Understanding the Mythical “Teardrop” Traffic Pattern Procedure

A Deadly Recipe for Midair Collisions

Current Level of Understanding

Have you ever heard of the “Teardrop” traffic pattern procedure?

Do you know how to perform the “Teardrop” traffic pattern procedure?

And finally, have you ever flown a Teardrop” traffic pattern procedure?

Historical Perspective

If you had asked those questions to a group of pilots as little as ten years ago, not a single person would have answered YES to any of them.

Traffic pattern procedures at non-towered airports have remained unchanged for many decades.

If there have been no changes to traffic pattern procedures, then where did this notion of a “teardrop” entry come from?

You are about to learn the answer to that question.

Key Points – Flight Operations at Non-Towered Airports

Most midair collisions occur in non-towered airport traffic patterns or in close proximity to those airports.

The FAA issues periodic guidance regarding safe flight operations at non-towered airports. This is done through three different publications.

Airplane Flying Handbook
Pilot's Handbook of Aeronautical Knowledge
Advisory Circulars

The two handbooks are quite detailed, while Advisory Circulars contain abbreviated information, with references back to the handbooks.

Key Points - continued

There are seven basic principles contained in the FAA reference documents.

1. The *preferred* method of entering the traffic pattern is on the 45-degree entry leg, headed toward a point abeam the midpoint of the runway to be used for landing.

2. Arriving aircraft should be at proper pattern altitude before reaching the 45-degree entry leg of the pattern and should stay clear of traffic flow until established on the entry leg.

3. The entry leg should be of sufficient length to give the pilot a clear view of the entire traffic pattern before entering the downwind leg of the pattern.

4. Entries into traffic patterns while descending create specific collision hazards and should always be avoided.

Key Points - continued

There are seven basic principles contained in the FAA reference documents.

5. Overflying an airport should be done at an altitude that is 500 or more feet above the traffic pattern altitude.

6. When landing after overflying the airport, the pilot should fly well clear of the pattern, descend to pattern altitude, then turn right to the 45-degree entry leg.

7. Pilots should avoid using confusing words for traffic pattern position reports and should use standard pattern phraseology.

History – Flight Operations at Non-Towered Airports

Since 1999, there have been seven FAA reference documents published that contain guidance regarding safe flight operations at non-towered airports. Although the wording varies somewhat between the different documents, the seven principles have remained consistent over the past 25 years.

1. Airplane Flying Handbook – 1999
2. Airplane Flying Handbook – 2014
3. Pilot's Handbook of Aeronautical Knowledge – 2016
4. Advisory Circular 90-66B – 2018
5. Airplane Flying Handbook – 2021
6. Advisory Circular 90-66C – 2023
7. Pilot's Handbook of Aeronautical Knowledge – 2023

The Airplane Flying Handbooks from 1999 and 2014 covered the subject of traffic pattern entries without the use of illustrations.

In addition, a scenario of determining which runway to use for landing, was the backdrop for explaining the procedure for overflying the airport, followed by a normal downwind landing that commenced with the 45-degree entry leg.

History – continued

The Pilot's Handbook of Aeronautical Knowledge – 2016 made three noteworthy changes from prior reference documents.

First, was dropping the scenario of overflying the airport for the purpose of determining which runway to use for landing. By 2016, that practice had largely disappeared due to the adoption of AWOS at many airports. That scenario was replaced with one of repositioning the airplane from the upwind side of the airport to the downwind side, for the purpose of making a normal downwind landing that commenced with the 45-degree entry leg. The overflight procedure consisted of the same four steps that had been included in FAA documents for decades.

History – continued

The four steps of the overflight procedure are:

1. Overfly the airport well above pattern altitude – and for the first time, they indicated “well above” means 500 or more feet. They also clarified the overflight should occur at mid-field.

2. Fly well clear of the pattern – and for the first time, they indicated “well clear” means approximately 2 miles beyond the pattern (not runway) boundaries.

3. Scan carefully for traffic, descend to pattern altitude.

4. Then turn right to enter the 45-degree entry leg.

History – continued

A second change was the addition of an alternate means of entering the downwind leg of the traffic pattern when approaching from the upwind side of the airport. The procedure was straightforward – enter on a midfield crosswind at pattern altitude, carefully scan for traffic, announce your intentions, and then turn downwind. This alternate method came with restrictions. It was not to be used if the pattern was busy and a pilot using the procedure had to give way to aircraft on the preferred 45-degree entry and to aircraft already established on downwind.

