



CHALLENGING THE MARKET/

SALES APPROACH

A TECHNICAL POSITION PAPER

Executive Summary

Aircraft are like no other piece of personal property. There are simply too many value points to consider and document properly. In addition, market information can be elusive and contradictory between sources. Because of both attributes, the question of “Is the Market/Sales Comparison Approach the most suitable for aircraft?” must be asked and examined.

Over the past decades, those attempting to value aircraft have been faced with a fundamental shortcoming and that shortcoming is a general lack of credible, reliable sales data referenced to a specific aircraft’s configuration. From the time of the very first aircraft transaction, there has never been a repository of actual sales information and all publications have relied on over the years is the honesty and integrity of “trusted” individuals who submit sales and aircraft specific data. Add to this limitation, the fact that a given year/make/model may not sell for months or even years thereby raising an issue of the “current market” for that given aircraft. In other words, not only is the source data questionable, it can be very “thin” in nature such that publishing ANY data based on the limited submitted criteria is misleading at best.

There may be “pockets” of information used by brokers and dealers but even this may be very limited in scope and self-defeating in addition to the data being confidential for use only by that broker/dealer. Consider that “Market Value” depends on both parties being informed and under no pressure to act plus the condition that the market is “normal”. It is unclear if brokers and dealers are collecting sales data that represents “Market Value” or whatever they could convince the buyer the aircraft was worth – or if they took advantage of the buyer’s ignorance or their need to purchase the aircraft ASAP without any hassles. Did the broker or dealer make themselves aware of any damage issues, maintenance records issues or items that would impact the value and were these considered? Perhaps the selling price included ferrying the aircraft to the buyer’s location, financing or other incentives not specifically accounted for?

All of these issues would need to be properly addressed in order to properly apply the Market Approach or Sales Comparison Approach to value. Failure to consider all factors adequately allows the aircraft evaluator to be manipulated by those supplying information to publishers along with the publishers themselves who have a vested interest in selling subscriptions.

The Professional Aircraft Appraisal Organization (PAAO) was founded on the principle of protecting the general public along with providing credible, reliable information when

appraising General Aviation aircraft. To avoid the manipulation of data submitted by questionable sources, the PAAO developed their own method of collecting and analyzing market data. This information is based on years of publicly available data along with statistical analysis tools. The result is data that is more reflective of the market (versus “accurate” which is subjective in nature) and immune from outside influences attributed to “trusted sources”.

Couple a more complete and reliable source of market data to the PAAO Analytical Methodology of gathering aircraft specific information, in addition to the proprietary PAAO calculation tool; and, the result is a more complete and detailed analysis of a specific aircraft that is second to none in this industry.

Essentially, the PAAO uses market derived data along with a very detailed database of component values and a proprietary set of calculations in an analysis that is a hybrid of the Market/Sales Comparison Approach and the Cost Approach in PAAO aircraft appraisal reports. The PAAO Certified Aircraft Appraiser is the final authority in the final opinion of value. However, the analysis in the report is more detailed than most.

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What is the Market Comparison Approach?

In simple terms, the Market Comparison Approach is based on the thinking that if you know what item A sold for, you can, with adjustments, estimate what item B will sell for or what its Market Value might be. Aircraft buyers and sellers use a very simplified Market Comparison Approach routinely when there is a question of what do I sell, buy or value aircraft X for. They may look at current public listings or reference one of the popular value guides that purport to give a general value overview for a specific make and model of aircraft. They may make a few adjustments to account for the differences in time and equipment and then price or value their aircraft accordingly.

If things are going well with this approach today, what could be better and what is the problem with this approach? Are we really talking about differences that matter in the overall scheme of things? Are there possibly other ways of looking at this valuation problem differently?

For this analysis, we will focus on General Aviation Aircraft which includes the larger business jets as well as piston single-engine aircraft.

Are There Other Approaches to Consider?

