early USAAF Lockheed P-80 *Shooting Star* crews in 1946 and 1947. Even as this 'transitional' helmet was finding application in the first production USAAF jet, research on hard



Figure 7: USAAF 'tanker' jet helmet, 1945.



Figure 9: The first USAF 'hard' protective jet helmet, P-1, 1949.

protective helmets was being conducted by the Air Force's Wright Patterson Aero Lab (Ohio) and by Northrop Aviation's Dr. Frank Lombard group.

In late 1947 the first standard USN and USAF production 'hard hats' were introduced, made from pressure-molded cotton fabric and thermally set phenolic resin polymer materials. The first standard issue US Navy hard protective helmet was designated the H-1; this one-piece helmet had a distinctive shape which set it apart visually from the first USAF hard shell design, the P-1 (which had been inspired by Dr. Lombard's studies in helmet design at Northrop and parallel studies at the Wright aerolaboratory). After the introduction of the improved one-piece Navy H-2 helmet (similar to the H-1), the Navy soon started examining the possibilities of a two-part helmet design that used a soft fabric inner helmet over which a fiberglass outer helmet shell could be fastened. This led to Air Force consideration of its

own two-part helmet proposal, an experimental Wright Aero lab study prototype designated the P-2, but the two-part P-2 helmet concept was ultimately rejected while still under study and never placed into production. The US Navy, after producing their fully integrated one-piece H-1 and H-2 hard helmets, finally standardized on the two-part helmet approach and this led to production of their subsequent (early 1950s) H-3 and H4 series protective helmets (these last two were quite similar to each other, both visually and structurally). Quite soon after it was adopted, the USAF's original P-1 helmet was upgraded to an improved and modified version called the P-1A, which was in turn followed by the P-1B. Investigation suggests that the P-1B was merely a *re-designated* P-1A. This change in designation may have had something to do with the decision to cancel the Air Force's two-part P-2 helmet, although that has never been absolutely confirmed to our knowledge.

Quite soon in the early 50s, the advancing state-of-the-art of aircraft emergency ejection seat systems made it clear that wind-blast would be principal hazard that pilots required protection against. Evidence soon demonstrated that although human subjects could experimentally withstood as much as 400 knots of direct wind-blast in tests, rapidly increasing jet aircraft speeds and the added forces of emergency ejection at those high speed would soon far surpass even these unprotected, minimally 'survivable' levels. After much study of the need for incorporating some sort of enhanced wind-blast protection into the P-1A helmet design, in 1953 the P-3 helmet specification (which was the first USAF standard to configure an externally attached and articulated rigid visor for windblast ejection protection), was introduced. The P-3 helmet was essentially a P-1A/B type helmet to which an articulated rigid plastic visor was permanently affixed. Both the P-3 and a subsequent P-4 design originally used a unique side-latching, trackless visor design; this was superseded somewhat later by an upgraded visor design on the improved P-4A helmet and in 1959 a final upgrade helmet specification was



Figure 8: The USAF P-3, a P-1A with a visor added, 1953.



Figure 10: The USAF P-4B, 1959, last of the P-series helmets.

designated the P-4B (each of the two latter helmets used fiberglass as a basic shell material instead of the cotton fabric/phenolic resin shell construction of earlier USAF P-helmets). The P-4A and P-4B visors were identical, but communications components (headsets, earphone and connections) differed.

Principally, the P-4B helmet used an oxygen mask communications cord to link the helmet to the aircraft communications system; this change did away with the so-called 'pigtail' communications cord exiting the earlier P-helmets at the rear (as found on P-1 through P-4A helmets). Incorporating the same rigid external visor assembly used earlier, the new visor articulation of the P-4A and P-4B helmets did away with the earlier complex and awkward side-latch mechanism and substituted a central track with a release actuator mounted on the upper part of the visor. Although still not quite perfect, the new central track visor system was infinitely easier for a pilot to manipulate in flight than the earlier

side-latch design, but there remained some unresolved issues involving the visor's potential for snagging riser shrouds upon ejection. These shroud-snagging issues would largely be eliminated when the later (and entirely new) HGU-series helmets came into production in the late 1950s.

Changes in helmet communications system components (earphones, com cords, and connectors) continued to be made throughout the 1949 to 1960 period as the aircraft radio systems improved. As each new protective helmet T.O. specification came into standard Air Force use, older helmets still being used were invariably updated to meet the latest technical change (T.O.) requirements. For this reason, most examples of the earliest US Air Force hard-shell crash helmets (such as the P-1, P-1A/P-1B, and P-3) that are found today are substantially modified and upgraded and therefore invariably do not reflect their original issue configuration (this is rarely the case with US Navy counterparts, interestingly enough). It is not unusual to routinely find early P-1A series helmets that have been fitted with a late-model (central track P-4A type) rigid external visor and corresponding H-143/AIC communications components, which *technically* updated them to the last P-4B specifications. For this reason, some knowledge of and familiarity with the complexities of the official Air Force Technical Orders applicable to the P-series helmets is mandatory if one is to successfully identify and correctly label a particular specimen. (Note: for a capsule summary of the important specifications and changes effected, see the attached appendix following this article, which provides a useful baseline of basic data).

Faced with a need to upgrade its own naval aviator headgear, the Navy's Air Crew Equipment Laboratory (ACEL) in Warminster, Pennsylvania, soon produced (1957) an entirely new protective helmet design called the APH-5, a bellwether design which basically set the general standard for all subsequent helmets used by all US military aviation forces from that time onward. By 1958 the US Air force had evaluated the Navy's new APH-5 design and found it to be significantly advanced over the old P-series helmets then in use.



Figure 11: The USN APH-5, a new design for a new age (1958); first of the 'next gen' helmets.



Figure 12: The TopTex, preferred by test pilots the world over. This one has the Hardman kit.

This led to the adoption of a design based closely upon the Navy's APH-5, which was shortly designated the US Air Force HGU-2/P; by 1963 the old original P-series helmets had been largely replaced by the new design with its covered external visor. Partly due to production and distribution delays, the older P-series helmets remained in use well after the new design had been accepted as "standard", however, and were generally taken out of service on an attritional basis (when they were damaged in use). Interestingly, when the early HGU-2/P was introduced it featured the same leather oxygen mask snap fastener leather tab system used on the original P-series helmets, but in the early-60s, a new oxygen mask retention system, using what were called MD-1 'Hardman kits' (an oxygen mask shell and harness suspension system which utilized notched bayonets and helmet-mounted receivers) began to replace the long-used snap-tab system on Air Force helmets. The Navy also used the Hardman receiver system on its later APH-5 helmets before introducing a modification on its later APH-6 model that incorporated a newer mask retention system featuring unique 'butterfly' type pinch releases. The Hardman receiver system with its '*Christmas tree bayonets*' did not remain in use long, as both services eventually standardized on the presently used 'Sierra kit' bayonet type mask receivers (a development of the Sierra Engineering Company), but the rigid plastic Hardman MS22001 oxygen mask shell suspension found increasing favor by both services, in combination with the newer Sierra receivers and bayonets. In passing, it should be noted that there were several interim helmet designs explored by both services (although not adopted in large production volumes); these include the US Navy Gentex H-5 (successfully marketed abroad but not used for any length of time by the US Navy) and the Gentex APH-7 series helmets (also marketed abroad), examples of which may still be found, although infrequently.

Existing parallel to the standard US Navy and US Air Force production helmets of the early to late 1950s was the Protection Incorporated 'TopTex' flight helmet. This developmental outgrowth of earlier so-called 'Lombard' helmets featured a custom fashioned, individualized fit inner liner that was shaped to the specific wearer's cranial conformation. The 'TopTex' aviation helmet soon gained a reputation that would remain with it through the 1950s and 60s period as the preferred protective flight helmet of professional flight test pilots and engineers. Featuring a center-track, articulated, adjustable rigid wind-blast visor, this helmet set a standard of excellence that would not be matched in US Air Force protective helmet design until the advent of the custom fitted HGU-55/P liners of the 70s. Such is the reputation of the Protection Incorporated (later merged with Gentex) TopTex helmets that they remain especially sought after today by knowledgeable flightgear collectors and command a premium price, when they are encountered.



Figure 13: A USN HGU-20/P 'clam-shell', 1968.



Figure 14: A rare HGU-20/P precursor design, experimental wind-blast helmet (USAF) 1960, on display at the National Air & Space Museum.

One especially interesting concept developed in the 60s period was the so-called '*clam-shell*' design. Originating in an Air Force requirement for wind blast protection and closely associated with a US Navy ACEL design known as the AOH-1 (*Aviator Oxygen Helmet*) integrated oxygen and helmet design, a formal concept took shape. Technically known as the US Air Force HGU-15/P 'Windblast Helmet' (USAF version) and the US Navy HGU-20/P (US Navy version) and developed as an integrated head protective unit with oxygen breathing system built in, the 'clam-shell' featured a two-part shell that opened and shut like a marine bi-valve's protective enclosure. It featured a bilaterally swivel-actuated face visor with separate articulated sun shade and it looked very much like the conventional high altitude *pressure helmet* in use at this time (viz. the Navy's Mk. IV full pressure helmet assembly of the early 60s). While the windblast protection afforded by the whole-head encasing clam-shell helmet in emergency high speed ejection was excellent (the Air Force version was intended for principal use in the Air Force's new Convair F-106 Mach 2 interceptor), there were also aspects of the design that were found to be operationally awkward (especially in high-G air combat situations). These included substantial weight of the assembly (bearing down disagreeably on the wearer's spine in high negative-G maneuvers and turns), fouling of the chin-piece on parachute harness hardware, lack of adequate peripheral fields of vision, and lastly, a tendency to leak around the rubber face seal of the assembly. Thus, after a very brief period of experimental testing by the US Air Force and a short term period operational flight testing by the US Navy, the 800 or so 'clam-shells' produced on a US Navy contract were rejected and the design faded temporarily into a dusty corner of history (surprisingly, it re-emerged somewhat later in a nearly identical form for early NASA space shuttle crews).

Another experimental program of special note was the USAF 'TLSS' (Tactical Life Support System) project of the mid-80s, one of several which attempted to combine for the first time all elements of a complete environmental protection package for high-performance aircraft crews (project objectives included high-altitude protection, NBC protection, and anti-G protection). While the TLSS system (an ambitious project from the onset that was extensively flight tested at the *Edwards Air Force Flight Test Center*, near Mojave, California) was never adopted as originally designed, the many research advances derived from this important project resulted directly in the consequent operational *Combat Edge* system in use today, and provided proof of concept for many other products later evaluated for use in the F-22 Raptor *Advanced Air Superiority Fighter*. [Note: One important fact that merits passing mention is that much of the precursor research that gave birth to the TLSS system derived directly from pioneering RAF aviation medicine



Figure 15: USAF TLSS (Tactical Life Support System) helmet, NBC configuration (late 80s).



Figure 16: USAF HGU-51/P ICDS (NBC) defense system (late 80s).

studies of the 50s. The present standard USAF MBU-20/P and HA/LP oxygen breathing mask uses a 'side-hose' design that was originally pioneered by British oxygen M-type masks of the 1950s; their modern P/Q series masks still use this feature, an aspect of their design also used by the Russians beginning in the early 1960s.]

From the mid-60s onwards, modifications continued to be made as advances in aircrew protective helmet technology led to new products, incorporating both new materials and improved fabrication techniques. These modifications included communications upgrades, twin-visor designs (one clear and one smoked, a feature principally favored in bombers, training aircraft, and special applications aircraft for protection against bird strikes), the use of advanced polymer materials in the external shell, and updated oxygen breathing mask systems. In fact, a whole new series of designs has since evolved, making accurate identification of these items more challenging than ever for those recently introduced to the field of modern era aircraft helmet

development history. Overall, one of the chief lessons learned from 20 years of aerospace medical research in protective flight headgear was that for high-G fighter type air-combat situations two factors were heavily weighted over all others: excellent peripheral visibility and low mass/weight.