The third change was the addition of illustrations for the previous two items. Typical of many illustrations used in FAA Handbooks, they were colorful, not-to-scale and did not include the many details of the actual procedures contained in the written narrative of the Handbooks. In neither of the illustrations is there enough information to understand all aspects of the written procedures.

History – continued

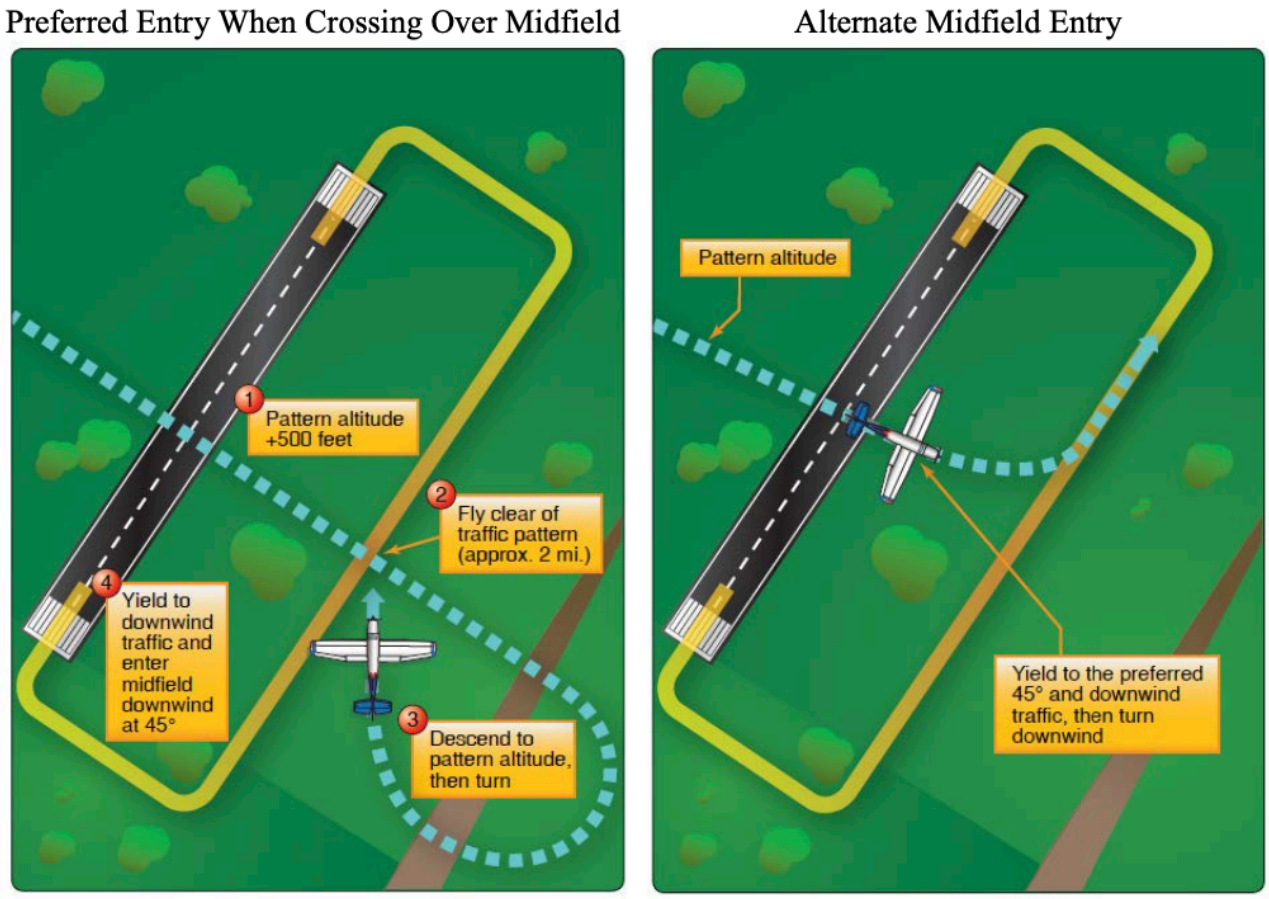
Two years after PHAK 2016 was published, the FAA published Advisory Circular 90-66B, Non-towered Airport Flight Operations. This was the first time the FAA had published an Advisory Circular pertaining to non-towered airport flight operations since 1993.

