Facts Not Phobia

Informing the Public on Aviation Safety Levels

Prescribed aviation safety requirements reflect market reality and not the theoretical wishes of well-meaning bureaucrats.

Dick Smith

Civil Aviation Authority
AUSTRALIA

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The Royal Aeronautical Society's
1991 Sir Charles Kingsford Smith Memorial Lecture

Delivered in Sydney, Australia,
25 September 1991

Dick Smith delivered *"Facts Not Phobia - Informing the Public on Aviation Safety Levels"* as the Royal Aeronautical Society's 1991 Sir Charles Kingsford Smith Memorial Lecture.

This re-print is produced in the interests of furthering informed discussion about the safety of aviation.

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About Dick Smith

At the lecture, Air Vice Marshal Rod Noble (right) presents Dick Smith with the 1991 Sir Charles Kingsford Smith Medal

Dick Smith is a renowned Australian businessman and pilot. He holds fixed wing and helicopter, Australian and US, licences.

He has flown extensively throughout the world in all continents including Antarctica.

He was named Australian of the Year in 1987.

Dick joined the Board of the Civil Aviation Authority, Australia, in June 1988. In February 1990 he was appointed Chairman by the Australian Government.

In his term as Chairman Dick has been the catalyst for a review of Australian airspace which has led to the adoption of an ICAO-based airspace system. His term has seen major changes in the Authority's structure and management. It has also begun a major re-equipment program to provide Australia with a state-of-the-art, internationally-used air traffic control system.

Dick is Publisher and Editor in Chief of the *Australian Geographic* journal and the *Australian Encyclopedia*.

I am honoured that the Royal Aeronautical Society has invited me to deliver the Sir Charles Kingsford Smith Memorial Lecture.

Smithy is admired by generations of Australians not only for his courage and for his flying feats but for his foresight on how the world aviation industry would develop. His feats demonstrated all that is fantastic about aviation: technology, the excitement of adventure, that sense of achievement and the entrepreneurial spirit which typifies so many of the people who have worked in this great industry. His pioneering flights were the basis for long-distance flying that we all benefit from — but in far greater safety than Smithy ever experienced.

The journalist Pedr Davis wrote of him in his book, *Smithy, The World's Greatest Aviator:*

> *"Smithy was impatient with officials who failed to share his vision of civil aviation. He had travelled the world many times over and could see, with almost prophetic clarity, the direction aviation was headed."*

I must admit that from time to time I have felt some affinity with Smithy on these frustrations.

Smithy, of course, also had his problems with the media. The most famous brush followed the Coffee Royal affair where it became apparent that the news coverage of the event was purposely staged to improve sales.

It seems that 60 years later, little has changed, especially when it comes to aviation safety.

Throughout the world the media treat aviation safety in a subjective and emotive way. This is probably because the prime objective of the media in a free enterprise society is to make-

money for shareholders. No doubt many in the media believe that the harum-scarum reports of aviation accidents and incidents sell newspapers or attract ratings.

In Australia, we can kill 20 or so people on the roads in a single weekend with hardly a mention in the media, but the forced landing of an ultralight aircraft in a paddock will bring headlines. In fact over 60 000 Australians have been killed on our roads in the last 20 years, yet not one person has died in an accident while travelling by jet airline in this country.

Figure 1 gives an example of recent reporting in Australian newspapers in relation to aviation safety.