Complicating things somewhat, the wide range of aircraft life support systems used in US Navy aircraft during the 60s through the 80s resulted in even more complexities in helmet and mask systems, which varied considerably from those meeting US Air Force standards. After years of this extreme variance between Air Force and Navy requirements, and conforming to then Defense Secretary Robert McNamara's desire to reduce (by standardizing) defense spending costs, an effort was mandated by the DoD in the late 80s to commonise both services' life support equipment requirements. To date this has been moderately successful, with important lessons learned about suitable high-G protection and aircrew survival requirements being uniformly applied to the life support equipment requirements of all US military aviation services.

Among the most important advances in recent protective helmet design have been enhancements designed to improve peripheral vision for fighter pilots, attempts to reduce helmet weight to lessen effects of high G-forces on a pilot's neck, and substantially upgraded oxygen masks and mask retention hardware. Many of these modifications, which are at present reflected in such more advanced assemblies as the US Air Force HGU-55/P and MBU-20/P Combat Edge system (or the US Navy's HGU-87/P and MBU-20/P helmet and mask equivalent CE system) for enhanced combat maneuvering capability, have literally been forced into being by the need to protect pilots from the physically brutal G forces modern high-performance aircraft are now capable of inflicting upon their more fragile human 'components'. These changes have been prompted by the fact that for the first time ever, modern military jets are being engineered to withstand more Gs than their human pilots are capable of sustaining. The 'Combat Edge' system,



Figure 17: USAF HGU-55/P and MBU-20/P oxygen mask, the 'Combat Edge' assembly, 1980-90s, and still current.

shown above at right remains current standard.

COLLECTING 'JET-AGE' FLIGHT HELMETS AS MILITARIA:

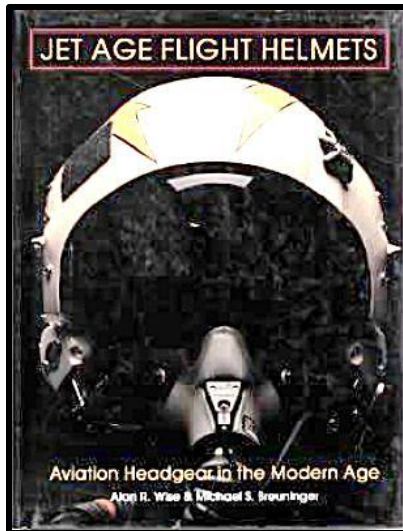


Figure 18: Wise & Breuninger, *JET AGE FLIGHT HELMETS*.

Today, one of the most rapidly growing areas of militaria collecting activity is centered on military flight helmets of the modern or 'jet' era. Although a few individuals have been collecting flight helmets for many decades, only recently has this special area within general militaria collecting gathered monumental inertia. One of the early precipitating stimuli of this groundswell was the release of the late 1980s movies 'TOP GUN' and Tom Wolfe's 'THE RIGHT STUFF.' Focusing public interest anew on the glamour and glory of modern 'hot' military aviation, these films created a notable surge in the area of collecting of modern aviation memorabilia in general. Subsequently, the relatively recent release of Alan Wise's and Mike Breuninger's excellently illustrated book, *JET AGE FLIGHT HELMETS* (1996) has predictably resulted in a further massive wave of interest in the collecting of these interesting artifacts of modern military aviation. Although there are some generally overlooked errors in the Wise and Breuninger book, prior to its release there had been no adequate concentrated historical

reference to act as a knowledgeable starting point for interest in modern flight helmets (perhaps the most glaring error in 'JAFH' is found on page 13 of that book, wherein a P-1A helmet has been misidentified as a "P-2"—more on this subject later). *JET AGE FLIGHT HELMETS* accomplishes this feat in a single substantial tour-de-force of photo-documentation and the book's cost (\$75) is a small price to pay for such a beautifully illustrated and valuable reference work on a formerly obscure and much under-researched subject (available from Schiffer Publications, Atglen, PA).

There are, of course, several even more specialised sub-areas within the general field of helmet collecting that bear mentioning. One area of aviation headgear collecting limits itself almost exclusively to *high-altitude* protection components (such as pressure helmets and their component partial and full pressure suit systems), eschewing anything more than a passing interest in helmets used in ordinary (non-high altitude) aircraft flight operations. As this is a very specialized area of interest and subsequent to a recent wave of increased interest in such things by modern aviation militaria collectors, the spectacular costs associated with collecting of high altitude items have recently soared beyond the reach of most individuals of ordinary means. Pressure helmets and suits that used to routinely be sold for several hundred dollars are now barely acquirable for thousands of dollars and the supply is also drying up.

Regrettably, this same broadened awareness of military flight helmet collecting in general has had some substantial impact upon availability

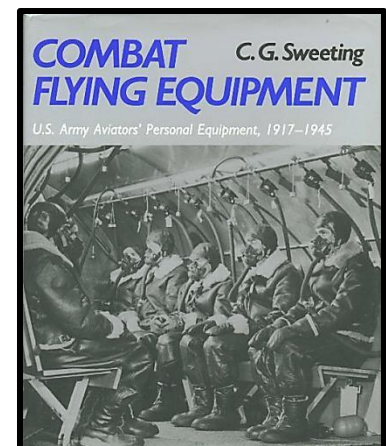


Figure 19: Glenn Sweeting's *COMBAT FLYING EQUIPMENT*.



Figure 20: Don't buy a helmet like this on eBay (is that a SAUCE pan...?!)

and cost of the more common helmet artifacts among collectors. For one thing, general prices have begun to increase to absurd levels for otherwise relatively ordinary items (due to lessened supply and enhanced demand). For another, more than a few people advertising themselves as being in the business of authoritatively selling aviation memorabilia are now asking unrealistically high prices for items they actually lack any real authoritative knowledge of. Although there are 'serious' specialists such as Wise, Breuninger (there are actually two Breuningers, both brothers), Wilson, Gilliam, Daugherty, Norris, LeBeau, Patterson, Mattson, Jamieson, and a few others who have true expertise in these areas, many others lack basic factual understanding of the technical variations frequently found in early military flight helmets (that constitute the basis of their distinctive model identification). This insufficiency of technical knowledge is reflected in their advertising and pricing of some items far beyond their true worth. The novice collector has, regrettably, no way of knowing this until he has gained more understanding and knowledge

on the subject. As in all areas of buying and selling, knowledge and understanding are the best assets one possesses.

An excellent example of this is found in the misidentification of some early jet-age helmets (particularly USAF P-series types) by a handful of aviation memorabilia dealers. As mentioned earlier, the early P series helmets, which remained in use after newer types 'came into standard', were regularly updated to meet the latest Air Force TO Standard specs. Consequently, what is commonly advertised as being a 'P-1A' helmet by an unknowledgeable dealer may actually bear little factual resemblance to the original "as issued" P-1A helmet (due to the possible addition of a P-4 type external visor, bayonet mask receivers, upgraded communications sets, or possibly even a P-4/P-4 type helmet suspension harness fitted to a P-1A shell) that the advanced collector may be seeking. The only method by which one encounters true "as issued" original-specification P-1A helmets these days is when they have come from personal effects saved by a family that had a member on active duty in the Air Force at the time when the helmet was issued and who kept it when he left the service (shortly after it was issued or before it had been modified by T.O changes). As such, and usually painted in colorful squadron markings, these helmets when found today constitute a fascinating 'time-warp anomaly' discovery that makes them extremely valuable finds to the serious early flight helmet tyro collector.

Due to these pitfalls, care must also be exercised in buying flight helmets sight-unseen through mail order businesses, unless the seller is known personally, as attempts to 'rebuild' or restore helmets purely for resale profit potential can occasionally be encountered in instances wherein a somewhat less than completely honest dealer attempts to pass off a 'restored' item as an original. There is, unfortunately, no substitute for a visual, hands-on inspection of any helmet one is interested in, with reference to type, condition and originality, unless the dealer's reputation is well established.



Figure 21: This is a movie prop helmet, constructed for the TV series 'Air Wolf', despite realistic appearances.



Figure 22: NASA 'LEH-1' clam-shell, 1986.

Still another 'market-induced' practice that has come into being recently is the practice by some of buying old flight helmet shells and 'restoring' or 'rebuilding' them with new or surplus components. While some of these efforts are exceptional, there are far too many that are inaccurate, less than expertly crafted, and in some cases, completely incorrect. The careful and knowledgeable collector takes great pains to learn as much as possible about the history of vintage aircrew life support equipment so as to be adequately prepared to spot these 'phony' restorations and avoid them when they are clearly overpriced (some of the best information sources are the old military Technical Order manuals and publications that were used by life support personnel themselves).

A further effect prompted by the recently enhanced interest in military flight helmet collecting is price gouging, resulting from increased demand for an increasingly smaller number of items. Perhaps the best example of this is the current asking price for an HGU-20/P "clam-shell" (descendent of the original US Navy Aviator's Integrated Oxygen Helmet, or AOH-1). Originally produced in limited quantities by Robertshaw Controls (with sub-contractor Sabre Industries) in the mid-60s (and somewhat later by GENTEX for NASA), not many years ago few individuals actually knew much about this very unique and interesting helmet, let alone were willing to pay almost any price to obtain one. Operationally tested by both the US Air Force and the US Navy as an advanced design which provided enhanced wind-blast protection and eliminated the need for a discrete oxygen mask, the clam-shell design was found to be too cumbersome and visually restrictive for naval combat use and was ultimately retired after a short period of trial applications in USN F4B Phantom IIs, A-4 Skyhawks, and A-7 Corsair II aircraft. After limited operational testing by two squadrons of USAF F104s and F105s, using two custom fabricated 'clamshells' made to USAF specifications, the helmet was not procured for regular production under USAF contract.

Much later (early 80s), the same design was revived by GENTEX for NASA and issued to flight crews of the first STS space shuttle missions (up to and including the ill-fated Challenger mission in 1986) as an LEH crash protective helmet (known as the *Launch & Entry Helmet*, it was adopted virtually unmodified from the Navy's HGU-20/P except for the addition of a second microphone and a Kevlar shell). 16 unique NBC defense versions of the USAF's HGU-15/P variant were also made for testing in a joint USAF/Army chemical defense program at Aberdeen (aside from these 16 and the two custom made HGU-15/P helmets used in USAF operational tests, there were no other USAF HGU-15/P versions ever made).

At one time these 16 helmets and the HGU-20/P (US Navy version) were available for as little as several hundred dollars each on the open market. Today, excellent examples used in US Navy service routinely bring prices in excess of several thousand dollars! Surviving specimens of the ultra-rare 16 HGU-15/P helmets that were specially modified as NBC protective assemblies (which program began in April of 68 and ended in June of 70) can command as much as \$6000 or more. In a related but separate instance, as recently as April of 2004, a nice specimen of the first standard issue (1948) US Air Force hard helmet, the P-1, went for almost \$4000! Clearly, knowledge of the subject helps the collector negotiate this potential economic minefield more adequately. As might be imagined, as the

supply of these aerospace artifacts continues to dry up, the value of most flight helmet and flightgear continues to increase proportionately.



Figure 23: An extremely rare helmet and mask, the Russian ZSh-2 and KM-24, copies of the USAF P-3 and MS22001 mask, 1955.