Advisory Circulars contain less information than what is included in the Handbooks. As such, the Circulars contain many references to the Handbooks or other relevant FAA documents, so the reader can get additional information whenever necessary.

Regarding the subject of traffic pattern entries at non-towered airports, the Advisory Circular contained the same illustrations used in the 2016 Pilot's Handbook of Aeronautical Knowledge concerning the subject of entering the traffic pattern when approaching from the upwind side of the airport. The AC did not include the narrative that is essential to understanding the actual procedures, but simply included the reference: (**From the PHAK**).

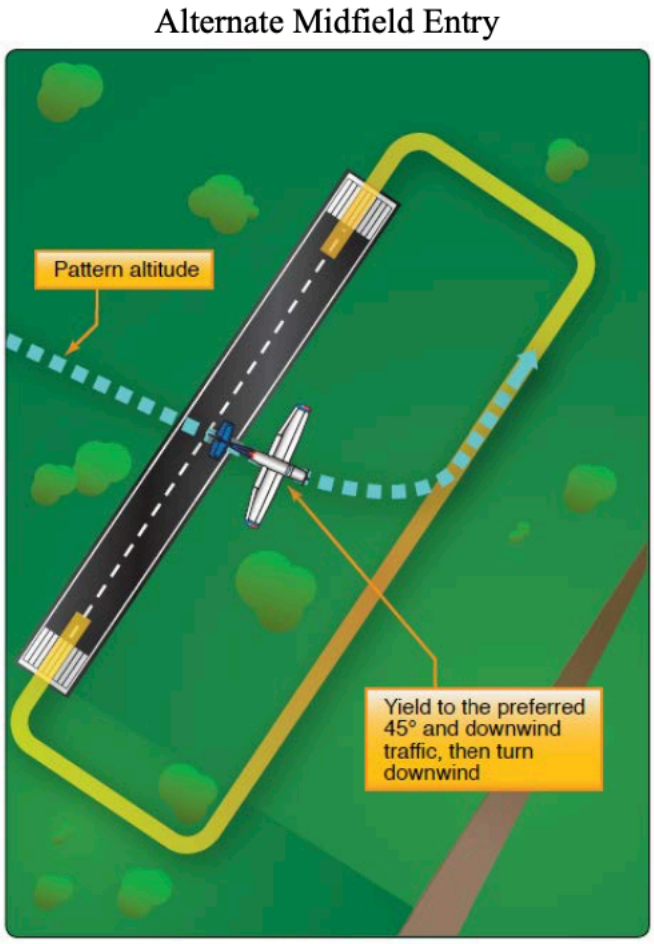
Following is the actual illustration from the AC 90-66B.

Figure 1. Preferred and Alternate Entry When Crossing Midfield (From the PHAK)



Remember, the *preferred* method of entering the traffic pattern is on the 45-degree entry leg, headed toward a point abeam the midpoint of the runway to be used for landing. The illustration on the left is the "Preferred entry" when crossing over midfield.

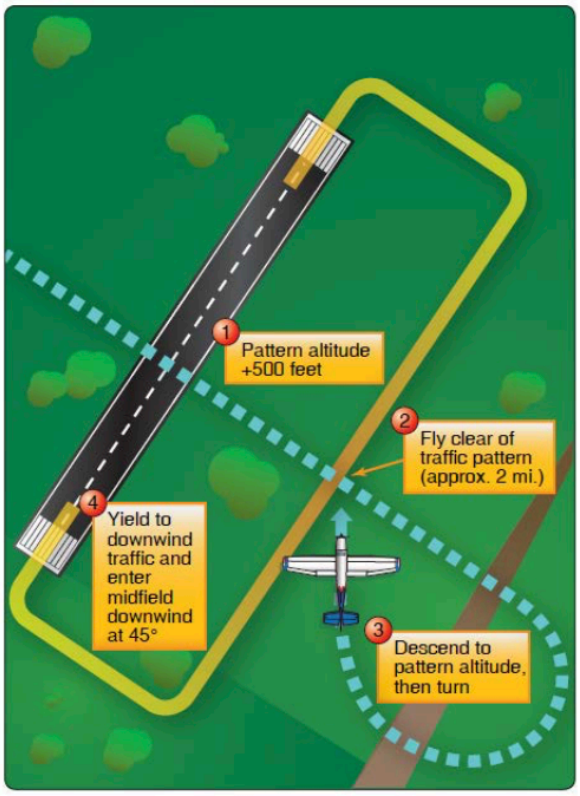
Comparison of the *Alternate* illustration to the **actual** procedure.