FIGURE 1

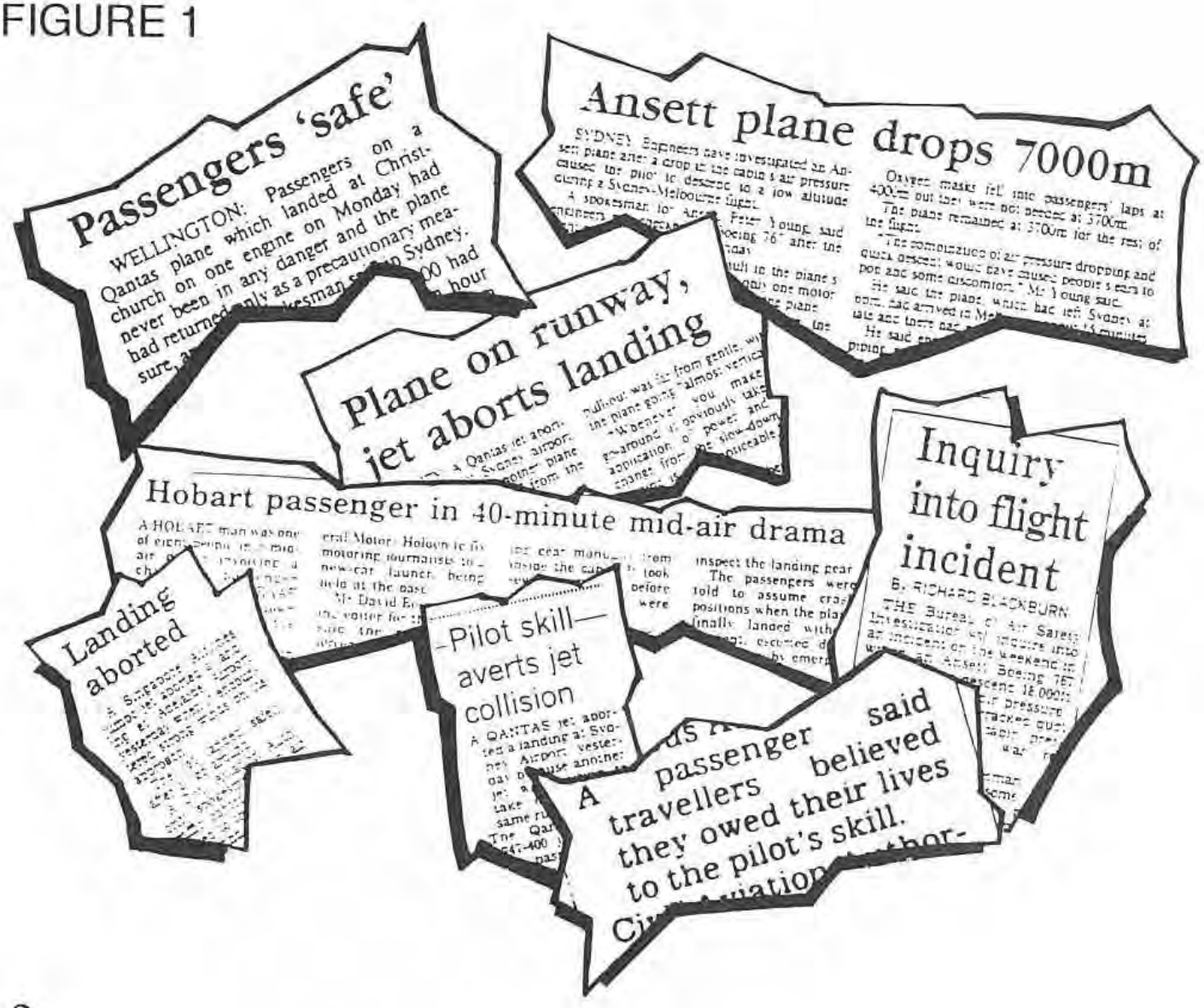
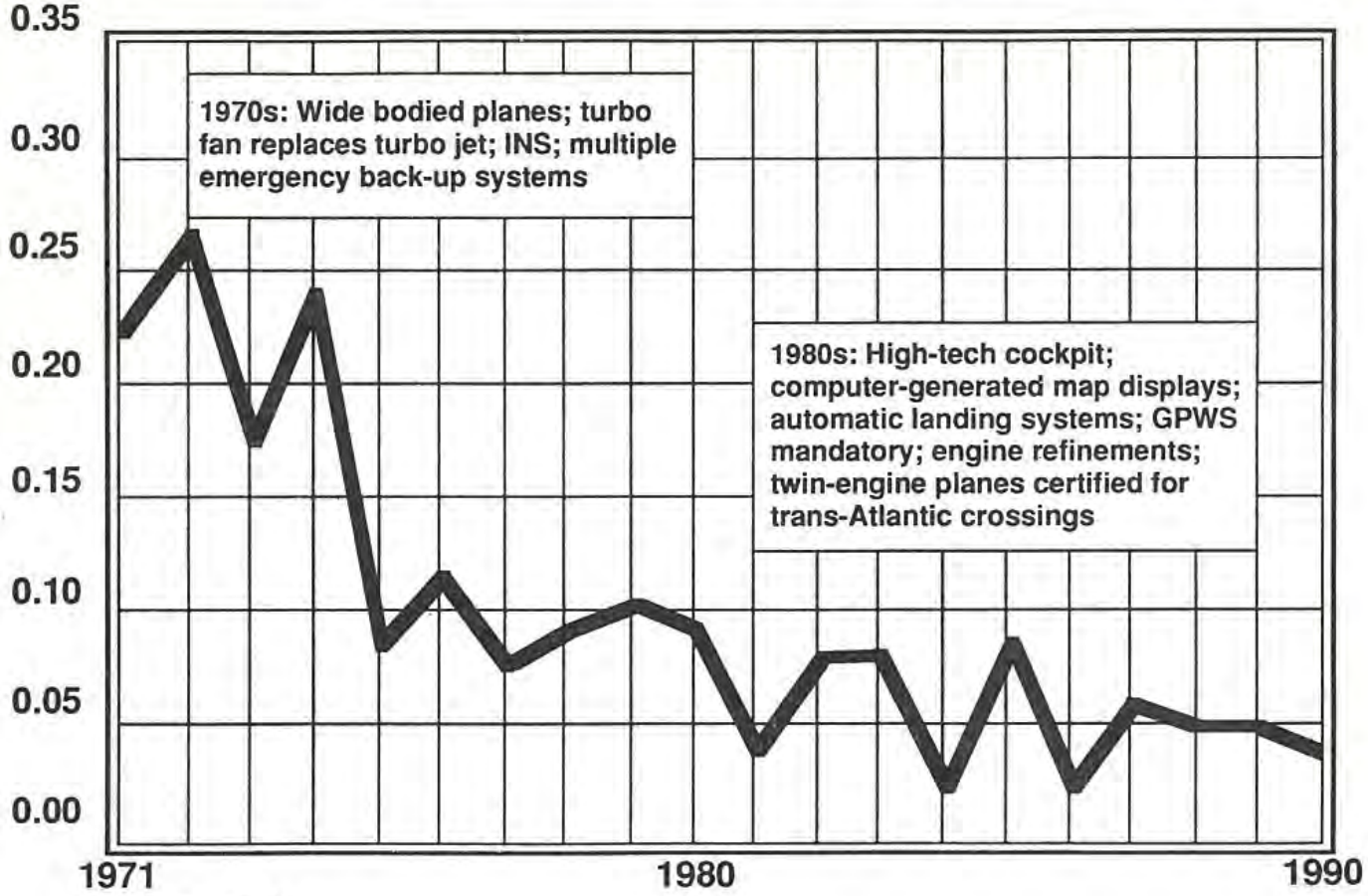