THE FUTURE OF FLIGHT HELMET COLLECTING AS MILITARIA:

As this article is being updated (2011), existing stocks of many of the earlier jet-age flight helmets are in the process of being depleted and/or are disappearing. Some, such as original, unmodified examples of the early USAF HGU-2/P have become increasingly rare (most were attrited during the Vietnam war, unfortunately, and thus early HGU-2/P examples remain one of the less common finds today); others, such as the fascinating HGU-20/P 'clam-shell', are now beyond the reach of all but the most serious and/or fanatical collectors. Still, the story of these interesting artifacts of the jet age is richly rewarding both to those who are interested in the history of aeronautical protection equipment and to those who collect aeronautical memorabilia as a

hobby.

This is especially so now that many foreign jet-age helmets of other nations (many formerly hostile enemies of the US) are currently finding their way into this country and comparisons between foreign and US design approaches are revealing interesting advances in the evolution of aircrew protection technology which the US did not instigate or even fully consider! Examples of this may be found in Russian (formerly Soviet) aircrew helmets (ZSh-5 and ZSh-7) which featured visors that automatically actuated upon ejection, and in occipital air bladders which served both to help combat negative G effects (termed 'G-LOC', or '*Gravity-induced Loss of Consciousness*') and hold oxygen masks more firmly to the face during high-G maneuvering. In both areas, Russia pioneered development of the technology that is today considered mandatory for enhanced safety in advanced fighter operations. The use of a snap-strap secured hard visor, such as found on the current US Air Force HGU-55/P helmet, was actually introduced by the French at a much earlier date! The interesting and somewhat hard to find Chinese TK-4A pressure helmet is another unusual design that combines features of several different design approaches; bringing to mind older helmets such as the US MA-2 and English Taylor model E pressure helmets, the TK-4A also resembles more modern pressure helmets such as the USAF HGU-8/P and the HGU-20/P in certain aspects. Additionally, due to the fact that both 'Cold War' nations (the USA and USSR) routinely studied and copied each other's designs, an unusual Russian P-3 helmet copy designated the ZSh-2 (used with a Russian MS22001 mask copy known as the KM-24 oxygen mask) is today a *very, very rare helmet* and a seldom seen type in the West. When an example does surface, the cost may be reckoned in the multiple thousands (for serious collectors only!).

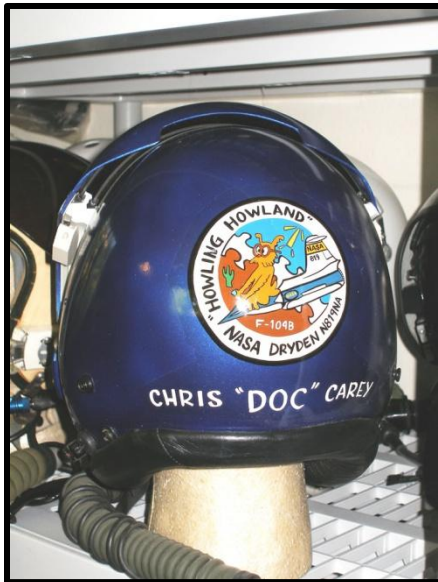


Figure 24: An example of a 'presentation helmet', decorated and presented to commemorate an event or aircraft.

If asked to make a personal list of a few of the most sought after and scarce jet age US aircrew helmets today, we would have to include all the early US Navy helmets (H-1 through H-5), all the early USAF helmets (from original P-1 through P-3), all of the early USAF Pressure helmets (including the K-1, MA-2, MA-3, HGK-13, etc.), clearly the 'clam-shells' (especially the very rare prototype USAF HGU-15/P 'Windblast Helmet', if one still exists, and NASA LEH versions), the TLSS helmet, The US Navy HGU-35/P, the HGU-51/P ICDS NBC helmet, the HGU-53/P, and so on. The list of rare and valuable, not to mention historically significant, helmets is almost endless.

With authentic, original examples of older jet-age helmets starting to become scarce, collectors must be especially watchful for unscrupulous individuals advertising helmets for sale at great cost as 'genuine', that have been 'built-up' (or put together from parts and pieces, and often inaccurately). Most reputable dealers take pains to be honest in their business, but there are a notable few who take grossly unwarranted liberties in this manner. A number of these are

found lurking on eBay and other 'on-line' auction sites (as always, caveat emptor!).

On-line auction houses such as eBay have had both a positive and negative effect on aeronautical flight helmet collecting; while prices for examples offered frequently rise way out of proportion to their actual value to a knowledgeable expert, a plus side is that many, many interesting specimens come to light that would otherwise not become discovered or found. One type of helmet that has recently become more and more popular on venues such as eBay is the 'presentation helmet', a restoration that may be intended to represent an original. These are sometimes given as gifts to departing aircrew by their squadrons but many are offered directly for sale (on ebay).

Hopefully, however, reason, a sense of proportion, and a spirit of fairness shall prevail as retail business and commercial speculation in the growing hobby of collecting aircrew protective helmets heats up, driving flight helmet prices unrealistically higher in a continuing cost escalation to the hypoxic sub-stratospheric heights wherein such items were originally intended only to serve as protection for their wearers!

Addendum: Presently, three very valuable and useful internet flightgear groups exist on the web for collectors and life support historians. Originators of the concept are Sven Schaffers and Ron Kraan from the Netherlands, whose site '[Flightgear-on-Line](http://www.flightgear.dk/)' may be found at (<http://www.flightgear.dk/>). Perhaps the most useful site, frequented by more 'serious' individuals interested in life support history is the Yahoo Group '[Flying Clothing Forum](http://groups.yahoo.com/group/flyingclothing/)' (<http://groups.yahoo.com/group/flyingclothing/>). The purpose of these internet sites is to serve as a central information exchange for anyone interested in flightgear and aircrew life support subjects (helmets, oxygen masks, ejection systems, survival equipment, etc.). Membership in the first group is open to all



Figure 25: Another rare helmet, the two-part modular helmet design, flight tested at DFRC (used to investigate multi-mission modes).

without qualification, while membership in the second is limited to nomination or invitation only (a petition for membership is seldom refused, however). Moderator of the 'Flying Clothing Forum' is Colonel Steen Hartov of the Royal Danish Air Force. One last internet site that is of exceptional value is the work of the *Flying Clothing Forum's* moderator. Containing an anthologized body of information and pictures of flightgear, '[The Best of Flightgear](#)' is well worth a visit on just about any question relating to modern military aviation flightgear. ['The Best of Flightgear' is a development of 'Flightgear on Line'.]

Thanks to NASA, Lockheed-Martin Skunk Works, and Trey Turner III of Check-6 Aviation for a few photographs used in this article; most of the others belong to the author.



Figure 26: An illustration that appeared in an early 1950s issue of AIR FORCE MAGAZINE

PART II: A History of the US Air Force P-series Protective Flight Helmets

By Christopher T. Carey, MA

Of all the so-called 'hard' or 'jet-era' protective flight helmets produced in the United States since the introduction of enhanced protection requirements (the need for which was prompted by the use of the new turbojet engine to power military aircraft), the most interesting to me have always been the very first USAF issued designs from about 1948 through approximately 1959.

When the *National Security Act of 1947* resulted in (among other things) the emergence of the US Air Force as a separate service, the requirement for a pilot's protective military flight helmet had already been issued under the aegis of the Army Air Forces command and a design finalised. US jet aircraft, notably the P-80 *Shooting Star* (the first standard production American combat jet aircraft generated in large numbers), had been flying operationally since about mid-1945. Just as the pilots of these aircraft lacked adequate head protection (necessitated by the higher performance of their machines), so too did the aircraft themselves lack any sort of vestigial provision for rapid, safe emergency egress (ejection seat systems), other than the traditional 'bail-out' over the side of a stricken craft.

Prior to the institution of a standard protective helmet design for use by all high performance aircraft crews, a number of unofficial and innovative designs were used by the earliest jet aviators--

particularly by the pilots of the new Lockheed P-80A *Shooting Star* squadrons, whose personnel devised interim cockpit 'bump protection' in 1946 by using the rigid fiber shells from WWII 'tank crew' helmets as an outer shell over existing soft AN-H-15 (summer), A-11 (winter), and A-10 (summer) flying helmets.



Figure 27: The USAF P-1 helmet, shown in use with an A-14 demand oxygen mask.

US Army Air Force Specification number 3277, drawing number 47R3184, resulted in the very first hard protective flight helmet, designated the 'Type P-1 Flying Helmet'. This was the result of Technical Order (TO) 13-1-37 / WF-(A)-O-17 Dec 1948, originating from Wright Field's aeronautical laboratory. At about the same time, the first ejection seat systems were being introduced into jet aircraft; it is interesting to note that Army Air Force air research and development investigators had actually been concerned with and were actively looking into the pressing problem of how to exit a high performance aircraft safely, somewhat in advance of parallel concerns about protecting the head of jet fighter and bomber aircrewmembers who flew the machines. Further, no less an authority on aviation medicine and flight physiology than the US Army Air Corps' Dr. Harry Armstrong had much earlier (late 30s) investigated the possible benefits of rigid protective helmets for aircrewmembers (but ironically found them 'impracticable').

Over the next 15 years (from about 1947) the Type P-1 Flying Helmet (substantially based upon pioneering studies undertaken by the Dr. Frank Lombard group) gradually evolved into its final configuration (known as the Type P-4B), a process that is best understood by modest familiarization with a profusion of complex USAF technical orders (TOs) that accompanied the updated specifications. Just how these changes regulated identification of the P-series helmets will be discussed briefly here, in hopes that this will enable those who are fascinated by modern flight protective headgear to more readily understand and identify the differences between all the variants of the important 'P-series' helmets, that were our first US Air Force issued 'hard' protective pilot headgear.

[One final note: Although an earlier type designated helmet was frequently upgraded to a subsequent specification, new production helmets manufactured at the precise moment a specification was in force were also given the same 'current type designation'. Thus, a type designation could be borne equally by both an older helmet (through T.O. upgrading) and a new one, by virtue of simply being a newly manufactured unit made to current specifications. This fact has created endless amounts of confusion, as regards positively and correctly identifying a particular P-series helmet today, and it is the chief reason why so many factors must be considered in deciding what designation a P-series helmet should properly bear in a chronological history.]



Figure 28: US Air Force pilots wearing early P-1 helmets for flight training, late 1940s.

Detailed descriptions of the P-Type Helmets

THE TYPE P-1 FLYING HELMET

This first hard protective helmet, the forebear of all US protective flight helmets today, came about as per the Wright Field Aircrew specification referenced above. Identified as Stock Number 8300-396400, this helmet was not intended to enable a pilot to survive a crash as much as to provide head protection within the close confines of the jet fighter (and bomber) cockpit. Thus, 'crash-helmet' is a misnomer and actually somewhat misleading. 'Hard-hat' and 'brain-bucket' were vintage slang terms in favor among US pilots for these items, while 'bone-dome' was a distinctly British (RAF) term in use, as the first hard helmets came into service on both sides of the Atlantic (the very first RAF rigid protective helmet was the Mk. I, which was a two-piece concept, with the outer shell being worn over the RAF type "F" and "G" soft fabric communications helmets). There were many other slang terms for these items of 'personal equipment' that were somewhat less polite and the new helmets were at first not readily accepted by all air crews, who sometimes found them awkward to wear, visually restrictive, and uncomfortable to get used to. [There is at least one authenticated report of a pilot removing his early hard hat and using it to relieve himself, rather than leave the controls of a multi-engine type aircraft.]



Figure 29: The interior of a P-1 helmet (the earphones have been removed): note the black mask tabs inserted through the black edgeroll.

