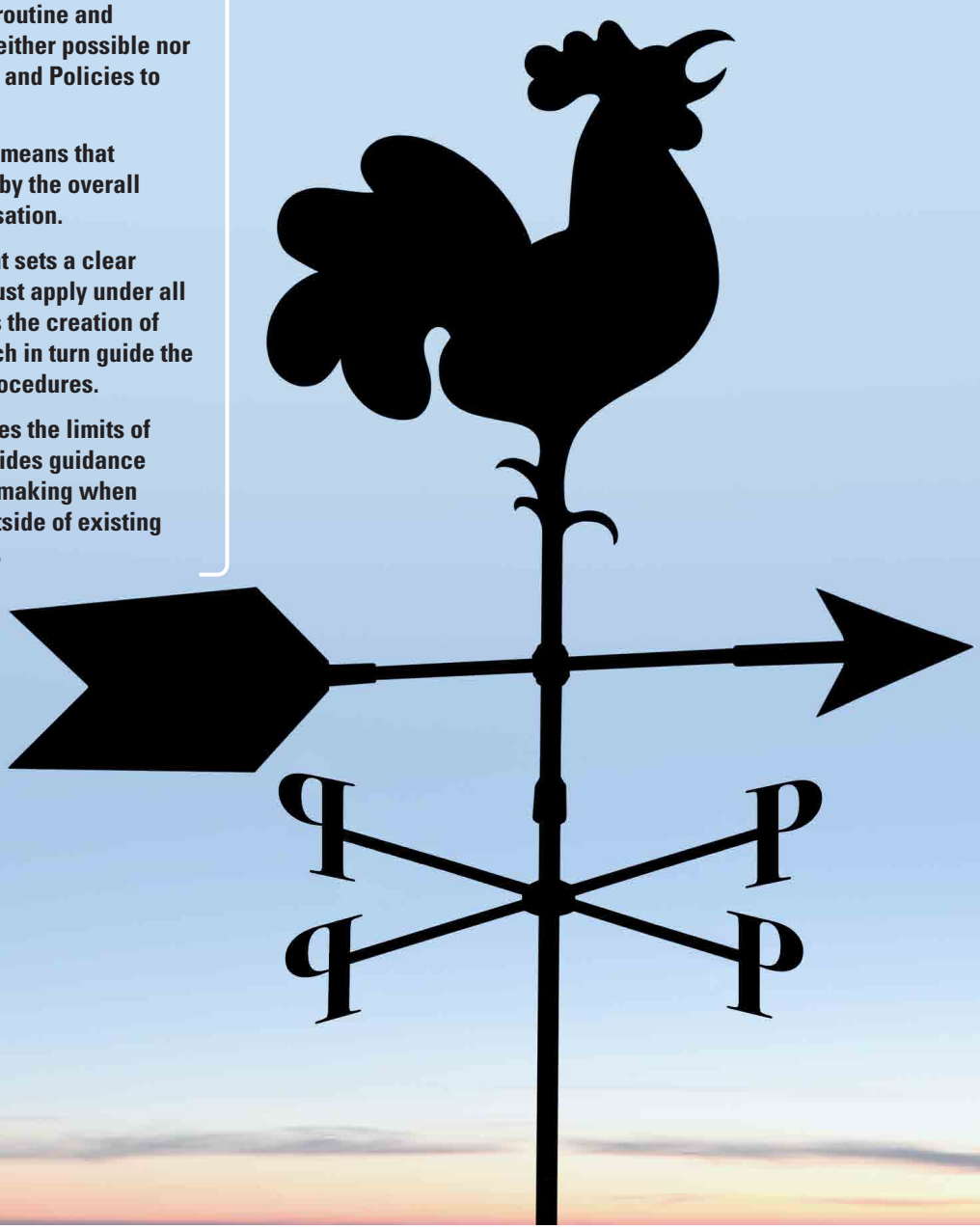
GUIDING THE PRACTICE: **THE 4PS**

Work-as-imagined is prescribed in a number of written forms, from the specific to the general. They all influence work-as-done in some way, but how can they best support and guide practice? In this article, **Immanuel Barshi, Asaf Degani, Robert Mauro, and Loukia Loukopoulou** outline a simple framework that anyone can remember and explain to others: The 4Ps.

