Flight Simulator 2020: To what end?

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There certainly is a lot of hype at the moment. In a wide range of forums regarding the forthcoming *Microsoft Flight Simulator 2020* (FS2020) questions are being asked, analyses proffered and speculations made. Some are so excited they can't contain themselves regarding its potential. Some of those have postponed expenditure pending release purchases.

This is a bit like intending to 'buy off the plan' in the housing market. Others are less forgiving of Microsoft's past track record within this genre. For them, a level of disappointment and lack of trust in the software giant's unreliable assurances, still sits deep. Where ever we stand on the matter, there is one thing for certain: many are being sucked in by the eye candy in development trailers driven by the enormous marketing power of the Microsoft behemoth.

But to what end? Has Microsoft had a change of heart and in its altruism decided to re-embrace hobbyist flight simmers world-wide, realising there might be a buck in it after all? Or, is there a wider agenda with this company with intentions of breaking into a much more lucrative area within the whole ecosystem of flight simulation? And, where are we – the hobbyist sector of the market? Where are we placed in relation to the intentions of the all-powerful Microsoft Corporation? These questions will be addressed in this article. While it adds to the chatter, it explores a possible scenario as to why Microsoft now wants to re-enter a thirty-eight-year involvement in flight simulator development.

What's on the table

Let's recap just what Microsoft is doing at the moment with the development of *FS2020.* They are introducing a flight simulation platform that is likely to be a gamechanger in the market. This is already in evidence with third-party aircraft developer PMDG announcing they will be developing a new 737 – the 737NG3 – for FS2020 and dropping development for X-Plane and all 32-bit platforms. Microsoft is also working with aircraft manufacturers such as Airbus, Boeing and Cessna.

The program will be two Petabytes (2000 Terabytes) in size! This won't fit on any of home computer, regardless of how high specifications may be. It will be in 4K ultra HD in clarity, truly enabling flying VFR anywhere in the world. It will have highly detailed 3D geometric modelling such that individual blades of grass will be able to be seen. The scenery, even at the default level, appears to be truly amazing. In partnership with French video game developer Asobo, use of various data sources in conjunction with Microsoft's Azure AI satellite data produces a level of realism never seen before. Multi-layered atmospheres will be possible with different densities, humidity and pollution affecting visibility and realistic up and down drafts and wind sheer.

Atmospheric rendering will be greatly enhanced. A whole new weather engine has been developed including the use of real live weather data. This will provide a level of weather interaction not previously accessible. True volumetric rain, clouds, icing and true to life light sources – even rainbows given the right atmospheric conditions – will be experienced. Up to thirty-two layers of cloud will be available with a visibility of up to 600 kilometres. Interaction with weather will thus be experienced as never before, creating real VFR/IFR implications, requiring a greater understanding of meteorological implications and more expansive situational awareness before and during flight.

New weather engine produces magnificent effects.　　　Screenshot credit: Tuckie4982, flightsimulator.com

The core physics of the platform will mean sloped surfaces can be modelled, as well as accurate depiction of friction when landing on different surfaces and using brakes. The effect on aircraft systems will have more of a realistic impact on modelled aircraft performance, in, for example, the raising and lowering of landing gear. Aircraft performance also in actions such as spins and stalls will be realistically enhanced. It also appears that cockpit rendering and accurate sound reproduction is featured in the new platform.

Now admittedly, the size and processing requirements of the platform are being addressed by Microsoft. *Adaptive streaming* that is, the amount of data being conveyed through the Internet to match Internet speed, will address the issue of variation of Internet band width. *Adaptive framerates* will also be a feature whereby the framerate will be adapted to match monitor refresh rates at any given point in time, providing a much smoother framerate experience.

The ability to take advantage of multiple CPUs, the employment of adaptive streaming and adaptive framerates may negate the necessity of super high-end computer specifications. But nonetheless the experience is likely to vary according band width, the power of the CPU, the number of cores in the computer and the capability of the graphics card.

So why?
So back to the primary question: To what end is Microsoft involved in this venture?

Do you really think that Microsoft is spending untold millions of dollars just for the development of yet another flight simulation platform? Do you really think they can recap their R&D expenditure and make a profit just from the sales of Flight Simulator 2020? I think not. So why is Microsoft investing so heavily into this flight simulator?