The US Army Air Force Type P-1 Flying Helmet (for as such it was first known) was constructed of pressure and heat molded laminated cotton duck fabric that had been saturated with phenolic-resin (essentially similar to "Bakelite", early plastic materials). It was produced in one shell size (based closely upon the original 'Lombard helmet' design) and used an internal head suspension sling of then-conventional design (similar to that used in Army infantry helmet liners and tanker crew helmets), consisting of a leather and cotton sling that could be adjusted through the use of laces at the rear to accommodate just about any size head. [Anecdotally, it is interesting to note that a study performed by the RAF in the 1950s found that pilots of fast, high performance (fighter) aircraft tended to have smaller head sizes than those who flew slower, multi-engine (bomber and transport) machines. We will stop short of engaging in any speculation about the size of the cranium in relation to the size of the pilot's ego, but the possibilities for formulating idle hypotheses thereupon are fascinating!]

The P-1 shell was issued in semi-gloss, off-white color paint, although it was not unusual to find them subsequently painted to suit the wearer's whims, with colorful personalised or squadron



Figure 30: A front view of an upgraded (to P-1A status) P-1 helmet; note the characteristic cross-stitching on the edgeroll, signifying modification.

markings added in the field. The P-1 head-suspension sling crown pad was imprinted in white with 'Army Air Forces' (this was very soon thereafter changed to 'US Air Forces', and still later 'U.S. Air Force', when the service became independent of the US Army in late 1947). While I have no absolute (documentary) evidence that the earliest P-1 helmets were issued with a winged star decal on the outer forehead segment of the hard-shell (as in the manner of the 'US Air Forces' decal found on the subsequent P-1A), my resources indicate that many did feature a decal of the traditional Army Air (Corps) Force winged star on a blue circular field (not unlike that used later, but without the lettering). Numerous photos and images from this period appear to provide evidence of this fact. The early P-1 head sling was identified by a woven black label that read "Sling Assembly for helmet, Pilot's Protective, Type P-1, Drawing no. 47D3185, Contract no. W33-038-AC1947S-(19413)". A manufacturer's name appeared in the last line and as per usual there were a number of primary subcontractors who produced the sling (among them Switlik Parachute Company, The Selby Shoe Company, The Bates Company, & the Joseph Beugelson Company). The P-1 head sling purportedly enabled a wide range of sizing adjustment, from about 6½ through 7¾, in use with the standard single size hard outer shell.



Figure 31: An original P-1 helmet that has not been upgraded to P-1A status; note earphone cushions have deteriorated and been removed.

The P-1 type sling, initially made of leather and OD cotton fabric, was later made of leather and nylon fabric (starting with subsequent TO versions of the P-1: P-1A/P-1B). Standard military white parachute riser cord was used to attach the sling to the hard shell and this is identified in the P-1 TO as being "Cord, Nylon, Type III, Spec no. AN-C-63", from which the inner core strands had been removed. The Type P-1 helmet did not have a fixed (riveted) chin strap as did later upgraded versions, but instead could be secured to the head if the wearer desired, through use of a chin cup that attached to the lowest of the snaps on the oxygen mask mounting tabs. Invariably, when an A-14 or A-13A mask was worn with the helmet, the mask itself served as a head securing mechanism. There was no nape strap on the P-1 helmet (as with P-1A/P-1B). Further, photographs we have seen of the original P-1 helmet show it to

have a black rubber edge roll that is distinctively different from that fitted to the P-1A/P-1B helmet; this fact is substantiated by examination of actual surviving specimens. The P-1 helmet also had black-finished leather oxygen mask tabs positioned on either side of the front face opening *that protruded through the edge roll*; each tab was fitted with three screw-threaded snaps for securing either the A-14 Demand Oxygen Mask or the A-13A (later MS22001) Pressure Demand Oxygen Mask. Later P-helmets used brown-finished leather tabs and had light tan rubber edge rolls of a slightly different construction *that did not protrude through the edge roll beading*. A paper specification label was fixed to the inside of the hard shell in the area where a nape strap would later be added (in compliance with the P-1A TO).

The Type P-1 Flying Helmet used three communications headsets. Type HS-33 was initially used, later the HS-38 headset, and finally the HS-38A headset, all of which featured the same kapok-filled, chamois leather covered earphone cushions found in all existing soft (leather or fabric) flying helmets, although the cushion attachment method differed from that used in the later P-1A TO upgrade. Active radio communications elements of the earliest original P-1 (HS-33/HS-38 loom) initially consisted of

the standard ANB-H-1 (WWII type) electromagnetic earphone receivers, identical to that in use on all soft fabric and leather US Army Air Forces flying helmets from WWII onwards; these receivers were used with both the HS-33 and HS-38 headset communications looms. Somewhat later, the P-1 headset specification was upgraded to HS-38A specification, which incorporated slightly different receiver elements and used the JK-48 female mic connector, and the U-75/U comm. connector.

One important feature of the original P-1 helmet is found in the original manner of attaching the HS-38 headset cushions. The P-1 helmet initially used a system of earphone mounting retainer 'flaps'. These leather flaps were situated above and below the earphone hard-rubber holders on each side of the helmet and the cushions were secured in place with these flaps. This system proved less efficient than desired in actual flight use and in the subsequent P-1A design, earphone pads were attached via lacing at top (to the head sling harness) and bottom (to the bottom left and right hard shell). The original US stock numbers for the later HS-38 and HS-38A headsets used in the P-1 helmet (and also in the subsequent P-1A) were "Electric Headset, 1790-207625000 or 1790-207625500" and "Electric Headset, 1790-207626000". The early P-1 HS-33 type headset featured a single PL-54 type phone



Figure 32: An original, unmodified P-1 helmet (very rare indeed).

jack plug on the end of its com cord; initially there was no microphone connector attached on the left side of the helmet shell that connected to the headset cord. Later, when the HS-38 headset was adopted, a microphone female connector was installed on the left helmet shell that was part of the headset communications cord. When the later HS-38A headset was adopted, the U-75/U communications connector replaced the single standard phone jack connector on the distal end of the helmet's 'pigtail' communications cord (that exited from the rear of the helmet shell).

The P-1 helmet, in its original, non-TO-updated issue configuration (with early HS-33 headset and ANB-H-1 receiver elements), is today among the 'rarest of the rare', and examples that are still able to be found have inevitably been upgraded to later specifications. Most have long since disappeared as these helmets easily suffered structural failures in flight use and were taken out of service to be destroyed.

Only a very few examples are now to be found and these were usually kept by the families of pilots to whom they were issued and whom had

left the Air Force before the P-1A specifications were introduced. In terms of rarity, the Army Air Force Type P-1 Flying Helmet is on par with the original US Navy hard-hat design, the H-1 (of which also very few surviving examples are to be found today).

Although the P-1 specification (3277) is dated 1948, quantities of the new helmet were very limited at first and thus it was in short supply among US Air Force flying personnel at the onset, when introduced; photographs may be seen of P-80 pilots who were still occasionally wearing the soft tan ANH-15 & A-10 summer flight helmets, or the brown leather A-11 well, into the 50s (this was especially true for training applications, particularly in propeller-driven aircraft such as the T-6, the P-51, where the soft fabric helmets continued in standard use for many years). As might well be understood, the first P-1 hard hat issue was prioritised for first-line, high performance, jet fighter aircraft crews. Before many of the helmets had been issued, however, the P-1 was upgraded to newer P-1A specifications and therefore there were not great numbers of the original, unmodified design manufactured (we are presently uncertain of specific numbers produced). By the time the Korean War

began, the P-1A specification had been issued and most of the hard helmets used by US Air Force personnel when that war began were either originally manufactured as P-1As or had already been upgraded to P-1A specs. Of additional interest from a historical standpoint is evidence (Col. Ralph Parr, quoted in the new book *Hot Shots: An Oral History of Air Force Combat Pilots of the Korean War*, ISBN 0-688-16455-2) that highlights the scarcity of these original hard-shell protective helmets at the onset of the Korean 'Police Action'. Col. Parr states that in early June of 1951, as he entered active Korean combat in the new F-86 Sabre, he was using a 'broken helmet' (presumably a P-1) that was held together with duct tape; he further states that these helmets were so scarce that several of the pilots in his squadron flew wearing the type of plastic football helmet that were in use in the early 50s by college football players (that the pilots themselves had brought over to Korea, or had sent to them from the US by relatives). This fact probably had at least something to do with a later decision to 'reissue' the P-1A (leading to the P-1B type re-designation), after it was found that the older helmets were still needed by aircrews after the P-2 concept was cancelled.

One final note concerning the original P-1 helmet: Many original P-1 helmets that were upgraded to P-1A specs will feature what seems at first to be a peculiar cross-stitched area on the forward bilateral edges of the edge-roll beading (about where the mask suspension tabs are located). This is because the original black leather tabs protruded through the beading and when they were removed and replaced by the newer (P-1A spec) types, the edge roll beading was stitched up and the new tabs were fastened to the *inside* of the helmet edges. This cross-hatched stitching is direct evidence of a P-1 helmet that has been upgraded to P-1A specs.

THE TYPE P-1A FLYING HELMET

The P-1 helmet, while it provided pilot basic protection, was far from perfectly configured for comfort and functional adequacy. As mentioned earlier, the 'flap attachment' provision for securing headset earphone receivers was shown to be somewhat less than desirable. Further, the lack of a secure chinstrap was another shortcoming. The forces encountered in high speed ACM (aerial combat maneuvering) required that the helmet remain fixed in place without slipping out of proper adjustment on the head. Further, with the adoption of ejection systems in the new jets, proper helmet fit, retention and positioning were even more of a pressing requirement. Several steps were therefore taken to address these shortcomings with the introduction of a riveted (permanently secured) chin strap that went under the chin, rather



Figure 33: The P-1A helmet was a slightly modified P-1, 1951.

than around it. Additionally, it was shown that an additional strap, fitted so that it ran crossways behind the cranial occiput ('nape strap'), helped considerably to maintain proper helmet adjustment for the wearer. At this time, rubber framed goggles of the B-8 or M-44 type were commonly used with the P-1 to provide eye protection. Modifications subsequently taken to the basic P-1 shell included the addition of a fixed chin-strap, addition of a nape-strap, installation of the HS-38 headset cushions with Nylon cord attachment (Type I, spec No. AN-C-63) at the top of the cushion assembly (to the head harness) and at the bottom (to the helmet shell itself). A final modification involved upgrading of the



Figure 34: An interior view of a P-1A helmet; note the so-called "doughnut" earphone cushions (kapok filled chamois), characteristic of P-1 through P-3 helmets.

oxygen mask leather attachment tabs, through removal of the original black finished tabs *that protruded through the black helmet edgeroll*, and replacement with light brown finished leather tabs *secured to the inside of the helmet shell*. The headset receiver elements themselves and communications plug remained initially unchanged.

A P-1 helmet, thus modified, was specified as the P-1A. As was the usual practice, any older P-1s in use when the new spec came into 'standard' were upgraded to the newer specification, but any new units manufactured during this period were produced already incorporating these improvements into the new production stock. Whereas the P-1 shell was made in one size that accommodated all heads, via adjustment of the head harness sling, the P-1A helmet shell was made in two sizes (small and large). This was an important innovation that made a proper, comfortable fit more readily achievable. The head harness slings used in each of the two shells again permitted more precise adjustment. Finally, a unique identifying characteristic of an original P-1 upgraded to P-1A specifications is a cross-hatched lacing of the front lateral edgeroll, where the edgeroll was sewn shut with heavy duty light colored thread after the original protruding mask suspension tabs had been removed and replaced.