Yes. There are two other acceptable approaches to value. One is the Income Approach which isn't generally used to value general aviation aircraft unless the aircraft in question is generating a revenue stream (income). For this analysis, the Income Approach will not be considered because most General Aviation aircraft are not generating income per se. They could be generating revenue and there are situations where this approach makes sense but it is not a typical approach to value for General Aviation aircraft.

The other method is the Cost Approach which is the value of the depreciated cost to make or purchase a *brand-new* similar item. In the case of general aviation aircraft, using the Cost Approach with this definition can become problematic because a brand-new aircraft with the latest equipment, a new engine with little to no time on it and a factory-fresh paint job may cost quite a bit more than an aircraft with 10 – 15 year old equipment, possibly a different engine with hours of use since one or more overhauls and an airframe that needs paint. Even depreciating the cost of a new aircraft may not be an adequate “apples-to-apples” comparison. In some cases, attempting to find the cost for something like an older King Silver Crown suite of avionics may be challenging and the individual pieces of equipment within that suite changes between models and years for the same manufacturer. However, there is some merit to this approach which will be explored later.

Generally, the Cost Approach is not used for General Aviation aircraft that are (or were) in production as most of these aircraft are openly traded and sold in a public marketplace. Keep in mind that the General Aviation fleet is about 30 – 40 years old on average. There are scenarios where the Cost Approach makes perfect sense for relatively new aircraft or unique aircraft as examples but for the typical transaction, it is not a suitable or practical approach. .

So What's the Problem?

There are several areas impacting effective use of the Market Comparison Approach when there is a need to establish a credible and believable opinion of Market Value.

Before going further, it is important to understand the definition of Market Value as used in this analysis. Market Value requires three conditions to be present. These are – 1) Normal market conditions, 2) an informed buyer and seller and, 3) neither party under any pressure to act. If any *ONE* of these conditions is not met, then some other undefined value is being discussed or used which falls outside this analysis. Examples include Liquidation Value or Salvage Value.

First, the Market Comparison Approach requires publicly available selling prices or a reasonable number of aircraft on the market with stated asking prices versus “call” listed as the asking price. Although there is a relationship between asking and selling prices, asking prices alone are not selling prices. Also, unlike real estate where an appraiser or evaluator can visit the courthouse to see local property records to determine what a similar property sold for or what has sold recently, ***there is no public repository of aircraft selling prices.*** As a result, *EVERY* evaluator must use some type of secondary sales or market information. Some brokers and dealers may maintain their own databases of “actual” selling prices but this information is not available to the public and without validation, it is not considered in this analysis. Aircraft sellers generally tend to treat the actual selling price as confidential information or retain it for their own internal use. In other situations, the seller may tend to misrepresent the actual selling price for their own purposes. There is also a mistaken belief that online and in-print publications are a reliable source of current information. However, publications are obtaining unverified information from subscribers – or other “trusted” resources to generate their data. ***In other words, the published information referenced by many is based solely on the integrity and honesty of those individuals reporting information to them.*** Furthermore, because publications release their information on a quarterly basis, there can be anywhere from a three to six months in delay when considering when the information was submitted to the publication, when that information was published and when it might be used. Because the submitted information is not verified and possibly “thin” in overall submissions, there exists the opportunity for subscribers and submitters to provide information to influence the outcome of

the published information or there may be a significant change in the market such that publications are unable to reflect the change in a timely manner.

Although there is a relationship between asking and selling prices, asking prices alone are not selling prices.

Second, the information available (trusted or not) tends to be spotty, thin and/or outdated. In some cases, no sales data is available for months regarding a specific year/make/model of aircraft – not that aircraft of that specific year/make/model haven't transacted (and in some cases sales haven't transacted) but no selling prices are reported. In those instances, some publications will just print similar data quarter after quarter or draw a straight-line analysis from the sale of a single aircraft years newer that occurred months ago. So, what is the evaluator going to use as a comparable reference? Will they use an ad from months ago when the market was very different? Will they use an aircraft that is newer or older than the subject aircraft thereby possibly introducing some level of bias? All of these scenarios are real problems for evaluators who have a vested interest in credible, reliable reporting.

