# UTTERANCES AND OPERATIONS IN AIR TRAFFIC CONTROL

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For a variety of reasons,ethnomethodology has developed an interest in the organisation of work,one which may be specified most bluntly and simply as with figuring out what the work is and how it gets done. Our investigation of the work of air traffic controllers is in accord with that,and what follows is a discussion of limited aspects of that investigation.

We're talking about the work of UK air traffic controllers,particularly those based at the London Air Traffic Control Centre (LATCC),West Drayton,and will say,only very briefly,that their work sites are control suites, (to which the ATCO is connected by a head set)which include amongst other things,a couple of radar display screens,telephones,and space for the display of paper strips which are printed out for them and provide information about the identity and expected arrival times of airplaines that will come under a given controller's control. Typically two controllers work at the same suite,at adjacent screens,and their activities are overseen by a chief. The suites are organised on the basis of the 'sector' organisation of air space,this being divided into areas,with the controller consequently being responsible for all the traffic within that given area of air space.

To say that the Air traffic controllers (hereafter ATCO's) work in an organisational environment is,at one level,an utterly

bland thing to say,but like so many other observations in sociology,the issues arise over what to make of such innocuous points. In this case,we want to pay some attention to the way in which the character of the ATCO's work is pervaded by its involvement within the organisational environment,the extent which it is organised as work-within-a-system.

The presence of the ATCO at the screen is,after all,an organisationally provided phenomenon,the provision of 'adequate staffing' of the work sites being a managerial task involving the distribution of people amongst shifts,the estimation and monitoring of the amount of work to be done,the number of control points required to handle that,and the distribution the volume of air space within the purview of controllers is occasionally changed as the amount of air traffic within a sector moves up to the perceived limits of a controllers capacity or,alternatively,falls well below those. Whether the ATCO is working,or,if not working,whether he needs to be readily available to start work,how hard he is working and for how long it will last,what kinds of work it is that he is and will be doing are all variable, and the actual situation as of any here and now is intelligible only against the known ways of the air traffic system and the operations room's daily and seasonal rounds etc.

Work is allocated amongst controllers on the basis of the sector organisation,but it involves the management of traffic

that is moving between sectors,and so the work involves the taking over planes from and passing them on to the control of others,so that coordination with other controllers is a routine feature of the work,which means that controllers will advise each other of decisions they are making,will inquire into each other's current preferences for disposition of traffic,and will direct traffic in ways which will facilitate transition between sectors.

The ATCO's work is heavily serviced,particularly with information,and particularly with the 'strips'. These are paper strips on which is printed a variety of information about planes which will relatively soon enter the controller's sector,and controller's write on them notes of the decisions that they have so far made with respect to the plane the strip identifies. The strips are not idle records of controlling,but are active instruments of it,for it is through their use that the ATCO can see how busy he's going to get,how many and what kinds of planes will be coming into his sector,what routes they will be taking through them. By placing the strips in an ordered ranking which reflects the time series of the plane's time of arrival,by removing strips from the sequence as the plane is dispatched from his air space, and by writing notes on them he's able to keep track of what he has already done and what remains to be done. The chiefs are also involved in servicing the ATCO's,in undertaking the liason work (by telephone or by walking around the ops room) which the ATCO's (being bound to the screen and

perhaps intensively and continuously engaged in controlling) cannot perform for themselves. There is also a substantial element of looking out for each other,with the chief and adjoining ATCO's monitoring things to ensure that things have been noticed,possible consequences forseen and so forth.

An expression that you soon come across in the air traffic control world is 'the picture' and this talks of the way in which ATCO's build up,during any working period,an overall conception of the deployment of traffic within their sector,where this is something that is to be 'built up' over a period of time,such that the controllers who are taking over a position do not simply move into it and commence work but instead sit beside the controller in place and watches what he is doing for some time. The other respect in which the picture is much talked of, is that of the risk of 'losing it',it being felt that the amount of work to be done,the amount of traffic which can be handled has a limit and that beyond a certain point it is no longer possible to keep a comprehensive conception of the state of play within the sector together. In the course of the handover,then,the working controller organises traffic in a way which facilitates the transition for the incoming one.

We've been depending upon the organisation's own conception of the ATCO as the 'front line' operator of the system,and indicating (in a superficial way) the extent to which activities are organised around the controller,the amount of work that is

done to enable the controller to sustain intense and prolonged concentration on the strips and the screen and within that sustained focus of controlling to be confronted with a manageable amount of work,such that should a controller be coming under undue pressure,traffic will be routed around him,held back or the sector will be subdivided and work handed to other controllers.