KEY LEARNING POINTS

1. **While Procedures and Policies are prevalent in aviation for routine and exceptional tasks, it is neither possible nor desirable for Procedures and Policies to contain all of Practice.**
2. **The nature of operations means that Practice must be guided by the overall Philosophy of the organisation.**
3. **The Philosophy statement sets a clear order of priorities that must apply under all conditions. It also guides the creation of consistent Policies, which in turn guide the creation of consistent Procedures.**
4. **The Philosophy recognises the limits of the imagination and provides guidance for operational decision making when the Practice must fall outside of existing Procedures and Policies.**



Air traffic controllers and pilots appear to live by procedures and policies. There are procedures for how to set up the workstation or cockpit, how to start the engines, and how to vector aircraft. There are policies that may govern how you speak and how you dress and even how to leave your station to use the restroom. Policies and procedures can be very useful. They can organise work, increase effectiveness, efficiency, and safety and even make work more enjoyable (Barshi, Mauro, Degani, & Loukopoulou, 2016). But poorly designed or disorganised policies and procedures can make work dispiriting, difficult, and dangerous. Creating an effective set of procedures requires coordination of the 4Ps: Philosophy, Policy, Procedures, and Practice.

Practice is what happens on the front line. It is the sum total of all the decisions operators make and all the actions they take during operations. For pilots, Practice is what gets recorded in FOQA/FDM (Flight Operations Quality Assurance/Flight Data Monitoring, the aircraft data bus) and ASAP (Aviation Safety Action Program/Partnership, the airline's confidential reporting system) data, and what gets observed during line checks and LOSA (Line Operations Safety Audit). For ATC/ANSP, it is what you see in the tower cab, on the floor in the radar facility; it's what gets recorded in the radar tracks and what's reported in confidential reports. It is work-as-done. It is the reality of the operation.

We can visualise the Practice as the sum total of activities as in Figure 1.

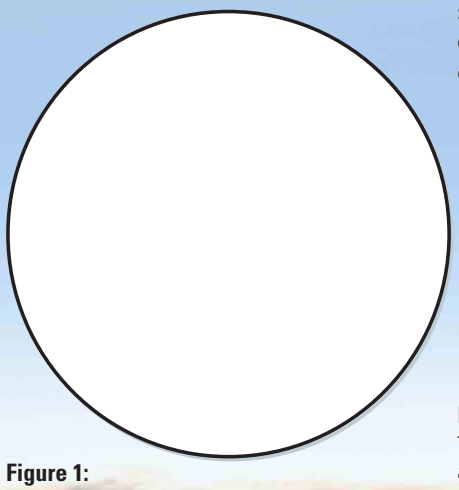


Figure 1: The Practice

It is often believed that all practices should follow prescribed company Procedures (SOPs). It can be visualised with a circle of Procedures that encompasses all of Practice, as in Figure 2.

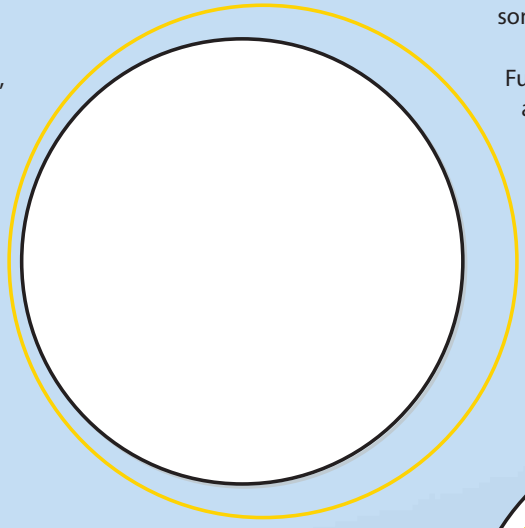


Figure 2: Procedures (yellow circle) contain the whole of Practice.

In reality, Procedures can only cover some of the Practice.

