

Covid-19 Pandemic Impact on the Aviation Future

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Abstract—In recent months, we have been experiencing a whole new kind of crisis in aviation. Well, not only in aviation, but in this paper we want to show the impact of Covid-19 crisis on the commercial aviation. The impact on the number of flights and passengers carried, airline fleet transformations, possible changes on the commercial airline models and possible consolidation acceleration. There is also possible to expect changes on external outsource companies behavior. Product definition and its pricing will change for sure. And total drop in number of operation will for sure change a number of the employees. There is not another branch of industry more affected then the aviation. But tomorrow never dies, so how is the future we can expect.

At the beginning of the pandemic, there are a few articles published about impact of covid-19 pandemic to aviation. The most complex was the paper of Pere Suau-Sanchez [6] using interview with couple of aviation heads to predict how the situation will develop. From today's view their conclusion is too optimistic. Situation is much worse.

I. INTRODUCTION

Until a few months ago, no one could have imagined that state borders could be closed almost overnight. There was, of course, immediate effect on the number of the flights, which drops almost into 20% of the average in same period of previous years [1]. This fall would be even more significant, if we will take into account only commercial flights cleared of repatriation and supply flights. It has a direct impact on the airlines, the airports and the external support companies.

A. Number of the flights drop

As a pandemic develops and number of infected people rise up, number of the state border closures increases and number of the flights drops.

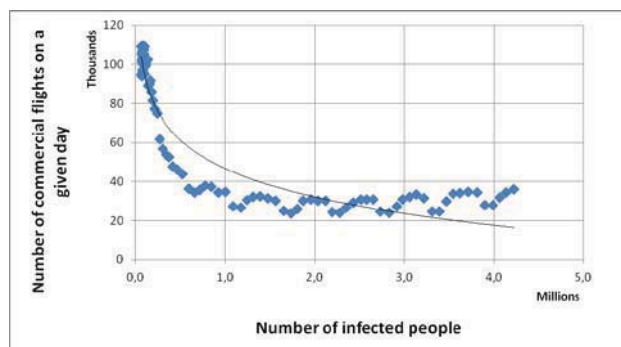


Figure 1. Development of the daily number of commercial flights in the world, depending on the worldwide number of COVID-19 infected people, between 13Feb and 15May 2020 (data from [1])

There was not kind of flights switch off button event at the beginning, which would stop the flights from one day

to another, but there was a deceleration made by numerous of factors.

I can demonstrate these factors on my “home company”, hybrid commercial model airline, Europe operating, Aegean Airlines (AEE/A3, Greece).

At the beginning of pandemic, problem starts in north Italy. MXP was an airport mostly affected for AEE. The problems started with disinfection of the aircraft procedures and extensive PAX security control amended with covid-19 symptoms search. These factors made schedule unable to follow, producing massive delays.

Germany came to the restricted area group, making same procedure problems and delays. Then after possible contact quarantine procedure started making problems with the crew members, when after flight with potential infected PAX, they have been sent to quarantine, unable to continue working. This situation took few weeks. Number of the destination with the same requirements rise up and made the schedule unable to be followed.

And the final cut has been made when the state borders start closing. That was a breakpoint, from where the companies started to ground majority of the fleet.

If we calculate number of the flights development depending on the time and number of covid-19 infected people, we can see the results in the Figure 1. Number of the flights is commercially inaccurate because of numerous repatriating and medical supply flights have been established, not in the schedule and with questionable profit.

So in real, number of the flights dropped down more then to 20% of the scheduled flights.

II. PASSENGER (PAX) NUMBER DROP

In the same way as number of the flights, the number of the passengers commercially carried fell down.

There is several metrics how it could be calculated, but most of them show, that number of PAX dropped by about 96% of the PAX travelled same day last year. For instance USA airport security agency TSA announced, that in USA passed through security check points 95,000 PAX a day March 31st, meanwhile 2.3 million passed security same day last year.

Comparing to US, Europe is even more affected. March statistics says at March 1st the number of PAX was 5,120,000 which was 11.7% less comparing to 2019. But March 31st says scary fall, 174,000 PAX, which is less by 97.1% comparing 2019.

The numbers in April and May will make things even worse. But pandemic in Europe slow down now. So, what we can expect for the rest of the year 2020 and later? There was published several models based on statistic business-as-usual scenario, means actual loss of PAX number plus acceleration to the normal expected statistic.