Figure 2: **Passenger Fatalities / 100 million Passenger KMs : 1971-1990**



Source: ICAO

The emotive approach is obvious. This is extraordinary when you consider that the trauma of loved ones and the cost to society are the same whether a person dies in an aviation accident or any other accident. Of course, aviation accidents can result in a large number of lives being lost, which the media must take into account, but this fails to explain the almost hysterical coverage of small incidents, in many cases involving light aircraft.

Most importantly this emotive reporting is not, as some would believe, the result of a worsening aviation safety record. Figure 2 shows the substantial improvement in flying safety over the last 20 years. Of course, you would never know this from media reports.

Another explanation for the hype is that some of those who earn a living from aviation, including pilots, air traffic staff and maintenance personnel, have long realised that an emotive statement to the media in relation to air safety is often the best way of ensuring high salaries and the continuation of inefficient practices.

My view is that it is the world aviation industry itself that is largely responsible for the emotive reaction to aviation safety because it has failed to effectively inform the media and the travelling public of the facts.

People respond emotively because of the fear of the unknown. To allay this fear, it is the responsibility of the industry to provide facts so that to the media and public, flying is less of an unknown.

In this paper I present some of these facts and go further in proposing that we inform people who fly about the different levels of aviation safety that are expressly provided by legislation and achieved in practice. I am proposing this so that people can make informed decisions about flying.

In other words I propose we de-emotionalise this issue as much as possible. I propose we show a safety rating on the air ticket or prominently at the place of booking. This has the potential to improve safety as it will reduce the misallocation of safety resources that often happens now due to uninformed and emotive media reporting.

Let me explain.

In the past a myth was propagated that in aviation safety there are no compromises. And in particular that government legislators should never be swayed to take into account commercial

considerations; that safety always came before cost. And if the regulations were strictly followed, you had potentially a totally safe system.

A leading airline executive was quoted in the 20 March 1989 issue of *Time* magazine: "Aviation in Australia is perfectly safe".