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Figure 35: A USAF P-1B helmet, virtually identical to the P-1A predecessor (1952-3)

THE TYPE P-1B FLYING HELMET

The type P-1B Flying Helmet specification was created through a change in designation nomenclature only and the P-1A and P-1B helmets are otherwise identical in all respects. This came about as a result of a rescinded decision to take the P-1A out of standard service when the P-2 helmet design was cancelled; as demands of the new war in Korea required more and more of the new aircrew protective helmets, and in the face of a critical shortage of flight helmets, the P-1A was re-introduced into standard issue with the designation P-1B (reference earlier remarks made by Colonel Ralph Parr of the 18th Fighter Wing--F-86 Sabre, Korea). There are no differences between the P-1A and the P-1B helmets; they are essentially the same helmet, with the annotation that the P-1B is a

'reissue' specification that was ordered to supplement the supply of the existing new P-1A hard protective helmets



Figure 37: A rare front view of the P-2 prototype.

replaced its original H-1 helmet (and the subsequent H-2, which was somewhat similar) with their new H-3 design (using the two-part helmet concept) that consisted of a two-component (soft inner/hard outer) assembly. [The Navy H-3 was in turn replaced by a slightly modified version known as the H-4, before the original integrated one-piece assembly approach was once again adopted in the short-lived H-5 integrated helmet. After a very short period of service, the H-5 was replaced by the new APH-5 in 1958]. The USAF P-2 design is shown in several Wright Patterson Aero Lab photographs as being a hard P-1 type white phenolic resin impregnated cotton duck shell

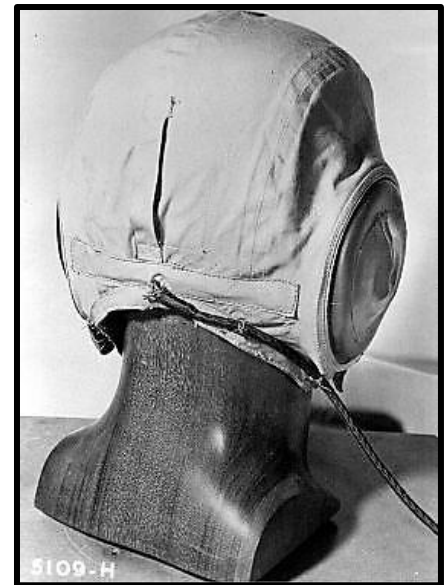


Figure 36: The inner soft communications helmet assembly worn with the P-2 shell.



Figure 38: A front view of the prototype P-2 helmet with MS22001 mask.

THE TYPE P-2 FLYING HELMET

Although conclusive research has not yet been definitively completed on this designation, existing evidence suggests that the Type P-2 Flying Helmet was a limited, non-standard research prototype design developed by Wright-Patterson Aeronautical Labs as a 'proof of concept' application of the new US Navy approach of utilising a soft fabric (nylon) helmet to hold the communications headset under a hard outer protective shell. The Navy experimented with this two-component helmet idea and

used over a conventional USAAF type A-10 khaki poplin flying helmet (to which the communications headset was configured). Presumably, the headset used was the HS-38 or 38A headset and the photographs referred to show an A-13A/MS22001 type mask in use that is attached to snaps on the leather tabs of the A-10A helmet. Otherwise, the outer rigid shell features the same conventional design P-1A type leather/nylon head suspension sling.

Fit accommodated the slightly extra protrusive bulk of the inner A-10 helmet. Although to this date, these facts have not yet been confirmed to us officially (research on the mysterious 'P-2' is still underway), these hypotheses appear to be reasonably certain, based upon several archival photographs referred to earlier. Seemingly, for unknown

reasons the Air Force found that the Navy concept was unsuited for Air

Force use and the original one-component, integrated design of the P-1A helmet was kept and simply updated on a continual basis until about 1959, when the entirely new HGU-2/P helmet was introduced. [Of interest is the fact that the RAF initially also used a two-part helmet design in their Mk.I hard shell outer helmet used over a fabric G-type helmet, which paralleled the US Navy's originally rigid helmet approach.]

[One additional fact has emerged that has led to some confusion among a few individuals who have erroneously identified P-1A/B helmets as being of P-2 specification. This is due to the fact that immediately prior to the US Air Force's decision to cancel the P-2 production, an unknown number of head harness slings with woven labels identifying them as "Head harness, Type P-2", were commercially produced on sub-contract. When the P-2 helmet order was cancelled, stocks of these 'P-2' head harnesses were used as replacement units in existing P-1A and P-1B helmets. It is important to reiterate that the P-2 helmet was never produced or issued to aircrew; these P-2 harnesses are not to be misconstrued as being evidence that the helmet they have been used in is a genuine 'P-2 helmet'.]

THE TYPE P-3 FLYING HELMET



Figure 39: Breathtakingly rare: a pristine, new USAF P-3 just taken out of the box after storage for over 56 years.

In 1950, a further modification was undertaken to add wind-blast protection to the P-1 style helmet. With the introduction of aircraft ejection seat systems, pilots no longer needed to attempt a manual 'bail-out' over the side of a stricken aircraft. Speeds, performance capabilities and wind-blast hazards were simply too great to insure aircrew survival in such situations. The old B-8 rubber framed goggles were thus replaced by a new rigid side-latching external visor assembly. Wind tunnel experiments had shown that rubber goggles tended to be blown off of the helmet in an ejection at speed and the new visor assembly, while still far from perfect, went a long way towards helping insure helmet and mask retention against the effects of severe wind-blast that

were a routine hazard of emergency ejection in the new jets. A series of prototype designs were examined and evaluated before a single design was settled upon. The early rigid, vertically articulated visor had two secure positions--full up or full down. It used a unique sort of ratcheted pivot-pin mechanism with each one of the two latches securing to a pinned triangular mounting plate positioned roughly at about the area of the helmet's temple on both sides. Springs were used to pull the helmet visor into the full-up position when it was lifted free of the temple pins by means of a positive forward and upward hand motion. This visor assembly was designated the PN 51C3632 assembly. Of central

interest is the fact that any P-1 helmet (P-1A or P-1B) to which this rigid visor assembly was added, automatically became re-designated as a P-3 helmet. The P-3 was otherwise identical in all respects and features to the P-1A and P-1B helmets. As before, all older P-1A/B helmets were upgraded to the new type designation as circumstances permitted and helmets manufactured after the TO change came into force were produced by assembly at the factory.

An item that is worth noting in passing is that due to the constraints of the Korean War on supplies in the combat areas, repairs to the headset cushion assemblies of P-1 and P-3 type helmets were frequently made using salvaged or cut-out kapok-filled chamois leather-covered cushion 'doughnuts' removed from AN-H-15 and A-10 type fabric helmets. Although the cushions were not absolutely identical in every respect to those used in the rigid P-series units, they were *nearly* so, and this explains the discovery of what appear to be AN-H-15 & A-10 type ear cushion units fitted to early P series helmets that were used in and around Korea from 1951 through 1953. For this reason it is therefore not technically 'incorrect' to 'restore' a helmet by replacing old, worn-out P-helmet earphone cushions with AN-H-15 and A-10 type units today when rebuilding these early items of headgear.

There was, after all, an expedient historical and practical precedent for the practice!



Figure 40: A P-3 viewed from the left side; note how the visor sits low above the eyes, due to the 'short J hook' visor.

Because of its superior wind-blast protection, and also because of its additional sun-glare protective function, the Type P-3 Flying Helmet was mandated for use in all high-speed, high performance jet fighters and bombers. Somewhat later slight modifications of the basic 'side-latch' rigid external visor were adopted. The differences between the original version and the later two, slightly modified versions are not readily apparent until helmets fitted with each version are compared side by side. The principal modification was two-fold: the protrusive 'tab' located at the top of the visor mounting bar was done away with and the length of the side latch securing arm was slightly lengthened. In the case of the latter modification, this small change permitted the visor to swing up completely out of the peripheral visual area of the pilot's face, whereas the original ratchet-securing articulation permitted part of the lower lens on both sides to slightly obscure the upper periphery of the pilot's field of view. [It is worthwhile to note that the rigid shaded visor lens used with the P-3 type side-latched visor came in three sizes (small, medium, and large); the required size was determined as being equal to the distance between the top center of the visor and its lower nose-bridge point and had nothing to do with the curvilinear lateral measurement of the visor lens itself (as has been sometimes assumed). The correct visor size for a wearer was established with a ruler, after the correct mask had been fitted to the helmet. The visor mounting bar assembly was referred to in official T.O. references as the visor 'yoke'.]

Other small changes that were incorporated into all the P-helmets at various times in the early to mid-50s included replacement of the original riveted chin-strap with a slightly modified one, addition of a chamois-covered, wool-cushioned pad to the helmet's chin-strap, replacement of the leather oxygen mask attachment tabs with slightly longer ones that made the snaps more accessible, and introduction of a slightly newer head-harness sling. Overall, however, the P-1A through P-3 helmets were virtually identical for the most part and only the new rigid external visor distinguished the P-1 series from the P-3 series helmet, for all *practical* purposes. All the early P-series helmets including the P-1 through

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Figure 43: A USAF P-4 helmet, 1955-56.

the P-3 helmets used the HS-33, HS-38, and HS-38A communications headset assemblies (AN-AIC-1), with characteristic chamois-covered, kapok-filled earphone cushions. The next major upgrade would come about with the introduction of the Type P-4 Flying Helmet specification in late 1955. [Of interest is the fact that chin straps found on early versions of the P-1A helmet—especially original P-1 helmets upgraded to P-1A standards--included olive drab cotton duck variants, as well as the white cotton duck straps that are more common.]

THE TYPE P-4 FLYING HELMET

The USAF Type P-4 Flying Helmet specification came about with the need to make helmet headset communications and oxygen mask

dynamic microphone compatible with new aircraft intercommunications sets of the AN AIC-10 standard. The year of 1955 saw a number of upgrades undertaken to modify the P-series flying helmets. In early 1955 all earlier type P-series helmets (P-1A/P-1B, and P-3 helmets) were updated with the new H-75/AIC headset. Originally, the A-13A/MS22001 masks had used, as did the A-14A mask, the ANB-M-C1 carbon element microphone. With the introduction of newer noise-canceling dynamic microphones (M-32/AIC mask microphone assembly and the boom-type M-33/AIC assemblies that were used through the early Vietnam period), the new H-75/AIC headset system was added to the earlier P-series helmets (the earlier HS-38 headsets and ANB-M-C1 microphones were not



Figure 42: Interior view of a P-4 helmet.

compatible with the new aircraft communications systems coming into use). Unlike the original HS-33/38 type earphone cushion design, the new earphone cushions used more modern cushioning material (open cell foam rubber, protected by a black 'Hypalon' external skin). More importantly, the new system did away with the original and simple system of using sponge rubber half-rings to custom adjust the HS-38 kapok-filled chamois cushions to the pilot's ears. The new earphone cushion assemblies were spring mounted and tethered to short nylon strings which protruded through the lateral helmet walls to be secured over a rubber lock-nut and snubber bar. A type U-93/U com connector was fitted to the distal end of the helmet communications 'pigtail' cord. Shortly thereafter (in July 1955), a slightly modified H-75A/AIC headset replaced the H-75/AIC assembly (TO 14P3-4-508). All helmets modified accordingly with



Figure 41: A P-4 helmet viewed from the left: note the higher visor position over eyes, due to the longer 'J-hook'.

the new communications assembly were type-specified to the new P-4 designation.

