Part of the History of Quiet, Fuel Efficient Continuous Descent Approaches into London Heathrow Airport Starting in 1975

and how many Non Precision Approach Accidents could still be avoided by using these procedures

Pages 2-7 **Article March 1974 Journal of the Guild of Air Pilots and Air Navigators**
How to Reduce Noise and Save Fuel - Now
by Hugh Dibley
proposing that:

1. ATC give aircraft expected DME distances and Flight Levels for bottom of descent points, so that crews could plan idle thrust descents from cruise altitude efficiently to the holding / inbound approach fixes, given suitable forms of guidance,
2. After leaving the holding fix, that the vectoring speed be increased above the then standard speed of 170 kts IAS to at least 200 kts IAS, to enable aircraft to be flown clean / without flaps for as long as possible,
3. Ideally from the holding fix, the track miles should allow a descending approach on about a 3° / 300 ft per mile gradient to smoothly intercept the ILS glideslope with minimum thrust and any need for thrust changes,
4. The height for intercepting the ILS glideslope to be increased from the then 2,500 ft to as high as practicable,
5. In suitable weather conditions, aircraft should be kept "clean" for as long as possible, lowering the gear at about 1,500 ft above the airport to be stabilised by 1,000 ft,
6. DMEs should be installed to show the distance from the runway to allow crews to judge their descending approaches efficiently.
   (NB: At the time ILS DMEs were not provided as part of the ground navigational system and some airlines indicated their unwillingness to pay for the installation, therefore the UK Department of the Environment funded the cost of the ILS DMEs at LHR for noise abatement, which were installed in 1978.)

Page 8 **Copy of letter from UK NATS dated 7th May 1974 in response to the GAPAN Article of March 1974,** which led to work on quiet, efficient Continuous Descending Approaches.

Page 9 **Flight International 25th September 1975 describing Lufthansa Managed Drag Approach procedures which were similar to the proposals in the GAPAN article of March 1974,** and the resistance by the UK CAA to the DLH procedures but emphasizing that these were being supported by BA Overseas Division.

Page 10 **Economist 20th September 1975**
Page 11 **Guardian 21st September 1975**
The newspaper articles mention the UK CAA and British Airways European Division's resistance to DLH's Managed Drag procedures which could reduce noise in central London.

Both illustrations used show similarity to that in the earlier GAPAN article on Page 6.

Page 12 **Example of Dibley Descent Computer showing how to follow an efficient idle thrust descent profile** from cruise altitude for an ATC clearance which defined an altitude and DME distance at the bottom of descent.

Pages 13-15 **Examples of Dibley Approach Computer improving Safety by providing a Constant Angle Glide Path for Non Precision Approach** eliminating the need for the Step Down / Dive & Drive NPAs involving most NPA accidents, but still being flown and causing accidents.

JOURNAL OF THE GUILD OF AIR PILOTS AND AIR NAVIGATORS

March 1974

How to Reduce Noise and Save Fuel - Now

By Senior First Officer Hugh Dibley *

(Liveryman and Vice-Chairman, Technical Committee, who is expressing a purely personal view)

FUEL conservation has always been a major factor in efficient airline operations but it is being highlighted by the present crisis *(1974)*. During climb and cruise it is relatively simple for a pilot to extract the best performance from the aircraft, mainly by flying at the correct speeds and at the optimum altitude for the aircraft weight. But during descent and approach practical information may not be so readily available which can lead to a considerable drop away from optimum efficiency.

Poor descent and/or approach operation dramatically increases the amount of fuel burnt – at least 20 per cent on a short sector – besides making life under the approach path unnecessarily noisy.

Air Traffic Control obviously largely governs an aircraft's navigation in a complex terminal area such as London. It is important that the profile prescribed by ATC should be as close to the aircraft's optimum descent and approach path as possible.
(An ideal profile for minimum fuel burn - but not minimum noise - is shown in Figure 1)

The aircraft descends from the cruise altitude at point A with minimum power to Point B at circuit height, and then decelerates to approach speed before starting its final approach at point C to land at D.

A good approach is a prerequisite for a safe landing, so it is vital that the aircraft is properly stabilised at the correct speed in the landing configuration (gear down, landing flap) in the last 1,000 ft or 3 miles of the approach to land.

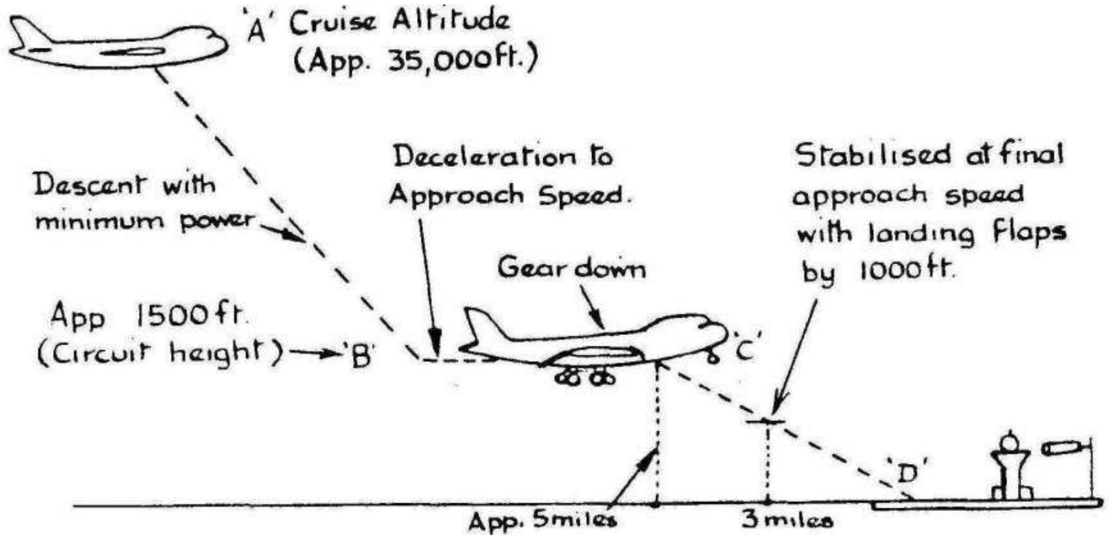


Figure 1. Ideal Descent & Approach to Land for Minimum Fuel (for noise see Fig. 6)

The final approach angle C-D (approximately 3° or 300 feet per nautical mile) is common for all current jet aircraft. The Top of Descent Point A must be determined accurately so that the aircraft decelerates smoothly from B to C, with flaps and landing gear being extended as power is applied to establish the aircraft on the final approach. (Flaps are ideally selected at about 10 miles and the gear about 5 miles to touchdown).

The descent profile A-B varies not only between different aircraft types but with individual aircraft's descent speed and landing weight as shown in *Figure 2.*

** The author is a 747 pilot instructor with British Airways and an IRE and TRE on the 747 Simulator*

This shows that a heavy Boeing 747 descending slowly at about 260 kts for best fuel economy follows a gradient of about 280 ft per mile, starting down from 35,000 ft about 135 miles from the runway; at the other extreme a 747 descending at maximum speed (Mach .89/390 kts IAS) would need less than 50 miles. For a descent at 340 kts IAS the descent distance for a heavy 747 is 95 miles against 65 for a light aircraft – the gradient being 380 and 550 ft per n mile respectively.

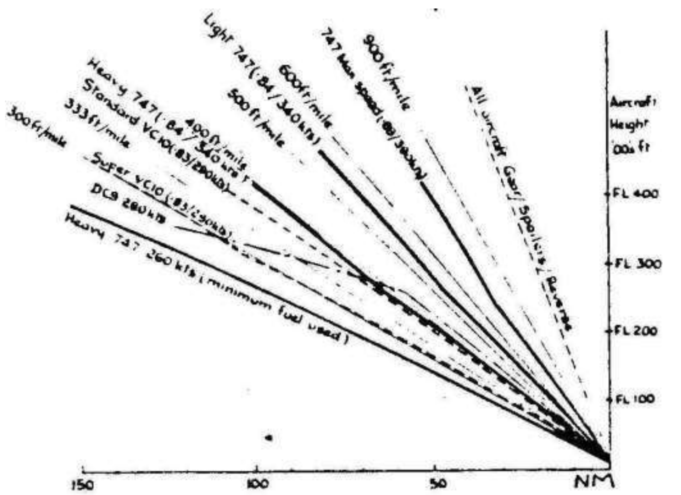


Figure 2. Examples of Aircraft Descent Profiles

Due to its lighter weight and greater drag a standard VC10 needs 25 miles less than a Super VC10 at the same speed, while some aircraft. e.g. the DC9 and BAC111, which require engine power for pressurization at high level, descend slowly to about 25,000 ft, and then at about 400 ft per mile at 2S0 kts IAS.

