terms of representations and interpretations. These flows are triggered by relevant presentations or signals ("it is more the presentation being different as opposed to position being different," "You need to physically bring the one presentation onto the screen"). Thus, for example, one pilot interviewed described how "everything needs to be done in a general way. You do create your own little triggers that triggers then into your own flow and process." Their movements become "second nature" to such an extent that they describe their flows in terms of "muscle memory" and operations that they "*all string together*." Similarly, returning to the older aircraft ATR 72-500 after having flown its newer sibling for a period of 6 months, another pilot reports: "When I am selecting functions on the ADU [advisory display unit], I looked straight up and I knew exactly what to hit. Just *muscle memory* from the [ATR 72]-600." The pilots are not (entirely) in control over their flows and therefore might find themselves at a loss when these do not unfold at work: "It's my defaults, my personal defaults that I didn't really have with me today. I couldn't recall them. *They didn't just crop up*. The little things… *they weren't there*." Many aspects of flying are described in terms of "muscle memory" rather than in terms of processing (re-) presentations or information. This muscle memory and the associated flow are beyond pilots' conscious control; but both constitute a large portion of the competent cockpit performance. Importantly, the pilots themselves speak about how a procedure or event *feels* or *does not feel right* rather than about knowing or being consciously aware of that something is (not) right and being able to provide reason. That is, there is a bodily, kinesthetic sense of flow associated with kinetic melodies.

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3 How (what) a cockpit knows and remembers: of flows and kinetic melodies

This ethnographic study was designed to contribute to a theory of cognition in and of a joint cognitive system by investigating how a cockpit forgets rather than calculates and remembers speed and speed-related issues. Our aim is to provide an account that (a) more closely reflects the experiential reality of pilots to whom flying an airplane has become "second nature" and (b) does justice to those aspects of workplace performance that are not well accounted for in terms of the processing of representations and information. In this section, we describe observations that have been left out in previous descriptions of the cockpit joint cognitive system, and which, following Woods and Hollnagel (2006), describe the system in its predominant functioning mode.

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3.1 Of flows and muscle memory: first-person descriptions of flying

Pilots account for much of what they do in terms of "flow," "muscle memory," and "presentations" rather than in

3.2 Phenomenology of kinetic melodies: on what and how a cockpit knows and remembers

In Sect. 3.1, we describe how pilots experience cockpit performance from their individual perspective in terms of flow, muscle memory, and presentations. We suggest that these experiences are consistent with cultural–historical activity theoretic and phenomenological descriptions of performance that highlight the importance of kinetic melodies that are performed as a whole rather than by stringing together individual actions and operations (Luria 1973). In this section, we provide an account of cockpit performances that do not (appear to) require representation and explicit coding.

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3.2.1 Kinetic melodies

Previous research on the cognition of flying presupposes that pilots operate with mental representations of procedures, explicit coding of instrument readings, and a