As much as some managers and lawyers would like it, it is not possible for Procedures to contain all of Practice. Nor is it wise to try. It is impossible to anticipate or imagine every situation such that a procedure could be written for it. Procedures assume a specific set of fixed conditions, but daily operations are conducted in a dynamic environment. The choice of actions in some situations must be left to situation-specific judgement. Furthermore, some activities for which procedures could be developed are better left to personal choice or a recommended practice. Over-proceduralising can lead to resentment and to resignation such that when a situation arises for which there is no procedure, people refuse to decide and to act on their own. Over-proceduralisation can also lead to conflicts among procedural requirements and it becomes impossible to operate without violating some procedures. It may also become impossible to actually know and remember all the procedures that are in books and manuals.

In reality, Procedures can only cover some of the Practice (see Figure 3).

Furthermore, Procedures do not cover a continuous, coherent area of the Practice, but only some areas of the Practice, and these areas may be disconnected. There isn't just one big procedure, but many separate different procedures. This can be visualised in Figure 4.

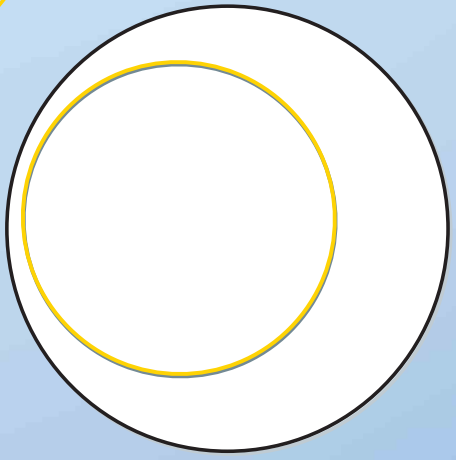


Figure 3: Some of Practice is covered by Procedures (yellow circle).

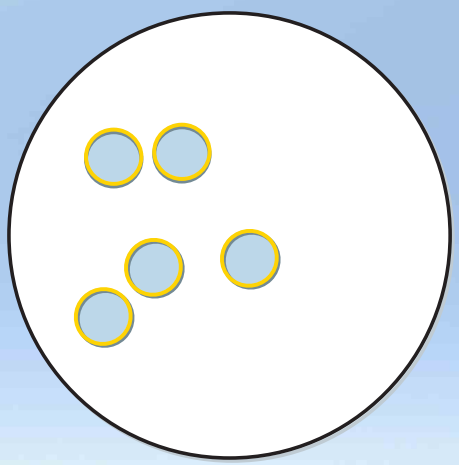


Figure 4: Some Practices are covered by separate and different Procedures (small yellow circles).

Having many separate and different procedures creates two problems: 1) how to ensure consistency across procedures, and 2) how to guide operators in situations when there is no procedure.

To create consistency across procedures and to guide the Practice that falls outside of Procedures, organisations create Policies. While Procedures address specific situations and dictate specific actions, Policies cover a broad range of situations, and provide guidance for decision making and action in those cases in which Practice must fall outside of existing Procedures. For pilots, Policies are also set to guide and limit general behaviours (e.g., a uniform policy), the way procedures should be conducted (e.g., checklists will be called for by the Captain on the ground, and by the Pilot Flying in the air), or the general ways in which equipment should be used (e.g., automation policy).

Some would like to visualise Policy as encompassing all of Practice as in Figure 5.

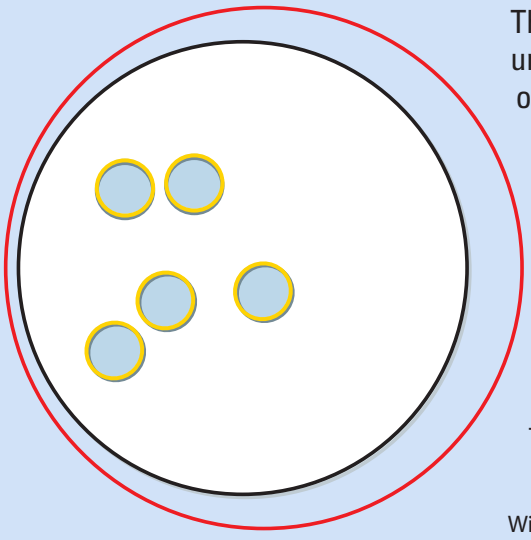


Figure 5: Practice as contained by Policy (red circle).