Third, there is the issue of variables. If for example, we choose a specific year/make/model of aircraft from a publication and then select whatever "Average Retail" value is provided, is there ever ANY consideration given to the times and equipment listed for the stated configuration? There really needs to be. Does anyone really think or believe that a given "Average Retail" model is reflected in the Average Retail value? The publication's online versions have simple calculators to adjust for time and equipment. But does the simple calculator consider the equipment removed over the years from the original configuration or model? There is no indication that it does. Perhaps the actual Average Retail value is more representative of a configuration model with newer equipment, a particular set of modifications, engine time(s) that are not mid-time or possibly on an insurance plan. Not understanding those variables allows the evaluator to double count items or misrepresent the model they are starting with. The result can be a significant overvaluation.

Is there a Better Solution?

A better solution requires better modeling and a better analysis of the publicly available market data. Better modeling requires analyzing massive amounts of data over time. It also requires software to make quick work of this analysis and the technical talent with knowledge of General Aviation aircraft AND software development skills to pull this all together.

Unfortunately, the aircraft appraisal and valuation industry is very small to the point that it makes no business sense for someone presently analyzing submitted information from subscribers to develop something this new and different. Furthermore, if they elected to do so they would need to collect and analyze years of data meaning that this would not be an overnight or immediate result so any return on that investment would take a great deal of time – more than most in the publishing industry are willing to invest. It is also rare to find the nexus of individuals who have the knowledge, skills and abilities to analyze this information and develop the code who also have a fundamental knowledge of General Aviation aircraft and related components.

Let's begin with better modeling. To improve on the modeling, it is imperative that a "typical" configuration be established and understand that "typical" is relative and dynamic and not static in nature as publications might have evaluators believe.

Years ago, before there were many new and numerous changes in technology, the "Average Retail" model (as the aircraft left the factory) may have been reasonably accurate for a good number of years and only minor changes to the published model were needed for airframe time, engine time(s), and equipment along with a mod or two. However, the presumption that this scenario would remain static or the inability to recognize and adapt to various configurations is a serious one. In fairness, the technology was not available or originally in place to properly capture and adjust for those types of changes over time.

Fast forward to today where new, more reliable and multi-functional equipment is manufactured and available for most years/makes and models of aircraft – and each year brings newer and better equipment. Furthermore, regulations such as ADS-B (Automatic Dependent Surveillance – Broadcast) and RVSM (Reduced Vertical Separation Minimums) require new and/or upgraded (read expensive) equipment. In this regard, one must question whether the "Average Retail" figure really represents an aircraft with mid-time engine(s) and factory original equipment or something that has undergone a number of changes and updates to comply with regulations? If the subject aircraft has gone through several changes and updates, what are these and how does that really relate to the "Average Retail" number along with other similar aircraft of this same year/make/model – or does it? Is the subject aircraft "exceptional" on the upper or lower end of the valuation scale for the current market? What about average airframe times? Is it unreasonable to believe that the "average" hours per year flown have remained static throughout the aircraft model's life? What about periods of industry downturn when aircraft may not have flown routinely, or the aircraft is flown less due to its age (compared to a newer model) or other factors? Most evaluators simply ignore these questions as answering them is not straightforward nor is there really any resource to turn to that might be helpful.

In general, non-profit appraisal organizations are not much help either when it comes to developing any type of aircraft value database for their aircraft appraisers. There simply is no business case to do so in a non-profit environment. The primary focus of these organizations appears to be mainly training heavy-equipment appraisers who have a specialty in aircraft on how to use the information that is available to them and these appraisers may develop their own spreadsheets or databases to address the current limitations of this industry but there is no indication this is the case. Unfortunately, there appears to be more of a focus on valuing aircraft without leaving the office or reviewing the aircraft's maintenance records which says something about the reliability and integrity of the reporting and final opinion of value.