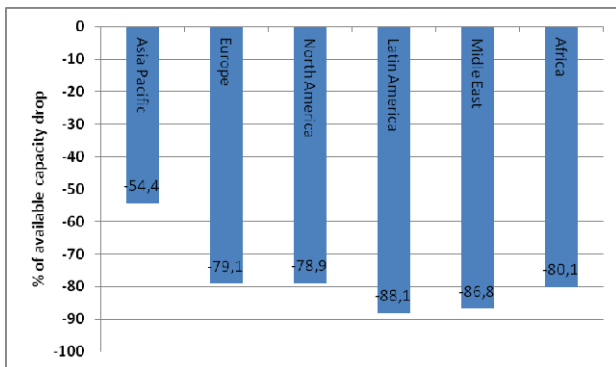


Figure 2. Percentage change in PAX seat capacity by region 25-May-2019 vs 27-May-2020

These models talking about approximately 900 million PAX loss in Europe 2020, which is about -35% in a year, where was predicted +2.3% grow.

The airlines are getting ready for more optimistic scenarios, which is visible on the airlines seat capacity progression. Grounding the airplanes made available seat capacity drop down, as you can see on figure 2.

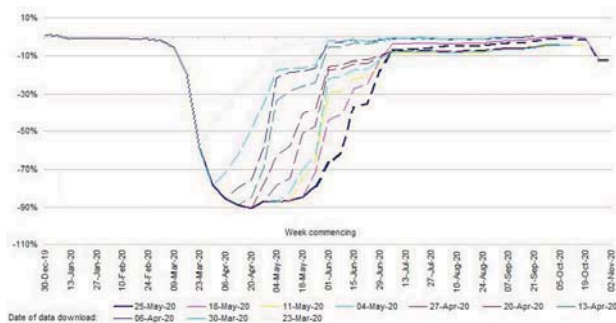


Figure 3. Europe: year-on-year % change in airline offered seat capacity – prediction at different dates

As they expect the lock down will start release soon, the airlines work with the U-shaped recovery. But they make the U-shape more and more wide then they expected some weeks ago (Figure 3.). And they expect to offer about 9% less year-on-year capacity at the end of crisis. But what will be the load factor of this offered capacity?

How precise these models are? They are based only on statistic. Main factors, upon my opinion very important ones, are not mentioned.

First factor, I can see, is the **willingness to travel**. All pandemic restrictions and daily scary news spread high level of the fear in between people. Especially some kind of demographic groups, like an elder people will suffer with fear of traveling for longer, then this year. Also,

some of business travelers realized during lock down, that it is quite efficient to make distant online business meetings and it is not necessary to travel to do it.

Second factor is people **income loss**, which we can generally expect after pandemic restrictions will be canceled. This factor will affect more Eastern Europe countries, generally weaker economy countries than big players like Germany etc. So we can expect groups of potential passengers who will have not enough money to travel.

These factors are not included in the published models of aviation recovery. It is quite difficult to state how much they will affect the business, but I would be more pessimistic and expect deeper drop in PAX number forecast with very shallow climb curve in the next years.

III. AIRLINE FLEET TRANSFORMATIONS

The post pandemic operations main feature will be lower seat capacity offered by the airlines. And as we said, on this lower capacity still we can expect load factor problems on high capacity airplanes.

Two main ways of the fleet changes can be expected then. It is removing away the high capacity four engine planes, which is already visible. Second is the pressure to regional, up to mid-range capacity downsizing, which we can expect soon.

A. Airbus A-380 Swan Song (and the others)

It was obvious already before covid-19 pandemic that the bright sparkling future of A-380 will not happen. Order cancelations made the Airbus factory to finish with production and increase NEOs production on the spot.

Lufthansa already announced that six Airbus A380s and seven A340-600s (rest of this fleet within 1-2 years) as well as five Boeing 747-400s will be permanently decommissioned.

There is a high pressure from debt holders of Etihad Airways that ten currently-grounded A380 jets might never return to service.

Air France also decided that the nine A380s that remained in its fleet would not take off again, two years before their official timeout.