That too is impossible. There isn't just one over-arching Policy, but several different policies. And again, Policies are fixed and the operation is dynamic, and takes place in an ever-changing environment. Like Procedures, Policies are work-as-imagined. In truth, Policies cover some groups of procedures and some parts of Practice, as can be seen in Figure 6.

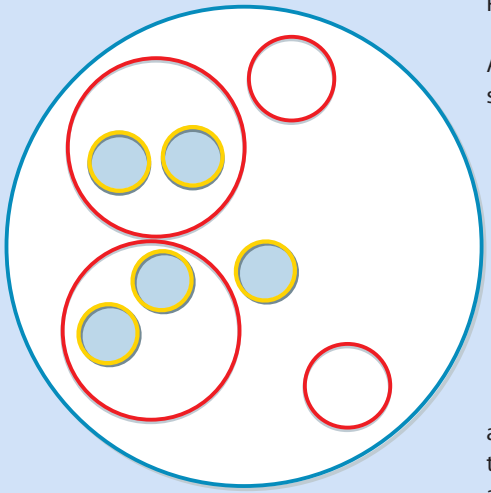


Figure 6: Policies (small red circles) apply to some Procedures and to some areas of the Practice.

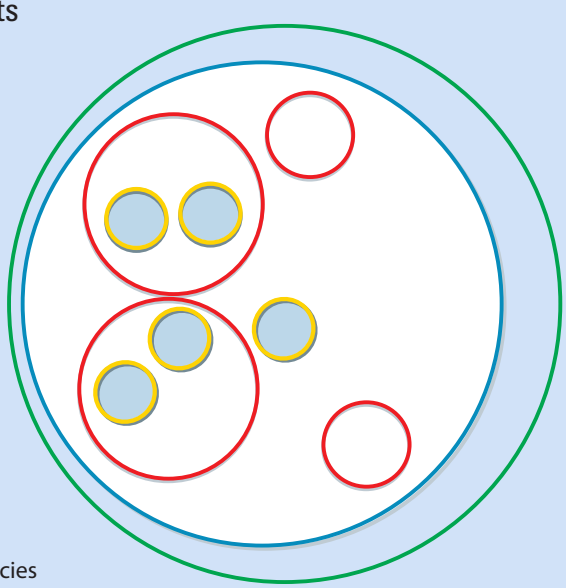
The dynamic, and at times unpredictable, nature of operations may lead operators to find themselves in situations for which no specific Procedure exists and for which no broad Policy applies. In such situations, the Practice must be guided by the overall Philosophy of the organisation.

Within their range, Policies guide the development of Procedures, and they guide the Practice when there are no procedures. But just like procedures, Policies are limited too. They cover separate areas and are different. So we are faced again with the problems of 1) how to make policies consistent, and 2) how to guide the Practice that falls outside of policies. The dynamic, and at times unpredictable, nature of operations may lead operators to find themselves in situations for which no specific Procedure exists and for which no broad Policy applies. In such situations, the Practice must be guided by the overall Philosophy of the organisation. A coherent and comprehensive Philosophy also guides the creation of consistent Policies, which in turn guide the creation of consistent Procedures.

An operational Philosophy is a statement of values. It explicitly articulates the operator's core beliefs. It reduces inconsistency among Policies and provides guidance in situations for which there is no Policy. Furthermore, because at times values might be in conflict (such as safety and on-time performance), the Philosophy statement sets a clear order of priorities that must apply under all conditions (e.g., it's always more important to be safe than to be on time). The Philosophy applies universally; a Policy applies to a particular set of conditions.

Ideally, Practice, Procedure, and Policy are contained within the organisation's Philosophy as can be seen in Figure 7.

Figure 7: The Philosophy (green circle) contains all of Practice.



