Sterile radio procedures

by Captain Wolfgang Starke

Basically there are four phases of flight where workload is high and errors of flight crews are likely to occur. These four phases are the taxi-phase, the take-off and initial departure phase, approach and landing as well as emergency situations.

While high workload during emergency situations seems pretty clear to understand, stress during approach, landing and take-off is self-explanatory, the issue of high workload during taxi-phase of flight might be unexpected to certain stakeholders. However, sticking to some basic principles most of these phases can be rather relaxed as huge amount of tasks is generated somewhere between ATC and pilots.

Workload has been a recurrent topic in the aviation community over the last few years, especially as flight crew workload varies a lot, even during routine flights, from low to high and vice versa. These two situations represent specific risks. But it is very personal how to quantify workload. The effects of workload are very individual as well. Problems resulting from high or low workload are normally a product of different factors like personal experience, emotional state, cooperation within the flight deck etc. Beginning from this point of view, I asked myself what have been the events from my personal experience when workload definitely became an issue.

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Taxi

During taxi-phase the workload can increase pretty fast, especially during taxi-out. Of course, the possibility of stopping always exists while taxiing an aircraft, however this opportunity is hardly ever used. Normally pilots try to expedite taxi whenever they can as a favour to ATC as well as to stay within their schedules.

As long as everything happens as predicted and the airport is known to the crews the taxi-phase should not be a problem. But if things change, an unusual re-routing is received, technical problems arise or there is an issue within the cabin workload does increase rapidly. This effect is greater during taxi-phase as there is no autopilot allowing the pilot flying to divide his attention. The ideal solution would be to stop the aircraft but no one wants to disturb a major airport operation because of a 'possibly small problem'. Proper communication can ease this issue. On the flight deck side, pilots should clearly state their problem to ATC while Controllers should try not asking pilots to move, depart or expedite when they obviously have a problem. Even soft pressure from controllers' side on pilots to move, depart or expedite could work counterproductive. It would be better to proactively offer the chance to stop somewhere in the vicinity as soon as the controller becomes aware of any 'possibly problem' on board the aircraft. Hints for this can be various, typically I would say very slow taxi speed, incorrect or very short communication or uncertainty about the route to follow.

The same goes for re-routings. As the Captain normally steers the aircraft (s) he is not able to make notes or study charts while handling the aircraft. The First Officer might be busy with cabin-calls, checklists or other actions. Solutions to this dilemma might be progressive taxi-clearances or a chance to stop for a couple of minutes. It might be disturbing for a controller to have a taxiway blocked due to an aircraft holding there. But the possible effects on safety if an aircraft is blind flying in vicinity of runways might rapidly become dramatic.

Departure

If you look at the departure-phase of a flight, there is much and more on the "to do" list and it has to be done within a short period of time. Also the engine power is high while airspeed is low, a combination which does not leave too much room for mistakes and little time to correct. During the take-off roll the lack of time leaves only two options, STOP or CONTINUE. A possible exchange of information is therefore limited to really essential information. The same should be true for ATC, deliver important information / instructions or keep quiet.

About a year ago the Tower-Controller on a major hub in Europe asked a departing Airbus A-321 if he was still able to abort the take-off. The crew just filtered out the words "abort take-off" and did so. At a speed close to V1, the maximum speed at which a take-off abort can be done, this was a risky manoeuvre in reaction to a question.

Once airborne there are a lot of limitations to obey and time to react is very short. While levelling off for example the time from level off to an exceedance of the maximum flap speed can be as little as a few seconds and climb rates can be very high.

A common practice amongst pilots is to brief themselves before departure about what to expect and how to handle the different steps during initial part of a flight. A solution to possible problems between controllers and pilots lies in communicating every request to pilots as soon as possible. This should be done at the latest combined with the take-off clearance, allowing pilots to properly prepare themselves for this high workload phase.

As soon as gear and flaps are retracted, the after take-off checklist has been read and no immediate level-offs are to be expected, pilot workload reduces rapidly and once past 10,000 feet altitude (FL100) any non-essential request by ATC can be dealt with.

To illustrating the problem of very short notice of important restrictions, the following is an incident that happened to me shortly after my upgrade to become a Captain. The whole story ended up in a massive exceedance of the maximum flap speed and a rapid high-G manoeuvre. When on take off and only about 10 knots below V1, we were informed by ATC about a light aircraft flying through our departure route at an altitude of 1,500 feet. The suggestion was to level off at 1,000 feet. Given the fact that our load was only about 30% of the maximum this request meant rotating for lift-off and literally starting the level-off manoeuvre at the same time. When levelling off, power had to be reduced by about 70%, flaps had to be retracted and the

gear needed to be raised. At the same time TCAS was starting to provide Traffic Advisories (TAs) and the controller gave us new clearances and instructions. This was a really dangerous situation and if I had had the knowledge earlier, I would have preferred to delay take-off until the VFR traffic had gone.

Approach and Landing

As flight efficiency becomes more and more important, a high priority is assigned to an optimum, continuous descent. For most jet aircraft this means a continuous descent with the engines at idle thrust. While prolonging the descent and approach as well as requests for high speed are taking aircraft to the non-optimum but safe side of the descent planning, reducing track miles to go or advising a required speed reduction takes aircraft above their idle-descent profile, effectively facing pilots with additional problems. Due to the limited effectiveness of speed brakes, especially in low speed regime, workload increases quite massively when pilots try to fix this problem in the absence of proper tools for this task.