In 1955, all P-series helmets were officially upgraded to the new P-4 type specification, which called for the replacement of earlier headsets with the H-75B/AIC assembly. An earlier P-3 helmet, thus updated, became designated as a Type P-4 Flying Helmet. P-4 helmets, newly assembled were delivered directly from production runs with the new headset assembly. The P-4 helmet still featured, however, the early original heat/pressure molded phenolic resin saturated cotton duck shell. As before, the new headset used a rear exiting 'pigtail' communications cord, but the com connector was designated Type U-93A/U. Also, in keeping with the earlier P-1A/P-1B system, the P-4 helmet was made in two sizes (small and large) only. A type JJ-055 microphone connector was an important



Figure 44: Another composite 4-view of a P-4 helmet.

feature of the new headset specification, the adoption of which required use of a slightly larger rubber 'boot' that was stitched to the left rear outer area of the helmet shell to replace the older connector and boot (this is simple way of determining at a quick glance whether an early P-series helmet has been TO upgraded to later P-4 type specifications; an original HS-38 type mic connector would feature the smaller elongated 'U' type rubber connector boot for the earlier JJ-048 connector).

At about this time (1954-55), due to all the TO changes that appear to have been introduced to the P-series helmets, an already somewhat confused type designation system becomes slightly more so. Another change resulted in P-1A/P-1B helmets used without the side-latch visor assembly being re-designated the MB-4 helmet. It is important to note that the

MB-4 configuration (which was otherwise identical to the P-4, except that it lacked the rigid external visor) was apparently intended for use in non-high performance aircraft, such as slower, multi-crewed bombers, transports, and utility aircraft, in which the extra protection of a wind-blast visor was not needed and in which the protruding visor mechanism itself might pose needless range-of-motion encumbrances on a crew flight deck or within a flight station. Here, the confusion increases further, as the external visor assembly was frequently added to the MB-4 designated helmets arising from individual pilot preference, *although the rigid wind-blast visor was not standard to the MB-4 specification*. Thus, surviving specimens of both the MB-4 and the P-4 can both be found today with the visor assembly installed...a situation which has created some consternation on the part of helmet collectors, flightgear archeologists, and life support historians. However, despite this apparent incongruity, the MB-4 and P-4 helmets were given mutually distinct PNs and other identifying nomenclatural numbers, according to the TOs. TO 14P3-4-508 dated 11 Jul 55 specifies that "...any P-1A/P-1B helmet updated with the newer H-75/AIC headset system (and lacking the visor) will be designated as 'Helmet, Flying, Type MB-4'", whereas "...any P-3 updated to the (new communications) specification will be thereafter designated as 'Helmet, Flying Type P-4'". Any MB-4 helmet with the external visor installed became technically a P-4. One final observation here is of interest. The TO also specified that any helmet thus modified or updated would have the original helmet shell identification tag covered with a new, self-adhering tag signifying that the assembly had been upgraded. Although some helmets modified accordingly will still have this added tag in place, in some cases it has been removed by collectors interested in learning what the original shell label specified (or it may have

simply come off). Unfortunately, the label has not been placed back on the shell in compliance with the strictest spirit of authenticity, in many cases.



Figure 45: A USAF P-4A helmet, 1959 (with new center track visor articulation assembly) .

Thus, all the early P-series helmets including the basic rigid helmet and suspension systems of the P-1, P-1A/P-1B, P-3, P-4, and MB-4, were essentially identical to each other, with only small, technical differences in communications assemblies, subcomponent items, visors, and accessory parts variations. A P-1A or B helmet with the new side-latching rigid visor added became a P-3 helmet; a P-3 to which the new com system had been installed became a P-4. Etc., etc.

THE TYPE P-4A FLYING HELMET

In June of 1957, a new type visor yoke assembly was retrofitted to all earlier P-4 helmets. This consisted of the new visor mechanism that, while quite similar to the original rigid external visor assembly in superficial appearance, did away with the side latching design in favor of a uni-tracked visor securing system actuated by grasping a central rubber knob and pulling the visor down into position. Two positions were permitted, full up and full down just as in the original design, but the new knob actuation was grossly simpler and somewhat easier for a pilot to accomplish quickly and positively. This new assembly was fitted to all external visor equipped P-helmets in place of the side-latch design, and there were two yoke sizes (small/PN 51C3632-1, and large/PN 51C3632-2) and three visor sizes (small, medium, and large). The P-4A specification was applied to all P-4 helmets thus retrofitted, but newly assembled P-4A helmets made use of the new fiberglass shell material that replaced the earlier phenolic resin and molded cotton duck material. Unlike the earlier phenolic resin shells, the newer fiberglass shells were not subject to distortion under prolonged physical pressure and also absorbed impact forces in a more broadly distributed manner.

T.O. 14P3-4-1 dated 30 Apr 57 states that "...with the exception of the new center-track actuated rigid external visor, type MB-4 and type P-4A helmets are identical" (although the MB-4 sometimes had the visor added by bomber crews that used them, as mentioned before). Further improvements to newly manufactured P-4A helmets included the incorporation of *Ensolite* type closed cell sponge pads lining the internal surface of the new fiberglass shell at front, rear and crown (replacing the original, older open-celled sponge rubber used in early P-series helmets). As before, the headset used remained either the H-75A/AIC or H-75B/AIC specification, but the communications 'pigtail' ended in the U-93A connector (similar to the U-93). A further additional change that was instituted with introduction of the new P-4A TO specification



Figure 46: Your first visual clue to P-4A identity is the pigtail com-cord coming from rear of helmet shell (the P-4B did away with this feature).

was inclusion of an additional shell size: Extra-Large. The USAF PNs for the P-4A shells were as follows: Helmet, Flying, Type P-4A, Small, PN 56D3508-1; Helmet, Flying, Type P-4A, Large, PN 56D3508-2; Helmet, Flying, Type P-4A, Extra-Large, PN 56D3508-3. MB-4 helmets were, of course, originally P-1A/P-1Bs, and their PNs were: Helmet, Flying, Type MB-4, Small, PN 54D3733-1, and Helmet, Flying, Type MB-4, Large, PN 54D3733-2. Visors for the three P-4A shell sizes were: Visor, Small, PN 51D3643-3; Visor, Medium, PN 51D3643-2; and Visor, Large, PN 51D3643-1. In simple summary, P-4 helmets to which the new center uni-track visor system was added became P-4A specification.

THE TYPE P-4B FLYING HELMET



Figure 47: A nice P-4B helmet; note issue carry bag; the com cord is connected to the mask hose, but in this example, the cord keepers have failed.

again secured to the rigid helmet shell at upper and lower sections in a manner not unlike the attachment system used in the P-1A/P-1B helmet. Foam pads inserted between the earphone receivers and the shell were again used to adjust the cushions to the pilot's ears. This system would also be used in the following, new generation helmet (the HGU-2/P), before a return to a slightly different type of spring-lever loaded earcup would be reinstated in the even later HGU-2A/P helmet. [The reason given for replacement of the coiled 'tophat' spring-loaded earphone system in the P-4A was that some aircrew had apparently sustained severe injury in crash situations involving a crushing lateral impact on the helmet; in certain instances, it was found that the metallic spring units and their screw retainers could

In 1959, a final TO P-helmet specification was issued that consisted principally of a change in the headset communications cord assembly. The P-4B helmet specification did away with the helmet communications 'pigtail' cord and substituted a new helmet cord assembly designated the CX-4708/AIC. This allowed the entire earphone and mask microphone communications system to be integrated into the aircraft radio and intercom systems via the oxygen mask communications cord that connected the new H-149/AIC system headset. The active earphone receivers were updated to H79/AIC specs and the previously used, coil spring-loaded earphone cushion assemblies (known by the slang term 'top-hats') were done away with. Instead, in what might appear a 'retrograde progressive' move, the earphone cushions were once



Figure 46: The P-4B used a com cord that connected to aircraft via the oxygen mask .

actually be driven into the cranium, resulting in severe, non-survivable head injuries to the temporal region of the skull.])

While older P-4A helmets were updated in the field to the new P-4B specs, newly manufactured stock featured all of these refinements directly from the factory run. The external rigid visor on the P-4B was unchanged from that used on the P-4A. It should be noted that newly manufactured P-4B helmets had no rubber plug-filled circular orifice at the rear of the shell (where a former com cord pigtail exited); older P-4A helmets that had been updated by squadron personal equipment/life support techs to P-4B specs featured this black rubber plug in that orifice. As before, the JJ-055 mic connector jack (outlet on pilot's left) was used in the helmet earphone loom.

The early H-149/AIC headset, originally used with the late model P-helmets (B) and with the first of the HGU-2/P helmets that replaced the P-series, was used with the new CX-4707/AIC series oxygen mask hose routed communications cords (these last specification cords are still in use today in slightly updated



Figure 47: Note short side latching 'J-hook' on an early P-3 (2nd gen visor yoke).



Figure 48: Note longer 'J-hook' on a P-4 (3rd gen visor yoke)

configurations; the original cords were woven-fabric wrapped, while the more recent versions use polymeric insulation). [It is not altogether uncommon to find that a P-4A specification helmet was occasionally 'created' simply by cutting and removing the 'pigtail' communications cord, a modification which resulted in the functional equivalent of the new P-4B wiring loom!]

Notes on the P-series visors

The P-series 1st and 2nd model visor

As far as the P-series visors go, there are actually four definitive variations in the P-series evolution. The VERY early (original) P-series visors (1st, 2nd, and 3rd design) featured several characteristic design details that subtly set them off from the 4th and final refinement. The earliest (original) visor yoke used a side-latching method of securing the visor, but had no 'J-hook' extensions to hold the visor in the 'down' position. The 2nd and 3rd style side-latching visors did have these distinctive 'J-hook' latching arms. Both of the 2nd and 3rd style visors



Figure 49: Top, 2nd gen short J-hook' from P-3; middle, longer 'J-hook' from P-4; bottom, P-4A & P-4B assembly.

used successive evolutions of what we have come to term the 'side-latch J-hook' visor yoke, in that they lacked a center uni-track (as used in the P-4A visor and TopTex systems) and secured the visor in an up-position by spring activated reflexive retraction, and a down position by the positive engagement of the short 'J' arms (attached to the lateral aspects of the visor 'yoke' bar) onto the pins protruding from the temporal helmet visor-mount fixtures. The differences between the first three visor yokes may be seen in the accompanying photographs. The 2nd and 3rd 'side latch J-hook' yoke visor assemblies may be differentiated from each other by virtue of the short throw of the 2nd design's lateral 'J' arms (about 1", versus 1&1/4" on the succeeding version). The short throw of the 2nd design's 'J' arms was found to result in the protrusion of the lower visor edges in the upper peripheral field of the pilot's vision; this constituted a slight, but significant visual distraction--not something, as the popularity of the much later HGU-55/P helmet and the HGU-33/P cutaway visor-cover has borne out, that pilots welcomed in heated air-combat engagements. Further, the protuberant upward thrusting square flange on the visor bar on visor yokes 1 and 2, although intended to serve as a convenient gripping point for visor hand actuation, was found to snag on things (such as parachute riser shrouds) and also scratched canopies. The 3rd version of this original P-series visor came with this protuberant flange removed (close examination of one such later visor bar will reveal only a vestigial short stub where the flange used to be); furthermore, longer 'J' arms on the side-latching mechanism (about a quarter of an inch longer, but enough to do the job quite effectively) of the 3rd design allowed the retracted visor to secure in the open-position much higher on the helmet's forehead section--this removing the offending lower visor field's peripheral distraction up and away from the pilot's fields of vision. In the field, the early original visor yoke was sometimes field modified with addition of the longer 'J' arms, and the upward thrusting 'grip' flange was often manually filed off to a nub. [There were also two distinctly different, although superficially similar appearing helmet mounting attachment plates upon which the visors swiveled. Very few of the earliest type with a top pivot extension (rather than a bottom pivot, as found on the last type plate) remain today and almost all examples found on surviving early helmet specimens are of the second and finally adopted type.]