Actual procedure - The procedure was straightforward – enter on a midfield crosswind at pattern altitude, carefully scan for traffic, announce your intentions, and then turn downwind. This alternate method came with restrictions. It was not to be used if the pattern was busy and a pilot using the procedure had to give way to aircraft on the preferred 45-degree entry and to aircraft already established on downwind. The illustration is clearly not-to-scale and did not include any reference to the restrictions.

Comparison of the *Preferred* illustration to the **actual** procedure.

Preferred Entry When Crossing Over Midfield



Actual procedure:

1. Overfly the airport 500+ feet above pattern altitude, at midfield.
2. Fly well clear of the pattern – 2 miles beyond the pattern.
3. Scan carefully for traffic, descend to pattern altitude.
4. Then turn right to enter the 45-degree entry leg.

The illustration is clearly not-to-scale. If the flight path was scaled to the length of the runway, more that 75% of the flight path would be outside of the picture.

Reactions of the pilot, flight instructor and flight school communities to PHAK -2016 and AC 90-66B.

When PHAK – 2016 was updated and published in 2016, there was no obvious reaction to the inclusion of the new traffic pattern illustrations. While the illustrations had clear deficiencies, they were located on the same pages as the actual written procedures.

When AC 90-66B was published in 2018, there was considerable reaction to the overall document.

- It was the first time an Advisory Circular pertaining to traffic pattern procedures has been issued since 1993. As such, it received a high level of interest from the aviation community.
- Advisory Circulars tend to be viewed as having a higher level of "authority" than the Handbooks.
- The stand-alone illustrations were generally viewed as depicting the appearance of the actual flight path.
- The reference to (From PHAK) was universally ignored.
- Aviation pundits began writing about FAA's new "Teardrop Traffic Pattern Entry" and the mythical procedure was born.
- Flight instructors began "teaching the picture" while ignoring the actual written procedure.

The period from 2016 through 2021, was one of confusion.

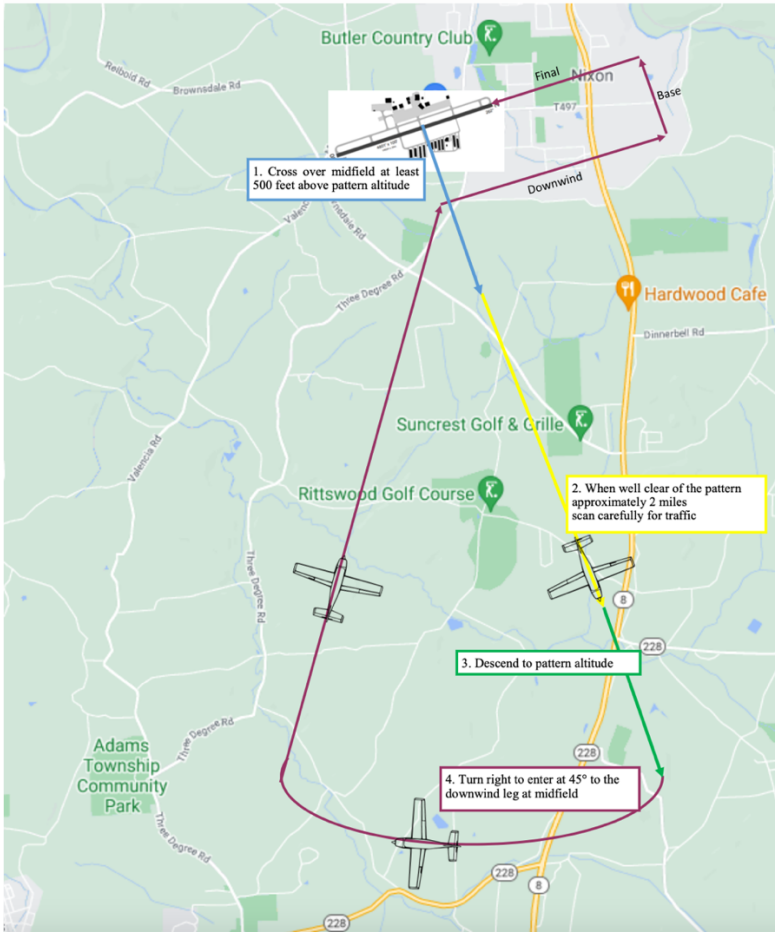
- Aviation pundits continued to explain their views of the proper way to actually *fly the picture*. None were advocating for flying the actual crossing procedure that was explained in the written narrative of PHAK – 2016.
- Flight instructors and flight schools began teaching students how to *fly the picture*.
- Although “teardrop entry” is an IFR term with a very specific meaning, it began being used in radio transmissions when pilots were flying the pattern entry procedure depicted in the picture.
- At some airports, radio transmissions such as “entering the teardrop for runway XX” morphed into ones such as “tear-dropping into the pattern for runway XX”.
- There was little or no consistency with the individual interpretations of the proper way to fly the “teardrop” entry. For many, it was an extremely dangerous descending right turn into the downwind leg of the traffic pattern.
- For non-towered airports where “teardrop entries” had become commonplace, near misses (both reported and not reported) were not unusual events.