Most pilots rely on mental arithmetic based on rules of thumb to compute their descent profile – 300 ft. per mile is popular as the sums are easy (Height = Distance X 3) and it suits the bigger jets (707, 747, Super VC10 etc) well at about 280 IAS.

But as Fig. 2 shows, the situation can get beyond a mental solution, and even when it is relatively simple many pilots will descend early to be safe. The effects of getting the profile wrong are considerable, as illustrated by *Figure 3*.

Height	Mach/IAS	Configuration	Fuel Used for 8 miles	Time for 8 miles
37,000 ft	·84/275	Clean	150 kgs (40 galls)	1 min
10,000 ft	340 kts	Clean	265 kgs (70 galls)	1·25 mins
5,000 ft	240 kts	Clean	310 kgs (85 galls)	1·9 mins
5,000 ft	200 kts	1° Flap	350 kgs (95 galls)	2·2 mins
5,000 ft	170 kts	10° Flap	470 kgs (130 galls)	2·6 mins
5,000 ft	150 kts	Gear down 20° Flap	770 kgs (210 galls)	2·9 mins

Figure 3. Increased fuel consumption by low altitude and low speed operation with flaps and gear

Descending / 1 minute (8 miles) early on a 747 and extending flaps and gear on reaching circuit altitude uses an extra 620 kgs (170 gallons) of fuel and adds 2 minutes, to the sector time.

A 747 descent computed at 300 ft per mile but flown at 340 kts IAS could end up 55 miles short of the field. If approach flap was then selected, with the gear still up, over 2,000 kgs (550-600 gals.) extra fuel would have been burnt, and 11 minutes added to the flight time.

Varying descent techniques between individual pilots, companies and aircraft can be one of the largest problems for ATC especially if an aircraft's ground-speed is not displayed on the ground radar.

When entering a complex terminal area under most present ATC systems, aircraft can be given an altitude at which to cross a particular point during descent and it is important from all aspects that pilots comply with the clearance efficiently. *Fig. 4* shows the effect of failing to do so.

Not only does aircraft B waste 200 gallons of fuel and 6 minutes of aircraft time but the job of the controllers is made that much more difficult. The aircraft could be anywhere in 24,000 ft of sky if they wished to coordinate crossing traffic over Lyneham. Longitudinal separation might be eroded extremely quickly and this has led to misidentification of radar returns where one aircraft has unexpectedly overtaken another. (Think if B had been a Standard VCI0 descending at 290 kts and A a 747 at 390 kts)

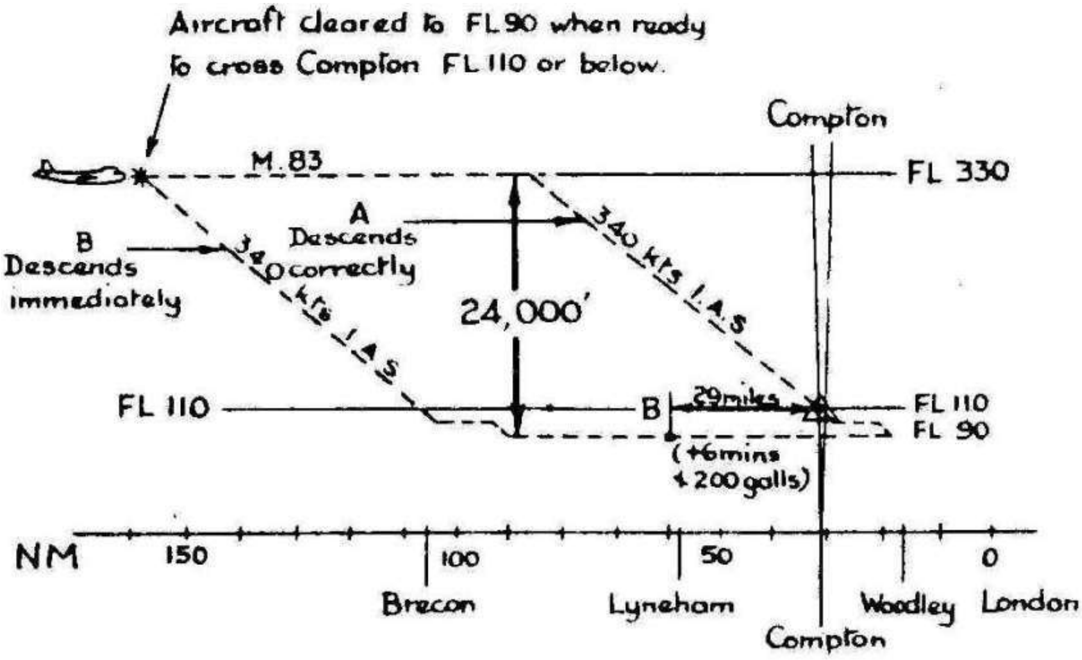


Figure 4. A 747 is cleared to FL90 to cross Compton FL110 or below. Pilot A descending at the correct point, crosses Compton 29 miles / 6 mins, ahead of Pilot B, who descends immediately, burning 200-250 gals. more.

Some controllers are therefore tempted to try to navigate the aircraft vertically themselves by giving positive instructions when to descend. Again *Figure 2* shows that they have little chance of doing this efficiently—unless practically knowing the pilot's name and aircraft weight, let alone the type etc! Further confusion might be caused as some airlines recently have reduced cruising speeds to save fuel. On starting descent the aircraft can "dive" off some thousands of feet to achieve its normal descent speed, possibly thereby losing all the savings gained by cruising slower!

The time has surely come for all pilots to have some form of descent guidance to allow them to plan their descents accurately, and monitor the correct profile throughout descent. This should be possible for all types of aircraft, not only those whose aerodynamics happen to suit the mental arithmetic of the pilot.

The latest types of Area Navigation Systems are capable of limited vertical navigation. But they are expensive, and not only are operators reluctant to retrofit present aircraft but some airlines do not even consider it worthwhile to fit to the latest aircraft (e.g. DC10, TriStar). The problem is that the full benefit will not be available from ATC until most aircraft are able to navigate vertically with a certain degree of accuracy, which appears to be many years away at present. *(The Concorde will probably enter service without vertical guidance.)*

Figure 5 shows a simple circular slide rule (kindly made by Airtour flight Equipment Ltd) which can enable all aircraft to follow a vertical profile accurately ***now***. This version shows a standard 747 descent (340 kts IAS to 10,000 ft with 250 kts IAS, for a landing weight of 250,000 kgs) but models can obviously be drawn up to suit any aircraft at any particular speed and configuration — e.g. for maximum fuel economy at minimum drag speed; or for minimum time at Vmo (maximum operating speed) — (*see Fig 2*)

Using the computer it is quite simple to navigate to within a few hundred feet vertically (i.e. a mile horizontally) whereas pilots would be content to be within a few thousand feet if relying on their mental prowess. Indeed, an analysis of reports shows that pilots using the computer estimate their accuracy has been improved average 9 miles horizontally (4,000 ft vertically). *Figure 3* shows this is worth at least 40 gallons on a 747. i.e. the cost the computer is covered by *one* sector's operation (British Airways operates some 400,000 sectors annually).

The computer in Figure 5 is set to solve the crossing clearance in Figure 4 — cross Compton (31.5 DME London) at FL 110 or below. 31.5 on the inner distance scale is set under 11(000 ft) on the outer scale. Descent from FL 330 is started at about 87 DME; if the groundspeed is 500 kts, the rate of descent required is 3,300 ft per minute as shown on the extreme outer scale: as the groundspeed drops off with height so the rate of descent will be reduced. (Wind is allowed for by making the rate of descent proportional to *ground speed*). Continuous altitude versus distance checks are available without effort — i.e. at 69 DME—FL260. 44 DME—FL 160 etc. Continuing below FL 110, if speed was reduced to 250 kts at FL100 the aircraft would cross Woodley (16 DME) at about FL 85, or at about FL50 if 340 kts was maintained below FL 100. The whole thing could be set up on the Ockham DME just as well, or else using aircraft's INS or doppler, assuming it to be sufficiently accurate