Figure 50: A P-4A helmet with Sierra Engineering Company bayonet receivers (MBU-5/P mask).

[One final observation is salient here. The earliest original 'side-latch non-J-hook' visors featured a curious circular perforation pattern in the external visor yoke bow. This may be clearly seen in some of the earliest images shown in Air Force technical publications. The reason for this unique pattern of holes in the outer visor yoke is still unknown at this time, but may have had to do with reducing wind-blast drag effect; subsequent to this appearance, the later yoke bows on all P-helmets are noted to all have been uniformly constructed of smooth (non-perforated) metal (aluminum).

The P-series 4th model visor

The 4th and final P-series visor design used the new 'center uni-track system', which is common to all P-4A and P-4B helmets (the early side-latch visors were used only on TO upgraded P-1A and P-1B helmets, and on P-3, and P-4 helmets). It retained the familiar springs on both sides for full up visor retraction, but relied for securing in full down positioning on insertion of the visor's spring steel

mounted and rubber knobbed ball-pin into a small square recess on the lower end of the track. Interestingly, this track was sometimes modified by the addition of additional holes spaced a short distance apart along the lower length of the track, so that variable positions of retraction could be achieved.

Lacking springs for positive self-retraction, Dr. Frank Lombard's *Protection Incorporated* TOPTEx system used a variation of the center *uni-track* idea but relied upon friction alone to allow variable positioning of the visor to allow the pilot to adjust its shading effect. Arguably the USAF spring-actuated, side-latching visor system came into use first, but it is entirely possible that the later improved USAF center-track visor system (P-4A & P-4B) was inspired by the TOPTEx center track system. (Practically speaking, both the original USAF side-latch system and the TOPTEx center-track system came into being at roughly the same time, as nearly as has been able to be determined.)

There were many complaints about the original side-latch visor from pilots; most reflected the fact that the visor was found to be somewhat difficult to engage and disengage the J-arms with a smooth one-handed motion. As the aluminum visor mechanism oxidised and gained a small layer of aluminum



Figure 51: A P-4A with the final 'center uni-track' visor actuation system (MBU-5/P mask).

oxide on the J-arms and as the visor bar got knocked slightly out of true in the course of use, this difficulty became more pronounced. Further, if the 'J' arms were not correctly positioned by personal equipment people to facilitate easy actuation of the 'J' arm engagement, after addition of the new visor to older helmets, this would also enhance the reluctance of the visor to engage and disengage smoothly. These were common complaints about the original P-helmet side-latch visor system.

While the later center uni-track system removed this problem, the old P-series visors were never an optimal design to begin with; further research into the matter by aircrew lab ergonomic engineers would have probably resulted in a better design, but concerns with the Korean War tended to divert attention away from 'minor' problems such as this that were deemed less important than the greater overall concerns of getting an effective wind-blast visor into issue.

In the broad and critical view of hindsight, the first P-helmet hard external visors were a simple and practically useful innovation for protection of aircrew against ejection airblast and canopy bird-strike hazards. They were, however, still marginal in the greater and final assessment of their usefulness, when benefits were compared to their drawbacks, snagging tendencies, and user-deployment awkwardness. It remained till later, with the development of the HGU-2/P & APH-5 type visor, that a substantially better design came into use, although it is interesting to note that even today, with all the advancements in aircrew protective equipment that have been made since 1950, the perfect flight helmet visor design has YET to be perfected!

[Some final bits of information bear recounting here: The original USAF side-latching ('J' hook) visor system was used in a few instances on US Navy H-3 and H-4 helmet shells, when Navy pilots found the hard external visor system preferable to use of their familiar old rubber-framed B-8 goggles in

extreme wind-blast situation (viz. as in ejections, which were a new concern prompted by increasing jet aircraft performance parameters). There are no known or recorded instances, however, where the later USAF type center uni-track visor system was ever used on a US Navy issue helmet. Finally, the USAF rigid P-helmet visor system was used on or copied by a number of other nations, in some cases with slight modifications that enabled them to work more effectively and with less difficulty. The Soviet Union itself produced a very near-copy of the USAF P-3 helmet and MS22001 mask in the mid-50s that they designated their ZSh-2 helmet and KM-24 mask, using it for limited studies and brief operational testing before electing to issue its own ZSh-3 series helmets to Russian aircrews.]

P-series oxygen mask attachments

The very first P-series oxygen mask attachment system used leather tabs (equipped with three internally threaded snaps), one on each side of the helmet's frontal face area. On the P-1 helmet these tabs were installed so that they *protruded through the black rubber edgeroll material*. Any older P-series helmet found today in that condition (or with the equally distinctive cross-stitched repair of these two edgeroll areas) is almost certainly an original P-1 specimen. Starting with the P-1A, the old black leather tabs were removed and new (but very similar) brown leather finished leather tabs (also fitted with three screw-snaps) were installed. In subsequent upgrade modifications, these tabs, located nearer the helmet's edge than in later versions, were replaced by tabs that extended a bit further out from the helmet shell edge (allowing easier access to the snaps).



Figure 52: Rarely seen, a short bayonet receiver system that snapped onto P-helmet leather mask tabs.

In about 1958 a new bayonet type mask receiver made of polished metal was installed on some late model P-series helmets. This kit, made by the Hardman Tool Company and known as the MD-1 kit, used a characteristic ratcheted bayonet sometimes known as the 'Christmas tree bayonet'. Both the



Figure 53: The Hardman Tool Company 'Christmas tree' bayonet receiver.

US Air Force and the US Navy used this kit on their helmets, along with a fiberglass or plastic MS22001 oxygen mask suspension cup attached by straps to the bayonets (the leather helmet tabs were removed when this kit was installed on the helmet). Shortly after introduction of the Hardman kit, an even newer mask suspension receiver & bayonet system was introduced by the Sierra Engineering Company of Sierra Madre California, which is still in use today (known appropriately enough as simply the 'Sierra Kit'). This kit used a bayonet that was initially of a single, straight blade type with a single strap eye, although later modifications used a two-strap design called the 'T-bayonet'. The Hardman kit was typically seen in use with the MS22001 type masks, whereas the Sierra kit was more commonly seen in use with the newer MBU-5/P hard-shell mask that was introduced in late 1958/early 1959. Ultimately, both

services standardized on the Sierra receiver and bayonet kit, but kept the Hardman type mask shell assembly.

Both the P-4A and field-updated P-4B helmets were initially fitted with the original leather snap-tabs for oxygen mask attachment, but the last examples of the late model P-4B helmet actually came from the Gentex and Consolidated Controls Company production lines (both major contractors for the last model P-4B helmet) with the Sierra kit already installed (the Air Force standardised on this kit for oxygen mask attachment). Although the last P-4B was provided with leather snap-tabs, these were quickly replaced by the early, single blade bayonet type Sierra system kits. A 'T-bayonet' was later used, but rarely on P-helmets (usually beginning with later HGU-2/P helmets in 1960)



Figure 54: P-helmet sling label sewn onto sling.

Notes on P-series head harness slings

The head harness slings used in P-series helmets were initially identified as to the specific specification of the helmet they were used in. That is, a P-1A head harness sling is labeled as such ('Head Harness, Type P-1A', etc.). Starting with the P-1A or thereabouts, the straps were made of sage green nylon instead of the original P-1 type OD canvas duck. This was true for all subsequent helmets in the P-series, although late in the 1950s a generic head harness sling was produced that was simply labeled "Head Harness, P-helmet, Universal" (although still marked for the correct size helmet to be used with and featuring the standard sage green nylon straps). Early universal head harness slings will also occasionally be found installed in helmets identified as "Sling Suspension, P-1 and P3".



Figure 55: The erstwhile 'false P-2 helmet' sling that was used as a replacement in P-1A and P-1B helmets.

As already mentioned, the earliest head harness slings (i.e. those found in the original P-1 helmet) had olive drab cotton duck straps joining the leather sweat band to the leather crown pad. The P-1 leather crown pad found in the original (earliest) P-1 helmets is marked with a white inked 'Army Air Forces' stamp. This was later briefly changed to 'US Air Forces', and in its final form (from about the P-1A onwards), with 'U.S. Air Force' stamped in white permanent ink on the central crown pad.

The earliest P-1 shells frequently featured a simple winged-star roundel (or 'meatball') on the front exterior of the shell. Starting with the P-1A, this had added to it the words 'U.S. Air Forces' in black lettering and still later to simply 'U.S. Air Force' (also in black lettering). These characteristics are frequently covered by or hidden under colorful helmet paint and personalised decorations that were

typical of Korean War vintage helmets. [Occasionally P-1A type helmets may also be found with the winged star roundel superimposed over the words "US Air Forces" in white lettering.]

Notes on P-series helmet specification stickers

The P-series helmets featured paper specification stickers attached to the inside upper surface of the shell (somewhat obscured from direct sight beneath the head sling webbing) with glue. Original specifications are given on this sticker, *including a stamped date of manufacture*, if the helmet is an original and not updated version. In the event a helmet underwent upgrading modifications (such as from P-1A to P-3, or from P-4 to P-4A or B), a second sticker would be placed atop the original indicating that the helmet had undergone modifications. The second sticker may be missing in some cases due to aging effects (glues drying up, etc.) and also the original sticker, as well, if the helmet has suffered from heat effects in storage. Since the paper would and often did become brittle, it isn't unusual for these paper tags to become very friable and simple disintegrate or crumble.

Quite often, individuals who lack understanding of the process of upgrading a helmet to newer specifications will offer a helmet for sale to a collector as an original (issue) version (such as a P-1, since that may be what the shell's sticker states), when in fact the helmet has undergone upgrading in communications or visor components that actually make it a 'newer' specification, per the Technical Order (TO) specs.

Older, unmodified and original (unaltered from issue specifications) are always substantially more valuable and historically significant than a helmet that has undergone upgrading.

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A final word: This history does not claim to be a definitive history of the P-helmet development story, but it is based upon a collection of documentation from a wide range of sources that include official USAF technical reports and orders, personal statements from former military personnel involved with life support activities, and other similarly collected material. You are encouraged to contact us with information that may have bearing on this topic, so that any needed revisions or inaccuracies may

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APPENDIX I: T.O References

Note: The below tables contain specific T.O. data, applicable dates, and sources for specifications and changes made for all P-series pilot protective helmets. (The following information is a condensation of important technical order changes and specifications that apply to each of the succeeding developments in the P-series evolution.)