Perhaps the answer lies not with the home-based flight simulation enthusiast market at all. Could it be that Microsoft has determined that this software has its real place in the whole ecosystem of the flight simulation industry, in Level 6 flight training devices (FTDs) and particularly in Level D full-motion simulators. Most computer games are actually professional software, the only difference is being the licencing terms to restrict their application to personal/home use. X-Plane, for example, offers a "Professional Level" of training software to aviation training facilities. It also has an FAA certified version

that if paired with proper controls is legal for accrediting certain training/instructional hours. So, could it be that Microsoft wants a share of the high-end commercial simulation market?

There are currently two main players in the commercial simulation industry: CAE Inc. (CAE) and L3 Commercial Training Solutions (L3 CTS). CAE, a Canadian company, sells flight simulators and training devices to airlines, aircraft manufacturers and training centres. It licenses its simulation software to various market segments and has a professional services division. In 2001, CAE acquired BAE Systems' Flight Simulation and Training division, formerly known as Reflectone Inc., a publicly listed company based in Tampa, Florida. Reflectone sold flight simulators to the military and provided pilot training on its premises.[1]

CAE has become the world's largest flight instructor. It conducts airline pilot training and business jet pilot training in its 65 aviation training centres worldwide. In the United States, the firm is a supplier of initial and recurrency training for airlines such as JetBlue and non-airline-based companies, including charter and cargo operators. In December 2001 the firm acquired Simuflite training centres in Dallas, Texas and Morristown, New Jersey, which are now called *CAE SimuFlite.* The facility at Dallas/Fort Worth International Airport is the largest business aviation training facility in the world at 39,600 square metres, with 34 simulators and approximately 450 employees. In February 2016, CAE acquired one of its competitors, Lockheed Martin Commercial Flight Training, formerly known as Sim-Industries.[2]

The demand for CAE's services is likely to keep growing. The company's sales pitch is that 20% to 30% savings on training can be made by either taking over an airline's training centres and running them more efficiently or having airline pilots go through one of the programs CAE operates in its 65 centers around the globe. CAE's customer base is dominated by rapidly expanding Asian airlines and low-cost carriers like AsiaAir, EasyJet and Ryanair. These airlines are happy to grow their expanding pilot cohorts without sinking capital into buying simulators or constructing their own training facilities.[3]

L3 Commercial Training Solutions (L3 CTS) is a flight training provider and manufacturer of civil flight simulators based in Crawley, England. It is a subsidiary of American simulator manufacturer L-3 Link Simulation & Training, itself part of L3 Technologies, and was formed as L-3 Link Simulation & Training UK in 2012, when L3 acquired the civil fixed-wing simulation division of Thales Training & Simulation (TTS).[4]

L3 CTS's core product is the *RealitySeven* line of full flight simulators, which covers a wide range of aircraft types: from turboprop ATR72 to single-aisle Embraer E2, A320, Boeing 737 and wide-bodies Boeing 747, Boeing 767, Boeing 777, Boeing 787 and Airbus A330, A350 and Airbus A380. A major part of the business is also the provision of flight training services, including cadet selection, initial training and airline training, both in the UK and in Bangkok, Thailand, through the controlled Asian Aviation Training Centre, which was acquired as part of the TTS deal.[5]

Many established airlines are hesitant to outsource pilot training to companies such as CAE Inc or L3 CTS. It seems the impetus is to imprint their own operating procedures company policies and cultures on pilots with in-house training. Meanwhile, Boeing and Airbus have expanded into pilot training as part of their push into higher-margin services. Nevertheless, inroads are being made with some big-name airlines. CAE launched a rookie pilot training program with American Airlines in 2018 and established a joint venture with Singapore Airlines to establish a training centre.[6]

The reason game software such as FSX and X-Plane can't be used for class D simulators is because their core physics and visual simulations are not up to regulatory standards such as that of the FAA. Reflections off waves in water, flight model characteristics in meteorological, other environmental conditions and aircraft systems can't cut the mustard for professional training purposes. They made be good enough for games, but not for real simulation. Yet, engines being developed by Microsoft for FS2020, as described earlier, could conceivably tip the balance towards their software meeting requirements for advanced training simulators and accreditation accordingly.