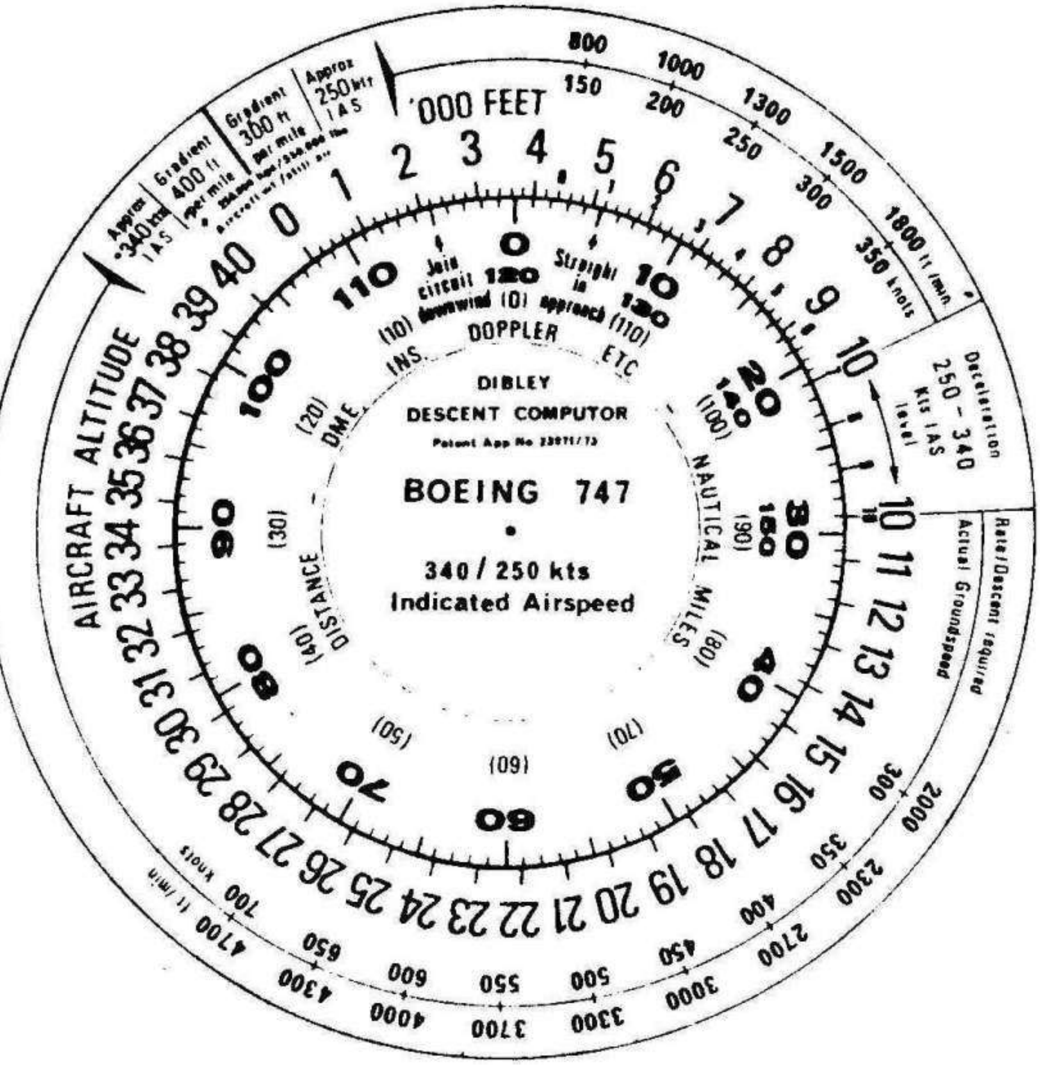


Figure 5. The Dibley Descent Computer

Although not revolutionising the Air Traffic Control scene, accurate vertical navigation on descent could help the situation a great deal. Not only could controllers rely upon pilots conforming to their vertical clearance uniformly, but by avoiding the type of gross variation shown in *Figure 4.* **the flow of aircraft to the approach director should be organised more easily. Controllers could give an expected final crossing clearance when ever possible — this might be the lowest slack level — which would benefit operators considerably as pilots could use their aircraft's optimum cruise and descent procedure to the maximum.**

Below this crossing altitude/fix, pilots must obviously expect to be vectored tactically by radar to allow the director to establish an orderly stream for landing. ***Ideally, the height and track miles to touch down should combine to give a gradient of about 3° or 300 ft per mile*** but this is obviously not always possible. Speed control will almost certainly be needed at a busy airport, but it is vital that a ***sensible speed*** is used.

170 kts has been the universal speed for controllers at London over the past few years. It is not unusual to be vectored from Ongar/Lambourne in Essex to land on 10 Left (over Windsor Castle) or from Woodley, near Reading to the 28s (over London), i.e. about 60 miles at 170 kts. Table 2 shows that on a 747 this can use an extra 200 gallons per approach over a higher speed allowing the aircraft to be kept clean. *(In the USA, the ATC rules state that a speed less than 200 kts will not be used for normal vectoring to an IFR approach).*

A speed of I70 kts has often been called for with hardly another aircraft airborne in the UK — e.g. a freighter arriving at 3 am — causing undue noise pollution. *(Concorde burns 25,000 kgs an hour at 170 kts — consuming over 4 times more per mile than when cruising at Mach 2 i.e. 1,100 kts.)*

Not only should the vectoring speed be increased but pilots should be given the option of flying their own approach when traffic permits.

An area where pilots themselves can make considerable savings, not only in fuel but in noise, is in the final approach path. The approach director normally turns aircraft onto the runway centre line at about 10 miles from touchdown — on a busy day it can be 20-30 miles — and a height of 2,500 to 3,000 ft. *Figure 1* shows that for a safe approach the gear and landing flap must be selected at about 1,500 ft or 5 miles: assuming the weather is fine there is no need to do so much earlier. Yet regularly on a beautiful day, without a cloud in the sky, people on the ground get blasted to pieces by aircraft thundering over the middle of London with everything hanging out.

Some aircraft require the gear to be extended early for an autoland, but surely such autolands need only be made on a small proportion of approaches in good weather.

The 747 isn't a particular noisy aircraft but on the other hand from *Figure 2* it can be seen that if gear and approach flap are extended 8 miles early, rather than flying at l80 kts with 5° flap, an extra 100 gallons is burnt.

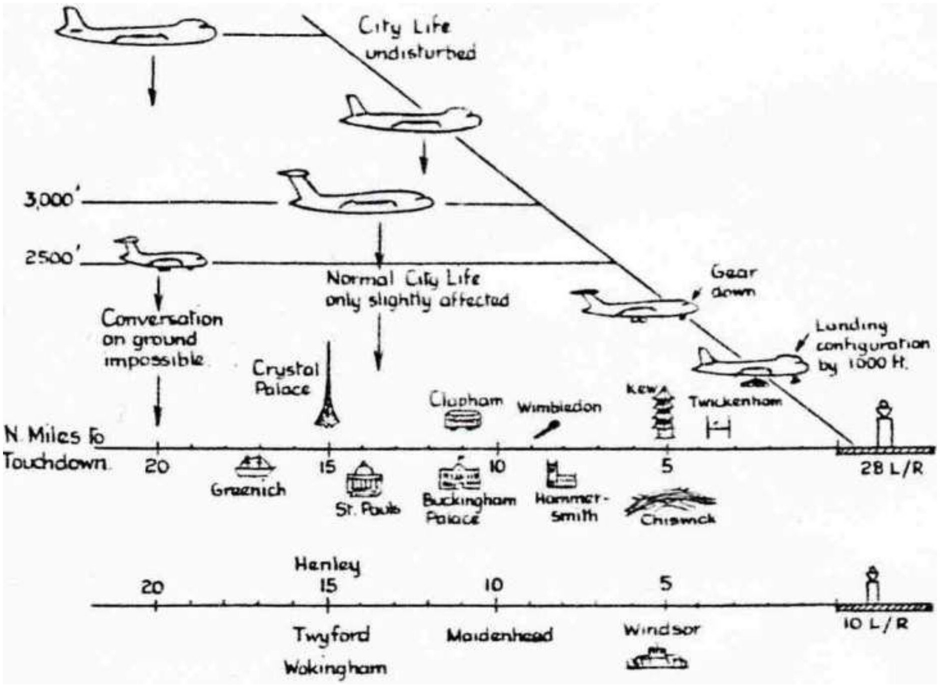


Figure 6. The effect on the environment of aircraft approaching at various levels, with and without gear and / or flaps extended.

Figure 6 shows the approach path over London and the effects on domestic life of premature dirtying up of aircraft. Even 10 years ago, you could always tell a TWA 707 because it was inevitably flying cleaner and quieter than most other aircraft. Now other operators seem to be getting the message! It is interesting to see various airlines' performance on the approach. I think that someone isn't really trying if the gear is down much before the Chiswick Flyover.

(There is much talk about the steep noise abatement approaches that are happening in the USA. Before we think about those, let's make our present procedures as quiet as possible — without impinging upon safety or re-equipment and re-training. Perhaps ATC could be persuaded to raise the height for flying over London — 2,500 feet over Regents Park is quite absurd?)

With a DME tied in with the ILS there is no excuse for getting settled down unduly early.