The facts are quite different.

Surely it is obvious that no one can have absolute safety or complete absence of risk while they are alive. Even staying at home has a level of risk. Every form of transport involves some risk.

Risk may be reduced by spending money. In fact ultimately the limit to risk reduction is the amount of money that is spent on it. This amount is finite. It is limited by what those who pay for it can afford. As there is never enough money available to implement every risk-reduction action that people can invent, we must constantly make decisions as to which compromise results in the money that is available being spent the most effectively.

Spending more money on some aspects of safety can actually have adverse effects. For example, in 1990 consumer groups in the USA proposed that child safety seats be compulsory for infants under two years of age on airlines. This would have required parents to buy airline seats for their infants, as the present rules allow parents to carry their infants on their laps without charge. However the safety regulators showed that the increased cost of air tickets would force many families away from air travel, which would result in 1600 more automobile accidents[1] and between 20 and 35 times more road deaths than the potential lives saved aboard aircraft through safety seat use.

A key factor in aviation is that efficiencies of scale allow much more to be spent on risk reduction for large aircraft than smaller aircraft. This is reflected in legislation which prescribes different levels of safety. This level of safety is set not to what the user desires (obviously the highest attainable) but to what the user can afford.

Diagram 1 shows the relative safety levels of four popular aircraft. All comply with Australian and international safety requirements even though the safety levels vary greatly. As the diagram shows, the larger the aircraft, the higher the capital cost of each seat. This would appear to be the opposite to that expected from efficiencies of scale.

How then do the efficiencies of scale work in aviation, and how does this affect safety?

Diagram 1: **Safety and the Cost of Travel**

TYPE OF TRAVEL	TYPICAL USE	CAPITAL COST PER SEAT	FATAL ACCIDENTS PER 100,000 HOURS
CESSNA 172 • Single engine • 4 place	Private Flying	$25,000	1.5
CESSNA 414 • Twin engines • 8 place	Charter	$100,000	0.8
BEECH KING AIR • Twin turbo prop • 10 place	R P T Commuter	$300,000	0.2
BOEING 747 • 4 engined jet • 400 place	R P T Airline	$500,000	0.03

Source: Safety Ratings - The Best and the Worst. *The Aviation Consumer*, December 1, 1985, Vol. XV, No. 23/24.
NOTE: Ratings for particular aircraft types based on US data..

efficiencies of scale come from two areas : construction cost savings per seat and operating cost savings-per-seat. Passengers in a Boeing 747 and a Cessna 172 generally have a similar set of needs for their flight. These include low cost, speed, comfort, convenience, and of course safety. Each aircraft is a compromise in construction.

A large aircraft could be built with the speed comfort and safety characteristics of a Cessna 172 which would be cheaper per seat than the 172 to construct and operate. Conversely, an aircraft with only four seats could be built with the same level of safety and other features as a Boeing 747 but it would cost tens of millions of dollars and nobody could afford to travel in it.

Companies who build aircraft know that the market wants a mix of benefits. They build larger aircraft that use most of the efficiencies gained by scale to increase safety, rather than reduce ticket cost further because they know that by doing this they will attract more passengers to their type of aircraft. They will sell more aircraft to airline operators because of this and make more profits for themselves.

Thus some of the cost savings from scale efficiencies in larger aircraft, that are normally used to reduce cost to passengers, are used to increase safety. Even though passengers always want the higher level of safety, they can only afford it when there are offsetting efficiencies of scale.

Aviation regulators throughout the world can only realistically specify the level of safety that a particular group of flyers can afford, otherwise the group ceases to exist as a group of flyers. For example, if we legislated for the highest levels of safety for all types of flying the cost per passenger for a service to, say a small country town, would be prohibitively high. Few could afford it, and many would move to road travel. This would be less

safe because travelling by road involves greater risk. Research has shown that a 10 per cent increase in airfares will lead to about a 2 percent increase in overall transport deaths. [2]

Everyone would like all flying to be safer. And the aviation industry continues to improve its safety record as illustrated earlier in Figure 2. Yet, as we have seen, different safety levels exist, and are tolerated, for the different types of flying.

The existence of these disparate safety levels shows clearly that the level of safety attained depends on the amount of money spent on it and this in turn depends on what the traveller can afford. Prescribed aviation safety requirements reflect market reality and not the theoretical wishes of well-meaning bureaucrats.