One of the biggest A380 operator Emirates canceled the order of last 8 new A380 (maybe take three of them) and decided to pay about 70 million USD penalty better, then to take this birds, which are already finishing assembly in Toulouse and pay full price. Tim Clark, the president of Emirates said, the days of A380 are already numbered and the A380 is over. Even he over reacts for sure, the signal he is sending is strong.

And the other follows. July 17 2020. British Airways has decided to immediately retire its entire Boeing 747-400 fleet of 30 aircraft due to the disruption in the aviation industry as a result of the coronavirus. The operation will continue with new A350s and 787s.

So what was already probable before pandemic crisis, now is accelerating a lot. The future is looking for twin engine planes with lower capacity, A350s and Dreamliners in front.

But, upon my opinion, not all high capacity birds will be grounded in the future. Lower demand on capacity will be significant on the long haul flights hub-to-point to the “niche” destinations and this capacity will be partly

transferred to hub-to-hub operations with higher demand, which could make us to see A380 & co. in the sky again.

Anyway generally speaking, the airplanes like Airbus A380, A340 and Boeing B-747 will not be so often to see as it was in previous years.

B. Short haul and mid haul airplanes downsize

Major legacy airlines in Europe still making benefits from hub & spoke operations. While it is an obvious now, that long haul, feeding part of the business is getting rid of the high capacity big birds, the consequent downsize in the “spoke” part of this business will be necessary in a future. There are three main reasons for that.

First reason comes from above mentioned. Less capacity comes to the hubs, less demand on the sector to final destinations.

As a second we might see, that in the local destinations, especially not business and politic leading cities, we can expect lower demand on transportation in post pandemic period. To prove this expectation, the wide spread survey would help to understand post pandemic customers behavior. There are two opposite opinions about that. First expressed by WizzAir CEO, saying there will be massive rise of traveling hungry backpackers or the other low yield passengers, which is WizzAir core business. On the other hand, the rest of European airlines expect the opposite. Even Ryanair CEO announced there is no hope to expand number of the travelers before 2022.

Last but not least reason for short haul fleet downsize is a mirror of the previous two, expressed by the fuel costs. It is necessary, to cope with the “spoke” part of business efficiency to lower costs per seat and mile. Fuel costs are on the top of this solution.

In the past, we had turboprops to do this job. But their time, to be part of the hub & spoke business model, is already gone. The product acceptable for temporary and the future costumers, lay only on jet planes. For that we have now new generation of smaller short haul planes. It is Airbus A220-100/300, formerly Bombardier's CSeries and Embraer E190/195 E2.

This downsizing inclination is visible not only in Europe (Lufthansa, Swiss etc.). Major US airline Delta holds unfilled orders for 64 A220s, including 14 A220-100s and 50 A220-300s, and has 31 A220-100s in service already. JetBlue holds orders for 70 A220-300s. These numbers made the Airbus to build up an assembly factory in Mobile, Alabama, US.

So short/mid haul airplane downsize is a fact, which would come in real anyway, but the pandemic crisis will accelerate this process. The airlines will be on the way to re-fleet the short/mid haul to NEO/MAX on one side, which will still dominate, and A220/E190/195 on the other side, to replace turboprops, operate spoke part of hub&spoke business to secondary destinations and help to work on fuel efficiency of the airlines.

IV. THE CONSOLIDATION ACCELERATION

A. Pre-covid European consolidation needs

The European airline market structure was not healthy well before the covid-19 pandemic. Comparing to US market, the Europe has too many companies fighting for smaller market, using only one weapon, low ticket prices. This strategy make almost 35% of European companies

making loss last year, and the others deals with cash problems and never ending restructuring.

Similar situation has been seen in US before September 11, and before 2008 crisis. But America used that dark situation to start process of fusions, acquisitions and closing operations for many airlines. The result we can see now. Four major airlines controls over 80% of the market, first six airlines, controls over 93% of US market and rest of the market is divided between around 100 companies. The market was stable, more resistant to the upcoming crisis.

While in Europe, even after the merge and acquisition effort of Lufthansa, Air France/KLM or IAG, the first six companies controls about 43% of the market and rest is divided between over 200 companies. This makes European market less stable, fragmented, and very sensitive to possible crisis.