To Summarise

1. Airlines should be encouraged if not actually required to adopt some form of vertical navigation aid as soon as possible.
2. ATC should give the point where lowest altitude is to be crossed. Whenever possible likely crossing clearances to be published with standard routings

   (NB: The US plans to introduce vertical navigation in 1977-82. New York already has routes tentatively drawn up.)
3. Intermediate approach speed for radar vectoring to be 200 kts minimum.
4. Whenever possible pilots should be allowed to control their own navigation - including speed - for an approach.
5. Minimum height for intercepting the glideslope, especially over London. to be 3,000 ft preferably higher.
6. DMEs to radiate from all ILS. Pilots to be encouraged to keep aircraft clean for as long as possible, and not to lower gear before about 5 miles DME unless precluded by weather. (The exact point will depend upon the aircraft's gear extension time.)

Assuming —

a) 1 and 2 allow a modest 15 mile improvement in descent accuracy (assuming aircraft kept clean on reaching lower level),

b) 3 produces a reduction in 170 kts for 10 miles, allowing aircraft to be kept clean,

c) 6 persuades pilots to lower their gear 5 miles later : —

The savings for a 747 type of aircraft would be:—

(a) 325 kgs (90 gals)

(b) 200 kgs (55 gals)

(c) 200 kgs (55 gals)

725 kgs (200) gals total

(NB: It is only too easy to lose 2000 kgs during descent and approach. The fuel burnt on a short sector such as Manchester or Paris to London should only be 8000 kgs).

There were about 120,000 landings at Heathrow last year. Of course they were not all 747s but it might be argued that there's a potential saving of 24 million gallons in the fuel that Heathrow has to provide annually. Even 10% would provide a worthwhile 2.5 million gallon reduction which could certainly be achieved ***now***.

NOTE

Continuous Descent Approaches (CDA) from stack level of FL 70 were introduced into LHR in 1975, initial approach speed 210 kts.

DMEs were installed on the ILS in 1978 - funded by the Department of the Environment for noise abatement.

National Air Traffic Services

FROM: Air Commodore Ian Pedder, OBE, DFC, MBIM, RAF,
Director of Control (Operations)
The Adelphi,
John Adam Street,
London WC2N 6BQ

Telephone 01 836 1207 *NATS*

H P K Dibley, Esq,
Guild of Air Pilots and Air Navigators,
163 Holland Park Avenue,
LONDON W11

Our Ref: 8M/52/03 S
7 May 1974

Dear Mr Dibley,

<u>FUEL SAVING</u>

It is with considerable interest that I read your article "How to reduce Noise and Save Fuel – Now" in the March edition of the Journal of the Guild of Air Pilots and Air Navigators.

We are, of course, very conscious of the need to afford operators the opportunity to conserve fuel whenever possible, and we have recently extended the period of operation on the White Airways that we introduced at the beginning of the fuel crisis. These specifically arranged direct routes have enabled significant fuel savings to be made in the en route phase.

The TMA phase has proved to be a more complex problem. I am sure that you are aware that UK controlled airspace is designed to affect the minimum amount of airspace commensurate with flight safety, and this very tight configuration does restrict the room for manoeuvring if we are to avoid any adverse effects upon the expeditious flow of traffic. Even the smallest revisions to procedures can have considerable impact upon other parts of the system. We are currently coming across difficulties in this area and, so far, have not found a solution which could be practically implemented. Nevertheless we shall keep on trying.

Finally, I should like to express my appreciation of your contribution to the problem and reaffirm that NATS is very much concerned to do what it possibly can to offer, to all operators, opportunities to conserve fuel.

Yours sincerely,
Ian Pedder

A Joint Ministry of Defence Civil Aviation Authority Service

Lufthansa Assistance to introduce CDAs

Flight International article in September 1975 describing Lufthansa's Managed Drag procedure for quieter approaches, how DLH were requesting higher vectoring speeds to permit the aircraft to be flown clean for longer during approach, and to delay extension of the landing gear to give minimum drag / thrust / noise.

LOW DRAG, LOW NOISE

LUFTHANSA'S "low-drag, low-power" approach technique is at least as safe as traditional approach techniques and the airline believes that its noise-abatement landing scheme has much to commend it. This view was given by Mr Wolfgang Jurzig, chairman of Lufthansa's Noise Abatement Working Group, speaking in London last week. Declaring that noise is currently one of the biggest problems facing his management and that much remains to be done in the control of noise at source, he claimed that the peak of the noise problem has been passed and outlined Lufthansa's contribution to the problem.

Introduction of the quiet, high-bypass-ratio engine had made the noise of earlier engine types more conspicuous. Retro-fitting of quiet engines, nacelles arid "hush-kits" is possible but almost prohibitively expensive, so Lufthansa has concentrated on other means of noise reduction. Careful construction of screens and hangars has reduced the number of complaints attracted by engine ground runs.

Noise-abatement departure routes and profiles have been refined, the preferential runway system is used wherever possible, "low-drag, low-power" approaches are now standard practice and the use of reverse thrust during the landing run has been minimised.

Capt Robert Salzl, chief pilot of the Lufthansa Boeing 727 fleet, explained the "low-drag, low-power" concept. Claiming a 50 per cent noise reduction during the intermediate approach (up to the outer marker), he noted that the International Air Transport Association had recommended the technique to all its members in 1972. The height at which the aircraft is required to be fully stabilised, with undercarriage and flaps down, is held down to about 1,000ft. Descent to within 3,000ft of touchdown is "clean," using idle power and optimum speed for the aircraft type. Below 3,000ft speed is reduced to 160-170kt, with flaps around take-off setting and being power set to maintain speed. Descent is continued at this speed. The glidepath is intercepted and followed to a height of approximately 500ft above normal height for crossing the outer marker. The undercarriage is now lowered, the flaps are further extended and power is increased, so that the aircraft is stabilised in the landing configuration on passing the outer marker. Considerable noise alleviation is gained up to the outer marker, but beyond this point no reduction is achieved. To be fully effective, close co-operation with air traffic control is necessary, and preferably all aircraft should fly the same technique.

At Frankfurt Airport, a particular problem has been the city of Offenbach situated close by. Conventional measures for a reduction of noise were insufficient and Lufthansa played a leading part in a study of more radical methods. Pan Am, Swissair and British Airways also worked with the German airline, the Frankfurt airport authority and others to devise low-noise arrival and departure routes. The Frankfurt approach procedure now allows use of the Lufthansa technique and requires captains unable to adhere to the procedure to declare their difficulties.

At London Heathrow, said Capt Salzl, a relatively low speed, (and therefore partial flap and more thrust), is required at distances up to 40 n.m. from touchdown.

Recently, he said, London Control has requested higher speeds (210kt) closer to the airport. From Lufthansa's point of view this is helpful and allows the airline to utilize its "standard" arrival profile to the benefit of the community beneath, as well as to reduce night time and fuel consumption.

Capt Salzl spoke of the Frankfurt environmental protection contest. Aircraft certificated to ICAO Annex 16 noise standards and using the Frankfurt approach technique are awarded points (according to the weight of aircraft) for each arrival; in November, DM2-5 million will be distributed to the airlines according to the points gained.

• Recent comment in the local press near Heathrow indicates that Lufthansa's low-drag, low-power technique has attracted the attention of sharp-eyed residents. The British Civil Aviation Authority told an enquirer that, using Lufthansa's technique, "there may be an erosion of safety margins." The CAA has not published any facts to back up this assertion, which not surprisingly received widespread coverage in the local press. Flight is told that the CAA's Directorate of Operational Research and Analysis reports that "Lufthansa's Boeings are no quieter than any others," but the CAA has neither commented on the noise levels of different approaches nor said where its measuring point or points were. Flight understands that the CAA is "against the procedure in principle because it changes standard procedures."

British Airways' Tridents in particular require long, relatively slow, approaches using automatic landing and autothrottle. It appears that Heathrow traffic patterns have been drawn to accommodate them.

The Overseas Division of the airline, however, is fully aware of the benefits to be gained from such techniques and independent of Lufthansa, a British Airways 747 captain has produced a circular slide rule for use during descent, so that the descent point can be accurately predicted and frequent checks easily made during descent. Not only is the resulting arrival quicker but it saves a considerable amount of fuel—savings of perhaps £50 can be made during a 747 approach.

From a pilot's point of view these techniques are attractive in reducing an often familiar "drag round the houses," and Lufthansa reports no adverse comment from its pilots using revised check lists with the technique.

Airport noise

The German way

A technique which could halve aircraft noise for people living under the landing route more than 3-4 miles, from London's Heathrow airport (say Westminster to Chiswick) is being given the cold shoulder by the Civil Aviation Authority. The technique, called "low-drag-low-noise", was developed by the West German airline, Lufthansa, to get round a problem with a small village directly in line with the runway at Frankfurt airport, where the residents were objecting to having their eardrums blasted. What it adds up to is that Lufthansa is leaving the noisy, final, bit of the landing process until its aeroplanes are nearer the airport and (don't get alarmed) nearer the ground.