If such a shortened flight path is accompanied by a change of runway or approach, workload of flight crew might exceed a safe value. To understand this, we need to see what needs to be done in order to prepare for an approach. First, the new approach needs to be selected and properly programmed into the Flight Management System (FMS). The route from present position to landing must be checked and closed if needed. Then the approach aids need to be tuned, inbound courses and minima set and, in most aircraft, the approach aids need to be identified.

After this is done, the approach must be briefed between the pilots including go-around procedures and missed approach route. The landing performance must be calculated and reference speeds must be set to complete the approach briefing. At complex airports the runway turn-offs as well as initially expected taxi-in routes should be reviewed.

The whole process of re-planning an approach can take up to ten minutes. As the descent phase of a flight is not free of any additional tasks, this can end up in high levels of stress for the flight crew. Not to mention that additional communication with cabin crew might become necessary if the remaining flight time is shortened significantly. This issue can also be found within the European Action Plan on the Prevention of Runway Excursions (EAPPRE 3.3.2, Appendix C).

Of course, getting closer to the landing runway, it becomes more and more important to maintain the intended flight path accurately and monitor the aircraft position and energy state. It is obvious that these tasks do increase workload.

During the normal operations of taxi, departure and landing, there is one important thing to reduce flight crews' workload. As flight crews are instructed to maintain sterile flight deck procedures that demand the omission of any non-essential task while taxiing and in flight below Flight level 100, "sterile radio procedures" should be clearly understood by controllers as well. This means refraining from any non-essential communication to an aircraft whilst it is in a high-workload phase. Any instruction, plan or information such as track-miles to go etc. should be given to flight crews on earliest convenience allowing them to pre-plan their actions in good time. Once an aircraft is below 10,000 feet altitude, ATC communication with that aircraft should be limited to important instructions or information only.

However, some situations are simply not foreseeable. Unexpected missed approaches or abnormal emergency conditions can normally not be planned.

Abnormal and Emergency Situations

On the day before Christmas in 2011 my aircraft was approaching a German Airport round about midday. The weather was a little windy with moderate icing conditions above 2,500 feet altitude but good visibilities below. Due to the reported winds, the First Officer as pilot flying decided to configure the aircraft a bit earlier than usual for landing. Passing approximately 2,000 feet on approach we recognised

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that the No. 1 engine was malfunctioning. Our first intent was to notify ATC, perform the required emergency drills and go on landing the aircraft.

However, the approach became unstable requiring us to go around and as an immediate consequence we received quite a few radio calls, a frequency-change to departure and another bunch of questions from the controller. Remember! we were flying a single-engine go-around into moderate icing conditions on a turbo-prop aircraft. It took a couple of "stand-by"s and "we'll call you back"s until we were able to sort ourselves out, work through the checklists, get the cabin prepared and all the required tasks.

As a comparison, only about two months ago my aircraft was approaching Vienna runway 34 with the First Officer again acting as pilot flying but this time also on initial line training. From what I judged a completely uneventful approach, he produced a rather hard landing and bounced the aircraft. After I took control and initiated a go around, the controller did exactly nothing at all, He just let us fly the aircraft. After we were through about 1,500/2,000 feet, he queried whether we needed any assistance to which I replied "negative, bounced landing, call you back". His response was "roger, follow standard missed approach" which left us free to sorting out all the problems. Only after we had cleaned up the aircraft, engaged the autopilot and called the controller back did he instructed us to contact departure for a second approach.

In any abnormal or unexpected situation, the best ATC response is to let the flight crew fly their aircraft until a safe flight path is assured.

Comparing these two situations, I have to say, that the handling of the latter was excellent! He must have guessed correctly that workload in this moment was simply too high to allow any radio communication. This empathy from the controller let us continue undisturbed, delaying non-essential things like information sharing to a later moment when a safe flight-path was assured. More than just this, his first call was questioning our needs; at no time he pressed us or disturbed us, although it was rush-hour in Vienna.

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A second important piece of advice is not to press or guide a flight crew in any direction. Under possibly extreme workload, the easiest solutions sometimes do not turn up. If flight crews are instructed to do something they do not want, an easy response is simply to say "NO". However, it is a mistake to rely on the ability of a flight crew to say "NO" at any time. It is better is to ask open questions and at same time separate all other traffic to the maximum possible from this aircraft in distress.

Conclusion

It is self explanatory that a controller cannot appreciate all the pressing factors that are building up a high flight crew workload. The same goes with pilots, sometimes there is no workaround a certain request although knowing the controller is being stressed. But whenever one side is recognising the other side suffering from high workload, it is generally true that less is better than more. Empathy with and knowledge about the other side of the ether helps to understand situations without asking and by that supports overall safety.

As a rule of thumb the following timeframes should be kept free of any non-essential radio calls i.e. remain sterile.

- During take-off from the moment the take-off clearance is issued until passing transition altitude or even better until passing FL100.
- While aircraft are approaching an airport, information about the approach to be expected, remaining distance, possible delay, weather, etc. should be given at earliest convenience but no later than passing FL100.
- After landing, every radio call should be delayed until the crew is no longer using reverse thrust/reverse pitch.

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