What's the Solution?

The Professional Aircraft Appraisal Organization, LLC (PAAO) is a for-profit organization that is focused exclusively on aircraft valuations and consulting for General Aviation aircraft. The PAAO from its inception in late 2018 was data driven and recognized from day 1 the issues outlined previously and began working on a solution for its Certified Appraisers.

The PAAO began collecting and analyzing data that goes back to 2020. Early on, the lack of actual selling prices was known and a conscious effort was made to use statistical analysis tools in an effort to fill in "the blanks" for the missing or unreported information and then adjust that result to better reflect actual selling prices – as there is a relationship between asking and selling prices albeit not a direct one. In other words, if there is no data regarding sales for a given year/make/model in a particular month, the PAAO *DID* have data from previous months and years along with data from adjacent year models of that same aircraft. As a result, a mathematical relationship could be established and modeled with these adjacent blocks of data thereby making a calculated estimate for the empty month(s) fairly straightforward in nature. As new data continues to be collected from new entrants into the marketplace and even some new (verified) sales data from properly executed Sales Agreements or Purchase Agreements, the mathematical relationship continues to be refined. The result for PAAO Certified Aircraft Appraisers is a term known as an **Average Expected Selling Price** (analogous to the Average Retail number used by publications albeit derived differently from other credible processes) along with a range of expected selling prices that would capture about 66% of those specific year/make/model aircraft selling (or would sell) at this specific point in time. If this analysis sounds complicated and involved, make no mistake that it is. In simple terms, the PAAO has been able to identify a midpoint and a range of expected selling prices for a given year/make/model at a specific point in time given a wide range of parameters including airframe time, engine time(s), modifications, damage history, missing logbooks, etc. However, there is even more to this analysis.

Along with this market data there exists configuration data as well. For a given year/make/model, there exists a typical “configuration” that is more representative of a given year/make/model at a specific point in time. So, it is now possible to mathematically tie that Average Expected Selling Price to a “typical” aircraft configuration. As the market changes in response to changes in the “typical” configuration (all other factors remaining constant), then these changes will be captured accordingly.

A case could be made that this level and type of analysis is bordering on “adaptive learning algorithms” or Artificial Intelligence (AI) and some AI tools are being used as part of this analysis. The overall process and analysis may not be 100% AI driven today but that is certainly the direction being taken. Regardless, there are a few points which are inescapable when using this type of analysis.

- It is no longer possible for “trusted” sources to manipulate or influence the overall Average Expected Selling Price due to the volume of information analyzed on an ongoing basis (analyzed several times a week and aggregated monthly). Radical changes either fall outside the expected “norms” or they are anomalies. In other words, a single data point is not a trend and a consistently large number of these data points would be required before significant changes are observed in the month-to-month Average Expected Selling Price.
- The aircraft’s configuration or model that is used for the analysis is no longer static and based on what someone thinks the model should be but is dynamic in nature and more representative of times and equipment of that specific year/make/model at a specific point in time.

What About Using a Different Approach?

Earlier, several approaches of value were discussed and while strict use of the Cost Approach may not be appropriate for aircraft, this type of approach might be more helpful with a few modifications. Especially if we consider the market value of components versus their cost.

There are several value points for aircraft that ARE known. These include the current market value for a piece of avionics gear, the market value of a given engine’s overhaul (be it factory overhaul, overhauled to “new” limits or “field overhaul” which are all different), modifications and so forth. As a result, the PAAO developed a hybrid approach using market value information along with the detailed analysis of a “cost approach” in developing their final opinion of value and related reporting.

Of course, now that we know (or derived) the Average Expected Selling Price, we need to develop some type of relationship between all value points.

Enter the PAAO's Analytical Methodology!