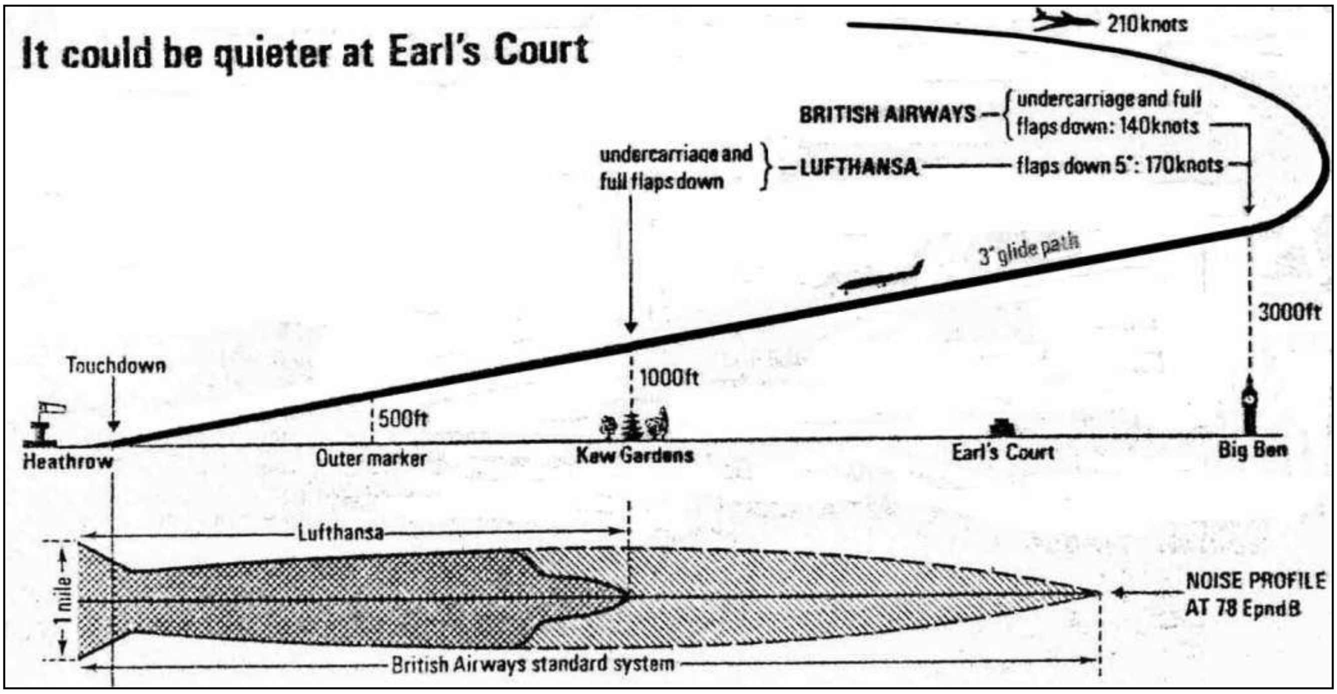
Under both the Lufthansa and the standard systems, air traffic controllers direct the aircraft, flying at about 210 knots, towards a point about 14 miles from the runway to intercept a theoretical glide path which points up from the end of the runway at 3°. Using the conventional landing approach, at about 12 miles from the runway the undercarriage and flaps are-put down, which means that power and noise are created. The aircraft flies in, slowing down to about 140 knots in this configuration, until it lands. On a fine day Lufthansa aircraft, by contrast, come in on minimum power at 170 knots all the way, no flaps, no wheels: these are then put out in time for the aircraft to be stabilised before reaching 1,000 feet (or higher if the weather is less good).

As well as making less-noise Lufthansa, reckons that it is now saving an average of 30 gallons of fuel on each landing by its Boeing 727 aircraft and on reduced maintenance. Less throttle is needed to push the aeroplane along when it does not have the wheels down and all those flaps (wing extensions which give more lift) hanging about.

The British concern about the new technique is said to centre on safety—in particular, whether the system increases the pilot's workload during landing, the most dangerous part of the flight. Yet British Airways pilots helped devise the new technique and it has been welcomed by the pilots' international association, Ifalpa. (The pilots are less happy about an American development, called the two-segment approach, where the aircraft first descends down a 6° slope, to intercept the 3° glide path not far from the outer marker.)

Your special correspondent can vouch that the crew seemed to have more than adequate time during a recent low-noise approach to Heathrow in a Lufthansa 727. The- three minutes or so between putting out the undercarriage and flaps and landing were more than adequate for the crew to go through its final checks that all was well (and for the captain to double-check).

The real reason for British official apathy may be a clash with the automatic landing system used on British Airways Tridents. This requires the undercarriage and flaps to be lowered miles out as in the standard technique. This is fine when the weather is foul (BA can land at Heathrow when most others cannot). But people who live from Westminster to Chiswick (and similar places around other airports) deserve better treatment when the weather is better, which is



OBSERVER 21st September 1975

‘Gliding’ Jets halve the noise

By ANDREW WILSON

BRITISH AIRWAYS and the Civil Aviation Authority are resisting introduction of a landing technique that could cut London and other cities airport noise by half.

The technique, known as ‘low drag, low power,’ has been safely and successfully used by the German airline Lufthansa for more than four years.

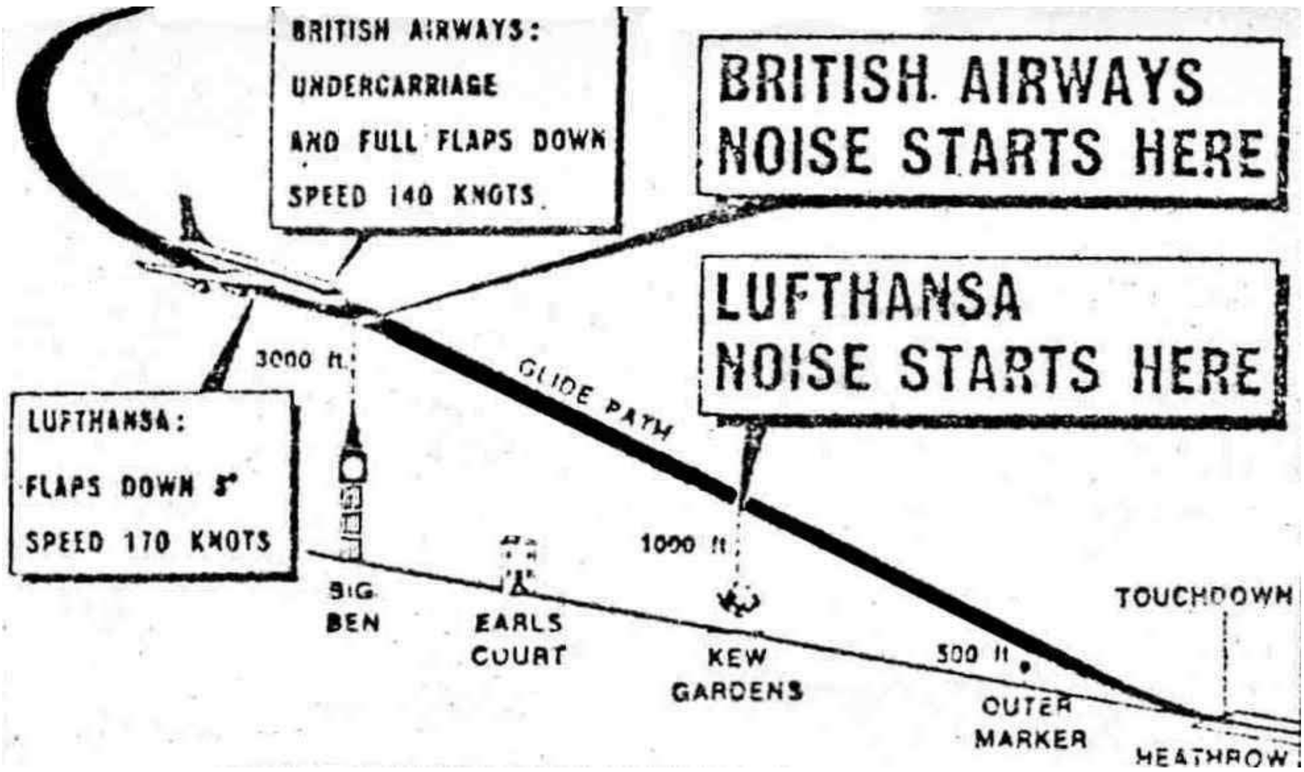
Instead of putting out flaps and landing gear 12 miles from the runway, and having to increase power and noise to overcome the extra drag (the conventional British Airways method), Lufthansa pilots fly 'clean' down the three degree glide-slope until they are near the airport.