We now want to say a little bit about the way in which the controller,through the step by step business of talking to planes achieves the (safe) organisation of traffic within his sector. The primary contact with planes is through instructions,and these principally involve the direction of the traffic through level,heading and speed.

Part of the difficulty in describing the ATCO's work (especially in such condensed form as this) is that of giving the wrong impression of the difficulty of the work itself. It is easy to make it sound as if the ATCO has an immense variety of things to attend to,and an enormous range of possibilities to contend with,but the proper yardstick for the difficulty of the task is that which applies within the work itself. For the ATCO's themselves,how difficult the work is depends upon the state its in,and there are times when the traffic load is very heavy that they find it difficult to do the work adequately,but for much of the time,the work is,as is work for anyone experienced with it,easily manageable. The ATCO,like Goffman's surgeon,is working well within the range of his competence and

not at its limits. Thus,at a time,in a sector,the prevailing work may be that of placing planes in an aligned sequence of descent to an airport,and this may involve no more than taking over and sustaining the order of planes which have been sequenced in the previous sector. The ATCO has to respect requirements of sector organisation,such as those requiring the preservation of minimal separation between planes,the separation of levels such that only one plane occupies a given height at a time,and has to effect the integration of planes coming from different directions into an integrated sequence,or has to ensure that planes which are crossing each others paths will be well separated by height,has to pass outbound and climbing planes through or around areas where inbound planes are 'stacked' in holding patterns awaiting descent,and may have to do this under conditions of mechanical breakdown,where an incompetent and lost pilot has wandered into his air space and can't be contacted over the radio. The ATCO is dependent upon the expeditiousness and accuracy with which pilots execute his instructions,and is dealing with craft which are variable in their speed,capacity for climing,and manouvreability,and is typically concerned to do the work in ways which expedite the passage of planes, economise on fuel and so forth. Here,though,we catalogue the range of considerations which **can** feature in the ATCO's deliberations,but the extent to which the work is difficult depends upon the extent to which these assorted tasks coincide. Its tempting to compare

the ATCO's decision making to chess playing, for there is the same need to see developmental possibilities and to be alert to consequences that could be negatively consequential and overlooked, but the chess player has a unified problem to consider, whereas the ATCO will have, instead, a variety of localised problems to handle. Further, its just worth pointing out that these 'problems' are not ones which confront the ATCO de novo, but represent routine troubles with stock solutions.

The sequencing of the ATCO's utterances, then, is to be understood as the sequencing of his operations, and the order in which these are given contributes to the shaping up of the developing situation and the constraint on the work is that of ensuring that there is time to get round the number of calls necessary to deliver the requisite instructions, and to do so in the sequence and at the times which leave adequate time for the instructions to be implemented. Thus, for example, there are three ways of descending or climbing planes, and these are by putting them on parallel headings, separating them by height, or separating them by speed, and it just is a feature of the work that separation by speed is deemed least preferable, for though time may be required to assess situations and the aim is to buy yourself as much time as possible, this is not to be done at the expense of either pilots or the next controller. Thus, if there are planes ascending and descending in different directions during quiet periods then the controlling will be done by the

next controller,actually discussing it with him. As things get busiⁿer,then the time taken up by talking,not to mention the problem of coordinating the talking so that the two controllers are not distracted gets to be such that a continuing ascending or descending movement for both planes is difficult,so it may be better to maintain the continuing climb of the outbound,bringing the descending plane down in a two step operation. Thus,for the ATCO its a question of whether (say) an inbound to Heathrow will require to be brought,in transit through his sector,down from thirty thousand feet to eleven simply by being given an instruction to descend by the time it reaches a certain marker (one of the beacons used in navigation) in the sector,to eleven thousand feet,and so if that instruction can be given 'early',before the plane has even entered the sector,or whether it is to be brought down in a series of steps,from thirty to twenty,from twenty to sixteen,and from sixteen to eleven. The continuous descent from a single instruction may be regarded as optimal,but its availability is restricted in busier periods by the fact that the plane which is descending in that way is thereby nominally,at least,occupying the levels through which it is passing,and the need to segregate planes by levels means that other planes cannot be assigned to those levels until the descending one has definitively cleared them. At busy times,then,though more instructions will be required to clear any individual plane,the step-by-step descent minimises the