The PAAO was founded on the basis of protecting the general public when appraising and valuing aircraft. The objective of the PAAO and its appraisers is to provide credible and reliable results when appraising and valuing aircraft. Keep in mind that the PAAO is a service organization helping its Certified Appraisers in their day-to-day aircraft appraisal business efforts through training and the use of proprietary data. The information outlined previously is just a starting point for PAAO Certified Aircraft Appraisers.

The PAAO recognized early on that it is important to break the aircraft's value down into its key value points or components and analyze these separately – which is a typical engineering approach. The initial calculation involves taking the Average Expected Selling Price and then removing the value of the components from its typical configuration. These would include the typical set of avionics, the typical value of the remaining engine overhaul, the typical value of the paint & interior, etc. and what is left is the value of the **AIRFRAME**. The PAAO Appraisers refer to this as the **Computed Base Airframe Value** – and this is a key component that no other aircraft valuation resource identifies but it is a critically important value point. Keep in mind that any aircraft evaluator *could* perform this same analysis, but most do not because the mathematics are too involved.

It turns out that there is a mathematical relationship between the Computed Base Airframe Value and other value points such as the Condition of the Airframe itself (NOT the value of the paint job which publications combine), excessive high or low airframe time, airframe damage history, missing logbooks – along with other components. For example, when evaluating an aircraft with damage history (and the airframe was properly repaired). The analysis and valuation are straightforward for a PAAO aircraft appraiser to capture as is the repair that was completed in a “less than professional” manner. This type of analysis is not possible with any other publication or analysis because the condition of the airframe as a separate value point is not a consideration.

If the objective is to provide a credible, believable analysis, PAAO Appraisers must obtain the key information they need by physically visiting the aircraft, examining the key value points (such as the repair of the damage) and digitize the maintenance records for further review and analysis. **DOING ANYTHING LESS IMPINGES ON THE CREDIBILITY OF THE ANALYSIS AND RELATED REPORTING** – and this is a key differentiator between PAAO Aircraft Appraisers and others.

At this point, most readers probably have an opinion that all PAAO Certified Aircraft Appraisers must have, at a minimum, multiple degrees in mathematics and statistical analysis. However, that is far from reality and it would be an unreasonable expectation. All PAAO Certified Aircraft Appraisers must have a background in aviation and they must undergo training regarding ethical behavior, how to conduct a field visit properly and the Best Practices of the PAAO along with report writing techniques. For the analysis itself, the PAAO developed a unique software tool that is only available to PAAO Certified Aircraft Appraisers. The result is a level of detail that no other aircraft appraisal organization is able to provide or explain.

While the software tool is just that – a tool or calculator, it is the job of the appraiser to ensure the information makes sense and is representative of the subject aircraft and the current market. For example, a piece of avionics gear found in the PAAO database of avionics values may be too low or high in the opinion of the Certified Aircraft Appraiser or the value of a given engine's overhaul value may be too high or low. The PAAO Certified Aircraft Appraiser has the option of changing any of these as long as they have supporting information in their workfile.

The value of the software tool is in the formulas. In simple terms, the ratings and value points of a Cessna 172 are different than those of a Cessna Citation. A good example may involve damage history. Generally, bizjets do not have damage history or any damage that has occurred is normally repaired in a professional and undetectable manner. Factory new parts are used and the repair is well documented. Regardless, there is usually some value impact to this event because it is rare. On the other hand, a single engine piston routinely has one or more incidents of damage. Some more serious than others but the point is that damage history is not unique. The type of repair and the parts used are more of a consideration– as is the value impact to the aircraft overall. In this scenario, a flat percentage approach to value the damage history would be incorrect and inadequate because flat percentages impact all value points. Why would a deduction on avionics or engines covered under an insurance plan be appropriate? Because there is no consideration of the airframe, the relationship to damage history, poor repairs, etc., then a flat percentage approach is about the only mathematical tool available to many evaluators – incorrect as it is.