At 1,000 feet they still have 40-50 seconds to extend flaps and gear and (stabilise for the touch-down. If that were allowed when approaching Heathrow, thousands of people living along the Thames would be spared ear-splitting noise.

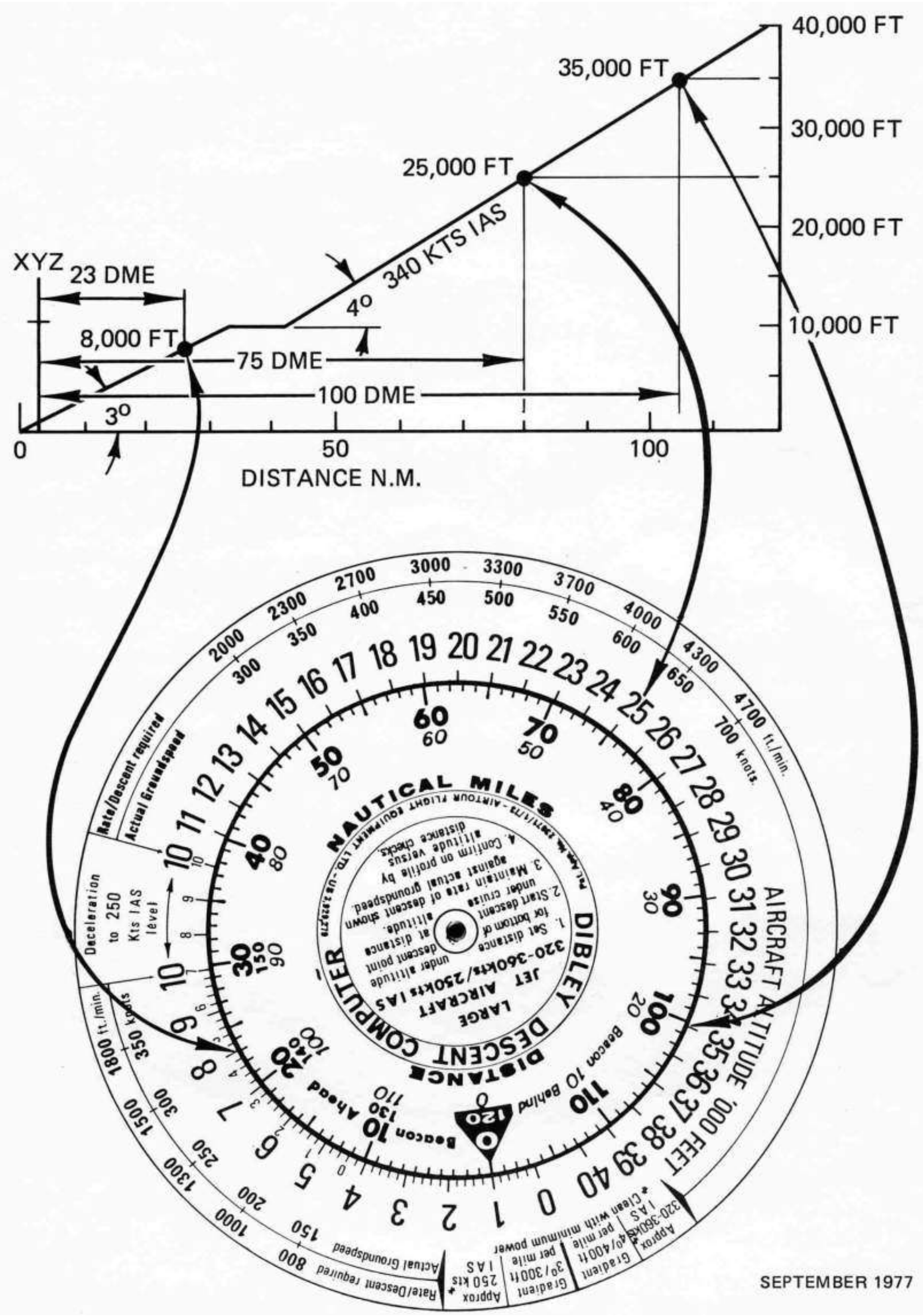
At a discussion in London last week CAA officials alluded to air traffic control problems with the German system. But the real reason for Britain's reluctance is that British Airways Tridents, already among the noisiest jets in the world, are equipped with an automatic landing system which requires that flaps be extended at conventional height.

The British planes descend at 140 knots (161 m.p.h.), spreading a carpet of noise over a wide area, whereas Lufthansa's Boeing 727s descend at 170 knots, with engines nearly idling, almost like gliders. Even at Kew, where noise would begin, (see diagram) it would be much reduced.

Lufthansa's technique has been recommended to member airlines by the International Air Transport Association.



‘Flaps out’ at the last minute. How Lufthansa’s way could save London’s ear drums.



Dibley Descent Computer Set to Cross 23 n miles DME from XYZ at 8,000 ft and 250 kts IAS

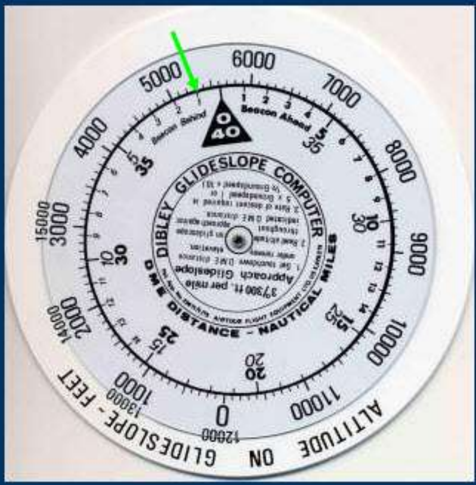
(Artwork by Lockheed, Burbank, for L1011 / TriStar Operators' Conference, September 1977)

Start descent from FL 400 at 113 DME n miles
At Sink Rate for Groundspeed:
3,700 fpm for 550 kts; 3,300 fpm for 500 kts; 3,000 fpm 450 kts, etc

Continuous Cross-checks to confirm on profile – e.g.
At 100 DME should be at FL 350
At 75 DME should be at FL 250
At 59 DME should be at FL 185, etc