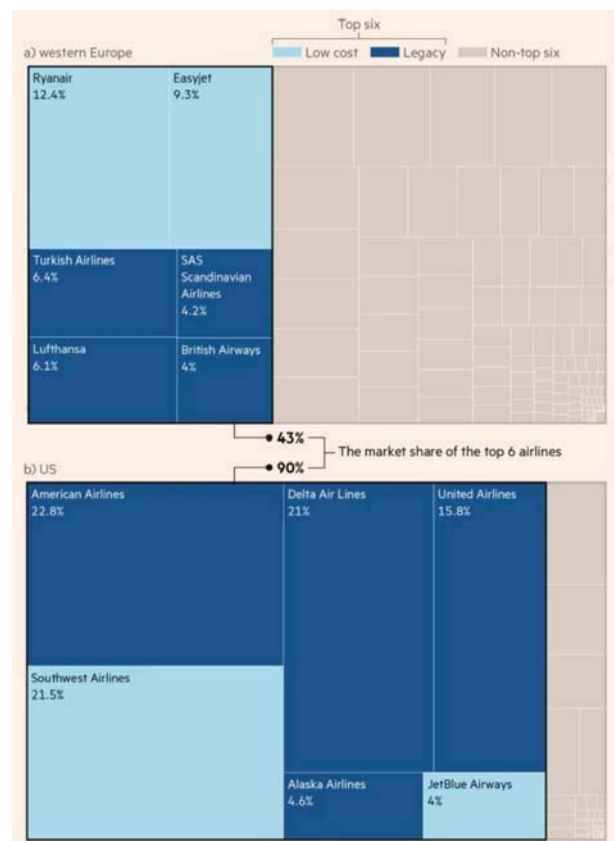


Figure 4. European and US consolidated market sharing

One reason why it is like that we could see in European antimonopoly office, which prefer weak companies to die before let them to be consolidated by big players, in the name of the fair market. The other reason is, that long lasting fight between low cost carriers and the legacy companies with low cash results, makes some acquisitions to come slowly. And of course I have to mention the excessive maternal instinct of Italian government protecting the biggest loss maker of last decades, Alitalia, and make it, for the third time, state owned.

Even everybody from European aviation industry knows, it is not possible to maintain the present situation, the changes are very slow.

B. Post-covid consolidation acceleration

Present pandemic crisis gives a big chance, the things will change. European governments start discussing possibilities of the state help to the airlines and European antitrust authority looks like agree with it.

The big portion of the companies will be not able to survive this crisis and the solution will be either to close the company and serve their market portion on the plate to the big survivors, or to make themselves as an acquisition target. That situation, together with state aid for strategic big companies makes perfect starting conditions for European consolidation process.

Alliances like we know them from previous times will not be the same anymore and hopefully will be replaced by the new merge & acquisition structures, new joint ventures.

But it is very difficult to predict how it will develop. First of all because it is not exactly visible how healthy will airlines be after the covid crisis. It is question of low solvency or liquidity of the companies. Low solvency means that the airline will be very unlikely to ever remain financially viable even if they will be state supported. Liquidity means that the airline has a high risk of running out of cash flow but should be solvent soon, if supported.

Some European governments already announced they are prepared to pay. Italians already paid 600million euro to renationalized Alitalia. France state said they will do whatever it takes to keep Air France/KLM in shape with possible €6 billion package. EU commission already approved state support €1.2 billion rescue loan. The US state already rolled out 50 billion USD fund to support airlines.

So it is already visible, that European commission and national governments understand, it is necessary to support and stabilize the big players. Next step what they must accept soon is, let the merge & acquisition activities go on in following years, to finish European aviation consolidation and make the European aviation market competitive to the US and rest of the world.

V. AIRLINE BUSINESS MODEL CHANGES

It has been visible already before pandemic, that the classic division of the airline business model into legacy and low-cost is not stone solid anymore. But present crisis shows some interesting moves in that.

A. Low-cost hard model melting

Model of the low-cost airlines as hard as we know it from previous years reached its peak. Cost structure is optimized, low fare prices as a main weapon to fight with the legacy companies could not be lower and some kind of cooperation with the other airlines is already established. And low fare players start to understand that point to point without any connection possibilities are limiting the expansion.

So they are starting to make network connection capabilities and also they want to participate on the consolidation process, taking part in the merge and acquisition efforts. Although now, during pandemic crisis it looks it is time to save the money, the big low cost sharks are getting ready to buy or merge the weak victims of this crisis. And their position for this is much better

then position of legacy competitors, who are surviving during crisis using the government support (figure 5).