The Practice is work-as-done. Procedures and Policies describe the work-as-imagined. The Philosophy recognises the limits of the imagination and provides guidance for operational decision making when the Practice must fall outside of existing Procedures and Policies. When practices exist outside of any procedure, policy, or philosophy, they are unguided and are a potential source of error and inefficiency. Besides guiding the Practice, the Philosophy also provides the guidance to align the Policies and Procedures into a single consistent and coherent framework (Degani & Wiener, 1994). This Philosophy, Policy, Procedures, and Practice framework is called: 'The 4Ps'. The 4Ps framework provides a systematic way of thinking about the relations between practice, procedures, policies, and philosophy.

Specific procedures are required in situations for which there is only one acceptable way to perform. These are situations in which the risk of variability in performance is too large for the operator to accept. For instance, during an ILS approach, the aircraft must be on the glide slope beam and on the localiser beam. It is not acceptable to be anywhere else. Thus, the cockpit approach procedure specifies that any substantial deviation must trigger a go-around. At the same time, the flight crew is given some discretionary space with respect to the landing configuration. It is allowable to land with different flap settings, depending on a number of variables, and it is possible to extend the landing gear at different points in time. The discretionary space is bounded such that the aircraft must be properly configured by a specific point in the approach. If the aircraft is not properly configured by that point, a go-around must be initiated per procedure. The discretionary space is also bounded by Policy and Philosophy such that the crew may not configure the aircraft very far in advance of the landing and thus waste time and precious fuel. But when a flight crew is uncomfortable with landing on a wet runway in a heavy crosswind, even though it's within the limits of the policy, and a go-around means late arrival, increased fuel consumption, and other costs, the policy is irrelevant because the operational philosophy clearly places safety above efficiency and on time performance.

A clearly articulated Philosophy provides guidance for the development of consistent Policies, which in turn provide guidance for the development of consistent Procedures. Procedures dictate the Practice in those situations for which there is only one acceptable way to perform. Policies guide the Practice in those situations that fall outside of Procedures, and the Philosophy guides the Practice in those situations that fall outside of Policy. When the Philosophy, the Policies, and the Procedures are clear, coherent, consistent, and comprehensive, the Practice, the work-as-done is well-guided.

References

- Barshi, I., Mauro, R., Degani, A., & Loukopoulou, L. (2016). *Designing Flightdeck Procedures*. NASA Technical Memorandum TM-2016-219421. Moffett Field, CA: NASA Ames Research Center.
- Degani, A., & Wiener, E. L. (1994). Philosophies, policies, procedures, and practices: The four 'P's of flight deck operations. In N. Johnston, N. McDonald, & R. Fuller (Eds.), *Aviation Psychology in Practice* (pp. 44-67). Routledge.

Dr. Immanuel Barshi is a Senior Principal Investigator in the Human Systems Integration Division at NASA Ames Research Center. He studies the skilled performance of astronauts and pilots, mission controllers and air traffic controllers, their ability to manage challenging situations, and their vulnerability to error. He holds Airline Transport Pilot certificate with A320, A330, B737, and CE500 Type Ratings, and is a certified flight instructor for airplanes and helicopters.

Dr. Asaf Degani is a Technical Fellow at General Motor's Research and Development Center. His current research is on developing formal and analytical methodologies for the design of autonomous vehicles and advanced concepts for future transportation systems. Prior to joining GM, he was at NASA Ames Research Center for 20 years conducting research on procedure and checklist design, automation, and formal methods for verification of human-automation interaction in modern aircraft.

Dr. Robert Mauro is a Senior Research Scientist at Decision Research and an Associate Professor of Psychology at the University of Oregon. He works on automation, pilot and space flight controller training, flightdeck procedures, pilot decision-making, and risk assessment. He has worked with regulators and major airlines in the USA and Europe, and his work has been supported, among others, by NASA, the FAA, and the National Science Foundation.

Dr. Loukia Loukopoulou is an aviation Human Factors professional with the Flight Safety department at SWISS International Air Lines. She is responsible for implementing and running the airline's Fatigue Risk Management program, while also involved in a number of projects concerning flight deck procedure and training issues. She has lived and worked in the USA (U.S. Navy, NASA Ames Research Center), and Greece (Air Accident Investigation Board, Hellenic Air Force).