requirement for talk with the other controller and maximises the number of levels to which traffic can be assigned. One other way in which the operations might be sequenced is through the simplification of complex traffic situations. Thus,a controller who is dealing with the sector in which inbounds for Heathrow are descending in sequence may find that there is an inbound for Gatwick airport which will cross there route, with one plane crossing the route of several descending ones, and he may,then,opt to take the Gatwick inbound down to a very low level such that there will be massive clearance at the point of crossing between it and the planes with the Heathrow destination,such that if the Gatwick plane is descended early and very low it is something which can be marginalised in the ATCO's attention,requiring only monitoring glances to ensure that its flight level is going down,thus freeing time and attention for the articulation of the Heathrow flights.

In a brief and condensed way,we have tried to sketch in the way in which the talk of air traffic controllers provides the medium for the operations of managing sectors of air space,taking note,first,of the ways in which the controller's activity is embedded in its organisational environment,and the way in which the talk comprises a central part of the ATCO's round of talks and therefore structures the organisation of traffic movement.

## *A SAMPLE OF TALK ON THE SUITE*

NOTES

Clacton Sector West Controller's radio transmissions (r/t) written in
**BOLD CAPITALS.**
Respondent written in *ITALIC CAPITALS.*
Explications written in Underlined Lower Case.
*EAST* is Clacton East(Outbound) Controller.
*CHIEF* is the Clacton sector chief.

| | **WEST CONTROLLER** | **RESPONSE** |
|---|---|---|
| TIME 8.50.00. | | |
| 50.34 | **SCANDINAVIAN FIVE ONE FIVE ROUTE DIRECT TO DETLING.** | |
| 50.42 | | *SK515."ROGER DIRECT DETLING SK515."* |
| | [East talking to chief.] [About the state of T.M.A.] [West sums up.] | |
| 51.05 | "You've got to learn to work under pressure, Paul." | |
| | [ A request from the phone] | |
| 51.14 | "if you like," | |
| | [ In response to phone.] [Telephone conversation in progress.] | |
| 51.20 | " o k ". | |
| 51.49 | **SK515 CONTINUE DESCENT NOW TO FLIGHT LEVEL ONE ZERO ZERO ONE FIVE MILES BEFORE DETLING.** | |
| 52.00 | | SK515 *"ROGER LEVEL ONE ZERO ZERO TO BE LEVEL FIFTEEN MILES BEFORE DETLING SK515".* |
| 52.04 | **KYOU** | [ East talking ] [ Strip sorting ] |
| 53.11 | "thank you, Sandy." [ to assistant.] | |
| 53.22 | "Ferry 201..... .... is ferry 201 past?" | |

*EAST: " Oui ".*

53.27 **AIR FERRY TWO ZERO ONE CONT-INUE WITH AMSTERDAM ONE TWO FIVE DECIMAL SEVEN GOODAY.**

53.34 *BAF201 " ONE TWO FIVE ER SEVEN GOODAY".*

53.44 *CHIEF; " How's he with the 89692. "*

53.51 *EAST: " Gotta go to ninet...*

*53.58 EAST: if you go to 19 and make sure he misses, then...."*

55.06 " Scandinavian going the ??? "

55.21 **SK515 WHAT'S YOUR PRESENT HEADING.**

55.25 *SK515 "DING TWO TWO FOUR ZERO SK515"*

55.28 **ROGER TURN LEFT HEADING TWO TWO ZERO KEEP YOU CLEAR OF THE DANGER AREA.**

*55.33 SK515 "ROGER HEADING TWO TWO ZERO SCANDINAVIAN FIVE ONE FIVE "*

[ Strip sorting ]

55.47 **SPEEDBIRD SEVEN TWO THREE YOU CAN TURN ER FOR LAMBOURN DESCEND WHEN READY TO FLIGHT LEVEL ONE FIVE ZERO.**

55.56 *BA723 "ROGER RECLEARED WHEN READY LEVEL ONE FIVE ZERO AND TURNING DIRECT FOR LAMBOURNE SPEEDBIRD ER SEVEN TWO THREE.*

56.04 *LH038 "GOODMORNING LONDON THIS IS LUFTHANSA ZERO THREE EIGHT LEVEL THREE FIVE ZERO."*

56.08 **LUFTHANSA ZERO THREE EIGHT GOOD MORNING STANDARD ROUTING TO LAMBOURNE LANDING RUNWAY IS ONE ZERO LEFT.**

56.15 *LH038 "STANDARD TO LAMBOURNE FOR ONE ZERO LEFT LUFTHANSA ZERO THREE EIGHT."*

56.31 "He's slow shifting this stack"