In 2021, two noteworthy FAA activities occurred.

1. As part of the FAA's ongoing efforts to keep their advisory documents current, they updated the Airplane Flying Handbook in 2021. Just as they had done with the Pilot's Handbook of Aeronautical Knowledge in 2016.
    - The actual wording of the narrative pertaining to traffic pattern entry procedures was little changed from what had been published in 2016, with one exception.
    - The exception was a clarification about the use of the word "Preferred" when the crossing procedure was used. The word Preferred was intended to mean the normal downwind entry, following the overflight, clearing and descent steps, that begins with the 45-degree entry leg.
    - The two not-to-scale illustrations were identical to what was published in both the 2016 PHAK and AC 90-66B.

In 2021, two noteworthy FAA activities occurred. (continued)

2. In 2021, a local FSDO office of the FAA conducted a Webinar, available throughout the US, that explained the 4-step crossing procedure. The focus of the webinar was how to correctly fly the FAA recommended procedure, using the actual steps of the procedure that were published in both Handbooks and are referred to in AC 90-66B. They also used the following to-scale illustration that looks nothing like the problematic not-to-scale illustrations.



The FAA analyses the reasons for the confusion.

By the end of 2021, the National offices of the FAA had become aware the traffic pattern entry illustrations included in the 2016 PHAK, AC 90-66B and the 2021 Airplane Flying Handbook were problematic in two fundamental ways.

1. Pilots, flight instructors and flight schools who used these illustrations were not looking at the detailed procedures that were referred to in these illustrations.

2. As standalone illustrations, they lacked the clarity necessary to correctly perform the intended traffic pattern entry procedures.

The result was predictable - - inconsistent and inappropriate procedures being taught and flown.

The FAA analyses the reasons for the confusion. (continued)

It was also becoming clear to the FAA that announcing and performing the so called “teardrop” traffic pattern entry was an inherently dangerous maneuver. It was in direct conflict with almost all of the established safety principles associated with traffic pattern procedures at non-towered airports that had been around for decades.

The National offices of the FAA eventually concluded the root cause of this widespread misunderstanding and the subsequent adoption of the “teardrop” traffic pattern entry concept by many pilots, was the not-to-scale illustration first introduced in the 2016 PHAK.

The FAA takes action to resolve the problem.

On June 6, 2023, the FAA issued Advisory Circular 90-66C, Flight Operations at Non-towered Airports. Since most individuals who are looking at a modern-day Advisory Circular will likely be doing so using an electronic device, direct links to source documents are provided.