USAF Pilot Protective Helmet Type P-1
FORMAT: ITEM...DESCRIPTION...SOURCE
Specification: 3277 T.O. 13-1-37, 15 Dec 1948
Shell: Laminated phenolic-treated cotton duck. One size (small). Chris Carey
Edge beading: Black. T.O. 13-1-37, 15 Dec 1948
Mask attachment: Studs on leather tabs <i>protruding through</i> the black edge beading. T.O. 13-1-37, 15 Dec 1948
Nape strap: None (part of upgrade to P-1A) T.O. 13-1-48, 25 Aug 1950
Chin strap: Attached with fasteners to studs on the oxygen mask attachment tabs. T.O. 13-1-37, 15 Dec 1948
Visor: None. Used with B-8 flying goggles. T.O. 13-1-37, 15 Dec 1948
Comms: Initially set up with HS-33 headset with PL-54 plug on pigtail, then modified with JJ-048 micro phone plug and PJ-291 male plug together with PL-54.
Later (pre-Dec 1948) modified with HS-HS-38 with U-75/U plug (a picture in T.O.13-1-37, page 1, shows a comm cord plug that is too big to be a PL-54 and microphone plug on sinister side of helmet shell, and the text refers to a composite connector plug) T.O.13-1-37, 15 Dec 1948 and Chris Carey
In service: Before 15 December 1948 (probably ordered early 1947 as crown pad is inscribed Army Air Forces). Helmet authorised by T.O. 00-30-41 (date?) T.O. 13-1-37, 15 Dec 1948 (later changed to T.O. 14P-3-4-1)
Withdrawn from service: Disappeared gradually from 25 August 1950 as P-1 helmets were T.O. upgraded to P-1A standard. T.O. 13-1-38 25 Aug 1950

USAF Pilot Protective Helmet Type P-1A
FORMAT: ITEM...DESCRIPTION...SOURCE
Specification: MIL-H-5290 T.O. 14P3-4-507, 15 Nov 1955
Shell: Laminated phenolic-treated cotton duck. Small and Large T.O. 13-1-38, 25 Aug 1950
T.O. 13-1-40, 3 July 1953
Edge beading: Originally white, turning dark tan with UV exposure (or black, if modified from P-1). T.O. 13-1-37, 15 Dec 1948 and Chris Carey
Mask attachment: Studs on leather tabs fixed inside of the edge beading. T.O. 13-1-38 25 Aug 1950
Nape strap: Yes T.O. 13-1-38, 25 Aug 1950
Chin strap: Riveted to helmet shell T.O. 13-1-37, 15 Dec 1948
Visor: None. Used with B-8 flying goggles. T.O. 13-1-38, 25 Aug 1950
Comms: HS38 or HS-38A with U-75/U plug. T.O. 14P3-4-508, 11 July 1955
In service: 25 August 1950 or earlier. Depends on whether production of new P-1As was initiated before T.O. 13-1-38 was issued. T.O. 13-1-38, 25 Aug 1950
Withdrawn from service: Some were modified into P-3 standard from 3 July 1953 and others into MB-4 from 11 July 1955. Still in service by 15 Nov 1955, but not mentioned by 1 Dec 1955 T.O. 13-1-40, 3 July 1953
T.O. 14P3-4-508, 11 July 1955
T.O. 14P3-4-507, 15 Nov 1955
T.O. 14P3-4-510, 1 Dec 1955

USAF Pilot Protective Helmet Type P-1B	
FORMAT: ITEM...DESCRIPTION...SOURCE	
Specification:	MIL-H-8003 T.O. 14P3-4-507, 15 Nov 1955
Shell:	Laminated phenolic-treated cotton duck. Sizes Small and Large only.
Edge beading:	Originally white, turning dark tan with UV exposure
Mask attachment:	Studs on leather tabs
Nape strap:	Yes
Chin strap:	Riveted to helmet shell
Visor:	None. Used with B-8 flying goggles.
Comms:	HS-38 or HS-38A with U-75/U plug.
In service:	Produced from October 1953 or earlier (Not mentioned in T.O.s before 11 July 1955).
Label from P-1B helmet:	T.O. 14P3-4-508, 11 July 1955
Withdrawn from service:	Some might have been modified into P-3 standard from 1955 (not mentioned in T.O. 13-1-40, 3 July 1953!), while others were modified into MB-4 from 11 July 1955. Still in service by 15 Nov 1955. T.O. 13-1-40, 3 July 1953
	T.O. 14P3-4-508, 11 July 1955
	T.O. 14P3-4-507, 15 Nov 1955

USAF Pilot Protective Helmet Type P-2	
FORMAT: ITEM...DESCRIPTION...SOURCE	
Specification:	

Shell:	Laminated phenolic-treated duck? Prototype only, shows P-1 helmet shell worn over an AN-H-15 cloth helmet fitted with coms. Chris Carey
Edge beading:	Prototype only: black.
Mask attachment:	Studs on black leather tabs
Nape strap:	None
Chin strap:	Riveted to helmet shell?
Visor:	None
Comms:	Used HS-38 type coms affixed to soft inner helmet; type U-75/U connector.
In service:	Prototype only; studied at Wright-Patterson AFB, but production cancelled. (Never issued for operational use to aircrews.) Chris Carey
<p>Prototype withdrawn from consideration for service production while still in prototype study phase. <i>Never produced or issued</i>, although a number of P-2 head suspension harnesses were fabricated before the design was cancelled; these harnesses labeled 'Protective Flying Helmet, Type P-2' have ended up as replacement units in P-1A and P-1B type helmets, creating confusion about a helmet being of P-1A type or of P-2 specification. <u>There were NO P-2 production helmets ever issued to aircrew!</u></p>	

USAF Pilot Protective Helmet Type P-3	
FORMAT: ITEM...DESCRIPTION...SOURCE	
Specification:	MIL-H-6474 T.O. 14P3-4-507, 15 Nov 1955
Shell:	Laminated phenolic-treated cotton duck. Small and Large T.O. 13-1-37, 18 Oct 1951
Edge beading:	Tan
Mask attachment:	Studs on leather tabs
Nape strap:	Yes
Chin strap:	Riveted to helmet shell
Visor:	Three types used:
Early Visor Original with visor up-lock pin over the visor yoke	

Early Visor Type I with short J-arm on visor yoke locking on visor up-lock pin below yoke.
Early Visor Type II with long J-arm on visor yoke locking on visor up-lock pin below yoke.
Comms: HS38 or HS-38A with U-75/U plug
In service: From 18 October 1951 through new production, and from 3 July 1953 also through T.O. upgrading P-1A (and P-1B?) helmets with visor mechanism assembly. T.O. 13-1-37, 18 Oct 1951 T.O. 13-1-40, 3 July 1953
Withdrawn from service: Disappeared gradually from 11 July 1955 as P-3 helmets for fighter use were T.O. upgraded to P-4 standard. Still in service by 1 October 1956. T.O. 14P3-4-508, 11 July 1955
T.O. 14P3-4-509, 1 Oct 1956

USAF Pilot Protective Helmet Type P-4
FORMAT: ITEM...DESCRIPTION...SOURCE
Specification: MIL-H-7328 T.O. 14P3-4-507, 15 Nov 1955
Shell: Laminated phenolic-treated cotton duck. Small and Large
Edge beading: Originally white turning dark tan with UV exposure.
Mask attachment: Studs on leather tabs
Some modified from August 1958 or earlier with the MD-1 oxygen mask modification kit (chrome bayonet receivers for 'Christmas tree' bayonets)
WADC Technical Note 58-259, August 1958
Nape strap: Yes
Chin strap: Riveted to helmet shell
Visor: Early (side-latching J-hook Visor) Type II or Early visor Type III Photo evidence
Comms: H-75A/AIC with either U-93/U or U-93A/U plug, (upgrade with H-75B/AIC or H-75C/AIC with U-93A/U not mentioned in available T.O.s. If performed then authorised later than 26 Aug 1957). T.O. 14P3-4-508, 11 July 1955

T.O. 14P3-4-34, 26 Aug 1957
In service: From 11 July 1955 or earlier depending on whether new production of P-4 helmets was initiated before T.O. 14P3-4-508 was issued. T.O. 14P3-4-508, 11 July 1955
Withdrawn from service Disappeared gradually from 28 June 1957 as P-4 helmets were T.O. upgraded to P-4A standard. T.O. 14P3-4-512, 28 June 1957

USAF Pilot Protective Helmet Type MB-4
FORMAT: ITEM...DESCRIPTION...SOURCE
Specification: MIL-H-7328 (T.O. 14P3-4-507), or MIL-H-25037 (T.O. 14P3-4-1) T.O. 14P3-4-507, 15 Nov 1955, T.O. 14P3-4-1, 30 April 1957
Shell: Laminated phenolic-treated cotton duck. Small and Large
Edge beading: Originally white, turning dark tan with UV exposure.
Mask attachment: Studs on leather tabs
Nape strap: Yes
Chin strap: Riveted to helmet shell
Visor: Originally none, but often found with P-4A type visor installed due to pilot preference.
Comms: H-75A/AIC with either U-93/U or U-93A/U plug, (upgrade with H-75B/AIC or H-75C/AIC with U-93A/U not mentioned in available T.O.s. If performed then authorised later than 26 Aug 1957). T.O. 14P3-4-508, 11 July 1955
T.O. 14P3-4-34, 26 Aug 1957
In service: From 11 July 1955 through modification of P-1A and P-1B helmets with H-75/AIC series comms (or earlier depending on whether new production of MB-4 helmets was initiated before T.O. 14P3-4-508 was issued). T.O. 14P3-4-508, 11 July 1955
Withdrawn from service T.O. rescinded on 2 June 1961.

USAF Pilot Protective Helmet Type P-4A
FORMAT: ITEM...DESCRIPTION...SOURCE
Specification: MIL-H-7328 T.O. 14P3-4-1, 30 April 1957
Shell: Fiberglass construction. Small, Large, and X-Large. (Laminated phenolic-treated duck if modified from P-4) T.O. 14P3-4-1, 30 April 1957
Edge beading: Originally white, turning dark tan with UV exposure
Mask attachment: Studs on leather tabs
Some modified from August 1958 or earlier with the MD-1 oxygen mask modification kit (chrome bayonet receivers for "Christmas tree" bayonets) WADC Technical Note 58-259, August 1958
Nape strap: Yes
Chin strap: Riveted to helmet shell
Visor: Centre track and no J-arms on side latches. T.O. 14P3-4-512, 28 June 1957
Comms: H-75A/AIC with either U-93/U or U-93A/U plug, (upgrade with H-75B/AIC or H-75C/AIC with U-93A/U not mentioned in available TOs. If performed, then authorised later than 26 Aug 1957). T.O. 14P3-4-34, 26 Aug 1957
In service: From 30 April 1957 or earlier through new production and from 28 June 1957 through modification of P-4 helmets with new visor type. T.O. 14P3-4-1, 30 Apr 1957
T.O. 14P3-4-512, 28 June 1957
Withdrawn from service: Disappeared gradually from August 1958 or earlier as P-4A helmets were T.O. upgraded to P-4B standard. T.O. rescinded on 2 June 1961. WADC Technical Note 58-259, August 1958

USAF Pilot Protective Helmet Type P-4B	
FORMAT: ITEM...DESCRIPTION...SOURCE	
Specification:	MIL-H-7328 WADC Technical Note 58-259, August 1958
Shell:	Fibreglass? Reinforced plastic? Small, Large, and X-Large
Edge beading:	Originally white, turning dark tan with UV exposure.
Mask attachment:	Studs on leather tabs
Some modified from August 1958 or earlier with the MD-1 oxygen mask modification kit (chrome bayonet receivers for 'Christmas tree' bayonets); more commonly used with later Sierra receiver kit.	
WADC Technical Note 58-259, August 1958	
Nape strap:	Yes
Chin strap:	Riveted to helmet shell
Visor:	Centre track and no J-arms on side latches.
Comms:	H-149/AIC headset (no pig tail comm. cord), using H-79/AIC earphone receiver elements. WADC Technical Note 58-259, August 1958
In service:	From August 1958 or earlier through modification of P-4A helmets with new comms (or earlier depending on whether new production of P-4B helmets was initiated before T.O. (???) was issued). WADC Technical Note 58-259, August 1958
Withdrawn from service:	Disappeared gradually from 1959 as the HGU-2/P helmet was introduced. Spec cancelled 8 July 1969. Chris Carey

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