*56.33 CHIEF: " Right ".*

56.34 " He's pretty slow shifting this stack "

*56.37* *CHIEF: " how many's he got then, two"*

56.38 "He's got 14, he's a well er er 14, he;s just left 14, I thinks it's One Three Six "

56.48 *CHIEF: "Ok, I'll go and have a look when he gets to Longsands "*

*56.56* *CHIEF: " How'd he get there? "*

57.00 " He went up there , now he's turning down there again"

57.02 *CHIEF: " Right ".*

*57.04* " he's obviously crossing at right angles ... and doing a good job"

57.06 *CHIEF: " Be warned "*

[ Talk about SK515 ]

57.10 **SCANDINAVIAN FIVE ONE FIVE ER RESUME YOUR OWN NAVIGATION NOW DIRECT TO DETLING.**

57.15 *SK515 "DIRECT DETLING SCANDINAVIAN FIVE ONE FIVE ."*

*57.42* *SEDEV "LONDON SIERRA ECHO DELTA ECHO VICTOR GOOD MORNING LEVEL THREE FIVE ZERO MAINTAINING,"*

[ Already analysed strip and position and ready with squawk; Note only plane on Amber 37.]

57.46 **SIERRA ECHO DELTA VICTOR GOOD -MORNING SQUAWK FIVE FOUR FOUR SIX STANDARD ROUTEING TO LAMBOURNE LANDING ONE ZERO LEFT.**

57.57 *SEDEV "SQUAWK FIVE FOUR FOUR SIX STANDARD ER ROUTING LAMBOURNE LANDING ER ONE ZERO LEFT SIERRA ECHO VICTOR".*

58.04 **SCANDINAVIAN FIVE ZERO FIVE CONTACT LONDON ON ONE TWO EIGHT DECIMAL FOUR GOODDAY.**

58.11

*SK515 " ROGER ONE TWO EIGHT FOUR GOODAY SCANDINAVIAN FIVE ONE FIVE."*

58.14 " Oh dear! "

58.17 **SIERRA ECHO DELTA ECHO VICTOR CONFIRM THE SWQUAWK FIVE FOUR FOUR SIX.**

58.20

*SEDEV "FIVE FOUR FOUR SIX SIERRA ECHO VICTOR."*

58.21 " Got it! "

58.22

*CHIEF: " That lufthansa going to come to you " [ To East ]*

58.26 **ROGER THANK YOU GOT IT NOW**

*58.29*

*EAST: " Yeh well,"*

*58.31*

*CHIEF: "he's looking for 21, he'll come to you at 37 "*

[Transmitter switched by *SEDEV* to acknowledge.]

58.35 " Have you got any dirty knees Den, thirty three's ".

58.37

*CHIEF: " No, You're going upto 31 on him."*

*58.38*

*EAST: " There's a 33 here "*

*58.39*

*EAST: "That's Swiss Air going up to 33"*

*58.41* "Yea....hh--s, at Gabbard"

58.45 "OK down to 31 ... with the Sierra Echo Victor"

58.48

*EAST: " OK !"*

[ Echo Victor is from Amber 37 he is cutting the outbound lane]

58.47 **SIERRA ECHO VICTOR DESCEND TO FLIGHT LEVEL THREE ONE ZERO**

58.58

*EAST: " Right the Swiss Air coming South "*

59.00

*SEDEV " LEAVING THREE FIVE ZERO FOR THREE ONE ZERO SIERRA ECHO VICTOR."*

59.00 *CHIEF: and this one coming down to thirty three's too"*

[ East controller changing over;
Description continues in background ]
[Chief interrupted by the phone].

59.26 *SEDEV " RADAR SIERRA ECHO VICTOR CONFIRM ER OUR ROUTEING IS ER VIA GABBARD CLACTON."*

59.34 **SIERRA ECHO VICTOR NEGATIVE ROUTE ER PRESENTLY ON A RADAR HEADING OF ER TWO THREE ZERO**

59.42 *SEDEV " O K RADAR HEADING TWO THREE ZERO SIERRA ECHO VICTOR."*

59.45 **ROGER REMAIN ON THAT HEADING TO INTERCEPT RED ONE SOUTH INTO LAMBOURNE.**

59.50 *SEDEV "ECHO VICTOR THANK YOU."*