With software development companies such as CAE making inroads into pilot training. With the emerging technology of VR, airlines such as Boeing and Airbus may turn back to simulator manufacturers with their in-built software for pilot training purposes. Add to this the latest development in the military sector of

electronic autonomous attack aircraft there are potential gains to be made. It has just been announced that Boeing and the US Navy have successfully flown a pair of EA-18G Growler attack aircraft autonomously.

In tests, of manned-unmanned teaming (MUM-T), two EA 18Gs flew as unmanned aerial systems (UAS) while being controlled by a third, manned Growler, acting as mission controller. According to Tom Brandt, Boeing's MUM-T team, said the aim of the US Navy and Boeing was to prove "the effectiveness of technology allowing F/A-18 Super Hornets and EA-18G Growlers to perform combat missions with unmanned systems".[7] Brant went on to say, "this demonstration allows Boeing and the navy the opportunity to [analyse] the data collected and decide where to make investments in future technologies…It could provide synergy with other US Navy unmanned systems in Development across the spectrum and in other services."[7]

Similar contemplations are emerging for the commercial sector. It is being suggested that drone-control software applications are poised to quickly become the world's most experienced pilots. Concerns are justifiably being raised that human pilots are forgetting, or not being adequately trained, how to fly on their own and may have trouble in taking over an autopilot in an emergency. Autopilot systems already control basically all of a flight, even handling the most harrowing of landings with zero visibility.

Larger and more capable drones capable of operating autonomously along human-defined routes are now being tested. Swarms of drones can fly without needing hundreds of humans to control them. They can perform coordinated manoeuvres that human controllers could never handle, and whether flying in swarms or individually, the software that controls them is rapidly gaining flight experience.[8] Thus a new breed of pilot could emerge – the 'software pilot'.

It is argued that giving software pilots more control would maximise computers' advantages over humans. In training, testing and reliability, the most significant advantage is scale: rather than teaching thousands of individual pilots new skills, updating thousands of aircraft would require only the downloading of updated software.[9]

Both Boeing and Airbus have made significant investments into automation. Boeing has bought Aurora Flight Sciences, a maker of automated drones and aviation parts, in a bid to bring increased automation to airliners, military drones and even personal air taxis. "The combined strength and innovation of our teams will advance the development of autonomy for our commercial; and military systems." said Greg Hyslop, chief technology officer and senior vice president of Boeing Engineering, Test & Technology in a statement.[10] Indeed, Boeing has set up a formal office to develop plans for its next generation passenger airliner, dubbed the 797. Such a jet would be the first all-new airplane to take advantage of the company's on-going research into sensors and automated systems. The dent to Boeing's reputation over the 737MAX debacle, however, may be a set-back to their status in the industry.

Airbus is also looking at the development of autonomous aircraft. It is investigating technologies that will allow a single pilot to operate commercial jetliners, helping cut costs for carriers. "We're pursuing single-pilot operation as a potential option and a lot of the technologies needed to make that happen has also put us on the path towards unpiloted operation," said Paul Eremenko, Airbus Chief Technology Officer. Airbus is also working on technologies that will bring more automation to the cockpit of planes that could help resolve a shortage of pilots in countries like China, which is set to emerge as the world's biggest aviation market. Discussions are underway with Chinese companies such as Baidu to find ways of applying self-driving vehicles to the aviation industry.[11]

It is within this context therefore that Microsoft finds itself. Given its long-standing investment in flight simulation technology, why shouldn't it re-emerge to delve further into the industry with the intention of gaining a market share in this burgeoning industry, estimated to be currently worth US$5.7 billion and rising to US$7.7 billion by 2025.[12] My only question is, why the hiatus of nearly a decade in flight simulation development by Microsoft? Was it purely an economic decision at the time with priorities resting with their other divisions; or something more strategic?

In January, 2009, it was reported that the Aces development team behind *FSX* was being heavily affected by Microsoft's ongoing job cuts. Indications were that the whole team would be laid off. The news was later confirmed by Microsoft officials stating they were committed to the *Flight Simulator* franchise, with expectations to continue product releases in the series, but had nothing specific to announce at that time.