Approach Slide Rule Set for Washington, Nairobi and Toulouse / Guam

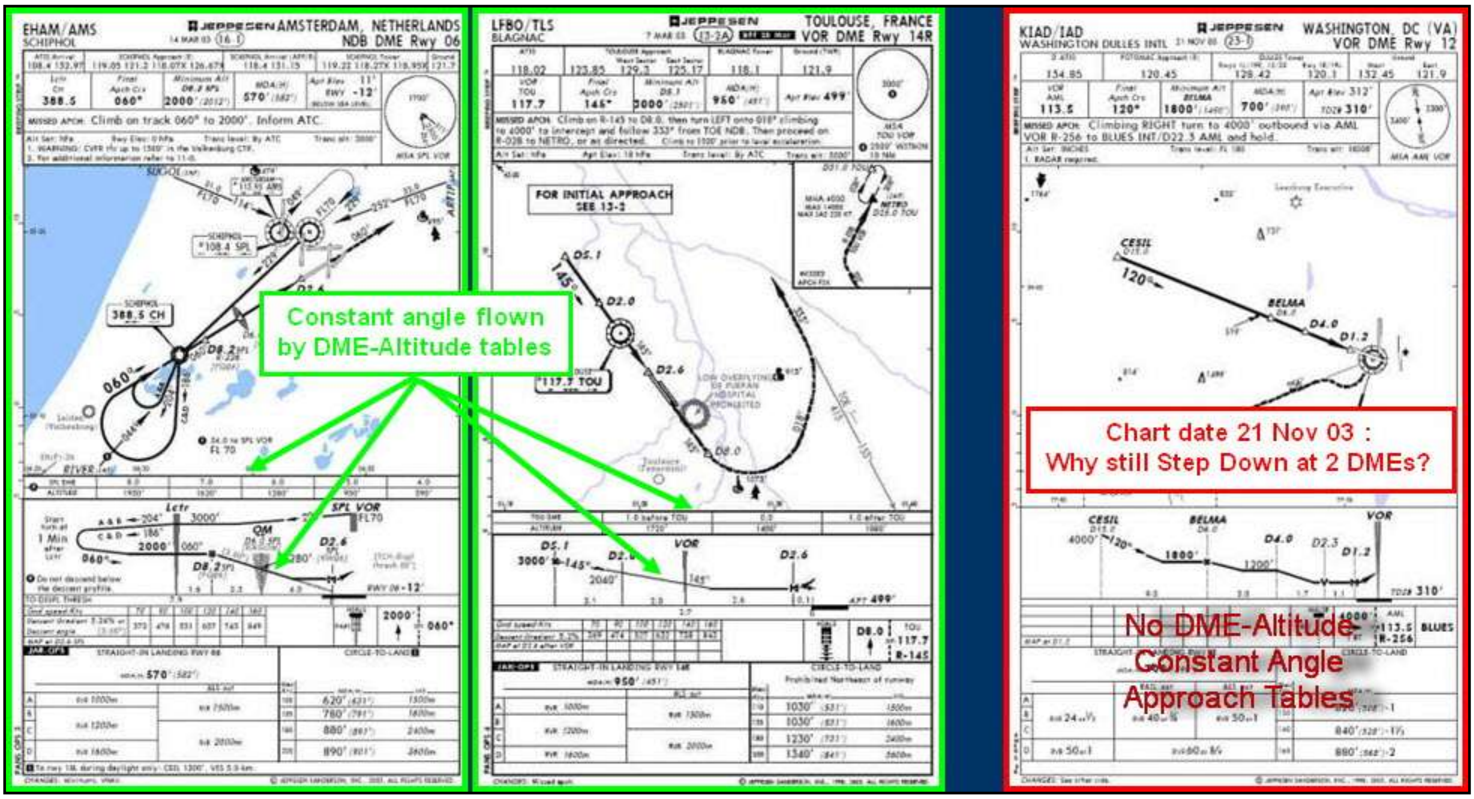
IAD 12 – set ahead 1.2 DME at 360 ft

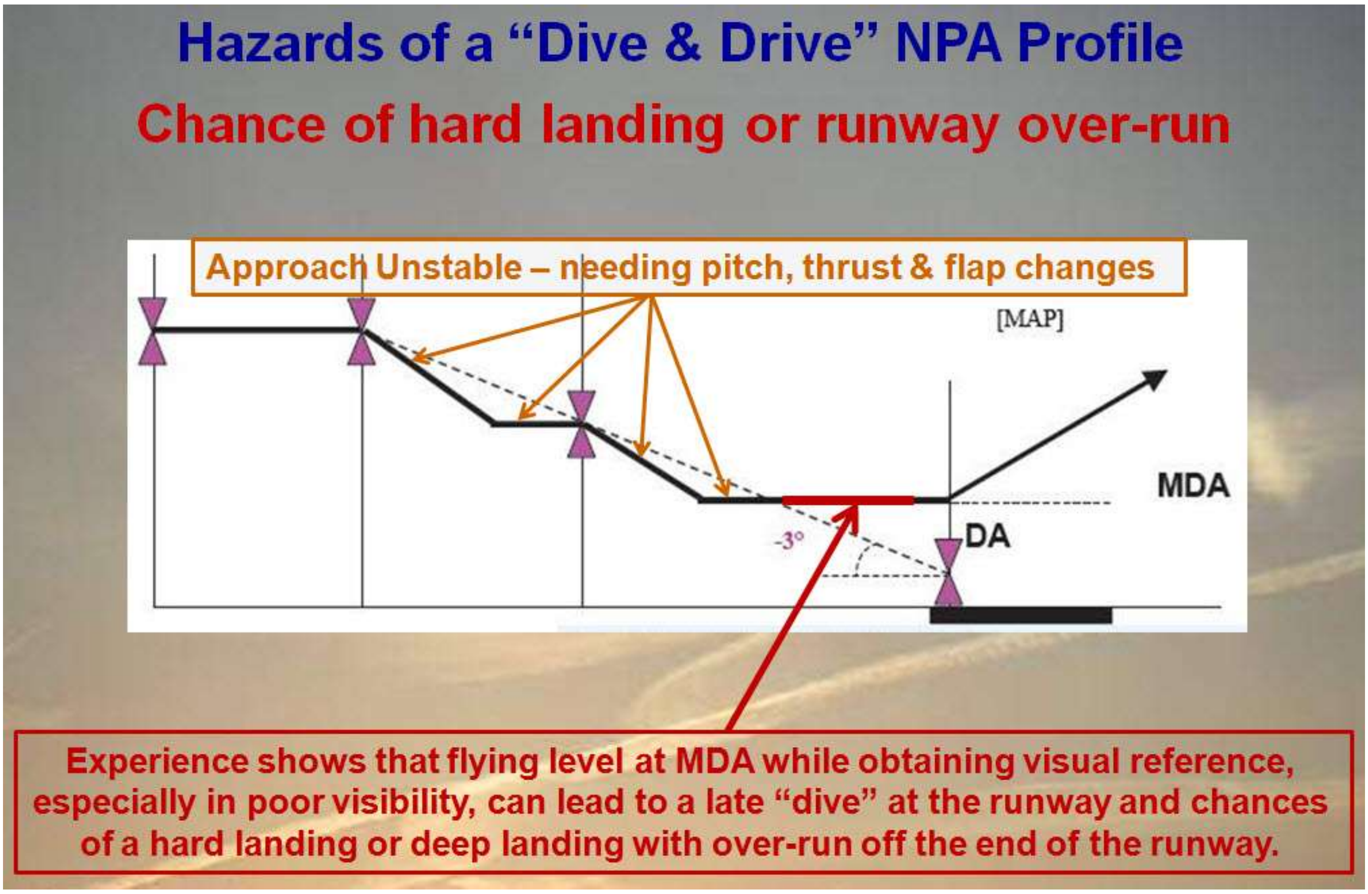


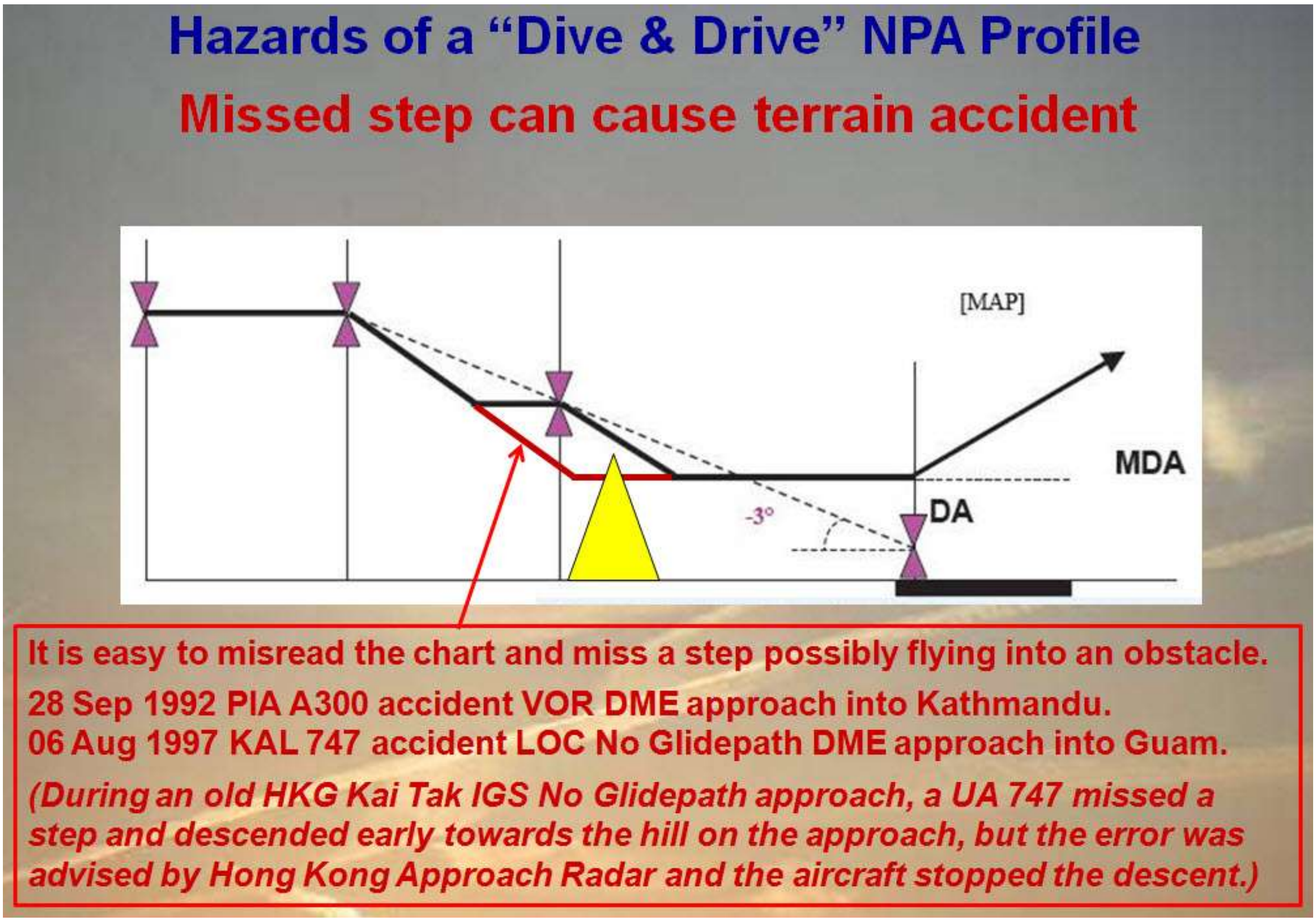
NBO 24 – set behind 1.0 DME at 5,300 ft

TLS 14R – set behind 2.7 DME at 550 ft or Guam 06 – set behind 3.3 at 310 ft

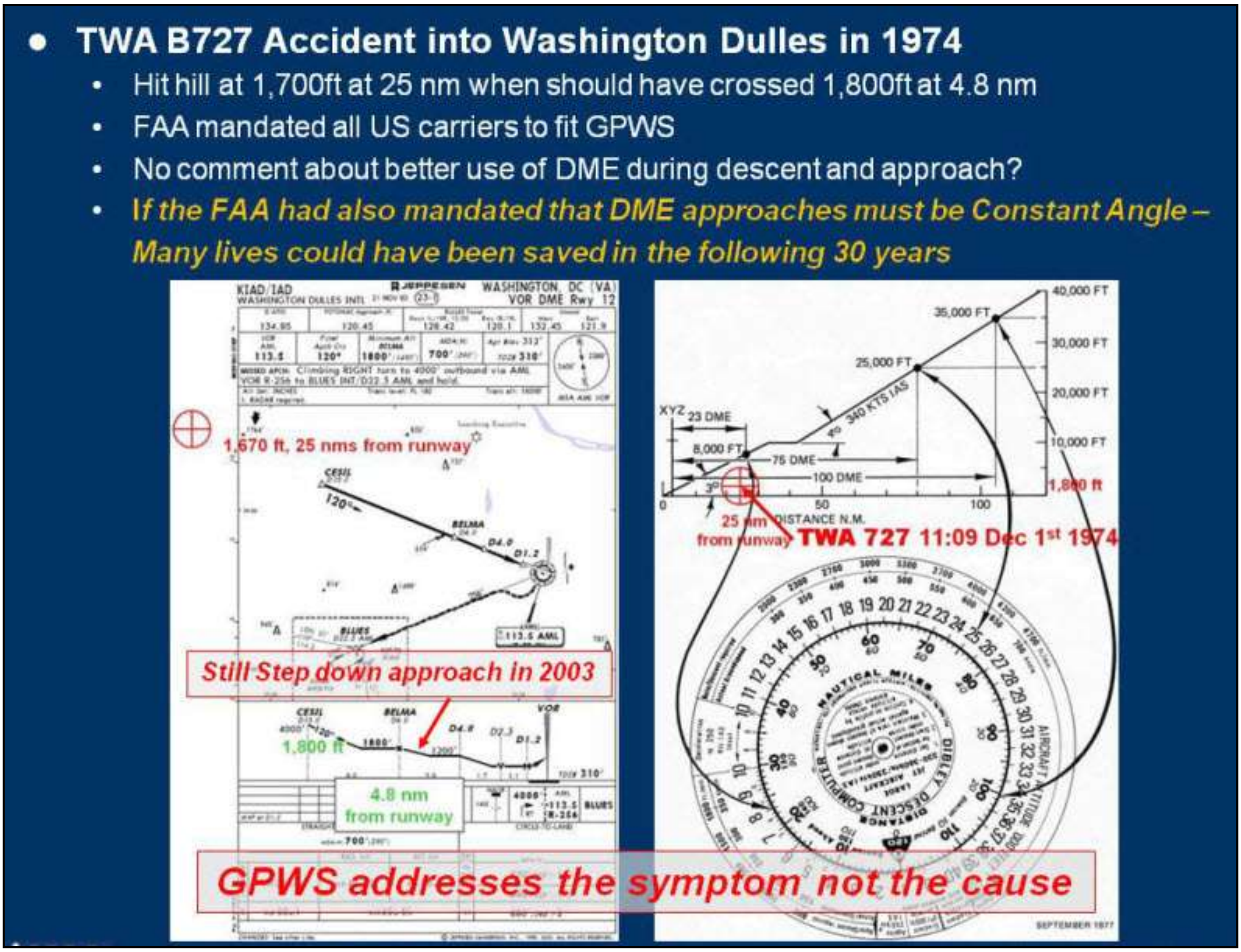
In 1974 the Dibley Glideslope Computer could be set to display a Constant Angle glideslope from a DME in line with the runway, eliminating the need for Step Down / Dive & Drive Non Precision Approaches known to cause more accidents than stabilized Constant Angle Approaches. In1975 BOAC/BAOD published similar information in tables on approach charts adopted by most Europeans operators.



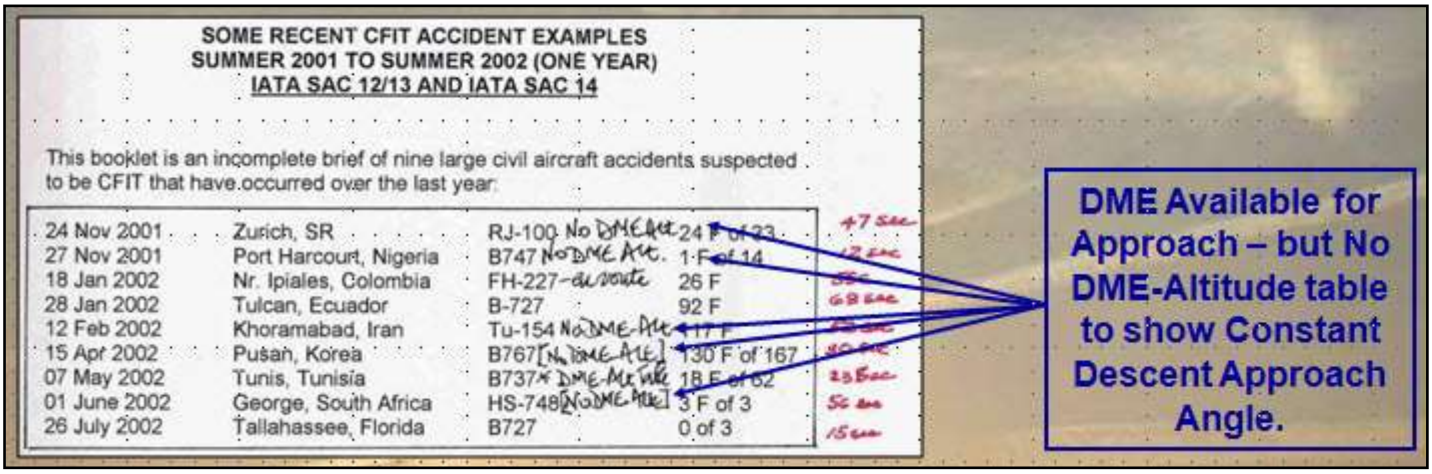




In 2012 Step Down Approaches causing accidents are still being flown



In 1974 a TWA 727 Flight 514 crashed 25nm from Washington Dulles 5,000 ft below its optimum altitude. The accident could have been avoided if the crew had been trained to follow an optimum fuel efficient profile and to fly a Constant Angle Non Precision Approach using DME-Altitude tables – which were then lacking. The US FAA mandated all US operators to install Ground Proximity Warning Systems which alert crews about to crash into the ground but which are not always followed. The prime solution is to avoid the error.