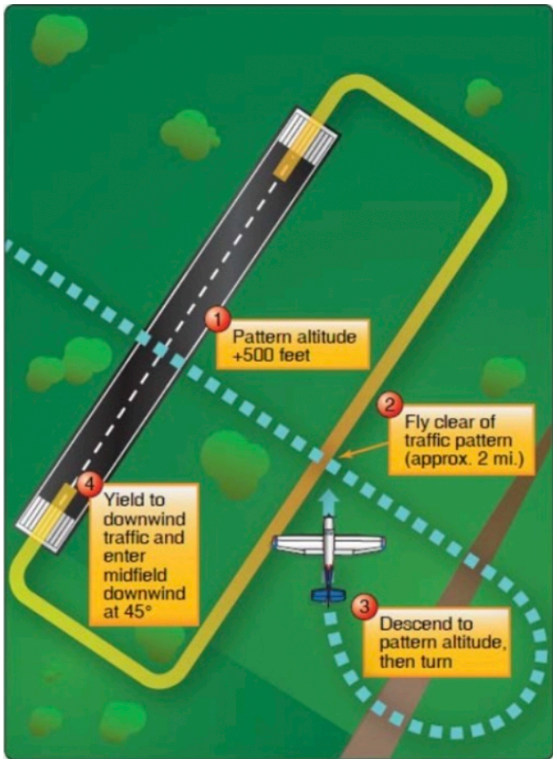
The new AC addressed the two problems that had been identified by the FAA.

To address the issue of pilots, flight instructors and flight schools not looking at the detailed procedures that were referred to in the illustrations, the AC contains a direct link to the appropriate source documents. Even though the AC doesn't show the actual detailed procedures, they are readily available through the click of a button.

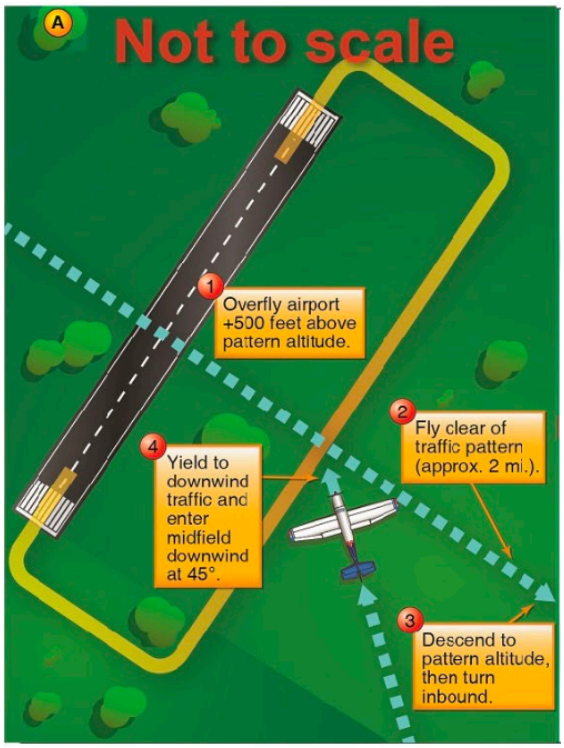
Regarding the lack of clarity in the original illustrations, four critical revisions were made that contain sufficient information for a pilot to perform the procedures correctly. Those changes are detailed on the next four slides.