In a statement on the FSInsider website a Microsoft official said: "This difficult decision was made to align Microsoft's resources with our strategic priorities. Microsoft Flight Simulator X will remain available at retail stores and Web retailers, the Flight Sim community will continue to learn from and encourage one another, and we remain committed to the Flight Simulator franchise for the long term."[13]

"For the long term" – what did that mean in consideration of their withdrawal from the market following the failure and ultimate cessation of the development of *Flight* in 2012, a product which boasted a further improved graphics engine and enhanced simulation features. According to former Aces employee, Phil Taylor, the shutdown was not due to sales performance of *FSX*, but due to management issues and delays in project delivery, combined with increased demand for staff. The word in the mainstream and gaming media was that future versions could be released as an Internet-based version, or on Microsoft's Xbox platform. [14] Was this pure speculation or an insider prophesy? Was Microsoft all along continuing to tinker with the platform in the background and developing a business plan with a view to a future return to the market. Let's face it, something had to be going on to be enable the announcement of FS2020 development at the Electronic Entertainment Expo (E3) in June, 2019.

Where we fit in

But what of us – those members of the hobby-based flight simulation community? – that small proportion of the whole flight simulation ecosystem. According to Navigraph's recent report on their 2019 survey of the global flight simulation community, the 17,800 respondents had a median annual expenditure on software of US $245. That's US$4,361,000 internationally.[15] Now it's difficult to extrapolate that to the flight sim community world-wide as actual numbers are difficult to gauge. In 2012 a well-known flight simulator add-on distributor made a fairly complex calculation based on sales figures, and came up with the number of 40,000. That supposedly being a figure for the number of flight simmers who present to a payware add-on developers' market, rather than the total number of simmers there actually are.

This seems somewhat low when you consider Microsoft had sold a million copies of *Flight Simulator X* by late 2008 and allegedly hoped to reach 20 million users with their failed Microsoft *Flight.* [16] So if we use a conservative figure of 1 million simmers, hobbyists would be contributing US$24.6 million to the total global flight simulation market, just 4.3%. This is not a small amount of money in itself, but not considerable in the overall scheme of things. It represents just 0.57% of Microsoft's operating income of US$ 43 billion in 2019.[17]

Yet flight simmers contribute significantly in kind. While it might seem we are just a drop in the Microsoft ocean financially, we are nonetheless significant contributors to the ongoing development of simulation software as a whole. We are the guinea pigs of the industry who act as testers to the efficacy of the software Microsoft produces. We are no different than those persons who volunteer to undertake human trials for the pharmaceutical industry in testing emerging drugs which may, or may not, improve the lives of untold thousands. Flight sim software sold to domestic users increases the userbase of the software, which helps shake out bugs a lot faster than if it were made available only those high-end commercial users. Hard-core users do this by accepting invitations from Microsoft to act as Tech Alpha and Alpha users and provide feedback with an expectation of taking it seriously. On Microsoft's February 6, 2020, development update, a Reddit User is quoted as saying "The only thing I hope is that people are serious about bug reports and suggestions/feedback". Steam Edition users of *FSX* can contribute by downloading a release of a beta branch that helps Microsoft gain valuable telemetry data "that will help us in the development of the new Microsoft Flight Simulator". [18]

There is a symbiotic relationship then between the Microsoft Corporation and flight simulation enthusiasts. One cannot exist without the other. Microsoft produces game software to satisfy the ever-increasing thirst for realism in the home-based market. At the same time, data obtained on product usability and reliability feeds into expansion of this software to align and integrate into much improved multi-million-dollar simulator hardware for accredited pilot training purposes. Airlines in turn save on training costs by turning to these systems rather than expending on in-house programs.

Conclusion

This then is the proposed answer to the question: To what end has Microsoft gone down the FS2020 path? It is a strategic, commercial plan to gain a foothold in the software market for the high-end simulator industry. It is a statement by Microsoft that it can compete with players such as CAE and L3 CTS in a joint race with aircraft manufacturers such as Being and Airbus to produce airplanes of the future; aircraft controlled by highly sophisticated software. In the not too distant future, planes will be able to fly pre-programed routes, under strict environmental and system parameters by 'software pilots' alone. This statement of course opens up another topic for discussion and debate.

Just as space technology has provided beneficial spin-offs for the broader community, Microsoft is giving the flight sim community a simulator which will redefine the longstanding idiom "As real as it gets". Leaked footage from Microsoft's technical Alpha testing indicates great things are in store on its release. Perhaps we will then be saying that *FS2020* is "As good as it can be". But for now, regardless of how we might feel about Microsoft's past track record, our passion for simulated flight, and quest for ever increasing realism cannot not be sated without Microsoft's return. It's a win win.

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