SOME RECENT CFIT ACCIDENT EXAMPLES
SUMMER 2001 TO SUMMER 2002 (ONE YEAR)
IATA SAC 12/13 AND IATA SAC 14

This booklet is an incomplete brief of nine large civil aircraft accidents suspected to be CFIT that have occurred over the last year.

24 Nov 2001	Zurich, SR	RJ-100 No DME Alt	24 F of 33
27 Nov 2001	Port Harcourt, Nigeria	B747 No DME Alt.	1 F of 14
18 Jan 2002	Nr. Ipiales, Colombia	FH-227 -en route	26 F
28 Jan 2002	Tulcan, Ecuador	B-727	92 F
12 Feb 2002	Khoramabad, Iran	Tu-154 No DME-Alt	117 F
15 Apr 2002	Pusan, Korea	B767 [No DME-Alt]	130 F of 167
07 May 2002	Tunis, Tunisia	B737* DME-Alt Table	18 F of 62
01 June 2002	George, South Africa	HS-748 [No DME-Alt]	3 F of 3
26 July 2002	Tallahassee, Florida	B727	0 of 3

In 2003 Don Bateman of Honeywell, who had developed GPWS into the Enhanced GPWS, published information on **9 CFIT (Controlled Flight Into Terrain) accidents** in the previous year which should have been avoided if the aircraft had been fitted with EGPWS.
However **5 accidents might have been avoided** if simple DME-Altitude tables had been published on their approach charts and the crew trained to use them to fly a Constant Angle Non Precision Approach.