The Old vs the New

Old



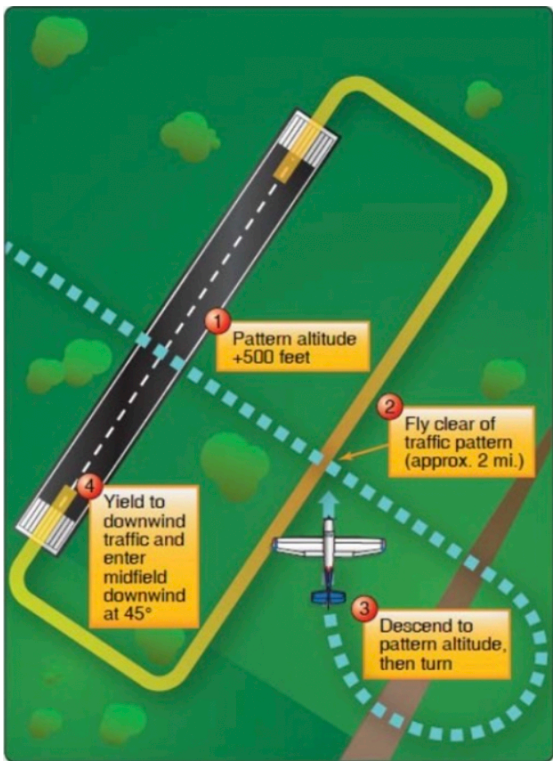
New



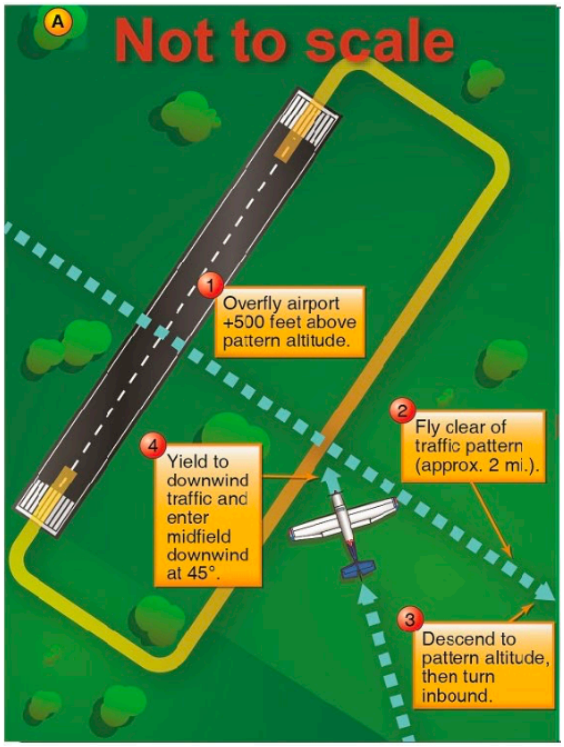
The most obvious change is the new illustration is clearly labeled as Not-to-scale.

The Old vs the New

Old



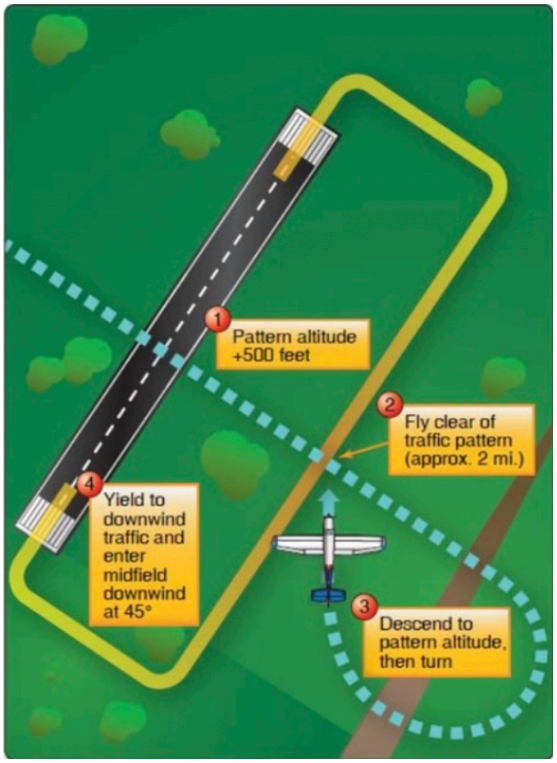
New



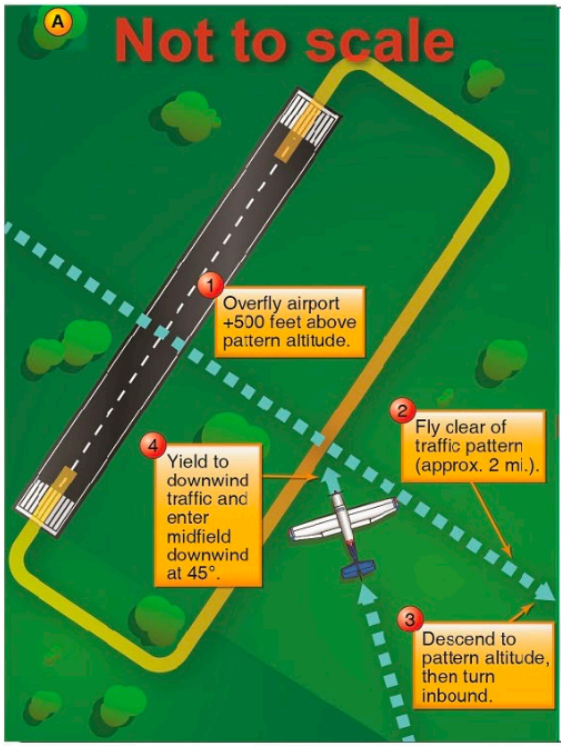
The second obvious change is the new illustration clearly shows that only a small part of the overall procedure is contained within the boundaries of the illustration. Approximately 75% of the flight track is not shown.