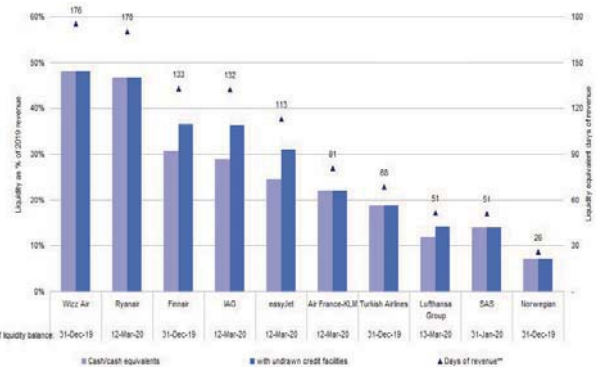


Figure 5. European airline groups: liquidity as a percentage of 2019 revenue [2]

But because the course of the crisis is presently very blur and unpredictable due to pandemic development but especially due to unpredictable behavior of the politics and responsible establishment every airline now is focusing only on surviving strategy. Once the situation will allow to start with merging process, the low-cost model will change.

There is also another impact on classic low-cost model. Low cost airlines had the main business strategy to sell tickets on the lowest possible price and compensate the revenue by selling additional services connected to main product and reducing costs to minimum, very often pushing local governments to pay “negative” taxes and support the low cost companies.

But present crisis made the politics to change this predator strategy. It has started in Austria, where ministry of transport established new rules saying new regulations on ecology taxes. The taxes was previously calculated on distance base proportionally. Now all flights will be taxed equally close to previous highest level and for more the short flights, shorter then 350km will be extra charged almost triple. And hand in hand with this regulation the most importantly, airlines will not be allowed to sell their tickets below their charges and taxes. The anti-dumping policy will result in round-trip tickets being sold for at least 40EUR [3]. If you compare this with Ryanair average ticket price is €37 including all costs and about €20 of revenue, it is obvious, that ticket price will have to rise up a lot, which will dull the main low-cost strategy knife.

This will be very important change for low-cost companies especially because the other countries, like Swiss, France and in Germany starts very loud discussion about the same. And as we know, once the Europe rulers, France and Germany will agree with this, it is only small step for this, to become all Europe law. And then the business model of the low-cost companies has to mature.

B. Legacy's low-cost subsidiaries shake down

During pre-covid economical fight between legacy and low-cost airlines, the big players established subsidiaries companies on the low cost basis as European competitors and disruptors for low-cost companies.

The crises made all airlines, mainly legacy companies, to bolster their liquidity, working on the better cost

structure and at the same time receiving the state support. They have to announce some kind of restructuring program. It usually consists of fleet cut, limit the aircraft deliveries and mainly closing the subsidiaries. There was always doubt if this aside companies are good move in legacy competition with low-cost companies. Especially in the European airspace we can see how the legacy airlines are not able to run this low-cost subsidiaries efficiently and they are focused with this airlines in the same market, as their core business, while main business model of the real low-cost companies is based on strategy to occupy every vacant area within all European airspace or to devour area with weak competitors. This misunderstanding of the legacy players in low-cost business model makes the subsidiaries easy to sacrifice during pandemic crisis restructuring process. Typical example is Lufthansa and its Germanwings flying under Eurowings brand, which operation will not resume [4]. So probably during pandemic crisis some of the low cost subsidiaries will disappear, the other will need to change the business strategy. Change way of thinking about business and clean it from legacy manners. Their presence then will make some sense in the mothers company cost optimization, even they can't fully compete with the low-cost big players anyway.

VI. LOSS OF STAFF, THE BIGGEST FUTURE PROBLEM

The impact of pandemic crisis to the airlines economy, when sales dropped by 80-85%, is massive. There is of course huge pressure to reduce the costs. The biggest costs, when majority of the fleet is grounded, remain the salaries. The salaries of all staff, but main portion is pilot's salaries.

The companies are trying to reduce this load and they are using two ways. First is just to lay off the pilots. This is way used by companies, using expats and contract pilots. Typical example is Qatar, laid off about 900 pilots.