Obviously regulators have a clear responsibility to ensure that the prescribed levels are maintained-that travellers get what they pay for. However, having recognised that the legislation and the market provide widely varying levels of safety, is there a responsibility to inform the user about the different levels of risk? I believe there is.

Surely those assuming a risk have the right to choose as far as possible that level because this is an essential part of people's democratic rights. They need factual information to do this.

Diagram 2 compares the safety of the various types of flying to the safety of motor vehicle travel. I have made this comparison because most people are familiar with motor vehicle travel and obviously accept its level of risk. The comparison will help people better understand the facts about aviation safety and make informed and, hopefully, objective choices about air travel.

It should be noted that all forms of paid air travel are safer than

Diagram 2: **The Safety of Air Travel**

	FATALITIES PER 100 BILLION PASSENGER KMs	AIR TRAVEL COMPARED WITH GENERAL ROAD TRAVEL
AIRLINE	19 *	90 times more safe
COMMUTER	374	5 times more safe
CHARTER	967	2 times more safe
GENERAL ROAD TRAVEL	1700	-
PRIVATE BUSINESS FLYING	10,666	16 % as safe
MOTORCYCLE	17,500	10 % as safe
ULTRALIGHTS	60,000 * *	3 % as safe

* Average of US & Australian scheduled services. There have been no fatal accidents in Australia since 1975.

* * Estimated.

Source: Bureau of Air Safety Investigation (BASI); Australian Ultralight Federation (AUF); International Civil Aviation Organisation (ICAO); FAA Statistical Handbook of Aviation.

travelling by car - varying from about twice as safe, if the traveller has chartered a small plane, to five times as safe in a commuter aircraft, to 90 times safer with the airlines. Private flying is not as safe as travelling by car, but is still safer than travelling by motorcycle - a mode chosen by over 300,000 Australians.

Diagram 3 (page 10) presents a safety rating scale for the different types of aviation. This rating scale will also help people in making these decisions. Already a number of Australian authorities issue safety ratings as a public service. These include fire danger ratings and beach pollution ratings in several states and recently in Sydney, beach swimming safety ratings have been proposed.

It is obvious to most people that flying in a 747 is safer than flying in an ultralight aircraft. But there are many who would not

Diagram 3: **Suggested Aviation Safety Ratings**

TYPE OF FLYING	SAFETY RATING	MAJOR POINTS OF SAFETY	Fatal Accidents Per 100,000 Hrs (Aust)*
AIRLINE • **Scheduled**	1	• As for charter, plus highest standard Air Operator's Certificate (CAO 82.5); additional route checks for pilots (CAR 218); airports well above minimum standards (eg rescue equipment available)	0.02
• **Charter**	2	• Large, mostly multi-engine turbo-jet aircraft; minimum 2 crew; extensive pilot training, min. 2000 hrs experience, hold a SCPL or ATPL • Aircraft certificated to CAO 101.6 transport category (e.g. FAR 25), performance conforms with CAO 20.7.1B e.g. capable of single engine performance, fitted with multiple back-up systems and safety features (ground proximity warning system), sophisticated navigation systems (INS, GPS) • Extensive system of maintenance (CAO 100.5.2) • Operate to CAO 82.1 Air Operator's Certificate (FAR 121) • Cabin attendants - safety and passenger service	
COMMUTER • **Scheduled**	3	• As for charter, plus: cabin crew in larger aircraft (safety) operate into licenced airports • Medium sized aircraft (at FAR 25 standard) frequently used	0.20
• **Charter**	4	• 9 to 38 passengers - mostly turbo-prop aircraft (higher safety) • 1 or 2 crew, minimum 1000 to 2000 hrs experience, hold at least a Commercial Pilot Licence (CPL) but probably an Airline Transport Pilot Licence (ATPL) • Aircraft certificated to CAO 101.22, performance conforms with CAO 20.7.2 (FAR 23) • Operate to CAO 82.3 Air Operator's Certificate (FAR 125) • Complex maintenance schedule	
GA CHARTER • **Twin engines**	5	• As below, plus: additional pilot training	0.96
• **Single engine**	6	• As for private flying, plus: min pilot training of 175 hrs (Commercial Pilot Licence); additional pilot experience required; operate to CAO 82.1 Air Operator's Certificate	
GA PRIVATE • **Twin engines**	7	• As below, plus: higher standard of equipment (multiple instruments for all weather flying); additional training for pilot	1.80
• **Single engine**	8	• Most aircraft commercially made • Minimum pilot training around 60 hrs (Private Pilot Licence) • Aircraft performance to CAO 20.7.4 (FAR 23), operations similar to FAR 91 • Mandatory maintenance, certified by Lic. Aircraft Maint. Eng. (CAO 100.5.1, FAR 43)	
ULTRALIGHT • **Registered**	9	• As below plus : self-regulated by association (e.g., AUF, construction and pilot training); some a/c commercially built ; certification through CAO 101.55 , or 101.28	5.19
• **Unregistered**	10	• Mostly home-built, min CAA involvement (e.g. CAO 95.10, 95.12), full cert. not required • Minimum pilot training through sport association; maintenance mostly by owner	