The Old vs the New

Old



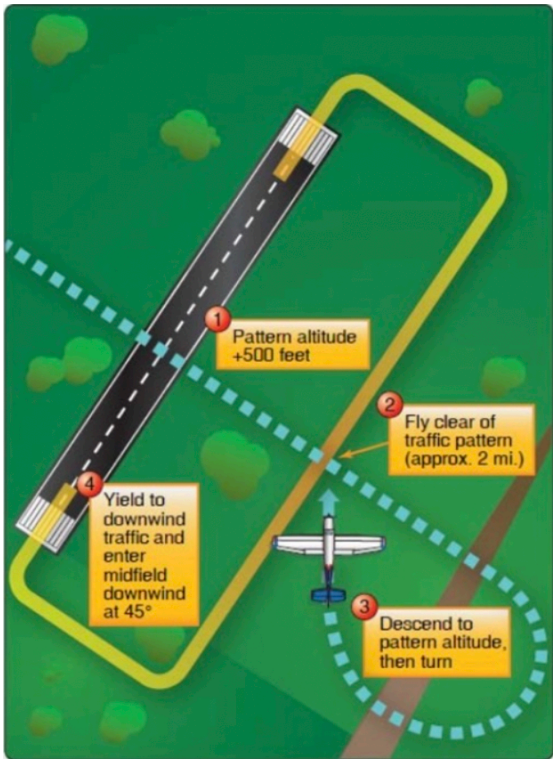
New



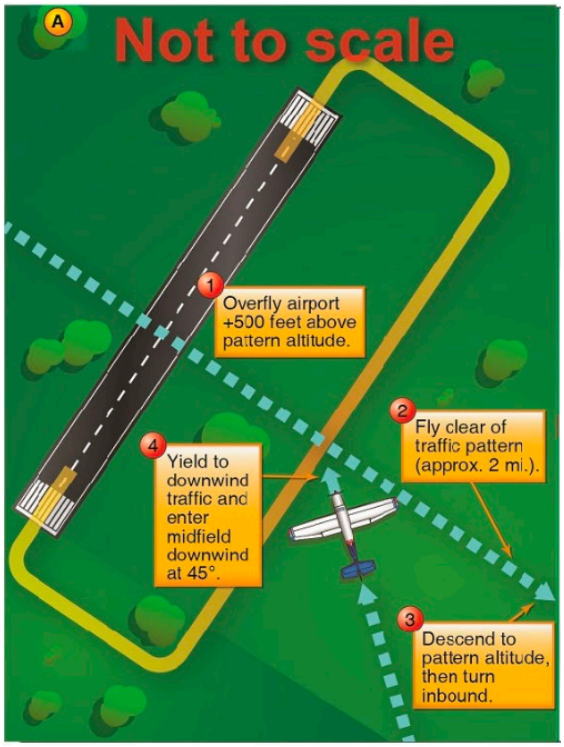
The third change is the movement of one arrow to the proper location and the addition of two arrows. These provide the appropriate context for the wording in the boxes.

The Old vs the New

Old



New



The fourth change is the addition of the word ***inbound*** to box 3. In the earlier version, the absence of that word gave some the impression they were referring to the final turn to enter the downwind leg.

Conclusion

At this point, you should have a much better understanding of the Mythical “Teardrop” Traffic Pattern Procedure and how it how it accidently came into existence.

It should also be clear that there is not now, nor has there ever been an FAA sanctioned traffic pattern procedure called a “teardrop” entry.

The *Principle of Primacy* is working against us as we try to unlearn something that seems to have been around forever. Nevertheless, it is something we must do if we are going to keep the inevitable midair collision, associated with a flawed traffic pattern procedure, from ever happening.

Working together, we can make this happen.