Who Cares and What's the Impact to the General Public?

The initial impulse by many evaluators is to perform a superficial comparison of the Average Retail figures and Average Expected Selling Price for a given year/make/model of aircraft. There may even be an effort to compare a specific aircraft using both sets of data. The expectation is to produce similar results (maybe not) thereby meaning that one set of data and methodology is just as good as another, but this would be an incorrect conclusion based on a very limited analysis. The comparison is really between two very different sets of primary market data, the

formulas used along with their respective methodology. Without that type and level of comparison over different aircraft, the result is biased and should not be relied upon.

For example, if only one aircraft or one scenario is selected, then no effort is being made to really research the data beyond what might be provided from an unverified source. For individuals who never leave their office, they may never be able to identify how bad (or good) the quality of the paint is. They may never see the irregular rivet lines or panels that do not appear to be factory original (and subsequently understand what that really means). They may never read the logbook entries discussing repeated repairs to address a specific issue or the misleading entry discussing repairs from a damage event – or even see the difference in paint gloss when that repair was repainted albeit undocumented. Missing pages of the logbook may never be noticed or maintenance events that should have taken place appear to be missing or possibly poorly written (meaning misleading). They may completely miss a poor repair of a damage event and if they do happen to catch it, they have no ability to properly capture this problem as there is no discussion or analysis of the airframe. All of which could seriously impact the final opinion of value.

For many misinformed or uncaring clients, any number will do if it meets some predetermined result. If the client can hire a credentialed aircraft appraiser to provide this same result in a timely manner (not even inexpensively), so much the better. There is no “need” for a field visit as a physical examination of the aircraft or records may uncover some unknown issues or cause too much delay. The thinking appears to be that they know their customer or the seller and all the other details do not really matter for whatever reason.

As a rule, PAAO Certified Aircraft Appraisers do not work for these types of clients for any period of time. The professional aircraft appraiser may have some expectations about the subject aircraft but they never really know what they will uncover until they get into the research. The final aircraft appraisal report is not a substitute for poor negotiating skills on either party’s side and there is no guarantee of the final outcome or opinion of value until all factors are known. This can represent a serious problem for some clients who just want the appraiser to “go along” when the facts about the subject aircraft and the market tell a very different story.

On the other hand, there are clients who understand that knowledge is power. These clients understand that there is really no good reason to avoid a field visit and efforts to do so begin to raise flags.

A number of these clients and potential clients also recognize that the publications have either lost credibility or laypeople find the information difficult to use and understand with any degree of certainty. Properly valuing an aircraft takes more than pointing to a single number or

selecting options from a menu and typing in a few parameters – if the objective is to provide a result that is credible and believable.

If the PAAO Information is Proprietary, What Use is it to me?

Several pieces of PAAO information are proprietary in nature – as are most other resources. However several months ago, the PAAO introduced its *Instant Aircraft Analyzer* tool (www.appraiseairplane.info) for fixed wing aircraft to help evaluators better understand the risk level of a given price or value (however it was determined), given a few basic parameters. Today, the *Instant Aircraft Analyzer* tool does not calculate a value but it will provide evaluators with graphs showing where that value “sits” in the overall market *FOR THAT SPECIFIC SET OF PARAMETERS*. The tool also pulls publicly available information in its analysis (think - No Damage History reported while finding an NTSB and/or FAA report on the subject aircraft). A subscription is required but this is true of any market valuation information.

Going forward, the PAAO will include a straightforward calculator which will utilize some of the concepts here such as the dynamic aircraft configuration, the ability for evaluators to adjust the configuration of the subject aircraft to arrive at an estimated market value. The calculator will need to be a simplified version of the one used by PAAO Certified Aircraft Appraisers and as a result, the calculator may not be able to capture all variables properly. When these scenarios develop, the evaluator knows that it is time to hire a professional, trained aircraft appraiser to assist.