* Bureau of Air Safety Investigation, various reports, AUF. Airline and ultralight rates have been estimated.

NOTE: General road travel would rate between 6 &7 on this scale

understand the subtle safety differences between flying in a scheduled airline aircraft and the identical aircraft on a charter flight. The rating scale has been developed using Australian and international safety statistics together with the professional judgement of some of the CAA's experts to develop the different classes.

It should be emphasised that these ratings are assessments based on averages only, and individual aircraft or flights may be more, or less, safe than the average ranking. It should also be pointed out that where users have personal control, say as a pilot in a private or ultralight aircraft, they can substantially improve their degree of safety by increasing their expertise and caution. Passengers in a private aircraft can improve their level of safety by carefully choosing their pilot and aircraft.

This safety rating scale should be widely communicated to people involved in all levels of flying. For commercial operations the rating number could be printed on the air ticket, and shown with booking information.

It would be desirable to expand this rating register to provide a further incentive to operators to improve safety levels. This could be done by a professional or consumer organisation allocating and approving an additional suffix to the rating. For example, an aircraft operator could be approved to attach a suffix "A" to its rating scale number. This suffix should be available if the operator has achieved certain prescribed conditions connected with safety. These would include a proven maintenance track record, a safety record above the industry average, and evidence that the operator is performing and spending more money on safety than is prescribed by the regulations. The "A" suffix must be earned by evidence of superior safety for the particular safety rating category in Diagram 3. The suffix should be available to all categories of flying, including ultralights,if

they can earn it. The "A" suffix could be reconsidered each year.

Conclusion

The real challenge to the safety regulator is to be aware of changing conditions. A better understanding of the facts and pressures on aviation safety by both the media and the public will allow the regulator to be less influenced by emotive and subjective pressure and as conditions change, move the safety-dollar to where it will save the most lives.

FOOTNOTES

1 Statement by Anthony J Broderick, Associate Administrator for Regulation and Certification, Federal Aviation Administration before the House Committee on Public Works and Transportation, concerning H.R. 4025, July 1990, in which he quotes data from the FAA commissioned study "An Impact Analysis of Requiring Child Safety Seats in Air Transportation", Apogee Research Inc., June 4 1990, and "Ending the Free Airplane Rides of Infants : A Myopic View of Saving Lives", by Professor Richard B. McKenzie (Professor of Economics and Finance at the University of Mississippi) and Dwight R. Lee (Professor of Economics at the University of Georgia), 1990.

2. Brookings Institution economists Stephen Morrison and Clifford Winston in "The Dynamics of Airplane Pricing and Competition", American Economic Review, p. 390 determined that USA airfares under deregulation were on average 18 percent lower than they would have been in a regulated environment. Professor Richard B. McKenzie (then Professor of Economics at Clemson University and an adjunct fellow at the Center for the Study of American Business (CSAB) at Washington University in St Louis) and John Warner (also a Professor of Economics at Clemson University) in "The Impact of Airline Deregulation on Highway Safety", CSAB, 1987, p.19, estimated that deregulation increased flying by over 11 percent. They also estimated that on average this was accompanied by a 3.9 percent reduction in passenger car miles, and a 3.5 percent reduction in total automotive deaths. Assuming a straight line relationship and ignoring other structural effects of deregulation, a 10 percent drop in airfares is therefore associated with a 1.94 percent drop in road deaths. The increase in fatalities from air travel is negligible in comparison. McKenzie and Shughart found that airline deregulation did not appear to have increased fatalities from air travel. (Richard B. McKenzie and William F. Shughart, "Deregulation's Impact on Air Safety : Separating Fact from Fiction", OP 65, CSAB, Sept 1987.)