Second way how to deal with big load of pilot's salary costs is to use some kind of negotiations with the pilots and often their union, to either reduce working time, or reduce temporarily salary, or very often combination of this two. And start negotiations about earlier retirements and voluntary leaves. Same time the companies are receiving government support to avoid redundancies. Typical example is Lufthansa, where negotiations has been done to reduce pilots salaries by 45% temporarily, which will save about 350 million euro, and same time company will receive about 9 billion euro from government to avoid redundancies and be ready for restart when crisis will bounce of the bottom [5]. This is a smarter way how to deal with the cost cut, but still, same for both ways, we can expect massive problems with frozen or laid off staff when recover period will come.

There will be problems to hire new staff, because there is assessment process, including simulator sessions, then ground training and line training. But very similar problem it will be in companies, where they just "freeze" the own pilot capacities. It will be huge demand on simulator capacities, line trainings and line checks.

When the airlines talking about recovery time of the crises, they usually expect steep rise of the operation, but I am afraid, the steep angle will be significantly reduced by simulators capacity, and also instructor and examiner capacities. The training departments and all companies

must be prepared. They must avoid the situation which will only postpone this problem to the future.

VII. TOMORROW NEVER DIES

If we are trying to ask when this crisis, which is the biggest in whole commercial aviation history, will be over and how it will affect the future of the commercial aviation, we can't say serious answer.

For sure we know, about the future passenger behavior changes, the changes in the fleet composition, airline business models, we can hope about consolidation of the European market.

The crisis itself gives a chance to change previous development in the field of the air transport. To change the over-burned aviation market, full of dumping ticket prices due to price war with low-cost companies, overbooked flights, making massive delays during season due to crowded skies, requiring big afford of all underpaid industry employees but finally producing minimum profit.

Change the aviation, which reached its peak and was probably no longer sustainable. We can therefore hope for changes to the system that will lead to reasonable ticket prices, adequate and efficient fleets, consolidated and stable market. Changes that attract smart people to work in the aviation industry, people who will be proud and stay. That is pros of this covid pandemic crisis.

On the other hand, it is very unsure how fast will be the recovery back to normal. And what will be this new normal. What will be percentage of the previous traffic volume. It is very unpredictable, what will be the potential costumer's willingness to fly. Here it is the biggest role of the states governments to make a stable trustworthy and predictable environment, which could reduce the fear of traveling of the potential passengers and customers.

Another big role of the governments is to support companies, to prevent redundancies, because loss of qualified personal would be devastating for the industry for very long period.

And what the airlines can do, to survive in the best possible conditions and to be ready for rise up when recovery will start. As I mentioned above, they should optimize seat capacity to follow how the situation is changing. This can be achieved also by re-fleet changes. Make the traveling for passengers the most possible safe, to suppress passengers' fear of flying and increase their confidence. The legacy companies are following this way. They are blocking out middle seats, having mandatory masks on board, limited interaction with the crew, changing boarding procedures. Delta CEO said, it is most important to attract passengers to travel and they will continue to block middle seats even load factor then could reach only 60%. He announced they will continue like this and if demand will rise up, they rather add more flights then fill the flights with more people.

The low-cost companies are different. Ryanair and Wizzair are not blocking middle seats and they are not following any of above actions to improve passenger confidence (O'Leary called the idea "idiotic") and they bet on one card, the lowest possible airfares. In addition, Wizzair decided to expand massively and opened seven new bases and expect to establish more than 200 new

routes. It looks very risky and Wizzair is only one doing that. Only time will tell who was right or who was wrong.

However present estimates predict the slow recovery in air travel demand which will reach a ceiling of around half of 2019 levels, at which point we can expect traffic to remain broadly static until a vaccine for Covid-19 becomes widely available. The recovery will be “rapid” once a vaccine is ready for mass distribution, but it will reach not over 80% of origin volume at least until 2024. Anyway I don’t see the recovery start could happen until late 2021 at the earliest. It means that demand will remain below 50% its former level for at least another year. And during this slow rise, up to this 50%, it will be long-haul operations and following feeding to short-haul operations most affected. So EU3 big players (IAG, AF&KLM, LH group) will suffer much more comparing to low-cost and leisure companies, which will still profit from VFR (visiting friends and relatives) and leisure business.

I wish to finish this paper more optimistic. There is the light at the end of the tunnel, but still is flickering and it is too blur to be able to say how far it is.

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